YCAL-SC

AIR COOLED LIQUID CHILLER

INSTALLATION, COMMISSIONING, OPERATION AND MAINTENANCE

STYLE: **A**

REFRIGERANT TYPE: **R22**

Software Version: **C.MMC.03.03** and Higher Revision Levels

CE

YORK®

INTERNATIONAL

035L02465-GB0 (07/01)

GB

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1 SUPPLIER INFORMATION

1.1 Introduction

York YCAL-SC *Millennium*™ 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 units are intended for cooling water or glycol solutions and are 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. The manual should be read thoroughly before attempting to operate or service the unit.

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

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

1.2 Warranty

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

The warranty is limited to free 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 and order number. These details are printed on the unit identification plate, fitted on the control panel.

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 Authorised York Service Centre.

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.

Failure to satisfy any of these conditions will automatically void the warranty.

1.3 Safety

Standards for Safety

YCAL-SC *Millennium*™ chillers are designed and built within an EN ISO 9001 accredited design and manufacturing organisation and, within the limits specified in this manual, are in conformity with the essential health and safety requirements of the following European Union Directives:

Machinery Directive (89/392/EEC)

Low Voltage Directive (73/23/EEC, EN 60204)

EMC Directive (89/336/EEC)

Pressure Equipment Directive (97/23/EC) Vessels only

1.4 Responsibility for Safety

Every care has been taken in the design and manufacture of the units to ensure that they meet the safety requirements listed in the previous paragraph. However, the individual operating or working on any machinery is primarily responsible for:

Personal safety, safety of other personnel, and the machinery.

Correct utilisation of the machinery in accordance with the procedures detailed in the manuals.

1.5 About this Manual

The following symbols 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, 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 authorisation from an Authorised YORK representative.

1.6 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 limits 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.

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 with 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 vapour 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 earthed. No installation or maintenance work should be attempted on electrical equipment without 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 inside of the control panel, wiring or other electrical enclosures during normal operation of the unit.

Rotating Parts

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

Sharp Edges

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

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. Build up of refrigerant vapour, from a leak for example, does pose a risk of asphyxiation in confined or enclosed spaces and attention should be given to good ventilation. For more comprehensive information on safety precautions for use of refrigerants and oils, refer to the Materials Safety Data tables provided.

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.

1.7 Emergency Shutdown

In case of emergency the power panel is fitted with a non-fused disconnect switch. When operated, it disconnects the unit power supply which removes the electrical supply from the control system.

1.8 Safety Labels

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

White symbol on blue background
For safe operation, read the Instructions first

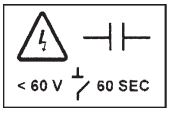
Black symbol on yellow background
Warning: This machine may start automatically without prior warning

Black symbol on yellow background
Warning: Hot surface

Black symbol on yellow background
Warning: Safety relief valve may discharge gas or liquid without prior warning

Black symbol on yellow background
Warning: Isolate all electrical sources of supply before opening or removing the cover, as lethal voltages may exist

Black symbol on yellow background
General attention symbol



Black symbol on yellow background
Power factor correction fitted
Warning: On isolating the supply it may take up to 60 seconds for the capacitor voltage to fall below 60 volts

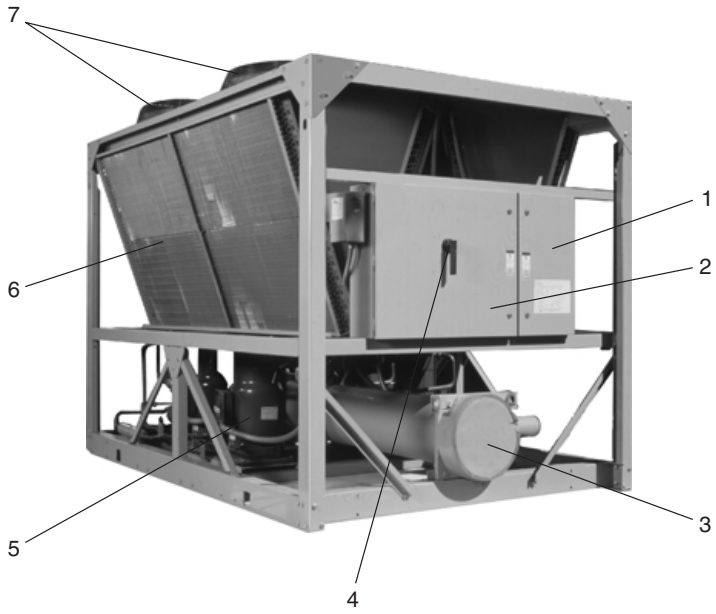
1.9 Material Safety Data

Refrigerant Safety Data R22:	
Toxicity	Low.
In contact with skin	Liquid splashes or spray may cause freeze burns. Unlikely to be hazardous by skin absorption. May be slightly irritant and liquid has a degreasing effect. Thaw affected areas with water. Remove contaminated clothing carefully — may adhere to skin in case of freeze burns. Wash affected areas with plenty of warm water. If symptoms occur (irritation or blistering) obtain medical attention.
In contact with eyes	Vapour has no effect. Liquid splashes or spray may cause freeze burns. Immediately irrigate with eyewash solution or clean water for at least 10 minutes. Obtain immediate medical attention.
Ingested	Highly unlikely to occur — but should this occur freeze burn will occur. Do not induce vomiting. Provided patient is conscious, wash mouth with water and give about 250 ml (0.5 pint) to drink. Obtain immediate medical attention.
Inhalation	High levels of vapour concentration initially produce stimulation and then depression of the central nervous system causing headaches and giddiness and may lead to unconsciousness. Can prove suddenly fatal if the exposure has been severe.
	At higher concentration there is a danger from asphyxiation due to reduced oxygen content of atmosphere. Remove patient to fresh air, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. In event of cardiac arrest apply external cardiac massage. Obtain immediate medical attention.
Further medical advice	Symptomatic and supportive therapy is indicated. Cardiac sensitisation has been described which may, in the presence of circulating catecholamines such as adrenalin, give rise to cardiac arrhythmia's and subsequent arrest following exposure to high concentrations.
Long term exposure	A lifetime inhalation study in rats and mice give a small excess in salivary gland tumours in male rats only at 50,000 ppm. 10,000 ppm showed no effect. This information suggests that R22 does not represent a carcinogenic hazard to humans.
Occupational exposure limits	Recommended limit : 1000 ppm v/v - 8 hr TWA 1250 ppm v/v - 12 hr TWA.
Stability	Unstable
Conditions to avoid	Use in presence of naked flames, red hot surfaces and high moisture levels.
Hazardous reactions	May react violently with sodium, potassium, barium and other alkali and alkaline earth metals. Incompatible materials: Magnesium and alloys containing more then 2% magnesium.
Hazardous decomposition products	Halogen acids by thermal decomposition.
General precautions	Avoid inhalation of high concentrations of vapours. Atmospheric concentrations should be minimised and kept as low as reasonably practicable below the occupational exposure limit. The vapour is heavier than air and collects at low level and in confined areas. Ventilate by extraction at lowest levels.
Respiratory protection	Where doubt exists on atmospheric concentration, HSE approved breathing apparatus should be worn. This should be self contained or of the long breather type.
Storage	Keep containers dry and in a cool place away from fire risk, direct sunlight, and all sources of heat such as radiators. Keep at temperatures not exceeding 45 °C.
Protective clothing	Wear overalls, impervious gloves and goggles/face protection.

Refrigerant Safety Data R22:	
Spill/leak procedure	Ensure suitable personal protective clothing and respiratory protection is worn. Provided it is safe to do so, isolate the source of the leak. Allow small spillage's to evaporate provided there is suitable ventilation. Large spillage's: Ventilate area. Contain spillage's with sand, earth or any suitable absorbent material. Prevent liquid from entering drains, sewers, basements and work pits since vapour may create a suffocating atmosphere.
Disposal	Best to recover and recycle. If this is not possible, destruction is to be in an approved facility which is equipped to absorb and neutralise acids and other toxic processing products.
Fire extinguishing data	Non-flammable.
Containers	Fire exposed containers should be kept cool with water sprays. Containers may burst if overheated.
Fire fighting protective equipment	Self contained breathing apparatus and protective clothing must be worn in fire conditions.

Refrigerant Oil Safety Data York 'F' (MANEUROP 160P) Oil:	
Classification	Non-hazardous polyol ester containing antioxidant.
In contact with skin	Repeated or prolonged skin contact may result in mild irritation. Remove contaminated clothing. Wash skin with soap and water. If symptoms develop, obtain medical attention.
In contact with eyes	Irrigate with eyewash solution or clean water, holding the eyelids apart, for at least 10 minutes. Obtain medical attention.
Ingested	Do not induce vomiting. Wash out mouth with water and give 200-300 ml (half a pint) of water to drink. Obtain medical attention. (Further Medical Treatment- Symptomatic treatment and supportive therapy as indicated).
Inhalation	High concentrations of mist may be slightly irritant to the upper respiratory tract. Remove patient from exposure. Obtain medical attention if ill effects occur.
Occupational exposure limits	Not assigned.
Stability	Stable but hygroscopic - store in sealed containers.
Conditions to avoid	Strong oxidising agents.
Hazardous decomposition	Thermal decomposition will evolve irritant vapours.
Handling	Avoid prolonged skin contact. Avoid inhalation of high concentrations of mists. Avoid inhalation of high concentrations of vapours.
Storage	Keep away from strong oxidising agents, store in mild steel containers. Avoid ingress of moisture by keeping containers properly sealed when not in use. Store at ambient temperature. Storage Life of 2 year(s).
Respiratory protection	Use in well ventilated areas.
Protective clothing	Gloves and goggles should be worn.
Spill / Leak procedure	Do not allow to entry into drains, sewers or watercourses. Adsorb spillages onto sand, earth or any suitable adsorbent material. Transfer to a container for disposal or recovery.
Disposal	Disposal should be in accordance with local, or national legislation.
Fire extinguishing data	Low fire hazard. Unlikely to ignite except in high heat flux conditions. Flash point 270°C.
	Use extinguishing media as appropriate for surrounding materials/equipment. Use water with care to avoid possible violent production of steam.
Containers	Fire exposed containers should be kept cool with water sprays.
Fire fighting protective equipment	Suitable respiratory protection.

Thermal & Acoustic Materials Data	
Health Hazard & First Aid	Toxicity Index <10 to NES713 Issue 3 (1991): Non-hazardous, non-toxic. No first aid necessary.
Stability / Reactivity	Stable.
Handling / Use / Disposal	No special handling precautions required. Dispose of according to local laws and regulations governing non-biodegradable non-hazardous solid wastes.
Fire & Explosion	Flammability rating Class 1 to BS 476 pt 7: Non-flammable. If forced to burn, combustion products are typically over 95% carbon dioxide and carbon monoxide.



1 Control Panel
2 Power Panel
3 Cooler
4 Non-Fused Disconnect Switch
5 Compressor
6 Condenser
7 Fans

2 PRODUCT DESCRIPTION

2.1 Introduction

York YCAL-SC *Millennium*™ chillers are designed for water or water-glycol cooling. All units are designed to be located outside on the roof of a building or at ground level.

The unit consists of two separate refrigerant circuits with two or three hermetic scroll compressors in each circuit, a single shell and tube DX evaporator, air cooled condensers and thermostatic expansion valves.

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

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 structure is manufactured from heavy gauge, galvanised steel and coated with “Desert Sand” (Munsell® System Notation 10YR 6:2) baked-on powder paint. This provides a finish which, when subjected to ASTM B117, 500 hour, 5% salt spray testing, yields a minimum ASTM 1654 rating of '6'.

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

2.2 Compressors

The suction-gas cooled, hermetic scroll compressors feature a no-contact scroll design utilising floating tip seals. High efficiency is achieved through a controlled orbit and the use of an advanced scroll geometry. All rotating parts are statically and dynamically balanced. A large internal volume and oil reservoir means greater liquid tolerance.

The compressor motors have integral thermistor protection against overloads which will automatically reset. Starting is direct on line. The motor terminal boxes have IP-55 weather protection.

The compressors are switched On and Off by the unit microprocessor to provide capacity control.

Each compressor is fitted with a crankcase strap heater.

2.3 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 service valve, 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.

2.4 Air Cooled Condensers

The condenser coils are manufactured from seamless, internally enhanced, high condensing coefficient, corrosion resistant copper tubes arranged in staggered rows and mechanically expanded into corrosion resistant black epoxy coated aluminium alloy fins with full height fin collars. They have a design working pressure of 27.9 barg (405 psig).

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

The fan motors are Totally Enclosed Air-Over (TEAO), squirrel-cage type. They feature ball bearings that are double-sealed and permanently lubricated.

2.5 Cooler

The unit uses a Shell and Tube type Direct Expansion Evaporator. Each of the refrigerant circuits consists of 4 passes with the chilled liquid circulating back and forth across the tubes from one end to the other.

The design working pressure of the cooler on the shell side is 10 barg (150 psig), and 16.2 barg (235 psig) for the tube (refrigerant side). The water baffles are fabricated from galvanised 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 equipped with a thermostatically controlled heater for protection to -29°C ambient and insulated with flexible closed-cell foam.

The water nozzles are provided with grooves for mechanical couplings and should be insulated by the contractor after pipe installation.

2.6 Power and Control Panels

All controls and motor starting equipment are factory wired and function tested. The panel enclosures are designed to IP55 and are manufactured from powder painted steel.

The power panel and control panel have separate hinged and gasket sealed doors.

The power panel contains:

A factory mounted non-fused disconnect switch with external, lockable handle to enable connection of the unit supply voltage. The disconnect switch can be used isolate the power for servicing.

Factory mounted compressor manual motor starters (to provide overload and short circuit protection).

Compressor motor starting contactors.

Factory mounted control transformer to convert the unit supply voltage to 115 V - 1 Ø - 50 Hz for the control system.

Fan contactors & overload current protection.

Customer terminal block for status outputs and chilled liquid pump.

The control panel contains:

A Liquid Crystal Display (two display lines of twenty characters per line) with Light Emitting Diode back lighting for outdoor viewing.

A Colour coded 12-button non-tactile keypad.

Customer terminal block for control inputs and liquid flow switch.

Microprocessor board, relay boards and power supply board.

2.7 Keypad Controls

Status Key

To display the status of the unit and each refrigerant circuit, and the system and unit safety fault messages.

Display/Print Keys

To display chilled liquid temperatures, ambient temperature, system pressures (each refrigerant circuit), operating hours and starts (each compressor) and status of liquid pump, evaporator heater, solenoid valve and condenser fan. Parameters may be displayed in Metric (°C and barg) or Imperial (°F and psig) units.

Operating data for the systems and the history of fault shutdown data for up to the last six fault shutdown conditions may also be displayed.

An RS-232 port, in conjunction with this press-to-print button, is provided to permit the capability of hard copy print-outs of operating data and fault history via a separate printer (by others).

Entry Keys

To program and modify system values.

Setpoints Keys

To enable the following parameters to be changed:

Chilled liquid temperature setpoint and range and remote reset temperature range.

Set daily schedule/holiday for start/stop and manual override for servicing.

Low and high ambient cutouts, number of compressors, low liquid temperature cutout, low suction pressure cutout, high discharge pressure cutout and anti-recycle timer (compressor start cycle time).

Unit Keys

To set the time and unit options.

Unit ON/OFF switch

To activate or deactivate the unit.

2.8 Accessories and Options

Power Options:

Power Factor Correction - Factory mounted passive (static) power factor correction capacitors to correct unit compressor power factors to a target of 0.9 - 0.95 (depending on operating conditions).

Soft Start - Factory fitted and wired reduced current soft start on compressor No. 2. of each circuit on models 0149 and 0175 or compressor No. 3 of each circuit on models 0199, 0219 and 0255.

Control Options:

Low Ambient Kit - Standard units will operate to -4°C. This accessory includes all necessary components to permit chiller operation to -18°C.

Building Automation System (BAS) Interface - The addition of a factory mounted PCB to accept a 4-20 mA, 0-10 Vdc or contact closure input to reset the leaving chiller liquid temperature from a building automation system. (Cannot be fitted when a Remote Control Panel or Multi-unit Sequence Control is fitted).

The standard unit capabilities include remote start-stop, remote water temperature reset via a PWM input signal or up to two steps of demand (load) limiting depending on model.

The standard unit control panel can be directly connected to a YORK Building Automated System via the standard on board RS485 communication port.

Language LCD and Keypad - Spanish, French, German, and Italian unit LCD read-out and keypad available. Standard language is English.

Suction Pressure Transducers - (option on YCAL0149 and 0175 models only, standard on YCAL0199, 0219 and 0255 models). The addition of factory mounted suction transducers to sense and display suction pressure.

Remote Control Panel and Wall Adaptor - Field mounted remote control panel (Cannot be fitted when a (BAS) Interface or Multi-unit Sequence Control is fitted).

Multi-unit Sequencing - A field mounted Sequencing Control Centre to manage sequencing control of up to eight chillers in parallel based on mixed liquid temperature (interconnecting wiring by others). (Cannot be fitted when a (BAS) Interface or Remote Control Panel is fitted).

Refrigerant Circuit Options:

Low Temperature Brine - Standard units will operate down to -1°C leaving chilled liquid temperature(LCHLT). For brine chilling applications below -1°C LCHLT this factory mounted option includes resized thermal expansion valves.

Hot Gas By-pass - Factory mounted Hot Gas By-pass installed on refrigerant circuit 1 to introduce an artificial load on the cooler, to permit continuous stable operation at capacities below the minimum step of compressor unloading to as low as 5% capacity (depending on both the unit and operating conditions).

Mechanical Gauge Kit - Factory fitted mechanical pressure gauges for display of suction and discharge pressures, one complete set per system.

Hydro Kit - Field mounted hydraulic package complete with buffer tank, pump and valves.

Electronic Expansion Valves (EEV) - Factory fitted kit comprises a combined electronic expansion valve / solenoid valve and suction temperature sensor in each refrigerant circuit, to provides improved part load performance. The control panel is fitted with all the electrical components to operate the valves. In addition, the unit software has the control logic to operate the electronic expansion valves.

DX Cooler Options:

38 mm Insulation - Double thickness insulation provided for enhanced efficiency, and low temperature applications.

Flanges - Consists of 10.5 bar (150 PSI) cooler raised face flanges to convert standard grooved connections to flanged connections and includes companion flanges for field mounting.

10.5 bar (150 PSI) DWP Flow Switch - For standard units. Johnson Controls model F61MG-1C Vapour-proof SPDT switch (10.5 bar [150 PSI] DWP), -29°C to 121°C, with 1" NPT connection for upright mounting in horizontal pipe (field mounted).

Condenser Options:

Aluminium Fin Condenser Coils - Condenser coils are constructed with uncoated aluminium fins.

Copper Fin Condenser Coils - Condenser coils are constructed with copper fins.

Blygold Protective Coating - is recommended for corrosive applications, such as coastal locations where salt spray may hit the condenser fins.

High Static Pressure Fans - Fans and motors suitable for high external static conditions.

Sound Options:

Compressor Acoustic Sound Blanket - Each compressor is individually enclosed by an acoustic sound blanket. The sound blankets are made with one layer of acoustical absorbent textile fibre of 15 mm thickness; one layer of anti-vibrating heavy material thickness of 3mm. Both are enclosed by two sheets of welded PVC, reinforced for temperature and UV resistance (factory mounted).

Low Sound Fans - Reduced RPM fan motors and alternative fan selection for low sound applications (factory mounted).

Unit Enclosures:

Wire Enclosure - Welded wire mesh guards mounted on the exterior of the unit (factory mounted).

Louvered Panels and Wired Guards - Louvered panels mounted over the exterior condenser coil faces, and welded wire mesh guards mounted around the bottom of the unit (factory mounted).

Louvered Panels (condenser coils only) - Louvered panels are mounted over the exterior condenser coil faces on the sides of the unit to visually screen and protect the coils (factory mounted).

Louvered Panels (full unit) - Louvered panels over condenser coils and around the bottom of the unit (factory mounted).

Vibration Isolation:

Neoprene Pad Isolators - Recommended for normal installations (field mounted).

25 mm Spring Isolators - Level adjustable, spring and cage type isolators for mounting under the unit base rails (field mounted).

50 mm Seismic Spring Isolators - Restrained Spring-Flex Mountings incorporate welded steel housing with vertical and horizontal limit stops. Housings designed to withstand a minimum 1.0 g accelerated force in all directions to 50 mm. Level adjustable, deflection may vary slightly by application (field mounted).

