

 BY JOHNSON CONTROLS	CENTRIFUGAL LIQUID CHILLER	
SERVICE MANUAL	Supersedes: 160.84-M2 (1013)	Form 160.84-M2 (114)

**OPTIVIEW™ CONTROL CENTER FOR
YMC² MODEL B
MAGNETIC CENTRIFUGAL CHILLER**



LD17500

R-134A

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IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: 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 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 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 this document and any referenced materials. This individual shall also be familiar with and comply with all applicable 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:



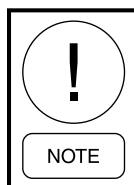
Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.



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

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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
Installation Checklist and Request for Startup	160.84-CL1
Startup Checklist	160.84-CL2
Unit Service Manual	160.84-M1
Installation and Reassembly	160.84-N1
Unit Operations and Maintenance Manual	160.84-OM1
Field Connections	160.84-PW1
Field Control, Wiring and MBC Modifications	160.84-PW2
VSD Wiring Diagrams	160.84-PW3
Unit Renewal Parts	160.84-RP1
OptiView™ Renewal Parts	160.84-RP2
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

Y M C 2 - S 0756 A B

YORK _____ Mod Level
Magnetic Bearing _____ Refrigerant R-134a
Centrifugal Chiller _____ Capacity in KW
S = Single Stage
T = Two Stage

COMPRESSOR NOMENCLATURE

M2 B - 197 F A A

Motor _____ Gas Path Revision Level
Motor Design Level _____ Impeller Design Revision Level
Impeller Tip Diameter (mm) _____
Rotation _____
F = Forward
R = Reverse

VESSEL NOMENCLATURE

E A 25 14 271 B R 1 1 F C R

Vessel _____ Inlet from Front View
E = Evaporator R = Right
C = Condenser L = Left
Heat Exchanger Mod Level _____ Waterbox Type
Nominal Inside Diameter (Inches) _____ C = Compact
Nominal Length (Feet) _____ M = Marine
Marketing Tube Number _____ Water Connection Type
Tube Code _____ F = Flanges
B = 3/4" Code 1 G = Grooved Standard
C = 3/4" Code 2 A = Victaulic AGS
D = 3/4" Code 3
E = 3/4" Code 4
2 = 1" Code 1
3 = 1" Code 2
4 = 1" Code 3
5 = 1" Code 4
Vessel Refrigerant Pressure Code _____ Number of Passes
R = Code 180
S = Code 235
T = Code 300
U = Code 350
V = Code 400
Water Side Pressure Code
1 = 150 psi
3 = 300 psi

VARIABLE SPEED DRIVE NOMENCLATURE

HYP 774 X H 15 D - 40

Hyper _____ 40 = 380V 60Hz
Amps _____ 50 = 400V 50Hz
X = Factory Mount _____ 46 = 460V 60Hz
R = Retrofit Model _____ 68 = 415V 50Hz
H = YMC² Chiller _____ D = Disconnect Switch
B = Circuit Breaker
Liquid DWP
15 = 150 psi
30 = 300 psi

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SECTION 1 - SYSTEM FUNDAMENTALS

1

INTRODUCTION

This manual explains the operation of the chiller controls system including printed circuit boards and major components of the OptiView™ Control Center. It includes advanced diagnostics and troubleshooting information for Service Technicians. Also included are detailed descriptions of chiller control features, such as capacity control, refrigerant level control, and magnetic bearing control.

SYSTEM COMPONENTS

The YORK Model YMC² Centrifugal Liquid Chiller is completely factory-packaged including evaporator, condenser, compressor, motor, Variable Speed Drive, Battery Power Panel, OptiView™ Control Center, and all interconnecting unit piping and wiring (see Figure 1).

Compressor

The compressor is a single-stage centrifugal type powered by a hermetic electric motor. The compressor has fixed inlet vanes and variable geometry diffuser. On

two-stage chillers, the second stage compressor is located on the same motor shaft at the opposite end.

Motor

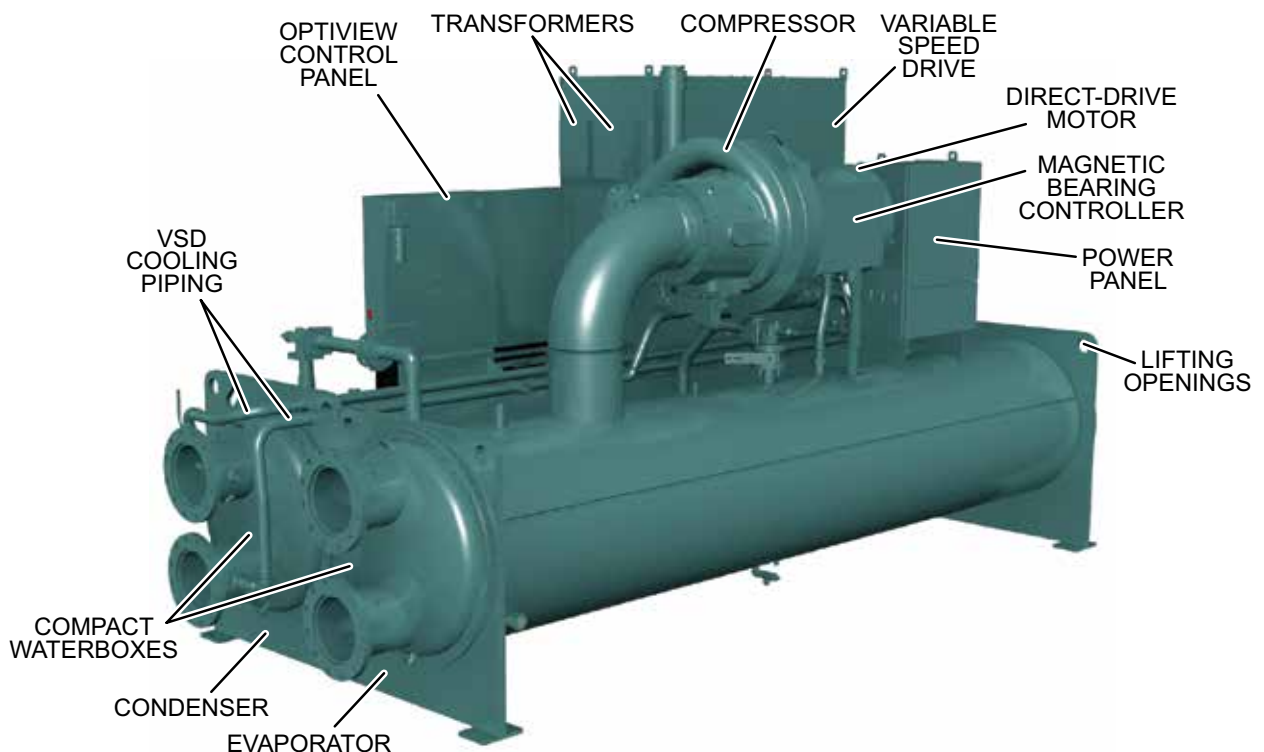
The compressor motor is a hermetic permanent magnet high speed design with magnetic bearings. The compressor impeller is overhung from the end of the motor shaft and has no bearings of its own.

The bearing control boards are mounted directly to the motor.

The bearing control maintains proper shaft position in the magnetic bearings.



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.



LD14022b

FIGURE 1 - YMC² CHILLER COMPONENTS

Heat Exchangers

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

Refrigerant Flow Control

Refrigerant flow to the evaporator is controlled by the liquid level control valve (refer to *Figure 2 on page 15*).

A level sensor senses the refrigerant level in the condenser and outputs an analog voltage to the Microboard that represents this level (0% = empty; 100% = full). Under program control, the control panel modulates the liquid level control valve to control the condenser refrigerant level to 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.

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.

OptiView™ Control Center

The OptiView™ Control Center is factory-mounted, wired and tested. This electronic panel is described in detail within this manual.

Variable Speed Drive

A Variable Speed Drive will be 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.

Power Panel

The power panel includes the Uninterruptible Power Supply and power storage battery. These feed essential loads upon loss of main chiller power while the chiller shuts down.

SYSTEM OPERATION DESCRIPTION

In operation, a liquid (water or brine to be chilled) flows through the evaporator, where boiling refrigerant

absorbs heat from the liquid. 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.

The refrigerant vapor, which is produced by the boiling action in the evaporator, flows to the compressor where the rotating impeller increases its pressure and temperature and discharges it into the condenser. Water flowing through the condenser tubes absorbs heat from the refrigerant vapor, causing it to condense. The condenser water 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 the liquid return line. The level control valve meters the flow of liquid refrigerant to the evaporator to complete the refrigerant circuit.

Basic Capacity Control

The speed at which the compressor rotates establishes the pressure differential that the chiller can operate against. Higher differential requires higher speed. However, if speed is reduced, the 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 water temperature and sufficient pressure differential. When the speed cannot be further reduced due to pressure difference required for the specified leaving chilled water temperature setting and available cooling to the condenser, a mechanism called 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 YMC² uses these mechanisms in a controlled order to maintain best efficiency. The details of that control logic and all ancillary controls is described in this manual.

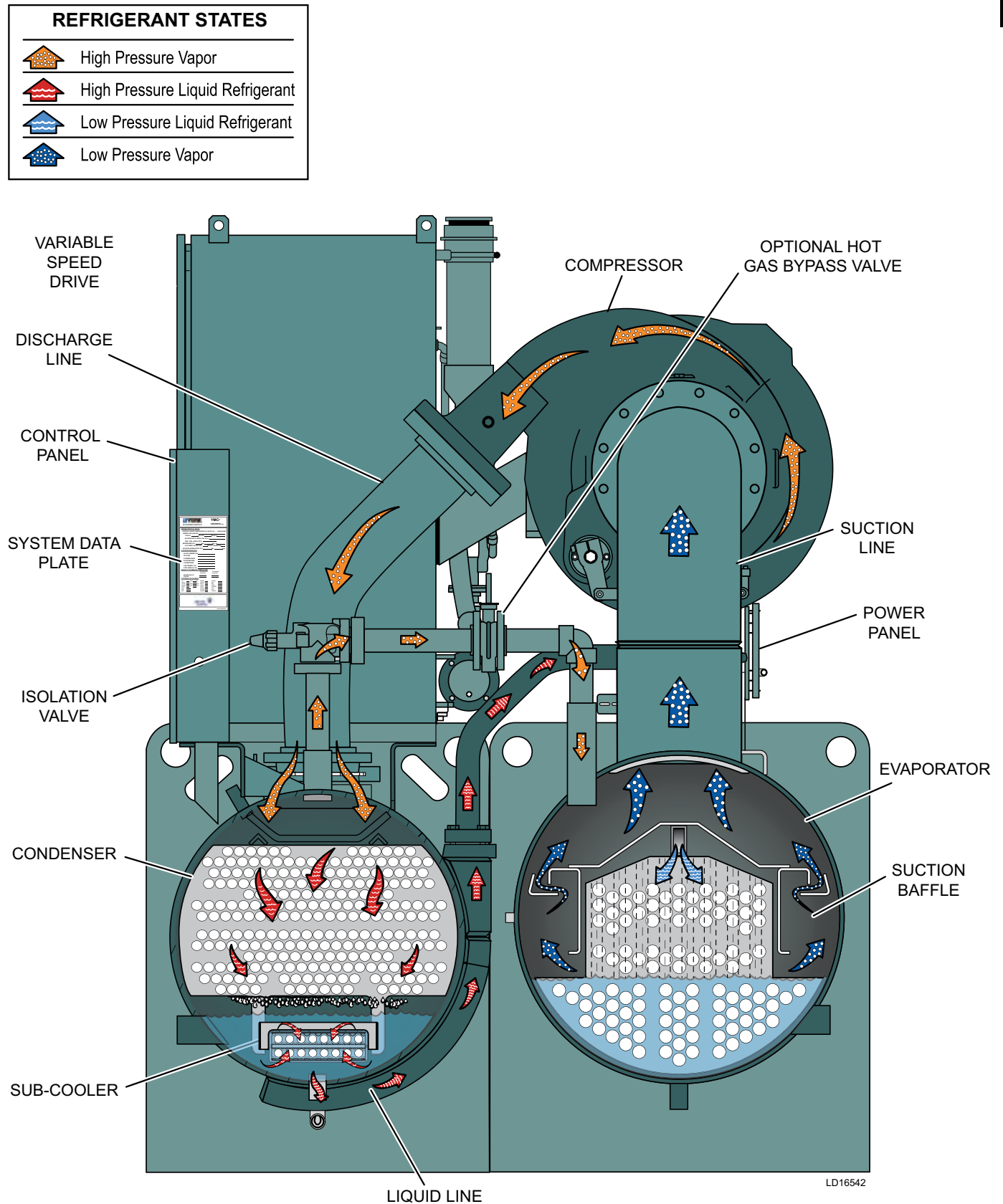


FIGURE 2 - REFRIGERANT FLOW-THRU CHILLER

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SECTION 2 - OPTIVIEW™ CONTROL CENTER INTRODUCTION

The YORK OptiView™ control center for YMC² is a microprocessor based control system. The OptiView™ Control Center performs the following functions:

- Controls chiller capacity to chill liquid to the chilled liquid temperature setpoint.
- Controls chiller, relays, actuators and motor drive per the operating program.
- Displays chiller operating conditions, alarms, shutdown messages and history data.
- Accepts operator-programmed setpoints and controls the chiller accordingly.
- Allows manual control of chiller motor drive speed and control actuators.
- Monitors chiller operating conditions and shuts down the chiller when Safety or Cycling thresholds are exceeded.
- Allows local manual start/stop and accepts start/stop commands from remote devices, via contact closures or serial communications.
- Allows setpoints to be changed from a remote location via 0-10VDC, 2-10VDC, 0-20mA, 4-20mA, contact closures or serial communications.
- Provides chiller operating data and status to remote devices via serial communications and contact closures.
- Allows real-time data and history data to be printed on an optional printer, or downloaded to a laptop.
- Controls the state of the compressor motor magnetic bearing controller and variable speed drive.

The panel comes configured with a full screen LCD Graphic Display mounted in the middle of a keypad interface. The graphic display allows the presentation of several operating parameters at once. In addition, the operator may view a graphical representation of the historical operation of the chiller as well as the present operation.

Included in this document are procedures that have to be performed at chiller commissioning or during service. They should not be performed by anyone other than a Service Technician. For example, cali-

bration procedures have to be performed or verified at system commissioning or when a component is replaced. Certain Safety shutdowns require special reset procedures to be performed before the chiller can be restarted. Since the operating program supplied in each OptiView™ Control Center is universal to all applications, special setpoints, program jumpers and program switches are required to configure the chiller for local operating conditions.

The *Unit Start-up Checklist (Form 160.84-CL2)* should be referenced for items to be performed during chiller commissioning.

The appropriate wiring diagrams, listed in the table in the front of this manual provide component interconnections within the OptiView™ Control Center and the connections between these components and the motor starter and chiller components.

When the chiller shuts down on a SAFETY or CYCLING shutdown or is being prevented from starting, a message is displayed providing the reason for the shutdown. This message, along with all the chiller operating conditions at the instant of the event are stored in the Microboard battery-backed memory. This history data can be displayed or printed using an optional printer. This manual provides a detailed description of this message, including the conditions required to produce the message and conditions required to restart the chiller.

Before beginning any troubleshooting, observe the shutdown message and retrieve the HISTORY data of that event. The conditions required to produce the message must be clearly understood before proceeding (if this is not done, much time will be wasted). Knowing overall system architecture and the function of each printed circuit board and signal flow provided by this manual, proceed with the appropriate Wiring Diagram listed to trace the problem through the system. Use the Diagnostic Routines where appropriate.

Diagnostic routines allow service analysis of the following functions:

- Display
- Analog inputs
- Digital inputs
- Digital outputs
- Serial Data ports

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SECTION 3 - CONTROL SYSTEM ARCHITECTURE

The overall system architecture is described and illustrated using block diagrams. These diagrams describe the general function of each component and provides the system interface and signal flow. The function of each component and signal flow between components must be understood before effective troubleshooting can commence.

The operation of each printed circuit board is described and illustrated with a block diagram that is a simplified representation of board circuitry. The expected voltage level at all inputs and outputs of each board for any operating condition is provided.

The OptiView™ Control Center contains the following standard components, listed with the general functions each is responsible for. The sections following describe each one in detail:

Microboard

- Contains the boot up and control programs.
- Operates the chiller and processes all decisions.
- Reads 0 to 5 vdc analog inputs from pressure transducers, temperature thermistors, refrigerant level sensor, stall detector board, and thermal flow switches.
- Reads hard-wired customer remote chilled water and current limit reset pulse-width-modulated or analog signals when applied.
- Communicates with the i/o (input/output) board via 5 vdc and 12 vdc signals over the connecting ribbon cable.
- Communicates with the ups (uninterruptible power supply) via rj-25 low voltage input and output.
- Communicates with the ltc i/o board over rs485 data coms.
- Communicates with the vsd (variable speed drive) over rs485 data coms.
- Communicates with the mbc (magnetic bearing control) over rs485 data coms.
- Communicates with the vgd (variable geometry diffuser) actuator over rs485 data coms to command position, initiate calibration routines and monitor status.

- Communicates with the operator keypad via 5 vdc switched across ribbon cable conductors.
- Communicates with the lcd (liquid crystal display) via its interface board with low voltage binary communication.
- Communicates with the optional e-link gateway over rs232 data coms for building system communication.

Input/Output (I/O) Board

- reads digital inputs, which are on/off inputs coming through external device switch and relay contacts. These inputs are 115VAC when the contacts are closed and 0VAC when open. These include optional paddle or differential pressure flow switches, local safety stop switch, remote cycling, high pressure switch, VSD fault contacts and magnetic bearing control safety device, etc.
- provides digital outputs, which are on/off outputs from onboard relay contacts and triacs. The relay contacts typically switch 115VAC and the triacs typically switch a nominal 30VAC. Relay outputs include status/alarm, and chilled and condenser water pump starter signals, etc.

LTC I/O Board

- Provides additional i/o capability beyond the standard i/o board.
- Provides analog output for the liquid level control valve and optional hot gas bypass valve actuators, motor cooling valve control board command, and optional head pressure control output.
- Reads analog inputs from motor housing temperature thermistor, power panel temperature thermistor, discharge temperature thermistor on high stage of 2-stage chillers.
- Reads vgd actuator fault contact digital input.

Display

- Presents system operating information on its 10.4 Inch color liquid crystal screen.
- Includes the display interface board and backlight inverter board for the ccfl backlight.

Keypad

- Contains touch-sensitive keys that make continuity between various paths to allow the Operator to interface with the OptiView™ Control Center.

Power Supply

- Provides the DC power for the LCD Display and all the printed circuit boards in the OptiView™ Control Center.

Motor Cooling stepper valve IB2 Interface board

- Reads a 0-10 VDC analog motor cooling valve position command signal from the LTC I/O board.
- Commands the motor cooling electronic expansion valve (EEV) open or closed with timed power pulses to its motor coils.

Stall detector board

- Reads 0 – 5 vdc analog signal from the discharge pressure transducer.
- Filters the pressure signal into two frequency ranges and conditions the signals into 0-5 vdc signals proportional to amplitude of stall energy in each of the frequency ranges.
- Transmits the raw pressure signal and the proportional stall energy signals to the microboard.

E-Link Gateway board (optional)

- Provides building automation system (BAS) networking connectivity.
- Maintains these active serial ports: Port 1 and Port 4 are used for BAS networking, Port 2 is reserved for connecting to the equipment, and Port 3 provides access for auxiliary monitoring and control.

Figure 3 on page 21 is an OptiView™ Control Center block diagram. On the block diagram, the standard components are shown.

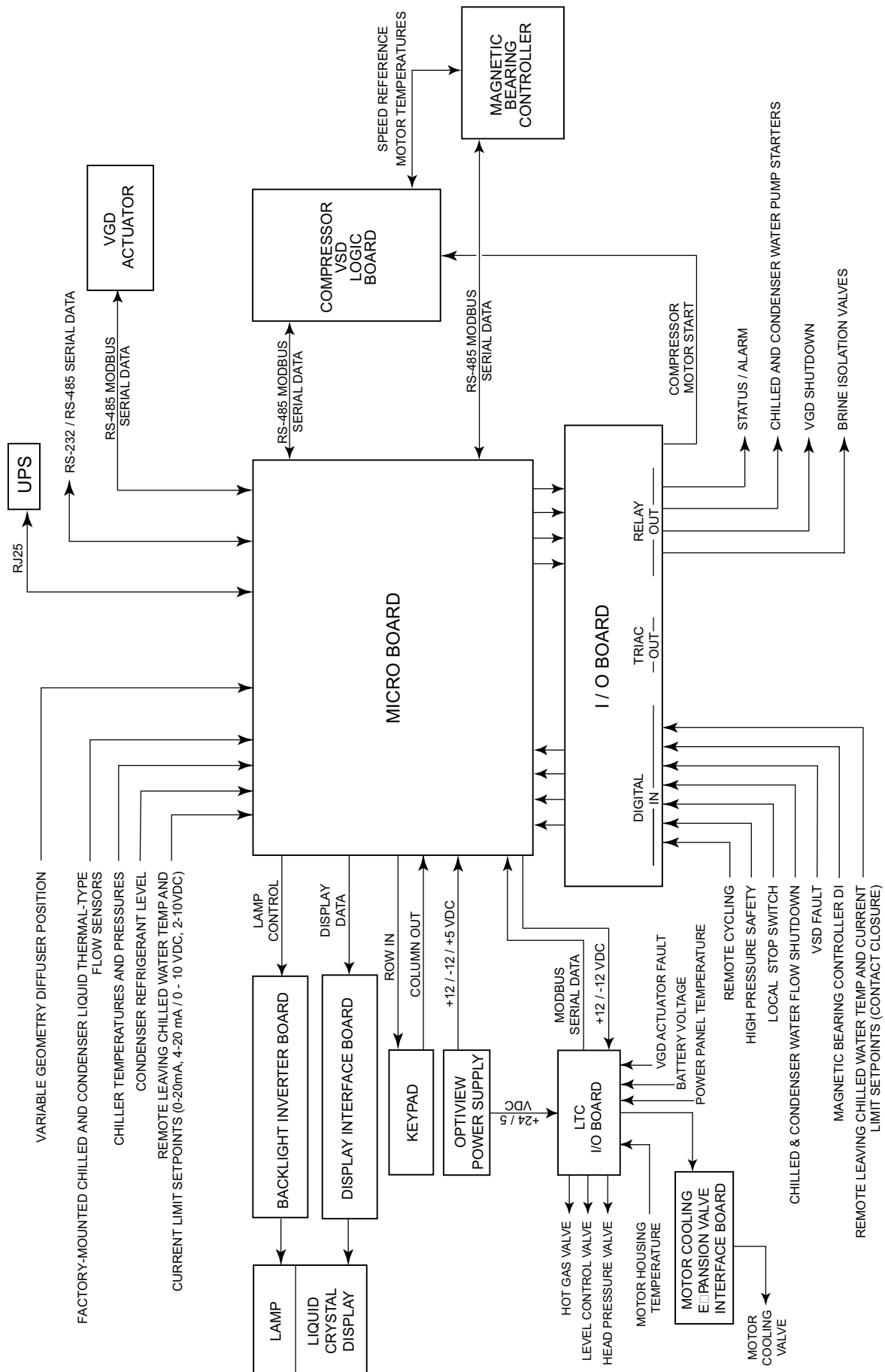


FIGURE 3 - OPTIVIEW™ CONTROL CENTER

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SECTION 4 - MICROBOARD 031-02430-007

YMC² Mod B chillers will be supplied with microboard 031-02430-007. It is supplied as service replacement for the YMC² in kit P/N 331-02430-614.

The board is supplied with +12VDC (J1-3), -12VDC (J1-4), +5VDC (J1-1) and ground (J1-2) from the Power Supply (refer to *Figure 6 on page 35*). The -12VDC is not used. The +5VDC (fused by F1) can be monitored at TP3. It is applied to a +3.3VDC regulator, +2.5VDC regulator and used directly by the microboard circuits as the Vcc voltage. The outputs of these regulators are applied to microboard circuits and can be monitored at TP2 and TP5 respectively. The +12VDC (fused by F2) can be monitored at TP4. It is applied to a +5VDC regulator and used directly by microboard circuits. The output of the regulator is the +5VDC (analog) supply that powers all analog circuits and is the source voltage for all transducers and thermistors. It can be monitored at TP10 as a 2.5VDC value created by 1K Ohm resistors voltage divider circuit as shown in *Figure 6 on page 35*.

TEST POINTS

The power supply voltages can be measured at following test points as noted in *Figure 6 on page 35*.

TP1 Gnd

TP2 +3.3VDC

TP3 +5VDC

TP4 +12VDC

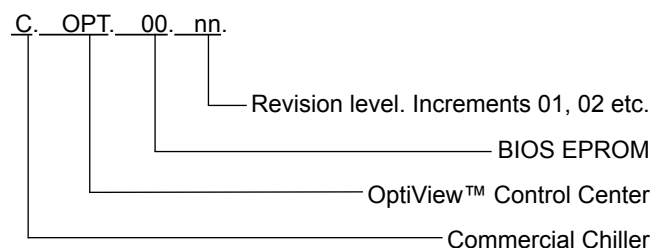
TP5 +2.5VDC

TP10 +2.5VDC

BOOT-UP PROGRAM

The BIOS (Basic Input Output System) Eprom (U37) contains the boot-up program. The YORK part number is 031-02429-002 and is used in the 031-02430-007 microboard. This part number specifies a BIOS Eprom with Floating Point enabled, as required for YMC² control. It is available from the Baltimore Parts Distribution Center as a replacement part. The version is an alphanumeric code that identifies the application and the program revision level. The part number and version are printed on a label adhered to the surface of the Eprom. It is also displayed on the DIAGNOSTICS Screen in Service Access Level.

The version is as follows:



When power is first applied to the OptiView™ Control Center, a white screen is displayed while the boot-up is performed. During the boot-up, the program in the BIOS Eprom configures the microprocessor and related components and performs testing of certain components to assure those components are operational.

The sequence of events in the boot-up process are listed in *Table 1 on Page 24*. The progress and pass/fail status of each step is displayed on the microboard 7-segment LED Display (U22). Due to the speed at which the boot-up proceeds, not all steps will be visible during the process. Not all pass/fail status are displayed on the white screen.

CHILLER OPERATING PROGRAM

The Chiller Operating Program is a set of instructions to control the chiller. It contains the Safety and Cycling shutdown thresholds (non-changeable) and display screen messages and graphics.

The chiller operating program is stored in a non-removable Flash Memory chip (U35) that is soldered to the Microboard. New chillers are supplied programmed with the latest program available at the time of manufacture. The program version that is currently residing in the Microboard Flash Memory chip is displayed on the DIAGNOSTICS Screen in Service Access Level.

The on-board program can be upgraded by downloading the latest version from a Program Card using the *Microboard Service Replacement on page 29* for instructions.

TABLE 1 - DIAGNOSTIC DISPLAY CODES

TEST	PASS CODE	FAIL ACTION	DISPLAY ON WHITE SCREEN
First init table complete	00	watchdog will cause reboot	No
SDRAM regs. Configured	01	watchdog will cause reboot	No
Switch to Protected Mode	02	watchdog will cause reboot	No
Jump to 32-bit code	03	watchdog will cause reboot	No
Low memory test start	04	watchdog will cause reboot	No
Low memory test complete	P1	“F1” on display and halt	No
Full memory test complete	P2	“F2” on display and halt	No
FPGA configuration	05	“P2” will remain on LED display	No
Display Cont. configured	06	“05” will remain on LED display	No
Flash Checksum Test (Note 1)	P3	“F3” will remain on LED display	Yes
BRAM test	P4	“F4” will remain on LED display	Yes
Flash Query Test	“passed”	“failed” and halt	Yes
Flash checksum	“passed”	“failed”, halt and display code = F3	Yes
BRAM Test	“passed”	“failed” and halt	Yes
MISCELLANEOUS CODES			
LED DISPLAY CODE	DESCRIPTION		
FF	FPGA Configuration Failed, trying again		
CH	Flash Checksum Test in progress		
AP	Application setup in progress		
CRITICAL CODES			
LED DISPLAY CODE	DESCRIPTION		
Ni	NMI handler invoked (should never occur)		
[]	GPF has occurred (should never occur)		

NOTE 1: In order to reduce boot-up time after a power event, the checksum test can be ignored using the programmable Checksum Test setting on the Diagnostics Screen in Service Access. If enabled, the flash checksum test will be performed on each panel bootup. If disabled, the flash checksum test will not be performed on panel bootup after the first with new software. The flash checksum test is performed if the flash loader program has cleared a byte in BRAM indicating that new software has been loaded. After the checksum test is performed, this byte shall be set preventing further flash checksum tests from being performed unless the programmable Checksum Test is set to Enabled.

PROGRAM CARD

The on-board program can be upgraded by downloading the latest program version from a Program Card. This is a 2 1/8 x 3 3/8 x 1/8 inch plastic card weighing 1.1oz (refer to *Page 25*). It is a portable memory storage device that is programmed with the chiller operating program. The Program Card part number for YMC² Mod B chillers is 031-03074-002 and is available from the Baltimore Parts Distribution Center (PDC). There is a Program Card for each chiller type (YT, YK, YS, YR, YD, YMC², etc) and each has a unique part number. A label affixed to the Program Card contains the part number and version. The version is an alpha-numeric code that identifies the chiller model applicability, language package, language package revision level and chiller operating program revision level.

The Program Card is applicable to both NEMA and CE applications. The Program Card for YMC² chillers has English, Simplified and Traditional Chinese, French, Portuguese, Spanish, Italian, German and Hungarian languages.

The program version that is currently residing in the Microboard flash memory chip is displayed as the "Controls" Software Version on the DIAGNOSTICS Screen in Service Access Level.

The Program Card obtained from the PDC is programmed with the latest version of the chiller operating program. Program Cards can be reprogrammed.

A Program Card for a particular chiller type can be used to re-program other chillers of the same type. For example, it is not necessary to have more than one

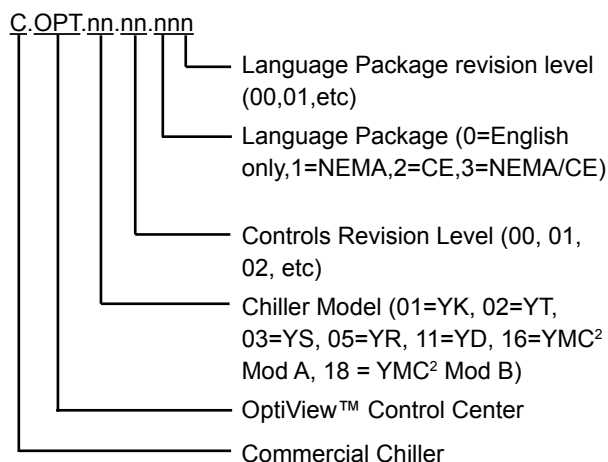
YMC² Program Card. A single YMC² card can be carried to different locations to re-program other YMC² OptiView™ Control Centers.

A Write Protect Switch on the edge of the Program Card prevents inadvertent writing to the Card during program downloading.

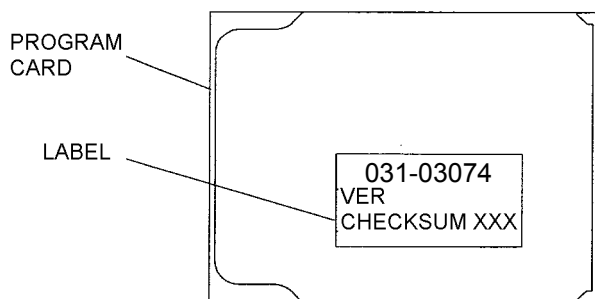
Handling precautions for the Program Card include:

- Do not allow dirt to enter connector
- Carry in protective sleeve
- Storage temperature range is -20°C to 65°C (-4°F to 149°F)

A label adhered to the Program Card contains the version and YORK part number. The version is an alphanumeric code that identifies the chiller model applicability, language package, language revision level and chiller control revision level. The version is as follows:

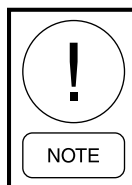


The Program card is inserted into connector U33 to download a program. Refer to the *Microboard Service Replacement* on page 29 for instructions.



PROGRAM DOWNLOAD CONNECTOR U33

A program card is inserted into connector U33 to download a program. A protective cover prevents dirt from entering this connector.



IMPORTANT! *The protective cover must be in place at all times when not performing a program download. If dirt accumulates inside this connector, re-programming will not be successful.*

PARALLEL PORT CONNECTOR

Parallel port connector J4 is for future use. It is presently not supported.

BRAM (U38)

The BRAM (battery backed random access memory) memory device contains a battery that preserves the stored data during power failures. All of the programmed Setpoints, Sales Order Data, History Data, time of day and calendar data is stored here. The YORK Part number is printed on a label adhered to the surface of the BRAM. It is available from the Baltimore Parts Distribution Center as a replacement part.

The part number of the BRAM (U52) in the 031-02430-007 board is 031-03424-000 and its size is 512KB. It is installed in a 32-pin socket. Program Jumper JP14 is a removable 2-pin shunt type jumper. The 512KB BRAM requires the shunt be NOT INSTALLED and the board is supplied in this configuration. If the shunt is installed on the board would not function.

The 031-02430-007 board with 512KB BRAM requires software that has "BRAM size detect" capability. If it does not have this capability, the board will not function. YMC² chiller software has this capability.

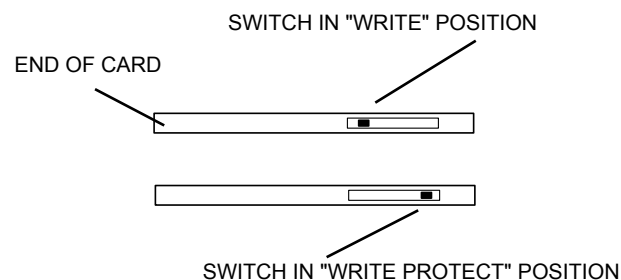


FIGURE 4 - PROGRAM CARD 031-03074

WATCHDOG CIRCUIT

The Watchdog circuit performs two functions as follows:

- Power failure detection
- Program latch-up detection/prevention

The Watchdog circuit monitors the +5VDC from the power supply and the +3.3VDC from the onboard regulator to determine when a power failure is occurring. If the +5VDC decreases to the threshold of (+4.75VDC to 4.5VDC) or the +3.3VDC decreases to the threshold of (3.04 to 2.8VDC), a reset is issued to the microprocessor and the chiller shuts down. When power is restored, the white screen is displayed and the boot-up is performed as described above. When the graphic screen is displayed, the message CONTROL PANEL – POWER FAILURE is displayed.

