	Air-Cooled Scroll Chiller	
Installation, Operation, Maintenance	Supersedes: QTC3-NM1 (1123)	Form QTC3-NM1 (1223)

035-24487-000

QTC3040T TO QTC3225T
Air-Cooled Scroll Chillers
with Braze Plate Heat Exchanger
Style B (60 Hz) 4 to 12 Fan
40 ton to 230 ton
140 kW to 800 kW



LD18971a

R-410A
R-454B



Issue Date:
December 19, 2023



Important!

Read before proceeding!

General safety guidelines

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may 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 improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/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, and operating/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, prior to 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:



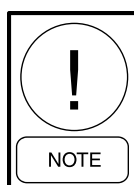
Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.



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



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



Highlights additional information useful to the technician in completing the work being performed properly.



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.



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.

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/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.

Revision notes

Revisions made to this document are indicated in the following table. These revisions are to technical information, and any other changes in spelling, grammar, or formatting are not included.

Affected pages	Description
3	Updated the refrigerant warning in <i>General safety guidelines</i>

Associated literature

Manual description	Form number
Start-Up Checklist - Style A and B, 60 Hz	150.72-CL1
Limited Warranty Engineered Systems Equipment	50.05-NM2
Chiller A2L Refrigerant Application Data	160.00-AD10

Conditioned-based maintenance

Traditional chiller maintenance is based upon assumed and generalized conditions. In lieu of the traditional maintenance program, a Johnson Controls Quantech 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

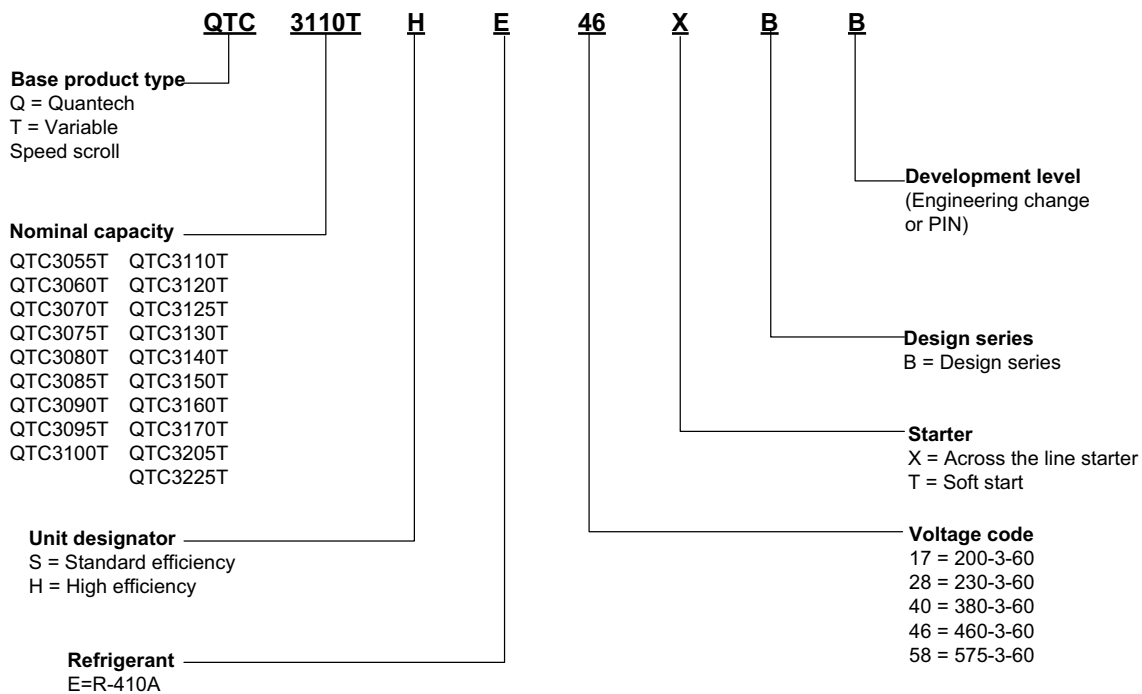


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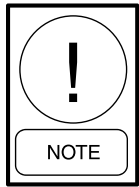
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Section 1: General chiller information and safety

1



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

Introduction

Quantech QTC3 chillers are manufactured to the highest design and construction standards to ensure high performance, reliability, and adaptability to all types of air conditioning installations.

Rigging and lifting should only be done by a professional rigger in accordance with a written rigging and lifting plan. The most appropriate rigging and lifting method will depend on job specific factors, such as the rigging equipment available and site needs. Therefore a professional rigger must determine the rigging and lifting method to be used, and it is beyond the scope of the manual to specify rigging and lifting details.

This manual contains all the information required for correct installation and commissioning of the unit, together with operating and maintenance instructions. The manuals should be read thoroughly before attempting to operate or service the unit.

All procedures detailed in the manuals, including installation, commissioning and maintenance tasks must only be performed by suitably trained and qualified personnel.

The manufacturer will not be 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 manuals.

Warranty

Quantech 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 start-up, whichever occurs 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 and serial 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 Quantech.

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 Quantech Service Center. See *Section 6: Commissioning*.
- Only use genuine Quantech approved spare parts, oils, coolants, and refrigerants.
- All the scheduled maintenance operations detailed in this manual must be performed at the specified times by suitably trained and qualified personnel. See *Section 10: Maintenance*.
- Failure to satisfy any of these conditions will automatically void the warranty. See previous *Warranty* section.

Handling

These units are shipped as completely assembled units containing full operating charge, and care should be taken to avoid damage due to rough handling.

Safety and quality

Standards for safety and quality

QTC3 chillers are designed and built within an ISO 9002 accredited design and manufacturing organization. The chillers comply with the applicable sections of the following standards and codes:

- ANSI/ASHRAE Standard 15 - Safety Code for Mechanical Refrigeration.
- ANSI/NFPA Standard 70 - National Electrical Code (NEC).
- ASME Boiler and Pressure Vessel Code - Section VIII Division 1.
- ARI Standard 550/590 - Positive Displacement Compressors and Air Cooled Rotary Screw Water Chilling Packages.
- ASHRAE 90.1 - Energy Efficiency compliance.
- Conform to Intertek Testing Services, formerly ETL, for construction of chillers and provide ETL/cETL listing label.
- Manufactured in facility registered to ISO 9002.
- OSHA – Occupational Safety and Health Act.

Conforms to UL60335-2-40 requirements.

Responsibility for safety

Every care has been taken in the design and manufacture of the unit to ensure compliance with the safety requirements listed above. 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 manuals.

About this manual

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

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

Misuse of equipment

Suitability for application

The unit is intended for cooling water or glycol solutions and is not suitable for purposes other than those specified in these instructions. Any use of the equipment other than its intended use, or operation of the equipment contrary to the relevant procedures may result in injury to the operator, or damage to the equipment.

The unit must not be operated outside the design parameters specified in this manual.

Structural support

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

Mechanical strength

The unit is not designed to withstand loads or stresses from adjacent equipment, pipework or structures. Additional components must not be mounted 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

There are a number of areas and features, which may be a hazard and potentially cause injury when working on the unit unless suitable safety precautions are taken. It is important to install the chiller in a secure area and ensure access to the unit is restricted to suitably qualified persons who are familiar with the potential hazards and precautions necessary for safe operation and maintenance of equipment containing high temperatures, pressures and voltages. 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. To further tighten security, ensure that the control panel is mechanically locked.

Pressure systems

The unit contains refrigerant vapor and liquid under pressure, release of which can be a danger and cause injury. The user should ensure that care is taken during installation, operation, and maintenance to avoid damage to the pressure system. No attempt should be made to gain access to the component parts of the pressure system other than by suitably trained and qualified personnel.

Electrical

The unit must be grounded. No installation or maintenance work should be attempted on the electrical equipment without first switching power OFF, isolating and locking-off the power supply. Servicing and maintenance on live equipment must only be performed by suitably trained and qualified personnel. No attempt should be made to gain access to the control panel or electrical enclosures during normal operation of the unit.

Rotating parts

Fan guards must be fitted at all times and not removed unless the power supply has been isolated. If ductwork is to be fitted, requiring the wire fan guards to be removed, alternative safety measures must be taken to protect against the risk of injury from rotating fans.

Sharp edges

The fins on the air-cooled condenser coils have sharp metal edges. Reasonable care should be taken when working in contact with the coils to avoid the risk of minor abrasions and lacerations. The use of gloves is recommended.

Frame rails, brakes, and other components may also have sharp edges. Reasonable care should be taken when working in contact with any components to avoid risk of minor abrasions and lacerations.

Refrigerants and oils

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 or death. 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*.

High temperature and pressure cleaning

High temperature and pressure cleaning methods (for example steam cleaning) should not be used on any part of the pressure system as this may cause operation of the pressure relief device(s). Detergents and solvents, which may cause corrosion, should also be avoided.

Emergency shutdown

In case of emergency, the control panel is fitted with a Unit Switch to stop the unit in an emergency. When operated, it removes the low voltage 120 VAC electrical supply from the unit controller, thus shutting down the unit.

MSDS Information

For Material Safety Data Sheets (MSDS) information, call (800) 451-8346 in the U.S. or by e-mail MSDS@3Ecompany.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/NA_Safety.

Safety labels



White symbol on black background.
For safe operation, read the instructions first.



Black symbol on white background.
Warning: Read operating instructions.



Black symbol on white background.
Warning: Read technical manual.



White, Black and Safety Orange.
Warning label.



Black and red symbol on white background.
Refrigerant Safety Group: A2L.



Black and red symbol on white background.
Refrigerant Safety Group: A2L.

Section 2: Product description



Introduction

Quantech QTC3 Air-Cooled Scroll Chillers provide chilled water for all air conditioning applications using central station air handling or terminal units. They are completely self-contained and are designed for outdoor (roof or ground level) installation. Each complete packaged unit includes hermetic scroll compressors, a liquid cooler, air cooled condenser, a charge of Zero Ozone Depletion Potential Refrigerant R-410A or R-454B and a weather resistant microprocessor control center, all mounted on a rugged steel base.

The units are completely assembled with all interconnecting refrigerant piping and internal wiring, ready for field installation.

Before delivery, the packaged unit is pressure-tested, evacuated, and fully charged with refrigerant and oil. After assembly, a complete operational test is performed with water flowing through the cooler to ensure that the refrigeration circuit operates correctly.

The unit structure is heavy-gauge, galvanized steel. This galvanized steel is coated with baked-on powder paint, which, when subjected to ASTM B117 1000 hour, salt spray testing, yields a minimum ASTM 1654 rating of 6. 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.

General system description

Compressors

The chiller has suction-gas cooled, hermetic, scroll compressors. The QTC3 compressors incorporate a compliant scroll design in both the axial and radial direction. All rotating parts are statically and dynamically balanced. A large internal volume and oil reservoir provides greater liquid tolerance. Compressor crankcase heaters are also included for extra protection against liquid migration.

Cooler: Evaporator

The cooler is a direct expansion type with refrigerant inside high-efficiency copper tubes. The liquid flowing through the cooler is forced over the tubes by water baffles.

The water baffles are constructed of galvanized steel to resist corrosion. The removable heads allow access to the internally enhanced, seamless copper tubes. Vent and drain connections are included.

Water inlet and outlet connections are grooved for compatibility with field supplied ANSI/AWWA C-606 couplings.

The cooler is equipped with a heater controlled by a separate thermostat. The heater provides freeze protection for the cooler, down to -20°F (-29°C) ambient temperature. The cooler is covered with 3/4 in. flexible, closed cell, foam insulation ($K = 0.25$).

Brazed plate evaporator

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. It offers excellent heat transfer performance with a compact size and low weight, reducing structural steel requirements on the job site.

The heat exchanger is manufactured in a precisely controlled vacuum-brazing process that allows the filler material to form a brazed joint at every contact point between the plates, creating complex channels. The arrangement is similar to older plate and frame technology, but without gaskets and frame parts.

Water inlet and outlet connections are grooved for compatibility with field supplied ANSI/AWWA C-606 couplings.

The evaporator is equipped with a thermostat-controlled heater. The heater provides freeze protection for the evaporator down to -20°F (-29°C) ambient. The evaporator is covered with 3/4 in. flexible, closed-cell, foam insulation (K=0.25).

A 40-mesh wye-strainer is provided as standard for installation upstream of the heat exchanger to prevent clogging from water system debris.

Canadian registration number (CRN) application and proof of conformance

Since all QTC3 brazed plate evaporators are categorized as pressure “H” fittings per CSA-B51, a CRN label or marking is not provided on the evaporator. 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.

Table 1: Canadian Registration Numbers

Canadian province	CRN #
BC	OH13953.51
AB	OH13953.52
ON	OH13953.5
PQ/MB/SK	OH13953.56
NB	OH13953.57
NS	OH13953.58
PEI	OH13953.59
NF	OH13953.50
NU	OH13953.5N
NWT	OH13953.5T
YU	OH13953.5Y

Condenser

Coils

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

Microchannel Condenser (MCHX)

MCHX condensers are made of a single material to avoid galvanic corrosion due to dissimilar metals. MCHX and headers are brazed as one piece. Integral sub cooling is included. The design working pressure of the MCHX is 650 psig (45 bar). MCHX Condenser is easily washable with clear water.

Fans

The condenser fans are composed of corrosion resistant aluminum hub and glass-fiber reinforced polypropylene composite blades molded into a low noise airfoil section. They are designed for maximum efficiency and are statically and dynamically balanced for vibration free operation. They are directly driven by independent motors, and positioned for vertical air discharge. The fan guards are constructed of heavy gauge, rust resistant, coated steel. All blades are statically and dynamically balanced for vibration free operation.

Motors

The fan motors are Totally Enclosed Air-Over, and are current protected. They feature ball bearings that are double sealed and permanently lubricated.

Control center

All controls are contained in a NEMA 3R/12 cabinet with hinged outer door and includes a Liquid Crystal Display with Light Emitting Diode backlighting for outdoor viewing:

- Two display lines
- Twenty characters per line

Display/print keys

- Color coded 12-button non-tactile keypad with sections for display and print of typical information:
- Chilled liquid temperatures
- Ambient temperature
- System pressures (each circuit)
- Operating hours and starts (each compressor)

- Print calls up to the liquid crystal display
- Operating data for the systems
- History of fault shutdown data for up to the last six fault shutdown conditions.
- An RS-232 port, in conjunction with this press-to-print button, is provided to allow hard copy print-outs using a separate printer (by others).

Entry keys

This section is used to enter setpoints or modify system values.

Setpoints Keys

Updating can be performed to:

- Chilled liquid temperature setpoint and range
- Remote reset temperature range
- Set daily schedule/holiday for start/stop
- Manual override for servicing
- Low and high ambient cutouts
- Number of compressors
- Low liquid temperature cutout
- Low suction pressure cutout
- High discharge pressure cutout
- Anti-recycle timer (compressor start cycle time)
- Anti-coincident timer (delay compressor starts)

Unit keys

This section is used to:

- Set time
- Set unit options

Oper data key

The microprocessor control center is capable of displaying the following:

- Return and leaving liquid temperature
- Low leaving liquid temperature cutout setting
- Low ambient temperature cutout setting
- Outdoor air temperature
- English or Metric data
- Suction pressure cutout setting
- Each system suction pressure
- Discharge pressure (optional)
- Liquid Temperature Reset via a Quantech BAS DDC or Building Automation System (by others) using a 4 mA to 20 mA or 0 VDC to 10 VDC input

- Anti-recycle timer status for each system
- Anti-coincident system start timer condition
- Compressor run status
- No cooling load condition
- Day, date and time
- Daily start/stop times
- Holiday status
- Automatic or manual system lead/lag control
- Lead system definition
- Compressor starts and operating hours
- (each compressor)
- Status of hot gas valves, evaporator heater and fan operation
- Run permissive status
- Number of compressors running
- Liquid solenoid valve status
- Load and unload timer status
- Water pump status

Provisions are included for: pumpdown at shutdown; optional remote chilled water temperature reset and two steps of demand load limiting from an external building automation system. Unit alarm contacts are standard.

The operating program is stored in non-volatile memory battery backed RAM to eliminate chiller failure due to AC powered failure/battery discharge. Programmed setpoints are retained in lithium battery-backed RTC memory for 5 years minimum.

Communications

- Native communication capability for BACnet (MS/TP) and Modbus.
- Optional communication available for N2 and LON via eLink Gateway option.

Building automation system interface

The Microprocessor Board can accept a 4 mA to 20 mA, or 0 VDC to 10 VDC input to reset the leaving chiller liquid temperature from a Building Automation System.

- The standard unit capabilities include remote start-stop, remote water temperature reset via a PWM 4 mA to 20 mA or 0 VDC to 10 VDC input signal or up to two stages of demand (load) limiting depending on model.
- The standard control panel can be directly connected to a Quantech Building Automated System.

Power panel

Each panel contains:

- Compressor power terminals
- Compressor motor starting contactors per I.E.C.**
- Control power terminals to accept incoming for 115-1-60 control power
- Fan contactors and overload current protection

The power wiring is routed through liquid-tight conduit to the compressors and fans.

Accessories and options

Power options

Compressor power connections

Single-point terminal block connections are provided as standard. The following power connections are available as options. See *Electrical data on page 57* for specific voltage and options availability. **(Factory-mounted)**

Single-point supply terminal block

Includes enclosure, terminal-block, and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming compressor-power wiring. Do not include this option if either the Single-Point Non-Fused Disconnect Switch or Single-Point Circuit Breaker options have been included.

Single-point non-fused disconnect switch

Unit-mounted disconnect switch with external, lockable handle (in compliance with Article 440-14 of NEC), can be supplied to isolate the unit power voltage for servicing. Separate external fusing must be supplied, by others in the power wiring, which must comply with the National Electrical Code and/or local codes.

Single-point circuit breaker

A unit mounted circuit breaker with external, lockable handle (in compliance with NEC Article 440-14), can be supplied to isolate the power voltage for servicing. (This option includes the Single-Point Power connection.)

Control transformer

Converts unit power voltage to 115-1-60 (2.0 or 3.0 KVA capacity). Factory mounting includes primary and secondary wiring between the transformer and the control panel. **(Factory-mounted)**

Control Options

Ambient Kit (Low)

Units will operate to 30°F (-1.1°C). This accessory includes all necessary components to permit chiller operation to 0°F (-18°C) or -10°F (-23°C) with variable speed fans. (This option includes the Discharge Pressure Transducer / Readout Capability option.) For proper head pressure control in applications below 30°F (-1°C) where wind gusts may exceed 5 mph, it is recommended that Optional Condenser Louvered Enclosure Panels also be included. **(Factory-mounted)**

High ambient kit with sunshield

Allows units to operate when the ambient temperature is above 115°F (46°C). Includes sun shield panels and discharge pressure transducers.

Language LCD and keypad display

Spanish, French, German, and Italian unit LCD controls and keypad display available. Standard language is English.

Compressor, piping, evaporator options

Low temperature glycol

Replaces standard Thermostatic Expansion Valves with Electronic Expansion Valves to achieve leaving glycol temperatures as low as 10°F (-12°C). Required for any leaving liquid temperature below 30°F (-1°C). Electronic Expansion Valves permit operation at both low temperatures and comfort cooling applications without a capacity loss or derate at either condition. **(Factory installed)**

Chicago code relief valves

Unit will be provided with relief valves to meet Chicago code requirements. **(Factory-Mounted)**

Service Suction Isolation Valve

Service suction (ball-type) isolation valves are added to unit per system (discharge service ball-type isolation valve is standard on each circuit). **(Factory-Mounted)**

Hot gas by-pass

Permits continuous, stable operation at capacities below the minimum step of compressor unloading to as low as 5% capacity (depending on both the unit and operating conditions) by introducing an artificial load on the cooler. Hot gas by-pass is installed on only refrigerant system #1 on two-circuited units. **(Factory-Mounted)**

Flanges (ANSI/AWWA C-606 couplings type)

Consists of (2) Flange adapter for grooved end pipe (standard 150 psi [10.5 bar] cooler). (Not available on optional DX cooler 300 psig DWP waterside.) **(Field-mounted)**

Flow switch

A thermal dispersion type flow switch provides accurate, low maintenance flow proving, and is included as standard. It is factory wired and installed in the extension pipe between evaporator outlet and edge of chiller.

Heat recovery condenser

A partially condensing refrigerant to liquid condenser recovers heat off both refrigerant circuits and rejects into a single liquid circuit. Factory installed between the compressor discharge and the condenser (air) coils to capture the maximum amount of heat. Capable of recovering up to 85% total heat of rejection (cooling load plus work input); temperatures as high as 140°F (60°C) are possible.

Hydro-kit

Factory-installed, hydro-kit suitable for water and glycol systems with up to 35% glycol at leaving temperatures down to 20°F. The hydro-kit option is available in a single or dual configuration (dual as standby duty only), with totally enclosed permanently lubricated pump motors.

The hydro-kit option comes standard with a balancing valve, discharge check valve, discharge shutoff valve, thermal dispersion flow switch, pressure ports, inlet wye-strainer, bleed and drain valves and frost protection.

Service shut off valves, additional pressure ports and expansion tanks are optional within the hydro-kit option.

Condenser and cabinet options

MCHX Condenser protection against corrosive environments is available by choosing any of the following options. For additional application recommendations, Refer to *FORM 150.12-ESI*. **(Factory-Mounted)**

Post-Coated Dipped MCHX condenser

The unit MCHX is constructed with post dipped-epoxy MCHX condenser. This is recommended for seashore and other corrosive applications (with the exception of strong alkalies, oxidizers and wet bromine, chlorine and fluorine in concentrations greater than 100 ppm).

Pre-Coated Fin Condenser Coils

The unit's coils are constructed with epoxy coated aluminum fins. This can provide corrosion resistance comparable to copper-fin coils in typical seashore locations. Either these or the post-coated coils (below), are recommended for units being installed at the seashore or where salt spray may hit the unit.

Post-Coated Dipped Condenser Coils

The unit's coils are constructed with dipped-cured condenser coils. This is another choice for seashore and other corrosive applications (with the exception of strong alkalies, oxidizers and wet bromine, chlorine and fluorine in concentrations greater than 100 ppm).

Copper Fin Condenser Coils

The unit's coils are constructed with copper fins. (This is not recommended for units in areas where they may be exposed to acid rain.)

Enclosure Panels (unit)

Tamper proof Enclosure Panels prevent unauthorized access to units. Enclosure Panels can provide an aesthetically pleasing alternative to expensive fencing. Additionally, for proper head pressure control, Quantech recommends the use of Condenser Louvered Panels for winter applications where wind gusts may exceed five miles per hour. The following types of enclosure panels are available:

- **Wire panels (full Unit)** - Consists of welded wire-mesh guards mounted on the exterior of the unit. Prevents unauthorized access, yet provides free air flow. **(Factory-Mounted)**
- **Wire/louvered panels** - Consists of welded wire-mesh panels on the bottom part of unit and louvered panels on the condenser section of the unit. **(Factory-Mounted)**

- **Louvered panels (MCHX Condenser Only) -** Louvered Panels are mounted on the sides and ends of the MCHX condenser for protection. **(Factory-Mounted)**
- **Louvered Panels (Full Unit) -** Louvered panels surround the front, back, and sides of the unit. They prevent unauthorized access and visually screen unit components. Unrestricted air flow is permitted through generously sized louvered openings. This option is applicable for any outdoor design ambient temperature up to 115°F (46°C). **(Factory-Mounted)**

MCHX end hail guard

Louvered panel attached to exposed MCHX end. **(Factory-Mounted)**

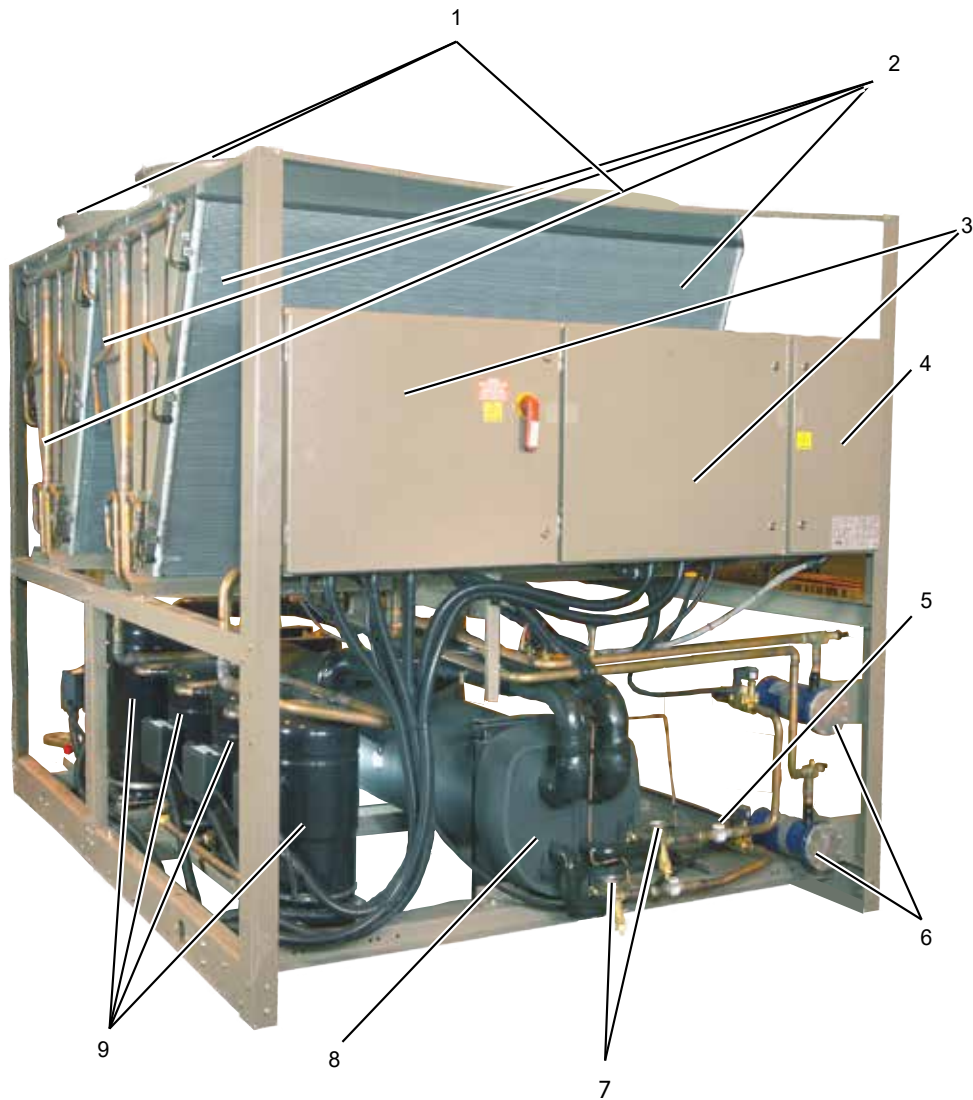
Sound attenuation

One or both of the following sound attenuation options are recommended for residential or other similar sound sensitive locations:

- **Compressor Acoustic Sound Blanket -** Each compressor is individually enclosed by an acoustic sound blanket. The sound blankets are made with one layer of acoustical absorbent textile fiber of 5/8 in. (15 mm) thickness; one layer of anti-vibrating heavy material thickness of 1/8 in. (3 mm). Both are closed by two sheets of welded PVC, reinforced for temperature and UV resistance. **(Factory-Mounted)**
- **Ultra Quiet Fans -** Lower RPM, 8-pole fan motors are used with steeper-pitch fans. **(Factory-Mounted)**

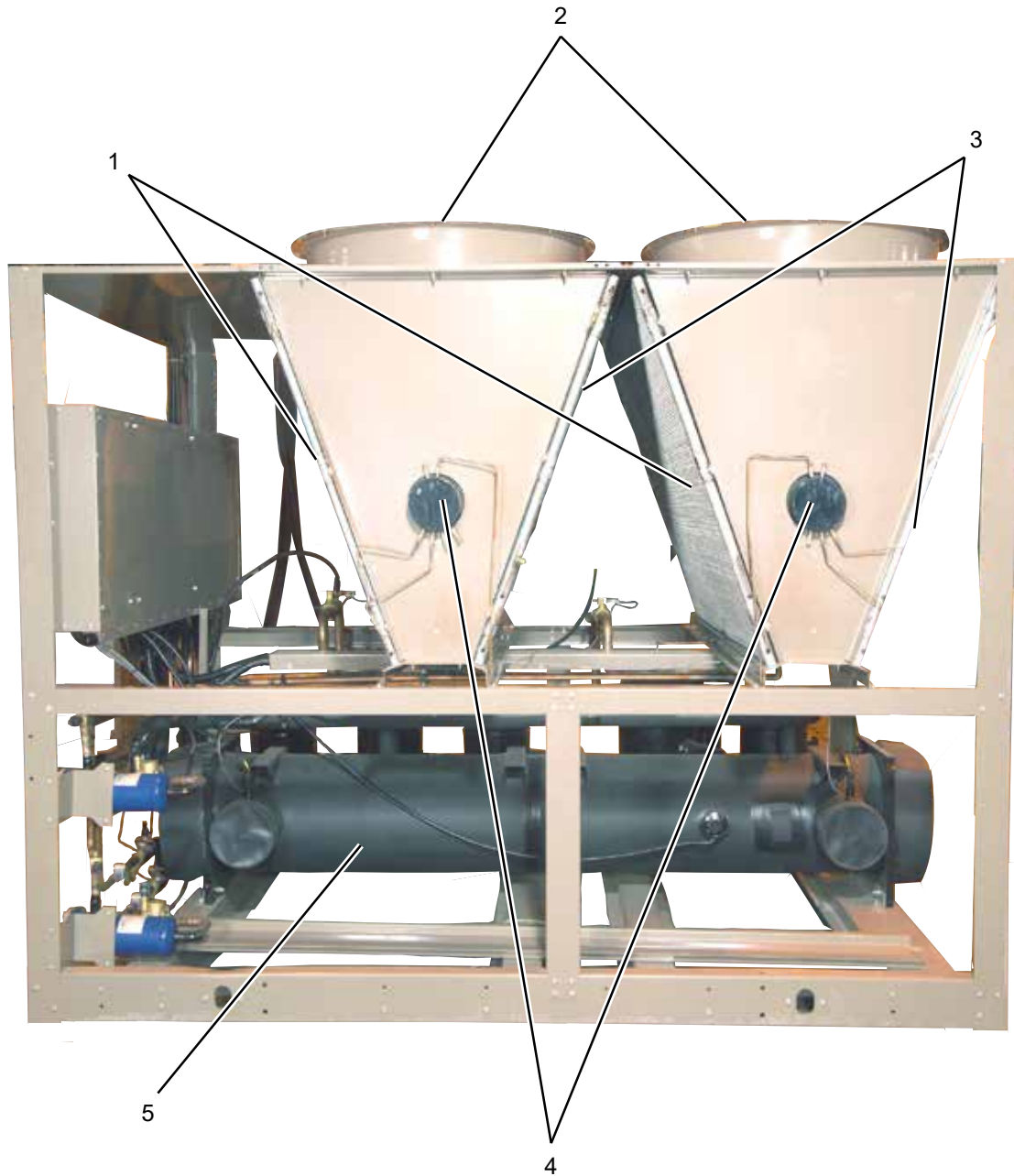
Vibration isolators

Level adjusting, spring type 1 in. (25.4 mm) or seismic deflection or neoprene pad isolators for mounting under unit base rails. **(Field-mounted)**



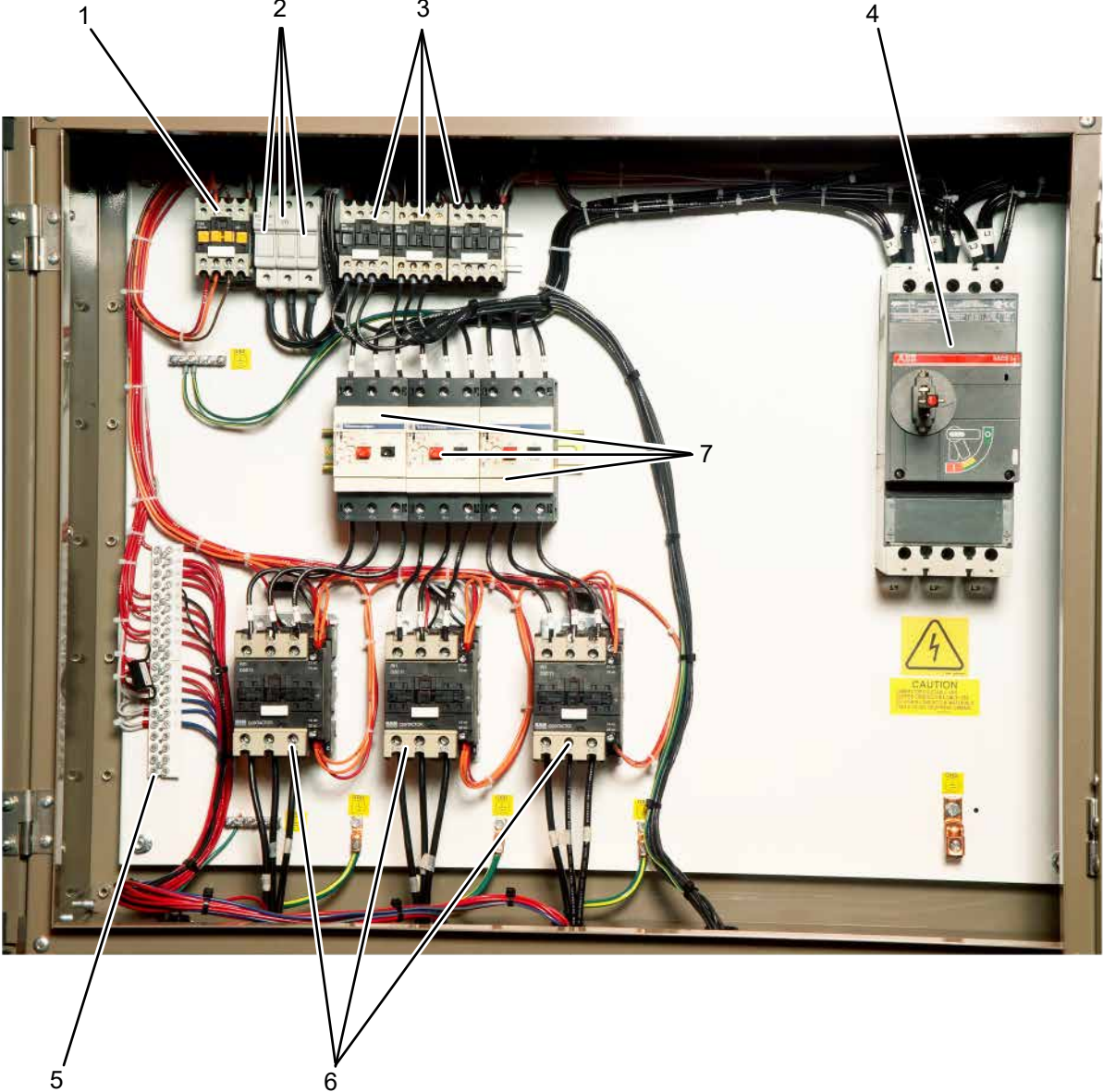
Item	Description	Item	Description
1	Fan assemblies	6	Filter drier
2	Condenser coils	7	TXV
3	Power panel	8	Evaporator
4	Control panel	9	Compressors
5	Sight glass	-	-

Figure 1: Unit components, front view



Item	Description
1	Condenser coils
2	Fan assemblies
3	Condenser coils
4	Receivers
5	Evaporator

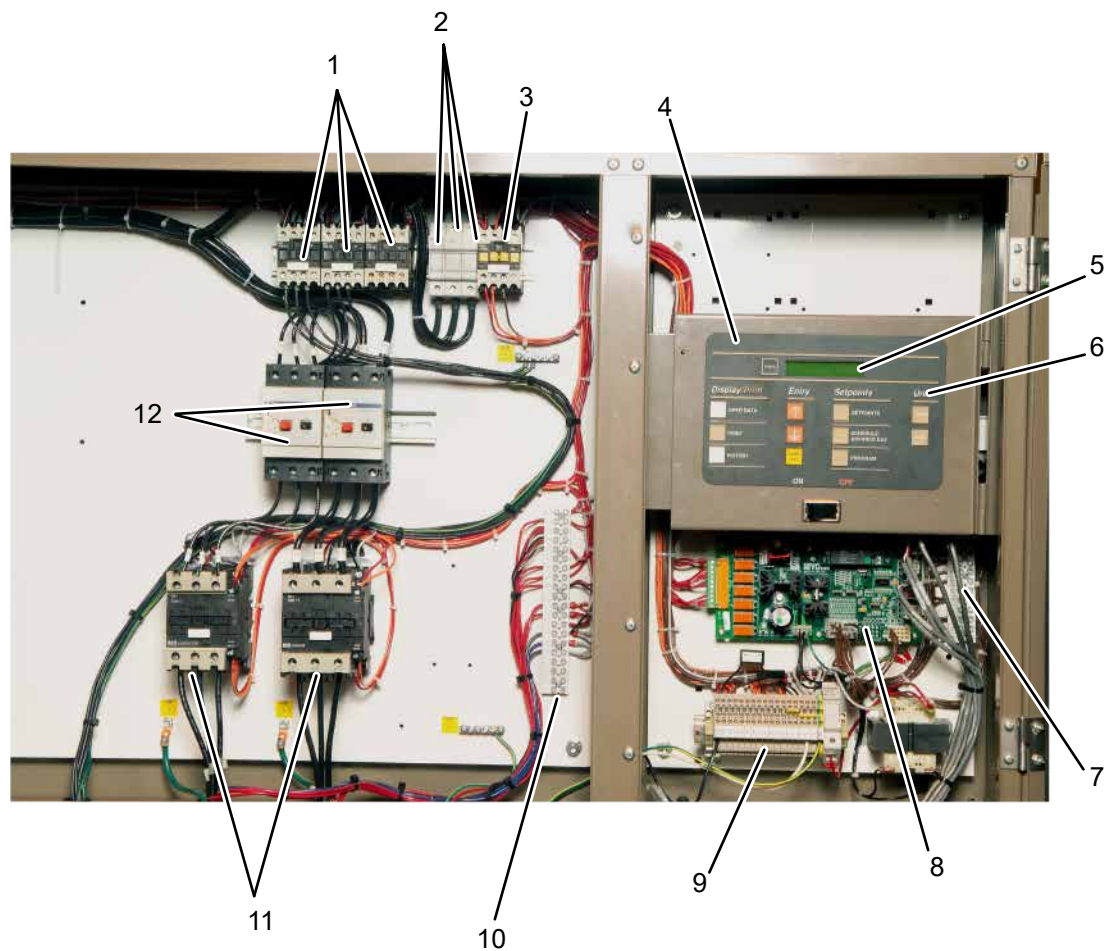
Figure 2: Unit components, side view



LD13248

Item	Description
1	Fan contactor
2	Fan fuses
3	Fan contactor
4	Disconnect switch (optional)
5	XTBF1
6	Compressor contactors
7	Compressor overloads

Figure 3: Power panel components



LD13248b

Item	Description
1	Fan contactor
2	Fan fuses
3	Control relay
4	Microcomputer control center
5	Display
6	Keypad
7	XTBC1
8	Microboard
9	XTCB2
10	XTBF2
11	Compressor contactors
12	Compressor overloads

Figure 4: Power Panel and control components

Table 2: Complete PIN number description

Feature	Feature description	Option	Option description
MODEL	Model (PIN 1-4)		QTC3
CAPACITY	Capacity (PIN 5-8)	0041	0041
		0048	0048
		0058	0058
		0065	0065
		0070	0070
		0080	0080
		0089	0089
		0092	0092
		0100	0100
		0101	0101
		0120	0120
		0125	0125
		0136	0136
		0155	0155
		0156	0156
		0170	0170
		0175	0175
		0200	0200
		0230	0230
UNIT	Unit Designator (PIN 9)	S	Standard Efficiency
		H	High Efficiency
		Z	Standard Efficiency, Round Tube
REF.	Refrigerant (PIN 10)	E	R-410A
		J	R-454B
VOLTS	Voltage (PIN 11 & 12)	17	200/3/60
		28	230/3/60
		40	380/3/60
		46	460/3/60
		58	575/3/60
STARTER	Starter (PIN 13)	X	Across the Line starter
		T	Soft Start
DESIGN	Design Series (PIN 14)	A	Design Series A (MicroChannel) Copeland Compressor
		C	Design Series C (MicroChannel CE/ETL Panel) Copeland Compressor
		D	Design Series D (MicroChannel) Bitzer Compressor
		F	Design Series F (MicroChannel CE/ETL Panel) Bitzer Compressor
DEV	Development Level (PIN 15)	B	Development Level B
POWER	Power Field (PIN 16 & 17)	SX	SP Supply TB
		SD	SP NF Disconnect Switch
		BC	SP Circuit Breaker w/ Lockable Handle, 65 kA SCWR
		BX	SP Circuit Breaker w/ Lockable Handle
		MB	MP Supply w/Ind Sys CB&L Ext Handles
TRANS	Cntrl Transformer (PIN 18)	X	No Control Transformer Required
		T	Control Transformer Required
		Q	Special Control Transformer Required

Table 2: Complete PIN number description, continued

Feature	Feature description	Option	Option description
PFC	Power Factor Capacitor (PIN 19)	X	No Power Capacitor required
		C	Power Capacitor required
		Q	Special Power Capacitor required
AMB	Ambient Kits (PIN 20)	H	High Ambient Kit Standard (factory)
		A	Both Low/High Ambient Kit required (factory)
		B	Both Low/High Ambient Kit w/Sunshield (factory)
		S	High Ambient Kit w/Sunshield (factory)
		Q	Special Ambient Kit required
BAS	Bas Reset/Offset (PIN 21)	X	No Selection
		L	LON E-Link
		S	SC-Equip Board
		Q	Special Quote
LCD	Language (PIN 22)	X	English
		S	Spanish
		C	Chinese (Simplified) (Not Applicable to eLogia)
		E	English with Chinese Displayed Board (Not Applicable to eLogia)
		F	French
		G	German
		I	Italian
RDOUT	Readout Kits (PIN 23)	B	Both Discharge & Suction Pressure Transducer Readout required
		Q	Special Pressure Readout required
SAFETY	Safety Codes (PIN 24)	C	European Safety Code (CE)
		G	China Safety Code (GB) (Not Applicable to eLogia)
		L	N American Safety Code (cUL/cETL)
SENSOR	PIN 25	X	X
		Q	Special Quote
PUMP	Motor Current Module (PIN 26)	C	Motor Current Module
		Q	Special Quote
REMOTE	Remote Panel (PIN 27)	X	No Remote Panel required
		Q	Special Remote Panel required
SEQ	Sequence Kit (PIN 28)	X	No Sequence Kit required
		Q	Special Sequence Kit required
TEMP	Leaving Water Temp (PIN 29,30)	NUM	Leaving Water Temp = Temp/Num Deg.
CHICAGO	Chicago Code Kit (PIN 31)	X	No Chicago Code Kit required
		B	Both Chicago Code & Serv Isolation
		C	Chicago Code Kit required
		G	Both Suction Service Valve and Dual Relief Valve (Europe only)
		R	Dual Relief Valves no Suction Service Valve (Europe only)
		S	Service Isolation Valves
		Q	Special Chicago Code Kit required
VALVES	Valves (PIN 32)	X	Standard Valves Required
		E	Electronic Expansion Valve
		Q	Special Optional Valves Required
HGBP	Hot Gas Bypass (PIN 33)	X	No Hot Gas Bypass required
		1	Hot Gas Bypass required - 1 circuit
		Q	Special Hot Gas Bypass required

Table 2: Complete PIN number description, continued

Feature	Feature description	Option	Option description
GAUGE	PIN 34	X	X
		Q	Special Quote
OVERLOAD	PIN 35	X	X
		Q	Special Quote
PIN36	PIN 36	K	Quick Start
		Q	Special Quote
HTR	Crankcase Heater (Pin 37)	H	Crankcase Heater Standard
		Q	Special Crankcase Heater required
DWP	DWP (PIN 38)	X	150 psig DWP Waterside
		3	300 psig DWP Waterside
INS	Insulation (PIN 39)	X	Standard Insulation
		D	Double Thick Insulation
		Q	Special Insulation required
FLANGES	Flanges (PIN 40)	X	No Flanges required
		V	Grooved Flanges required
		Q	Special Flanges required
FLOW	Flow Switch (PIN 41)	X	No Flow Switch required
		S	One Flow Switch Required
		Y	Flow Switch With Extension Kit
VESSEL	Vessel Codes (PIN 42)	A	ASME Pressure Vessel Codes
		E	PED Pressure Vessel Codes
		G	GB Pressure Vessel Codes
		Q	Special Quote
CLR	Cooler (PIN 43)	X	Standard Cooler Required
		R	Remote Cooler Required
PIN44	PIN 44	X	No Dispersion Switch Required
		G	Flow Switch >= 10% Glycol
		W	Flow Switch < 10% Glycol
		Q	Special Quote
COILS	Coils (PIN 45)	X	Aluminum Coils
		P	Post Coated Dipped Coil
		T	Post Coated Microchannel Coils
HEAT	Heat Recovery (PIN 46)	X	No Option required
		H	Heat Recovery
		Q	Special Quote
FANMOTORS	Fan Motors (PIN 47)	X	TEAO Fan Motors
		Q	Special Fan Motors required
ENCL	Enclosure Panels (PIN 48)	X	No Enclosure required
		1	Wire (Full Unit) Encl Panels (factory)
		2	Wire (Full Unit) Encl Panels (field)
		3	Wire/Louvered Encl Panels (factory)
		4	Wire/Louvered Encl Panels (field)
		5	Louvered (Cond only) Encl Panels (factory)
		6	Louvered (Cond only) Encl Panels (field)
		7	Louvered (Full Unit) Encl Panels (factory)
		8	Louvered (Full Unit) Encl Panels (field)
		9	End Louver (End Hail Guard) Encl Panels (factory)
		A	End Louver (End Hail Guard) Encl Panels (field)
		B	Aesthetic Panel Kit only (factory)
		C	Aesthetic Panel Kit only (field)
		D	Aesthetic Panel Kit plus Hail Guards (factory)
		E	Aesthetic Panel Kit plus Hail Guards (field)
		Q	Special Enclosure Panels

Table 2: Complete PIN number description, continued

Feature	Feature description	Option	Option description
ACOUSTIC	Acoustic Blanket (PIN 49)	X	No Acoustic Blanket required
		B	Acoustic Blanket Required
		E	Acoustic Enclosure
		Q	Special Acoustic Blanket required
SRDOCS	SR Documents (PIN 50)	X	No Documents Required
		A	Base, Material & Witness Documents
		B	Base Document
		M	Base & Material Documents
		W	Base & Witness Documents
		Q	Special Quote
		A	Quantech Branding
		S	SASO Compliant Label
		Q	Special Quote
FANS	Sound Fans (PIN 52)	X	Standard Low Sound Fan Required
		L	Ultra Quiet Fans Required
		G	High Air Flow Fan Required
		V	Standard Low Sound Fan with VSD Required
		M	Ultra Quiet Fans with VSD Required
		A	High Air Flow Fan Required (Vendor Specific)
		E	Low Sound Fan Required (Vendor Specific)
		S	High Static Fan Required (Vendor Specific)
		U	Ultra Quiet Fans Required (Vendor Specific)
		2	2-Speed Fans Required (Vendor Specific)
PAINT	PIN 53	X	X
		Q	Special Quote
ISOL	Vibration Isolators (PIN 54)	X	No Isolators required
		1	1 in. Deflection Isolators required
		N	Neoprene Isolators required
		S	2 in. Deflection Isolators required
		Q	Special Isolators required
PIN 55	PIN 55	–	Marketing purposes only
PIN 56	PIN 56	–	Marketing purposes only

Table 2: Complete PIN number description, continued

Feature	Feature description	Option	Option description
SHIP	Ship Instructions (PIN 57)	X	No Containerization required with Shipping Bag
		A	Buy American Act Compliance with Shipping Bag
		B	Both Buy American Act Compliance and Container Ready without Shipping Bag (Factory Prep)
		C	Container Shipped without Shipping Bag (Factory Load)
		D	Container Shipped with Shipping Bag (Factory Load US Port)
		E	Container Shipped with Shipping Bag (Factory Load Mexico Port)
		F	Container Ready with Shipping Bag (Factory Prep)
		G	Both Buy America Act Compliance and Container Shipped with Shipping Bag (Factory Prep)
		M	Container Shipped without Shipping Bag (Factory Load Mexico Port)
		N	No Containerization required without Shipping Bag
		P	Container Ready without Shipping Bag (Factory Prep)
		U	Buy American Act Compliance without Shipping Bag
		Q	Special quote
PIN 58	PIN 58	–	Marketing purposes only
PKG	Pump Package (PIN 59)	X	No Pump
		A	Pump Kit A
		B	Pump Kit B
		C	Pump Kit C
		D	Pump Kit D
		E	Pump Kit E
		F	Pump Kit F
		G	Pump Kit G
		H	Pump Kit H
		I	Pump Kit I
		J	Pump Kit J
		K	Pump Kit K
		L	Pump Kit L
		M	Pump Kit M
		N	Pump Kit N
		O	Pump Kit O
		P	Pump Kit P
		R	Pump Kit R
		S	Pump Kit S
		T	Pump Kit T
		U	Pump Kit U
		V	Pump Kit V
		W	Pump Kit W
		Y	Pump Kit Y
		Z	Pump Kit Z
PKGOPT	Pump Package Options (PIN 60)	X	No Option
		1	Single Pump, Standard
		2	Single Pump, Full Feature
		3	Dual Pump, Standard
		4	Dual Pump, Full Feature
		5	VSD Single Pump, Full Feature
		6	VSD Dual Pump, Full Feature

Table 2: Complete PIN number description, continued

Feature	Feature description	Option	Option description
PIN 61	PIN 61	–	Marketing purposes only
LOC	Mfg Location	GZ	Guangzhou, China
		MTY	Monterrey, Mexico
		SAT	San Antonio, Texas

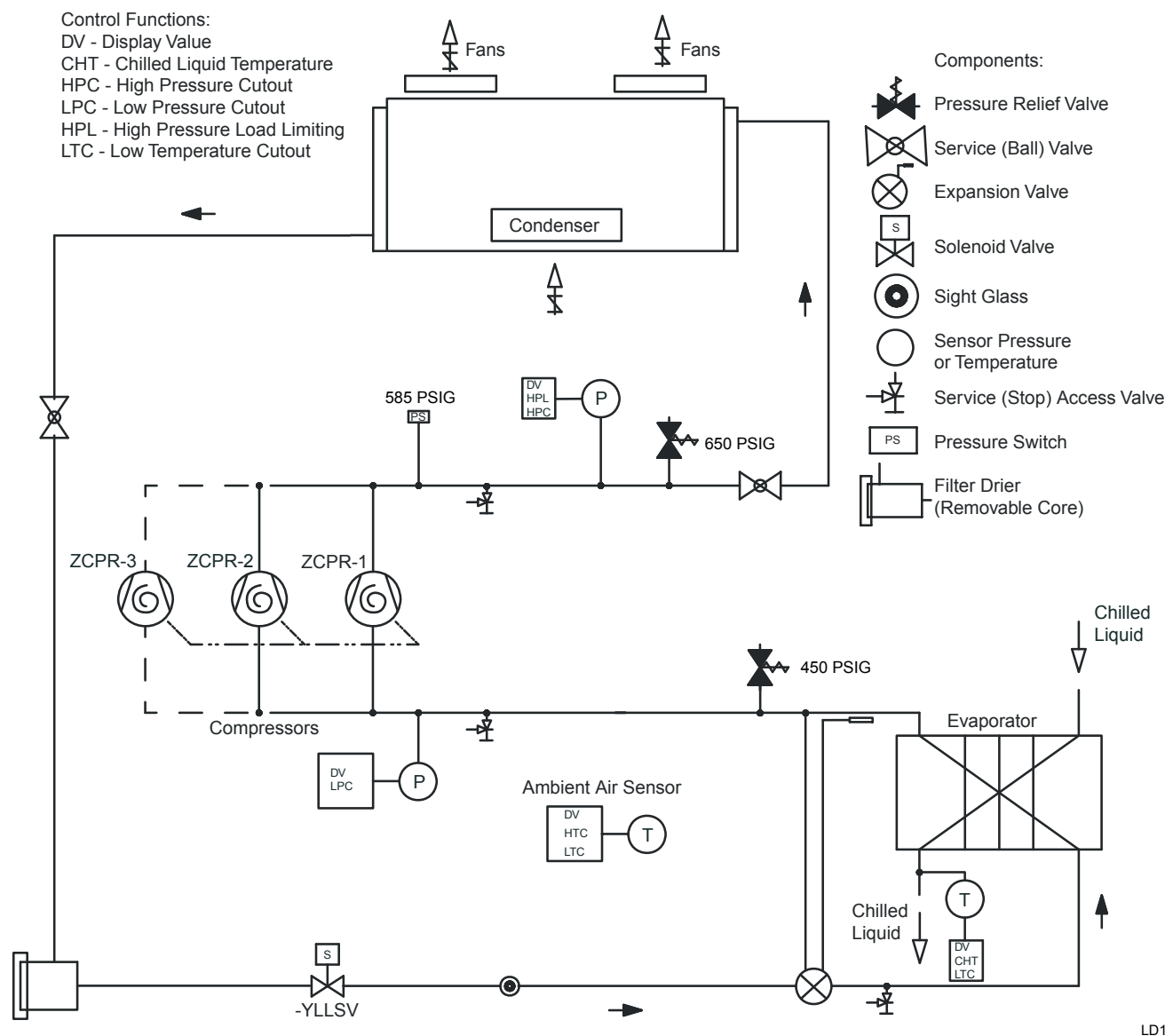


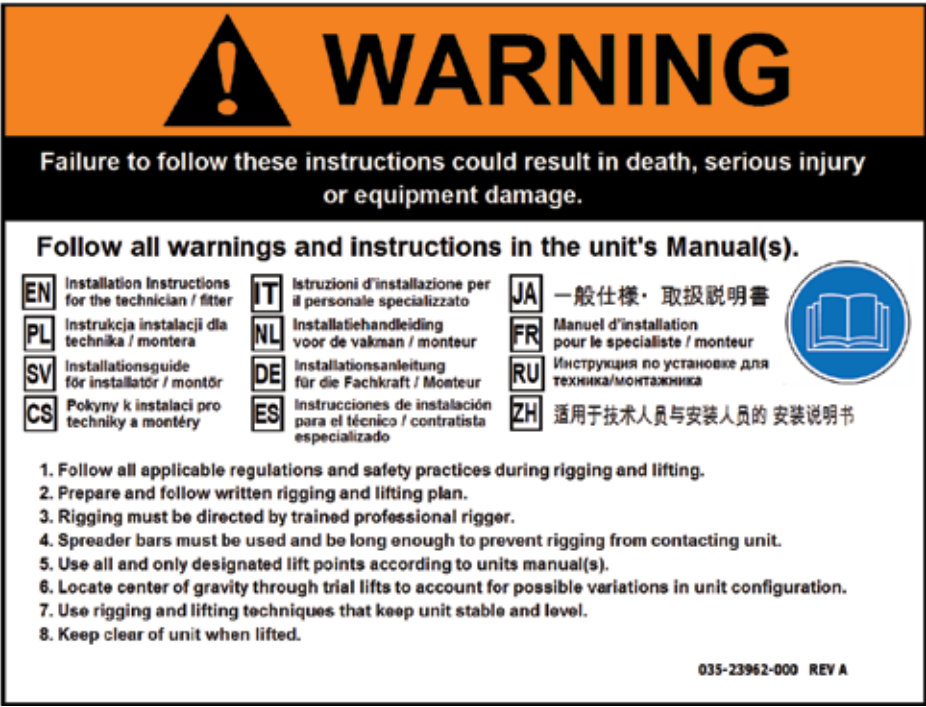
Figure 5: Process and instrumentation diagram

Low pressure liquid refrigerant enters the cooler and is evaporated and superheated by the heat energy absorbed from the chilled liquid passing through the cooler shell. Low pressure vapor enters at the compressor where pressure and superheat are increased. The

high pressure vapor is fed to the air cooled condenser coil and fans where the heat is removed. The fully condensed and subcooled liquid passes through the expansion valve where pressure is reduced and further cooling takes place before entering to the cooler.

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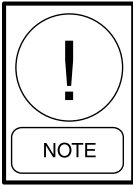
Section 3: Handling and storage



3

Figure 6: Rigging and lifting label

LD18119



Read carefully the rigging warning label on the chiller packaging.



Rigging and lifting should only be done by a professional rigger in accordance with a written rigging and lifting plan. The most appropriate rigging and lifting method will depend on job specific factors, such as the rigging equipment available and site needs. Therefore a professional rigger must determine the rigging and lifting method to be used and it is beyond the scope of the manual to specify rigging and lifting details.

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 to be put into storage, before installation, the following precautions should be observed:

- The chiller must be blocked so that the base is not permitted to sag or bow.
- Ensure that all openings, such as water connections, are securely capped.
- Do not store where exposed to ambient air temperatures exceeding 112°F (44.5°C).
- The condensers should be covered to protect the fins from potential damage and corrosion, particularly where building work is in progress.
- The unit should be stored 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 the unit must not be steam cleaned.
- It is recommended that the unit is periodically inspected during storage.

Inspection

Remove any transit packing and inspect the unit to ensure that all components have been delivered and that no damage has occurred during transit. If any damage is evident, it should be noted on the carrier's freight bill and a claim entered in accordance with the instructions given on the advice note.

Major damage must be reported immediately to your local Quantech representative.

Moving the chiller

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.



The unit must only be lifted by the base frame at the points provided. Never move the unit on rollers, or lift the unit using a forklift truck.

Care should be taken to avoid damaging the condenser cooling fins when moving the unit.

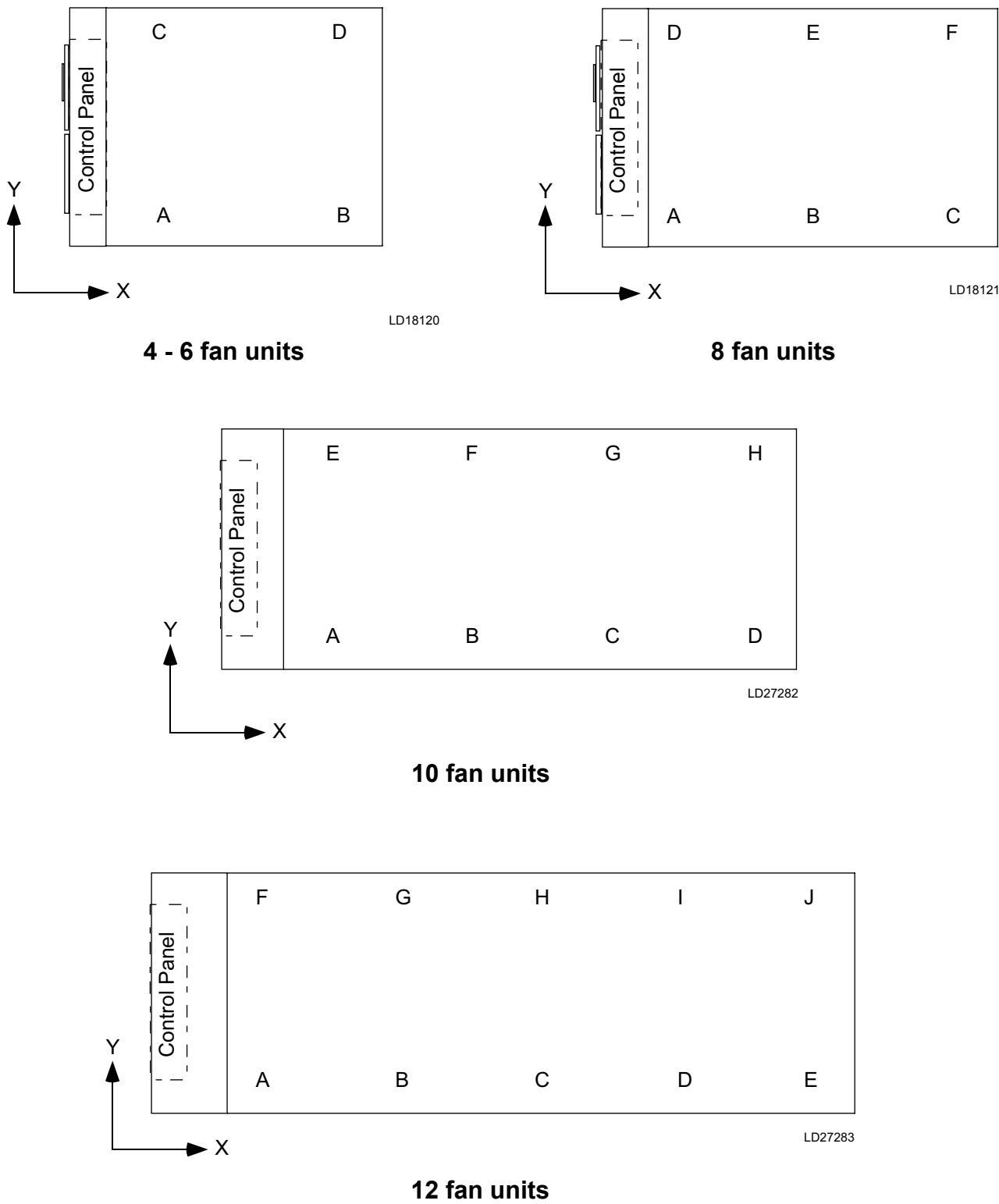


Figure 7: Unit Rigging/Lifting

Lifting weights

See the unit nameplate for unit shipping weight. Note that weight may vary depending on unit configuration at the time of lifting. See page 57 for further information regarding shipping and operating weights.

Lifting using lugs

Units are provided with lifting holes in the base frame which accept the accessory lifting lug set as shown in the following figure. The lugs (RH and LH) should be inserted into the respective holes in the base frame and turned so that the spring loaded pin engages into the hole and the flanges on the lug lock behind the hole. The lugs are attached to the cables/chains using shackles or safety hooks.

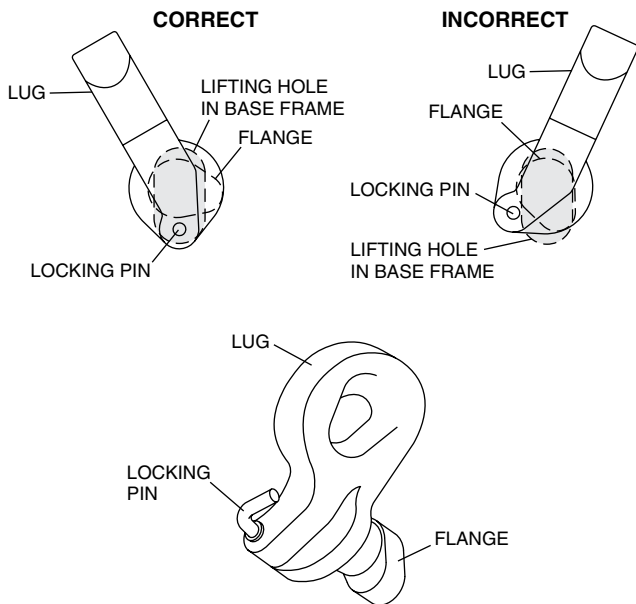


Figure 8: Lifting lugs

Lifting using shackles

Insert the shackles into the respective holes in the base frame and secure from the inside.

Use spreader bars to prevent the lifting chains from hitting the chiller. Various methods of spreader bar arrangements may be used, keeping in mind the intent is to keep the unit stable and to keep the chains from hitting the chiller and causing damage.

Lifting Instructions are placed on a label on the chiller and on the shipping bag.

Section 4: Installation



To ensure warranty coverage, this equipment must be commissioned and serviced by an authorized Quantech service mechanic or a qualified service person experienced in chiller installation. Installation must comply with all applicable codes, particularly in regard to electrical wiring and other safety elements such as relief valves, HP cutout settings, design working pressures, and ventilation requirements consistent with the amount and type of refrigerant charge.

Lethal voltages exist within the control panels. Before servicing, open and tag all disconnect switches.

Installation checklist

Complete the following steps before placing the units into operation:

- Inspect the unit for shipping damage.
- Rig unit using spreader bars.
- Only open the unit to install water piping system. Do not remove protective covers from water connections until piping is ready for attachment. Check the water piping to ensure cleanliness.
- Pipe the unit using good piping practice. Refer to ASHRAE handbook section 215 and 195.
- Ensure the wiring is tight and meets NEC and local codes.
- Check that the unit is installed and operated within limitations. See *Operational limitations on page 47*.

Location and clearances

Units are designed for outdoor installations on ground level, rooftop, or beside a building. Due to the properties of the refrigerant, never install the chiller inside a structure or without correct ventilation. Location should be selected for minimum sun exposure and to ensure adequate supply of fresh air for the condenser. The units must be installed with sufficient clearances for air entrance to the condenser coil, for air discharge away from the condenser, and for servicing access.

In installations where winter operation is intended and snow accumulations are expected, additional height must be provided to ensure normal condenser air flow. Do not smoke or have an open flame in the vicinity of the chiller.

See *Figure 37 on page 107* for clearances.

Foundation

Mount the unit on a flat and level foundation, floor, or rooftop capable of supporting the operating weight of the equipment. See *Physical data QTC3041 to QTC3230, 60 Hz on page 50* for operating weight. If the unit is elevated beyond the normal reach of service personnel, install a suitable catwalk capable of supporting service personnel, their equipment, and the compressors.

Ground level locations

It is important that the units be installed on a substantial base that will not settle. A one piece concrete slab with footers extended below the frost line is highly recommended. Additionally, the slab should not be tied to the main building foundations as noise and vibration may be transmitted. Mounting holes (5/8 in. dia.) are provided in the steel channel for bolting the unit to its foundation. See *Dimensions on page 35*.

For ground level installations, precautions should be taken to protect the unit from tampering by, or injury to, unauthorized persons. Screws and/or latches on access panels will prevent casual tampering. However, further safety precautions such as a fenced-in enclosure or locking devices on the panels are advisable.

Rooftop locations

Choose a spot with adequate structural strength to safely support the entire weight of the unit and service personnel. Care must be taken not to damage the roof.

Consult the building contractor or architect if the roof is bonded. Roof installations should have wooden beams (treated to reduce deterioration), cork, rubber, or spring type vibration isolators under the base to minimize vibration.

Noise sensitive locations

Efforts should be made to ensure that the chiller is not located next to occupied spaces or noise sensitive areas where chiller noise level would be a problem. Chiller noise is a result of compressor and fan operation.

Spring isolators: optional

When ordered, isolators will be furnished. Identify the isolator, locate at the proper mounting point, and adjust per instructions.

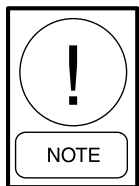
Compressor mounting

The compressors are mounted on four rubber isolators. The mounting bolts should not be loosened or adjusted at installation of the chiller.

Chilled liquid piping

General: When the unit(s) has been located in its final position, the unit water piping may be connected. Normal installation precautions should be observed in order to receive maximum operating efficiencies. Piping should be kept free of all foreign matter. All chilled water evaporator piping must comply in all respects with local plumbing codes and ordinances.

Since elbows, tees and valves decrease pump capacity, all piping should be kept as straight and as simple as possible. **All piping must be supported independent of the chiller.**



Consideration should be given to compressor access when laying out water piping. Routing the water piping too close to the unit could make compressor servicing/replacement difficult.

Hand stop valves should be installed in all lines to facilitate servicing.

Piping to the inlet and outlet connections of the chiller should include high-pressure rubber hose or piping loops to ensure against transmission of water pump vibration. The necessary components must be obtained in the field.

Drain connections should be provided at all low points to permit complete drainage of the cooler and system water piping.

A small valve or valves should be installed at the highest point or points in the chilled water piping to allow any trapped air to be purged. Vent and drain connections should be extended beyond the insulation to make them accessible.