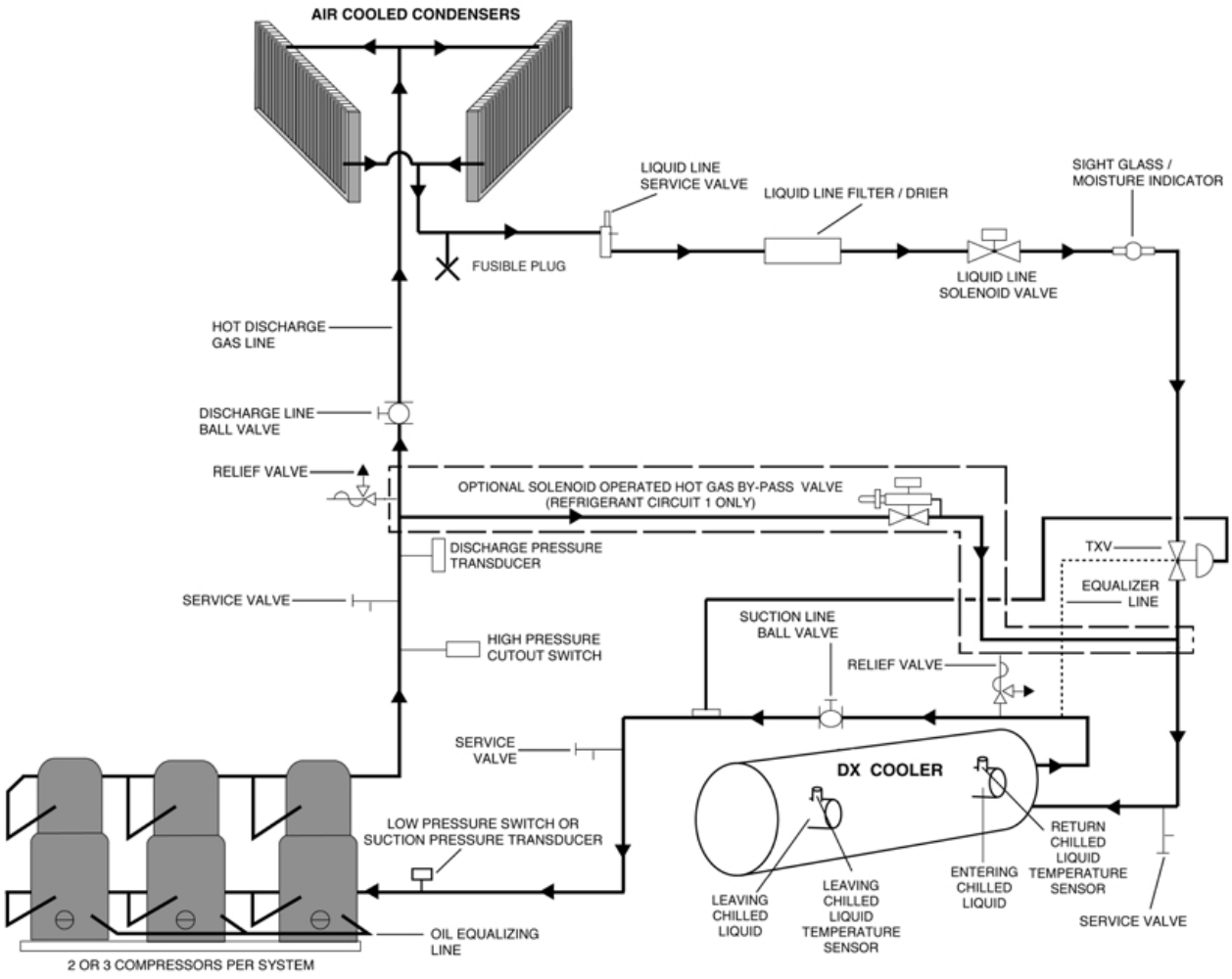
2.9 Nomenclature

YCAL0175SC50XAA

1 2 3 4	5 6 7 8	9	10	11 12 13	14 15
BASE PRODUCT TYPE	NOMINAL CAPACITY	UNIT DESIGNATION	REFRIGERANT	VOLTAGE / STARTER	DESIGN / DEVELOPMENT LEVEL
Y : York C : Chiller A : Air Cooled L : Scroll	# # # # kW :0149 :0199 :0255 :0175 :0219	S : Standard Unit	C : R22	5 0 : 380-415 / 3 / 50 X : Direct on Line S : Soft Start	A : Design Series A : Engineering Change or PIN Level

2.10 Functional Description

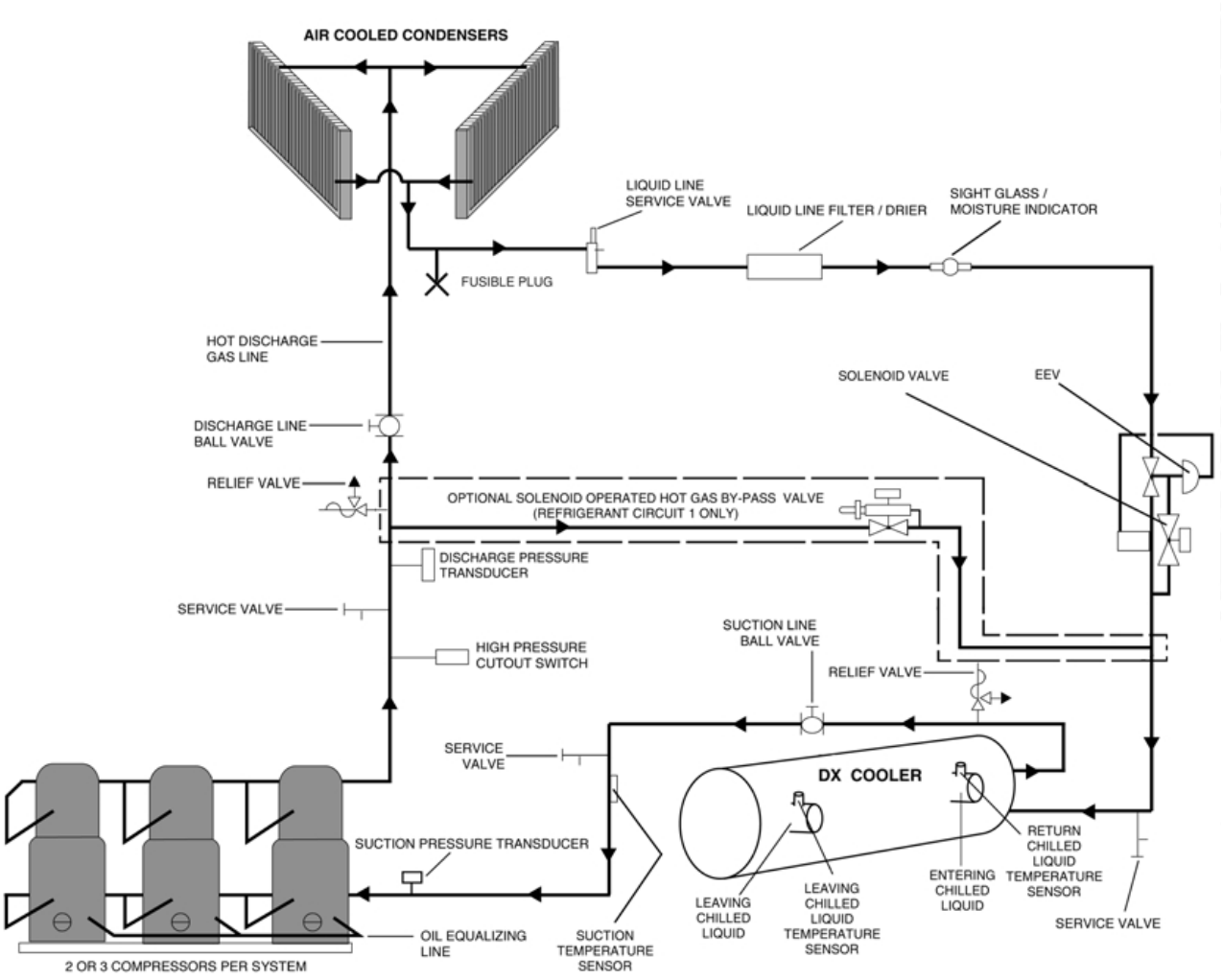
Units without Optional Electronic Expansion Valves



Low pressure liquid refrigerant enters the cooler and is evaporated and superheated by the heat energy absorbed from the chilled water passing through the cooler shell. Low pressure vapour enters the compressor where pressure and superheat are increased. The high pressure vapour is fed to the air cooled condenser coil and fans where the heat is removed. The fully condensed and subcooled liquid passes through the expansion valve where pressure is reduced and further cooling takes place before returning to the cooler.

The optional Hot Gas By-pass, when installed on refrigerant circuit 1, will introduce an artificial load on the cooler, to permit continuous stable operation at capacities below the minimum step of compressor unloading to as low as 5% capacity (depending on both the unit and operating conditions).

Units with Optional Electronic Expansion Valves



3 TRANSPORTATION, HANDLING AND STORAGE

3.1 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.

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 sealed.

The condensers should be covered to protect the fins from potential damage and corrosion, particularly where building work is in progress.

The unit should be stored in a location where there is minimal activity 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.

3.2 Inspection

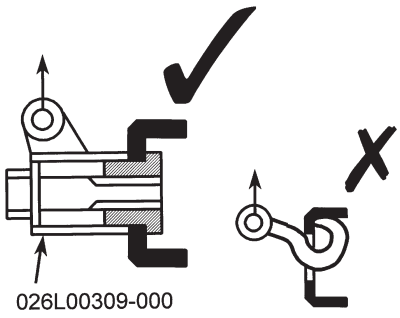
Remove any transit packing and inspect the unit to ensure that all components have been delivered and that no damage has occurred during transit. If any damage is evident, it should be noted on the shipment documentation and a claim entered according to the instructions given.

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

3.3 Moving the Unit

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

The unit should be lifted using lifting lugs and a spreader bar or frame of sufficient width to prevent damage to the unit from the lifting chains. Units are provided with holes in the base frame which accept the accessory lifting lug set (part number 026L00309-000) which bolts through the base frame to allow shackles or safety hooks to be attached.



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

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

3.4 Lifting Weights

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

4 INSTALLATION

4.1 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.

It is important to ensure that the minimum service access space is maintained for cleaning and maintenance purposes.

Outdoor Installations

The units may be installed at ground level, or on a suitable rooftop location. In both cases an adequate supply of air is required. Avoid locations where the air discharge from the unit may be objectionable.

The location should be selected for minimum sun exposure and away from boiler flues and other sources of airborne chemicals that could attack the condenser coils and steel parts of the unit.

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

For ground level locations, the unit must be installed on a suitable flat and level concrete base that extends to fully support the two side channels of the unit base frame. A one-piece concrete slab, with footings extending below the frost line is recommended. To avoid noise and vibration transmission the unit should not be secured to the concrete base.

On rooftop installations, choose a location with adequate structural strength to safely support the entire operating weight of the unit and service personnel. If the unit is elevated beyond the normal reach of service personnel, a suitable catwalk capable of supporting service personnel, their equipment, and the compressors must be installed. The unit may be mounted on a concrete slab, similar to ground floor locations, or on steel channels of suitable strength. The channels should be spaced at the same centres as the vibration mounting holes in the unit base frame and must be at least 120 mm wide at the contact points. This will allow vibration isolators to be fitted if required.

Any ductwork or attenuators fitted above the unit must not have a total static pressure resistance, at full unit airflow, exceeding the capability of the fans installed in the unit.

Indoor Installations

The unit may be installed in an enclosed plant room providing the floor is level and of suitable strength to support the full operating weight of the unit. It is essential that there is adequate clearance for airflow to the unit. The discharge air from the top of the unit must be ducted away to prevent recirculation of air within the plant room. If common ducts are used for fans, non-return dampers must be fitted to the outlet from each fan.

The discharge ducting must be sized with a total static pressure loss, together with any intake static pressure loss, less than the available static pressure capability for the type of fan fitted.

The discharge air duct usually rejects outside the building through a louvre. The outlet must be positioned to prevent the air being drawn directly back into the air intake for the condenser coils as such recirculation will affect unit performance.

4.2 Location Clearances

Adequate clearances around the unit(s) are required for the unrestricted airflow for the air-cooled condenser coils and to prevent recirculation of warm discharge air back onto the coils. If clearances given are not maintained, airflow restriction or recirculation will cause a loss of unit performance, an increase in power consumption and may cause the unit to malfunction. Consideration should also be given to the possibility of down draughts, caused by adjacent buildings, which may cause recirculation or uneven unit airflow.

For locations where significant cross winds are expected, such as exposed roof tops, a solid enclosure or louvre type is recommended to prevent wind turbulence interfering with the unit airflow.

When units are installed in an enclosure, the enclosure height should not exceed the height of the unit on more than one side. If the enclosure is of louvered construction the same requirement of static pressure loss applies as for ducts and attenuators stated above.

Where accumulation of snow is likely, additional height must be provided under the unit to ensure normal airflow to the unit is unimpeded.

The clearance dimensions given are necessary to maintain good airflow and ensure correct unit operation. It is also necessary to consider access requirements for 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.

4.3 Installation of Vibration Isolators

Optional sets of vibration isolators may be supplied loose with each unit.

- Using the Isolator tables (refer to Section 9), identify each mount and its correct location on the unit.

Mounts - Installation

- Place each mount in its correct position and lower the unit carefully onto the mounts.
- Transfer the unit weight evenly to the springs and fit and adjust the mounts in accordance with Section 9

.

4.4 Pipework Connection

General Requirements

The following piping recommendations are intended to ensure satisfactory operation of the unit(s). 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 must not be exceeded at any time. Refer to Section 9 for details.

- The liquid must enter the cooler by the **INLET** connection (refer to Section 9).
- A flow switch must be installed in the customer pipework at the outlet of the cooler and wired back to the control panel using screened cable. For details refer to 'Electrical Connection.' This is to prevent damage to the cooler caused by the unit operating without adequate liquid flow. To prevent turbulent flow there must be straight pipework either side of the flow switch equal in length to at least 5 times the diameter of the pipe.
- The flow switch used must have gold plated contacts for low voltage/current operation. Paddle type flow switches suitable for 10 barg working pressure and having a 1" N.P.T. connection may be obtained from York as an accessory for the unit.
- The chilled liquid pump installed in the pipework system should discharge directly into the unit cooler section of the system. The pump may be controlled external to the unit — but an override must be wired to the control panel so that the unit can start the pump in the event that the liquid temperature falls below the minimum setting. For details refer to 'Electrical Connection.'
- Pipework and fittings must be separately supported to prevent any loading on the cooler. Flexible connections are recommended which will also minimise 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 adjacent to the cooler should be readily de-mountable to enable cleaning before operation, and to facilitate visual inspection of the cooler nozzles.

- The cooler must be protected by a strainer, preferably of 30 mesh, fitted as close as possible to the liquid inlet connection, and provided with a means of local isolation.

- The cooler must not be exposed to flushing velocities or debris released during flushing. It is recommended that a suitably sized by-pass and valve arrangement is installed to allow flushing of the pipework system. The by-pass may 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 the cooler.

- 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 must also be used to ensure liquid is circulated when the ambient temperature approaches freezing point. Insulation should also be installed around the cooler nozzles. Heater tape of 21 watts per metre under the insulation is recommended, supplied independently and controlled by an ambient temperature thermostat set to switch on at 3°C above the freezing temperature of the liquid.

- The liquid circulation pump must be controlled by the unit. This will ensure that when the liquid temperature falls within 2 or 3°C of freezing the pump will start.

- The cooler is protected by heater mats under the insulation which are supplied from the unit control system power supply. During risk of freezing the control system should be left switched 'ON' to provide the freeze protection function unless the liquid systems have been drained.

Any debris left in the water pipework between the strainer and cooler could cause serious damage to the tubes in the cooler 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 may cause oxidation of steel parts within the cooler.

4.5 Water Treatment

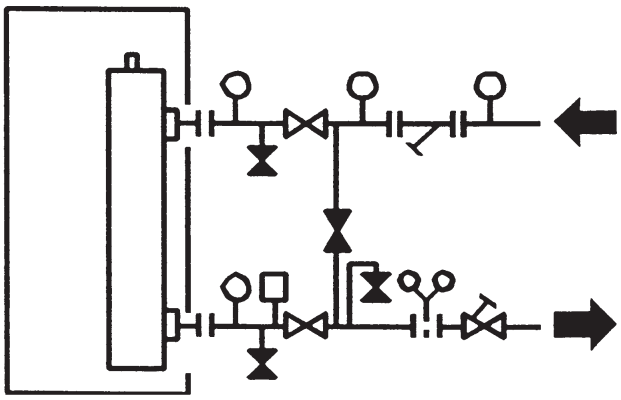
The unit performance given in the Design Guide is based on a fouling factor of 0.044 m² °C/kW (0.00025 ft²hr°F/Btu). Dirt, scale, grease and certain types of water treatment will adversely affect the heat exchanger surfaces and therefore unit performance. Foreign matter in the water system will increase the heat exchanger pressure drop, reducing the flow rate and causing potential damage to the heat exchanger tubes.

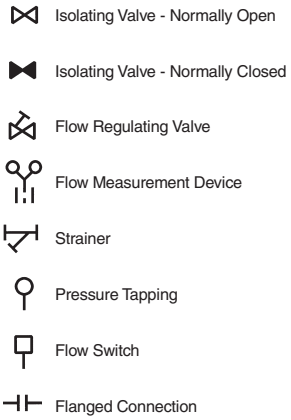
Aerated, brackish or salt water is not recommended for use in the water system. York recommend that a water treatment specialist is consulted to determine that the proposed water composition will not affect the evaporator materials of carbon steel and copper. The pH value of the water flowing through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

4.6 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



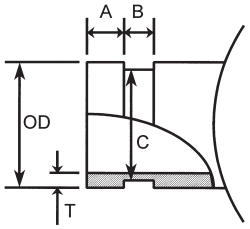


4.7 Connection Types & Sizes

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

Cooler Connections

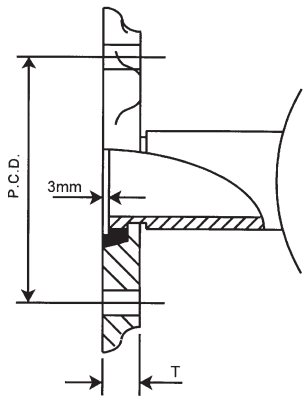
Standard chilled liquid connections on all coolers are of the Victaulic Groove type.



Nominal Size	OD	T	A	B	C
5" (DN125 mm)	141.3	5.2	16	9.5	135.5
6" (DN150 mm)	168.3	8.0	16	9.5	164.0

Option Flanges

Optional flanges may be fitted depending on the customer or local Pressure Vessel Code requirements. Victaulic-Adapter flanges are supplied loose for field installation. Flange dimensions are to ISO 7005 - NP10 (BS 4504 - NP10).



Victaulic-Adapter Flange

Nominal Size	PCD	T	Bolts
5" (DN125 mm)	180	20	8 X M16
6" (DN150 mm)	240	22	8 X M20

4.8 Refrigerant Relief Valve Piping

The cooler is protected against internal refrigerant over pressure by refrigerant relief valves. A pressure relief valve is mounted on each of the main refrigerant lines connecting the cooler to the compressors.

It is recommended that a vent pipe is fitted to each valve and directed so that when the valve is activated the release of high pressure gas and liquid cannot be a danger or cause injury. For indoor installations pressure relief valves should be piped to the exterior of the building.

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

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

Where:

D = minimum pipe internal diameter in centimetres
L = length of pipe in metres

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.

YCAL-SC ICOM [035L02465-GB0 (07/01)] - LITERATURE SUPPLEMENT 1
Cooler connection data revised for new 5” chilled liquid connections on models 0147 and 0173.

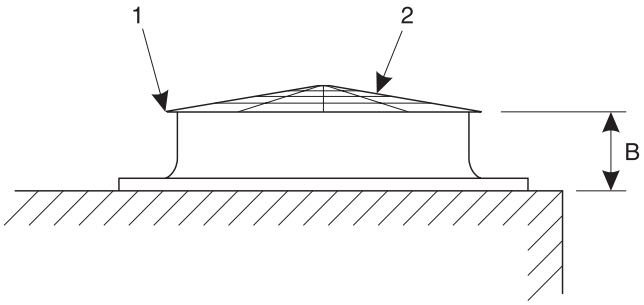
4.9 Ductwork Connection

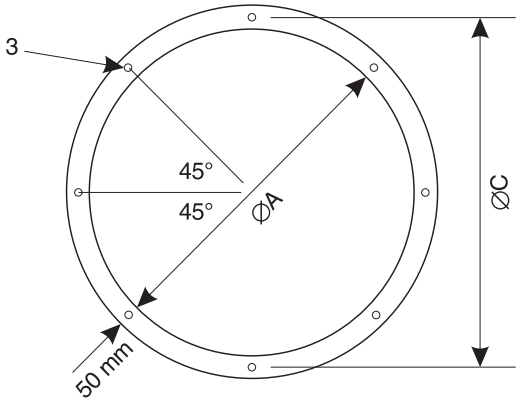
General Requirements

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

- When ducting is to be fitted to the fan discharge it is recommended that the duct should be the same cross sectional area as the fan outlet and straight for at least one metre to obtain static regain from the fan.
- Ductwork should be suspended with flexible hangers to prevent noise and vibration being transmitted to the structure. A flexible joint is also recommended between the duct attached to the fan and the next section for the same reason. Flexible connectors should not be allowed to concertina.
- The unit is not designed to take structural loading. No significant amount of weight should be allowed to rest on the fan outlet flange, deck assemblies or condenser coil module. No more than one metre of light construction ductwork should be supported by the unit. Where cross winds may occur, any ductwork must be supported to prevent side loading on the unit.
- If the ducts from two or more fans are to be combined into a common duct, back-flow dampers should be fitted in the individual fan ducts. This will prevent recirculation of air when only one of the fans is running.
- Units are supplied with outlet guards for safety and to prevent damage to the fan blades. If these guards are removed to fit ductwork, adequate alternative precautions must be taken to ensure persons cannot be harmed or put at risk from rotating fan blades.

Connection Details and Dimensions





1 Top Flange
2 Guard
3 8 Holes, 9 mm Ø for M8 bolts on ØC

	Standard Fans	Low Sound Fans
A	900	900
B	144.5	144.5
C	970	970

4.10 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 power to the unit. Some internal components are live when power is switched on and this must only be carried out by Authorised persons.

The unit ON/OFF 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 Authorised 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.

4.11 Power Wiring

These units are suitable for 380 or 400 V, 3 phase, 50 Hz nominal supplies only.
Minimum allowable 360 V.
Maximum allowable 440 V.

All electrical wiring should be carried out in accordance with local regulations. Route properly sized cables to the cable entries in the bottom of the power panel.

In accordance with EN 60204 it is the responsibility of the user to install over current protection devices between the supply conductors and the power supply terminals on the unit.

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

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

Single Point Power Supply Wiring

All models require one field provided 400 V, 3Ø, 50 Hz + PE (Protected Earth) supply to the unit with circuit protection.

Connect the 3 phase supply to the non-fused disconnect switch located in the power panel using the wire range specified in Section 9.7.

Connect the earth wire to the main protective earth terminal located in the power panel.

Control Circuit Transformer - Primary Voltage Tappings

The control circuit transformer (400 V, 2Ø, 50 Hz) providing the 115 V, 1Ø, 50 Hz supply to the unit control system is fitted in a separate IP55 enclosure mounted on the side of the control panel.

The control circuit transformer is factory wired for a 400 V supply.

Additional primary tappings are available for 380 V and 416 V supplies. When required the tappings should be changed:

With the supply to the unit isolated remove the lid of the transformer enclosure and rewire the transformer primary tappings as shown on the wiring diagram or transformer label.

Remote Emergency Stop Device

If required, a remote emergency stop device may be wired into the unit. This device should be rated at 16 amps, 110 V, AC-15. The device should be wired into terminals L and 5 on XCTB2 in the power panel after removing the factory fitted link.

4.12 Volts Free Contacts

All wiring to the voltage free contact terminal block (XCTB2) requires a supply provided by the customer maximum voltage 254 volts AC, 28VDC. The terminal block is in the power panel with orange interconnecting wiring to the relay contacts on the relay boards in the logic section of the control panel.

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 EN 60204 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 colour, 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 125 VA.

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.

Chilled Liquid Pump Starter

XCTB2 terminals 23 and 24 close to start the liquid pump. This contact is closed if there is a 'Leaving Liquid Temperature Cutout' or any of the compressors are running or the daily schedule is not calling for a shutdown with the unit switch on.

The contact must be used to ensure that the pump is running in the event of a 'Leaving Liquid Temperature Cutout'.

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

Run Contacts

XCTB2 terminals 25 and 26 close to indicate that refrigerant system 1 is running and XCTB2 terminals 27 and 28 close to indicate that refrigerant system 2 is running.

Alarm Contacts

Each refrigerant system has a voltage-free normally open contact which will close when control power is applied to the panel, if no fault conditions are present. When a fault occurs which locks a system out, or there is a power failure the contact closes. To obtain a system alarm signal, connect the alarm circuit to XCTB2 volt free terminals 29 and 30 for No. 1 system and terminals 31 and 32 for No. 2 system.

4.13 Control Panel Wiring

All wiring to the control panel terminal block XCTB1 (nominal 30 Vdc) 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. Use the control panel cable entry to avoid the power cables.

The voltage free contacts must be suitable for 30 Vdc (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.

4.14 System Inputs

Flow Switch

A chilled liquid flow switch of suitable type must be connected to terminals 13 and 14 of XCTB1 to provide adequate protection against loss of liquid flow.