The Watchdog Circuit also assures that the entire program is being executed and that the program has not latched-up, bypassing important safety checks. The Watchdog circuit is a timer that times-out if not given a reset pulse within its time-out period (1-2.25 seconds). To prevent a time-out, the microprocessor sends a reset pulse to the Watchdog circuit every time the complete program has been executed. Since it takes less than 1 second to perform the entire program, the Watchdog circuit doesn't time-out under normal operation. However, if the entire program is not executed or something prevents the microprocessor from sending the reset pulse as described below, the Watchdog circuit times-out and sends a reset to the microprocessor, initiating a re-boot. If running, the chiller shuts down. The display momentarily blanks and white screen is displayed while the boot-up program executes as described above. When the graphic screen is displayed, either of two messages is displayed depending on the type of Watchdog shutdown as explained below.

There are two different watchdog initiated shutdowns; a “hardware” watchdog initiated shutdown and a “software” watchdog initiated shutdown.

In the “hardware” watchdog initiated shutdown, a program problem, on-board noise or hardware problem could prevent the watchdog time-out. If this occurs, a re-boot is initiated and when the graphic screen is displayed, CONTROL PANEL – POWER FAILURE is displayed.

In the “software” watchdog initiated shutdown, the program intentionally initiates the reboot because it has detected program interruption. After the re-boot, WATCHDOG – SOFTWARE REBOOT is displayed on the graphic screen.

PROGRAM JUMPERS/PROGRAM SWITCHES

The microboard 031-02430-007 program jumpers and microboard 031-02430-007 program switches are used to alter the program operation or configure the Microboard hardware for specific operation. This allows the Program and Microboard to be universal for all standard applications. The position of some jumpers can be determined by the Service Technician to meet the desired operation. Others must be positioned according to the requirements of the size, type or style of components and thus are determined by the YORK factory. The jumpers are plastic sleeves with metal inserts that are inserted over 2-prong or 3-prong conductors. The Program Switches are miniature switches that are placed in either the ON or OFF position.

KEYPAD INTERFACE

The Keypad is read via J18. The Keypad is a matrix of conductors arranged in rows and columns (refer to *Figure 38 on page 78*). There are 4 rows and 8 columns. When a key is pressed, the conductors are pressed together at that point, creating continuity between the row conductor and the column conductor. The keypad is read by applying a logic low to a row while leaving +5VDC pullup on all other rows. The micro then reads the 8 columns. If any column has a logic low on it, the key corresponding to that coordinate (row, column) is being pressed. The micro reads the entire keypad by repeating this routine beginning with row 1 and ending with row 4. The entire keypad is continually read while the control center is powered. Refer to *SECTION 11 - KEYPAD on page 77* of this manual for details of the Keypad.

VARIABLE SPEED DRIVE INTERFACE

The Variable Speed Drive communicates with microboard 031-02430-007 via COM2 serial data port (J13) using RS-485 Modbus protocol. COM2 serial port is selectable between RS-232 and RS-485 with Program Jumper JP17. It must be positioned on pins 1 and 2 to select RS-485 serial port operation.

PRINTER INTERFACE

An optional Printer can be connected to COM1 RS-232 serial data port (J2). J2-4 is TX data to the printer. J2-2 is the DSR (Data Set Ready or busy) signal from the printer. Signal levels are standard RS-232. The microboard sends data to the printer at the selected baud rate until the printer buffer becomes full, whereupon the printer asserts its busy signal. The microboard suspends data transmission until the printer can accept

more data. Each printer must be setup/configured to operate properly with the microboard. The Baud, Data Bits, Parity and Stop Bits must be programmed on the Comms Screen. Other printer setup is performed on the PRINTER Screen. Refer to the *YMC² Operations and Maintenance (Form 160.84-O1)* for details of available printers and printer setup instructions.

E-LINK GATEWAY INTERFACE

An optional E-Link Gateway printed circuit board can be connected to the COM 4B RS-232 serial data port (J2). J2-7 is TX data to the E-Link. J2-6 is RX data from the E-Link. Signal levels are standard RS-232. The E-Link polls system pressures, temperatures and status from the microboard. It holds it for retrieval by third-party devices. Refer to *SECTION 14 - E-LINK GATEWAY* for more information

MAGNETIC BEARING CONTROLLER INTERFACE

The driveline Magnetic Bearing Controller communicates with the microboard 031-02430-007 via COM6, serial data port TB-2 using RS-485 Modbus protocol.

DIGITAL INPUTS

An RJ-45 connector at J23 in parallel with terminals on TB1 provides eight opto-coupled, isolated low voltage digital inputs. Voltage supplied externally at J23-1 or TB1-1 is switched through the other terminals to energize the opto-coupler inputs. These are used to communicate with the chiller Uninterruptible Power Supply.

The I/O Board converts 115VAC inputs to logic level inputs for the microboard at J19. A 115VAC input to the I/O board is converted to a logic low (less than 1VDC). A 0VAC input to the I/O Board is converted to a logic high (greater than 4VDC). Refer to *SECTION 6 - I/O BOARD* for more information.

DIGITAL OUTPUTS

An RJ-45 connector at J23 in parallel with terminals on TB1 provides one opto-coupled, isolated low voltage digital output. Voltage supplied externally at J23-1 or TB1-1 is switched on the microboard by an opto-coupler to J23-7 and TB1-10. It is used to communicate with the chiller Uninterruptible Power Supply.

The microboard controls 115vac relays via the I/O Board (via J19). The I/O Board contains +12VDC relays that isolate the microboard low voltage circuits from the 115VAC device coils. Solid state switching devices are used to control the relays. The microboard

energizes the +12VDC relays by applying a ground to the coil input. They are de-energized by opening the ground path. The contacts of these relays switch 115VAC to system relays. The outputs that control the chilled liquid pump and compressor motor starter have anti-chatter (anti-recycle) timers associated with them. The output that controls relay K0 is not allowed to change at a rate greater than once every 10 seconds. The output that controls relay K13 is not allowed to change at a rate greater than once every 20 seconds.

ANALOG INPUTS

System pressures, in the form of analog DC voltages, are input from Pressure Transducers. Refer to *SECTION 15 - PRESSURE TRANSDUCERS* of this manual. Formulas and graphs are included to calculate the expected transducer output voltage for a given pressure input.

System temperatures, in the form of analog DC voltages, are input from Thermistors. Refer to *SECTION 16 - TEMPERATURE THERMISTORS* of this manual. Included are tables to convert the expected output voltage for any temperature applied to the thermistor.

Chilled liquid and condenser liquid flow sensor are normally Factory-mounted thermal switches. These switch 5vdc from the microboard back to the board when the switch setting is met. Refer to *SECTION 17 - LIQUID FLOW SENSORS* of this manual for information.

SERIAL DATA PORTS

Microboard 031-02430-007 is equipped with 7 serial ports (refer to *Figure 8 on page 37*). Each port is dedicated for a specific function as follows:

- A. COM1 (J2) – RS-232 Printer
- B. COM2 (J13) – RS-232 or RS-485, as selected with Program Jumper JP17 on Microboard 031-02430-007. The RS-485 port is used for Modbus communications to the Variable Speed Drive. The RS-232 port is not used.
- C. COM3 (J12) – RS-485 LTC I/C Board
- D. COM4 (4A-J11), (4B-J2) – This port is actually two ports. However, they cannot be used simultaneously. The position of program jumper JP27 determines which port can be used (Refer to *SECTION 4 - MICROBOARD 031-02430-007*). COM4A – RS485 not used. COM4B – RS-232 E-Link.

- E. COM5 (J15) – Not used.
- F. COM6 (TB2) – RS-485 Modbus communication to the Magnetic Bearing Controller.

Each port is equipped with two LED's. A red TX LED illuminates as data is transmitted to or requested from another device. A green RX LED illuminates as data is received from another device. The RS-232 voltages are industry standard +5 to +25VDC and -5VDC to -25VDC logic levels. The RS-485 voltages are industry standard 0VDC and +1.5 to +5VDC logic levels. COM5 logic levels are 0VDC and +5VDC. A diagnostic test can be performed on each serial port to confirm proper operation. Refer to *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003 on page 55* of this manual.

The LED's and their functions are as follows:

- CR2 RX6 – COM6 serial port receive data.
- CR3 TX6 – COM6 serial port transmit data.
- CR4 RX1 – COM1 serial port receive data.
- CR5 TX1 – COM1 serial port transmit data.
- CR13 TX4 – COM4 serial port transmit data.
- CR14 RX4 – COM4 serial port receive data.
- CR15 TX3 – COM3 serial port transmit data.
- CR16 RX3 – COM3 serial port receive data.
- CR17 RX2 – COM2 serial port receive data.
- CR18 TX2 – COM2 serial port transmit data.
- CR19 RX5 – COM5 serial port receive data.
- CR20 TX5 – COM5 serial port transmit data.

DISPLAY INTERFACE

The graphic screens displayed on the liquid Crystal Display are created from the program downloaded from the Program Card and stored in the flash memory chip. The data to form these screens is output from J5. This data is in the form of red, green and blue drive signals applied to each of the 303,200 display pixels arranged in a matrix of 640 columns x 480 rows. Each pixel consists of 3 windows; red, green and blue, through which a variable amount of light from the Display Backlight, is permitted to pass to the front of the display. The drive signals determine the amount of light permitted to pass through each window. The overall pixel color is a result of the gradient of red, green and blue light allowed to pass. The drive signal for each pixel is an 18 bit bi-

nary word; 6 for each of the 3 colors. The greater the binary value, the more light is permitted to pass. The pixels are driven sequentially from left to right, beginning with the top row. To coordinate the drive signals and assure the pixels in each row are driven from left to right and the columns are driven from top to bottom, the drive signals are accompanied by a clock and horizontal and vertical sync signals.

During the boot-up, the program in the BIOS eeprom reads wire jumpers PID0 through PID3 on the Display Interface Board to determine the manufacturer of the display. Each display manufacturer requires a slightly different control. The program in the BIOS eeprom configures the microboard for correct operation for the actual display installed.

Different display manufacturers require different supply and control voltages for their displays and backlights. Program Jumpers JP2 through JP5 and JP7 and JP8 must be configured to provide the required supply and control voltages to the display and backlight control. *MICROBOARD 031-02430-007 PROGRAM JUMPERS* lists the required program jumper configuration for each display. Also, a label attached to the display mounting plate lists the required program jumper configuration for that display. The position of program jumper JP2 determines whether the supply voltage is +5VDC or +3.3VDC.

The microboard controls the Display Backlight via J6. The Display Backlight is the light source for the display. The Backlight Inverter Board provides a high voltage AC power source for the lamp. It converts low voltage DC via J6-1 (+12VDC or +5VDC, depending on position of Program Jumper JP5) to high voltage AC (500 to 1500VAC). This high voltage AC is applied to the lamp to cause it to illuminate. The Backlight is turned on and off with the "Backlight Enable" signal (J6-5). The position of Program Jumper JP4 determines whether this is a +12VDC or +5VDC signal. In some displays, the backlight turns on when this signal transitions from low to high; others turn off when it transitions from high to low. The position of Program Jumper JP3 determines the transition that will occur when the Microboard outputs the Backlight Enable signal. JP3 must be positioned according to the display manufacturer's requirement.

Under program control, the microboard controls the backlight brightness via the Lamp Dimmer circuit output at J6-7. In order to extend the life of the Backlight lamp, the brightness is driven to 50% after 10 minutes

of Keypad inactivity. At this brightness level, the graphics are still visible. When Keypad activity is detected (a key is pressed), the lamp is driven back to full (100%) brightness. Some display manufacturers require a variable voltage to vary the brightness; others require a variable resistance. Program Jumpers JP7 and JP8 must be configured to enable the appropriate technique.

The Lamp Dimmer is an integrated circuit that is the electrical equivalent of a 10K ohm potentiometer with 100 positions or steps (refer to *Figure 7 on page 36*). The Lamp Dimmer controls the position of the potentiometer. The Lamp Dimmer varies the brightness of the backlight by applying a variable voltage (0-5.0VDC) or a variable resistance (0-10K ohms) to the Backlight Inverter Board. If Program Jumpers JP7 and JP8 are installed, the lamp Dimmer output is a variable voltage; if both are removed, the output is a variable resistance. The Lamp Dimmer outputs "Brightness Control Wiper" (J6-7) to the Backlight Inverter Board. If configured for variable voltage output, the voltage between J6-7 and J6-8 can be varied from 0VDC (100% brightness) to 5.0VDC (0% brightness). If configured for variable resistance, the resistance between J6-6 and J6-7 varies from 0 ohms (0% brightness) to 10K ohms (100% brightness).

Refer to *SECTION 8 - LIQUID CRYSTAL DISPLAY*, *SECTION 9 - DISPLAY INTERFACE BOARD*, and *SECTION 10 - DISPLAY BACKLIGHT INVERTER BOARD* of this manual for details of the display interface.

REMOTE SETPOINTS

Remote Leaving Chilled Liquid temperature and Current Limit setpoints can be input via the RS-232 E-Link Gateway interface at J2 or directly to the Microboard at J22 (refer to *Figure 9 on page 38*). The inputs at J22 are configured with Program Jumpers JP23 and JP24 to accept these inputs in either 0-10VDC, 2-10VDC, 0-20Ma or 4-20Ma form. Refer to *MICROBOARD 031-02430-007 PROGRAM JUMPERS* for configurations and *SECTION 5 - REMOTE SETPOINTS* of this manual.

CONFIGURATION/SETUP

The following functions are entered as setpoints on the SETUP Screen. Refer to entry instructions in *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003* of this manual.

- Chilled Liquid Pump Operation – Determines Chilled Liquid Pump control contacts (I/O Board TB2-44/45) operation when chiller shuts down on cycling shutdowns. Selections are:

1. Standard – Contacts open at completion of "System Coastdown" after all shutdowns except "Leaving Chilled Liquid – Low Temperature". On this shutdown, they remain closed, causing the pump to continue to run while the chiller is shutdown.
2. Enhanced – Contacts open at completion of "System Coastdown" after all shutdowns except "Leaving Chilled Liquid – Low Temperature, Multi-Unit Cycling- Contacts Open" and "System Cycling – Contacts Open". On these shutdowns, they remain closed, causing the pumps to continue to run while the chiller is shutdown.

- Power Failure Restart – Determines the course of action required to restart the chiller, if a power failure occurs while the chiller is running. Selections are:

1. Manual – Requires a manual reset after power is restored. The chiller cannot be started until the operator moves the keypad Start-Run-Stop/Reset rocker switch to the stop/reset position.
2. Auto – Chiller will automatically restart when power is restored.

- Head Pressure Control – Allows the Head Pressure feature to be enabled or disabled.

MICROBOARD SERVICE REPLACEMENT

If the microboard is replaced within the warranty period, the defective board must be returned to YORK per the warranty return procedure. Use the return instructions and return address label provided with the replacement board.

To order a replacement Microboard for a YMC² Chiller, order part number 331-02430-614. This part number provides an 031-02430-614 Microboard that has been programmed with the latest version of the YMC² "Controls" software. It comes equipped with a BRAM (U38) and BIOS Eprom (U37) (replacement Microboards cannot be ordered by the basic board part number of 031-02430-007). Refer to the *YMC² Unit Renewal Parts (Form 160.84-RP1)*.

The Microboard is shipped with a label on the outside of the shipping box that lists the part number of the pre-programmed Microboard (331-02430-614), the basic Microboard part number (031-02430-007) and the version of the pre-programmed "Controls" software (for example, C.OPT.18.01.306).

When replacing a microboard, it is sometimes desirable to transfer the BRAM from the defective board to the replacement board to save stored Setpoint, History or Sales Order data. Not all BRAM devices are compatible with all Microboards. Also, not all BIOS Eproms are compatible with all Microboards. The board will not function with incorrect memory components. Therefore, before attempting to transfer memory components between boards, refer to the following compatibility chart before proceeding:

TABLE 2 - COMPATIBILITY CHART

MICROBOARD	BRAM	BIOS EPROM
031-02430-007	031-03424-000	031-02429-002

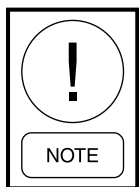
PROGRAM CARD SERVICE REPLACEMENT

Since one YMC² Program Card can be used to re-program other YMC² chillers, it is not necessary for an individual Service Technician to have more than one YMC² Program Card. Program Cards can be shared among Service Technicians where appropriate.

However, since chiller operating programs are occasionally revised, the Service Technician could have a Program Card that does not contain the latest program. Program Cards (031-03074-001) for YMC² chillers are available from the Baltimore Parts Distribution Center (PDC). The card received from the PDC is programmed with the latest version of the chiller operating program.

Program Cards can be re-programmed with the latest program version.

DOWNLOADING A PROGRAM FROM A PROGRAM CARD



Before proceeding ensure the Program Card Write Protect Switch must be in the "Write Protect" position!

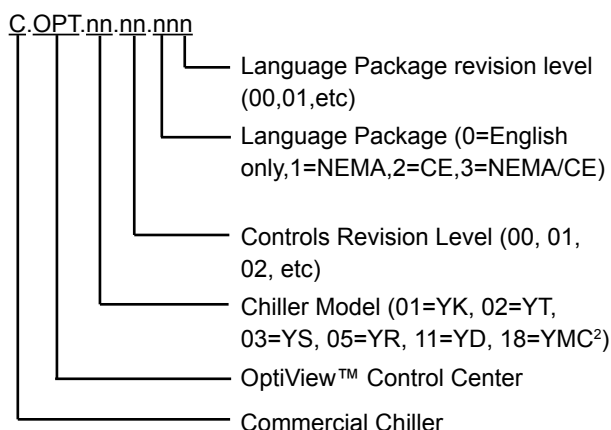


Before proceeding, be absolutely certain the Program Card is applicable to your chiller model.

There are 3 steps to the re-programming process:

1. Erase
2. Program
3. Verification

Once the re-programming process is initiated, it automatically proceeds through these steps to completion. It cannot be manually terminated before completion. Therefore, once the process is initiated, the existing on-board program will be erased and replaced by the program in the Program Card. For example, if your chiller is a YMC² chiller, the Program Card used **MUST** be for a YMC² chiller. If a YS chiller program is downloaded into a YMC² chiller, for example, the chiller will be rendered inoperable until this procedure is repeated using the correct Program Card! A label affixed to the Program Card contains the card version. The version is an alpha-numeric code that identifies the chiller model applicability, language package and program revision level. The version is as follows:



Download the program as follows:

1. Remove power to OptiView™ Control Center.
2. Remove protective cover from Microboard connector U33.
3. Reposition Microboard Program Jumper JP6 to pins 2 and 3 (left-hand pins).
4. Insert Program Card into Microboard connector U33.
5. Restore power to OptiView™ Control Center. A white screen appears displaying "Flash Checksum Test" and Microboard 7-segment LED (U22) displays "Ch". While this is displayed, the Microboard is performing a checksum test on the Program Card. This assures the integrity of the card before the download procedure can begin. If the checksum test fails, the card is defective or corrupted and the download procedure cannot be performed. If the checksum test passes, the "OptiView™ Flash Programmer" Screen is displayed.

6. Press START key to start the downloading process. A dialog box appears asking if you want to “Erase Onboard Flash and Re-Program from PcCard?”. **Do not proceed until you understand the above caution!**
7. Use the ► key to scroll to “YES”.
8. Press ✓ key. The following steps will be performed:
 - a. Erasing - During this procedure, the program in the Microboard Flash Memory will be erased. A green bar reflects the progress of this procedure. The red LED next to this bar illuminates while this procedure is in progress.
 - b. Programming - During this procedure, the program in the Program Card is downloaded into the Microboard Flash memory. A green bar reflects the progress of this procedure. The red LED next to this bar illuminates while this procedure is in progress.
 - c. Verifying - During this procedure, a checksum test is performed on the new program in the Microboard Flash Memory. A green bar reflects the progress of this procedure. The red LED next to this bar illuminates while this procedure is in progress.

The Microboard 7-segment LED Display (U22) displays the steps of the programming process while they are in effect. During the Erasing procedure, “Er” displayed. During the Programming procedure, “Pr” is displayed. During the Verifying procedure, “Ch” is displayed.

At the completion of the re-programming process, if it is successful, “Flash Has Been Successfully Programmed” is displayed and “Operation Successful” is displayed in the Status Code box. Otherwise, a message in the status box indicates the step that failed.

1. Remove power from OptiView™ control center.
2. Remove Program Card from Microboard connector U33.
3. Install protective cover on Microboard connector U33.
4. Reposition Microboard Program Jumper JP6 to pins 1 and 2 (right-hand pins) pins.
5. Apply power to OptiView™ Control Center. The re-programming procedure is now complete.

TABLE 3 - MICROBOARD 031-02430-007 PROGRAM JUMPERS

JUMPER	DESCRIPTION
JP1 –	Parallel Port Enable/Disable. Used to enable and disable the parallel port in the microprocessor. Since the board is presently not populated with a parallel port connector, this jumper must be in the Disable position. Pins 1-2: Enables Parallel Port Pins 2-3: Disables Parallel Port. Must be in this position for correct microboard operation.
JP2 –	Display power and logic levels Determines the power supply voltage applied to the display. Pins 1-2: +5VDC SHARP LQ10D367/368 (031-01774-000) displays. Pins 2-3: +3.3VDC SHARP LQ104V1DG61 (031-02886-000) and LG Semicon LP104V2-W (031-02046-000) displays.
JP3 –	Display backlight enable signal level polarity. Jumper must be positioned according to the voltage level required to turn on the Display Backlight. Pins 1-2: 0VDC – Not Used. Pins 2-3: +12VDC or +5VDC as determined by position of JP4. SHARP LQ10D367/368 (031-01774-000), SHARP LQ104V1DG61 (031-02886-000) and LG Semicon LP104V2-W (031-02046-000) displays.
JP4 –	Display Backlight enable signal logic levels. Determines the logic levels of the Backlight Enable signal. Pins 1-2: +12VDC/0VDC – Not Used. Pins 2-3: +5VDC/0VDC SHARP LQ10D367/368 (031-01774-000), SHARP LQ104V1DG61 (031-02886-000) and LG Semicon LP104V2-W (031-02046-000) displays.
JP5 –	Display Backlight power. Determines the power supply voltage applied to the Display Backlight Inverter Board. Pins 1-2: +12VDC. SHARP LQ10D367/368 (031-01774-000) and SHARP LQ104V1DG61 (031-02886-000) and LG Semicon LP104V2-W (031-02046-000) displays. Pins 2-3: +5VDC. Not Used.
JP6 –	Boot-up source. Determines whether the boot-up is performed from the Program Card or Eprom U37. Pins 1-2: Boots-up from Eprom U37. Must be in this position unless re-programming from the Program Card. Pins 2-3: Boots-up from the Program Card. Must be in this position when re-programming from the Program Card.
JP7, JP8 –	Display brightness control technique. Determines whether the display brightness is controlled by a variable resistance or a variable voltage. IN: Variable voltage (0-5.0VDC). SHARP LQ10D367/368 (031-01774-000) and SHARP LQ104V1DG61 (031-02886-000), and LG Semicon LP104V2-W (031-02046-000) displays. OUT: Variable resistance – Not Used
JP9 –	Not Used.
JP10 –	Factory mounted thermal flow sensor – evaporator. Pins 1-2: Not Used Pins 2-3: REQUIRED
JP11 –	Factory mounted thermal flow sensor – condenser. Pins 1-2: Not Used Pins 2-3: REQUIRED
JP12 –	Not Used
JP13 –	Watchdog Enable/Disable. Soldered wire jumper.  <i>Never disable the watchdog protection. Severe compressor or chiller damage could result. The ability to disable the watchdog protection is provided for factory testing only.</i> IN: – Watchdog enabled OUT: – Watchdog disabled
JP14 –	BRAM size (Microboard 031-02430-007 only) – Must be positioned according to the size of the BRAM installed on the board. IN: Not Used OUT: REQUIRED 512K BRAM

TABLE 3 - MICROBOARD 031-02430-007 PROGRAM JUMPERS (CONT'D)

JUMPER	DESCRIPTION
JP16 –	Not Used
JP17 –	COM 2 Serial port mode. This port can operate in either RS-232 or RS-485 mode, depending on the position of this jumper. PINS 1-2: RS-485 (REQUIRED) PINS 2-3: RS-232 (Not Used)
JP21 –	VGD Actuator Position Feedback for Hi Stage of 2-stage chiller. Jumper on pins 2 and 3
JP22 –	VGD Actuator Position Feedback. Jumper on pins 2 and 3
JP23 –	Remote Current Limit Setpoint (J22) type. Configures analog input for 0-10VDC, 2-10VDC, 0-20mA or 4-20mA. OUT: Allows 0-10VDC or 2-10VDC input on J22-1 Pins 1-2: Allows a 0-20mA or 4-20mA input on J22-2 Pins 2-3: Not Used.
JP24 –	Remote Leaving Chilled Liquid Temperature Setpoint (J22) type. Configures analog input for 0-10VDC, 2-10VDC, 0-20mA or 4-20mA. OUT: Allows 0-10VDC or 2-10VDC input on J22-3 Pins 1-2: Allows a 0-20mA or 4-20mA input on J22-4 Pins 2-3: Not Used.
JP27 –	COM 4 serial communications port. Configures COM 4 port for either RS-485 (COM 4A) or RS-232 for E-Link Gateway board (COM4B). Pins 1-2: Enables port 4A. Allows an RS-485 connection to microboard J11. Not Used. Pins 2-3: Enables port 4B. Allows an RS-232 connection to microboard J2 for E-Link Gateway communications.
JP28, JP29 –	COM 6 serial communications port. Configured for MBC with jumpers OUT.
JP30, JP31 –	COM 5 serial communications port. Configured for VGD actuator with jumpers IN

TABLE 4 - MICROBOARD 031-02430-007 PROGRAM SWITCHES

JUMPER	DESCRIPTION
SW1-1 –	Not Used
SW1-2 –	Liquid Type. Must be set according to whether the chiller is cooling water or brine solution. ON – Brine. Leaving Chilled Setpoint range is 10°F to 70°F. OFF – Water. Leaving Chilled Setpoint range 38°F (36°F if Smart Freeze enabled) to 70°F.
SW1-3 –	Diagnostics. Enables or Disables the software diagnostics. ON – Enables diagnostics. Disables normal chiller operation. OFF – Disables diagnostics. Enables normal chiller operation.
SW1-4 –	Not Used.

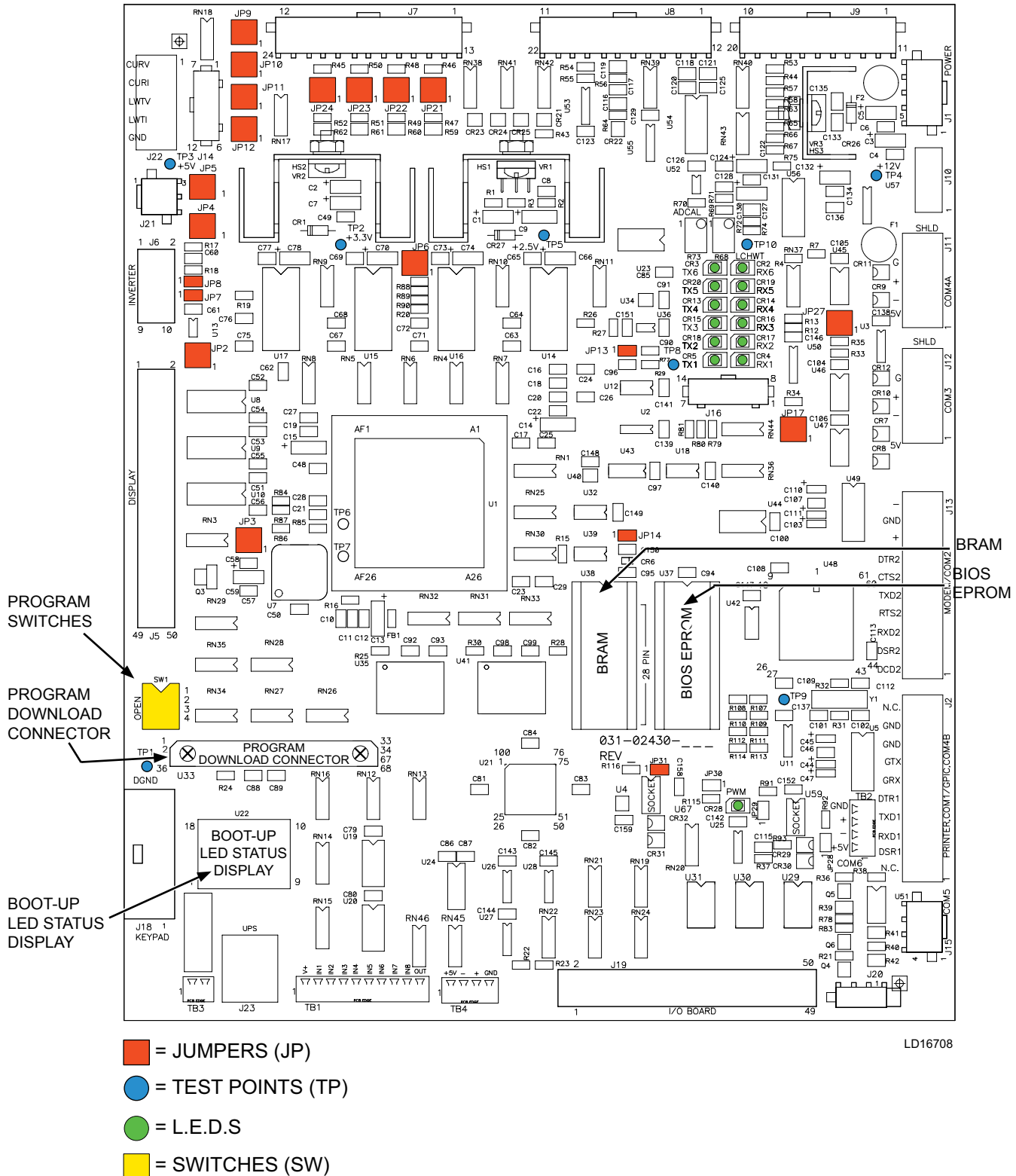


FIGURE 5 - MICROBOARD 031-02430-007

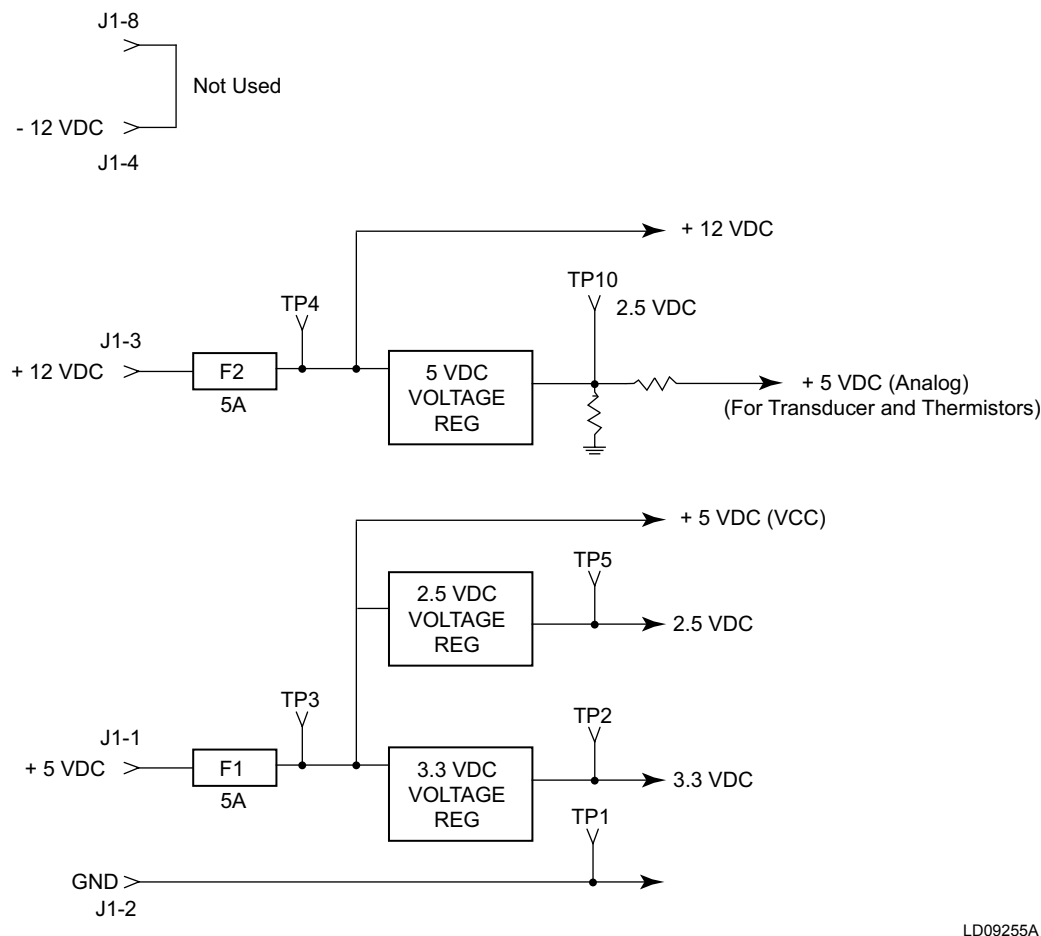
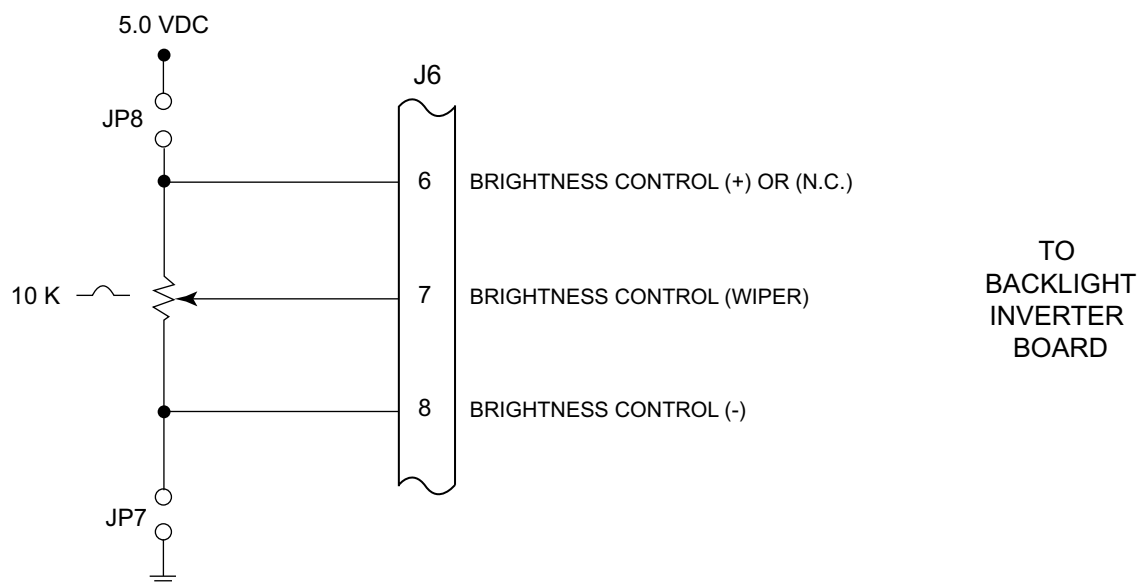


