



CENTRIFUGAL LIQUID CHILLERS WITH R-1233zd REFRIGERANT

OPERATIONS AND MAINTENANCE

NEW RELEASE

Form 161.01-OM1 (618)

035-27132-100

YZ MODEL A MAGNETIC BEARING CENTRIFUGAL CHILLER WITH OPTIVIEW™ CONTROL CENTER



Issue Date:
June 8, 2018



IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During rigging, installation, operation, maintenance, or service, individuals may be exposed to certain components or conditions including, but not limited to: heavy objects, refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of rigging, installation, and operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in

which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized rigging, installation, and operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood the on-product labels, this document and any referenced materials. This individual shall also be familiar with and comply with all applicable industry and governmental standards and regulations pertaining to the task in question.

SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:



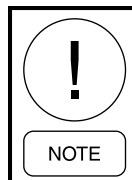
Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.



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



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



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



External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls' published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office or accessing the Johnson Controls QuickLIT website at <http://cgproducts.johnsoncontrols.com>.

Operating/service personnel maintain responsibility for the applicability of these documents to the equipment. If there is any question regarding the applicability of

these documents, the technician should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the chiller.

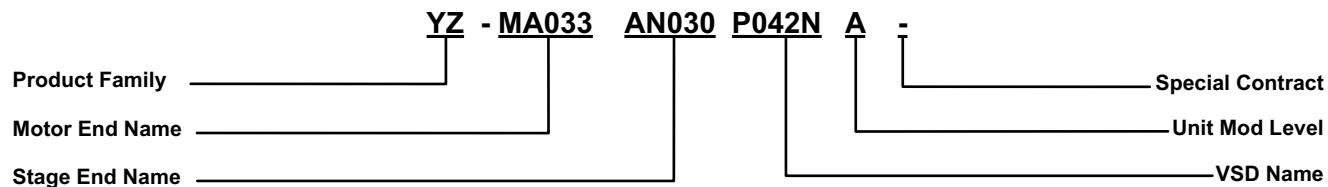
CHANGE BARS

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

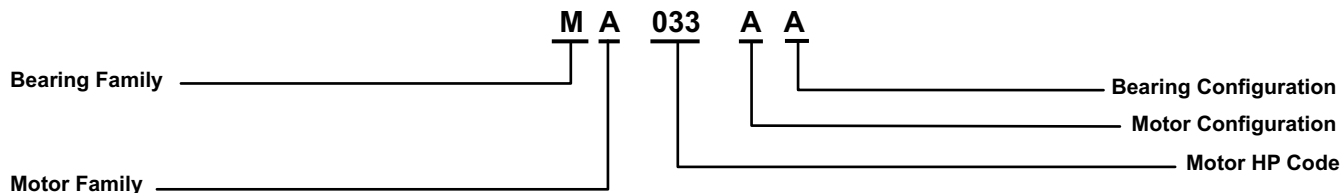
ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
Chiller Operations & Maintenance	161.01-OM1
Unit Installation Checklist	161.01-CL1
Unit Startup Checklist	161.01-CL2
Field Connections Diagram - Water Pump Starters	161.01-PW1
Field Control, Modifications	161.01-PW2
Field Connections Diagram	161.01-PW3
Wiring Diagram, Unit	161.01-PW4
Liquid Chiller Log Sheet	161.01-MR1
Centrifugal Chiller Long Term Storage	50.20-NM5
All Products - Replacement Parts Electrical Connectors	50.20-RP1
All Products - Replacement Parts Fittings	50.20-RP2

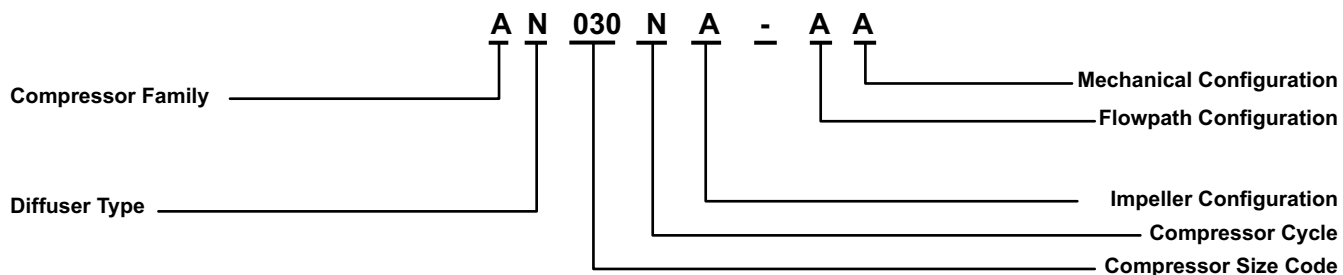
SYSTEM NOMENCLATURE



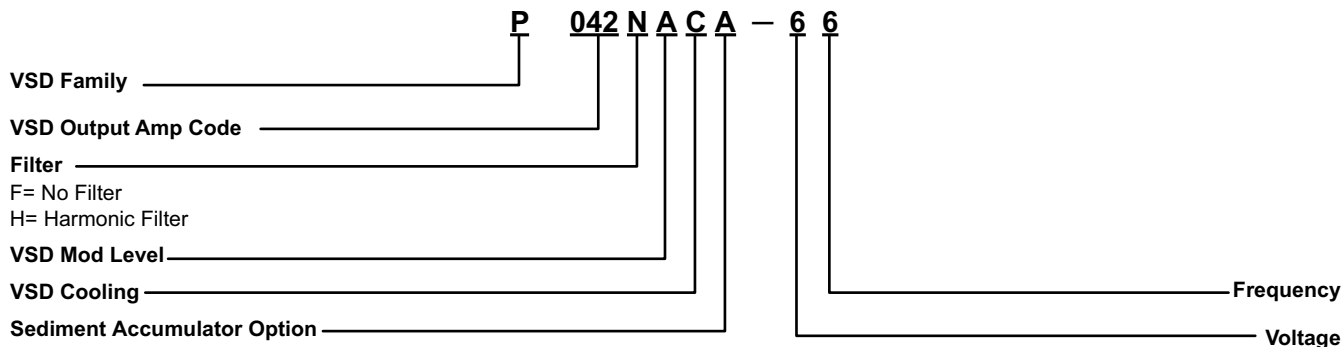
MOTOR END NAMING



STAGE END NAMING

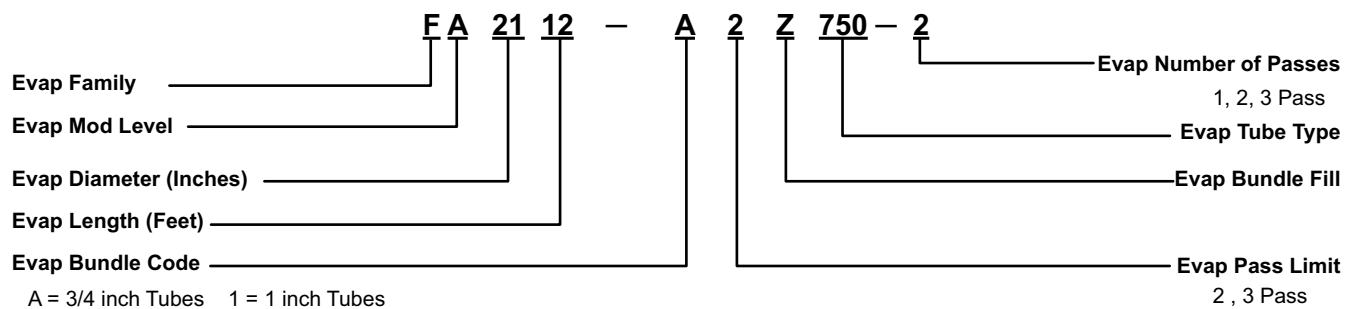


VARIABLE SPEED DRIVE NOMENCLATURE

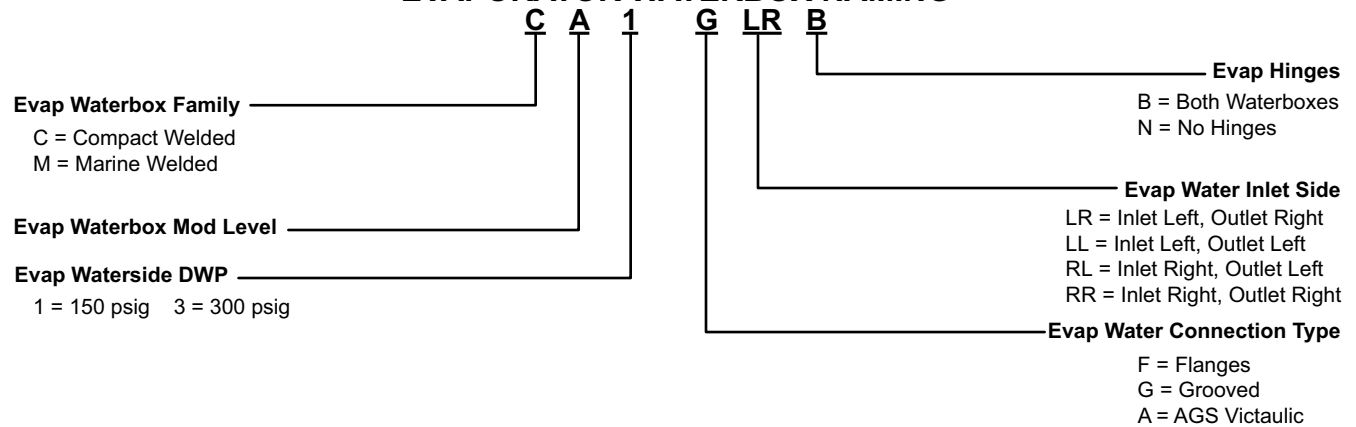


LD26924

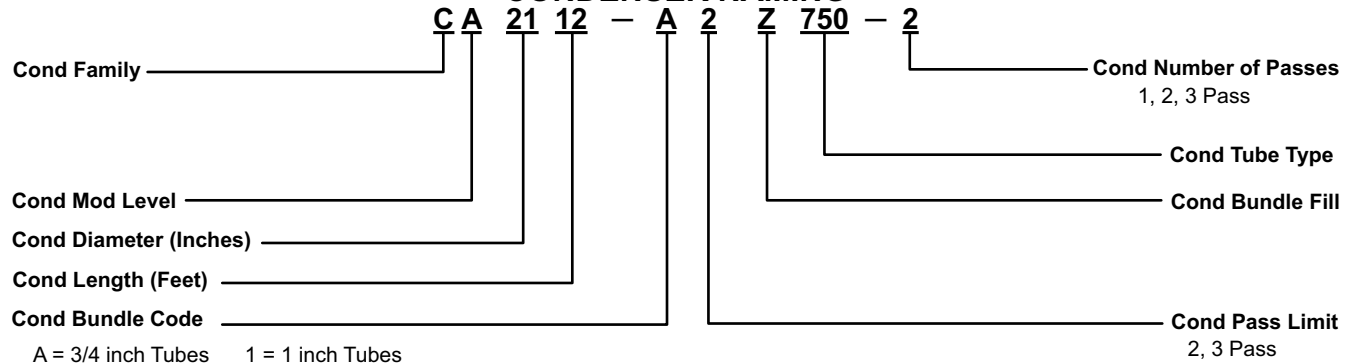
EVAPORATOR NAMING



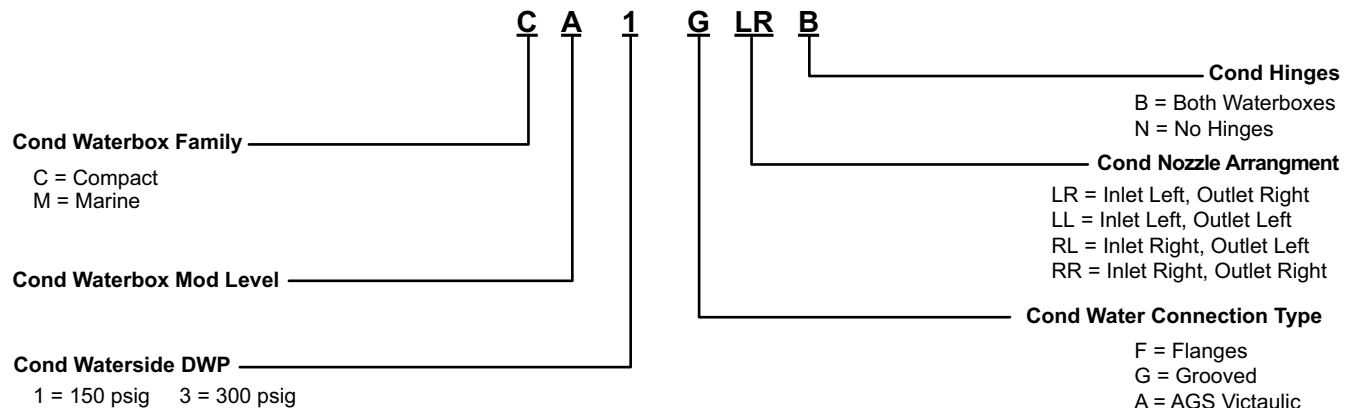
EVAPORATOR WATERBOX NAMING



CONDENSER NAMING



CONDENSER WATERBOX NAMING



LD2692E

TABLE OF CONTENTS

SECTION 1 - SYSTEM FUNDAMENTALS	11
System Components	11
System Operation	15
Water Circuits	17
SECTION 2 - SYSTEM OPERATING PROCEDURES	21
Pre-Starting	21
Start-Up	21
Chiller Operation	22
Chilled Liquid Control Settings	22
Operator Setpoints Quick Reference	23
Stopping The System	24
Safety Stop	24
Operating Logs	24
Fault Shutdowns	25
Prolonged Shutdown	25
Restart After Prolonged Shutdown	25
SECTION 3 - OPTIVIEW™ CONTROL CENTER FUNCTIONS AND NAVIGATION	27
Interface Conventions	27
Languages	29
Analog Input Ranges	29
Display Messages	90
Master Slot Numbers List For Use With Trend Feature	87
SECTION 4 - VSD OPERATION	107
PYT Model VSD Overview	107
PYT Model VSD Components	107
PYT Model VSD (330, 420, 780, 1020 & 1280 Amp)	108
Harmonic Filter Option	108
Critical Load Power	109
SECTION 5 - MAINTENANCE	119
Preventative Maintenance	119
Renewal Parts	120
Operating Inspections	120
Checking System For Leaks	120
Conduct Pressure Test	120
System Evacuation	121
Vacuum Dehydration	121
Conduct Pressure Test	124
Refrigerant Charging	124
Checking The Refrigerant Charge	124
Handling Refrigerant For Dismantling And Repairs	125
Compressor and Motor	125
Condensers and Evaporators	125
Electrical Controls	127
Automatic Battery Health Test – During Shutdown	128

TABLE OF CONTENTS (CONT'D)

SECTION 6 - PRINTING 129
 Printing Overview 129
 Downloading System Prints to a Laptop 129

SECTION 7 - DECOMMISSIONING, DISMANTLING, AND DISPOSAL 139
 Temperature 140

APPENDIX - MATERIAL SAFETY DATA SHEETS.....141

LIST OF FIGURES

FIGURE 1 - YZ Chiller Components (Rear)	12
FIGURE 2 - YZ Chiller Components (Front)	12
FIGURE 3 - OptiView Control Center	13
FIGURE 4 - Refrigerant Flow-Thru Chiller	19
FIGURE 5 - Liquid Chiller Log Sheets	24
FIGURE 6 - Home Screen	30
FIGURE 7 - System Screen	32
FIGURE 8 - Evaporator Screen	34
FIGURE 9 - Condenser Screen	36
FIGURE 10 - Purge Screen	38
FIGURE 11 - Compressor Screen	40
FIGURE 12 - Capacity Control Screen	42
FIGURE 13 - Magnetic Bearing Controller (MBC) Screen	45
FIGURE 14 - Surge Protection Screen	47
FIGURE 15 - Variable Geometry Diffuser (VGD) Screen	49
FIGURE 16 - Motor Details Screen	50
FIGURE 17 - UPS Screen	52
FIGURE 18 - Motor - Variable Speed Drive (VSD) Screen	54
FIGURE 19 - Variable Speed Drive (VSD) Details Screen	56
FIGURE 20 - Harmonic Filter Details Screen	58
FIGURE 21 - Setpoints Screen	60
FIGURE 22 - Setup Screen	62
FIGURE 23 - Schedule Screen	64
FIGURE 24 - User Screen	66
FIGURE 25 - Comms Screen	67
FIGURE 26 - Printer Screen	68
FIGURE 27 - Sales Order Screen	70
FIGURE 28 - Operations Screen	72
FIGURE 29 - Remote Control Screen	73
FIGURE 30 - History Screen	74
FIGURE 31 - History Details Screen	76
FIGURE 32 - Custom Screen	77
FIGURE 33 - Custom Setup Screen	78
FIGURE 34 - Trend Screen	80
FIGURE 35 - Trend Setup Screen	82
FIGURE 36 - Advanced Trend Setup Screen	84
FIGURE 37 - Common Slots Screen	86
FIGURE 38 - Drive Cabinet Door (PYT330, PYT420, PYT780 & PYT1020)	110
FIGURE 39 - Drive Cabinet Door (PYT1280)	110
FIGURE 40 - Drive Cabinet Model PYT330	111
FIGURE 41 - Drive Cabinet Model PYT420	111
FIGURE 42 - Left Side of Drive Cabinet Model PYT780	112
FIGURE 43 - Right Side of Drive Cabinet Model PYT780	113
FIGURE 44 - Left Side of Drive Cabinet Model PYT1020	114
FIGURE 45 - Right Side of Drive Cabinet Model PYT1020	115
FIGURE 46 - Left Side of Drive Cabinet Model PYT1280	116
FIGURE 47 - Right Side of Drive Cabinet Model PYT1280	117
FIGURE 48 - Evacuation of Chiller	122
FIGURE 49 - Saturation Curve	123
FIGURE 50 - Communications Block Diagram	131
FIGURE 51 - OptiView Panel to PC Serial Cable	131
FIGURE 52 - Sample Printout (Status or History)	132
FIGURE 53 - Sample Printout (Setpoints)	133
FIGURE 54 - Sample Printout (Schedule)	135

LIST OF FIGURES (CONT'D)

FIGURE 55 - Sample Printout (Sales Order).....	135
FIGURE 56 - Sample Printout (Security Log Report).....	136
FIGURE 57 - Sample Printout (Trend Data New or Existing Points).....	137
FIGURE 58 - Sample Printout (Custom Screen Report).....	137

LIST OF TABLES

TABLE 1 - Input Current Limit Threshold	22
TABLE 2 - Temperature Setpoint	23
TABLE 3 - Input Current Limit Threshold	23
TABLE 4 - Analog Input Ranges	29
TABLE 5 - Status Messages	90
TABLE 6 - Run Messages.....	91
TABLE 7 - MBC Startup Messages.....	91
TABLE 8 - Start Inhibit Messages	91
TABLE 9 - Warning Messages.....	92
TABLE 10 - Routine Shutdown Messages.....	94
TABLE 11 - Cycling Shutdown Messages.....	95
TABLE 12 - Safety Shutdown Messages	101
TABLE 13 - Maintenance Requirements.....	119
TABLE 14 - System Pressures	122
TABLE 15 - Approximate Refrigerant and Water Weight	125
TABLE 16 - SI Metric Conversion	140

THIS PAGE INTENTIONALLY LEFT BLANK.

SECTION 1 - SYSTEM FUNDAMENTALS

SYSTEM COMPONENTS

The YORK Model YZ Centrifugal Chiller is completely factory-packaged. The package includes the evaporator, condenser, compressor, motor, variable speed drive (VSD), OptiView™ Control Center and all inter-connecting unit piping and wiring (*see Figure 1 and Figure 2 on page 12*).

Compressor

The compressor is a single-stage centrifugal type. It is powered by a high speed hermetic induction motor, on a common shaft with a cast aluminum, fully shrouded, impeller. The compressor assembly includes a variable geometry diffuser.

Motor

The compressor motor is a high speed hermetic induction motor design with magnetic bearings. The compressor impeller is overhung from the end of the motor shaft and has no bearings of its own.

The motor includes angular contact ball bearings. The bearings engage with the rotor shaft during shutdown and after the rotation is stopped.

Heat Exchangers

The evaporator and condenser shells are fabricated from rolled carbon steel plates with fusion welded seams. Heat exchanger tubes are internally and externally enhanced type.

Evaporator

The evaporator is a shell and tube, hybrid falling film and flooded type heat exchanger. A spray header provides uniform distribution of refrigerant over tubes in the falling film section. Residual refrigerant floods the tubes in the lower section. Mesh eliminators are located above the tube bundle to prevent liquid refrigerant carryover into the compressor.

A 2 inch liquid level sight glass is located on the side of the shell. The evaporator shell may contain single or dual refrigerant relief valves, unless the optional condenser isolation valve is installed.

Condenser

The condenser is a shell and tube type heat exchanger. It has a discharge gas baffle to prevent direct high velocity impingement on the tubes. A separate subcooler is located in the condenser to enhance performance. Single or dual refrigerant relief valves are located on the condenser shell, unless the optional refrigerant isolation valves are installed.

Water Boxes

The removable compact water boxes are made of steel. The design working pressure is 150 PSIG (1034 kPa). The boxes are tested at 225 PSIG (1551 kPa). Integral steel water baffles provide the required pass arrangements. Stub-out water nozzle connections with Victaulic grooves are welded to the water boxes. These nozzle connections are suitable for Victaulic couplings, welding or flanges. They are capped for shipment. Plugged 3/4 inch drain and vent connections are provided on each water box. Optional marine water boxes and higher working pressure ratings are available.

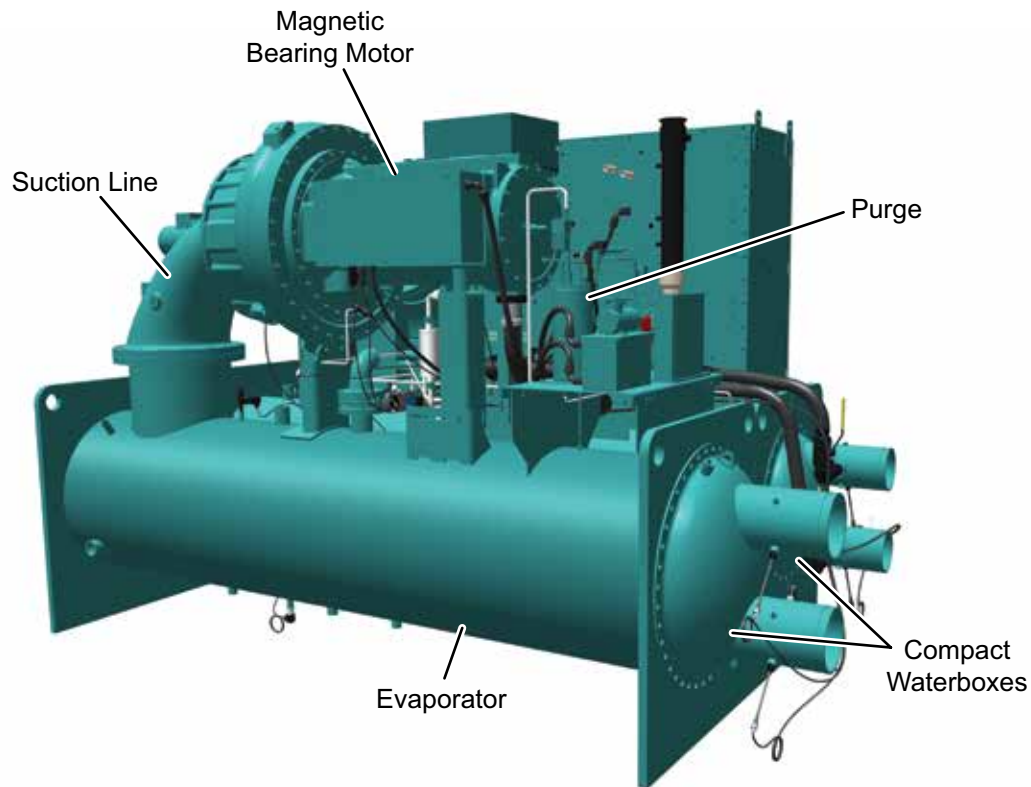
Refrigerant Flow Control

Refrigerant flow to the evaporator is controlled by the liquid level control valve. While the chiller is running, the refrigerant level is normally controlled to the level setpoint.

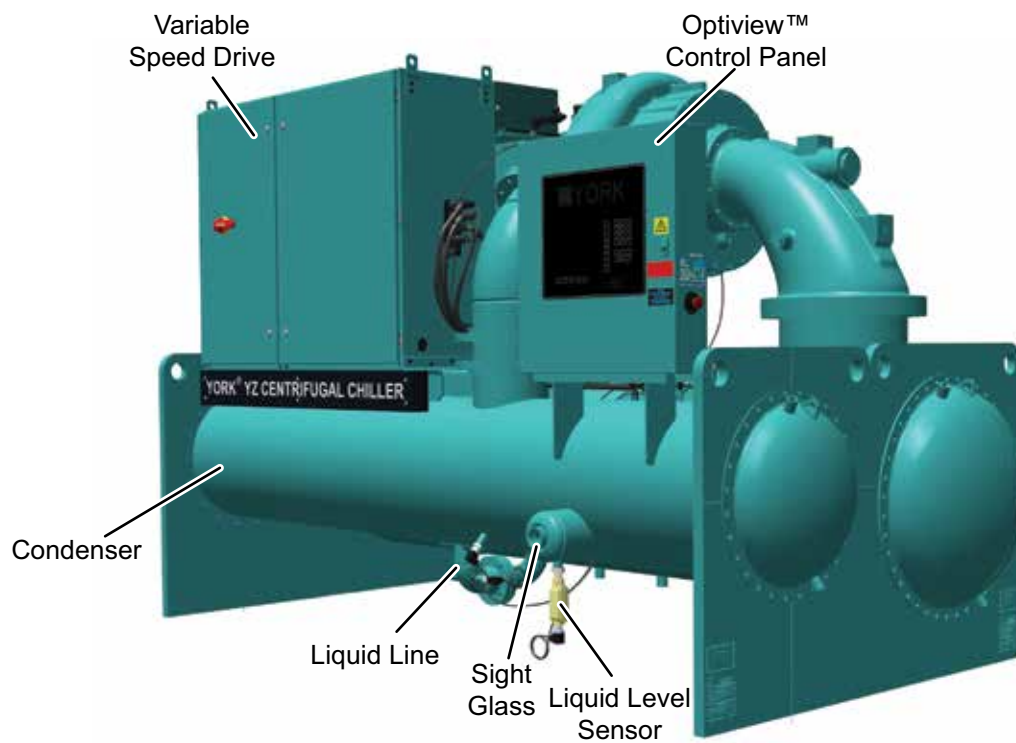
A level sensor senses the refrigerant level in the condenser. The sensor outputs an analog voltage to the control panel to indicate the level, with 0% indicating empty and 100% indicating full.

Under program control, the control panel modulates the liquid level control valve to maintain the condenser refrigerant level at a programmed setpoint. Other setpoints affect the control sensitivity and response. Only a qualified service technician may modify these settings. The level setpoint must be entered at chiller commissioning by a qualified service technician.

While the chiller is shut down, the level control valve is pre-positioned to anticipate run. When the chiller starts, if the actual level is less than the level setpoint, a linearly increasing ramp is applied to the level setpoint. This ramp causes the setpoint to go from the initial refrigerant level to the programmed setpoint over a specific period of time. If the actual level is greater than the setpoint upon run, it immediately begins to control to the programmed setpoint.



LD22373

FIGURE 1 - YZ CHILLER COMPONENTS (REAR)

LD22514

FIGURE 2 - YZ CHILLER COMPONENTS (FRONT)

Variable Speed Drive

The Variable Speed Drive is factory packaged with the chiller. It is designed to vary the compressor motor speed by controlling the frequency and voltage of the electrical power to the motor. The control logic automatically adjusts motor speed as required to suit lift and capacity requirements. The VSD is connected to an OptiView Control center. The VSD and OptiView communicate using a Modbus communication protocol.

Optional Service Isolation Valves

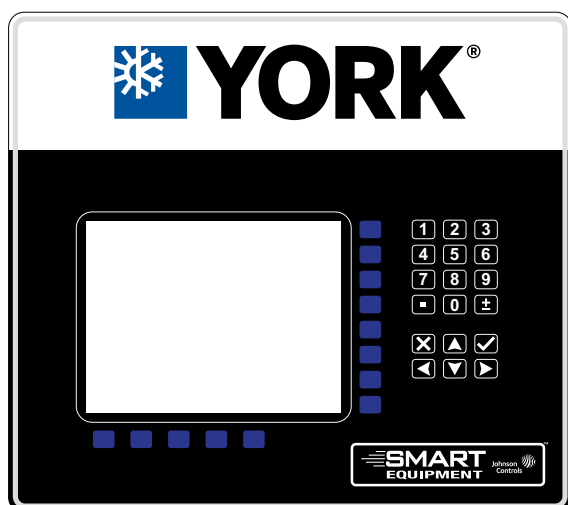
If the chiller is equipped with optional service isolation valves on the discharge and liquid line. These valves are used for isolating the refrigerant charge in either the evaporator or condenser to allow service access to the system and must remain open during operation. A refrigerant pump-out unit will be required to isolate the refrigerant.



Isolation of the refrigerant in this system must be performed by a qualified service technician.

Optional Hot Gas Bypass

Hot gas bypass is optional and is used to provide greater turndown than otherwise available for load and head conditions. The OptiView Control Center will automatically modulate the hot gas valve open and closed as required. Adjustment of the hot gas control valve must only be performed by a qualified service technician.



LD26720

FIGURE 3 - OPTIVIEW CONTROL CENTER

OptiView Control Center

The YORK OptiView™ control center LCD graphic display and keypad is the interface for starting, stopping, configuring, monitoring, and commanding the chiller. The control center is a microprocessor based system designed for centrifugal chillers. It controls the LCHLT (leaving chilled liquid temperature) and maintains safe operation of the chiller.

The display allows for the presentation of operating parameters and can trend data to present a graphical representation of both present and historical operation of the chiller. The locations of various chiller parameters are clearly and intuitively marked. Instructions for specific operations are provided on many of the screens. The screens and navigation are shown in "SECTION 3 - OPTIVIEW™ CONTROL CENTER FUNCTIONS AND NAVIGATION".

Eight buttons are available on the right side of the panel, which are primarily used for navigation between the system screens. At the base of the display are 6 additional buttons. The button functions are redefined based on the currently displayed screen. The area to the right of the keypad is used for data entry. A standard numeric keypad is provided for entry of system setpoints and limits.



The *Decimal* key provides accurate entry of setpoint values.



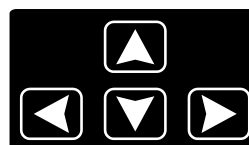
A +/- key has also been provided to allow entry of negative values and AM/PM selection during time entry.



In order to accept changes made to the chiller setpoints, the *Check* key is provided as a universal 'Enter' key or 'Accept' symbol.



In order to reject entry of a setpoint or dismiss an entry form, the 'X' key is provided as a universal 'Cancel' symbol.



Cursor Arrow keys are provided to allow movement on screens which contain a large amount of entry data. In addition, these keys can be used to scroll through history and event logs.

The graphic display can display data in either English or Metric mode.

- English (temperatures in °F and pressures in PSIA)
- Metric (temperatures in °C and pressures in kPa)

The control center continually monitors system operations. Operators are advised of chiller conditions by use of various status and warning messages. This data is recorded and preserved in memory even through a power failure. Operational data, warnings and shutdown messages may be viewed at any time.

In addition, the control center may use alarms to notify the user of certain conditions. A complete listing of shutdown, status, and warning messages is listed in the *Display Messages on page 90* of this manual.

The control center includes capabilities for remote control and communications. Common networking protocol through the Building Automation System (BAS) allows increased remote control of the chiller, as well as 24-hour performance monitoring via a remote site. An optional circuit board called the SC-EQUIP provides Johnson Controls and YORK mechanical equipment such as the YZ chiller with building automation system (BAS) networking connectivity.

The chiller also maintains standard digital remote capabilities. Both of these remote control capabilities allow for the following standard Energy Management System (EMS) interfaces. The actual connection details are in the Field Connections section of the *Wiring Diagram (Form 161.01-PW1 and PW3)*:

- Remote Start
- Remote Stop
- Remote Leaving Chilled Liquid Temperature Setpoint adjustment: BAS coms, Analog signal, (0-10VDC or 4-20mA) or Pulse Width Modulation
- Remote Current Limit Setpoint adjustment: BAS coms, Analog signal, (0-10VDC or 4-20mA) or Pulse Width Modulation
- Remote “Ready to Start” Contacts
- Safety Shutdown Contacts
- Cycling Shutdown Contacts

The OptiView panel can be used to control the customer chilled and condenser liquid flow. A set of contacts exists to initiate flow for each shell. Details are in the Field Connections section of the *Wiring Diagram (Form 161.01-PW2 and PW4)*. The chilled water pump contacts close immediately upon execution of a chiller start command. They open coincident with the receipt of a stop command or a fault other than those below:

- A. LEAVING CHILLED LIQUID - LOW TEMPERATURE cycling shutdown.
- B. MULTIUNIT CYCLING - CONTACTS OPEN or SYSTEM CYCLING - CONTACTS OPEN (Only if Chilled Liquid Pump Operation is set to ENHANCED)
- C. LEAVING CHILLED LIQUID FLOW SWITCH OPEN cycling shutdown

The Condenser Pump contacts close immediately upon execution of a chiller start command. They open coincident with receipt of a chiller stop command or fault other than CONDENSER-FLOW SWITCH OPEN cycling shutdown.

If the chiller is stopped and the condenser pump contacts are open (flow off), the contacts close when saturated condenser temperature is less than 35.0 °F (1.67 °C). This helps mitigate condenser freeze due to plant issues in brine applications.

If the contacts are closed only due to the saturated condenser temperature, they are opened when saturated condenser temperature returns above 40.0 °F (4.44 °C). If the existing logic calls for them to be closed, they remain closed.

Some screens, displayed values, programmable setpoints and manual controls exist for service technician use only. They are only displayed when logged in at SERVICE access level or higher. These parameters affect chiller operation and should never be modified by anyone other than a qualified service technician.

The chiller operating program resides in the OptiView Control Center microboard. Software versions (Y.OPT.01.xx.yzz) are alpha-numeric codes that represent the application, language package and revision levels as follows.

- Y – Commercial Chiller 03630 Microboard
- OPT - OptiView
- 01 – YZ Mod A Chiller
- xx - Controls Revision level (00, 01, etc)
- y – Language Package (0=English only, 1=NEMA, 2=CE, 3=NEMA/CE)
- zz – Language Package Revision level (00, 01, etc)

Each time the controls portion or language section is revised, the respective revision level increments. Software upgrades should only be performed by a service technician.

SYSTEM OPERATION

In operation, a liquid to be chilled (water or brine) flows through the evaporator tubes, where its heat is transferred to low pressure liquid refrigerant sprayed over and pooled outside the tubes, boiling the refrigerant. The chilled liquid is then piped to air conditioning or process terminal units, absorbing heat. The warmed liquid is then returned to the chiller to complete the chilled liquid circuit cycle.

The refrigerant vapor, which is produced by the boiling action in the evaporator, is drawn into the suction of the compressor where the rotating impeller increases its pressure and temperature and discharges it into the condenser. The cooling fluid flowing through the condenser tubes absorbs heat from the refrigerant vapor, causing it to condense. The cooling fluid is supplied to the chiller from an external source, usually a cooling tower. The condensed refrigerant drains from the condenser into the subcooler section. There, it is cooled by the entering condenser water and exits to into the liquid return line. The level control valve meters the flow of liquid refrigerant to the evaporator to complete the refrigerant circuit. The level control valve continually adjusts position as load changes to meet the changed mass flow rate of refrigerant required to keep the system balanced. It does this by maintaining a constant level in the condenser, enough to maintain a liquid seal to the outlet.

Capacity Control

The major components of a chiller are selected to handle the required refrigerant flow at full load design conditions. However, most systems will be called upon to deliver full load capacity for only a relatively small part of the time the unit is in operation.

The speed at which the compressor rotates establishes the pressure differential that the chiller can operate against. This is referred to as 'lift'. Speed must always be maintained above the minimum necessary to create the lift required for the pressure difference between the condenser and evaporator, regardless of load. Below that speed, gas surge occurs. That pressure difference is a function of the LCHLT and the leaving condenser liquid temperature and the heat transfer between those liquids and the refrigerant.

Reduced speed also reduces the available capacity of the chiller. If speed is reduced, chiller power use is reduced. Therefore, at reduced capacity requirements where condenser pressure is also reduced, the motor speed is reduced as much as possible while maintaining chilled liquid temperature and sufficient lift. When the speed cannot be further reduced due to lift required for the specified leaving chilled water temperature setting and available cooling to the condenser and capacity must be further reduced, a mechanism called the Variable Geometry Diffuser (VGD) at the exit of the impeller is used to reduce refrigerant gas flow. The VGD not only controls capacity, but serves to mitigate "stall." Stall is an effect caused by slow refrigerant gas passing through the compressor at reduced flow rates needed for low capacity operation.

A final optional means to reduce capacity called Hot Gas Bypass (HGBP) is available regardless of compressor model. When selected for an application, HGBP is used to re-circulate some refrigerant through the compressor without using it for cooling the chilled liquid. Although this does not reduce power consumption, it greatly reduces the capacity of the chiller for maximum turndown. The YZ uses these mechanisms in a controlled order to maintain the best possible efficiency.

The YZ Chiller controls capacity by adjusting the compressor VGD position, the compressor motor Variable Speed Drive (VSD), and optional Hot Gas Bypass valve (HGBP) position (if equipped) in a specific sequence depending on whether loading or unloading is required to keep LCHLT at setpoint. Motor speed is additionally and simultaneously adjusted as necessary to maintain the minimum compressor lift required to prevent surge. The sequence for operation of the control devices is as follows:

- Conditions require capacity increase:
 1. HGBP (if present) is driven toward closed.
 2. When the HGBP is full closed, the VGD is driven toward open.
 3. When the VGD is fully opened, VSD speed is increased.
- Conditions require capacity decrease:
 1. VSD speed is decreased.
 2. When VSD speed is at the minimum limit to avoid surge, the VGD is driven toward closed.
 3. When the VGD reaches closed, the HGBP (if present) is driven toward open.

Also, high condenser pressure, low evaporator pressure, high motor current, and high input current limits and overrides limit or reduce the output to the appropriate devices (HGBP, VGD, or VSD) to mitigate the condition to keep the chiller online. As any of these physical thresholds are approached, the control will proportionally limit the amount of capacity increase permitted and if exceeded will issue unloading into the capacity control command.

Anti-Surge Minimum Frequency

In order to maintain sufficient compressor lift to overcome condenser pressure and prevent surge throughout operation, the control maintains and continuously updates a minimum limit for VSD speed. This limit is the Active Anti-Surge Minimum Frequency. It is calculated and applied to the speed each cycle of the capacity control routine.

Surge Protection

The surge protection feature detects surge events. It provides a running count of the surges detected over the lifetime of the chiller. It allows the user to define how many surges are excessive and how the control will react to an excess surge condition. When excessive surging is detected, this feature can shutdown the chiller.

Surge events are detected by monitoring the relationship between the Condenser pressure and Evaporator pressure while the chiller is running. An excess surge condition is detected by comparing the number of surge events that occur in a selectable time period to a selectable threshold.

If the number of surge events (Surge Window Count) detected in the time period programmed as the COUNT WINDOW setpoint (1 to 5 minutes; default 3) exceeds the threshold programmed as the COUNT LIMIT setpoint (4 to 20; default 15) an excess surge condition has been detected.

Unless the SHUTDOWN features have been enabled as explained below, the chiller will continue running under the same conditions displaying WARNING – EXCESS SURGE DETECTED. This message will be displayed until manually reset with the Warning Reset key in Operator access level. If the SHUTDOWN setpoint is Enabled when an excess surge condition has been detected, a safety shutdown will be performed and SURGE PROTECTION - EXCESS SURGE is displayed.

Head Pressure Control

The Head Pressure Control feature enables chiller control of a field-mounted facility condenser water temperature control means, if one is necessary for prolonged cold water startup as described in *SECTION 3 - OPTIVIEW™ CONTROL CENTER FUNCTIONS AND NAVIGATION*. YZ chillers are capable of operation within a wide range of condenser water temperatures; however, a low minimum condenser water temperature, as specified in the *YZ Engineering Guide (Form 161.01-EG1)*, is required to maintain a sufficient pressure differential (head) between the condenser and evaporator for proper refrigerant management in the chiller. The head pressure control function provides an analog output control signal from the OptiView Control Center that responds to the programmed head pressure (condenser pressure minus evaporator pressure) Setpoint. The 0-10VDC or 4-20mA output is configurable from the Head Pressure Control screen when the feature is enabled. Output wiring is described in *Unit Wiring and Field Connections for YZ Centrifugal Chiller with Magnetic Bearing Control (Form 161.01-PW4)*.

WATER CIRCUITS

Flow Rate

For normal water chilling duty, the flow rates are permitted at water velocity levels within the heat exchanger tubes between 0.91m/s and 3.66m/s (3.0 fps and 12.0 fps) for evaporators and 1.0m/s and 3.66m/s (3.3 fps and 12.0 fps) for condensers. Two pass units are also limited to 134kPa (45ft H₂O) water pressure drop. The three pass limit is 201kPa (67.5ft H₂O). Variable flow in the condenser is not recommended, as it generally raises the energy consumption of the system by keeping the condenser pressure high in the chiller. Additionally, the rate of fouling in the condenser will increase at lower water velocities associated with variable flow, raising system maintenance costs. Cooling towers typically have narrow ranges of operation with respect to flow rates, and will be more effective with full design flow.

Chillers can tolerate a 50% flow rate change in one minute that is typically associated with the staging of an additional chiller. A lower flow rate change is used for better system stability and set point control. Proper sequencing via the building automation system will make this a very smooth transition.

Variable Primary Flow

Typically, the Variable Primary Flow (VPF) systems are utilized in large chilled water plants, as VPF systems can offer lower installation and operating costs, but require sophisticated control and flow monitoring. YZ chillers operate successfully in VPF systems. With a minimum allowable evaporator tube velocity of 0.5m/s (1.5 fps) for standard tubes at part load rating conditions, YZ chillers accommodate the wide variation in flow required by many chilled water VPF applications.

Temperature Ranges

For normal water chilling duty, leaving chilled water temperatures may range between 3.5°C (38°F) and 21.0°C (70°F), to obtain temperature deltas between entering chilled water temperatures and leaving chilled water temperatures of 1.7°C to 16.7°C (3°F to 30°F).

Water Quality

Water quality may affect the performance of any chiller through corrosion, deposition of heat-resistant scale, sedimentation or organic growth. These will degrade the chiller's performance and increase operating and maintenance costs. The quality of the water supply for

the condenser and evaporator must be analyzed by a water treatment specialist for practical and economical liquid chiller applications. Typically, corrective water treatment and periodic cleaning of tubes maintains a chiller's performance. If water conditions exist which cannot be corrected by proper water treatment, it may be necessary to provide a larger allowance for fouling, and/or to specify special materials of construction.

General Piping

All chilled water and condenser water piping is designed, and should be installed in accordance with, approved piping practices.

- Chilled water pump and condenser water pumps should be located to discharge through the chiller to assure positive pressure and flow.
- Piping should include offsets to provide flexibility and be arranged to prevent drainage of water from the evaporator and condenser when the pumps are shut off.
- Piping should be adequately supported and braced independently of the chiller to avoid strain on chiller components.
- Hangers must allow for alignment of the pipe. Isolators in piping and in the hangers are highly desirable in achieving sound and vibration control.
- Piping should be arranged for ease of disassembly at the unit for tube cleaning. All water piping should be thoroughly cleaned of all dirt and debris before final connections are made to the chiller.

Vents and Drain Valves

The following precautions may be taken to improve chiller performance and maintenance.

- Evaporator and condenser waterboxes are equipped with plugged vent and drain connections.
- If desired, vent and drain valves maybe installed with or without piping to open drain.
- Pressure gauge equipped with stop-clocks and stop-valves maybe installed in the intelts and outlets of the condenser and chilled water lines, both places as close as possible to the chiller. An over-hear monorail maybe used to facilitate servicing.

Connections

The standard YZ chiller unit is designed for 1034 kPa (150 PSIG) working pressure in both, chilled water circuits and condenser water circuits. The water nozzle connections to these circuits are furnished with grooves standardized to ANSI/AWWA C-606 for shoulder joints. All water piping should be thoroughly cleaned of all dirt and debris before final connections are made to the chiller.

Chilled Water

A water strainer of maximum 3.2 mm (1/8") perforated holes must be field-installed in the chilled water inlet line as close as possible to the chiller such that the chilled water pump is protected by the strainer. The strainer is important to protect the chiller from debris or objects which could block flow through individual heat exchanger tubes. A reduction in flow through tubes could seriously impair the chiller performance or even result in tube freeze-up. A flow switch is factory installed in the evaporator nozzle and connected to the OptiView panel, which assures adequate chilled water flow during operation.

Condenser Water

The chiller is engineered for maximum efficiency at both design and part load operation by taking advantage of the colder cooling tower water temperatures which occur during winter. Appreciable power savings are realized from these reduced heads. At initial startup, entering condensing water temperature may be 16.7°C (30°F) colder than the standby chilled water temperature.

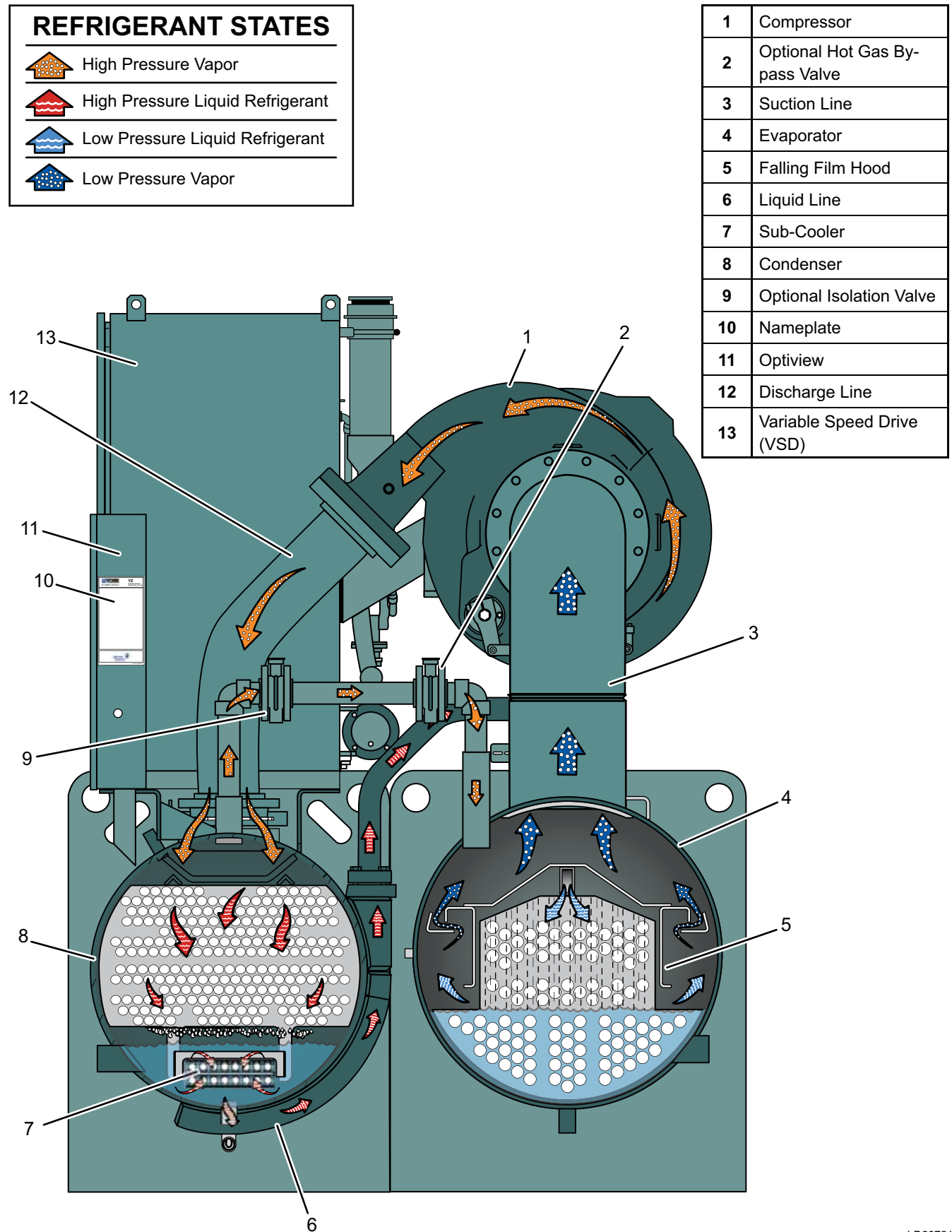


FIGURE 4 - REFRIGERANT FLOW-THRU CHILLER

LD26721

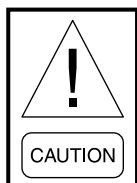
THIS PAGE INTENTIONALLY LEFT BLANK.