The piping to and from the cooler must be designed to suit the individual installation. It is important that the following considerations be observed:

- The chilled liquid piping system should be laid out so that the circulating pump discharges directly into the cooler. The suction for this pump should be taken from the piping system return line and not the cooler. This piping scheme is recommended, but is not mandatory.
- The inlet and outlet cooler connection sizes are provided in *Table 6 on page 50* (Physical Data).
- A 40-mesh strainer is provided at the cooler inlet line just ahead of the cooler. This is important to protect the cooler from entrance of large particles that could cause damage to the evaporator.
- All chilled liquid piping should be thoroughly flushed to free it from foreign material before the system is placed into operation. Use care not to flush any foreign material into or through the cooler.
- As an aid to servicing, thermometers and pressure gauges should be installed in the inlet and outlet water lines.
- The chilled water lines that are exposed to outdoor ambients should be wrapped with supplemental heater cable and insulated to protect against freeze-up during low ambient periods, and to prevent formation of condensation on lines in warm humid locations. As an alternative, ethylene glycol should be added to protect against freeze-up during low ambient periods.
- A chilled water flow switch, (either by Quantech or others) **MUST** be installed in the leaving water piping of the cooler. If the factory wired flow switch and extension pipe kit is not selected, the field installed flow switch must be installed so that there is a straight horizontal run of at least 5 diameters on each side of the switch. Adjust the flow switch paddle to the size of the pipe in which it is to be installed (refer to the manufacturer's instructions furnished with the switch). The switch is to be wired to Terminals 13 and 14 of XTBC1 located in the control panel, as shown on the unit wiring diagram.



The Flow Switch MUST NOT be used to start and stop the chiller (i.e. starting and stopping the chilled water pump). It is intended only as a safety switch.

Pipework arrangement

The following are suggested pipework arrangements for single unit installations, for multiple unit installations, each unit should be piped as shown.

Recommendations of the Building Services Research Association.

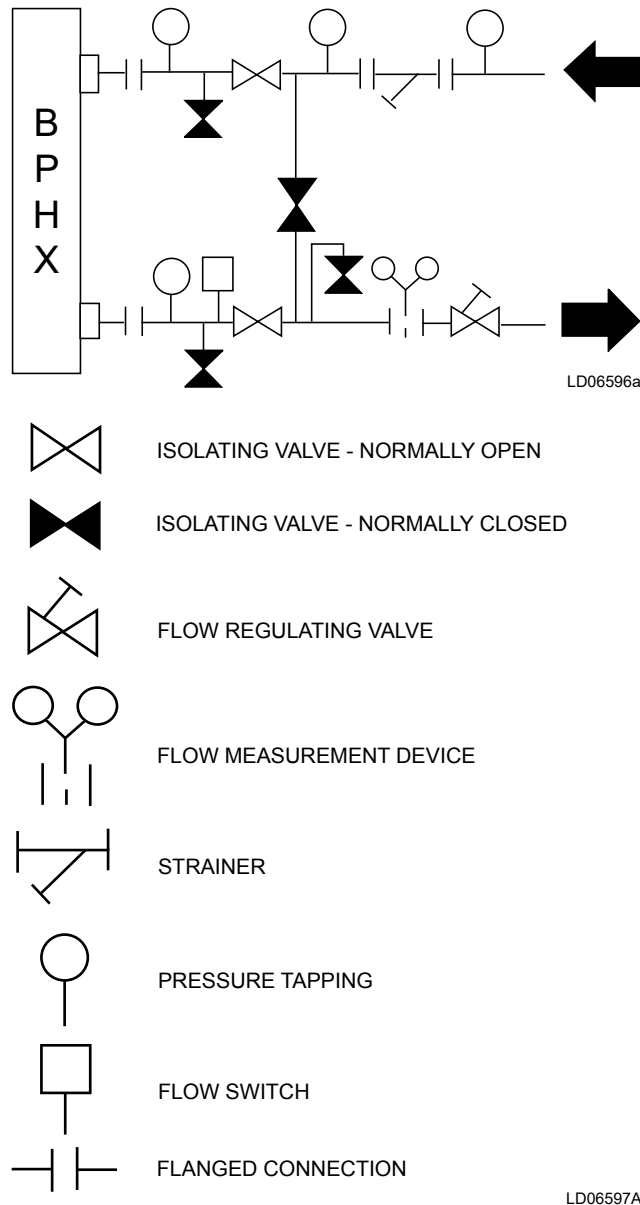


Figure 9: Chilled liquid system

Fan discharge ducting

The following ductwork 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.

When ducting is to be fitted to the fan discharge it is recommended that the duct should be the same cross-sectional area as the fan outlet and straight for at least 3 ft (1 m) to obtain static regain from the fan. Ductwork should be suspended with flexible hangers to prevent noise and vibration being transmitted to the structure. A flexible joint is also recommended between the duct attached to the fan and the next section for the same reason. Flexible connectors should not be allowed to concertina.

The unit is not designed to take structural loading. No significant amount of weight should be allowed to rest on the fan outlet flange, deck assemblies, or condenser coil module. No more than 3 ft (1 m) of light construction ductwork should be supported by the unit. Where cross winds may occur, any ductwork must be supported to prevent side loading on the unit.

If the ducts from two or more fans are to be combined into a common duct, back-flow dampers should be fitted in the individual fan ducts. This will prevent recirculation of air when only one of the fans is running.

Units are supplied with outlet guards for safety and to prevent damage to the fan blades. If these guards are removed to fit ductwork, adequate alternative precautions must be taken to ensure persons cannot be harmed or put at risk from rotating fan blades.

Wiring

Liquid chillers are shipped with all factory-mounted controls wired for operation.

Field wiring: Power wiring must be provided through a fused disconnect switch to the unit terminals (or optional molded disconnect switch) in accordance with NEC or local code requirements. Minimum circuit ampacity and maximum dual element fuse size are given in the Electrical Data tables.

Copper power wiring only should be used for supplying power to the chiller. This is recommended to avoid safety and reliability issues resulting from connection failure at the power connections to the chiller. Aluminum wiring is not recommended due to thermal characteristics that may cause loose terminations resulting from the contraction and expansion of the wiring. Aluminum oxide may also build up at the termination causing hot spots and eventual failure. If aluminum wiring is used to supply power to the chiller, AL-CU compression fittings should be used to transition from aluminum to copper. This transition should be done in

an external box separate to the power panel. Copper conductors can then be run from the box to the chiller.

A 120-1-60, 15 A source must be supplied for the control panel through a fused disconnect when a control panel transformer (optional) is not provided. See *Figure 10 on page 41*.

See unit wiring diagrams for field and power wiring connections, chilled water pump starter contacts, alarm contacts, compressor run status contacts, PWM input, and load limit input. See *Section 8: Unit operation* for a detailed description of operation concerning aforementioned contacts and inputs.

Relief valves

Relief valves are located on both the high and low pressure side of the piping. High side relief valve pressure setting is 650 psig. Low side relief valve pressure setting is 450 psig.

High pressure cutout

A high pressure cutout is installed in the discharge piping of each system. The cutout opens at 585 psig plus or minus 10 psig and closes at 440 psig plus or minus 25 psig.

Evaporator pump start contacts

Terminal block XTBC2 – Terminals 23 (115 VAC) to 24, are normally- open contacts that can be used to switch field supplied power to provide a start signal to the evaporator pump contactor. The contacts will be closed when any of the following conditions occur:

1. Low Leaving Chilled Liquid Fault
2. Any compressor is running
3. Daily schedule is not programmed OFF and the Unit Switch is ON

The pump will not run if the micro panel has been powered up for less than 30 seconds, or if the pump has run in the last 30 seconds, to prevent pump motor overheating. See *Figure 14 on page 46* and unit wiring diagram.

System run contacts

Contacts are available to monitor system status. Normally-open auxiliary contacts from each compressor contactor are wired in parallel with XTBC2 – Terminals 25 to 26 for system 1, and XTBC2 – Terminals 27 to 28 for system 2. See *Figure 4 on page 24*, *Figure 14 on page 46* and unit wiring diagram.

Alarm status contacts

Normally-open contacts are available for each refrigerant system. These normally-open contacts close when the system is functioning normally. The respective contacts will open when the unit is shut down on a unit fault, or locked out on a system fault. Field connections are at XTBC2 - Terminals 29 to 30 (system 1), and Terminals 31 to 32 (system 2).

Remote start/stop contacts

To remotely start and stop the chiller, dry contacts can be wired across terminals 13 and 51 on XTBC1. See *Figure 4 on page 24*, *Figure 11 on page 42*, and unit wiring diagram.

Remote emergency cutoff

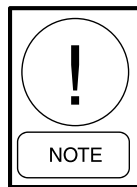
Immediate shutdown of the chiller can be accomplished by opening a field-installed dry contact to break the electrical circuit between Terminals 5 to L on terminal block XTBC2. The unit is shipped with a factory jumper installed between Terminals 5 to L, which must be removed if emergency shutdown contacts are installed. See *Figure 11 on page 42* and unit wiring diagram.

Remote temp reset input

The Remote Temp Reset input allows reset of the chilled liquid setpoint by supplying a voltage or current signal field wiring should be connected to XTBC1 – Terminals A+ to A-. A detailed explanation is provided in *Section 7: Unit controls*. See *Figure 3 on page 23*, *Figure 4 on page 24*, and unit wiring diagram.

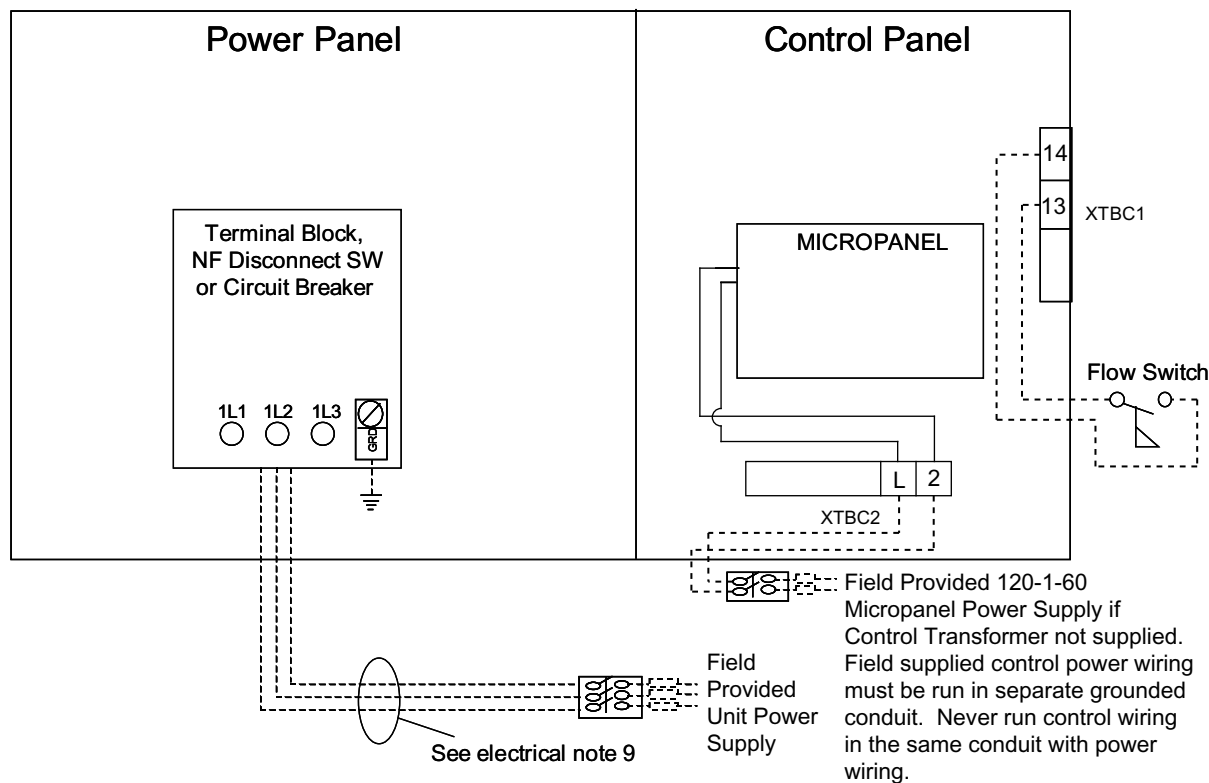
Load limit input

Load limiting is a feature that prevents the unit from loading beyond a certain value. The unit can be “load limited” either 33%, 40%, 50%, 66%, or 80%, depending on the number of compressors on unit. The field connections are wired to XTBC1 – Terminals 13 to 21, and work in conjunction with the PWM inputs. A detailed explanation is provided in *Section 7: Unit controls*. See *Figure 4 on page 24*, *Figure 11 on page 42*, and unit wiring diagram.



When using the Load Limit feature, the PWM feature will not function. Simultaneous operation of load limiting and temperature reset (PWM input) cannot be done.

Single-point supply connection – terminal block, non-fused disconnect switch or circuit breaker



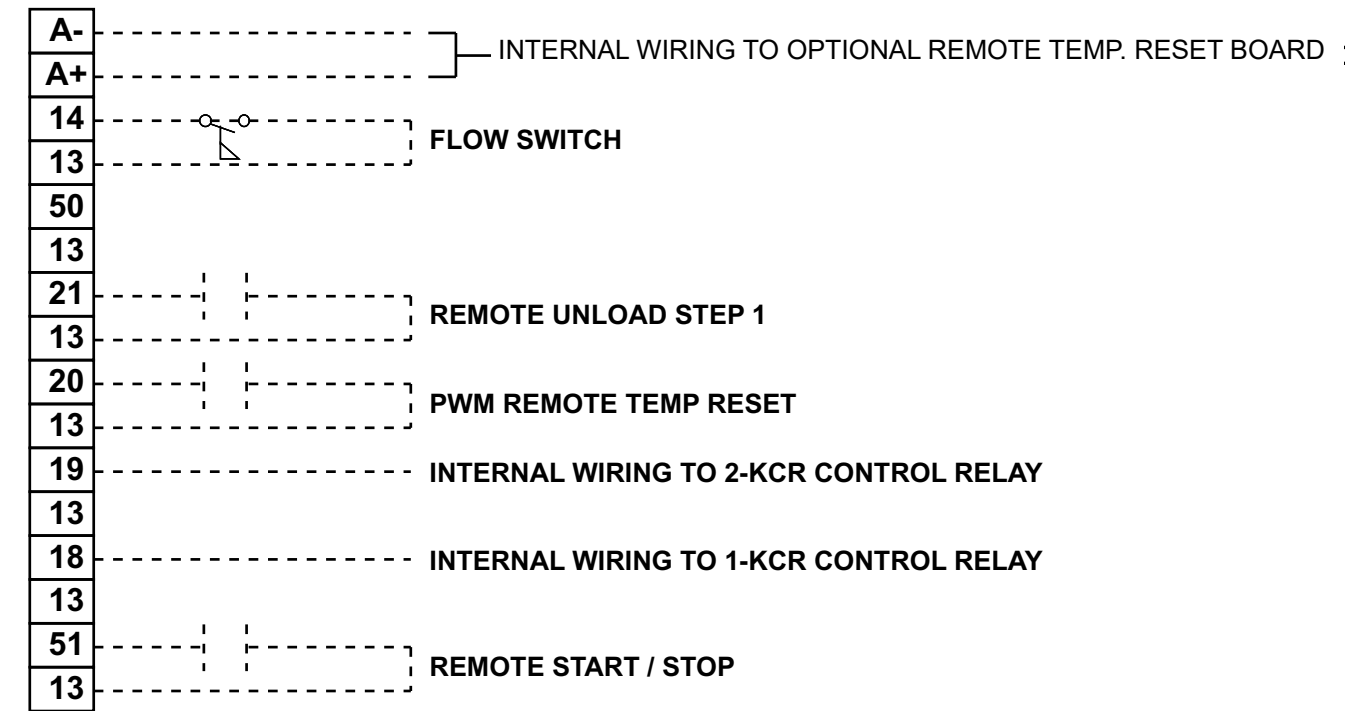
*It is possible that multiple sources of power can be supplying the unit power panel. To prevent serious injury or death, the technician should verify that **NO LETHAL VOLTAGES** are present inside the panel **AFTER** disconnecting power, before working on equipment.*



The unit evaporator heater uses 120 VAC. Disconnecting 120 VAC power from the unit, at or below freezing temperatures, can result in damage to the evaporator and unit as a result of the chilled liquid freezing.

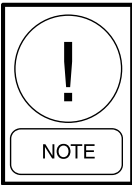
Figure 10: Single-Point Supply Connection – Terminal Block, Non-Fused Disconnect Switch or Circuit Breaker

User control wiring inputs



XTBC1

LD13130



All externally supplied contacts must be capable of switching 24 VDC / 115 VAC. Gold contacts are recommended. If supplied contacts are from a Relay / Contactor (Inductive Load), the coil of the Relay / Contactor must be suppressed. Typical suppressor is P/N 031-00808-000.



The unit evaporator heater uses 120 VAC. Disconnecting 120 VAC power from the unit, at or below freezing temperatures, can result in damage to the evaporator and unit as a result of the chilled liquid freezing.



It is possible that multiple sources of power can be supplying the unit power panel. To prevent serious injury or death, the technician should verify that NO LETHAL VOLTAGES are present inside the panel AFTER disconnecting power, before working on equipment.

Figure 11: Control Wiring Inputs

Specification of water

- Prevent particles such as silt, pipe slag, and biological matter from entering the unit to prevent the water side channels in a BPHE from clogging. These matters may block the channels, causing bad performance and increased pressure drop. Under extreme conditions, they may lead to the BPHE freezing.
- Properly flush the piping system to clean out the debris and particles generated in the piping welding and process before the BPHE is connected.
- Strainers can prevent the BPHE from blocking. If any of the media contains particles larger than 1 mm, use a strainer with a size 40 mesh at the upstream of the BPHE.
- Back flushing is an ideal method to clear out the blockage. Contact a professional company if a chemical cleaning to the BPHE is required. Chemical cleaning is one of the high risks of BPHE corrosion, because any chemical corrosion will void the warranty.
- Do not allow muddy water to be used in this chiller.
- Check the chemical specification of water in the following table for chemical consideration.

Table 3: Chemical specification of water

WATER CONTENT	UNIT	CONCENTRATION (mg/l or ppm)	TIME LIMIT (analyze before)
Alkalinity (HCO ³⁻)	ppm	70–300	Within 24 hrs
Sulfate (SO ₄ ²⁻)	ppm	< 70	No Limit
HCO ₃ ⁻ / SO ₄ ²⁻	—	> 1.0	No Limit
Electrical Conductivity	μS/cm	10–500	No Limit
pH	—	7.5–10	Within 24 hrs
Ammonium (NH ₄ ⁺)	ppm	< 2	Within 24 hrs
Chlorides (Cl ⁻)	ppm	< 100	No Limit
Free Chlorine (Cl ₂)	mg/L	< 1	Within 5 hrs
Oxygen	mg/L	< 0.02	Within 5 hrs
Hydrogen Sulfide (H ₂ S)	mg/L	< 0.05	No Limit
Free Carbon Dioxide (CO ₂)	mg/L	< 5	No Limit
Total Hardness (odH)	mg/L	4.0–8.5	No Limit
Nitrate (NO ₃ ⁻)	ppm	< 100	No Limit
Iron (Fe)	mg/L	< 0.2	No Limit
Aluminum (Al)	mg/L	< 0.2	No Limit
Manganese (Mn)	mg/L	< 0.1	No Limit

Thermal dispersion flow switch

1. Thermal Dispersion Flow Switch Operating Principle

The operating principle of the thermal dispersion flow switch is based on the calorimetric principle. It uses the cooling effect of a flowing fluid to monitor the flow rate. The amount of thermal energy that is removed from the tip determines the local flow rate. This temperature-based operating principle can reliably sense the flow of virtually any liquid or gas.

The sensor tip of the thermal dispersion flow sensor houses two transistors and a heater element. One transistor is located in the sensor tip, closest to the flowing fluid. This transistor is used to detect changes in the flow velocity of the liquid. The second transistor is bonded to the cylindrical wall and is a reference for ambient fluid conditions.

In order to make the sensor sense flow, it is necessary to heat one of the transistors in the probe. When power is applied, the tip of the probe is heated. As the fluid starts to flow, heat will be carried away from the sensor tip. Cooling of the first transistor is a function of how fast heat is conducted away by the flowing liquid. The difference in temperature between the two transistors provides a measurement of fluid velocity past the sensor probe. When fluid velocity is high, the temperature differential is small. As fluid velocity decreases, there is an increase in the temperature differential.

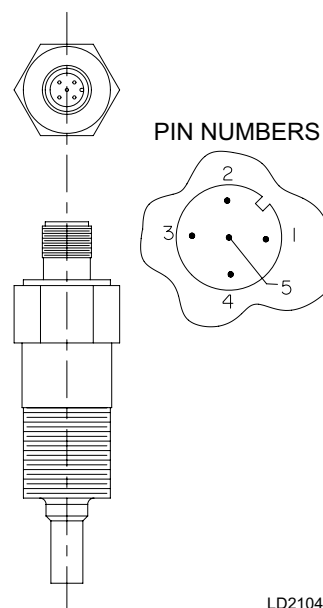
2. Service Information

The P/N of the thermal dispersion switch is 025-43553-000, SAP # is 618247. you can purchase it from JCI part center through JCI service office close to your site.

The connection of thermal dispersion switch is 1/4 in. NPT, so when replacing a flow switch with different connection size, the connector on the liquid system need to replace as well so that it can adapt to the thermal dispersion flow switch.

3. Wiring of Thermal Dispersion Flow Switch

- a. The wire connection of thermal dispersion switch contains 5 pins, the central pin is Pin #5 used for programming, which is unnecessary for wiring. See *Figure 13 on page 44*.



LD21044

Figure 12: Thermal Dispersion Flow Switch

- b. Pin #1 and Pin #3 are used to connect with 24 VAC from transformer T1 by terminal # 40 and 41. (see the red dot line frame in *Figure 15 on page 76*)
- c. Pin #2 and Pin #4 are used to output the status of thermal dispersion flow switch, these 2 pins need to be connected with terminal #13 and #14 of XTBC1 as *Figure 11 on page 42* indicated.

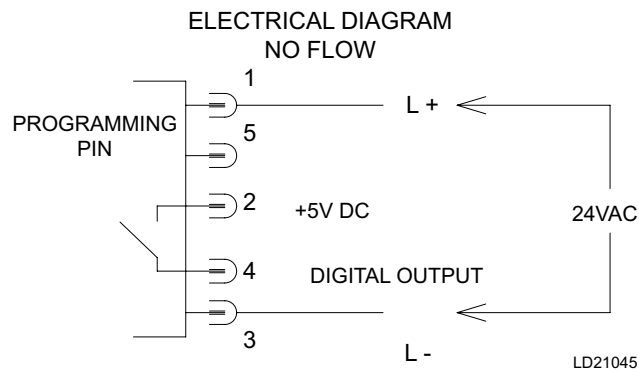


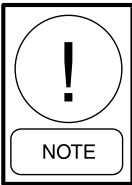
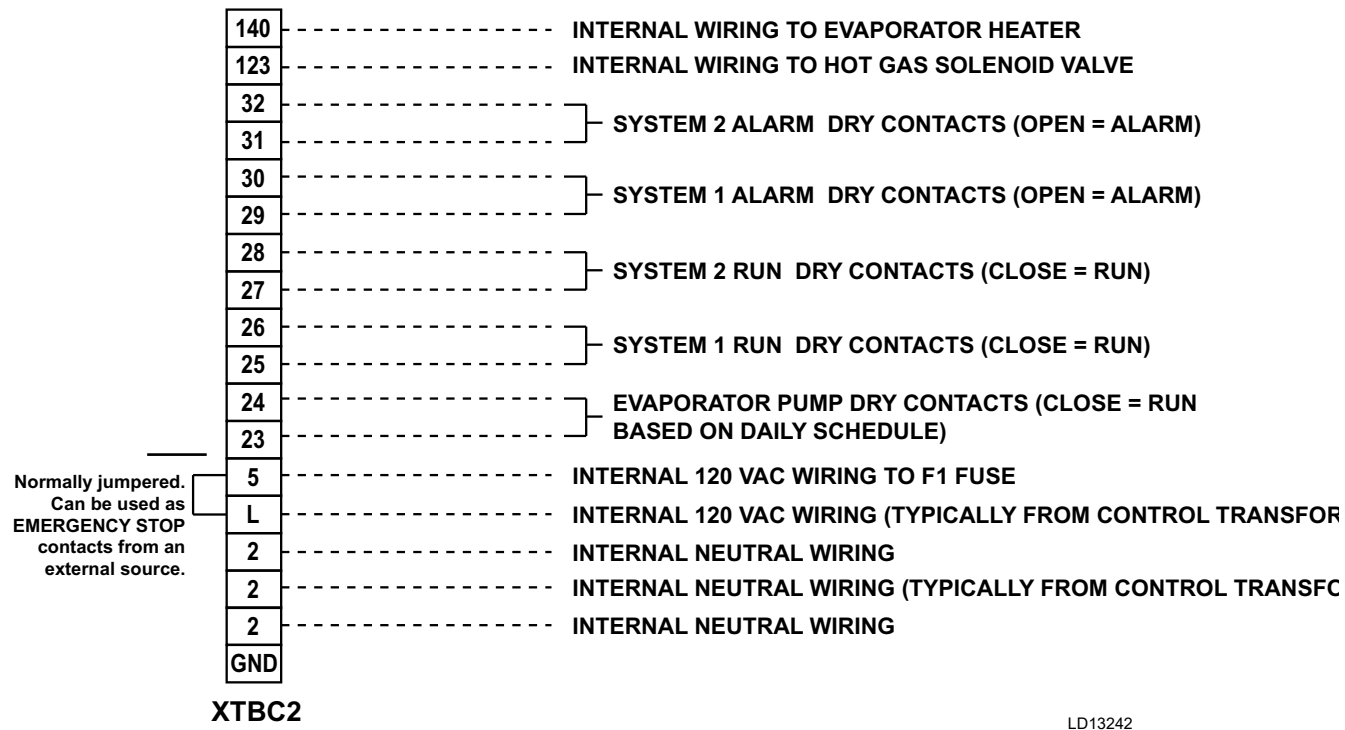
Figure 13: Wiring of Thermal Dispersion Flow Switch

Generally, the thermal dispersion flow switch is shipped with the unit as a loose part.

To mount the IFM thermal dispersion switch, use the following guidelines:

- Use a pipe coupling to mount the thermal dispersion flow switch. The length of the pipe coupling must be suitable to ensure that the insertion depth of the sensor is at least 12 mm.
- Mount the thermal dispersion flow switch in horizontal pipes from the side. If it has to be mounted in vertical pipes, mount the switch in the rising pipes.
- Mount the thermal dispersion flow switch on the top of the horizontal pipes only if the pipe is fully filled with liquid. Mount the thermal dispersion flow switch on the bottom of the horizontal pipes only if the pipe is free from buildup.
- Ensure that the sensor tip does not contact the pipe wall. Do not mount it in a downpipe, in which the liquid flows downwards.
- Avoid turbulence of the liquid resulting from bends, valves, reducers, and other pipe fittings. Ensure that the distance from the potential turbulence upstream or downstream of the sensor location is at least 5 times of the pipe diameter.
- Connect the control monitor with the flow sensor directly. No extension cable between them is allowed.

User control wiring outputs



All chiller supplied contacts are rated at 115 VAC, 100 VA, resistive load only, and must be suppressed at the load by user if powering an inductive load (Relay / Contactor Coil). Typical suppressor P/N is 031-00808-000.



It is possible that multiple sources of power can be supplying the unit power panel. To prevent serious injury or death, the technician should verify that NO LETHAL VOLTAGES are present inside the panel AFTER disconnecting power, before working on equipment.



The unit evaporator heater uses 120 VAC. Disconnecting 120 VAC power from the unit, at or below freezing temperatures, can result in damage to the evaporator and unit as a result of the chilled liquid freezing.

Figure 14: Control wiring outputs

Section 5: Technical data

Operational limitations

Table 4: Temperatures and Flows

Unit Designation	Temperature, °F (°C)		Water Flow, gpm (L/s)			Air On Condenser, °F (°C)	
	Minimum	Maximum	Nominal	Minimum	Maximum	Minimum	Maximum
Standard Efficiency							
3070TSE	40 (4.4)	55 (12.8)	170 (10.7)	60 (3.8)	285 (18.0)	-10 (-23.3)	125 (51.7)
3075TSE	40 (4.4)	55 (12.8)	186 (11.7)	100 (6.3)	355 (22.4)	-10 (-23.3)	125 (51.7)
3085TSE	40 (4.4)	55 (12.8)	205 (12.9)	100 (6.3)	385 (24.3)	-10 (-23.3)	125 (51.7)
3090THE	40 (4.4)	55 (12.8)	230 (14.5)	100 (6.3)	385 (24.3)	-10 (-23.3)	125 (51.7)
3110TSE	40 (4.4)	55 (12.8)	286 (18.0)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3125TSE	40 (4.4)	55 (12.8)	299 (18.9)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3140TSE	40 (4.4)	55 (12.8)	347 (21.9)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3160TSE	40 (4.4)	55 (12.8)	406 (25.6)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3070TZJ	40 (4.4)	55 (12.8)	170 (10.7)	60 (3.8)	285 (18.0)	0 (-17.8)	125 (51.7)
3095TZJ	40 (4.4)	55 (12.8)	230 (14.5)	100 (6.3)	385 (24.3)	0 (-17.8)	125 (51.7)
3140TZJ	40 (4.4)	55 (12.8)	347 (21.9)	150 (9.5)	625 (39.4)	0 (-17.8)	125 (51.7)
High Efficiency							
3040THE	40 (4.4)	55 (12.8)	94 (5.9)	41 (2.6)	224 (14.1)	-10 (-23.3)	125 (51.7)
3050THE	40 (4.4)	55 (12.8)	117 (7.4)	48 (3.0)	224 (14.1)	-10 (-23.3)	125 (51.7)
3055THE	40 (4.4)	55 (12.8)	136 (8.6)	60 (3.8)	285 (18.0)	-10 (-23.3)	125 (51.7)
3060THE	40 (4.4)	55 (12.8)	149 (9.4)	60 (3.8)	285 (18.0)	-10 (-23.3)	125 (51.7)
3079THE	40 (4.4)	55 (12.8)	186 (11.7)	100 (6.3)	385 (24.3)	-10 (-23.3)	125 (51.7)
3095TSE	40 (4.4)	55 (12.8)	205 (12.9)	100 (6.3)	385 (24.3)	-10 (-23.3)	125 (51.7)
3100THE	40 (4.4)	55 (12.8)	237 (15.0)	100 (6.3)	385 (24.3)	-10 (-23.3)	125 (51.7)
3120THE	40 (4.4)	55 (12.8)	282 (17.8)	100 (6.3)	385 (24.3)	-10 (-23.3)	125 (51.7)
3129THE	40 (4.4)	55 (12.8)	302 (19.1)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3150THE	40 (4.4)	55 (12.8)	351 (22.1)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3170THE	40 (4.4)	55 (12.8)	419 (26.4)	150 (9.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3205THE	40 (4.4)	55 (12.8)	467 (29.5)	230 (14.5)	625 (39.4)	-10 (-23.3)	125 (51.7)
3225THE	40 (4.4)	55 (12.8)	529 (33.4)	230 (14.5)	650 (41.0)	-10 (-23.3)	125 (51.7)

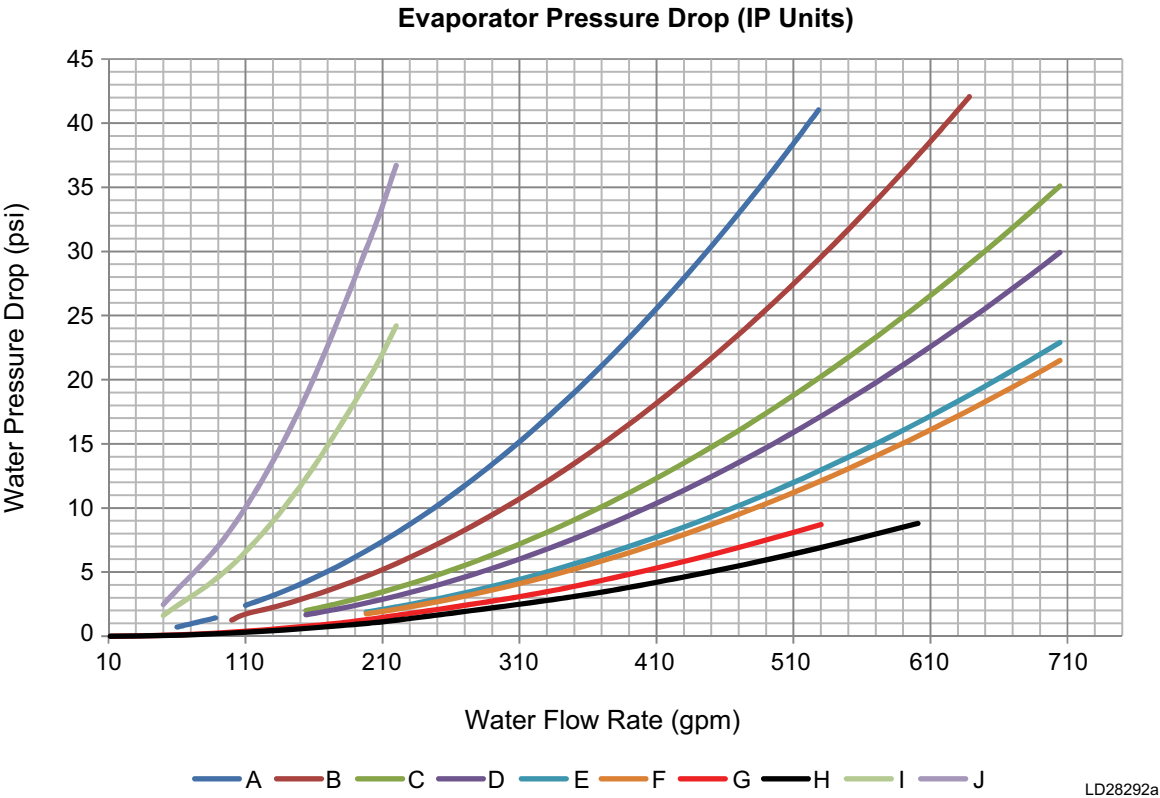
Notes:

1. For leaving liquid temperature below 40°F (4.4°C) (to 10°F [-12.2°C]), an optional low temperature glycol kit is required. Contact your nearest Quantech Office for application requirements.
2. For leaving liquid temperature higher than 55°F (12.8°C), contact the nearest Quantech Office for application guidelines.
3. The evaporator is protected against freezing to -20°F (-28.9°C) with an electric heater as standard.
4. For operation at temperatures below 30°F (-1.1°C), install the optional Low Ambient Kit on the system.
5. For operation at temperatures below 0°F (-17.8°C), install the optional Low Ambient Kit with Variable Speed Fans on the system.



Excessive flow will cause damage to the cooler. Do not exceed the maximum cooler flow. Special care should be taken when multiple chillers are fed by a single pump.

Heat exchanger flow, gpm



EVAPORATOR	QTC3 MODELS
A	3055THE, 3060THE, 3070TSE
B	3075TSE
C	3079THE, 3085TSE, 3090THE, 3095TSE, 3100THE, 3120THE
D	3125TSE, 3129THE, 3150THE, 3160TSE
E	3110TSE, 3140TSE
F	3170THE
G	3205THE
H	3225THE
I	3050THE
J	3040THE

Table 5: Ethylene and Propylene Glycol Correction Factors

ETHYLENE GLYCOL						PROPYLENE GLYCOL					
% WEIGHT	TONS	COMPR KW	GPM F/ TON	PRESS DROP	FREEZE PT	% WEIGHT	TONS	COMPR KW	GPM F/ TON	PRESS DROP	FREEZE PT
10.0	1.0	1.0	24.3	1.0	26.2	10.0	1.0	1.0	24.0	1.0	26.0
20.0	1.0	1.0	25.1	1.1	17.9	20.0	1.0	1.0	24.3	1.1	19.0
30.0	1.0	1.0	25.9	1.2	6.7	30.0	1.0	1.0	24.9	1.3	9.0
40.0	1.0	1.0	26.9	1.4	-8.1	40.0	1.0	1.0	25.6	1.4	-6.0
50.0	1.0	1.0	28.0	1.6	-28.9	50.0	0.9	1.0	26.6	1.7	-28.0

NOTE: Water Pressure Drop Curves may extend past the minimum and maximum water flow ranges.

Physical data QTC3041 to QTC3230, 60 Hz**Table 6:** Physical data and nominal data

Refrigerant R-410A	QTC3							
	Standard efficiency units							
	3070TSE	3075TSE	3085TSE	3095TSE	3110TSE	3125TSE	3140TSE	3160TSE
Nominal ratings								
Tons	71.0	77.8	81.8	96.5	120.0	125.3	145.3	170.1
kW	82.2	92.3	99.7	119.2	147.2	154.9	179.6	210.0
EER	10.4	10.0	9.8	9.7	9.8	9.7	9.7	9.7
IPLV	16.8	16.3	16.5	15.3	15.7	16.6	16.6	16.2
General unit data								
Length, in.	116.1	116.1	116.1	142.7	142.7	187.7	187.7	232.7
Width, in.	88	88	88	88	88	88	88	88
Height, in.	94.2	94.2	94.2	94.2	94.0	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2	2	2	2	2	2
Refrigerant charge, operating								
R-410A, circuit 1 / circuit 2, lb	38/38	42/39	42/42	39/55	53/55	75/71	75/70	90/87
Oil charge, circuit 1 / circuit 2, gal	2.58/2.58	3.28/2.58	3.28/2.76	3.28/3.33	3.33/3.33	4.99/2.76	4.99/3.33	4.99/4.99
Shipping weight, lb	3578	3898	4168	4791	5183	6148	6414	7734
Operating weight, lb	3623	3954	4241	4864	5293	6232	6524	7818
Compressors, scroll type								
Compressors per circuit	3/3	3/3	3/3	3/2	2/2	3/3	3/2	3/3
Compressors per unit	6	6	6	5	4	6	5	6
Nominal tons per compressor								
Circuit 1	13	15	15	15	32	32	32	32
Circuit 2	13	13	15	32	32	15	32	32
Condenser								
Total Face Area ft ²	106.9	106.9	106.9	133.6	160.3	213.8	213.8	267.2
Number of rows	1	1	1	1	1	1	1	1
Fins per in.	20	20	20	20	20	20	20	20
Condenser fans, low sound								
Number of fans, circuit 1/circuit 2	2/2	2/2	2/2	3/2	3/3	4/4	4/4	5/5
Fan, HP	2	2	2	2	2	2	2	2
Fan rpm	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160
Total chiller, cfm	60,000	60,000	60,000	75,000	90,000	120,000	120,000	150,000
Evaporator								
Water volume, gal	5.4	6.7	8.8	8.8	13.2	10.0	13.2	10.0
Maximum water side pressure, psig	150	150	150	150	150	150	150	150
Maximum refrigerant side pressure, psig	450	450	450	450	450	450	450	450
Minimum chiller water flow rate, gpm	60	100	100	100	150	150	150	150
Maximum chiller water flow rate, gpm	285	355	385	385	625	625	625	625
Water connections size, in.	3	3	3	3	3	4*	4*	4*

Note: * Standard side extension kit, evaporator nozzle remains 3 in.

Table 6: Physical data and nominal ratings, continued

Refrigerant R-410A	QTC3					
	High efficiency units					
	3040THE	3050THE	3055THE	3060THE	3079THE	3090THE
Nominal ratings						
Tons	39.5	48.9	57.0	62.3	77.9	85.7
kW	40.8	53.8	64.4	71.9	90.9	83.6
EER	11.6	10.9	10.6	10.4	10.3	11.0
IPLV	17.5	16.4	16.3	16.3	16.8	16.8
General unit data						
Length, in.	100.2	100.2	100.2	100.2	100.2	142.7
Width, in.	88.0	88.0	88.0	88.0	88.0	88
Height, in.	94.2	94.2	94.2	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2	2	2	2
Refrigerant charge, operating						
R-410A, circuit 1 / circuit 2, lb	35/35	40/39	38/38	38/38	39/37	54/50
Oil charge, circuit 1 / circuit 2, gal	0.86/0.86	0.86/0.86	2.58/2.58	2.89/2.58	2.58/2.58	2.76/2.76
Shipping weight, lb	3855	3724	3508	3704	4213	4718
Operating weight, lb	3877	3754	3552	3748	4295	4791
Compressors, scroll type						
Compressors per circuit	2/2	2/2	2/2	3/2	3/3	3/3
Compressors per unit	4	4	4	5	6	6
Nominal tons per compressor						
Circuit 1	10	13	15	13	15	15
Circuit 2	10	13	15	15	13	15
Condenser						
Total face area ft ²	106.9	106.9	106.9	106.9	106.9	160.3
Number of rows	1	1	1	1	1	1
Fins per in.	20	20	20	20	20	20
Condenser fans, low sound						
Number of fans, circuit 1/circuit 2	2/2	2/2	2/2	2/2	2/2	3/3
Fan, HP	2	2	2	2	2	2
Fan, rpm	1,160	1,160	1,160	1,160	1,160	1,160
Total chiller, cfm	26,800	60,000	60,000	60,000	60,000	90,000
Evaporator						
Water volume, gal	2.6	3.6	5.4	5.4	10	8.8
Maximum water side pressure, psig	150	150	150	150	150	150
Maximum refrigerant side pressure, psig	450	450	450	450	450	450
Minimum chiller water flow rate, gpm	41	48	60	60	100	100
Maximum chiller water flow rate, gpm	224	224	285	285	385	385
Water connections size, in.	3	3	3	3	3	3

Table 6: Physical data and nominal ratings, continued

Refrigerant R-410A	QTC3						
	High efficiency units						
	3100THE	3120THE	3129THE	3150THE	3170THE	03205THE	03225THE
Nominal ratings							
Tons	99.3	118.0	126.3	146.9	175.3	195.8	221.7
kW	117.4	137.9	149.6	172.8	214.7	231.4	260.6
EER	10.2	10.3	10.1	10.2	9.8	10.2	10.2
IPLV	16.5	16.3	16.7	16.1	16.2	16.9	16.4
General unit data							
Length, in.	142.7	187.7	187.7	232.7	232.7	274.4	274.4
Width, in.	88	88	88	88	88	88.3	88.3
Height, in.	94.2	94.2	94.2	94.2	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2	2	2	2	2
Refrigerant charge, operating							
R-410A, circuit 1 / circuit 2, lb	44/58	70/66	71/70	90/68	94/92	92/99	100/100
Oil charge, circuit 1 / circuit 2, gal	3.28/3.33	3.33/3.33	4.20/2.80	4.99/3.33	4.99/4.99	4.2/4.2	4.99/4.99
Shipping weight, lb	4953	5869	6386	7344	7882	9205	9690
Operating weight, lb	5026	5942	6488	7428	8001	9333	9821
Compressors, scroll type							
Compressors per circuit	3/2	2/2	3/2	3/2	3/3	3/3	3/3
Compressors per unit	5	4	5	5	6	6	6
Nominal tons per compressor							
Circuit 1	15	32	25	32	32	35	40
Circuit 2	32	32	32	32	32	35	40
Condenser							
Total face area ft ²	160.3	213.8	213.8	267.2	267.2	320	320
Number of rows	1	1	1	1	1	1	1
Fins per in.	20	20	20	20	20	20	20
Condenser fans, low sound							
Number of fans, circuit 1/circuit 2	4/2	4/4	4/4	6/4	5/5	6/6	6/6
Fan HP	2	2	2	2	2	2	2
Fan rpm	1,160	1,160	1,160	1,160	1,160	1,160	1,160
Total chiller cfm	90,000	120,000	120,000	150,000	150,000	180,000	180,000
Evaporator							
Water volume, gal	8.8	8.8	13.2	10.0	14.3	12.6	14.3
Maximum water side pressure, psig	150	150	150	150	150	150	150
Maximum refrigerant side pressure, psig	450	450	450	450	450	450	450
Minimum chiller water flow rate, gpm	100	100	150	150	150	230	230
Maximum chiller water flow rate, gpm	385	385	625	625	625	625	650
Water connections size, in.	3	4*	4*	4*	4*	5	5

Note: * Standard side extension kit, evaporator nozzle remains 3 in.

Table 6: Physical data and nominal ratings, continued

Refrigerant R-454B	QTC3							
	Standard efficiency units							
	3070TSJ	3075TSJ	3085TSJ	3095TSJ	3110TSJ	3125TSJ	3140TSJ	3160TSJ
Nominal ratings								
Tons	70.0	76.6	80.6	95.0	118.2	123.4	143.2	167.6
kW	79.2	88.9	96.0	114.8	141.7	149.3	173.0	202.3
EER	10.6	10.3	10.1	9.9	10.0	9.9	9.9	9.9
IPLV	16.8	16.3	16.5	15.2	15.6	16.5	16.5	16.2
General unit data								
Length, in.	116.1	116.1	116.1	142.7	142.7	187.7	187.7	232.7
Width, in.	88	88	88	88	88	88	88	88
Height, in.	94.2	94.2	94.2	94.2	94.0	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2	2	2	2	2	2
Refrigerant charge, operating								
R-454B, circuit 1 / circuit 2, lb	32/32	35/33	35/35	33/46	44/46	63/60	63/59	76/73
Oil charge, circuit 1 / circuit 2, gal	2.58/2.58	3.28/2.58	3.28/2.76	3.28/3.33	3.33/3.33	4.99/2.76	4.99/3.33	4.99/4.99
Shipping weight, lb	3578	3898	4168	4791	5183	6148	6414	7734
Operating weight, lb	3623	3954	4241	4864	5293	6232	6524	7818
Compressors, scroll type								
Compressors per circuit	3/3	3/3	3/3	3/2	2/2	3/3	3/2	3/3
Compressors per unit	6	6	6	5	4	6	5	6
Nominal tons per compressor								
Circuit 1	13	15	15	15	32	32	32	32
Circuit 2	13	13	15	32	32	15	32	32
Condenser								
Total face area ft ²	106.9	106.9	106.9	133.6	160.3	213.8	213.8	267.2
Number of rows	1	1	1	1	1	1	1	1
Fins per in.	20	20	20	20	20	20	20	20
Condenser fans, low sound								
Number of fans, circuit 1/circuit 2	2/2	2/2	2/2	3/2	3/3	4/4	4/4	5/5
Fan, HP	2	2	2	2	2	2	2	2
Fan rpm	1,160	1,160	1,160	1,160	1,160	1,160	1,160	1,160
Total chiller, cfm	60,000	60,000	60,000	75,000	90,000	120,000	120,000	150,000
Evaporator								
Water volume, gal	5.4	6.7	8.8	8.8	13.2	10.0	13.2	10.0
Maximum water side pressure, psig	150	150	150	150	150	150	150	150
Maximum refrigerant side pressure, psig	450	450	450	450	450	450	450	450
Minimum chiller water flow rate, gpm	60	100	100	100	150	150	150	150
Maximum chiller water flow rate, gpm	285	355	385	385	625	625	625	625
Water connections size, in.	3	3	3	3	3	4*	4*	4*

Note: * Standard side extension kit, evaporator nozzle remains 3 in.

Table 6: Physical data and nominal ratings, continued

Refrigerant R-454B	QTC3		
	Standard efficiency units		
	3070TZJ	3095TZJ	3140TZJ
Nominal ratings			
Tons	70.9	94.6	141.5
kW	81.0	113.8	168.1
EER	10.5	10.0	10.1
IPLV	16.2	14.9	15.8
General unit data			
Length, in.	116.1	142.7	187.7
Width, in.	88	88	88
Height, in.	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2
Refrigerant charge, operating			
R-454B, circuit 1 / circuit 2, lb	48 / 45	51 / 70	98 / 92
Oil charge, circuit 1 / circuit 2, gal	2.58 / 2.58	3.28 / 3.33	4.99 / 3.33
Shipping weight, lb	4112	5407	7152
Operating weight, lb	4450	5835	7705
Compressors, scroll type			
Compressors per circuit	3/3	3/2	3/2
Compressors per unit	6	5	5
Nominal tons per compressor			
Circuit 1	13	15	32
Circuit 2	13	32	32
Condenser			
Total face area ft ²	106.9	133.6	213.8
Number of rows	1	1	1
Fins per in.	20	20	20
Condenser fans, low sound			
Number of fans, circuit 1/circuit 2	2/2	3/2	4/4
Fan, HP	2	2	2
Fan rpm	1160	1160	1160
Total chiller, cfm	62400	78000	124800
Evaporator			
Water volume, gal	40	51	66
Maximum water side pressure, psig	150	150	150
Maximum refrigerant side pressure, psig	450	450	450
Minimum chiller water flow rate, gpm	60	100	150
Maximum chiller water flow rate, gpm	285	385	625
Water connections size, in.	6	6	8

Note: * Standard side extension kit, evaporator nozzle remains 3 in.

Table 6: Physical data and nominal ratings, continued

Refrigerant R-454B	QTC3					
	High efficiency units					
	3040THJ	3050THJ	3055THJ	3060THJ	3079THJ	3090THJ
Nominal ratings						
Tons	39.0	48.3	56.1	61.4	76.8	84.4
kW	39.5	51.9	62.1	69.3	87.5	90.4
EER	11.9	11.2	10.9	10.6	10.5	11.2
IPLV	17.4	16.4	16.3	16.3	16.7	16.8
General unit data						
Length, in.	100.2	100.2	100.2	100.2	100.2	142.7
Width, in.	88.0	88.0	88.0	88.0	88.0	88
Height, in.	94.2	94.2	94.2	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2	2	2	2
Refrigerant charge, operating						
R-454B, circuit 1 / circuit 2, lb	29/30	34/33	32/32	32/32	33/31	45/42
Oil charge, circuit 1 / circuit 2, gal	1.33/1.33	1.89/1.89	2.58/2.58	2.89/2.58	2.58/2.58	2.76/2.76
Shipping weight, lb	3327	3194	3508	3704	4213	4718
Operating weight, lb	3347	3225	3552	3748	4295	4791
Compressors, scroll type						
Compressors per circuit	2/2	2/2	2/2	3/2	3/3	3/3
Compressors per unit	4	4	4	5	6	6
Nominal tons per compressor						
Circuit 1	10	13	15	13	15	15
Circuit 2	10	13	15	15	13	15
Condenser						
Total face area ft ²	106.9	106.9	106.9	106.9	106.9	160.3
Number of rows	1	1	1	1	1	1
Fins per in.	20	20	20	20	20	20
Condenser fans, low sound						
Number of fans, circuit 1/circuit 2	2/2	2/2	2/2	2/2	2/2	3/3
Fan, HP	2	2	2	2	2	2
Fan, rpm	1160	1160	1,160	1,160	1,160	1,160
Total chiller, cfm	26800	60000	60,000	60,000	60,000	90,000
Evaporator						
Water volume, gal	2.6	3.6	5.4	5.4	10	8.8
Maximum water side pressure, psig	150	150	150	150	150	150
Maximum refrigerant side pressure, psig	450	450	450	450	450	450
Minimum chiller water flow rate, gpm	41	48	60	60	100	100
Maximum chiller water flow rate, gpm	224	224	285	285	385	385
Water connections size, in.	3	3	3	3	3	3

Table 6: Physical data and nominal ratings, continued

Refrigerant R-454B	QTC3						
	High efficiency units						
	3100THJ	3120THJ	3129THJ	3150THJ	3170THJ	3205THJ	3225THJ
Nominal ratings							
Tons	97.8	116.2	124.4	144.7	172.7	192.8	221.7
kW	113.1	132.9	144.2	166.5	206.8	222.9	260.6
EER	10.4	10.5	10.4	10.4	10.0	10.4	10.2
IPLV	16.5	16.3	16.7	16.0	16.2	16.9	17.1
General unit data							
Length, in.	142.7	187.7	187.7	232.7	232.7	274.4	274.4
Width, in.	88	88	88	88	88	88.3	88.3
Height, in.	94.2	94.2	94.2	94.2	94.2	94.2	94.2
Number of refrigerant circuits	2	2	2	2	2	2	2
Refrigerant charge, operating							
R-454B, circuit 1 / circuit 2, lb	37/49	59/55	60/59	76/57	79/77	77/83	84/84
Oil charge, circuit 1 / circuit 2, gal	3.28/3.33	3.33/3.33	4.20/2.80	4.99/3.33	4.99/4.99	4.2/4.2	5.31/5.31
Shipping weight, lb	4953	5869	6386	7344	7882	9205	9690
Operating weight, lb	5026	5942	6488	7428	8001	9333	9821
Compressors, scroll type							
Compressors per circuit	3/2	2/2	3/2	3/2	3/3	3/3	3/3
Compressors per unit	5	4	5	5	6	6	6
Nominal tons per compressor							
Circuit 1	15	32	25	32	32	35	40
Circuit 2	32	32	32	32	32	35	40
Condenser							
Total face area ft ²	160.3	213.8	213.8	267.2	267.2	320	320
Number of rows	1	1	1	1	1	1	1
Fins per in.	20	20	20	20	20	20	20
Condenser fans, low sound							
Number of fans, circuit 1/circuit 2	4/2	4/4	4/4	6/4	5/5	6/6	6/6
Fan HP	2	2	2	2	2	2	2
Fan rpm	1,160	1,160	1,160	1,160	1,160	1,160	1,160
Total chiller cfm	90,000	120,000	120,000	150,000	150,000	180,000	180,000
Evaporator							
Water volume, gal	8.8	8.8	13.2	10.0	14.3	12.6	14.3
Maximum water side pressure, psig	150	150	150	150	150	150	150
Maximum refrigerant side pressure, psig	450	450	450	450	450	450	450
Minimum chiller water flow rate, gpm	100	100	150	150	150	230	230
Maximum chiller water flow rate, gpm	385	385	625	625	625	625	650
Water connections size, in.	3	4*	4*	4*	4*	5	5

Note: * Standard side extension kit, evaporator nozzle remains 3 in.

Electrical data

Table 7: Micropanel Power Supply

UNIT VOLTAGE	UNIT VOLTAGE	CONTROL POWER	MCA NOTE A	OVER CURRENT PROTECTION, SEE NOTE B		NF DISC Sw
MODELS w/o CONTROL TRANS		115-1-60/50		MIN	MAX	
			15 A	10 A	15 A	30 A / 240 V
MODELS w/ CONTROL TRANS	-17	200-1-60	15 A	10 A	15 A	30 A / 240 V
	-28	230-1-60	15 A	10 A	15 A	30 A / 240 V
	-40	380-1-60	15 A	10 A	15 A	30 A / 480 V
	-46	460-1-60	15 A	10 A	15 A	30 A / 480 V
	-50	380/415-1-60	15 A	10 A	15 A	30 A / 415 V
	-58	575-1-60	15 A	10 A	15 A	30 A / 600 V

A. Minimum #14 AWG, 75°C, Copper Recommended

B. Minimum and Maximum Over Current Protection, Dual Element Fuse or Circuit Breaker



*It is possible that multiple sources of power can be supplying the unit power panel. To prevent serious injury or death, the technician should verify that **NO LETHAL VOLTAGES** are present inside the panel **AFTER** disconnecting power, before working on equipment.*



The unit evaporator heater uses 120 VAC. Disconnecting 120 VAC power from the unit, at or below freezing temperatures, can result in damage to the evaporator and unit as a result of the chilled liquid freezing.

5

Voltage limitations

The following voltage limitations are absolute and operation beyond these limitations may cause serious damage to the compressor.

Table 8: Voltage Range

VOLTAGE RANGE			
VOLTAGE CODE	UNIT POWER	MIN.	MAX.
-17	200/3/60	180	220
	208/3/60	187	228
-28	230-3-60	207	253
-40	380-3-60	355	415
-46	460-3-60	414	506
-50	380/415-3-50	360	440
-58	575-3-60	517	633

Compressor heaters

Compressor heaters are standard. Smaller compressors use 70 W heaters and larger compressors use 120 W heaters. If power is OFF more than two hours, the crankcase heaters must be energized for 18 hours to 24

hours before restarting a compressor. This ensures that liquid slugging and oil dilution does not damage the compressors on start.

Table 9: Pump Electrical Data 60 Hz

Pump Model	Horse Power	RPM	PUMP Electrical Data									
			208 - 3 - 60 HZ		230 - 3 - 60 HZ		380 - 3 - 60 HZ		460 - 3 - 60 HZ		575 - 3 - 60 HZ	
			FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA	FLA	LRA
A	5	3600	N/A	N/A	12.0	92.0	7.1	55.5	6.0	46.0	4.8	36.8
B	7.5	3600	N/A	N/A	17.6	126.0	10.6	78.0	8.8	63.0	7.0	50.4
C	10	3600	N/A	N/A	23.6	162.0	14.3	102.0	14.0	81.0	9.4	64.8
D	15	3600	N/A	N/A	35.0	232.0	20.9	143.0	17.5	116.0	14.0	92.8
E	5	1800	N/A	N/A	13.0	92.0	7.9	55.5	6.5	46.0	5.2	36.8
F	15	3600	N/A	N/A	35.0	232.0	20.9	143.0	17.5	116.0	14.0	92.8
G	7.5	3600	N/A	N/A	17.6	126.0	10.6	78.0	8.8	63.0	7.0	50.4
H	10	3600	N/A	N/A	23.6	162.0	14.3	102.0	14.0	81.0	9.4	64.8
I	15	3600	N/A	N/A	35.0	232.0	20.9	143.0	17.5	116.0	14.0	92.8
J	5	1800	N/A	N/A	13.0	92.0	7.9	55.5	6.5	46.0	5.2	36.8
K	15	3600	N/A	N/A	35.0	232.0	20.9	143.0	17.5	116.0	14.0	92.8
L	20	3600	N/A	N/A	45.0	290.0	28.7	190.0	22.5	145.0	18.0	116.0
M	3	1800	N/A	N/A	8.0	64.0	4.7	38.0	4.0	32.0	3.2	25.6
N	7.5	3600	N/A	N/A	17.6	126.0	10.6	78.0	8.8	63.0	7.0	50.4
O	10	3600	N/A	N/A	23.6	162.0	14.3	102.0	14.0	81.0	9.4	64.8
P	15	3600	N/A	N/A	35.0	232.0	20.9	143.0	17.5	116.0	14.0	92.8
R	5	1800	N/A	N/A	13.0	92.0	7.9	55.5	6.5	46.0	5.2	36.8
S	10	1800	N/A	N/A	24.0	162.0	15.1	102.0	12.0	81.0	9.6	64.8
T	15	1800	N/A	N/A	36.4	232.0	22.0	143.0	18.2	116.0	14.6	92.8
U	7.5	1800	N/A	N/A	18.4	126.0	11.1	78.0	9.2	63.0	7.4	50.4
V	20	3600	N/A	N/A	45.0	290.0	28.7	190.0	22.5	145.0	18.0	116.0

Note:

Reference PIN 59 for Pump Model.

Use this table along with *Table 11 on page 59* to determine electrical data of the unit plus the pump.**Table 10:** Transformer Load

Volt	VA	
	2000	3000
208	9.6	14.4
230	8.7	13.0
380	5.3	7.9
460	4.3	6.5
575	3.5	5.2

Table 11: Electrical data without pumps, R-410A

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 1								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3040T	208	60	172	250	200	200	33.3	239	33.3	239	—	—	2	7.6	44
	230	60	171	250	200	200	33.3	239	33.3	239	—	—	2	7.4	37
	380	60	119	150	125	125	23.7	145	23.7	145	—	—	2	4.5	23.1
	460	60	92	150	100	100	17.9	125	17.9	125	—	—	2	4	19
	575	60	66	100	70	70	12.8	80	12.8	80	—	—	2	2.9	15.3
3050T	208	60	248	400	250	250	51.3	300	51.3	300	—	—	2	7.6	44
	230	60	248	400	250	250	51.3	300	51.3	300	—	—	2	7.4	37
	380	60	137	200	150	150	28	139	28	139	—	—	2	4.5	23.1
	460	60	114	150	125	125	23.1	150	23.1	150	—	—	2	4	19
	575	60	96	150	110	110	19.9	109	19.9	109	—	—	2	2.9	15.3
3055T	208	60	276	400	300	300	57.7	284	57.7	284	—	—	2	7.6	44
	230	60	275	400	300	300	57.7	330	57.7	330	—	—	2	7.4	37
	380	60	149	200	175	175	30.9	192	30.9	192	—	—	2	4.5	23.1
	460	60	130	200	150	150	26.9	180	26.9	180	—	—	2	4	19
	575	60	103	150	110	110	21.5	132	21.5	132	—	—	2	2.9	15.3
3060T	208	60	306	400	350	350	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	305	400	350	350	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	170	250	200	200	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	150	200	175	175	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	112	150	125	125	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3070T	208	60	334	400	350	350	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	333	400	350	350	48.5	249	48.5	249	48.5	249	2	7.4	37
	380	60	191	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	169	200	175	175	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	120	150	125	125	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3075T	208	60	363	600	400	400	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	363	600	400	400	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	201	250	225	225	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	177	250	200	200	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	134	200	150	150	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3079T	208	60	363	400	400	400	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	363	400	400	400	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	201	250	225	225	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	177	250	200	200	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	134	200	150	150	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3085T	208	60	391	600	450	450	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	390	600	450	450	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	211	250	250	250	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	184	250	200	200	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	146	200	150	150	21.5	132	21.5	132	21.5	132	2	2.9	15.3

Notes:

- Reference PIN 59 for pump models.
- Use this table along with Table 9 on page 58 to determine electrical data of the unit plus the pump.
- Does not include the control transformer.

Table 11: Electrical data without pumps, R-410A, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 1								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3090T	208	60	406	600	450	450	57.7	284	57.7	284	57.7	284	3	7.6	44
	230	60	405	600	450	450	57.7	330	57.7	330	57.7	330	3	7.4	37
	380	60	220	400	250	250	30.9	192	30.9	192	30.9	192	3	4.5	23.1
	460	60	192	250	225	225	26.9	180	26.9	180	26.9	180	3	4	19
	575	60	152	200	150	150	21.5	132	21.5	132	21.5	132	3	2.9	15.3
3095T	208	60	450	600	500	500	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	449	600	500	500	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	260	400	300	300	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	220	400	250	250	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	175	250	200	200	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3100T	208	60	458	600	500	500	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	456	600	500	500	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	264	400	300	300	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	224	400	250	250	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	178	250	200	200	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3110T	208	60	497	800	600	600	106.2	523	106.2	523	—	—	3	7.6	44
	230	60	496	800	600	600	106.2	578	106.2	578	—	—	3	7.4	37
	380	60	300	400	350	350	64.3	355	64.3	355	—	—	3	4.5	23.1
	460	60	250	400	300	300	53.1	290	53.1	290	—	—	3	4	19
	575	60	198	250	225	225	42.5	255	42.5	255	—	—	3	2.9	15.3
3120T	208	60	512	800	600	600	106.2	523	106.2	523	—	—	4	7.6	44
	230	60	511	800	600	600	106.2	578	106.2	578	—	—	4	7.4	37
	380	60	309	400	350	350	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	258	400	300	300	53.1	290	53.1	290	—	—	4	4	19
	575	60	204	250	225	225	42.5	255	42.5	255	—	—	4	2.9	15.3
3125T	208	60	579	800	600	600	106.2	523	106.2	523	106.2	523	4	7.6	44
	230	60	577	800	600	600	106.2	578	106.2	578	106.2	578	4	7.4	37
	380	60	338	600	400	400	64.3	355	64.3	355	64.3	355	4	4.5	23.1
	460	60	285	400	300	300	53.1	290	53.1	290	53.1	290	4	4	19
	575	60	226	400	250	250	42.5	255	42.5	255	42.5	255	4	2.9	15.3
3130T	208	60	555	800	600	600	85.1	394	85.1	394	85.1	394	4	7.6	44
	230	60	553	800	600	600	85.1	436	85.1	436	85.1	436	4	7.4	37
	380	60	329	400	350	350	49.3	252	49.3	252	49.3	252	4	4.5	23.1
	460	60	274	400	300	300	40.7	212	40.7	212	40.7	212	4	4	19
	575	60	217	400	250	250	32.6	168	32.6	168	32.6	168	4	2.9	15.3
3140T	208	60	618	800	700	700	106.2	523	106.2	523	106.2	523	4	7.6	44
	230	60	617	800	700	700	106.2	578	106.2	578	106.2	578	4	7.4	37
	380	60	374	600	400	400	64.3	355	64.3	355	64.3	355	4	4.5	23.1
	460	60	311	400	350	350	53.1	290	53.1	290	53.1	290	4	4	19
	575	60	246	400	300	300	42.5	255	42.5	255	42.5	255	4	2.9	15.3
3150T	208	60	634	800	700	700	106.2	523	106.2	523	106.2	523	6	7.6	44
	230	60	632	800	700	700	106.2	578	106.2	578	106.2	578	6	7.4	37
	380	60	383	600	400	400	64.3	355	64.3	355	64.3	355	6	4.5	23.1
	460	60	319	400	350	350	53.1	290	53.1	290	53.1	290	6	4	19
	575	60	252	400	300	300	42.5	255	42.5	255	42.5	255	6	2.9	15.3

Notes:

- Reference PIN 59 for pump models.
- Use this table along with Table 9 on page 58 to determine electrical data of the unit plus the pump.
- Does not include the control transformer.

Table 11: Electrical data without pumps, R-410A, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 1								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3160T	208	60	740	1,000	800	800	106.2	523	106.2	523	106.2	523	5	7.6	44
	230	60	738	1,000	800	800	106.2	578	106.2	578	106.2	578	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	600	400	400	53.1	290	53.1	290	53.1	290	5	4	19
	575	60	295	400	350	350	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3170T	208	60	740	1,000	800	800	106.2	523	106.2	523	106.2	523	5	7.6	44
	230	60	738	1,000	800	800	106.2	578	106.2	578	106.2	578	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	600	400	400	53.1	290	53.1	290	53.1	290	5	4	19
	575	60	295	400	350	350	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3205T	208	60	734	1,000	800	800	102.8	574	102.8	574	102.8	574	6	7.6	44
	230	60	731	1,000	800	800	102.8	635	102.8	635	102.8	635	6	7.4	37
	380	60	443	600	500	500	62.2	355	62.2	355	62.2	355	6	4.5	23.1
	460	60	369	600	400	400	51.4	280	51.4	280	51.4	280	6	4	19
	575	60	292	400	300	300	41.1	225	41.1	225	41.1	225	6	2.9	15.3
3225T	208	60	959	1,200	1,000	1,000	138.8	943	138.8	943	138.8	943	6	7.6	44
	230	60	956	1,200	1,000	1,000	138.8	943	138.8	943	138.8	943	6	7.4	37
	380	60	599	800	600	600	87.2	564	87.2	564	87.2	564	6	4.5	23.1
	460	60	504	600	600	600	73	408	73	408	73	408	6	4	19
	575	60	359	600	400	400	51.9	375	51.9	375	51.9	375	6	2.9	15.3

Notes:

- Reference PIN 59 for pump models.
- Use this table along with Table 9 on page 58 to determine electrical data of the unit plus the pump.
- Does not include the control transformer.

