YORK BY JOHNSON CONTROLS	WATER-COOLED LIQUID CHILLERS HERMETIC SCROLL	
INSTALLATION, OPERATION, MAINTENANCE	Supersedes 150.27-NM1 (511)	Form 150.27-NM1 (915)

035-22148-101

YCRL0064 - 0198
REMOTE CONDENSER SCROLL LIQUID CHILLERS
STYLE A (60 Hz)
50 - 170 TONS
175kW THROUGH 597kW

R410A

AHRI CERTIFIED
www.ahridirectory.org
Water-Cooled Chillers
AHRI Standard 550/590

Issue Date:
September 30, 2015

ISO 9001 Registered
Products are produced at a facility whose quality-management systems are ISO9001 certified.

INTERTEK ETL LISTED C US

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.

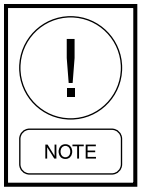
SAFETY SYMBOLS

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 micro panel 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.

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 QuickLIT website at http://cgproducts.johnsoncontrols.com.

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.

CHANGE BARS

Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
Unit Replacement Parts	150.27-RP1
All Products - Replacement Parts Electrical Connectors	50.20-RP1
All Products - Replacement Parts Fittings	50.20-RP2

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SECTION 1 – GENERAL CHILLER INFORMATION AND SAFETY

INTRODUCTION

YORK YCRL Remote Condenser Liquid Chillers provide chilled water for all air conditioning applications that use central station air handling or terminal units. They are self-contained and are designed for indoor (new or retrofit) installation. Each unit includes hermetic scroll compressors, a liquid evaporator, and a user-friendly, diagnostic MicroComputer Control Center all mounted on a rugged steel base. Remote condensers (model VDC) are available separately from Johnson Controls. The units are produced at an ISO 9001 registered facility. The YCRL chillers are rated in accordance with ARI Standard 550/590.

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

The unit is intended for cooling water or glycol solutions and is not suitable for purposes other than those specified in this manual.

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

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

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

WARRANTY

Johnson Controls warrants all equipment and materials against defects in workmanship and materials for a period of eighteen months from shipment unless 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. Labor warranty may be purchased as part of the contract. Labor warranty must be performed by Johnson Controls technicians.

All warranty claims must specify the unit model, serial number, order number and run hours/starts. These details are printed on the unit identification plate.

The unit warranty will be void if any modification to the unit is carried out without prior written approval from Johnson Controls.

For warranty purposes, the following conditions must be satisfied:

- The initial start of the unit must be carried out by trained personnel from an Authorized Johnson Controls Service Center. Refer to *SECTION 6 – COMMISSIONING.*
- Only genuine YORK approved spare parts, oils 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. Refer to *SECTION 10 – MAINTENANCE.*
- Failure to satisfy any of these conditions will automatically void the warranty.

SAFETY

Standards for Safety

YCRL chillers are designed and built within an ISO 9002 accredited design and manufacturing organization. Products shall be designed, tested, rated and certified in accordance with, and installed in compliance with applicable sections of the following Standards and Codes:

1. ANSI/ASHRAE Standard 15 – Safety Code for Mechanical Refrigeration.
2. ASHRAE 90.1 – Energy Efficiency Compliance.
3. ANSI/NFPA – Standard 70 – National Electrical Code (N.E.C.)
4. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
5. ASHRAE 34 – Number Designation and Safety Classification of Refrigerants.
6. ARI Standard 550/590 – Positive Displacement Compressors and Water Cooled Rotary Screw Water-Chilling Packages.
7. Conform to UL code 1995 for construction of chillers and provide ETL/cETL listing label.
8. Manufactured in facility registered to ISO 9001.
9. OSHA – Occupied Safety and Health Act.

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 utilization of the machinery in accordance with the procedures detailed in the manuals.

MISUSE OF EQUIPMENT

Suitability for Application

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

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

Structural Support

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

Mechanical Strength

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

General Access

There are a number of areas and features, which may be a hazard and potentially cause injury when working on the unit unless suitable safety precautions are taken. It is important to ensure access to the unit is restricted to suitably qualified persons who are familiar with the potential hazards and precautions necessary for safe operation and maintenance of equipment containing high temperatures, pressures and voltages.

Pressure Systems

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

Electrical

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

Rotating Parts

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

Sharp Edges

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

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

Refrigerants and Oils

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

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 120VAC electrical supply from the inverter system, thus shutting down the unit.

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SECTION 2 – PRODUCT DESCRIPTION

INTRODUCTION

YORK YCRL chillers are designed for water or water-glycol cooling.

All models are designed for indoor installation. The units are completely assembled with all interconnecting refrigerant piping and internal wiring ready for field connection to a remote condenser.

The unit consists of up to 6 scroll compressors in a corresponding number of separate refrigerant circuits, a shell and tube DX evaporator, and oil separators for each circuit.

Before delivery, the unit is pressure tested, evacuated, and fully charged with a nitrogen holding charge and YORK "V" oil (POE synthetic) in each of the independent refrigerant circuits. After assembly, an operational test is performed with water flowing through the cooler to ensure that each refrigerant circuit operates correctly.

Additional oil change may be required depending upon the length of piping.

The unit framework is fabricated using heavy-gauge galvanized steel which is zinc phosphate pre-treated and powder coated to minimize corrosion.

COMPRESSORS

The chiller utilizes suction-gas cooled hermetic, scroll compressors. The YCRL 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. All compressors are mounted on isolator pads to reduce transmission of vibration to the rest of the unit.

REFRIGERANT CIRCUITS

Two independent refrigerant circuits are provided on each unit. All piping will be copper with brazed joints.

Liquid line components include: a shut off valve with charging port, a high absorption removable core filter-drier, a solenoid valve, a sight glass with moisture indicator and a thermal expansion valve. The entire suction line and the liquid lines between the expansion valve and the cooler are covered with flexible, closed-cell insulation.

Suction line components include: a pressure relief valve, a pressure transducer and a service valve. Optional isolation ball valves are available. Suction lines are covered with flexible, closed-cell insulation.

Discharge lines include service and isolation (ball) valves, two high-pressure cutout switches, a pressure transducer and a pressure relief valve.

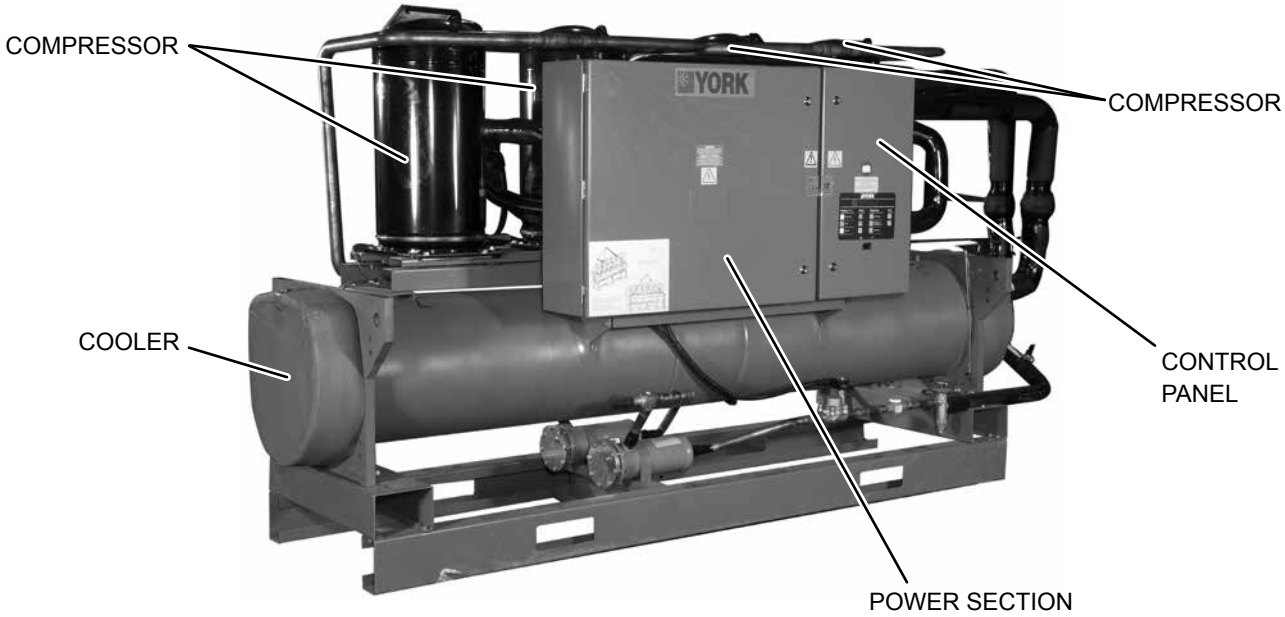


FIGURE 1 - YCRL WATER COOLED LIQUID CHILLER

EVAPORATOR

The 2-pass dual circuit shell and tube type direct expansion (DX) evaporator has refrigerant in the tubes and chilled liquid flowing through the baffled shell. The waterside (shell) design working pressure of the cooler is 150 PSIG (10.3 barg). The refrigerant side (tubes) design working pressure is 450 PSIG (31.0 barg). The refrigerant side is protected by pressure relief valve(s).

The evaporator shall have water pass baffles fabricated from galvanized steel to resist corrosion. Removable heads are provided for access to internally enhanced, seamless, copper tubes. Water vent and drain connections are included. The cooler is insulated with 3/4" (19mm) flexible closed-cell foam.

Water connection to the evaporator is via Victaulic grooved connections. Flange connections are available as an option. The shell will be constructed and tested in accordance with Section VII, Division 1 of the ASME Pressure Vessel Code. The water side is exempt per paragraph U-1 (ºC) of Section VII, Division 1 of the ASME Pressure Vessel Code.

The evaporator is constructed and tested in accordance with applicable sections of the ASME Pressure Vessel Code, Section VIII, Division (1). The water side will be exempt per paragraph U-1, (ºC) (6).

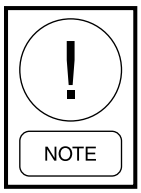
A strainer with a mesh size between .5 and 1.5 mm (40 mesh) is recommended upstream of the evaporator to prevent clogging.

CONDENSER

The condenser can be either a field supplied YORK VDC remote air-cooled condenser (available separately from Johnson Controls) or an evaporative condenser.

REFRIGERANT CIRCUIT

Two independent refrigerant circuits will be furnished on each unit. All piping will be copper with brazed joints. The liquid line will include: a shutoff valve with charging port; sight-glass with moisture indicator; thermal expansion valve; solenoid valve; and high absorption removable-core filter drier. The entire suction line and the liquid line between the expansion valve and the evaporator will be insulated with flexible, closed-cell, foam insulation.



Refrigerant R410A is field supplied.

MILLENNIUM CONTROL CENTER

All controls are contained in a NEMA 1 (and equivalent to IP32) powder painted steel cabinet with hinged outer door and includes:

- 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:
  - Control supply fuses and connections for a remote emergency stop device.
  - ON/OFF rocker switch, microcomputer keypad and display, microprocessor board, I/O expansion board, relay boards, and 24V fused power supply board.
  - Customer terminal block for control inputs and liquid flow switch.

The microprocessor control includes:

- Automatic control of compressor start/stop, anticoincidence and anti-recycle timers, automatic pumpdown on shutdown, evaporator pump and unit alarm contacts. Automatic reset to normal chiller operation after power failure.
- Remote water temperature reset via a pulse width modulated (PWM) input signal or up to two steps of demand (load) limiting.
- Software stored in non-volatile memory (EPROM), with programmed setpoints retained in a lithium battery backed Real Time Clock (RTC) memory for a minimum of five years.
- Forty character liquid crystal display, with description available in five languages (English, French, German, Spanish or Italian).

Programmable Setpoints

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

Displayed Data

- Return and leaving liquid temperature
- Low leaving liquid temperature cutout setting
- Metric or Imperial data
- Discharge and suction pressure cutout settings
- System discharge and suction pressure
- Anti-recycle timer status for each compressor
- Anti-coincident system start timer condition
- Compressor run status
- No cooling load condition
- Day, date and time
- Daily start/stop times
- Holiday status
- Automatic or manual system lead/lag control
- Lead system definition
- Compressor starts and operating hours (each compressor)
- Run permissive status
- Number of compressors running
- Liquid solenoid valve status
- Load and unload timer status
- Water pump status

System Safeties

System Safeties cause individual compressors to perform auto shut down and require manual reset in the event of three trips in a 90-minute time period:

- High discharge pressure
- Low suction pressure
- High pressure switches
- Motor protector

Unit Safeties

Unit Safeties are automatic reset and cause all compressors to shut down:

- Low leaving chilled liquid temperature
- Under voltage
- Loss of liquid flow (through flow switch)
- Low battery

Power and Control Panels

All power and controls are contained in an IP32 cabinet with hinged, latched and gasket sealed outer doors.

Power Panel

The power panel includes factory mounted compressor contactors and manual motor starters to provide overload and short circuit protection.

ACCESSORIES AND OPTIONS

Power Options

Single Point Supply Terminal Block

The standard power wiring connection on all models is a single point power connection to a factory provided terminal block. Components included are the enclosure, terminal-block and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming power wiring. (Do not include this option if either the Single-Point Non-fused Disconnect Switch or Single-point Circuit Breaker options have been included.) (**Factory-Mounted**)

Single Point Non-Fused Disconnect Switch

An optional unit-mounted disconnect switch 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. (**Factory-Mounted**)

Single Point Circuit Breaker

An optional 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. (**Factory-Mounted**)

Multiple Point Circuit Breaker

Optional multiple point supply with independent system circuit breakers and locking external handles (in compliance with Article 440-14 of N.E.C) can be factory supplied. (**Factory-Mounted**).

Control Transformer

Converts unit power voltage to 115-1-60 (0.5 or 1.0 KVA capacity). Factory mounting includes primary and secondary wiring between the transformer and the control panel. (**Factory-Mounted**)

Compressor External Overloads

Optional compressor motor overloads can be factory mounted in the unit control/power panel. This option will reduce the chiller MCA (minimum circuit ampacity) and allow for reduced wire sizing to the unit. This option is not available for applications with Leaving Condenser Water Temperature (LCWT) greater than 105ºF (40.6ºC). (**Factory-Mounted**)

Controls Options

Building Automation System Interface

A standard feature of the YCRL control panel to accept a pulse width modulated (PWM), 4-20 milliamp, or 0-10VDC input to reset the leaving chilled liquid temperature from a Building Automation System. (**Factory-Mounted**)

Language LCD and Keypad

Standard display language and keypad is in English. Spanish, French, German, and Italian are available as an option. (**Factory-Mounted**)

Heat Exchanger Options

Flow Switch

An optional flow switch can be factory supplied for the evaporator. Vapor-proof SPDT, NEMA 3R switch, 150 PSIG (10.3 bar) DWP, 20°F to 250°F (-29°C to 121°C) with 1" NPT (IPS) connection for upright mounting in horizontal pipe. The flow switch or its equivalent must be furnished with each unit. (**Field mounted**)

Differential Pressure Switch

An alternative option to the paddle-type flow switch. 3-45 PSIG (0.2-3 bar) range with ¼" NPTE pressure connections. (**Field Mounted**)

Pressure Vessel Codes

Evaporators and condensers are to be supplied (standard) in conformance with the A.S.M.E. pressure codes.

Flanges (ANSI/AWWA C-606 Couplings Type)

Consists of (2) flange adapters for grooved end pipe on evaporator and condenser. Standard 150 PSI (10.3 bar). (Field Kit, matching pipe flange by contractor.)

Double Thick Insulation

Double thick (1-1/2") insulation provided on the evaporator. (**Factory-Mounted**)

Chiller Options

Final Paint Overspray

Overspray painting of unit after assembly. (**Factory-Mounted**)

Service Isolation Valve

Service suction isolation valve added to unit per system in addition to the standard discharge service valve. (**Factory Mounted**)

Hot Gas By-pass

Permits continuous, stable operation at capacities below the minimum step of compressor unloading to as low as 5% capacity (depending on both the unit and operating conditions) by introducing an artificial load on the evaporator. Hot gas by-pass is installed on only refrigerant system #2 on two-circuited units. (**Factory-Mounted**)

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" (15mm) thickness; one layer of anti-vibrating heavy material thickness of 1/8" (3mm). Both are closed by two sheets of welded PVC, reinforced for temperature and UV resistance. (**Factory- Mounted**)

Vibration Isolation

Neoprene Isolation

Recommended for normal installations. Provides very good performance in most applications for the least cost. (**Field-mounted**)

One Inch Spring Isolators

Level adjustable, spring and cage type isolators for mounting under the unit base rails. One inch nominal deflection may vary slightly by application. (**Field -Mounted**)

Two Inch Seismic Isolators

Restrained spring-flex mountings incorporate a rugged welded steel housing with vertical and horizontal limit stops. Housings designed to withstand a minimum 1.0g accelerated force in all directions to two inches. Level adjustable, deflection may vary slightly by application. (**Field-Mounted**)

CONTROL / POWER PANEL COMPONENTS

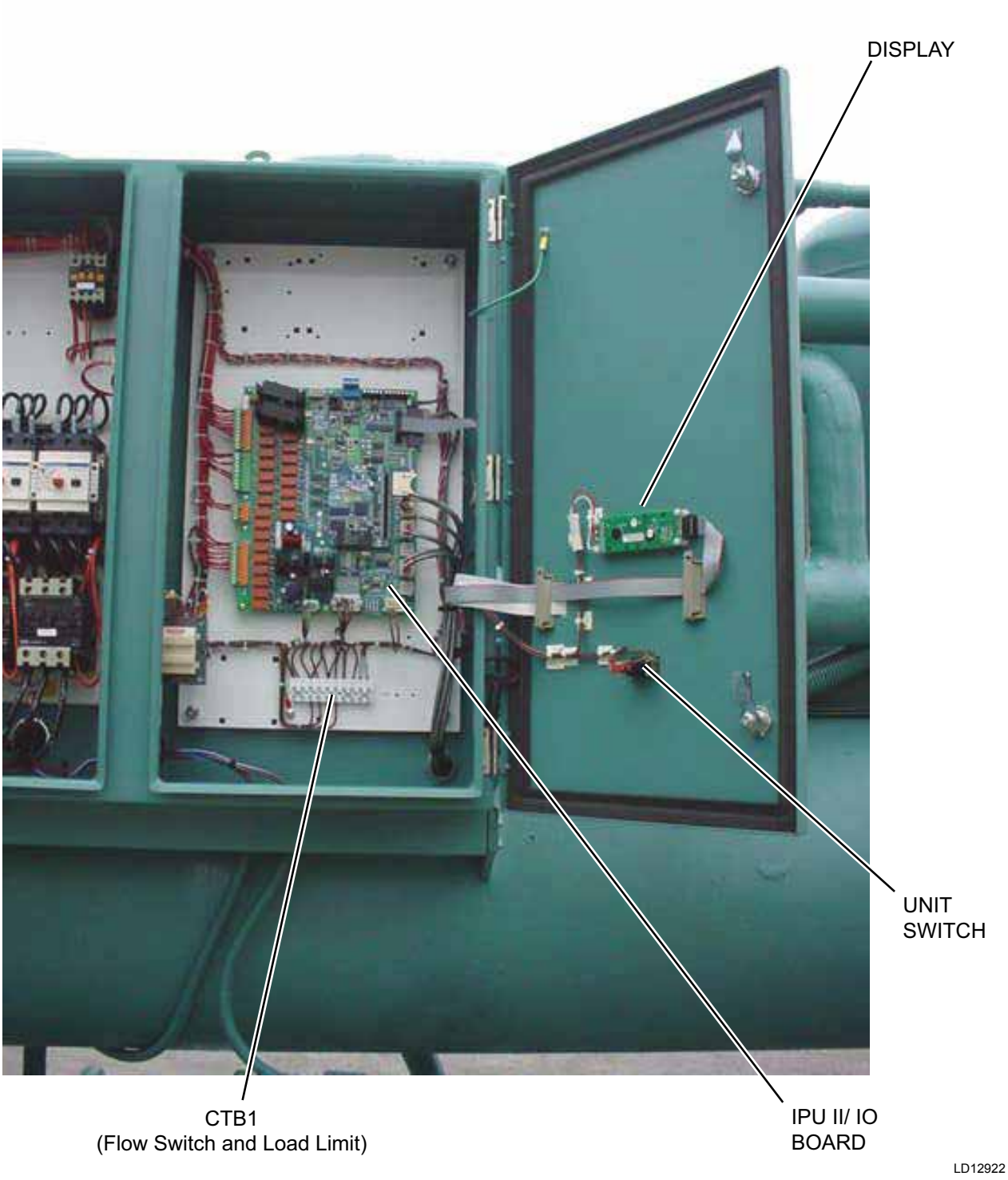


FIGURE 2 - CONTROL/PANEL COMPONENTS

CONTROL / POWER PANEL COMPONENTS (CONT'D)

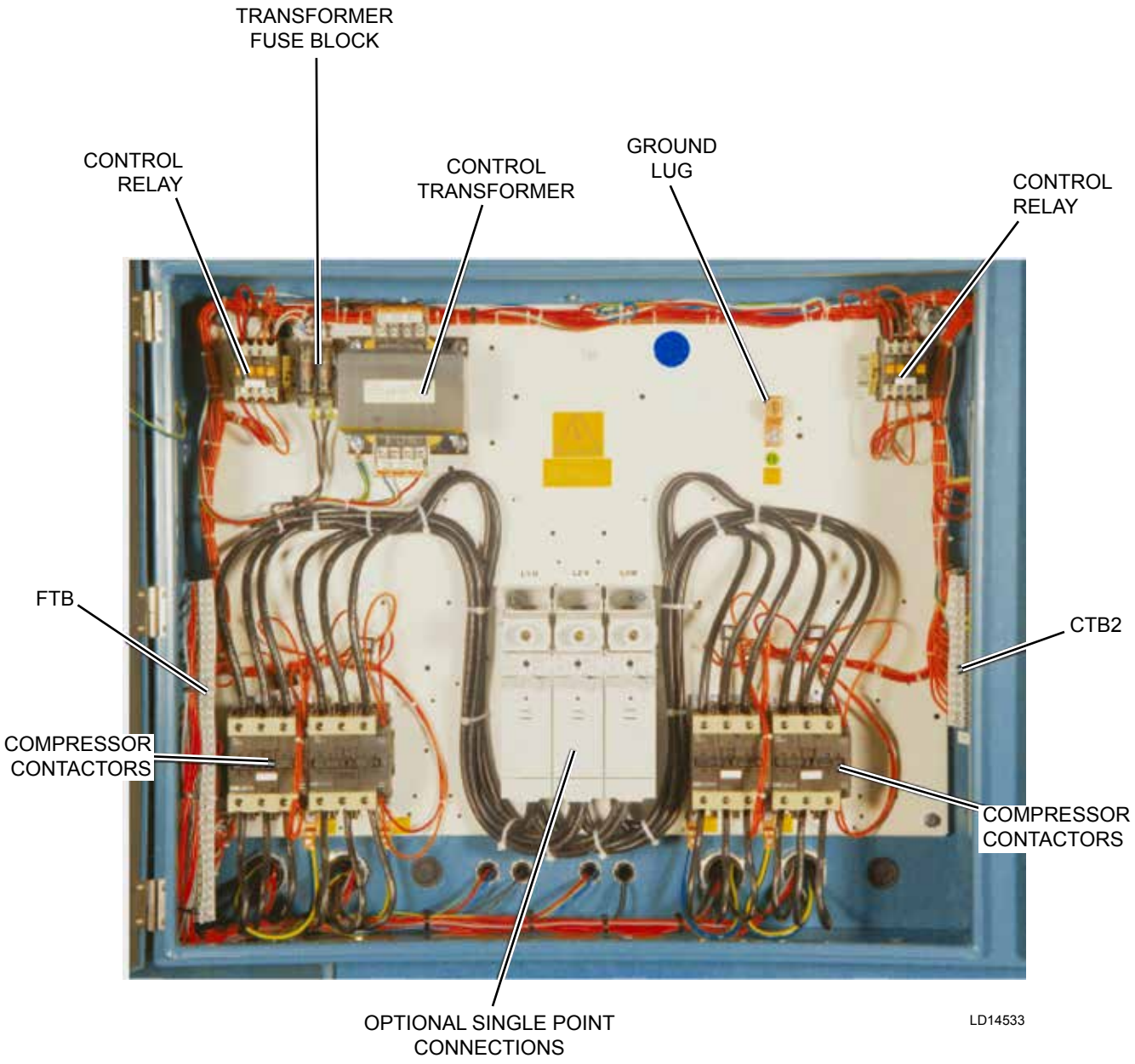


FIGURE 3 - CONTROL POWER PANEL COMPONENTS

UNIT COMPONENTS

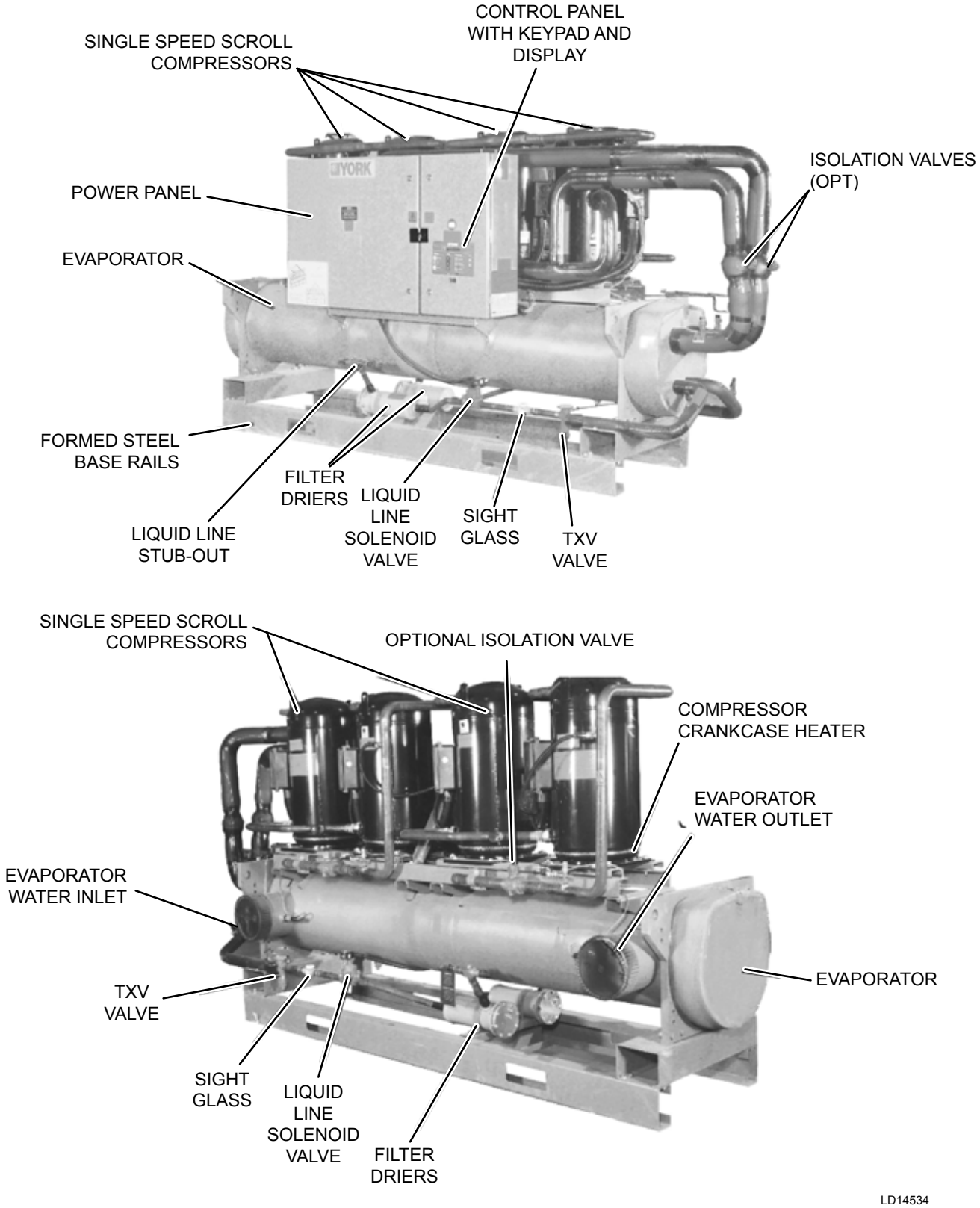
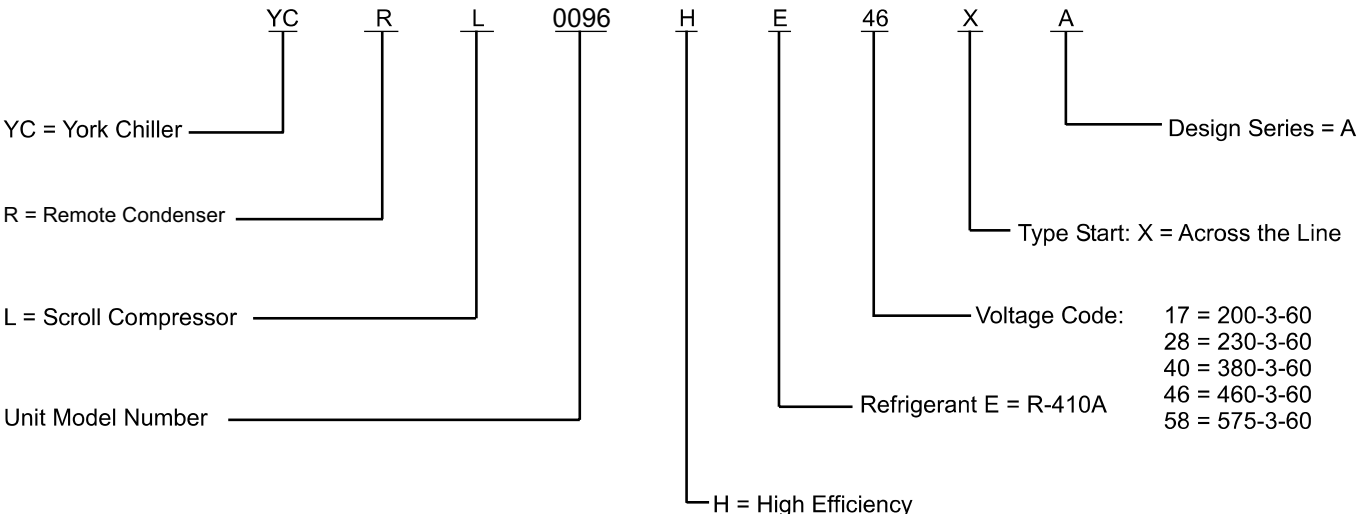


FIGURE 4 - UNIT COMPONENTS

2

PRODUCT IDENTIFICATION NUMBER (PIN)



FEATURE	DESCRIPTION	OPTION	DESCRIPTION
CONTRACT	**CONTRACT NUMBER**	**NUM**	**CONTRACT NUMBER = {CONTRACT/NUM}**
ORDER	**ORDER QUANTITY**	**QTY**	**ORDER QUANTITY = {ORDER/QTY}**
MODEL	**MODEL (PIN 1-4)**	**YCRL**	**YCRL**
CAP	CAPACITY (PIN 5-8)	0064	0064
		0074	0074
		0084	0084
		0096	0096
		0118	0118
		0126	0126
		0156	0156
		0177	0177
		0198	0198
UNIT	UNIT DESIGNATOR (PIN 9)	H	HIGH EFFICIENCY UNIT
REF	REFRIGERANT (PIN 10)	E	R-410A
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 START
		T	SOFT START (FACTORY) (50HZ ONLY)
DESIGN	DESIGN SERIES (PIN 14)	A	DESIGN SERIES A
DEV	DEVELOPMENT LEVEL (PIN 15)	A	DEVELOPMENT LEVEL B
POWER	POWER FIELD (PIN 16 AND 17)	XX	STANDARD POWER OPTION (SP SUPPLY TERMINAL BLOCK)
		BX	SP CIRCUIT BREAKER W/ LOCKABLE HANDLE
		SD	SP SUPPLY NF DISCONNECT SWITCH
		MB	MP SUPPLY W/IND SYS CB AND L. EXT HANDLES
		QQ	SPECIAL QUOTE

FEATURE	DESCRIPTION	OPTION	DESCRIPTION
TRANS	CONTROL TRANSFORMER (PIN 18)	X	NO OPTION
		T	CONTROL TRANSFORMER (FACTORY)
		Q	SPECIAL QUOTE
PIN 19	PIN 19	X	NO OPTION
		Q	SPECIAL QUOTE
PIN 20	PIN 20	X	NO OPTION
		Q	SPECIAL QUOTE
BAS	BAS INTERFACE (PIN 21)	X	BAS/EMS TEMP RESET/OFFSET (STANDARD)
		Q	SPECIAL QUOTE
LCD	LANGUAGE (PIN 22)	X	STANDARD (ENGLISH) LCD AND KEYPAD DISPLAY
		F	FRENCH LCD AND KEYPAD DISPLAY
		G	GERMAN LCD AND KEYPAD DISPLAY
		I	ITALIAN LCD AND KEYPAD DISPLAY
		S	SPANISH LCD AND KEYPAD DISPLAY
		Q	SPECIAL QUOTE
RDOUT	READOUT KITS (PIN 23)	X	BOTH DISCHARGE AND SUCTION PRESSURE TRANSDUCERS / READOUT (STANDARD)
		Q	SPECIAL QUOTE
SAFETY	SAFETY CODES (PIN 24)	C	EUROPEAN SAFETY CODE (CE)
		L	N AMERICAN SAFETY CODE (CUL/CETL)
		Q	SPECIAL QUOTE
HPUMP	HEAT PUMP (PIN 25)	X	NO OPTION
		Q	SPECIAL QUOTE
CTEMP	CONDENSER WATER TEMP (PIN 26 AND 27)	XX	NO OPTION
		Q	SPECIAL QUOTE
PIN 28	PIN 28	X	NO SEQUENCE KIT
		Q	SPECIAL QUOTE
TEMP	EVAPORATOR WATER TEMP (PIN 29 AND 30)	TS	NUM LEAVING SUPPLY WATER TEMP {TEMP/NUM} DEGREES
		Q	SPECIAL LST REQUIREMENTS
CHICAGO	CHICAGO CODE KIT (PIN 31)	X	NO OPTION
		G	BOTH SUCTION ISOLATION VALVES AND DUAL RELIEF VALVES
		R	DUAL RELIEF VALVES (50 HZ ONLY)
		S	SERVICE ISOLATION VALVES (SUCTION)
		Q	SPECIAL QUOTE
VALVES	VALVES (PIN 32)	X	SOLENOID VALVES (LIQUID LINE)
		E	ELECTRONIC EXPANSION VALVE
		Q	SPECIAL QUOTE
HGBP	HOT GAS BY-PASS (PIN 33)	X	NO OPTION
		1	HOT GAS BY-PASS (1 CIRCUIT)
		Q	SPECIAL QUOTE
PIN34	PIN 34	X	NO OPTION
		Q	SPECIAL QUOTE

FEATURE	DESCRIPTION	OPTION	DESCRIPTION
OVERLOAD	COMPRESSOR OVERLOADS (PIN 35)	X	NO OPTION
		E	COMPRESSOR EXTERNAL OVERLOADS
		Q	SPECIAL QUOTE
PRESSURE	PRESSURE CONTROL (PIN 36)	X	NO OPTION
		Q	SPECIAL QUOTE
PIN 37	PIN 37	X	NO OPTION
		Q	SPECIAL QUOTE
DWP	DWP (PIN 38)	X	150 PSIG DWP WATERSIDE
		Q	SPECIAL QUOTE
INS	INSULATION (PIN 39)	X	SINGLE THICK INSULATION
		D	DOUBLE THICK INSULATION
		Q	SPECIAL QUOTE
FLANGES	FLANGES (PIN 40)	X	NO FLANGE KIT
		V	VITAULIC FLANGE KIT
		Q	SPECIAL QUOTE
EVAPFLOW	EVAP FLOW SWITCH (PIN 41)	X	NO FLOW SWITCH
		D	ONE DIFFERENTIAL PRESSURE SWITCH PER CHILLER
		E	TWO DIFFERENTIAL PRESSURE SWITCHES PER CHILLER
		F	THREE DIFFERENTIAL PRESSURE SWITCHES PER CHILLER
		S	ONE FLOW SWITCH PER CHILLER
		T	TWO FLOW SWITCHES PER CHILLER
		U	THREE FLOW SWITCHES PER CHILLER
		Q	SPECIAL QUOTE
VESSEL	VESSEL CODES (PIN 42)	A	ASME PRESSURE VESSEL AND ASSOCIATED CODES
		E	EUROPEAN “CE” PRESSURE VESSEL DIRECTIVE
		Q	SPECIAL QUOTE
PIN43	PIN 43	X	NO OPTION
		Q	SPECIAL QUOTE
PIN44	PIN 44	X	NO OPTION
		Q	SPECIAL QUOTE
CONDTUBE	CONDENSER TUBES (PIN 45)	X	NO OPTION
		Q	SPECIAL QUOTE
HEAT	HEAT RECOVERY (PIN 46)	X	NO OPTION
		Q	SPECIAL QUOTE
CONDFLOW	CONDENDENSER FLOW SWITCH (PIN 47)	X	NO FLOW SWITCH
		Q	SPECIAL QUOTE
PIN48	PIN 48	X	NO OPTION
		Q	SPECIAL QUOTE
ACOUSTIC	ACOUSTICAL ARRGT. (PIN 49)	X	NO ACOUSTIC ENCLOSURE
		B	COMPRESSOR SOUND BLANKET
		Q	SPECIAL QUOTE

FEATURE	DESCRIPTION	OPTION	DESCRIPTION
SRDOCS	SR DOCUMENTS (PIN 50)	X	NO DOCUMENTS REQUIRED
		A	BASE MATERIAL AND WITNESS DOCUMENTS
		B	BASE DOCUMENT
		M	BASE AND MATERIAL DOCUMENTS
		W	BASE AND WITNESS DOCUMENTS
		Q	SPECIAL QUOTE
FORM	SHIPMENT FORM (PIN 51)	2	FORM 2 SHIPMENT (COMPLETE UNIT, HOLDING CHARGE) (STANDARD)
		Q	SPECIAL QUOTE
PIN52	PIN 52	X	NO OPTION
		Q	SPECIAL QUOTE
PAINT	OVERSPRAY PAINT (53)	X	NO FINAL OVERSPRAY PAINT
		S	FINAL OVERSPRAY PAINT
		Q	SPECIAL QUOTE
ISOL	ISOLATORS (PIN 54)	X	NO ISOLATORS
		1	1" DEFLECTION
		N	NEOPRENE
		S	SEISMIC
		Q	SPECIAL QUOTE
PIN55	PIN 55		MARKETING PURPOSES ONLY!
PIN56	PIN 56		MARKETING PURPOSES ONLY!
SHIP	SHIP INSTRUCTIONS (PIN 57)	X	NO CONTAINERIZATION REQUIRED WITH SHIPPING BAG
		A	BUY AMERICA ACT COMPLIANCE WITH SHIPPING BAG
		B	BOTH BUY AMERICA ACT COMPLIANCE AND CONTAINER SHIPPED WITHOUT SHIPPING BAG (FACTORY PREP)
		C	CONTAINER SHIPPED WITHOUT SHIPPING BAG (FACTORY LOAD FOR US PORT)
		M	CONTAINER SHIPPED WITHOUT SHIPPING BAG (FACTORY LOAD FOR MEXICO PORT)
		N	NO CONTAINERIZATION REQUIRED WITHOUT SHIPPING BAG
		P	CONTAINER SHIPPED WITHOUT SHIPPING BAG (FACTORY PREP)
		U	BUY AMERICA ACT COMPLIANCE WITHOUT SHIPPING BAG
		Q	SPECIAL QUOTE
PIN 58	PIN 58		MARKETING PURPOSES ONLY!
PIN 59	PIN 59	X	NO OPTION
		Q	SPECIAL QUOTE
PIN 60	PIN 60	X	NO OPTION
		Q	SPECIAL QUOTE
MFG	PLANT OF MFG (PIN 61)	R	MONTERREY
LOC	MFG LOCATION	CUR	CURITIBA, BRAZIL
		MEX	MEXICO, ES
		MTY	MONTERY, BE
		SAT	SAN ANTONIO TEXAS
YW	YORKWORKS VERSION	CV	YORKWORKS CONFIGURATION VERSION {YW/CV}
		UV	YORKWORKS UPLOAD VERSION {YW/UV}
SQ	SPECIAL QUOTE	Q	SPECIAL QUOTE

REFRIGERANT FLOW DIAGRAM - YCRL (STANDARD)

Low-pressure liquid refrigerant enters the cooler tubes and is evaporated and superheated by the heat energy absorbed from the chilled liquid passing through the cooler shell. Low-pressure vapor enters the compressor where pressure and superheat are increased. The high pressure superheat refrigerant enters the remote air cooled condenser where heat is rejected via the condenser coil and fans. The fully condensed and sub-cooled liquid leaves the remote air cooled condenser and enters the expansion valve, where pressure reduction and further cooling takes place. The low-pressure liquid refrigerant then returns to the cooler.

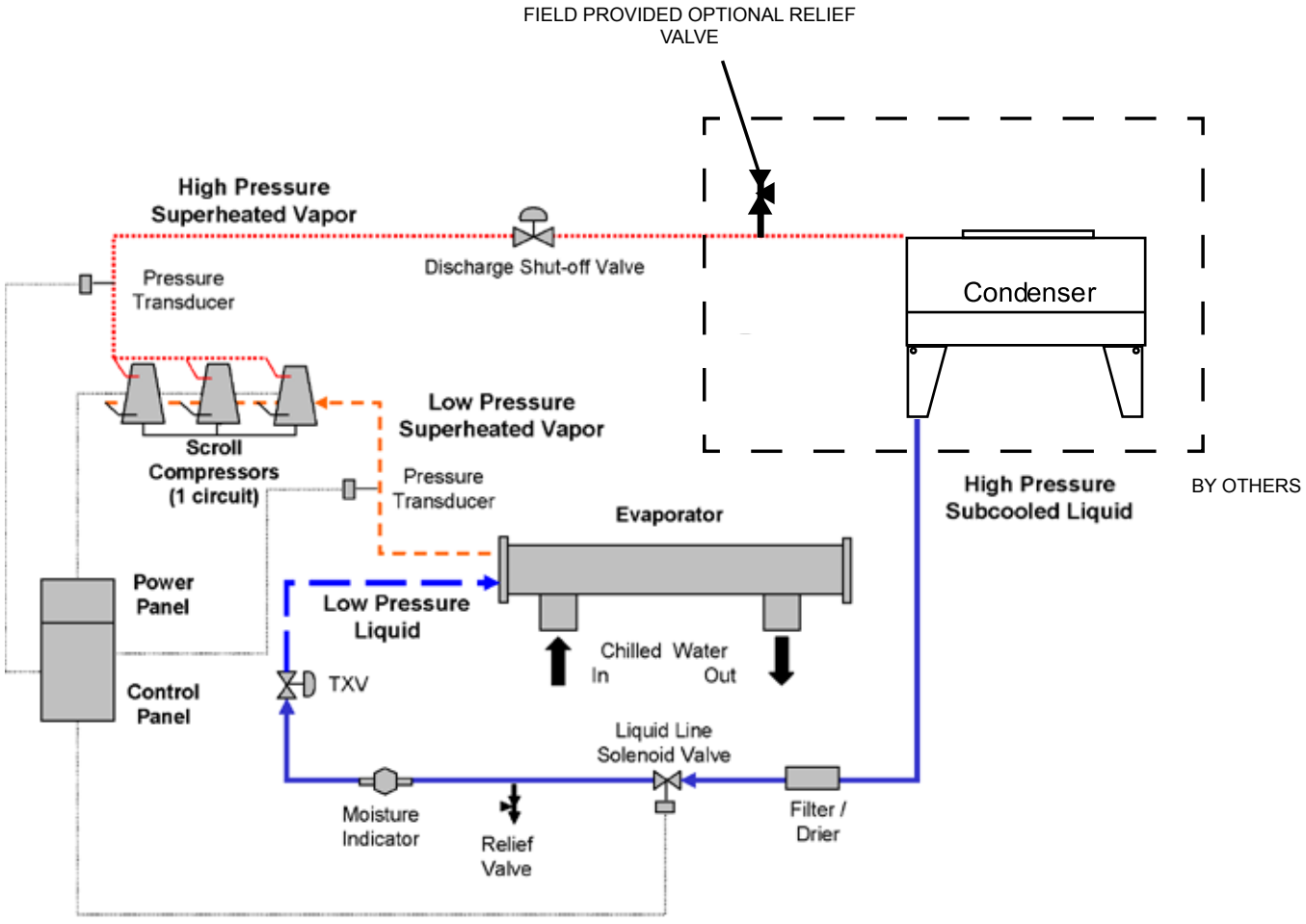


FIGURE 5 - REFRIGERANT FLOW DIAGRAM (STANDARD)

REFRIGERANT FLOW DIAGRAM - YCRL (EUROPEAN)

Low-pressure liquid refrigerant enters the cooler tubes and is evaporated and superheated by the heat energy absorbed from the chilled liquid passing through the cooler shell. Low-pressure vapor enters the compressor where pressure and superheat are increased. The high pressure superheat refrigerant enters the remote air cooled condenser where heat is rejected via the condenser coil and fans. The fully condensed and sub-cooled liquid leaves the remote air cooled condenser and enters the expansion valve, where pressure reduction and further cooling takes place. The low-pressure liquid refrigerant then returns to the cooler.

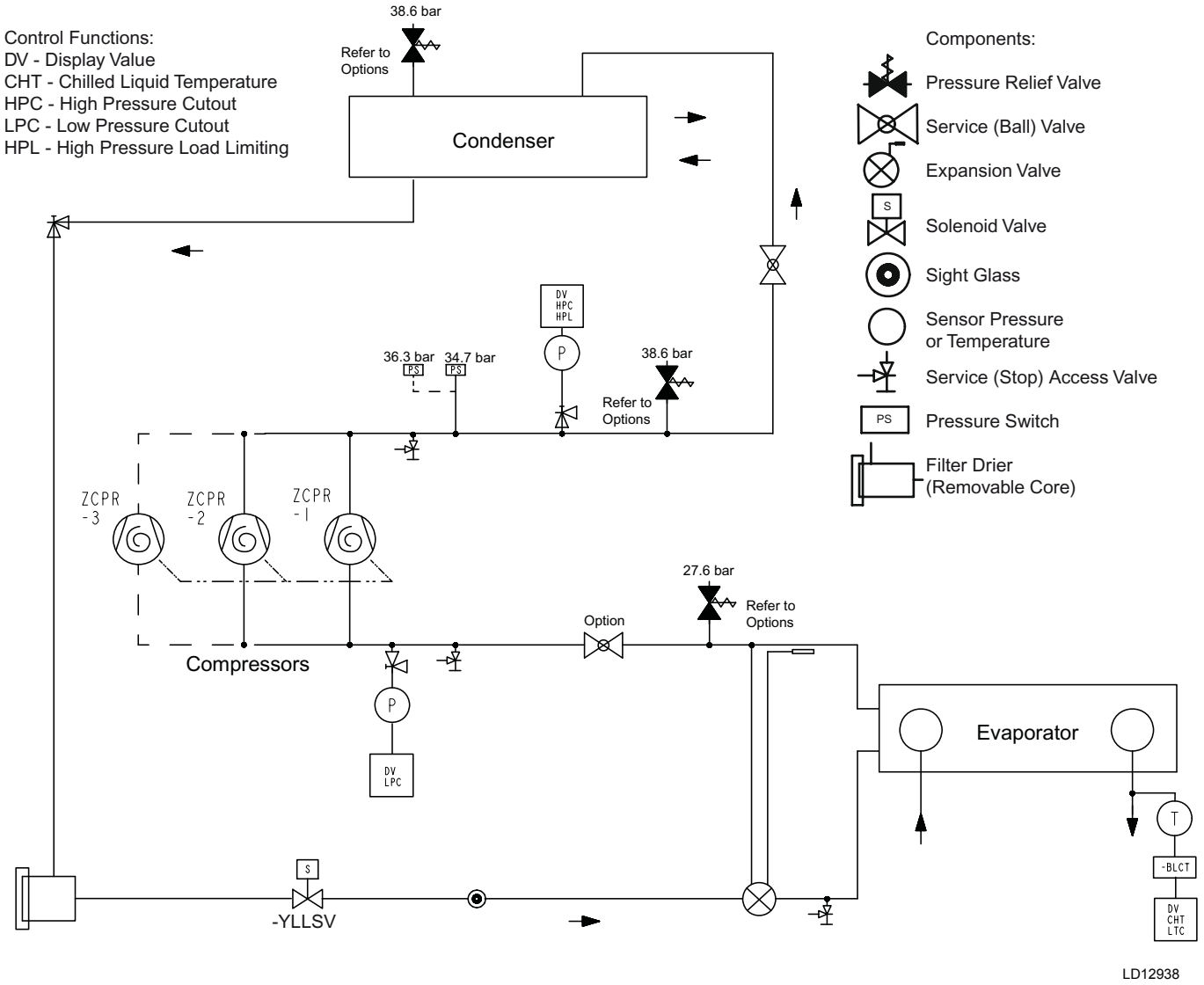


FIGURE 6 - REFRIGERANT FLOW DIAGRAM (EUROPEAN)

SECTION 3 – TRANSPORTATION, 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 this has been specified on the Sales Order.

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

- Ensure that all openings, such as water connections, are securely capped.
- Do not store where exposed to ambient air temperatures exceeding 107°F (42°C).
- The unit should be stored in a location where there is minimal activity 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. *See "Instruction Manual", Form 50.15-NM for more information and details.*

Major damage must be reported immediately to your local Johnson Controls representative.

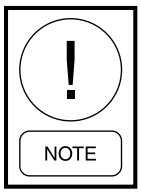
MOVING THE UNIT

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

The units are designed to be lifted using either lifting chains or a fork lift.

Lifting by Crane / Hoist

A spreader frame should be used to prevent damage to the unit from the lifting chains *(see Figure 7 on page 32)*.



