YORK®	YCRS WATER COOLED LIQUID CHILLERS	
INSTALLATION, OPERATION AND MAINTENANCE	New Release	Form 201.25-NM1 (302)

YCRS WATER COOLED REMOTE CONDENSER
YCRS0100SC – 0240SC

00635VIP

81 TONS THROUGH 194 TONS
(285 KW THROUGH 682 KW)

60 HERTZ
STYLE A
REFRIGERANT TYPE: R-22

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GENERAL CHILLER INFORMATION & SAFETY

INTRODUCTION

YORK YCRS 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 the manuals, including installation, commissioning and maintenance tasks must only be performed by suitably trained and qualified personnel.

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

WARRANTY

York International warrants all equipment and materials against defects in workmanship and materials for a period of one year from initial start-up, or eighteen months from delivery (whichever occurs first) unless extended warranty has been agreed upon as part of the contract.

The warranty is limited to parts only replacement and shipping of any faulty part, or sub-assembly which has failed due to poor quality or manufacturing errors. All claims must be supported by evidence that the failure has occurred within the warranty period, and that the unit has been operated within the designed parameters specified.

All warranty claims must specify the unit model, serial number, order number and run hours/starts. 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 York International.

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 YORK Service Center. See Commissioning, page 29.
- 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. See Maintenance Section, page 76.
- Failure to satisfy any of these conditions will automatically void the warranty.

SAFETY

Standards for Safety

YCRS chillers are designed and built within an ISO 9002 accredited design and manufacturing organization. The chillers comply with the applicable sections of the following Standards and Codes:

- ANSI/ASHRAE Standard 15, Safety Code for Mechanical Refrigeration
- ANSI/NFPA Standard 70, National Electrical Code (N.E.C.)
- ASME Boiler and Pressure Vessel Code, Section VIII Division 1
- ARI Standard 550/590-98, Centrifugal and Rotary Screw Water Chilling Packages

In addition, the chillers conform to Underwriters Laboratories (U.L.) for construction of chillers and provide U.L./cU.L. listing label.

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.

ABOUT THIS MANUAL

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

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

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

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

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

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

MISUSE OF EQUIPMENT

Suitability for Application

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

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

Structural Support

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

Mechanical Strength

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

General Access

There are a number of areas and features which may be a hazard and potentially cause injury when working on the unit unless suitable safety precautions are taken. It is important to 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 with out first switching OFF, isolating and locking-off the power supply. Work on live equipment must

only be carried out 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.

Refrigerants and Oils

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

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 electrical option panel is fitted with an emergency stop switch CB3 (Circuit Breaker 3). Separate Circuit Breakers, CB1 (System 1) and CB2 (System 2), can also be used to stop the respective system in an emergency. When operated, it removes the electrical supply from the control system, thus shutting down the unit.

SECTION 2
PRODUCT DESCRIPTION

1 COMPRESSOR
2 COOLER
3 POWER SECTION - SYSTEM 1
4 COMMON INPUT SECTION
5 POWER SECTION - SYSTEM 2
6 CONTROL PANEL

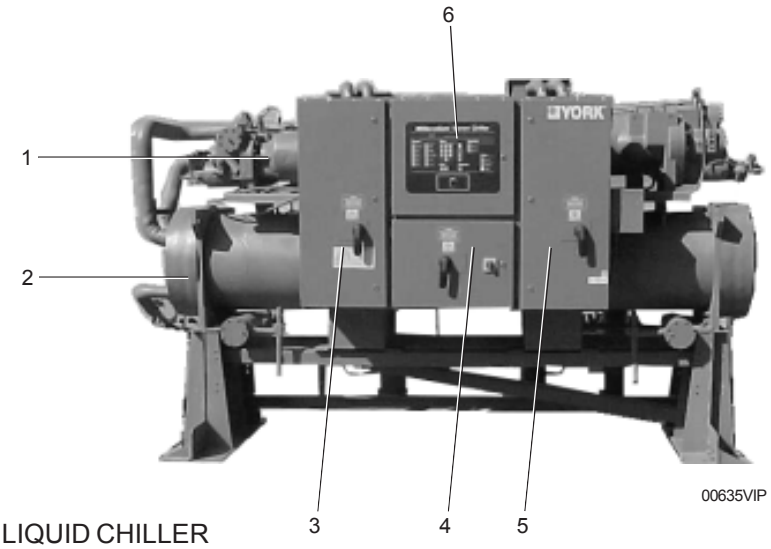

FIG. 1 – YCRS WATER COOLED LIQUID CHILLER

INTRODUCTION

YORK YCRS 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 installation.

The unit consists of 2 screw 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 refrigerant and oil 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.

The unit is shipped with a nitrogen holding charge. Refrigerant (R-22) must be added on site.

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

Compressor

Twin helical semi-hermetic screw compressors, are provided to ensure high operational efficiencies and reliable performance. Capacity control is achieved through a single slide valve. The compressor is a positive displacement type characterized by two helically grooved rotors which are manufactured from forged steel. The 60 Hz motor operates at 3600 rpm to direct drive the male rotor which in turn drives the female rotor on a light film of oil.

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Each compressor is direct drive, semi-hermetic, rotary twin screw type and includes the following items:

Two screw rotors, with asymmetric profiles, manufactured from forged steel.

A cast iron compressor housing precision machined to provide optimal clearance for the rotors.

An internal discharge check valve to prevent rotor backspin during shutdown.

An acoustically tuned, internal discharge muffler to minimize noise, while optimizing flow for maximum performance.

Discharge and suction shut-off service valves.

A reliable suction gas cooled high efficiency, accessible hermetic motor with redundant overload protection using both thermistor and current overload protection.

A suction gas screen and serviceable, 0.5 micron full flow oil filter within the compressor housing.

Refrigerant gas is injected into the void created by the unmeshing of the five lobed male and seven lobed female rotor. Further meshing of the rotors closes the rotor threads to the suction port and progressively compresses the gas in an axial direction to the discharge port. The

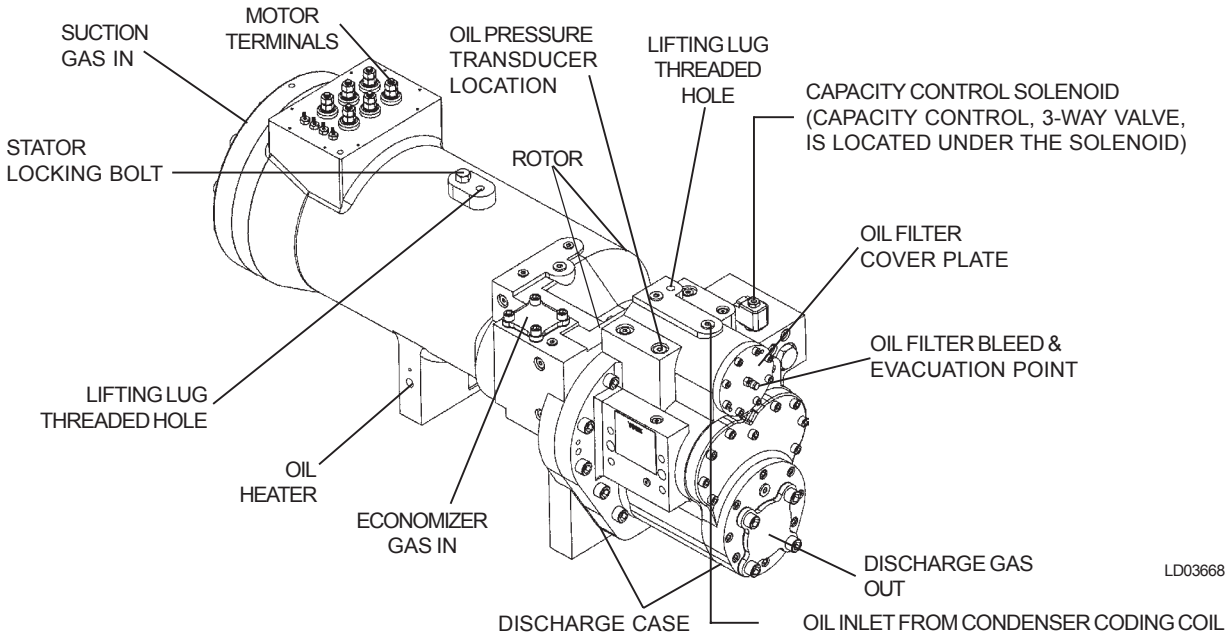


FIG. 2 – SCREW COMPRESSOR

gas is compressed in volume and increased in pressure before exiting at a designed volume at the discharge end of the rotor casing. Since the intake and discharge cycles overlap, a resulting smooth flow of gas is maintained.

The rotors are housed in a cast iron compressor housing precision machined to provide optimal clearances for the rotors. Contact between the male and female rotor is primarily rolling on a contact band on each of the rotor's pitch circle. This results in virtually no rotor wear and increased reliability.

The compressor incorporates a complete anti-friction bearing design for reduced power input and increased reliability. Four separated, cylindrical, roller bearings handle radial loads. Angular-contact ball bearings handle axial loads. Together they maintain accurate rotor positioning at all pressure ratios, thereby minimizing leakage and maintaining efficiency. A springless check valve is installed in the compressor discharge housing to prevent compressor rotor backspin due to system refrigerant pressure gradients during shutdown.

Motor cooling is provided by suction gas from the evaporator flowing across the motor. Redundant overload protection is provided using both thermistor and current overload protection.

The compressor is lubricated by removing oil from the refrigerant using an external oil separator.

A 350 watt (115V 1 Ø 60 Hz) immersion heater is located in the compressor. The heater is temperature activated to prevent refrigerant condensation.

Motor Starting

Compressor motor starting is Star/Delta (S/D) open transition. The starter utilizes 3 motor contactors, a transition delay relay and a start relay. The starter allows inrush current to be limited to approximately 33% LRA for the first 4 to 10 seconds, with current increasing to normal running current when the Delta connection is completed.

When the microprocessor initiates a start signal to run a compressor, the applicable relays are energized. The transition of the relay contacts enable the 'Star' connection of the motor start. The 'Star' connection of the motor start is enabled for 4 to 10 seconds depending upon motor current as sensed by the microprocessor.

Normally, the transition to Delta takes 10 seconds if current is below 125% FLA. If motor current exceeds 125% FLA, the transition is made to Delta as long as the "Star" has been enabled for at least 4 seconds.

Capacity Control

The compressors will start at the minimum load position and provide a capacity control range from 10% to 100% per compressor using a continuous function slide valve. The microprocessor controlled output pressure regulating capacity control valve will command compressor capacity independent of control valve input pressure and balance the compressor capacity with the cooling load.

The automatic spring return of the capacity control valve to the minimum load position will ensure compressor starting at minimum motor load.

OIL SEPARATOR

Each circuit has a high efficiency, augmented gas impingement type oil separator to maximize oil extraction without fragile media to break down.

The oil separator, is mounted in the discharge line of the compressor. The high pressure discharge gas is forced around a 90 degree bend. Oil is forced to the outside of the separator through centrifugal action and captured on wire mesh where it drains to the bottom of the oil separator and into the compressor.

The oil drains back into the compressor through a replaceable 0.5-3.0 micron oil filter, and oil supply solenoid, is at high pressure. This high pressure "oil injection" forces the oil into the compressor where it is gravity fed to the rotors and bearings for lubrication.

After lubricating the rotor and bearings, it is injected through orifices on a closed thread near the suction end of the rotors. The oil is automatically injected because of the pressure difference between the discharge pressure and the reduced pressure at the suction end of the rotors. This lubricates the rotors as well as provides an oil seal against leakage around the rotors to assure refrigerant compression (volumetric efficiency).

The oil also provides cooling by transferring much of the heat of compression from the gas to the oil keeping discharge temperatures down and reducing the chance for oil breakdown.

Oil injected into the rotor cage flows into the rotors at a point about 1.2 x suction. This assures that a required minimum differential of at least 26 psi (1.8 bar) exists between discharge and 1.2 x suction, to force oil into rotor case, a minimum of 9 psi (0.6 bar) is all that is required to assure protection of the compressor. Oil pressure is measured as the difference between discharge pressure and the pressure of the oil entering the rotor case.

Maximum working pressure of the oil separator is 31 bar (450 psi). The oil level should be above the midpoint of the "lower" oil sight glass when the compressor is running. The oil level should never be above the top of the "upper" sight glass.

Oil temperature control is provided through liquid injection activated by the microprocessor, utilizing a temperature sensor, and a solenoid valve.

OIL COOLER

Compressor oil cooling is provided by refrigerant liquid, which is injected into the rotor suction when the temperature setpoint has been exceeded.

REFRIGERANT CIRCUITS

Each refrigerant circuit uses copper refrigerant pipe formed on computer controlled bending machines to reduce the number of brazed joints resulting in a reliable and leak resistant system.

Liquid line components include: a manual shut-off valve with charging port, a high absorption removable core filter-drier, a solenoid valve, a sight glass with moisture indicator, and a thermostatic expansion valve.

Suction lines are covered with closed-cell insulation.

CONDENSER

The condenser can be either a field supplied YORK VCB/Remote Air-cooled condenser or an evaporative condenser.

COOLER

The 4 pass dual circuit shell and tube type direct expansion (DX) evaporator has chilled liquid circulating across the tubes from one end to the other. The design working pressures of the cooler are 150 psi (10 bar) on the waterside (shell) and 300 psi (20 bar) on the refrigerant side (tubes) which is protected by pressure relief valve(s).

The water baffles are 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 flexible closed-cell foam.
The water nozzles are provided with grooves for victualic couplings and should be insulated by the contractor after pipe installation.

POWER AND CONTROL PANELS

All controls and motor starting equipment are factory wired and function tested. The panel enclosures are designed to NEMA 1(IP33) and are manufactured from powder painted galvanized steel.

The panel is divided into power sections for each electrical system, a control section and a common input section. Each section has separate hinged, latched, and gasket sealed doors.

Each power section contains:

Compressor starting contactors, control circuit serving compressor, compressor contactor coils and compressor motor overloads.

The current transformers for the compressor motor overloads sense each phase, as an input to the microprocessor. This protects the compressor motors from damage due to: low input current, high input current, unbalanced current, single phasing, phase reversal, and compressor locked rotor.

The control section contains:

On/Off toggle switch, microcomputer keypad and display, microprocessor board (ARB), I/O expansion board (AIOB), power supply board (APB) and customer terminal block (-XTB1).

MICROPROCESSOR CONTROLS

The microprocessor has the following functions and displays:

A liquid crystal 40 character display with text provided on two lines and light emitting diode backlighting for outdoor viewing.

A color coded, 35 button, sealed keypad with sections for Display, Entry, Setpoints, Clock, Print, Program and the unit Auto/Off switch.

The standard functions include: water or glycol cooling, automatic pump down, demand load limiting from external building automation system input, remote reset liquid temperature reset input, unit alarm and status contacts, chilled liquid pump control, automatic reset after power failure, automatic system optimization to match operating conditions.

The software is stored in non-volatile memory (EPROM) to eliminate unit failure due to AC power failure. The programmed setpoint is stored in a lithium battery backed memory.

MOTOR CURRENT PROTECTION

The microprocessor motor protection provides high current protection to assure that the motor is not damaged due to voltage, excess refrigerant, or other problems that could cause excessive motor current.

If the motor current exceeds the 115% FLA trip point after 3 seconds of operation on Star/Delta starter, the microprocessor will shut the system down and lock it out after one fault. A manual reset of the respective system switch is required to clear the fault and restart the system. A thorough check of the motor, wiring, and refrigerant system should be carried out before restarting a system that has faulted on high motor current.

The microprocessor also provides low motor current protection when it senses a motor current less than 10% FLA. Low motor current protection is activated 4 seconds after start on Star/Delta to allow the motor to start. The microprocessor will shut the system down whenever low motor current is sensed and will lock out a system if three faults occur in 90 minutes. Once a system is locked out on Low Motor Current, it must be manually reset with the system switch.

The microprocessor also senses low motor current whenever a High Pressure Cutout (HPCO) or Motor Protector (MP) contact opens. The MP and HPCO contacts are connected in series with the motor contactor. Whenever either of these devices are open, the contactor de-energizes and the motor shuts down. Since the microprocessor is sending a run signal to the contactor, it senses the low motor current below 10% FLA and shuts the system down.

Motor Protector Module

The mechanical motor protector module provides thermal and current motor overload protection. This module protects against phase to phase current imbalance, over current, under current, and phase rotation. The

module, mounted in the power panel, utilizes a 7 segment display which provides operating status and fault diagnostic information. The 7 segment display will display either a stationary or a flashing alphanumeric value which can be decoded by the operator:

TABLE 1 – MOTOR PROTECTOR FAULTS

0	NORMAL - NO FAULT DETECTED
FLASHING "0"	MOTOR OFF OR UNLOADED < 5A AC CURRENT LEVEL
1	HIGH CURRENT FAULT
2	LOADED PHASE TO PHASE CURRENT IMBALANCE > 17%
3	UNLOADED PHASE TO PHASE CURRENT IMBALANCE > 25%
4	IMPROPER INCOMING PHASE ROTATION
5	HIGH MOTOR TEMPERATURE TRIP POINT = 13 KOHM RESET = 3.25 KOHM
6	COMMUNICATION ERROR
E	OUT OF RANGE OF RLA CALIBRATION
OTHER SYMBOLS	DEFECTIVE MODULE OR SUPPLY VOLTAGE

Whenever a motor protector trips, the motor protector contacts wired in series with the motor contacts, open and the motor contactor de-energizes allowing the motor to stop. The microprocessor senses the low motor current and shuts the system down. The microprocessor will try two more starts before locking the system out. The system locks out because the motor protector is a manual reset device. After the first start the protector contacts will be open, thus preventing the motor contactors from energizing. Power must be removed and re-applied to reset the module.

Current Overload

The protector module uses integral current transformers per phase to provide protection against rapid current overload conditions. The module responds to changes in current and must be set-up using the DIP switches located on the module (refer to Section 5 for details). Integral trip curves allow for in-rush currents during Star/Delta starting without nuisance tripping.

Thermal Overload

Three PTC (positive temperature coefficient) thermistors in the motor windings of each phase provide thermal protection. The sensor resistance stays relatively constant at 1 kW until a temperature of 266°F (130°C) is sensed. The sensor experiences a rapid rise in resistance beyond this temperature. Whenever the resistance of one of the sensors reaches 13 kW, the module trips, which ultimately de-energizes the motor's pilot circuit. Reset is manual after the motor cools and the sensor resistance drops to 3.25 kW.

Current Unbalance (Loaded & Unloaded) Loss of Phase

A 2 second delay at start-up allows for any unbalances resulting during normal starting conditions. After this initial delay, the protector module compares the "Operating Current" to the measured half line current. The "Operating Current" is given by 0.65 x factory overload current setting.

An unloaded compressor condition occurs when any measured half line current is less than the "Operating Current." A current unbalance exceeding an unloaded level of 25% will result in the motor pilot circuit being de-energized.

A loaded compressor condition occurs when any measured half line current is greater than or equal to the "Operating Current." A current unbalance exceeding a loaded level of 17% will result in the motor pilot circuit being de-energized.

Improper Phase Sequence

The protector module calculates the phase sequence at start-up using the three current transducers to determine whether the three phase sequence on the load side of the main contactor is miswired. Upon detection of a miswired motor load, the module will de-energize the main contactor pilot circuit within 50 millisecond response time.

KEYPAD CONTROLS

For a detailed description of the keypad controls refer to the Microprocessor Based Control System Operating Section 7.

Status Key

This key provides a display of the current operational and/or fault status of the unit or the individual refriger-

ant systems. The display will show the 'highest priority' information as determined by the microprocessor.

The main categories of messages are: General Status Messages; Unit Warnings; Anticipation Control Status Messages; Chiller Fault Status Messages; System Fault Status Messages.

Display Keys

Each key provides a real-time display of commonly required information about the chiller and individual refrigerant system operating conditions and settings. This is particularly useful during commissioning, monitoring the operation of the chiller, diagnosing potential future problems and service troubleshooting. Parameters may be displayed in Imperial (°F and PSIG) or Metric (°C and bar) units.

Print Keys

These keys allow control panel display or remote printout of both current real-time operating and programmed data as well as fault history data from the most recent six safety shutdowns.

Entry Keys

The numeric and associated keys are used for entering data required for programming the chiller. The 'ENTER' and '↑' '↓' keys are also used for scrolling through information available after pressing other keys.

Setpoints Keys

These keys are used for display and programming of the local and remote offset chilled liquid temperature setpoints.

Clock Keys

These keys are used for display and programming of the clock and operating schedule for the chiller.

Program Key

This key is used for display and programming of the chiller operational settings and limits.

ACCESSORIES AND OPTIONS:

Alternative Refrigerants

Contact your nearest YORK office for information and availability on alternative HFC refrigerants.

ELECTRICAL OPTIONS:

MULTIPLE POINT POWER SUPPLY CONNECTION – *Standard* field power wiring connection on all models is Multiple Point Power Connection to factory-provided Terminal Blocks. Two field-supplied electrical power circuits with appropriate branch circuit protection provide power to each of two motor control center cabinets, located on either side of the Control panel on the front of the chiller. Each cabinet contains starter elements for one compressor.

Optional to the Terminal Blocks for field power connection are Non-Fused Disconnects or Circuit Breaker Switches with external, lockable handles.

SINGLE-POINT POWER CONNECTION – (Factory-mounted) An optional configuration for field connection of a single electrical circuit to: either Terminal Block or Non-Fused Disconnect Switch with lockable external handle (in compliance with Article 440 of N.E.C., to isolate unit power supply for service). Factory wiring is provided from the Terminal Block or Disconnect Switch to Factory supplied individual system Circuit Breakers, Non-Fused Disconnect switch with external, lockable handle or J Class Fuses/Fuse Block in each of the two compressor motor control centers. (Note: Single-Point Non-Fused Disconnect Switch will not be supplied with individual system Non Fused Disconnect Switches with external, lockable handles in each of the two compressor motor control centers).

65 Ka HIGH VOLTAGE PROTECTION – Non-Fused Disconnect Switch with fuses (200 & 575V) or Circuit Breakers (230, 380, & 460V) are used for applications where customers have a requirement for Single-Point wiring with high "fault current" withstanding capability. This option provides between 50Ka and 65Ka withstand protection to the equipment.

BUILDING AUTOMATION SYSTEM INTERFACE (Factory-mounted) – Provides means to reset the leaving chilled liquid temperature or percent full load amps (current limiting) from the BAS **(Factory-mounted):**

- Printed circuit board to accept 4 to 20 milliamp, 0 to 10VDC, or dry contact closure input from the BAS.
- A YORK ISN Building Automation System can provide a Pulse Width Modulated (PWM) signal direct to the standard control panel via the standard onboard RS485 port.

FLOW SWITCH – The flow switch or its equivalent must be furnished with each unit. 150 PSIG (10.5 bar) DWP – For standard units. Johnson Controls model F61MG-1C Vapor-proof SPDT, NEMA 4X switch (150 PSIG [10.5 bar] DWP), -20°F to 250°F- (29°C to 121°C), with 1" NPT connection for upright mounting in horizontal pipe. (**Field-mounted**)

DIFFERENTIAL PRESSURE SWITCH – Alternative to the above mentioned Flow Switch. Pretemco Model DPS 300A-P4OPF-82582-S (20.7bar max working pressure). SPDT 5 amp 125/250VAC switch. Range: 0 - 2.8 bar, deadband: 0.003 - 0.005bar, with 1/4 NPTE pressure connections.

LANGUAGE LCD AND KEYPAD – Standard display language and keypad is in English. Spanish is available as an option.

PRINTER KIT – Printer for obtaining printout of unit operating and history data. (**Field-mounted**)

MULTIPLE UNIT SEQUENCE CONTROL (Field-mounted) – Sequencing Control with automatic unit sequencing. Necessary items for operation and control of up to eight units with parallel water circuits. Includes software and mixed liquid temperature sensor (interconnecting wiring by others).

PRESSURE VESSEL CODES – Coolers and condensers can be supplied in conformance with the following pressure codes:
A.S.M.E. (Standard)

CHICAGO CODE RELIEF VALVES (Factory-mounted) – Unit will be provided with relief valves to meet Chicago Code requirements.

ACCESSORIES:

FLANGES (Weld Type) – Consists of 150 PSI (10.5 bar) standard cooler (150 lb) R.F. flanges to convert to flanged cooler-connections and includes companion flanges. (**Field-mounted**)

FLANGES (Victaulic Type) – Consists of (2) Flange adapter for grooved end pipe (standard 150 PSI [10.5 bar] cooler). Includes companion flanges. **(Field-mounted)**

FINAL PAINT – The unit can be painted with an optional coat of Caribbean Blue overspray paint. **(Factory)**

VIBRATION ISOLATION:

- **Neoprene Isolators –** Recommended for normal installations. Provides very good performance in most applications for the least cost. **(Field- mounted)**
- **1" Spring Isolators –** Level adjustable, spring and cage type isolators for mounting under the unit base rails. 1" nominal deflection may vary slightly by application. **(Field-mounted)**
- **2" Seismic Spring 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 2". Level adjustable, deflection may vary slightly by application. **(Field-mounted)**

ALTERNATIVE CHILLED FLUID APPLICATIONS:

Standard water chilling application range is 40°F to 50°F (4.4°C to 10°C) Leaving Chilled Water Temperature. To protect against nuisance safety trips below 40°F (4.4°C) and reduce the possibility of cooler damage due to freezing during chiller operation, the unit microprocessor automatically unloads the compressors at abnormally low suction temperature (pressure) conditions, prior to safety shutdown.

- **Process Brine Option –** Process or other applications requiring chilled fluid below 40°F (4.4°C) risk water freezing in the evaporator, typically overcome by using antifreeze. For these applications, the chiller system incorporates brine (ethylene or propylene glycol solution), and the system design Leaving Chilled Fluid Temperature must be provided on the order form to ensure proper factory configuration.

- **Thermal Storage Option –** Thermal Storage requires special capabilities from a chiller, including the ability to ‘charge’ an ice storage tank, then possibly automatically reset for operation at elevated Leaving Chilled Fluid Temperatures as required by automatic building controls. The Thermal Storage Option provides Ice Storage duty Leaving Chilled Fluid setpoints from 25°F to 15°F (-4°C to -10°C) minimum during charge cycle, with a Reset range of 36°F (20°C) supply fluid temperature.

NOMENCLATURE

YCRS0140SC46YAA

1	2	3	4	5 6 7 8	9	10	11	12	13	14	15
BASE PRODUCT TYPE				NOMINAL CAPACITY	UNIT DESIGNATOR	REFRIGERANT	VOLTAGE/STARTER			DESIGN / DEVELOPMENT LEVEL	
Y	C	R	S	# # # # kW	S	C	1	7	Y	A	A
							2	8			
							4	0			
							4	6			
							5	8			

- 4: S : Condenser; : Remote; : Chiller; : YORK
- 5 6 7 8: : 0100: 0120: 0140; : 0180: 0200: 0220; : 0240
- 9: S Standard Unit
- 10: C :R-22
- 13: Y :Wye-Delta
- 14 15: :Design Series F; :Engineering Change or PIN Level

FUNCTIONAL DESCRIPTION

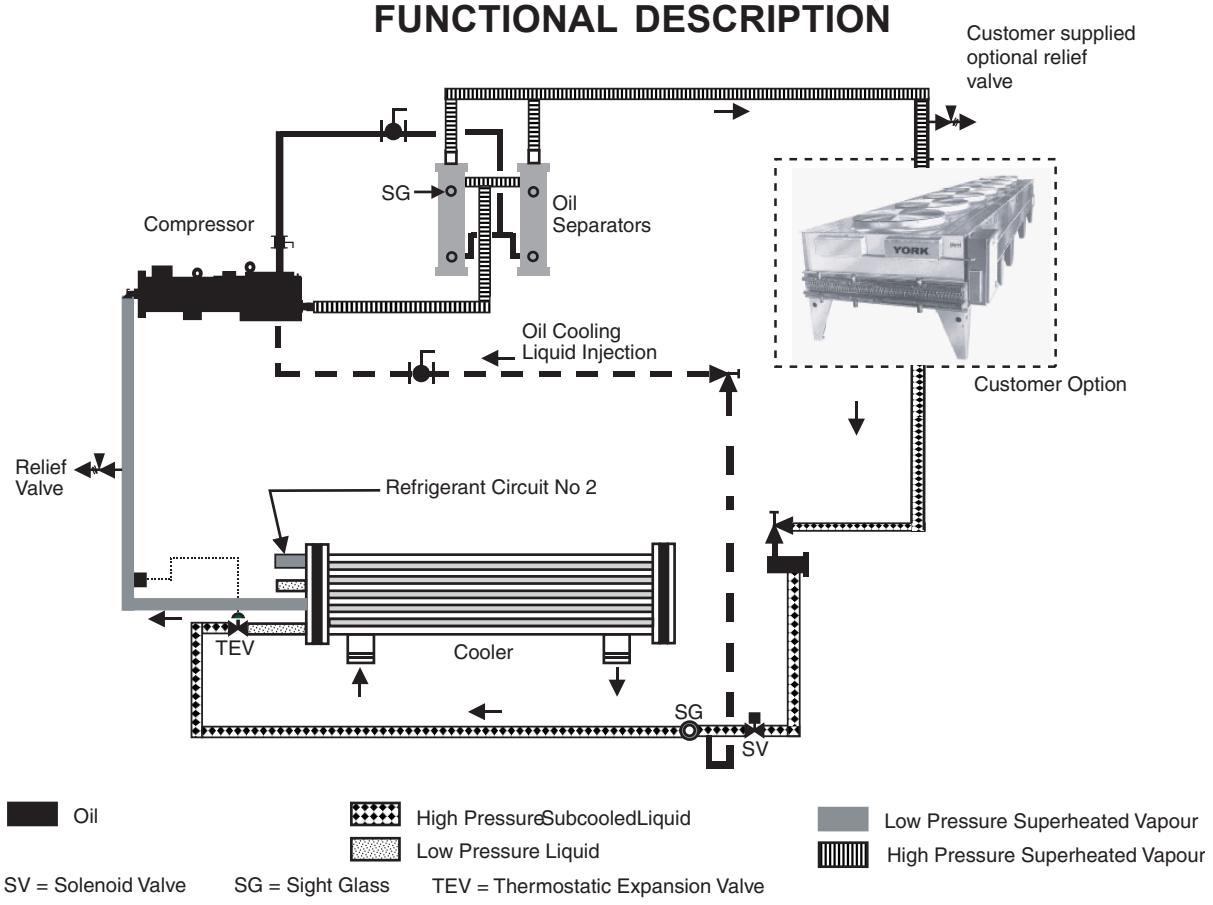


FIG. 3 – FLOW DIAGRAM

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. High pressure vapor is passed through the oil separator where compressor oil is removed and recirculated to the compressor. High pressure superheated refrigerant enters the condenser shell where heat is rejected to the condenser water passing through the tubes. The fully condensed and subcooled liquid leaves the condenser and enters the expansion valve, where pressure reduction and further cooling takes place. The low pressure liquid refrigerant then returns to the cooler. Each refrigerant circuit utilizes a refrigerant to refrigerant suction line heat exchanger to maximize chiller capacity and efficiency by subcooling liquid refrigerant delivered to the expansion valve and superheating suction gas delivered to the compressor.

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

Remove any transit packing and inspect the unit to ensure that all components have been delivered and that no damage has occurred during transit. If any damage is evident, it should be noted on the shipment documentation and a claim entered according to the instructions given.

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

MOVING THE UNIT

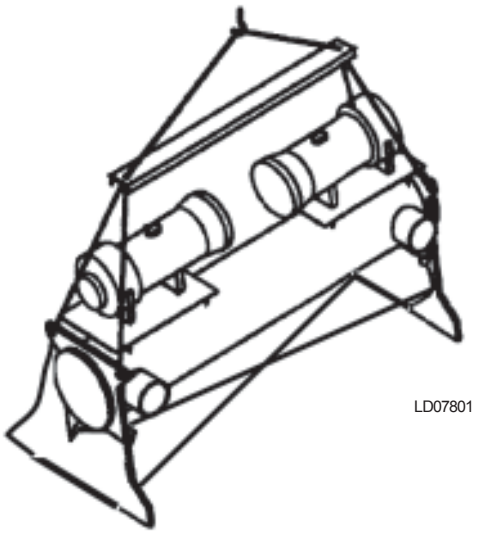
Before moving the unit, ensure that the installation site is suitable for installing the unit and is capable of supporting the weight of the unit and all associated services.

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.

The unit must only be lifted at the points provided.



RIGGING INSTRUCTIONS AND ESTIMATED SHIPPING WEIGHT LBS.

MODEL	WEIGHT
YCRS0100SC	5,989
YCRS0120SC	6,271
YCRS0140SC	6,584
YCRS0180SC	9,026
YCRS0200SC	9,132
YCRS0220SC	9,162
YCRS0240SC	9,252

FIG. 4 – LIFTING INFORMATION

Lifting by Fork Lift

Insert the forks into the lifting slots in the shipping skid. The forks must pass through the lifting slots on both sides of the unit to prevent damage.

CONTROL PANEL REMOVAL

For installation in locations where access width is limited, the control panel may be removed as shown in the figure below.

LIFTING WEIGHTS

For details of weights and weight distribution refer to Section 9.

