YMAE Air-Cooled Inverter Scroll Chiller and Heat Pump

35 ton to 140 ton, 60 Hz, R-454B

035-27485-000

Installation Guide

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New Release

Contents

General safety guidelines

Important: Read before proceeding.

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals might be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled incorrectly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating and service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, operating, and service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, before performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question

Safety symbols

The following symbols are used in this document to alert the reader to specific situations:

DANGER

Indicates a possibly hazardous situation which will result in death or serious injury if correct care is not taken.

WARNING

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if correct care is not taken.

CAUTION

Identifies a hazard which could lead to damage to the machine, damage to other equipment and environmental pollution if correct care is not taken or instructions and are not followed.

Note: Highlights additional information useful to the technician in completing the work being performed correctly.

Changeability of this document

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual or product owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls Knowledge Exchange website at https://docs.johnsoncontrols.com/chillers/.

It is the responsibility of rigging, lifting, and operating/service personnel to verify the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, rigging, lifting, and operating and service personnel should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the chiller.

Wiring warning

⚠ WARNING

External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls' published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

Refrigerant warning

⚠ WARNING

Working with chiller vessels which are designed to contain contents under pressure must only be conducted by fully qualified technicians who have been certified in accordance with EPA Section 608 of the Clean Air Act requirements for the US or equivalently the Federal Halocarbon Regulations and the Refrigerant Code of Practice for Canada. This equipment is only intended for installation in locations that are not accessible to the general public. Further, this equipment is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge. Refrigerant R-454B is classified as an A2L refrigerant and must be handled in accordance with all governing regulations. Failure to meet this requirement can result in damage to equipment, release of refrigerant into the environment, contamination of the operating space for the equipment and pose a risk of personal injury or death. It is the responsibility of any service technician or operator to adhere to these requirements. See *160.00-AD10* for greater details regarding the application and use of A2L refrigerants.

Conditioned based maintenance

Traditional chiller maintenance is based upon assumed and generalized conditions. In lieu of the traditional maintenance program, a Johnson Controls YORK Conditioned Based Maintenance (CBM) program can be substituted. This CBM service plan is built around the specific needs for the chiller, operating conditions, and annualized impact realized by the chiller. Your local Johnson Controls Branch can propose a customized Planned Service Agreement that leverages real time and historical data, delivering performance reporting, corrective actions required and data enabled guidance for optimal operation and lifecycle assurance. The program will include fault detection diagnostics, operation code statistics, performance based algorithms and advance rules based rationale delivered by the Johnson Controls Connected Equipment Portal.

Nomenclature

Table 1: YMAE example

Y	M	A	E	0035	P	J	P	46
1	2	3	4	5	6	7	8	9

Table 2: YMAE nomenclature

Number	Description	Options
1	Brand	Y: York
2	System type	M: Variable speed
3	Chiller type	A: Air cooled
4	Design series	E: Scroll
5	Nominal capcaity	0035
		0070
		0105
		0140
6	Unit designator	P: Premiumn efficiency
7	Refrigerant	J: R-454B
8	Unit configuration	P: Two pipe
		S: Four pipe
9	Voltage	46: 460 V, 3 Ph, 60 Hz

General chiller information and safety

Note: Before operating the unit, refer to *Chiller A2L Refrigerant Application Data, Form 160.00-AD10*.

About this guide

The contents of this guide include suggested best working practices and procedures. These are issued for guidance only, and they do not take precedence over the stated individual responsibility or local safety regulations.

This guide and any other document supplied with the unit are the property of Johnson Controls, which reserves all rights. They may not be reproduced, in whole or in part, without prior written authorization from an authorized Johnson Controls representative.

Introduction

YORK YMAE heat pumps are manufactured to the highest design and construction standards to ensure high performance, reliability, and adaptability to all types of air conditioning installations.

The unit provides chilled water, hot water, or glycol solutions for air conditioning applications and industrial processes using central station air handling or terminal units.

The unit combines a variable speed control design with industry-leading DC inverter technology allowing the unit's compressors and EC fans to operate more efficiently than constant speed units across all capacity-load and ambient-temperature conditions. It is designed for part-load efficiency exceeding ASHRAE 90.1 2022 standard.

Ensure that only a professional rigger does the rigging and lifting, in accordance with a written rigging and lifting plan. The most appropriate rigging and lifting method depends on job specific factors, such as the rigging equipment available and site needs. As a result, a professional rigger must determine an appropriate rigging and lifting method, and it is beyond the scope of this guide to specify rigging and lifting details.

Note: The rigger must locate the center of gravity through trial lifts to account for possible variations in unit configurations. Contact your nearest Johnson Controls Sales Office for weight data. See Rigging, handling, and storage for more details.

This guide contains all the information required for installing, commissioning, operating, and maintaining the unit. Read the relevant information thoroughly before attempting to operate or service the unit. Ensure only suitably trained and qualified personnel perform the installation, commissioning, operation, and maintainence procedures.

The manufacturer is not liable for any injury or damage caused by incorrect installation, commissioning, operation, or maintenance resulting from a failure to follow the procedures and instructions detailed in the guide.

Warranty

Johnson Controls warrants YMAE chillers in accordance with the Limited Warranty Engineered Systems Equipment procedure. Refer to Form 50.05-NM2.

Johnson Controls warrants all equipment and materials against defects in workmanship and materials for a period of eighteen months from date of shipment or 12 months from date of startup, whichever comes first, unless labor or extended warranty has been purchased as part of the contract. The warranty is limited to parts only replacement and shipping of any faulty part, or sub-assembly, which has failed due to poor quality or manufacturing errors. All claims must be supported by evidence that the failure has occurred within the warranty period, and that the unit has been operated within the designed parameters specified.

All warranty claims must specify the unit model, serial number, order number and run hours/starts. Model, serial number, and order number information is printed on the unit identification plate.

The unit warranty will be void if any modification to the unit is carried out without prior written approval from Johnson Controls. For warranty purposes, the following conditions must be satisfied:

- The initial start of the unit must be carried out by trained personnel from an authorized Johnson Controls Service Centre.
- Only genuine Johnson Controls approved spare parts, oils, coolants, and refrigerants must be used.
- All the scheduled maintenance operations detailed in this manual must be performed at the specified times by suitably trained and qualified personnel.
- Failure to satisfy any of these conditions will automatically void the warranty.

Handling

These units are shipped as completely assembled units containing full operating charge. Take care to avoid damage due to rough handling.

Safety standards

YMAE units are designed and manufactured within an ISO9002 accredited organization and comply with the applicable sections of the following Standards and Codes:

- ARI 550/590: Performance Rating of Water-chilling and Heat Pump Water-heating Packages Using the Vapor Compression Cycle
- ARI 370: Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
- ANSI/ASHRAE 15: Safety Code for Mechanical Refrigeration
- ASHRAE 90.1: Energy Efficiency compliance.
- ANSI/NFPA 70: National Electrical Code (N.E.C.)
- ASME Boiler and Pressure Vessel Code, Section VIII, Division 1
- UL 60335-1: Safety of Household and Similar Electrical Appliances, Part 1: General Requirements
- UL 60335-2-40: Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers
- Conform to Intertek Testing Services, formerly ETL, for construction of units and provide ETL or cETL listing label.
- OSHA: Occupational Safety and Health Act
- Manufactured in facility registered to ISO 9002

Fluorinated greenhouse gases

- This equipment contains fluorinated greenhouse gases covered by the Kyoto Protocol.
- The global warming potential of refrigerant R-454B is 466.
- See Table 10 and Table 11 for the refrigerant quantity.
- Do not vent the fluorinated greenhouse gases in this equipment to the atmosphere. Follow ASHRAE 15 and other local safety regulations.
- This equipment must only be serviced by qualified technicians.

Responsibility for safety

Every care has been taken in the design and manufacture of the unit to ensure compliance with the safety requirements. However, the individual rigging, lifting, maintaining, operating, or working on any machinery is primarily responsible for:

- Personal safety, safety of other personnel, and the machinery.
- Correct utilization of the machinery in accordance with the procedures detailed in the guide.

Misuse of equipment

Suitability for application

The unit provides chilled water, hot water, or glycol solutions for air conditioning applications and industrial processes using central station air handling or terminal units. Using any equipment outside its intended use, or operating the equipment contrary to the relevant procedures may result in injury to the operator, or damage to the equipment.

Do not operate the unit outside the design parameters specified in this guide.

Structural support

Structural support of the unit must be provided as indicated in these instructions. Failure to provide the correct support may result in injury to the operator, or damage to the equipment or building.

Mechanical strength

The unit is not designed to withstand loads or stresses from adjacent equipment, pipework, or structures. Do not mount additional components on the unit. Any such extraneous loads may cause structural failure and may result in injury to the operator, or damage to the equipment.

General access

Potentially hazardous areas or features can cause injury when working on the unit, unless personnel take suitable safety precautions. It is important to ensure access to the unit is restricted to suitably qualified personnel who are familiar with the potential hazards and precautions necessary for safe operation and maintenance of equipment containing high temperatures, pressures, and voltages.

Pressure systems

The unit contains refrigerant vapor and liquid under pressure, release of which can be a danger and cause injury. The user must take care during installation, operation and maintenance to avoid damage to the pressure system. Untrained and unqualified personnel must not attempt to gain access to the component parts of the pressure system. Ensure only suitably trained and qualified personnel access the component parts of the pressure system.

Electrical

The unit must be grounded. Do not attempt installation or maintenance work on the electrical equipment without switching the power off, and isolating and locking-off the power supply. Do not attempt any servicing and maintenance on live equipment. Do not attempt to gain access to the control panel or electrical enclosures during normal operation of the unit.

Heat radiation

Some of the visible components, like the discharge pipe and driver heat sink, may work under high temperatures and radiate high-heat flux. Pay special attention while getting close to the unit. Do not touch the unit during normal operation.

Rotating parts

Fan guards must be fitted at all times and not removed unless the main power supply has been isolated. If you remove the wire fan guards when fitting ductworks, take alternative safety measures to protect against the risk of injury from rotating fans.

Sharp edges

The fins on the air-cooled condenser coils have sharp metal edges. Frame rails, panels, and other components may also have sharp edges. Take reasonable care when working in contact with the coils or any components to avoid the risk of minor abrasions and lacerations, such as wearing appropriate gloves.

Refrigerants and oils

Working with chiller vessels that are designed to contain contents under pressure must only be conducted by fully qualified technicians who have been certified in accordance with EPA Section 608 of the Clean Air Act requirements for the US or equivalently the Federal Halocarbon Regulations and the Refrigerant Code of Practice for Canada. This equipment is only intended for installation in locations that are not accessible to the general public. Further, this equipment is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge. Refrigerant R-454B is classified as an A2L refrigerant and must be handled in accordance with all governing regulations. Failure to meet this requirement can result in damage to equipment, release of refrigerant into the environment, contamination of the operating space for the equipment and pose a risk of personal injury or death. It is the responsibility of any service technician or operator to adhere to these requirements. Refer to *Chiller A2L Refrigerant Application Data, 160.00-AD10* for more details regarding the application and use of A2L refrigerants.

Refrigerants and oils used in the unit are generally non-toxic and non-corrosive. However, use gloves and safety glasses when working on the unit. The buildup of refrigerant vapor, from a leak for example, does pose a risk of asphyxiation in confined or enclosed spaces and attention must be given to good ventilation.

Use only the refrigerant and oil specifically designated for the unit. Any other type of refrigerant or oil may cause damage to the equipment and voids the warranty.

High temperature and pressure cleaning

Do not use high temperature and pressure cleaning methods, for example steam cleaning, on any part of the pressure system as this may cause operation of the pressure relief devices. Also avoid using detergents and solvents, which may cause corrosion.

Emergency shutdown

In case of emergency, the control panel is fitted with an incoming supply circuit breaker switch that acts as the emergency stop device. When operated it removes all the electrical supply, excluding the customer voltage, to the control panel and the unit shuts down. The emergency stop only interrupts control power. Use the main circuit breaker when working in the unit.

MSDS information

To obtain the Manufacturer Safety Data Sheets (MSDS) information, call (800) 451-8346 in the US or email SDS@verisk3e.com. Provide the product name, manufacturer, part number, and the specific language required. For additional safety information, refer to https://my.jci.com/sites/BE/NASafety

Generator operation

The variable speed drive (VSD) can operate on a generator, provided that the generator's output voltage can be maintained within the voltage specifications for the drive. When switching from utility power to generator power, allow a minimum of a 10 s delay. This same delay is required when switching power back from generator power to utility power, unless using a synchronized transfer system.

Safety labels

The following labels are fixed to each unit to give instruction or to indicate potential hazards that may exist.

Table 3: Safety symbols

Symbol	Description
	White symbol on nameplate or labels. For safe operation, read the instructions firstly.
	Black symbol on yellow background. Warning: This machine may start automatically without prior warning.
	Black symbol on yellow background. Warning: Hot surface.
	Black symbol on yellow background. Warning: Safety relief valve may discharge gas or liquid without prior warning.
	Black symbol on yellow background. Warning: Isolate all electrical sources of supply before opening or removing the cover, because lethal voltages may exist.
	Black symbol on yellow background. General attention symbol.
	Black symbol on yellow background or white symbol on nameplate. R-454B refrigerant is classified as an A2L refrigerant due in part to its designation as mildly flammable. Correct precautions are required when handling A2L refrigerants. Furthermore, ensure that all local building and safety codes, including and not limited to ASHRAE 15, are reviewed and followed.

YMAE units with R-454B refrigerant

R-454B refrigerant is classified as a Group 1 PED fluid and Safety class A2L in accordance with ISO 817.

Check your local regulations and the correct standards, such as those in Safety standards, to verify the allowable filling charge, new equipment design, and safe handling requirements for the intended application.

When an equipment standard provides guidance for charge limitations, the equipment standard overrules charge limitations in the general safety standard.

The pressure relief valves fitted to YMAE units with R-454B refrigerant are individually approved in accordance with existing standards under ASME from the manufacturer. National and local standards may apply regards relief valves and refrigerant release into the environment.

Do not retrofit an existing system with other refrigerants such as R-410A or R-454B in the field. For more information, contact your local Johnson Controls branch.

Product description

Before operating the unit, refer to *Chiller A2L Refrigerant Application Data, Form 160.00-AD10*.

Introduction

YMAE Air-Cooled Modular Chillers and Heat Pumps provide chilled water or hot water for all air conditioning applications and industrial processes using central station air handling or terminal units. They are completely self-contained and are designed for outdoor installation, either at roof or ground level. Each complete packaged unit includes hermetic scroll compressors, plate heat exchanger, air-cooled ambient coils, R-454B refrigerant charge, and a weather resistant microprocessor control center, with all these components mounted on a rugged steel base.

The units are completely factory-assembled with all interconnecting refrigerant piping and wiring ready for field installation. The unit is pressure tested, evacuated, and, in most cases, fully factory-charged with refrigerant and oil in each of the independent refrigerant circuits. After assembly, an operational test is performed with water flowing through the heat exchanger to ensure that each refrigerant circuit operates correctly.

The unit structure is manufactured from heavy-gauge, galvanized steel coated with baked-on powder paint. Units are designed in accordance with NFPA 70 (National Electric Code), ASHRAE/ ANSI 15 Safety code for mechanical refrigeration, ASME, and rated in accordance with ARI Standard 550/590.

Optional corrosion-resistant wire mesh grills or special quote offering hail guards protect the condenser coils from external damage and restrict unauthorized access.

General system description

Compressors

YMAE is a direct current (DC) inverter scroll compressors that is driven directly by an external driver. An acoustic blanket comes as standard on compressors to improve sound levels. Compressor crankcase heaters are included for extra protection against liquid migration. The inverter scroll compressors is UL certified.

Refrigerant circuits

Each single module has a dual circuits design.

Each circuit incorporates the following components:

- A suction accumulator.
- A liquid receiver.
- Discharge and suction service ball valves.
- Discharge and suction dual safety relief valves.
- An oil separator, fitted on each of the inverter compressor circuits.
- Electronic expansion valve (EEV).
- Economizer plate heat exchanger (PHE) and enhanced vapor injection (EVI) EEV for enhanced vapor injection and performance improvement.
- A four-way reversing valve.

The EEV works as the throttle device and supports automatic adjustment of refrigerant flowrate under optimized conditions to ensure fast cooling or heating, precise temperature control, and energy saving. It permits operation for both air conditioning, seasonal cooling or heating applications, and full-year industrial processes at high efficiency, with the benefit of an inverter compressor and EC fan system.

Discharge pressure transducers automatically adjust ambient coil fan speed to suit different ambient conditions and protects the unit from over pressure. Suction pressure transducers ensure correct suction superheat control.

The EVI does two things to enhance performance:

- The EVI uses a BPHE that subcooled liquid refrigerant stacking from the condenser passes through on one side before reaching the main EEV.
- On the other side of the BPHE, refrigerant is metered at the inlet by the EVI's EEV that is piped back to the liquid line before reaching the main EEV. The leaving refrigerant metered side of the BPHE is piped back to suction side of compressor

This process creates a pressure drop, transferring the cool gas caused by the pressure drop flashing from liquid to vapor to the already subcooled liquid coming from the condenser, further subcooling it. After this, the remaining cool gas returns to the compressor allowing for a wider envelope of compressor motor cooling and lower discharge superheat, especially during low load conditions when cool suction return gas would otherwise be insufficient.

Heat exchanger

The compact, high-efficiency brazed plate heat exchanger (BPHE) is constructed with 316L stainless steel corrugated channel plates with a filler material between each plate. Units with two refrigerant systems use dual circuit BPHEs.

The refrigerant-side design working pressure of the heat exchanger is 725 psi (50 bar) and the waterside, or piping, design working pressure is 334 psi (23 bar).

BPHE inlet and outlet connections are grooved for compatibility with standard Victaulic connections. A 30-mesh wye-strainer is provided as standard for installation upstream of the BPHE to prevent clogging from liquid system debris, particularly at system start-up when construction debris may be present in the piping system.

The BPHE is equipped with a thermostat-controlled heater for freeze protection within the operational evelope and insulated with 3/4 in. (19 mm) flexible, closed-cell foam.

The flow switch is a standard offering for each module, installed in a pipe section at the outlet of the BPHE.

Ambient coils

Coils: Fin and tube coils of seamless, internally-enhanced, high-condensing-coefficient, corrosion resistant copper tubes are arranged in staggered rows, mechanically expanded into hydrophilic aluminum fins. The designed working pressure of the coil is 650 psig (45 bar).

Fans: The ambient fans are composed of corrosion-resistant aluminum blades sprayed with PP plastic and galvanized sheet steel fan housing coated with black plastic. They are designed for maximum efficiency with integrated VSD. All blades are statically and dynamically balanced for vibration-free operation. The fan grilles are constructed of heavy-gauge, rust-resistant, coated steel.

EC motors: The fans are directly driven by electrical commutation (EC) motors. Fan speed is controlled through Modbus® communication.

SPC, control panel, and HMI

The single point connection (SPC) and control panel are contained in an IP 54 cabinet with a hinged, latched, and gasket sealed outer door. Each module contains a control panel, and each unit contains a human-machine interface (HMI), the Optiview™ LT HMI, contained in the IP54 cabinet.

SPC:

- The SPC box with circuit breaker is used to provide a single point connection for each modular array and isolate the power for servicing.
- The SPC terminal box is an optional offering to support multi-module arrays.

Control panel:

- A factory-mounted circuit breaker with external, red lockable handle to enable connection of the unit power supply. The circuit breaker can be used to isolate the power for servicing, and also be used as an emergency stop device.
- Factory-mounted filter board with fuses to provide protection for each inverter compressor driver. It converts alternating current into DC to drive the variable-speed compressor.
- Factory-mounted fuses to provide protection for each fan.
- The unit microprocessor control board (IPU3).
- A relay board connected to the control board to extend digital output.
- A factory-mounted fuse to provide protection for the hydro kit of a single module.
- A factory-mounted control transformer must be wired to the power panel, with input/output fuse protection and emergency stop isolation to supply the 115-1-60 from the unit power supply.

HMI:

- Password protected.
- Access level restrictions for operation and servicing.
- Multi-language LCD controls and keypad display, with English as the default language.

SC-equip (SC-EQ)

A factory-mounted SC-EQ communication card provides BAS network connectivity and communication capability for BACnet (MS/TP), Modbus, and N2 as standard.

The SC-EQ communication card is designed with three active serial ports: The J3 BAS (RS-485) port, the J5 equipment (RS-485) port, and the J1 CS port or remote unit monitoring and diagnostics.

⚠ CAUTION

Locate the chiller control panel in a physically secured area with access only to authorized personnel. To further tighten security, ensure that the control panel is mechanically locked. Remove the keys to the control panel and store them in a secure location.

Canadian registration number (CRN) application

YMAE BPHE are categorized as pressure H fittings per CSA-B51. According to the Canadian Standards Association's Boiler, Pressure Vessel, and Pressure Piping Code B-51 (2009 version), a product registered as a category H fitting does not require a label or marking displaying the CRN.

YMAE refrigeration systems' individual circuir power rated less than 125kW are exempted from CRN registration. These systems are covered by CSA C22.2 and must be tested and certified by an approved testing laboratory, equivalent of UL 60335-2-40/1995 in the US.

Accessories and options

Low sound kit

The option includes acoustic insulation for the unit's lower panels. You can use these for residential or other similar sound-sensitive locations.

Neoprene pads isolators

Johnson Controls suggests using neoprene pads isolators for standard installations, which you must mount in the field.

1 in. spring isolators

Level adjustable, spring and cage-type isolators for mounting under the unit base rails. They must be field-mounted.

2 in. spring isolators

Restrained spring isolators incorporate a rugged, welded steel housing with vertical and horizontal limit stops. Housings are designed to withstand a minimum 1.0 G accelerated force in all directions up to 2 in. (51 mm). They are level adjustable and field-mounted.

Flow switch for special temperature difference

Vaporproof, paddle-type with 1 in. NPT connection for upright mounting in horizontal piping. The flow switch is a standard offering for each unit with standard flow settings. An optional flow switch is available for larger liquid temperature differences that allows a minimum flowrate down to 37 gpm (140 Lpm) with glycol applications. For applications where the single module flowrate is less than 57 gpm (140 Lpm), select the optional low-flow type flow switch.

Water temperature sensor in a modular array

For 0070PJ, 0105PJ, and 0140PJ units, or the modular applications with a combination of multiple modules, additional system outlet water temperature sensors, BLST 1, BLST 2, are required for modular control. PJP two-pipe models require one system temperature sensor for one water loop, PJS four-pipe models require two system temperature sensors for two water loops. Install the system water temperature sensors on the customer supply header pipe. The sensors are necessary for compressor sequencing and water side protection. Field-mounted.

Hydro kit

The external hydro kit option is suitable for water or glycol systems with an open drive air-cooled variable speed motor. The pump kit for two-pipe, single modules is factory-mounted with 0035PJP models. The hydro kit for other models is loose-shipped and field-mounted.

The hydro kit option is available in a single or dual pump configuration and includes an inlet strainer, air purge, drainage valve, and trace heater in the water pipe. The second pump is for standby use only.

Corrosion-resistant unit wire and panel enclosures are also available for the hydro kit.

Enclosure panels

Tamperproof enclosure panels prevent unauthorized access to units. Enclosure panels can provide an aesthetically pleasing alternative to expensive fencing. The following types of enclosure panels are available:

- **Wire panels**: Consists of welded wire-mesh panels on the airside coils section of the unit. Factory-mounted.
- **Hail guard**: Consists of sheet metal stamping guard net panels on the airside coils section of the unit. Hail guard can be SQ offering. Factory-mounted.

Air-to-water heat pump unit modes of operation

The two-pipe heat pump has two operation modes: cooling only or heating only. A reversing valve changes the function of the heat exchangers to provide either heated or cooled liquid as required. A third operating mode, defrost cycle, is enabled automatically as necessary to remove ice build-up when the unit is in heating operation.

The four-pipe heat pump has three operation modes: cooling only, heating only, and simultaneous heating and cooling. Intelligent control logic of the operation mode can meet dynamic cooling and heating load in one building, offering an integrated cooling and heating solution. A fourth operating mode, defrost cycle, is enabled automatically as necessary to remove ice buildup when the air source heat exchanger is functioning as an evaporator.

Two-pipe cooling mode

Low-pressure liquid refrigerant enters the brazed plate heat exchanger (BPHE), it is evaporated, and superheated by the heat energy absorbed from the chilled water. Low-pressure vapor flow enters the compressor through the four-way reversing valve and accumulator, where pressure and superheat are increased

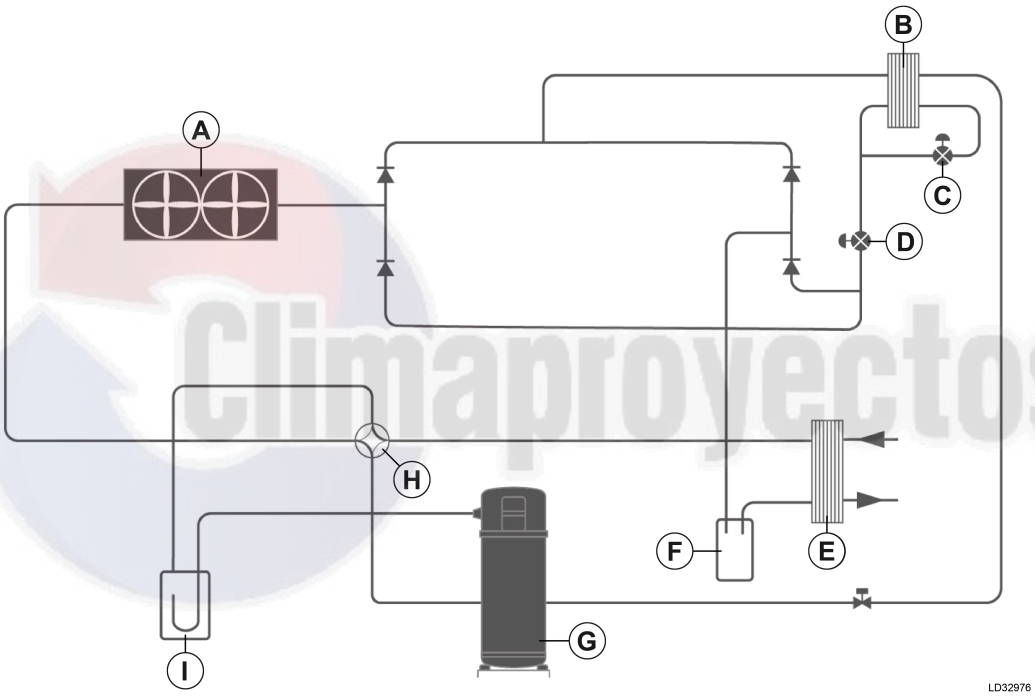
High-pressure vapor is fed to the ambient coils through the four-way reversing valve, where heat is removed. Then, the refrigerant flows from the condenser coil to the enhanced vapor injection's (EVI) BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's electronic expansion valve (EEV), the refrigerant flow is evaporated and superheated in the EVI's BPHE, then flows to the compressor as a cool gas. Also happening parallel to this, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure causing the cooling effect to occur in the BPHE before returning to compressor through the accumulator starting the refrigerant cycle over.

Two-pipe heating mode

Low-pressure liquid refrigerant enters the air source coil, it is fully evaporated, and superheated by the energy absorbed from the ambient air. Low-pressure superheated refrigerant vapor passes through the four-way reversing valve through the accumulator and enters the compressor, where pressure and superheat are increased.

High-pressure superheated refrigerant vapor enters the main BPHE where heat is rejected to the water. Then, the refrigerant flows from the main BPHE to the EVI BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's EEV, the refrigerant flow is evaporated and superheated in the EVI's BPHE, then flows to the compressor as a cool gas. Also happening parallel to this, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure for the air source coils to absorb heat from the ambient air before returning to compressor through the accumulator starting the refrigerant cycle over.

Figure 1: Two-pipe refrigeration system diagram



Callout	Component	Callout	Component
A	Fan coil	F	Receiver
B	Economizer PHE	G	Compressor
C	EVI EEV	H	Four-way valve
D	Main EEV	I	Accumulator
E	BHPE	–	–

Note: This figure is for reference only. It does not reflect the actual PID.

Four-pipe cooling mode

Low-pressure liquid refrigerant enters the cooling BPHE through solenoid valve SV2 through the main EEV, it is evaporated and superheated by the heat energy absorbed from the chilled water. Low-pressure vapor flow enters the compressor through the accumulator, where pressure and the superheat are increased.

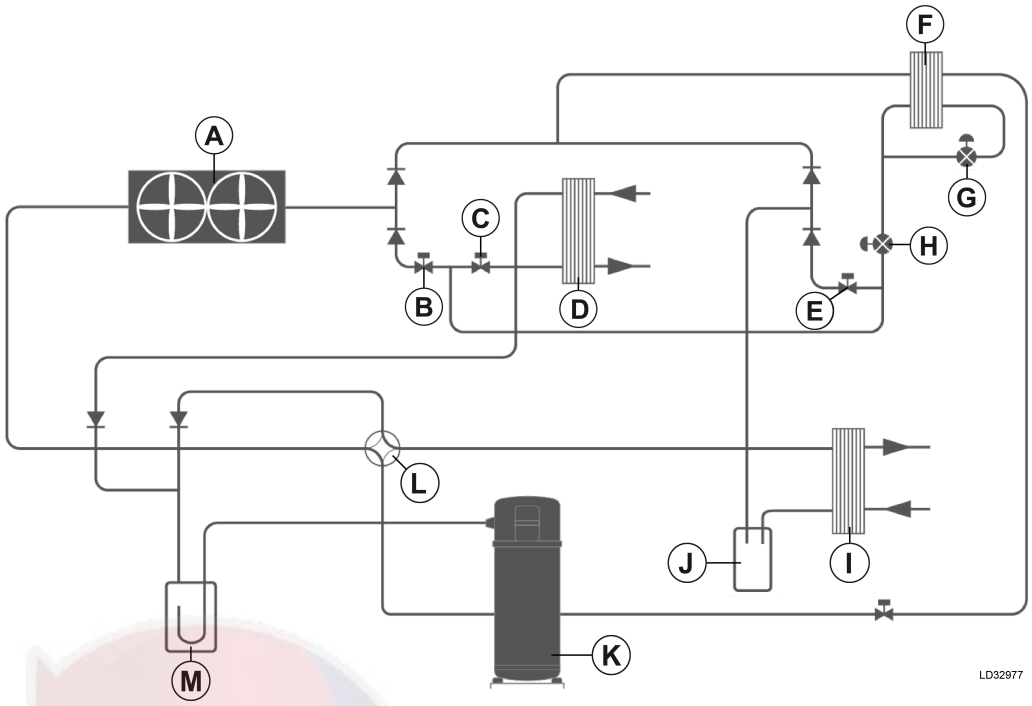
High-pressure vapor is fed to the ambient coils through the four-way reversing valve, where heat is removed. Then, the refrigerant flows from the condenser coil to the EVI BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's EEV, the refrigerant flow is evaporated and superheated in the EVI's BPHE, then flows to the compressor as a cool gas. Also happening parallel to this, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure causing the cooling effect to occur in the BPHE before returning to compressor through the accumulator starting the refrigerant cycle over.

Four-pipe heating mode

Low-pressure liquid refrigerant enters the air source coil through the main EEV, then passes through SV1 and is fully evaporated and superheated by the energy absorbed from the ambient air. Low-pressure superheated refrigerant vapor passes through the four-way reversing valve and the accumulator, then enters the compressor where pressure and superheat are increased.

High-pressure superheated refrigerant vapor enters the main BPHE where heat is rejected to the water. Then the refrigerant flows from the main BPHE to the EVI BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's EEV, the refrigerant flow is evaporated and superheated in the EVI's BPHE, then flows to the compressor as a cool gas. Also happening parallel to this, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure for the air source coils to absorb heat from the ambient air before returning to compressor through the accumulator starting the refrigerant cycle over.

Figure 2: Four-pipe refrigeration system diagram



Callout	Component	Callout	Component
A	Fan coil	H	Main EEV
B	SV1	I	Heating BHPE
C	SV2	J	Receiver
D	Cooling BHPE	K	Compressor
E	SV3	L	Four-way valve
F	Economizer PHE	M	Accumulator
G	EVI EEV	–	–

Defrost mode

When ice builds up on the ambient coils, an automatic defrost cycle is initiated with the air-source coil working as a condenser. Each of the refrigerant circuits are defrosted separately. When in defrost mode, the circuit operating in heat pump mode is in balance with the circuit operating in defrost (cooling). Heat output is, at worst case, net zero during defrost period.

Advanced defrost logic is employed to reduce defrost cycle time and system impact. This includes the following capabilities:

- Defrost based on the refrigerant pressure.
- Subcooling circuits are designed to prevent ice build-up at the bottom of the coil.
- Defrost staging logic that cycles circuits through defrost sequentially, minimizing deviation from setpoint during defrost. No more than half of the total number of circuits can defrost at the same time. In the most extreme case, the system provides net zero heating output for the defrost period.
- The defrost generates water, which collects in the unit drain pan below the coils and channels out the bottom of the unit frame through large diameter flexible tubing. The drain pan and tubing are freeze protected by the heat generated inside the unit cabinet. It is possible to include a drain under each unit to collect condensate water and move it away from the working area surrounding the unit.