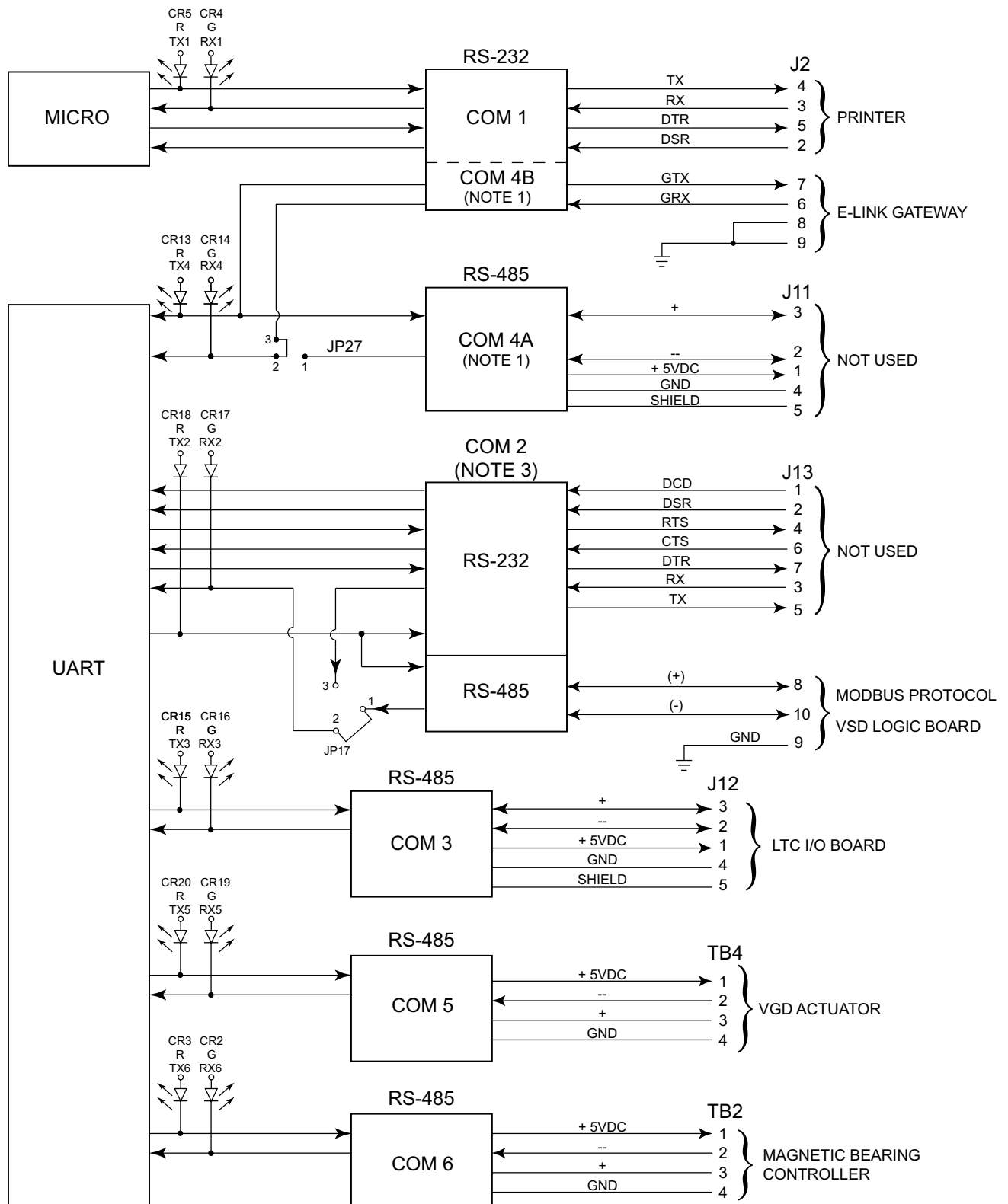
FIGURE 6 - MICROBOARD (031-02430-007) DC POWER SUPPLY TEST POINTS

**NOTES:**

1. J6-6 not connected (N.C.) to Backlight Inverter Board when display is manufactured by Sharp or NEC.
2. The position of Program Jumpers JP7 and JP8 determine the output at J6-7; In = Variable Voltage; Out = Variable Resistance. Refer to Program Jumper Listing in TABLE 1 for applications.
3. Potentiometer is actually an integrated circuit that is the electrical equivalent of a 10K—potentiometer.

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FIGURE 7 - MICROBOARD LAMP DIMMER CIRCUIT

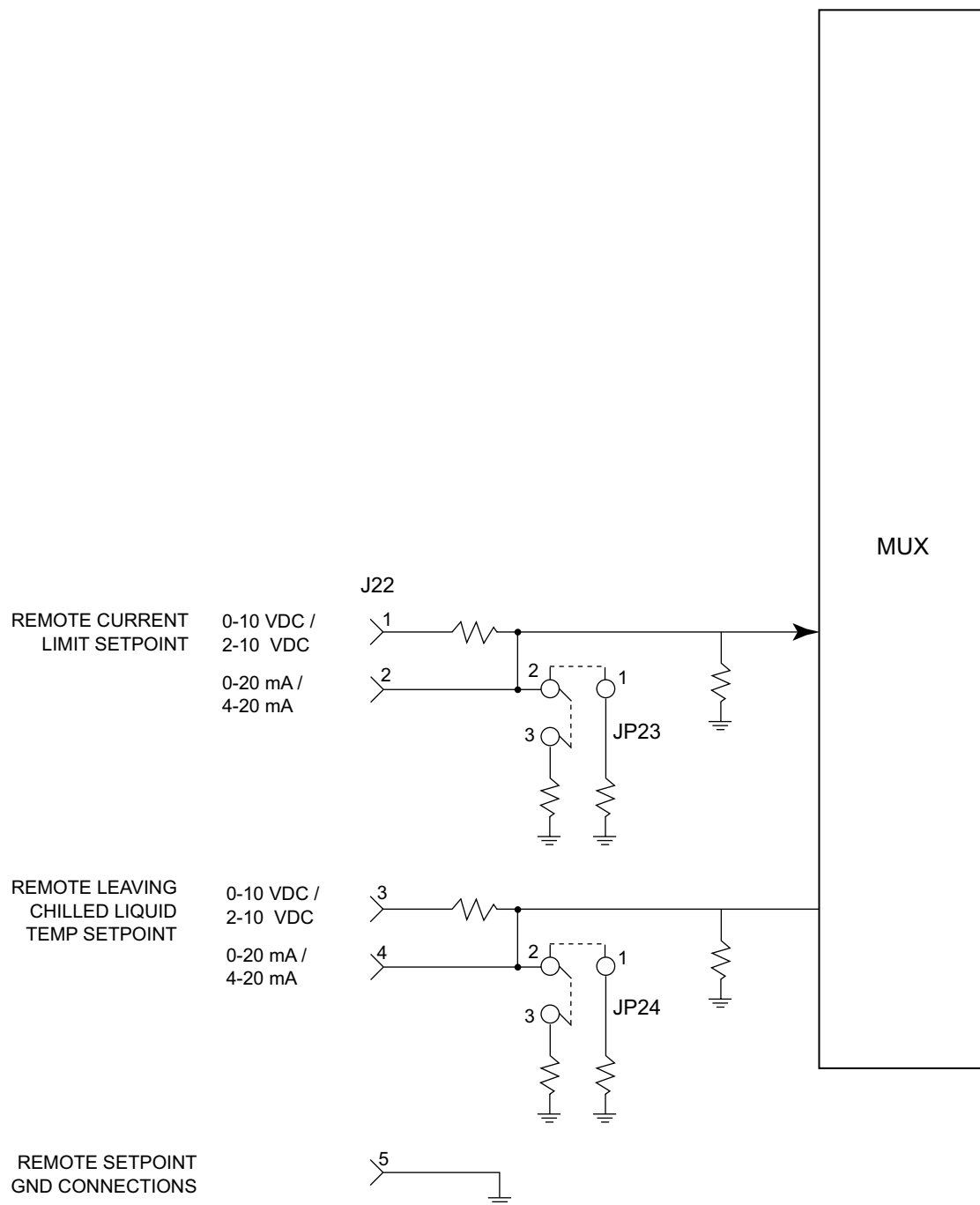


NOTES:

1. Microboard Program Jumper JP27 determines whether COM 4A or 4B can be used. 1 and 2 - 4A, 2 and 3, 4B (Refer to TABLE 1).
2. J15-4 Loop-Around Test IN. J15-5 Loop-Around Test OUT.
3. The COM 2 port has two selectable serial modes. It can operate in either RS-232 or RS-485 mode, depending upon the position of program jumper JP17 as follows: On pins 1 and 2 for RS-485 operation. On Pins 2 and 3 for RS-232 operation (Refer to TABLE 1).

FIGURE 8 - MICROBOARD SERIAL DATA COMMUNICATIONS PORTS

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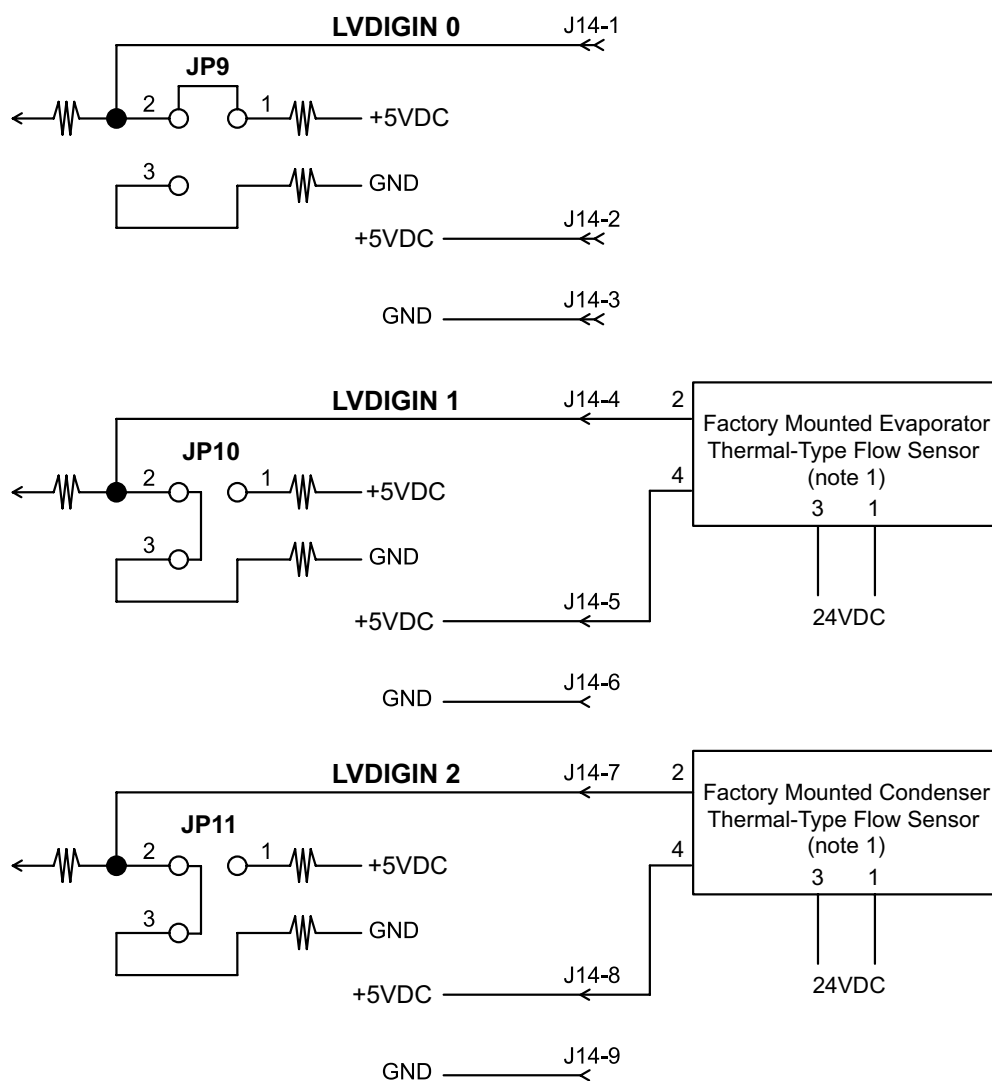
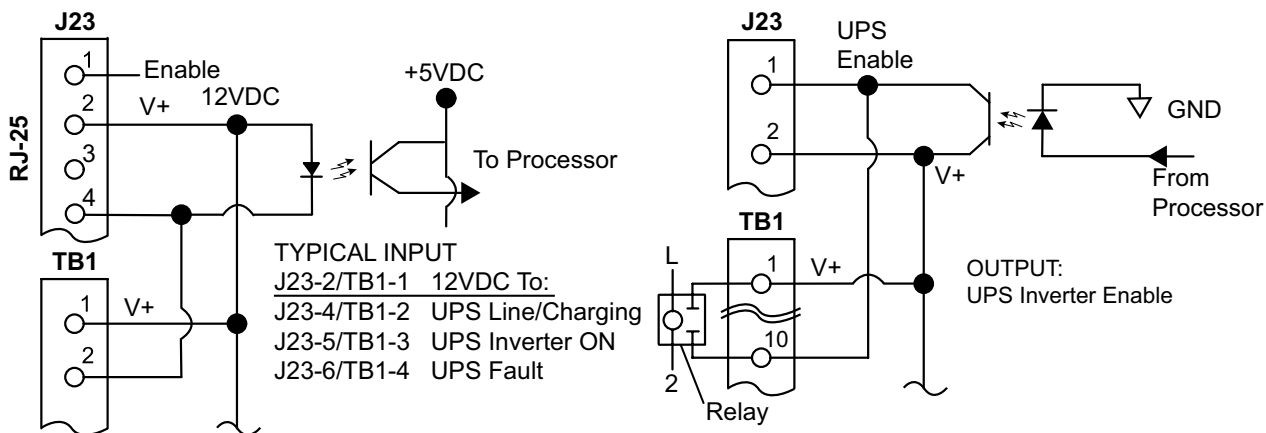


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NOTE:

1. Program Jumpers JP23 – JP24 must be positioned on pins 1-2 or 3-4 according to input signal type (Refer to TABLE 1).
2. Program Jumper JP22 must be positioned so it is not connecting any pins together for proper VGD position signal conditioning.

FIGURE 9 - MICROBOARD CONFIGURABLE ANALOG AND REMOTE SETPOINT INPUTS



NOTE:

- Thermal type flow sensors are connected to Microboard J14 as shown above. Program Jumpers JP10 through JP12 must be positioned on pins 2-3.

FIGURE 10 - MICROBOARD LOW VOLTAGE DIGITAL INPUTS/OUTPUTS

TABLE 5 - MICROBOARD ANALOG INPUTS

CONNECTOR	DESCRIPTION
J9-10	Leaving Chilled Liquid Temperature
J9-9	Entering Chilled Liquid Temperature
J9-8	Leaving Condenser Liquid Temperature
J9-7	Entering Condenser Liquid Temperature
J9-6	Drop Leg Refrigerant Temperature
J9-5	Discharge Temperature
J9-4	High Stage Stall Voltage High
J9-3	Evaporator Refrigerant Temperature
J8-21	Condenser Pressure
J8-18	Evaporator Pressure
J9-1	High Stage Discharge Pressure
J8-6	Economizer Pressure
J9-12	Economizer Refrigerant Level
J8-15	Stall Voltage High
J10-6	Reserved
J8-13	Condenser Refrigerant Level
J8-1	Discharge Pressure
J7-23	Stall Voltage Std
J7-10	High Stage Stall Voltage Std
J7-8,20	Remote LCHLT Setpoint Offset
J7-6,18	Remote Current Limit Setpoint
J7-4,16	Spare
J7-2,14	Spare

SECTION 5 - REMOTE SETPOINTS

There are three different remote operating modes that can be selected using the Keypad: **Analog** Remote mode, **Digital** Remote Mode or **BAS (ISN)** Remote Mode.

The OptiView™ Control Center can receive a remote Current Limit and/or a Remote Leaving Chilled Liquid Temperature Setpoint via the following:

Analog Remote Mode:

- 0-10VDC Analog Input
- 2-10VDC Analog Input
- 0-20mA Analog Input
- 4-20mA Analog Input

Software filtering is applied to these inputs. This stabilizes the remote setpoint values under electrical noise conditions and when the inputs are unstable.

The Analog setpoint are connected to the Microboard J22 as shown in *Figure 9 on page 38* and described below. Microboard Program Jumpers JP23 and JP24 must be positioned appropriately to receive either a 0-10VDC, 2-10VDC, 0-20mA or a 4-20mA signal. Refer to *MICROBOARD 031-02430-007 PROGRAM JUMPERS* and explanation below for required configurations.

Digital Remote Mode: Pulse width Modulation (PWM) Input.

The PWM inputs are in the form of a 1 to 11 second Relay contact closure that applies 115VAC to the I/O Board TB4-19 (Leaving Chilled Liquid Temperature) and TB4-20 (Remote Current Limit) for 1 to 11 seconds. Refer to *Figure 12 on page 50*. The source of 115VAC is I/O Board TB4-1. The PWM input must be received at a frequency of at least once every 30 minutes. If not received within this time interval, the Program assumes the remote device is defective and defaults the Current Limit Setpoint to 100% and the Leaving Chilled Liquid Temperature Setpoint to the locally programmed Local **BASE** value.

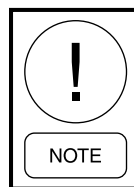
BAS (ISN) Remote Mode: RS-232 Serial Port via E-link Gateway

The Microboard COM 4B RS-232 Serial Port (J2) receives the setpoints in serial data form from the E-link Gateway located inside the OptiView™ Control Center enclosure. The E-link Gateway receives setpoints from remote external devices and transfers them to the Microboard from the BAS system and transfers them to the Microboard. Refer to *SECTION 14 - E-LINK GATEWAY* for more information on the E-Link.

CURRENT LIMIT

REMOTE CURRENT LIMIT SETPOINT with 0-10VDC, 2-10VDC, 0-20mA, 4-20mA or Pulse Width Modulation Signal – The Remote Current Limit setpoint can be reset over the range of 100% to 30% Full Load Amps (FLA) by supplying (by others) a 0-10VDC, 2-10VDC, 0-20mA, 4-20mA or 1 to 11 second Pulse Width Modulated (PWM) signal to the OptiView™ Control Center. The OptiView™ Control Center must be configured appropriately to accept the desired signal type as follows:

- The appropriate Remote Mode must be selected: **ANALOG** Remote Mode must be selected when using a voltage or current signal input. **DIGITAL** Remote Mode must be selected when using a **PWM** input.
- If **ANALOG** Remote Mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint must be set to “0-10VDC” or “2-10VDC” as detailed below, regardless of whether the signal is a voltage or current input signal type.
- Microboard Program Jumper JP23 must be positioned appropriately per the input signal type as detailed below. It is recommended that a qualified Service Technician position this jumper.



IMPORTANT! - The signal type used for Remote Current Limit setpoint reset and the signal type used for Remote Leaving Chilled Liquid Temperature setpoint reset must be the same. For example, if a 0-10VDC signal is being used for Remote Leaving Chilled Liquid Temperature Reset, then a 0-10VDC signal must be used for Remote Current Limit Reset.

0-10VDC

As shown in *Figure 9 on page 38*, connect input to Microboard J22-1 (signal) and J22-5 (Gnd). The setpoint varies linearly from 100% to 30% FLA as the input varies from 0 to 10VDC. This input will only be accepted when **ANALOG** Remote Mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “0-10 Volts” and Microboard Program Jumper JP23 has been removed. Calculate the setpoint for various inputs as follows:

$$\text{Setpoint (\%)} = 100 - (\text{VDC} \times 7)$$

For example, if the input is 5VDC, the setpoint would be set to 65% as follows:

$$\begin{aligned}\text{Setpoint (\%)} &= 100 - (5 \times 7) \\ &= 100 - 35 \\ &= 65\%\end{aligned}$$

2-10VDC

As shown in *Figure 9 on page 38*, connect input to Microboard J22-1 (signal) and J22-5 (Gnd). The setpoint varies linearly from 100% to 30% FLA as the input varies from 2 to 10VDC. This input will only be accepted when **ANALOG** Remote Mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “2-10 Volts” and Microboard Program Jumper JP23 has been removed. Calculate the setpoint for various inputs as follows:

$$\text{Setpoint (\%)} = 100 - [(\text{VDC} - 2) \times 8.75]$$

For example, if the input is 5VDC, the setpoint would be set to 74% as follows:

$$\begin{aligned}\text{Setpoint (\%)} &= 100 - [(5 - 2) \times 8.75] \\ &= 100 - [3 \times 8.75] \\ &= 100 - 26.25 \\ &= 74\%\end{aligned}$$

0-20mA

As shown in *Figure 9 on page 38*, connect input to Microboard J22-2 (signal) and J22-5 (Gnd). The setpoint varies linearly from 100% to 30% FLA as the input varies from 0mA to 20mA. This input will only be accepted when **ANALOG** remote mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “0-10 Volts” and Microboard Program Jumper JP23 has been placed on pins 1 and 2. Calculate the setpoint for various inputs as follows:

$$\text{Setpoint (\%)} = 100 - (\text{mA} \times 3.5)$$

For example, if the input is 8mA, the setpoint would be set to 72% as follows:

$$\begin{aligned}\text{Setpoint (\%)} &= 100 - (8 \times 3.5) \\ &= 100 - 28 \\ &= 72\%\end{aligned}$$

4-20mA

As shown in *Figure 9 on page 38*, connect input to Microboard J22-2 (signal) and J22-5 (Gnd). The setpoint varies linearly from 100% to 30% FLA as the input varies from 4mA to 20mA. This input will only be accepted when **ANALOG** remote mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “2-10 Volts” and Microboard Program Jumper JP23 has been placed on pins 1 and 2. Calculate the setpoint for various inputs as follows:

$$\text{Setpoint (\%)} = 100 - [(\text{mA} - 4) \times 4.375]$$

For example, if the input is 8mA, the setpoint would be set to 83% as follows:

$$\begin{aligned}\text{Setpoint (\%)} &= 100 - [(8 - 4) \times 4.375] \\ &= 100 - (4 \times 4.375) \\ &= 100 - 17.5 \\ &= 82.5 \\ &= 83\%\end{aligned}$$

PWM

The Pulse Width Modulation input is in the form of a 1 to 11 second relay contact closure that applies 115VAC to the I/O Board TB4-20 for 1 to 11 seconds. As shown in *Figure 12 on page 50*, connect dry closure relay contacts between I/O Board TB4-20 (signal) and TB4-1 (115VAC). The setpoint varies linearly from 100% to 30% as the relay contact closure time changes from 1 to 11 seconds. 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 is defaulted to 100%. A closure is only accepted at rates not to exceed once every 70 seconds. This input will only be accepted in **DIGITAL** remote mode. Calculate the setpoint for various pulse widths as follows:

$$\text{Setpoint (\%)} = 100 - [(\text{pulse width in seconds} - 1) \times 7]$$

For example, if the relay contacts close for 3 seconds, the setpoint would be set to 86% as follows:

$$\begin{aligned}\text{Setpoint (\%)} &= 100 - [(3 - 1) \times 7] \\ &= 100 - (2 \times 7) \\ &= 100 - 14 \\ &= 86\%\end{aligned}$$

RS-232 (COMM Port 4B)

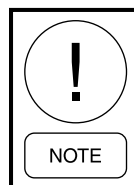
As shown in *Figure 8 on page 37*, a setpoint can be received from a BAS system through Microboard port 4B when connected to the optional E-Link Gateway card at terminals J2-7, J2-6.

LEAVING CHILLED LIQUID TEMPERATURE

REMOTE LEAVING CHILLED LIQUID TEMPERATURE SETPOINT with 0-10VDC, 2-10VDC, 0-20mA, 4-20mA or Pulse Width Modulation Signal – Remote Leaving Chilled Liquid Temperature setpoint reset can be accomplished by supplying (by others) a 0-10VDC, 2-10VDC, 0-20mA, 4-20mA or 1 to 11 second Pulse Width Modulated (PWM) signal to the OptiView™ Control Center. The **LEAVING CHILLED LIQUID TEMPERATURE** setpoint is programmable over the range of 38°F to 70°F (water applications); 36°F to 70°F (water applications with Smart Freeze protection enabled); or 10°F to 70°F (brine applications). The Remote input signal changes the setpoint by creating an offset above the locally programmed Leaving Chilled Liquid Temperature Base setpoint value. The setpoint can be remotely changed over the range of the value programmed for the **REMOTE RESET TEMPERATURE RANGE** setpoint (10, 20, 30, or 40°F with Software version C.OPT.01.18.307 (or later); 10 or 20°F with earlier software versions). For example, if the Local setpoint is 40°F and the **REMOTE RESET TEMPERATURE RANGE** setpoint is programmed for 10°F, the Leaving Chilled Liquid Temperature setpoint can be remotely reset over the range of 40°F to 50°F. The setpoint received through the COM 4B RS-232 serial port is not an offset that is applied to the locally programmed **BASE** value as described above. Rather, it is an actual Setpoint value. The locally programmed value is not used as a **BASE** in this application.

The OptiView™ Control Center must be configured appropriately to accept the desired signal type as follows:

- The appropriate Remote Mode must be selected: **ANALOG** Remote Mode must be selected when using a voltage or current signal input. **DIGITAL** Remote Mode must be selected when using a PWM input.
- If **ANALOG** Remote Mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint must be set to “0-10VDC” or “2-10VDC” as detailed below, regardless of whether the signal is a voltage or current signal type.
- Microboard Program Jumper JP24 must be positioned appropriately per the input signal type as detailed below. It is recommended a qualified Service Technician position this jumper.



IMPORTANT! - The signal type used for Remote Leaving Chilled Liquid Temperature setpoint reset and the signal type used for Remote Current Limit setpoint reset must be the same. For example, if a 0-10VDC signal is being used for Remote Current Limit setpoint reset, then a 0-10VDC signal must be used for Leaving Chilled Liquid Temperature reset.

0-10VDC

As shown in *Figure 9 on page 38*, connect input to Microboard J22-3 (signal) and J22-5 (Gnd). A 0VDC signal produces a 0°F offset. A 10VDC signal produces the maximum offset above the Local Setpoint value (as allowed by the **REMOTE RESET TEMPERATURE RANGE** setpoint). The setpoint is changed linearly between these extremes as the input varies linearly over the range of 0VDC to 10VDC. This input will only be accepted when **ANALOG** Remote mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “0-10VDC” and Microboard Program Jumper JP24 has been removed. Calculate the setpoint for various inputs as follows:

$$\text{Offset (°F)} = \frac{(\text{VDC})(\text{Remote Reset Temp Range})}{10}$$

$$\text{Setpoint (°F)} = \text{Local Setpoint} + \text{Offset}$$

For example, if the input is 5VDC and the Remote Reset Temp Range setpoint is programmed for 10°F and the Local Leaving Chilled Liquid Temperature setpoint is programmed for 40°F, the setpoint would be set to 45°F as follows:

$$\begin{aligned}\text{Offset (°F)} &= \frac{5 \times 10}{10} \\ &= \frac{50}{10} \\ &= 5^\circ\text{F} \\ \text{Setpoint} &= 40 + 5 \\ &= 45^\circ\text{F}\end{aligned}$$

2-10VDC

As shown in *Figure 9 on page 38*, connect input to Microboard J22-3 (signal) and J2-5 (Gnd). A 2VDC signal produces a 0°F offset. A 10VDC signal produces the maximum allowed offset above the Local Setpoint value (as allowed by the REMOTE RESET TEMPERATURE RANGE setpoint). The setpoint is changed linearly between these extremes as the input varies over the range of 2VDC to 10VDC. This input will only be accepted when **ANALOG** remote mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “2-10VDC” and the Microboard Program Jumper JP24 has been removed. Calculate the setpoint for various inputs as follows:

$$\text{Offset (°F)} = \frac{(\text{VDC} - 2)(\text{Remote Reset Temp Range})}{8}$$

$$\text{Setpoint (°F)} = \text{Local Setpoint} + \text{Offset}$$

For example, if the input is 5VDC and the Remote Reset Temp Range setpoint is programmed for 10°F and the Local Leaving Chilled Liquid Temperature setpoint is programmed for 40°F, the setpoint would be set to 43.8°F.

$$\begin{aligned}\text{Offset (°F)} &= \frac{(5 - 2)(10)}{8} \\ &= \frac{(3)(10)}{8} \\ &= \frac{30}{8} \\ &= 3.8^\circ\text{F}\end{aligned}$$

$$\begin{aligned}\text{Setpoint (°F)} &= 40 + 3.8 \\ &= 43.8^\circ\text{F}\end{aligned}$$

0-20mA

As shown in *Figure 9 on page 38*, connect input to Microboard J22-4 (signal) and J22-5 (Gnd). A 0mA signal produces a 0°F offset. A 20mA signal produces the maximum allowed offset above the Local Setpoint value (as allowed by the REMOTE RESET TEMPERATURE RANGE setpoint). The setpoint is changed linearly between these extremes as the input varies over the range of 0-20mA. This input will only be accepted when **ANALOG** remote mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “0-10VDC” and Microboard Program Jumper J24 has been placed on pins 1 and 2. Calculate the setpoint for various inputs as follows:

$$\text{Offset (°F)} = \frac{(\text{mA})(\text{Remote Reset Temp Range})}{20}$$

$$\text{Setpoint (°F)} = \text{Local Setpoint} + \text{Offset}$$

For example, if the input is 8mA, the Remote Reset Temp Range Setpoint is programmed for 10°F and the Local Leaving Chilled Liquid Temperature setpoint is programmed for 40°F, the setpoint would be set to 44°F as follows:

$$\begin{aligned}\text{Offset (°F)} &= \frac{(8)(10)}{20} \\ &= \frac{80}{20} \\ &= 4^\circ\text{F}\end{aligned}$$

$$\begin{aligned}\text{Setpoint (°F)} &= 40 + 4 \\ &= 44^\circ\text{F}\end{aligned}$$

4-20mA

As shown in *Figure 9 on page 38*, connect input to Microboard J22-4 (signal) and J22-5 (Gnd). A 4mA signal produces a 0°F offset. A 20mA signal produces the maximum allowed offset above the Local Setpoint value (as allowed by the REMOTE RESET TEMPERATURE RANGE setpoint). The setpoint is changed linearly between these extremes as the input varies over the range of 4-20mA. This input will only be accepted when **ANALOG** Remote mode is selected, the **REMOTE ANALOG INPUT RANGE** setpoint is set for “2-10VDC” and Microboard Program Jumper JP24 has been placed on pins 1 and 2. Calculate the setpoint for various inputs as follows:

$$\text{Offset (}^{\circ}\text{F)} = \frac{(\text{mA}-4)(\text{Remote Reset Temp Range})}{16}$$

$$\text{Setpoint (}^{\circ}\text{F)} = \text{Local Setpoint} + \text{Offset}$$

For example, if the input is 8mA, and the Remote Reset Temp Range setpoint is programmed for 10°F and the Local Leaving Chilled Liquid Temperature setpoint is programmed for 40°F, the setpoint would be set to 42.5°F as follows:

$$\begin{aligned}\text{Offset (}^{\circ}\text{F)} &= \frac{(8-4)(10)}{16} \\ &= \frac{(4)(10)}{16} \\ &= \frac{40}{16} \\ &= 2.5^{\circ}\text{F}\end{aligned}$$

$$\begin{aligned}\text{Setpoint (}^{\circ}\text{F)} &= 40 + 2.5 \\ &= 42.5\end{aligned}$$

PWM

The Pulse Width Modulation input is in the form of a 1 to 11 second relay contact closure that applies 115VAC to the I/O Board TB4-19 for 1 to 11 seconds. As shown in *Figure 12 on page 50*, connect dry closure relay contacts between I/O Board TB4-19 (input) and TB4-1 (115VAC). A contact closure time (pulse width) of 1 second produces a 0°F offset. An 11 second closure produces the maximum allowed offset above the Local Setpoint value (as allowed by the REMOTE RESET TEMPERATURE RANGE setpoint). 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 is defaulted to the Local setpoint value. A closure is only accepted at rates not to exceed once every 70 seconds. This input will only be accepted in **DIGITAL** Remote mode. Calculate the setpoint for various pulse widths as follows:

$$\text{Offset (}^{\circ}\text{F)} =$$

$$\frac{(\text{pulse width in seconds} - 1)(\text{Remote Reset Temp Range})}{10}$$

$$\text{Setpoint (}^{\circ}\text{F)} = \text{Local Setpoint} + \text{Offset}$$

For example, if the relay contacts close for 5 seconds and the Remote Reset Temp Range setpoint is programmed to 10°F and the Local Leaving Chilled Liquid Temperature setpoint is programmed for 40°F, the setpoint would be set to 44°F as follows:

$$\begin{aligned}\text{Offset (}^{\circ}\text{F)} &= \frac{(5-1)(10)}{10} \\ &= \frac{(4)(10)}{10} \\ &= \frac{40}{10} \\ &= 4^{\circ}\text{F} \\ \text{Setpoint (}^{\circ}\text{F)} &= 40 + 4 \\ &= 44^{\circ}\text{F}\end{aligned}$$

RS-232

As shown in *Figure 8 on page 37*, a Setpoint can be received in serial data form at the Microboard COM 4B serial port (J2) from the E-link Gateway.