Table 11: Electrical data without pumps, R-410A, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 2								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3040T	208	60	172	250	200	200	33.3	239	33.3	239	—	—	2	7.6	44
	230	60	171	250	200	200	33.3	239	33.3	239	—	—	2	7.4	37
	380	60	119	150	125	125	23.7	145	23.7	145	—	—	2	4.5	23.1
	460	60	92	150	100	100	17.9	125	17.9	125	—	—	2	4	19
	575	60	66	100	70	70	12.8	80	12.8	80	—	—	2	2.9	15.3
3050T	208	60	248	400	250	250	51.3	300	51.3	300	—	—	2	7.6	44
	230	60	248	400	250	250	51.3	300	51.3	300	—	—	2	7.4	37
	380	60	137	200	150	150	28	139	28	139	—	—	2	4.5	23.1
	460	60	114	150	125	125	23.1	150	23.1	150	—	—	2	4	19
	575	60	96	150	110	110	19.9	109	19.9	109	—	—	2	2.9	15.3
3055T	208	60	276	400	300	300	57.7	284	57.7	284	—	—	2	7.6	44
	230	60	275	400	300	300	57.7	330	57.7	330	—	—	2	7.4	37
	380	60	149	200	175	175	30.9	192	30.9	192	—	—	2	4.5	23.1
	460	60	130	200	150	150	26.9	180	26.9	180	—	—	2	4	19
	575	60	103	150	110	110	21.5	132	21.5	132	—	—	2	2.9	15.3
3060T	208	60	306	400	350	350	57.7	284	57.7	249	—	—	2	7.6	44
	230	60	305	400	350	350	57.7	330	57.7	288	—	—	2	7.4	37
	380	60	170	250	200	200	30.9	192	30.9	139	—	—	2	4.5	23.1
	460	60	150	200	175	175	26.9	180	26.9	180	—	—	2	4	19
	575	60	112	150	125	125	21.5	132	21.5	132	—	—	2	2.9	15.3
3070T	208	60	334	400	350	350	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	333	400	350	350	48.5	249	48.5	249	48.5	249	2	7.4	37
	380	60	191	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	169	200	175	175	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	120	150	125	125	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3075T	208	60	363	600	400	400	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	363	600	400	400	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	201	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	177	200	200	200	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	134	150	150	150	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3079T	208	60	363	400	400	400	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	363	400	400	400	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	201	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	177	200	200	200	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	134	150	150	150	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3085T	208	60	391	600	450	450	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	390	600	450	450	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	211	250	250	250	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	184	200	200	200	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	146	150	150	150	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3090T	208	60	406	600	450	450	57.7	284	57.7	284	57.7	284	3	7.6	44
	230	60	405	600	450	450	57.7	330	57.7	330	57.7	330	3	7.4	37
	380	60	220	250	250	250	30.9	192	30.9	192	30.9	192	3	4.5	23.1
	460	60	192	250	225	225	26.9	180	26.9	180	26.9	180	3	4	19
	575	60	152	200	150	150	21.5	132	21.5	132	21.5	132	3	2.9	15.3

Notes:

- Reference PIN 59 for pump models.
- Use this table along with Table 9 on page 58 to determine electrical data of the unit plus the pump.
- Does not include the control transformer.

Table 11: Electrical data without pumps, R-410A, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 2								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3095T	208	60	450	600	500	500	106.2	523	106.2	523	—	—	3	7.6	44
	230	60	449	600	500	500	106.2	578	106.2	578	—	—	3	7.4	37
	380	60	260	400	300	300	64.3	355	64.3	355	—	—	3	4.5	23.1
	460	60	220	250	250	250	53.1	290	53.1	290	—	—	3	4	19
	575	60	175	200	200	200	42.5	255	42.5	255	—	—	3	2.9	15.3
3100T	208	60	458	600	500	500	106.2	523	106.2	523	—	—	4	7.6	44
	230	60	456	600	500	500	106.2	578	106.2	578	—	—	4	7.4	37
	380	60	264	400	300	300	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	224	250	250	250	53.1	290	53.1	290	—	—	4	4	19
	575	60	178	200	200	200	42.5	255	42.5	255	—	—	4	2.9	15.3
3110T	208	60	497	600	600	600	106.2	523	106.2	523	—	—	3	7.6	44
	230	60	496	600	600	600	106.2	578	106.2	578	—	—	3	7.4	37
	380	60	300	400	350	350	64.3	355	64.3	355	—	—	3	4.5	23.1
	460	60	250	400	300	300	53.1	290	53.1	290	—	—	3	4	19
	575	60	198	250	225	225	42.5	255	42.5	255	—	—	3	2.9	15.3
3120T	208	60	512	600	600	600	106.2	523	106.2	523	—	—	4	7.6	44
	230	60	511	600	600	600	106.2	578	106.2	578	—	—	4	7.4	37
	380	60	309	400	350	350	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	258	400	300	300	53.1	290	53.1	290	—	—	4	4	19
	575	60	204	250	225	225	42.5	255	42.5	255	—	—	4	2.9	15.3
3125T	208	60	579	800	600	600	57.7	284	57.7	284	57.7	284	4	7.6	44
	230	60	577	800	600	600	57.7	330	57.7	330	57.7	330	4	7.4	37
	380	60	338	400	400	400	30.9	192	30.9	192	30.9	192	4	4.5	23.1
	460	60	285	400	300	300	26.9	180	26.9	180	26.9	180	4	4	19
	575	60	226	250	250	250	21.5	132	21.5	132	21.5	132	4	2.9	15.3
3130T	208	60	555	800	600	600	106.2	523	106.2	523	—	—	4	7.6	44
	230	60	553	800	600	600	106.2	578	106.2	578	—	—	4	7.4	37
	380	60	329	400	350	350	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	274	400	300	300	53.1	290	53.1	290	—	—	4	4	19
	575	60	217	400	250	250	42.5	255	42.5	255	—	—	4	2.9	15.3
3140T	208	60	618	800	700	700	106.2	523	106.2	523	—	—	4	7.6	44
	230	60	617	800	700	700	106.2	578	106.2	578	—	—	4	7.4	37
	380	60	374	400	400	400	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	311	400	350	350	53.1	290	53.1	290	—	—	4	4	19
	575	60	246	400	300	300	42.5	255	42.5	255	—	—	4	2.9	15.3
3150T	208	60	634	800	700	700	106.2	523	106.2	523	—	—	4	7.6	44
	230	60	632	800	700	700	106.2	578	106.2	578	—	—	4	7.4	37
	380	60	383	400	400	400	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	319	400	350	350	53.1	290	53.1	290	—	—	4	4	19
	575	60	252	400	300	300	42.5	255	42.5	255	—	—	4	2.9	15.3

Notes:

- Reference PIN 59 for pump models.
- Use this table along with Table 9 on page 58 to determine electrical data of the unit plus the pump.
- Does not include the control transformer.

Table 11: Electrical data without pumps, R-410A, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 2								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3160T	208	60	740	800	800	800	106.2	523	106.2	523	106.2	523	5	7.6	44
	230	60	738	800	800	800	106.2	578	106.2	578	106.2	578	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	400	400	400	53.1	290	53.1	290	53.1	290	5	4	19
	575	60	295	400	350	350	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3170T	208	60	740	800	800	800	106.2	523	106.2	523	106.2	523	5	7.6	44
	230	60	738	800	800	800	106.2	578	106.2	578	106.2	578	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	400	400	400	53.1	290	53.1	290	53.1	290	5	4	19
	575	60	295	400	350	350	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3205T	208	60	734	1,000	800	800	102.8	574	102.8	574	102.8	574	6	7.6	44
	230	60	731	1,000	800	800	102.8	635	102.8	635	102.8	635	6	7.4	37
	380	60	443	600	500	500	62.2	355	62.2	355	62.2	355	6	4.5	23.1
	460	60	369	600	400	400	51.4	280	51.4	280	51.4	280	6	4	19
	575	60	292	400	300	300	41.1	225	41.1	225	41.1	225	6	2.9	15.3
3225T	208	60	959	1,200	1,000	1,000	138.8	943	138.8	943	138.8	943	6	7.6	44
	230	60	956	1,200	1,000	1,000	138.8	943	138.8	943	138.8	943	6	7.4	37
	380	60	599	800	600	600	87.2	564	87.2	564	87.2	564	6	4.5	23.1
	460	60	504	600	600	600	73	408	73	408	73	408	6	4	19
	575	60	359	600	400	400	51.9	375	51.9	375	51.9	375	6	2.9	15.3

Notes:

- Reference PIN 59 for pump models.
- Use this table along with Table 9 on page 58 to determine electrical data of the unit plus the pump.
- Does not include the control transformer.

Table 12: Electrical data without pumps, R-454B

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 1								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3040T	208	60	172	250	200	200	33.3	255	33.3	255	—	—	2	7.6	44
	230	60	171	250	200	200	33.3	255	33.3	255	—	—	2	7.4	37
	380	60	95	150	110	110	18.1	172.8	18.1	172.8	—	—	2	4.5	23.1
	460	60	81	100	90	90	15.4	140	15.4	140	—	—	2	4	19
	575	60	66	100	70	70	12.9	107.6	12.9	107.6	—	—	2	2.9	15.3
3050T	208	60	225	400	250	250	45.9	335.5	45.9	335.5	—	—	2	7.6	44
	230	60	225	400	250	250	45.9	335.5	45.9	335.5	—	—	2	7.4	37
	380	60	119	150	125	125	23.8	183	23.8	183	—	—	2	4.5	23.1
	460	60	104	150	110	110	20.6	141	20.6	141	—	—	2	4	19
	575	60	73	100	80	80	14.5	109	14.5	109	—	—	2	2.9	15.3
3055T	208	60	276	400	300	300	57.7	284	57.7	284	—	—	2	7.6	44
	230	60	275	400	300	300	57.7	330	57.7	330	—	—	2	7.4	37
	380	60	149	200	175	175	30.9	192	30.9	192	—	—	2	4.5	23.1
	460	60	130	200	150	150	26.9	180	26.9	180	—	—	2	4	19
	575	60	103	150	110	110	21.5	132	21.5	132	—	—	2	2.9	15.3
3060T	208	60	306	400	350	350	57.7	284	57.7	249	—	—	2	7.6	44
	230	60	305	400	350	350	57.7	330	57.7	288	—	—	2	7.4	37
	380	60	170	250	200	200	30.9	192	30.9	139	—	—	2	4.5	23.1
	460	60	150	200	175	175	26.9	180	26.9	180	—	—	2	4	19
	575	60	112	150	125	125	21.5	132	21.5	132	—	—	2	2.9	15.3
3070T	208	60	334	400	350	350	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	333	400	350	350	48.5	249	48.5	249	48.5	249	2	7.4	37
	380	60	191	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	169	200	175	175	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	120	150	125	125	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3075T	208	60	363	600	400	400	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	363	600	400	400	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	201	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	177	200	200	200	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	134	150	150	150	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3079T	208	60	363	400	400	400	48.5	249	48.5	249	48.5	249	2	7.6	44
	230	60	363	400	400	400	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	201	250	225	225	27.6	159	27.6	159	27.6	159	2	4.5	23.1
	460	60	177	200	200	200	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	134	150	150	150	17.4	109	17.4	109	17.4	109	2	2.9	15.3
3085T	208	60	391	600	400	400	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	390	600	400	400	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	211	250	225	225	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	184	250	200	200	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	146	200	150	150	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3090T	208	60	406	600	450	450	57.7	284	57.7	284	57.7	284	3	7.6	44
	230	60	405	600	450	450	57.7	330	57.7	330	57.7	330	3	7.4	37
	380	60	220	400	250	250	30.9	192	30.9	192	30.9	192	3	4.5	23.1
	460	60	192	250	200	200	26.9	180	26.9	180	26.9	180	3	4	19
	575	60	152	200	175	175	21.5	132	21.5	132	21.5	132	3	2.9	15.3
3095T	208	60	450	600	500	500	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	449	600	500	500	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	260	400	300	300	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	220	400	250	250	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	175	250	200	200	21.5	132	21.5	132	21.5	132	2	2.9	15.3

Table 12: Electrical data without pumps, R-454B, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 1								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3100T	208	60	458	600	500	500	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	456	600	500	500	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	264	400	300	300	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	224	400	250	250	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	178	250	200	200	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3110T	208	60	497	800	600	600	106.2	652	106.2	652	—	—	3	7.6	44
	230	60	496	800	600	600	106.2	652	106.2	652	—	—	3	7.4	37
	380	60	300	400	350	350	64.3	355	64.3	355	—	—	3	4.5	23.1
	460	60	250	400	300	300	53.1	316	53.1	316	—	—	3	4	19
	575	60	198	250	225	225	42.5	255	42.5	255	—	—	3	2.9	15.3
3120T	208	60	512	800	600	600	106.2	652	106.2	652	—	—	4	7.6	44
	230	60	511	800	600	600	106.2	652	106.2	652	—	—	4	7.4	37
	380	60	309	400	350	350	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	258	400	300	300	53.1	316	53.1	316	—	—	4	4	19
	575	60	204	250	225	225	42.5	255	42.5	255	—	—	4	2.9	15.3
3125T	208	60	579	800	600	600	106.2	652	106.2	652	106.2	652	4	7.6	44
	230	60	577	800	600	600	106.2	652	106.2	652	106.2	652	4	7.4	37
	380	60	338	600	400	400	64.3	355	64.3	355	64.3	355	4	4.5	23.1
	460	60	285	400	300	300	53.1	316	53.1	316	53.1	316	4	4	19
	575	60	226	400	250	250	42.5	255	42.5	255	42.5	255	4	2.9	15.3
3130T	208	60	555	800	600	600	85.1	506	85.1	506	85.1	506	4	7.6	44
	230	60	553	800	600	600	85.1	506	85.1	506	85.1	506	4	7.4	37
	380	60	329	400	350	350	49.3	280	49.3	280	49.3	280	4	4.5	23.1
	460	60	274	400	300	300	40.7	212	40.7	212	40.7	212	4	4	19
	575	60	217	400	250	250	32.6	168	32.6	168	32.6	168	4	2.9	15.3
3140T	208	60	618	800	700	700	106.2	652	106.2	652	106.2	652	4	7.6	44
	230	60	617	800	700	700	106.2	652	106.2	652	106.2	652	4	7.4	37
	380	60	374	600	400	400	64.3	355	64.3	355	64.3	355	4	4.5	23.1
	460	60	311	400	350	350	53.1	316	53.1	316	53.1	316	4	4	19
	575	60	246	400	250	250	42.5	255	42.5	255	42.5	255	4	2.9	15.3
3150T	208	60	634	800	700	700	106.2	652	106.2	652	106.2	652	6	7.6	44
	230	60	632	800	700	700	106.2	652	106.2	652	106.2	652	6	7.4	37
	380	60	383	600	400	400	64.3	355	64.3	355	64.3	355	6	4.5	23.1
	460	60	319	400	350	350	53.1	316	53.1	316	53.1	316	6	4	19
	575	60	252	400	300	300	42.5	255	42.5	255	42.5	255	6	2.9	15.3
3160T	208	60	740	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.6	44
	230	60	738	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	600	400	400	53.1	316	53.1	316	53.1	316	5	4	19
	575	60	295	400	300	300	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3170T	208	60	740	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.6	44
	230	60	738	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	600	400	400	53.1	316	53.1	316	53.1	316	5	4	19
	575	60	295	400	300	300	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3205T	208	60	734	1,000	800	800	102.8	635	102.8	635	102.8	635	6	7.6	44
	230	60	731	1,000	800	800	102.8	635	102.8	635	102.8	635	6	7.4	37
	380	60	443	600	500	500	62.2	355	62.2	355	62.2	355	6	4.5	23.1
	460	60	369	600	400	400	51.4	316	51.4	316	51.4	316	6	4	19
	575	60	292	400	300	300	41.1	258	41.1	258	41.1	258	6	2.9	15.3
3225T	208	60	904	1,200	1,000	1,000	130.1	761	130.1	761	130.1	761	6	7.6	44
	230	60	902	1,200	1,000	1,000	130.1	761	130.1	761	130.1	761	6	7.4	37
	380	60	498	600	500	500	71.1	475	71.1	475	71.1	475	6	4.5	23.1
	460	60	472	600	500	500	67.9	344	67.9	344	67.9	344	6	4	19
	575	60	339	400	350	350	48.7	296	48.7	296	48.7	296	6	2.9	15.3

Table 12: Electrical data without pumps, R-454B, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 2								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3040T	208	60	172	250	200	200	33.3	255	33.3	255	—	—	2	7.6	44
	230	60	171	250	200	200	33.3	255	33.3	255	—	—	2	7.4	37
	380	60	95	150	110	110	18.1	172.8	18.1	172.8	—	—	2	4.5	23.1
	460	60	81	100	90	90	15.4	140	15.4	140	—	—	2	4	19
	575	60	66	100	70	70	12.9	107.6	12.9	107.6	—	—	2	2.9	15.3
3050T	208	60	225	400	250	250	45.9	335.5	45.9	335.5	—	—	2	7.6	44
	230	60	225	400	250	250	45.9	335.5	45.9	335.5	—	—	2	7.4	37
	380	60	119	150	125	125	23.8	183	23.8	183	—	—	2	4.5	23.1
	460	60	104	150	110	110	20.6	141	20.6	141	—	—	2	4	19
	575	60	73	100	80	80	14.5	109	14.5	109	—	—	2	2.9	15.3
3055T	208	60	276	400	300	300	57.7	284	57.7	284	—	—	2	7.6	44
	230	60	275	400	300	300	57.7	330	57.7	330	—	—	2	7.4	37
	380	60	149	200	175	175	30.9	192	30.9	192	—	—	2	4.5	23.1
	460	60	130	200	150	150	26.9	180	26.9	180	—	—	2	4	19
	575	60	103	150	110	110	21.5	132	21.5	132	—	—	2	2.9	15.3
3060T	208	60	306	400	350	350	57.7	284	57.7	284	—	—	2	7.6	44
	230	60	305	400	350	350	57.7	330	57.7	330	—	—	2	7.4	37
	380	60	170	250	200	200	30.9	192	30.9	192	—	—	2	4.5	23.1
	460	60	150	200	175	175	26.9	180	26.9	180	—	—	2	4	19
	575	60	112	150	125	125	21.5	132	21.5	132	—	—	2	2.9	15.3
3070T	208	60	334	400	350	350	48.5	257	48.5	257	48.5	257	2	7.6	44
	230	60	333	400	350	350	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	191	250	225	225	27.6	172	27.6	172	27.6	172	2	4.5	23.1
	460	60	169	200	175	175	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	120	150	125	125	17.4	114	17.4	114	17.4	114	2	2.9	15.3
3075T	208	60	363	600	400	400	48.5	257	48.5	257	48.5	257	2	7.6	44
	230	60	363	600	400	400	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	201	250	225	225	27.6	172	27.6	172	27.6	172	2	4.5	23.1
	460	60	177	200	200	200	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	134	150	150	150	17.4	114	17.4	114	17.4	114	2	2.9	15.3
3079T	208	60	363	400	400	400	48.5	257	48.5	257	48.5	257	2	7.6	44
	230	60	363	400	400	400	48.5	288	48.5	288	48.5	288	2	7.4	37
	380	60	201	250	225	225	27.6	172	27.6	172	27.6	172	2	4.5	23.1
	460	60	177	200	200	200	24.4	145	24.4	145	24.4	145	2	4	19
	575	60	134	150	150	150	17.4	114	17.4	114	17.4	114	2	2.9	15.3
3085T	208	60	391	600	400	400	57.7	284	57.7	284	57.7	284	2	7.6	44
	230	60	390	600	400	400	57.7	330	57.7	330	57.7	330	2	7.4	37
	380	60	211	250	225	225	30.9	192	30.9	192	30.9	192	2	4.5	23.1
	460	60	184	250	200	200	26.9	180	26.9	180	26.9	180	2	4	19
	575	60	146	200	150	150	21.5	132	21.5	132	21.5	132	2	2.9	15.3
3090T	208	60	406	600	450	450	57.7	284	57.7	284	57.7	284	3	7.6	44
	230	60	405	600	450	450	57.7	330	57.7	330	57.7	330	3	7.4	37
	380	60	220	400	250	250	30.9	192	30.9	192	30.9	192	3	4.5	23.1
	460	60	192	250	200	200	26.9	180	26.9	180	26.9	180	3	4	19
	575	60	152	200	175	175	21.5	132	21.5	132	21.5	132	3	2.9	15.3
3095T	208	60	450	600	500	500	106.2	652	106.2	652	—	—	3	7.6	44
	230	60	449	600	500	500	106.2	652	106.2	652	—	—	3	7.4	37
	380	60	260	400	300	300	64.3	355	64.3	355	—	—	3	4.5	23.1
	460	60	220	400	250	250	53.1	316	53.1	316	—	—	3	4	19
	575	60	175	250	200	200	42.5	255	42.5	255	—	—	3	2.9	15.3

Table 12: Electrical data without pumps, R-454B, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 2								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3100T	208	60	458	600	500	500	106.2	652	106.2	652	—	—	4	7.6	44
	230	60	456	600	500	500	106.2	652	106.2	652	—	—	4	7.4	37
	380	60	264	400	300	300	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	224	400	250	250	53.1	316	53.1	316	—	—	4	4	19
	575	60	178	250	200	200	42.5	255	42.5	255	—	—	4	2.9	15.3
3110T	208	60	497	800	600	600	106.2	652	106.2	652	—	—	3	7.6	44
	230	60	496	800	600	600	106.2	652	106.2	652	—	—	3	7.4	37
	380	60	300	400	350	350	64.3	355	64.3	355	—	—	3	4.5	23.1
	460	60	250	400	300	300	53.1	316	53.1	316	—	—	3	4	19
	575	60	198	250	225	225	42.5	255	42.5	255	—	—	3	2.9	15.3
3120T	208	60	512	800	600	600	106.2	652	106.2	652	—	—	4	7.6	44
	230	60	511	800	600	600	106.2	652	106.2	652	—	—	4	7.4	37
	380	60	309	400	350	350	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	258	400	300	300	53.1	316	53.1	316	—	—	4	4	19
	575	60	204	250	225	225	42.5	255	42.5	255	—	—	4	2.9	15.3
3125T	208	60	579	800	600	600	57.7	284	57.7	284	57.7	284	4	7.6	44
	230	60	577	800	600	600	57.7	330	57.7	330	57.7	330	4	7.4	37
	380	60	338	600	400	400	30.9	192	30.9	192	30.9	192	4	4.5	23.1
	460	60	285	400	300	300	26.9	180	26.9	180	26.9	180	4	4	19
	575	60	226	400	250	250	21.5	132	21.5	132	21.5	132	4	2.9	15.3
3130T	208	60	555	800	600	600	106.2	652	106.2	652	—	—	4	7.6	44
	230	60	553	800	600	600	106.2	652	106.2	652	—	—	4	7.4	37
	380	60	329	400	350	350	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	274	400	300	300	53.1	316	53.1	316	—	—	4	4	19
	575	60	217	400	250	250	42.5	255	42.5	255	—	—	4	2.9	15.3
3140T	208	60	618	800	700	700	106.2	652	106.2	652	—	—	4	7.6	44
	230	60	617	800	700	700	106.2	652	106.2	652	—	—	4	7.4	37
	380	60	374	600	400	400	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	311	400	350	350	53.1	316	53.1	316	—	—	4	4	19
	575	60	246	400	250	250	42.5	255	42.5	255	—	—	4	2.9	15.3
3150T	208	60	634	800	700	700	106.2	652	106.2	652	—	—	4	7.6	44
	230	60	632	800	700	700	106.2	652	106.2	652	—	—	4	7.4	37
	380	60	383	600	400	400	64.3	355	64.3	355	—	—	4	4.5	23.1
	460	60	319	400	350	350	53.1	316	53.1	316	—	—	4	4	19
	575	60	252	400	300	300	42.5	255	42.5	255	—	—	4	2.9	15.3
3160T	208	60	740	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.6	44
	230	60	738	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	600	400	400	53.1	316	53.1	316	53.1	316	5	4	19
	575	60	295	400	300	300	42.5	255	42.5	255	42.5	255	5	2.9	15.3
3170T	208	60	740	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.6	44
	230	60	738	1,000	800	800	106.2	652	106.2	652	106.2	652	5	7.4	37
	380	60	447	600	500	500	64.3	355	64.3	355	64.3	355	5	4.5	23.1
	460	60	372	600	400	400	53.1	316	53.1	316	53.1	316	5	4	19
	575	60	295	400	300	300	42.5	255	42.5	255	42.5	255	5	2.9	15.3

Table 12: Electrical data without pumps, R-454B, continued

QTC3	V	Hz	MCA	Min. N/F disc SW	Min. dual elem. fuse and CB	Max. dual elem. CB	System 2								
							Compr. 1		Compr. 2		Compr. 3		Std. flow fans		
							RLA	LRA	RLA	LRA	RLA	LRA	Qty.	FLA	LRA
3205T	208	60	734	1,000	800	800	102.8	635	102.8	635	102.8	635	6	7.6	44
	230	60	731	1,000	800	800	102.8	635	102.8	635	102.8	635	6	7.4	37
	380	60	443	600	500	500	62.2	355	62.2	355	62.2	355	6	4.5	23.1
	460	60	369	600	400	400	51.4	316	51.4	316	51.4	316	6	4	19
	575	60	292	400	300	300	41.1	258	41.1	258	41.1	258	6	2.9	15.3
3225T	208	60	904	1,200	1,000	1,000	130.1	761	130.1	761	130.1	761	6	7.6	44
	230	60	902	1,200	1,000	1,000	130.1	761	130.1	761	130.1	761	6	7.4	37
	380	60	498	600	500	500	71.1	475	71.1	475	71.1	475	6	4.5	23.1
	460	60	472	600	500	500	67.9	344	67.9	344	67.9	344	6	4	19
	575	60	339	400	350	350	48.7	296	48.7	296	48.7	296	6	2.9	15.3

Table 13: Wiring lugs

QTC3	Global market		Single point supply terminal block	Molded case switch single point supply		Molded case circuit breaker single point supply	
	V	Hz	Installed lug	Installed lug	Alternate lug	Installed lug	Alternate lug
3040T	208	60	(1) # 6 - 500	—	—	(1) 4 - 300	—
	230	60	(1) # 6 - 500	—	—	(1) 4 - 300	—
	380	60	(1) # 6 - 500	—	—	(1) 4 - 300	—
	460	60	(1) # 6 - 500	—	—	(1) 4 - 300	—
	575	60	(1) # 6 - 500	—	—	(1) 4 - 300	—
3050T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	380	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	460	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3055T	208	60	(1) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	230	60	(1) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	380	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	460	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3060T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	380	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 6 - 350	—
	460	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3070T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	380	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	460	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3075T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	380	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(1) 6 - 350	—
	460	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3079T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(3) 2/0 - 400	(2) 250 - 500
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(3) 2/0 - 400	(2) 250 - 500
	380	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(2) 3/0 - 250	(1) 250 - 500
	460	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3085T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	380	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	460	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3090T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	380	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	460	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 6 - 350	—
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—

Note: Alternate lugs are available in the panel for field electricians and contractors, if other lug arrangements are necessary for the installed lugs on the non-fused disconnect switch and circuit breaker panels.

Table 13: Wiring lugs, continued

QTC3	Global market		Single point supply terminal block	Molded case switch single point supply		Molded case circuit breaker single point supply	
	V	Hz	Installed lug	Installed lug	Alternate lug	Installed lug	Alternate lug
3095T/3100T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	230	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	380	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	460	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	575	60	(1) # 6 - 500	(1) 6 - 350	—	(1) 6 - 350	—
3110T/3120T	208	60	(2) # 6 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500
	230	60	(2) # 6 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500
	380	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	400/460	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	575	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
3125T	208	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	230	60	—	—	—	—	—
	380	60	(2) # 6 - 500	(3) 2/0 - 400	(2) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
	400/460	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250
	575	60	(1) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250
3129T	208	60	(3) 2/0 - 400	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500
	230	60	(3) 2/0 - 400	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500
	380	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	460	60	(2) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250
	575	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
3140T/ 3140T/ 3150T	208	60	(3) 2/0 - 400	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500
	230	60	(3) 2/0 - 400	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500
	380	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	400/460	60	(2) # 6 - 500	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250
	575	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
3160T/ 3170T/ 3205T	208	60	(4) 4/0 - 500	(4) 4/0 - 500	—	(3) 2/0 - 400	(2) 250 - 500
	230	60	(4) 4/0 - 500	(4) 4/0 - 500	—	(3) 2/0 - 400	(2) 250 - 500
	380	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	460	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 3/0 - 250	(1) 250 - 500
	575	60	(1) # 6 - 500	(2) 3/0 - 250	(1) 250 - 500	(2) 3/0 - 250	(1) 250 - 500
3225T	208	60	(4) 4/0 - 500	(4) 4/0 - 500	—	(4) 4/0 - 500	—
	230	60	(4) 4/0 - 500	(4) 4/0 - 500	—	(4) 4/0 - 500	—
	460	60	(2) # 6 - 500	(2) 250 - 500	(3) 2/0 - 400	(2) 250 - 500	(3) 2/0 - 400
	575	60	(2) # 6 - 500	—	—	(2) 3/0 - 250	(1) 250 - 500

Note: Alternate lugs are provided in the panel for field electricians and contractors, if other lug arrangements are necessary for the installed lugs on the non-fused disconnect switch and circuit breaker panels.

Electrical notes

Notes

1. Minimum Circuit Ampacity (MCA) is based on 125% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per NEC Article 430-24. If the optional Factory Mounted Control Transformer is provided, add the following MCA values to the electrical tables for the system providing power to the transformer: -17, add 2.5 A; -28, add 2.3 A; -40, add 1.5 A, -46, add 1.3 A; -58, add 1 A.
2. The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per NEC Article 440.
3. Minimum fuse size is based upon 150% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit to avoid nuisance trips at start-up due to lock rotor amps. It is not recommended in applications where brown outs, frequent starting and stopping of the unit, and/or operation at ambient temperatures in excess of 95°F (35°C) is anticipated.
4. Maximum fuse size is based upon 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit, per NEC Article 440-22.
5. Circuit breakers must be UL listed and CSA certified and maximum size is based on 225% of the rated load amps for the largest motor plus 100% of

the rated load amps for all other loads included in the circuit. Otherwise, HACR-type circuit breakers must be used. Maximum HACR circuit breaker rating is based on 225% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit.

6. The “INCOMING WIRE RANGE” is the minimum and maximum wire size that can be accommodated by the unit wiring lugs. The (2) preceding the wire range indicates the number of termination points available per phase of the wire range specified. Actual wire size and number of wires per phase must be determined based on the National Electrical Code, **using copper connectors only**. Field wiring must also comply with local codes.
7. A ground lug is provided for each compressor system to accommodate a field grounding conductor per NEC Table 250-95. A control circuit grounding lug is also supplied.
8. The supplied disconnect is a “Disconnecting Means” as defined in the NEC 100, and is intended for isolating the unit for the available power supply to perform maintenance and troubleshooting. This disconnect is not intended to be a Load Break Device.
9. Field Wiring by others which complies to the National Electrical Code and Local Codes.

Legend

ACR-LINE	ACROSS THE LINE START
C.B.	CIRCUIT BREAKER
D.E.	DUAL ELEMENT FUSE
DISC SW	DISCONNECT SWITCH
FACT MOUNT CB	FACTORY MOUNTED CIRCUIT BREAKER
FLA	FULL LOAD AMPS
HZ	HERTZ
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MIN	MINIMUM
MIN NF	MINIMUM NON FUSED
RLA	RATED LOAD AMPS
S.P. WIRE	SINGLE POINT WIRING
UNIT MTD SERV SW	UNIT MOUNTED SERVICE (NON-FUSED DISCONNECT
LRA	LOCKED ROTOR AMPS

Voltage Code

-17	= 200-208-3-60
-28	= 230-3-60
-40	= 380-3-60
-46	= 460-3-60
-50	= 380/415-3-50
-58	= 575-3-60


Electrical notes and legend

035-21966-101 REV. Y

DESIGNATION	DESCRIPTION
ACC	ACCESSORY
- ADIS	DISPLAY BOARD
- AMB	MICRO BOARD
- AUX	AUXILIARY SWITCH
- BAMB	AMBIENT
- BDAT	DISCHARGE AIR TEMPERATURE
- BDP	DISCHARGE PRESSURE
- BECT	ENTERING CHILLED TEMPERATURE
- BLCT	LEAVING CHILLED TEMPERATURE NOT FITTED ON REMOTE EVAP UNITS
- BMP	MOTOR PROTECTOR COMPRESSOR
- BSP	SUCTION PRESSURE
BST	SUCTION TEMPERATURE
- CPF	CAPACITOR POWER FACTOR
- ECH	CRANKCASE HEATER
- EEH	EVAPORATOR HEATER
- EEV	ELECTRONIC EXPANSION VALVE
- EEVC	ELEC. EXPAN. VALVE CONTROLLER
- EHRH	HEAT RECOVERY HEATER
- EPH	PUMP HEATER
- ETXVH	EXPANSION VALVE HEATER
- ETH	TRACE HEATER
- EXT	EXTERNAL TO CONTROL PANEL
- F	FUSE
- FHP	HIGH PRESSURE CUTOUT
- FSC	FAN SPEED CONTROLLER
- FSI	FAN SPEED INHIBIT TWO SPEED FAN OPTION ONLY
GND	GROUND
G/Y	GREEN / YELLOW
J	PLUG BOARD CONNECTOR
- K	CIRCUIT BOARD RELAY
- KEEV	ELECTRONIC EXPANSION VALVE CONTROL RELAY
- KF	FAN CONTACTOR LINE (INCLUDING COIL SUPPRESSOR)
- KFH	FAN CONTACTOR HIGH SPEED (INCLUDING COIL SUPPRESSOR)
- KFL	FAN CONTACTOR LOW SPEED (INCLUDING COIL SUPPRESSOR)
- KFOL	FAN OVERLOAD
- KFS	RELAY FAN SPEED
- KH	HEATER RELAY
- KM	COMPRESSOR CONTACTOR (INCLUDING COIL SUPPRESSOR)
- KCR	CONTROL RELAY
- KP	PUMP CONTACTOR PART (INCLUDING COIL SUPPRESSOR)

DESIGNATION	DESCRIPTION
- KT	RELAY TIMER
- M	COMPRESSOR MOTOR
- MF	MOTOR FAN
- MP	MOTOR PUMP
NU	NOT USED
PE	PROTECTIVE EARTH
PWM	PULSE WIDTH MODULATION TEMP RESET or REMOTE UNLOAD 2nd STEP
- QCB	CIRCUIT BREAKER
- QMMSC	MANUAL MOTOR STARTER COMPRESSOR
- QMMSP	MANUAL MOTOR STARTER PUMP
- QSD	SWITCH DISCONNECT
R	RESISTOR
RED	RED
RP	RUN PERMISSIVE
RU	REMOTE UNLOAD 1st STEP
SCH	THERMOSTAT CRANKCASE HEATER
SCR	SCREEN
- SF	FLOW SWITCH
- SFE	FLOW SWITCH ELECTRONIC
- SKP	KEYPAD
- SOA	SWITCH OFF AUTO
- SZT	ZONE THERMOSTAT
- T	TRANSFORMER
- TC	TRANSFORMER CURRENT
TXV	THERMAL EXPANSION VALVE
- UBR	BRIDGE RECTIFIER
- WHT	WHITE
- XP	PLUGS BETWEEN POW./MICRO. SECTION
- XTBC	TERMINAL BLOCK CUSTOMER
- XTBF	TERMINAL BLOCK FACTORY
- XTBM	TERMINAL BLOCK MOTOR FAN TRIP
- YESV	EVAPORATOR SOLENOID VALVE
- YHGSV	HOT GAS SOLENOID VALVE (INCLUDING COIL SUPPRESSOR)
- YLLSV	LIQUID LINE SOLENOID VALVE FIELD MOUNTED AND WIRED ON REMOTE EVAP. UNITS
- ZCPR	COMPRESSOR
Ⓝ	NOTE WELL {SEE NOTE}
— . — . — . — .	WIRING AND ITEMS SHOWN THUS ARE STANDARD QUANTECH ACCESSORIES
— . . . — . . . — . . .	WIRING AND ITEMS SHOWN THUS ARE NOT SUPPLIED BY QUANTECH
— — —	ITEMS THUS ENCLOSED FORM A COMPONENTS OR SETS OF COMPONENTS

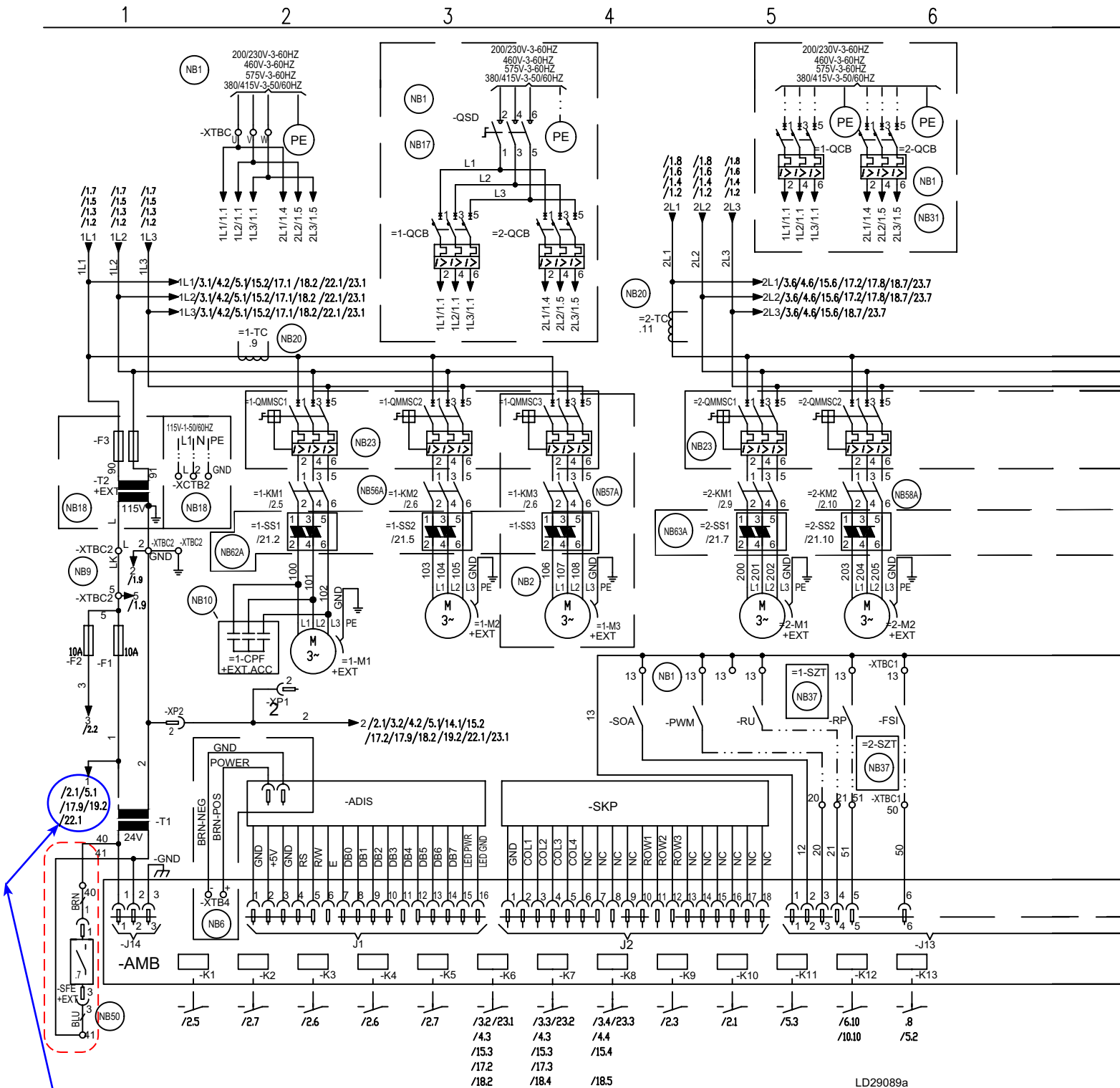
Electrical notes and legend (cont'd)

GENERAL	
a.	This drawing is based on IEC symbols.
b.	Field wiring must be in accordance with the relevant electrical code and all other applicable codes and specifications.
c.	All sources of supply shown on this diagram must be taken from one main isolator, not shown or supplied by Quantech.
d.	Green and yellow wire is used for earth, multi-colored cable used for low voltage. Red wire used for AC Control, blue wire for neutral, black wire for AC and DC power. Orange wire is used for interlock control wiring supplied by external source.
e.	The legend designation depicts component abbreviations. Number prefix located, if applicable, on schematic circuit, refers to system thereon, for example = 1-FHP2 refers to high pressure cutout no 2 on system no 1.
f.	All wiring to control section voltage free contacts requires a supply provided by the customer maximum voltage 240 volts. The customer must take particular care when deriving the supplies for the voltage free terminals with regard to a common point of isolation. These circuits when used must be fed through the common point of isolation. The voltage to these circuits is removed when the common point of isolation to the unit is opened. This common point of isolation is not supplied by Quantech. The Quantech voltage free contacts are rated at 100 VA. All inductive devices {relays} switch by the Quantech voltage free contacts must have their coil suppressed using standard R/C suppressors.
g.	Customer voltage free contacts connected to terminal 13 must be rated at 30 V 5 mA.
h.	No controls {relays etc.} Should be mounted in any section of the control panel. Additionally, control wiring not connected to the Quantech control panel must not be run through the panel. If these precautions are not followed, electrical noise could cause malfunctions or damage to the unit and its controls.
i.	 120/14.3 - (Signal IN/OUT) i.e. 120 is wire # and 14.3 refers to SHT. 14 column 3.
NOTES	
1	Refer to installation commissioning operation and maintenance manual for customer connections and customer connection notes, non compliance to these instructions will invalidate unit warranty.
2	Wiring and components for compressor 3 only fitted when unit has 3 compressors on the system. 1-BMP3 is replaced by a link across terminals 134 & 135. 2-BMP3 is replaced by a link across terminals 234 & 235.
3	-
4	Fitted on units with hot gas bypass option.
5	EMS option is wired as shown.
6	This wiring must be used for old display 031-0110-000.
7	Network connection point.
8	Printer port.
9	Remote emergency stop can be wired between terminal 1 and 5 after removing link.
10	Power factor correction accessory. Power factor correction fitted to each compressor contactor.
11	Not fitted on compressors with internal motor protection. For system 1 terminals 132 & 133, 133 & 134 and 134 & 135 are linked. For system 2 terminals 232 & 233, 233 & 234 and 234 & 235 are linked.
12	Only fitted on systems with 3 or more fans.
13	Only fitted on systems with 4 fans.
14	Only fitted on systems with 5 fans.
15	Only fitted on systems with 6 fans.
16	Input switch disconnect (standard on CE units) or circuit breaker option replaces input terminal block.
17	Input switch disconnect & individual system circuit breaker option replaces input terminal block.
18	115 V control circuit requires a 115 V supply unless control circuit transformer -T2 & -F3 are fitted (standard on CE units).
19	Fitted on hydro kit option. On single pump -KP1, -QMMSP1 & -MP1 are fitted & wired as shown. On two pump hydro kits -KP2, -QMMSP2 & -MP2 are also fitted and wired as shown. Insulated wire 1E under -F1 is connected to -F1.
20	Only fitted on systems with single speed fans.
21	Only fitted on systems with two speed fans.
22	Optional compressor manual motors starters (standard on CE units).
23	See sheet 3 of connection diagram for power input options.
24	Alternate connections shown for different two speed motor types.
25	Only fitted on systems with a maximum of 4 fans.
26	220/230V units require a separate fuse for units w/4 or more fans per system.
27	Low ambient kit -FSC for fan -MF1 is only fitted on systems with less than 4 fans.
28	Only fitted on QTC3090T
29	Only fitted on QTC3085T, QTC3090T
30	Input dual point circuit breaker option replaces input terminal block.
31	Field installed on remote evaporator units.

Electrical notes and legend (cont'd)

32	Fitted on units with single phase motors only.
33	Fitted on units with low ambient option only.
34	Only fitted on units with an acoustic kit.
35	Only fitted on heat recovery units.
36	Only fitted on condensing units.
37	Omitted on condensing units.
38	Fitted on units with low ambient option using single phase motors (50hz only).
39	Fitted on units with high airflow fan option only.
40	Part of E-link kit option.
41	Part of temp. sensor kit (on condensing units only).
42	-
43	When the compressors motor protection (-bmp) includes phase reversal the extra -bmp terminals and three wires are fitted as shown in the compressor terminal box as detailed. Terminal L1, L2, L3 with wires colored red, black, white or alternatively just wires colored (black) (brown) (blue)
44	Omitted on units with EEV
45	EEV option
46	Only fitted on units with plate evaporator
47	Only fitted on unit with shell and tube evaporator
48	Fitted on units with second hot gas bypass (2-YHGSV).
49	Units with plate evaporators - flow switch -SFE is fitted as standard on units that have 7 or more fans, ref 035-21589-107, units with hydro kit or pipe extension kit. Units with shell and tube evaporator and hydro kit flow switch -SF is fitted. For all other units - the customer must fit a field mounted flow switch, wired to terminals 13 and 14 on -XTBC1.
50	Only fitted on units with plate evaporator that have 7 or more fans
51	Not fitted on units with plate evaporator that have 7 or more fans
52	On systems with 3 fan contactors wire number in () replaces wire number shown
53	Only fitted on systems with 4 or more fans
54	Only fitted on systems with 5 or more fans. This page is intentionally left blank.
55	Soft starter option details shown on sheet -120 of schematic replaces the standard drawing details for a unit with two compressor on system 1
56	Soft starter option details shown on sheet -120 of schematic replaces the standard drawing details for a unit with three compressor on system 1
57	Soft starter option details shown on sheet -120 of schematic replaces the standard drawing details for a unit with two compressor on system 2
58	Soft starter option details shown on sheet -120 of schematic replaces the standard drawing details for a unit with three compressor on system 2
59	On systems with 2 compressors wire number in () replaces wire number shown
60	Not fitted on units with soft starter option
61	Soft starter option details shown on sheet -121 of schematic replaces the standard drawing with 2-compressors on system 1
62	Soft starter option details shown on sheet -121 of schematic replaces the standard drawing with 2-compressors on system 2
63	VSD single pump option with fuses, details shown on sheet -122 of schematic replaces the standard drawing -105.
64	VSD dual pump option with fuses, details shown on sheet -122 of schematic replaces the standard drawing -105.
65	VSD single pump option with circuit breakers, details shown on sheet -122 of schematic replaces the standard drawing -105.
66	VSD dual pump option with circuit breakers, details shown on sheet -122 of schematic replaces the standard drawing -105.
67	VSD fan option details shown on drawing -123
	A System 1 with 3-fans - details shown on drawing - 123
	B System 1 with 4-fans - details shown on drawing - 123
	C System 1 with 5-fans - details shown on drawing - 123
	D System 1 with 6-fans - details shown on drawing - 123
	E System 2 with 3-fans - details shown on drawing - 123
	F System 2 with 4-fans - details shown on drawing - 123
	G System 3 with 5-fans - details shown on drawing - 123
68	Auxiliary switches for manual motor protectors
69	Auxiliary switches for manual motor protectors for 3 compressor units only
70	LON module option for smart chiller enclosure
71	Smart chiller assembly

Wiring diagrams elementary wiring diagrams



1/2.1 What these numbers mean. Example:

1 = follow wire no.1

2. = is the drawing number on the bottom center of each page.

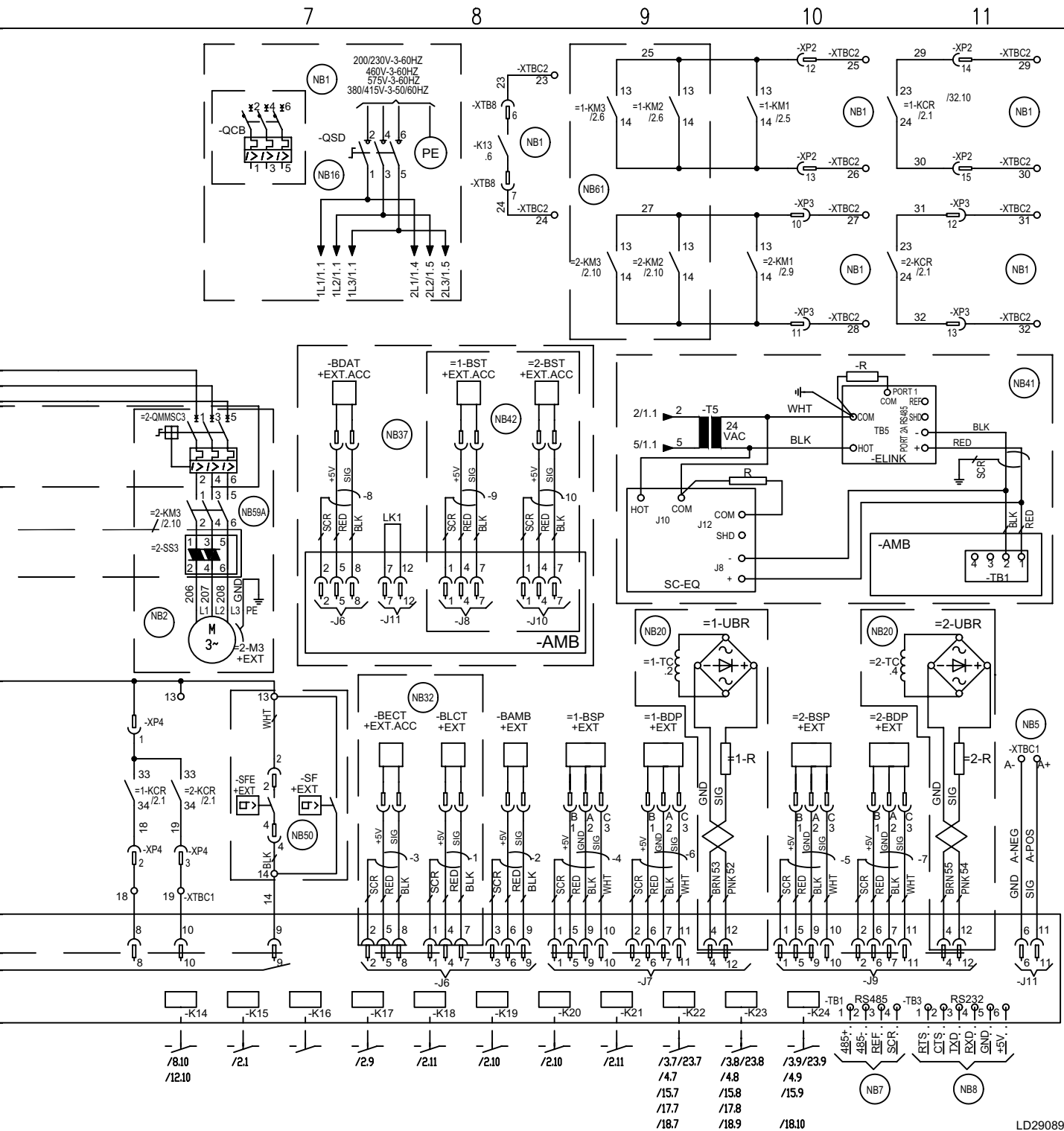
.1 = is the locator number across the top of the page.

At the top of the pages the numbers 1 to 11 go from left to right. Find drawing number 2 and in column number 1 across the top of the page, locate wire number 1.

DWG. 1

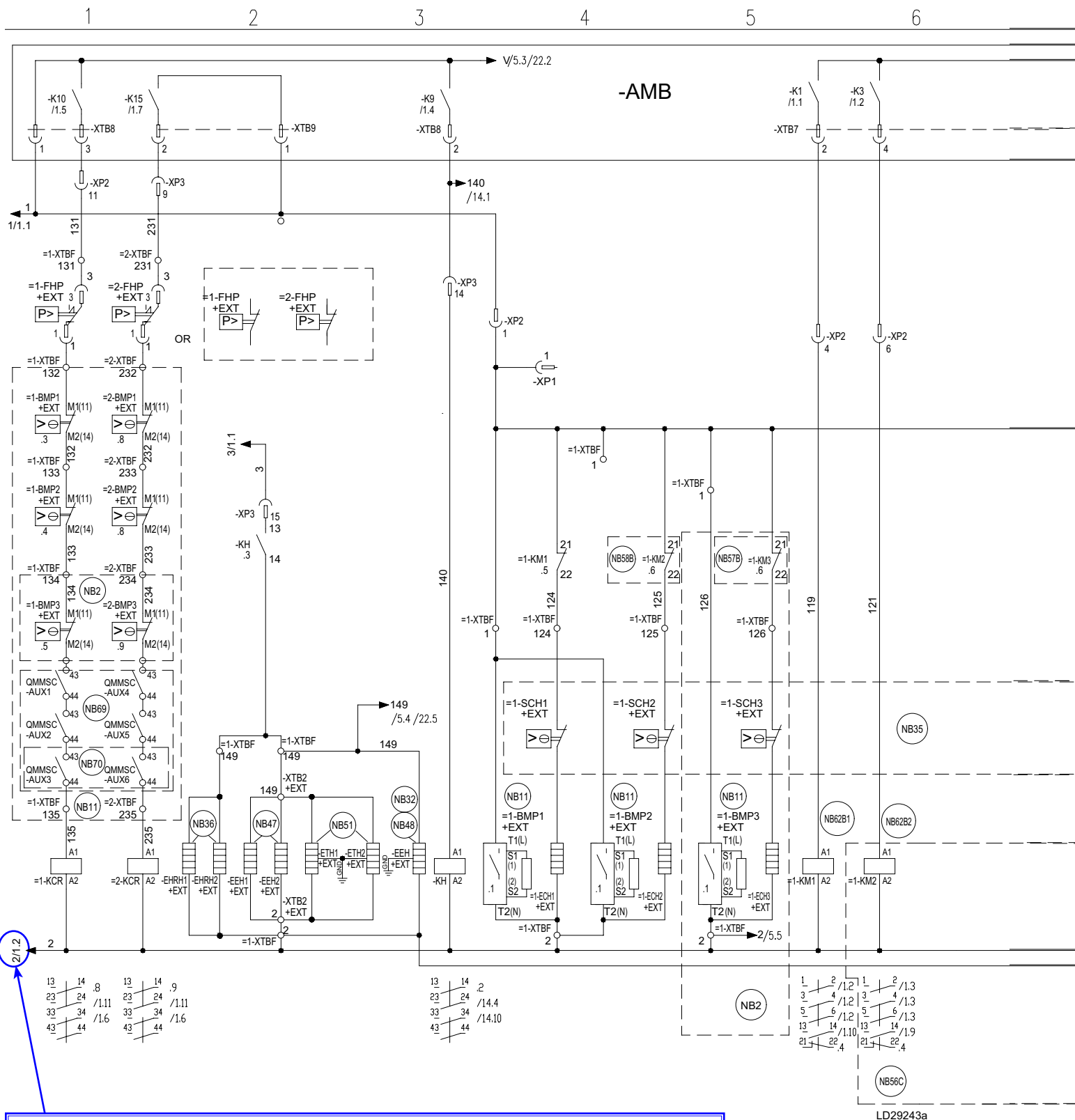
Figure 15: Elementary Wiring Diagram

035-21583-101
REV. R



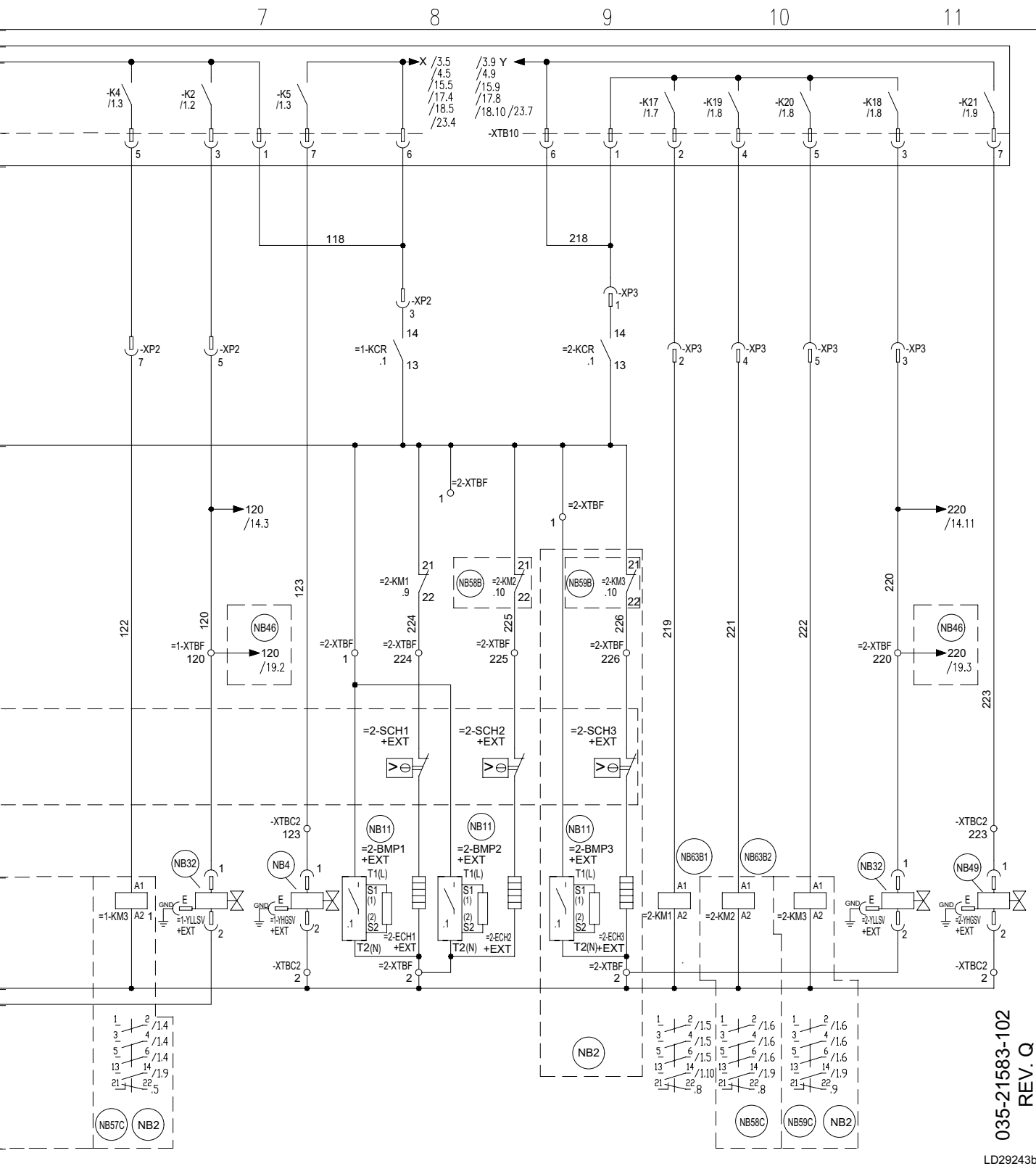
DWG. 1

Figure 16 - Elementary Wiring Diagram (Cont'd)

**2/1.2 What these numbers mean. Example:****2** = follow wire no.2**1.** = is the drawing number on the bottom center of each page.**.2** = is the locator number across the top of the page.

At the top of the pages the numbers 1 to 11 go from left to right. Find drawing number 1 and in column number 2 across the top of the page, locate wire number 2.

