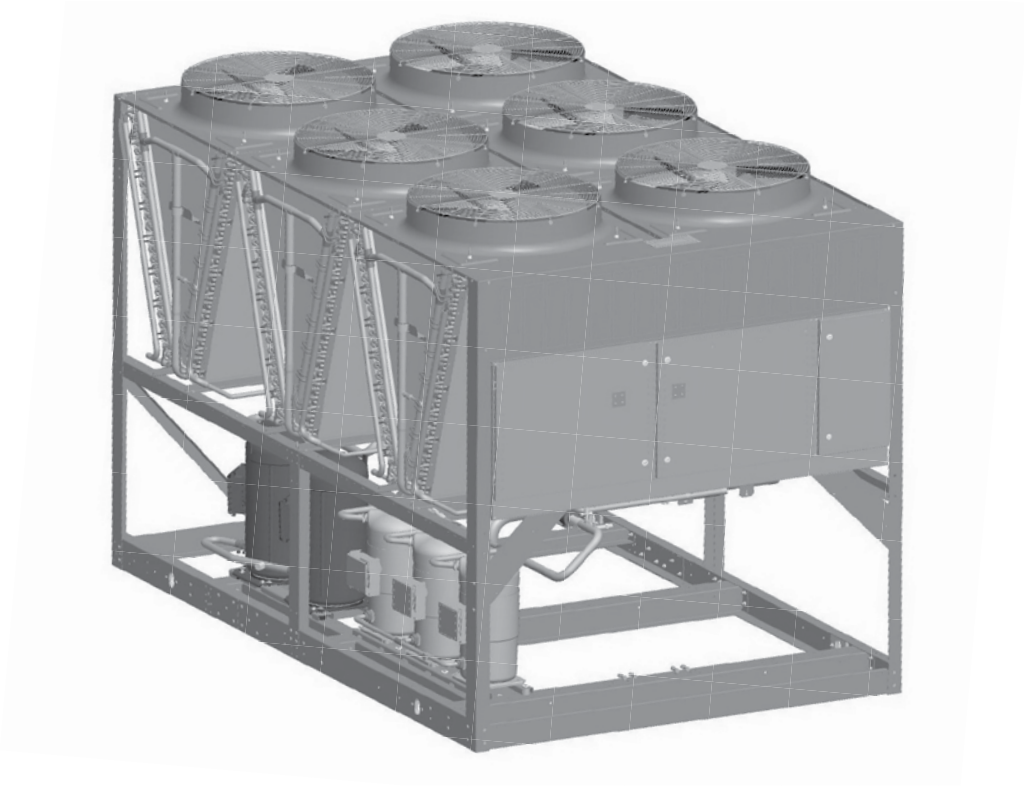
QUANTECH	Air-Cooled Scroll Condensing Units	
Installation, Operation, Maintenance	Supersedes QCC3-NM1 (1123)	Form QCC3-NM1 (1223)

035-26917-000

QCC3080C – QCC3160C
Air-Cooled Scroll Condensing Units
Style A and B (60 Hz)
80 ton to 160 ton
281 kW to 522 kW



R-410A and R-454B

ISO 9000 REGISTRATION

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.

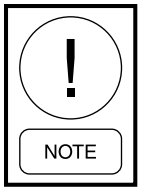
Safety symbols

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 and 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	Refrigerant warning added to *General safety guidelines*

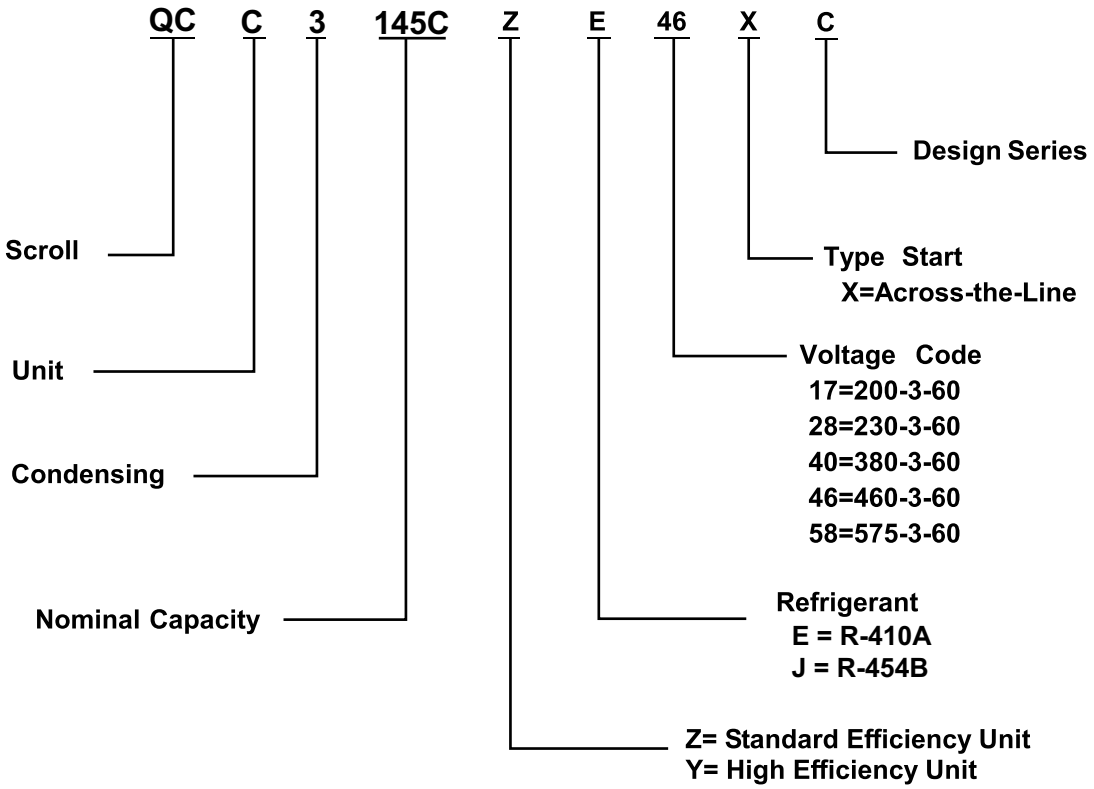
Associated literature

MANUAL DESCRIPTION	FORM NUMBER
Installation and Start-up Checklist	QCC3-CL2
Limited Warranty Engineered Systems Equipment	50.05-NM2
Shipping Damage Claims	50.15-NM
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



NOTE

See *Nomenclature on page 23* for additional information on PIN.

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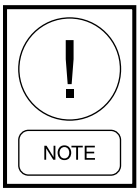
Section 1: General equipment information and safety



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

Introduction

The 78 ton to 160 ton (273 kW to 560 kW) QCC3 condensing unit models are shipped complete from the factory ready for field installation.

The unit is pressure-tested, evacuated and given a nitrogen holding charge and includes an initial oil charge (R-410A or R-454B refrigerant supplied by others). After assembly, an operational test is performed to ensure that each control device 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, and are cETL listed. All units are produced at an ISO 9000-registered facility.

Compressors

The condensing unit has suction-gas cooled, hermetic, scroll compressors. The compressors incorporate a compliant scroll design in both the axial and radial direction. All rotating parts of the compressors 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.

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 barg).

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, squirrel-cage type, current protected. They feature ball bearings that are double-sealed and permanently lubricated.

Refrigerant circuit

Two independent refrigerant circuits will be furnished on each unit. All unit piping will be copper, with brazed joints. The liquid line will include a field connection shutoff valve with charging port located on each condenser circuit. Suction line connections are provided on each refrigeration circuit.

All expansion valves, liquid line solenoid valves, filter driers, sight glasses, refrigerant, and refrigerant field piping are supplied and installed by others.

Warranty

Quantech warrants all equipment and materials against defects in workmanship and materials for a period of eighteen months from date of shipment, 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 genuine Quantech approved spare parts, oils, coolants, and refrigerants must be used.
- All the scheduled maintenance operations detailed in this manual must be performed at the specified times by suitably trained and qualified personnel *(*see *SECTION 10 – MAINTENANCE)*.
- Failure to satisfy any of these conditions will automatically void the warranty *(*see *Warranty Policy Form 50.05-NM2)*.

Safety and quality

Standards for safety and quality

QCC3 units are designed and built within an ISO 9002 accredited design and manufacturing organization. The condensing units 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 (N.E.C.).
- ASME Boiler and Pressure Vessel Code- Section VIII Division 1.
- ASHRAE 90.1- Energy Efficiency compliance.
- ARI 370- Sound Rating of Large Outdoor Refrigeration and Air Conditioning Equipment.

In addition, the condensing units conform to Underwriters Laboratories (U.L.) for construction of chillers and provide U.L./cU.L. Listing Label. 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 operating or working on any machinery is primarily responsible for:

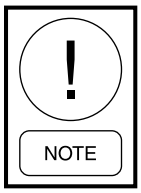
- Personal safety, safety of other personnel, and the machinery.
- Correct use of the machinery in accordance with the procedures detailed in the manuals.

About this manual

The following terms are used in this document to alert the reader to areas of potential hazard.

A WARNING is given in this document to identify a hazard, which could lead to personal injury. Usually an instruction will be given, together with a brief explanation and the possible result of ignoring the instruction.

A CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation and the possible result of ignoring the instruction.



A NOTE is used to highlight additional information, which may be helpful to you but where there are no special safety implications.

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 and/or local safety regulations.

Misuse of equipment

Suitability for application

The unit is intended for DX cooling applications 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 ensure that the chiller is installed in a secure area and 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

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. Take care 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 and oils used in the unit are generally nontoxic, non-flammable and non-corrosive, and pose no special safety hazards. Use of gloves and safety glasses is, however, recommended when working on the unit. The build up of refrigerant vapor, from a leak for example, does pose a risk of asphyxiation in confined or enclosed spaces and attention should be given to good ventilation.

Refrigerants classified as A2L refrigerant 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 details, refer to access *Chiller A2L Refrigerant Application Data, Form 160.00-AD10*.

High temperature and pressure cleaning

High temperature and pressure cleaning methods (e.g. 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 inverter system, 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/NASafety.

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 Millennium® Air-Cooled Scroll Condensing Units can be used 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 unit includes hermetic scroll compressors, a liquid cooler, air cooled condenser, and a weather resistant microprocessor control center, all mounted on a pressed steel base.

The 78 ton to 160 ton (273 kW to 560 kW) QCC3 Condensing Unit Models are shipped complete from the factory ready for field installation.

The unit is pressure-tested, evacuated and given a nitrogen holding charge and includes an initial oil charge (R-410A or R-454B refrigerant supplied by others). After assembly, a operational test is performed to ensure that each control device 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, and are cETL listed. All units are produced at an ISO 9000-registered facility.

All exposed power wiring is routed through liquid-tight, non-metallic conduit.

General system description

Compressors

The condensing unit has suction-gas cooled, hermetic, scroll compressors. The QCC3 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.

FIGURE 1 - COMPRESSORS

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).

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, squirrel-cage type, current protected. They feature ball bearings that are double-sealed and permanently lubricated.

Refrigerant circuit

Two independent refrigerant circuits will be furnished on each unit. All unit piping will be copper, with brazed joints. The liquid line will include a field connection shutoff valve with charging port located on each condenser circuit. Suction line connections are provided on each refrigeration circuit.

All expansion valves, liquid line solenoid valves, filter driers, sight glasses, refrigerant, and refrigerant field piping are supplied and installed by others.

Microcomputer control center

All controls are contained in a NEMA 3R/12 cabinet with hinged outer door and include:

Liquid Crystal Display with Light Emitting Diode backlighting for outdoor viewing:

- Two display lines
- Twenty characters per line

Color coded 12-button non-tactile keypad with sections for:

Display/print of typical information:

- Suction temperatures (optional)
- 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 permit the capability of hard copy print-outs via a separate printer (by others).

Entry section to:

Enter setpoints or modify system values SETPOINTS updating can be performed to:

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

Unit section to:

- Set clock
- Set options
- Set unit option

Set unit control for Discharge Air Temperature Control or for Suction Pressure Control (requires Suction Pressure Transducers – standard).

Unit on/off switch

The microprocessor control center is capable of displaying the following:

- Suction temperatures (optional)
- Low ambient temperature cutout setting
- English or Metric data
- Suction pressure cutout setting
- Each system suction pressure
- System discharge pressure
- Discharge Air Temperature Reset via a Quantech BAS DDC or Building Automation System (by others) via:
  - a pulse width modulated (PWM) input as standard
  - a 4 mA to 20 mA or 0 VDC to 10 VDC input, or contact closure with the optional B.A.S. interface option

- 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 (Discharge Air Temperature control only)
- Automatic lead/lag of compressors within a system
- Compressor starts and operating hours (each compressor)
- Status of hot gas valves, and fan operation
- Run permissive status
- Number of compressors running
- Liquid solenoid valve status
- Load and unload timer status

Provisions are included for: pumpdown at shutdown; optional remote discharge air 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 (EPROM) to eliminate condensing unit failure due to AC powered failure/battery discharge. Programmed setpoints are retained in lithium battery-backed RTC memory for 5 years minimum.

High ambient kit

Required if units are to operate when the ambient temperature is above 115°F (46°C). Includes sun shield panels and discharge pressure transducers. (This option includes the Discharge Pressure Transducer /Readout Capability option). (**Field mounted**).

Communications

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

Power panel

Each panel contains:

- Compressor power terminals
- Compressor motor starting contactors per l.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 connection(s) are provided as standard. The following power connections are available as options. (See electrical data for specific voltage and options availability.) (**Factory mounted**).

Single point non-fused disconnect switch: Unit-mounted disconnect switch(s) with external, lockable handle (in compliance with Article 440-14 of N.E.C.), 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 non-fused disconnect switch with individual system breakers: Includes unit-mounted disconnect switch with external, lockable handles (in compliance with Article 440-14 of N.E.C.) to isolate unit power voltage for servicing. Factory interconnecting wiring is provided from the disconnect switch to factory supplied system circuit breakers.

Single point circuit breaker: A unit mounted circuit breaker with external, lockable handle, in compliance with N.E.C. 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 (0.5 kVA or 1.0 kVA capacity). Factory mounting includes primary- and secondary-wiring between the transformer and the control panel. **(Factory mounted)**.

Power factor correction capacitors: Corrects the unit compressor power factors to a 0.90-0.95. **(Factory mounted)**.

* Intensity of Protection European Standard
** International Electrotechnical Commission

Control options

Ambient kit (low): Units will operate to (standard) 32°F (-4°C). This accessory includes all necessary components to permit condensing unit operation to 0°F (-18°C). (This option includes the Discharge Pressure Transducer / Readout Capability option.) For proper head pressure control in applications below 25°F (-4°C) where wind gusts may exceed 5 mph (8 km/h), it is recommended that Optional Condenser Louvered Enclosure Panels also be included. **(Factory mounted)**.

Building automation system interface: The factory addition of a Printed Circuit Board to accept a 4 mA to 20 mA, 0 VDC to 10 VDC, or contact closure input to reset the discharge air temperature from a Building Automation System. **(Factory Mounted)**. (The standard control panel can be directly connected to a Quantech Building Automated System via the standard on board RS485 communication port.)

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

Discharge pressure transducers and readout capability: The addition of pressure transducers allows models to sense and display discharge pressure. (This option as included with either the low or high ambient kits). (**Factory mounted**).

Suction pressure transducers and readout capability: The addition of suction transducers allows models to sense and display suction pressure. **(Factory mounted)**.

Suction temperature readout: The addition of temperature sensors allow models to sense and display suction temperature. **(Factory mounted)**.

Compressor and piping options

Chicago code relief valves: Unit will be provided with relief valves to meet Chicago code requirements. **(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. Hot gas by-pass is available installed on refrigerant system 1 or on both systems of two circuited units. **(Factory mounted)**.

Service isolation valve: Service suction and discharge (ball type) isolation valves are added to unit per system. This option also includes a system high pressure relief valve in compliance with ASHRAE 15. **(Factory mounted)**.

Condenser and cabinet options

Condenser coil protection against corrosive environments is available by choosing any of the following options. For additional application recommendations, refer to *Form 150.12-ES1*. **(Factory mounted)**.

Pre-coated fin condenser coils: The air-cooled condenser coils are constructed of black 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 is built with dipped and cured condenser coils. This is another choice for seashore and other corrosive applications (with the exception of strong alkalis, oxidizers and wet bromine, chlorine and fluorine in concentrations greater than 100 ppm).

Copper-fin condenser coils: The unit constructed with condenser coils which have copper fins. (This is not recommended for units in areas where they may be exposed to acid rain).

Enclosure panels for unit: Tamperproof 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 5 mph (8 km/h).

The following types of enclosure panels are available:

Wire panels, full unit: Consists of welded-wiremesh guards mounted on the exterior of the unit. Prevents unauthorized access, yet provides free air flow. **(Factory mounted)**.

Wire and louvered panels: Consists of welded-wiremesh panels on the bottom part of unit and louvered panels on the condenser section of the unit. **(Factory mounted)**.

Louvered panels, ondenser coil only: Louvered panels are mounted on the sides and ends of the condenser coils for protection. **(Factory mounted)**.

Louvered panels, full unit: Louvered panels surround the front, back, and sides of the unit. These 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)**.

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. **(Factory mounted)**.

Unit components

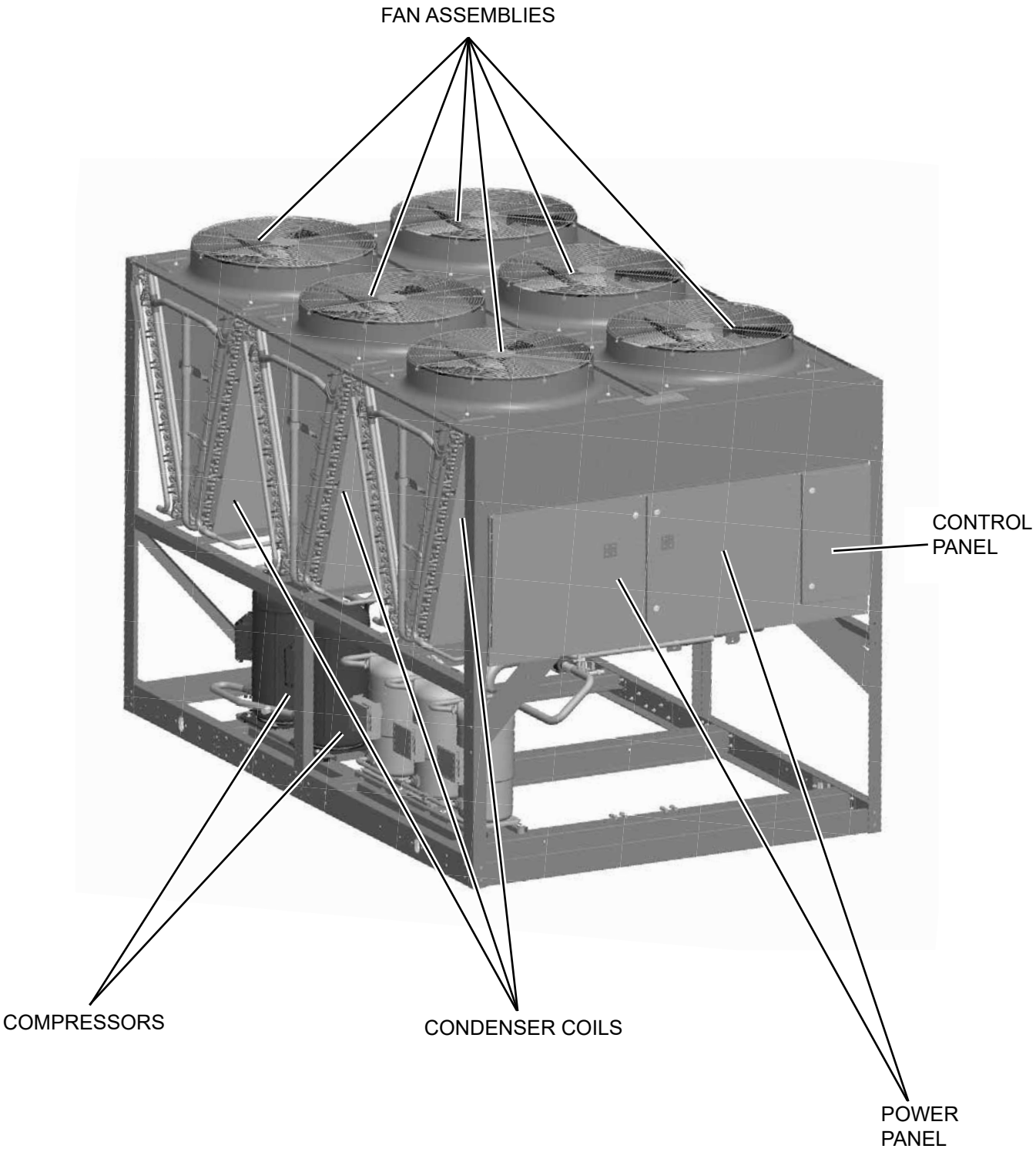
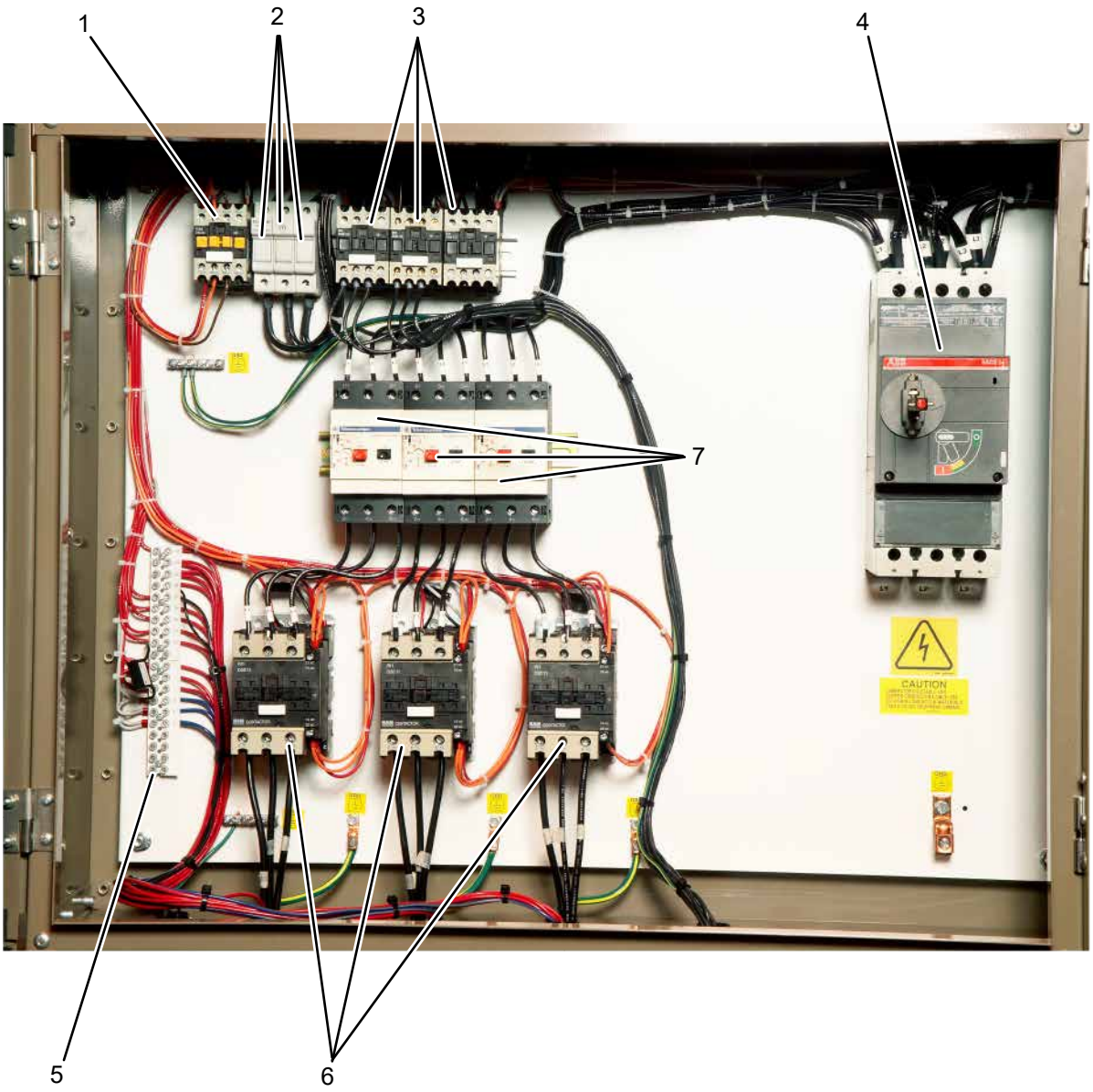
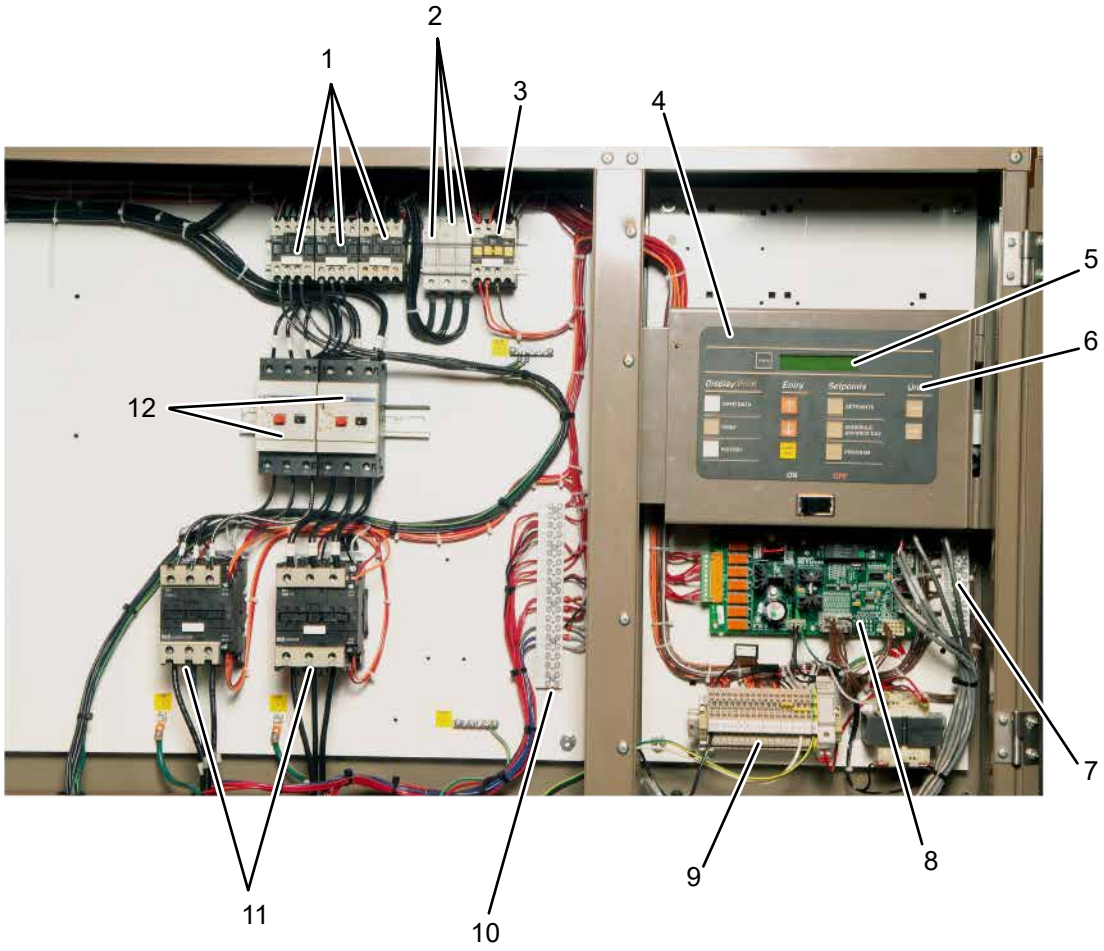


FIGURE 2 - UNIT COMPONENTS FRONT



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 / CONTROL COMPONENTS

Nomenclature

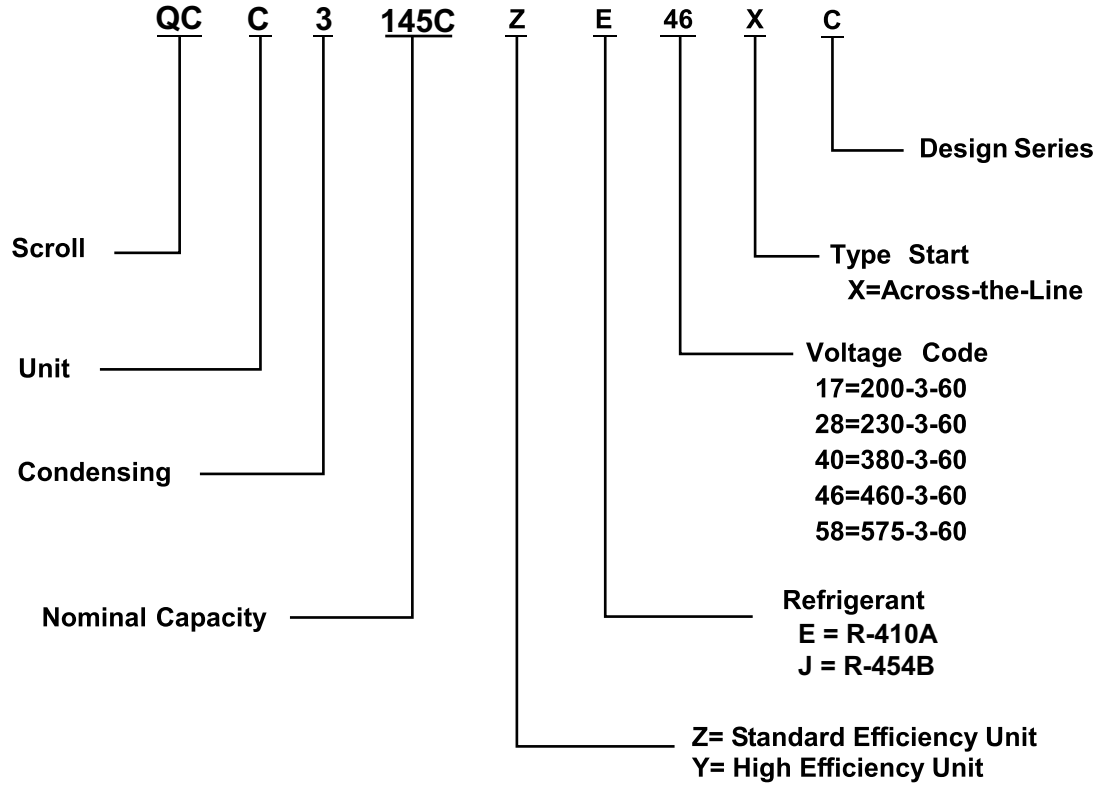


TABLE 1 - PRODUCT IDENTIFICATION NUMBER (PIN)

FEATURE	FEATURE DESCRIPTION	OPTION	OPTION DESCRIPTION
MODEL	Model (PIN 1-4)	QCC3	QCC3
CAP	Capacity (PIN 5-8)	080C	080C
		085C	085C
		090C	090C
		100C	100C
		110C	110C
		130C	130C
		145C	145C
		160C	160C
UNIT	Unit Designator (PIN 9)	H	High Efficiency
		S	Standard Efficiency
		Y	High Efficiency (Round Tube)
		Z	Standard Efficiency (Round Tube)
REF	Refrigerant (PIN 10)	E	R-410A
		J	R-454B

TABLE 1: PRODUCT IDENTIFICATION NUMBER (PIN), CONT'D

FEATURE	FEATURE DESCRIPTION	OPTION	OPTION DESCRIPTION
VOLTS	Voltage (PIN 11 and 12)	17	200/3/60
		28	230/3/60
		40	380/3/60
		46	460/3/60
		50	380-415/3/50
		58	575/3/60
STARTER	Starter (PIN 13)	X	Across the Line starter
DESIGN	Design Series (PIN 14)	A	Design Series A (MicroChannel)
		B	Design Series B (Tube and Fin)
DEV	Development Level (PIN 15)	A	Development Level A
POWER	Power Field (PIN 16 and 17)	SX	SP Supply TB
		SD	SP NF Disconnect Switch
		BX	SP Circuit Breaker w/ Lockable Handle
		DB	SP NF Disc Switch w/Ind Sys CB
TRANS	Cntrl Transformer (PIN 18)	X	No Control Transformer Required
		T	Control Transformer Required
		Q	Special Control Transformer Required
PFC	Power Factor Capacitor (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)
		AG	High Ambient Kit required (field)Both Low/High Ambient Kit required (factory)
		Q	Special Ambient Kit required
BAS	Bas Reset/Offset (PIN 21)	T	BAS/EMS Reset/Offset (standard)required
		Q	Special BAS Reset/Offset required
LCD	Language (PIN 22)	X	English
RDOUT	Readout Kits (PIN 23)	RX	Discharge Pressure Readout (standard)X
		Q	Special Quote
SAFETY	Safety Codes (PIN 24)	L	N American Safety Code (cUL/cETL)
SENSOR	Suction Temp (PIN 25)	XT	Suction Temp Readout (standard)X
		Q	Special Quote
PUMP	Motor Current Module (PIN 26)	C	Motor Current Module (standard)
REMOTE	Remote Panel (PIN 27)	X	X
		Q	Special Quote
SEQ	Sequence Kit (PIN 28)	X	X
		Q	Special Quote
TEMP	Leaving Water Temp(29,30)	NUM	Leaving Water Temp = {TEMP/NUM} degrees
		QQ	Special LWT requirements
CHICAGO	Chicago Code Kit (PIN 31)	X	No Chicago Code Kit required
		B	Both Chicago Code and Serv Isolation
		C	Chicago Code Kit required
		S	Service Isolation Valves
		Q	Special Chicago Code Kit required

TABLE 1: PRODUCT IDENTIFICATION NUMBER (PIN), CONT'D

FEATURE	FEATURE DESCRIPTION	OPTION	OPTION DESCRIPTION
VALVES	Valves (PIN 32)	X	Standard Valves Req'd
		Q	Special Optional Valves Req'd
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
GAUGE	PIN 34	X	X
		Q	Special Quote
OVERLOAD	PIN 35	X	X
		Q	Special Quote
PIN36	PIN 36	X	X
		Q	Special Quote
HTR	Crankcase Heater (Pin 37)	H	Crankcase Heater (Standard)
		Q	Special Crankcase Heater required
DWP	DWP (PIN 38)	X	X
		Q	Special Quote
INS	Insulation (PIN 39)	X	X
		Q	Special Quote
FLANGES	Flanges (PIN 40)	X	X
		Q	Special Quote
FLOW	Flow Switch (PIN 41)	X	X
		Q	Special Quote
VESSEL	Vessel Code (PIN 42)	XA	No Vessel required
		Q	Special Quote
CLR	Cooler (PIN 43)	X	X
		Q	Special Quote
PIN44	PIN 44	X	X
		Q	Special Quote
COILS	Coils (PIN 45)	X	Aluminum Coils
		C	Copper Fin Coils
		B	Pre-Coated Fin Coils
		P	Post-Coated Dipped Coils
		Q	Special Coils
HEAT	Heat Recovery (PIN 46)	X	X
		Q	Special Quote
FAN MOTORS	Fan Motors (PIN 47)	X	TEAO Fan Motors

TABLE 1: PRODUCT IDENTIFICATION NUMBER (PIN), CONT'D

FEATURE	FEATURE DESCRIPTION	OPTION	OPTION DESCRIPTION
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)
		Q	Special Enclosure Panels
ACOUSTIC	Acoustic Blanket (PIN 49)	X	No Acoustic Blanket required
		B	Acoustic Blanket Required
		Q	Special Acoustic Blanket required
PIN 50	PIN 50	X	X
		Q	Special Quote
PIN 51	PIN 51	X	X
		Q	Special Quote
FANS	Sound Fans (PIN 52)	X	Standard Low Sound Fans required
		L	Ultra Quiet Fans required
		Q	Special Sound Fans required
PAINT	PIN 53	X	X
		Q	Special Quote
ISOL	Vibration Isolators (PIN 54)	X	No Isolators required
		1	1" Deflection Isolators required
		N	Neoprene Isolators required
		S	Seismic Isolators required
		Q	Special Isolators required

Refrigerant flow diagram

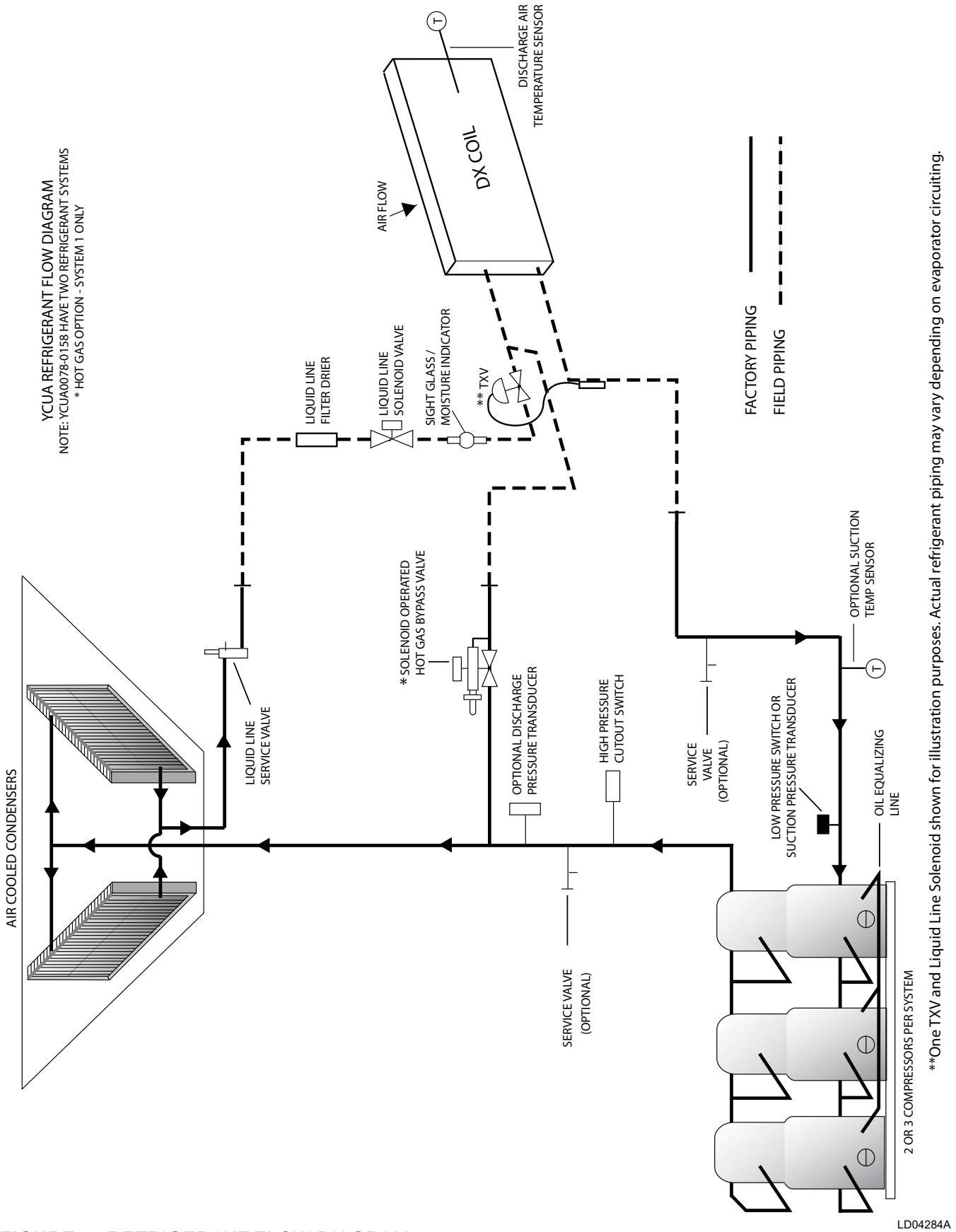
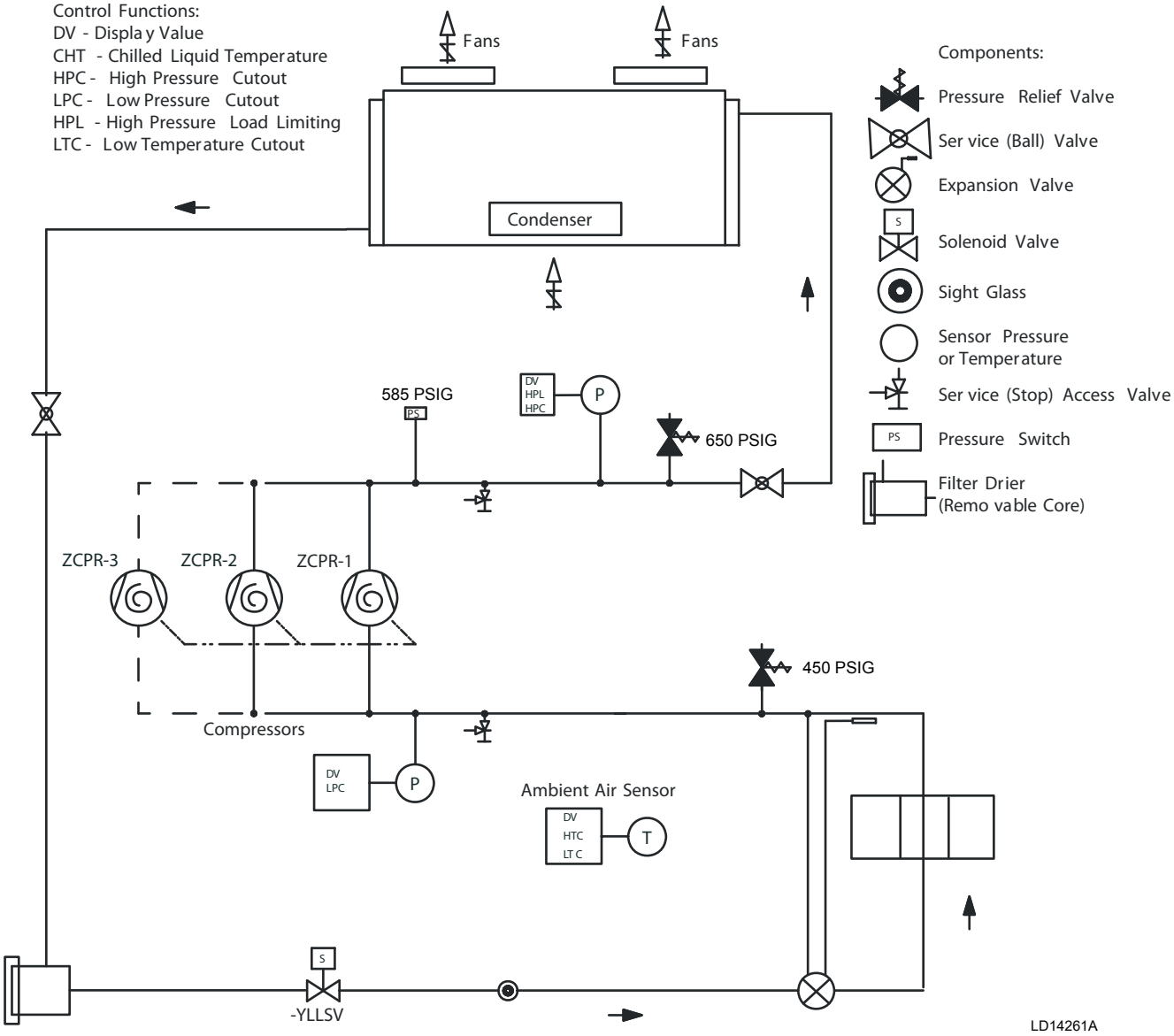


FIGURE 5 - REFRIGERANT FLOW DIAGRAM

Process and instrumentation diagram



Low pressure liquid refrigerant enters the DX coil and is evaporated and superheated by the heat energy absorbed from the air passing through the DX coil.

Low pressure vapor enters 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 returning to the cooler.

FIGURE 6 - PROCESS AND INSTRUMENTATION DIAGRAM

Section 3: Handling and storage

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, prior to installation, the following precautions should be observed:

- The unit 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 110 °F (43 °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.

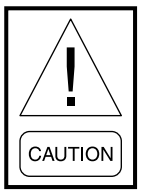
Inspection

Immediately upon receiving the unit, it should be inspected for possible damage which may have occurred during transit. If damage is evident, it should be noted in the carrier's freight bill. A written request for inspection by the carrier's agent should be made at once. Refer to *Shipping Damage Claims Policy, Form 50.15-NM* for more information and details. The form to submit for Chiller FOB destination inspection.

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

Unit rigging

Use spreader bars to avoid lifting chains hitting the unit.



Never lift the unit using a forklift or by hooking to the top rails. Use only the lifting holes provided.

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

The unit should be lifted by inserting hooks through the holes provided in unit base rails. Spreader bars should be used to avoid crushing the unit frame rails with the lifting chains (See* Figure 7 on page 29*).

FIGURE 7 - UNIT RIGGING

Moving the condensing unit

Prior to 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 units are designed to be lifted using cables. A spreader bar or frame should be used in order to prevent damage to the unit from the lifting chains.

Units are provided with lifting eyes in the sides of the base frame, which can be attached to directly using shackles or safety hooks.

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.

Lifting weights

For details of weights and weight distribution, refer to the data shipped in the unit information packet and unit nameplate.

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 equipment 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

The following items, 1 through 5, must be checked before placing the units in operation.

1. Inspect the unit for shipping damage.
2. Rig unit using spreader bars.
3. Open the unit only to install water piping system. Do not remove protective covers from water connections until piping is ready for attachment. Check water piping to ensure cleanliness.
4. Pipe unit using good piping practice (refer to *ASHRAE handbook section 215 and 195*).
5. Check to see that the unit is installed and operated within limitations. See *Section 5: Technical data*.

The following pages outline detailed procedures to be followed to install and start-up the unit.

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.

Location and clearances

These 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 proper 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. It is critical to avoid smoking or open flames in vicinity of the chiller.

In installations where winter operation is intended and snow accumulations are expected, additional height must be provided to ensure normal condenser air flow.

Clearances are listed under “Notes” in *Dimensions on page 92*.

Foundation

The unit should be mounted on a flat and level foundation, floor, or rooftop capable of supporting the entire operating weight of the equipment. See *Physical data* for operating weight. If the unit is elevated beyond the normal reach of service personnel, a suitable catwalk must be 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 are provided in the steel channel for bolting the unit to its foundation. See *Dimensions on page 92*.

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 may be 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 vibration isolators under the base to minimize vibration.

Noise sensitive locations

Efforts should be made to ensure that the unit is not located next to occupied spaces or noise sensitive areas where unit noise level would be a problem. Unit noise is a result of compressor and fan operation. Considerations should be made utilizing noise levels published in the Quantech Engineering Guide for the specific condensing unit model. Sound blankets for the compressors and low sound fans are available.

Snow load

In installations where winter operation is intended and snow accumulations are expected, additional height must be provided to ensure normal condenser air flow.

Clearances

Recommended clearances for units are given in *Dimensions*.

Corrosive environments

Protection against corrosive environments is available by supplying the units with either copper fin, cured phenolic, or epoxy coating on the condenser coils. The phenolic or epoxy coils should be offered with any units being installed at the seashore or where salt spray may hit the unit.