The unit must only be lifted at the points provided

LIFTING WEIGHTS

For details of weights and weight distribution *see Table below.*

1453.jpeg

LIFTING WEIGHTS - High Efficiency (HE)								
YCRL 60 HZ MODEL - lbs. (kg)								
0064HE	0074HE	0084HE	0096HE	0118HE	0126HE	0156HE	0177SE	0198SE
2883 (1308)	3261 (1479)	3439 (1560)	3753 (1702)	3705 (1681)	4587 (2081)	4989 (2263)	4418 (2004)	4773 (2165)

FIGURE 7 - CHILLER RIGGING AND LIFTING WEIGHTS

SECTION 4 – INSTALLATION

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

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

INSTALLATION CHECKLIST

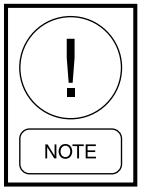
The following items, 1 through 5, must be checked before placing the units in operation:

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 *(see ASHRAE handbook Section 215 and 195)*.
5. Check to see that the unit is installed and operated within limitations *(refer to LIMITATIONS)*.

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

LOCATION REQUIREMENTS

To achieve optimum performance and trouble-free service, it is essential that the proposed installation site meets with the location and space requirements for the model being installed. For dimensions, weight and space requirements, including service access details, refer to *SECTION 5 – TECHNICAL DATA*.



The clearances recommended are nominal for the safe operation and maintenance of the unit and power and control panels. Local health and safety regulations, or practical considerations for service replacement of large components, may require larger clearances than those given in Section 5 Technical Data.

Units should be installed indoors where they are not exposed to rain or water splash. Chillers should be located near a drain. The use of chillers in corrosive, dusty or explosive atmospheres should be avoided unless the unit is properly protected. A unit in a clean room will run best, require least maintenance, and last longest. Heat or ventilation may be required to maintain the ambient between 40°F and 115°F (4 4°C and 46.1°C).

Units are designed for indoor installation and not intended for wet, corrosive or explosive atmospheres. Installation should allow for water drain, ventilation and sufficient clearance for service, including tube cleaning.

UNIT ISOLATION (NOISE SENSITIVE LOCATION)

For installation in equipment rooms near noise-critical areas, common walls should be of adequate sound attenuating construction, all doors should be tightly gasketed, and the unit should have vibration isolators fitted.

FOUNDATION

The unit must be installed on a suitable flat and level concrete base that extends to fully support the unit base frame. The chiller foundation must be rigid to reduce vibration transmission to a minimum. All upper story installations should use vibration isolators under the unit base. To maintain isolator efficiency, no mechanical ties should be made to the building. Properly selected flexible connectors and piping isolators are recommended. All the above recommendations will help to reduce vibration transmission and ‘result in a quieter operation.

On basement foundations remove a portion of the basement floor so that a concrete base can be poured resting on the ground, with a corkboard installed on both sides, and a waterproof sealing compound.

The concrete base must capable o f supporting 150% of the operating weight. In case of upper floors, the unit and piping should be isolated from walls and ceiling. The unit may be bolted to the foundation using 1/2" (13 mm) dia. holes in the base of the framework. When lower transmitted vibration levels are required optional anti-vibration isolators can be supplied loose for site installation.

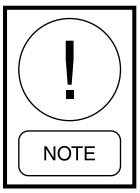
INSTALLATION OF VIBRATION ISOLATORS

An optional set of vibration isolators can he supplied loose with each unit *(*refer to *SECTION 5 – TECHNICAL DATA for details)*.

CHILLED LIQUID PIPEWORK CONNECTION

General Requirements

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



The maximum flow rate and pressure drop for the cooler and condenser must not be exceeded at any time. Refer to Section 5 Technical Data for details.

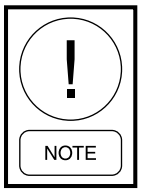
The water must enter the heat exchanger(s) by the inlet connection. Refer to *SECTION 5 – TECHNICAL DATA for details.*

A flow switch or differential switch must be installed in the customer pipework at the outlet of the exchangers as shown in the arrangement diagrams, and wired back to the control panel using screened cable. There should be a straight horizontal run of at least five diameters on each side of the switch. Adjust the flow switch paddle to the size of the pipe in which it is to be installed *(see manufacturer's instructions furnished with the switch)*. The switch is to be wired to terminals 13 – 14 of CTBl located in the control pane1, as shown on the unit wiring diagram. This is to prevent damage to the exchanges caused inadequate liquid flow.

The flow switch used must have gold plated contacts for low voltage/current operation. Paddle type flow switches suitable for 150 PSIG (10 barg) working pressure and having 1" N.P.T. connection can be obtained from Johnson Controls as an option for the unit.

- The liquid pump(s) installed in the pipework system(s) should discharged directly into the unit heat exchanger section of the system. The pump(s) require an auto-starter (by others) to be wired to the control panel. *For details refer to "Electrical Connection"*.
- All chilled liquid piping should he thoroughly flushed to free it from foreign material before the system is placed into operation. Use care not to flush any foreign material into or through the cooler.
- Pipework and fittings must he separately supported to prevent any loading on the heat exchanger(s). Flexible connections are recommended which will also minimize transmission of vibrations to the building. Flexible connections must he used if the unit is mounted on anti-vibration mounts as some movement of the unit can he expected in normal operation.
- Pipework and fittings immediately next to the heat exchangers should he readily de-mountable to enable cleaning prior to operation, and to facilitate visual inspection of the exchanger nozzles.
- Each heat exchanger must be protected by a strainer, preferably of 40 mesh, fitted as close as possible to the liquid inlet connection in both the evaporator and condenser water lines and provided with a means of local isolation.
- The heat exchanger(s) must not he exposed to flushing velocities or debris released during flushing. It is recommended that a suitably sized bypass and valve arrangement is installed to allow flushing of the pipework system. The bypass can he used during maintenance to isolate the heat exchanger with-out disrupting flow to other units.

- Thermometer and pressure gauge connections should he provided on the inlet and outlet connections of each heat exchanger.
- Drain and air vent connections should be provided at all low and high points in the pipework to permit drainage of the cooler and system, and to vent any air in the pipes.
- Liquid systems at risk of freezing, due to low ambient temperatures, should be protected using insulation and heater tape and/or a suitable glycol solution. The liquid pump(s) must also be used to ensure liquid is circulated when the ambient temperature approaches freezing point. Insulation should also he installed around the heat exchanger nozzles.
- A small valve or valves should be installed at the highest point or points in the chilled water piping to allow any trapped air to be purged. Vent and drain connections should be extended beyond the insulation to make them accessible.
- Piping must comply in all respects with applicable local plumbing codes and ordinances. In no case should the unit support the weight of connecting piping. Since elbows, tees, and valves increase pressure drop, all piping should be kept as simple as possible. Hand stop valves should be installed where required to facilitate servicing. Piping to the inlet and outlet connections of the evaporator and condenser may include high-pressure rubber hose or piping loops to ensure against water pump transmission of vibration.
- Facilities should be provided for measuring temperature and pressure in the evaporator and condenser field piping. Drain connections should be provided at all low points to permit complete drainage of the evaporator(s), condenser(s), and system piping. This is especially important if the unit is located in an unheated room where freezing could prevail. Water lines subjected to ambient temperatures below freezing may require heater cables or antifreeze (by others).



Any debris left in the water pipework between the strainer and heat exchanger could cause serious damage to the tubes in the heat exchanger and must be avoided. The installer/user must also ensure that the quality of the water in circulation is adequate, without any dissolved gasses which can cause oxidation of steel parts within the heat exchanger(s).

The flow switch MUST NOT be used to start and stop the chiller (i.e. starting and stopping the chilled water pump). It is intended only as a safety switch. It is recommended to interlock the auxiliary contacts of the pump contactor in series with the flow switch. The coil of the pump contactor must have a voltage suppressor installed across the terminals.

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

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

WATER TREATMENT

The unit performance given in the Design Guide is based on a fouling factor of 0.00025 ft^2/hr °F/BTU (0.44m^2 ºC/kW). Dirt, scale, grease and certain types of water treatment will adversely affect the heat exchanger surfaces and therefore unit performance. Foreign matter in the water system(s) can increase the heat exchanger pressure drop, reducing the flow rate and causing potential damage to the heat exchanger tubes.

Aerated, brackish or salt water is not recommended for use in the water system(s). Johnson Controls recommends that a water treatment specialist is consulted to determine that the proposed water composition will not affect the evaporator materials of carbon steel and copper. The pH value of the water flowing through the heat exchangers must be kept between 7 and 8.5.

Glycol Solutions

For unit operation with chilled liquid temperatures leaving the cooler at below 40°F (4.4°C), glycol solutions should be used to help prevent freezing. *SECTION 9 – SERVICE AND TROUBLESHOOTING*, gives recommended solution strength with water, as a percentage by weight, for the most common types of glycol. It is important to check glycol concentration regularly to ensure adequate concentration and avoid possible freeze-up in the cooler.

When using glycol solutions, pressure drops are higher than with water. Special care must be taken not to exceed the maximum pressure drop allowed.

OPTION FLANGES

One of two types of flanges may be fitted depending on the customer or local Pressure Vessel Code requirements. These are Victaulic adapter flanges or weld flanges. Victaulic adapter flanges are supplied loose for field installation and weld flanges are factory fitted. Flange dimensions are to ISO 7005 - NP10 (BS 4504 - NP10).

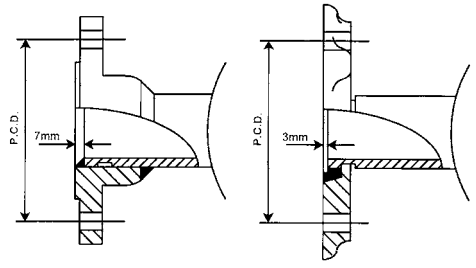


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FIGURE 8 - VICTAULIC - ADAPTER FLANGES

REFRIGERANT RELIEF VALVE PIPING

The cooler and low side piping is protected against internal refrigerant overpressure by a 400 PSIG refrigerant relief valve.

It is recommended that each valve should be piped to the exterior of the building so that when the valve is activated the release of high pressure gas and liquid cannot be a danger or cause injury.

The size of any pipework attached to a relief valve must be of sufficient diameter so as not to cause resistance to the operation of the valve. *For piping size requirements and specifications, refer to ASHRE-15 (latest edition).*

If relief pipework is common to more than one valve its cross sectional area must be at least the total required by each valve. Valve types should not be mixed on a common pipe. Precautions should be taken to ensure that the exit of relief valves/vent pipe remain clear of obstructions at all times.

Unless otherwise specified by local regulations, the internal diameter depends on the length of pipe required and is given by the following formula:

$$D^5 = 1.447 \times L$$

Where:

D = minimum pipe internal diameter (cm)

L = length of pipe (m)

CONDENSER RELIEF VALVE

A high side pressure relief valve will normally be required. The pressure rating of the valve will be determined by the lowest pressure rated component in the high side, and local code. This valve will need to be installed in the high side piping.

The YCRL is shipped with a high pressure cutout that opens at 585 plus or minus 10 PSIG. This may need to be field changed to a lower rating depending upon the lowest rated component on the high side in the remote piping / condenser.

PIPEWORK ARRANGEMENT

The following are suggested pipework arrangements for single unit installations, for multiple unit installations, each unit should be piped as shown in *Figure 9 on page 37.*

Recommendations of the Building Services Research Association.

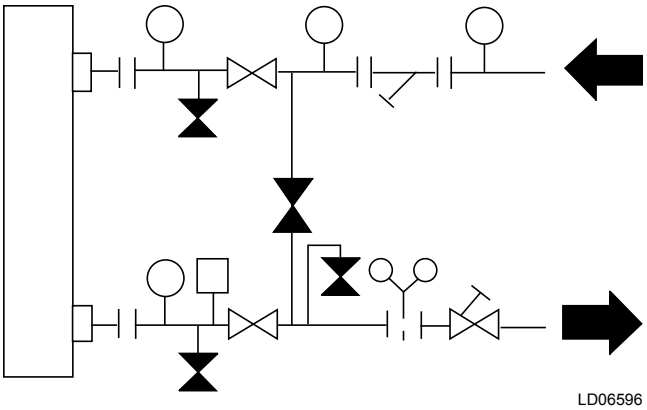

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FIGURE 9 - CHILLED LIQUID SYSTEM

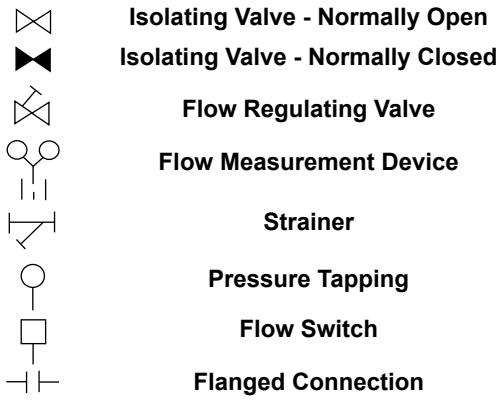

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FIGURE 10 - PIPEWORK ARRANGEMENTS LEGEND

CONNECTION TYPES AND SIZES

For connection sizes relevant to individual models refer to *SECTION 9 – SERVICE AND TROUBLESHOOTING*.

Cooler Connections

Standard chilled and condenser cooling liquid connections are of the Victaulic groove type.

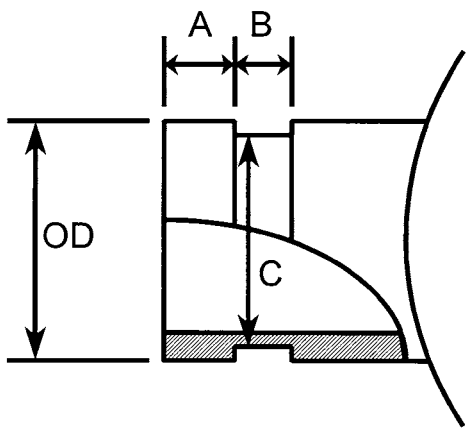

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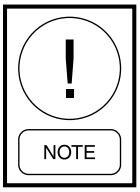
FIGURE 11 - COOLER CONNECTIONS

TABLE 1 - CONDENSER / COOLER CONNECTIONS

Nominal Size	OD	A	B	C
8”	8-5/8”	3/4 ±1/32”	7/16 ±1/32”	8.416”
6”	6-5/8”	5/8 ±1/32”	3/8 ±1/32”	6.433”
5”	5-9/16”	5/8 ±1/32”	3/8 ±1/32”	5.395

REMOTE CONDENSER PIPING

Improper design and sizing of refrigerant piping may result in loss of system efficiency and/or eventual failure of the system. Factors that must be considered in a piping design are the inter-relationships between velocity, pressure, friction, as well as, economics. Economics favor the use of the smallest possible line sizes. However, high suction and discharge line pressure drops will cause loss in capacity and increased power consumption. Another important design criterion is oil return to the compressor. The refrigerant line velocities have to be sufficiently high to carry oil up suction or hot gas risers at all operating capacities.



Johnson Controls assumes no warranty responsibility for system operation or failures due to improper piping of piping design.

REFRIGERANT LINE LOSSES

The pressure drops (line losses) are typically presented as a given change in the corresponding saturation temperature. The effect of line losses on the capacity and energy consumption (kW/ton) is illustrated in *Figure 12 on page 38*. Line sizing is a balance between pressure drop (reflected in system performance) and oil return (for system reliability).

PRESSURE DROP CONSIDERATIONS

Pressure drop calculations are determined as pressure changes associated with a change in saturation temperature of the refrigerant. Systems are typically sized for pressure losses of 2°F or less for the discharge, suction and liquid lines. This is the conventional method for sizing and is accepted practice throughout the industry (ASHRAE).

Table 2 on page 40 and *Table 3 on page 41* show capacities HFC-410A at specified pressure drops for the various refrigerant lines.

DISCHARGE LINE

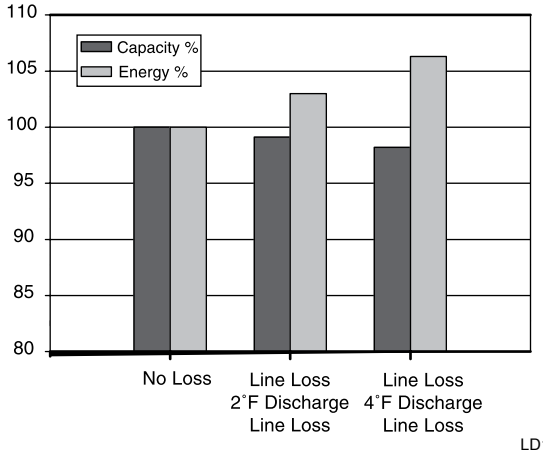


FIGURE 12 - EXAMPLE OF TYPICAL EFFECT OF SUCTION AND DISCHARGE LINE PRESSURE DROP ON CAPACITY AND POWER (ASHRAE)

System operating at 100°F saturated condensing and 40°F saturated evaporating temperature. Energy percentage is rated at kW/ton.)

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. Be sure to review *DX Piping Guide (Form 050.40-ES2)*. Considerations should be given to:

1. Discharge line pressure drop due to refrigerant flow.
2. Discharge 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.

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, discharge 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.

Chiller Below Condenser

On a system where the chiller is located below the condenser, the discharge line must be sized for both pressure drop and oil return. In some cases a double discharge riser must be installed to ensure reliable oil return at reduced loads.

Condenser Below Chiller

When the condenser is located below the chiller, 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 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 discharge lines should be pitched at least 1/4" per foot (2 cm/m) in the direction of the refrigerant flow to aid in the return of oil to the chiller. All discharge lines with a vertical rise exceeding 3 feet (.91 meters) should have a "P" trap at the bottom and top of the riser. Discharge lines with a vertical rise exceeding 25 feet (7.6 meters) should be trapped every 15 feet (4.6 meters).

REFRIGERANT CHARGE

The chiller is charged and shipped with a dry nitrogen holding charge. The chiller and the remote piping condenser must be evacuated and the operating charge for the chiller, remote condenser and refrigerant piping must be weighed in after all refrigerant piping is installed, leak checked, and evacuated. A minimum of 70% of the calculated complete system charge must be installed before attempting to operate a system. Final adjustment of refrigerant charge should be verified by subcooling values (refer to *Checking Superheat And Subcooling on Page 97 in SECTION 6 – COMMISSIONING*).

REFRIGERANT PIPING REFERENCE

R-410A Copper Line Sizing

When selecting pipe diameter and material for remote condenser piping R-410A systems such as used with YCRL chillers, 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.

YCRL Line Sizing Notes

The YCRL chiller has a maximum design working pressure of 560 psig, a mechanical high pressure cutout to shut the unit off at 585 psig, and (the unit) is rated at 650 psig. The maximum discharge pipe diameter used on YCRL is 2-1/8".

ASTM B280, type "L" pipe, 2-1/8" diameter has a pressure rating of 608 psi per ASME B31.5-2006 section 504.1.2, with an additional 20% increase allowed in section 502.2.3 "Ratings: Allowance for Variations from Normal Operation" for a maximum allowable pressure of 730 psi.

Type "K" pipe (thicker wall), per ASME B31.5-2006 section 504.1.2, has a rating of 725 psi before the additional 20% allowance is taken.

For more details, refer to *"ASHRAE Refrigeration Handbook, Chapter 2", "Tables 2 and 3" in this IOM and YORK DX Piping Guide "Form 050.40-ES2"*

1. Table capacities are in tons of refrigeration.

   Δp = Pressure drop due to line friction, PSI per 100 feet equivalent length.

   Δt = Change in saturation temperature corresponding to pressure drop, °F per 100 feet.

2. Line capacity for other saturation temperatures Δt and equivalent lengths.

$$\text{Line Capacity} = \text{Table Capacity} \times \left(\frac{\text{Table } L_e}{\text{Actual } L_e}\right) \times \left(\frac{\text{Actual } \Delta t}{\text{Table } \Delta t}\right)^{0.55}$$

3. Saturation temperature Δt (for other capacities and equivalent lengths L_e

$$\Delta t = \text{Table } \Delta t \times \left(\frac{\text{Actual } L_e}{\text{Table } L_e} \times \frac{\text{Actual Capacity}}{\text{Table Capacity}}\right)^{1.8}$$

TABLE 2 - DISCHARGE AND LIQUID LINE CAPACITIES IN TONS FOR REFRIGERANT 410A

LINE SIZE TYPE L COPPER, O.D.		DISCHARGE LINES (DELTA T = 1°F, DELTA P = 4.75 PSI) SATURATED SUCTION TEMPERATURE, °F DELTA P = 4.75						LINE SIZE TYPE L COPPER, O.D.		LIQUID LINES		
										VEL. = 100 FPM	DELTA T = 1°F	DELTA T = 5°F
		-60	-40	-20	0	20	40				DELTA P = 4.75	DELTA P = 23.3
1/2		1.13	1.17	1.22	1.26	1.30	1.33	1/2		2.00	4.60	10.81
5/8		2.11	2.20	2.29	2.36	2.43	2.49	5/8		3.20	8.60	20.24
3/4		3.59	3.74	3.88	4.02	4.14	4.23	3/4		4.70	14.30	33.53
7/8		5.53	5.76	5.99	6.19	6.38	6.52	7/8		6.70	22.60	52.92
1-1/8		11.16	11.64	12.09	12.50	12.88	13.17	1-1/8		11.40	45.80	106.59
1-3/8		19.39	20.21	21.00	21.72	22.37	22.88	1-3/8		17.40	79.70	185.04
1-5/8		30.63	31.92	33.16	34.30	35.33	36.14	1-5/8		24.60	125.90	291.48
2-1/8		63.20	65.88	68.44	70.78	72.90	74.57	2-1/8		42.80	260.70	601.13
2-5/8		111.20	115.90	120.41	124.53	128.25	131.20	2-5/8		66.00	459.70	1056.39
3-1/8		177.12	184.62	191.80	198.36	204.29	208.98	3-1/8		94.20	733.00	1680.52
3-5/8		262.44	273.54	284.19	293.90	302.70	309.64	3-5/8		127.40	1087.50	2491.00
4-1/8		369.45	385.08	400.07	413.75	426.13	435.90	4-1/8		165.70	1530.20	3500.91
5-1/8		658.32	686.18	712.88	737.26	759.31	776.72	5-1/8		258.20	2729.80	6228.40
6-1/8		1054.47	1099.10	1141.87	1180.91	1216.24	1244.13	6-1/8		371.10	4383.70	9980.43
STEEL												
IPS	**SCH**							**IPS**	**SCH**			
3/8	80	0.81	0.84	0.88	0.91	0.93	0.95	3/8	80.00	1.90	3.40	7.60
1/2	80	1.59	1.66	1.73	1.78	1.84	1.88	0.50	80.00	3.20	6.70	15.00
3/4	80	3.59	3.74	3.88	4.02	4.14	4.23	0.75	80.00	6.00	15.10	33.60
1	80	7,02	7.32	7.60	7.86	8.10	8.28	1	80.00	10.00	29.50	65.80
1-1/4	80	15.03	15.67	16.28	16.83	17.34	17.74	1-1/4	80.00	17.70	63.30	140.90
1-1/2	80	22.89	23.86	24.79	25.64	26.41	27.01	1-1/2	80.00	24.40	96.60	214.70
2	40	53.16	55.41	57.57	59.54	61.32	62.73	2	40.00	46.40	224.20	498.00
2-1/2	40	84.56	88.14	91.57	94.70	97.53	99.77	2-1/2	40.00	66.20	356.50	793.00
3	40	149.44	155.76	161.82	167.36	172.37	176.32	3	40.00	102.20	630.00	1398.40
4	40	304.02	316.88	329.21	340.47	350.66	358.70	4	40.00	176.10	1284.60	2851.70
5	40	548.97	572.20	594.46	614.79	633.19	647.71	5	40.00	276.50	2313.70	5137.00
6	40	886.76	924.29	960.25	993.09	1022.80	1046.26	6	40.00	399.60	3741.90	8308.90

The refrigerant cycle for determining capacity is based on saturated gas leaving the evaporator and no sub-cooling in the condenser. Discharge superheat is 105°F. The saturated suction temperature 40°F for liquid line sizing.

Multiply table capacities by the following factors for condensing temperatures other than 105°F.

CONDENSING TEMPERATURE, °F	SUCTION LINE	DISCHARGE LINE
80	1.16	0.81
90	1.09	0.89
100	1.03	0.96
110	0.97	1.03
120	0.9	1.1
130	0.83	1.16
140	0.76	1.19

TABLE 3 - MINIMUM REFRIGERATION CAPACITY IN TONS FOR OIL ENTRAINMENT UP HOT GAS RISERS (TYPE L COPPER TUBING)

REFRIGERANT	SATURATION TEMP. °F	DISCHARGE GAS TEMP. °F	PIPE O.D., IN.					
			1/2	5/8	3/4	7/8	1-1/8	1-3/8
			AREA, IN2					
				0.233	0.348	0.484	0.825	1.256
410A	80	110	0.30	0.54	0.88	1.33	2.60	4.40
		140	0.28	0.50	0.82	1.24	2.41	4.08
		170	0.25	0.45	0.74	1.11	2.17	3.67
	90	120	0.30	0.54	0.90	1.36	2.64	4.47
		150	0.28	0.50	0.83	1.25	2.43	4.11
		180	0.25	0.45	0.75	1.13	2.21	3.73
	100	130	0.31	0.55	0.91	1.37	2.67	4.51
		160	0.27	0.48	0.80	1.20	2.34	3.96
		190	0.26	0.46	0.76	1.15	2.23	3.77
	110	140	0.31	0.55	0.91	1.37	2.67	4.52
		170	0.27	0.49	0.80	1.21	2.36	3.99
		200	0.26	0.46	0.76	1.15	2.24	3.79
	120	150	0.30	0.54	0.90	1.36	2.64	4.47
		180	0.27	0.48	0.80	1.21	2.35	3.98
		210	0.26	0.46	0.76	1.15	2.23	3.78

REFRIGERANT	SATURATION TEMP. °F	DISCHARGE GAS TEMP. °F	PIPE O.D., IN.					
			1-5/8	2-1/8	2-5/8	3-1/8	3-5/8	4-1/8
			AREA, IN2					
			1.780	3.094	4.770	6.812	9.213	11.970
410A	80	110	6.80	13.56	23.30	36.38	53.06	73.60
		140	6.31	12.60	21.64	33.79	49.28	68.36
		170	5.67	11.32	19.44	30.35	44.27	61.41
	90	120	6.91	13.80	23.70	37.00	53.96	74.85
		150	6.36	12.69	21.79	34.02	49.62	68.83
		180	5.77	11.52	19.79	30.89	45.05	62.49
	100	130	6.98	13.93	23.93	37.36	54.49	75.59
		160	6.13	12.23	21.01	32.79	47.83	66.35
		190	5.84	11.65	20.01	31.24	45.56	63.19
	110	140	6.99	13.95	23.96	37.41	54.56	75.69
		170	6.16	12.30	21.13	32.98	48.11	66.73
		200	5.86	11.70	20.10	31.37	45.76	63.47
	120	150	6.91	13.80	23.70	37.00	53.97	74.86
		180	6.15	12.28	21.09	32.92	48.02	66.61
		210	5.84	11.66	20.03	31.27	45.61	63.27

Refrigeration capacity in tons is based on a saturated suction temperature of 20°F with 15°F superheat at the indicated saturated condensing temperature with 15°F subcooling. The saturated condensing and suction conditions are referenced to the dewpoint for R-407C. For other saturated suction temperatures with 15°F superheat, use correction factors to the capacity given in the table below.

REFRIGERANT	SATURATED SUCTION TEMPERATURE, °F			
	-40	-20	0	40
410A	0.91	0.94	0.97	1.02

ELECTRICAL CONNECTION

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

No additional controls (relays, etc.) should be mounted in the control panel. Power and control wiring not connected to the control panel should not be run through the control panel. If these precautions are not followed it could lead to a risk of electrocution. In addition, electrical noise could cause malfunctions or damage the unit and its controls.

Remote Emergency Stop Device

A remote emergency stop device may be wired into the unit. This device should be rated at 8 amps, 230V.

The emergency stop device should be wired into terminals L and 5 of CTB2.

Chilled Liquid Pump (CLP) (Evaporator Pump Start Contacts)

Terminals 23 and 24 on CTB1 close to start the chilled liquid pump. These terminals can be used as a master start/stop for the pump in conjunction with the daily start/stop schedule. If no schedule is set, and the customer has master control of the pump, the terminals must be used to override the customer master start/stop so that the unit can start the pump in the event of a low liquid temperature condition.

System Run Contacts

Terminals 25 and 26 on CTB2 close to indicate that System 1 is running. Terminals 27 and 28 on CTB2 close to indicate System 2 is running. These terminals may be used to start the cooling liquid pump(s) for the condenser.

System Alarm (SA) (System Alarm Contacts)

Terminals 29 and 30 (system 1) and 31 and 32 (system 2) on CTB2 close to indicate an alarm condition whenever a system locks out, or there is a power failure.

FIELD WIRING

All field wiring must comply with the National Electric Code and all applicable local codes. YORK liquid chiller units are factory wired for optimum reliability. Therefore the unit controls must not be modified without expressed written consent by Johnson Controls. The use of a simple switch or timer from a remote point is permitted; but it must be connected to the YORK unit panel at points expressly indicated for that purpose.

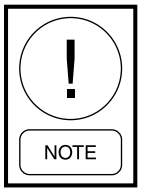
Copper power wiring only should be used for supplying power to the chiller. This is recommended to avoid safety and reliability issues resulting from connection failure at the power connections to the chiller. Aluminum wiring is not recommended due to thermal characteristics that may cause loose terminations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

A 120-1-60, 15 amp source must be supplied for the control panel through a fused disconnect when a control panel transformer (optional) is not provided (*refer to Use 1/2" or better grade 80 chain*).

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. Refer to *SECTION 8 – UNIT OPERATION* for a detailed description of operation concerning aforementioned contacts and inputs.

YCRL Connection Sizes

Piping connection sizes are provided in *Table 4 on page 43*. These sizes indicate the connection size that is provided on the chiller where the remote piping connects.



The connection sizes should not be used as a guide for sizing remote piping, since sizing of the remote piping will vary to assure oil return and limit pressure drop.

TABLE 4 - YCRL CONNECTION LINE SIZES

UNIT SIZE (60HZ)	LIQUID LINE SYSTEM 1, IN.	LIQUID LINE SYSTEM 2, IN.	DISCHARGE LINE SYSTEM 1, IN.	DISCHARGE LINE SYSTEM 2, IN.
0064HE	7/8	7/8	1 3/8	1 3/8
0074HE	1 1/8	7/8	1 5/8	1 3/8
0084HE	1 1/8	1 1/8	1 5/8	1 5/8
0096HE	1 1/8	1 1/8	1 3/8	1 3/8
0118HE	1 1/8	1 1/8	1 5/8	1 5/8
0126HE	1 1/8	1 1/8	2 1/8	2 1/8
0156HE	1 1/8	1 1/8	2 1/8	2 1/8
0177SE	1 1/8	1 1/8	2 1/8	2 1/8
0198SE	1 1/8	1 1/8	2 1/8	2 1/8

YCRL Chiller Charge Capability

Table 5 on page 43 provides a refrigerant charge capability for each refrigerant system in the chiller. This information is valuable when calculating the total charge needed for each of the refrigerant systems. Simply add the system charge capability to the calculated charge of all the field piping and remote condenser in the circuit to compute the total approximate charge required for each refrigerant system in the chiller.

TABLE 5 - YCRL CHILLER CHARGES

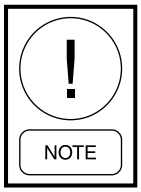
MODEL (60 HZ)	TOTAL HFC-410A CHARGE (LB)	PER SYSTEM (LB)
0064HE	34	17
0074HE	40	20
0084HE	82	41
0096HE	106	53
0118HE	90	45
0126HE	126	63
0156HE	126	63
0177SE	122	63/59
0198SE	126	63

Note: Charge for remote condenser and interconnecting piping must be calculated separately.

CONTROL PANEL WIRING

All wiring to the control panel terminal block (CTBI) (nominal 30VDC) must be run in screened cable, with the screen earthed at the panel end only. Run screened cable separately from mains cable to avoid electrical noise pick-up.

The voltage free contacts connected to CTB1 must be suitable for 30VDC (gold contacts recommended). If the voltage free contacts form part of a relay or contactor, the coil of the device must be suppressed using a standard R/C suppressor. The above precautions must be taken to avoid electrical noise which could cause a malfunction or damage to the unit and its controls.



The length of cable to these terminals must not exceed 24 ft. (7.5 m).

Flow Switch (SF)

A chilled liquid flow switch of suitable type must be connected to terminals 13 and 14 to provide adequate protection against loss of liquid flow.

After connection, do not switch on mains power to the unit until it has been commissioned by Johnson Controls Authorized personnel. Some internal components are live when mains is switched ON.

The unit ON/OFF rocker switch on the front of the control panel has been set in the OFF position at the factory.

This switch MUST remain in the OFF position until the unit is commissioned by Johnson Controls Authorized personnel. If the switch is set to the ON position before commissioning then it must be reported to Johnson Controls, otherwise the warranty may be invalidated.

Remote Start/Stop

Remote Start and Stop is accomplished by a contact placed between Terminals 13 and 51 on the CTBl terminal strip. If this function is not utilized, the terminals must be jumpered for the chiller to run.

POWER WIRING

All electrical wiring should be carried out in accordance with local regulations. Route properly sized cables to cable entries on the bottom of the control panel. For wiring specifications, refer to *SECTION 5 – TECHNICAL DATA*.

In accordance with National Electric Code (N.E.C.) it is the responsibility of the user to install overcurrent protection devices between the supply conductors and the power supply terminals on the unit.

To ensure that no eddy currents are set up in the metal gland plate the cables forming each 3-phase power supply must enter via the same hole in the gland plate. If separate entries for each cable forming the 3-phase supplies are used, the metal gland plate must be replaced by a non-metallic gland plate, with due regard given to sealing the panel to NEMA 1.

All sources of supply to the unit must be taken via a common point of isolation (not supplied by Johnson Controls).

Units with Single-Point Power Supply Wiring

Models require one field provided 200 VAC, 3-phase, 60 Hz; 230VAC, 3-phase, 60 Hz; 380 VAC, 3-phase, 60 Hz; 460 VAC, 3-phase, 60 Hz; 575 VAC, 3-phase, 60 Hz, ground supply to the unit with circuit protection.

Connect the 3-phase supply to the terminal block or Non-fused Disconnect Switch located in the common input section using the wire sizes detailed in *SECTION 5 – TECHNICAL DATA*.

Connect the earth wire ground to the main protective earth terminal in the common input section.

Units with Multi Point Power Supply Wiring

Units require two field provided 200 VAC, 3-phase, 60 Hz; 230VAC, 3-phase, 60 Hz; 380 VAC, 3-phase, 60 Hz; 460 VAC, 3-phase, 60 Hz; 575 VAC, 3-phase, 60 Hz, supplies with circuit protection and a separate control supply with circuit protection (200 VAC, 3-phase, 60 Hz; 230VAC, 3-phase, 60 Hz; 380 VAC, 3-phase, 60 Hz; 460 VAC, 3-phase, 60 Hz; 575 VAC, 3-phase, 60 Hz, +ground).

Connect each of the 3-phase supplies to the door interlocked circuit breakers located in the power sections, using the wire sizes detailed in *SECTION 5 – TECHNICAL DATA*.

Connect each of the earth grounds to the main protective earth ground terminals in the power sections.

Connect the control supply to the door interlocked emergency stop device located in the common input section, using the wire sizes detailed in *SECTION 5 – TECHNICAL DATA*.

Connect the earth ground to the main protective earth terminal in the common input section.

Control Transformer Primary Voltage Tappings

It is important to check that the correct primary tapping has been used on the control transformer:

- With the supply to the unit isolated remove the lid to the transformer box.
- Check that the tapping used conforms to the site supply voltage. The two tappings are 342-424V and 360-440V.

COMPRESSOR HEATERS

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

RELIEF VALVES

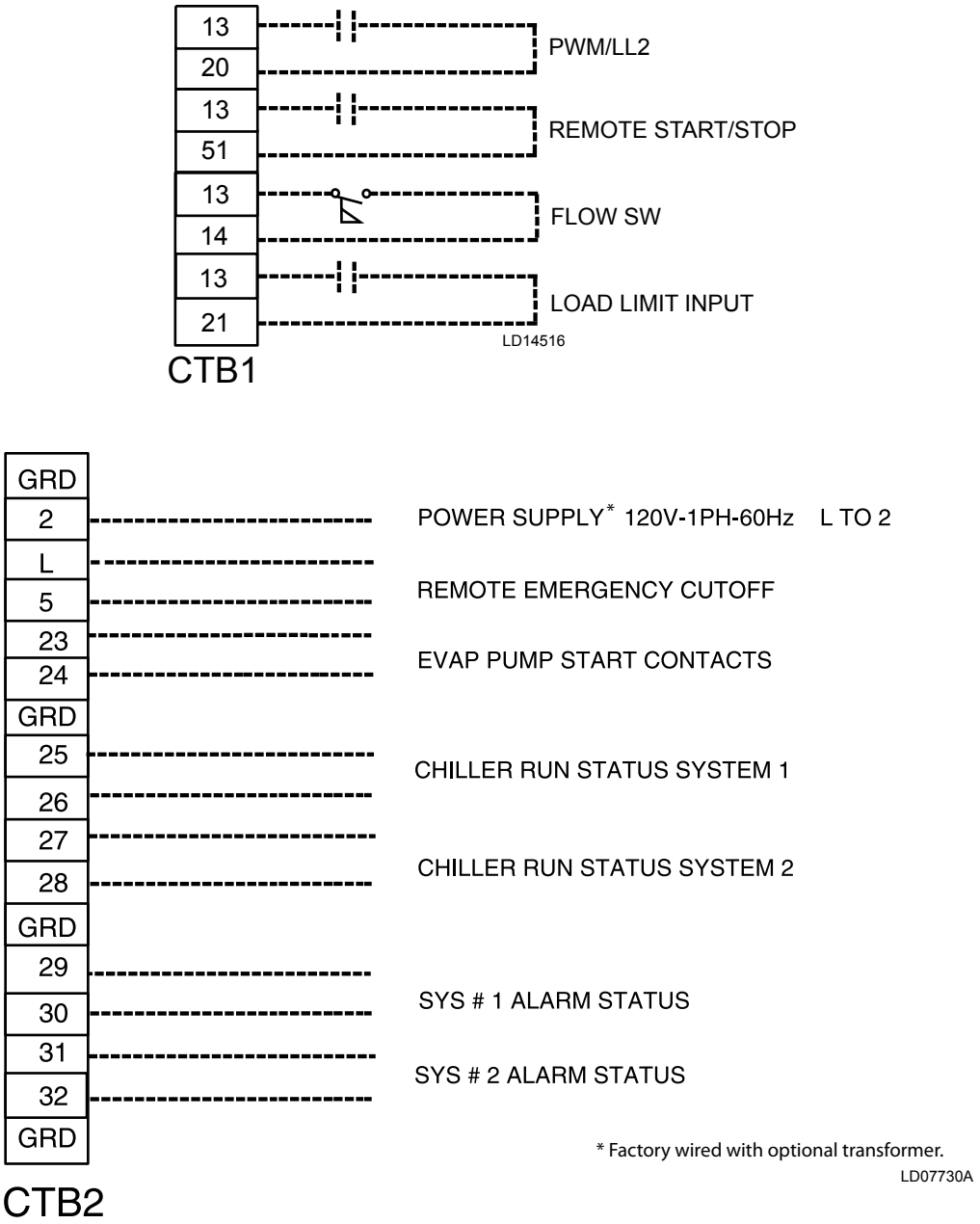
Relief valves are located in the low pressure side of the piping. High side relief valve pressure setting is determined by the lowest pressure rated component in the highside piping and local code. The high side relief valve is field installed.

HIGH PRESSURE CUTOUT

On 60 Hz chillers, a high pressure cutout is installed in the discharge piping of each system. The cutout opens at 585 PSI ±10 PSIG and automatically closes at 440 PSIG ±25 PSIG.

On 50Hz chillers, all models will utilize a manual reset high pressure cutout of 503 PSIG (34.7 barg). On chillers with compressors exceeding a swept volume of 25L/sec, a second tool reset cutout is installed with a cutout of 532 PSIG (36.7 barg). These cutouts conform to relevant requirements of Pressure Equipment Directive PD 97/23/EC.

CONTROL WIRING



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, PRIOR to working on equipment.

CAUTION

The unit evaporator heater uses 120VAC. Disconnecting 120VAC 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 13 - CONTROL WIRING

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SECTION 5 – TECHNICAL DATA

OPERATIONAL LIMITATIONS (ENGLISH AND SI)

TABLE 6 - TEMPERATURES AND FLOWS

DESIGN PARAMETERS – HIGH EFFICIENCY (HE) – ENGLISH								
YCWL MODEL NUMBER	EVAPORATOR FLOW (GPM)		LEAVING EVAP. WATER TEMP. (°F)		MIN SAT. DISCH. TEMP. (°F)	MAX. SAT DISCH TEMP (°F)	EQUIPMENT ROOM TEMP. (°F)	
	MIN	MAX	MIN1	MAX2	MIN	MAX	MIN	MAX
0064	100	450	40	50	80	130	40	115
0074	140	450	40	50	80	130	40	115
0084	140	450	40	50	80	130	40	115
0096	150	700	40	50	80	130	40	115
0118	140	700	40	50	80	130	40	115
0126	200	700	40	50	80	130	40	115
0156	200	700	40	50	80	130	40	115
0177	200	700	40	50	80	130	40	115
0198	200	700	40	50	80	130	40	115

DESIGN PARAMETERS – HIGH EFFICIENCY (HE) – SI								
YCWL MODEL NUMBER	EVAPORATOR FLOW (L/S)		LEAVING EVAP. WATER TEMP. (°C)		MIN SAT. DISCH. TEMP. (°C)	MAX. SAT DISCH. TEMP (°C)	EQUIPMENT ROOM TEMP. (°C)	
	MIN	MAX	MIN1	MAX2	MIN	MAX	MIN	MAX
0064	6.3	28.4	4.4	10	26.7	54	4.4	46
0074	8.8	28.4	4.4	10	26.7	54	4.4	46
0084	8.8	28.4	4.4	10	26.7	54	4.4	46
0096	9.5	44.2	4.4	10	26.7	54	4.4	46
0118	8.8	44.2	4.4	10	26.7	54	4.4	46
0126	12.6	44.2	4.4	10	26.7	54	4.4	46
0156	12.6	44.2	4.4	10	26.7	54	4.4	46
0177	12.6	44.2	4.4	10	26.7	54	4.4	46
0198	12.6	44.2	4.4	10	26.7	54	4.4	46

NOTES:
1. For leaving brine temperature below 40°F (4.4°C), contact the nearest Johnson Controls Office for application requirements.
2. For leaving water temperature higher than 50°F (10°C), contact the nearest Johnson Controls Office for application guidelines.

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.

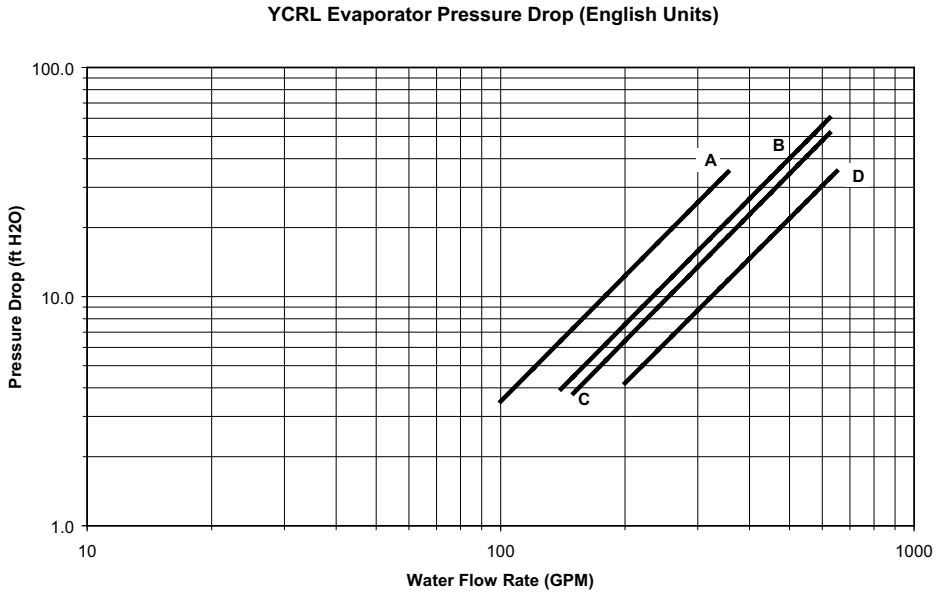
Voltage Limitations

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

PRESSURE DROP CHARTS



YCRL Model Number	Evap
0064HE	A
0074HE, 0084HE, 0118HE,	B
0096HE	C
0126HE, 0156HE, 0177SE, 198SE	D

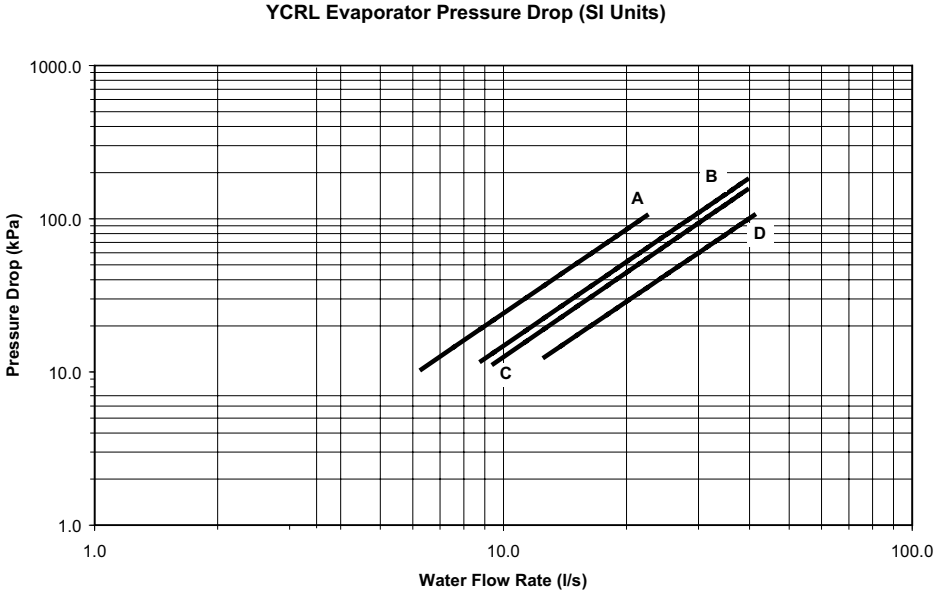


FIGURE 14 - EVAPORATOR WATER PRESSURE DROP CURVES (ENGLISH AND SI)

ETHYLENE AND PROPOLYNE GLYCOL CORRECTION FACTORS

Evaporator Pressure Drop

When using evaporator pressure drop to determine flow, error may result due to actual pressure drops that are below the published data. In all cases, the published values are worst case values. Errors of 10 to 25% below published values are not uncommon due to manufacturing differences. When attempting to operate with flow near the high end of the pressure drop curve, always use a flowmeter to avoid excessive flow through the evaporator, which will cause damage and premature failure.

Table 8 on page 49 lists glycol correction factors that should be used in conjunction with pressure drops. Pressure drop will increase at a given flow rate as the glycol concentration is increased.

TABLE 8 - ETHYLENE AND PROPOLYNE GLYCOL CORRECTION FACTORS

ETHYLENE GLYCOL					
% WEIGHT	TONS	COMPR KW	GPM	PRESS DROP	FREEZE PT
10	0.993	1.002	1.029	1.095	26
20	0.98	1.004	1.04	1.191	18
30	0.964	1.007	1.055	1.302	7
40	0.945	1.009	1.071	1.435	-8
50	0.922	1.013	1.091	1.599	-29

PROPYLENE GLYCOL					
% WEIGHT	TONS	COMPR KW	GPM	PRESS DROP	FREEZE PT
10	0.985	1.002	1.003	1.078	26
20	0.968	1.005	1.000	1.157	19
30	0.937	1.008	0.992	1.266	9
40	0.898	1.012	0.982	1.414	-6
50	0.862	1.019	0.985	1.605	-28

TABLE 9 - RECOMMENDED GLYCOL SOLUTION STRENGTHS

ETHYLENE GLYCOL LCHLT °C	PROPYLENE GLYCOL CONCENTRATION % W/W	CONCENTRATION % W/W
6	5	5
4	12	13
2	18	20
0	23	25
-2	28	30
-4	32	34
-6	35	38

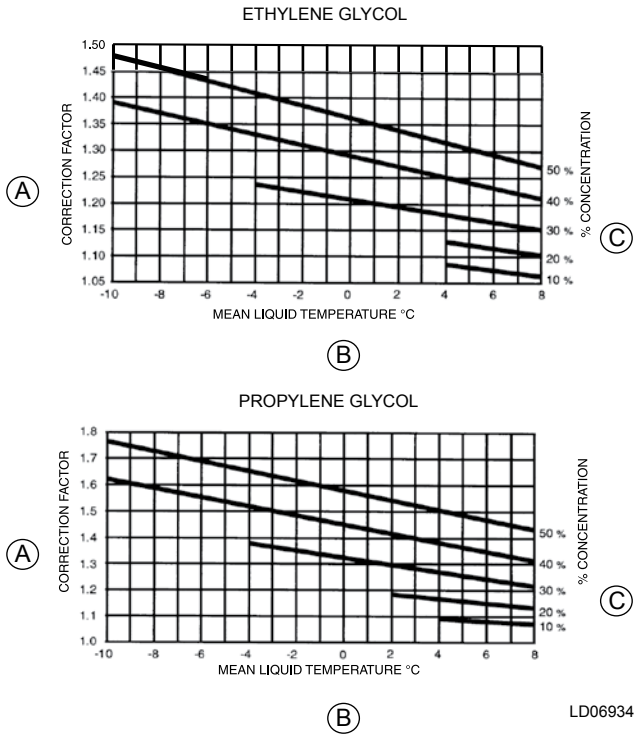
Pressure drop across the evaporator should only be used as a guide for setting up flow. When very accurate flows need to be measured, use a flowmeter. When gauges are used to measure pressure drop and calculate flow, always use a single gauge to measure the pressure drop at both inlet and outlet of the evaporator to avoid introducing more error into the measurement resulting from the use of two gauges.