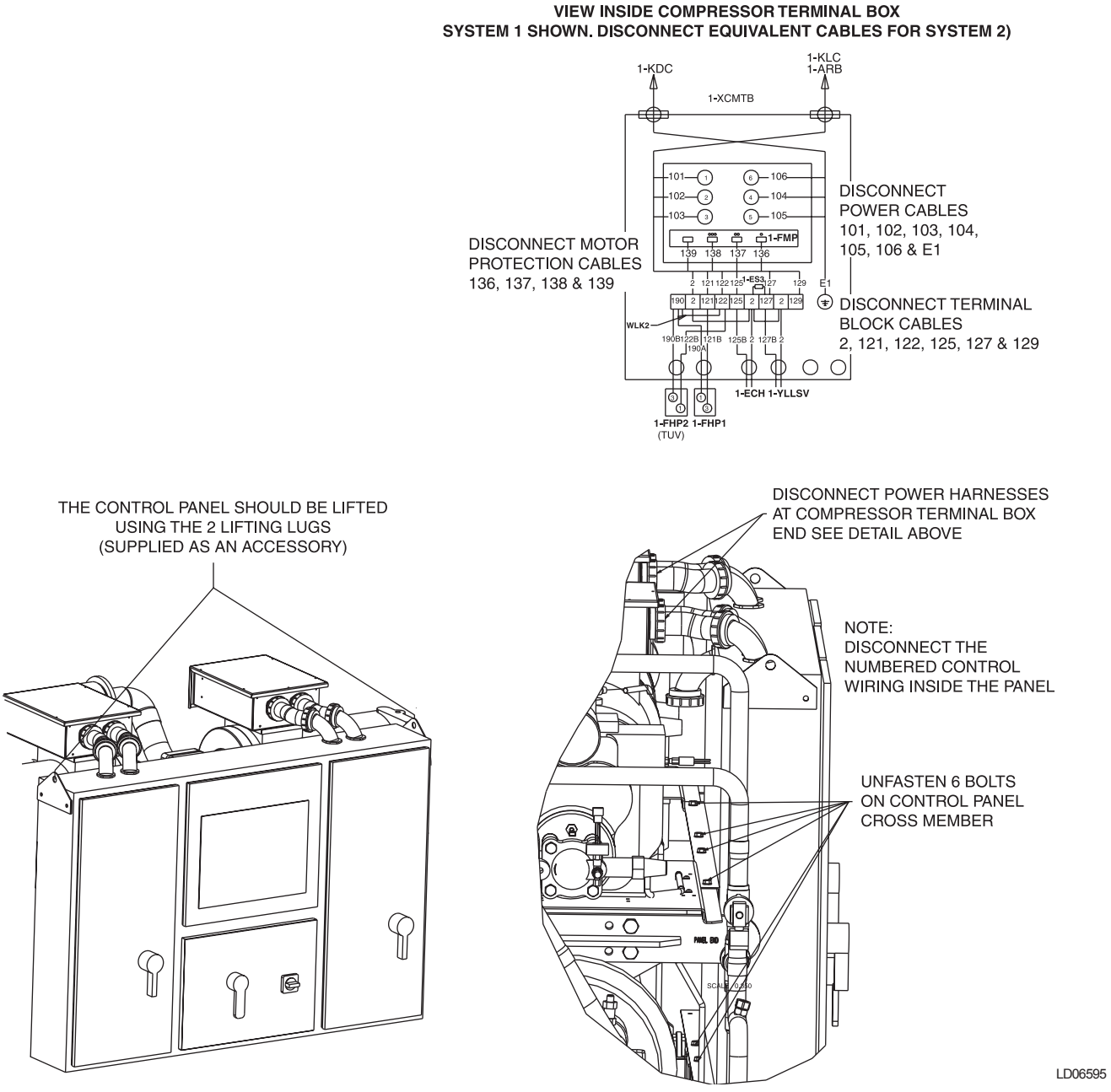


FIG. 5 – CONTROL PANEL REMOVAL

SECTION 4
INSTALLATION

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 9.

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 9.

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/removal.

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.

The unit must be installed on a suitable flat and level concrete base (2) that extends to fully support the unit base frame.

On basement foundations remove a portion of the basement floor (3) so that a concrete base can be poured resting on the ground (1) , with a corkboard (4) installed on both sides, and a waterproof sealing compound (5).

The concrete base must capable of 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) Ø 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 be supplied loose with each unit (refer to Section 9 for details).

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 9 for details.

- The water must enter the heat exchanger(s) by the inlet connection. Refer to Section 9 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. For details refer to “Electrical Connection”. 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 bar g) working pressure and having a 1" N.P.T. connection can be obtained from YORK as an option for the unit.

- The liquid pump(s) installed in the pipework system(s) should discharge 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”.

- Pipework and fittings must be 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 be used if the unit is mounted on anti-vibration mounts as some movement of the unit can be expected in normal operation.
- Pipework and fittings immediately next to the heat exchangers should be 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, and provided with a means of local isolation.
- The heat exchanger(s) must not be 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 be used during maintenance to isolate the heat exchanger without disrupting flow to other units.
- Thermometer and pressure gauge connections should be 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 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 be installed around the heat exchanger nozzles.

Heater tape of 21 watts per meter under the insulation is recommended, supplied independently and controlled by an ambient temperature thermostat set to switch on at 37°F (3°C) above the freezing temperature of the liquid.

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).

WATER TREATMENT

The unit performance given in the Design Guide is based on a fouling factor of 0.00025 ft²hr °F/Btu (0.044 m² °C/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). YORK 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, 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.

PIPEWORK ARRANGEMENT

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

Recommendations of the Building Services Research Association

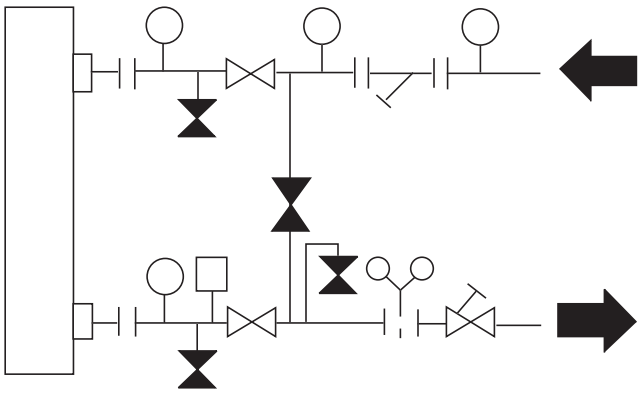


FIG. 6 – CHILLED LIQUID SYSTEM

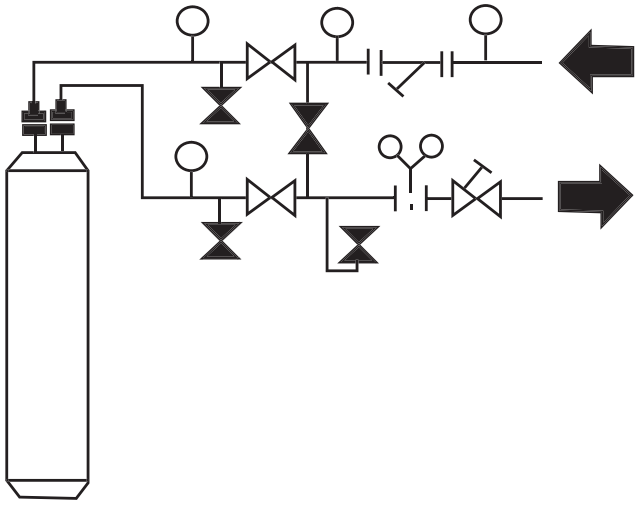


FIG. 7 – CONDENSER COOLING LIQUID SYSTEM

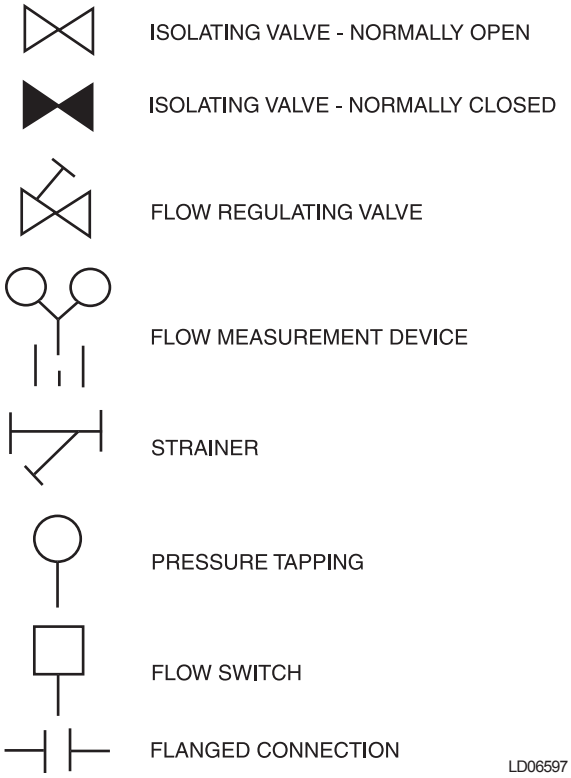


FIG. 8 – PIPEWORK ARRANGEMENT LEGEND

CONNECTION TYPES & SIZES

For connection sizes relevant to individual models refer to Section 9.

Cooler Connections

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

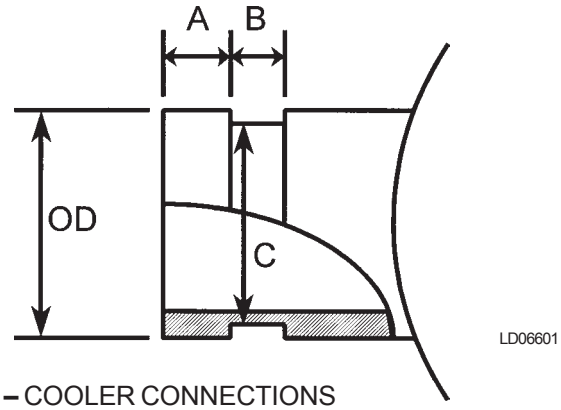


FIG. 9 – COOLER CONNECTIONS

TABLE 2 – 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

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).

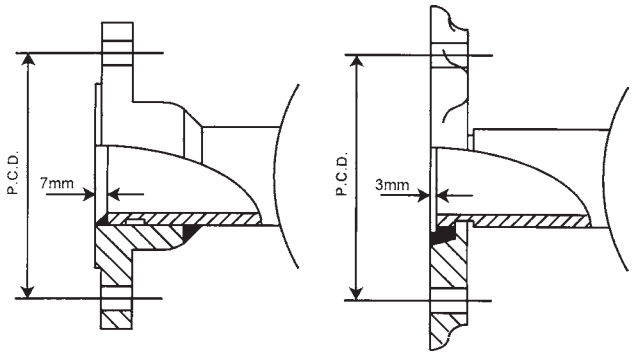


FIG. 10 – VICTAULIC - ADAPTER FLANGES

REFRIGERANT RELIEF VALVE PIPING

The cooler and condenser are each protected against internal refrigerant overpressure by refrigerant relief valves. Refer to Section 9 for details.

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.

CONDENSER COOLING LIQUID SYSTEMS

YORK YCB/Remote Air-cooled Condenser or Evaporative Condenser may be used – Refer to Installation & Operation Instructions per manufacturer.

CONDENSER PIPING

Discharge Lines

Pressure loss in the discharge line increases the power to capacity ratio (kW/ton) of the system and decreases the compressor capacity. This is illustrated in Figure 11. ASHRAE recommends a saturation temperature change of 1°F based on frictional pressure drop for discharge line sizing. Table 3 contains discharge line sizing data for refrigerant R22. Capacities are for a condensing temperature of 105°F and correction factors are given at the bottom of the tables for other condensing temperatures.

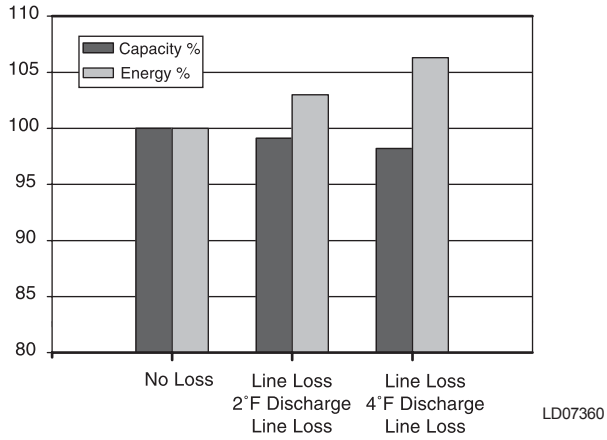


FIG. 11 – EFFECT OF SUCTION AND DISCHARGE LINE PRESSURE DROP ON CAPACITY AND POWER. (R-22 system operating at 100°F saturated condensing and 40°F saturated evaporating temperature. Energy percentage is rated at kW/ton.)

Liquid Lines

Pressure drop in liquid lines causes flashing of the refrigerant and reduction in pressure at the liquid feed device. ASHRAE recommends that systems be designed so that the pressure drop be no more than 1 to 2°F change in saturation temperature. Table 3 contains liquid line sizing data for refrigerants R-22 based on frictional pressure drop causing a 1°F change in saturation temperature. Liquid sub-cooling is the only means of overcoming the liquid line pressure loss to ensure liquid entering the expansion device. Insufficient sub cooling may lead to flashing of liquid refrigerant in the liquid line, which may result in degradation of system performance. Liquid line risers are an additional source of pressure loss. The loss in the risers is approximately 0.5 psi per foot of liquid lift (ASHRAE). Other losses include those caused by accessories like solenoid valves, filter driers, hand valves, etc. Liquid lines from the condensers to the receivers should be sized for a refrigerant velocity of 100 fpm or less to ensure positive gravity flow without backup of liquid flow.

TABLE 3 – DISCHARGE AND LIQUID LINE CAPACITIES IN TONS FOR REFRIGERANT 22

LINE SIZE	DISCHARGE LINES (Δt = 1°F, Δp = 3.03 PSI)					LINE SIZE	LIQUID LINES	
TYPE L	SATURATED SUCTION TEMPERATURE, °F					TYPE L	VEL. = 100	Δt = 1°F
COPPER, O.D.	-40	-20	0	20	40	COPPER, O.D.	FPM	Δp = 3.03
1/2	0.75	0.78	0.8	0.83	0.85	**1/2**	2.4	3.7
5/8	1.4	1.5	1.5	1.6	1.6	**5/8**	3.8	7.0
3/4	2.4	2.5	2.6	2.6	2.7	**3/4**	5.7	12.0
7/8	3.7	3.8	4.0	4.1	4.2	**7/8**	8.0	18.6
1-1/8	7.5	7.8	8.0	8.3	8.5	**1-1/8**	13.6	37.8
1-3/8	13.1	13.5	14.0	14.4	14.8	**1-3/8**	20.7	66.1
1-5/8	20.6	21.4	22.1	22.8	23.4	**1-5/8**	29.3	104.7
2-1/8	42.7	44.2	45.7	47.1	48.4	**2-1/8**	51.0	217.5
2-5/8	75.3	78.0	80.6	83.1	85.3	**2-5/8**	78.7	385.0
3-1/8	119.9	124.3	128.4	132.3	135.9	**3-1/8**	112.3	615.0
3-5/8	177.9	184.4	190.6	196.3	201.6	**3-5/8**	151.8	914.6
4-1/8	250.6	259.7	268.4	276.5	283.9	**4-1/8**	197.4	1291.0
5-1/8	447.0	463.3	478.7	493.2	506.4	**5-1/8**	307.6	–
6-1/8	717.1	743.2	768.0	791.2	812.5	**6-1/8**	442.2	–
STEEL								
IPS	**SCH**					**IPS**	**SCH**		
1/2	**40**	1.5	1.6	1.7	1.7	1.8	**1/2**	**80**	3.9	5.8
3/4	**40**	3.3	3.4	3.5	3.6	3.7	**3/4**	**80**	7.1	13.1
1	**40**	6.1	6.4	6.6	6.8	7.0	**1**	**80**	11.9	25.8
1-1/4	**40**	12.7	13.1	13.6	14.0	14.3	**1-1/4**	**80**	21.1	55.4
1-1/2	**40**	19.0	19.7	20.3	21.0	21.5	**1-1/2**	**80**	29.1	84.5
2	**40**	36.6	37.9	39.2	40.4	41.5	**2**	**40**	55.3	196.5
2-1/2	**40**	58.3	60.4	62.5	64.3	66.1	**2-1/2**	**40**	78.9	313.4
3	**40**	103.0	106.7	110.3	113.6	116.7	**3**	**40**	121.8	554.0
4	**40**	209.6	217.3	224.5	231.3	237.5	**4**	**40**	209.8	1129.0
5	**40**	378.3	392.1	405.2	417.4	428.6	**5**	**40**	329.7	2039.0
6	**40**	611.1	633.3	654.4	674.1	692.3	**6**	**40**	476.2	3294.0

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.

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

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

Saturation temperature Δt for other capacities and equivalent lengths L_e

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

The refrigerant cycle for determining capacity is based on saturated gas leaving the evaporator and no subcooling in the condenser. Discharge superheat is 105°F. The saturated suction temperature is 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	1.12	0.82
90	1.07	0.89
100	1.03	0.96
110	0.97	1.03
120	0.92	1.10
130	0.87	1.16
140	0.82	1.22

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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.

After connection do not switch on mains power to the unit until it has been commissioned by YORK 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 YORK Authorized personnel. If the switch is set to the "ON" position before commissioning then it must be reported to YORK, otherwise the warranty may be invalidated.

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 9.

In accordance with National Electrical 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 points of isolation (not supplied by YORK).

Units with Single-Point Power Supply Wiring

Models require one field provided 200, 3Ø, 60 Hz; 230VAC, 3Ø, 60 Hz; 380V, 3Ø, 60 Hz; 460V, 3Ø, 60 Hz; 575V, 3Ø, 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 9.

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, 3Ø, 60 Hz; 230VAC, 3Ø, 60 Hz; 380V, 3Ø, 60 Hz; 460V, 3Ø, 60 Hz; 575V, 3Ø, 60 Hz, supplies with circuit protection and a separate control supply with circuit protection (200, 3Ø, 60 Hz; 230VAC, 3Ø, 60 Hz; 380V, 3Ø, 60 Hz; 460V, 3Ø, 60 Hz; 575V, 3Ø, 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 9.

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 9.

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.

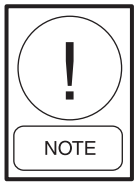
Remote Emergency Stop Device (QRRSB)

A remote emergency stop device may be wired into the unit. This device should be rated at 8 amps, 230V, AC-15 and is protected by a maximum fuse size of 8 amps class gG.

The emergency stop device should be wired into terminals 3 and 4 of the door interlocked emergency stop device located in the common input section after removing the link.

COMMON INPUT SECTION WIRING

All wiring to the customer relay board (ACRB) volt free contacts (XVFT) require a supply, maximum 254V, provided by the customer. The customer must take particular care deriving the supplies for the volt free terminals with regard to a common point of isolation. These circuits when used must be fed via the common point of isolation so that the voltage is removed when the common point of isolation to the unit is opened.



In accordance with National Electrical Code (N.E.C.) it is recommended that the customer wiring to these terminals uses orange wires. This will ensure that circuits not switched off by the supply disconnecting device are distinguished by color so that they can easily be identified as live even when the disconnecting device is off.

The volt-free contacts are rated at 125VA. All inductive devices (relays) switched by the volt-free contacts must have their coil suppressed using standard R/C suppressors.

Chilled Liquid Pump (CLP)

Terminals 5 and 6 (XVFT) 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.

Common Run Signal (CRS)

Terminals 3 and 4 close to indicate that a system is running. These terminals may be used to start the cooling liquid pump(s) for the condenser.

System Alarm (SA)

Terminals 1 and 8 (system 1) and 1 and 7 (system 2) close to indicate an alarm condition whenever a system locks out, or there is a power failure.

CONTROL PANEL WIRING

All wiring to the control panel terminal block (XTB1) (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 XTB1 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 24 and 13 to provide adequate protection against loss of liquid flow.

Remote Run/Stop

Connect remote switch(es) in series with the flow switch to provide remote run/stop control if required.

Remote Print (PNT)

Closure of suitable contacts connected to terminals 28 and 13 will enable a hard copy printout of Operating Data/Fault History to be obtained (an optional printer must be connected to the RS 232 port on the microprocessor board).

Remote Setpoint Offset – Temperature (PWMT)

Timed closure of suitable contacts connected to terminals 27 and 13 (PWM contacts) will give remote offset function of the chilled liquid setpoint if required.

Remote Setpoint Offset – Current (PWMC)

Timed contact closure of a suitable contact connected to terminals 26 and 13 (PWM contact) will give remote offset of EMS% CURRENT LOAD LIMIT.

CUSTOMER WIRING DATA

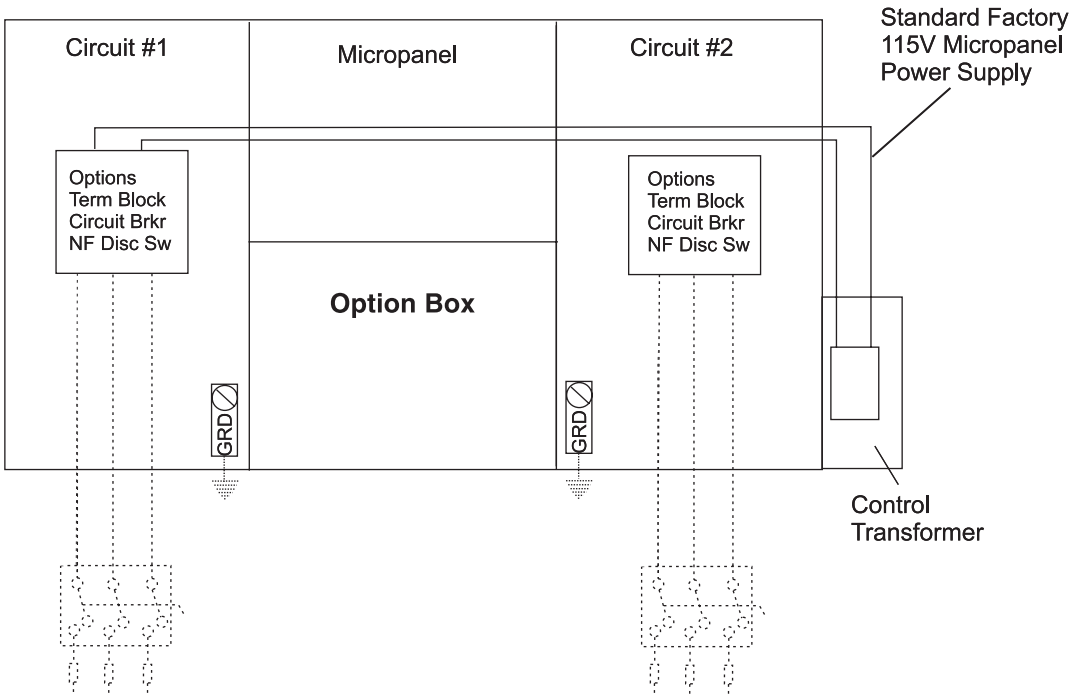


FIG. 12 – MULTI-POINT POWER SUPPLY CONNECTION - STANDARD UNIT

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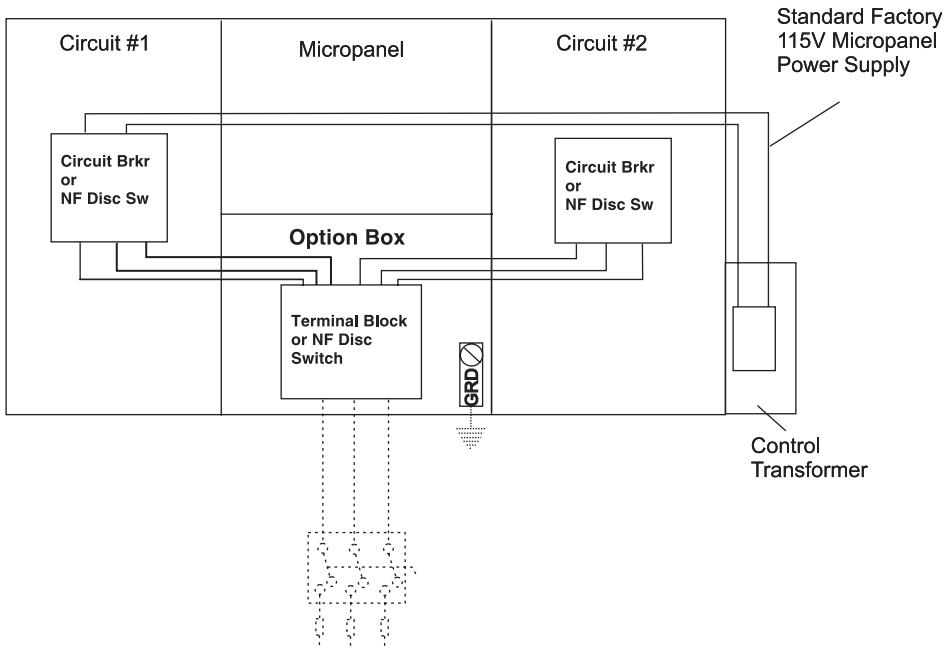


FIG. 13 – SINGLE-POINT POWER SUPPLY WITH INTERNAL CIRCUIT BREAKER OR NON-FUSED DISCONNECT SWITCH

CUSTOMER WIRING DATA

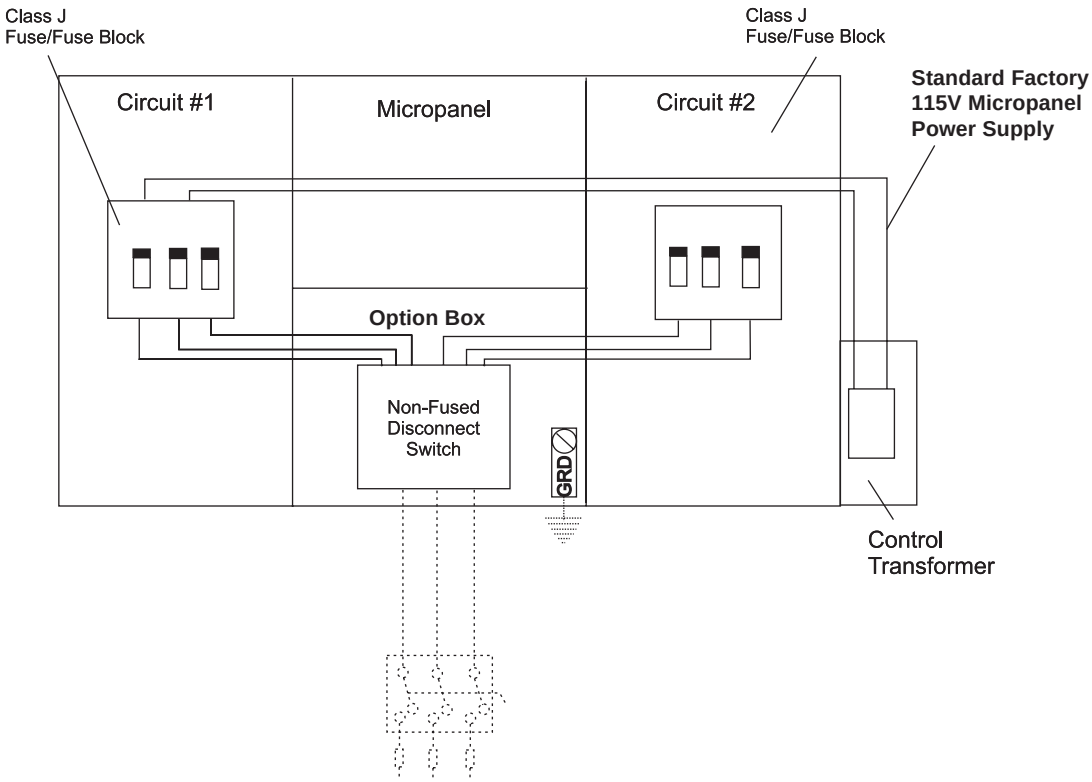


FIG. 14 – OPTIONAL SINGLE-POINT POWER SUPPLY WITH INTERNAL CLASS J FUSES/BLOCK

CONNECTION DIAGRAM LEGEND AND NOTES

NOTES:

1. Dashed line indicates field provided wiring
2. The above recommendations are based upon the National Electric Code and the use of copper connectors only. Field wiring must comply with local codes.
3. Single-Point Non-Fused Disconnect Switch is not offered with additional separate Non-Fused Disconnect Switches

VOLTAGE CODE

17 = 200-3-60
28 = 230-3-60
40 = 380-3-60
46 = 460-3-60
58 = 575-3-60

LEGEND

TERM BLOCK	TERMINAL BLOCK (FACTORY MOUNTED)
C.B.	CIRCUIT BREAKER (FACTORY MOUNTED)
NF DISC SW	NON-FUSED DISCONNECT SWITCH (FACTORY MOUNTED)
D.F.	DUAL FUSE
DISC	SW DISCONNECT SWITCH
HZ	HERTZ
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MIN	MINIMUM
MIN NF	MINIMUM NON FUSED
RLA	RATED LOAD AMPS
Y-D LRA	WYE-DELTA INRUSH LOCKED ROTOR AMPS

SECTION 5
COMMISSIONING

COMMISSIONING

Preparation

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

The Microprocessor Based Control System (MBCS) Operating Instructions must be read in conjunction with this section.

The unit 'ON/OFF' toggle switch on the front of the control panel has been set to the 'OFF' position at the factory. This switch must remain in the 'OFF' position, preventing running of the unit until commissioned by YORK Authorized personnel. If the switch has been set to the 'ON' position before commissioning then it must be reported to YORK otherwise the warranty may be invalidated.

Preparation – Power Off

The following checks should be made with the customer supply/supplies 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 as standard with a nitrogen holding charge. Repaired systems and units supplied with a nitrogen holding charge must be evacuated with a suitable vacuum pump/recovery unit as appropriate to below 100 microns.

REFRIGERANT	BREAK VACUUM FROM BOTTLE CONNECTION FOR:	RAISE SYSTEM PRESSURE TO APPROXIMATELY:
R-22	LIQUID	70 PSIG (4.6 BARG)

Charging from the liquid connection is necessary on R-22 to ensure the correct refrigerant mix is maintained.

Do not charge liquid refrigerant with static water in the cooler. Care must also be taken to charge liquid refrigerant slowly to avoid excessive thermal stress at the charging point. Once the vacuum is broken, charge into the condenser with the full operating charge as given in Section 9.

Valves: Open the compressor suction and discharge and liquid line service valves on both systems.

Compressor oil: The compressor oil level must be between the two sight glasses on the oil separators.

Isolation/protection: Verify that all sources of electrical supply to the unit are taken from point(s) of isolation.

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 the customer power cables are connected correctly. Ensure that connections of power cables within the panels to the circuit breakers, terminal blocks or switch disconnectors are tight.

Earthing: Verify that the units protective terminal(s) are properly connected to a suitable earthing point. Ensure that all unit internal earth connections are tight.

Compressor Motor Protector Module (-FMP) Current Overloads: Check the factory setting of the current overload trip value for each compressor motor:

STAR DELTA OPEN TRANSITION STARTING – 200V/60 HZ

YCRS	SYSTEM	SYS X MOTOR CURRENT = 100% FLA	SYS X MP INPUT VOLTAGE = 125% FLA	115% FLA	AMP SET	DIP SWITCH SETTINGS ON -FMP LEFT = 1 RIGHT = 0							
						128	64	32	16	8	4	2	1
0100	1 & 2	172	2.51	198	114	0	1	1	1	0	0	1	0
0120	1	172	2.51	198	114	0	1	1	1	0	0	1	0
	2	231	3.37	266	153	1	0	0	1	1	0	0	1
0140	1 & 2	231	3.37	266	153	1	0	0	1	1	0	0	1
0180	1	233	3.39	268	155	1	0	0	1	1	0	1	1
	2	296	4.31	340	196	1	1	0	0	0	1	0	0
0200	1 & 2	296	4.31	340	196	1	1	0	0	0	1	0	0
0220	1	296	4.31	340	196	1	1	0	0	0	1	0	0
	2	357	5.20	411	237	1	1	1	0	1	1	0	1
0240	1 & 2	357	5.20	411	237	1	1	1	0	1	1	0	1

STAR DELTA OPEN TRANSITION STARTING – 230V/60 HZ

YCRS	SYSTEM	SYS X MOTOR CURRENT = 100% FLA	SYS X MP INPUT VOLTAGE = 125% FLA	115% FLA	AMP SET	DIP SWITCH SETTINGS ON -FMP LEFT = 1 RIGHT = 0							
						128	64	32	16	8	4	2	1
0100	1 & 2	149	2.17	171	99	0	1	1	0	0	0	1	1
0120	1	149	2.17	171	99	0	1	1	0	0	0	1	1
	2	201	2.93	231	133	1	0	0	0	0	1	0	1
0140	1 & 2	201	2.93	231	133	1	0	0	0	0	1	0	1
0180	1	203	2.96	233	135	1	0	0	0	0	1	1	1
	2	258	3.76	297	171	1	0	1	0	1	0	1	1
0200	1 & 2	258	3.76	297	171	1	0	1	0	1	0	1	1
0220	1	258	3.76	297	171	1	0	1	0	1	0	1	1
	2	310	4.52	357	206	1	1	0	0	1	1	1	0
240	1 & 2	310	4.52	357	206	1	1	0	0	1	1	1	0

STAR DELTA OPEN TRANSITION STARTING – 460V/60 HZ

YCRS	SYSTEM	SYS X MOTOR CURRENT = 100% FLA	SYS X MP INPUT VOLTAGE = 125% FLA	115% FLA	AMP SET	DIP SWITCH SETTINGS ON -FMP LEFT = 1 RIGHT = 0							
						128	64	32	16	8	4	2	1
0100	1 & 2	75	1.09	86	50	0	0	1	1	0	0	1	0
0120	1	75	1.09	86	50	0	0	1	1	0	0	1	0
	2	101	1.47	116	67	0	1	0	0	0	0	1	1
0140	1 & 2	101	1.47	116	67	0	1	0	0	0	0	1	1
0180	1	101	1.47	116	67	0	1	0	0	0	0	1	1
	2	129	1.88	148	86	0	1	0	1	0	1	1	0
0200	1 & 2	129	1.88	148	86	0	1	0	1	0	1	1	0
0220	1	129	1.88	148	86	0	1	0	1	0	1	1	0
	2	155	2.26	178	103	0	1	1	0	0	1	1	1
0240	1 & 2	155	2.26	178	103	0	1	1	0	0	1	1	1

STAR DELTA OPEN TRANSITION STARTING – 380V/60 HZ

YCRS	SYSTEM	SYS X MOTOR CURRENT = 100% FLA	SYS X MP INPUT VOLTAGE = 125% FLA	115% FLA	AMP SET	DIP SWITCH SETTINGS ON -FMP LEFT = 1 RIGHT = 0							
						128	64	32	16	8	4	2	1
0100	1 & 2	90	1.31	104	60	0	0	1	1	1	1	0	0
0120	1	90	1.31	104	60	0	0	1	1	1	1	0	0
	2	122	1.78	140	81	0	1	0	1	0	0	0	1
0140	1 & 2	122	1.78	140	81	0	1	0	1	0	0	0	1
0180	1	123	1.79	141	82	0	1	0	1	0	0	1	0
	2	156	2.27	179	104	0	1	1	0	1	0	0	0
0200	1 & 2	156	2.27	179	104	0	1	1	0	1	0	0	0
0220	1	156	2.27	179	104	0	1	1	0	1	0	0	0
	2	188	2.74	216	125	0	1	1	1	1	1	0	1
0240	1 & 2	188	2.74	216	125	0	1	1	1	1	1	0	1

STAR DELTA OPEN TRANSITION STARTING – 575V/60 HZ

YCRS	SYSTEM	SYS X MOTOR CURRENT = 100% FLA	SYS X MP INPUT VOLTAGE = 125% FLA	115% FLA	AMP SET	DIP SWITCH SETTINGS ON -FMP LEFT = 1 RIGHT = 0							
						128	64	32	16	8	4	2	1
0100	1 & 2	60	0.87	69	40	0	0	1	0	1	0	0	
0120	1	60	0.87	69	40	0	0	1	0	1	0	0	0
	2	81	1.18	93	54	0	0	1	1	0	1	1	0
0140	1 & 2	81	1.18	93	54	0	0	1	1	0	1	1	0
0180	1	81	1.18	93	54	0	0	1	1	0	1	1	0
	2	103	1.50	118	68	0	1	0	0	0	1	0	0
0200	1 & 2	103	1.50	118	68	0	1	0	0	0	1	0	0
0220	1	103	1.50	118	68	0	1	0	0	0	1	0	0
	2	124	1.81	143	82	0	1	0	1	0	0	1	0
0240	1 & 2	124	1.81	143	82	0	1	0	1	0	0	1	0

Supply voltage: Verify that the site voltage supply corresponds to the unit requirement and is within the limits given in Section 9.