Spring isolators: optional

When ordered, four isolators are 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.

Pipework arrangement

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

Ductwork connection

Recommendations of the Building Services Research Association.

General requirements

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(s) 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.

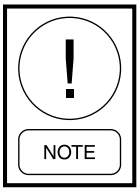
Wiring

Condensing Units 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 N.E.C. or local code requirements. Minimum circuit ampacity and maximum dual element fuse size are given in *Table 10 on page 45*.

Copper power wiring only should be used for supplying power to the unit. This is recommended to avoid safety and reliability issues resulting from connection failure at the power connections to the unit. 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 unit, 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 unit.

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 8 on page 40*.



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.***

Compressor heaters

Compressor heaters are standard. ZP103, ZP120 and ZP137 compressors use 90 W heaters; ZP180 compressors use 70 W heaters; ZP235 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.

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 ± 10 psig and closes at 440 ± 25 psig.

Electrical wiring

Field wiring

Power wiring must be provided through a fused disconnect switch to the unit terminals (or optional molded disconnect switch) in accordance with N.E.C. or local code requirements. Minimum circuit ampacity and maximum dual element fuse size are given in the *Electrical data on page 45*.

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 4 on page 22* and *Figure 10 on page 41*.

See *Figure 3 on page 21* and *Figure 10 on page 41* and unit wiring diagrams for field and power wiring connections. See *Section 8: Unit operation* for a detailed description of operation concerning unit contacts and inputs.

Liquid line solenoid connections

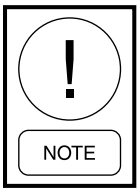
The field supplied and installed liquid line solenoid valves should be installed at the evaporator and wired using 18 AWG minimum wire. Electrical connections should be made at 1-XTBF for Sys. #1 and 2-XTBF for Sys. #2. **Note that power for the solenoid coil is 120 VAC.** See *Figure 11 on page 68, Figure 12 on page 78,* and unit wiring diagram.

Discharge air sensor

The discharge air sensor and associated connector hardware is factory supplied but must be field installed. Field wire must be field supplied (QUABBIN 930421-2 or equivalent 2 conductor with shield and drain wire - 20 AWG 300 V 60°C - polyethylene insulation UV resistant). Field wiring is connected to pins 3, 6, and 9 of J6 on the microboard. See *Figure 9 on page 40* and unit wiring diagram.

Zone thermostats for remote start and stop

Field-supplied thermostats or dry contacts must be field-wired when operating the unit in Suction Pressure Control Mode. The System 1 zone thermostat is field wired at XTBC1 terminals 13 to 51. On two system units, System 2 zone thermostat is field wired to XTBC1 terminals 13 to 50. XTBC 1 terminal is located near the bottom of the micro control panel. See *Figure 3 on page 21* and unit wiring diagram.



See Air Proving Switch/Remote Start-Stop Contacts.

Air proving switch/remote start-stop contacts

The Air 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.

The air proving switch is field wired to XTBC1 terminals 13 to 50 (SYS 1) and 13 to 51 (SYS 2) to prevent operation of the refrigerant circuit when the supply air blower is not operating.

If separate evaporator blowers are used with respect to each refrigerant system in the condensing unit, then two air proving must be wired in series across XTBC1 terminals 13 - 50 and 13 - 51 (one for each evaporator blower). See *Figure 10 on page 41* and unit wiring diagram.

When using Zone Thermostats in Suction Pressure control mode, the air proving switch(s) should be wired in series with the respective Zone Thermostats.

Remote start/stop contacts

To remotely start and stop the condensing unit, dry contacts can be wired in series with the air proving switch and XTBC1 - terminals 13 to 50 (SYS 1) and 13 to 51 (SYS 2). See *Figure 10 on page 41* and unit wiring diagram.

Remote emergency cutoff

Immediate shutdown of the condensing unit can be accomplished by opening a field installed dry contact to break the electrical circuit between terminals 5 to L on terminal block XTBC2. XTBC2 is located in the power panel. 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 10 on page 41* and unit wiring diagram.

Evaporator blower start contacts

For constant fan operation: Terminal block XTBC2 - terminals 23 to 24, are normally open contacts that can be used to switch field supplied power to provide a start signal to the evaporator blower contactor. Contacts will close whenever the daily schedule is programmed for cooling. See *Figure 10 on page 41* and unit wiring diagram.

Compressor run contacts

Contacts are available to monitor “Compressor Run” 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 22*, *Figure 10 on page 41,* and Unit Wiring Diagram.

Alarm status contacts

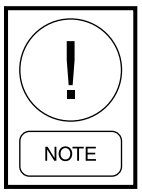
Normally-open contacts are available for each refrigerant system. These normally-open contacts close when the system is functioning normally. The respective contacts will open when the unit is shut down on a unit fault, or locked out on a system fault. Field connections are at XTBC2 terminals 29 to 30 (SYS 1), and terminals 31 to 32 (SYS 2). See *Figure 10 on page 41* and unit wiring diagram.

Remote reset of setpoint

Remote reset of setpoint can only be enabled in Discharge Air Temperature mode. The 4-20mA or 0-10V input allows reset of the discharge air temperature setpoint (when unit is programmed for Discharge Air Temperature Control mode) by supplying a “timed” contact closure. Field wiring should be connected to XTBC1 - terminals A+ to A-.

Load limit input

Load limiting is a feature that prevents the unit from loading beyond a desired value. The unit can be “load limited” either 33% or 66% on 3 or 6 compressor units, 50% on 2 or 4 compressor units, 40% or 80% on 5 compressor units, depending on the number of compressors on the 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 the Unit Control section. See *Figure 10 on page 41* 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.

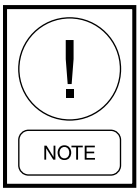
Compressor heaters

Compressor heaters are standard on all models. If power is OFF more than two hours, the crankcase heaters must be energized for 18 h to 24 h prior to restarting a compressor. This ensures that liquid slugging and oil dilution does not damage the compressors on start.

Refrigerant piping

General

When the unit has been located in its final position, the unit piping may be connected. Normal installation precautions should be observed in order to receive maximum operating efficiencies. System piping should conform to the DX piping guide *Form 050.40-ES2* or ASHRAE refrigeration handbook guidelines. All piping design and installation is the responsibility of the user.



Quantech assumes no warranty responsibility for system operation or failures due to improper piping, piping design, control problems, or lack of oil return.

All expansion valves, liquid line solenoid valves, filter driers, sight glasses, refrigerant, and refrigerant piping are supplied and installed by others. TXV sizing should be equal in size or slightly smaller than the capacity of the circuit. If multiple coil sections are utilized, a TXV for each section, sized accordingly, must be installed.

Refrigerant piping reference

Copper line sizing

When selecting pipe diameter and material for remote condenser piping systems, it is recommended that ASTM B280 material, type L or K is used. According to *ASME Standard B31.5-2006 (table 502.3.1)*, ASTM B280 copper does not require a derate when brazed. By comparison, ASTM B88 material does take an annealing penalty when brazing, which, in some applications, could reduce the calculated yield strength to a level below the system design.

For more details, refer to *ASHRAE Refrigeration Handbook, Chapter 2* and the DX Piping Guide *Form 050.40-ES2*.

Table 5 on page 37 lists refrigerant line connections sizes per unit model number.

TABLE 2 - FITTING EQUIVALENT LENGTHS

*COPPER FITTING EQUIVALENT LENGTHS		
LINE SIZE O.D.	**SHORT-RADIUS ELL**	**LONG-RADIUS ELL**
3/4 in. (19 mm)	6.5 ft. (2 m)	4.5 ft. (1.4 m)
7/8 in. (22 mm)	7.8 ft. (2.4 m)	5.3 ft. (1.6 m)
1-1/8 in. (29 mm)	2.7 ft. (.8 m)	1.9 ft. (0.6 m)
1-3/8 in. (35 mm)	3.2 ft. (1 m)	2.2 ft. (0.7 m)
1-5/8 in. (41 mm)	3.8 ft. (1.2 m)	2.6 ft. (0.8 m)
2-1/8 in. (54 mm)	5.2 ft. (1.6 m)	3.4 ft. (1.0 m)
2-5/8 in. (67 mm)	6.5 ft. (20 m)	4.2 ft. (1.3 m)

TABLE 3 - REFRIGERANT PIPING CHARGES

R410A SUCT AT 36 DEG LIQ AT 105 DEG					
SUCTION LINES					
SIZE	**ID**	**CU FT**	**DENSITY LB/CU FT**	**OZ/FT**	**GRAMS/30 CM**
1-3/8 in. (35 mm)	1.3	0.0	2.1	0.3	8.1
1-5/8 in. (41 mm)	1.5	0.0	2.1	0.4	11.5
2-1/8 in. (54 mm)	2.0	0.0	2.1	0.7	20.0
2-5/8 in. (67 mm)	2.5	0.0	2.1	1.1	30.9
LIQUID LINES					
3/4 in. (19 mm)	0.7	0.0	60.9	2.4	66.8
7/8 in. (22 mm)	0.8	0.0	60.9	3.3	92.8
1-1/8 in. (29 mm)	1.0	0.0	60.9	5.6	158.3
1-3/8 in. (35 mm)	1.3	0.0	60.9	8.5	241.1

TABLE 4 - MISCELLANEOUS LIQUID LINE PRESSURE DROPS

***MISCELLANEOUS LIQUID LINE PRESSURE**	
SOLENOID VALVE	2 to 3 psi (13.8 to 20.7 kPa)
FILTER/DRIER	2 to 3 psi (13.8 to 20.7 kPa)
SIGHT GLASS	0.5 psi (3.4 kPa)

* Pressure drops or equivalent length values are approximate. If more precise value is desired, consult ASHRAE Refrigerant Handbook.

TABLE 5 - REFRIGERANT LINE CONNECTIONS

MODEL NUMBER	TONS	SYSTEM NUMBER	REFRIGERANT LINE CONNECTION		SUCTION LINE		LIQUID LINE	
			SUCTION	LIQUID	COPPER TYPE L INCHES OD	VELOCITY @ NOMINAL CAPACITY IN FPM	NOMINAL TONS UNLOADED	COPPER TYPE L INCHES OD
080CZE	81.3	1	2.7	1.1	2-5/8	1656	13.5	1-1/8
		2	2.7	1.1	2-5/8	1656	13.5	1-1/8
085CZE	84.3	1	2.7	1.1	2-5/8	1818	14.9	1-1/8
		2	2.7	1.1	2-5/8	1572	13.2	1-1/8
090CZE	91.1	1	2.7	1.1	2-5/8	1812	14.9	1-1/8
		2	2.7	1.1	2-5/8	1896	14.9	1-1/8
100CYE	98.5	1	2.7	1.1	2-5/8	1896	14.9	1-1/8
		2	2.7	1.1	2-5/8	1896	14.9	1-1/8
110CYE	111.5	1	2.7	1.1	2-5/8	1812	14.9	1-1/8
		2	2.7	1.1	2-5/8	2598	33.6	1-1/8
130CZE	131.5	1	2.7	1.1	2-5/8	2658	32.8	1-1/8
		2	2.7	1.1	2-5/8	2658	32.8	1-1/8
145CZE	145.3	1	3.1	1.4	3-1/8	2790	31.3	1-3/8
		2	2.7	1.1	2-5/8	1926	14.9	1-1/8
160CZE	158.3	1	3.1	1.4	3-1/8	2658	30.7	1-3/8
		2	2.7	1.1	2-5/8	2556	33.1	1-1/8

Refrigerant Piping Notes:

1. Based on R-410A and R-454B at the nominal capacity of the unit or system, an ambient temperature of 95°F (35°C) and a suction temperature of 45°F (7.2°C).
2. Suction line sizes were calculated based on a nominal maximum pressure drop to 3 psi/100 ft. (20.7 kPa/30.5 m). When calculating suction line pressure drop for a specific application, it should be noted that system capacity decreases as suction line pressure drop increases.
4. Nominal Tons (KW) Unloaded is based on one compressor (per system) operating at design conditions.
5. Based on minimum compressor staging for the given pipe size, a double suction riser should be used to ensure proper oil return to the compressor on all vertical suction risers. Oil returning up the riser moves up the inner surface of the pipe and depends on the mass velocity of the refrigerant vapor at the wall surface to move the oil up the vertical rise.
6. Hot gas bypass lines are typically 7/8 in. for lines up to 40 ft and 1 1/8 in. for lines over 40 ft in length (12 m). The field connections sizes are 7/8 in. for the optional factory mounted hot gas bypass valve. Note: Hot gas bypass is only available for refrigerant system number 1.
7. For more information, refer to either the DX Piping Guide (*Form 050.40-ES2*) or the *ASHRAE Refrigeration Handbook*.

Refrigerant line sizing

Refrigerant piping systems must be designed to provide practical line sizes without excessive pressure drops, prevent compressor oil from being "trapped" in the refrigerant piping, and ensure proper flow of liquid refrigerant to the thermal expansion valve. Considerations should be given to:

1. Suction line pressure drop due to refrigerant flow.
2. Suction line refrigerant velocity for oil return.
3. Liquid line pressure drop due to refrigerant flow.
4. Liquid line pressure drop (or gain) due to vertical rise of the liquid line.

Table 6 on page 39 provides the pressure drops for given pipe sizes for both liquid and suction lines. The pressure drops given are per 100 ft. (30.5 m) of refrigerant piping. These friction losses do not include any allowances for strainer, filter drier, solenoid valve, isolation valve, or fittings.

Nominal pressure drop for solenoids, sight glass, and driers are shown in *Table 4 on page 36*.

Table 2 on page 36 includes approximate equivalent lengths for copper fittings.

To ensure a solid column of liquid refrigerant to the expansion valve, the total liquid line pressure drop should never exceed 40 psi (276 kPa). Refrigerant vapor in the liquid line will measurably reduce valve capacity and poor system performance can be expected.

To allow adequate oil return to the compressor, suction risers should be sized for a minimum of 1000 fpm (5.08 m/s) while the system is operating at minimum capacity to ensure oil return up the suction riser. See *Table 6 on page 39* under column labeled "Nominal Tons (kW) Unloaded. For more details, refer to *ASHRAE Refrigeration Handbook, Chapter 2*.

Evaporator below condensing unit

On a system where the evaporator is located below the condensing unit, the suction line must be sized for both pressure drop and oil return. In many cases a double suction riser must be installed to ensure reliable oil return at reduced loads. *Table 6 on page 39* indicates when a double suction riser should be used for listed pipe sizes to provide adequate oil return at reduced loads. The calculated information was based on maintaining a minimum of 1000 fpm (5.08 m/s) refrigerant vapor velocity at full load.

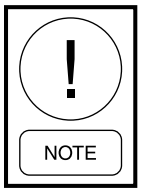
Condenser below evaporator

When the condensing unit is located below the evaporator, the liquid line must be designed for both friction loss and static head loss due the vertical rise. The value of static head loss of 0.5 psi/ft.(3.4 kPa/30 cm) must be added to the friction loss pressure drop in addition to all pressure drops due to driers, valves, etc.

Oil traps

All horizontal suction lines should be pitched at least 1/4 in./ft (2 cm/m) in the direction of the refrigerant flow to aid in the return of oil to the compressor. All suction lines with a vertical rise exceeding 3 ft (0.91 m) should have a "P" trap at the bottom and top of the riser to facilitate oil return. Suction lines with a vertical rise exceeding 25 ft (7.6 m) should be trapped every 15 ft (4.6 m).

For more details, refer to *ASHRAE Refrigeration Handbook. System Practices for Halocarbon Refrigerants*.



On systems where oil return is a problem, oil separators may be required. However, if piping design is poor, even with a separator, oil may be lost into the system over time, which may cause compressor failure.

Refrigerant charge

The condensing unit is charged with nitrogen a holding charge. The operating charge for the condensing unit, evaporator coil, and refrigerant piping must be "weighed-in" after all refrigerant piping is installed, leak checked, and evacuated.

70% of the calculated charge must be added prior to starting a system. Failure to add 70% of the charge may cause compressor overheating when the system is first started.

Final adjustment of refrigerant charge should be verified by subcooling values (refer to section on Pre-Start-up for checking subcooling). See *Table 3 on page 36* for Refrigerant Line Charges.

Filter driers, sight glasses, and TXV'S

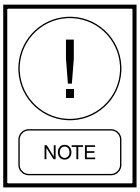
Liquid line filter driers, sight glass, and TXV's are field supplied for each refrigerant circuit.

TABLE 6 - REFRIGERANT LINE PRESSURE DROPS (IMPERIAL)

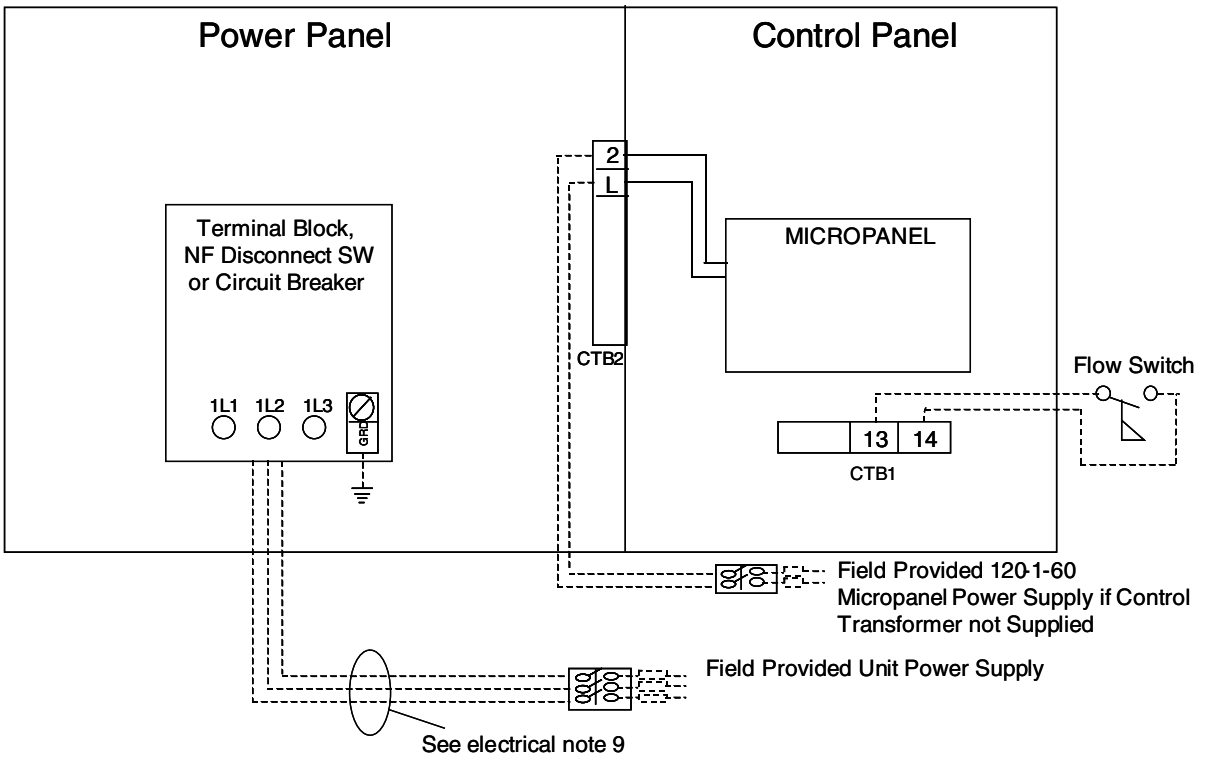
MODEL NUMBER	SYSTEM NUMBER	NOMINAL TONS	SUCTION LINE			LIQUID LINE		
			COPPER TYPE L INCHES OD	PRESSURE DROP PSI/100FT	VELOCITY @ NOMINAL CAPACITY IN FPM	NOMINAL TONS UNLOADED	COPPER TYPE L INCHES OD	PRESSURE DROP PSI/100FT
080CZE	1	40.6	2-5/8	1	1656	13.5	1-1/8	3.90
	2	40.6	2-5/8	1	1656	3.5	1-1/8	3.90
085CZE	1	44.7	2-5/8	1.2	1818	14.9	1-1/8	4.92
	2	39.6	2-5/8	0.9	1572	13.2	1-1/8	3.73
090CZE	1	44.7	2-5/8	1.2	1812	14.9	1-1/8	4.85
	2	46.4	2-5/8	1.3	1896	14.9	1-1/8	5.26
100CYE	1	49.2	2-5/8	1.3	1896	14.9	1-1/8	5.21
	2	49.2	2-5/8	1.3	1896	14.9	1-1/8	5.21
110CYE	1	44.4	2-5/8	1.2	1812	14.9	1-1/8	4.86
	2	67.2	2-5/8	2.3	2598	33.6	1-1/8	9.26
130CZE	1	65.5	2-5/8	2.4	2658	32.8	1-1/8	9.64
	2	65.5	2-5/8	2.4	2658	32.8	1-1/8	9.64
145CZE	1	93.9	3-1/8	2.1	2790	31.3	1-3/8	5.74
	2	51.4	2-5/8	1.4	1926	14.9	1-1/8	5.28
160CZE	1	92.1	3-1/8	2	2658	30.7	1-3/8	6.31
	2	66.1	2-5/8	2.3	2556	33.1	1-3/8	8.87

Refrigerant piping notes

1. Based on R-22 at the nominal capacity of the unit or system, an ambient temperature of 95°F (35°C) and a suction temperature of 45°F (7.2 °C).
2. Suction line sizes were calculated based on a nominal maximum pressure drop of 3 psi/100 ft (20.7 kPa/30.5 m). When calculating suction line pressure drop for a specific application, it should be noted that system capacity decreases as suction line pressure drop increases.
3. Liquid pressure drop (or gain) due to a vertical liquid line is not included in the tables and must be taken into account when determining pressure drop (or gain) of the liquid line. The nominal value that must be included in the liquid line loss (or gain) is 0.5 psi/foot (3.4 kPa/30 cm) of rise (or gain). To ensure a solid column of liquid refrigerant to the expansion valve, the total maximum pressure drop of the liquid line should not exceed 40 psi (276 kPa) based on 15°F (8.3 °C) subcooled liquid. Vapor in the liquid line, even in small amounts, will measurably reduce valve capacity and poor system performance will result. In addition, pressure loss for strainers, filter driers, solenoid valves, and isolation valve or fittings are not included in this table, and must be taken into account.
4. Nominal Tons (KW) Unloaded is based on one compressor (per system) operating at design conditions.
5. Based on minimum compressor staging for the given pipe size, a double suction riser should be used to ensure proper oil return to the compressor on all vertical suction risers. Oil returning up the riser moves up the inner surface of the pipe and depends on the mass velocity of the refrigerant vapor at the wall surface to move the oil up the vertical rise. Using piping of this size will allow velocities at part load to fall below 1000 fpm (5.08 m/s) minimum required for oil return.
6. Hot gas bypass lines are typically 7/8 in. for lines up to 40 ft and 1 1/8 in. for lines over 40 ft (12 m) in length. The field connections sizes are 7/8 in. for the optional factory mounted hot gas bypass valve.
7. For more information, refer to either the *DX Piping Application Guide* or the *ASHRAE Refrigeration Handbook*.



Hot gas bypass is only available for refrigerant system number 1.



Electrical Notes and Legend located on page 58.

WARNING

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.

CAUTION

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 8 - SINGLE-POINT SUPPLY CONNECTION – TERMINAL BLOCK, NON-FUSED DISCONNECT SWITCH OR CIRCUIT BREAKER

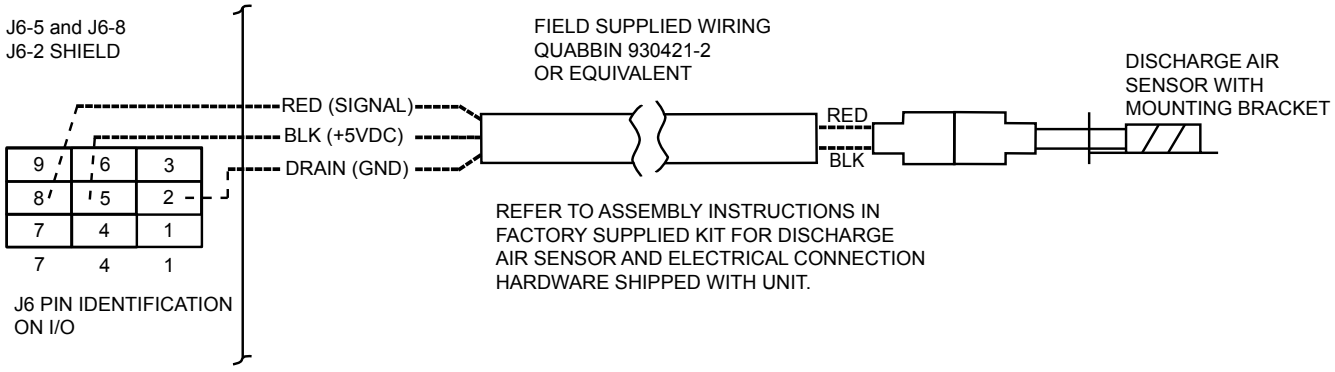
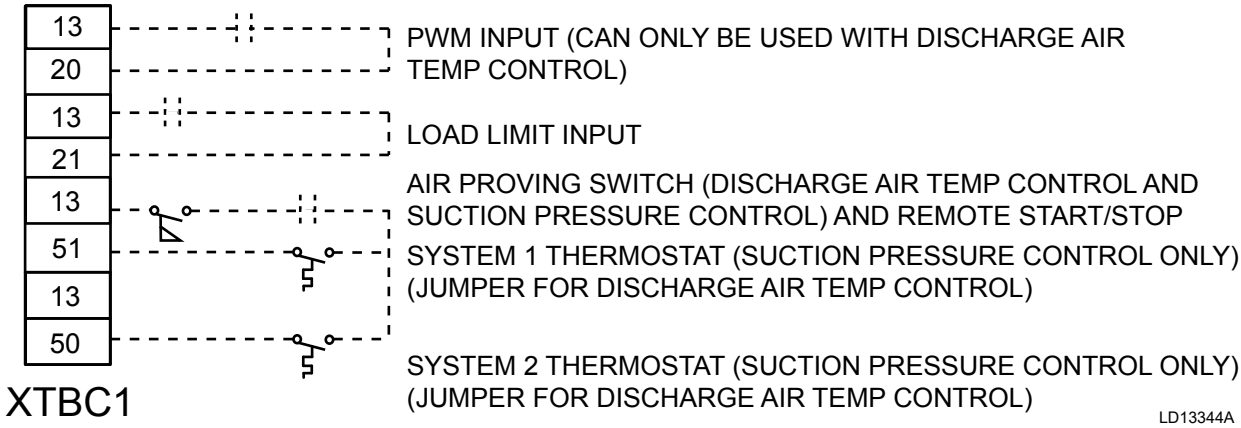
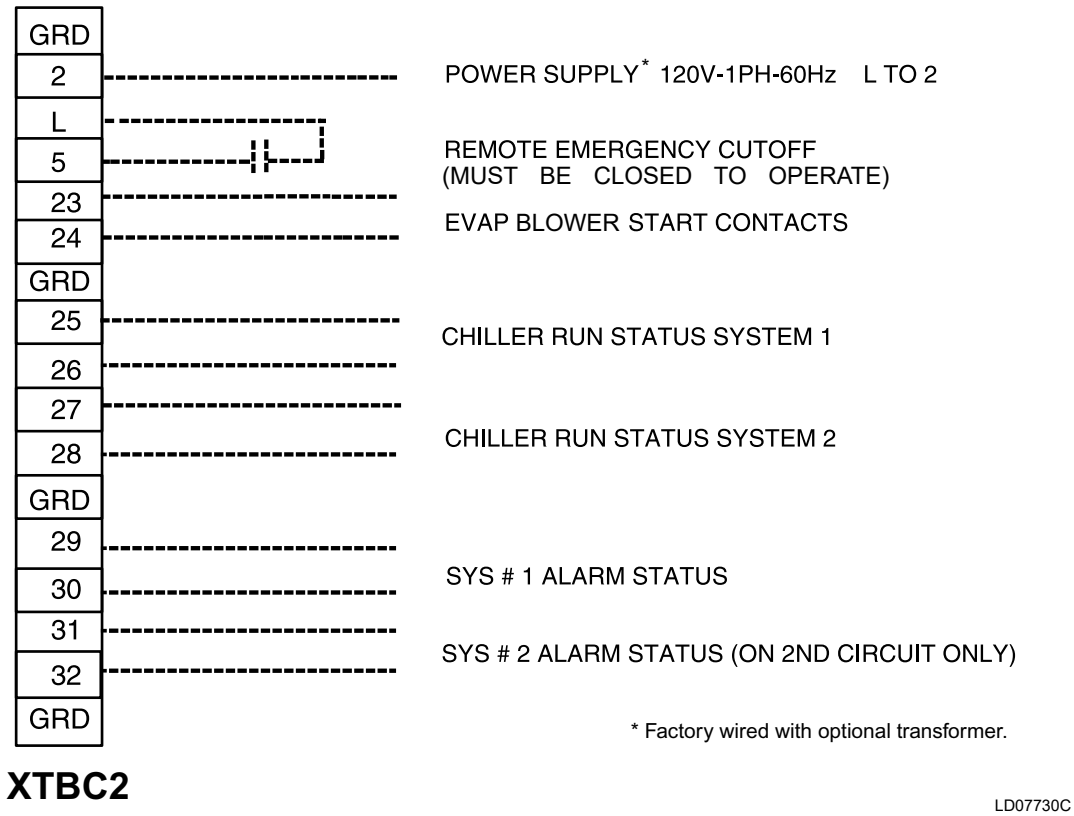


FIGURE 9 - DISCHARGE AIR SENSOR FIELD WIRING

Control wiring





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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 - CONTROL WIRING

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Section 5: Technical data

Operational limitations

Temperature and flows

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

Note

- For leaving brine temperature below 40°F (4.4°C), contact your nearest Quantech Office for application requirements.
- For leaving water temperature higher than 55°F (12.8°C), contact the nearest Quantech Office for application guidelines.
- The evaporator is protected against freezing to -20°F (-28.8°C) with an electric heater as standard.
- For operation at temperatures below 25°F (-3.9°C), the optional Low Ambient Kit will need to be installed.
- For operation at temperatures above 115°F (46.1°C), the optional High Ambient Kit will need to be installed on the system.

Voltage limitations

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

TABLE 7 - VOLTAGE LIMITATIONS

UNIT POWER	MIN.	MAX.
200-3-60	180	220
230-3-60	207	253
380-3-60	355	415
460-3-60	414	506
575-3-60	517	633

Physical data

QCC3080C_ – QCC3160C_
60 Hz

TABLE 8 - PHYSICAL DATA (IMPERIAL)

REFRIGERANT R-410A AND R-454B	MODEL NUMBER - STANDARD EFFICIENCY UNITS							
GENERAL UNIT DATA	**080CZE**	**085CZE**	**090CZE**	**100CYE**	**110CYE**	**130CZE**	**145CZE**	**160CZE**
Length, in.	116.1	116.1	116.1	142.7	142.7	142.7	187.7	187.7
Width, in.	88.0	88.0	88.0	88.0	88.0	88.0	88.0	88.0
Height, in.	94.2	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	2
Oil charge, circuit 1/circuit 2, gal (L)	2.58/2.58	3.28/2.58	3.28/2.76	2.76/2.76	3.28/3.33	3.33/3.33	4.99/2.76	4.99/3.33
Shipping weight, lb	3,941	3,941	3,941	4,747	4,838	4,929	6,172	6,263
Compressors, Scroll Type								
Compressors per circuit	3/3	3/3	3/ 3	3/3	3/2	2/2	3/3	3/2
Compressors per unit	6	6	6	6	5	4	6	5
Nominal Tons Per Compressor								
Circuit 1	13	15	15	15/32	15	32	32	32
Circuit 2	13	13	15/32	15/32	32	32	15/32	32
Condenser								
Total face area ft^2	106.9	106.9	106.9	160.3	160.3	160.3	213.8	213.8
Number of rows	3	3	3	3	3	3	3	3
Fins per in.	17	17	17	17	17	17	17	17
Condenser Fans, Low Sound								
Number of fans, circuit 1/circuit 2	2/2	2/2	2/2	3/3	2/4	3/3	4/4	4/4
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	62,400	62,400	62,400	93,600	93,600	93,600	12,800	12,800

Electrical data

TABLE 9 - MICRO PANEL 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		MINIMUM	MAXIMUM	
			15A	10A	15A	30 A / 240V
MODELS W/ CONTROL TRANS	-17	200-1-60	15A	10A	15A	30 A / 240V
	-28	230-1-60	15A	10A	15A	30 A / 240V
	-40	380-1-60	15A	10A	15A	30 A / 480V
	-46	460-1-60	15A	10A	15A	30 A / 480V
	-50	380/415-1-60	15A	10A	15A	30A / 415V
	-58	575-1-60	15A	10A	15A	30 A / 600V

A. Minimum #14 AWG, 75 °C, Copper Recommended
B. Minimum and Maximum Over Current Protection, Dual Element Fuse or Circuit Breaker

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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.

TABLE 10 - VOLTAGE RANGE

VOLTAGE RANGE			
VOLTAGE CODE	UNIT POWER	MINIMUM	MAXIMUM
-17	200-3-60	180	220
-28	230-3-60	207	253
-40	380/415-3-60	342	440
-46	460-3-60	414	506
-50	380/415-3-50	342	440
-58	575-3-60	517	633

Single point

TABLE 11 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, SINGLE POINT

MODEL	EFF.	PUMP MODEL	VOLT CODE	PUMP FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
130C	SE	X	17	-	511	600	600	600	110	599	110	599
			23	-	510	600	600	600	110	599	110	599
			40	-	321	400	350	350	69	358	69	358
			46	-	255	400	300	300	55	310	55	310
			58	-	227	250	250	250	49	239	49	239

TABLE 12 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, SINGLE POINT

MODEL	EFF.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
090C	SE	X	17	-	391	600	450	500	56	425	56	425
			23	-	390	600	450	450	56	425	56	425
			40	-	249	400	300	300	36	239	36	239
			46	-	192	250	225	225	27	187	27	187
			58	-	168	200	200	200	24	148	24	148
145C	SE	X	17	-	582	800	700	700	110	599	110	599
			23	-	581	800	700	700	110	599	110	599
			40	-	366	600	400	400	69	358	69	358
			46	-	291	400	350	350	55	310	55	310
			58	-	257	400	300	300	49	239	49	239
160C	SE	X	17	-	636	800	700	700	110	599	110	599
			23	-	635	800	700	700	110	599	110	599
			40	-	399	600	450	450	69	358	69	358
			46	-	318	400	350	350	55	310	55	310
			58	-	283	400	300	300	49	239	49	239

TABLE 11 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, SINGLE POINT, CONT'D

	SYSTEM # 1					SYSTEM # 2								
	COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
	-	-	3	7.6	44.0	110	599	110	599	-	-	3	7.6	44.0
	-	-	3	7.4	37.0	110	599	110	599	-	-	3	7.4	37.0
	-	-	3	4.5	23.1	69	358	69	358	-	-	3	4.5	23.1
	-	-	3	4.0	19.0	55	310	55	310	-	-	3	4.0	19.0
	-	-	3	2.9	15.3	49	239	49	239	-	-	3	2.9	15.3

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TABLE 12 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, SINGLE POINT, CONT'D

	SYSTEM # 1					SYSTEM # 2								
	COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
	56	425	2	7.6	44.0	110	599	56	425	-	-	2	7.6	44.0
	56	425	2	7.4	37.0	110	599	56	425	-	-	2	7.4	37.0
	36	239	2	4.5	23.1	69	358	36	239	-	-	2	4.5	23.1
	27	187	2	4.0	19.0	55	310	27	187	-	-	2	4.0	19.0
	24	148	2	2.9	15.3	49	239	24	148	-	-	2	2.9	15.3
	110	599	4	7.6	44.0	110	599	56	425	-	-	4	7.6	44.0
	110	599	4	7.4	37.0	110	599	56	425	-	-	4	7.4	37.0
	69	358	4	4.5	23.1	69	358	36	239	-	-	4	4.5	23.1
	55	310	4	4.0	19.0	55	310	27	187	-	-	4	4.0	19.0
	49	239	4	2.9	15.3	49	239	24	148	-	-	4	2.9	15.3
	110	599	4	7.6	44.0	110	599	110	599	-	-	4	7.6	44.0
	110	599	4	7.4	37.0	110	599	110	599	-	-	4	7.4	37.0
	69	358	4	4.5	23.1	69	358	69	358	-	-	4	4.5	23.1
	55	310	4	4.0	19.0	55	310	55	310	-	-	4	4.0	19.0
	49	239	4	2.9	15.3	49	239	49	239	-	-	4	2.9	15.3

TABLE 13 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-410A, SINGLE POINT

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
080C	SE	X	17	-	351	400	400	400	51	300	51	300
			23	-	350	400	400	400	51	300	51	300
			40	-	186	250	200	200	27	139	27	139
			46	-	160	200	175	175	23	150	23	150
			58	-	136	200	150	150	20	109	20	109
085C	SE	X	17	-	366	600	400	400	56	425	56	425
			23	-	365	600	400	400	56	425	56	425
			40	-	216	250	225	250	36	239	36	239
			46	-	173	200	200	200	27	187	27	187
			58	-	148	200	175	175	24	148	24	148

TABLE 14 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, SINGLE POINT

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
100C	HE	X	17	-	404	600	450	500	110	599	56	425
			23	-	403	600	450	500	110	358	56	425
			40	-	255	400	300	300	69	310	36	239
			46	-	200	250	225	250	55	239	27	187
			58	-	176	200	200	225	49	310	24	148

TABLE 15 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, SINGLE POINT

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
110C	HE	X	17	-	460	600	500	500	56	425	56	425
			23	-	458	600	500	500	56	425	56	425
			40	-	291	400	350	350	36	239	36	239
			46	-	227	250	250	250	27	187	27	187
			58	-	200	250	225	225	24	148	24	148

TABLE 13 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-410A, SINGLE POINT, CONT'D

SYSTEM # 1					SYSTEM # 2								
COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
51	300	2	7.6	44.0	51	300	51	300	51	300	2	7.6	44.0
51	300	2	7.4	37.0	51	300	51	300	51	300	2	7.4	37.0
27	139	2	4.5	23.1	27	139	27	139	27	139	2	4.5	23.1
23	150	2	4.0	19.0	23	150	23	150	23	150	2	4.0	19.0
20	109	2	2.9	15.3	20	109	20	109	20	109	2	2.9	15.3
56	425	2	7.6	44.0	51	300	51	300	51	300	2	7.6	44.0
56	425	2	7.4	37.0	51	300	51	300	51	300	2	7.4	37.0
36	239	2	4.5	23.1	27	139	27	139	27	139	2	4.5	23.1
27	187	2	4.0	19.0	23	150	23	150	23	150	2	4.0	19.0
24	148	2	2.9	15.3	20	109	20	109	20	109	2	2.9	15.3

TABLE 14 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, SINGLE POINT, CONT'D

SYSTEM # 1					SYSTEM # 2								
COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
-	-	3	7.6	44.0	110	599	56	425	-	-	3	7.6	44.0
-	-	3	7.4	37.0	110	599	56	425	-	-	3	7.4	37.0
-	-	3	4.5	23.1	69	358	36	239	-	-	3	4.5	23.1
-	-	3	4.0	19.0	55	310	27	187	-	-	3	4.0	19.0
-	-	3	2.9	15.3	49	239	24	148	-	-	3	2.9	15.3

TABLE 15 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, SINGLE POINT, CONT'D

SYSTEM # 1					SYSTEM # 2								
COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
56	425	2	7.6	44.0	110	599	110	599	-	-	4	7.6	44.0
56	425	2	7.4	37.0	110	599	110	599	-	-	4	7.4	37.0
36	239	2	4.5	23.1	69	358	69	358	-	-	4	4.5	23.1
27	187	2	4.0	19.0	55	310	55	310	-	-	4	4.0	19.0
24	148	2	2.9	15.3	49	239	49	239	-	-	4	2.9	15.3

TABLE 16 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-454B, SINGLE POINT

MODEL	EFF.	PUMP MOD-EL	VOLT CODE	PUMP FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
130C	SE	X	17	-	497	-	-	600	106.2	652	106.2	652
			23	-	496	-	-	600	106.2	652	106.2	652
			40	-	300	-	-	350	64.3	355	64.3	355
			46	-	250	-	-	300	53.1	316	53.1	316
			58	-	198	-	-	250	42.5	255	42.5	255

TABLE 17 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, SINGLE POINT

MODEL	EFF.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
160C	SE	X	17	-	618	-	-	700	106.2	652	106.2	652
			23	-	617	-	-	700	106.2	652	106.2	652
			40	-	374	-	-	400	64.3	355	64.3	355
			46	-	311	-	-	350	53.1	316	53.1	316
			58	-	246	-	-	250	42.5	255	42.5	255

TABLE 18 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, SINGLE POINT

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
080C	SE	X	17	-	334	-	-	350	48.5	257	48.5	257
			23	-	333	-	-	350	48.5	288	48.5	288
			40	-	191	-	-	200	27.6	172	27.6	172
			46	-	169	-	-	175	24.4	145	24.4	145
			58	-	120	-	-	125	17.4	114	17.4	114
085C	SE	X	17	-	363	-	-	400	57.7	284	57.7	284
			23	-	363	-	-	400	57.7	330	57.7	330
			40	-	201	-	-	225	30.9	192	30.9	192
			46	-	177	-	-	200	26.9	180	26.9	180
			58	-	134	-	-	150	21.5	132	21.5	132

TABLE 16 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-454B, SINGLE POINT, CONT'D

	SYSTEM # 1					SYSTEM # 2								
	COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
	-	-	3	7.6	44.0	106.2	652	106.2	652	-	-	3	7.6	44.0
	-	-	3	7.4	37.0	106.2	652	106.2	652	-	-	3	7.4	37.0
	-	-	3	4.5	23.1	64.3	355	64.3	355	-	-	3	4.5	23.1
	-	-	3	4.0	19.0	53.1	316	53.1	316	-	-	3	4.0	19.0
	-	-	3	2.9	15.3	42.5	255	42.5	255	-	-	3	2.9	15.3

TABLE 17 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, SINGLE POINT, CONT'D

	SYSTEM # 1					SYSTEM # 2								
	COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
	106.2	652	4	7.6	44.0	106.2	652	106.2	652	-	-	4	7.6	44.0
	106.2	652	4	7.4	37.0	106.2	652	106.2	652	-	-	4	7.4	37.0
	64.3	355	4	4.5	23.1	64.3	355	64.3	355	-	-	4	4.5	23.1
	53.1	316	4	4.0	19.0	53.1	316	53.1	316	-	-	4	4.0	19.0
	42.5	255	4	2.9	15.3	42.5	255	42.5	255	-	-	4	2.9	15.3

TABLE 18 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, SINGLE POINT, CONT'D

	SYSTEM # 1					SYSTEM # 2								
	COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
	48.5	257	2	7.6	44.0	48.5	257	48.5	257	48.5	257	2	7.6	44.0
	48.5	288	2	7.4	37.0	48.5	288	48.5	288	48.5	288	2	7.4	37.0
	27.6	172	2	4.5	23.1	27.6	172	27.6	172	27.6	172	2	4.5	23.1
	24.4	145	2	4.0	19.0	24.4	145	24.4	145	24.4	145	2	4.0	19.0
	17.4	114	2	2.9	15.3	17.4	114	17.4	114	17.4	114	2	2.9	15.3
	57.7	284	2	7.6	44.0	48.5	257	48.5	257	48.5	257	2	7.6	44.0
	57.7	330	2	7.4	37.0	48.5	288	48.5	288	48.5	288	2	7.4	37.0
	30.9	192	2	4.5	23.1	27.6	172	27.6	172	27.6	172	2	4.5	23.1
	26.9	180	2	4.0	19.0	24.4	145	24.4	145	24.4	145	2	4.0	19.0
	21.5	132	2	2.9	15.3	17.4	114	17.4	114	17.4	114	2	2.9	15.3

TABLE 18 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, , SINGLE POINT CONT'D

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
090C	SE	X	17	-	391	-	-	400	57.7	284	57.7	284
			23	-	390	-	-	400	57.7	330	57.7	330
			40	-	211	-	-	225	30.9	192	30.9	192
			46	-	184	-	-	200	26.9	180	26.9	180
			58	-	146	-	-	150	21.5	132	21.5	132
160C	SE	X	17	-	579	-	-	600	106.2	652	106.2	652
			28	-	577	-	-	600	106.2	652	106.2	652
			40	-	338	-	-	400	64.3	355	64.3	355
			46	-	285	-	-	300	53.1	316	53.1	316
			58	-	226	-	-	250	42.5	255	42.5	255

TABLE 19 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, SINGLE POINT

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
110C	HE	X	17	-	446	-	-	500	57.7	284	57.7	284
			23	-	444	-	-	500	57.7	330	57.7	330
			40	-	256	-	-	250	30.9	192	30.9	192
			46	-	218	-	-	225	26.9	180	26.9	180
			58	-	172	-	-	175	21.5	132	21.5	132

TABLE 20 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, SINGLE POINT

MODEL	Eff.	Pump Model	Volt Code	Pump FLA	MCA	MIN N/F DS	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE MAX CB	SYSTEM # 1			
									COMPR 1		COMPR 2	
									RLA	LRA	RLA	LRA
100C	HE	X	17	-	406	-	-	450	57.7	284	57.7	284
			23	-	405	-	-	450	57.7	330	57.7	330
			40	-	220	-	-	250	30.9	192	30.9	192
			46	-	192	-	-	200	26.9	180	26.9	180
			58	-	152	-	-	150	21.5	132	21.5	132

TABLE 18 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, SINGLE POINT, CONT'D

SYSTEM # 1					SYSTEM # 2								
COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
57.7	284	2	7.6	44.0	57.7	284	57.7	284	57.7	284	2	7.6	44.0
57.7	330	2	7.4	37.0	57.7	330	57.7	330	57.7	330	2	7.4	37.0
30.9	192	2	4.5	23.1	30.9	192	30.9	192	30.9	192	2	4.5	23.1
26.9	180	2	4.0	19.0	26.9	180	26.9	180	26.9	180	2	4.0	19.0
21.5	132	2	2.9	15.3	21.5	132	21.5	132	21.5	132	2	2.9	15.3
106.2	652	4	7.6	44.0	57.7	284	57.7	284	57.7	284	4	7.6	44.0
106.2	652	4	7.4	37.0	57.7	330	57.7	330	57.7	330	4	7.4	37.0
64.3	355	4	4.5	23.1	30.9	192	30.9	192	30.9	192	4	4.5	23.1
53.1	316	4	4.0	19.0	26.9	180	26.9	180	26.9	180	4	4.0	19.0
42.5	255	4	2.9	15.3	21.5	132	21.5	132	21.5	132	4	2.9	15.3

TABLE 19 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, SINGLE POINT, CONT'D

SYSTEM # 1					SYSTEM # 2								
COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
57.7	284	2	7.6	44.0	106.2	652	106.2	652	-	-	4	7.6	44.0
57.7	330	2	7.4	37.0	106.2	652	106.2	652	-	-	4	7.4	37.0
30.9	192	2	4.5	23.1	64.3	355	64.3	355	-	-	4	4.5	23.1
26.9	180	2	4.0	19.0	53.1	316	53.1	316	-	-	4	4.0	19.0
21.5	132	2	2.9	15.3	42.5	255	42.5	255	-	-	4	2.9	15.3