DWG. 2**Figure 16: Elementary Wiring Diagram**



5

035-21583-102
REV. Q
LD29243b

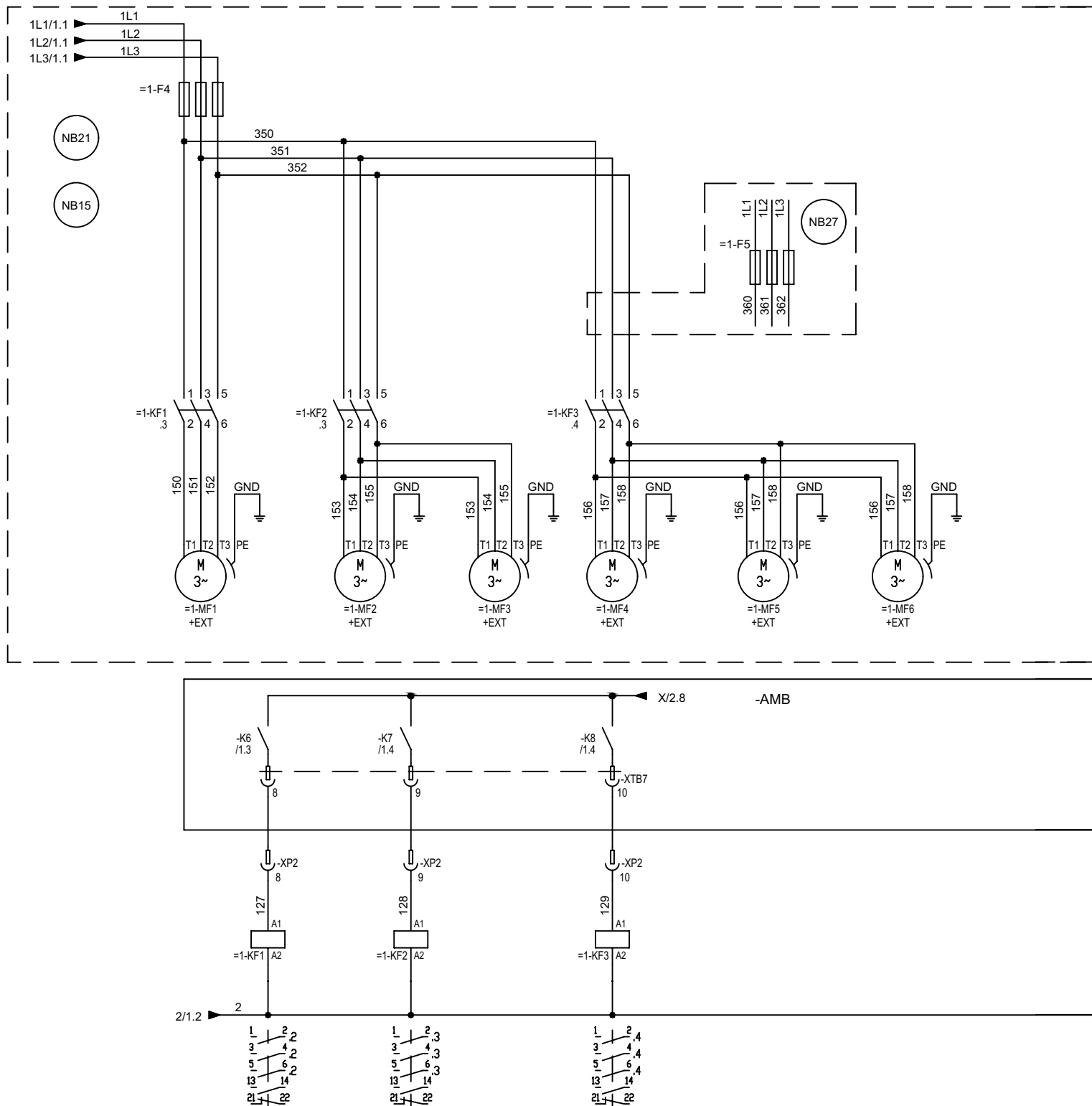
DWG. 2

Figure 17 - Elementary Wiring Diagram (Cont'd)

Fan wiring

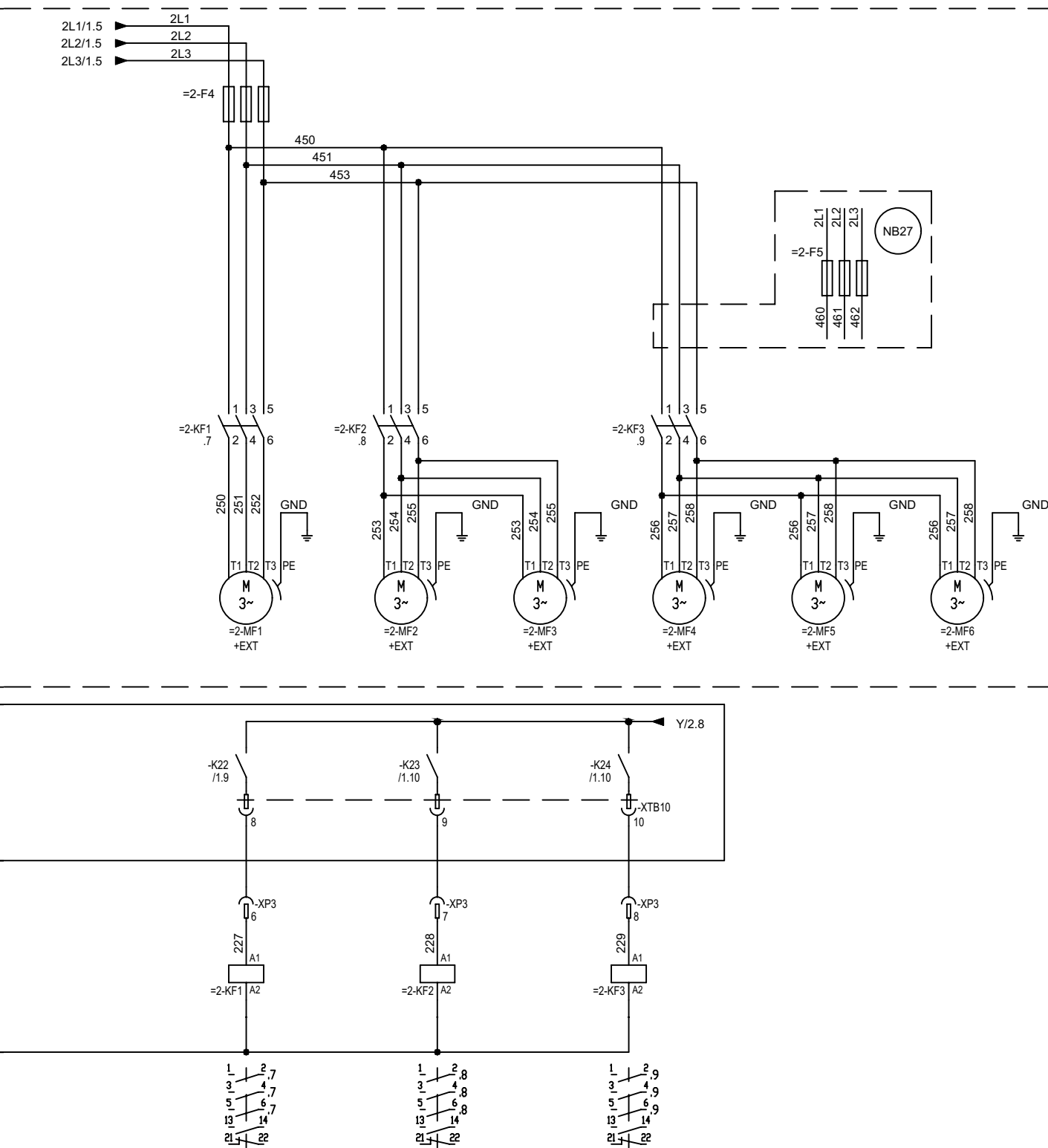
035-21583-125

Rev C



LD27947a

Figure 17: Fan Wiring, Standard Air Flow

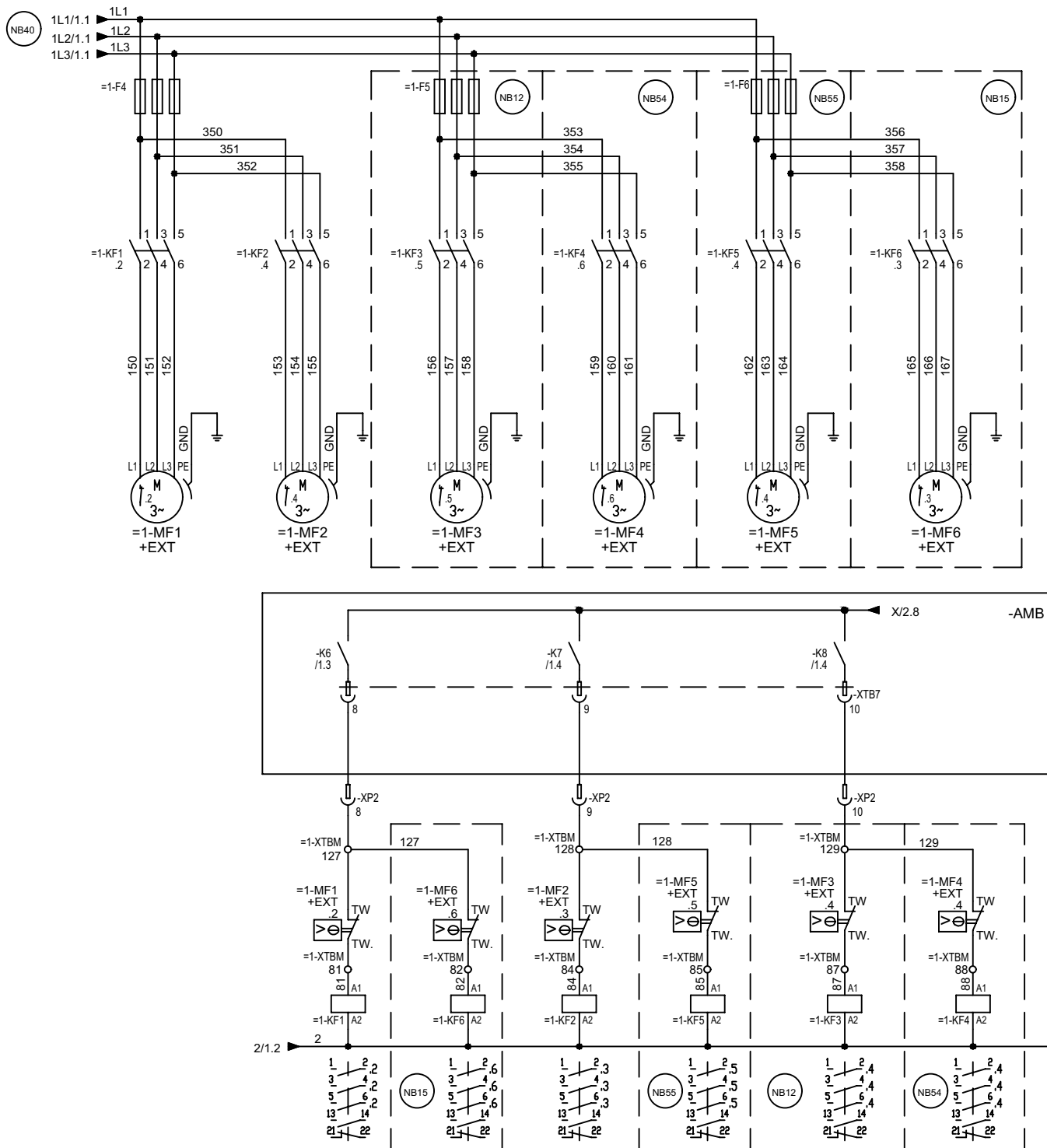


LD27947b

Figure 18 - Fan Wiring, Standard Air Flow (CONT'D)

Fan wiring

035-21583-118
Rev H



LD27948a

Figure 18: Fan Wiring, High Air Flow

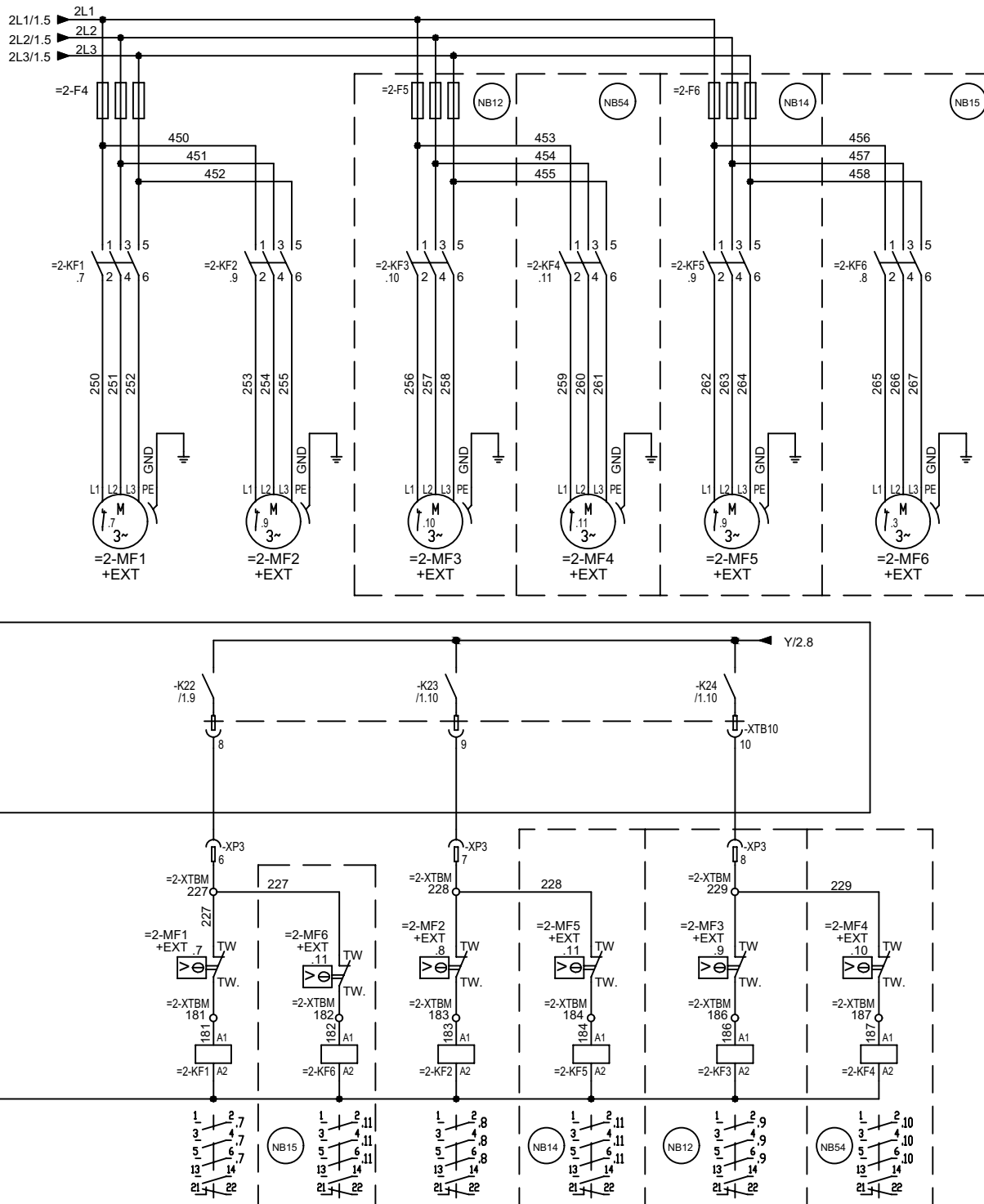
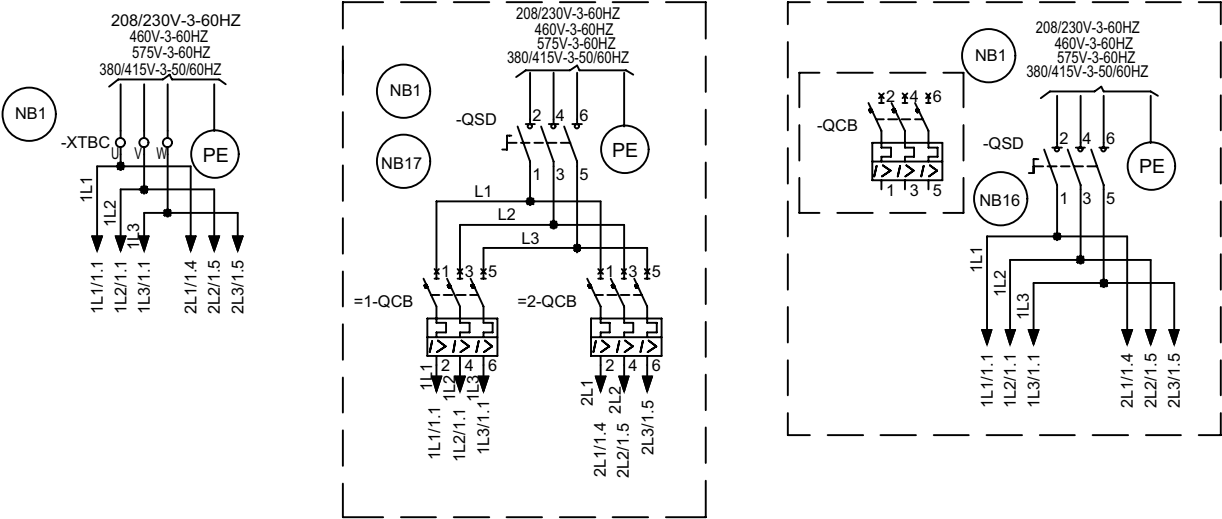


Figure 19 - Fan Wiring, High Air Flow (CONT'D)

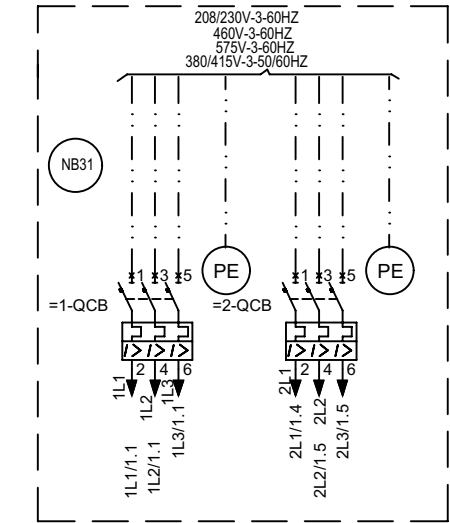
LD27948b

Single and dual point wiring options

035-21583-116
Rev E



SINGLE POINT WIRING OPTIONS



DUAL POINT WIRING OPTION

LD27949

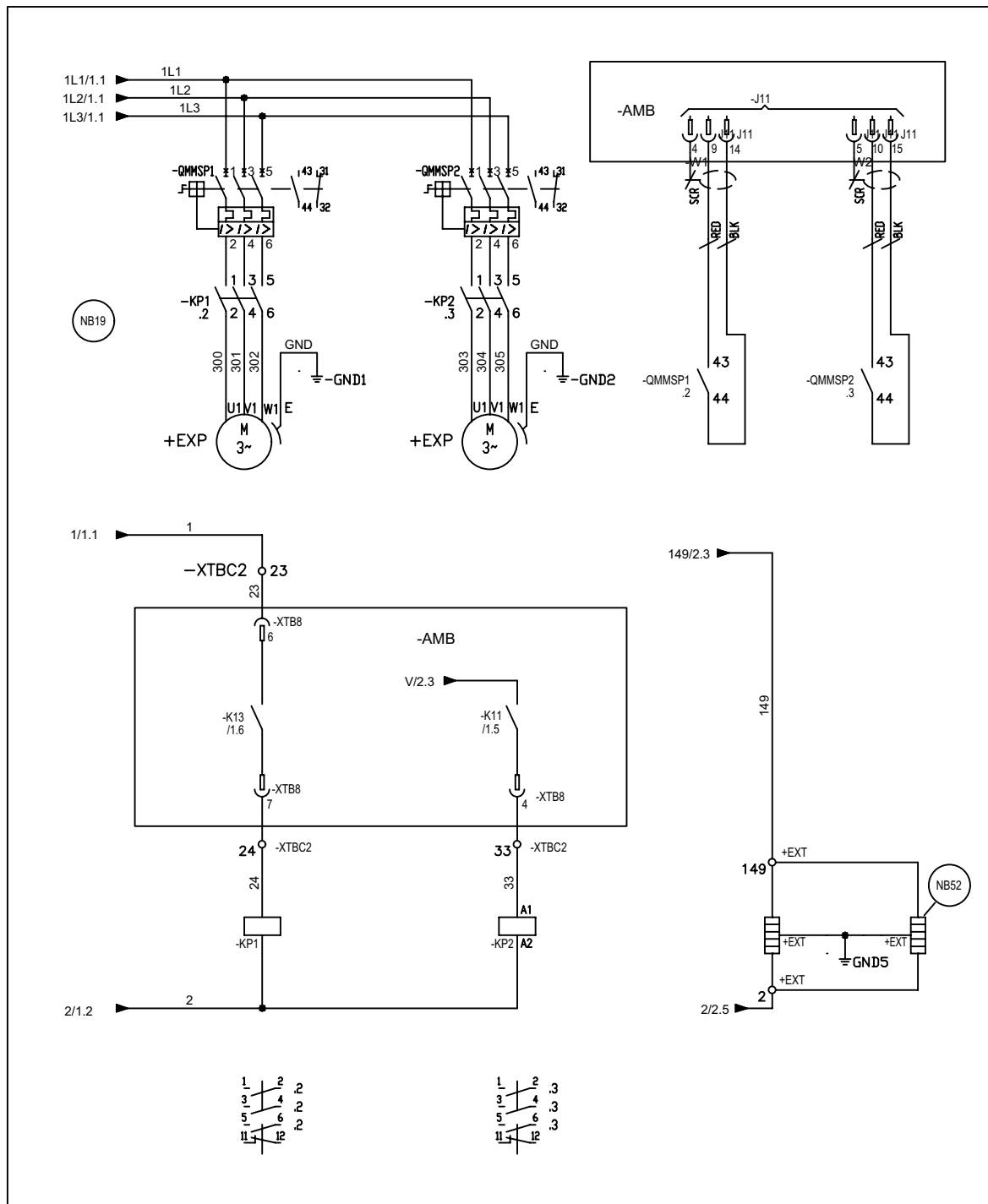
DWG. 16

Figure 19: Single and Dual Point Wiring Options

Pump wiring

035-21583-105

Rev G



LD27950a

5

DWG. 5

Figure 20: Pump Wiring

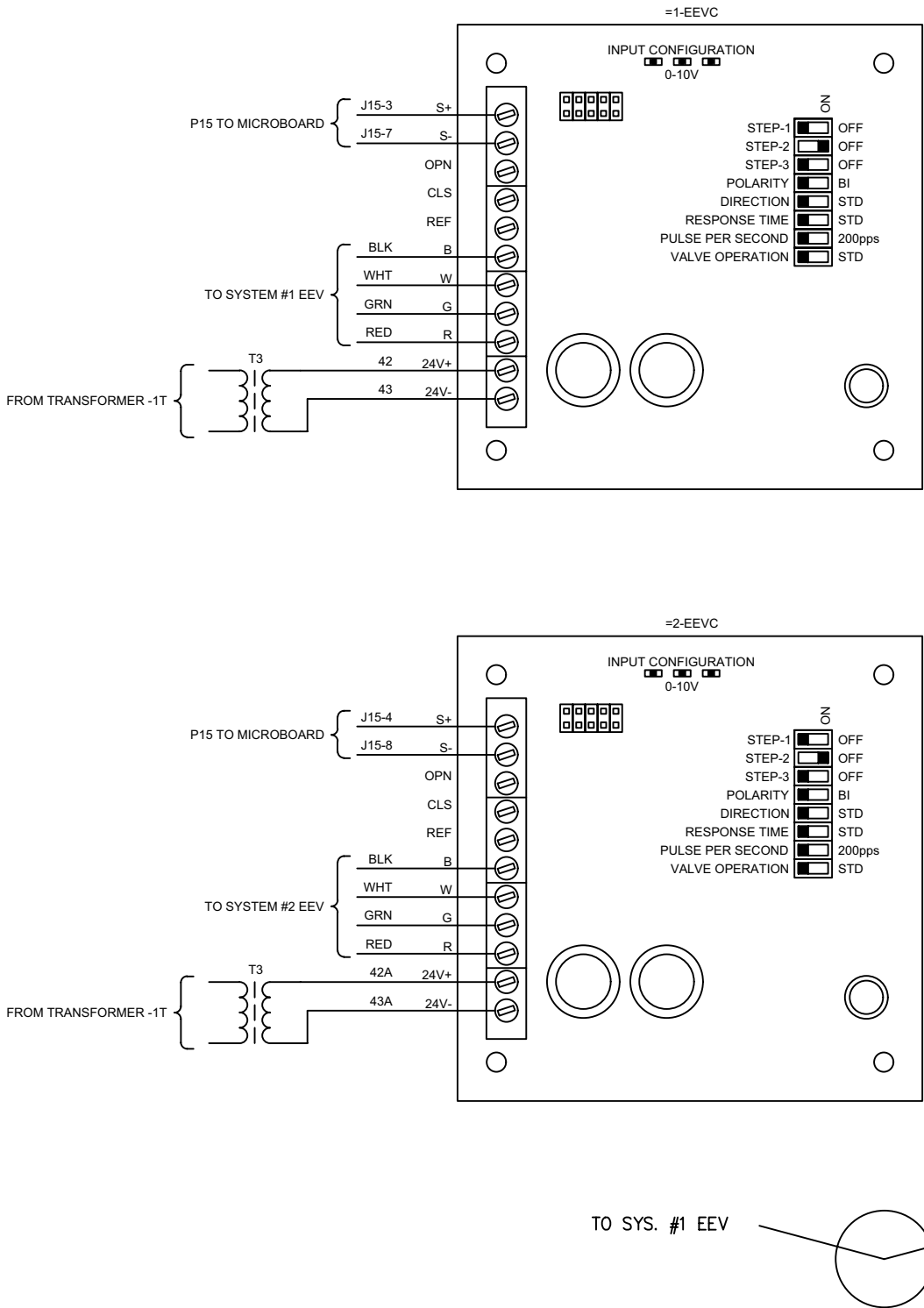
DWG. 5



FIGURE 21 - Pump Wiring (Cont'd)

Connection - EEV option

035-21499-105
Rev C



5

Figure 21: EEV Controller Elementary Diagram

LD27951

035-21589-106 REV N



88

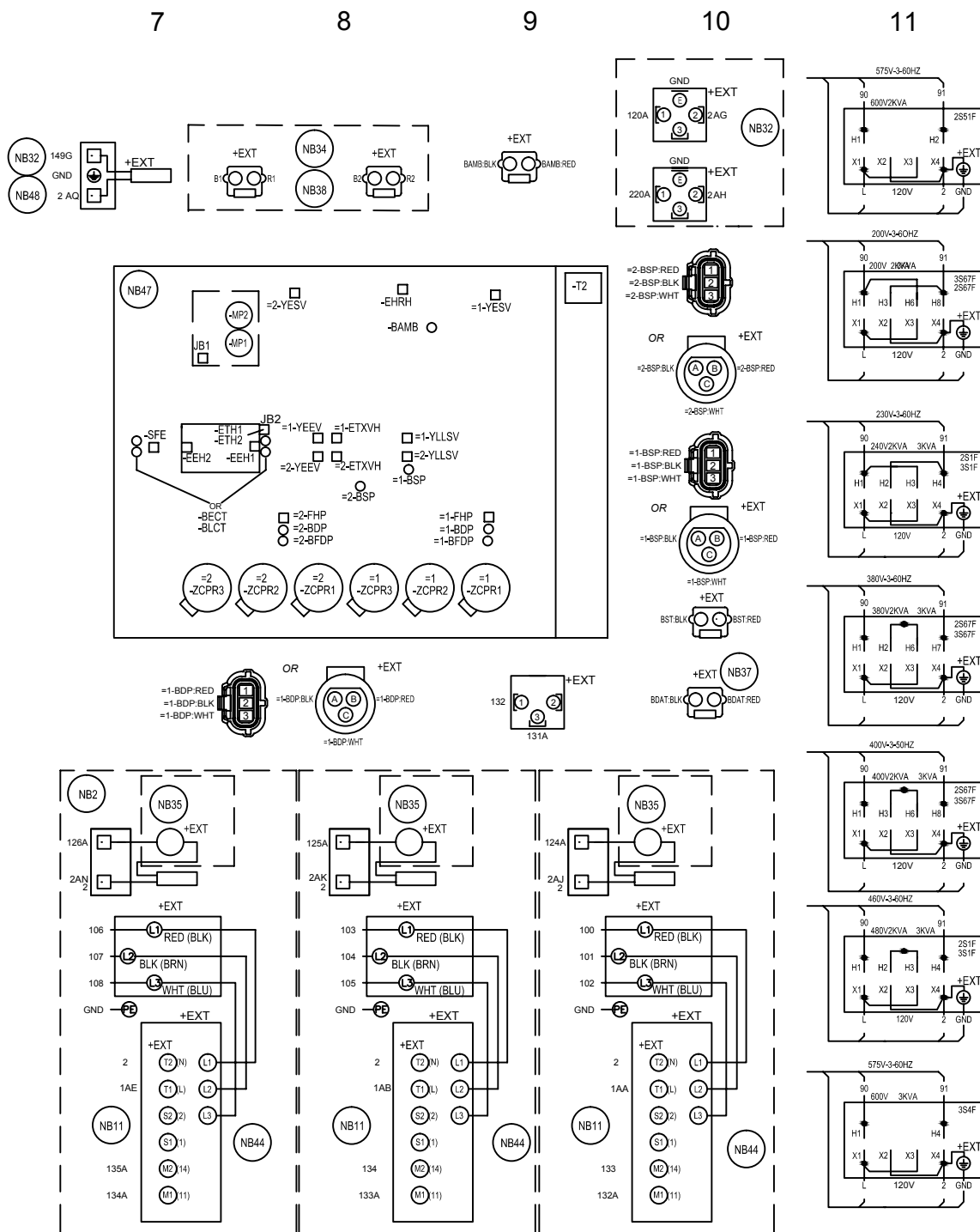
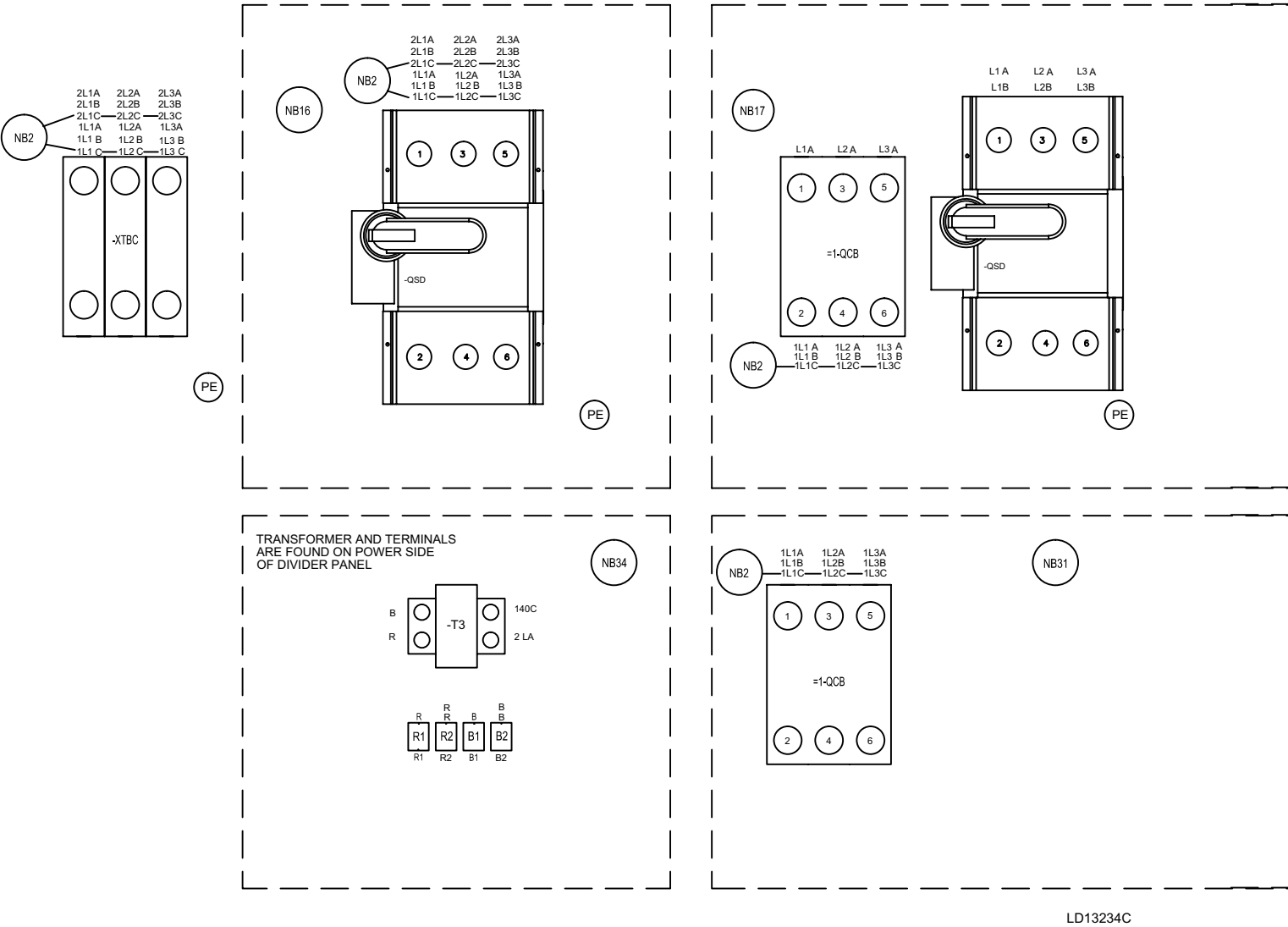


Figure 23 - Compressor Wiring (Cont'd)

LD21210

Power options connection diagram

035-21589-103 REV C



LD13234C

Figure 23: Power Options Connection Diagram

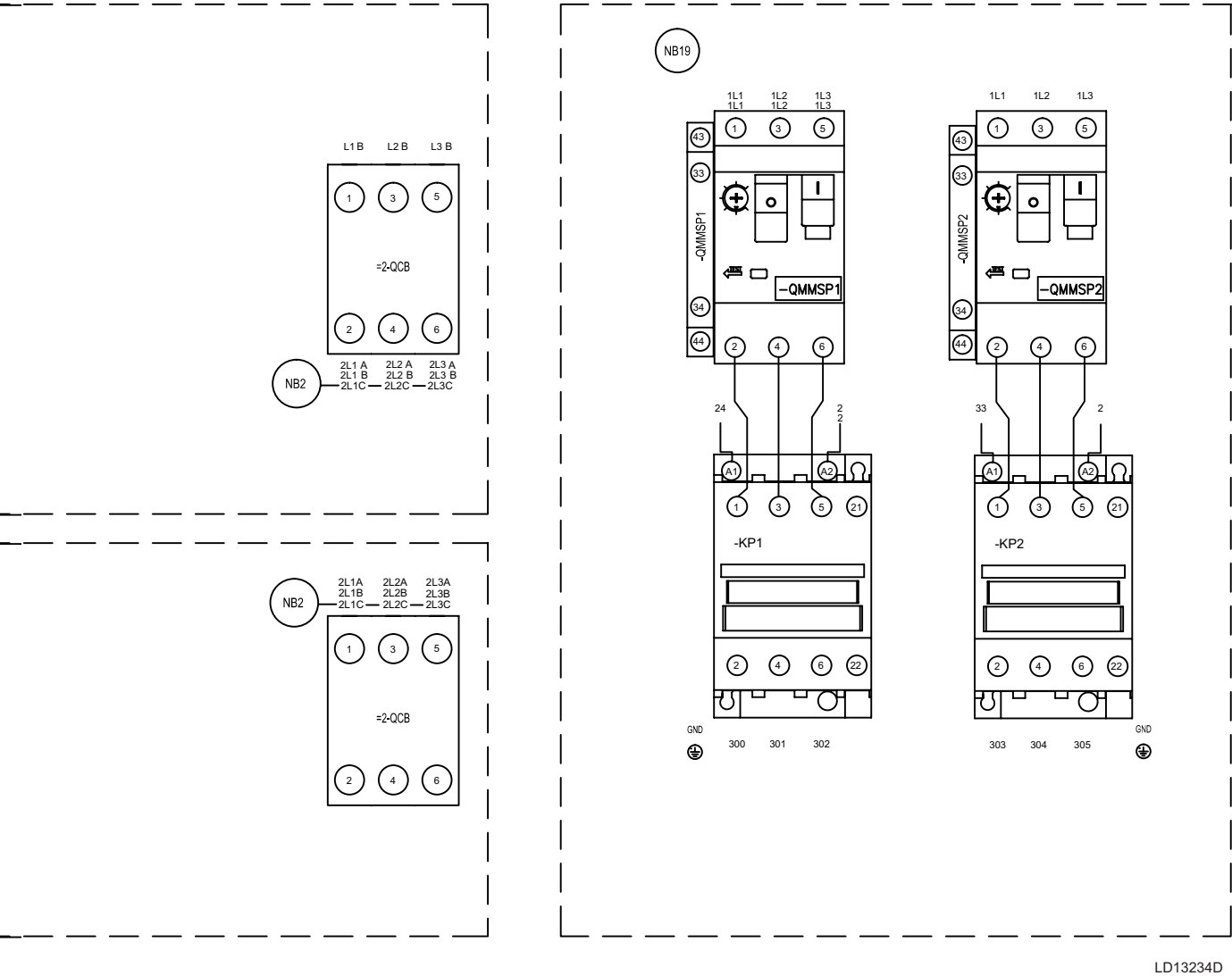


Figure 24 - Power Options Connection Diagram (CONT'D)

035-21589-101 REV H



Quantech



LD16755

Figure 25: Micro Panel Connections



035-21589-102
REV. O

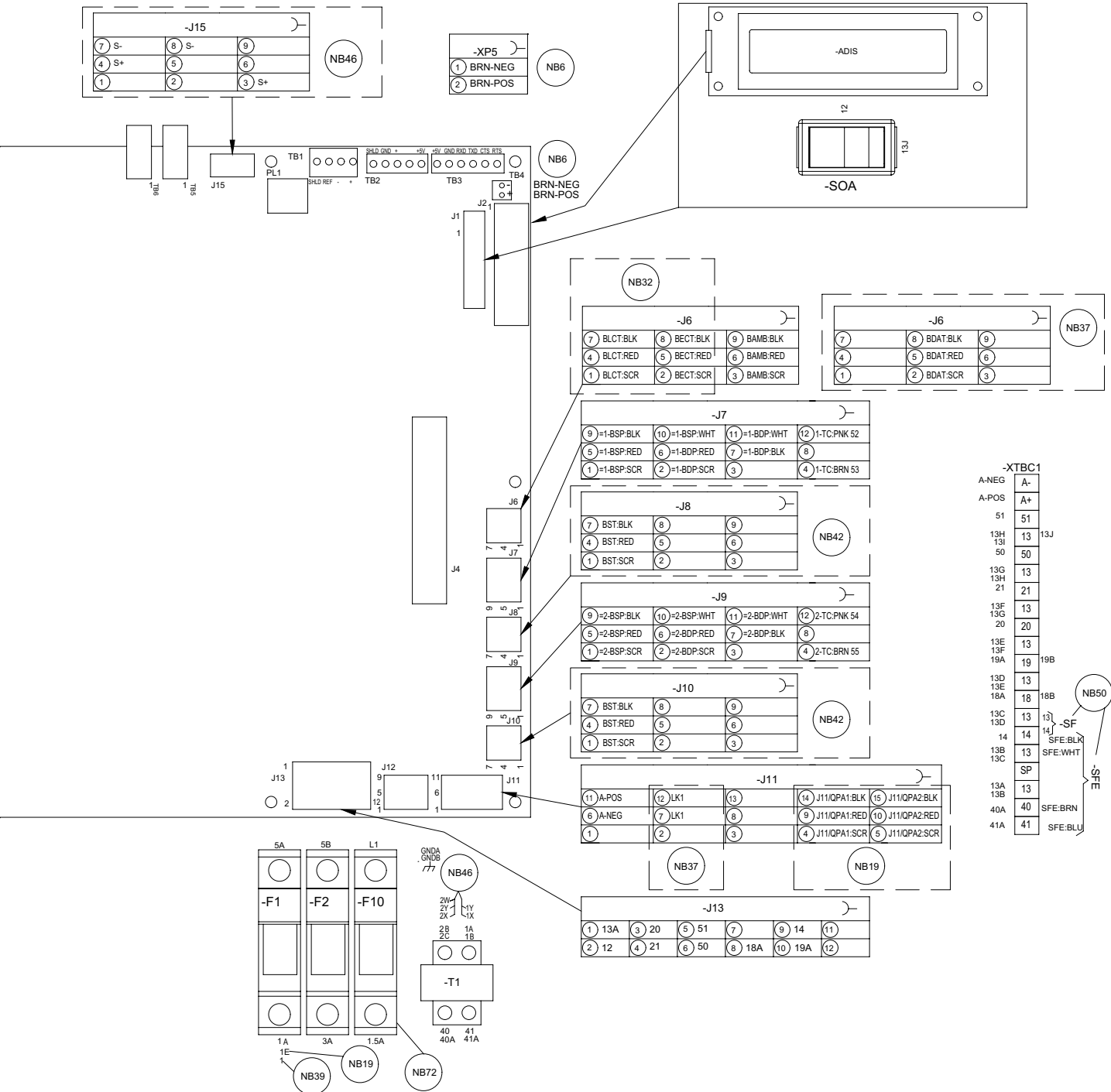
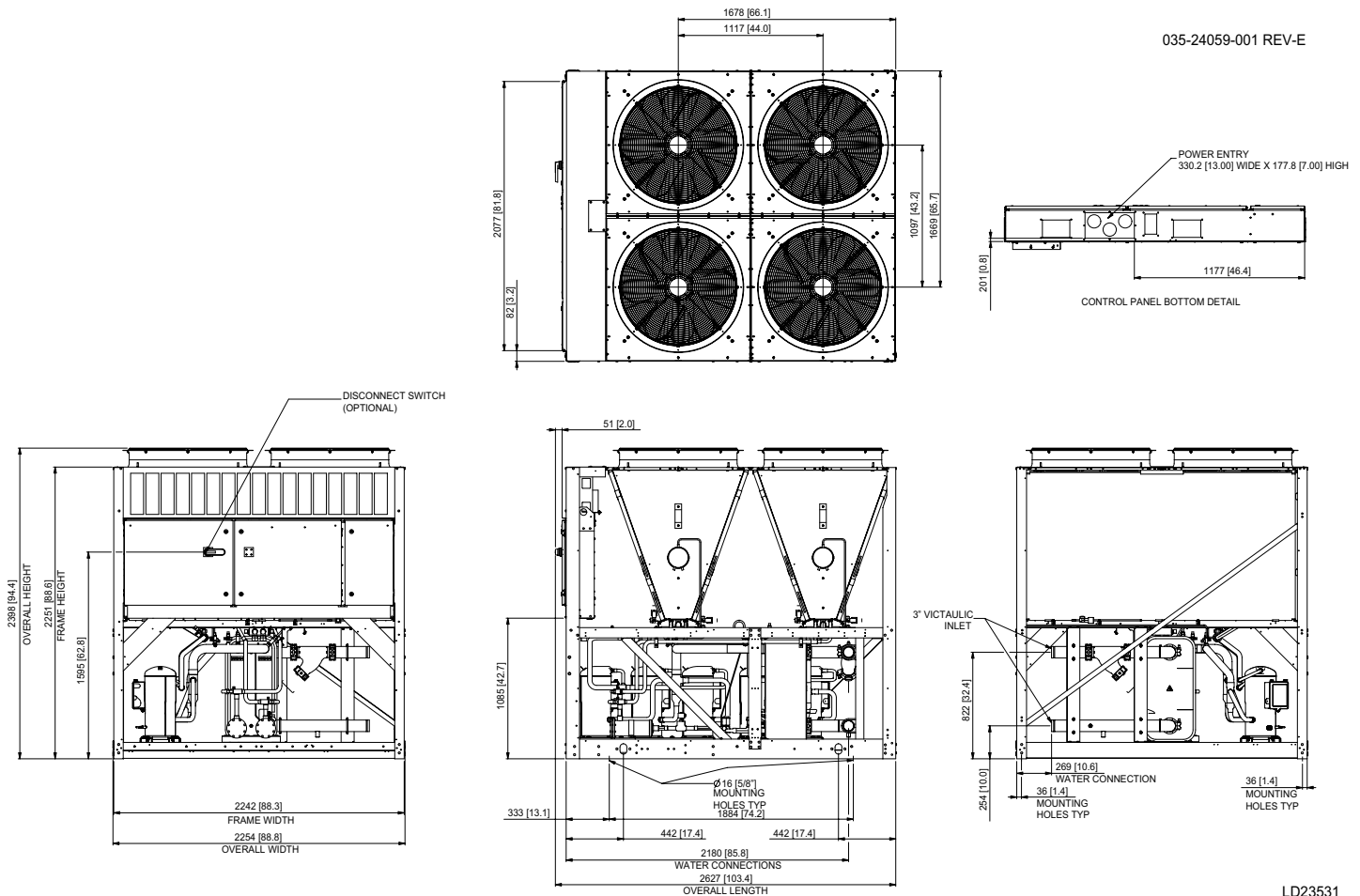


Figure 26 - Micro Panel Connections (CONT'D)

Four fan units**Dimensions – 3040THE, 3050THE, 3055THE, 3060THE, 3079THE**

LD23531

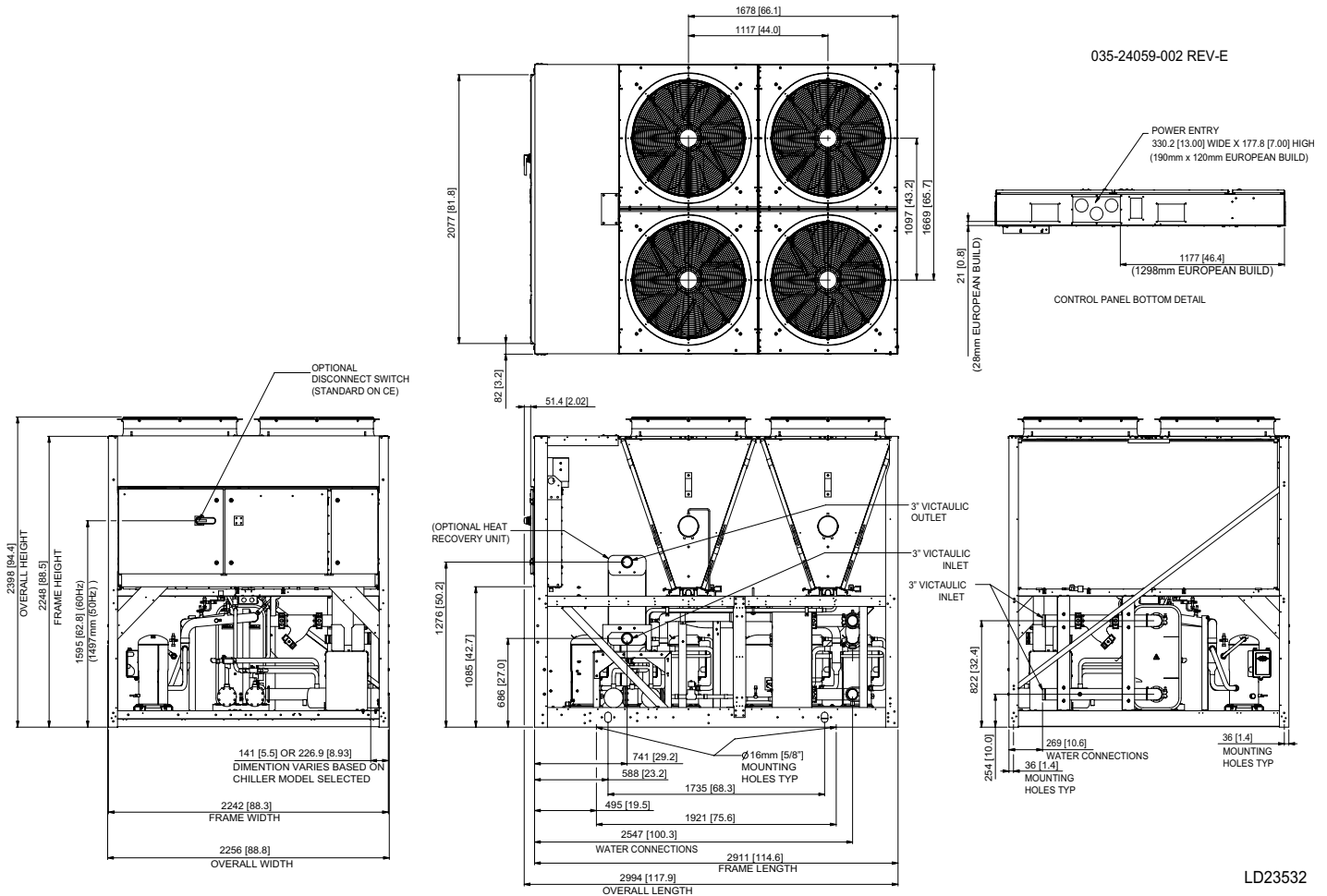
NOTE:

Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 26: Four Fan Units Dimensions – 3040THE, 3050THE, 3055THE, 3060THE, 3079THE

Four fan units

Dimensions – 3070TSE, 3075TSE, 3085TSE



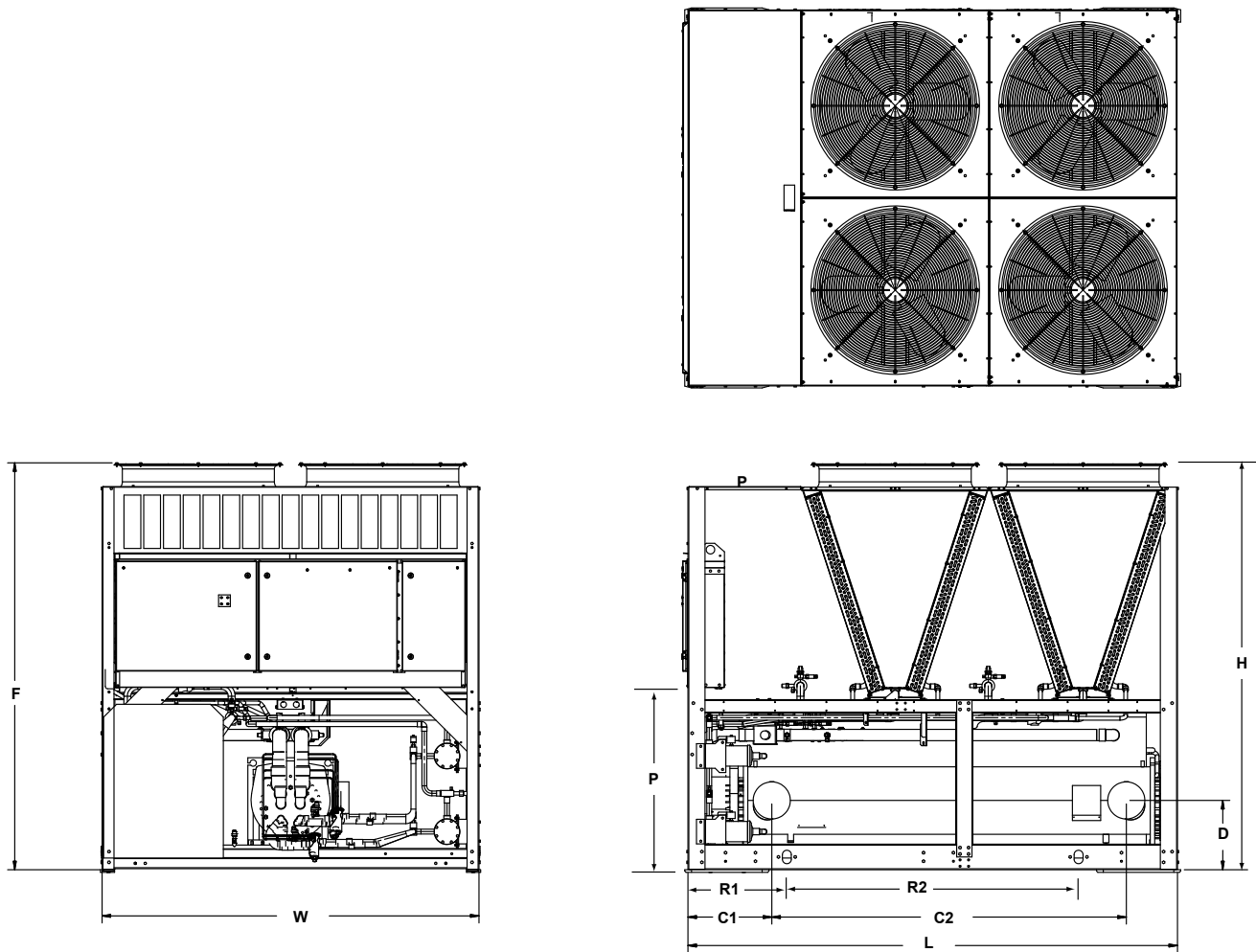
NOTE:

Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 27: Four Fan Units Dimensions – 3070TSE, 3075TSE, 3085TSE

Four fan units

Dimensions – 3070TZJ



QTC3 Model	L (length)	W (width)	H (height)	F	P	D	C1	C2	R2	R1
3070TSE	116.0	88.3	94.2	88.5	42.8	13.4	19.0	84.5	68.3	23.0

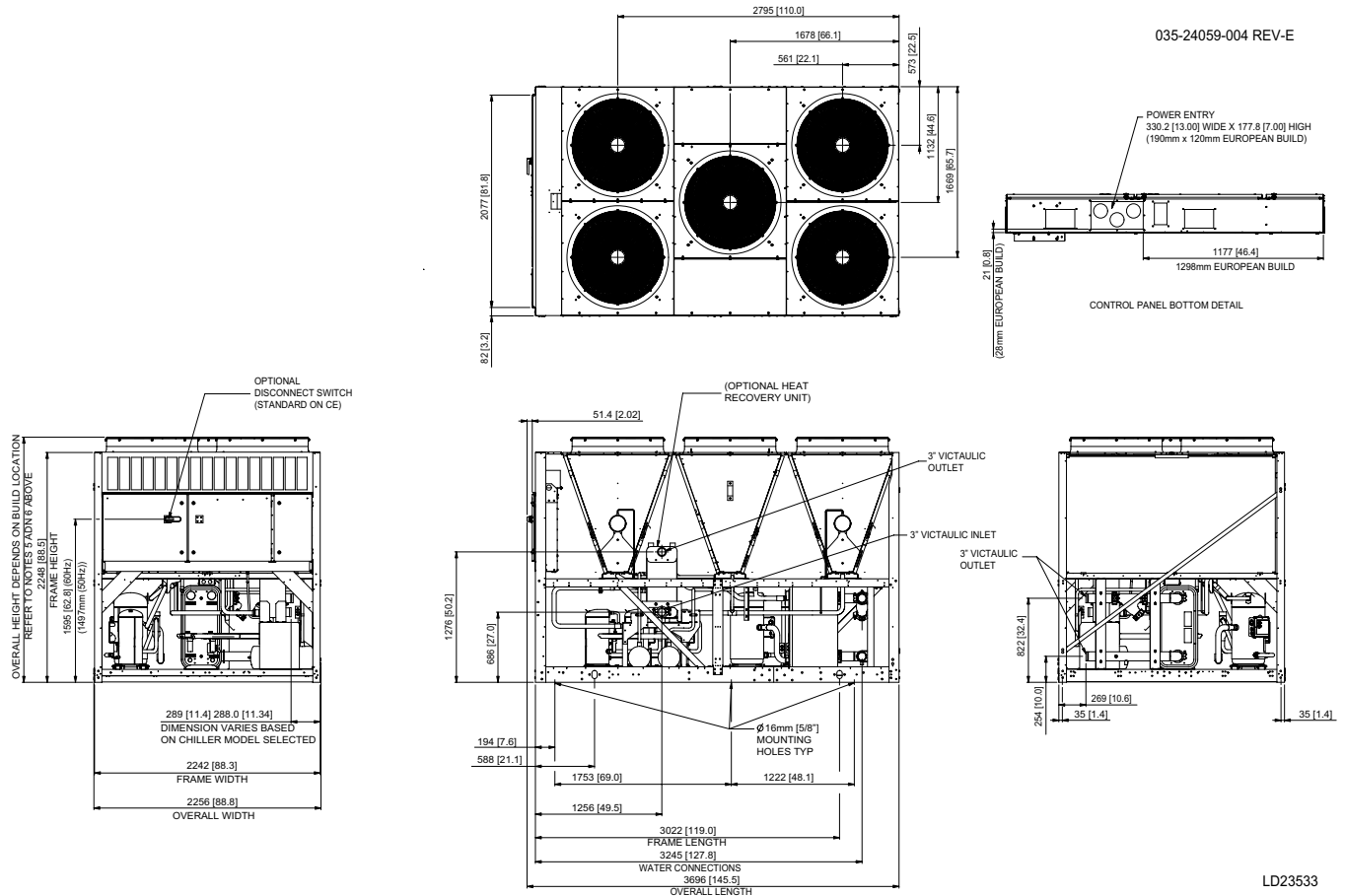
NOTE:

Placement on a level surface of free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6"; rear to wall – 6"; control panel to end wall – 4'0"; top – no obstructions allowed; distance between adjacent units – 10'. No more than one adjacent wall may be higher than the unit.

Figure 28: Four Fan Units Dimensions – 3070TZJ

Five fan units

Dimensions – 3090THE

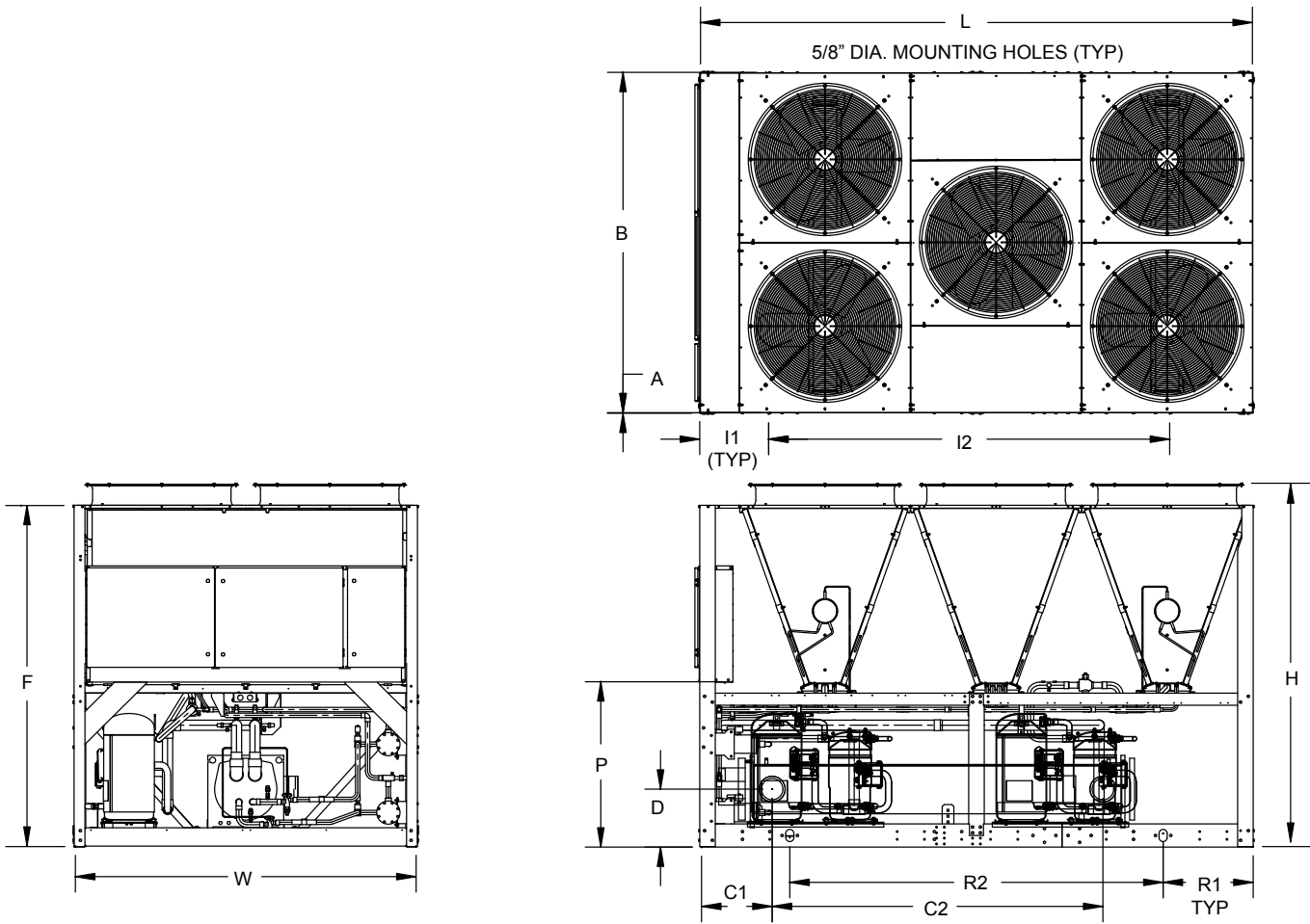


NOTE:

Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 29: Five Fan Units Dimensions – 3090THE

Five fan units
Dimensions – 3095TZJ



Five Fan Units

QTC3 Model	L (length)	W (width)	H (height)	F	P	D	C1	C2	R2	R1
3090THE	143.5	88.3	94.2	88.5	42.8	15	18.6	85.5	96	23.0

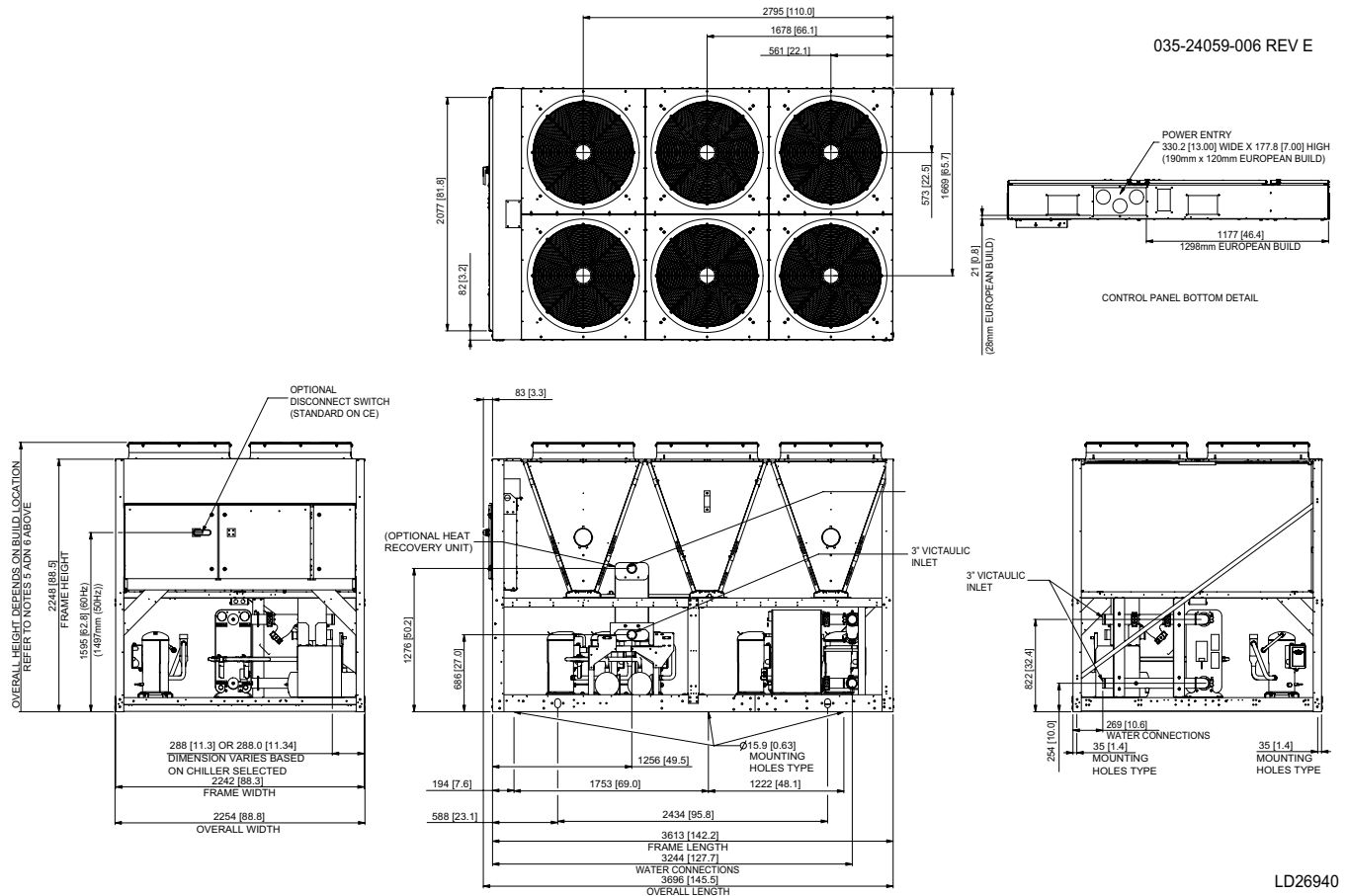
NOTE:

Placement on a level surface of free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6'; rear to wall – 6'; control panel to end wall – 4'0"; top – no obstructions allowed; distance between adjacent units – 10'. No more than one adjacent wall may be higher than the unit.

Figure 30: Five Fan Units Dimensions – 3095TZJ

Six fan units

Dimensions – 3095TSE, 3100THE, 3110TSE



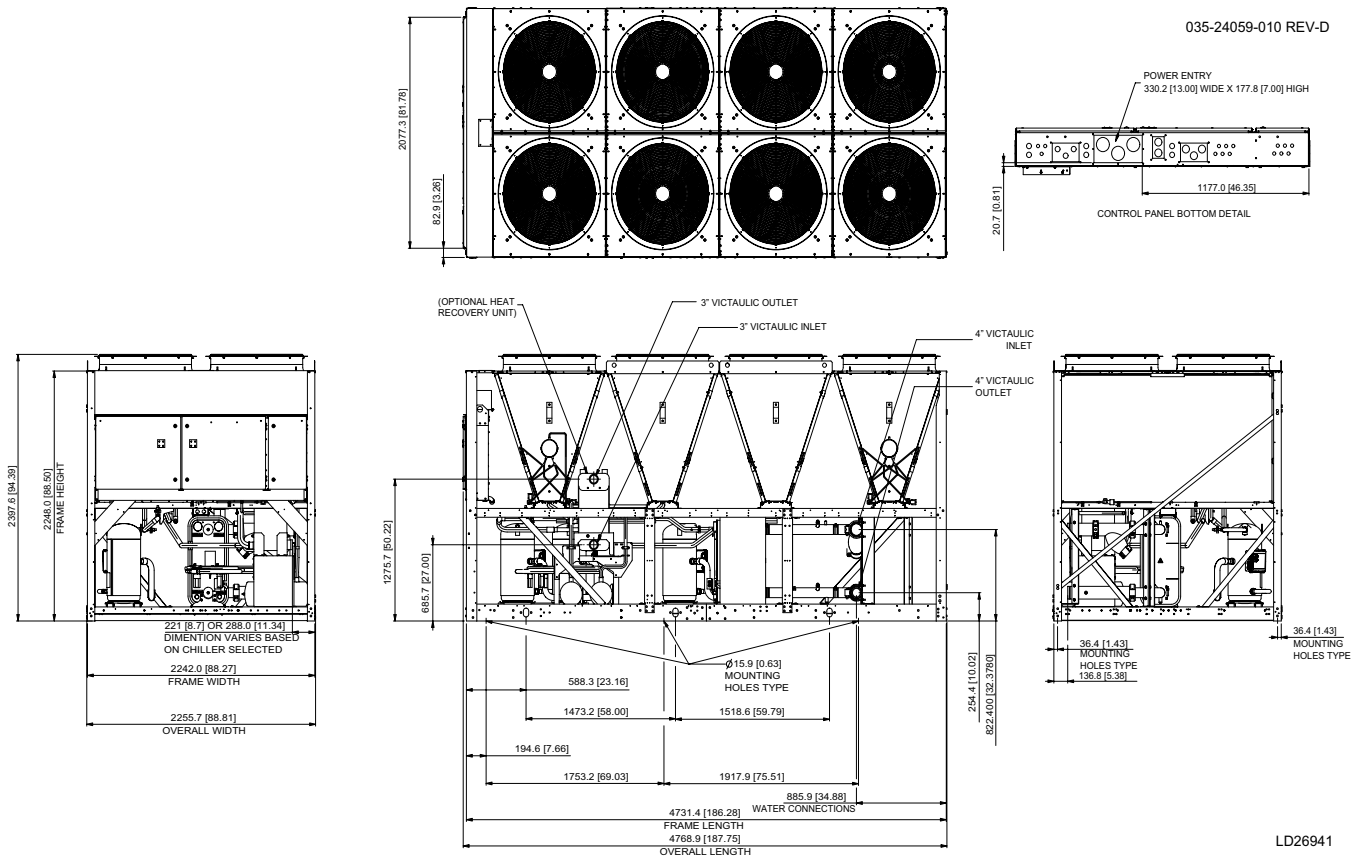
NOTE:

Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 31: Six Fan Units Dimensions – 3095TSE, 3100THE, 3110TSE

Eight fan units

Dimensions – 3120THE, 3125TSE, 3129THE, 3140TSE

**NOTE:**

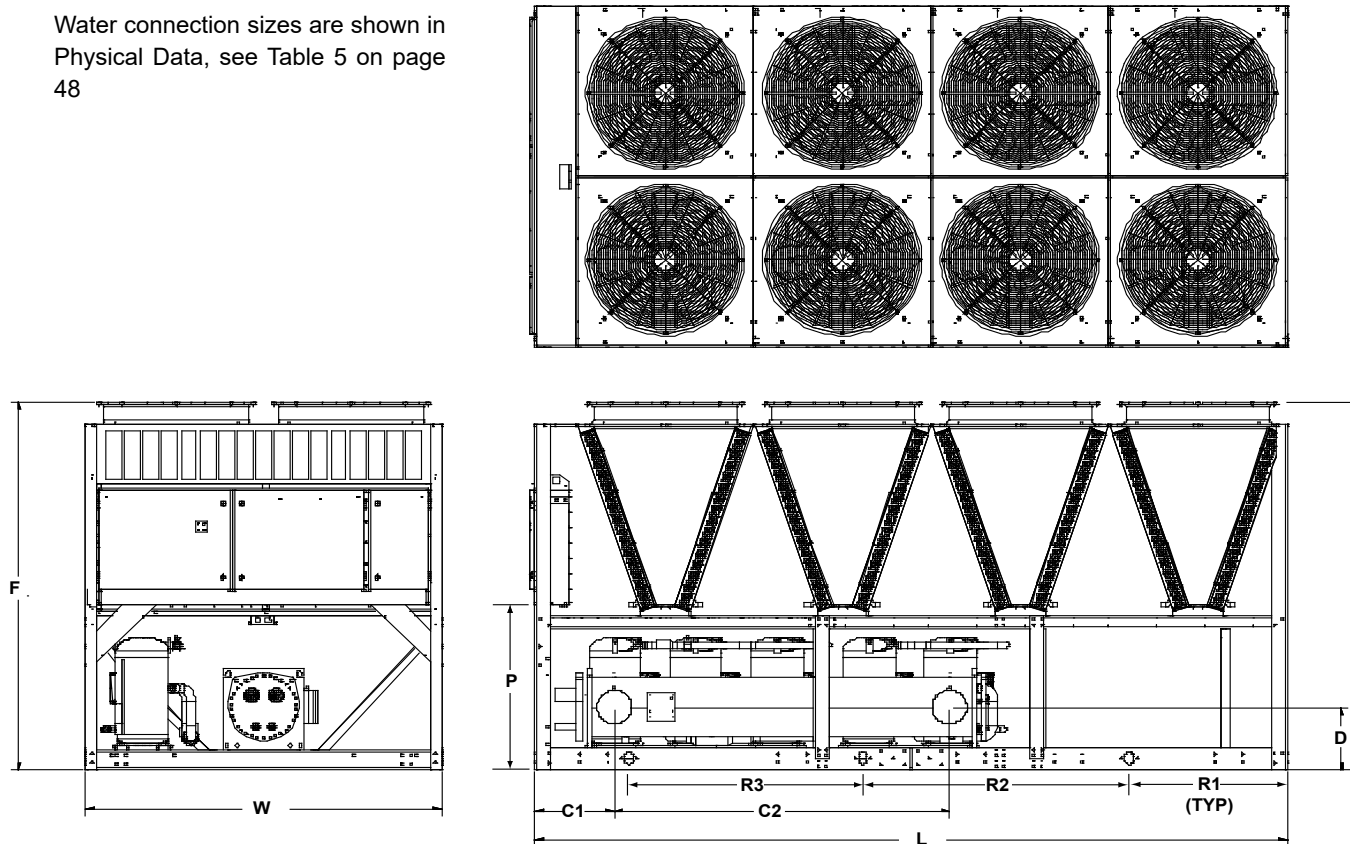
Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 32: Eight Fan Units Dimensions – 3120THE, 3125TSE, 3129THE, 3140TSE

Eight fan units

3140TZJ

Water connection sizes are shown in Physical Data, see Table 5 on page 48



8Fan_assyax

QTC3 Model	L (length)	W (width)	H (height)	F	P	D	C1	C2	R3	R2	R1
3140TSE	187.5	88.3	94.2	88.5	42.8	17.3	22	102	58	66	39

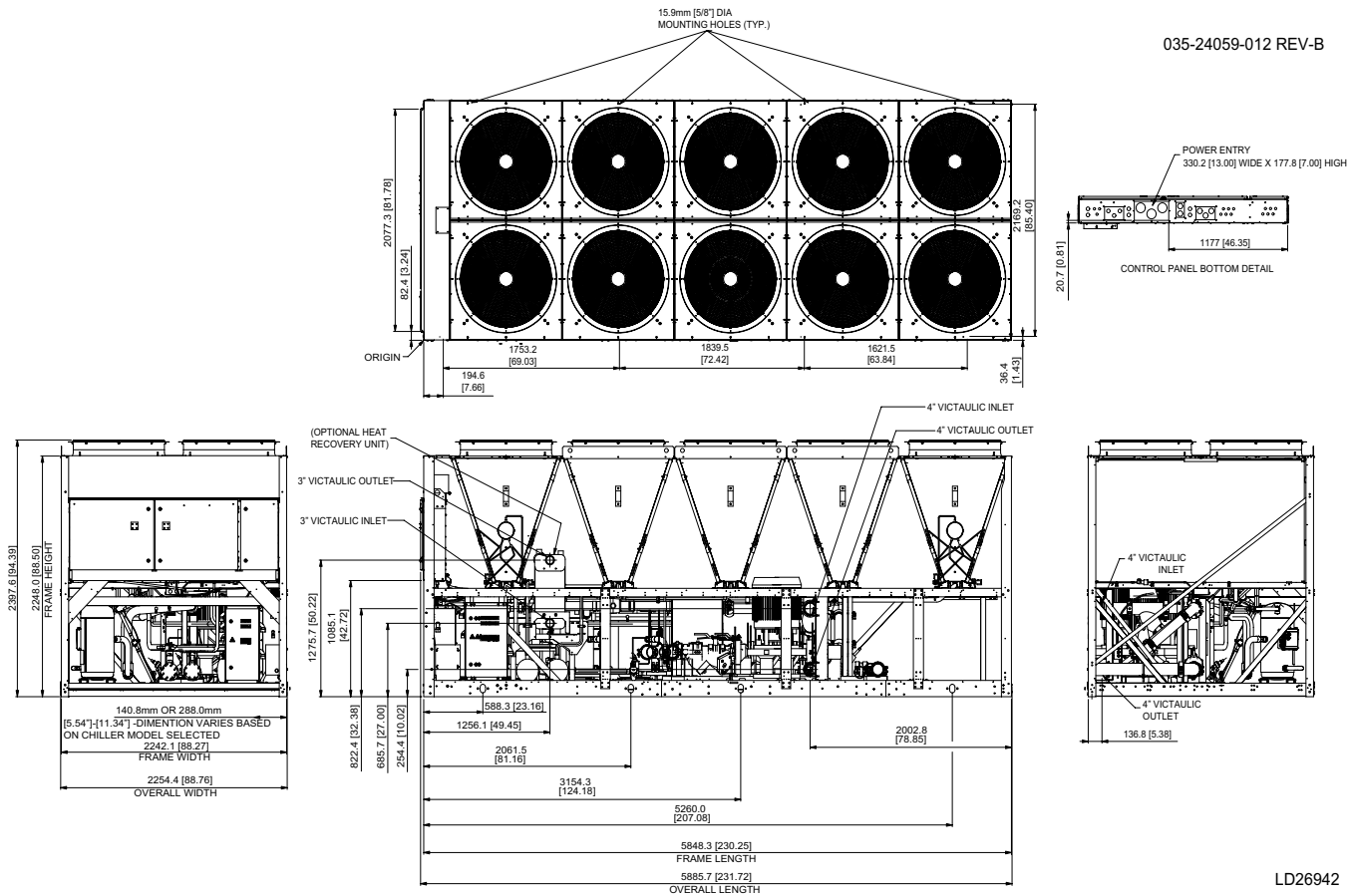
NOTE:

Placement on a level surface of free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6'; rear to wall – 6'; control panel to end wall – 4'0"; top – no obstructions allowed; distance between adjacent units – 10'. No more than one adjacent wall may be higher than the unit.