SECTION 2 - SYSTEM OPERATING PROCEDURES

PRE-STARTING

Prior to starting the chiller, the display should read "SYSTEM READY TO START."

The Panel can only boot up when line power is available to the VSD transformers and the UPS battery is present and connected with its disconnect closed.



After periods of waterside maintenance or prolonged shutdown, vent any air from the chiller water boxes prior to starting the water pumps. Failure to do so can result in pass baffle damage.

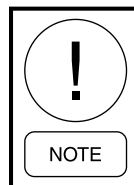
Condenser Water Temperature Control

The YORK YZ chiller is designed to lower power consumption by taking advantage of lower than design temperatures that are naturally produced by cooling towers throughout the operating year. Exact control of condenser water, such as a cooling tower bypass, is not necessary for most installations.

At start-up, the entering condenser water temperature may be as much as 30°F (16.66°C) colder than the standby return chilled water temperature. Cooling tower fan cycling will normally provide adequate control of the entering condenser water temperature.

START-UP

If the chilled water and/or condenser water pumps are manually operated, start the pump. The control center will not allow the chiller to start unless chilled liquid flow is established through the unit. If the liquid pumps are wired to the microcomputer control center pump run contacts, the pump will automatically start, therefore, this step is not necessary.



The coolant temperature inside any JCI-supplied liquid-cooled motor starter must be maintained above the dewpoint temperature in the equipment room to prevent condensing water vapor inside the starter cabinet. An additional temperature-controlled throttle valve is needed in the flow path for the starter heat exchanger to regulate cooling above the equipment room dewpoint for applications using cooling sources other than evaporative air-exchange methods. The temperature control valve should be the type to open on increasing drive coolant temperature, fail-closed, and set for a temperature above dewpoint. It can be requested as factory-supplied by special quotation.

Start/stop control depends on whether the chiller control source is set to Local or one of the Remote start types on the chiller Setup - Operations screen.

The chiller is started:

- By pressing the Start key on the Home Screen when the chiller is set to local mode.
- Remotely through digital input in hardwire remote mode by closing a contact between TB3-1 and TB3-7. The local keypad start key must be pressed initially to allow remote operation.
- Remotely by the SC-EQUIP in BAS remote mode. The local keypad start key must be pressed initially to allow remote operation.

In LOCAL control source pressing the START key on the home screen will immediately start the chiller. In remote ISN, ANALOG, DIGITAL, or MODEM, a remote start command must also be provided to the proper input connection.

When the control is changed to local mode from any other source, it will remain in RUN if already running or remain in STOP if already stopped. A hardware safety stop button is located on the side of the panel to stop the chiller in an emergency situation.

The chiller will start if the following conditions are met:

- Leaving Chilled Liquid Temperature is above the setpoint
- Chilled liquid flow is established
- Condenser liquid flow is established
- No uncleared faults or start inhibits exist

CHILLER OPERATION

Upon a start request, the following occurs in sequence:

1. The chiller's system pump run contacts close
2. The VSD pre-charges (~12 seconds)
3. The VSD pre-regulates (~3 seconds)
4. The Motor runs

The chiller will vary capacity to maintain the leaving chilled liquid temperature setpoint. Throughout capacity control, the compressor speed is maintained above the minimum required to avoid surge. Otherwise, the device maintaining capacity is controlled based on the leaving chiller liquid temperature. Pressure and motor current overrides also apply as necessary to maintain operating limits.

The Input Current limit threshold value is determined from several settings, depending on the chiller control source selected according to the Table 1.

TABLE 1 - INPUT CURRENT LIMIT THRESHOLD

CONTROL SOURCE	ACTIVE INPUT CURRENT LIMIT THRESHOLD
Local	Lowest of: • Local Input Current Limit Setpoint (% Input Job FLA) • Pulldown Input Current Limit (when active)
BAS	Remote Input Current Limit Setpoint (comms)
Hardwire	Lowest of: • Local Input Current Limit Setpoint (% Input Job FLA) • Analog Remote Input Current Limit Setpoint • Pulldown Input Current Limit (when active)

CHILLED LIQUID CONTROL SETTINGS

Temperature Control Setpoint

The temperature to which the chiller will control the chilled fluid leaving the evaporator must be set by the operator. The way it is selected depends on whether the operator wants this value set locally or modulated by a remote input.

Regardless of which method is used to select the desired Leaving Chilled Liquid Temperature (LCHLT), the chiller will control to its own Active LCHLT Setpoint. The Active Setpoint varies but is targeted to the programmed setpoint when the chiller is running. When the chiller is not running, the active setpoint is set to Entering Chilled Liquid Temperature minus a programmable offset (default 5 °F (-15 °C)), but not adjusted to less than the programmed LCHLT setpoint. When the compressor motor starts, the Active LCHLT Setpoint is ramped from this value to the programmed LCHLT Setpoint at the programmable LCHLT Setpoint Ramp Rate (default 0.1 °F or °C/second). This keeps the chiller from undershooting setpoint excessively during pulldown. Any time the programmed setpoint is changed during operation, the active setpoint is ramped to the new value at this rate.

Automatic Temperature Shutdown

This setting defines the temperature offset below the LCHLT setpoint where shutdown is expected. It is programmable over a range of 1 °F to 70 °F (-17.2 °C to 21.1 °C). However the actual shutdown temperature will never be calculated to lower than 34 °F (1.1 °C) (water) or 6°F (-14.4 °C) (brine). Anytime the LCHLT setpoint is decreased, the shutdown threshold decreases to the new LCHLT active setpoint minus offset at a rate equal to the programmed LCHLT Setpoint Ramp Rate. Anytime the Leaving Chilled Liquid Temperature setpoint is increased, the shutdown threshold increases to the new LCHLT active setpoint minus offset at a rate equal to 1/2 the programmed LCHLT Setpoint Ramp Rate. This allows time for the chiller to change temperature without shutting down first.

TABLE 2 - TEMPERATURE SETPOINT

CONTROL SOURCE	LEAVING CHILLED LIQUID TEMPERATURE SETPOINT
Local	Local Leaving Chilled Liquid Temperature Setpoint, entered from the panel. It is programmable over the range of 36.0°F to 72.0°F (2.2°C to 22.2 °C) (water) or 10.0°F to 72.0°F (-12.2 °C to 22.2 °C) (brine).
Building Automation Systems (BAS)	Remote Leaving Chilled Liquid Temperature Setpoint value sent over communications 36.0°F to 72.0°F (2.2°C to 22.2 °C) (water) or 10.0°F to 72.0°F (-12.2 °C to 22.2 °C) (brine). If nothing is written to the address, the default is 45 °F (7.2 °C).
Hardwire	The Remote Setpoint Minimum is user selectable at the Operator password level between 0.0°F and 200.0°F (-17.8 °C and 93.3 °C) (default = 0.0°F (-17.8 °C)). The Remote Setpoint Maximum is also user selectable between 0.0°F and 200.0°F (-17.8 °C and 93.3 °C) (default = 100.0°F (37.8 °C)). The Setpoint will vary over the range selected by the Min and Max by the proportion of the Hardwire Analog 0 to 10VDC or 4 to 20mA signal from the BAS controller. For example: with the Min set to 40 and the Max to 60 and the BAS 0 to 10VDC control signal sending a 5VDC signal, the Selected Cooling Setpoint will be 50.0°F (10 °C).
Pulse Width Modulation (PWM)	The Remote Setpoint Minimum is user selectable at the Operator password level between 0.0°F and 200.0°F (-17.8 °C and 93.3 °C) (default = 0.0°F (-17.8 °C)). The Remote Setpoint Maximum is also user selectable between 0.0°F and 200.0°F (-17.8 °C and 93.3 °C) (default = 100.0°F (37.8 °C)). The Setpoint will vary over the range selected by the Min and Max by the proportion of the timed 1 to 11 second pulse. For example: with the Min set to 40 and the Max to 60 and the BAS closing a contact between TB3-19 and TB3-1 for 6 seconds, the Selected Cooling Setpoint will be 50.0°F (10 °C). The PWM input is in the form of a 1 to 11 second relay contact closure that applies 115VAC to the I/O Board TB3-19 for 1 to 11 seconds. A contact closure time (pulse width) of 1 second produces a 0°F offset from the Min Setpoint. An 11 second closure produces the maximum offset. The relay contacts should close for 1 to 11 seconds at least once every 30 minutes to maintain the setpoint to the desired value. If a 1 to 11 second closure is not received within 30 minutes of the last closure, the setpoint reverts to the Min setpoint valve. A closure is only accepted at rates not to exceed once every 70 seconds

Automatic Temperature Restart

This setting defines the temperature offset above the LCHLT setpoint where automatic restart is expected. It is programmable over a range of 0°F to 46 °F (-17.8 °C and 7.8 °C) varying with the LCHWT setpoint. However, the restart temperature will never be calculated above 82°F. This setpoint can be used to reduce chiller cycling by delaying the chiller restart until the cooling load has increased sufficiently.

OPERATOR SETPOINTS QUICK REFERENCE

The most common Operator level setpoints can be found on the Setpoints screen or the following screens:

TABLE 3 - INPUT CURRENT LIMIT THRESHOLD

SCREEN NAME	SETPOINT
Home > Evaporator	Local Cooling Setpoint Temperature
Home > Evaporator	Shutdown Temperature Offset
Home > Evaporator	Restart Temperature Offset
Home > Motor	Local Motor Current Limit
Home > Motor	Pulldown Demand Limit
Home > Motor	Pulldown Demand Time
Home > Condenser > Head Pressure Control	Head Pressure Control

STOPPING THE SYSTEM

There are three ways to stop the chiller.

1. Push the soft stop key on the home screen of the OptiView panel, if in LOCAL control Mode.
2. Send a stop command through the remote system if in Hardwire or BAS control. If the chiller is in a remote control state and the local soft stop key is used to stop the chiller, the Start key must be pressed before the chiller will again permit a start via the remote source.
3. In an emergency situation, requiring immediate stoppage, a safety stop switch is located on the side of the control panel. A normal stop eases the driveline to stop and should always be used instead of the safety stop during regular operation. The safety stop is NOT intended for normal shutdown of the chiller.

The OptiView Control Center can be programmed to start and stop the chiller automatically at a designated time (maximum once each day).

See Figure 23 on page 64 in SECTION 3 - OPTIVIEW™ CONTROL CENTER FUNCTIONS AND NAVIGATION of this manual.

SAFETY STOP

When depressed, the chiller will not run under any condition. For safety reasons, this position is required for many maintenance tasks to be completed. The safety stop button must be rotated clockwise to release the stop condition. The safety stop is not intended for normal shutdown of the chiller. If used, an immediate stop occurs that bypasses the programmed controlled shutdown.

OPERATING LOGS

A permanent daily record should be kept of system operating conditions (temperatures and pressures) recorded at regular intervals throughout each 24-hour operating period. Automatic data logging is possible by connecting a laptop PC or serial printer and programming the DATA LOGGER function. Figure 5 on page 24 shows an example log sheet used for recording test data on chiller systems. Log sheets are available in pads of 50 sheets and may be obtained through the nearest Johnson Controls office.

An accurate record of readings serves as a valuable reference. Readings taken when a system is newly installed establish normal operating conditions. These readings can be compared to later readings to identify possible operational concerns.

YORK YZ CENTRIFUGAL LIQUID CHILLER LOG SHEET

Chiller Location _____
System No. _____

DATE																			
TIME																			
Hour Meter Reading																			
O.A. Temperature Dry Bulb / Wet Bulb																			
Compressor	Discharge Temp																		
	Input Power																		
Motor	% Input FLA																		
	% Motor FLA																		
	DC Bus Volt																		
	Motor Hours																		
Magnetic Bearing Controller	Rotor Elong																		
	Evaporator																		
Evaporator	Refrigerant																		
	Liquid																		
	Supply																		
	Return																		
Condenser	Refrigerant																		
	Liquid																		
	Supply																		
	Return																		
Capacity Control	VSD Command																		
	VGD Command																		
	HGBP Command																		
	Flow Rate - GPM (if equipped)																		

Remarks: _____

YORK YZ MOD A CENTRIFUGAL LIQUID CHILLER LOG SHEETS

...an Energy-Saving approach to your Service needs...

Input Date: August 31, 2017

Form 161.01-MR1 (8/17) New Release

161.01-MR1 (8/17) New Release
Issue Date: August 30, 2017

* NOTE: A pad of 50 log sheets can be ordered from your local Johnson Controls branch by requesting Form 161.01-MR1.

FIGURE 5 - LIQUID CHILLER LOG SHEETS

For example, an increase in condenser approach temperature (condenser temperature minus leaving condenser water temperature) may be an indication of dirty condenser tubes.

FAULT SHUTDOWNS

The chiller is programmed to shut down on two types of fault conditions.

- A Cycling fault will allow the chiller to automatically restart when the condition clears.
- A Safety fault requires the cause for the condition be determined and resolved before restarting.

To restart, all safety faults must be cleared by pressing the Clear Faults key on the Home screen. The chiller will restart unless the local Stop key is pressed or the remote run command has ceased.

PROLONGED SHUTDOWN

If the chiller is to be shut down for an extended period of time, such as over the winter season, the following procedure should be followed.

1. Test all system joints for refrigerant leaks with a leak detector.
 - If any leaks are found, they should be repaired before allowing the system to stand for a long period of time.
2. During long idle periods, the tightness of the system should be checked periodically.

3. If freezing temperatures could be encountered while the system is idle, drain the cooling water from the cooling tower, condenser and condenser pump.
4. Drain the chilled water system, chilled water pump and coils.
5. Open the drains on the evaporator.
6. Open the condenser liquid heads to assure complete drainage.
7. Drain the Variable Speed Drive cooling system.
8. Open the main disconnect switches to the VSD, condenser water pump and the chilled water pump.
9. Open the battery disconnect.
10. Ensure the control center is powered off.

RESTART AFTER PROLONGED SHUTDOWN

1. Close all drain valves.
2. Close the battery disconnect switch.
3. Restore power to the control panel so that the UPS can charge the battery for at least eight hours prior to the planned start-up. The chiller has a start inhibit setting for if the battery voltage is below 12.8VDC.

THIS PAGE INTENTIONALLY LEFT BLANK.

SECTION 3 - OPTIVIEW™ CONTROL CENTER FUNCTIONS AND NAVIGATION

INTERFACE CONVENTIONS

Each screen description in this document will begin with a section describing the graphical elements on the screen along with a short summary of the functions available. Each element on the screen will then be categorized into three distinct groups:

- Display Only Fields
- Programmable
- Navigation

The Programmable values and Navigation commands are also subject to access level restrictions as described below. For each of these elements, an indication is given to show the minimum access level required to program the value or navigate to the subscreen.

Display Only Fields

Values in this group are read-only parameters of information about the chiller operation. This type of information may be represented by a numerical value, a text string, or an LED image. For numerical values, if the monitored parameter is above the normal operating range, the high limit value will be displayed along with the '>' symbol; if it is below the normal operating range, the low limit value will be displayed along with the '<' symbol. In some cases, the value may be rendered invalid by other conditions and the display will use X's to indicate this.

Programmable

Values in this group are available for change by the user. In order to program any setpoints on the system, the user must first be logged in with the appropriate access level. Each of the programmable values requires a specific access level which will be indicated beside the specified value. All of the programmable controls in the system fall into one of the categories described below:

Access Level

The OptiView Panel restricts certain operations based on password entry by the operator. Three different access levels are provided as follows:

- **VIEW:** The panel defaults to the lowest access level which is termed **VIEW**. In this mode, the chiller operating values and setpoints can be observed, but no changes can be made.

- **OPERATOR:** The second access level is termed **OPERATOR** and will allow the customer to change all of the setpoints required to operate the chiller system. In order to gain standard **OPERATOR** level access, the Home Screen Login Password would be entered as 9 6 7 5, using the numeric keypad. The **OPERATOR** access level is accompanied by a 10-minute timeout. After ten (10) successive minutes without a keypress, the panel will revert to the **VIEW** access level. This prevents unauthorized changes to the chiller if a user was logged in at a higher access level and failed to logout.
- **SERVICE:** In the event that advanced diagnostics are necessary, a **SERVICE** access level has been provided. Only qualified service personnel utilize this access level. This level provides advanced control over many chiller functions and allows calibration of many chiller controls.

The access levels are listed above beginning with the lowest access level and proceeding to the highest access level. Users logged in under higher access levels may perform any actions permitted by lower access levels. Proper procedure requires that after making necessary setpoint adjustments the user return to the home screen and logout.

Change Setpoints

On screens containing setpoints programmable at the **OPERATOR** access level, a key with this label will be visible if the present access level is **VIEW**. This key brings up the access level prompt described above. It allows the user to login at a higher Access Level without returning to the Home Screen. After logging in, the user may then modify setpoints on that screen.

Setpoints

The control center uses the setpoint values to control the chiller and other devices connected to the chiller system. Setpoints can fall into several categories. They can be numeric values (such as 45.0°F for the Leaving Chilled Liquid Temperature) and they can enable or disable a feature or function.

Regardless of which setpoint is being programmed, the following procedure applies:

1. Press the desired setpoint key. A dialog box appears displaying the present value, the upper and lower limits of the programmable range, and the default value.
2. If the dialog box begins with the word “ENTER”, use the numeric keys to enter the desired value. Leading zeroes are not necessary. If a decimal point is necessary, press the ‘.’ key.

Pressing the ▲ key, sets the entry value to the default for that setpoint. Pressing the ▼ key, clears the present entry. The ◀ key is a backspace key and causes the entry point to move back one space.

If the dialog box begins with “SELECT”, use the ◀ and ▶ keys to select the desired value.

If the previously defined setpoint is desired, press the "X" (Cancel) key to dismiss the dialog box.

3. Press the "✓" (Enter) key.

If the value is within range, it is accepted and the dialog box disappears. The chiller will begin to operate based on the new programmed value. If out of range, the value will not be accepted and the user is prompted to try again.

Manual Controls

Some keys are used to perform manual control functions. These may involve manual control of items such as the compressor speed or valve actuators. These are typically restricted to qualified technicians in **SERVICE** access. Other keys in this category are used to initiate/terminate processes such as calibrations or reports.

Free Cursor

On screens containing many setpoints, a specific “soft” key may not be assigned to each setpoint value. A soft key will be assigned to enable the cursor arrow keys below the numeric keypad which are used to “highlight” the desired setpoint field. At this point, the ‘✓’ key is pressed to bring up a dialog prompting the user to enter a new setpoint value. The ‘X’ key cancels cursor mode. (See the Schedule Screen for an example.)

Navigation

In order to maximize the number of values which the panel can display to the user, and to place those values in context, multiple screens have been designed to describe the chiller operation. In order to move from one screen to the next, navigation keys have been defined. These keys allow the user to either move “forward” to a subscreen of the present screen, or move “backward” to the previous screen. Except for the home screen display, the upper-right “soft” key will always return the user to the home screen. Navigating with “soft” keys is as simple as pressing the key next to the label containing the name of the desired screen. The system will immediately refresh the display with the graphics for that screen. Following is a layout of all the screens and how they are connected.

- Home Screen (*Page 30*)
 - System Screen (*Page 32*)
 - Evaporator Screen (*Page 34*)
 - Condenser Screen (*Page 36*)
 - Compressor Screen (*Page 40*)
 - Magnetic Bearing Controller Screen (*Page 45*)
 - Surge Screen (*Page 47*)
 - Variable Geometry Diffuser Screen (*Page 49*)
 - Capacity Controls Screen (*Page 42*)
 - VSD Screen (*Page 54*)
 - VSD Details Screen (*Page 56*)
 - Motor Details Screen (*Page 50*)
 - Setpoints Screen (*Page 60*)
 - Setup Screen (*Page 62*)
 - Schedule Screen (*Page 64*)
 - User Screen (*Page 66*)
 - COMMS Screen (*Page 67*)
 - Printer Screen (*Page 68*)
 - Sales Order Screen (*Page 70*)
 - Operations Screen (*Page 72*)
 - History Screen (*Page 74*)
 - History Details Screen (*Page 76*)
 - Custom Screen (*Page 77*)
 - Custom Setup Screen (*Page 78*)
 - Trend Screen (*Page 80*)
 - Trend Setup Screen (*Page 82*)
 - Advanced Trend Setup Screen (*Page 84*)
 - Common Slots Screen (*Page 86*)

LANGUAGES

The screens can be displayed in various languages. Language selection is done on the user screen. The desired language is selected from those available. English, French, German, Hungarian, Italian, Japanese, Korean, Portuguese, Simplified Chinese, Traditional Chinese, Russian and Turkish. English is the default language. If a language other than English is being displayed, an English speaking person can navigate to the USER screen (using the preceding Navigation chart) and select English.

ANALOG INPUT RANGES

The following table indicates the valid display range for each of the analog input values. In the event that the input sensor is reading a value outside of these ranges, the < or > symbols will be displayed beside the minimum or maximum value, respectively.

3

TABLE 4 - ANALOG INPUT RANGES

ANALOG INPUT	ENGLISH RANGE			METRIC RANGE		
	LOW	HIGH	UNITS	LOW	HIGH	UNITS
Leaving Chilled Liquid Temperature	0.0	133.9	°F	-17.7	56.6	°C
Return Chilled Liquid Temperature	0.0	133.9	°F	-17.7	56.5	°C
Leaving Condenser Liquid Temperature	-20.0	180.0	°F	-28.8	82.2	°C
Return Condenser Liquid Temperature	-20.0	180.0	°F	-28.8	82.2	°C
Evaporator Refrigerant Temperature (Optional)	0.0	133.9	°F	-17.7	56.6	°C
Discharge Temperature	20.0	226.3	°F	-6.67	107.9	°C
Condenser Pressure	0.0	80.0	PSIA	0.0	552	KPA
Condenser Temperature*	-99.7	163.3	°F	-73.2	72.9	°C
Evaporator Pressure	0.0	30	PSIA	0	206.8	KPA
Evaporator Temperature*	-99.7	101.7	°F	73.2	38.7	°C
Refrigerant Level	0.0	100.0	%	0.0	100.0	%
Drop Leg Refrigerant Temperature	-20.0	180.0	°F	-28.8	82.2	°C
Motor Housing Temperature	10.0	270.0	°F	12.2	132.2	°C

*Saturation temperatures are calculated values. They will display XXX if the pressure used for the calculation is out of range.

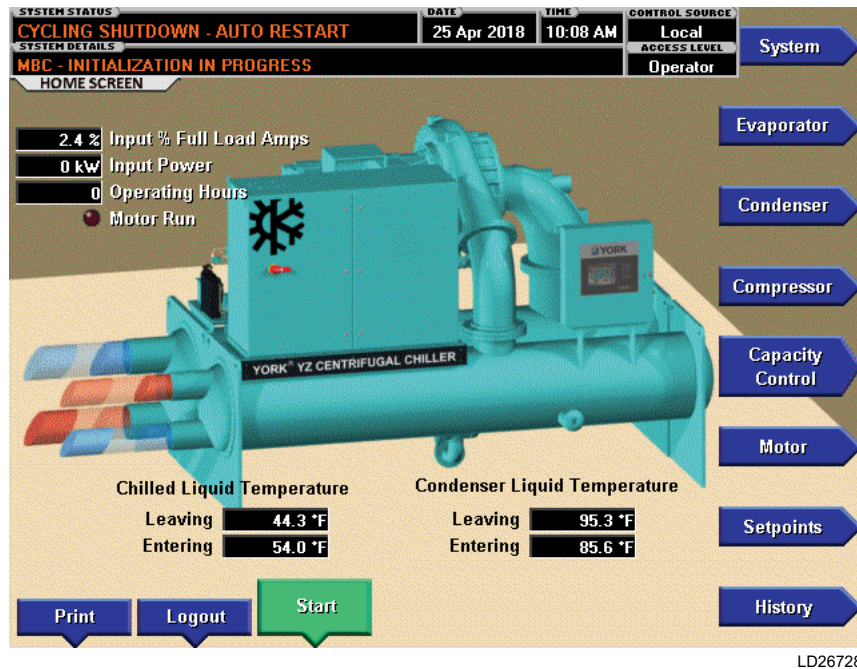


FIGURE 6 - HOME SCREEN

When the chiller system is powered on, the above default display appears. The Home Screen display depicts a visual representation of the chiller itself. Animation

indicates chilled liquid flow and/or condenser cooling liquid flow when the flow switch inputs are satisfied.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Chilled Liquid Temperature - Leaving	Displays the temperature of the liquid as it leaves the evaporator.
Chilled Liquid Temperature - Entering	Displays the temperature of the liquid as it enters the evaporator.
Condenser Liquid Temperature - Leaving	Displays the temperature of the liquid as it leaves the condenser.
Condenser Liquid Temperature - Entering	Displays the temperature of the liquid as it enters the condenser.
Input % Full Load Amps	This displays the percentage of full load amps utilized by the system.
Input Power (kW)	This displays the total input power used by the system.
Operating Hours	Displays the cumulative operating hours of the chiller.
Motor Run (LED)	Is ON when the digital output that gives the VSD a motor run command is on.

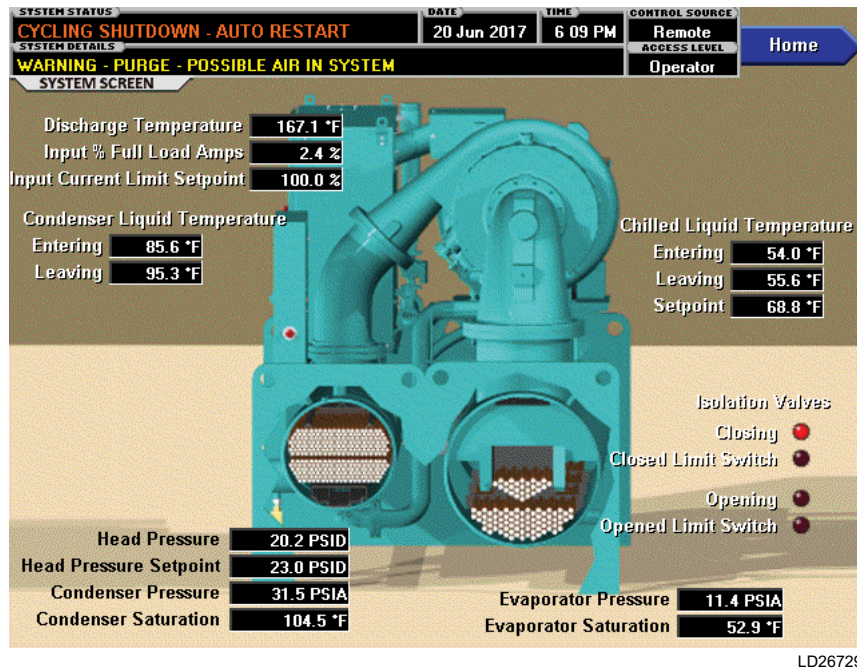
PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Login	VIEW	This key allows the user to change Access Level when the proper password is entered at the prompt.
Logout	OPERATOR	This key is displayed when a user is logged in at any level other than VIEW . Pressing it will return the access level to VIEW .

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Print	VIEW	Use this key to generate a hard-copy report of the present system status. This provides a snapshot of the primary operating conditions at the time the key is pressed. The History page provides enhanced reporting capability. (See HISTORY Screen.) This option will not be present if the chiller is presently configured to print History, New Data, which continuously logs.
Clear Fault	VIEW	When safety conditions have been detected, the chiller is shutdown, and the main status display of the chiller will display a message indicating the cause of the shutdown. Using this key, the fault and message can be cleared once the condition has been removed. The key only shows when the condition can be cleared. If the chiller has a standing Local or Remote run command, it will start when the key is pressed.
Warning Reset	OPERATOR	Use of this key acknowledges a warning condition and resets the message display associated with it.
Start	OPERATOR	This key is only available when the chiller does not have a local run request. Pressing this key allows selection of enter to run or cancel to abort to stopped. Enter causes the chiller to start if control source is LOCAL, or permits run if the Run/Stop source is any remote mode.
Soft Stop	OPERATOR	This key is displayed whenever the chiller is running. It shows in place of the start key. Pressing this key allows selection of enter to stop or cancel to remain running. Enter causes the chiller to perform a soft shutdown and disables the remote run permissive. This key should always be used to stop the chiller unless an emergency situation exists, in which case the Safety Stop button can be used.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
System	Jumps to the System Screen.
Evaporator	Navigates to the Evaporator Screen.
Condenser	Navigates to the Condenser Screen.
Compressor	Navigates to the Compressor Screen for a detailed view of all the compressor parameters.
Capacity Control	Navigates to the Capacity Control Screen for a detailed view of all the parameters associated with capacity control
Motor	Navigates to the VSD Screen to view VSD parameters. This screen allows programming of the Current Limit and the Pulldown Demand Limit values.
Setpoints	This screen provides a single location to program the most common system setpoints. It is also the gateway to many of the general system setup parameters such as Date/Time, Display Units, Scheduling, Printer Setup, etc.
History	This screen provides access to a snapshot of system data at each of the last 50 shutdown conditions, and provides for trending operating parameters.

**FIGURE 7 - SYSTEM SCREEN**

The System Screen provides a general overview of common chiller parameters for both shells.

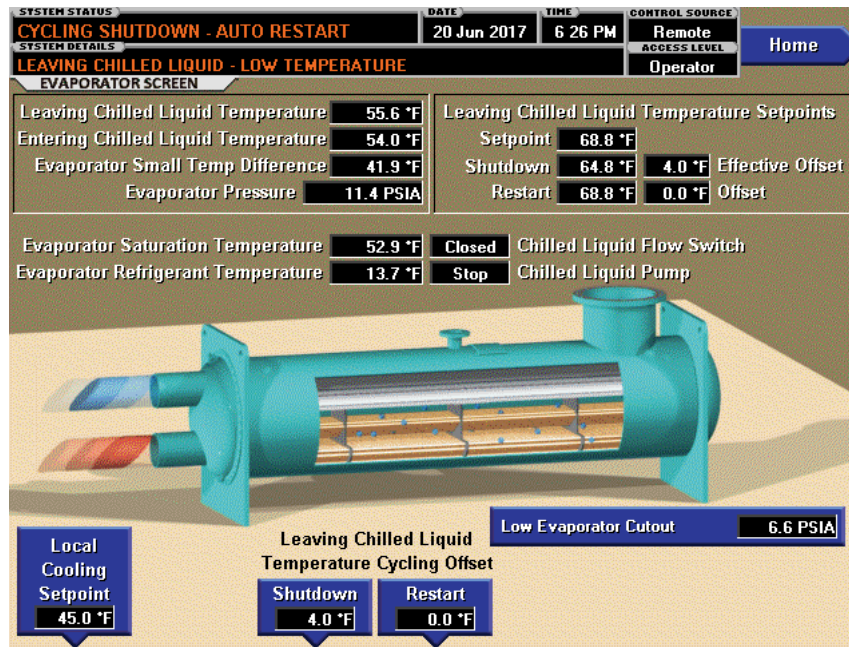
DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Discharge Temperature	Displays the temperature of the refrigerant in its gaseous state at discharge of the compressor as it travels to the condenser.
Input % Full Load Amps	This displays the percentage of full load amps utilized by the system.
Input Current Limit Setpoint	Displays the current limit value in use. This value is percent of Input Full Load Amps.
Condenser Liquid Temperature - Entering	Displays the temperature of the liquid as it enters the condenser.
Condenser Liquid Temperature - Leaving	Displays the temperature of the liquid as it leaves the condenser.
Chilled Liquid Temperature - Entering	Displays the temperature of the liquid as it enters the evaporator.
Chilled Liquid Temperature - Leaving	Displays the temperature of the liquid as it leaves the evaporator.
Chilled Liquid Temperature - Setpoint	Displays the programmed temperature setpoint for leaving chilled liquid. It is the local value or remote reset value depending on control source.
Head Pressure	Displays the pressure difference between the condenser and evaporator (condenser minus evaporator). Only appears when Head Pressure Control is enabled
Head Pressure Setpoint	Displays the active Head Pressure Setpoint to which the head pressure is being controlled. Only appears when Head Pressure Control is enabled
Condenser Pressure	Displays the refrigerant pressure in the condenser.

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Condenser Saturation Temperature	Displays the saturation temperature in the condenser calculated from condenser pressure.
Evaporator Pressure	Displays the present refrigerant pressure in the evaporator
Evaporator Saturation Temperature	Displays the present saturation temperature in the evaporator calculated from evaporator pressure.
Isolation Valves (LEDs)	Only show when optional brine isolation valve feature exists and enabled. Closing - The control is commanding the valve close output on. Closed Limit Switch - Feedback from the valve limit switch at the full closed position shows the switch made, indicating closed valve. Opening - The control is commanding the valve open output on. Opened Limit Switch - Feedback from the valve limit switch at the full open position shows the switch made, indicating open valve.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.



LD26730

FIGURE 8 - EVAPORATOR SCREEN

This screen displays a cutaway view of the chiller evaporator. All setpoints relating to the evaporator side of the chiller are maintained on this screen. Animation

of the evaporation process indicates whether the chiller is presently in a **RUN** condition. Animation of the liquid flow indicates chilled liquid flow.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Leaving Chilled Liquid Temperature	Displays the temperature of the liquid as it leaves the evaporator
Entering Chilled Liquid Temperature	Displays the temperature of the liquid as it enters the evaporator.
Evaporator Small Temperature Difference	Displays the difference between the Leaving Chilled Liquid temperature and the Evaporator Refrigerant temperature. The Evaporator Refrigerant temperature will be represented by the Refrigerant Temperature sensor input if the sensor is enabled, otherwise it will be represented by the Evaporator Saturation temperature.
Evaporator Pressure	Displays the present refrigerant pressure in the evaporator.
Leaving Chilled Liquid Temperature Setpoints – Setpoint	Displays the present setpoint to which the chiller is operating, whether controlled locally or remotely.
Leaving Chilled Liquid Temperature Setpoints - Shutdown	Displays the Leaving Chilled Liquid Temperature at which the chiller will shutdown on LEAVING CHILLED LIQUID – LOW TEMPERATURE cycling shutdown. It is calculated automatically from the temperature setpoint minus the shutdown offset setpoint and limited to chiller minimum
Leaving Chilled Liquid Temperature Setpoints – Restart	Displays the Leaving Chilled Liquid Temperature at which the chiller will restart after it has shutdown on LEAVING CHILLED LIQUID – LOW TEMPERATURE cycling shutdown. This temperature is set as an offset using the LEAVING CHILLED LIQUID TEMPERATURE CYCLING OFFSET – RESTART setpoint.

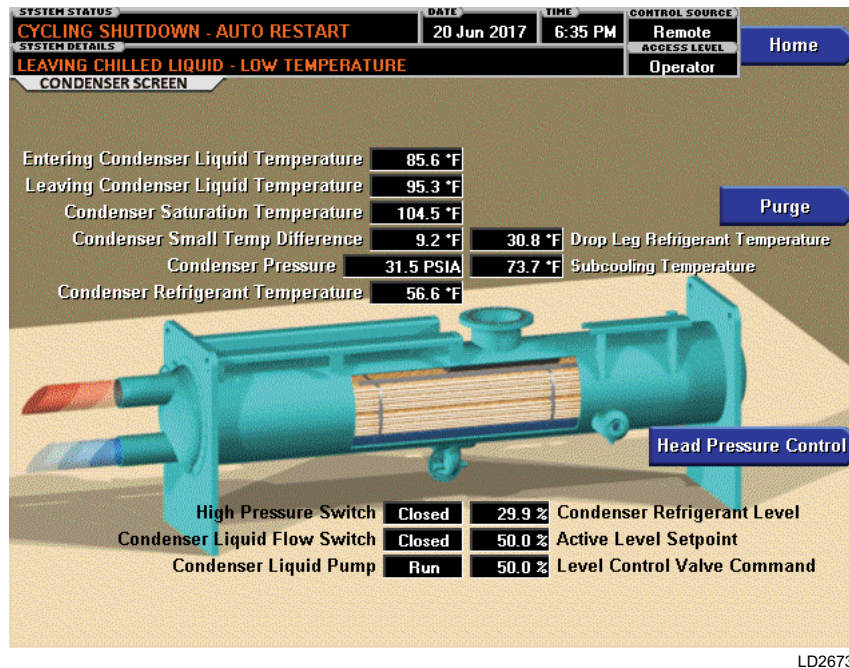
DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Leaving Chilled Liquid Temperature Setpoints (Shutdown) – Effective Offset	Displays the present value of the leaving chilled liquid temperature shutdown offset in effect limited by the chiller minimum temperature.
Leaving Chilled Liquid Temperature Setpoints (Restart) – Offset	Displays the value set for leaving chilled liquid temperature restart offset.
Evaporator Saturation Temperature	Displays the present saturation temperature in the evaporator, determined from evaporator pressure.
Evaporator Refrigerant Temperature	Displays the temperature of the refrigerant in the evaporator if this option is installed and enabled.
Chilled Liquid Flow Switch (Open/ Closed)	Displays whether the liquid flow switch input indicates flow is present in the evaporator.
Chilled Liquid Pump	Displays the command presently sent by the control center to the Chilled Liquid Pump run contacts (RUN or STOP).
Low Evaporator Cutout	The cutout value is displayed in Water mode and displayed and adjustable in Brine mode by a JCI Service Technician as appropriate for water or brine

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Local Leaving Chilled Liquid Temperature - Setpoint	Operator	This value allows the user to define the Leaving Chilled Liquid Temperature that is to be maintained by the chiller. It is programmable over the range of 36.0°F to 72.0°F (2.2 °C to 22.2 °C) (water) or 10.0°F to 72.0°F (-12.2 °C to 22.2 °C) (brine). When the chiller is running, performing capacity control, any change to the LCHLT setpoint results in a ramp from the old value to the new value at the programmed LCHLT setpoint ramp rate.
Leaving Chilled Liquid Temperature Cycling Offset - Shutdown	Operator	This value allows the user to specify the Leaving Chilled Liquid Temperature at which the chiller will shut down on a LEAVING CHILLED LIQUID – LOW TEMPERATURE cycling shutdown. This is done by defining an offset below the Leaving Chilled Liquid Temperature setpoint. It is programmable over a range of 1°F to 70°F (-17.2 °C to 21.1 °C).
Leaving Chilled Liquid Temperature Cycling Offset - Restart	Operator	This value allows the user to specify the Leaving Chilled Liquid Temperature at which the chiller will restart after a shutdown on a LEAVING CHILLED LIQUID – LOW TEMPERATURE cycling shutdown. This is done by defining an offset above the Leaving Chilled Liquid Temperature setpoint. It is programmable over a range of 0°F to 37°F (-17.8 °C to 2.8 °C).

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.



LD26731

FIGURE 9 - CONDENSER SCREEN

This screen displays a cutaway view of the chiller condenser. All setpoints relating to the condenser side of the chiller are maintained on this screen. Animation in-

dicates condenser liquid flow. This screen also serves as a gateway to controlling the Refrigerant Level.

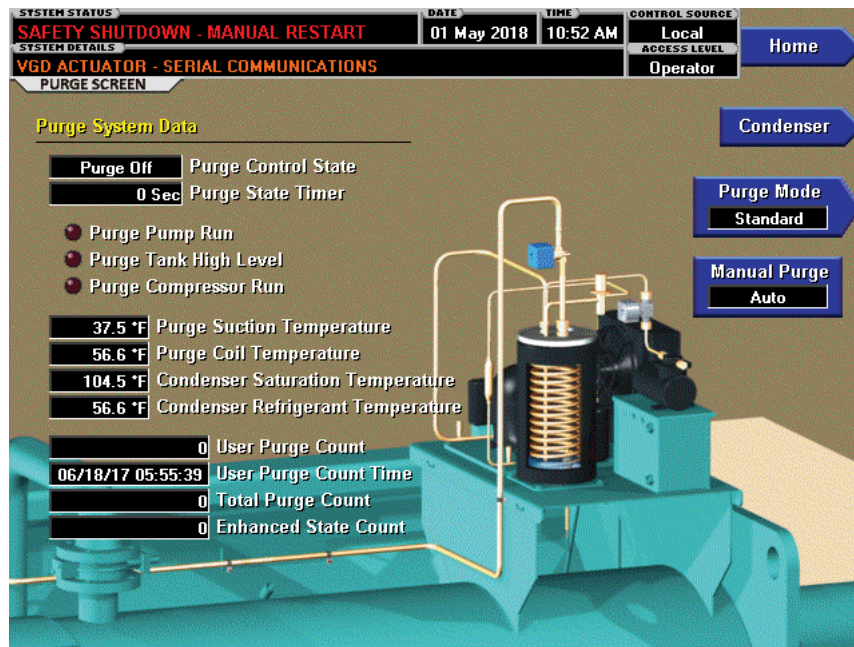
DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Entering Condenser Liquid Temperature	Displays the water temperature as it enters the condenser
Leaving Condenser Liquid Temperature	Displays the water temperature as it leaves the condenser.
Condenser Saturation Temperature	Displays the saturation temperature in the condenser.
Condenser Small Temperature Difference	Displays the difference between the Condenser Refrigerant temperature and the Leaving Condenser Liquid temperature. The Condenser Refrigerant temperature will be represented by the Condenser Saturation temperature
Condenser Pressure	Displays the refrigerant pressure in the condenser.
Drop Leg Refrigerant Temperature	Displays the temperature of the refrigerant in the drop leg between the condenser and evaporator shells.
Subcooling Temperature	Displays the difference between the Condenser Refrigerant temperature and the Drop Leg Refrigerant temperature. The Condenser Refrigerant temperature will be represented by the Condenser Saturation temperature.
High Pressure Switch (Open/Closed)	Displays the present position of the high pressure switch. This will indicate open when a High Pressure fault is present.
Condenser Liquid Flow Switch	Indicates whether flow is present in the condenser.
Condenser Liquid Pump (Run/Stop)	Displays the command presently sent by the control center to the Condenser Liquid Pump run contacts.
Condenser Refrigerant Level	Displays the present position of the refrigerant level.

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Active Level Setpoint	Displays the setpoint to which the refrigerant level is being controlled.
Level Control Valve Command	Displays the position command to the level control valve in percent of travel with 0% full closed to 100% full open.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Purge	Navigates to the Purge Screen where the Operator can view the purge parameters and select Standard or Enhanced Purge mode of operation.
Head Pressure Control	Navigates to the Head Pressure Control Screen where the Operator can view and adjust some of the Head Pressure Control parameters.



LD26732

FIGURE 10 - PURGE SCREEN

Low pressure systems such as the YZ chiller operate at pressures below atmospheric pressure. This means that any leaks will suck air into the system. Air is non-condensable and therefore interferes with the refrigeration cycle causing high head and poor heat transfer. The purge system monitors for air in the system and re-

moves it. This screen displays a view of the purge system. Setpoints relating to the purge system are shown on this page as well as the chiller parameters affecting the purge cycle. The YZ purge system monitors the chiller conditions to diagnose when non-condensables are present and then remove them from the system.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Purge Control State	Indicates the current control state in effect for the purge system. • Disabled • Auto Inhibit • Manual Inhibit • Purge Off • Purge On • Purge Air • Regen • Regen Drain • Equalizing • Purge Take Drain
Purge State Timer	Indicates the current control state currently in effect for the Purge system.
Purge Pump Run (LED)	Indicates ON when the Purge Vacuum Pump runs.
Purge Tank High Level (LED)	Indicates ON when the Purge High Level switch is closed indicating that the Purge Tank is full of refrigerant
Purge Compressor Run (LED)	Indicates ON when the Purge Compressor runs.
Purge Suction Temperature	Displays the Purge Compressor Suction Temperature.