TABLE 20 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, SINGLE POINT, CONT'D

SYSTEM # 1					SYSTEM # 2								
COMPR 3		FAN			COMPR 1		COMPR 2		COMPR 3		FAN		
RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
57.7	284	3	7.6	44.0	57.7	284	57.7	284	57.7	284	3	7.6	44.0
57.7	330	3	7.4	37.0	57.7	330	57.7	330	57.7	330	3	7.4	37.0
30.9	192	3	4.5	23.1	30.9	192	30.9	192	30.9	192	3	4.5	23.1
26.9	180	3	4.0	19.0	26.9	180	26.9	180	26.9	180	3	4.0	19.0
21.5	132	3	2.9	15.3	21.5	132	21.5	132	21.5	132	3	2.9	15.3

Dual point

TABLE 21 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
130C	SE	17	269	400	300	350	269	400	300	350
		23	269	400	300	350	269	400	300	350
		40	169	200	200	225	169	200	200	225
		46	135	150	150	175	135	150	150	175
		58	120	150	150	150	120	150	150	150

TABLE 22 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
090C	SE	17	197	250	225	250	208	250	250	300
		23	196	250	225	250	208	250	250	300
		40	126	150	150	150	132	150	150	200
		46	95	150	110	110	103	150	125	150
		58	83	100	90	100	91	100	110	125
160C	SE	17	387	600	450	450	277	400	350	350
		23	386	600	450	450	276	400	350	350
		40	243	400	300	300	174	200	200	225
		46	193	250	225	225	139	150	175	175
		58	172	200	200	200	123	150	150	150

TABLE 21 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
110	599	110	599	-	-	3	7.6	44.0	110	599	110	599	-	-	3	7.6	44.0
110	599	110	599	-	-	3	7.4	37.0	110	599	110	599	-	-	3	7.4	37.0
69	358	69	358	-	-	3	4.5	23.1	69	358	69	358	-	-	3	4.5	23.1
55	310	55	310	-	-	3	4.0	19.0	55	310	55	310	-	-	3	4.0	19.0
49	239	49	239	-	-	3	2.9	15.3	49	239	49	239	-	-	3	2.9	15.3

TABLE 22 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
56	425	56	425	56	425	2	7.6	44.0	110	599	56	425	-	-	2	7.6	44.0
56	425	56	425	56	425	2	7.4	37.0	110	599	56	425	-	-	2	7.4	37.0
36	239	36	239	36	239	2	4.5	23.1	69	358	36	239	-	-	2	4.5	23.1
27	187	27	187	27	187	2	4.0	19.0	55	310	27	187	-	-	2	4.0	19.0
24	148	24	148	24	148	2	2.9	15.3	49	239	24	148	-	-	2	2.9	15.3
110	599	110	599	110	599	4	7.6	44.0	110	599	110	599	-	-	4	7.6	44.0
110	599	110	599	110	599	4	7.4	37.0	110	599	110	599	-	-	4	7.4	37.0
69	358	69	358	69	358	4	4.5	23.1	69	358	69	358	-	-	4	4.5	23.1
55	310	55	310	55	310	4	4.0	19.0	55	310	55	310	-	-	4	4.0	19.0
49	239	49	239	49	239	4	2.9	15.3	49	239	49	239	-	-	4	2.9	15.3

TABLE 23 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-410A, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
080C	SE	17	182	200	200	225	182	200	200	225
		23	182	200	200	225	182	200	200	225
		40	96	150	110	110	96	150	110	110
		46	83	100	90	100	83	100	90	100
		58	70	100	80	90	70	100	80	90
085C	SE	17	197	250	225	250	182	200	200	225
		23	196	250	225	250	182	200	200	225
		40	126	150	150	150	96	150	110	110
		46	95	150	110	110	83	100	90	100
		58	83	100	90	100	70	100	80	90
145C	SE	17	387	600	450	450	223	250	300	300
		23	386	600	450	450	222	250	250	300
		40	243	400	300	300	141	150	175	200
		46	193	250	225	225	111	150	125	150
		58	172	200	200	200	97	100	110	125

TABLE 24 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
100C	HE	17	216	250	250	300	216	250	250	300
		23	215	250	250	300	215	250	250	300
		40	136	150	175	200	136	150	175	200
		46	107	150	125	150	107	150	125	150
		58	94	100	110	125	94	100	110	125

TABLE 25 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
110C	HE	17	197	250	225	250	277	400	350	350
		23	196	250	225	250	276	400	350	350
		40	126	150	150	150	174	200	200	225
		46	95	150	110	110	139	150	175	175
		58	83	100	90	100	123	150	150	150

TABLE 23 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-410A, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
51	300	51	300	51	300	2	7.6	44.0	51	300	51	300	51	300	2	7.6	44.0
51	300	51	300	51	300	2	7.4	37.0	51	300	51	300	51	139	2	7.4	37.0
27	139	27	139	27	139	2	4.5	23.1	27	139	27	139	27	150	2	4.5	23.1
23	150	23	150	23	150	2	4.0	19.0	23	150	23	150	23	109	2	4.0	19.0
20	109	20	109	20	109	2	2.9	15.3	20	109	20	109	20	425	2	2.9	15.3
56	425	56	425	56	425	2	7.6	44.0	51	300	51	300	51	300	2	7.6	44.0
56	425	56	425	56	425	2	7.4	37.0	51	300	51	300	51	300	2	7.4	37.0
36	239	36	239	36	239	2	4.5	23.1	27	139	27	139	27	139	2	4.5	23.1
27	187	27	187	27	187	2	4.0	19.0	23	150	23	150	23	150	2	4.0	19.0
24	148	24	148	24	148	2	2.9	15.3	20	109	20	109	20	109	2	2.9	15.3
110	599	110	599	110	599	4	7.6	44.0	110	599	56	425	110	599	4	7.6	44.0
110	599	110	599	110	599	4	7.4	37.0	110	599	56	425	110	599	4	7.4	37.0
69	358	69	358	69	358	4	4.5	23.1	69	358	36	239	69	358	4	4.5	23.1
55	310	55	310	55	310	4	4.0	19.0	55	310	27	187	55	310	4	4.0	19.0
49	239	49	239	49	239	4	2.9	15.3	49	239	24	148	49	239	4	2.9	15.3

TABLE 24 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-410A, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
110	599	56	425			3	7.6	44.0	110	599	56	425			3	7.6	44.0
110	599	56	425			3	7.4	37.0	110	599	56	425			3	7.4	37.0
69	358	36	239			3	4.5	23.1	69	358	36	239			3	4.5	23.1
55	310	27	187			3	4.0	19.0	55	310	27	187			3	4.0	19.0
49	239	24	148			3	2.9	15.3	49	239	24	148			3	2.9	15.3

TABLE 25 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-410A, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
56	425	56	425	56	425	2	7.6	44.0	110	599	110	599			4	7.6	44.0
56	425	56	425	56	425	2	7.4	37.0	110	599	110	599			4	7.4	37.0
36	239	36	239	36	239	2	4.5	23.1	69	358	69	358			4	4.5	23.1
27	187	27	187	27	187	2	4.0	19.0	55	310	55	310			4	4.0	19.0
24	148	24	148	24	148	2	2.9	15.3	49	239	49	239			4	2.9	15.3

TABLE 26 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-454B, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
130C	SE	17	262	-	-	350	262	-	-	350
		23	261	-	-	350	261	-	-	350
		40	158	-	-	200	158	-	-	200
		46	131	-	-	175	131	-	-	175
		58	104	-	-	125	104	-	-	125

TABLE 27 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
160C	SE	17	376	-	-	450	269	-	-	350
		23	375	-	-	450	269	-	-	350
		40	227	-	-	250	163	-	-	225
		46	189	-	-	225	135	-	-	175
		58	150	-	-	175	107	-	-	125

TABLE 28 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
080C	SE	17	173	–	–	200	173	–	–	200
		23	172	–	–	200	172	–	–	200
		40	99	–	–	125	99	–	–	125
		46	87	–	–	110	87	–	–	110
		58	62	–	–	70	62	–	–	70
085C	SE	17	203	–	–	250	173	–	–	200
		23	202	–	–	250	172	–	–	200
		40	109	–	–	125	99	–	–	125
		46	95	–	–	110	87	–	–	110
		58	76	–	–	90	62	–	–	70

TABLE 26 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (4 COMPR) R-454B, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
106.2	652	106.2	652	-	-	3	7.6	44.0	106.2	652	106.2	652	-	-	3	7.6	44.0
106.2	652	106.2	652	-	-	3	7.4	37.0	106.2	652	106.2	652	-	-	3	7.4	37.0
64.3	355	64.3	355	-	-	3	4.5	23.1	64.3	355	64.3	355	-	-	3	4.5	23.1
53.1	316	53.1	316	-	-	3	4.0	19.0	53.1	316	53.1	316	-	-	3	4.0	19.0
42.5	255	42.5	255	-	-	3	2.9	15.3	42.5	255	42.5	255	-	-	3	2.9	15.3

TABLE 27 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
106.2	652	106.2	652	106.2	652	4	7.6	44.0	106.2	652	106.2	652	-	-	4	7.6	44.0
106.2	652	106.2	652	106.2	652	4	7.4	37.0	106.2	652	106.2	652	-	-	4	7.4	37.0
64.3	355	64.3	355	64.3	355	4	4.5	23.1	64.3	355	64.3	355	-	-	4	4.5	23.1
53.1	316	53.1	316	53.1	316	4	4.0	19.0	53.1	316	53.1	316	-	-	4	4.0	19.0
42.5	255	42.5	255	42.5	255	4	2.9	15.3	42.5	255	42.5	255	-	-	4	2.9	15.3

TABLE 28 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
48.5	257	48.5	257	48.5	257	2	7.6	44.0	48.5	257	48.5	257	48.5	257	2	7.6	44.0
48.5	288	48.5	288	48.5	288	2	7.4	37.0	48.5	288	48.5	288	48.5	288	2	7.4	37.0
27.6	172	27.6	172	27.6	172	2	4.5	23.1	27.6	172	27.6	172	27.6	172	2	4.5	23.1
24.4	145	24.4	145	24.4	145	2	4.0	19.0	24.4	145	24.4	145	24.4	145	2	4.0	19.0
17.4	114	17.4	114	17.4	114	2	2.9	15.3	17.4	114	17.4	114	17.4	114	2	2.9	15.3
57.7	284	57.7	284	57.7	284	2	7.6	44.0	48.5	257	48.5	257	48.5	257	2	7.6	44.0
57.7	330	57.7	330	57.7	330	2	7.4	37.0	48.5	288	48.5	288	48.5	288	2	7.4	37.0
30.9	192	30.9	192	30.9	192	2	4.5	23.1	27.6	172	27.6	172	27.6	172	2	4.5	23.1
26.9	180	26.9	180	26.9	180	2	4.0	19.0	24.4	145	24.4	145	24.4	145	2	4.0	19.0
21.5	132	21.5	132	21.5	132	2	2.9	15.3	17.4	114	17.4	114	17.4	114	2	2.9	15.3

TABLE 28 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, , DUAL POINT, CONT'D

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
090C	SE	17	203	-	-	250	203	-	-	250
		23	202	-	-	250	202	-	-	250
		40	109	-	-	125	109	-	-	125
		46	95	-	-	110	95	-	-	110
		58	76	-	-	90	76	-	-	90
145C	SE	17	376	–	–	450	218	–	–	250
		23	375	–	–	450	217	–	–	250
		40	227	–	–	250	118	–	–	125
		46	189	–	–	225	103	–	–	125
		58	150	–	–	175	81	–	–	100

TABLE 29 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
110C	HE	17	203	–	–	250	269	–	–	350
		23	202	–	–	250	269	–	–	350
		40	109	–	–	125	163	–	–	225
		46	95	–	–	110	135	–	–	175
		58	76	–	–	90	107	–	–	125

TABLE 30 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, DUAL POINT

MODEL	EFF	VOLT Code	System 1				System 2			
			MCA	MIN N/ FDS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB	MCA	MIN N/F DS	MIN DUAL ELEM FUSE and MIN CB	MAX DUAL ELEM FUSE and MAX CB
100C	HE	17	210	–	–	250	210	–	–	250
		23	210	–	–	250	210	–	–	250
		40	114	–	–	125	114	–	–	125
		46	99	–	–	125	99	–	–	125
		58	79	–	–	100	79	–	–	100

TABLE 28 - STANDARD EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
57.7	284	57.7	284	57.7	284	2	7.6	44.0	57.7	284	57.7	284	57.7	284	2	7.6	44.0
57.7	330	57.7	330	57.7	330	2	7.4	37.0	57.7	330	57.7	330	57.7	330	2	7.4	37.0
30.9	192	30.9	192	30.9	192	2	4.5	23.1	30.9	192	30.9	192	30.9	192	2	4.5	23.1
26.9	180	26.9	180	26.9	180	2	4.0	19.0	26.9	180	26.9	180	26.9	180	2	4.0	19.0
21.5	132	21.5	132	21.5	132	2	2.9	15.3	21.5	132	21.5	132	21.5	132	2	2.9	15.3
106.2	652	106.2	652	106.2	652	4	7.6	44.0	57.7	284	57.7	284	57.7	284	4	7.6	44.0
106.2	652	106.2	652	106.2	652	4	7.4	37.0	57.7	330	57.7	330	57.7	330	4	7.4	37.0
64.3	355	64.3	355	64.3	355	4	4.5	23.1	30.9	192	30.9	192	30.9	192	4	4.5	23.1
53.1	316	53.1	316	53.1	316	4	4.0	19.0	26.9	180	26.9	180	26.9	180	4	4.0	19.0
42.5	255	42.5	255	42.5	255	4	2.9	15.3	21.5	132	21.5	132	21.5	132	4	2.9	15.3

TABLE 29 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (5 COMPR) R-454B, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
57.7	284	57.7	284	57.7	284	2	7.6	44.0	106.2	652	106.2	652	–	–	4	7.6	44.0
57.7	330	57.7	330	57.7	330	2	7.4	37.0	106.2	652	106.2	652	–	–	4	7.4	37.0
30.9	192	30.9	192	30.9	192	2	4.5	23.1	64.3	355	64.3	355	–	–	4	4.5	23.1
26.9	180	26.9	180	26.9	180	2	4.0	19.0	53.1	316	53.1	316	–	–	4	4.0	19.0
21.5	132	21.5	132	21.5	132	2	2.9	15.3	42.5	255	42.5	255	–	–	4	2.9	15.3

TABLE 30 - HIGH EFFICIENCY UNIT ELECTRICAL DATA (6 COMPR) R-454B, DUAL POINT, CONT'D

SYSTEM # 1									SYSTEM # 2								
COMPR 1		COMPR 2		COMPR 3		COND FANS			COMPR 1		COMPR 2		COMPR 3		COND FANS		
RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	QTY	FLA	LRA
57.7	284	57.7	284	57.7	284	3	7.6	44.0	57.7	284	57.7	284	57.7	284	3	7.6	44.0
57.7	330	57.7	330	57.7	330	3	7.4	37.0	57.7	330	57.7	330	57.7	330	3	7.4	37.0
30.9	192	30.9	192	30.9	192	3	4.5	23.1	30.9	192	30.9	192	30.9	192	3	4.5	23.1
26.9	180	26.9	180	26.9	180	3	4.0	19.0	26.9	180	26.9	180	26.9	180	3	4.0	19.0
21.5	132	21.5	132	21.5	132	3	2.9	15.3	21.5	132	21.5	132	21.5	132	3	2.9	15.3

TABLE 31 - LUG SIZING

MODEL	NON-FUSE DISC SW.			CIRCUIT BREAKER			TERMINAL BLOCK
	RATING	SIZE	LUG	RATING	SIZE	LUG	LUG
080C	600	S6-600	S6: (2) 250kcmil - 500kcmil	400	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	400	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	200	S3-225	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
	200	S3-225	S3-S4-S5: 4AWG - 300kcmil	175	S3-175	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
	200	S3-225	S3-S4-S5: 4AWG - 300kcmil	150	S3-150	S3-S4: 2AWG - 4/0	(2) 4AWG - 500kcmil
085C	600	S6-600	S6: (2) 250kcmil - 500kcmil	400	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	400	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	250	S4-250	S4: 6AWG - 350kcmil	(2) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	200	S3-225	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
	200	S3-225	S3-S4-S5: 4AWG - 300kcmil	175	S3-175	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
090C	600	S6-600	S6: (2) 250kcmil - 500kcmil	500	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	450	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	300	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	225	S3-225	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	200	S3-225	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
100C	600	S6-600	S6: (2) 250kcmil - 500kcmil	500	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	500	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	300	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	250	S4-250	S4: 6AWG - 350kcmil	(2) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	225	S3-225	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
110C	600	S6-600	S6: (2) 250kcmil - 500kcmil	500	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	500	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	350	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	250	S4-250	S4: 6AWG - 350kcmil	(2) 4AWG - 500kcmil
	250	S4-250	S4: 6AWG - 350kcmil	225	S3-225	S3-S4-S5: 4AWG - 300kcmil	(2) 4AWG - 500kcmil
130C	800	S6-800	S6: (3) 2/0 - 400kcmil	600	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	800	S6-800	S6: (3) 2/0 - 400kcmil	600	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	350	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	300	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	250	S4-250	S4: 6AWG - 350kcmil	(2) 4AWG - 500kcmil
145C	800	S6-800	S6: (3) 2/0 - 400kcmil	700	S6-800	S6: (3) 2/0 - 400kcmil	(4) 4AWG - 500kcmil
	800	S6-800	S6: (3) 2/0 - 400kcmil	700	S6-800	S6: (3) 2/0 - 400kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	400	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	350	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	300	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil
160C	800	S6-800	S6: (3) 2/0 - 400kcmil	700	S6-800	S6: (3) 2/0 - 400kcmil	(4) 4AWG - 500kcmil
	800	S6-800	S6: (3) 2/0 - 400kcmil	700	S6-800	S6: (3) 2/0 - 400kcmil	(4) 4AWG - 500kcmil
	600	S6-600	S6: (2) 250kcmil - 500kcmil	450	S6-600	S6: (2) 250kcmil - 500kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	350	S5-400	S5: (2) 3/0 - 250kcmil	(4) 4AWG - 500kcmil
	400	S5-400	S5: (2) 3/0 - 250kcmil	300	S5-400	S5: (2) 3/0 - 250kcmil	(2) 4AWG - 500kcmil

Electrical 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 N.E.C. 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 amps; -28, add 2.3 amps; -40, add 1.5 amps, -46, add 1.3 amps; -58, add 1 amps.
2. The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per N.E.C. 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 95ºF (35ºC) 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 N.E.C. 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 N.E.C. Table 250-95. A control circuit grounding lug is also supplied.
8. The supplied disconnect is a “Disconnecting Means” as defined in the N.E.C. 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.

5

LEGEND		VOLTAGE CODE
ACR-LINE	ACROSS THE LINE START	-17 = 200-3-60
C.B.	CIRCUIT BREAKER	-28 = 230-3-60
D.E.	DUAL ELEMENT FUSE	-40 = 380-3-60
DISC SW	DISCONNECT SWITCH	-46 = 460-3-60
FACT MOUNT CB	FACTORY MOUNTED CIRCUIT BREAKER	-58 = 575-3-60
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 SWITCH)	
LRA	LOCKED ROTOR AMPS	

Electrical notes and legend

DESIGNATION	DESCRIPTION
ACC	Accessory
- ADIS	Display Board
- AMB	Micro Board
- BAMB	Ambient
- BDAT	Discharge Air Temperature
- BDP	Discharge Pressure
- BECT	Entring Chilled Temperature
- BLCT	Leaving Chilled Temperature Not Fitted On Remote Evap Units
-BMP	Motor Protector Compressor
- BSP	Suction Pressure
- CPF	Capacitor Power Factor
- ECH	Crankcase Heater
- EEH	Evaporator Heater
- EHRH	Heat Recovery Heater
- EPH	Pump 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
- 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)
- KT	Relay Timer
- M	Compressor Motor
- MF	Motor Fan

DESIGNATION	DESCRIPTION
- 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
- SKP	Keypad
- SOA	Switch Off Auto
- SZT	Zone Thermostat
- T	Transformer
- TC	Transformer Current
- UBR	Brigde Recfifier
- WHT	White
- XP	Plugs Between Pow./Micro. Section
- XTBC	Terminal Block Customer
- XTBF	Terminal Block Factory
- 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
(NB)	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

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Electrical notes and legend (Continued)

	GENERAL
a.	This drawing is based on IEC symbols.
b.	Field wiring to be in accordance with the relevant electrical code as well as all other applicable codes and specifications.
c.	All sources of supply shown on this diagram to 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 should be used for interlock control wiring supplied by external source.
e.	Legend designation depicts component abbreviations. Number prefix located, if applicable, on schematic circuit, refers to system thereon, E.G. = 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 120 volts. The customer must take particular care when deriving the supplies for the voltage free terminals with regard to a common point of isolation. Thus, these circuits when used must be fed via 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 100va. 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 30V 5ma.
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 should 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 Input) i.e. 120 is wire # and 14.3 refers to sht. 14 column 3
A	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 and 135. 2-BMP3 is replaced by a link across terminals 234 and 235.
3	When not fitted 1-FHP2 is replaced by a link across terminals 132 and 139. 2-FHP2 is replaced by a link across terminals 232 and 239.
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 L 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 and 133, 133 and 134 and 134 and 135 are linked. For system 2 terminals 232 and 233, 233 and 234 and 234 and 235 are linked.
12	Only fitted on systems with 3 or 4 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 and individual system circuit breaker option replaces input terminal block.
18	115V control circuit requires a 115V supply unless control circuit transformer -T2 and -F3 are fitted (standard on CE units).

Electrical notes and legend (continued)

	GENERAL
19	For optional hydro kit. Heater -EPH is fitted and wired as shown. On single pump -KP1, -QMMSP1 and -MP1 are fitted and wired as shown. On two pump hydro kits -KP2, -QMMSP2 and -MP2 are also fitted and wired as shown.
20	Current measurement option wired as show.
21	Only fitted on systems with single speed fans.
22	Only fitted on systems with two speed fans.
23	Optional compressor manual motors starters (standard on CE units).
24	See sheet 3 of connection diagram for power input options.
25	Alternate connections shown for different two speed motor types.
26	Only fitted on systems with a maximum of 4 fans.
27	220/230V units require a separate fuse for units w/4 or more fans per system.
28	Low ambient kit -FSC for fan -MF1 is only fitted on systems with less than 4 fans.
29	Only fitted on QCC3100.
30	Only fitted on QCC3090, 3100 and 0145.
31	Input dual point circuit breaker option replaces input terminal block.
32	Field installed on remote evaporator units.
33	Fitted on units with single phase motors only
34	Fitted on units with low ambient option only
35	Only fitted on units with an acoustic kit
36	Only fitted on heat recovery units
37	Only fitted on condensing units
38	Omitted on condensing units

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Wiring Diagrams

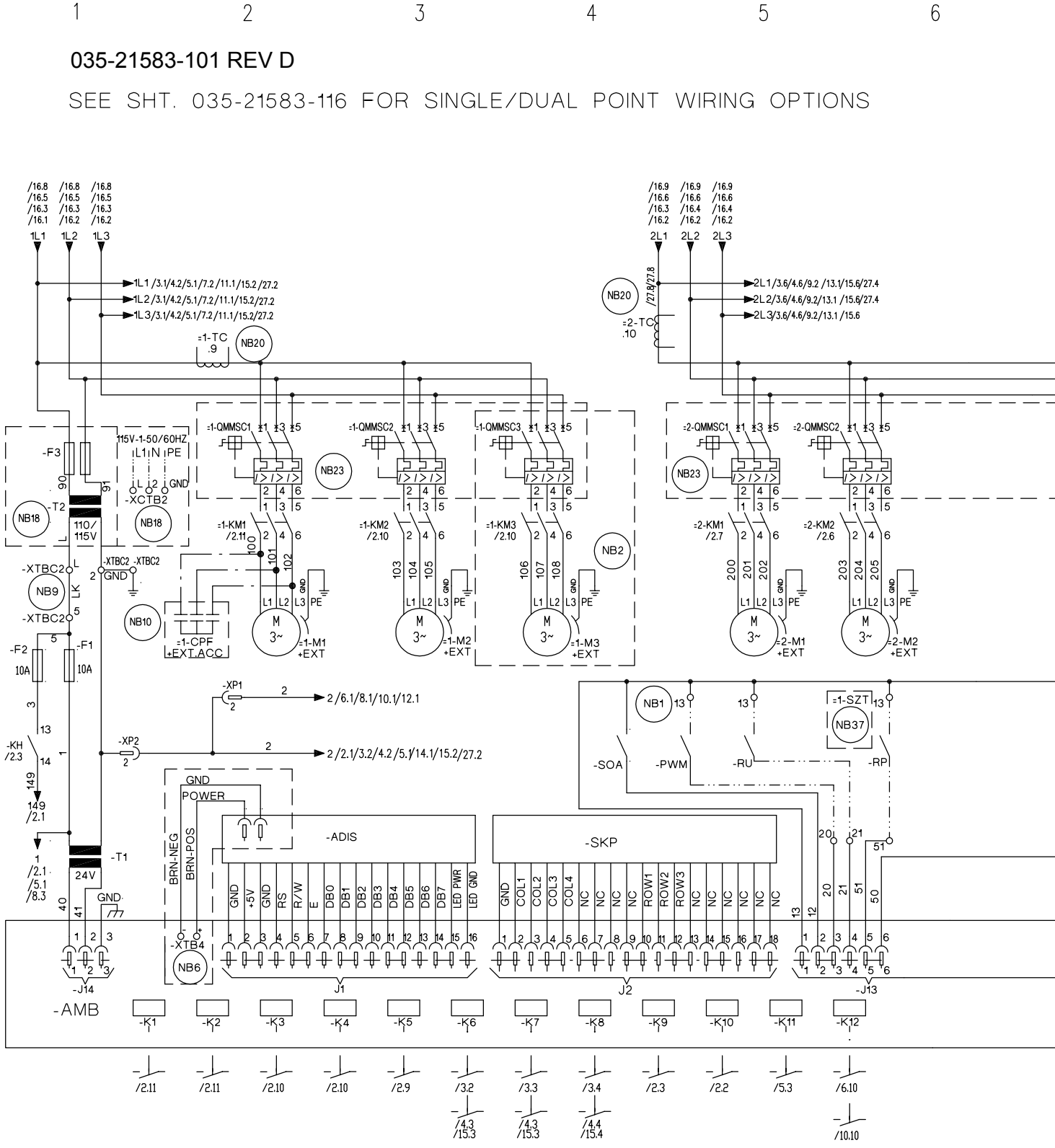

FIGURE 11 - ELEMENTARY WIRING DIAGRAM

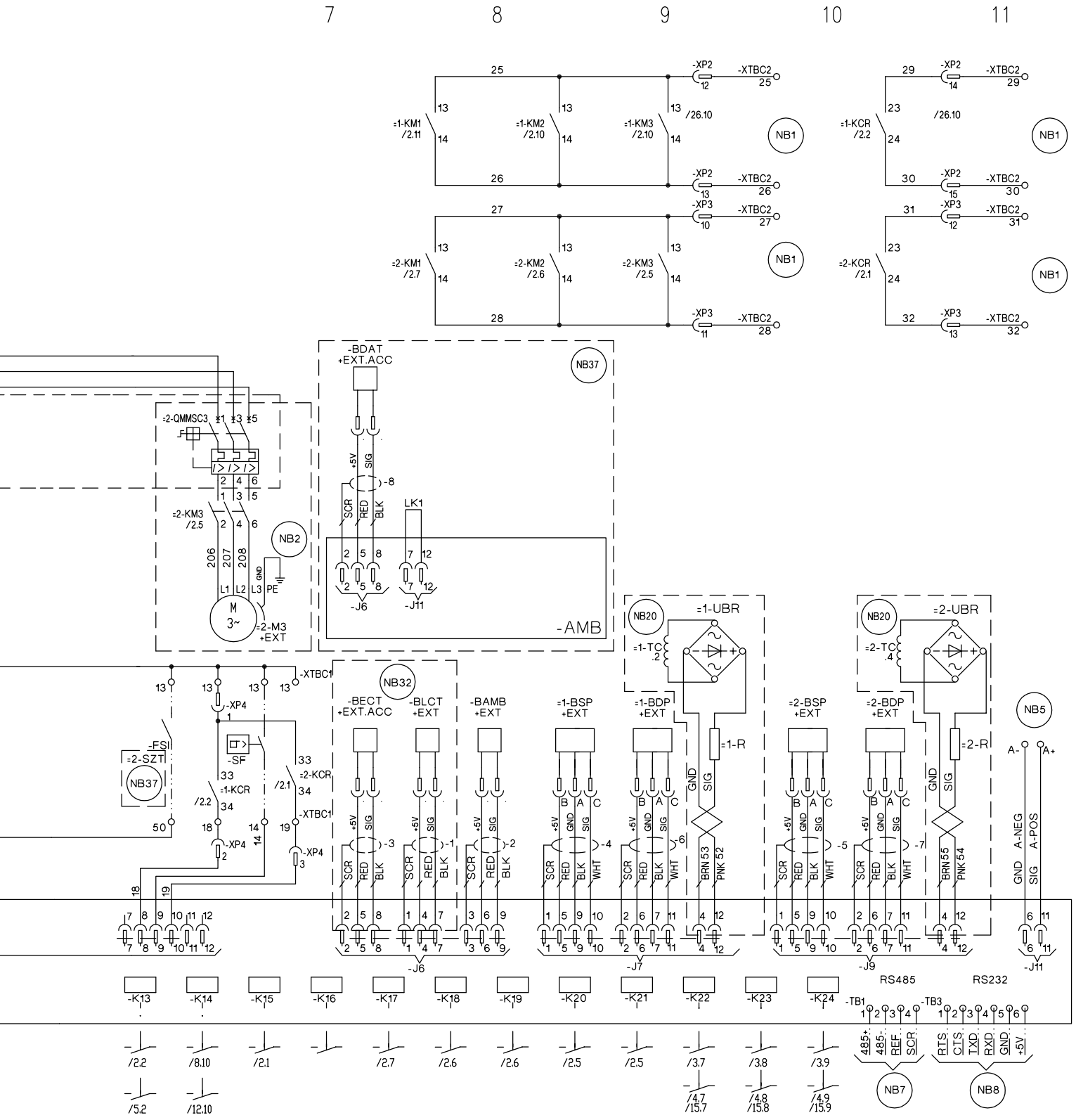

FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

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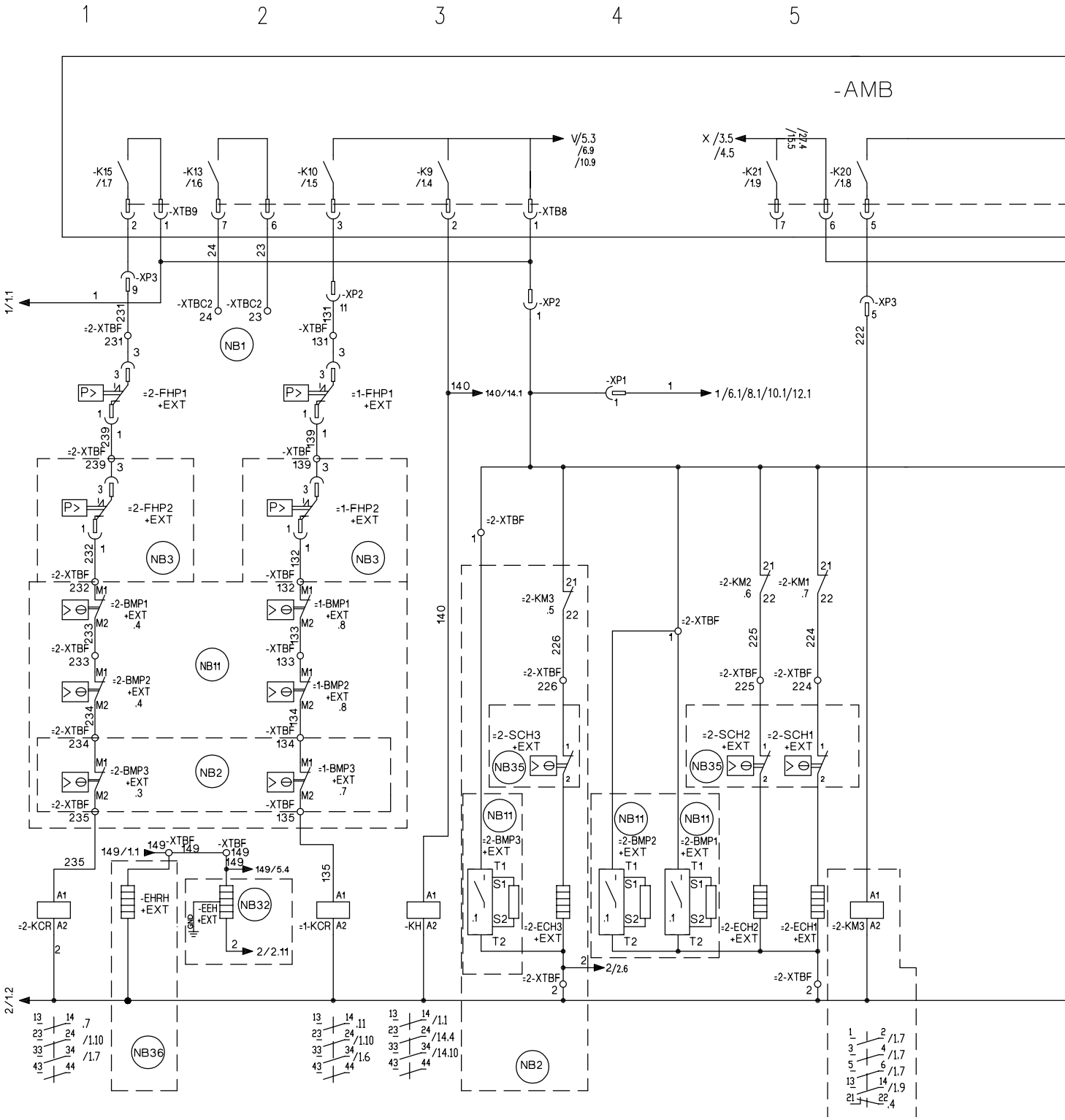

FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

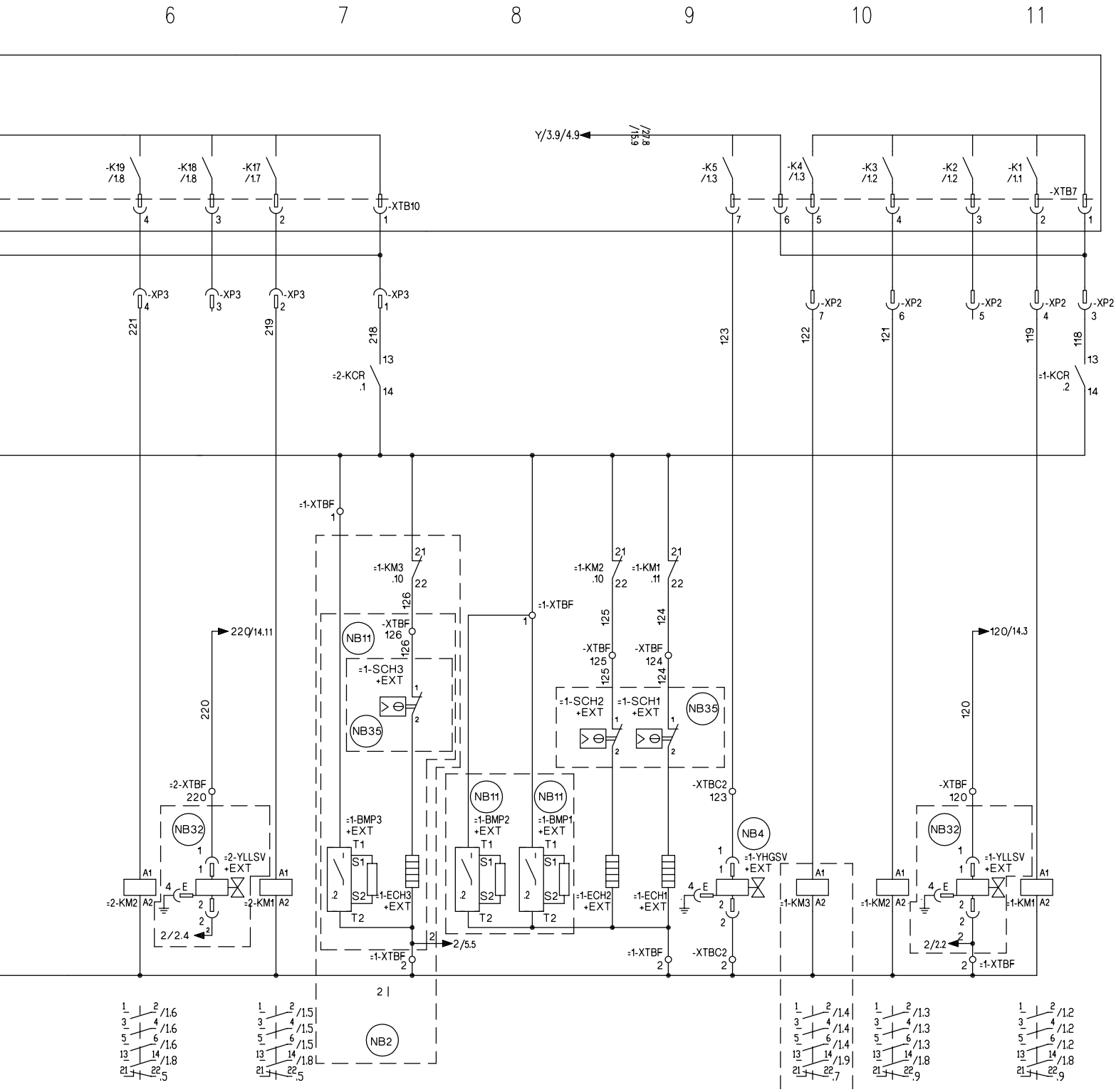

FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

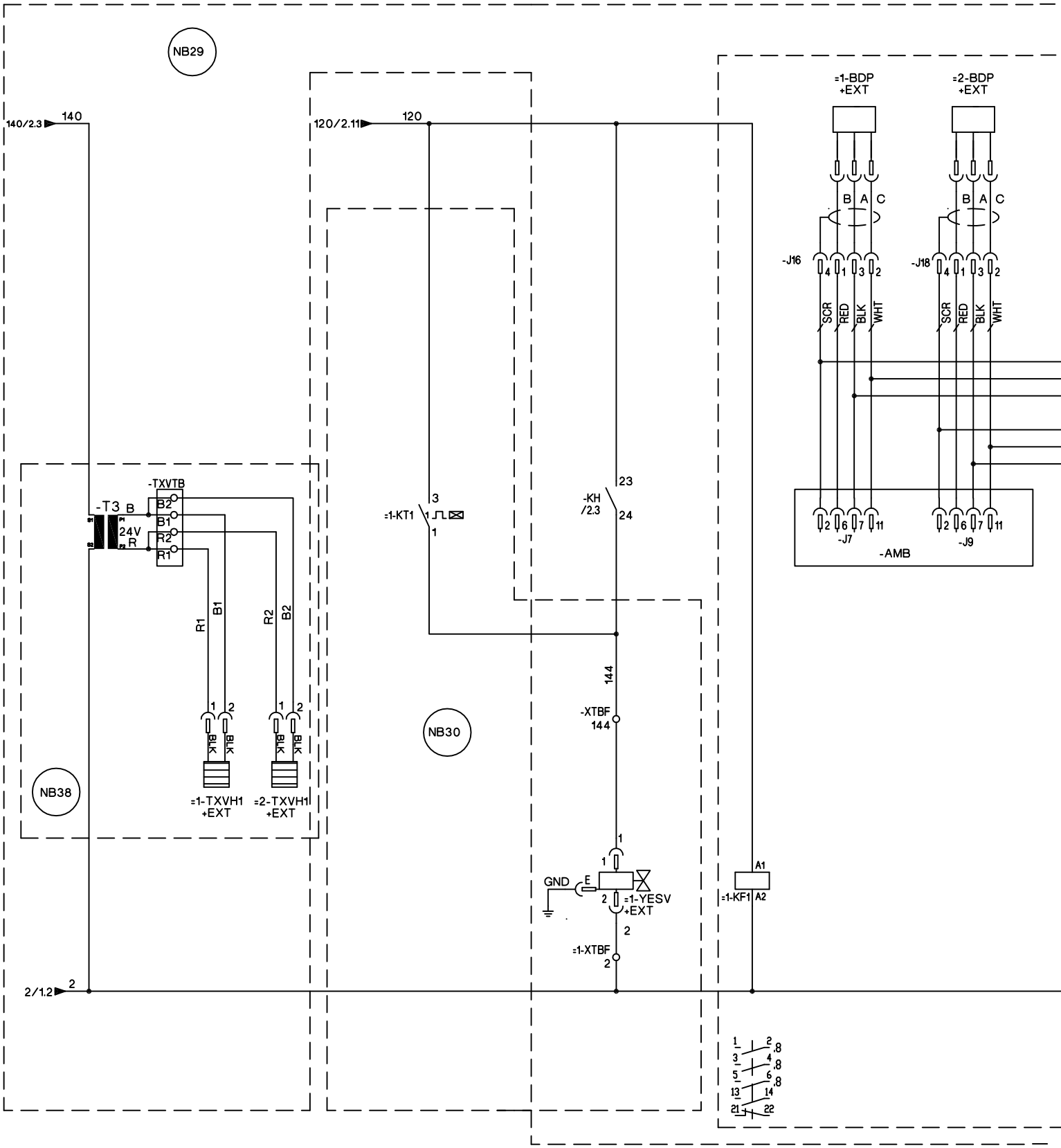

FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

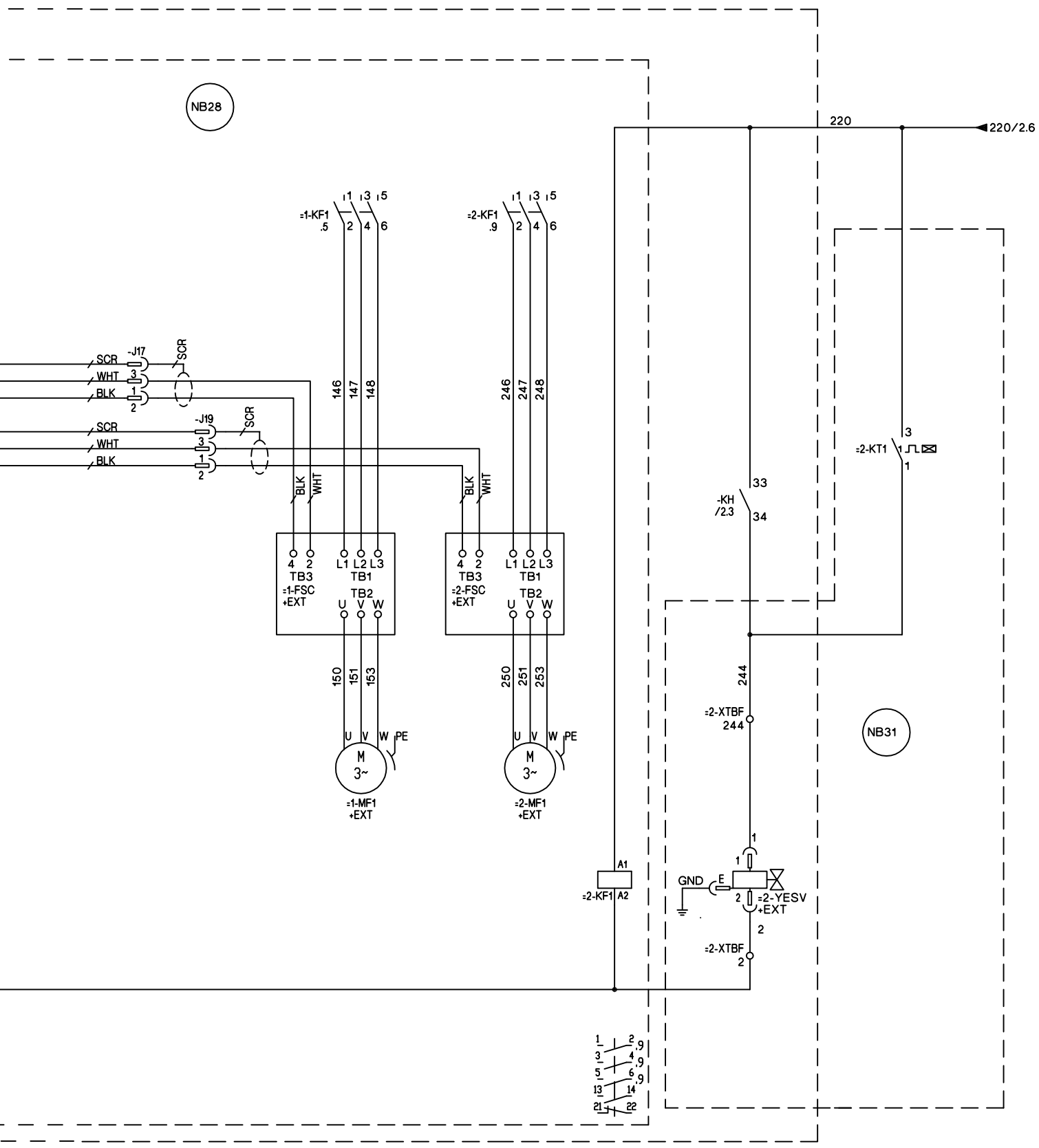

FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

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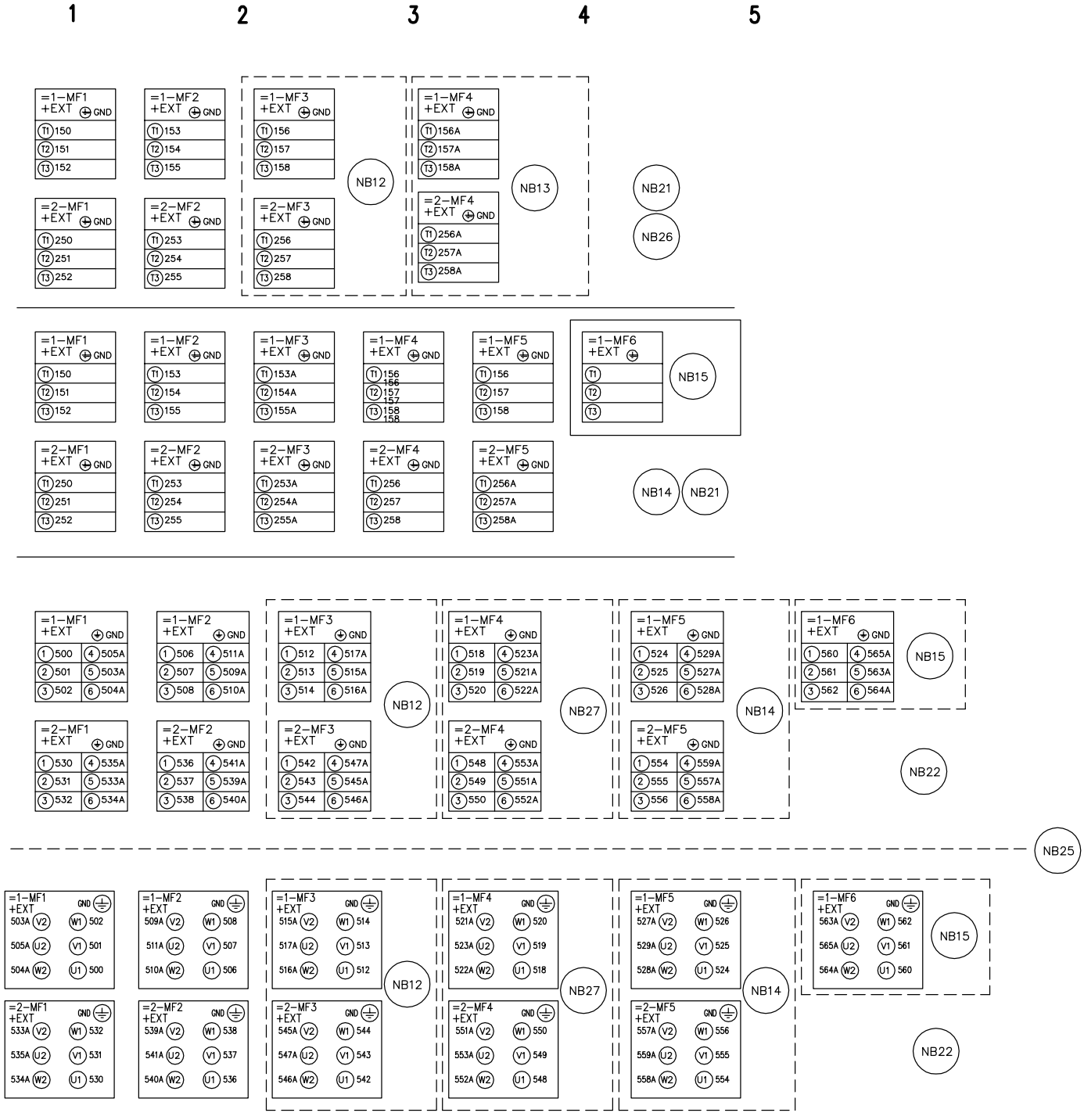


FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

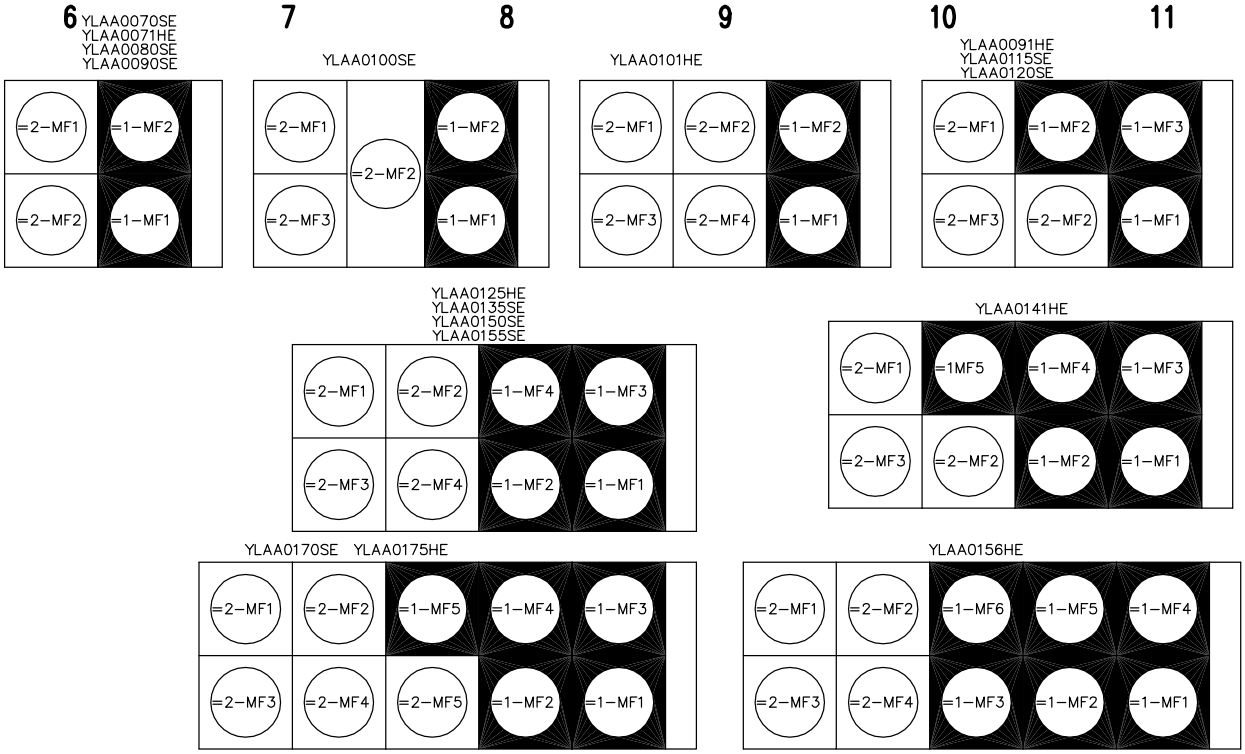


FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

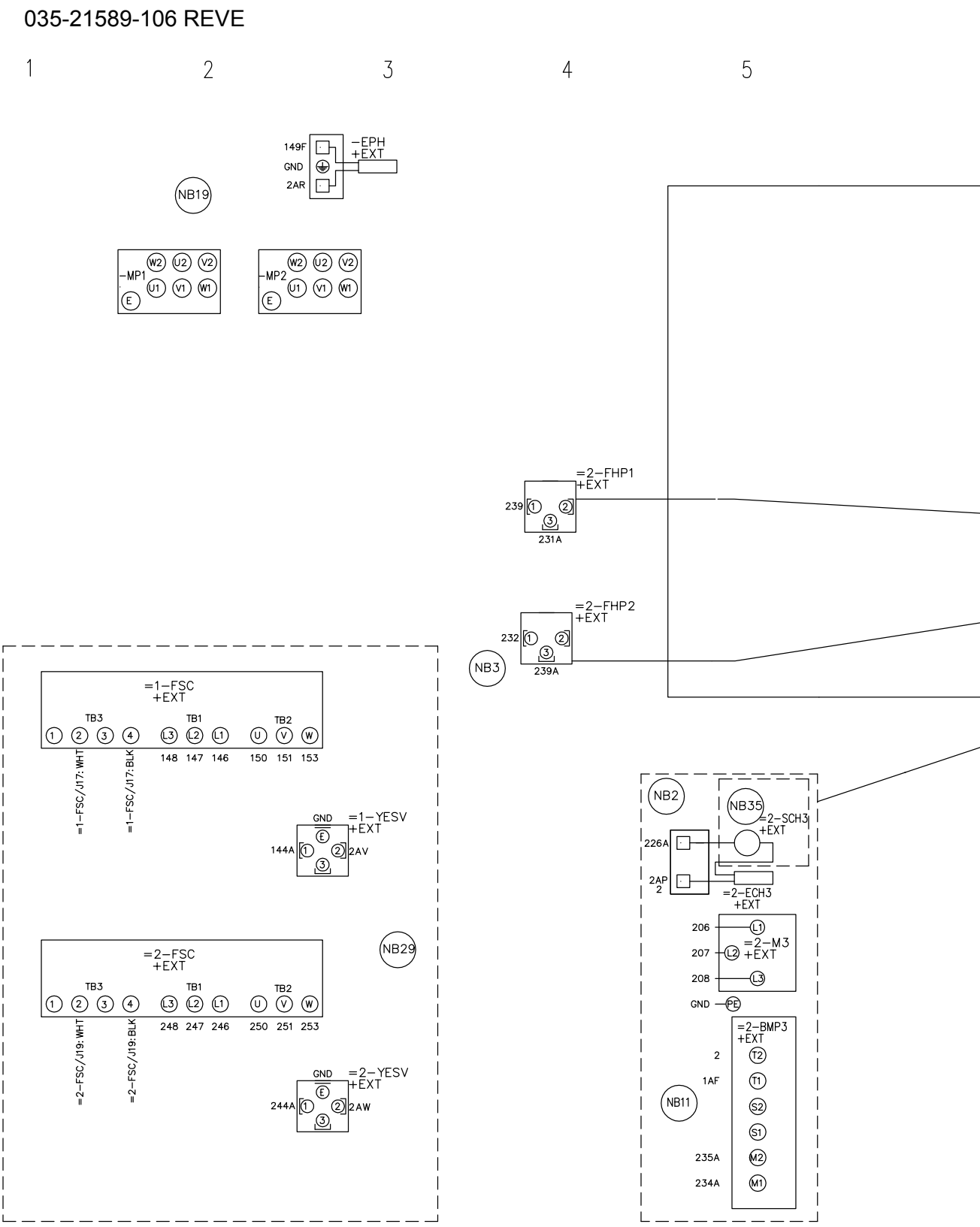


FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

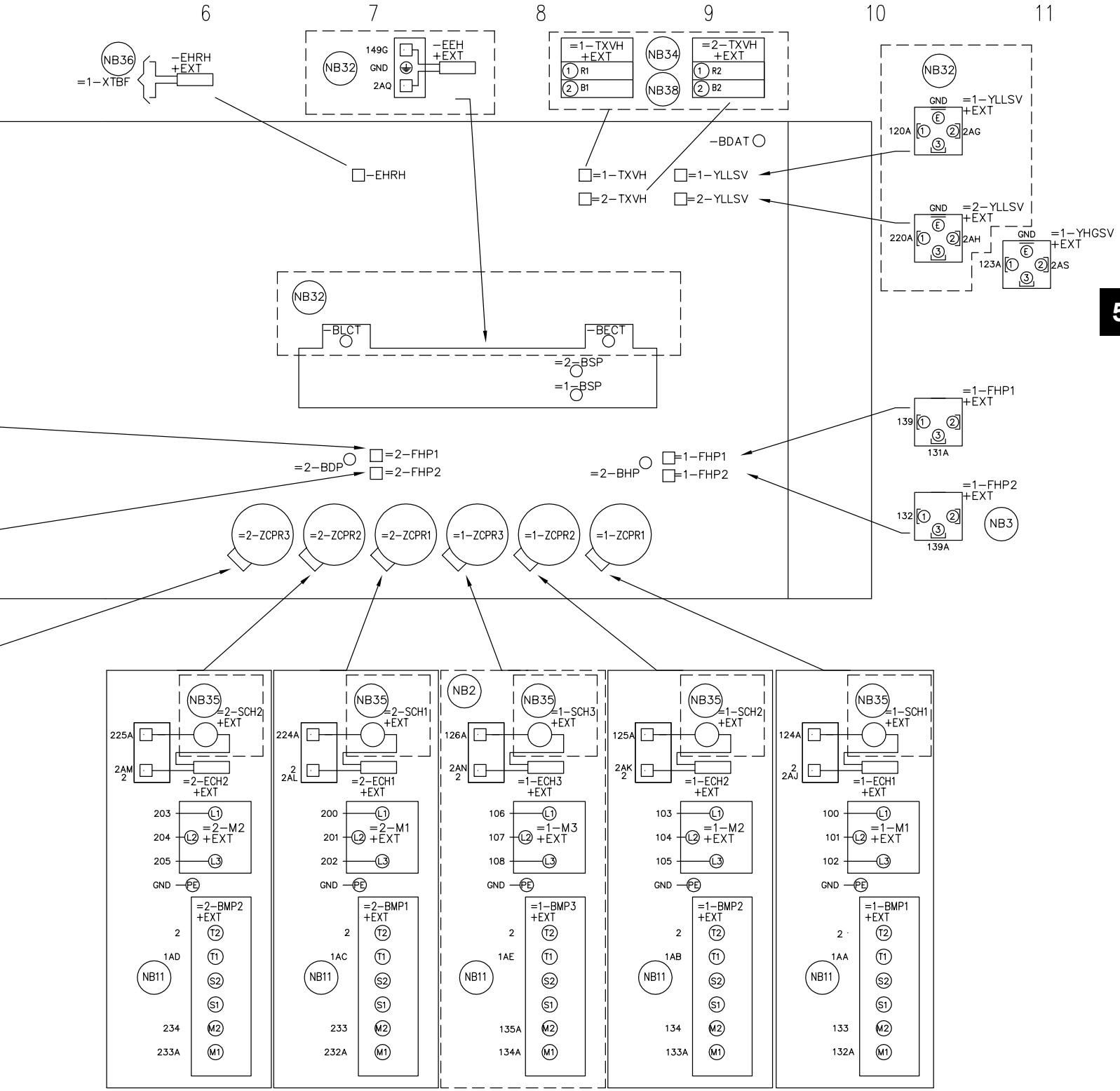


FIGURE 11 - ELEMENTARY WIRING DIAGRAM (CONT'D)

Power options connection diagram

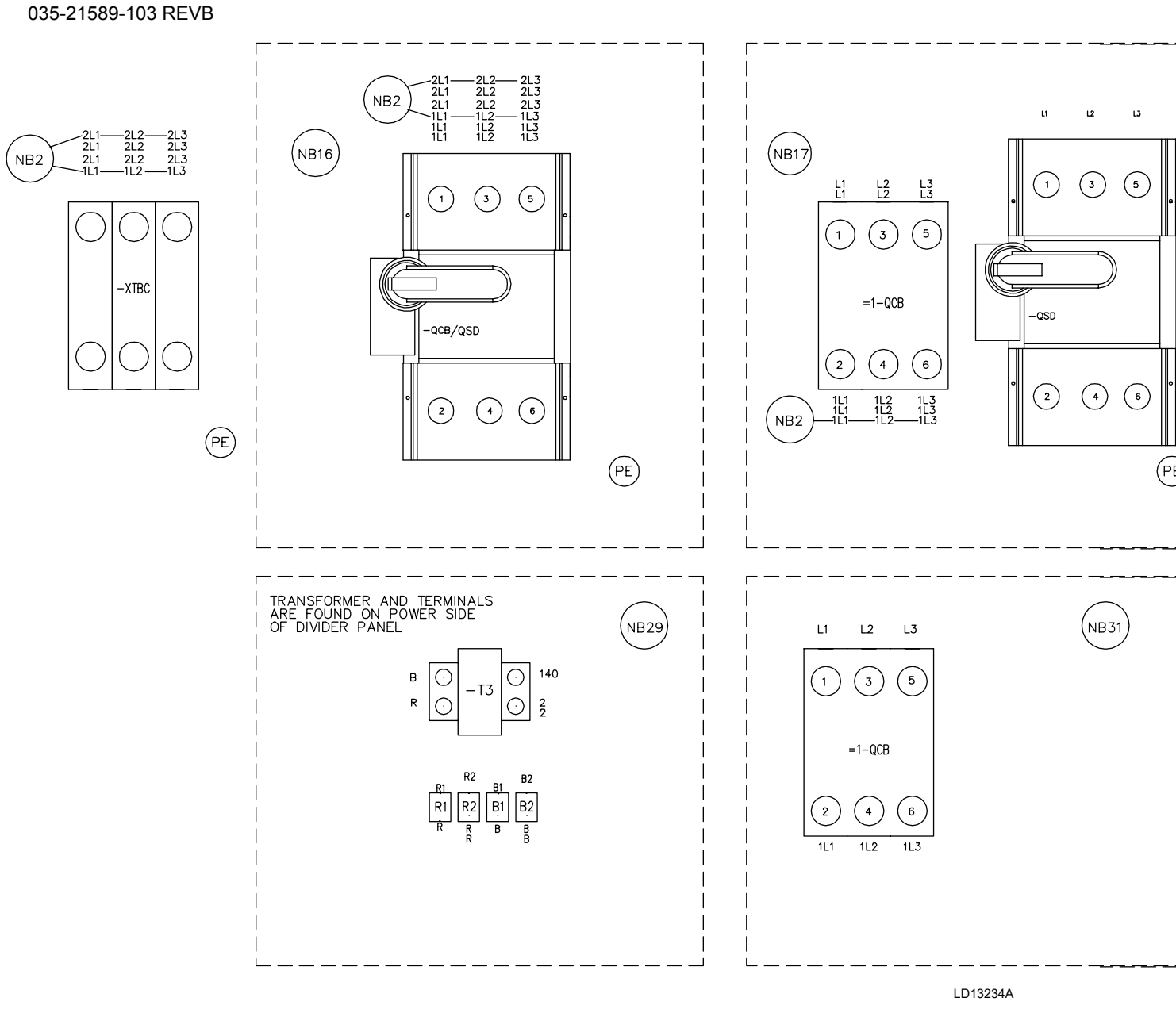
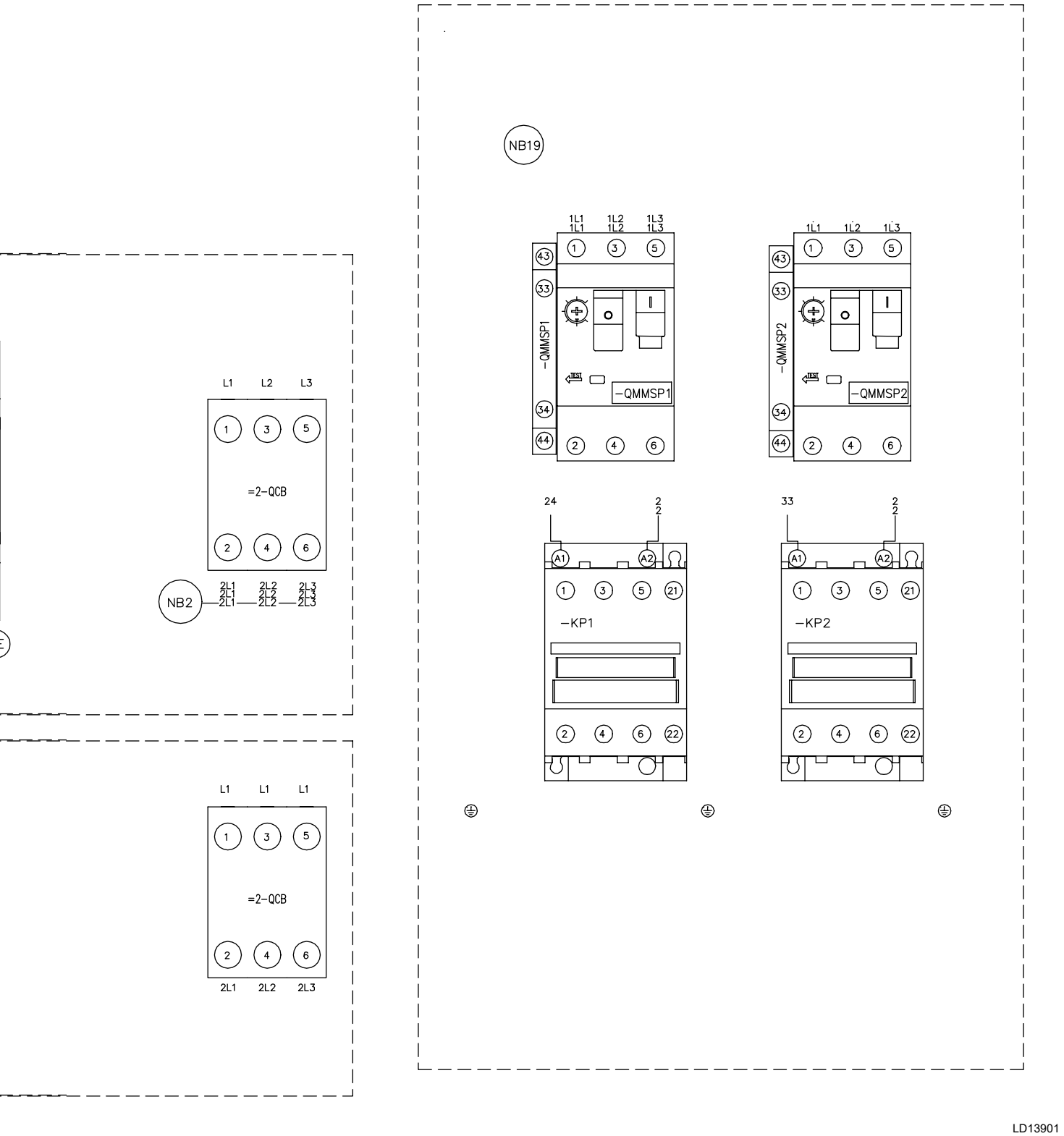


FIGURE 12 - POWER OPTIONS CONNECTION DIAGRAM



LD13901

FIGURE 12 - POWER OPTIONS CONNECTION DIAGRAM (CONT'D)

035-21589-101 REVC

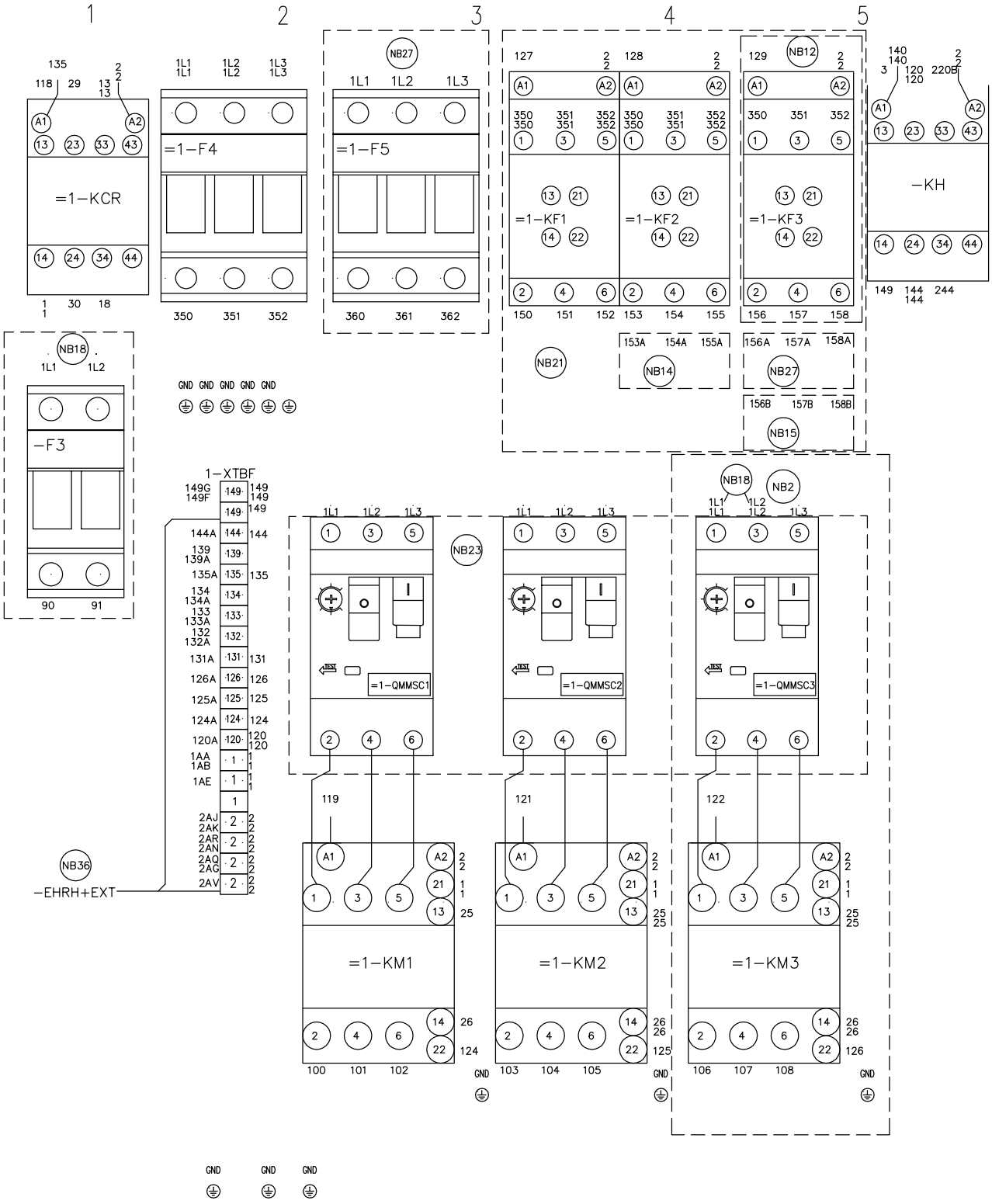


FIGURE 12 - POWER OPTIONS CONNECTION DIAGRAM (CONT'D)

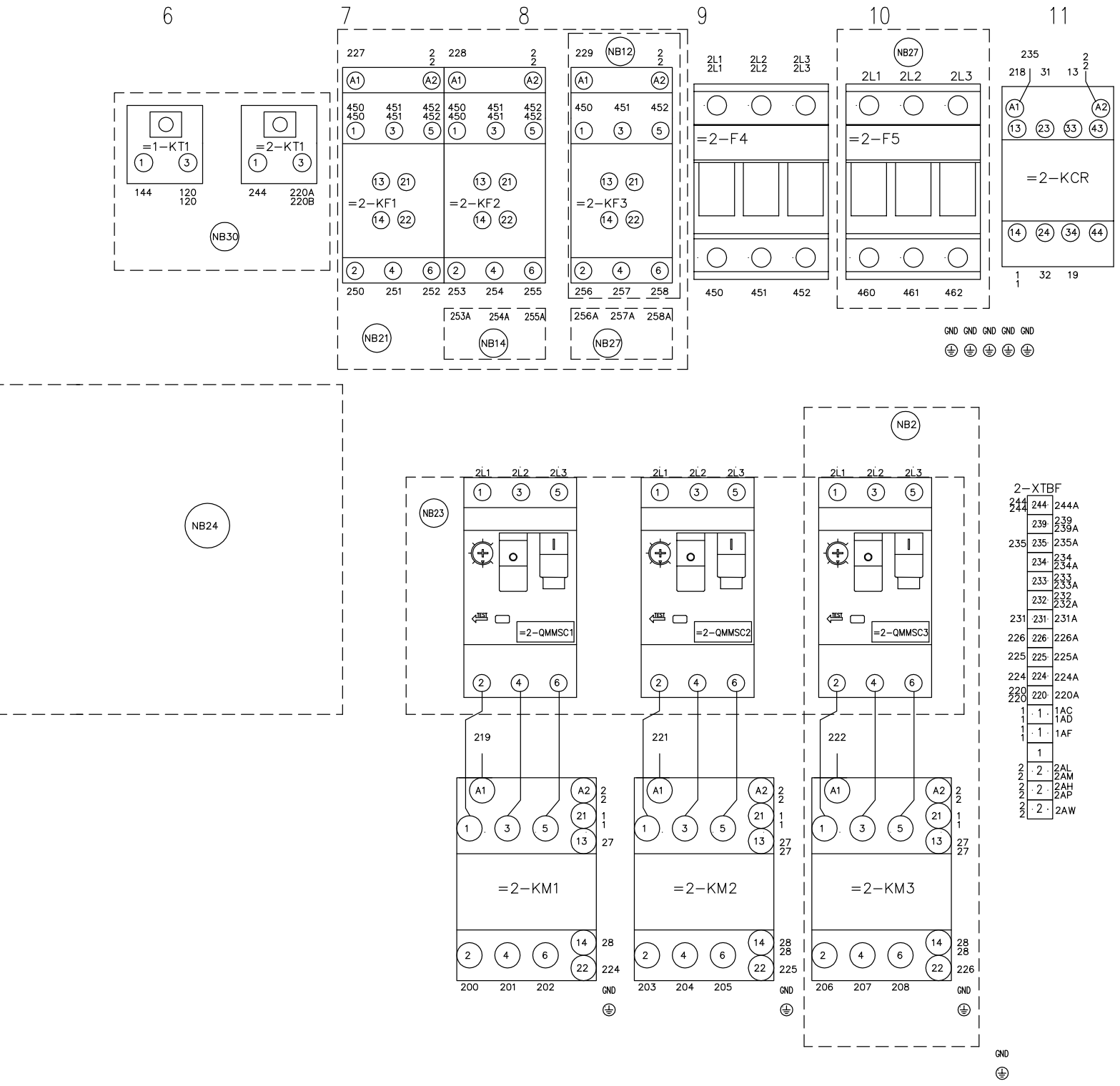
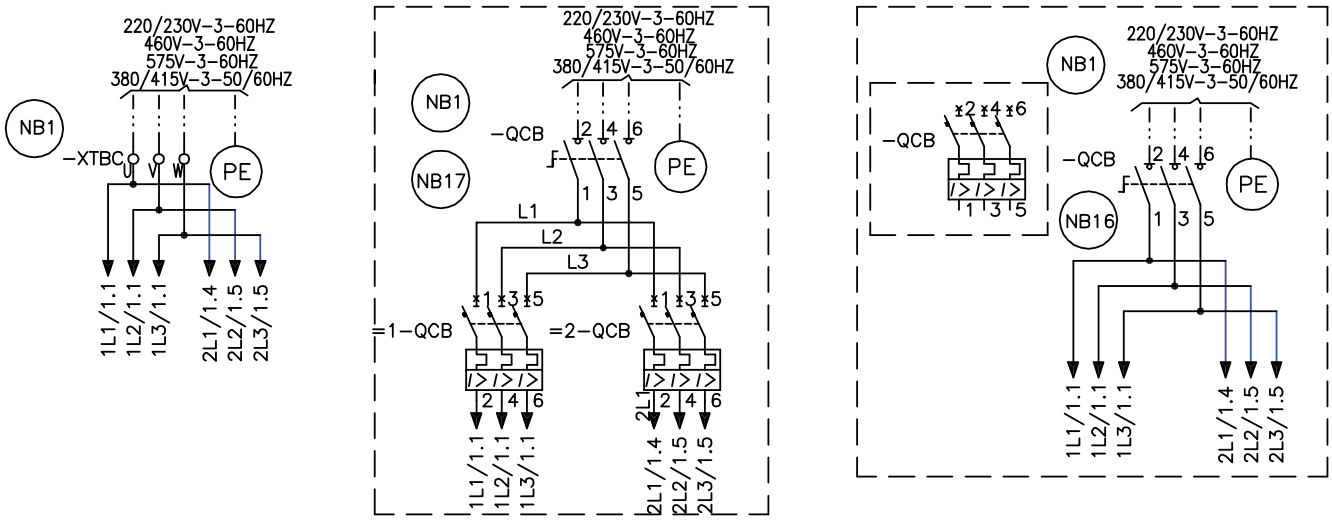
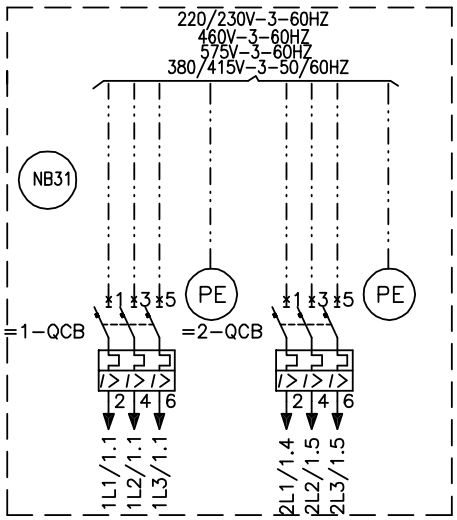


FIGURE 12 - POWER OPTIONS CONNECTION DIAGRAM (CONT'D)

035-21583-116_rev -



SINGLE POINT WIRING OPTIONS



DUAL POINT WIRING OPTION

FIGURE 13 - SINGLE POINT AND DUAL POINT WIRING

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Wiring

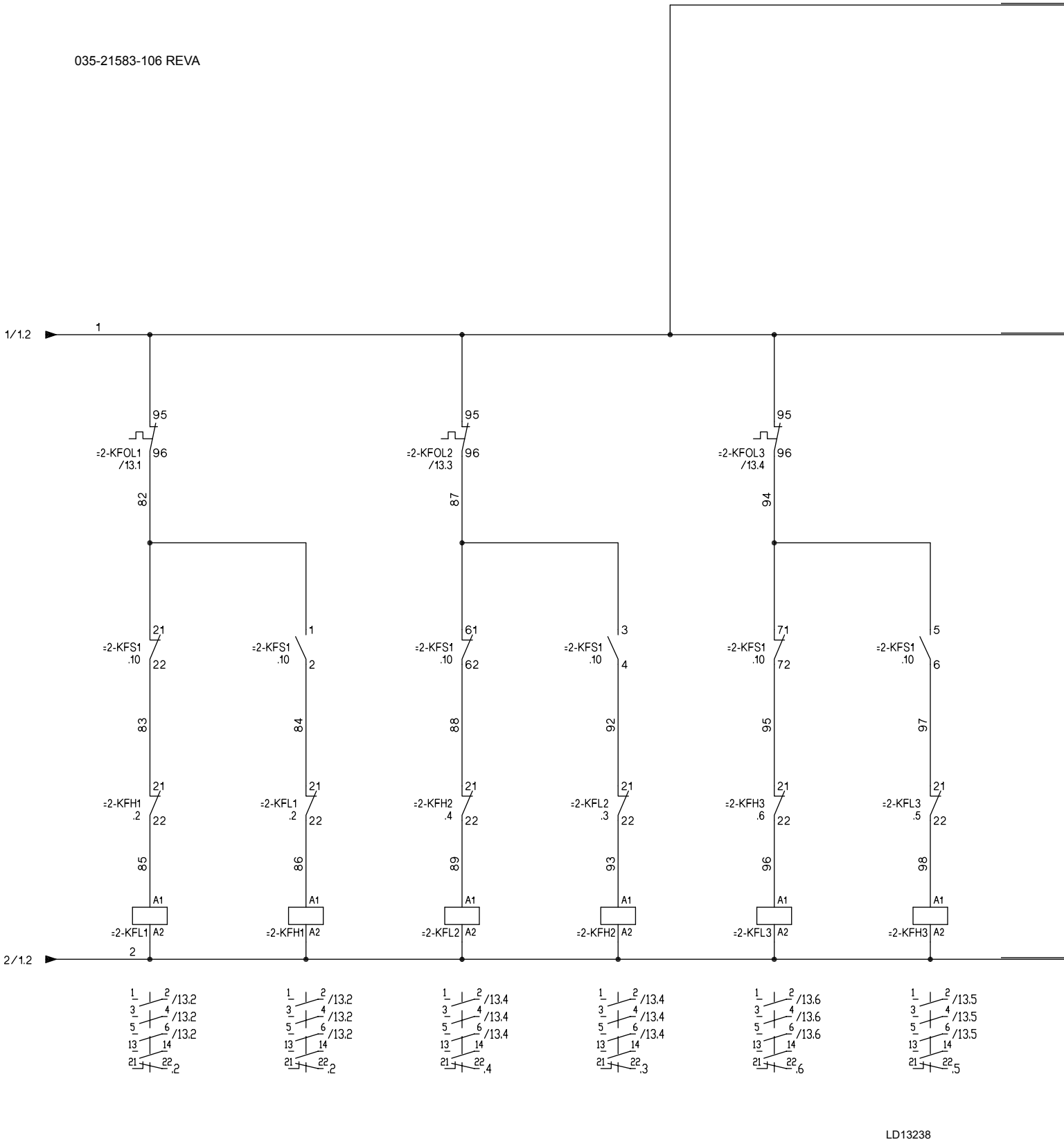
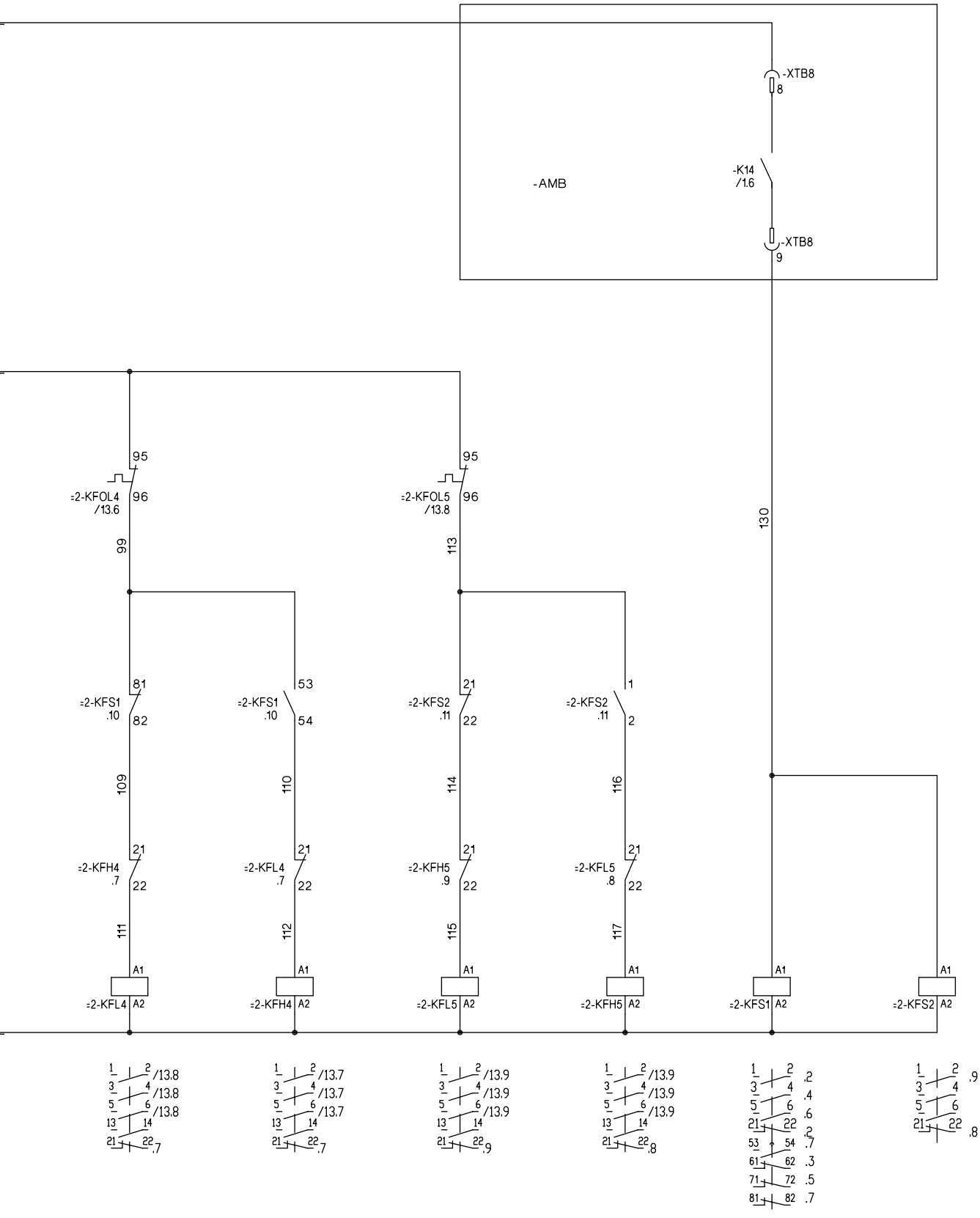


FIGURE 14 - WIRING



LD13239

FIGURE 14 - WIRING (CONT'D)

Micro panel connections

035-21589-102 REVD

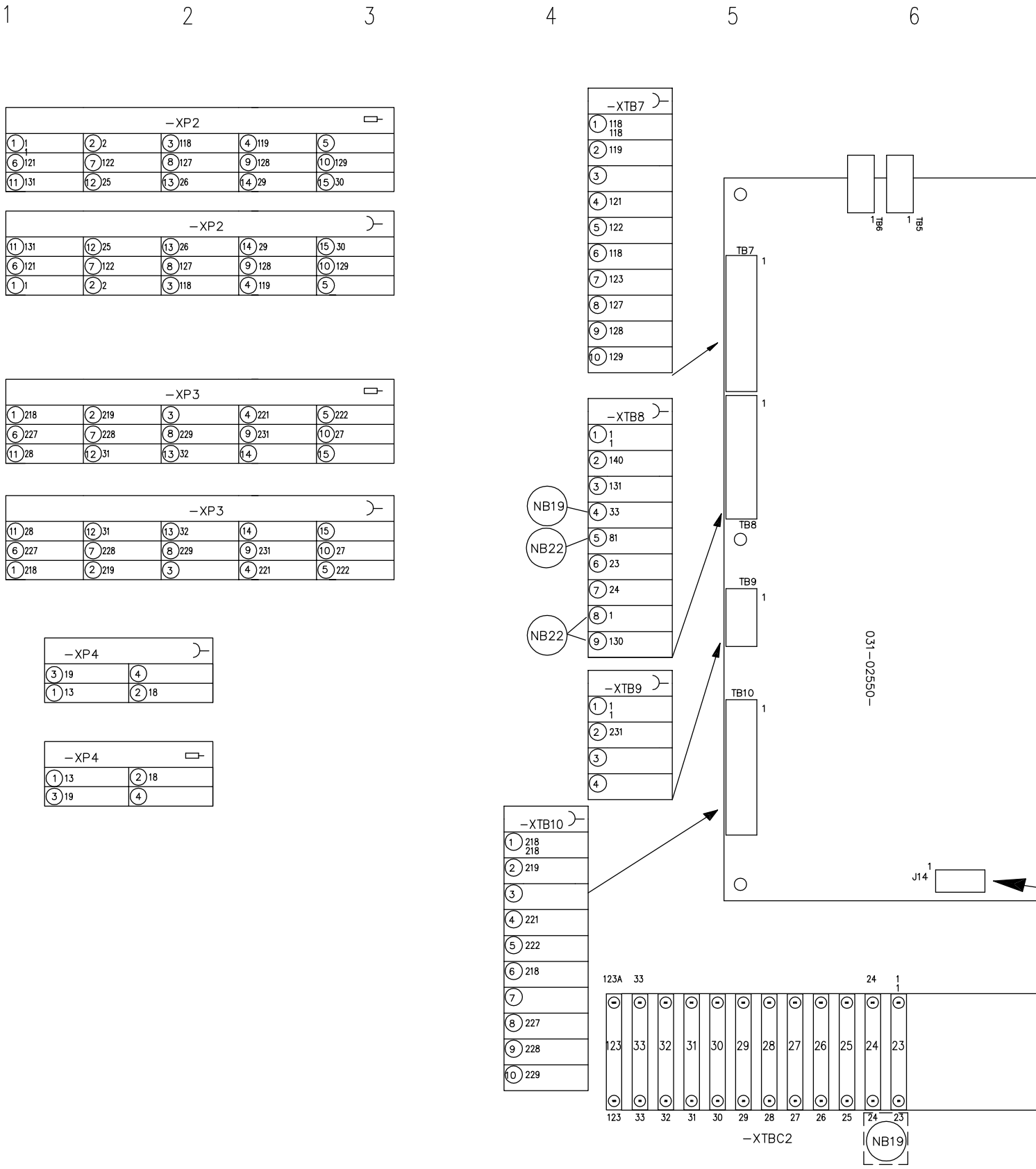


FIGURE 15 - MICRO PANEL CONNECTIONS

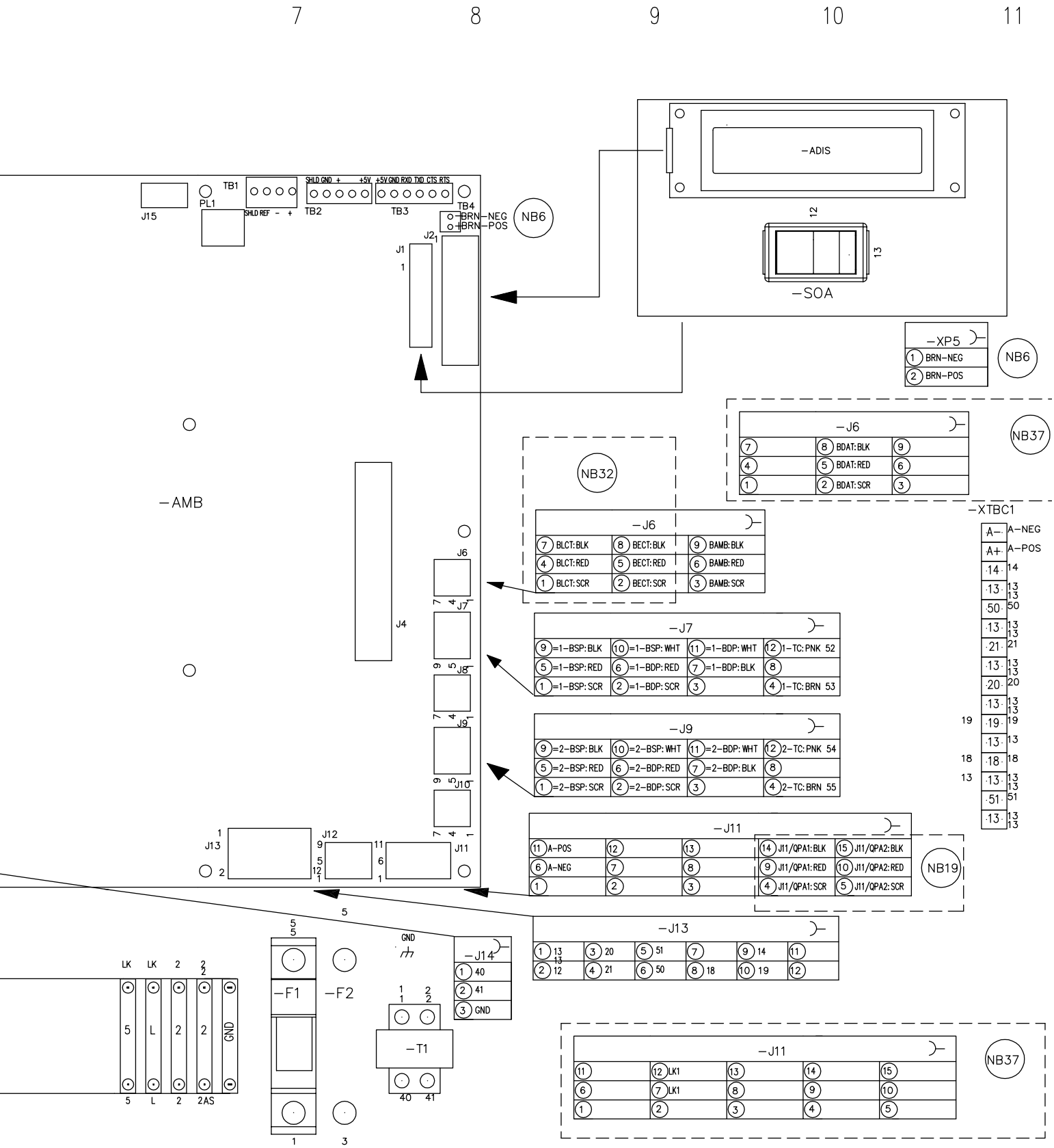


FIGURE 15 - MICRO PANEL CONNECTIONS (CONT'D)