NOTE

The cooler design allows for an increase in pressure drop of up to 15% above the design value given. Debris in the water may also cause additional pressure drop.

CAUTION

When using glycol solutions, pressure drops are higher than with water. Special care must be taken not to exceed the maximum allowed.



A = Correction Factor **B** = Temperature
C = Concentration % Through Cooler

FIGURE 15 - GLYCOL SOLUTION STRENGTHS

PHYSICAL DATA - STANDARD AND HIGH EFFICIENCY - ENGLISH

YCRL MODEL	0064HE	0074HE	0084HE	0096HE	0118HE	0126HE	0156HE	0177SE	0198SE
GENERAL UNIT DATA									
NOMINAL UNIT CAPACITY (TONS)	55.8	64.6	73.0	85.1	101.7	110.5	129.7	170.5	203.2
NUMBER OF INDEPENDENT REFRIGERANT CIRCUITS	2	2	2	2	2	2	2	2	2
OIL CHARGE, CKT. 1/CKT. 2, (GAL.)	2.2/2.2	2.5/2.2	2.5/2.5	3.3/3.3	3.3/3.1	3.7/3.7	4.7/4.7	4.7/4.7	4.7/4.7
SHIPPING (LBS.)	2883	3261	3439	3753	3705	4587	4989	4418	4773
OPERATING (LBS.)	3090	3547	3725	4195	3991	5030	5432	4773	5128
COMPRESSORS, SCROLL									
QUANTITY PER CHILLER	4	4	4	6	4	6	6	5	6
NOMINAL SIZE CKT. 1/ CKT. 2	15-15 / 15-15	20-20 / 15-15	20-20 / 20-20	15-15-15/ 15-15-15	32-32 / 25-25	20-20-20 / 20-20-20	25-25-25 / 25-25-25	32-32-32 / 32-32	32-32-32 / 32-32-32
EVAPORATOR									
WATER VOLUME (GALS.)	37.3	59.8	59.8	57.6	59.8	77	77	77	77
MAXIMUM WATER SIDE PRESSURE (PSIG)	150	150	150	150	150	150	150	150	150
MAXIMUM REFRIGERANT SIDE PRESSURE (PSIG)	450	450	450	450	450	450	450	450	450
DIA. X LENGTH (INCHES X FEET)	13” X 8’	16” X 8’	16” X 8’	15” X 10’	16” X 8’	17” 10’	17” 10’	17” 10’	17” 10’
WATER NOZZLE CONNECTION SIZE, (INCHES)	6	8	8	8	8	8	8	8	8

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ELECTRICAL DATA - SINGLE POINT

HIGH EFFICIENCY without EXTERNAL COMPRESSOR OVERLOADS (CONT'D)

YCRL	VOLT	HZ	MINIMUM CIRCUIT AMPS MCA	MIN N/F DISC SW MDSW	MIN DUAL ELEM FUSE	MAX DUAL ELEM FUSE	LUGS PER PHASE			
							CIRCUIT BREAKER LUG SIZE (OPT)		TERMINAL BLOCK LUG SIZE (STD)	
							QTY/Ø	LUG INFO	QTY/Ø	LUG INFO
0064HE	208	60	237	400	300	300	1	250 - 500 KCM	1	# 4 - 500 KCM
	230	60	237	400	300	300	1	250 - 500 KCM	1	# 4 - 500 KCM
	380	60	153	200	175	175	1	# 4 - 300 KCM	1	# 10 - 300 KCM
	460	60	114	150	125	125	1	# 2 - 4/0 AWG	1	# 10 - 300 KCM
	575	60	101	150	110	110	1	# 2 - 4/0 AWG	1	# 10 - 300 KCM
0074HE	208	60	278	400	300	350	1	250 - 500 KCM	1	# 4 - 500 KCM
	230	60	278	400	300	350	1	250 - 500 KCM	1	# 4 - 500 KCM
	380	60	158	200	175	175	1	# 4 - 300 KCM	1	# 10 - 300 KCM
	460	60	122	150	150	150	1	# 2 - 4/0 AWG	1	# 10 - 300 KCM
	575	60	103	150	110	125	1	# 2 - 4/0 AWG	1	# 10 - 300 KCM
0084HE	208	60	314	400	350	350	1	250 - 500 KCM	1	# 4 - 500 KCM
	230	60	314	400	350	350	1	250 - 500 KCM	1	# 4 - 500 KCM
	380	60	162	200	175	200	1	# 4 - 300 KCM	1	# 10 - 300 KCM
	460	60	129	150	150	150	1	# 2 - 4/0 AWG	1	# 10 - 300 KCM
	575	60	105	150	125	125	1	# 2 - 4/0 AWG	1	# 10 - 300 KCM
0096HE	208	60	349	400	400	400	1	250 - 500 KCM	2	#10 - 300 KCM
	230	60	349	400	400	400	1	250 - 500 KCM	2	#10 - 300 KCM
	380	60	225	250	250	250	1	# 6 - 350 KCM	1	# 4 - 500 KCM
	460	60	168	200	175	175	1	# 4 - 300 KCM	1	# 4 - 500 KCM
	575	60	148	200	175	175	1	# 6 - 350 KCM	1	# 4 - 500 KCM
0118HE	208	60	425	600	500	500	2	250 - 500 KCM	2	#10 - 300 KCM
	230	60	425	600	500	500	2	250 - 500 KCM	2	#10 - 300 KCM
	380	60	265	400	300	300	1	250 - 500 KCM	1	# 4 - 500 KCM
	460	60	208	250	225	250	1	# 6 - 350 KCM	1	# 4 - 500 KCM
	575	60	175	200	200	200	1	# 6 - 350 KCM	1	# 4 - 500 KCM
0126HE	208	60	462	600	500	500	2	250 - 500 KCM	2	# 10 - 300 KCM
	230	60	462	600	500	500	2	250 - 500 KCM	2	# 10 - 300 KCM
	380	60	239	400	250	250	1	# 6 - 350 KCM	1	# 4 - 500 KCM
	460	60	190	250	200	200	1	# 6 - 350 KCM	1	# 4 - 500 KCM
	575	60	154	200	175	175	1	# 6 - 350 KCM	1	# 4 - 500 KCM
0156HE	208	60	557	800	600	600	2	250 - 500 KCM	2	# 4 - 500 KCM
	230	60	557	800	600	600	2	250 - 500 KCM	2	# 4 - 500 KCM
	380	60	341	400	400	400	1	250 - 500 KCM	2	# 10 - 300 KCM
	460	60	268	400	300	300	1	250 - 500 KCM	1	# 4 - 500 KCM
	575	60	201	250	225	225	1	250 - 500 KCM	1	# 4 - 500 KCM
0177SE	380	60	358	400	400	400	*	*	2	# 10 - 300 KCM
	460	60	288	400	300	300	1	250 - 500 KCM	1	# 4 - 500 KCM
	575	60	261	400	300	300	1	#6 AWG - 350 KCM	1	# 4 - 500 KCM
0198SE	380	60	435	600	500	500	2	250 - 500 KCM	2	#10 - 300 KCM
	460	60	343	400	350	350	2	#3/0 - 250 KCM	1	# 4 - 500 KCM
	575	60	310	400	350	350	1	250 - 500 KCM	1	# 4 - 500 KCM

* Contact Johnson Controls

HIGH EFFICIENCY without EXTERNAL COMPRESSOR OVERLOADS (CONT'D)

MODEL YCRL	SYSTEM # 1						SYSTEM # 2					
	COMPR 1		COMPR 2		COMPR 3		COMPR 1		COMPR 2		COMPR 3	
	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA
0064HE	55.8	425	55.8	425	-	-	55.8	425	55.8	425	-	-
	55.8	425	55.8	425	-	-	55.8	425	55.8	425	-	-
	36.0	239	36.0	239	-	-	36.0	239	36.0	239	-	-
	26.9	187	26.9	187	-	-	26.9	187	26.9	187	-	-
	23.7	148	23.7	148	-	-	23.7	148	23.7	148	-	-
0074HE	73.9	505	73.9	505	-	-	55.8	425	55.8	425	-	-
	73.9	505	73.9	505	-	-	55.8	425	55.8	425	-	-
	38.2	290	38.2	290	-	-	36.0	239	36.0	239	-	-
	30.4	225	30.4	225	-	-	26.9	187	26.9	187	-	-
	24.6	180	24.6	180	-	-	23.7	148	23.7	148	-	-
0084HE	73.9	505	73.9	505	-	-	73.9	505	73.9	505	-	-
	73.9	505	73.9	505	-	-	73.9	505	73.9	505	-	-
	38.2	290	38.2	290	-	-	38.2	290	38.2	290	-	-
	30.4	225	30.4	225	-	-	30.4	225	30.4	225	-	-
	24.6	180	24.6	180	-	-	24.6	180	24.6	180	-	-
0118HE	109.6	599	109.6	599	-	-	89.1	500	89.1	500	-	-
	109.6	599	109.6	599	-	-	89.1	500	89.1	500	-	-
	69.2	358	69.2	358	-	-	54.5	305	54.5	305	-	-
	54.5	310	54.5	310	-	-	42.9	250	42.9	250	-	-
	49.4	239	49.4	239	-	-	32.1	198	32.1	198	-	-
0096HE	55.8	425	55.8	425	55.8	425	55.8	425	55.8	425	55.8	425
	55.8	425	55.8	425	55.8	425	55.8	425	55.8	425	55.8	425
	36.0	239	36.0	239	36.0	239	36.0	239	36.0	239	36.0	239
	26.9	187	26.9	187	26.9	187	26.9	187	26.9	187	26.9	187
	23.7	148	23.7	148	23.7	148	23.7	148	23.7	148	23.7	148
0126HE	73.9	505	73.9	505	73.9	505	73.9	505	73.9	505	73.9	505
	73.9	505	73.9	505	73.9	505	73.9	505	73.9	505	73.9	505
	38.2	290	38.2	290	38.2	290	38.2	290	38.2	290	38.2	290
	30.4	225	30.4	225	30.4	225	30.4	225	30.4	225	30.4	225
	24.6	180	24.6	180	24.6	180	24.6	180	24.6	180	24.6	180
0156HE	89.1	500	89.1	500	89.1	500	89.1	500	89.1	500	89.1	500
	89.1	500	89.1	500	89.1	500	89.1	500	89.1	500	89.1	500
	54.5	305	54.5	305	54.5	305	54.5	305	54.5	305	54.5	305
	42.9	250	42.9	250	42.9	250	42.9	250	42.9	250	42.9	250
	32.1	198	32.1	198	32.1	198	32.1	198	32.1	198	32.1	198
0177SE	69.2	358	69.2	358	69.2	358	69.2	358	69.2	358	-	-
	54.5	310	54.5	310	54.5	310	54.5	310	54.5	310	-	-
	49.4	239	49.4	239	49.4	239	49.4	239	49.4	239	-	-
0198SE	69.2	358	69.2	358	69.2	358	69.2	358	69.2	358	69.2	358
	54.5	310	54.5	310	54.5	310	54.5	310	54.5	310	54.5	310
	49.4	239	49.4	239	49.4	239	49.4	239	49.4	239	49.4	239

ELECTRICAL DATA - DUAL POINT

HIGH EFFICIENCY without EXTERNAL COMPRESSOR OVERLOADS (CONTD)

YCRL	VOLT	HZ	SYSTEM 1 WIRING				SYSTEM 2 WIRING			
			MINIMUM CIRCUIT AMPS	MIN N/F DISC SW	MIN DUAL ELEM FUSE AND MIN CB	MAX DUAL ELEM FUSE AND MAX CB	MINIMUM CIRCUIT AMPS	MIN N/F DISC SW	MIN DUAL ELEM FUSE AND MIN CB	MAX DUAL ELEM FUSE AND MAX CB
0064HE	208	60	126	150	150	175	126	150	150	175
	230	60	126	150	150	175	126	150	150	175
	380	60	81	100	90	110	81	100	90	110
	460	60	61	100	70	80	61	100	70	80
	575	60	53	60	60	70	53	60	60	70
0074HE	208	60	166	200	200	225	126	150	150	175
	230	60	166	200	200	225	126	150	150	175
	380	60	86	100	100	110	81	100	90	110
	460	60	68	100	80	90	61	100	70	80
	575	60	55	60	70	70	53	60	60	70
0084HE	208	60	166	200	200	225	166	200	200	225
	230	60	166	200	200	225	166	200	200	225
	380	60	86	100	100	110	86	100	100	110
	460	60	68	100	80	90	68	100	80	90
	575	60	55	60	70	70	55	60	70	70
0118HE	208	60	247	400	300	350	200	250	225	250
	230	60	247	400	300	350	200	250	225	250
	380	60	156	200	175	200	123	150	150	175
	460	60	123	150	150	175	97	100	110	125
	575	60	111	150	125	150	72	100	90	100
0096HE	208	60	181	200	200	225	181	200	200	225
	230	60	181	200	200	225	181	200	200	225
	380	60	117	150	150	150	117	150	150	150
	460	60	87	100	100	110	87	100	100	110
	575	60	77	100	90	100	77	100	90	100
0126HE	208	60	240	400	300	300	240	400	300	300
	230	60	240	400	300	300	240	400	300	300
	380	60	124	150	150	150	124	150	150	150
	460	60	99	150	110	125	99	150	110	125
	575	60	80	100	90	100	80	100	90	100
0156HE	208	60	290	400	350	350	290	400	350	350
	230	60	290	400	350	350	290	400	350	350
	380	60	177	200	200	225	177	200	200	225
	460	60	139	150	175	175	139	150	175	175
	575	60	104	150	125	125	104	150	125	125
0177SE	230	60	345	400	400	450	239	250	300	300
	380	60	209	250	250	250	145	150	175	200
	460	60	173	200	200	225	119	150	150	150
	575	60	138	150	150	175	96	100	110	125
0198SE	230	60	345	400	400	450	345	400	400	450
	380	60	209	250	250	250	209	250	250	250
	460	60	173	200	200	225	173	200	200	225
	575	60	138	150	150	175	138	150	150	175

HIGH EFFICIENCY without EXTERNAL COMPRESSOR OVERLOADS (CONTD)

YCRL	VOLT	SYSTEM 1 CIRCUIT BREAKER LUG SIZE		SYSTEM # 1						SYSTEM 2 CIRCUIT BREAKER LUG SIZE		SYSTEM # 2					
				COMPR 1		COMPR 2		COMPR 3				COMPR 1		COMPR 2		COMPR 3	
		QTY/Ø	LUG INFO	RLA	LRA	RLA	LRA	RLA	LRA	QTY/Ø	LUG INFO	RLA	LRA	RLA	LRA	RLA	LRA
0064HE	208	1	#6 - 350KCMIL	55.8	425.0	55.8	425.0			1	#6 - 350KCMIL	55.8	425.0	55.8	425.0		
	230	1	#6 - 350KCMIL	55.8	425.0	55.8	425.0			1	#6 - 350KCMIL	55.8	425.0	55.8	425.0		
	380	1	#14 - 1/0AWG	36.0	239.0	36.0	239.0			1	#14 - 1/0AWG	36.0	239.0	36.0	239.0		
	460	1	#14 - 1/0AWG	26.9	187.0	26.9	187.0			1	#14 - 1/0AWG	26.9	187.0	26.9	187.0		
	575	1	#14 - 1/0AWG	23.7	148.0	23.7	148.0			1	#14 - 1/0AWG	23.7	148.0	23.7	148.0		
0074HE	208	1	#6 - 350KCMIL	73.9	505.0	73.9	505.0			1	#6 - 350KCMIL	55.8	425.0	55.8	425.0		
	230	1	#6 - 350KCMIL	73.9	505.0	73.9	505.0			1	#6 - 350KCMIL	55.8	425.0	55.8	425.0		
	380	1	#2 - 4/0AWG	38.2	290.0	38.2	290.0			1	#14 - 1/0AWG	36.0	239.0	36.0	239.0		
	460	1	#14 - 1/0AWG	30.4	225.0	30.4	225.0			1	#14 - 1/0AWG	26.9	187.0	26.9	187.0		
	575	1	#14 - 1/0AWG	24.6	180.0	24.6	180.0			1	#14 - 1/0AWG	23.7	148.0	23.7	148.0		
0084HE	208	1	#6 - 350KCMIL	73.9	505.0	73.9	505.0			1	#6 - 350KCMIL	73.9	505.0	73.9	505.0		
	230	1	#6 - 350KCMIL	73.9	505.0	73.9	505.0			1	#6 - 350KCMIL	73.9	505.0	73.9	505.0		
	380	1	#2 - 4/0AWG	38.2	290.0	38.2	290.0			1	#2 - 4/0AWG	38.2	290.0	38.2	290.0		
	460	1	#14 - 1/0AWG	30.4	225.0	30.4	225.0			1	#14 - 1/0AWG	30.4	225.0	30.4	225.0		
	575	1	#14 - 1/0AWG	24.6	180.0	24.6	180.0			1	#14 - 1/0AWG	24.6	180.0	24.6	180.0		
0096HE	208	1	250 - 300KCMIL	55.8	425.0	55.8	425.0	55.8	425.0	1	#6 - 350KCMIL	55.8	425.0	55.8	425.0	55.8	425.0
	230	1	250 - 300KCMIL	55.8	425.0	55.8	425.0	55.8	425.0	1	#6 - 350KCMIL	55.8	425.0	55.8	425.0	55.8	425.0
	380	1	#6 - 350KCMIL	36.0	239.0	36.0	239.0	36.0	239.0	1	#6 - 350KCMIL	36.0	239.0	36.0	239.0	36.0	239.0
	460	1	#6 - 350KCMIL	26.9	187.0	26.9	187.0	26.9	187.0	1	#2 - 4/0AWG	26.9	187.0	26.9	187.0	26.9	187.0
	575	1	#2 - 4/0AWG	23.7	148.0	23.7	148.0	23.7	148.0	1	#14 - 1/0AWG	23.7	148.0	23.7	148.0	23.7	148.0
0118HE	208	1	#6 - 350KCMIL	109.6	599.0	109.6	599.0			1	#6 - 350KCMIL	89.1	500.0	89.1	500.0		
	230	1	#6 - 350KCMIL	109.6	599.0	109.6	599.0			1	#6 - 350KCMIL	89.1	500.0	89.1	500.0		
	380	1	#2 - 4/0AWG	69.2	358.0	69.2	358.0			1	#2 - 4/0AWG	54.5	305.0	54.5	305.0		
	460	1	#14 - 1/0AWG	54.5	310.0	54.5	310.0			1	#14 - 1/0AWG	42.9	250.0	42.9	250.0		
	575	1	#14 - 1/0AWG	49.4	239.0	49.4	239.0			1	#14 - 1/0AWG	32.1	198.0	32.1	198.0		
0126HE	208	1	250 - 300KCMIL	73.9	505.0	73.9	505.0	73.9	505.0	1	250 - 300KCMIL	73.9	505.0	73.9	505.0	73.9	505.0
	230	1	250 - 300KCMIL	73.9	505.0	73.9	505.0	73.9	505.0	1	250 - 300KCMIL	73.9	505.0	73.9	505.0	73.9	505.0
	380	1	#2 - 4/0AWG	38.2	290.0	38.2	290.0	38.2	290.0	1	#2 - 4/0AWG	38.2	290.0	38.2	290.0	38.2	290.0
	460	1	#2 - 4/0AWG	30.4	225.0	30.4	225.0	30.4	225.0	1	#2 - 4/0AWG	30.4	225.0	30.4	225.0	30.4	225.0
	575	1	#14 - 1/0AWG	24.6	180.0	24.6	180.0	24.6	180.0	1	#14 - 1/0AWG	24.6	180.0	24.6	180.0	24.6	180.0
0156HE	208	1	250 - 300KCMIL	89.1	500.0	89.1	500.0	89.1	500.0	1	250 - 300KCMIL	89.1	500.0	89.1	500.0	89.1	500.0
	230	1	250 - 300KCMIL	89.1	500.0	89.1	500.0	89.1	500.0	1	250 - 300KCMIL	89.1	500.0	89.1	500.0	89.1	500.0
	380	1	#6 - 350KCMIL	54.5	305.0	54.5	305.0	54.5	305.0	1	#6 - 350KCMIL	54.5	305.0	54.5	305.0	54.5	305.0
	460	1	#6 - 350KCMIL	42.9	250.0	42.9	250.0	42.9	250.0	1	#6 - 350KCMIL	42.9	250.0	42.9	250.0	42.9	250.0
	575	1	#2 - 4/0AWG	32.1	198.0	32.1	198.0	32.1	198.0	1	#2 - 4/0AWG	32.1	198.0	32.1	198.0	32.1	198.0
0177SE	230	1	(2) #3/0 AWG - 250 kCMIL	106.2	578.4	106.2	578.4	106.2	578.4	1	(1) 250 - 500 kCMIL	106.2	578.4	106.2	578.4		
	380	1	(1) #4 AWG - 300 Kcmil	64.3	355.4	64.3	355.4	64.3	355.4	1	(1) #6 AWG - 350 kCMIL	64.3	355.4	64.3	355.4		
	460	1	(1) #4 AWG - 300 Kcmil	53.1	290.0	53.1	290.0	53.1	290.0	1	(1) #2 - 4/0 AWG	53.1	290	53.1	290		
	575	1	(1) #2 - 4/0 AWG	42.5	254.6	42.5	254.6	42.5	254.6	1	(1) #2 - 4/0 AWG	42.5	254.6	42.5	254.6		
0198SE	230	1	(1) 250 - 500 kCMIL	106.2	578.4	106.2	578.4	106.2	578.4	1	(1) 250 - 500 kCMIL	106.2	578.4	106.2	578.4	106.2	578.4
	380	1	(1) #6 AWG - 350 kCMIL	64.3	355.4	64.3	355.4	64.3	355.4	1	(1) #6 AWG - 350 kCMIL	64.3	355.4	64.3	355.4	64.3	355.4
	460	1	(1) #4 AWG - 300 kCMIL	53.1	290	53.1	290	53.1	290	1	(1) #4 AWG - 300 kCMIL	53.1	290	53.1	290	53.1	290
	575	1	(1) #2 - 4/0 AWG	42.5	254.6	42.5	254.6	42.5	254.6	1	(1) #2 - 4/0 AWG	42.5	254.6	42.5	254.6	42.5	254.6

5

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

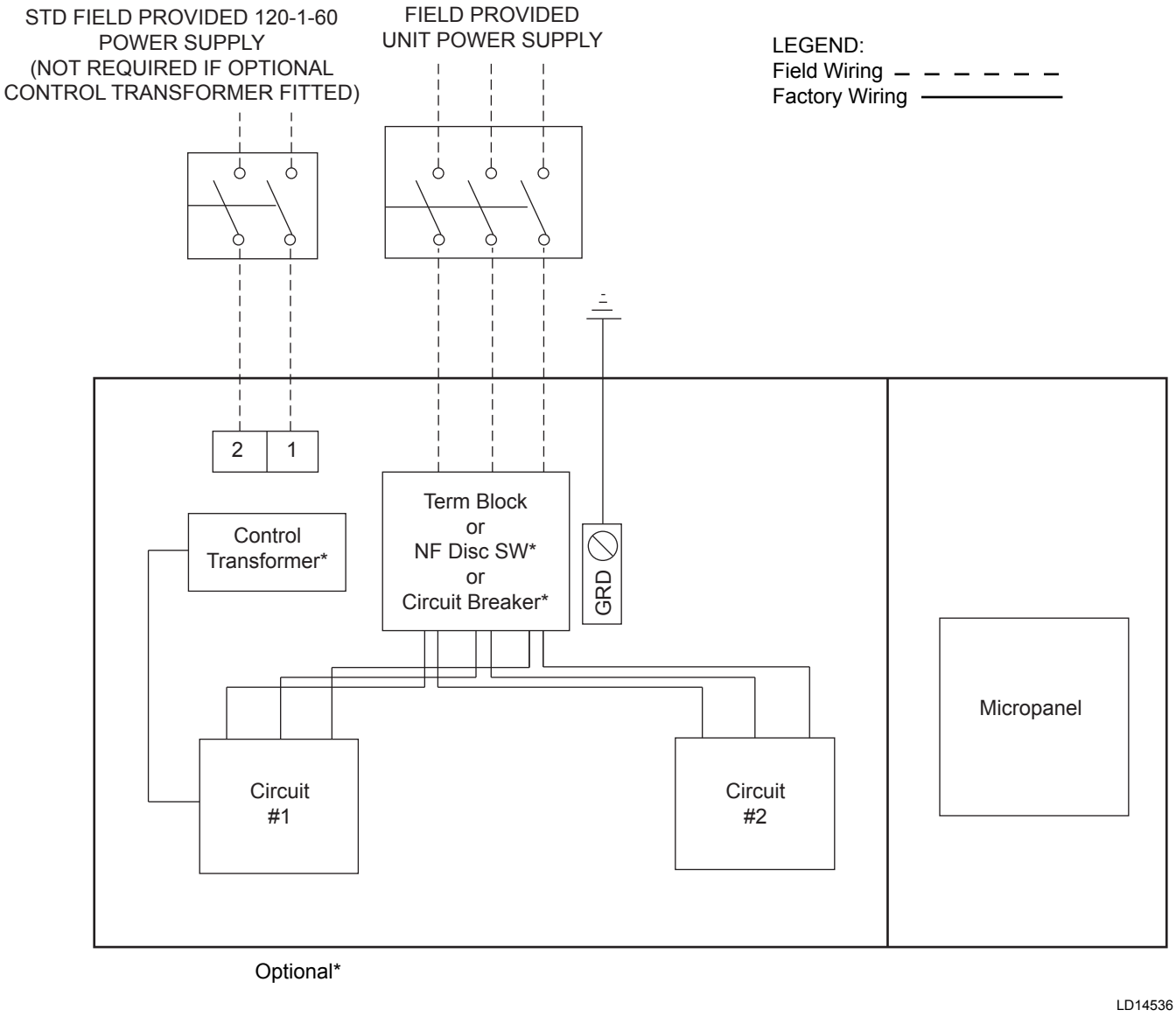

FIGURE 16 - SINGLE POINT POWER SUPPLY CONNECTION – STANDARD UNIT

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, PRIOR to working on equipment.

CAUTION

The unit evaporator heater uses 120VAC. Disconnecting 120VAC 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.

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

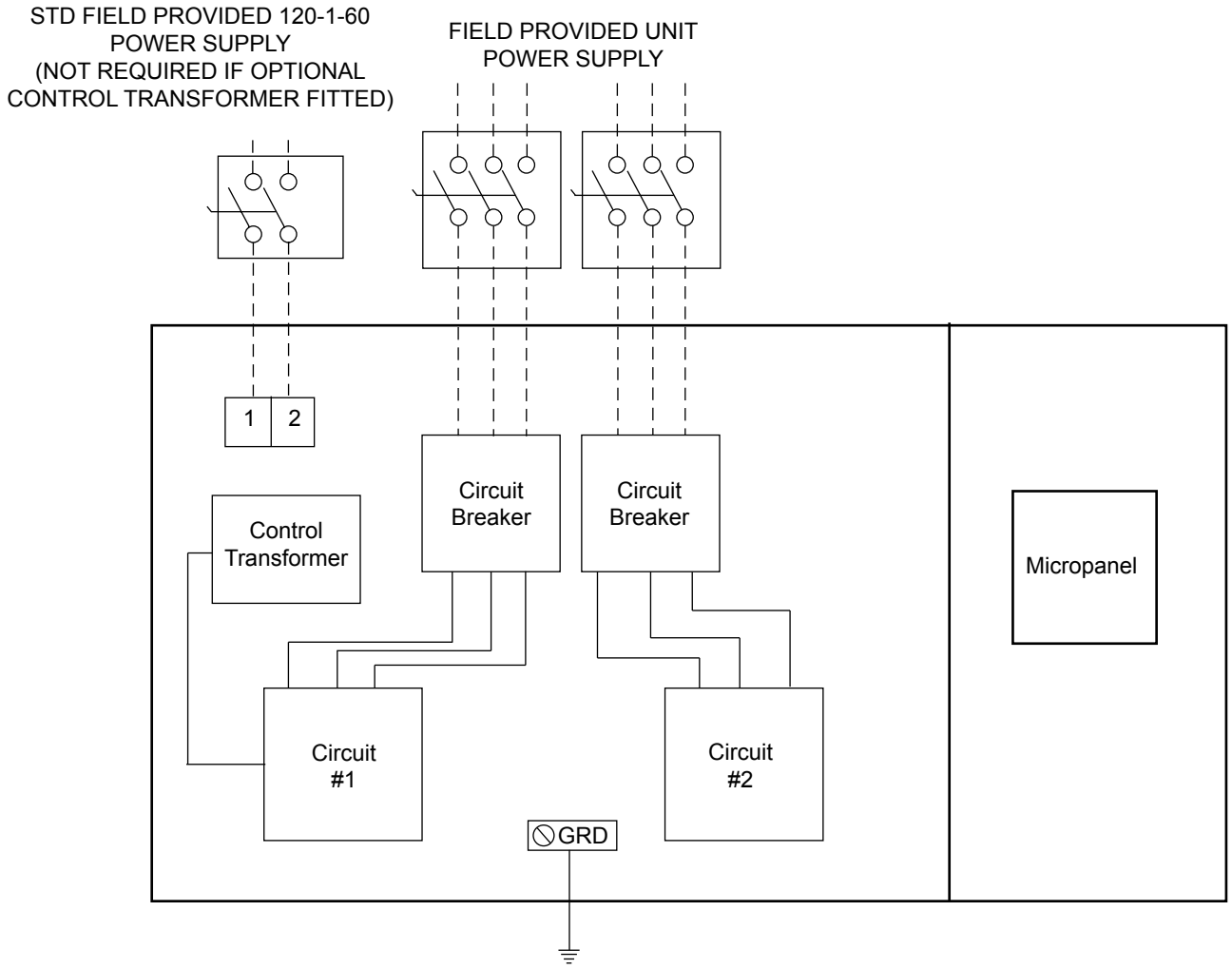

FIGURE 17 - DUAL POINT POWER SUPPLY CONNECTION – OPTIONAL

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, PRIOR to working on equipment.

CAUTION

The unit evaporator heater uses 120VAC. Disconnecting 120VAC 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.

ELECTRICAL DATA

TABLE 10 - 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				MIN	MAX	
		115-1-60/50	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

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, PRIOR to working on equipment.

The unit evaporator heater uses 120VAC. Disconnecting 120VAC 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 11 - VOLTAGE RANGE (LIMITATIONS)

VOLTAGE RANGE			
VOLTAGE CODE	UNIT POWER	MIN.	MAX.
-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

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 43024. 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 amp.
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 startup 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, an 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. An equipment ground lug(s) is provided for the incoming power. Ground line sizing shall be in accordance with the current NEC Table 250-122.
8. Field Wiring by others which complies to the National Electrical Code and Local Codes.
9. Voltage Utilization Range

RATED VOLTAGE	UTILIZATION RANGE
200/60/3	180 - 220
230/60/3	208 - 254
380/60/3	342 - 402
460/60/3	414 - 508
575/60/3	520 - 635

LEGEND

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

TABLE 12 - GROUND LUG SIZING

CIRCUIT BREAKER OPTION		
RATING	**INCOMING WIRE**	**GROUND WIRE**
60A	# 14 - 1/0 AWG	# 14 - 6 AWG
70A	# 14 - 1/0 AWG	# 14 - 6 AWG
80A	# 14 - 1/0 AWG	# 14 - 6 AWG
90A	# 14 - 1/0 AWG	# 14 - 6 AWG
100A	# 14 - 1/0 AWG	# 8 - 2 AWG
125A	# 14 - 1/0 AWG	# 8 - 2 AWG
125A	# 2 - 4/0 AWG	# 8 - 2 AWG
150A	# 2 - 4/0 AWG	# 8 - 2 AWG
175A	# 4 - 300 KCM	# 6 - 1/0 AWG
200A	# 4 - 300 KCM	# 6 - 1/0 AWG
225A	# 4 - 300 KCM	# 6 - 1/0 AWG
250A	# 6 - 350 KCM	# 4 - 3/0 AWG
400A	# 250 - 500 KCM	# 2 - 4/0 AWG
400A	(2) # 3/0 - 250 KCM	(2) # 6 - 1/0 AWG
600A	(2) # 250 - 500 KCM	(2) # 2 - 4/0 AWG

TERMINAL BLOCK OPTION		
RATING	**INCOMING WIRE**	**GROUND WIRE**
130A	# 12 - 1 AWG	# 8 - 2 AWG
165A	# 10 - 3/0 AWG	# 6 - 1/0 AWG
240A	# 10 - 300 KCM	# 4 - 3/0 AWG
320A	# 4 - 500 KCM	# 2 - 4/0 AWG
480A	(2) # 10 - 300 KCM	(2) # 4 - 3/0 AWG

Notes:

1. Start in correct power option table (breaker, terminal block)
2. Match engineering guide value for Amperage
3. Match engineering guide value for wire range
4. Note corresponding ground wire range

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WIRING DIAGRAMS

ELEMENTARY WIRING DIAGRAM
YCRL0064, 0074, 0084, and 0118

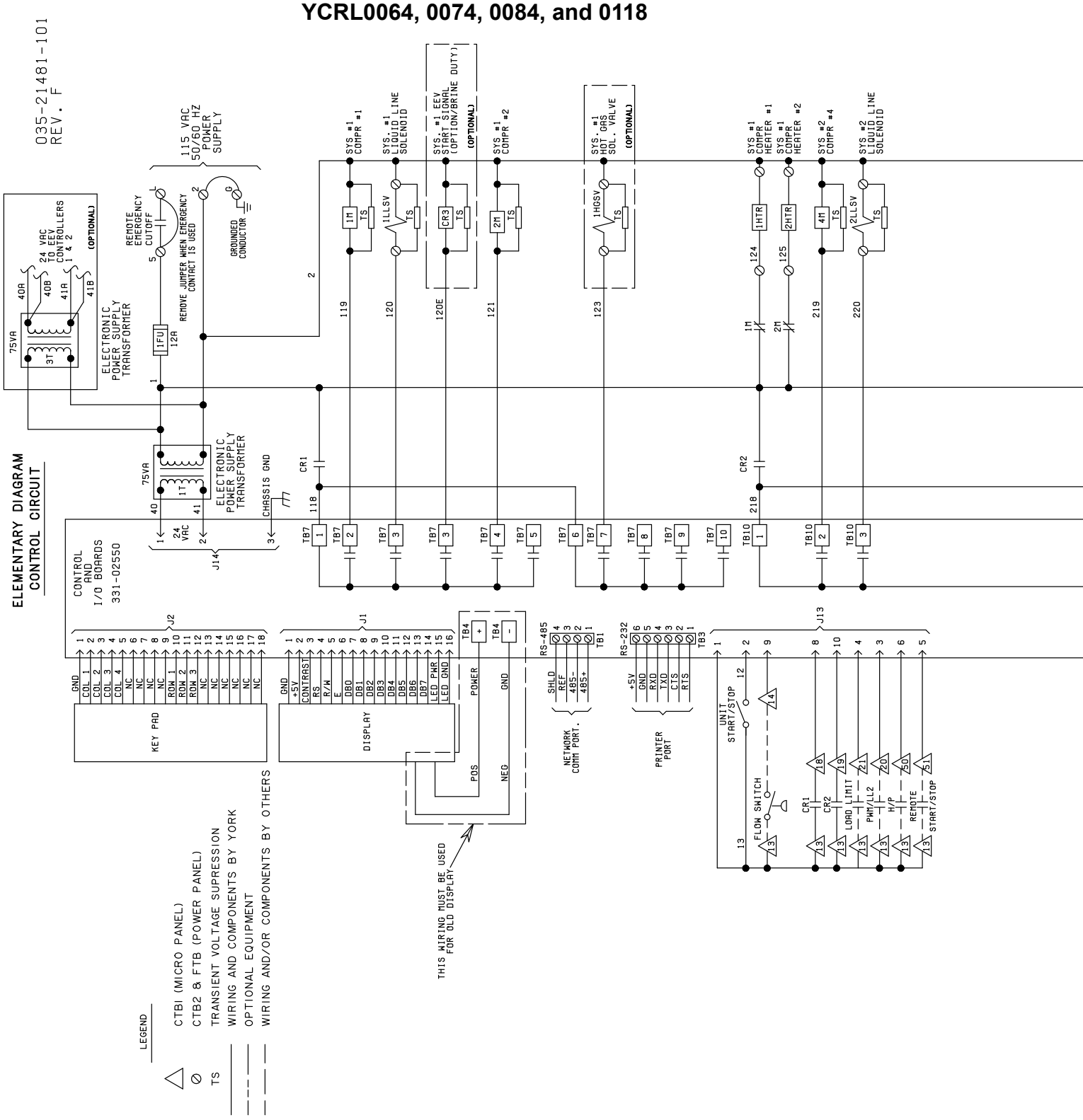


FIGURE 18 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT CONTROL PANEL WIRING, 4 COMPRESSOR UNIT

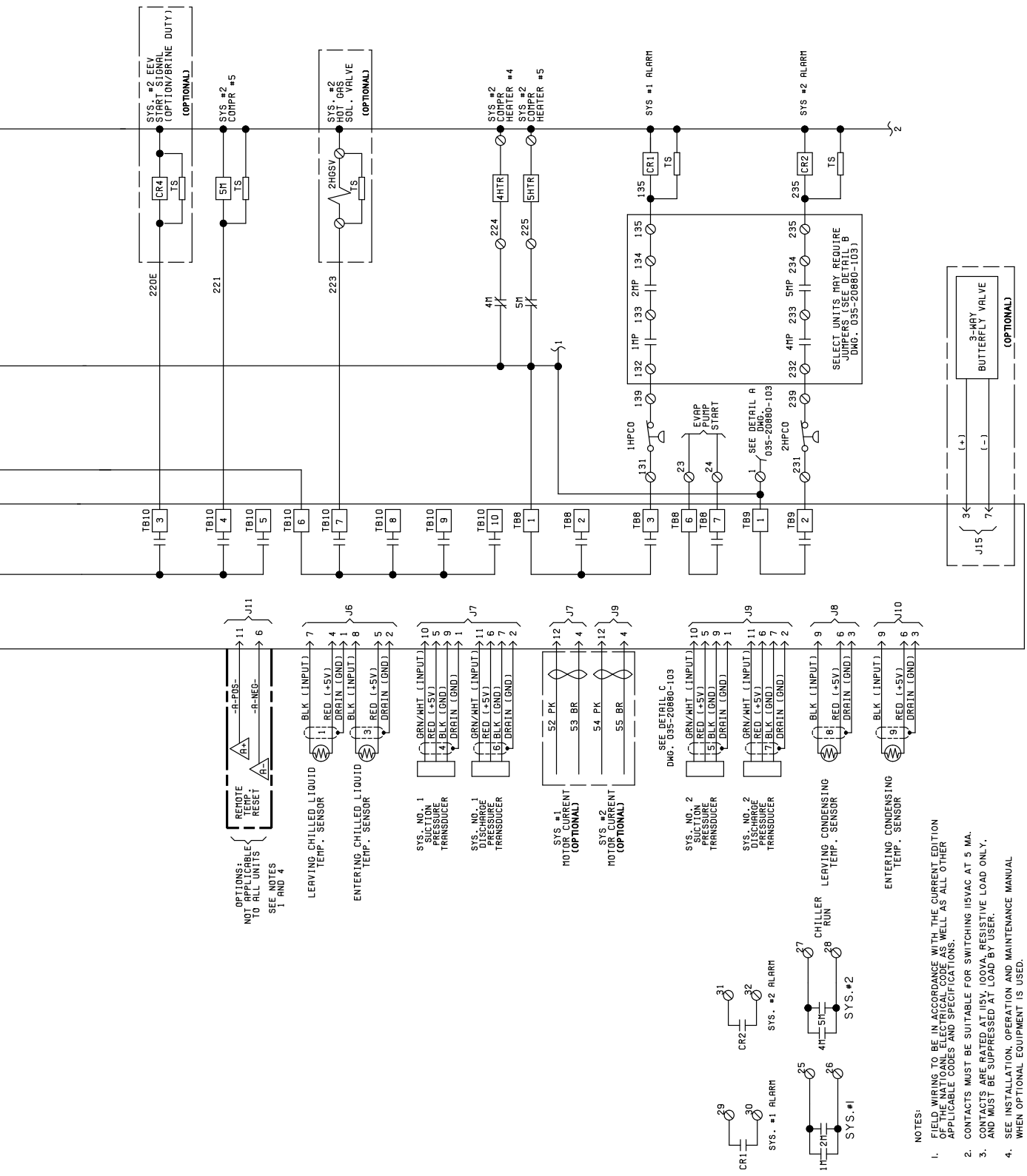


FIGURE 18 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT CONTROL PANEL WIRING, 4 COMPRESSOR UNIT (CONT'D)