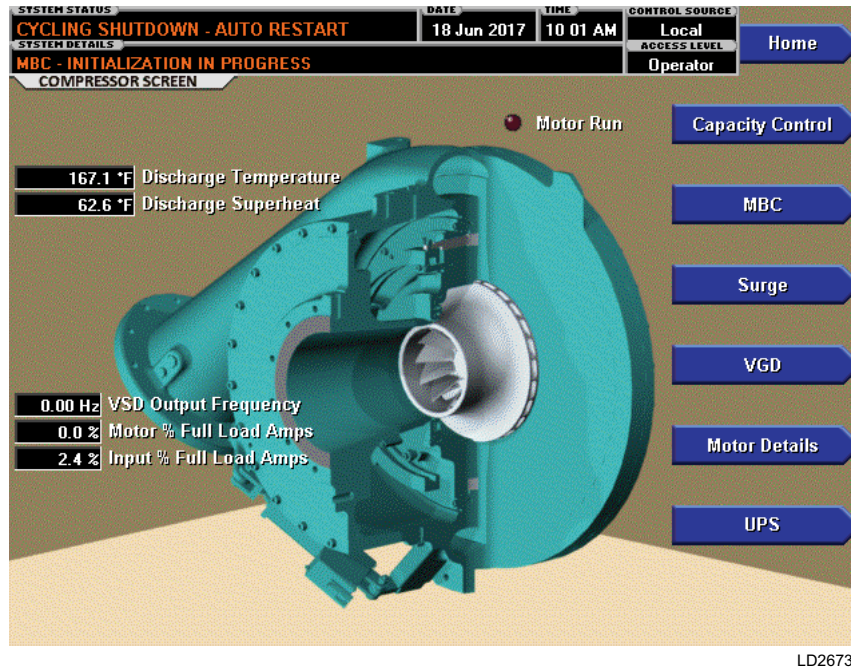
DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Purge Coil Temperature	Displays the Purge Coil temperature.
Condenser Saturation Temperature	Displays the Condenser Saturation Temperature calculated from the Condenser Pressure.
Condenser Refrigerant Temperature	Displays the Condenser Refrigerant temperature.
User Purge Count	To aid in troubleshooting, the user may reset the Purge Count to zero and then monitor the number of purges over a period of time.
Total Purge Count	Displays the date and time that the User Purge Count was reset to zero.
Enhanced State Count	Displays the Enhanced Purge state Count since chiller commissioning.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Purge Mode: Standard	Operator	Purge Inlet Solenoid is Open and the Purge Pump Solenoid is Closed. When the chiller runs, if the Condenser Saturation Temperature is > (Condenser Refrigerant Temperature + Condenser Temperature Offset) [Range 0.5°F to 2.5°F (-17.5 °C to -16.4 °C), Default= 1.0°F (-17.2 °C)] the Purge Compressor will run for 1 hour. If the Purge Suction Temperature drops below -7°F (-21.7 °C) a purge cycle will be initiated.
Purge Mode: Enhanced	Operator	Purge Inlet Solenoid is Open and the Purge Pump Solenoid is Closed. When the chiller runs, if the Condenser Saturation Temperature is > (Condenser Refrigerant Temperature + Condenser Temperature Offset) [Range 0.5°F to 2.5°F (-17.5 °C to -16.4 °C), Default= 1.0°F (-17.2 °C)] the Purge Compressor will run for 1 hour. If the Purge Suction Temperature drops below -7°F (-21.7 °C) a purge cycle will be initiated. If the Purge Suction Temperature does not drop below -7°F (-21.7 °C), the Purge Compressor will turn off for 4 hours. After the 4 hour wait the Purge Compressor will be run for another hour. If the Purge Suction Temp drops below -7°F (-21.7 °C) a purge cycle will be initiated. If it does not drop then the Purge Compressor will again be shut off for a 4 hour wait. If no purges are needed after 3 four hour purge cycles, the Purge Compressor will stay off for 24 hours. If no purges occur after 7 twenty-four hour purge cycles then the Purge Time Interval will increase to 1 week and remain there indefinitely. If at any time during the enhanced mode of operation the Purge Suction Temperature drops below -7°F (-21.7 °C) a purge cycle will be initiated and the purge cycle time will revert back to the four hour off time.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Returns user to HOME Screen
Condenser	Returns user to CONDENSER Screen



LD26733

FIGURE 11 - COMPRESSOR SCREEN

This screen displays a cutaway view of the chiller compressor, revealing the impeller, and shows all conditions associated with the compressor. Animation of the compressor impeller indicates whether the chiller is

presently in a **RUN** condition. This screen also serves as a gateway to subscreens for jumping to capacity control and displaying MBC, Surge and VGD and Power Panel detail.

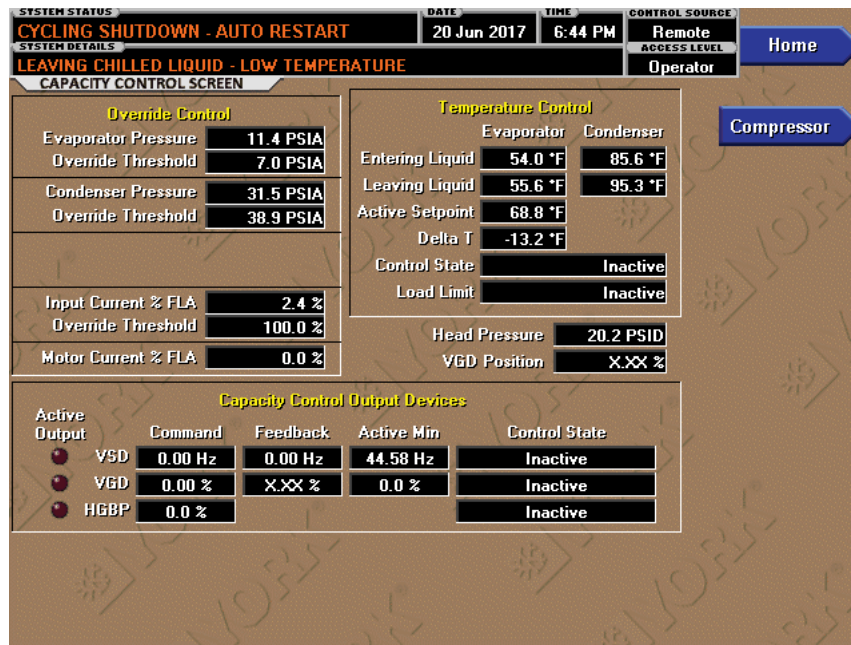
DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Discharge Temperature	Displays the temperature of the refrigerant in its gaseous state at discharge of the compressor as it travels to the condenser.
Discharge Superheat	Displays the Discharge superheat, calculated as (Discharge Temperature – Condenser Saturation temperature).
Motor Run (LED)	Indicates ON when the digital output run command to the VSD is on.
Input % Full Load Amps	Displays the chiller current as a percentage of the job input Full Load Amps (FLA) value.
Motor % Full Load Amps	Displays the current to the motor as a percentage of the motor maximum current.
VSD Output Frequency	Displays the VSD frequency.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Returns user to HOME Screen
Capacity Control	Causes an instant transfer to the Capacity Control Screen.
MBC	Moves to the subscreen allowing view of the Magnetic Bearing Controller parameters and event log.

NAVIGATION	
BUTTON	DESCRIPTION
Surge	Moves to the subscreen that allows viewing and programming of the Surge Protection feature.
VGD	Moves to the subscreen that allows viewing and calibrating the Variable Geometry Diffuser feature. Programming requires an access level of SERVICE.
Motor Details	Moves to the screen showing motor operating details.
Power Panel	Moves to the subscreen that allows viewing power panel status and parameters.



LD26734

FIGURE 12 - CAPACITY CONTROL SCREEN

This screen displays the pertinent parameters associated with capacity control in relation to Leaving Chilled Liquid temperature, current and pressure overrides, and

anti-surge control. This screen also provides a means for a Service Technician to control VGD, Speed, and Optional Hot Gas Bypass Valve manually for service.

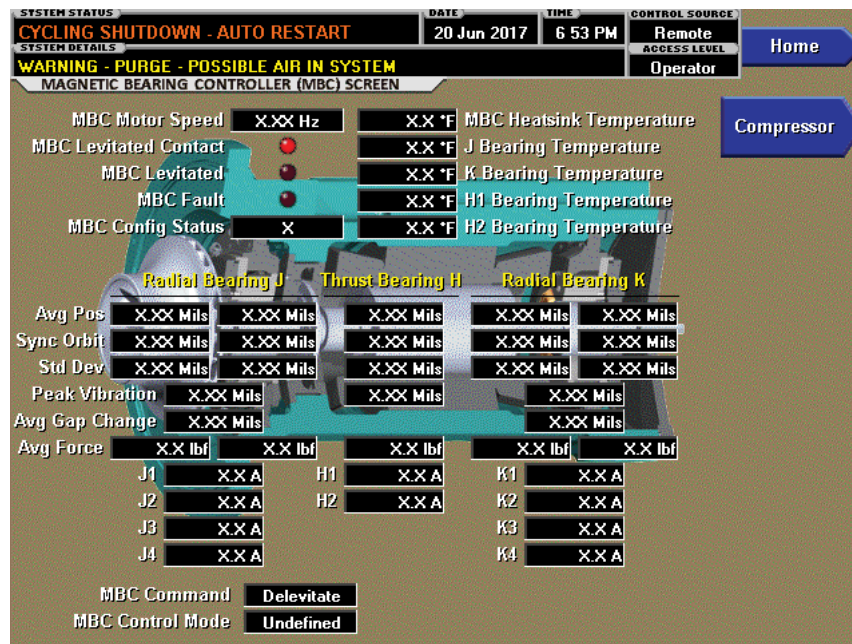
DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Evaporator Pressure	Displays the pressure in the evaporator.
[Evaporator Pressure] Override Threshold	Displays the evaporator pressure setpoint below which the low evaporator pressure capacity control override takes effect.
Condenser Pressure	Displays the pressure in the condenser.
[Condenser Pressure] Override Threshold	Displays the condenser pressure setpoint above which the high condenser pressure capacity control override takes effect.
Input Current % FLA	Displays the percent of useful job full load current presently supplied to the chiller, determined from the highest of the three phase Input Currents/(Input Job FLA setting/0.9).
[Input Current % FLA] Override Threshold	Displays the active input current percent limit, which is the minimum of Local Input Current Limit, Remote Input Current Limit, and Pulldown Current Limit or BAS current limit.
Motor Current % FLA	Displays the percentage of maximum motor current delivered to the motor, determined from the highest of the three phase Motor Currents/Maximum Motor Current Limit.
Entering Chilled Liquid	Displays the temperature of the chilled liquid as it enters the evaporator.
Leaving Chilled Liquid	Displays the temperature of the chilled liquid as it leaves the evaporator.

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Active LCHLT Setpoint	Displays the active temperature setpoint to which the chiller is set to control liquid leaving the evaporator. The Active Setpoint is a target to the Local, Remote or BAS (ISN) LCHLT programmed setpoint, depending on the control source selected. When the chiller is not running, the Active Setpoint is set to Entering Chilled Liquid Temperature - LCHLT Setpoint Start Offset. When the VSD starts, the Active LCHLT Setpoint is ramped to the programmed LCHLT Setpoint at the programmable LCHLT Setpoint Ramp Rate. When the chiller is running, performing capacity control, any change to the programmed LCHLT setpoint results in a ramp from the old Active Setpoint value to the new LCHLT setpoint value at the programmed LCHLT Setpoint Ramp Rate.
Delta T	Displays the difference between the temperature of the chilled liquid leaving the evaporator and the Leaving Chilled Liquid Active Setpoint.
Control State	Displays the present source controlling the command to the capacity control devices, based on conditions as follows: • Inactive – Capacity Control is not active • Temperature Control – Capacity Control is active with no overrides acting • Input Current – Input Current Override is in control • Motor Current – Motor Current Override is in control • Condenser Pressure – Condenser Pressure Override is in control • Evaporator Pressure – Evaporator Pressure Override is in control • Low LCHLT – LCHLT low temperature Override is in control
Load Limit	Displays if any load limiting control is acting on the temperature control output to the capacity control devices. The field indicates the following: • Inactive – Capacity Control is not active • None – No limit is in effect • Input Current • Motor Current • Condenser Pressure • Evaporator Pressure
Head Pressure	Displays the difference between condenser refrigerant pressure and evaporator refrigerant pressure.
Entering Condenser Liquid Temperature	Displays the temperature of the condenser liquid entering the condenser.
VGD Position	Displays the Position of the VGD actuator.
Capacity Control Output Devices	Displays the following for each of the devices that is available: VSD (Variable Speed Drive), VGD (Variable Geometry Diffuser) or HGBP (Hot Gas Bypass Valve) • Active Output (LED): Indicates which device is currently selected by the control for manipulation. • Command: Displays the output command from the control to the device in Hertz to the VSD or in percent of full open to the VGD or HGBP valve. • Feedback: Displays the present speed feedback from the VSD or present position feedback from the VGD. • Control Mode: Displays whether the device is under Automatic or Manual control. • Active Min: Displays the prevailing minimum value to which the control to the device is limited, based upon surge controls or operating limits. • Control State: Displays whether the device is under Automatic or Manual control.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes and instant return to the Home Screen.
Compressor	Causes an instant navigation to the Compressor Screen.
VSD	Causes an instant navigation to the VSD Screen.



LD26735

FIGURE 13 - MAGNETIC BEARING CONTROLLER (MBC) SCREEN

This screen displays the orientation of the magnetic bearing axes relative to the compressor driveline. Pertinent parameters transmitted to the control panel from the Magnetic Bearing Controller (MBC) are displayed

on this screen. Many parameters are shown in the diagram in the locations they represent. The left end of the motor shaft graphic represents the low stage Impeller End Bearing. The right end of the motor shaft graphic represents the Opposite End Bearing.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
MBC Motor Speed	Indicates the compressor motor rotational speed.
MBC Levitated Contact LED	Illuminates when the Levitated Contact switch closes to provide a proof of levitation to the controller.
MBC Levitated LED	Illuminates when the MBC is levitating the shaft.
MBC Fault LED	Illuminates when an MBC Fault is active.
MBC Config Status	Displays what configuration the MBC has been initialized for.
MBC Heatsink Temperature	Displays the MBC Heatsink Temperature in °F or °C.
J Bearing Temperature	Displays the J Bearing Temperature in °F or °C.
K Bearing Temperature	Displays the K Bearing Temperature in °F or °C.
H1 Bearing Temperature	Displays the H1 Thrust Bearing Temperature in °F or °C.
H2 Bearing Temperature	Displays the H2 Thrust Bearing Temperature in °F or °C.
Avg Pos	Displays a running 1 second average position of the Radial Bearing J in the X and Y axis. H Thrust Bearing and the Radial Bearing K in the X and Y axis expressed in Mils.
Sync Orbit	Displays the synchronous orbit of the radial bearing J in the X and Y axis, Thrust Bearing H and the Radial Bearing K in the X and Y axis expressed in Mils

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Std Dev	Displays the Standard Deviation of the Radial Bearing J in the X and Y axis, Thrust Bearing H and the Radial Bearing K in the X and Y axis expressed in Mils.
Peak Vibration	Displays the Peak Vibration of the Radial Bearing J, Thrust Bearing H and the Radial Bearing K expressed in Mils.
Avg Gap Change	Displays the Average Gap Change of the Radial Bearing J and the Radial Bearing K expressed in Mils.
Avg Force	Displays a running 1 second Average Force of the Radial Bearing J in the X and Y axis, Thrust Bearing H and the Radial Bearing K in the X and Y axis. Expressed in lbs or Nm.
J1, J2, J3, J4 (Current)	Displays the four magnetizing currents for the impeller end bearing expressed in Amps.
H1, H2 (Current)	Displays the two magnetizing currents for the thrust bearing expressed in Amps.
K1, K2, K3, K4 (Current)	Displays the four magnetizing currents for the drive end bearing expressed in Amps.
MBC Command	Displays the OptiView state command to the MBC. (Delevitate, Levitate or Calibrate).
MBC Control Mode	Indicates the MBC Control Mode. (Delevitated, Levitated, Calibrating J, Calibrating K or Calibrating H).

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes immediate return to the Home Screen.
Compressor	Causes immediate transfer to the Compressor Screen.

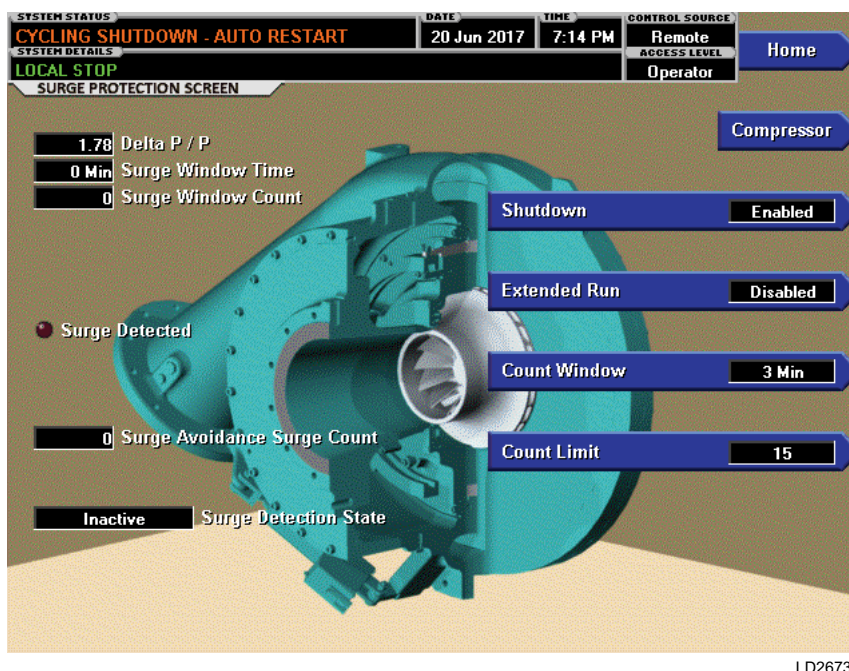


FIGURE 14 - SURGE PROTECTION SCREEN

This screen displays the chiller compressor and all parameters relating to the Surge Protection feature. All setpoints relating to this screen are maintained on this screen.

The Surge Protection feature allows the user to define how many surges are excessive and how the control will react to an excess surge condition. When excess surging is detected, it can be configured to shutdown the chiller.

DISPLAY ONLY FIELDS

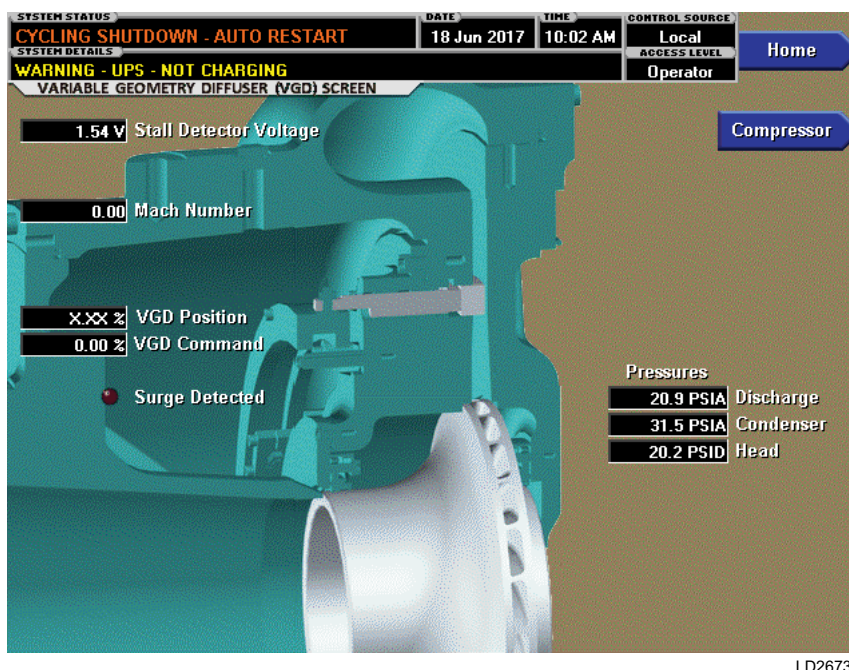
DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Delta P/P	A parameter that represents the system differential or HEAD PRESSURE. It is calculated as (condenser pressure – evaporator pressure) / evaporator pressure.
Surge Window Time	When the chiller enters run mode, this value counts up to the time programmed as the COUNT WINDOW setpoint. When it reaches the COUNT WINDOW minutes, the number of surge events in the oldest minute is discarded and the number of surge events in the most recent minute is added, thus providing a rolling count of the total surge events that have occurred in the last COUNT WINDOW minutes. This value is reset when the chiller shuts down.
Surge Window Count	Displays the number of surge events that have occurred in the last 1 to 5 minutes as programmed with the COUNT WINDOW setpoint. If the chiller has been running for less than the COUNT WINDOW minutes, it is the number of surge events that have occurred within the last number of minutes displayed as the SURGE WINDOW TIME. The count is cleared when the chiller shuts down.
Surge Detected (LED)	Illuminates momentarily when a surge is detected by the Surge Protection feature.
Surge Avoidance Surge Count	This is the total number of surges accumulated by the Surge Protection feature.
Surge Detection State	This is the current state of the surge detection feature.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Shutdown (Enabled/ Disabled)	Operator	Allows the user to select whether the chiller will shutdown or continue to run when an Excess Surge situation has been detected.
Extended Run (Enabled/ Disabled)	Operator	Allows the user to select whether the chiller will shut-down or continue to run when an Excess Surge situation has been detected.
Count Window	Operator	Allows the user to define the period of time (1 to 5 minutes; default 5; default 3 in which the number of surge events (SURGE WINDOW COUNT) are compared to the maximum allowed (COUNT LIMIT), for the purpose of detecting an excess surge situation
Count Limit	Operator	Allows the user to define the maximum number of surge events (4 to 20; default 4; default 15 that can occur within a defined period of time before an Excess Surge situation is detected. If the SURGE WINDOW COUNT exceeds the COUNT LIMIT, an Excess Surge situation has occurred. When an Excess Surge situation is detected, and the SHUTDOWN setpoint is Enabled, the chiller will perform a safety shutdown and display SURGE PROTECTION – EXCESS SURGE.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Condenser	Causes an instant return to the Compressor Screen.



LD26737

FIGURE 15 - VARIABLE GEOMETRY DIFFUSER (VGD) SCREEN

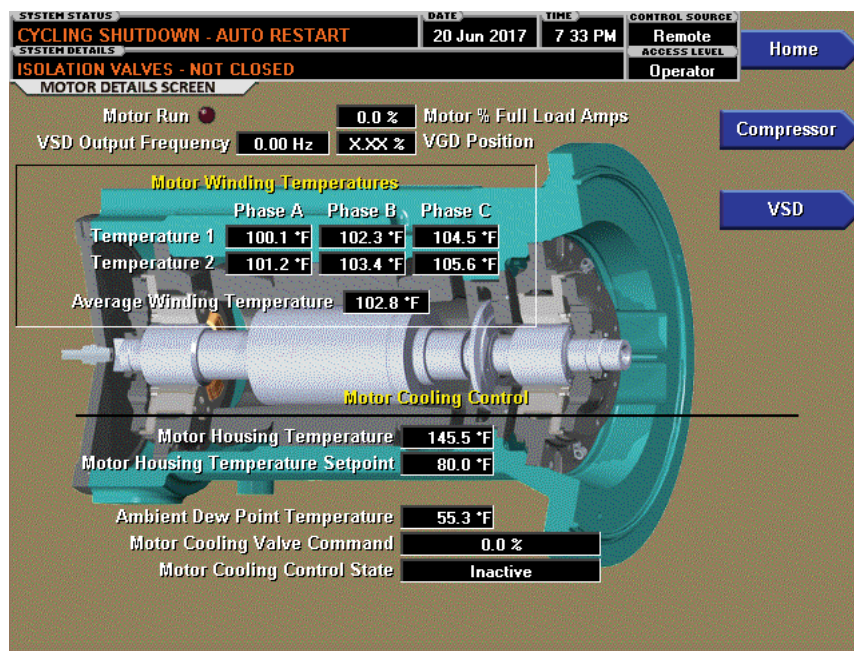
This screen displays information pertinent to the VGD operation.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Stall Detector Voltage	Displays the Stall Detector output voltage (x.xxVdc), as received by the Microboard, from the stall board.
Mach Number	Displays the compressor calculated mach number, based on drive speed and suction conditions.
VGD Position	Displays the position of the VGD over the range of 0% (fully closed) to 100% (fully open). Displayed as XXX until calibration procedure is performed by a qualified Service technician.
VGD Command	Displays the position command from the control to the VGD.
Surge Detected (LED)	Illuminates for 5 seconds each time a surge is detected.
Discharge Pressure	Displays the compressor discharge pressure as sensed by the transducer used for the stall signal determination.
Condenser Pressure	Displays the condenser pressure sensed by the condenser shell transducer.
Head Pressure	Displays the resultant of the Condenser Pressure minus the evaporator pressure.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Compressor	Causes an instant return to the Compressor Screen.



LD26738

FIGURE 16 - MOTOR DETAILS SCREEN

This screen displays information pertinent to the Motor Temperature Monitoring feature. The feature consists of motor winding temperature and motor housing tem-

perature. Also, individual winding temperature sensors can be disabled on this screen

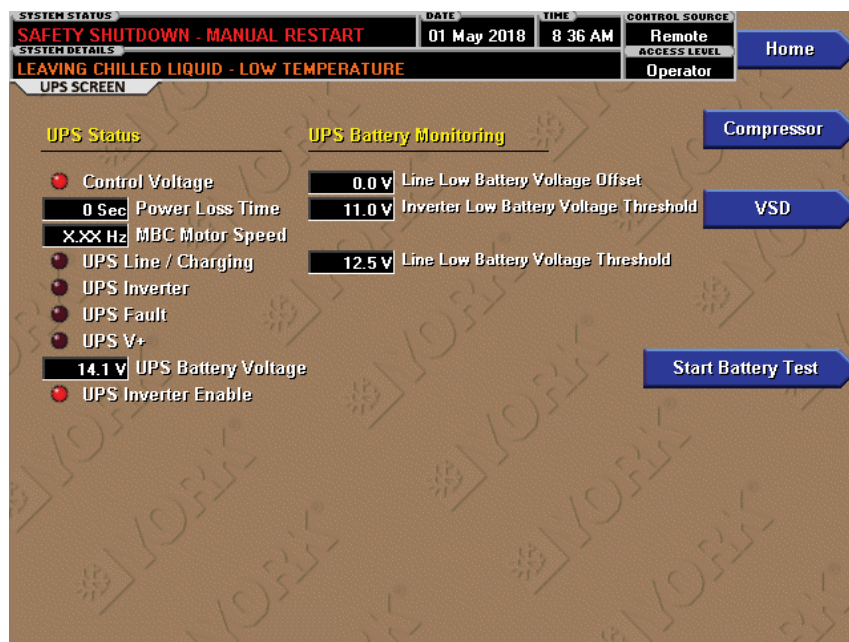
DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Motor Run (LED)	Illuminates when the OptiView control center is commanding the motor to run.
Motor % Full Load Amps	Displays the input current as a percentage of chiller full load amps.
VSD Output Frequency	Displays the frequency at which the VSD is operating the motor. This value is returned from the VSD Logic Board.
VGD Position	Displays the present variable geometry diffuser position as a value between 0% (closed) and 100% (full open).
Motor Temperatures	Displays the enabled motor winding temperatures for phase A, B and C. Individual temperatures can be disabled using the TEMPERATURE DISABLE Setpoint. The software prevents more than 2 of the 3 sensors at either end of the motor to be disabled. When an individual temperature is disabled, the temperature data box does not appear. Any input that registers as open will display the minimum temperature.
Average Winding Temperature	This value is calculated as the average of all enabled and valid motor winding temperatures. Any winding temperature that registers as open, out of range or disabled is not used in the calculation. A maximum of 6 temperatures is used to calculate the average.
Motor Housing Temperature	Displays the temperature of the motor housing sensed at the thermistor on the motor externally.
Motor Housing Temperature Setpoint	Displays the target temperature for the motor cooling control. It is equal to entering condenser water temperature plus the programmable setpoint offset.

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Ambient Dew Point Temperature	When the optional Ambient Dew Point Temperature sensor is Enabled, its reading is displayed here.
Motor Cooling Valve Command	Output to the motor cooling valve in percent from 0% (closed) to 100% Opened)
Motor Cooling Control State	Displays whether the motor cooling valve is in Auto, Manual or Inactive control.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Returns user to HOME Screen
VSD	Returns to the VSD Screen.



LD26739

FIGURE 17 - UPS SCREEN

This screen displays information pertaining to the uninterruptable power supply (UPS) and storage battery for essential loads necessary for shutdown during a line power loss.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Control Voltage (LED)	Indicates the OptiView control voltage digital input voltage is present, indicating line power is available.
Power Loss Time	Indicates the time in seconds while the OptiView control voltage digital input is low, indicating time without line power for the present outage.
MBC Motor Speed	Indicates the motor speed as reported from the MBC.
UPS Line / Charging (LED)	Indicates the UPS is in charging mode, using line power to supply loads and any necessary current to the power storage battery.
UPS Inverter (LED)	Indicates the UPS is providing power from the storage battery.
UPS Fault (LED)	Indicates the UPS has faulted.
UPS Battery V+ (LED)	Indicates the UPS senses battery present
UPS Battery Voltage	Indicates the UPS battery voltage available to the UPS.
UPS Inverter Enable (LED)	Indicates the presence of the signal from OptiView to the UPS permitting the UPS to supply power from the battery as needed upon loss of line power.
Line Low Battery Voltage Offset, Inverter Low Battery Voltage Threshold, Line Low Battery Voltage Threshold	These are control setpoints for battery health fault logic.

UPS BATTERY MONITORING

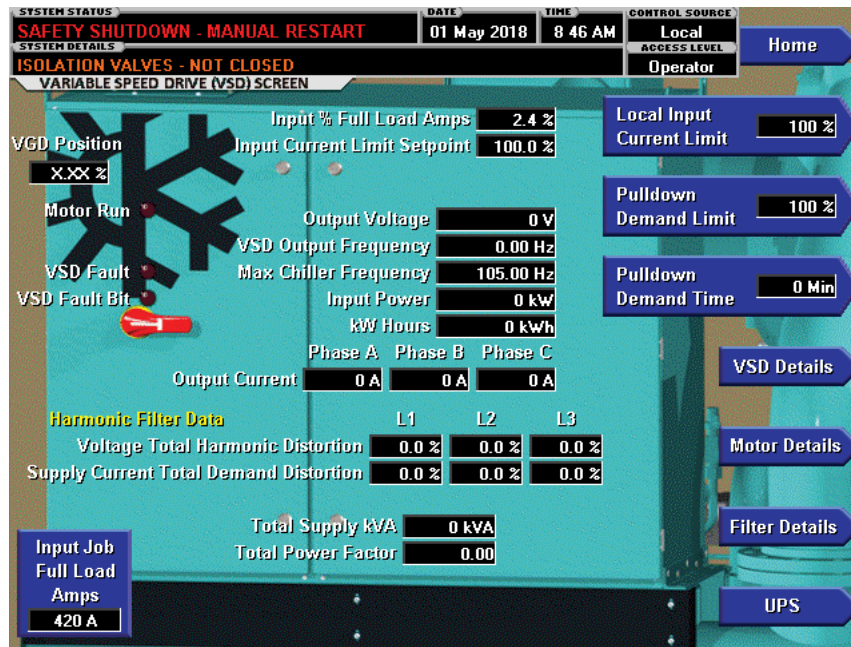
DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Line Low Battery Voltage Offset, Inverter Low Battery Voltage Threshold, Line Low Battery Voltage Threshold	These are control setpoints for battery health fault logic.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Start Battery Test	Operator	Initiates a battery load test. Only applies when chiller is shutdown and manual operation of power supply to the chiller can be performed.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Returns user to HOME Screen
Compressor	Causes an instant return to the Compressor Screen.
VSD	Causes an instant return to the Variable Speed Drive Screen.

**FIGURE 18 - MOTOR - VARIABLE SPEED DRIVE (VSD) SCREEN**

This screen displays information pertaining to the Variable Speed Drive (VSD).

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Motor Run (LED)	Indicates whether the digital output from the controls is commanding the motor to RUN.
VSD Fault (LED)	Indicates the VSD is reporting a fault through the hardwired digital input.
Input % Full Load Amps	Displays the input current as a percentage of the job Full Load Amps (FLA) value, based on the highest phase.
Input Current Limit Setpoint	Displays the input current limit value in use. This value can come from a 4-20mA, 0-10VDC or PWM signal in a Hardwired Remote mode, an SC-Equip or interface in BAS mode, or a locally programmed value.
Pulldown Demand Time Left	Displays the time remaining in the programmed pulldown period if the value is nonzero.
Output Voltage	Displays the output voltage measured to the motor.
VSD Output Frequency	Displays the present output frequency to the motor.
Max Chiller Frequency	Displays the maximum value that the Output frequency is limited to for the chiller, based on configuration.
Input Power	Displays the total input Kilowatts measured by the VSD.
Input kW Hours	Displays the cumulative amount of kilowatts used over time as the VSD motor controller operates.
Output Current (RMS) - Phase A, B, C	Displays the RMS current measured to the motor, per phase.
VGD Position	Displays the variable geometry diffuser position as a value between 0 and 100%.

HARMONIC FILTER DATA

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Voltage Total Harmonic Distortion - (L1, L2, L3)	Displays the Total Harmonic Distortion (THD) for each of the voltage lines as calculated by the VSD.
Supply Current Total Demand Distortion - (L1, L2, L3)	Displays the Total Dynamic Distortion (TDD) for each of the supply current lines as calculated by the VSD.
Total Supply kVA	Displays the supply kVA measured by the VSD.
Total Power Factor	Displays the relationship between the Input Power and the Supply kVA.
Input Job Full Load Amps	Shows the maximum rated input full load amp.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Local Input Current Limit	Operator	Allows the user to specify the maximum allowed input current (as a percentage of job FLA). When the input current reaches this value, the input current override takes effect.
Pulldown Demand Limit	Operator	Allows the user to specify the current limit value (as a percentage of FLA) to which the chiller will be limited during the specified pulldown limit time. This value will override the input Current Limit value during this time period. This function is used to provide energy savings following chiller start-up. Pulldown demand limit is ignored in BAS control source because the BAS system is expected to use its algorithms to reset current limit as required in that operating mode.
Pulldown Demand Time	Operator	Allows the user to set a period of time for which the pulldown demand limit will be in effect after the chiller starts.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Returns user to HOME Screen
Motor Details	Moves to the subscreen which provides more information on the Motor Temperatures and Cooling System.
Filter Details	Moves to a subscreen that shows details on the Harmonic Filter if this option is installed.
UPS	Navigates to the UPS screen which was explained earlier in this manual.



FIGURE 19 - VARIABLE SPEED DRIVE (VSD) DETAILS SCREEN

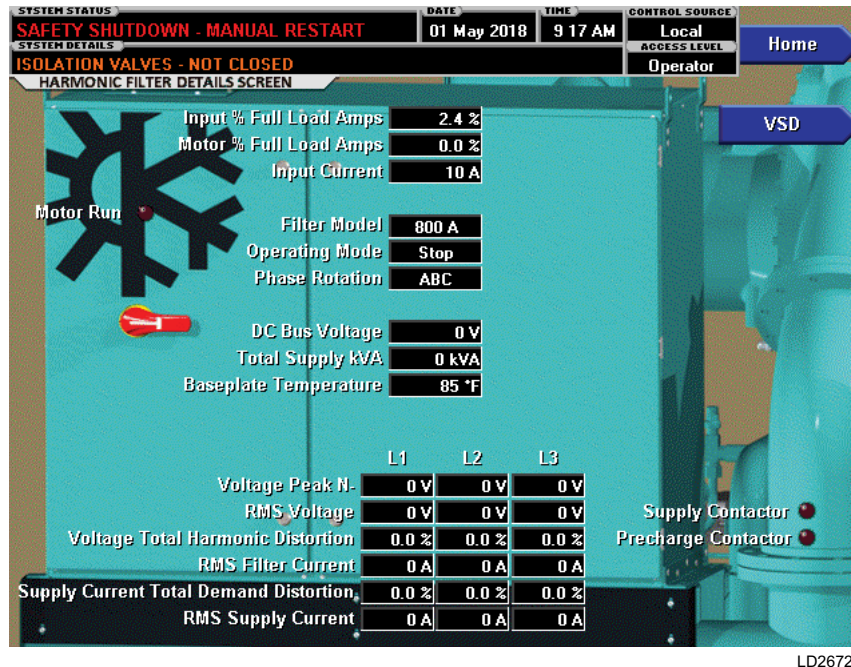
This screen displays more detailed parameters associated with the Variable Speed Drive. This screen also provides a means for a Service Technician to access setpoints for maintenance or service.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Motor Run (LED)	Indicates the digital output from the controls is commanding the motor to RUN.
Input % Full Load Amps	Displays the current draw as a percentage of the unit Full Load Amps.
Motor % Full Load Amps	Displays the current draw as a percentage of the motor Full Load Amps.
Input Current	Displays the Input Current to the VSD.
Motor Full Load Amps	Displays the rated motor FLA.
VSD Model	Displays the VSD model as reported by the VSD.
Water Pump Output (LED)	Indicates the relay controlling the VSD water pump and fans output is energized.
Precharge Relay Output (LED)	Indicates the VSD DC bus has been pre-charged.
Trigger SCR Output (LED)	Indicates the Trigger SCRs are energized.
DC Bus Voltage	Displays the DC Bus voltage.
DC Inverter Link Current	Displays the current draw of the Inverter from the DC Link.
Internal Ambient Temperature	Displays the ambient temperature inside the VSD cabinet as reported by the VSD.
Converter Heatsink Temperature	Displays the highest VSD input rectifier baseplate temperature.
Baseplate Temperature	Displays VSD output inverter baseplate temperatures. When there are multiple power modules per phase, the highest temperature per phase is displayed.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home screen.
VSD	Causes an instant return to the VSD screen

**FIGURE 20 - HARMONIC FILTER DETAILS SCREEN**

This screen displays more detailed parameters associated with the Harmonic Filter.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Motor Run (LED)	Indicates the digital output from the controls is commanding the motor to RUN.
Input % Full Load Amps	Displays the current draw as a percentage of the unit Full Load Amps.
Motor % Full Load Amps	Displays the current draw as a percentage of the motor Full Load Amps.
Input Current	Displays the Input Current to the VSD.
Filter Model	Displays the Filter model as reported by the VSD.
Operating Mode	Displays Run or Stop.
Phase Rotation	Displays rotation sequence of the incoming power.
DC Bus Voltage	Displays the DC Bus voltage for the harmonic filter.
Total Supply kVA	Displays the supply kVA measured by the VSD.
Baseplate Temperature	Displays the highest harmonic filter output inverter baseplate temperature.
Supply Contactor (LED)	Indicates the Supply Contactor is energized.
Precharge Contactor (LED)	Indicates the harmonic filter DC bus has been pre-charged.
Voltage Peak N-	Displays the peak voltage for L1, L2 and L3.
RMS Voltage	Displays the RMS voltage for L1, L2 and L3.
Voltage Total Harmonic Distortion	Displays the percentage of Harmonic Distortion for L1, L2 and L3.
RMS Filter Current	Displays the RMS Filter Current for L1, L2 and L3.
Supply Current Total Demand Distortion	Displays the Supply Current TDD for L1, L2 and L3.
RMS Supply Current	Displays the RMS Supply Current for L1, L2 and L3.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home screen.
VSD	Causes an instant return to the VSD screen

LD26742

FIGURE 21 - SETPOINTS SCREEN

This screen provides a convenient location for programming the most common setpoints involved in the chiller control. This screen also serves as a gateway to a subscreen for defining the setup of general system parameters.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Leaving Chilled Liquid Temperature - Setpoint	Displays the present Active setpoint to which the chiller is operating whether controlled remotely or locally.
Leaving Chilled Liquid Temperature Cycling - Shutdown	Displays the Leaving Chilled Liquid Temperature at which the chiller will shut down to avoid over-cooling LCHLT below setpoint in low load situations.
Leaving Chilled Liquid Temperature Cycling - Restart	Displays the Leaving Chilled Liquid Temperature at which the chiller will restart after it has shut down due to over-cooling temperature.
Leaving Chilled Liquid Temperature Cycling - Shutdown Offset	This Offset is the number of degrees below the Setpoint that the chiller will shut down on Low Leaving Chilled Water Temp.
Leaving Chilled Liquid Temperature Cycling - Restart Offset	This Offset is the number of degrees above the Setpoint that the chiller will restart after cycling off on Low Leaving Chilled Water Temp.
Current Limit Setpoint	Displays the active Input Current Limit setpoint.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Local Input Current Limit	Operator	Allows the user to specify the maximum allowed chiller input current (as a percentage of FLA). When the chiller input current reaches this value, the input current override takes effect.

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Pulldown Demand Limit	Operator	Allows the user to specify the current limit value (as a percentage of Full Load Amps) to which the chiller will be limited during the specified pulldown limit time. This value will override the Input Current Limit value during this time period. This function is used to provide energy savings following chiller start-up. Pulldown demand limit is ignored in BAS control source because the BAS system is expected to use its algorithms to reset current limit as required in that operating mode.
Pulldown Demand Time	Operator	Allows the user to set a period of time for which the pulldown demand limit will be in effect after the chiller starts.
Local Cooling Setpoint	Operator	This value allows the user to define the Leaving Chilled Liquid Temperature that is to be maintained by the chiller. It is programmable over the range of 36.0°F to 72.0 °F (2.2 °C to 22.2 °C) (water) or 10.0°F to 72.0°F (-12.2 °C to 22.2 °C) (brine). Default = 45°F.
Leaving Chilled Liquid Temperature Cycling Offset - Shutdown	Operator	Programmable over the range of 1.0°F to 70.0°F (-17.2 °C to 21.1 °C). Default = 4°F (-15.6 °C).
Leaving Chilled Liquid Temperature Cycling Offset - Restart	Operator	Programmable over the range of 0.0°F to 37.0°F (-17.8 °C to 2.8 °C). Default = 0.0°F (-17.8°C).
Print	Operator	Generates Setpoints print report.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Moves to the subscreen allowing setup of general system parameters.
Remote Control	Navigates to the subscreen allowing setup of the Remote Control BAS interface.

The screenshot displays the 'SETUP SCREEN' of the Optiview control center. At the top, it shows 'SYSTEM STATUS' with 'CYCLING SHUTDOWN - AUTO RESTART', 'SYSTEM DETAILS' with 'WARNING - UPS - NOT CHARGING', and 'SETUP SCREEN'. The top right corner includes 'DATE' (18 Jun 2017), 'TIME' (10 05 AM), 'CONTROL SOURCE' (Local), 'ACCESS LEVEL' (Operator), and a 'Home' button. The main area contains configuration parameters: 'Liquid Type' (Water, R-1233zd), 'Refrigerant Type', 'Isolation Valves' (Disabled, Standard), 'Chilled Liquid Pump Operation', 'Line Voltage' (460V, Disabled), 'Head Pressure Control', 'Line Frequency' (60Hz, Auto), and 'Power Failure Restart'. A vertical sidebar on the right has buttons for 'Schedule', 'User', 'Comms', 'Printer', 'Sales Order', and 'Operations'. At the bottom, there are buttons for 'Present Date', 'Present Time', '12 / 24 hr' (selected), and 'Change Settings'.

LD26743

FIGURE 22 - SETUP SCREEN

This screen is the top level of the general configuration parameters. It allows programming of the time and date, along with specifications as to how the time will

be displayed (12 or 24 hour format). This screen also serves as a gateway to more subscreens for defining general system parameters.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Liquid Type	Displays either Water or Brine as configured by the factory.
Isolation Valves	Displays whether optional Isolation Valves control has been Enabled or Disabled.
Line Voltage	Displays the configured supply line voltage.
Line Frequency	Displays the configured supply line frequency
Refrigerant Type	Shows refrigerant selected at factory level. For YZ chillers it is always R-1233zd.
Chilled Liquid Pump Operation	Displays what mode of operation the chilled liquid pump contacts have been configured to operate. Standard or Enhanced. Enhanced = Pump contacts open at the completion of system coastdown except when the chiller shuts down on Chilled Liquid - Low Temperature, Multi Unit Cycling - Contacts Open and System Cycling - Contacts Open. Standard = Pump contacts open after all shut-downs except Leaving Chilled Liquid - Low Temperature.
Head Pressure Control	Displays Enabled or Disabled to indicate if the optional Head Pressure control feature is being used.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Power Failure Restart	Operator	Allows the user to select Manual or Automatic restart after power failure.
Present Date	Operator	Allows the user to specify the present date. This value is critical to logging system shutdowns accurately and for utilizing the scheduling capabilities. When prompted to enter a date value, the user must enter the day, month, and four-digit year (using leading zeroes as necessary). If within range, the value will be accepted. If out of range, the user is prompted for the information again. At this point the user may retry the date entry, or cancel the programming attempt.
Present Time	Operator	Allows the user to specify the present time. This value is critical to logging system shutdowns accurately and for utilizing the scheduling capabilities. When prompted to enter a time value, the user must enter the hour and minute desired (using leading zeroes as necessary). If the chiller is presently set to 24-hour mode, the time must be entered in the 24-hour format. Otherwise, the user must also select AM or PM for the entered time. If out of range, the user is prompted for the information again. At this point the user may retry the time entry, or cancel the programming attempt.
12/24 Hr	Operator	Allows the user to specify the format in which the time will be presented. This setpoint affects the display of the time on the chiller panel and on all reports generated. The 12-Hour time format will include the AM and PM modifiers and show the range of time between 1:00 and 12:59, while the 24-Hour time format will show the range of time between 0:00 and 23:59.
Change Set-tings	Operator	Used to enter the following setpoints. Pressing this key places a green selection box around the Power Failure Restart setpoint. With the setpoint selected, press the ENTER " ✓ " key. A dialog box appears with the range of settings.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Schedule	Moves to the subscreen allowing definition of the chiller operation schedule.
User	Moves to the subscreen allowing configuration of user preferences such as units of measure and language.
Comms	Moves to the subscreen allowing configuration of system communications.
Printer	Moves to the subscreen allowing configuration and control of printer functions.
Sales Order	Moves to the subscreen displaying the Sales Order in-formation for the chiller system.
Operations	Moves to the subscreen displaying operating parameters of the chiller system such as Run Time, Total Operating Hours and Total Number of Starts.

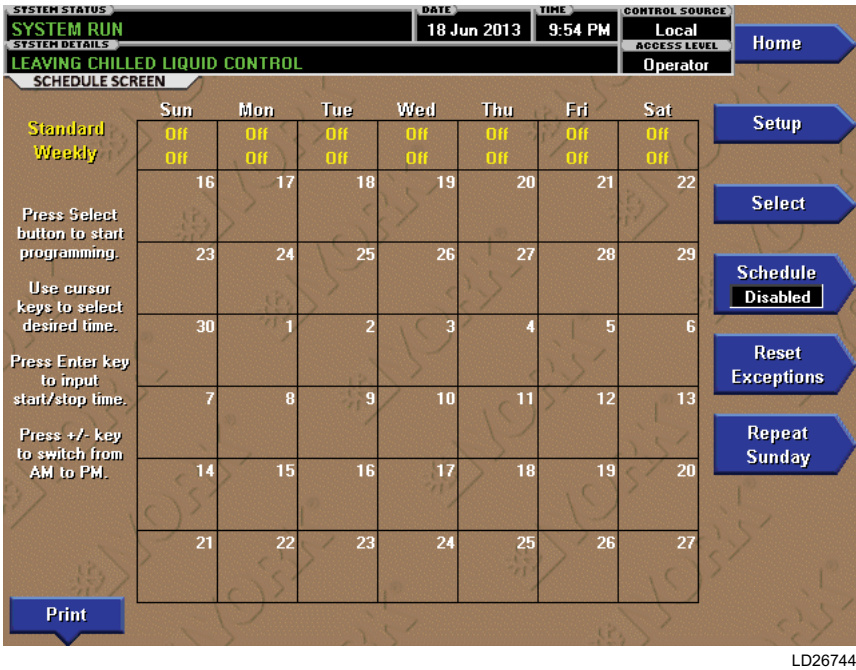


FIGURE 23 - SCHEDULE SCREEN

The schedule screen contains more programmable values than a normal display screen. As such, each programmable value is not linked to a specific button. Instead the **Select** key is used to enable the cursor arrows which are used to highlight the day and the start or stop time the user wishes to modify. At this point the user may press the "✓" (**Check**) key to program the Start / Stop times for that day.

In order for the Start / Stop combination to be utilized, each Start time must have a corresponding Stop time which occurs later in the day. The presently programmed schedule for a given day can be cancelled by setting both the Start time and Stop time to 12:00 AM. If the Start time equals the Stop time (with any time other than 12:00 AM), the chiller is OFF for that day. If the user desires the chiller to operate continuously

through several days, the Stop time of Day 1 can be set to 11:59 PM and the Start time of Day 2 can be set to 12:00 AM. The chiller will not stop but continue to operate until the stop of Day 2.