035-21583-103 REV. B

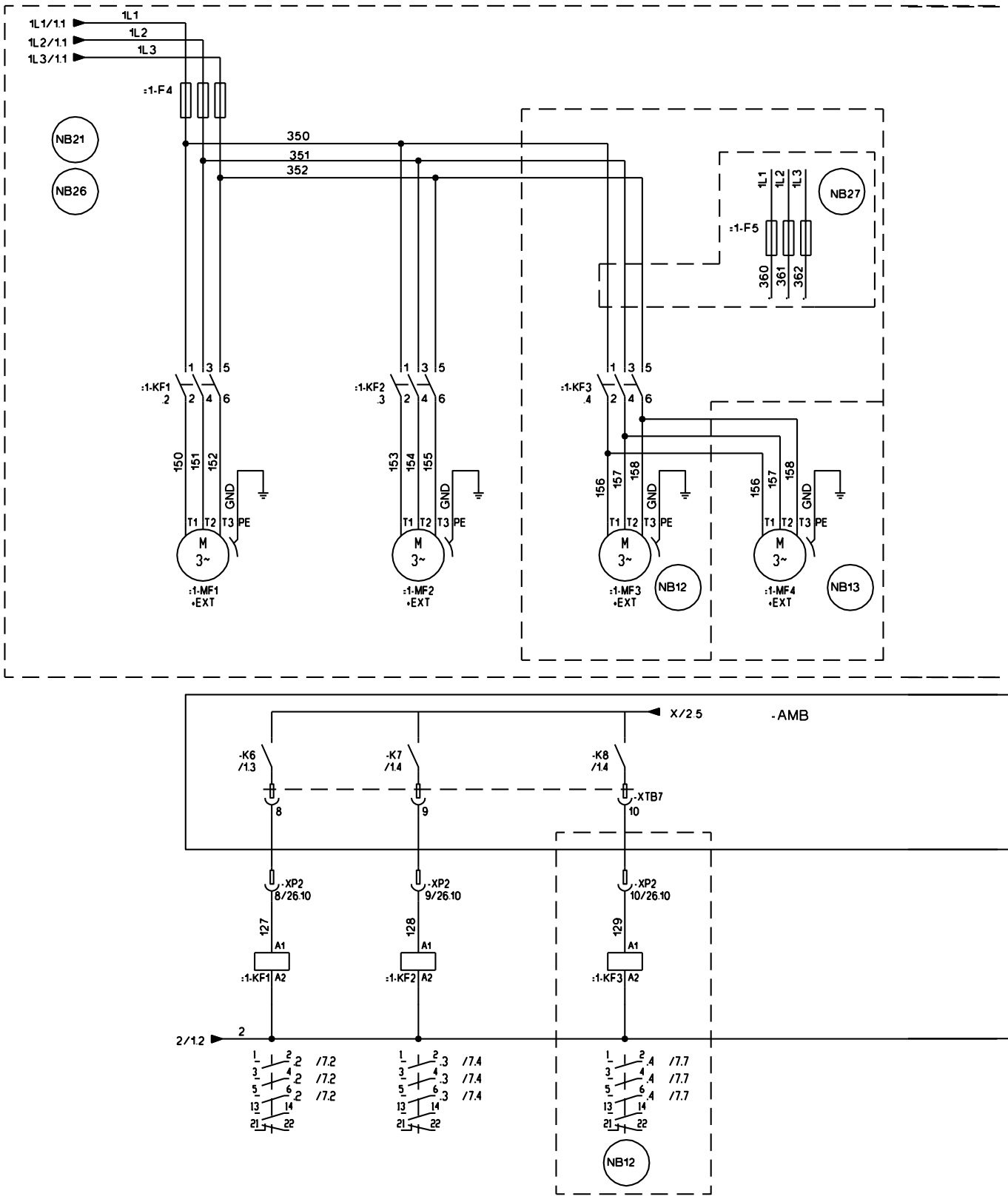
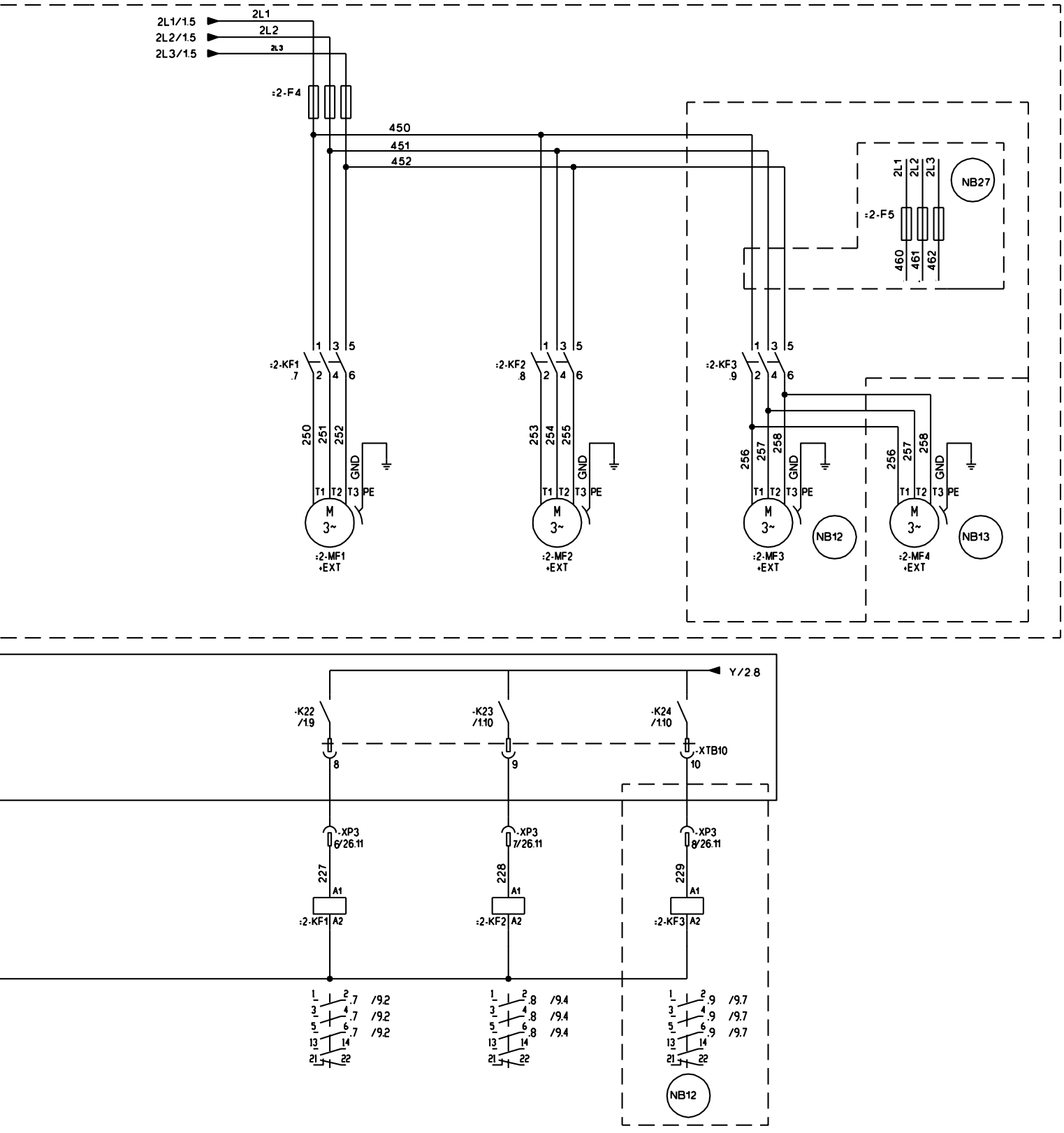


FIGURE 16 - ELEMENTARY DIAGRAM



LD13993A

FIGURE 16 - ELEMENTARY DIAGRAM (CONT'D)

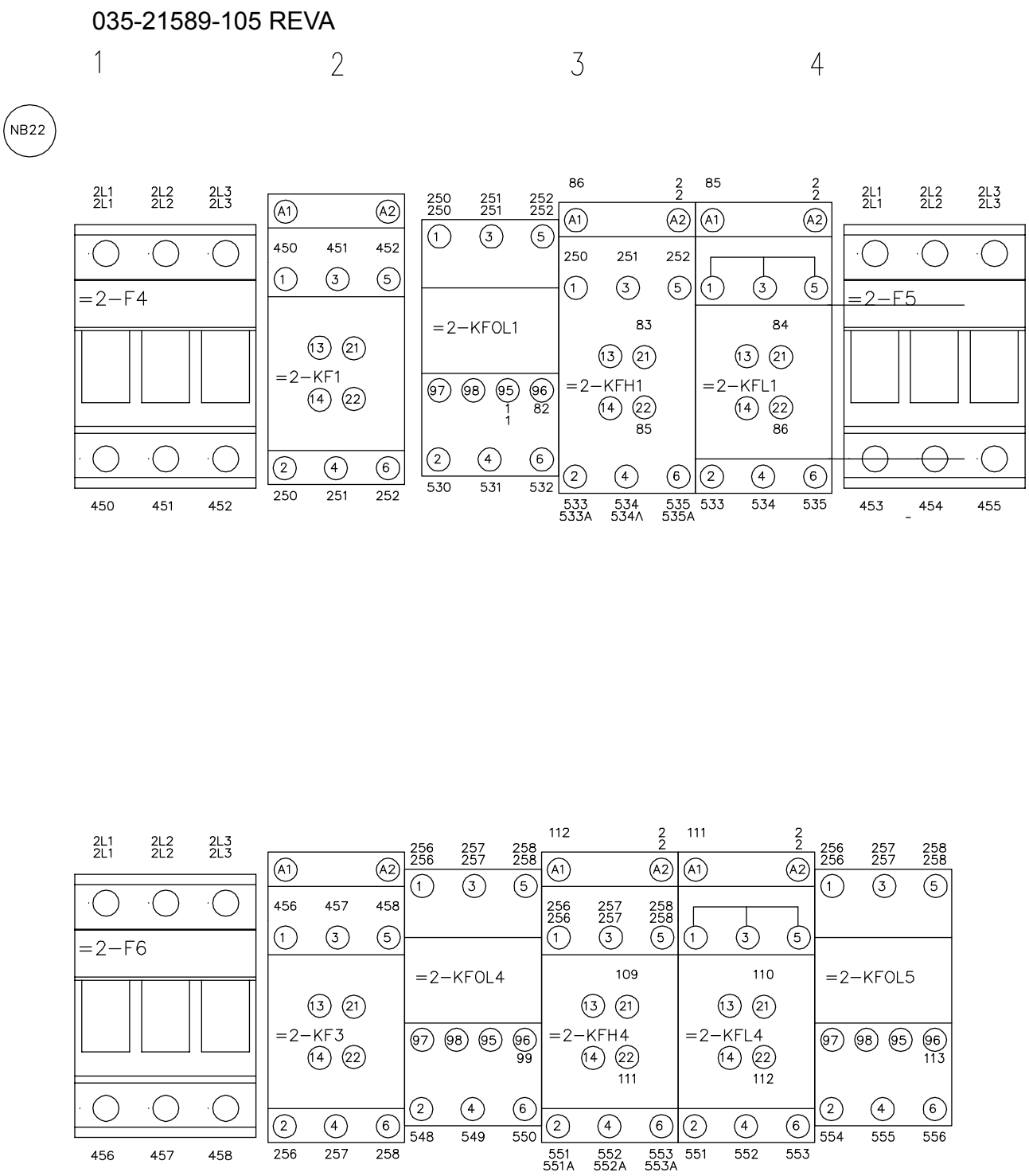


FIGURE 16 - ELEMENTARY DIAGRAM (CONT'D)

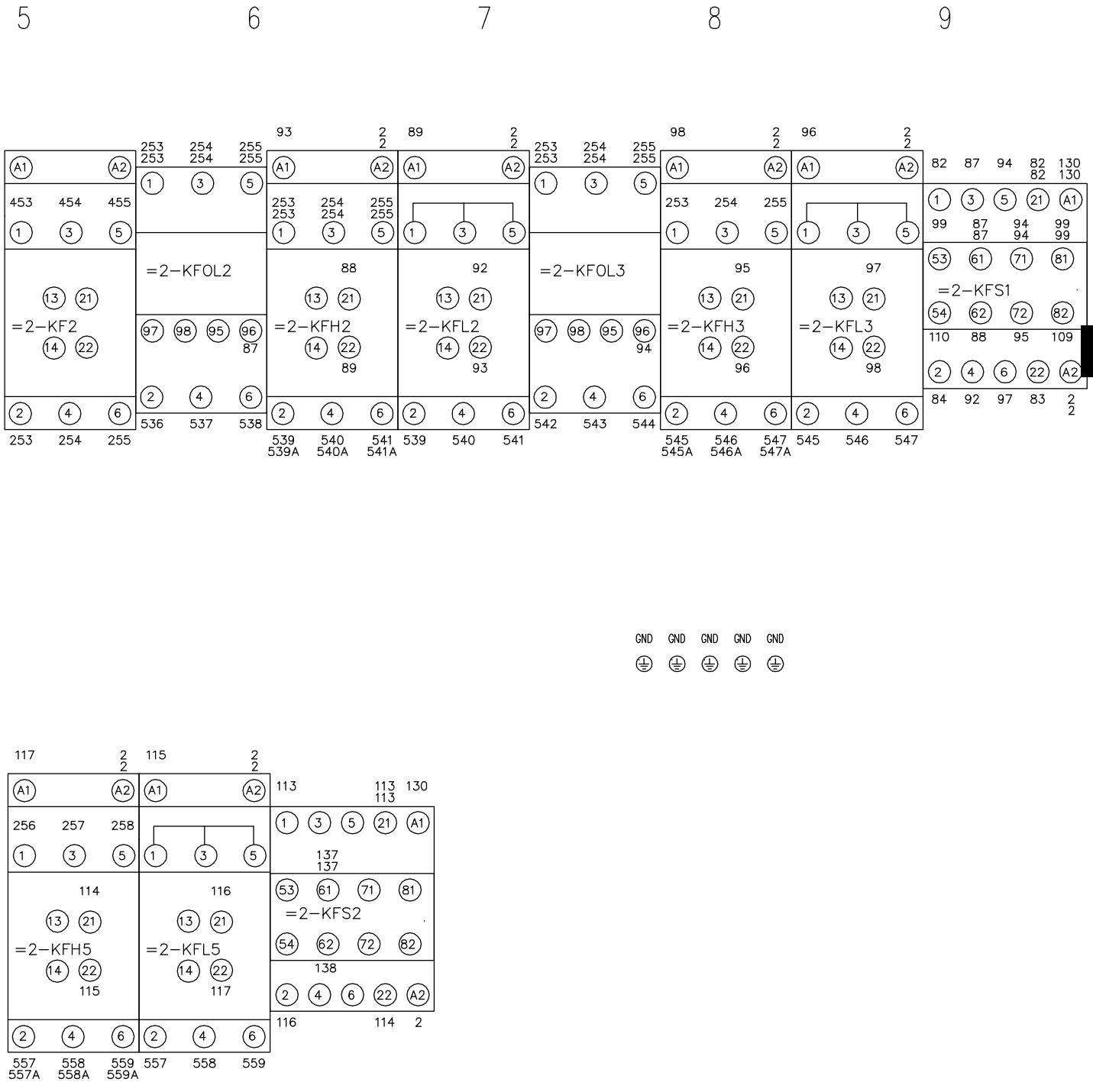
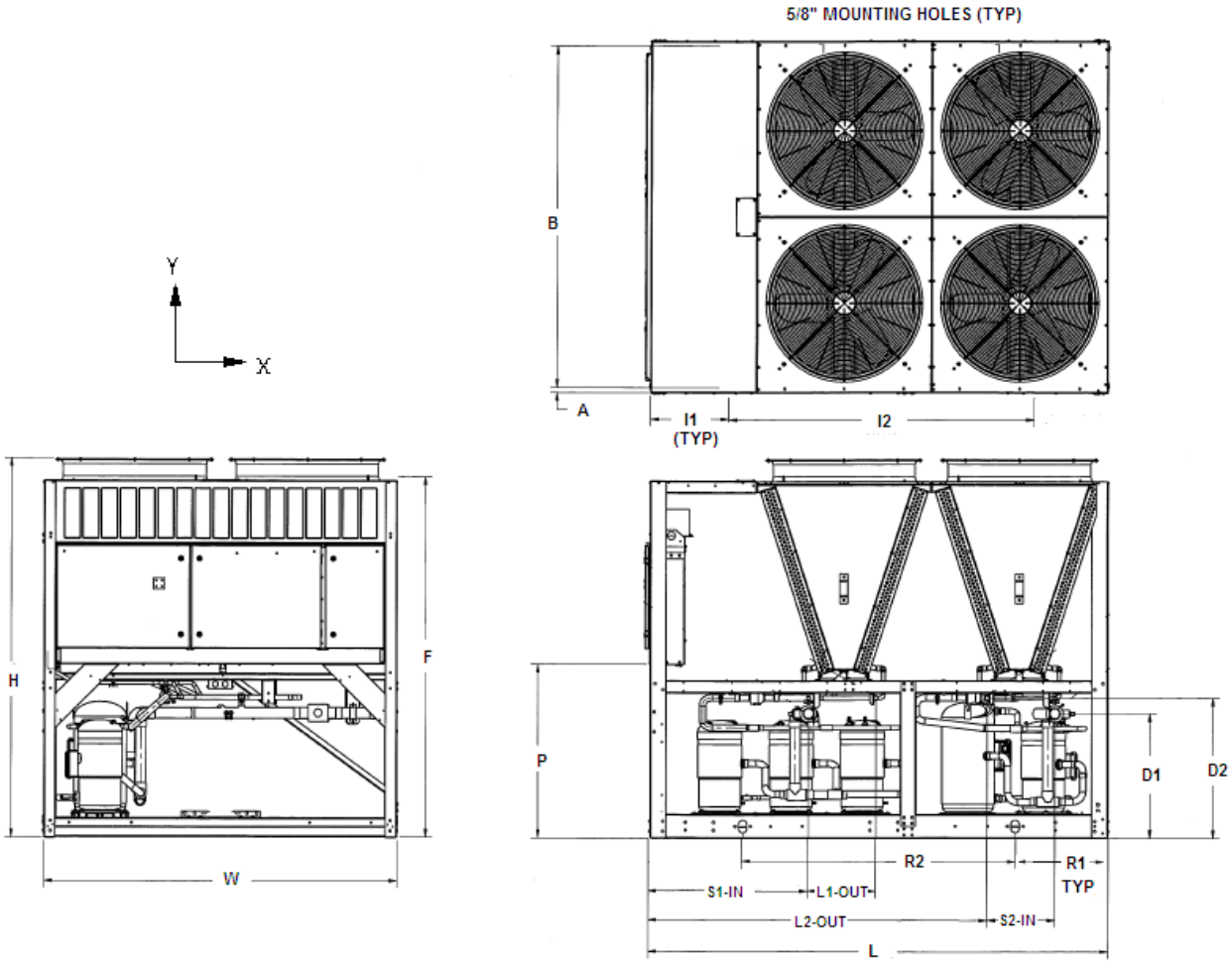


FIGURE 16 - ELEMENTARY DIAGRAM (CONT'D)

Dimensions

Dimensions – QCC3080C TO 090C (Imperial)



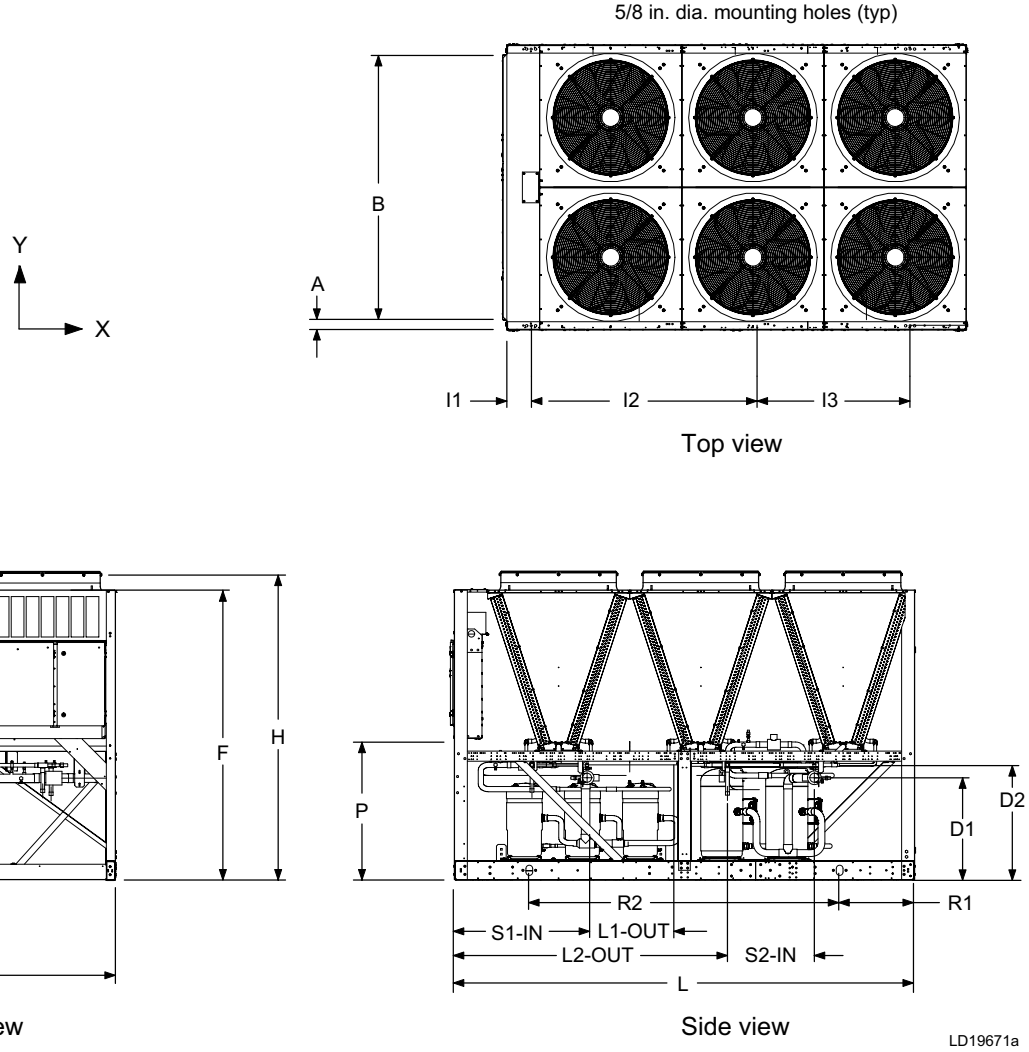
NEW MODEL	LENGTH	WIDTH	HEIGHT			CONNECTION SIZES		SYSTEM 1 DIMENSIONS		SYSTEM 2 DIMENSIONS	
	L	W	H	F	P	SUCTION IN 1/2	LIQUID OUT 1/2	SUCTION IN	LIQUID OUT	SUCTION IN	LIQUID OUT
QCC3080CZE	116.1	88.3	95.3	89.7	43.9	2.7	1.1	39.6	17	17	84.3
QCC3085CZE	116.1	88.3	95.3	89.7	43.9	2.7	1.1	39.6	17	17	84.3
QCC3090CZE	116.1	88.3	95.3	89.7	43.9	2.7	1.1	39.6	17	17	84.3

NEW MODEL		ISOLATOR LOCATION DIMENSIONS										RIGGING HOLE LOCATIONS				UNIT COG	
	D2	I1	I2	I3	I4	I5	I6	I7	I8	A	B	R1	R2	R3	R4	X	Y
QCC3080CZE	35.5	19.5	76.6							1.3	85.5	23.2	68.3				
QCC3085CZE	35.5	19.5	76.6							1.3	85.5	23.2	68.3				
QCC3090CZE	35.5	18.5	76.6							1.3	85.5	23.2	68.3				

All Dimensions are in inches unless otherwise specified.

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. Quantech 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.

Dimensions – QCC3100C TO 130C



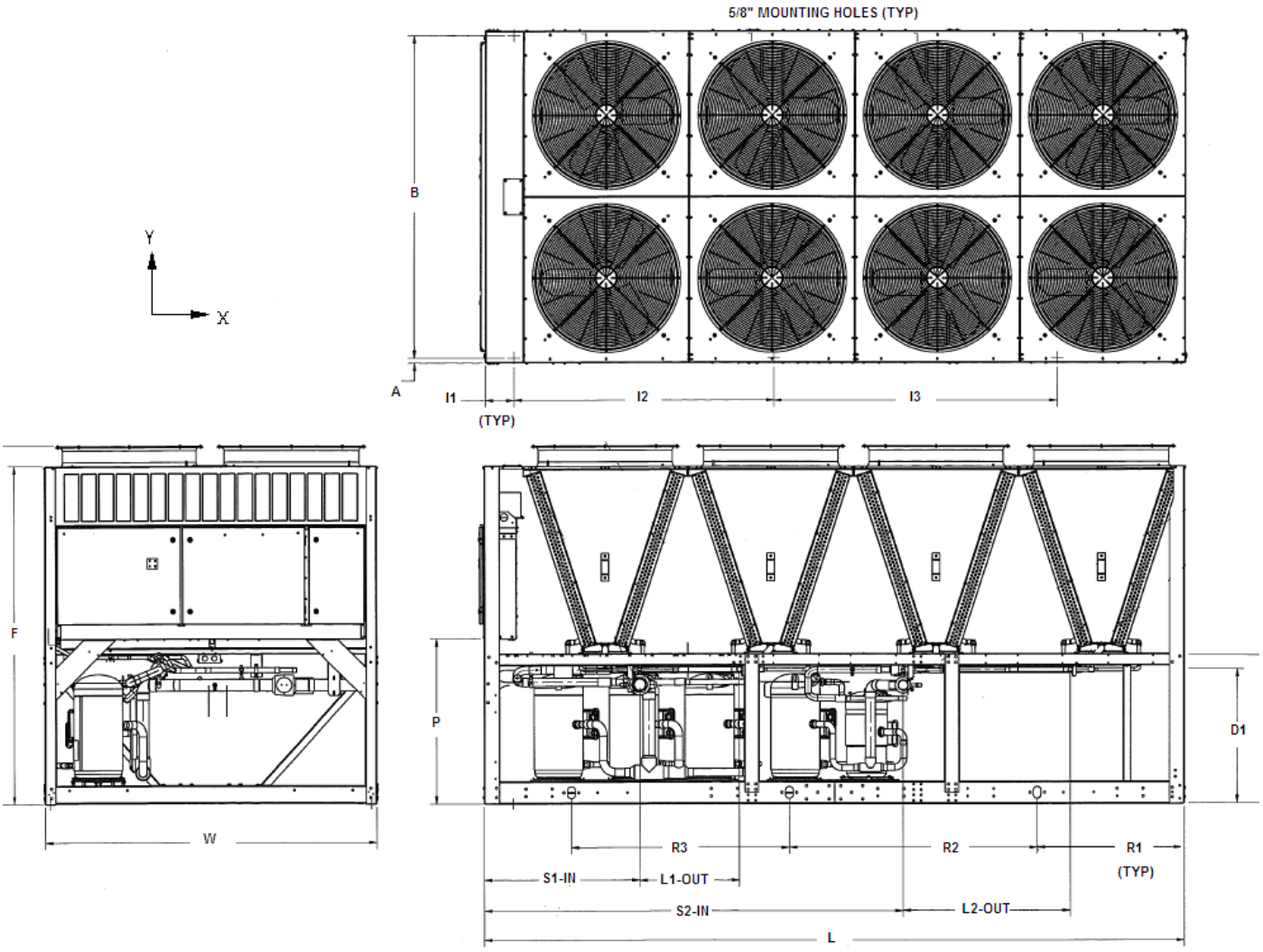
NEW MODEL	LENGTH	WIDTH	HEIGHT			CONNECTION SIZES		SYSTEM 1 DIMENSIONS		SYSTEM 2 DIMENSIONS	
	L	W	H	F	P	SUCTION IN 1/2	LIQUID OUT 1/2	SUCTION IN	LIQUID OUT	SUCTION IN	LIQUID OUT
QCC3100CYE	143.5	88.3	95.3	89.7	43.9	2.7	1.1	41	26.9	26.9	84.4
QCC3110CYE	143.5	88.3	95.3	89.7	43.9	2.7	1.1	41	24.0	26.9	60.4
QCC3130CZE	143.5	88.3	95.3	89.7	43.9	2.7	1.1	41	26.9	26.9	84.4

NEW MODEL		ISOLATOR LOCATION DIMENSIONS										RIGGING HOLE LOCATIONS				UNIT COG	
	D2	I1	I2	I3	I4	I5	I6	I7	I8	A	B	R1	R2	R3	R4	X	Y
QCC3100CYE	35.5	7.6	69.8	47.4						1.4	85.5	23.2	95.9				
QCC3110CYE	35.5	7.6	69.8	47.4						1.4	85.5	23.2	95.9				
QCC3130CZE	35.5	7.6	69.8	47.4						1.4	85.5	23.2	95.9				

All Dimensions are in inches unless otherwise specified.

NOTE: Placement on a level surface of free 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. Quantech 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.

Dimensions – QCC3145C TO 160C



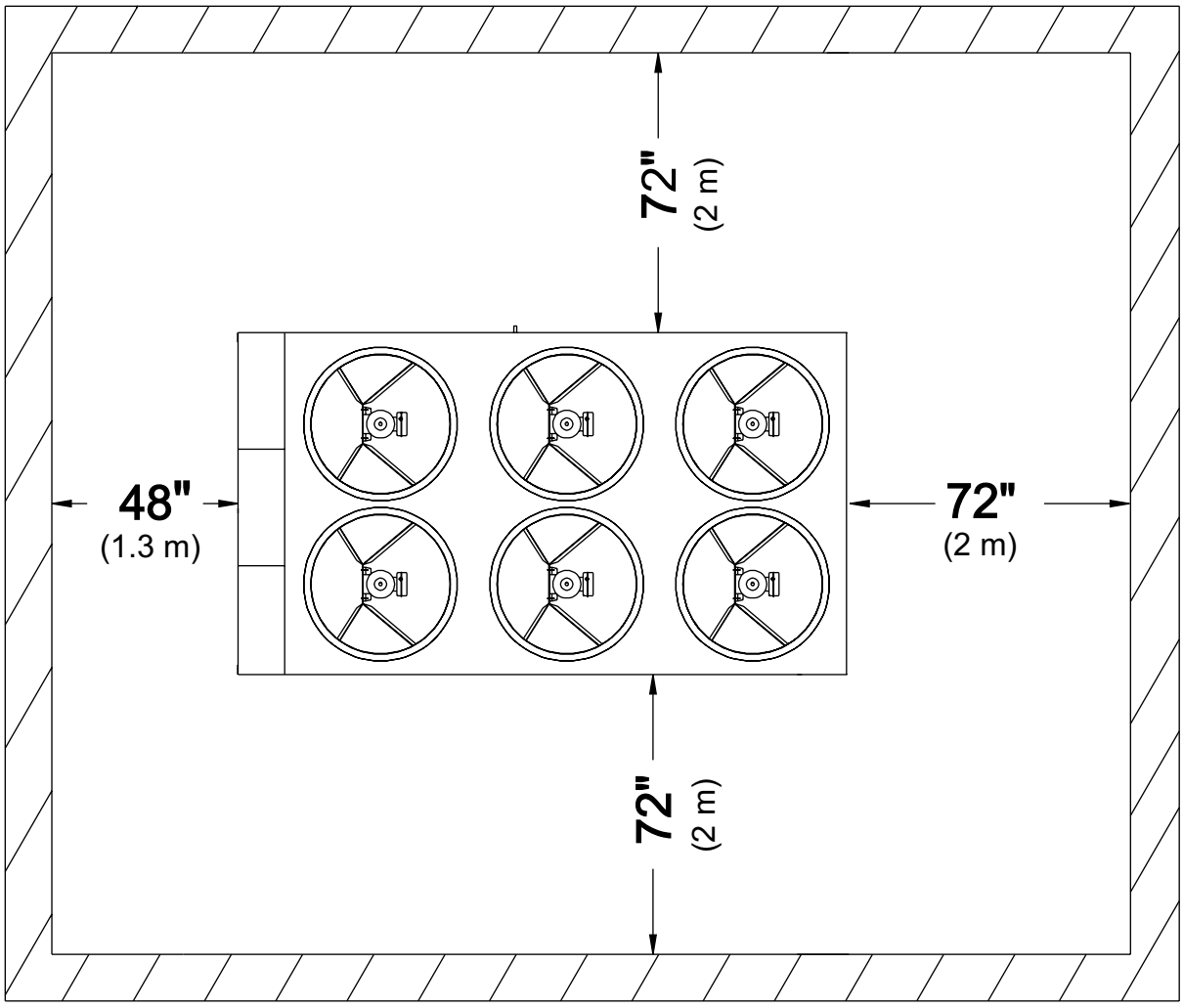
NEW MODEL	LENGTH	WIDTH	HEIGHT			CONNECTION SIZES		SYSTEM 1 DIMENSIONS		SYSTEM 2 DIMENSIONS	
	L	W	H	F	P	SUCTION IN 1/2	LIQUID OUT 1/2	SUCTION IN	LIQUID OUT	SUCTION IN	LIQUID OUT
QCC3145CZE	187.5	88.3	95.3	89.7	43.9	3.1/2.7	1.4/1.1	41.4	26.5	44.6	111.3
QCC3160CZE	187.5	88.3	95.3	89.7	43.9	3.1/2.7	1.4/1.1	41.4	26.5	44.6	111.3

NEW MODEL		ISOLATOR LOCATION DIMENSIONS										RIGGING HOLE LOCATIONS				UNIT COG	
	D2	I1	I2	I3	I4	I5	I6	I7	I8	A	B	R1	R2	R3	R4	X	Y
QCC3145CZE	35.5	7.6	69	80						1.4	85.5	39	66	58			
QCC3160CZE	35.5	7.6	69	80						1.4	85.5	39	66	58			

All Dimensions are in inches unless otherwise specified.

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. Quantech 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.

Clearances



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 17 - UNIT CLEARANCES – ALL MODELS

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 Drawing

Order No: 082533060301

Line No: 1

Product: QCC3

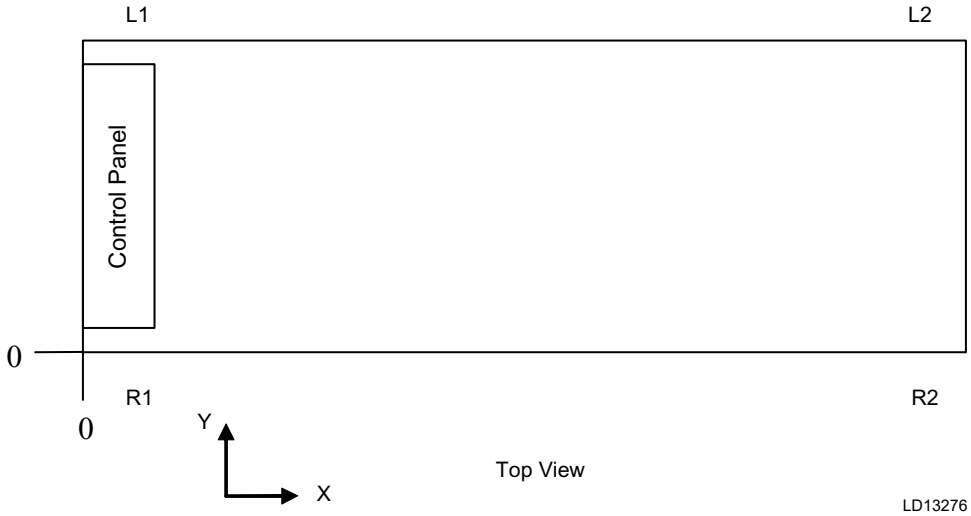
Model: QCC3145CZE46XC

Volatage: 46

Remote clr: X

Sound encl: X

UNIT SHIPPING WEIGHT (Display on unit data nameplate)	kg	lb
	2631	5801



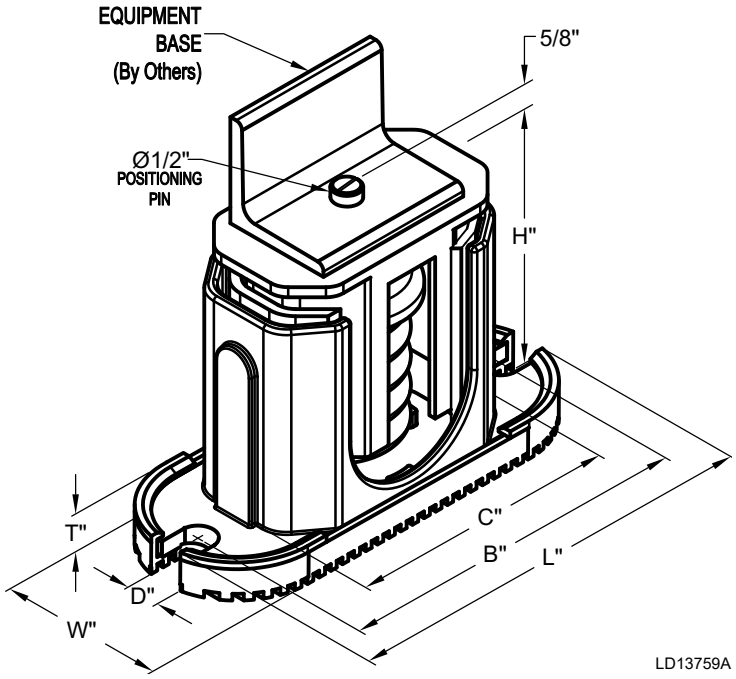
LOCATION	X DISTANCE IN. (MM)	Y DISTANCE IN. (MM)	VENDOR NUMBER	OPERATING WEIGHT LB (KG)
R1	7.6 (193.0)	1.36 (34.5)	ND-D / Yellow	1312 (595.1)
L1	7.6 (193.0)	86.86 (2206.2)	ND-DS / Yellow	1843 (836.0)
R2	124.76 (3168.9)	1.36 (34.5)	ND-D / Yellow	1280 (580.6)
L2	124.76 (3168.9)	86.86 (2206.2)	ND-DS / Yellow	1793 (813.3)

FIGURE 18 - SAMPLE PRINTOUT SUPPLIED IN THE ISOLATOR PACKAGE AND IN THE CHILLER PANEL LITERATURE PACKET.

Isolator information

1 in. deflection spring isolator cross-reference

CP



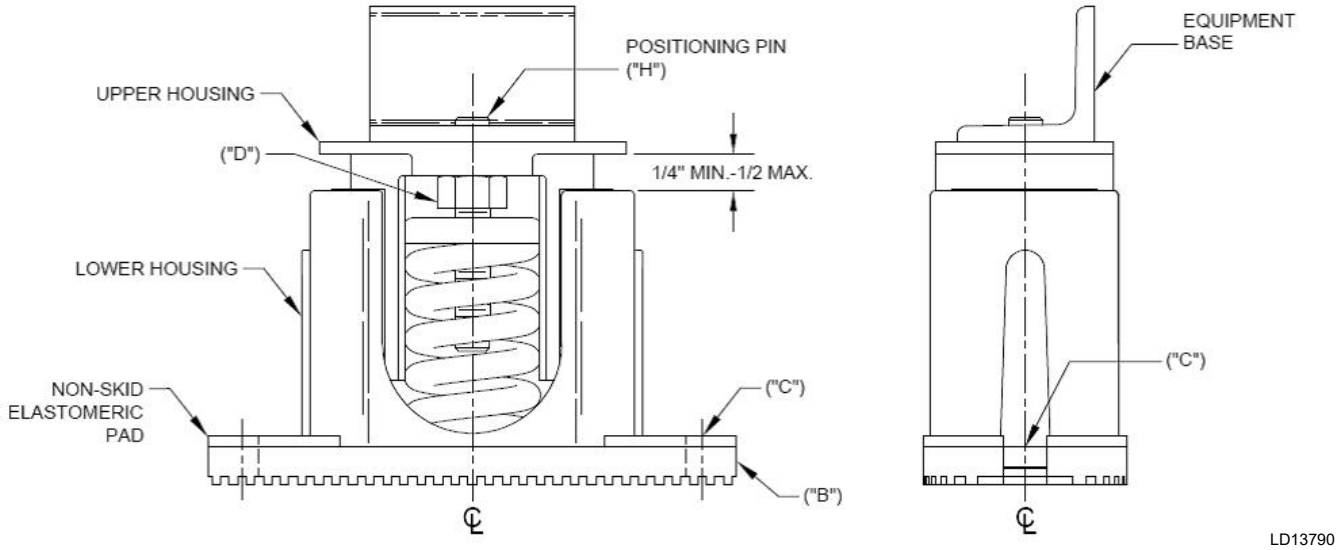
MOUNT TYPE	DIMENSION DATA (INCHES)						
	W	D	L	B	C	T	H
CP1	3	5/8	7-3/4	6-1/2	4-3/4	1/2	5-5/8
CP2	3	5/8	10-1/2	9-1/4	7-3/4	9/16	6

MODEL NUMBER	COLOR CODE	RATED CAPACITY (FOR UNITS WITH ALL LOAD POINTS LESS THAN 1785 LB (810 KG)	
		(LB)	(KG)
CP-1D-510	BLACK	Up thru 434	Up thru 197
CP-1D-900	DARK GREEN	435 thru 765	198 thru 347
CP-1D-1200	GRAY	766 thru 1020	348 thru 463
CP-1D-1360	WHITE	1021 thru 1156	464 thru 524
CP-1D-1785N	GRAY/RED	1157 thru 1785	525 thru 810

MODEL NUMBER	COLOR CODE	RATED CAPACITY (FOR UNITS WITH ANY LOAD POINT ABOVE 1518 LB (689 KG)	
		(LB)	(KG)
C2P-1D-1350	DARK PURPLE	Up thru 1148	Up to 521
C2P-1D-1350	DARK PURPLE	Up thru 1148	Up to 521
C2P-1D-1800	DARK GREEN	1149 thru 1530	522 - 694
C2P-1D-2400	GRAY	1531 thru 2040	695 - 925
C2P-1D-2400	GRAY	1531 thru 2040	695 - 925
C2P-1D-2720	WHITE	2041 thru 2312	926 - 1049
C2P-1D-3570N	GRAY/RED	2313 thru 3570	1050 - 1619

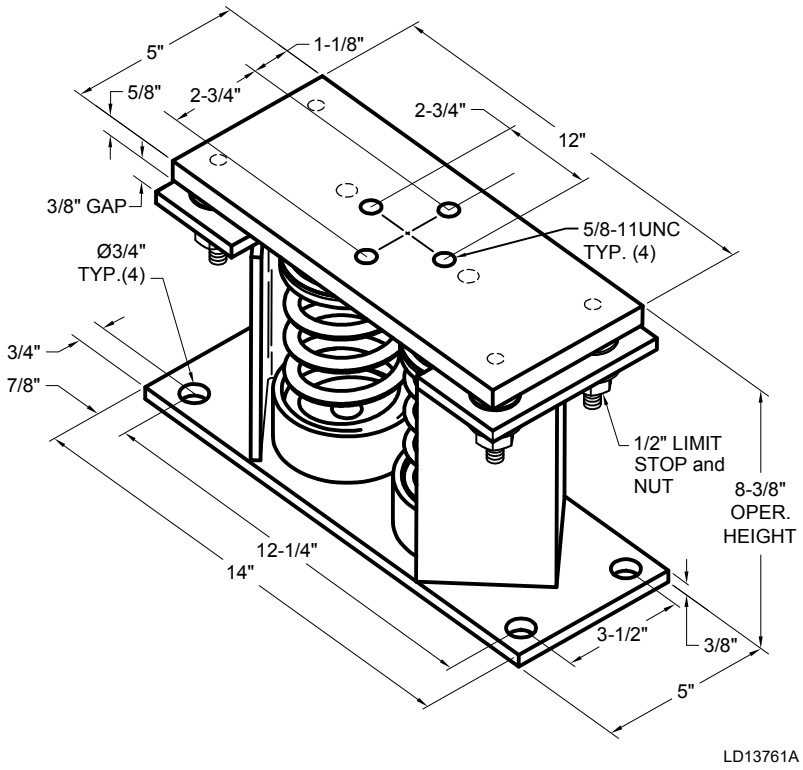
1 in. deflection spring isolators installation instructions

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 subbase, 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 drawing below).
9. Fine adjust isolators to level equipment.
10. Installation is complete.



2 in. deflection seismic isolator cross-reference

Y2RS

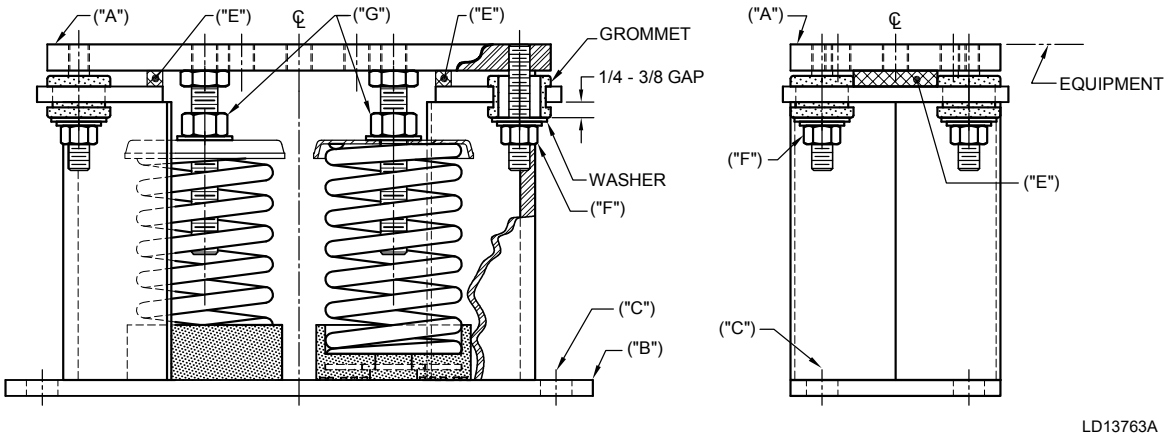


NOTES:
1. All dimensions are in inches, interpret per ANSI Y14.
2. Standard finish: housing-powder coated (color: black), spring-powder coated (color: see T hardware zinc-electroplate.
3. Equipment must be bolted or welded to the top plate to meet allowable seismic ratings.
4. All springs are designed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

VMC PART NUMBER	VMC ISOL. COLOR	WEIGHT RANGE (LB)	WEIGHT RANGE (KG)
Y2RSI-2D-460	GREEN	Up to 391	Up to 177
Y2RSI-2D-460	GREEN	Up to 391	Up to 177
Y2RSI-2D-710	DARK BROWN	392 to 604	178 to 274
Y2RSI-2D-870	RED	605 to 740	275 to 336
Y2RSI-2D-1200N	RED/BLACK	741 to 1020	337 to 463
Y2RSI-2D-1690	PINK	1021 to 1437	464 to 652
Y2RSI-2D-2640N	PINK/GRAY	1438 to 2244	653 to 1018
Y2RSI-2D-2870N	PINK/GRAY/ORANGE	2245 to 2618	1019 to 1188
Y2RSI-2D-3280N	PINK/GRAY/DK.BROWN	2619 to 3740	1189 to 1696

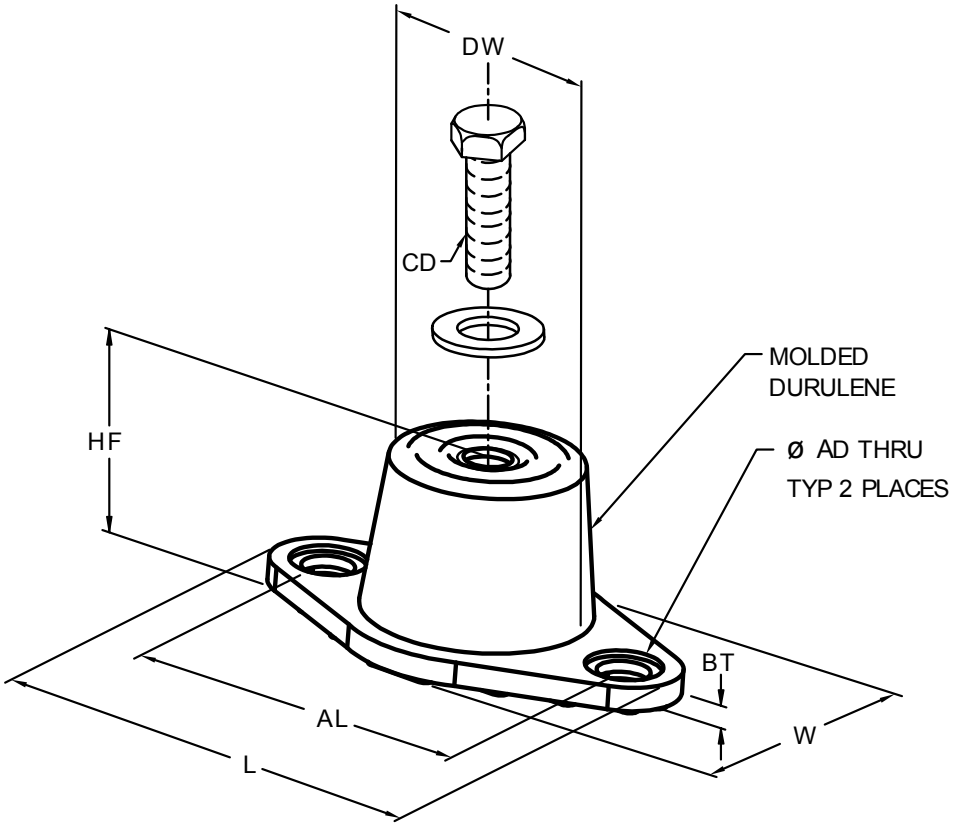
Seismic isolator installation and adjustment

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 subbase, ensuring that all isolator centerlines 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 thru 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 bolt or weld equipment or bracket to the top plate ("a") of isolator with a minimum 3/8 fillet welds 2 in. long at 3 in. o.C. 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 1/4-to 3/8-in. gap. The limit stop 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.