ELEMENTARY WIRING DIAGRAM
YCRL0096, 0126, 0156, 0177 and 0198

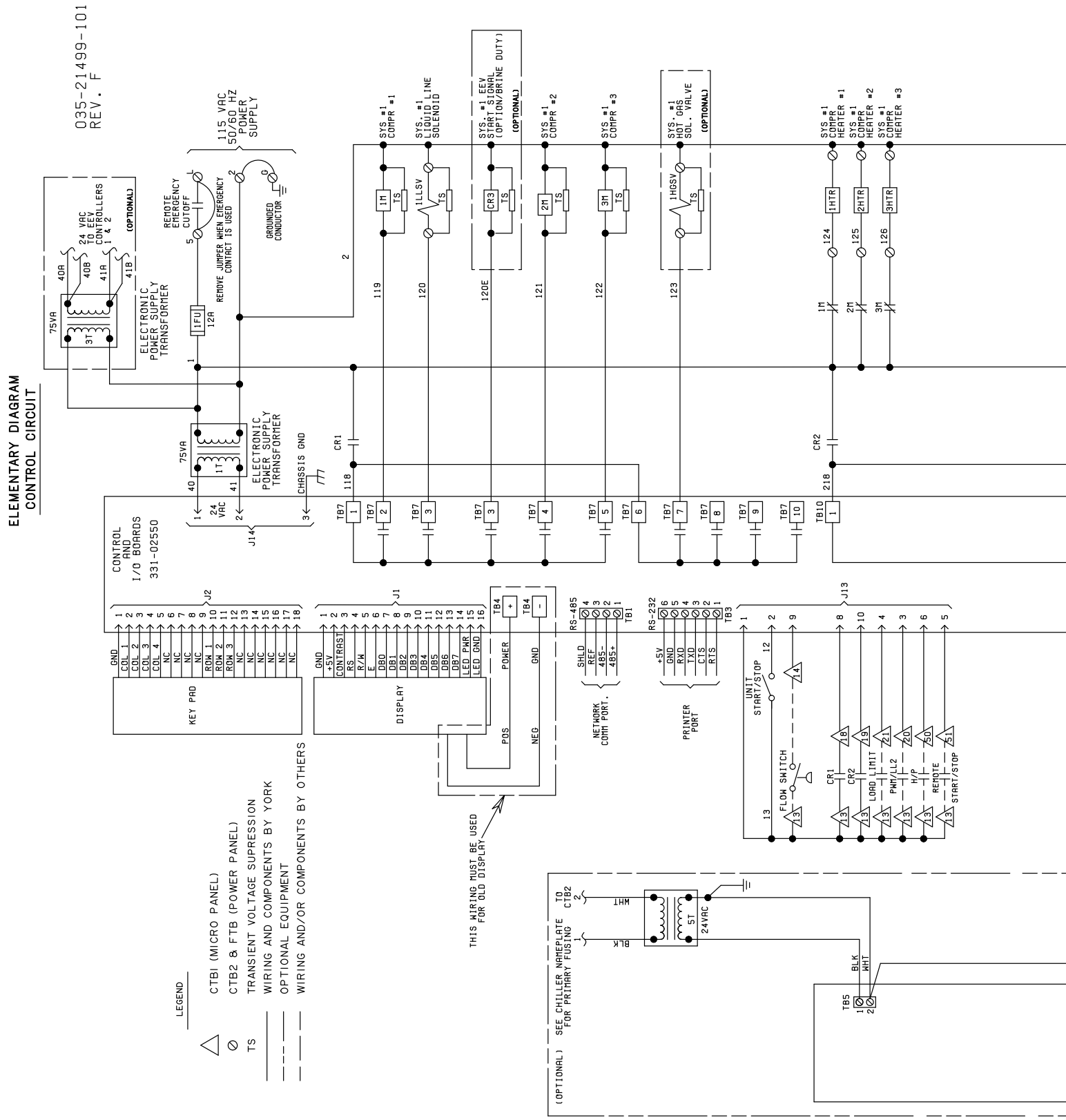


FIGURE 19 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT CONTROL PANEL WIRING, 6 COMPRESSOR UNIT

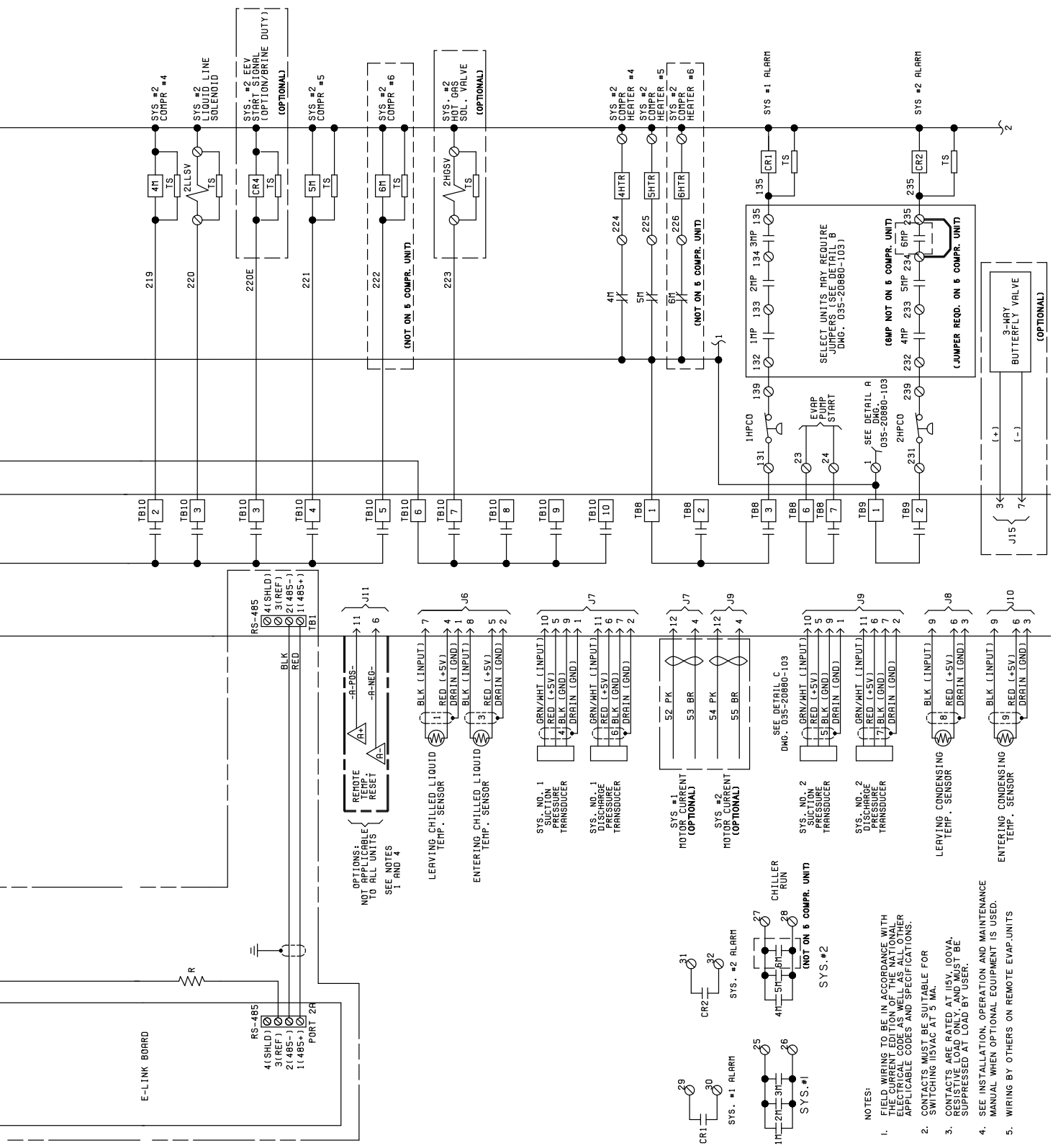


FIGURE 19 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT CONTROL PANEL WIRING, 6 COMPRESSOR UNIT

ELEMENTARY WIRING DIAGRAM
YCRL0064, 0074, 0084, and 0118

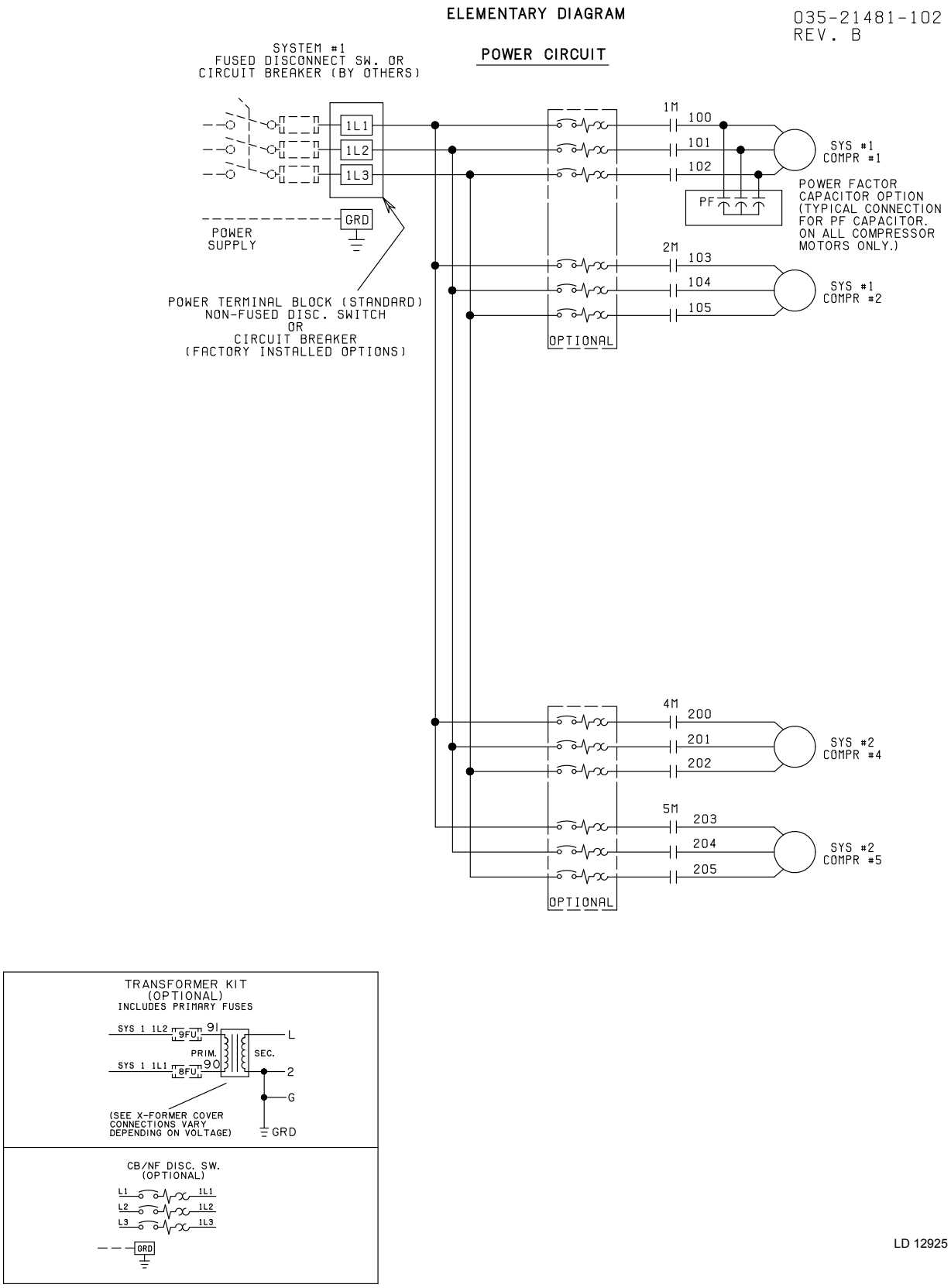


FIGURE 20 - STANDARD POWER AND SINGLE POINT POWER CIRCUIT, 4 COMPRESSOR UNIT

ELEMENTARY WIRING DIAGRAM
YCRL0064, 0074, 0084, and 0118

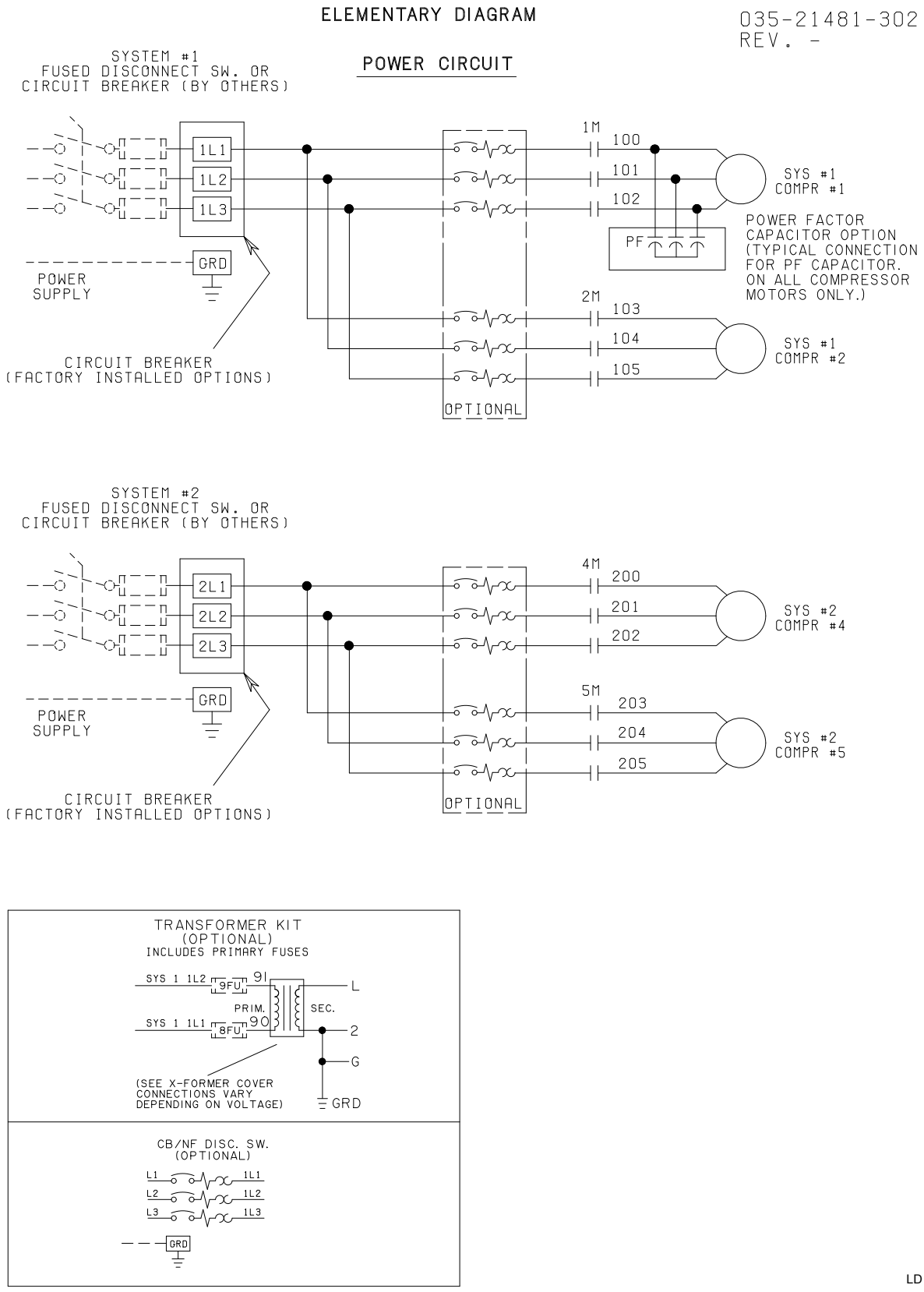
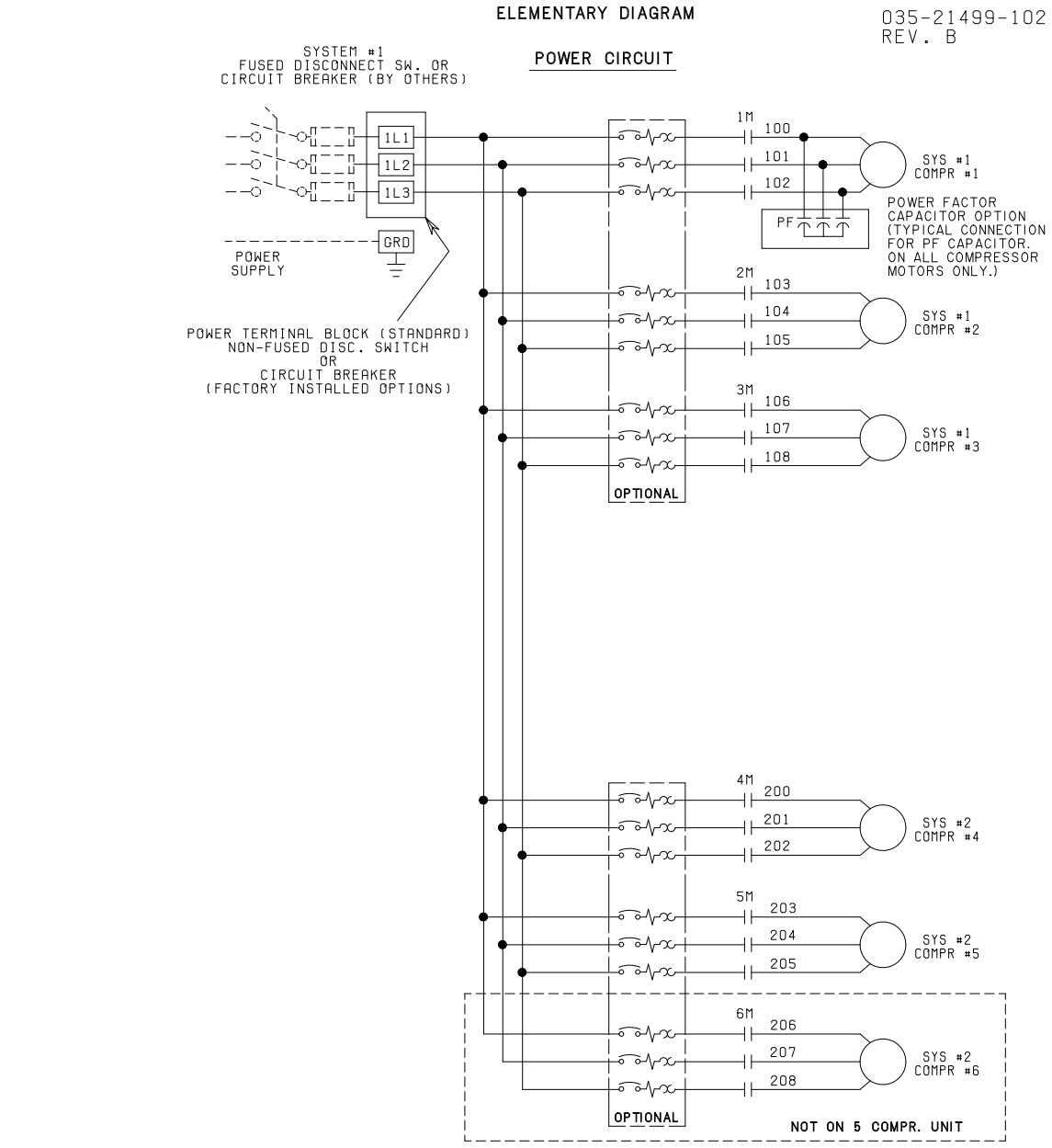


FIGURE 21 - MULTIPLE POINT POWER CIRCUIT, 4 COMPRESSOR UNIT

ELEMENTARY WIRING DIAGRAM
YCRL0096, 0126, 0156, 0177 and 0198



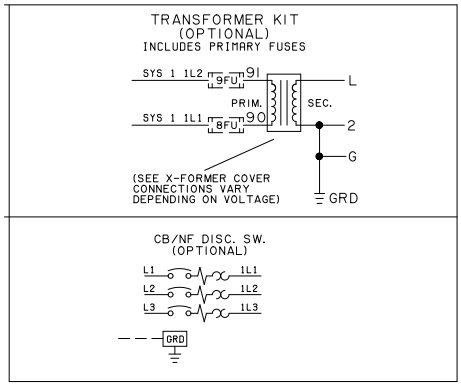
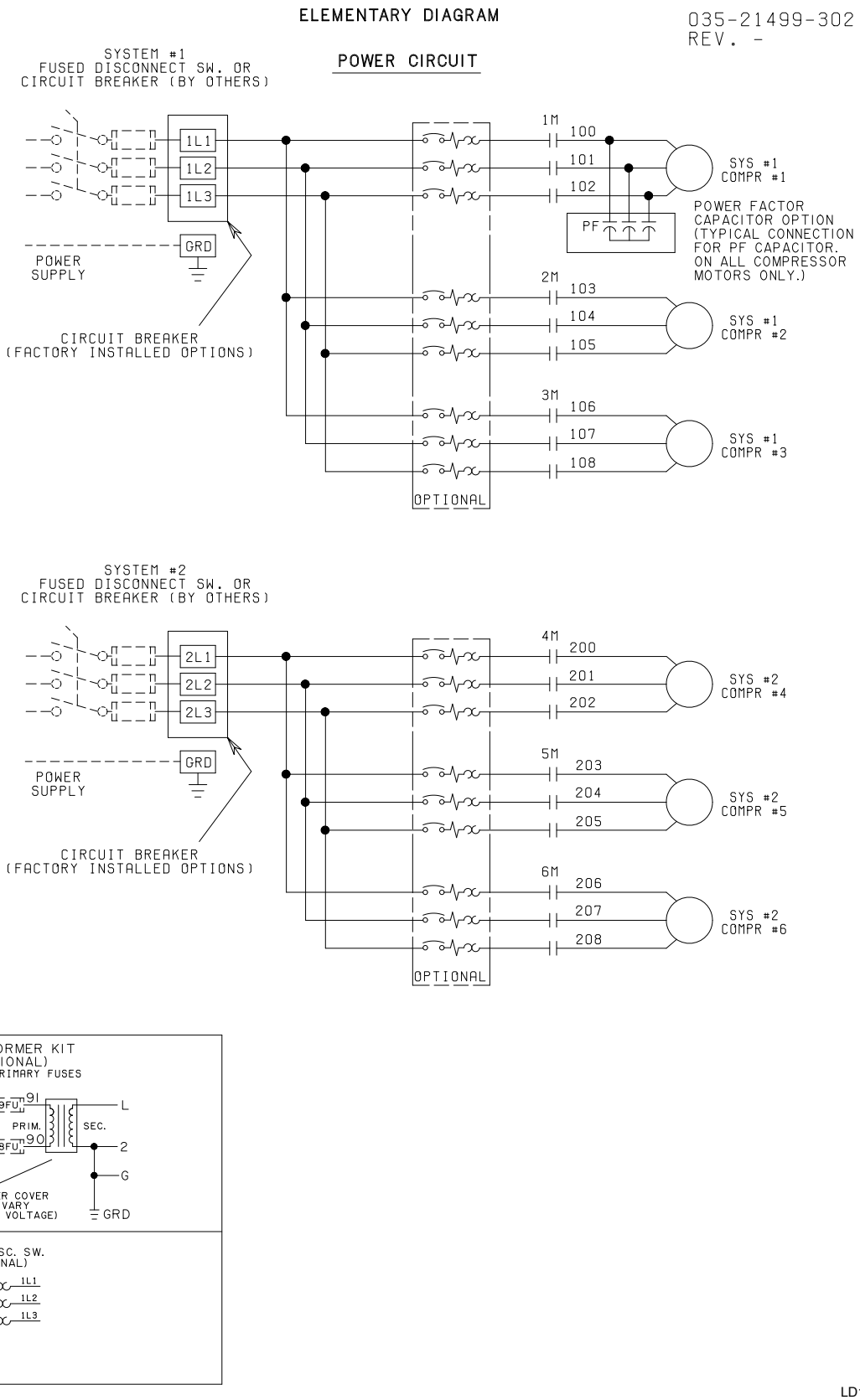


FIGURE 22 - STANDARD POWER AND SINGLE POINT POWER CIRCUIT, 6 COMPRESSOR UNIT

ELEMENTARY WIRING DIAGRAM (CONT'D)
YCRL0096, 0126, 0156, 0177 and 0198



LD14000

FIGURE 23 - MULTIPLE POINT POWER CIRCUIT, 6 COMPRESSOR UNIT

CONNECTION WIRING DIAGRAM
YCRL0064, 0074, 0084, and 0118

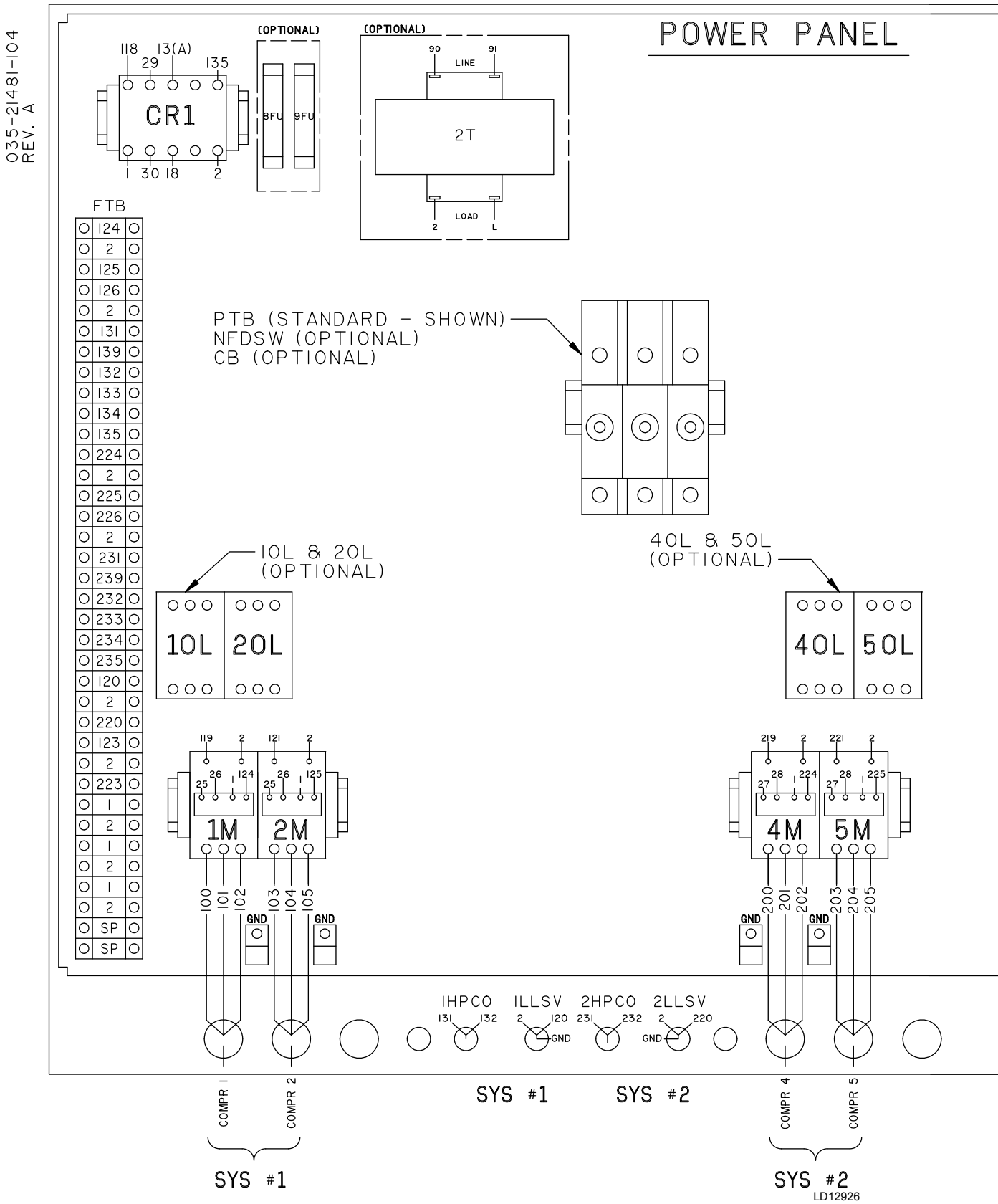
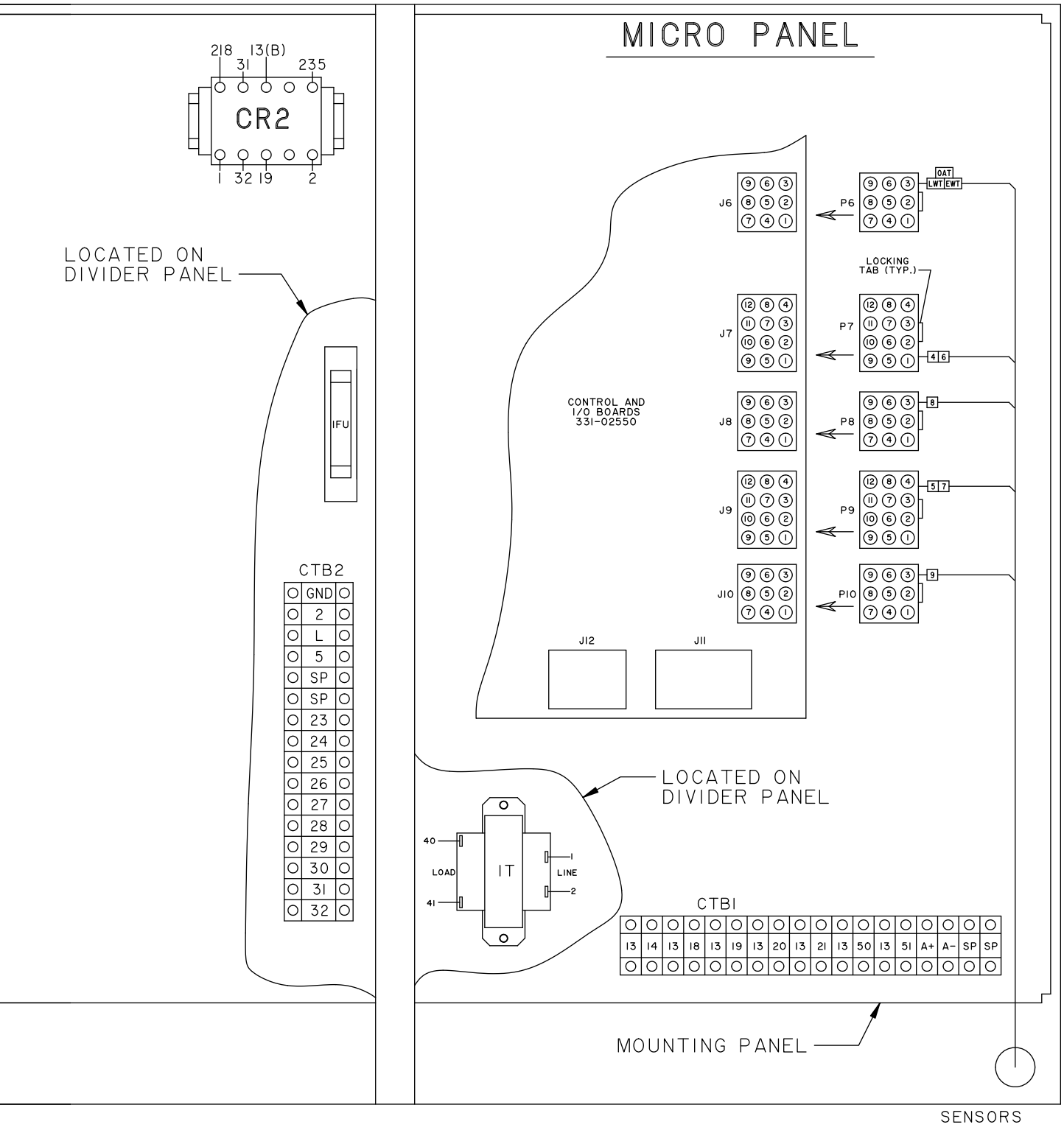


FIGURE 24 - STANDARD POWER AND SINGLE POINT CONNECTION WIRING DIAGRAM, 4 COMPRESSOR UNIT



LD12927

FIGURE 24 - STANDARD POWER AND SINGLE POINT CONNECTION WIRING DIAGRAM, 4 COMPRESSOR UNIT

CONNECTION WIRING DIAGRAM
YCRL0064, 0074, 0084, and 0118

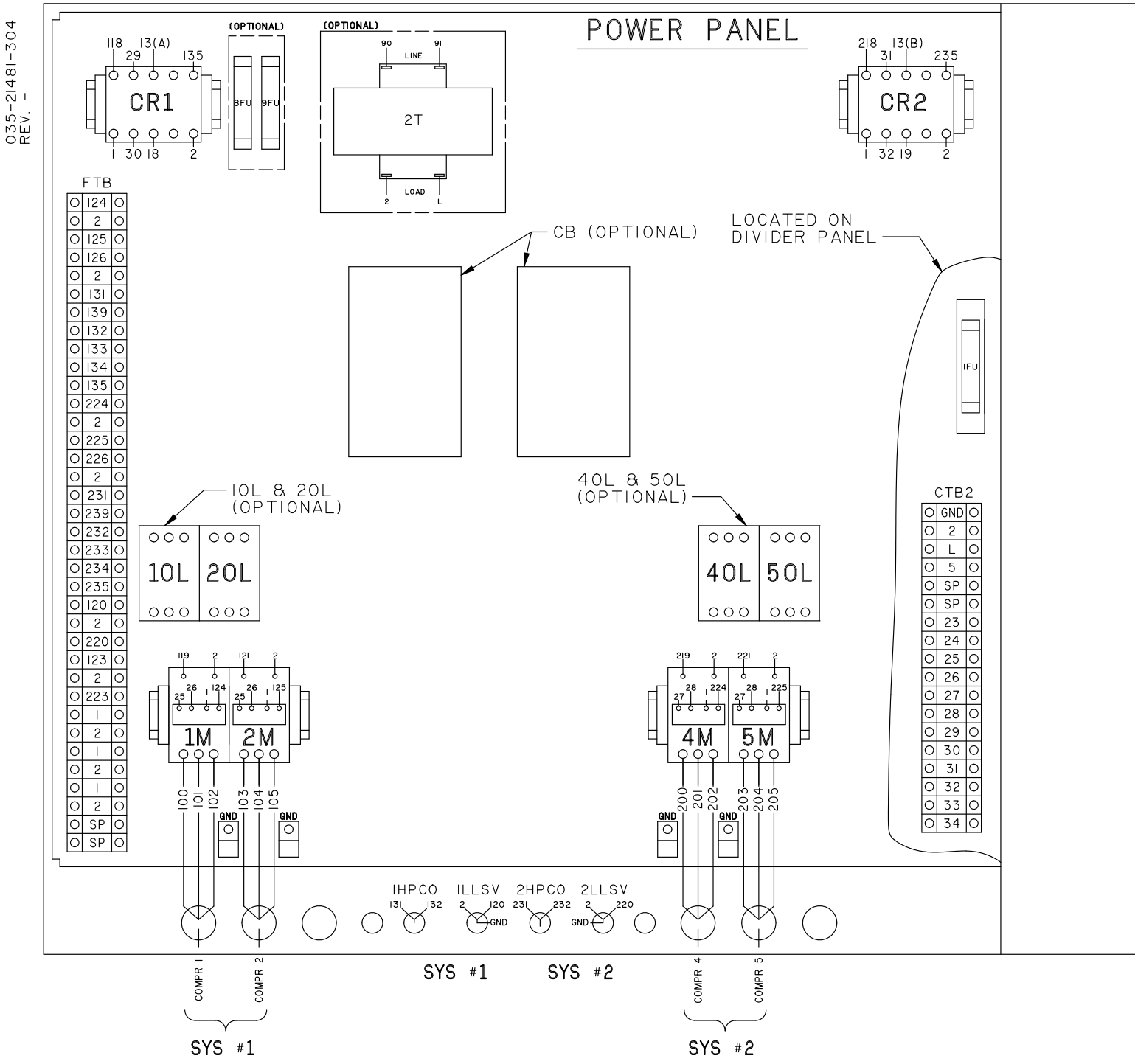
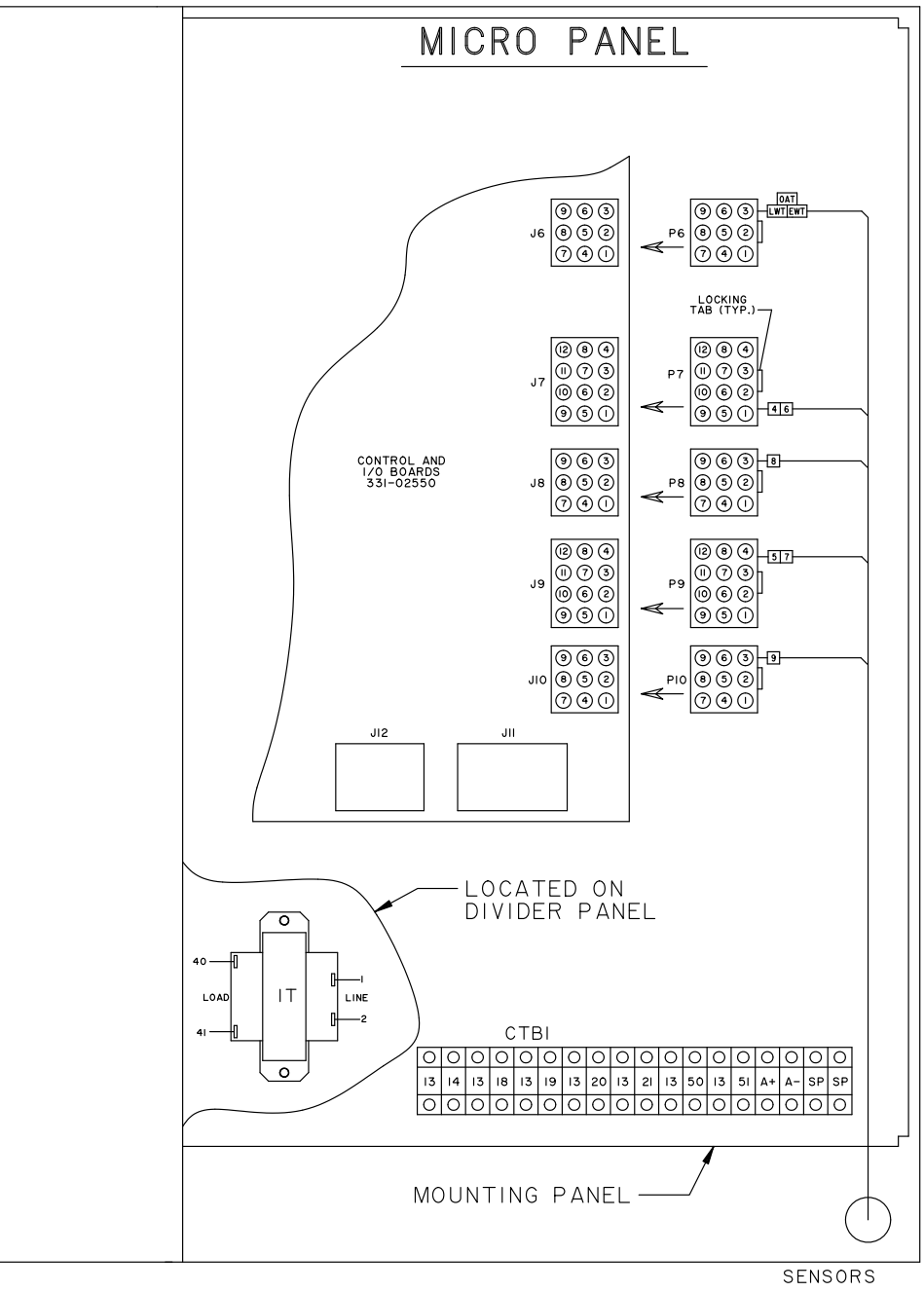


FIGURE 25 - MULTIPLE POINT POWER CONNECTION WIRING DIAGRAM, 4 COMPRESSOR UNIT



LD13999

FIGURE 25 - MULTIPLE POINT POWER CONNECTION WIRING DIAGRAM, 4 COMPRESSOR UNIT (CONT'D)

CONNECTION WIRING DIAGRAM
YCRL0096, 0126, 0156, 0177 and 0198

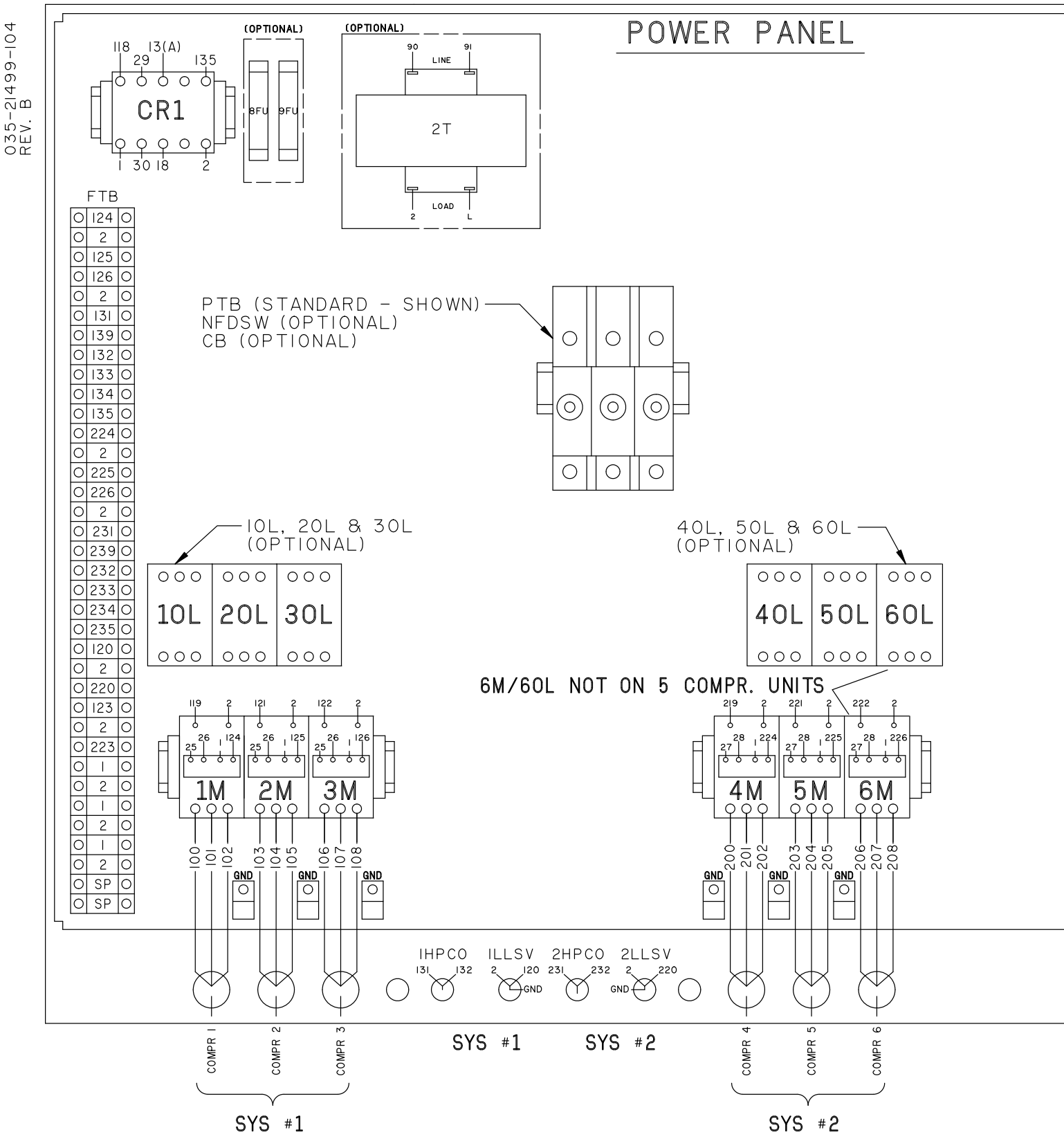


FIGURE 26 - STANDARD POWER AND SINGLE POINT CONNECTION WIRING DIAGRAM, 6 COMPRESSOR UNIT

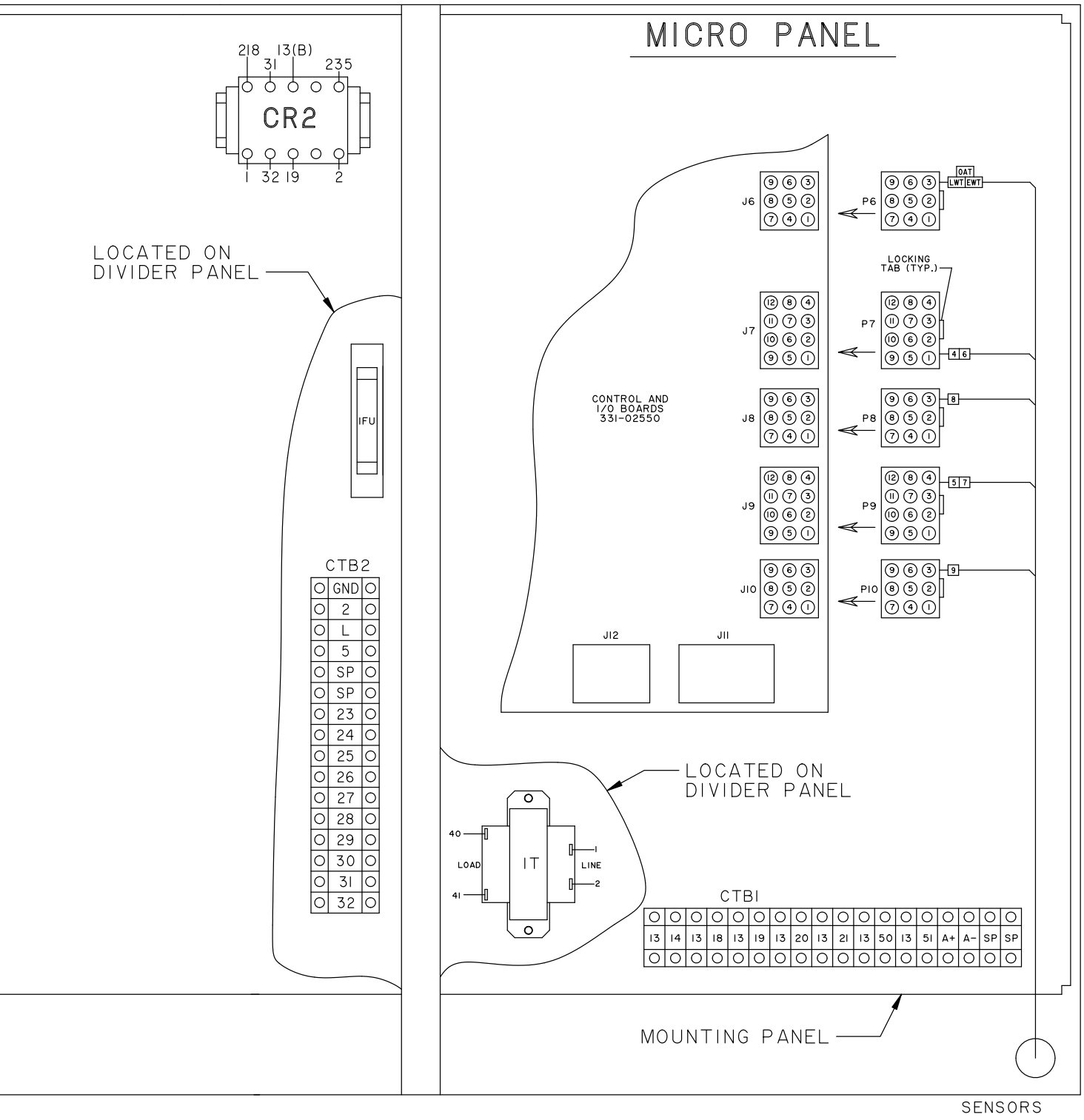


FIGURE 26 - STANDARD POWER AND SINGLE POINT CONNECTION WIRING DIAGRAM, 6 COMPRESSOR UNIT (CONT'D)

CONNECTION WIRING DIAGRAM
YCRL0096, 0126, 0156, 0177 and 0198

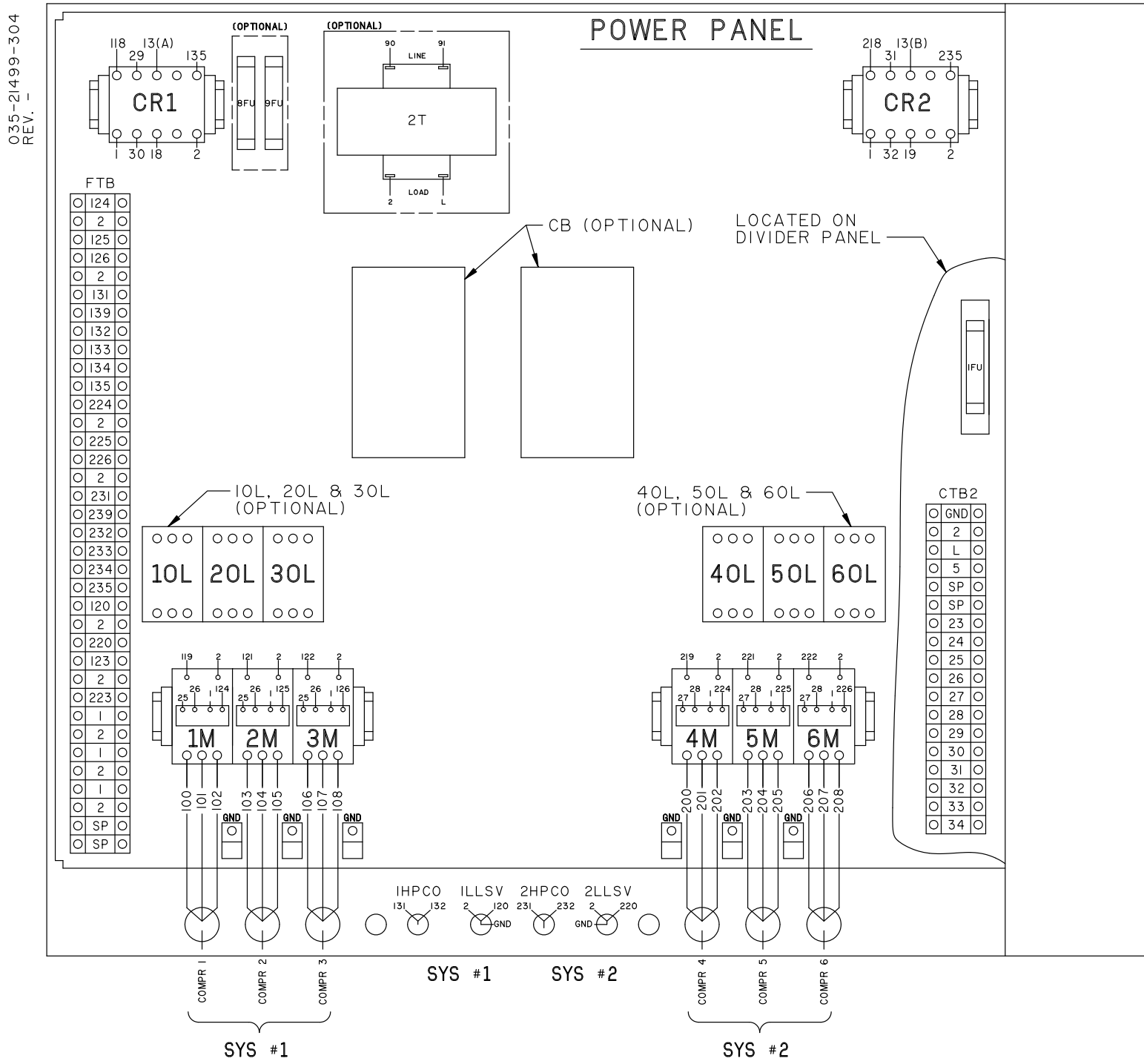
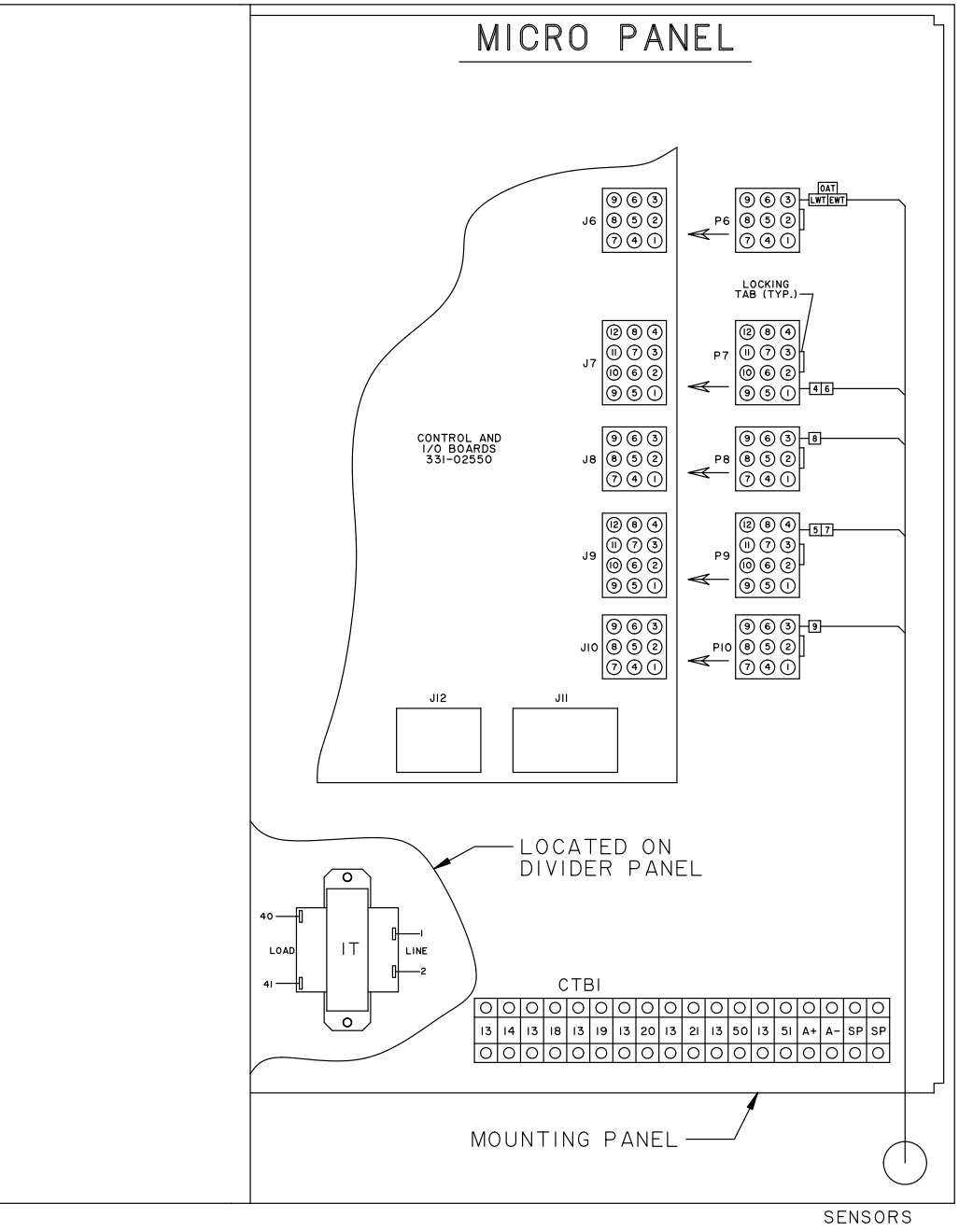


FIGURE 27 - MULTIPLE POINT CONNECTION WIRING DIAGRAM, 6 COMPRESSOR UNIT

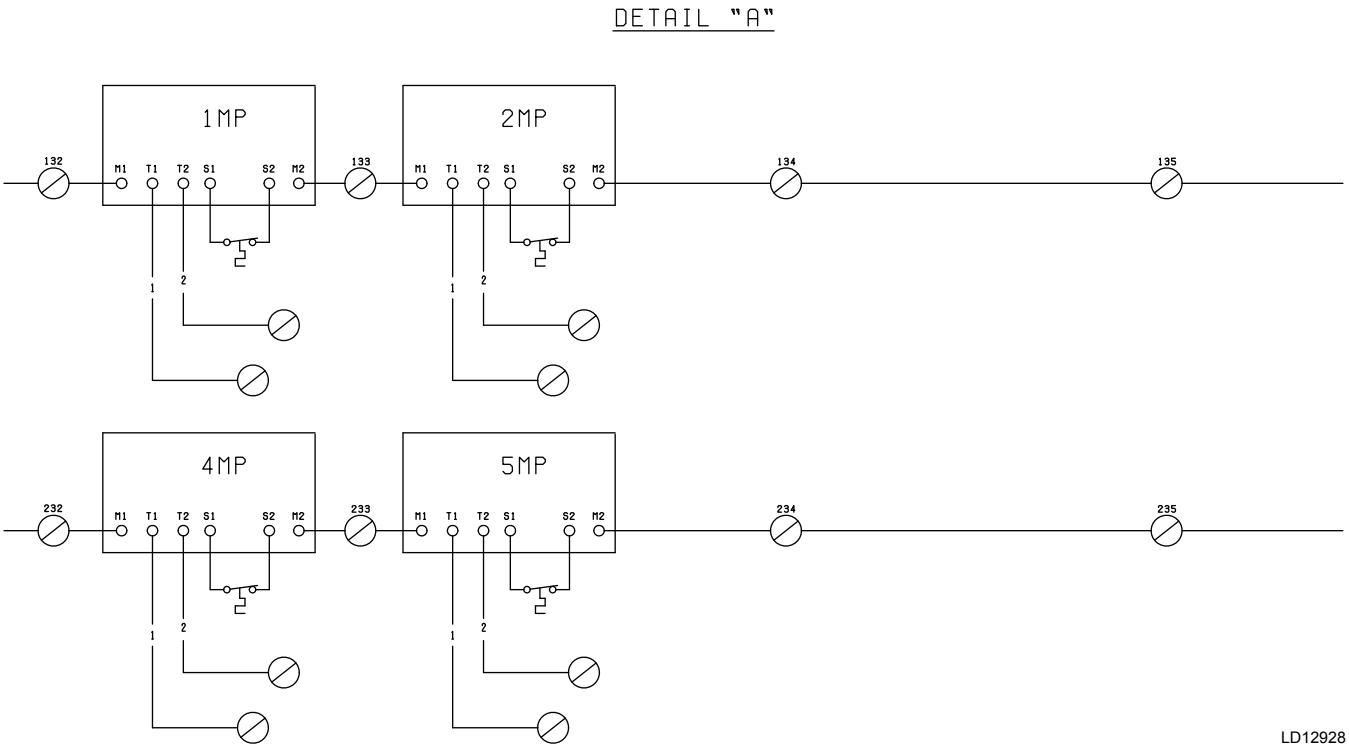


LD14001

FIGURE 27 - MULTIPLE POINT CONNECTION WIRING DIAGRAM, 6 COMPRESSOR UNIT (CONT'D)

ELEMENTARY WIRING DIAGRAM DETAILS
YCRL0064, 0074, 0084, and 0118

035-21481-103 REV -



Notes:

I. Field wiring to be in accordance with the current edition of the National Electrical Code as well as all other applicable codes and specifications.