Figure 3: Ambient heat exchanger

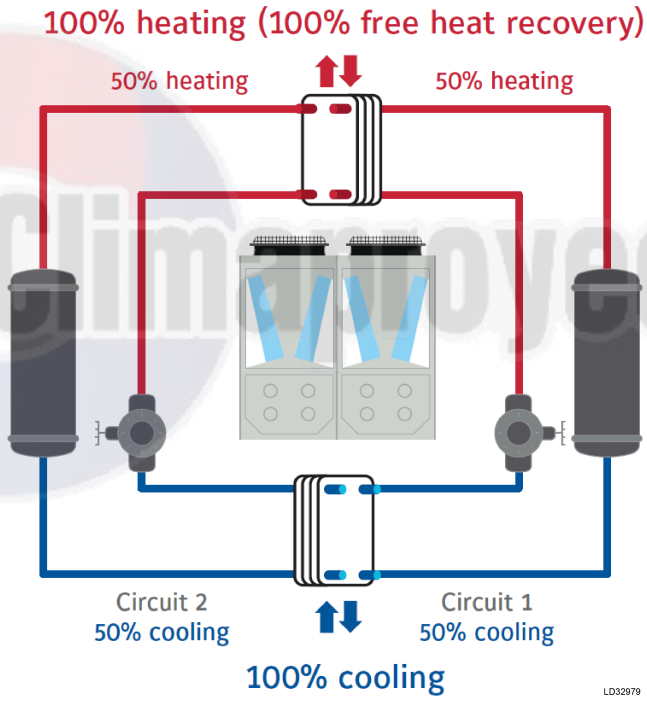
Four-pipe simultaneous cooling and heat recovery

Air source coils are not utilized during simultaneous heating and cooling mode other than defrost mode. Low-pressure liquid refrigerant enters the cooling BPHE through solenoid valve SV2 and is fully evaporated and superheated by the energy absorbed from the chilled water loop. Low-pressure superheated refrigerant vapor passes through the accumulator and enters the compressor, where pressure and superheat are increased.

High-pressure superheated refrigerant vapor enters the heating BPHE where heat is rejected to the hot water loop. The subcooled refrigerant flows from the heating BPHE to the receiver, then to the EVI's BPHE to be further subcooled. Simultaneously, a portion of the subcooled refrigerant flow passes through the EVI's EEV, the refrigerant flow is then evaporated and superheated in the EVI's BPHE, then returns to the compressor as a cool gas. Also happening parallel to this, the main portion of the subcooled liquid refrigerant flow passes through the main EEV, significantly reducing the pressure causing the cooling effect to occur in the BPHE before returning to compressor through the accumulator starting the refrigerant cycle over.

The four-pipe heat pump can simultaneously provide both heating and cooling to different zones or areas within a building.

Figure 4: Simultaneous heating and cooling



Control logic auto-balances cooling and heating within the YMAE four-pipe chiller allowing independent and dynamic control of both hot and chilled water temperatures. Auto-balance logic also maximizes the utilization of cooling with heat recovery to improve energy efficiency.

To avoid the unit frequently shutting off and turning on cycling and to ensure water temperature is stable, the building system water volume needs to be above the recommended minimum value.

Component location diagrams

Figure 5: 0035 component locations

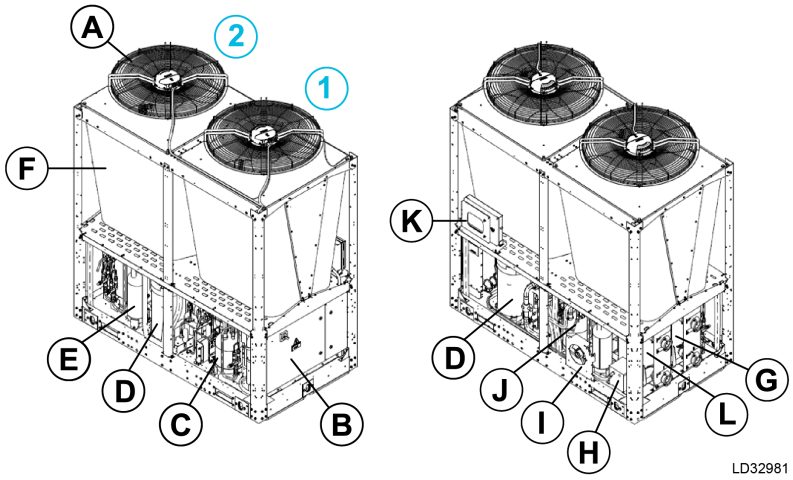


Figure 6: 0070 component locations

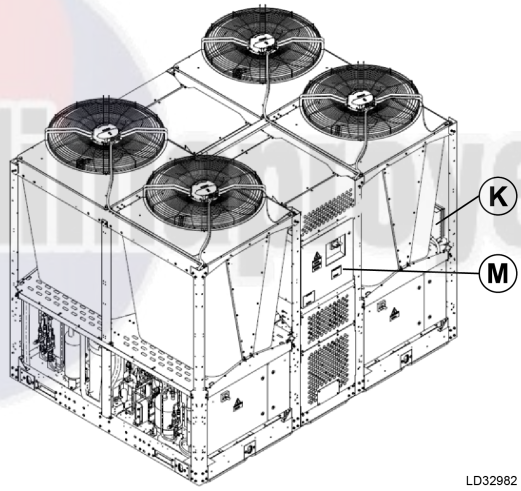


Figure 7: 0105 component locations

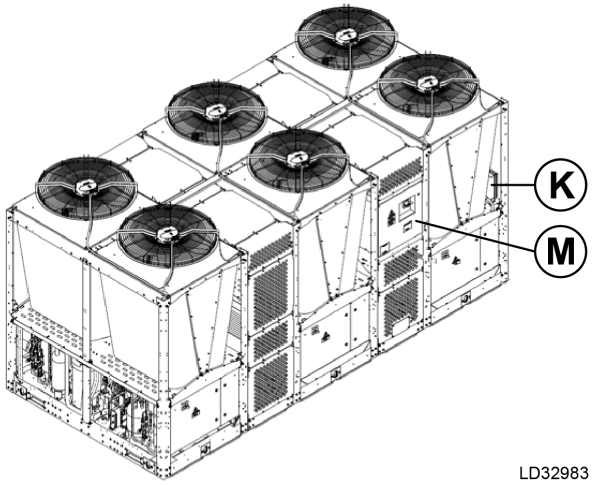
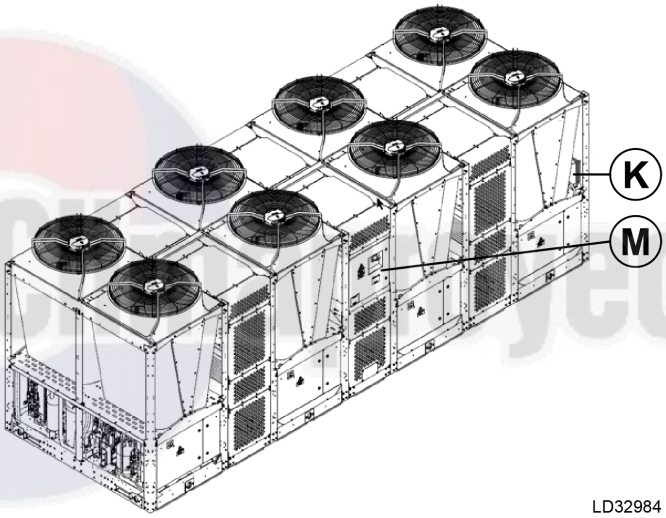


Figure 8: 0140 component locations



Callout	Description	Callout	Description
1	Unit one	G	Hot water heat-exchanger
2	Unit two	H	Control circuits transformer
A	Fans	I	Ventilation fan
B	Control panel	J	Pressure relief
C	Accumulator	K	HMI
D	Compressor	L	Chilled water heat-exchanger
E	Receiver	M	SPC box
F	Ambient coil	–	–

Figure 9: Pump kit 0035SS

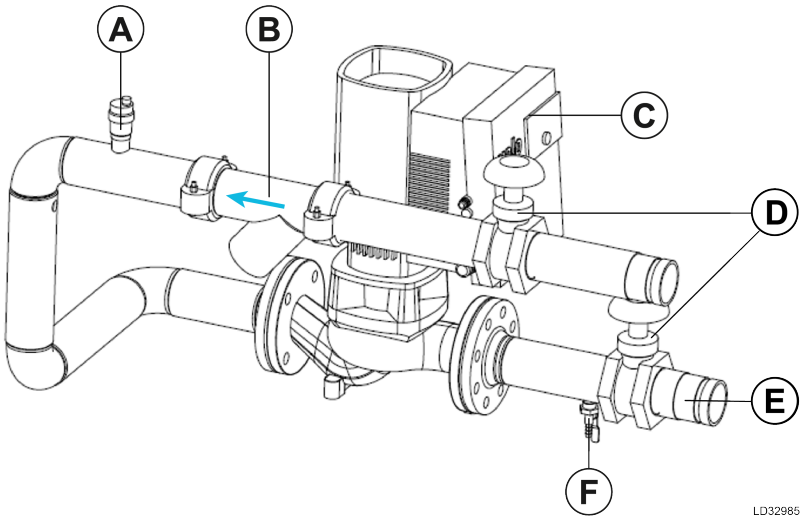
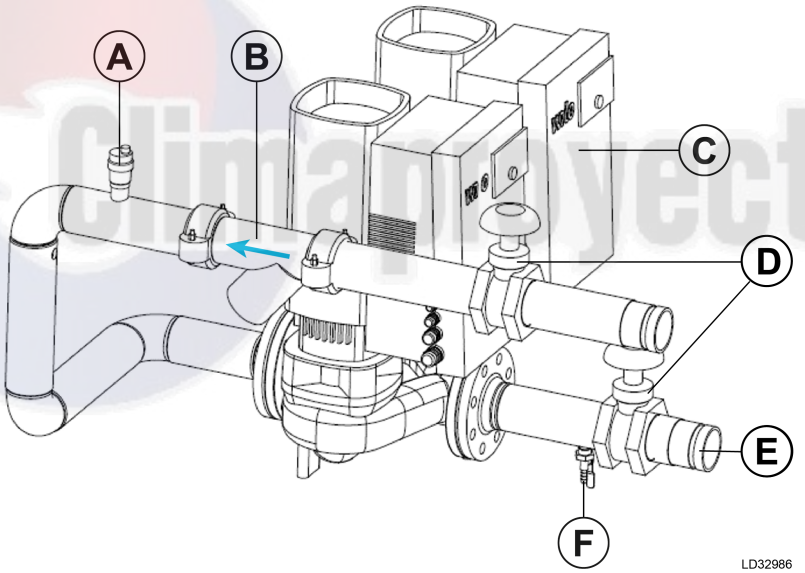


Figure 10: Pump kit 0035DS



Callout	Description	Callout	Description
A	Air purger	D	Shutoff valves
B	Strainer	E	Connection to unit
C	VSD pump	F	Drainage valves

Figure 11: Pump kit 0035SP

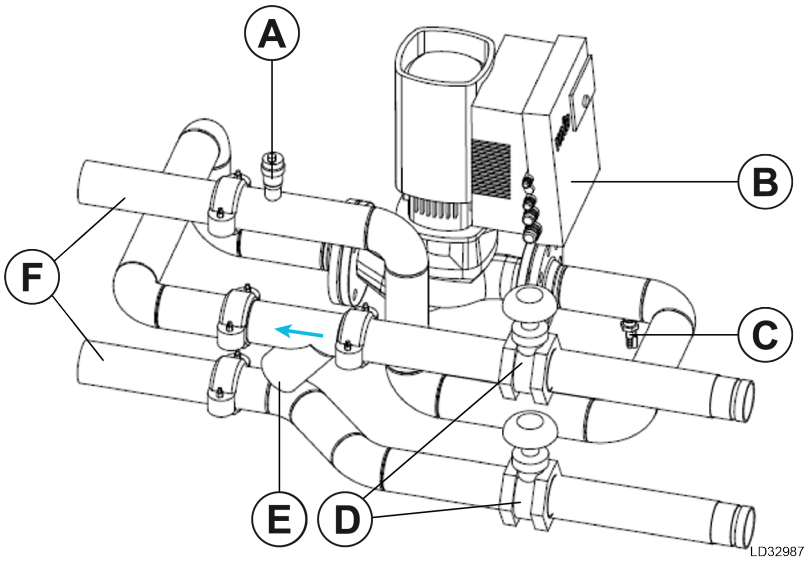
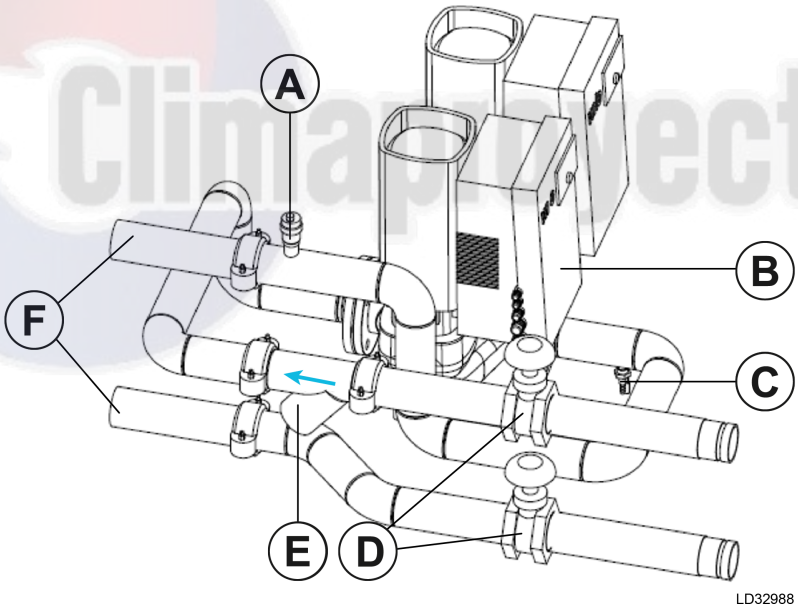


Figure 12: Pump kit 0035DP



Callout	Description	Callout	Description
A	Air purger	D	Shutoff valves
B	VSD Pump	E	Strainer
C	Drainage valves	F	Connection to unit

Figure 13: Pump kit 0070S

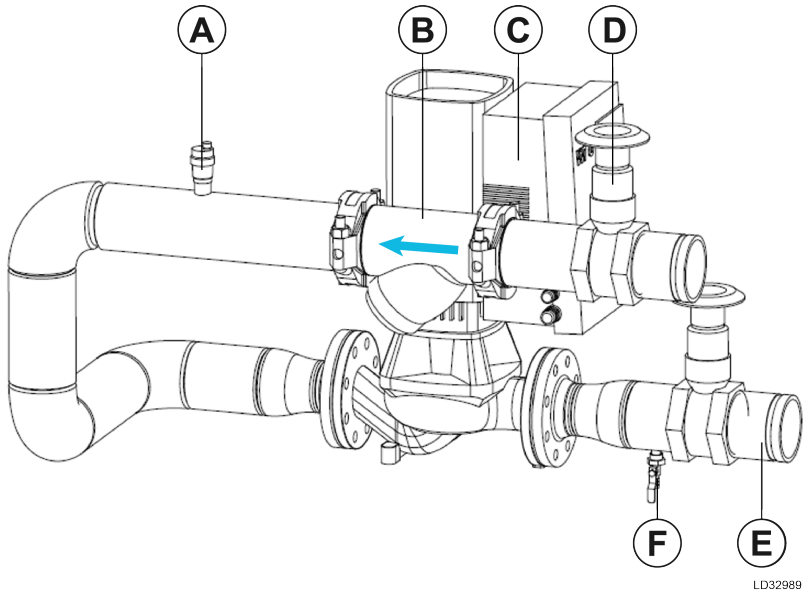
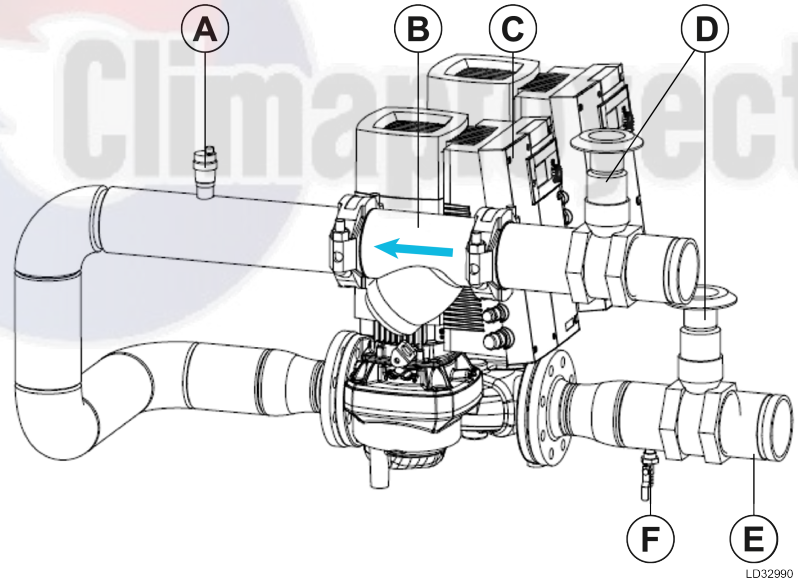


Figure 14: Pump kit 0070D



Callout	Description	Callout	Description
A	Air purger	D	Shutoff valves
B	Strainer	E	Connection to unit
C	VSD Pump	F	Drainage valves

Figure 15: Pump kit 0105S

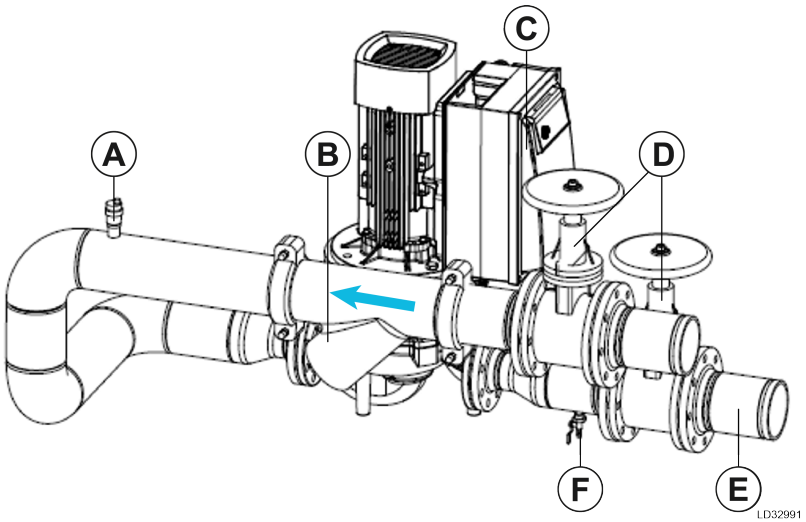
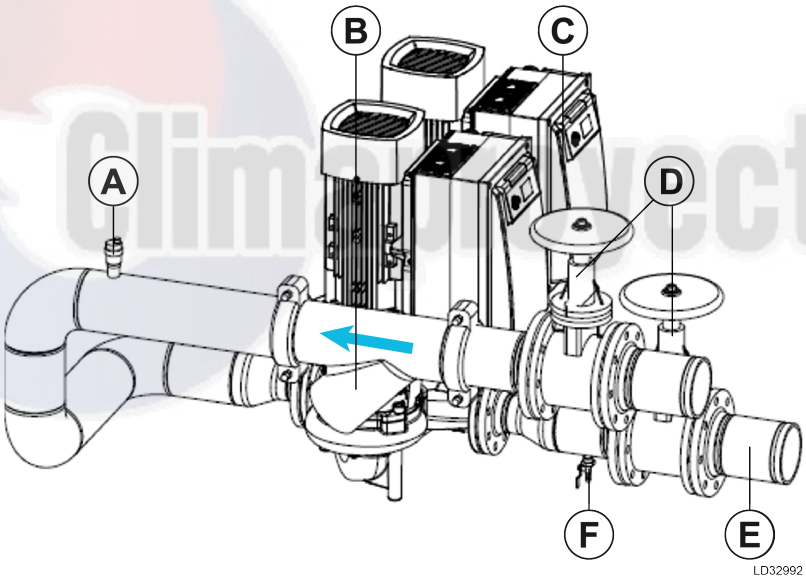
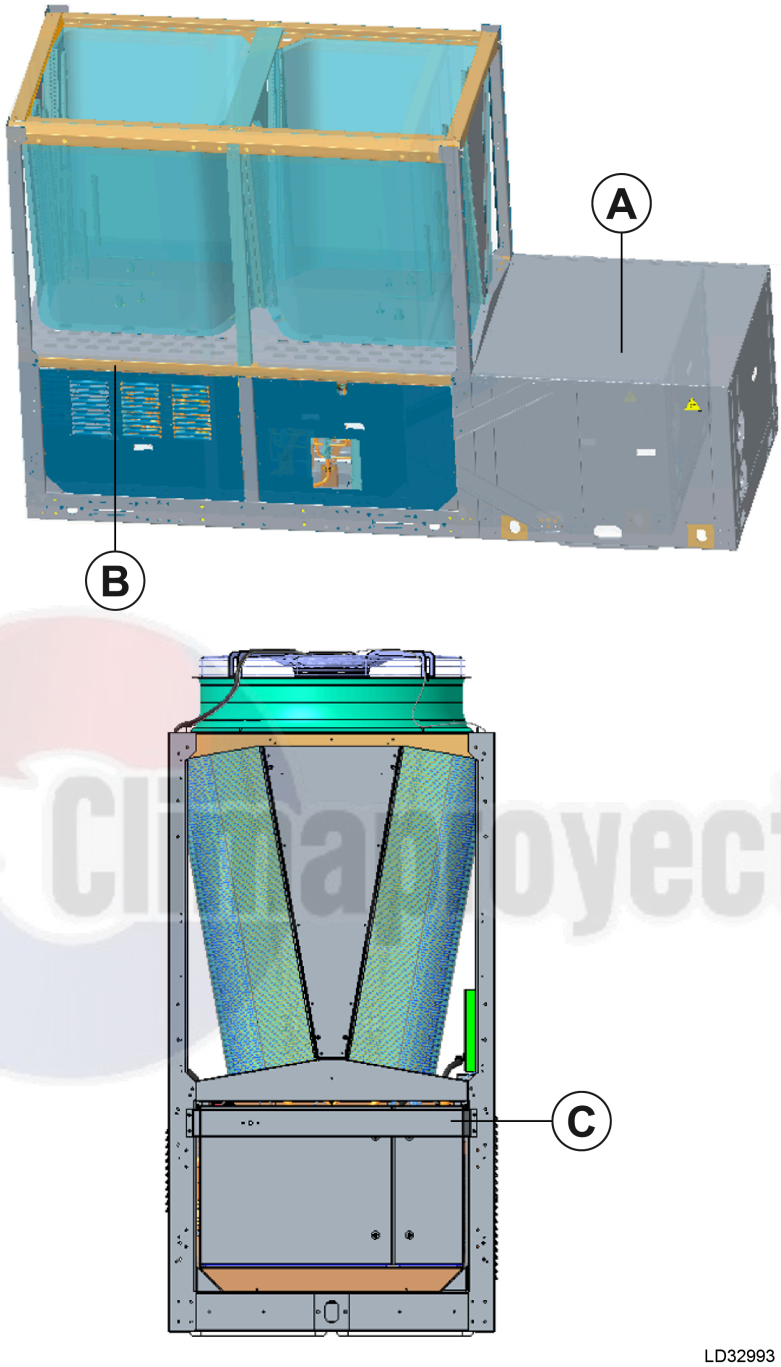


Figure 16: Pump kit 0105D



Callout	Description	Callout	Description
A	Air purger	D	Shutoff valves
B	Strainer	E	Connection to unit
C	VSD Pump	F	Drainage valves

Figure 17: Internal hydronic kit, two pipe single module



Callout	Description	Callout	Description
A	Internal hydronic kit	C	Protective plate
B	Two-pipe single module	–	–

Note: You must remove the protective plate before commissioning.

R-454B components

A refrigerant gas leakage detection sensor and ventilation fans are installed inside the unit enclosure to avoid potential refrigerant accumulation, if any leak occurs. The sensor is located near the compressor sets where the piping is most densely arranged.

Figure 18: Two-pipe gas sensor location

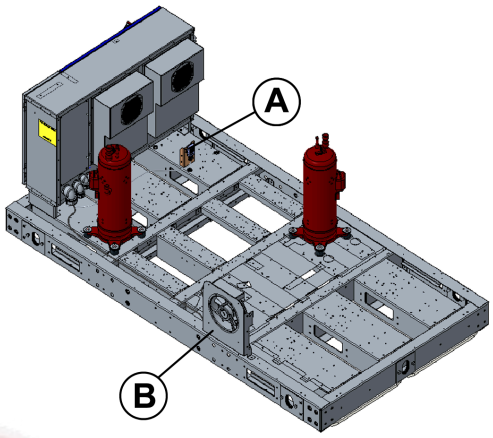
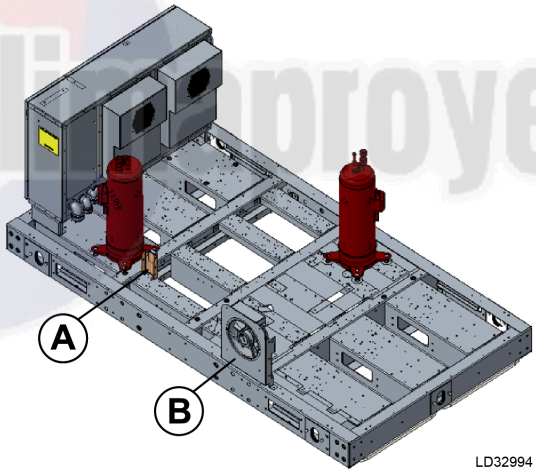


Figure 19: Four-pipe gas sensor location

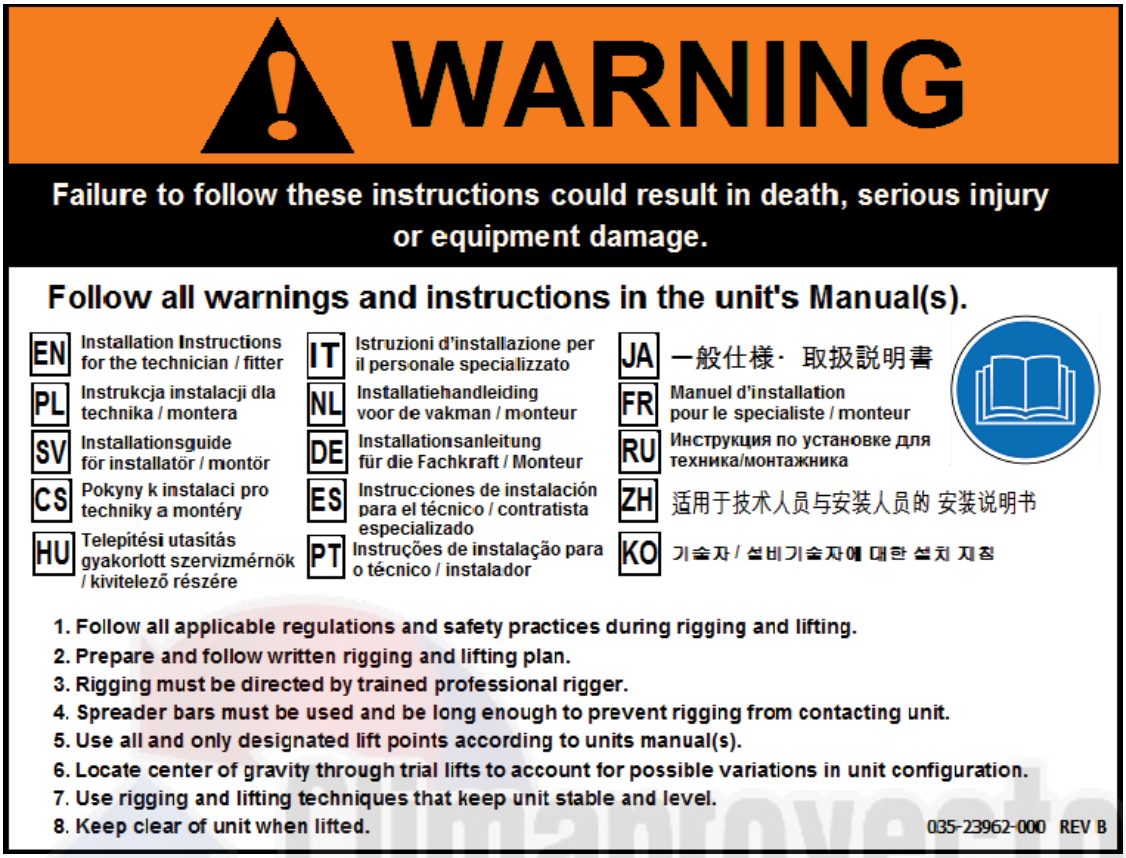


Callout	Component	Callout	Component
A	Gas sensor	B	Ventilation fan

The ventilation fan runs for 60 s when the unit is powered on for the first time, and periodically for 30 s every 24 h. When the refrigerant concentration reaches 25% of low flammable limit (LFL), the fans start to extract the gas mixture from the enclosure. The unit shuts down, with the exception of the ventilation fans if the concentration reaches 50% of LFL.

The leakage sensor is a non-dispersive infrared (NDIR) sensor. The sensor is calibration-free and designed for a lifespan of 15 years.

Rigging, handling, and storage



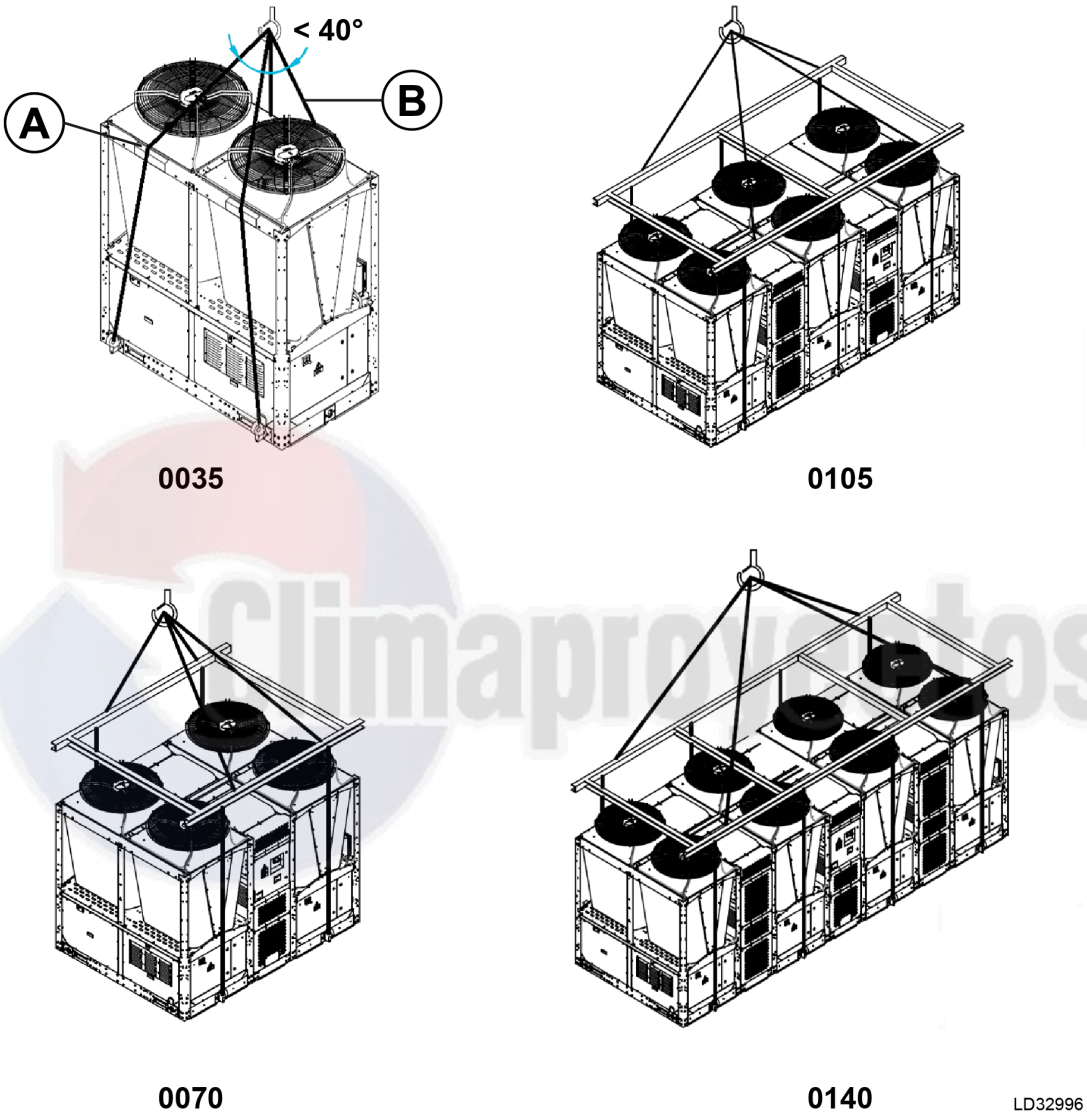
WARNING

Rigging and lifting must only be done by a professional rigger in accordance with a written rigging and lifting plan. The most appropriate rigging and lifting method depends on job specific factors, such as the rigging equipment available and site needs. A professional rigger must determine the rigging and lifting method to be used, and it is beyond the scope of this manual to specify rigging and lifting details. Failure to follow these instructions could result in death, serious injury or equipment damage.