Durulene isolator cross-reference

RD-style isolators



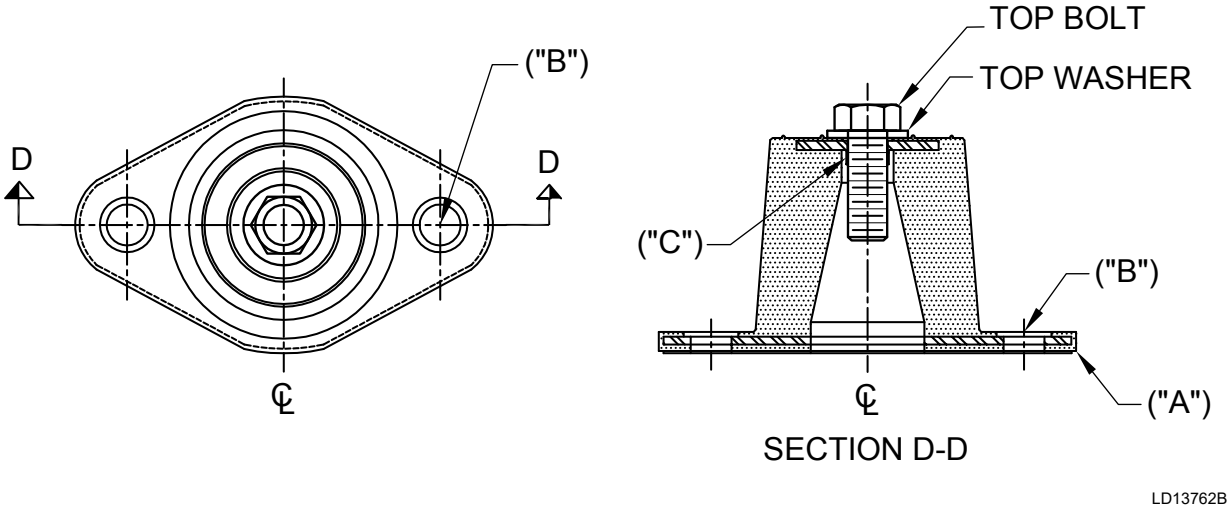
Notes:
1. All dimensions are inches, interpreted per ANSI Y14.
2. See the following page for installation instructions.
3. Mount molded in weather resistant duralene compound as standard. Also available in other materials such as natural rubber, extreme high temperature silicone, high-damped silicone, nitrile and EDPM.
4. AL = Mounting hole center to center spacing.
5. HF = Free height of mount, prior to 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 (INCHES)							
	L	W	HF	AL	AD	BT	CD	DW
RD1-WR	3.13	1.75	1.25	2.38	0.34	0.19	5/16-18 UNC X 3/4	1.25
RD2-WR	3.88	2.38	1.75	3.00	0.34	0.22	3/8-16 UNC X 1	1.75
RD3-WR	5.50	3.38	2.88	4.13	0.56	0.25	1/2-13 UNC X 1	2.50
RD4-WR	6.25	4.63	2.75	5.00	0.56	0.38	1/2-13 UNC X 1	3.00

VMC PART NUMBER	VMC ISOL. COLOR	WEIGHT RANGE (LBS)	WEIGHT RANGE (KGS)
RD-3-CHARCOAL-WR	CHARCOAL	Up thru 825	UP TO 374
RD-4-BRICK RED-WR	BRICK RED	826 thru 1688	375 - 766
RD-4-CHARCOAL-WR	CHARCOAL	1689 thru 4000	767 - 1814

Installation of durulene 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 subbase, 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 Thru 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.



Section 6: Commissioning

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 in the Installation and Start-Up Checklist or use *Form 150.73-CL2* as the commissioning procedure is carried out.

Preparation: 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 classified as A2L refrigerant 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 details, refer to access *Chiller A2L Refrigerant Application Data, Form 160.00-AD10*.

Check that 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. Condensing units are supplied with a nitrogen or refrigerant holding charge (see tag on unit). These systems must be evacuated with a suitable vacuum pump/recovery unit as appropriate to below 500 microns.

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 to provide 18°F subcooling.

Service and oil line valves

Open each compressor suction 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.

Compressor oil

To add oil to a circuit - connect a Quantech hand oil pump (Part No. 470-10654-000) to the 1/4 in. oil charging valve on the compressor with a length of clean hose or copper line, but do not tighten the flare nut. Using clean oil of the correct type (“V” oil), pump oil until all air has been purged from the hose then tighten the nut. Stroke the oil pump to add oil to the oil system. The oil level should be between the bottom and middle of the sight glass. Check oil levels after operating the system at full load. Turn off the system and check the level. 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.

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.

Isolation / 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.

Control panel

Check the panel to see that it is free of foreign materials (wire, metal chips, etc.) and clean out if required.

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 terminal(s) are properly connected to a suitable grounding point. Ensure that all unit internal ground connections are tight.

Supply voltage

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

Preparation: power on

Perform the commissioning using the detailed checks outlined in the EQUIPMENT PRE-STARTUP and STARTUP CHECK LIST as the commissioning procedure is carried out.

Apply power to the unit. Turn ON the option panel circuit breaker if supplied.

The machine is now live!

Switch settings

Ensure that the condensing unit 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 that the system switches under the SYSTEM SWITCHES Key are in the OFF position.

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.

Air flow switch

Verify an air flow switch is correctly fitted in the customer's ductwork and wired into the control panel correctly using shielded cable.

The air flow switch should be connected to terminals 13, 50 and 51 of XTBC1 on the panel. (See *Figure 10 on page 41*).

QUANTECH	QCC3	
Installation and Startup Checklist	Supersedes: QCC3-CL2 (417)	Form: QCC3-CL2 (1123)

Customer: _____ Job name: _____

Address: _____ Location: _____

Phone: _____ Customer order number: _____

Phone number: _____ Order number: _____ Contract number: _____

Chiller model number: _____ **Unit serial number**: _____

The work, as checked below, is in process and will be completed by: _____ / _____ / _____
Month Day Year

Complete the following work in accordance with installation instructions:

A. Unit checks, no power

Correct electrical lock out and tag procedures must be followed.

Check the system before the initial start:

1. Inspect the unit for shipping or installation damage. ☐
2. Ensure that all piping has been completed. ..... ☐
3. Visually check for refrigerant piping leaks. ..... ☐
4. Open suction line ball valve, discharge line ball valve, and liquid line valve for each system. ..... ☐
5. The compressor oil level should be maintained so that an oil level is visible or splashing in the sight glass when fully loaded. At shutdown, the oil level should be between the bottom and middle of the oil equalizing sight glass. ..... ☐
6. Verify proper CFM of air across evaporator coil. Verify air flow switch operation. ..... ☐
7. Check the control panel to ensure it is free of foreign material such as wires, metal chips, or tools. .. ☐
8. Visually inspect wiring (power and control). Wiring must meet N.E.C. and local codes. ..... ☐
9. Check the tightness of power wiring inside the power panel on both sides of the motor contactors and overloads. ..... ☐
10. Check for correct size fuses in the main and control circuits, and verify overload settings correspond with RLA and FLA values in electrical tables. ..... ☐
11. Ensure 120 VAC Control Power to TB1 has 15 A minimum capacity. ..... ☐
12. Be certain all water temperature sensors are inserted completely in their respective wells and are coated with heat-conductive compound. ..... ☐
13. Ensure that the evaporator TXV bulbs are strapped to the suction lines at 4 or 8 o'clock positions or to suction temperature sensors, if EEVs are installed. .. ☐

B. Compressor heaters
Power on, 24 h before start-up

1. Apply 120 VAC and verify its value between terminals 5 and 2 of XTBC2. Ensure the voltage is 120 VAC ± 10%. ..... ☐
2. Power must be applied 24 h before start-up. ..... ☐
3. Ensure each heater draws approximately 0.5 A to 1 A. ..... ☐

C. Panel checks
Power on, both unit switches off

You are about to turn power on for this machine. Safety is the main priority. Only qualified individuals are permitted to service this product. The qualified individual must also know, and adhere to, all safe work practices as required by NEC, OSHA, and NFPA 70E. Use the correct personal protection equipment (PPE) when required.

1. Apply 3-phase power and verify its value. Voltage imbalance should be no more than 2% of the average voltage. ..... ☐
2. Apply 120 VAC and verify its value on the terminal block in the Power Panel. Make the measurement between terminals 5 and 2 of XTBC2. The voltage should be 120 VAC +/- 10%. ..... ☐
3. Program and verify the cooling setpoints, program setpoints, and unit options. Record the values in the following table. ..... ☐

Table 1: Program values

Options	Value
Display language	
SYS 1 switch	
Sys 2 switch	
Chilled liquid	
* Ambient control	
Local/remote mode	
Control mode	
Display units	
* Lead/lag control	
* Fan control	
Manual override	
Current feedback	
** Soft start	
** Unit type	
** Refrigerant type	
** Expansion valve type	
Cooling setpoints	
Cooling setpoint	
Range	
EMS-PWM maximum setpoint	
Program	
Discharge pressure cutout	
Suction pressure cutout	
Low ambient temperature cutout	
Anti-recycle time	
Fan control on pressure	
Fan differential off pressure	
Total number of compressors	
* Number of fans/system	
* Unit/system voltage	
Unit ID	
* System 1 superheat setpoint	
* System 2 superheat setpoint	

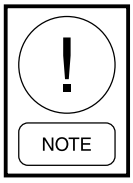
* Not on all models
** Viewable Only

4. Put the unit into service mode and cycle each condenser fan to ensure correct rotation. Refer to *Form QCC3-NM1, Service and Troubleshooting* section for more information. ..... ☐

5. Before this step, turn system 2 off (if applicable – refer to *QCC3 - Installation, Operation, Maintenance Manual (Form QCC3-NM1)* Unit Keys, Option 2 for more information on system switches). Connect a manifold gauge to system 1 suction and discharge service valves. ..... ☐

   Turn on the control panel unit switch. 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. After verifying correct compressor rotation, turn off the unit switch.

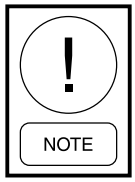
The discharge air or suction pressure setpoint may need to be temporarily lowered to ensure all compressors cycle "on."



This unit uses scroll compressors which can only operate in one direction. Failure to observe this will lead to compressor failure.

6. Turn system 1 off and system 2 on (refer to *QCC3 - Installation, Operation, Maintenance Manual (Form QCC3-NM1)* Unit Keys, Option 2 for more information on system switches). ..... ☐

   Turn on the control panel unit switch. 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. After verifying the correct compressor rotation, turn off the unit switch.



The chilled liquid setpoint may need to be temporarily lowered to ensure all compressors cycle "ON".

D. CHECKING SUPERHEAT AND SUBCOOLING

The subcooling temperature of each system can be calculated 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 (liquid line saturation temperature is converted from a temperature/pressure chart).

Example:

Liquid line press. =	
202 psig converted to temp.	102°F
minus liquid line temp.	- 84°F
Subcooling =	18°F

The subcooling should be adjusted to 15°F at design conditions.

Record the liquid line pressure and its corresponding temperature, liquid line temperature and subcooling below:

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

After the subcooling is verified, the suction superheat should be checked. The superheat should be checked only after steady state operation of the condensing unit has been established, the leaving water temperature has been pulled down to the required leaving water temperature, and the unit is running in a fully loaded condition. Correct superheat setting for a system is 10°F - 15°F (5.56°C - 8.33°C) 18 in. (46 cm) from the cooler.

Superheat should typically be set for no less than 10°F with only a single compressor running on a circuit. The superheat is calculated as 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.	
60 psig converted to temp.	- 34°F
Superheat =	12°F

When adjusting the expansion valve (TXV only), the adjusting screw should be turned not more than one turn at a time, allowing sufficient time (approximately 15 minutes) 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, suction saturation temperature, and superheat of each system below:

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

E. LEAK CHECKING

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

If the unit is functioning satisfactorily during the initial operating period, no safeties trip and the compressors cycle to control water temperature to setpoint, the chiller is ready to be placed into operation.

Section 7: Unit controls

LD19046

Introduction

The Quantech MicroComputer Control Center is a microprocessor based control system designed to provide the entire control for the condensing unit. The control logic embedded in the microprocessor based control system will provide control for the suction pressure or discharge air temperature, as well as sequencing, system safeties, displaying status, and daily schedules. The MicroComputer Control Center consists of four basic components,

1. Microprocessor Board,
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 suction pressure or discharge air temperature. These decisions are a function of temperature or pressure deviation from setpoint.

A Master ON/Off switch is available to activate or deactivate the unit.

Microprocessor board

The Microprocessor Board is the controller and decision maker in the control panel. System inputs such as pressure transducers and temperature sensors are connected directly to the Microprocessor Board. The Microprocessor Board circuitry multiplexes the analog inputs, digitizes them, and scans them to keep a constant watch on the unit operating conditions. From this information, the Microprocessor then issues commands to the Relay Outputs to control contactors, solenoids, etc. for Chilled Liquid Temperature Control and to react to safety conditions.

Keypad commands are acted upon by the micro to change setpoints, cutouts, scheduling, operating requirements, and to provide displays.

The on-board power supply converts 24 VAC from the 1T transformer to a +12 VDC and +5 VDC regulated supply located on the Microprocessor Board. This voltage is used to operate integrated circuitry on the board. The 40 character display and unit sensors are supplied power from the microboard 5 VDC supply.

24 VAC is rectified and filtered to provide unregulated +30 VDC to supply the flow switch, PWM remote temperature reset, and demand limit circuitry which is available to be used with field supplied contacts. The Microprocessor Board energizes on-board relays to output 120 VAC to motor contactors, solenoid valves, etc. to control system operation. 120 VAC is supplied to the optimal T3 Transformer, which supplies 12 VAC to the bridge diode module. The Bridge Diode Module rectifies the voltage to -12 V unreg. The +12 V unreg voltage supplies power to the Remote Temp. Reset Circuit Board.

Unit switch

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

Display

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

The display in conjunction with the keypad, allows the operator to display system operating parameters as well as access programmed information already in memory. The display has a lighted background for night viewing and for viewing in direct sunlight.

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.

Battery back-up

The Microprocessor Board contains a Real Time Clock integrated circuit chip with an internal battery backup. The purpose of this battery backup is to ensure that 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.

Transformer

A 40 VA, 120/24 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.

Single system select and programming number of compressors

The control software is common between single (1) and dual (2) system units. A jumper is installed between terminals 13 and 17 on the user terminal block to configure a unit for a single system. Dual (2) system units do not have a jumper installed. The jumper is only checked by the micro on power-up.

The total number of compressors is programmable under the Program Key. Single (1) system units can have 2 or 3 compressors. Dual (2) system units can have 4, 5, or 6 compressors.

Status key

00066VIP

Unit status

Pressing the STATUS key will enable the operator to determine current unit 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 micro. 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 BAS 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.

```
FLOW SWITCH/REM STOP
NO RUN PERM
```

NO RUN PERM shows that either the flow switch is open or a remote start/stop contact is open in series with the flow switch. A 3-second delay is built into the software to prevent nuisance shutdowns due to erroneous signals on the run permissive input.

```
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 discharge air temperature is below the point (determined by the setpoint and control range) that the micro will bring on a system or that the micro 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 ZONE THERM OFF
SYS 2 ZONE THERM OFF
```

These messages indicate that the zone thermostats for system 1 and system 2 are open. These messages will only be displayed when the control mode is programmed for Suction Pressure

```
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 micro 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 micro will automatically unload the affected system by de energizing one compressor. The discharge pressure unload will occur when the discharge pressure gets within 15 psig 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 80 psig/5.52 Bar suction pressure cutout, the micro would inhibit loading of the affected system with the suction pressure less than or equal to 1.15 * 80 psig/5.52 Bar = 92 psig/6.34 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, BAS 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 unit 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

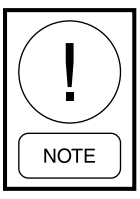
System safeties are faults that cause individual systems to be shut down if a safety threshold is exceeded for 3 seconds. They are auto reset faults in that the system will be allowed to restart automatically after the fault condition is no longer present. However, if 3 faults on the same system occur 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 funtion 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 unit from operating in a low ambient condition. If the outdoor ambient temperature falls below the programmable cutout, the unit will shut down. Restart can occur when temperature rises 2°F above the cutoff.

```
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 will occur 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 unit.

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

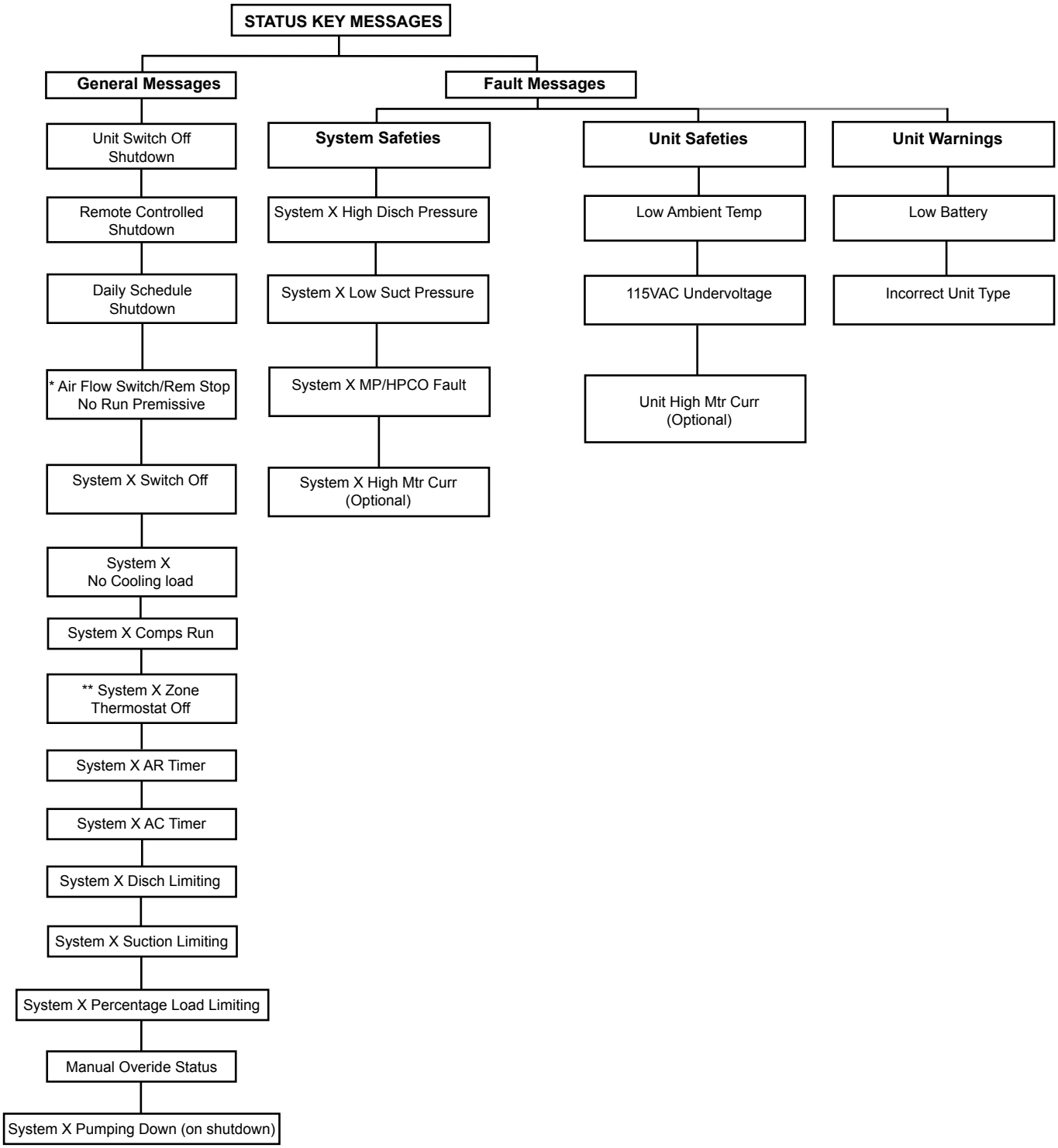
The Low Battery Warning can only occur at unit power-up. On micro panel power-up, the RTC battery is checked. If a low battery is found, all programmed setpoints, program values, options, time, schedule, and history buffers will be lost. These values will all be reset to their default values which may not be the desired 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 IPU microboard (031-02630-000).

```
INCORRECT
UNIT TYPE
```

This indicates the condensing unit jumper is not installed between J11-7 and J11-12, on the I/O Board. This jumper must be installed to operate the condensing unit.

Status key messages



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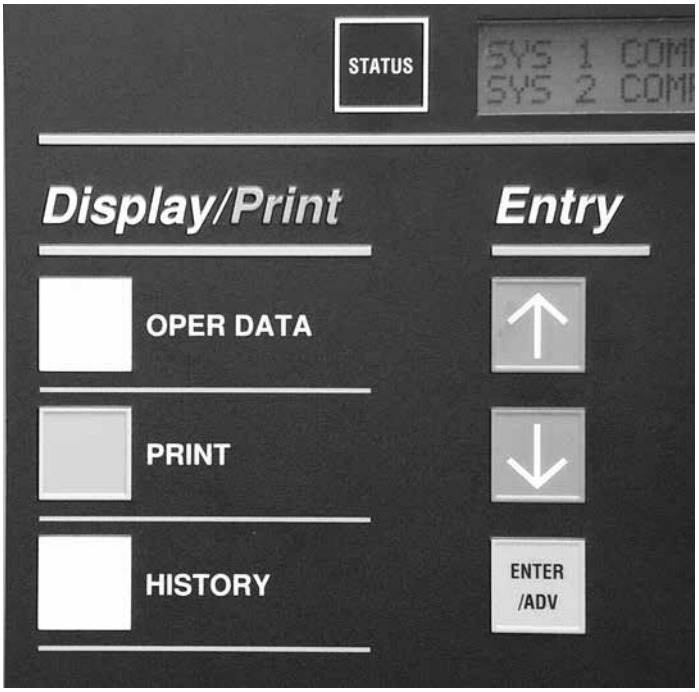
* Only displayed when unit control mode programmed for Discharge Air Temperature.

** Only displayed when unit control mode programmed for Suction Pressure.

FIGURE 19 - STATUS KEY MESSAGES QUICK REFERENCE LIST

Display/print keys



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

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.

NOTE

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

With the "UNIT TYPE" set as a condensing unit (via jumper between J11-7 and 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:

NOTE

The unit MUST be set to be a condensing unit via jumper between J11-7 and J11-12 on the I/O Board. DO NOT operate the unit if not properly set up.

```
DISCHARGE AIR TEMP
    = 57.4°F
```

This display shows the discharge air temperature leaving the evaporator. The display will only be shown when the Control Mode is programmed for Discharge Air (under the Options key). The minimum limit on the display for these parameters are 9.2°F (-12.7°C). The maximum limit on the display is 85.4°F (29.7°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).

```
SYS X SP = 72.1 PSIG
      DP =227.0 PSIG
```

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).

Some models come factory wired with a low pressure switch in place of the suction transducer. In this case, the suction pressure would only be displayed as the maximum suction pressure reading of >200 psig (13.79 barg) when closed, or < 0 psig (0 barg) when open.

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:

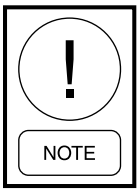
Suction Pressure: 400 psig (27.6 barg)

Discharge Pressure: 650 psig (44.8 barg)

```
SYS X HOURS 1 = XXXXX
      2= XXXXX, 3 = XXXXX
```

```
SYS X STARTS 1 = XXXXX
      2= XXXXX, 3 = XXXXX
```

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.

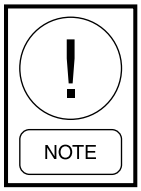
A total of 99,999 hours and starts can be logged before the counter rolls over to “0”.

```
LOAD TIMER 58 SEC
UNLOAD TIMER 0 SEC
```

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.

```
LEAD SYSTEM IS
SYSTEM NUMBER 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. Refer to the programming under the “Options” key. 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.

```
EVAP PUMP IS ON
EVAP HEATER IS OFF
```

This display is for chiller applications only and does not apply to condensing units. However, the evaporator contacts could be used to control the air handler.

The evaporator pump dry contacts are energized (closed) when any compressor is running, or the unit is not OFF on the daily schedule and the unit switch is on. However, even if one of above is true, the contacts will not close if the micro panel has been powered up for less than 30 seconds or if the contacts have been closed in the last 30 seconds.

```
ACTIVE REMOTE CTRL
NONE
```

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 BAS.

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

*LOAD LIM – load limiting enabled. Can be either stage 1 or stage 2 of limiting.

*PWM TEMP – EMS-PWM temperature reset

*See *Section 8: Unit operation*.

If the micro is programmed for CURRENT FEEDBACK ONE PER UNIT under the OPTIONS Key, the display will show up as the first display prior to the SYS 1 displays. Total unit current is displayed as shown below:

```
UNIT  AMPS = 54.0
      VOLTS =  1.2
```

If the micro is programmed for CURRENT FEEDBACK NONE, no current display will appear.

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

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

```
SYS X LLSV IS ON
HOT GAS SOL IS OFF
```

```
SYS X FAN STAGE 3
```

```
SYS X AMPS = 36.0
     VOLTS =  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. Please 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. Please 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 which stage of condenser fan operation is active.

See *Condenser fan control on page 145* in the *Section 8: Unit operation* for more information.

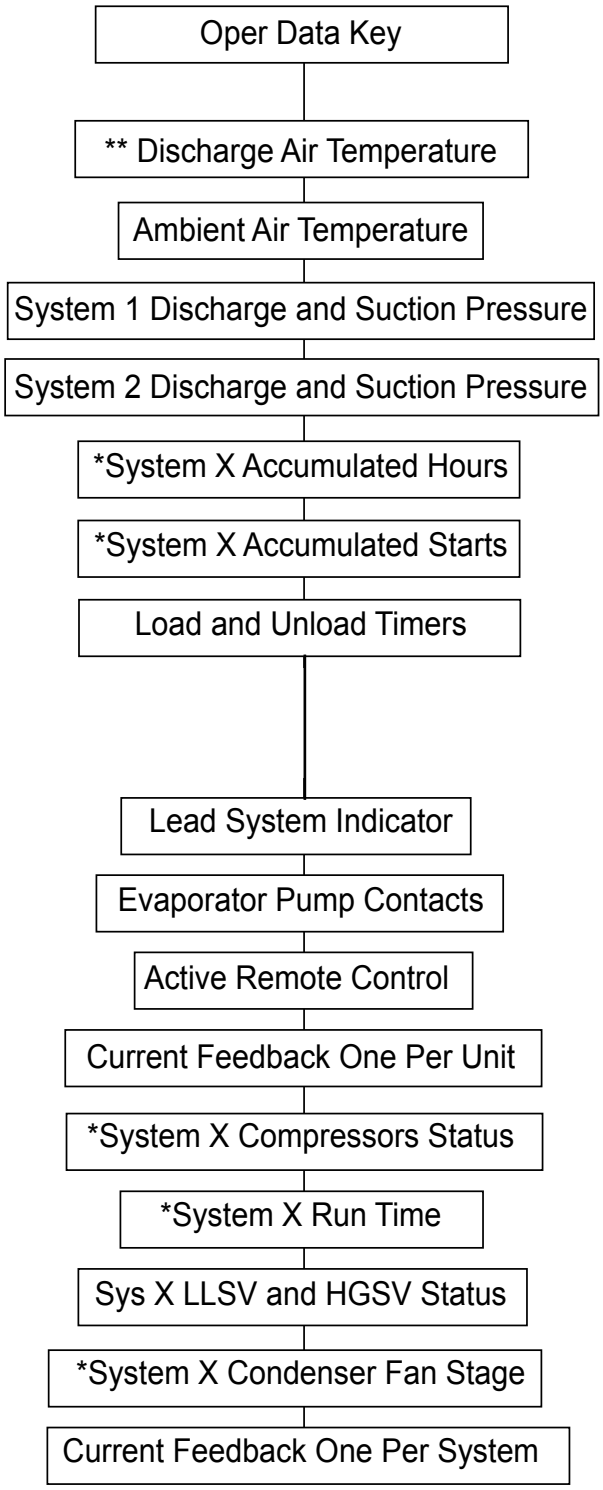
The fifth message displays current as sensed by the optional current feedback circuitry. The display reads out in amps along with the DC feedback voltage from the module. Current is calculated by:

$$\frac{225\text{A} \bullet \text{Actual Volts}}{5\text{ Volts}}$$

Individual displays will be present for each system, if CURRENT FEEDBACK ONE PER SYSTEM is programmed under the OPTIONS Key. Combined compressor current for each system is displayed.

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

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** Only displayed when Control Mode is programmed for Discharge Air Temperature Control.

FIGURE 20 - 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.)

```
   Quantech INTERNATIONAL CORPORA-
                TION
     MILLENNIUM CONDENSING UNIT

            UNIT STATUS
          2:04PM 01 MAR 09

SYS 1              NO COOLING LOAD
SYS 2       COMPRESSORS RUNNING 2

             OPTIONS
AMBIENT CONTROL           STANDARD
LOCAL/REMOTE MODE           REMOTE
CONTROL MODE       LEAVING LIQUID
LEAD/LAG CONTROL         AUTOMATIC
FAN CONTROL      AMB & DSCH PRESS
CURRENT FEEDBACK              NONE
SOFT START                 ENABLED
 EXPANSION VALVE      THERMOSTAT-
IC
          PROGRAM VALUES
DSCH PRESS CUTOUT         395 psig
SUCT PRESS CUTOUT          44 psig
LOW AMBIENT CUTOUT      25.0 DEGF
ANTI RECYCLE TIME         600 SECS
FAN CONTROL ON PRESS      240 psig
FAN DIFF OFF PRESS         80 psig
NUMBER OF COMPRESSORS           6
NUMBER OF FANS PER SYSTEM       4
UNIT TRIP VOLTS               3.0
REFRIGERANT TYPE              R-22
REMOTE UNIT ID PROGRAMMED       1

             UNIT DATA
DISCHARGE AIR TEMP      67.0 DEGF
COOLING RANGE    65.0 +/- 5.0 DEGF
AMBIENT AIR TEMP        74.8 DEGF
LEAD SYSTEM                SYS 2
EVAPORATOR PUMP              ON
EVAPORATOR HEATER           OFF
ACTIVE REMOTE CONTROL      NONE
UNIT  XXX.X AMPS        X.X VOLTS
SOFTWARE VERSION     C.M08.14.02
```

```
          SYSTEM 1 DATA
COMP STATUS   1=OFF 2=OFF 3=OFF
RUN TIME     0- 0- 0- 0 D-H-M-S
SUCTION PRESSURE         66 psig
DISCHARGE PRESSURE      219 psig
SUCTION TEMPERATURE    52.8 DEGF
LIQUID LINE SOLENOID         OFF
HOT GAS BYPASS VALVE         OFF
CONDENSER FAN STAGES         OFF
SYSTEM     XXX.X AMPS X.X VOLTS

          SYSTEM 2 DATA
COMP STATUS 1=OFF, 2=OFF, 3=OFF
RUN TIME     0- 0- 0- 0 D-H-M-S
SUCTION PRESSURE         51 psig
DISCHARGE PRESSURE      157 psig
SUCTION TEMPERATURE    44.3 DEGF
LIQUID LINE SOLENOID          ON
CONDENSER FAN STAGE            3
SYSTEM    XXX.X AMPS  X.X VOLTS

          DAILY SCHEDULE
S M T W T F S          *=HOLIDAY
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
```

NOTE

See Service And Troubleshooting section 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 6 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 lock-out.

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 6 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.

```
Quantech INTERNATIONAL CORPORA-
TION
MILLENNIUM CONDENSING UNIT

SAFETY SHUTDOWN NUMBER 1
SHUTDOWN @ 3:56PM  29 JAN 08

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 6)
```

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
```

Pressing the ↓ (DOWN) arrow key repeatedly from the DISPLAY SAFETY SHUTDOWN NO. X displays the software version.

```
SOFTWARE VERSION
C.M08.14.02
```

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 SUCT PRESS
```

Displays the type of fault that occurred.

```
UNIT TYPE
CONDENSING UNIT
```

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

```
AMBIENT CONTROL
XXXXXXXXXX
```

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

```
LOCAL/REMOTE MODE
XXXXXXXXX
```

Displays Local or Remote control selection.

```
CONTROL MODE
SUCTION PRESSURE
```

Displays the type of DSCH Air Temp Control (OAT or Suct Press.

```
LEAD/LAG CONTROL
XXXXXXXX
```

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

```
FAN CONTROL
DISCHARGE PRESSURE
```

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

```
MANUAL OVERRIDE MODE
XXXXXXXXX
```

Displays whether Manual Override was Enabled or Disabled.

```
CURRENT FEEDBACK
XXXXXXXXXXXXXXXX
```

Displays type of Current Feedback utilized.

```
SOFT START
XXXXXXX
```

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.

```
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.

```
DISCHARGE AIR TEMP
= XXX.X °F
```

Displays the Discharge Air Temp if Discharge Air Temp Control is selected.

```
SETPOINT = XXX.X °F
RANGE = +/- °F
```

Displays the programmed Setpoint and Range, if the unit is programmed for DAT Control Mode.

```
SETPOINT = XXX.X °F
RANGE = +XX.X °F
```

Displays the programmed Setpoint and Range, if the unit is programmed for Discharge Air Control.

```
SYS 1 SP = XXXX PSIG
RANGE = +/-XXX PSIG
```

```
SYS 2 SP = XXXX PSIG
RANGE = +/-XXX PSIG
```

Displays the SP Setpoint and Control Range if SP Control is selected.

```
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.

```
EVAP PUMP IS XXX
EVAP HEATER IS XXX
```

Displays status of the Evaporator Pump and Heater (not installed on a QCC3) at the time of the fault.

```
ACTIVE REMOTE CTRL
XXXX
```

Displays whether Remote Control was active when the fault occurred.

```
UNIT ACTUAL AMPS
=XXX.X AMPS
```

This is only displayed when the Current Feedback option is one per unit.

```
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
```

Displays the system Amperage (calculated approximately) at the time of the fault.

For this message to appear, CURRENT FEEDBACK ONE PER SYSTEM must be programmed under the options key. If the micro is programmed as one CURRENT FEEDBACK ONE PER UNIT under the program key, the display will be the first display prior to the SYS 1 info. If the micro is programmed for CURRENT FEEDBACK NONE, no current display will appear.

Displays for System 1 starting with SYS X NUMBER OF COMPS RUNNING X through SYS X AMPS = XXX.X VOLTS = X.X will be displayed first, followed by displays for System 2.

Further explanation of the above displays is covered under the STATUS, OPER DATA, COOLING SETPOINTS, PROGRAM, and OPTIONS keys.

Software version

The software version may be viewed by first pressing the HISTORY key and then the ↓ (DOWN) arrow key.

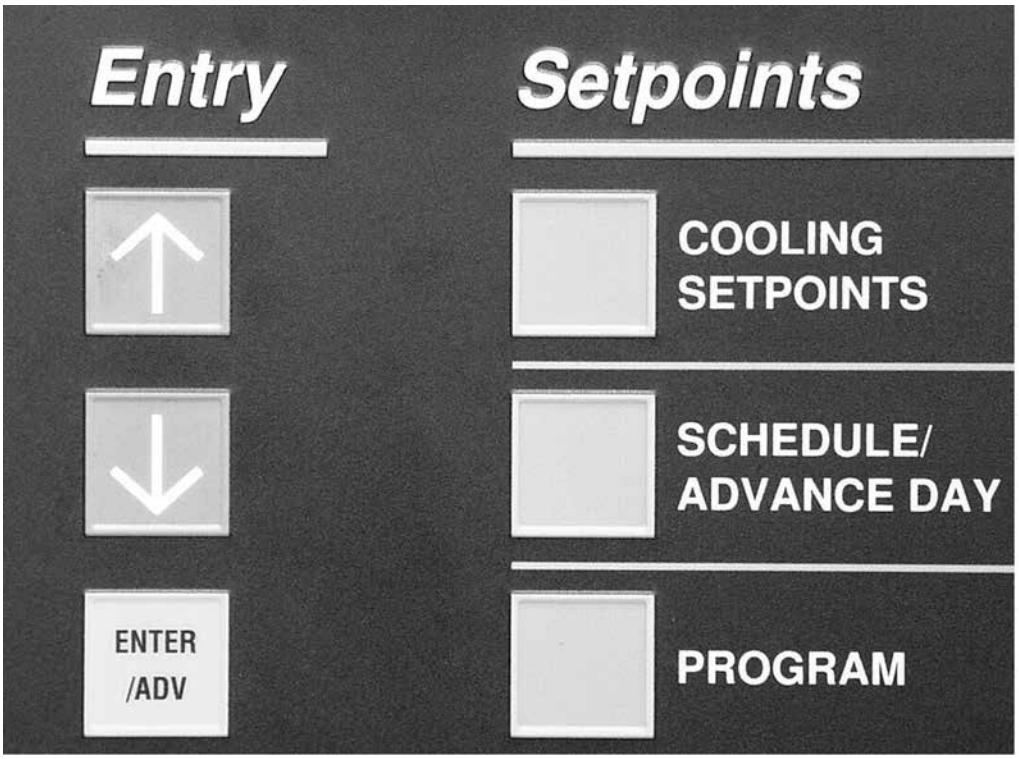
After pressing the HISTORY key, the display safety shutdown message will be displayed.

```
DISPLAY SAFETY SHUT-
DOWN NO.1 (1TO6)
```

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

```
SOFTWARE VERSION
    C.M08.14.02
```

Entry keys



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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 the section on *Display/ print keys* for specific information on the displayed information and specific use of the ↑ (UP) and ↓ (DOWN) arrow keys.

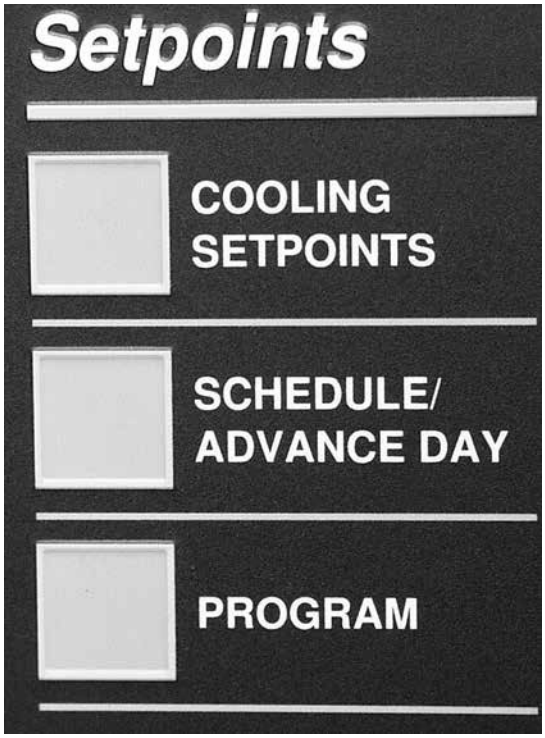
The ↑ (UP) arrow key and ↓ (DOWN) arrow key are also used for programming the control panel such as changing numerical or text values when programming cooling setpoints, setting the daily schedule, changing safety setpoints, unit options, and setting the clock.

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



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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. After pressing the COOLING SETPOINTS key, the Cooling Mode (Discharge Air Temperature or Suction Pressure Control) will be displayed for a few seconds, and then the setpoint entry screen will be displayed.

NOTE

Unit must first be checked for "Unit Type - Condensing Unit" under the Option Key to allow programming of appropriate setpoints. This is accomplished by the jumper between J11-7 and J11-12 on the I/O Board.

Following are the four possible messages that can be displayed after pressing the COOLING SETPOINT key, indicating the cooling mode:

```
LOCAL DISCHARGE
AIR TEMP CONTROL
```

This message indicates that the cooling setpoint is under LOCAL control. That is, the cooling setpoint is controlling to the *locally* programmed setpoint. The message also indicates that the control point is based on Discharge Air temperature leaving the evaporator coil.

```
LOCAL SUCTION
PRESSURE CONTROL
```

This message indicates that the cooling setpoint is under LOCAL control (the cooling setpoint is controlling to the *locally* programmed cooling setpoint). However, unlike the previous message, it is now indicating that the control point is based on Suction Pressure.

```
REMOTE DISCHARGE
AIR TEMP CONTROL
```

This message indicates that the cooling setpoint is under REMOTE control. When under remote control, the cooling setpoint will be determined by a remote device

such as an BAS control. The message also indicates that the control point is based on Discharge Air Temperature leaving the evaporator.

```
   REMOTE SUCTI ON
  PRESSURE CONTROL
```

This message indicates that the cooling setpoint is under REMOTE control. When under remote control, the cooling setpoint will be determined by a remote device such as an BAS control. This message also indicates that the control point is based on Suction Pressure.

Immediately after the control mode message is displayed, the COOLING SETPOINT entry screen will be displayed. If the unit is programmed for Discharge Air Temperature the following message will be displayed:

```
SETPOINT = 55.0°F
 RANGE = +/-5.0°F
```

(Discharge Air Temperature control)

The above message shows the current Discharge Air temperature SETPOINT at 55.0°F (notice the cursor positioned under the number 5). Pressing either the UP or DOWN arrow will change the setpoint in .5°F increments. After using the UP and DOWN arrows to adjust to the desired setpoint, the ENTER/ADV key must be pressed to enter this number into memory and advance to the RANGE SETPOINT.

This will be indicated by the cursor moving under the RANGE setpoint. The UP and DOWN arrow keys are used to set the RANGE, in .5 °F increments, to the desired RANGE setpoint. After adjusting the setpoint, the ENTER/ADV key must be pressed to enter the data into memory.

The Discharge Air temperature SETPOINT is programmed from 45°F to 70°F. The Control Range is programmed from 3.0°F to 10°F.

If the unit was programmed for Suction Pressure control, the following message would be displayed instead of the previous message.

```
SYS X SP = 105_PSIG
 RANGE = +/-5 PSIG
```

(Suction Pressure control)

The setpoint and range are programmed with the UP arrow. DOWN arrow, and ENTER/ADV key as described in the previous setpoint message. The setpoints in Suction Pressure Control are the suction pressures of each individual system on the condensing Unit and will control to within +/- the cooling range.

On two system units, each system is controlled independently of each other according to its own setpoint and cooling range, so there will be two similar displays - a setpoint and range for both system 1 and system 2.

The Suction Pressure SETPOINTS are programmable from 60 psig to 90 psig. The Control Range is programmable from 2 psig to 10 psig.

Both Discharge Air Temperature and Suction Pressure control are described in detail under the section on Capacity Control.

Pressing the COOLING SETPOINTS again, after setting the “local” setpoint(s), 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 BAS control. These setpoints would only be valid if the unit was operating in the REMOTE mode. The following messages illustrate both Discharge Air Temperature and Suction Pressure control respectively.

```
REM SETP = 55.0°F
 RANGE = +/-5.0°F
```

(Discharge Air Temperature control)

```
REM SP X = 70_ PSIG
 RANGE = +/- 3 PSIG
```

(Suction Pressure control)

Pressing the COOLING SETPOINTS again 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 reset of the Discharge Air Temperature Setpoint. The setpoint can be reset upwards by the use of a contact closure on the PWM Temp Reset input (XTBC1 terminals 13 - 20). See the section on Operating Controls 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 desired setpoint, the ENTER/ADV key must be pressed to enter this number into memory.

The low limit, high limit, and default values for the keys under "SETPOINTS" are listed in Table 14.

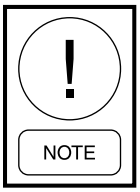
Schedule/advance day key

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 unit 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.

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

The line under the 0 is the cursor. 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 desired schedule.

To page to a specific day press the SCHEDULE/ADVANCE DAY key. 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.

Program key

There are ten 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 15 shows the programmable limits and default values for each operating parameter.

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

```
DISCHARGE  PRESSURE
CUTOUT  =  570  PSIG
```

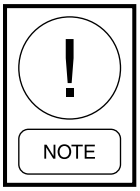
DISCHARGE PRESSURE CUTOUT is the discharge pressure at which the system will shutdown as monitored by the optional discharge transducer. This is a software shutdown that acts as a backup for the me-

chanical 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.

```
SUCTION PRESSURE
CUTOUT = 80.0 PSIG
```

The SUCTION PRESSURE CUTOUT protects the unit from a coil freeze-up or compressor damage. If the suction pressure drops below the cutout point, the system will shut down.