Remote Start/Stop

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

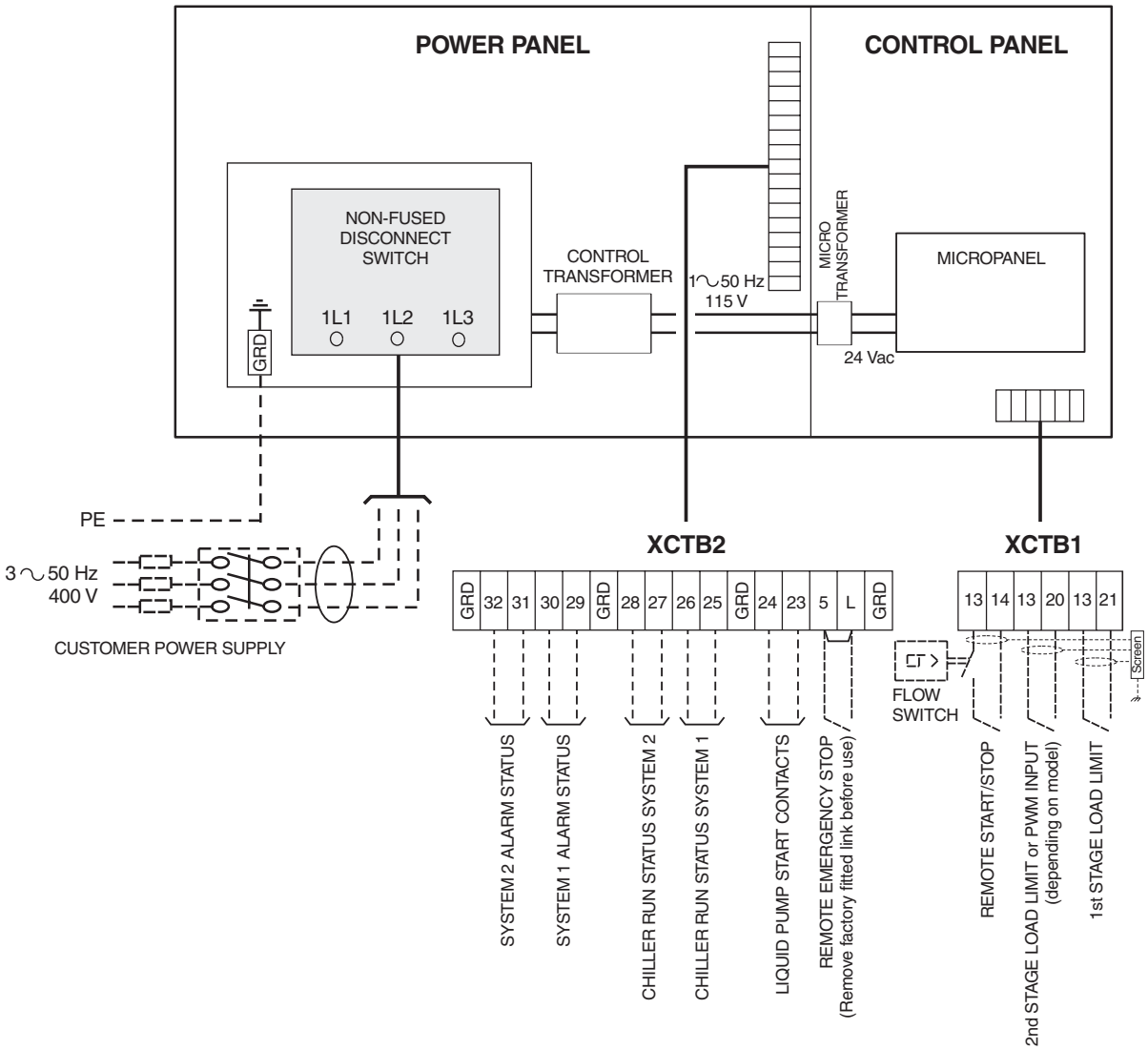
Remote Reset of Chilled Liquid Setpoint

The PWM input (XCTB1 terminals 13 to 20) allows reset of the chilled liquid setpoint by supplying a 'timed' contact closure. Refer to Section 6 for details.

Remote Load Limiting

Load limiting prevents the unit from loading beyond a desired value. The unit load can be limited at either 33%, 50%, or 66%, depending on the number of compressors on the unit. The load limit inputs to XCTB1 terminals 13 to 21 work in conjunction with the PWM input to XCTB1 terminals 13 to 20. Refer to Section 6 for details.

4.15 Connection Diagram



5 COMMISSIONING

5.1 Preparation

Commissioning of this unit should only be carried out by York Authorised personnel.

The unit On/Off 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 Authorised personnel. If the switch has been set to the On position before commissioning then it must be reported to York International 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 full refrigerant operating charge. Check that refrigerant pressure is present in both systems and that no leaks are apparent. If no pressure is present a leak test must be undertaken, the leak(s) located and repaired. Repaired systems must be evacuated with a suitable vacuum pump/recovery unit as appropriate to below 100 microns before charging.

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 coils with the full operating charge as given in Section 9.

Liquid sub-cooling measured at the liquid line should be between 8.5 and 11.0 °C at circuit full load. Sub-cooling is determined by the level of refrigerant charge in each system.

Valves: Ensure that the compressor suction and discharge ball valves and the liquid line service valves are set correctly (**OPEN**).

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

Compressor oil: The oil level in multiple scroll compressors (piped in parallel) must be checked directly after all compressors are shut down and have been allowed time to stabilise. In this case the oil level must be at about 1/3 in the oil sight glass. Despite the oil balancing line there is a small pressure difference within the compressors which may lead to confusing oil levels in each of their respective sight glasses.

Isolation/protection: Verify that all sources of electrical supply to the unit are taken from a point 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 power panel to the non-fused switch disconnects are tight.

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

Compressor Manual Motor Starters: Check the factory setting of the Compressor Manual Motor Starters (Refer to Section 9.5 for settings).

Fan Overloads: Check the fan overload settings are correct for the type of fan fitted (Refer to Section 9.6 for settings).

Control Circuit Transformer: Verify that the control circuit transformer primary tapping is correct for the site voltage, refer to Section 4 for details.

Supply voltage: Verify that the site voltage supply corresponds to the unit requirement and is within the limits given in Section 9. The phase imbalance should less than 2% of the average voltage.

Switch Settings: Ensure that the unit On/Off toggle switch on the control panel is set to OFF. Set the non-fused disconnect switch to ON. The customers disconnection devices can now be set to ON.

The machine is now live!

Crankcase Heaters: Verify the heaters are energised.

Depending upon the ambient temperature the crankcase heaters must be on for 12 to 24 hours before start-up.

Water 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. Inlet should be at the refrigerant pipework connection end of the cooler. Purge air from the cooler using the air vent mounted on top of the cooler.
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 leaving (-BLCT) and return (-BECT) liquid temperature sensors are coated with heat conductive compound (Part No. 013-00890-000) and are inserted in the water inlet and outlet sensor pockets of the cooler.

Control supply: Verify the control panel display is illuminated.

HP cut-out reset: Check that the hand reset mechanical high pressure cut-outs mounted on the discharge lines are at the correct setting and are reset.

Programmed options: Verify that the options factory programmed into the Microprocessor Control Centre are in accordance with the customers order requirements by pressing the 'OPTIONS' key on the keypad and reading the settings from the display. Refer also to Section 6 for notes and explanation of messages.

Programmed settings: Ensure the system cut-out and operational settings are in accordance with operational requirements by pressing the 'PROGRAM' key (refer to Section 6).

Date & time: Programme the date and time by first ensuring that the CLK jumper on the microprocessor board is in the ON position. Then press the 'CLOCK' key and set the date and time (refer to Section 6).

Start/Stop schedule: Programme the daily and holiday start/stop by pressing the 'SCHEDULE/ADVANCE DAY' key (refer to Section 6).

Setpoints: Set the required leaving chilled liquid temperature set-point and control range using the 'COOLING SETPOINTS' key (refer to Section 6).

Compressor Operation: Use the 'OPTIONS' key to switch off each refrigerant system in turn (refer to Section 6 for details) and then check the compressors on the active system:

Connect a manifold gauge to each refrigerant circuit suction and discharge valves and temporarily start each compressor and check that the discharge pressure rises and the suction pressure decreases to ensure that the compressors are operating in the correct direction. Any faults found must be corrected before starting the unit.

After completing the checks on both circuits, set both systems to on using the 'OPTIONS' key.

5.2 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 Section 6, 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.

Start-up: Set the unit 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. Refer to the Section 6 for the normal operating sequence from start-up.

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. Check that the moisture indicator is satisfactory (Green).

System Operation: Use the 'OPER DATA' key to check the system pressures and temperatures.

Fan rotation: As discharge pressure rises, the condenser fans operate in stages to control the pressure. Verify that the fan operation is correct for the type of unit.

General operation: Check that loading occurs as specified in Section 6 and that general operation is correct.

Electronic Expansion Valve (when fitted) During pulldown from high chilled water temperatures, display of the electronic expansion valve opening percentage could reach 100% and the actual suction superheat would be above the setpoint. At operating conditions with a full sight glass, the electronic expansion valve opening percentage will be less than 100% and suction superheat will stabilise around the setpoint under all stages of capacity. Refer to page 6.10 for further details.

6 UNIT OPERATION

6.1 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 temperatures at the unit and take the appropriate action to maintain the temperatures within desired limits. This action will involve running one or more compressors 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 from the air cooled condenser coils.

6.2 Operation

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

For a unit to run, the flow switch must be closed, any remote cycling contacts must be closed, the 'Daily Schedule' must be scheduling the unit on, and a temperature demand must be present.

When power is applied to the microprocessor a 2 minute timer will start. This timer also prevents instantaneous starting after a power failure.

At the end of the 2 minute timer, the microprocessor will check for cooling demand. If all conditions allow for start, the first compressor on the lead system will start and the liquid line solenoid will open. Coincident with the start, the anti-coincident timer will be set and begin counting downward from '60' seconds to '0' seconds.

If the unit is programmed for 'Automatic Lead/Lag Control', the system with the shortest average run-time of the compressors will be assigned as the 'lead' system. A new lead/lag assignment is made whenever all systems shut down.

Several seconds after the compressor starts, that systems first condenser fan will be cycled ON if the discharge pressure is above the programmed set point.

After 1 minute of compressor run time, the next compressor in sequence will start when a system has to load. Additional compressors will be started at 60 second intervals as needed to satisfy temperature load.

If demand requires, the lag system will cycle on with the same timing sequences as the lead system.

As the load decreases below the 'SETPOINT', the compressors will be shut down in sequence. This will occur at intervals of either 60, 30, or 20 seconds based on the liquid temperature as compared to 'SETPOINT', and control mode.

When the last compressor in each system is to be cycled off, the system will initiate a pump-down. On a non-safety, non-unit switch shutdown, the YLLSV will be turned off, and the last compressor will be allowed to run until the suction pressure falls below the suction pressure cut-out or for 180 seconds, which ever comes first.

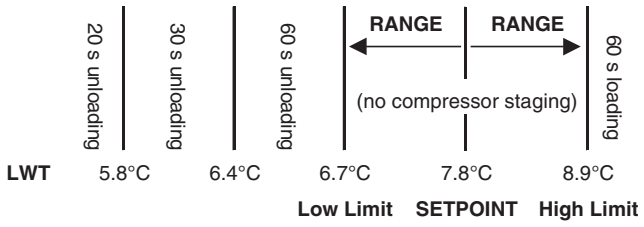
6.3 Capacity Control

The control system will evaluate the need for cooling by comparing the actual leaving or return chilled liquid temperature to the desired 'SETPOINT', and regulate the leaving or return chilled liquid temperature to meet that desired 'SETPOINT'.

6.3.1 Leaving Chilled Liquid Control

The leaving chilled liquid 'SETPOINT' is the temperature the unit will control to within +/- the 'RANGE'. The Setpoint High Limit is the 'SETPOINT' plus the 'RANGE'. The Setpoint Low Limit is the 'SETPOINT' minus the 'RANGE'.

The ‘RANGE’ setting takes into account the number of compressors on the unit and the temperature difference between leaving (LCHLT) and return (RCHLT) chilled liquid at full load (refer to Section 6.9 for details).



When the leaving chilled liquid temperature is above the Setpoint High Limit, the lead compressor on the lead system will be energised along with the liquid line solenoid. Upon energising any compressor, the 60 second anti-coincidence timer will be initiated.

After 60 seconds of run-time if the leaving chilled liquid temperature is still above the Setpoint High Limit, the next compressor in sequence will be energised. Additional loading stages are energised at a rate of one every 60 seconds if the chilled liquid temperature remains above the Setpoint High Limit. In this case, the load timer will be 60 seconds.

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

If the chilled liquid temperature drops to less than 0.28°C below the Setpoint Low Limit, unloading occurs at a rate of 60 seconds. If the chilled liquid temperature falls to a value greater than 0.28°C below the Setpoint Low Limit but not greater than 0.83°C below the Setpoint Low Limit, unloading occurs at a rate of 30 seconds. If the chilled liquid temperature falls to a value greater than 0.83°C below the Setpoint Low Limit, unloading occurs at a rate of 20 seconds.

The leaving chilled liquid 'SETPOINT' is programmable from 4.4°C to 21.1°C in the chilled liquid water mode and from -12.2°C to 21.1°C in chilled liquid glycol mode. In both modes, the 'RANGE' can be from +/-0.8°C to 1.4°C.

The sequences of for loading and unloading are shown below.

4 Compressors (6 Steps)

STEP	Lead System Compressor			Lag System Compressor		
	1	2		1	2	
0	OFF	OFF		OFF	OFF	
1 (1)	ON+HG	OFF		OFF	OFF	
2	ON	OFF		OFF	OFF	
3 (2)	ON	OFF		ON	OFF	
4 (3)	ON	ON		OFF	OFF	
5	ON	ON		ON	OFF	
6	ON	ON		ON	ON	

6 Compressors (8 Steps)

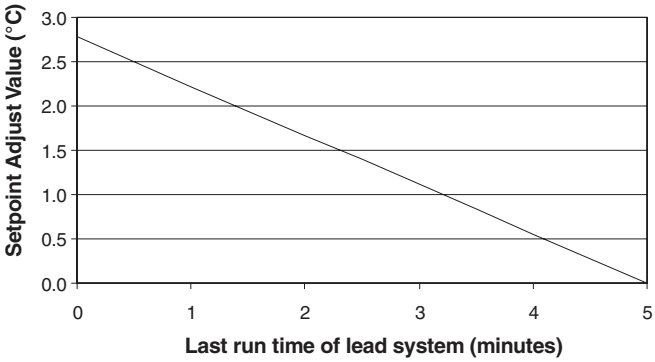
STEP	Lead System Compressor			Lag System Compressor		
	1	2	3	1	2	3
0	OFF	OFF	OFF	OFF	OFF	OFF
1 (1)	ON+HG	OFF	OFF	OFF	OFF	OFF
2	ON	OFF	OFF	OFF	OFF	OFF
3 (2)	ON	OFF	OFF	ON	OFF	OFF
4 (3)	ON	ON	OFF	OFF	OFF	OFF
5	ON	ON	OFF	ON	OFF	OFF
6	ON	ON	OFF	ON	ON	OFF
7	ON	ON	ON	ON	ON	OFF
8	ON	ON	ON	ON	ON	ON

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

To ensure reliable operation of the unit the software will modify the operation of the 'Leaving Chilled Liquid Control' as follows:

1. If the run time of the lead system is less than 5 minutes the Setpoint High Limit is increased up to a maximum of 10°C by the 'Setpoint Adjust Value' shown in the following graph. Any adjustment value in excess of the value taking the Setpoint High Limit to 10°C is taken from the Setpoint Low Limit. When the run time exceeds 5 minutes the 'Setpoint Adjust Value' returns to zero. This will occur whilst the unit is running. Pressing the 'COOLING SETPOINTS' key four times will display the lead system's last run time and the 'Setpoint Adjust Value'.

2. If the run time of the lead system is less than 5 minutes on 3 successive occasions, the anti-recycle timer will be doubled, with a maximum allowable anti-recycle value of 10 minutes.



6.3.2 Return Chilled Liquid Control

Return chilled liquid control is based on staging the compressors to match the cooling load. The unit will be fully loaded when the return water temperature is equal to the 'SETPOINT' plus the 'RANGE'. The unit will be totally unloaded (all compressors off) when the return water temperature is equal to the 'SETPOINT'. At return water temperatures between the 'SETPOINT', and 'SETPOINT' plus the 'RANGE', compressor loading and unloading will be determined by temperature based on the relationship of 'SETPOINT', 'RANGE', number of compressors and number of compressors running.

Normal loading will occur at intervals of 60 seconds according to the temperatures determined. Unloading will occur at a rate of 30 seconds according the temperatures determined.

The return chilled liquid 'SETPOINT' is programmable from 4.4°C to 21.1°C in the chilled liquid water mode and from -12.2°C to 21.1°C in chilled liquid glycol mode. In both modes, the 'RANGE' can be from 2.2° to 11.1°C.

NOTE

Refer to Operating Limitations (Section 9.2) for chilled liquid limitations.

For example, a unit with six compressors using a 'SETPOINT' programmed for 7.20°C and a 'RANGE' of 5.56°C. The control range will be split up into six (seven including optional hot gas) segments, with the control range determining the separation between segments. The 'SETPOINT' is the point at which all the compressors are off, and 'SETPOINT' plus the 'RANGE' is the point that all the compressors are on. Specifically, if the return water temperature is 12.8°C, then all compressors will be on, providing full capacity. At nominal flow, this would provide approximately 7.2°C leaving liquid temperature from the cooler.

If the return water temperature drops to 11.8°C, one compressor would cycle off leaving the remaining compressors running. The compressors would continue to cycle off approximately every 0.94°C, with the exception of hot gas bypass. The hot gas bypass would be available when the return water temperature dropped to 7.9°C. At this point one compressor would be running.

Should the return water temperature rise from this point to 8.2°C, the hot gas bypass would shut off, still leaving one compressor running. As the load increased, the compressors would stage on every 0.94°C.

The tables opposite provide the formulas for the loading (ON POINT) and unloading (OFF POINT) of the system, and the 'STEP' in the capacity control scheme.

6.3.3 Optional Electronic Expansion Valve (EEV)

The optional electronic expansion valves are operated by heat motors. The heat motors are supplied with a 24 Vac supply in the form of a pulse width modulated signal. The period of the signal is 1 second and the ON time of the signal is varied from 0 to 100%. The switching is via an electronic relay, (-KSS1 for System 1 and -KSS2 for System 2) light emitting diodes (LED's) next to the relays shown the status of the relays. The relays and the LED's are mounted on a circuit board -ARB in the electronic section of the control panel. The microprocessor determines the ON period of the EEV heater motor based on the 'SETPOINT for superheat set under the 'PROGRAM' key, saturated suction temperature, suction pressure and suction temperature.

This control is active when the system is running but not in a pumpdown. When the system is 'OFF' the controls, dependant on ambient, can pre heat the EEV as follows:

- When the ambient is above 10°C the heater motor signal is OFF.
- When the ambient is below -3.9 °C the heater motor signal is ON for 25% of the 1 second period.
- Between 10°C and -3.9 °C ambient the heater motor signal is ramped from OFF to ON for 25% of the 1 second period.

4 Compressors (6 Steps)

STEP	COMPRESSOR ON POINT		COMPRESSOR OFF POINT	
	Formulae	RCHLT	Formulae	RCHLT
0				
1 (1)			SETPOINT	7.2°C
2	SP + CR/4	8.60°C	SP + CR/8	7.9°C
3 (2)	SP + 2*CR/4	10.0°C	SP + CR/4	8.60°C
4 (3)	SP + 2*CR/4	10.0°C	SP + CR/4	8.60°C
5	SP + 3*CR/4	11.4°C	SP + 2*CR/4	10.0°C
6	SP + CR	12.8°C	SP + 3*CR/4	11.4°C

6 Compressors (8 Steps)

STEP	COMPRESSOR ON POINT		COMPRESSOR OFF POINT	
	Formulae	RCHLT	Formulae	RCHLT
0				
1 (1)			SETPOINT	7.2°C
2	SP + CR/6	8.13°C	SP + CR/8	7.9°C
3 (2)	SP + 2*CR/6	9.07°C	SP + CR/6	8.13°C
4 (3)	SP + 2*CR/6	9.07°C	SP + CR/6	8.13°C
5	SP + 3*CR/6	10.0°C	SP + 2*CR/6	9.07°C
6	SP + 4*CR/6	10.93°C	SP + 3*CR/6	10.0°C
7	SP + 5*CR/6	11.87°C	SP + 4*CR/6	10.93°C
8	SP + CR	12.8°C	SP + 5*CR/6	11.87°C

1. Step 1 is Hot Gas By-pass and is skipped when loading occurs. Hot Gas By-pass operation is inhibited during pumpdown.
2. Step 3 is skipped when loading occurs.
3. Step 4 is skipped when unloading occurs.

RCHLT staging at 'SETPOINT' = 7.2°C, 'RANGE' = 5.8°C

6.4 Control Panel

The YORK Millennium Control Centre is a microprocessor based control system fitted to YCAL-SC Air Cooled Liquid Chillers. It is capable of dual refrigerant system (circuit) control to maintain chilled liquid temperature within programmed limits, as well as sequencing, system safeties, displaying status, and daily schedules.

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

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

A master (UNIT) ON/OFF switch is provided on the chiller control panel to activate or deactivate the complete chiller.

6.4.1 Microprocessor Board (AMB)

The AMB board controls and makes decisions for the chiller. Signal inputs from transducers and sensors on the unit are connected directly to the board. The AMB board circuitry multiplexes the analogue inputs, digitises them, and constantly scans them to monitor chiller operating conditions. Based on this information, the microprocessor issues commands to the relay outputs to activate and deactivate contactors, solenoids, etc. for chilled liquid temperature control, operating control, and safety control.

Keypad commands are acted upon by the microprocessor to change setpoints, cut-outs, scheduling, operating requirements, and to provide displays.

The on-board power supply converts the 24 Vac from the transformer (-T1) to regulated +12 Vdc and +5 Vdc to operate the integrated circuitry on the board. The 5 Vdc also supplies the unit sensors and liquid crystal display.

The 24 Vac from the transformer (-T1) is also rectified and filtered to provide the +30 Vdc unregulated supply for the flow switch, PWM remote temperature reset, and load limit customer contacts.

The AMB board energises on-board relays to output 115 Vac to the motor contactors, solenoid valves, etc. to control system operation.

6.4.2 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, cut-outs, 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 energised. 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 (J11) 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.

6.4.3 Keypad and Display

User interface is via a touch keypad and a liquid crystal display allowing access to operating and programmed data. Information can be displayed in S.I. (Metric) or Imperial units. The 40 character liquid crystal display (2 lines of 20 characters) is used for displaying system parameters and operator messages. The display has a lighted background for night viewing as well as a special feature which intensifies the display for viewing in direct sunlight.

6.4.4 Unit (Chiller) ON/OFF Switch

The unit ON/OFF switch is located just below the keypad. This switch allows the operator to turn the entire chiller OFF, if desired. The switch must be placed in the ON position for the chiller to operate. Any time the switch is in the OFF position, a STATUS message will be displayed.

6.4.5 Customer Controls

The microprocessor based control system can accept remote signals to start and stop the chiller, to adjust the chilled liquid temperature setpoint and to load limit the unit. These functions can easily be controlled by connecting user supplied voltage free contacts to the customer terminals in the control panel.

In addition, run status and alarm contacts are provided to remotely signal system status and faults.

SYSTEM INPUTS

Wiring from remote voltage free contacts should be run in screened cable earthed at the panel end only. If an inductive device (relay, contactor) is supplying these contacts, the coil of the device must be suppressed with a standard RC suppresser across the inductive coil.

6.4.6 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 & 14) of XCTB1 in 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 by-passed. This will cause damage to the chiller and invalidate the warranty.

Wiring from remote voltage free contacts should be run in screened cable earthed at the control panel end only. 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.

6.4.7 EMS PWM Remote Setpoint Reset

The chilled liquid temperature setpoint programmed into the microprocessor can be remotely adjusted to a higher value using repeated timed closure of voltage free contacts (Terminals 13 & 20) on XCTB1 in the control panel. The duration of the contact closure will decide the amount of adjustment.

For noise immunity, the microprocessor will ignore closures of less than 1 second.

6.4.8 Chilled Liquid Pump Control

XCTB2 terminals 23 and 24 close to start the liquid pump. This contact is closed if there is a 'Leaving Liquid Temperature Cutout' or any of the compressors are running or the daily schedule is not calling for a shutdown with the unit switch on.

The contact must be used to ensure that the pump is running in the event of a 'Leaving Liquid Temperature Cutout'.

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

6.4.9 Load Limiting

Load Limiting is a feature that prevents the unit from loading beyond a desired value. 4 compressor units can be load limited to 50% by allowing only 1 compressor per system to run. 6 compressor units can be load limited to 33% or 66%. The 66% limit would allow up to 2 compressors per system to run, and the 33% limit would allow one system to run with a maximum of 2 compressors. No other values of limiting are available.

The unit can be load limited through remote communication via an ISN or through closing contacts connected to the Load Limit (XCTB1-Terminals 13-21) and PWM inputs (XCTB1-Terminals 13-20). Stage 1 of load limiting involves closing the Load Limit input. Stage 2 of load limiting involves closing both the Load Limit and PWM inputs. The first stage of limiting is either 66% or 50%, depending on the number of compressors on the unit. The second stage of limiting is 33% and is only available on 6 compressor units.