The user has the ability to define a standard set of Start / Stop times which are utilized every week. The user may then specify *exception* Start / Stop combinations for any day of the week up to 6 weeks in advance. At the end of each week the schedule for the next week is created by combining the standard week definition and the next defined exception week. The schedule is then updated as each of the exception weeks "shifts down", leaving a new, blank exception week in the 6th week slot.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Standard Week Start/Stop Times	Operator	For each day of the week, the user may specify a time for the chiller to start and a time for the chiller to stop. The times specified in this entry week will be used as the default for every week of chiller operation.
Exception Start/Stop Times	Operator	For each day of the month, the user may specify a time for the chiller to start and a time for the chiller to stop. These Start / Stop combinations may be scheduled up to five (5) weeks in advance and also for the present week. As each week goes by, the new schedule will be created for the present week using the Exception specification in combination with the Standard week definition, as described above.
Select	Operator	Places a selection box around a start time for a given day. Use ◀, ▶, ▲ or ▼ cursor arrows to place the box around the desired start or stop time for a given day
Schedule (Enabled / Disabled)	Operator	Allows the user to enable or disable the scheduled starting and stopping of the chiller.
Reset Exceptions	Operator	Deletes all programming for exception days within the next 6 weeks.
Repeat Sunday	Operator	Duplicates the schedule defined for Sunday for the remainder of the standard weekdays.
Print	Operator	Generates a Schedule print report.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.

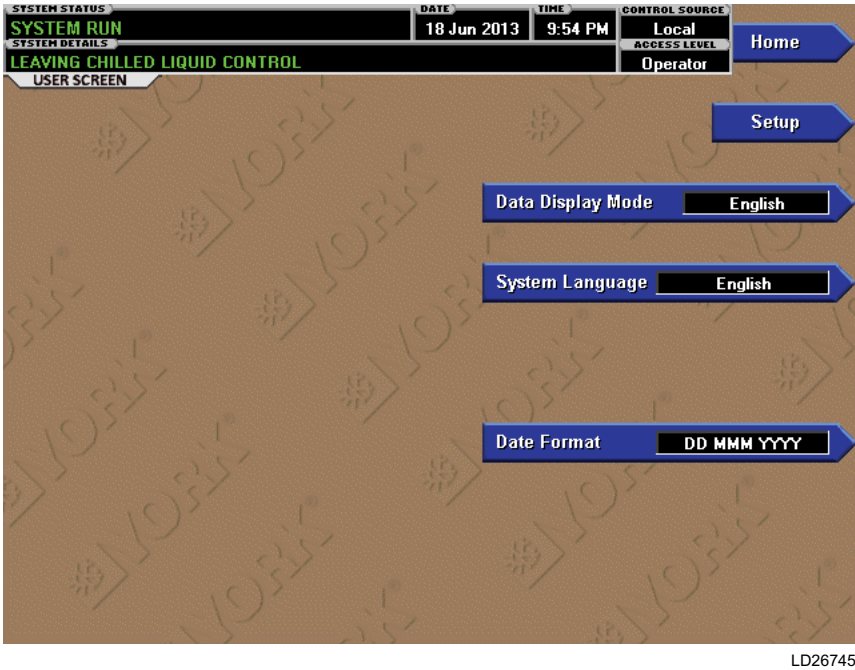


FIGURE 24 - USER SCREEN

This screen allows definition of custom User ID's and matching passwords. This allows the building administrator to assign custom passwords to those who are authorized to maintain the chiller.

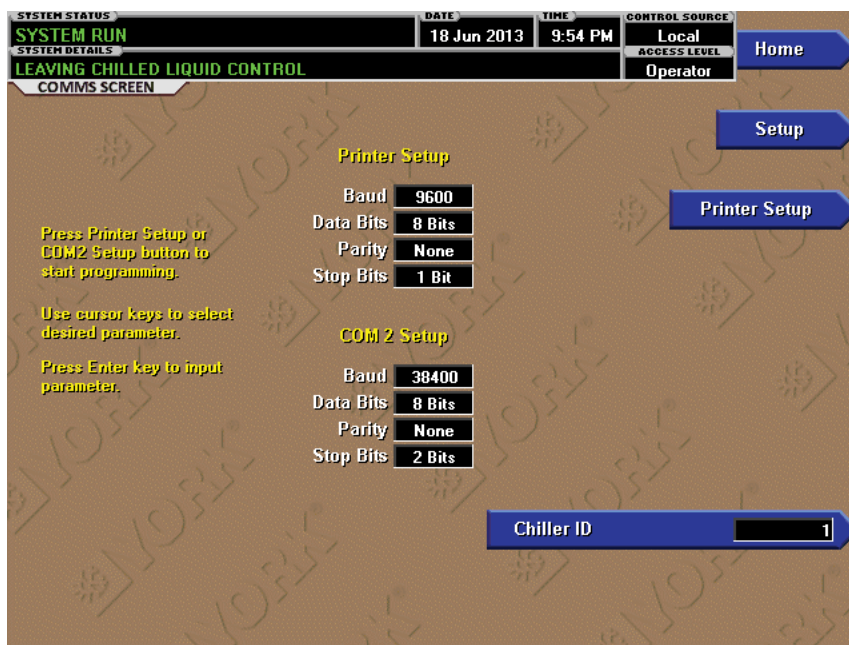
Each Custom User value is not linked to a specific button. Instead, the **Change** button is pressed which enables the cursor arrows which are used to highlight the Custom User parameter the user wishes to modify. At this point the "✓" (**ENTER**) key is pressed and the value may be entered.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
System Language	Operator	Allows the user to define the language for all Screens. The desired language is selected by scrolling through the list of those available. English is the Default language and is selected by pressing the ▲ key when the dialog box appears during the selection process. The selected language will not be displayed until after the user navigates from the USER Screen to another Screen. The selections are: English, French, German, Hungarian, Italian, Japanese, Portuguese, Simplified Chinese, Spanish, Korean, Russian, Turkish and Traditional Chinese.
English / Metric Units	Operator	Define the unit system (English or Metric) used by the chiller display.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.



LD26746

FIGURE 25 - COMMS SCREEN

This screen allows definition of the necessary communications parameters. See *SECTION 6 - PRINTING* of this manual for details on the Printer connections and

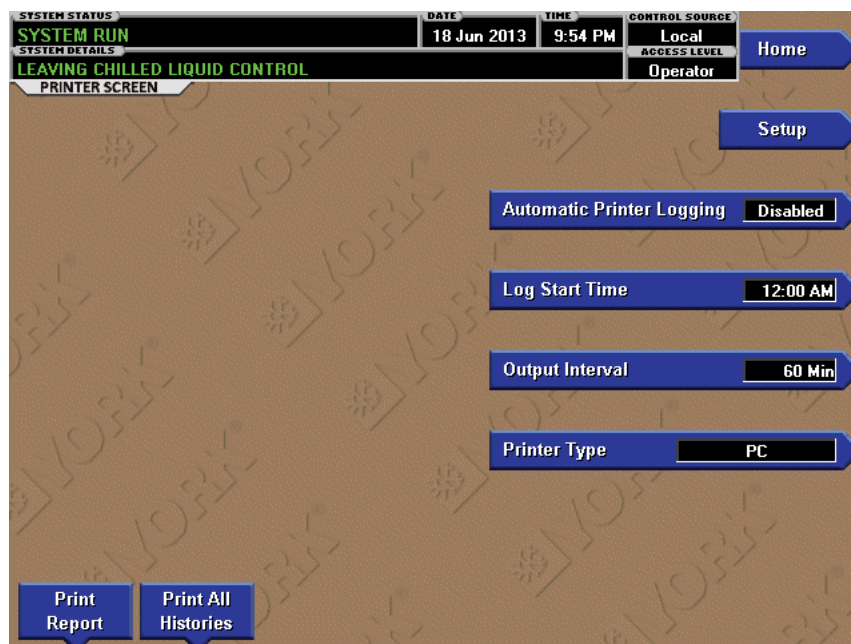
setup. COM 2 communications features are automatically set and can not be adjusted.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Chiller ID	Operator	Define the numeric chiller ID when used within an BAS network of chillers. This ID number is also printed at the top of reports obtained with a local printer.
Printer Setup	Operator	Pressing either key places a green selection box around the first changeable parameter. Use the ▲ and ▼ keys to place the selection box around the desired parameter to be changed. With the selection box around the desired parameter, press the ENTER "✓" key. A dialog box is displayed permitting data entry.
Printer Baud Rate	Operator	Define the baud rate at which the panel shall communicate to the printer.
Printer Data Bit(s)	Operator	Define the number of data bits with which the panel shall communicate to the printer.
Printer Parity Bit(s)	Operator	Define the number of parity bits with which the panel shall communicate to the printer.
Printer Stop Bit(s)	Operator	Define the number of stop bits with which the panel shall communicate to the printer.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.



LD26747

FIGURE 26 - PRINTER SCREEN

This screen allows definition of the desired printer type and print interval.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Time Remaining Until Next Print	Displays the time until the next print log will occur, if the function is enabled.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Automatic Printer Logging (Enabled/Disabled)	Operator	Enable the printer to begin printing status reports beginning at the programmed start time and recurring at the interval defined above.
Log Start Time	Operator	Set the time at which scheduled print logs will begin.
Output Interval	Operator	Define the interval at which log printing will occur.
Printer Type	Operator	Define the printer type connected to the chiller system.
Print Report	Operator	Select the report type to print when the Print Report key is selected. This can vary from Status report (present system parameters), Setpoints report (present value of the system setpoints), Schedule report (present value of the system schedule times), or a Sales Order Data report (information provided on the Sales Order screen), list of Slot Numbers or a Custom Data report. A print report is generated upon completion of selection.
Print All Histories	Operator	Generate a report of the system data at the time of all stored shutdowns.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.

SYSTEM STATUS
CYCLING SHUTDOWN - AUTO RESTART

DATE
18 Jun 2017

TIME
10:06 AM

CONTROL SOURCE
Local

ACCESS LEVEL
Operator

Home

SYSTEM DETAILS
MBC - INITIALIZATION IN PROGRESS

SALES ORDER SCREEN

Order Information

Commissioning Date 00 000 0000

Job Name

Job Location

Model Number YZ-MA033AN030A

York Order Number

Panel Serial Number

Chiller Serial Number

Nameplate Information

Motor Code

Volts

Phases

Frequency (Hz)

LRA

Full Load Amps

Inrush Amps

Design Load

Evaporator

Condenser

Passes

Water Box Press (PSIG)

Fouling (hr-ft²/F/Btu)

Pressure Drop (ft)

Nozzle Arrangement In

Nozzle Arrangement Out

Leaving Liquid (°F)

Entering Liquid (°F)

Flow (GPM)

Tube Code

System Information

Refrigerant

Capacity (Tons)

Gear Code WR

Liquid Type

Brine Percent

VSD/SSS/EM

Kilowatts Input

Print

Setup

LD26748

FIGURE 27 - SALES ORDER SCREEN

This screen displays the sales order parameters. The Commissioning date is entered by the YORK/Johnson Controls Service Technician at the time of chiller com-

missioning. These values should never be changed or entered by anyone other than a qualified Service Technician. The remainder of the values are entered at the YORK Factory during the manufacturing of the chiller.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Commissioning Date	Define the date at which the chiller was commissioned.
Job Name and Location	Factory defined job name and location the chiller is destined for.
Model Number	Factory defined model number of the chiller system.
YORK Order Number	Factory defined order number under which the chiller was sold.
Panel Serial Number	Factory defined serial number for the control panel.
Chiller Serial Number	Factory defined serial number for the chiller system.
Evaporator and Condenser Passes	Factory defined number of passes.
Evaporator and Condenser Water Box Press	Factory defined Water Box Pressure rating.
Evaporator and Condenser Pressure Drop	Factory defined Pressure drop across the shell.
Evap and Cond Nozzle Arrangement	In Factory defined inlet nozzle arrangements.
Evap and Cond Leaving Liquid	Factory defined design Leaving Liquid Temperature.
Evap and Cond Entering Liquid	Factory defined design Entering Liquid Temperature.
Evap and Cond Flow	Factory defined design Flow Rates
Evap and Cond Tube Code	Factory defined Tube Codes.
Motor Code	Factory defined Motor Code.

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Volts	Factory defined motor line Voltage.
Phases	Factory defined number of line Phases.
Frequency	Factory defined line Frequency.
LRA	Factory defined motor Locked Rotor Amps.
Full Load Amps	Factory defined motor Full Load Amps.
Inrush Amps	Factory defined motor Inrush Amps
Refrigerant	Factory defined type of Refrigerant.
Capacity	Factory defined chiller Tonnage.
Gear Code	Factory defined compressor Gear Code.
Liquid Type	Factory defined Liquid Type Water or Brine.
Brine Percent	Factory defined Percent Brine solution if applicable.
VSD/SSS/EM	Factory defined type of Starter. (VSD).
Kilowatts Input	Factory defined design Input KW.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Print	Operator	This generates a listing of the Sales Order data.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.

SYSTEM STATUS
CYCLING SHUTDOWN - AUTO RESTART

DATE 18 Jun 2017 **TIME** 12 11 PM **CONTROL SOURCE** Remote

SYSTEM DETAILS
VGD ACTUATOR - SERIAL COMMUNICATIONS

ACCESS LEVEL Operator

OPERATIONS SCREEN

Johnson Controls North America
1-800-861-1001

Run Time
0 Days
0 Hr
0 Min

Number of Starts 4

Operating Hours 0

Buttons: Home, Setup, Remote Control

LD26749

FIGURE 28 - OPERATIONS SCREEN

This screen allows definition of general parameters having to do with the operation of the chiller. This screen also displays the Johnson Control Service telephone number.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Run Time	Displays the amount of time the chiller has been running since the last start signal was received. Value is reset to zero when the chiller enters Coastdown. It remains at zero while shutdown and during "MBC Startup". Displays in Days, Hours and Minutes.
Number of Starts	Displays the total number of the starts the chiller has initiated.
Operating Hours	Displays the total accumulated run time of the chiller.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.
Remote Control	Navigates to the Remote Control Screen.

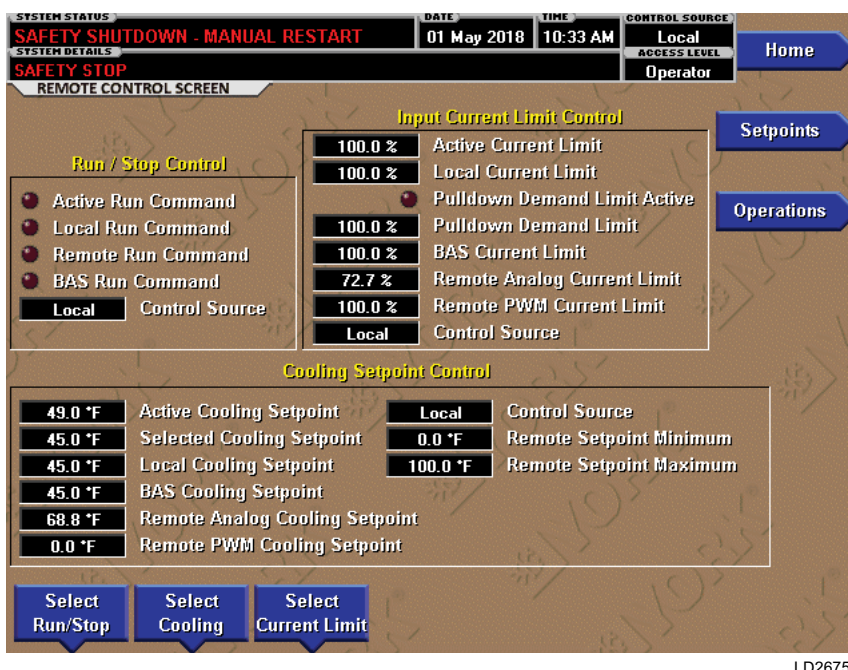


FIGURE 29 - REMOTE CONTROL SCREEN

This screen allows the user to independently select the method of control for Run/Stop, Cooling Setpoint and Current Limit Setpoint. This gives complete flexibility for the control interface. *Refer to YZ Field Control Modification 161.01-PW2* for more information on BAS interface specifics.

- In Local mode the chiller will control to the Local Setpoint.
- In BAS mode a Building Automation System may communicate the Setpoint via an optional SC-EQ communication card.
- In Hardwire, 0-10V, 4-20mA or PWM, the BAS interface uses hardwired control signals.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Select Run/Stop	Operator	Upon pressing the Select Run/Stop button the user may then choose the source for Run/Stop control of the chiller. Local, BAS or Hardwire. Default = Local
Select Cooling	Operator	Upon pressing the Select Cooling button the user may then choose the source of the chiller Cooling Setpoint. Local, BAS, 0-10V, 4-20mA, PWM. Default = Local.
Select Current Limit	Operator	Upon pressing the Select Current Limit button the user may then choose the source for Current Limit Setpoint of the chiller. Local, BAS, 0-10V, 4-20mA or PWM. Default = Local..

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Setup	Return to the previous Setup Screen.
Operations	Returns to the Operations Screen.



FIGURE 30 - HISTORY SCREEN

This screen allows the user to browse through the faults. In order to get a more thorough reporting of the system conditions at the time of the recorded shutdown, move to the History Details subscreen.

The user may use the **Select Fault** button to select the history to view. At this point the **View Details** button

is used to jump to a subscreen containing stored chiller parameters values at the time of the shutdown. Additionally, the **Print History** button can be used to generate a hard-copy report of the parameter values at the time of the shutdown.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Last Normal Shutdown	This window displays the date and time and the description of the last normal shutdown. A normal shutdown is defined as: - Local (Soft Stop Button) - Remote (Hardwire or BAS)
Last Fault While Running	This window displays the date and time and the description of the last safety or cycling shutdown while the system was running.
Last Fifty Faults	This window displays a chronological listing (most recent first) of the date and time and the description of the last 50 safety or cycling shutdowns that occur while the system is running or stopped.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Select Fault	Operator	Allows the user to select which type of faults to display. Normal, Running or #1 through #10 of the presently displayed faults.
Page Up	Operator	Scrolls up 10 faults on the display.

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Page Down	Operator	Scrolls down 10 faults on the display.
View Details	Operator	Causes a move to a subscreen containing the values of select chiller parameters at the time of the associated shutdown
Print History	Operator	This generates a report listing the status of the chiller parameters at the time of the selected shutdown.
Print All Histories	Operator	This generates a report listing the status of the chiller parameters at the time of each of the stored shutdowns.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Trending	Causes a move to a subscreen allowing the user to view trending data on selected chiller parameters.
Custom View	Causes a move to a subscreen allowing the user to view the Custom Setup Screen.



FIGURE 31 - HISTORY DETAILS SCREEN

This screen allows the user to see an on-screen printout of all the system parameters at the time of the selected shutdown. Not all screens are shown above. The number of screens required to display all of the data varies according to type of motor starter and options applied.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
History Printout	This is the on-screen printout of the system parameters at the time of the fault.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Page Up / Page Down	Operator	Scroll up in the displayed data (if applicable).
Print History	Operator	This generates a report listing the status of the chiller parameters at the time of the selected shutdown.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
History	Causes a return to the History Screen.

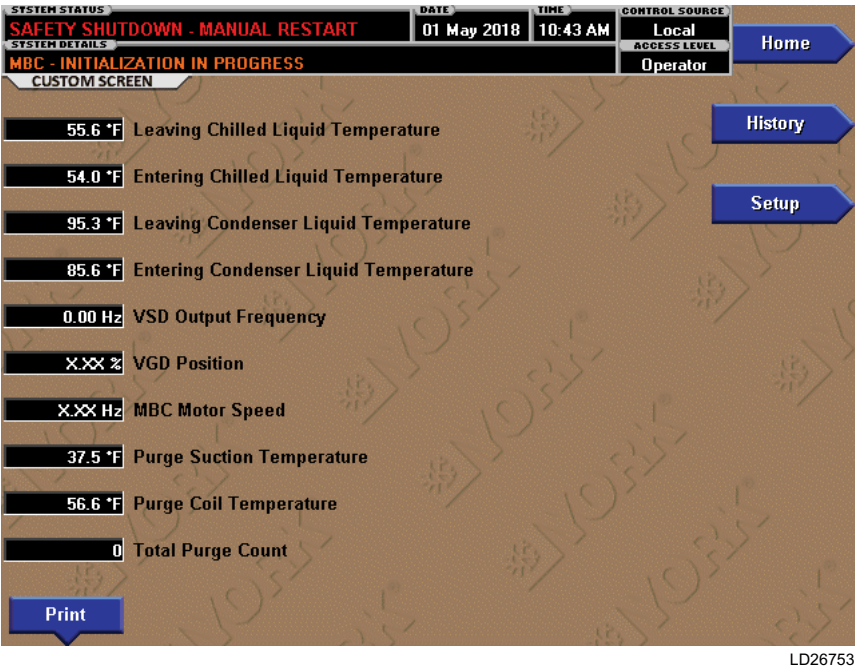


FIGURE 32 - CUSTOM SCREEN

This screen allows up to 10 Service Technician selected parameters to be displayed. These parameters are selected from the slot list on the Custom View Setup Screen. This allows the Service Technician to display

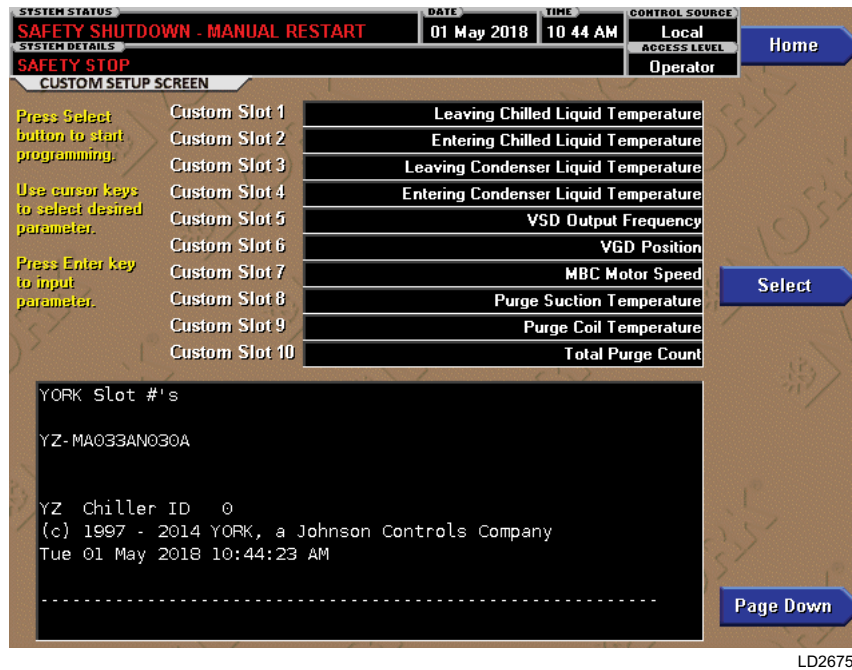
parameters pertinent to a particular problem during troubleshooting. At completion of the service call, the display can be cleared or the parameters can be left there for monitoring by operations personnel.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Print	Operator	This generates a listing of the parameters displayed on this screen.

NAVIGATION

NAVIGATION		
BUTTON	ACCESS LEVEL	DESCRIPTION
Home	View	Causes an instant return to the Home Screen.
History	View	Causes an instant return to the History Screen.
Setup	Operator	Causes a jump to the subscreen where the parameters to be displayed on the custom screen are selected.



LD26754

FIGURE 33 - CUSTOM SETUP SCREEN

This screen allows the Service technician to select up to 10 parameters for display on the Custom View Screen.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Slot Numbers	Lists the available parameters that can be displayed. The desired parameters for display are selected from this list.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Page Up	Operator	Scroll up through list of available parameters.
Page Down	Operator	Scroll down through list of available parameters.
Select	Operator	First use the Page Up and Page Down keys to scroll through the Slot Numbers list and note the number of the parameter(s) to be displayed. Pressing the Select key places a green colored selection box around Custom Slot 1. If it is desired to change an already entered parameter, use the 5 and 6 keys to place the selection box around the slot number to be changed. With the selection box around the slot number to be changed or entered, press the ENTER (✓) key. A dialog box is displayed permitting data entry. Using the numeric keypad keys, enter the desired slot number and press the ENTER (✓) key.
Custom Slot (1-10)	Operator	Use the Select key and numeric keypad keys as described above and enter the slot number from Slot Numbers list. Setting the Slot number to zero clears the display of this slot number.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Custom View	Causes a return to the custom view screen.

**FIGURE 34 - TREND SCREEN**

As many as six Operator selected parameters (data points) can be plotted in an X/Y graph format. The X-axis is scaled per the selected Data Collection Interval and displayed in a time of day or elapsed time format, as selected with the X-axis toggle key. The Y-axis is scaled for each parameter per the selected minimum and maximum value for each parameter. Analog parameters are scaled in pressure, temperature, volts, amps, hertz or time. Digital on/off parameters are scaled as zero (off) and one (on). Only one Y-axis label is displayed at a time. The Y-axis Toggle Key is used to toggle the Y-axis labels through the different parameters. The Y-axis label that is being displayed is identified at the top of the graph. For identification, each plotted parameter and associated Y-axis labeling is color coordinated.

The parameters are sampled at the selected Data Collection Interval and plotted using 450 data points across the X-axis. If the actual value of the sampled parameter is less than the Y-axis label minimum for that parameter, the value will be plotted at the minimum value. Similarly, if the actual value is greater than the Y-axis label maximum for that parameter, the value will be plotted at the maximum value.

There are three types of charts that can be created:

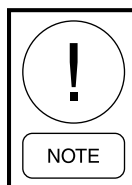
- One screen
- Continuous
- Triggered

When plotting reaches the end of the X-axis, and one screen is selected, trending stops and data is frozen. If continuous is selected, the oldest data is dropped from the left-hand side of the graph at the next collection interval. Thereafter, the oldest data is dropped from the left hand-side of the graph at each data collection interval. If triggered is selected, data collection can be set to start or stop based upon the selected trigger action (START or STOP). If START is selected, data collection will not begin until the Triggers have been satisfied and any selected trigger delay has elapsed. Data collection will stop at the completion of one screen of data similar to the one screen. If STOP is selected, data collection will not stop until the Triggers have been satisfied and any selected trigger delay has elapsed.

If a power failure occurs while the trending is running, the trending is stopped. Upon restoration of power, the last screen of data that was collected will be displayed on the trending screen. The START key must be pressed to initiate a new trend screen.

DISPLAY ONLY FIELDS

This screen allows the user to view the graphical trending of the selected parameters and is also a gateway to the graph setup screens.



*A red screen displaying **TREND MAX MUST BE > TREND MIN** will appear if the Y-Axis minimum has been programmed to a value that is greater than the Y-Axis maximum for any parameter. If this appears, proceed to the Trend Setup Screen to change the values.*

3

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Start	Operator	Pressing this key clears the graph, starts a new graph, sets the time of day to the present clock time and begins the trending. This key is only available if trending is stopped. If the selected Chart Type is TRIGGERED and TRIGGER ACTION is set to START, data collection will not begin until the Triggers have been satisfied and any selected TRIGGER DELAY has elapsed. Otherwise, data collection will begin immediately.
Stop	Operator	Pressing this key stops the trending. The trend data is frozen on the display until another graph is started with the START key. The STOP key is only available if trending is running.
Print	Operator	Allows the data on the trend screen to be printed in tabular format. If set to EXISTING, a snapshot of the data presently on the screen is sent to the printer. If set to NEW, all data collected after pressing this key will be sent to the printer as it is collected. If set to DISABLED, no data is sent to the printer.
Data Select	Operator	Allows the user to display all trended data points simultaneously or select a single trended data point for display, hiding the other data points. Selections are ALL DATA or DATA POINT X (1-6).
Y-Axis	Operator	This key toggles the Y-Axis labels of the graph. Each key press changes the label to another of the selected parameters.
X-Axis	Operator	This key toggles the X-Axis labels of the graph. Each key press alternates the scaling between time of day and elapsed time. The Time of Day scaling is in 24-hour format. The Elapsed Time scaling is the time elapsed since the START key was pressed, starting the trending.

NAVIGATION

NAVIGATION		
BUTTON	ACCESS LEVEL	DESCRIPTION
Home	View	Causes an instant return to the Home Screen.
History	View	Causes an instant return to the History Screen.
Trend Setup	Operator	Only displayed if the trending is stopped. Causes a jump to a subscreen for configuring the trending display.

SYSTEM STATUS: CYCLING SHUTDOWN - AUTO RESTART
SYSTEM DETAILS: DATE: 20 Jun 2017 TIME: 5:50 PM CONTROL SOURCE: Remote
ACCESS LEVEL: Operator
MBC - INITIALIZATION IN PROGRESS
TREND SETUP SCREEN

Data Point	Slot	Value
Data Point 1	Slot	Not Assigned
Data Point 2	Slot	Not Assigned
Data Point 3	Slot	Not Assigned
Data Point 4	Slot	Leaving Chilled Active Setpoint
	Minimum	0.0 °F
	Maximum	100.0 °F
Data Point 5	Slot	Condenser Refrigerant Level
	Minimum	0.0 %
	Maximum	100.0 %
Data Point 6	Slot	Leaving Chilled Liquid Temperature
	Minimum	0.0 °F
	Maximum	100.0 °F

Press Select button to start programming. Use cursor keys to select desired parameter. Press Enter key to input parameter.

LD26756

FIGURE 35 - TREND SETUP SCREEN

This screen is used to configure the trending screen. The parameters to be trended are selected from the Common Slots Screen or Common Slots Master list and entered as Slot Numbers for Data Points 1 through

6. The Y-Axis minimum and maximum values for each parameter are entered as Data Point Min and Data Point Max for Data Points 1 through 6. The interval at which all the parameters are sampled is selected as the Data Collection Interval.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Chart Type	Operator	Selects CONTINUOUS, ONE SCREEN or TRIGGERED. When the Chart Type is set to Triggered, the Triggers button will be displayed providing access to the Advanced Trend Setup Screen.
Collection Interval	Operator	Selects the interval at which the parameters are sampled. There are 450 data points displayed across the X-Axis of the graph. Each point represents the instantaneous value of the parameter. The user selects the time interval between these points. This is called the DATA COLLECTION INTERVAL, or the interval at which the parameter is sampled. This interval is programmable over the range of 1 second to 3600 seconds (1 hour), in one second increments. The selected interval not only determines the sample interval, but also the full screen time display. The full screen time display is a result of the selected interval in seconds, multiplied by the 450 data points. To select the desired Data Collection Interval: - Determine the desired time interval (in seconds), between data samples. - Calculate the full screen time display as follows: $450 \times \text{Data Collection Interval} = \text{full screen seconds}$ $\text{full screen seconds} / 60 = \text{full screen minutes}$ $\text{full screen minutes} / 60 = \text{full screen hours}$ $\text{full screen hours} / 24 = \text{full screen days}$ - Decide if the resultant sample interval and full screen display meet the requirements. If not, select a different sample interval.

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Select	Operator	This key is used to enter the slot numbers and the minimum and maximum Y-Axis values of each parameter to be trended. Pressing this key places a yellow box around Data Point 1 Slot Number. Use the ▲ and ▼ navigation keys to place the box around the value of Data Points 1 through 6 to be changed. With the desired value selected, press the "✓" ENTER key. A dialog box is displayed permitting data entry.
Data Point Slot # (1-6)	Operator	Use the SELECT key as described above and enter the slot number from the Common Slots Screen or Master Slot Number List of the desired parameter to be trended. The selected parameter description will be displayed for the Data Point. Setting this slot number to zero will disable trending for that particular Data Point. Any or all points can be disabled.
Data Point Min (1-6)	Operator	Only displayed if the Associated Slot Number is not Zero. This is the minimum value displayed for the Y-Axis. Selecting a parameter for a Data Point sets this to the default value, which is the lowest value allowed for that parameter. It can be changed to a value that provides a more appropriate resolution for the parameter being monitored. To change, use the SELECT key as described above and enter the desired value. The value must always be set to a value less than the Data Point Max. Otherwise, a red graph is displayed on the Trend Screen with the words TREND MAX MUST BE > TREND MIN. If the parameter selected for this data point is a digital type (on/off), this value must be set to zero (0). Zero indicates the OFF state.
Data Point Max (1-6)	Operator	Only displayed if the associated slot number is not zero. This is the maximum value displayed for the Y-Axis. Selecting a parameter for a Data Point sets this to the default value, which is the highest value allowed for that parameter. It can be changed to a value that provides a more appropriate resolution for the parameter being monitored. To change, use the SELECT key as described above and enter the desired value. The value must always be set to a value greater than the Data Point Min. Otherwise, a red graph is displayed on the Trend Screen with the words TREND MAX MUST BE > TREND MIN. There are 20 Y-Axis divisions. If a MIN-MAX span is selected that is not evenly divided by 20, the Program will automatically select the next higher MAX value that makes the span evenly divided by 20. For example, if 0.0 is selected as the MIN and 69.0 is selected as the MAX, the Program will insert 70.0 as the MAX value. If the parameter selected for this data point is a digital type (on/off), this value must be set to one (1). One indicates the on state.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes a return to the Home Screen.
Trending	Causes a return to the Trending Screen.
Slot Numbers	Causes a jump to a subscreen that lists the slot numbers of the most commonly monitored parameters. The desired parameters to be plotted are selected from this screen.
Triggers	Causes a jump to the Advanced Trend Setup Screen, where the start/stop Triggers can be setup. Only displayed if TRIGGERED has been selected as Chart Type.

SYSTEM STATUS: SYSTEM RUN
SYSTEM DETAILS: LEAVING CHILLED LIQUID CONTROL
ADVANCED TREND SETUP SCREEN

DATE: 01 May 2018
TIME: 1:55 PM
CONTROL SOURCE: Local
ACCESS LEVEL: Operator

Home

Trend Setup

Primary Trigger

Primary Operator

Primary Test

Trigger Action

Trigger Delay

If Leaving Chilled Liquid Temperature
is < 45.0 °F
AND
Evaporator Pressure
is <= 55.0 PSIG
then Stop the data collection
with a delay of 0 Days 0 Hr 5 Min 0 Sec

Primary to Secondary Operator
Secondary Trigger
Secondary Operator
Secondary Test

LD26757

FIGURE 36 - ADVANCED TREND SETUP SCREEN

The desired data collection start/stop triggers are setup on this screen. The trend data collection can be set to start or stop based upon the status of up to two selected Triggers.

The Triggers can consist of digital events or analog parameters compared to thresholds. The Triggers can be used individually or in combination. The digital and analog parameters are selected from the Common Slots Screen (or Master Slot Numbers List in this manual).

The parameter selected as the Primary Trigger is compared to a value selected as the Primary Test, using the Primary Operator as a comparator. If it is evaluated as true, then the data collection is started or stopped (after any selected Trigger delay) per the selected Trigger Action.

A Secondary Trigger can be evaluated with the Primary Trigger to start/stop data collection. The Primary to Secondary Operator is used to define the Trigger combinations required to be true to start/stop data collection. The Secondary Trigger is setup and evaluated the same as the Primary Trigger.

Entry fields are as follows:

If *Primary Trigger*
Is *Primary Operator Primary Test*

Primary to Secondary Operator

Secondary Trigger
Is *Secondary Operator Secondary Test*

Then *Trigger Action* the Data Collection
With a delay of *Trigger Delay*

After the desired Triggers are set, the START key on the TREND Screen must be manually pressed before the triggers will be evaluated. While waiting for the triggers to start or stop data collection, a status message is displayed in the upper right corner of the TREND Screen describing the pending action.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Primary Trigger	Operator	Selects the first parameter to be evaluated. Selection is made from the Slot Numbers listing on the Trend Common Slots Screen or the Master Slot Numbers List in this manual. Setting this slot number to zero disables the Primary Trigger.
Primary Operator	Operator	Selects the comparator for the Primary Trigger's relationship to the Primary Test. If the Primary Trigger is an analog value, selections are: <, <=, =, >=, >. If the Primary Trigger is a digital event, selections are: Equal To, Not Equal To.
Primary Test	Operator	Selects the value or condition that the Primary Trigger is compared to. Selection ranges from the Primary Trigger minimum value to the Primary Trigger maximum value.
Trigger Action	Operator	Selects whether the trend data collection will Start or Stop when the Trigger comparisons are true. If set to Start, data collection will stop after one screen of data is collected
Trigger Delay	Operator	Allows the data collection start or stop to be delayed after the Triggers evaluate as true. The delay is selectable from 1 to 864000 seconds (10 days). Display is in days, hours, minutes and seconds. The delay timer begins when the triggers evaluate as true. If the Trigger Action is set to Start, data collection will begin after the triggers evaluate as true and the delay timer has elapsed. If the Trigger Action is set to Stop, data collection will stop after the Triggers evaluate as true and the delay timer has elapsed.
Primary to Secondary Operator	Operator	Selects whether the Primary Trigger, Secondary Trigger or both have to be true in order to start or stop data collection. Selections are AND, OR, XOR and None. If NONE is selected, the Secondary Trigger is disabled. Data collection will start/stop (as selected with Trigger Action): • If AND is selected: Both Primary AND Secondary are true • If OR is selected: Either Primary OR Secondary (or both) are true • If XOR is selected: Either Primary OR Secondary (but not both) are true
Secondary Trigger	Operator	Selects the second parameter to be evaluated. Selection is made from the Slot Numbers listing on the Trend Common Slots Screen or the Master Slot Numbers List in this manual. Setting this slot number to zero disables the Secondary Trigger.
Secondary Operator	Operator	Selects the comparator for the Secondary Trigger's relationship to the Secondary Test. If the Secondary trigger is an Analog value, selections are: <, <=, =, >=, >. If the Secondary Trigger is a digital event, selections are: Equal To, Not Equal To.
Secondary Test	Operator	Selects the value or condition that the Secondary Trigger is compared to. Selection ranges from the Secondary Trigger minimum to the Secondary Trigger maximum.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes a return to the Home Screen.
Trend Setup	Causes an instant return to the Trend Setup Screen.



LD26758

FIGURE 37 - COMMON SLOTS SCREEN

This screen displays the slot numbers of the commonly monitored parameters. The slot numbers for the remainder of the available parameters are listed on the Master Slot Numbers List that follows.

From these lists, select up to six parameters to be trended. Return to the Trend Setup Screen and enter the parameters Slot Numbers into Data Points 1 through 6.

DISPLAY ONLY FIELDS

DISPLAY ONLY FIELDS	
FIELD/LED NAME	DESCRIPTION
Slot Numbers	These are the slot numbers of the most commonly used parameters.

PROGRAMMABLE

PROGRAMMABLE		
BUTTON	ACCESS LEVEL	DESCRIPTION
Page Down	Operator	Scroll down in the displayed data.
Page Up	Operator	Scroll up in the displayed data.
Print	Operator	Generates a list of the slot numbers of the available parameters.

NAVIGATION

NAVIGATION	
BUTTON	DESCRIPTION
Home	Causes an instant return to the Home Screen.
Trend Setup	Causes a return to the Trend Setup Screen.

MASTER SLOT NUMBERS LIST FOR USE WITH TREND FEATURE

SLOT #	DESCRIPTION
SYSTEM	
256	Chiller Operating State
259	Safety Relay
260	Cycling Relay
261	Warning Relay
262	Operating Hours
264	Number Of Starts
267	Remote Ready To Start
1925	Local Run Command
EVAPORATOR	
1792	Leaving Chilled Liquid Temperature
1793	Temperature Differential
1794	Chilled Liquid Flow Switch
1795	Chilled Liquid Pump
1807	Entering Chilled Liquid Temperature
1808	Evaporator Pressure
1809	Evaporator Saturation Temperature
1810	Evaporator Small Temp Difference
1812	Evaporator Refrigerant Temperature
1813	Active LCHLT Setpoint
CONDENSER	
2048	Leaving Condenser Liquid Temperature
2049	Condenser Liquid Flow Switch
2050	Condenser Liquid Pump
2051	Entering Condenser Liquid Temperature
2052	Condenser Pressure
2053	Condenser Saturation Temperature
2054	Condenser Small Temperature Difference
2056	Condenser Refrigerant Temperature
2057	High Pressure Switch
2059	Subcooling Temperature
2061	Drop Leg Refrigerant Temperature
2056	Condenser Refrigerant Temperature
COMPRESSOR	
1296	Discharge Temperature
1299	Discharge Superheat
17748	Discharge Superheat Limiting Allowed
17750	Discharge Superheat Limit Threshold
18397	Adjusted Discharge Superheat
HOT GAS	
8231	HGBP COMMAND

SLOT #	DESCRIPTION
SURGE	
8236	ACC Surge Detected
8238	Surge Avoidance Count
8319	Surge Avoidance Surge Detected
CONDENSER REFRIGERANT LEVEL CONTROL	
8206	Condenser Refrigerant Level
17715	Condenser Active Level Setpoint
17716	Condenser Level Control State
17718	Condenser Level Control Valve Command
2072	Subcooler Effectiveness
VARIABLE GEOMETRY DIFFUSER	
8354	VGD Shutdown Command
8355	VGD Fault Code
8358	Stroke Calibration Complete
8359	VGD Stroke Calibration Command
17408	Discharge Pressure
18135	Mach Number
VARIABLE SPEED DRIVE	
2305	Motor Run
3047	VSD Fault
20823	Input % Full Load Amps
2306	Motor % Full Load Amps
2818	Input Power
2819	kW Hours
2820	DC Bus Voltage
2821	DC Inverter Link Current
2822	Output Frequency
2823	Output Voltage
2824	Phase A Output Current
2825	Phase B Output Current
2826	Phase C Output Current
2828	Trigger SCR Output
2829	Water Pump Output
2833	Internal Ambient Temperature
2834	Converter Heatsink Temperature
2835	Phase A Heatsink Temperature
2836	Phase B Heatsink Temperature
2837	Phase C Heatsink Temperature
3047	VSD Fault

SLOT #	DESCRIPTION
CAPACITY CONTROL	
18273	Control State
18280	Load Limit
18122	VSD Frequency Command
20825	VSD Output Frequency
18093	Active Anti-Surge Minimum Frequency
18300	VGD Command
18983	VGD Position
18023	HGBP Command
18058	Head Pressure
18288	Speed of Sound
18289	Isentropic Head
18290	Omega
18291	Surge Mach
18332	Anti-Surge Transient Offset
18292	Surge Frequency
18293	Anti-Surge Minimum Frequency
18042	Evaporator Pressure Override Threshold
18041	Condenser Pressure Override Threshold
20822	Input Current Override Threshold
2981	ACC Surge Sensitivity
3004	VSD Start Frequency
3005	Mapping Enable
3006	Quick Ramp Current Threshold
2849	ACC Surge Count
MOTOR COOLING	
20994	Motor Winding Phase A1 temperature
20996	Motor Winding Phase B1 temperature
20998	Motor Winding Phase C1 temperature
20995	Motor Winding Phase A2 temperature
20997	Motor Winding Phase B2 temperature
20999	Motor Winding Phase C2 temperature
19148	Average Winding Temperature
8751	Motor Housing Temperature
8707	Motor Housing Temperature Setpoint
8752	Motor Winding Temperature Setpoint
8723	Ambient Dew Point Temperature
8708	Motor Cooling Valve Command
8710	Motor Cooling Control State
MBC	
24032	MBC Command
23860	MBC Control Mode
23809	MBC Levitated Contact
24033	MBC Levitated
23808	MBC Fault

SLOT #	DESCRIPTION
23844	MBC Motor Speed
23849	MBC Heatsink Temperature
23845	J Bearing Temperature
23848	K Bearing Temperature
23846	H1 Bearing Temperature
23847	H2 Bearing Temperature
23829	J Average Position X
23830	J Average Position Y
23833	H Average Position
23831	K Average Position X
23832	K Average Position Y
23824	J Synchronous Orbit X
23825	J Synchronous Orbit Y
23828	H Synchronous Orbit
23826	K Synchronous Orbit X
23827	K Synchronous Orbit Y
23834	J Standard Deviation X
23835	J Standard Deviation Y
23838	H Standard Deviation
23836	K Standard Deviation X
23837	K Standard Deviation Y
23819	J Peak Vibration
23821	H Peak Vibration
23820	K Peak Vibration
23822	J Average Gap Change
23823	K Average Gap Change
23839	J Average Force X
23840	J Average Force Y
23843	H Average Force
23841	K Average Force X
23842	K Average Force Y
23850	J1 Current
23851	J2 Current
23852	J3 Current
23853	J4 Current
23858	H1 Current
23859	H2 Current
23854	K1 Current
23855	K2 Current
23856	K3 Current
23857	K4 Current

SLOT #	DESCRIPTION
UPS	
24354	Control Voltage
24353	Power Loss Time
24355	UPS Line/Charging
24356	UPS Inverter
24357	UPS Fault
24360	UPS Battery Voltage
24358	UPS Inverter Enable
PURGE	
24322	Purge Control State
24323	Purge State Timer
24324	Purge Compressor Run
24325	Purge Pump Run
24326	Enhanced State Count
24327	Total Purge Count
24329	User Purge Count
24332	Purge Tank High Level
24333	Purge Suction Temperature
24334	Purge Coil Temperature
24335	Regeneration Tank Drain Solenoid
24336	Regeneration Tank Heater
24337	Regeneration Tank Temperature

DISPLAY MESSAGES

The Status Bar of the Display contains a Status Line and, beneath it a Details Line. The Status Line contains a message describing the operating state of the chiller; whether it is stopped, running, starting or shutting down. The Details Line displays Warning, Cycling, Safety, Start Inhibit and other messages that provide further details of the Status Bar messages. The Status Messages listed below are displayed on the Status Line. All other messages are displayed on the Details Line. For convenience they are listed in alphabetical order.

To aid in the meaning of the message, messages are displayed in different colors as follows:

- Normal Operation messages - Green
- Warning messages - Yellow
- Cycling Shutdown messages - Orange
- Safety Shutdown messages - Red

Warning messages will scroll between all those standing. Shutdowns will show first occurrence.

TABLE 5 - STATUS MESSAGES

MESSAGE	DESCRIPTION
CYCLING SHUTDOWN – AUTO RESTART	The chiller is shut down on a CYCLING shutdown. The cause of the shutdown is still in effect and is displayed on the Details line of the Status Bar. The chiller will automatically restart when the CYCLING condition clears.
MBC STARTUP	A chiller start has been initiated. The MBC conditions are verified and transitional to levitate the driveline rotor (MBC Levitation Mode). The progress of the MBC startup is described in the Details Line of the Status Bar.
SAFETY SHUTDOWN – MANUAL RESTART	The chiller is shut down on a SAFETY shutdown. The cause of the shutdown is still in effect and is displayed on the Details line of the Status Bar. The chiller can be started after the Safety condition clears and the Operator presses the CLEAR FAULT key.
SOFT SHUTDOWN	The chiller is performing a Soft Shutdown. Simultaneously, the Hot Gas Bypass Valve is commanded to 100% open (if Hot Gas Bypass is Enabled), the compressor VGD commanded to close rapidly. The motor drive speed is slowed from its initial speed to the minimum required to prevent surge. Then the motor drive speed is ramped to 0 Hz. The chiller then transitions to coastdown. Soft Shutdown is initiated by the following: • Leaving Chilled Liquid – Low Temperature • Local Panel Stop Key • Remote Stop • Any MBC Fault occurs • Multi-Unit Cycling – Contacts Open • System Cycling – Contacts Open • Control Panel – Schedule • "Condenser – Flow Switch Open" fault active • "Chilled Liquid – Flow Switch Open" fault active • "Expansion I/O – Serial Communications" fault active If the local panel safety stop switch is pressed or any chiller shutdown faults other than those listed above occur, Soft Shutdown is immediately terminated and a System Coastdown will occur.
START INHIBIT	The chiller is prevented from being started due to the reason displayed on the Details Line of the Status bar.
SYSTEM COASTDOWN	The chiller has shut down and removed the run signal from the motor variable speed drive (VSD). The system is waiting for confirmation that the driveline has stopped rotating. When the MBC and VSD report drive frequency of 0Hz for 5 seconds, coastdown is considered completed. Then, after 60 seconds delay the VSD Precharge command is released.
SYSTEM READY TO START	The chiller is shut down but will initiate start upon receipt of a Local or Remote start signal. The Magnetic Bearing Controller (MBC) does not have the driveline rotor levitated. The Hot Gas Bypass Valve position (if present) is set to the programmed Hot Gas Startup Position. The Level Control Valve position is set to the programmed Condenser Level Control Valve Startup Position. The VGD driven to the programmed VGD Startup Position.
SYSTEM RUN	The chiller is running under the condition described in the Details Line of the Status Bar.
SYSTEM STOPPED	The chiller is shutdown with a prevailing stop command.