Lifting weights

Refer to the unit nameplate for unit shipping weight. Note that the weight and center of gravity may vary slightly depending on unit configuration at the time of lifting.

Figure 20: Unit lifting



Callout	Description	Callout	Description
A	Requires protective pads	B	Lifting ropes

Figure 21: Lifting locations for single module, 0035

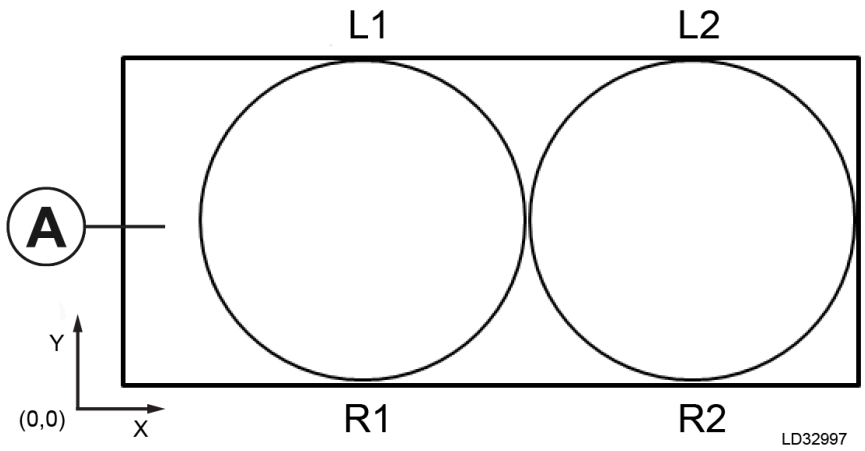
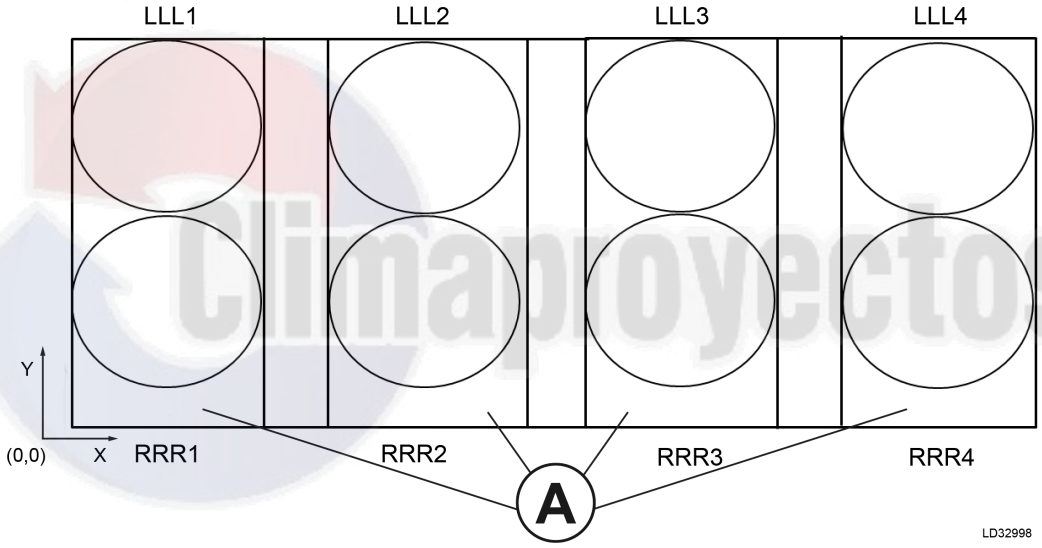


Figure 22: Lifting locations for modular array, 0070, 0105, and 0140



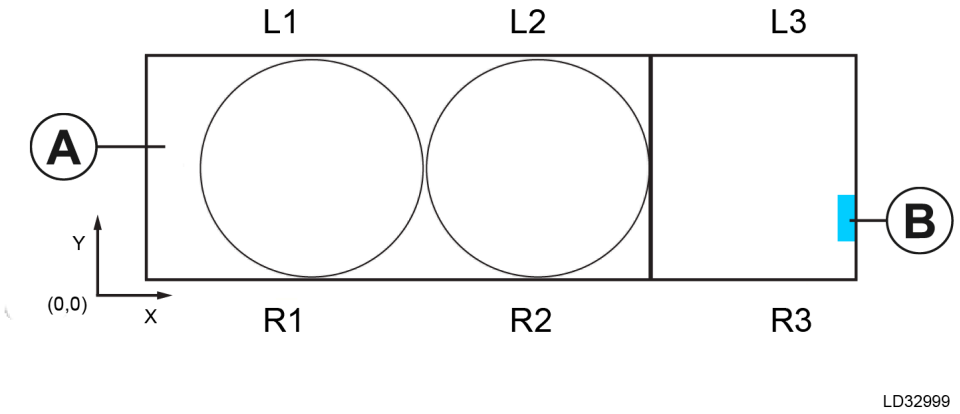
Callout	Description
A	Control panel

Table 4: Unit lifting locations

		Location coordinates (X, Y)											
		R1	**L1**	**R2**	**L2**	**RR1**	**LL1**	**RR2**	**LL2**	**RR3**	**LL3**	**RR4**	**LL4**
X Distance	**mm**	223	223	2,017	2,017	600	600	2,450	2,450	4,300	4,300	6,150	6,150
Y Distance	**mm**	0	1,199	0	1,199	39	2,201	39	2,201	39	2,201	39	2,201
X Distance	**in.**	8.78	8.78	79.41	79.41	23.62	23.62	96.46	96.46	169.29	169.29	242.13	242.13
Y Distance	**in.**	0.00	47.20	0.00	47.20	1.54	86.65	1.54	86.65	1.54	86.65	1.54	86.65

Note: Coordinates are measured from the geometric center of the unit, excluding the hydro kit.

Figure 23: Lifting locations for modular array, 0035PJP with two-pipe combined pump kit, 0035SA/0035DA



Callout	Description
A	Control panel
B	Customer water side connection side

Table 5: Unit lifting locations, 0035PJP, two-pipe combined with pump kit

		Location coordinates (X, Y)					
		R1	L1	R2	L2	R3	L3
X Distance	mm	223	223	2,017	2,017	3,337	3,337
Y Distance	mm	0	1,199	0	1,199	0	1,199
X Distance	in.	8.78	8.78	79.41	79.41	131.36	131.36
Y Distance	in.	0.00	47.20	0.00	47.20	0.00	47.20

Figure 24: Lifting locations for pump kits only, 0035*S, 0070*S, single and dual, 450 V and 575 V

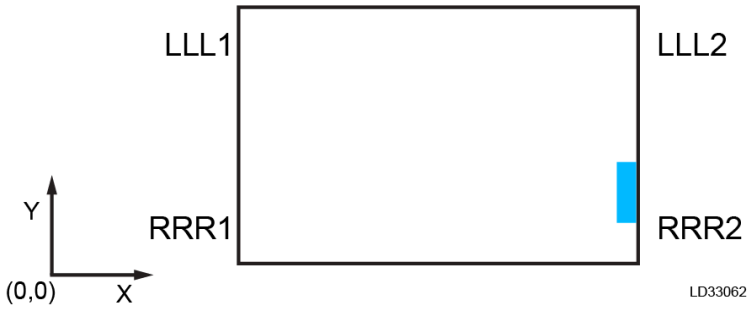
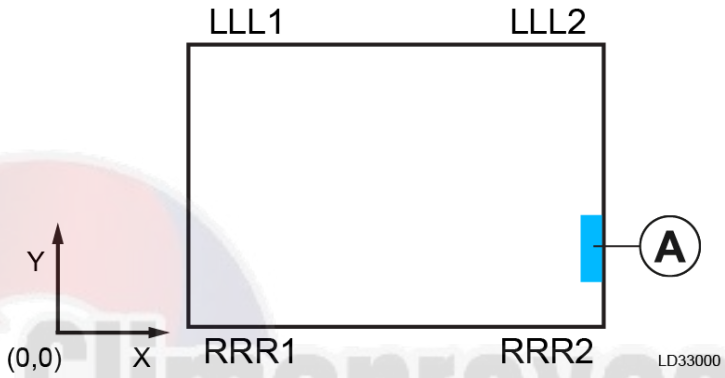


Figure 25: Lifting locations for pump kits only, 0035*A, 0105*S, single and dual, 450 V and 575 V



Callout	Description
A	Customer water side connection side

Table 6: Lifting locations, 460 V and 575 V

Location coordinates (X, Y), Pump kit 0035SA, Pump kit 0035DA					
		RRR1	**LLL1**	**RRR2**	**LLL2**
X Distance	**mm**	174	174	1,097	1,097
Y Distance	**mm**	0	1,200	0	1,200
X Distance	**in.**	6.83	6.83	43.17	43.17
Y Distance	**in.**	0.00	47.24	0.00	47.24
Pump kit 0035SS, Pump kit 0035DS					
X Distance	**mm**	0	0	1,301	1,301
Y Distance	**mm**	185	815	185	815
X Distance	**in.**	0.00	0.00	51.22	51.22
Y Distance	**in.**	7.28	32.09	7.28	32.09
Pump kit 0070SS, Pump kit 0070DS					
X Distance	**mm**	0	0	1,663	1,663
Y Distance	**mm**	255	920	255	920
X Distance	**in.**	0.00	0.00	65.47	65.47
Y Distance	**in.**	10.02	36.22	10.02	36.22
Pump kit 0105SS, Pump kit 0105DS					
X Distance	**mm**	414	414	1,635	1,635
Y Distance	**mm**	0	1,403	0	1,403
X Distance	**in.**	16.28	16.28	64.35	64.35
Y Distance	**in.**	0.00	55.24	0.00	55.24

Delivery and storage

To ensure consistent quality and maximum reliability, all units are tested and inspected before leaving the factory. Units are shipped completely assembled and containing refrigerant under pressure. Units are shipped without export crating unless crating has been specified on the sales order.

If the unit is being put into storage before installation, observe the following precautions:

- Block the chiller so that the base cannot sag or bow.
- Securely cap all openings, such as water connections.
- Do not store the chiller where it is exposed to high ambient air temperatures that may exceed relief valve settings. Refer to *Long-Term Storage Requirement - Field Preparation (Form 50.20-NM7)*.
- Cover the condensers to protect the coils and fins from potential damage and corrosion, particularly where building work is in progress.
- Store the unit in a location where there is minimal activity in order to limit the risk of accidental physical damage.
- To prevent inadvertent operation of the pressure relief devices, do not steam clean the unit.
- Inspect the unit periodically during storage.
- Unit storage ambient temperature: -22°F to 125.6°F (-30°C to 52°C).

Inspecting the delivery

1. Remove any transit packing and inspect the unit to ensure that all components have been delivered and that no damage has occurred during transit.
2. If there is any evident damage, note the damage on the carrier's freight bill and enter a claim in accordance with the instructions given on the advice note.
3. Report any major damage immediately to your local Johnson Controls representative.

Moving the unit

Before moving the unit, ensure that the installation site is suitable for installing the unit and is easily capable of supporting the weight of the unit and all associated services.

To prevent damage to the unit from the lifting chains, lift the unit using lifting lugs and a spreader bar or a frame of sufficient width.

⚠ CAUTION

The unit must only be lifted at the rigging plates fitted to the base frame at the points provided. Never move the unit on rollers or lift the unit using a forklift.

Take care to avoid damaging the condenser coil fins when moving the unit.

Removing the unit from the shipping container

1. Place nylon straps through the lifting holes and forklift hole on the base. See Figure 26 and Figure 31.

Figure 26: Nylon in lifting and fork holes

2. Attach nylon straps onto a suitable lift truck for pulling the unit out of the container.
3. Slowly place tension on the straps until the unit begins to move and then slowly pull the unit out from the container. Pull straight so the sides do not scrape the container. See the following figure:

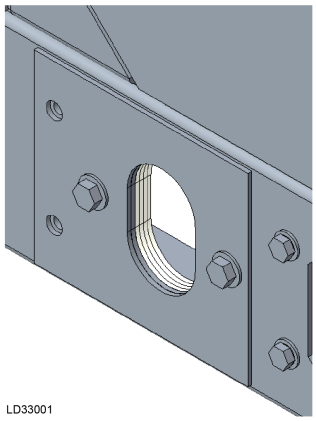
Figure 27: Pulling the unit

4. Place a lifting fixture on the forks of the lift truck and re-attach the strap.
5. Slightly lift the front of the unit to remove some weight from the floor of the container.
6. Continue pulling the unit with an operator on each side to guide the lift truck operator.
7. Pull the unit until the lifting locations are outside of the container.
8. Place 4 x 4 blocks of wood under the base rails of the unit.
9. Gently rest the unit on the blocks and remove the strap and lift truck.
10. Attach lifting rigging from the crane and slowly complete the removal from the container, then lift up and away.

Lifting the unit

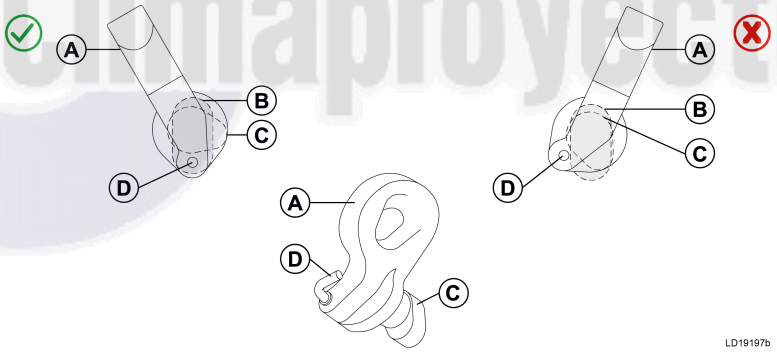
Units are provided with rigging slots located at the unit base frame, which accept the accessory lifting lug set as shown in the following figures.

Figure 28: Correct lifting lug position



1. Insert the RH and LH lugs into the respective holes in the rigging plates.
2. Turn the lugs so that the spring loaded pin engages into the hole and the flanges on the lug lock behind the hole.
3. Attach the lugs to the cables and chains using shackles or safety hooks.

Figure 29: Lifting lug

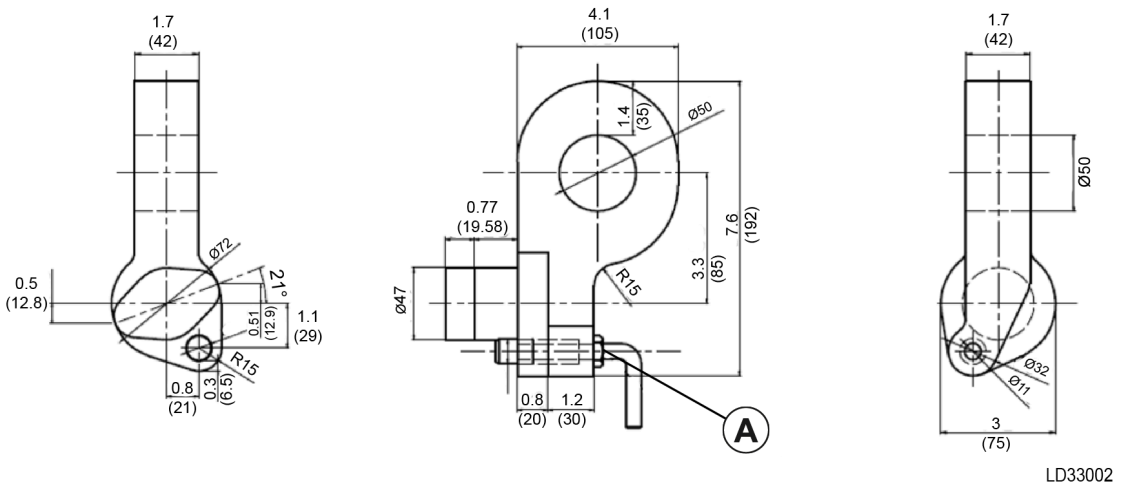


Callout	Component	Callout	Component
A	Lug	C	Flange
B	Lifting hole in the base frame	D	Locking pin

Note:

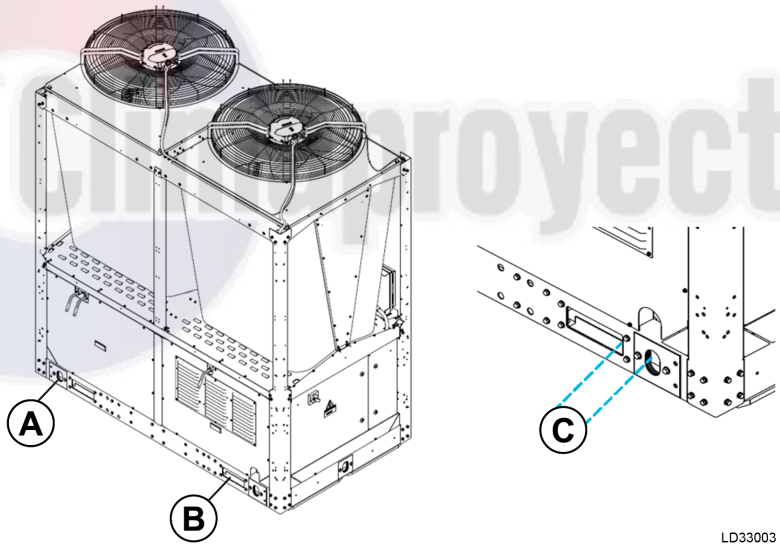
- The lugs are not included with the unit.
- Do not use the dragging plates as lifting lugs when lifting the units. Refer to the lifting instructions on each unit before you lift units.

Figure 30: Lifting lug dimensions, in. (mm)



Callout	Description
A	Locking pin

Figure 31: Single module 0035 rigging holes and forking slots

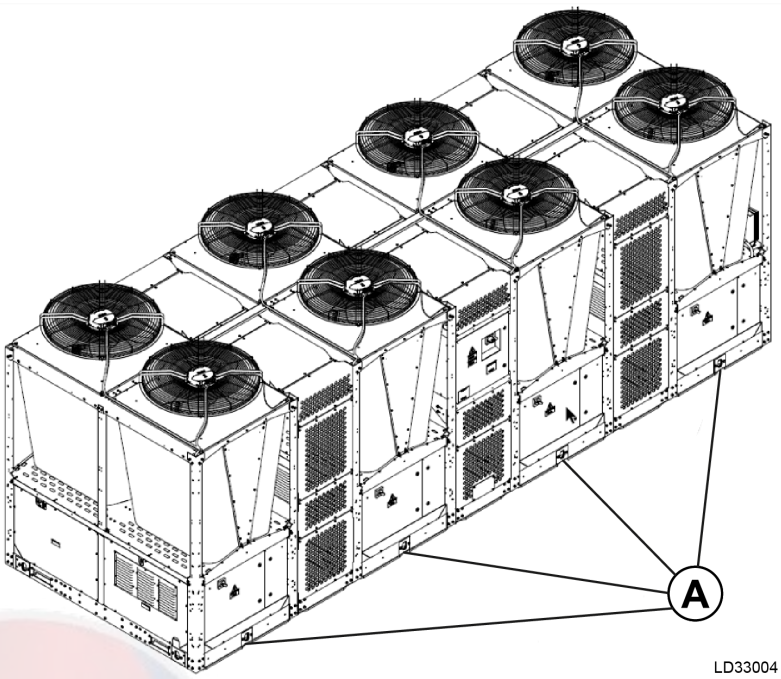


Callout	Component	Callout	Component
A	Rigging holes	C	Dragging rope
B	Forking slots		

Note:

- Rigging holes are located at the four-corner of the unit.
- The rigging-hole and forking-slot can be used when dragging the unit from container.

Figure 32: Modular array 0070, 0105, and 0140 rigging holes



Callout	Component
A	Rigging holes located at the ends of unit in the modular array

Note:

- Rigging holes are located at bottom base frame.
- To prevent damage to the unit from the lifting chains, lift the unit using lifting lugs and a spreader bar or a frame of sufficient width.

Moving the unit by crane

Johnson Controls suggests moving the units using a crane for transit transfer. For 0070, 0105, and 0140 models, do not use a forklift truck.

Installation

To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized YORK service engineer. Installation must comply with all applicable local codes.

⚠ DANGER

The control and power panels can deliver lethal voltages. Before servicing, open and tag all disconnect switches.

Location and clearance

For optimum performance and trouble-free service, it is essential that the installation site meet the location and space requirements for the model being installed.

It is important to ensure that the minimum service access space is maintained for cleaning and maintenance purposes. Local health and safety regulations, or practical considerations for service replacement of large components, may require larger clearances than those given in this guide.

Outdoor installations

The units can be installed on rail bracket, at least 6 in. (152 mm) higher above ground, at ground level on a suitable, level foundation easily capable of supporting the weight of the unit, or on a suitable rooftop location. In both cases an adequate supply of air is required. Avoid locations where the sound output and air discharge from the unit may be a problem.

Select a location away from boiler flues and other sources of airborne chemicals that could damage the condenser coils and steel parts of the unit.

If located in an area accessible to unauthorized persons, steps must be taken to prevent access to the unit by means of a protective fence. This helps to prevent the possibility of vandalism, accidental damage, or possible harm caused by unauthorized removal of protective guards or opening panels to expose rotating or high-voltage components.

For ground level locations, install the unit on a suitable flat concrete base or rails that extends to fully support the two side channels of the unit base frame. A one-piece concrete slab, with footings extending below the frost line is recommended. To avoid noise and vibration transmission, do not secure the unit to the building foundation. It is advisable, at the very least, to use neoprene isolators.

On rooftop locations, choose a place with adequate structural strength to safely support the entire operating weight of the unit and service personnel. Mount the unit on a concrete slab, similar to ground floor locations, or on steel channels of suitable strength.

Space the channels with the same centers as the unit side and front base rails. This allows vibration isolators to be fitted if required. Isolators are recommended for rooftop locations.

Ensure that the place of installation and operation can support the weight of the unit and any extra operation and maintenance weights that may occur.

Noise sensitive locations

Ensure that the unit is not located next to occupied spaces or noise sensitive areas where unit noise levels would be a problem. Unit noise is a result of compressor and fan operation. Use published noise level information as part of your considerations.

Corrosion locations

The unit is designed to withstand most climate conditions. If the unit is installed near the seashore where high levels of salt may shorten the life of the unit, make sure it is not exposed to sea winds directly.

Installations close to environmental, chemical, or corrosive effects require special consideration. For example, contact Johnson Controls with regards to units being installed near the seashore, or near chlorine-treated swimming pools.

Operating in low ambient conditions

If the unit is operating in low ambient temperature, consider the following precautions:

- Install a baffle plate on the airside of the unit to prevent exposure to snow.
- Use a canopy to prevent the coil and fan being affected by heavy snowfall.
- De-ice the fan blades before operation if the fan blades fail to rotate after a long period of standby in low ambient temperature.
- Install flexible hoses to ensure effective condensation water drainage during operation.

Location clearances

Adequate clearances around the units are required for the unrestricted airflow for the air-cooled condenser coils and to prevent re-circulation of warm discharge air back onto the coils. If the appropriate clearances are not maintained, airflow restriction or re-circulation can cause a loss of unit performance, an increase in power consumption, and may cause the unit to malfunction. Consider the possibility of down drafts, caused by adjacent buildings, which may cause re-circulation or uneven unit airflow.

For locations where significant cross winds can occur, such as exposed rooftops, use a louvre enclosure to prevent wind turbulence interfering with the unit airflow.

When units are installed in an enclosure, ensure the enclosure height does not exceed the height of the unit on more than one side. If the enclosure is of louvered construction, the same requirement of static pressure loss applies as for ducts and attenuators. If the surrounding enclosures or wall exceed the height of the unit on more than one side, see Figure 33 for the minimum necessary clearances.

Where accumulation of snow is likely, ensure there is additional height clearance under the unit to ensure normal airflow to the unit.

Figure 33: Location clearances, top view

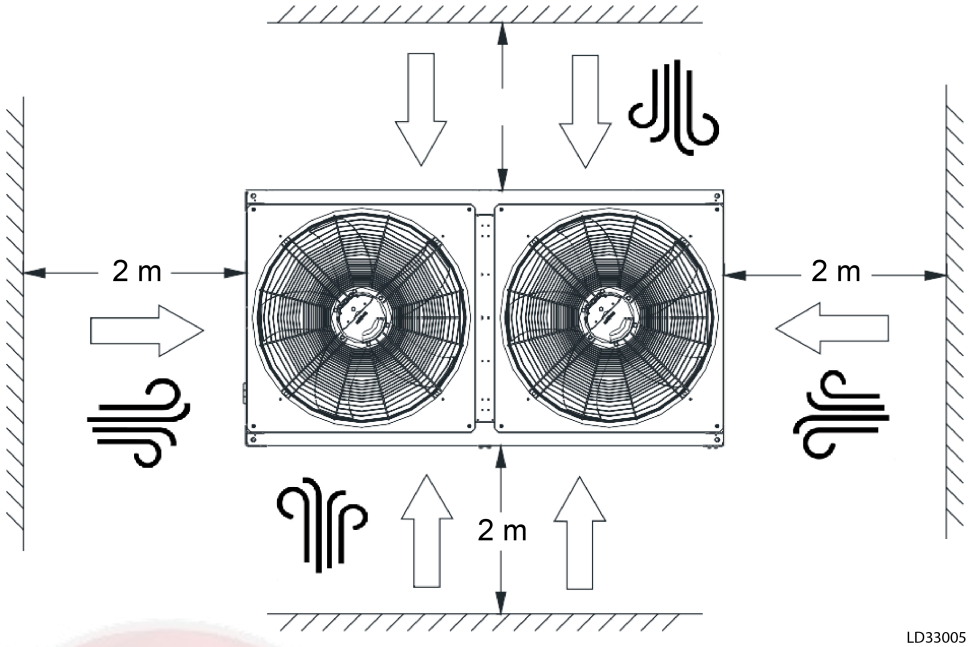


Figure 34: Location clearances, side view

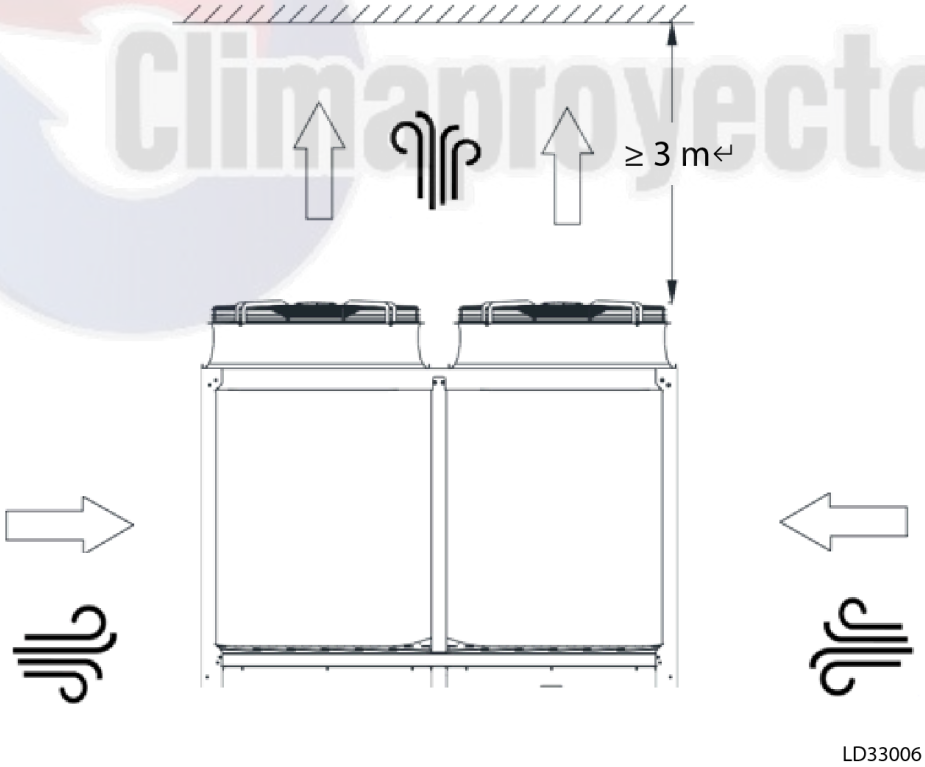
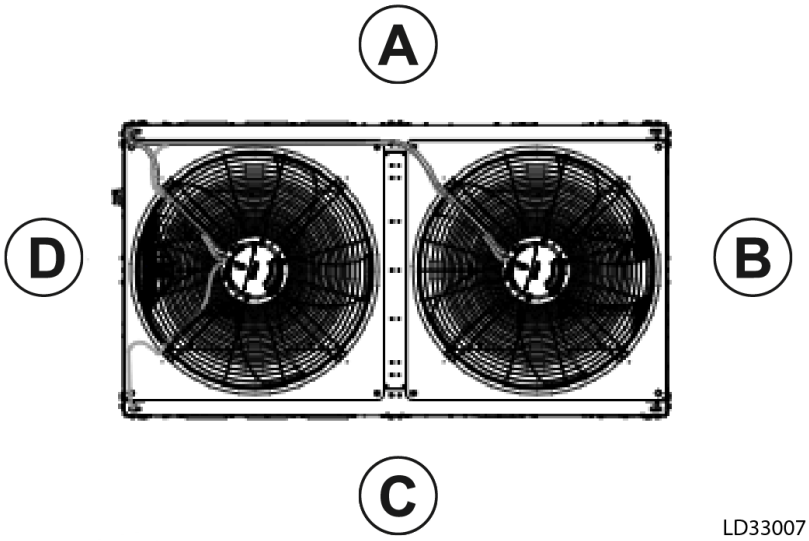
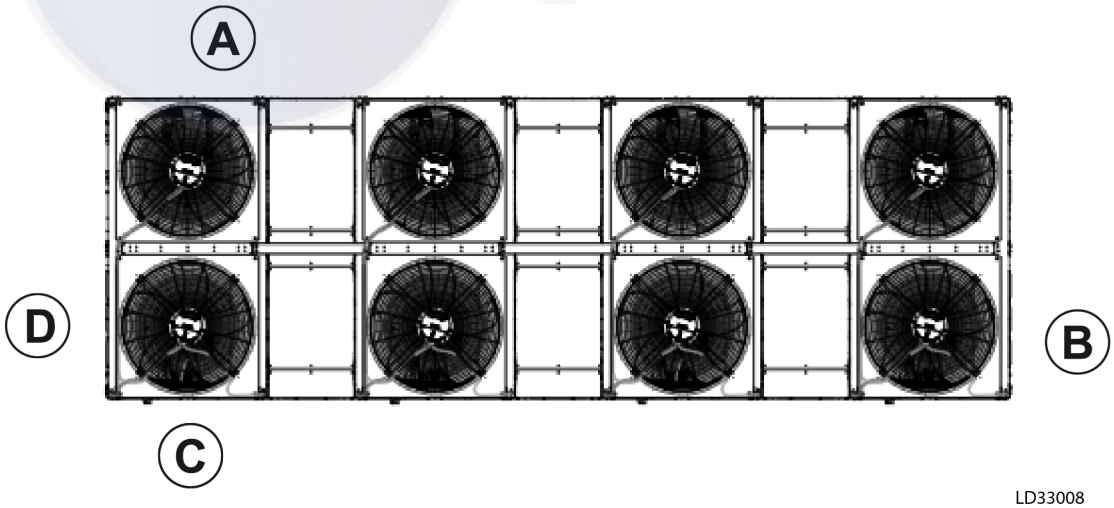