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.

```
LOW AMBIENT TEMP
CUTOUT = 25.0°F
```

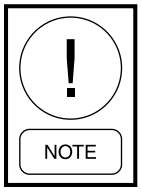
The LOW AMBIENT TEMP CUTOUT allows the user to select the unit outside ambient temperature cutout point. If the ambient falls below this point, the unit will shut down. Restart can occur when temperature rises 2°F (1.11°C) above the cutout setpoint.

```
ANTI RECYCLE TIMER
= 600 SEC
```

The programmable anti-recycle timer ensures that systems do not cycle. This timer is programmable under the PROGRAM key between 300 - 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 maximum.

```
FAN CONTROL ON
PRESSURE=XXXPSIG
```

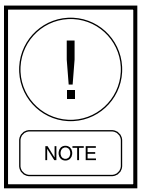
The Fan Control On-Pressure is the programmed pressure value that is used to stage the condenser fans on, in relation to discharge pressure. *See Condenser fan control on page 145* in the *Section 8: Unit operation and Tables 27, 28 and 29.*



The microprocessor will not allow programming the "FAN CONTROL ON PRESSURE" minus the "FAN CONTROL DIFFERENTIAL OFF PRESSURE" below 160 psig. This ensures discharge pressure does not drop too low.

```
FAN DIFFERENTIAL OFF
PRESSURE = XXX PSIG
```

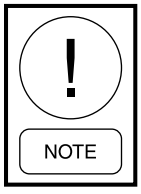
The Fan Differential Off Pressure is the programmed differential pressure value that is used to stage the condenser fans off, in relation to discharge pressure. S*ee Condenser fan control on page 145* in the *Section 8: Unit operation and Tables 27 - 31.*



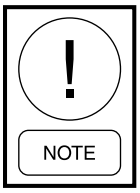
The microprocessor will not allow programming the "FAN CONTROL ON PRESSURE" minus the "FAN CONTROL DIFFERENTIAL OFF PRESSURE" below 160 psig. This ensures discharge pressure does not drop too low.

```
TOTAL NUMBER OF
COMPRESSORS = 6
```

The TOTAL NUMBER OF COMPRESSORS are the amount of compressors in the unit, and determines the stages of cooling available. Notice in *Table 33 on page 131* that the selection available will vary depending on the unit model.



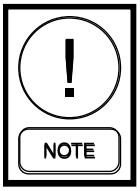
This MUST be programmed correctly to ensure proper condensing unit operation.



A single system condensing unit MUST have a jumper between terminals 13 - 17 on terminal block XTBC1. If the jumper is not installed, which is the correct configuration for QCC3080 and 0160 units, the unit will act as a 2-system unit. The jumper is only checked by the micro at unit power-up. If the jumper needs to be removed, power must be removed and re-applied to register the change in memory.

```
NUMBER OF FANS
PER SYSTEM = X
```

The number of fans per system is programmed for the total number of fans on each system, or the total number on the condensing unit divided by 2.



This MUST be programmed correctly to ensure proper condensing unit operation.

```
SYS X TRIP VOLTS
          =X.X VOLTS
```

```
UNIT TRIP VOLTS
      =X.X VOLTS
```

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

460 VAC system trip volts

For individual system high current trip programming on 460 VAC units:

- 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:

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

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

460 VAC Unit Trip Volts

For total unit high current trip programming on 460 VAC units:

- Add the sum of all the compressor and fan RLA's in the unit
- 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:

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

The programmed value will be 5.0 V.

208/230 VAC units

On 208/230 VAC units, the process is similar, but instead of performing the calculation using 225 A, a number of 450 A must be substituted.

```
REMOTE UNIT ID
PROGRAMMED = X
```

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

TABLE 32 - COOLING SETPOINTS PROGRAMMABLE LIMITS AND DEFAULTS

SETPOINT VALUE	LOW LIMIT	HIGH LIMIT	DEFAULT
Discharge Air Temp. Setpoint	45.0 °F	70.0°F	44.0°F
	7.2°C	21.1°C	12.7°C
Discharge Air Temp. Range	3.0°F	10.0°F	5.0°F
	1.7°C	5.6°C	2.8°C
Suction Pressure Setpoints	102 psig	155 psig	122 psig
	7.03 Bars	10.7 Bars	8.4 Bars
Suction Pressure Range	3 psig	16 psig	5 psig
	0.21 Bars	1.1 Bars	0.34 Bars
Max EMS - PWM Remote Temp. Reset	2°F	40°F	20°F
	1°C	22°C	11°C

TABLE 33 - PROGRAM AND DEFAULTS

PROGRAM VALUE	MODE	LOW LIMIT	HIGH LIMIT	DEFAULT
Discharge Pressure Cutout	--	325 psig	575 psig	570 psig
		22.4 barg	39.6 barg	39.3 barg
Suction Pressure Cutout		80.0 psig	120.0 psig	80.0 psig
		5.52 barg	8.27 barg	5.52 barg
Low Ambient Temp. Cutout	Standard Ambient	25.0°F	60.0°F	25.0°F
		-3.9°C	15.6°C	-3.9°C
	Low Ambient	0°F	60.0°F	25.0°F
		-17.8°C	15.6°C	-3.9°C
Anti-Recycle Timer	--	300 SEC.	600 SEC.	600 SEC.
Fan Control On Pressure	--	360 psig	485 psig	385 psig
		24.8 barg	33.4 barg	26.5 barg
Fan Differential Off Pressure	--	80 psig	160 psid*	125 psid
		5.51 barg	11.03 barg*	8.0 barg
Total Number Of Compressors	Single System	2	3	3
	Two Systems	4	6	6
Number Of Fans Per System	QCC3096 - QCC2140 Only	3	4	3
Unit/System Trip Volts	Current Feedback Option Enabled One Per Unit	0.5 VOLTS	4.5 VOLTS	2 VOLTS
Remote Unit Id	--	0	7	0

* The minimum discharge pressure allowed is 160 psig. The fan differential Off Pressure will be lowered to prevent going below 235 psig based on where the fan control On Pressure is programmed.

Oper data quick reference list

This table provides a quick reference of the setpoints list for the Setpoints Keys.

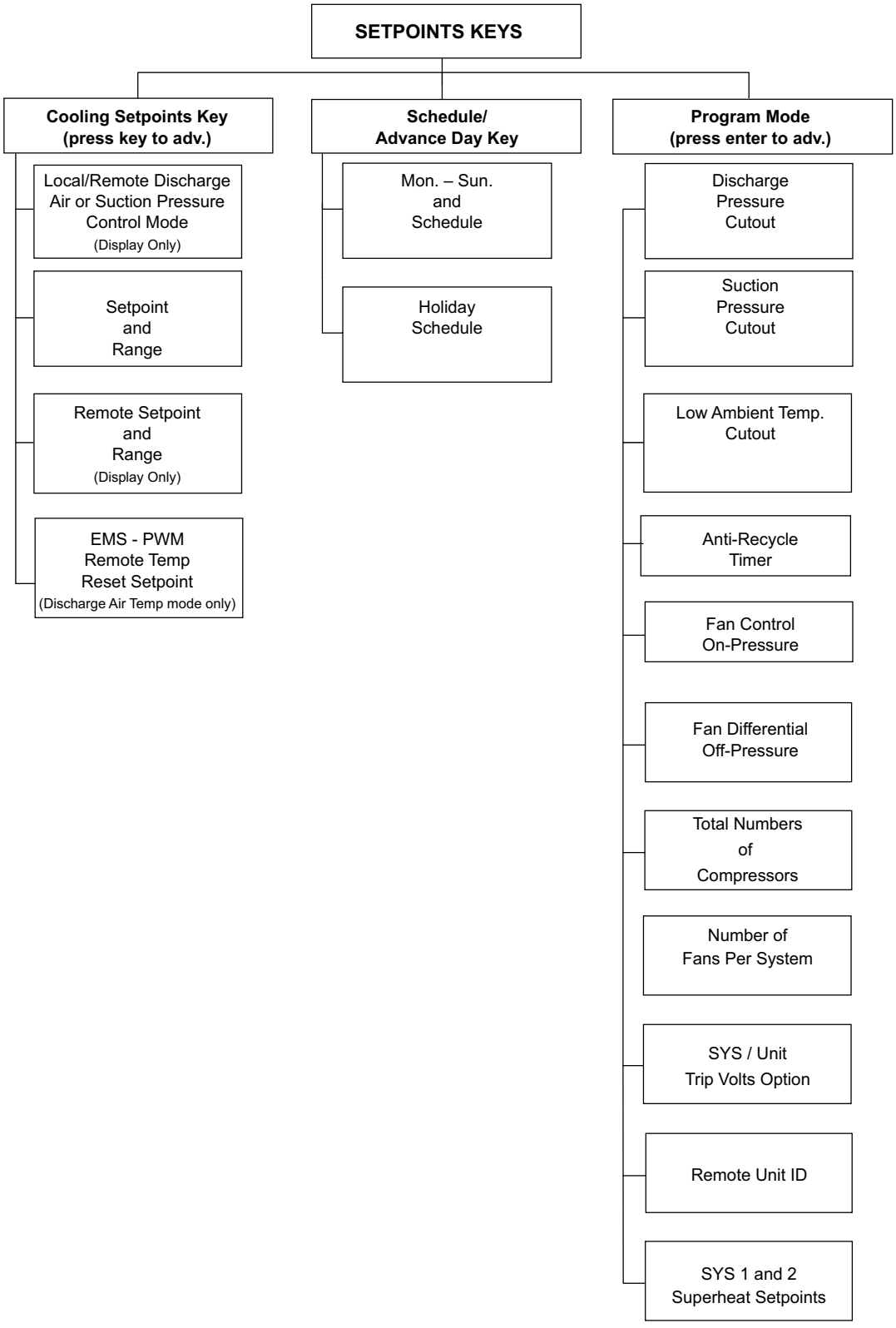
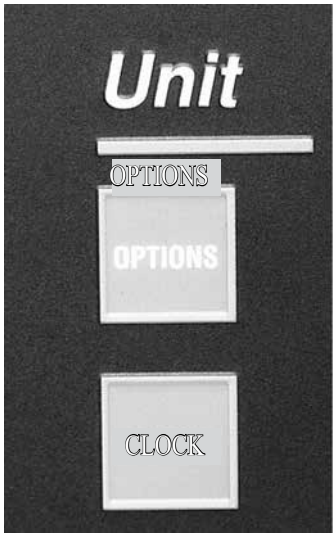


FIGURE 21 - SETPOINTS QUICK REFERENCE LIST

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. *Figure 22 on page 138* shows the programmable options. Following are the displays in the order they appear:

Option 1: Language

```
DISPLAY LANGUAGE
ENGLISH
```

English, Spanish, French, German, and Italian 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

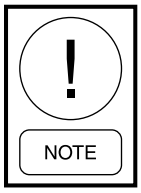
```
SYS 1 SWITCH OFF
SYS 2 SWITCH ON
```

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 prior to shutdown.

Option 3: Ambient control type

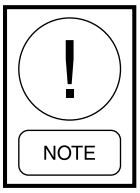
```
AMBIENT CONTROL
STANDARD
```

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

or

```
AMBIENT CONTROL
LOW AMBIENT
```

The low ambient cutout is programmable down to 0°F (-17.8°C). A low ambient kit 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.



The software may skip the low ambient selection, but a low ambient kit is still needed to operate below 25°F.

Option 4: Local/remote control type

```
LOCAL / REMOTE MODEL
LOCAL
```

When programmed for LOCAL, an BAS or RCC control can be used to monitor only. The micro panel will operate on locally programmed values and ignore all commands from the remote devices. The condensing unit will communicate and send data to the remote monitoring devices.

or

```
LOCAL/REMOTE MODE
REMOTE
```

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

Option 5: Unit control mode

```
CONTROL MODE
SUCTION PRESSURE
```

Unit control is based on Suction Pressure Control.

or

```
CONTROL MODE
DISCHARGE AIR
```

Unit control is based on Discharge Air Temp. Control.

Option 6: Display units

```
DISPLAY UNITS
IMPERIAL
```

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

or

```
DISPLAY UNITS
SI
```

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 condensing units with 2 refrigerant systems operating on discharge air temp control. 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 micro will then assign the “lead” to the system with the shortest average run time.

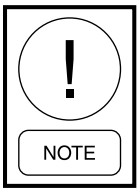
Option 8: Condenser fan control mode

```
FAN CONTROL
DISCHARGE PRESSURE
```

Condenser fans are controlled by discharge pressure only. This mode may only be chosen when discharge pressure transducers are installed.

```
FAN CONTROL
AMBIENT & DSCH PRESS
```

Condenser fans are controlled by ambient temperature and discharge pressure. This mode must be chosen if the discharge pressure transducers are not installed.



The software may skip the Fan Control message on QCC3 units.

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 10: Current feedback options installed

```
CURRENT FEEDBACK
NONE
```

This mode should be selected when the panel is not equipped with current sensing capability.

or

```
CURRENT FEEDBACK
ONE PER UNIT
```

This mode should be selected when an optional module is installed to allow combined current monitoring of all systems by sensing current on the incoming line. Current input is to J7-4 to J7-12 of the micro.

or

```
CURRENT FEEDBACK
ONE PER SYSTEM
```

This mode should be selected when an optional module is installed to allow individual current monitoring of each system. SYS 1 input is to J7-4 to J7-12 of the micro. SYS 2 input is to J9-4 to J9-12 of the micro.

Option 11: Power fail restart

```
POWER FAIL RESTART
AUTOMATIC
```

Unit auto restarts after a power failure.

```
POWER FAIL RESTART
MANUAL
```

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

```
SOFT START
DISABLED
```

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

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

Option 13: Unit type

```
UNIT TYPE
CONDENSING UNIT
```

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

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

If unit type needs to be changed to make the unit a condensing unit, add a jumper between J11-7 and J11-12, of the microboard and reapply power to the micropanel.

Option 14: Refrigerant type

```
REFRIGERANT TYPE
R-410A
```

Refrigerant type R-410A or R-454B may 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. R-410A and R-454B MUST be programmed.

Option 15: Expansion valve type

```
EXPANSION VALVE TYPE
THERMOSTATIC
```

Expansion valve type must be thermostatic. or electronic may be selected under Service Mode. Expansion valve type is displayed under the Options key, but is programmable in Service Mode.

Incorrect programming may cause damage to compressors.

Option 16: Flash card update

```
FLASH CARD UPDATE
DISABLED
```

A Flash Card is used to input the operating program into the unit 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 unit 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
```

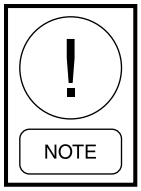
If the update resulted in an error, the original program will still be active. When an error occurs, ensure the correct Flash Card was utilized. Incorrect unit software will cause an error. If this is not the case, the Flash Card is most likely defective or the IPU and I/O combo board is bad.

Option 17: Remote temperature reset

```
REMOTE TEMP RESET
INPUT          XXXXXXXXXXXXX
```

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

- DISABLED (default)
- 0.0 – 10.0 VDC
- 2.0 – 10.0 VDC
- 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.

Option 18: Hot gas bypass type

The Hot Gas Bypass Type must be programmed based on the option installed. Some chillers will not have hot gas bypass installed. Others will have it installed on System #1, System #2 or both systems.

The selected option is only displayed under the OPTIONS Key and must be programmed under the Service Mode.

```
HOT GAS BYPASS TYPE
NONE
```

```
HOT GAS BYPASS TYPE
SYSTEM 1
```

```
HOT GAS BYPASS TYPE
SYSTEM 2
```

```
HOT GAS BYPASS TYPE
BOTH SYSTEMS
```

Option 19: Data logging

This should be disabled.

```
DATALOG TO FLASHCARD
OFF
```

Also see the UNIT KEYS PROGRAMMING QUICK REFRENCE LIST in *Figure 22 on page 138*.

Clock

The CLOCK display shows the current day, time, and date. Pressing the CLOCK key will show the current day, time, and date.

It is important that the date and time be correct, otherwise the daily schedule will not function as desired 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 FRI 08:51AM
25 JAN 08
```

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 desired 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 desired hour, minute, meridian; day, month, and year are displayed. Pressing the ENTER/ADV Key will save the valve and move the cursor on to the next programmable variable.

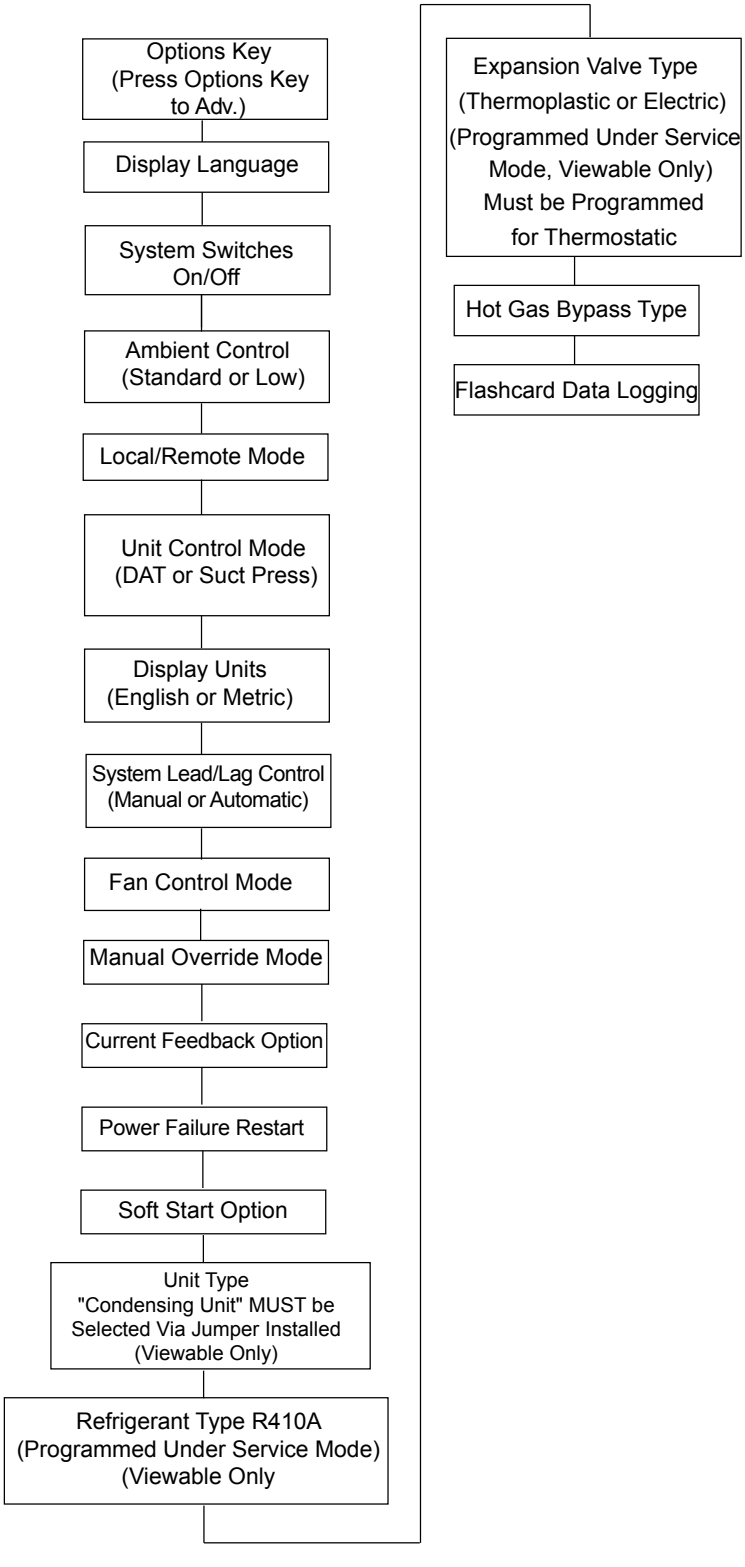


Figure 22 provides a quick reference list for the Unit key setpoints.

FIGURE 22 - UNIT KEYS PROGRAMMING QUICK REFERENCE LIST

Section 8: Unit operation

Capacity control

To initiate the start sequence of the unit, all run permissive inputs must be satisfied (air proving/remote start/stop switch), and no unit or system faults exist.

The first phase of the start sequence is initiated by the Daily Schedule Start or a Remote Cycling Device. If the unit is shut down on the daily schedule, the evaporator blower contacts (Terminals 23 and 24 of XTBC2) will close when the daily schedule start time has been reached. Once the air proving switch closes, capacity control functions are initiated.

If unit cycling is accomplished with a remote cycling device wired in series with the air proving switch, the evaporator contacts will always be energized as long as the unit switch is turned on. When the air proving switch and remote cycling contacts are closed, the capacity control functions will be initiated.

It should be noted that the evaporator contacts (Terminals 23 and 24 of XTBC2) are not required to be used to cycle the evaporator blower. However, in all cases the air proving switch must be closed to allow unit operation.

The control system will evaluate the need for cooling by comparing the actual discharge air temperature or suction pressure(s) to the desired setpoint, and regulate the discharge air temperature or suction pressure to meet that desired 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 micro 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). Reloading 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.

Discharge air temperature control

The setpoint in Discharge Air Temperature Control is the temperature the condensing unit will control to within +/- the control range. The setpoint High Limit is the Setpoint plus the Cooling Range. The Setpoint Low Limit is the Setpoint minus the Cooling Range. See *Figure 23 on page 140*.

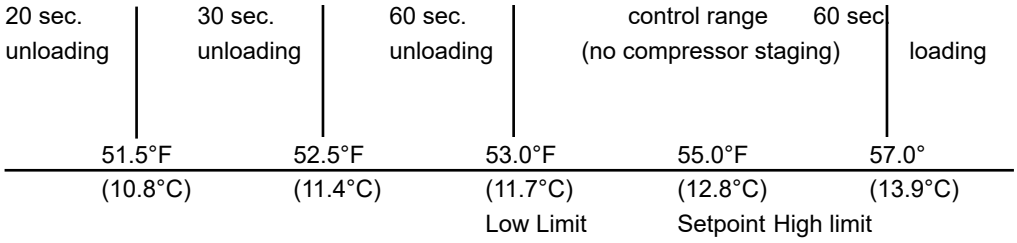
If the Discharge Air Temperature is above the Setpoint High Limit, the lead compressor on the lead system will be energized along with the liquid line solenoid. Upon energizing any compressor, the 60 second Anti-Coincidence timer will be initiated.

If after 180 seconds of run time the discharge air temperature is still above the Setpoint High Limit, the next compressor in sequence will be energized. Additional loading stages are energized at a rate of once every 180 seconds if the discharge air temperature remains above the Setpoint High Limit.

If the discharge air 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 discharge air temperature drops below the Setpoint Low Limit, unloading occurs at a rate of 60 seconds.

The sequences of Capacity Control (compressor staging) for loading and unloading are shown in *Table 34 on page 140* and *Table 35 on page 140*.



Discharge Air Temperature Control – Compressor Staging
Setpoint = 55.0°F (12.8°C) Range = +/- 5°F (-12.2°C)

FIGURE 23 - DISCHARGE AIR TEMPERATURE CONTROL

TABLE 34 - DISCHARGE AIR TEMPERATURE CONTROL FOR 5 AND 6 COMPRESSORS (7 AND 8 STEPS)

LEAD SYSTEM (SEQUENCE - SEE NOTE 4)					LAG SYSTEM (SEQUENCE - SEE NOTE 4)		
* STEP	COMP 1	COMP 2	COMP 3		COMP 1	COMP 2	COMP 3
0	OFF	OFF	OFF		OFF	OFF	OFF
1	ON+HG	OFF	OFF	SEE NOTE 1	OFF	OFF	OFF
2	ON	OFF	OFF		OFF	OFF	OFF
3	ON	OFF	OFF	SEE NOTE 2	ON	OFF	OFF
4	ON	ON	OFF	SEE NOTE 3	OFF	OFF	OFF
5	ON	ON	OFF		ON	OFF	OFF
6	ON	ON	OFF		ON	ON	OFF
7	ON	ON	ON		ON	ON	OFF
8	ON	ON	ON		ON	ON	ON

Notes:
1. Step 1 is Hot Gas Bypass and is skipped when loading occurs. Hot Gas Bypass operation is inhibited during Pumpdown. For Discharge Air Temperature Control the Hot Gas Bypass solenoid is energized only when the lead compressor is running and the DAT < SP, the Hot Gas Bypass solenoid is turned off when the DAT > SP + CR/2.
2. Step 3 is skipped when loading occurs.
3. Step 4 is skipped when unloading occurs.
   * STEP can be viewed using the OPER DATA key and scrolling to COOLING DEMAND.
4. Each system will attempt to rotate the lead compressor start sequence to help even out the run hours in a system, therefore piping suction risers should be sized off the smallest compressor capacity in either system.

TABLE 35 - DISCHARGE AIR TEMPERATURE CONTROL FOR 4 COMPRESSORS (6 STEPS)

LEAD SYSTEM (SEQUENCE - SEE NOTE 4)				LAG SYSTEM (SEQUENCE - SEE NOTE 4)	
* STEP	COMP 1	COMP 2		COMP 1	COMP 2
0	OFF	OFF		OFF	OFF
1	ON+HG	OFF	SEE NOTE 1	OFF	OFF
2	ON	OFF		OFF	OFF
3	ON	OFF	SEE NOTE 2	ON	OFF
4	ON	ON	SEE NOTE 3	OFF	OFF
5	ON	ON		ON	OFF
6	ON	ON		ON	ON

Notes:
1. Step 1 is Hot Gas Bypass and is skipped when loading occurs. Hot Gas Bypass operation is inhibited during Pumpdown. For Discharge Air Temperature Control the Hot Gas Bypass solenoid is energized only when the lead compressor is running and the DAT < SP, the Hot Gas Bypass solenoid is turned off when the DAT > SP + CR/2.
2. Step 3 is skipped when loading occurs.
3. Step 4 is skipped when unloading occurs.
   * STEP can be viewed using the OPER DATA key and scrolling to COOLING DEMAND.
4. Each system will attempt to rotate the lead compressor start sequence to help even out the run hours in a system, therefore piping suction risers should be sized off the smallest compressor capacity in either system.

Suction Pressure control

The setpoint in Suction Pressure Control is the suction pressures each individual system on the condensing unit will control to within +/- the cooling range. The Setpoint High Limit is the Setpoint plus the Cooling Range. The Setpoint Low Limit is the Setpoint minus the Cooling Range. Each system is controlled independently of each other according to its setpoint and cooling range.

Each system must have its own zone thermostat. If the respective zone thermostat is closed, the lead compressor on that system will be energized. In addition the liquid line solenoid to that system will be energized. Upon energizing any compressor the 60 second Anti-Coincidence timer will be initiated.

If after 150 seconds of run-time the suction pressure is still above the Setpoint High Limit, the next compressor in sequence will be energized. Additional loading stages are energized at a rate of once every 150 seconds if the suction pressure remains above the Setpoint High Limit. Each system will have its own load timer of 150 seconds.

If the suction pressure falls below the Setpoint High Limit and greater than the Setpoint Low Limit, loading and unloading do not occur. This area of control is called the control range.

If the suction pressure falls below the Setpoint Low Limit, unloading (compressors cycling off) occurs at a rate of 30 seconds per system. The zone thermostat must be satisfied before the last compressor in the system cycles off, even if the suction pressure is below the Setpoint Low Limit.

Hot Gas Bypass solenoid will be energized as the last stage of unloading. If the zone thermostat calls for cooling when the suction pressure is below the Setpoint Low Limit, the first stage compressor will be energized with the hot gas solenoid.

It should be noted that the zone thermostat has ultimate control. As long as the zone thermostat is calling for cooling, at least compressor will be running, regardless of whether the suction pressure is below Setpoint Low Limit.

The figure below illustrates loading and unloading in Suction Pressure Control Mode. See section on *Setpoints keys* for programmable values.

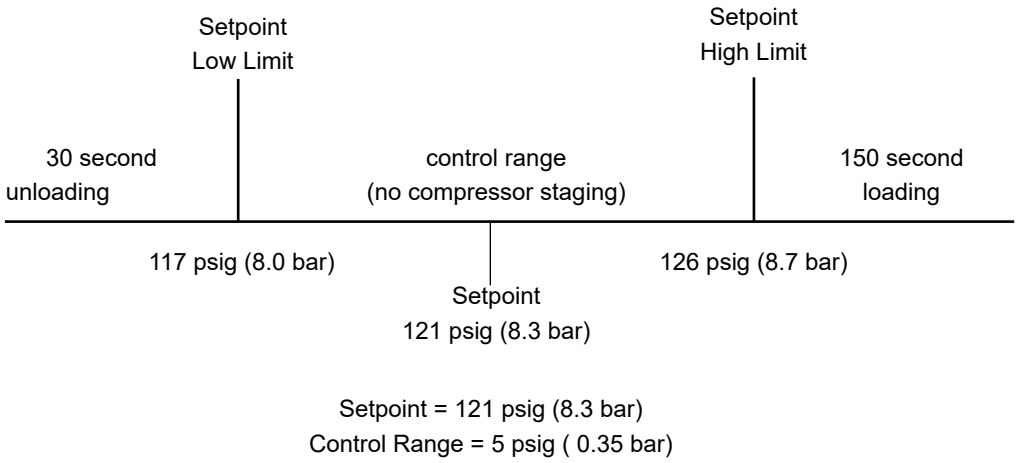


FIGURE 24 - SUCTION PRESSURE CONTROL

System lead/lag

(Discharge Air Temp Control Only)

Lead/lag between systems may be selected to help equalize average run hours between systems on condensing units 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 in which the micro starts systems. Systems in Suction Pressure Control act independently based on the individual Suction Pressure Control SETPOINTS.

Compressor lead/lag

The compressors within a system rotate starts in sequence 1, 2 or 1, 2, 3 with wraparound. The longest-off compressor in a system will start first, and the longest-running compressor in a system will turn off first. When unloading, the system with the most compressors on unloads first. The lag system will shut down a compressor first when equal numbers of compressors are operating in each system. The micro will not attempt to equalize run time of compressors in a system.

Once the second system has started a compressor, the micro will attempt to equally load each system. Once this occurs, loading will alternate between systems.

If Soft Start is enabled on European models with this option, compressor lead/lag will function as outlined in Option 12 under the Options key.

Anti-recycle timer

The programmable anti-recycle timer ensures that systems do not cycle. This timer is programmable under the PROGRAM key between 300 – 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 blower control

The evaporator blower start contacts (XTBC2 - terminals 23 - 24) are energized when any of the following conditions are true:

1. Any compressor is running
2. Daily Schedule is not programmed OFF and Unit Switch is ON.

The contacts will not close if the micropanel has been powered up for less than 30 seconds or if the contacts have been closed in the last 30 seconds to prevent motor overheating. These contacts can be used to start the evaporator blower and for all practical purposes, will be running in a “constant fan” mode. However, if the blower is desired to cycle with the compressors, then cycling of the evaporator blower can be achieved by using the “Run Contacts” located at XTBC2 - terminals 25 to 26 for system 1, or XTBC2 - terminals 27 to 28 for system two (if applicable).

Pumpdown control

Each system has a pump-down feature upon shut-off. Manual pumpdown from the keypad is possible by turning off the respective system’s switch under the OPTIONS key. 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

Condenser fan control: QCC3080C - QCC3090C

TABLE 36 - QCC3080C – QCC3090C CONDENSER FAN CONTROL USING OUTDOOR AMBIENT TEMPERATURE AND DISCHARGE PRESSURE

(Discharge Pressure Controls Will Not Function Unless The Optional Discharge Pressure Transducer Is Installed)

FAN STAGE	ON	OFF	CONTACTOR		I/O BOARD OUTPUT		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1 1 FAN FWD	OAT >25°F (-3.9°C) OR DP > Fan Ctrl On Press	OAT < 20°F (-6.7°C) AND DP < Fan Ctrl On Press – (Diff. Press.)	8M	11M	TB7-9	TB10-9	3	4
***3 2 FANS FWD**	OAT >65°F (18.3°C) OR DP > Fan Ctrl On Press + 40 psig (2.76 Bars)	OAT < 60°F (15.6°C) AND DP < Fan Ctrl On Press.- [Diff. Press + 40 psig (2.76 Bars)]	7M and 8M	10M and 11M	TB7-8 and TB7-9	TB10-8 and TB10-9	1 and 3	2 and 4

TABLE 37 - QCC3080C –QCC3090C CONDENSER FAN CONTROL USING DISCHARGE PRESSURE ONLY

FAN STAGE	ON	OFF	CONTACTOR		I/O BOARD OUTPUT		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1 1 FAN FWD	DP > Fan Ctrl On Press	DP < Fan Ctrl On Press – (Diff. Press.)	8M	11M	TB7-9	TB10-9	3	4
***3 2 FANS FWD**	DP > Fan Ctrl On Press + 40 psig (2.76 Bars)	DP < Fan Ctrl On Press.) – [(Diff Press.) + 40 psig (2.76 Bars)]	7M and 8M	10M and 11M	TB7-8 and TB7-9	TB10-8 and TB10-9	1 and 3	2 and 4

*** NOTE:** STEP 2 is not active in the “Standard Ambient” mode. When changing to “Low Ambient” control, fan power wiring also changes.

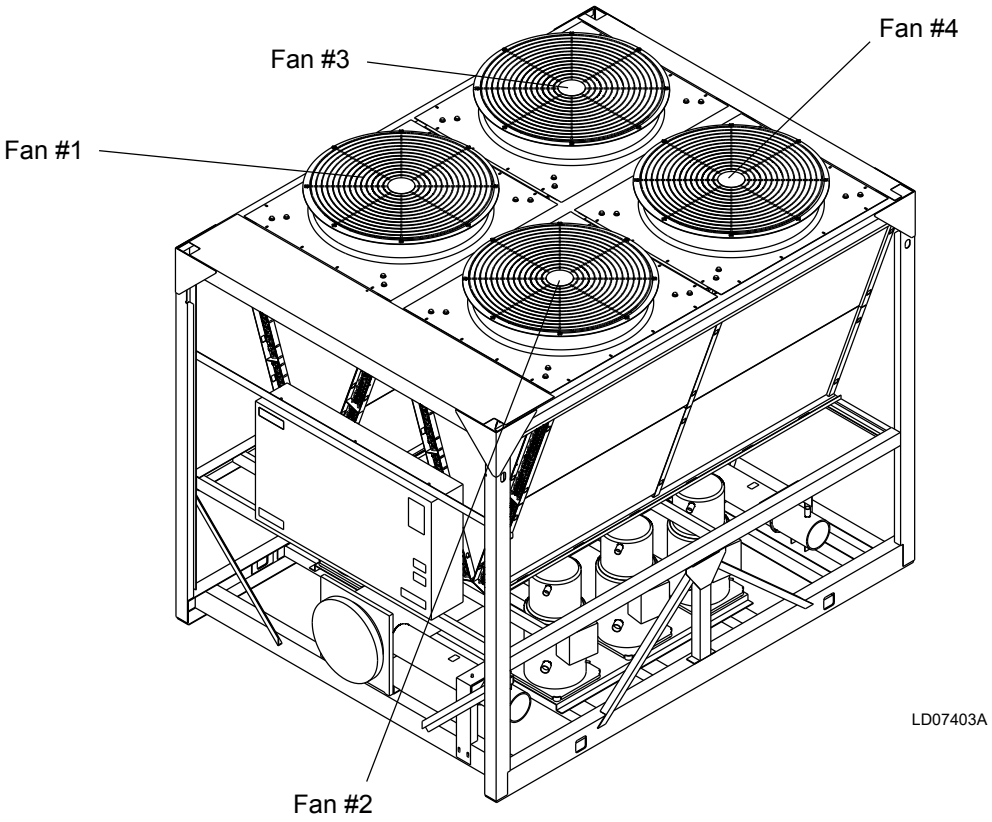
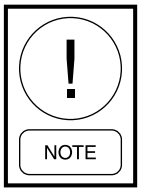


FIGURE 25 - QCC3080C – QCC3090C FAN LOCATION (TYPICAL)

Condenser fan control: QCC3080CZE – QCC3090CZE

TABLE 38 - QCC3080C – QCC3090C LOW AMBIENT CONDENSER FAN CONTROL – DISCHARGE PRESSURE CONTROL

FAN STAGE	ON	OFF	CONTACTOR		I/O BOARD OUTPUT		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1 1 FAN REV	DP > Fan Ctrl On Press	DP < Fan Ctrl On Press – Diff. Press.	7M	10M	TB7-8	TB10-8	1 REV	2 REV
2 1 FAN FWD	DP > Fan Ctrl On Press + 20 psig (1.38 Bars)	DP < Fan Ctrl On Press.) – [Diff Press. + 20 psig (1.38 Bars)]	8M	11M	TB7-9	TB10-9	3 FWD	4 FWD
3 2 FANS FWD	DP > Fan Ctrl On Press + 40 psig (2.76 Bars)	DP < Fan Ctrl On Press.) – [Diff Press. + 40 psig (2.76 Bars)]	8M and 9M	11M and 12M	TB7-9 and TB7-10	TB10-9 and TB10-10	1 and 3 FWD	2 and 4 FWD



When Low Ambient Control of the fans is selected, fan control will be by discharge pressure only.

Condenser fan control: QCC3100CYE – QCC3130CZE

Condenser fan control

Condenser fan control on models QCC3100C – QCC3130C will always be by discharge pressure. The on pressure and the differential off pressure are programmable under the PROGRAM key.

The following Figures and Tables outline fan sequencing for the various models. These models are equipped to operate to 0°F ambient as a standard.

TABLE 39 - QCC3100C – QCC3130C CONDENSER FAN CONTROL

FAN STAGE	ON	OFF	CONTACTOR		I/O BOARD OUTPUT		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1 1 FAN FWD	DP > Fan Ctrl On Press	DP < Fan Ctrl On Press – (Diff. Press.)	10M	14M	TB7-9	TB10-9	7	8
2 2 FANS FWD	DP > Fan Ctrl On Press + 20 psig (1.38 Bars)	DP < Fan Ctrl On Press. – [(Diff Press.) + 20 psig (1.38 Bars)]	9M and 10M	13M and 14M	TB7-9 and TB7-10	TB10-9 and TB10-10	5 and 7	6 and 8
3 3 FANS FWD	DP > Fan Ctrl On Press + 40 psig (2.76 Bars)	DP < Fan Ctrl On Press.) – [(Diff Press.) + 40 psig (2.76 Bars)]	8M, 9M and 10M	12M, 13M and 14M	TB7-8, TB7-9 and TB7-10	TB10-8, TB10-9 and TB10-10	3, 5 and 7	4, 6 and 8

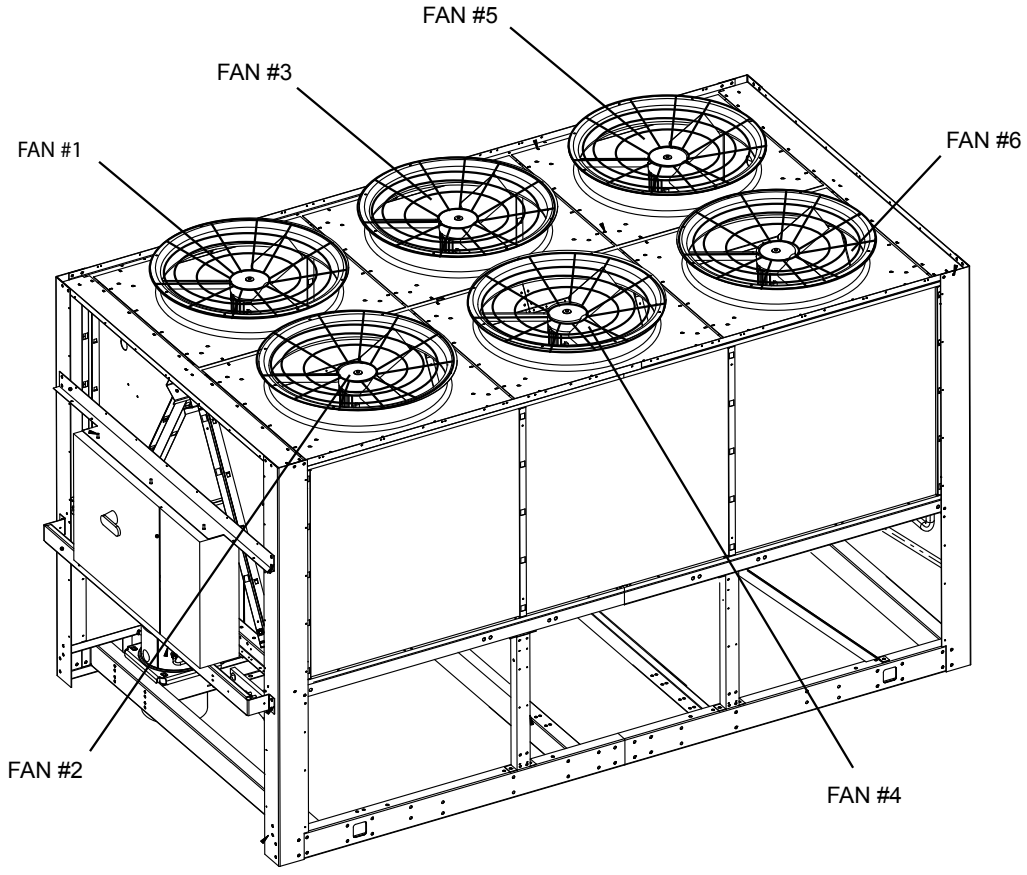


FIGURE 26 - QCC3100C – QCC3130C FAN LOCATION

Condenser fan control: QCC3145C – QCC3160C

Condenser fan control on models QCC3145C – QCC3160C will always be by discharge pressure. The on pressure and the differential off pressure are programmable under the PROGRAM key.

The following Figure and Table outlines fan sequencing for the various models. These models are equipped to operate to 0°F ambient as a standard.

TABLE 40 - QCC3145C – QCC3160C CONDENSER FAN CONTROL

FAN STAGE	ON	OFF	CONTACTOR		MICROBOARD OUTPUT TB-4		FAN #	
			SYS 1	SYS 2	SYS 1	SYS 2	SYS 1	SYS 2
1 **1 FAN FWD**	DP > Fan Ctrl On Press	DP < Fan Ctrl On Press – (Diff. Press.)	10M	14M	2	6	7	8
2 **2 FANS FWD**	DP > Fan Ctrl On Press + 20 psig (1.38 Bars)	DP < Fan Ctrl On Press – [(Diff. Press.) + 20 psig (1.38 Bars)]	9M and 10M	13M and 14M	2 and 4	6 and 8	5 and 7	6 and 8
3 **3 FANS FWD**	DP > Fan Ctrl On Press + 40 psig (2.76 Bars)	DP < Fan Ctrl On Press – [(Diff. Press.) + 40 psig (2.76 Bars)]	7M, 8M, and 10M	11M, 12M and 14M	2 and 5	6 and 9	1, 3 and 7	2, 4 and 8
4 **4 FANS FWD**	DP > Fan Ctrl On Press + 60 psig (4.14 Bars)	DP < Fan Ctrl On Press – [(Diff. Press.) + 60 psig (4.14 Bars)]	7M, 8M, 9M, 10M	11M, 12M, 13M, 14M	2, 4 and 5	6, 8 and 9	1, 3 5, 7	2, 4 6, 8

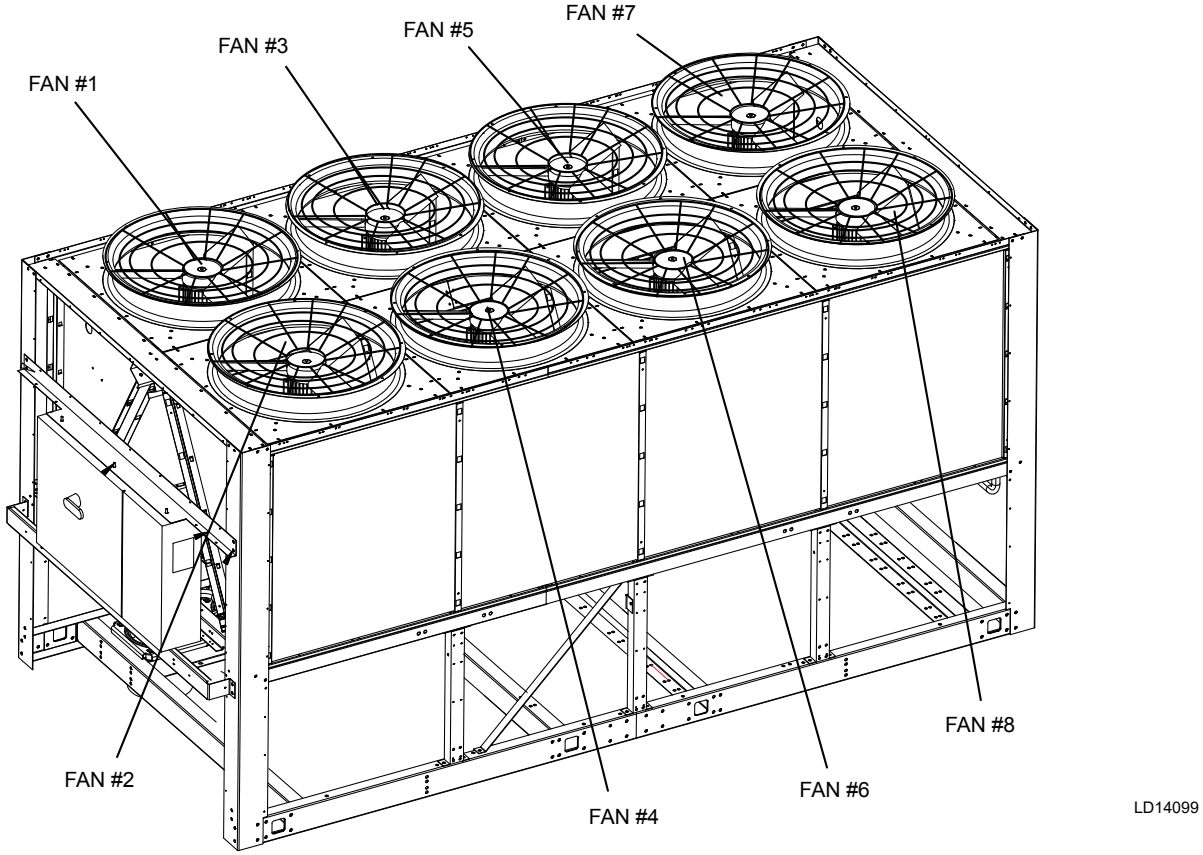


FIGURE 27 - QCC3145C – QCC3160C FAN LOCATION

Load limiting

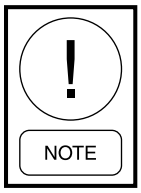
Load Limiting is a feature that prevents the unit from loading beyond the desired value. 2 and 4 compressor units can be load limited to 50%. This would allow only 1 compressor per system to run. 3 and 6 compressor units can be load limited to 33% or 66%. The 66% limit would allow up to 2 compressors 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 BAS.

A second way to load limit the unit is through 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. *Table 41 on page 147* shows the load limiting permitted for the various numbers of compressors.

TABLE 41 - 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. The respective contact will close anytime a compressor is running in that particular system.

The compressor Run Status contacts can also be used to cycle the evaporator fan contactor with the compressors.

Alarm status

System or unit shutdown is indicated by normally-open contacts opening whenever the unit shuts down on a unit fault, or locks out on a system fault. 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.

BAS/EMS discharge air temperature reset using a voltage or current signal

The Remote Reset Option allows the Control Center of the unit to reset the discharge air temperature 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 discharge air temp setpoint for values between 0 VDC and 10 VDC, use the following formula:

Setpoint = Local Discharge Air Temp Setpoint + °Reset

$$\text{°Reset} = \frac{(\text{DC voltage signal}) \times (\text{*Max Reset Value})}{10}$$

Example:
Local Discharge Air Temp Setpoint = 45 °F (7.22 °C)

*Max Reset Value = 20 °F (11.11 °C)
Input Signal = 6 VDC

(Imperial)

$$\text{°Reset} = \frac{6\ \text{VDC} \times 20\ \text{°F}}{10} = 12\ \text{°F Reset}$$

New Setpoint = 45 °F + 12 °F = 57 °F

(Metric)

$$\text{°Reset} = \frac{6\ \text{VDC} \times 11.11\ \text{°C}}{10} = 6.67\ \text{°C Reset}$$

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 the programming section under Cooling Setpoints. Programmable values are from 2 °F to 40 °F (1.11 °C to 11.11 °C).