Figure 33: Eight Fan Units Dimensions – 3140TZJ

Ten fan units

Dimensions – 3160TSE, 3150THE, 3170THE

**NOTE:**

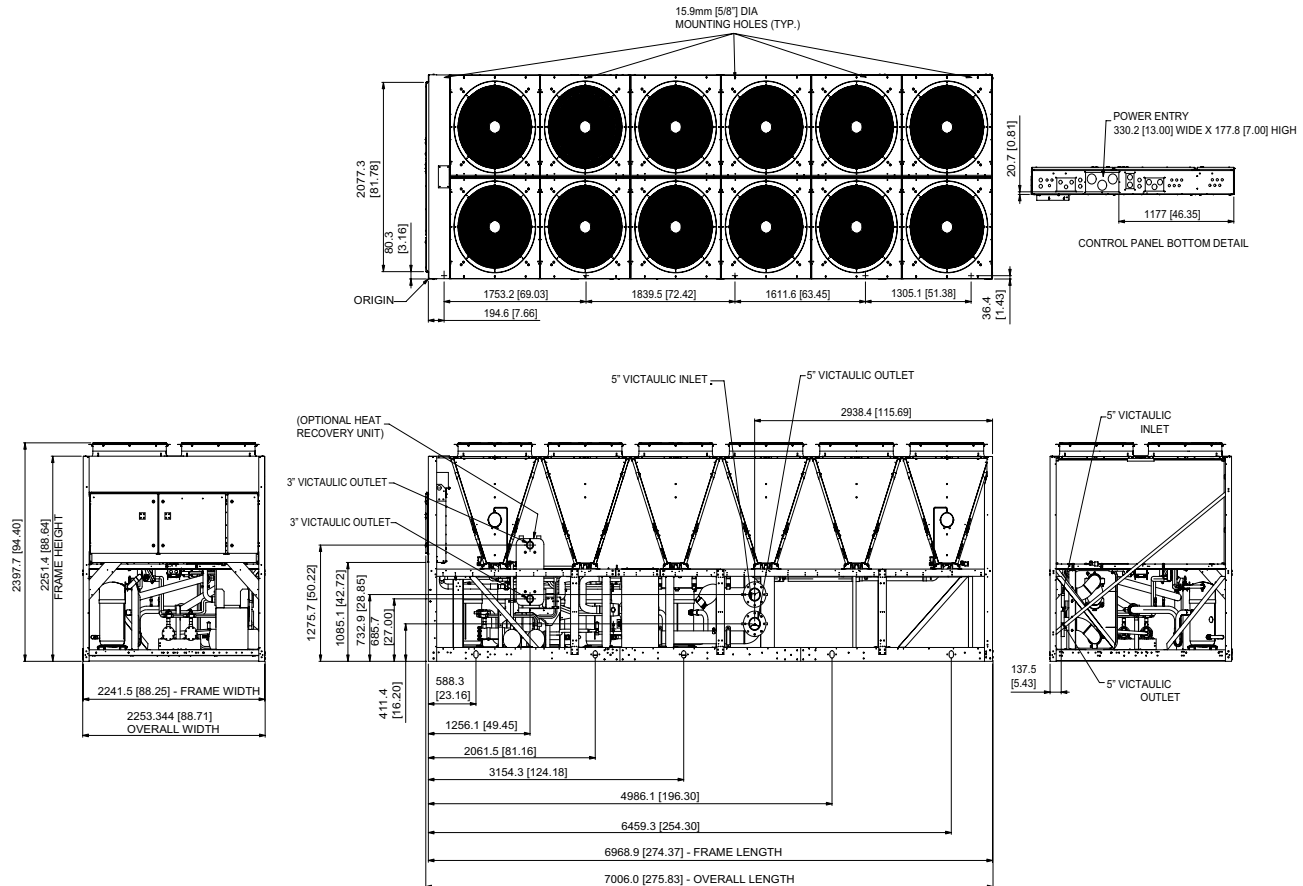
Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 34: Ten Fan Units Dimensions – 3160TSE, 3150THE, 3170THE

Twelve fan units

Dimensions – 3205THE, 3225THE

035-24059-017



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Note:

Placement on a level surface free of obstructions (including snow, for winter operation) or air circulation ensures rated performance, reliable operation, and ease of maintenance. Site restrictions may compromise minimum clearances indicated below, resulting in unpredictable airflow patterns and possible diminished performance. Johnson Control's unit controls will optimize operation without nuisance high-pressure safety cutouts; however, the system designer must consider potential performance degradation. Access to the unit control center assumes the unit is no higher than on spring isolators. Recommended minimum clearances: Side to wall – 6 ft; rear to wall – 6 ft; control panel to end wall – 4 ft; top – no obstructions allowed; distance between adjacent units – 10 ft. No more than one adjacent wall may be higher than the unit.

Figure 35: Twelve Fan Units Dimensions - 3205THE, 3225THE

Weight distribution and isolator mounting positions

General

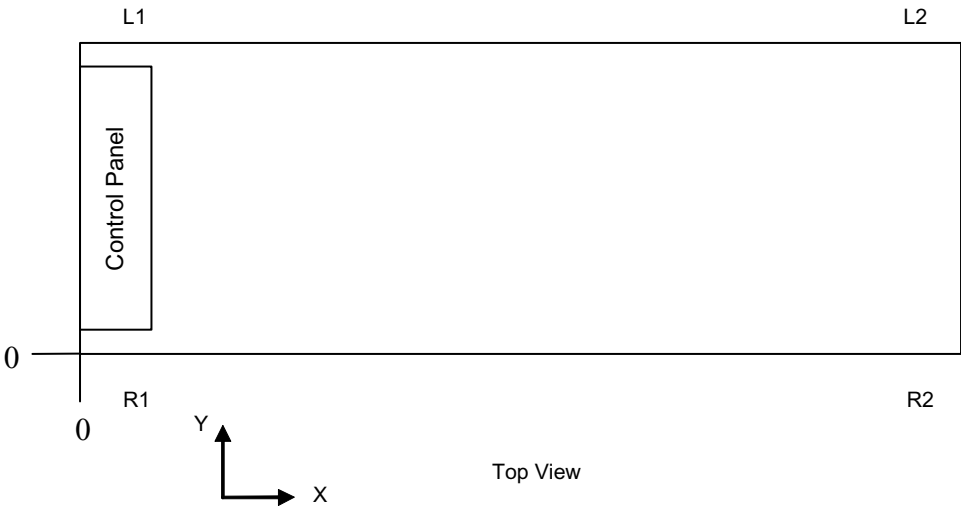
Weights of specific chiller models vary significantly as options are added. As a result, total weights, weights at individual isolator positions, and actual isolator selection at each position cannot be published due to the vast number of possible combinations. This information will be available when the specific chiller/ option selection is made from the local Quantech sales office. Be aware, weights will change with each option along with possible isolator changes. Weights and isolators may need to be recalculated when the option selections are changed.

Whenever the isolator option is ordered, the isolators will be shipped loose with the chiller. Packed with the isolators and also in the control panel information packet is a drawing and table specifically for each chiller, based on the option selection. The drawing and table will be similar to the two samples shown below and on the following page. The drawing will show the isolator locations along with the weight in pounds and kilograms at the specific location, isolator position, and location measurements for each isolator.

Sample isolator location drawings

See *Figure 36* below for sample printouts supplied in the isolator package and in the chiller panel literature packets.

Unit Shipping Weight (Display on unit data nameplate)	kg	lb
	2032	4480

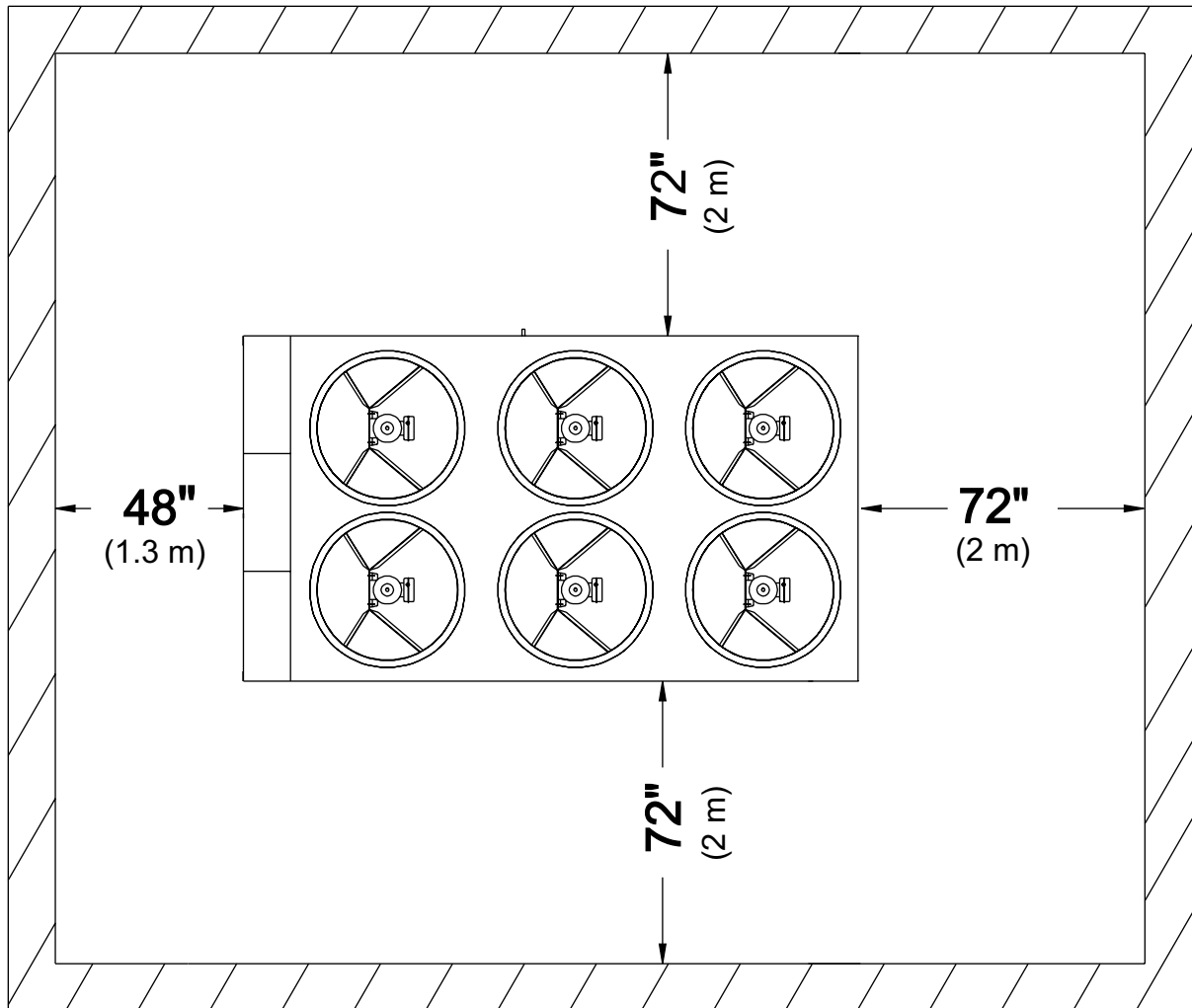


Location	X Distance in. (mm)	Y Distance in. (mm)	Vendor Number	Operating Weight lb (kg)
R1	19.5 (495.3)	1.36 (34.5)	ND-D / Yellow	1092 (495.3)
L1	19.5 (495.3)	86.86 (2206.2)	ND-D / Yellow	1406 (637.8)
R2	96.1 (2440.9)	1.36 (34.5)	ND-D / Yellow	1015 (460.4)
L2	96.1 (2440.9)	86.86 (2206.2)	ND-D / Yellow	1304 (591.5)

Figure 36: Sample Printout Supplied in the Isolator Package and in the Chiller Panel Literature Packet

Clearances

See *Figure 37* below for minimum clearances for all QTC3 units.

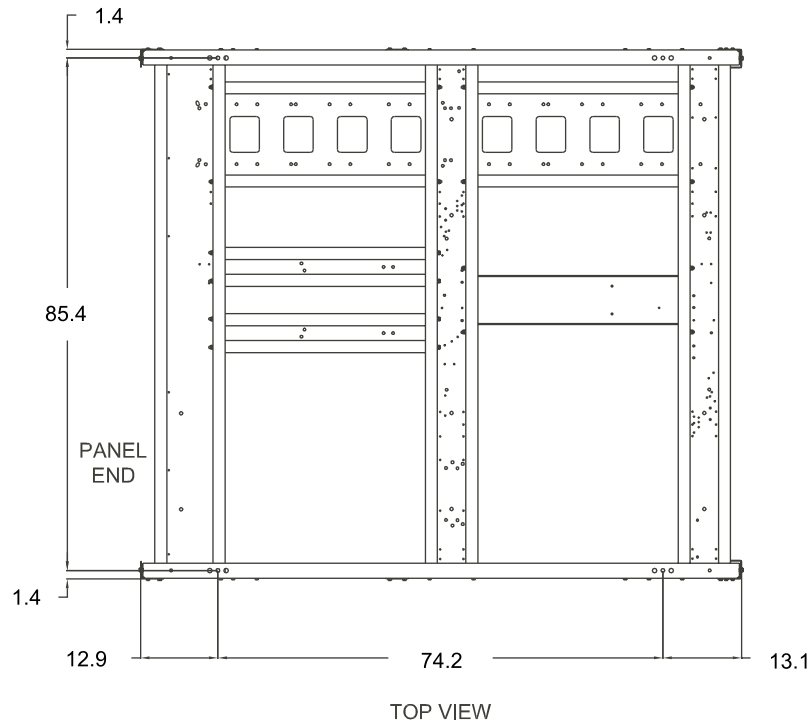


NOTES:

1. No obstructions allowed above the unit.
2. Only one adjacent wall may be higher than the unit.
3. Adjacent units should be 10 ft (3 m) apart.

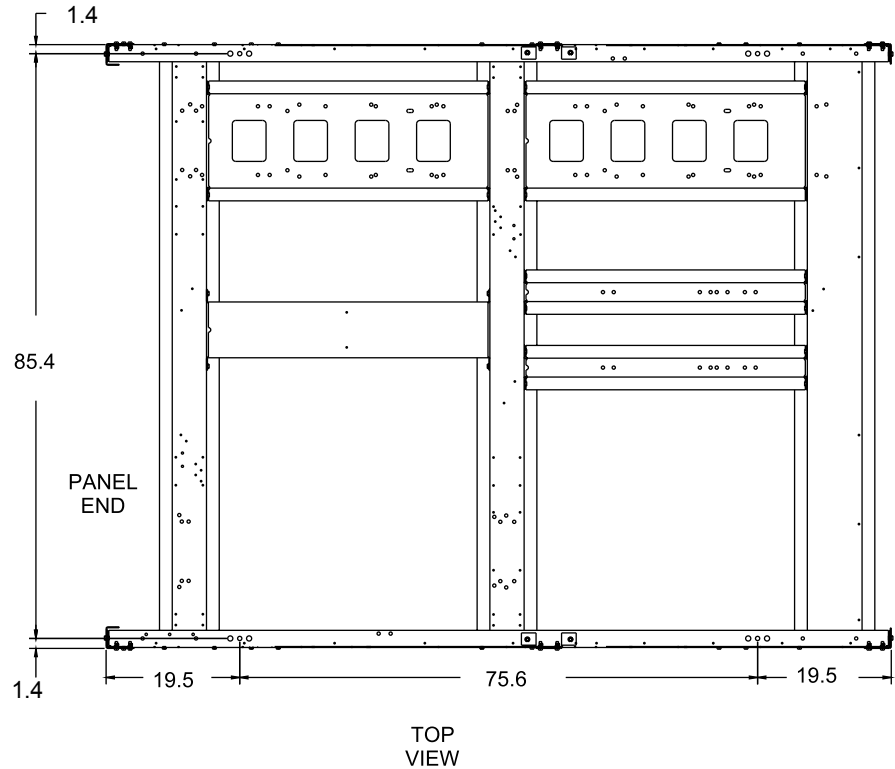
Figure 37: Unit Clearances – All Models

Isolator locations
Four fan isolator locations - 3040THE, 3050THE, 3055THE, 3060THE, 3079THE



LD18078

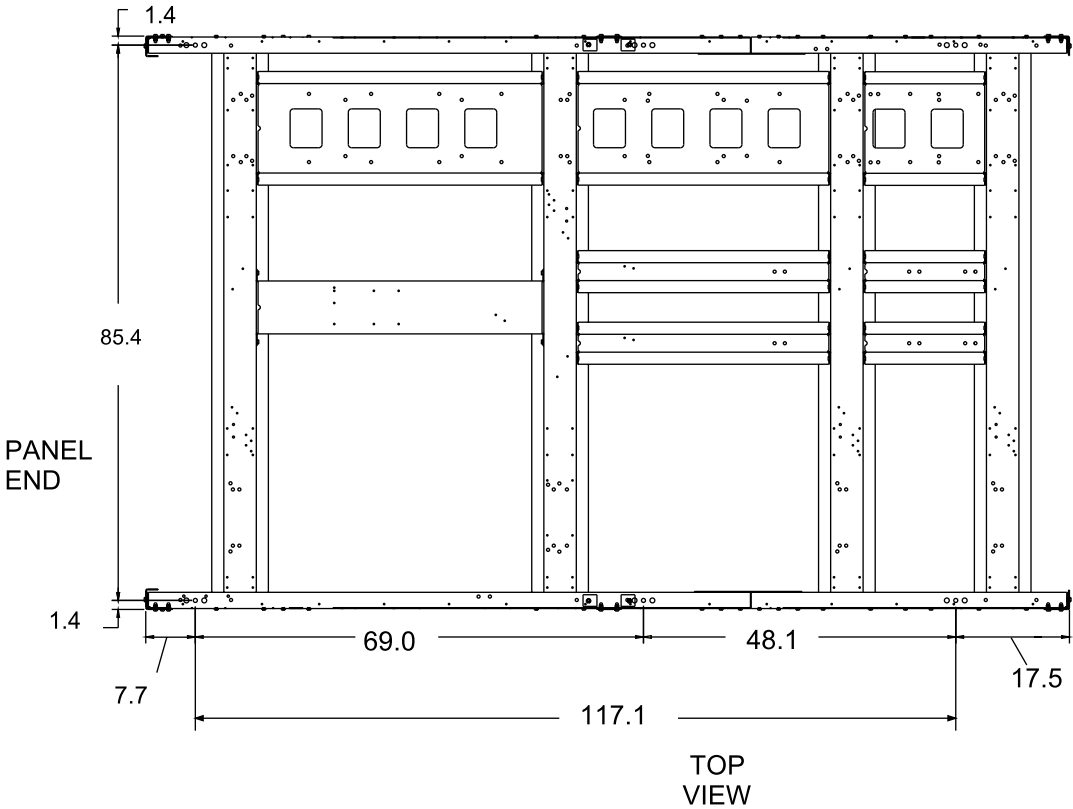
Four fan isolator locations - 3070TSE, 3075TSE, 3085TSE



LD18079

All dimensions are inches unless otherwise specified.

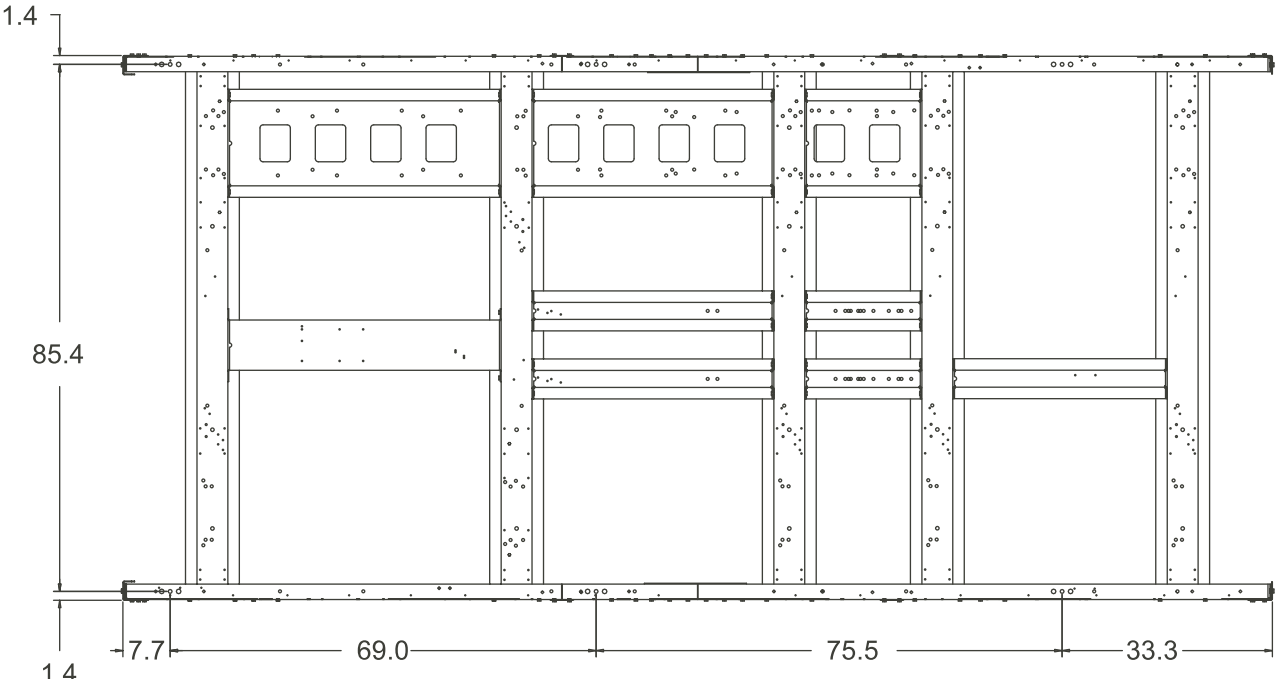
**Five and six fan isolator locations -
3090THE, 3110TSE, 3095TSE, 3100THE**



5

LD18080

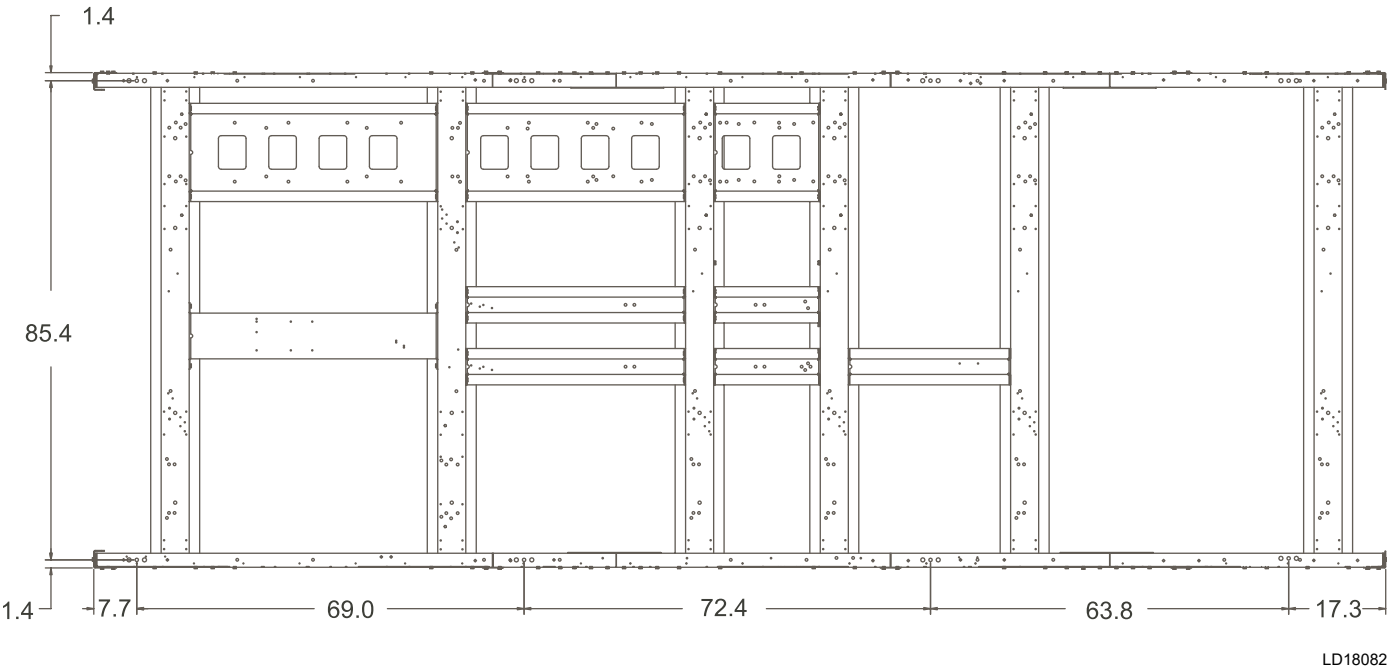
Eight fan isolator locations - 3125TSE, 3140TSE, 3129THE



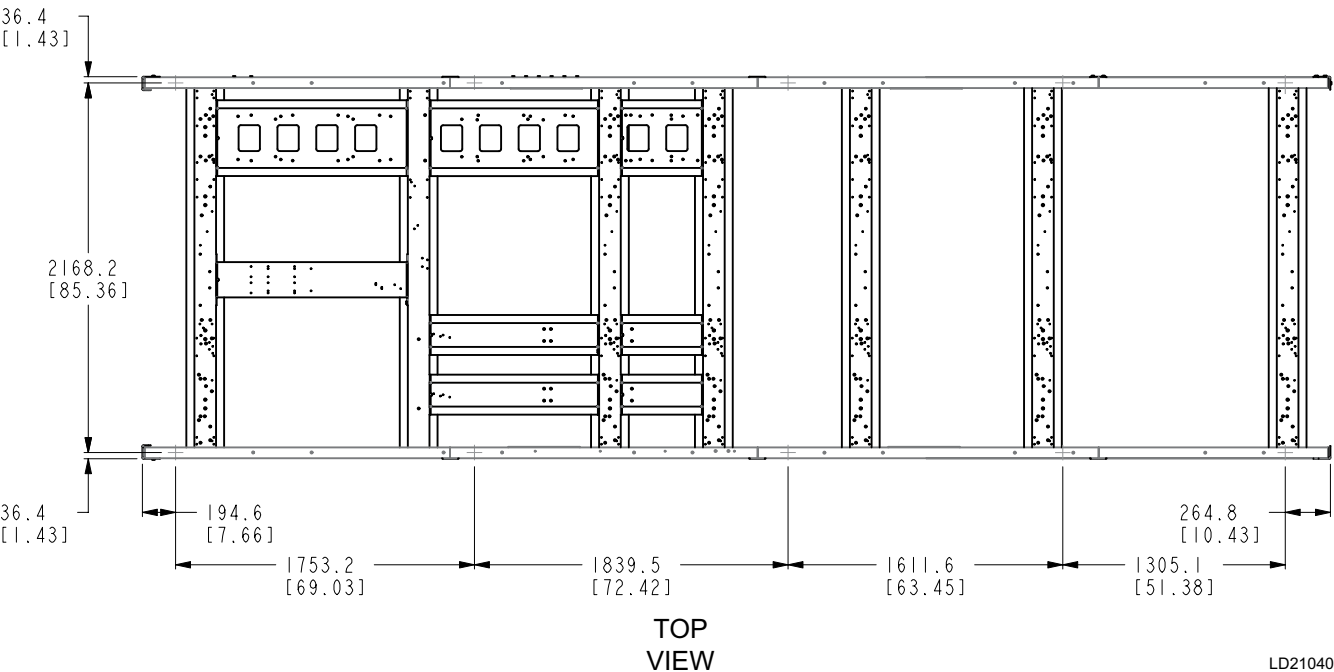
LD18081

All dimensions are inches unless otherwise specified.

Ten fan isolator locations - 3160TSE, 3150THE, 3170THE



Twelve fan isolator locations - 3205THE, 3225THE

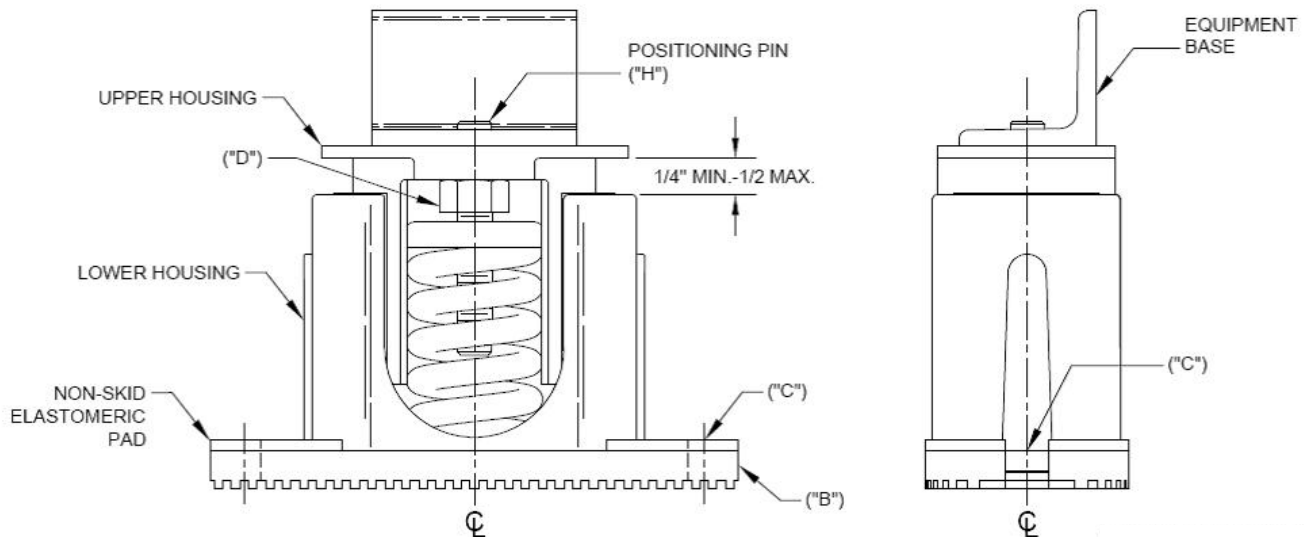


All dimensions are inches unless otherwise specified.

Type b model p/n	RATED CAPACITY (LB)	DEFLECTION RATED (IN.)	COLOR CODE
029-25334-008 (433997)	1350	1.320	DK. PURPLE
029-25334-009 (433998)	1800	1.020	DK. GREEN
029-25334-010 (433999)	2400	0.900	GRAY
029-25334-012 (434000)	2720	0.770	WHITE
029-25334-013 (434001)	3570	0.880	GRAY / RED

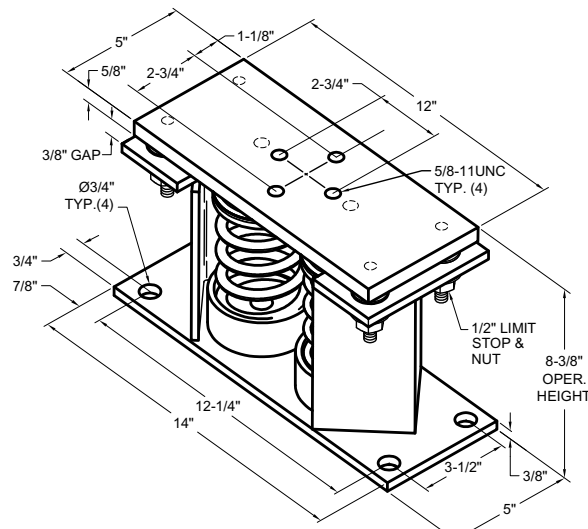
1 in. deflection spring isolators installation instructions

1. Read instructions in their entirety before beginning installation.
2. Isolators are shipped fully assembled and are to be positioned in accordance with the submittal drawings or as otherwise recommended.
3. Set isolators on floor, housekeeping pad or sub-base, ensuring that all isolators centerlines match the equipment mounting holes. The VMC group recommends that the isolator base ("B") be installed on a level surface. Shim or grout as required, leveling all isolator bases to the same elevation (1/4 in. maximum difference can be tolerated).
4. Bolt or anchor all isolators to supporting structure utilizing base slotted holes ("C").
5. Place equipment on top of isolators making sure that mounting holes of the equipment line up with isolator positioning pin ("H").
6. The adjustment process can only begin after the equipment or machine is at its full operating weight.
7. Adjust each isolator in sequence by turning spring adjusting bolt ("D") one full counterclockwise turn at a time. Repeat this procedure on all isolators, one at a time.
8. Continue adjusting each isolator until a minimum of 1/4 in. clearance is achieved between the lower housing and upper housing. See the following figure.
9. Fine adjust isolators to level equipment.
10. Installation is complete.



LD13790

2 in. deflection isolator cross-reference



LD13761A

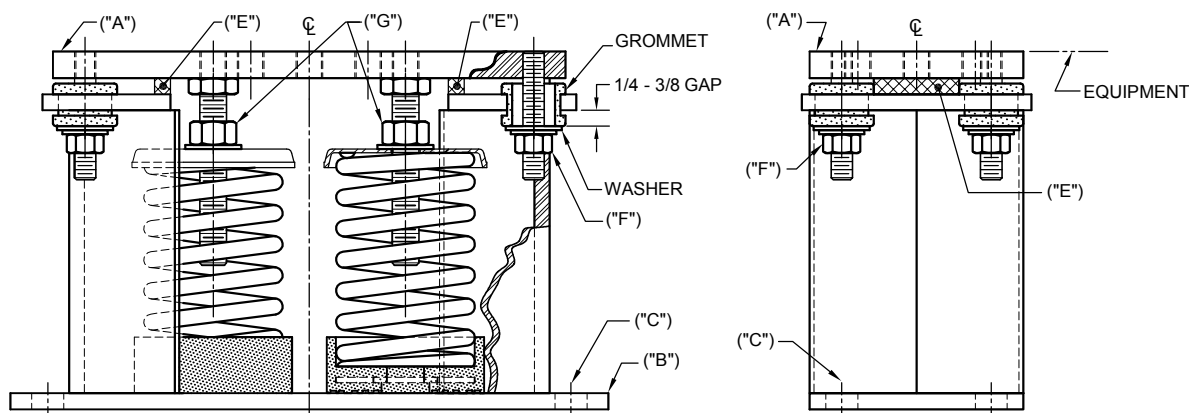
1. All dimensions are in inches, interpret per ANSI Y14.
2. Standard finish: housing-powder coated (color, black), spring-powder coated (color, see table below) hardware - zinc-electroplate.
3. Equipment must be bolted or welded to the top plate to meet allowable seismic ratings.
4. All springs are designed for 50% overload capacity with exception of the 2D-3280N and 2D-2870.
5. See next page for installation instructions.
6. Consult factory for concrete installation.

Restrained vibration isolator for 2 inch deflection

Model P/N	RATED LOAD (LB)	RATED DEFLECTION (IN.)	SPRING RATE (LB/IN.)	SOLID LOAD (LB)	COLOR CODE	ALLOWABLE G RATING HORIZONTAL
029-25336-006 (688690)	150	2.4	62	234	WHITE	34.7
029-25336-008 (688691)	320	2.3	140	490	YELLOW	16.3
029-25336-009 (688692)	460	2.3	200	688	GREEN	11.3
029-25336-010 (688693)	710	2.2	330	1072	DK BROWN	7.3
029-25336-011 (688694)	870	1.9	460	1312	RED	6.0
029-25336-012 (688695)	1200	1.9	638	1818	RED/BLACK	4.3
029-25336-013 (688697)	1450	1.8	900	2450	TAN	3.6
029-25336-014 (688698)	1690	1.7	1140	2892	PINK	3.1
029-25336-015 (688699)	2000	1.7	1318	3342	PINK/BLACK	2.6
029-25336-016 (688700)	2640	1.5	1854	4283	PINK/GRAY	2.0
029-25336-017 (688701)	3080	1.5	2004	4629	PINK/GRAY/ ORANGE	1.7
029-25336-018 (688702)	3740	1.8	2134	4930	PINK/GRAY/DK BROWN	1.4

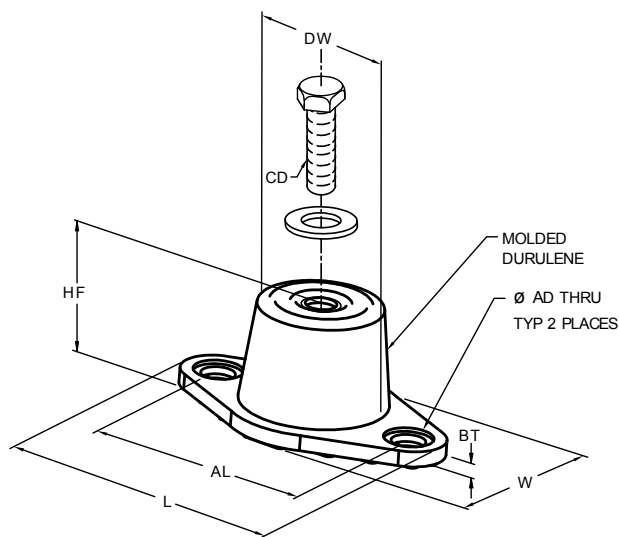
2 in. deflection isolator installation and adjustment

1. Read instructions in their entirety before beginning installation.
2. Isolators are shipped fully assembled and are to be positioned in accordance with the submittal drawings or as otherwise recommended.
3. Set isolators on floor, housekeeping pad, or sub-base, ensuring that all isolator center lines match the equipment mounting holes. The VMC group recommends that the isolator base plates ("B") be installed on a level surface. Shim or grout as required, leveling all isolator base plates to the same elevation (1/4 in. maximum difference can be tolerated).
4. Bolt or anchor all isolators to supporting structure utilizing base plate through holes ("C") or weld base plate to supporting structure with 3/8 fillet weld 2 in. long at 4 in. on center around entire base plate or as engineered for specific load and or field conditions.
5. Isolators are shipped to the job site with (2) removable spacer shims ("E") between the top plate and the housing. These shims must be in place when the equipment is positioned over the isolators.
6. With all shims ("E") in place, position equipment on top of plate ("A") of isolator. Bolt equipment securely to top plate of isolator using a minimum of (2) 5/8 UNC A325 grade 5 SAE bolts or weld equipment or bracket to the top plate ("A") of isolator with a minimum of 3/8 fillet welds 2 in. long at 3 in. on center for a minimum total weld of 10 in. (All sides of equipment or bracket resting on top plate ("A") must be welded).
7. The adjustment process can only begin after the equipment or machine is at its full operating weight.
8. Back off each of the (4) limit stop lock nuts ("F") on isolators 1/2 in.
9. Adjust each isolator in sequence by turning spring adjusting nuts ("G") one full clockwise turn at a time. Repeat this procedure on all isolators, one at a time. Check the limit stop lock nuts ("F") periodically to ensure that clearance between the washer and rubber grommet is maintained. Stop adjustment of isolator only when the top plate ("A") has risen just above the shim ("E").
10. Remove all spacer shims ("E").
11. Fine adjust isolators to level equipment.
12. Adjust all limit stop lock nuts ("F") per isolator, maintaining a 1/4 in. to 3/8 in. gap. The limit stop lock nuts must be kept at this gap to ensure uniform bolt loading during uplift (as the case when equipment is drained).
13. Installation is complete.



LD13763B

Neoprene isolator cross-reference



LD13760A

1. All dimensions are inches, interpreted per ANSI Y14.
2. See next page for installation instructions.
3. Mount molded in weather resistant duralene compound as standard. Also available in other materials such as natural rubber, extreme high temperature silicone, high-damped silicone, nitrile and EDPM.
4. AL = Mounting hole center to center spacing.
5. HF = Free height of mount, before loading. Operating height calculated by the free height less the static deflection under load. All dimensions for reference only.
6. Hardware zinc-electroplated.

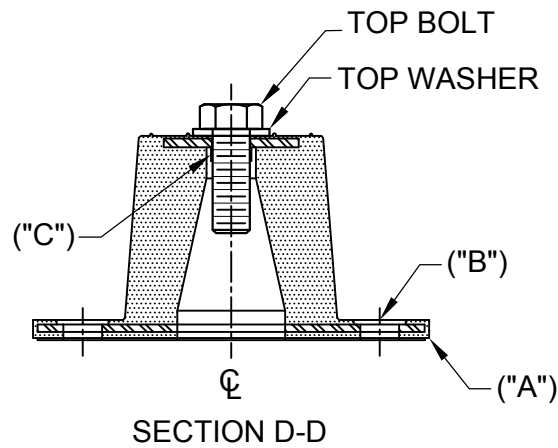
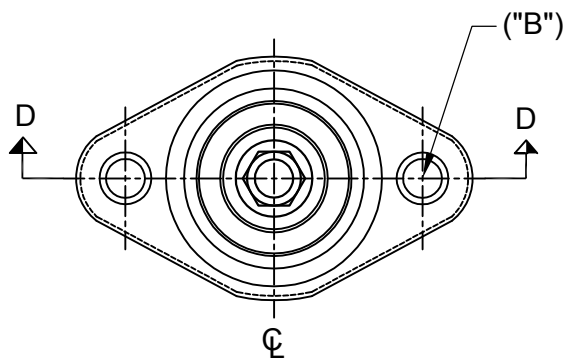
Mount Type	Dimension Data (in.)							
	L	W	HF	AL	AD	BT	CD	DW
Type a	5.50 (139.7)	3.38 (85.85)	2.88 (73.15)	4.13 (10.90)	0.56 (14.22)	0.25 (6.35)	1/2-13 UNC X 1	2.50 (63.5)
type b	6.25 (168.7)	4.63 (117.60)	2.75 (69.85)	5.00 (127)	0.56 (14.22)	0.38 (9.65)	1/2-13 UNC X 1	3.00 (76.2)

Type a MODEL P/N	ISOLATOR COLOR	weight range (lb)	Weight Range (kg)
029-25335-001 (434002)	CHARCOAL	UP TO 825	UP TO 374

TYPE B MODEL P/N	ISOLATOR COLOR	WEIGHT RANGE (LB)	WEIGHT RANGE (KG)
029-25335-002 (434004)	BRICK RED	826 TO 1688	375 TO 766
029-25335-004 (434005)	CHARCOAL	1689 TO 4000	767 TO 1814

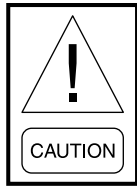
Installation of Neoprene vibration isolators

1. Read instructions in their entirety before beginning installation.
2. Isolators are shipped fully assembled and are to be positioned in accordance with the submittal drawings or as otherwise recommended.
3. Set isolators on floor, housekeeping pad, or sub-base, ensuring that all isolator centerlines match the equipment mounting holes. The VMC group recommends that the isolator base ("A") be installed on a level surface. Shim or grout as required, leveling all isolator bases to the same elevation (1/32 in. maximum difference can be tolerated).
4. Bolt or anchor all isolators to supporting structure utilizing base through holes ("B").
5. Remove top bolt and top washer. Place equipment on top of isolators so that mounting holes in equipment or base line up with threaded hole ("C").
6. Reinstall top bolt and washer and tighten down.
7. Installation is complete.



LD13762B

Section 6: Commissioning



Commissioning of this unit should only be carried out by Quantech Authorized personnel.

Commissioning personnel should be thoroughly familiar with the information contained in this literature, in addition to this section.

Perform the commissioning using the detailed checks outlined. See *Equipment Pre-Startup And Startup Checklist (Form 150.72-CL1)* as the commissioning procedure is carried out.

Preparation, with power off

The following basic checks should be made with the customer power to the unit switched OFF.

Inspection

Inspect unit for installation damage. If found, take action and/or repair as appropriate.

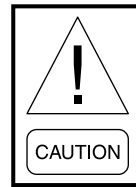
Refrigerant charge

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 or death. 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*.

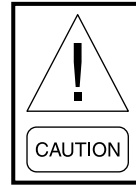
Packaged units are normally shipped as standard with a full refrigerant operating charge. Check that refrigerant pressure is present in both systems and that no leaks are apparent. If no pressure is present, a leak test must be undertaken, the leak(s) located and repaired. Remote systems and units are supplied with a nitrogen holding charge. These systems must be evacuated with a suitable vacuum pump/recovery unit as appropriate to below 500 μm .

Do not liquid charge with static water in the cooler. Care must also be taken to liquid charge slowly to avoid excessive thermal stress at the charging point. Once the vacuum is broken, charge into the condenser

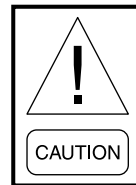
coils with the full operating charge as given in *Section 5: Technical data*.



ALWAYS keep the water pump running when vacuuming the system, removing refrigerating from the system or adding refrigerant to the system until the process is completed. If you do NOT, the evaporator may freeze and ruin the system.



Charging after vacuuming - Charge 10% of the specified amount of refrigerant into the evaporator. Otherwise, the compressor is in risk when it starts. Find the system charges on the unit nameplate.



Do NOT overcharge the system. Otherwise High Discharge Pressure will frequently occur.

Charging refrigerant

If you vacuum the system first, add only the volume of refrigerant shown on the nameplate.

To charge the refrigerant after vacuuming, complete the following steps:

1. Start the chilled liquid pump and use the water valve to ensure that the chilled liquid is circulating in the evaporator.
2. Place the refrigerant drum on the scale and log the weight (W_i).
3. Connect the refrigerant valve to the angle valve in the liquid line and purge the air from the charging pipe.
4. Use the angle valve to direct the charge to the high side only.
5. Find the system charge on the nameplate. Calculate the weight to the high side (W_h), which is 90% of the system charge, and calculate W as follows:

$$W = W_i - W_h$$

6. Open the valve on the drum and reverse the drum, so only liquid is charged into the system.

7. Monitor the reading of the scale and shut off the valve when the scale reaches W.
8. Close the angle valve and switch the charging pipe from angle valve to Schrader valve between the evaporator and EEV/TXV.
9. Purge the air from the charging pipe.
10. Open the valve on the drum to charge the remaining 10% of the system charge into the low side.

However, sometimes the system can run without enough refrigerant in it. If you have no idea how much refrigerant is inside of the system, then follow the steps below.

1. Connect the charging hose between the refrigerant tank and the angle valve at the inlet of evaporator. Exclude the air inside of hose.
2. Put the refrigerant tank on a scale and read the initial weight. Leave the tank on scale until process is complete.
3. Get as many compressors running as the system permits.
4. Open the angle valve 1.5 turns.
5. Open the valve on the tank.



Quickly shut down the angle valve or the tank valve immediately if all of compressors stop suddenly in the process of charging.

6. Monitor the suction superheat (SH) and liquid subcooling (SC). If SH is around 10R and SC > 6R, close the angle valve. Wait at least 15 min.
7. If SC < 10R or SH > 10R always, continue to charge the system. Open the angle valve 1.5 turns. Close it after one pound is added. Wait another 15 min. Repeat this step until both SC and SH are around 10R with all of the fans and compressors running.
8. Close the angle valve and tank valve. Disconnect the hose.

Service and oil line valves

Open each compressor suction, economizer, and discharge service valve. If valves are of the back-seat type, open them fully (counterclockwise) then close one turn of the stem to ensure operating pressure is fed to pressure transducers. Open the liquid line service valve and oil return line ball valve fully in each system.

Fans

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

Temperature sensors

Ensure that the leaving liquid temperature sensor is coated with heat conductive compound (Part No. 013-00890-000) and is inserted to the bottom of the water outlet sensor well in the cooler. This sensor also provides some freeze protection and must always be fully inserted in the water outlet sensor well.

Compressor heaters

Verify the compressor heaters are energized. If the ambient temperature is above 96°F (36°C) the compressor heaters must be on for at least 8 hours before start-up to ensure all refrigerant liquid is driven out of the compressor and the oil. If the ambient temperature is below 86°F (30°C), allow 24 hours.

Power connections

Check that the customer power cables are connected correctly to the terminal blocks or optional circuit breaker. Ensure that connections of power cables within the panels to the circuit breaker or terminal blocks are tight.

Grounding

Verify that the unit's protective ground terminals are correctly connected to a suitable grounding point. Ensure that all unit internal ground connections are tight.

Compressor oil

To add oil to a circuit, complete the following steps:

1. Connect a Quantech hand oil pump (P/N 470-10654-000) to the 1/4 in. oil charging connection on the compressors with a length of clean hose or copper line, but do not tighten the flare nut.
2. Pump the oil until all air has been purged from the hose, then tighten the nut.
3. Stroke the oil pump to add oil to the oil system. Approximately 1.8 gal to 2.3 gal is present in each refrigerant system.

Oil levels in the oil equalizing line sight glass should be between the bottom and the middle of the sight glass with the system OFF. When running, a visible sign of oil splashing in the sight glass in normal.

Jump location	Input signal
1	0–10 V

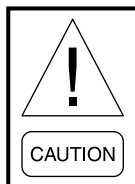


DIP switch number	QTC3225T	All other chillers
1	OFF	OFF
2	OFF	ON
3	OFF	OFF

DIP switch number	ALL CHILLERS
4	OFF
5	OFF
6	ON
7	OFF
8	OFF

LD23530

Figure 38: EEV IB-G Interface Board



High oil levels may cause excessive oil carryover in the system. High oil concentration in the system may cause nuisance trips resulting from incorrect readings on the level sensor and temperature sensors. Temperature sensor errors may result in poor liquid control and resultant liquid overfeed and subsequent damage to the compressor.

For Copeland compressors, use YORK V oil, YORK P/N 011-00949-000.

For Bitzer compressors, use YORK PVE oil, YORK P/N 011-00982-000.

Switch settings

Ensure the chiller OFF/ON UNIT switch at the bottom of the keypad is OFF. Place the optional circuit breaker handle on the panel door to ON. The customer's disconnection devices can now be set to ON.

Verify the control panel display is illuminated. Ensure the system switches under the SYSTEM SWITCHES key are in the OFF position.

Supply voltage

Verify that the site voltage supply corresponds to the unit requirement and is within the limits given in *Section 5: Technical data*.

Water system

Verify the chilled liquid system has been installed correctly, and has been commissioned with the correct direction of water flow through the cooler. The inlet should be at the refrigerant piping connection end of the cooler. Purge air from the top of the cooler using the plugged air vent mounted on the extension pipe.

Flow rates and pressure drops must be within the limits given in *Section 5: Technical data*. Operation outside of these limits is undesirable and could cause damage.

If mains power must be switched OFF for extended maintenance or an extended shutdown period, the compressor suction, discharge and economizer service stop valves should be closed (clockwise). If there is a possibility of liquid freezing due to low ambient temperatures, the coolers should be drained or power should be applied to the chiller. This will allow the cooler heater to protect the cooler from freezing down to –20°F. Be-

fore placing the unit back in service, valves should be opened and power must be switched ON (if power is removed for more than 8 hours) for at least 8 hours (24 hours if ambient temperature is below 86°F [30°C]) before the unit is restarted.

Sporlan EEV interface board

Verify the jumper and dip switch settings, *Figure 38 on page 119*, during a chiller start-up for QTC3 and QWC3 chillers with Sporlan Electronic Expansion Valves.

With the IB-G unpowered, select the input signal of 0 V to 10 V by installing the supplied jumper to number 1 of the 5 pin locations shown in the left hand side of EEV board. Set numbers 1 to 3 of the DIP switches in accordance with the unit models. Set numbers 4 to 8 in accordance with the table shown in *Figure 38 on page 119*. For QTC3 chillers, DIP switch number 6 must be set to ON for a quicker EEV response.

F/ protection

Verify all sources of electrical supply to the unit are taken from a single point of isolation. Check that the maximum recommended fuse sizes given in *Section 5: Technical data* has not been exceeded.

Preparation, with power on



Perform the commissioning using the detailed checks outlined. Refer to the Equipment Pre-Startup And Startup Checklist (Form 150.72-CL1) as the commissioning procedure is carried out.

Apply power to the chiller. Turn on the option panel circuit breaker if supplied.



The machine is now live!

Low switch

Verify a chilled water flow switch is correctly fitted in the customer's piping on the cooler outlet, and wired into the control panel correctly using shielded cable.

There should be a straight run of at least 5 pipe diameters on either side of the flow switch. The flow switch should be connected to terminals 13 and 14 of XTBC1 on the panel.

Commissioning the pump VFD

1. Put pump in HAND mode.



LD18418

2. Change parameter 0-20 (default value is option 1601 – “Reference [Unit]”) to option 1850 “Sensorless Readout” to display Sensorless flow readout on top left corner of screen.

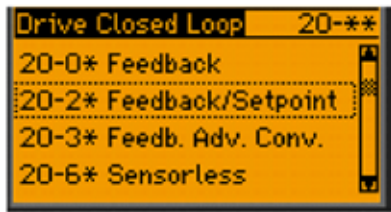


LD18419

3. Change parameter 0-22 (default value is option 1610 – “Power [kW]”) to option 1654 “Feedback 1 [unit]” to display Sensorless pressure readout on top right corner of screen.
4. Check with customer regarding new actual flow and head and verify what flow is required. Ramp the pump up or down to achieve requested flow. Record the VFD sensorless flow and pressure – this will be your new setpoint.
5. Set parameter 20-21 to the Sensorless Pressure readout taken in the previous step.



LD18420



LD18421



LD18422

6. Set parameter 22-89 to the Sensorless Flow read-out taken in the previous step.



LD18423

7. Set parameter 22-87 to a value that is X% of the value in 20-21. This percentage needs to be calculated based on the design flow and the published minimum flow for the unit. This ensures that the drive will not allow the pump to operate below the minimum flow of the chiller. You have now readjusted the quadratic control curve to match actual site conditions.
8. Change parameter 0-20 back to default value of option 1601 – “Reference [Unit]”.
9. Change parameter 0-22 back to default value of option 1610 – “Power [kW]”.
10. Put the VFD back into AUTO mode.



LD18424

Programming the drive

Instructions to access Service Mode are located on the chiller control panel.

1. To enable Service Mode, set the unit rocker switch to OFF.
2. Press the Program key.
3. Press the Up Arrow twice and then the Down Arrow twice.
4. Press the Enter/Advance key.
5. Press the Enter/Advance key until the Liquid Line solenoid option is displayed.
6. Press the Up/Down arrow keys to enable the Liquid Line solenoid output and press Enter/Advance key.
7. Turn on the System 1 Fan Output 1. This sends voltage to the drive, enabling you to adjust the drive parameters.
8. Set up the drive. See *Table 14 on page 122*.

Setting up the ABB ACS255 VSD for the low ambient kit

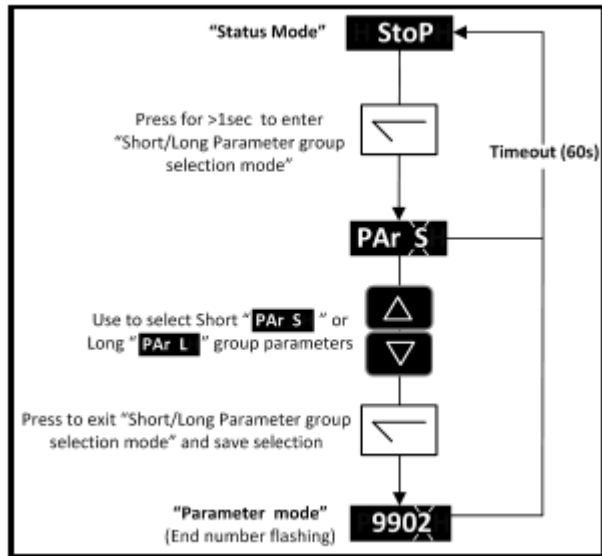
Refer to the ABB ACS255 manual for more detailed instructions on entering modes and making adjustments to the drive. Ensure that the drive is set for Par L to see all parameter code settings.

Parameter structure

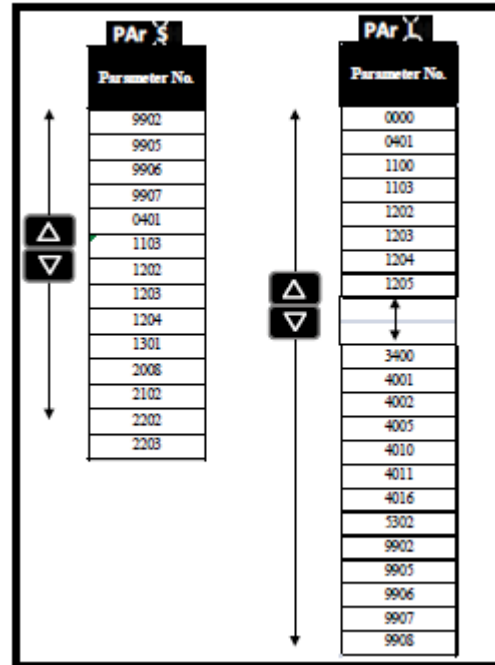
The parameters within the drive are split into two groups. Group 1 is titled Short Parameter Mode and is displayed as PAr S on the drive display. Group 2 is titled Long Parameter Mode and is displayed as PAr L on the drive display.

- PAr S group brings together the most commonly used parameters to aid in a quick setup.
- PAr L group includes all of the drive parameters.

GROUP NAVIGATION



PARAMETER STRUCTURE



LD29434

Figure 39: Drive Display

Leave all other settings not listed in the following table in their default values.

Table 14: Drive programming parameters

Parameter code	Description	Setting
9902	Function select	0
9905	Motor rated voltage	See motor nameplate (208 V, 230 V, 460 V)
9906	Motor rated current	See motor nameplate
9907	Motor frequency	See motor nameplate (50 Hz, 60 Hz)
1103	Command source mode	0
1300	Analog input 1 signal format	U 0-10
1301	Analog input 1 offset	23.5
1302	Analog input 1 scaling	1850
2007	Min frequency limit	0
2008	Max frequency limit	See motor nameplate (50 Hz, 60 Hz)
2102	Stop mode	0
2202	Accel time	30.0
2203	Decel time	30.0
2601	Energy optimizer	0

Setting the adjustable breaker

The maximum over current protection (MOCP) for each chiller is provided on the nameplate. The I_1 trip setting cannot exceed this value.

To set a 250 A breaker for 200 A, complete the following steps:

1. Note the I_n value.
2. Set I_1 , the trip setting.

$$I_1 = I_n \times (0.4 + \text{the sum of the dip switch settings})$$

For a 200 A trip setting, set switches 0.08 and 0.32 in the up position. This results in the following calculation:

$$I_1 = 250 \times (0.4 + 0.08 + 0.32) = 200$$

3. Set t_1 switch to 12 s.
4. Set S/I switch to I.
5. Set I_3 to 10, which is the sum of all dip switches in the up position.

There are no requirements for adjusting the other switches.



LD29345

Figure 40: Circuit breaker panel

Determining proper oil levels

The following charts list the proper oil levels in tandem and trio compressor manifold sets.

TANDEM		
COMPRESSOR	COMPRESSOR STATUS	OIL LEVEL
1	on	1/8 to full SG
2	on	Bottom of SG
1	off	Bottom of SG
2	on	1/8 to full SG
1	on	1/8 to full SG
2	off	Bottom of SG

TRIO		
COMPRESSOR	COMPRESSOR STATUS	OIL LEVEL
1	on	1/8 to full SG
2	on	Bottom of SG
3	on	1/8 to full SG
1	on	1/8 to full SG
2	off	Bottom of SG
3	on	1/8 to full SG
1	off	Bottom of SG
2	on	Bottom of SG
3	on	1/8 to full SG
1	on	1/8 to full SG
2	on	Bottom of SG
3	off	Bottom of SG
1	on	1/8 to full SG
2	off	Bottom of SG
3	off	Bottom of SG
1	off	Bottom of SG
2	off	Bottom of SG
3	on	1/8 to full SG
1	off	Bottom of SG
2	on	1/8 to full SG
3	off	Bottom of SG

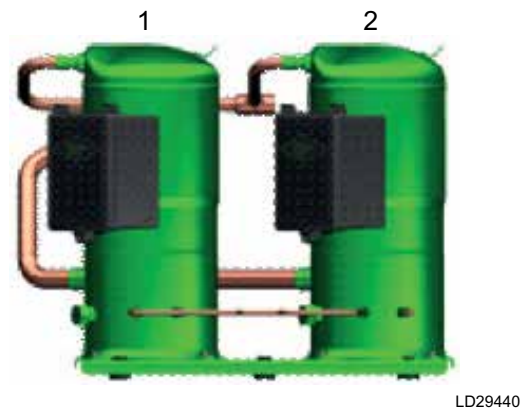


Figure 41: Tandem Set

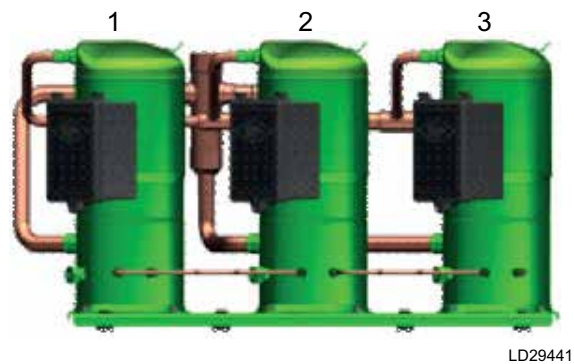



Figure 42: Trio Set

		QTC3	
Installation Checklist		Supersedes QTC3-CL1 (820)	Form QTC3-CL1 (1123)

Customer: _____ Job name: _____
 Address: _____ Location: _____
 Phone: _____ Customer order number: _____
 Telephone number: _____ Order number: _____ Contract number: _____

Chiller model number: _____	Unit serial number: _____
VSD software version: _____	Controls software version: _____
The work, as checked below, is in process and will be completed by: _____ / _____ / _____ <div style="display: flex; justify-content: space-around; width: 100%;"> Month Day Year </div>	

Complete the following checks in accordance with the relevant installation instructions:

Pre-startup

Unit checks: no power

Turn off the customer power to the unit and complete the following checks:

1. Ensure that chiller is installed in an outdoor location and that all safety and service clearances are met. ☐
2. Inspect the unit for shipping or installation damage. ☐
3. Ensure that all piping has been completed. ☐
4. Visually check for refrigerant piping leaks. ☐
5. If available, open the suction line ball valve, discharge line ball valve, and liquid line valve for each system. ☐
6. At shutdown, check that the oil level is between the bottom and middle of the oil equalizing sight glass. ☐
7. Check the water pumps:
 - a. Check and adjust the water pump flow rate and pressure drop across the cooler. Refer to *QTC3-ICOM6, Section 8: Technical Data, Operating Limitations*. ☐
 - b. Ensure the flow switch is in place, wired correctly, and operational. ☐
 - c. Ensure the chilled water pumps are operational. ☐
 - d. Ensure the water system is filled with water. ☐
 - e. Ensure all air is purged from the water system. ☐

Note: Purge any air found in the water system before starting up the chiller. Excessive flow may cause catastrophic damage to the heat exchanger.

8. Check that the control panel is free of foreign material, for example, wires and metal chips. ☐
9. Check that all power is wired to the chiller and meets the following NEC and local codes. ☐

- a. High voltage. ☐
- b. Low voltage. ☐
- c. Check the tightness of the power wiring inside the power panel on both sides of the motor contactors and overloads. ☐
- d. Check that the BAS control is wired correctly and operational. ☐

10. Check the fuses in the main and control circuits to ensure they are the correct size, and verify that the overload setting corresponds with RLA and FLA values in electrical tables. ☐
11. Ensure that the 120 VAC, or 110 VAC for 50 Hz units, control power to TB1 has 15 A minimum capacity. ☐
12. Check that all water temperature sensors are inserted completely into their respective wells and are coated with heat conductive compound. ☐
13. Check that the evaporator TXV bulbs are strapped onto the suction lines at four or eight o'clock positions or suction temperature sensors if EEVs are installed. ☐
14. Check that all sides of the unit have the appropriate amount of space for air ventilation. Refer to *QTC3-ICOM6, Section 4: Installation*. ☐
15. Check that the cabinet edge clears the insulation of the cable at the power entry to avoid slicing the cable. ☐

Compressor heater

Power on 24 hours before starting up

Apply 120 VAC and verify its value between terminals 5 and 2 of XTBC2. The voltage should be 120 VAC (110 VAC for 50 Hz units) plus or minus 10%. ☐

Note: Power must be applied 24 hours before start-up. Each heater should draw approximately 0.5 A to 1 A.

Startup

Panel checks: power on, both unit switches off

1. Apply three-phase power and verify the value. Ensure voltage imbalance is no more than 2% of the average voltage ☐
2. Apply 120 VAC, 110 VAC for 50 Hz units, and verify the value on the terminal block in the power panel. Make the measurement between Terminals 5 and 2 of XTBC2. Ensure the voltage is 120 VAC \pm 10% ☐
3. Program and verify the cooling setpoints, program setpoints, and unit options. Record the values in Table 1 ☐
4. Place the unit into service mode and cycle each condenser fan to ensure correct rotation ☐



If the chiller is equipped with VSD fans, the cycling condenser fan can not be used to confirm phase sequence. Use a phase checker or temporarily bypass the VSD before starting a compressor.

5. Turn system 2 **OFF** and leave system 1 running. Refer to QTC3-ICOM6, Section 6: Operations, Unit Keys for more information on system switches ☐
6. Connect a manifold gauge to system 1 suction and discharge service valves ☐
7. Turn the unit switch in the control panel **ON** ☐

Note: The chilled liquid setpoint may need to be temporarily lowered to ensure all compressors cycle on.

As each compressor cycles on, ensure that the discharge pressure rises and the suction pressure decreases. If this does not occur, the compressor being tested is operating in the reverse direction and must be corrected.

8. Verify that compressor rotation is correct and then turn the unit switch **OFF** ☐

Note: This unit uses scroll compressors, which can only operate in one direction. Failure to observe this leads to compressor failure.

9. Turn system 1 **OFF** and system 2 **ON** (two system units only). Refer to QTC3-ICOM6, Section 6: Operations, Unit Keys for more information ☐

10. Turn the unit switch in the control panel **ON** ☐

Note: The chilled liquid setpoint may need to be temporarily lowered to ensure all compressors cycle on.

As each compressor cycles on, ensure that the discharge pressure rises and the suction pressure decreases. If this does not occur, the compressor being tested is operating in the reverse direction and must be corrected.

11. Ensure that you enable the data logging feature ☐
12. Verify that compressor rotation is correct and then turn the unit switch **OFF** ☐

Table 1: Setpoints entry list

Unit options	
Display language	
System 1 switch	
System 2 switch	
Chilled liquid	
Ambient control*	
Local/remote mode	
Control mode	
Display units	
Lead/lag control*	
Fan control*	
Manual override	
Power fail restart	
Soft start**	
Unit type**	
Refrigerant type**	
Flash card update	
Remote temperature reset	
External evaporator pump	
Quantech hydro kit pump	
Pump selection	
Data log to flashcard enabled	
Expansion valve type**	
Cooling setpoints	
Cooling setpoint	
Range	
EMS-PWM maximum setpoint	
Program setpoints	
Discharge pressure cutout	
Suction pressure cutout	
Low ambient temperature cutout	
Leaving liquid temperature cutout	
Anti-recycle time	
Fan control ON pressure	
Fan differential OFF pressure	
Total number of compressors	
Number of fans/system*	
Unit/system voltage*	
Remote unit ID	

*Not on all models, **Viewable only

Checking the superheat and subcooling

Calculate the subcooling temperature of each system by recording the temperature of the liquid line at the outlet of the condenser and subtracting it from the liquid line saturation temperature at the liquid stop valve. The liquid line saturation temperature is converted from a temperature-pressure chart.

Example:

Liquid line pressure =	
325 psig converted to temp.	101°F
minus liquid line temp.	- 83°F
Subcooling =	18°F

Adjust the subcooling to 18°F (10°C) at design conditions.

- Record the liquid line pressure and its saturated temperature, liquid line temperature, and subcooling below: ☐

	SYS. 1	SYS. 2
Liquid line pressure =	_____	_____ psig
Saturated temp. =	_____	_____ °F
Liquid line temp. =	_____	_____ °F
Subcooling =	_____	_____ °F

After verifying the subcooling, check the suction superheat. Only check the superheat after establishing steady state operation of the chiller, the leaving water temperature has reached the required leaving water temperature, and the unit is running in a fully loaded condition. The correct superheat setting for a system is 10°F to 15°F (5.56°C to 8.33°C) 18 in. (46 cm) from the heat exchanger.