Figure 35: Single module clearances



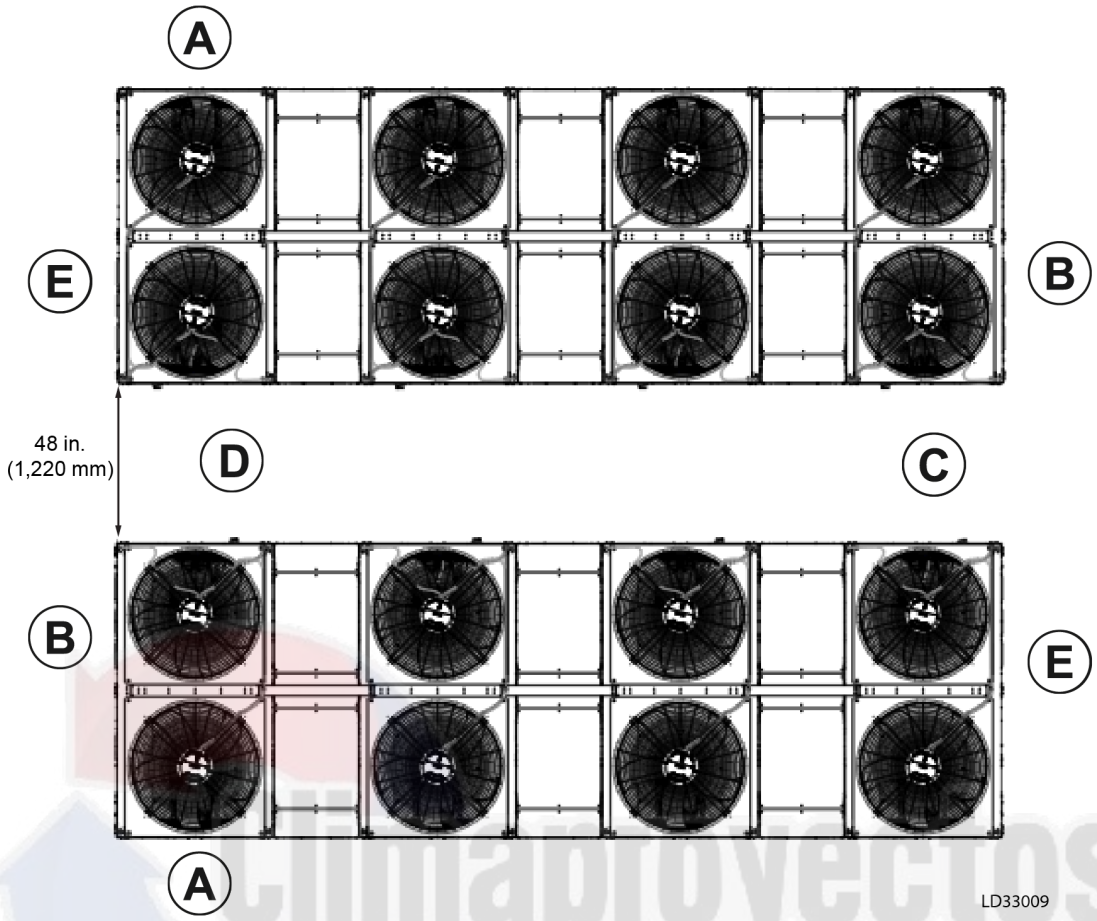
Callout	Description	Callout	Description
A	Minimum 25.6 in. (650 mm) clearance, service airflow	C	Minimum 25.6 in. (650 mm) clearance, HMI side
B	Minimum 20 in. (510 mm) clearance, piping side	D	Minimum 36 in. (914 mm) clearance, panel door side

Figure 36: Modular array clearances



Callout	Description	Callout	Description
A	Minimum 20 in. (510 mm) clearance, piping side	C	Minimum 36 in. (914 mm) clearance, panel door side
B	Minimum 25.6 in. (650 mm) clearance, HMI side	D	Minimum 25.6 in. (650 mm) clearance, service airflow

Figure 37: Modular array panel face-to-face clearance



Callout	Description	Callout	Description
A	Minimum 20 in. (510 mm) clearance, piping side	D	Minimum 48 in. (1,220 mm) clearance, if panels are face-to-face
B	Minimum 25.6 in. (650 mm) clearance, HMI side	E	Minimum 25.6 in. (650 mm) clearance, service airflow
C	Panel door side	–	–

Figure 38: Modular connections diagram for two-pipe modules

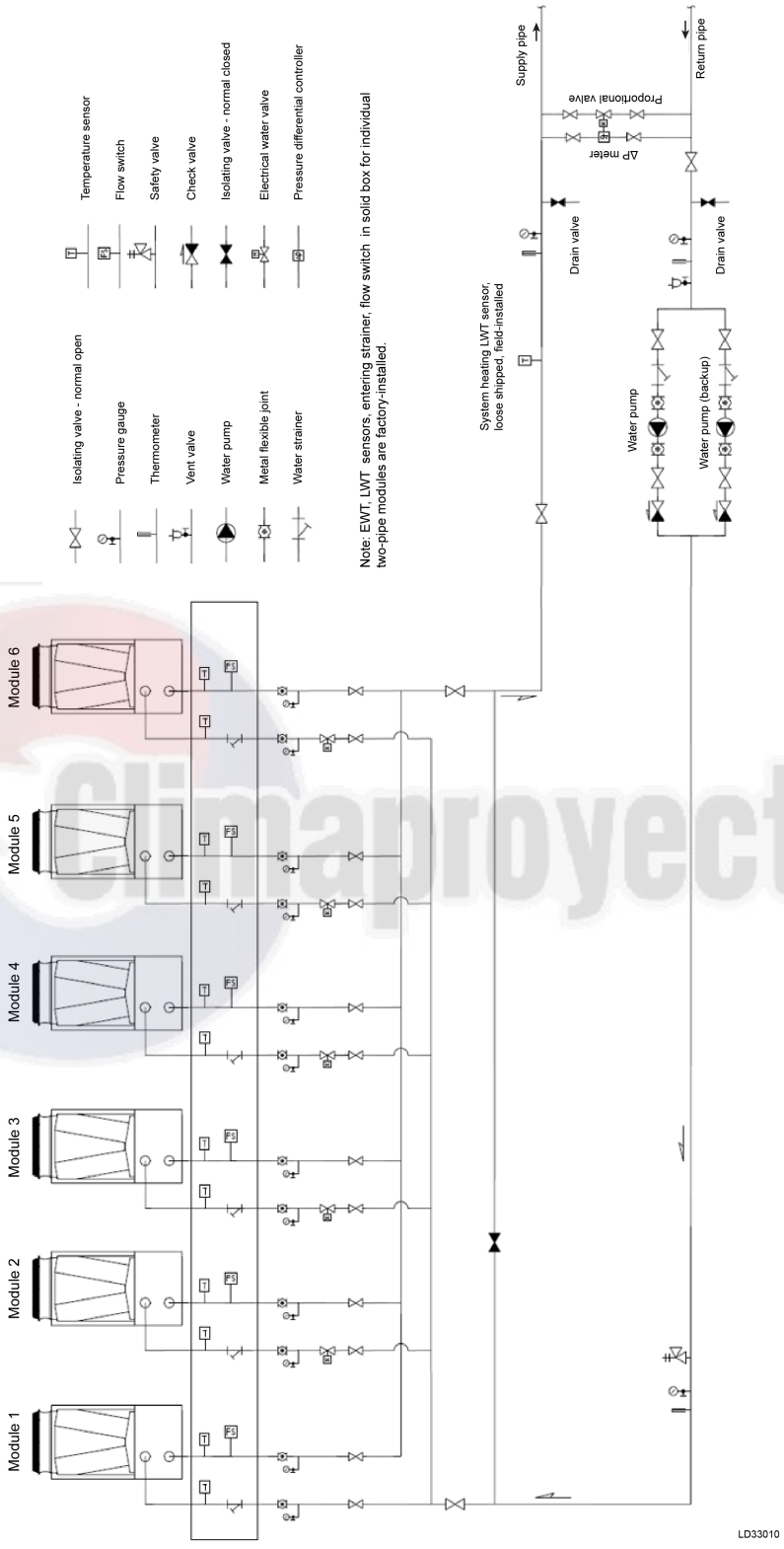
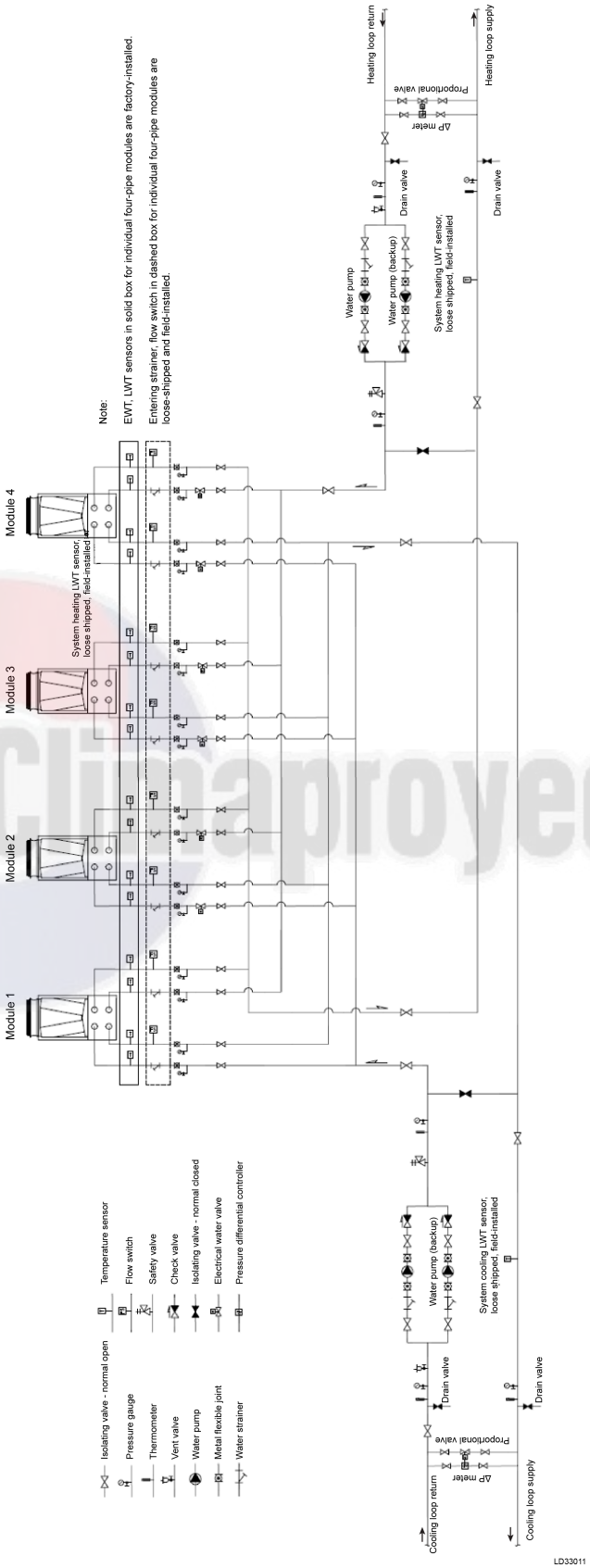


Figure 39: Modular connections diagram for four-pipe modules



- Placement on a level surface free of obstructions (including snow, for winter operation) or air recirculation ensures rated performance, reliable operation and ease of maintenance.
- Site restrictions may compromise minimum clearances, resulting in unpredictable air flow patterns and possible reduced performance.
- The distances between the walls and peripheral units must employ the same rules as shown in location clearances if the units are surrounded by walls.
- No more than one adjacent wall may be higher than the unit.
- The installing contractor must include vent and drain connections in the water piping near the heat exchanger.
- Balancing valves must be installed at the inlet of each unit to balance chilled liquid distribution.
- A minimum space of 48 in. (1,220 mm) for R-454B units must be reserved for field wiring, commissioning and maintenance in case of control panel face to face installation.
- Refer to the single module and modular array drawings for detailed dimensions.

Installation of vibration isolators

An optional set of vibration isolators can be supplied loose with each unit. The correct number of isolators are supplied to suit the unit model with or without a hydro kit.

Pipework arrangement

The following piping recommendations are intended to ensure satisfactory operation of the unit. Failure to follow these recommendations could cause damage to the unit, or loss of performance, and may invalidate the warranty. See Figure 38 and Figure 39 for pipwork arrangement.

For two-pipe units, a flow switch is included as standard on each module. It is factory-wired and installed in the extension pipe between heat exchanger outlet and edge of chiller. For four-pipe units, a flow switch is packaged as accessory and is installed on the heat exchanger outlet pipe at side.

Support pipework and fittings separately, to prevent any loading on the heat exchangers. Flexible connections are recommended, which also minimizes transmission of vibrations to the building. Use flexible connections if the unit is mounted on anti-vibration mounts because some movement of the unit can be expected in normal operation.

Pipework and fittings immediately next to the heat exchangers must be readily demountable to enable cleaning before operation, and to facilitate visual inspection of the exchanger nozzles.

Protect each heat exchanger by a strainer, preferably at least 30 mesh, fitted as close as possible to the liquid inlet connection pf the PHE, and provided with a means of local isolation. A 30-mesh wye-strainer is provided as standard to provide protection at the heat exchanger inlet.

The heat exchangers must not be exposed to flushing velocities or debris released during flushing. It is recommended that a suitably sized by-pass and valve arrangement be installed to allow flushing of the pipework system. The by-pass can be used during maintenance to isolate the heat exchangers without disrupting flow to other units.

Johnson Controls suggests providing thermometer and pressure gauge connections on the inlet and outlet connections of each heat exchanger.

Provide drain and air vent connections at all low and high points in the pipework to permit drainage of the system, and to vent any air in the pipes.

Protect liquid systems at risk of freezing, due to low ambient temperatures, by using insulation and heater tape or a suitable glycol solution. The liquid pumps must also be used to ensure liquid is circulated when the ambient temperature approaches freezing point. Install insulation around the heat exchanger nozzles also.

Heater tape of appropriate heating capacity based on the location’s conditions is required. This is supplied independently and controlled by an ambient temperature thermostat set to switch on when the ambient temperature is below 26.6°F (-3°C). Water piping systems require site installations to ensure that water temperature is 5.4°F to 9°F (3°C to 5°C) above freezing point at all times.

The heat exchanger is protected by a heater placed under the insulation, which is powered from the unit control system power supply. During cold weather when there is a risk of freezing, leave the unit switched on to provide the freeze protection function, unless the liquid systems have been drained.

Connection types and sizes

Standard pipework connections are Victaulic-groove type. For connection sizes for each models see Table 10 and Table 11.

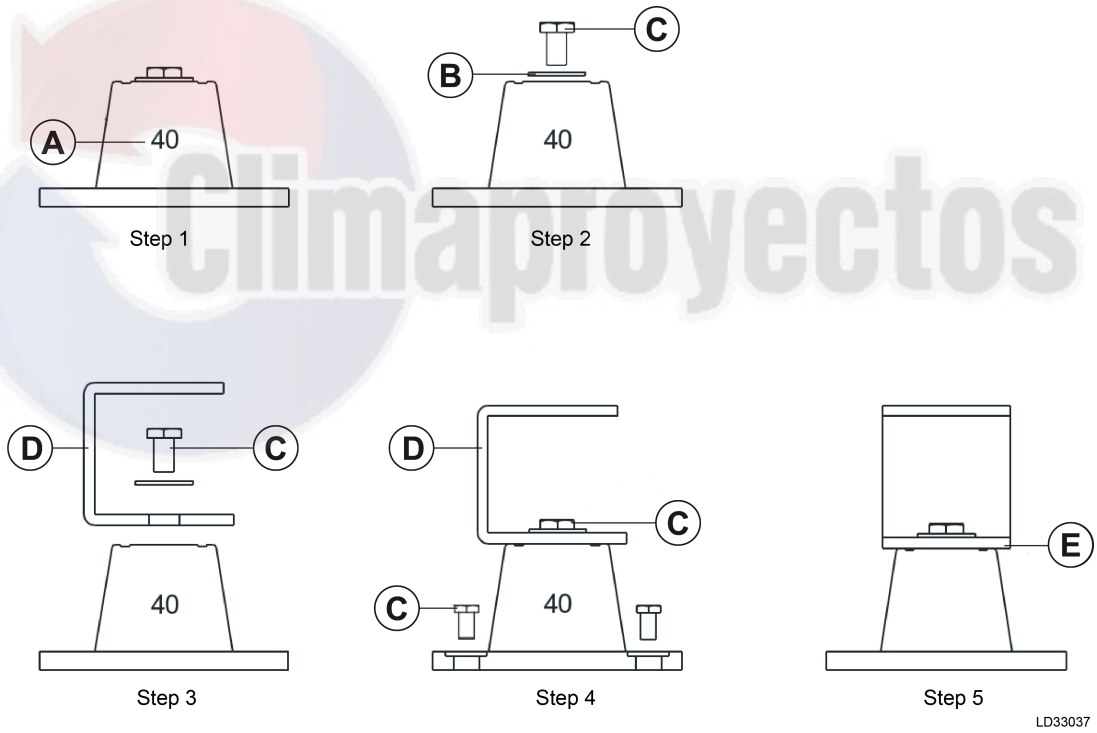
Installing the neoprene isolators

Note:

- Read the instructions in their entirety before beginning installation.
- Isolators are shipped fully assembled. Make sure the AVM types are correct, as found on the print codes and adhesive labels, and match each load point with corresponding isolators.

1. Use a spanner to twist off the fixing bolt and washer.
2. Set the isolators on floor. Ensure that all isolator centerlines match the equipment mounting holes. Install the isolator base on a level surface. Level all isolator bases to the same elevation.
3. Place the equipment on top of the isolators making sure that the mounting holes of the equipment line up with the isolator installation holes.
4. Tighten the fixing bolt and ensure the verticality of the isolators.
5. Tighten the bolts at the base of the isolator.

Figure 40: Neoprene isolator



Callout	Description
A	Code
B	Washer
C	Fixing bolt
D	Unit
E	Ensure the base of the unit covers the surface of AVM

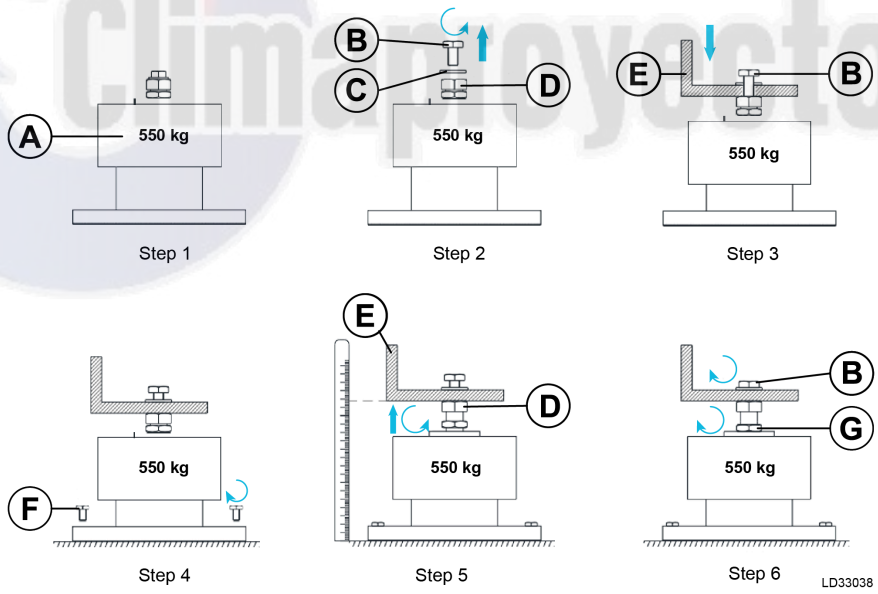
Installing the 1 in. deflection spring isolators

Note:

- Read the instructions in their entirety before beginning installation
- Isolators are shipped fully assembled. Make sure the AVM types are correct, as found on the print codes and adhesive labels, and match each load point with corresponding isolators

1. Twist off the fixing bolt and washer anti-clockwise.
2. Set the isolators on the floor. Ensure that all isolator centerlines match the equipment mounting holes. Install the isolator base on a level surface. Level all isolator bases to the same elevation. A maximum difference of 1/4 in. can be tolerated.
3. Place the equipment on top of the isolators making sure that the mounting holes of the equipment line up with isolator installation holes.
4. Place the fixing bolt and washer but do not tighten them.
5. Ensure the verticality of the isolators and use bolts to fix the bases of the isolators to the level floor. Use the same torque to fasten the bolts.
6. Only begin the adjustment process after the unit is at its full operating weight.
7. Measure the height of the housing. Adjust each isolator in sequence by turning adjusting bolt. Repeat this procedure on all isolators, one at a time.
8. Fine adjust isolators to level the equipment. Fasten the M20 thin nut and fixing bolt.

Figure 41: 1 in. deflection spring isolator



Callout	Description	Callout	Description
A	Load label	E	Unit
B	Fixing bolt	F	Bolt
C	Washer	G	M20 nut
D	Adjusting Bolt	–	–

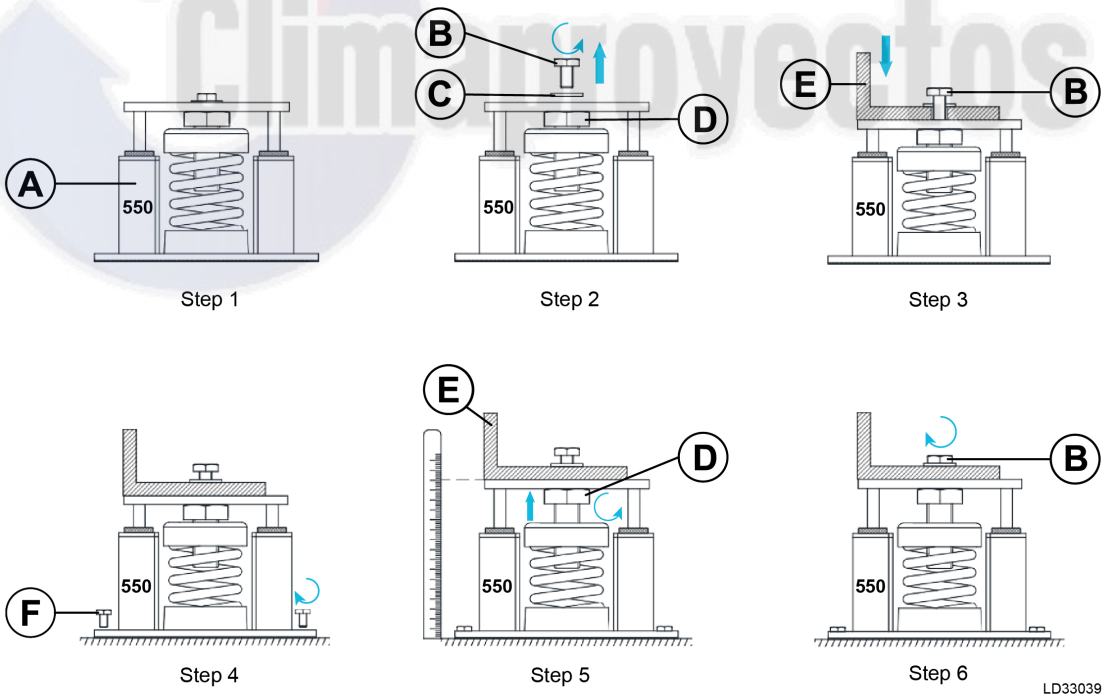
Installing the 2 in. deflection spring isolators

Note:

- Read the instructions in their entirety before beginning installation
- Isolators are shipped fully assembled. Make sure the AVM types are correct, as found on the print codes and adhesive labels, and match each load point with corresponding isolators

1. Twist off the fixing bolt and washer anticlockwise.
2. Set the isolators on the floor. Ensure that all isolator centerlines match the equipment mounting holes. Install the isolator base on a level surface. Level all isolator bases to the same elevation. A maximum difference of 1/4 in. can be tolerated.
3. Place the equipment on top of isolators making sure that mounting holes of the equipment line up with isolator installation holes.
4. Place the fixing bolt and washer but do not tighten them.
5. Ensure the verticality of the isolators and use bolts to fix the bases of the isolators to the level floor. Use the same torque to fasten the bolts.
6. Only begin the adjustment process after the unit is at its full operating weight.
7. Measure the height of the housing. Adjust each isolator in sequence by turning adjusting bolt. Repeat this procedure on all isolators, one at a time.
8. Fine adjust isolators to level the equipment. Fasten the M20 thin nut and fixing bolt.

Figure 42: 2 in. deflection spring isolator



Callout	Description	Callout	Description
A	Load label	D	Adjusting bolt
B	Fixing bolt	E	Unit
C	Washer	F	Bolt

R-454B pipework

DANGER

Ensure there is no potential ignition sources within 4 ft (1.2 m) in all directions from the outlet of the relief valve piping.

Dual pressure relief valves are installed in each circuit on both the high and low pressure sides. There are two external vent pipes in each refrigerant system. The pipes are shipped loose and the connection is 7/8-14UNF.

Remove the panels to connect the vent pipes that are shipped loose with the unit.

CAUTION

Check that all vent pipes are correctly connected after the chiller is in its final location.

Water treatment

The unit performance is based on a standard fouling factor of 0.0001 h ft^2 °F/Btu. Dirt, scale, grease and certain types of water treatment adversely affect the heat exchanger surfaces and unit performance.

Note: Foreign matter in the water systems can increase the pressure drop, reducing the flow rate and causing potential damage.

Do not use aerated, brackish, or salt water in the water systems. Johnson Controls suggests consulting a water treatment specialist to determine whether the proposed water composition could affect the heat exchanger materials of carbon steel and copper. Keep the pH value of the water flowing through the unit between 7 and 8.5.

Refrigerant relief valve piping

The unit is protected against internal refrigerant overpressure by refrigerant relief valves. For indoor installations, pipe pressure relief valves and vent to the exterior of the building.

Note: Only install R-454B units in outdoor or unenclosed areas.

The size of any extended pipework attached to a relief valve must be of sufficient diameter so as not to cause resistance to the operation of the valve.

Unless otherwise specified by local regulations, the internal diameter depends on the length of pipe required. Use the following formula to estimate the internal diameter:

$D^5=1.447 \times L$

Where:

D = minimum pipe internal diameter (cm)

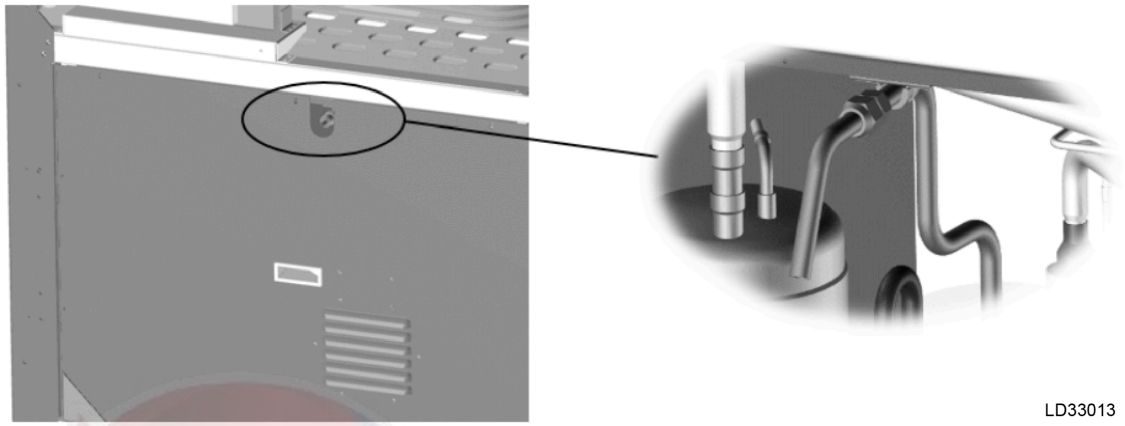
L = length of pipe (m)

If relief pipework is common to more than one valve, its cross sectional area must be at least the total required by each individual valve.

⚠ CAUTION

Do not mix high-pressure and low-pressure relief valves on a common pipe. Take precautions to ensure that the exit of relief valves and vent piping remain clear of obstructions at all times.

Figure 43: PRV exhausting piping connection



Electrical connection

The following connection recommendations are intended to ensure safe and satisfactory operation of the unit. Failure to follow these recommendations could cause harm to persons, or damage to the unit, and may invalidate the warranty.

⚠ WARNING

Do not mount any additional controls, such as relays, in the power panel. Do not run power and control wiring through the power panel that is not connected to the power panel. If these precautions are not followed it could lead to a risk of electrocution. In addition, electrical noise could cause malfunctions or damage the unit and its controls.

Power wiring

⚠ CAUTION

These units are suitable for 460 V, 3-phase, 60 Hz nominal supplies only.

Conduct all electrical wiring in accordance with local regulations. Route correctly sized cables to the cable entries in the power panel.

In accordance with UL 60335, it is the responsibility of the user to install overcurrent protection devices between the supply conductors and the power supply terminals on the unit.

To ensure that no eddy currents are set up in the power panel, the cables forming each 3-phase power supply must enter through the same cable entry.

⚠ WARNING

All sources of supply to the unit must be taken through a common point of isolation, which is not supplied by Johnson Controls.

Single point power supply wiring

All models require one field-provided 460 V, 3-phase, 60 Hz and protected earth (PE) supply to the unit with circuit protection.

Connect the 3-phase supply to the circuit breaker in the power panel.

Connect the earth wire to the main protective earth terminal located in the power panel. The PE is printed on the steel metal by steel seal.

Control wiring

Remote mode selection: SC-H

For remote mode selection, either for cooling or heating, connect a contact between terminals 86 and 80F. You must also activate remote mode selection on the HMI when necessary.

Remote mode selection: SC&H

For remote mode selection for simultaneous cooling and heating, connect a contact between terminals 84 and 80D. You must also activiate remote mode selection on the HMI when necessary.

Remote start or stop: SRS

Connect a remote switch to terminals 87 and 80G to provide remote start or stop control, if required. You must also activiate remote mode selection on the HMI.

Remote interlock: SEI

Connect a remote switch to terminals 88 and 80H to provide remote interlock, if required. Connect a jumper to terminals 88 and 80H if no remote interlock switch is connected by customer.

ⓘ **Note:** Changing operation mode requires the user to stop the unit.

Cold-water flow switch: SFM1

Connect the cold-water flow switch SFM1 for each module to terminals 92 and 80K of XT2. For all PJP models, SFM1 is installed and wired in the factory by default. For all PJS models, SFM1 must be installed and wired in the field.

Hot-water flow switch: SFM2

Connect the module hot-water flow switch SFM2 to terminals 93 and 80L of XT2. SFM2 isn't required for any PJP models. SFM2 must be installed and wired in the field for all PJS models.

Liquid pump starter contacts

Use terminals TB1:1-2 (DO1-E) of the relay board (ARB) to control the cold-water pump, and use terminals TB3:1-2 (DO3-E) of the ARB to control the hot-water pump. The voltage of free contacts are 115 VAC. Four-pipe units need to connect both the cold-water and hot-water pumps. The two-pipe units only need to connect the pump for one water loop with DO1-E.

Water valve control contacts

Use terminals TB2:1-2 (DO2-E) of the ARB to control the cold-water valve, and use terminals TB4:1-2 (DO4-E) of the ARB to control the hot-water valve. The voltage of free contacts are 115 VAC. Four-pipe units need to connect both cold-water and hot-water valves. The two-pipe units only need to connect one water valve with DO2-E.

Inlet and outlet pipe heater of cold water BPHE: EPH11 and EPH12

The active contact for the inlet and outlet pipe heater of the cold-water BPHE is on terminals 76B-2B. For 0035PJP models, the wiring for the heater in the control panel is completed in factoy.

Inlet pipe heater of cold-water hydro kit: EPH13

The active contact for the cold-water pump control is on terminals 76C-2C in the control panel. The wiring between the hydro kit and the control panel must be completed in the field, except for hydro kit combined with units.

Outlet pipe heater of cold-water hydro kit: EPH14

The active contact for the cold-water pump control is on terminals 76D-2D in the control panel. The wiring between the hydro kit and the control panel is completed in the factory, and the heater (EPH14) is only for 0035PJP models,which is combined with the hydro kit. This can also be reserved for customers who need to install a heater on the outlet pipe of the cold-water hydro kit.

Inlet pipe heater of hot-water hydro kit: EPH23

The active contact for the hot-water pump control is on terminals 77C-2G in the control panel. The wiring between the hydro kit and the control panel must be completed in the field, except for the hydro kit combined with units.

Outlet pipe heater of hot-water hydro kit: EPH24

The active contact for the hot-water pump control is on terminals 77D-2H in the control panel. This is reserved for customers who need to install a heater on the outlet pipe of hot-water hydro kit.

Alarm contacts

The free contact for the alarm signal is on terminals 65 and 66.

Run status contacts

The free contact for the run status signal is on terminals 67 and 68.

System leaving liquid temperature sensor: BLST

Connect the system leaving temperature sensor for cold water (BLST1) to AI6 (1 and 3) on the control board of the leader module. Connect the system leaving temperature sensor for hot water (BLST2) to AI18 (1 and 2) on the control board of the leader module. BLST2 is only for four-pipe units.

Emergency stop switch

Customer can connect an emergency stop switch to terminals 3 and 4 of XT1. When the switch is open, the entire control power is cut off and the unit can be stopped. The jumper needs to be removed before connecting the emergency stop switch.