2. Contacts must be suitable for switching 24VDC (gold contacts recommended). Wiring shall not be run in the same conduit with any line voltage (class 1) wiring.

3. To cycle unit ON and OFF automatically with contact shown, install a cycling device in series with the flow switch. *See Note 2 for contact rating and wiring specifications.*

4. To stop unit (emergency stop) with contacts other than those shown, install the stop contact between terminals 5 and 1. If a stop device is not installed, a jumper must be connected between terminals 5 and 1. Device must have a minimum contact rating of 6A at 115VAC.

5. Contacts are rated at 115V, 100VA, resistive load only, and must be suppressed at load by user.

6. *See Installation Operation and Maintenance manual when optional equipment is used.*

7. Optional current readout, 5V = 200A.

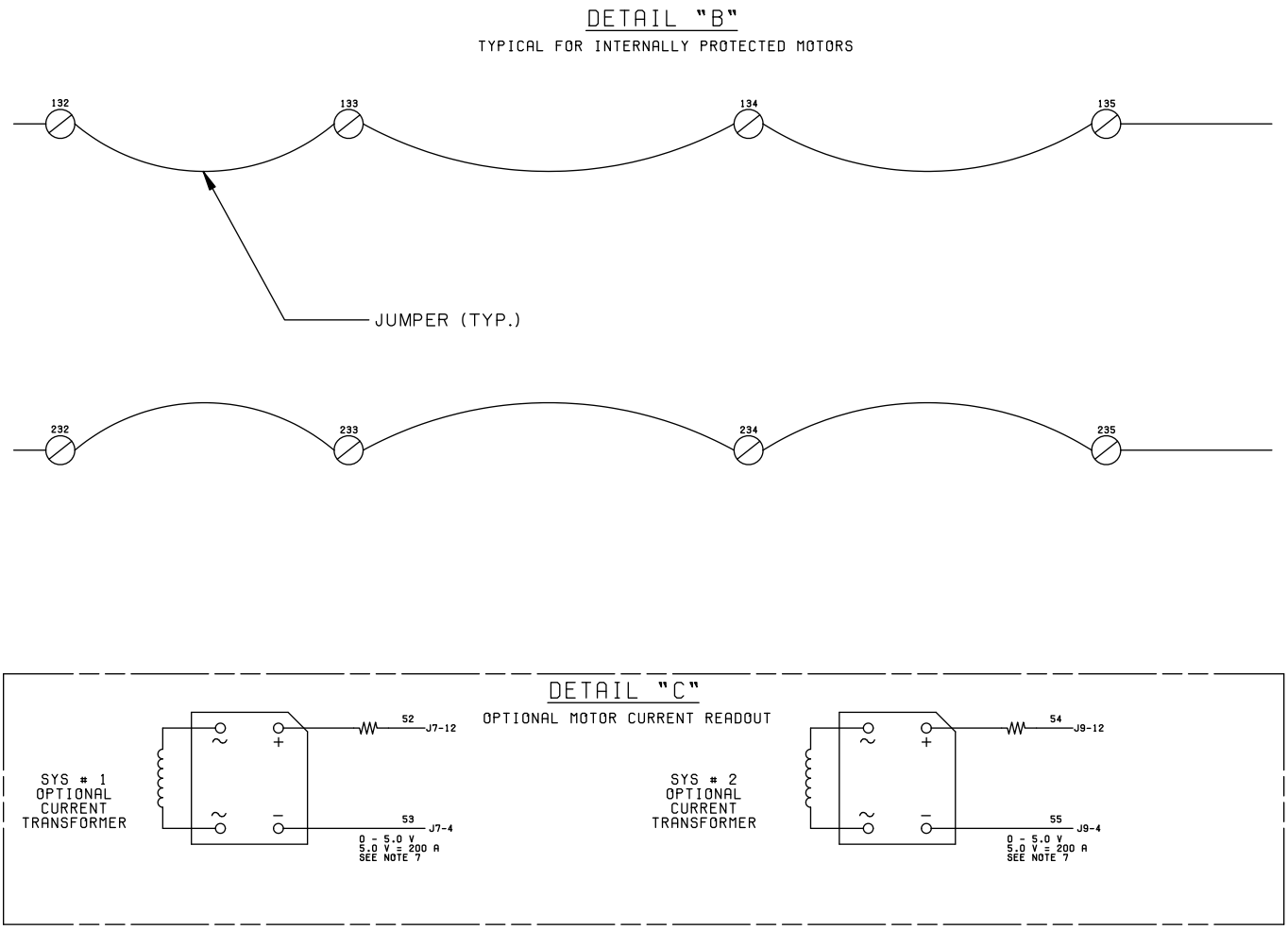
8. 1MP thru 3MP are contained in their respective compressor junction boxes.

LEGEND

TS	Transient Voltage Suppression.
△	Terminal Block for customer low voltage (class 2) connections. *See Note 2.*
⊘	Terminal block for YORK and customer connections.
———	Wiring and components by YORK.
—— - - ——	Optional equipment.
— — —	Wiring and/or components by others.

FIGURE 28 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT ELEMENTARY WIRING DIAGRAM DETAILS, 4 COMPRESSOR

ELEMENTARY WIRING DIAGRAM DETAILS (CONT'D)

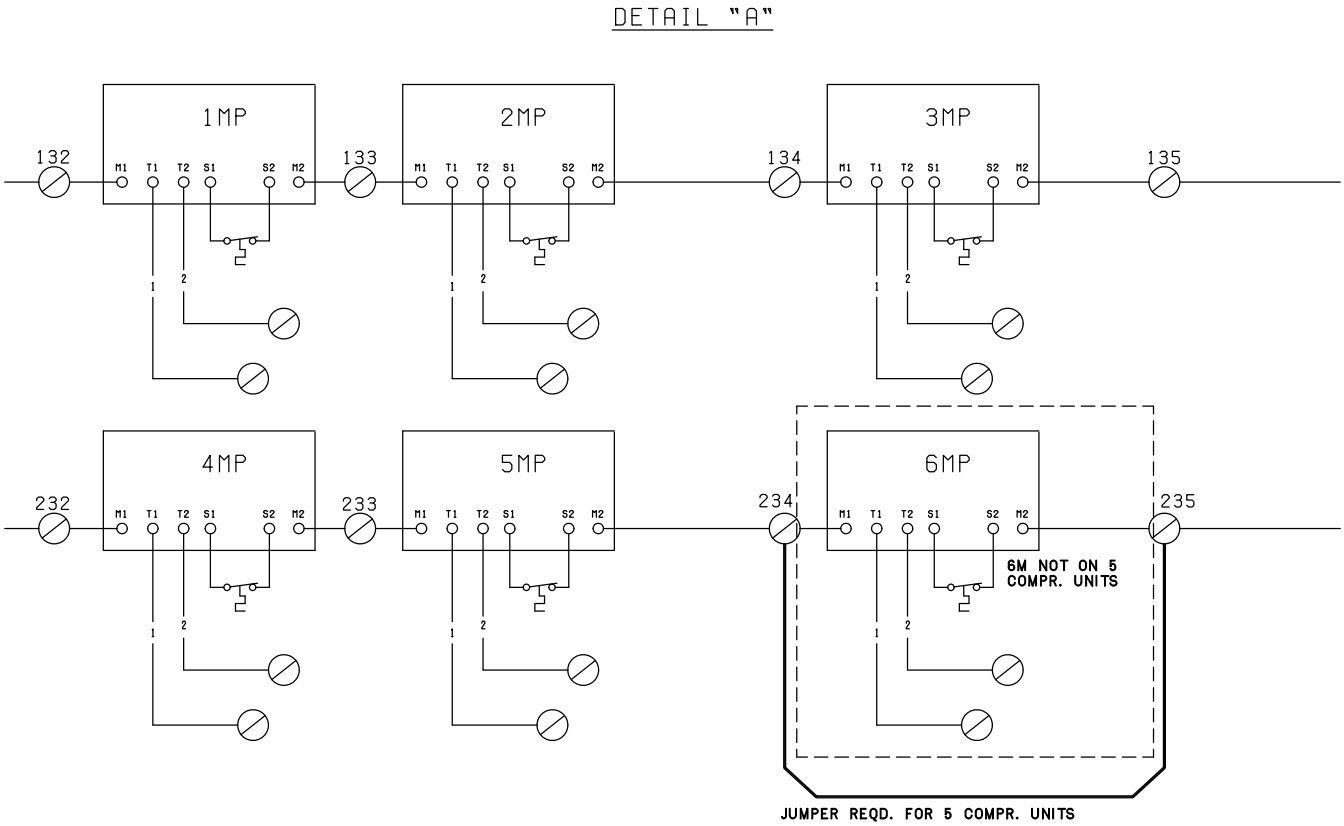


LD12929

FIGURE 28 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT ELEMENTARY WIRING DIAGRAM DETAILS, 4 COMPRESSOR (CONT'D)

ELEMENTARY WIRING DIAGRAM DETAILS
YCRL0096, 0126, 0156, 0177 and 0198

035-21499-103 REV B



Notes:

I. Field wiring to be in accordance with the current edition of the National Electrical Code as well as all other applicable codes and specifications.

2. Contacts must be suitable for switching 24VDC (gold contacts recommended). Wiring shall not be run in the same conduit with any line voltage (class 1) wiring.

3. To cycle unit ON and OFF automatically with contact shown, install a cycling device in series with the flow switch. *See Note 2 for contact rating and wiring specifications.*

4. To stop unit (emergency stop) with contacts other than those shown, install the stop contact between terminals 5 and 1. If a stop device is not installed, a jumper must be connected between terminals 5 and 1. Device must have a minimum contact rating of 6A at 115VAC.

5. Contacts are rated at 115V, 100VA, resistive load only, and must be suppressed at load by user.

6. *See Installation Operation and Maintenance manual when optional equipment is used.*

7. Optional current readout, 5V = 200A.

8. 1MP thru 3MP are contained in their respective compressor junction boxes.

LEGEND

TS Transient Voltage Suppression.

Terminal Block for customer low voltage (class 2) connections. *See Note 2.*

Terminal block for YORK and customer connections.

Wiring and components by YORK.

Optional equipment.

Wiring and/or components by others.

LD12935

FIGURE 29 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT ELEMENTARY WIRING DIAGRAM DETAILS, 6 COMPRESSOR

ELEMENTARY WIRING DIAGRAM DETAILS (CONT'D)

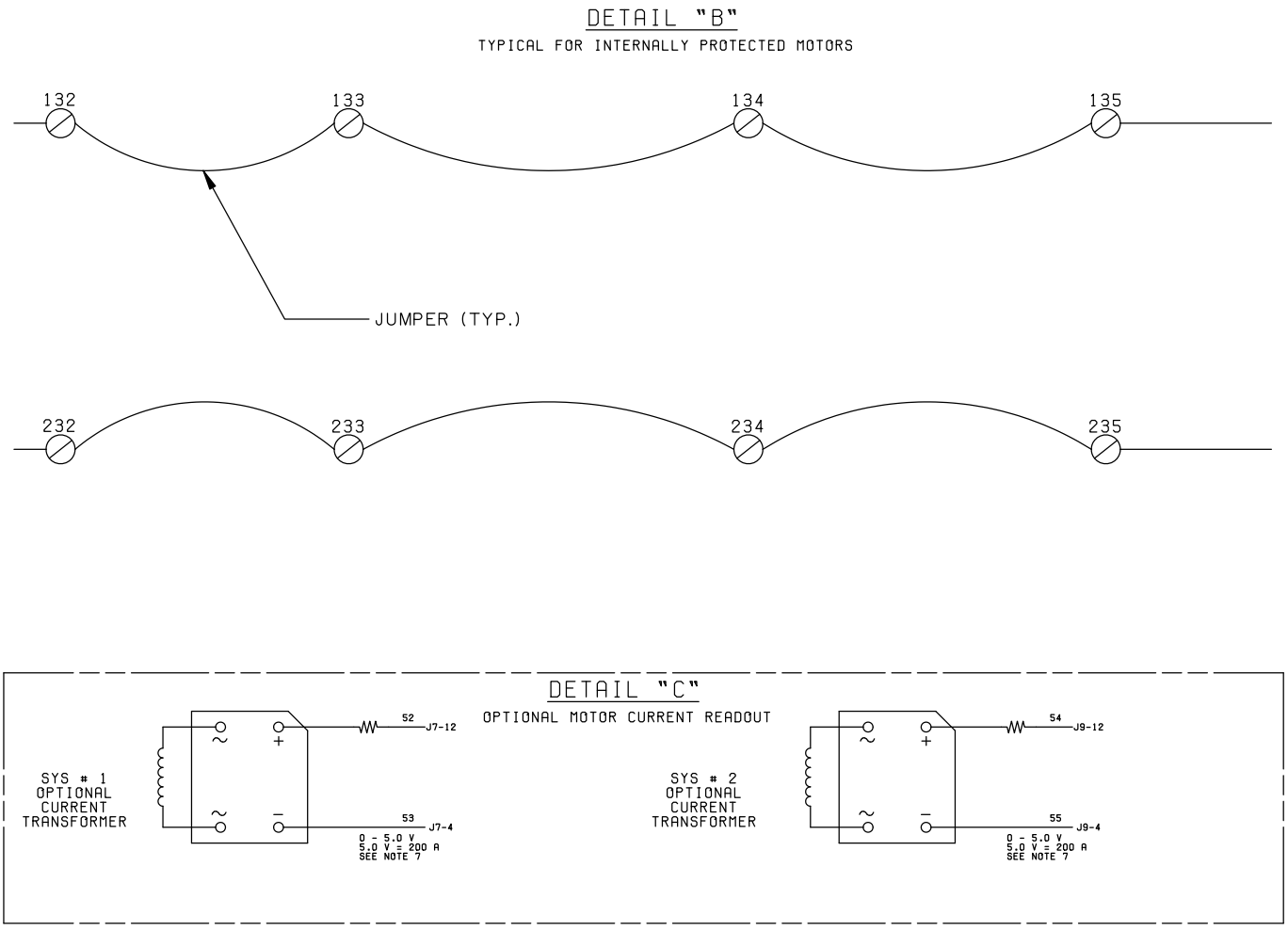


FIGURE 29 - STANDARD POWER, SINGLE POINT AND MULTIPLE POINT ELEMENTARY WIRING DIAGRAM DETAILS, 6 COMPRESSOR (CONT'D)

ELEMENTARY WIRING DIAGRAM DETAILS (CONT'D)

ELEMENTARY DIAGRAM
EEV CONTROLLER

035-21499-105
REV. -

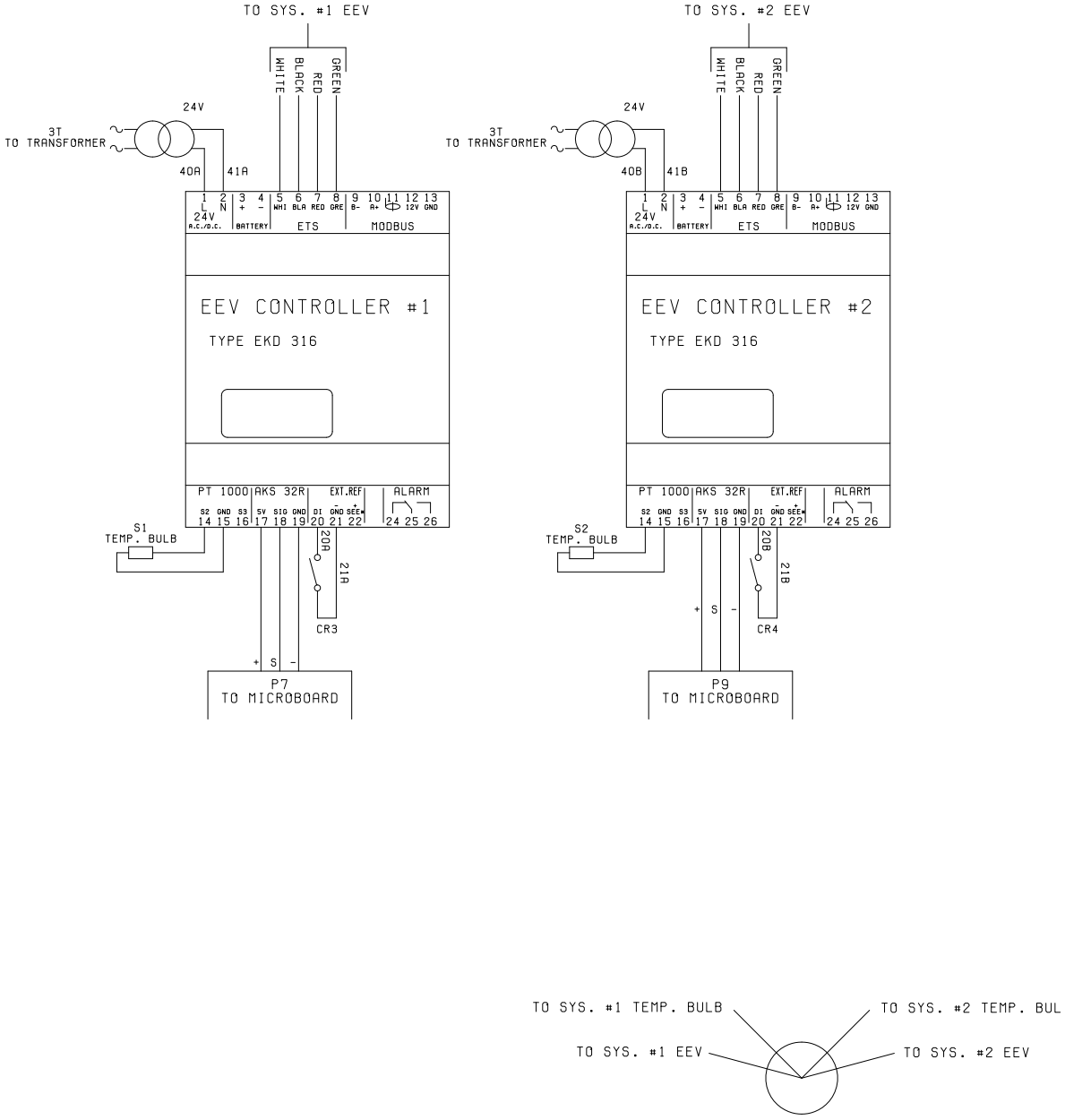
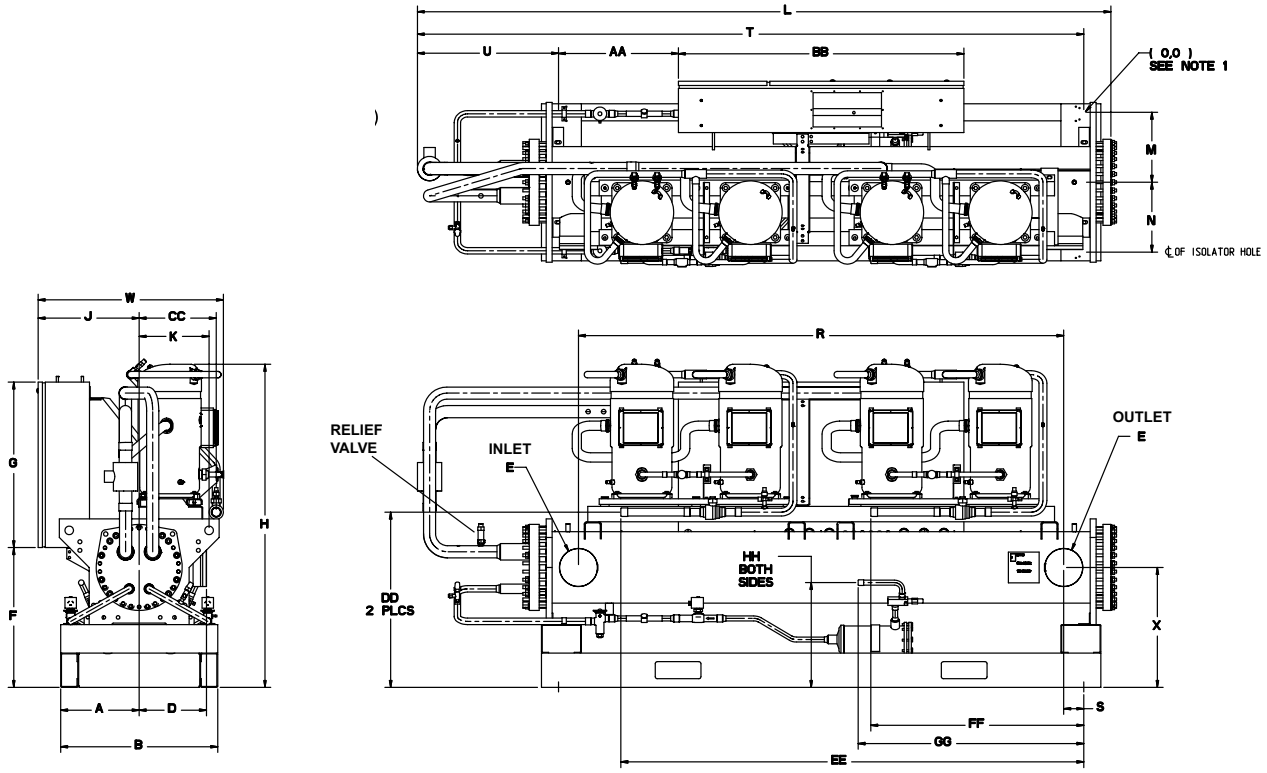


FIGURE 30 - EEV CONTROLLER WIRING

UNIT DIMENSIONS - ENGLISH - FOUR COMPRESSOR



Notes:

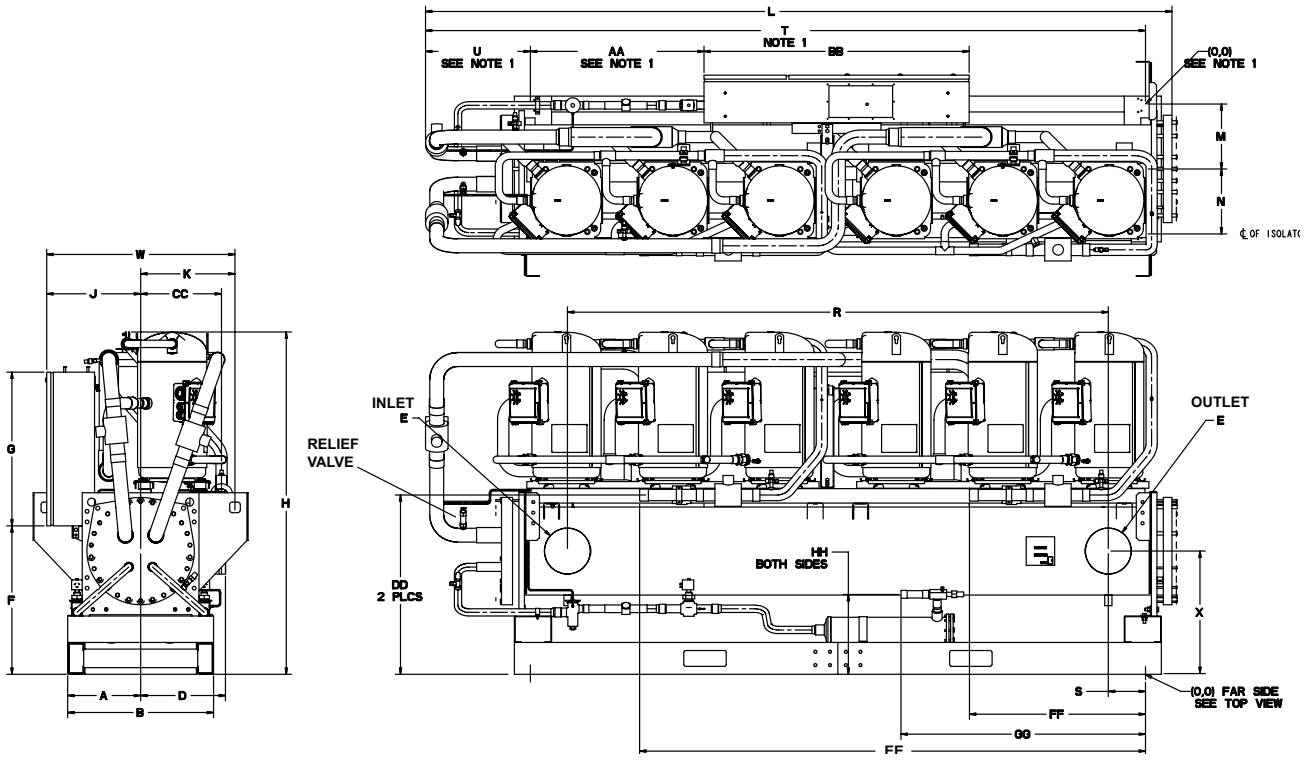
1. Recommended service clearances:
   Rear to wall - 20" (508mm)
   Front to wall - 36" (915mm)
   Top - 43" (1092mm)
   Tube cleaning and removal - 132" (3353mm) either end
2. Relief valve connection sizes.
   Low side (suction line) - 1/2" flare

YCrL (4 Comp)	0064HE	0074HE	0084HE	0118HE
W	32.5	33.7	33.7	33.7
H	56.6	63.6	63.6	63.3
L	121.5	120.5	123.2	120.5
A	13.8	13.8	13.8	13.8
B	27.5	27.5	27.5	27.5
D	11.8	16	16	16
E	8.6	8.6	8.6	8.6
F	24.5	29	29	29
G	29	29	29	29
J	17.7	17.7	17.7	17.7
K	12.3	12.8	12.8	12.8
M	12.3	12.3	12.3	12.3
N	12.3	12.3	12.3	12.3
R	85	83	83	83

YCrL (4 Comp)	0064HE	0074HE	0084HE	0118HE
S	3.5	4.5	4.5	4.5
T	116.7	115.7	118.3	115.7
U	24.7	23.7	26.3	22.1
X	21	22.2	22.3	22.2
AA	21	21	21	21
BB	50	50	50	50
CC	13.5	13.5	13.5	14
DD	30.7	33	33	33
EE	81.1	82.1	78.7	79.1
FF	37.3	34.9	34.4	34.8
GG-1	39.5	39.5	39.5	41
GG-2	39.5	39.5	39.5	41
HH	18.3	14.7	14.7	14.9

H* - for 200/230 volt units, which require a larger electrical enclosure

UNIT DIMENSIONS - ENGLISH - SIX COMPRESSOR



Notes:

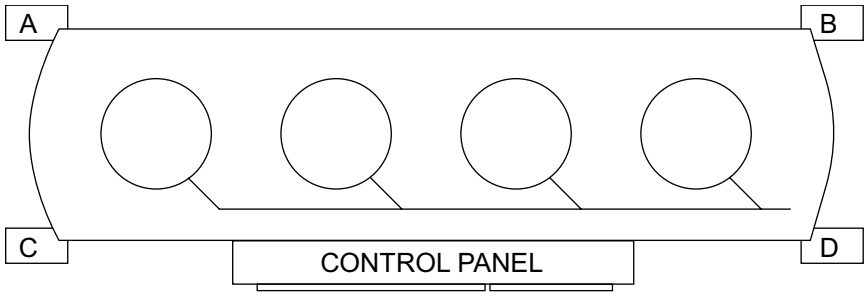
1. Recommended service clearances:
   Rear to wall - 20" (508mm)
   Front to wall - 36" (915mm)
   Top - 43" (1092mm)
   Tube cleaning and removal - 132" (3353mm) either end
2. Relief valve connection sizes.
   Low side (suction line) - 1/2" flare

YCrL (6 Comp)	0096HE	0126HE	0156HE	0177SE	0198SE
W	38	38	38	38.0	38.0
H	59.1	64.6	64.5	64.5	64.5
L	140.6	142.6	140.8	140.8	140.8
A	13.8	13.8	13.8	13.8	13.8
B	27.5	27.5	27.5	27.5	27.5
D	16	16	16	16.0	16.0
E	8.6	8.6	8.6	8.6	8.6
F	28	28	28	28.0	28.0
G	29	29	29	29.0	29.0
J	17.7	17.7	17.7	17.7	17.7
K	17.8	17.8	15.3	15.3	15.3
M	12.3	12.3	12.3	12.3	12.3
N	12.3	12.3	12.3	12.3	12.3
R	102	102	102	102.0	102.0

H* - for 200/230 volt units, which require a larger electrical enclosure

YCrL (6 Comp)	0096HE	0126HE	0156HE	0177SE	0198SE
S	7	7	7	7.0	7.0
T	135.8	137.6	135.8	135.8	135.8
U	19.8	21.6	19.8	19.8	19.8
X	23.3	23.3	23.2	23.2	23.2
AA	32.8	32.8	32.8	32.8	32.8
BB	50	50	50	50.0	50.0
CC	15	15.3	17.8	17.8	17.8
DD	33.3	33.8	33.8	33.8	33.8
EE	94.2	95.4	95.4	95.4	95.4
FF	32	33.2	33.2	33.2	33.2
GG-1	57.9	57.7	53.7	53.7	53.7
GG-2	57.9	57.7	53.7	53.7	53.7
HH	14.7	14.9	14.9	14.9	14.9

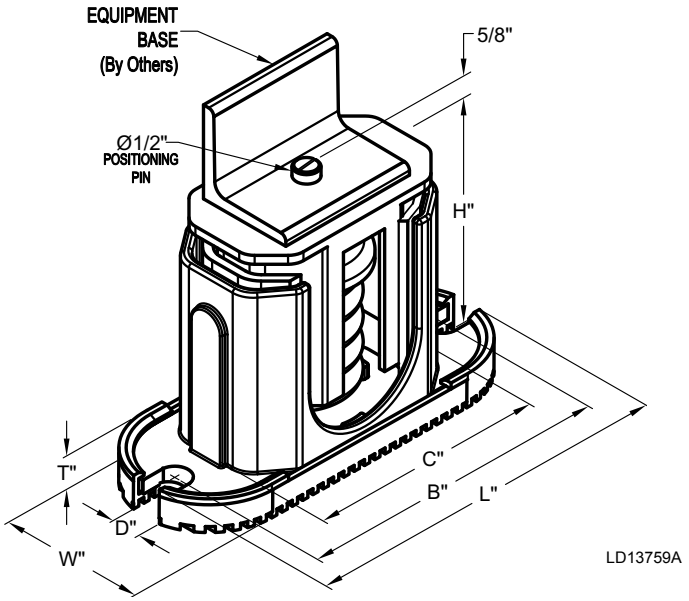
ISOLATOR SELECTION DATA



MODEL YCRL	UNIT SHIPPING WEIGHT	TOTAL OPERATING WEIGHT	WEIGHT ON EACH FRONT ISOLATOR	WEIGHT ON EACH BACK ISOLATOR	STANDARD ISOLATOR SELECTION	NEOPRENE ISOLATOR	SEISMIC ISOLATOR SLRS-2-C2-
0064HE	2883	2973	699	766	CP-1D-1200 GRAY	RD-3 CHARCOAL	RED/BLACK
0074HE	3261	3531	797	913	CP-1D-1200 GRAY	RD-4 BRICK RED	RED/BLACK
0084HE	3439	3709	821	977	CP-1D-1200 GRAY	RD-4 BRICK RED	RED/BLACK
0096HE	3753	4043	896	1112	CP-1D-1360 WHITE	RD-4 BRICK RED	PINK
0118HE	3705	3975	866	1092	CP-1D-1360 WHITE	RD-4 BRICK RED	PINK
0126HE	4587	5037	1008	1386	CP-1D-1785N GRAY/RED	RD-4 BRICK RED	PINK/GRAY
0156HE	4989	5439	1084	1609	C2P-1D-2400 GRAY	RD-4 BRICK RED	PINK/GRAY
0177SE	4418	4773	1380	1054	CP-1D-1785N GRAY/RED	RD-4 BRICK RED	PINK
0198SE	4868	5223	1522	1089	C2P-1D-1800 DK. GREEN	RD-4 BRICK RED	PINK/GRAY

ISOLATOR INFORMATION

ONE INCH DEFLECTION SPRING ISOLATORS CROSS-REFERENCE



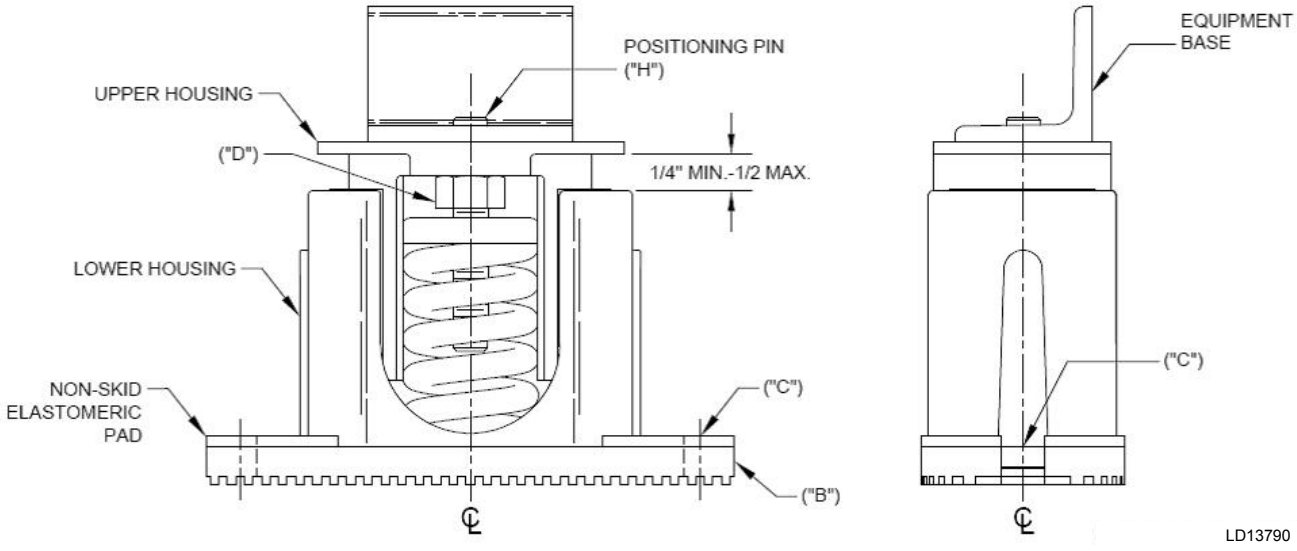
MOUNT TYPE	DIMENSION DATA (INCHES)						
	W	D	L	B	C	T	H
CP1	3	5/8	7-3/4	6-1/2	4-3/4	1/2	5-5/8
CP2	3	5/8	10-1/2	9-1/4	7-3/4	9/16	6

MODEL NUMBER	RATED CAPACITY (LBS.)	RATED DEFLECTION (IN)	COLOR CODE
CP1-1D-85	85	1.36	LT. PURPLE
CP1-1D-120	120	1.2	DK. YELLOW
CP1-1D-175	175	1.17	DK. BLUE
CP1-1D-250	250	1.4	YELLOW
CP1-1D-340	340	1.13	RED
CP1-1D-510	510	1.02	BLACK
CP1-1D-675	675	1.32	DK. PURPLE
CP1-1D-900	900	1.02	DK. GREEN
CP1-1D-1200	1200	0.9	GRAY
CP1-1D-1360	1360	0.77	WHITE
CP1-1D-1785N	1785	0.88	GRAY/RED

MODEL NUMBER	RATED CAPACITY (LBS.)	RATED DEFLECTION (IN)	COLOR CODE
CP2-1D-1020	1020	1.02	BLACK
CP2-1D-1350	1350	1.32	DK. PURPLE
CP2-1D-1800	1800	1.02	DK. GREEN
CP2-1D-2400	2400	0.9	GRAY
CP2-1D-2720	2720	0.77	WHITE
CP2-1D-3570N	3570	0.88	GRAY / RED

ONE INCH DEFLECTION SPRING ISOLATORS INSTALLATION INSTRUCTIONS

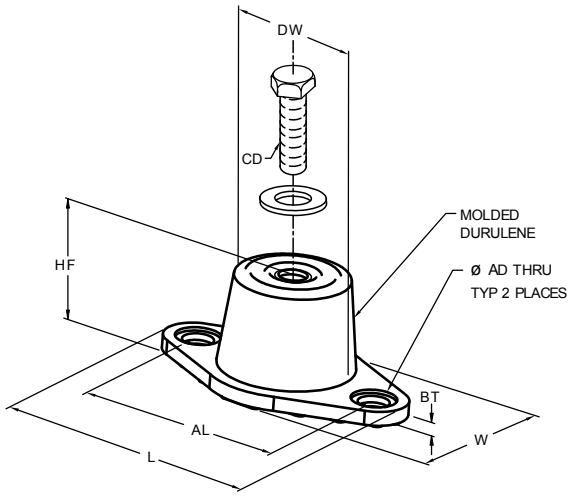
1. Read instructions in their entirety before beginning installation.
2. Isolators are shipped fully assembled and are to be positioned in accordance with the submittal drawings or as otherwise recommended.
3. Set isolators on floor, housekeeping pad or subbase, ensuring that all isolator centerlines 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-inch 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" clearance is achieved between the lower housing and upper housing. *(See drawing below).*
9. Fine adjust isolators to level equipment.
10. Installation is complete.



ISOLATOR INFORMATION (CONT'D)

DURALENE ISOLATOR CROSS-REFERENCE

RD-Style Isolators



Notes:

1. All dimensions are inches, interpreted per ANSI Y14.
2. *Refer to next page for installation instructions.*
3. Mount molded in weather resistant duralene compound as standard. Also available in other materials such as natural rubber, extreme high temperature silicone, high-damped silicone, nitrile and EDPM.
4. AL = Mounting hole center to center spacing.
5. HF = Free height of mount, 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.

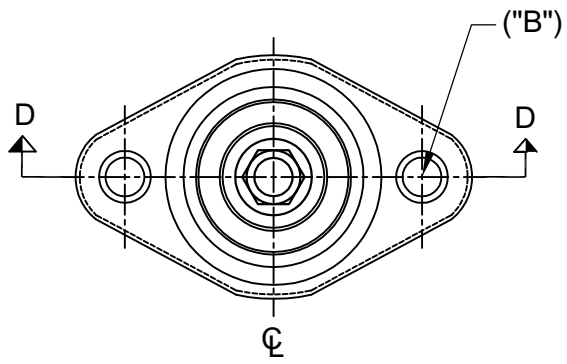
Mount Type	Dimension Data (inches)							
	L	W	HF	AL	AD	BT	CD	DW
RD1-WR	3.13	1.75	1.25	2.38	0.34	0.19	5/16-18 UNC X 3/4	1.25
RD2-WR	3.88	2.38	1.75	3.00	0.34	0.22	3/8-16 UNC X 1	1.75
RD3-WR	5.50	3.38	2.88	4.13	0.56	0.25	1/2-13 UNC X 1	2.50
RD4-WR	6.25	4.63	2.75	5.00	0.56	0.38	1/2-13 UNC X 1	3.00

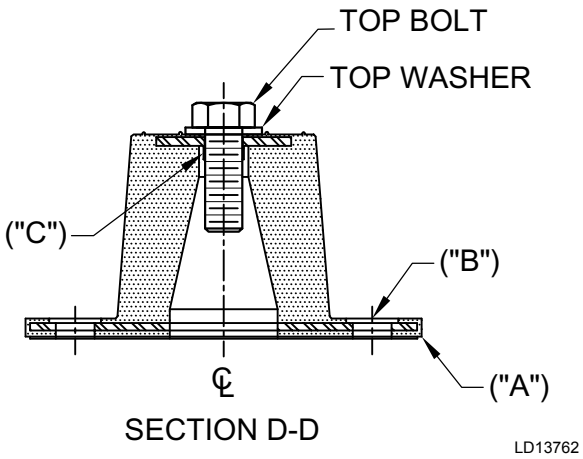
MODEL NUMBER	RATED CAPACITY [LBS]	RATED DEFLECTION [IN]	DURO (± 5)	MODEL NUMBER	RATED CAPACITY [LBS]	RATED DEFLECTION [IN]	DURO (± 5)
RD2-Light Blue-WR	35	0.4	30	RD3-Brown-WR	250	0.5	40
RD2-Brown-WR	45	0.4	40	RD3-Brick Red-WR	525	0.5	50
RD2-Brick Red-WR	70	0.4	50	RD3-Lime-WR	750	0.5	60
RD 2-Lime-WR	120	0.4	60	RD3-Charcoal-WR	1100	0.5	70

MODEL NUMBER	RATED CAPACITY [LBS]	RATED DEFLECTION [IN]	DURO (± 5)	MODEL NUMBER	RATED CAPACITY [LBS]	RATED DEFLECTION [IN]	DURO (± 5)
RD2-Light Blue-WR	135	0.5	30	RD4-Brown-WR	1500	0.5	40
RD2-Brown-WR	170	0.5	40	RD4-Brick Red-WR	2250	0.5	50
RD2-Brick Red-WR	240	0.5	50	RD4-Lime-WR	3000	0.5	60
RD 2-Lime-WR	380	0.5	60	RD4-Charcoal-WR	4000	0.5	70
RD2 Charcoal-WR	550	0.5	70				

INSTALLATION OF DURALENE VIBRATION ISOLATORS

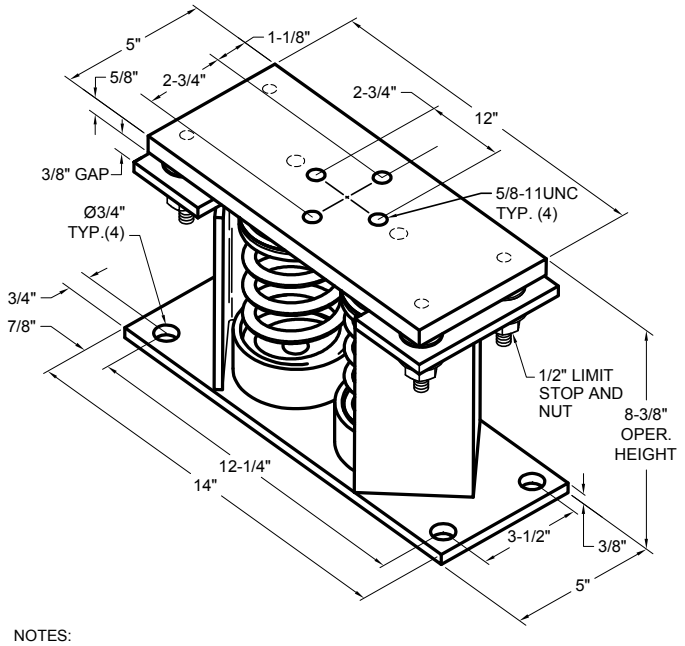
1. Read instructions in their entirety before beginning installation.
2. Isolators are shipped fully assembled and are to be positioned in accordance with the submitial drawings or as otherwise recommended.
3. Set isolators on floor, housekeeping pad, or subbase, ensuring that all isolator centerlines 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-inch 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.





TWO INCH DEFLECTION, SEISMIC SPRING ISOLATOR CROSS-REFERENCE

Y2RS



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Notes:

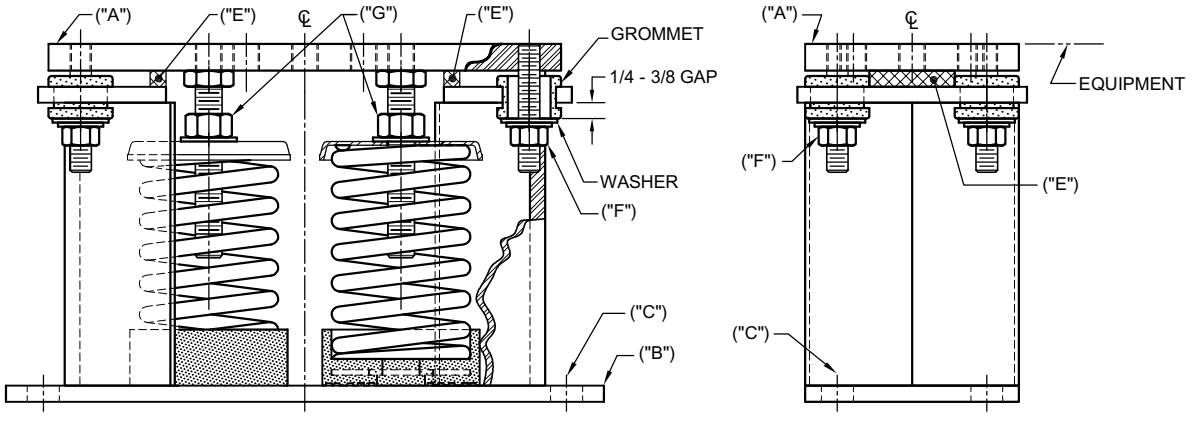
NOTES:

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

MODEL Y2RSI-2D SEISMICALLY RESTRAINED VIBRATION ISOLATOR FOR 2" DEFLECTION						
SEISMIC MOUNT SIZE	RATED LOAD (LBS)	RATED DEFLECTION (IN)	SPRING RATE (LBS/IN)	SOLID LOAD (LBS)	COLOR CODE	ALLOWABLE G RATING HORIZONTAL
Y2RSI-2D-150	150	2.42	62	234	WHITE	34.7
Y2RSI-2D-320	320	2.29	140	490	YELLOW	16.3
Y2RSI-2D-460	460	2.30	200	688	GREEN	11.3
Y2RSI-2D-710	710	2.15	330	1072	DK BROWN	7.3
Y2RSI-2D-870	870	1.89	460	1312	RED	6.0
Y2RSI-2D-1200N	1200	1.88	638	1818	RED/ BLACK	4.3
Y2RSI-2D-1450	1450	1.81	900	2450	TAN	3.6
Y2RSI-2D-1690	1690	1.69	1140	2892	PINK	3.1
Y2RSI-2D-2000N	2000	1.69	1318	3342	PINK/ BLACK	2.6
Y2RSI-2D-2640N	2640	1.54	1854	4283	PINK/ GRAY	2.0
Y2RSI-2D-2870N	3080	1.54	2004	4629	PINK/GRAY/ ORANGE	1.7
Y2RSI-2D-3280N	3740	1.75	2134	4930	PINK/GRAY/ DK BROWN	1.4

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-inch 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" long @ 4" on center around entire base plate or as engineered for specific load and or field conditions.
5. Isolators are shipped to the job site with (2) removable spacer shims (“E”) between the top plate and the housing. These shims must be in place when the equipment is positioned over the isolators.
6. With all shims (“E”) in place, position equipment on top of plate (“A”) of isolator. Bolt equipment securely to top plate of isolator using a minimum of (2) 5/8 UNC A325 grade 5 SAE bolts or weld equipment or bracket to the top plate (“A”) of isolator with a minimum of 3/8 fillet welds 2" long @ 3" on center for a minimum total weld of 10". (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".
9. Adjust each isolator in sequence by turning spring adjusting nuts (“G”) one full clockwise turn at a time. Repeat this procedure on all isolators, one at a time. Check the limit stop lock nuts (“F”) periodically to ensure that clearance between the washer and rubber grommet is maintained. Stop adjustment of isolator only when the top plate (“A”) has risen just above the shim (“E”).
10. Remove all spacer shims (“E”).
11. Fine adjust isolators to level equipment.
12. Adjust all limit stop lock nuts (“F”) per isolator, maintaining a 1/4 to 3/8-inch 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.



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SECTION 6 – COMMISSIONING

GENERAL

Commissioning of this unit should only be carried out by Johnson Controls 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 *Equipment Pre Start-Up And Start-Up Checklist on Page 95* 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

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

Do not liquid charge with static water in the cooler. Care must also be taken to liquid charge slowly to avoid excessive thermal stress at the charging point. Once the vacuum is broken, charge into the condenser coils with the full operating charge as given in *SECTION 5 – TECHNICAL DATA*.

Service and Oil Line Valves

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

Compressor Oil

To add oil to a circuit – connect a YORK hand oil pump (Part No. 470-10654-000) to the 1/4" oil charging connection on the compressors 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. Approximately 1.8-2.3 gallons is present in the each refrigerant system.

Additional oil change may be required depending upon the length of piping.

Oil levels in the oil equalizing line sight glass should be between the bottom and the middle of the sight glass with the system off. High oil levels may cause excessive oil carryover in the system. High oil concentration in the system may cause nuisance trips resulting from incorrect readings on the level sensor and temperature sensors. Temperature sensor errors may result in poor liquid control and resultant liquid overfeed and subsequent damage to the compressor. While running, a visible sign of oil splashing in the sight glass is normal.

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 Start-up and Start-up Checklist as the commissioning procedure is carried out.

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

The machine is now live!

Switch Settings

Assure the chiller ON/OFF 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. Assure 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.

Water System

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

Flow rates and pressure drops must be within the limits given in *SECTION 5 – TECHNICAL DATA*. Operation outside of these limits is undesirable and could cause damage.

If mains power must be switched OFF for extended maintenance or an extended shutdown period, the compressor suction, discharge and economizer service stop valves should be closed (clockwise). If there is a possibility of liquid freezing due to low ambient temperatures, the coolers should be drained or power should be applied to the chiller. This will allow the cooler heater to protect the cooler from freezing down to –20 °F. Before placing the unit back in service, valves should be opened and power must be switched ON (if power is removed for more than 8 hours) for at least 8 hours (24 hours if ambient temperature is below 86 °F [30 °C]) before the unit is restarted.

Flow Switch

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

There should be a straight run of at least 5 pipe diameters on either side of the flow switch. The flow switch should be connected to terminals 13 and 14 of CTB1 in the panel.