Switch Settings: Ensure that the unit 'ON/OFF' toggle switch on the control panel and the microprocessor board system switches 'S2' and 'S3' are set to 'OFF'. Set the red emergency stop device on the common input section to '1' (ON). For units fitted with door interlocked isolators the power section doors must be closed and the devices set to '1' (ON). The customers disconnection devices can now be set to 'ON'.

The unit is now live!

Compressor heaters: Verify the compressor heaters are energized.

Chilled Liquid System: Verify that the chilled liquid system has been installed correctly, and has been commissioned with the correct direction of water flow through the cooler. Purge air from the top of the cooler using the plugged air vent mounted on the top of the cooler body.

Cooling Liquid System: Verify that the cooling liquid system has been installed correctly, and has been commissioned with the correct direction of water flow through the condenser. Purge air from the top of the condenser using the plugged air vent mounted at the top of the condenser water head.

Cooler and Condenser flow rates and pressure drops must be within the limits given in Section 9. Operation outside of these limits is undesirable and could cause damage.

Flow switch: Verify a chilled liquid flow switch is correctly fitted in the customer's pipework on the cooler outlet, and wired into the control panel correctly.

Temperature sensor(s): Ensure the chilled liquid temperature sensors are coated with heat conductive com-

pound (Part No. 013-00890-000) and inserted in the sensor pockets of the cooler. This outlet sensor also acts as the freeze protection thermostat sensor and must always be fitted.

Ensure the cooling liquid temperature sensor is coated with heat conductive compound (Part No. 013-00890-000) and inserted in the outlet sensor pocket of the condenser.

Control supply: Verify the control panel display is illuminated.

HP Cutout Reset: Check that the hand reset mechanical high pressure cutouts mounted on the compressors are at the correct setting and are reset.

Programmed Options: Verify that the options factory programmed into the Microprocessor Based Control System are in accordance with the customers order requirements by pressing the 'OPTIONS' key on the keypad and reading the settings from the display. Refer to the MBCS Section for notes and explanation of messages.

Programmed Settings: Ensure the system cutout and operational settings are in accordance with the instructions given in the MBCS Section and with operational requirements by pressing the 'PROGRAM' key.

Date and time: Program the date and time by first ensuring that the CLK jumper J18 on the microprocessor board is in the 'ON' position. Then press the 'SET TIME/DATE' key and set the date and time (see MBCS Section).

Start/Stop Schedule: Program the daily and holiday start/stop by pressing the 'SET SCHEDULE/HOLIDAY' key (see MBCS Section).

Setpoints: Set the required leaving chilled liquid temperature setpoint and control range using the 'LOCAL COOLING SETPOINTS' and 'REMOTE COOLING SETPOINTS' keys. (see MBCS Section).

FIRST TIME START-UP

During the commissioning period there should be sufficient heat load to run the unit under stable full load operation to enable the unit controls, and system operation to be set up correctly and a commissioning log taken. Read the following section in conjunction with the MBCS Section, then proceed step by step as follows:

Interlocks: Verify that liquid is flowing through the cooler and that heat load is present. Ensure that any remote run interlocks are in the run position and that the run schedule requires the unit to run or is overridden.

System switches: Set the system 1 switch on the microprocessor board to the 'ON' position – see operating sequence in the MBCS Section.

Start-up: Press the 'STATUS' key, and set the toggle switch to the 'ON' position to start the unit (there may be a few seconds delay before the first compressor starts because of the anti-recycle timer). Be ready when each compressor starts, to switch the unit off immediately if any unusual noises or other adverse conditions develop. Use the emergency stop device if necessary. Also refer to the MBCS Section for the normal operating sequence from start-up.

Oil Pressure: When a compressor starts, press the relevant 'SYSTEM DATA' key and verify that oil differential pressure develops immediately. If oil pressure does not develop, the automatic CONTROLS WILL shut down the compressor. Under no circumstances should a restart attempt be made on a compressor which does not develop oil pressure immediately.

Refrigerant Flow: When a compressor starts a flow of liquid refrigerant will be seen in the liquid line sight glass. After several minutes operation and providing a full charge of refrigerant is in the system, the bubbles will disappear and be replaced by a solid column of liquid.

Suction Superheat: Check suction superheat at steady full compressor load only. It is important that no bubbles show in the liquid line sight glass. Superheat should be 10°F (4°C to 5°C) relative to the 'dew' temperature.

Expansion Valve Adjustment: The expansion valves are factory set and should not need adjustment. If any superheat values are out of range, however, the expansion valve adjusting screw should be adjusted no more than 1 turn at a time ('in' to increase superheat, 'out' to decrease superheat), allowing at least 10 minutes for the valve to stabilize before rechecking the value of superheat.

Subcooling: Check liquid subcooling at steady full compressor load only. It is important that cooling system is operating correctly. Subcooling should be 10°F relative to the 'bubble' temperature.

General Operation: After completion of the above checks for system 1 repeat the process for system 2. When the checks are complete stop the unit, switch both system switches to the 'ON' position and restart the unit. Check that loading occurs as specified in the MBCS and that general operation is correct.

SECTION 6
UNIT OPERATION

UNIT OPERATION

General Description

The units are designed to work independently, or in conjunction with other equipment via a YORK ISN building management system or other automated control system. When operating, the unit controls monitor the chilled liquid system temperature at the unit and take the appropriate action to maintain this temperature within desired limits. This action will involve running one or both compressors at a suitable load step to match the cooling effect of the refrigerating systems to the heat load on the liquid system. The heat removed from the chilled liquid is then rejected via the water cooled condenser.

The following sections give an overview of the operation of the unit. For detailed information, reference should be made to the MBCS Operating Instructions for the unit.

START-UP

Check the main power supplies to the unit are 'ON', all refrigerant service valves are open (anti-clockwise one turn short of fully open) and chilled liquid flow has been established (unless the unit chilled liquid pump start control is being used, in which case just ensure the pump supply is on). Ensure that system 1 and 2 switches on the microprocessor circuit board are in the 'ON' position.

Press the 'STATUS' key on the keypad and then switch the unit 'ON/OFF' toggle switch below the keypad to the 'ON' position.

The controller will perform a pre-check to ensure that the daily/holiday schedule and any remote interlocks will allow the unit to run, all safety cutouts are satisfied and that cooling load is required (i.e. that the chilled liquid temperature is outside the set limits). Any problems found by the pre-check will be displayed if present. If no problems are present and cooling duty is required the lead compressor will start. The display will show the anti-coincidence timer status for the lag compressor.

NORMAL RUNNING AND CYCLING

Once the unit has been started, all operations are fully automatic. After an initial period at minimum capacity on the lead compressor, the control system will adjust the unit load depending on the chilled liquid temperature and rate of temperature change. If high heat load is present, the controller will increase the capacity of the lead compressor and/or start-up the other compressor.

If very little heat load is present, the lead compressor will continue at minimum capacity or may simply stop again to avoid overcooling the liquid. If the latter is the case, one compressor will restart automatically should the liquid temperature rise again.

When a compressor is running the controller monitors oil pressure, motor current, and various other system parameters such as discharge pressure, chilled liquid temperature, etc. Should any problems occur, the control system will immediately take appropriate action and display the nature of the fault (see MBCS Section).

SHUTDOWN

The unit can be stopped at any time by switching the unit 'ON/OFF' toggle switch just below the keypad to the 'OFF' position. The compressor heaters will energize to prevent refrigerant condensing in the compressor rotors and to prevent the compressor oil becoming saturated with refrigerant.

To prevent damage to the unit the control supply to the compressor heaters should not be switched off, even when the unit is not required to run.

If mains power must be switched off, (for extended maintenance or a shutdown period), the compressor suction, discharge and liquid line service valves on both systems should be closed (clockwise) and if there is a possibility of liquid freezing due to low ambient temperatures, the cooler and condenser should be drained. The valves should be opened, the cooler and condenser refilled and the power must be switched on **for at least 8 hours before the unit is restarted!**

SECTION 7
MICROPANEL

1. INTRODUCTION & PHYSICAL DESCRIPTION

1.1 SYSTEM SWITCHES 1 - 2

System switches for each refrigerant system are located on the AMB board. These switches allow the operator to selectively turn a given system 'ON' or 'OFF' as required.

1.2 INTERNAL CLOCK & MEMORY BACKUP BATTERY

The AMB board contains a real time clock (RTC) integrated circuit chip with an internal battery backup. The battery backup assures that any programmed values (setpoints, clock, cutouts, etc.) are not lost during a power failure or shutdown period regardless of the time involved.

The battery is a 10 year lithium type, but life will depend upon whether the RTC internal clock circuit is energized. With the clock 'OFF', a rated life of approximately 10 years can be expected. With the clock 'ON', approximately 5 years. The clock is enabled and disabled using a jumper on the AMB board.

If the chiller is shutdown or power failure is expected for extended periods, it may be desirable to disable the clock to save battery life. The clock can then be reactivated and reprogrammed when the chiller is returned to service. This will not affect the maintenance of programmed values and stored data by the backup battery. While a chiller is operating, the clock must be 'ON' or the internal clock on the microprocessor will not be active and the microprocessor cannot keep track of time, although all other functions will operate normally. Failure to turn the Clock 'ON' could result in the chiller not starting due to the time "frozen" on the clock falling outside the start/stop time programmed in the 'DAILY SCHEDULE'.

1.3 POWER SUPPLY BOARD (APB)

The onboard switching power supply is fuse protected and converts 24VAC from the logic transformer 2T to +12VDC REG which is supplied to the AMB board, ARB boards, and the 40 character display to operate the integrated circuitry. The 24VAC is filtered, but not regulated, to provide unregulated + 24VDC to supply the flow switch, PWM remote temperature reset, PWM remote current reset, lead/lag select, and remote print circuitry which may be utilized with user supplied contacts.

The 24VAC is also filtered and regulated to +24VDC to be used by the optional EMS/BAS circuit boards for remote temperature or remote current reset.

1.4 INPUT/OUTPUT EXPANSION BOARD (AIOB)

The AIOB boards provide multiplexing to allow additional inputs to be connected to the AMB board via a single data line. The additional inputs are multiplexed according to the selection made by the microprocessor through address lines.

Signals routed through the AIOB board are Discharge, Oil and Cooler Inlet Refrigerant temperatures. Signals from the motor protector modules representing motor current are also routed through the AIOB board.

Included on the AIOB boards are the outputs for the slide valve control. This control consists of a Digital to Analogue Converter (DAC) and power transistors to modulate current through the slide valve solenoids. Power to drive the slide valves is taken from Transformer T3.

1.5 RELAY OUTPUT BOARD (ARB)

The ARB boards operate the motor contactors / starters, solenoid valves, and heaters which control system operation.

The relay boards are located in the logic section of the control panel. The boards convert 0 - 12VDC logic outputs from the AMB board to 115VAC used by the contactors, valves, etc.

The common side of all relays on the ARB board is connected to +12VDC REG. The open collector outputs of the AMB board energize the DC relays by pulling the other side of the relay coil to 0VDC. When not energized, both sides of the relay coils or triacs will be at +12VDC potential.

1.6 CIRCUIT BREAKERS (QCB)

Circuit breakers are provided for the 115VAC controls. Individual circuit breakers remove the control supply to each refrigerant circuit. Specifically, the 115VAC fed to the ARB boards, which energize the contactors and solenoids.

An additional circuit breaker removes the control supply to the transformers which feed the APB board FMP modules and AIOB board.

The circuit breakers remove the 115VAC control supply only. The 3-phase circuitry will still be energized from the power supply.

1.7 CURRENT TRANSFORMERS (CT)

Current transformers located internally in the motor protector modules (one for each of the 3-phases of the power wiring of each compressor motor) send a VDC signal proportional to motor current to the AIOB. These analogue levels are then converted to a digital signal and fed to the AMB board allowing the microprocessor to monitor motor currents for low current and high current.

1.8 TRANSFORMERS

Transformers are located in the control panel, which convert the 115VAC control supply to 24VAC to operate the microprocessor circuitry, 24VAC to operate the motor protection modules and 12VAC to the AIOB to drive the slide valves.

1.9 MOTOR PROTECTOR MODULES

A motor protector module for each compressor is located in the control panel. These modules provide motor over-temperature protection, 3-phase current protection, phase imbalance, phase rotation, and a programming and troubleshooting 7 segment display.

The motor over-temperature protection is supplied by 3 temperature sensors imbedded in the motor windings 120 degrees apart. The module monitors these sensors allowing it to sense a hot winding and shutdown the compressor if motor cooling is inadequate.

The onboard CTs provide 3-phase current protection which look at phase current and send an analogue signal proportional to average motor current to AIOB board and on to the AMB board for microprocessor low/high current protection and current display. This allows the microprocessor to monitor current and shut a system down if low or high motor current is sensed. This is a non-adjustable protection circuit electronically sized to a system's motor specifications.

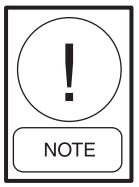
Internally, the onboard 3 CTs and internal circuitry allow the motor protector module to protect against high motor current as programmed on the motor protector dip switches. These switches are set at the factory according to motor specifications.

The module also provides phase rotation protection to assure the screw compressor does not rotate backwards.

A single phase protection circuit located in the module also monitors for a phase imbalance. If current imbalance exceeds a number of preset levels of the average motor current in one of the phases, the motor protector will recognize it and shutdown the system.

Whenever the Motor Protector Module senses a fault, an internal contact will open and shutdown the system. This contact is wired in series with the compressor motor contactor. When the contact opens, the microprocessor will attempt to start the system 2 more times. Since the motor contactor signal path from the ARB board to the motor contactor is broken by the motor protector module contact, it will lock the system out after 3 faults.

The motor protector module must then be reset by removing 115VAC power from the control panel. After the motor protector is reset, the individual system switch must be switched 'OFF' and then 'ON' to reset the microprocessor to allow restart of the system.



When a module faults, a thorough investigation of the problem should be performed before attempting to return the system to operation. Failure to perform this investigation could lead to motor or compressor failure.

1.10 LOGIC SECTION

The logic section of the control panel contains the relay output boards (ARB), which have 115VAC connected to them.

All wiring to the logic section customer terminal blocks are nominal 30VDC and must be run in screened cable, with the screen earthed at panel end only. Run screen cable separately from mains cable to avoid electrical noise pick-up. Use the gland plate on the back of the logic section to avoid the mains cables. The length of the cable must not exceed 7.5 meters.

The voltage free contacts must be suitable for 30VDC (gold contacts recommended). If voltage free contacts form part of a relay or contactor, the coil of this device must be suppressed by 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 units and its controls.

The microprocessor based control system can accept remote signals to start and stop the chiller, to adjust maximum allowable running current for each compressor, and to adjust the chilled liquid leaving temperature setpoint. These functions can easily be controlled by connecting user supplied 'voltage free' contacts to the customer terminals in the control panel.

1.11 REMOTE START/STOP

Remote start/stop can be accomplished using a time clock, manual contact or other 'voltage free' contact in series with the flow switch (Terminals 13 and 24) connected to terminals in the logic section of the control panel. The contact must be closed to allow the chiller to run. Any time the contact opens, the chiller will shutdown and the 'NO RUN PERM' message will be displayed.

The flow switch should never be bypassed. This will cause damage to the chiller and invalidate the warranty.

For individual system start stop contacts connect flow switch to terminal 13 to feed the two start stop contacts. Then connect No. 1 system start stop contact to terminal 24 and No. 2 system start stop contact to terminal 25. With the associated contact open the 'NO RUN PERM' message will be displayed and the associated systems will not run.

1.12 REMOTE CURRENT RESET

The maximum allowable running current for each compressor can be adjusted remotely to a lower value using repeated timed closure of 'voltage free' contacts (Terminals 13 and 26). The duration of the contact closure will determine the amount of adjustment.

Generally, this input is used for purposes of demand limit and operates as follows:

Closing the input contact for a defined period of time allows reset of the % current limit downward.

- Contact closure of 1 - 11 seconds will allow % current limiting to be adjusted downward from 105% by a maximum of 75%, i.e. to a minimum value of 30% FLA.

EMS current limiting operates independently of the high average current unload. The microprocessor will always look at the two current limit setpoints and choose the lower as the controlling value, whenever remote current limiting is utilized.

- Contact closures of less than 1 second will be ignored.
- A closure of 11 seconds is the maximum allowable closure and provides a Current Limit reduction of 75%.

7

The remote reset current can be calculated as follows:

$$\text{REMOTE RESET CURRENT} = \frac{105\%\ \text{FLA} - [(\text{CONTACT CLOSED TIME} - 1\ \text{SEC}) \times (75\%\ \text{FLA})]}{10\ \text{SEC}}$$

For example, after a 4 second pulse, the offset would equal:

$$\text{REMOTE RESET CURRENT} = \frac{105\%\ \text{FLA} - [(4\ \text{sec} - 1\ \text{sec}) \times (75\%\ \text{FLA})]}{10\ \text{sec}}$$

$$\text{REMOTE RESET CURRENT} = \frac{105\% - 225\%\ \text{FLA sec}}{10}$$

$$\text{REMOTE RESET CURRENT} = 82.5\%\ \text{FLA}$$

To maintain a given offset, the contact closure signal must be repeated at not more than 30 minute intervals but not less than 30 seconds from the end of each PWM signal. After 30 minutes, if no refresh is provided, the setpoint will change back to its original value.

After an offset signal, the new remote current limit may be viewed on the remote EMS limiting display under the 'MOTOR CURRENT' key (see Section 3.5). However, if this display is being viewed when the reset pulse occurs, the setpoint will not change on the display. To view the new offset, first press any other display key on the keypad and then press the 'MOTOR CURRENT' key.

Remote EMS reset will not operate when a Remote Control Center Option Kit is connected to the microprocessor. The Remote Control Center will always determine the setpoint.

Wiring from remote 'voltage free' contacts (for reset functions) should not exceed 25 feet (7.5 meters), and should be run in grounded conduit that carries only control wiring. If an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a standard RC suppressor across the inductive coil.

1.13 REMOTE SETPOINT RESET

The chilled liquid leaving temperature setpoint programmed into the microprocessor can be remotely adjusted to a higher value using repeated timed closure of 'voltage free' contacts (Terminals 13 & 27). The duration of the contact closure will decide the amount of adjustment.

This is achieved as follows:

The maximum allowable reset value can be programmed from 2°F to 40°F (1°C to 22°C), as appropriate to the application. Once the maximum reset is programmed, an input contact closure of 11 seconds provides the maximum reset. Closure for less than 11 seconds will provide a smaller reset. For noise immunity, the microprocessor will ignore closures of less than 1 second.

To calculate the necessary contact closure time to provide a required Reset, use the following steps:

$$\text{RESET TEMPERATURE OFFSET} = \frac{[(\text{CONTACT CLOSURE} - 1\ \text{SEC}) \times \text{PROGRAMMED MAX RESET}]}{10\ \text{SEC}}$$

For example, with a programmed setpoint of 44°F (7°C), after a 4 second pulse and a programmed maximum offset of 40°F (22°C), the temperature offset would equal:

$$\text{RESET TEMPERATURE OFFSET} = \frac{(4\ \text{sec} - 1\ \text{sec}) \times 40°\text{F}\ (22°\text{C})}{10\ \text{sec}}$$

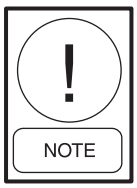
$$\text{RESET TEMPERATURE OFFSET} = \frac{120°\text{F}\ (66°\text{C})\ \text{sec}}{10\ \text{sec}}$$

$$\text{RESET TEMPERATURE OFFSET} = 12°\text{F}\ (6.6°\text{C})$$

To determine the new setpoint, add the reset to the setpoint programmed into memory. In the example above, if the programmed setpoint = 44°F (7°C), the new setpoint after the 4 second contact closure would be 44°F + 12°F = 56°F (7°C + 6.6°C = 13.6°C). This new setpoint can be viewed on the display using the 'REMOTE COOLING SETPOINTS' key.

To maintain a given offset, the contact closure signal must be repeated every 30 seconds to 30 minutes. The refresh is not accepted sooner than 30 seconds from the end of the last PWM signal, but must be refreshed before 30 minutes has elapsed. After 30 minutes, if no refresh is provided, the setpoint will change back to its original value.

After an offset signal, the new remote setpoint may be viewed on the Remote Reset Temperature Range display. However, if this display is being viewed when the reset pulse occurs, the setpoint will not change on the display. To view the new offset, first press any other display key on the keypad and then press the 'REMOTE COOLING SETPOINTS' key. The new setpoint will then appear.



Remote setpoint reset will not operate when a Remote Control Center Option Kit is connected to the microprocessor. The Remote Control Center will always determine the setpoint.

1.14 CONTROL PANEL

No controls (Relays etc.) should be mounted in any section of the control panels. Additionally control wiring not connected to the YORK Control Panel should not be run through the Control Panel. If these precautions are not followed, electrical noise could cause malfunctions or damage to the unit and its controls.

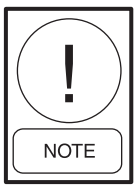
1.15 REMOTE EMERGENCY STOP DEVICE

A remote emergency stop device can be connected to terminals 3 and 4 in the common input supply section after removing a link. When operated it removes the 115VAC control supply and supply to the electronics. All devices are de-energized including compressor contractors. The loss of supply to the power supply board results in the display going off.

To conform with the requirement of EN 418 and EN 60204-1 that re-setting the emergency stop device will not initiate a restart, 'POWER FAIL RESTART' should be programmed under the 'PROGRAM' key to 'MANUAL'. 'MANUAL' restart requires a reset using the unit ON/OFF switch under the keypad.

1.16 COMMON INPUT POWER SECTION VOLTAGE FREE CONTACTS

All wiring to the power section voltage free contacts requires a supply provided by the customer maximum voltage 254 volts AC, 28VDC. These contacts are on the customer relay board -ACRB in the common input power section, the terminals being on a removable plug for ease of wiring.



The terminal numbers are situated on the circuit board, not the plug. The customer must take particular care deriving the supplies for the voltage free terminals with regard to a common point of isolation. Thus, these circuits when used must be fed via the common point of isolation so the voltage to these circuits is removed when the common point of isolation to the unit is opened. This common point of isolation is not supplied by YORK.

In accordance with the National Electrical Code (N.E.C.) it is recommended that the customer wiring to these terminals uses orange wires. This will ensure that circuits not switched off by the units supply disconnecting device are distinguished by color, so that they can easily be identified as live even when the unit disconnecting devices are off. The YORK voltage free contacts are rated at 125VA. All inductive devices (relays) switched by the YORK voltage free contacts must have their coil suppressed using standard R/C suppressors. If these precautions are not followed, electrical noise could cause malfunctions or damage to the unit and its controls.

1.17 ALARM CONTACTS

Each system has a voltage free contact which will OPEN to signal an alarm condition whenever a system locks out or there is a power failure. To obtain a system alarm signal, connect live to Terminal 1 and use terminal 8 for No. 1 system alarm and terminal 7 for No. 2 system alarm.

1.18 CHILLED LIQUID PUMP CONTACT

YORK provides a voltage free contact terminals 5 and 6 which close to start a pump. This contact can be used as a master start/stop for the pump in conjunction with the daily start/stop schedule. If no schedule is set the contact will close when the unit switch is set to on. The contact must be used so that the contact can start the pump in the event of a low temperate liquid condition. A stop start timer is included so that the pump will not be asked to restart within 30 seconds of stopping.

1.19 RUN CONTACT

YORK provides a run contact which closes terminals 3 and 4 to indicate that the unit is running. This contact closes when any system runs. This contact can be used to start the condenser pump or fan.

1.20 ANTI-RECYCLE TIMER

The programmable anti-recycle timer allows the user to select the compressor anti-recycle time to best suit their needs. Motor heating occurs as a result of inrush current when the motor is started. This heat must be dissipated before another start takes place or motor damage may result. The anti-recycle timer assures that the motor has sufficient time to cool before it is restarted.

An adjustable timer allows for the motor cooling, but gives the user the ability to extend the anti-recycle timer to cut down on cycling. In some applications, faster compressor start response is necessary and shorter anti-recycle times are required. These needs should be kept in mind but whenever possible the timer should be adjusted for the longest period of time tolerable.

600 seconds is recommended, although 300 seconds provides adequate motor cooling time. Longer periods will allow more heat dissipation, reduce cycling, and possibly increase in motor life.

1.21 ANTI-COINCIDENCE TIMER

The anti-coincidence timer prevents 2 compressors starting simultaneously. This assures that the inrush current is kept to a minimum. A 60 second time delay will always separate motor starts. This timer is not programmable.

1.22 COMPRESSOR HEATER CONTROL

Each compressor has its own heater. The heater will be off whenever the compressor is running. When the compressor shuts off, the heater will be switched on and stay on for 5 minutes. After 5 minutes has elapsed, the heater will switch off if the discharge temperature rises above 150°F (66°C) and will come on when the discharge temperature is equal to or less than 150°F (66°C).

1.23 PUMPDOWN (LLSV) CONTROL

Each compressor undergoes a pump down cycle on start-up and shutdown. This assures that liquid refrigerant does not enter the compressor on start-up, eliminating the need for recycling pump down, saving energy and reducing compressor starts and wear.

On start-up, the controls unload the compressor and the system either pumps down to the low suction pressure cutout setting or pumps down for 60 seconds (whichever comes first) after which the liquid line solenoid valve is energized and normal operation starts.

On shutdown, the microprocessor controls unload the compressor and the liquid line solenoid valve and economizer/motor cooling liquid supply solenoid valve are de-energized. The compressor continues to operate until it either pumps down to the low suction pressure cutout setting or for 180 seconds, whichever comes first.

Pump down occurs on "normal" shutdowns where cooling demand has been satisfied or when a system switch is turned off, a flow switch opens, run permissive is lost or a 'Daily Schedule' or a remote shutdown is called for. No pump-down will occur on a safety shutdown.

1.24 LEAD/LAG COMPRESSOR SELECTION

The chiller may be set up for 'AUTO' or 'MANUAL' lead/lag. This is accomplished by programming the option under the 'PROGRAM KEY'.

When 'AUTO' lead/lag is used, the microprocessor attempts to balance run time between the compressors. A number of conditions can occur which will prevent this from happening. Factors determining lead/lag selection and the resulting lead/lag determination are:

- The microprocessor automatically defaults the lead to system 1 and the lag to system 2 if both compressors are ready to start (Anti-recycle Timers timed out) and compressors have equal run time.
- If all compressors are ready to start (Anti-recycle timers timed out), the compressor with the lowest run hours will start first.
- If all compressors are waiting to start (Anti-recycle timers have not timed out), the microprocessor will assign the lead to the compressor with the shortest anti-recycle time to provide cooling quickly.
- If the lead compressor is locked out, faulted and waiting to restart, the system switch on the AMB board is 'OFF', or a run permissive is keeping an individual system from running, the lag compressor is swapped to the lead. This is true regardless of whether the lag compressor is 'ON' or 'OFF'.

'MANUAL' lead/Lag selection will be automatically overridden by the microprocessor to allow the lag compressor to automatically become the lead anytime the selected lead compressor shuts down due to a lockout, lead system faults and is waiting to restart, lead switch on the AMB board is in the 'OFF' position, or if a run permissive is keeping the lead of the system off.

Automatic switch over in 'MANUAL' mode is provided to try to maintain chilled liquid temperature as close to setpoint as possible.

2. CONTROL PANEL PROGRAMMING AND DATA ACCESS

29023a

2.1 DISPLAY AND STATUS KEYS

Status Key – (refer to Section 3)

This key provides a display of the current operational and/or fault status of the chiller or individual refrigerant systems.

Display Keys – (refer to Section 4)

Each key provides a real-time display of commonly required information about the chiller and individual refrigerant system operating conditions and settings.

Print Keys – (refer to Section 5)

These keys allow control panel display or remote printout of both current real-time operating and programmed data as well as fault history data from recent safety shutdowns.

Unit ON/OFF Switch

This switch shuts down the entire chiller when placed in the 'OFF' position. The switch must be 'ON' for the chiller to operate.

2.2 PROGRAM AND SETUP KEYS

Entry Keys – (refer to Section 6)

The numeric and associated keys are used for entering data required for programming the chiller. The 'ENTER' and '↑' '↓' keys are also used for scrolling through information available after pressing certain keys.

Setpoints Keys – (refer to Section 7)

These keys are used for display and programming of the local and remote offset chilled liquid temperature setpoints.

Clock Keys – (refer to Section 8)

These keys are used for display and programming of the clock and operating schedule for the chiller.

Program Key – (refer to Section 9)

This key is used for display and programming of the chiller operational settings and limits.

3. STATUS KEY

29023a

3.1 GENERAL

Pressing the 'STATUS' key displays the current chiller or individual refrigerant system operational status. The display will show the 'highest priority' information as determined by the microprocessor.

For individual refrigerant system status or fault messages, the display shows information for up to two refrigerant systems.

The main categories of messages are:

- General Status Messages
- Unit Warnings
- Anticipation Control Status Messages
- Chiller Fault Status Messages
- System Fault Status Messages

These messages are described in detail below, with examples of each display. In each example '#' is used as applicable to represent the system number where messages apply to individual systems.

Each display is followed by a brief description of the message.

3.2 GENERAL STATUS MESSAGES

Unit Switch OFF:

```
UNIT SWITCH IS
IN THE OFF POSITION
```

The unit 'ON/OFF' switch on the control panel is in the 'OFF' position and the chiller will not run.

Schedule Shutdown:

```
DAILY SCHEDULE
SHUTDOWN
```

The chiller has been shut down by the 'DAILY SCHEDULE' programmed into the 'CLOCK'.

Remote Controlled Shutdown:

```
REMOTE CONTROLLED
SHUTDOWN
```

The ISN or RCC (Remote Control Center) has turned the unit 'OFF' through the RS-485 port.

Compressor Running:

```
SYS # COMP RUNNING
SYS # COMP RUNNING
```

The respective compressor is running due to demand.
System Switch OFF:

The system switch on the AMB board for the respective system is in the 'OFF' position.

```
SYS # SWITCH OFF
SYS # SWITCH OFF
```

A system can only run if the system switch is in the 'ON' position. The switches for systems 1 and 2 should normally be in the 'ON' position for all models. Switches for systems 3 and 4 should only be in the 'ON' position for three and four system models respectively.

Anti-Recycle Timers:

```
SYS # AR TIMER    0 S
SYS # AR TIMER  120 S
```

Shows the amount of time remaining on the anti-recycle timer before a compressor can be called to restart.

These 300 - 600 second timers allow the motor cooling to dissipate the heat generated by inrush current at start-up. The timers begin timing when a compressor starts, although a minimum of two minutes must always elapse after a compressor shuts down, before it may again re-start. If a power failure occurs, the anti-recycle timers will reset to 120 seconds after power is restored.

Anti-Coincidence Timers:

```
SYS #    COMP RUNNING
SYS #  AC TIMER 22 S
```

Shows the amount of time remaining before the respective compressor can start. This display will only appear after the anti-recycle timers have timed out.

The anti-coincident timer guards against two or more compressors starting simultaneously. This avoids excessive instantaneous starting currents. A minimum of 60 seconds between compressor starts is maintained even if demand is present and the anti-recycle timers are timed out.

Run Permissive and Flow Switch Contacts OPEN:

```
SYS #   NO RUN PERM
SYS #   NO RUN PERM
```

The flow switch must be connected to terminals 13 and 24 in the logic section. If a common start stop contact is required it should be connected in series with the flow switch. For individual system start stop contacts connect flow switch to terminal 13 to feed the two start stop contacts. Then connect No. 1 system start stop contact to terminal 24 and No. 2 system start stop contact to terminal 25. With the associated contact open the 'NO RUN PERM' message will be displayed and the associated systems will not run.

System Loading Requirement:

```
SYS # NO COOL LOAD
SYS # NO COOL LOAD
```

The chilled liquid temperature is below the point where the microprocessor will bring the lead system on and/or that the loading sequence has not loaded the chiller far enough 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.

3.3 UNIT WARNINGS

Unit warnings indicate conditions which require operator intervention to start the unit or extreme operating conditions. All setpoints and programmable values should be checked, if a chiller shutdown occurred, before restarting the chiller. Unit warnings are not logged into the 'History Buffer'.

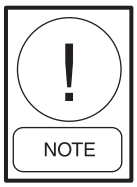
Low Battery Warning:

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

On power-up the microprocessor will check the RTC (Real Time Clock) memory back-up battery to make sure it is still operational. Provided the battery checks out, operation will continue normally. If a check is made and the battery has failed, the microprocessor will not allow the chiller to run and the above 'STATUS' message will appear.

If a low battery condition exists, the microprocessor will restore programmed cutouts, setpoints, and schedules to their default values.

Once a low battery condition is detected, the only way to run the chiller is to use the 'MANUAL OVERRIDE' key. This allows reprogramming of setpoints, cutouts, and schedule.



The RTC chip (U13) should be replaced immediately. Otherwise, the chiller will shutdown and lose all programmed data, and require a 'MANUAL OVERRIDE' restart, if a power failure occurs.

Pump Down:

```
SYS 1 PUMPING DOWN
SYS 2 PUMPING DOWN
```

Both refrigerant systems are in a pump-down cycle. Pump down display messages occur on shutdowns

where the cooling load has been met, or when a system switch is turned 'OFF'. Only one compressor could be pumping down, as shown in the following display:

```
SYS 1 PUMPING DOWN
SYS 2 COMP RUNNING
```

Incorrect Refrigerant Warning:

```
REPROGRAM TYPE OF
REFRIGERANT TO RUN
```

This message should never appear, if it does consult your local YORK office. This message is a warning that the setting for the type of refrigerant used with the unit has been tampered with and the unit will not run.

Incorrect Unit Type:

```
REPROGRAM
UNIT TYPE
```

This message should never appear, if it does consult your local YORK office. This message is a warning that the setting for the unit type has been tampered with and the unit will not run.

Power Failure Warning:

```
!! POWER FAILURE !!
CYCLE UNIT SWITCH
```

The power failure warning will only be displayed on 'power restoration' after a 'power loss', if manual restart on power failure is selected under the 'PROGRAM' key.

If manual restart on power failure has been selected, the warning message is displayed indefinitely on power restoration and the chiller will not run until the unit switch is cycled 'OFF' and 'ON' to restart the unit.

3.4 ANTICIPATION CONTROL STATUS MESSAGES

Anticipation controls are built into the software to prevent safety shutdowns by automatically overriding the controls, if system conditions approach safety thresholds. This avoids total loss of cooling resulting from a lock-out by a safety control.

Anticipation controls monitor discharge pressure, motor current and suction temperature for each compressor and if maximum limits are approached, the slide valve loading of the respective compressor will be reduced to avoid exceeding the limit.

Discharge Pressure Limiting:

Discharge pressure limiting takes effect when compressor discharge pressure nears the point at which the high pressure cutout would shut the system down.

```
SYS # DSCH LIMITING
SYS # DSCH LIMITING
```

The message indicates the discharge pressure has exceeded the programmable threshold and the compressor is being unloaded to prevent nuisance shutdown on the high pressure cutout.

The operation of this safety is important if condenser coils become dirty, if there is a problem with the condenser fan operation, or if extreme ambient or load conditions occur.