** Note: The Suction Pressure Setpoints are not remotely resettable.

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 discharge air temp setpoint for values between 4 mA and 20 mA use the following formula:

Setpoint = Local Discharge Air Temp Setpoint + °Reset

$$\text{°Reset} = \frac{(\text{mA signal} - 4) \times (\text{*Max Reset Value})}{16}$$

Example:
Local Discharge Air Temp Setpoint = 45° (7.22 °C)

*Max Reset Value = 10 °F (5.56 °C)
Input Signal = 12 mA

(Imperial)

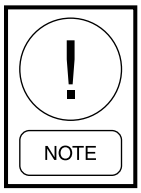
$$\text{°Reset} = \frac{8\ \text{mA} \times 10\ \text{°F}}{16} = 5\ \text{°F Reset}$$

Setpoint = 45 °F + 5 °F = 50 °F

(Metric)

$$\text{°Reset} = \frac{8\ \text{mA} \times 5.56\ \text{°C}}{16} = 2.78\ \text{°C Reset}$$

Setpoint = 7.22 °C + 2.78 °C = 10.0 °C



A 240-24 Volt Ratio Transformer (T3) is used to derive nominal 12 V output from the 120 V supply.

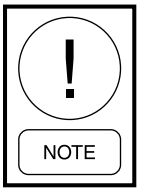
Section 9: Service and troubleshooting

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.

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 unit 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

A display may 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 condensing unit configuration

After the Outputs are displayed, the next group of displays relate to unit 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 unit configuration.

Soft start (disabled), Refrigerant Type (R-410A and R-454B), 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 unit configuration selections, in order of appearance:

HOT GAS BYPASS TYPE
UNIT TYPE (Standard or Heat Pump)
COMPRESSOR HOURS
COMPRESSOR STARTS
DATA LOGGING TIMER X SECS
FAN CONTROL TYPE (Single)
SOFT START (disabled)
REFRIGERANT TYPE (R410A 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

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 micro 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:

```
SYS 1 SUCT PR J7-10
 2.1 VDC = 81 PSIG
```

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 volts dc which corresponds to 81 psig (5.6 bars) 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 1 3 - 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 and outputs

These tables 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 42 - I/O DIGITAL INPUTS

J13-2	Unit ON/OFF Switch
J13-3	Load Limit Stage 2 on 3, 5 and 6 Comp. Units
J13-4	Load Limit Stage 1
J13-5	SYS 1 Zone Thermostat
J13-6	SYS 2 Zone Thermostat
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 43 - 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 and 7	Evaporator Pump Starter
TB10-7	SYS 2 Hot Gas Bypass Valve

TABLE 44 - I/O ANALOG INPUTS

J7-10	SYS 1 Suction Transducer
J11-12	Unit Type: Chiller = NO Jumper J11-12 to +24 VDC QCC3 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 (Not Used)
J6-8	Discharge Air Temp Sensor
J9-10	SYS 2 Suction Pressure Transducer
J9-11	SYS 2 Discharge Pressure Transducer
J7-12	Unit/SYS 1 Voltage
J9-12	SYS 2 Voltage

TABLE 45 - I/O ANALOG OUTPUTS

N/A	Not Applicable

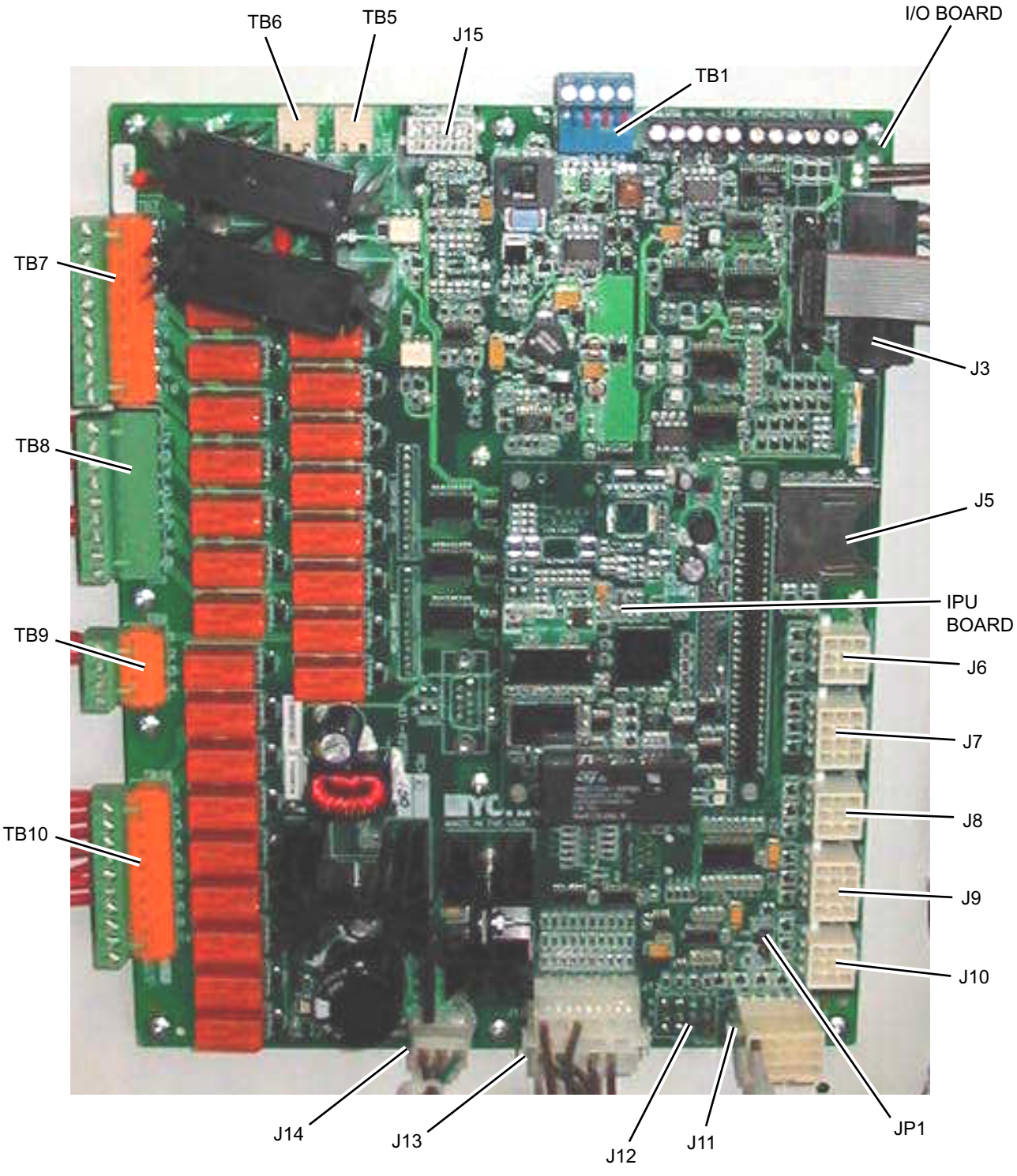


FIGURE 28 - MICROBOARD LAYOUT

Checking inputs and outputs

Digital inputs

Refer to 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 volts DC will be applied to J13, pin 5 (J13-5) of the I/O board. If the flow switch is open, 0 volts DC will then be present at J13-5.

Pin 1 of J13 is an unregulated 30VDC 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, 0VDC 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.

Temperature analog inputs

Refer to 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 46 on page 153* for voltage readings that correspond to specific outdoor temperatures.

J6-3 = drain (shield connection = 0 VDC) Return

TABLE 46 - 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 47 - DISCHARGE AIR TEMPERATURE SENSOR TEMPERATURE/VOLTAGE/RESISTANCE CORRELATION

TEMP °F	VOLTAGE	RESISTANCE	TEMP °C
0	1.71	25619	-18
2	1.78	24046	-17
4	1.85	22580	-16
6	1.93	21214	-14
8	2.00	19939	-13
10	2.07	18749	-12
12	2.15	17637	-11
14	2.22	16599	-10
16	2.30	15629	-9
18	2.37	14721	-8
20	2.45	13872	-7
22	2.52	13077	-6
24	2.59	12333	-4
26	2.67	11636	-3
28	2.74	10982	-2
30	2.81	10370	-1
32	2.88	9795	0
34	2.95	9256	1
36	3.02	8750	2
38	3.08	8276	3
40	3.15	7830	4
42	3.21	7411	6
44	3.27	7017	7
46	3.33	6647	8
48	3.39	6298	9
50	3.45	5970	10
52	3.51	5661	11
54	3.56	5370	12
56	3.61	5096	13
58	3.67	4837	14
60	3.72	4593	16
62	3.76	4363	17
64	3.81	4145	18
66	3.86	3941	19
68	3.90	3747	20
70	3.94	3564	21
72	3.98	3392	22
74	4.02	3228	23
76	4.06	3074	24
78	4.10	2928	26
80	4.13	2790	27

Discharge air temperature sensor

J6-5 = +5 VDC regulated supply to sensor.

J6-8 = vdc input signal to the microboard. See *Table 47 on page 154* for voltage readings that correspond to specific discharge temperatures.

J6-2 = drain (shield connection = 0 VDC)

Pressure analog inputs

Refer to 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 QCC3 units. 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 650 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 48 - 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 = (Pressure in psig x .01) + .5

or

V = (Pressure in barg x .145) + .5

where V = DC voltage output
Pressure = pressure sensed by transducer

The I/O board connections for the Discharge Transducers:

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 = 0 VDC)

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 psig 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 = (Pressure in psig x .02) + .5

or

V = (Pressure in barg x .29) + .5

where V = dc voltage input to micro
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 = 0VDC)

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 = 0 VDC)

Digital outputs

Refer to the unit wiring diagram and *Figure 29 on page 156*. 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 (see *Figure 29 on page 156*).

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 29 on page 156* illustrates the relay contact architecture on the microboard.

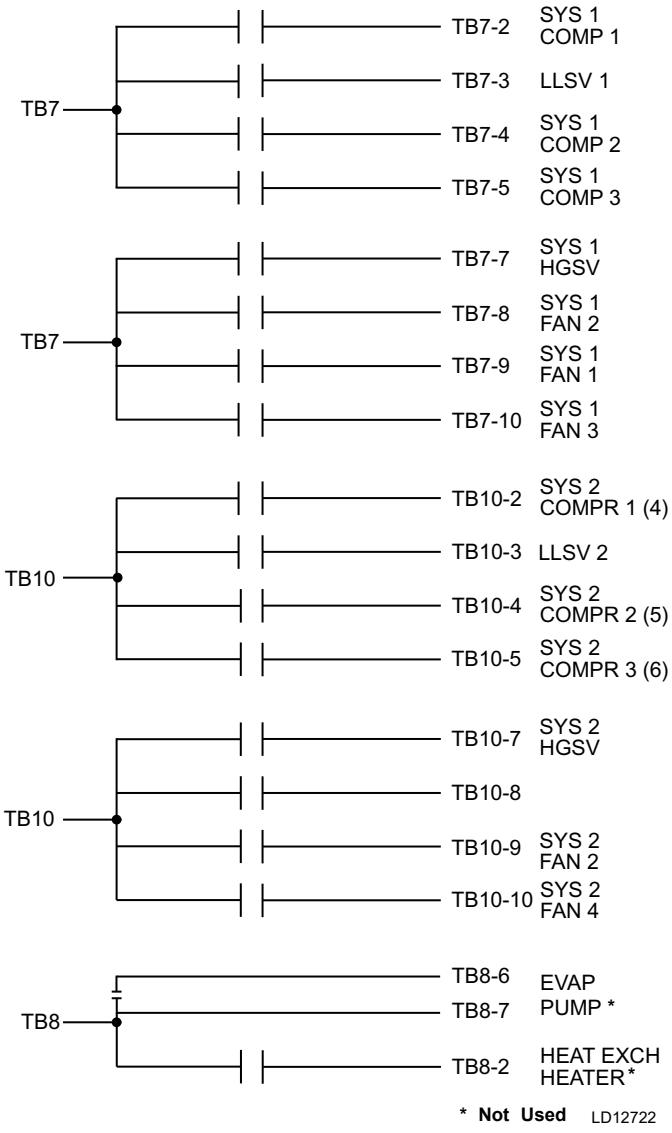


FIGURE 29 - I/O BOARD RELAY CONTACT ARCHITECTURE

Optional printer installation

The micro panel is capable of supplying a printout of unit conditions or fault shutdown information at any given time. This allows operator and service personnel to obtain data and system status with the touch of the keypad. In addition to manual print selection, the micro panel will provide an automatic printout whenever a fault occurs. Detailed explanation of the print function is given under “Print Key” located in the Keypad and Display section.

Quantech recommends the field tested WEIGH-TRONIX model 1220 printer (or former IMP 24). This is a compact low cost printer that is ideal for service work and data logging.

The printer can be obtained by contacting WEIGH-TRONIX for purchase information at:

WEIGH-TRONIX
2320 Airport Blvd.
Santa Rosa, CA 95402
Phone: 1-800-982-6622 or 1-707-527-5555
(International Orders Only)

The part number for the printer that is packaged specifically for Quantech is P/N 950915576. The cable to connect the printer can either be locally assembled from the parts listed, or ordered directly from WEIGH-TRONIX under part number 287-040018.

Parts

The following parts are required:

1. WEIGH-TRONIX model 1220 printer.
2. 2.25 in. (5.7 cm) wide desk top calculator paper.
3. 25 ft (7.62 m) maximum length of Twisted Pair Shielded Cable (minimum 3 conductor), #18 AWG stranded, 300 V minimum insulation.
4. One 25 pin Cannon connector and shell.
   Connector: Cannon P/N DB-25P or equivalent.
   Shell: Cannon P/N DB-C2-J9.

Assembly and wiring

All components should be assembled and wired as shown in *Figure 30 on page 157*. 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

A printout is obtained by pressing the PRINT key on the keypad and then pressing either the OPER DATA key or HISTORY key.

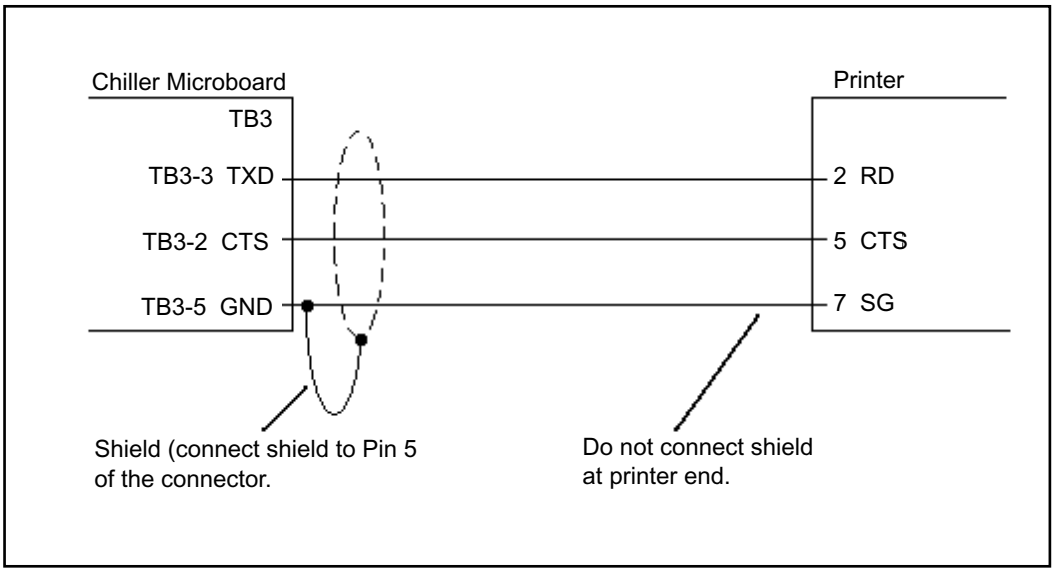


FIGURE 30 - PRINTER TO MICROBOARD ELECTRICAL CONNECTIONS

TABLE 49 - TROUBLESHOOTING

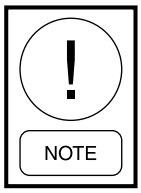
PROBLEM	CAUSE	SOLUTION
NO DISPLAY ON PANEL. UNIT WILL NOT OPERATE	1. No 115 VAC to 24 VAC Transformer.	1a. Check wiring and fuse 1FU. 1b. Check wiring emergency stop contacts 5 to L of XTBC2 Terminal Block. 1c. Replace Control Transformer.
	2. No 24 VAC to Microboard.	2. Check wiring Control Transformer to Microboard.
	3. Control Transformer defective, no 24 VAC output.	3. Replace Control Transformer.
	4. Short in wire to temp. sensors or pressure transducers.	4. Unplug connections at IPU I and I/O Board to isolate.
	5. Defective IPU II and I/O Board or the Display Board.	5. Replace IPU II and I/O Board or the Display Board.  ***Contact Quantech Service before replacing Circuit Boards!***
"FLOW SWITCH/REM STOP NO RUN PERMISSIVE"	1. No air flow.	1. Check air flow.
	2. Air Proving Switch improperly installed.	2. Check that the Air Proving Switch is installed according to manufacturer's instructions.
	3. Defective Air Proving Switch.	3. Replace Air Proving Switch.
	4. Remote cycling device open.	4. Check cycling devices connected to terminals 13 and 14 of the XTBC1 Terminal Block.
"LOW SUCTION PRESSURE FAULT"	1. Improper suction pressure cutouts adjustments.	1. Adjust per recommended settings.
	2. Low refrigerant charge.	2. Repair leak if necessary and add refrigerant.
	3. Fouled Filter Dryer.	3. Change Dryer/Core.
	4. TXV defective.	4. Replace TXV.
	5. Reduced air flow.	5. Check air flow.
	6. Defective Suction Pressure Transducer/Low Pressure Switch or wiring.	6. Replace Transducer/Low Pressure Switch or faulty wiring. See *Section 9: Service and troubleshooting* for pressure/voltage formula.
	7. LLSV defective.	7. Replace LLSV.

TABLE 38 - troubleshooting (cont'd)

PROBLEM	CAUSE	SOLUTION
"HIGH DISCHARGE PRESSURE" FAULT	1. Condenser fans not operating or operating backwards.	1. Check Fan Motor, and Contactors. Ensure Fan blows air upward.
	2. Too much refrigerant.	2. Remove refrigerant.
	3. Air in refrigerant system.	3. Evacuate and recharge system.
	4. Defective Discharge Pressure Transducer.	4. Replace discharge pressure. See *Section 9: Service and troubleshooting* for pressure/voltage formula.
"MP / HPCO" FAULT	1. Compressor Internal Motor Protector (MP) open.	1. Verify refrigerant charge is not low. Verify superheat setting of 10°F - 15°F (5.6°C - 8.3°C). Verify compressor is not over loaded.
	2. External overload tripped.	2. Determine cause and reset.
	3. HPCO Switch open.	3. See "High Press. Disch." Fault.
	4. Defective HPCO Switch.	4. Replace HPCO Switch.
	5. Defective CR Relay.	5. Replace Relay.
COMPRESSOR(S) WON'T START	1. Demand not great enough.	1. No problem. Consult "Installation" Manual to aid in understanding compressor operation and capacity control.
	2. Defective Water Temperature Sensor.	2. Compare the display with a thermometer. Should be within +/- 2 degrees. See *Section 9: Service and troubleshooting* for RWT/ LWT temp./ voltage table.
	3. Contactor/Overload failure.	3. Replace defective part.
	4. Compressor failure.	4. Diagnose cause of failure and replace.
LACK OF COOLING EFFECT	1. Check DX Coil.	1. Contact the local Quantech service representative.
	2. Improper air flow through the DX Coil.	2. Reduce flow to within unit design specs. See Limitations in Installation Section.
	3. Low refrigerant charge. Low suction pressure will be observed.	3. Check subcooling and add charge as needed.

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Section 10: Maintenance

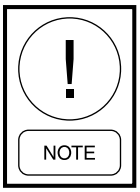
It is the responsibility of the equipment owner to perform maintenance on the system.

Important

If system failure occurs due to incorrect 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 provided by Quantech. System components must be maintained according to the individual manufacture's recommendations as their operation affects 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 must be taken and analyzed. If contaminants are present, clean the system to prevent compressor failure.

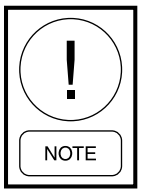
Never use the scroll compressor to pump the refrigerant system down into a vacuum. Doing so causes internal arcing of the compressor motor which will result in failure of compressor.

Condenser fan motors

Condenser fan motors are permanently lubricated and require no maintenance.

Condenser MCHX

Dirt must not be allowed to accumulate on the MCHX condenser surfaces. Cleaning should be as often as necessary to keep 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 document 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. The following care points must be followed during cleaning:

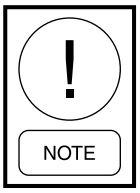
- **Do not** use high pressure water, such as a pressure washer, to clean the coils. High pressure water can damage the fins and the protective coatings on the coil.
- **Do not** contact the coil with a hard object such as a hose nozzle, hard vacuum nozzle or any other tool. Hard objects or tools can cause mechanical damage to the coil material and protective coatings on the coil.
- **Do not** use caustic or acidic cleaning solutions on the 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 proper procedures to maintain the integrity of each type of coil.

Cleaning procedure required for standard and environment guard microchannel coils

Standard and Environment Guard microchannel coils must be cleaned following this procedure at least once per quarter to ensure that the integrity of the coils and the warranty of the coils are maintained. In environments where coils become heavily fouled, a monthly frequency of cleaning is recommended. 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.



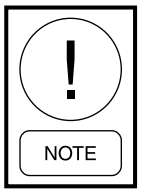
Standard and Environment Guard coils are gray/silver in color.

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 a soft bristle brush, not wire, can also be used. 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.
3. Apply a coil cleaning solution approved by Johnson Controls. Johnson Controls approves the use of RectorSeal brand GulfCleanTM 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 mins.
4. Repeat the water rinse as described in Step 2 to remove the cleaning solution.
5. It is important to remove and 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 properly dry the coils. Any excess water can also be removed by blowing air through the coils with a hand held blower or vacuum.

Cleaning procedure for environment guard premium microchannel coils

Environment Guard Premium microchannel coils must be cleaned following this procedure at least once quarterly to ensure that the integrity of the coils and the warranty of the coils are maintained. In environments 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 1-8. 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 a soft bristle brush, not wire, can also be used. 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.

3. Apply a coil cleaning solution approved by Johnson Controls. Johnson Controls approves the use of RectorSeal brand GulfClean™ coil cleaner 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 Johnson Controls. Johnson Controls approves the use of RectorSeal brand GulfClean™ salt reducer 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 are wetted with the solution. Allow the salt reducer solution to remain on each of the coils for approximately 10 mins.
6. Repeat the water rinse as described in Step 2 to remove the salt reducer solution. The final rinse must be thorough to ensure all cleaning solution and salt reducer solution is removed from the coils.
7. It is important to remove any excess water trapped in the coils imemdiately after the final water rinse. The condenser fans on the chiller can be run after the final water rinse to correctly dry the coils. Any excess water can also be removed by blowing air through the coils with a hand helf blower or vacuum.
8. Visually inspect the Environment Guard Premium coating for any damage, degradation, or bare spots. If touch up of the coating is necessary, follow the process and materials approved by Quantech in the condenser coil repair guide.

Steps to touch-up small sections of finned coil surface

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 mins.
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 and condenser coil headers:

In cases where e-coating on the end tubes or condenser coil headers are showing signs of degredation, two-part Urethane Mastic must be used for touch-up. Do not use

Do not use two-part Urethane Mastic on finned coil surface. Using Urethane Mastic on finned surfaces may result in blockage of fin sections which leads to a reduction in air flow across the coil.

two-part Urethane Mastic on finned coil surface.

Materials required:

- Two-part urethane mastic kit, part number 013-04188-000)
- 1 x mixing dish
- 3 x 3 ml droppers
- Soft bristle paint brush

Complete the following steps to touch-up end tubes and condenser coil headers:

1. Two-part Urethane Mastic kit consists of Component A-Urethane Mastic (black component) and Component B-Urethane Mastic Activator (clear component).
2. 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.
3. Gently shake the can containing component B (Activator).
4. Urethane Mastic and Activator must be mixed in a 5:1 ratio. Using one dropper, add 5 ml of com-

ponent A to the mixing dish.

5. Using the clean, second dropper, add 1 ml of component B to the mixing dish.
6. Mix the components well and allow the solution in the dish to set for 30 mins. Power mixing is preferred. If required, make more of the solution for application.
7. Using the paint brush, apply the touch-up paint to the end tubes or coil headers as required.

PART NUMBER (P/N)	DESCRIPTION
013-04185-000	Cleaner, Coil, 4-1 gal
013-04185-001	Cleaner, Coil, 1 gal
013-04186-000	Reducer, Salt, 4-1 gal
013-04186-001	Reducer, Salt, 1 gal
013-04187-000	Paint, Touch-up 12 oz
013-04188-000	Mastic, two-part Urethane

Chilled liquid system maintenance

Whenever the chilled liquid system requires maintenance, adhere to and observe all precautions noted below.

Scheduled maintenance

The maintenance operations detailed in this section must be carried out on a regular basis by a suitably qualified Service Engineer. It should be noted that the interval necessary between each ‘minor’ and ‘major’ service can vary depending on, for instance, application, site conditions and expected operating schedule. Normally a ‘minor’ service should be carried out every three to six months and a ‘major’ service once a year. It is recommended that your local Quantech Service Center is contacted for recommendations for individual sites.

Chiller / compressor operating log

A Chiller/Compressor Operating Log is supplied at the end of this section for logging compressor and chiller operating data.

Evaporator freeze damage

Power must remain on the chiller whenever the ambient temperature drops below 32°F with water in the evaporator to avoid evaporator damage. To avoid damage, assure the correct heater option for 0°F minimum ambient or -20°F minimum ambient temperature is installed, based on the lowest expected ambient temperature at the chiller location.

During operation, the glycol freeze point must also be below the lowest expected refrigerant temperature.

Glycol concentration

If glycol is installed in the evaporator, the glycol concentration must assure that the freeze point is below the lowest expected ambient temperature at the chiller location to avoid evaporator damage.

Winterization

If glycol is installed in the evaporator, the glycol concentration must assure that the freeze point is below the lowest expected ambient temperature at the chiller location to avoid evaporator damage.

Before applying power to the chiller, ensure the chilled liquid system is filled

DO NOT apply power to the chiller unless the system is filled with water or glycol. If the chiller is equipped with the -20°F option, applying power to an empty chilled liquid system will cause the evaporator immersion heaters to fail.

Removing water/glycol from the evaporator

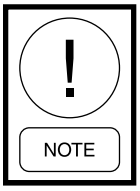
If the chiller is equipped with a -20°F evaporator freeze protection option, which incorporates immersion heaters, power must be removed from the chiller before the evaporator is drained to assure the heaters are not damaged. Failure to remove power will cause the evaporator immersion heaters to fail.

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.

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.

BAS control

Received data: control data

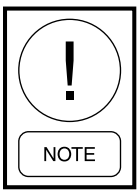
The unit receives 8 data values from the BAS. The first 4 are analog values and the last 4 are digital values. These 8 data values are used as control parameters when in REMOTE mode. When the unit is in LOCAL mode, these 8 values are ignored. If the unit receives no valid BAS transmission for 5 minutes, it will revert back to all local control values. *Table 50 on page 166* lists the 5 control parameters. These values are found under feature 54 on the BAS.

TABLE 50 - BAS RECEIVED DATA

BAS PAGE	CONTROL DATA
P03	Setpoint Cooling
P04	Load Limit Stage (0,1, 2)
P05	—
P06	—
P07	Start/Stop Command (0 = Stop, 1 = Run)
P08	—
P09	—
P10	History Buffer Request (0 = Current Data, 1 = Last History Data)

Transmitted data

After receiving a valid transmission from the BAS, the unit will transmit either operational data or history buffer data depending on the "History Buffer Request" on BAS PAGE 10. Data must be transmitted for every BAS page under feature 54. If there is no value to be sent to a particular page, a zero will be sent. *Table 51 on page 166* show the data values and page listings for this unit.



BAS PAGES listed are ENG PAGE REFERENCES and must be decoded to the corresponding PAGE REF point map related to the communications protocol type utilized. The latest point map information is available from the Chillers Knowledge Exchange website at docs.johnsoncontrols.com/chillers/

TABLE 51 - BAS TRANSMITTED DATA

BAS PAGE	CHARACTER	TYPE	DATA
P11	8-11	Analog	Leaving Chilled Liquid Temp.
P12	12-15	Analog	Return Chilled Liquid Temp.
P13	16-19	Analog	----
P14	20-23	Analog	----
P15	24-27	Analog	SYS 1 Suction Temp. (EEV Only)
P16	28-31	Analog	Ambient Air Temp.
P17	32-35	Analog	SYS 1 Suction Superheat (EEV Only)
P18	36-39	Analog	SYS 1 Run Time (Seconds)
P19	40-43	Analog	SYS 1 Suction Pressure
P20	44-47	Analog	SYS 1 Discharge Pressure
P21	48-51	Analog	----
P22	52-55	Analog	----
P23	56-59	Analog	SYS 1 EEV Output % (EEV Only)
P24	60-63	Analog	SYS 1 Anti-Recycle Timer
P25	64-67	Analog	Anti-Coincidence Timer
P26	68-71	Analog	SYS 2 Suction Temp. (EEV Only)
P27	72-75	Analog	SYS 2 Run Time (Seconds)
P28	76-79	Analog	SYS 2 Suction Pressure
P29	80-83	Analog	SYS 2 Discharge Pressure
P30	84-87	Analog	----
P31	88-91	Analog	----
P32	92-95	Analog	SYS 2 Suction Superheat (EEV Only)
P33	96-99	Analog	SYS 2 Anti-Recycle Timer
P34	100-103	Analog	SYS 2 EEV Output % (EEV Only)
P35	104-107	Analog	# of Compressors
P36	108	Digital	SYS 1 Alarm
P37	109	Digital	SYS 2 Alarm

table 40 – BAS Transmitted Data (CONT'D)

BAS PAGE	CHARACTER	TYPE	DATA
P38	110	Digital	Evaporator Heater Status
P39	111	Digital	Evaporator Pump Status
P40	112	Digital	SYS 1 Comp. 2 Run
P41	113	Digital	SYS 2 Comp. 2 Run
P42	114	Digital	SYS 1 Liquid Line Solenoid Valve or EEV Pilot Solenoid
P43	115	Digital	SYS 1 Hot Gas Bypass Valve
P44	116	Digital	SYS 1 Comp. 2 Run
P45	117	Digital	SYS 2 Comp. 2 Run
P46	118	Digital	SYS 2 Liquid Line Solenoid Valve or EEV Pilot Solenoid
P47	119	Digital	Lead System (0=SYS 1, 1=SYS 2)
P48	120	Digital	SYS 1 Comp.3 Run
P49	121	Digital	SYS 2 Comp. 3 Run
P50	122	Digital	Chilled Liquid Type (0=Water, 1=Glycol)
P51	123	Digital	Ambient Control Mode (0=Std. Ambient, 1=Low Ambient)
P52	124	Digital	Local/Remote Control Mode (0=Local, 1=Remote)
P53	125	Digital	Units (0=Imperial, 1= SI)
P54	126	Digital	Lead/Lag Control Mode (0=Manual,1= Remote)
P55	127	Digital	----
P56	128	Coded	* SYS 1 Operational Code
P57	129	Coded	* SYS 1 Fault Code
P58	130	Coded	* SYS 2 Operational Code
P59	131	Coded	* SYS 2 Fault Code
P60	132	Coded	----

table 40 – BAS Transmitted Data (CONT'D)

BAS PAGE	CHARACTER	TYPE	DATA
P61	133	Coded	SYS 1 Condenser Fan Stage
P62	134	Coded	----
P63	135	Coded	SYS 2 Condenser Fan Stage
P64	136	Coded	----
P65	137	Coded	Unit Control Mode (0=Leaving Water, 1=Return Water, 2=Discharge Air, 3=Suction Press., 4=Cooling 5=Heating)
P66	138-141	Analog	Anti-Recycle Timer
P67	142-145	Analog	Leaving Chilled Liquid Temp. Cutout
P68	146-149	Analog	Low Ambient Temp. Cutout
P69	150-153	Analog	----
P70	154-157	Analog	Low Suction Pressure Cutout
P71	158-161	Analog	High Discharge Pressure Cutout
P72	162-165	Analog	Setpoint
P73	166-169	Analog	Cooling Range
P74	170-173	Analog	----
P75	174-177	Analog	----
P76	178-181	Analog	SYS 1 Discharge Temp. (EEV Only-Optional)
P77	182-185	Analog	SYS 1 Discharge Superheat (EEV Only- Optional)
P78	186-189	Analog	SYS 2 Discharge Temp. (EEV Only- Optional)
P79	190-193	Analog	SYS 2 Discharge Superheat (EEV Only- Optional)
P80	194	Digital	----
P81	195	Digital	----
P82	196	Digital	----
P83	197	Digital	----
P84	198	Digital	----

* The operational and fault codes sent to BAS pages 56 through 59 are defined in Table 42. Note that this table of fault and operational codes is for all DX products.

TABLE 52 - BAS OPERATIONAL AND FAULT CODES

P56/58	OPERATIONAL CODE
0	NO ABNORMAL CONDITION
1	UNIT SWITCH OFF
2	SYSTEM SWITCH OFF
3	LOCK-OUT
4	UNIT FAULT
5	SYSTEM FAULT
6	REMOTE SHUTDOWN
7	DAILY SCHEDULE SHUTDOWN
8	NO RUN PERMISSIVE
9	NO COOL LOAD
10	ANTI-COINCIDENCE TIMER ACTIVE
11	ANTI-RECYCLE TIMER ACTIVE
12	MANUAL OVERRIDE
13	SUCTION LIMITING
14	DISCHARGE LIMITING
15	CURRENT LIMITING
16	LOAD LIMITING
17	COMPRESSOR(S) RUNNING
18	HEAT PUMP LOAD LIMITING

P57/59	FAULT CODE
0	NO FAULT
1	VAC UNDER VOLTAGE
2	LOW AMBIENT TEMPERATURE
3	HIGH AMBIENT TEMPERATURE
4	LOW LEAVING CHILLED LIQUID TEMP
5	HIGH DISCHARGE PRESSURE
6	HIGH DIFFERENTIAL OIL PRESSURE
7	LOW SUCTION PRESSURE
8	HIGH MOTOR CURRENT
9	LLSV NOT ON
10	LOW BATTERY WARNING
11	HIGH OIL TEMPERATURE
12	HIGH DISCHARGE TEMPERATE
13	IMPROPER PHASE ROTATION
14	LOW MOTOR CURRENT / MP / HPCO
15	MOTOR CURRENT UNBALANCED
16	LOW DIFFERENTIAL OIL PRESSURE
17	GROUND FAULT
18	MP /HPCO
19	LOW EVAPORATOR TEMPERATURE
20	INCORRECT REFRIGERANT PROGRAMMED
21 REQUIRED	POWER FAILURE, MANUAL RESET
22	UNIT MOTOR CURRENT
23	LOW SUPERHEAT
24	SENSOR FAIL
25	DISCHARGE INHIBIT
26	MP/HPCO INHIBIT
27	PUMP TRIP
28	PUMP FAIL MAKE FLOW

BACnet and Modbus data communication

Data can be read and in some cases modified using a serial communication BACnet or Modbus network connection. This information allows communications of unit operating parameters and external control changes to setpoint, load limiting, and start/stop commands.

In some cases, BACnet parameters may need to be modified. 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 XXXXX	P2 STOP BITS X
P1 PARITY XXXXX	REAL TIME ERROR ## RESET 1 = YES, 0 = NO 0
P1 STOP BITS X	

The table below shows the minimum, maximum, and default values.

TABLE 53 - 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 the real time error numbers and a description of each.

TABLE 54 - 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

Unit data that can be read and modified using specific Modbus Register Addresses; and the data associated with the addresses, is outlined in the following description:

Serial communication analog value data

This data can be read and modified using a BACnet or Modbus network connection. The Modbus Register Address for these points is 1025 + AV #.

TABLE 55 - SERIAL COMMUNICATION ANALOG VALUE DATA

AV	BACNET NAME	ANALOG VALUE DESCRIPTION
1	REM_SETP	Setpoint Cooling Setpoint (HP Only), 99 = Auto (40 °F - 70 °F)
2	SP_REM_SP_S1	SYS 1 Setpoint (Suction Pressure Control)
3	LOAD_LIMIT	Load Limit Stage (0, 1, 2)
4	REM_CR	Cooling Range (DAT Mode Only)
5	SP_REM_SP_S2	SYS 2 Setpoint (Suction Pressure Control)
6	REM_SP_HEAT	Heating Setpoint (HP Only) 99 = Auto (95 °F - 122 °F)
7	HP_MODE	Mode (HP Only) (0 = Panel, 1 = Cooling, 2 = Heating)

Serial communication binary value data

This data can be read and modified using a BACnet or Modbus network connection. The Modbus Register Address for these points is 1537 + BV #.

TABLE 56 - SERIAL COMMUNICATION BINARY VALUE DATA

BV	BACNET NAME	BINARY VALUE DESCRIPTION
1	START_STOP	Start / Stop Command
2	SS_SYS1	SYS 1 Start / Stop Command (Suction Pressure Control)
3	SS_SYS2	SYS 2 Start / Stop Command (Suction Pressure Control)

Serial Communication analog input data

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 #.

TABLE 57 - SERIAL COMMUNICATION ANALOG INPUT DATA

AI	BACNET NAME	ANALOG INPUT DESCRIPTION
1	LCHLT	Leaving Chilled Liquid Temp
2	RCHLT	Return Chilled Liquid Temp
3	DAT	Discharge Air Temp (Cond Unit Only)
4	S1_SUCT_TEMP	SYS 1 Suction Temperature (EEV And Cond Unit Only)
5	OAT	Ambient Air Temperature
6	S1_SUCT_SH	SYS 1 Suction Superheat (EEV Only)
7	S1_RUN_TIME	SYS 1 Run Time (Seconds)
8	S1_SUCT_PR	SYS 1 Suction Pressure
9	S1_DSCH_PR	SYS 1 Discharge Pressure
10	S1_CIR_TEMP	SYS 1 Cooler Inlet Refrigerant Temperature (R-407C Only)

table 46 - Serial Communication Analog Input Data (cont'd)

AI	BACNET NAME	ANALOG INPUT DESCRIPTION
11	S1_DEF_TEMP	SYS 1 Defrost Temperature (HP Only)
12	S1_EEV_OUT	SYS 1 EEV Output % (EEV Only)
13	S1_AR_TIMER	SYS 1 Anti-Recycle Timer
14	AC_TIMER	Anti-Coincident Timer
15	S2_SUCT_TEMP	SYS 2 Suction Temperature (EEV and cond unit only)
16	S2_RUN_TIME	SYS 2 Run Time (Seconds)
17	S2_SUCT_PR	SYS 2 Suction Pressure
18	S2_DSCH_PR	SYS 2 Discharge Pressure
19	S2_CIR_TEMP	SYS 2 Cooler Inlet Refrigerant Temperature (R407C Only)
20	S2_DEF_TEMP	SYS 2 Defrost Temperature (HP ONLY)
21	S2_SUCT_SH	SYS 2 SUCTION SUPERHEAT (EEV Only)
22	S2_AR_TIMER	SYS 2 Anti-Recycle Timer
23	S2_EEV_OUT	SYS 2 EEV Output % (EEV Only)
24	NUM_COMPS	Number Of Compressors
25	S1_OP_CODE	SYS 1 Operational Code
26	S1_FLT_CODE	SYS 1 Fault Code
27	S2_OP_CODE	SYS 2 Operational Code
28	S2_FLT_CODE	SYS 2 Fault Code
29	S1_DBG_CODE	SYS 1 Debug Code
30	S1_FAN_STAGE	SYS 1 Condenser Fan Stage
31	S2_DBG_CODE	SYS 2 Debug Code
32	S2_FAN_STAGE	SYS 2 Condenser Fan Stage
33	CONTROL_M0DE	Unit Control Mode (1=Leaving Water, 2=Return Water. 3=Discharge Air, 4=Suction Press, 5=Cooling, 6=Heating)
34	AR_TIME	Anti-Recycle Time (Programmed)
35	LCHLT_CUT	Leaving Chilled Liquid Temp Cutout
36	LOW_AMB_CUT	Low Ambient Temperature Cutout
37	SUCT_P_CO_HT	Low Suction Pressure Cutout Heating (HP Only)
38	L_SUCT_P_CO	Low Suction Pressure Cutout (Cooling On HP Units)
39	H_DSCH_P_CO	High Discharge Pressure Cutout
40	COOL_SETP	Setpoint
41	SP_SETP_S1	Setpoint 1 (SP Control)
42	CONTROL_RG	Cooling Range
43	SP_CTL_RG_S1	Cooling Range 1 (SP Control)
44	SP_SETP_S2	Setpoint 2 (SP Control)
45	HEAT_SETP	Heating Setpoint (HP Only)
46	SP_CTL_RG_S2	Cooling Range 2 (SP Control)
47	HEAT_RANGE	Heating Range (HP Only)
48	S1_DSCH_TEMP	SYS 1 Discharge Temperature (EEV Only)
49	S1_DSCH_SH	SYS 1 Discharge Superheat (EEV Only)
50	S2_DSCH_TEMP	SYS 2 Discharge Temperature (EEV Only)
51	S2_DSCH_SH	SYS 2 Discharge Superheat (EEV Only)

Serial communication binary input data

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 #.

TABLE 58 - SERIAL COMMUNICATION BINARY INPUT DATA

BI	BACNET NAME	BINARY INPUT DESCRIPTION
1	S1_ALARM	SYS 1 Alarm
2	S2_ALARM	SYS 2 Alarm
3	EVAP_HTR	Evaporator Heater Status
4	EVAP_PUMP	Evaporator Pump Status
5	SI_C1_RUN	SYS Comp 1 Run
6	S2_C1_RUN	SYS 2 Comp 1 Run
7	S1_LLSV	SYS 1 Liquid Line Solenoid Valve
8	S1_MODE_SV	SYS 1 Mode Solenoid Valve (HP Only)
9	S1_HGBV	SYS 1 Hot Gas Bypass Valve
10	S1_BHS	Bivalent Heat Source (HP Only)
11	S1_C2_RUN	SYS 1 Comp 2 Run
12	S2_C2_RUN	SYS 2 Comp 2 Run
13	S2_LLSV	SYS 2 Liquid Line Solenoid Valve
14	S2_MODE_SV	SYS 2 Mode Solenoid Valve (HP Only)
15	LEAD_SYS	Lead System (0 = SYS 1, 1 = SYS 2)
16	S1_C3_RUN	SYS 1 Comp 3 Run
17	S2_C3_RUN	SYS 2 Comp 3 Run
18	CH_LIQ_TYPE	Chilled Liquid Type (0 = Water, 1 = Glycol)
19	AMB_MODE	Ambient Control Mode (O = STD AMB, 1 = LOW AMB)
20	CNTL_MODE_	Local / Remote Control Mode (0 = Local, 1 = Remote)
21	DATA_UNIT	Units (0 = Imperial, 1 = SI)
22	AUTO_LL	Lead / Lag Control Mode (0 = Manual, 1 = Auto)

Temperature conversion chart

TABLE 59 - TEMPERATURE CONVERSION CHART - ACTUAL TEMPERATURE

°F=	°C	°C=	°F
0	-17.8	-18	-0.4
4	-15.6	-16	3.2
8	-13.3	-14	6.8
12	-11.1	-12	10.4
16	-8.9	-10	14
20	-6.7	-8	17.6
24	-4.4	-6	21.2
28	-2.2	-4	24.8
32	0.0	-2	28.4
36	2.2	0	32
40	4.4	2	35.6
44	6.7	4	39.2
48	8.9	6	42.8
52	11.1	8	46.4
56	13.3	10	50
60	15.6	12	53.6
64	17.8	14	57.2
68	20.0	16	60.8
72	22.2	18	64.4
76	24.4	20	68
80	26.7	22	71.6
84	28.9	24	75.2
88	31.1	26	78.8
92	33.3	28	82.4
96	35.6	30	86
100	37.8	32	89.6
104	40.0	34	93.2
108	42.2	36	96.8
112	44.4	38	100.4
116	46.7	40	104
120	48.9	42	17.6
124	51.1	44	111.2
128	53.3	46	114.8
132	55.6	48	118.4
136	57.8	50	122
140	60.0	52	125.6
144	62.2	54	129.2
148	64.4	56	132.8
152	66.7	58	136.4
156	68.9	60	140
160	71.1	62	143.6
164	73.3	64	147.2
168	75.6	66	150.8
172	77.8	68	154.4
176	80.0	70	158
180	82.2	72	161.6
184	84.4	74	165.2
188	86.7	76	168.8
192	88.9	78	172.4
196	91.1	80	176
200	93.3	82	179.6
204	95.6	84	183.2
208	97.8	86	186.8
212	100.0	88	190.4
216	102.2	90	194
220	104.4	92	197.6
224	106.7	94	201.2
228	108.9	96	204.8
232	111.1	98	208.4
236	113.3	100	212
240	115.6	102	215.6
244	117.8	104	219.2

TABLE 60 - TEMPERATURE CONVERSION CHART DIFFERENTIAL TEMPERATURES

°F=	°C	°C=	°F
0	0	0	0
4	2.2	2	3.6
8	4.4	4	7.2
12	6.7	6	10.8
16	8.9	8	14.4
20	11.1	10	18
24	13.3	12	21.6
28	15.6	14	25.2
32	17.8	16	28.8
36	20	18	32.4
40	22.2	20	36
44	24.4	22	39.6
48	26.7	24	43.2
52	28.9	26	46.8
56	31.1	28	50.4
60	33.3	30	54

TABLE 61 - PRESSURE CONVERSION CHART - GAUGE OR DIFFERENTIAL

PSI = BAR		BAR = PSI	
20	1.38	1.5	21.8
30	2.07	2	29
40	2.76	2.5	36.3
50	3.45	3	43.5
60	4.14	3.5	50.8
70	4.83	4	58
80	5.52	4.5	65.3
90	6.21	5	72.5
100	6.9	5.5	79.8
110	7.59	6	87
120	8.28	6.5	94.3
130	8.97	7	101.5
140	9.66	7.5	108.8
150	10.34	8	116
160	11.03	8.5	123.3
170	11.72	9	130.5
180	12.41	9.5	137.8
190	13.1	10	145
200	13.79	10.5	152.3
210	14.48	11	159.5
220	15.17	11.5	166.8
230	15.86	12	174
240	16.55	12.5	181.3
250	17.24	13	188.5
260	17.93	13.5	195.8
270	18.62	14	203
280	19.31	14.5	210.3
290	20	15	217.5
300	20.69	15.5	224.8
310	21.38	16	232
320	22.07	16.5	239.3
330	22.76	17	246.5
340	23.45	17.5	253.8
350	24.14	18	261
360	24.83	18.5	268.3
370	25.52	19	275.5
380	26.21	19.5	282.8
390	26.9	20	290
400	27.59	20.5	297.3

TABLE 62 - R-410A PRESSURE-TEMPERATURE CHART

PSIG	TEMP ˚F	PSIG	TEMP ˚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 63 - R-454B PRESSURE-TEMPERATURE CHART

psig	Temp. ˚F	psig	Temp. ˚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	–

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Form QCC3-NM1 (1223)
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Supersedes: QCC3-NM1 (1123)