Temperature Sensor(s)

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

EQUIPMENT PRE START-UP AND START-UP CHECKLIST

JOB NAME: _____
SALES ORDER #: _____
LOCATION: _____
SOLD BY: _____
INSTALLING CONTRACTOR: _____
START-UP TECHNICIAN/ COMPANY: _____
START-UP DATE : _____

CHILLER MODEL #: _____
SERIAL #: _____

Pre Start-up

Checking The System Prior To Initial Start (No Power)

Unit Checks

☐ 1. Inspect the unit for shipping or installation damage.

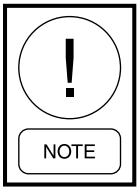
☐ 2. Assure that all piping has been completed.

☐ 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 sight glass.

☐ 6. Ensure water pumps are on. Check and adjust water pump flow rate and pressure drop across the cooler (see *Operational Limitations (English and SI) on Page 47*). Verify flow switch operation.



Excessive flow may cause catastrophic damage to the heat exchanger (evaporator).

☐ 7. Check the control panel to ensure it is free of foreign material (wires, metal chips, etc.).

☐ 8. Visually inspect wiring (power and control). Wiring MUST meet N.E.C. and local codes.

☐ 9. Check tightness of power wiring inside the power panel on both sides of the motor contactors and overloads.

☐ 10. Check for proper size fuses in main and control circuits, and verify overload setting corresponds with RLA and FLA values in electrical tables.

☐ 11. Ensure 120VAC Control Power to TB1 has 15 amp minimum capacity.

☐ 12. Be certain all water temp sensors are inserted completely in their respective wells and are coated with heat conductive compound.

☐ 13. Ensure that evaporator TXV bulbs are strapped onto the suction lines at 4 or 8 o'clock positions or suction temp. sensors if EEVs are installed.

Compressor Heaters (Power On – 24 Hours Prior To Start)

☐ 1. Apply 120VAC and verify its value between terminals 5 and 2 of CTB2. The voltage should be 120VAC plus or minus 10%.

Power must be applied 24 hours prior to start-up.

Each heater should draw approximately 0.5 to 1A.

Start-up

Panel Checks (Power On – Unit switch Off)

☐ 1. Apply 3-phase power and verify its value. Voltage imbalance should be no more than 2% of the average voltage.

☐ 2. Apply 120VAC and verify its value on the terminal block in the power panel. Make the measurement between terminals 5 and L of CTB2. The voltage should be 120VAC plus or minus 10%.

☐ 3. Program/verify the Cooling Setpoints, Program Setpoints, and Unit Options. Record the values below in Table 13. (See *Setpoints Keys on Page 116* and *Unit Keys on Page 123* for programming instruction)

TABLE 13 - SETPOINTS ENTRY LIST

OPTIONS		
	Display Language	
	Sys 1 Switch	
	Sys 2 Switch	
	Chilled Liquid	
*	Ambient Control	
	Local/Remote Mode	
	Control Mode	
	Display Units	
*	Lead/Lag Control	
*	Fan Control	N/A
	Manual Override	
	Current Feedback	
**	Soft Start	
**	Unit Type	
**	Refrigerant Type	
**	Expansion Valve Type	
COOLING SETPOINTS		
	Cooling Setpoint	
	Range	
	EMS-PWM Max. Setpoint	
PROGRAM		
	Discharge Pressure Cutout	
	Suct. Pressure Cutout	
	Low Amb. Temp. Cutout	
	Leaving Liquid Temp. Cutout	
	Anti-Recycle Time	
	Fan Control On Pressure	N/A
	Fan Differential Off Pressure	N/A
	Total # of Compressors	
*	Number of Fans/System	N/A
*	Unit/Sys Voltage	
	Unit ID	

* Not on All Models

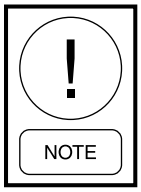
** Viewable Only

☐ 4. Put the unit into Service Mode (*as described under the SECTION 9 – SERVICE AND TROUBLESHOOTING)* and cycle each condenser fan to ensure proper rotation.

☐ 5. Prior to this step, turn system 2 OFF and system 1 ON (*refer to Option 2 under Unit Keys on Page 123 for more information on system switches)*. Connect a manifold gauge to system 1 suction and discharge service valves.

Place the Unit Switch in the control panel to the ON position. 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 proper compressor rotation, turn the Unit Switch to OFF.

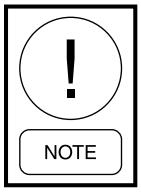
The Chilled Liquid Setpoint may need to be temporarily lowered to ensure all compressors cycle ON.



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 Option 2 under *Unit Keys on Page 123* for more information on system switches).

Place the Unit Switch in the control panel to the ON position. 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 proper compressor rotation, turn the Unit Switch to OFF.



Excessive flow may cause catastrophic damage to the heat exchanger (evaporator).

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 temp. is converted from a temperature/pressure chart).

Example:

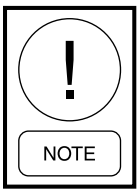
Liquid line pressure =	
325 PSIG converted to temp.	101 °F
minus liquid line temp.	- 89 °F
Subcooling =	12 °F

The subcooling should be adjusted to 12 °F at design conditions.

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

	SYS 1	SYS 2	
Liq Line Press =	_____	_____	PSIG
Saturated Temp =	_____	_____	°F
Liq 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 chiller 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" (46 cm) from the heat exchanger.



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	
105 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.

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

☐ 2. 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

LEAK CHECKING

☐ 1. 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.

UNIT OPERATING SEQUENCE

The operating sequence described below relates to operation on a hot water start after power has been applied, such as start-up commissioning. When a compressor starts, internal timers limit the minimum time before another compressor can start to 1 minute.

1. For the chiller system to run, the Flow Switch must be closed, any remote cycling contacts must be closed, the Daily Schedule must not be scheduling the chiller off, and temperature demand must be present.
2. When power is applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure.
3. At the end of the 2 minute timer, the microprocessor will check for cooling demand. If all conditions allow for start, a compressor on the lead system will start and the liquid line solenoid will open. Coincident with the start, the anti-coincident timer will be set and begin counting downward from “60” seconds to “0” seconds.

   If the unit is programmed for Auto Lead/Lag, the system with the shortest average run-time of the compressors will be assigned as the “lead” system. A new lead/lag assignment is made whenever all systems shut down.
4. After 1 minute of compressor run time, the next compressor in sequence will start when a system has to load. Additional compressors will be started at 60 second intervals as needed to satisfy temperature setpoint.
5. If demand requires, the lag system will cycle ON with the same timing sequences as the lead system after the lead system has run for five minutes. *Refer to Capacity Control on Page 129 for a detailed explanation of system and compressor staging.*
6. As the load decreases below setpoint, the compressors will be shut down in sequence. This will occur at intervals of either 60, 30, or 20 seconds based on water temperature as compared to setpoint, and control mode. *See Capacity Control on Page 129 for a detailed explanation.*
7. When the last compressor in a “system” (two or three compressors per system), is to be cycled off, the system will initiate a pump-down. Each “system” has a pump-down feature upon shut-off. On a non-Safety, non-Unit Switch shutdown, the LLSV will be turned off and the last compressor will be allowed to run until the suction pressure falls below the suction pressure cutout or for 180 seconds, whichever comes first.

SECTION 7 – UNIT CONTROLS
YORK *MILLENNIUM* CONTROL CENTER

LD15596

INTRODUCTION

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

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

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

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

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

A Master ON/OFF switch is available to activate ordeactivate the unit.

IPU II and I/O Boards

The IPU and I/O boards are assembled to function as a single microprocessor controller requiring no additional hardware. The IPU II board contains a coldfire microprocessor and is the controller and decision maker in the control panel. The I/O board handles all the chiller I/O (Inputs and Outputs). System inputs from pressure transducers and temperature sensors are connected to the I/O board. The I/O board contains a processor capable of reading the inputs and controlling the outputs. It communicates through the transition header with the IPU II microprocessor.

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

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

The on-board power supply converts 24VAC from 75VA, 120/24VAC 50/60Hz UL listed class 2 power transformer to +12V, +5V and +3.3V using switching and linear voltage regulators located on the I/O and IPU II boards. These voltages are used to operate integrated circuitry on the board. The 40 Character Display and unit sensors (transducers and temp sensors) are supplied power for the microprocessor board +5V supply. 24V AC is rectified, but not regulated, to provide unregulated +30VDC to supply all of the digital inputs.

The IPU II board contains one green "Power" LED to indicate that the board is powered up and one red "Status" LED to indicate by blinking that the processor is operating.

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

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

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 chiller 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 IPU II contains a Real Time Clock integrated circuit chip with an internal battery backup. The purpose of this battery backup is to assure 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 75VA, 120/24VAC 50/60Hz 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.

Programming # of Compressors

The total number of compressors is programmable under the PROGRAM key. Chillers can have 4 or 6 compressors.

STATUS KEY

00066VIP

Unit Status

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

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

General Status Messages

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

UNIT SWITCH OFF
SHUTDOWN

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

REMOTE CONTROLLED
SHUTDOWN

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

DAILY SCHEDULE
SHUTDOWN

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

REMOTE STOP
NO RUN PERM

REMOTE STOP NO RUN PERM shows that either the flow switch is open or a remote start/stop contact is open in series with the flow switch. These contacts are connected to J13-5. 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 chilled liquid temperature is below the point (determined by the setpoint and control range) that the microprocessor will bring on a system or that the microprocessor has not loaded the lead system far enough into the loading sequence to be ready to bring the lag system ON. The lag system will display this message until the loading sequence is ready for the lag system to start.

```
SYS 1 COMPS RUN X
SYS 2 COMPS RUN X
```

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

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

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

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

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

```
SYS 1 DSCH LIMITING
SYS 2 DSCH LIMITING
```

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

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

```
SYS 1 SUCT LIMITING
SYS 2 SUCT LIMITING
```

When this message appears, suction pressure limiting is in effect. The suction pressure limit is a control point that limits the loading of a system when the suction pressure drops to within 15% above the suction pressure cutout. On a standard system programmed for 44 PSIG (3.0 Bar) suction pressure cutout, the microprocessor would inhibit loading of the affected system with the suction pressure less than or equal to 1.15 x 44 PSIG (3.0 Bar) equals 50 PSIG (3.5 Bar). The system will be allowed to load after 60 seconds and after the suction pressure rises above the suction pressure load limit point.

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

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

```
MANUAL
OVERRIDE
```

If MANUAL OVERRIDE mode is selected, the STATUS display will display this message. This will indicate that the Daily Schedule is being ignored and the chiller will start-up when chilled liquid temperature allows, Remote Contacts, UNIT switch and SYSTEM switches permitting. This is a priority message and cannot be overridden by anti-recycle messages, fault messages, etc. when in the STATUS display mode. Therefore, do not expect to see any other STATUS messages when in the MANUAL OVERRIDE mode. MANUAL OVERRIDE is to only be used in emergencies or for servicing. MANUAL OVERRIDE mode automatically disables itself after 30 minutes.

SYS 1 PUMPING DOWN
SYS 2 PUMPING DOWN

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

Fault Safety Status Messages

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

System Safeties

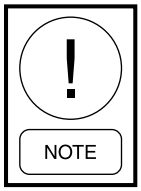
System safeties are faults that cause individual systems to be shut down if a safety threshold is exceeded for 3 seconds. They are auto reset faults in that the system will be allowed to restart automatically after the fault condition is no longer present. However, if 3 faults on the same system occur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

SYS 1 HIGH DSCH PRES
SYS 2 HIGH DSCH PRES

The Discharge Pressure Cutout is a software cutout in the microprocessor and is backed-up by a mechanical high pressure cutout switch located in the refrigerant circuit. It assures 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

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 these 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 utilize a low pressure switch in place of the suction pressure transducer.*

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 these 30 seconds the suction pressure falls below the ramped cutout, the system will stop.

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 protects 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 0VDC to be read on the inputs to the microboard. The fault condition is cleared when a 30VDC signal is restored to the input.

The internal motor protector opens between 185 °F and 248 °F (85 °C and 120 °C) and auto resets. On 60Hz chillers, the mechanical HP switch opens at 585 PSIG plus or minus 10 PSIG and automatically closes at 440 PSIG plus or minus 25 PSIG.

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 assure 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
```

When the SYSTEM CURRENT FEEDBACK option is installed and selected (Option 11 under OPTIONS key Current Feedback), this safety will operate as follows. If the actual feedback voltage of the system proportional to currents exceeds the programmed trip voltage for 5 seconds, the system will shutdown.

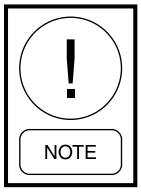
This safety will shut down a system if either suction temperature or suction pressure sensors read out of range high or low. This condition must be present for 3 seconds to cause a system shutdown. The safety locks out a system after the first fault and will not allow automatic restarting.

Unit Safeties

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

```
UNIT FAULT:
LOW AMBIENT TEMP
```

The Low Ambient Temp Cutout is a Safety Shutdown designed to protect the chiller from operating in a low ambient condition. If the outdoor ambient temperature falls below the programmable cutout, the chiller will shut down. Restart can occur when temperature rises 2 °F above the cutoff. This message should not apply to a YCRL chiller



If this message does appear, put the chiller in the LOW AMBIENT mode under the OPTIONS key and program the low ambient cutout to 0.00˚ F under the PROGRAM key.

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

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

```
UNIT FAULT:
115VAC UNDER VOLTAGE
```

The Under Voltage Safety assures that the system is not operated at voltages where malfunction of the microprocessor could result in system damage. When the 115VAC 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 chiller.

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

The Low Battery Warning can only occur at unit power-up. On micro panel power-up, the RTC battery is checked. If a low battery is found, all programmed setpoints, program values, options, time, schedule, and history buffers will be lost. These values will all be reset to their default values which may not be the 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 U17 on the microboard.

```
INCORRECT
UNIT TYPE
```

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

Status Key Messages

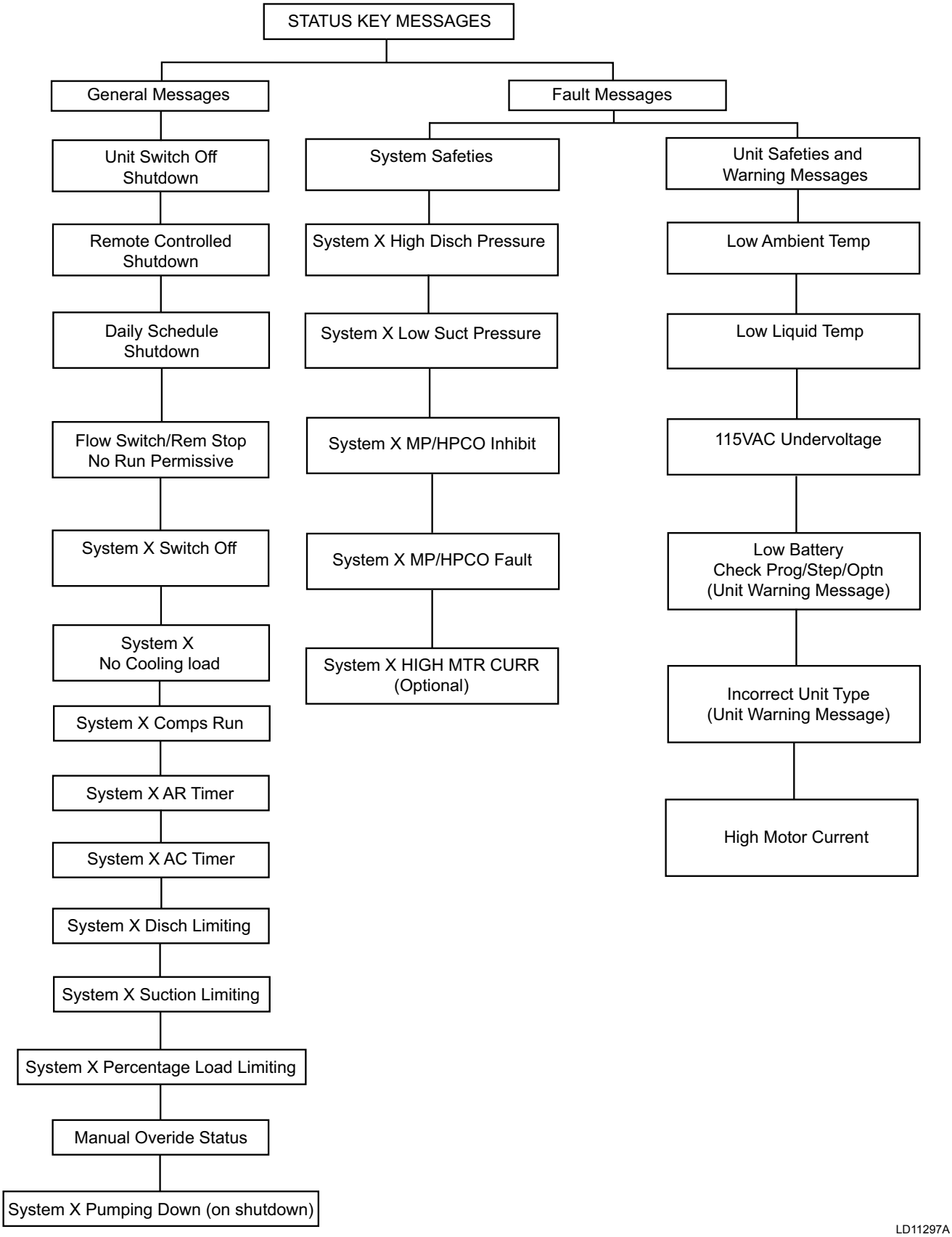
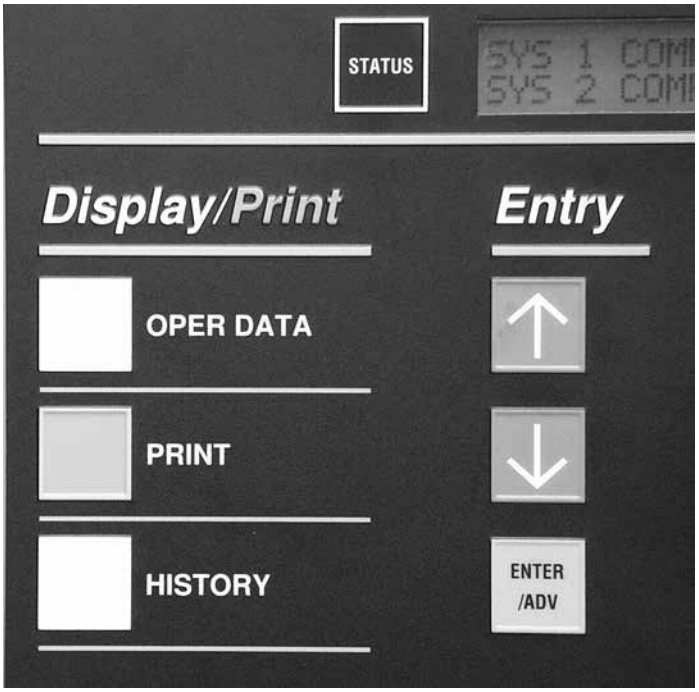


FIGURE 31 - STATUS KEY MESSAGES QUICK REFERENCE LIST

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 chiller operation, diagnosing potential problems, troubleshooting, and commissioning the chiller.

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

Oper Data Key

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

NOTE

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

With the "UNIT TYPE" set as a liquid chiller (no jumper to J11-12), 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 chiller MUST be set to be a liquid chiller (no jumper to J11-12). DO NOT operate the chiller if not properly set up.

```
LCHLT  =  46.2°F
RCHLT  =  57.4°F
```

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

```
AMBIENT AIR TEMP
     =  87.5°F
```

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

The minimum limits for the display are:

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

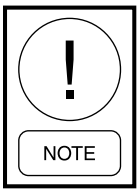
The maximum limits for the display are:

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

```
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.

```
COOLING DEMAND
2 OF 8 STEPS
```

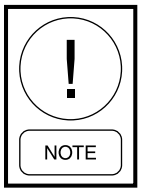
The display of COOLING DEMAND indicates the current “step” in the capacity control scheme when in Return Water Control Mode. The number of available steps are determined by how many compressors are in the unit. In the above display, the “2” does not mean that two compressor are running but only indicates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

```
TEMP ERROR XXX.X°F
TEMP RATE  XXX.X°F/M
```

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

```
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 on Page 123.* 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.

```
EVAPORATOR HEATER
STATUS IS          =XXX
```

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

```
EVAPORATOR WATER
PUMP    STATUS     =XXXX
```

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

```
EVAP PUMP TOTAL RUN
HOURS              =XXXXX
```

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

```
  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 ISN.
- ISN – YORK Talk via ISN allows remote load limiting and temperature reset through an ISN system.
- LOAD LIM – Load limiting enabled using contact closure.
- PWM TEMP – EMS temperature reset

If the microprocessor 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 chiller current is displayed as shown below:

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

If the microprocessor 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 the stage of condenser fan operation that is active. This message does not apply to a YCRL chiller and is displayed as a result of the use of software common to YCA, YCRL and YCW chillers.

See Condenser Fan Control in *SECTION 8 – UNIT OPERATION* for more information.

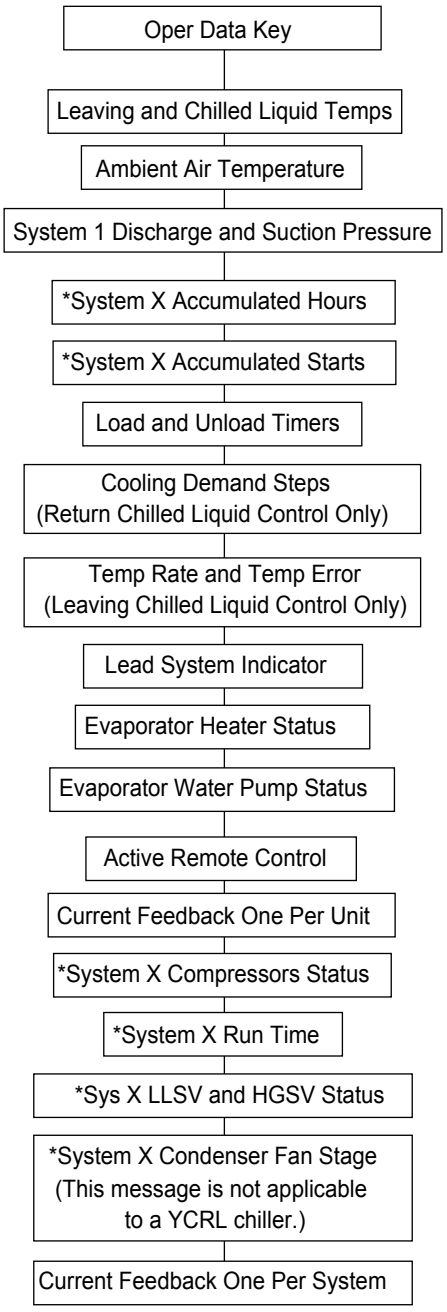
The fifth message displays current as sensed by the optional current feedback circuitry. The display reads out in amps along with the DC feedback voltage from the module. Current is calculated by:

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

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 figure is a quick reference list for information available under the OPER DATA key.



* Block of information repeats for each system

FIGURE 32 - OPERATION DATA

Print Key

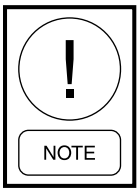
The PRINT key allows the operator to obtain a printout of real-time system operating data or a history printout of system data at the “instant of the fault” on the last six faults which occurred on the unit. An optional printer is required for the printout.

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. Not all data applies to a YCRL chiller.)

```
   YORK INTERNATIONAL CORPORATION
     MILLENNIUM LIQUID CHILLER

           UNIT STATUS
         2:04PM 01 JAN 10

SYS 1              NO COOLING LOAD
SYS 2       COMPRESSORS RUNNING 2

             OPTIONS
CHILLED LIQUID                WATER
AMBIENT CONTROL            STANDARD
LOCAL/REMOTE MODE            REMOTE
CONTROL MODE        LEAVING LIQUID
LEAD/LAG CONTROL          AUTOMATIC
FAN CONTROL       AMB & DSCH PRESS
CURRENT FEEDBACK               NONE
POWER FAILURE RESTART     AUTOMATIC
SOFT START                  ENABLED
EXPANSION VALVE       THERMOSTATIC
REMOTE TEMP RESET          4 TO 20MA

          PROGRAM VALUES
DSCH PRESS CUTOUT          570 PSIG
SUCT PRESS CUTOUT           80 PSIG
SUCT PRESS CUT COOLING      42 PSIG
SUCT PRESS CUT HEATING      31 PSIG
LOW AMBIENT CUTOUT        25.0 DEGF
LEAVING LIQUID CUTOUT     25.0 DEGF
ANTI RECYCLE TIME          600 SECS
FAN CONTROL ON PRESS       425 PSIG
FAN DIFF OFF PRESS         125 PSIG
NUMBER OF COMPRESSORS            6
NUMBER OF FANS PER SYSTEM        4
UNIT TRIP VOLTS                3.0
REFRIGERANT TYPE               R-22
DEFROST INIT TEMP        41.0 DEGF
DEFROST INITIATION TIME     60MIN
DEFROST TERMINATION TIME     3MIN
BIVALENT HEAT DELAY TIME  30 MIN
REMOTE UNIT ID PROGRAMMED        2
YORK HYDRO KIT PUMPS     1 (410a)
PUMP TOTAL RUN HOURS XXXXX (410a)
```

```
             UNIT DATA
RETURN LIQUID TEMP         58.2 DEGF
LEAVING LIQUID TEMP        53.0 DEGF
DISCHARGE AIR TEMP         55.3 DEGF
COOLING RANGE   42.0 +/- 2.0 DEGF
HEATING RANGE  122.0 +/- 2.0 DEGF
SYS 1 SETPOINT      70 +/- 3 PSIG
SYS 2 SETPOINT      70 +/- 3 PSIG
REMOTE SETPOINT          44.0 DEGF
AMBIENT AIR TEMP         74.8 DEGF
LEAD SYSTEM                SYS 2
EVAPORATOR PUMP              ON
EVAPORATOR HEATER           OFF
ACTIVE REMOTE CONTROL      NONE
LAST DEFROST SYS X DURATION XXXS
TIME TO SYS X DEFROST     XX MIN
BIVALENT DELAY REMAINING XX MIN
UNIT  XXX.X AMPS        X.X VOLTS
SOFTWARE VERSION     C.M02.13.00

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

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

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



See 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 nine 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 nine 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.

```
YORK INTERNATIONAL CORPORATION
MILLENNIUM LIQUID CHILLER

SAFETY SHUTDOWN NUMBER 1
SHUTDOWN @ 3:56PM  01 JAN 10

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 (1TO9)
```

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

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

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

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

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

Displays the type of fault that occurred.

```
UNIT TYPE
LIQUID CHILLER
```

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

```
CHILLED LIQUID
XXXXX
```

Displays the chilled liquid type; Water or Glycol.

```
AMBIENT CONTROL
XXXXXXXXXX
```

Displays the type of Ambient Control; Standard or Low Ambient. This does not apply to a YCRL chiller.

```
LOCAL/REMOTE MODE
XXXXXXXXX
```

Displays Local or Remote control selection.

```
CONTROL MODE
LEAVING LIQUID
```

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

```
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 chillers.

```
FAN CONTROL
DISCHARGE PRESSURE
```

This message does not apply to a YCRL chiller.

```
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.

```
LEAVING LIQUID TEMP
CUTOUT = XXX.X °F
```

Displays the Leaving Liquid Temp. Cutout programmed.

```
FAN CONTROL ON
PRESSURE=XXX PSIG
```

This message does not apply to a YCRL chiller.

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

This message does not apply to a YCRL chiller.

```
SYS 1 TRIP VOLTS
= X.X VOLTS
```

Displays the programmed High Current Trip Voltage.

```
SYS 2 TRIP VOLTS
= X.X VOLTS
```

Displays the programmed High Current Trip Voltage.

```
YORK HYDRO
KIT PUMPS =X
```

Indicates the Pump Control option is selected.

```
LCHLT = XXX.X °F
RCHLT = XXX.X °F
```

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

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

Displays the programmed Setpoint and Range, if the chiller is programmed for Leaving Chilled Liquid Control.

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

Displays the programmed Setpoint and Range, if the chiller is programmed for Return Chilled Liquid Control.

```
AMBIENT AIR TEMP
= XXX.X °F
```

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

```
LEAD SYSTEM IS
SYSTEM NUMBER X
```

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

```
EVAPORATOR HEATER
STATUS IS          XXX
```

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

```
EVAPORATOR WATER
PUMP STATUS        XXXX
```

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

```
EVAP PUMP TOTAL RUN
HOURS             =XXXX
```

Evap Pump total run hours at the time of fault.

```
  ACTIVE REMOTE CTRL
          XXXX
```

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

```
  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
```

This message does not apply to a YCRL chiller.

```
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 microprocessor 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 microprocessor 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

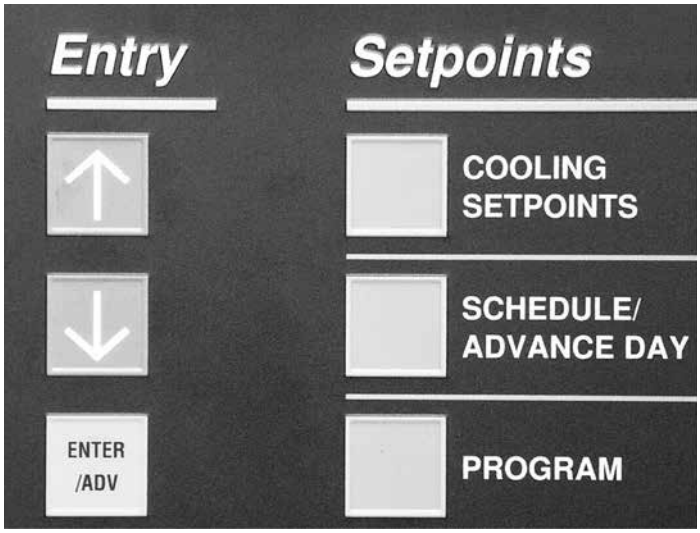
The software version may be viewed by first pressing the HISTORY key and then repeatedly pressing the ↓ (DOWN) arrow key until you scroll past the first history buffer choice.

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

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

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

ENTRY KEYS



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The ENTRY keys allow 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. *Refer to the section on DISPLAY/PRINT keys for specific information on the displayed information and specific use of the ↑ (UP) and ↓ (DOWN) arrow keys.*

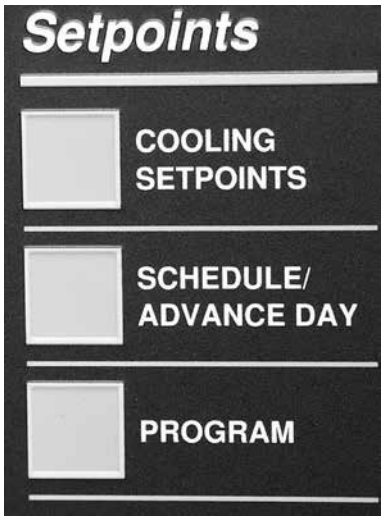
The ↑ (UP) arrow key, and ↓ (DOWN) arrow key are also used for programming the control panel such as changing numerical or text values when programming Cooling Setpoints, setting the Daily Schedule, changing safety Setpoints, Chiller Options, and setting the clock.

Enter/Adv Key

The ENTER/ADV key must be pushed after any change is made to the Cooling Setpoints, Daily Schedule, Safety Setpoints, Chiller Options, and the clock. Pressing this key "enters" the new values into memory. If the ENTER/ADV key is not pressed after a value is changed, the changes will not be "entered" and the original values will be used to control the chiller.

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

SETPOINTS KEYS



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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. The cooling mode (leaving chilled liquid or return chilled liquid) will be displayed for a few seconds, and the setpoint display entry screen will appear.

Leaving Chilled Liquid Control

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

The above message shows the current chilled water temperature SETPOINT at 45.0 °F (notice the cursor positioned under the number 0). Pressing either the ↑ (UP) or ↓ (DOWN) arrow will change the setpoint in .5 °F increments. After using the ↑ (UP) or ↓ (DOWN) arrow keys 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.

Entry of the setpoint will be indicated by the cursor moving under the current RANGE setpoint. The ↑ (UP) and ↓ (DOWN) arrow keys are used to set the RANGE, in .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.

Notice that the RANGE was programmed for +/- X.X° F. This indicates the SETPOINT to be in the center of the control range. If the control mode has been programmed for RETURN LIQUID control, the message below would be displayed in place of the previous message.

When in Leaving Chilled Liquid Temperature Control, the microprocessor will attempt to control the leaving water temperature within the temperature range of the setpoint plus or minus the range. In the above example, control will be in the range of 43 to 47 °F.

Return Chilled Liquid Control

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

In Return Chilled Liquid Control, the range no longer has a +/- X.X °F, but only a + X.X °F RANGE setpoint. This indicates that the setpoint is not centered within the RANGE but could be described as the bottom of the control range. A listing of the limits and the programmable values for the Cooling Setpoints are shown in *Table 14 on page 118*.

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

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

Both LEAVING and RETURN control are described in detail under the *Capacity Control on Page 129*.

Remote Setpoint Control

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

The following messages illustrate both Leaving Chilled Liquid Control and Return Chilled Liquid Control respectively.

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

(Leaving Chilled Liquid Control)

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

(Return Chilled Liquid Control)

The low limit, high limit, and default values for the keys under “SETPOINTS” are listed in *Table 14 on page 118*.

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

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

The Temp Reset value is the maximum allowable remote reset of the temperature setpoint. The setpoint can be reset upwards by the use of an Energy Management System or from the Temperature Reset Option Board. *See EMS-PWM Remote Temperature Reset on Page 134 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.

Schedule/Advance Day Key

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

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

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

TABLE 14 - COOLING SETPOINTS, PROGRAMMABLE LIMITS AND DEFAULTS

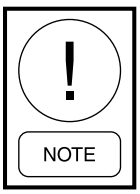
SETPOINTS KEY	MODE	LOW LIMIT	HIGH LIMIT	DEFAULT
Leaving Chilled Liquid Setpoint	Water Cooling	40.0°F 4.4°C	**70.0°F 21.1°C	44.0°F 6.7°C
	Glycol Cooling	*10.0°F -12.2°C	**70.0°F 21.1°C	44.0°F 6.7°C
Leaving Chilled Liquid Control Range	—	1.5°F 0.8°C	2.5°F 1.4°C	2.0°F 1.1°C
Return Chilled Liquid Setpoint	Water Cooling	40.0°F 4.4°C	70.0°F 21.1°C	44.0°F 6.7°C
	Glycol Cooling	10.0°F -12.2°C	70.0°F 21.1°C	44.0°F 6.7°C
Return Chilled Liquid Control Range	—	4.0°F 2.2 °C	20.0°F 11.1°C	10.0°F 5.6°C
Max Ems-Pwm Remote Temperature Reset	—	2°F 1.1°C	40°F 22.2°C	20°F 11.1°C

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

* When using glycol, Leaving Chilled Liquid Setpoint should not be set below 20 °F (-6.7 °C).

** Do not exceed 55 °F (12.8 °C) setpoint before contacting the nearest Johnson Controls Office for application guidelines.

The line under the 0 is the cursor. If the value is wrong, 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 until the desired day appears. The start and stop time of each day may be programmed differently using the ↑ (UP) and ↓ (DOWN) arrow, and ENTER/ADV keys.

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

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

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

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

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

The Holiday schedule must be programmed weekly. Once the Holiday schedule runs, it will revert to the normal Daily Schedule.

Program Key

There are several operating parameters under the PROGRAM key that are programmable. These setpoints can be changed by pressing the PROGRAM key, and then the ENTER/ADV key to enter Program Mode. Continuing to press the ENTER/ADV key will display each operating parameter. While a particular parameter is being displayed, the ↑ (UP) and ↓ (DOWN) arrow keys can be used to change the value. After the value is changed, the ENTER/ADV key must be pressed to enter the data into memory. *Table 15 on page 121* shows the programmable limits and default values for each operating parameter.

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

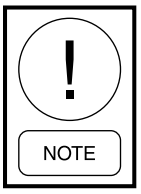
```
DISCHARGE PRESSURE
CUTOUT = 570 PSIG
```

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 mechanical high pressure switch located in the refrigerant circuit. The system can restart when the discharge pressure drops 40 PSIG (2.76 barg) below the cutout point.

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

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

The SUCTION PRESSURE CUTOUT protects the chiller from an evaporator freeze-up. If the suction pressure drops below the cutout point, the system will shut down. Typically, the cutout should be set to 80 PSIG (5.52 Bars) form water cooling.



There are some exceptions when the suction pressure is permitted to temporarily drop below the cutout point. Details are explained under the System Safeties topic.

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

The LOW AMBIENT TEMP CUTOUT allows the user to select the chiller outside ambient temperature cutout point. If the ambient falls below this point, the chiller will shut down. Restart can occur when temperature rises 2 °F (1.11 °C) above the cutout setpoint. This does not apply to a YCRL chiller.

```
LEAVING LIQUID TEMP
CUTOUT = 36.0°F
```

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

When water cooling mode is programmed (OPTIONS key), the value is fixed at 36.0 °F (2.22 °C) and cannot be changed. Glycol cooling mode can be programmed to values listed in *Table 15 on page 121*.

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

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

```
FAN CONTROL ON
PRESSURE = XXX PSIG
```

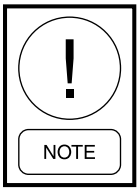
Does not apply to YCRL.

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

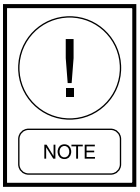
Does not apply to YCRL.

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

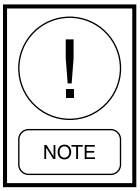
The TOTAL NUMBER OF COMPRESSORS is the total quantity of compressors in the chiller, and determines the stages of cooling available. Dual system units may have 4 or 6 compressors.



This MUST be programmed correctly to assure proper chiller operation.



A single system chiller MUST have a jumper between terminals J9-7 and +24V on the I/O board. This connection can be made between terminals 13 and 17 on terminal block CTB1. If the jumper is not installed, the unit will act as a 2-system chiller. The jumper is only checked by the microprocessor at unit power-up. If the jumper is removed, power must be removed and re-applied to register the change in memory.



This MUST be programmed correctly to assure proper chiller operation.

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

Does not apply to a YCRL chiller.

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

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

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

System Trip Volts

For individual system high current trip programming on chillers:

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

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

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

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

Unit Trip Volts

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

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

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

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

The programmed value will be 5.0V.

REMOTE UNIT ID PROGRAMMED = X

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

TABLE 15 - PROGRAM KEY LIMITS AND DEFAULT

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	Water Cooling	80.0 PSIG	120.0 PSIG	80.0 PSIG
		5.52 BARG	8.27 BARG	5.52 BARG
	Glycol Cooling	42.0 PSIG	70.0 PSIG	44.0 PSIG
		2.9 BARG	4.83 BARG	3.03 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 (N/A)	0 °F	60.0 °F	25.0 °F
		-17.8 °C	15.6 °C	-3.9 °C
Leaving Chilled Liquid Temp. Cutout	Water Cooling	—	—	36 °F
				2.2 °C
	Glycol Cooling	-1.0 °F	36.0 °F	36.0 °F
		-18.3 °C	2.2 °C	2.2 °C
Anti-Recycle Timer	—	300 SEC.	600 SEC.	600 SEC.
Fan Control On Pressure (Not Applicable To A Ycrl)	—	N/A	N/A	N/A
		N/A	N/A	N/A
Fan Differential Off Pressure (Not Applicable To A Ycrl)	—	N/A	N/A	N/A
		N/A	N/A	N/A
Total Number Of Compressors	Single System	2	3	3
	Dual System	4	6	6
Number Of Fans Per System		N/A	N/A	N/A
Unit/System Trip Volts	Current Feedback	0.5 Volts	4.5 Volts	2.5 Volts
Remote Unit Id	—	0	7	0

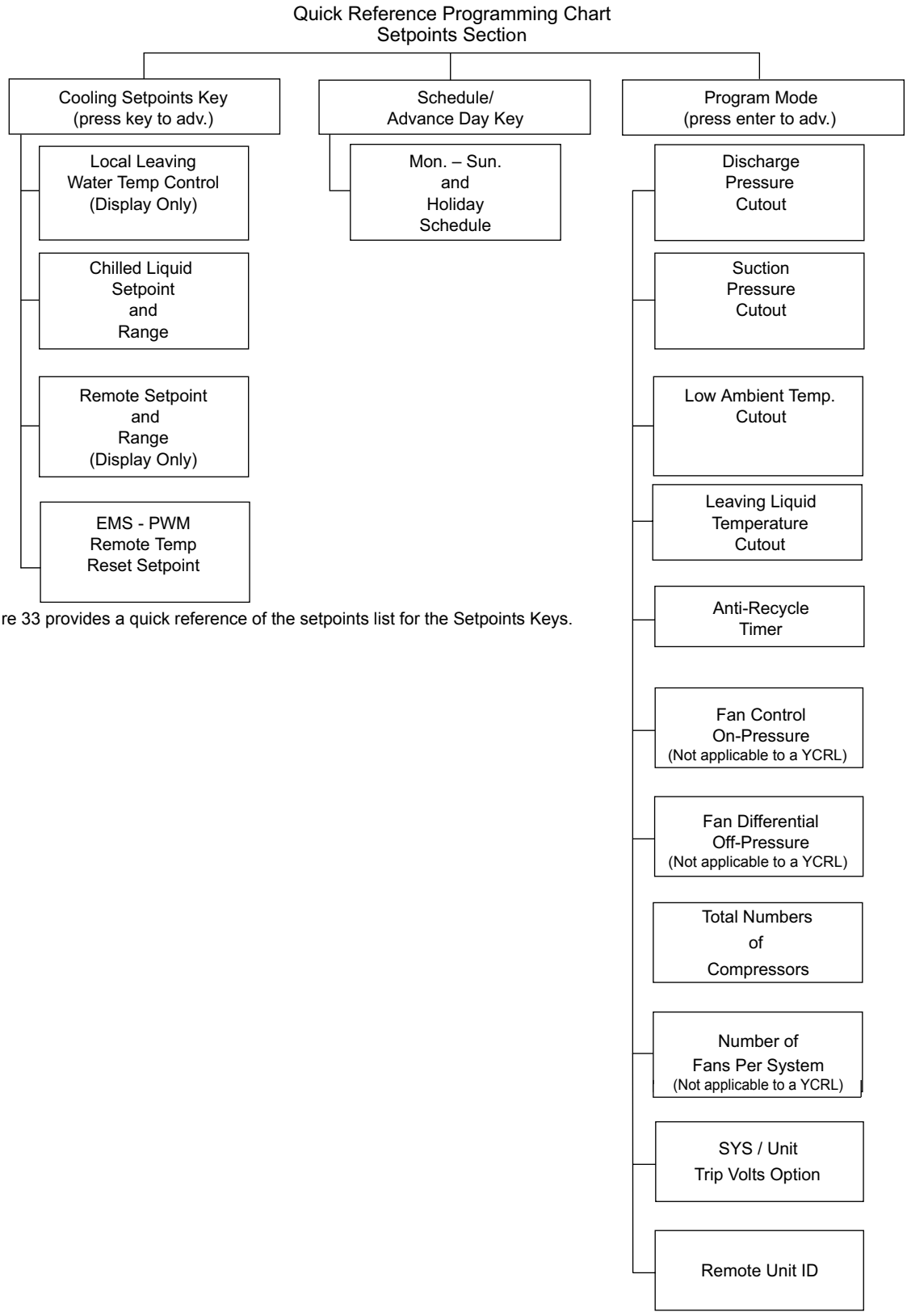
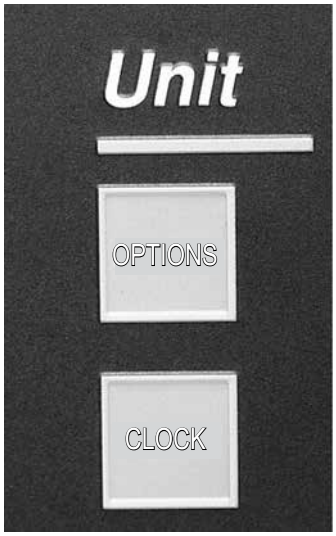


Figure 33 provides a quick reference of the setpoints list for the Setpoints Keys.

FIGURE 33 - 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.

NOTE

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

Figure 34 on page 128 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

NOTE

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

Option 3 – Chilled Liquid Cooling Type

```
CHILLED LIQUID
WATER
```

The chilled liquid is water. The Cooling Setpoint can be programmed from 40 °F to 70 °F (4.4 °C to 21.1 °C)

or

```
CHILLED LIQUID
GLYCOL
```

The chilled liquid is glycol. The Cooling Setpoint can be programmed from 10 °F to 70 °F (-12.2 °C to 21.1 °C).

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Option 4 – 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). This option does not apply to a YCRL chiller.

Option 5 – Local/Remote Control Type

```
LOCAL / REMOTE MODEL
LOCAL
```

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

or

```
LOCAL/REMOTE MODE
REMOTE
```

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

Option 6 – Unit Control Mode

```
CONTROL MODE
RETURN LIQUID
```

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

or

```
CONTROL MODE
LEAVING LIQUID
```

Option 7 – 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 8 – Lead/Lag Type (two system units only)

```
LEAD/LAG CONTROL
MANUAL SYS 1 LEAD
```

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

or

```
LEAD/LAG CONTROL
MANUAL SYS 2 LEAD
```

SYS 2 selected as lead compressor.

or

```
LEAD/LAG CONTROL
AUTOMATIC
```

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

Option 9 – Condenser Fan Control Mode

```
FAN CONTROL
DISCHARGE PRESSURE
```

Does not apply to a YCRL chiller.

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

Does not apply to a YCRL chiller.

Option 10 – Manual Override Mode

```
MANUAL OVERRIDE MODE
DISABLED
```

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

or

```
MANUAL OVERRIDE MODE
ENABLED
```

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

Option 11 – 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 2ACE Module is installed to allow combined current monitoring of all systems by sensing current on the incoming line.

or

```
CURRENT FEEDBACK
ONE PER SYSTEM
```

This mode should be selected when an optional 2ACE module is installed to allow individual current monitoring of each system. SYS 1 input is to J7 of the I/O. SYS 2 input is to J8 of the I/O.

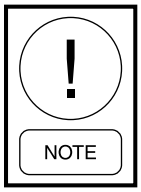
Option 12 – Power Fail Restart

```
POWER FAIL RESTART
AUTOMATIC
```

Chiller 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 13 – Soft Start Enable/Disable

```
SOFT START
DISABLED
```

SOFT START "DISABLED" MUST be selected on all chillers.

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

Option 14 – Unit Type

```
UNIT TYPE
LIQUID CHILLER
```

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

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

7

If Unit Type needs to be changed to make the unit a liquid chiller, remove power and then remove the jumper on J11-12. Reapply power to the micropanel and the microprocessor will store the change.

Option 15 – Refrigerant Type

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

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

Incorrect programming may cause damage to compressors.

Option 16 – Expansion Valve Type

```
EXPANSION VALVE TYPE
THERMOSTATIC
```

Expansion valve type, thermostatic or electronic may be selected under Service Mode. Expansion valve type is displayed under the OPTIONS key, but is only programmable in Service Mode. YCRL 0064 – 0156 chillers will typically always be equipped with thermostatic expansion valves.

Incorrect programming may cause damage to compressors.

Also see *Figure 34 on page 128, Unit Keys Programming Quick Reference List.*

Option 17 – Flash Card Update

```
FLASH CARD UPDATE
DISABLED
```

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

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

```
FLASH CARD UPDATE
ENABLED
```

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

```
FLASH CARD UPDATING
PLEASE WAIT...
```

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

```
FLASH CARD UPDATE
ERROR                XXXXX
```

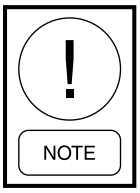
If the update resulted in an error, the original program will still be active. When an error occurs, assure the correct Flash Card was utilized. Incorrect chiller software will cause an error. If this is not the case, the Flash Card is most likely defective or the IPU and I/O combo board is bad.

Option 18 – 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 – 10.0VDC
- 2.0 – 10.0VDC
- 0.0 – 20.0mA
- 4.0 – 20.0mA



The options display message for Remote Temp Reset Input only appears if the Temp reset Option is enabled under Service Mode.

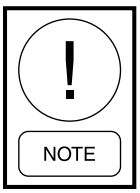
Option 19 – Pump Control

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

```
      YORK HYDRO
KIT PUMPS          = 1
```

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

- Low Leaving Chilled Liquid Fault.
- Any compressor is running.
- Daily Schedule is ON and Remote Stop is closed.



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

```
     EXTERNAL
    EVAP PUMP
```

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

The following option should not be selected.

```
      YORK HYDRO
KIT PUMPS          = 2
```

Does not apply to a YCRL chiller.

Option 20 – Pump Selection

The displays for this PUMP SELECTION option should only appear if "YORK HYDRO KIT PUMPS = 2" are selected under Option 19. This option should not be used on a YCRL chiller.