TABLE 6 - RUN MESSAGES

MESSAGE	DESCRIPTION
LEAVING CHILLED LIQUID CONTROL	The chiller is running, controlling the Leaving Chilled Liquid to the Leaving Chilled Liquid Temperature Setpoint. No system conditions is inhibiting this operation.
WARNING – VSD DC BUS ACTIVE	This non-annunciating message alerts that the DC Bus is precharged or pre-regulated for a state outside of chiller run. It is set when the VSD indicates a precharge or pre-regulated state or DC Bus voltage >50v in the stopped state. A countdown timer shows with this message to indicate the time remaining in a precharge or pre-regulate command while stopped.
VSD – HIGH INPUT CURRENT LIMIT	The Chiller Input current is greater than or equal to the Active Current Limit Setpoint. The Current Limit Setpoint is programmed over a range of 30 to 100% of the Chiller Full Load Amps (FLA). The Active limit is the minimum of the Local, pulldown (if active), and Remote Current Limit Setpoints in Remote mode or the remote value in BAS mode. While this condition is in effect, chiller capacity control is in override to reduce current. Normal LCHLT capacity control operation is resumed and this message automatically clears when the input current decreases below this limit. The highest of the three phase input currents divided by the programmed Job Input FLA is compared to the limit for this override..
VSD – INPUT PULLDOWN LIMIT	The chiller input current will be limited by the pulldown demand limit setpoint. The message clears when the pulldown demand time expires.

TABLE 7 - MBC STARTUP MESSAGES

MESSAGE	DESCRIPTION
WAITING FOR FLOW	The chilled liquid or condenser flow switch input is not reading voltage indicating no presence of flow from the flow switch. Indication of flow is required during the M Startup state to allow transition to chiller run.
WAITING FOR MBC LEVITATION	The OptiView has issued a MBC Levitate command to the MBC and is waiting for confirmation from the MBC that the Levitated mode is ON, and the input from the digital contacts on the MBC is high at OptiView I/O board terminal TB15-18. This message precedes "Waiting for Chilled Liquid Flow".
WAITING FOR VSD PREREGULATION	The OptiView has issued a VSD Pre-Charge command to the VSD and is waiting for confirmation from the VSD that it has achieved regulated DC bus voltage and is awaiting a run command. This message precedes "Waiting for MBC Levitation".
WAITING FOR ZERO MOTOR SPEED	The Motor Speed is > 0.001Hz. The message will be removed when the motor speed is <= 0.001Hz.

TABLE 8 - START INHIBIT MESSAGES

MESSAGE	DESCRIPTION
LINE FREQUENCY NOT SET	This start inhibit is set when the Line Frequency setpoint is "INVALID". Line Frequency is set invalid on a new or cleared Flash Memory until programmed.
LINE VOLTAGE NOT SET	This start inhibit is set when the Line Voltage setpoint is "INVALID". Line Voltage is set invalid on a new or cleared Flash Memory until programmed.
VGD STROKE NOT CALIBRATED	The Variable Geometry Diffuser stroke calibration procedure has NOT yet been performed.
VGD ACTUATOR FEEDBACK NOT CALIBRATED	The Variable Geometry Diffuser feedback calibration has not yet been performed.
MBC - INITIALIZATION FAILURE	OptiView was unable to read a valid validation key code over serial communications from the MBC.
MBC - INITIALIZATION IN PROGRESS	OptiView is initializing communications with the MBC.

TABLE 9 - WARNING MESSAGES

MESSAGE	DESCRIPTION
WARNING - CONDENSER FREEZE THREAT FROM LOW PRESSURE	While the chiller state is Stopped, the Saturated Condenser Temperature decreased below 35.0 °F (1.7 °C). The condenser pump run contacts close. The message is automatically reset and pump contacts return to prior state when either the chiller is not in stopped state or the Saturated Condenser Temperature > 40.0 °F (4.4 °C).
WARNING – CONDENSER – HIGH PRESSURE LIMIT	The Condenser Pressure exceeds the High Pressure Warning Setpoint threshold, programmed by a Service technician logged in at SERVICE access level. While this condition is in effect, the chiller capacity is in override to reduce pressure. This message automatically clears and normal LCHLT capacity control restored when the Condenser pressure decreases to below the Setpoint.
WARNING – CONDENSER OR EVAPORATOR XDCR ERROR	The Evaporator pressure Transducer is indicating a higher pressure than the Condenser pressure Transducer after the chiller has been running for 10 minutes. This is indicative of a Condenser or Evaporator Transducer failure. This message will be displayed until the condition clears and the WARNING RESET Keypad key is pressed in OPERATOR (or higher) access mode. Condition not checked in Brine mode.
WARNING – CONDENSER OR VGD SENSOR FAILURE	The difference between the Discharge Pressure Transducer output and the Condenser Pressure Transducer output has exceeded 21 PSID for 3 continuous minutes while the chiller was running. This feature verifies the operation of the transducers. Since both transducers are measuring essentially the same pressure, both outputs should be within the specified tolerance. This message must be manually cleared. It will be displayed until the transducer outputs are within the acceptable range of each other and the WARNING RESET key in SERVICE access level.
WARNING – HARMONIC FILTER - INVALID MODEL	This warning is set when the Harmonic Filter Model is invalid. The warning is reset when the filter model is valid or the filter operation is inhibited.
WARNING – MBC SPEED SIGNAL FAULT	The speed signal from the Speed Sensor 1 is not reading. The chiller will continue to run and the warning message will clear when the speed sensor signal is reading again.
WARNING - LIQUID LEVEL SETPOINT NOT ACHIEVED	The chiller is running and Refrigerant Level > (Refrigerant Level setpoint +15%) OR Refrigerant Level < (Refrigerant Level setpoint -15%) for 10 continuous minutes. The Warning is bypassed for the first 30 minutes of run to allow stable operation to establish. It is released when the chiller is not running or Refrigerant Level is within setpoint +/- 15%. The message clears automatically.
WARNING - LOSS OF SUBCOOLER LIQUID SEAL	The chiller is running greater than 30 minutes and the Subcooler Effectiveness value decreased less than 0.400 (ADMIN programmable) at any drop leg refrigerant temperature or increased greater than 1.50 (ADMIN programmable) when the drop leg refrigerant temperature is at least 0.5 °F (-17.5 °C) below or any amount above the Entering Condenser Liquid Temperature. The subcooler effectiveness is (Condenser Sat Temp - Drop leg refrigerant temp)/(Cond Sat Temp - Entering Condenser Liquid Temp). To clear message press WARNING RESET key on HOME Screen when logged in at OPERATOR (or higher) access level.
WARNING – MBC – LOW AMPLIFIER RESISTANCE	This warning is displayed when any of the MBC Amplifier resistances are low.
WARNING – MBC – HIGH AMPLIFIER RESISTANCE	This warning is displayed when any of the MBC Amplifier resistances are high.
WARNING – MBC – LOW AMPLIFIER CURRENT	This warning is displayed when any of the MBC Amplifier currents are low.
WARNING – MBC – HIGH AMPLIFIER CURRENT	This warning is displayed when any of the MBC Amplifier currents are high.
WARNING – MBC – POSITION SENSOR ERROR	This warning is displayed when any of the MBC Position Sensors read in error.
WARNING – MBC – INTERNAL ALARM	The MBC experienced an unsatisfactory condition detected internally to the control system. This message will clear when the condition is resolved and the WARNING RESET key is pressed in OPERATOR (or higher) access mode.

TABLE 9 - WARNING MESSAGES

MESSAGE	DESCRIPTION
WARNING – MOTOR – HIGH CURRENT LIMIT	The chiller motor current is greater than or equal to the Motor Overload current limit. The Motor Overload current limit is predetermined from the motor model and Maximum VSD Output Current. While this condition is in effect, chiller capacity control is in over-ride to reduce current. Normal LCHLT capacity control operation is resumed and this message automatically clears when the motor current decreases below this limit.
WARNING – MOTOR – HIGH HOUSING TEMPERATURE	The Motor Housing Temperature is greater than or equal to 167°F (75°C). This warning is released when Motor Housing Temperature is less than 167°F (70°C).
WARNING - MOTOR – HIGH WINDING TEMPERATURE	This warning occurs when any of the enabled motor winding temperatures exceeds 250°F (121.1°C) for 3 continuous seconds. This warning will automatically clear when all winding temperatures decrease below 232°F (111.1°C). It will not use any individual winding temperature sensor that has been disabled with the TEMPERATURE DISABLED Setpoint on the Motor Details Screen.
WARNING - PURGE – EQUALIZATION LOW SUCTION TEMP	This warning occurs when the purge equalization period is complete but the purge suction temperature is < -7°F (-21.7 °C). The warning can be manually reset on the Home screen when the purge suction temperature > 7°F (-21.7 °C). Possible causes: Inlet Solenoid not functioning or a failed Purge Pump.
WARNING – PURGE - EXCESS PURGE	This warning is displayed when the number of purges exceed 20 in a 24 hour period. The warning may be manually reset. Possible causes: Large leak in chiller or a faulty Purge Suction Line Temperature sensor.
WARNING – PURGE - HIGH COIL TEMP	This warning is displayed when the Purge Coil Temperature is > -10°F (-23.3 °C) for 5 minutes after the Purge Compressor has been running for 5 minutes. The warning can be manually reset on the Home screen. Possible causes: Purge system low on refrigerant, purge CPEV valve failure or incorrectly adjusted, purge strainer blocked, purge condenser fan motor failed or dirty purge condenser coil.
WARNING – PURGE – HIGH COIL TEMP - INHIBIT	This warning is displayed when the Purge Coil Temperature is > 0°F (17.8 °C) for 10 minutes after the purge compressor has been running for 5 minutes. The warning can be manually reset on the Home screen. Possible causes: Purge system low on refrigerant, purge CPEV valve failure or incorrectly adjusted, purge strainer blocked, purge condenser fan motor failed or dirty purge condenser coil.
WARNING – PURGE – HIGH LEVEL	This warning is displayed when the Purge High Level Switch opens for 61 seconds or more. The warning will automatically reset when the High Level Switch opens. Possible causes: Level sensor failure, open sensor wire, restriction in the tank drain line.
WARNING – PURGE – OPERATION INHIBITED	This warning is displayed whenever the purge system has been manually set to be inhibited from running. The message will clear when the purge mode is no longer set to inhibited.
WARNING – PURGE – POSSIBLE AIR IN SYSTEM	This warning is displayed when the Condenser Saturation Temp > (Condenser Refrigerant Temp + Condenser Temperature Offset) for 24 hours. The warning may be manually reset on the Home screen. Possible causes: Leaks in chiller system.
WARNING - UPS - BATTERY TEST FAILED	This message is displayed whenever any step of the Battery Health Test fails or if the Battery Health Test is interrupted by a power cycle during the test. The Warning will clear when UPS Battery Health Test is successfully completed.
WARNING – UPS – BATTERY NOT CONNECTED	This is an auto reset warning. The minimum and maximum Battery Voltage is read each 10 second window and stored. At the end of each 10 second window, if the difference between the min and max battery voltage is greater than 0.5 V, a counter is increased. If the difference between them is less than 0.5 V, the counter is reset to 0. This warning is set when the Battery Disconnected Counter >= 4 (The intent is for 4 consecutive 10 second windows to see battery voltage fluctuations to set this fault. It is released when the Battery Disconnected Counter is 0 for 60 continuous seconds.
WARNING – UPS – CHECK BATTERY CONNECTION	This manual reset warning is set when Battery Voltage > 16.0 V. (Indicates only the UPS output is connected to the battery leads). It is released when Battery Voltage < 16.0 V.

TABLE 9 - WARNING MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
WARNING – UPS – LINE LOW BATTERY VOLTAGE	This auto reset warning is set when all of the following are true for 5 continuous seconds: - Control Voltage digital input is high (indicates line power is available) - Battery Voltage < Line Low Battery Voltage Threshold It releases when Battery Voltage > Line Low Battery Voltage Threshold + 0.1 V.
WARNING – UPS – NOT CHARGING	This auto reset warning is set when all of the following are true for 5 continuous seconds: - Control Voltage digital input is high (indicates line power is available) - UPS Line / Charging digital input is low (indicates UPS not reporting in charge mode) It releases when any of the following are true: - Control Voltage digital input is low (indicates line power is lost) - UPS Line / Charging digital input is high (UPS is reporting in charge mode)
WARNING – HARMONIC FILTER – DATA LOSS	After initialization has been successfully completed the Micropanel shall request fault data and, following receipt of the fault data, status data shall be requested until a fault is encountered. The Micropanel shall initiate a command on the data link every two seconds. If the Micropanel does not receive a proper reply from the IEEE 519 logic board after attempting to communicate ten times in a row, the Micropanel shall display the message WARNING - HARMONIC FILTER - DATA LOSS and X's shall be displayed for all 519 data. The VSD logic board shall initiate a command on the data link every 10 milliseconds. If the IEEE 519 logic board does not receive a legitimate command from the VSD logic board within 25 msec of the last legitimate command, the Micropanel shall display the message WARNING - HARMONIC FILTER - DATA LOSS, X's shall be displayed for all 519 data and the power supply LED on the 519 logic board shall blink
WARNING – HARMONIC FILTER – OPERATION INHIBITED	This message is displayed when the function of the Harmonic Filter is inhibited at the Control Center. This message is no longer displayed when the function of the Harmonic Filter is enabled at the Control Center. The function of the harmonic filter can only be inhibited or turned on when the chiller is not running.

TABLE 10 - ROUTINE SHUTDOWN MESSAGES

MESSAGE	DESCRIPTION
LOCAL STOP	A local shutdown command has been received by pressing the Keypad Stop key.
REMOTE STOP	A shutdown command has been received from a remote device. Remote Stop commands can be received in Hardwire Remote mode via I/O Board TB3-7 or in BAS Remote mode via the SC-EQ Communications card. If the chiller is running when this occurs, the chiller performs a soft shutdown.

TABLE 11 - CYCLING SHUTDOWN MESSAGES

The chiller will automatically restart when the cycling condition clears.

MESSAGE	DESCRIPTION	
CHILLED LIQUID – FLOW SWITCH OPEN	The Chilled Liquid Flow Switch has remained open for 5 continuous seconds while the chiller was running, in soft shutdown, or at least 45 seconds after MBC startup is initiated. The chiller will automatically restart when the flow switch closes or the fault will clear if the chiller is run command is ceased.	
CONDENSER – FLOW SWITCH OPEN	The Condenser water flow switch has remained open for 5 continuous seconds while the chiller was running, in soft shutdown, or at least 45 seconds after MBC startup is initiated. The chiller will automatically restart when the flow switch closes or the fault will clear if the chiller is run command is ceased.	
CONDENSER -FREEZE THREAT-FLOW SWITCH OPEN	This fault is set when all of the following are true: • Chiller State is Stopped • Saturated Condenser Temperature < 35.0 °F (1.6 °C) • Condenser Flow Switch is Open for 1 minute or longer It is released when any of the following are true: • Chiller State is not Stopped • Saturated Condenser Temperature > 40.0 °F (4.4 °C) • Condenser Flow Switch is Closed	
CONTROL PANEL – LOSS OF CONTROL VOLTAGE	The line power input signal at I/O board TB3-8 was low for 1 second continuous. This signal is used to determine when the digital inputs are affected by a line power loss versus an actual condition for their devices. This fault is not expected on an actual loss of microboard power from the critical load bus, because the processor will be off before the fault delay. This message can indicate a Cycling (auto-restart after power failure) or Safety (manual restart after power failure) shutdown, depending upon control center configuration	
CONTROL PANEL – POWER FAILURE	A Control Power failure has occurred. If the power failure occurred while the chiller was running, it will automatically restart when power is restored. This message can indicate a Cycling (auto-restart after power failure) or Safety (manual restart after power failure) shutdown, depending upon control center configuration. It indicates a cycling shutdown when displayed in orange characters; Safety shutdown when displayed in red characters. The control center may be configured for auto-restart or manual restart after power failure.	
CONTROL PANEL – SCHEDULE	The programmed Daily Schedule Setpoint has shutdown the chiller. If this occurs while the chiller is running, a Soft Shutdown is performed. The chiller will automatically restart at the next scheduled start time.	
EVAPORATOR – LOW PRESSURE	Set when the Evaporator Pressure is less than or equal to the Low Evaporator Cutout. The fault is released when the Evaporator Pressure is greater than the Low Evaporator Cutout. If this shutdown occurs 3 times in a 90 minute period, an EVAPORATOR-LOW PRESSURE safety shutdown is initiated.	
	FLUID TYPE	SHUTDOWN (PSIA)
	Water Cooling	6.6 (adj 6.4 to 7.4)
	Brine Cooling	6.6 (adj 2.9 to 7.4)
EVAPORATOR – LOW PRESSURE - SMART FREEZE	Set when the Evaporator Pressure is less than the Evaporator Pressure Override Threshold for 120 seconds. The fault is released when the Evaporator Pressure is greater than the Low Evaporator Pressure Override Threshold. If this shutdown occurs 3 times in a 90 minute period, an EVAPORATOR-LOW PRESSURE - SMART FREEZE safety shutdown is initiated.	
EXPANSION I/O – SERIAL COMMUNICATIONS	Valid communication between the microboard and the LTC I/O Board have been disrupted for 3 consecutive attempts. The chiller will automatically restart when valid communication is received.	

TABLE 11 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
ISOLATION VALVES - NOT CLOSED	The optional brine freeze protection motorized isolation valves Close output is energized > 40 seconds but the feedback from the valve limit switch does not indicate it closed for 3 continuous seconds. This cycling fault is released when the isolation valves closed input is energized
LEAVING CHILLED LIQUID – LOW TEMPERATURE	The Leaving Chilled Liquid Temperature has decreased to the programmed Shutdown Temperature Setpoint. If the chiller is running when this occurs, a Soft Shutdown is performed. The chiller will automatically restart when the temperature increases to the programmed Restart Temperature Setpoint.
MBC- CALIBRATION FAULT	This Cycling Shutdown is displayed when the MBC Calibration has not successfully completed. It will automatically clear when the MBC calibration is successful.
MBC – FAULT CONTACTS OPEN	This Safety Shutdown is set when the MBC detects a fault condition and opens a relay contact which is read by the 03631 I/O Board at TB15-70. The fault is cleared when the MBC contact closes. If this happens 3 times in a 15 minute period, the fault becomes a Safety Fault.
MBC - LOW DC BUS VOLTAGE	The MBC DC BUS Voltage has dropped below 300 VDC. The fault will clear when the voltage rises above 300 VDC
MBC – H RADIAL POSITION	The MBC has measured a severe deviation of the H Bearing position while running.
MBC – J RADIAL POSITION	The MBC has measured a severe deviation of the J Bearing position while running.
MBC – K RADIAL POSITION	The MBC has measured a severe deviation of the K Bearing position while running.
MBC – SERIAL COMMUNICATIONS	This Cycling Shutdown is set when an invalid or no response is received from the MBC to a Modbus command from the panel for 3 consecutive attempts with a 2 second timeout between attempts. It shall be triggered by the Modbus communications task when its fault conditions are met (thresholds of consecutive timeouts, ID mismatches, checksum failures, or error packets). It is released when a valid response is received.
MULTIUNIT CYCLING – CONTACTS OPEN	The Multiunit Cycling contacts connected to I/O Board TB2-9, have opened to initiate a cycling shutdown. If the chiller is running when this occurs, a soft shutdown will be initiated. The chiller will automatically restart when the contacts close.
SYSTEM CYCLING – CONTACTS OPEN	The System Cycling contacts connected to I/O Board TB2-13, have opened to initiate a cycling shutdown. If the chiller is running when this occurs, a soft shutdown will be initiated. The chiller will automatically restart when the contacts close.
SYSTEM - STARTUP FAILURE	The System has failed to progress from the Startup state for 60 seconds after start. If this occurs 3 times in 90 minutes the system will lock out on a Safety. The cycling fault is released when the chiller is stopped.
UPS – LINE LOW BATTERY VOLTAGE	This cycling fault initiates a soft shutdown if it is set while the chiller state is Running. It is set during chiller state Running or Soft Shutdown when all of the following are true: • Battery Voltage Faults setting is “Enabled” • “Warning – UPS – Line Low Battery Voltage” warning has been set for 60 continuous minutes This fault is also set during chiller state Stopped when all of the following are true: • Battery Voltage Faults setting is “Enabled” • Control Voltage digital input is high (indicates line power is available) • Battery Voltage < Line Low Battery Voltage Threshold It is released when any of the following are true: • Battery Voltage Faults is Disabled • Battery Voltage > Line Low Battery Voltage Threshold + 0.1 V.
VGD ACTUATOR - SERIAL COMMUNICATIONS	When valid communications do not occur between the microboard and the VGD actuator for 3 times within 6 seconds. The fault is reset when the communications are established.
VSD – DC BUS VOLTAGE IMBALANCE	The VSD's DC link voltage is continuously monitored. If the 1/2 BUS voltage is not within +/- 88 VDC of the 1/2 of the total Bus Voltage then this message is displayed. Typically this indicates a problem with some of the BUS capacitors.

TABLE 11 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION	
VSD – HIGH DC BUS VOLTAGE	The DC bus voltage is continuously monitored and a shutdown will occur if the DC bus voltage exceeds 737-795 VDC. This shutdown will protect the capacitors from a voltage that exceeds their rating.	
VSD – HIGH INTERNAL AMBIENT TEMPERATURE	The ambient temperature of the drive is monitored by a temperature sensor mounted on the drive logic board. The high ambient trip threshold is 122°F (50 °C) for all models. If this fault occurs, the fans and coolant pump/s will remain on until the internal ambient temperature has fallen to 115°F (46 °C).	
VSD – HIGH PHASE A (OR B, C) INSTANTANEOUS CURRENT	This shutdown is generated by the drive logic board. If any one phase of motor current as measured by the Output Current Transformers exceeds a threshold. Refer to the chart below for the shutdown threshold value. If an Instantaneous Current Fault occurs but the chiller restarts and runs without a problem, the cause may be attributed to a voltage sag on the utility power feeding the drive that is in excess of the specified dip voltage rating for this product. This is especially true if the chiller was running at, or near, full load. If there is a sudden dip in line voltage, the current to the motor will increase.	
	DRIVE AMP RATING	NOMINAL PEAK TRIP LEVEL
	330A	773 Amps Peak
	420A	773 Amps Peak
	780A	1890 Amps Peak
	1020A	1890 Amps Peak
	1280A	2406 Amps Peak
VSD – INVALID VSD MODEL	The J1 connector on the drive logic board contains jumpers along with wires from the output CTs. The jumpers configure the drive logic board to the output current rating of the drive being used in this application in order to properly scale the output current. If the jumper configuration is found by the logic board to be invalid, the system will be shut down and the above message will be generated. The proper jumper configuration is shown on the wiring label for the drive.	
VSD – LOGIC BOARD POWER SUPPLY	This shutdown is generated by the VSD logic board and it indicates that the low voltage power supplies for the logic board have dropped below their allowable operating limits. The power supplies for the logic boards are derived from the secondary of the 120 to 24VAC transformer, which in turn, is derived from the line to 120VAC control power transformer. This message usually means the power to the VSD has been removed.	
VSD – LOGIC BOARD PROCESSOR	This shutdown is generated by the drive logic board. If a communications problem occurs between the two microprocessors on the drive logic board this shutdown will occur.	
VSD – LOW CONVERTER HEATSINK TEMPERATURE	A thermistor sensor is located on the SCR/Diode block side of the copper chill plate on the DRIVE Power Unit. Anytime this thermistor detects a temperature of 37 °F (3 °C) or lower a shutdown will occur.	
VSD – LOW DC BUS VOLTAGE	Following a successful DC link pre-charge and pre-regulation, the DC link under-voltage shutdown is generated when the DC link voltage falls below the trip level for 10 ms. The trip level is set to 500 VDC for 460 VAC and 414 VDC for 400/380 VAC unit.	
VSD – LOW INVERTER BASEPLATE TEMPERATURE	A thermistor sensor is located inside the transistor module(s) on the drive power unit. Anytime this thermistor detects a temperature of 37 °F (3 °C) or lower a shutdown will occur.	
VSD – PHASE A (B or C) GATE DRIVER	A second level of overcurrent current protection exists on the drive gate driver board. The collector-to-emitter voltage of each transistor module is checked while the device is turned on. This is called the collector-to-emitter saturation voltage. If the voltage across the transistor module is greater than a set threshold, the transistor module is turned off. This fault can also be caused if the transistor is not being turned on when it should.	
VSD – PRECHARGE - DC BUS VOLTAGE IMBALANCE	The definition for this fault is identical to “VSD - DC Bus Voltage Imbalance” except the fault occurred during the precharge period. Refer to “VSD - DC Bus Voltage Imbalance” shutdown for possible problems.	

TABLE 11 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION			
VSD – PRECHARGE – LOW DC BUS VOLTAGE 1	During Pre-charge, the dc-link voltage must reach at least low threshold which is determined by Line Voltage Setpoint (see the table below) within 4 seconds after the pre-charge signal has been commanded. If this condition is not met, this shutdown is generated. The VSD logic board shall time 10 seconds before clearing the fault and allowing another pre-charge to start. The VSD's fan(s) and water pump(s) shall remain energized during this time. The VSD logic board shall allow up to three consecutive pre-charge-related faults to occur. After the third consecutive pre-charge-related fault, Safety Shutdown message "VSD – PRECHARGE LOCKOUT" is generated.			
	LINE VOLTAGE			
	LOW THRESHOLD (VOLTS)			
	<table> <tr> <td>380/400/415</td><td>41</td></tr> <tr> <td>460</td><td>50</td></tr> </table>	380/400/415	41	460
380/400/415	41			
460	50			
VSD – PRECHARGE – LOW DC BUS VOLTAGE 2	During Pre-charge, the DC-link voltage must reach at least high threshold which is determined by Line Voltage Setpoint (see the table below) within 20 seconds after the pre-charge signal has been commanded. If this condition is not met, this shutdown is generated. The VSD logic board shall time 10 seconds before clearing the fault and allowing another pre-charge to start. The VSD's fan(s) and water pump(s) shall remain energized during this time. The VSD logic board shall allow up to three consecutive pre-charge-related faults to occur. After the third consecutive pre-charge-related fault, Safety Shutdown message "VSD – PRECHARGE LOCKOUT" is generated.			
	LINE VOLTAGE			
	LOW THRESHOLD (VOLTS)			
	<table> <tr> <td>380/400/415</td><td>414</td></tr> <tr> <td>460</td><td>500</td></tr> </table>	380/400/415	414	460
380/400/415	414			
460	500			
VSD – RUN SIGNAL	Redundant RUN signals are generated by the control center; one via TB6-24 and the second via the Serial Communications link. If both run commands are not received by the VSD Logic Board within 5 seconds, a shutdown is performed and this message is displayed. This is generally indicative of a wiring problem between the control center and the VSD.			
VSD – SERIAL RECEIVE	This message is generated when communications between the micro board and the drive logic board is disrupted for a least 22 seconds. If the optional Harmonic Filter is installed then the fault can be generated when the communications between the drive logic board and the Harmonic Filter logic board is disrupted.			
VSD – SINGLE PHASE INPUT POWER	The VSD monitors the RMS value of each of the three line-to-line voltages on a cycle-by-cycle basis. If the RMS value of any one of the three line-to-line voltages falls below 230 Vrms in any 1/2 cycle, this shutdown is generated.			
VSD – STOP (FAULT) CONTACTS OPEN	Whenever the drive initiates a fault, it first opens the fault relay on the drive logic board. When the relay opens a message is sent to control panel's micro board, detailing the cause of the fault. If this circuit ever opens without receiving an accompanying cause for the fault over the communication link (within 11 communication tries, approximately 22 seconds) this message will be displayed. This fault may be replaced with a Serial Communications fault if the serial link has failed.			
VSD – INVALID PWM SOFTWARE	On power up the main processor shall communicate the software type (LP, HP or production) to the PWM processor. The PWM processor shall then confirm that it has the corresponding software installed. If this condition is not met the unit shall trip on an invalid PWM software fault.			

TABLE 11 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION	
HARMONIC FILTER – INPUT CURRENT OVERLOAD	The three phases of RMS filter current are measured by the filter DCCTs'. This information is sent to the harmonic filter logic board. If any one phase of filter current exceeds a threshold for 40 seconds a shutdown will occur. Refer to the chart below for the shutdown threshold	
	DRIVE CURRENT RATING	NOMINAL PEAK TRIP LEVEL
	330/420	128 AMPS RMS
	780	176 AMPS RMS
	1020	278 AMPS RMS
	1280	385 AMPS RMS
HARMONIC FILTER – DC BUS VOLTAGE IMBALANCE	The DC link is filtered by many large capacitors. These capacitors are connected in series to achieve a higher DC link voltage than can be supported by a single capacitor. It is important that the voltage is shared equally between the two sets of series capacitors. Each set of capacitors must share approximately 1/2 of the total DC link voltage. The harmonic filter logic board then measures the voltage of the 2 sets of the bus capacitors. If at any time while the harmonic filter is running the difference in the voltage between the 2 sets of capacitors is greater than 50 VDC then a shutdown will occur.	
HARMONIC FILTER – DC CURRENT TRANSFORMER 1 (OR 2)	During initialization, with no current flowing through the direct current current transducers (DCCT's), the DCCT's output current are measured and compared to a preset limit defined by the harmonic filter logic board. If the measured values exceed the preset limit, the DCCT's are presumed to be bad and this shutdown will be generated.	
HARMONIC FILTER – HIGH DC BUS VOLTAGE	The harmonic filter logic board continuously monitors the harmonic filter DC bus voltage. If the level of the DC bus voltage exceeds a range of 822 to 900 VDC this shutdown is initiated. Keep in mind that the harmonic filter has its own DC bus as part of the harmonic filter power unit. The harmonic filter DC bus is not connected in any way with the drive's DC bus.	
HARMONIC FILTER – HIGH PHASE A (OR B, C) CURRENT	The output current of the harmonic filter is read by the Direct Current-Current Transducer (DCCT). This current information is sent to the harmonic filter logic board where it is compared against a threshold. If the output current of the harmonic filter power unit is greater than the threshold..	
	DRIVE CURRENT RATING	NOMINAL PEAK TRIP LEVEL
	330	270 ± 25 AMPS Pk
	420	378 ± 59 AMPS Pk
	780	523 ± 84 AMPS Pk
	1020	782 ± 118 AMPS Pk
	1280	1274 ± 104 AMPS Pk
HARMONIC FILTER – LOGIC BOARD OR COMMUNICATIONS	This shutdown states the hardware on the harmonic filter logic board is indicating a fault, but the software on the harmonic filter logic board does not state why. The harmonic filter logic board signals a fault condition to the drive logic board but does not respond to a software request for fault information.	
HARMONIC FILTER – LOGIC BOARD POWER SUPPLY	This shutdown indicates one of the low voltage power supplies on the harmonic filter logic board have dropped below their permissible operating voltage range. The harmonic filter logic board receives its power from the drive logic board. The power supplies for the drive logic board are in turn derived from the secondary of the 120 to 24 VAC transformer. This fault is typical when control power to the board is removed and reapplied.	

TABLE 11 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION	
HARMONIC FILTER – LOW DC BUS VOLTAGE	The harmonic filter dynamically generates its own filter DC bus voltage by the interaction of the harmonic filter inductor and switching the power devices in the harmonic filter power unit. This DC level is actually higher than the level obtained by simply rectifying the input line voltage. NOTE: The DC link voltage is always higher on the harmonic filter power unit than on the VSD power unit. Thus, the harmonic filter actually performs a voltage “boost” function. This is necessary in order to permit current to flow into the AC line from the harmonic filter when the AC line is at its peak level. This particular shutdown and its accompanying message are generated when the harmonic filter’s DC link voltage drops to a level less than 80 VDC (for 380 through 460 VAC input voltage) below the harmonic filter DC link voltage setpoint.	
HARMONIC FILTER – PHASE LOCKED LOOP	This shutdown indicates a circuit called a “phase locked loop” on the harmonic filter logic board has lost synchronization with the incoming power line for a period of time. This message may also appear when utility power is removed and reapplied	
HARMONIC FILTER – PRECHARGE LOW DC BUS VOLTAGE 1 (OR 2)	Two minimum voltage thresholds must be met in order to complete the precharge cycle. The first occurs 1/10th of a second after pre-charge is initiated. This measurement will verify the bus structure, or bus capacitors are not damaged. The second threshold occurs 5 seconds after precharge is initiated. This measurement will verify the bus capacitors are charging properly. See table below for specific values of a Nominal Input Voltage Value of 380-460 VAC.	
	1ST MINIMUM VOLTAGE VALUE	2ND MINIMUM VOLTAGE VALUE
	41 VDC	630 VDC
HARMONIC FILTER – Run Signal	When a hardware run command is received at the harmonic filter logic board from the drive logic board, a 5 second timer is started. A redundant run command must also occur on the communication link from the drive logic board before the timer expires or the drive will be shut down.	

TABLE 12 - SAFETY SHUTDOWN MESSAGES

The chiller can be started after manual resets are performed as detailed below.

MESSAGE	DESCRIPTION		
AUXILIARY SAFETY – CONTACTS CLOSED	The Auxiliary Safety shutdown input, connected to I/O Board TB2-31 senses 115 VAC, initiating a safety shutdown. This input is a general-purpose, user defined safety shutdown input. The chiller can be started after the contacts open and the CLEAR FAULT key is pressed.		
CONDENSER – HIGH PRESSURE	The condenser pressure, as sensed by the Condenser Transducer, has increased to greater than 40.0 PSIA. The chiller can be started after the pressure decreases to is less than 30.0 PSIA and the CLEAR FAULT key is pressed.		
CONDENSER – HIGH PRESSURE CONTACTS OPEN	The contacts of the electromechanical high pressure safety device, located on the con-denser shell, have opened because this device has detected a pressure greater than 40±5 PSIG. The contacts will automatically close when the condenser pressure decreases to is less than 20±5 PSIG. The chiller can be started after the contacts close and the CLEAR FAULT key is pressed.		
CONDENSER – PRESSURE TRANSDUCER OUT OF RANGE	The Condenser Pressure Transducer is indicating a pressure that is less than 0.0 PSIA or greater than 80.0 PSIA This is outside the normal operating range of the transducer. This is generally indicates a defective transducer. The chiller can be started after the transducer is indicating a pressure that is within range and the CLEAR FAULT key is pressed.		
CONTROL PANEL – LOSS OF CONTROL VOLTAGE	The line power input signal at I/O board TB3-81 was low for 1 second continuous. This signal is used to determine when the digital inputs are affected by a line power loss versus an actual condition for their devices. This fault is not expected on an actual loss of microboard power from the critical load bus, because the processor will be off before the fault delay. This message can indicate a Cycling (auto-restart after power failure) or Safety (manual restart after power failure) shutdown, depending upon control center configuration		
CONTROL PANEL – POWER FAILURE	A Control Power failure has occurred. If the power failure occurred while the chiller was running, it will automatically restart when power is restored. This message can indicate a Cycling (auto-restart after power failure) or Safety (manual restart after power failure) shutdown, depending upon control center configuration. It indicates a cycling shutdown when displayed in orange characters; Safety shutdown when displayed in red characters. The control center is configured for auto-restart or manual restart after power failure by a qualified Service Technician.		
EVAPORATOR – LOW PRESSURE	The evaporator pressure, as sensed by the Evaporator Transducer, has decreased to the shutdown threshold and caused 3 cycling shutdowns in a 90 minute period. For water cooling applications, the shutdown threshold is a fixed value. For Brine cooling applications, the shutdown threshold varies according to the concentration of the Brine solution. The Brine shutdown threshold is programmed at the YORK Factory. The chiller can be started after the evaporator pressure increases to the restart threshold and the CLEAR FAULT key is pressed.		
	FLUID	SHUTDOWN (PSIA)	RESTART (PSIA)
	Water Cooling	6.4 to 7.4 as programmed	+0.1> Shutdown threshold
	Brine Cooling	6.4 to 7.4 as programmed	+0.1> Shutdown threshold
EVAPORATOR – TRANSDUCER OR TEMPERATURE SENSOR	A possible defective Evaporator Pressure Transducer ir Refrigerant Temperature Sensor has been detected. The control center converts the evaporator pressure to a Saturated Temperature value and compares this value to the optional Evaporator Refrigerant Temperature Sensor. If the difference between these temperatures is greater than 3.0°F (1.77 °C), continuously for 1 minute, this shutdown is performed. This check is only performed under the following conditions: • Chiller has been running for at least 10 minutes • Evaporator Refrigerant temperature (RT7) is enabled • NOT in Brine cooling mode • Evaporator Temperature Sensor (RT7) or Evaporator Saturation Temperature is indicating a temperature of less than 32.0 °F (0 °C). The chiller can be started after the temperatures are within 3.0 °F (1.77 °C) of one an-other and the CLEAR FAULT key is pressed.		

TABLE 12 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
ISOLATION VALVES - NOT OPENED	The optional brine freeze protection motorized isolation valves Open output is energized 40 seconds but the feedback from the valve limit switch does not indicate it opened for 3 continuous seconds. This cycling fault is released when the chiller is stopped with the run command removed. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC - DC BUS FUSE	This Safety is set when the MBC detects no voltage on the DC Bus indicating an open DC BUS Fuse. The chiller can be started when the MBC DC BUS FUSE Fault is corrected and the OptiView panel CLEAR FAULTS key is pressed.
MBC – GROUND FAULT	This Safety Shutdown is set when the MBC detects a Ground Fault condition. The chiller can be started when the MBC Ground Fault is corrected and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH BEARING J TEMPERATURE	This Safety Shutdown is set when the MBC control board detects the J Bearing Temperature is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH BEARING H1 TEMPERATURE	This Safety Shutdown is set when the MBC control board detects the H1 Bearing Temperature is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH BEARING H2 TEMPERATURE	This Safety Shutdown is set when the MBC control board detects the H1 Bearing Temperature is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH BEARING K TEMPERATURE	This Safety Shutdown is set when the MBC control board detects the K Bearing Temperature is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH AMPLIFIER TEMPERATURE	This Safety Shutdown is set if the MBC Amplifier Temperature is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH AMPLIFIER VOLTAGE	This Safety Shutdown is set if the MBC Amplifier Voltage is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH GATE VOLTAGE	This Safety Shutdown is set if the MBC Gate Voltage is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – LOW GATE VOLTAGE	This Safety Shutdown is set if the MBC Gate Voltage is too low. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – EXCESSIVE SHUTDOWNS	This Safety Shutdown is set if 3 MBC Cycling Shutdowns occur in a 15 minute window. It is released when the chiller is stopped. The 15 minute window begins with the first MBC fault. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC- FAULT CONTACTS OPEN	This Safety Shutdown is set when the MBC detects a fault condition and opens a relay contact which is read by the 03631 I/O Board at TB15-70. The fault is cleared when the MBC contact closes.
MBC – INITIALIZATION FAILURE	This Safety Shutdown is set when the MBC does not correctly initialize communications with the OptiView panel. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – HIGH DC BUS VOLTAGE	This Safety Shutdown is set when the MBC detects that the MBC DC 300VDC Bus is too high. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC - HIGH HEATSINK TEMPERATURE	This Safety Shutdown is set when the MBC Heatsink Temperature exceeds the trip point. The chiller can be started when the temperature drops below the trip point and the OptiView panel CLEAR FAULTS key is pressed.

TABLE 12 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
MBC – NOT LEVITATED	This Safety Shutdown is set when OptiView software is commanding MBC Levitation Mode ON but the MBC is not reporting Levitated within 15 seconds. This fault is prohibited when the MBC Alive input is not high, indicating the MBC unavailable. This fault is released when the chiller is stopped. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – OVERSPEED FAULT	This Safety Shutdown is set when the MBC determines the rotor speed exceeds the programmed setpoint for 0.1 seconds continuous. Rotor speed is transmitted to the MBC from the VSD. The MBC Fault contacts open. The MBC remains in Levitation mode with the motor shaft levitated until commanded to de-levitate over serial comms. This shutdown is released when the speed signal no longer exceeds the setpoint, which should occur when the chiller is stopped. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC - POWER SUPPLY FAULT	This Safety Shutdown is set when any of the MBC power supplies drops below their low limit. This fault could be caused by a faulty MBC power supply or faulty wiring. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC - POWER FAIL LANDING	This Safety Shutdown is set when the panel boots up after a power loss has occurred and the buffer data prior to the shutdown showed motor speed > 0, indicating the motor was rotating when the UPS power was lost. If the Power Fail Landing Counter on the MBC Details Screen is < 3, the chiller can be restarted after the cause of a loss of UPS power is determined and remedied and the OptiView panel CLEAR FAULTS key is pressed. IF the Power Fail Landing Counter is => 3, lockout occurs and must be reset by a Service Technician.
MBC – SPEED SIGNAL FAULT	This Safety Shutdown is set when the MBC has the speed signal cycling fault three times in a 90-minute window. The window is started when not currently in a window and a MBC Speed Signal cycling fault is received. The MBC Fault contacts open. The MBC remains in Levitation mode with the motor shaft levitated until commanded to de-levitate over serial comms. This shutdown is released when a valid speed signal over 10 Hz is presented or the MBC is not in Rotation mode. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – WATCHDOG	This Safety Shutdown is set when the MBC microboard program does not reset the watchdog timer. This fault could be caused by a faulty MBC program load or a failed MBC microboard. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
SAFETY STOP	This is set when the panel safety stop hardware push button is depressed, removing in-put from the I/O Board terminal TB13-28 for > 500msec. continuous. It also sets the local command to STOP. The chiller can be started when the push button is released and the OptiView panel CLEAR FAULTS key is pressed.
MOTOR – HIGH WINDING TEMPERATURE	This safety shutdown occurs when any of the enabled motor winding temperatures exceeded the programmed High Winding Temperature Shutdown Threshold of 270°F (132.2°C) for 3 continuous seconds. The chiller can be started after all winding temperatures decreased to at least 18°F (10°C) below the shutdown threshold and the COMPRESSOR is stopped. The safety shutdown will not act on any individual winding temperature sensor that has been disabled with the TEMPERATURE DISABLE Setpoint on the Motor Details Screen.
MOTOR – HIGH HOUSING TEMPERATURE	This Safety Shutdown is set when Motor Housing Temperature is greater than or equal to 185 °F (85 °C). This fault is released when Motor Housing Temperature is less than 185 °F (85 °C). The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MOTOR – LOW WINDING TEMPERATURE	This Safety Shutdown is set when any enabled Motor Winding Temperature is less than 32.1°F (0.05°C). This fault is released when the windings are greater than 32.1°F (0.05 °C).

TABLE 12 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
SALES ORDER - INVALID MODEL NUMBER	This safety shutdown is set when the Model Number field entered on the Setpoints – Setup – Sales Order screen does not conform to the format expected. The format and data can be found on the dataplate if it ever needs re-entry in the control. Example: YZ-MA033AN030P042A The “Sales Order - Invalid Model Number” safety shutdown is set when any of the following are true: • Bearing Type is InvalidBearing • Motor Size is InvalidMotorSize • Compressor Size is InvalidCompSize • Compressor Model Mag is InvalidCompModel AND Bearing Type is MagneticBearing The fault is released when all of the values have been corrected. The chiller can be restarted after the CLEAR FAULTS key is pressed.
SAFETY STOP	The System has been stopped immediately due to the Safety Stop Button being depressed on the side of the chiller control panel. The chiller should normally be shut down using the Stop button on the Home Screen. The chiller can be restarted by rotating the red Safety Stop button clockwise to reset it.
SYSTEM - STARTUP FAILURE	The System has failed to progress from the Startup state for 60 seconds after start. If this occurs 3 times in 90 minutes the system will lock out on a Safety. The cycling fault is released when the chiller is stopped and the Clear Fault button is pressed.
WATCHDOG – SOFTWARE REBOOT	The Microboard's software Watchdog initiated a Microprocessor reset because it de-tected that a portion of the chiller operating Program was not being executed. The result of this reset is a Safety shutdown and re-initialization of the Program. This is generally indicative of a severe electrical power disturbance or impending Microboard Failure. The chiller can be started after the CLEAR FAULT key is pressed.
UPS – BATTERY NOT CONNECTED	This safety fault initiates a soft shutdown if it is set while the chiller state is Running. It is set during chiller state Running or Soft Shutdown when all of the following are true: Battery Voltage Faults is Enabled • “Warning - UPS - Battery Not Connected” warning has been set for 10 continuous minutes This fault is also set during chiller state Stopped when all of the following are true: • Battery Voltage Faults is Enabled • Battery Disconnected Counter ≥ 4 It is released when any of the following are true: • Battery Voltage Faults is Disabled • Battery Disconnected Counter is 0
UPS – INVERTER LOW BATTERY VOLTAGE	This safety fault is set when all of the following are true for 5 continuous seconds: • Battery Voltage Faults is Enabled • Control Voltage digital input is low (indicates line power is lost) • Battery Voltage < Inverter Low Battery Voltage Threshold It is released when any of the following are true: • Battery Voltage Faults is Disabled • Battery Voltage > Line Low Battery Voltage Threshold + 0.1 V. (Note the thresholds for set and release are intended to be different)
VGD ACTUATOR FAULT	The VGD actuator fault digital input has lost voltage either by wiring issue or fault indicated at the actuator. The chiller begins a standard soft shutdown. The fault clears when the digital input sees voltage. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VGD ACTUATOR - POSITIONING FAULT	The VGD Position feedback indicates greater or less than the VGD command by 5% for 1 minute continuous. The fault clears when the position is within the command + 5 % over 1 minute. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VGD FEEDBACK FAULT	The VGD Feedback voltage is below 0.4 VDC or above 4.6 VDC. It is released when voltage is within the range. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.