Simultaneous operation of Load Limiting and EMS-PWM Temperature Reset is not possible.

VOLTAGE FREE CONTACTS

A 28 Vdc or up to 254 Vac external circuit (supplied by others) may be connected to these contacts. The contacts are rated at 125 VA.

If any inductive load device (relay or contactor) is connected to the alarm contacts, the device must be suppressed at the load with a RC suppressor across the inductive coil. Failure to install suppressors will result in nuisance faults and possible damage to the unit.

6.4.10 Alarms

Contacts are provided in the control panel which can be used to remotely signal alarms. The contacts are normally open (N.O.) and will close when control power is applied to the panel, if no fault conditions are present. When a fault occurs which locks out a system or the unit power is lost, the contacts open.

6.4.11 System Run Status

System run status is indicated by closure of contacts on XCTB2 - terminals 25 and 26 for system 1 and terminals 27 and 28 for system 2.

6.4.12 Anti-Recycle Timer

The programmable anti-recycle timer allows the user to select the compressor anti-recycle time on each system 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.

6.4.13 Anti-Coincidence Timer

The anti-coincidence timer prevents both systems from 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.

6.4.14 Evaporator Heater Control

The evaporator heater is controlled by ambient temperature. When the ambient temperature is below 4.4 °C and the compressors are turned off, the heater will be switched on. When the temperature rises above 7.2°C, the heater is switched off. An under voltage condition will keep the heater off until full voltage is restored to the system. The heater will provide freeze protection to -29°C.

The 115 Vac control supply must remain ON for freeze protection. Otherwise, the cooler must be drained.

6.4.15 Pumpdown (YLLSV) Control

Each system has a pumpdown feature at shut-off. On a non-safety, non-unit switch shutdown, all compressors but one in the system will be shut off. The liquid line solenoid (YLLSV) will also be turned off. The final compressor will be allowed to run until the suction pressure falls below the cut-out or for 180 seconds, which ever comes first. Systems can be manually pumped down, using the system switches under the 'OPTIONS' key.

6.4.16 Units with Optional Electronic Expansion Valves

The liquid line solenoid (YLLSV) is also used as a low superheat safety device on units with optional EEV. While a system is running and not in a pumpdown mode the YLLSV will close if the suction superheat falls below -15.6°C. The YLLSV will open again when the superheat rises above -13.9°C. This safety device is ignored for the first 30 seconds of system run time. If the YLLSV is closed 10 times in 2 minutes the system will trip on a low superheat safety.

6.4.17 Lead/Lag Control

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

When AUTO lead/lag is used, the microprocessor attempts to balance run time between the systems. 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 systems are ready to start (Anti-recycle Timers timed out) and the systems have equal run time.

If both systems are waiting to start (Anti-recycle timers have not timed out), the microprocessor will assign the lead to the system with the shortest anti-recycle time to provide cooling quickly.

If the lead system is locked out, faulted and waiting to restart the lag system is swapped to the lead.

MANUAL lead/Lag selection will be automatically overridden by the microprocessor to allow the lag system to automatically become the lead anytime the selected lead system shuts down due to, lead system faults.

Automatic switch over in MANUAL mode is provided to try to maintain chilled liquid temperature as close to ‘SETPOINT’ as possible.

6.4.18 Compressor Sequencing

Compressor lead/lag can be 'Enabled' or 'Disabled' under the 'OPTIONS' key. If disabled on the system stopping the lead compressor will become the last compressor to start and the other compressors will move forward in the start sequence.

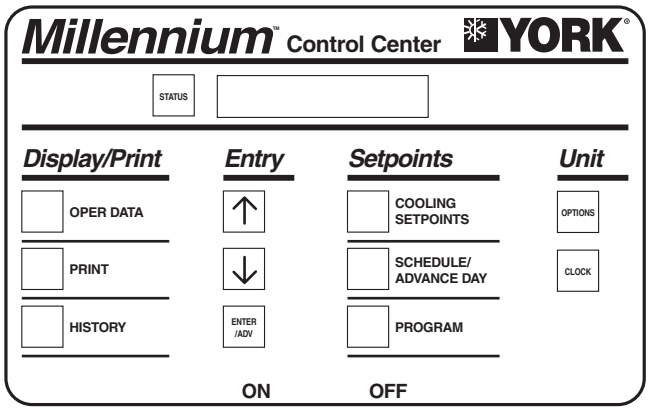
With compressor lead/lag enabled the unit control will attempt to equalise the total run hours on individual compressors within a system. When a system is about to start, the compressor with the least run time in that system will be the first to start. When the system has to load, the next compressor to start will be the one with the least run time that is currently not running in that system.

Units with Optional Soft Start

These units have a soft starter fitted to the No. 2 compressor on each system on 4 compressor units and the No. 3 compressor on each system on 6 compressor units.

The soft start option is 'Enabled' under the 'OPTIONS' key. With this option enabled the controls ensure that the compressor fitted with the soft starter is the last compressor to start in the system.

6.5 Control Panel Keys



Status Key - (refer to Section 6.6)

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

Display/Print Keys - (refer to Section 6.7)

These keys allow control panel display or remote printout of both current real-time operating 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.

Entry Keys - (refer to Section 6.8)

These keys are used for entering data required for programming the chiller. The keys are also used for scrolling through displays.

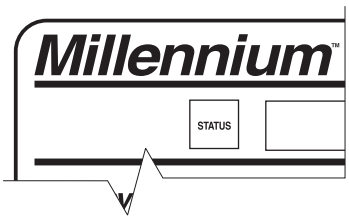
Setpoints Keys - (refer to Section 6.9)

These keys are used for display and programming: the local and remote chilled liquid temperature setpoints; the operating schedule for the chiller; the chiller operational settings and limits.

Unit Keys - (refer to Section 6.10)

These keys allow the unit options and clock to be set.

6.6 Status Key



Pressing the ‘STATUS’ key displays the unit operating status. The messages displayed will include running status, cooling demand, fault status, external cycling device status, load limiting and anti-recycle/coincident timer status. The display will be a single message relating to the highest priority message as determined by the microprocessor. Status messages fall into the categories of General Status and Fault Status.

The following messages can be displayed when the 'Status' key is pressed. In the case of messages which apply to individual systems, system 1 and system 2 messages will both be displayed and may be different. Following each message is an explanation of its meaning:

6.6.1 General Status Messages

```
UNIT SWITCH OFF
SHUTDOWN
```

The unit 'ON/OFF' switch on the control panel is in the 'OFF' position which will not allow the unit to run.

```
REMOTE CONTROLLED
SHUTDOWN
```

An Integrated Systems Network (ISN) or Building Automation System (BAS) has turned the unit off.

```
DAILY SCHEDULE
SHUTDOWN
```

The 'DAILY/HOLIDAY SCHEDULE' programmed is keeping the unit from running.

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

The flow switch is open or a remote start/stop contact in series with the flow switch is open and the unit will not run.

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

The system switch under 'OPTIONS' is turned off. The system will not be allowed to run until the switch is turned back on.

```
SYS 1 NO COOL LOAD
SYS 2 NO COOL LOAD
```

The chilled liquid temperature is below the point (determined by the ‘SETPOINT’ and 'RANGE') that the microprocessor will bring on a system or that the microprocessor has not loaded the lead system far enough into the loading sequence to be ready to bring the lag system on. The lag system will display this message until the loading sequence is ready for the lag system to start.

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

Indicates that the respective system is running due to demand. The 'X' will be replaced with the number of compressors in that system that are running.

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

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

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

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

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

Discharge pressure limiting is in effect. The limiting pressure is a factory set limit to keep the system from faulting on the high discharge pressure cutout due to high load or pull down conditions. When the unload point is reached, the microprocessor will automatically unload the affected system by de-energising one compressor.

The discharge pressure unload will occur when the discharge pressure gets within 1.03 barg of the programmed discharge pressure cutout. This will only happen if the system is fully loaded and will shut only one compressor off. If the system is not fully loaded, discharge limiting will not go into effect. Reloading the affected system will occur when the discharge pressure drops to 85% of the unload pressure and 10 minutes have elapsed.

SYS 1 SUCT LIMITING
SYS 2 SUCT LIMITING

Suction pressure limiting is in effect. Suction pressure limiting is standard on models 0199, 0219 and 0255 and optional on models 0149 and 0175 when the optional suction pressure transducers are installed.

Suction pressure transducers are fitted as standard when optional electronic expansion valves are fitted to the unit.

Units without Suction Pressure Transducers

On initial start if the suction pressure cutout is open the 'SUCT LIMITING' message will be displayed, but suction pressure limiting will not operate as described below. If the suction pressure rises to close the cutout the message (after a delay) will revert to the system run message. If the suction pressure does not rise the system will trip on suction pressure.

Units with Suction Pressure Transducers

The suction pressure limit is a control point that limits the loading of a system when the suction pressure drops to within 15% above the suction pressure cutout. On a standard system programmed for 3.0 bar suction pressure cutout, the microprocessor would inhibit loading of the affected system with the suction pressure less than or equal to 1.15 x 3.0 bar = 3.5 bar. The system will be allowed to load after 60 seconds and after the suction pressure rises above the suction pressure limit point.

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

Load limiting is in effect at the percentage shown. This limiting could be due to a load limit/PWM input on CTB1or an ISN load limit command.

MANUAL
OVERRIDE

'MANUAL OVERRIDE' mode is selected under the 'OPTIONS' key. In this mode the 'Daily Schedule' is ignored and the chiller will start-up when chilled liquid temperature allows and the flow switch/remote contacts, unit switch and system switches permit. This is a priority message and cannot be overridden other 'STATUS' messages.

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

SYS 1 PUMPING DOWN
SYS 2 PUMPING DOWN

Indicates that a compressor in the respective system is pumping the system down. When pumpdown is initiated, the liquid line solenoid will close and a compressor will continue to run. When the suction pressure decreases to the suction pressure cutout, the compressor will cycle off. If pump down cannot be achieved within three minutes of the liquid line solenoid closure, the compressor will cycle off.

6.6.2 Fault Status Messages

Safeties are divided into two categories - system safeties and unit safeties. System safeties are faults that cause the individual system to be shut down. Unit safeties are faults that cause all running compressors to be shut down.

System Safeties

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

SYS 1 HIGH DSCH PRES
SYS 2 HIGH DSCH PRES

The software discharge pressure cut-out is backed-up by a mechanical high pressure cut-out switch located in each refrigerant circuit. The software cut-out assures that the system pressure does not exceed safe working limits. The system will shutdown when the programmable cut-out is exceeded and will be allowed to restart when the discharge pressure falls below the cut-out.

SYS 1 LOW SUCT PRESS
SYS 2 LOW SUCT PRESS

The software suction pressure cut-out protects the chiller from an evaporator freeze-up should the system attempt to run with a low refrigerant charge or a restriction in the refrigerant circuit.

At system start, the cut-out is set to 10% of programmed value. During the next 3 minutes the cut-out point is ramped up to the programmed cut-out point. If at any time during this 3 minutes the suction pressure falls below the ramped cut-out point, the system will stop.

This cut-out is ignored for the first 90 seconds of system run time to avoid nuisance shutdowns.

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

The transient protection scheme will only work when suction pressure transducers are installed (standard on models 0199, 0219 and 0255 and optional on models 0149 and 0175).

When using the mechanical low pressure (LP) switches (models 0149 and 0175), the operating points of the LP switches are: open at 1.59 barg +/- 0.34 barg and closed at 2.62 barg +/- .34 barg.

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

The Motor Protector(MP)/Mechanical High Pressure (HP) Cut-out protect the compressor motor from overheating or the system from experiencing dangerously high discharge pressure. This fault condition is present when 1-K1 (system 1) or 2-K1 (system 2) relays de-energise due to the HP switch or the MP opening.

The internal MP opens at 85°C - 120°C and automatically resets. The mechanical HP switch opens at 27.92 barg +/- 0.69 barg and closes at 22.75 barg +/- 1.72 barg.

Units with Optional Electronic Expansion Valves

SYS 1 LOW SUPERHEAT
SYS 2 LOW SUPERHEAT

The low superheat cutout is to protect the compressor(s) from liquid floodback due to low suction superheat. This safety is ignored for the first 15 seconds of system run time.

This safety can be triggered by two events. The first is when the suction superheat < 1.1°C for 3 seconds. The second is when the YLLSV is closed 10 times in 2 minutes due to low superheat. The liquid line solenoid is used as a low superheat safety device. While the system is running and not in a pumpdown mode the YLLSV will close if the suction superheat falls below 2.2°C. The YLLSV will open again when the superheat rises above 3.9°C. The YLLSV safety is ignored for the first 30 seconds of system run time.

SYS 1 SENSOR FAILURE
SYS 2 SENSOR FAILURE

The sensor failure cutout is to prevent the EEV from running when the sensors measuring superheat are not functioning properly. This safety is ignored for the first 15 seconds of system run time. This safety will shutdown a system if either suction temperature or suction pressure sensors read out of range high or low. This condition must be present for 3 seconds to cause a system shutdown. This safety will lock out a system the first time and will not allow automatic restarting.

Unit Safeties

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

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

The low ambient temperature cut-out is a safety shutdown designed to protect the chiller from operating in a low ambient conditions. If the outdoor ambient temperature falls below the programmable cutout, the chiller will shut down. Restart can occur when temperature rises 1.2°C above the cut-off.

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

The low leaving chilled liquid temperature cut-out protects the chiller form an evaporator freeze-up should the chilled liquid temperature drop below the freeze point. This situation could occur under low flow conditions or if the microprocessor setpoint values are improperly programmed. Anytime the leaving chilled liquid temperature (water or glycol) drops below the cut-out point, the chiller will shutdown. Restart can occur when chilled liquid temperature rises 1.2°C above the cut-out.

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

The under voltage safety assures that the system is not operated at voltages where malfunction of the microprocessor could result in system damage. When the 115 Vac to the microprocessor drops below the limit, a unit fault is initiated to safely shut down the unit. Restart is allowed when the 115 Vac is within limits and the anti-recycle timers have finished counting down.

Unit Warning

The low battery message is not a unit safety and will not be logged to the history buffer. It is a unit warning and will not auto-restart. Operator intervention is required to allow a re-start of the chiller.

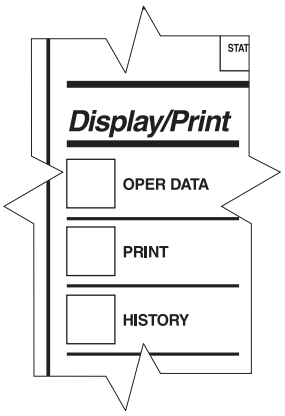
```
!! LOW BATTERY !!
CHECK PROG/ SETP/ OPTN
```

The low battery warning will only occur at microprocessor power-up, when the RTC battery is checked. If a low battery is found, all programmed setpoints, program values, options, time, schedule, and history buffers will be lost. These values will all be reset to their default values which may not be the desired operating values.

Once a faulty battery is detected, the unit will be prevented from running until the 'PROGRAM' key is pressed. Once 'PROGRAM' is pressed the anti-recycle timers will be set to allow the operator time to check setpoints, program values, and options.

If a low battery is detected, it should be replaced as soon as possible. The programmed values will all be lost and the unit will be prevented from running on the next power interruption. The RTC/battery is located at U17 on the microprocessor board.

6.7 Display/Print Keys



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

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

6.7.1 OPER DATA Key

The 'OPER DATA' key gives access to unit and system operating parameters. When the 'OPER DATA' key is pressed, system parameters will be displayed and remain on the display until another key is pressed. After pressing the 'OPER DATA' key, the operating data messages can be scrolled through by using the 'UP ARROW' and 'DOWN ARROW' keys.

With the 'UNIT TYPE' programmed as a liquid chiller (under the 'OPTIONS' key), the following operating data messages will be displayed in the order shown:

```
LCHLT = 6.2°C
RCHLT = 10.7°C
```

This display shows chilled leaving and return liquid temperatures. The minimum display limit is -12.7°C and the maximum display limit is 60.1°C.

```
AMBIENT AIR TEMP
= 34.5°C
```

This display shows the ambient air temperature. The minimum display limit is -17.4°C and the maximum display limit is 55.2°C.

```
SYS 1 SP = 3.39 BARG
DP = 15.6 BARG
```

This display shows suction and discharge pressures.

Suction pressure transducers are optional on models 0149 and 0175 (except when optional EEV are fitted) and low pressure switches are fitted as standard. In this case, the suction pressure would only be displayed as the maximum suction pressure reading of >13.79 barg when closed, or < 0 barg when open.

The minimum display limit for suction and discharge pressure is 0 barg. The maximum display limit for suction pressure is 13.79 barg and for discharge pressure is 27.5 barg.

Units with Optional Electronic Expansion Valves

```
SYS 1 SUCT = 10.2°C
SAT SUCT = 4.1°C
```

This display shows suction temperature and saturated suction temperature. The minimum display limit for suction temperature is -20.0°C the maximum 59.9°C.

```
SYS 1 EEV = 42.7 %
SUC SHEAT = 6.2°C
```

This display shows the EEV % and is a representation of the operation of the electronic expansion valve. The second line shows the suction superheat.

The above messages will be repeated sequentially for System 2.

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

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

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

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

This message shows the status of the load and unload timers in seconds until the unit can load or unload. Whether the unit loads or unloads is determined by how far the actual liquid temperature is from the 'SETPOINT'. Refer to capacity control for details of unit loading and unloading.

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

This message indicates the current 'step' in the capacity control scheme. The number of available steps is determined by how many compressors are in the unit. In the above display, the '2' does not mean that two compressors are running but only indicates that the capacity control scheme is on step 2 of 8. Refer to capacity control for further details.

```
LEAD SYSTEM IS
SYSTEM NUMBER 2
```

This message indicates the current lead system. In the example system 2 is the lead system, making system 1 the lag system. The lead system can be manually or automatically selected. Refer to the 'Options' key for details.

Units with optional hot gas by-pass should be programmed for 'MANUAL' with system 1 as the lead system under the 'Options' key. Failure to do so will prevent hot gas by-pass operation if system 2 switches to the lead system when programmed for 'AUTOMATIC LEAD/LAG'.

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

This message indicates the status of the evaporator pump contacts and the evaporator heater.

The evaporator pump dry contacts are energised when any compressor is running, or the unit is not OFF on the daily schedule and the unit switch is on, or the unit has shutdown on a low leaving chilled liquid fault. However, even if one of above is true, the pump will not run if the microprocessor has been powered up for less than 30 seconds or if the pump has run in the last 30 seconds to prevent pump motor overheating.

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

```
ACTIVE REMOTE CTRL
NONE
```

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

```
ACTIVE REMOTE CTRL
NONE
```

No remote control active. Remote monitoring may be via ISN.

```
ACTIVE REMOTE CTRL
ISN
```

YorkTalk via ISN (Remote Mode).

```
ACTIVE REMOTE CTRL
LOAD LIM
```

Load limiting enabled. Can be either stage 1 or stage 2 of limiting.

```
ACTIVE REMOTE CTRL
PWM TEMP
```

EMS-PWM temperature reset.

```
SYS X NUMBER OF
COMPS RUNNING X
```

```
SYS X RUNTIME
XX-XX-XX-XX D-H-M-S
```

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

```
SYS X FAN STAGE 3
```

The above four message will appear sequentially, first for system 1, then for system 2.

The first message indicates the system and number of compressors that are being commanded on by the microprocessor.

The second message indicates the system run time in days - hours - minutes - seconds.

This is not accumulated run time but only the current system cycle.

The third message indicates the system, and whether the liquid line solenoid and hot gas solenoid are being commanded on by the microprocessor.

The hot gas by-pass option is not available for system 2, so there is no message for the hot gas solenoid when the system 2 message is displayed.

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

Only stages 1 and 2 will be used to cycle the condenser fans unless the optional low ambient kit is fitted. However, stage 3 may be shown when the low ambient kit option is not fitted, but it has no effect.

6.7.2 PRINT Key

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

Operating Data Print-out

Pressing the 'PRINT' key and then 'OPER DATA' key allows the operator to obtain a printout of current system operating parameters. When the 'OPER DATA' key is pressed, a snapshot will be taken of system operating conditions and panel programming selections. This data will be temporarily stored in memory and transmission of this data will begin to the printer. A sample operating data printout is shown opposite.

History Print-out

Pressing the 'PRINT' key and then the 'HISTORY' key allows the operator to obtain a printout of information relating to the last 6 Safety Shutdowns which occurred. The information is stored at the instant of the fault, regardless of whether the fault caused a lockout to occur. The information is also not affected by power failures or manual resetting of a fault lock-out.

When the 'HISTORY' key is pressed, a printout is transmitted of all system operating conditions which were stored at the "instant the fault occurred" for each of the 6 Safety Shutdowns buffers. The printout will begin with the most recent fault which occurred. The most recent fault will always be stored as Safety Shutdown No. 1. Identically formatted fault information will then be printed for the remaining safety shutdowns.