Set the superheat for no less than 10°F with only a single compressor running on a circuit. The superheat is the difference between the actual temperature of the returned refrigerant gas in the suction line entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure-temperature chart.

Example:

Suction temp. =	46°F
minus suction press.	
105 psig converted to temp.	- 34°F
Superheat =	12°F

When adjusting the expansion valve, TXV only, turn the adjusting screw no more than one turn at a time, allowing sufficient time, approximately 15 min, between adjustments for the system and the thermal expansion valve to respond and stabilize.

Ensure that superheat is set at a minimum of 10°F (5.56°C) with a single compressor running on each circuit.

- Record the suction temperature, suction pressure, saturation temperature, and superheat of each system below: _____

	SYS. 1	SYS. 2
Suction temp. =	_____	_____ °F
Suction pressure =	_____	_____ psig
Saturation temp. =	_____	_____ °F
Superheat =	_____	_____ °F

Checking for leaks

Leak check compressors, fittings, and piping to ensure no leaks. _____

If the unit is functioning correctly during the initial operating period, with no safeties tripped and the compressors cycle to control water temperature to the setpoint, the chiller is ready for operation.

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Section 7: Unit controls



Introduction

The Quantech Control Center is a microprocessor based control system designed to provide the entire control for the liquid chiller. The control logic embedded in the microprocessor based control system will provide control for the chilled liquid temperatures, sequencing, system safeties, displaying status, and daily schedules. The MicroComputer Control Center consists of four basic components:

1. IPU II and I/O Boards
2. Transformer
3. Display
4. Keypad

The keypad allows programming and accessing setpoints, pressures, temperatures, cutouts, daily schedule, options, and fault information.

Remote cycling, demand limiting, and chilled liquid temperature reset can be accomplished by field supplied contacts.

Compressor starting/stopping and loading/unloading decisions are performed by the Microprocessor to maintain leaving or return chilled liquid temperature. These decisions are a function of temperature deviation from setpoint.

A Master ON/OFF switch activates or deactivates the unit.

IPU II and I/O boards

The IPU and I/O boards are assembled to function as a single microprocessor controller. The IPU II board contains a microprocessor and is the controller. The I/O board handles all of the chiller I/O (Inputs and Outputs). System inputs from pressure transducers and temperature sensors are connected to the I/O board.

The I/O board constantly scans inputs to monitor the chiller operating conditions. The input values are transmitted the IPU II microprocessor board. From this information, the IPU II then issues commands to the I/O board relay outputs to control contactors, solenoids, etc. for Chilled Liquid Temperature Control and to react to safety conditions. The I/O board converts logic signals to operate relay outputs to 115 VAC levels used by motor contactors, fan contactors, solenoid valves, etc. to control system operation. The low voltage side of all relay coils on the I/O board are powered by +12 V.

Keypad commands are actuated upon by the microprocessor to change setpoints, cutouts, scheduling, operating requirements, and to provide displays. The keypad and display are connected to the I/O board.

The on-board power supply converts 24 VAC from 75 VA, 120/24 VAC 50/60 Hz UL listed class 2 power transformer to +12 V, +5 V and +3.3 V using switching and linear voltage regulators located on the I/O and IPU II boards. These voltages are used to operate integrated circuitry on the board. The 40 character display and unit sensors (transducers and temp sensors)

are supplied power for the micro board +5 V supply. 24 VAC is rectified, but not regulated, to provide unregulated +30 VDC to supply all of the digital inputs.

The I/O board contains one green “Power” LED to indicate that the board is powered up and one red “Status” LED to indicate by blinking that the processor is operating. The I/O board also contains two sets of Receiver/Transmit LED’s, one for each available serial communication port. The receive LED’s are green, and the Transmit LED’s are red.

A jumper on the I/O board selects 4 mA to 20 mA or 0 VDC to 10 VDC as the input type on the remote temperature reset analog input.

Transformer

A 75 VA, 120/240 VAC, 50/60 Hz transformer is provided to supply power to the Microprocessor Board, which in turn rectifies, filters, and regulates as necessary to supply power to the display, sensors, and transducers.

Display

The 40 Character Display (2 lines of 20 characters) is a liquid crystal display used for displaying system parameters and operator messages.

When a key is pressed, such as the OPER DATA key, system parameters will be displayed and will remain on the display until another key is pressed. The system parameters can be scrolled with the use of the ↑ (UP) and ↓ (DOWN) arrow keys. The display will update all information at a rate of about 1 a second.

Display Messages may show characters indicating “greater than” (>) or “less than” (<). These characters indicate the actual values are greater than or less than the limit values which are being displayed.

Keypad

The 12 button non-tactile keypad allows the user to retrieve vitals system parameters such as system pressures, temperatures, compressor running times and starts, option information on the chiller, and system setpoints. This data is useful for monitoring chiller operation, diagnosing potential problems, troubleshooting, and commissioning the chiller.

It is essential the user become familiar with the use of the keypad and display. This will allow the user to make full use of the capabilities and diagnostic features available.

Unit switch

A unit ON/OFF switch is just underneath the keypad. This switch allows the operator to turn the entire unit OFF if required. The switch must be placed in the ON position for the chiller to operate.

Battery backup

The IPU II contains a Real Time Clock integrated circuit chip with an internal battery backup. The purpose of this battery backup is to ensure any programmed values (setpoints, clock, cutouts, etc.) are not lost during a power failure regardless of the time involved in a power cut or shutdown period.

Programming the number of compressors

The total number of compressors is programmable under the PROGRAM key. Dual (2) system chillers can have 4, 5, or 6 compressors.

Status key



00066VIP

Unit status

Pressing the STATUS key will enable the operator to determine current chiller operating status. The messages displayed will include running status, cooling demand, fault status, external cycling device status. The display will be a single message relating to the highest priority message as determined by the microprocessor. Status messages fall into the categories of General Status and Fault Status.

The following General, Safety, and Warning messages are displayed when the STATUS key is pressed. Following each displayed message is an explanation pertaining to that particular message.

General status messages

In the case of messages which apply to individual systems, SYS 1 and SYS 2 messages will both be displayed and may be different. In the case of single system units, all SYS 2 messages will be blank.

**UNIT SWITCH OFF
SHUTDOWN**

This message informs the operator that the UNIT switch on the control panel is in the OFF position which will not allow the unit to run.

**REMOTE CONTROLLED
SHUTDOWN**

The REMOTE CONTROLLED SHUTDOWN message indicates that either an ISN system or RCC has turned the unit OFF, not allowing it to run.

**DAILY SCHEDULE
SHUTDOWN**

The DAILY SCHEDULE SHUTDOWN message indicates that the daily/holiday schedule programmed is keeping the unit from running.

**REMOTE STOP
NO RUN PERM**

REMOTE STOP NO RUN PERM shows that a remote start/stop contact is open in series with the flow switch. These contacts are connected to Terminals 51 and 13 of XTBC1. A 3-second delay is built into the software to prevent nuisance shutdowns due to erroneous signals on the run permissive input.

**FLOW SWITCH
OPEN**

FLOW SWITCH OPEN indicates the flow switch contacts connected to Terminals 13 and 14 of XTBC1 are open. A 3-second delay is built into software to prevent nuisance shutdowns due to erroneous signals from the flow switch.

**SYS 1 SYS SWITCH OFF
SYS 2 SYS SWITCH OFF**

SYS SWITCH OFF tells that the system switch under OPTIONS is turned OFF. The system will not be allowed to run until the switch is turned back ON.

```

SYS 1 NO COOL LOAD
SYS 2 NO COOL LOAD

```

This message informs the operator that the chilled liquid temperature is below the point (determined by the setpoint and control range) that the microprocessor will bring on a system or that the microprocessor has not loaded the lead system far enough into the loading sequence to be ready to bring the lag system ON. The lag system will display this message until the loading sequence is ready for the lag system to start.

```

SYS 1 COMPS RUN X
SYS 2 COMPS RUN X

```

The COMPS RUNNING message indicates that the respective system is running due to demand. The “X” will be replaced with the number of compressors in that system that are running.

```

SYS 1 AR TIMER XX S
SYS 2 AR TIMER XX S

```

The anti-recycle timer message shows the amount of time left on the respective systems anti-recycle timer. This message is displayed when the system is unable to start due the anti-recycle timer being active.

```

SYS 1 AC TIMER XX S
SYS 2 AC TIMER XX S

```

The anti-coincidence timer is a software feature that guards against 2 systems starting simultaneously. This ensures instantaneous starting current does not become excessively high due to simultaneous starts. The microprocessor limits the time between compressor starts to 1 minute regardless of demand or the anti-recycle timer being timed out. The anti-coincidence timer is only present on two system units.

```

SYS 1 DSCH LIMITING
SYS 2 DSCH LIMITING

```

When this message appears, discharge pressure limiting is in effect. The Discharge Pressure Limiting feature is integral to the standard software control; however the discharge transducer is optional on some models. Therefore, it is important to keep in mind that this control will not function unless the discharge transducer is installed in the system.

The limiting pressure is a factory set limit to keep the system from faulting on the high discharge pressure cutout due to high load or pull down conditions. When the unload point is reached, the microprocessor will automatically unload the affected system by de energizing one compressor. The discharge pressure unload will occur when the discharge pressure gets within 10 psig (0.69 barg) of the programmed discharge pressure cutout. This will only happen if the system is fully loaded and will shut only one compressor OFF. If the system is not fully loaded, discharge limiting will not go into effect. Reloading the affected system will occur when the discharge pressure drops to 85% of the unload pressure and 10 minutes have elapsed.

```

SYS 1 SUCT LIMITING
SYS 2 SUCT LIMITING

```

When this message appears, suction pressure limiting is in effect. The suction pressure limit is a control point that limits the loading of a system when the suction pressure drops to within 15% above the suction pressure cutout. On a standard system programmed for 44 psig / 3.0 bar suction pressure cutout, the microprocessor would inhibit loading of the affected system with the suction pressure less than or equal to $1.15 * 44 \text{ psig} / 3.0 \text{ bar} = 50 \text{ psig} / 3.5 \text{ bar}$. The system will be allowed to load after 60 seconds and after the suction pressure rises above the suction pressure load limit point.

```

SYS 1 LOAD LIMIT XX %
SYS 2 LOAD LIMIT XX %

```

This message indicates that load limiting is in effect and the percentage of the limiting in effect. This limiting could be due to the load limit/pwm input, ISN or RCC controller sending a load limit command.

```

MANUAL
OVERRIDE

```

If MANUAL OVERRIDE mode is selected, the STATUS display will display this message. This will indicate that the Daily Schedule is being ignored and the chiller will start-up when chilled liquid temperature allows, Remote Contacts, UNIT switch and SYSTEM switches permitting. This is a priority message and cannot be overridden by anti-recycle messages, fault messages, etc. when in the STATUS display mode. Therefore, do not expect to see any other STATUS messages when in the MANUAL OVERRIDE mode. MANUAL

OVERRIDE is to only be used in emergencies or for servicing. Manual override mode automatically disables itself after 30 minutes.

SYS 1 PUMPING DOWN
SYS 2 PUMPING DOWN

The PUMPING DOWN message indicates that a compressor in the respective system is presently in the process of pumping the system down. When pumpdown is initiated on shutdown, the liquid line solenoid or EEV will close and a compressor will continue to run. When the suction pressure decreases to the suction pressure cutout setpoint or runs for 180 seconds, whichever comes first, the compressor will cycle OFF.

Fault safety status messages

Safety Status messages appear when safety thresholds in the unit have been exceeded. Safeties are divided into two categories – system safeties and unit safeties. System safeties are faults that cause the individual system to be shut down. Unit safeties are faults that cause all running compressors to be shut down. Following are display messages and explanations.

System safeties

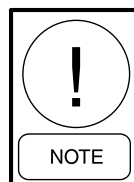
System safeties are faults that cause individual systems to be shut down if a safety threshold is exceeded for 3 seconds. They are auto reset faults in that the system will be allowed to restart automatically after the fault condition is no longer present. However, if 3 faults on the same system occur within 90 minutes, that system will be locked out on the last fault. This condition is then a manual reset. The system switch (under OPTIONS key) must be turned OFF and then back on to clear the lockout fault. Fault messages will be displayed whenever a system is locked out.

SYS 1 HIGH DSCH PRES
SYS 2 HIGH DSCH PRES

The Discharge Pressure Cutout is a software cutout in the microprocessor and is backed-up by a mechanical high pressure cutout switch located in the refrigerant circuit. It ensures that the system pressure does not exceed safe working limits. The system will shutdown when the programmable cutout is exceeded and will be allowed to restart when the discharge pressure falls 40 psig below the cutout. Discharge transducers must be installed for this function to operate.

SYS 1 LOW SUCT PRESS
SYS 2 LOW SUCT PRESS

Low suction pressure will display if the system is not locked out. The Suction Pressure Cutout is a software cutout that helps protect the chiller from an evaporator freeze-up should the system attempt to run with a low refrigerant charge or a restriction in the refrigerant circuit.



Repeated starts after resetting a low suction pressure fault will cause evaporator freeze-up. Whenever a system locks out on this safety or any safety, immediate steps should be taken to identify the cause.

At system start, the cutout is set to 10% of programmed value. During the next 3 minutes the cutout point is ramped up to the programmed cutout point. If at any time during this 3 minutes the suction pressure falls below the ramped cutout point, the system will stop. This cutout is completely ignored for the first 30 seconds of system run time to avoid nuisance shutdowns, especially on units that use a low pressure switch in place of the suction pressure transducer.

SYS 1 SP/ FREEZE WARN
SYS 2 SP/ FREEZE WARN

After the first 3 minutes, if the suction pressure falls below the programmed cutout setting, a “transient protection routine” is activated. This sets the cutout at 10% of the programmed value and ramps up the cutout over the next 30 seconds. If at any time during this 30 seconds the suction pressure falls below the ramped cutout, the system will stop. Suction pressure transducers must be enabled for this function to work

SYS 1 MP / HPCO FAULT
SYS 2 MP / HPCO FAULT

SYS 1 MP / HPCO INHIB
SYS 2 MP / HPCO INHIB

The Motor Protector/Mechanical High Pressure Cutout protect the compressor motor from overheating or the system from experiencing dangerously high discharge pressure.

This fault condition is present when CR1 (SYS 1) or CR2 (SYS 2) relays de-energize due to the HP switch or motor protector opening. This causes the respective CR contacts to open causing 0 VDC to be read on the inputs to the microboard. The fault condition is cleared when a 30 VDC signal is restored to the input.

The internal motor protector opens at 185°F to 248°F (85°C to 120°C) and auto resets. The mechanical HP switch opens at 585 psig plus or minus 10 psig (27.92 barg plus or minus 0.69 barg) and closes at 330 psig plus or minus 25 psig (22.75 barg plus or minus 1.72 barg).

The compressor is also equipped with a discharge temperature sensor for the purpose of sensing internal scroll temperature. This sensor protects the scrolls from overheating due to inadequate cooling that may occur when refrigerant charge is low, or superheat is too high.

When the sensor senses a high temperature, it opens the motor protector circuit in the compressor causing the compressor to shut down.

During the first two faults an MP/HP INHIBIT message will be displayed and the system will not be locked out. Only after the third fault in 90 minutes will the MP/HPCO FAULT message be displayed.

Whenever the motor protector or discharge sensor shuts down a compressor and the system, the internal compressor contacts will open for a period of 30 minutes to ensure that the motor or scroll temperatures have time to dissipate the heat and cool down. The MP/HP INHIBIT message will be displayed while these contacts are open or when the HPCO is open. While this message is displayed, the compressors will not be permitted to start.

After 30 minutes, the contacts will close and the system will be permitted to restart. The microprocessor will not try to restart the compressors in a system that shuts down on this safety for a period of 30 minutes to allow the internal compressor to time out.

During the 30 minute timeout, the MP/HPCO INHIB message will be displayed. The MP/HPCO fault will only be displayed after 3 shutdowns in 90 minutes, indicating the system is locked out and will not restart.

SYS	1	HIGH	MTR	CURR
SYS	2	HIGH	MTR	CURR

This safety will shut down a system if either suction temperature or suction pressure sensors read out of range high or low. This condition must be present for 3 seconds to cause a system shutdown. The safety locks out a system after the first fault and will not allow automatic restarting.

SYS	1	LOW	SUCT	SHEAT
SYS	2	LOW	SUCT	SHEAT

System Suction Superheat drops below 2°F and trips after the programmed trip time has passed. The fault resets if the superheat rises above 2°F and will lockout after three shutdowns in 90 minutes. Only active when EEV is selected.

SYS	1	LOW	DSCH	SHEAT
SYS	2	LOW	DSCH	SHEAT

System Discharge Superheat drops below 18°F and trips after 5 minutes have passed. The fault resets if the superheat rises above 18°F and will lockout after three shutdowns in 90 minutes. Only active when Discharge Temperature Sensors are enabled.

SYS	1	SENSOR	FAILURE
SYS	2	SENSOR	FAILURE

The Sensor Failure Cutout is to prevent the EEV from running when the sensors measuring superheat are not functioning properly. This safety is only active when EEV is selected as the expansion valve type. This Sensor Failure is ignored for the first 15 seconds of system run time.

If either the suction temperature, or suction pressure sensors, read out of range high or low for 3 seconds, the system will shut down. This safety will lock out on the first time and will not automatically restart.

SYS	1	ATV	SUCT	PRESS
SYS	2	ATV	SUCT	PRESS

If a system is running the system will shut down when the suction pressure falls below the anti-vacuum low pressure cut out for more than programmed Anti-Vacuum Delay Time. If the system is not running, the system is inhibited from starting if the suction pressure is below the anti-vacuum low pressure cutout.

This fault is a standard system fault (lockout 3 times in 90 minutes and the fault cannot be reset until the fault condition is resolved).

Unit Safeties

Unit safeties are faults that cause all running compressors to be shut down. Unit faults are auto reset faults in that the unit will be allowed to restart automatically after the fault condition is no longer present.

**UNIT FAULT :
LOW AMBIENT TEMP**

The Low Ambient Temp Cutout is a safety shutdown designed to protect the chiller from operating in a low ambient condition. If the outdoor ambient temperature falls below the programmable cutout, the chiller will shut down. Restart can occur when temperature rises 2°F above the cutoff.

**UNIT FAULT :
LOW LIQUID TEMP**

The Low Leaving Chilled Liquid Temp Cutout protects the chiller from an evaporator freeze-up should the chilled liquid temperature drop below the freeze point. This situation could occur under low flow conditions or if the micro panel set point values are improperly programmed. Anytime the leaving chilled liquid temperature (water or glycol) drops below the cutout point, the chiller will shutdown. Restart can occur when chilled liquid temperature rises 2°F above the cutout.

**UNIT FAULT :
CHECK LIQ TEMP SENS**

If the leaving chilled liquid temperature rises over 2.0°F above the entering chilled liquid temperature for 60 continuous seconds, the chiller shuts down. This fault activates when the unit is running, and the control panel is programmed for leaving chiller liquid temperature control. If the Entering Chilled Liquid Temperature Sensor is disabled under Unit Setup, this fault is disabled. This fault requires a manual reset to restart the unit.

**UNIT FAULT :
PUMP TRIP**

On units with one pump: This indicates that the manual motor starter protecting the pump from short circuit or overload conditions has tripped or been set to OFF. Setting the device to ON resets the trip. On units with two pumps, duty and standby: This indicates that both the manual motor starters protecting the pumps from short circuit or overload conditions have

tripped or both have been set to OFF. Setting at least one of the devices to ON resets the trip.

**UNIT FAULT :
PUMP FAIL MAKE FLOW**

On units with one pump: After the 30 second stop to start timer has timed out, the pump is started if there is a Leaving Liquid Temperature Cutout, or any of the compressors are running, or with the daily schedule not calling for a shutdown with the unit switch on and the remote stop/start input closed. If the flow switch does not close within 10 seconds, the unit locks out on UNIT FAULT: PUMP FAIL MAKE FLOW and the pump is stopped. Setting the unit switch to OFF then back to ON resets the trip. On units with two pumps, duty and standby: After the 30 second stop to start timer has timed out, the pump is started if there is a Leaving Liquid Temperature Cutout, or any of the compressors are running, or with the daily schedule not calling for a shutdown with the unit switch on and the remote stop/start input closed. If the flow switch does not close within 10 seconds the running pump is stopped and the standby pump is started. If in a further 10 seconds the flow switch does not close the unit locks out on UNIT FAULT: PUMP FAIL MAKE FLOW and the running pump is stopped. Setting the unit switch to OFF, then back to ON resets the trip. In attempting to clear this fault check that one of the manual motor starters protecting the pumps has not tripped.

**UNIT FAULT :
115VAC UNDER VOLTAGE**

The Under Voltage Safety ensures that the system is not operated at voltages where malfunction of the microprocessor could result in system damage. When the 115 VAC to the micro panel drops below a certain level, a unit fault is initiated to safely shut down the unit. Restart is allowed after the unit is fully powered again and the anti-recycle timers have finished counting down.

**UNIT FAULT :
HIGH MTR CURR**

When the CURRENT FEEDBACK ONE PER UNIT option is selected under the OPTIONS key, the unit will shut down when the voltage exceeds the programmed trip voltage for 5 seconds.

The trip voltage is programmed at the factory according to compressor or unit RLA.

Restart occurs after the anti-recycle timer times out.

Unit warning

The following messages are not unit safeties and will not be logged to the history buffer. They are unit warnings and will not auto-restart. Operator intervention is required to allow a restart of the chiller.

!! LOW BATTERY !!
CHECK PROG / SETP / OPTN

The Low Battery Warning can only occur at unit power-up. On micro panel power-up, the RTC battery is checked. If a low battery is found, all programmed setpoints, program values, options, time, schedule, and history buffers will be lost. These values will all be reset to their default values which may not be the required operating values. Once a faulty battery is detected, the unit will be prevented from running until the PROGRAM key is pressed. Once PROGRAM is pressed the anti-recycle timers will be set to the programmed anti-recycle time to allow the operator time to check setpoints, and if necessary, reprogram programmable values and options.

If a low battery is detected, it should be replaced as soon as possible. The programmed values will all be lost and the unit will be prevented from running on the next power interruption. The RTC/battery (031-02565-000) is located at U5 on the microboard.

INCORRECT
UNIT TYPE

This indicates the condensing unit jumper is installed between J11-12 and J11-7. This jumper must be removed to operate the chiller.

Resetting system lockout faults

If three faults on the same system occur within 90 minutes, that system will be locked out on the last fault. This condition requires a manual reset. The system switch (under OPTIONS key) must be turned off and then back on to clear the lockout fault. Fault messages will be displayed whenever a system is locked out.

System safety

Discharge pressure cutout

When the operating envelope is disabled, the discharge

pressure cutout is the programmable cutout.

When the operating envelope is a standard operating envelope and the suction pressure is less than 94.0 psig, the discharge pressure cutout will be set to 10 psig above the discharge pressure unload limit.

When the operating envelope is an extended operating envelope and the suction pressure is less than 42.0 psig, the discharge pressure cutout will be set to 10 psig above the discharge pressure unload limit.

The system will shut down when the discharge pressure cutout, as determined above, is exceeded. The system can be restarted when the discharge pressure falls below the cutout of minus 40 psig.

SYS 1 HIGH DSCH PRES
SYS 2 HIGH DSCH PRES

Suction pressure cutout

The Suction Pressure Cutout protects the chiller from an evaporator freeze-up should the system attempt to run with a low refrigerant charge. Following are the messages for both systems.

SYS 1 LOW SUCT PRESS
SYS 2 LOW SUCT PRESS

At system start, the cutout is set to 10% of programmed value. During the next 3 minutes the cutout point is ramped up to the programmed cutout point. If at any time during the 3 minutes the suction pressure falls below the ramped cutout point, the system will stop. This cutout is completely ignored for the first 30 seconds of system run time to avoid nuisance shutdowns, especially on units with a low pressure switch.

After the first 3 minutes, if the suction pressure falls below the programmed cutout setting, a transient protection routine is activated. This sets the cutout at 10% of the programmed value and ramps up the cutout over the next 30 seconds. If at any time during the 30 seconds the suction pressure falls below the ramped cutout, the system will stop. This transient protection scheme only works if the suction pressure transducer is installed.

Motor protector/high pressure cutout fault

The Motor Protector/High Pressure Cutout protects the motor from overheating or the system from experiencing dangerously high discharge pressure. This fault condition is present when CR1 (SYS 1) or CR2 (SYS

2) opens causing 0 VDC to be read on the input. The fault condition is cleared and will allow to restart the system when a 30 VDC signal is restored to the input by closing CR1 or CR2. This fault will shut down the system 0.5 seconds after the relay opens. This fault will only occur when a system is running. Following are the messages for both systems.

```
SYS 1 MP / HPCO FAULT
SYS 2 MP / HPCO FAULT
```

Motor protector/high pressure cutout inhibit

The Motor Protector/High Pressure Cutout Inhibit prevents the system from trying to start when a motor protector is faulted or the mechanical high pressure cutout is open. This inhibit condition is present when CR1 (SYS 1) or CR2 (SYS 2) opens causing 0 VDC to be read on the input. The inhibit condition is cleared and will allow to restart the system when a 30 VDC signal is restored to the input by CR1 or CR2 closing. This inhibit will only occur when a system is not running. Following are the messages for both systems.

```
SYS 1 MP / HPCO INHIB
SYS 2 MP / HPCO INHIB
```

High motor current

The Motor Protector/High Pressure Cutout Inhibit prevents the system from starting when a motor protector is faulted or the mechanical high pressure cutout is open. This inhibit condition is present when CR1 (sys 1) or CR2 (sys 2) opens, causing 0 V to be read on the input. The inhibit condition is cleared and allows the system to start when a 30 V signal is restored to the input by CR1 or CR2 closing. This inhibit only occurs when a system is not running. The following are the messages for both systems.

```
SYS 1 HIGH MTR CURR
SYS 2 HIGH MTR CURR
```

Low superheat cutout (EEV mode only)

The Low Superheat Cutout protects the compressors from liquid flowing back due to low suction superheat. This safety is only active when EEV is selected as the expansion valve type. This safety is ignored for the first 15 seconds of system run time.

Two events can trigger this safety. The first event is when the suction superheat is lower than 2.0°F for 3 seconds. The second event is when the LLSV is closed 10 times in 2 minutes due to low superheat. See the LLSV control section for further details. Following are the messages for all systems.

```
SYS 1 LOW SUPERHEAT
SYS 2 LOW SUPERHEAT
```

Sensor failure cutout (EEV mode only)

The Sensor Failure Cutout prevents the EEV from running when the sensors measuring superheat are not functioning properly. This safety is only active when EEV is selected as the expansion valve type. This safety is ignored for the first 15 seconds of system run time. This safety will shut down a system if either the suction temperature or suction pressure sensors read out of range high or low. The condition must be present for 3 seconds, to cause a system shutdown. This safety will lock out a system the first time and will not allow automatic restarting. Following are the messages for all systems.

```
SYS 1 SENSOR FAILURE
SYS 2 SENSOR FAILURE
```

Anti-vacuum low pressure cutout

When the suction pressure falls below the anti-vacuum low pressure cutout for more than the programmed delay time 3 times in 90 minutes, this safety will shut down a system. This fault is a standard system fault. Following are the messages for both systems.

```
SYS 1 ATV SUCT PRESS
SYS 2 ATV SUCT PRESS
```

Fault and inhibit codes and reset

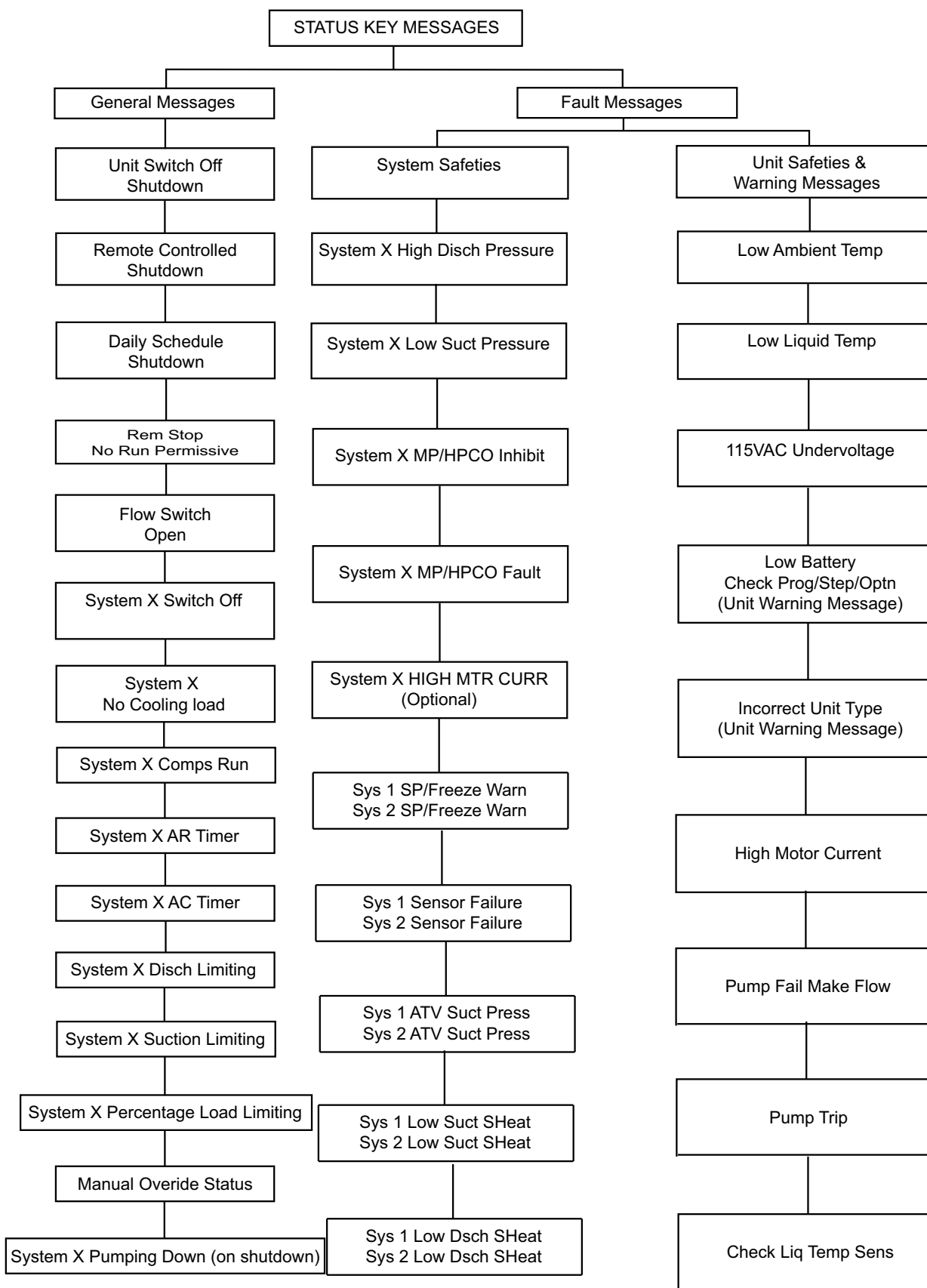
Table 14 on page 122 shows the fault and inhibit codes and how to reset them. There are three ways to reset the fault and inhibit. See on page 103 for more information.

Table 15: QTC3 Fault and Inhibit Codes

Code	Type	Fault or Inhibit Description	Auto, 1x, 3x See Table 16
2	Unit Fault	Low Ambient Temperature	Auto
4	Unit Fault	Low Leaving Chilled Liquid Temperature	Auto
22	Unit Fault	Unit High Motor Current (Unit Current Feedback Option)	Auto
27	Unit Fault	Pump Trip (Hydro Pumps 1 or Hydro Pumps 2)	Auto
28	Unit Fault	Pump Flow Failure (Hydro Pumps 1 or Hydro Pumps 2)	1x
29	Unit Fault	High Ambient Temperature	Auto
31	Unit Fault	Flow Switch Open	Auto
5	System Fault	High Discharge Pressure (Software)	3x
7	System Fault	Low Suction Pressure	3x
17	System Fault	System High Motor Current (System Current Feedback option)	3x
18	System Fault	Motor Protector/High Pressure (Mechanical)	3x
19	System Fault	Low Evaporator Temperature (R407c Only - N/A Hp Heating Mode)	3x
23	System Fault	Low Suction Superheat (EEV)	3x
24	System Fault	Sensor Failure (EEV)	1x
25	System Fault	Discharge Inhibit (Heat Pump heating mode only)	3x
26	System Inhibit	Motor Protector/High Pressure Inhibit	Auto
30	System Inhibit	Anti-Vacuum Low Pressure Cutout	3x
32	System Inhibit	Leaving Chilled Liquid Temperature Sensor Fault	3x
33	System Inhibit	Low Discharge Superheat	Auto

Table 16: Legend

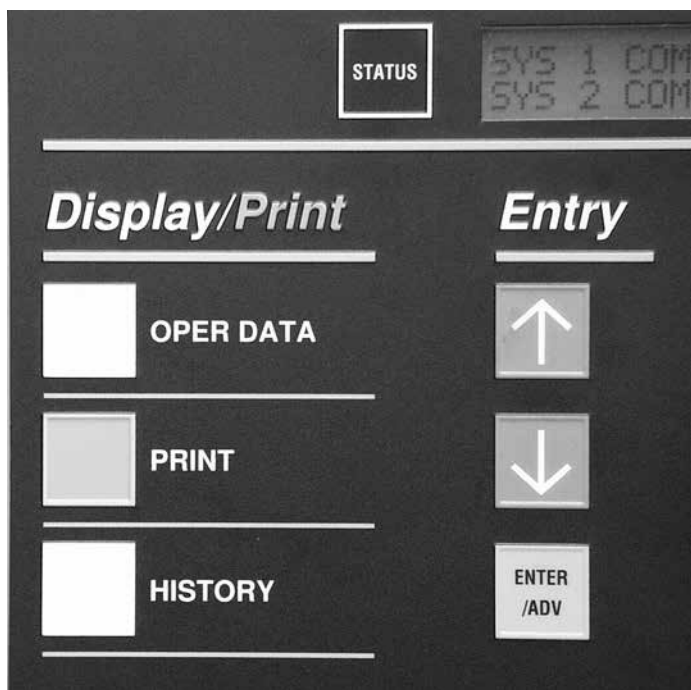
Type	Definition
3x	Automatically restarts on the first and second fault with a lockout on the third fault in 90 minutes
1x	Locks out on the first fault
Auto	Allows restart once meeting the required conditions



LD11297B

Figure 43: Status Key Messages Quick Reference List

Display/print keys



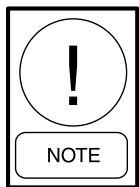
00067VIP

The Display/Print keys allow the user to retrieve system and unit information that is useful for monitoring chiller operation, diagnosing potential problems, troubleshooting, and commissioning the chiller.

System and unit information, unit options, setpoints, and scheduling can also be printed out with the use of a printer. Both real-time and history information are available.

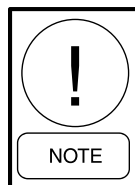
Oper data key

The OPER DATA key gives the user access to unit and system operating parameters. When the OPER DATA key is pressed, system parameters will be displayed and remain on the display until another key is pressed. After pressing the OPER DATA key, the various operating data screens can be scrolled through by using the ↑ (UP) and ↓ (DOWN) arrow keys or the ENTER/ADV key located under the “ENTRY” section.



System 2 information will only be displayed for 2 system units.

With the “UNIT TYPE” set as a liquid chiller (no jumper from J11-7 to J11-12 on the I/O Board), the following list of operating data screens are viewable under the OPER DATA key in the order that they are displayed. The ↓ (DOWN) arrow key scrolls through the displays in the order they appear below:



The chiller MUST be set to be a liquid chiller (no jumper from J11-7 to J11-12 on the I/O Board). DO NOT operate the chiller if not properly set up.

LCHLT = 46.2 °F
RCHLT = 57.4 °F

This display shows chilled leaving and return liquid temperatures. The minimum limit on the display for these parameters are 2.2 °F (-19 °C). The maximum limit on the display is 140 °F (60 °C).

AMBIENT AIR TEMP
= 87.5 °F

This display shows the ambient air temperature. The minimum limit on the display is 0.4°F (-17.6°C). The maximum limit on the display is 131.2°F (55.1°C).

S Y S X S P = 7 2 . 1 P S I G
D P = 2 2 7 . 0 P S I G

These displays show suction and discharge pressures for each system. The discharge pressure transducer is optional on some models.

If the optional discharge transducer is not installed, the discharge pressure would display 0 PSIG (0 barg).

The minimum limits for the display are:

- Suction Pressure: 0 psig (0 barg)
- Discharge Pressure: 0 psig (0 barg)

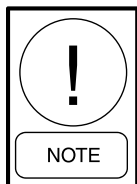
The maximum limits for the display are:

- Suction Pressure: 400 psig (27.58 barg)
- Discharge Pressure: 650 psig (44.82 barg)

S Y S X H O U R S 1 = X X X X X
2 = X X X X X, 3 = X X X X X

S Y S X S T A R T S 1 = X X X X X
2 = X X X X X, 3 = X X X X X

The above two messages will appear sequentially for each system. The first display shows accumulated running hours of each compressor for the specific system. The second message shows the number of starts for each compressor on each system.



Run times and starts will only be displayed for the actual number of systems and compressors on the unit.

A total of 99,999 hours and starts can be logged before the counter rolls over to “0”.

L O A D T I M E R 5 8 S E C
U N L O A D T I M E R 0 S E C

This display of the load and unload timers indicate the time in seconds until the unit can load or unload. Whether the systems loads or unloads is determined by how far the actual liquid temperature is from setpoint. A detailed description of unit loading and unloading is covered under the topic of Capacity Control.

C O O L I N G D E M A N D
2 O F 8 S T E P S

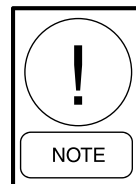
The display of COOLING DEMAND indicates the current “step” in the capacity control scheme when in Return Water Control Mode. The number of available steps are determined by how many compressors are in the unit. In the above display, the “2” does not mean that two compressor are running but only indicates that the capacity control scheme is on step 2 of 8. Capacity Control is covered in more detail in this publication which provides specific information on compressor staging (for Return Water Control only).

T E M P E R R O R X X X . X ° F
T E M P R A T E X X X . X ° F / M

The COOLING DEMAND message will be replaced with this message when Leaving Chilled liquid control is selected. This message indicates the temperature error and the rate of change of the chilled liquid temperature.

L E A D S Y S T E M I S
S Y S T E M N U M B E R 2

This display indicates the current LEAD system. In this example system 2 is the LEAD system, making system 1 the LAG system. The LEAD system can be manually selected or automatic. See the programming under the *Options key on page 158*. The Lead System display will only appear on a two system unit.



A unit utilizing hot gas bypass should be programmed for MANUAL with system 1 as the lead system. Failure to do so will prevent hot gas operation if system 2 switches to the lead system when programmed for AUTOMATIC LEAD/LAG.

E V A P O R A T O R H E A T E R
S T A T U S I S = X X X

This display indicates the status of the evaporator heater. The evaporator heater is controlled by ambient air temperature. When the ambient temperature drops below 40°F the heater is turned ON. When the temperature rises above 45°F the heater is turned OFF. An under voltage condition will keep the heater OFF until full voltage is restored to the system.

```

E V A P O R A T O R   W A T E R
P U M P           S T A T U S       = X X X X

```

The evaporator pump dry contacts are energized when any compressor is running, or the unit is not OFF on the daily schedule and the unit switch is ON, or the unit has shutdown on a Low Leaving Chilled Liquid fault. However, even if one of above is true, the pump will not run if the micro panel has been powered up for less than 30 seconds or if the pump has run in the last 30 seconds to prevent pump motor overheating.

```

E V A P   P U M P   T O T A L   R U N
H O U R S                               = X X X X X

```

The Evaporator Pump Total Run Hours display indicates the total pump run hours. Total hours continually increments similar to Compressor Run Hours. If dual pumps are fitted, run hours indicates total hours on both pumps.

```

A C T I V E   R E M O T E   C T R L
                N O N E

```

There are several types of remote systems that can be used to control or monitor the unit. The following messages indicate the type of remote control mode active:

NONE – no remote control active. Remote monitoring may be via ISN.

ISN – YORKTalk via ISN allows remote load limiting and temperature reset through an ISN system.

LOAD LIM – Load limiting enabled using contact closure.

PWM TEMP – EMS temperature reset

**See Remote BAS/EMS temperature reset using a voltage or current signal on page 180.*

```

S Y S   X   C O M P   S T A T U S
1 = X X X   2 = X X X   3 = X X X

```

```

S Y S   X   R U N       T I M E
X X - X X - X X - X X   D - H - M - S

```

```

S Y S   X   L L S V   I S   O N
H O T   G A S   S O L   I S   O F F

```

```

S Y S   X   F A N   S T A G E   3

```

```

S Y S   X   A M P S   =   3 6 . 0
                V O L T S   =   0 . 8

```

The preceding five messages will appear sequentially, first for system 1, then for system 2.

The first message indicates the system and the associated compressors which are running.

The second message indicates the system run time in days – hours – minutes – seconds. Note that this is not accumulated run time but pertains only to the current system cycle.

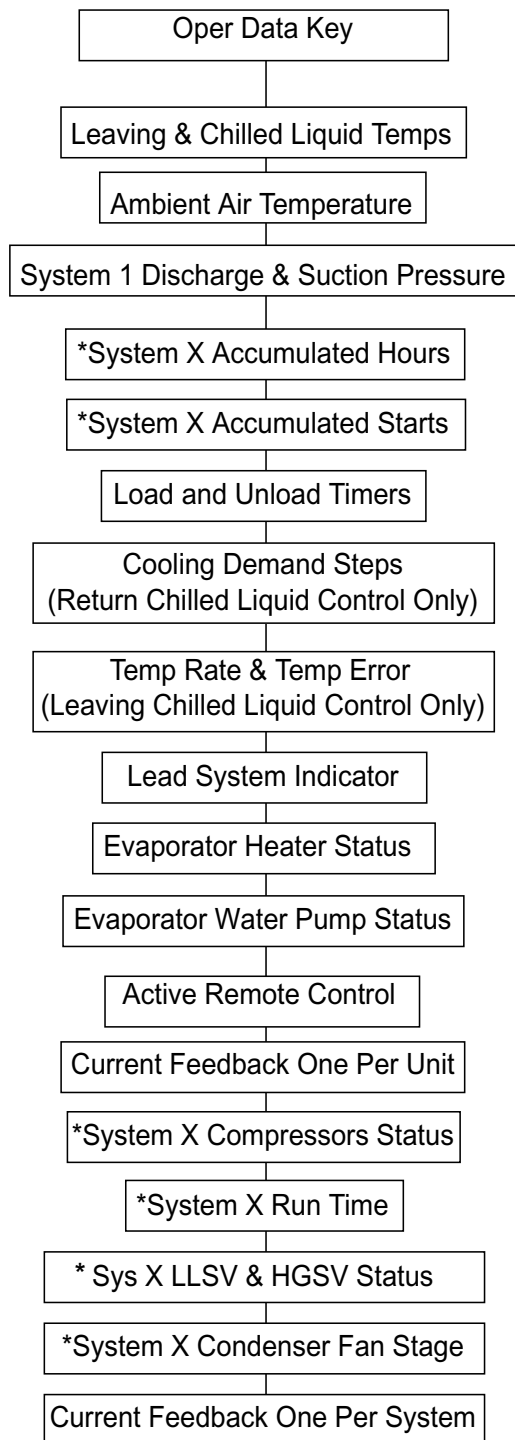
The third message indicates the system, and whether the liquid line solenoid or EEV pilot solenoid and hot gas solenoid are being turned ON by the microboard. Note that hot gas is not available for system 2, so there is no message pertaining to the hot gas solenoid when system 2 message is displayed.

The fourth message indicates the stage of condenser fan operation that is active.

See *Standard condenser fan control on page 175* for more information.

Oper data quick reference list

The following table is a quick reference list for information available under the OPER DATA key.



* Block of information repeats for each system

LD12585

Figure 44: Operation data

Print key

The PRINT key allows the operator to obtain a printout of real-time system operating data or a history printout of system data at the “instant of the fault” on the last six faults which occurred on the unit. An optional printer is required for the printout.

Operating data printout

Pressing the PRINT key and then OPER DATA key allows the operator to obtain a printout of current system operating parameters. When the OPER DATA key is pressed, a snapshot will be taken of system operating conditions and panel programming selections. This data will be temporarily stored in memory and transmission of this data will begin to the printer. A sample Operating Data printout is shown below. (Note: Not all values are printed for all models.)

```

JOHNSON CONTROLS INTERNATIONAL
CORPORATION
MILLENNIUM LIQUID CHILLER
UNIT STATUS
2:04PM 01 OCT 07
SYS 1 NO COOLING LOAD
SYS 2 COMPRESSORS RUNNING 2
OPTIONS
CHILLED LIQUID WATER
AMBIENT CONTROL STANDARD
LOCAL/REMOTE MODE REMOTE
CONTROL MODE LEAVING LIQUID
LEAD/LAG CONTROL AUTOMATIC
FAN CONTROL AMB & DSCH PRESS
CURRENT FEEDBACK NONE
POWER FAILURE RESTART AUTOMATIC
SOFT START ENABLED
EXPANSION VALVE THERMOSTATIC
REMOTE TEMP RESET 4 TO 20 MA
PROGRAM VALUES
DSCH PRESS CUTOUT 570 PSIG
SUCT PRESS CUTOUT 80 PSIG
SUCT PRESS CUT COOLING 42 PSIG
SUCT PRESS CUT HEATING 31 PSIG
LOW AMBIENT CUTOUT 25.0 DEGF
LEAVING LIQUID CUTOUT 25.0 DEGF
ANTI RECYCLE TIME 600 SECS
FAN CONTROL ON PRESS 425 PSIG
FAN DIFF OFF PRESS 125 PSIG
NUMBER OF COMPRESSORS 6
NUMBER OF FANS PER SYSTEM 4
UNIT TRIP VOLTS 3.0
REFRIGERANT TYPE R-22
DEFROST INIT TEMP 41.0 DEGF
DEFROST INITIATION TIME 60MIN
DEFROST TERMINATION TIME 3MIN
BIVALENT HEAT DELAY TIME 30 MIN
REMOTE UNIT ID PROGRAMMED 2
QUANTECH HYDRO KIT PUMPS 1(410a)
PUMP TOTAL RUN HOURS XXXXX (410a)
UNIT DATA
RETURN LIQUID TEMP 58.2 DEGF
LEAVING LIQUID TEMP 53.0 DEGF
  
```

```

DISCHARGE AIR TEMP      55.3 DEGF
COOLING RANGE    42.0 +/- 2.0 DEGF
HEATING RANGE   122.0 +/- 2.0 DEGF
SYS 1 SETPOINT   70 +/- 3 PSIG
SYS 2 SETPOINT   70 +/- 3 PSIG
REMOTE SETPOINT   44.0 DEGF
AMBIENT AIR TEMP  74.8 DEGF
LEAD SYSTEM              SYS 2
EVAPORATOR PUMP              ON
EVAPORATOR HEATER            OFF
ACTIVE REMOTE CONTROL        NONE
LAST DEFROST SYS X DURATION  XXXS
TIME TO SYS X DEFROST        XX MIN
BIVALENT DELAY REMAINING XX MIN
UNIT   XXX.X AMPS           X.X VOLTS
SOFTWARE VERSION    C.M02.13.00

```

SYSTEM 1 DATA

```

COMP STATUS  1=OFF 2=OFF 3=OFF
RUN TIME     0- 0- 0- 0 D-H-M-S
TIME YYYYYY 0- 0- 0- 0 D-H-M-S
LAST STATE   YYYYYYY
SUCTION PRESSURE    105 PSIG
DISCHARGE PRESSURE  315 PSIG
SUCTION TEMPERATURE 46.0 DEGF
SAT SUCTION TEMP    34.0 DEGF
SUCTION SUPERHEAT   12.0 DEGF
COOLER INLET REFRIG 31.6 DEGF
DEFROST TEMPERATURE 52.8 DEGF
LIQUID LINE SOLENOID OFF
MODE SOLENOID       OFF
HOT GAS BYPASS VALVE OFF
CONDENSER FAN STAGE OFF
EEV OUTPUT          0.0 %
SYSTEM              XXX.X AMPS X.X VOLTS

```

SYSTEM 2 DATA

```

COMP STATUS  1=ON, 2=OFF, 3=ON
RUN TIME     0-0-1-46 D-H-M-S
TIME YYYYYY  0-0-0-0 D-H-M-S
LAST STATE   YYYYYYY
SUCTION PRESSURE    110 PSIG
DISCHARGE PRESSURE  320 PSIG
SUCTION TEMPERATURE 49.3 DEGF
SAT SUCTION TEMP    36.0 DEGF
SUCTION SUPERHEAT   13.3 DEGF
COOLER INLET REFRIG 31.6 DEGF
DEFROST TEMPERATURE 52.8 DEGF
LIQUID LINE SOLENOID ON
MODE SOLENOID       ON
CONDENSER FAN STAGE 3
EEV OUTPUT          63.2%
SYSTEM              XXX.X AMPS X.X VOLTS

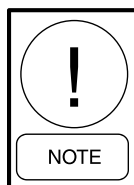
```

DAILY SCHEDULE

```

S M T W T F S      *=HOLIDAY
SUN  START=00:00AM  STOP=00:00AM
MON  START=00:00AM  STOP=00:00AM
TUE  START=00:00AM  STOP=00:00AM
WED  START=00:00AM  STOP=00:00AM
THU  START=00:00AM  STOP=00:00AM
FRI  START=00:00AM  STOP=00:00AM
SAT  START=00:00AM  STOP=00:00AM
HOL  START=00:00AM  STOP=00:00AM

```



See Optional printer installation on page 191 for Printer Installation information.

History printout

Pressing the PRINT key and then the HISTORY key allows the operator to obtain a printout of information relating to the last 9 Safety Shutdowns which occurred. The information is stored at the instant of the fault, regardless of whether the fault caused a lockout to occur. The information is also not affected by power failures (long-term internal memory battery backup is built into the circuit board) or manual resetting of a fault lockout.

When the HISTORY key is pressed, a printout is transmitted of all system operating conditions which were stored at the “instant the fault occurred” for each of the 9 Safety Shutdowns buffers. The printout will begin with the most recent fault which occurred. The most recent fault will always be stored as Safety Shutdown No. 1. identically formatted fault information will then be printed for the remaining safety shutdowns.

Information contained in the Safety Shutdown buffers is very important when attempting to troubleshoot a system problem. This data reflects the system conditions at the instant the fault occurred and often reveals other system conditions which actually caused the safety threshold to be exceeded.

The history printout is similar to the operational data printout shown in the previous section. The differences are in the header and the schedule information. The daily schedule is not printed in a history print.

One example history buffer printout is shown following. The data part of the printout will be exactly the same as the operational data print so it is not repeated here. The difference is that the Daily Schedule is not printed in the history print and the header will be as follows.

```

JOHNSCON CONTROLS INTERNATIONAL
CORPORATION
MILLENNIUM LIQUID CHILLER
SAFETY SHUTDOWN NUMBER 1
SHUTDOWN @ 3:56PM 29 SEP 07
SYS 1   HIGH DSCH PRESS SHUTDOWN
SYS 2                               NO FAULTS

```

History displays

The HISTORY key gives the user access to many unit and system operating parameters at the time of a unit or system safety shutdown. When the HISTORY key is pressed the following message is displayed.

```
DISPLAY SAFETY SHUT-  
DOWN NO. 1 (1 TO 9)
```

While this message is displayed, the ↑ (UP) arrow key can be used to select any of the six history buffers. Buffer number 1 is the most recent, and buffer number 6 is the oldest safety shutdown that was saved.

After selecting the shutdown number, pressing the ENTER key displays the following message which shows when the shutdown occurred.

```
SHUTDOWN OCCURRED  
03:56 PM 29 JAN 02
```

The ↑ (UP) and ↓ (DOWN) arrow keys are used to scroll forward and backward through the history buffer to display the shutdown conditions stored at the instant the fault occurred. The ↓ (DOWN) arrow key scrolls through the displays in the order they appear below:

```
UNIT FAULT :  
LOW LIQUID TEMP
```

Displays the type of fault that occurred.

```
UNIT TYPE  
LIQUID CHILLER
```

Displays the type of chiller; Liquid, Condensing Unit or Heat Pump.

```
CHILLED LIQUID  
XXXXX
```

Displays the chilled liquid type; Water or Glycol.

```
AMBIENT CONTROL  
XXXXXXXXXX
```

Displays the type of Ambient Control; Standard or Low Ambient.

```
LOCAL / REMOTE MODE  
XXXXXXXXXX
```

Displays Local or Remote control selection.

```
CONTROL MODE  
LEAVING LIQUID
```

Displays the type of chilled liquid control; Leaving or Return.

```
LEAD / LAG CONTROL  
XXXXXXXXXX
```

Displays the type of lead/lag control; Manual System 1, Manual System 2 or Automatic. This is only selectable on 2-system chillers.

```
FAN CONTROL  
DISCHARGE PRESSURE
```

Displays the type of fan control; Discharge Pressure or Ambient and Discharge Pressure.

```
MANUAL OVERRIDE MODE  
XXXXXXXXXX
```

Displays whether Manual Override was Enabled or Disabled.

```
SOFT START  
XXXXXXXXXX
```

Displays whether the optional European Soft Start was installed and selected.

```
DISCHARGE PRESSURE  
CUTOUT = XXXX PSIG
```

Displays the programmed Discharge Pressure Cutout.

```
SUCTION PRESSURE  
CUTOUT = XXXX PSIG
```

Displays the programmed Suction Pressure Cutout.

```
LOW AMBIENT TEMP  
CUTOUT = XXX.X °F
```

Displays the programmed Low Ambient Cutout.

LEAVING LIQUID TEMP
CUTOUT = XXX.X °F

Displays the Leaving Liquid Temp. Cutout programmed.

FAN CONTROL ON
PRESSURE = XXX PSIG

Displays the programmed Fan On Pressure.

FAN DIFFERENTIAL OFF
PRESSURE = PSIG

Displays the programmed Fan Off Differential.

SYS 1 TRIP VOLTS
= X.X VOLTS

Displays the programmed High Current Trip Voltage.

SYS 2 TRIP VOLTS
= X.X VOLTS

Displays the programmed High Current Trip Voltage.

YORK HYDRO
KIT PUMPS = X

Indicates the Pump Control option is selected.

LCHLT = XXX.X °F
RCHLT = XXX.X °F

Displays the Leaving and Return chilled Liquid Temperature at the time of the fault.

SETPOINT = XXX.X °F
RANGE = + / - °F

Displays the programmed Setpoint and Range, if the chiller is programmed for leaving chilled liquid control.

SETPOINT = XXX.X °F
RANGE = + XX.X °F

Displays the programmed Setpoint and Range, if the chiller is programmed for return chilled liquid control.

AMBIENT AIR TEMP
= XXX.X °F

Displays the Ambient Temp. at the time of the fault.

LEAD SYSTEM IS
SYSTEM NUMBER X

Displays which system is in the lead at the time of the fault.

EVAPORATOR HEATER
STATUS IS XXX

Displays status of the Evaporator Heater at the time of the fault.

EVAPORATOR WATER
PUMP STATUS XXXX

Displays status of Evaporator Water Pump at the time of fault. Status may read ON, OFF or trip.

EVAP PUMP TOTAL RUN
HOURS = XXXX

Evap Pump total run hours at the time of fault.

ACTIVE REMOTE CTRL
XXXX

Displays whether Remote Chiller Control was active when the fault occurred.

SYS X COMP STATUS
1 = XXX 2 = XXX 3 = XXX

Displays which Compressors were running in the system when the fault occurred.

SYS X RUN TIME
XX - XX - XX - XX D - H - M - S

Displays the system run time when the fault occurred.

SYS X SP = XXXX PSIG
DP = XXXX PSIG

Displays the system Suction and Discharge Pressure of the time of the fault.

SYS X SUCT = XXX.X °F
SAT SUCT = XXX.X °F

Displays the System Suction Temp and Saturated Suction Temp when an EEV is installed.

```
SYS  X  LLSV  IS  XXX
HOT  GAS  SOL  IS  XXX
```

Displays whether the System Liquid Line Solenoid or Hot Gas Solenoid was energized at the time of the fault.

```
SYS  X  FAN  STAGE  XXX
```

Displays the number of Fan Stages in the system active at the time of the fault.

```
SYS  X  ACTUAL  AMPS
      = XXX . X  AMPS
```

Software version

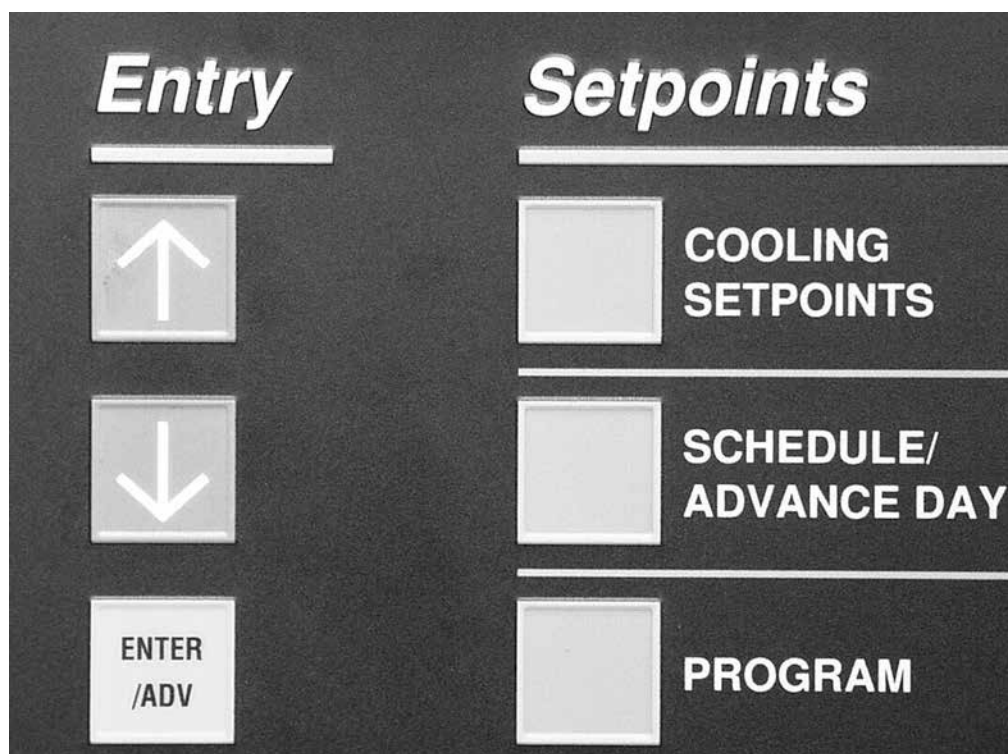
The software version may be viewed by first pressing the HISTORY key and then repeatedly pressing the ↓ (DOWN) arrow key until you scroll past the first history buffer choice.

```
DISPLAY SAFETY SHUT -
DOWN NO . 1 ( 1 TO 6 )
```

After the ↓ (DOWN) arrow key is pressed again, the software version will appear.

```
CONTROL          C.MXX.ZZ.YY
I / O            C.MXX.18.YY
```

Entry keys



00068VIP

The Entry Keys allows the user to view, change programmed values. The ENTRY keys consist of an ↑ (UP) arrow key, ↓ (DOWN) arrow key, and an ENTER/ADV key.

Up and down arrow keys

Used in conjunction with the OPER DATA, HISTORY, COOLING SETPOINTS, SCHEDULE/ADVANCE DAY, OPTIONS, and CLOCK keys, the ↑ (UP) and ↓ (DOWN) arrow keys allow the user to scroll through the various data screens. See *Display/print keys on page 140* for specific information on the displayed information and specific use of the ↑ (UP) and ↓ (DOWN) arrow keys.

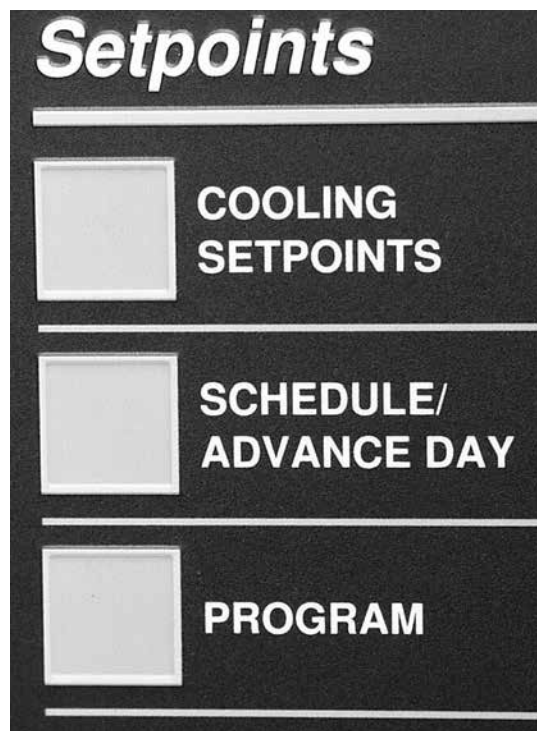
The ↑ (UP) arrow key, and ↓ (DOWN) arrow key are also used for programming the control panel such as changing numerical or text values when programming cooling setpoints, setting the daily schedule, changing safety setpoints, chiller options, and setting the clock.

Enter/ADV key

The ENTER/ADV key must be pushed after any change is made to the cooling setpoints, daily schedule, safety setpoints, chiller options, and the clock. Pressing this key “enters” the new values into memory. If the ENTER/ADV key is not pressed after a value is changed, the changes will not be “entered” and the original values will be used to control the chiller.

Programming and a description on the use of the ↑ (UP) arrow key, and ↓ (DOWN) arrow, and ENTER/ADV keys are covered in detail under the SETPOINTS, and UNIT keys.

Setpoints keys



00069VIP

Programming of the cooling setpoints, daily schedule, and safeties is accomplished by using the keys located under the SETPOINTS section.

The three keys involved are labeled COOLING SETPOINTS, SCHEDULE/ADVANCE DAY, and PROGRAM.

Following are instructions for programming the respective setpoints. The same instruction should be used to view the setpoints with the exception that the setpoint will not be changed.

Cooling Setpoints

The Cooling Setpoint and Range can be programmed by pressing the COOLING SETPOINTS key. The cooling mode (leaving chilled liquid or return chilled liquid) will be displayed for a few seconds, and the setpoint display entry screen will appear.

Leaving chilled liquid control

SETPOINT = 45.0 ° F
RANGE = +/- 2.0 ° F

The above message shows the current chilled water temperature SETPOINT at 45.0°F (notice the cursor positioned under the number 0). Pressing either the ↑ (UP) or ↓ (DOWN) arrow will change the setpoint in 0.5°F increments. After using the ↑ (UP) or ↓ (DOWN) arrow keys to adjust to the required setpoint, the ENTER/ADV key must be pressed to enter this number into memory and advance to the RANGE SETPOINT.

Entry of the setpoint will be indicated by the cursor moving under the current RANGE setpoint. The ↑ (UP) and ↓ (DOWN) arrow keys are used to set the RANGE, in 0.5°F increments, to the required RANGE setpoint. After adjusting the setpoint, the ENTER/ADV key must be pressed to enter the data into memory.

Notice that the RANGE was programmed for +/- X.X°F. This indicates the SETPOINT to be in the

center of the control range. If the control mode has been programmed for RETURN LIQUID control, the message below would be displayed in place of the previous message.

When in leaving chilled liquid temperature control, the microprocessor will attempt to control the leaving water temperature within the temperature range of the setpoint + or – the range. In the above example, control will be in the range of 43°F to 47°F.

Return chilled liquid control

```
SETPOINT = 45.0 °F
RANGE = +10.0 °F
```

In return chilled liquid control, the range no longer has a +/- X.X°F, but only a + X.X°F RANGE setpoint. This indicates that the setpoint is not centered within the RANGE but could be described as the bottom of the control range. A listing of the limits and the programmable values for the COOLING SETPOINTS are shown in *Table 23 on page 173*.

The SETPOINT and RANGE displays just described were based on LOCAL control. If the unit was programmed for REMOTE control (under the OPTIONS key), the above programmed setpoints would have no effect.

When in return chilled liquid temperature control, the microprocessor will turn all compressors OFF at setpoint and will turn compressors ON as return chilled liquid temperature rises. All compressors will be on at setpoint plus the range. If the range equals the temperature drop across the evaporator when fully loaded, the leaving chilled liquid temperature will remain near the setpoint plus or minus a few degrees as the chiller loads and unloads according to return chilled liquid temperature.

Both LEAVING and RETURN control are described in detail under *Capacity control on page 171*.

Remote setpoint control

Pressing the COOLING SETPOINTS key a second time will display the remote setpoint and cooling range. This display automatically updates about every 2 seconds. Notice that these setpoints are not “locally” programmable, but are controlled by a remote device such as an ISN control, remote reset option board, or remote PWM signal. These setpoints would only be valid if the unit was operating in the REMOTE mode.

The following messages illustrate both leaving chilled liquid control and return chilled liquid control respectively.

```
REM SETP = 44.0 °F
RANGE = + / - 2.0 °F
```

(leaving chilled liquid control)

```
REM SETP = 44.0 °F
RANGE = +10.0 °F
```

(return chilled liquid control)

The low limit, high limit, and default values for the keys under “SETPOINTS” are listed in *Table 23 on page 173*.

Pressing the COOLING SETPOINTS a third time will bring up the display that allows the Maximum EMS-PWM Temperature Reset to be programmed. This message is shown below.

```
MAX EMS - PWM REMOTE
TEMP RESET = +20 °F
```

The Temp Reset value is the maximum allowable remote reset of the temperature setpoint. The setpoint can be reset upwards by the use of an Energy Management System or from the Temperature Reset Option Board. See *Remote BAS/EMS temperature reset using a voltage or current signal on page 180* for a detailed explanation of this feature.

As with the other setpoints, the ↑ (Up) arrow and ↓ (Down) arrow keys are used to change the Temp Reset value. After using the ↑ (UP) and ↓ (DOWN) arrows to adjust to the required setpoint, the ENTER/ADV key must be pressed to enter this number into memory.

Schedule/advance day key

The SCHEDULE is a seven day daily schedule that allows one start/stop time per day. The schedule can be programmed Monday through Sunday with an alternate holiday schedule available. If no start/stop times are programmed, the unit will run on demand, providing the chiller is not shut off on a unit or system shutdown. The daily schedule is considered “not programmed” when the times in the schedule are all zeros (00:00 AM).

To set the schedule, press the SCHEDULE/ADVANCE DAY key. The display will immediately show the following display.

Table 17: Cooling Setpoint, Programmable Limits, and Defaults

Setpoint key	Mode	Low limit	High limit	Default
Leaving chilled liquid setpoint	WATER COOLING	40.0°F 4.4°C	**70.0°F 21.1°C	44.0°F 6.7°C
	GLYCOL COOLING*	10.0°F -12.2°C	**70.0°F 21.1°C	44.0°F 6.7°C
	LOW TEMPERATURE GLYCOL COOLING	8.5°F -13.1°C	70.0°F 21.1°C	44.0°F 6.7°C
Leaving chilled liquid control range	—	1.5°F 0.8°C	2.5°F 1.4°C	2.0°F 1.1°C
Returned chilled liquid setpoint	WATER COOLING	40.0°F 4.4°C	70.0°F 21.1°C	44.0°F 6.7°C
	GLYCOL COOLING*	10.0°F -12.2°C	70.0°F 21.1°C	44.0°F 6.7°C
Return chilled liquid control range	—	4.0°F 2.2°C	20.0°F 11.1°C	10.0°F 5.6°C
Max EMS-PWM remote temperature reset	—	2°F 1.0°C	40°F 22.0°C	20°F 11.0°C

* Refer to the Engineering Guide, Form 150.72-EG6, for operation below 30°F (-1.1°C). Alternate thermal expansion valves must be used below 30°F (-1.1°C).