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SECTION 6 - I/O BOARD

The **I/O (input/output) Board** conditions the digital inputs for the microboard and conditions the microboard's digital outputs for application to other components and devices. The left side of the I/O Board performs the digital inputs function; the right side performs the digital outputs function (refer to *Figure 11 on page 47*).

Digital Inputs are on/off inputs to the microboard from relay and switch contacts, such as flow switches, start/stop switch, and remote cycling/safety devices (refer to *Figure 12 on page 50*). The Microboard reads the state of these contacts and reacts per the program instructions. The contact voltage is 115VAC when closed and 0VAC when open. These voltages are not suitable for direct input to the microboard. Therefore, the I/O Board converts the 115VAC/0VAC contact voltages to 0VDC/+5VDC logic level inputs for the microboard. Individual optocoupler circuits (refer to *Figure 13 on page 51*) perform the conversion for each Digital Input. When the input is 115VAC, the output will be 0VDC; when the input is 0VAC, the output will be +5VDC.

Field connected digital inputs, such as those from external devices that cycle the chiller, are connected to terminal strip TB4 (refer to *Figure 12 on page 50*). These inputs are in the form of dry contacts connected as shown in *Figure 14 on page 51*. The 115VAC power source that is switched by the remote contacts is supplied by the I/O Board TB4-1. There are multiple TB4-1 terminals located adjacent to the field input connections, as shown in *Figure 11 on page 47* and *Figure 12 on page 50*.

Digital Outputs are on/off outputs from the Microboard that control, motor contactors, actuators, system relays and provide operating status to external devices (refer to *Figure 15 on page 52*, and *Figure 16 on page 53*). Per program instructions, the microboard energizes and de-energizes these devices. The coils of these devices operate on 115VAC and therefore cannot be directly connected to the microboard. The digital outputs section of the I/O Board contains +12VDC coil relays that are driven by the microboard's logic level outputs. The contacts of these +12VDC relays operate the external 115VAC coil devices. On the I/O Board, one side of the each of the relay coils is permanently connected to +12VDC at J19-26/27. The other side of each relay coil is connected to the microboard via I/O Board connector J19. The microboard energizes each relay by driving the appropriate input at J19 to logic low voltage level (ground potential). The DC voltage at the appropriate input pin at J19 will be a logic high (greater than +10VDC) when the microboard is commanding a relay to de-energize; logic low (less than +1VDC) when commanding a relay to energize.

Relay K18 is different from all other relays on the I/O Board; it has a 115VAC coil. It provides the start/stop signal to the Compressor Variable Speed Drive (VSD) and provides **Compressor Run** status to remote devices (refer to *Figure 16 on page 53*). Relay K18 is controlled by DC relays K13 (start) and K14 (stop). To start the compressor motor, the Microboard energizes K13 and K14 simultaneously.

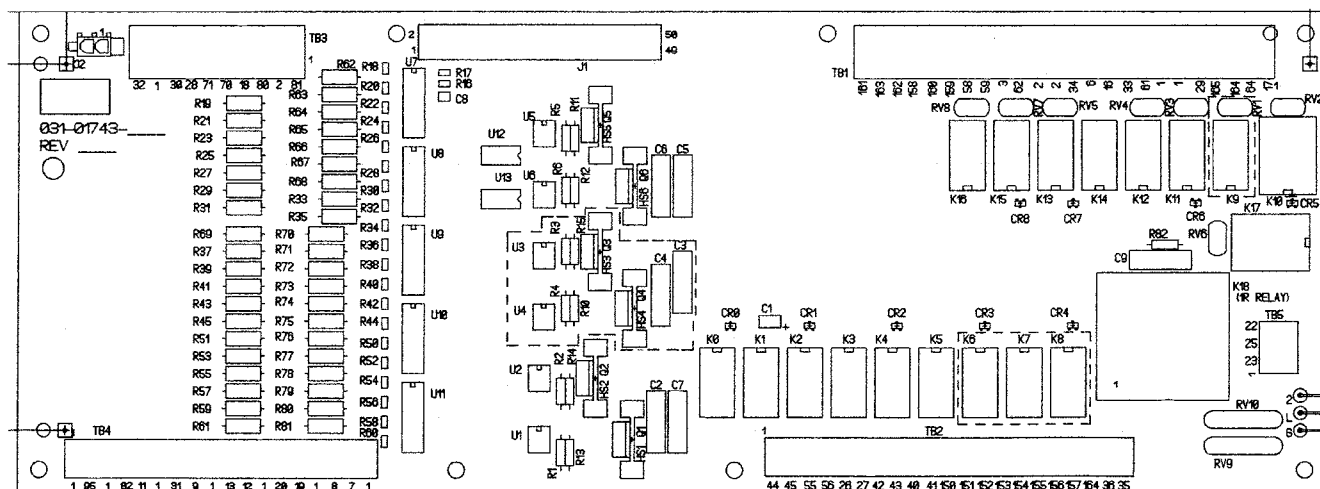


FIGURE 11 - I/O BOARD

The 115VAC at TB1-6 is applied to the coil of K18 via K13 contacts, energizing K18. Approximately 0.2 seconds later, K13 is de-energized. K18 remains energized through K14 contacts and holding contacts of K18. To stop the compressor motor, the Microboard de-energizes K14. To prevent sags in utility power from chattering K18, the holding contact of K18, along with the contact of K13, creates an anti-chatter circuit for relay K18. Once energized, K18 cannot be re-energized until K13 is again energized; this will not occur until after a controlled shutdown has occurred and another start sequence has been initiated.

There are conditions external to the I/O Board required to energize relay K18. The 115VAC will be present at TB1-16 only if the motor controller contacts "CM" are closed and the circuit between external terminal strip TB6-15 and TB6-53 is closed. The "CM" are located on the Variable Speed Drive Logic Board. The high pressure safety switch "HP", must be also closed. The local safety stop switch must be released to provide 115VAC through K18 to the starter.

RELAY TIMING

Under program control, the relays are energized and de-energized producing contact operation as follows. Unless otherwise noted, contact rating is 5 amps resistive or 2 Amps inductive at 250VAC.

K0 - Chilled Water Pump Starter (TB2-44/45)

Dry closure contacts. When open, the contacts close immediately upon entering "MBC Startup". 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. If Chilled Liquid Pump Operation is set to ENHANCED, MULTIUNIT CYCLING - CONTACTS OPEN SYSTEM CYCLING - CONTACTS OPEN.
- C. LEAVING CHILLED LIQUID FLOW SWITCH OPEN cycling shutdown.

K1 - Anticipatory Alarm (TB2-55/56)

Dry closure contacts. Contacts close when one of the following Warning messages is Displayed:

- Real Time Clock Failure
- Condenser or Evaporator Transducer Error
- Setpoint Override

- Condenser-High Pressure Limit
- Evaporator-Low Pressure Limit
- Vanes Uncalibrated
- Excess Surge Detected

The contacts automatically open when the warning condition is no longer present.

K2 - Remote Mode Ready to Start (only operational in Digital, Analog or BAS (ISN) Remote mode)(TB2-26/27)

Dry closure status contacts that are closed to indicate to a Remote device that the chiller will start upon receipt of a remote start signal. The contacts open coincident with any Cycling or Safety shutdown or anytime the Keypad COMPRESSOR switch is placed in the Stop-Reset (O) position. On Cycling shutdowns, the contacts will close when the cycling condition clears. On safety shutdowns, the contacts will close only after the Safety condition clears, a manual reset is performed with the Clear Fault key.

K3 - Safety Shutdown Status (TB2-42/43)

Dry closure status contacts. They close coincident with a Safety shutdown. They remain closed until the safety condition clears and a manual reset is performed with the Clear Fault key, whereupon they open.

K4 - Cycling Shutdown Status (TB2-40/41)

Dry closure status contacts. They close coincident with a Cycling shutdown. They remain closed until the cycling condition clears, whereupon they open.

K5 - Condenser Motor Pump Starter (TB2-150/151)

Dry closure contacts. Contacts close coincident with beginning of "MBC Startup". 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 (pump off), the contacts close when Saturated Condenser Temperature is less than 35.0 °F. This helps mitigate condenser freeze due to plant issues in brine applications.

If the contacts are closed only due to the Saturated Condenser Temp, they are opened when Saturated Condenser Temperature returns above 40.0 °F. If the existing logic calls for them to be closed, they remain closed.

If it is desired to supply the dry contacts with 115VAC power from the OptiView™ Control Panel to control the Condenser Pump Motor Starter, a field installed wire must be connected from TB5-22 to I/O Board TB2-150 and then connect I/O Board TB2-151 to the Condenser Pump Motor Starter.

K6 - VGD Shutdown ((TB2-152/153)

Dry closure contacts close to send a shutdown command to the VGD actuator to initiate fast closure.

K7 - High Stage VGD Shutdown ((TB2-154/155)

Dry closure contacts close to send a shutdown command to the High Stage VGD actuator to initiate fast closure, on 2-stage chillers only.

K8, K9 - Not Used

K10 - Power Panel Cooling System Run (TB1-17/64)

Contacts close to initiate run command to the cooling system for the power panel.

K11 - Optional Brine Isolation valves Open

If option is Enabled, the contacts close at MBC Startup state and remain closed during run. They re-open at the end of Coastdown. If option is Disabled, the contacts remain closed.

K12 - Optional Brine Isolation valves Close

If option is Enabled, the contacts open at MBC Startup state and remain open during run. They close at the end of Coastdown. If option is Disabled, the contacts remain open.

K13 - Compressor Motor Starter (start) (TB1-6/16)

Contacts close coincident with the beginning of “System Run”. They remain closed for 0.2 seconds and then open.

K14 - Compressor Motor Stop (stop) (TB 1-6/16)

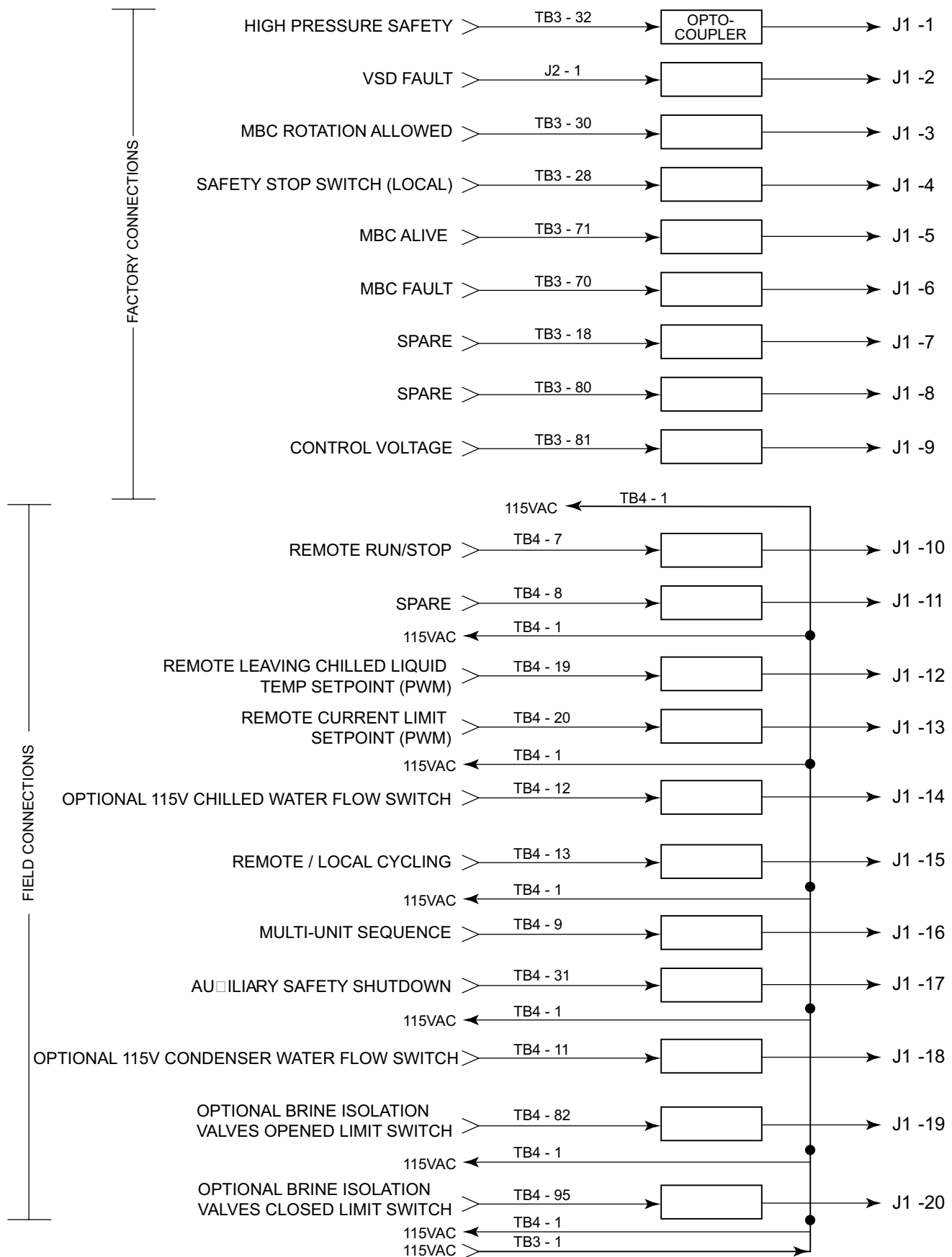
Contacts close coincident with the beginning of “System Run”. They remain closed for the duration of “System Run”. They open coincident with the beginning of “System Coastdown”.

K17 - Condenser Motor Pump Starter (TB1- 164)

Contacts operate the same as K14.

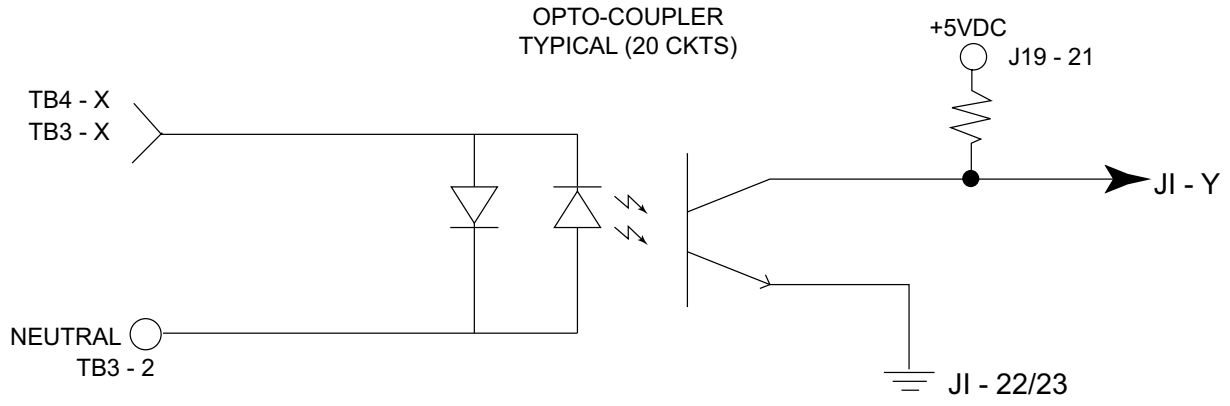
K18 - Compressor Motor Starter (TB5-22/25) Run Status (TB2-35/36)

Contacts operate the same as K14.



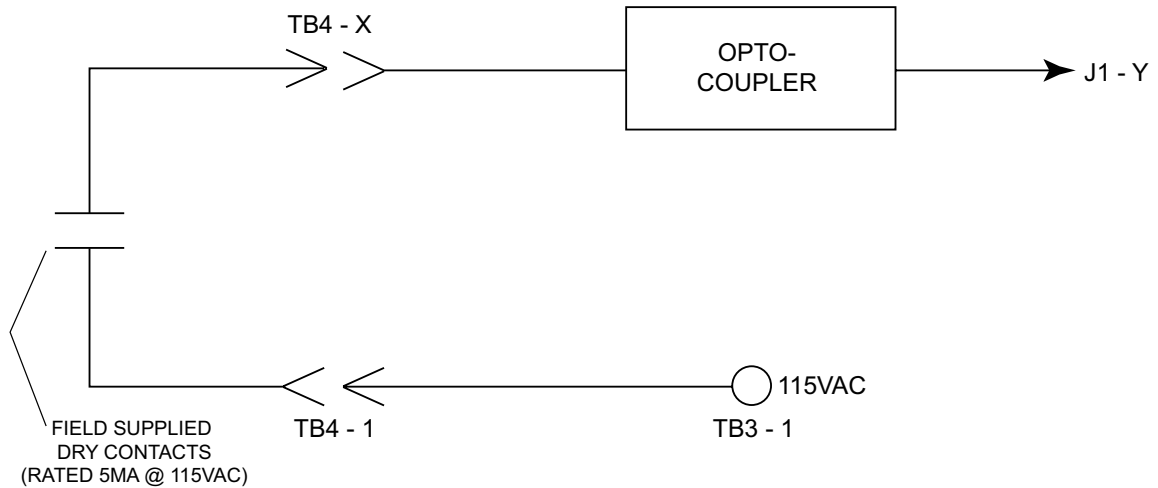
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FIGURE 12 - I/O BOARD DIGITAL INPUTS



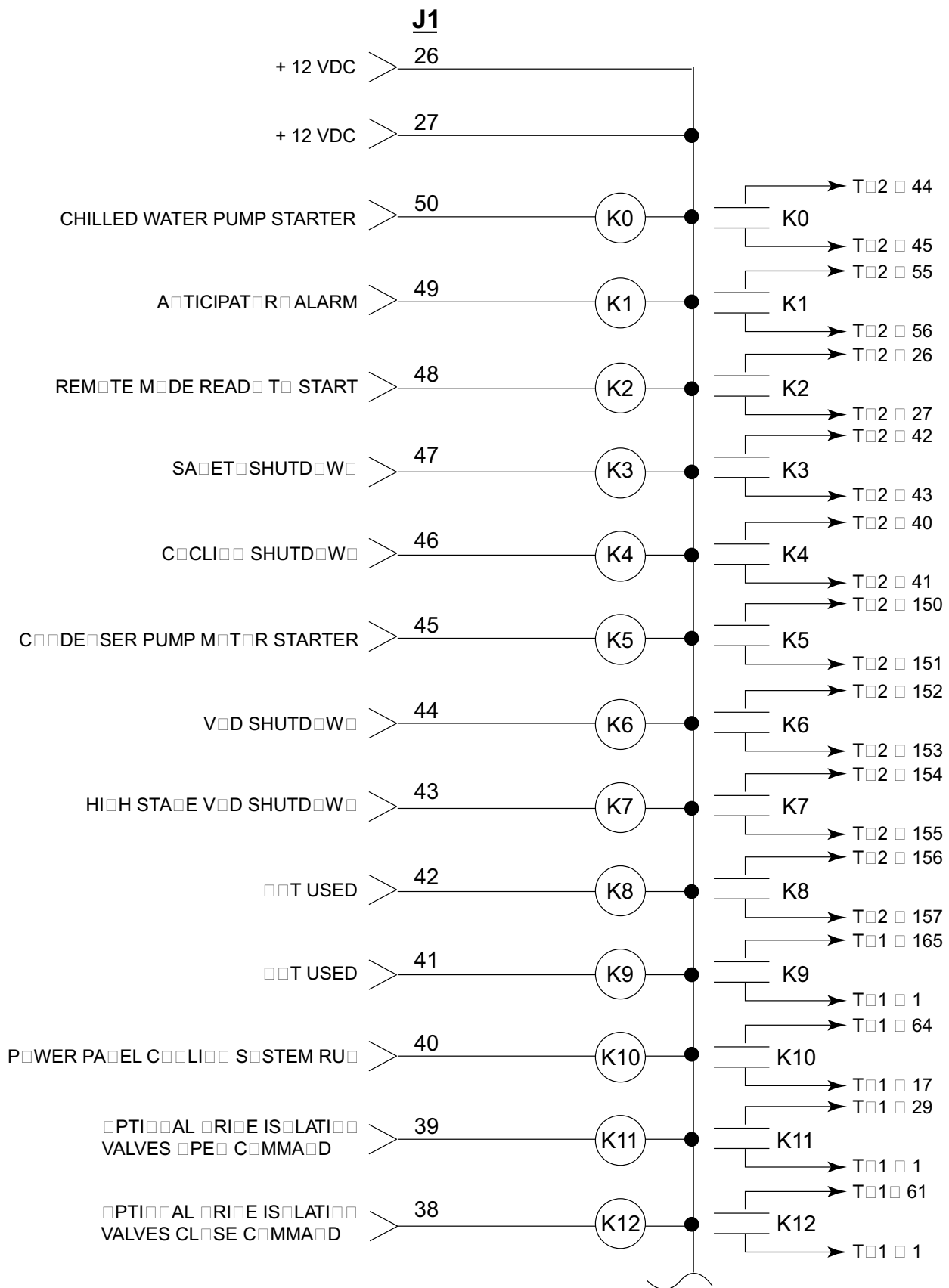
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FIGURE 13 - I/O BOARD TYPICAL OPTO-COUPLER CIRCUIT



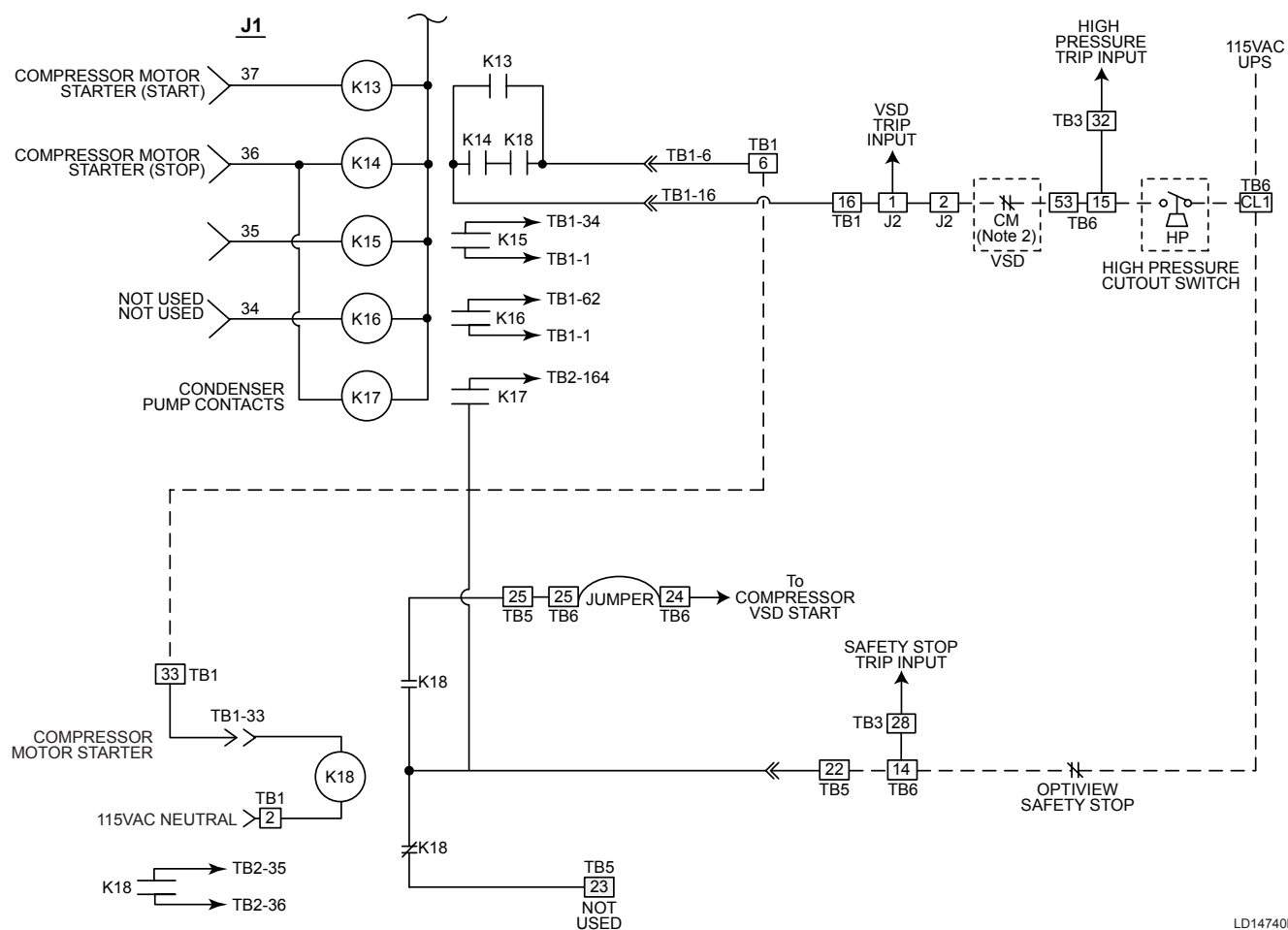
LD04058

FIGURE 14 - I/O BOARD TYPICAL FIELD CONNECTIONS



LD09042

FIGURE 15 - J1 I/O BOARD DIGITAL OUTPUTS



NOTES:

1. ----- indicates wiring external to I/O Board.
2. "CM" – Contacts of Relay K1 on VSD Logic Board

FIGURE 16 - J1 I/O BOARD DIGITAL OUTPUTS

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SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 OR 003

The Large Tonnage Chiller (LTC) Input/Output Board provides both analog and digital input/output capability to the Microboard from external devices. *Figure 17 on page 55* is a top level block diagram of this board. *Figure 18 on page 56* through *Figure 23 on page 58* show details of the I/O circuits and should be referred to while reading the following description of the board operation. *Figure 25 on page 60* is a board layout showing component identification.

The board is manufactured with a 000 through 003 part number suffix. This product uses the -002 board for single stage and the -003 board for the two stage chiller. The -002 and -003 boards have hardware conditioned for the devices used on the YMC². The -003 board has additional I/O quantity than the -002 board. The board is required for this product.

This board operates from +12VDC (TP3) and +24VDC (TP4) power supply voltages. The +12VDC applied to the +5VDC regulator produces a +5VDC regulated output (TP2), which causes the POWER LED (CR3) to illuminate. These voltages are referenced to GND (TP1).

Power fail circuits detect low DC voltage and put the processor into a reset state as long as the voltage is below a threshold. This prevents the processor from processing data while the DC Voltage is below the minimum required for stable circuit operation. The low voltage reset thresholds are:

- +5VDC supply @ 4.41VDC-4.87VDC
- +12VDC supply @ 9.6VDC-11.2VDC

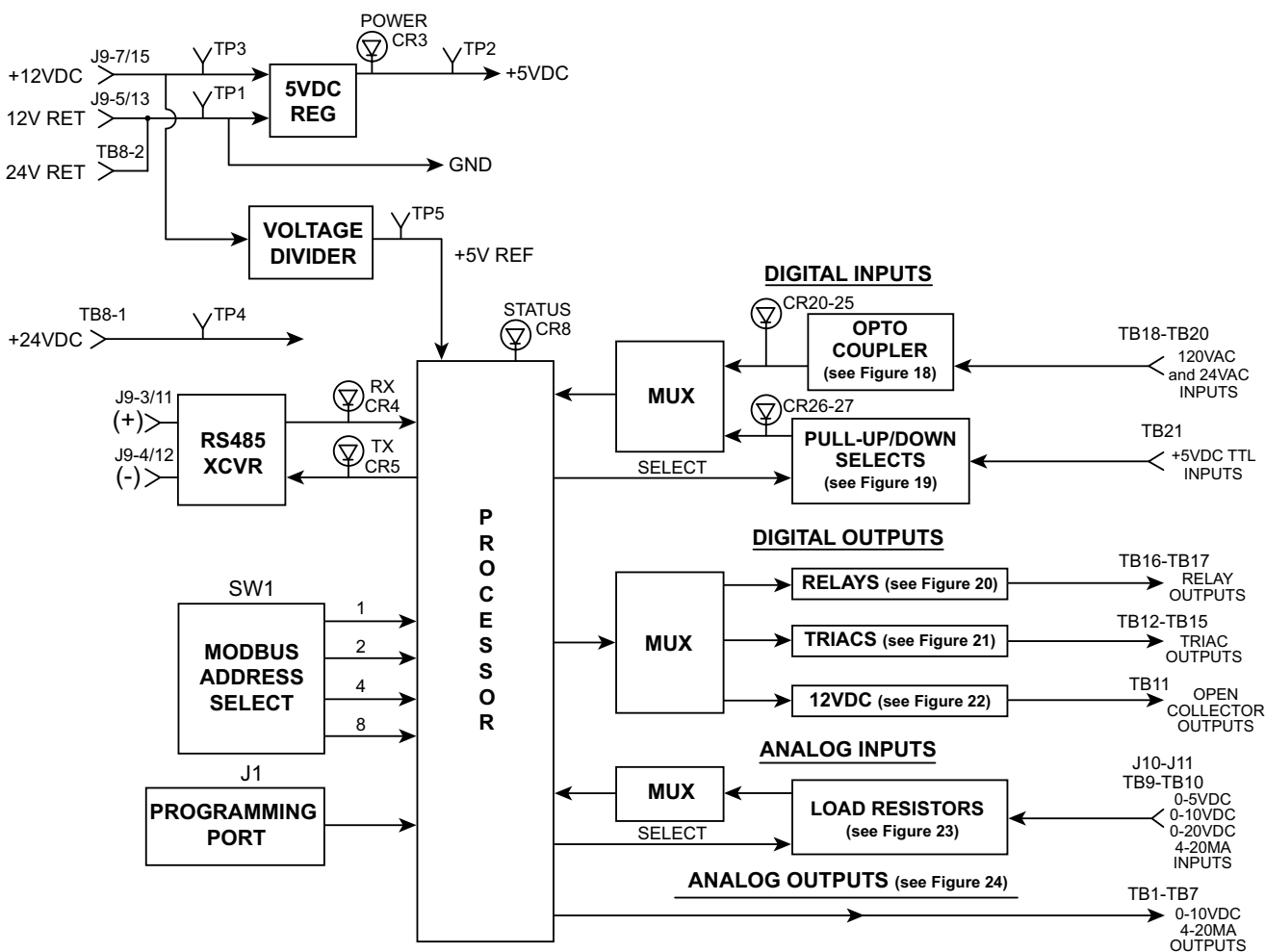


FIGURE 17 - LTC I/O BOARD BASIC BLOCK DIAGRAM (-003 BOARD)

When the I/O Board is operating, the STATUS LED (CR8) flashes at a regular interval (1/sec) indicating that the board is functional.

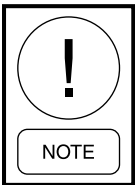
This board communicates with the Microboard COM 3 serial port (J12) using Modbus Protocol RS-485 serial communications. When a read/write request is sent from the microboard, the microboard’s TX3 (CR15) LED illuminates. When that request is received at the I/O Board, the I/O Board’s RX (CR4) LED illuminates. When the I/O Board responds, the I/O Board’s TX (CR5) LED illuminates. When the response is received at the microboard, the microboard’s RX3 (CR16) illuminates.

Each read/write request from the microboard contains a Modbus Net address. In order for the I/O Board to respond to the microboard’s requests, the Modbus Net address of the I/O Board must match the one sent from the microboard. The Modbus Net address of the I/O Board is set with a four position DIP switch SW1, labeled NET ADDRESS. This should be set to “1” by moving SW1-1 to ON and the other segments to OFF.

The operating program is stored in the processor. The program is downloaded into the processor through the J1 programming port at the time of board manufacture. Service replacement boards are provided preloaded with the proper software. It is not necessary to field load software into the board.

Refer to the following sections of this manual for a description of how this board is interfaced for these applications:

- SECTION 22 - REFRIGERANT LEVEL CONTROL
- SECTION 23 - HOT GAS BYPASS VALVE



Important! These are not general purpose I/O points available for field use. Unless specifically listed in the above referenced sections of this manual, the I/O point cannot be used.

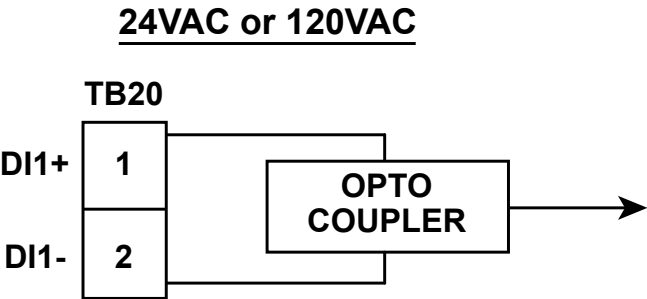
DIGITAL INPUTS

120VAC Digital Inputs: DI1(-002 and -003 board), DI4, DI5, DI6 (-003 board only)
24VAC Digital Inputs: DI2 (-002 and -003 board), DI3 (-003 board only)

These inputs are not interchangeable. The 24VAC inputs can not handle 120VAC. *Figure 18 on page 56* is a detail of this input and is representative of all of these inputs. Each input is applied to the respective (+) and (-) input. Each input is applied to an opto-coupler circuit that converts the AC voltage to a DC voltage. Each input has an LED associated with it. The respective LED illuminates when the input is present. Otherwise, it is extinguished.