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

The history printout is identical to the operational data printout with the exception of the header and the schedule information which is not printed. An example of a history buffer header printout is shown below.

```
YORK INTERNATIONAL CORPORATION
   MILLENNIUM LIQUID CHILLER

         UNIT STATUS
       3:09AM  23 JAN 01

       UNIT SWITCH IS IN
       THE OFF POSITION

            OPTIONS

CHILLED LIQUID              WATER
AMBIENT CONTROL       LOW AMBIENT
LOCAL/REMOTE MODE           LOCAL
CONTROL MODE        LEAVING LIQUID
LEAD/LAG CONTROL        AUTOMATIC
FAN CONTROL       DISCHARGE PRESS
CURRENT FEEDBACK              NONE
COMPRESSOR LEAD/LAG       ENABLED
SOFT START                ENABLED
EXPANSION VALVE        ELECTRONIC

         PROGRAM VALUES

DSCH PRESS CUTOUT      27.2 BARG
SUCT PRESS CUTOUT       3.03 BARG
LOW AMBIENT CUTOUT      -3.9 DEGC
LEAVING LIQUID CUTOUT    2.2 DEGC
ANTI RECYCLE TIME        600 SECS
FAN CONTROL ON PRESS    15.8 BARG
FAN DIFF OFF PRESS       5.5 BARG
NUMBER OF COMPRESSORS          6
REFRIGERANT TYPE             R22
REMOTE UNIT ID PROGRAMMED      0

           UNIT DATA

RETURN LIQUID TEMP      30.6 DEGC
LEAVING LIQUID TEMP     39.1 DEGC
COOLING RANGE    6.1 +/- 1.1 DEGC
AMBIENT AIR TEMP         3.1 DEGC
LEAD SYSTEM                SYS 1
EVAPORATOR PUMP             OFF
EVAPORATOR HEATER            ON
ACTIVE REMOTE CONTROL       NONE
SOFTWARE VERSION     C.MMC.03.03

         SYSTEM 1 DATA

COMPRESSORS STATUS          OFF
RUN TIME      0- 0- 0- 0 D-H-M-S
SUCTION PRESSURE      13.79 BARG
DISCHARGE PRESSURE     14.2 BARG
SUCTION TEMPERATURE    32.4 DEGC
SAT SUCTION TEMP       38.4 DEGC
SUCTION SUPERHEAT      -6.0 DEGC
LIQUID LINE SOLENOID        OFF
HOT GAS BYPASS VALVE        OFF
CONDENSER FAN STAGES        OFF
EEV OUTPUT                0.0 %

         SYSTEM 2 DATA

COMPRESSORS STATUS          OFF
RUN TIME      0- 0- 0- 0 D-H-M-S
SUCTION PRESSURE      13.79 BARG
DISCHARGE PRESSURE      6.9 BARG
SUCTION TEMPERATURE   -20.0 DEGC
SAT SUCTION TEMP       38.4 DEGC
SUCTION SUPERHEAT     -58.4 DEGC
LIQUID LINE SOLENOID        OFF
CONDENSER FAN STAGES        OFF
EEV OUTPUT                0.0 %

         DAILY SCHEDULE

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

```
YORK INTERNATIONAL CORPORATION
   MILLENNIUM LIQUID CHILLER

   SAFETY SHUTDOWN NUMBER 1
 SHUTDOWN @ 3:56 PM 29 SEPT 99

SYS 1 HIGH DSCH PRESS SHUTDOWN
SYS 2 NO FAULTS
```

6.7.3 History Key

The 'HISTORY' key displays unit and system operating parameters at the time of a unit or system safety shutdown. When the 'HISTORY' key is pressed the following message is displayed.

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

While this message is displayed, the 'UP ARROW' or 'DOWN ARROW' keys can be used to select any of the six history buffers. Buffer number 1 is the most recent, and buffer number 6 is the oldest safety shutdown that was saved.

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

```
SHUT DOWN OCCURRED
11:23 PM 29 MAY 98
```

The 'UP ARROW' and 'DOWN ARROW' keys are used to scroll forwards and backwards through the history buffer to display the shutdown conditions. The history data messages are shown below in the order that they are displayed:

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

```
UNIT TYPE
LIQUID CHILLER
```

```
CHILLED LIQUID
WATER
```

```
AMBIENT CONTROL
STANDARD
```

```
LOCAL/REMOTE MODE
LOCAL
```

```
CONTROL MODE
LEAVING LIQUID
```

```
LEAD/LAG CONTROL
AUTOMATIC
```

```
FAN CONTROL
DISCHARGE PRESSURE
```

```
MANUAL OVERRIDE MODE
DISABLED
```

```
CURRENT FEEDBACK
NONE
```

```
COMPRESSOR LEAD/LAG
DISABLED
```

```
SOFT START
DISABLED
```

```
DISCHARGE PRESSURE
CUTOUT = 27.2BARG
```

```
SUCTION PRESSURE
CUTOUT = 3.03 BARG
```

```
LOW AMBIENT TEMP
CUTOUT = -3.9°C
```

```
LEAVING LIQUID TEMP
CUTOUT = 2.2°C
```

```
FAN CONTROL ON
PRESSURE=15.9BARG
```

```
FAN DIFFERENTIAL OFF
PRESSURE=5.52BARG
```

```
LCHLT = 6.2°C
RCHLT = 9.8°C
```

```
SETPOINT = 6.7°C
RANGE = +/-1.1°C
```

```
AMBIENT AIR TEMP
= 31.0 °C
```

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

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

```
ACTIVE REMOTE CTRL
NONE
```

```
SYS 1 NUMBER OF
COMPS RUNNING 2
```

```
SYS 1 RUN TIME
00-1-46-15 D-H-M-S
```

```
SYS 1 SP = 2.97BARG
DP = 15.66BARG
```

```
SYS 1 SUCT = 10.2°C
SAT SUCT = 4.2°C
```

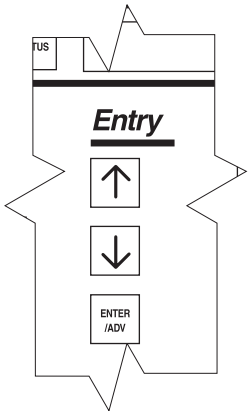
```
SYS 1 EEV = 42.0 %
SUC SHEAT = 6.1°C
```

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

```
SYS 1 FAN STAGE 2
```

The System 1 messages above are repeated for System 2. The suction, saturated suction, EEV and suction superheat messages are only shown on units with optional electronic expansion valves. Explanations of the history data messages are given under the 'STATUS', 'DISPLAY/PRINT', 'SETPOINTS' or 'UNIT' keys.

6.8 Entry Keys



The Entry Keys allow the programmed values to be viewed and changed.

6.8.1 UP ARROW and DOWN ARROW Keys

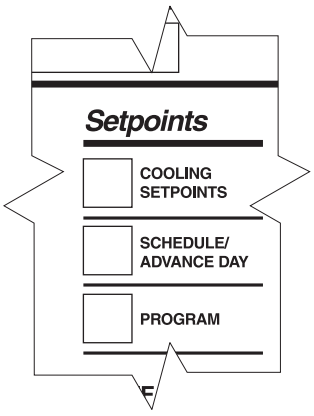
Used in conjunction with the 'OPER DATA' and 'HISTORY' keys, the 'UP ARROW' and 'DOWN ARROW' keys allow the user to scroll through the data messages.

The 'UP ARROW' and 'DOWN ARROW' keys are also used for programming the control panel when changing cooling setpoints, setting the daily schedule, changing safety setpoints, chiller options, and setting the clock.

6.8.2 ENTER/ADV Key

The 'ENTER' key must be pushed after any change is made during programming to enter the new value into memory. If the 'ENTER' key is not pressed afer a value is changed, the changes will not be 'entered' and the original values will be used to control the chiller.

6.9 Setpoints Keys



NOTE

The unit must first be programmed for 'Unit Type' liquid chiller under the 'OPTIONS' key to allow programming of the setpoints.

Programming and viewing the cooling setpoints, daily schedule, and safeties is accomplished by using the 'SETPOINTS' keys:

6.9.1 Cooling Setpoints

The cooling 'SETPOINT' and 'RANGE' can be viewed or programmed by pressing the 'COOLING SETPOINTS' key (Refer to Section 6.9.5 Setpoint Settings). After pressing the key, the cooling mode (leaving chilled liquid or return chilled liquid) will be displayed for a few seconds, and then the setpoint entry screen will be displayed.

Four possible messages can be displayed after pressing the 'COOLING SETPOINTS' key, indicating the cooling mode:

```
    LOCAL LEAVING
WATER TEMP CONTROL
```

```
    LOCAL RETURN
WATER TEMP CONTROL
```

```
   REMOTE LEAVING
WATER TEMP CONTROL
```

```
    REMOTE RETURN
WATER TEMP CONTROL
```

The 'LOCAL LEAVING WATER TEMP CONTROL' message indicates that the cooling setpoint is under locally programmed control and based on leaving liquid temperature.

The 'LOCAL RETURN WATER TEMP CONTROL' message indicates that the cooling setpoint is under locally programmed control and based on return liquid temperature.

The 'REMOTE LEAVING WATER TEMP CONTROL' message indicates that the cooling setpoint is under remote control (ISN/BAS) and based on leaving liquid temperature.

The 'REMOTE RETURN WATER TEMP CONTROL' message indicates that the cooling setpoint is under remote control (ISN/BAS) and based on return liquid temperature.

The control mode message is replaced by the 'SETPOINT' and 'RANGE' entry message. If the unit is programmed for leaving liquid temperature control the following message will be displayed:

```
SETPOINT =   6.7°C
 RANGE   = +/- 1.1°C
```

The above message shows the current chilled water temperature 'SETPOINT' at 6.7°C (the cursor is positioned under the number 6). Pressing the 'UP ARROW' or 'DOWN ARROW' will change the 'SETPOINT' in 0.2°C to 0.3°C increments. The 'ENTER/ADV' key must be pressed to enter the 'SETPOINT' into memory and advance to the 'RANGE'.

The cursor will move under the current 'RANGE' setting. Pressing the 'UP ARROW' or 'DOWN ARROW' will change the setting between 0.8°C, 1.1°C and 1.4°C. The 'ENTER/ADV' key must be pressed to enter the range into memory.

The 'RANGE' setting takes into account the number of compressors on the unit and the temperature difference between leaving (LCHLT) and return (RCHLT) chilled liquid at full load. The 'RANGE' should be set in accordance with the following table:

Model	0149SC, 0175SC			0199SC, 0219SC, 0255SC		
Compressors	4			6		
ΔT °C	3.0	5.5	8.0	3.0	5.5	8.0
RANGE	0.8	1.0	1.4	0.8	0.8	1.0

The 'RANGE' is programmed for +/- X.X° C when control is based on leaving liquid temperature. The 'SETPOINT' is in the centre of the control range.

When control is based on return liquid temperature the 'SETPOINT' and 'RANGE' entry message:

```
SETPOINT =   6.7°C
  RANGE  = +1.1°C
```

The +/- X.X° C 'RANGE' is replaced by + X.X° C, this indicates that the 'SETPOINT' is at the bottom of the 'RANGE' when control is based on return liquid temperature.

The programmed 'SETPOINT' and 'RANGE' values under local control have no effect when the unit is programmed for 'REMOTE' control (under the 'OPTIONS' key).

For further details of cooling setpoint programming refer to Capacity Control.

Pressing the 'COOLING SETPOINTS' key a second time will display the remote 'SETPOINT' and 'RANGE':

```
REM SETP =   6.7°C
 RANGE   = +/-1.1°C
```

Remote leaving chilled liquid temperature control

```
REM SETP =   6.7°C
 RANGE   = +5.6°C
```

Remote return chilled liquid temperature control

This message automatically updates every 2 seconds. These setpoints are not programmable, but are controlled by a remote device such as an ISN control. These setpoints would only be valid if the unit is operating in the 'REMOTE' mode.

Pressing the 'COOLING SETPOINTS' a third time will allow the maximum remote EMS-PWM temperature reset to be programmed:

```
MAX EMS-PWM REMOTE
TEMP RESET = 11.0°C
```

The temperature reset value is the maximum allowable reset of the temperature 'SETPOINT' . The 'SETPOINT' can be reset upwards by the use of a timed contact closure on the PWM input (CTB1 terminals 13 - 20).

Pressing the 'UP ARROW' or 'DOWN ARROW' will change the temperature reset value in 1.0°C increments. The 'ENTER/ADV' key must be pressed to enter the value into memory.

```
LAST RUN TIME =  167S
SETP ADJUST   =  1.7°C
```

Pressing the 'COOLING SETPOINTS' a forth time will display the lead system's last run time and the setpoint adjust value. See section 6.3.1.

6.9.2 EMS-PWM Remote Temperature Reset

The EMS-PWM remote temperature reset value at XCTB1 terminals 13 - 20, will reset the chilled liquid 'SETPOINT' based on the length of time the contacts remain closed. The maximum temperature reset allowed is achieved with a contact closure of 11 seconds. 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 microprocessor board 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:

'SETPOINT' = chilled liquid 'SETPOINT' + °'RESET'

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

Example:

Local Chilled Liquid Setpoint = 6.1°C.

*Max Reset Value = 10.0°C

Contact Closure Time = 6 Seconds.

(6 sec - 1) * (10.0°C/10) = 5.0°C

Reset 'SETPOINT' = 6.1°C + 5.0°C = 11.1°C

This can be viewed by pressing the 'COOLING SETPOINTS' key twice:

```
REM SETP = 10.0°C
  RANGE = +/- 1.1°C
```

Remote leaving chilled liquid temperature control

```
REM SETP = 10.0°C
   RANGE = +5.6°C
```

Remote return chilled liquid temperature control

6.9.3 SCHEDULE/ADVANCE DAY Key

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.

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. The daily schedule is considered 'not programmed' when the times in the schedule are all zeros (00:00 AM).

Programming of the operating and holiday schedules are described below.

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

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

The cursor will be under the 0. The time may be changed by using the 'UP ARROW' and 'DOWN ARROW' keys. Pressing the 'ENTER/ADV' key will enter the time and then move the cursor to the minute box. This process should be repeated until the hour, minutes, and meridian (AM or PM) of both the 'START' and 'STOP' times are set. After setting the meridian of the stop time, pressing the 'ENTER/ADV‘ key will advance the schedule to the next day.

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

To page to a specific day press the 'SCHEDULE/ADVANCE DAY' key. The start and stop time of each day may be programmed differently using the 'UP ARROW' and 'DOWN ARROW' and 'ENTER/ADV' keys.

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

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

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

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

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

The holiday schedule must be reprogrammed after holiday, because once the holiday schedule runs it will revert to the normal daily schedule.

6.9.4 PROGRAM Key

The 'PROGRAM' key is used to set the programmable cut-outs, timers and switching points. These parameters can be changed by pressing the 'PROGRAM' key, and then the 'ENTER/ADV' key to enter the program mode. Continuing to press the 'ENTER/ADV' key will display each operating parameter. While a particular parameter is being displayed, the 'UP ARROW' and 'DOWN ARROW' keys can be used to change the value (Refer to Section 6.11 Cut-out Settings). After the value is changed, the 'ENTER/ADV' key must be pressed to enter the new parameter into memory .

The programmable parameters are displayed in the following order:

```
DISCHARGE PRESSURE
CUTOUT = 27.2BARG
```

The discharge pressure cut-out is the pressure at which the system will shutdown as monitored by the discharge transducer. This cut-out acts as a back-up for the mechanical high pressure switch located in each refrigerant circuit. The system will restart when the discharge pressure drops 2.76 barg below the cut-out setting.

```
SUCTION PRESSURE
CUTOUT = 3.03 BARG
```

The suction pressure cut-out protects the chiller from an evaporator freeze-up. If the suction pressure drops below the cutout point, the system will shut down.

There are some exceptions when the suction pressure is permitted to temporarily drop below the cut-out setting. Refer to System Safeties for details.

```
LOW AMBIENT TEMP
CUTOUT = -3.9°C
```

The low ambient temperature cut-out sets the chiller outside ambient temperature cut-out point. If the ambient temperature falls below this point, the chiller will shut down. Restart can occur when temperature rises 1.11°C above the cut-out setting.

```
LEAVING LIQUID TEMP
CUTOUT = 2.2°C
```

The leaving liquid temperature cut-out protects the chiller from an evaporator freeze-up. Anytime the leaving chilled liquid temperature drops to the cut-out point, the chiller shuts down. Restart will be permitted when the leaving chilled liquid temperature rises 1.11°C above the cut-out setting.

When water cooling mode is programmed ('OPTIONS' key), the cut-out is fixed at 2.22°C and cannot be changed. Glycol cooling mode values are programmable.

```
ANTI RECYCLE TIME
= 600 SEC
```

The anti-recycle time sets the minimum time start-to-start of the number one compressors of each system. A second non-programmable anti-recycle timer fixed at 120 seconds, starts to countdown when the systems number one compressor cycles off.

The anti-recycle message is displayed when a system is unable to start due to either of the anti-recycle timers being active (counting down). The actual time displayed will be the longer of the two timers, start-to-start or stop-to-start.

```
FAN CONTROL ON
PRESSURE=15.9BARG
```

The fan control ON pressure is the programmed setting that is used to stage the condenser fans on, in relation to discharge pressure.

```
FAN DIFFERENTIAL OFF
PRESSURE=5.52BARG
```

The fan differential OFF pressure is the programmed differential setting that is used to stage the condenser fans off, in relation to discharge pressure.

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

The total number of compressors setting determines the stages of cooling available.

The total number of compressors must be programmed correctly to ensure proper chiller operation.

```
REMOTE UNIT ID
PROGRAMMED = 0
```

When the unit is connected to a remote ISN controller this message allows the identification number to be programmed into the unit.

```
DATA LOGGING MODE
1 = ON 0 = OFF 0
```

Under normal operation this should be set to 0 (OFF).

6.9.5 Setpoint and Cut-out Settings

Refer to Operating Limitations (Section 9.2) when setting or adjusting Setpoint and Cut-out Settings.

```
DATA LOGGING TIMER
6 SECS
```

Under normal operation as the 'DATA LOGGING MODE' is 'OFF' the 'DATA LOGGING TIMER' which has a default of 6 seconds is not used.

Units with Optional Electronic Expansion Valves

```
SYS 1 SUPERHEAT
SETPOINT = 6.7°C
```

The superheat setpoint can be programmed for both systems individually. The setpoints are used for the electronic expansion valves. Valid setpoint values are between 5.5°C and 7.8°C, recommended setting of 6.7°C.

Cooling 'SETPOINTS' Programmable Limits and Defaults

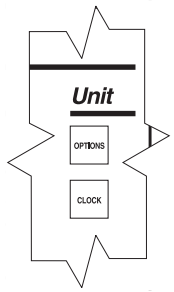
Parameter	Type	Low Limit	High Limit	Default
Leaving Chilled Liquid 'SETPOINT' (1)	Water Cooling (2)	4.4°C	21.1°C	6.7°C
	Glycol Cooling (3)	-12.2°C	21.1°C	6.7°C
Leaving Chilled Liquid 'RANGE'	All	0.8°C	1.4°C	1.1°C
Return Chilled Liquid 'SETPOINT' (1)	Water Cooling (2)	4.4°C	21.1°C	6.7°C
	Glycol Cooling (3)	-12.2°C	21.1°C	6.7°C
Return Chilled Liquid 'RANGE'	All	2.2°C	11.1°C	5.6°C
EMS-PWM Remote Temperature Reset	All	1.0°C	22.0°C	11.0°C

(1) Contact York for application guidelines before exceeding 12.8°C 'SETPOINT'.
(2) **Leaving Chilled Liquid 'SETPOINT' should not be set below 5°C for water cooling.**
(3) **Leaving Chilled Liquid 'SETPOINT' should not be set below -6.7°C for glycol cooling.**

Cut-outs Programmable Limits And Defaults

Parameter	Type	Low Limit	High Limit	Default
Discharge Pressure Cutout	All	13.8 barg	27.5 barg	27.2 barg
Suction Pressure Cutout	Water Cooling	3.03 barg	4.83 barg	3.03 barg
	Glycol Cooling	1.38 barg	4.83 barg	3.03 barg
Low Ambient Temperature Cut-out	Standard	-3.9°C	15.6°C	-3.9°C
	Low Ambient	-17.8°C	15.6°C	-3.9°C
Leaving Chilled Liquid Temperature Cut-out	Water Cooling			2.2°C
	Glycol Cooling	-13.3°C	2.2°C	2.2°C
Anti-Recycle Timer	All	300 s	600 s	600 s
Fan Control On-Pressure	All	15.5 barg	20.7 barg	15.9 barg
Fan Differencial Off-Pressure	All	3.45 barg	10.3 barg	5.52 barg
Total Number Of Compressors	All	4	6	6
Unit ID	All	0	7	0
Superheat Setpoint **(EEV Option)**	All	5.5°C	7.8°C	6.7°C

6.10 Unit Keys



6.10.1 OPTIONS Key

The 'OPTIONS' key is used to scroll through the list of options by repeatedly pressing the 'OPTIONS' key. The options may be changed using the 'UP ARROW‘ and 'DOWN ARROW' keys. After an option is changed the 'ENTER/ADV' key must be pressed to enter the setting into memory. The options are displayed in the following order:

```
DISPLAY LANGUAGE
ENGLISH
```

One of five display message languages maybe selected (English, Spanish, French, German and Italian).

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

or

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

or

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

or

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

The System Switches can be set to allow both systems to run, stop both systems or only one system to run.

```
CHILLED LIQUID
WATER
```

or

```
CHILLED LIQUID
GLYCOL
```

The chilled liquid type can be set for water or glycol.

```
AMBIENT CONTROL
STANDARD
```

or

```
AMBIENT CONTROL
LOW AMBIENT
```

Ambient control can be set for standard or low ambient control.

A low ambient kit MUST be installed when low ambient control is selected.

```
LOCAL/REMOTE MODE
LOCAL
```

or

```
LOCAL/REMOTE MODE
REMOTE
```

When programmed for 'LOCAL' an ISN or RCC control can be used to monitor only. The microprocessor will operate on locally programmed values and ignore all commands from the remote devices. The chiller will communicate and send data to the remote monitoring devices.

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

```
CONTROL MODE
RETURN LIQUID
```

or

```
CONTROL MODE
LEAVING LIQUID
```

Unit control can be based on return chilled liquid temperature or leaving chilled liquid temperature. Refer to Capacity Control for details on loading and unloading sequences.

```
DISPLAY UNITS
IMPERIAL
```

or

```
DISPLAY UNITS
SI
```

Display messages can be shown in Imperial units (°F or PSI) or SI units (°C or Bar).

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

or

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

or

```
LEAD/LAG CONTROL
AUTOMATIC
```

System1or system 2 can be selected as the lead system under manual or the microprocessor will determine which system is assigned to the lead and lag under automatic. A new lead/lag assignment is made whenever all compressors are shut down in automatic. The microprocessor will then assign the lead to the system compressor with the shortest average run time.

```
FAN CONTROL
DISCHARGE PRESSURE
```

or

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

The condenser fans can be controlled by discharge pressure only or by ambient temperature and discharge pressure.

Condenser fan control must be set to 'FAN CONTROL DISCHARGE PRESSURE'.

```
MANUAL OVERRIDE MODE
DISABLED
```

or

```
MANUAL OVERRIDE MODE
ENABLED
```

This option allows the programmed daily schedule to be overridden for service tasks when the mode is enabled. It will automatically be disabled after 30 minutes.

```
CURRENT FEEDBACK
NONE
```

This option should always be disabled.

```
COMPRESSOR LAED/LAG
DISABLED
```

or

```
COMPRESSOR LAED/LAG
ENABLED
```

With compressor lead/lag disabled on the system stopping the lead compressor will become the last compressor to start and the other compressors will move forward in the start sequence.

With the compressor lead/lag enabled the unit control will attempt to equalise the total run hours on individual compressors within a system. When a system is about to start, the compressor with the least run time in that system will be the first to start. When the system has to load, the next compressor to start will be the one with the least run time that is currently not running in that system.

```
SOFT START
DISABLED
```

or

```
SOFT START
ENABLED
```

The soft start option should only be enabled if the unit is fitted with a soft starter.

When enabled the compressor fitted with soft start in each system is the last compressor to start. On units with two compressors per system, compressor No. 2 of each system will always start last. On units with three compressors per system, compressor No. 3 of each system will always start last.

```
UNIT TYPE
LIQUID CHILLER
```

This option is factory set and should always read LIQUID CHILLER. If a unit type other than liquid chiller is displayed contact your local York office.