SC-EQ communication board

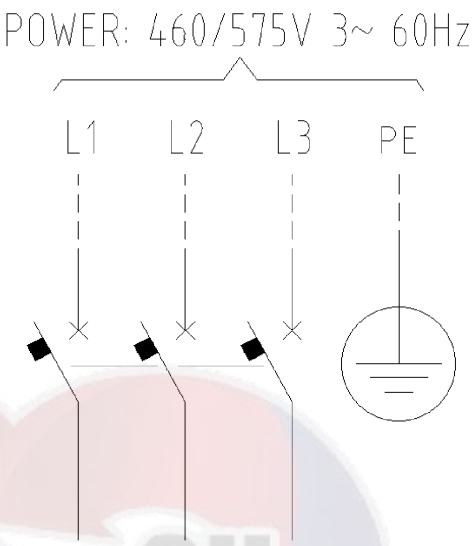
The SC-EQ communication board can provide a BACnet communication port for BAS connectivity. Refer to *SC-EQ Communication Card, Form 450.50-N1* and *YMAE Quick Start Guide, Form 150.89-QSG* for more information.

Modular communications

Note: The maximum number of modules connected within one control group must not exceed 32 and each module must have a unique address set using the module address switch. Set all addresses before power is applied in order to avoid damage.

For information on settings, refer to the *Modular units installation* in *Form 150.89-QSG1*.

Figure 44: Power supply connection



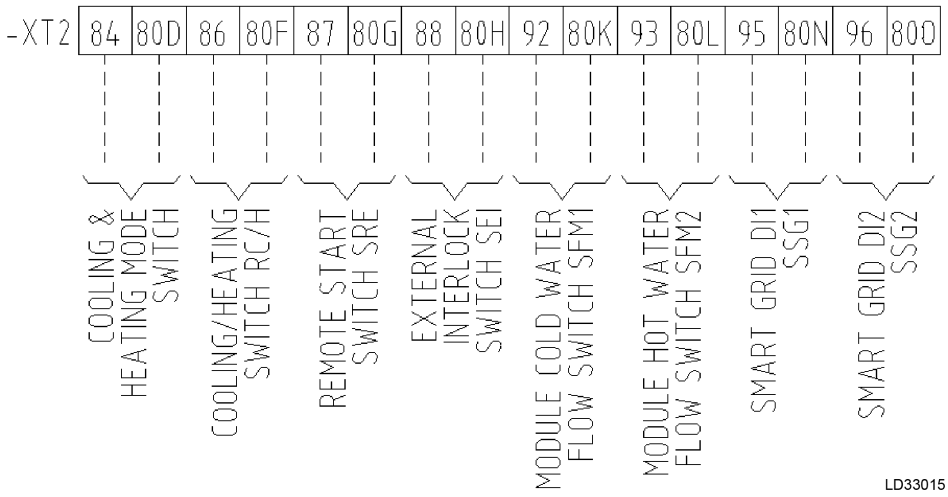
MODEL	POWER VOLTAGE
YMAE-PJS46	460V
YMAE-PJP46	460V
YMAE-PJS58	575V
YMAE-PJP58	575V

LD33014

Note:

- For the appropriate power supply, refer to the voltage and current on the nameplate.
- For 0035 units, connect customer power to the control panel and for 0070, 0105, and 0140 units, connect customer power to the SPC box. Internal wiring between the SPC box and control panel of individual modules is completed in factory.
- Deploy a leakage current protector in the customer circuit breaker, and ensure there is a reliable ground connection on site.
- For any discrepancy on site, such as capacitance decreases, refer to UL standards and requirements by cable manufacturers.
- Only use copper conductors for the power supply cable.

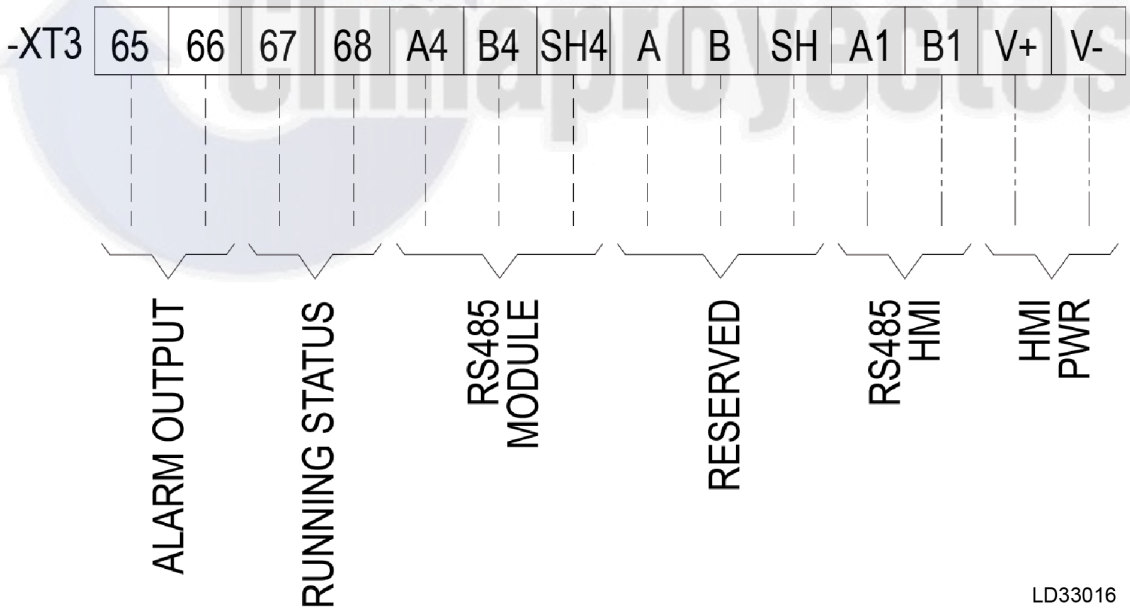
Figure 45: External customer input control connections



Note:

- The contact resistance of external switch cannot be greater than 1kΩ. The loop voltage is 12 VDC when the external switch is open.
- SFM1 are installed and wired in the factory for two-pipe units, and SFM1 and SFM2 are loose shipped and installed in the field for four-pipe units.

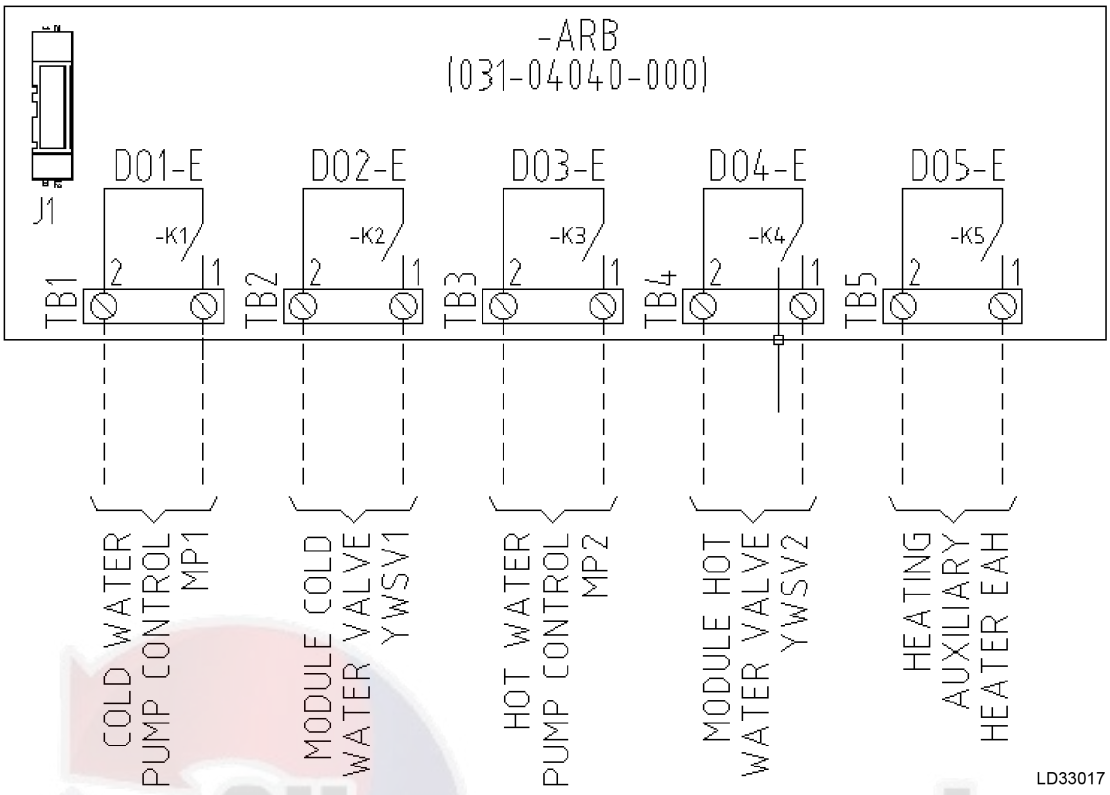
Figure 46: Alarm output and running status connections



Note:

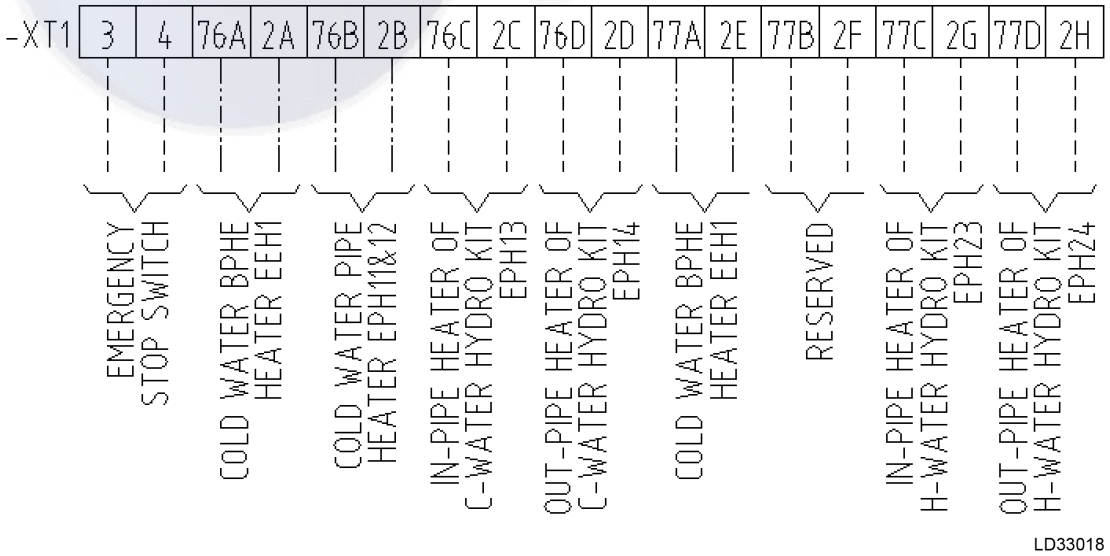
- Alarm output on terminals 65 and 66 and running status on terminals 67 and 68 are free contacts, and the rating capacity is 1A/115V.
- Connections of the modular communication for 0070, 0105, and 0140 models are completed in the factory. Modular communication connections for other multi-module applications are completed in the field.

Figure 47: Pump control and water valve connections



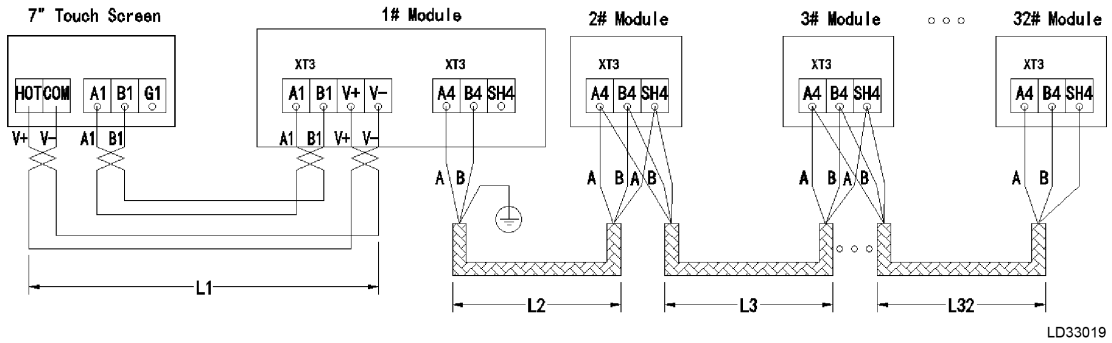
Note: The customer must wired these connections.

Figure 48: Emergency stop switch and pipe heater of hydro kit connections



Note: The customer must wired these connections.

Figure 49: Communication connections – modular array



Note: Connections for the modular communication for 0070, 0105, and 0140 models are completed in the factory. Modular communication connections for other multi-module applications are completed in the field.

See the following table for the appropriate communication cable to use:

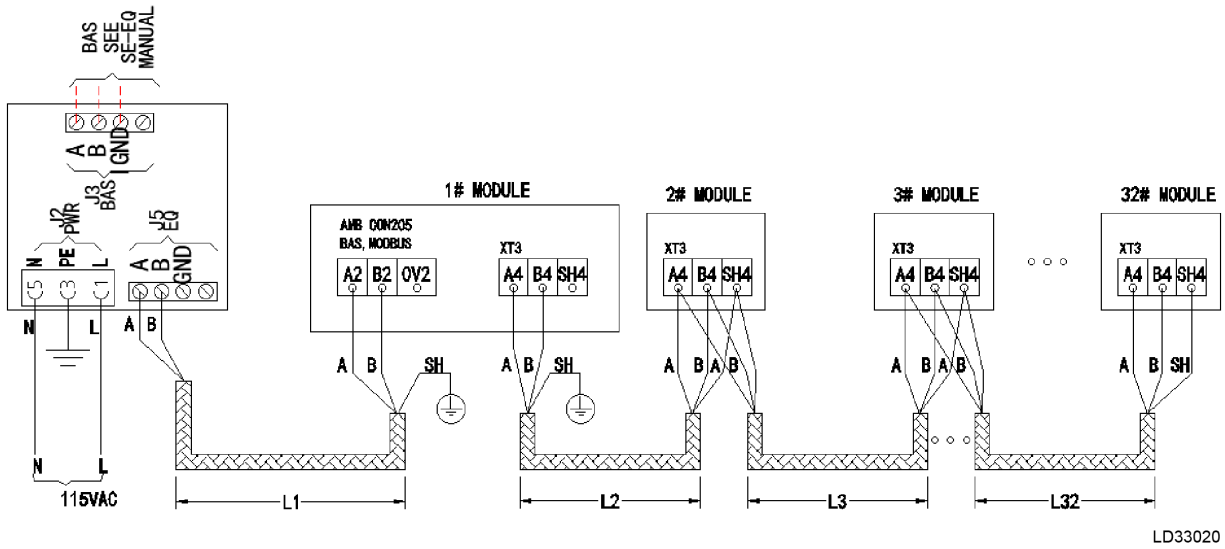
Table 7: Communication cable length and type

Total length	L = L1 + L2 + L3 + … + Ln (n ≤ 32, m)		
	L < 100 m	100 m < L < 500 m	L > 500 m
Cable type	Recommend shield twisted pair cable 2 x 0.75 mm^2	Recommend shield twisted pair cable 2 x 1.0 mm^2	Contact Johnson Controls

Note:

- The total length of the communication cable is L= L2+L3…+ Ln.
- Ensure the communication cable is shielded twisted pair (STP).
- Every control board of each individual module is assigned one ID address. The ID address can be set using the DIP switch in the control panel of each module. The ID addresses are factory-set for modular array models 0070, 0105, and 0140.
- For other multi-module combination applications, you need to set the ID addresses in the field.
- Connect the HMI to the leader module.

Figure 50: Communication connections, SC-EQ and BAS



Note: The SC-EQ on the leader module provides the BACnet communication port for the BAS.

See the following table for a guide to electrical cable connections. These are for reference only.

Table 8: Electrical cable connections

YMAE	V	Max FLA (A)	MCA (A)	Max Dual Elem Fuse/CB (Max OP) (A)	Screw/Nut		Recommended Conductor Size				
					Phase, Recommended Torque	PE, Recommended Torque	Phase (AWG)	Number of conductors per phase	PE (AWG)	Number of PE conductors	Max. length (m)
0035PJS	460	84	92	110	M8, 15N.M	M8, 18N.M	2	1	6	1	242
0070PJS		151	159	175	M10, 38N.M	M10, 25N.M	2/0		2		270
0105PJS		262	270	300			1/0	2	4	2	247
0140PJS		328	336	350			3/0		1/0		314
0035PJP		75	83	110	M8, 15N.M	M8, 18N.M	2	1	6	1	271
0070PJP		142	149	175	M10, 38N.M	M10, 25N.M	2/0		2		287
0105PJP		230	238	250			1/0	2	4	2	282
0140PJP		296	304	300			3/0		1/0		348

Note:

- The data in the table are based on including the hydraulic kit.
- The maximum distance is calculated using the cable diameters shown in this table. For longer lengths, and for cables laying with other cables, re-calculate the minimum cable diameter to a higher value to allow for any electromagnetic or harmonic effects.

⚠ WARNING

Refer to the dimensions of any power cable connectors to ensure that the fitting to the specified power cables and circuit breaker is correct. Due to the high risk of electrical shock and in compliance with electrical regulations, cable and power terminals must be protected. Any accessories to adapt allowable cable connections can be sourced at electrical suppliers. The number of options are too numerous to list in this document.

Figure 51: Electrical schematic 1

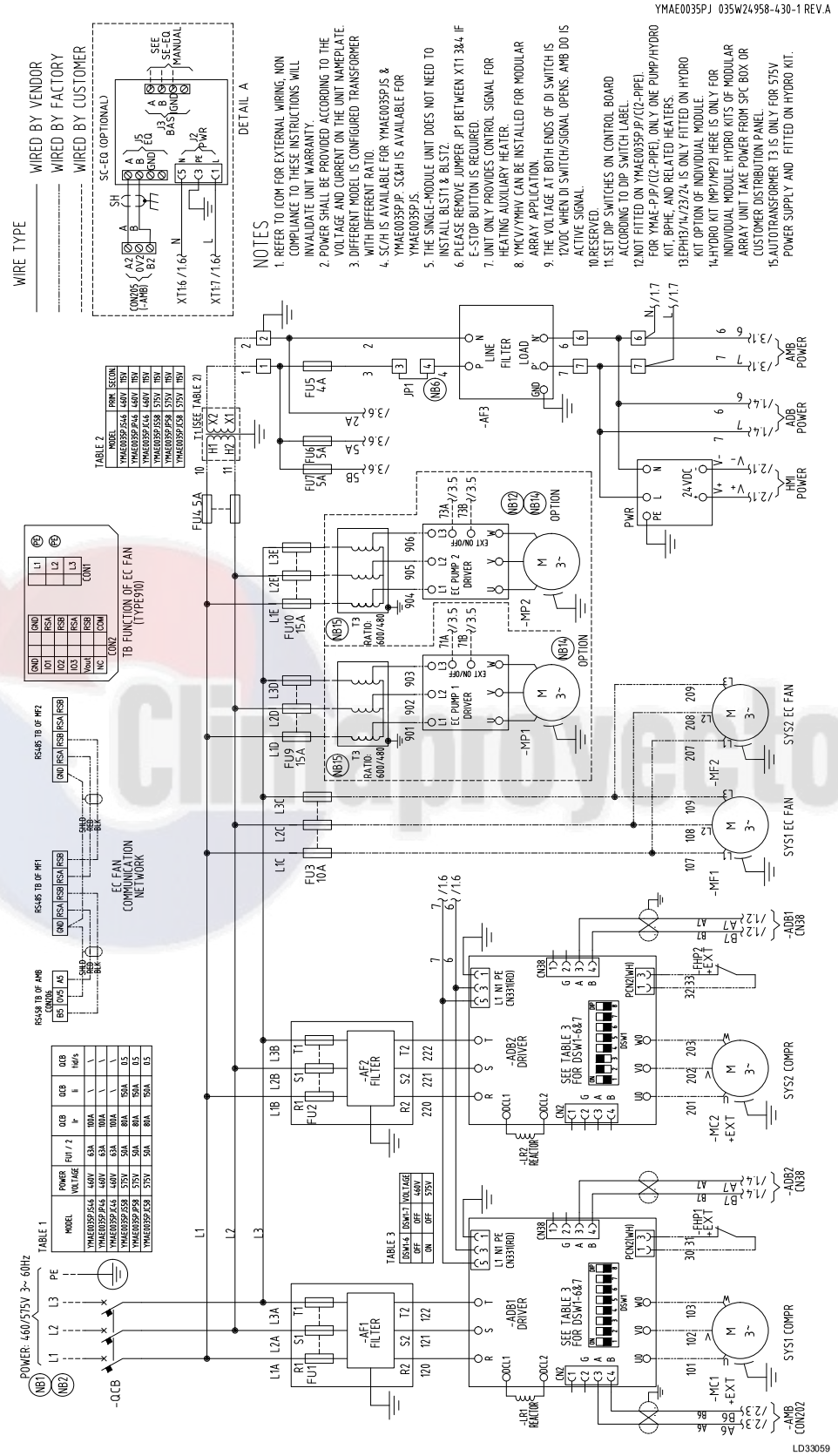


Figure 52: Electrical schematic 2

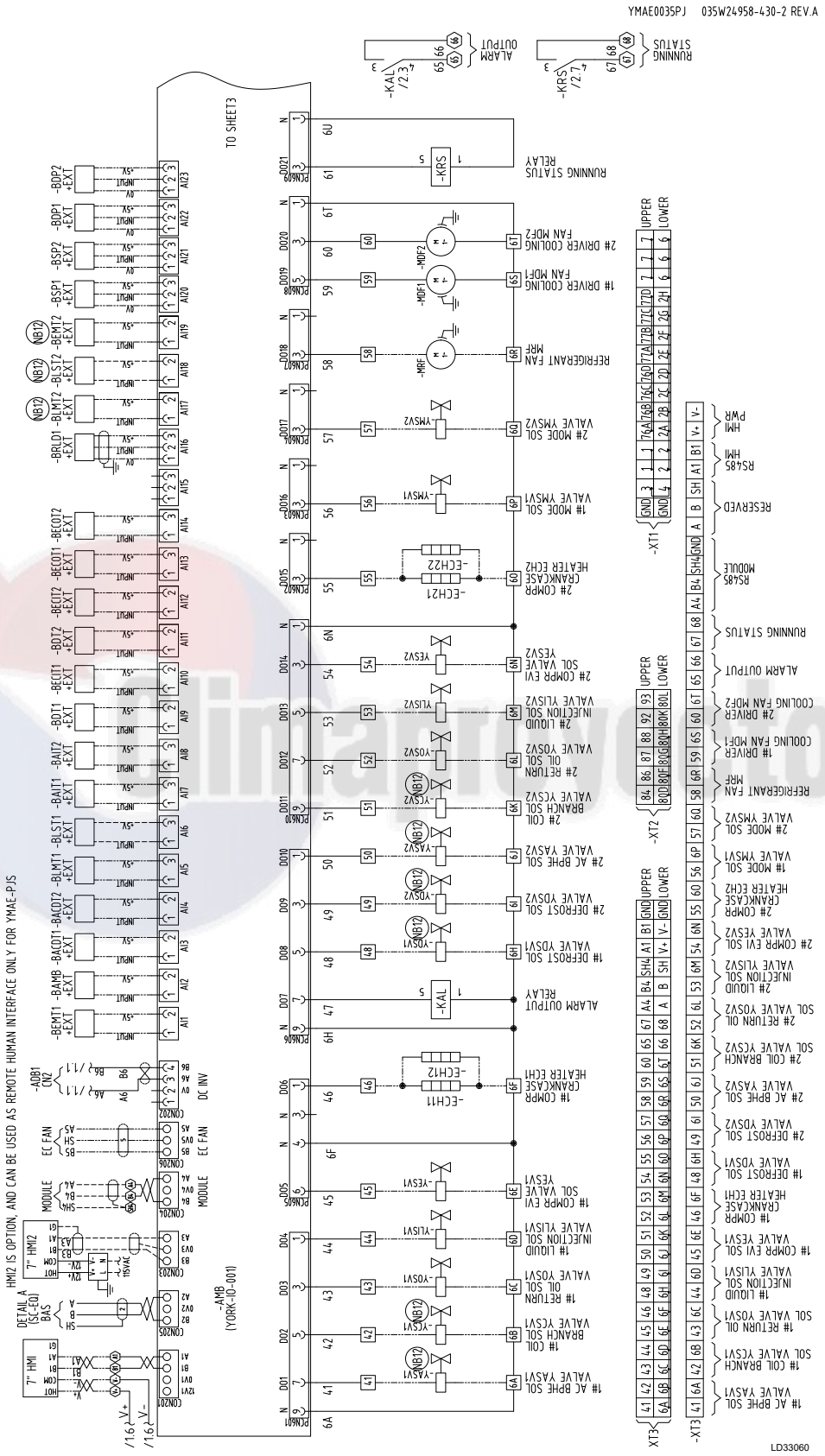
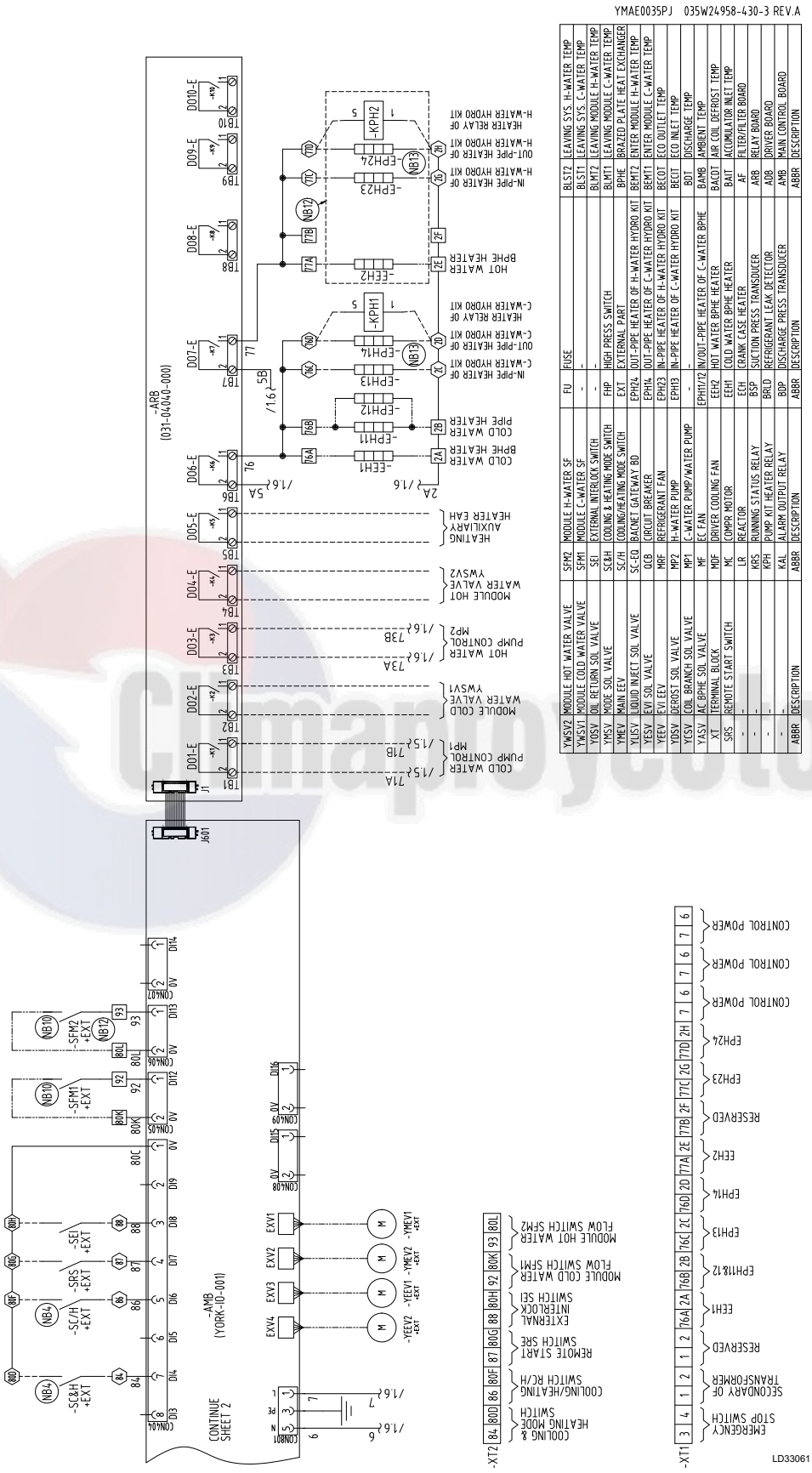


Figure 53: Electrical schematic 3



Commissioning

Preparing with the power off

About this task:

> **⚠ CAUTION**
>
> Ensure only authorized personnel perform commissioning of this unit.

> **⚠ WARNING**
>
> Complete the following checks with the customer supply to the unit switched OFF.

Inspection: Inspect the unit for installation damage. If found take action or repair as appropriate. Inspect the wiring and ensure connection terminals are correctly tightened.

Refrigerant charge: Units are normally shipped as standard with a full refrigerant operating charge. Check that refrigerant pressure is present in both systems and that there are no leaks. If there is no pressure in the system, complete a leak test, locate the leak, and repair the problem. Evacuate any repaired systems with a suitable vacuum pump or recovery unit as appropriate to below 1,000 microns before charging.

> **⚠ CAUTION**
>
> Do not charge liquid refrigerant with static water in the heat exchanger. Care must also be taken to charge liquid refrigerant slowly to avoid excessive thermal stress at the charging point.

After the vacuum is broken, charge with the full operating charge. See Refrigerant and oil charge.

Valves: Ensure that the compressor discharge and suction service valves are set correctly, that is they are open.

Fans: Check that all fans are free to rotate and are not damaged. Ensure blades are at the same height when rotated. Ensure the fan guard is securely fixed.

Isolation/protection: Verify that all sources of electrical supply are taken from a point of isolation.

Power panel: Check the panel to see that it is free of foreign materials, for example wire or metal chips, and clean out if required. Vacuum clean only. Do not pressure clean.

Power connections: Check the customer power cables are connected correctly. Ensure that connections of power cables within the power panel to the circuit breaker are tight. See Table 8.

Earthing: Verify that the unit earth terminal is correctly connected to a suitable earthing point. Ensure that all unit internal earth connections are tight.

Supply voltage: Verify that the site voltage supply corresponds to the unit requirements and is within the limits given in Electrical data. The phase imbalance must be less than 2% of the average voltage.

Switch settings: Set the circuit breaker to ON, then set the customers disconnection devices to ON. Close all doors on the electrical panel with the handle engaged.

⚠ WARNING

The machine is now live.

Preparing with the power on

About this task:
Complete the steps in Preparing with the power off.

Crankcase heaters: Verify the heaters are energized.

⚠ CAUTION

Depending on the ambient temperature, the crankcase heaters must be on for 8 h before the first start-up.

Water system: Verify that the liquid system has been correctly installed and has been commissioned with the correct direction of water flow through the heat exchanger. Follow the installation indicated by the arrows on the pipework. Purge air from the heat exchanger using the air vent mounted in the pipework.

⚠ CAUTION

See Technical data for flow rate and pressure drop limits. Do not operate outside of these limits because it could damage the unit.

Flow switch SFM: The flow switch is a standard offering for each individual module. All two-pipe unit flow switches are factory-installed, and the four-pipe flow switch is loose shipped and field-installed on the outlet water tube for each module. Verify a chilled-liquid flow switch is correctly fitted in the customer's pipework on the system outlet, and wired into the control panel correctly.

Temperature sensor BLST: Ensure the leaving liquid temperature sensors are coated with heat conductive compound, part number 013-00898-000, and are inserted in the water outlet sensor pockets of the system. This is applicable for modular systems only, such as modular arrays or multi-module combination applications.

Programmed settings: Ensure the system cut-out and operational settings are in accordance with operational requirements. See Unit operation.

Date and time: Set the date and time. See Setting the date and time.

Start or stop schedule: Program the daily and holiday start/stop. See Setting a schedule and Setting a holiday.

Setpoints: Set the required leaving chilled or hot liquid temperature setpoint and control range. See Setting the cooling and heating setpoints.

First time start-up

About this task:

ⓘ **Note:** During the commissioning period, ensure there is sufficient heat load to run the unit under stable full load operation to enable the unit controls and system operation to be set up correctly and a commissioning log taken.

Read the following section in conjunction with Unit operation, and complete the following steps:

1. **Emergency stop**: Remove the protective plate from the control panel before commissioning. See Figure 17.
2. **Interlocks:** Verify that liquid is flowing through the heat exchanger and that heat load is present. Ensure that any remote run interlocks are in the run position and that the run schedule requires the unit to run or is overridden.
3. **Start-up:** On the HMI, set the unit switch to the ON position to start the unit. There may be a few minutes delay before the first compressor starts because of the anti-recycle timer. If any unusual noises or other adverse conditions develop when each compressor starts, be ready to switch the unit off immediately. Refer to Unit operating sequence for the normal operating sequence from start-up.
4. **System operation:** Check the system pressures and temperatures.
5. **General operation:** After completing the above checks for System 1, repeat the process for all other systems. In addition, check that loading occurs as specified in Technical data and that general operation is correct.