*When using glycol, Leaving Chilled Liquid Setpoint must not be set below 10°F (-23.3°C).

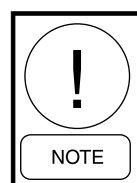
**If the setpoint exceeds 55°F (12.8°C), contact the nearest Quantech Office for application guidelines.

```

MON  START  =  00 : 00  AM
          STOP  =  00 : 00  AM

```

The line under the 0 is the cursor. If the value is incorrect, it may be changed by using the ↑ (UP) and ↓ (DOWN) arrow keys until correct. Pressing the ENTER/ADV key will enter the times and then move the cursor to the minute box. The operation is then repeated if necessary. This process may be followed until the hour, minutes, and meridian (AM or PM) of both the START and STOP points are set. After changing the meridian of the stop time, pressing the ENTER/ADV key will advance the schedule to the next day.



Whenever the daily schedule is changed for Monday, all the other days will change to the new Monday schedule. This means if the Monday times are not applicable for the whole week, then the exceptional days would need to be reprogrammed to the preferred schedule.

To page to a specific day, press the SCHEDULE/ADVANCE DAY key until the required day appears. The start and stop time of each day may be programmed differently using the ↑ (UP) and ↓ (DOWN) arrow, and ENTER/ADV keys.

After SUN (Sunday) schedule appears on the display a subsequent press of the SCHEDULE/ADVANCE DAY key will display the Holiday schedule. This is a two part display. The first reads:

```

HOL  START  =  00 : 00  AM
          STOP  =  00 : 00  AM

```

The times may be set using the same procedure as described above for the days of the week. After changing the meridian of the stop time, pressing the ENTER/ADV key will advance the schedule to the following display:

```

S _ M T W T F S
HOLIDAY NOTED BY *

```

The line below the empty space next to the S is the cursor and will move to the next empty space when the ENTER/ADV key is pressed. To set the Holiday, the cursor is moved to the space following the day of the week of the holiday and the ↑ (UP) arrow key is pressed. An * will appear in the space signifying that day as a holiday. The * can be removed by pressing the ↓ (DOWN) arrow key.

The Holiday schedule must be programmed weekly – once the Holiday schedule runs, it will revert to the normal daily schedule.

```

F A N      O N      0 0 : 0 0   A M
I N H I B I T  O F F      0 0 : 0 0   A M

```

Fan inhibit is used mainly for two-speed fan control but affects VSD fan control. Disabling this setting by using 00:00 for all time entries allows the VSD fan to run.

Program key

There are several operating parameters under the PROGRAM key that are programmable. These setpoints can be changed by pressing the PROGRAM key, and then the ENTER/ADV key to enter *Program Mode*. Continuing to press the ENTER/ADV key will display each operating parameter. While a particular parameter is being displayed, the ↑ (UP) and ↓ (DOWN) arrow keys can be used to change the value. After the value is changed, the ENTER/ADV key must be pressed to enter the data into memory. *Table 18 on page 154* shows the programmable limits and default values for each operating parameter.

Following are the displays for the programmable values in the order they appear:

```

D I S C H A R G E      P R E S S U R E
C U T O U T   =   3 9 5   P S I G

```

DISCHARGE PRESSURE CUTOUT is the discharge pressure at which the system will shutdown as monitored by the optional discharge transducer. This is a software shutdown that acts as a backup for the mechanical high pressure switch located in the refrigerant circuit. The system can restart when the discharge pressure drops 40 psig (2.76 barg) below the cutout point.

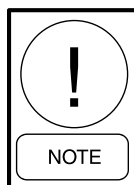
If the optional discharge pressure transducer is not installed, this programmable safety would not apply. It should be noted that every system has a mechanical high pressure cutout that protects against excessive high discharge pressure regardless of whether or not the optional discharge pressure is installed.

```

S U C T I O N      P R E S S U R E
C U T O U T   =   8 7 . 0   P S I G

```

The SUCTION PRESSURE CUTOUT protects the chiller from an evaporator freeze-up. If the suction pressure drops below the cutout point, the system will shut down. Typically, the cutout should be set to 87 psig (6.00 bar) from water cooling.



*There are some exceptions when the suction pressure is permitted to temporarily drop below the cutout point. Details are explained under the topic of **SYSTEM SAFETIES**.*

```

L O W   A M B I E N T   T E M P
C U T O U T   =   2 5 . 0   ° F

```

The LOW AMBIENT TEMP CUTOUT allows the user to select the chiller outside ambient temperature cutout point. If the ambient falls below this point, the chiller will shut down. Restart can occur when temperature rises 2°F (1.11°C) above the cutout setpoint.

```

L E A V I N G   L I Q U I D   T E M P
C U T O U T   =   3 6 . 0   ° F

```

The LEAVING LIQUID TEMP CUTOUT protects the chiller from an evaporator freeze-up. Anytime the leaving chilled liquid temperature drops to the cutout point, the chiller shuts down. Restart will be permitted when the leaving chilled liquid temperature rises 2°F (1.11°C) above the cutout setpoint.

When water cooling mode is programmed (OPTIONS key), the value is fixed at 36.0°F (2.22°C) and cannot be changed. Glycol cooling mode can be programmed to values listed in *Table 18 on page 154*.

```

A N T I   R E C Y C L E   T I M E R
=   6 0 0   S E C

```

The programmable anti-recycle timer ensures that systems do not short cycle, and the compressor motors have sufficient time to dissipate heat after a start. This timer is programmable under the PROGRAM key between 300 seconds and 600 seconds. Whenever possible, to reduce cycling and motor heating, the anti-recycle timer should be adjusted as high as possible. The programmable anti-recycle timer starts the timer when the first compressor in a system starts. The timer begins to count down. If all the compressors in the circuit cycle OFF, a compressor within the circuit will not be permitted to start until the anti-recycle timer has timed out. If the lead system has run for less than 5 minutes, 3 times in a row, the anti-recycle timer will be extended to 10 minutes, if currently programmed for less than 10 minutes.

```

F A N   C O N T R O L   O N
P R E S S U R E   =   X X X   P S I G

```

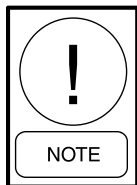
The Fan Control On Pressure is the programmed pressure value that is used to stage the condenser fans on, in relation to discharge pressure. See *Standard condenser fan control on page 175* in *Section 7: Unit controls* and *Table 24 on page 177* and *Table 25 on page 178*.

FAN DIFFERENTIAL OFF
PRESSURE = XXX PSIG

The Fan Differential Off Pressure is the programmed differential pressure value that is used to stage the condenser fans OFF, in relation to discharge pressure. See *Standard condenser fan control on page 175* in *Section 8: Unit operation* and *Table 24 on page 177* and *Table 25 on page 178*.

TOTAL NUMBER OF
COMPRESSORS = 6

The TOTAL NUMBER OF COMPRESSORS is the total quantity of compressors in the chiller, and determines the stages of cooling available. Note in *Table 18 on page 154*, the chiller may have single or dual systems. Single system units can have 2 or 3 compressors, while dual system units may have 4 or 6 compressors.



This MUST be programmed correctly to ensure proper chiller operation.

NUMBER OF FANS
PER SYSTEM = X

The Number of Fans Per System must be programmed as needed to match the number of fans on each system.

SYS X TRIP VOLTS
= X.X VOLTS

UNIT TRIP VOLTS
= X.X VOLTS

Depending on the option, the trip voltage for a specific system or unit high current trip can be programmed. It also calibrates the current read-out under the OPER DATA key. The approximate programmed value is calculated using the following formulas.

System trip volts

For individual system high current trip programming on chillers:

- Add the sum of the compressor and fan RLA's in the system
- Multiply the sum by 1.25
- Divide by 225 A
- The resulting voltage is the value that should be programmed

For example, if fan and compressor RLA's total 100 A:

$$\frac{5 \text{ V} \times 100 \text{ A}}{225 \text{ A}} \times 1.25 = \frac{625 \text{ VA}}{225 \text{ A}} = 2.8 \text{ V}$$

The programmed value will be 2.8 V. A similar calculation and programming will be necessary for the other system in a 2-system chiller.

Unit Trip Volts

For total chiller high current trip programming on 460 VAC chillers:

- Add the sum of all the compressors and fan RLA's in the chiller
- Multiply the sum by 1.25
- Divide by 225 A
- The resulting voltage is the value that should be programmed

For example, if fan and compressor RLA's total 180 A:

$$\frac{5 \text{ V} \times 180 \text{ A}}{225 \text{ A}} \times 1.25 = \frac{1125 \text{ VA}}{225 \text{ A}} = 5.0 \text{ V}$$

The programmed value will be 5.0 V.

REMOTE UNIT ID
PROGRAMMED = X

When communications is required with a BAS or OptiView Panel, individual unit IDs are necessary for communications with specific chillers on a single RS-485 line. ID 0 - 7 is selectable.

ANTI - VAC SUCT PRESS
CUTOUT = XXXX PSIG

ANTI - VAC DELAY TIME
= XX SEC

Table 18: Program key limits and default

Program value	Mode	Low limit	High limit	Default
Discharge pressure cutout	—	325 psig	575 psig	570 psig
		22.41 barg	39.64 barg	39.30 barg
Suction pressure cutout	Water cooling	87.0 psig	120.0 psig	87.0 psig
		6.00 barg	8.27 barg	6.00 barg
	Glycol cooling	82.0 psig	120.0 psig	87.0 psig
		5.65 barg	8.27 barg	6.0 barg
Low ambient temperature cutout	Standard ambient	33.0 psig	120.0 psig	44.0 psig
		2.28 barg	8.27 barg	3.03 barg
	Low ambient	25.0°F	60.0°F	25.0°F
		-3.9°C	15.6°C	-3.9°C
	VSD fan	-10.0°F	60.0°F	25.0°F
		-23.3°C	15.6°C	-3.9°C
Leaving chilled liquid temperature cutout	Water cooling	—	—	36°F
		—	—	2.2°C
	Glycol cooling	8.0°F	36.0°F	36.0°F
		-13.3°C	2.2°C	2.2°C
	Low temperature glycol cooling	-1.0°F	36.0°F	36.0°F
		-18.3°C	2.2°C	2.2°C
Anti-recycle timer	—	300 s	600 s	600 s
Fan control on pressure	—	360 psig	485 psig	385 psig
		24.8 barg	33.4 barg	26.5 barg
Fan differential off pressure	—	80 psid	160 psid*	125 psid
		5.51 bard	11.03 bard*	8.62 bard
Total number of compressors	Single system	2	3	3 comps
	Dual system	4	6	6 comps
Number of fans per system	—	2	6	3 fans
Unit/system trip volts	Current feedback	0.5 V	4.5 V	2.5 V
Remote unit ID	—	0	7	0
Duty/standby pump change over	—	1	30	30
Three-way valve RLH temperature setpoint	—	55.0°F	65.0°F	60.0°F
	—	12.8°C	18.3°C	15.6°C
Three-way valve pressure differential setpoint	—	100 psig	140 psig	100 psig
	—	6.89 barg	9.65 barg	6.89 barg
Three-way valve voltage setpoint	—	4.0 V	7.0 V	5.0 V
Three-way valve on time	—	180 s	600 s	300 s
Anti-vacuum suction pressure cutout	—	3 psig	20 psig	10% programmed suction cutout
	—	0.21 barg	1.38 barg	
Anti-vacuum delay time	—	3 s	30 s	6 s
VSD fan low pressure limit	—	247 psig	345 psig	247 psig
	—	17.03 barg	23.78 barg	17.03 barg
VSD fan high pressure limit	—	350 psig	450 psig	450 psig
		24.13 barg	31.03 barg	31.03 barg

Table 18: Program key limits and details, continued

Program value	Mode	Low limit	High limit	Default
VSD fan low ambient discharge pressure setpoint	—	360 psig	420 psig	390 psig
		24.82 barg	28.96 barg	26.89 barg
VSD fan low ambient discharge pressure control range	—	60 psig	120 psig	90 psig
		4.14 barg	8.27 barg	6.21 barg
Cooling suction superheat setpoint	—	5.0°F (differential)	18.0°F (differential)	10.0°F (differential)

* The minimum discharge pressure allowed is 235 psig. The high limit for fan differential off pressure is reduced to prevent going below 235 psig based on where the fan control on pressure is programmed.

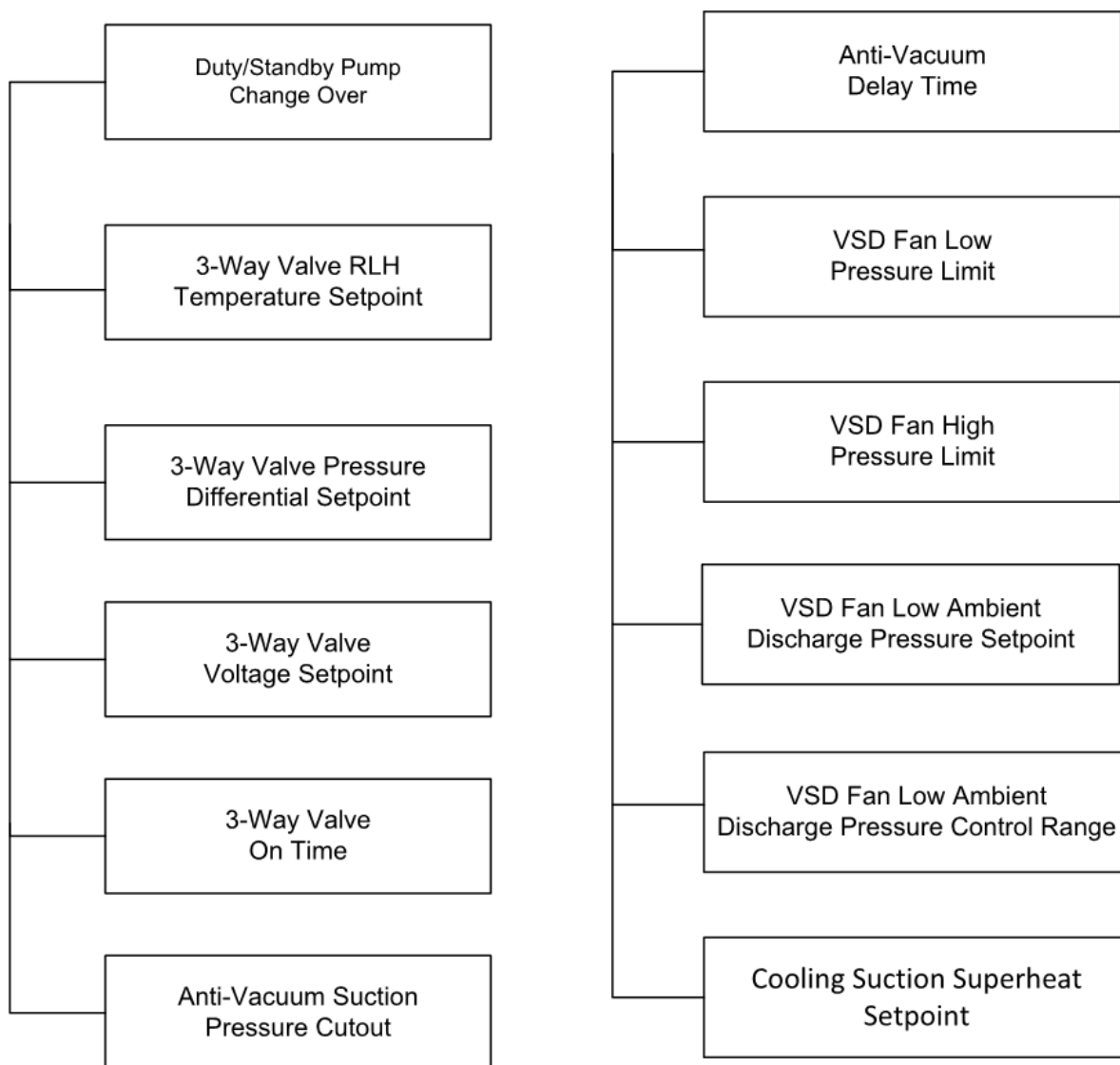


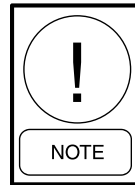
Figure 45: Setpoints Quick Reference List

LD07404c

Service mode

Use the Service Mode to view all the inputs and enable or disable all the outputs on the unit, except the compressors. Some of the internal timers and counters are viewable and modifiable in the Service Mode. To enter the Service Mode, turn off the unit switch and press PROGRAM, ↑, ↓, and ENTER in sequence. The Service Mode times out after 30 minutes and returns to

normal control. The user can disable the Service Mode by turning on the unit switch or by powering off and on the 115 VAC.



The Imperial units are exact values. The Metric units are approximates.

Table 19: Program key limits and default

Program value	Low limit	High limit	Options	Default
Data logging mode	—	—	OFF or ON	OFF
Data logging timer (1 s Inc./Dec.)	1 s	60 s	—	1 s
Fan speed control (single speed (CE) and standard (NA) use staged fan Control)	—	—	SINGLE SPEED or STANDARD QTC3 TWO SPEED FANS QTC3 VSD FANS	SINGLE SPEED
Two comp fan speed ref. 1 (VSD Fans) (1 Inc.)	10%	99%	—	10%
Three comp fan speed ref. 1 (VSD Fans) (1 Inc.)	10%	99%	—	10%
Fan ramp speed (VSD Fans) (0.5 Inc.)	0.5 %/s	6.0 %/s	—	1.0 %/s
Sys 1, 2 fan stage operation (two speed fans) (1 Stage Inc./Dec.)	0	Number of fan stages	—	0
Compressor soft start	—	—	DISABLE or ENABLE	DISABLE
Refrigerant select	—	—	R-22, R-407C, R-410A, or R-454B	R-410A
Expansion valve type	—	—	THERMOSTATIC or ELECTRONIC	ELECTRONIC
Remote temp reset option	—	—	DISABLE or ENABLE	DISABLE
Remote inputs service time (1 min Inc./Dec.)	5 min	60 min	—	15 min
Feature set (R-410A/R-454B)	—	—	NORTH AMERICAN or EUROPEAN	NORTH AMERICAN
Evaporator pump control	—	—	(R-410A/R-454B Chiller or Heatpump) EXTERNAL, KIT PUMPS 1 or KIT PUMPS 2	EXTERNAL
Evaporator pump total run hours (R-410A/ R-454B chiller or heatpump) (1 Inc./Dec. per entry position)	0	99999	—	0
Control Mode	—	—	R-410A/R-454B LEAVING or RETURN	LEAVING

Table 19: Program key limits and details, continued

Program value	Low limit	High limit	Options	Default
Hot Gas Bypass Valve Type	—	—	R-410A/R-454B NONE, ONE PER UNIT, or ONE PER SYSTEM	SYS 1
Unit Type Select	—	—	(R-410A/R-454B Chiller or Condensing Unit) STANDARD or QWC3 HP	STANDARD
Operating Envelope	—	—	(031-02755-004, R-410A/R-454B) DISABLE, STANDARD, or EXTENDED	DISABLE
Sys 1,2 Comp. Sequence	—	—	(031-02755-004) AUTO, COMP 1 COMP 2, or COMP 3	AUTO
Sys 1,2/Compressor 1-3 Operating Hours (1 Inc./Dec. per entry position)	0	99999	—	0
Sys 1,2/Compressor 1-3 Start Counters (1 Inc./Dec. per entry position)	0	99999	—	0
EEV Max Operating Pressure (031-02577-004, EEV) (5.0 Inc./Dec.)	20.0 psig (1.38 barg)	600.0 psig (41.38 barg)	—	150.0 psig (10.34 barg)
Chilled liquid cooling type*	—	—	WATER or GLYCOL	WATER
Entering chilled liquid temperature sensor	—	—	DISABLED or ENABLED	ENABLED
Reset EEV to default	Choices: No (0) Yes (1)		—	NO
EEV startup position (1 Inc./Dec.)	10.0%	50.0%	—	25.0%
EEV startup delay time (10 Inc./Dec.)	0 Sec	180 Sec	—	60 Sec

* If the chilled liquid cooling type is modified, the suction pressure cutout is set to the default value.

Selecting low temperature

To enable the LOW TEMPERATURE operation, complete the following steps:

1. Under SERVICE MODE, select GLYCOL.
2. To display the following screen, press PROGRAM, ↓, ↑, ↑, ↓, ENTER in sequence.

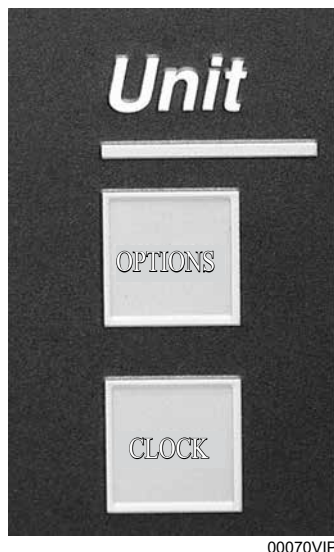
**STANDARD TEMPERATURE
GLYCOL**

or

**LOW TEMPERATURE
GLYCOL**

3. To select the required option, use the ↑ and ↓ keys. See on page 103 and on page 103 for the modified limits when the low temperature glycol is enabled.

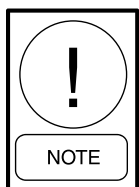
Unit keys



00070VIP

Options key

There are many user programmable options under the OPTIONS key. The OPTIONS key is used to scroll through the list of options by repeatedly pressing the OPTIONS key. After the selected option has been displayed, the ↑ (UP) and ↓ (DOWN) arrow keys are then used to change that particular option. After the option is changed, the ENTER/ADV key must be pressed to enter the data into memory.



*Many of the **OPTIONS** displayed are only programmable under the **SERVICE MODE** and not under the **OPTIONS** key. Options only programmable under the **SERVICE MODE** are noted in the details describing the option.*

Figure 46 on page 165 shows the programmable options. Following are the displays in the order they appear:

Option 1: Language

DISPLAY LANGUAGE
ENGLISH

English, Spanish, French, German, Italian, Portuguese, Hungarian, Polish, and Swedish can be programmed.

Option 2 : System switches (two system units only)

(Single System Display is similar)

SYS 1 SWITCH ON
SYS 2 SWITCH ON

This allows both systems to run.

or

SYS 1 SWITCH ON
SYS 2 SWITCH OFF

This turns system 2 OFF.

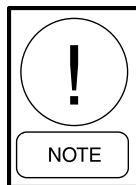
SYS 1 SWITCH OFF
SYS 2 SWITCH ON

This turns system 1 OFF.

or

SYS 1 SWITCH OFF
SYS 2 SWITCH OFF

This turns systems 1 and 2 OFF.



*Turning a system **OFF** with its system switch allows a pumpdown to be performed before shutdown.*

Option 3: Ambient control type

A M B I E N T C O N T R O L
S T A N D A R D

The low ambient cutout is adjustable from 25°F to 60°F (-3.9°C to 15.6°C).

or

A M B I E N T C O N T R O L
L O W A M B I E N T

The low ambient cutout is programmable down to -10°F (-23.3°C). A low ambient kit and variable speed fans **MUST** be installed for this option to be chosen. If the kit is **NOT** installed, and low ambient is selected, low pressure faults and compressor damage may occur.

Option 4: Local/remote control type

L O C A L / R E M O T E M O D E
L O C A L

When programmed for LOCAL, an ISN or RCC control can be used to monitor only. The micro panel will operate on locally programmed values and ignore all commands from remote devices, or through the RS-485 inputs. The chiller will communicate and send data to the remote monitoring devices.

or

L O C A L / R E M O T E M O D E
R E M O T E

This mode should be selected when an ISN or RCC control is to be used to control the chiller. This mode will allow the ISN to control the following items: Remote Start/Stop, Cooling Setpoint, Load Limit, and History Buffer Request. If the unit receives no valid ISN transmission for 5 minutes, it will revert back to the locally programmed values.

Option 5: Unit control mode

C O N T R O L M O D E
R E T U R N L I Q U I D

Unit control is based on return chilled liquid temp. Return Chilled Liquid Control can only be selected on units that have 4 to 6 compressors (dual system units).

or

C O N T R O L M O D E
L E A V I N G L I Q U I D

Option 6: Display units

D I S P L A Y U N I T S
I M P E R I A L

This mode displays system operating values in Imperial units of °F or PSIG.

or

D I S P L A Y U N I T S
S I

This mode displays system operating values in Scientific International Units of °C or barg.

Option 7: Lead/lag type (two system units only)

LEAD / LAG CONTROL
MANUAL SYS 1 LEAD

SYS 1 selected as lead compressor. SYS 1 lead option MUST be chosen if Hot Gas Bypass is installed.

or

LEAD / LAG CONTROL
MANUAL SYS 2 LEAD

SYS 2 selected as lead compressor.

or

LEAD / LAG CONTROL
AUTOMATIC

Lead/lag between systems may be selected to help equalize average run hours between systems on chillers with 2 refrigerant systems. Auto lead/lag allows automatic lead/lag of the two systems based on an average run hours of the compressors in each system. A new lead/lag assignment is made whenever all compressors shut down. The microprocessor will then assign the “lead” to the system with the shortest average run time.

Option 8: Condenser fan control mode

FAN CONTROL
DISCHARGE PRESSURE

Condenser fans are controlled by discharge pressure only. This mode must be chosen.

or

FAN CONTROL
AMBIENT & DSCH PRESS

Do not select this option on R-410A chillers.

Option 9: Manual override mode

MANUAL OVERRIDE MODE
DISABLED

This option allows overriding of the daily schedule that is programmed. MANUAL OVERRIDE MODE – DISABLED indicates that override mode has no effect.

or

MANUAL OVERRIDE MODE
ENABLED

Manual Override Mode is enabled. This is a service function and when enabled, will allow the unit to start when shut down on the daily schedule. It will automatically be disabled after 30 minutes.

Option 11: Power fail restart

P O W E R F A I L R E S T A R T
A U T O M A T I C

Chiller auto restarts after a power failure.

P O W E R F A I L R E S T A R T
M A N U A L

After a power failure, the UNIT switch must be toggled before restart at the unit is allowed. NORMALLY MANUAL RESTART should NOT BE SELECTED.

Option 12: Soft start enable/disable

S O F T S T A R T
D I S A B L E D

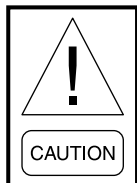
SOFT START “DISABLED” MUST be selected on all chillers.

This message may not be viewable on non-European chillers.

Option 13: Unit type

U N I T T Y P E
L I Q U I D C H I L L E R

The UNIT TYPE message cannot be modified under the unit keys.



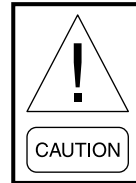
“Liquid CHILLER” must be displayed, or damage to compressors or other components will occur if operated in the HEAT PUMP or CONDENSING UNIT modes.

If unit type needs to be changed to make the unit a liquid chiller, remove power and then remove the jumper between J11-7 and J11-12 on the I/O Board. Reapply power to the micro panel and the microprocessor will store the change.

Option 14: Refrigerant type

R E F R I G E R A N T T Y P E
R - 4 1 0 A

Refrigerant type R-410A must be selected under Service Mode. Refrigerant type is displayed under the OPTIONS key, but is only programmable in Service Mode.

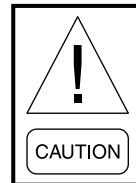


Incorrect programming may cause damage to compressors.

Option 15: Expansion valve type

E X P A N S I O N V A L V E T Y P E
T H E R M O S T A T I C

Expansion valve type, thermostatic or electronic may be selected under Service Mode. Expansion valve type is displayed under the OPTIONS key, but is only programmable in Service Mode. QTC3 chillers will typically always be equipped with thermostatic expansion valves.



Incorrect programming may cause damage to compressors.

Also see the UNIT KEYS PROGRAMMING QUICK REFERENCE LIST in Figure 46 on page 165.

Option 16: Flash card update

F L A S H C A R D U P D A T E
D I S A B L E D

A Flash Card is used to input the operating program into the chiller IPU. A Flash Card is used instead of an EPROM. Normally, a Flash Card update is not required and the message above will be displayed.

If the operating software is to be updated, insert the Flash Card into the Flash Card input port. Turn off the unit switch and set the FLASH CARD UPDATE TO “ENABLED” using the ↑ and ↓ keys.

FLASH CARD UPDATE
ENABLED

Press the ENTER key and the following message will be displayed until the update has been completed. The keypad and display will not respond during the update. DO NOT reset or power down the chiller until the update is completed.

FLASH CARD UPDATING
PLEASE WAIT...

After the update is completed, an automatic reboot will occur. If an error occurred, the following message will appear with the error code and no reboot will occur.

```
FLASH CARD UPDATE
ERROR                XXXXX
```

If the update resulted in an error, the original program will still be active. When an error occurs, ensure the correct Flash Card was used. Incorrect chiller software will cause an error. If this is not the case, the Flash Card is most likely defective or the IPU and I/O combo board is bad.

Option 17: Remote temperature reset

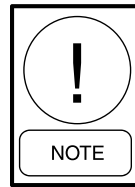
```

REMOTE  TEMP  RESET
INPUT                      XXXXXXXXXXXXXXXX

```

Remote Temp Reset input selection is programmable according to the type of input used. The following options are available:

- DISABLED (default)
- 0.0 – 10.0 (DC)
- 2.0 – 10.0 V (DC)
- 0.0 – 20.0 mA
- 4.0 – 20.0 mA



The options display message for Remote Temp Reset Input only appears if the Temp Reset Option is enabled under Service Mode. The option must be enabled under the Service Mode for the Remote Temperature Reset to operate.

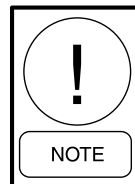
Option 18: Pump control

Pump Control is used to operate the optional onboard pump kit or to control an external pump through dry contacts 23 and 24 on Terminal Block XTBC2. To use this option, the following selection should be made in the Service Mode:

YORK HYDRO
KIT PUMPS = 1

When Quantech HYDRO KIT PUMPS = 1, the controls will be closed to run the pumps whenever any one of the following conditions are true:

- Low Leaving Chilled Liquid Fault
- Any compressor is running
- Daily Schedule is ON and Remote Stop is closed.
- Ambient air temperature <40°F (4.4°C) and leaving chilled liquid temperature <44°F (6.7°C)



Even if one of the above conditions are true, the pump will not run if the chiller has been powered up for less than 30 seconds; or if the pump has run in the last 30 seconds to prevent pump overheating.

EXTERNAL
EVAP PUMP

EXTERNAL EVAP PUMP should be selected if an external pump is being controlled with the chiller pump contacts. The operation will be the same as Quantech HDRO KIT PUMPS = 1

YORK HYDRO
KIT PUMPS = 2

Option 19: Pump selection

The displays for this PUMP SELECTION option should only appear if “QUANTECH HYDRO KIT PUMPS = 2” are selected under Option 19.

Option 20: Hot gas bypass type

Hot gas bypass type cannot be programmed under the options key. This option will display the hot gas bypass type as programmed in Service Mode for R-410A units. Reference unloading logic flow chart for hot gas bypass valve operation local/remote is set to local

HOT GAS BYPASS TYPE
NONE

When programmed for hot gas bypass type None, the unit will pump down and shutdown the lead system.

HOT GAS BYPASS TYPE
SYSTEM 1

When programmed for hot gas bypass type System 1, the unit will operate system 1 hot gas bypass if system 1 is the lead system.

HOT GAS BYPASS TYPE
SYSTEM 2

When programmed for hot gas bypass type System 2, the unit will operate system 2 hot gas bypass if system 2 is the lead system.

HOT GAS BYPASS TYPE
BOTH SYSTEMS

When programmed for hot gas bypass type Both Systems, the condensing units operating in suction pressure control operate independent of the lead/lag system. All other units will use the hot gas bypass valve of the lead system when unloading.

Option 21: Flash card data logging

When the following message appears, data logging is disabled.

D A T A L O G T O F L A S H C A R D
O F F

When the following message appears, data logging is enabled.

D A T A L O G T O F L A S H C A R D
O N

When the following message appears, data logging is enabled and is not logging unchanged data.

D A T A L O G T O F L A S H C A R D
S K I P U N C H A N G E D

Option 22: Temperature sensors enable

This option will display for QTC3 R-410A units.

Note: When R-22 is programmed, the optional discharge temperature sensors will not be affected by this modification.

D S C H T E M P S E N S O R S
E N A B L E D

When the following option is selected, the discharge temperature sensors are enabled for non-QWC3 units and disabled on QWC3, leaving liquid and return liquid hot temperature sensors.

Y C W L T E M P S E N S O R S
E N A B L E D

When the following option is selected, the discharge temperature sensors are disabled.

D S C H T E M P S E N S O R S
D I S A B L E D

Option 23: Variable water outlet mode

When the following option is selected, the variable water outlet mode is enabled.

VARIABLE OUTLET MODE
ENABLED

When the following option is selected, the variable water outlet mode is disabled.

VARIABLE OUTLET MODE
DISABLED

Clock

The CLOCK display shows the current day, time, and date. Press the CLOCK key to view the current day, time, and date.

It is important that the date and time be correct, otherwise the daily schedule will not function as required if programmed. In addition, for ease of troubleshooting via the History printouts, the day, time, and date should be correct.

To change the day, time, and date press the CLOCK key. The display will show something similar to the following:

TODAY IS ERI 08 : 51 AM
25 JAN 02

The line under the F is the cursor. If the day is correct, press the ENTER/ADV key. The cursor will move under the 0 in 08 hours. If the day is incorrect, press the ↑ (UP) or ↓ (DOWN) arrow keys until the preferred day is displayed and then press the ENTER/ADV key at which time the day will be accepted and the cursor will move under the first digit of the “2 digit hour”. In a similar manner, the hour, minute, meridian, month, day, and year may be programmed, whenever the cursor is under the first letter/numeral of the item. Press the ↑ (UP) or ↓ (DOWN) arrow keys until the preferred hour, minute, meridian; day, month, and year are displayed. Pressing the ENTER/ADV key will save the value and move the cursor on to the next programmable variable.

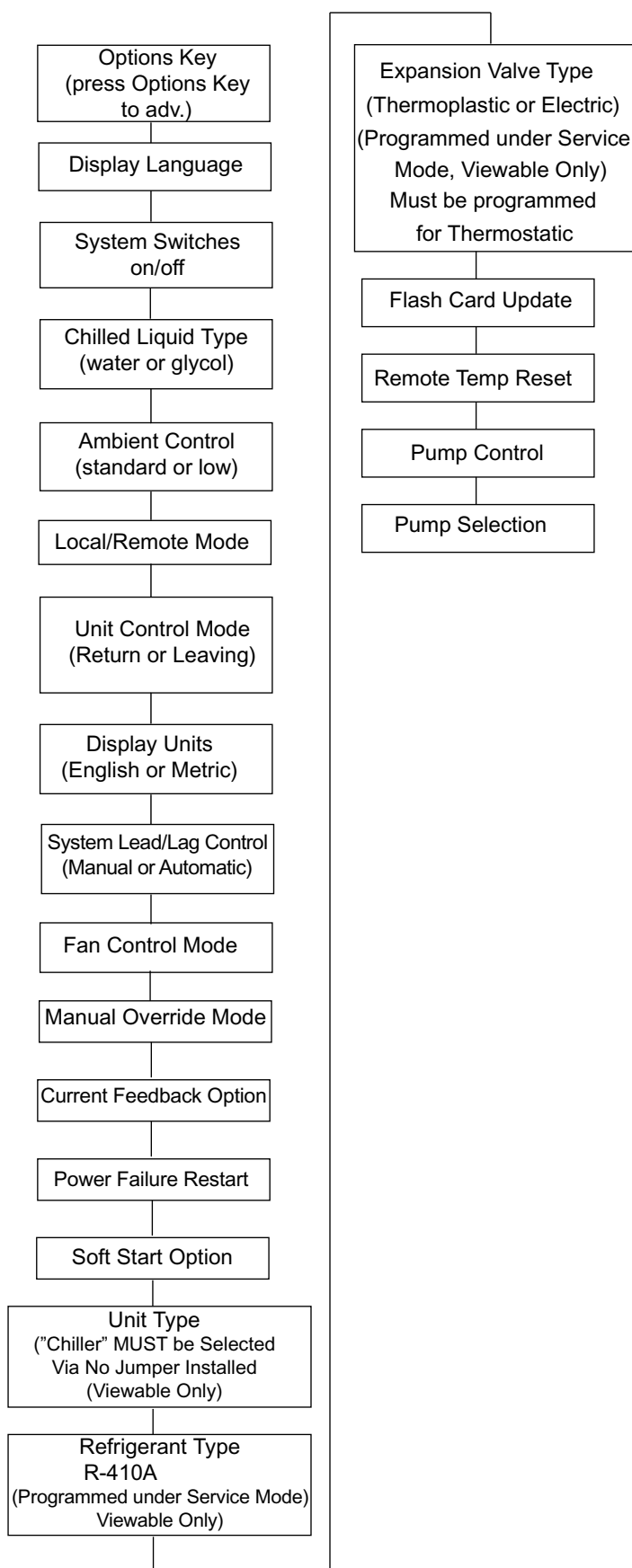


Figure 46 provides a quick reference list for the Unit key setpoints.

LD07405d

Figure 46: Unit Keys Options Programming Quick Reference List

BACnet, Modbus, N2, and YORKTalk 2 communications

Data can be read and in some cases modified using a serial communication BACnet, Modbus, or YORKTalk 2 network connection. This information allows communications of chiller operating parameters and external control changes to setpoint, load limiting, and start/stop commands.

BACnet and YORKTalk 2 RS485 networks are wired to the + and - terminals of TB1 for port 1 communications. Modbus network connection has the option of RS232 or RS485 connection for port 2 communications. Modbus network is wired to either TB2 or TB3 as follows:

- RS-485: connect to TB2 - Network (-1) to TB2 (-1); Network (+1) to TB2 (+1)
- RS-232: connect to TB3 - Network (RX) to TB3 (TXD); Network (TX) to TB3 (RXD); Network (GND) to TB3 (GND)

See Figure 47 on page 167 for TB1, TB2 and TB3 locations.

In most cases, communication parameters will need to be modified. Table 30 on page 168 lists setup parameters for the available protocols. Modification is accomplished by pressing the PROGRAM, DOWN ARROW, DOWN ARROW, DOWN ARROW, DOWN ARROW, and ENTER keys in sequence. The list below shows the displays for the values that may be modified:

DE MODIFIER ADDRESS XXXXX	P2 PROTOCOL XXXXXXXXXX
DE MODIFIER OFFSET XX	P2 MANUAL MAC ADDRESS XXX
P1 PROTOCOL XXXXXX	P2 BAUD RATE XXXXX
P1 MANUAL MAC ADDRESS XXX	P2 PARITY XXXXX
P1 BAUD RATE XXXXXX	P2 STOP BITS X
P1 PARITY XXXXXX	P2 HW SELECT BIT XXXXX
P1 STOP BITS X	REAL TIME ERROR ## RESET 1 = YES, 0 = NO 0

Note: See Table 22 on page 169 for error descriptions

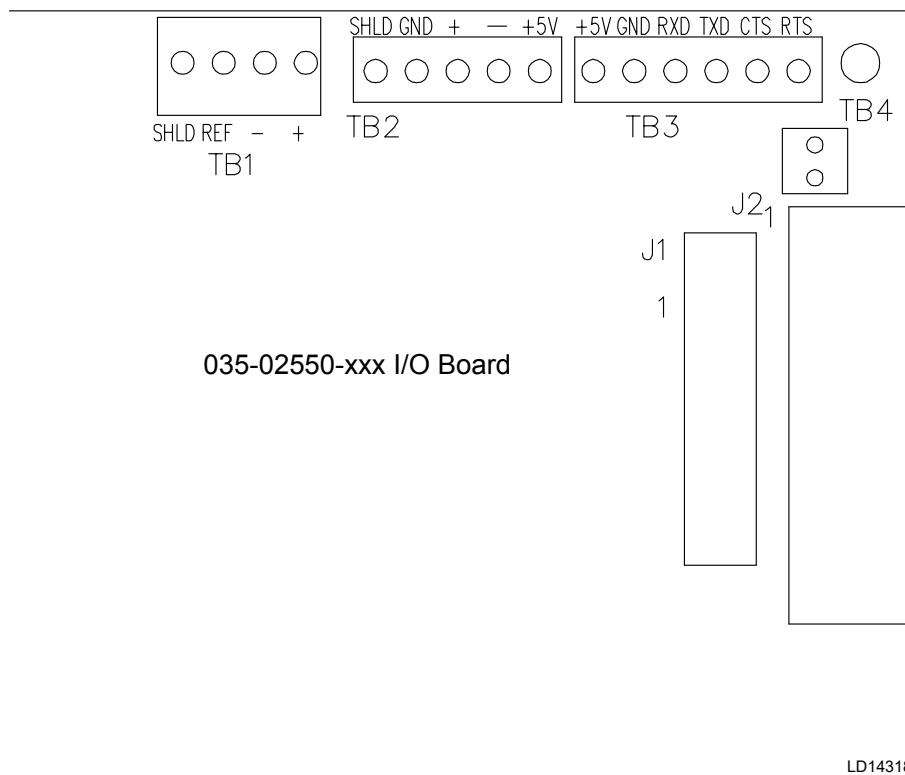


Figure 47: Micro Panel Connections

The table below shows the minimum, maximum, and default values.

Table 20: Minimum, Maximum and Default Values

DESCRIPTION	MINIMUM	MAXIMUM	DEFAULT
DE MODIFIER ADDRESS	-1	41943	-1
DE MODIFIER OFFSET	-1	99	-1
P1 BAUD RATE	1200	76800	4800
	1200, 4800, 9600, 19200, 38400, 76800, AUTO SELECTABLE		
P2 BAUD RATE	1200	57600	1200
	1200, 4800, 9600, 19200, 38400, 57600 SELECTABLE		
P1, P2 MANUAL Mac ADDRESS	-1	127	-1
P1, P2 PARITY	NONE	IGNORE	NONE
	NONE, EVEN, ODD, IGNORE SELECTABLE		
P1 PROTOCOL	BACNET	API	BACNET
	BACNET, API SELECTABLE		
P2 PROTOCOL	TERMINAL	MODBUS CLIENT	API
	TERMINAL, MODBUS IO, MODBUS SERVER, API, MODBUS CLIENT SELECTABLE		
P1, P2 STOP BITS	1	2	1
RESET REAL TIME ERROR	NO	YES	NO

The table below shows set-up requirements for each communication protocol.

Table 21: Values Required for BAS Communication

Setting description	Protocol			
	BACnet MS/TP	Modbus RTU ⁵	YORKTalk 2	N2 ⁶
De modifier address	0 to 41943 ³	1	-1	0 to 41943 ³
De modifier offset	0 to 99 ⁴	0	N/A	0 to 99 ⁴
P1 protocol	BACNET	N/A	N/A	9n2
P1 manual MAC address	0-127 ¹	N/A	N/A	0-127 ¹
P1 baud rate	9600 To 76800 or Auto Selectable ¹	N/A	N/A	9600
P1 parity	NONE	N/A	N/A	NONE
P1 stop bits	1	N/A	N/A	1
P2 protocol	N/A	MODBUS SVR	N/A	N/A
P2 manual MAC address	N/A	0-127 ¹	N/A	N/A
P2 baud rate	N/A	19,200 ²	N/A	N/A
P2 parity	N/A	NONE ²	N/A	N/A
P2 stop bits	N/A	1	N/A	N/A
P2 HW select bit	N/A	RS-485 or RS-232 ¹	N/A	N/A
Reset real time error	N/A	N/A	N/A	N/A
P1 hw select bit	N/A	N/A	N/A	N/A
Chiller ID	N/A	N/A	0	N/A

1. As required by network. 2. Or other as required by network. 3. Number is multiplied by 100, set as required by network.

4. Number is added to de modifier address, set as required by network.

5. Unit operating software version C.Mmc.13.03 or later required for Modbus Protocol.

6. Unit operating software version 04 (C.MMC.13.04, C.MMC.14.04, or C.MMC.16.04) or higher required for N2 protocol functionality.

BACnet and Modbus communications

Chiller data that can be read and modified using specific BACnet or Modbus Register Addresses; and the data associated with the addresses, is outlined in the following description:

Analog write points

This data can be read and modified using a BACnet or Modbus network connection. The Modbus Register Address for these points is 1025 + AV #.

Binary write points

This data can be read and modified using a BACnet or Modbus network connection. The Modbus Register Address for these points is 1537 + BV #.

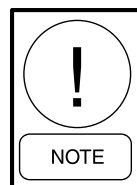
Analog read only points

This data can be read using a BACnet or Modbus network connection and can NOT be modified using this connection. The Modbus Register Address for these points is 513 + AI #.

Binary monitor only points

This data can be read using a BACnet or Modbus network connection and can NOT be modified using this connection. The Modbus Register Address for these points is 1281 + BI #.

See Table 22 on page 169 for complete list of BACnet and Modbus registers.



Go to the Johnson Controls Chillers Knowledge Exchange website for the most up-to-date SC-EQ BAS point maps: <https://docs.johnsoncontrols.com/chillers/>. You can also contact your local Quantech office for a copy of the data map.

Communications data map notes

See Table 22 on page 169.

1. IPU II based units are configured for Native BACnet MS/TP and Modbus RTU communications. E-Link Gateway not required for these two communication protocols.

2. BACnet Object Types:

0 = Analog In	5 = Binary Value
1 = Analog Out	8 = Device
2 = Analog Value	15 = Alarm Notification (0 through 127 are reserved ASHRAE Objects).
3 = Binary In	
4 = Binary Output	

- 3.

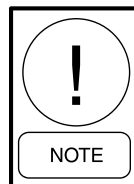
WC= Inches of water column	Pa = Pascals
CFM = Cubic Feet per Minute	kPa = Kilopascals
FPM = Feet per Minute	PPM = Part per Million
PSI = Lb per square inch	kJ/kg = Kilojoules per Kilogram.

4. Water Cooled Scroll units use the same firmware as Air Cooled Scroll units, ignoring Fan Control.

The following table shows the real time error numbers that may be encountered during communication setup and a description of each.

Table 22: Real Time Error Numbers

Error number (##)	Description
0	All ok
1	Datum type ok test failed
2	English text too long
3	Floating point exception
4	Get packet failed
5	Get type failed
6	Invalid unit conversion
7	Invalid hardware selection
8	Real time fault
9	Spanish text too long
10	Thread exited
11	Thread failed
12	Thread stalled
13	IO board reset
14	BRAM invalid
15	BACnet setup failed



Reboot required (cycle power) after settings are changed.

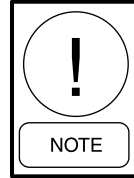
YORKTalk 2 communications

Received data, control data

The unit receives eight data values from the E-Link Gateway. The first four are analog values and the last four are digital values. These eight data values are used as control parameters when in REMOTE mode. When the unit is in LOCAL mode, these eight values are ignored. If the unit receives no valid YORKTalk 2 transmission for 5 minutes it will revert back to all local control values. These values are found under feature 54 in the E-Link Gateway.

Transmitted data

After receiving a valid transmission from the E-Link Gateway, the unit will transmit either operational data or history buffer data depending on the “History Buffer Request” on ENG PAGE 10. Data must be transmitted for every page under feature 54. If there is no value to be sent to a particular page, a zero will be sent.



Go to the Johnson Controls Chillers Knowledge Exchange website for the most up-to-date SC-EQ BAS point maps: <https://docs.johnsoncontrols.com/chillers/>. You can also contact your local Quantech office for a copy of the data map.

Section 8: Unit operation

Unit operating sequence

The operating sequence described below relates to operation on a hot water start after power has been applied, such as start-up commissioning. When a compressor starts, internal timers limit the minimum time before another compressor can start to 1 minute.

1. For the chiller system to run, the Flow Switch must be closed, any remote cycling contacts must be closed, the Daily Schedule must not be scheduling the chiller OFF, and temperature demand must be present.
2. When power is applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure.
3. At the end of the 2 minute timer, the microprocessor will check for cooling demand. If all conditions allow for start, a compressor on the lead system will start and the liquid line solenoid will open. Coincident with the start, the anti-coincident timer will be set and begin counting downward from “60” seconds to “0” seconds.

If the unit is programmed for Auto Lead/Lag, the system with the shortest average run-time of the compressors will be assigned as the “lead” system. A new lead/lag assignment is made whenever all systems shut down.

4. Several seconds after the compressor starts, that systems first condenser fan will be cycled ON (outdoor air temperature more than 25°F (-4°C) or discharge pressure). See *Standard condenser fan control on page 175* for details concerning condenser fan cycling.
5. After 1 minute of compressor run time, the next compressor in sequence will start when a system has to load. Additional compressors will be started at 60 second intervals as needed to satisfy temperature setpoint.
6. If demand requires, the lag system will cycle ON with the same timing sequences as the lead system after the lead system has run for five minutes. See the section on Capacity Control for a detailed explanation of system and compressor staging.

7. As the load decreases below setpoint, the compressors will be shut down in sequence. This will occur at intervals of either 60, 30, or 20 seconds based on water temperature as compared to setpoint, and control mode. See *Leaving chilled liquid control on page 172* for a detailed explanation.

8. When the last compressor in a “system” (two or three compressors per system), is to be cycled OFF, the system will initiate a pump-down. Each “system” has a pump-down feature upon shut-off. On a non-safety, non-unit switch shutdown, the LLSV will be turned OFF and the last compressor will be allowed to run until the suction pressure falls below the suction pressure cutout or for 180 seconds, whichever comes first.

Capacity control

To initiate the start sequence of the chiller, all run permissive inputs must be satisfied (flow/remote start/stop switch), and no chiller or system faults exist.

The first phase of the start sequence is initiated by the Daily Schedule Start or any Remote Cycling Device. If the unit is shut down on the daily schedule, the chilled water pump contacts (Terminals 23 and 24 of XTBC2) will close to start the pump when the daily schedule start time has been reached. Once flow has been established and the flow switch closes, capacity control functions are initiated, if the remote cycling contacts wired in series with the flow switch are closed.

It should be noted that the chilled water pump contacts (Terminals 23 and 24 of XTBC2) are not required to be used to cycle the chilled water pump. However, in all cases the flow switch must be closed to allow unit operation.

The control system will evaluate the need for cooling by comparing the actual leaving or return chilled liquid temperature to the preferred setpoint, and regulate the leaving or return chilled liquid temperature to meet that setpoint.

Suction pressure limit controls

The anticipatory controls are intended to prevent the unit from ever actually reaching a low-pressure cutout. Loading is prevented, if the suction pressure drops below 1.15 x suction pressure cutout (15% below the cutout). Loading may reoccur after suction pressure rises above the unload point and a period of one minute elapses. This control is only operable if the optional suction pressure transducers are installed.

Discharge pressure limit controls

The discharge pressure limit controls unload a system before it reaches a safety limit due to high load or dirty condenser coils. The microprocessor monitors discharge pressure and unloads a system, if fully loaded, by one compressor when discharge pressure exceeds the programmed cutout minus 10 psig (0.69 barg). Re-loading will occur when the discharge pressure on the affected system drops to 85% of the unload pressure and 10 minutes have elapsed.

This control is only applicable if optional discharge pressure transducers are installed.

Leaving chilled liquid control

The setpoint, when programmed for Leaving Chilled Liquid Control, is the temperature the unit will control to within plus or minus the (control) cooling range. The Setpoint High Limit is the Setpoint plus the Cooling Range. The Setpoint Low Limit is the Setpoint minus the Cooling Range. *Figure 48* should be used to aid in understanding the following description of Leaving Chilled Liquid Control.

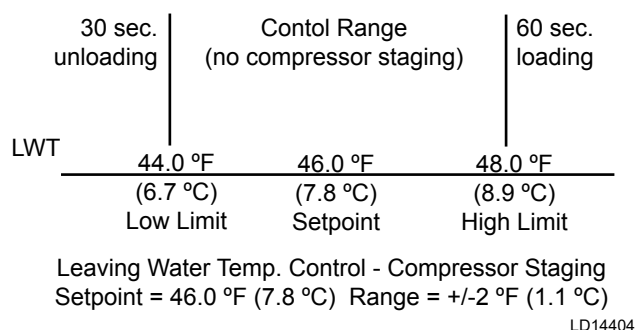


Figure 48: Leaving Water Temperature Control Example

If the leaving chilled liquid temperature is above the Setpoint High Limit, the lead compressor on the lead system will be energized along with the liquid line solenoid. Upon energizing any compressor, the 60 second Anti-Coincidence timer will be initiated to prevent multiple compressors from turning ON.

If after 60 seconds of run-time the leaving chilled liquid temperature is still above the Setpoint High Limit, the next compressor in sequence will be energized. Additional compressors will be energized at a rate of once every 60 seconds if the chilled liquid temperature remains above the Setpoint High Limit and the chilled liquid temperature is dropping less than 3 °F/min. The lag system will not be allowed to start a compressor until the lead system has run for 5 minutes.

If the chilled liquid temperature falls below the Setpoint High Limit but is greater than the Setpoint Low Limit, loading and unloading do not occur. This area of control is called the control range.

If the chilled liquid temperature drops to between Setpoint Low Limit and 0.5°F (0.28°C) below the Setpoint Low Limit, unloading (a compressor turns OFF) occurs at a rate of 1 every 30 seconds. If the chilled liquid temperature falls to a value greater than 0.5°F (0.28°C) below the Setpoint Low Limit but not greater than 1.5°F (0.83°C) below the Setpoint Low Limit, unloading occurs at a rate of 20 seconds. If the chilled liquid temperature falls to a value greater than 1.5°F (0.83°C) below the Setpoint Low Limit, unloading occurs at a rate of 10 seconds. If the chilled liquid temperature falls below 1°F above the low chilled liquid temperature cutout, unloading occurs at a rate of 10 seconds if it is greater than 10 seconds.

In water cooling mode on R-410A chillers, the minimum low limit of the control range will be 40.0°F. For leaving chilled liquid temperature setpoint and control range combinations that result in the low limit of the control range being below 40.0°F, the low limit will be reset to 40.0°F and the difference will be added to the high limit. This will result in a control range the same size as programmed but not allow the unit to run below 40.0°F. This control will not affect glycol chillers.

Hot gas, if present, will be the final step of capacity. Hot gas is energized when only a single compressor is running and LWT is less than SP. Hot gas is turned OFF as temperature rises when LWT is more than SP plus CR/2. If temperature remains below the setpoint low limit on the lowest step of capacity, the microprocessor will close the liquid line solenoid, after turning off hot gas, and pump the system down before turning off the last compressor in a system.

The leaving chilled liquid setpoint is programmable from 40°F to 70°F (4.4°C to 21.1°C) in water chilling mode and from 10°F to 70°F (-12.2°C to 21.1°C) in glycol chilling mode. In both modes, the cooling range can be from plus or minus 1.5°F to plus or minus 2.5°F (plus or minus 0.83°C to 1.39°C). leaving chilled liquid control.

Table 23: Sample compressor staging for return water control

4 Compressor						
Cooling Setpoint = 45 °F (7.2 °C) Range = 10 °F (5.6 °C)						
# of Comp ON	0	* 1+HG	1	2	3	4
RWT	45°F (7.2°C)	46.25°F (7.9°C)	47.5°F (8.6°C)	50.0°F (10.0°C)	52.5°F (11.4°C)	55.0°F (12.8°C)

*Unloading only

Leaving chilled liquid control override to reduce cycling

To avoid compressor cycling the microprocessor adjusts the setpoint upward temporarily. The last run time of the system is saved. If the last run time was greater than 5 minutes, do not take any action. If the last run time for the lead system was less than 5 minutes, the microprocessor increases the setpoint high limit according to the chart at right, with a maximum value allowed of 50°F. See *Figure 49*.

If adding the setpoint adjust value to the setpoint high limit causes the setpoint high limit to be greater than 50°F, the setpoint high limit is set to 50°F and the difference is added to the setpoint low limit.

When a system runs for greater than 5 minutes, the setpoint adjust sets back to 0. This occurs while the system is still running.

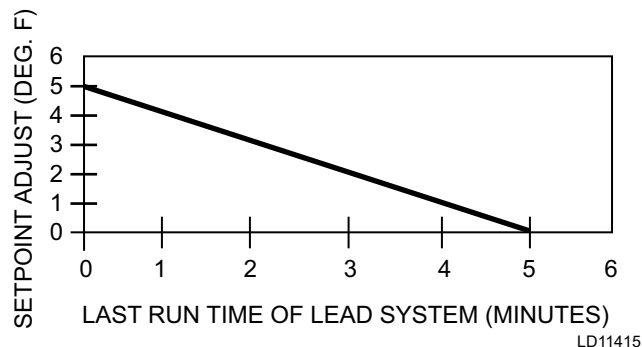


Figure 49: Setpoint Adjust

Leaving chilled liquid system lead/lag and compressor sequencing

A Lead/Lag option may be selected to help equalize average run hours between systems with 2 refrigerant systems. This may be programmed under the OPTIONS key. Auto Lead/Lag allows automatic Lead/Lag of the two systems based on average run hours of the compressors in each system. Manual Lead/Lag selects specifically the sequence which the microprocessor starts systems.

On a hot water start, once a system starts, it will turn ON all compressors before the next system starts a compressor. The microprocessor will sequence compressors within each circuit to maximize individual compressor run time on individual compressors within a system to prevent short cycling.

Each compressor in a system will be assigned an arbitrary priority number 1, 2, or 1, 2, 3. The non-running compressor within a system with the lowest priority number will always be the next compressor to start. The running compressor with priority number 1 will always be the next to shut OFF. Whenever a compressor is shut OFF, the priority numbers of all compressors will be decreased by 1 with wrap-around. This control scheme ensures the same compressor does not repeatedly cycle ON and OFF.

Once the second system starts a compressor on a 2 system chillers, the microprocessor will attempt to equally load each system as long as the system is not limiting or pumping down. Once this occurs, loading and unloading will alternate between systems, loading the lead system first or unloading the lag system first.

Return chilled liquid system lead/lag and compressor sequencing

A Lead/Lag option may be selected to help equalize average run hours between systems with 2 refrigerant systems. This may be programmed under the OPTIONS key. Auto Lead/Lag of the 2 systems based on average run hours of the compressors in each system. Manual Lead/Lag selects specifically the sequence which the microprocessor starts the systems.

The microprocessor will sequence compressors load and unload systems. The microprocessor will lead/lag compressors within each circuit to maximize individual compressor run time for the purpose of lubrication. It will also prevent the same compressor from starting 2 times in a row. The microprocessor will not attempt to equalize run time on individual compressors within a system.

Each compressor in a system will be assigned an arbitrary number 1, or 2. The non-running compressor within a system with the lowest priority number will always be the next compressor to start. The running compressor with priority number 1 will always be the next compressor to shut OFF. Whenever a compressor is shut OFF, the priority numbers of all compressors in each system will be decreased by 1 with the wrap around. This control scheme ensures the same compressor does not repeatedly cycle ON and OFF.

Anti-recycle timer

The programmable anti-recycle timer ensures that systems do not cycle. This timer is programmable under the PROGRAM key between 300 and 600 seconds. Whenever possible, to reduce cycling and motor heating, the anti-recycle timer should be adjusted to 600 seconds. The programmable anti-recycle timer starts the timer when the first compressor in a system starts. The timer begins to count down. If all of the compressors in a circuit cycle OFF, a compressor within the circuit will not be permitted to start until the anti-recycle timer has timed out. If the lead system has run for less than 5 minutes, 3 times in a row, the anti-recycle timer will be extended to 10 minutes.

Anti-Coincidence Timer

This timer is not present on single-system units. Two timing controls are present in software to ensure compressors within a circuit or between systems, do not start simultaneously. The anti-coincidence timer ensures there is at least a one minute delay between system starts on 2-circuit systems. This timer is NOT programmable. The load timers further ensure that there is a minimum time between compressor starts within a system.

Evaporator pump control and Quantech hydro kit pump control

The evaporator pump dry contacts (XTBC2 – Terminals 23 and 24) are energized when any of the following conditions are true:

1. Low Leaving Chilled Liquid Fault
2. Any compressor is running
3. Daily Schedule is ON, Unit Switch is ON and Remote Stop is closed

The pump will not run if the microprocessor panel has been powered up for less than 30 seconds or if the pump has run in the last 30 seconds to prevent pump motor overheating.

Whenever the option “YORK HYDRO KIT PUMPS = 1” is selected under the OPTIONS key, the pump control will be as described above. DO NOT SELECT the option “YORK HYDRO KIT PUMPS = 2” under the OPTIONS key. If a dual pump option is installed, the active pump is selected by the selector switch.

Evaporator heater control

The evaporator heater is controlled by ambient air temperature. When the ambient temperature drops below 40°F (4.4°C) the heater is turned ON. When the temperature rises above 45°F (7.2°C) the heater is turned OFF. An under voltage condition will keep the heater OFF until full voltage is restored to the system.

Pumpdown control

Each system has a pump-down feature upon shut-off. Manual pumpdown from the keypad is not possible. On a non-safety, non-unit switch shutdown, all compressors but one in the system will be shut OFF. The LLSV will also be turned OFF. The final compressor will be allowed to run until the suction pressure falls below the cutout, or for 180 seconds, whichever comes first.

Standard condenser fan control

Condenser fan operation must be programmed with the OPTIONS key under “Fan Control.” Condenser fan must be selected for Discharge Pressure only. Fan control by discharge pressure will work according to the tables on the following pages. See *Table 24 on page 177* and *Table 25 on page 178*. The fan control on pressure and fan differential off-pressure are programmable under the PROGRAM key. Standard fan control operates down to a temperature of 25°F.

The delay between turning ON and OFF fan stages is always fixed at 5 seconds.

When a fan stage is turned ON by pressure, the on pressure for the next stage is increased 20 psig and ramped back to the programmed on pressure over the next 20 seconds. Typically, standard ambient control on pressure should be programmed at 385 psig with a differential of 125 psig.

When a fan stage is turned OFF (programmed on pressure minus programmed differential), the off pressure for the next stage is decreased 20 psig and ramped back to the programmed off pressure minus the differential over the next 20 seconds.

Condenser fan locations are shown in *Figure 50 on page 176*. Detailed Standard Fan Control operation is shown in *Table 24 on page 177* and *Table 25 on page 178*.

VSD fan

VSD fans are equipped and controlled to extend the minimum starting ambient temperature to -10°F (-23.3°C).

The number of compressors running in the system, the programmed fan speed references, and the fan ramp speed determine the speed of the VSD.

For the QTC3 fan speed control, there are the following options:

- SINGLE SPEED or STANDARD fans
- QTC3 TWO SPEED FANS
- QTC3 VSD FANS

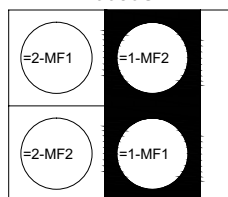
To enable fan inverter control, set the fan speed control in SERVICE MODE to QTC3 VSD FANS.

Changing the switch point of the thermal dispersion flow switch

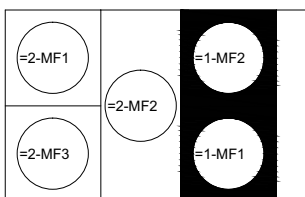
To change the factory-set LED 7, complete the following steps:

1. Press the ◀ or ▶ push button. The switch point LED flashes.
2. Press the ◀ or ▶ push button as many times as required in less than 2 seconds between each press. Each press of the push button shifts the LED by one position in the indicated direction.
3. Stop pressing the button when the switch position LED changes to the required position. The flow switch automatically returns to the operating mode with the new setting in 2 seconds.
4. To prevent unintentional settings, press both push buttons simultaneously for at least 10 seconds in operating mode to lock the switch electronically. To unlock the flow switch, perform the same operation again. The setting remains the same in case of power failure.

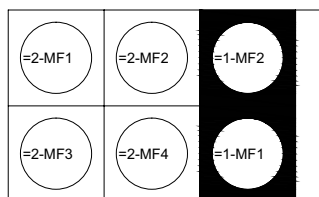
YLAA0041HE, YLAA0048HE,
YLAA0058HE, YLAA0065HE,
YLAA0070SE, YLAA0080SE,
YLAA0081HE, YLAA0082HE,
YLAA0089SE



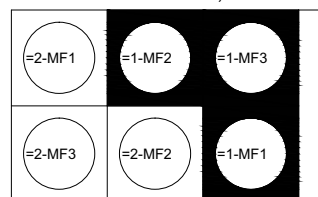
YLAA0100SE



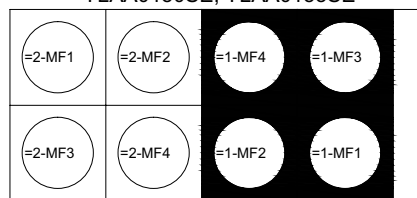
YLAA0101HE



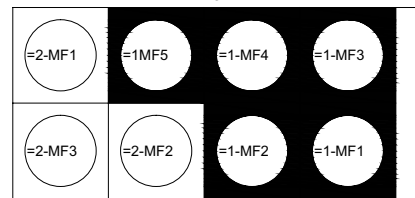
YLAA0092HE, YLAA0115SE,
YLAA0120SE,



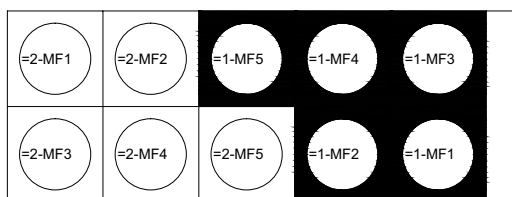
YLAA0125HE, YLAA0136SE, YLAA0139HE,
YLAA0150SE, YLAA0155SE



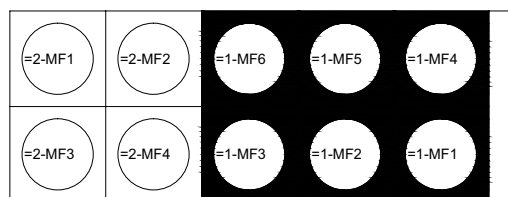
YLAA0142HE



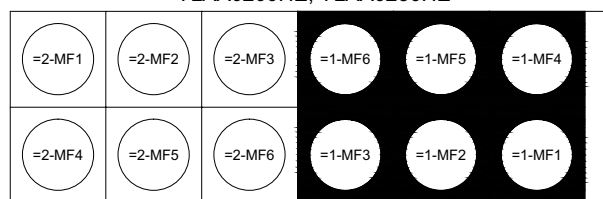
YLAA0170SE, YLAA0175HE



YLAA0156HE



YLAA0200HE, YLAA0230HE



LD27281a

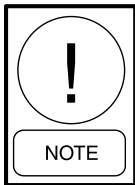
Figure 50: Condenser Fan Locations

Table 24: QTC3 Standard Condenser Fan Control Using Discharge Pressure Only (2, 3, or 4 Fans per System)

FAN STAGE	ON*	OFF**	IPU I/O OUTPUT		FAN CONTACTOR		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1	DP > PROGRAMMED FAN CONTROL ON PRESSURE	DP < PROGRAMMED FAN CONTROL ON PRESSURE MINUS PROGRAMMED DIFFERENTIAL PRESSURE	7B7-8	TB10-8	1-KF1	2-KF1	1-MF1	2-MF2
2	DP > PROGRAMMED FAN CONTROL ON PRESSURE AND FAN STAGE 1 IS ENERGIZED	DP < PROGRAMMED FAN CONTROL ON PRESSURE MINUS PROGRAMMED DIFFERENTIAL PRESSURE AND FAN STAGE 1 IS ENERGIZED	TB7-8 and TB7-9	TB10-8 and TB10-9	1-KF1 and 1-KF2	2-KF1 and 2-KF2	1-MF1 and 1-MF2	2-MF1 and 2-MF2
3	DP > PROGRAMMED FAN CONTROL ON PRESSURE AND FAN STAGES 1 AND 2 ARE ENERGIZED	DP < PROGRAMMED FAN CONTROL ON PRESSURE MINUS PROGRAMMED DIFFERENTIAL PRESSURE AND FAN STAGES 1 AND 2 ARE ENERGIZED	TB7-8 and TB7-9 and TB7-10	TB10-8 and TB10-9 and TB10-10	1-KF1 and 1-KF2 and 1-KF3	2-KF1 and 2-KF2 and 2-KF3	3 FAN: 1-MF1 and 1-MF2 and 1-MF3 4 FAN: 1-MF1 and 1-MF2 and 1-MF3 and 1-MF4	3 FAN: 2-MF1 and 2-MF2 and 2-MF3 4 FAN: 2-MF1 and 2-MF2 and 2-MF3 and 2-MF4

* When a fan stage is turned on, the pressure for the next stage is increased 20 PSIG and ramped back to the programmed on pressure over the next 20 seconds.