INPUT	CONNECTION	LED
DI1 120V Heating Condenser Liquid Flow Switch (Heat Recovery Option)	TB20-1(+) -2(-)	CR20
DI2 VGD Actuator Fault	TB20-3(+) -4(-)	CR21
DI3 High Stage VGD Actuator Fault	TB19-1(+) -2(-)	CR22
DI4	TB19-3(+) -4(-)	CR23
DI5	TB18-1(+) -2(-)	CR24
DI6	TB18-3(+) -4(-)	CR25

The VGD Actuator Faults remove voltage from the input when the fault is present.



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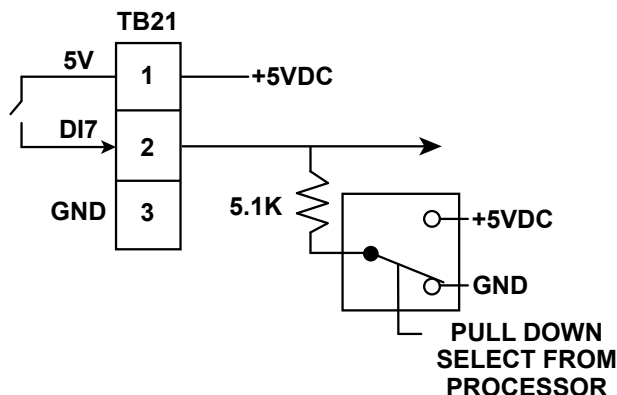
FIGURE 18 - 120VAC DIGITAL INPUT

+5VDC Digital Inputs

There are two of each +5VDC TTL inputs. *Figure 19 on page 57* is a detail of an input and is representative of all of these inputs. Each input accepts an open/close input that can be configured in either pull-up configuration (+5VDC when open/0VDC when closed) or pull-down configuration (0VDC when open/+5VDC when closed). It is connected between the +5VDC and the DI input for a pull-up configuration; between the Gnd and DI input for a pull-down configuration. Under program control, the pull-up/pull-down selector switch connects the input load resistor to either +5VDC (pull-up) or ground (pull-down) per the requirements of the input.

INPUT	CONNECTION	LED
DI7	TB21-1 +5VDC -2 DI7 -3 Gnd	CR26
DI8	TB21-4 +5VDC -5 DI8 -6 Gnd	CR27

5VDC TTL



5VDC TTL

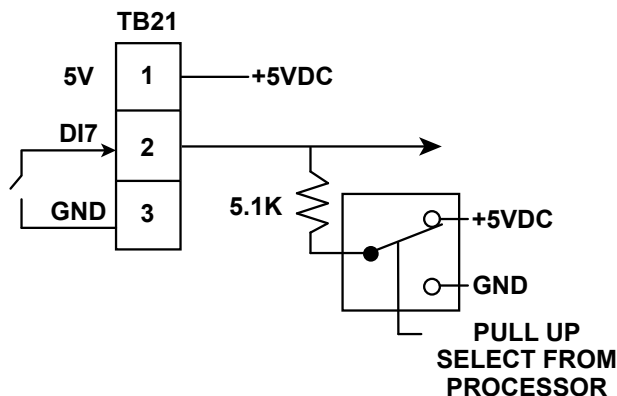


FIGURE 19 - +5VDC DIGITAL INPUT

LD14233

DIGITAL OUTPUTS

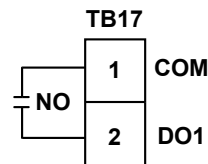
Relay Outputs

There are two of each 120/240VAC Relay contact outputs. *Figure 20 on page 57* is a detail of an output and is representative of all these outputs. Each relay has one set of normally open contacts that are closed and opened under program control. The relay contact rating is 250VAC (5 amps resistive, 2 amps inductive). Each output is connected between the respective COM(X) and NO(X) terminals.

OUTPUT CONNECTION

DO1	TB17-1 COM1 -2 NO1
DO2	TB16-1 COM2 -2 NO2

RELAY OUTPUTS



LD14234

FIGURE 20 - RELAY OUTPUTS

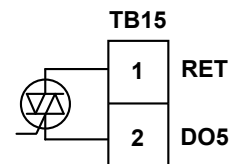
Triac Outputs

There are four of each 24/120VAC triac outputs. *Figure 21 on page 57* is a detail of an output and is representative of all these outputs. Each output can switch 2 amps at 17-132VAC. Each output is connected between the respective RET and DO(X) connection.

OUTPUT CONNECTION

DO5	TB15-1 Ret -2 DO5
DO6	TB14-1 Ret -2 DO6
DO7	TB13-1 Ret -2 DO7
DO8	TB12-1 Ret -2 DO8

TRIAC OUTPUTS



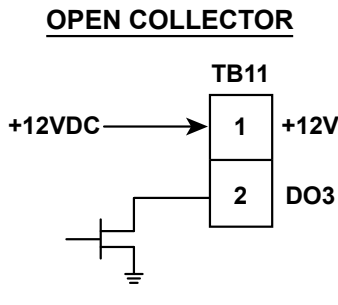
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FIGURE 21 - TRIAC OUTPUTS

Open Collector Outputs

There are two of each open collector outputs. *Figure 22 on page 58* is a detail of an output and is representative of all these outputs. Each output switches a ground connection through an onboard solid state device to an external load connected to the board supplied +12VDC power source. Each output is connected between the respective +12VDC and DO(X) terminals.

OUTPUT	CONNECTION
DO3	TB11-1 +12VDC -2 DO3
DO4	-3 +12VDC -4 DO4



LD14234

FIGURE 22 - OPEN COLLECTOR

ANALOG INPUTS

There are eight of each analog inputs on the -002 board and 16 each on the -003 board. *Figure 23 on page 58* is a detail of this input and is representative of all these inputs. Each input accepts either a 0-5VDC, 0-10VDC, 4-20mA, Transducer or Thermistor input. The on-board software configures each input per the requirements of the input type. The configuration consists of selecting the appropriate input series resistor to ground. The software closes the appropriate switch(s) (1, 2, 3), selecting the appropriate input resistor. *Figure 23 on page 58* shows the switch settings and resistance values for each input type.

Inputs AI7 and AI8 have dual input connectors that allow either a pin/socket connection or screw terminal connection as shown in *Table 6 on Page 59*.

Thermistors and Transducers operate from the board supplied +5VDC supply voltage. To compensate for a varying +5VDC supply voltage, this voltage is compared to a precise +5VDC reference. The output of the device is adjusted according to any difference.

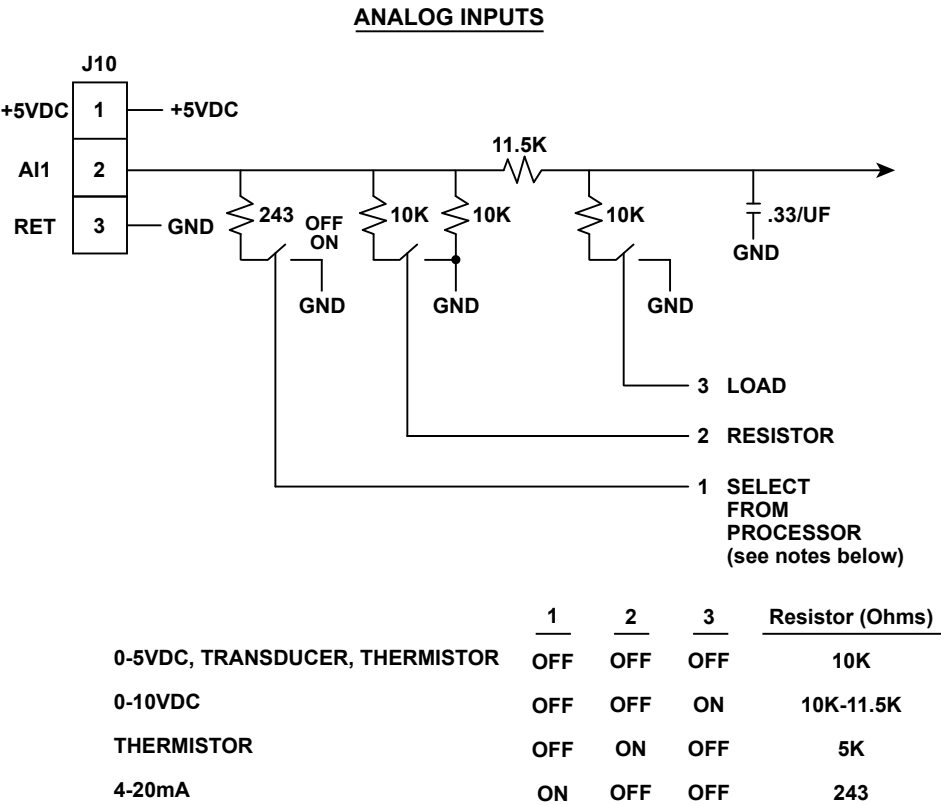


FIGURE 23 - ANALOG INPUTS

LD14235A

TABLE 6 - INPUT CONNECTIONS

INPUT	CONNECTION
AI1	J10-1 +5VDC -2 AI1 -3 Ret
AI2	J10-4 +5VDC -5 AI2 -6 Ret
AI3	J10-7 +5VDC Motor housing -8 AI3 temperature -9 Ret
AI4	J10-10 +5VDC Power Panel -11 AI4 temperature -12 Ret
AI5	J10-13 +5VDC Ambient dew point -14 AI5 temperature -15 Ret
AI6	J10-16 +5VDC -17 AI6 -18 Ret
AI7	J10-19 +20VDC -20 AI7 or TB9-1 UPS Battery -21 Ret TB9-2 Voltage
AI8	J10-22 +5VDC -23 AI8 or TB9-3 -24 Ret TB9-4
AI9	J11-1 +5VDC High Stage -2 AI9 Discharge -3 Ret Temperature
AI10	J11-4 +5VDC -5 AI10 -6 Ret
AI11	J11-7 +5VDC -8 AI11 -9 Ret
AI12	J11-10 +5VDC -11 AI12 -12 Ret
AI13	J11-13 +5VDC -14 AI13 -15 Ret
AI14	J11-16 +5VDC -17 AI14 -18 Ret
AI15	J11-19 +5VDC -20 AI15 -21 Ret
AI16	J11-22 +5VDC -23 AI16 -24 Ret

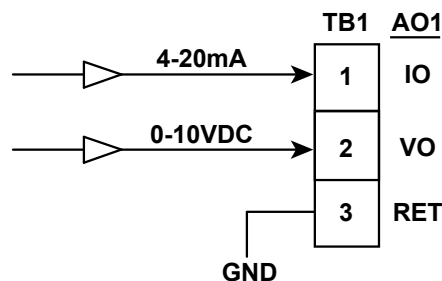
ANALOG OUTPUTS

There are five of each analog outputs on the -002 board and seven of each on the -003 board. *Figure 24 on page 59* is a detail of this input and is representative of all these inputs. Each output can provide either a 0-10VDC output (between terminals 2 and 3) or 4-20mA output (between terminals 1 and 3).

OUTPUT	CONNECTION
AO1	TB1-1 4-20mA -2 0-10V -3 Ret } Hot Gas Valve
AO2	TB2-1 4-20mA -2 0-10V -3 Ret } Head Pressure Control
AO3	TB3-1 4-20mA -2 0-10V -3 Ret } Refrigerant Level Valve
AO4	TB4-1 4-20mA -2 0-10V -3 Ret } Motor Cooling Valve Control
AO5	TB5-1 4-20mA -2 0-10V -3 Ret } VSD Cooling
AO6	TB6-1 4-20mA -2 0-10V -3 Ret } Economizer Level Valve (2-stage only)
AO7	TB7-1 4-20mA -2 0-10V -3 Ret }

7

ANALOG OUTPUTS



LD14236

FIGURE 24 - ANALOG OUTPUTS

DIAGNOSTIC SCREEN

The Diagnostic Screen (*Figure 109 on page 280*), accessible from the MAIN DIAGNOSTICS Screen, is used to analyze the analog and digital inputs and outputs. It is also used to manually control the digital outputs and set analog output voltages.

There are two versions of this screen available as follows:

Service Access Level

The voltage value of each analog input at the board input terminals/pins, as interpreted by the I/O Board and transmitted to the Microboard, is displayed as ANALOG INPUTS.

The voltage value sent from the Microboard to the I/O Board for each Analog Output is displayed as ANALOG OUTPUTS.

The on/off status of the Digital Inputs and Digital Outputs are indicated with an LED. It is illuminated when the input or output is on; extinguished when it is off.

Modbus communication error counters are displayed as follows, along with the ability to reset the counters:

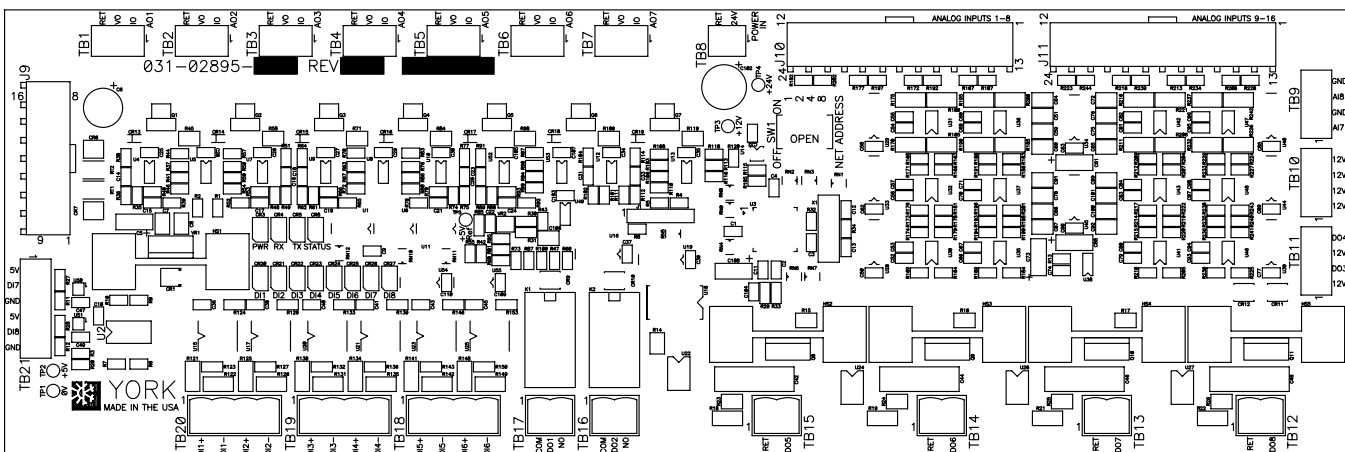
- ID faults – This is the number of packets received with an incorrect slave ID.

- Checksum errors – This is the number of checksum errors encountered in communication.
- Error packets – This is the number of error packets received.
- Timeout Faults – This is the number of timeout faults encountered. A timeout is registered when no valid response is received for a poll within 2 seconds.

Service Access Level plus Microboard Program DIP Switch 1-3 to ON (*Figure 5 on page 34*).

In addition to the same displays above, the following can be performed:

- The digital outputs can be individually turned on or off. Use the SELECT DIGITAL OUTPUTS key to select the desired output, then use the ENABLE and DISABLE keys to turn it on or off.
- The Analog Outputs can be individually set to a desired voltage value. Use the SELECT ANALOG OUTPUT key to select the desired output, then use the numeric keypad keys to set it to the desired value.



LD14349

FIGURE 25 - I/O BOARD (031-02895-XXX)

SECTION 8 - LIQUID CRYSTAL DISPLAY

A 10.4 inch color **Liquid Crystal Display**, along with supporting components **Display Interface Board** and **Backlight Inverter Board** are mounted on a plate that is attached to the OptiView™ Control Center door. A clear plexiglass faceplate prevents display surface damage. System operating parameters are displayed on various color graphic screens. The various display screens are selected for display using keys on the Keypad.

The Display provided in the new chiller or from YORK as a service replacement part, could be manufactured by any of several approved manufacturers. Each Display requires a specific Display Interface Board, Backlight Inverter Board, Inverter Board interface cable and Program command set. **Therefore, Service replacement Displays or supporting components cannot be arbitrarily selected!!!** As explained below, replacement Displays are provided from YORK as kits to assure compatibility of all components.

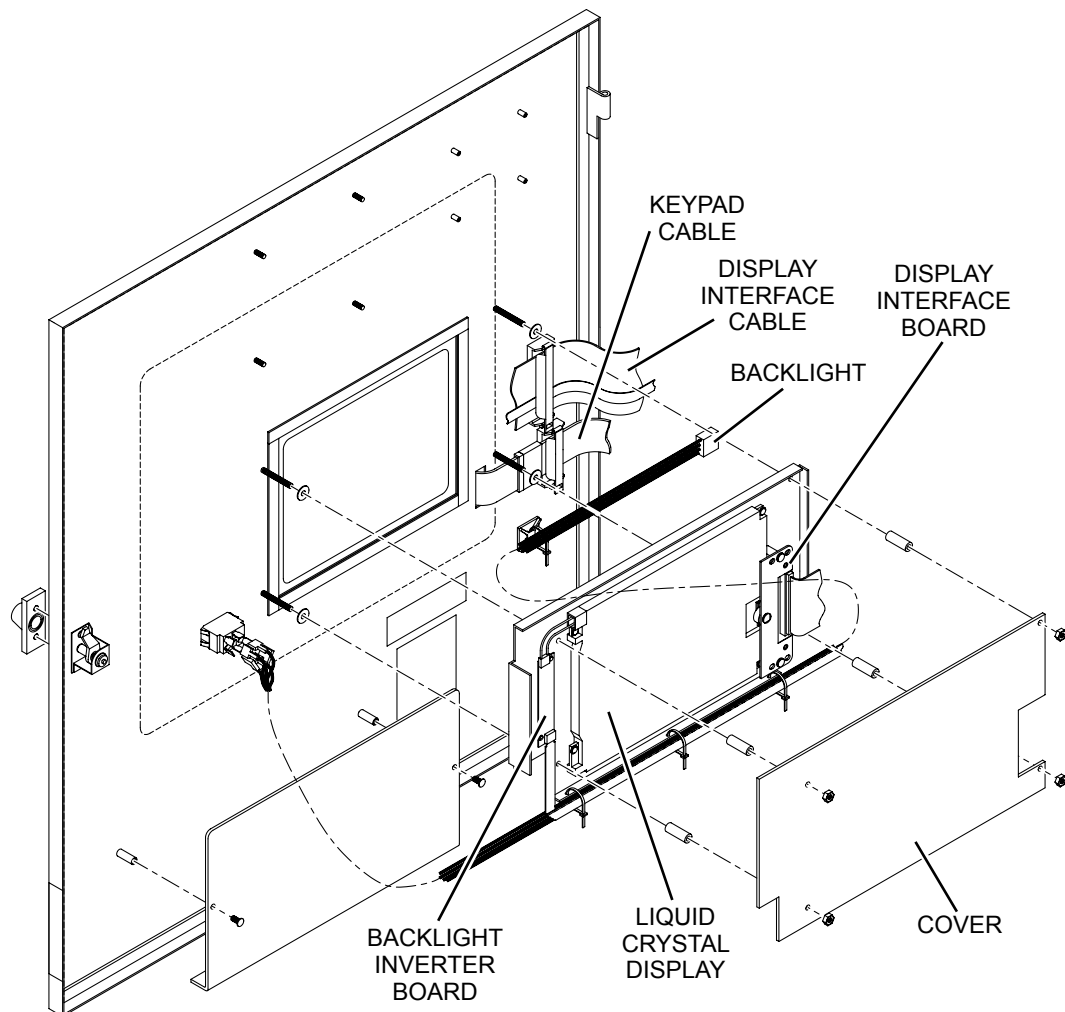


Non-compatibility of components will result in incorrect operation!!!

Refer to **SECTION 9 - DISPLAY INTERFACE BOARD** and **SECTION 10 - DISPLAY BACKLIGHT INVERTER BOARD** for more details.

Displays that could be provided from Johnson Controls in new chillers or as replacement parts are:

- SHARP LQ104V1DG61 (031-02886-000)
- SHARP LQ10D367/368 (031-01774-000)
- LG SEMICON LP104V2-W (031-02046-000)



LD04062

FIGURE 26 - DISPLAY MOUNTING

The YORK part numbers of the Display Interface Board, Backlight Inverter Board and Inverter ribbon cable provided, are listed on a label attached to the Display mounting plate. These are the part numbers of the supporting components that are compatible with the installed display. These supporting components can be individually replaced. However, if the Liquid Crystal Display fails, Display replacement kit (P/N 331-01771-000) must be ordered and installed as detailed in this section. This kit contains a replacement Display and all compatible supporting components.

The Display has 307,200 pixels arranged in a 640 columns X 480 rows matrix configuration. Each pixel consists of 3 windows; red, green and blue, through which a variable amount of light from the Display Backlight is permitted to pass through the front of the display. Imbedded in each window of the pixel is a transistor, the conduction of which determines the amount of light that will pass through the window. The conduction of each transistor is controlled by a signal from the Display Controller on the Microboard. The overall pixel color is a result of the gradient of red, green and blue light allowed to pass.

Under program control, the display controller on the microboard sends a drive signal for each pixel to create the image on the display. Each pixel's drive signal is an 18 bit binary word; 6 bits for each of the 3 colors, red green and blue. The greater the binary value, the greater the amount of light permitted to pass. The columns of pixels are driven from left to right and the rows are driven top to bottom. To coordinate the drive signals and assure the columns are driven from left to right and the rows are driven from top to bottom, each drive signal contains a horizontal and vertical sync signal. The **Display Interface Board** receives these display drive signals from the Microboard J5 and applies them to the Display at connector J1 (refer to *Figure 33 on page 70* and *Figure 34 on page 71*).

Although there are variations in control signal timing between different display manufacturers, *Figure 30 on page 66* depicts typical control signals. Since these control signals occur at rates greater than can be read with a Voltmeter, the following description is for information only. There are 480 horizontal rows of pixels. Each row contains 640 3-window pixels. Beginning with the top row, the drive signals are applied within each row, sequentially left to right, beginning with the left most pixel and ending with the right most pixel. The rows are driven from top

to bottom. The Vertical Sync (VSYNC) pulse starts the scan in the upper left corner. The first Horizontal Sync (HSYNC) pulse initiates the sequential application of RGB drive signals to the 640 pixels in row 1. Upon receipt of the **ENABLE** signal, an RGB drive signal is applied to the first pixel. As long as the **ENABLE** signal is present, RGB drive signals are then applied to the remaining 639 pixels at the CLK rate of 25.18M Hz, or one every 39.72 nanoseconds. Typically it takes 31 microseconds to address all 640 pixels. Similarly, the next HSYNC pulse applies drive signals to row 2. This continues until all 480 rows have been addressed. Total elapsed time to address all 480 rows is approximately 16 milliseconds. The next VSYNC pulse causes the above cycle to repeat. Displays can be operated in **FIXED** mode or **DISPLAY ENABLE** mode. In **FIXED** mode, the first pixel drive signal is applied a fixed number (48) of clock (CLK) cycles from the end of the HSYNC pulse and the drive signals are terminated a fixed number (16) of CLK cycles prior to the next HSYNC pulse. In **DISPLAY ENABLE** mode, the pixel drive signals are applied to the pixels only while **ENABLE** signal is present. This signal is typically present 4-48 CLKS after the end of the HSYNC pulse and 2-16 CLKS prior to the next HSYNC pulse. All YORK applications operate in the **DISPLAY ENABLE** mode. The state of the **ENABLE** (Display Interface Board J1-27) signal from the Microboard places the Display in the desired mode as follows:

- SHARP LQ10D367/368 (031-01774-000) and LQ104V1DG61 (031-02886-000) Displays - When **ENABLE** maintained "low", display operates in fixed mode.
- LG SEMICON Display (031-02046-000) does not have the fixed mode feature.

As described above, in OptiView™ Control Center applications, the Display scan is left to right, beginning with the top row and continuing sequentially through the rows to the last row. However, in Display applications other than OptiView™ Control Centers, image reversal is sometimes required. In image reversal applications, the scan is reversed; the scan is right to left, beginning with the last row and proceeding to the top row. The scan mode is determined by the configuration of wire jumpers on the Display Interface Board (refer to *SECTION 9 - DISPLAY INTERFACE BOARD*).

Displays by different manufacturers can require different timing and control signals. The Microboard must know which Display is present in order to provide the

correct signals. Therefore, when AC control power is first applied to the OptiView™ Control Center, as part of the power-up sequence, the Microboard reads the Panel ID wire jumpers P1D0 - P1D3 on the **Display Interface Board** and determines which Display is present. It can then provide the correct timing and control signals to produce the graphic image, as required by the Display manufacturer. Since the **Display Interface Board** identifies the Display for the Microboard, there is a different **Display Interface Board** required for each Display application and each has a unique jumper configuration that identifies the Display. A complete explanation of this process is included in *SECTION 4 - MICROBOARD 031-02430-007* and *SECTION 9 - DISPLAY INTERFACE BOARD*.

The DC power source to operate the Display is provided by the Microboard J5. Some Display manufacturers require +5VDC; others require +3.3VDC. The position of Microboard Program Jumper JP2 determines which of these power sources is supplied to the Display. JP2 must be positioned according to the Display manufacturers requirements (refer to *SECTION 4 - MICROBOARD 031-02430-007*).

The **Backlight Lamp** provides the illumination for the display. Average lamp life is 25000 hours (2.9 years). Some displays use one lamp. Others use two lamps. Lamps are replaceable, but not interchangeable between different displays. Each Display manufacturer specifies the required lamp for their display. Refer to replacement parts list for appropriate replacement lamp. Service replacement lamps are stocked in the Baltimore Parts Center. The lamp is illuminated by applying a high voltage AC (500 to 1500VAC) to it. This illumination voltage is created from a low level DC voltage (+12VDC or +5VDC as required by the Display manufacturer) by the **Backlight Inverter Board**. Lamp brightness is controlled by varying the high voltage AC. The greater the voltage the brighter the illumination. The lamp is controlled by on/off commands and brightness control signals applied to the **Backlight Inverter Board** from the Microboard.

The Microboard Program determines when the lamp is turned on and off and the lamp brightness. Each Display manufacturer specifies the **Backlight Inverter Board** to be used. Therefore, it will vary according to the Display manufacturer. The ribbon cable that connects the Microboard to the Backlight Inverter Board also varies according to the Display manufacturer's re-

quirements (refer to *Figure 33 on page 70* and *Figure 34 on page 71*). Microboard Program Jumpers JP3, 4, 5, 7 and 8 determine the voltage levels of the control signals sent to the **Backlight Inverter Board** and must be configured per the Display manufacturer's requirements as listed in *Table 3 on Page 32*. A detailed description of the operation of this board is in the "Backlight Inverter Board" section that follows. Also refer to the preceding "Microboard" section for a detailed description of the **Lamp Dimmer** circuit.

The actual Display that is installed in the OptiView™ Control Center of the new chiller is determined by the Display manufacturer contractual agreement in place during the time of OptiView™ Control Center production. Displays stocked for Service replacement are a result of that same agreement. Therefore, the Display received for service replacement may be manufactured by a different company than the one installed in the OptiView™ Control Center. Since each Display manufacturer requires a specific Display Interface Board, Backlight Inverter Board and Inverter Ribbon Cable, replacement Displays are ordered and supplied as a Display Replacement Kit (YORK Part Number 331-01771-000) to assure component compatibility. The items supplied in the kit are compatible with the supplied Display. The kit consists of the following items mounted on a Display mounting plate:

Display Replacement Kit 331-01771-000

1. Liquid Crystal Display with Lamp
2. Appropriate Display Interface Board for item 1
3. Appropriate Backlight Inverter Board for item 1
4. Appropriate ribbon cable (Backlight Inverter Board to Microboard) for item 1
5. Ribbon cable (Display Interface Board to Microboard)
6. All mounting hardware
7. Installation instructions. A label attached to the Display mounting plate lists the YORK part numbers of the Display supporting components mounted on the Display mounting plate and the required Microboard Program Jumper (JP2 through 8) configurations. **Microboard Program Jumpers JP2- JP8 will have to be configured appropriately for the replacement display.**

Display Handling

1. The display is made of glass. It could break if dropped.
2. The display front surface is easily scratched. If soiled, wipe with a dry cotton cloth. Use no water or chemicals.
3. The display is static sensitive. Electrostatic discharges may damage the display.
4. A laminated film is adhered to the display front glass surface to prevent it from being scratched. Peel off very slowly to prevent static damage.



Always remove control power from the OptiView™ control center before connecting or disconnecting wires to the display. Connecting or disconnecting wires to the display with power applied will damage the display!!!

BACKLIGHT LAMP REPLACEMENT**SHARP LQ10D367/368 (031-01774-000) Display****Removal**

The Lamp slides into the Display from left to right and is secured with a locking tab.

1. Remove Control Power from the OptiView™ Control Center.
2. Remove protective cover from rear of Display.
3. Disconnect Lamp AC power connector from Backlight Inverter Board.
4. Using fingernail or thin flat blade screwdriver, bend the locking tab outward slightly to clear the Lamp housing protrusion.
5. Grasp Lamp AC power connector and gently pull until Lamp housing clears locking tab.
6. Grasp Lamp housing and pull until Lamp housing is completely removed from the Display.

Installation

1. Slide new Lamp into Display from left to right until Lamp housing protrusion locks into Display locking tab.
2. Connect Lamp AC power connector to Backlight Inverter Board.
3. Apply Control Power to OptiView™ Control Center.

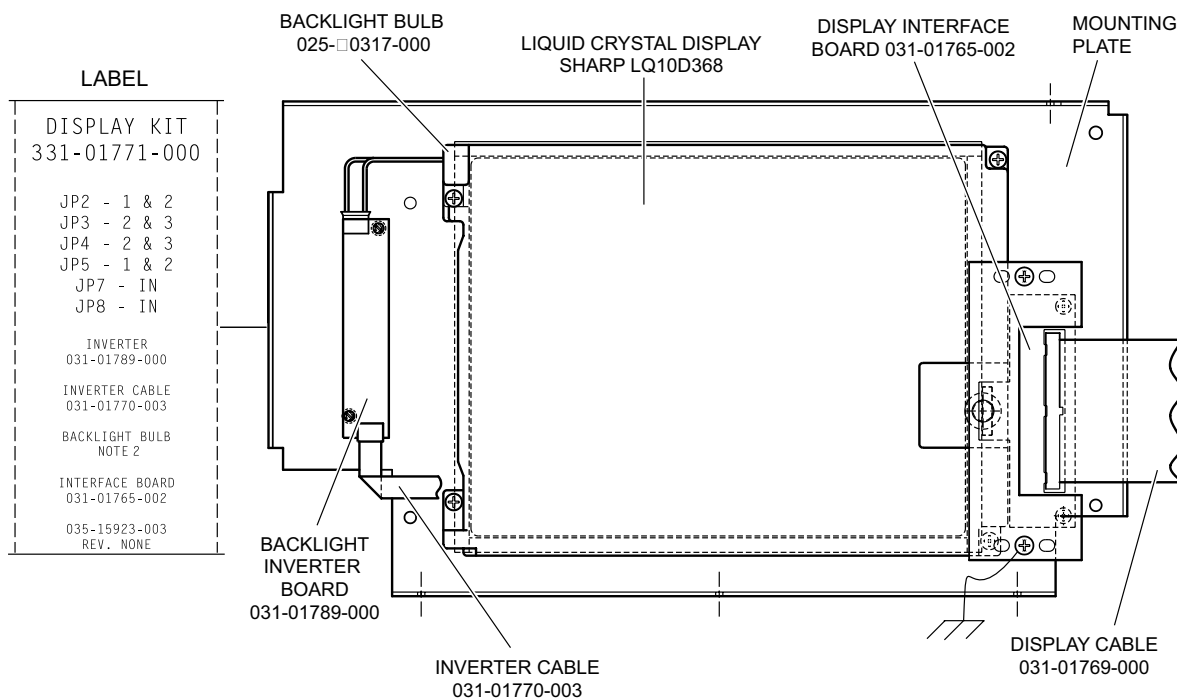
LG Semicon LP104V2-W (031-02046-000) and SHARP LQ104V1DG61 (031-02886-000) Display**Removal**

The Lamp slides into the Display from left to right and is secured with a screw.

1. Remove Control Power from the OptiView™ Control Center.
2. Remove protective cover from rear of Display.
3. Disconnect Lamp AC power connector from Backlight Inverter Board.
4. Using small Phillips screwdriver, remove lamp retaining screw.
5. Grasp Lamp AC power connector and gently pull until Lamp housing is completely removed from the Display.

Installation

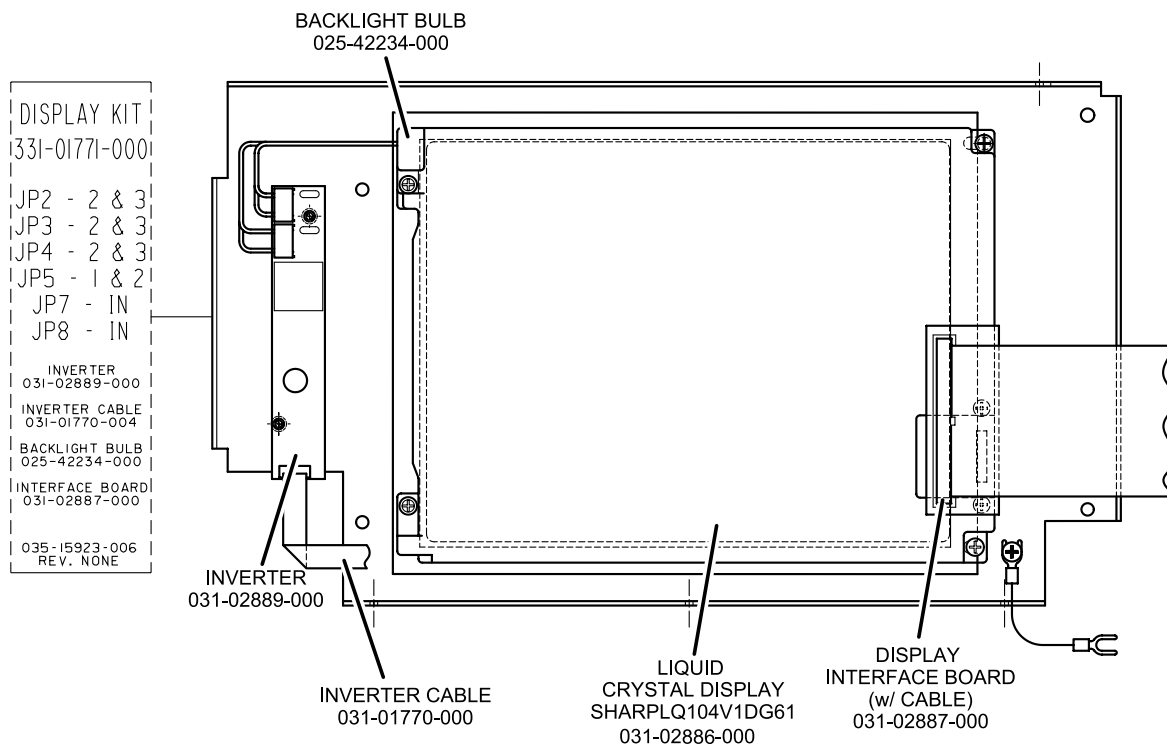
1. Slide new Lamp into Display from left to right until Lamp housing is fully inserted.
2. Secure Lamp with Lamp retaining screw.
3. Connect Lamp AC power connector to Backlight Inverter Board.
4. Apply AC power to OptiView™ Control Center.