⚠ CAUTION

Units equipped with factory-fitted hydro kits are shipped with the following settings on the pump VSD. All other settings are default.

Operation Mode is set to Δp-v

Pump Head is set to H = 30 m.

Customers can adjust the pump setting according to application requirements in field. Refer to the pump guide for more information.

Special items required for vacuuming and refrigerant charging

As standard, the refrigerant for these units is charged in factory. If the units are delivered without R-454B and charged with Nitrogen instead, the following items are necessary to complete an onsite refrigerant charge:

- Nitrogen chart
- Leak detector
- ATEX vacuum pump
- ATEX ventilation fan
- Antistatic gloves
- Warning sign to indicate no ignition sources in the area

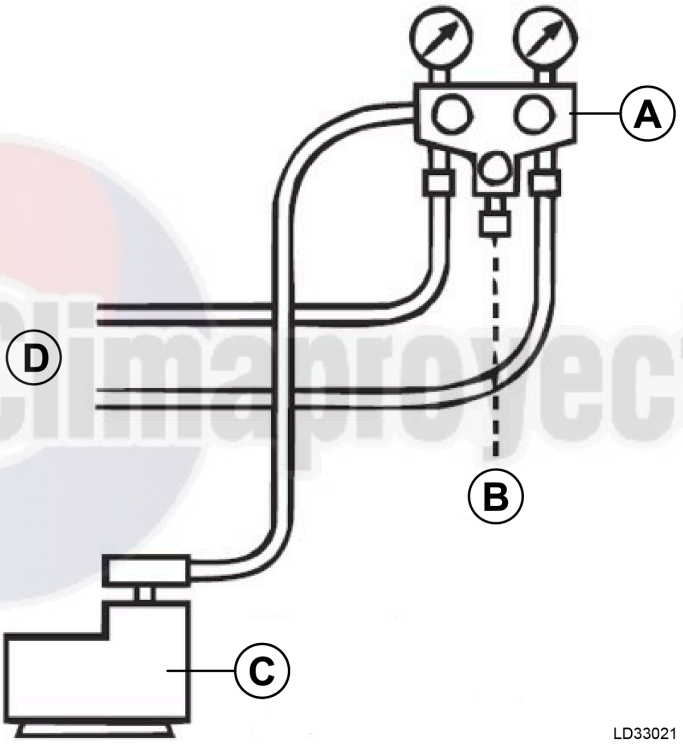
Vacuuming procedure

If you need to charge refrigerant, it is necessary to first obtain a sufficiently dry system. Perform a vacuuming in the high and low side service access valves, which are in the discharge line and suction line.

1. Connect a manifold valve, a vacuum pump, and a vacuum gauge suitable for R-454B refrigerant.
2. Operate the vacuuming pump for at least 1 h to 2 h until the vacuum grade is below 130 Pa (1,000 microns).

   ⓘ **Note:** If the vacuum grade has not decreased to 130 Pa (1,000 microns) after 2 h, ensure that there is no leakage and no water in the system, and then continue to vacuum for another 1 h.

Figure 54: Vacuuming procedure



A	Manifold valve for vacuuming	C	Vacuuming pump
B	Refrigerant tank for R-454B	D	Connection to the unit

Confirming a vacuum

Use a vacuum gauge to measure a target vacuum. However, it is not possible to read the vacuum gauge installed in the manifold accurately. Use a digital vacuum measuring device.

Water evaporation

In atmospheric pressure, water boils at 212°F (100°C). However, each time the pressure in the pipes reaches a vacuum state, water boils at a lower temperature than 212°F (100°C). The lower this temperature is, the easier the water evaporators and vacuum drying occurs.

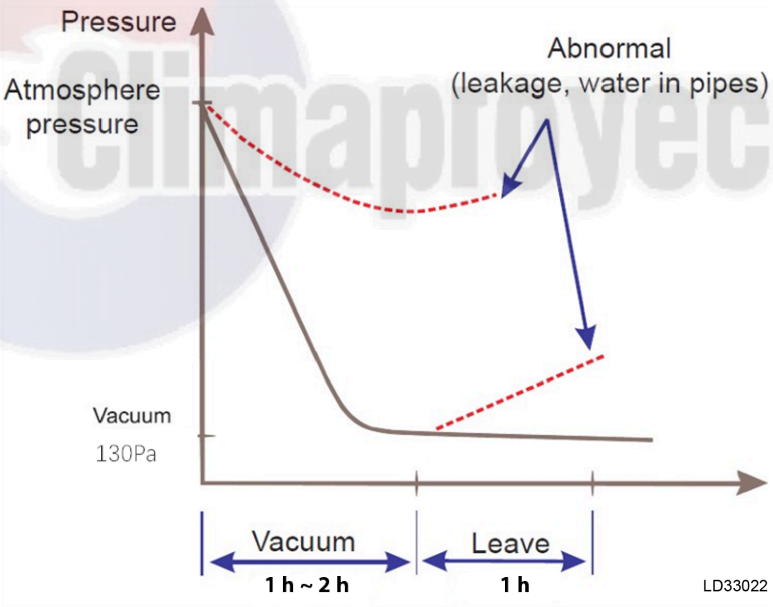
If there is a possibility of dew condensation, the vacuuming time must be controlled more strictly because water does not evaporate easily and it is difficult to know the degree of dew condensation. 130 Pa (1,000 microns) is a guideline to control the vacuum grade.

After finishing vacuuming, close the manifold valve and stop the vacuum pump. Leave the unit for 1 h to confirm that the pressure measured by a vacuum gauge has not increased.

This process is necessary because the ambient air can leak into the system due to negative pressure in the system after the vacuum process. Additionally, an air leak may not be confirmed in the air tightness test alone.

In the case of pressure increasing significantly, it can indicate that there may be a leakage somewhere in the system. Complete an air tightness check and the vacuum drying process again after fixing the leakage.

Figure 55: Vacuuming and leave time



Refrigerant charging for R-454B

⚠ CAUTION

Do not charge liquid refrigerant with static water in the heat exchanger. Take care to charge liquid refrigerant slowly to avoid excessive thermal stress at the charging point.

Due to refrigerant characteristics, ensure the following points:

- Refrigerant must be added in a liquid state and not in gas state.
- Confirm if the tanks are specialized for R-454B.
- The valves or hose for charge must be specialized for R-454B.

Refrigerants are classified as A2L refrigerant and must be handled in accordance with all governing regulations. Failure to meet this requirement can result in damage to equipment, release of refrigerant into the environment, contamination of the operating space for the equipment, and pose a risk of personal injury. It is the responsibility of any service technician or operator to adhere to these requirements. For more details refer to *Chiller A2L Refrigerant Application Data, Form 160.00-AD10.*

Confirming the correct refrigerant tank

The color of the cylinder tank differs depending on the type of refrigerant. It is also possible to confirm the refrigerant by the engraved text on the container.

ⓘ **Note:** The specification of the connection screw for R-454B is usually UNF1/2.

Charging the refrigerant

Complete the refrigerant charge using the charging valve located in the liquid line between the air source coil and the small economizer PHE. The refrigerant is charged in liquid form:

1. Confirm the measurement with a scale for refrigerant charge. See Refrigerant and oil charge for more information.
2. If it is not possible to charge the defined amount due to low outdoor temperature or other reasons, complete the following steps:
   a. Operate the compressor in cooling mode.
   b. Gradually charge the refrigerant from the service access valve in the suction line before the accumulator.
   c. Adjust the stop valve opening of the liquid from fully closed to slightly open, and charge the remaining defined amount on the low-pressure side.

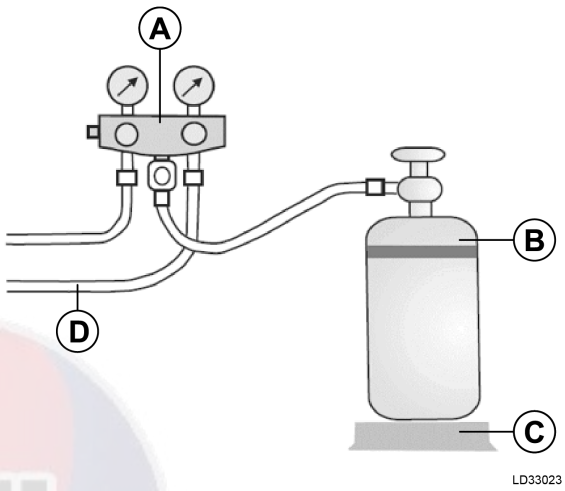
⚠ WARNING

Checks for refrigerant leakage must be performed steadily. The refrigerant used in this unit is flammable, non-toxic, and odorless. Ensure air ventilation to avoid potential refrigerant accumulation risk. Any ignition sources are strictly prohibited during vacuuming, refrigerant charging, and commissioning.

⚠ CAUTION

Over-charging and insufficient refrigerant charge may cause damage to the compressor. Always weigh the refrigerant to ensure that the correct amount of refrigerant is used. Refer to the nameplate and Technical data for more information.

Figure 56: Charging R-454B

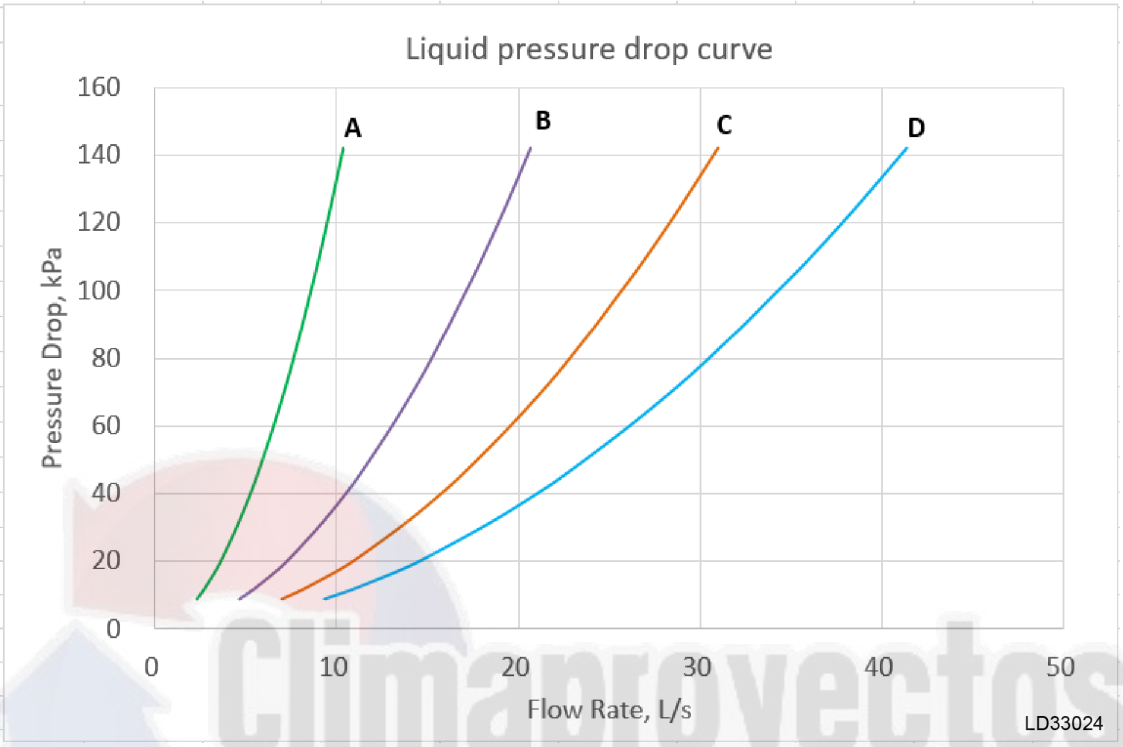


Callout	Component	Callout	Component
A	Manifold valve specialized for R-454B	C	Scale
B	Refrigerant tank with siphon pipe, specialized for R-454B	D	Hose for charge specialized for R-454B

Technical data

Heat exchanger flow

Figure 57: Heat exchanger pressure drop



Unit models	Pressure drop curve	Correlation
0035	A	y = 1.1725*x^2 + 1.842*x - 2.0427
0070	B	y = 0.2931*x^2 + 0.921*x - 2.0427
0105	C	y = 0.1303*x^2 + 0.614*x - 2.0427
0140	D	y = 0.0733*x^2 + 0.4605*x - 2.0427

Note: The pressure drop curve is based on using water. If you need other liquid data, contact your Johnson Controls representative.

Operational limitations

Table 9: Operational limitations

Unit models	Leaving liquid temperature °F (°C)		Liquid flow gpm (Lpm)		Air on ambient coil °F (°C)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Cooling, low temperature process chiller						
0035PJP	14 (-10)	68 (20)	37 (140)	126 (477)	-4 (-20)	118.4 (48)
0070PJP	14 (-10)	68 (20)	74 (280)	252 (954)	-4 (-20)	118.4 (48)
0105PJP	14 (-10)	68 (20)	111 (420)	378 (1,431)	-4 (-20)	118.4 (48)
0140PJP	14 (-10)	68 (20)	148 (560)	504 (1,904)	-4 (-20)	118.4 (48)
0035PJS	14 (-10)	68 (20)	47 (140)	126 (477)	-4 (-20)	118.4 (48)
0070PJS	14 (-10)	68 (20)	74 (280)	252 (954)	-4 (-20)	118.4 (48)
0105PJS	14 (-10)	68 (20)	111 (420)	378 (1,431)	-4 (-20)	118.4 (48)
0140PJS	14 (-10)	68 (20)	148 (560)	504 (1,904)	-4 (-20)	118.4 (48)
Cooling, water or glycol						
0035PJP	40 (4.4)	68 (20)	37 (140)	126 (477)	-4 (-20)	118.4 (48)
0070PJP	40 (4.4)	68 (20)	74 (280)	252 (954)	-4 (-20)	118.4 (48)
0105PJP	40 (4.4)	68 (20)	111 (420)	378 (1,431)	-4 (-20)	118.4 (48)
0140PJP	40 (4.4)	68 (20)	148 (560)	504 (1,904)	-4 (-20)	118.4 (48)
0035PJS	40 (4.4)	68 (20)	37 (140)	126 (477)	-4 (-20)	118.4 (48)
0070PJS	40 (4.4)	68 (20)	74 (280)	252 (954)	-4 (-20)	118.4 (48)
0105PJS	40 (4.4)	68 (20)	111 (420)	378 (1,431)	-4 (-20)	118.4 (48)
0140PJS	40 (4.4)	68 (20)	148 (560)	504 (1,904)	-4 (-20)	118.4 (48)
Heating						
0035PJP	77 (25)	140 (60)	37 (140)	126 (477)	-13 (-25)	109.4 (43)
0070PJP	77 (25)	140 (60)	74 (280)	252 (954)	-13 (-25)	109.4 (43)
0105PJP	77 (25)	140 (60)	111 (420)	378 (1,431)	-13 (-25)	109.4 (43)
0140PJP	77 (25)	140 (60)	148 (560)	504 (1,904)	-13 (-25)	109.4 (43)
0035PJS	77 (25)	140 (60)	37 (140)	142 (537)	-13 (-25)	109.4 (43)
0070PJS	77 (25)	140 (60)	74 (280)	284 (1,073)	-13 (-25)	109.4 (43)
0105PJS	77 (25)	140 (60)	111 (420)	426 (1,610)	-13 (-25)	109.4 (43)
0140PJS	77 (25)	140 (60)	148 (560)	568 (2,147)	-13 (-25)	109.4 (43)

Note:

- For water system applications, the liquid flow rate for 0035, 0070, 0105, and 0140 models must be above 57 gpm (216 Lpm), 114 gpm (431 Lpm), 171 gpm (647 Lpm), and 228 gpm (863 Lpm), respectively.
- For glycol system applications, if the flow rate for 0035, 0070, 0105, and 0140 models is potentially less than 57 gpm (216 Lpm), 114 gpm (431 Lpm), 171 gpm (647 Lpm), and 228 gpm (863 Lpm), respectively, select the optional low-flow type flow switch.

Operating and storage conditions

- Standard leaving chilled water temperature: 40°F to 68°F (4.4°C to 20°C)
- Low leaving chilled temperature, processing: 14°F to 68°F (-10°C to 20°C)
- Standard ambient temperature, cooling mode: -4°F to 118.4°F (-20°C to 48°C)
- Standard heating leaving temperature: 77°F to 140°F (25°C to 60°C)
- Ambient temperature, heating mode: -13°F to 109.4°F (-25°C to 43°C)
- Unit storage ambient temperature: -22°F to 125.6°F (-30°C to 52°C)

Figure 58: Two-pipe cooling operation envelope

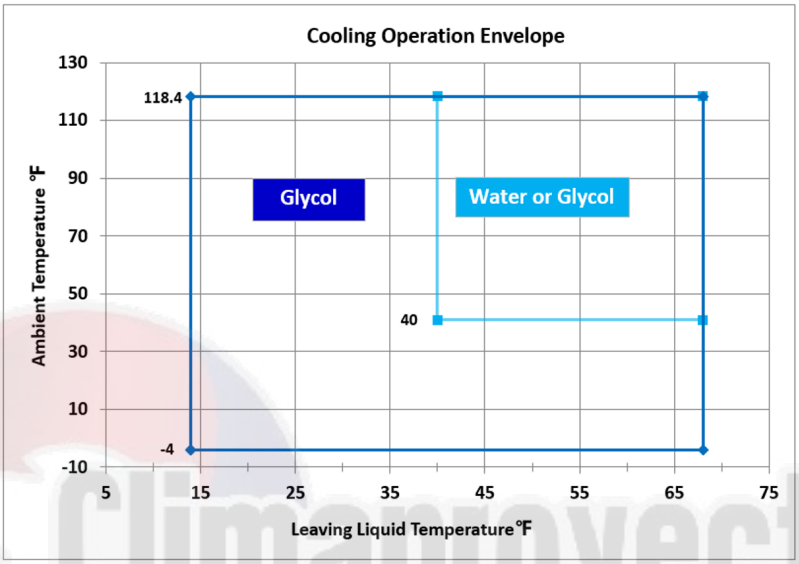


Figure 59: Two-pipe heating operation envelope

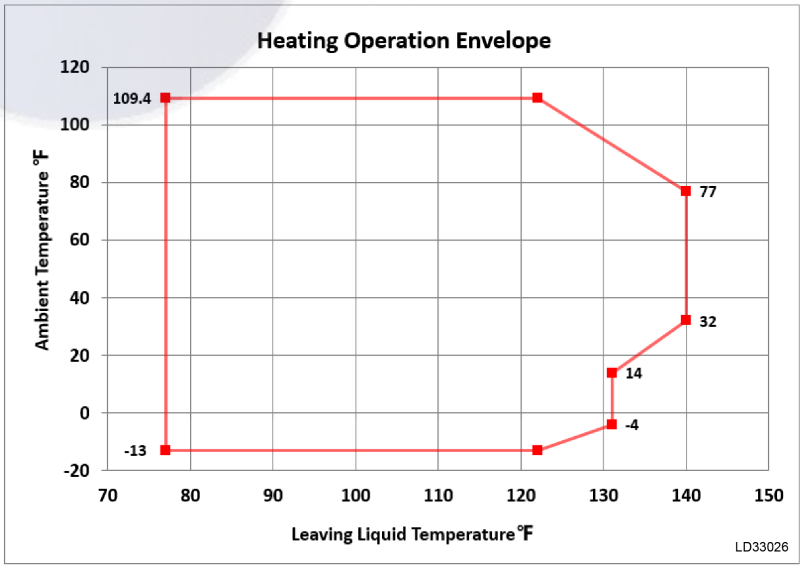


Figure 60: Four-pipe cooling operation envelope

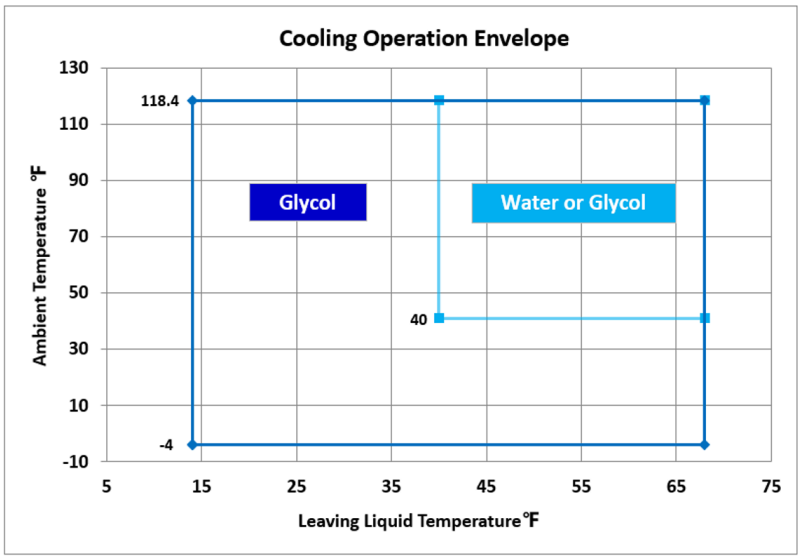


Figure 61: Four-pipe heating operation envelope

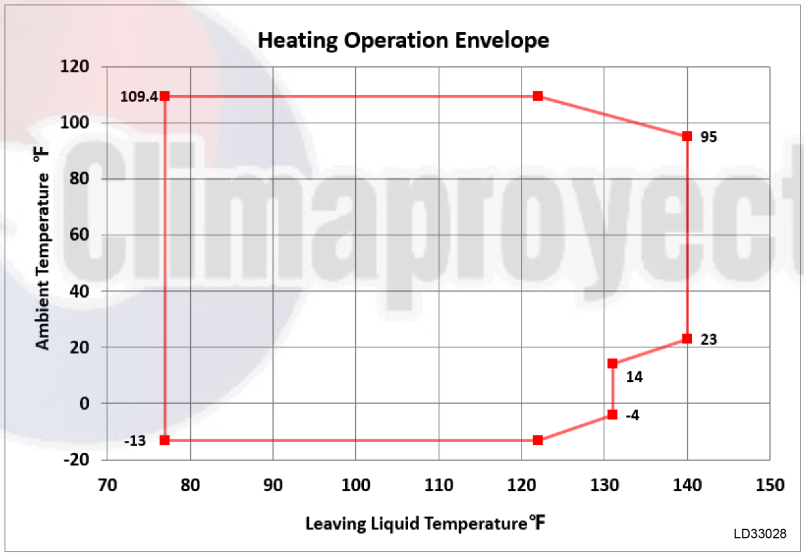
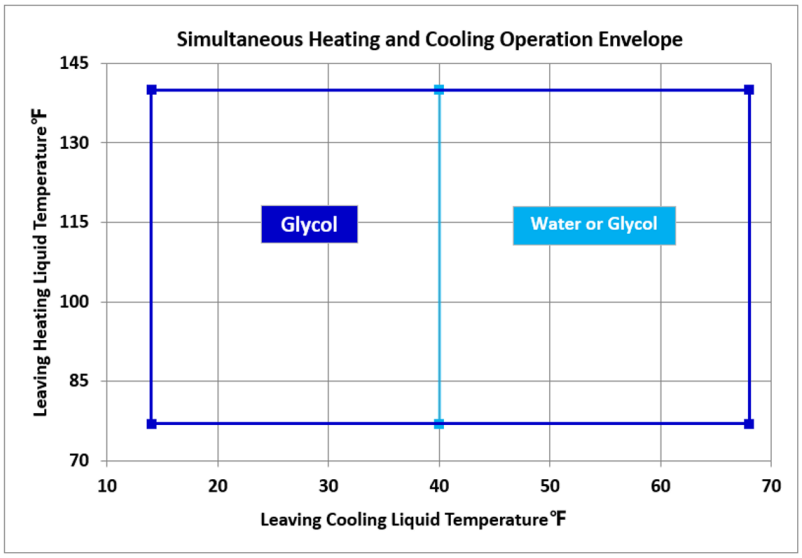


Figure 62: Four-pipe, simultaneous cooling and heating operation envelope



Physical data

Table 10: Two-pipe physical data, 0035 to 0140, 460 V, 3-phase, 60 Hz

Two pipe model			0035PJP	0070PJP	0105PJP	0140PJP
Performance	**Cooling mode**					
	Cooling capacity	Ton	35	70	105	140
	Input power	kW	41.17	82.4	123.5	164.8
	EER	BTU/W	10.2			
	IPLV	BTU/W	20.01			
	Heating mode, ambient: 47°F/43°F, leaving: 105°F					
	Heating capacity	MBH	458.4	916.8	1,375	1,834
	Input power	kW	38.94	77.88	116.8	155.8
	COPH	kW	3.45			
	Sound power level for cooling	dB(A)	84	87	90	91
Refrigerant	Type		R-454B			
	Refrigerant circuit	No.	2	4	6	8
	Refrigerant charge for each circuit	lb (kg)	25.4 (11.5)			
Compressor	Type		DC inverter EVI scroll			
	Capacity step		Stepless (Inverter)			
	Quantity	No.	2	4	6	8
Air side heat exchanger	Coil type		Copper tube, aluminum plate fin			
	Fan type		Axial fan, EC inverter motor			
	Fan quantity	No.	2	4	6	8
	Total air flow rate	CFM	25,900	51,800	77,700	103,600
	Working ambient temperature for cooling	°F (°C)	-4.0 ~ 118.4 (-20 ~ 48)			
	Working ambient temperature for heating	°F (°C)	-13.0 ~ 109.4 (-25 ~ 43)			
Water side heat exchanger	Type		Braze plate exchanger			
	Water connection		Victaulic			
	Nominal water flow rate for cooling	gpm (Lpm)	83.38 (315.63)	166.8 (631.41)	250.1 (946.73)	333.5 (1,262.43)
	Nominal water flow rate for heating					
	Pressure drop for cooling	ft H_2O	13.7			
	Pressure drop for heating		12.9			
	Working range leaving water temperature for cooling	°F (°C)	14.0 ~ 68.0 (-10 ~ 20)			
	Working range leaving water temperature for heating	°F (°C)	77.0 ~ 140.0 (25 ~ 60)			
Dimensions and weight	Length, without pump kit	in. (mm)	88.2 (2,240)	120.1 (3,051)	192.9 (4,900)	265.8 (6,751)
	Width, without pump kit	in. (mm)	47.2 (1,199)	88.2 (2,240)		
	Height, without pump kit	in. (mm)	99 (2,515)			
	Shipping weight without pump kit	lb (kg)	2,370 (1,075)	5,164 (2,342)	7,870 (3,570)	10,569 (4,794)
	Operation weight without pump kit	lb (kg)	2,403 (1,090)	5,230 (2,372)	7,969 (3,615)	10,701 (4,854)
Electrical features	Voltage	V/Ph/Hz	460/3/60			
	MCA without pump kit	A	74	140	206	272
	RLA without pump kit	A	66	132	198	264

Note:

- Rated cooling performance: chilled EWT/LWT 54°F/44°F (12.2°C/6.7°C), outdoor air 95°F (35°C); IPLV data per AHRI standard 550/590 I-P.
- Rated heating performance: hot LWT 105°F (40.6°C), outdoor air 47°F/43°F (8.4°C/6.1°C) (DB/WB), the water flow rate used for heating is the same as cooling.

Table 11: Four-pipe physical data, 0035 to 0140, 460 V, 3-phase, 60 Hz

Four-pipe model			0035PJS	0070PJS	0105PJS	0140PJS
Performance	**Cooling mode**					
	Cooling capacity	Ton	35	70	105	140
	Input power	kW	41.17	82.34	123.5	164.7
	EER	BTU/W	10.2			
	IPLV	BTU/W	20.01			
	Heating mode, ambient: 47°F/43°F, leaving: 105°F					
	Heating capacity	MBH	450.8	901.5	1,352	1,803
	Input power	kW	37.21	74.42	111.6	148.8
	COPH	kW/kW	3.55			
	Simultaneous heating and cooling mode: Cooling chilled LWT 44°F, heating hot EWT/LWT 95°F/105°F					
	Cooling capacity	Ton	34.1	68.2	102.3	136.4
	Heating capacity	MBH	546	1,092	1,638	2,184
	Input power	kW	34.6	69.2	103.8	138.4
	COPshc	kW/kW	8.1			
	Sound power level (cooling)	dB(A)	84	87	90	91
Refrigerant	Type	No.	R-454B			
	Refrigerant circuit	No.	2	4	6	8
	Refrigerant charge/circuit	lb (kg)	25.4 (11.5)			
Compressor	Type		DC inverter EVI scroll			
	Capacity step		Stepless (Inverter)			
	Quantity	No.	2	4	6	8
Air side heat exchanger	Coil Type		Copper tube, aluminum plate fin			
	Fan Type		Axial fan, EC inverter motor			
	Fan quantity	No.	2	4	6	8
	Total air flow rate	cfm	25,900	51,800	77,700	103,600
	Working ambient temperature for cooling	°F (°C)	-4.0 ~ 118.4 (-20 ~ 48)			
	Working ambient temperature for heating	°F (°C)	-13.0 ~ 109.4 (-25 ~ 43)			

Table 11: Four-pipe physical data, 0035 to 0140, 460 V, 3-phase, 60 Hz

Four-pipe model			0035PJS	0070PJS	0105PJS	0140PJS
Water side heat exchanger	Type		Braze plate exchanger			
	Water connection		Victaulic			
	Nominal water flow rate for cooling	gpm (Lpm)	83.97 (317.86)	167.9 (635.57)	251.9 (953.55)	335.9 (1,271.52)
	Nominal water flow rate for heating		90.04 (340.84)	180.1 (681.75)	270.1 (1,022.44)	360.2 (1,363.51)
	Nominal water flow rate for simultaneous heating and cooling		**Cooling**			
			83.90 (317.60)	167.8 (635.19)	251.7 (952.79)	335.6 (1,270.38)
			Heating			
			109.1 (413.0)	218.2 (825.98)	327.3 (1,238.97)	436.4 (1,651.95)
	Pressure drop for cooling	ft H_2O	13.4			
	Pressure drop for heating		15.3			
	Pressure drop for simultaneous heating and cooling		13.4 (cooling)			
			22.0 (heating)			
	Working range leaving water temperature for cooling	°F (°C)	14.0 ~ 68.0 (-10 ~ 20)			
	Working range leaving water temperature for heating	°F (°C)	77.0 ~ 140.0 (25 ~ 60)			
	Working range water leaving temperature for simultaneous heating and cooling	°F (°C)	**Cooling**: 14.0 ~ 68.0 (-10 ~ 20)			
			Heating: 77.0 ~ 140.0 (25 ~ 60)			
Dimensions and weight	Length, without pump kit	in. (mm)	88.2 (2,240)	120.1 (3,051)	192.9 (4,900)	265.8 (6,751)
	Width, without pump kit	in. (mm)	47.2 (1,199)	88.2 (2,240)		
	Height, without pump kit	in. (mm)	99 (2,515)			
	Shipping weight without pump kit	lb (kg)	2,602 (1,180)	5,627 (2,552)	8,564 (3,885)	11,495 (5,214)
	Operation weight without pump kit	lb (kg)	2,668 (1,210)	5,759 (2,612)	8,762 (3,974)	11,759 (5,334)
Electrical features	Voltage	V/Ph/Hz	460/3/60			
	MCA without pump kit	Amps	74	140	206	272
	RLA without pump kit	Amps	66	132	198	264

Note:

- Rated cooling performance: chilled EWT/LWT 54°F/44°F (12.2°C/6.7°C), outdoor air 95°F IPLV data per AHRI standard 550/590 I-P.
- Rated heating performance: hot LWT 105°F (40.6°C), outdoor air 47°F/43°F (8.4°C/6.1°C) (DB/WB), the water flow rate used is determined by the hot EWT/LWT 95°F/105°F (35°C/40.6°C).
- Simultaneous heating and cooling: chilled LWT 44°F (6.7°C), water flow rate is determined by the water temperature at rated cooling capacity; hot EWT/LWT 95°F/105°F (35°C/40.6°C), the water flow rate is determined by heating capacity and hot water temperature.