Compressor Motor Current Limiting:

```
SYS # CURR LIMITING
SYS # CURR LIMITING
```

The message indicates that a compressor motor current has reached a programmable, BAS, or remote limit and the system is being unloaded to assure that motor current does not become excessively high causing a fault, during initial high load conditions.

Suction Temperature Limiting:

```
SYS # SUCT LIMITING
SYS # SUCT LIMITING
```

The suction temperature limiting message applies only when the chiller is set for Water Cooling Mode (S1-1). The message indicates that saturated suction temperature on a system has dropped to 28°F (-2°C) and that any further temperature reduction could cause some icing of the evaporator tubes. Saturated suction temperature is calculated by the microprocessor by converting suction pressure to temperature.

For the first 3 minutes that the saturated suction temperature is at or below 28°F (-2°C) any further compressor loading is inhibited to allow time for the temperature to rise. If the condition persists for more than 3 minutes, a 5 minute timer is started. As this timer counts down to zero, a 1 second unload pulse will be sent to the slide valve of the affected compressor every 5 seconds as long as the temperature is below 30°F (-1°C). If the temperature rises above 30°F (-1°C), the microprocessor will inhibit loading for the remainder of the 5 minute period.

If after the 5 minute period the saturated suction temperature is above 28°F (-2°C), the compressor is allowed to reload, if required, to maintain leaving chilled water. Otherwise, the microprocessor will reset the 5 minute timer and start the process again. To assure that leaving chilled water requirements are satisfied while one compressor is under suction temperature limiting control, the microprocessor will start or load other compressor(s) as necessary.

3.5 UNIT FAULT STATUS MESSAGES

Unit faults will shut the entire chiller down when a pre-set safety threshold is exceeded. The chiller will automatically restart after the condition causing the shutdown clears. Restart will occur only after anti-recycle timers are satisfied and cooling demand requires additional cooling. A reset hysteresis is built into each safety to prevent repetitive faulting and clearing.

Continuous monitoring by the microprocessor assures that instantaneous reactions result. When the chiller is shutdown on one of these safeties, a message will appear on the 'STATUS' display informing the operator of the problem. When a unit fault occurs, the shutdown will be logged into the 'History Buffer'.

Low Ambient Temperature Cutout:

This cutout protects the chiller from running in very low temperatures which could cause damage due to low system pressures.

```
UNIT FAULT
LOW AMBIENT TEMP
```

This cutout is programmable and can also be used to shutdown the chiller at a temperature where continued running of the chiller is not economical compared to the use of "free" cooling techniques.

The fault will clear when ambient temperature rises 2°F (1°C) above the cutout.

High Ambient Temperature Cutout:

```
UNIT FAULT
HIGH AMBIENT TEMP
```

This cutout protects the chiller from running in ambients above 130°F (54°C) where potential malfunction of system mechanical and electrical components may result.

The cutout is programmable and can be set for lower limit values if required.

The fault will clear when ambient temperature drops 30°F (1°C) below the cutout.

Low Leaving Chilled Liquid Temperature Cutout:

This cutout assures that the evaporator is not damaged from freezing due to improperly set control points. It also attempts to protect the chiller from freezing, if the flow switch should fail.

```
UNIT FAULT
LOW LIQUID TEMP
```

Whenever the chilled liquid temperature drops below the programmable cutout, the chiller will shutdown.

The chiller fault will clear when temperature rises 36°F (2°C) above the cutout and a cooling demand exists.

115VAC Under Voltage Cutout:

This cutout assures that the system is not operated at voltages where malfunction of the microprocessor could result in system damage.

```
UNIT FAULT
LOW LIQUID TEMP
```

Whenever the microprocessor senses an on-board control power supply failure while a compressor is running, the chiller is shutdown. The microprocessor circuitry is capable of operating at voltages 10% below the nominal 115VAC supply to the panel.

Auto-restart of the chiller occurs after a 2 minute start-up timer has elapsed from the time when power is re-applied, if the automatic restart on power failure is enabled. Otherwise the chiller must be manually reset.

Flow Switch Open:

Closure of the flow switch is monitored to check that flow is present in the evaporator when a compressor is running. Any external cycling devices fitted by the customer are connected in series with the flow switch.

```
SYS # NO RUN PERM
SYS # NO RUN PERM
```

If the flow switch opens, all systems will shutdown and a 'NO RUN PERM' (Permissive) message will be displayed.

Closing of the flow switch, when flow is present, will cause the message to disappear and auto-restart to occur.

Never bypass a flow switch. This will cause damage to the chiller and void any warranties.

3.6 SYSTEM FAULT STATUS MESSAGES

System faults will shut the affected system down whenever a pre-set safety threshold is exceeded for 3 seconds. Automatic restart will occur after the first 2 shutdowns when the anti-recycle timer times out and temperature demand exists.

After any combination of 3 Manual Reset Safeties in a 90 minute period, the affected system will shutdown and lock out on the last fault. When one or more systems are shutdown on one of these safeties, a message will appear on the 'STATUS' display informing the operator of the problem.

The High Motor Current Safety is a unique safety which will lock-out a system after only a single fault.

To reset a locked-out system, turn the system switch for the affected system to the 'OFF' position, then back to the 'ON' position.

Before returning a locked-out system to service, a thorough investigation of the cause of the fault should be made. Failure to repair the cause of the fault while manually allowing repetitive restarts may cause further damage to the system.

High Discharge Pressure Cutout:

```
SYS # HIGH DSCH TEMP
SYS # HIGH DSCH TEMP
```

This cutout prevents system pressure from exceeding safe working limits. This safety is a backup for the mechanical High Pressure Cutout in each system.

The cutout is programmable for a range of values below the system upper limit.

High Discharge Temperature Cutout:

This cutout protects the compressor rotors from damage due to overheating, expansion, and breakdown of the oil film seal between the rotors. It also protects against excessive oil temperature in the discharge oil separator.

```
SYS # HIGH DSCH PRES
SYS # HIGH DSCH PRES
```

For the first 4 seconds of operation discharge temperature is ignored. After 4 seconds of operation the compressor will shutdown if the discharge temperature exceeds 260°F (127°C).

High Oil Differential Pressure Cutout:

This cutout protects the compressors against loss of proper lubrication due to oil return line blockage.

```
SYS # HIGH OIL DIFF
SYS # HIGH OIL DIFF
```

The 'differential oil pressure' for this cutout is calculated by measuring discharge (oil separator) pressure and subtracting oil pressure returning to the compressor (Discharge - Oil = Oil bar D).

Under typical operation, the oil pressure differential display will read less than 25 psi (1.7 bar). If oil pressure at the compressor drops due to filter blockage, the differential pressure on the display will increase and when the maximum limit is reached the compressor will be shutdown.

This cutout is activated after 3 minutes of operation. Oil pressure must be less than 64 psi (4.4 bar) as long as the compressor continues to run.

Low Oil Differential Pressure Cutout:

The cutout assures the compressor receives proper lubrication by monitoring the differential between oil pressure returning to the compressor and suction pressure.

```
SYS # LOW OIL DIFF
SYS # LOW OIL DIFF
```

Lack of a differential indicates that the compressor is not pumping or low condenser pressure and no oil is being pumped through the compressor to lubricate the bearings and rotors.

This type of oil failure will not be picked up by the High Oil Differential Safety since no flow will cause the differential through the oil piping to drop to zero.

Example:

For ambients above 50°F (10°C), the cutout will be activated (and system shutdown) after 1 minute of compressor operation if the oil pressure differential is not greater than 10 psi (0.7 bar). After 2 minutes it must be greater than 20 psi (1.4 bar); after 3 minutes, 30 psi (2 bar); after 4 minutes, 40 psi (2.7 bar); and after 5 minutes of operation and onwards, oil pressure must remain higher than 50 psi (3.4 bar).

For lower ambient temperatures the ramp times are as follows:

AMBIENT TEMP		RAMP TIME
>50°F	(10°C)	5 Minutes
>45°F	(7°C)	6 Minutes
>40°F	(4°C)	7 Minutes
>35°F	(2°C)	8 Minutes
>30°F	(1°C)	9 Minutes
<30°F	(1°C)	10 Minutes

High Oil Temperature Cutout:

This cutout assures oil temperature does not exceed a safe operating temperature which affects compressor lubrication. Typical oil temperature during normal operation will be approximately 130 to 150°F (54 to 66°C).

```
SYS # HIGH OIL TEMP
SYS # HIGH OIL TEMP
```

The cutout will be activated (and system shutdown) after 2 minutes of compressor operation, when the oil temperature is above 225°F (107°C) for more than 3 seconds.

Low Suction Pressure Cutout:

This cutout aids in protecting the evaporator from damage due to ice build up caused by operation at low refrigerant charge or restricted refrigerant flow. A number of transient timer features prevent nuisance trips during start-up, compressor loading, etc. The cutout is programmable.

```
SYS # LOW SUCT PRESS
SYS # LOW SUCT PRESS
```

The suction pressure cutout is ignored for the first 45 seconds of operation. During the next 180 seconds of running, suction pressure may be lower than the cutout, but must be greater than:

$$\text{SUCTION PRESSURE CUTOUT} = \frac{\text{PROGRAMMED CUTOUT} * (\text{RUN TIME} - 25)}{25}$$

This cutout value increases with time until after 225 seconds it equals the programmed cutout value. If suction pressure falls below the calculated cutout value before 225 seconds of run time, the system will be shutdown.

The following graph shows a typical programmed suction pressure cutout of 44 psi (3 bar) and its change from time = 0 sec of compressor run time to 225 seconds of compressor run time.

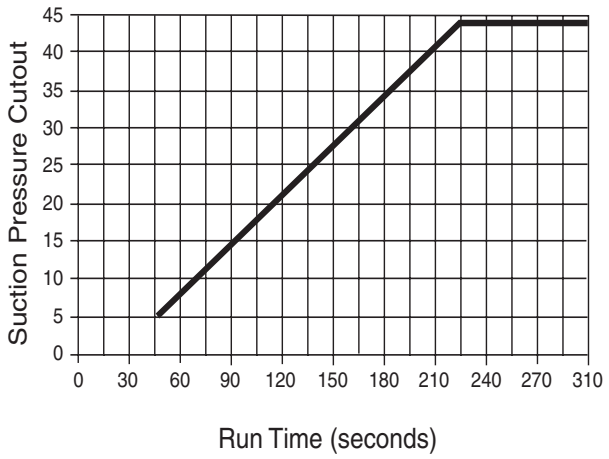


FIG. 15 – SUCTION PRESSURE CUTOUT WITH 44 PSIG (PROGRAMMED CUTOUT)

After 225 seconds of operation with suction pressure operating above the cutout, a 30 second transient timer prevents short term fluctuations in suction pressure due to loading or fan cycling from causing shutdown.

If suction pressure drops below the cutout point after 225 seconds of operation, the transient timer is activated. While the transient timer is active, suction pressure must not drop below 10% of the cutout initially programmed and must be greater than:

$$\text{C.O.} = \frac{\text{PROGRAMMED C.O.} \times (\text{TIME} + .1)}{33.3}$$

This transient cutout value increases with time until after 30 seconds it equals the programmed cutout value. If the suction pressure falls below the value as calculated by the formula relative to time, the system will shutdown on a low suction pressure fault. If the suction pressure rises above the programmed cutout value, the 30 second timer will be reset.

When the Dip Switch (S1) on the AMB board is set for 'Water Cooling', the cutout is programmable between to 44 to 70 psi (3 to 5 bar). In this mode, a setting of 44 psi (3 bar) is recommended. If the switch is set for 'Brine Cooling' (glycol) the cutout is programmable between 5 - 70 psi (0.3 to 5 bar). In this mode, the cutout should typically be set to the saturated refrigerant pressure equivalent to 18°F (10°C) below the temperature of the chilled liquid.

The sludge point of the glycol MUST be at least 20°F (11°C) below the equivalent cutout temperature.

High Compressor Motor Current Cutout:

This cutouts protects against excessively high motor current and shuts a system down and locks it out after only a single occurrence of a rise in average motor current above the cutout point. Motor current is monitored using 3 current transformers (CTs) per motor, one on each phase.

```
SYS # HIGH MTR CURR
SYS # HIGH MTR CURR
```

Average motor current is monitored after 7 seconds of compressor operation. The system will be shutdown if average motor current exceeds 115% FLA.

When a system is fully loaded, typical motor currents may be at 60 - 85% FLA depending on operating conditions.

Low Motor Current Cutout / Motor Protector (high motor winding temperature cutout) **/ Mechanical High Pressure Cutout / External Motor Overload:**

The low motor current cutout prevents a compressor motor running with less current than would normally be expected. This may result from loss of refrigerant, contactor, or power problems as well as from a compressor that is not pumping due to a mechanical malfunction. Motor current is monitored using 3 current transformers (CTs) per motor, one on each phase.

```
SYS # LOW CURR / MP / HP
SYS # LOW CURR / MP / HP
```

Average motor current is monitored after 3 seconds of compressor operation. From this time the system will be shutdown if average motor current is less than 10% of FLA.

Compressor motor protection modules and mechanical high pressure cutouts are fitted to each system. All these devices stop the compressor by removing power from its motor contactor coils. This causes the CTs to sense a zero current draw by the compressor motor and causes a low motor current fault to be displayed. These devices operate as follows:

Motor Over Temperature Protection:

The motor protection module protects against excessive motor winding temperature by monitoring 3 or 6 sensors built into the motor windings. If the temperature becomes excessive, the module will cause power to be removed from the compressor contactors shutting down the compressor. Sensor trip resistance is 13 kW ± 3 kW. Reset is 3.25 kW ± 0.5 kW.

The module provides current overload protection using its 3 current transformers to monitor phase current. The modules DIP switches are Factory set to trip at 120% FLA phase current, i.e. 112% of DIP SW setting, the setting being 107% of FLA. Protection against phase loss, phase unbalance as well as incorrect phase rotation is included. The module provides a seven segment display to define the module status as follows:

0 = NO FAULT
1 = CURRENT OVERLOAD
2 = UNBALANCE > 17%
3 = UNBALANCE > 25%
4 = INCORRECT PHASE ROTATION
5 = OVER TEMP
6 = OUT OF RANGE DIP SWITCH SETTINGS
7 = UNBALANCE > 50%
8 = PHASE LOSS

TABLE 4 – MP DIP SWITCH SETTINGS
(200V shown. See page 31 for other voltages.)

YCRS	SYSTEM	SYS X MOTOR CURRENT = 100% FLA	SYS X MP INPUT VOLTAGE = 125% FLA	115% FLA	AMP SET	DIP SWITCH SETTINGS ON -FMP LEFT = 1 RIGHT = 0							
						128	64	32	16	8	4	2	1
0100	1 & 2	172	2.51	198	114	0	1	1	1	0	0	1	0
0120	1	172	2.51	198	114	0	1	1	1	0	0	1	0
	2	231	3.37	266	153	1	0	0	1	1	0	0	1
0140	1 & 2	231	3.37	266	153	1	0	0	1	1	0	0	1
0180	1	233	3.39	268	155	1	0	0	1	1	0	1	1
	2	296	4.31	340	196	1	1	0	0	0	1	0	0
0200	1 & 2	296	4.31	340	196	1	1	0	0	0	1	0	0
0220	1	296	4.31	340	196	1	1	0	0	0	1	0	0
	2	357	5.20	411	237	1	1	1	0	1	1	0	1
0240	1 & 2	357	5.20	411	237	1	1	1	0	1	1	0	1

FMP DIP SWITCH SETTINGS

Auto restart will not occur because a manual reset is required. A fault lock-out will automatically occur after the microprocessor attempts 2 more starts with the MP contacts open.

Manual reset is accomplished by firstly shutting down the other system (if running) and removing the 115VAC control power (using the common input section control circuit switch disconnect) from the control panel, in the case of over temperature after the motor sensors have sufficient time to cool.

Mechanical High Pressure Cutout:

The cutout protects against excessive refrigerant discharge pressure and is set to 297 psi (20 bar) Auto-restart will be permitted after shutdown on discharge pressure, when the pressure drops below 230 psi (16 bar) and the cutout contacts close.

A fault lock-out will result if safety thresholds are exceeded three times in a 90 minute period.

3.7 PRINTOUT ON FAULT SHUTDOWN

If an optional printer is installed, the contents of History Buffer 1 will be sent to the printer any time a fault shutdown occurs.

This will allow record keeping of individual faults, even if they do not cause a lock-out of the system. This information may be useful to identify developing problems and troubleshooting.

The 'NO RUN PERMISSIVE' fault messages will not be stored in the History Buffer and will not cause an automatic printout.

Due to extreme operating conditions or systems where control deficiencies are present, occasional faults may occur with the corresponding automatic printout. This is not a cause for concern.

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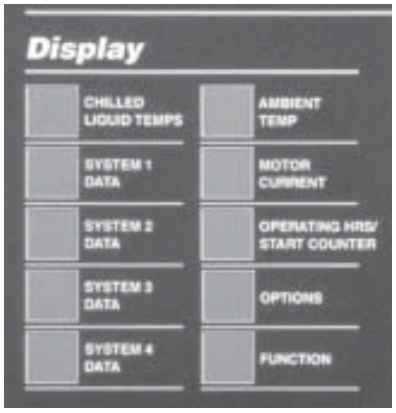
4. DISPLAY KEYS



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4.1 GENERAL

The display keys provide direct access to retrieve commonly required data about the operation of the chiller. This is particularly useful during commissioning, monitoring the operation of the chiller, diagnosing potential future problems and service troubleshooting.

When a display key is pressed, the corresponding message will be displayed and will remain on the display until another key is pressed.

Displayed data is in 'real-time' and is updated approximately every 2 seconds. If updating of one of the messages is required faster than every 2 seconds, the appropriate key for the desired display can be pushed and held to provide updating every 0.4 seconds.

Display messages may show characters indicating 'greater than' (>) or 'less than' (<). These characters indicate the actual values are greater than or less than the values which are being displayed, but are outside the ability of the microprocessor to give an actual reading. This is unlikely to occur unless a problem exists in the measuring sensors or during extreme conditions.

The display keys and the data available from each is as follows:

4.2 CHILLED LIQUID TEMPS KEY

When the key is pressed the chiller leaving chilled liquid temperature (LCHLT) and returning chilled liquid temperature (RCHLT) are displayed.

```
LCHLT  =   44.2  °  F
RCHLT  =   54.0  °  F
```

If the key is pressed again, the following message will appear if an optional mixed chilled leaving temp. sensor is installed for multi unit sequencing. If a sensor is not installed, pressing the key will have no effect.

```
MCHLT  =   43.8  °  F
```

4.3 SYSTEM DATA KEYS

Repeatedly pressing one of the 'SYSTEM # DATA' keys scrolls through displays of:

- Differential oil pressure (OIL)
- Suction pressure (SP)
- Discharge pressure (DP)
- Oil temperature
- Suction temperature (ST)
- Discharge temperature (DT)
- Saturated suction temperature
- Suction superheat
- Saturated discharge temperature
- Discharge superheat
- Compressor slide valve position
- Cooler inlet refrigerant temperature

Examples of these displays are as follows where # is the appropriate system number:

```
SYS # OIL= 176 PSIG
SP=64 DP=195 PSIG
```

```
SYS # OIL = 157.4°F
ST= 31.0 DT= 123.2°F
```

```
S# SAT SUCT = 32.9°F
SUCT SHEAT = 15.0°F
```

```
S# SAT DSCH=130.0°F
DSCH SHEAT = 54.3°F
```

```
SYS # S V STEP = 3
```

```
SYS # COOLER INLET
REFRIG TEMP= 28.2°F
```

Temperatures and pressures are either measured directly by transducers and sensors, or computed from these measurements as follows:

Differential oil pressure is the pressure difference between oil leaving the discharge oil separator and oil pressure reaching the compressor. It is calculated by subtracting oil pressure measured after the oil line filter from discharge pressure (oil in the oil separator is at discharge pressure). Typically for a clean oil filter the drop will be 1.5 to 10 psi (0.1 to 0.7 bar) but may reach up to 44 psi (3 bar).

Saturated discharge and suction temperatures are calculated by converting measured pressure to temperature.

Slide valve position is calculated based on the number of loading steps that the microprocessor has sent to the slide valve solenoid as a current signal.

Slide valve position is approximate and should be used for reference only. Under many conditions, it will be fully loaded between step 60 to 75 and fully unloaded between step 0 to 40.

Superheats are the difference between the respective saturated temperature (converted from pressure) and the actual.

Display limits for the system pressures and temperatures displays are as follows:

TABLE 5 – DISPLAY LIMITS

	MINIMUM LIMIT	MAXIMUM LIMIT
OIL PRESSURE	208 PSID (0 BAR)	0 PSID (14 BAR)
SUCTION PRESSURE	0 PSIG (0 BAR)	199 PSIG (14 BAR)
DISCHARGE PRESSURE	0 PSIG (0 BAR)	399 PSIG (28 BAR)
SUCTION TEMPERATURE*	*9°F (-13°C)	84.2°F (29°C)
DISCHARGE TEMPERATURE	40.3°F (5°C)	302.6°F (150°C)
OIL TEMPERATURE	40.3°F (5°C)	240.0°F (116°C)
SATURATED DISCH. TEMP.	-41.0°F (-41°C)	140.5°F (60°C)
SATURATED SUCT. TEMP.	-41.0°F (-41°C)	101.3°F (39°C)
SLIDE VALVE POSITION	0% (0%)	100% (100%)
SUCTION SUPERHEAT*	*-81.5°F (-63°C)	60.9°F (16°C)
DISCHARGE SUPERHEAT	22.5°F (-5.3°C)	216.0°F (102.2°C)

NOTES:
1. *Below 9°F (13°C) the Suction Temperature display will disappear.
2. This will in turn cause the Suction Superheat display to disappear.
3. Minimum and maximum values may change as software (EPROM) revisions are made.

4.4 AMBIENT TEMP KEY

When the key is pressed, ambient air temperature, as measured surrounding the chiller, is displayed.

```
AMBIENT AIR TEMP
= 71.9 °F
```

Display Limits: Minimum -4.6°F (-20.3°C)
Maximum 137.9°F (58.8°C)

4.5 MOTOR CURRENT KEY

Pressing the key displays compressor current for each system:

```
COMP #=186 AMP 100%FLA
COMP #=135 AMP 99%FLA
```

This display shows the average motor current in amps and average compressor motor current as a percentage of FLA. All values are approximate.

On the second press of the of the key, the current limit values as set by the ISN (Remote BAS System) and EMS-PWM current limiting input are displayed, if they are active.

```
ISN CRNT LIMIT: NONE
EMS CRNT LIMIT: NONE
```

4.6 OPERATING HRS / START COUNTER KEY

When the key is pressed, the accumulated running hours and starts for refrigerant system 1 and 2 compressors are displayed.

```
HRS  1 =  1143.2  =  1382
STR  1 =   285.2  =   322
```

Display Limits: Maximum run hours 99,999
Maximum starts 99,999

Values roll over to zero, if the maximum limit is exceeded.

These counters are zeroed at the factory, but may indicate run time and number of starts logged during factory testing before shipment.

4.7 OPTIONS KEY AND DIP SWITCH SETTINGS

This key provides a display of options which are programmed by the positions of the S1 Dip Switches on the AMB board. Proper programming of the switches is important during the commissioning of the chiller. The options key can be used to verify the Dip Switch positions without checking the AMB board.

Each press of the key will scroll to the next option/dip switch setting.

Four Option Switch Messages (S1-1 to S1-4) will then be displayed in sequence. At the end of the sequence, the display will automatically revert to the first Option Switch message.

The following is a detailed guide to programming the Dip Switches together with the associated display message provided for each selection when the 'OPTIONS' key is pressed:

SWITCH 1: Water / Brine Cooling

Open:

```
S1-1 CHILLED LIQUID
       WATER
```

Water cooling mode is for water cooling applications and allows the chilled liquid leaving temperature setpoint to be programmed from 40 - 70°F (4.4 to 21.1°C).

Selecting this mode also auto-programs the low chilled liquid cutout at 36°F (2.2°C) and the suction pressure cutout at 44 psi (3.03 bar).

Closed:

```
S1-1 CHILLED LIQUID
       GLYCOL
```

Brine cooling mode is for brine/glycol applications with setpoints below 40°F (4.4°C) and allows the chilled liquid leaving temperature setpoint to be programmed from 10 to 70°F (-12.2 to 21.1°C).

In this mode, the low chilled liquid cutout can be programmed from 8 to 36°F (-13.3 to 2.2°C) and the suction pressure cutout can be programmed from 5 to 70 psi (0.34 to 4.83 bar).

SWITCH 2: Ambient Temp. Low Limit

Open:

```
S1-2 AMBIENT CONTROL
       STANDARD
```

Standard ambient mode with the low ambient cutout set at 25°F (-3.9°C) (not adjustable).

Closed:

```
S1-2 AMBIENT CONTROL
       LOW AMBIENT
```

Low ambient mode allows the low ambient cutout to be programmed from 0 to 50°F (-17.8 to 10°C).

SWITCH 3: Refrigerant

Closed:

```
S1-3 REFRIGERANT
       R-22
```

The R-22 mode MUST be selected. The closed position MUST be selected. Incorrect selection of this switch may cause damage to the chiller.

SWITCH 4: Unit

Open:

```
S1-4 YCRS
```

CAUTION

YCRS mode MUST be selected. The closed position MUST NOT be selected. Incorrect selection of this switch may cause serious damage to the chiller.

4.8 DIP SWITCH SETTING

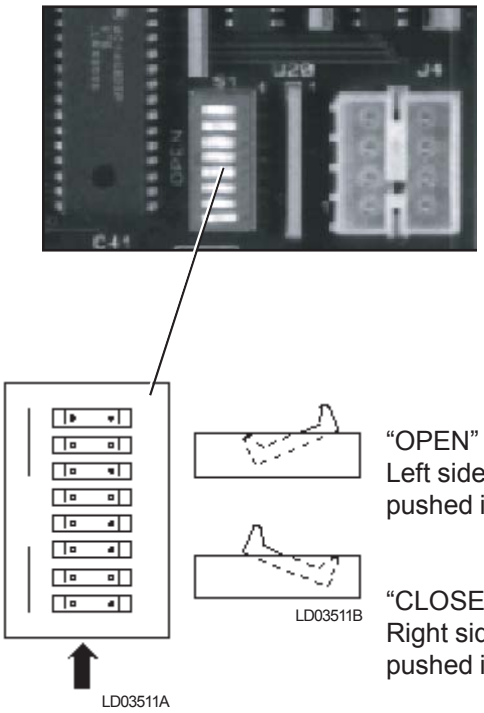

FIG. 16 – ENLARGED PHOTOGRAPH OF DIP SWITCHES ON MICROPROCESSOR BOARD

4.9 FUNCTION KEY

Pressing this key displays the same message as pressing the 'STATUS' key.

Pressing the 'FUNCTION' key followed by another display key will scroll through all the data available under the display key once.

For example, pressing the 'FUNCTION' key followed by the 'SYSTEM 1 DATA' key will result in scrolling through the displays shown below, without the need to press the 'SYSTEM 1 DATA' key to scroll to the next display.

```
SYS # OIL= 176 PSIG
SP=64 DP=195 PSIG
```

```
SYS # OIL = 157.4°F
ST= 31.0 DT= 123.2°F
```

```
S# SAT SUCT = 32.9°F
SUCT SHEAT = 15.0°F
```

```
S# SAT DSCH=130.0°F
DSCH SHEAT = 54.3°F
```

```
SYS # S V STEP = 3
```

```
SYS # COOLER INLET
REFRIG TEMP= 28.2°F
```

After scrolling through the data, the display returns to the status message.

The FUNCTION Key can be used to scroll through the displays for:

- Chilled Liquid Temps
- System # Data
- Motor Current
- Options

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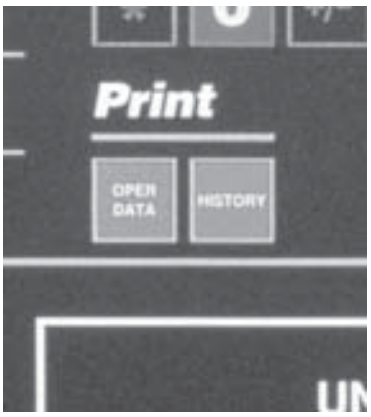
5. PRINT KEYS



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5.1 GENERAL

The print keys provide access to two sets of information either locally on the panel display or, if an optional printer is connected, remotely as hard copy printouts.

The operating data ('OPER DATA') key provides a real-time list of system operating data and programmed settings. The 'HISTORY' key provides a comprehensive list of operating data and programmed settings 'at the instant of fault' on each of the last six faults (local display) or three faults (remote printout) which occurred on the chiller.

5.2 OPER DATA KEY

When no remote printer is connected, pressing the 'OPER DATA' key allows the user to scroll through information, on the 40 character display, which is not directly available from the display keys on the panel.

If a remote printer is connected, pressing the 'OPER DATA' key causes a snapshot to be taken of system operating conditions and of the user programming selections. The data is stored in temporary memory, then transmitted from the microprocessor to the remote printer. As the data is transmitted it is erased from the memory.

Information available using the 'OPER DATA' key is described in the following sections. In example displays '#' is used to indicate system number where appropriate.

5.3 OPER DATA — LOCAL DISPLAY MESSAGES

When the 'OPER DATA' key is pressed, the following message appears:

```
OPERATING DATA
DISPLAYS
```

Repetitively pressing the '↑↓' keys will scroll through the common (whole chiller) data and individual system data information displays.

Common Data:

```
   LOAD TIMER   10 SEC
UNLOAD TIMER    0 SEC
```

This message shows the time remaining on the load and the unload timers.

These timers constantly recycle and are used in conjunction with 'RATE CONTROL' and 'TEMPERATURE DEVIATION FROM SETPOINT' to determine when loading should occur.

```
TEMP ERROR   00.5 °F
TEMP RATE -  0.9 °F/M
```

The upper message gives the difference (error) between actual leaving chilled liquid temperature and the programmed target temperature.

The lower message gives the rate of change of the chilled liquid leaving temperature in degrees per minute. A minus sign (-) indicates falling temperature. No sign indicates rising temperature.

```
LEAD SYSTEM IS
SYSTEM NUMBER      #
```

This message advises which system is programmed as the lead.

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

This message indicates the position of the optional auxiliary contacts for the evaporator water pump.

For the evaporator pump contacts:
ON = contacts closed,
OFF = contacts open.

```
ACTIVE REMOTE CTRL
        NONE
```

This message indicates that a remote device such as a Remote Control Center, an ISN controller, or another device sending a PWM signal for temperature or current reset is overriding control points programmed through the keypad or default microprocessor setpoints.

The following displays are available:

```
ACTIVE REMOTE CTRL
        NONE
```

No remote control active. Remote monitoring may be active.

```
ACTIVE REMOTE CTRL
        ISN
```

YorkTalk via ISN or Remote Control Center (remote mode).

```
ACTIVE REMOTE CTRL
      PWM CURR
```

EMS PWM Current Limiting Enabled.

```
ACTIVE REMOTE CTRL
      PWM TEMP
```

EMS PWM Temperature Reset Enabled.

```
ACTIVE REMOTE CTRL
      CUR / TEMP
```

EMS PWM Current Limiting & Temperature Reset Enabled.

System Data:

The following sequence of three displays are provided first for System 1 and then for Systems 2:

```
SYS # RUN TIME
1- 11-15-10 D-H-M-S
```

This message displays the accumulated run time since the last start in Days (D), Hours (H), Minutes (M), and Seconds (S).

```
SYS # LLSV IS          ON
OIL COOLING IS         ON
```

This message indicates the liquid line solenoid valve and the oil cooling solenoid valve position:

ON = Energized/Open,
OFF = De-energized/Closed.

The oil cooling solenoid is not fitted on all models.

```
SYS # FAN STAGE        3
COMP HEATER IS         ON
```

This message shows the stage of condenser fan operation and is only relevant if the unit is controlling a remote air cooled condenser and the status of the compressor heater.

Once the system data sequence has been repeated for the other systems, pressing the ↑o r ↓ keys again will loop back to the beginning to the common data.
To exit the sequence at any point press a key from another section of the keypad.

Pressing the '*' at any time while in the operating data mode displays the EPROM software version, as shown below:

```
SOFTWARE VERSION
   C.A14.10.01
```

5.4 OPER DATA - REMOTE PRINTOUT

The following shows a typical example YCRS printout obtained by pressing the 'OPER DATA' key with an optional printer attached.

```
YORK  INTERNATIONAL  CORPORATION
MILLENNIUM SCREW CHILLER

UNIT STATUS
2:04PM 10 OCT 99

SYS 1   NO COOLING LOAD
SYS 2   COMPRESSOR RUNNING

OPTIONS

CHILLED LIQUID      WATER
AMBIENT CONTROL   STANDARD
REFRIGERANT TYPE    R-22

PROGRAM VALUES

DSCH PRESS CUTOUT        399 PSIG
DSCH PRESS UNLOAD      375 PSIG
SUCT PRESS CUTOUT         44 PSIG
HIGH AMBIENT CUTOUT    130.0 DEGF
LOW AMBIENT CUTOUT     25.0 DEGF
LEAVING LIQUID CUTOUT  36.0 DEGF
MOTOR CURRENT UNLOAD    100 %FLA
ANTI RECYCLE TIME       600 SECS
LOCAL/REMOTE MODE       REMOTE
LEAD/LAG CONTROL       AUTOMATIC

UNIT DATA

LEAVING LIQUID TEMP     49.0 DEGF
RETURN LIQUID TEMP      58.2 DEGF
MIXED LIQUID TEMP       51.3 DEGF
COOLING RANGE   42.0 + / - 2.0 DEGF
AMBIENT AIR TEMP       74.8 DEGF
LEAD SYSTEM                 SYS 2
EVAPORATOR PUMP            ON
EVAPORATOR HEATER          OFF
ACTIVE REMOTE CONTROL      NONE
SOFTWARE VERSION     C.ACS.09.00
```

```
SYSTEM 1 DATA

COMPRESSORS STATUS       OFF
RUN TIME     0- 0-00-00 D-H-M-S
MOTOR CURRENT    0  AMPS 00 %FLA
SUCTION PRESSURE       125 PSIG
DISCHARGE PRESSURE     131 PSIG
OIL PRESSURE            130 PSIG
SUCTION TEMPERATURE     68.4 DEGF
DISCHARGE TEMPERATURE  71.8 DEGF
OIL TEMPERATURE         3.4 DEGF
SAT SUCTION TEMP        74.5 DEGF
SUCTION SUPERHEAT     6.3 DEGF
SAT DISCHARGE TEMP    74.5 DEGF
DISCHARGE SUPERHEAT    6.3 DEGF
SLIDE VALVE STEP       0
COOLER INLET REFRIG   44.6 DEGF
LIQUID LINE SOLENOID     OFF
OIL COOLING SOLENOID     OFF
COMPRESSOR HEATER        OFF
WYE-DELTA RELAY          OFF

SYSTEM 2 DATA

COMPRESSORS STATUS       ON
RUN TIME     0- 0-15-26 D-H-M-S
MOTOR CURRENT  104 AMPS 87 %FLA
SUCTION PRESSURE       57 PSIG
DISCHARGE PRESSURE     233 PSIG
OIL PRESSURE            218 PSIG
SUCTION TEMPERATURE     42.9 DEGF
DISCHARGE TEMPERATURE  145.5 DEGF
OIL TEMPERATURE         102.8 DEGF
SAT SUCTION TEMP        31.7 DEGF
SUCTION SUPERHEAT     11.2 DEGF
SAT DISCHARGE TEMP    112.1 DEGF
DISCHARGE SUPERHEAT    33.4 DEGF
SLIDE VALVE STEP       70
COOLER INLET REFRIG   23.6 DEGF
LIQUID LINE SOLENOID     ON
OIL COOLING SOLENOID     ON
COMPRESSOR HEATER        ON
WYE-DELTA RELAY          OFF

DAILY SCHEDULE

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

5.5 HISTORY KEY

If a safety shutdown occurs on the chiller, a comprehensive list of operating and programmed settings data is stored by the microprocessor. The information is stored at the instant of the fault, regardless of whether the fault caused a lock-out to occur. This information is not affected by power failures or manual resetting of a fault lock-out.

The microprocessor stores data for up to 6 safety shutdowns on 2 refrigerant circuit models. Once this limit is reached, a further shutdown will cause the oldest set of data to be discarded in favor of storing the new shutdown data. The safety shutdowns are numbered in sequence, number 1 always being the most recent.

On two system units the six history buffers contain information on both systems. There is a total of six history buffers not 6 buffers per system. Thus on a fault shutdown on No. 2 system the normal operating condition of No. 1 system will also be recorded.

When no remote printer is connected, pressing the 'HISTORY' key allows the operator to locally scroll through information relating to the stored safety shutdowns on the control panel display.

If a remote printer is connected, pressing the 'HISTORY' key will send the safety shutdown data to the remote printer. The printout will begin with the most recent fault which occurred. This does not affect the stored data and as many prints as desired may be taken.

5.6 HISTORY – LOCAL DISPLAY MESSAGES

When the 'HISTORY' key is pressed, the following message will appear:

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

To select a Safety Shutdown, press the appropriate key on the numeric key pad then press 'ENTER'. Remember that the most recent fault information is stored as shutdown No. 1.

After the 'ENTER' Key is pressed, a message indicating the time and date of the Fault Shutdown will appear:

Repetitively pressing the ↑ ↓ keys allows scrolling through the information available in the safety shutdown buffer. This is divided into common data (whole chiller) and individual system data displays as follows:

Common Data:

This message indicates the fault that caused the shutdown, in this case, a high motor current in system 2 was the cause of the shutdown.