```
REFRIGERANT TYPE
R22
```

This option is factory set and should always read R22. If the refrigerant type is incorrect contact your local York office

```
EXPANSION VALVE TYPE
THERMOSTATIC
```

or

```
EXPANSION VALVE TYPE
ELECTRONIC
```

This option is factory set and should always read the correct expansion valve type. If the expansion valve type is incorrect contact your local York office.

6.10.2 CLOCK Key

Pressing the 'CLOCK' displays the current day, time, and date. It is important that the date and time are correct, otherwise the daily schedule will not function as correctly. In addition, for ease of troubleshooting via the History printouts, the day, time, and date should be correct.

To change the day, time, and date press the 'CLOCK' key. The display will show:

```
TODAY IS TUE 17:15PM
14 DEC 99
```

The cursor is positioned under the day. Pressing the 'UP ARROW' or 'DOWN ARROW' will change the day. The 'ENTER/ADV' key must be pressed to enter the value into memory and to move to the next value. The hour, minute, meridian, date, month and year may be programmed in the same manner.

Jumper J11 on the microprocessor board must be set to the 'CLKON' position to turn on the clock. If this is not done the clock will not function.

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7 MAINTENANCE

7.1 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 organisation 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 Section 6.

7.2 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 Section 6 for explanation of messages and Section 8 for courses of action).

Operating conditions: Read the operating pressures and temperatures at the control panel using the 'OPER DATA' key and check that these are within the operating limitations given in Section 6.

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

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

Airflow obstructions: Check the air cooled condenser coil intakes and adjacent areas are clear of foreign materials or obstructions e.g. paper, leaves, etc.

Compressor oil level: Check the compressor oil level when the compressor is operating normally. The oil level should be between the ½ and ¾ in the oil sight glass.

At shutdown the oil level can fall to the lower limit of the oil sight glass.

Compressor Oil Quality: The oil used in the compressors is pale in colour. If the oil colour darkens or exhibits a change in colour, this may be an indication of contaminants in the refrigerant system. If this occurs, an oil sample should be taken and analysed. If contaminants are present, the system must be cleaned to prevent compressor failure.

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.

On-board Battery Back-up: The real time clock integrated circuit (U17) maintains the date/time and stores customer programmed setpoints. Anytime the chiller is to be off (no power to the microprocessor board) for an extended time (weeks/months), the clock should be turned off to conserve power of the on-board battery. To accomplish this, the J11 jumper on the microprocessor board must be moved to the 'CLKOFF' position while power is still supplied to the microprocessor board.

In addition to the checks listed above, periodic inspections of the unit should be carried out to ensure proper equipment operation. Items such as loose equipment, component operation, unusual noises, etc. should be investigated and corrected immediately.

7.3 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 Centre is contacted for recommendations for individual sites.

Standard Units

SERVICE SCHEDULE	MINOR SERVICE	MAJOR SERVICE All items under Minor Service plus:
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:	Check oil level. Check condition of oil.	
Evaporator:	Check water flow. Check water pressure drop. Check heater mats.	Check water pH / glycol strength.
Air cooled condensers:	Check for airflow obstructions. Check fins. Check fans and fan guards.	Brush fins. Check fan motor bearings.
Power & Control system general:	Check panel condition. Check mains and control wiring. Check sensor locations. Check mechanical HP cut-outs.	Check all connections. Check compressor contactors. Check fan contactors / overloads. Check sensor / transducer calibration. Check motor protectors. Check contactor contacts.
Microprocessor controls:	Check fault history. Check program settings. Check HP / LP cut-out function's. Check pump-down function. Check load / unload function.	Check fan control function. Check ambient cut-out function.

7.4 Evaporator (Cooler) In-Service Inspection

There is no corrosion on the refrigerant side therefore in-service inspection on the refrigerant side is not necessary.

For the water side, if the water used is treated in accordance with Section 4.5, in-service inspection is not necessary. In the design of the vessels used in the unit, a 1 mm corrosion allowance has been used to consider slight corrosion on the water side. This allowance is sufficient to cover the lifetime of the unit.

York International believes that periodic in service proof testing (e.g.; hydro tests) is not required. However, York International recognises that national regulations may require such testing to be conducted.

8 TROUBLE SHOOTING

8.1 Competent Persons Trouble Shooting Guide

PROBLEM	POSSIBLE CAUSE	ACTION
No display on panel — Unit will not operate	Mains supply to unit off.	Switch on mains supply if safe to do so.
	Emergency stop device off.	Check if remote emergency stop device is in the 'OFF' position. Turn to 'ON' position if safe to do so.
	No supply to -T1.	Check wiring to -T1 and fuse -F1.
	No 24 Vac supply to microprocessor board.	Check wiring from -T1 to microprocessor board.
	No 24 Vac output from Transformer -T1.	Replace -T1.
	Short circuit in wiring to temperature sensors or pressure transducers.	Unplug connections at microprocessor board to isolate.
	Defective microprocessor board or display board.	Replace board after contacting York Service.
FLOW SWITCH / REM STOP NO RUN PERMISSIVE displayed	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.
	Defective flow switch.	Replace flow switch.
	Remote cycling device open.	Check cycling devices connected to terminals 13 and 14 on terminal block CTB1.
UNIT FAULT: LOW AMBIENT TEMP displayed	Ambient air temperature is lower than the programmed operating limit.	Use the 'ambient temp.' key to display the temperature and confirm that the displayed value is approximately correct. The warning message should clear when the ambient air temperature reaches the programmed operating limit. Check the programmed settings are correct for the options fitted to the unit.
	Measured temperature is incorrect.	Check sensor calibration, location and wiring.
UNIT FAULT: LOW LIQUID TEMP displayed	Improperly adjusted leaving chilled liquid temperature cut-out (glycol only).	Re-program the leaving chilled liquid temperature cut-out.
	Control panel setpoint/range values improperly programmed.	Re-adjust setpoint/range.
	Chilled liquid flow too low.	Increase chilled liquid flow.
	Defective -BLCT or -BECT sensor. (Check the sensor is properly installed in the bottom of the well with a generous amount of heat conductive compound).	Compare sensor against a known good temperature sensing device. Refer to sensor calibration tables.
UNIT FAULT: 115 VAC UNDERVOLTAGE displayed	Poor mains supply voltage.	Check mains supply is stable and within allowable limits. Check for voltage dip on compressor start.

PROBLEM	POSSIBLE CAUSE	ACTION
SYS X HIGH DSCH PRES displayed	Discharge pressure cut-out incorrectly set.	Adjust in accordance with recommended setting.
	Poor airflow through the condenser coils.	Check for airflow restrictions caused by blockages on intake faces of air coils. Check for damaged fins.
	Condenser fans not operating or operating backwards.	Check fan motor, fuses, and contactors. Check fan airflow is upward.
	Air in refrigerant system.	Check for non-condensables (air) in system. Evacuate and recharge system.
	Excessive refrigerant charge.	Remove refrigerant.
	Measured pressure is incorrect.	Check discharge transducer calibration and wiring.
SYS X LOW SUCT PRESS displayed	Suction pressure cut-out incorrectly set.	Adjust in accordance with recommended setting.
	Faulty expansion valve (TXV).	Replace valve
	Reduced cooler performance.	Check for restricted chilled liquid flow. Check for fouled tube surfaces.
	Low refrigerant charge.	Check for leaks.
	Restricted refrigerant flow.	Check for blocked filter/drier. Check -YLLSV is operating correctly Check for moisture in the system.
	Measured pressure incorrect.	Check suction pressure transducer calibration/pressure switch and wiring.
SYS X MP/HPCO FAULT displayed	Compressor internal motor protector (MP) open.	Verify refrigerant charge is not low. Verify superheat setting of 5.6° - 8.3°C. Verify correct compressor rotation. Verify compressor is not over loaded.
	External overload tripped.	Determine cause and reset.
	-FHP switch open.	See 'High Discharge Pressure Fault'.
	Defective -FHP switch.	Replace -FHP switch.
	Defective -K1 relay.	Replace relay.
	No motor cooling.	
Compressor(s) do not start	Demand not sufficient.	No problem.
	Defective water temperature sensor.	Compare the display with a thermometer. Should be within +/- 2 degrees. Refer to BECT/ BLCT calibration charts.
	Contactor/Overload failure.	Replace defective part.
	Compressor failure.	Diagnose cause of failure and replace.
Lack of cooling effect	Fouled cooler surface. (Low suction pressure will be observed).	Contact the local York service representative.
	Improper flow through the cooler	Reduce flow to within unit design specification.
	Low refrigerant charge. (Low suction pressure will be observed).	Check subcooling and add charge as needed. Check for leaks.
!! LOW BATTERY !! CHECK PROG / SETP / OPTN displayed	RTC battery (U17) flat.	Replace U17 and reprogram setpoints, values, options, time and schedule.

8.2 Sensor Calibration Charts

Leaving Chilled Liquid (-BLCT), Return Chilled Liquid (-BECT) and Suction Temperature Sensors

Temperature °C	Resistance ohms	Voltage Vdc
-8	14721	2.37
-6	13077	2.52
-4	12333	2.59
-2	10982	2.74
0	9795	2.88
2	8750	3.02
4	7830	3.15
6	7411	3.21
8	6647	3.33
10	5970	3.45
12	5370	3.56
14	4837	3.67

Red wire = Signal, Black wire = 5 V

Test points :

Leaving Chilled Liquid (-BLCT) -AMB J6-8/5

Return Chilled Liquid (-BECT) -AMB J6-9/6

EEV Option Only

Suction Temperature (1-BST) -AMB J5-14/9

(2-BST) -AMB J5-15/10

Discharge (-BDP) and Suction (-BSP) Pressure Transducers

0 - 13.79 barg Transducer		0 - 27.5 barg Transducer	
Pressure barg	Voltage Vdc	Pressure barg	Voltage Vdc
0.00	0.5	0.0	0.5
1.75	1.0	5.0	1.2
3.50	1.5	10.0	2.0
5.25	2.0	15.0	2.7
7.00	2.5	17.5	3.0
8.75	3.0	20.0	3.4
10.00	3.4	22.5	3.8
12.00	4.0	25.0	4.1
13.79	4.5	27.5	4.5

Red wire = 5 V, Black wire = 0 V, White/Green wire = signal

Test points :

Discharge Pressure (-BDP) 27.5 barg Transducer:

Refrigerant Circuit 1 -AMB J4-12/8

Refrigerant Circuit 2 -AMB J7-12/8

Voltage = (Pressure (barg) X 0.145) + 0.5

Suction Pressure (-BSP) 13.79 barg Transducer:

Refrigerant Circuit 1 -AMB J4-10/1

Refrigerant Circuit 2 -AMB J7-10/1

Voltage = (Pressure (barg) X 0.29) + 0.5

Ambient Air Temperature (-BAMB) Sensor

Temperature °C	Resistance ohms	Voltage Vdc
-18	85398	0.70
-15	72950	0.80
-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
43	4665	3.70
46	4184	3.80

Red wire = Signal, Black wire = 5 V

Test point :

Ambient Air (-BAMB) -AMB J6-7/4

Suction (-FSP) Pressure Switches

Suction Pressure (-FSP) Switches:

Refrigerant Circuit 1 -AMB J4-10/5

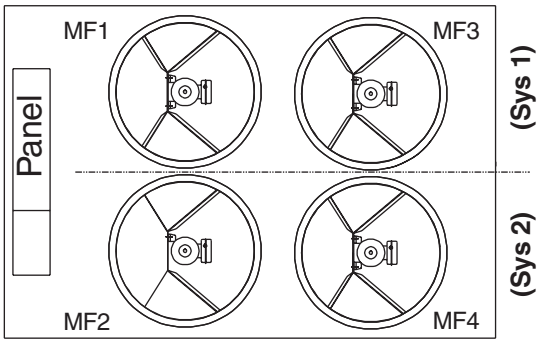
Refrigerant Circuit 2 -AMB J7-10/5

0 Vdc = Switch Open, 5 Vdc = Switch Closed

8.3 Condenser Fan Control Settings

NOTE

Condenser fan control under the options key must be set to 'FAN CONTROL DISCHARGE PRESSURE'.



STANDARD FAN CONTROL (-4 °C TO 46 °C AMBIENT)

Control using Discharge Pressure only			
	FANS	ON	OFF
STAGE 1	MF3 (Sys 1) Fan Forward	DP > ctrl_press	DP < ctrl_press - diff_press
	MF4 (Sys 2) Fan Forward		
STAGE 2	MF3 and MF1 (Sys 1) Fans Forward	DP > ctrl_press + 1.38 barg	DP < ctrl_press - diff_press + 1.38 barg
	MF4 and MF2 (Sys 2) Fans Forward		

LOW AMBIENT FAN CONTROL (-18 °C TO 46 °C AMBIENT)

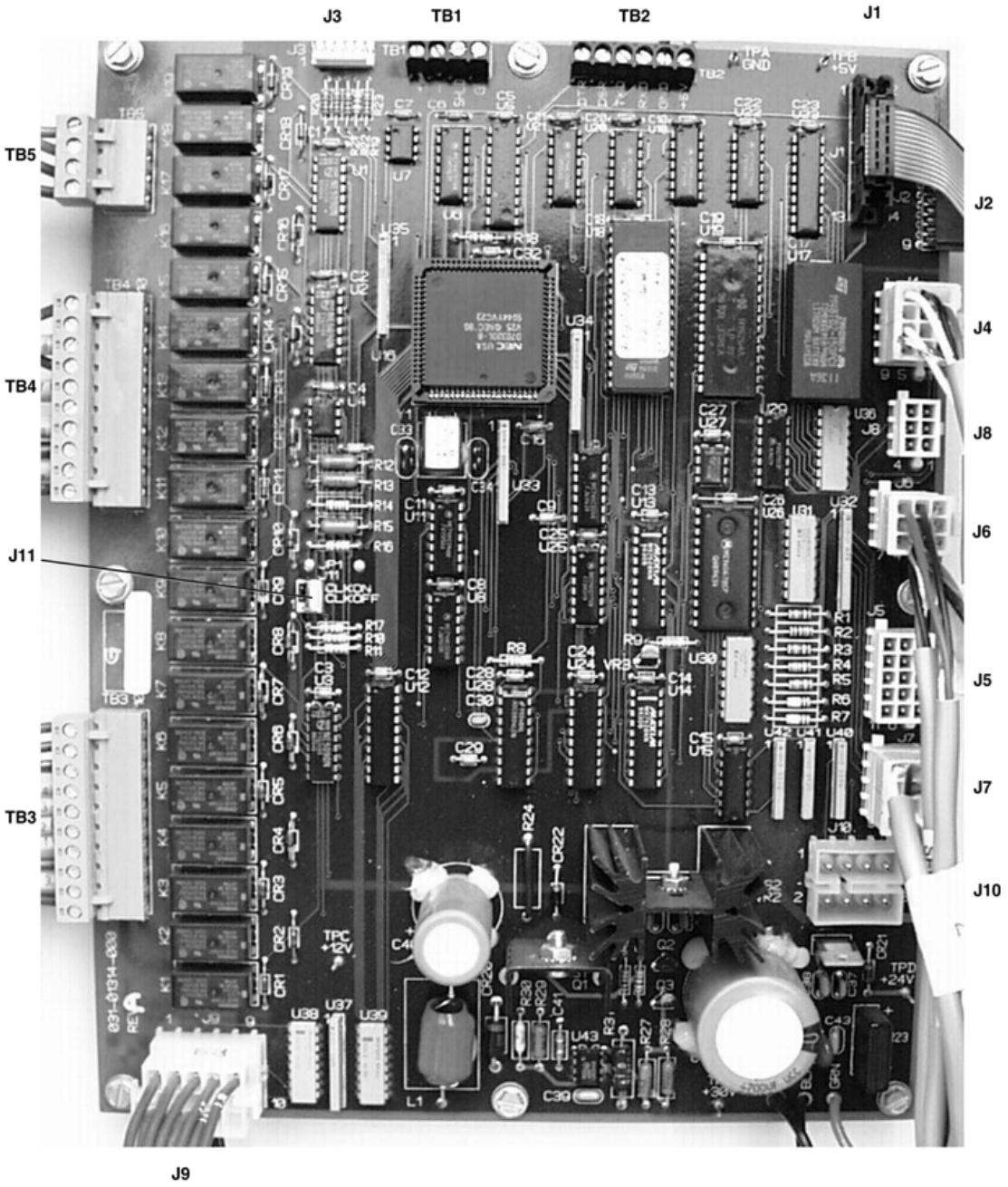
Control using Discharge Pressure only			
	FANS	ON	OFF
STAGE 1	MF1 (Sys 1) Fan Reverse	DP > ctrl_press	DP < ctrl_press - diff_press
	MF2 (Sys 2) Fan Reverse		
STAGE 2	MF3 (Sys 1) Fan Forward	DP > ctrl_press + 1.38 barg	DP < ctrl_press - diff_press + 1.38 barg
	MF4 (Sys 2) Fan Forward		
STAGE 3	MF3 and MF1 (Sys 1) Fans Forward	DP > ctrl_press + 40 PSIG (2.76 Bars)	DP < ctrl_press - diff_press + 2.76 barg
	MF4 and MF2 (Sys 2) Fans Forward		

The 'FAN CONTROL ON PRESSURE' (ctrl_press) and 'FAN DIFFERENTIAL OFF' (diff_press) are set under the 'PROGRAM' key.

NOTE

The minimum condensing pressure must be greater than 10.7 barg (minimum condensing temperature 30 °C).

8.4 Microprocessor Board Layout



8.5 Optional Printer Installation

The microprocessor is capable of supplying a printout of chiller conditions or fault shutdown information at any given time. In addition, to the manually selected printouts the microprocessor will provide an automatic printout whenever a fault occurs. An explanation of the print function is given Section 6 under the Display/Print Keys.

YORK offer a kit which includes a printer which has an internal Ni-cad battery, a roll of paper, a 'D' type connector, one metre lead and a charger. 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 58 mm wide desktop calculator paper that can be easily and inexpensively purchased at most stationery stores.

Installation Limitations

NOTE

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

- Maximum cable length between the printer and the Microprocessor Board is 7.5 m. Twisted pair shielded cable is required (1 m with optional printer).
- Serial printer should be set for data bits = 8 parity = none and baud rate = 1200.
- The printer may be left connected to the microprocessor panel.

Parts

The following parts are required:

- Printer kit, York part number:

362L11330-002 UK
362L11330-003 EUROPE

NOTE

The printer must be set up by customer as detailed using the operator guide supplied with printer.

- 58 mm wide desk top calculator paper.

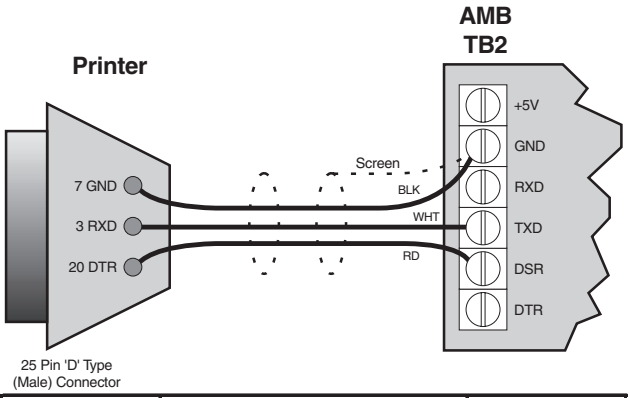
One roll included in kit.
Extra roll part no. 025L01992-000

- Spare Ink Ribbon York part number:

025L01993-000

8.5.1 Assembly and Wiring

All components should be assembled and wired as shown in below. Strip the outer insulation back several centimetres and individual wires 10 mm to connect the cable at the microprocessor board (TB2). Do not connect the shield at the printer-end of the cable.



AMB TB2	Function	Printer
TXD	Serial data to printer	RXD
DSR	Busy signal from printer (high to accept data)	DTR
GND	Signal ground to printer	GND

White (WHT) Black (BLK) Red (RD)	Cable colours with York Supplied printer option

Using Other Printers

Control codes vary from printer to printer. This may 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 mis-wiring 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 board or unit operation problems which may result.

8.5.2 Obtaining a Printout

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

8.6 Optional BAS/EMS Remote Temperature Reset PCB

The optional BAS/EMS remote temperature reset PCB allows the chilled liquid 'SETPOINT' to be reset using a 0 - 10 Vdc input, a 4 - 20 ma input, or a contact closure input. The PCB converts the signals into pulse width modulated (PWM) signals which the microprocessor can interpret. After a reset , the change may be checked by pressing the 'COOLING SETPOINTS' key twice. The new value will be displayed as 'REM SETP = XXX°C'

The optional remote reset PCB option should 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 PCB will convert a voltage, current, or contact signal that is available from an EMS to a PWM signal, and every 80 seconds provide a PWM input to the microprocessor board. The diagram below shows the field and factory electrical connections.

0 - 10 Vdc Signal

If a 0 - 10 Vdc signal is available, it is applied to terminals A+ and A-, and jumpers are applied to JU4 and JU2 on the PCB. This dc signal is conditioned to a 1 - 11 second PWM output and supplied to the PWM input on the microprocessor board at XCTB1 terminals 13 and 20. To calculate the reset chilled liquid 'SETPOINT' for values between 0 Vdc and 10 Vdc use the following formula:

'SETPOINT' = chilled liquid 'SETPOINT' + °'RESET'

$$°'RESET' = \frac{(Input\ Signal) \times (*Max\ Reset\ Value)}{10}$$

Example:

Local chilled liquid 'SETPOINT' = 7.2°C

*Max Reset Value = 11.0°C

Input Signal = 6 Vdc

$$\frac{6\ Vdc \times 11.0°C}{10} = 6.6°C\ 'RESET'$$

'SETPOINT' = 7.2°C + 6.6°C = 13.8°C

4 - 20 ma Signal

If a 4 - 20 ma signal is available, it is applied to terminals A+ and A- and jumpers are applied to JU5 and JU3 on the PCB. The ma signal is conditioned to a 1-11 second PWM output. The PWM output is then supplied to the PWM input on the microprocessor board at XCTB1 terminals 13 and 20. To calculate the chilled liquid 'SETPOINT' for values between 4 ma and 20 ma use the following formula:

'SETPOINT' = chilled liquid 'SETPOINT' + °'RESET'

$$°'RESET' = \frac{(ma\ Signal - 4) \times (*Max\ Reset\ Value)}{16}$$

Example:

Local chilled liquid 'SETPOINT' = 7.2°C

*Max Reset Value = 5.0°C

Input Signal = 12 ma

$$\frac{8\ ma \times 5.0°C}{16} = 2.5°C\ 'RESET'$$

'SETPOINT' = 7.2°C + 2.5°C = 9.7°C

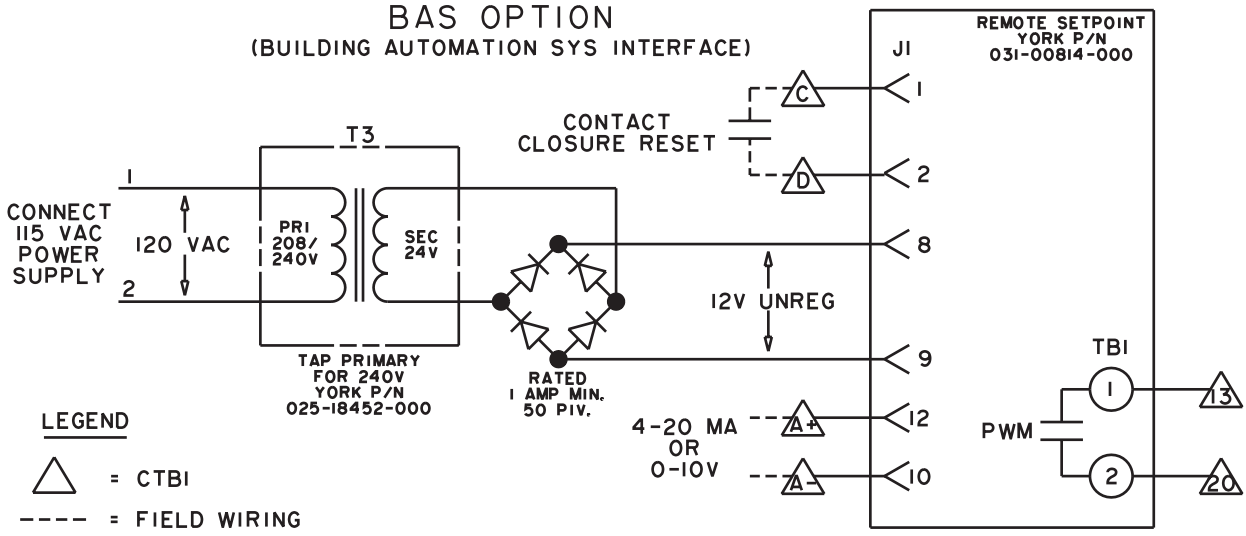
Contact Closure

If the Contact Closure input is used. The connections are made to terminals C and D and only jumper JU1 must be in place on the PCB. This input is used when a single reset value is needed. When the contacts are closed, the remote reset PCB will convert this contact closure to a PWM signal that is applied to XCTB1 terminals 13 and 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 10 Vdc as measured at TP3 to terminal 10 on the PCB. The reset value will be the 'Max EMS-PWM Remote Temp. Reset' value programmed by the 'COOLING SETPOINTS' key.

The coil of any added relay used for reset must be suppressed to prevent possible component damage.

Optional BAS/EMS Remote Temperature Reset PCB - Connections



8.7 ISN Control

8.7.1 Received Data (Control Data)

The unit receives 8 data values from the ISN. The first 4 (ISN Page P03 to P06, 2 unused) are analog values and the last 4 (ISN Page P07 to P10, 2 unused) are digital values. These 4 data values are used as control parameters when in REMOTE mode. When the unit is in LOCAL mode, these 4 values are ignored. If the unit receives no valid ISN transmission for 5 minutes it will revert back local control values. The table below lists the 4 used control parameters. These values are found under feature 54 on the ISN.

ISN PAGE	CONTROL DATA
P03	SETPOINT (99 = UNIT SETPOINT)
P04	LOAD LIMIT STAGE (0,1,2)
P07	START/STOP COMMAND
P10	HISTORY BUFFER REQUEST

8.7.2 Transmitted Data

After receiving a valid transmission from the ISN, the unit will transmit either operational data or history buffer data depending on the status of the 'History Buffer Request' (ISN Page 10). Data must be transmitted for every ISN Page under feature 54. If there is no value to be sent to a particular page, a zero will be sent.

The tables below show the data values and Page listings for the unit.

ISN Transmitted Data

ISN PAGE	TYPE	DATA
P11	ANALOG	LEAVING CHILLED LIQUID TEMP.
P12	ANALOG	RETURN CHILLED LIQUID TEMP.
P13	ANALOG	MIXED CHILLED LIQUID TEMP.
P14	ANALOG	DISCHARGE AIR TEMP.
P16	ANALOG	AMBIENT AIR TEMP.
P18	ANALOG	SYS 1 RUN TIME (SECONDS)
P19	ANALOG	SYS 1 SUCTION PRESSURE (BSP FITTED)
P20	ANALOG	SYS 1 DISCHARGE PRESSURE
P24	ANALOG	SYS 1 ANYI-RECYCLE TIMER
P25	ANALOG	ANTI-COINCIDENT TIMER
P27	ANALOG	SYS 2 RUN TIME (SECONDS)
P28	ANALOG	SYS 2 SUCTION PRESSURE (BSP FITTED)
P29	ANALOG	SYS 2 DISCHARGE PRESSURE
P33	ANALOG	SYS 2 ANTI-RECYCLE TIMER
P35	ANALOG	NUMBER OF COMPRESSORS
P36	DIGITAL	SYS 1 ALARM
P37	DIGITAL	SYS 2 ALARM
P38	DIGITAL	EVAPORATOR HEATER STATUS
P39	DIGITAL	EVAPORATOR PUMP STATUS
P42	DIGITAL	SYS 1 LIQUID LINE SOLENOID VALVE
P43	DIGITAL	SYS HOT GAS BYPASS VALVE
P46	DIGITAL	SYS 2 LIQUID LINE SOLENOID VALVE
P47	DIGITAL	LEAD SYSTEM (0=SYS 1, 1 SYS 2)
P50	DIGITAL	CHILLED LIQUID TYPE (0=WATER, 1=GLYCOL)
P51	DIGITAL	AMBIENT CONTROL MODE (0=STD, 1 = AMB)
P52	DIGITAL	LOCAL / REMOTE CONTROL MODE (0=LOCAL, 1=REMOTE)
P53	DIGITAL	UNITS (0=IMPERIAL, 1=SI)
P54	DIGITAL	LEAD/LAG CONTROL MODE (0=MANUAL, 1=AUTO)
P56	CODED	*SYS 1 OPERATIONAL CODE
P57	CODED	*SYS 1 FAULT CODE
P58	CODED	*SYS 2 OPERATIONAL CODE
P59	CODED	*SYS 2 FAULT CODE
P60	CODED	SYS 1 COMP RUNNING
P61	CODED	SYS 1 COND FANS RUNNING
P62	CODED	SYS 2 COMP RUNNING
P63	CODED	SYS 2 COND FANS RUNNING
P65	ANALOG	UNIT CONTROL MODE 0=LEAVING WATER 1=RETURN WATER
P66	ANALOG	ANTI-RECYCLE TIME (PROGRAMMED)
P67	ANALOG	LEAVING CHILLED LIQUID TEMP CUTOUT
P68	ANALOG	LOW AMBIENT TEMP CUTOUT
P70	ANALOG	LOW SUCTION PRESS CUTOUT
P71	ANALOG	HIGH DISCHARGE PRESS CUTOUT
P72	ANALOG	SETPOINT
P73	ANALOG	COOLING RANGE

ISN Operational and Fault Codes

P56/58	OPERATIONAL CODE
0	NO ABNORMAL CONDITION
1	UNIT SWITCH OFF
2	SYSTEM SWITCH OFF
3	LOCK-OUT
4	UNIT FAULT
5	SYSTEM FAULT
6	REMOTE SHUTDOWN
7	DAILY SCHEDULE SHUTDOWN
8	NO RUN PERMISSIVE
9	NO COOL LOAD
10	ANTI-COINCIDENCE TIMER ACTIVE
11	ANTI-RECYCLE TIMER ACTIVE
12	MANUAL OVERRIDE
13	SUCTION LIMITING
14	DISCHARGE LIMITING
16	LOAD LIMITING
17	COMPRESSOR(S) RUNNING
P57/59	**FAULT CODE**
0	NO FAULT
1	VAC UNDERVOLTAGE
2	LOW AMBIENT TEMPERATURE
4	LOW LEAVING CHILLED LIQUID TEMP
5	HIGH DISCHARGE PRESSURE
7	LOW SUCTION PRESSURE
10	LOW BATTERY WARNING
18	MP /HPCO
23	LOW SUPERHEAT (EEV Option Only)
24	SENSOR FAILURE (EEV Option Only)

8.8 Clearing History Buffers

The history buffers may be cleared by pressing the 'HISTORY' key and then repeatedly pressing the 'UP ARROW' key until you scroll past the last history buffer choice. The following message will be displayed:

```
I N I T I A L I S E   H I S T O R Y
      E N T E R  =  Y E S
```

Pressing the 'ENTER/ADV' key at this display will cause the history buffers to be cleared. Pressing any other key will cancel the operation.

8.9 Software Version

The software version may be viewed by pressing the 'HISTORY' key and then repeatedly pressing the 'DOWN ARROW' key until you scroll past the first history buffer choice. The following messages are an example of what will be displayed:

```
S O F T W A R E  V E R S I O N
    C . M M C . 0 3 . 0 3
```

(Standard version)

```
S O F T W A R E  V E R S I O N
    C . M X X . Z Z . Y Y
```

(Field version)

Where

C is the Product Classification and stands for **Commercial Unit**

MMC or **M** is the Family Code and stands for **Middle Market**

XX is the Field Revision Number

ZZ = **03** which is the Product Code and stands for **2 System Chiller**

YY = **03** which is the Version Number.

8.10 Optional Soft Start

Always isolate the supply before removing the compressor motor terminal box covers. On compressors with soft start fitted phase L2 of the starter is uncontrolled and thus the motor terminals will be LIVE even with the compressor OFF, unless the unit supply is isolated.

Optional soft start can be fitted to compressor No. 2 in each system on units with two compressors per system or compressor No. 3 on units with three compressors per system.

The soft starter controls the inrush current by switching the voltage to the compressor motor phases LI and L3. The starter characteristics are specifically matched to the needs of the scroll compressors to ensure trouble free starting and to meet lubrication requirements by acceleration to full speed within 0.6 of a second. At the end of the voltage ramp up time an output will close in the starter to energise a bypass contactor.

The soft starter is provided with status LED's:

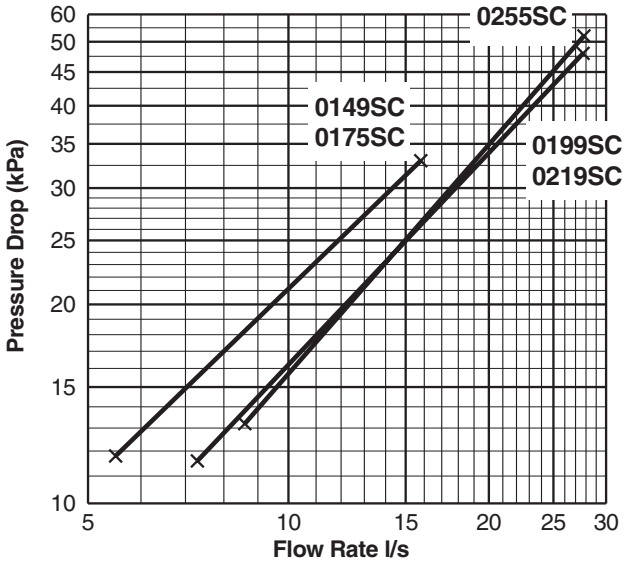
LED 1 will be ON when the compressor is running.

LED 2 will be ON when power is applied to terminals LI, L2 and L3 with the compressor OFF (ie. no control supply to the starter terminals A1 and A2).

LED's 1 and 2 will flash when there is a phase missing on one of the supply inputs (LI, L2 or L3) or an open circuit on one of the outputs (terminals 2, 4 or 6).

9 TECHNICAL DATA

9.1 Flow Rate and Pressure Drop Graph



Model	Pressure Drop Calculation
0149SC **0175SC**	Pressure Drop [kPa] = 2.2406 x (Flow Rate [l/s]$^{0.9746}$)
0199SC **0219SC**	Pressure Drop [kPa] = 1.3965 x (Flow Rate [l/s]$^{1.0650}$)
0255SC	Pressure Drop [kPa] = 1.1067 x (Flow Rate [l/s]$^{1.1520}$)

NOTE

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

9.2 Operating Limitations

Model				0149SC		0175SC		0199SC		0219SC		0255SC	
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Chilled Liquid	Liquid outlet temperature	Water outlet	°C	5°C To 13°C									
		Brine outlet (1)	°C	-6.7°C To 13°C									
		Temp. spread	°C	3.3°C To 8°C									
	Flow rate		l/s	5.5	15.8	5.5	15.8	7.3	27.7	7.3	27.7	8.6	27.8
	Pressure drop		kPa	11.8	33.0	11.8	33.0	11.6	48.0	11.6	48.0	13.2	51.0
	Max. working pressure		barg	10.35									
Ambient Air	Air Entering temperature	Standard units	°C	-4°C To 46°C									
		Low ambient units	°C	-18°C To 46°C									
	Fan available static pressure	Standard fans	Pa	20									
		Low sound fans	Pa	10									
Power supply voltage 400 V, 3 Ø, 50 Hz (nominal)			V	360 To 440									
Recommended system water volume (2)			l	568		680		755		832		1004	

(1) -6.7°C is the minimum leaving chilled liquid temperature (LCLT) for ASME, for all other Pressure Vessel Codes the minimum LCLT is -3°C.

(2) Table shows minimum water / brine volume of system

9.3 Physical Data

Model			0149SC	0175SC	0199SC	0219SC	0255SC
Refrigerant circuits			2	2	2	2	2
Refrigerant Charge	Circuit 1 (1)	kg	24.5	32.7	34.1	34.1	45.5
	Circuit 2 (1)	kg	24.5	32.7	28.2	34.1	45.5
Oil Charge	Circuit 1	l	8	13.2	12	12	19.8
	Circuit 2	l	8	13.2	11.4	12	19.8
Compressor	Number		4	4	6	6	6
	Qty./Type (circuit 1)		2 / Scroll	2 / Scroll	3 / Scroll	3 / Scroll	3 / Scroll
	Designation		SZ160	SZ185	SZ160	SZ160	SZ185
	Qty./Type (circuit 2)		2 / Scroll	2 / Scroll	3 / Scroll	3 / Scroll	3 / Scroll
	Designation		SZ160	SZ185	SZ125	SZ160	SZ185
Unit Capacity Control		%	25 to 100	25 to 100	16 to 100	16 to 100	16 to 100
Evaporator	Number		1	1	1	1	1
	Type		DXC270	DXC270	DXC420	DXC420	DXC480
	Water volume per evaporator	l	95	95	143	143	130
Air Cooled Condenser	Total coil face area	m²	12	12	14	14	14
	Number of tube rows		2	3	2	2	3
	Number of fans (circuit 1)		2	2	2	2	2
	Number of fans (circuit 2)		2	2	2	2	2
Standard Fans	Nominal speed	rpm	950	950	950	950	950
	Total airflow	m3/s	22.3	21.7	26.4	26	25.3
Low Sound Fans	Nominal speed	rpm	710	710	710	710	710
	Total airflow	m3/s	21.8	21.2	25.8	25.4	24.7
Weight (coated aluminum fins)	Operating	kg	1933	2180	2573	2648	2802
	Shipping	kg	1824	2071	2440	2515	2662
Additional weight for copper fin coils		kg	174	261	203	232	304
Sound level (2) to EN 292 1991	Standard SPL at 1m	dBA	76	76	77	77	77
	Low sound SPL at 1m (3)	dBA	72	72	73	73	73
Dimensions	Length	mm	3022	3022	3022	3022	3022
	Width	mm	2045	2045	2311	2311	2311
	Height	mm	2282	2282	2473	2473	2473

(1) Liquid sub-cooling measured at the liquid line should be between 8.5 and 11.0 °C at circuit full load. Sub-cooling is determined by the level of refrigerant charge in each system.

(2) Sound Pressure levels are 1 m from the Control Panel, at a height of 1.6 m from the unit base. Levels may vary at different positions around the unit.

(3) Low sound fans and compressor acoustic sound blankets fitted.

9.4 Unit Electrical Data

Model YCAL SC	Standard Fan Chillers							
	Nominal Running kW (1) @ 400 V	Maximum Running kW (2) @ 400 V	Running Amps Units **without** Power Factor Correction		Running Amps Units **with** Power Factor Correction		DOL Starting Current (A) per Compressor (5) (LRA) @ 400 V	Fan Starting Amps (5) (LRA) @ 400 V
			Nominal (3) @ 400 V	Maximum (4) @ 400 V	Nominal (3) @ 400 V	Maximum (4) @ 400 V		
0149	53.5	63.5	94.8	108.8	86.8	101.2	135 (88)	15.0
0175	62.3	74.3	116.0	131.2	101.6	118.4	175 (114)	15.0
0199	69.3	82.8	124.0	142.3	111.4	130.9	135 (88)*	15.0
0219	76.5	91.5	134.2	155.2	122.2	143.8	135 (88)	15.0
0255	89.7	107.7	166.0	188.8	144.4	169.6	175 (114)	15.0

Model YCAL SC	Low Sound Fan Chillers							
	Nominal Running kW (1) @ 400 V	Maximum Running kW (2) @ 400 V	Running Amps Units **without** Power Factor Correction		Running Amps Units **with** Power Factor Correction		DOL Starting Current (A) per Compressor (5) (LRA) @ 400 V	Fan Starting Amps (5) (LRA) @ 400 V
			Nominal (3) @ 400 V	Maximum (4) @ 400 V	Nominal (3) @ 400 V	Maximum (4) @ 400 V		
0149	53.7	63.9	94.8	109.1	86.6	101.3	135 (88)	15.0
0175	62.7	74.9	116.4	131.9	101.7	118.8	175 (114)	15.0
0199	69.8	83.6	124.6	143.2	111.7	131.6	135 (88)*	15.0
0219	77.2	92.5	135.0	156.4	122.7	144.8	135 (88)	15.0
0255	90.6	109.0	167.4	190.7	145.4	171.1	175 (114)	15.0

(1) Nominal Running kW is the power absorbed by the unit at 7°C leaving chilled liquid temperature and 35°C ambient air temperature.
(2) Maximum Running kW is the power absorbed by the unit at 13°C leaving chilled liquid temperature and 46°C ambient air temperature.
(3) Nominal Running Amps (with or without Power Factor Correction) is the sum of the compressor running load amps and the fan full load amps.
(4) Maximum Running Amps (with or without Power Factor Correction) is the sum of the compressor full load amps and the fan full load amps.
(5) Compressor / Fan Starting Amps is the maximum in-rush current per compressor / fan. Currents in brackets are with optional Soft Start fitted.
* The SZ125 compressors fitted to System 2 on model 0199 have a reduced starting current of 120 (78) Amps.

Soft Start can only be fitted on compressor No. 2 of each circuit on models 0149 and 0175 or compressor No. 3 of each circuit on models 0199, 0219 and 0255. Power Factor Correction cannot be fitted to a compressor with Soft Start fitted.

9.5 Compressor Electrical Data (without Power Factor Correction)

Model YCAL SC	Electrical System 1																	
	Compressor 1						Compressor 2						Compressor 3					
	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL
		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)
0149	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135 (88)						
0175	SZ185	13.7	25	16.7	28.8	175	SZ185	13.7	25	16.7	28.8	175 (114)						
0199	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135 (88)
0219	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135 (88)
0255	SZ185	13.7	25	16.7	28.8	175	SZ185	13.7	25	16.7	28.8	175	SZ185	13.7	25	16.7	28.8	175 (114)

Model YCAL SC	Electrical System 2																	
	Compressor 1						Compressor 2						Compressor 3					
	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL
		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)
0149	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135 (88)						
0175	SZ185	13.7	25	16.7	28.8	175	SZ185	13.7	25	16.7	28.8	175 (114)						
0199	SZ125	9.1	16.3	11.1	18.9	120	SZ125	9.1	16.3	11.1	18.9	120	SZ125	9.1	16.3	11.1	18.9	120 (78)
0219	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135	SZ160	11.5	19.7	14	23.2	135 (88)
0255	SZ185	13.7	25	16.7	28.8	175	SZ185	13.7	25	16.7	28.8	175	SZ185	13.7	25	16.7	28.8	175 (114)

All compressors are protected with Manual Motor Starters. These devices should be set to the FLA.
Nominal conditions are 7°C leaving liquid temperature and 35°C ambient air temperature.
Maximum conditions are 13°C leaving liquid temperature and 46°C ambient air temperature.
The DOL LRA currents in brackets are with optional Soft Start fitted on the last compressor per circuit.
(1) RLA : Running load Amps (2) FLA : Full load amps (3) LRA : Locked rotor amps Data given at 400 V 50 Hz

On models 0149 and 0175 Soft Start can be installed on compressor No.2 in each circuit.
On models 0199, 0219 and 0255 Soft Start can be installed on compressor No.3 in each circuit.

9.6 Compressor Electrical Data (with Optional Power Factor Correction)

	Electrical System 1																	
Model	Compressor 1						Compressor 2						Compressor 3					
YCAL	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL
SC		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)
0149	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135 (88)						
0175	SZ185	13.7	21.4	16.7	25.6	175	SZ185	13.7	21.4	16.7	25.6	175 (114)						
0199	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135 (88)
0219	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135 (88)
0255	SZ185	13.7	21.4	16.7	25.6	175	SZ185	13.7	21.4	16.7	25.6	175	SZ185	13.7	21.4	16.7	25.6	175 (114)

	Electrical System 2																	
Model	Compressor 1						Compressor 2						Compressor 3					
YCAL	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL	Compr.	Nominal		Maximum		DOL
SC		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)		Kw	RLA(1)	Kw	FLA(2)	LRA(3)