TABLE 12 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION			
VSD – 105% MOTOR CURRENT OVERLOAD	The drive logic board generates this shutdown by reading the current from the 3 output current transformers. The shutdown is generated when the drive logic board has detected that the highest of the three output phase currents has exceeded 105% of the programmed 100% full load amps (FLA) value for more than 40 seconds. This shutdown requires a manual reset via the Reset push-button on the drive logic board.			
VSD – High Converter Heatsink Temperature	A thermistor sensor is located on the copper chill plate of the drive Power Unit. If at any time this thermistor detects a temperature of 170°F (77°C) or higher a shutdown will occur. The cooling fans and coolant pump/s on the drive will continue to run after the shutdown until the thermistor temperature has dropped below 160°F (71°C).			
VSD – High Phase A (B or C) Inverter Baseplate Temperature	A thermistor sensor is located inside the transistor module on the drive power unit. If at any time this thermistor detects a temperature of 190°F (88°C) or higher a shutdown will occur. The cooling fans and coolant pump on the pump/s on the drive will continue to run after the shutdown until the thermistor temperature has dropped below 165°F (74°C).			
VSD – INPUT CURRENT OVERLOAD	The input RMS currents are monitored and compared against 105% of the job input current per the following table. If this value is exceeded continuously for 10 seconds, this shutdown is generated. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.			
	VSD MODEL	BREAKER RATING (AMPS)	MAX VSD INPUT CURRENT (AMPS) (BREAKER RATING/1.05)	INPUT CURRENT OVERLOAD TRIP LEVEL (AMPS)
	330A	240	228	Input Job FLA*1.05
	420A	400	380	Input Job FLA*1.05
	780A	600	571	Input Job FLA*1.05
	1020A	800	761	Input Job FLA*1.05
	1280A	1200	1142	Input Job FLA*1.05
VSD – MOTOR CURRENT IMBALANCE	The three phase compressor motor current imbalance was greater than 30% continuously for 45 seconds. The imbalance is not checked until the chiller has been running for at least 45 seconds and the average of the three phases of motor current is greater than 80% of the programmed 100% chiller Full Load Amps. The average is calculated as: $\text{lave} = (\text{Ia} + \text{Ib} + \text{Ic}) / 3$. The imbalance is calculated as: $((\text{Ia} - \text{lave}) + (\text{Ib} - \text{lave}) + (\text{Ic} - \text{lave}) \times 100) / 2(\text{lave})$. The Variable Speed Drive detects the unbalance condition and advise the OptiView control center Microboard via serial communications. The chiller can be started after the CLEAR faults key is pressed.			
VSD – PRECHARGE LOCKOUT	If the drive fails to meet the pre-charge criteria (refer to pre-charge faults), the pre-charge circuit will wait for a period of 10 seconds before another pre-charge attempt. The unit's cooling fans and coolant pump/s shall remain energized during this time period. Following this 10-second period, the pre-charge shall again be initiated. The unit shall attempt to meet the pre-charge criteria three consecutive times before the drive will shutdown, lockout, and display this message.			
HARMONIC FILTER – HIGH BASEPLATE TEMPERATURE	A thermistor sensor is located inside the transistor module on the harmonic filter power unit. If at any time this thermistor detects a temperature higher then the threshold value a shutdown will occur. Refer to the chart below for the shutdown threshold values. A manual reset is required by pressing the "Overtemp Reset" pushbutton located on the Filter Logic board.			
	VSD MODEL		THRESHOLD SHUTDOWN VALVE	
	330A/420A		175° F (79° C)	
	780A		190° F (88° C)	
	1020A/1280A		171° F (77° C)	

TABLE 12 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
Harmonic Filter – High Total Demand Distortion	The control center determines this shutdown by using data supplied from the harmonic filter logic board. This shutdown indicates that the filter is not operating correctly or the input current to the drive/filter system is not sinusoidal. This shutdown will occur if the Total Demand Distortion (TDD) in any one phase exceeds 25% continuously for 45 seconds. TDD is an acronym for Total Demand Distortion, a term defined by the IEEE Std 519-1992 standard as “the total root - sum - square harmonic current distortion, in percent of the maximum demand load current (15 or 30 min demand)”. .

SECTION 4 - VSD OPERATION

PYT MODEL VSD OVERVIEW

The YORK PYT model VSD is a liquid cooled, transistorized, PWM inverter in a highly integrated package mounted directly to the chiller. This VSD is specifically designed to drive the high speed induction motor with magnetic bearings used on the YORK model YZ Centrifugal Liquid Chiller. This allows the chiller to be designed as a complete system, and take full advantage of the strengths of each major component within the system.



The PYT drive enclosure contains lethal AC and DC voltages. Only suitably trained and qualified personnel are permitted to open the VSD enclosure for service.

- ***NEVER place loose tools, debris or any objects inside the PYT drive enclosure.***
- ***NEVER allow the PYT drive enclosure doors to remain open. Keep the doors closed and ensure all latches are engaged on each door unless the unit is being serviced.***
- ***ALWAYS lockout the disconnect supplying AC to the chiller when servicing the VSD.***
- ***DO NOT switch on the circuit breaker if a VSD door remains open.***

The power section of the VSD is composed of four major blocks:

- The AC to DC rectifier section
- The DC bus filter section
- The three phase DC to AC inverter section
- The output suppression network

PYT MODEL VSD COMPONENTS

At the input of the VSD, an electronic circuit breaker with ground fault sensing connects the AC line to an AC line inductor and then to the DC converter. The line inductor will limit the amount of fault current so that the electronic circuit breaker is sufficient for protecting the VSD. The following description of operation is specific for the 330 amp VSD unless otherwise noted. See *Figure 38 on page 110* through *Figure 47 on page 117* for component locations in each PYT model cabinet.

AC to DC Rectifier

The AC to DC converter uses 3 Silicon Controlled Rectifiers (SCR's) and 3 diodes. One SCR and one diode are contained in each module. Three modules are required to convert the 3 phase input AC voltage into DC voltage. The SCRs are mounted on the bottom of the liquid cooled heat sink. The use of the SCR's in the converter permits pre-charge of the DC bus capacitors when the chiller enters the prelube cycle; it also provides a fast disconnect from the AC line when the chiller enters the coastdown cycle. During a coastdown cycle, the SCR's in the converter are no longer turned on and remain in a turned off condition until the next pre-charge cycle and the DC bus capacitors will start to discharge through the bleeder resistors.

When the chiller enters the prelube cycle, the VSD is commanded to pre-charge and the SCR's are gradually turned on to slowly charge the DC bus capacitors. This is called the pre-charge period, which last for 20 seconds. At this time the SCR's are fully turned on. The VSD logic board provides the command to the SCR trigger board to pre-charge and the SCR trigger board provides the turn on commands for the SCR's.



Although many of these parts are similar to the parts used in previous VSD designs, these parts are only compatible with VSDs having the base part numbers. Failure to use the correct parts may cause major damage to these and other components in the VSD.

DC Bus Filter

The DC link section of the VSD consists of a series of electrolytic capacitors. The capacitors provide a large energy reservoir for use by the DC to AC inverter section of the VSD and serve to filter voltage ripple on the DC bus. The capacitors are contained in the VSD power unit. "Bleeder" resistors are mounted on the side of the power unit to provide a discharge path for the stored energy in the capacitors in the off cycle, and to allow for balanced charging of the capacitor banks during operation.

DC to AC Converter

The DC to AC inverter section of the VSD serves to convert the DC voltage to AC voltage at the proper magnitude and frequency, as commanded by the VSD logic board. The inverter section is composed of a single power unit which contains three transistor modules mounted on the same liquid cooled heat sink as the converter modules, the DC bus capacitors, and a VSD gate driver board. The gate driver board provides the turn on and turn off commands to the transistor modules. The VSD logic board determines when the turn on and turn off commands should occur. The gate driver board is soldered directly to the top of the transistor module and is held in place with mounting screws.

Output Suppression Network

The DV/DT output suppression network is composed of a series of capacitors and resistors. The job of the suppressor network is to increase the time it takes for the output voltage to switch, as seen by the motor, and reduce the peak voltage applied to the motor windings. This network protects the compressor motor from problems commonly associated with PWM motor VSDs.

Drive Logic Board

The drive logic board performs numerous functions including, control of the VSD cooling fans and pumps, determining when to pre-charge the bus capacitors and performs PWM calculations. The drive logic board also determines shutdown conditions by monitoring the three phases of the motor current, the heat sink temperature, the baseplate temperatures, the internal ambient temperature, and the DC bus voltage.

Each transistor module and heatsink have thermistors which provide temperature information to the VSD logic board. These sensors protect the VSD from over temperature conditions. A bus voltage isolator board is used to ensure that the DC bus capacitors are properly charged. Three output current transformers protect the VSD and motor from over current conditions.

Heat generated from the electronic controls and power components is removed through liquid cooled heat-sinks and cooling coils, with fans. The inhibited liquid that flows through the heatsinks and cooling coils is pumped through the system by an externally mounted pump. A shell and tube heat exchanger, with removable heads, is mounted on the back of the VSD cabinet.

PYT MODEL VSD (330, 420, 780, 1020 & 1280 AMP)

All PYT model VSDs function in the same manner and have the same basic components. The power requirements of the higher amperage VSDs require more capacitors in the DC Bus. The 330 and 420 amp design use one transistor module per phase on in the inverter section, the 780 and 1020 use 2 per phase, and the 1280 uses 3 in parallel per phase. The modules and the boards are not interchangeable between different PYT models.

HARMONIC FILTER OPTION

The PYT model VSD may also include an optional harmonic filter and high frequency trap designed to meet the IEEE Std 519, "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems". The harmonic filter is offered as a means to improve the input current waveform drawn by the VSD from the AC line. The filter reduces the possibility of causing electrical interference with other sensitive electronic equipment connected to the same power source. An additional benefit of the optional harmonic filter is that it will correct the system power factor to near unity.

Within the enclosure of the PYT model VSD, the drive logic board and optional harmonic filter logic board are interconnected via a 16-position ribbon cable. This cable provides power for the filter logic board and a method of communication between the two boards.

The power section of the harmonic filter is composed of three major blocks:

- The pre-charge section
- The three phase inductor
- The filter power unit

Pre-charge

The pre-charge section contains pre-charge resistors, a pre-charge contactor and a supply contactor. The pre-charge network serves two purposes, to slowly charge the DC bus capacitors associated with the filter power unit and to provide a means of disconnecting the filter power unit from the AC line. When the chiller is turned off, both contactors are de-energized and the fil-

ter power unit is disconnected from the AC line. When the chiller begins to run, the pre-charge resistors are switched into the circuit via the precharge contactor for a fixed time period of 5 seconds. This permits the filter capacitors in the filter power unit to slowly charge. After the 5 second time period, the supply contactor is energized and the pre-charge contactor is de-energized, permitting the filter power unit to completely charge. Three power semiconductor fuses connect the power components to the AC line and serve to help prevent rupture if a catastrophic failure occurs on the DC bus portion of the filter power unit.

Three Phase Inductor

The three phase inductor provides some impedance for the filter to boost bus voltage. It effectively limits the rate of change in current at the input to the filter to a reasonable level.

Filter Power Unit

The filter power unit generates the harmonic currents required by the VSD's AC- to -DC converter so that these harmonic currents are not drawn from the AC line. The filter power unit is similar to the PYT model VSD power unit in the 330 amp VSD, except with 2 fewer capacitors in the filter capacitor "bank", and a smaller transistor module and modified gate driver board. The harmonic filter gate driver board provides turn on and turn off commands as determined by the harmonic filter logic board. "Bleeder" resistors are mounted on the side of the filter power unit to provide a discharge path for the DC bus capacitors.

Transistor Module

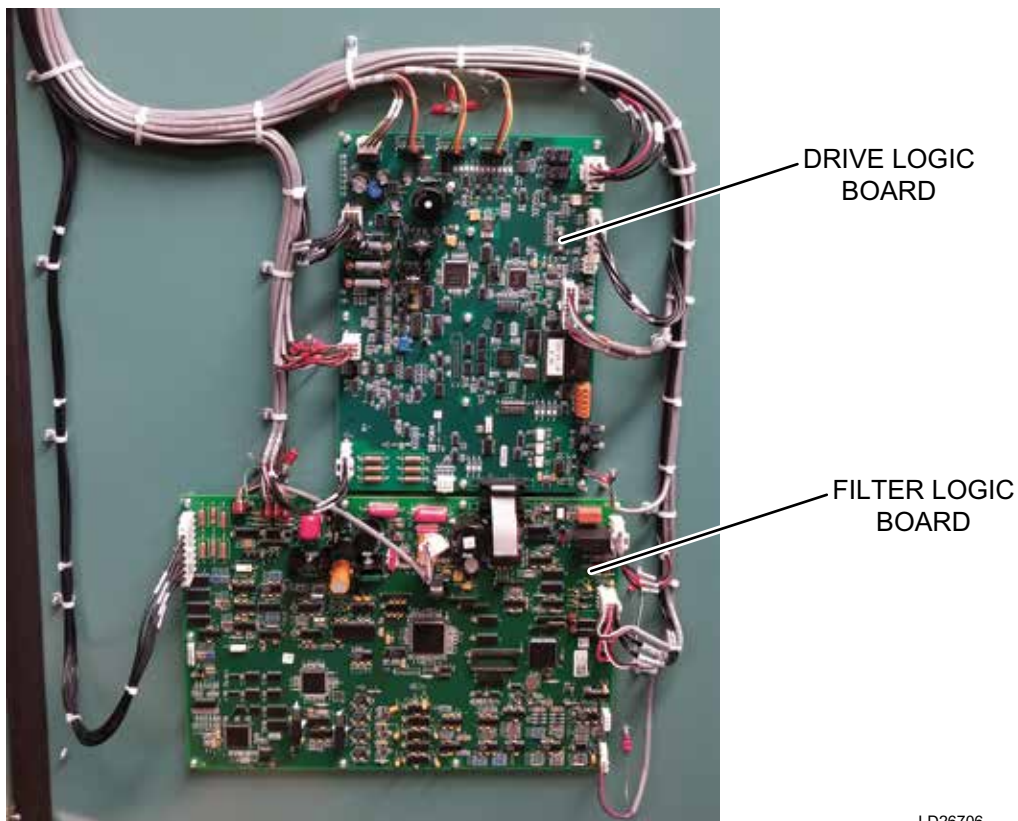
The transistor module contains a temperature sensor that provides temperature information back to the filter logic board. This sensor protects the filter transistor module from over temperature conditions. A bus isolator board is used to ensure that the DC bus capacitors are properly charged and that the voltage is balanced. Two output current sensors are used to protect the filter against an over current or an overload condition. Input current transformers sense the input current drawn by the VSD's AC to DC converter. The line voltage isolation board provides AC line voltage information to the harmonic filter logic board, which is used to determine the proper bus voltage setpoint.

High Frequency Trap

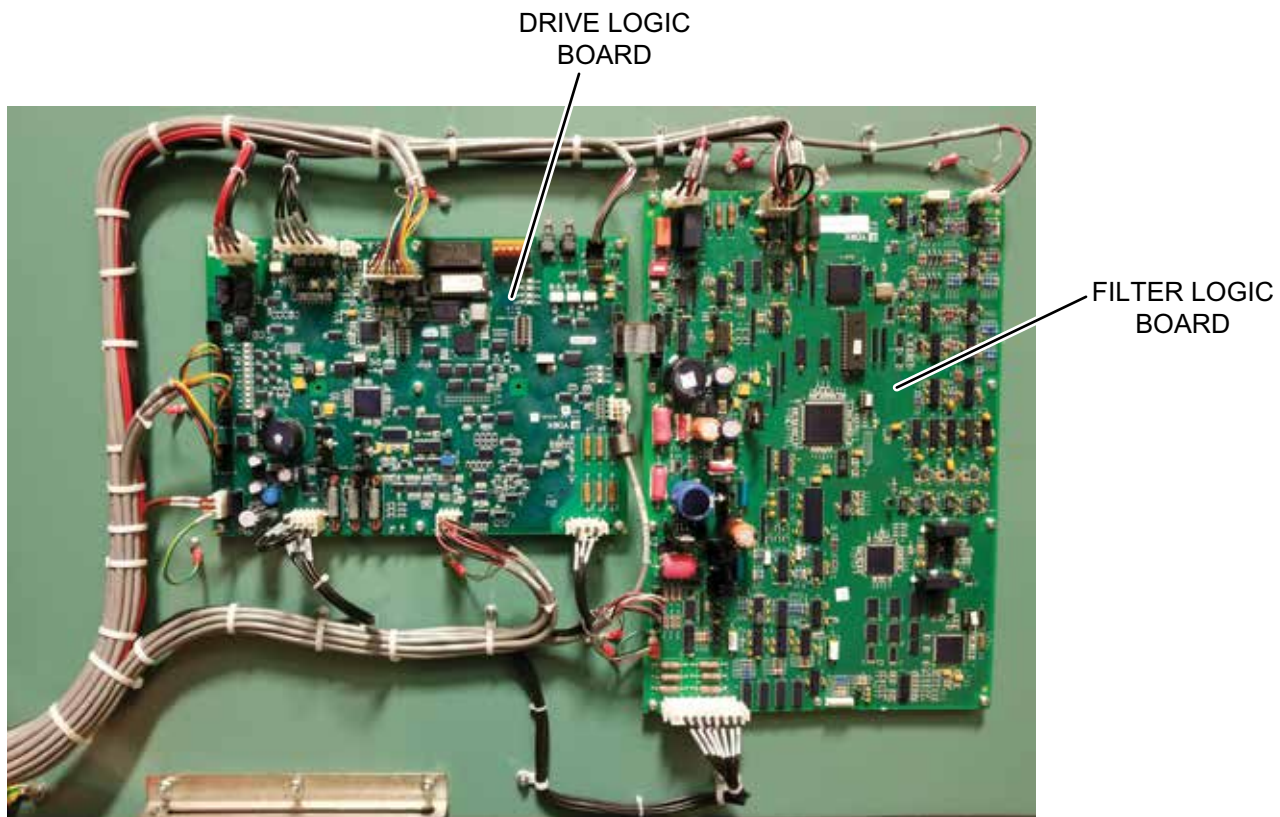
The high frequency trap is standard on all VSD's that contain an optional harmonic filter. The high frequency trap is composed of a series of capacitors, inductors, and resistors used to reduce the effects of the PWM switching frequency of the filter inverter.

CRITICAL LOAD POWER

The VSD cabinet includes an inverter and a battery. When the source power feeding the chiller is removed, the inverter-battery combination provides an energy source to sustain control power until the motor coasts to a stop and is de-levitated. During normal operation, the inverter passes 120 VAC through a switch to power the chiller controls. This inverter is monitoring the incoming voltage and when the source is removed, the inverter begins to provide power to the critical load circuit, drawing energy from the 12V battery.

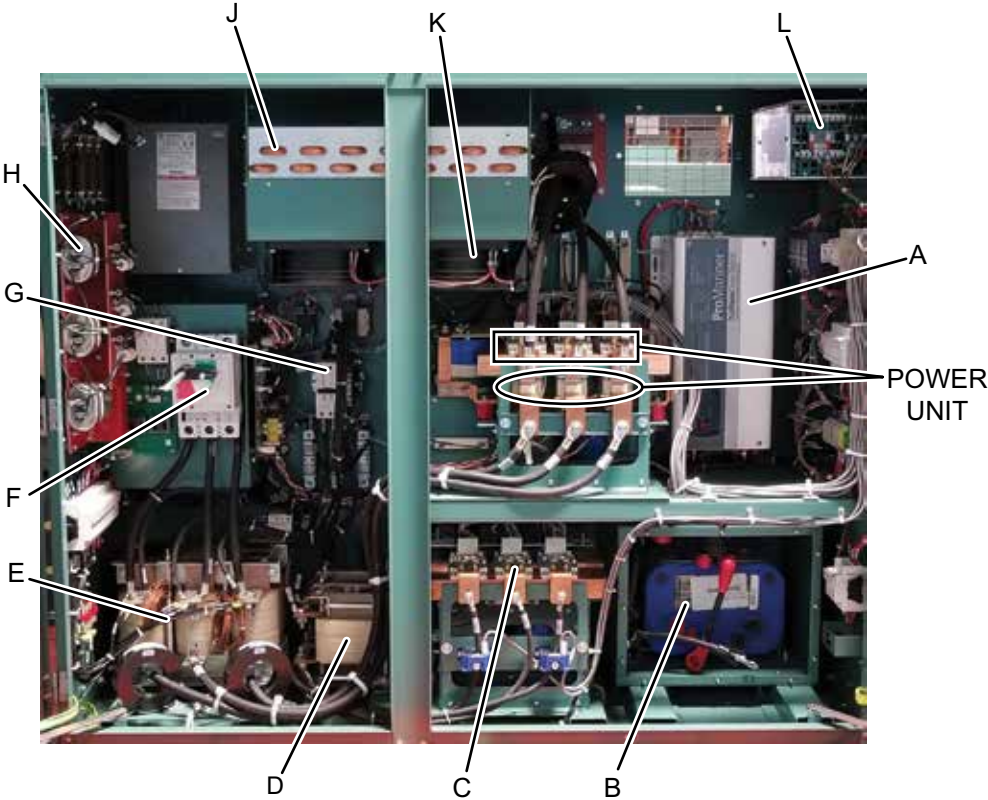


LD26706

FIGURE 38 - DRIVE CABINET DOOR (PYT330, PYT420, PYT780 & PYT1020)

LD26707

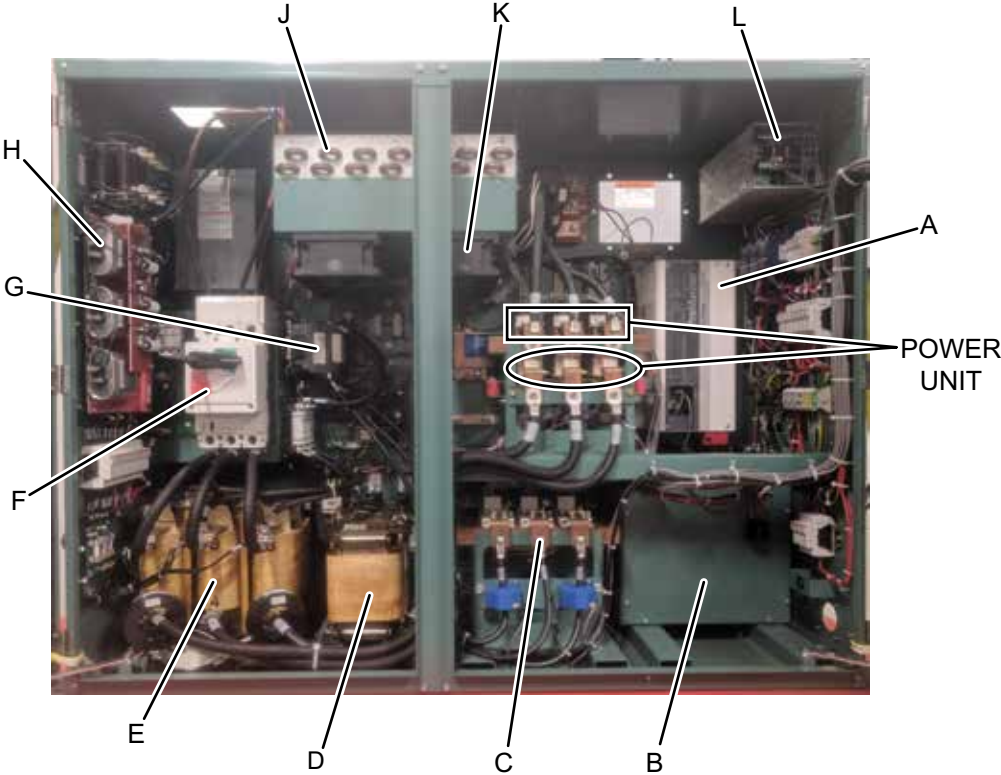
FIGURE 39 - DRIVE CABINET DOOR (PYT1280)



A	Main UPS
B	UPS Battery
C	Filter Power Unit
D	Filter Inductor
E	Input Inductor
F	Circuit Breaker
G	Filter Supply Contactor
H	Filter Trap Assembly
J	Cooling Coil
K	Cooling Fan
L	300VDC Magnetic Bearing Power Supply
○	Rectifier
□	Inverter

LD26704

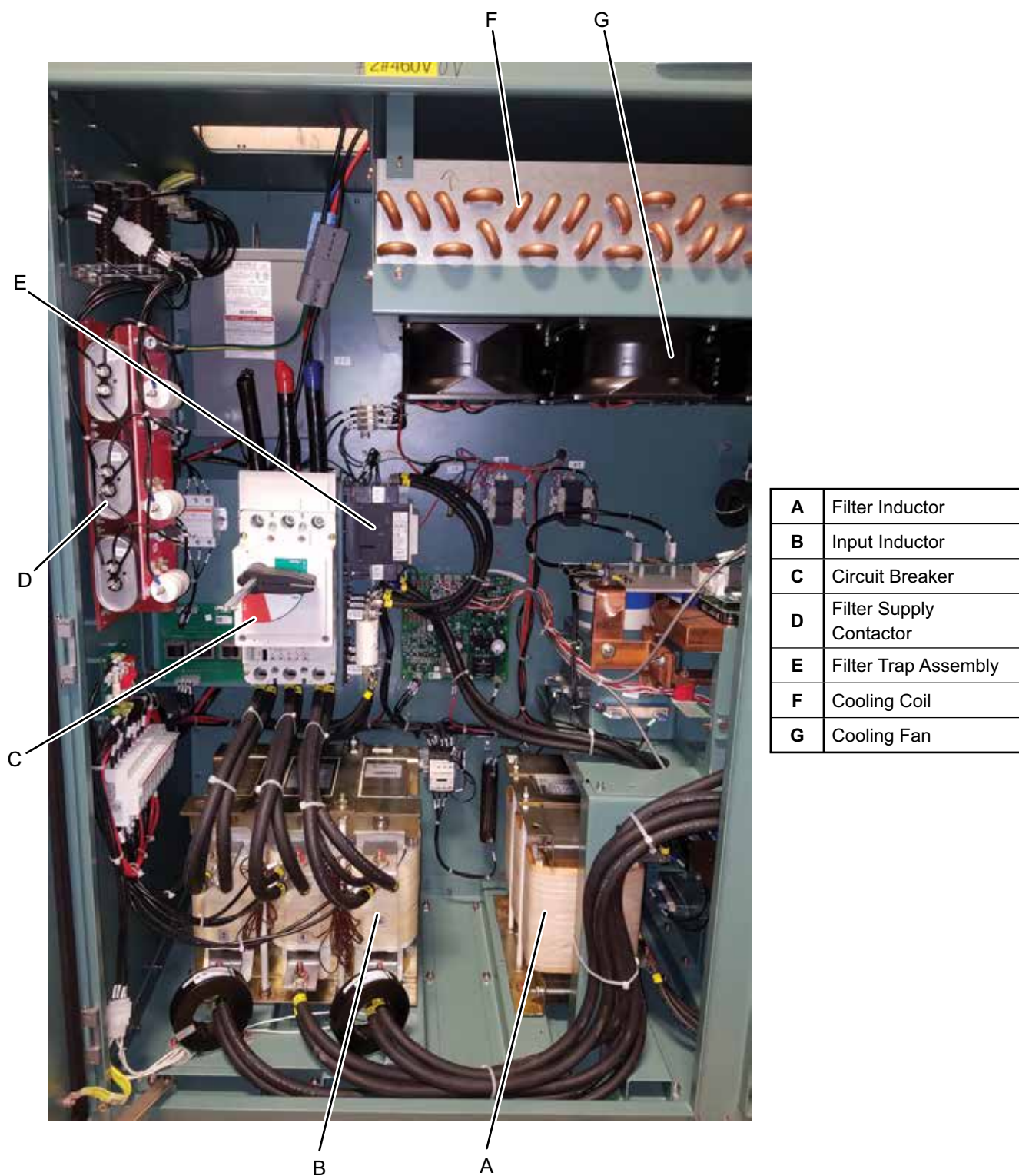
FIGURE 40 - DRIVE CABINET MODEL PYT330



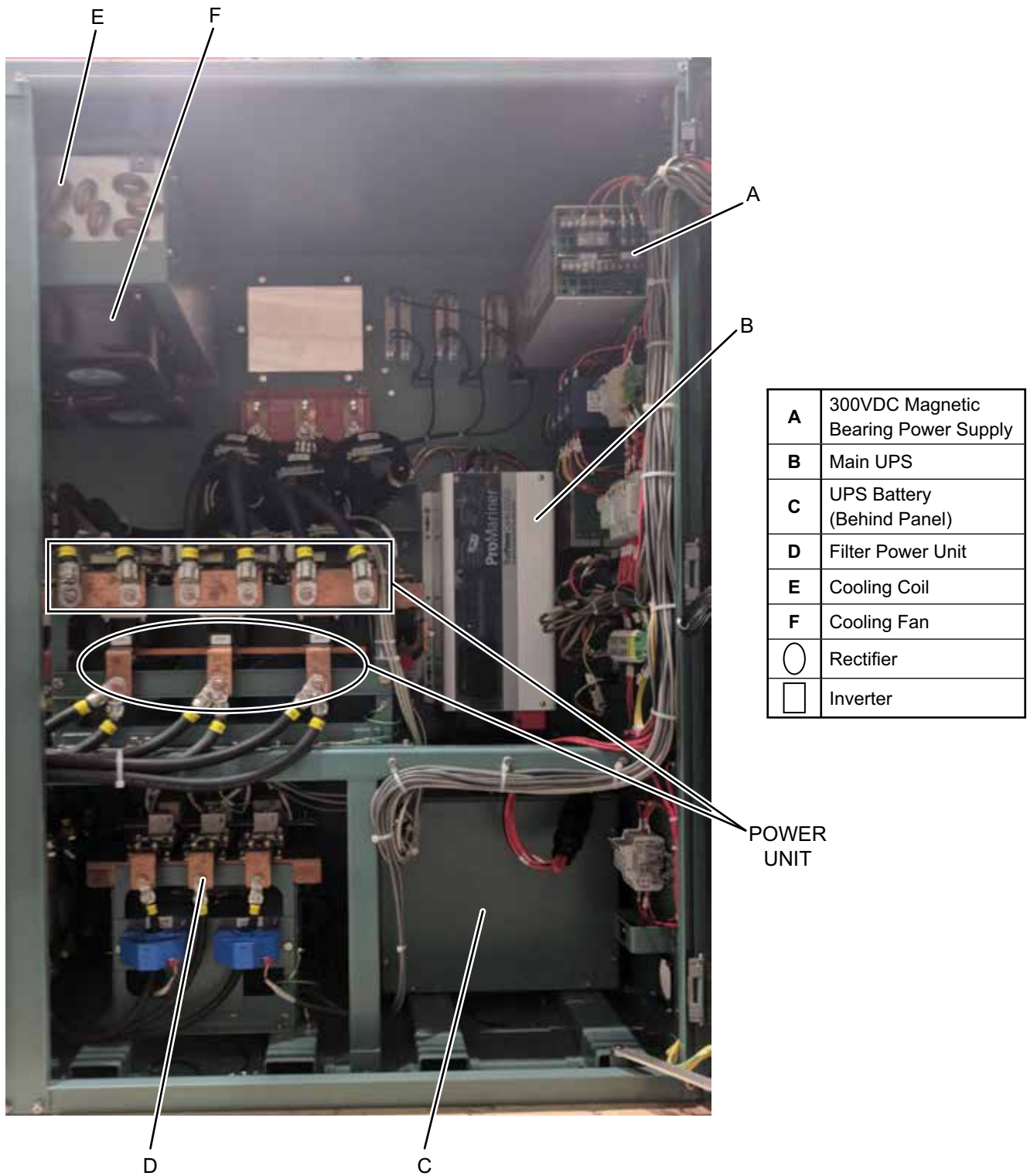
A	Main UPS
B	UPS Battery
C	Filter Power Unit
D	Filter Inductor
E	Input Inductor
F	Circuit Breaker
G	Filter Supply Contactor
H	Filter Trap Assembly
J	Cooling Coil
K	Cooling Fan
L	300VDC Magnetic Bearing Power Supply
○	Rectifier
□	Inverter

LD26708

FIGURE 41 - DRIVE CABINET MODEL PYT420

**FIGURE 42 - LEFT SIDE OF DRIVE CABINET MODEL PYT780**

LD26709



LD26710

FIGURE 43 - RIGHT SIDE OF DRIVE CABINET MODEL PYT780

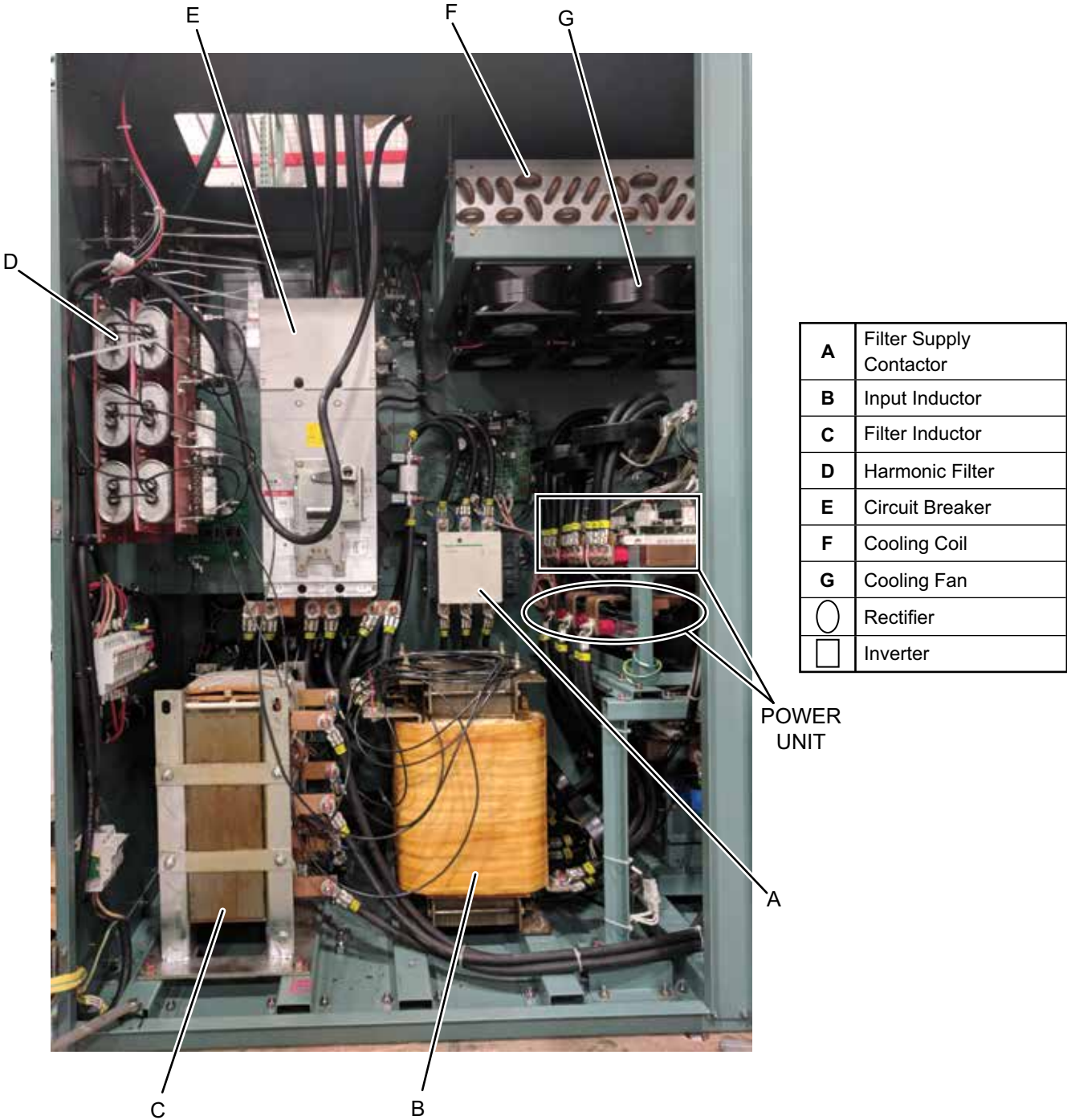
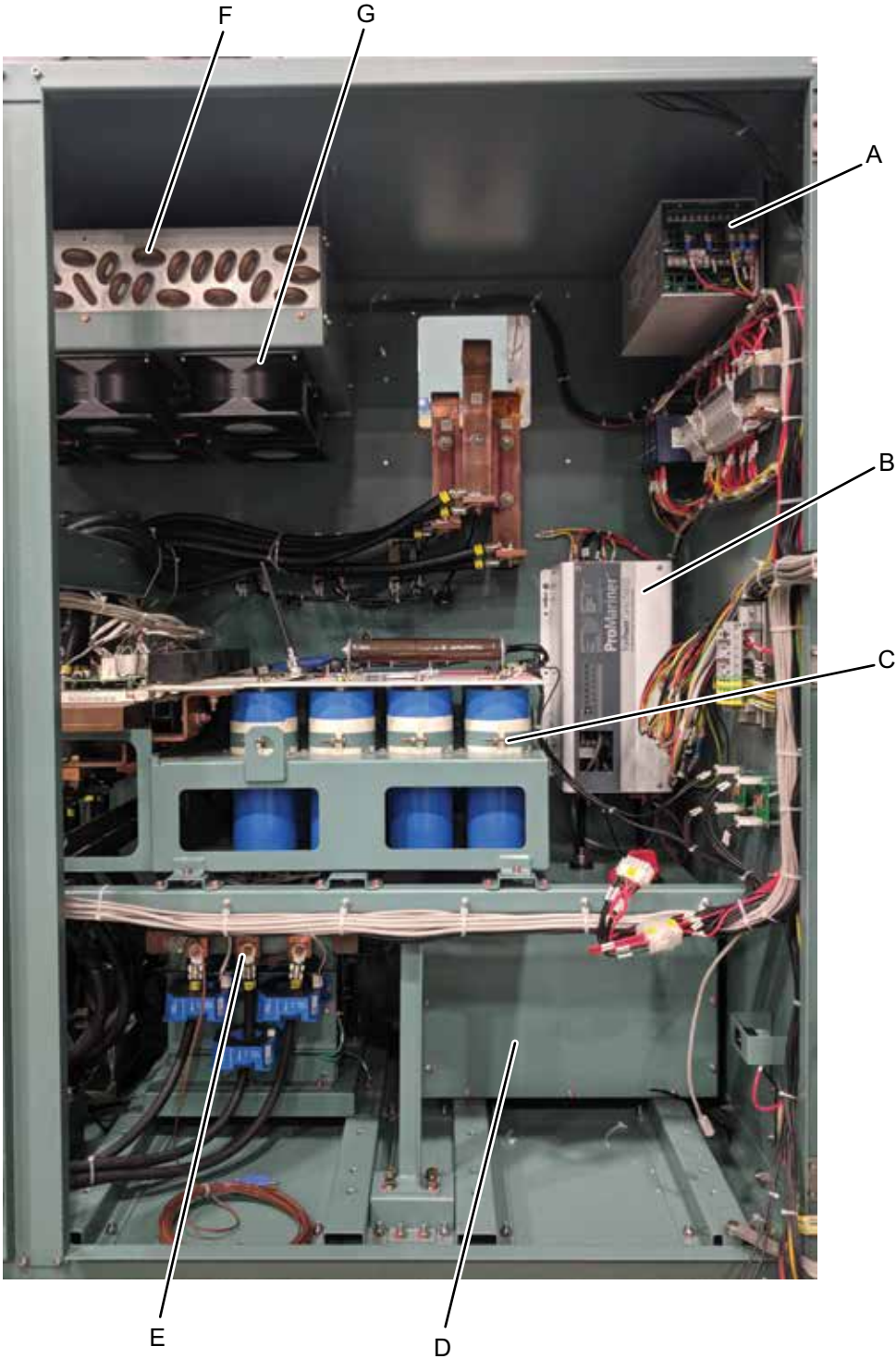


FIGURE 44 - LEFT SIDE OF DRIVE CABINET MODEL PYT1020

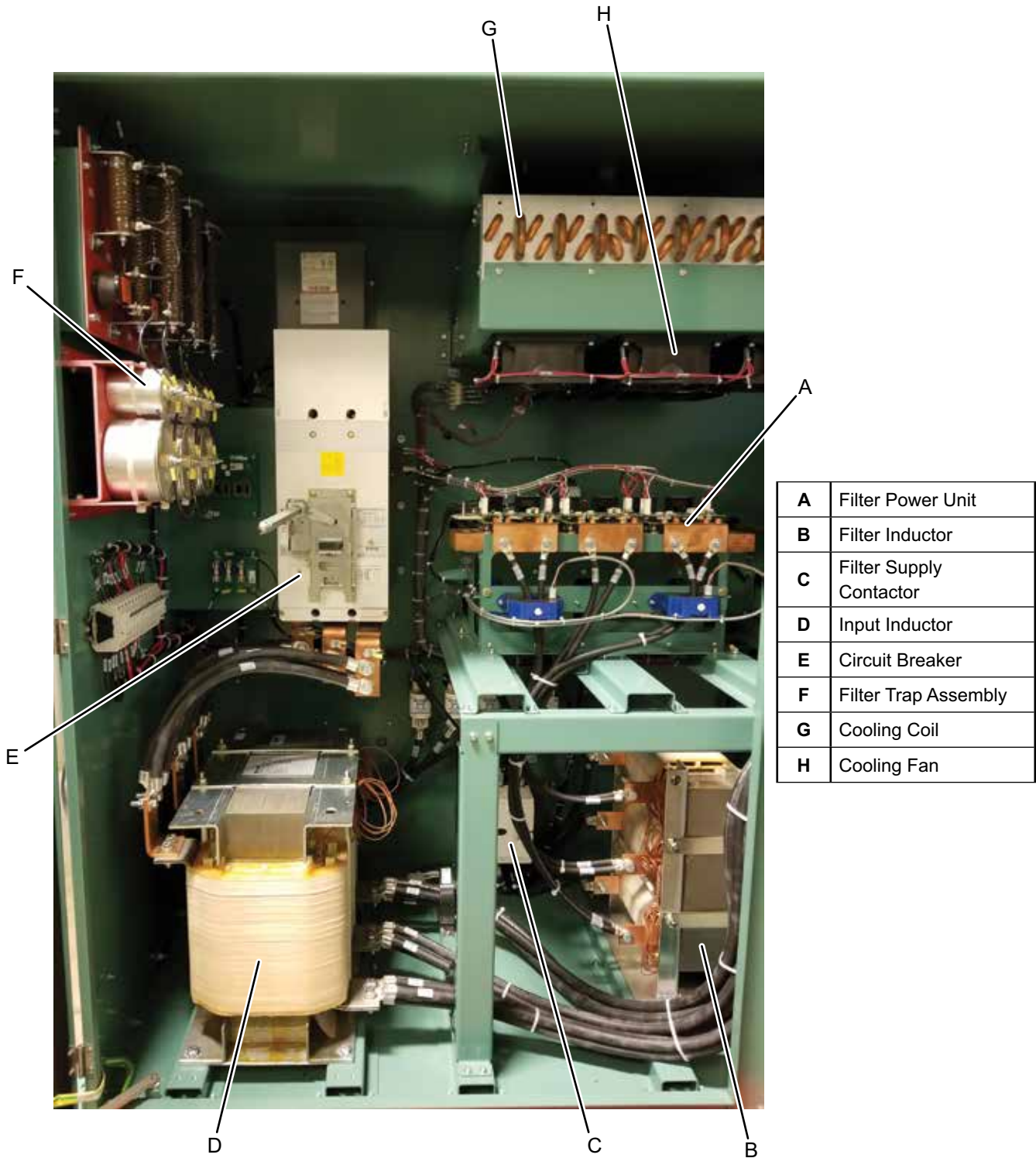
LD26716



A	300VDC Magnetic Bearing Power Supply
B	Main UPS
C	Bus Capacitors
D	UPS Battery (Behind Panel)
E	Filter Power Unit
F	Cooling Coil
G	Cooling Fan

FIGURE 45 - RIGHT SIDE OF DRIVE CABINET MODEL PYT1020

LD26717



LD26711

FIGURE 46 - LEFT SIDE OF DRIVE CABINET MODEL PYT1280

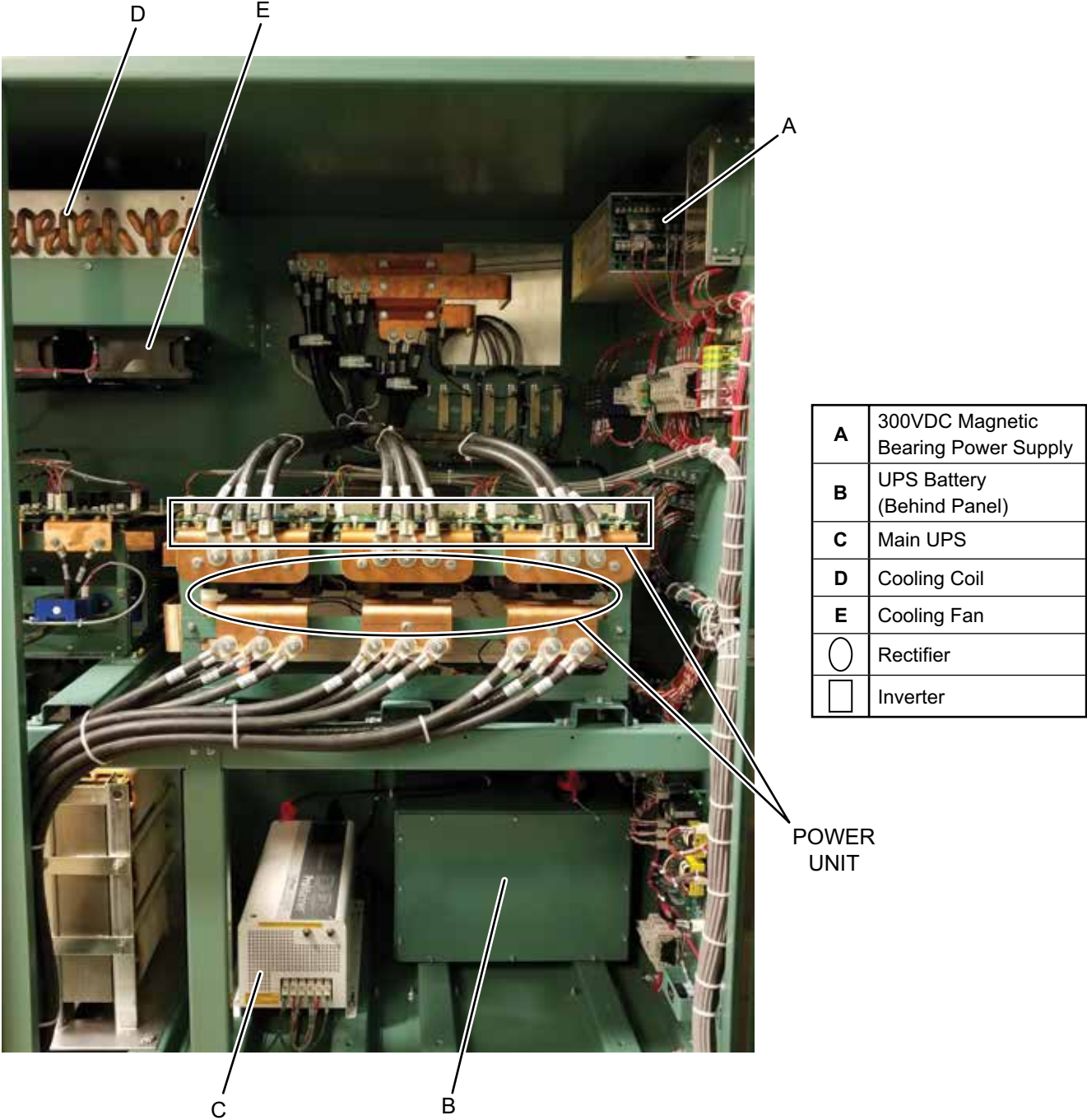


FIGURE 47 - RIGHT SIDE OF DRIVE CABINET MODEL PYT1280

LD26712

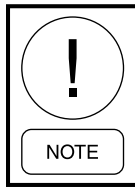
THIS PAGE INTENTIONALLY LEFT BLANK.