Electrical data

Table 12: Electrical data

YMAE	No. of modules	Main power supply (3-phase)		Control supply (1-phase)		Hz	SCCR (A)	With hydro kit			
		Voltage (V)	Voltage limits	Voltage (V)	Voltage limits			Max FLA (A)	MCA (A)	Min. dual elem. fuse/CB (Min. OP) (A)	Max. dual elem. fuse/CB (Max. OP) (A)
0035PJS46	1	460	414-506	115	104-127	60	65	84	92	90	110
0070PJS46	2	460	414-506	115	104-127	60	65	151	159	175	175
0105PJS46	3	460	414-506	115	104-127	60	65	262	270	300	300
0140PJS46	4	460	414-506	115	104-127	60	65	328	336	350	350
0035PJP46	1	460	414-506	115	104-127	60	65	75	83	90	110
0070PJP46	2	460	414-506	115	104-127	60	65	142	149	150	175
0105PJP46	3	460	414-506	115	104-127	60	65	230	238	250	250
0140PJP46	4	460	414-506	115	104-127	60	65	296	304	300	300

Refrigerant and oil charge

Table 13: Refrigerant and oil charge, R-454B

YMAE		0035PJP	0070PJP	0105PJP	0140PJP	0035PJS	0070PJS	0105PJS	0140PJS
Refrigerant charge, lb (kg)	Sys 1	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)
	Sys 2	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)
	Sys 3	-	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	-	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)
	Sys 4	-	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)	-	25.4 (11.5)	25.4 (11.5)	25.4 (11.5)
	Sys 5	-	-	25.4 (11.5)	25.4 (11.5)	-	-	25.4 (11.5)	25.4 (11.5)
	Sys 6	-	-	25.4 (11.5)	25.4 (11.5)	-	-	25.4 (11.5)	25.4 (11.5)
	Sys 7	-	-	-	25.4 (11.5)	-	-	-	25.4 (11.5)
	Sys 8	-	-	-	25.4 (11.5)	-	-	-	25.4 (11.5)
Tonnes of CO_2 equivalent (GWP)		10.8	21.7	32.5	43.3	10.8	21.7	32.5	43.3
Oil charge, gal (L)	Sys 1	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)
	Sys 2	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)
	Sys 3	-	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	-	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)
	Sys 4	-	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)	-	6.34 (3.0)	6.34 (3.0)	6.34 (3.0)
	Sys 5	-	-	6.34 (3.0)	6.34 (3.0)	-	-	6.34 (3.0)	6.34 (3.0)
	Sys 6	-	-	6.34 (3.0)	6.34 (3.0)	-	-	6.34 (3.0)	6.34 (3.0)
	Sys 7	-	-	-	6.34 (3.0)	-	-	-	6.34 (3.0)
	Sys 8	-	-	-	6.34 (3.0)	-	-	-	6.34 (3.0)

Note:

- Oil type: FVC85EA
- Both systems are charged with additional oil before delivery.
- The oil charge show in this table is the total oil charge amount.

Water requirements

Table 14: Chilled water requirements

Item	Unit	Allowable value	Tendency	
			Corrosion	Deposition
PH value (25°C)		7.5 to 8.0	X	
SO4-	ppm	<100	X	
HCO3- /SO4--	ppm	>1.0	X	
Cl-	ppm	<50	X	
PO4	ppm	<2.0	X	
NH3	ppm	<0.5	X	
Free Chlorine	ppm	<0.5	X	
Fe+++	ppm	<0.5	X	
Mn++	ppm	<0.05	X	
CO2	ppm	<10	X	
H2S	ppm	<50	X	
Temperature	°C	<65	X	X
Oxygen content	pm	<0.1	X	
Total hardness	dH	4.8 to 8.5		X

Note:

- Items with corrosion tendency indicate that water quality that exceeds the allowable value for a long time may cause corrosion-related leakage of the heat exchanger and breakdown.
- Items with deposition tendency indicate that water quality that exceeds the allowable value for a long time may cause serious incrustation of the heat exchanger and affect heat transfer efficiency, resulting in a low efficiency of cooling or heating.

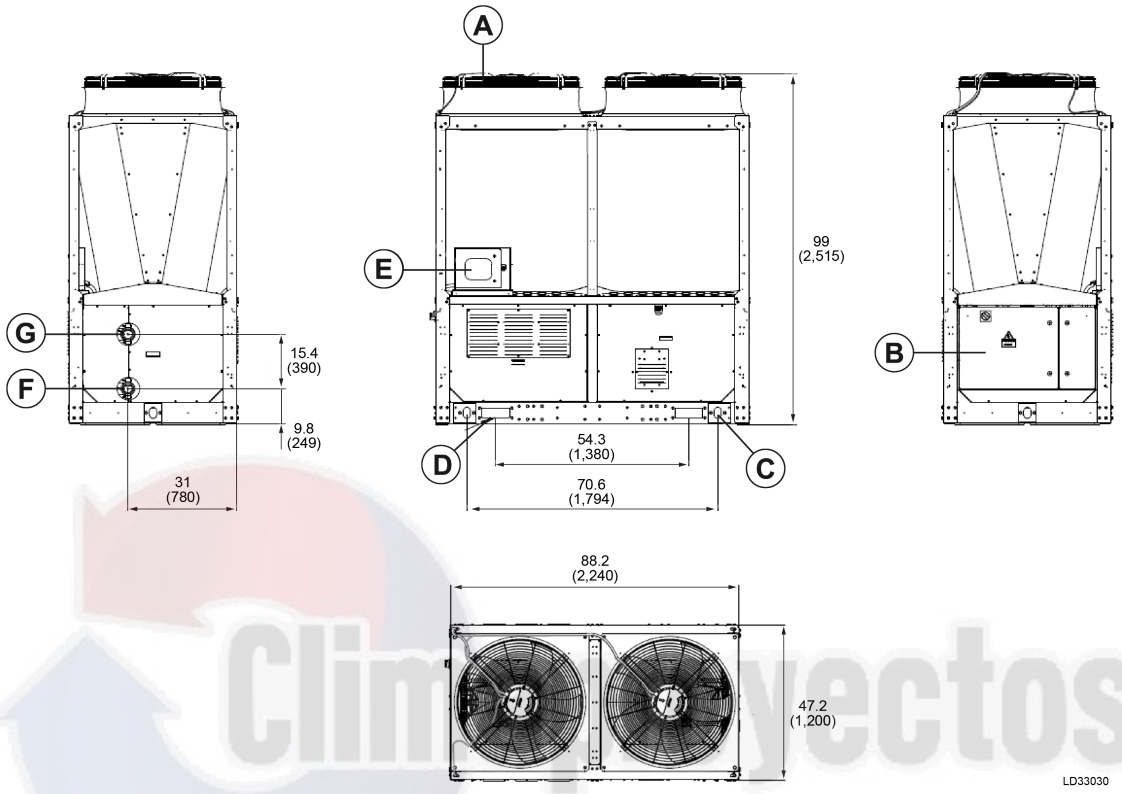
Sound data

Contact your local Johnson Controls representative for details about sound power and sound pressure level data, ISO 9614.

Dimensions

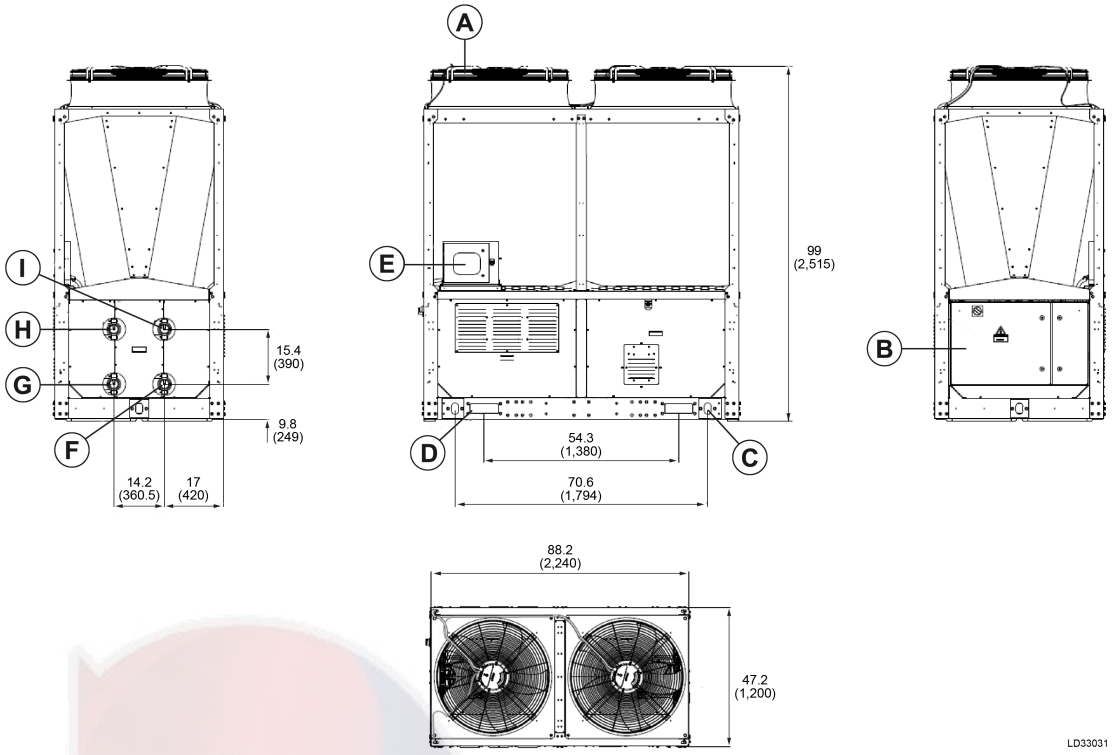
Note: All unit model inlet and outet water tube connections are 2 ½ in. victaulic. The water tube OD diameter is 73 mm.

Figure 63: 0035PJP dimensions, in. (mm)



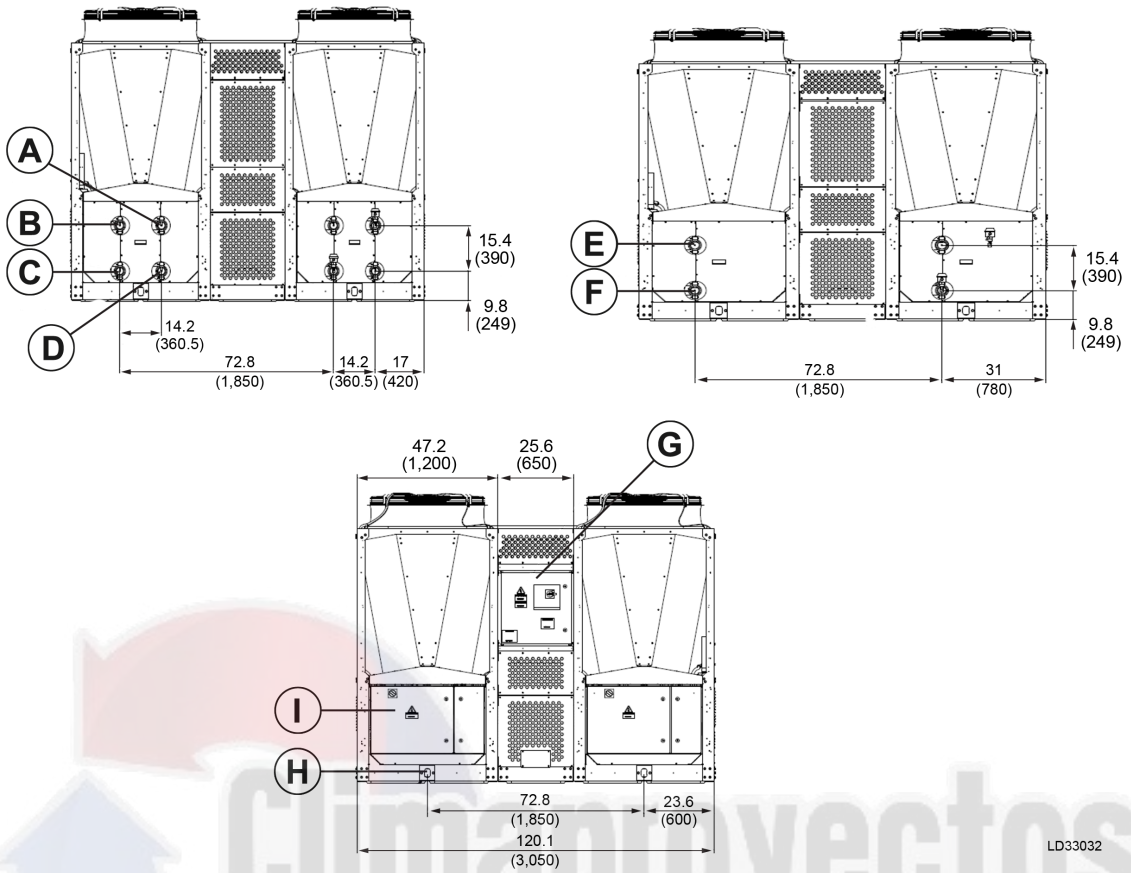
Callout	Description	Callout	Description
A	Fan	E	HMI
B	Control panel	F	PHE outlet 2 ½ in. victaulic connection
C	Rigging holes	G	PHE inlet 2 ½ in. victaulic connection
D	Forklift slots	–	–

Figure 64: 0035PJS dimensions, in. (mm)



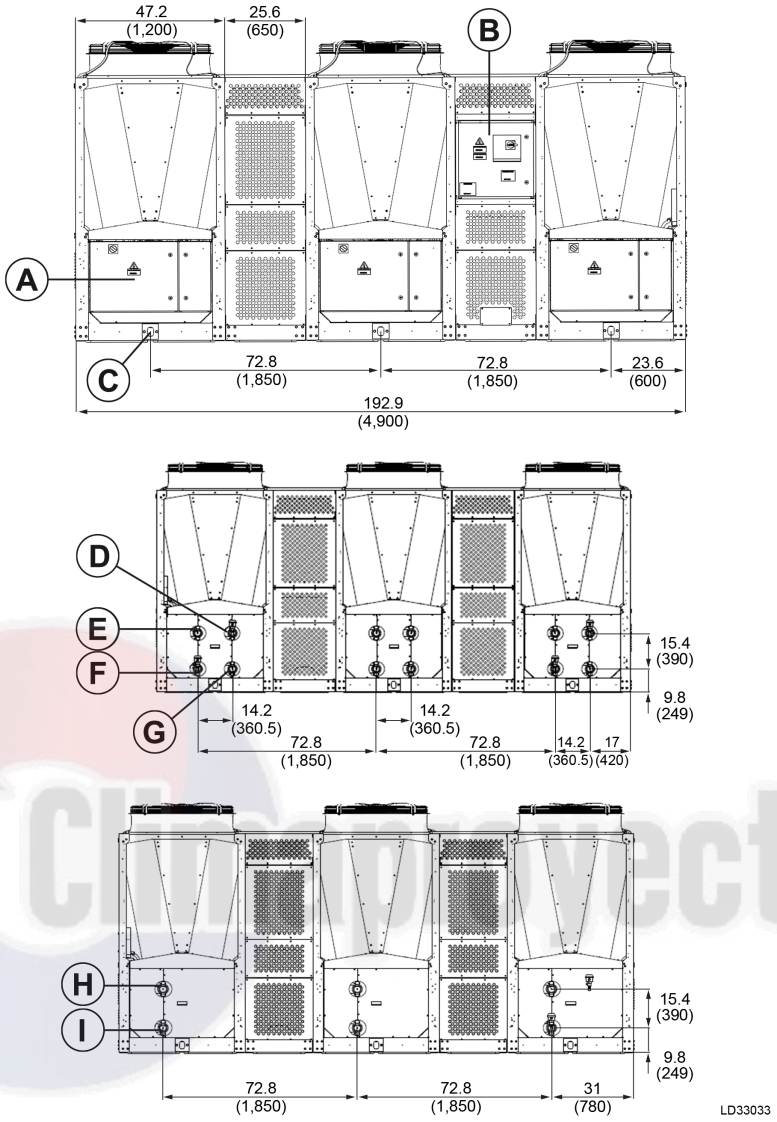
Callout	Description	Callout	Description
A	Fan	F	Hot-water PHE inlet 2 ½ in. victaulic connection
B	Control panel	G	Cold-water PHE outlet 2 ½ in. victaulic connection
C	Rigging holes	H	Cold-water PHE inlet 2 ½ in. victaulic connection
D	Forklift slots	I	Hot-water PHE outlet 2 ½ in. victaulic connection
E	HMI	–	–

Figure 65: 0070 dimensions, in. (mm)



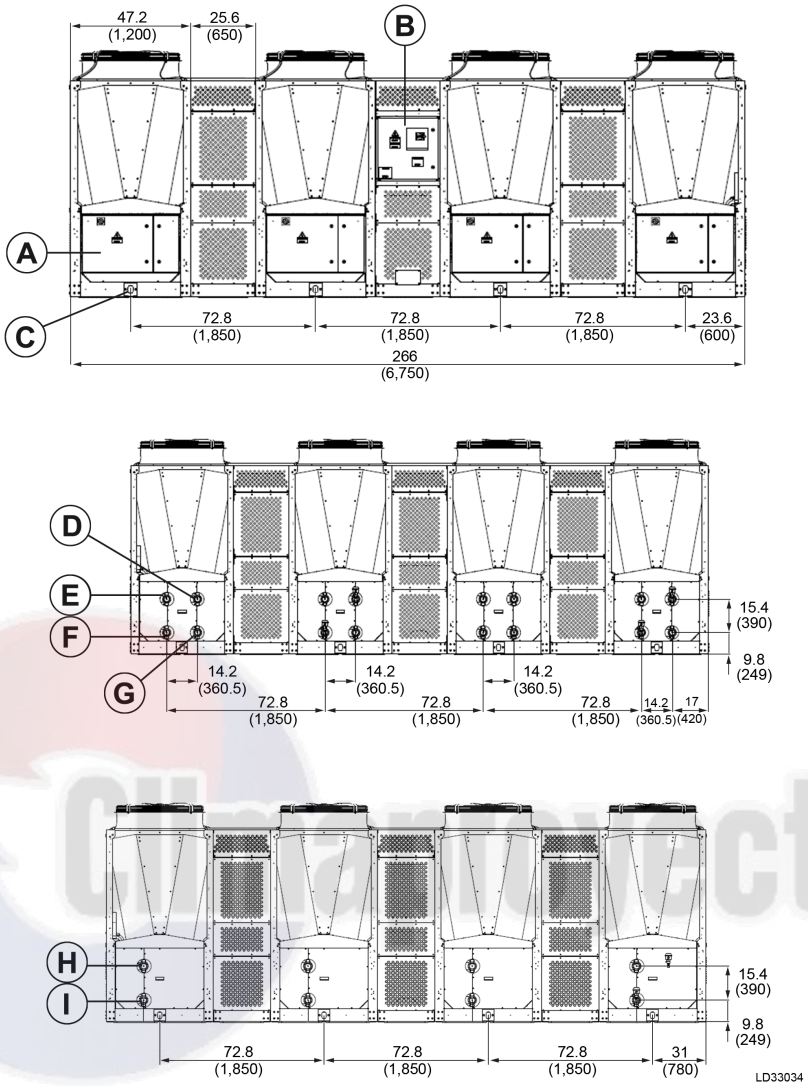
Callout	Description	Callout	Description
A	Hot-water PHE outlet 2 ½ in. victaulic connection	F	PHE outlet 2 ½ in. victaulic connection
B	Cold-water PHE inlet 2 ½ in. victaulic connection	G	SPC
C	Cold-water PHE outlet 2 ½ in. victaulic connection	H	Rigging holes
D	Hot-water PHE inlet 2 ½ in. victaulic connection	I	Control panel
E	PHE inlet 2 ½ in. victaulic connection	–	–

Figure 66: 0105 dimensions, in. (mm)



Callout	Description	Callout	Description
A	Control panel	F	Cold-water PHE outlet 2 ½ in. victaulic connection
B	SPC	G	Hot-water PHE inlet 2 ½ in. victaulic connection
C	Rigging holes	H	PHE inlet 2 ½ in. victaulic connection
D	Hot-water PHE outlet 2 ½ in. victaulic connection	I	PHE outlet 2 ½ in. victaulic connection
E	Cold-water PHE inlet 2 ½ in. victaulic connection	–	–

Figure 67: 0140 dimensions, in. (mm)



Callout	Description	Callout	Description
A	Control panel	F	Cold-water PHE outlet 2 ½ in. victaulic connection
B	SPC	G	Hot-water PHE inlet 2 ½ in. victaulic connection
C	Rigging holes	H	PHE inlet 2 ½ in. victaulic connection
D	Hot-water PHE outlet 2 ½ in. victaulic connection	I	PHE outlet 2 ½ in. victaulic connection
E	Cold-water PHE inlet 2 ½ in. victaulic connection	–	–

Figure 68: Two-pipe system PID

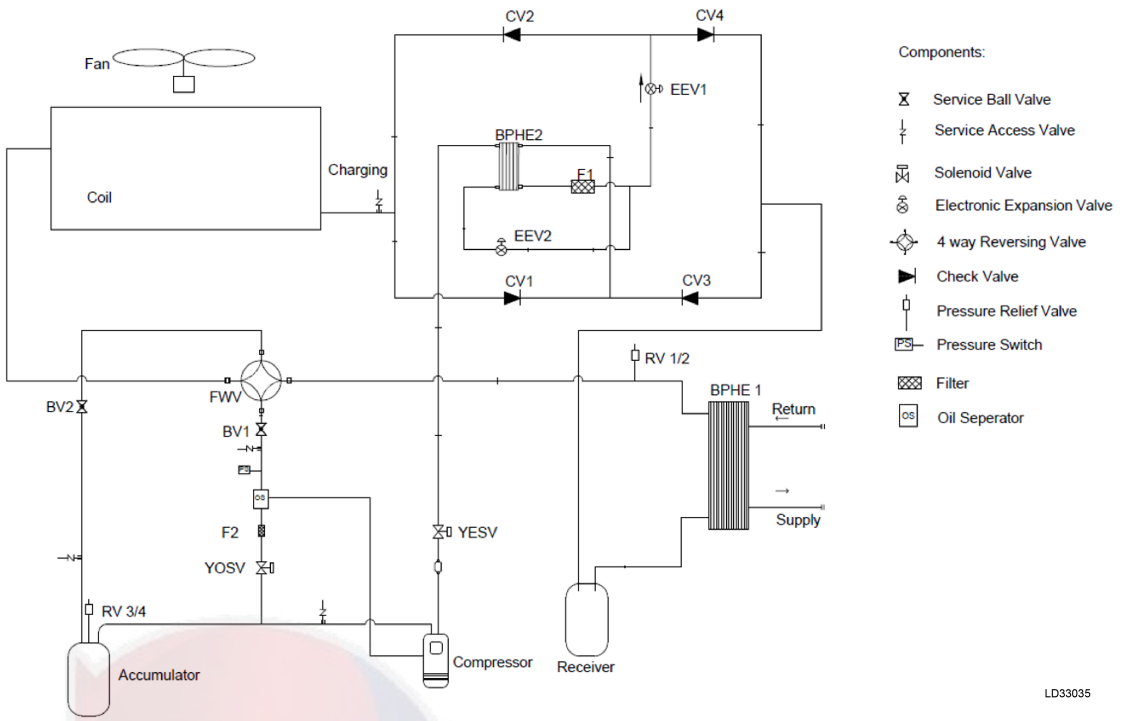


Table 15: PID legend

PID ref.	Desciption	PID ref.	Desciption	PID ref.	Desciption	PID ref.	Desciption
FWV	4-way valve	BPHE1	Liquid loop 1 PHE	SV	Solenoid valve	BV	Ball valve
Fan	EC fan	BPHE2	Liquid loop 2 PHE	CV	Check valve	–	–
Coil	Ambient coil	BPHE3	Economizer PHE	F	Filter	–	–
OS	Oil separator	EEV	Electronic expansion valve	RV	Dual relief valve	–	–

Figure 69: Four-pipe system PID

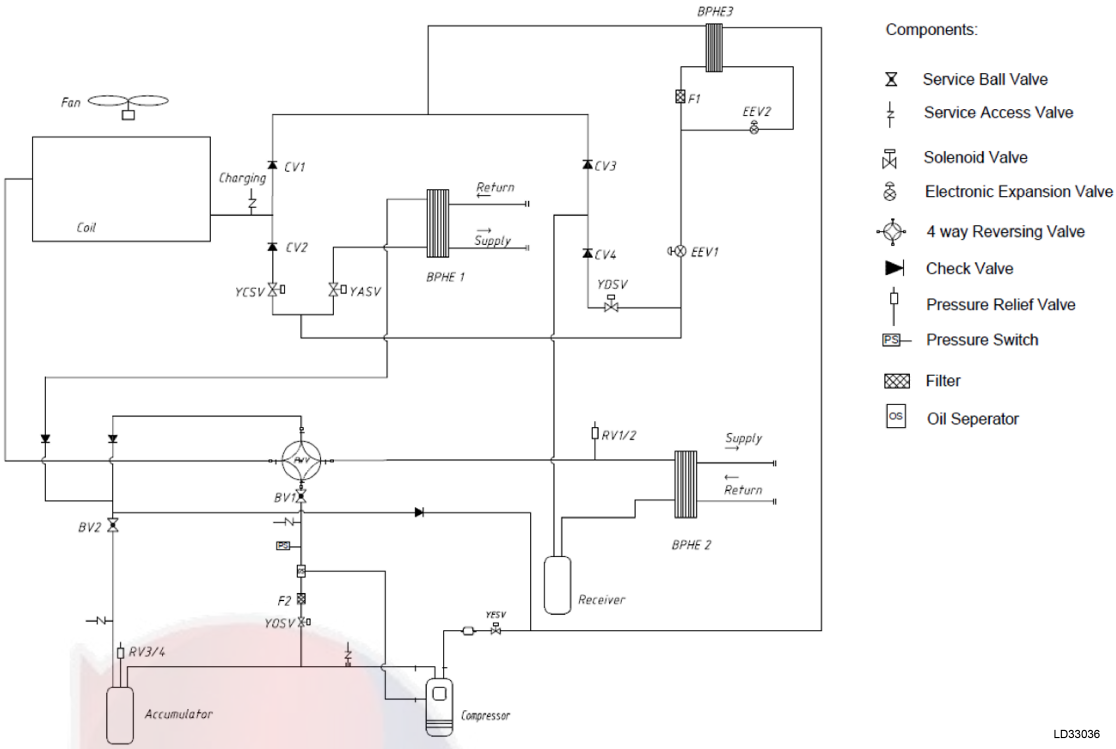


Table 16: PID legend

PID ref.	Desciption	PID ref.	Desciption	PID ref.	Desciption	PID ref.	Desciption
FWV	4-way valve	BPHE1	Liquid loop 1 PHE	SV	Solenoid valve	BV	Ball valve
Fan	EC fan	BPHE2	Liquid loop 2 PHE	CV	Check valve	–	–
Coil	Ambient coil	BPHE3	Economizer PHE	F	Filter	–	–
OS	Oil separator	EEV	Electronic expansion valve	RV	Dual relief valve	–	–

Figure 70: Lifting locations for single module, 0035

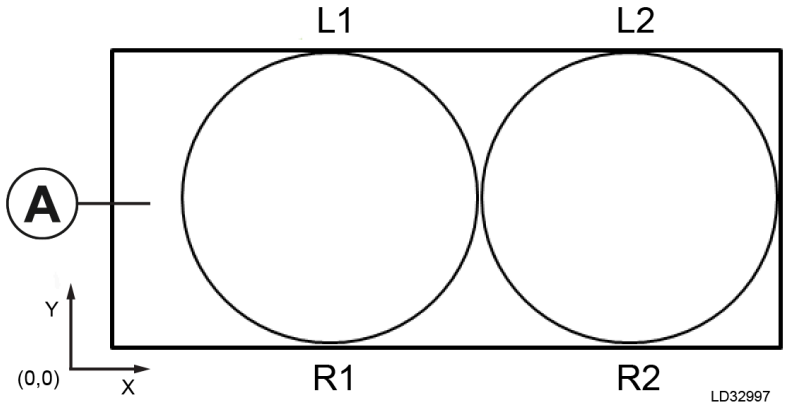
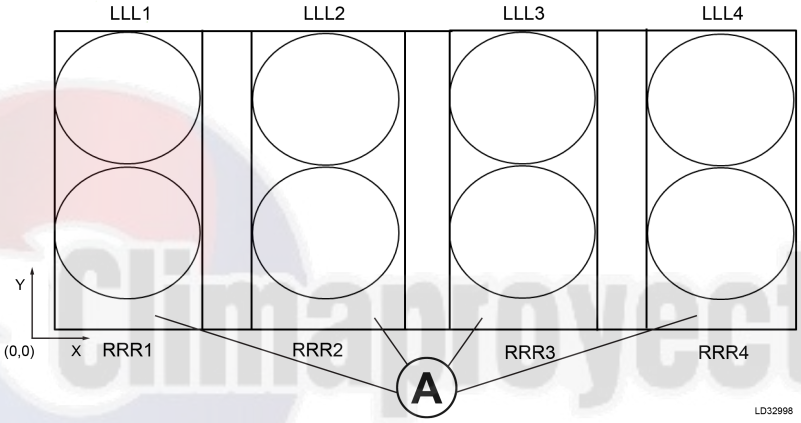


Figure 71: AVM coordinate locations for modular array, 0070, 0105, and 0140



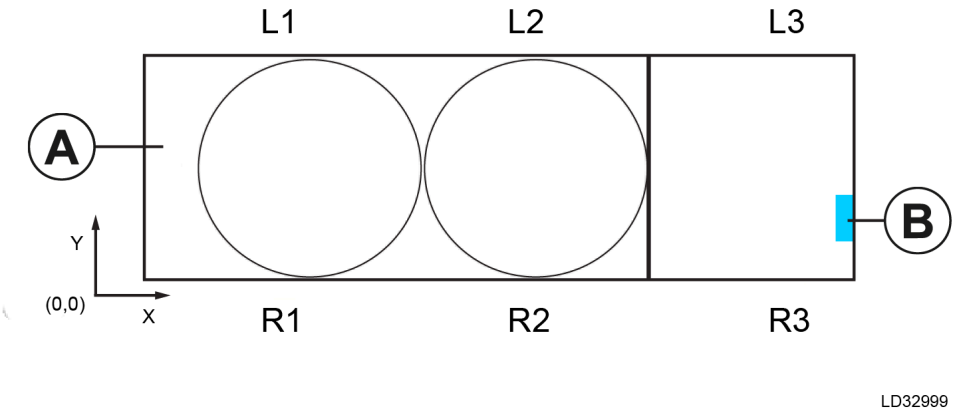
Callout	Description
A	Control panel

Table 17: Unit AVM coordinate locations

	Location coordinates (X, Y) mm, in.											
	R1	**L1**	**R2**	**L2**	**RR1**	**LL1**	**RR2**	**LL2**	**RR3**	**LL3**	**RR4**	**LL4**
X Distance (mm)	430	430	1,810	1,810	600	600	2,450	2,450	4,300	4,300	6,150	6,150
Y Distance (mm)	39	1,161	39	1,161	39	2,201	39	2,201	39	2,201	39	2,201
X Distance (in.)	16.93	16.93	71.26	71.26	23.62	23.62	96.46	96.46	169.29	169.29	242.13	242.13
Y Distance (in.)	1.54	45.71	1.54	45.71	1.54	86.65	1.54	86.65	1.54	86.65	1.54	86.65

ⓘ **Note:** Coordinates are measured from the geometric center of the unit, excluding the hydro kit.

Figure 72: AVM coordinate locations for modular array, 0035PJP two-pipe unit combined pump kit, 0035SA and 0034DA

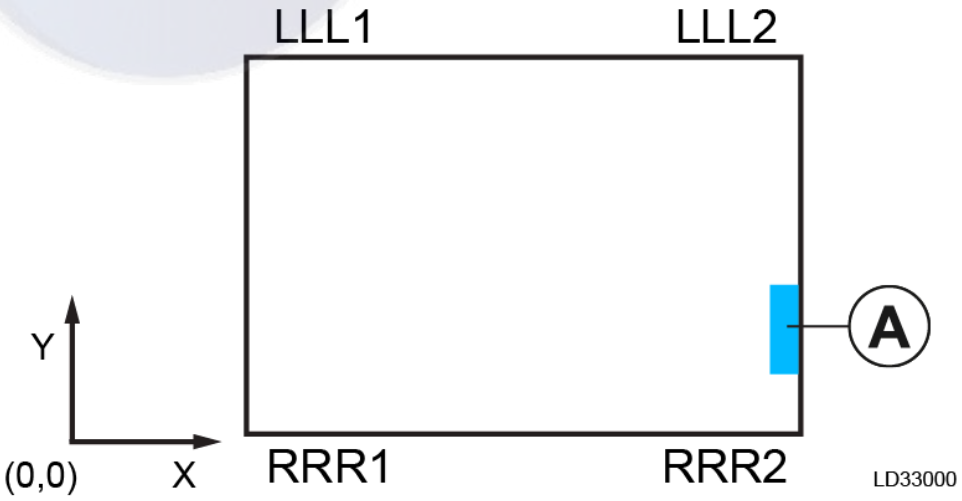


Callout	Description
A	Control panel
B	Customer water side connection side

Table 18: AVM coordinate locations, 0035PJP, two-pipe unit combined with pump kit

Location coordinates (X, Y) mm, in.							
		R1	L1	R2	L2	R3	L3
X Distance	mm	430	430	1,810	1,810	2,875	2,875
Y Distance	mm	39	1,161	39	1,161	38	1,162
X Distance	in.	16.93	16.93	71.26	71.26	113.19	113.19
Y Distance	in.	1.54	45.71	1.54	45.71	1.50	45.75

Figure 73: AVM coordinate locations for pump kit only



Callout	Description
A	Customer water side connection side

Table 19: Pump kit 0035SS/DS, 460 V and 575 V

Isolator AVM location coordinates (X, Y) mm, in.					
		RRR1	LLL1	RRR2	LLL2
X Distance	mm	219	219	1,079	1,079
Y Distance	mm	31	969	31	969
X Distance	in.	8.62	8.62	42.48	42.48
Y Distance	in.	1.22	38.15	1.22	38.15

Table 20: Pump kit 0070SS/DS, 460 V and 575 V

Isolator AVM location coordinates (X, Y) mm, in.					
		RRR1	LLL1	RRR2	LLL2
X Distance	mm	270	270	1,390	1,390
Y Distance	mm	31	1,169	31	1,169
X Distance	in.	10.63	10.63	54.72	54.72
Y Distance	in.	1.22	46.02	1.22	46.02

Table 21: Pump kit 0105SS/DS, 460 V and 575 V

Isolator AVM location coordinates (X, Y) mm, in.					
		RRR1	LLL1	RRR2	LLL2
X Distance	mm	239	239	1,809	1,809
Y Distance	mm	31	1,369	31	1,369
X Distance	in.	9.41	9.41	71.22	71.22
Y Distance	in.	1.22	53.90	1.22	53.90

Unit operation

General

Units are designed to work independently, or in conjunction with other equipment through the Modbus building management systems (BMS) or other automated control systems.