NOTE:

1. Configure Microboard Program Jumpers per label.
2. 025-33752-000 (prior to October 2002)
025-40317-000 (after October 2002)

FIGURE 27 - LIQUID CRYSTAL DISPLAY ASSEMBLY – SHARP LQ10D367/368 (031-01774-000) DISPLAY



NOTE:

1. Configure Microboard Program Jumpers per label.

FIGURE 28 - LIQUID CRYSTAL DISPLAY ASSEMBLY – SHARP LQ104V1DG61 (031-02886-000) DISPLAY



1. Configure Microboard Program Jumpers per label.

FIGURE 29 - LIQUID CRYSTAL DISPLAY ASSEMBLY – LG SEMICON LP104V2-W (031-02046-000)



FIGURE 30 - LIQUID CRYSTAL DISPLAY TYPICAL CONTROL SIGNAL TIMING

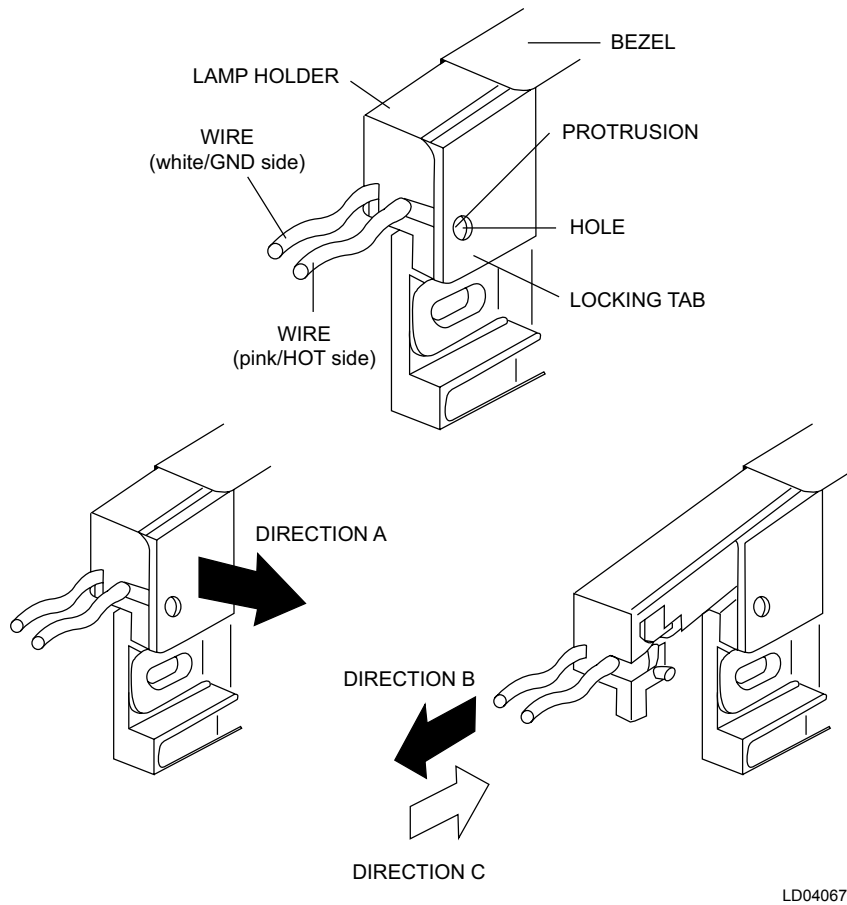


FIGURE 31 - DISPLAY (SHARP LQ10D367/368) LAMP REPLACEMENT

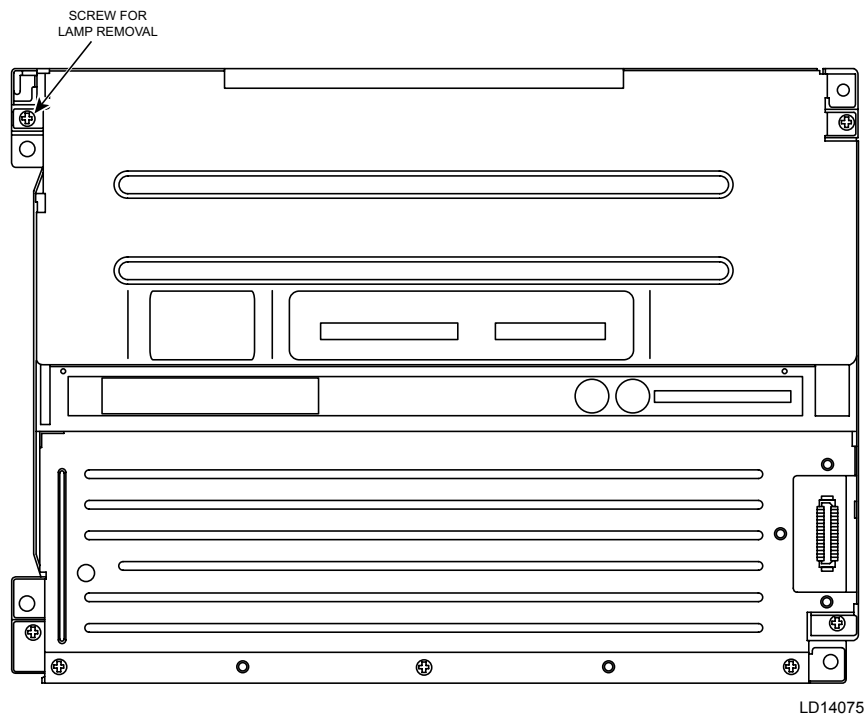


FIGURE 32 - DISPLAY (SHARP LQ104V1DG61 (031-02886-000) AND LG LP104V2-W (031-02046-000))

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SECTION 9 - DISPLAY INTERFACE BOARD

The Display Interface Board is located on the Liquid Crystal Display and is part of the Microboard interface to the Display. It permits the use of Displays by different manufacturers, by providing the Microboard with a means of automatically determining which Display is present.

Since different display manufacturers require different timing and control signals, the Microboard Display Controller must be configured to meet the requirements of the actual display installed. When AC power is applied to the OptiView™ Control center, the Microboard reads the Panel Identification (PID0 thru PID3) voltage levels on the Display Interface Board during the power-up sequence to determine which display is present. These voltage levels indicate the actual display installed and the Display Controller is automatically configured appropriately.

To provide the appropriate Panel ID voltage levels for the different displays, there are different Display Interface Boards. These boards have permanent wire jumpers that provide the voltage levels to the microboard for Panel ID signals (PID0 thru PID3). These jumpers connect the signals to either ground or open-circuit. When connected to ground, the voltage level for that signal is 0VDC. When open, the voltage level is the VCC logic level which is either 3.3VDC or 5.0VDC, depending on the display (refer to Microboard Program Jumper JP2).

The following are the different Display Interface Boards and the Panel ID signals they provide to the Microboard:

TABLE 7 - DISPLAY INTERFACE BOARD

DISPLAY INTERFACE BOARD	DISPLAY MANUFACTURER	PANEL ID
031-01765-001	LG Semicon LP104V2-W (031-02046-000)	PID0 – IN (GND) PID1 – OUT (VCC) PID2 – OUT (VCC) PID3 – OUT (VCC)
031-01765-002	SHARP LQ10D367/368 (031-01774-000)	PID0 – OUT (VCC) PID1 – IN (GND) PID2 – OUT (VCC) PID3 – OUT (VCC)
031-02887-000	SHARP LQ104V1DG61 (031-02886-000)	PID0 – OUT (VCC) PID1 – IN (pin 45 is tied to 44) (GND) PID2 – No Connection Open (VCC) PID3 – No Connection Open (VCC)

The Displays can operate in either Normal or Reverse mode for the right/left (R/L) and up/down (U/D) scan. Normal for the R/L scan is left to right. Normal for the U/D scan is top to bottom. As used in the OptiView™ Control Center, it is configured to operate in Normal mode for both of these scans.

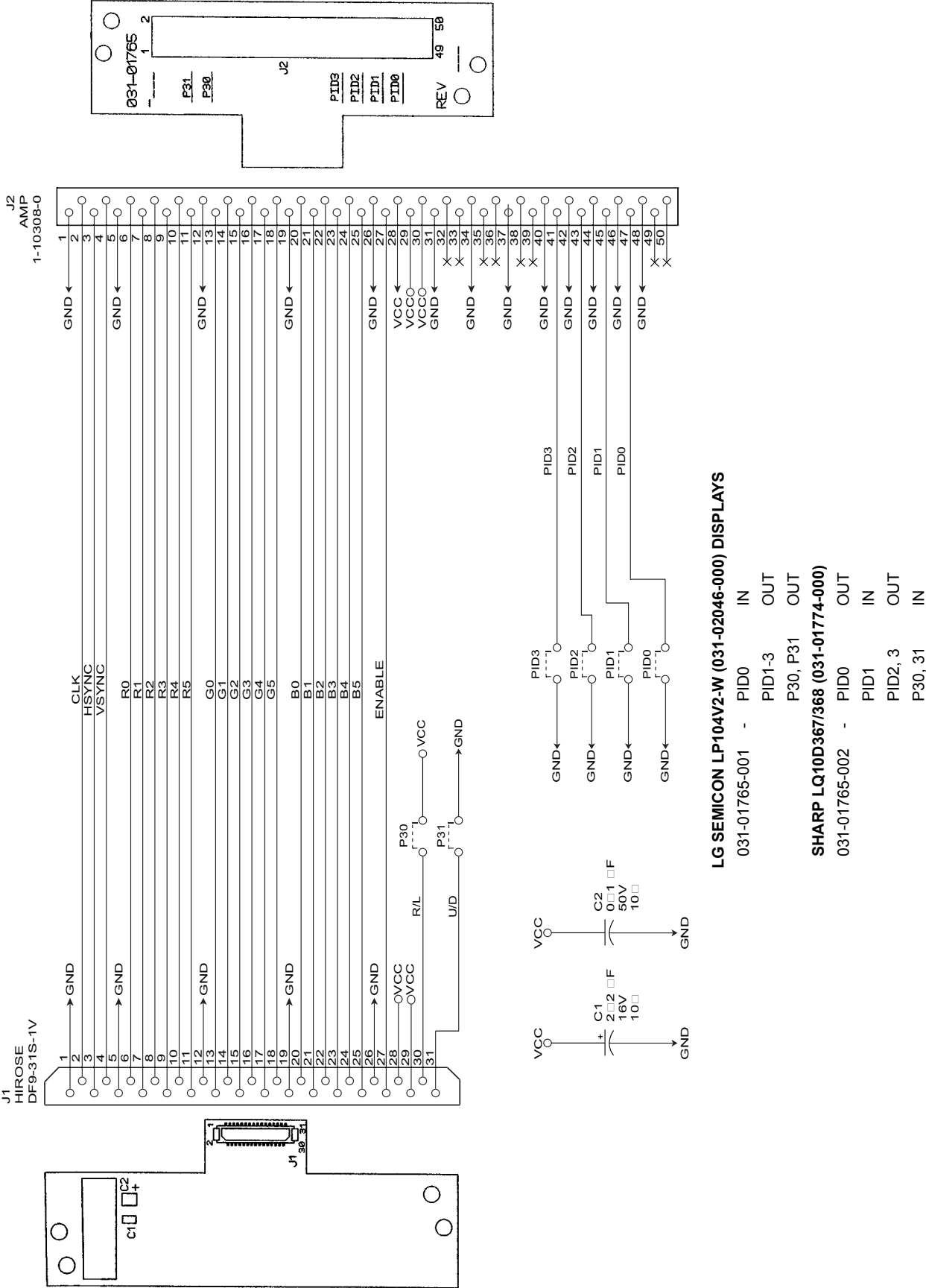
The Reverse mode for R/L is right to left. Reverse mode for U/D is bottom to top. The Display Interface Board provides the appropriate signals to the display to put it in Normal scan mode. By hardwired jumper or wiring configuration, the signal is either tied to ground, VCC (+3.3VDC or +5VDC, as determined by Microboard Program Jumper JP2) or left open as follows:

TABLE 8 - DISPLAY INTERFACE BOARD WIRING

DISPLAY INTERFACE BOARD	DISPLAY MANUFACTURER	PANEL ID
031-01765-001	LG Semicon LP104V2-W (031-02046-000)	P30 – OUT (Open) P31 – OUT (Open)
031-01765-002	SHARP LQ10D367/368 (031-01774-000)	P30 – IN (VCC) P31 – IN (GND)
031-02887-000	SHARP LQ104V1DG61 (031-02886-000)	J1-30 – (VCC) J1-31 – (GND)

Display Interface Boards are available individually for service replacement. The part number of the Display Interface Board for the installed display is listed on a label attached to the display mounting plate. The appropriate board is also supplied with display kit 331-01771-000.

The red, green and blue display drive and control signals are simply passed through the **Display Interface Board**. The value of VCC is either +5VDC or +3.3VDC, as determined by the position of Program Jumper JP2 on the microboard.



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FIGURE 33 - DISPLAY INTERFACE BOARD 031-01765-001 AND 031-01765-002

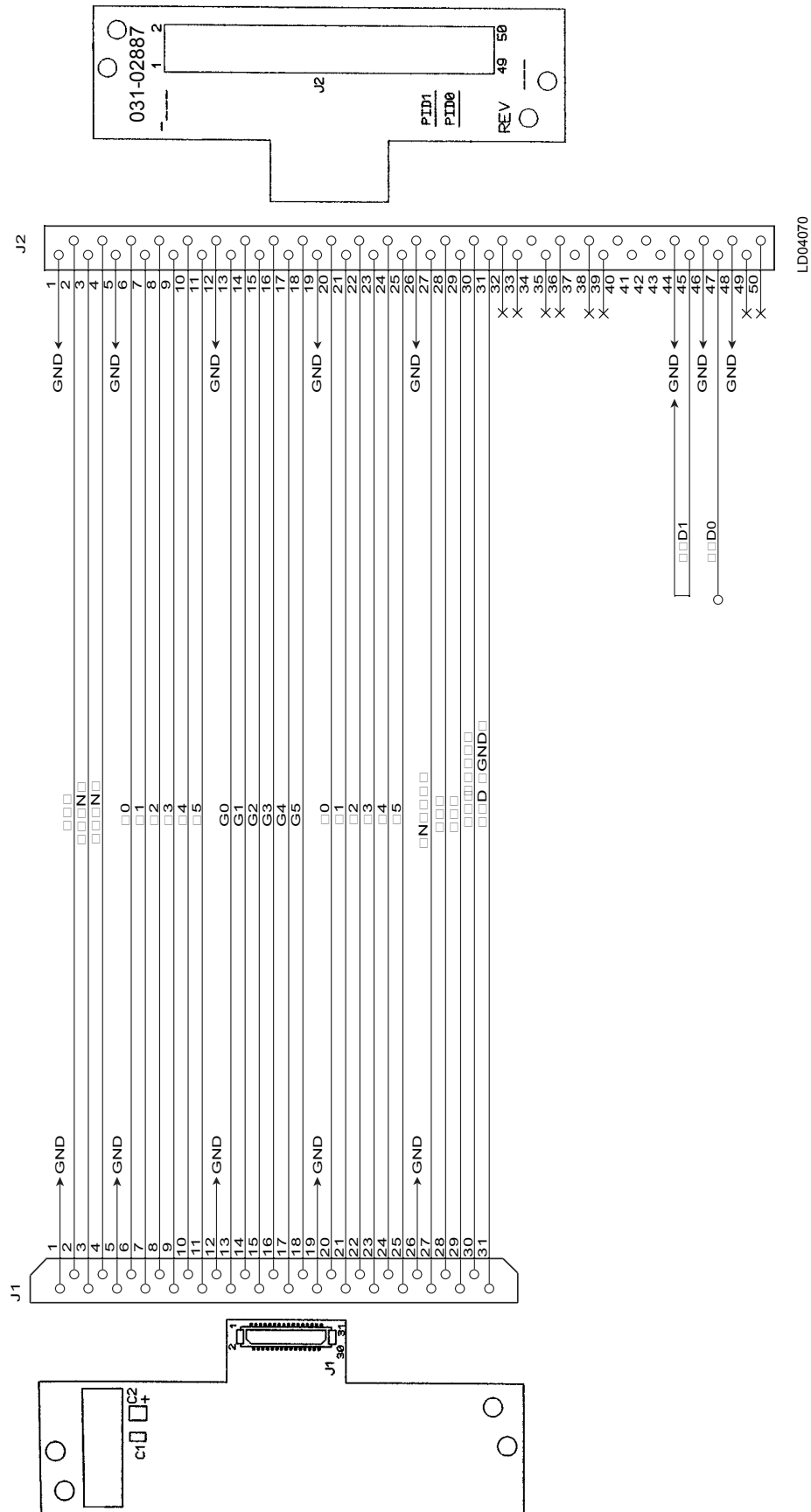


FIGURE 34 - DISPLAY INTERFACE BOARD 031-02887-000

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SECTION 10 - DISPLAY BACKLIGHT INVERTER BOARD

The **Display Backlight Inverter Board** generates a high voltage AC signal that is applied to the backlight lamp, causing it to illuminate. The magnitude of the signal determines the lamp brightness. Displays by some manufacturers have two lamps; one at the top and one at the bottom of the display. Other display manufacturers have only a lamp at the top of the display.

An **Inverter** converts low level DC voltage (+12VDC or +5VDC, as required by the manufacturer) from the Microboard to a 500 to 1500VAC 60K Hz signal that is applied to the lamp. The higher the AC voltage, the greater the brightness of the lamp. When this voltage is not present, the lamp is turned off.



High voltage, up to 1500VAC, is present at the output of the backlight inverter board. Refer to Figure 35 and 36 to locate the output connectors. Use extreme caution when working in this area!

Different Display manufacturers require different Backlight Inverter Boards. The different board designs require different control voltage inputs. To accommodate these variations, Microboard Program Jumpers JP3 - JP5, JP7 and JP8 must be configured to provide the required voltage levels. A label attached to the Display mounting plate lists the required Program Jumper configuration for that particular display. Refer to *SECTION 4 - MICROBOARD 031-02430-007* for required Program Jumper configurations for the various Display applications.

Under Program control, the Microboard generates the control signals that are applied to the Backlight Inverter Board. The Program determines when the lamp is turned on and off. It also adjusts the lamp brightness. To increase the average lamp life of 25000 hours, the lamp brightness is normally adjusted to 50%. This brightness level will still allow the display to be visible. When the program senses a key on the Keypad has been pressed, it adjusts the brightness to 100% (maximum).

The lamp illumination high voltage AC is generated from either +12VDC or +5VDC as required by the

manufacturer. Microboard Program Jumper JP5 must be positioned to provide the required voltage. The Microboard provides the **Backlight Enable** signal. This signal turns the lamp on and off. Some manufacturers require this signal to be +12VDC, others require +5VDC. Program Jumper JP4 must be positioned to provide the required voltage. Further, some applications require this signal to be a +VDC (+12VDC or +5VDC) to turn on the lamp. Others require this signal to be 0VDC to turn on the lamp. Program Jumper JP3 must be positioned to provide the required polarity.

Depending upon the display manufacturer, the brightness control input from the Microboard must be either a variable voltage or a variable resistance. Microboard program jumpers JP7 and JP8 are used to provide the appropriate technique. The lamp dimmer circuit on the Microboard is an IC that is the electrical equivalent of a 10K ohm potentiometer with 100 positions or steps. The Program adjusts the position of the potentiometer. When configured for variable voltage (JP7 and JP8 installed), the output between Microboard J6-7 and J6-8 is a 0 to +5.0VDC signal. Not all applications require the full 5.0VDC range. If configured for variable resistance (JP7 and JP8 removed), the output between Microboard J6-7 and J6-8 is a 0 to 10K ohm variable resistance.

The OptiView™ Control Center could be supplied with any of several approved Displays. Each Display requires a specific Backlight Inverter Board as specified below and in *Figure 35 on page 74 and Page 75*. These boards are individually available as service replacement parts (the required Backlight Inverter Board part number is listed on the label attached to the Display mounting plate). However, service replacement Displays are provided in a kit (YORK P/N 331-01771-000) that includes the appropriate Backlight Inverter Board (refer to *SECTION 8 - LIQUID CRYSTAL DISPLAY*).

SHARP model LQ10D367/368 (031-01774-000) AND LG Semicon LP104V2-W (031-02046-000) displays require a Backlight Inverter Board 031-01789-000 (Refer to *Figure 35 on page 74*).

SHARP model LQ104V1DG61 display (031-02886-000) requires Backlight Inverter Board 031-02889-000 (Refer to *Figure 36 on page 75*). These boards generate a lamp illumination high voltage AC from +12VDC. When the Backlight Enable signal is +5VDC, the high voltage signal is applied to the lamp. When the Enable is 0VDC, the high voltage is removed from the lamp.

The lamp brightness is controlled by a variable voltage signal, developed by the lamp dimmer circuit (Refer to *Figure 7 on page 36*) on the Microboard and applied to the Inverter Board. The lamp dimmer circuit varies the voltage over the range of 0 to +3.0 VDC. 0VDC produces maximum brightness (100%). +3.0VDC produces minimum brightness (0%). Voltages between these values produce a linear brightness between 100% and 0%.

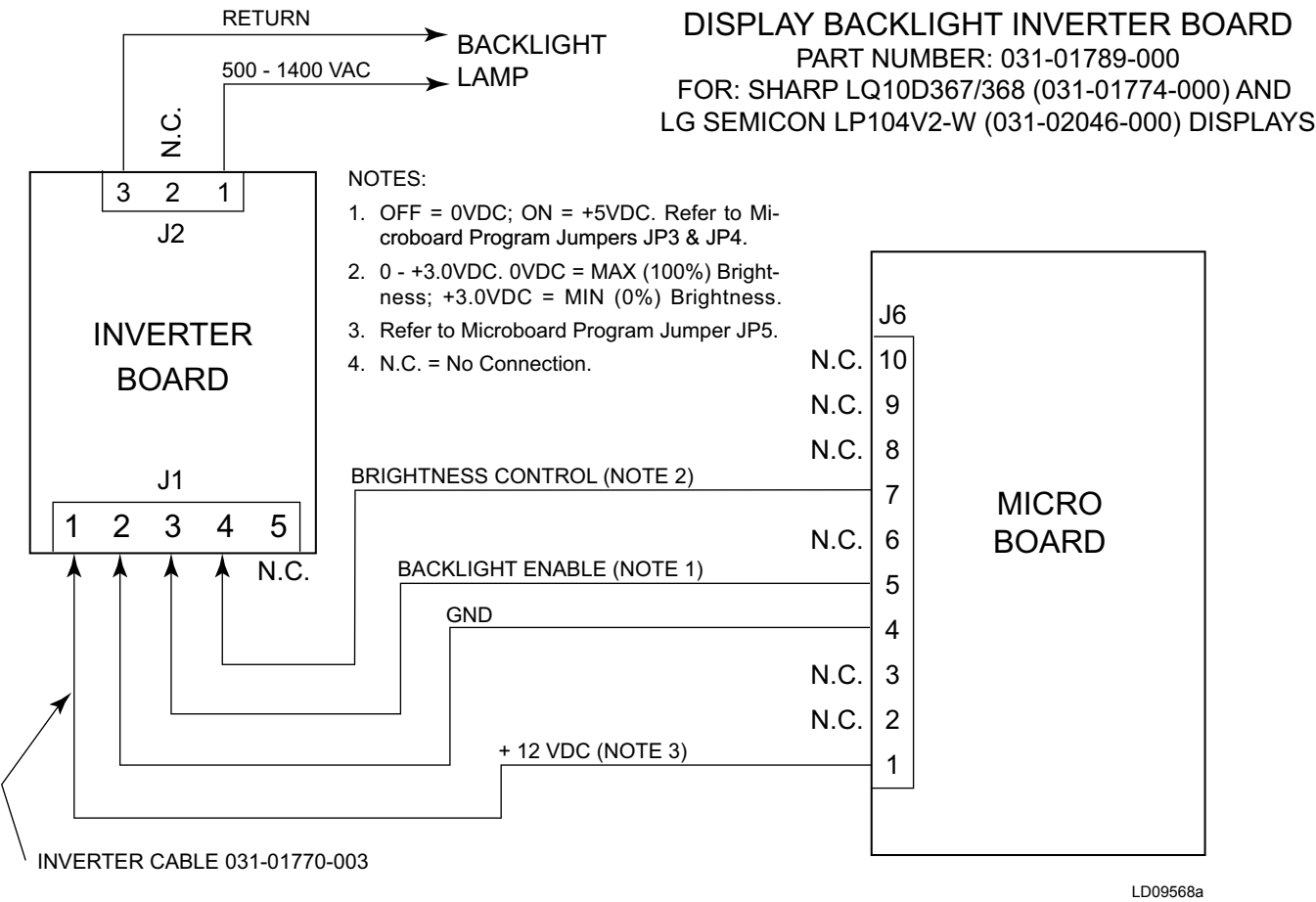
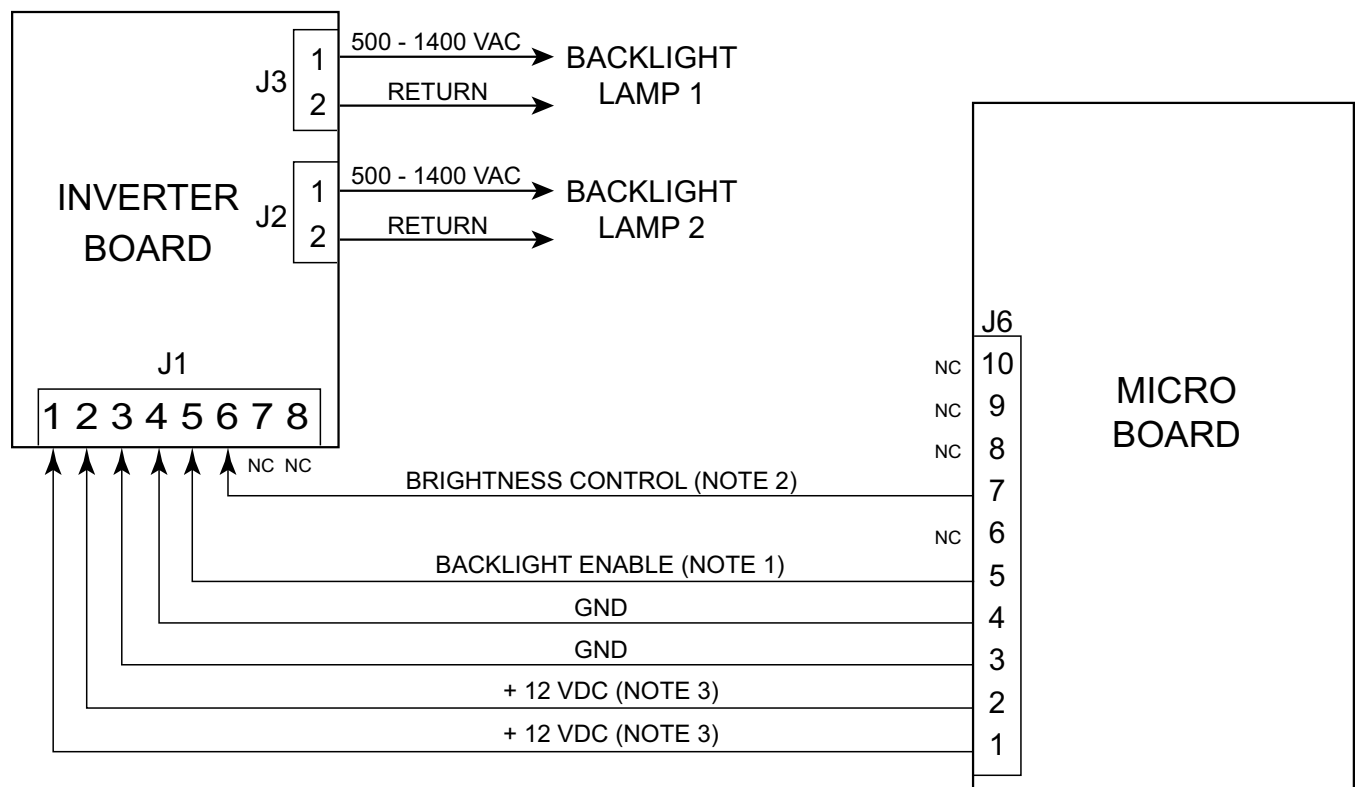


FIGURE 35 - DISPLAY BACKLIGHT INVERTER BOARD (SHARP LQ10D367/368 (031-01774-000) AND LG SEMICON LP104V2-W (031-02046-000))

DISPLAY BACKLIGHT INVERTER BOARD
PART NUMBER: 031-02889-000
FOR: SHARP LQ104V1DG6 (031-02886-000) DISPLAYS



NOTES:

1. OFF = 0VDC; ON = + 5VDC. Refer to Microboard Program Jumpers JP3 and JP4.
2. 0- + 3.0 VDC. 0VDC = MAX (100%) brightness. +3VDC = MIN (0%) brightness. Refer to Microboard Program Jumpers JP7 and JP8.
3. Refer to Microboard Program Jumper JP5.
4. N.C. = No Connection.

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FIGURE 36 - DISPLAY BACKLIGHT INVERTER BOARD - SHARP LQ104V1DG61 DISPLAY 031-02886-000

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SECTION 11 - KEYPAD

The **Keypad** contains touch-sensitive keys that allow the Operator to interface with the OptiView™ Control Center. The Operator presses the keys to request the desired screens of information and enter System Setpoints.

The top layer of the Keypad contains embossed areas identifying the keys. Under each embossed key area are two conductors, one on top of the other, separated by an air space. The conductors are arranged in a matrix of rows and columns and connected to the Keypad connector as shown in *Figure 38 on page 78*. The embossed area of each key is located directly over the intersection point of the conductors. Pressing the embossed key area causes contact and electrical continuity between the two conductors. For example, pressing the “1” key creates continuity between the Keypad connector pin 5 (column 3) and pin 13 (row 4). Since this connector is interfaced to the Microboard (J18), the Microboard senses this continuity as described below and concludes the “1” key is pressed.

The Microboard Program continuously scans the Keypad to determine if a key is pressed. Beginning with row 1 and proceeding through all rows, the Program places a “logic low” (less than 1VDC) on a row, a “logic high” (greater than 4VDC) on the remaining rows and reads the columns. A logic low in any column indicates a key in that column and row is pressed. For example, if at the

time row 4 is being driven low, if column 3 is low, then the Micro concludes the key at coordinate of row 4 and column 3 is pressed. Since the coordinates of all keys are stored in the Microboard’s Program, it can identify which key is at this coordinate and responds accordingly. In this example the “1” key is pressed.

In order for the Microboard to reliably detect closed and open keys, each key must meet a closed circuit and open circuit resistance requirement. When a key is pressed, the contact resistance must be < 100 Ohms. When a key is not pressed, the contact resistance must be > 1Meg Ohm. If the Microboard is not responding to a pressed key, or if it’s detecting a closed key when none are pressed, it could be because the contact resistance requirements are not being met. The operation of each key can be checked with an Ohmmeter. To check the open and closed contact resistance of any key. Refer to the *SECTION 32 - DIAGNOSTICS AND TROUBLESHOOTING*.

The Keypad is attached to the front of the OptiView™ Control Center door with an adhesive backing. If service replacement is required, start at one corner and slowly peel the Keypad from the door. The rear side of the replacement Keypad is coated with an adhesive covered with a paper backing. Remove the paper backing, align the Display and rocker switch openings and apply the Keypad to the door.