```
SHUTDOWN OCCURRED
5:59AM 29 NOV 98
```

The next series of messages display the programmed settings for the following parameters at the time of the fault.

- Chilled liquid type (water or glycol)
- Ambient temperature control (standard or low)
- Refrigerant type (R-22)
- Discharge pressure cutout setting
- Discharge pressure unload point
- Suction pressure cutout setting
- High ambient temperature cutout setting
- Low ambient temperature cutout setting
- Low leaving chilled liquid cutout setting
- High motor current unload point
- Control mode (remote or local)
- Lead/lag control (manual or automatic)

```
S1-1 CHILLED LIQUID
WATER
```

```
S1-2 AMBIENT CONTROL
LOW AMBIENT
```

```
S1-3 REFRIGERANT
R-22
```

```
S1-4 YCRS
```

```
DISCHARGE PRESSURE
CUTOUT = 297.0 PSIG
```

```
DISCHARGE PRESSURE
UNLOAD = 265.0 PSIG
```

```
SUCTION PRESSURE
CUTOUT = 44 PSIG
```

```
HIGH AMBIENT TEMP
CUTOUT = 130.0 °F
```

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

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

```
HIGH MOTOR CURRENT
UNLOAD - 100% FLA
```

```
LOCAL/REMOTE MODE
      LOCAL
```

```
LEAD/LAG CONTROL
    AUTOMATIC
```

```
LCHLT = 44.1 °F
RCHLT = 52.9 °F
```

This message indicates the leaving and return chilled liquid temperatures at the time of the fault.

```
LHLT = 46.4 °F
```

This message indicates the leaving hot liquid temperature at the time of the fault on units with water cooled condensers.

```
SETPOINT = 44.0 °F
 RANGE = +/ 2.0 °F
```

This message displays the programmed chilled liquid setpoint and deviation (control range) programmed at the time of the fault.

```
  AMBIENT AIR TEMP
      = 77.6 °F
```

This message indicates the outdoor ambient air temperature at the time of the fault.

```
LEAD SYSTEM IS
SYSTEM NUMBER    1
```

This message indicates which refrigerant system was in the lead at the time of the fault.

```
EVAP PUMP IS      ON
```

This message indicates the status of the evaporator pump signal from the microprocessor.

```
ACTIVE REMOTE CTRL
        NONE
```

This message indicates that a remote device such as a Remote Control Center, an ISN controller, or another device sending a PWM signal for temperature or current reset is overriding control points programmed through the keypad or default microprocessor setpoints.

System Data:

Following the common data is a sequence of system messages, which are repeated for each refrigerant system. These messages display system parameters at the time of the fault:

- Compressor status (ON or OFF)
- System run time since the last compressor start (in Days, Hours, Minutes, and Seconds)
- Compressor motor current (as a percentage of FLA)
- System differential oil pressure, suction pressure and discharge pressure
- System oil temperature, suction temperature and discharge temperature
- Compressor suction gas saturation temperature and superheat
- Compressor discharge gas saturation temperature and superheat
- Compressor slide valve position (Step 0 = minimum capacity, Step 75 = fully loaded)
- Refrigerant temperature at the inlet of the cooler
- Liquid line solenoid valve and oil cooling solenoid valve, when fitted, position (ON = energized, OFF = de-energized)
- Stage of condenser fan operation (remote air cooled condenser if fitted) and status of the compressor heater
- Wye-Delta timer output.

In the examples shown, "#" is used to indicate system number:

```
SYS # COMPRESSOR
      IS ON
```

```
SYS # RUN TIME
 1-3-48-17 D-H-M-S
```

```
SYS# MOTOR CURRENT
            78% FLA
```

```
 SYS # OIL = 65 PSIG
SP=62 DP= 271 PSIG
```

```
 SYS # OIL = 131.9 °F
SP= 1 .1 DP = 121.2 °F
```

```
SYS# SAT DSCH=129 °F
SUCT S HEAT = 8 °F
```

```
SYS# S V STEP=3
```

```
SYS # COOLER INLET
REFRIG TEMP = 28.2°F
```

```
SYS# LLSV IS ON
OIL COOLINGIS ON
```

```
SYS# FAN STAGE 3
COMP HEATER IS ON
```

```
SYS# WYE-DELTA
```

5.7 HISTORY - REMOTE PRINTOUT

A history printout of the unit and system operating conditions, at the time of the fault, can be obtained by pressing the 'HISTORY' Key with an optional printer installed.

Two refrigerant system chillers will provide a history printout of the last 6 faults.

An example of the first of the 6 HISTORY Printouts is shown below:

```
YORK INTERNATIONAL CORPORATION
MILLENNIUM SCREW CHILLER
WATER COOLED LIQUID CHILLER

SAFETY SHUTDOWN NUMBER 1
SHUTDOWN @ 3:56 PM 29 SEPT 98

SYS 1 HIGH DSCH PRESS SHUTDOWN
SYS 2 NO FAULTS

OPTIONS

CHILLED LIQUID     WATER
AMBIENT CONTROL   STANDARD
REFRIGERANT TYPE    R-22

PROGRAM VALUES

DSCH PRESS CUTOUT        399 PSIG
DSCH PRESS UNLOAD        375 PSIG
SUCT PRESS CUTOUT         44 PSIG
HIGH AMBIENT CUTOUT    130.0 DEGF
LOW AMBIENT CUTOUT      25.0 DEGF
LEAVING LIQUID CUTOUT   36.0 DEGF
MOTOR CURRENT UNLOAD    100 %FLA
ANTI RECYCLE TIME       600 SECS
LOCAL/REMOTE MODE         REMOTE
LEAD/LAG CONTROL       AUTOMATIC

UNIT DATA

LEAVING LIQUID TEMP     49.0 DEGF
RETURN LIQUID TEMP      58.2 DEGF
COOLING RANGE   42.0 +/- 2.0 DEGF
AMBIENT AIR TEMP        74.8 DEGF
LEAD SYSTEM              SYS 2
EVAPORATOR PUMP                ON
EVAPORATOR HEATER             OFF
ACTIVE REMOTE CONTROL        NONE
SOFTWARE VERSION      C.ACS.09.00
```

```
SYSTEM 1 DATA

COMPRESSORS STATUS        OFF
RUN TIME       0- 0-0-0 D-H-M-S
MOTOR CURRENT     0 AMPS 0 %FLA
SUCTION PRESSURE       125 PSIG
DISCHARGE PRESSURE     131 PSIG
OIL PRESSURE            130 PSIG
SUCTION TEMPERATURE    68.4 DEGF
DISCHARGE TEMPERATURE  68.8 DEGF
OIL TEMPERATURE        68.8 DEGF
SAT SUCTION TEMP       71.8 DEGF
SUCTION SUPERHEAT       3.4 DEGF
SAT DISCHARGE TEMP     74.5 DEGF
DISCHARGE SUPERHEAT     6.3 DEGF
SLIDE VALVE STEP        0
COOLER INLET REFRIG    44.6 DEGF
LIQUID LINE SOLENOID    OFF
OIL COOLING SOLENOID    OFF
CONDENSER FAN STAGE     OFF
COMPRESSOR HEATER       ON
WYE-DELTA RELAY         OFF

SYSTEM 2 DATA

COMPRESSORS STATUS      ON
RUN TIME     0- 0-15-26 D-H-M-S
MOTOR CURRENT 104 AMPS 87 %FLA
SUCTION PRESSURE        57 PSIG
DISCHARGE PRESSURE     233 PSIG
OIL PRESSURE            218 PSIG
SUCTION TEMPERATURE    42.9 DEGF
DISCHARGE TEMPERATURE 145.5 DEGF
OIL TEMPERATURE       102.8 DEGF
SAT SUCTION TEMP       31.7 DEGF
SUCTION SUPERHEAT      11.2 DEGF
SAT DISCHARGE TEMP    112.1 DEGF
DISCHARGE SUPERHEAT    33.4 DEGF
SLIDE VALVE STEP        70
COOLER INLET REFRIG    23.6 DEGF
LIQUID LINE SOLENOID    ON
SOLENOID                ON
CONDENSER FAN STAGE     3
COMPRESSOR HEATER       OFF
WYE-DELTA RELAY         ON
```

5.8 LOCAL PRINTER OPTION

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. An explanation of the keypad use to obtain a printout is discussed in the "PRINT" KEY Section on Page 52.

YORK recommends the field tested WEIGH-TRONIX IMP-24, Model 2600 printer. This is a compact low cost printer that is ideal for service work and data logging. Paper is in the form of a compact roll and is easily handled compared to larger printers using wider business form style paper. The paper is 2.25" wide desktop calculator paper that can be easily and inexpensively purchased at most stationery stores. Shown in Fig. 17 and 18 is the WEIGH-TRONIX printer and a typical sample printout.

The WEIGH-TRONIX IMP-24 Model 2600 printer can be purchased for approximately $150.00. Contact Weigh-Tronix for purchase information:

Weigh-Tronix
2320 Airport Blvd.
Santa Rosa, Ca. 95402
Phone: 1-800-358-9110 or 1-707-527-5555
(International Orders Only)

NOTE

The printout is made to be universal to all types of chillers both air and water cooled with or without options. Items may be indicated on the printout which may not be present on the chiller.

Installation Limitations

The following limitations must be adhered to. Failure to do so may result in improper printer and/or chiller operation.

1. The printer option is adaptable to all versions and revisions of Microprocessor boards and EPROMs. No modifications are necessary to the panel.
2. Maximum cable length between the printer and the Microprocessor Board is 25 feet. Twisted pair shielded cable is required.
3. The printer must be supplied a 115VAC source.
4. The printer may be left connected to the micro panel.

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FIG. 17 – WEIGH-TRONIX IMP-24 MODEL 2600 PRINTER

YORK INTERNATIONAL CORPORATION
RECIPROCATING WATER CHILLERS

SYSTEM STATUS
8:45AM 6/3/98

SYS 1	COMPRESSOR RUNNING
SYS 2	ANTI-COIN TIMER 13 SEC

RETURN WATER TEMP	65.0	DEGF
LEAVING WATER TEMP	54.0	DEGF
LOW WATER CUTOUT	36.0	DEGF
SETPOINT TEMP	45.0	DEGF
OUTSIDE AIR TEMP	75.0	DEGF
LOW AMBIENT CUTOUT	10.0	DEGF
LOW PRESSURE CUTOUT	44	PSIG
LEAD SYSTEM		SYS 1
CONTROL TYPE		LCHWT
COOLING RANGE	45.0 TO 47.0	DEGF

SYSTEM 1 DATA

COMPRESSOR STATUS		ON
MOTOR AMPS	50	%FLA
SUCTION PRESSURE	61	PSIG
DISCHARGE PRESSURE	143	PSIG
OIL PRESSURE	75	PSID
LIQUID LINE SOLENOID		OFF
RUN PERMISSIVE		ON
STAGES OF LOADING		1
FORWARD FANS		OFF
REVERSE FANS		OFF
HOT GAS BYPASS VALVE		OFF

SYSTEM 2 DATA

COMPRESSOR STATUS		ON
MOTOR AMPS	0	%FLA
SUCTION PRESSURE	61	PSIG
DISCHARGE PRESSURE	80	PSIG
OIL PRESSURE	1	PSID
LIQUID LINE SOLENOID		OFF
RUN PERMISSIVE		ON
STAGES OF LOADING		1
FORWARD FANS		1
REVERSE FANS		OFF
HOT GAS BYPASS VALVE		OFF

S M T W T F S		✶=HOLIDAY
SUN	START=06:00AM	STOP=11:00PM
MON	START=06:00AM	STOP=11:00PM
TUE	START=06:00AM	STOP=11:00PM
WED	START=06:00AM	STOP=11:00PM
THU	START=06:00AM	STOP=11:00PM
FRI	START=06:00AM	STOP=11:00PM
SAT	START=06:00AM	STOP=11:00PM
HOL	START=00:00AM	STOP=00:00AM

FIG. 18 – PRINTOUT

7

Parts

The following parts are required:

1. Weigh-Tronix IMP-24, Model 2600 printer.
2. 2.25" wide desk top calculator paper.
3. 25 ft. Twisted Pair Shielded Cable (minimum 3 conductor), #18 AWG Stranded, 300V min. insulation.
4. (1 ea.) 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 follows in Fig. 19. Strip the outside insulation back several inches and individual wires about 3/8" to connect the cable at the Micro Logic Board. Connect the shield of the cable as shown on the Micro Logic Board. Do not connect at the printer end of the cable.

Printer Configuration

2 Switches on the printer must be properly configured. Remove the paper roll to access these switches. Place the switches in the following position:
SW. 1 OFF
SW. 2 ON

Obtaining a Printout

A printout of current operating data may be obtained by pressing the OPER DATA key. A snapshot will be taken by the micro of current operating conditions. These conditions will be stored in memory until they can be transmitted to the printer and printed. A sample printout is shown in Fig. 18 on page 59.

A printout of the fault shutdown history may be obtained by pressing the HISTORY key. A printout showing the last 3 faults with all system conditions at the time of the fault will be transmitted. A sample printout is shown on page 58.

An automatic printout will be sent to the printer whenever the chiller shuts down on a fault, regardless of whether the fault causes a system or the entire chiller to lockout or whether restart is permitted. This is the same printout that is obtained when the OPER DATA Key is pressed; however, it will be a snapshot of system operating conditions at the instant fault occurred. Additionally, the Status indication that is noted in the printout will note the specific fault that occurred.

Using Other Printers

Control codes vary from printer to printer. This will result in unusual formatting of printed data from many printers. In addition, “handshaking” lines and “handshaking” sequence will differ between printers. This makes the equipment susceptible to operation problems or miswiring which may cause damage to the printer or the Microprocessor Board. YORK assumes no responsibility for assistance or damage in the use of non-specified printers.

Warranty

YORK assumes no warranty responsibility in the use of the printer. This includes damages to the printer and the Microprocessor Boards or chiller operation problems which may result.

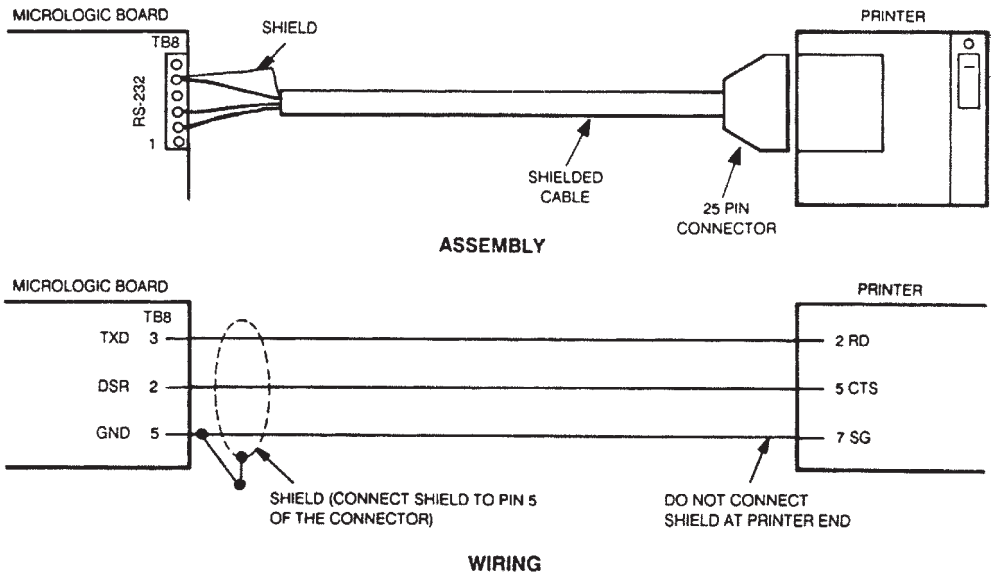

FIG. 19 – ASSEMBLY AND WIRING

6. ENTRY KEYS

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6.1 GENERAL

The entry keys allow the user to change numerical values during programmed for chiller setpoints, cutouts, clock, etc.

6.2 NUMERICAL KEYPAD

The numerical keypad provides all keys necessary to program numerical values into the microprocessor.

The '*' key is used to designate holidays when programming special start/stop times for designated holidays in the 'SET SCHEDULE/HOLIDAY' program mode.

The '+/-' key allows programming of negative setpoints and cutouts.

6.3 ENTER KEY

The 'ENTER' key must be pressed to confirm any change to setpoints, cutouts, or system clock. Pressing this key tells the microprocessor to accept new values into memory. If this is not done, the new values entered will be lost and the original values will be restored.

The 'ENTER' key is also used to scroll through available data when using the 'PROGRAM' or 'SET SCHEDULE/HOLIDAY' keys.

6.4 CANCEL KEY

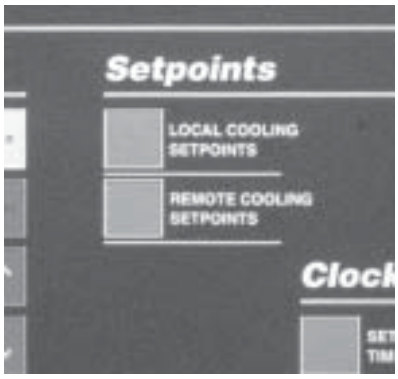
When the 'CANCEL' key is pressed, the cursor will always return to the first character to be programmed in the display message. This allows the operator to begin reprogramming, if an error is made. When the 'CANCEL' key is pressed, the values already keyed in will be erased and the original or internally programmed default values will appear. In other instances the display will remain the same and the only reaction will be the cursor returning to the first character.

6.5 ↑↓ KEYS

The '↑↓' keys allow the user to scroll through data under the 'OPER DATA' and 'HISTORY' keys and to select the correct day of the week and the correct month when programming the microprocessor with the correct time and date.

The '↑' key also operates as a toggle 'AM/PM' key if the cursor is over 'AM' or 'PM' on the display. For example, pressing the '↑' key when the cursor is on 'PM' changes it to 'AM'.

7. SETPOINT KEYS AND CHILLED LIQUID CONTROL



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7.1 GENERAL

The microprocessor monitors leaving chilled liquid temperature and adjusts the chiller cooling capacity to maintain this temperature within a programmed range. The capacity is controlled by switching compressors on or off, and by varying a load/unload current to each compressor slide valve to adjust the capacity of the compressors.

The microprocessor controls chilled liquid temperature through a combination of Fuzzy Logic control and internal timers. Fuzzy logic enables the microprocessor to analyze the deviation from the setpoint and the rate of change and determine the amount of loading and unloading necessary to control to the desired chilled liquid setpoint temperature.

The microprocessor also attempts to maximize efficiency by spreading the cooling load between compressors, minimizing compressor cycling, and optimally utilizing evaporator tube surface (maximize efficiency). This method of control is suitable for both water and brine cooling.

Control setpoints can be programmed into the chiller to establish the desired range of leaving chilled liquid operating temperatures. A description of the operation and programming follows.

7.2 CHILLED LIQUID TEMPERATURE CONTROL

The 'SETPOINTS' keys are used to program the required chilled water liquid temperature for the application. This is accomplished by programming the setpoint and the range. The range and is the maximum acceptable + and - deviation from setpoint.

The minimum acceptable temperature is the 'LOWER RANGE' and is calculated by subtracting the '-' range from the setpoint.

The maximum acceptable temperature is the 'UPPER RANGE' and is calculated by adding the '+' range to the setpoint.

For example, if the desired setpoint temperature is 44°F and the range is +/-2°F, then the microprocessor will attempt to control leaving chilled liquid temperatures to 42°F to 46°F, as shown below:

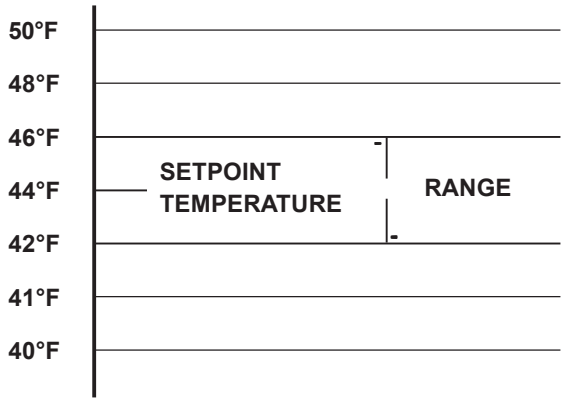

FIG. 20 – SETPOINT RANGE

To ensure that the chilled liquid leaving temperature stays within the range, the microprocessor will attempt to control the leaving temperature to the actual setpoint temperature.

This is accomplished by analyzing the temperature error (ERROR) and the rate of change (RATE) to determine the amount of loading necessary to cool the chilled

liquid to the setpoint temperature. The amount of loading is varied by changing the amount of signal to the slide valve solenoid of each compressor.

7.3 SLIDE VALVE CONTROL

The slide valve of each compressor can be moved '75' steps, where '0' equals minimum capacity and fully loaded equals '75' steps. The amount of movement that occurs when the microprocessor initiates changes may vary according to the 'ERROR' (deviation from setpoint) and 'RATE' (rate of change of liquid temperature).

Each time a change is made, the incremental change may vary from 1 to 10 steps as determined from the microprocessor.

In cases where internal limiting is in effect due to possible fault conditions, the microprocessor will load the compressor with the lowest number of steps, alternating loading back and forth between compressors until both are fully loaded or unloaded.

In some cases the microprocessor will be required to make decisions regarding loading under conditions where the 'ERROR' and 'RATE' conflict.

For example, the microprocessor may elect to unload a compressor if the 'ERROR' is 'zero' (chilled liquid temperature = setpoint), while the 'RATE' is 'negative' (liquid temperature is falling). The microprocessor may also elect to hold capacity when error is 'positive' (chilled liquid temperature > setpoint) because the 'RATE' is 'negative' (liquid temperature is falling), as shown below:

	ERROR		
RATE	Negative	Zero	Positive
Negative	Unload	Unload	Hold
Zero	Unload	Hold	Load
Positive	Hold	Load	Load

FIG. 21 – SLIDE VALVE RANGE

7.4 LOAD TIMERS

Fixed timers are set to minimize undershoot and overshoot as a result of slide valve control.

Load timers are always set at 10 seconds between changes.

Unload timers are set at 5 seconds between changes.

7.5 SLIDE VALVE POSITION

A slide valve position (S V STEP), under the keypad 'SYSTEM # DATA' keys, of '75' indicates that the compressor is fully loaded. However due to the non-exact movement of the mechanism, a position less than '75', possibly '60', could also mean that the compressor is fully loaded. Keep this potential indicator error in mind when attempting to determine slide valve position.

7.6 COMPRESSOR STARTING AND LOADING SEQUENCE

With no compressors running, the 'DAILY SCHEDULE' permits, all safeties and run permissives are satisfied, the anti-recycle timers have timed out, and the leaving liquid temperature rises above the upper limit of the range, the lead compressor will be started:

- A full current signal is sent to the compressor slide valve control solenoid to allow the internal spring to push the slide valve to a minimum loading position to assure it is fully unloaded at start.
- For the first 15 seconds of operation, or until pump down to cutout occurs, the liquid line solenoid valve will remain closed.
- After the initial period of 15 seconds, the microprocessor will begin to load up the lead compressor to bring the chilled liquid temperature to the setpoint.

After 5 minutes of run time, if setpoint temperature is not met:

- The microprocessor will start the lag compressor.

This is not dependent on slide valve position which after 5 minutes will be fully loaded at a S V Step of '75'.

- The lead compressor will be reduced in capacity to a slide valve step of '40'.
- The lag compressor will then be loaded until it also reaches a slide valve step of '40' while the lead compressor is maintained at a constant load.

At this point the compressors will be alternately loaded with loading always occurring on the compressor with the lowest slide valve step until the leaving chilled liquid is satisfied.

7.7 COMPRESSOR LOADING

The microprocessor loads and unloads individual compressors by varying current to the slide valve solenoid which controls oil flow to the slide valve.

The slide valve load solenoid applies oil pressure to the slide valve which increases capacity. An internal spring moves the slide valve in the opposite direction to decrease capacity.

Whenever chilled liquid leaving temperature is above the setpoint, loading current will increase to allow oil pressure to move the slide valve to increase capacity.

Every 10 seconds, the microprocessor will increment the slide valve step from 1 to 10 according to error (deviation from setpoint) and rate of change of chilled liquid.

The microprocessor will always choose the compressor with the lowest slide valve position to load on increasing demand, provided the compressor is not pumping down, has run at least 15 seconds, and is not in a 'Limiting' condition.

7.8 LOADING LIMITING

Load limiting will occur if a system safety threshold is neared. The microprocessor limits loading or unloads a system if the microprocessor anticipates a safety threshold will be exceeded.

Under circumstance where loading is required and one of the systems is nearing a threshold, the microprocessor may elect to split the number of steps that it would normally load a compressor between more than one compressor.

For instance, if system 1 were nearing its motor current unload point and it was scheduled to load, the microprocessor could split a load signal of 10 steps between systems 1 and 2. It could only load system 1 '2' steps while loading system 2 '8' steps. Under these circumstances, the two systems will not appear to equalize loading.

7.9 COMPRESSOR UNLOADING AND SHUTDOWN SEQUENCE

Whenever temperature is below the setpoint the slide valve current is decreased to relieve oil pressure on the slide valve.

This allows spring pressure to move the slide valve to decrease capacity. Every 5 seconds, the microprocessor will decrement the slide valve position by 1 -10 steps according to the 'ERROR' (deviation from setpoint) and the 'RATE' (rate of change of chilled liquid temperature).

Unloading will occur in the reverse sequence as loading. As load drops, the microprocessor will unload the compressor with the highest slide valve step until all compressor slide valves are at '0'.

At this point, the lag compressor will pump down and cycle off, if chilled liquid temperature drops below 'SETPOINT – CONTROL RANGE/2'. When the lag compressor cycles off, the microprocessor will set the lead compressor at slide valve position of '10'.

As load continues to decrease, the lead compressor will be pumped down and cycled off if the chilled liquid temperature drops below 'SETPOINT – CONTROL RANGE/2'.

7.10 LOCAL COOLING SETPOINTS KEY

The 'LOCAL COOLING SETPOINTS' key is used to program the required leaving chilled liquid control temperature and range for the application. When the key is pressed, the following message will be displayed:

```
SETPOINT =   44.0 °F
 RANGE = +/- 2.0 °F
```

Key in the desired chilled liquid setpoint, the microprocessor will accept values from 10.0°F to 70°F (-12.2 to 21.1°C).

For values below 40°F (4.4°C), Dip Switch S1-1 on the AMB board must be programmed for glycol (Brine) cooling.

When an unacceptable value are entered the following message will be displayed before returning to the 'SETPOINT' message:

```
OUT OF RANGE-
TRY AGAIN!
```

After the setpoint is keyed in, the cursor will automatically advance to the first digit of the range as shown:

```
SETPOINT =   44.0 °F
  RANGE = +/- 2.0 °F
```

This range should be programmed for the maximum allowable positive and negative chilled liquid temperature deviation that is acceptable from setpoint in the system application. The microprocessor will accept a range from 0.9 to 1.4°C.

After the setpoint and range are keyed in, press the 'ENTER' key to store the data in memory.

Failure to press the 'ENTER' key will cause the newly programmed values to be ignored and not entered into memory.

After pressing the 'ENTER' key, the display will continue to show the message until another key is pressed.

7.11 REMOTE COOLING SETPOINTS KEY

The 'REMOTE COOLING SETPOINTS' key allows resetting the setpoint upward from the programmed value in memory from a remote device. This feature is typically used for demand limiting or ice storage applications.

Reset is accomplished by timed closure of external contacts for a defined period of time and allows reset of the setpoint upward by up to 40°F (22°C) above the setpoint programmed in memory.

The maximum allowable reset must be programmed into memory and can be a value of 1 to 40°F (22°C) depending on user requirements.

To program the reset, press the 'REMOTE COOLING SETPOINTS' key. The following message will appear:

```
REM SETP =   54.0 °F
RANGE = +/-   2.0 °F
```

The display indicates the current remote setpoint which is always equal to the chilled liquid setpoint programmed under the 'LOCAL COOLING SETPOINTS' key plus the offset from the remote reset signal. The display will also show the control range.

Pressing the 'REMOTE COOLING SETPOINTS' key again scrolls the display to the 'MAX EMS-PWM REMOTE TEMP RESET' display which is programmable.

```
MAX EMS-PWM REMOTE
TEMP RESET = 35°F
```

This should be programmed to the maximum offset which is required for the application. The programmable range is 2°F to 40°F (1°C to 22°C).

The cursor will stop beneath the first digit of the maximum reset. Key in the maximum reset allowed for the application, remembering to use a leading '0' for values less than 10°F. Press the 'ENTER' key to store the new value in memory.

8. CLOCK KEYS

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8.1 GENERAL

The microprocessor features a continuously running internal clock and calendar and can display actual time as well as the day of the week and the date. An automatic schedule feature is provided for starting and stopping the chiller on individual days of the week, eliminating the need for an external time clock. Also provided are a holiday feature, allowing special start/stop times to be set for designated holidays, and a manual override feature to aid servicing.

If the automatic schedule feature is not required, the microprocessor can be programmed to run the chiller on demand as long as the chiller 'ON/OFF' and system switches are in the 'ON' position.

Programming of the internal clock/calendar and operating schedule are described below.

8.2 SET TIME/DATE KEY

When the 'SET TIME/DATE' key is pressed, a message showing the day, time and date will be displayed with the cursor below the first digit of the time as shown:

```
TODAY IS MON 11.12AM
     19 FEB 1999
```

First press the '↑' or '↓' key until the correct day appears.

Press 'ENTER' to move to the hour part of the display. Next, key in the time (hours/minutes) using a leading '0' for times before 10 o'clock. e.g. 08:31.

The cursor will then advance to the 'AM/PM' designation. If necessary press the '↑' or '↓' key to change to the opposite time period.

Next, key in the day of the month (the cursor will automatically skip from 'AM/PM' to the first digit of the date when a 'number key' is pressed).

The cursor will then skip to the first digit of the year. Key in the year. Always use two digits for the day and the year, using a leading '0' for days 1-9 e.g. 02 FEB 99.

Finally, change the month as needed by repetitively pressing the '↑' or '↓' key until the correct month appears.

Once the desired information is keyed in, it must be stored into memory by pressing the 'ENTER' key.

Any valid time or date will be accepted. If an out of range value is entered, the following message will be displayed for 3 seconds then revert back to the 'SET TIME/DATE' display message for reprogramming.