** When a fan stage is turned off (Programmed ON pressure minus the differential), the OFF pressure for the next stage is decreased 20 psig and ramped back to the programmed OFF pressure minus the differential.



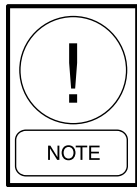
The time delay (fan delay timer) between turning fan stages on and off is fixed at 5 seconds.

Table 25: QTC3 Standard Condenser Fan Control Using Discharge Pressure Only (5 or 6 Fans per System)

FAN STAGE	ON*	OFF**	IPU I/O OUTPUT		FAN CONTACTOR		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1	DP > PROGRAMMED FAN CONTROL ON PRESSURE	DP < PROGRAMMED FAN CONTROL ON PRESSURE MINUS PROGRAMMED DIFFERENTIAL PRESSURE	TB7-8	TB10-8	1-KF1	2-KF1	1-MF1	2-MF1
2	DP > PROGRAMMED FAN CONTROL ON PRESSURE AND FAN STAGE 1 IS ENERGIZED	DP < PROGRAMMED FAN CONTROL ON PRESSURE MINUS PROGRAMMED DIFFERENTIAL PRESSURE AND FAN STAGE 1 IS ENERGIZED	TB7-8 and TB7-9	TB10-8 and TB10-9	1-KF1 and 1-KF2	2-KF1 and 2-KF2	1-MF1 and 1-MF2 and 1-MF3	2-MF1 and 2-MF2 and 2-MF3
3	DP > PROGRAMMED FAN CONTROL ON PRESSURE AND FAN STAGES 1 AND 2 ARE ENERGIZED	DP < PROGRAMMED FAN CONTROL ON PRESSURE MINUS PROGRAMMED DIFFERENTIAL PRESSURE AND FAN STAGES 1 AND 2 ARE ENERGIZED	TB7-8 and TB7-9 and TB7-10	TB10-8 and TB10-9 and TB10-10	1-KF1 and 1-KF2 and 1-KF3	2-KF1 and 2-KF2 and 2-KF3	5 FAN: 1-MF1 and 1-MF2 and 1-MF3 and 1-MF4 and 1-MF5 6 FAN: 1-MF1 and 1-MF2 and 1-MF3 and 1-MF4 and 1-MF5 and 1-MF6	5 FAN: 1-MF1 and 1-MF2 and 1-MF3 and 1-MF4 and 1-MF5 6 FAN: 1-MF1 and 1-MF2 and 1-MF3 and 1-MF4 and 1-MF5 and 1-MF6

* When a fan stage is turned on, the pressure for the next stage is increased 20 psig and ramped back to the programmed on pressure over the next 20 seconds.

** When a fan stage is turned off (Programmed ON pressure minus the differential), the OFF pressure for the next stage is decreased 20 psig and ramped back to the programmed OFF pressure minus the differential.



The time delay (fan delay timer) between turning fan stages on and off is fixed at 5 seconds.

Load limiting

Load Limiting is a feature that prevents the unit from loading beyond the preferred value. 2 and 4 compressor units can be load limited to 50%. This would allow only 1 compressor per system to run. 3 and 6 compressor units can be load limited to 33% or 66%. The 66% limit would allow up to 2 compressors per system to run, and the 33% limit would allow only 1 compressor per system to run. Five-compressor units may be load limited to 40% (1 compressor per system runs) or 80% (up to 2 compressors per system) are permitted to run. No other values of limiting are available.

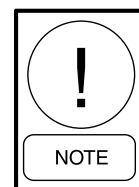
There are two ways to load limit the unit. The first is through remote communication via an ISN. Load limit stages are sent through YORKTalk on pages 9 and 10 of feature 54. Page 9 is stage 1 load limit and page 10 is stage 2 load limit.

A second stage of load limiting the unit is accomplished by closing contacts connected to the Load Limit (XTBC1 – terminals 13-21) and PWM inputs (XTBC1 – terminals 13-20). Stage 1 of load limiting involves closing the Load Limit input. Stage 2 of load limiting involves closing both the Load Limit and PWM inputs. The first stage of limiting is either 80%, 66% or 50%,

depending on the number of compressors on the unit. The second stage of limiting is either 40% or 33% and is only available on 3, 5 and 6 compressor units. The following table shows the load limiting permitted for the various numbers of compressors.

Table 26: Compressor Operation Load Limiting

Compressors In UNit	Stage 1	Stage 2
2	50%	—
3	66%	33%
4	50%	—
5	80%	40%
6	66%	33%



Simultaneous operation of Remote Load Limiting and EMS-PWM Temperature Reset (described on following pages) cannot occur.

Compressor run status

Compressor run status is indicated by closure of contacts at XTBC2 – Terminals 25 to 26 for system 1 and XTBC2 – Terminals 27 to 28 for system 2.

Alarm status

System or unit shutdown is indicated by normally-open alarm contacts opening whenever the unit shuts down on a unit fault, locks out on a system fault, or experiences a loss of power to the chiller electronics. System 1 alarm contacts are located at XTBC2 – Terminals 29

to 30. System 2 alarm contacts are located at XTBC2 – Terminals 31 to 32. The alarm contacts will close when conditions allow the unit to operate, or the fault is reset during a loss of power, the contacts will remain open until power is reapplied and no fault conditions exist.

Remote BAS/EMS temperature reset using a voltage or current signal

The Remote Reset Option allows the Control Center of the unit to reset the chilled liquid setpoint using a 0 VDC to 10 VDC input, or a 4 mA to 20 mA input connected to XTBC1 Terminals A- and A+. Whenever a reset is called for, the change may be noted by pressing the COOLING SETPOINTS key twice. The new value will be displayed as “REM SETP = XXX °F.”

If a 0 VDC to 10 VDC signal is supplied, it is applied to Terminals A+ and A-, and jumper JP1 on the I/O board must be inserted between pins 2 and 3. To calculate the reset chilled liquid setpoint for values between 0 VDC and 10 VDC, use the following formula:

$$\text{Setpoint} = \text{Local Chilled Liquid Setpoint} + \text{°Reset}$$

$$\text{°Reset} = \frac{(\text{DC voltage signal}) \times (\text{*Max Reset Value})}{10}$$

Example:

Local Chilled Liquid Setpoint = 45°F (7.22°C)

*Max Reset Value = 20°F (11.11°C)

Input Signal = 6 VDC

(English)

$$\text{°Reset} = \frac{6 \text{ VDC} \times 20^\circ\text{F}}{10} = 12^\circ\text{F Reset}$$

New Setpoint = 45°F + 12°F = 57°F

(Metric)

$$\text{°Reset} = \frac{6 \text{ VDC} \times 11.11^\circ\text{C}}{10} = 6.67^\circ\text{C Reset}$$

New Setpoint = 7.22°C + 6.67°C = 13.89°C

* Max Reset Value is the “Max EMS-PWM Remote Temp. Reset” setpoint value described in *Remote setpoint control on page 150* under “Cooling Setpoints”. Programmable values are from 2°F to 40°F (1.11°C to 11.11°C).

If a 4 mA to 20 mA signal is supplied, it is applied to Terminals A+ and A- and jumper JP1 on the I/O board must be installed between pin 1 and 2. To calculate the chilled liquid setpoint for values between 4 mA and 20 mA, use the following formula:

$$\text{Setpoint} = \text{Local Chilled Liquid Setpoint} + \text{°Reset}$$

$$\text{°Reset} = \frac{(\text{mA signal} - 4) \times (\text{*Max Reset Value})}{16}$$

Example:

Local Chilled Liquid Setpoint = 45°F (7.22°C)

*Max Reset Value = 10°F (5.56°C)

Input Signal = 12 mA

(English)

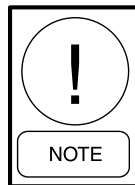
$$\text{°Reset} = \frac{8 \text{ mA} \times 10^\circ\text{F}}{16} = 5^\circ\text{F Reset}$$

Setpoint = 45°F + 5°F = 50°F

(Metric)

$$\text{°Reset} = \frac{8 \text{ mA} \times 5.56^\circ\text{C}}{16} = 2.78^\circ\text{C Reset}$$

Setpoint = 7.22°C + 2.78°C = 10.0°C



A 240 to 24 V Ratio Transformer (T3) is used to derive nominal 12 V output from the 120 V supply.

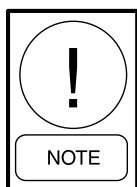
Section 9: Service and troubleshooting

Clearing history buffers

The history buffers may be cleared by pressing the HISTORY key and then repeatedly pressing the UP arrow key until you scroll past the last history buffer choice. The following message will be displayed:

INITIALIZE HISTORY
ENTER = YES

Pressing the ENTER/ADV key at this display will cause the history buffers to be cleared. Pressing any other key will cancel the operation.



DO NOT CLEAR BUFFERS. Important information may be lost. Contact factory service.

Resetting system lockout faults

If 3 faults on the same system occur within 90 minutes, that system is locked out on the last fault. This condition requires a manual reset. Turn off and then turn on the system switch (under OPTIONS key) to clear the lockout fault. Fault messages are displayed whenever a system is locked out.

Service mode

Service Mode is a mode that allows the user to enable or disable all of the outputs (except compressors) on the unit, change chiller configuration setup parameters and view all the inputs to the microboard.

To enter Service Mode, turn the Unit Switch OFF and press the following keys in the sequence shown:

- PROGRAM
- UP ARROW
- UP ARROW
- DOWN ARROW
- DOWN ARROW
- ENTER

Service Mode will time out after 30 minutes and return to normal control mode, if the panel is accidentally left in this mode. Otherwise, turning the unit switch ON will take the panel out of Service Mode.

Service mode, outputs

After pressing the key sequence as described, the control will enter Service Mode permitting the outputs (except compressors), operating hours, refrigerant type, expansion valve type, and start/hour counters to be viewed/modified. The ENTER/ADV key is used to advance through the outputs. Using the ↑ and ↓ (UP/DOWN) arrow keys will turn the respective digital output ON/OFF or modify the value.

Following is the order of outputs that will appear as the ENTER/ADV key is pressed:

SYS 1 COMP 1 STATUS TB7-2 IS:
 SYS 1 LLSV STATUS TB7-3 IS:
 SYS 1 COMP 2 STATUS TB7-4 IS:
 SYS 1 COMP 3 STATUS TB7-5 IS:
 SYS 1 HGBP STATUS TB7-7 IS:
 SYS 2 COMP 1 STATUS TB10-2 IS:
 SYS 2 LLSV STATUS TB10-3 IS:
 SYS 2 COMP 2 STATUS TB10-4 IS:
 SYS 2 COMP 3 STATUS TB10-5 IS:
 SYS 1 FAN OUTPUT 1 TB7-8 IS:
 SYS 1 FAN OUTPUT 2 TB7-9 IS:
 SYS 1 FAN OUTPUT 3 TB7-10 IS:
 SYS 2 FAN OUTPUT 1 TB10-8 IS:
 SYS 2 FAN OUTPUT 2 TB10-9 IS:
 SYS 2 FAN OUTPUT 3 TB10-10 IS:
 EVAP HEATER STATUS TB8-2 IS:
 SYS 1 ALARM STATUS TB8-3 IS:
 SYS 2 ALARM STATUS TB9-2 IS:
 EVAP PUMP STATUS TB8-6,7 IS:
 SYS 2 HGBV STATUS TB10-7 IS:
 SPARE DO TB8-4 IS:
 SPARE DO TB8-5 IS:
 SPARE DO TB8-8, 9 IS:
 SPARE DO TB9-4 IS:
 SYS 1 EEV OUTPUT TB5-1, 2 = XXX%
 SYS 2 EEV OUTPUT TB6-1, 2 = XXX%
 SYS 1 COND FAN SPEED J15-1,5 = XXX%
 SYS 2 COND FAN SPEED J15-2,6 = XXX%
 SPARE AO J15-3,7 = XXX%
 SPARE AO J15-4,8 = XXX%
 DATA LOGGING MODE 1 = ON, 0 = OFF
 DATA LOGGING TIMER X SECS
 SOFT START (disabled)
 REFRIGERANT TYPE (R-410A only)
 EXPANSION VALVE TYPE (Thermostatic Only)
 REMOTE TEMP RESET OPTION =
 REMOTE INPUT SERVICE TIME =

“NORTH AMERICAN FEATURE SET ENABLED”
HYDRO PUMP SELECTION
EVAP PUMP TOTAL RUN HOURS
SYS 1 HOURS
SYS 2 HOURS
SYS 1 STARTS
SYS 2 STARTS

Each display will also show the output connection on the microboard for the respective output status shown. For example:

```
SYS 1 LLSV STATUS
TB10 - 3 IS OFF
```

This display indicates that the system 1 liquid line solenoid valve is OFF, and the output connection from the microboard is coming from terminal block 10 – pin 3.

Pressing the ↑ (UP) arrow key will energize the liquid line solenoid valve and OFF will change to ON in the display as the LLSV is energized. Energizing and de-energizing outputs may be useful during troubleshooting.

Service mode, chiller configuration

After the Outputs are displayed, the next group of displays relate to chiller configuration and start/hour counters. Data logging, soft start, refrigerant type, pump control selection and expansion valve type all must be programmed to match actual chiller configuration.



Soft start (disabled), Refrigerant Type (R-410A), and Expansion Valve Type (Thermostatic), and North American Feature (Enabled) MUST be properly programmed or damage to compressors and other system components may result

Following is a list of chiller configuration selections, in order of appearance:

DATA LOGGING MODE = : DO NOT MODIFY
DATA LOGGING TIMER = : DO NOT MODIFY
SOFT START
REFRIGERANT TYPE
EXPANSION VALVE TYPE
REMOTE TEMP RESET OPTION
REMOTE INPUT SERVICE TIME
FEATURE SET
PUMP CONTROL SELECTION
SYS 1 HOURS
SYS 2 HOURS
SYS 1 STARTS

SYS 2 STARTS

The last displays shown on the above list are for the accumulated run and start timers for each system. All values can also be changed using the ↑ (UP) and ↓ (Down) arrow keys, but under normal circumstances would not be required or advised. After the last start display, the microprocessor will display the first programmable value under the PROGRAM key.

Service mode, analog and digital inputs

After entering Service Mode (PROGRAM ↑↑ ↓↓), all digital and analog inputs to the microboard can be viewed by pressing the OPER DATA key. After pressing the OPER DATA key, the ↑ (UP) arrow and ↓ (DOWN) arrow keys are used to scroll through the analog and digital inputs.

Following is the order of analog and digital inputs that will appear when sequenced with the ↓ (Down) arrow key:

(analog inputs)
SYS 1 SUCT PRESSURE
UNIT TYPE
SYS 1 *DISCH PRESSURE
SYS 1** SUCTION TEMP.
SYS 2** SUCTION TEMP.
AMBIENT AIR TEMP.
LEAVING LIQUID TEMP.
RETURN LIQUID TEMP.
SYS 2 SUCTION PRESSURE
SYS 2 SPARE
SYS 2 *DISCH PRESSURE
SYS 1 MTR VOLTS
SYS 2 MTR VOLTS
(digital inputs)
PWM TEMP RESET INPUT
LOAD LIMIT INPUT
FLOW SW / REM START
SPARE
SINGLE SYSTEM SELECT
SYS 1 MP / HPCO INPUT
SYS 2 MP / HPCO INPUT

* The discharge pressure transducer is optional on some models.

** The suction temp. sensor is on EEV units only.

The analog inputs will display the input connection, the temperature or pressure, and corresponding input voltage such as:

S Y S 1 S U C T P R J 7 - 1 0
2 . 1 V D C = 8 1 P S I G

This example indicates that the system 1 suction pressure input is connected to plug 7 – pin 10 (J7-10) on the I/O board. It indicates that the voltage is 2.1 VDC which corresponds to 81 psig (5.6 bar) suction pressure.

The digital inputs will display the input connection and ON/OFF status such as:

F L O W S W / R E M S T A R T
J 13 - 5 I S O N

This indicates that the flow switch/remote start input is connected to plug 13- pin 5 (J13-5) on the microboard, and is ON (ON = +30 VDC unregulated input, OFF = 0VDC input on digital inputs).

Control inputs/outputs

Table 27 through Table 30 on page 183 are a quick reference list providing the connection points and a description of the inputs and outputs respectively. All input and output connections pertain to the connections at the microboard.

Table 27: I/O Digital Inputs

J13-2	Unit ON/OFF Switch
J13-3	Load Limit Stage 2 on 3, 5 & 6 Comp. Units
J13-4	Load Limit Stage 1
J13-5	Flow Switch and Remote Start/Stop
J13-6	Spare
J13-7	Single System Select (Jumper = Single Sys, No Jumper = Two Sys)
J13-8	CR1 (Sys 1 Motor Protector/High Pressure Cutout)

J13-10	CR2 (Sys 2 Motor Protector/High Pressure Cutout)
---------------	---

Table 28: I/O Digital Outputs

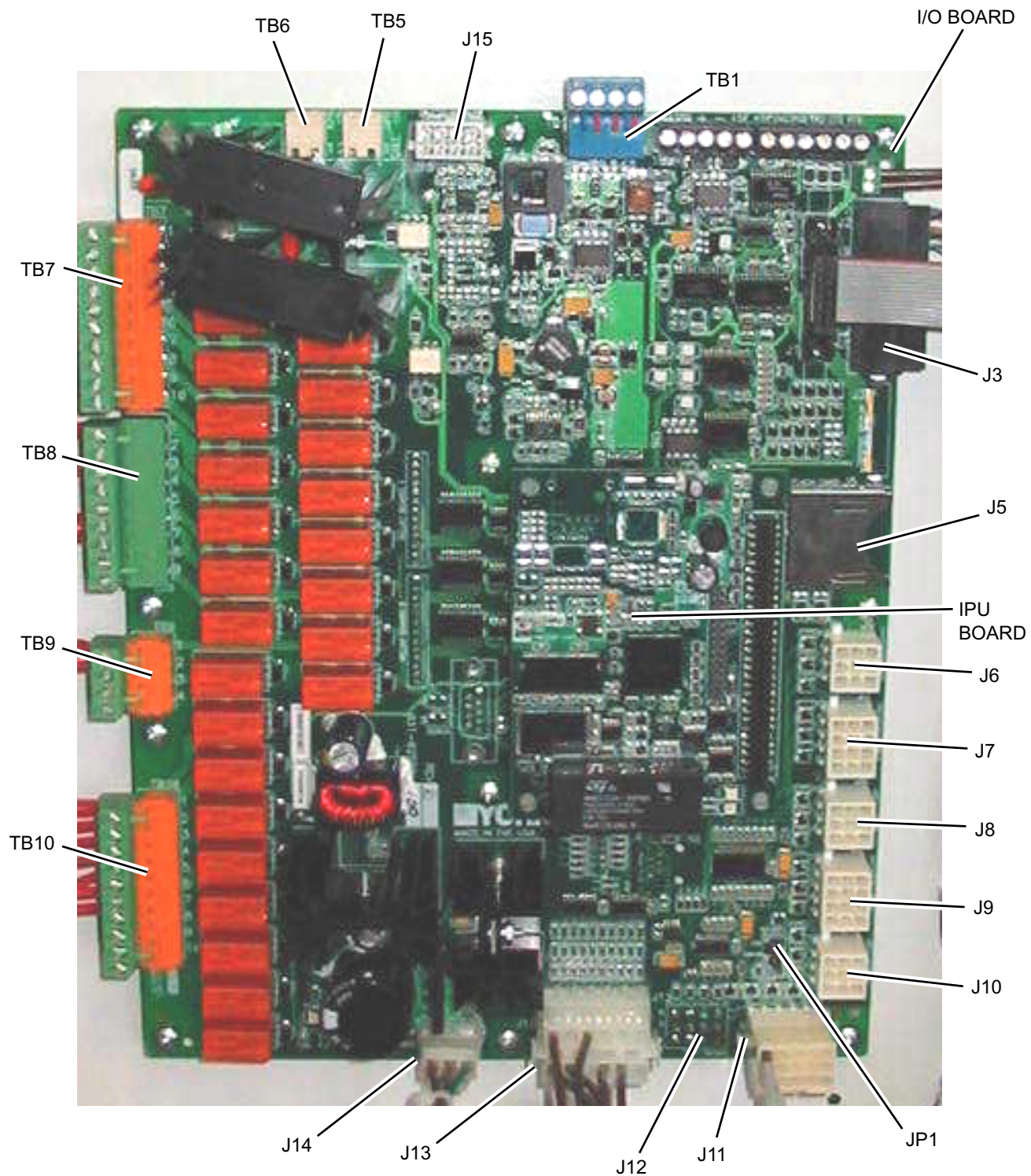
TB7-2	SYS 1 Compressor 1
TB7-3	SYS 1 Liquid Line Solenoid Valve
TB7-4	SYS 1 Compressor 2
TB7-5	SYS 1 Compressor 3
TB7-7	SYS 1 Hot Gas Bypass Valve
TB10-2	SYS 2 Compressor 1
TB10-3	SYS 2 Liquid Line Solenoid Valve
TB10-4	SYS 2 Compressor 2
TB10-5	SYS 2 Compressor 3
TB7-8	SYS 1 Condenser Fan Output 1
TB7-9	SYS 1 Condenser Fan Output 2
TB7-10	SYS 1 Condenser Fan Output 3
TB10-8	SYS 2 Condenser Fan Output 1
TB10-9	SYS 2 Condenser Fan Output 2
TB10-10	SYS 2 Condenser Fan Output 3
TB8-2	Evaporator Heater
TB8-3	SYS 1 Alarm
TB9-2	SYS 2 Alarm
TB8-6 & 7	Evaporator Pump Starter
TB10-7	SYS 2 Hot Gas Bypass Valve

Table 29: I/O Analog Inputs

J7-10	SYS 1 Suction Transducer -or- SYS 1 Low Pressure Switch
J11-12	Unit Type: Chiller = NO Jumper J11-12 to +24 VDC YCUL Condensing Unit = Jumper J11-12 to +24 VDC (Do NOT Use)
J7-11	SYS 1 Discharge Pressure Transducer (Optional)
J6-9	Ambient Air Temp. Sensor
J6-7	Leaving Chilled Liquid Temp. Sensor
J6-8	Return Chilled Liquid Temp. Sensor
J9-10	SYS 2 Suction Pressure Transducer -or- SYS 2 Low Pressure Switch
J9-11	SYS 2 Discharge Pressure Transducer (Optional)
J7-12	Unit/SYS 1 Voltage
J9-12	SYS 2 Voltage
J11-11	Remote Temperature Reset

Table 30: I/O Analog Outputs

N/A	Not Applicable
------------	----------------



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Figure 51: Microboard Layout

Checking inputs and outputs

Digital inputs

See the unit wiring diagram. All digital inputs are connected to J13-1 of the I/O board. The term “digital” refers to two states – either ON or OFF. As an example, when the flow switch is closed, 30 VDC will be applied to J13, pin 5 (J13-5) of the I/O board. If the flow switch is open, 0 VDC will then be present at J13-5.

Pin 1 of J13 is an unregulated 30 VDC source used to supply the DC voltage to the various user contacts, unit switch, flow switch, etc. This DC source is factory wired to XTBC1, Terminal 13. Any switch or contact used as a digital input would be connected to this terminal, with the other end connecting to its respective digital input on the microboard. Any time a switch or contact is closed, 30 VDC would be applied to that particular digital input. Any time a switch or contact is open, 0 VDC would be applied to that particular digital input.

Typically, voltages of 24 VDC to 36 VDC could be measured for the DC voltage on the digital inputs. This voltage is in reference to ground. The unit case should be sufficient as a reference point when measuring digital input voltages.

Analog inputs, temperature

See the unit wiring diagram. Temperature inputs are connected to the microboard on plug J6. These analog inputs represent varying DC signals corresponding to varying temperatures. All voltages are in reference to the unit case (ground). Following are the connections for the temperature sensing inputs.

Outside air sensor

J6-6 = +5 VDC regulated supply to sensor.

J6-9 = VDC input signal to the microboard.
See *Table 31 on page 185* for voltage readings that correspond to specific outdoor temperatures.

J6-3 = drain (shield connection = 0 VDC) return

Table 31: Outdoor Air Sensor Temperature/Voltage/Correlation

TEMP °F	VOLTAGE (Signal Input to Return)	TEMP °C
0	0.7	-18
5	0.8	-15
10	0.9	-12
15	1.0	-9
20	1.1	-7
25	1.2	-4
30	1.4	-1
35	1.5	2
40	1.7	4
45	1.8	7
50	2.0	10
55	2.2	13
60	2.3	16
65	2.5	18
70	2.6	21
75	2.8	24
80	2.9	27
85	3.1	29
90	3.2	32
95	3.4	35
100	3.5	38
105	3.6	41
110	3.7	43
115	3.8	46
120	3.9	49
125	4.0	52
130	4.1	54

Table 32: Entering/Leaving Chilled Liquid Temp. Sensor, Temperature/Voltage Correlation

TEMP °F	VOLTAGE (Signal Input to Return)	TEMP °C
10	1.33	-12
12	1.39	-11
14	1.46	-10
16	1.51	-9
18	1.58	-8
20	1.65	-7
22	1.71	-6
24	1.78	-4
26	1.85	-3
28	1.91	-2
30	1.98	-1
32	2.05	0
34	2.12	1
36	2.19	2
38	2.26	3
40	2.33	4
42	2.40	6
44	2.47	7
46	2.53	8
48	2.60	9
50	2.65	10
52	2.73	11
54	2.80	12
56	2.86	13
58	2.92	14
60	2.98	16
62	3.05	17
64	3.11	18
66	3.17	19
68	3.23	20
70	3.29	21
72	3.34	22
74	3.39	23
76	3.45	24
78	3.5	26
80	3.54	27

Liquid and refrigerant sensor test points

See Table 32 on page 186.

Entering chilled liquid sensor

J6-5 = +5 VDC regulated supply to sensor.

J6-8 = VDC input signal to the I/O board. See Table 32 on page 186 for voltage readings that correspond to specific liquid temperatures.

J6-2 = drain (shield connection = 0 VDC) Return

Leaving chilled liquid temperature sensor

J6-4 = +5 VDC regulated supply to sensor.

J6-7 = VDC input signal to the microboard. See Table 32 on page 186 for voltage readings that correspond to specific liquid temperatures.

J6-1 = drain (shield connection = 0 VDC) return

Analog inputs, pressure

See the unit wiring diagram. Pressure inputs are connected to the microboard on plugs J7 and J9. These analog inputs represent varying DC signals corresponding to varying pressures. All voltages are in reference to the unit case (ground).

System 1 discharge and suction pressures will be connected to J7 of the microboard. System 2 discharge and suction pressure transducers will be connected to J9 of the microboard.

The discharge transducers are optional on all units. If the discharge transducers are not installed, no connections are made to the microboard and the discharge pressure readout on the display would be zero.

The suction pressure transducers are standard on all QTC3. The suction pressure transducers have a range of 0 psig to 400 psig. The output will be linear from 0.5 VDC to 4.5 VDC over the 400 psig (27.5 barg) range.

The discharge transducers have a range from 0 psig to 650 psig. The output will be linear from 0.5 VDC to 4.5 VDC over the 600 psig (41.25 barg) range. Following is the formula that can be used to verify the voltage output of the transducer. All voltage reading are in reference to ground (unit case).

Table 33: Pressure Transducers

0-400 PSIG SUCTION PRESSURE TRANSDUCER		0-600 PSIG DISCHARGE PRESSURE TRANSDUCER	
PRESSURE PSIG	VOLTAGE VDC	PRESSURE PSIG	VOLTAGE VDC
0	0.5	0	0.5
50	1.0	75	1.0
100	1.5	150	1.5
150	2.0	225	2.0
200	2.5	300	2.5
250	3.0	375	3.0
300	3.5	450	3.5
350	4.0	525	4.0
400	4.5	600	4.5

RED WIRE = 5V, BLACK WIRE = 0V, WHITE/GREEN WIRE = SIGNAL

TEST POINTS:

Suction Pressure:

System 1:Microboard J7-10 to J7-9

System 2:Microboard J9-10 to J9-9

Discharge Pressure:

System 1:Microboard J7-11 to J7-7

System 2:Microboard J9-11 to J9-7

$$V = (\text{Pressure in psig} \times .01) + 0.5$$

or

$$V = (\text{Pressure in barg} \times .145) + 0.5$$

where V = DC voltage output

Pressure = pressure sensed by transducer

The I/O board connections for the Discharge Transducers are as follows.

System 1 discharge transducer

J7-6 = +5 VDC regulated supply to transducer.

J7-11 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific discharge pressures.

J7-7 = +5 VDC return

J7-2 = drain (shield connection = 0VDC)

System 2 discharge transducer

J9-6 = +5 VDC regulated supply to transducer.

J9-11 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific discharge pressures.

J9-7 = +5 VDC return

J9-2 = drain (shield connection = 0 VDC)

The suction transducers have a range from 0 to 400 psig (27.5 barg). The output will be linear from 0.5 VDC to 4.5 VDC over the 400 psig (27.5 barg) range. Following is a formula that can be used to verify the voltage output of the transducer. All voltage reading are in reference to ground (unit case).

$$V = (\text{Pressure in psig} \times 0.02) + 0.5$$

or

$$V = (\text{Pressure in barg} \times 0.29) + 0.5$$

where V = DC voltage input to microprocessor

Pressure = pressure sensed by transducer

Following are the I/O board connections for the Suction Transducer.

System 1 suction transducer

J7-5 = +5 VDC regulated supply to transducer.

J7-10 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific suction pressures.

J7-9 = +5 VDC return.

J7-1 = drain (shield connection = 0 VDC).

System 2 suction transducer

J9-5 = +5 VDC regulated supply to transducer.

J9-10 = VDC input signal to the microboard. See the formula above for voltage readings that correspond to specific suction pressures.

J7-9 = +5 VDC return.

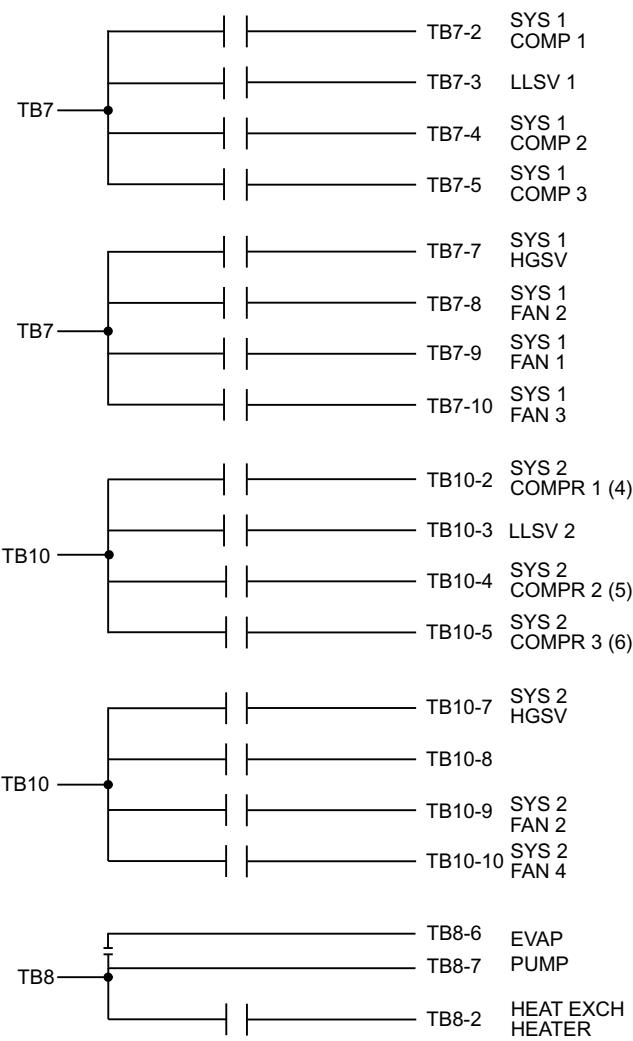
J7-11 = drain (shield connection = 0VDC).

Digital outputs

See the unit wiring diagram and *Figure 52 on page 188*. The digital outputs are located on TB7, TB8, and TB9 and TB-10 of the microboard. All outputs are 120 VAC with the exception of TB8-6 to TB8-7 which are the contacts that can be used for a remote evaporator pump start signal. The voltage applied to either of these terminals would be determined by field wiring.

Each output is controlled by the microprocessor by switching 120 VAC to the respective output connection energizing contactors, evaporator heater, and solenoids according to the operating sequence.

120 VAC is supplied to the I/O board via connections at TB7-1, TB7-6, TB10-1, TB10-6, TB8-1 and TB9-1. Figure 34 illustrates the relay contact architecture on the microboard.



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Figure 52: I/O Board Relay Contact Architecture

Data logging to flash

Enabling Data Logging to Flash

The user can enable data logging to an SD card in the unit setup mode. When data logging is ENABLED or SKIP UNCHANGED, data is continuously stored at the programmed data log time on an SD card. The SD card is in the socket of the 031-02550 I/O board.

Content

The root directory contains directories for each month, named RMyyyyymm, where yyyy is the four digit year and mm is the two digit month. Under each monthly directory, there are the individual daily CSV formatted files named yyymmdd.csv, where yyyy is the four digit year, mm is the two digit month, and dd is the two digit day.

The first row of the file is the header text. The second row is the header unit. The remaining rows contain the data captured at the specified interval of 5 seconds.

If the user disables and then enables the data logging the same day, the new data is appended to the existing file.

When the SD card is full, the oldest day of data is deleted.

Table 34: Data logging to flash

Data Number	Header		Data	
	Text	Unit	Format	Value Description
1	Date		x/x/xxxx	Date
2	Time		x:x:x	Time (24 Hour Format)
3	Elapsed Time	s	x	Elapsed time (seconds since data logging started)
4	LCHLT	°F	x.x	Leaving Chilled Liquid Temperature
5	RCHLT	°F	x.x	Return Chilled Liquid Temperature
6	LHLT	°F	x.x	Leaving Hot Liquid Temperature (QWC3)
7	RHLT	°F	x.x	Return Hot Liquid Temperature (QWC3)
8	Ambient Air	°F	x.x	Ambient Air Temperature (N/A QWC3)
9	Active Cool Setp	°F	x.x	Active Cooling Setpoint
10	Active Heat Setp	°F	x.x	Active Heating Setpoint
11	Evap Heater		x	Evaporator Heater Status
12	Evap Pump		x	Evaporator Pump Contact Status
13	Evap Pump 2		x	Evaporator Pump 2 Contact Status (Hydro Kit 2)
14	Biv Ht Step		x	Bivalent Heat Step (N/A)
15	Drip Tray Htr		x	Drip Tray Heater (N/A)
16	Mode Select		x	Mode Select (QWC3) (0=Chiller, 1=Heatpump)
17	Lead System		x	Lead System (0=System1, 1=System2)
18	Flow Switch		x	Flow Switch Status
19	S1 Run Time	s	x	Sys 1 Run Time
20	S1 Operating Code		x	Sys 1 Operational Code
21	S1 Fault Code		x	Sys 1 Fault Code
22	S1 Suct Press	psig	x.x	Sys 1 Suction Pressure
23	S1 Act_Spc	psig	x.x	Sys 1 Actual Suction Pressure Cutout
24	S1 Dsch Press	psig	x.x	Sys 1 Discharge Pressure
25	S1 Suct Temp	°F	x.x	Sys 1 Suction Temperature
26	S1 Sat Suct Temp	°F	x.x	Sys 1 Saturated Suction Temperature
27	S1 Suct Sheat	°F	x.x	Sys 1 Suction Superheat
28	S1 C1 Run		x	Sys 1 Compressor 1 Run Status
29	S1 C2 Run		x	Sys 1 Compressor 2 Run Status
30	S1 C3 Run		x	Sys 1 Compressor 3 Run Status
31	S1 LLSV		x	Sys 1 Liquid Line Solenoid Valve Status
32	S1 Hot Gas		x	Sys 1 Hot Gas Bypass Solenoid Valve Status
33	S1 Fan Stage		x	Sys 1 Condenser Fan Stage
34	S1 Fan Speed	%	x	Sys 1 VSD Fan Speed (VSD Fans)
35	S1 Comp Seq		x	Sys 1 Programmed Compressor Sequence (1=C1, 2=C2, 3=C3)
36	S1 CIR Temp	°F	x.x	Sys 1 Cooler Inlet Refrig. Temp (R-407c)
37	S1 Dsch Sheat	°F	x.x	Sys 1 Discharge Superheat (discharge temperature sensors enabled)
38	S1 Sheat Setp	°F	x.x	Sys 1 Superheat Setpoint
39	S1 Dsch Temp	°F	x.x	Sys 1 Discharge Temperature (discharge temperature sensors enabled)
40	S1 EEV Cmd	%	x x.x	Sys 1 EEV Command (0 – 100%) 031-02755-001, -003 Sys 1 EEV Command (0.0 – 100.0%) 031-02755-004
41	S1 EEV PWM	%	x	Sys 1 EEV PWM (0 – 100%) 031-02755-001, -003

Table 34: Data logging to flas, continued

Data Number	Header		Data	
	Text	Unit	Format	Value Description
42	S1 EEV Ctlr State		x	Sys 1 EEV Controller State 031-02755-001, -003 Sys 1 CSHALG_CURRENT_CYCLE_INDEX, 0 = Setup, 1 = Off, 2 = Pulldown, 3 = Controlling, 4 = Pumpdown, 5 = MOP Control 031-02755-004
43	S1 Dfst Temp	°F	x.x	Sys 1 Defrost Coil Temperature (Heatpump)
44	S1 Mode Valve		x	Sys 1 Mode Valve (Heatpump)
45	S2 Run Time	s	x	Sys 2 Run Time
46	S2 Operating Code		x	Sys 2 Operational Code
47	S2 Fault Code		x	Sys 2 Fault Code
48	S2 Suct Press	psig	x.x	Sys 2 Suction Pressure
49	S2 Act_Spc	psig	x.x	Sys 2 Actual Suction Pressure Cutout
50	S2 Dsch Press	psig	x.x	Sys 2 Discharge Pressure
51	S2 Suct Temp	°F	x.x	Sys 2 Suction Temperature
52	S2 Sat Suct Temp	°F	x.x	Sys 2 Saturated Suction Temperature
53	S2 Suct Sheat	°F	x.x	Sys 2 Suction Superheat
54	S2 C1 Run		x	Sys 2 Compressor 1 Run Status
55	S2 C2 Run		x	Sys 2 Compressor 2 Run Status
56	S2 C3 Run		x	Sys 2 Compressor 3 Run Status
57	S2 LLSV		x	Sys 2 Liquid Line Solenoid Valve Status
58	S2 Hot Gas		x	Sys 2 Hot Gas Bypass Solenoid Valve Status
59	S2 Fan Stage		x	Sys 2 Condenser Fan Stage
60	S2 Fan Speed	%	x	Sys 2 VSD Fan Speed (VSD Fans)
61	S2 Comp Seq		x	Sys 2 Programmed Compressor Sequence (1=C1, 2=C2, 3=C3)
62	S2 CIR Temp	°F	x.x	Sys 2 Cooler Inlet Refrig. Temp (R-407c)
63	S2 Dsch Sheat	°F	x.x	Sys 2 Discharge Superheat (discharge temperature sensors enabled)
64	S2 Sheat Setp	°F	x.x	Sys 2 Superheat Setpoint
65	S2 Dsch Temp	°F	x.x	Sys 2 Discharge Temperature (discharge temperature sensors enabled)
66	S2 EEV Cmd	%	x x.x	Sys 2 EEV Command (0 – 100%) 031-02755-001, -003 Sys 2 EEV Command (0.0 – 100.0%) 031-02755-004
67	S2 EEV PWM	%	x	Sys 2 EEV PWM (0 – 100%) 031-02755-001, -003
68	S2 EEV Ctlr State		x	Sys 2 EEV Controller State 031-02755-001, -003 Sys 2 CSHALG_CURRENT_CYCLE_INDEX, 0 = Setup, 1 = Off, 2 = Pulldown, 3 = Controlling, 4 = Pumpdown, 5 = MOP Control 031-02755-004
69	S2 Dfst Temp	°F	x.x	Sys 2 Defrost Coil Temperature (Heatpump)
70	S2 Mode Valve		x	Sys 2 Mode Valve (Heatpump)
71	S1 Full PID Index		x	Sys 1 CSHALG_FULL_PID_ACTIVE_INDEX (0 = Disable, 1 = Active)
72	S1 Dim PID Index		x	Sys 1 CSHALG_DIMINISHED_PID_ACTIVE_INDEX (0 = Disable, 1 = Active)
73	S1 Alg Ctrl Act		x	Sys 1 CSHALG_ALGORITHM_CONTROL_ACTIVE (0 = Disable, 1 = Enable)
74	S1 Sheat Ex In		x	Sys 1 CSHALG_SUPERHEAT_EXCURSIONS_INDEX (0 – 255 in x1 format)

Table 34: Data logging to flas, continued

Data Number	Header		Data	
	Text	Unit	Format	Value Description
75	S1 Prop Cont In		x	Sys 1 CSHALG_PROPORTIONAL_CONTRIBUTION_INDEX (0-10000 in x100 format)
76	S1 Int Cont In		x	Sys 1 CSHALG_INTEGRAL_CONTRIBUTION_INDEX (0-1000000 in x10000 format)
77	S1 Der Cont In		x	Sys 1 CSHALG_DERIVATIVE_CONTRIBUTION_INDEX (0-10000 in x100 format)
78	S2 Full PID Index		x	Sys 2 CSHALG_FULL_PID_ACTIVE_INDEX (0 = Disable, 1 = Active)
79	S2 Dim PID Index		x	Sys 2 CSHALG_DIMINISHED_PID_ACTIVE_INDEX (0 = Disable, 1 = Active)
80	S2 Alg Ctrl Act		x	Sys 2 CSHALG_ALGORITHM_CONTROL_ACTIVE (0 = Disable, 1 = Enable)
81	S2 Sheat Ex In		x	Sys 2 CSHALG_SUPERHEAT_EXCURSIONS_INDEX (0 – 255 in x1 format)
82	S2 Prop Cont In		x	Sys 2 CSHALG_PROPORTIONAL_CONTRIBUTION_INDEX (0-10000 in x100 format)
83	S2 Int Cont In		x	Sys 2 CSHALG_INTEGRAL_CONTRIBUTION_INDEX (0-1000000 in x10000 format)
84	S2 Der Cont In		x	Sys 2 CSHALG_DERIVATIVE_CONTRIBUTION_INDEX (0-10000 in x100 format)
85	S1 Thr Limit	%	x	Sys 1 CSHALG_EEV_THROTTLE_LIMIT (0-10000 in x100 format)
86	S2 Thr Limit	%	x	Sys 2 CSHALG_EEV_THROTTLE_LIMIT (0-10000 in x100 format)

Optional printer installation

The micro panel can supply a printout of chiller conditions or fault shutdown information at any given time. Operators and service personnel can access this data and system status information using the keypad. In addition to manual print selection, the micro panel provides an automatic printout whenever a fault occurs. Detailed explanation of the print function is given under *Print key on page 143*.

Parts

The following parts are required:

1. Printer.
2. Desk top calculator paper, 2.25 in. (5.7 cm) wide.
3. Twisted Pair Shielded Cable (minimum 3 conductor), #18 AWG stranded, 300 V minimum insulation, 25 ft (7.62 m) maximum length.
4. One 25 pin Cannon connector and shell.
5. Cannon P/N DB-25P connector, or equivalent.
6. Cannon P/N DB-C2-J9 shell.

Assembly and wiring

Assemble and wire all components as shown in *Figure 53*. Strip the outside insulation back several inches and individual wires about 3/8 in. (9.5 mm) to connect the cable at the Microboard. Do not connect the shield at the printer-end of the cable.

Obtaining a printout

To obtain a printout, press the PRINT key on the keypad and then press either the OPER DATA key or HISTORY key.

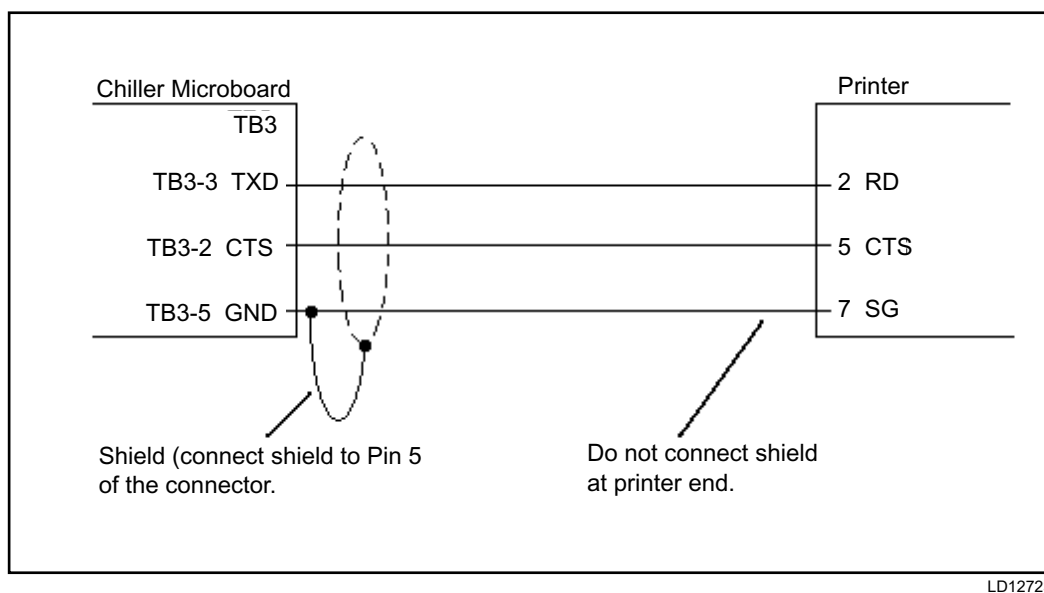


Figure 53: Printer to microboard electrical connections

Troubleshooting

Table 35: Troubleshooting

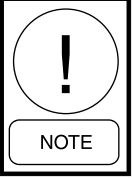
Problem	Cause	Solution
No display on panel. Unit will not operate	<ol style="list-style-type: none"> 1. No 115 VAC to 24 VAC Transformer. 2. No 24 VAC to Microboard. 3. Control Transformer defective, no 24 VAC output. 4. Short in wire to temp. sensors or pressure transducers. 5. Defective IPU II & I/O Board or the Display Board. 	<ol style="list-style-type: none"> 1a. Check wiring and fuse 1FU. 1b. Check wiring emergency stop contacts 5 to L of XTBC2 Terminal Block. 1c. Replace Control Transformer. 2. Check wiring Control Transformer to Microboard. 3. Replace Control Transformer. 4. Unplug connections at IPU II & I/O Board to isolate. 5. Replace IPU II & I/O Board or the Display Board. <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="margin-left: 10px;"> <p>Contact Quantech Service before replacing circuit Boards!</p> </div> </div>
Flow switch/rem stop no run permissive	<ol style="list-style-type: none"> 1. No chilled liquid flow. 2. Flow switch improperly installed. 3. Defective flow switch. 4. Remote cycling device open. 	<ol style="list-style-type: none"> 1. Check chilled liquid flow. 2. Check that the flow switch is installed according to manufacturer's instructions. 3. Replace flow switch. 4. Check cycling devices connected to terminals 13 and 14 of the XTBC1 Terminal Block.
Low suction pressure fault	<ol style="list-style-type: none"> 1. Improper suction pressure cutouts adjustments. 2. Low refrigerant charge. 3. Fouled filter dryer. 4. TXV defective. 5. Reduced flow of chilled liquid through the cooler. 6. Defective suction pressure transducer/low pressure switch or wiring. 7. LLSV defective 	<ol style="list-style-type: none"> 1. Adjust per recommended settings. 2. Repair leak if necessary and add refrigerant. 3. Change dryer/core. 4. Replace TXV. 5. Check gpm. See <i>Operational limitations on page 47</i>. Check operation of pump, clean pump strainer, purge chilled liquid system of air. 6. Replace transducer/low pressure switch or faulty switch or wiring. See <i>Section 9: Service and troubleshooting</i> for pressure/voltage formula. 7. Replace LLSV
High discharge pressure fault	<ol style="list-style-type: none"> 1. Condenser fans not operating or operating backwards. 2. Too much refrigerant. 3. Air in refrigerant system. 4. Defective discharge pressure transducer. 	<ol style="list-style-type: none"> 1. Check fan motor, and contactors. Ensure fan blows air upward. 2. Remove refrigerant. 3. Evacuate and recharge system. 4. Replace discharge pressure transducer. See <i>Section 9: Service and troubleshooting</i> for pressure/voltage formula on <i>page 187</i>.

Table 35: Troubleshooting, continued

Problem	Cause	Solution
Low liquid temp fault	<ol style="list-style-type: none"> 1. Improperly adjusted leaving chilled liquid temp. cutout (glycol only). 2. Micro panel setpoint/range values improperly programmed. 3. Chilled liquid flow too low. 4. Defective LWT or RWT sensor (ensure the sensor is properly installed in the bottom of the well with a generous amount of heat conductive compound). 	<ol style="list-style-type: none"> 1. Re-program the leaving chilled liquid temp. cutout. 2. Re-adjust setpoint/range. 3. Increase chilled liquid flow. See <i>Operational limitations on page 47</i>). 4. Compare sensor against a known good Temperature sensing device. See <i>Table 32 on page 186</i>.
Mp / hpcO fault	<ol style="list-style-type: none"> 1. Compressor internal motor protector (MP) open. 2. External overload tripped. 3. HPCO switch open. 4. Defective HPCO switch. 5. Defective CR relay. 	<ol style="list-style-type: none"> 1. Verify refrigerant charge is not low. Verify superheat setting of 10°F to 15°F (5.6°C to 8.3°C). Verify correct compressor rotation. Verify compressor is not overloaded. 2. Determine cause and reset. 3. See High Press. Disch. Fault. 4. Replace HPCO switch. 5. Replace relay.
Compressor(s) won't start	<ol style="list-style-type: none"> 1. Demand not great enough. 2. Defective water temperature sensor. 3. Contactor/Overload failure. 4. Compressor failure. 	<ol style="list-style-type: none"> 1. No problem. <i>Consult Installation Manual to aid in understanding compressor operation and capacity control.</i> 2. Compare the display with a thermometer. Should be within plus or minus 2 degrees. See <i>Table 32 on page 186 for RWT/LWT temp./voltage table.</i> 3. Replace defective part. 4. Diagnose cause of failure and replace.
Lack of cooling effect	<ol style="list-style-type: none"> 1. Fouled evaporator surface. Low suction pressure will be observed. 2. Improper flow through the evaporator. 3. Low refrigerant charge. Low suction pressure will be observed. 	<ol style="list-style-type: none"> 1. Contact the local Quantech service representative. 2. Reduce flow to within chiller design specs. See <i>Operational limitations on page 47</i>). 3. Check subcooling and add charge as needed.

Section 10: Maintenance

It is the responsibility of the equipment owner to perform maintenance on the system.

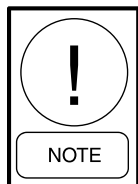
Important

If system failure occurs due to improper maintenance during the warranty period, Quantech will not be liable for costs incurred to return the system to satisfactory operation. The following is intended only as a guide and covers only the chiller unit components. It does not cover other related system components which may or may not be furnished by Quantech. System components should be maintained according to the individual manufacture's recommendations as their operation will affect the operation of the chiller.

Compressors

Oil level check

The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running at stabilized conditions, the oil level must be between 1/4 and 3/4 in the oil sight glass. **At shutdown, it is acceptable if the oil level falls to the bottom limit of the oil sight glass.**



Use YORK "V" oil 011-00949-000, when adding oil to Copeland compressor. The Bitzer compressor uses 011-00982-000 oil.

Oil analysis

The oil used in these compressors is pale yellow in color (POE oil). If the oil color darkens or exhibits a change in color, this may be an indication of contaminants in the refrigerant system. If this occurs, an oil sample should be taken and analyzed. If contaminants are present, clean the system to prevent compressor failure.



Never use the scroll compressor to pump the refrigerant system down into a vacuum. Doing so will cause internal arcing of the compressor motor which will result in failure of compressor.

Condenser fan motors

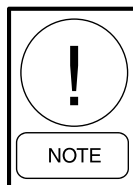
Condenser fan motors are permanently lubricated and require no maintenance.

Condenser round tube coils

Ensure dirt does not accumulate on the condenser coil surfaces. Clean as often as necessary to keep the coils clean.

Condenser MCHX

Ensure dirt does not accumulate on the MCHX condenser surfaces. Clean as often as necessary to keep the coils clean.



Exercise care when cleaning the MCHX so that the fins are not damaged.

Microchannel coil cleaning

Regular cleaning is an essential part of maintaining the integrity and heat transfer properties of heat exchangers. Failure to follow cleaning guidelines can result in heat exchanger damage, including leaks or loss of performance. The cleaning procedures described in this section are required to maintain the warranty of the condenser coils.

Microchannel coils tend to accumulate less dirt inside the coils than on the surface, which makes them easier to clean than conventional round tube and fin coils. The reduced depth and parallel tube layout of microchannel heat exchangers minimize the restriction of cleaning water through the heat exchanger. This provides a shorter and more direct path for cleaning water to effectively carry away dirt and debris during regular maintenance. During the cleaning process, take care to avoid damage to the coils and the protective coatings. Adhere to the following care points during cleaning:

- **Do not** use high-pressure water, such as a pressure washer, to clean the coils. High-pressure water can damage the fins and the protective coatings on the coil.

- **Do not** contact the coil with a hard object such as a hose nozzle, hard vacuum nozzle, or any other tool. Hard objects or tools can cause mechanical damage to the coil material and protective coatings on the coil.
- **Do not** use caustic or acidic cleaning solutions on coils. Only use cleaning solutions approved by Quantech.

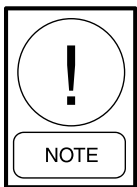
The required cleaning procedure is different depending on the type of coil and protective coating supplied with the coil. This section describes the correct procedures to maintain the integrity of each type of coil.

Cleaning procedure required for standard and environment guard microchannel coils

You must clean standard and environment guard microchannel coils following this procedure at least once every 3 months to ensure that the integrity of the coils and the warranty of the coils are maintained. In environments where coils become heavily fouled or there are high levels of pollution or corrosive elements, a monthly frequency of cleaning is recommended. Refer to the Quantech Microchannel Heat Exchanger Application Guide (Form 150-12-AD1) for further details on the classification of polluted and corrosive environments.



Proper care must be taken to ensure that cleaning agents and water are not sprayed directly onto electrical components and wiring in the V-panels and the chiller.



Standard and Environment Guard coils are grey/silver color.

1. Remove surface debris such as dirt, leaves, insects, or fibers with a vacuum cleaner having a soft brush attachment. When brushing debris off the face of the coil, you can also use a soft bristle brush (not wire). Do not scrape the coil with the vacuum nozzle, air nozzle, or any other hard tool.
2. Rinse the coil with potable tap water. Use a gentle spray from a spray nozzle with a plastic end. Do not contact the coil with the hose nozzle. Rinse the coil by running water through every passage

in the heat exchanger surface until it is clean. For QTC3 chiller, rinse the microchannel coils from the inside out through the access window on the V-Panel and the round the tube coils from the outside.

3. Apply a coil cleaning solution approved by Quantech. Quantech approves the use of RectorSeal brand GulfClean™ coil cleaner, or equivalent, on microchannel coils. Coil cleaning solution is available from Johnson Controls Aftermarket Parts Centers in all global regions. Mix the correct amount of cleaner solution and water in accordance with the manufacturer's directions on the container. Use a hand-held pump sprayer to apply the mixed cleaner solution on the coils. Ensure that the entire surface of the coils is wetted with the solution.

Allow the cleaning solution to remain on each of the coils for approximately 10 min.

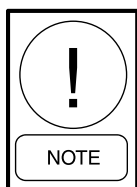
4. Repeat the water rinse as described in Step 2 to remove the cleaning solution.
5. It is important to remove any excess water trapped in the coils immediately after the final water rinse. The condenser fans on the chiller can be run after the final water rinse to correctly dry the coils. Remove any excess water by blowing air through the coils with a hand-held blower or vacuum.

Cleaning procedure for environment guard premium microchannel coils

You must clean environment guard premium microchannel coils following this procedure described below at least once every 3 months to ensure that the integrity of the coils and the warranty of the coils are maintained. In environments where the coils become heavily fouled, or where there are high levels of pollution or corrosive elements, a monthly cleaning procedure using Steps 1, 2, and 7 below is recommended, in addition to the quarterly cleaning using Steps 1 to 8. Refer to the *Microchannel Heat Exchanger Application Guide (Form 150-12-AD1)* for further details on the classification of polluted and corrosive environments



Proper care must be taken to ensure that cleaning agents and water are not sprayed directly onto electrical components and wiring in the V-panels and the chiller.



Environment Guard Premium coils are coated with a black epoxy coating..

1. Remove surface debris such as dirt, leaves, insects, or fibers with a vacuum cleaner having a soft brush attachment. When brushing debris off the face of the coil, you can also use a soft bristle brush (not wire). Do not scrape the coil with the vacuum nozzle, air nozzle, or any other hard tool.
2. Rinse the coil with potable tap water. Use a gentle spray from a spray nozzle with a plastic end. Do not contact the coil with the hose nozzle. Rinse the coil by running water through every passage in the heat exchanger surface until it is clean. For QTC3 chiller, rinse the microchannel coils from the inside out through the access window on the V-Panel and the round the tube coils from the outside.
3. Apply a coil cleaning solution approved by Quantech. Quantech approves the use of RectorSeal brand GulfClean™ coil cleaner, or equivalent, on Environment Guard Premium microchannel coils only. Coil cleaning solution is available from Johnson Controls Aftermarket Parts Centers in all global regions. Mix the correct amount of cleaner solution and water in accordance with the manufacturer's directions on the container. Use a hand-held pump sprayer to apply the mixed cleaner solution on the coils. Ensure that the entire surface of the coils is wetted with the solution.

Allow the cleaning solution to remain on each of the coils for approximately 10 mins.

4. Repeat the water rinse as described in Step 2 to remove the cleaning solution.
5. Apply a salt reducer solution approved by Quantech. Quantech approves the use of RectorSeal brand GulfClean™ salt reducer, or equivalent, on Environment Guard Premium microchannel coils only. Salt reducer solution is available from Johnson Controls Aftermarket Parts Centers in all global regions. Mix the correct amount of salt reducer solution and water in accordance with the

manufacturer's directions on the container. Use a hand-held pump sprayer to apply the solution on the coils. Ensure that the entire surface of the coils is wetted with the solution.

Allow the salt reducer solution to remain on each of the coils for approximately 10 min.

6. Repeat the water rinse as described in Step 2 to remove the salt reducer solution. Ensure that the final rinse is thorough in order to remove all cleaning solution and salt reducer solution from the coils.
7. It is important to remove any excess water trapped in the coils immediately after the final water rinse. The condenser fans on the chiller can be run after the final water rinse to correctly dry the coils. Remove any excess water by blowing air through the coils with a hand-held blower or vacuum.
8. Visually inspect the Environment Guard Premium e-coating on the microchannel coils for any damage, degradation or bare spots. If touch-up of the coating is necessary, follow the applicable steps in the following section to touch-up the e-coat after cleaning.

Steps to touch-up small sections of finned coil surface on microchannel coils

1. Use the touch-up paint to touch up small sections of the coil surface. Shake the aerosol can thoroughly until the mixing ball rattles, then continue to shake the can for 2 min.
2. Using slow dusting passes, spray the contents of the can in both horizontal and vertical patterns around 4 in. to 6 in. from the impacted section of the coil surface for an even coating.

Steps to touch-up end (dead) tubes or condenser coil headers on microchannel coils

In cases where e-coating on the end tubes or condenser coil headers is showing signs of degradation, you must use 2-part urethane mastic for touch-up. Do not use 2-part urethane Mastic on finned coil surface.



Do not use 2-part Urethane Mastic on finned coil surface. Using Urethane Mastic on finned surfaces can result in blockage of fin sections which will lead to reduction in air flow across the coil.

Necessary materials:

- 2-Part urethane mastic kit, part number: 013-04188-000).
- 1 x mixing dish.
- 3 x 3 ml droppers.
- Soft bristle paint brush.

The 2-part urethane mastic kit consists of component A-urethane mastic (black component) and component B-urethane mastic activator (clear component)

To touch-up the end tubes and condenser coil headers, complete the following steps:

1. Thoroughly stir the can containing component A (Urethane Mastic). It is important to stir the urethane mastic thoroughly to ensure any settled pigment is dispersed before application.
2. Gently shake the can containing component B, the activator.
3. Mix the urethane mastic and activator in a 5:1 ratio. Using one dropper, add 5 mm of component A to the mixing dish.
4. Using the second (clean) dropper, add 1 ml of component B to the mixing dish.
5. Mix the components well and allow the solution in the dish to set for 30 min. Power mixing is preferred. If needed, make more amount of solution for application.
6. Using the paint brush, apply the touch up paint to the end tubes or coil headers as needed.

Table 36: Cleaning materials

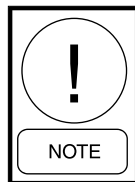
Part number (p/n)	Description
013-04185-000	Cleaner, coil, 4 gal- 1 gal
013-04185-001	Cleaner, coil, 1 gal
013-04186-000	Reducer, salt 4 gal - 1 gal
013-04186-001	Reducer, salt 1 gal
013-04187-000	Paint, touch-up 12 oz
013-04188-000	Mastic, 2-part urethane

Operating parameters

Perform regular checks on the system to ensure that operating temperatures and pressures are within limitations, and that the operating controls are set within proper limits. See *Section 8: Unit operation*, *Section 6: Commissioning*, and *Section 4: Installation*.

On-board battery backup

The Real Time Clock chip (U5) located on the 031-02630 IPU II board that maintains the date/time and stores customer programmed setpoints.



Do not confuse JP1 on the IPU II (031-02630) board with JP1 on the I/O (031-02550) board.

Thermal dispersion flow switch

Check the sensor tip for buildup regularly, because it can affect the sensitivity of the sensor.

In case of any buildup at the sensor tip, use a soft cloth to remove it. Use vinegar as the cleaning agent to remove any stubborn buildup if necessary.

Brazed plate heat exchanger (evaporator) heater

The internal power supply to the Evaporator Heater is 120 VAC. Disconnecting 120 VAC power from the unit, at or below freezing temperatures, can result in damage to the evaporator and unit as a result of the chilled liquid freezing.

Overall unit inspection

In addition to the checks listed on this page, perform periodic overall inspections on the unit to ensure proper equipment operation. Investigate and correct immediately items such as loose hardware, component operation, refrigerant leaks, and unusual noises.

Table 37: Temperature conversion chart

Temperature Conversion Chart - Actual Temperatures			
° F	=	° C	° C = ° F
0		-17.8	-18
4		-15.6	-16
8		-13.3	-14
12		-11.1	-12
16		-8.9	-10
20		-6.7	-8
24		-4.4	-6
28		-2.2	-4
32		0.0	-2
36		2.2	0
40		4.4	2
44		6.7	4
48		8.9	6
52		11.1	8
56		13.3	10
60		15.6	12
64		17.8	14
68		20.0	16
72		22.2	18
76		24.4	20
80		26.7	22
84		28.9	24
88		31.1	26
92		33.3	28
96		35.6	30
100		37.8	32
104		40.0	34
108		42.2	36
112		44.4	38
116		46.7	40
120		48.9	42
124		51.1	44
128		53.3	46
132		55.6	48
136		57.8	50
140		60.0	52
144		62.2	54
148		64.4	56
152		66.7	58
156		68.9	60
160		71.1	62
164		73.3	64
168		75.6	66
172		77.8	68
176		80.0	70
180		82.2	72
184		84.4	74
188		86.7	76
192		88.9	78
196		91.1	80
200		93.3	82
204		95.6	84
208		97.8	86
212		100.0	88
216		102.2	90
220		104.4	92
224		106.7	94
228		108.9	96
232		111.1	98
236		113.3	100
240		115.6	102
244		117.8	104

Temperature Conversion Chart - Differential Temperatures			
° F	=	° C	° C = ° F
0		0	0
4		2.2	3.6
8		4.4	7.2
12		6.7	10.8
16		8.9	14.4
20		11.1	18
24		13.3	21.6
28		15.6	25.2
32		17.8	28.8
36		20	32.4
40		22.2	36
44		24.4	39.6
48		26.7	43.2
52		28.9	46.8
56		31.1	50.4
60		33.3	54

Pressure Conversion Chart - Gauge or Differential			
PSI	=	BAR	BAR = PSI
20		1.38	1.5
30		2.07	2
40		2.76	2.5
50		3.45	3
60		4.14	3.5
70		4.83	4
80		5.52	4.5
90		6.21	5
100		6.9	5.5
110		7.59	6
120		8.28	6.5
130		8.97	7
140		9.66	7.5
150		10.34	8
160		11.03	8.5
170		11.72	9
180		12.41	9.5
190		13.1	10
200		13.79	10.5
210		14.48	11
220		15.17	11.5
230		15.86	12
240		16.55	12.5
250		17.24	13
260		17.93	13.5
270		18.62	14
280		19.31	14.5
290		20	15
300		20.69	15.5
310		21.38	16
320		22.07	16.5
330		22.76	17
340		23.45	17.5
350		24.14	18
360		24.83	18.5
370		25.52	19
380		26.21	19.5
390		26.9	20
400		27.59	20.5

Table 38: R-410A pressure temperature chart

psig	Temperature, °F	psig	Temperature, °F
0	-60	78	20
2	-58	80	21
4	-54	85	24
6	-50	90	26
8	-46	95	29
10	-42	100	32
12	-39	105	34
14	-36	110	36
16	-33	115	39
18	-30	120	41
20	-28	125	43
22	-26	130	45
24	-24	135	47
26	-20	140	49
28	-18	145	51
30	-16	150	53
32	-14	160	57
34	-12	170	60
36	-10	180	64
38	-8	190	67
40	-6	200	70
42	-4	210	73
44	-3	220	76
46	-2	225	78
48	0	235	80
50	1	245	83
52	3	255	85
54	4	265	88
56	6	275	90
58	7	285	92
60	8	295	95
62	10	305	97
64	11	325	101
66	13	355	108
68	14	375	112
70	15	405	118
72	16	500	134
74	17	600	149
76	19	700	159

Table 39: R-454B pressure temperature chart

psig	Temperature, °F	psig	Temperature, °F
0	–	78	25
2	–	80	26
4	-49	85	29
6	-45	90	32
8	-41	95	34
10	-37	100	37
12	-34	105	39
14	-31	110	42
16	-28	115	44
18	-26	120	46
20	-23	125	48
22	-21	130	51
24	-18	135	52
26	-16	140	54
28	-14	145	56
30	-12	150	58
32	-10	160	60
34	-8	170	66
36	-6	180	69
38	-4	190	72
40	-2	200	76
42	–	210	79
44	1	220	82
46	3	225	83
48	4	235	86
50	6	245	89
52	8	255	91
54	9	265	94
56	11	275	95
58	12	285	99
60	13	295	101
62	15	305	103
64	16	325	108
66	17	355	114
68	19	375	118
70	20	405	124
72	21	500	140
74	22	600	–
76	24	700	–

The following factors can be used to convert from English to the most common SI Metric values.

Table 40: SI-metric conversion

Measurement	Multiply English unit	By factor	To obtain metric unit
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in.)	25.4	Millimeters (mm)
Weight	Pounds (lb)	0.4536	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

Temperature

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example: $(45.0^{\circ}\text{F} - 32^{\circ}) \times 0.5556 = 7.22^{\circ}\text{C}$

To convert a temperature range (i.e., a range of 10°F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example: $10.0^{\circ}\text{F range} \times 0.5556 = 5.6^{\circ}\text{C range}$

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