0149	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135 (88)						
0175	SZ185	13.7	21.4	16.7	25.6	175	SZ185	13.7	21.4	16.7	25.6	175 (114)						
0199	SZ125	9.1	14.1	11.1	17	120	SZ125	9.1	14.1	11.1	17	120	SZ125	9.1	14.1	11.1	17	120 (78)
0219	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135	SZ160	11.5	17.7	14	21.3	135 (88)
0255	SZ185	13.7	21.4	16.7	25.6	175	SZ185	13.7	21.4	16.7	25.6	175	SZ185	13.7	21.4	16.7	25.6	175 (114)

All compressors are protected with Manual Motor Starters. These devices should be set to the FLA.

Nominal conditions are 7°C leaving liquid temperature and 35°C ambient air temperature.

Maximum conditions are 13°C leaving liquid temperature and 46°C ambient air temperature.

The DOL LRA currents in brackets are with optional Soft Start fitted on the last compressor per circuit.

(1) RLA : Running load Amps (2) FLA : Full load amps (3) LRA : Locked rotor amps Data given at 400 V 50 Hz

If Soft Start is installed on models 0149 and 0175, compressor No.2 RLA and FLA values will be as shown in table 9.5.
Compressor No.1 RLA and FLA values are as shown above.
If Soft Start is installed on models 0199, 0219 and 0255, compressor No.3 RLA and FLA values will be as shown in table 9.5.
Compressors No.1 and No.2 RLA and FLA values are as shown above.

9.7 Fan Electrical Data

	Standard Fans				Low Speed Fans			
	FLA at 400 volts = 4 Amps 1.87 kW per fan, Start Current 15 A per fan				FLA at 400 volts = 3.6 Amps 1.7 kW per fan, Start Current 15 A per fan			
Model	Electrical System 1		Electrical System 2		Electrical System 1		Electrical System 2	
YCAL	No. of	Total	No. of	Total	No. of	Total	No. of	Total
SC	Fans	Amps	Fans	Amps	Fans	Amps	Fans	Amps
0149	2	8	2	8	2	7.2	2	7.2
0175	2	8	2	8	2	7.2	2	7.2
0199	2	8	2	8	2	7.2	2	7.2
0219	2	8	2	8	2	7.2	2	7.2
0255	2	8	2	8	2	7.2	2	7.2

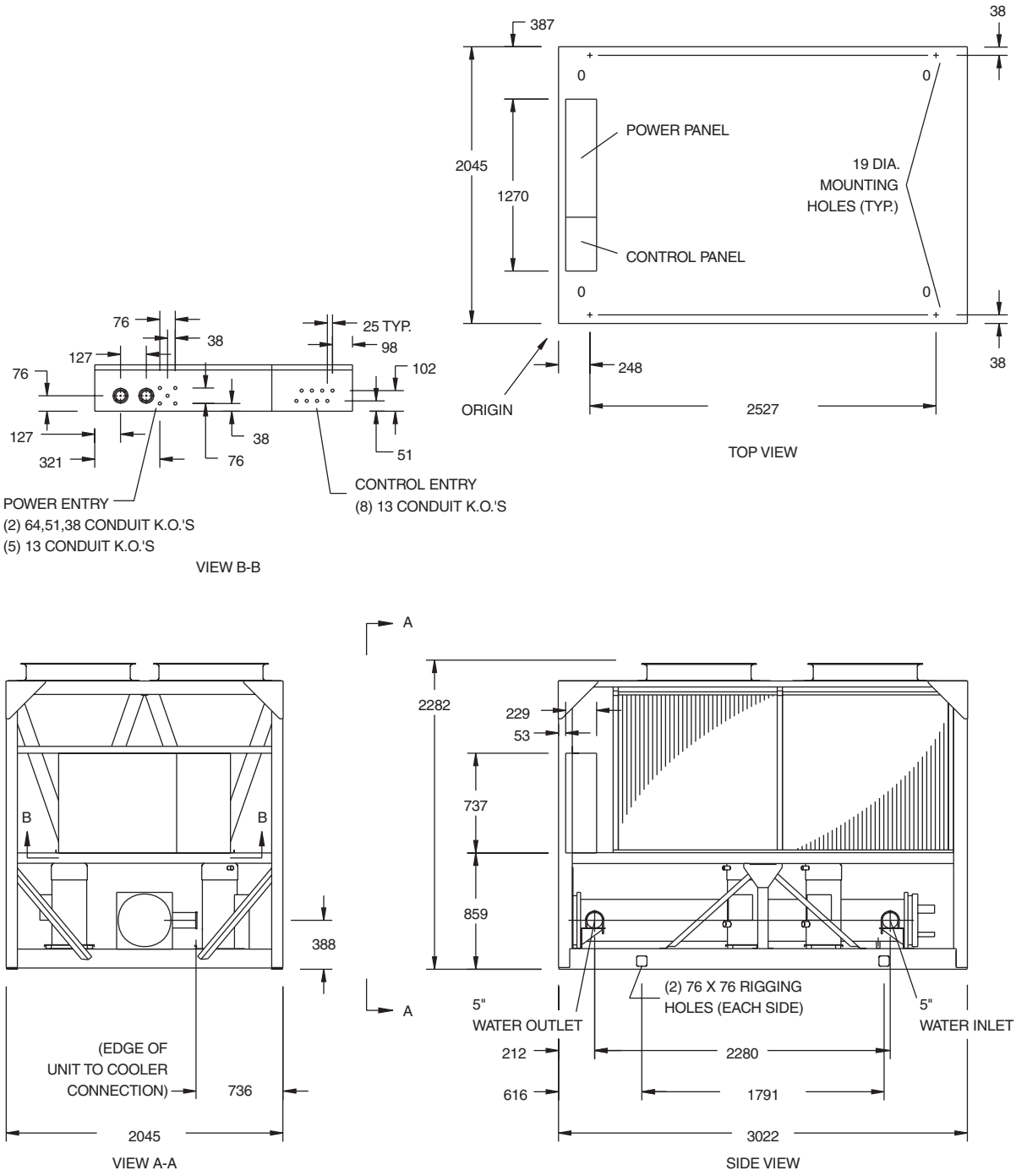
All fans are protected with overloads. These devices should be set to the FLA.

9.8 Connection Data

	Single Point Power Supply Factory Provided Connections
Model	**NF Disconnect Switch**
YCAL	Wire Range
0149SC	35 - 95 mm
0175SC	35 - 95 mm
0199SC	35 - 95 mm
0219SC	25 -150 mm
0255SC	25 -150 mm

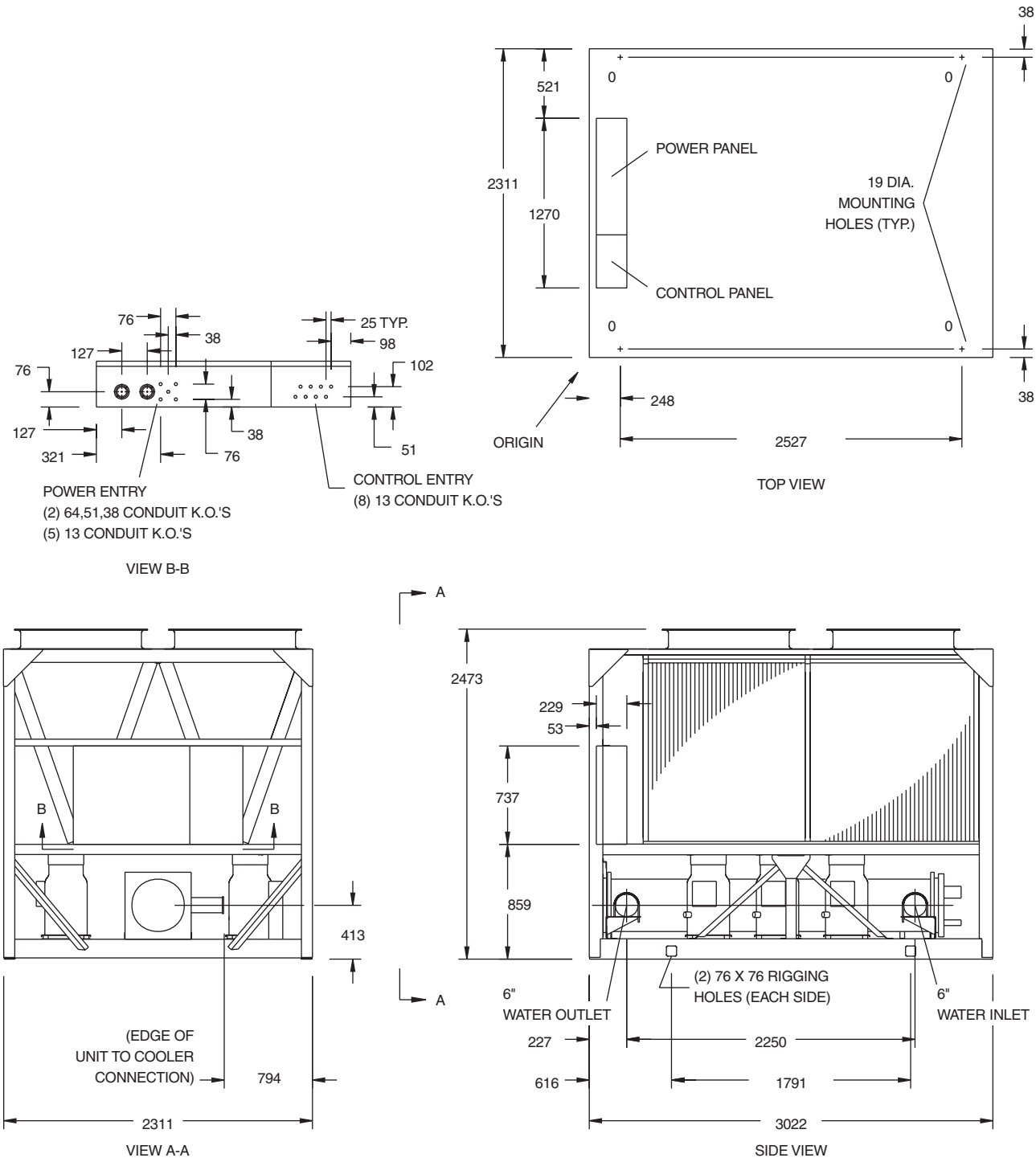
9.9 Dimensions

YCAL0149SC and 0175SC



Model YCAL	Center of Gravity from origin (mm)		
	X	Y	Z
0149SC	1491	1022	727
0175SC	1503	1022	760

YCAL0199SC, 0219SC and 0255SC



Model YCAL	Center of Gravity from origin (mm)		
	X	Y	Z
0199SC	1430	1167	764
0219SC	1430	1159	764
0255SC	1437	1159	782

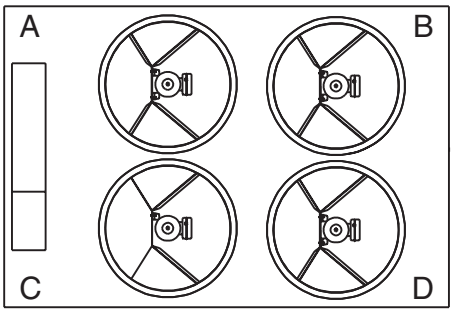
9.10 Operating Weight Distribution

Black Epoxy Coated Aluminium Fin Condenser Coils

MODEL SC	Point Weight (kg)				Total Weight (kg)
	A	B	C	D	
YCAL0149	491.25	475.25	491.25	475.25	1933
YCAL0175	548.5	541.5	548.5	541.5	2180
YCAL0199	683.25	603.25	683.25	603.25	2573
YCAL0219	702	622	702	622	2648
YCAL0255	740.5	660.5	740.5	660.5	2802

Copper Fin Condenser Coils

MODEL SC	Point Weight (kg)				Total Weight (kg)
	A	B	C	D	
YCAL0149	534.75	518.75	534.75	518.75	2107
YCAL0175	613.75	606.75	613.75	606.75	2441
YCAL0199	734	654	734	654	2776
YCAL0219	760	680	760	680	2880
YCAL0255	816.5	736.5	816.5	736.5	3106



9.11 Isolator Selection Data and Details

Black Epoxy Coated Aluminium Fin Condenser Coils

MODEL SC	Neoprene Pad Isolators
YCAL0149	402260-1 (Red)
YCAL0175	402260-2 (Green)
YCAL0199	402260-2 (Green)
YCAL0219	402260-2 (Green)
YCAL0255	402260-3 (Green)

Copper Fin Condenser Coils

MODEL SC	Neoprene Pad Isolators
YCAL0149	402260-2 (Green)
YCAL0175	402260-2 (Green)
YCAL0199	402260-2 (Green)
YCAL0219	402260-3 (Green)
YCAL0255	402260-3 (Green)

Black Epoxy Coated Aluminium Fin Condenser Coils

25 mm Spring Isolators				
MODEL SC	A	B	C	D
YCAL0149	CP-2-27	CP-2-27	CP-2-27	CP-2-27
YCAL0175	CP-2-27	CP-2-27	CP-2-27	CP-2-27
YCAL0199	CP-2-28	CP-2-28	CP-2-28	CP-2-28
YCAL0219	CP-2-28	CP-2-28	CP-2-28	CP-2-28
YCAL0255	CP-2-31	CP-2-28	CP-2-31	CP-2-28

Copper Fin Condenser Coils

25 mm Spring Isolators				
MODEL SC	A	B	C	D
YCAL0149	CP-2-27	CP-2-27	CP-2-27	CP-2-27
YCAL0175	CP-2-28	CP-2-28	CP-2-28	CP-2-28
YCAL0199	CP-2-31	CP-2-28	CP-2-31	CP-2-28
YCAL0219	CP-2-31	CP-2-28	CP-2-31	CP-2-28
YCAL0255	CP-2-31	CP-2-31	CP-2-31	CP-2-31

Black Epoxy Coated Aluminium Fin Condenser Coils

50 mm Seismic Spring Isolators				
MODEL SC	A	B	C	D
YCAL0149	AEQM-1600	AEQM-1300	AEQM-1600	AEQM-1300
YCAL0175	AEQM-1600	AEQM-1600	AEQM-1600	AEQM-1600
YCAL0199	AEQM-1625	AEQM-1600	AEQM-1625	AEQM-1600
YCAL0219	AEQM-1625	AEQM-1600	AEQM-1625	AEQM-1600
YCAL0255	AEQM-1625	AEQM-1625	AEQM-1625	AEQM-1625

Copper Fin Condenser Coils

50 mm Seismic Spring Isolators				
MODEL SC	A	B	C	D
YCAL0149	AEQM-1600	AEQM-1600	AEQM-1600	AEQM-1600
YCAL0175	AEQM-1625	AEQM-1625	AEQM-1625	AEQM-1625
YCAL0199	AEQM-1628	AEQM-1625	AEQM-1628	AEQM-1625
YCAL0219	AEQM-1628	AEQM-1625	AEQM-1628	AEQM-1625
YCAL0255	AEQM-1628	AEQM-1628	AEQM-1628	AEQM-1628

25 mm Spring Isolators		
Model	Part No.	Colour
CP-1-27	308439-27	ORANGE
CP-1-28	308439-28	GREEN
CP-1-31	308439-31	GREY
CP-1-32	308447-32	WHITE
CP-2-27	308692-27	ORANGE
CP-2-28	308692-28	GREEN
CP-2-31	308692-31	GREY

50 mm Seismic Spring Isolators		
Model	Part No.	Colour
AEQM-97	301055-97	WHITE
AEQM-98	301055-98	GREY
AEQM-99	301055-99	BLUE
AEQM-1000	301060-1000	GREEN
AEQM-1300	301060-1300	YELLOW
AEQM-1600	301060-1600	GREY
AEQM-1625	301060-1625	RED
AEQM-1628	301060-1628	GREY/GREEN

9.12 Isolator Installation

9.12.1 Installation and Adjustment of Type CP Mounting

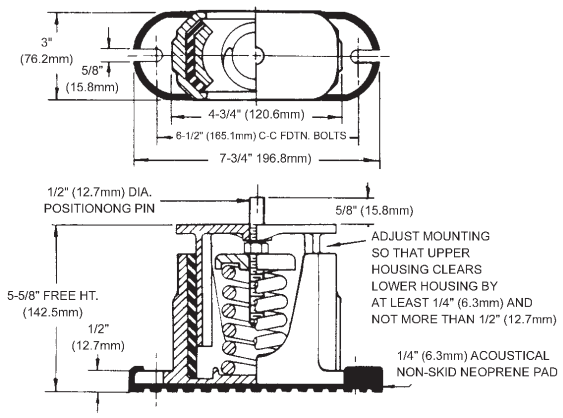
- Isolators are shipped fully assembled and are to be spaced and located in accordance with installation drawings or as otherwise recommended.

CAUTION

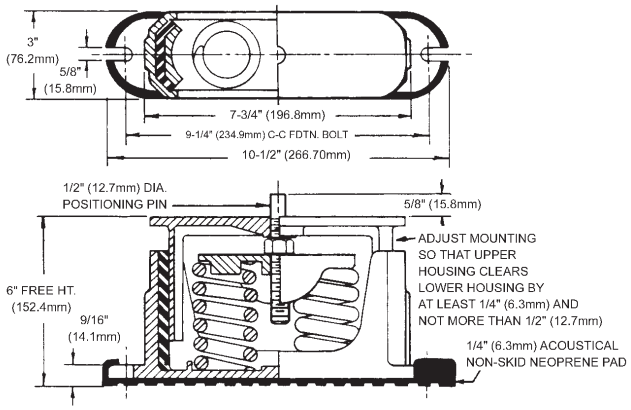
The supports shipped with the isolators must be fitted to the base frame as shown on page 9-10.

- Set mountings on base, shimming or grouting where required to provide flat and level surface at the same elevation for all mountings (6.4 mm maximum difference in elevation can be tolerated). Support the full underside of the base plate - do not straddle gaps or small shims.
- Unless specified, mountings need not be fastened to floor in any way. If required, bolt mountings to floor through slots.
- Set the unit on the mountings. The weight of the unit will cause the upper housing of the mount to go down, possibly resting on the lower housing.
- If clearance between the upper housing and lower housing is less than 6.3 mm on any mounting, with wrench turn up one complete turn on the adjusting bolt of each mounting. Repeat this procedure until 6.3 mm, clearance at is obtained on all mountings.
- Level the unit by taking additional turns on all mounts at the low side. The clearance between the upper housing and lower housing should not exceed 12.7 mm, greater clearance indicate that mountings were not all installed at the same elevation, and shims are required.

Type CP -1



Type CP-2



9.12.2 Installation and Adjustment of Type AEQM Mounting

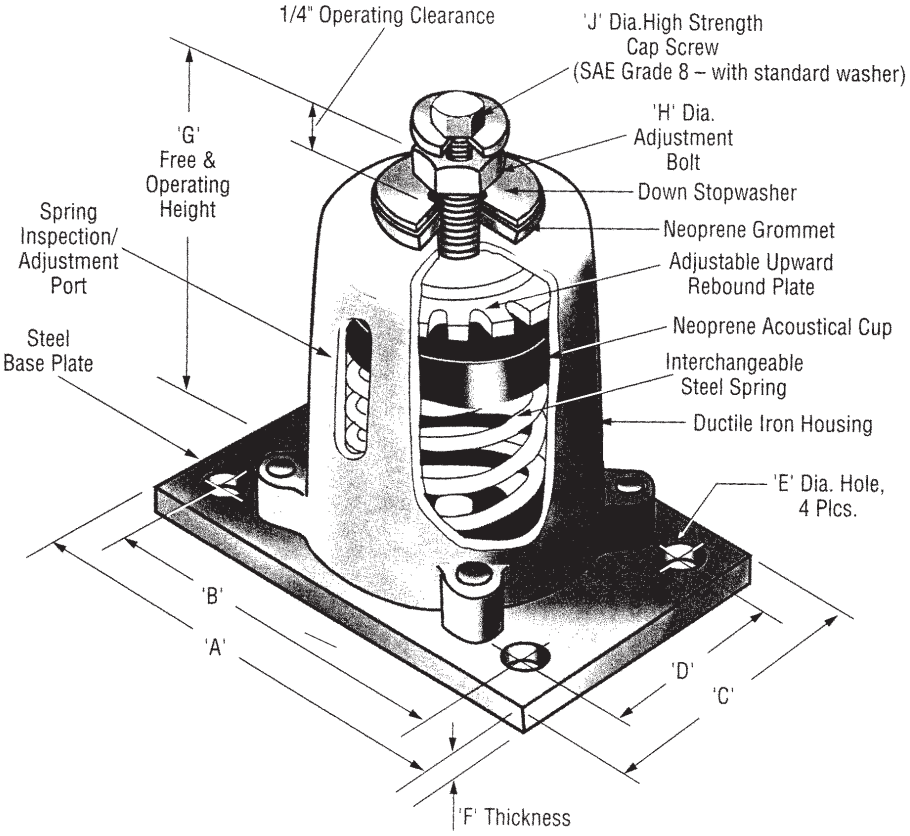
- Isolators are shipped fully assembled and are to be spaced and located in accordance with installation drawings or as otherwise recommended.

CAUTION

The supports shipped with the isolators must be fitted to the base frame as shown on page 9-10.

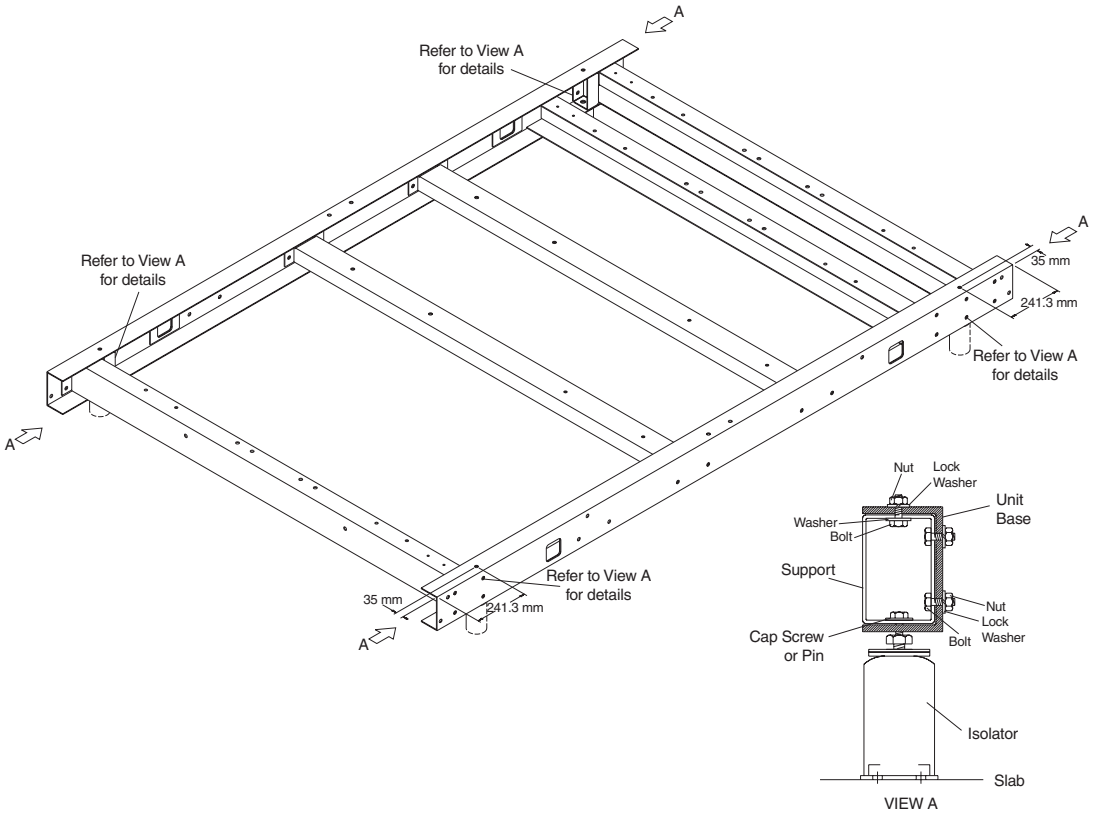
- Locate spring port facing outward from equipment or base so that spring is visible.
- To facilitate installation, prior to installing, it is recommended that the adjustment bolt is set for a clearance of approximately 50 mm.
- Set isolators on base as required, ensuring that the isolator centreline matches the equipment or equipment base mounting holes. Shim and/or grout as required to level all isolator base plates (6.4 mm maximum difference in elevation allowed).
- Anchor all isolators to floor or subbase as required. On concrete HILTI type HSL heavy duty anchors are recommended.
- Remove and save the cap screw, and gently place the unit base on top of the bolt and re-install the cap screw but DO NOT tighten.
- The weight of the unit will cause the spring to descend. Adjust all isolators by turning the adjustment bolt so that the operating clearance is approximately 6.3 mm. It may be necessary to adjust the rebound plate for clearance.
- Check the unit is level and adjust the rebound plate so that its operating clearance is no more than 6.3 mm and tighten cap screw.

Type AEQM

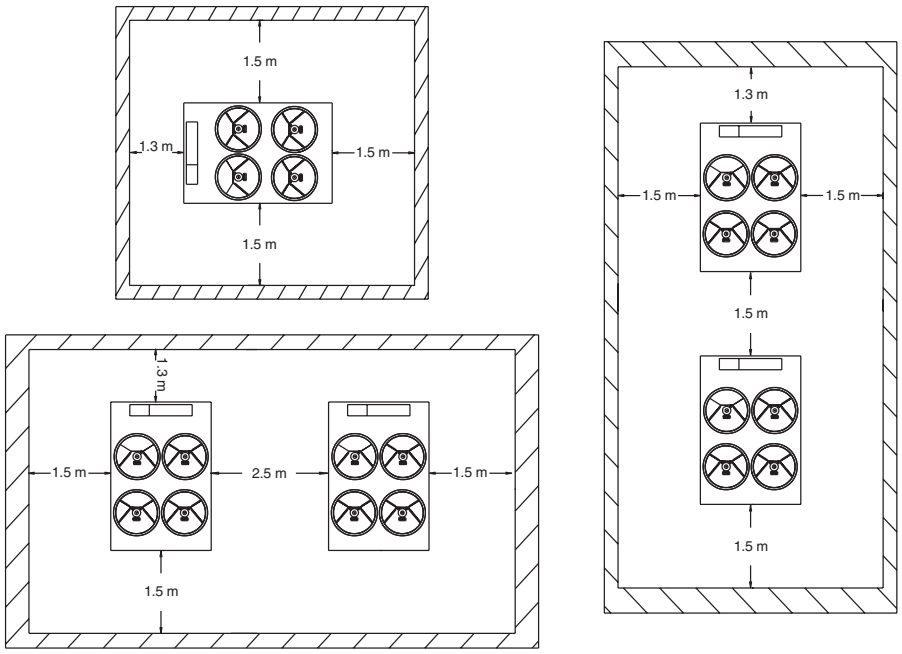


Model	A	B	C	D	E	F	G	H	J
AEQM-97	177.8	139.7	114.3	63.5	15.9	6.4	184.2	15.9	9.5
AEQM-98	177.8	139.7	114.3	63.5	15.9	6.4	184.2	15.9	9.5
AEQM-99	177.8	139.7	114.3	63.5	15.9	6.4	184.2	15.9	9.5
AEQM-1000	215.9	165.1	152.4	114.3	19.1	9.5	212.7	22.2	12.7
AEQM-1300	215.9	165.1	152.4	114.3	19.1	9.5	212.7	22.2	12.7
AEQM-1600	215.9	165.1	152.4	114.3	19.1	9.5	212.7	22.2	12.7
AEQM-1625	215.9	165.1	152.4	114.3	19.1	9.5	212.7	22.2	12.7
AEQM-1628	215.9	165.1	152.4	114.3	19.1	9.5	212.7	22.2	12.7

9.13 Isolator Supports



9.14 Clearances



10 SPARE PARTS

10.1 Recommended Spares

It is recommended that the following common spare parts are held for preventative of corrective maintenance operations.

Description	Item	Part Number
Pressure Transducer 200psi	-BSP	025-29583-000
Pressure Transducer 400psi	-BDP	025-29139-001
Sensor Ambient Temperature	-BAMB	025-28663-001
Sensor Water Temperature	-BLCT, -BECT	025-29964-000
Suction Temperature	-BST	025-28935-000

Other spare parts vary depending on the unit model. Contact your local York Sales and Service Centre for information and please quote the unit model number and serial number.

When ordering spare parts, we will require the following information to ensure the correct parts are supplied:

Full unit model number, serial number, application and details of the parts required.

All requests for parts should be made to your local York Sales and Service Centre.

10.2 Recommended Compressor Oil

The correct type of oil must be used in the unit as shown on the unit data plate and labels. Standard units use the following oil:

Refrigerant	Compressor Oil
R22	York Type F (MANEUROP 160P)

10.3 Associated Drawings

All YCAL Models		
Wiring Diagrams	Schematic	035-15957-201
	Connection	035-15957-202
	Legend/Notes	035-15957-203

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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.

11.1 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 refrigerant oil from each system into a suitable container and dispose of according to local laws and regulations governing the disposal of oily wastes. Any spilt oil should be mopped up and similarly disposed of.

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

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 may be disconnected and removed.

Packaged units can generally be removed in one piece after disconnection as above. Any fixing down 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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