```
OUT OF RANGE-
TRY AGAIN!
```

NOTE

Pressing the 'SET TIME/DATE' key once enters the 'programming' mode in which the displayed time does not update. Pressing the 'SET TIME/DATE' key a second time enters 'display' mode in which the cursor will disappear and the 'live' clock will be displayed.

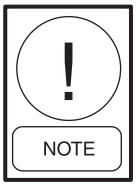
8.3 SET SCHEDULE/HOLIDAY KEY

Messages showing each week day and the holiday start/stop schedule, as shown below, can be displayed using the 'SET SCHEDULE/HOLIDAY' key:

```
MON  START  =  06:00  AM
     STOP   =  05:30  PM
```

The displays for each day are scrolled through by repetitively pressing the '↑' or '↓' key.

To reprogram any of the daily schedules, key in the new start time then, if necessary, change the associated AM/PM by pressing the '↑' or '↓' key.



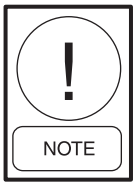
The '↑' or '↓' key can only be pressed once to change 'AM/PM'. If an error is made, press 'CANCEL' and begin again.

Next key in the stop time (the cursor will automatically skip from 'AM/PM' to the first digit of the date when a 'number key' is pressed) and change the AM/PM if necessary.

Now press the 'ENTER' key to store the new schedule. The display will scroll to the next day.

If an unacceptable time is entered, the following message will be displayed for 3 seconds then return to the schedule display:

```
OUT OF RANGE
TRY AGAIN!
```



New start/stop times programmed for Monday are automatically used for all following days of the week.

Always use the 'SET SCHEDULE/HOLIDAY' key, not the 'ENTER' key to scroll through the schedule displays. Pressing the 'ENTER' key after viewing Monday will change times programmed for the remainder of the week to the Monday schedule.

If the chiller is not cycled by the 'DAILY SCHEDULE', but is required to run whenever remote cycling devices, system switches, and the chiller 'ON/OFF' switch are in the 'ON' position, all '00.00's should be programmed into the daily schedule. This can be done manually for individual days or for all days by pressing 'CANCEL' and 'ENTER' for the Monday start/stop schedule.

Programming the 'DAILY SCHEDULE' will not affect on the 'HOLIDAY SCHEDULE'.

If the chiller is not required to run on a given day, the start time should be programmed for '00:00 AM' and the stop time programmed for '12:00 AM'.

Continue to program each day as needed. After 'SUN' (Sunday) has been entered, the Holiday message will be displayed:

```
HOL  START  =  08:30  AM
     STOP   =  12:00  PM
```

The 'HOLIDAY SCHEDULE' allows a specific day(s) to be assigned for special requirements. This is provided so that a day(s) needing special start/stop requirements can be programmed without changing the normal working schedule.

The start/stop times for the 'HOLIDAY SCHEDULE' are programmed just as any other day.

Only one start/stop time can be programmed which will apply to each of the holiday days selected.

After the 'ENTER' key is pressed, a display to designate which days of the week are holidays will appear:

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

When the display appears, the cursor will first stop after 'S' (Sunday) as shown. To designate a day as a holiday, press the '*' key. If a day marked as a holiday is not to be a holiday, press the '*' key.

When the '*' key is pressed, the cursor will advance to the next day. Use the '↑' or '↓' keys to move back and forth among days.

After all the holiday days are programmed, press 'ENTER' to store the new data. The display will then return to the beginning of the 'DAILY SCHEDULE'.

The 'HOLIDAY SCHEDULE' is only performed once, then erased from memory. This avoids the need for re-programming after the holiday, as most special 'HOLIDAY SCHEDULE' requirements occur only occasionally.

If an error is made while programming or a change is required, press 'CANCEL'. This will clear the programmed (*) holiday days (the '0' key will not cancel out a '*' and cannot be used for correcting a programming error).

8.4 MANUAL OVERRIDE KEY

When the 'MANUAL OVERRIDE' key is pressed, the 'DAILY SCHEDULE' programmed into the chiller is ignored and the chiller will start up when water temperature is above the high limit of the control range, the Chiller 'ON/OFF' switch is 'ON', remote cycling devices are closed, and system switches permit.

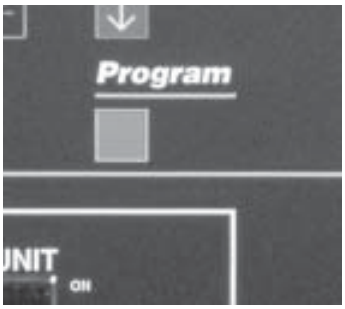
Normally this key is only used for servicing when the chiller is required to run but the 'DAILY SCHEDULE' is in an 'OFF' period. This key avoids the need to re-program the 'DAILY SCHEDULE'. Once activated, manual override is only active for a period of 30 minutes and the following status message will be displayed:

M A N U A L
O V E R R I D E

If a 'LOW BATTERY WARNING' message appears on the display the internal clock, calendar and program settings cannot be relied on for accuracy. Default values are loaded into the microprocessor memory and the 'MANUAL OVERRIDE' key can be used to zero out the daily schedule and allow unlimited operation regardless of the time on the internal clock.

Reprogramming of the setpoints and cutout values may also be necessary. When the 'MANUAL OVERRIDE' key is pressed the low battery message will disappear. If a power failure occurs, the above process will again need to be repeated to bring the chiller back on line.

9. PROGRAM KEYS



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9.1 GENERAL

The 'PROGRAM' key is used to program the system operating parameters including cutout points for safeties, anticipatory unload points to avoid faults, and anti-recycle timer duration.

When the 'PROGRAM' key is pressed, the following message will be displayed to indicate the display is in the program mode:

```
PROGRAM MODE
```

Pressing the 'ENTER' key displays the control panel message language:

```
DISPLAY LANGUAGE
ENGLISH
```

One of six display message languages maybe selected (English, 23;14 (Code), Spanish, French, German and Italian). The '↑' or '↓' keys should be used to select the desired language.

Pressing the 'ENTER' key repeatedly allows scrolling through the programmable displays.

As each value is displayed, it may be programmed using the 'Entry' and '↑' or '↓' keys. To program a value, key in the desired value and press the 'ENTER' key to store the value into memory and scroll to the next display.

If an unacceptable value is entered at any stage, the following message is displayed for a few seconds and the entered value is ignored:

```
OUT OF RANGE
TRY AGAIN!
```

The following section shows examples of each programmable value display in the order in which they appear after pressing the 'PROGRAM' key, together with guidance on the programming values for each parameter.

The programmable values must be checked and properly programmed when commissioning the chiller. Failure to properly program these values may cause damage to the chiller or operating problems.

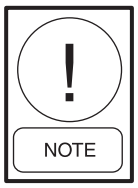
9.2 USER PROGRAMMABLE VALUES

High Discharge Pressure Cutout:

```
DISCHARGE PRESSURE
CUTOUT = 297 PSIG
```

This safety is bypassed for the first 5 seconds of operation after which if the cutout point is exceeded for 3 seconds, the system will shutdown.

Normally, the cutout should be set at 297 PSIG (26.5 bar). The microprocessor will, however, accept values between 200 to 400 PSIG (13.8 to 27.52 bar).



The microprocessor discharge pressure cutout is backed-up by the mechanical high pressure cutout located in each refrigerant circuit.

High Discharge Pressure Unload Point:

```
DISCHARGE PRESSURE
UNLOAD = 275.0 PSIG
```

The discharge pressure unload point is used to avoid a high pressure cutout shutdown by unloading a compressor, if its discharge pressure approaches the cutout value. The chiller can then continue to run automatically at reduced capacity until the cause of the excessive pressure is resolved (e.g. dirty condenser coils) or cleared (e.g. high ambient temperature).

For the first 60 seconds of operation, discharge pressure limiting is disabled. After this time, if discharge pressure exceeds the programmed limit, a 1 second unload pulse will be sent to the slide valve of the affected compressor every 5 seconds until the discharge pressure drops below the programmed limit.

Reloading will take place when discharge pressure has dropped 58 PSIG (4 bar) below the programmed threshold.

Typically the unload point should be set 18 to 30 PSIG (1.2 to 2 bar) below the discharge pressure cutout setting. The microprocessor will accept a range of programmable values between 200 and 400 PSIG (13.8 and 27.52 bar).

Low Suction Pressure Cutout:

```
SUCTION PRESSURE
CUTOUT = 44 PSIG
```

The low suction pressure cutout protects the evaporator from damage due to ice build up caused by operation at low refrigerant suction pressure.

After the compressor starts, and the pump down cycle is completed (pump down to cutout or 30 seconds, whichever comes first), suction pressure is monitored as long as the compressor runs. For the first 270 seconds of running, suction pressure can be lower than the programmed cutout, but must be greater than:

$$\text{PROGRAMMED CUTOUT} \times \frac{\text{RUN TIME} / 3 + 10}{100}$$

For example, if the programmed cutout = 44 PSIG (3 bar) and the run time = 60 seconds

$$\text{NEW CUTOUT} = 3 \times \frac{60/3 + 10}{100} = 13.2 \text{ PSIG (0.9 bar)}$$

This cutout value increases with time, until after 270 seconds, it equals the programmed cutout value. If suction pressure falls below the calculated cutout value before 270 seconds, the system will be shutdown.

After 270 seconds, a transient timer system prevents short term fluctuations in suction pressure from causing shutdown as follows: If suction pressure drops below the cutout point, a 90 second transient timer starts. During the 90 second time period, the suction pressure must be greater than:

$$\text{PROGRAMMED CUTOUT} \times \frac{100 - \text{TRANSIENT TIME REMAINING}}{100}$$

For example, if the programmed cutout = 44 PSIG (3 bar) and the timer has run 30 seconds

$$\text{NEW CUTOUT} = 3 \times \frac{100 - 60}{100} = 17.6 \text{ PSIG (1.2 bar)}$$

This cutout value increases with time, until after 90 seconds, it equals the programmed cutout value. If the suction pressure rises to more than 5 PSIG (0.3 bar) above the programmed cutout value during the 90 second time period, the timer will be reset.

If the suction pressure does not rise to more than 5 PSIG (0.3 bar) above the cutout, the timer will remain at zero and if the pressure then falls below the cutout again, the system will shutdown on a low pressure fault.

If the Dip Switch (S1) on the AMB board is set for 'WATER' cooling mode, the cutout is programmable between 44 and 70 PSIG (3.03 and 4.83 bar). In this mode, a setting of 44 PSIG (3.03 bar) is recommended.

If the Dip Switch (S1) on the AMB board is set for 'GLYCOL' (Brine) cooling mode, the cutout is programmable between 5 and XX PSIG (0.34 and 4.83 bar). In this mode, the cutout should be set to the saturated refrigerant pressure equivalent to 18°F (10°C) below the temperature of the chilled liquid.

High Ambient Temperature Cutout:

```
HIGH AMBIENT TEMP
CUTOUT = 130°F
```

The high ambient temperature cutout is used to select the ambient temperature above which the chiller may

this point, the chiller will shutdown. Restart will occur automatically, when temperature falls more than 1°F (1°C) below the cutout and cooling demand is present.

This cutout is normally set at 130°F (54°C) to allow operation to the absolute maximum temperature capability of the electromechanical components; however, values between 100 and 130°F (37.8 and 54.4°C) are acceptable.

Low Ambient Temperature Cutout:

```
LOW AMBIENT TEMP
CUTOUT =  39°F
```

The low ambient temperature cutout is used to select the ambient temperature below which the chiller may not operate. If the ambient temperature falls 1°F (1°C) below this point, the chiller will shutdown. Restart will occur automatically, when temperature rises more than 1°F (1°C) above the cutout and cooling demand is present.

If the Dip Switch (S1) on the AMB board is set for 'STANDARD AMBIENT CONTROL' the low ambient temperature cutout is set at 25°F (-4°C) and is not programmable.

If the Dip Switch (S1) on the AMB board is set for 'LOW AMBIENT CONTROL', programming of the cutout between 0.0° and 50° F (-17.8°C and 10°C) is allowed. This allows higher values than 25°F (-3.9°C) to be programmed to shutdown the chiller when other cooling methods become operational. Values below 25°F (-3.9°C) can be used for applications requiring chiller operation at lower temperatures.

Low Leaving Liquid Temperature Cutout:

```
LEAVING LIQUID TEMP
CUTOUT =  36°F
```

The low leaving liquid temperature cutout protects the evaporator from damage due to ice build up caused by operation below the chilled liquid freezing point.

If the leaving chilled liquid temperature (water or glycol) drops below the cutout point, the chiller will shutdown. The chiller will restart automatically when temperature rises more than 36°F (2°C) above the cutout point and cooling demand exists.

If the Dip Switch (S1) on the AMB board is set for 'WATER' cooling mode, the cutout is automatically set at 36°F (2.2°C) and cannot be reprogrammed.

If the Dip Switch (S1) on the AMB board is set for 'GLYCOL' (Brine) cooling mode, the cutout can be programmed between 8°F and 36°F (-13.3°C and -2.2°C). The cutout should normally be set to 4°F (2°C) below the setpoint minus the range, i.e. 32°F (setpoint) -1°F (range) -20°F = -40°F [0°C (setpoint) - 1°C (range) - 2°C = -3°C].

High Motor Current Unload Point:

```
HIGH MOTOR CURRENT
UNLOAD = 100% FLA
```

The motor current unload point is used to avoid a high motor current safety shutdown by unloading a compressor, if current draw approaches the maximum limit cutout value. The chiller can then continue to run automatically at reduced capacity until the cause of the excessive current is resolved.

The microprocessor will accept between 30 - 105% for the unload point. The motor current safety will shut the compressor down whenever current exceeds 115%.

If the programmable limit is set between 100% and 105% of full load current, this safety will protect against excessive current causing compressor shutdown due to extremely high ambient, high chilled liquid temperature, and condenser malfunction caused by dirt or fan problems.

If the programmable limit is set below 100% of full load current, this feature can be used for 'demand limiting'. This is important when demand limiting is critical due to power requirements or limitations in the building.

For the first 60 seconds of operation, the unloading safety is disabled. After this time, if motor current exceeds the programmed limit, slide valve current will be slowly reduced until the motor current drops below the programmed limit. Additional loading will take place when motor current drops below 90% of the programmed threshold.

Typically, this point should be set at 100% for maximum motor protection, programming for 100% is advisable. When programming values below 100% use of a leading '0' is required, e.g. 085%.

Anti-Recycle Time:

```
ANTI RECYCLE TIMER
= 600 SECS
```

The anti-recycle timer controls the minimum time between starts for each compressor. This is the time available for the heat build up caused by inrush current at start to be dissipated before the next start. Insufficient cooling time between starts can cause heat build up and motor damage. A fast compressor start response is needed in some applications and not in others.

Although the minimum setting allowed on this timer will avoid excessive heat build up, adjusting the timer for the longest period acceptable in each application will reduce cycling and maximize motor life. 600 seconds is recommended.

The microprocessor will accept a range of programmable values between 300 and 600 seconds.

Local/Remote Communications:

```
LOCAL / REMOTE MODE
LOCAL
```

The panel can be programmed for 'LOCAL' or 'REMOTE' communications. 'LOCAL' mode allows monitoring through the RS485 port only. 'REMOTE', allows an external device such as an ISN or Remote Control Center to change setpoints and programming points. The '↑' or '↓' keys are used to change from 'LOCAL' to 'REMOTE'.

Imperial/SI Units Display:

```
DISPLAY UNITS
IMPERIAL
```

This allows the operator to select the display messages to display 'IMPERIAL' (PSIG, °F, etc.) or 'SI' (Scientific International, Barg, °C, etc.). The '↑' or '↓' keys are used to change from 'IMPERIAL' to 'SI' units.

Automatic/Manual Lead/Lag:

```
LEAD / LAG CONTROL
AUTOMATIC
```

The chiller may be selected for 'MANUAL' lead/lag or 'AUTOMATIC' lead/lag. In some cases the operator may want to manually select the system that is desired to be the lead system. In most cases, automatic lead/lag is selected to allow the microprocessor to attempt to balance run time between the systems. The '↑' or '↓' keys are used to change from 'AUTOMATIC' to 'MANUAL' lead/lag.

If 'MANUAL' control is desired, press the '↑' or '↓' key. One of the following messages will be displayed:

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

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

System 1 or 2 can be selected as the lead by pressing the '↑' or '↓' key. The 'ENTER' key must be pressed to save the selection in memory.

Automatic/Manual Power Failure Restart:

```
POWER FAIL RESTART
AUTOMATIC
```

The chiller may be selected for 'AUTOMATIC' or 'MANUAL' restart after a power failure. When 'MANUAL' is selected, the chiller will not operate after power is reapplied until the chiller 'ON/OFF' switch on the keypad is cycled 'OFF' and then 'ON'.

Programming manual restart ensures that re-setting the emergency stop device will not initiate a re-start as required by EN 418 and EN60204-1.

9.3 INPUT/OUTPUT DISPLAY ROUTINE

All digital and analog inputs and all digital outputs connected to the microprocessor board (-AMB) and input/output boards (-AIOB) can be viewed by pressing the 'FUNCTION' key and then pressing the 'OPER DATA' key. The 'UP' and 'DOWN' arrow keys can be used to scroll through this information. This shows all -AMB and -AIOB digital and analog inputs and all digital outputs including spares.

The currents to the slide valves – YSV are not shown.

Each analog input display will include:

- Name of the measured value (example: Sys 1 Suct Pr)
- Input plug to -AMB or AIOB (example: J13-7)
- Voltage read on input
- Converted value (example: 54.3 PSIG [3.75 BARG])

An example message follows:

```
SYS1 SUCT PRJ 13-7
X.XVDC = X.X PSIG
```

Each digital input display will include:

- Name of the measured value (example: Sys 1 Run Perm)
- Input to the -AMB (example: J4-5)
- State of input (ON or OFF)

An example message follow:

```
SYS1 RUN PERM
J 4-5 IS ON
```

Each digital output display will include:

- Name of the controlled item (example: Sys 1 LLSV)
- Output from the -AMB (example: J7-3)
- State of the output (ON or OFF)

An example message follows.