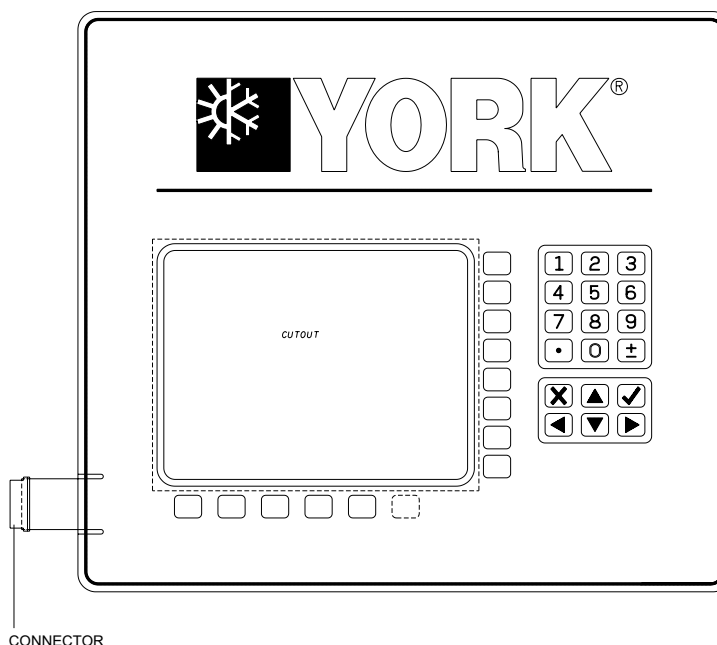
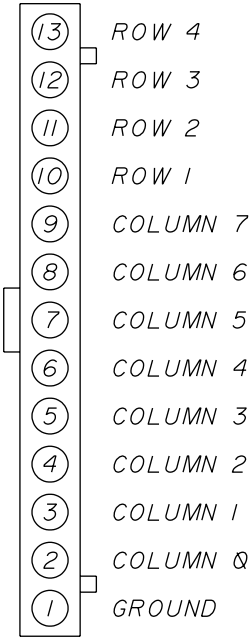
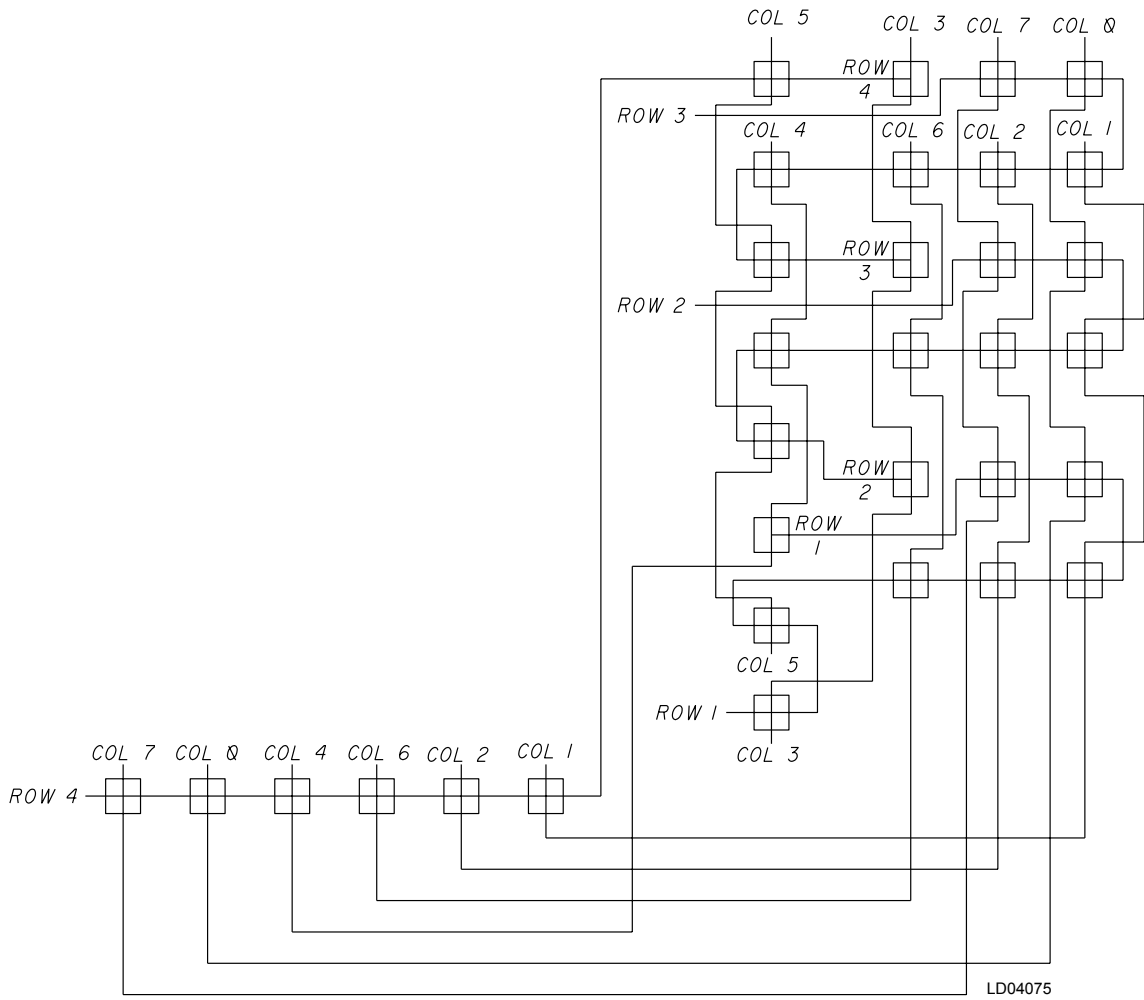


FIGURE 37 - KEYPAD



CONNECTOR PIN OUT

LD04076

FIGURE 38 - KEYPAD

SECTION 12 - OPTIVIEW DC POWER SUPPLY

The Power Supply provides the DC power for the LCD Display and all the printed circuit boards in the OptiView™ Control Center. It receives a 102 to 132VAC input from an external power source and provides the following DC outputs:

- -12VDC
- +12VDC
- +5VDC
- +24VDC
- Ground

The +24VDC output provides power to the LTC I/O Board.

The -12VDC, +12VDC, Gnd and +5VDC outputs are applied to the Microboard. There, these voltages are applied to the circuits requiring the respective voltage. From the Microboard, the +12VDC and +5VDC are distributed to other system components requiring these voltages. These include the E-Link Gateway, I/O Board, LCD Display and Display Backlight Inverter Board. The Condor Power supply allows adjustment of the +5VDC output. To account for losses in wiring and connections and assure sufficient voltage level at the microboard input, the “V Adj” (R51) potentiometer is adjusted to achieve +5.1VDC at the input to the Microboard J1-1.

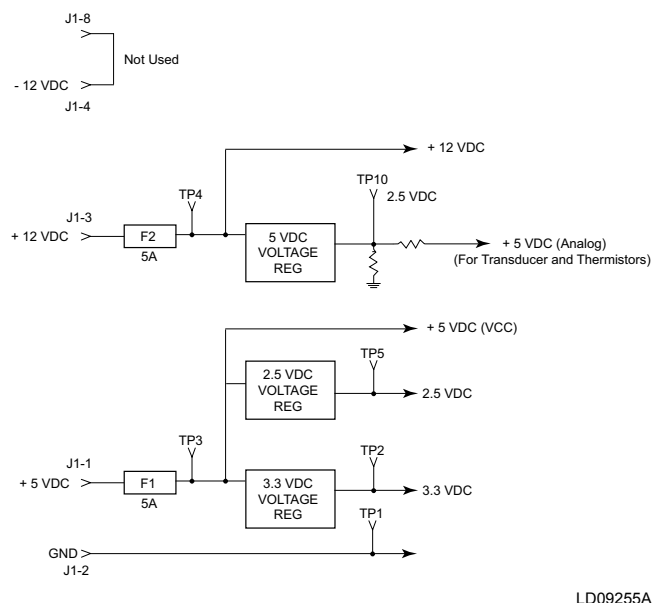
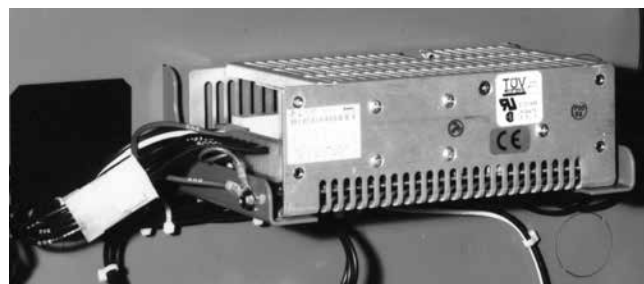


FIGURE 39 - MICROBOARD (031-02430-007) DC POWER SUPPLY TEST POINTS

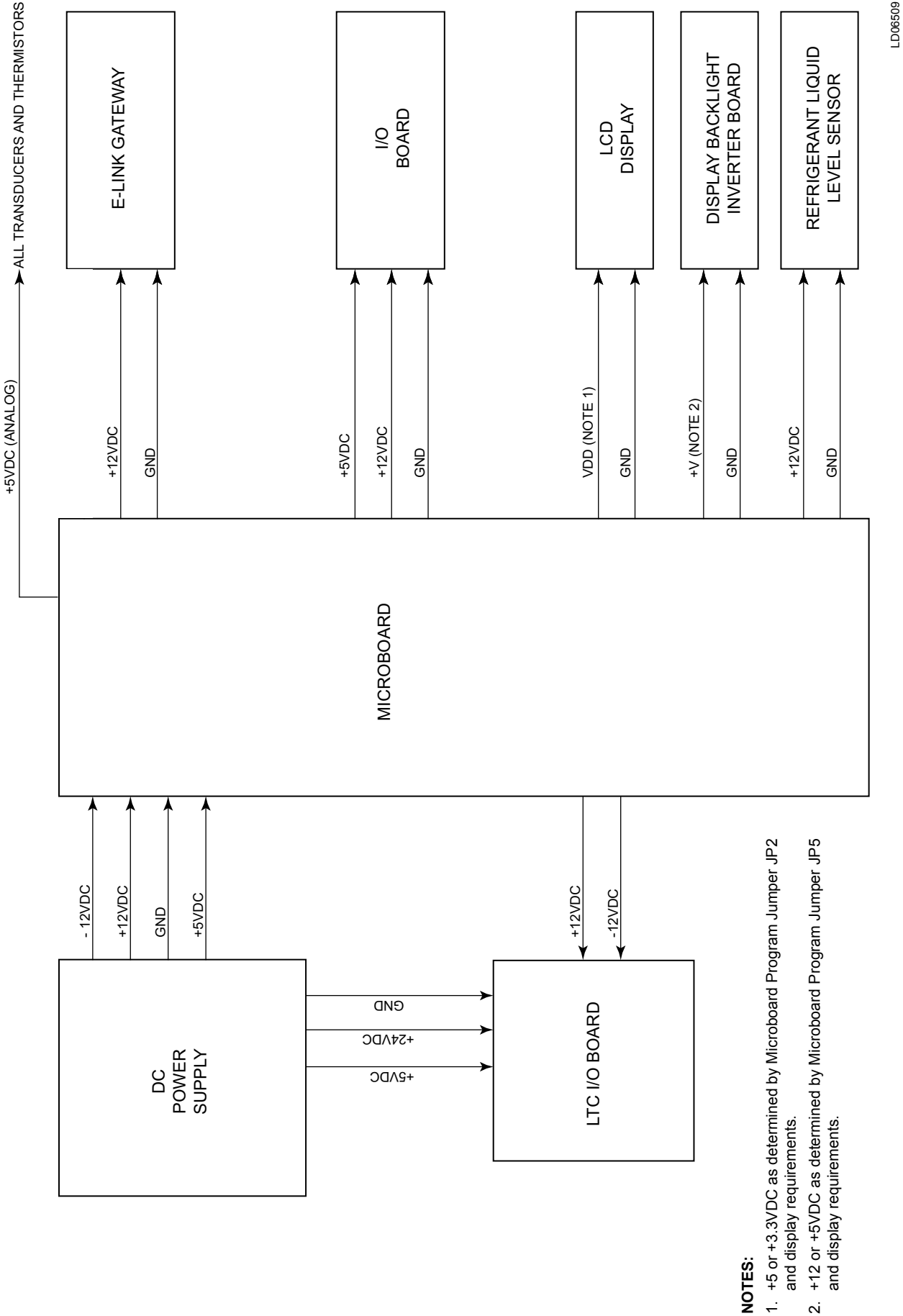
As shown in *Figure 39 on page 79*, the Microboard contains two voltage regulators that create separate +5VDC and +3.3VDC supplies. The +5VDC supply is dedicated to all the Microboard Analog circuits and is labeled as the +5VDC (Analog) supply. It is also routed to all Pressure Transducers, Temperature Thermistors, and flow switches. This permits all Analog circuits to be powered by the same supply, eliminating any offsets caused by voltage regulator drift. The Microboard has an additional voltage regulator that provides a 2.5VDC power source. The +3.3VDC supply is utilized by the Microprocessor, Flash Memory Card and other digital circuits. It could also be applied to the Backlight Inverter Board, depending on the Display manufacturer's requirements as explained below.



29136A

FIGURE 40 - POWER SUPPLY

Different Display manufacturers can require different supply voltages for their display and supporting circuits. To accommodate the different Display manufacturer's voltage requirements, Microboard Program Jumpers JP2 and JP5 must be positioned to provide the required supply voltages to the Display and the Display Backlight Inverter Board. Either +5VDC or +3.3VDC, as determined by JP2, is applied to the Display. Either +12VDC or +5VDC, as determined by JP5, is applied to the Display Backlight Inverter Board. Refer to *SECTION 4 - MICROBOARD 031-02430-007*.



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FIGURE 41 - OPTIVIEW POWER SUPPLY – DC POWER DISTRIBUTION (REFER TO OPTIVIEW™ CONTROL CENTER WIRING DIAGRAM FOR WIRE CONNECTIONS)

SECTION 13 - CONTROL POWER CABINET

The chiller includes a separate control power cabinet which contains an Uninterruptible Power Supply (UPS) with battery back-up and the DC power supplies and conditioning hardware mentioned below. The cabinet is liquid cooled through an air-exchange coil to a parallel loop from coolant used for VSD cooling. The function of this cabinet and included circuitry is to provide continuous power to designated critical loads when line power is available to the chiller and for a period of time when line power is interrupted. The critical loads are those devices necessary for maintaining the motor shaft levitated and compressor backspin managed during shutdown and allow for reduced recovery time to restart chilling when power is restored. The critical loads are:

- Low stage Variable Geometry Diffuser (VGD) actuator
- High stage Variable Geometry Diffuser (VGD) actuator (two stage option)
- Magnetic Bearing Control (MBC) boards
- VSD logic board
- OptiView™ control board

120VAC power from the control transformer in the Variable Speed Drive (VSD) supplies the input of the UPS in the control power cabinet. This source feeds through the UPS to 120VAC output and also keeps the battery charged. Upon loss of line power, the UPS and 12VDC battery provide uninterrupted transfer to maintain 120VAC from the UPS.

The 120VAC output from the UPS supplies the following devices in the cabinet:

- A 48VDC $\pm$ 1% power supply for the output to the VGD actuator(s).
- A 160 VDC + 1% power supply for the MBC boards. The output of the supply passes through a filter located in this power cabinet to condition the power for the quality required by the MBC.
- A 120VAC feed to the VSD.
- A 120VAC feed to the OptiView™ panel via the VSD cabinet.

The UPS battery is sufficiently sized to provide power for the critical loads at worst-case conditions for the longest shutdown time possible during a loss of line

power. This capacity is sufficient for three power fail events in a twenty minute interval or a total of six events in one hour.

When the UPS does not output any power, the OptiView has no power to boot up. The UPS also does not begin to output power if the battery is missing or disconnected when line power is first applied to the UPS.

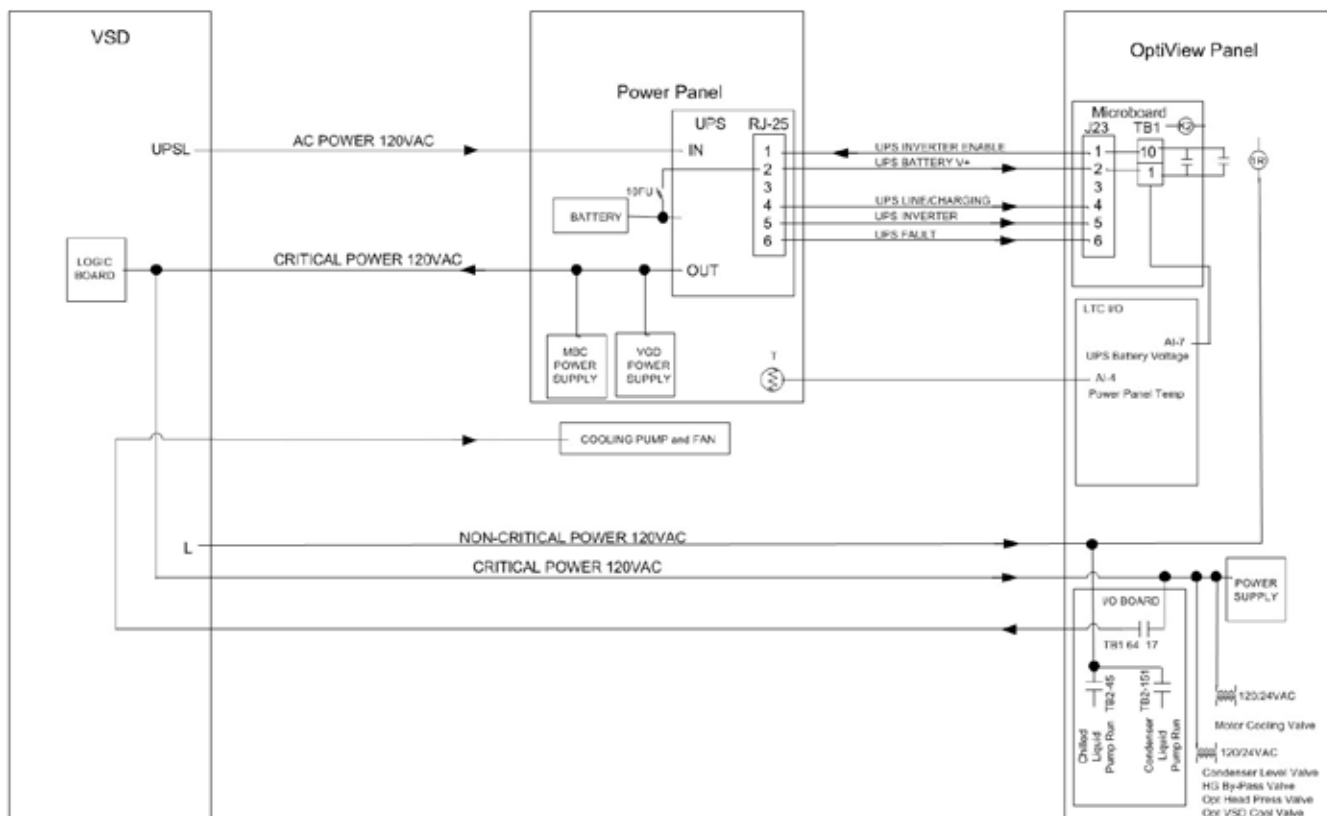
The battery condition is monitored by the control panel as follows:

- Indication of a battery problem based on measurements while it is charging from the UPS.
- Indication of a battery problem based on measurements while it is providing power to the UPS with loss of line power.
- Indication of a disconnected battery.
- Indication that the UPS is not charging the battery when line power is available.

The relationship of voltage at the battery to known loads is used by the chiller controls to assess the items listed above. Voltage is fed directly from the battery leads to the panel LTC I/O board analog input AI7. The control uses several parameters to evaluate the battery.

- Inverter Low Battery Voltage Threshold is a programmable setpoint with default 11.0 V, that can only be changed between 10.5V and 12.0V in ADMIN access.
- Line Low Battery Voltage Threshold is calculated from the Line Low Battery Voltage Lookup value + the Line Low Battery Voltage Offset (Default, 0.0V, Programmable between -1.0V and 0.2V in ADMIN access only). It is limited to the range of 11.3V to 13.3V. The Line Low Battery Voltage Lookup value is based on the prevailing power panel temperature in the table below:

POWER PANEL TEMPERATURE	LINE LOW BATTERY VOLTAGE LOOKUP
40.0 °F	13.1 V
60.0 °F	12.8 V
80.0 °F	12.5 V
100.0 °F	12.4 V
120.0 °F	12.3 V



Normal Power – 120VAC is supplied from the VSD out the L line to the Non-Critical Power Circuit which energizes the 1R relay. The 1R contacts pass the UPS Battery Voltage V+ 12VDC back to the UPS as the UPS Inverter Enable Signal which enables the UPS to operate in the Pass-Through Mode. In Pass-Through Mode, the 120VAC from the VSD UPSL line runs in the UPS AC Input and is routed out the UPS OUT through the Critical Power wiring thereby powering the VSD Logic Board and the OptiView Power Supply. Once the OptiView boots up, the Microboard closes the K2 Relay whose contacts are in parallel with the 1R contacts providing the +12VDC UPS Inverter Enable Signal to the UPS. With line voltage applied to the UPS, it will run in Battery Charge Mode. The UPS will send a low signal through the RJ25 cable pin 4 to indicate to the OptiView that the UPS has normal input line voltage and is in charging mode. The battery voltage on Microboard TB1-1 is routed to the LTC I/O AI-7 where the battery voltage is measured.

Power Outage – When the incoming power drops off, the UPS will automatically switch to Inverter Mode providing a Quasi Sine Wave 120VAC to the Critical Power circuits. The UPS will send a high signal out the RJ25 pin 4 and a low out pin 5 to indicate to the

OptiView Microboard that the incoming line voltage is missing and the UPS is now operating in Inverter Mode. The Non-Critical power circuit drops off de-energizing the 1R relay but the Inverter Enable signal is maintained by the parallel K2 relay which is controlled by the OptiView Microboard. The OptiView Microboard, VSD Logic board and other Critical components will continue to run since they are powered by the UPS Inverter Critical Power. The Microboard will command the VSD to stop while maintaining the levitate command to the MBC. The Microboard monitors the motor speed and once it drops to 0 the MBC will be commanded to de-levitate thereby ensuring a soft landing for the motor. The Microboard will then open the K2 relay contacts to turn off the UPS Inverter Enable.

Power Panel Temperature – Since battery life is affected by temperature, a cooling coil and fan are installed in the Power Panel. A thermistor is mounted in the Power Panel to provide the internal cabinet temperature reading to the OptiView panel. The Microboard determines when the cooling is required and the I/O board energizes the cooling pump and fan. When cooling is not required, the Microboard commands the I/O Board to open the relay contact connected between TB1-64 and TB1-17.

The following actions are taken when applicable:

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 – UPS – Line Low Battery Voltage

This auto reset warning is set when all of the following are true:

- 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

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.

Warning – UPS – Battery Not Connected

This is an auto reset warning. The minimum and maximum Battery Voltage that occurs within each 10 second window is 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.

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 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.

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)

Faults Enable

The chiller control has a Battery Voltage Faults setting which is default to “Enabled”. It allows the battery voltage shutdowns to be active. It can only be disabled by a qualified JCI Service Technician in ADMIN access with a call to the Factory for the authorized password.

Battery Health Test

An automatic battery health test can be commanded from the Optiview panel when the chiller is off. It is described in the *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual. It uses similar technology as for the online monitoring, under controlled shutdown conditions to assess battery capacity.

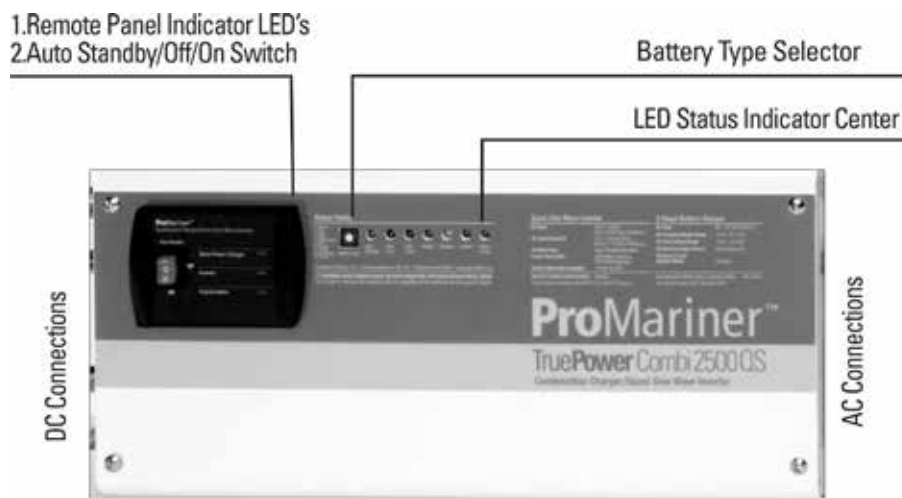
The power panel is cooled by a side stream of the VSD coolant, pumped through a fan-coil air exchange unit located in the panel. The power panel coolant pump and fan are switched on or off together through I/O board TB1-17 to 64. The Power Panel Cooling System is energized when any of the following are true:

- Chiller State is MBC Startup, Running, Soft Shutdown, or Coastdown.
- Chiller State is Stopped and Power Panel Temperature > Power Panel Cooling Threshold (80 to 120 °F, default 100°F). This temperature threshold is available in Service Access on the Power Panel screen.
- Manually enabled in Service Access from the Power Panel Screen with the Manual Power Panel Cooling button.

The Power Panel Cooling System is de-energized when the Chiller State is Stopped and Power Panel Temperature < Power Panel Cooling Threshold - 2.0 °F.

The power panel temperature is sensed inside the cabinet from a thermistor connected to the LTC I/O board AI4.

The UPS Battery Type Selector switch needs to be pointing to the #3 Position (AGM 2) for the YMC² chiller application. It is factory-set to this position, but should be verified during any troubleshooting of the panel.



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FIGURE 43 - UPS BATTERY TYPE SELECTOR SWITCH

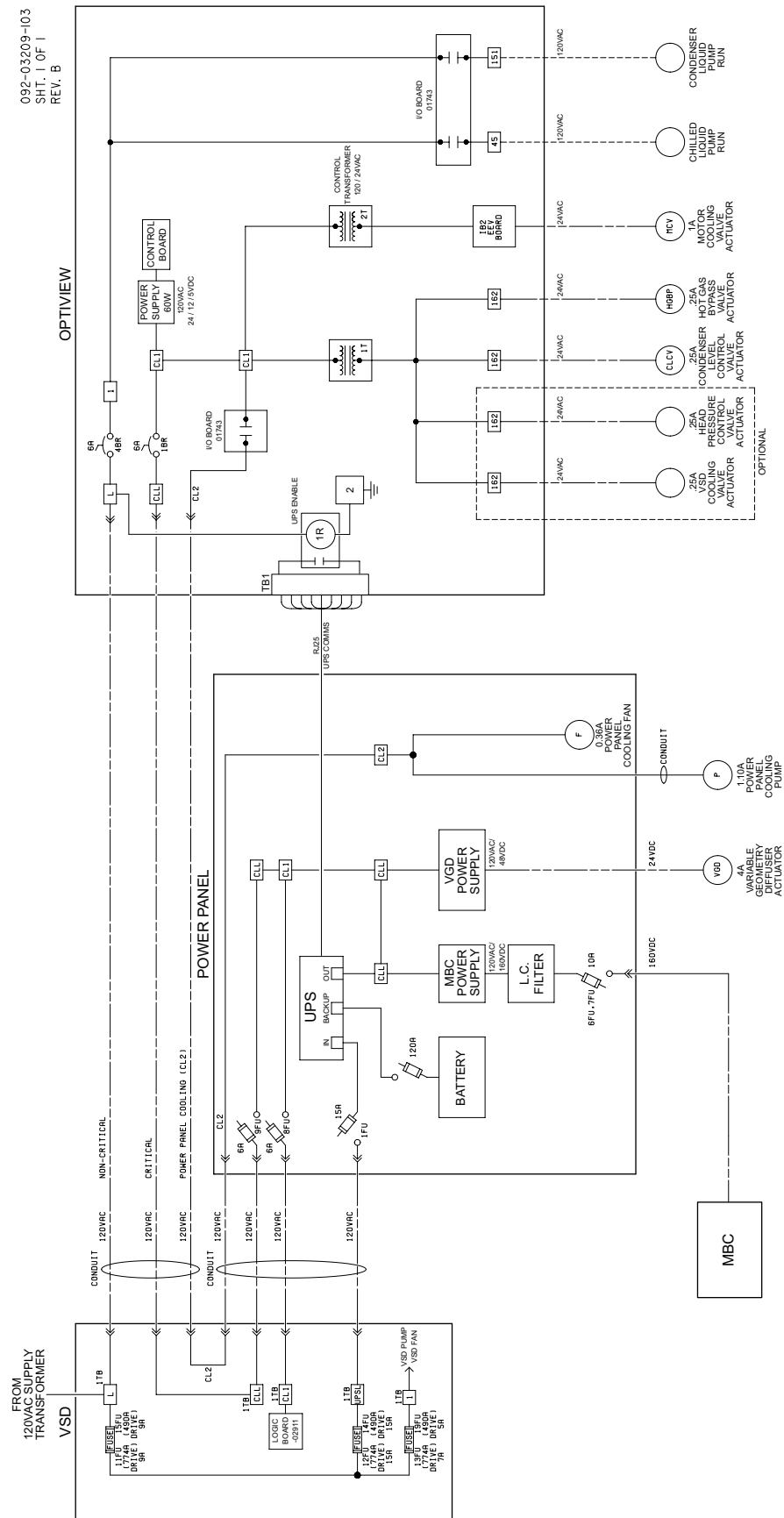


FIGURE 44 - CONTROL POWER CABINET

LD17145

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SECTION 14 - E-LINK GATEWAY

The E-Link Gateway provides Johnson Controls and YORK mechanical equipment such as the YMC² chiller with building automation system (BAS) networking connectivity. It is designed with three active serial ports: Port 1 and Port 4 are used for BAS networking, Port 2 is reserved for connecting to the equipment.

The E-Link Gateway may be installed in the factory as an option with the new equipment order or, it may be retrofitted into the panel at a later date.

The E-Link Gateway is powered by +12VDC from the microboard (J21).

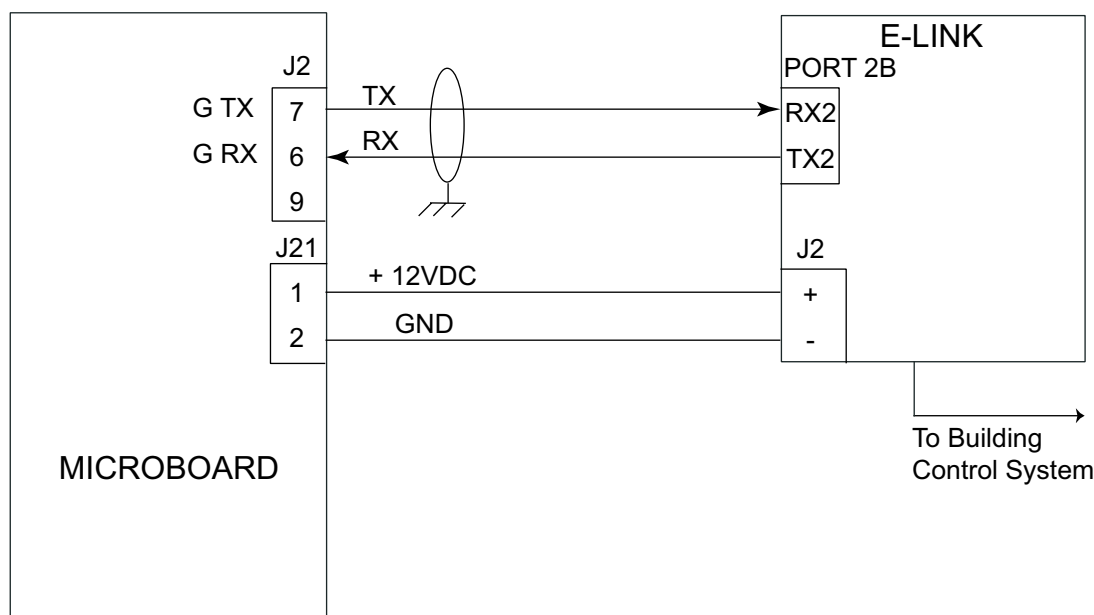
The E-Link Gateway communicates with the microboard COM 4B communications port via an RS-232 interface. As shown in the figure below. Microboard Program Jumper JP27 must be placed on pins 2 and 3 to allow data to be received from the E-Link.

If the BAS controller that is connected to the E-Link is going to provide remote start/stop signals, remote leaving chilled liquid temperature and/or remote current limit setpoints, the OptiView™ Control source must be set to BAS (ISN).

In operation, the microboard provides chiller pressures, temperatures and status to the E-Link in response to requests from the E-Link. Microboard status LED's illuminate when the microboard transmits and receives data on Com 4B. Green LED CR13 (RX4) illuminates when data is being received from the E-Link. Red LED CR12 (TX4) illuminates when data is being transmitted to the E-Link. Similar LED's on the E-Link annunciate data transfer to/from the microboard.

If there is a communications problem between the microboard and E-Link, use the LEDs described above to analyze the problem. The COM 4B loop back test can be used to verify operation of the microboard COM 4B communications port. Refer to *SECTION 32 - DIAGNOSTICS AND TROUBLESHOOTING*.

The complete description of the E-Link Gateway Installation Instructions are available in form P/N 24-10404-9 II. This form can be obtained from the Johnson Controls Portal under Equipment Communications and Integration in the Documents Library or ordered from Baltimore Parts Center.



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FIGURE 45 - E-LINK INTERFACE BLOCK DIAGRAM

The E-Link has pre-defined data maps for the various models of chillers. One set of DIP switches on the E-Link select the chiller model data map, another set of DIP switches selects the BAS communication protocol.

For the YMC² chiller with Version K data, the E-Link APP A DIP switch should be set to a value of 34 for Imperial values and 35 for Metric values.

Set the E-Link APP B DIP switches based upon the following table.