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 02
```

The line under the F is the cursor. If the day is correct, press the ENTER/ADV key. The cursor will move under the 0 in 08 hours. If the day is incorrect, press the ↑ (UP) or ↓ (DOWN) arrow keys until the 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.

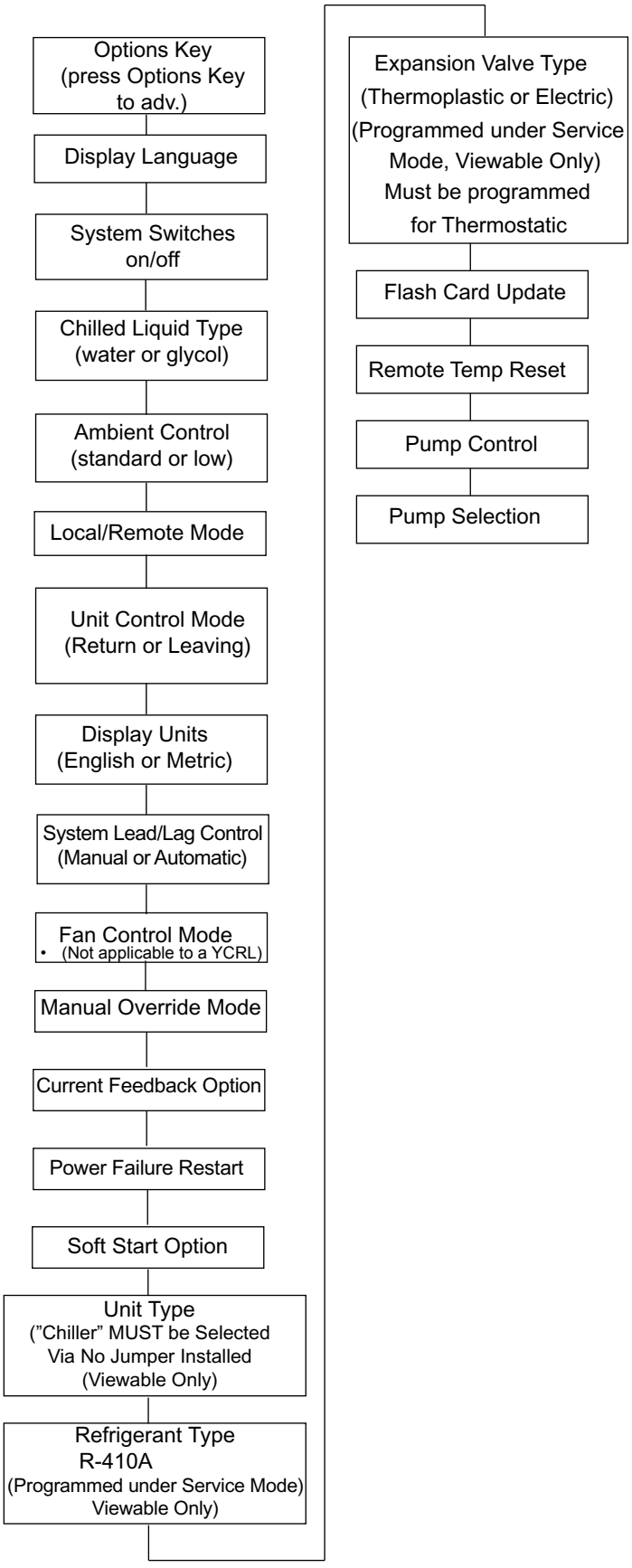


FIGURE 34 - UNIT KEYS OPTIONS PROGRAMMING QUICK REFERENCE LIST

SECTION 8 – UNIT OPERATION

CAPACITY CONTROL

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

The first phase of the start sequence is initiated by the Daily Schedule Start or any Remote Cycling Device. If the unit is shut down on the Daily Schedule, the chilled water pump microboard contacts (TB8 6-7) will close to start the pump when the Daily Schedule start time has been reached. Once flow has been established and the flow switch closes, capacity control functions are initiated, if the remote cycling contacts wired in series with the flow switch are closed.

It should be noted that the chilled water pump contacts (TB8 6-7) are not required to be used to cycle the chilled water pump. However, in all cases the flow switch must be closed to allow unit operation.

The control system will evaluate the need for cooling by comparing the actual leaving or return chilled liquid temperature to the desired setpoint, and regulate the leaving or return chilled liquid temperature 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 microprocessor monitors discharge pressure and unloads a system, if fully loaded, by one compressor when discharge pressure exceeds the programmed cutout minus 10 PSIG (0.69 barg). 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.

LEAVING CHILLED LIQUID CONTROL

The setpoint, when programmed for Leaving Chilled Liquid Control, is the temperature the unit will control to within plus or minus the (control) cooling range. The Setpoint High Limit is the Setpoint plus the cooling range. The Setpoint Low Limit is the Setpoint minus the cooling range. *Figure 35 on page 129* should be utilized to aid in understanding the following description of Leaving Chilled Liquid Control.

If the leaving chilled liquid temperature is above the Setpoint High Limit, the lead compressor on the lead system will be energized along with the liquid line solenoid. Upon energizing any compressor, the 60 second anti-coincidence timer will be initiated to prevent multiple compressors from turning ON.

If after 60 seconds of run-time the leaving chilled liquid temperature is still above the Setpoint High Limit, the next compressor in sequence will be energized. Additional compressors will be energized at a rate of once every 60 seconds if the chilled liquid temperature remains above the Setpoint High Limit and the chilled liquid temperature is dropping less than 3 °F/min. The lag system will not be allowed to start a compressor until the lead system has run for 5 minutes.

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

If the chilled liquid temperature drops to between Setpoint Low Limit and 0.5 °F (.28 °C) below the Setpoint Low Limit, unloading (a compressor turns off) occurs at a rate of one every 30 seconds.

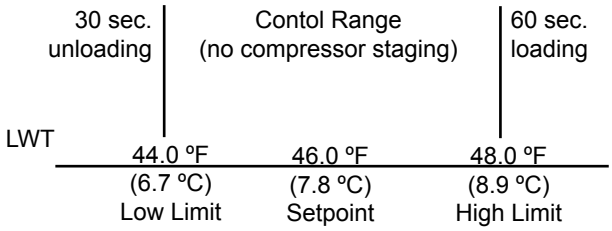


FIGURE 35 - LEAVING WATER TEMPERATURE CONTROL EXAMPLE

If the chilled liquid temperature falls to a value greater than 0.5 °F (.28 °C) below the Setpoint Low Limit but not greater than 1.5 °F (.83 °C) below the Setpoint Low Limit, unloading occurs at a rate of 20 seconds. If the chilled liquid temperature falls to a value greater than 1.5 °F (.83 °C) below the Setpoint Low Limit, unloading occurs at a rate of 10 seconds. If the chilled liquid temperature falls below 1 °F above the low chilled liquid temperature cutout, unloading occurs at a rate of 10 seconds if it is greater than 10 seconds.

In water cooling mode on R-410A chillers, the minimum low limit of the control range will be 40.0ºF. For leaving chilled liquid temperature setpoint and control range combinations that result in the low limit of the control range being below 40.0ºF, the low limit will be reset to 40.0ºF and the difference will be added to the high limit. This will result in a control range the same size as programmed but not allow the unit to run below 40.0ºF. This control will not affect glycol chillers.

Hot gas, if present, will be the final step of capacity. Hot gas is energized when only a single compressor is running and LWT is less than SP. Hot gas is turned off as temperature rises when LWT is more than SP plus CR/2. If temperature remains below the setpoint low limit on the lowest step of capacity, the microprocessor will close the liquid line solenoid, after turning off hot gas, and pump the system down before turning off the last compressor in a system.

The Leaving Chilled Liquid Setpoint is programmable from 40 °F to 70 °F (4.4 °C to 21.1 °C) in water chilling mode and from 10 °F to 70 °F (-12.2 °C to 21.1 °C) in glycol chilling mode. In both modes, the cooling range can be from plus or minus 1.5 °F to plus or minus 2.5 °F (plus or minus .83 °C to 1.39 °C) Leaving Chilled Liquid Control.

LEAVING CHILLED LIQUID CONTROL OVERRIDE TO REDUCE CYCLING

To avoid compressor cycling the microprocessor will adjust the setpoint upward temporarily. The last run time of the system will be saved. If the last run time was greater than 5 minutes, no action is to be taken. If the last run time for the lead system was less than 5 minutes, the microprocessor will increase the setpoint high limit according to the chart below, with a maximum value allowed of 50 °F (See *Figure 36 on page 130*).

If adding the setpoint adjust value to the setpoint high limit causes the setpoint high limit to be greater than 50 °F, the setpoint high limit will be set to 50 °F, and the difference will be added to the setpoint low limit.

Once a system runs for more than 5 minutes, the setpoint adjust will be set back to 0. This will occur while the system is still running.

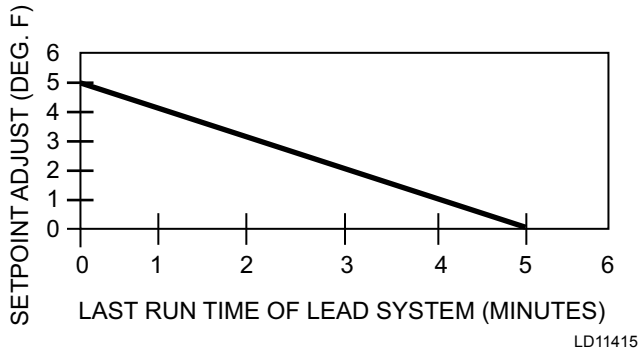


FIGURE 36 - SETPOINT ADJUST

LEAVING CHILLED LIQUID SYSTEM LEAD/ LAG AND COMPRESSOR SEQUENCING

A Lead/Lag option may be selected to help equalize average run hours between systems with 2 refrigerant systems. This may be programmed under the OPTIONS key. Auto Lead/Lag allows automatic Lead/ Lag of the two systems based on average run hours of the compressors in each system. Manual Lead/Lag selects specifically the sequence which the microprocessor starts systems.

On a hot water start, once a system starts, it will turn on all compressors before the next system starts a compressor. The microprocessor will sequence compressors within each circuit to maximize individual compressor run time on individual compressors within a system to prevent short cycling.

Each compressor in a system will be assigned an arbitrary priority number 1, 2, or 1, 2, 3. The non-running compressor within a system with the lowest priority number will always be the next compressor to start. The running compressor with priority number 1 will always be the next to shut off. Whenever a compressor is shut off, the priority numbers of all compressors will be decreased by 1 with wrap-around. This control scheme assures the same compressor does not repeatedly cycle ON and OFF.

Once the second system starts a compressor on a 2 system chillers, the microprocessor will attempt to equally load each system as long as the system is not limiting or pumping down. Once this occurs, loading and unloading will alternate between systems, loading the lead system first or unloading the lag system first.

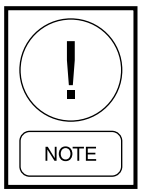
TABLE 16 - SAMPLE COMPRESSOR STAGING FOR RETURN WATER CONTROL

COMPRESSOR STAGING FOR RETURN WATER CONTROL						
4 COMPRESSORS COOLING SETPOINT = 45°F (7.2°C) RANGE = 10°F (5.6°C)						
# OF COMP ON	**0**	***1+HG**	**1**	**2**	**3**	**4**
RWT	45°F (7.2°C)	46.25°F (7.9°C)	47.5°F (8.6°C)	50.0 °F (10.0 °C)	52.5 °F (11.4 °C)	55.0 °F (12.8 °C)

* Unloading Only

RETURN CHILLED LIQUID CONTROL

Return chilled liquid control is based on staging the compressors to match the cooling load. The chiller will be fully loaded when the return water temperature is equal to the Cooling Setpoint plus the Range. The chiller will be totally unloaded (all compressors off) when the return water temperature is equal to the Cooling Setpoint (See sample in *Table 16 on page 131)*. At return water temperatures between the Cooling Setpoint and Cooling Setpoint plus Range, compressor loading and unloading will be determined by the formulas in *Table 17 on page 131*.



Return Chilled Liquid Control MUST only be used when constant chilled liquid flow is ensured.

The RANGE MUST always be programmed to equal the temperature drop across the evaporator when the chiller is "fully loaded". Otherwise, chilled liquid temperature will over or under shoot. Variable flow must never be used in return chilled liquid mode.

Normal loading will occur at intervals of 60 seconds according to the temperatures determined by the formulas. Unloading will occur at a rate of 30 seconds according to the temperatures determined in the formulas used to calculate the ON and OFF points for each step of capacity.

The Return Chilled Liquid Setpoint is programmable from 40 °F to 70 °F (4.4 °C to 21.1 °C) in water chilling mode and from 10 °F to 70 °F (-12.2 °C to 21.1 °C) in glycol chilling mode. In both modes, the cooling range can be from 4 °F to 20 °F (2.2° to 11.1 °C).

As an example of compressor staging (refer to *Table 18 on page 132*), a chiller with six compressors using a Cooling Setpoint programmed for 45 °F (7.20 °C) and a Range Setpoint of 10 °F (5.56 °C). Using the formulas in *Table 17 on page 131*, the control range will be split up into six (seven including hot gas) segments, with the control range determining the separation between segments. Note also that the Cooling Setpoint is the point at which all compressors are off, and Cooling Setpoint plus Range is the point all compressors are on. Specifically, if the return water temperature is 55 °F (12.8 °C), then all compressors will be on, providing full capacity. At nominal GPM, this would provide approximately 45 °F (7.2 °C) leaving water temperature out of the evaporator.

8

TABLE 17 - RETURN CHILLED LIQUID CONTROL FOR 4 COMPRESSORS (6 STEPS)

*STEP	COMPRESSOR	COMPRESSOR ON POINT	COMPRESSOR OFF POINT
0	0	SETPOINT	SETPOINT
1	1 W/HGB	SP + CR/8 (Note 1)	SETPOINT
2	1 NO HGB	SP + CR/4	SP + CR/8
3	2	SP + 2*CR/4 (Note 2)	SP + CR/4
4	2	SP + 2*CR/4	SP + CR/4 (Note 3)
5	3	SP + 3*CR/4	SP + 2*CR/4
6	4	SP + CR	SP + 3*CR/4

Notes:

1. Step 1 is Hot Gas Bypass and is skipped when loading occurs. Hot Gas Bypass operation is inhibited during Pumpdown.
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.

TABLE 18 - RETURN CHILLED LIQUID CONTROL FOR 4 COMPRESSORS (6 STEPS)

	LEAD SYSTEM				LAG SYSTEM		
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	-		ON	OFF	-
4	ON	ON	-	*See NOTE 2*	OFF	OFF	-
5	ON	ON	-	*See NOTE 3*	ON	OFF	-
6	ON	ON	-		ON	ON	-

NOTES:

1. Step is Hot Gas Bypass and is skipped when loading occurs. Hot Gas Bypass operation is inhibited during pumpdown. For Leaving Chilled Liquid Control the Hot Gas Bypass solenoid is energized only when the lead compressor is running and the LWT < SP, the Hot Gas Bypass solenoid is turned off when the LWT > SP + CR/2.
2. Step 3 is skipped when loading occurs.
3. Step 4 is skipped when unloading occurs.

If the return water temperature drops to 53.4 °F (11.9 °C), one compressor would cycle off leaving five compressors running. The compressors would continue to cycle off approximately every 1.7 °F (.94 °C), with the exception of Hot Gas Bypass. Notice that the Hot Gas Bypass would cycle on when the return water temperature dropped to 46.25 °F (7.9 °C). At this point one compressor would be running with hot gas.

Should the return water temperature rise from this point to 46.7 °F (8.2 °C), the Hot Gas Bypass would shut off, still leaving one compressor running. As the load increased, the compressors would stage on every 1.7 °F (.94 °C).

Also note that *Table 17 on page 131* not only provides the formulas for the loading (On Point) and unloading (Off Point) of the system, the "STEP" is also shown in the tables. The "STEP" is the increment in the sequence of the capacity control scheme that can be viewed under the OPER DATA key. *Refer to Display/ Print Keys on Page 107 for specific information on the OPER DATA key.*

RETURN CHILLED LIQUID SYSTEM LEAD/ LAG AND COMPRESSOR SEQUENCING

A lead/Lag option may be selected to help equalize average run hours between systems with 2 refrigerant systems. This may be programmed under the OPTIONS key. Auto Lead/Lag of the 2 systems based on average run hours of the compressors in each system. Manual Lead/Lag selects specifically the sequence which the microprocessor starts the systems.

The microprocessor will sequence compressors load and unload systems according to *Table 18 on page 132*. The microprocessor will lead/lag compressors within each circuit to maximize individual compressor run time for the purpose of lubrication. It will also prevent the same compressor from starting two times in a row. The microprocessor will not attempt to equalize run time on individual compressors within a system.

Each compressor in a system will be assigned an arbitrary number 1, or 2. The non-running compressor within a system with the lowest priority number will always be the next compressor to start. The running compressor with priority number 1 will always be the next compressor to shut off. Whenever a compressor is shut off, the priority numbers of all compressors in each system will be decreased by 1 with the wrap around. This control scheme assures the same compressor does not repeatedly cycle ON and OFF.

ANTI-RECYCLE TIMER

The programmable anti-recycle timer assures that systems do not cycle. This timer is programmable under the PROGRAM key between 300 and 600 seconds. Whenever possible, to reduce cycling and motor heating, the anti-recycle timer should be adjusted to 600 seconds. The programmable anti-recycle timer starts the timer when the first compressor in a system starts. The timer begins to count down. If all of the compressors in a circuit cycle off, a compressor within the circuit will not be permitted to start until the anti-recycle timer has timed out. If the lead system has run for less than 5 minutes, 3 times in a row, the anti-recycle timer will be extended to 10 minutes.

ANTI-COINCIDENCE TIMER

This timer is not present on single-system units. Two timing controls are present in software to assure compressors within a circuit or between systems, do not start simultaneously. The anti-coincidence timer assures there is at least a one minute delay between system starts on 2-circuit systems. This timer is NOT programmable. The load timers further assure that there is a minimum time between compressor starts within a system.

EVAPORATOR PUMP CONTROL AND YORK HYDRO KIT PUMP CONTROL

The evaporator pump dry contacts (CTB2 – terminals 23 and 24) are energized when any of the following conditions are true:

1. Low Leaving Chilled Liquid Fault.
2. Any compressor is running.
3. Daily Schedule is ON, Unit Switch is ON and Remote Stop is closed.

The pump will not run if the micro panel has been powered up for less than 30 seconds or if the pump has run in the last 30 seconds to prevent pump motor overheating.

Whenever the option "YORK HYDRO KIT PUMPS = 1" is selected under the OPTIONS key, the pump control will be as described above. DO NOT SELECT the option "YORK HYDRO KIT PUMPS = 2" under the OPTIONS key.

EVAPORATOR HEATER CONTROL

The evaporator heater is controlled by ambient air temperature. When the ambient temperature drops below 40 °F (4.4 °C) the heater is turned ON. When the temperature rises above 45 °F (7.2 °C) the heater is turned off. An under voltage condition will keep the heater off until full voltage is restored to the system.

PUMPDOWN CONTROL

Each system has a pump-down feature upon shut-off. Manual pumpdown from the keypad is not possible. On a non-Safety, non-Unit Switch shutdown, all compressors but one in the system will be shut off. The LLSV will also be turned off. The final compressor will be allowed to run until the suction pressure falls below the cutout, or for 180 seconds, whichever comes first.

LOAD LIMITING

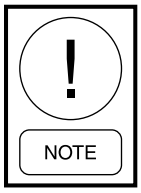
Load Limiting is a feature that prevents the unit from loading beyond the desired value. Four-compressor units can be load limited to 50%. This would allow only 1 compressor per system to run. Six-compressor units can be load limited to 33% or 66%. The 66% limit would allow up to 2 compressors per system to run, and the 33% limit would allow only 1 compressor per system to run. No other values of limiting are available.

There are two ways to load limit the unit. The first is through remote communication via an ISN. Load limit stages are sent through YORK Talk on pages 9 and 10 of feature 54. Page 9 is stage 1 load limit and page 10 is stage 2 load limit.

A second method of load limiting the unit is through closing dry contacts connected to the Load Limit (CTB1 – Terminals 13 and 21). Stage 1 load limiting involves closing the Load Limit input (13 and 21) with a dry contact. Load limiting is either 66% or 50%, depending on the number of compressors on the unit. A second step of load limiting on six-compressor chillers is available by closing the CTB1 terminals 13 and 20 with dry contact. This allows only a single compressor to run on each system, unloading the chiller to 33%. *Table 19 on page 133* shows the load limiting permitted for the various number of compressors. Only Stage 1 is available utilizing a dry contact.

TABLE 19 - COMPRESSOR OPERATION – LOAD LIMITING

COMPRESSORS IN UNIT	STAGE 1	STAGE 2
4	50%	-
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 CTB2 – terminals 25 to 26 for system 1 and CTB2 – terminals 27 to 28 for system 2.

ALARM STATUS

System or unit shutdown is indicated by normally-open alarm contacts opening whenever the unit shuts down on a unit fault, locks out on a system fault, or experiences a loss of power to the chiller electronics. System 1 alarm contacts are located at CTB2 – terminals 29 to 30. System 2 alarm contacts are located at CTB2 – terminals 31 to 32. The alarm contacts will close when conditions allow the unit to operate, or the fault is reset during a loss of power, the contacts will remain open until power is reapplied and no fault conditions exist.

EMS-PWM REMOTE TEMPERATURE RESET

EMS PWM Remote Temperature Reset is a value that resets the Chilled Liquid Setpoint based on a PWM input (timed contact closure) to the microboard. This PWM input would typically be supplied by an Energy Management System.

A contact closure on the PWM Temp Reset input at CTB1 terminals 13-20, will reset the Chilled Liquid Setpoint based on the length of time the contacts remain closed. The maximum temperature reset is achieved at a contact closure of 11 seconds. This is the longest contact closure time allowed. One second is the shortest time allowed and causes the Chilled Liquid Setpoint to revert back to the local programmed value. The reset value is always added to the Chilled Liquid Setpoint, meaning that this function never lowers the Chilled Liquid Setpoint below the locally programmed value, it can only reset to a higher value. The microboard must be refreshed between 30 seconds and 30 minutes. Any contact closure occurring sooner than 30 seconds will be ignored. If more than 30 minutes elapse before the next contact closure, the setpoint will revert back to the locally programmed value. The new Chilled Liquid Setpoint is calculated by the following equation:

Setpoint = Local Chilled Liquid Setpoint + °reset

$$°\text{Reset} = (\text{Contact Closure} - 1) \times \frac{*\text{Max. Reset Value}}{10}$$

Example:
Local Chilled Liquid Setpoint = 45°F (7.22°C).
*Max Reset Value = 10°F (5.56°C)
Contact Closure Time = 6 Seconds.

(English)
(6 sec. - 1) (10°F/10) = 5°F Reset

So, the new Chilled Liquid Setpoint = 45°F + 5°F= 50°F. This can be viewed by pressing the COOLING SETPOINTS key twice. The new value will be displayed as “REM SETP = 50.0°F.”

(Metric)
(6 sec - 1) x (5.56°C/10) = 2.78°C
Reset Cooling Setpoint = 7.22°C + 2.78°C = 10.0°C

So, the new reset Cooling Setpoint = 7.22 °C + 2.78°C = 10°C. This can be viewed by pressing the COOLING SETPOINTS key twice. The new value will be displayed as “REM SETP = 10.0°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 22.22°C).

BAS/EMS TEMPERATURE RESET USING A VOLTAGE OR CURRENT SIGNAL

The Remote Reset Option allows the Control Center of the unit to reset the Chilled Liquid Setpoint using a 0 to 10VDC input, or a 4 to 20mA input connected to CTB1 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.” This reset value is always added to the locally programmed Chilled Liquid Setpoint, meaning this function never lowers the Chilled Liquid Setpoint below the locally programmed value.

If a **0 to 10VDC** signal is supplied, it is applied to terminals A+ and A-, and **jumper JP1 on the I/O board must be inserted between pins 2 and 3**. To calculate the reset Chilled Liquid Setpoint for values between 0VDC and 10VDC use the following formula:

Setpoint = Local Chilled Liquid Setpoint + °Reset

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

Example:
Local Chilled Liquid Setpoint = 45 °F (7.22 °C)
*Max Reset Value = 20 °F (11.11 °C)
Input Signal = 6VDC

(English)
°Reset = $\frac{6\text{VDC} \times 20\ °\text{F}}{10}$ = 12 °F Reset
New Setpoint = 45 °F + 12 °F = 57 °F

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

If a 4 to 20mA signal is supplied, it is applied to terminals A+ and A- and jumper JP1 on the I/O board must be installed between pin 1 and 2. To calculate the Chilled Liquid Setpoint for values between 4mA and 20mA use the following formula:

Setpoint = Local Chilled Liquid Setpoint + °Reset

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

Example:
Local Chilled Liquid Setpoint = 45° (7.22 °C)
*Max Reset Value = 10 °F (5.56 °C)
Input Signal = 12mA

(English)
°Reset = $\frac{8\text{mA} \times 10\ °\text{F}}{16}$ = 5 °F Reset
Setpoint = 45 °F + 5 °F = 50 °F

(Metric)
°Reset = $\frac{8\text{mA} \times 5.56\ °\text{C}}{16}$ = 2.78 °C Reset
Setpoint = 7.22 °C + 2.78 °C = 10.0 °C

VDC PRESSURE SETTING GUIDELINES

When a Johnson Controls remote condenser type VDC is used with a YCRL chiller, the VDC must be ordered and installed with the "Head Pressure Control – High Pressure" option which provides Johnson Controls model P470 pressure controllers factory mounted in the VDC control panel. Operating manuals for the P470 controllers is included in the VDC control panel to allow field setup of the fan staging.

The following pressure set points are recommended for general use. If excessive fan cycling is noted the final stage of cycling should be adjusted (deadband increased). The dead band proposed in these guidelines is set to 125 psi, which is the standard setting for Johnson Controls air cooled R410 units (YLAA, YCAL).

- 2 stage units (2 fan single wide, 4 fan double wide VDC):
  - Stage 1, ON when any compressor is ON
  - Stage 2, ON at 385 psig, OFF at 260 psig
- 3 stage units (3 fan single wide, 6 fan double wide VDC):
  - Stage 1, ON when any compressor is ON
  - Stage 2, ON at 385 psig, OFF at 260 psig
  - Stage 3, ON at 405 psig, OFF at 280 psig
- 4 stage units (4 fan single wide, 8 fan double wide VDC):
  - Stage 1, ON when any compressor is ON
  - Stage 2, ON at 385 psig, OFF at 235 psig
  - Stage 3, ON at 405 psig, OFF at 280 psig
  - Stage 4, ON at 425 psig, OFF at 300 psig

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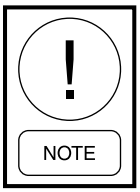
SECTION 9 – SERVICE AND TROUBLESHOOTING

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 chiller configuration setup parameters and view all the inputs to the microboard.

To enter Service Mode, turn the Unit Switch OFF and press the following keys in the sequence shown; PROGRAM, UP ARROW, UP ARROW, DOWN ARROW, DOWN ARROW, ENTER. Service Mode will time out after 30 minutes and return to normal control mode, if the panel is accidentally left in this mode. Otherwise, turning the Unit Switch ON will take the panel out of Service Mode.

SERVICE MODE – OUTPUTS

After pressing the key sequence as described, the control will enter Service Mode permitting the outputs (except compressors), operating hours, refrigerant type, expansion valve type, and start/hour counters to be viewed/modified. The ENTER/ADV key is used to advance through the outputs. Using the ↑ and ↓ (UP/DOWN) arrow keys will turn the respective digital output ON/OFF or modify the value.

Following is the order of outputs that will appear as the ENTER/ADV key is pressed:

SYS 1 COMP 1 STATUS TB7-2 IS:
SYS 1 LLSV STATUS TB7-3 IS:
SYS 1 COMP 2 STATUS TB7-4 IS:
SYS 1 COMP 3 STATUS TB7-5 IS:
SYS 1 HGBP STATUS TB7-7 IS:
SYS 2 COMP 1 STATUS TB10-2 IS:
SYS 2 LLSV STATUS TB10-3 IS:
SYS 2 COMP 2 STATUS TB10-4 IS:
SYS 2 COMP 3 STATUS TB10-5 IS:
SYS 1 FAN OUTPUT 1 TB7-8 IS:
SYS 1 FAN OUTPUT 2 TB7-9 IS:
SYS 1 FAN OUTPUT 3 TB7-10 IS:
SYS 2 FAN OUTPUT 1 TB10-8 IS:
SYS 2 FAN OUTPUT 2 TB10-9 IS:
SYS 2 FAN OUTPUT 3 TB10-10 IS:
} N/A
EVAP HEATER STATUS TB8-2 IS:
SYS 1 ALARM STATUS TB8-3 IS:
SYS 2 ALARM STATUS TB9-2 IS:
EVAP PUMP STATUS TB8-6,7 IS:
SYS 2 HGBV STATUS TB10-7 IS:
SPARE DO TB8-4 IS:
SPARE DO TB8-5 IS:
SPARE DO TB8-8, 9 IS:
SPARE DO TB9-4 IS:
SYS 1 EEV OUTPUT TB5-1, 2 = XXX%
SYS 2 EEV OUTPUT TB6-1, 2 = XXX%
SYS 1 COND FAN SPEED J15-1,5 = XXX%
SYS 2 COND FAN SPEED J15-2,6 = XXX%
SPARE AO J15-3,7 = XXX%
SPARE AO J15-4,8 = XXX%
DATA LOGGING MODE 1 = ON, 0 = OFF
DATA LOGGING TIMER X SECS
SOFT START (disabled)
REFRIGERANT TYPE (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

Each display will also show the output connection on the microboard for the respective output status shown. For example:

```
SYS 1 LLSV STATUS
TB10-3 IS OFF
```

This display indicates that the system 1 liquid line solenoid valve is OFF, and the output connection from the microboard is coming from terminal block 10 – pin 3.

Pressing the ↑ (UP) arrow key will energize the liquid line solenoid valve and OFF will change to ON in the display as the LLSV is energized. Energizing and de-energizing outputs may be useful during troubleshooting.

SERVICE MODE – CHILLER CONFIGURATION

After the Outputs are displayed, the next group of displays relate to chiller configuration and start/hour counters. Data logging, soft start, refrigerant type, pump control selection and expansion valve type all must be programmed to match actual chiller configuration.

Soft start (disabled), Refrigerant Type (R410A), and Expansion Valve Type (Thermostatic), and North American Feature (Enabled) MUST be properly programmed or damage to compressors and other system components may result.

The following is a list of chiller configuration selections, in order of appearance:

DATA LOGGING MODE = : DO NOT MODIFY
DATA LOGGING TIMER = : DO NOT MODIFY
SOFT START
REFRIGERANT TYPE
EXPANSION VALVE TYPE
REMOTE TEMP RESET OPTION
REMOTE INPUT SERVICE TIME
FEATURE SET
PUMP CONTROL SELECTION
HOT GAS TYPE
UNIT TYPE
SYS 1 HOURS
SYS 2 HOURS
SYS 1 STARTS
SYS 2 STARTS

The last displays shown on the above list are for the accumulated run and start timers for each system. All values can also be changed using the ↑ (UP) and ↓ (DOWN) arrow keys, but under normal circumstances would not be required or advised. After the last start display, the microprocessor will display the first programmable value under the PROGRAM key.

SERVICE MODE – ANALOG AND DIGITAL INPUTS

After entering Service Mode (PROGRAM ↑↑ ↓↓), all digital and analog inputs to the microboard can be viewed by pressing the OPER DATA key. After pressing the OPER DATA key, the ↑ (UP) arrow and ↓ (DOWN) arrow keys are used to scroll through the analog and digital inputs.

The 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 2.1VDC which corresponds to 81 PSIG (5.6 bars) suction pressure.

The digital inputs will display the input connection and ON/OFF status such as:

```
FLOW SW/REM START
J13-9 IS ON
```

This indicates that the flow switch/remote start input is connected to plug 13 - pin 9 (J13-9) on the I/O Board, and is ON (ON equals +30VDC unregulated input, OFF equals 0VDC input on digital inputs).

CONTROL INPUTS/OUTPUTS

Tables 20 through 26 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 20 - 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	Flow Switch and Remote Start/Stop
J13-6	Spare
J13-7	Single System Select (Jumper = Single Sys, No Jumper = Two Sys)
J13-8	CR1 (Sys 1 Motor Protector/High Pressure Cutout)
J13-10	CR2 (Sys 2 Motor Protector/High Pressure Cutout)

TABLE 21 - 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 (N/A)
TB7-9	SYS 1 Condenser Fan Output 2 (N/A)
TB7-10	SYS 1 Condenser Fan Output 3 (N/A)
TB10-8	SYS 2 Condenser Fan Output 1 (N/A)
TB10-9	SYS 2 Condenser Fan Output 2 (N/A)
TB10-10	SYS 2 Condenser Fan Output 3 (N/A)
TB8-2	Evaporator Heater
TB8-3	SYS 1 Alarm
TB9-2	SYS 2 Alarm
TB8-6 & 7	Evaporator Pump Starter
TB10-7	SYS 2 Hot Gas Bypass Valve

TABLE 22 - I/O ANALOG INPUTS

J7-10	SYS 1 Suction Transducer -or- SYS 1 Low Pressure Switch
J11-12	Unit Type: Chiller = NO Jumper J11-12 to +24 VDC YCUL Condensing Unit = Jumper J11-12 to +24 VDC (Do NOT Use)
J7-11	SYS 1 Discharge Pressure Transducer (Optional)
J6-9	Ambient Air Temp. Sensor
J6-7	Leaving Chilled Liquid Temp. Sensor
J6-8	Return Chilled Liquid Temp. Sensor
J9-10	SYS 2 Suction Pressure Transducer -or- SYS 2 Low Pressure Switch
J9-11	SYS 2 Discharge Pressure Transducer (Optional)
J7-12	Unit/SYS 1 Voltage
J9-12	SYS 2 Voltage
J11-11	Remote Temperature Reset

TABLE 23 - I/O ANALOG OUTPUTS

N/A	Not Applicable

MICROBOARD LAYOUT

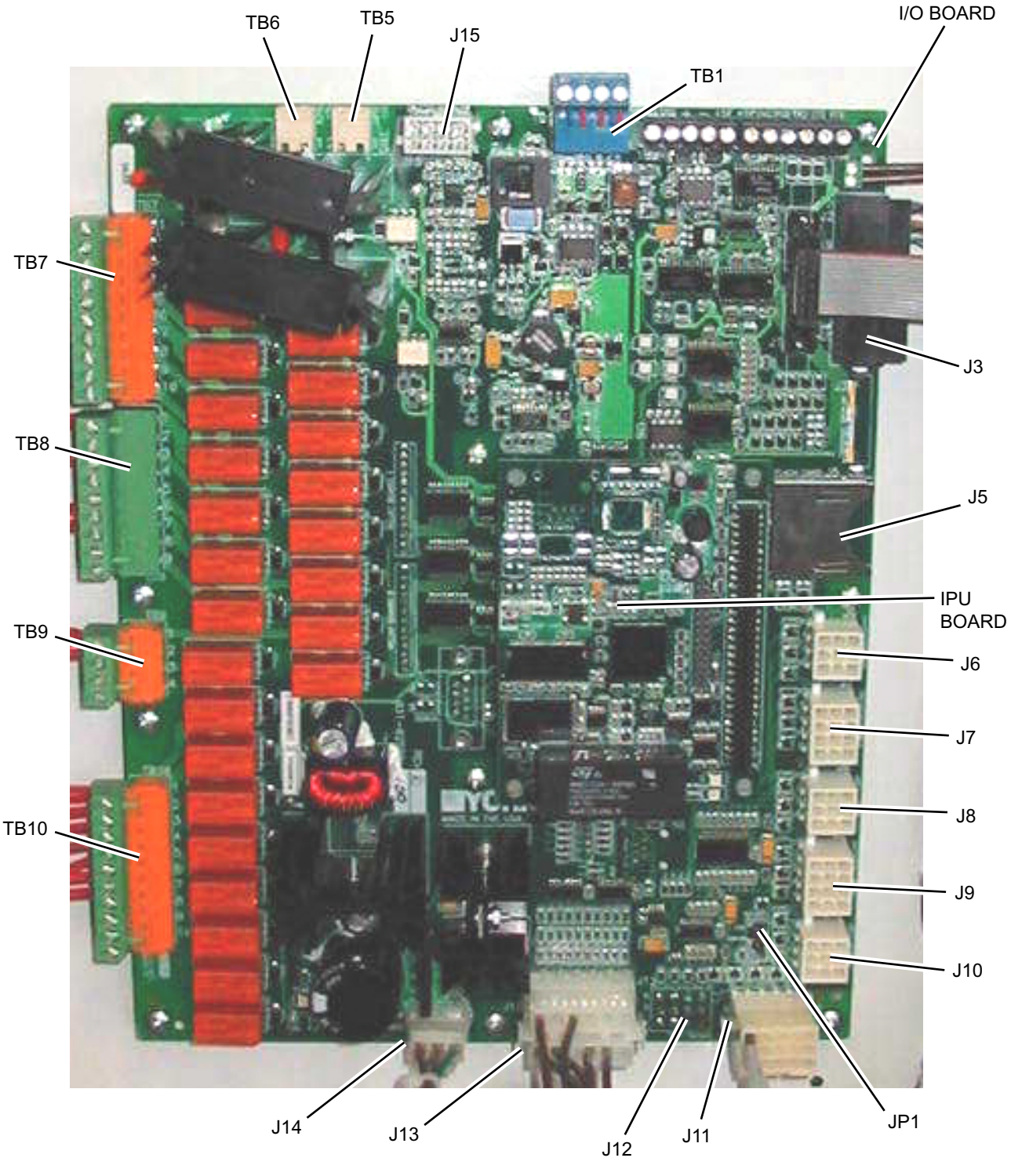


FIGURE 37 - MICROBOARD LAYOUT

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, 30VDC will be applied to J13, pin 9 (J13-9) of the I/O board. If the flow switch is open, 0VDC will then be present at J13-9.

Typically, voltages of between 24 and 36VDC could be measured for the DC voltage on the digital inputs. This voltage is in reference to ground. The unit case should be sufficient as a reference point when measuring digital input voltages.

Analog Inputs – Temperature

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:

Liquid and Refrigerant Sensor Test Points

Entering Chilled Liquid Sensor

J6-5 = +5VDC regulated supply to sensor.
J6-8 = VDC input signal to the I/O board. *See Table 24 on page 141 for voltage readings that correspond to specific liquid temperatures.*
J6-2 = drain (shield connection = 0VDC) Return

Leaving Chilled Liquid Temperature Sensor

J6-4 = +5VDC regulated supply to sensor.
J6-7 = VDC input signal to the microboard. *See Table 24 on page 141 for voltage readings that correspond to specific liquid temperatures.*
J6-1 = drain (shield connection = 0VDC) Return

TABLE 24 - ENTERING/LEAVING CHILLED LIQUID TEMPERATURE SENSOR, TEMPERATURE/VOLTAGE CORRELATION

TEMP °F	VOLTAGE (Signal Input to Return)	TEMP °C
10	1.33	-12
12	1.39	-11
14	1.46	-10
16	1.51	-9
18	1.58	-8
20	1.65	-7
22	1.71	-6
24	1.78	-4
26	1.85	-3
28	1.91	-2
30	1.98	-1
32	2.05	0
34	2.12	1
36	2.19	2
38	2.26	3
40	2.33	4
42	2.40	6
44	2.47	7
46	2.53	8
48	2.60	9
50	2.65	10
52	2.73	11
54	2.80	12
56	2.86	13
58	2.92	14
60	2.98	16
62	3.05	17
64	3.11	18
66	3.17	19
68	3.23	20
70	3.29	21
72	3.34	22
74	3.39	23
76	3.45	24
78	3.5	26
80	3.54	27

Analog Inputs – Pressure

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 YCRL's. The suction pressure transducers have a range of 0 to 400 PSIG. The output will be linear from 0.5VDC to 4.5VDC over the 400 PSIG (27.5 barg) range.

TABLE 25 - PRESSURE TRANSDUCERS

0-400 PSIG SUCTION PRESSURE TRANSDUCER		0-650 PSIG DISCHARGE PRESSURE TRANSDUCER	
PRESSURE PSIG	VOLTAGE VDC	PRESSURE PSIG	VOLTAGE VDC
0	0.5	0	0.5
50	1.0	81.25	1.0
100	1.5	162.5	1.5
150	2.0	243.75	2.0
200	2.5	325	2.5
250	3.0	406.25	3.0
300	3.5	487.75	3.5
350	4.0	568.75	4.0
400	4.5	650	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

The discharge transducers have a range from 0 to 650 PSIG. The output will be linear from 0.5VDC to 4.5VDC 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).

$$V = (\text{Pressure in PSIG} \times .01) + .5$$

or

$$V = (\text{Pressure in barg} \times .145) + .5$$

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 = +5VDC 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 = +5VDC return
J7-2 = drain (shield connection = 0VDC)

System 2 Discharge Transducer

J9-6 = +5VDC 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 = +5VDC return
J9-2 = drain (shield connection = 0VDC)

The suction transducers have a range from 0 to 400 PSIG (27.5 barg). The output will be linear from 0.5VDC to 4.5VDC over the 400 PSIG (27.5 barg) range. Following is a formula that can be used to verify the voltage output of the transducer. All voltage reading are in reference to ground (unit case).

$$V = (\text{Pressure in PSIG} \times .02) + .5$$

or

$$V = (\text{Pressure in barg} \times .29) + .5$$

where V = DC voltage input to microprocessor
Pressure = pressure sensed by transducer

Following are the I/O board connections for the Suction Transducer:

System 1 Suction Transducer

J7-5 = +5VDC 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 = +5VDC return
J7-1 = drain (shield connection = 0VDC)

System 2 Suction Transducer

J9-5 = +5VDC regulated supply to transducer.
J9-10 = VDC input signal to the microboard. *See the formula above for voltage readings wthat correspond to specific suction pressures.*
J7-9 = +5VDC return
J7-11 = drain (shield connection = 0VDC)

Digital Outputs

Refer to the unit wiring diagram and *Figure 38 on page 143*. The digital outputs are located on TB7, TB8, and TB9 and TB-10 of the microboard. All outputs are 120VAC 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 120VAC to the respective output connection energizing contactors, evaporator heater, and solenoids according to the operating sequence (*see Figure 38 on page 143*).

120VAC is supplied to the I/O board via connections at TB7-1, TB7-6, TB10-1, TB10-6, TB8-1 and TB9-1. *Figure 38 on page 143* illustrates the relay contact architecture on the microboard.

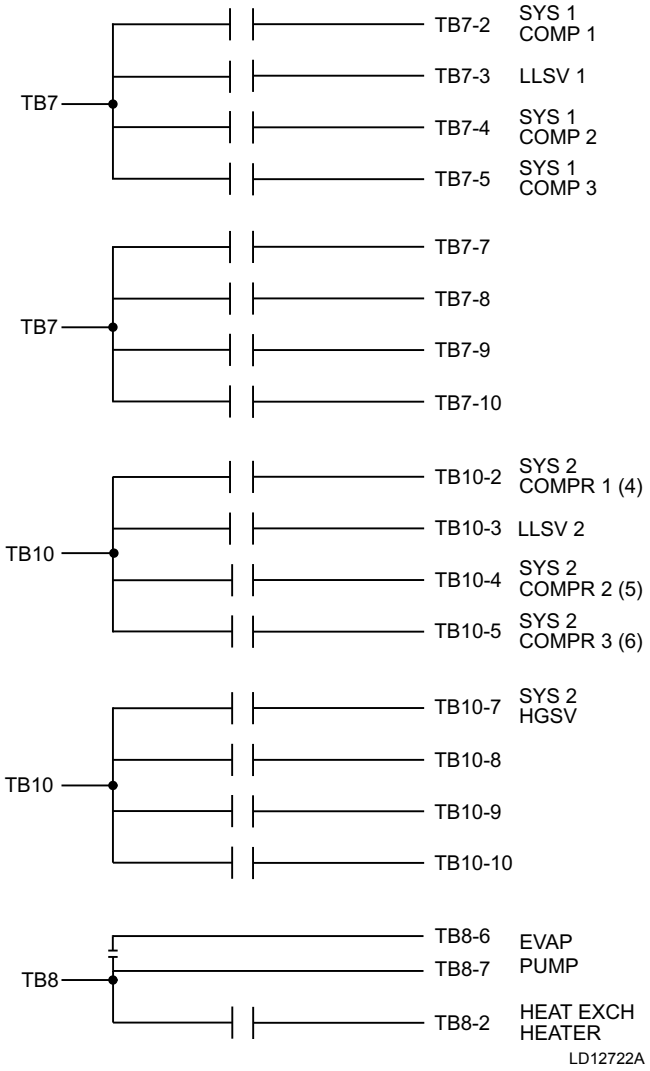


FIGURE 38 - I/O BOARD RELAY CONTACT ARCHITECTURE

9

OPTIONAL PRINTER INSTALLATION

The micro panel is capable of supplying a printout of chiller 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 *SECTION 7 – UNIT CONTROLS*.

Johnson Controls 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 WEIGH-TRONIX 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 Johnson Controls 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. Desk top calculator paper, 2.25" (5.7cm) wide.
3. Twisted Pair Shielded Cable (minimum 3 conductor), #18 AWG stranded, 300V minimum insulation, 25 ft. (7.62m) maximum length.
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 39 on page 144*. Strip the outside insulation back several inches and individual wires about 3/8" (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.

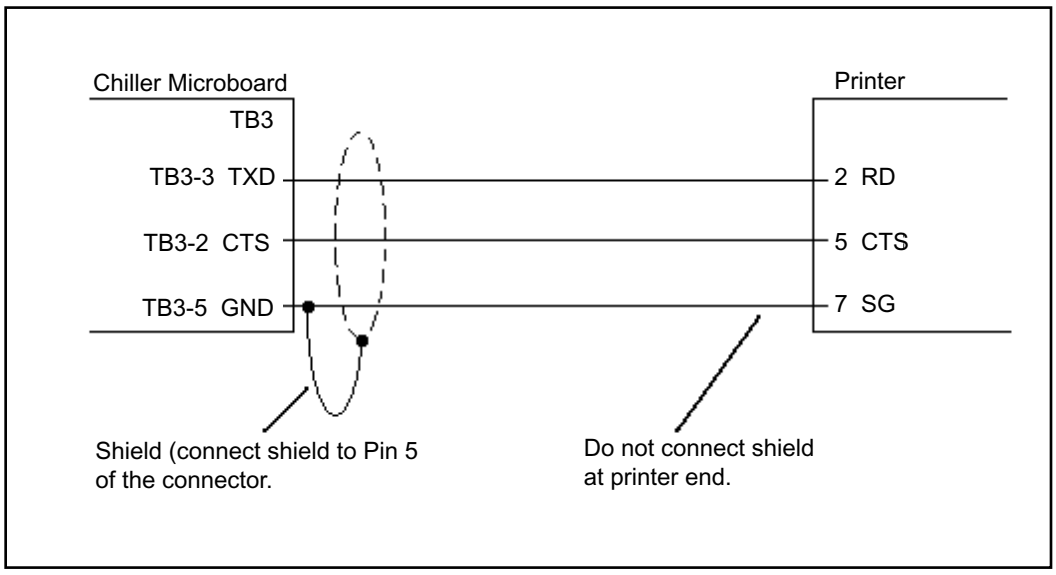


FIGURE 39 - PRINTER TO MICROBOARD ELECTRICAL CONNECTIONS

TROUBLESHOOTING

TABLE 26 - TROUBLESHOOTING

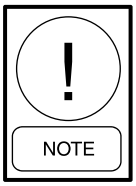
PROBLEM	CAUSE	SOLUTION
NO DISPLAY ON PANEL. UNIT WILL NOT OPERATE.	1. No 115VAC to 24 VAC Transformer.	1a. Check wiring and fuse 1FU. 1b. Check wiring emergency stop contacts 5 to L of CTB2 Terminal Block. 1c. Replace Control Transformer.
	2. No 24VAC to Microboard.	2. Check wiring Control Transformer to Microboard.
	3. Control Transformer defective, no 24VAC output.	3. Replace Control Transformer.
	4. Short in wire to temp. sensors or pressure transducers.	4. Unplug connections at IPU II 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 Johnson Controls Service before replacing circuit boards.***
FLOW SWITCH/REM STOP NO RUN PERMISSIVE	1. No chilled liquid flow.	1. Check chilled liquid flow.
	2. Flow switch improperly installed.	2. Check that the flow switch is installed according to manufacturer's instructions.
	3. Defective flow switch.	3. Replace flow switch.
	4. Remote cycling device open.	4. Check cycling devices connected to terminals 13 and 14 of the CTB1 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 flow of chilled liquid through the cooler.	5. Check GPM (*See "Limitations" liquid through the cooler in Installation section)*. Check operation of pump, clean pump strainer, purge chilled liquid system of air.
	6. Defective suction pressure transducer/low pressure switch or wiring.	6. Replace transducer/low pressure switch or faulty switch or wiring. *Refer to "Service" section for pressure/voltage formula.*
	7. LLSV defective	7. Replace LLSV
HIGH DISCHARGE PRESSURE FAULT	1. Remote condenser fans not operating.	1. Check Remote Condenser.
	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 transducer. *Refer to Service section for pressure/voltage formula.*

TABLE 29 - TROUBLESHOOTING (CONT'D)

PROBLEM	CAUSE	SOLUTION
LOW LIQUID TEMP FAULT	1. Improperly adjusted leaving chilled liquid temp. cutout (glycol only).	1. Re-program the leaving chilled liquid temp. cutout.
	2. Micro panel setpoint/range values improperly programmed.	2. Re-adjust setpoint/range.
	3. Chilled liquid flow too low.	3. Increase chilled liquid flow. *Refer to Limitations in Installation section.*
	4. Defective LWT or RWT sensor (assure the sensor is properly installed in the bottom of the well with a generous amount of heat) conductive compound).	4. Compare sensor against a known good Temperature sensing device. *Refer to Service section for temp./ voltage table.*
MP / HPCO FAULT	1. Compressor internal motor protector (MP) open.	1. Verify refrigerant charge is not low. Verify superheat setting of 10 °F to 15 °F (5.6 °C to 8.3 °C). Verify correct compressor rotation. Verify compressor is not overloaded.
	2. 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 plus or minus 2 degrees. *Refer to Service section 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. Fouled evaporator surface. Low suction pressure will be observed.	1. Contact the local Johnson Controls service representative.
	2. Improper flow through the evaporator.	2. Reduce flow to within chiller 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.

SECTION 10 – MAINTENANCE

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

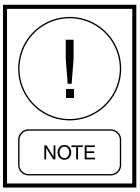
IMPORTANT

If system failure occurs due to improper maintenance during the warranty period, Johnson Controls will not be liable for costs incurred to return the system to satisfactory operation. The following is intended only as a guide and covers only the chiller unit components. It does not cover other related system components which may or may not be furnished by Johnson Controls. System components should be maintained according to the individual manufacture's recommendations as their operation will affect the operation of the chiller.

COMPRESSORS

Oil Level Check

The oil level can only be tested when the compressor is running in stabilized conditions, to ensure that there is no liquid refrigerant in the lower shell of the compressor. When the compressor is running at stabilized conditions, the oil level must be visible in the oil sight glass.



At shutdown, the oil level should be between the bottom and middle of the oil sight glass. Use only YORK "V" oil when adding oil.

Oil Analysis

The oil used in these compressors is pale yellow in color (POE oil). If the oil color darkens or exhibits a change in color, this may be an indication of contaminants in the refrigerant system. If this occurs, an oil sample should be taken and analyzed. If contaminants are present, the system must be cleaned to prevent compressor failure.

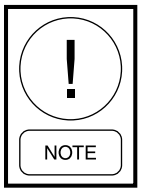
Never use the scroll compressor to pump the refrigerant system down into a vacuum. Doing so will cause internal arcing of the compressor motor which will result in failure of compressor.

OPERATING PARAMETERS

Regular checks of the system should be preformed to ensure that operating temperatures and pressures are within limitations, and that the operating controls are set within proper limits. *Refer to the Operation, Start-Up, and Installation sections of this manual.*

ON-BOARD BATTERY BACK-UP

U5 is the Real Time Clock chip located on the 031-02630 IPU II board that maintains the date/time and stores customer programmed setpoints. The Real Time Clock is a 128K bram, P/N 031-02565-000. The IPU II board must have JP1 installed when the 128K bram is installed.



Do not confuse JP1 on the IPU II (031-02630) board with JP1 on the I/O (031-02550) board.

OVERALL UNIT INSPECTION

In addition to the checks listed on this page, periodic overall inspections of the unit should be accomplished to ensure proper equipment operation. Items such as loose hardware, component operation, refrigerant leaks, unusual noises, etc. should be investigated and corrected immediately.

BACNET, MODBUS AND YORKTALK 2 COMMUNICATIONS

Data can be read and in some cases modified using a serial communication BACnet, Modbus or YorkTalk 2 network connection. This information allows communications of chiller operating parameters and external control changes to setpoint, load limiting, and start/stop commands.

BACnet and YorkTalk 2 RS485 networks are wired to the + and - terminals of TB1 for port 1 communications. Modbus network connection has the option of RS232 or RS485 connection for port 2 communications. Modbus network is wired to either TB2 or TB3 as follows:

- RS-485: connect to TB2 - Network (-1) to TB2 (-1); Network (+1) to TB2 (+1)
- RS-232: connect to TB3 - Network (RX) to TB3 (TXD); Network (TX) to TB3 (RXD); Network (GND) to TB3 (GND)

Refer to Figure 40 on page 149 "Micro Panel Connections" for TB1, TB2 and TB3 locations.

In most cases, communication parameters will need to be modified. *Values Required For Bas Communication on Page 150* "Values Required for BAS Communication" lists setup parameters for the available protocols. Modification is accomplished by pressing the PROGRAM, DOWN ARROW, DOWN ARROW, DOWN ARROW, DOWN ARROW, and ENTER keys in sequence. The list below shows the displays for the values that may be modified:

DE MODIFIER ADDRESS XXXXX	P2 PROTOCOL XXXXXXXXXX
DE MODIFIER OFFSET XX	P2 MANUAL MAC ADDRESS XXX
P1 PROTOCOL XXXXXX	P2 BAUD RATE XXXXX
P1 MANUAL MAC ADDRESS XXX	P2 PARITY XXXXX
P1 BAUD RATE XXXXX	P2 STOP BITS X
P1 PARITY XXXXX	P2 HW SELECT BIT XXXXX
P1 STOP BITS X	REAL TIME ERROR ## RESET 1 = YES, 0 = NO 0

Note: *See Table 29 for error descriptions*

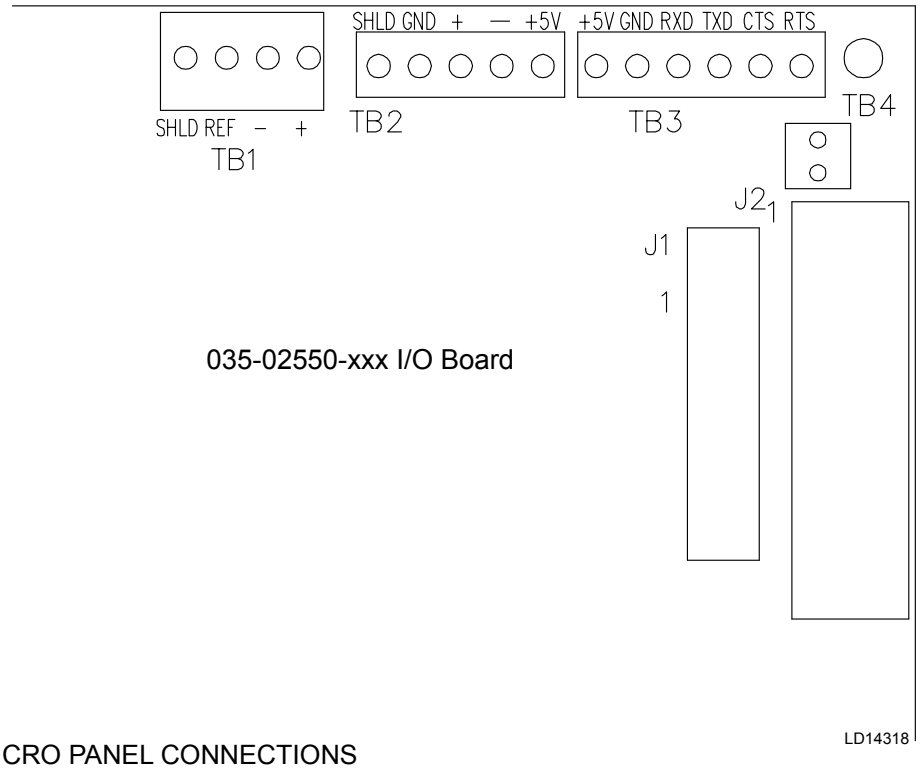


FIGURE 40 - MICRO PANEL CONNECTIONS

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

TABLE 27 - MINIMUM, MAXIMUM AND DEFAULT VALUES

DESCRIPTION	MINIMUM	MAXIMUM	DEFAULT
De Modifier Address	-1	41943	-1
De Modifier Offset	-1	99	-1
P1 Baud Rate	1200	76800	4800
	1200, 4800, 9600, 19200, 38400, 76800, Auto Selectable		
P2 Baud Rate	1200	57600	1200
	1200, 4800, 9600, 19200, 38400, 57600 Selectable		
P1, P2 Manual Mac Address	-1	127	-1
P1, P2 Parity	None	Ignore	None
	None, Even, Odd, Ignore Selectable		
P1 Protocol	BACNET	API	BACNET
	BACNET, API Selectable		
P2 Protocol	Terminal	Modbus Client	API
	Terminal, Modbus Io, Modbus Server, API, Modbus Client Selectable		
P1, P2 Stop Bits	1	2	1
Reset Real Time Error	No	Yes	No

The table below shows set-up requirements for each communication protocol.

TABLE 28 - VALUES REQUIRED FOR BAS COMMUNICATION

SETTING DESCRIPTION	Protocol		
	BACnet MS/TP	Modbus RTU[5]	YorkTalk 2
DE Modifier Address	0 to 41943(3)	1	-1
DE Modifier Offset	0 to 99(4)	0	N/A
P1 Protocol	BACNET	N/A	N/A
P1 Manual Mac Address	0-127(1)	N/A	N/A
P1 Baud Rate	9600 To 76800 or Auto Selectable(1)	N/A	N/A
P1 Parity	NONE	N/A	N/A
P1 Stop Bits	1	N/A	N/A
P2 Protocol	N/A	MODBUS SVR	N/A
P2 Manual Mac Address	N/A	0-127(1)	N/A
P2 Baud Rate	N/A	19,200(2)	N/A
P2 Parity	N/A	NONE(2)	N/A
P2 Stop Bits	N/A	1	N/A
P2 Hw Select Bit	N/A	RS-485 or RS-232(1)	N/A
Reset Real Time Error	N/A	N/A	N/A
P1 HW Select Bit	N/A	N/A	N/A
Chiller ID	N/A	N/A	0

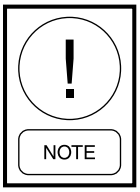
[1]as Required By Network

[2]or Other As Required By Network

[3]number Is Multiplied By 100, Set As Required By Network

[4]number Is Added To De Modifier Address, Set As Required By Network

[5]unit Operating Software Version C.Mmc.13.03 Or Later Required For Modbus Protocol



Reboot Required (Cycle Power) After Settings are Changed.

The table shows the real time error numbers that may be encountered during communication setup and a description of each.

TABLE 29 - 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

BACnet and Modbus Communications

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

Analog Write Points

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

Binary Write Points

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

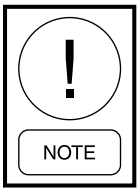
Analog Read Only Points

This data can be read using a BACnet or Modbus network connection and can NOT be modified using this connection. The Modbus Register Address for these points is 513 + AI #.

Binary Monitor Only Points

This data can be read using a BACnet or Modbus network connection and can NOT be modified using this connection. The Modbus Register Address for these points is 1281 + BI #.

Refer to Table 30 on page 152 for complete list of BACnet and Modbus registers.



The latest data map information is listed on the Johnson Controls Equipment Integration website.

Communications Data Map Notes

1. IPU II based units are configured for Native BACnet MS/TP and Modbus RTU communications. MicroGateway or E-Link not required for these two communication protocols.
2. BACnet Object Types:
   - 0 = Analog In
   - 1 = Analog Out
   - 2 = Analog Value
   - 3 = Binary In
   - 4 = Binary Output
   - 5 = Binary Value
   - 8 = Device
   - 15 = Alarm Notification (0 through 127 are reserved ASHRAE Objects)
3. WC= Inches of water column

   CFM = Cubic Feet per Minute

   FPM = Feet per Minute

   PSI = Lbs per square inch

   Pa = Pascals

   kPa = Kilopascals

   PPM = Part per Million

   kJ/kg = Kilojoules per Kilogram
4. Water Cooled Scroll units use the same firmware as Air Cooled Scroll units, ignoring Fan Control.

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YCAL/YCUL/YCWL/YLAA/YLUA IPU II **Native** **Modbus and BACnet MS/TP Data Maps** **Board: 031-02630-xxx w/ 031-02550**

ITEM	Version	Date	York PN	Check Sum	Comments
1	C.MMC.13.00	29-Nov-06	031-02755-001		Standard with Board: 031-02630-xxx w/ 031-02550
2	C.MMC.15.00	29-Nov-06	031-02755-002		Basildon with Board: 031-02630-xxx w/ 031-02550
3	C.MMC.14.00	29-Nov-06	031-02755-003		MMHP with Board: 031-02630-xxx w/ 031-02550
4	C.MMC.16.00	29-Nov-06	031-02755-004		Basildon MMHP with Board: 031-02630-xxx w/ 031-02550
5	C.MMC.13.02	17-Oct-08	031-02755-001		Standard Micro Board 031-02550-xxx . Fix native Modbus communications. Fix Café Metric functionality (SCR-766)
6	C.MMC.14.02	17-Oct-08	031-02755-003		MMHP with Board: 031-02630-xxx w/ 031-02550Fix native Modbus communications. Fix Café Metric functionality (SCR-766)
7	C.MMC.16.02	17-Oct-08	031-02755-004		Basildon MMHP with Board: 031-02630-xxx w/ 031-02550 Fix native Modbus communications. Fix Café Metric functionality (SCR-766)
8	C.MMC.13.03	3-Mar-09	031-02755-001		Add AI 54, 55, 56, 57
9	C.MMC.14.03	3-Mar-09	031-02755-003		Add AI 54, 55, 56, 57
10	C.MMC.16.03	3-Mar-09	031-02755-004		Add AI 54, 55, 56, 57

ITEM REF NUM	BACnet NAME	BACnet Object/Instance	MODBUS ADDRESS	MODBUS Data Type Supported	ENG UNITS	READ WRITE	POINT DESCRIPTION	Point List Code S=Standard; O = Optional; N = Not Available									
								1	2	3	4	5	6	7	8	9	10
1					SEE NOTE 5		**SEE NOTE 1**										
3	**ANALOG WRITE POINTS**																
4	REM_SETP	AV_1	1026	03,06,16	F°	R/W	Setpoint Cooling Setpoint(HP Only), 99 = Auto; (40°F - 70°F)	S	S	S	S	S	S	S	S	S	S
5	SP_REM_SP_S1	AV_2	1027	03,06,16	PSIG	R/W	Sys 1 Setpoint (Suction Pressure Control units only)	S	S	S	S	S	S	S	S	S	S
6	LOAD_LIMIT	AV_3	1028	03,06,16	index	R/W	Load Limit Stage (0, 1, 2)	S	S	S	S	S	S	S	S	S	S
7	REM_CR	AV_4	1029	03,06,16	F°	R/W	Cooling Range (DAT Mode Only)	S	S	S	S	S	S	S	S	S	S
8	SP_REM_SP_S2	AV_5	1030	03,06,16	PSIG	R/W	Sys 2 Setpoint (Suction Pressure Control)	S	S	S	S	S	S	S	S	S	S
9	REM_SP_HEAT	AV_6	1031	03,06,16	F°	R/W	Heating Setpoint (HP Only), 999 = Auto (95°F - 122°F)	S	S	S	S	S	S	S	S	S	S
10	HP_MODE	AV_7	1032	03,06,16	index	R/W	Mode (HP Only) (0=Panel, 1=Cooling, 2=Heating)	S	S	S	S	S	S	S	S	S	S
11								S	S	S	S	S	S	S	S	S	S
12	**BINARY WRITE POINTS**																
13	START_STOP	BV_1	1538	01,03,05,15,06,	0, 1	R/W	Stop Start Command	S	S	S	S	S	S	S	S	S	S
14	SS_SYS1	BV_2	1539	01,03,05,15,06,	0, 1	R/W	Sys 1 Start/Stop (Suction Pressure (SP) Control Only)	S	S	S	S	S	S	S	S	S	S
15	SS_SYS2	BV_3	1540	01,03,05,15,06,	0, 1	R/W	Sys 2 Start/Stop (Suction Pressure (SP) Control Only)	S	S	S	S	S	S	S	S	S	S
16	**ANALOG READ ONLY POINTS**																
17	LCHLT	AI_1	514	03,04	F°	R	Leaving Chilled Liquid Temp	S	S	S	S	S	S	S	S	S	S
18	RCHLT	AI_2	515	03,04	F°	R	Return Chilled Liquid Temp	S	S	S	S	S	S	S	S	S	S
19	DAT	AI_3	516	03,04	F°	R	Condensing Unit Models Only	S	S	S	S	S	S	S	S	S	S
20	S1_SUCT_TEMP	AI_4	517	03,04	F°	R	Electronic Expansion Valve Models Only	S	S	S	S	S	S	S	S	S	S
21	OAT	AI_5	518	03,04	F°	R	Ambient Air Temperature	S	S	S	S	S	S	S	S	S	S
22	S1_SUCT_SHEAT	AI_6	519	03,04	F°	R	Sys 1 Suction Superheat (EEV Models Only)	S	S	S	S	S	S	S	S	S	S
23	S1_RUN_TIME	AI_7	520	03,04	seconds	R	Sys 1 Run Time (seconds)	S	S	S	S	S	S	S	S	S	S
24	S1_SUCT_PR	AI_8	521	03,04	PSIG	R	Sys 1 Suction Pressure	S	S	S	S	S	S	S	S	S	S
25	S1_DSCH_PR	AI_9	522	03,04	PSIG	R	Sys 1 Discharge Pressure	S	S	S	S	S	S	S	S	S	S
27	S1_CIR_TEMP	AI_10	523	03,04	F°	R	Sys 1 Cooler Inlet Refrigerant Temp (R-407c Models Only)	S	S	S	S	S	S	S	S	S	S
28	S1_DEF_TEMP	AI_11	524	03,04	F°	R	Sys 1 Defrost Temperature (HP Only)	S	S	S	S	S	S	S	S	S	S
29	S1_EEV_OUT	AI_12	525	03,04	F°	R	System 1 EEV Output % (EEV Models Only)	S	S	S	S	S	S	S	S	S	S
30	S1_AR_TIMER	AI_13	526	03,04	seconds	R	Sys 1 Anti-Recycle Timer	S	S	S	S	S	S	S	S	S	S
31	AC_TIMER	AI_14	527	03,04	seconds	R	Anti-Coincident Timer	S	S	S	S	S	S	S	S	S	S
32	S2_SUCT_TEMP	AI_15	528	03,04	°F	R	System 2 Suction Temp (EEVModels Only)	S	S	S	S	S	S	S	S	S	S
33	S2_RUN_TIME	AI_16	529	03,04	seconds	R	Sys 2 Run Time (seconds)	S	S	S	S	S	S	S	S	S	S
34	S2_SUCT_PR	AI_17	530	03,04	PSIG	R	Sys 2 Suction Pressure	S	S	S	S	S	S	S	S	S	S
35	S2_DSCH_PR	AI_18	531	03,04	PSIG	R	Sys 2 Discharge Pressure	S	S	S	S	S	S	S	S	S	S
36	S2_CIR_TEMP	AI_19	532	03,04	F°	R	Sys 2 Cooler Inlet Refrigerant Temperature(R-407c Only)	S	S	S	S	S	S	S	S	S	S
37	S2_DEF_TEMP	AI_20	533	03,04	F°	R	Sys 2 Defrost Temperature (HP Only)	S	S	S	S	S	S	S	S	S	S
38	S2_SUCT_SH	AI_21	534	03,04	F°	R	Sys 2 Suction SuperHeat (EEV Models Only)	S	S	S	S	S	S	S	S	S	S
39	S2_AR_TIMER	AI_22	535	03,04	F°	R	Sys 2 Anti-Recycle Timer	S	S	S	S	S	S	S	S	S	S

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TABLE 30 - BACNET AND MODBUS COMMUNICATIONS DATA MAP (CONT'D)

ITEM REF NUM	BACnet NAME	BACnet Object/Instance	MODBUS ADDRESS	MODBUS Data Type Supported	ENG UNITS	READ WRITE	POINT DESCRIPTION	Point List Code S=Standard; O = Optional; N = Not Available									
								1	2	3	4	5	6	7	8	9	10
40	S2_EEV_OUT	AI_23	536	03,04	seconds	R	Sys 2 Suction Superheat (EEV Models Only)	S	S	S	S	S	S	S	S	S	S
41	NUM_COMPS	AI_24	537	03,04	count	R	Number of Compressors	S	S	S	S	S	S	S	S	S	S
42	S1_OP_CODE	AI_25	538	03,04	index	R	Sys 1 Operational Code (Definition in Table A)	S	S	S	S	S	S	S	S	S	S
43	S1_FLT_CODE	AI_26	539	03,04	index	R	Sys 1 Fault Code (Definition in Table B)	S	S	S	S	S	S	S	S	S	S
44	S2_OP_CODE	AI_27	540	03,04	index	R	Sys 2 Operational Code (Definition in Table A)	S	S	S	S	S	S	S	S	S	S
45	S2_FLT_CODE	AI_28	541	03,04	index	R	Sys 2 Fault Code (Definition in Table B)	S	S	S	S	S	S	S	S	S	S
46	S1_DBG_CODE	AI_29	542	03,04	index	R	Sys 1 Debug Code	S	S	S	S	S	S	S	S	S	S
47	S1_FAN_STAGE	AI_30	543	03,04	count	R	Sys 1 Condenser Fan Stage	S	S	S	S	S	S	S	S	S	S
48	S2_DBG_CODE	AI_31	544	03,04	index	R	Sys 2 Debug Code	S	S	S	S	S	S	S	S	S	S
49	S2_FAN_STAGE	AI_32	545	03,04	count	R	Sys 2 Condenser Fan Stage	S	S	S	S	S	S	S	S	S	S
50	CONTROL_MODE	AI_33	546	03,04	count	R	Unit Control Mode (0=Leaving Water, 1=Return Water, 2=Discharge Air, 3=Suction Press, 4=Cooling, 5=Heating)	S	S	S	S	S	S	S	S	S	S
51	AR_TIME	AI_34	547	03,04	seconds	R	Anti-Recycle Time (Programmed)	S	S	S	S	S	S	S	S	S	S
52	LCHLT_CUT	AI_35	548	03,04	F°	R	Leaving Chilled Liquid Temp Cutout	S	S	S	S	S	S	S	S	S	S
53	LOW_AMB_CUT	AI_36	549	03,04	F°	R	Low Ambient Temperature Cutout	S	S	S	S	S	S	S	S	S	S
54	SUCT_P_CO_HT	AI_37	550	03,04	PSIG	R	Low Suction Pressure Cutout Heating (HP Only)	S	S	S	S	S	S	S	S	S	S
55	L_SUCT_P_CO	AI_38	551	03,04	PSIG	R	Low Suction Pressure Cutout (Cooling on HP units)	S	S	S	S	S	S	S	S	S	S
56	H_DSCH_P_CO	AI_39	552	03,04	PSIG	R	High Discharge Pressure Cutout	S	S	S	S	S	S	S	S	S	S
57	COOL_SETP	AI_40	553	03,04	F°	R	Setpoint	S	S	S	S	S	S	S	S	S	S
58	SP_SETP_S1	AI_41	554	03,04	F°	R	Setpoint 1 (SP Control)	S	S	S	S	S	S	S	S	S	S
59	CONTROL_RG	AI_42	555	03,04	F°	R	Cooling Range	S	S	S	S	S	S	S	S	S	S
60	SP_CTL_RG_S1	AI_43	556	03,04	F°	R	Cooling Range 1 (SP Control)	S	S	S	S	S	S	S	S	S	S
61	SP_SETP_S2	AI_44	557	03,04	F°	R	Setpoint 2 (SP Control)	S	S	S	S	S	S	S	S	S	S
62	HEAT_SETP	AI_45	558	03,04	F°	R	Heating Setpoint (HP Only)	S	S	S	S	S	S	S	S	S	S
63	SP_CTL_RG_S2	AI_46	559	03,04	F°	R	Cooling Range 2 (SP Control)	S	S	S	S	S	S	S	S	S	S
64	HEAT_RANGE	AI_47	560	03,04	F°	R	Heating Range (HP Only)	S	S	S	S	S	S	S	S	S	S
65	S1_DSCH_TEMP	AI_48	561	03,04	F°	R	Sys 1 Discharge Temperature (EEV Only)	S	S	S	S	S	S	S	S	S	S
66	S1_DSCH_SHEAT	AI_49	562	03,04	F°	R	Sys 1 Discharge Superheat (EEV Only)	S	S	S	S	S	S	S	S	S	S
67	S2_DSCH_TEMP	AI_50	563	03,04	F°	R	Sys 2 Discharge Temperature (EEV Only)	S	S	S	S	S	S	S	S	S	S
68	S2_DSCH_SH	AI_51	564	03,04	F°	R	Sys 2 Discharge Superheat (EEV Only)	S	S	S	S	S	S	S	S	S	S
69	LEAVING_HOT	AI_52	565	03,04	F°	R	Leaving Liquid Hot Temp (R-410a)	S	S	S	S	S	S	S	S	S	S
70	RETURN_HOT	AI_53	566	03,04	F°	R	Return Liquid Hot Temp (R-410a)	S	S	S	S	S	S	S	S	S	S
71	R_COOL_SETP	AI_54	567	03,04	F°	R	Remote Setpoint	N	N	N	N	N	N	N	S	S	S
72	R_SP_SETP_S1	AI_55	568	03,04	F°	R	Remote Setpoint 1 (SP Control)	N	N	N	N	N	N	N	S	S	S
73	R_SP_SETP_S2	AI_56	569	03,04	F°	R	Remote Setpoint 2 (SP Control)	N	N	N	N	N	N	N	S	S	S
74	R_HEAT_SETP	AI_57	570	03,04	F°	R	Remote Heating Setpoint (HP and YCWL HP)	N	N	N	N	N	N	N	S	S	S
75																	
76	**BINARY MONITOR ONLY POINTS**																
77	S1_ALARM	BI_1	1282	01,02,03	0, 1	R	Sys 1 Alarm	S	S	S	S	S	S	S	S	S	S
78	S2_ALARM	BI_2	1283	01,02,03	0, 1	R	Sys 2 Alarm	S	S	S	S	S	S	S	S	S	S
79	EVAP_HTR	BI_3	1284	01,02,03	0, 1	R	Evaporator Heater Status	S	S	S	S	S	S	S	S	S	S
80	EVAP_PUMP	BI_4	1285	01,02,03	0, 1	R	Evaporator Pump Status	S	S	S	S	S	S	S	S	S	S
81	S1_C1_RUN	BI_5	1286	01,02,03	0, 1	R	Sys 1 Comp 1 Run	S	S	S	S	S	S	S	S	S	S
82	S2_C1_RUN	BI_6	1287	01,02,03	0, 1	R	Sys 2 Comp 1 Run	S	S	S	S	S	S	S	S	S	S
83	S1_LLSV	BI_7	1288	01,02,03	0, 1	R	Sys 1 Liquid Line Solenoid Valve	S	S	S	S	S	S	S	S	S	S
84	S1_MODE_SV	BI_8	1289	01,02,03	0, 1	R	Sys 1 Mode Solenoid Valve (HP Only)	S	S	S	S	S	S	S	S	S	S
85	S1_HGBV	BI_9	1290	01,02,03	0, 1	R	Sys 1 Hot Gas Bypass Valve	S	S	S	S	S	S	S	S	S	S
86	S1_BHS	BI_10	1291	01,02,03	0, 1	R	Bivalent Heat Source (YLAE HP Only), Tray Heater (YLPA HP only)	S	S	S	S	S	S	S	S	S	S
87	S1_C2_RUN	BI_11	1292	01,02,03	0, 1	R	Sys 1 Comp 2 Run	S	S	S	S	S	S	S	S	S	S
88	S2_C2_RUN	BI_12	1293	01,02,03	0, 1	R	Sys 2 Comp 2 Run	S	S	S	S	S	S	S	S	S	S

TABLE 30 - BACNET AND MODBUS COMMUNICATIONS DATA MAP (CONT'D)

ITEM REF NUM	BACnet NAME	BACnet Object/Instance	MODBUS ADDRESS	MODBUS Data Type Supported	ENG UNITS	READ WRITE	POINT DESCRIPTION	Point List Code S=Standard; O = Optional; N = Not Available									
								1	2	3	4	5	6	7	8	9	10
89	S2_LLSV	BI_13	1294	01,02,03	0, 1	R	Sys 2 Liquid Line Solenoid Valve	S	S	S	S	S	S	S	S	S	S
90	S2_MODE_SV	BI_14	1295	01,02,03	0, 1	R	Sys 2 Mode Solenoid Valve (HP Only)	S	S	S	S	S	S	S	S	S	S
91	LEAD_SYS	BI_15	1296	01,02,03	0, 1	R	Lead System (0 = Sys 1, 1 = Sys 2)	S	S	S	S	S	S	S	S	S	S
92	S1_C3_RUN	BI_16	1297	01,02,03	0, 1	R	Sys 1 Comp 3 Run	S	S	S	S	S	S	S	S	S	S
93	S2_C3_RUN	BI_17	1298	01,02,03	0, 1	R	Sys 2 Comp 3 Run	S	S	S	S	S	S	S	S	S	S
94	CH_LIQ_TYPE	BI_18	1299	01,02,03	0, 1	R	Chilled Liquid Type (0=Water, 1=Glycol)	S	S	S	S	S	S	S	S	S	S
93	AMB_MODE	BI_19	1300	01,02,03	0, 1	R	Ambient Control Mode (0=Std Amb, 1=Low Amb)	S	S	S	S	S	S	S	S	S	S
94	CNTL_MODE	BI_20	1301	01,02,03	0, 1	R	Local/Remote Control Mode (0=Local, 1=Remote)	S	S	S	S	S	S	S	S	S	S
95	DATA_UNIT	BI_21	1302	01,02,03	0, 1	R	Units (0=Imperial, 1=SI)	S	S	S	S	S	S	S	S	S	S
96	AUTO_LL	BI_22	1303	01,02,03	0, 1	R	Lead/Lag Control Mode (0=Manual, 1=Auto)	S	S	S	S	S	S	S	S	S	S

TABLE A	
Code	**Operational Codes**
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
19	
20	

TABLE B	
Code	**Fault Codes**
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 Temperature
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 Fault
19	Low Evaporator Temperature
20	Incorrect Refrigerant Programmed

Note

Shaded Codes may not be available on all models. Please check the Fault and Operational codes against the codes published in your operators manual or confirm Code is available through the display of your unit. If the Code appears in the display, you will recieve that value through the BAS.

TABLE B (cont)	
Code	**Fault Codes**
21	Power Failure, Manual Reset
22	Unit Motor Current
23	Low Superheat
24	Sensor Fault
25	Discharge Inhibit
26	MP/HPCO Inhibit
27	Pump Trip
28	Pump Fail Make Flow
29	High Ambient Temperature
30	
31	
32	
33	
34	
35	
36	
37	
38	
39	
40	
41	

NOTES

1	IPU II (PN 031-02550-xxx) based equipment are configured for Native BACnet MS/TP and Modbus RTU communications. The Microgateway product is not required for these 2 interfaces
2	
3	BACnet Object Types: 0= Analog In, 1 = Analog Out, 2= Analog Value, 3= Binary In, 4 = Binary Output, 5= Binary Value, 8= Device, 15 = Alarm Notification (0 -127 are reserved ASHRAE Objects)
4	WC= Inches of water column; CFM = Cubic Feer per Minute; FPM = Feet per Minute: PSI = Lbs per square inch; Pa = Pascals; kPa = Kilopascals; PPM = Part Per Million; kJ/kg = Kilojoules per Kilogram
5	See the applicable Middle Market Chiller Operations Manual for more details
6	The YCWL uses the same firmware as a YCAL , it just ignores Fan Control
7	
8	
9	
10	

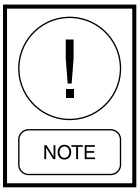
Yorktalk 2 Communications

Received Data (Control Data)

The unit receives eight data values from the MicroGateway or E-Link. The first four are analog values and the last four are digital values. These eight data values are used as control parameters when in REMOTE mode. When the unit is in LOCAL mode, these eight values are ignored. If the unit receives no valid YorkTalk 2 transmission for 5 minutes it will revert back to all local control values. *Table 31 on page 156 "Yorktalk 2 Communications Data Map" lists the control parameters.* These values are found under feature 54 in the MicroGateway or E-Link.

Transmitted Data

After receiving a valid transmission from the MicroGateway or E-Link, the unit will transmit either operational data or history buffer data depending on the "History Buffer Request" on ENG PAGE 10. Data must be transmitted for every page under feature 54. If there is no value to be sent to a particular page, a zero will be sent. *Table 31 on page 156 "Yorktalk 2 Communications Data Map" shows the data values and page listings for this unit.*



The latest point map information is listed on the Johnson Controls Equipment Integration website.

TABLE 31 - YORKTALK 2 COMMUNICATIONS DATA MAP

YCAL/YCWL/YLAA/YLUA/YCRL Middle Market w/ 2050, 2550 **York Talk 2** **ELINK** **Micro Board: 031-02050/02550**

Item	Ref.	Version	Date	YORK P N	Checksum	Baud	COMMENTS
1		C.MMC.03.02		031-02049-001	944D	4800	YCAL Micro Board 031-02050-xxx
2		C.MMC.03.01		031-02049-001	964B	4800	YCAL Micro Board 031-02050-xxx
3		C.MMC.03.00		031-02049-001	2226	4800	YCAL Micro Board 031-02050-xxx
4		C.MMC.13.xx		flash	xxxx	4800	YCAL Micro Board 031-02550-xxx, IPU 2 board.
5		C.MMC.13.xx		flash	xxxx	4800	YCWL (water cooled version) Micro Board 031-02550-xxx, IPU 2 board.
6		C.MMC.13.02		flash	xxxx	4800	Micro Board 031-02550-xxx . Fix native Modbus communications (SCR . Fix Café Metric functionality (SCR-766)
7							
8							
9							
10							
	▽	Use ASCII page column for interfaces utilizing an ASCII XL Translator or MicroGateway to communicate to a chiller LINC					

ENG PAGE REF	ASCII PAGE REF	York Talk Point Type	LON Profile Name	LON SNVT Type	York Talk Character Position	N2 Address	POINT LIST CODE: S = STANDARD O = OPTIONAL N = NOT AVAILABLE POINT LIST DESCRIPTION	1	2	3	4	5	6	7	8	9	10	ENG PAGE REF
P03	P01	A. Control	nviYTS01p003	SNVT_count_f (51)		ADF 1	Setpoint	S	S	S	S	S						P03
P04	P02	A. Control	nviYTS01p004	SNVT_count_f (51)		ADF 2	Load Limit Stage (0, 1, 2)	S	S	S	S	S						P04
P05	P03	A. Control	nviYTS01p005	SNVT_count_f (51)		ADF 3	Heating Setpoint (HP and YCWL HP)	O	O	O	O	O						P05
P06	P04	A. Control	nviYTS01p006	SNVT_count_f (51)		ADF 4	Mode (HP and YCWL HP only) (0=Panel, 1= Cooling, 2 = Heating)	O	O	O	O	O						P06
P07	P05	D. Control	nviYTS01p007	SNVT_switch (95)		BD 1	Start/Stop Command	S	S	S	S	S						P07
P08	P06	D. Control	nviYTS01p008	SNVT_switch (95)		BD 2												P08
P09	P07	D. Control	nviYTS01p009	SNVT_switch (95)		BD 3												P09
P10	P08	D. Control	nviYTS01p010	SNVT_switch (95)		BD 4	History Buffer Request	S	S	S	S	S						P10
P11	P09	A. Monitor	nvoYTS01p011	SNVT_count_f (51)	8 - 11	ADF 5	Leaving Chilled Liquid Temp	S	S	S	S	S						P11
P12	P10	A. Monitor	nvoYTS01p012	SNVT_count_f (51)	12 - 15	ADF 6	Return Chilled Liquid Temp	S	S	S	S	S						P12
P13	P11	A. Monitor	nvoYTS01p013	SNVT_count_f (51)	16 - 19	ADF 7	Leaving Hot Liquid Temp (R-410a) Heat Mode Only	O	O	O	O	O						P13
P14	P12	A. Monitor	nvoYTS01p014	SNVT_count_f (51)	20 - 23	ADF 8	Discharge Air Temp (Cond Unit) Return Hot Liquid Temp (410a- Heat Mod	S	S	S	S	S						P14
P15	P13	A. Monitor	nvoYTS01p015	SNVT_count_f (51)	24 - 27	ADF 9	Leaving Liquid Temp Hot (R-410a)	O	O	O	O	O						P15
P16	P14	A. Monitor	nvoYTS01p016	SNVT_count_f (51)	28 - 31	ADF 10	Ambient Air Temperature	S	S	S	S	S						P16
P17	P15	A. Monitor	nvoYTS01p017	SNVT_count_f (51)	32 - 35	ADF 11	Sys 1 Suction Superheat (EEV only)	O	O	O	O	O						P17
P18	P16	A. Monitor	nvoYTS01p018	SNVT_count_f (51)	36 - 39	ADF 12	Sys 1 Run Time (seconds)	S	S	S	S	S						P18
P19	P17	A. Monitor	nvoYTS01p019	SNVT_count_f (51)	40 - 43	ADF 13	Sys 1 Suction Pressure	S	S	S	S	S						P19
P20	P18	A. Monitor	nvoYTS01p020	SNVT_count_f (51)	44 - 47	ADF 14	Sys 1 Discharge Pressure	S	S	S	S	S						P20
P21	P19	A. Monitor	nvoYTS01p021	SNVT_count_f (51)	48 - 51	ADF 15	Sys 1 Cooler Inlet Refrigerant Temperature(R-407c Only)	S	S	S	S	S						P21
P22	P20	A. Monitor	nvoYTS01p022	SNVT_count_f (51)	52 - 55	ADF 16												P22
P23	P21	A. Monitor	nvoYTS01p023	SNVT_count_f (51)	56 - 59	ADF 17	Sys 1 EEV Output % (EEV only)	O	O	O	O	O						P23
P24	P22	A. Monitor	nvoYTS01p024	SNVT_count_f (51)	60 - 63	ADF 18	Sys 1 Anti- Recycle Timer	S	S	S	S	S						P24
P25	P23	A. Monitor	nvoYTS01p025	SNVT_count_f (51)	64 - 67	ADF 19	Anti-Coincident Timer	S	S	S	S	S						P25
P26	P24	A. Monitor	nvoYTS01p026	SNVT_count_f (51)	68 - 71	ADF 20	Sys Suction Temp (EEV only)	O	O	O	O	O						P26
P27	P25	A. Monitor	nvoYTS01p027	SNVT_count_f (51)	72 - 75	ADF 21	Sys 2 Run Time (seconds)	S	S	S	S	S						P27
P28	P26	A. Monitor	nvoYTS01p028	SNVT_count_f (51)	76 - 79	ADF 22	Sys 2 Suction Pressure	S	S	S	S	S						P28
P29	P27	A. Monitor	nvoYTS01p029	SNVT_count_f (51)	80 - 83	ADF 23	Sys 2 Discharge Pressure	S	S	S	S	S						P29
P30	P28	A. Monitor	nvoYTS01p030	SNVT_count_f (51)	84 - 87	ADF 24	Sys 2 Cooler Inlet Refrigerant Temperature (R-407c systems Only)	S	S	S	S	S						P30
P31	P29	A. Monitor	nvoYTS01p031	SNVT_count_f (51)	88 - 91	ADF 25	Sys 2 Defrost Temperature (HP only)	O	O	O	O	O						P31
P32	P30	A. Monitor	nvoYTS01p032	SNVT_count_f (51)	92 - 95	ADF 26	Sys 2 Suction Superheat (EEV only)	O	O	O	O	O						P32
P33	P31	A. Monitor	nvoYTS01p033	SNVT_count_f (51)	96 - 99	ADF 27	Sys 2 Anti-Recycle Timer	S	S	S	S	S						P33
P34	P32	A. Monitor	nvoYTS01p034	SNVT_count_f (51)	100 - 103	ADF 28	Sys 2 EEV Output % (EEV only)	O	O	O	O	O						P34
P35	P33	A. Monitor	nvoYTS01p035	SNVT_count_f (51)	104 - 107	ADF 29	Number of Compressors	S	S	S	S	S						P35
P36	P34	D. Monitor	nvoYTS01p036	SNVT_switch (95)	108	BD 5	Sys 1 Alarm	S	S	S	S	S						P36
P37	P35	D. Monitor	nvoYTS01p037	SNVT_switch (95)	109	BD 6	Sys 2 Alarm	S	S	S	S	S						P37
P38	P36	D. Monitor	nvoYTS01p038	SNVT_switch (95)	110	BD 7	Evaporator Heater Status	S	S	S	S	S						P38
P39	P37	D. Monitor	nvoYTS01p039	SNVT_switch (95)	111	BD 8	Evaporator Pump Status	S	S	S	S	S						P39
P40	P38	D. Monitor	nvoYTS01p040	SNVT_switch (95)	112	BD 9	Sys 1 Compressor 1 Run	S	S	S	S	S						P40
P41	P39	D. Monitor	nvoYTS01p041	SNVT_switch (95)	113	BD 10	Sys 2 Compressor 1 Run	S	S	S	S	S						P41
P42	P40	D. Monitor	nvoYTS01p042	SNVT_switch (95)	114	BD 11	Sys 1 Liquid Line Solenoid Valve	S	S	S	S	S						P42

TABLE 31 - YORKTALK 2 COMMUNICATIONS DATA MAP (CONT'D)

ENG PAGE REF	ASCII PAGE REF	York Talk Point Type	LON Profile Name	LON SNVT Type	York Talk Character Position	N2 Address	POINT LIST CODE: S = STANDARD O = OPTIONAL N = NOT AVAILABLE POINT LIST DESCRIPTION	1	2	3	4	5	6	7	8	9	10	ENG PAGE REF
P43	P41	D. Monitor	nvoYTS01p043	SNVT_switch (95)	115	BD 12	Sys 1 Hot Gas Bypass Valve	S	S	S	S	S						P43
P44	P42	D. Monitor	nvoYTS01p044	SNVT_switch (95)	116	BD 13	Sys 1 Compressor 2 Run	S	S	S	S	S						P44
P45	P43	D. Monitor	nvoYTS01p045	SNVT_switch (95)	117	BD 14	Sys 2 Compressor 2 Run	S	S	S	S	S						P45
P46	P44	D. Monitor	nvoYTS01p046	SNVT_switch (95)	118	BD 15	Sys 2 Liquid Line Solenoid Valve	S	S	S	S	S						P46
P47	P45	D. Monitor	nvoYTS01p047	SNVT_switch (95)	119	BD 16	Lead System (0 = Sys 1, 1 = Sys 2)	S	S	S	S	S						P47
P48	P46	D. Monitor	nvoYTS01p048	SNVT_switch (95)	120	BD 17	Sys 1 Compressor 3 Run	S	S	S	S	S						P48
P49	P47	D. Monitor	nvoYTS01p049	SNVT_switch (95)	121	BD 18	Sys 2 Compressor 3 Run	S	S	S	S	S						P49
P50	P48	D. Monitor	nvoYTS01p050	SNVT_switch (95)	122	BD 19	Chilled Liquid Type (0=Water, 1=Glycol)	S	S	S	S	S						P50
P51	P49	D. Monitor	nvoYTS01p051	SNVT_switch (95)	123	BD 20	Ambient Control Mode (0=Std Amb, 1=Low Amb)	S	S	S	S	N						P51
P52	P50	D. Monitor	nvoYTS01p052	SNVT_switch (95)	124	BD 21	Local/Remote Control Mode (0=Local, 1=Remote)	S	S	S	S	S						P52
P53	P51	D. Monitor	nvoYTS01p053	SNVT_switch (95)	125	BD 22	Units (0=Imperial, 1=SI)	S	S	S	S	S						P53
P54	P52	D. Monitor	nvoYTS01p054	SNVT_switch (95)	126	BD 23	Lead/Lag Control Mode (0=Manual, 1=Auto)	S	S	S	S	S						P54
P55	P53	D. Monitor	nvoYTS01p055	SNVT_switch (95)	127	BD 24	Sys 2 Hot Gas Bypass Valve	S	S	S	S	S						P55
P56	P54	Code Monitor	nvoYTS01p056	SNVT_count_f (51)	128	ADI 1	*Sys 1 Operational Code	S	S	S	S	S						P56
P57	P55	Code Monitor	nvoYTS01p057	SNVT_count_f (51)	129	ADI 2	*Sys 1 Fault Code	S	S	S	S	S						P57
P58	P56	Code Monitor	nvoYTS01p058	SNVT_count_f (51)	130	ADI 3	*Sys 2 Operational Code	S	S	S	S	S						P58
P59	P57	Code Monitor	nvoYTS01p059	SNVT_count_f (51)	131	ADI 4	*Sys 2 Fault Code	S	S	S	S	S						P59
P60	P58	Code Monitor	nvoYTS01p060	SNVT_count_f (51)	132	ADI 5		S	S	S	S	S						P60
P61	P59	Code Monitor	nvoYTS01p061	SNVT_count_f (51)	133	ADI 6	Sys 1 Condenser Fan Stage	S	S	S	S	S						P61
P62	P60	Code Monitor	nvoYTS01p062	SNVT_count_f (51)	134	ADI 7		S	S	S	S	S						P62
P63	P61	Code Monitor	nvoYTS01p063	SNVT_count_f (51)	135	ADI 8	Sys 2 Condenser Fan Stage	S	S	S	S	S						P63
P64	P62	Code Monitor	nvoYTS01p064	SNVT_count_f (51)	136	ADI 9												P64
P65	P63	Code Monitor	nvoYTS01p065	SNVT_count_f (51)	137	ADI 10	Unit Control Mode (0=Lv Wtr, 1=Ret Wtr, 2=Dis Air, 3=SP, 4=Cool, 5=Heat	S	S	S	S	S						P65
P66	P64	A. Monitor	nvoYTS01p066	SNVT_count_f (51)	138 - 141	ADF 30	Anti-Recycle Time (Programmed)	S	S	S	S	S						P66
P67	P65	A. Monitor	nvoYTS01p067	SNVT_count_f (51)	142 - 145	ADF 31	Leaving Chilled Liquid Temp Cutout	S	S	S	S	S						P67
P68	P66	A. Monitor	nvoYTS01p068	SNVT_count_f (51)	146 - 149	ADF 32	Low Ambient Temperature Cutout	S	S	S	S	S						P68
P69	P67	A. Monitor	nvoYTS01p069	SNVT_count_f (51)	150 - 153	ADF 33	Low Suction Pressure Cutout (Heating HP Only)	S	S	S	S	S						P69
P70	P68	A. Monitor	nvoYTS01p070	SNVT_count_f (51)	154 - 157	ADF 34	Low Suction Pressure Cutout (Cooling HP only)	S	S	S	S	S						P70
P71	P69	A. Monitor	nvoYTS01p071	SNVT_count_f (51)	158 - 161	ADF 35	High Discharge Pressure Cutout	S	S	S	S	S						P71
P72	P70	A. Monitor	nvoYTS01p072	SNVT_count_f (51)	162 - 165	ADF 36	Remote Setpoint	S	S	S	S	S						P72
P73	P71	A. Monitor	nvoYTS01p073	SNVT_count_f (51)	166 - 169	ADF 37	Cooling Range	S	S	S	S	S						P73
P74	P72	A. Monitor	nvoYTS01p074	SNVT_count_f (51)	170 - 173	ADF 38	Remote Setpnt 2 (SP Control), Remote Heatng Setpnt (HP and YCWL HP	O	O	O	O	O						P74
P75	P73	A. Monitor	nvoYTS01p075	SNVT_count_f (51)	174 - 177	ADF 39	Cool Range Setpoint 2 (SP Control), Heat Range (HP and YCWL HP only)	O	O	O	O	O						P75
P76	P74	A. Monitor	nvoYTS01p076	SNVT_count_f (51)	178 - 181	ADF 40	Sys 1 Discharge Temp (EEV only)	O	O	O	O	O						P76
P77	P75	A. Monitor	nvoYTS01p077	SNVT_count_f (51)	182 - 185	ADF 41	Sys 1 Discharge Superheat (EEV only)	O	O	O	O	O						P77
P78	P76	A. Monitor	nvoYTS01p078	SNVT_count_f (51)	186 - 189	ADF 42	Sys 2 Discharge Temp (EEV only)	O	O	O	O	O						P78
P79	P77	A. Monitor	nvoYTS01p079	SNVT_count_f (51)	190 - 193	ADF 43	Sys 2 Discharge Superheat (EEV only)	O	O	O	O	O						P79
P80	P78	D. Monitor	nvoYTS01p080	SNVT_switch (95)	194	BD 25												P80
P81	P79	D. Monitor	nvoYTS01p081	SNVT_switch (95)	195	BD 26												P81
P82	P80	D. Monitor	nvoYTS01p082	SNVT_switch (95)	196	BD 27												P82
P83	P81	D. Monitor	nvoYTS01p083	SNVT_switch (95)	197	BD 28												P83
P84	P82	D. Monitor	nvoYTS01p084	SNVT_switch (95)	198	BD 29												P84

NOTE: The Appropriate Product Code Listing Summary Should Accompany Document

TABLE 31 - YORKTALK 2 COMMUNICATIONS DATA MAP (CONT'D)

ENG PAGE	ASCII PAGE	Operational Code	ENG PAGE	ASCII PAGE	Fault Code			
P56	P54	C_OPER.CODE	P57	P55	C_FAULT.CODE			
0	0	No Abnormal Condition	0	0	No Fault Code			
1	1	Unit Switch Off	1	1	VAC Undervoltage			
2	2	System Switch Off	2	2	Low Ambient Temperature			
3	3	Lock-Out	3	3	High Ambient Temperature			
4	4	Unit Fault	4	4	Low Leaving Chilled Liquid Temperature			
5	5	System Fault	5	5	High Discharge Pressure			
6	6	Remote Shutdown	6	6	High Differential Oil Pressure			
7	7	Daily Schedule Shutdown	7	7	Low Suction Pressure			
8	8	No Run Permissive	8	8	High Motor Current			
9	9	No Cool Load	9	9	LLSV Not On			
10	10	Anti-Coincidence Timer Active	10	10	Low Battery Warning			
11	11	Anti-Recycle Timer Active	11	11	High Oil Temperature			
12	12	Manual Override	12	12	High Discharge Temperature			
13	13	Suction Limiting	13	13	Improper Phase Rotation			
14	14	Discharge Limiting	14	14	Low Motor Current / MP / HPCO			
15	15	Current Limiting	15	15	Motor Current Inpomabalanced			
16	16	Load Limiting	16	16	Low Differntail Oil Pressure			
17	17	Compressor(s) Running	17	17	Grpound Fault			
18	18	Heat Pump Load Limiting (HP Only)	18	18	MP / HPCO Fault			
			19	19	Low Evaporator Temperature			
			20	20	Incorrect Refrigemat Programmed			
			21	21	Power Failure, Manual Reset Required			
			22	22	Unit Motor Current			
			23	23	Low Superheat			
			24	24	Sensor Fault			
			25	25	Discharge Inhibit			
			26	26	MP/HPCO Inhibit			
			27	27	Pump Trip			
			28	28	Pump Fail Make Flow			
			29	29	High Ambient Temperature			

**** Note***

Shaded Codes may not be available on all models. Please check the Fault and Operational codes against the codes published in your operators manual or confirm Code is available through the display of your unit. If the Code appears in the display, you will recieve that value through the BAS.

TEMPERATURE CONVERSION CHART

Temperature Conversion Chart - Actual Temperatures

° 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		107.6
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

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

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

R410-A
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

The following factors can be used to convert from English to the most common SI Metric values.

TABLE 32 - SI METRIC CONVERSION

MEASUREMENT	MULTIPLY ENGLISH UNIT	BY FACTOR	TO OBTAIN METRIC UNIT
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

TEMPERATURE

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example: (45.0°F - 32°) x 0.5556 = 7.22°C

To convert a temperature range (i.e., a range of 10°F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example: 10.0°F range x 0.5556 = 5.6 °C range

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