```
SYS1 RUN PERM
J 4-5 IS ON
```

TABLE 6 – PROGRAMMED PRESSURE/TEMPERATURE SETTINGS

SETPOINTS			
LOCAL COOLING SETPOINT KEY	SETPOINT	40°F TO 70°F WATER (4.5°C TO 21.1°C)	10°F TO 70°F GLYCOL (-12.2° TO 21.2°C)
	RANGE	+/- 0.9°C TO 0.9°C	
REMOTE COOLING SETPOINT KEY	RANGE	36°F TO 71°F (2°C TO 22°C)	
FIRST MECHANICAL DISCHARGE PRESSURE CUTOUT		275 PSIG (27.2 BARG)	
SECOND MECHANICAL DISCHARGE PRESSURE CUTOUT		297 PSIG (27.9 BARG)	

PROGRAM KEY			
MICRO DISCHARGE PRESSURE CUTOUT		297 PSIG (26.5 BARG)	
DISCHARGE PRESSURE UNLOAD		275 PSIG (25.7 BARG)	
SUCTION PRESSURE CUTOUT		44 TO 70 PSIG SET TO 44 BARG WATER	-5 TO 70 PSIG BARG GLYCOL
HIGH AMBIENT TEMP CUTOUT		113°F STANDARD (45°C)	
LOW AMBIENT TEMP CUTOUT		25°F STANDARD (-3.9°C)	
LEAVING LIQUID TEMP CUTOUT		36°F WATER (2.2°C)	9°F to 36°F(-12.9° TO 2.2°C) GLYCOL
HIGH MOTOR CURRENT UNLOAD		30 TO 105% FLA	
ANTI-RECYCLE TIME		300 - 600 SECONDS	

10. EMS / BAS INTERFACE CARD KITS

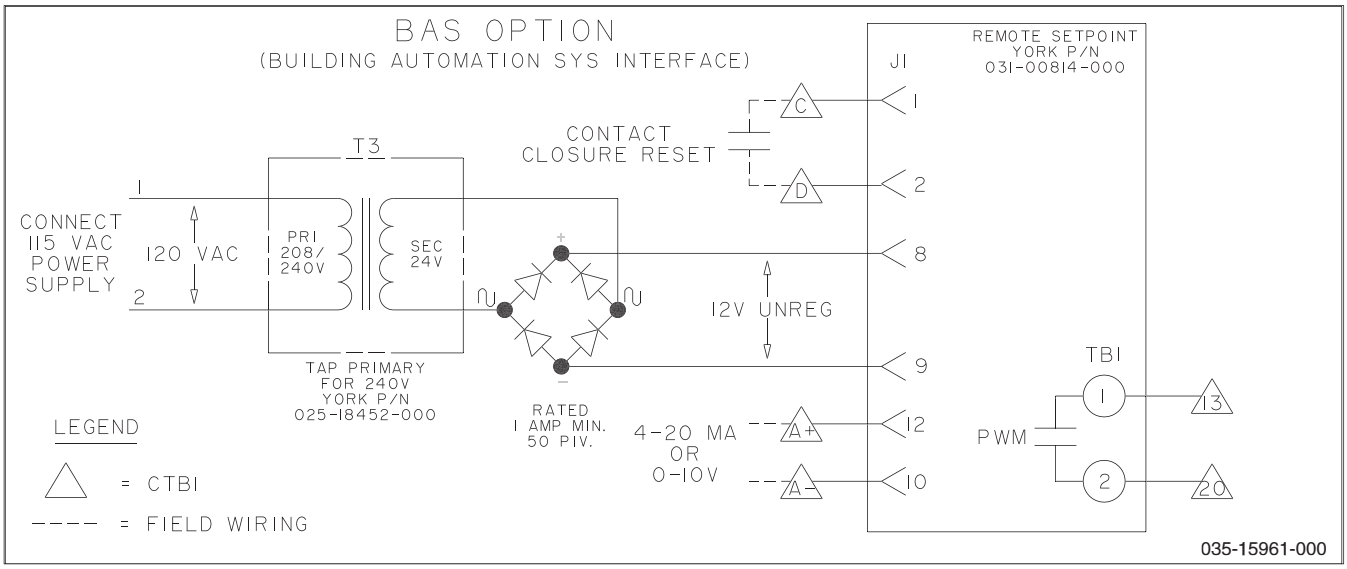


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FIG. 22 – EMS / BAS OPTION

10.1 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 CTB 1 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 equations:

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) * (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.”

10.2 BAS/EMS TEMPERATURE RESET OPTION

The Remote Reset Option allows the Control Center of the unit to reset the chilled liquid setpoint using a 0 - 10VDC input, a 4-20mA input, or a contact closure input. The Remote Reset circuit board converts the signals mentioned above into pulse width modulated (PWM) signals which the microprocessor can understand. 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”.

* 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).

The optional Remote Reset option would be used when reset of the chilled liquid setpoint is required and a PWM signal (timed contact closure) cannot be supplied by an Energy Management System. The Remote Temp. Reset Board will convert a voltage, current, or contact not operate. If the ambient temperature rises 1.8°F (1°C) above signal that is available from an EMS to a PWM signal, and every 80 seconds provide a PWM input to the microboard. Figure 3 shows a diagram of the field and factory electrical connections.

If a **0 - 10VDC** signal is available, it is applied to terminals A+ and A-, and **jumpers are applied to JU4 and JU2** on the reset board. This dc signal is conditioned to a 1 - 11 second PWM output and supplied to the PWM input on the microboard at CTB 1 terminals 13 - 20. To calculate the reset chilled liquid setpoint for values between 0VDC and 10VDC use the following formula:

setpoint = local chilled liquid setpoint + °reset

°reset = (dc voltage signal) x (*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 = 6VDC x 20°F = 12°F reset
10
setpoint = 45 °F + 12 °F = 57°F

(Metric)
°reset = 6VDC x 11. 11°C = 6.67°C reset
10
setpoint = 7.22°C + 6.67°C = 13.89°C

If a **4-20mA signal is available,** it is applied to terminals A+ and A- and **jumpers are applied to JU5 and JU3** on the reset board. The mA signal is conditioned to a 1-11 second PWM output. The PWM output is then supplied to the PWM input on the microboard at CTB 1 terminals 13 - 20. To calculate the chilled liquid setpoint for values between 4mA and 20 ma use the following formula:

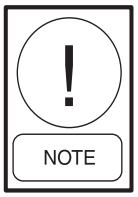
setpoint = local chilled liquid setpoint + °reset

°reset = (mA signal - 4) x (*Max Reset Value)
16

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

(English)
°reset = 8mA x 10°F = 5°F reset
16
setpoint = 45°F + 5°F = 50°F

(Metric)
°reset = 8mA x 5.56°C = 2.78°C reset
16
setpoint = 7.22°C + 2.78°C = 10.0°C



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

If the **Contact Closure input** is used. The connections are made to terminals C and D and only **jumper JUI must be in place** on the reset board. This input is used when a *single* reset value is needed. When the contacts are closed, the remote temperature reset board will convert this contact closure to a PWM signal that is applied to CTB 1 terminals 13 - 20.

To set the PWM output, the contacts must be closed on inputs C - D, and potentiometer R11 (located on the front edge of the PC board) is adjusted to 10VDC as measured at TP3 to terminal 10 on the circuit board. The reset value will be the "Max EMS-PWM Remote Temp. Reset" setpoint value programmed in the SETPOINTS section under the Cooling Setpoints key.

NOTE: The coil of any added relay used for reset must be suppressed to prevent possible component damage. Use YORK PN031-00808-000 suppressor.

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*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).

SECTION 8
MAINTENANCE

GENERAL REQUIREMENTS

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

It is entirely the responsibility of the owner to provide for these regular maintenance requirements and/or enter into a maintenance agreement with a York International service organization to protect the operation of the unit. If damage or a system failure occurs due to improper maintenance during the warranty period, YORK shall not be liable for costs incurred to return the unit to satisfactory condition.

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

The Safety Section of this manual should be read carefully before attempting any maintenance operations on the unit. This section should be read in conjunction with the MBCS Section.

DAILY MAINTENANCE

The following maintenance checks should be carried out on a daily basis by the operator/customer. Please note that the units are not generally user serviceable and no attempt should be made to rectify faults or problems found during daily checks unless competent and equipped to do so. If in any doubt, contact your local YORK Service Agent.

Unit Status: Press the 'STATUS' key on the keypad and ensure no fault messages are displayed (refer to the MBCS Manual for explanation of messages and the Trouble Shooting section for courses of action).

Refrigerant Leaks: Visually check the heat exchangers, compressors and pipework for damage and gas leaks.

Operating Conditions: Read the operating pressures and temperatures at the control panel using the display keys and check that these are within the operating limitations given in the MBCS manual.

Compressor Oil Level: Check the compressor oil level after the compressor has been operating on 'FULL LOAD' for approximately half an hour. The oil level should be between the upper and lower sight glasses on the oil separators.

Refrigerant Charge: When a system starts up, or sometimes after a change of capacity, a flow of bubbles will be seen in the liquid line sight glass. After a few minutes of stable operation, the bubbles should clear leaving just liquid refrigerant showing in the sight glass.

SCHEDULED MAINTENANCE

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

STANDARD UNITS

TABLE 7 – STANDARD UNITS

SERVICE SCHEDULE	MINOR SERVICE All items under Minor Service plus:	MAJOR SERVICE
Unit general:	Check thermal insulation. Check vibration isolators.	Check main structure. Check paint-work.
Refrigerant systems general:	Check relief valves. Check fusible plugs. Check for pipework damage. Check for leaks. Check moisture indicator. Check suction superheat. Check liquid subcooling.	Check solenoid valves.
Compressors / Oil separator:	Check oil level. Check oil pressure. Check unloader operation. Check crankcase heater. Check condition of oil.	
Cooler:	Check water flow. Check water pressure drop.	Check water pH / glycol strength.
Condenser:	Check water flow. Check water pressure drop.	Check water pH / glycol strength.
Power & Control system general:	Check panel condition. Check mains and control wiring. Check sensor locations. Check mechanical HP cutouts. Check emergency stop.	Check all connections. Check compressor contactors. Check sensor / transducer calibration. Check motor protectors. Check contactor contacts.
Microprocessor controls:	Check fault history. Check program settings. Check HP / LP cutout functions. Check pump-down function. Check load / unload function.	Check low and high ambient cutout functions. Check low LCHLT cutout function. Check low differential oil pressure function. Check low evaporator temperature cutout function.

TROUBLESHOOTING GUIDE

TABLE 8 – TROUBLESHOOTING GUIDE

PROBLEM	POSSIBLE CAUSE	ACTION
No display on panel – unit will not operate	Mains supply to control system off.	Switch on mains supply if safe to do so.
	Emergency stop device off.	Check if control panel emergency stop switch and any remote emergency stop devices are in the 'OFF' position. Turn to 'ON' position (1) if safe to do so.
	No supply to -T3.	Check emergency stop switch fuses.
	No 24VAC supply to power board.	Check wiring from -T3 to power board and fuse -F3.
	No +12V output from power board.	Replace power board or isolate excessive load on the board.
NO RUN PERM displayed (No run permissive)	No liquid flow through the cooler.	Ensure that liquid pumps are running. Valves are correctly set and flow is established.
	Flow switch contacts are not made	Check the flow switch is functional and is installed according to the manufacturers instructions. Note: On some systems the pump starter may be wired to the unit and controlled to start by the unit.
SYS # HIGH OIL TEMP displayed	Measured temperature incorrect.	Check for blockages in condenser coils and check oil cooler.
		Check sensor calibration, location and wiring
Chiller FAULT: LOW AMBIENT TEMP displayed	Ambient air temperature is lower than the programmed operating limit.	Use the 'ambient temp.' key to display the tempera ture and confirm that the displayed value is approxi mately correct. The warning message should clear when the ambient air temperature reaches the programmed operating limit.
	Measured temperature is incorrect.	Check the programmed settings are correct for the options fitted to the unit.
		Check sensor calibration, location and wiring.
Chiller FAULT: HIGH AMBIENT TEMP displayed		Ambient air temperature is higher than the programmed operating limit.
	Measured temperature is incorrect.	Use the 'ambient temp.' key to display the tempera- ture and confirm that the displayed value is approxi- mately correct. The warning message should clear when the ambient air temperature falls below the programmed operating limit.
		Check the programmed settings are correct for the options fitted to the unit.
		Check sensor calibration, location and wiring.
Chiller FAULT: LOW WATER TEMP displayed	Leaving liquid drops below the programmed low limit faster than the unit can unload.	Check for restrictions in the liquid flow line.
		Check the liquid flow is stable.
	Unit is not unloading.	Check the supply to the unloader valve solenoid.
		Check the compressor unloads correctly.
	Measured temperature is incorrect.	Check sensor calibration, location and wiring.
Chiller FAULT: VAC UNDERVOLTAGE displayed	Poor mains supply voltage.	Check mains supply is stable and within allowable limits.
		Check for voltage dip on compressor start.

TROUBLESHOOTING GUIDE (CONT'D)

TABLE 8 – TROUBLESHOOTING GUIDE (CONT'D)

PROBLEM	POSSIBLE CAUSE	ACTION
SYS # HIGH DSCH displayed (High discharge pressure trip)	Poor cooling liquid flow through the condenser.	Check for restricted cooling liquid flow. Check for non-condensables (air) in system.
	Excessive refrigerant charge.	Check sub-cooling is correct.
	Measured pressure is incorrect.	Check discharge transducer calibration and wiring.
SYS # HIGH DSCH TEMP displayed (High discharge temperature)	Suction superheat too high.	Check suction superheat is within range.
	Measured temperature incorrect.	Check for restricted cooling liquid flow.
		Check sensor calibration, location and wiring.
SYS # DSCH LIMITING displayed (Discharge pressure unloading)	Discharge pressure unloading due to unit operating above load limit. See also SYS # HIGH DSCH.	Check chilled liquid temperature is within range.
SYS # HIGH OIL PRESS DIFF is displayed. (High oil differential pressure)	Ball valve in oil circuit closed.	Check ball valves are in open position.
	Dirty / blocked oil filter.	Check and change oil filter cartridge.
SYS # LOW SUCTION displayed	Badly adjusted or faulty expansion valve.	Check superheat.
	Reduced evaporator performance.	Check for restricted chilled liquid flow.
		Check for fouled tube surfaces.
		Check superheat.
	Low refrigerant charge.	Check subcooling is correct. Check for leaks.
	Restricted refrigerant flow.	Check for blocked filter/drier. Check YLLSV operating correctly
	Measured pressure incorrect.	Check suction pressure transducer calibration and wiring.
SYS # LOW CURR/ MP/HP displayed	Compressor current too low.	Check compressor mains supply, fuses, contactors and wiring. Check mains supply voltage is within tolerance.
	Measured current is incorrect.	Check for defective current transformer (resistance should be between 42 and 44 Ohms).
		Check calibration resistor is correctly fitted.
	Compressor motor protector signal failure.	Check motor protector and wiring.
		Check compressor motor.
	Mechanical high pressure cutout trip.	Check compressor discharge valve is open.
		Check cutout setting and wiring.
	No motor cooling.	Check motor cooling service valve is open.
		Check operation of motor cooling, TEVs and liquid solenoid valve.
SYS # CURR LIMITING displayed (Compressor current operating limits.	High compressor motor current has activated unloading.	Check liquid temperature is within operating limits.
		Check if ambient air temperature is above unloading).

SENSOR CALIBRATION CHARTS

Chilled Leaving Water (BLCT), Chilled Return Water (BECT), Leaving Hot Liquid Temperature (BLHT), Suction (BST) and Refrigerant (BCIRT) Temperature Sensors

TABLE 9 – WATER & REFRIGERANT TEMPERATURES SENSORS

Temperature °C	Resistance ohms	Voltage VDC
-10	16598	1,45
-8	14896	1,57
-6	13388	1,69
-4	12047	1,80
-2	10856	1,93
0	9795	2,05
2	8849	2,17
4	8005	2,30
6	7251	2,42
8	6575	2,54
10	5970	2,66
20	3748	3,22
30	2417	3,69
40	1598	4,05

TEST POINTS:

Leaving Water ..... (BLCT) AMB J11-7/4
Return Water ..... (BECT) AMB J11-8/5

Suction Temperature (BST):
Refrigerant Circuit 1 ..... AMB J16-6/5
Refrigerant Circuit 2 ..... AMB J16-4/2

Refrigerant Temperature (BCIRT)
Refrigerant Circuit 1 ..... AIOB1 J11-2/1
Refrigerant Circuit 2 ..... AIOB1 J7-2/1

TABLE 10 – AMBIENT TEMPERATURE SENSOR

Temperature °C	Resistance ohms	Voltage VDC
-10	55330	0,97
-5	42227	1,20
0	32650	1,45
5	25390	1,72
10	19900	2,00
15	15710	2,29
20	12490	2,58
25	10000	2,85
30	8057	3,11
35	6530	3,35
40	5327	3,57

TEST POINT:

Ambient Air (BAMB) ..... AMB J11-9/6

TABLE 11 – OIL & DISCHARGE TEMPERATURE SENSORS

Temperature °C	Resistance ohms	Voltage VDC
0	163250	0,282
10	99500	0,447
20	62450	0,676
30	40285	0,976
40	26635	1,34
50	18015	1,76
60	12440	2,20
70	8760	2,63
80	6290	3,04
90	4588	3,40
100	3400	3,71
110	2556	3,96
120	1946	4,17
130	1504	4,33
140	1174	4,46
150	926	4,57

TEST POINTS:

Oil Temperature (BOT):
Refrigerant Circuit 1 ..... AIOB1 J10-7/4
Refrigerant Circuit 2 ..... AIOB1 J10-6/5

Discharge Temperature (BDT):
Refrigerant Circuit 1 ..... AIOB1 J8-4/2
Refrigerant Circuit 2 ..... AIOB1 J8-6/5

TABLE 12 – PRESSURE TRANSDUCERS

0 - 200 PSIG Transducer		0 - 400 bar Transducer	
Pressure PSIG	Voltage VDC	Pressure PSIG	Voltage VDC
0	0,5	0	0,5
25	1,0	50	1,0
50	1,5	100	1,5
75	2,0	150	2,0
100	2,5	200	2,5
125	3,0	250	3,0
150	3,5	300	3,5
175	4,0	350	4,0
200	4,5	400	4,5

Red Wire = 5V, Black wire = 0V, White/Green Wire = signal

TEST POINTS:

Oil Pressure (BOP):
Refrigerant Circuit 1 ..... AMB J13-8/3
Refrigerant Circuit 2 ..... AMB J14-8/3

Discharge Pressure (BSP):
Refrigerant Circuit 1 ..... AMB J15-8/3
Refrigerant Circuit 2 ..... AMB J15-7/1

Suction Pressure (BSP):
Refrigerant Circuit 1 ..... AMB J13-7/1
Refrigerant Circuit 2 ..... AMB J14-7/1

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TYPICAL CONTROL PANEL WIRING

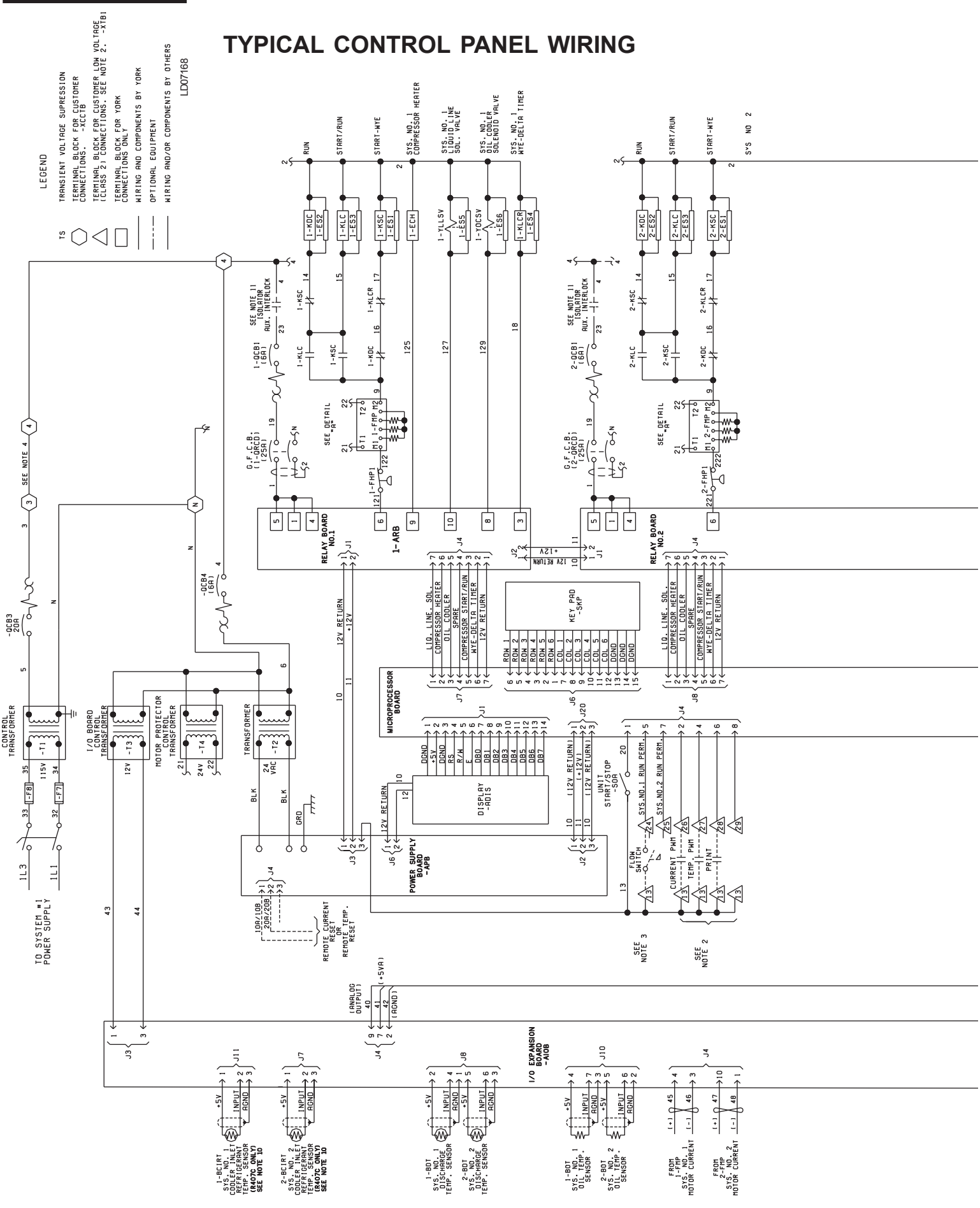
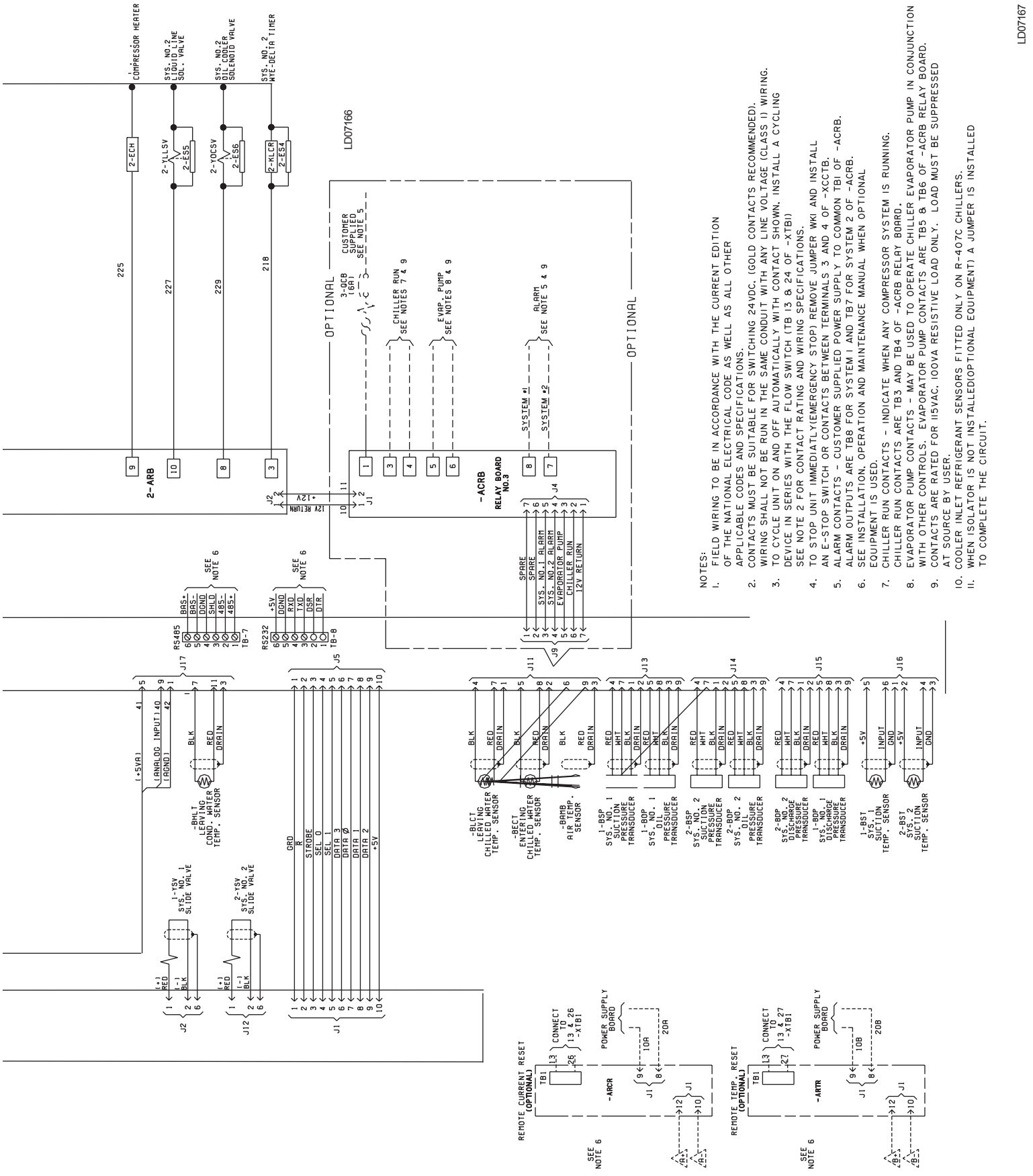
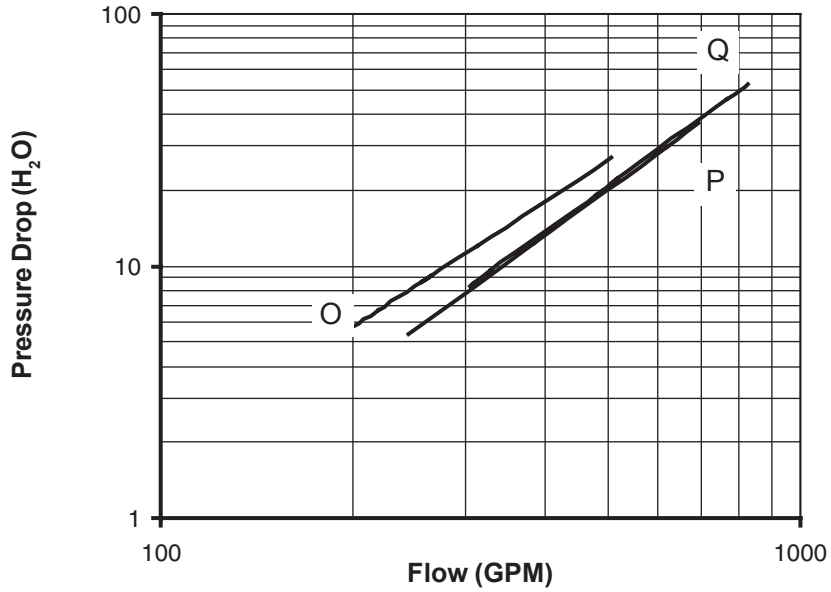


FIG. 23 – TYPICAL CONTROL PANEL WIRING

TYPICAL CONTROL PANEL WIRING



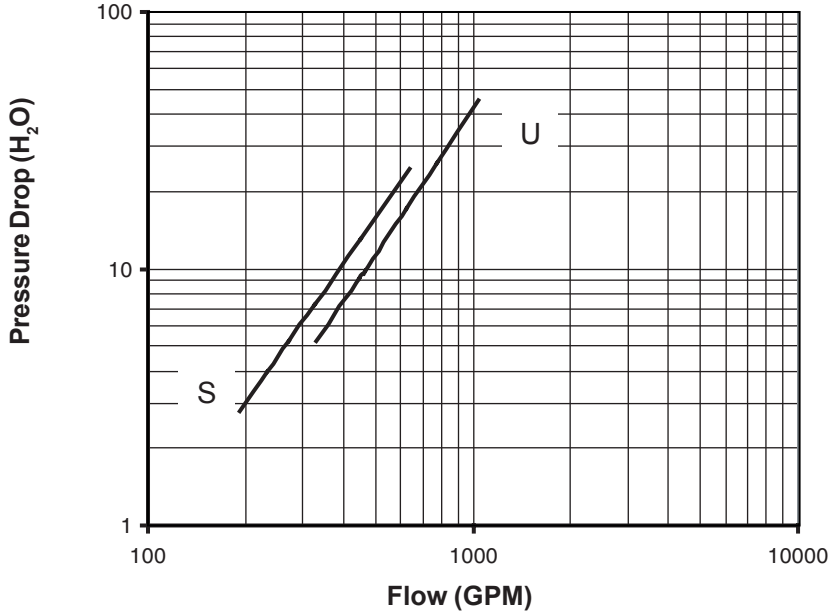
SECTION 9
TECHNICAL DATA
PRESSURE DROP CHARTS



LD07162

YCRS MODEL NUMBER	COOLER
0100SC, 0120SC, 0140SC	O
0180SC, 0200SC	P
0220SC, 0240SC	Q

FIG. 24 – COOLER WATER PRESSURE DROP CURVES (ENGLISH)

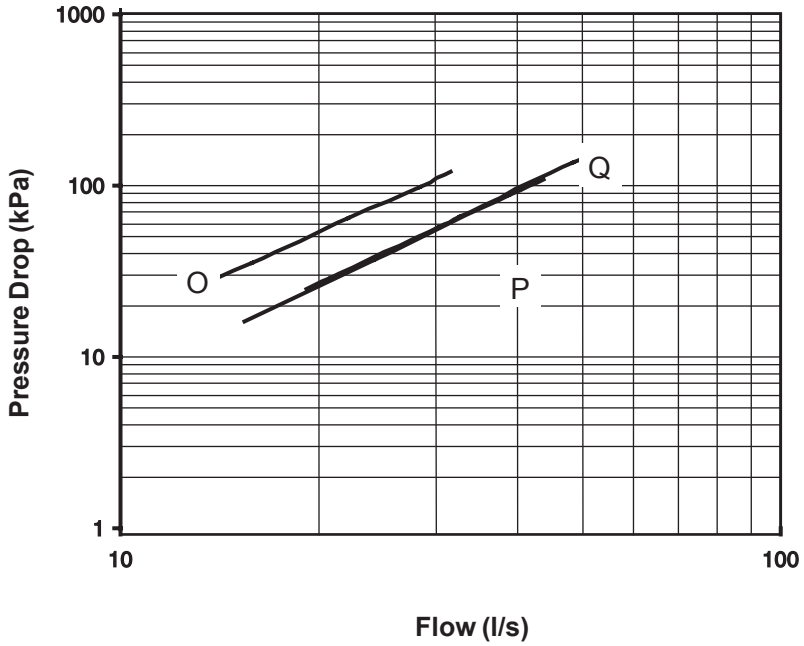


LD07163

YCRS MODEL NUMBER	COOLER
0100SC, 0120SC, 0140SC	S
0180SC, 0200SC 0220SC, 0240SC	U

FIG. 25 – CONDENSER WATER PRESSURE DROP CURVES (ENGLISH)

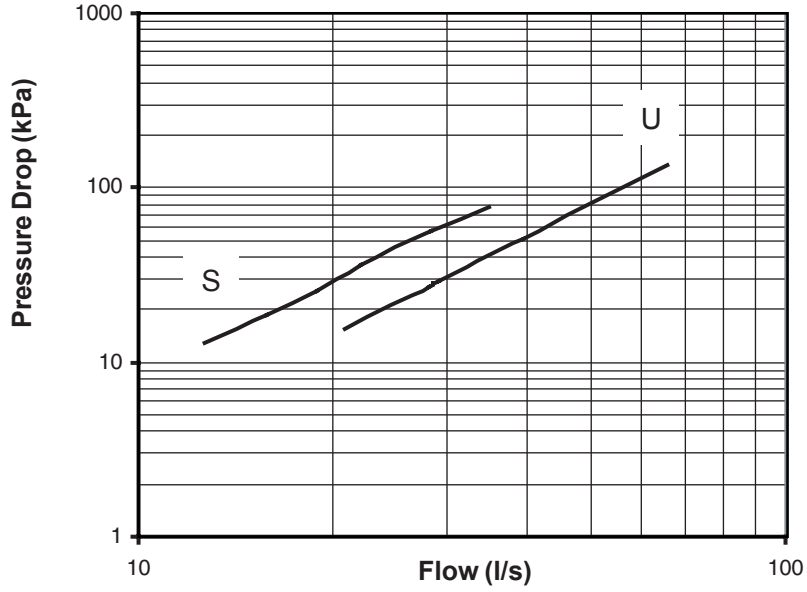
PRESSURE DROP CHARTS



LD07164

YCRS MODEL NUMBER	COOLER
0100SC, 0120SC, 0140SC	O
0180SC, 0200SC	P
0220SC, 0240SC	Q

FIG. 26 – COOLER WATER PRESSURE DROP CURVES (SI)



LD07165

YCRS MODEL NUMBER	COOLER
0100SC, 0120SC, 0140SC	S
0180SC, 0200SC 0220SC, 0240SC	U

FIG. 27 – CONDENSER WATER PRESSURE DROP CURVES (SI)

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NOTE

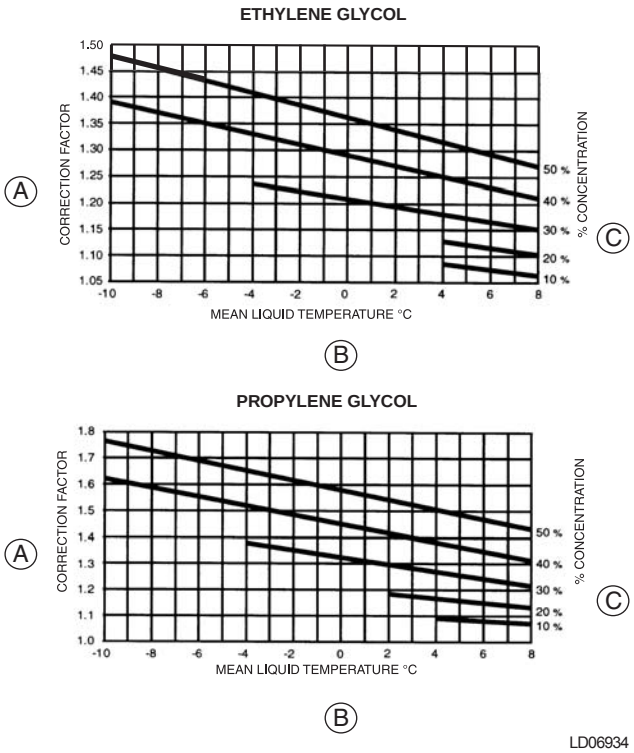
The cooler and condenser design allows for an increase in pressure drop of up to 15% above the design value given. Debris in the water may also cause additional pressure drop.

CAUTION

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

TABLE 13 – 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



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

FIG. 28 – GLYCOL SOLUTION STRENGTHS

PHYSICAL DATA

TABLE 14 – PHYSICAL DATA, ENGLISH

MODEL YCRS	0100SC	0120SC	0140SC	0180SC	0200SC	0220SC	0240SC
General Unit Data							
Nominal Unit Capacity (Tons)	81	101	120	145	164	179	194
Number of Independent Refrigerant Circuits	2	2	2	2	2	2	2
Nitrogen (N_2) Shipping Charge, Ckt 1/Ckt. 2 (lbs.)	-	-	-	-	-	-	-
Oil Charge, Ckt. 1/Ckt. 2, (gal.)	2/2	2/3	3/3	3/3	3/3	3/3	3/3
Shipping Weight (lbs.)	5989	6271	6584	9026	9132	9162	9252
Operating Weight (lbs.)	6550	6852	7126	10124	10222	10232	10344
Compressors, Semi-Hermetic Twin Screw							
Quantity per Chiller	2	2	2	2	2	2	2
Nominal Size, Ckt. 1/ Ckt. 2	F/F	F/C	C/C	C/A	A/A	A/B	B/B
Evaporator, Direct Expansion - Code	**O**	**O**	**O**	**P**	**P**	**Q**	**Q**
Water Volume (gals.)	64	64	64	94	94	107	107
Maximum Water Side Pressure (psig)	150	150	150	150	150	150	150
Maximum Refrigerant Side Pressure (psig)	300	300	300	300	300	300	300
Dia. X Length, inches	19-1/2x 108	19-1/2x 108	19-1/2 x 108	21-1/4 x 156	21-1/4x 156	21-1/4x 156	21-1/4 x 156
Water Nozzle Connection Size, (inches)	8	8	8	8	8	8	8

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TABLE 15 – PHYSICAL DATA, SI

MODEL YCRS	0100SC	0120SC	0140SC	0180SC	0200SC	0220SC	0240SC
General Unit Data							
Nominal Unit Capacity (kW)	286	354	423	508	578	631	682
Number of Independent Refrigerant Circuits	3	3	3	5	5	5	5
Nitrogen (N_2) Shipping Charge, Ckt 1/Ckt. (kgs.)	-	-	-	-	-	-	-
Oil Charge, Ckt. 1/Ckt. 2, (l)	7.6 / 7.6	7.6 / 11.4	11.4 / 11.4	11.4 / 11.4	11.4 / 11.4	11.4 / 11.4	11.4 / 11.4
Shipping Weight (kg.)	2716	2845	2986	4049	4142	4156	4197
Operating Weight (kg.)	2971	3108	3249	4592	4637	4641	4692
Compressors, Semi-Hermetic Twin Screw							
Quantity per Chiller	2	2	2	2	2	2	2
Nominal Size, Ckt. 1/ Ckt. 2	F/F	F/C	C/C	C/A	A/A	A/B	B/B
Evaporator, Direct Expansion - Code	**O**	**O**	**O**	**P**	**P**	**Q**	**Q**
Water Volume (l/s)	242	242	242	357	357	406	406
Maximum Water Side Pressure (barg)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Maximum Refrigerant Side Pressure (barg)	22.7	22.7	22.7	22.7	22.7	22.7	22.7
Dia. X Length, mm	495 x 2743	495 x 2743	495 x 2743	540 x 3963	540 x 3963	540 x 3963	540 x 3963
Water Nozzle Connection Size, (inches)	8	8	8	8	8	8	8

ELECTRICAL DATA

MULTI-POINT POWER SUPPLY (See Fig. 12, Page 27)

(Each of the two field provided power supply circuits individually protected with branch circuit protection. Field connections to factory provided Terminal Block (std), Non-Fused Disconnects (opt) or individual system Circuit Breakers (opt) in each of the two motor control centers.)

TABLE 16 – MULTI-POINT POWER SUPPLY

	SYSTEM #1						
CHILLER MODEL	VOLT CODE HZ	MIN(1) CIR. MCA	MIN NF DISC SW	MIN DUAL FUSE	MAX DUAL FUSE MAX CB	RLA	Y-D LRA
YCRS0100SC	200	215	200	300	350	172	404
	230	187	200	225	300	149	354
	380	113	150	150	200	90	219
	460	94	100	125	150	75	174
	575	75	100	100	125	60	138
YCRS0120SC	200	215	200	300	350	172	404
	230	187	200	225	300	149	354
	380	113	150	150	200	90	219
	460	94	100	125	150	75	174
	575	75	100	100	125	60	138
YCRS0140SC	200	289	400	350	500	231	591
	230	252	250	350	450	201	481
	380	153	150	200	250	122	285
	460	127	150	175	225	101	228
	575	102	100	125	175	81	182
YCRS0180SC	200	292	400	350	500	233	591
	230	254	250	350	450	203	481
	380	154	150	200	250	123	285
	460	127	150	175	225	101	228
	575	102	100	125	175	81	182
YCRS0200SC	200	370	400	450	600	296	708
	230	323	400	400	500	258	642
	380	195	200	250	350	156	343
	460	162	150	200	250	129	280
	575	129	150	175	225	103	224
YCRS0220SC	200	370	400	450	600	296	708
	230	323	400	400	500	258	642
	380	195	200	250	350	156	343
	460	162	150	200	250	129	280
	575	129	150	175	225	103	224
YCRS0240SC	200	447	600	600	800	357	708
	230	388	400	500	600	310	642
	380	235	250	300	400	188	343
	460	194	200	250	300	155	280
	575	155	150	200	250	124	224

	SYSTEM #2							
	CHILLER MODEL	VOLT CODE HZ	MIN[1] CIR. MCA	MIN NF DISC SW	MIN DUAL FUSE	MAX DUAL FUSE MAX CB	RLA	Y-D LRA
	YCRS0100SC	200	215	200	300	350	172	404
		230	187	200	225	300	149	354
		380	113	150	150	200	90	219
		460	94	100	125	150	75	174
		575	75	100	100	125	60	138
	YCRS0120SC	200	289	400	350	500	231	591
		230	252	250	350	450	201	481
		380	153	150	200	250	122	285
		460	127	150	175	225	101	228
		575	102	100	125	175	81	182
	YCRS0140SC	200	289	400	350	500	231	591
		230	252	250	350	450	201	481
		380	153	150	200	250	122	285
		460	127	150	175	225	101	228
		575	102	100	125	175	81	182
	YCRS0180SC	200	370	400	450	600	296	708
		230	323	400	400	500	258	642
		380	195	200	250	350	156	343
		460	162	150	200	250	129	280
		575	129	150	175	225	103	224
	YCRS0200SC	200	370	400	450	600	296	708
		230	323	400	400	500	258	642
		380	195	200	250	350	156	343
		460	162	150	200	250	129	280
		575	129	150	175	225	103	224
	YCRS0220SC	200	447	600	600	800	357	708
		230	388	400	500	600	310	642
		380	235	250	300	400	188	343
		460	194	200	250	300	155	280
		575	155	150	200	250	124	224
	YCRS0240SC	200	447	600	600	800	357	708
		230	388	400	500	600	310	642
		380	235	250	300	400	188	343
		460	194	200	250	300	155	280
		575	155	150	200	250	124	224

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ELECTRICAL DATA (CONT'D)

MULTI-POINT WIRING

TABLE 17 – INCOMING WIRE RANGE SELECTIONS

SYSTEM #1							
CHILLER MODEL	VOLT CODE	TERM BLK	TERMINAL BLK CUSTOMER GROUND	N-F DIS SW	N-F DISC SW CUSTOMER GROUND	CKT. BRKR	CKT. BRKR CUSTOMER GROUND
YCRS0100SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0120SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0140SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0180SC	-17	#2/0 - 500 KCM	# 4 - 3/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0200SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	# 8 - 350 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0220SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0240SC		(2) #2 - 4/0 AWG	(2) # 6 - 1/0 AWG	(2) #3/0 - 250 KCM	# 4 - 3/0 AWG	(3) 2/0 - 400 KCM	(2) # 2 - 4/0 AWG
YCRS0100SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0120SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0140SC		#2 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 4 - 3/0 AWG
YCRS0180SC	-28	#2 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0200SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0220SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0240SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0100SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0120SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0140SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0180SC	-40	#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0200SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0220SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0240SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0100SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG
YCRS0120SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG
YCRS0140SC		#6 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0180SC	-46	#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0200SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0220SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0240SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0100SC		#18 - 2 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG
YCRS0120SC		#18 - 2 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG
YCRS0140SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#2 - 4/0 AWG	# 8 - 2 AWG
YCRS0180SC	-58	#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#2 - 4/0 AWG	# 8 - 2 AWG
YCRS0200SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0220SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0240SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG

NOTES: (for Electrical Data on pages 88-93)

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 440.33. 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: -50, add 5 amps;
2. The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per N.E.C. Article 440.
3. Minimum fuse size is based upon 150% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit to avoid nuisance trips at start-up due to lock rotor amps. It is not recommended in applications where brown outs, frequent starting and stopping of the unit, and/or operation at ambient temperatures in excess of 35°C (95°F) 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 supplied by third party vendors must be certified by local electrical standards. 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.
6. The "INCOMING WIRE RANGE" is the minimum and maximum wire size that can be accommodated by the unit wiring lugs. The (2) preceding the wire range indicates the number of termination points available per phase of the wire range specified. Actual wire size and number of wires per phase must be determined based on the National Electrical Code, using copper connectors only. Field wiring must also comply with local codes.
7. A ground lug is provided for each compressor system to accommodate a field grounding conductor per N.E.C. Table 250.122. A control circuit grounding lug is also supplied.
8. The supplied disconnect is a "Disconnecting Means" as defined in the N.E.C. 100.I, and is intended for isolating the unit for the available power supply to perform maintenance and troubleshooting. This disconnect is not intended to be a Load Break Device.
9. Field Wiring by others which complies to the National Electrical Code & Local Codes.

SYSTEM #2

CHILLER MODEL	VOLT CODE	TERM BLK	TERMINAL BLK CUSTOMER GROUND	N-F DISC SW	N-F DIS SW CUSTOMER GROUND	CKT. BRKR	CKT. BRKER CUSTOMER GROUND
YCRS0100SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0120SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0140SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0180SC	-17	#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0200SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0220SC		(2) #2 - 4/0 AWG	(2) # 6 - 1/0 AWG	(2) #3/0 - 250 KCM	# 4 - 3/0 AWG	(3) 2/0 - 400 KCM	(2) # 2 - 4/0 AWG
YCRS0240SC		(2) #2 - 4/0 AWG	(2) # 6 - 1/0 AWG	(2) #3/0 - 250 KCM	# 4 - 3/0 AWG	(3) 2/0 - 400 KCM	(2) # 2 - 4/0 AWG
YCRS0100SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0120SC		#2 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 4 - 3/0 AWG
YCRS0140SC		#2 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 4 - 3/0 AWG
YCRS0180SC	-28	#2/0 - 500 KCM	# 4 - 3/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0200SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0220SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0240SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0100SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0120SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0140SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0180SC	-40	#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0200SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0220SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0240SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0100SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG
YCRS0120SC		#6 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0140SC		#6 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0180SC	-46	#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0200SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0220SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0240SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0100SC		#18 - 2 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG
YCRS0120SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#2 - 4/0 AWG	# 8 - 2 AWG
YCRS0140SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#2 - 4/0 AWG	# 8 - 2 AWG
YCRS0180SC	-58	#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0200SC		#6 - 1/0 AWG	# 8 - 2 AWG	#14 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG
YCRS0220SC		#6 - 1/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0240SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 8 - 2 AWG	#6 - 350 KCM	# 6 - 1/0 AWG

NOTES: (for Electrical Data on pages 88-93)

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 440.33. 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: -50, add 5 amps;
2. The minimum recommended disconnect switch is based on 115% of the rated load amps for all loads included in the circuit, per N.E.C. Article 440.
3. Minimum fuse size is based upon 150% of the rated load amps for the largest motor plus 100% of the rated load amps for all other loads included in the circuit to avoid nuisance trips at start-up due to lock rotor amps. It is not recommended in applications where brown outs, frequent starting and stopping of the unit, and/or operation at ambient temperatures in excess of 35ºC (95ºF) 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 supplied by third party vendors must be certified by local electrical standards. 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.
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8. The supplied disconnect is a “Disconnecting Means” as defined in the N.E.C. 100.I, and is intended for isolating the unit for the available power supply to perform maintenance and troubleshooting. This disconnect is not intended to be a Load Break Device.
9. Field Wiring by others which complies to the National Electrical Code & Local Codes.

ELECTRICAL DATA (CONT'D)

SINGLE-POINT POWER SUPPLY (See Fig. 13 & 14, Page 27 & 28)

(One field provided power supply circuit to the control panel. Field connections to factory provided Terminal Blocks (opt) or Non-Fused Disconnect (opt). Individual system Circuit Breakers, Non-Fused Disconnects or Class 'J' Fuse/Fuse Blocks in each motor control center.)

TABLE 18 – SINGLE-POINT POWER SUPPLY

CHILLER MODELS	VOLT CODE	MIN[1] CIR. MCA	MIN N/F DISC SW	MIN DUAL FUSE	MAX DUAL FUSE MAX CB	SYSTEM #1		SYSTEM #2	
						RLA	Y-D LRA	RLA	Y-D LRA
YCRS0100SC	200	387	400	450	500	172	404	172	404
	230	335	400	400	450	149	354	149	354
	380	203	250	250	250	90	219	90	219
	460	169	200	200	225	75	174	75	174
	575	135	150	175	175	60	138	60	138
YCRS0120SC	200	461	600	600	600	172	404	231	591
	230	400	600	500	600	149	354	201	481
	380	243	250	300	350	90	219	122	285
	460	201	250	250	300	75	174	101	228
	575	161	200	200	225	60	138	81	182
YCRS0140SC	200	520	600	600	700	231	591	231	591
	230	452	600	600	600	201	481	201	481
	380	275	400	350	350	122	285	122	285
	460	227	250	300	300	101	228	101	228
	575	182	200	225	250	81	182	81	182
YCRS0180SC	200	603	800	700	800	233	591	296	708
	230	526	600	600	700	203	481	258	642
	380	318	400	400	450	123	285	156	343
	460	262	400	300	350	101	228	129	280
	575	210	250	250	300	81	182	103	224
YCRS0200SC	200	666	800	800	800	296	708	296	708
	230	581	600	700	800	258	642	258	642
	380	351	400	400	500	156	343	156	343
	460	290	400	350	400	129	280	129	280
	575	232	250	300	300	103	224	103	224
YCRS0220SC	200	742	800	1000	1000	296	708	357	708
	230	646	800	800	800	258	642	310	642
	380	391	400	450	500	156	343	188	343
	460	323	400	400	450	129	280	155	280
	575	258	400	300	350	103	224	124	224
YCRS0240SC	200	803	1000	1000	1000	357	708	357	708
	230	698	800	800	1000	310	642	310	642
	380	423	600	500	600	188	343	188	343
	460	349	400	400	500	155	280	155	280
	575	279	400	350	400	124	224	124	224

ELECTRICAL DATA (CONT'D)

SINGLE-POINT POWER SUPPLY

TABLE 19 – INCOMING WIRE RANGE SELECTIONS

SYSTEM # 1 & SYSTEM #2					
MODEL NUMBER	**VOLT CODE**	**TERM BLK**	**TERM BLK CUST. GROUND**	**N-F DIS SW**	**N-F DIS SW CUST. GROUND**
YCRS0100SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0120SC		(2) #2 - 300 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0140SC		(2) #2 - 300 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0180SC	-17	(2) #2/0 - 500 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0200SC		(2) #2/0 - 500 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0220SC		(2) #2/0 - 500 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 4/0 AWG
YCRS0240SC		(2) #2/0 - 500 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 4/0 AWG
YCRS0100SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0120SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0140SC		(2) #2 - 4/0 AWG	(2) # 6 - 1/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0180SC	-28	(2) #2 - 300 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0200SC		(2) #2 - 300 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0220SC		(2) #2/0 - 500 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0240SC		(2) #2/0 - 500 KCM	(2) # 4 - 3/0 AWG	(2) 250 - 500 KCM	(2) # 4 - 3/0 AWG
YCRS0100SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0120SC		#2 - 300 KCM	# 6 - 1/0 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0140SC		#2 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0180SC	-40	#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0200SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0220SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0240SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0100SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0120SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0140SC		#2 - 4/0 AWG	# 8 - 2 AWG	#4 - 300 KCM	# 6 - 1/0 AWG
YCRS0180SC	-46	#2 - 300 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0200SC		#2 - 300 KCM	# 6 - 1/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0220SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0240SC		#2/0 - 500 KCM	# 4 - 3/0 AWG	250 - 500 KCM	# 4 - 3/0 AWG
YCRS0100SC		# 2/0 - 500 KCM	# 8 - 2 AWG	#2 - 4/0 AWG	# 8 - 2 AWG
YCRS0120SC		(2) # 2 - 4/0 AWG	# 8 - 2 AWG	#2 - 4/0 AWG	# 8 - 2 AWG
YCRS0140SC		(2) # 2 - 300 KCM	# 8 - 2 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0180SC	-58	(2) # 2/0 - 500 KCM	# 8 - 2 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0200SC		(2) 2/0 - 500 KCM	# 8 - 2 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0220SC		(2) 2/0 - 500 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG
YCRS0240SC		(2) 2/0 - 500 KCM	# 6 - 1/0 AWG	#6 - 350 KCM	# 6 - 1/0 AWG

DIMENSIONS (ENGLISH)

TABLE 20 – MOUNTING DIMENSIONS (INCHES)

MODEL	AA	BB	CC
YCRS0100SC	115-5/8	34	23-3/4
YCRS0120SC	115-5/8	34	23-3/4
YCRS0140SC	115-5/8	34	23-3/4
YCRS0180SC	162-7/8	36	25-3/4
YCRS0200SC	162-7/8	36	25-3/4
YCRS0220SC	162-7/8	36	25-3/4
YCRS0240SC	162-7/8	36	25-3/4

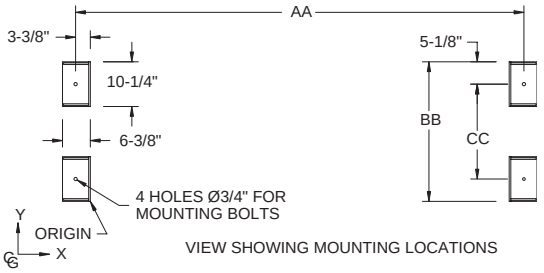

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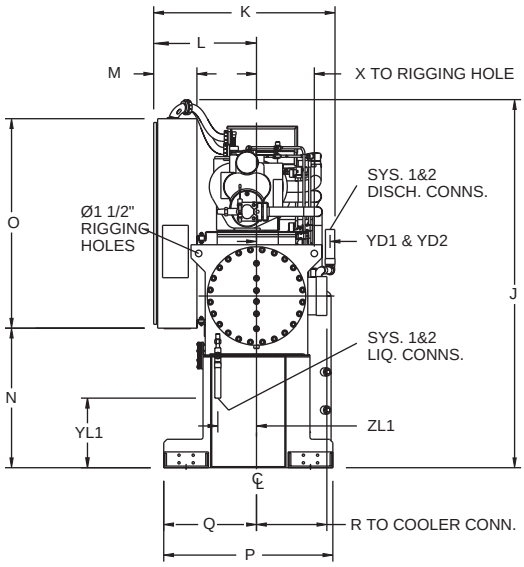
TABLE 21 – CENTER OF GRAVITY (INCHES)

MODEL	X	Y	Z
YCRS0100SC	57	21	39
YCRS0120SC	58	22	39
YCRS0140SC	57	22	39
YCRS0180SC	80	24	43
YCRS0200SC	80	24	43
YCRS0220SC	80	24	43
YCRS0240SC	80	24	43



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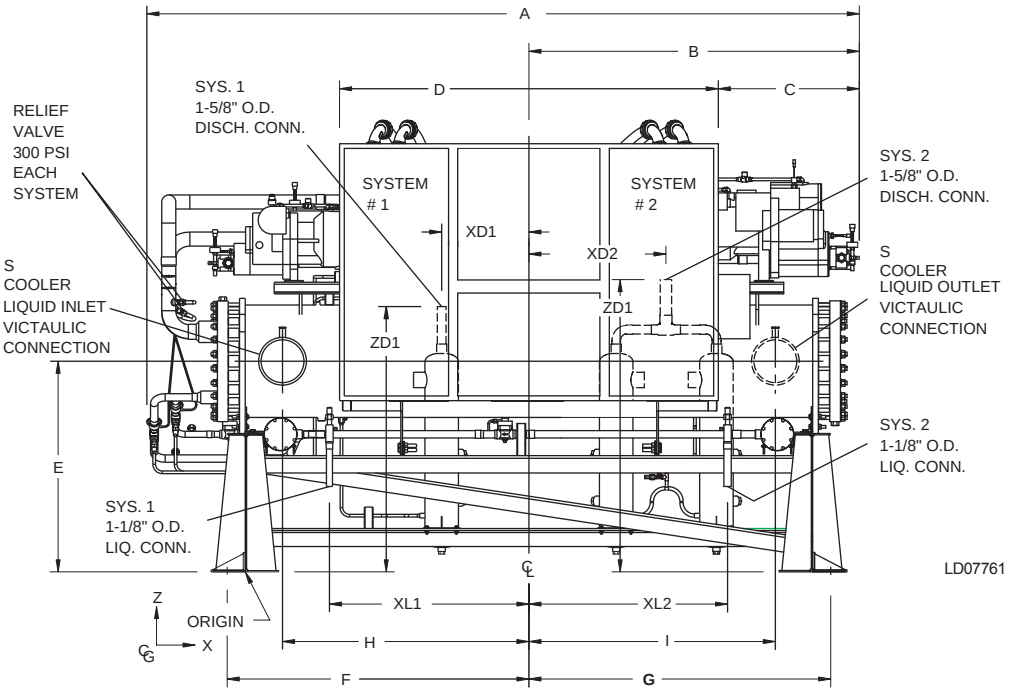

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DIMENSIONS (ENGLISH) (CONT'D)

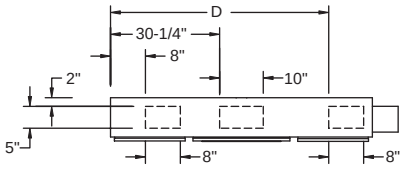
TABLE 22 – DIMENSIONS, ENGLISH

REF	YCRS0100	YCRS0120	YCRS0140	YCRS0180	YCRS0200	YCRS0220	YCRS0240
A	131-5/16"	139-3/32"	139-3/32"	177-3/4"	177-3/4"	177-3/4"	177-3/4"
B	59-15/16"	61-3/4"	61-3/4"	83-3/8"	83-3/8"	83-3/8"	83-3/8"
C	29-15/16"	31-3/8"	31-3/8"	53"	53"	53"	53"
D	60"	60"	60"	60"	60"	60"	60"
E	33-3/8"	33-3/8"	33-3/8"	39-9/32"	39-9/32"	39-9/32"	39-9/32"
F	56-3/8"	56-3/8"	56-3/8"	80-5/16"	80-5/16"	80-5/16"	80-5/16"
G	56-3/8"	56-3/8"	56-3/8"	80-5/16"	80-5/16"	80-5/16"	80-5/16"
H	46-1/32"	46-1/32"	46-1/32"	67-25/32"	67-25/32"	67-25/32"	67-25/32"
I	46-1/32"	46-1/32"	46-1/32"	67-25/32"	67-25/32"	67-25/32"	67-25/32"
J	78-1/4"	78-1/4"	78-1/4"	78-27/32"	78-27/32"	78-27/32"	78-27/32"
K	38-3/8"	40-7/16"	40-7/16"	42-5/16"	42-5/16"	42-5/16"	42-5/16"
L	23-21/32"	23-21/32"	23-21/32"	23-3/4"	23-3/4"	23-3/4"	23-3/4"
M	10"	10"	10"	10"	10"	10"	10"
N	32"	32"	32"	32"	32"	32"	32"
O	40-7/8"	40-7/8"	40-7/8"	40-7/8"	40-7/8"	40-7/8"	40-7/8"
P	38-3/4"	38-3/4"	38-3/4"	38-3/4"	38-3/4"	38-3/4"	38-3/4"
Q	21-1/4"	21-1/4"	21-1/4"	21-1/4"	21-1/4"	21-1/4"	21-1/4"
R	17-1/2"	17-1/2"	17-1/2"	17-1/2"	17-1/2"	17-1/2"	17-1/2"
S	8"	8"	8"	8"	8"	8"	8"
T	13-1/4"	13-1/4"	13-1/4"	14-21/32"	14-21/32"	14-21/32"	14-21/32"
XL1	37- 1/4"	37-1/4"	37-1/4"	61-1/16"	61-1/16"	61-1/16"	61-1/16"
XL2	37-9/32"	37-9/32"	37-9/32"	61-1/8"	61-1/8"	61-1/8"	61-1/8"
YLI	15-15/16"	15-15/16"	15-15/16"	15-1/2"	15-1/2"	15-1/2"	15-1/2"
ZL1	10-3/16"	10-3/16"	10-3/16"	10-3/4"	10-3/4"	10-3/4"	10-3/4"
XD1	16-15/16"	16-15/16"	16-15/16"	16-15/16"	16-15/16"	16-15/16"	16-15/16"
XD2	16-5/16"	16-5/16"	16-5/16"	16-5/16"	16-5/16"	16-5/16"	16-5/16"
YD1	13-7/8"	13-7/8"	10-9/16"	17-1/2 "	17-1/2"	17-1/2"	17-1/2"
YD2	13-7/8"	10-9/16"	10-9/16"	17-1/2"	17-1/2"	17-1/2"	17-1/2"
ZD1	49-1/4"	49-1/4"	54-7/8"	51-13/16"	51-13/16"	51-13/16"	51-13/16"
ZD2	49 - 1/4"	54-7/8"	54-7/8"	51-13/16"	51-13/16"	51-13/16"	51-13/16"

REVISED DIMENSIONS FOR 200/230V CHILLERS

REF	YCRS0100	YCRS0120	YCRS0140	YCRS0180	YCRS0200	YCRS0220	YCRS0240
C	32-1/4"	32-1/4"	32-1/4"	56"	56"	56"	56"
D	70-1/2"	70-1/2"	70-1/2"	70-1/2"	70-1/2"	70-1/2"	70-1/2"
Q	20-7/8"	20-7/8"	20-7/8"	25-15/16"	25-15/16"	25-15/16"	25-15/16"
R	48"	48"	48"	48"	48"	48"	48"

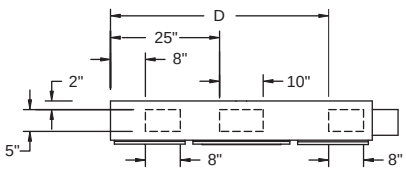
200/230V



VIEW SHOWING CUSTOMER POWER ENTRY LOCATIONS ON UNDERSIDE OF PANEL

LD07762

308/460/575V



VIEW SHOWING CUSTOMER POWER ENTRY LOCATIONS ON UNDERSIDE OF PANEL

LD07763

NOTES:

1. CLEARANCES - Recommended YORK clearances to service the unit are as follows:

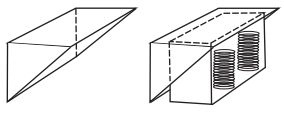
Rear to Wall:	1' 8"
Front to Wall:	2' 8"
Top:	1' 8"
Tube removal 100, 120, 140:	9' (either end)
180,200, 220, 240	13" (either end)

2. Shipping skids (not shown) will increase the height of the unit by 6", but **MUST** be removed upon installation.

3. Spring and neoprene isolators will increase the overall height of the unit by approximately 3".

4. Seismic isolators will increase the height of the unit by approximately 9-1/2".

5. To install spring 1" isolators, the bracket/feet must be flipped over so that the isolator fits within the bracket.

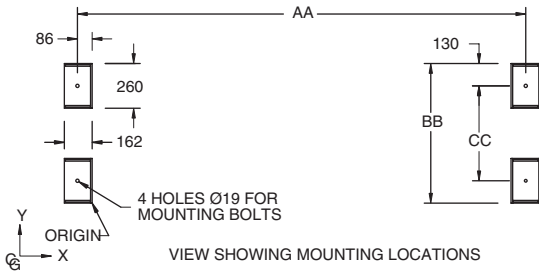


LD07243

DIMENSIONS (SI)

TABLE 23 – MOUNTING DIMENSIONS (mm)

MODEL	AA	BB	CC
YCRS0100SC	2937	864	603
YCRS0120SC	2937	864	603
YCRS0140SC	2937	864	603
YCRS0180SC	4137	914	654
YCRS0200SC	4137	914	654
YCRS0220SC	4137	914	654
YCRS0240SC	4137	914	654

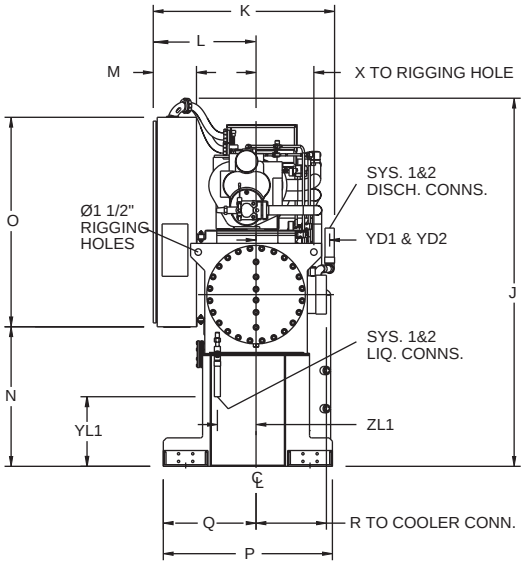


LD07764

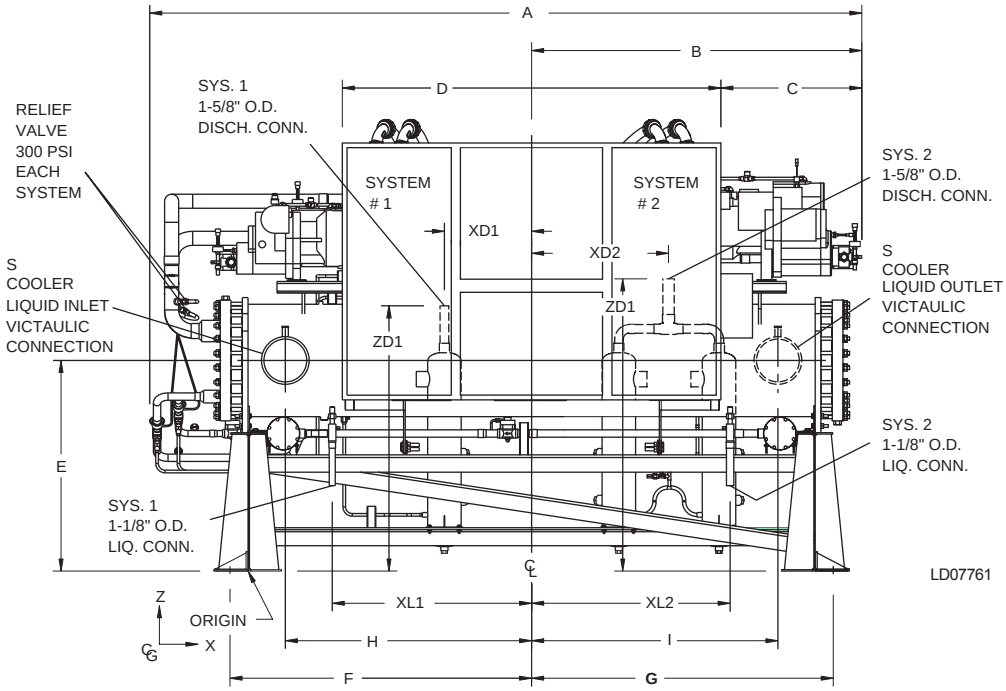
TABLE 24 – CENTER OF GRAVITY (mm)

MODEL	X	Y	Z
YCRS0100SC	1443	543	991
YCRS0120SC	1470	550	991
YCRS0140SC	1443	554	991
YCRS0180SC	2032	613	1092
YCRS0200SC	2025	612	1092
YCRS0220SC	2035	610	1092
YCRS0240SC	2029	609	1092

All dimensions are in mm unless otherwise noted.



LD07760



LD07761

DIMENSIONS (SI) (CONT'D)

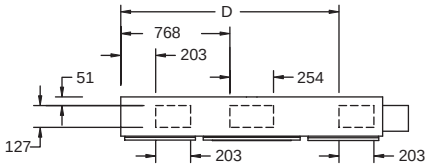
TABLE 25 – DIMENSIONS, SI

REF	YCRS0100	YCRS0120	YCRS0140	YCRS0180	YCRS0200	YCRS0220	YCRS0240
A	3335	3533	3533	4515	4515	4515	4515
B	1522	1568	1568	2118	2118	2118	2118
C	760	797	797	1346	1346	1346	1346
D	1524	1524	1524	1524	1524	1524	1524
E	848	848	848	998	998	998	998
F	1432	1432	1432	2040	2040	2040	2040
G	1432	1432	1432	2040	2040	2040	2040
H	1169	1169	1169	1722	1722	1722	1722
I	1169	1169	1169	1722	1722	1722	1722
J	1988	1988	1988	2003	2003	2003	2003
K	975	1027	1027	1075	1075	1075	1075
L	601	601	601	603	603	603	603
M	254	254	254	254	254	254	254
N	813	813	813	813	813	813	813
O	1038	1038	1038	1038	1038	1038	1038
P	984	984	984	984	984	984	984
Q	540	540	540	540	540	540	540
R	445	445	445	445	445	445	445
S	203	203	203	203	203	203	203
T	337	337	337	372	372	372	372
XL1	946	946	946	1551	1551	1551	1551
XL2	947	947	947	1553	1553	1553	1553
YLI	405	405	405	394	394	394	394
ZL1	259	259	259	273	273	273	273
XD1	430	430	430	430	430	430	430
XD2	414	414	414	414	414	414	414
YD1	352	352	268	445	445	445	445
ZD1	352	268	268	445	445	445	445

REVISED DIMENSIONS FOR 200/230V CHILLERS

REF	YCRS0100	YCRS0120	YCRS0140	YCRS0180	YCRS0200	YCRS0220	YCRS0240
C	819	819	819	1422	1422	1422	1422
D	1791	1791	1791	1791	1791	1791	1791
Q	530	530	530	659	659	659	659
R	1219	1219	1219	1219	1219	1219	1219

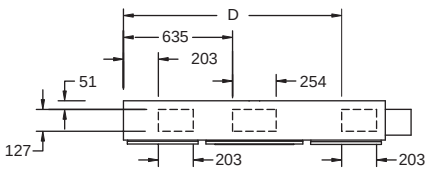
200/230V



VIEW SHOWING CUSTOMER POWER ENTRY LOCATIONS ON UNDERSIDE OF PANEL

LD07765

380/460/575V



VIEW SHOWING CUSTOMER POWER ENTRY LOCATIONS ON UNDERSIDE OF PANEL

LD07766

NOTES:

1. CLEARANCES - Recommended YORK clearances to service the unit are as follows:

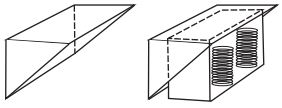
Rear to Wall:	508mm
Front to Wall:	813mm
Top:	508mm
Tube removal 100, 120, 140:	2743mm (either end)
180, 200, 220, 240	3962mm (either end)

2. Shipping skids (not shown) will increase the height of the unit by 152mm, but **MUST** be removed upon installation.

3. Spring and neoprene isolators will increase the overall height of the unit by approximately 76mm.

4. Seismic isolators will increase the height of the unit by approximately 241mm.

5. To install spring 1" isolators, the bracket/feet must be flipped over so that the isolator fits within the bracket.



LD07243

ISOLATOR SELECTION DATA

TABLE 26 – WEIGHT DISTRIBUTION BY MODEL (ENGLISH)

MODEL	A	B	C	D	OPER. WEIGHT (LBS)
YCRS0100SC	1595	1595	1680	1680	6550
YCRS0120SC	1699	1699	1727	1727	6852
YCRS0140SC	1798	1798	1783	1783	7162
YCRS0180SC	2531	2531	2531	2531	10124
YCRS0200SC	2548	2548	2563	2563	10222
YCRS0220SC	2543	2543	2573	2573	10232
YCRS0240SC	2566	2566	2606	2606	10344

TABLE 27 – WEIGHT DISTRIBUTION BY MODEL (SI)

MODEL	A	B	C	D	OPER. WEIGHT (KG)
YCRS0100SC	723	723	762	762	2971
YCRS0120SC	771	771	783	783	3108
YCRS0140SC	816	816	809	809	3249
YCRS0180SC	1148	1148	1148	1148	4592
YCRS0200SC	1156	1156	1163	1163	4637
YCRS0220SC	1154	1154	1167	1167	4641
YCRS0240SC	1164	1164	1182	1182	4692

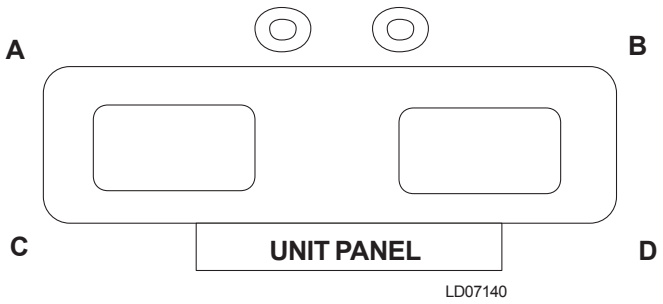


TABLE 28 – SEISMIC ISOLATOR AWMR-2- SELECTIONS

MODEL	A	B	C	D
YCRS0100SC	53	53	53	53
YCRS0120SC	53	53	53	53
YCRS0140SC	53	53	53	53
YCRS0180SC	532	532	532	532
YCRS0200SC	532	532	532	532
YCRS0220SC	532	532	532	532
YCRS0240SC	532	532	532	532

TABLE 29 – 1" ISOLATOR SELECTIONS - VMC TYPE CP-2- X

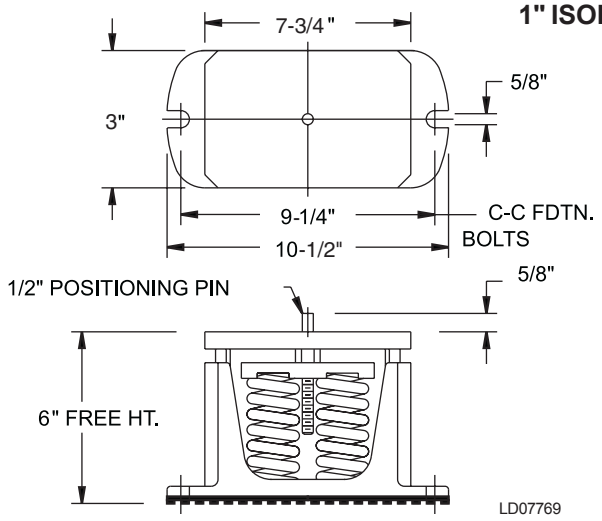
MODEL	A	B	C	D
YCRS0100SC	28	28	28	28
YCRS0120SC	31	31	31	31
YCRS0140SC	31	31	31	31
YCRS0180SC	35	35	35	35
YCRS0200SC	35	35	35	35
YCRS0220SC	35	35	35	35
YCRS0240SC	35	35	35	35

TABLE 30 – NEOPRENE -VMC TYPE RD-4 SELECTIONS

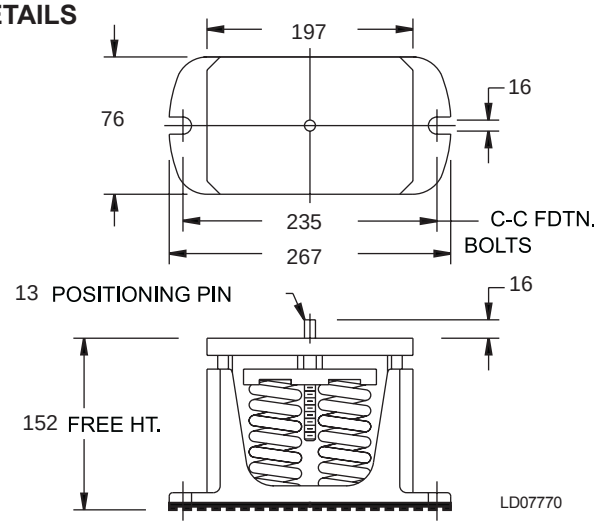
MODEL	A	B	C	D
YCRS0100SC	RED	RED	RED	RED
YCRS0120SC	RED	RED	RED	RED
YCRS0140SC	RED	RED	RED	RED
YCRS0180SC	GREEN	GREEN	GREEN	GREEN
YCRS0200SC	GREEN	GREEN	GREEN	GREEN
YCRS0220SC	GREEN	GREEN	GREEN	GREEN
YCRS0240SC	GREEN	GREEN	GREEN	GREEN

ISOLATOR DETAILS

1" ISOLATOR DETAILS



ENGLISH



SI

TABLE 31 – 1" ISOLATOR DETAILS

TYPE & SIZE	MAX LOAD lbs.	MAX LOAD kg	DEFL. in.	DEFL. mm	SPRING COLOR
CP-2-28	1800	816	1.0	26	Green
CP-2-31	2200	998	0.83	21.0	Gray
CP-2-35	3000	1360	0.7	17.7	Gold

9

ISOLATOR MOUNTING BRACKET

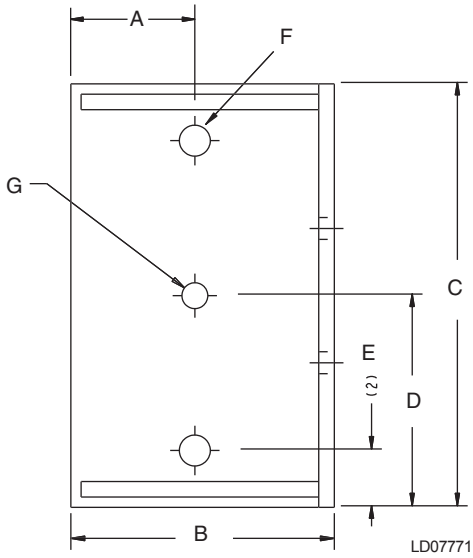


TABLE 32 – ISOLATOR BRACKET DIMENSIONS

ITEM	A	B	C	D
(ENG)	3	6-3/8	10-1/4	5-1/8
(SI)	76	162	260	130

ITEM	E	F	G
(ENG)	1-3/8	3/4	5/16
(SI)	35	19	8

NEOPRENE ISOLATOR DETAILS

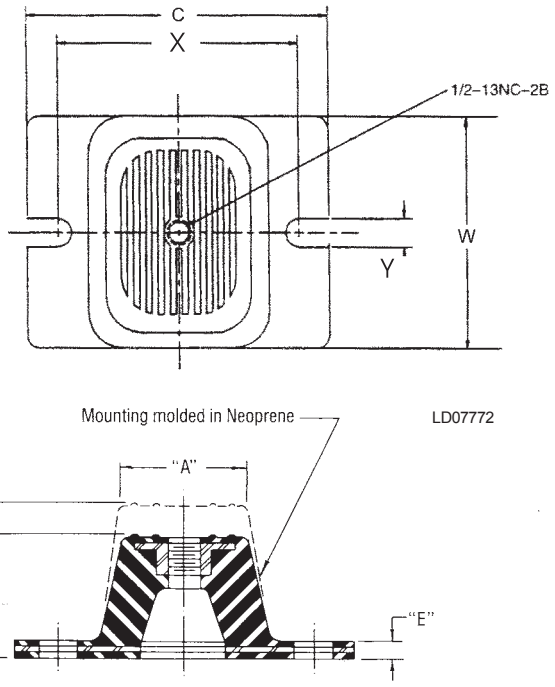


TABLE 33 – NEOPRENE ISOLATOR DETAILS DIMENSIONS

TYPE	A	C	E	H	HD	W	X	Y
R-4 or	3"	6.250"	0.4"	1.625"	2.75"	4.625"	5"	0.55"
RD-4	76mm	159mm	10mm	41mm	70mm	118mm	127mm	14mm

ISOLATOR DETAILS (CONT'D)

SEISMIC ISOLATOR DETAILS

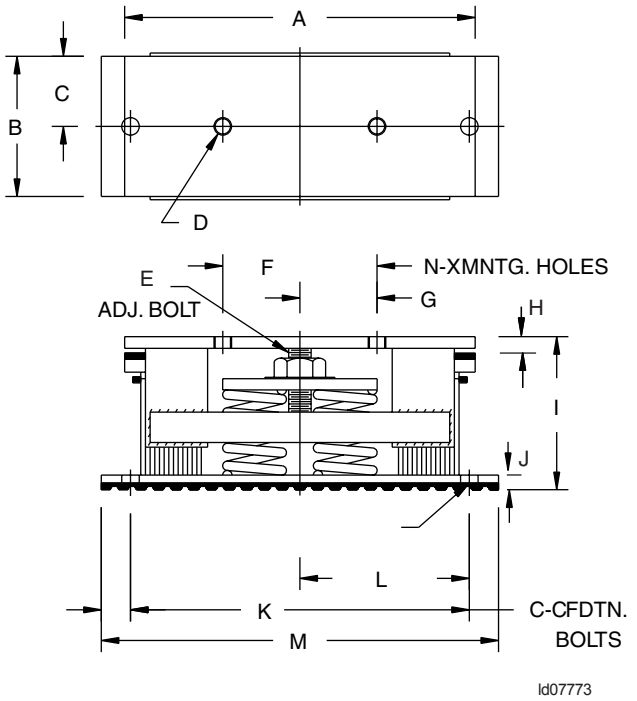


TABLE 34 – SEISMIC ISOLATORS

TYPE & SIZE	MAX LOAD		DEFL.	
	kg	lbs.	mm	in
AWMR-2-53	907	2000	51	2
AWMR-2-532	1361	3000	51	2

TABLE 35 – AWMR DIMENSIONS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N/X
AWMR-2 50-5XX	381mm	152mm	76mm	19 10NC	19mm	191mm	95mm	13mm	241mm	17mm	368mm	184mm	432mm	19mm 16mm

	A	B	C	D	E	F	G	H	I	J	K	L	M	N/X
AWMR-2 50-5XX	15"	6"	3"	3/4 10NC	1"	7 - 1/2"	3-3/4"	1/2"	9 1/2"	5/8"	14.5"	7-1/4"	17"	3/4" 5/8"

SOUND DATA

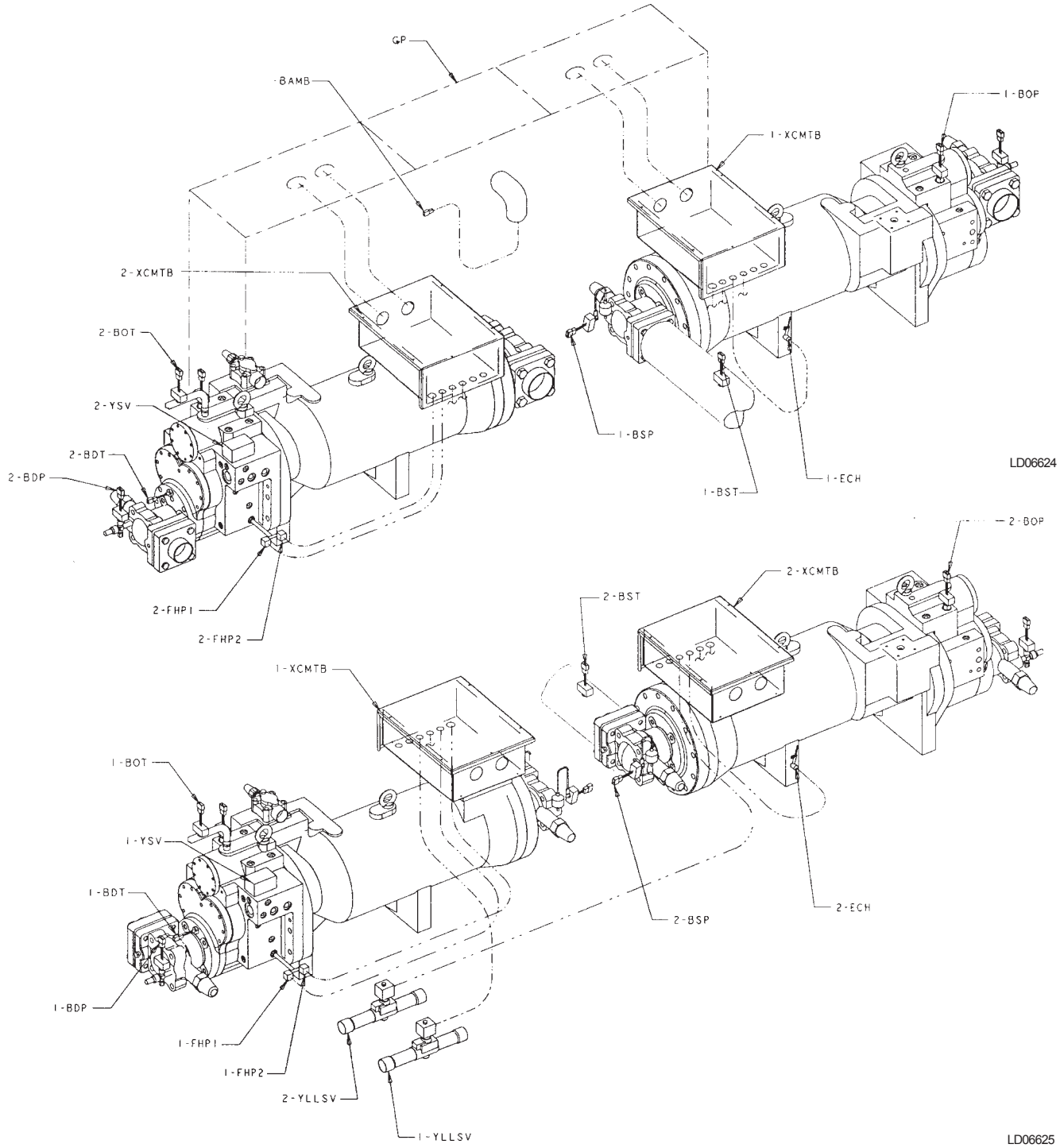
TABLE 36 – SOUND PRESSURE LEVELS (SPL), dB re 20 microPa IN ACCORDANCE WITH ARI STANDARD 575-94

MODEL	OCTAVE BAND HZ								WEIGHTED dBA
	63	125	250	500	1000	2000	4000	8000	
YCRS0100SC	76	72	71.5	76	75	73	64	62	79
YCRS0120SC	76	72	72	77	76	73	64	62	80
YCRS0140SC	76	72	72.5	78	77	74	65	62	81
YCRS0180SC	76	73	73	79	78.5	75	65	62	82
YCRS0200SC	76	73	73.5	80	79.5	76	66	62	83
YCRS0220SC	76	74	74	81	80.5	77	66.5	62	84
YCRS0240SC	76	74	75	82	81.5	78	67	62	85

Note:

All 'A' weighted sound pressure data ± 3 dBA

COMPRESSORS



-BAMB	AMBIENT AIR TEMPERATURE	**-CCCV**	COMPRESSOR CAPACITY CONTROL VALVE
-BDP	DISCHARGE PRESSURE	**-CP**	CONTROL PANEL
-BDT	DISCHARGE TEMPERATURE	**-ECH**	CRANK CASE HEATER
-BECT	CHILLED ENTERING TEMPERATURE	**-FHP**	HIGH PRESSURE CUTOUT
-BLCT	CHILLED LEAVING TEMPERATURE	**-XCMTB**	COMPRESSOR MOTOR TERMINAL BOX
-BOP	OIL PRESSURE	**-YSV**	SOLENOID VALVE
-BOT	OIL TEMPERATURE	**-YLLSV**	LIQUID LINE SOLENOID VALVE
-BSP	SUCTION PRESSURE	**-ZCPR**	COMPRESSOR
-BST	SUCTION TEMPERATURE		

FIG. 29 – COMPRESSORS

SECTION 10
SPARE PARTS

This information will be available at a later date.

SECTION 11
DECOMMISSIONING, DISMANTLING AND DISPOSAL

Never release refrigerant to the atmosphere when emptying the refrigerating circuits. Suitable retrieval equipment must be used. If reclaimed refrigerant cannot be reused. It must be returned to the manufacturer.

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

Unless otherwise indicated, the operations described below can be performed by any properly trained maintenance technician.

GENERAL

Isolate all sources of electrical supply to the unit including any control system supplies switched by the unit. Ensure that all points of isolation are secured in the 'OFF' position. The supply cables may then be disconnected and removed. For connection points refer to Section 4.

Remove all refrigerant from each system of the unit into a suitable container using a refrigerant reclaim or recovery unit. This refrigerant may then be re-used, if appropriate, or returned to the manufacturer for disposal. Under NO circumstances should refrigerant be vented to atmosphere. Drain the oil from each system into a suitable container and dispose of according to local laws and regulations governing the disposal of oily wastes. Any spilt oil should be mopped up and similarly disposed of.

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

If glycol or similar solutions have been used in the water system, or chemical additives are contained, the solution MUST be disposed of in a suitable and safe manner. Under NO circumstances should any system containing glycol or similar solutions be drained directly into domestic waste or natural water systems.

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

Units can generally be removed in one piece after disconnection as above. Any mounting bolts should be removed and then the unit should be lifted from position using the points provided and equipment of adequate lifting capacity.

Reference should be made to Section 4 for unit installation instructions, Section 9 for unit weights and Section 3 for handling.

Units which cannot be removed in one piece after disconnection as above must be dismantled in position. Special care should be taken regarding the weight and handling of each component. Where possible units should be dismantled in the reverse order of installation.

Residual refrigerant oil and glycol or similar solutions may remain in some parts of the system. These should be mopped up and disposed of as described above.

It is important to ensure that whilst components are being removed the remaining parts are supported in a safe manner.

Only use lifting equipment of adequate capacity.

After removal from position the unit parts may be disposed of according to local laws and regulations.

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Form 201.25-NM1 (302)
New Release