SECTION 5 - MAINTENANCE

PREVENTATIVE MAINTENANCE

It is the responsibility of the owner to provide the required daily, monthly and yearly maintenance of the system.

In any operating system it is most important to provide planned maintenance and inspection of its functioning parts to keep it operating at peak efficiency. Therefore, the following maintenance should be performed when prescribed.



IMPORTANT – If a unit failure occurs due to improper maintenance during the warranty period; Johnson Controls will not be liable for costs incurred to return the system to satisfactory operation.

Electrical Isolation

1. Isolate the electrical power supply to the chiller from the facility
2. Isolate the Power Panel battery from the Uninterrupted Power Supply by opening the Power Panel disconnect switch.
3. Isolate plant fluid flow to the chiller at appropriate valves or have refrigerant isolated to prevent free-wheeling the driveline and generating electrical energy from the permanent magnet rotor.

5

TABLE 13 - MAINTENANCE REQUIREMENTS

 MAINTENANCE REQUIREMENTS FOR YZ CHILLERS					
Procedure	Daily	Weekly	Monthly	Yearly	Other
Record operating conditions (on applicable Log Form)	X				
Check operating parameters for indication of tube fouling or refrigerant loss		X			
Check three-phase voltage and current balance			X		
Check programmable operating setpoints and safety cut-outs. Make sure they are correct for the application			X		
Verify condenser and evaporator water flows			X		
Leak check and repair leaks as needed ¹			X		
Check and tighten all electrical connections				X	
Clean or backflush VSD heat exchanger				X	
Replace VSD starter coolant				X	
Measure motor winding and insulation resistance				X	
Perform refrigerant analysis ¹				X	
Review operating data for trends which indicate increasing vibration or power consumption. The MBC data includes 1 x rotational speed vibration in displacement.				X	
Clean tubes				X ²	
Perform Eddy current testing and inspect tubes					2-5 Years

For operating and maintenance requirements listed above, refer to appropriate service literature, or contact your local Johnson Controls Service Office.

¹ This procedure must be performed at the specified time interval by an Industry Certified Technician who has been trained and qualified to work on this type of YORK equipment. A record of this procedure being successfully carried out must be maintained on file by the equipment owner should proof of adequate maintenance be required at a later date for warranty validation purposes.

² More frequent service may be required depending on local operating conditions.

RENEWAL PARTS

For any required Renewal Parts, refer to [Parts Navigator](#).

OPERATING INSPECTIONS

By following a regular inspection using the display readings of the OptiView Control Center, and maintenance procedure, the operator will avoid serious operating difficulty. The following list of inspections and procedures should be used as a guide.

Daily

1. Check OptiView Control Center displays.
2. Check entering and leaving condenser water temperatures for comparison with job design conditions. Condenser water temperatures can be checked on the SYSTEM Screen.
3. Check the entering and leaving chilled liquid temperatures and evaporator pressure for comparison with job design conditions. Chilled liquid temperatures can be checked on the SYSTEM Screen.
4. Check the condenser saturation temperature (based upon condenser pressure sensed by the condenser transducer) on the SYSTEM Screen.
5. Check the compressor discharge temperature on the SYSTEM Screen. During normal operation discharge temperature should not exceed 220°F (104°C).
6. Check the compressor motor current on the SYSTEM Screen.
7. Check for any signs of dirty or fouled condenser tubes. (The temperature difference between water leaving condenser and saturated condensing temperature should not exceed the difference recorded for a new unit by more than 4°F (2.2°C)).

Weekly

Check the refrigerant charge. *See Checking The Refrigerant Charge on page 124.*

Semi-Annually (Or More Often As Required)

Check controls.

Annually (More Often If Necessary)

1. Evaporator and Condenser
 - a. Inspect and clean water strainers
 - b. Inspect and clean tubes as required
 - c. Inspect end sheet.
2. Compressor Drive Motor
 - a. Measure motor winding insulation resistance
3. Inspect and service electrical components as necessary
4. Perform refrigerant analysis

CHECKING SYSTEM FOR LEAKS**Leak Testing During Operation**

The refrigerant side of the system is carefully pressure tested and evacuated at the factory.

After the system has been charged, the system should be carefully leak tested with a refrigerant compatible leak detector to be sure all joints are tight.

If any leaks are indicated, they must be repaired immediately. At times, leaks can be stopped by ensuring face seal nuts and flange bolts are properly torqued. However, for any major repair, the refrigerant charge must be removed. *See Handling Refrigerant For Dis-mantling And Repairs on page 125* in this section.

CONDUCT PRESSURE TEST

With the refrigerant charge removed and all known leaks repaired, charge the system with dry nitrogen to 30 psig to (206 kPa) detect any leaks using a liquid soap solution test. The test can be enhanced with the use of an ultrasonic leak detector.

Optional Trace Gas Pressure Test

1. With no pressure in the system and refrigerant removed, charge a trace gas (helium may be used) and dry nitrogen mixture into the chiller until pressure is at least 30 psig (206 kPa).
2. One method is to charge 5 to 10 lbm of the environmentally-appropriate trace gas and then add dry nitrogen into the system to a pressure of 30 psig (206 kPa).
3. To make sure that the concentration of tracer reached all parts of the system, slightly open the service valve and test for the presence of gas with a leak detector.

4. Test around each joint and factory weld carefully and thoroughly.
5. To check for tube or tube joint leaks:
 - a. Isolate and drain the condenser and evaporator waterboxes
 - b. Purge the waterboxes and tubes with dry nitrogen through the vents or drains until the detector does not indicate
 - c. Close the vents and drains and wait an hour
 - d. Open a vent or drain and insert the leak detector. If a leak is detected, the heads must be removed and the source of the leak determined as outlined in the *Condensers and Evaporators on page 125* in this section.
6. Recover the test gas as applicable, make necessary repairs, repeat leak tests, evacuate the chiller and perform time hold test. Always consider the effect of temperature change when performing any time-based hold test. For an ideal gas, at time 1, pressure over temperature (absolute unit system) = the ratio at time 2.

SYSTEM EVACUATION

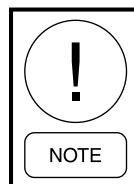


Ensure power is removed from the input side of the VSD at all times when the chiller is under vacuum (less than atmospheric pressure). The VSD maintains voltage to ground on the motor when the chiller is off while voltage is available to the VSD. Insulating properties in the motor are reduced in vacuum and may not insulate this voltage sufficiently.

After the pressure test has been completed, the vacuum test should be conducted as follows:

1. Connect a high capacity vacuum pump, with indicator, to the system charging valve as shown in *Figure 48 on page 122* and start the pump. See *Vacuum Dehydration on page 121* in this section.
2. Open wide all system valves. Be sure all valves to the atmosphere are closed and flare caps installed on outlets.
3. Operate the vacuum pump in accordance with *Vacuum Dehydration on page 121* in this section until a wet bulb temperature of +32°F (0°C) or a pressure of 5 mm Hg is reached. See *Table 14 on page 122* for corresponding pressure values.

4. To improve evacuation circulate hot water, not to exceed 120 °F (49 °C) through the evaporator and condenser tubes to thoroughly dehydrate the shells. If a source of hot water is not readily available, a portable water heater should be employed. **DO NOT USE STEAM.** A suggested method is to connect a hose between the source of hot water under pressure and the evaporator head drain connection, out the evaporator vent connection, into the condenser head drain and out the condenser vent. To avoid the possibility of causing leaks, the temperature should be brought up slowly so that the tubes and shell are heated evenly.
5. Close the system charging valve and the stop valve between the vacuum indicator and the vacuum pump. Then disconnect the vacuum pump leaving the vacuum indicator in place.
6. Hold the vacuum obtained in *Step 3* above in the system for 8 hours; the slightest rise in pressure indicates a leak or the presence of moisture, or both. It is important to check for pressure change with the chiller at the same temperature. Pressure will change proportional to temperature and affect results. If after 24 hours the wet bulb temperature in the vacuum indicator has not risen above 40°F (4.4°C) or a pressure of 6.3 mm Hg, the system may be considered tight.



Be sure the vacuum indicator is valved off while holding the system vacuum and be sure to open the valve between the vacuum indicator and the system when checking the vacuum after the 8 hour period.

7. If the vacuum does not hold for 8 hours within the limits specified in *Step 6* above, the leak must be found and repaired.

VACUUM DEHYDRATION

To obtain a sufficiently dry system, the following instructions have been assembled to provide an effective method for evacuating and dehydrating a system in the field. Although there are several methods of dehydrating a system, we are recommending the following, as it produces one of the best results, and affords a means of obtaining accurate readings as to the extent of dehydration.

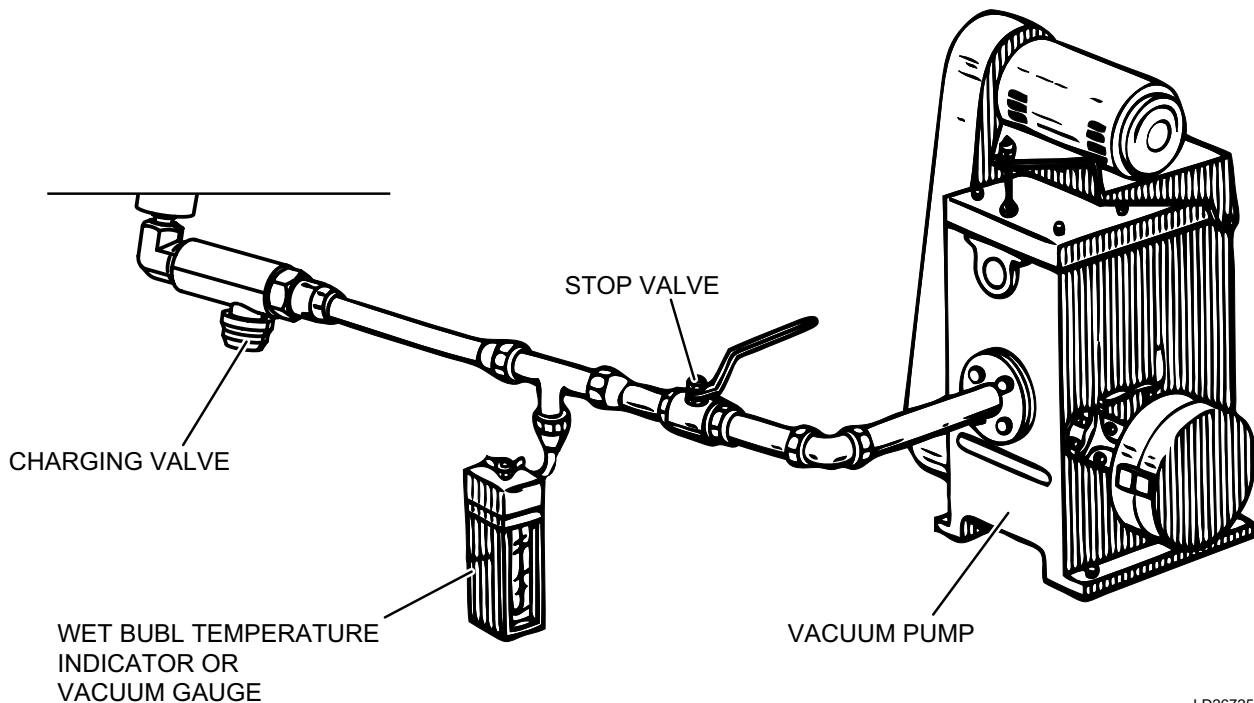
The equipment required to follow this method of dehydration consists of a wet bulb indicator or vacuum gauge, a chart showing the relation between dew point temperature and pressure in inches of mercury (vacuum), (See *Table 14 on page 122*) and a vacuum pump capable of pumping a suitable vacuum on the system.

TABLE 14 - SYSTEM PRESSURES

*GAUGE	ABSOLUTE			BOILING TEMPERATURES OF WATER °F
INCHES OF MERCURY (HG) BELOW ONE STANDARD ATMOSPHERE	PSIA	MILLIMETERS OF MERCURY (HG)	MICRONS	
0"	14.6960	760.00	760,000	212
10.240"	9.6290	500.00	500,000	192
22.050"	3.8650	200.00	200,000	151
25.980"	1.9350	100.00	100,000	124
27.950"	0.9680	50.00	50,000	101
28.940"	0.4810	25.00	25,000	78
29.530"	0.1920	10.00	10,000	52
29.670"	0.1220	6.30	6,300	40
29.720"	0.0990	5.00	5,000	35 ← Water Freezes
29.842"	0.0390	2.00	2,000	15
29.882"	0.0190	1.00	1,000	1
29.901"	0.0100	0.50	500	-11
29.917"	0.0020	0.10	100	-38
29.919"	0.0010	0.05	50	-50
29.9206"	0.0002	0.01	10	-70
29.921"	0	0	0	

*One standard atmosphere = 14.696 PSIA
= 760 mm Hg. absolute pressure at 32°F
= 29.921 inches Hg. absolute at 32°F

NOTES: PSIG = Lbs. per sq. in. gauge pressure
= Pressure above atmosphere
PSIA = Lbs. per sq. in. absolute pressure
= Sum of gauge plus atmospheric pressure

**FIGURE 48 - EVACUATION OF CHILLER**

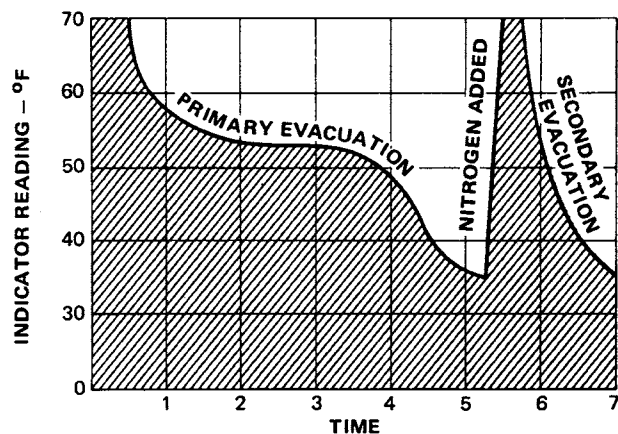
LD26725

Operation

Dehydration of a refrigerant system can be obtained by this method because the water present in the system reacts much as a refrigerant would. By pulling down the pressure in the system to a point where its saturation temperature is considerably below that of room temperature, heat will flow from the room through the walls of the system and vaporize the water, allowing a large percentage of it to be removed by the vacuum pump. The length of time necessary for the dehydration of a system is dependent on the size or volume of the system, the capacity and efficiency of the vacuum pump, the room temperature and the quantity of water present in the system. By the use of the vacuum indicator as suggested, the test tube will be evacuated to the same pressure as the system, and the distilled water will be maintained at the same saturation temperature as any free water in the system, and this temperature can be observed on the thermometer.

If the system has been pressure tested and found to be tight prior to evacuation, then the saturation temperature recordings should follow a curve similar to the typical saturation curve shown as in *Figure 49 on page 123* below.

The temperature of the water in the test tube will drop as the pressure decreases, until the boiling point is reached, at which point the temperature will level off and remain at this level until all of the water in the shell is vaporized. When this final vaporization has taken place the pressure and temperature will continue to drop until eventually a temperature of 35°F (1.6°C) or a pressure of 5 mm Hg. is reached.



LD26726

FIGURE 49 - SATURATION CURVE

When this point is reached, practically all of the air has been evacuated from the system, but there is still a small amount of moisture left. In order to provide a medium for carrying this residual moisture to the vacuum pump, nitrogen should be introduced into the system to bring it to atmospheric pressure and the indicator temperature will return to approximately ambient temperature. Close off the system again, and start the second evacuation.

The relatively small amount of moisture left will be carried out through the vacuum pump and the temperature or pressure shown by the indicator should drop uniformly until it reaches a temperature of 35°F (1.6°C) or a pressure of 5 mm Hg.

When the vacuum indicator registers this temperature or pressure, it is a positive sign that the system is evacuated and dehydrated to the recommended limit. If this level cannot be reached, it is evident that there is a leak somewhere in the system. Any leaks must be corrected before the indicator can be pulled down to 35°F (1.6°C) or 5 mm Hg. in the primary evacuation.

During the primary pulldown, keep a careful watch on the wet bulb indicator temperature, and do not let it fall below 35°F (1.6°C). If the temperature is allowed to fall to 32°F (0°C), the water in the test tube will freeze, and the result will be a faulty temperature reading.

CONDUCT PRESSURE TEST

If a pressure test indicates all joints are not leaking, proceed to test with appropriate refrigerant as follows:

1. With no pressure in the system, charge refrigerant vapor into the chiller until pressure is at least 30 psig (206 kPa) so pressure is above the saturation temperature for water to freeze.
2. Add refrigerant until the saturation pressure for the prevailing ambient temperature of the chiller is achieved, leak checking repaired joints with a refrigerant leak detector as pressure is increased.
3. Test around each joint and factory weld carefully and thoroughly.
4. To check for tube or tube joint leaks:
 - a. Isolate and drain the condenser and evaporator waterboxes
 - b. Purge the waterboxes and tubes with dry nitrogen through the vents or drains until the detector does not indicate
 - c. Close the vents and drains and wait an hour
 - d. Open a vent or drain and insert the leak detector. If a leak is detected, the heads must be removed and the source of the leak determined as outlined in the *Condensers and Evaporators on page 125* in this section.

REFRIGERANT CHARGING

To avoid the possibility of freezing liquid within the evaporator tubes when charging an evacuated system, only refrigerant vapor from the top of the drum or cylinder must be admitted to the system until the system pressure is raised above the point corresponding to the freezing point of the evaporator liquid.

While charging, every precaution must be taken to prevent moisture laden air from entering the system. Make up a suitable charging connection from new copper tubing to fit between the system charging valve and the fitting on the charging drum. This connection should be as short as possible but long enough to permit sufficient flexibility for changing drums. The charging connection should be purged each time a full container of refrigerant is connected and changing containers should be done as quickly as possible to minimize the loss of refrigerant.

Refrigerant may be furnished in cylinders containing either 100 lbs or 1900 lbs. (45 kg or 862 kg) of refrigerant.

CHECKING THE REFRIGERANT CHARGE

The refrigerant charge is specified for each chiller model in *Table 15 on page 125*. Charge the correct amount of refrigerant.

Charge the refrigerant in accordance with the method shown in this section. The weight of the refrigerant charged should be recorded after initial charging.

During operation, the refrigerant charge level is correct when the condenser level is above the subcooler, and the measured Evaporator Approach and Discharge Refrigerant Gas Superheat are at the design values for the condition. Design values would be provided upon request from the chillers sales engineer from the chiller rating program. These depend on tube selection, chilled fluid type, operating head, and operating condition. The equations (below) define these parameters. Condenser level is detected by the liquid level sensor and controlled to the programmed setpoint by the chiller control logic.

Equations

- Evaporator Approach = (LELT) - (SET)
- Discharge Superheat = (CDGT) - (SCT)

Definitions:

- SET = Saturated Evaporator Temperature
- LELT = Leaving Evaporator Liquid Temperature
- CDGT = Compressor Discharge Gas Temperature
- SCT = Saturated Condensing Temperature

The parameters can be viewed on the control center. The chiller must be at design operating conditions and full load operation before the correct refrigerant charge level can be properly determined when operating. When proper condenser level is set, evaporator approach can be trended at constant operating points to monitor potential loss of charge.

Liquid refrigerant will be visible in the evaporator sight glass, but the refrigerant charge amount cannot be properly determined by viewing the liquid refrigerant level in the evaporator sight glass. The level changes due to suction conditions and load. If exact conditions are repeated, level should repeat in the glass from a known baseline.

HANDLING REFRIGERANT FOR DISMANTLING AND REPAIRS

If it becomes necessary to open any part of the refrigerant system for repairs, it will be necessary to remove the charge before opening any part of the unit. If the chiller is equipped with optional valves, the refrigerant can be isolated in either the condenser or evaporator / compressor while making any necessary repairs.

COMPRESSOR AND MOTOR

1. Check mounting screws and piping joint nuts frequently to insure tightness.
2. Test motor windings annually to check for deterioration of windings.

Electrical test of motor winding resistance should be performed by a qualified service technician because it involves determination of power leads between the motor and the VSD. Results from these winding insulation resistance tests should be trended each interval to determine degradation in motor windings.

5

TABLE 15 - APPROXIMATE REFRIGERANT AND WATER WEIGHT

EVAPORATOR	CONDENSER	REFRIGERANT WEIGHT LBS (KG)*	WATER WEIGHT LBS (KG)**
FB2910	CA2110	579 (263)	1375 (625)
FB2912	SA2512	746 (339)	1870 (850)
FA3312	SA2512	770 (350)	2035 (925)
FA3312	SA2512	869 (395)	2035 (925)
FA3314	SA3314	1177 (535)	3520 (1600)
FA3314	SA3314	1302 (592)	4125 (1875)
FA3914	CA3314	1751 (796)	4015 (1825)
FA3916	SA3916	2105 (957)	5665 (2475)
FA4816	SA3916	2451 (1114)	6820 (3100)
FA4816	CA3916	2779 (1263)	6765 (3075)
FB4818	SA4418	3291 (1496)	8635 (3925)
FB5618	SS4418	3577 (1626)	9680 (4400)

*Refrigerant Weight based on maximum tube bundle.

** Water Weight is the total water in both shells and for 150PSI, 2-pass, compact water boxes.

CONDENSERS AND EVAPORATORS

General

Maintenance of condenser and evaporator shells is important to provide trouble free operation of the chiller. The water side of the tubes in the shell must be kept clean and free from scale.

The major portion of maintenance on the condenser and evaporator will deal with the maintaining the water side of the condenser and evaporator in a clean condition.

The use of untreated water in cooling towers, closed water systems, etc. frequently results in one or more of the following:

1. Scale Formation
2. Corrosion or Rusting
3. Slime and Algae Formation

It is therefore to the benefit of the user to provide for proper water treatment to provide for a longer and more economical life of the equipment. The following recommendation should be followed in determining the condition of the water side of the condenser and evaporator tubes.

1. The condenser tubes should be cleaned annually or earlier if conditions warrant. If the temperature difference between the water off the condenser and the condenser liquid temperature is more than 4°F (2°C) greater than the difference recorded on a new unit, it is a good indication that the condenser tubes require cleaning. *See Cleaning Evaporator and Condenser Tubes on page 126* in this section for condenser tube cleaning instructions.
2. The evaporator tubes under normal circumstances will not require cleaning. If the temperature difference between the refrigerant and the chilled water increases slowly over the operating season, it is an indication that the evaporator tubes may be fouling or that there may be a water bypass in the water box requiring gasket replacement or refrigerant may have leaked from the chiller.

Chemical Water Treatment

Since the mineral content of the water circulated through evaporators and condensers varies with almost every source of supply, it is possible that the water being used may corrode the tubes or deposit heat resistant scale in them. Reliable water treatment companies are available in most larger cities to supply a water treating process which will greatly reduce the corrosive and scale forming properties of almost any type of water.

As a preventive measure against scale and corrosion and to prolong the life of evaporator and condenser tubes, a chemical analysis of the water should be made preferably before the system is installed. A reliable water treatment company can be consulted to determine whether water treatment is necessary, and if so, to furnish the proper treatment for the particular water condition.

Cleaning Evaporator and Condenser Tubes

Evaporator

It is difficult to determine by any particular test whether possible lack of performance of the evaporator is due to fouled tubes alone or due to a combination of troubles. Trouble which may be due to fouled tubes is indicated when, over a period of time, the cooling capacity decreases and the split (temperature difference between water leaving the evaporator and the refrigerant temperature in the evaporator) increases. A gradual drop-off in cooling capacity can also be caused by a gradual leak of refrigerant from the system or by a combination of fouled tubes and shortage of refrigerant charge.

Condenser

In a condenser, trouble due to fouled tubes is usually indicated by a steady rise in head pressure, over a period of time, accompanied by a steady rise in condensing temperature.

Tube Fouling

Fouling of the tubes can be due to deposits of two types as follows:

1. Rust or sludge – which finds its way into the tubes and accumulates there. This material usually does not build up on the inner tube surfaces as scale, but does interfere with the heat transfer. Rust or sludge can generally be removed from the tubes by a thorough brushing process.
2. Scale – due to mineral deposits. These deposits, even though very thin and scarcely detectable upon physical inspection, are highly resistant to heat transfer. They can be removed most effectively by circulating an acid solution through the tubes using skilled experts as described below.

Tube Cleaning Procedures

Brush Cleaning of Tubes

If the tube consists of dirt and sludge, it can usually be removed by means of the brushing process. Drain the water sides of the circuit to be cleaned (cooling water or chilled water) remove the heads and thoroughly clean each tube with a soft bristle nylon brush. **DO NOT USE A STEEL BRISTLE BRUSH.** A steel brush may damage the tubes.

Improved results can be obtained by admitting water into the tube during the cleaning process. This can be done by mounting the brush on a suitable length of 1/8" pipe with a few small holes at the brush end and connecting the other end by means of a hose to the water supply.

The tubes should always be brush cleaned before acid cleaning.

Acid Cleaning of Tubes

If the tubes are fouled with a hard scale deposit, they may require acid cleaning. It is important that before acid cleaning, the tubes be cleaned by the brushing process described above. If the relatively loose foreign material is removed before the acid cleaning, the acid solution will have less material to dissolve and flush

from the tubes with the result that a more satisfactory cleaning job will be accomplished with a probable saving of time.



Acid cleaning should only be performed by an expert. Please consult your local water treatment representative for assistance in removing scale buildup and preventative maintenance programs to eliminate future problems.

Commercial Acid Cleaning

In many major cities, commercial organizations now offer a specialized service of acid cleaning evaporators and condensers. If acid cleaning is required, Johnson Controls recommends the use of this type of organization. The Dow Industries Service Division of the Dow Chemical Company, Tulsa, Oklahoma, with branches in principal cities is one of the most reliable of these companies.

Testing for Evaporator and Condenser Tube Leaks

Evaporator and condenser tube leaks in refrigerant circuits may result in refrigerant leaking into the water circuit, or water leaking into the shell depending on the pressure levels. If refrigerant is leaking into the water, it can be detected at the liquid head vents after a period of shutdown. If water is leaking into the refrigerant, system capacity and efficiency will drop off sharply. If a tube is leaking and water has entered the system, the evaporator and condenser should be valved off from the rest of the water circuit and drained immediately to prevent severe rusting and corrosion. The refrigerant system should then be drained and purged with dry nitrogen to prevent severe rusting and corrosion. If a tube leak is indicated, the exact location of the leak may be determined as follows:

1. Remove the heads and listen at each section of tubes for a hissing sound that would indicate gas leakage. This will assist in locating the section of tubes to be further investigated. If the probable location of the leaky tubes has been determined, treat that section in the following manner (if the location is not definite, all the tubes will require investigations).
2. Wash off both tube heads and the ends of all tubes with water.

3. With nitrogen or dry air, blow out the tubes to clear them of traces of refrigerant laden moisture from the circulation water. As soon as the tubes are clear, a cork should be driven into each end of the tube. Pressurize the dry system with 50 to 100 PSIG (345 to 690 kPa) of nitrogen. Repeat this with all of the other tubes in the suspected section or, if necessary, with all the tubes in the evaporator or condenser. Allow the evaporator or condenser to remain corked up to 12 to 24 hours before proceeding. Depending upon the amount of leakage, the corks may blow from the end of a tube, indicating the location of the leakage. If not, it will be necessary to make a very thorough test with the leak detector.

4. After the tubes have been corked for 12 to 24 hours, it is recommended that two men working at both ends of the evaporator carefully test each tube – one man removing corks at one end and the other at the opposite end to remove corks and handle the leak detector. Start with the top row of tubes in the section being investigated. Remove the corks at the ends of one tube simultaneously and insert the exploring tube for 5 seconds – this should be long enough to draw into the detector any refrigerant gas that might have leaked through the tube walls. A fan placed at the end of the evaporator opposite the detector will assure that any leakage will travel through the tube to the detector.

5. Mark any leaking tubes for later identification.
6. If any of the tube sheet joints are leaking, the leak should be indicated by the detector. If a tube sheet leak is suspected, its exact location may be found by using a soap solution. A continuous buildup of bubbles around a tube indicates a tube sheet leak.

ELECTRICAL CONTROLS

Ensure electrical connections are tight and connectors are secure annually.

It is important that the factory settings of controls (operation and safety) not be changed. If the settings are changed without Johnson Controls approval, the warranty will be jeopardized.

AUTOMATIC BATTERY HEALTH TEST – DURING SHUTDOWN

For periodic maintenance or to diagnose battery faults or warnings, a battery health test can be performed. This test is initiated from the Power Panel screen of the Optiview panel to monitor battery voltage while under a known load. This will ensure that the battery has enough capacity left to withstand a power failure event. The test is available though operator access level or higher.

At the keypad, log in at Operator access level using access level code 9 6 7 5 or a higher level.

Navigate to Compressor – Power Panel screen.

On the Power Panel screen, the “Start Battery Test” button is shown and the function available when all of the following are true:

- Access Level is Operator or higher
- Chiller State is Stopped
- Safety Stop push-button is depressed
- The Local Run/Stop is set to Stop

When the “Start Battery Test” button is pressed the Battery Health Test is initiated. When the Battery Health Test is in progress, this button changes to a “Cancel Battery Test” button to cancel the active Battery Health Test in progress if needed. The test proceeds as follows:

The panel instructs “UPS Battery Test - Disconnect 3-phase line power to the chiller now”. At that time, remove three-phase power to the chiller. Once the power is removed, the UPS becomes available for a limit of 10 minutes for performance of the test.

When the panel detects control voltage is low and UPS is in Inverter mode due to loss of the line power, the panel displays “UPS Battery Test - Evaluating Battery”. The MBC is then commanded to Levitation. After the MBC reports to Optiview that it is in Levitation mode, the battery voltage is monitored for the next 60 seconds.

The following constitute a fail result:

- If Battery Voltage drops to less than the Inverter Low Battery Voltage Threshold (Default 11.0 V) (UPS – Inverter Low Battery Voltage fault threshold) the test fails and ends
- If the test takes longer than 75 seconds the test fails and ends

- If the UPS shuts down (Optiview will lose power) due to voltage, fuses, disconnect, or any other reason the test fails and the Optiview displays a fault on next power up stating that the battery health test has failed. This fault can be cleared by running a successful battery health test

If the “UPS – Inverter Low Battery Voltage” fault is not set by the end of the 60 second test (Battery Voltage stays above the threshold), the battery evaluation is considered good.

Next, the control ceases MBC levitation. If this step takes longer than 15 seconds, the test fails and ends.

Then the panel instructs “Reconnect 3-phase line power to the chiller now”. At that time, reapply three-phase power to the chiller. The full test successfully ends when Optiview detects the control voltage has returned.

If the 10 minute power loss holdup timer runs out (Optiview power will be lost due to turning off UPS Inverter) before the test completes and power is restored the test is considered failed.

“UPS Battery Health Test Successful” is displayed for 10 seconds when the test passes.

“UPS Battery Health Test Failed – Step X” (Where X is the step that failed) is displayed when the test fails. It remains while the “Warning – UPS – Battery Test Failed” warning is active. It and the warning will be cleared when a Battery Health Test completes successfully.

For a fail, the following steps may be indicated as the fail point:

- Step 2 is when the Optiview is waiting to sense line power removed – typically the user has taken too long and exceeded 10 minute test time
- Step 3 is during the 60 second battery voltage monitoring under Levitation load – typically would be a bad battery
- Step 4 is after completion of the 60 second monitoring and waiting for successful automatic delevitation – would indicate some unplanned failure of the control or communication
- Step 5 is waiting to sense line power restored – typically the user has taken too long and exceeded 10 minute test time

SECTION 6 - PRINTING

PRINTING OVERVIEW

A laptop computer can be connected to the Control Center's Microboard to print the following reports. The screen from which each report can be generated is listed below in parenthesis.

- **Status** - System parameters (Printer, Home)
- **Setpoints** - Programmed values of all setpoints (Printer, Setpoints)
- **Schedule** - Value of programmed daily schedule (Printer, Schedule)
- **Sales Order** - Information about SALES ORDER Screen (Printer, Sales Order)
- **History** - System parameters at the time of the last normal stop, last fault while running and last 10 faults, whether running or not (Printer, History)
- **Cycling or Safety Shutdown Initiated Print** - Snapshot of all system parameters at instant of shutdown. Automatically occurs if printer is connected at time of shutdown.
- **Trend** - Prints a snapshot of the existing TREND Screen data or prints new data collected after the TREND PRINT key is pressed.

A laptop computer can be permanently connected to the Control Center or connected as required to generate a report. If permanently connected, a DATA LOGGING feature can produce a status report automatically, beginning at an Operator selected start time and occurring at an Operator selected interval thereafter. An SD data card can log chiller parameters every 0.1 to 60 seconds (Default 1.0 seconds) and reviewed in Excel.

The following figures are examples of the different print reports.

- Status or History - *Figure 52 on page 132*
- Setpoints - *Figure 53 on page 133*
- Schedule - *Figure 54 on page 135*
- Sales Order - *Figure 55 on page 135*
- Security Log - *Figure 56 on page 136*
- Trend - *Figure 57 on page 137*
- CUSTOM Screen - *Figure 58 on page 137*

Automatic Data Logging

Access Level Required: OPERATOR

If automatic data logging is desired, a status report can be automatically printed at a specified interval beginning at a specified time, using the PRINTER Screen. The interval is programmable over the range of 1 minute to 1440 minutes in 1 minute increments. The first print will occur at the programmed START time and occur at the programmed Output Interval thereafter. The time remaining until the next print is displayed on the PRINTER Screen.

- Automatic Printer Logging - Enables and disables automatic data logging.
- Log Start Time - Enter the time the first print is desired.
- Output Interval - Enter the desired interval between prints.

DOWNLOADING SYSTEM PRINTS TO A LAPTOP

Downloading system histories to a file is another useful method to capture system operating conditions. The following instructions are used to establish communication between the OptiView Control Panel and a laptop computer running any terminal emulation program such as HyperTerminal, TeraTerm or PuTTY.

1. Connect the laptop computer to the OptiView as described below.

LAPTOP (RS-232 SERIAL PORT)			OPTIVIEW (COM 1)	
PIN	DESC		Connector	Terminal
2	RX	to	J2	4 (TXD1)
4	DTR	to	J2	2 (DSR1)
5	GND	to	J2	8 GND

2. On OptiView Printer Screen, select "PC". This will allow faster data download than the printer selections. On Setpoints - Setup - Comms screen, ensure the printer settings match "h. Port settings" see below.

3. Setup HyperTerminal

- a. Go to START menu
- b. Select All Programs
- c. Select Accessories
- d. Select Communications
- e. Select HyperTerminal
- f. In the box displayed, it requires a name and icon for the connection. Select a name that is descriptive and select an icon. Select OK.
- g. In the box labeled Connect using the select com port that will connect to the YK unit. This port is usually labelled Com 1. Select OK.
- h. Port settings

Bits per second	57600
Data bits	8
Parity	None
Stop Bits	1
Flow control	None

4. Set HyperTerminal to capture a file.

- a. Select Transfer from toolbar
 - b. Select Capture Text from the drop down menu.
 - c. A Capture Text Filebox will be displayed. Verify location and file name.
 - d. Select Start.
5. Press the Print Screen key on the appropriate screen to be captured. The HyperTerminal will display the printed information and the information will be recorded as a .txt file.

When the print file has been recorded, select Transfer from the toolbar and capture from the drop down menu and select Stop. This will stop the transfer and allow access to the capture file.

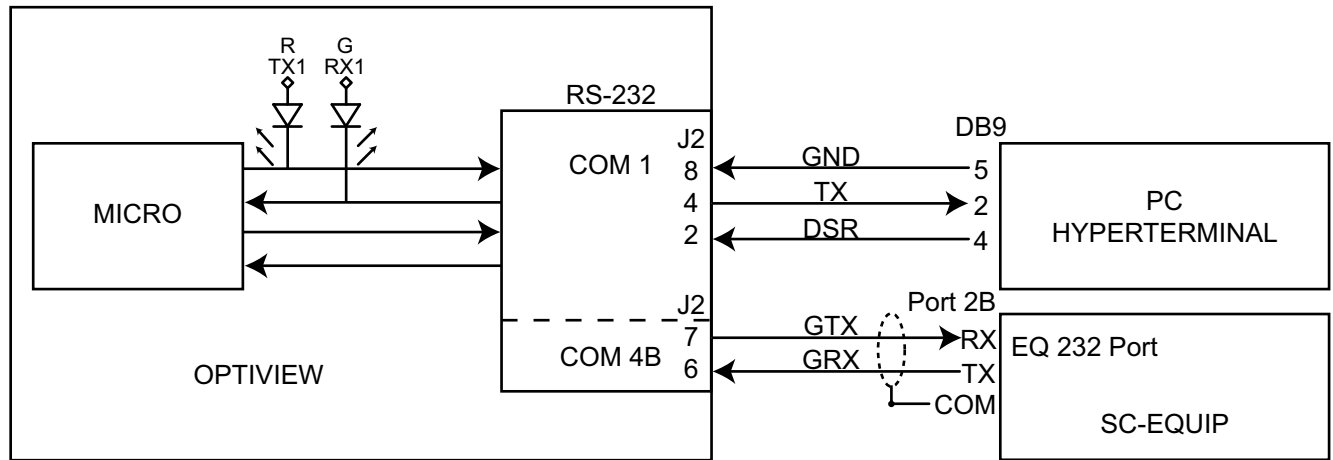
The following additional RS232 connections, are used to wire up serial devices for desktop and laptop computers.

RS-232 PIN ASSIGNMENTS (DB25 PC SIGNAL SET) (OLDER DESKTOPS ONLY)	
Pin 1	Protective Ground
Pin 2	Transmit Data
Pin 3	Received Data
Pin 4	Request To Send
Pin 5	Clear To Send
Pin 6	Data Set Ready
Pin 7	Signal Ground
Pin 8	Received line Signal Detector (Data Carrier Detect)
Pin 20	Data Terminal Ready
Pin 22	Ring Indicator

The connector on the PC has Male pins, therefore the mating cable needs to terminate in a DB25/F (Female pin) connector.

RS-232 PIN ASSIGNMENTS (DB9 PC SIGNAL SET) (MOST LAPTOPS)	
Pin 1	Received line Signal Detector (Data Carrier Detect)
Pin 2	Received Data
Pin 3	Transmit Data
Pin 4	Data Terminal Ready
Pin 5	Signal Ground
Pin 6	Data Set Ready
Pin 7	Request To Send
Pin 8	Clear To Send
Pin 9	Ring Indicator

The connector on the PC has male pins; therefore, the mating cable needs to terminate DB9/F (female pin) connector.

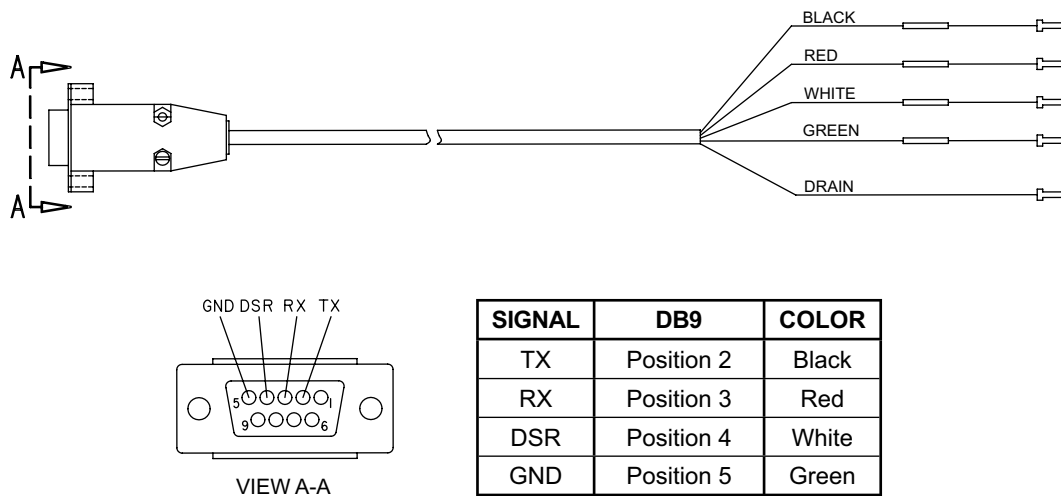


6

LD26723

FIGURE 50 - COMMUNICATIONS BLOCK DIAGRAM

A serial cable to go from the OptiView Control Panel to the serial port is available from the parts center (P/N 075-90490-230)



LD26724

FIGURE 51 - OPTIVIEW PANEL TO PC SERIAL CABLE

YORK HISTORY 1

JCI GLENDALE
YZ-MA033AN030P042A
16-885000-5

YK CHILLER ID 0
(C) 1997 - 2014 YORK, A JOHNSON CONTROLS COMPANY
TUE 29 AUG 2017 9:52:26 AM

SYSTEM RUN
MBC - FAULT CONTACTS OPEN

CONTROLS Y.OPT.01.05.308
RUN TIME 0 DAYS 23 HR 0 MIN 27 SEC

OPERATING HOURS
NUMBER OF STARTS
ACTIVE RUN COMMAND

CAPACITY CONTROL

CONTROL STATE	= COOLING CONTROL
LOAD LIMIT	= NONE
VSD FREQUENCY COMMAND	= 138.07 HZ
VSD OUTPUT FREQUENCY	= 138.05 HZ
VSD CONTROL MODE	= INACTIVE
ACTIVE ANTI-SURGE MINIMUM	= 120.62 HZ
ANTI-SURGE MINIMUM FREQUE	= 120.45 HZ
ANTI-SURGE TRANSIENT OFFS	= 0.00 HZ
VGD COMMAND	= 100.00 %
VGD POSITION	= 100.00 %
VGD CONTROL MODE	= AUTO
HGBP CONTROL MODE	= AUTO
HEAD PRESSURE	= 9.7 PSID
SURGE MARGIN ADJUST	= 0.0 HZ
VSD START FREQUENCY	= 111.45 HZ
MAPPING ENABLE	= 5.0 ~F
ACC SURGE COUNT	= 4587590

EVAPORATOR

CHILLED LIQUID PUMP	= RUN
CHILLED LIQUID FLOW SWITC	= CLOSED
ACTIVE COOLING SETPOINT	= 42.0 ~F
SHUTDOWN TEMPERATURE	= 34.0 ~F
LEAVING CHILLED LIQUID TE	= 41.9 ~F
ENTERING CHILLED LIQUID T	= 53.5 ~F
EVAPORATOR PRESSURE	= 8.5 PSIA
EVAPORATOR SATURATION TEM	= 40.4 ~F
EVAPORATOR SMALL TEMP DIF	= 1.5 ~F

CONDENSER

CONDENSER LIQUID PUMP	= RUN
CONDENSER LIQUID FLOW SWI	= CLOSED
LEAVING CONDENSER LIQUID	= 75.5 ~F
ENTERING CONDENSER LIQUID	= 67.6 ~F
CONDENSER PRESSURE	= 18.2 PSIA
CONDENSER SATURATION TEMP	= 75.4 ~F
CONDENSER SMALL TEMP DIF	= -0.1 ~F
CONDENSER REFRIGERANT TEM	= 75.9 ~F
DROP LEG REFRIGERANT TEMP	= 68.5 ~F
SUBCOOLING TEMPERATURE	= 6.9 ~F
Head Pressure	= 9.7 PSID
Head Pressure Setpoint	= 23.0 PSID
PID Control Mode	= Inactive
Control Valve Command	= 0.0 %

Compressor

Motor Speed	= -1.20 Hz
Discharge Temperature	= 84.7 ~F
Discharge Superheat	= 9.4 ~F
Adjusted Discharge Superh	= 9.4 ~F
Discharge Superheat Limit	= 11.1 ~F
Discharge Superheat Limit	= No

Surge

Surge Avoidance Surge Cou	= 0
Delta P / P	= 1.14
Surge Window Time	= 3 Min
Surge Window Count	= 0
Surge Detection State	= State 3

Condenser Refrigerant Level Control

Condenser Refrigerant Lev	= 47.6 %
Condenser Active Level Se	= 45.0 %
Condenser Level Control S	= PID Control
Condenser Level Control V	= 23.5 %
Subcooler Effectiveness	= 0.884

Variable Geometry Diffuser

Stall Detector Voltage	= 0.24 V
Mach Number	= 0.000
Discharge Pressure	= 18.5 PSIA
Stall Time	= 0 Days 0 Hr 0 Min 0 Sec
VGD Feedback Counts	= 29945
VGD Fault Code	= 0000 0000 0000 0000

Variable Speed Drive

Motor Run	= On
Motor % Full Load Amps	= 60.8 %
Full Load Amps	= 362 A
Precharge Relay Output	= Off
Trigger SCR Output	= On
Cooling System	= On
kW Hours	= 76921 kWh
Input Power	= 209 kW
Output Frequency	= 138.05 Hz
Max Chiller Frequency	= 178.33 Hz
Output Voltage	= 362 V
DC Bus Voltage	= 637 V
DC Inverter Link Current	= 245 A
Phase A Output Current	= 216 A
Phase B Output Current	= 220 A
Phase C Output Current	= 216 A
Internal Ambient Temperat	= 80 ~F
Converter Heatsink Temper	= 75 ~F
Phase A Baseplate Tempera	= 103 ~F
Phase B Baseplate Tempera	= 101 ~F
Phase C Baseplate Tempera	= 98 ~F
Manual DC Bus	= Disabled
Manual VSD Cooling	= Disabled
ID Faults	= 0
Checksum Errors	= 0
Error Packets	= 0
Timeout Faults	= 162

Motor Cooling

Motor Winding Phase A1 Te	= 32.0 ~F
Motor Winding Phase B1 Te	= 32.0 ~F
Motor Winding Phase C1 Te	= 32.0 ~F
Motor Winding Phase A2 Te	= 32.0 ~F
Motor Winding Phase B2 Te	= 32.0 ~F
Motor Winding Phase C2 Te	= 32.0 ~F
Average Winding Temperatu	= 32.0 ~F
Motor Housing Temperature	= 103.4 ~F
Motor Housing Temperature	= 80.0 ~F
Motor Cooling Valve Comma	= 0.0 %
Motor Cooling Control Sta	= Dual PID Control

LD26759

FIGURE 52 - SAMPLE PRINTOUT (STATUS OR HISTORY)

YORK Setpoints

~Sales Order Job Name here
Sales Order Model Number here
Sales Order Serial Number here
Sales Order Compressor Model here
Sales Order Evaporator Model here
Sales Order Condenser Model here
Sales Order VSD Model here
YZ ~Chiller ID 1
(c) 2010 Johnson Controls
Mon 01 Nov 2010 9:25:18 AM

Software Versions

Controls	= Y.OPT.1.05.308
CC	= 3.09
BIOS	= C.OPT.00.02
Kernel	= 1.20
GP	= 1.09
GUI	= 0.43
SIO	= 1.25
GPIC	= 0.14
Ext I/O	= C.EXP.01.00
VSD Inverter	= C.H035.04.01.02
VSD Rectifier	= C.H035.03.01.02
VSD Modbus	= 05.01

System Information

Data Display Mode	= English
System Language	= English
Date Format	= DD MMM YYYY
Control Source	= Local
Remote Analog Input Range	= 0-10 Volts
Line Voltage	= 460V
Line Frequency	= 60Hz
Chilled Liquid Pump Operation	= Standard
Head Pressure Control	= Disabled
Hot Gas Bypass	= Enabled
Flow Switch Input	= J14
Power Failure Restart	= Auto
Clock	= Enabled