Control system

The microprocessor control system is capable refrigerant circuit control to maintain liquid temperature within programmed limits, as well as system safeties, displaying status, and daily schedules.

Remote starting and flow and equipment interlock can be accomplished by field supplied contacts.

Remote indications of alarms and pump control are available as outputs.

Compressor starting/stopping and loading/unloading decisions are performed by the microprocessor to maintain leaving liquid temperature.

Unit operating sequence

The following sequence describes the start-up process after unit power up. When a compressor starts, internal timers limit the minimum time before another compressor can start.

1. After starting the system, the microprocessor performs a pre-check to ensure that the daily or holiday schedule and any remote interlocks allow the unit to run, all safety cut-outs are satisfied, and no faults are unsettled. Any problems identified during the pre-check are shown on the HMI display.
2. The unit can start automatically based on an internal schedule function, without user or building management system (BMS) input. When the unit is on, the water pump starts working instantly and the water valves open. The unit then detects the status of the flow switch to ensure sufficient liquid flow is supplied. Ensure the water pump is controlled by the leader chiller unit.
3. If there are no problems, the control system adjusts the unit load depending on the liquid temperature and temperature change rate. If operating at a high load demand, the controller increases the speed of the inverter compressor or turns on more compressors. If there is a low load demand, the inverter compressor may continue to operate at low speed or may simply stop. If the latter is the case, one compressor restarts automatically when needed.
4. When a compressor is running, the controller monitors discharge and suction pressure and various other system parameters such as liquid temperature, ambient temperature, and heat exchanger temperature. If any problems are detected, the control system takes appropriate action and displays the related fault message on the HMI display.
5. The corresponding EC fans cycle on when the compressor starts in cooling and heating mode. Fan speed is automatically adjusted based on system pressure, ambient temperature, and other key parameters.
6. Each system is configured with a main EEV in the liquid line between the condenser and the evaporator. The device automatically adjusts opening steps to satisfy refrigerant flow demand, mainly based on the difference between the actual and target suction superheat.

7. If demand requires, more compressors start up, either from another system for dual circuit units or another unit in a modular control system. The priority is as follows:
   - Increase the running speed for the compressor that meets the hertz increase criteria before loading more compressors. The maximum load limit is 85 Hz for one compressor, 75 Hz for two compressors, and 65 Hz for more than two compressors.
   - To start up a compressor in other standby modules.
   - To start up the standby compressor from the module in which one compressor has been already running.
   - If the compressors have the same loading conditions, the priority is the compressor with less running hours and without operation limits.
8. As the load decreases below the setpoint, the compressors shut down in sequence. This normally occurs at intervals of between approximately 20 s and 40 s based on water temperature as compared to the setpoint and the rate of temperature change.
9. When the compressor in a system and is unloading to shut off, the system switches off its fan and EEV shortly afterwards.
10. The compressor heaters energize based on ambient temperature and discharge temperature, to prevent liquid refrigerant condensing from being accumulated in the compressor housing, and to prevent liquid flooding and oil lubrication risk.
11. For simultaneous cooling and heating mode, the following sequence and priorities occur:
   - If both cooling and heating require loading, priority is to upload systems running in heat recovery. After heating load meets requirement, continue loading systems running in cooling mode.
   - If both cooling and heating require unloading, priority is to unload systems running in heat recovery. If the heating load meets the requirement, continue unloading systems running in cooling mode.
12. When multiple modules are packaged together, the capacity of each circuit is 1/2n of the total capacity, where n is the number of modules. When the unit is running, the following processes can occur:
   - If only cooling or heating is required, the unit loads step by step and operates in cooling only or heating only mode until it meets the required capacity.
   - If cooling and heating are both required simultaneously, the unit starts up with the cooling and heat recovery mode. The unit loads the circuits step by step until it meets the required capacity for cooling or heating, whichever is lower. Then, for the remaining cooling or heating capacity, the unit continues to load other circuits and operate in cooling only or heating only mode until the remaining capacity is met.
   - If the cooling and heating recovery mode has been loaded into the last circuit, this last circuit switches between the cooling and heat recovery mode and cooling only or heating only mode.
13. To mitigate adverse effects on system performance due to air-source heat exchanger frosting, the module intermittently activates defrost mode when one of the following conditions are met:
   - If the coil temperature is less than or equal to the target temperature for 3 min and the cumulative heating duration is greater than or equal to 40 min. The default target temperature is the current ambient temperature value minus 12.6°F (7°C).
   - If the saturated suction temperature is less than or equal to the target temperature for 3 min and the cumulative heating duration is greater than or equal to 40 min. The default target temperature is the current ambient temperature value minus 23.4°F (13°C).

- The system cumulative heating duration is greater than or equal to 180 min when ambient temperature is below 14°F (-10°C).

14. In defrost mode, the module runs a reversed refrigeration cycle and air-to-water heat pump heating capacity diminishes as a result.
15. When ice builds up on the ambient coils, operate the unit in defrosting mode to remove defrost. The number of defrosting circuits must not exceed half of the total number of circuits. When in defrost mode, the circuit operating in heat pump mode is in balance with the circuit operating in defrost. Heat energy is not removed from the hot water system because the controller minimizes the quantity of circuits that can defrost at any one time. Less than half of total circuits can enter defrost at any time, which reduces heating capacity loss and helps minimize the temperature impact on the system.

Human machine interface (HMI)

The HMI enables the user to control the unit operation either manually or automatically, or through remote communications. In addition, it provides access to view, change, and program parameters and system commands and view faults using a 7 in. touchscreen.

Use the 7 in. resistive touchscreen to configure unit parameters and view operating data. It is protected by an IP55 insulation panel. The controller is connected with the mainboard by RS-485 communication port. Different access levels are available through the button in the upper-right corner.

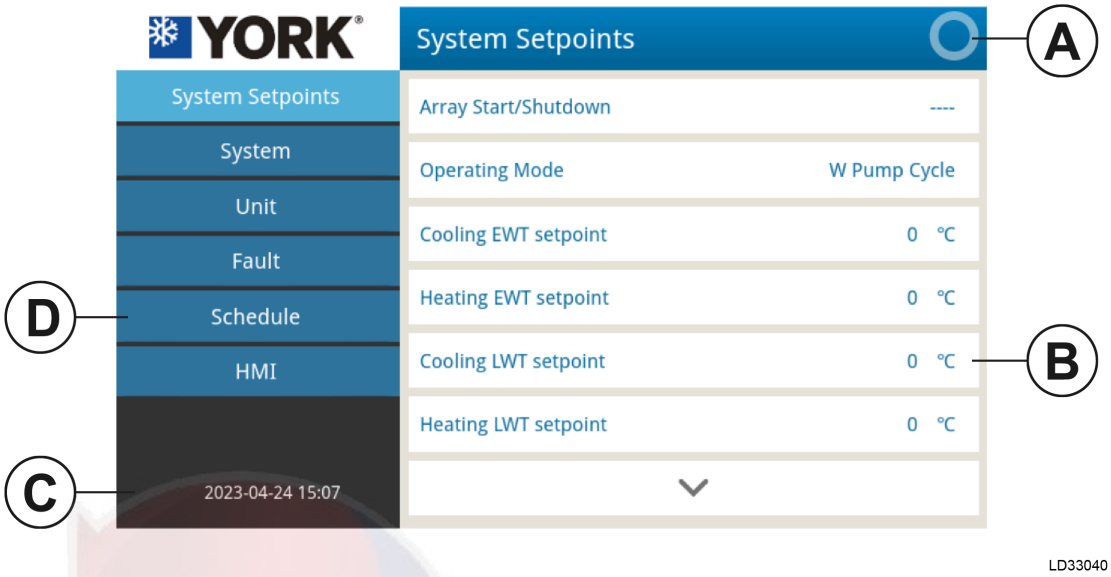
All the data is displayed in metric values, in English or a number of European languages. The following sections give an overview of the operation of the unit and the use of the HMI.

ⓘ **Note:** The default access is **Viewer**. To access **Operator**, enter the password `9017`. After 5 min of inactivity, the screen dims and the access level returns to **Viewer**. You can set the default standby time duration within a range from 2 min to 60 min in **HMI** menu.

Main interface

The sceen takes about 1 min to display after powering on. The default access level for operation is **Viewer** at first startup. The interface is divided into the following areas:

Figure 74: Main interface



Callout	Description	Callout	Description
A	Privilege access level	C	Date and time
B	System operating status	D	Menu

System

Select **System** to view and interact with the following parameters:

Table 22: System page items

Menu	No.	Parameter items	PJP two pipe	PJP four pipe
System	1	Array status	√	√
	2	Running mode	√	√
	3	Array cooling EWT	√	√
	4	Array cooling LWT	√	√
	5	Array heating EWT	X	√
	6	Array heating LWT	X	√
	7	Ambient temperature	√	√
	8	Array loading	√	√
	9	Available mode	√	√
	10	Total run hours	√	√
	11	Cooling ant freezing	√	√
	12	Defrosting	√	√
	13	Low noise	√	√
	14	Cooling pump status	√	√
	15	Heating ant freezing	X	√
	16	Heating pump status	X	√

When logged in at Operator or Service levels, system setpoints and modes on the following table can be viewed or set:

Table 23: System setpoints viewable in operator and service level

Array Start/Shutdown	Array LWT offset	Clear running time
Mode Setting	EWT pulldown rate	EXV cooling Initial steps
Cooling EWT setpoint	Heater on Water temperature differential	EXV heating Initial steps
Heating EWT setpoint	Heater off Water temperature differential	EXV cooling minimum steps
Cooling LWT setpoint	Heater on Ambient temperature	EXV heating minimum steps
Heating LWT setpoint	Low LWT alarm	Defrost Initial steps
Noise reduction mode	High LWT alarm	Cooling target suction superheat
Default setting	Defrost temperature (Ambient temperature?0?)	Heating target suction superheat
Cooling Control Select	Defrost temperature (Ambient temperature ≥0?)	Pump periodic run
Heating Control Select	Defrost time limit	Water valve opening time
Temperature control cycle	Defrost interval	Manual defrost unit
Water temperature control differential	Coil temperature after defrost	Limited hours

Table 23: System setpoints viewable in operator and service level

Unit quantity	Mode control Select	Cooling Minimum operating ambient Temp
BAS Modbus address	ON/OFF control Select	Heating Maximum operating ambient Temp
Array EWT offset	Memory in power off or on/off	–

For detailed information on settings, refer to the *Modular units installation* in *Form 150.89-QSG1*.

Unit

Select **Unit** to view the operating status of different modules in the network:

Table 24: Unit parameter items

No.	Parameter	PJP two pipe	PJS four pipe
1	Unit selection	√	√
2	Unit network status	√	√
3	Unit fault status	√	√
4	Circuit 1 oil preheating	√	√
5	Circuit 2 oil preheating	√	√
6	Software version a	√	√
7	Software name a	√	√
8	Unit cooling EWT	√	√
9	Ambient temperature	√	√
10	Circuit 1 coil temperature	√	√
11	Circuit 2 coil temperature	√	√
12	Unit cooling LWT	√	√
13	Circuit 1 suction temperature	√	√
14	Circuit 2 suction temperature	√	√
15	Circuit 1 Compressor discharge Temp	√	√
16	Circuit 1 economizer entering temperature	√	√
17	Circuit 2 compressor discharge temperature	√	√
18	Circuit 2 economizer entering temperature	√	√
19	Circuit 1 economizer leaving temperature	√	√
20	Circuit 2 economizer leaving temperature	√	√
21	R-454B relative lower flammability limit percentage	√	√
22	Unit heating LWT	X	√
23	Unit heating EWT	X	√
24	Circuit 1 suction pressure	√	√
25	Circuit 2 suction pressure	√	√
26	Circuit 1 discharge pressure	√	√
27	Circuit 2 discharge pressure	√	√
28	Switch to cooling and heating	X	√
29	Cooling and heating switch	√	√

Table 24: Unit parameter items

No.	Parameter	PJP two pipe	PJS four pipe
30	On and off switch	√	√
31	External lock	√	√
32	Unit cooling WFS	√	√
33	Unit heating WFS	X	√
34	Exhaust fan	√	√
35	Circuit 1 variable frequency driver fan	√	√
36	Circuit 2 variable frequency driver fan	√	√
37	Unit operation status	√	√
38	Fault output	√	√
39	cooling loop pump	√	√
40	Unit cooling water valve	√	√
41	Heating loop pump	X	√
42	Unit heating water valve	X	√
43	Water auxiliary heater	√	√
44	Cooling side freeze protection heater	√	√
45	Heating side freeze protection heater	X	√
46	Circuit 1 BPHE valve	X	√
47	Circuit 1 coil valve	X	√
48	Circuit 1 oil valve	√	√
49	Circuit 1 liquid injection valve	√	√
50	Circuit 1 EVI valve	√	√
51	Circuit 1 compressor oil heater	√	√
52	Circuit 1 defrosting valve	X	√
53	Circuit 2 defrosting valve	X	√
54	Circuit 2 BPHE valve	X	√
55	Circuit 2 coil valve	X	√
56	Circuit 2 oil valve	√	√
57	Circuit 2 liquid injection valve	√	√
58	Circuit 2 EVI valve	√	√
59	Circuit 2 compressor oil heater	√	√
60	Circuit 1 FWV	√	√
61	Circuit 2 FWV	√	√
62	Circuit 1 EEV	√	√
63	Circuit 2 EEV	√	√
64	Circuit 1 EVI EEV	√	√
65	Circuit 2 EVI EEV	√	√
66	Circuit 1 fan speed	√	√
67	Circuit 2 fan speed	√	√

Table 24: Unit parameter items

No.	Parameter	PJP two pipe	PJS four pipe
68	Circuit 1 compressor speed	√	√
69	Circuit 2 compressor speed	√	√

Fault

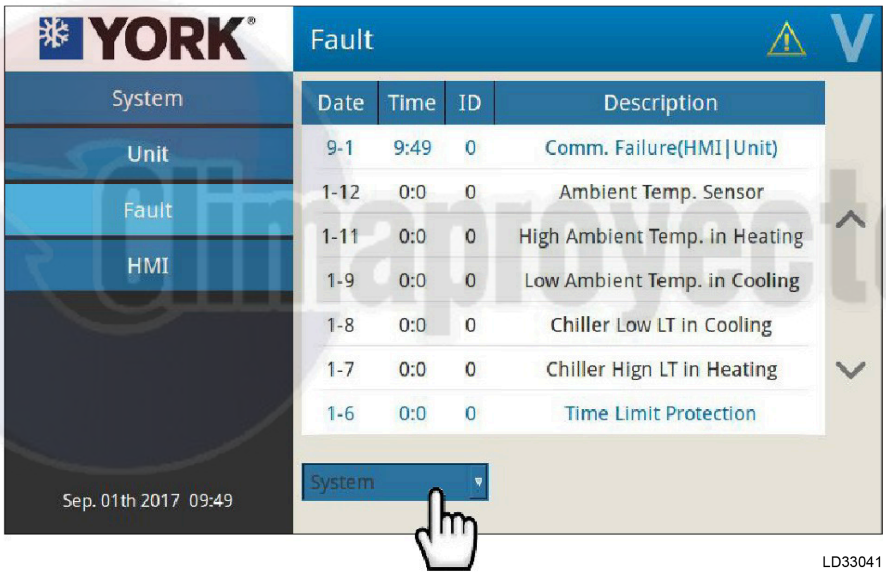
Select **Fault** to view fault readouts and resets. The warning symbol in the upper-right corner indicates that there is a fault present.

On the bottom of the screen, use the drop down box to filter the faults by different parts of the network. See Figure 75

1. To see the system faults, select **System**.
2. To view units in modular systems, select **Unit 1**, **Unit** 2, or any other available unit.

The faults are listed sequentially on the screen, with details of date, time, ID, and a description of the fault. Current faults are displayed in blue and historical faults in black.

Figure 75: Fault screen



The unit number is displayed as 0 if the fault is systemic.

HMI

Select **HMI** to view display settings and software information. When logged in at the operator level, you can view the HMI software version, adjust the display, set the standby time, set the language, set the system date and time, and change the operator password.

Figure 76: HMI screen

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Changing the system setpoints

1. Press the system setpoint that you want to change. A pop-up called **Operating Mode** appears with the different available setpoint options.
2. Select an option and press the tick icon.
3. Press **Confirm** or **Cancel**.
4. For setpoints that require a specific unit input, such as **Cool EWT Setpoint**, enter the appropriate number and press the tick icon.

Changing the access level

There are three access levels in the HMI control:

- V: Viewer
- O: Operator
- S: Service

To change the access level, complete the following steps:

1. Press the access letter in the upper-right corner of the screen.
2. Press **Change Access Level**.
3. Enter the password and press the enter key. The operator password is 9017.
   The letter indicating the access level in the upper-right corner changes accordingly.

Starting or stopping the chiller

1. In the operator access level, press **System Setpoints** and select **Array Start/Shutdown**.
2. Select **ON/OFF** to either start or stop the chiller.

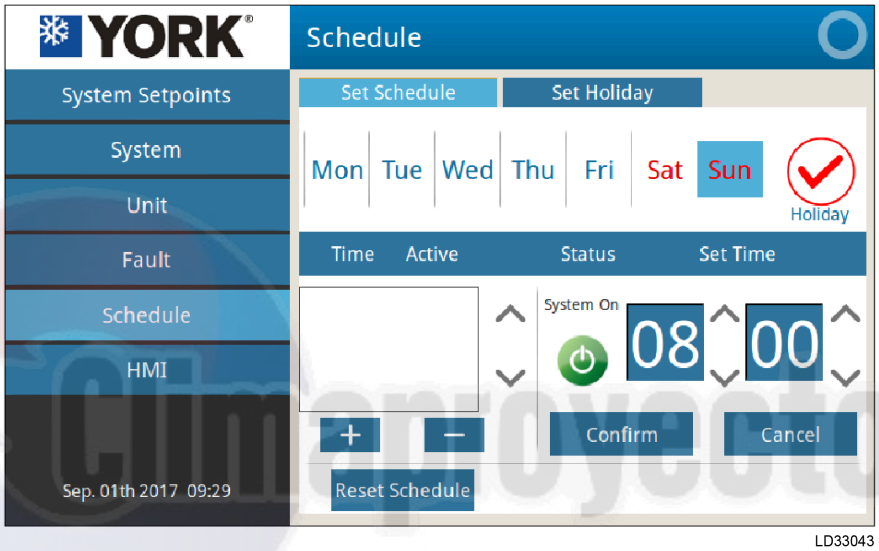
Setting the date and time

1. In the operator access level, press **HMI** and select **Date Time Setpoint**.
2. Set the date and time and press **Confirm**.

Setting a schedule

1. In the operator or service access level O or S, press **Schedule**.
2. Press **Set Schedule**.
3. Press the **plus** icon to add a new item.
4. Configure the settings using the icons on the right and press **Confirm**
   - Press the **minus** icon to delete an item.

Figure 77: Setting a schedule



Setting a holiday

Use the holiday setting to set specified dates as holidays. You can enter a maximum of 30 days in the holiday setting.

1. In the operator access level, press **Schedule**.
2. Press **Set Holiday**
3. Choose the dates in the calendar and press **Confirm**.

Setting the water temperature control using return (RT) or leaving (LT)

1. In the operator access level, press **System Setpoints**.
2. Select **Cooling/Heating Control Select**.

Setting the cooling and heating setpoints

1. In the operator access level, press **System Setpoints**.
2. Configure the setpoints in **Cooling/Heating EWT Setpoint** or **Cooling/ Heating LWT Setpoint**.
3. Set according to cooling or heating control selection.

Setting the low temperature leaving alarm

Note: For the target cooling LWT setpoints between 40ºF (4.4ºC) and 14ºF (-10ºC), configure the micro DIP switches to glycol mode.

1. In the operator access level, press **System Setpoints**, and select **Low LWT Alarm**.
2. Set this parameter to between or 5.4ºF (3ºC) to 9ºF (5ºC) degrees above the liquid freeze temperature setpoint. For example, if the glycol liquid freeze setpoint is 14ºF (-10ºC), you can set the alarm to 23ºF (-5ºC).

Maintenance

General requirements

The units have been designed to operate continuously provided they are regularly maintained and operated within the limitations given in this guide. Each unit must be included in a routine schedule of daily maintenance checks by the operator or customer, backed up by regular service inspection and maintenance visits by a suitably qualified service engineer.

It is entirely the responsibility of the owner to provide these regular maintenance requirements or enter into a maintenance agreement with a Johnson Controls service organization to protect the operation of the unit. If damage or a system failure occurs due to incorrect maintenance during the warranty period, Johnson Controls is not liable for costs incurred to return the unit to satisfactory condition.

Note: This maintenance section applies to the basic unit only and may, on individual contracts, be supplemented by additional requirements to cover any modifications or ancillary equipment as applicable.

CAUTION

You must carefully read General chiller information and safety and Unit operation before attempting any maintenance operations on the unit.

Daily maintenance

About this task:
The operator or customer must carry out the following maintenance checks daily. Note that the units are not generally user serviceable. Do not attempt to rectify faults or problems found during daily checks unless competent and equipped to do so. If in any doubt, contact your local Johnson Controls Service Centre.

Refrigerant leaks: Visually check the cooler, air-cooled condensers, compressors, and pipework for damage and gas leaks.

Condenser fan motors: The fan motors are permanently lubricated and require no maintenance.

Airflow obstructions: Check the air-cooled condenser coil intakes and adjacent areas are clear of foreign materials or obstructions for example paper or leaves.

CAUTION

See Technical data for the inverter compressor oil information.

Pressure relief valves

The dual pressure relief valves are standard for each system. A shutoff valve is installed to allow individual relief valves to be removed for testing or calibrating as required by local regulations.

Overall unit inspection

Conduct periodic inspections of the unit to ensure correct equipment operation. Inspect items such as loose equipment, component operation, unusual noises, and other similar issues and correct if necessary.

Heat exchanger in-service inspection

It is not necessary to perform an in-service inspection on the refrigerant side because there is no corrosion on the refrigerant side so it is.

For the water side, if the water used is treated in accordance with Water treatment, an in-service inspection is not necessary.

Ensure the system has adequate water or brine treatment. Adhere to any local standards for closed-loop heating and cooling circuits.

While periodic in-service proof testing, for example hydro tests, may not be required, Johnson Controls recognizes that national regulations may require such testing to be conducted.

Maintenance alerts

Scheduled maintenance alerts display on the fault screen. See Fault for information.

Table 25: Maintenance alerts

Alert	Access level	Description
Strainer cleaning	Service	A warning appears on the fault screen when the 4,000 h service is due. The warning clears after cleaning the strainer and the fault is reset.
Heat sink cleaning	Service	A warning appears on fault screen when the 4,000 h service is due. The warning clears after cleaning the heat sink and the fault is reset.

The unit keeps running when any of the alerts occur. The counter resets if the warning is cleared.

Scheduled maintanence

Table 26: Scheduled maintanence

Procedure	Weekly	Quarterly	Semi-annually	Yearly	Every hour*
Check the unit operation for optimal function. Report any faults or leaks.	X				
Overall inspection of unit structure and components condition		X			
Record system operating pressures, temperatures, compressor/fan speeds, EEV steps		X			
Check programmable operating setpoints and assure they are correct for the particular application		X			
Check condenser coils, water pans and VSD heat sink duct for dirt/debris and clean if necessary		X			
Check compressor superheat on evaporator and condenser subcooling[1]		X			
Measure and record compressor/fan running currents		X			
Check compressor heaters, evaporator heaters, and piping heaters for operation		X			
Leak check the chiller[1]		X			
Disconnect the power source and lock out; check tightness of power wiring connections[1]				X	
Others	Refer to the manufacturer's recommendations				

Note:

- *Reserved for customer use for any special site-determined requirements.
- [1]This procedure must be performed at the specified time interval by an industry certified technician who has been trained and qualified to work on this type of Johnson Controls equipment. Maintain a record on file of this procedure being successfully carried out by the equipment owner if proof of adequate maintenance is required at a later date for warranty validation purposes.

Service and troubleshooting

Table 27: Troubleshooting guide

Problem	Cause	Solution
No display on the HMI. Unit does not operate.	24 VDC ON/OFF switch for HMI power supply is defective.	Check input and output power supply firstly. If input power is abnormal, need to check the 115 V control circuit. If output power is abnormal, need to check or replace the 24 V ON/OFF switch.
	Not appropriate volatge (115 VAC) for the control circuit.	Check wiring and power supply. Check wiring emergency stop contacts of terminal block
	Not appropriate volatge (115 VAC) for the microboard.	Check the wiring control transformer to the microboard.
	Control transformer is defective.	Replace the control transformer.
	Defective IPU3 and I/O board or display board.	Replacethe IPU3 control board and I/O board or the display board.
	HMI is defective.	Replace with a new HMI.
Chiller water flow fault	No chilled liquid flow.	Check field site chilled liquid flow.
	Too much air in piping system.	Purge the air though a gas release valve.
	Flow switch incorrectly installed.	Check that the flow switch is installed according to manufacturer's instructions.
	Defective flow switch.	Replace flow switch.
	Remote cycling device open.	Check cycling devices (pump) ON/OFF control wiring to ensure they are connected to terminals of the terminal block, as shown in the electrical wiring schematics.

Table 27: Troubleshooting guide

Low suction pressure fault	Suction side isolation valve not open or isolation valve defective.	Open or replace suction service valve.
	Low refrigerant charge.	Repair leak if necessary and add refrigerant.
	Fouled or clogged BPHE.	Clean BPHE and ensure strainer is correctlt installed on the upstream tube of BPHE.
	EEV defective.	Check the EEV valve wiring or replace EEV.
	Reduced flow of chilled.	Check liquid flow rate. Check operation of pump, clean pump strainer, purge chilled liquid system of air.
	Defective suction pressure transducer, low pressure switch, or wiring.	Replace transducer/low pressure switch or faulty wiring.
	Fouled chilled BPHE surface in cooling mode. Low suction pressure observed.	Contact your local Johnson Controls representative.
	Fouled coil surface in heating mode. Low suction pressure observed.	
	Incorrect flow through the evaporator.	Adjust flow to within chiller design specs. See Operational limitations.
	Low refrigerant charge. Low suction pressure observed.	Check subcooling and add charge id necessary.
	Fans not operating, in heating mode.	Check fan wiring and communication.

Table 27: Troubleshooting guide

High discharge pressure or compressor overload fault	Discharge side isolation valve not open or valve defective.	Open or replace discharge side isolation valve.
	Condenser fans not operating or operating backwards.	Check fan motor. Ensure the fan blows air.
	Too much refrigerant.	Remove refrigerant.
	Air in refrigerant system.	Evacuate, vacuum, and recharge system with new refrigerant.
	Defective discharge pressure transducer.	Replace discharge pressure transducer.
	Compressor motor locked.	Check if there is any phase loss at compressor level due to defective contactor. Replace compressor, and oil if necessary.
	Compressor internal motor protector (MP) open.	Verify refrigerant charge is not low. Verify superheat setting. The default superheat setting is 5°C (9°F) for cooling, and 4°C (7.2°F) for heating. 3°C to 5°C (5.4°F to 9°F) is the reasonable superheat setting range. Verify correct compressor rotation. Verify compressor is not overloaded.
	Inverter compressor overload system tripped.	Determine cause and reset.
	Defective high-pressure cutout switch.	Replace switch.
Low liquid leaving temperature fault	Incorrectly adjusted leaving chilled liquid temperature cutout (glycol only).	Ensure the leaving chilled liquid temperature cutout is correct.
	Micropanel setpoint or range values incorrectly programmed.	Re-adjust setpoint or range.
	Chilled liquid flow too low.	Increase chilled liquid flow. See Operational limitations
	Defective LWT or RWT sensor.	Compare sensor against a known good temperature sensing device. Ensure the sensor is correctly installed in the bottom of the well with a generous amount of heat conductive compound.

Table 27: Troubleshooting guide

Compressors do not start	Defective water temperature sensor.	Compare the display with a thermometer. Ensure it is within ± 2°C (3.6°F).
	Overload failure.	Replace defective part.
	Compressor driver failure.	Check driver running status and the flicker of LEDs.
	Unit is in oil preheat time.	When first powering up the unit, this is normal. Wait for a maximum of 120 min.
	Compressor failure.	Diagnose cause of failure and replace.
Fan stops	Circuit failure.	Contact your local Johnson Controls representative.
	Internal overheat protection is in operation.	
Unit turns off, the leakage alarm sounds and stops.	A potential refrigerant leak.	The unit automatically resets the alarm and restarts when the error is detected after refrigerant leakage concentration is low. Contact your local Johnson Controls representative.
Unit turns off, the leakage alarm sounds.	A potential refrigerant leak.	Contact your local Johnson Controls representative.
Individual module failure in modular array or in modular combination group	Follower module failure.	Turn off unit power switch on the modules with failure issue, the other modules can still operate.
	HMI failure, on the leader module.	Turn off SPC main power switch, to replace HMI. Or, if controlling through BACnet, the unit can operate before HMI replacement.
	Leader module failure.	1. Turn off the SPC main power switch. 2. Set the DIP-switch of control panel on follower modules to make one follower modules the new leader, then install the HMI on this new leader. 3. Connect the modular system leaving temp senor, for hot and cold, to the new leader module control panel. 4. Wire pump control connections to the new leader. 5. Supply power to the SPC.
Other	Contact your local Johnson Controls representative.	

Decommissioning, dismantling, and disposal

WARNING

Never release refrigerant to the atmosphere when emptying the refrigerating circuits. Use suitable retrieval equipment. If reclaimed refrigerant cannot be reused, return it to the manufacturer.

WARNING

Never discard used compressor oil, as it contains refrigerant in solution. Return used oil to the oil manufacturer.

WARNING

Refer to local codes and specialized recycling companies. Contact Johnson Controls for more information.

Unless otherwise indicated, any suitably trained maintenance technician can complete the operations described in General.

General

Isolate all sources of electrical supply to the unit including any control system supplies switched by the unit. Ensure that all points of isolation are secured in the OFF position. The supply cables can then be disconnected and removed. For connection points refer to Installation Section.

Remove all refrigerant from each system of the unit into a suitable container using a refrigerant reclaim or recovery unit. This refrigerant can then be re-used, if appropriate, or returned to the manufacturer for disposal. Never vent refrigerant to the atmosphere. Drain the refrigerant oil from each system into a suitable container and dispose of according to local laws and regulations governing the disposal of oily wastes. Any spilt oil must be mopped up and similarly disposed of.

Isolate the unit heat exchanger from the external water systems and drain the heat exchanger section of the system. If no isolation valves are installed it may be necessary to drain the complete system.

WARNING

If glycol or similar solutions have been used in the water system, or chemical additives are contained, the solution must be disposed of in a suitable and safe manner. Under no circumstances, do not drain any system containing glycol or similar solutions directly into domestic waste or natural water systems.

⚠ WARNING

Water used in the system can also be contaminated. Do not dispose of water systems without prior checks. Refer to local codes.

After draining, the water pipework can be disconnected and removed.

Packaged units can generally be removed in one piece after disconnection as above. Any fixing bolts must be removed and then the unit must be lifted from position following all the provided steps and with equipment of adequate lifting capacity.

Units that cannot be removed in one piece after disconnection as above must be dismantled in position. Carry out an inspection to determine the safest means of removal. Special care must be taken regarding the weight and handling of each component. Where possible, dismantle units in the reverse order of installation.

⚠ WARNING

Residual refrigerant oil and glycol or similar solutions may remain in some parts of the system. Mop up and dispose of this residue as described above.

When removing the components ensure that the remaining parts are supported in a safe manner.

⚠ WARNING

Only use lifting equipment of adequate capacity.

After removing from its position, the unit parts can be disposed of according to local laws and regulations.