Jumper Settings

Liquid Type	= Water
Refrigerant Selection	= R134a

Printer Setup

Automatic Printer Logging	= Disabled
Log Start Time	= 12:00 AM
Output Interval	= 60 Min
Printer Type	= Okidata
Baud	= 9600 Baud
Data Bits	= 8 Bits
Parity	= None
Stop Bits	= 1 Bit

COM 2 Setup

Baud	= 38400 Baud
Data Bits	= 8 Bits
Parity	= None
Stop Bits	= 2 Bits

Evaporator

Leaving Chilled Local Setpoint	= 42.0 ~F
Leaving Chilled ISN Setpoint	= 45.0 ~F
Leaving Chilled Modem Setpoint	= 45.0 ~F
Leaving Chilled Analog Setpoint	= 42.0 ~F
Leaving Chilled Digital Setpoint	= 42.0 ~F
Remote Range	= 10.0 ~F
Restart Offset	= 4.0 ~F
Restart Temperature	= 46.0 ~F
Shutdown Offset	= 6.0 ~F
Shutdown Temperature	= 36.0 ~F
Brine Low Evaporator Cutout	= 25.0 PSIG
Smart Freeze	= Off
Refrigerant	= Disabled

Condenser

High Pressure Warning Threshold	= 162.5
PSIGHead Pressure Control	= Enabled
Head Pressure Setpoint (when HPC is Enabled)	= 23.0 PSID
Type (when HPC is Enabled)	= 0-10V
PID Output (when HPC is Enabled)	= Direct
Minimum PID Output (when HPC is Enabled)	= 0.0 %
Shutdown Position (when HPC is Enabled)	= 0.0 %
Head Pressure Control P (when HPC is Enabled)	= 2.00
Head Pressure Control I (when HPC is Enabled)	= 2.00
Head Pressure Control D (when HPC is Enabled)	= 0.00
Isolation Valves	= Enabled

Surge

Surge Sensitivity	= 0.3
Shutdown	= Enabled
Count Limit	= 15
Count Window	= 3 Min

Condenser Refrigerant Level Control

Condenser Level Setpoint	= 50.0 %
Condenser Level Control Startup Position	= 25.0 %
Condenser Level Control Startup Delay	= 15 Sec
Condenser Level Control Ramp Time	= 1 Min
Condenser Level Control Kp	= 0.50
Condenser Level Control Ti	= 100.0
Condenser Level Control Td	= 0.00

FIGURE 53 - SAMPLE PRINTOUT (SETPOINTS)

```

Variable Geometry Diffuser
-----
100% VGD Counts          = 2000
0% VGD Counts            = 28493
VGD Feedback Calibrated   = True

Variable Speed Drive
-----
Local Input Current Limit   = 100 %
Remote ISN Input Current Limit = 100 %
Remote Analog Input Current Limit = 100 %
Remote Digital Input Current Limit = 100 %
Remote Modem Input Current Limit = 100 %
Pull-down Demand Limit     = 70 %
Pull-down Demand Time      = 5 Min
Input Job Full Load Amps    = 181 A
Rated Motor Voltage         = 507V
Maximum Motor Current       = 505 A
Output Current Rating       = 525 A
DC Bus Voltage Setpoint     = 750 V
Operation Mode              = Voltage
Soft Shutdown Frequency     = 0.00 Hz
SW Fault Mask 1
SW Fault Mask 2
SW Fault Mask 3

Motor Monitoring
-----
Ambient Dew Point Temperature Enable = Enabled
Motor Winding Phase A Temp Z1 End Enable = Enabled
Motor Winding Phase B Temp Z1 End Enable = Enabled
Motor Winding Phase C Temp Z1 End Enable = Enabled
Motor Winding Phase A Temp Z2 End Enable = Enabled
Motor Winding Phase B Temp Z2 End Enable = Enabled
Motor Winding Phase C Temp Z2 End Enable = Enabled
Motor Cooling Setpoint Offset = 4.0 ~F
Min Housing Temp              = 46.0 ~F
Max Winding Temp              = 46.0 ~F
Motor Cooling Primary Kp      = 5.0
Motor Cooling Primary Ti      = 25.0
Motor Cooling Primary Td      = 0.0
Motor Cooling Secondary Kp    = 5.0
Motor Cooling Secondary Ti    = 25.0
Motor Cooling Secondary Td    = 0.0
Motor Cooling Valve Start Position = 0.0 %

Capacity Control
-----
Unit Control Mode            = Cooling
VSD Start Frequency          = 250.00 Hz
VSD Soft Shutdown Ramp Rate  = 20 Hz/Sec
VGD Start Position           = 10.0 %
Minimum VGD Position         = 10.0 %
HGBP Start Position          = 0.0 %
LCHLT Setpoint Ramp Rate     = 0.1 ~F/S
LCHLT Setpoint Start Offset  = 10.0 ~F
Temperature Control Kp       = 5.0
Temperature Control Ti       = 25.0
Temperature Control Td       = 0.0

```

```

Temperature Control Max Loading Delta = 1.0
Temperature Control Max Unloading Delta = 1.0
VSD Output Gain                      = 0.5
VGD Output Gain                      = 1.0
HGBP Output Gain                    = 1.0
Max Frequency Multiplier              = 1.000
Min Frequency Multiplier              = 1.000
Min Frequency Offset                  = 0.0
Min Frequency Rate Maximum            = 10.00 Hz/Sec
Min Frequency Rate Minimum            = 0.10 Hz/Sec
Min Frequency Admin Multiplier        = 1.000
Min Frequency Mid Position            = 40.0 %
Min Frequency Coefficient a1          = 1.440
Min Frequency Coefficient a2          = 1.315
Min Frequency Coefficient a3          = 1.305
Min Frequency Coefficient b1          = 0.525
Min Frequency Coefficient b2          = 0.497
Min Frequency Coefficient b3          = 0.495
Transient Time Delay                  = 2.5
Transient Deadband                    = 0.010
Transient Max Change                  = 0.25
Evaporator Pressure Load Limit Threshold = 20.0 PSID
Evaporator Pressure Load Limit Delta = 0.10
Evaporator Pressure Max Override Threshold = 2.0 PSID
Evaporator Pressure Max Override Delta = -0.20
Condenser Pressure Load Limit Threshold = 10.0 PSID
Condenser Pressure Load Limit Delta = 0.10
Condenser Pressure Max Override Threshold = 10.0 PSID
Condenser Pressure Max Override Delta = -0.10
Input Current Load Limit Threshold    = 20.0 %
Input Current Load Limit Delta        = 0.10
Input Current Max Override Threshold  = 5.0 %
Input Current Max Override Delta      = -0.10
Motor Current Load Limit Threshold    = 20.0 %
Motor Current Load Limit Delta        = 0.10
Motor Current Override Threshold      = 100.0 %
Motor Current Max Override Threshold  = 5.0 %
Motor Current Max Override Delta      = -0.10
LCHLT Max Override Delta              = -0.10

Magnetic Bearing Controller
-----
Z1 Clearance Stored                 = 14 ~m
Z2 Clearance Stored                 = 14 ~m
Z1 Clearance Last                   = 14 ~m
Z2 Clearance Last                   = 14 ~m
Z1 Centering Offset                 = 14 ~m
Z2 Centering Offset                 = 14 ~m
Date Axial Centering Stored         = 01 Nov 2012
Date of Last Clearance Check        = 01 Nov 2012

Power Panel
-----
Minimum Power Loss Holdup Time      = 15 Sec
Power Panel Cooling Threshold        = 100.0 ~F

```

LD26761

FIGURE 54 - SAMPLE PRINTOUT (SETPOINTS) (CONT'D)

YORK SCHEDULE

CHILLER ID 3

© 1997 - 1999 YORK INTERNATIONAL CORPORATION

MON 29 MAR 1999 1 27 PM

SCHEDULE = OFF

STANDARD SCHEDULE

SUN START = OFF STOP = OFF
MON START = 8:00 AM STOP = 5:00 PM
TUE START = 8:00 AM STOP = 5:00 PM
WED START = 8:00 AM STOP = 5:00 PM
THU START = 8:00 AM STOP = 5:00 PM
FRI START = 8:00 AM STOP = 5:00 PM
SAT START = OFF STOP = OFF

EXCEPTION DAYS

02 APR 1999 START = OFF STOP = OFF
13 APR 1999 START = 8:00 AM STOP = 10:00 PM

LD26762

FIGURE 54 - SAMPLE PRINTOUT (SCHEDULE)

YORK SALES ORDER

YZ -CHILLER ID 1

(C) 2010 JOHNSON CONTROLS

MON 01 NOV 2010 9:25:18 AM

ORDER INFORMATION

COMMISSIONING DATE =
JOB NAME = YORK BUILDING 36 CHILLER 1
SYSTEM MODEL = YZXXXXXX
YORK ORDER NUMBER
UNIT SERIAL NUMBER
COMPRESSOR MODEL
EVAPORATOR MODEL
CONDENSER MODEL
VSD MODEL

NAMEPLATE INFORMATION

CAPACITY (TONS OR KW)
REFRIGERANT
REFRIG WEIGHT (LBS OR KG)
RPM
INPUT KW
VOLTAGE
PHASES
FREQUENCY
INPUT JOB FLA
MIN CIRCUIT AMPACITY

DESIGN CONDITIONS - EVAPORATOR

EVAPORATOR PRESSURE DROP (FT OR KPA)
EVAPORATOR FLOW (GPM OR L/S)
EVAPORATOR LEAVING TEMPERATURE (°F OR °C)
EVAPORATOR ENTERING TEMPERATURE (°F OR °C)

LD26763

FIGURE 55 - SAMPLE PRINTOUT (SALES ORDER)

EVAPORATOR FOULING FACTOR (HR-FT-°F/BTU OR M^2-°C/KW)

EVAPORATOR LIQUID TYPE

EVAPORATOR BRINE PERCENT

DESIGN CONDITIONS - CONDENSER

CONDENSER PRESSURE DROP (FT OR KPA)

CONDENSER FLOW (GPM OR L/S)

CONDENSER LEAVING TEMPERATURE (°F OR °C)

CONDENSER ENTERING TEMPERATURE (°F OR °C)

CONDENSER FOULING FACTOR (HR-FT-°F/BTU OR M^2-°C/KW)

CONDENSER LIQUID TYPE

CONDENSER BRINE PERCENT

SALES ORDER SETUP

FINISH PANEL SETUP = NO

LD26764

FIGURE 56 - SAMPLE PRINTOUT (SALES ORDER)
(CONT'D)

CHILLER ID 0

(c) 1997 - 2001 YORK INTERNATIONAL CORPORATION

Fri 05 Oct 2001 4:48:04 PM

Log Entry 1 Evaporator - Leaving Chilled Local Setpoint

Date = 05 Oct 2001

Time = 4:23:49 PM

Access Level = Service

User Id = 4268

Old Value = 46.5 ~F

New Value = 48.0 ~F

Log Entry 2 Condenser - High Pressure Warning Threshold

Date = 05 Oct 2001

Time = 1:36:12 PM

Access Level = Service

User Id = 4268

Old Value = 162.5 Psig

New Value = 225.0 Psig

Log Entry 3 Condenser - Drop Leg

Date = 05 Oct 2001

Time = 1:36:02 PM

Access Level = Service

User Id = 4268

Old Value = Disabled

New Value = Enabled

Log Entry 4 Evaporator - Refrigerant

Date = 05 Oct 2001

Time = 1:35:48 PM

Access Level = Service

User Id = 4268

Old Value = Disabled

New Value = Enabled

LD26765

FIGURE 56 - SAMPLE PRINTOUT (SECURITY LOG
REPORT)

CHILLER ID 163

© 1997 - 2000 YORK INTERNATIONAL CORPORATION

MON 09 OCT 2000 3:33:47 PM

DATA 1: LEAVING CHILLED LIQUID TEMPERATURE

DATA 2: RETURN CHILLED LIQUID TEMPERATURE

DATA 3: EVAPORATOR PRESSURE

DATA 4: LEAVING CONDENSER LIQUID TEMPERATURE

DATA 5: RETURN CONDENSER LIQUID TEMPERATURE

DATA 6: CONDENSER PRESSURE

TIME	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6
3:33:47 PM	45.5 °F	55.0 °F	39.0 PSIG	95.0 °F	85.0 °F	120.0 PSIG
3:33:48 PM	45.5 °F	55.0 °F	39.0 PSIG	95.0 °F	85.0 °F	120.0 PSIG
3:33:49 PM	45.5 °F	55.0 °F	39.0 PSIG	95.0 °F	85.0 °F	120.0 PSIG
3:33:50 PM	45.5 °F	55.0 °F	39.0 PSIG	95.0 °F	85.3 °F	120.1 PSIG
3:33:51 PM	45.5 °F	55.2 °F	39.1 PSIG	95.1 °F	85.4 °F	120.2 PSIG

LD26766

**FIGURE 57 - SAMPLE PRINTOUT (TREND DATA
NEW OR EXISTING POINTS)**

YORK CUSTOM VIEW

CHILLER ID 0

(c) 1997 - 2001 YORK INTERNATIONAL CORPORATION

Mon 21 Jun 1999 1:28:25 PM

Leaving Chilled Liquid Temperature	= 45.0 ~F
Return Chilled Liquid Temperature	= 55.0 ~F
Leaving Condenser Liquid Temperature	= 95.0 ~F
Return Condenser Liquid Temperature	= 85.0 ~F
Evaporator Saturation Temperature	= 41.0 ~F
Condenser Saturation Temperature	= 78.5 ~F
Evaporator Pressure	= 70.0 Psig
Condenser Pressure	= 140.0 Psig
Oil Pressure	= 45.0 Psid
% Full Load Amps	= 50 %

LD26767

**FIGURE 58 - SAMPLE PRINTOUT (CUSTOM
SCREEN REPORT)**

THIS PAGE INTENTIONALLY LEFT BLANK.

SECTION 7 - 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.

Unless otherwise indicated, the operations described below can be performed by any properly trained maintenance technician.

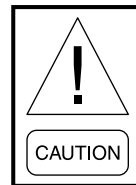
1. Isolate all sources of electrical supply to the unit, including any control system supplies switched by the unit. Make sure that all isolation points are secured in the off position.
2. Disconnect and remove the supply cables. For connection points, *refer to form 161.01-PW3*.
3. Remove all refrigerant from each system into a suitable container, using a refrigerant reclaim or recovery unit. This refrigerant may then be reused, if appropriate, or returned to the manufacturer for disposal. Under NO circumstances should refrigerant be vented into the atmosphere.
4. Isolate the heat exchangers from the external water systems and drain that section of the system. If no isolation valves are installed it may be necessary to drain the entire system.
 - If glycol was used in the water system, or if the system contains chemical additives, dispose of the solution in a suitable and safe manner. Under NO circumstances should any system containing glycol be drained directly into domestic waste or natural water systems.

5. After draining the heat exchangers, disconnect the water lines.
6. Remove the unit in one piece after disconnecting. Remove all bolts securing the chiller, and lift the unit using the designated rigging points and equipment with adequate lifting capacity.

Refer to form 161.01-N1 for unit installation instructions, and *SECTION 5 - MAINTENANCE* for unit weights.

Units, which cannot be removed in one piece after being disconnected must be dismantled in position. Handle each component carefully. Where possible, dismantle units in the reverse order of installation.

Make sure that while components are being removed, the remaining parts are adequately supported.



Only use lifting equipment of adequate capacity. See form 161.01-N1 for all lifting and rigging.

After removing the unit, dispose of all parts according to local laws and regulations.

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

TABLE 16 - SI METRIC CONVERSION

MEASUREMENT	MULTIPLY ENGLISH UNIT	BY FACTOR	TO OBTAIN METRIC UNIT
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4536	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

TEMPERATURE

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

Example: $(45.0^{\circ}\text{F} - 32^{\circ}) \times 0.5556 = 7.22^{\circ}\text{C}$

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

Example: $10.0^{\circ}\text{F range} \times 0.5556 = 5.6^{\circ}\text{C range}$

APPENDIX - MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Solstice® ZD, Solstice® 1233zd (E)

MSDS Number : 000000018007

Product Use Description : Refrigerant, Power cycle fluid, Heat transfer fluid

Manufacturer or supplier's details : Honeywell International Inc.
115 Tabor Road
Morris Plains, NJ 07950-2546

For more information call : 800-522-8001
+1-973-455-6300
(Monday-Friday, 9:00am-5:00pm)

In case of emergency call : **Medical: 1-800-498-5701 or +1-303-389-1414**
: **Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**
:
: (24 hours/day, 7 days/week)

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form : liquid, clear

Color : colourless

Odor : slight

Classification of the substance or mixture

Classification of the substance or mixture : Gases under pressure, Liquefied gas
Simple Asphyxiant

GHS Label elements, including precautionary statements

Page 1 / 14

SAFETY DATA SHEET

Honeywell**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Symbol(s)



Signal word

: Warning

Hazard statements

: Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

: **Prevention:**
Use personal protective equipment as required.**Storage:**

Protect from sunlight. Store in a well-ventilated place.

Carcinogenicity

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature

: Substance

Chemical Name	CAS-No.	Concentration
trans-1-Chloro-3,3,3-trifluoropropene	102687-65-0	>99.00 %

SECTION 4. FIRST AID MEASURES

Inhalation

: Remove to fresh air. If not breathing, give artificial respiration.
If breathing is difficult, give oxygen. Use oxygen as required,
provided a qualified operator is present. Call a physician.

Skin contact

: After contact with skin, wash immediately with plenty of water.
If symptoms persist, call a physician. Take off all contaminated
clothing immediately. Wash contaminated clothing before re-
use.

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician if irritation develops or persists.

Ingestion : If victim is fully conscious, give a cupful of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Call a physician immediately.

Notes to physician

Treatment : Treat symptomatically.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : The product is not flammable.
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Water spray
Carbon dioxide (CO₂)
Dry chemical
Foam

Specific hazards during firefighting : This product is not flammable at ambient temperatures and atmospheric pressure.
However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources.
Container may rupture on heating.
Cool closed containers exposed to fire with water spray.
Do not allow run-off from fire fighting to enter drains or water courses.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Exposure to decomposition products may be a hazard to health.
In case of fire hazardous decomposition products may be produced such as:
Hydrogen fluoride
Gaseous hydrogen chloride (HCl).
Carbon monoxide
Carbon dioxide (CO₂)
Carbonyl halides

SAFETY DATA SHEET

Honeywell**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Special protective equipment for firefighters : In the event of fire and/or explosion do not breathe fumes.
Wear self-contained breathing apparatus and protective suit.
No unprotected exposed skin areas.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Immediately evacuate personnel to safe areas.
Keep people away from and upwind of spill/leak.
Wear personal protective equipment. Unprotected persons must be kept away.
Remove all sources of ignition.
Ventilate the area.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Avoid accumulation of vapours in low areas.
Unprotected personnel should not return until air has been tested and determined safe.
Ensure that the oxygen content is $\geq 19.5\%$.

Environmental precautions : Do not flush into surface water or sanitary sewer system.
Prevent further leakage or spillage if safe to do so.
Prevent spreading over a wide area (e.g. by containment or oil barriers).

Methods for cleaning up : Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

SECTION 7. HANDLING AND STORAGE**Handling**

Handling : Handle with care.
Do not use in areas without adequate ventilation.
Do not breathe vapours or spray mist.
Avoid contact with skin, eyes and clothing.
Follow all standard safety precautions for handling and use of compressed gas cylinders.

Page 4 / 14

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Use authorized cylinders only.
Protect cylinders from physical damage.
Do not puncture or drop cylinders, expose them to open flame or excessive heat.
Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Do not remove screw cap until immediately ready for use.
Always replace cap after use.

Advice on protection against fire and explosion : Can form a combustible mixture with air at pressures above atmospheric pressure.
Keep product and empty container away from heat and sources of ignition.

Storage

Requirements for storage areas and containers : Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 55 °C.
Keep containers tightly closed in a dry, cool and well-ventilated place.
Storage rooms must be properly ventilated.
Ensure adequate ventilation, especially in confined areas.
Protect cylinders from physical damage.
Store away from incompatible substances.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Protective measures : Ensure that eyewash stations and safety showers are close to the workstation location.
Do not breathe vapours or spray mist.
Avoid contact with skin, eyes and clothing.

Engineering measures : Use with local exhaust ventilation.
Perform filling operations only at stations with exhaust ventilation facilities.

Eye protection : Do not wear contact lenses.
Wear as appropriate:
Goggles or face shield, giving complete protection to eyes

Hand protection : Impervious gloves
Gloves must be inspected prior to use.

SAFETY DATA SHEET

Honeywell**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Replace when worn.

Skin and body protection : Wear as appropriate:
Solvent-resistant gloves
Solvent-resistant apron and boots
If splashes are likely to occur, wear:
Protective suit

Respiratory protection : In case of insufficient ventilation wear suitable respiratory equipment.
Wear a positive-pressure supplied-air respirator.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus.
Use NIOSH approved respiratory protection.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.
Avoid contact with skin, eyes and clothing.
Do not breathe vapours or spray mist.
Ensure adequate ventilation, especially in confined areas.
Remove and wash contaminated clothing before re-use.
Contaminated work clothing should not be allowed out of the workplace.
Keep working clothes separately.
Wash hands before breaks and immediately after handling the product.

Exposure Guidelines

Components	CAS-No.	Value	Control parameters	Update	Basis
trans-1-Chloro-3,3,3-trifluoropropene	102687-65-0	TWA : time weighted average	(800 ppm)	2013	WEEL:OARS - Workplace Environmental Exposure Level (WEEL) Guides

trans-1-Chloro-3,3,3-trifluoropropene	102687-65-0	TWA : time weighted average	(800 ppm)	2013	Honeywell: Limit established by Honeywell International Inc.
---------------------------------------	-------------	--------------------------------	-----------	------	--

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	: liquid, clear
Color	: colourless
Odor	: slight
Melting point/freezing point	: < -90 °C Method: OECD Test Guideline 102
Boiling point/boiling range	: 19 °C
Flash point	: Method: ISO 2719 Note: not applicable
Flammability	: The product is not flammable. Method: Flammability (gases)
Lower explosion limit	: Note: None
Upper explosion limit	: Note: None
Vapor pressure	: 1,516 hPa at 30 °C(86 °F)
Vapor density	: Note: (Air = 1.0), not determined
Density	: 1.27 g/cm3
Water solubility	: 1.90 g/l at 20 °C Method: OECD Test Guideline 105

SAFETY DATA SHEET

Honeywell**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Partition coefficient: n-octanol/water : log Pow: 2.2 at 25 °C

Ignition temperature : 380 °C at 986.8 - 1,035.9 hPa
Method: DIN 51794

Oxidizing properties : The substance or mixture is not classified as oxidizing.

Molecular weight : 130.5 g/mol

SECTION 10. STABILITY AND REACTIVITY

Chemical stability : Stable under recommended storage conditions.

Possibility of hazardous reactions : Polymerization can occur.

Conditions to avoid : Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 55 °C.
Can form a combustible mixture with air at pressures above atmospheric pressure.
Do not mix with oxygen or air above atmospheric pressure.

Incompatible materials to avoid : Strong oxidizing agents
Finely divided magnesium
Finely divided aluminium

Hazardous decomposition products : In case of fire hazardous decomposition products may be produced such as:
Carbon monoxide
Carbon dioxide (CO₂)
Carbonyl halides
Gaseous hydrogen chloride (HCl).
Gaseous hydrogen fluoride (HF).

SECTION 11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity : LC50: 120000 ppm

Page 8 / 14

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

	Exposure time: 4 h Species: rat
Skin irritation	: Species: rabbit Result: No skin irritation Classification: Not classified as a skin irritant in animal testing. Method: OECD Test Guideline 404 Exposure time: 4 h
Sensitisation	: Result: Does not cause skin sensitisation. Classification: Patch test on human volunteers did not demonstrate sensitisation properties. : Cardiac sensitization Species: dogs Note: Cardiac sensitisation threshold (dog): 25000 ppm.
Repeated dose toxicity	: Species: rat Application Route: Inhalation Exposure time: 4 Weeks NOEL: 4500 ppm Note: Subacute toxicity
Genotoxicity in vitro	: Test Method: Mutagenicity (Salmonella typhimurium - reverse mutation assay) Result: negative
Genotoxicity in vivo	: Species: rat Cell type: Bone marrow Method: Mutagenicity (micronucleus test) Result: negative
Genotoxicity in vivo	: Test Method: Unscheduled DNA synthesis Species: rat Result: negative
Genotoxicity in vivo	: Species: mouse Cell type: Bone marrow Method: Mutagenicity (micronucleus test) Result: negative

SAFETY DATA SHEET

Honeywell**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

Reproductive toxicity	: Species: rabbit Note: No-observed-effect level - 15,000 ppm
	: Species: rat Note: No-observed-effect level - 10,000 ppm
Teratogenicity	: Species: rabbit Note: No-observed-effect level - 15,000 ppm
	: Species: rat Note: No-observed-effect level - 10,000 ppm
Further information	: Note: Excessive exposure may cause central nervous system effects including drowsiness and dizziness. Excessive exposure may also cause cardiac arrhythmia.

SECTION 12. ECOLOGICAL INFORMATION**Ecotoxicity effects**

Toxicity to fish	: LC50: 38 mg/l Exposure time: 96 h Species: Oncorhynchus mykiss (rainbow trout) Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	: Immobilization EC50: 82 mg/l Exposure time: 48 h Species: Daphnia magna (Water flea) Method: OECD Test Guideline 202
Toxicity to algae	: Growth inhibition EC50: 106.7 mg/l Exposure time: 72 h Species: Pseudokirchneriella subcapitata (green algae) Method: OECD Test Guideline 201

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

: Growth rate
NOEC: 115 mg/l
Exposure time: 72 h
Species: Pseudokirchneriella subcapitata (green algae)
Method: OECD Test Guideline 201

Elimination information (persistence and degradability)

Biodegradability : Result: Not readily biodegradable.
Value: 0 %
Method: OECD 301 D

Further information on ecology

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods : Observe all Federal, State, and Local Environmental regulations.

Note : Where possible recycling is preferred to disposal or incineration.

SECTION 14. TRANSPORT INFORMATION

DOT UN/ID No. : UN 3163
Proper shipping name : LIQUEFIED GAS, N.O.S.
(Trans-1-Chloro-3,3,3-trifluoropropene)
Class 2.2
Packing group
Hazard Labels 2.2

IATA UN/ID No. : UN 3163
Description of the goods : LIQUEFIED GAS, N.O.S.
(Trans-1-Chloro-3,3,3-trifluoropropene)
Class : 2.2
Hazard Labels : 2.2
Packing instruction (cargo aircraft) : 200

SAFETY DATA SHEET

Honeywell**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

	Packing instruction (passenger aircraft)	: 200
IMDG	UN/ID No.	: UN 3163
	Description of the goods	: LIQUEFIED GAS, N.O.S. (TRANS-1-CHLORO-3,3,3- TRIFLUOROPROPENE)
	Class	: 2.2
	Hazard Labels	: 2.2
	EmS Number	: F-C, S-V
	Marine pollutant	: no

SECTION 15. REGULATORY INFORMATION**Inventories**

US. Toxic Substances Control Act	: On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	: On the inventory, or in compliance with the inventory
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)	: All components of this product are on the Canadian DSL.
Japan. Kashin-Hou Law List	: On the inventory, or in compliance with the inventory
Korea. Toxic Chemical Control Law (TCCL) List	: On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	: Not in compliance with the inventory
	: trans-1-Chloro-3,3,3- trifluoropropene
China. Inventory of Existing Chemical Substances	: On the inventory, or in compliance with the inventory

102687-65-0

SAFETY DATA SHEET



Solstice® ZD, Solstice® 1233zd (E)

000000018007

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand : Not in compliance with the inventory

: trans-1-Chloro-3,3,3-trifluoropropene 102687-65-0

National regulatory information

SARA 302 Components : SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components : SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards : Acute Health Hazard
Sudden Release of Pressure Hazard

California Prop. 65 : This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

New Jersey RTK : trans-1-Chloro-3,3,3-trifluoropropene 102687-65-0

Pennsylvania RTK : trans-1-Chloro-3,3,3-trifluoropropene 102687-65-0

WHMIS Classification : A: Compressed Gas
This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

SAFETY DATA SHEET

**Solstice® ZD, Solstice® 1233zd (E)****000000018007**

Version 1.2

Revision Date 06/16/2014

Print Date 03/30/2016

SECTION 16. OTHER INFORMATION

	HMIS III	NFPA
Health hazard	: 2	2
Flammability	: 0	0
Physical Hazard	: 0	
Instability	:	0

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user. This information should not constitute a guarantee for any specific product properties.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

Previous Issue Date: 12/03/2013

Prepared by Honeywell Performance Materials and Technologies Product Stewardship Group



Du Pont
Material Safety Data Sheet

Page 1

"SUVA" HP62 (R404A)
CEFSHP62 Revised 9-Mar-11 Printed 03/09/2011

Substance ID :130000000494

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

Corporate MSDS Number : DU005612

Product Use

Refrigerant

Tradenames and Synonyms

HP62
R404A
Refrigerant
"SUVA" is a registered trademark of E.I. du Pont de Nemours
and Company, and its affiliates. E.I. du Pont Canada Company
is a licensee.

Company Identification

MANUFACTURER/DISTRIBUTOR
E.I. du Pont Canada Company
P.O. Box 2200
Streetsville
Mississauga, Ontario L5M 2H3

PHONE NUMBERS

Product Information : 1-800-387-2122
Medical Emergency : 1-800-441-3637 (24 hours)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
PENTAFLUOROETHANE (HFC 125)	354-33-6	44 %
1,1,1-TRIFLUOROETHANE (HFC 143a)	420-46-2	52 %
1,1,1,2-TETRAFLUOROETHANE (HFC 134a)	811-97-2	4 %

HAZARDS IDENTIFICATION

Potential Health Effects

Inhalation of high concentrations of vapor is harmful and
may cause heart irregularities, unconsciousness, or death.
Intentional misuse or deliberate inhalation may cause death

Print Date: 3 - 10 - 2011

CEFSHP62

**Du Pont
Material Safety Data Sheet**

Page 2

without warning. Vapor reduces oxygen available for breathing and is heavier than air. Liquid contact can cause

frostbite.

HUMAN HEALTH EFFECTS:

Overexposure to the vapors by inhalation may include temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. Higher exposures to the vapors may cause temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation; or fatality from gross overexposure. Contact with the liquid may cause frostbite.

Individuals with preexisting diseases of the central nervous or cardiovascular system may have increased susceptibility to the toxicity of increased exposures.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid**INHALATION**

If inhaled, immediately remove to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

SKIN CONTACT

Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.

EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION

Not a probable route. However, in case of accidental ingestion, call a physician.

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

Du Pont
Material Safety Data Sheet

Page 3

Notes to Physicians

THIS MATERIAL MAY MAKE THE HEART MORE SUSCEPTIBLE TO ARRHYTHMIAS. Catecholamines such as adrenaline, and other compounds having similar effects, should be reserved for emergencies and then used only with special caution.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : No flash point

Flammable Limits in Air, % by Volume:

LEL : None per ASTM E681

UEL : None per ASTM E681

Autoignition: Not determined

Fire and Explosion Hazards:

Cylinders may rupture under fire conditions. Decomposition may occur.

Contact of welding or soldering torch flame with high concentrations of refrigerant can result in visible changes in the size and color of torch flames. This flame effect will only occur in concentrations of product well above the recommended exposure limit, therefore stop all work and ventilate to disperse refrigerant vapors from the work area before using any open flames.

R-404A is not flammable in air at temperatures up to 100 deg C (212 deg F) at atmospheric pressure. However, mixtures of R-404A with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. R-404A can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing R-404A and air, or R-404A in an oxygen enriched atmosphere becomes combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, R-404A should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example: R-404A should NOT be mixed with air under pressure for leak testing or other purposes.

Experimental data have also been reported which indicate combustibility of HFC-134a, a component in this blend, in the presence of chlorine.

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

Du Pont
Material Safety Data Sheet

Page 4

Extinguishing Media

As appropriate for combustibles in area.

Fire Fighting Instructions

Cool cylinder with water spray or fog. Self-contained breathing apparatus (SCBA) is required if cylinders rupture and contents are released under fire conditions. Water runoff should be contained and neutralized prior to release.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Accidental Release Measures

Ventilate area using forced ventilation, especially in low or enclosed places where heavy vapors might collect. Remove open flames. Use self-contained breathing apparatus (SCBA) for large spills or releases.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapor. Avoid liquid contact with eyes and skin. Use with sufficient ventilation to keep employee exposure below recommended limits. Contact with chlorine or other strong oxidizing agents should also be avoided. See Fire and Explosion Data section.

Storage

Clean, dry area. Do not heat above 52 deg C (125 deg F).

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Avoid breathing vapors. Avoid contact with skin or eyes. Use with sufficient ventilation to keep employee exposure below the recommended exposure limit. Local exhaust should be used if large amounts are released. Mechanical ventilation should be used in low or enclosed places.

Refrigerant concentration monitors may be necessary to

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

Du Pont
Material Safety Data Sheet

Page 5

determine vapor concentrations in work areas prior to use of torches or other open flames, or if employees are entering enclosed areas.

Personal Protective Equipment

Impervious gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions, no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines

Applicable Exposure Limits

PENTAFLUOROETHANE (HFC 125)

PEL (OSHA)	: None Established
TLV (ACGIH)	: None Established
AEL * (DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA)	: 1000 ppm, 4900 mg/m3, 8 Hr. TWA

1,1,1-TRIFLUOROETHANE (HFC 143a)

PEL (OSHA)	: None Established
TLV (ACGIH)	: None Established
AEL * (DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA)	: 1000 ppm, 8 Hr. TWA

1,1,1,2-TETRAFLUOROETHANE (HFC 134a)

PEL (OSHA)	: None Established
TLV (ACGIH)	: None Established
AEL * (DuPont)	: 1000 ppm, 8 & 12 Hr. TWA
WEEL (AIHA)	: 1000 ppm, 8 Hr. TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	: -46.7 C (-52.1 F) Average
Vapor Pressure	: 182.1 psia at 25 deg C (77 deg F)
% Volatiles	: 100 WT%
Evaporation Rate	: (CL4 = 1) Greater than 1
Solubility in Water	: Not determined
Odor	: Slight ethereal
Form	: Liquefied gas

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

**Du Pont
Material Safety Data Sheet**

Page 6

Color : Clear, colorless
Specific Gravity : 1.05 @ 25C (77F)

STABILITY AND REACTIVITY

Chemical Stability

Material is stable. However, avoid open flames and high temperatures.

Incompatibility with Other Materials

Incompatible with active metals, alkali or alkaline earth metals--powdered Al, Zn, Be, etc.

Decomposition

Decomposition products are hazardous. This material can be decomposed by high temperatures (open flames, glowing metal surfaces, etc.) forming hydrofluoric acid and possibly carbonyl fluoride.

These materials are toxic and irritating. Contact should be avoided.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

The blend is untested.

HFC-125

Inhalation 4 hour ALC: > 709,000 ppm in rats

Single, high inhalation exposures caused lethargy, decreased activity, labored breathing and weight loss. Weak cardiac sensitization effect, a potentially fatal disturbance of heart rhythm caused by a heightened sensitivity to the action of epinephrine. Lowest-Observed-Adverse-Effect-Level for cardiac sensitization: 100,000 ppm.
Repeated exposure caused: No significant toxicological effects. No-Observed-Adverse-Effect-Level (NOAEL): 50,000 ppm

No animal data are available to define carcinogenic, developmental or reproductive hazards. In animal testing this material has not caused developmental toxicity.
HFC-125 does not produce genetic damage in bacterial or

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

Du Pont
Material Safety Data Sheet

Page 7

mammalian cell cultures or when tested in animals (not tested for heritable genetic damage).

HFC-134a

Inhalation 4-hour LC50: 567,000 ppm in rats

Single exposure caused: Cardiac sensitization, a potentially fatal disturbance of heart rhythm associated with a heightened sensitivity to the action of epinephrine. Lowest-Observed-Adverse-Effect-Level for cardiac sensitization: 75,000 ppm. Single exposure caused: Lethargy. Narcosis. Increased respiratory rates. These effects were temporary. Single exposure to near lethal doses caused: Pulmonary edema. Repeated exposure caused: Increased adrenals, liver, spleen weight. Decreased uterine, prostate weight. Repeated dosing of higher concentrations caused: the following temporary effects - Tremors. Incoordination.

CARCINOGENIC, DEVELOPMENTAL, REPRODUCTIVE, MUTAGENIC EFFECTS:

In a two-year inhalation study, HFC-134a, at a concentration of 50,000 ppm, produced an increase in late-occurring benign testicular tumors, testicular hyperplasia and testicular weight. The no-effect-level for this study was 10,000 ppm. Animal data show slight fetotoxicity but only at exposure levels producing other toxic effects in the adult animal. Reproductive data on male mice show: No change in reproductive performance. Tests have shown that this material does not cause genetic damage in bacterial or mammalian cell cultures, or in animals. In animal testing, this material has not caused permanent genetic damage in reproductive cells of mammals (has not produced heritable genetic damage).

HFC-143a

Inhalation 4-hour LC50: >540,000 ppm in rats

Single exposures by inhalation to 500,000 ppm caused anesthesia but no mortality at 540,000 ppm. Cardiac sensitization occurred in dogs at 300,000 ppm following an intravenous challenge with epinephrine. Two, 4-week inhalation have been conducted. In the first study, pathological changes in the testes were observed at all exposure concentrations; no effects were observed in females. The testicular effect was considered related to the method used to expose the rats to HFC-143a. In the second study using the same exposure concentrations, no effects were noted in males at any concentration. Data from a 90-day study revealed no effects in male or female rats at exposures up to 40,000 ppm. Long-term exposure caused

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

Du Pont
Material Safety Data Sheet

Page 8

significantly decreased body weights in male rats fed 300 mg/kg for 52 weeks, but there was no effect on mortality. Tests in rats demonstrated no carcinogenic activity when administered orally 300 mg/kg/day for 52 weeks and observed for an additional 73 weeks. Tests in bacterial cell cultures demonstrated mutagenic activity, but the compound did not induce transformation of mammalian cells in culture

or in the whole animal. Tests in animals demonstrate no developmental toxicity.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

HFC 143a

96-hour LC50, Rainbow trout: >40 mg/L

HFC-134a

48-hour EC50, Daphnia magna: 980 mg/L

96-hour LC50, Rainbow trout: 450 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Comply with Federal, State, and local regulations. Reclaim by distillation or remove to a permitted waste disposal facility.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO/IATA

Proper Shipping Name : Refrigerant Gas R-404A

Hazard Class : 2.2

UN No. : 3337

Label(s) : Nonflammable Gas

Shipping Containers

Tank Cars.

Cylinders

Ton Tanks

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

Du Pont
Material Safety Data Sheet

Page 9

Shipping Information -- Canada

TDG
Proper Shipping Name : Refrigerant Gas R-404A
TDG Class : 2.2
UN # : 3337

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : No
Chronic : No
Fire : No
Reactivity : No
Pressure : Yes

LISTS:

SARA Extremely Hazardous Substance -No
CERCLA Hazardous Material -No
SARA Toxic Chemicals -No

Canadian Regulations

WHMIS Classification:

CLASS A Compressed Gas

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

CEPA Status : All components either on DSL, or notified.

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating
Health : 1
Flammability : 0
Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

Printed on 03/09/2011

Print Date: 3 - 10 - 2011

CEFSHP62

**Du Pont
Material Safety Data Sheet**

Page 10

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS

(Continued)

FLUOROPRODUCTS E.I. E.I. du Pont Canada Company Company
Box 2200, Streetsville
Mississauga, Ontario, L5M 2H3
(905) 821-3300.

Indicates updated section.

End of MSDS

Printed on 03/09/2011

Print Date: 3 - 10 - 2011



Manufactured For:
Johnson Controls Inc.
(York International)

For emergency assistance, call:
INFOTRAC at 1-800-535-5053

Safety Data Sheet

Solid State Starter / VSD Coolant

1. IDENTIFICATION

Product name Solid State Starter / VSD Coolant
Description Aqueous Heat Transfer Solution
Product class Closed System
Manufacturer's address 201 Burch Drive
Moon Township, PA 15108
Telephone numbers
Manufacturers Phone (412) 262-4827
Emergency Telephone INFOTRAC 800-535-5053

2. HAZARDS IDENTIFICATION

Hazard classification Not hazardous pursuant to 29 CFR 1910.1200.
Signal word None
Hazard statements None
Pictograms of related hazards None

Precautionary statements

Prevention

Read label before use.
Wash skin thoroughly after handling.
Wear protective gloves, protective clothing, eye protection, and face protection.

Response

IF SWALLOWED: Contact a POISON CENTER or health care provider if you feel unwell.
IF ON SKIN: Wash with soap and water.

Storage

Store in a well-ventilated place. Keep container tightly closed. Keep out of direct sunlight.

Disposal

Dispose of contents and container in accordance with local, state, and federal regulations.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS #	Weight %
Non-hazardous substances	Proprietary	100

Safety Data Sheet

Product: Solid State Starter / VSD Coolant

4. FIRST-AID MEASURES

Eye contact	Flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally to ensure complete rinsing. Remove contact lenses if present and easy to do, then resume rinsing. Get medical attention if symptoms occur.
Skin contact	Remove contaminated clothing and wash the affected area with soap and water. Wash contaminated clothing before reuse.
Ingestion	If swallowed, DO NOT induce vomiting. Rinse mouth and get emergency medical attention. Do not give anything by mouth unless instructed to do so by a poison center or health care provider.
Inhalation	If inhaled, move victim to fresh air. Seek emergency medical attention if breathing is difficult; perform artificial respiration if breathing stops.
Note to health care provider	No specific information—treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	Use extinguishing media appropriate for the surrounding fire.
Unsuitable extinguishing media	No information available
Protective equipment and precautions for firefighters	Stay upwind of the fire. Full protective equipment including self-contained breathing apparatus should be used. Use water to cool closed containers. Contain water runoff if possible.
Specific hazards	Combustion may produce toxic gases.
Hazardous combustion products	Carbon oxides, nitrogen oxides, sulfur oxides, phosphorous oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Evacuate the area of all non-essential personnel. Do not touch spilled material without proper protective equipment. Ventilate the area and mitigate further release if it is safe to do so. Avoid contact with eyes.
Methods for clean-up	
<u>Small spills</u>	Contain spill and soak up with an inert absorbent material and place residues in a properly labeled container for disposal. Avoid discharge into sewer or surface water.
<u>Large spills</u>	Contain spill using trenches, diking, or absorption with an inert material (i.e. sand or earth). Reclaim spilled material into recovery or salvage drums or tank truck for proper disposal.

7. HANDLING AND STORAGE

Advice on safe handling	Avoid contact with eyes, skin, and clothing. Avoid breathing vapor or mist. Wash hands thoroughly after handling.
--------------------------------	---

Safety Data Sheet

Product: Solid State Starter / VSD Coolant

Storage conditions	Store in a cool, dry, well-ventilated area away from incompatible materials. Keep containers closed when not in use.
Suitable materials of construction	No information available
Unsuitable materials of construction	No information available

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye/face protection	Chemical splash goggles
Skin protection	Chemical-resistant gloves and body-covering clothing
Respiratory protection	Respiratory protection is not normally required. A respirator is recommended if significant mists, vapors, or aerosols are generated.
Engineering controls	Adequate ventilation, eye-wash station, and emergency shower
General hygiene considerations	Do not eat, drink, or smoke while handling this product.

Chemical Name	OSHA PEL	ACGIH TLV
Non-hazardous substances	None established	None established

9. PHYSICAL AND CHEMICAL PROPERTIES

pH	7.5-8.0
Appearance	Blue, Clear liquid
Odor	Mild
Odor Threshold	No information available
Melting/freezing point	No information available
Initial boiling point/boiling range	No information available
Flash point	No information available
Evaporation rate	No information available
Flammability (solid, gas)	No information available
Upper/lower flammability or explosive limits	No information available
Vapor pressure	No information available
Vapor density	No information available
VOC content	No information available
Specific gravity	0.960-1.040
Solubility	Complete
Partition coefficient n-octanol/water	No information available
Auto-ignition temperature	No information available
Decomposition temperature	No information available
Viscosity	No information available

Safety Data Sheet

Product: Solid State Starter / VSD Coolant

10. STABILITY AND REACTIVITY

Chemical stability	Stable under normal conditions of storage and handling.
Hazardous polymerization	Polymerization will not occur.
Conditions to avoid	Extreme temperatures, incompatibilities
Incompatibilities	Strong acids, strong bases, oxidizers
Hazardous decomposition products	No known non-thermal decomposition hazards.

11. TOXICOLOGICAL INFORMATION

Likely routes of exposure	Skin, eyes, ingestion
Acute symptoms and effects	
Eye	Eye irritation with or without pain, burning, itching, redness, and discharge.
Skin	Skin irritation with or without pain, burning, itching, redness, and swelling. Symptoms may be exacerbated by open wounds, excoriations, rashes, or other skin breaches.
Ingestion	Gastrointestinal distress with or without nausea, vomiting, and diarrhea.
Inhalation	Upper respiratory irritation with or without cough, watering of the eyes, and postnasal drip.
Reproductive effects	No information available
Teratogenicity	No information available
Mutagenicity	No information available
Embryotoxicity	No information available
Sensitization to product	No information available
Synergistic products	No information available
Carcinogenicity	No components have been identified as carcinogenic by OSHA, NTP, or IARC.
Chronic	No information available

12. ECOLOGICAL INFORMATION

Persistence	No information available
Bioaccumulative potential	No information available
Mobility	No information available

13. DISPOSAL CONSIDERATIONS

Disposal	Dispose of in accordance with federal, state, and local regulations.
RCRA status	Discarded product, as sold, would not be considered a RCRA Hazardous Waste.

Safety Data Sheet

Product: Solid State Starter / VSD Coolant

14. TRANSPORT INFORMATION

US Department of Transportation (DOT)

UN Number
Proper shipping name Not regulated
Primary hazard class/division
Secondary hazard
Packing group
Label

15. REGULATORY INFORMATION

OSHA Hazard Communication Status Not hazardous pursuant to 29 CFR 1910.1200.
EPA Registration Number Not applicable
TSCA The ingredients of this product are listed on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory.

CERCLA

EPA Hazardous Substances (40 CFR 302)

Chemical Name	Reportable Quantity (RQ)
Non-hazardous substances	None

SARA Title III (Sections 302, 311, 312, and 313)

Section 302 Extremely Hazardous Substances (40 CFR 355)

Chemical Name	CAS#	RQ	TPQ
None			

Section 311 and 312 Health and Physical Hazards

Immediate	Delayed	Fire	Pressure	Reactivity
No	No	No	No	No

Section 313 Toxic Chemicals (40 CFR 372)

Chemical Name	CAS Number	Percent by Weight
None		

16. OTHER INFORMATION

HMIS Ratings Health—0; Flammability—0; Reactivity—0
NFPA Ratings Health—0; Flammability—0; Reactivity—0
HMIS/NFPA Rating Scale Minimal—0; Slight—1; Moderate—2; Serious—3; Severe—4
SDS Issue Date 10/14/2016
Version 1

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal, and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.



5000 Renaissance Drive, New Freedom, Pennsylvania USA 17349
Copyright © by Johnson Controls 2018
Form 161.01-OM1 (618)
Issue Date: June 8, 2018
New Release

800-861-1001
www.johnsoncontrols.com

Subject to change without notice. Printed in USA
ALL RIGHTS RESERVED