TABLE 9 - BAS PROTOCOL QUICK START SELECTIONS

SWITCH SETTINGS	APP GROUP SWITCH B				OUTPUT PROTOCOL QUICK STARTS		
	8	4	2	1	PORT 1	PORT 3	PORT 4
0 ¹	0	0	0	0	MS/TP, AUTO, N, 8, 1	Modbus, 19,200, N, 8, 1	Terminal
1 ^{2,5}	0	0	0	1	MS/TP, AUTO, N, 8, 1	Modbus, 19,200, N, 8, 1	Terminal
2 ^{2,5}	0	0	1	0	MS/TP, AUTO, N, 8, 1	Modbus, 19,200, N, 8, 2	Terminal
3 ^{2,5}	0	0	1	1	MS/TP, AUTO, N, 8, 1	N2, 9,600, N, 8, 1	Terminal
4 ^{2,5}	0	1	0	0	N2, 9,600, N, 8, 1	MS/TP, 38,400, N, 8, 1	Terminal
5 ^{2,5}	0	1	0	1	Modbus, 19,200, N, 8, 1	MS/TP, 38,400, N, 8, 1	Terminal
6 ^{2,5}	0	1	1	0	Modbus, 19,200, N, 8, 2	MS/TP, 38,400, N, 8, 1	Terminal
7 ^{2,5}	0	1	1	1	Modbus, 9,600, E, 8, 1	MS/TP, 38,400, N, 8, 1	Terminal
8 ^{2,5}	1	0	0	0	Modbus, 9,600, N, 8, 1	MS/TP, 38,400, N, 8, 1	Terminal
9 ^{3,5,6}	1	0	0	1	N2, 9,600, N, 8, 1	Modbus, 19,200, N, 8, 1	LONWORKS – Pass through
10 ^{4,5,6}	1	0	1	0	N2, 9,600, N, 8, 1	Modbus, 19,200, N, 8, 1	LONWORKS – Conversion
11 ^{3,5}	1	0	1	1	Modbus, 19,200, N, 8, 2	N2, 9,600, N, 8, 1	LONWORKS – Pass through
12 ^{4,5}	1	1	0	0	Modbus, 19,200, N, 8, 2	N2, 9,600, N, 8, 1	LONWORKS – Conversion
13 ^{2,5}	1	1	0	1	Modbus, 9,600, E, 8, 1	Modbus, 19,200, N, 8, 2	Terminal
14 ^{2,5}	1	1	1	0	MS/TP, 38,400, N, 8, 1	N2, 9,600, N, 8, 1	Terminal
15 ⁷	1	1	1	1	Reserved	Reserved	Terminal

1. When making edits to User Report 4 (Port Configuration), Group Application Switch B **must** be set to zero. This setting ensures that the edits are stored. Otherwise, the edits are overwritten to the default values assigned to the particular Group Switch B setting the next time E-Link is reset, or power is cycled. Edits made in any other User Reports do not require alterations to either bank of Group Application switches. For standard set-up, not requiring modifications via User Report 4, use application switch B, settings 1 to 14.
2. The Terminal setting on Port 4 is restricted for factory use only. To comply with the LONMARK® specification, all data transmitted on the LonWorks network must be expressed in SI units (metric units). The LONWORKS ProtoCessor performs no unit conversions; it assumes that the data supplied is already correctly expressed.
3. Use Quick Start 9 and 11 if the equipment is supplying the data in SI units (the E-Link is not required to perform any conversions, so it operates in pass-through mode).
4. Use Quick Start 10 and 12 if the equipment is supplying the data in Imperial units and the E-Link is required to convert these units into SI.
5. Setting Switch T = ON, on the MAC address, forces TERMINAL mode of Port 3, at 57,600 baud, N, 8, 1. This setting is only required to debug the E-Link Gateway's operation, or access the User Reports.
6. Select Quick Starts 9 and 10 when connecting the E-Link Gateway to an ECO2 unit.
7. Quick Starts 15 on APP Group B, and 63 on APP Group A, are reserved for field adjustments.

SECTION 15 - PRESSURE TRANSDUCERS

System pressures within the chiller (e.g., the evaporator and the condenser) are sensed by Pressure Transducers. When the chiller is equipped with the Variable Geometry Diffuser, a Stall Detection transducer is located in the discharge scroll of the compressor (Refer to *SECTION 24 - VARIABLE GEOMETRY DIFFUSER* for details). Different transducers are used to sense these different pressures. The actual transducer used is determined by the required pressure range and refrigerant application. The operation of the various transducers is identical. The difference between them is simply the pressure range over which they operate. Each of the different transducers has a different YORK part number found in the *YMC² Renewal Parts Guide (Form 160.84-RP2)*.

The transducers output a 0.5 to 4.5VDC voltage that is analogous to the pressure applied to the device. These outputs are applied to the Microboard, where this voltage is interpreted as a pressure value in terms of PSIG (pounds per square inch gauge) in English mode or KpaG (Kilo Pascals) in Metric mode. The Program converts the transducer output voltage to a pressure value with the appropriate formula in *Figure 46 on page 90*. The pressures are displayed and used for Chiller control and Safety shutdowns.

The Evaporator and Condenser pressures are converted to saturation temperatures per the appropriate refrigerant pressure/temperature conversion table contained in the program. These saturation temperatures are displayed and used for Chiller control.

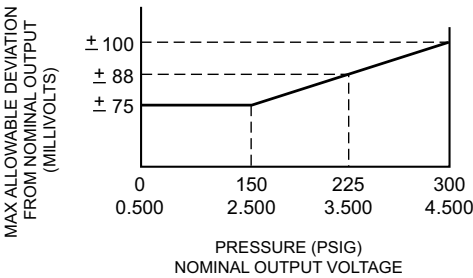
The transducers operate from a +5VDC power source which is created on the Microboard from the +12VDC from the Power Supply. Each transducer is connected to the Microboard with three wires. Two wires provide the +5VDC supply voltage and Ground (GND) and the remaining wire connects the transducer output to the Microboard. The voltage output of each transducer can be measured with a Voltmeter at the Microboard. Measurement should be made from the transducer output to Ground (GND). For example, the output of the Condenser transducer would be read from Microboard J8-21 (signal) to J8-22 (GND). To convert this output to a pressure, refer to the appropriate formula in *Figure 46 on page 90*. If the pressure is known, the transducer output can be predicted with the appropriate formula in *Figure 46 on page 90*.

If any of the displayed pressures do not appear to be correct. Refer to *SECTION 32 - DIAGNOSTICS AND TROUBLESHOOTING* for more information.

TABLE 10 - PRESSURE TRANSDUCER APPLICATIONS

TRANSDUCER PART NUMBER*	FUNCTION	R134a	
		Water	Brine
025-28678-006	Condenser	X	X
025-28678-115	Evaporator	X	X
025-40088-000	Discharge/Stall	X	X

*Note: Transducers 025-28678-006, -115 and 025-40088-000 have straight threads with O-rings.

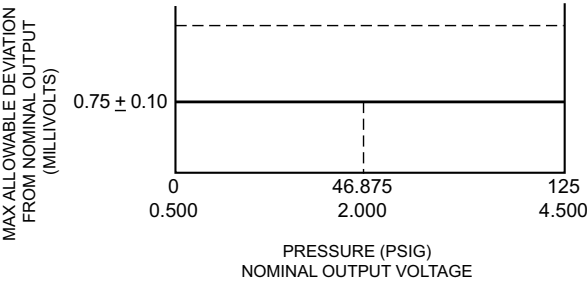


CONDENSER TRANSDUCER
YORK PART NO. 025-28678-006

$$V = \frac{P + 37.5}{75}$$
$$P = (75 \times V) - 37.5$$

V = VOLTS DC P = PRESSURE (PSIG)

LD05537A

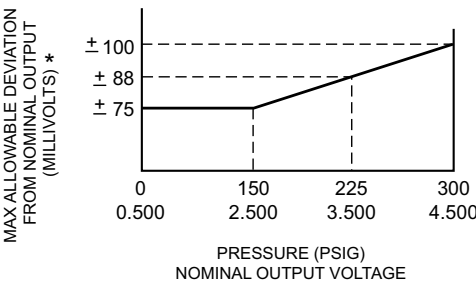


EVAPORATOR TRANSDUCER
R134a WATER AND BRINE APPLICATIONS
YORK PART NO. 025-28678-115

$$V = \frac{P + 15.625}{31.25}$$
$$P = (31.25 \times V) - 15.625$$

V = VOLTS DC P = PRESSURE (PSIG)

LD14745



DISCHARGE/STALL TRANSDUCER
YORK PART NO. 025-40088-000

$$V = \frac{P + 37.5}{75}$$
$$P = (75 \times V) - 37.5$$

V = VOLTS DC P = PRESSURE (PSIG)

LD09569a

FIGURE 46 - PRESSURE TRANSDUCERS

SECTION 16 - TEMPERATURE THERMISTORS

System temperatures are sensed by Thermistors. There are three different thermistor types used to sense the various system temperatures and an optional ambient dewpoint temperature thermistor. Each type has its own YORK part number. Part numbers are listed in *YMC² OptiViewTM Renewal Parts (Form 160.84-RP2)*. The Return and Leaving Chilled Liquid, Return and Leaving Condenser Liquid, Drop Leg Refrigerant and Evaporator Temperatures are sensed by 3K Ohm thermistors. The Compressor Discharge and Motor Housing temperatures are temperature is sensed by a 50K Ohm thermistor. The Power Panel temperature is sensed by a 10K Ohm thermistor.

The 3K Ohm thermistors are defined by the characteristic of being 3000 Ohms at 77°F (25°C). Similarly, the 50K Ohm thermistors are 50,000 Ohms at the same temperature. Both thermistor types vary their resistance as the sensed temperature varies. Both are negative temperature coefficient devices. That is, as the temperature increases, the resistance decreases. As the temperature decreases, the resistance increases.

The thermistors are connected to the Microboard or LTC I/O board analog input. A +5VDC supply voltage is applied to one side of the thermistor. The other side of the thermistor is connected to Ground through a series resistor on the circuit board, thus forming a voltage divider network. The temperature applied to the thermistor determines the resistance value. The resistance value determines the amount of current that will flow through the thermistor and thus the voltage drop across it. The Program reads this voltage at the input to the circuit board and converts it to a temperature value.

Each thermistor is connected to the circuit board with two wires. One wire supplies the +5VDC voltage and the other is the output of the thermistor. This output voltage can be measured with a Voltmeter. Measurement should be made from the thermistor output to Ground (Gnd). For example, the Leaving Chilled Liquid Temperature would be read from Microboard J9-20 (output) to Microboard TP1 (Gnd). To convert this voltage to a pressure, refer to the appropriate volts/temperature chart as follows:

- TABLE 11 – Motor Housing And Compressor Discharge on *Page 92*.
- TABLE 12 – Evaporator Refrigerant, Leaving Chilled And Entering Chilled Liquid on *Page 93*.
- TABLE 13 – Leaving Condenser, Entering Condenser And Drop Leg on *Page 94*.
- TABLE 14 – Power Panel on *Page 95*.

The Dew Point sensor has the following characteristics:

- Temperature Range: -20°F to 120°F
- Output Range: 0V to 10V. Ambient Dew Point Temperature is indicated as follows:

0.0 V = -20.0°F (Minimum value) and 10.0 V = 120°F (Maximum value).
- Linear in between

If any of the displayed pressures do not appear to be correct, refer to *SECTION 32 - DIAGNOSTICS AND TROUBLESHOOTING* for more information.

TABLE 11 - MOTOR HOUSING AND COMPRESSOR DISCHARGE

50k Ω thermistor with a 10k Ω pulldown		
TEMP (°F)	TEMP (°C)	VIN
10.39	-12.01	0.1416
24.88	-3.96	0.2197
35.51	1.95	0.2979
44.04	6.69	0.3760
51.26	10.70	0.4541
57.57	14.21	0.5322
63.21	17.34	0.6104
68.35	20.19	0.6885
73.10	22.83	0.7666
77.52	25.29	0.8447
81.69	27.61	0.9229
85.64	29.80	1.0010
89.41	31.89	1.0791
93.03	33.91	1.1572
96.52	35.84	1.2354
99.90	37.72	1.3135
103.19	39.55	1.3916
106.40	41.33	1.4697
109.54	43.08	1.5479
112.62	44.79	1.6260
115.65	46.47	1.7041
118.65	48.14	1.7822
121.61	49.78	1.8604
124.55	51.42	1.9385
127.48	53.04	2.0166
130.39	54.66	2.0947
133.29	56.27	2.1729
136.20	57.89	2.2510
139.11	59.51	2.3291

50k Ω thermistor with a 10k Ω pulldown		
TEMP (°F)	TEMP (°C)	VIN
142.04	61.13	2.4072
144.98	62.77	2.4854
147.95	64.42	2.5635
150.95	66.08	2.6416
153.99	67.77	2.7197
157.07	69.48	2.7979
160.20	71.22	2.8760
163.39	72.99	2.9541
166.64	74.80	3.0322
169.98	76.66	3.1104
173.40	78.56	3.1885
176.92	80.51	3.2666
180.55	82.53	3.3447
184.30	84.61	3.4229
188.19	86.77	3.5010
192.25	89.03	3.5791
196.49	91.38	3.6572
200.94	93.86	3.7354
205.63	96.46	3.8135
210.60	99.22	3.8916
215.89	102.16	3.9697
221.58	105.32	4.0479
227.71	108.73	4.1260
234.40	112.44	4.2041
241.77	116.54	4.2822
249.99	121.11	4.3604
259.30	126.28	4.4385
270.05	132.25	4.5166

TABLE 12 - EVAPORATOR REFRIGERANT, LEAVING CHILLED AND ENTERING CHILLED LIQUID

3kΩ thermistor with a 7.5kΩ pulldown		
TEMP (°F)	TEMP (°C)	VIN
0.04	-17.76	1.1353
2.79	-16.23	1.2134
5.44	-14.76	1.2915
8.02	-13.32	1.3696
10.53	-11.93	1.4478
12.98	-10.57	1.5259
15.39	-9.23	1.604
17.75	-7.92	1.6821
20.08	-6.62	1.7603
22.38	-5.34	1.8384
24.66	-4.08	1.9165
26.92	-2.82	1.9946
29.17	-1.57	2.0728
31.41	-0.33	2.1509
33.66	0.92	2.229
35.9	2.17	2.3071
38.15	3.42	2.3853
40.41	4.67	2.4634
42.69	5.94	2.5415
44.99	7.22	2.6196
47.31	8.51	2.6978
49.67	9.82	2.7759
52.06	11.14	2.854
54.49	12.49	2.9321
56.96	13.87	3.0103
59.5	15.28	3.0884
62.1	16.72	3.1665
64.77	18.21	3.2446
67.51	19.73	3.3228
70.35	21.31	3.4009
73.29	22.94	3.479
76.36	24.64	3.5571
79.55	26.42	3.6353
82.89	28.27	3.7134
86.41	30.23	3.7915
90.12	32.29	3.8696
94.07	34.48	3.9478
98.31	36.84	4.0259
102.87	39.37	4.104
107.81	42.12	4.1821
113.26	45.14	4.2603
119.3	48.50	4.3384
126.1	52.28	4.4165

TABLE 13 - LEAVING CONDENSER, ENTERING CONDENSER AND DROP LEG

3k Ω thermistor with a 4.53k Ω pulldown		
TEMP (°F)	TEMP (°C)	VIN
-19.97	-28.87	0.4199
-14.42	-25.79	0.498
-9.52	-23.07	0.5762
-5.08	-20.60	0.6543
-1.02	-18.34	0.7324
2.76	-16.24	0.8105
6.3	-14.28	0.8887
9.64	-12.42	0.9668
12.82	-10.66	1.0449
15.87	-8.96	1.123
18.79	-7.34	1.2012
21.62	-5.77	1.2793
24.37	-4.24	1.3574
27.04	-2.76	1.4355
29.66	-1.30	1.5137
32.22	0.12	1.5918
34.73	1.52	1.6699
37.21	2.89	1.748
39.67	4.26	1.8262
42.09	5.61	1.9043
44.5	6.94	1.9824
46.9	8.28	2.0605
49.29	9.61	2.1387
51.68	10.93	2.2168
54.07	12.26	2.2949
56.46	13.59	2.373
58.87	14.93	2.4512

3k Ω thermistor with a 4.53k Ω pulldown		
TEMP (°F)	TEMP (°C)	VIN
61.3	16.28	2.5293
63.75	17.64	2.6074
66.22	19.01	2.6855
68.73	20.41	2.7637
71.28	21.82	2.8418
73.87	23.26	2.9199
76.52	24.73	2.998
79.22	26.23	3.0762
81.99	27.77	3.1543
84.83	29.35	3.2324
87.76	30.98	3.3105
90.78	32.66	3.3887
93.9	34.39	3.4668
97.17	36.21	3.5449
100.58	38.10	3.623
104.12	40.07	3.7012
107.86	42.14	3.7793
111.82	44.34	3.8574
116	46.67	3.9355
120.52	49.18	4.0137
125.35	51.86	4.0918
130.6	54.78	4.1699
136.36	57.98	4.248
142.76	61.53	4.3262
149.95	65.53	4.4043
158.2	70.11	4.4824

TABLE 14 - POWER PANEL

10k Ω thermistor with a 5k Ω pulldown		
TEMP (°F)	TEMP (°C)	VIN
-19.12	-28.40	0.1514
-6.13	-21.18	0.2295
3.55	-15.81	0.3076
11.4	-11.44	0.3857
18.08	-7.73	0.4639
23.94	-4.48	0.542
29.21	-1.55	0.6201
34.01	1.12	0.6982
38.46	3.59	0.7764
42.62	5.90	0.8545
46.54	8.08	0.9326
50.25	10.14	1.0107
53.81	12.12	1.0889
57.22	14.01	1.167
60.53	15.85	1.2451
63.72	17.62	1.3232
66.83	19.35	1.4014
69.87	21.04	1.4795
72.85	22.69	1.5576
75.78	24.32	1.6357
78.66	25.92	1.7139
81.5	27.50	1.792
84.31	29.06	1.8701
87.12	30.62	1.9482
89.89	32.16	2.0264
92.66	33.70	2.1045
95.42	35.23	2.1826
98.21	36.78	2.2607
100.99	38.33	2.3389

10k Ω thermistor with a 5k Ω pulldown		
TEMP (°F)	TEMP (°C)	VIN
103.77	39.87	2.417
106.58	41.43	2.4951
109.42	43.01	2.5732
112.29	44.61	2.6514
115.16	46.20	2.7295
118.14	47.86	2.8076
121.13	49.52	2.8857
124.16	51.20	2.9639
127.3	52.94	3.042
130.49	54.72	3.1201
133.77	56.54	3.1982
137.15	58.42	3.2764
140.64	60.36	3.3545
144.25	62.36	3.4326
148	64.44	3.5107
151.9	66.61	3.5889
156	68.89	3.667
160.29	71.27	3.7451
164.82	73.79	3.8232
169.62	76.46	3.9014
174.77	79.32	3.9795
180.31	82.39	4.0576
186.28	85.71	4.1357
192.85	89.36	4.2139
200.11	93.39	4.292
208.25	97.92	4.3701
217.55	103.08	4.4482
228.39	109.11	4.5264
241.37	116.32	4.6045

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SECTION 17 - LIQUID FLOW SENSORS

Chillers are supplied with factory-mounted Flow Sensors on the evaporator and condenser. These are electronic thermal-type sensors. The operating principle of the sensor is thermal conductivity. It uses the cooling effect of a flowing liquid to sense flow. The temperature of the heated sensor tip is sensed by a thermistor located in the tip. A second thermistor, located higher in the tip in a non-heated area, is only affected by changes in liquid temperature.

The temperatures sensed by the thermistors are compared. Flowing liquid carries heat away from the heated sensor tip, lowering its temperature. The higher the flow rate, the lower the tip temperature and therefore a lower differential between thermistors. Lower flow rates remove less heat from the tip allowing a higher tip temperature. The lower the flow, the greater the differential between thermistors.

The sensor is vendor-calibrated to turn on its output at a flow rate of 20cm(0.6 ft.)/second. This is the setpoint. The sensor operates from a 24VAC power source and has a solid state relay output. On each sensor, one side of the solid state relay (pin 4) is connected to +5VDC

on the Microboard and the other side (pin 2) is connected to an analog input of the Microboard (refer to *Figure 8 on page 37*). After power is applied, there is a thermal warm-up period of up to 20 seconds. During this time, the output could be unstable. When the setpoint (or greater) flow rate is sensed, the solid state relay output is turned on causing it to conduct current through the 7.5K ohm microboard load resistor to the +5VDC. This applies greater than +4VDC to the microboard input.

When a flow rate less than the setpoint is sensed, the solid state relay output is turned off, resulting in no conduction through the load resistor. This applies less than 1VDC to the microboard input. To determine the state of the solid state relay, first confirm that +5VDC is present at pin 2 of the flow sensor. Then connect a voltmeter between the Microboard TP1 (Gnd) and the respective flow sensor input to the Microboard. The software accommodates either the Paddle type sensors connected to the TB4 of the I/O Board or the Thermal type sensors connected to J14 on the Microboard.

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SECTION 18 - MOTOR MONITORING

Six motor winding temperatures are reported by the thermistors via the VSD to microboard serial communications. These temperatures are used for motor protection faults described below and as input to the motor cooling control system described in *SECTION 25 - MOTOR COOLING CONTROL VALVE* of this manual.

The enabled winding temperatures for phase A, B and C on the Z1 end and Z2 end of the motor, along with the Average Winding Temperature and Maximum Winding Temperature, are displayed on the MOTOR DETAILS Screen. They are displayed over the range of: 31.2 to 412.5°F (-.4 to 211.4°C). Individual winding temperatures can be disabled using the TEMPERATURE DISABLE Setpoint on the Motor Details Screen according to the steps in the *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual (in ADMIN access level). When an individual temperature is disabled, the temperature data boxes indicate disabled.

The Average Winding Temperature and Maximum Winding Temperatures are from 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.

The OptiView control compares the winding temperature to warning and safety shutdown thresholds as follows:

Motor – High Winding Temperature

This safety fault is set when any of the enabled winding temperatures > 302.0°F for 3 seconds. The fault is released when all enabled winding temperatures < 284.0°F.

Warning – Motor – High Winding Temperature

This auto-reset warning is set when any of the enabled winding temperatures > 275°F for 3 seconds. The warning is released and the message clears when all winding temperatures < 275°F.

The OptiView control also calculates an Estimated Rotor Temperature from the motor housing temperature thermistor, the motor speed signal, rotor elongation, and some geometry coefficients for the motor specified in the Sales Order screen. The equation determines temperature from thermal growth as detected at the bearing axial position sensors. This is compared to warning and safety shutdown thresholds below:

Motor – High Rotor Temperature

This safety fault is set when Estimated Rotor Temperature > 250.0°F for 3 seconds. The fault is released when Estimated Rotor Temperature < 230.0°F.

Warning – Motor – High Rotor Temperature

This auto reset warning is set when Estimated Rotor Temperature > 230°F for 3 seconds. The warning is released and the message clears when Estimated Rotor Temperature < 230°F.

Refer to *Table 15 on page 100* for Thermistor resistance/voltage table.

TABLE 15 - THERMISTOR RESISTANCE / TEMPERATURE CHART

THERMISTOR RESISTANCE (OHMS)	°C	°F
165667	-0.442	31.20
106304	8.390	47.10
77581	14.970	58.95
60641	20.309	68.56
49468	24.856	76.74
41545	28.854	83.94
35635	32.449	90.41
31056	35.737	96.33
27405	38.782	101.81
24425	41.633	106.94
21947	44.324	111.78
19854	46.884	116.39
18063	49.333	120.80
16513	51.690	125.04
15157	53.967	129.14
13963	56.178	133.12
12902	58.332	137.00
11954	60.438	140.79
11101	62.503	144.51
10329	64.534	148.16
9629	66.538	151.77
8989	68.518	155.33
8403	70.482	158.87
7864	72.433	162.38
7367	74.375	165.87
6907	76.313	169.36
6480	78.251	172.85
6082	80.192	176.35
5711	82.142	179.86
5364	84.103	183.39

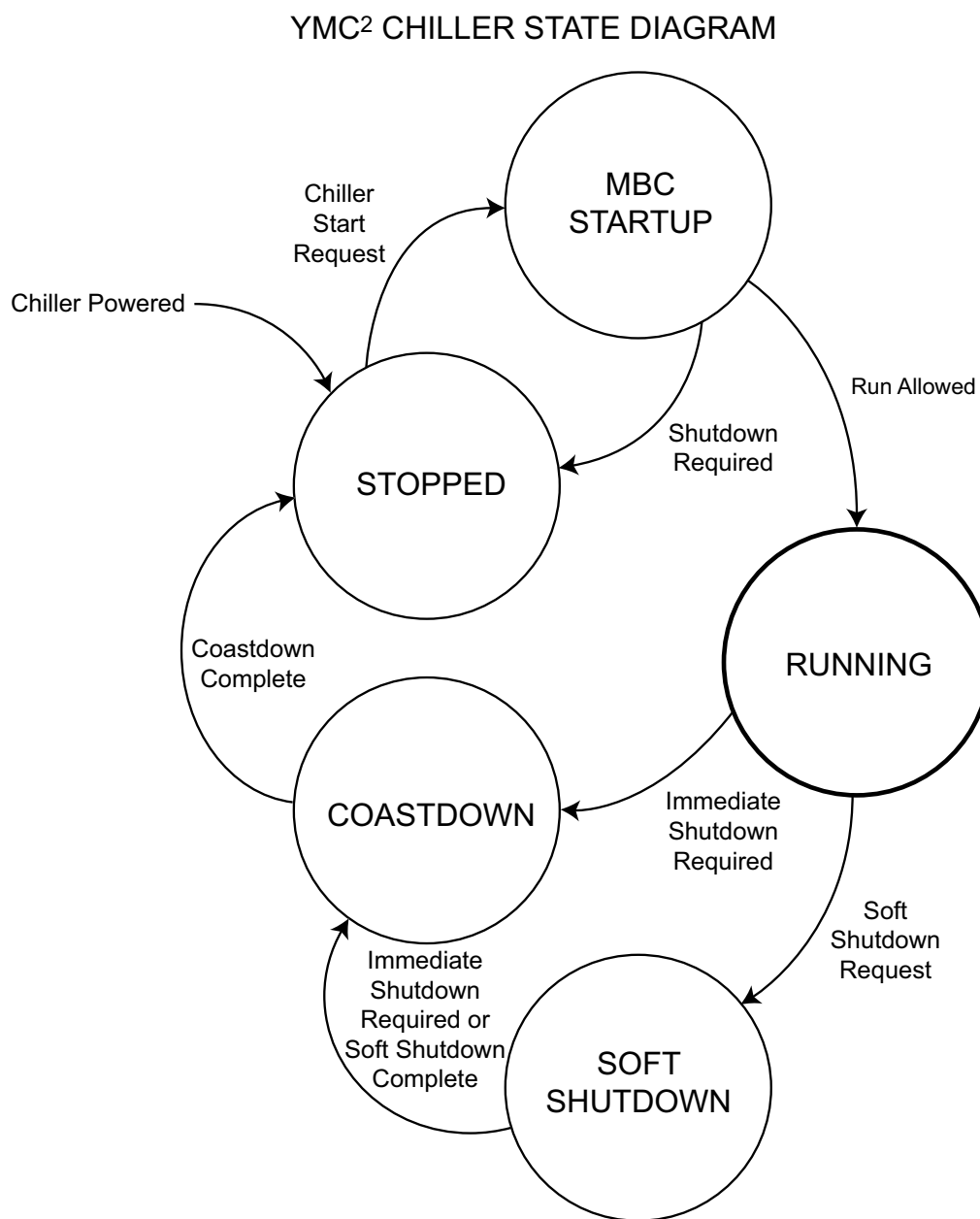
THERMISTOR RESISTANCE (OHMS)	°C	°F
5039	86.080	186.94
4734	88.076	190.54
4446	90.097	194.17
4176	92.146	197.86
3920	94.228	201.61
3678	96.349	205.43
3449	98.514	209.33
3232	100.729	213.31
3025	103.001	217.40
2829	105.336	221.60
2642	107.744	225.94
2464	110.233	230.42
2293	112.814	235.07
2131	115.500	239.90
1975	118.305	244.95
1827	121.245	250.24
1684	124.340	255.81
1547	127.614	261.71
1416	131.096	267.97
1290	134.821	274.68
1169	138.835	281.90
1052	143.193	289.75
940	147.971	298.35
831	153.267	307.88
727	159.219	318.59
626	166.021	330.84
529	173.966	345.14
435	183.518	362.33
344	195.478	383.86
257	211.400	412.52

SECTION 19 - BASIC OPERATION

CHILLER SEQUENCING

The following is the Chiller State Diagram. This flow diagram is used to define each possible chiller state with the basic conditions necessary to transfer to the next state. Associated with each state are In-State Ac-

tions, Exit Actions, and Transition Conditions, which are described in the following sections. The Chiller is in Stopped State on power-up. Programmable setpoints are designated in *UPPERCASE ITALIC*.



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FIGURE 47 - YMC² CHILLER STATE DIAGRAM

MBC STARTUP

Actions performed in MBC Startup state

- OptiView™ issues the VSD Pre-Charge/Pre-Regulate Command to the VSD over coms link.
- OptiView™ issues the MBC Levitation ON command to the MBC over coms link.
- The VGD Shutdown relay is energized via the OptiView™ I/O board, which sets the VGD in Standard Control Mode and OptiView commands it to 0.0%.
- OptiView™ maintains the Hot Gas Bypass valve at the programmable *HGBP START POSITION*.
- The System Status Message “MBC Startup” is displayed when in this state. The following System Details messages are also shown in the priority order listed below:
 1. System Details Line Message “Waiting for VSD Pre-regulation” is displayed when VSD Pre-Charge / Pre-Regulate VSD Command is issued until the VSD reports back its control state is WAIT RUN.
 2. System Details Line Message “Waiting for MBC Levitation” is displayed when MBC Levitation ON command is issued until Levitation Mode is reported from the MBC and the MBC Rotation Allowed Digital Input is high.
 3. System Details Line Message “Waiting for Chilled Liquid Flow” is displayed when the Chilled Liquid Flow Switch is Open.

Transition to Running state

Transition to Running state occurs when all of the following are true:

- MBC to OptiView™ valid serial communications are verified.
- MBC is reporting no shutdown faults over coms.
- OptiView™ MBC Fault digital input (I/O board TB3-70) is High, indicating the MBC fault relay contacts are closed signifying no faulted condition.
- MBC reports over coms that the Levitation Mode is ON.

- OptiView™ Rotation Allowed digital input (I/O board TB3-30) is High, indicating the MBC has closed its rotation allowed relay contacts signifying permission to run.
- VSD reports over coms that its control state is Wait Run. VSD timing is about 3 seconds to complete precharge and another 15 seconds to pre-regulate before Wait Run state.
- MBC reports over coms that Motor Speed = 0 Hz
- Chilled Liquid Flow Switch is Closed, indicated by input high at the selected switch input.
- Condenser Liquid Flow Switch is Closed, indicated by input high at the selected switch input.

Transition to Stopped state

Transfer to Stopped state occurs if any of the following are true:

- A shutdown is required. (User shutdown, panel fault, VSD fault, MBC fault, etc)
- Time in the MBC Startup state exceeds 60 seconds. If the conditions for transition do not occur before this time expires, the panel initiates the “MBC – Startup Failure” fault.

RUNNING

Actions performed in Running state

- OptiView™ issues the VSD Run signals to the VSD (Hardware and VSD coms) and maintains them while in Running state.
- OptiView™ issues the MBC Rotation ON command to the MBC over coms link.
- When VSD Output Frequency ramps up to exceed 84 Hz (the minimum chiller frequency – 1.0 Hz), the VSD acceleration and deceleration rate is set = 10.00 Hz/sec.
- OptiView™ commands the VGD to the programmable *VGD START POSITION* then issues HGBP, VGD and VSD commands according to Capacity Control.

Transition to Soft Shutdown state

Transfer to Soft Shutdown state occurs when any of the following are true:

- Local Run/Stop command is Stop and Control Source is Local.

- Any MBC fault is reported over coms.
- MBC Fault relay opening is reported at the I/O board digital input (input is low).
- Leaving Chilled Liquid – Low Temperature” fault active.
- “Remote Stop” shutdown active.
- “Multiunit Cycling – Contacts Open” fault active.
- “System Cycling – Contacts Open” fault active.
- “Control Panel – Schedule” shutdown active.
- “Condenser – Flow Switch Open” fault active.
- “Chilled Liquid – Flow Switch Open” fault active.
- “Expansion I/O – Serial Communications” fault active.

Transition to Coastdown state

Transfer to Coastdown state occurs when any of the following are true:

- Panel Safety Stop switch is opened (pressed).
- Any fault or shutdown not in the soft shutdown list above occurs.

Exit Actions

When transitioning out of the Running state to any state, all of the following are done:

- Hot Gas Bypass control mode is set to Auto (if Hot Gas Bypass is Enabled).
- VGD control mode is set to Auto.
- VSD control mode is set to Auto.

SOFT SHUTDOWN

Actions performed in Soft Shutdown state

- The System Status Message “Soft Shutdown” is displayed when in this state. The Soft Shutdown Timer is displayed on the System Details line. It counts down the Max Soft Shutdown Time from the value calculated below:
- The control determines Soft Shutdown Type and Ramp Rate.
 - If any MBC generated fault, Chilled Liquid-Flow Switch Open or Condenser-Flow Switch Open fault is active Soft Shutdown type will be Fast.
 - Else, Soft Shutdown type will be Standard.

- VGD command is set to 0%.
- Hot Gas Bypass (if enabled) command is set to 100% open.
- If Soft Shutdown type is Fast, Soft Shutdown is performed as follows:
 - VSD deceleration rate is set to 65.00 Hz/sec
 - If VSD Output Frequency > Soft Shutdown Frequency (50Hz):
 - Max Soft Shutdown Time is calculated as $[(\text{VSD Output Frequency} - \text{Soft Shutdown Frequency}(50\text{Hz})) / \text{VSD Deceleration Rate}] + 5 \text{ sec}$
 - OptiView™ issues the VSD Soft Shutdown state command to the VSD over coms, which causes the VSD to ramp down to its minimum control frequency (50Hz)
 - OptiView™ sets the VSD Frequency Command = Soft Shutdown Frequency (50Hz)
 - When VSD Output Frequency is less than the Minimum Chiller Frequency + 130 Hz (215 Hz), OptiView™ issues the MBC Levitation ON command and MBC Rotation OFF command to the MBC over coms link. 130Hz margin gives 2 seconds for the command to execute at the VSD deceleration rate, before speed reaches minimum.
- If Soft Shutdown Type is Standard, Soft Shutdown is performed as follows:
 - The control checks the present command to the VGD, and VSD frequency. It calculates a time to close the VGD, proportional to its command percent open, based on 20 seconds to achieve this from full open. It calculates the time required to ramp the VSD speed down from its present frequency to the programmed soft shutdown frequency (0 to 50 Hz, default 50 Hz) at the programmed soft shutdown ramp rate (2Hz/sec to 50 Hz/sec, default 20 z/sec). The control sets the Max Soft Shutdown time equal to the calculated time for VGD closing + calculated time for VSD to ramp to soft shutdown frequency + 5 seconds.

- The control allows the VSD frequency to decrease to the active anti-surge minimum frequency as it changes for the time calculated to close the VGD. The Active Anti-surge minimum frequency is allowed to decrease at 2Hz/second during this time. When the VGD position is < 1% or the time in soft shutdown has exceeded the time calculated to close the VGD, then the control ramps the VSD speed down to the programmed soft shutdown frequency at the programmed soft shutdown ramp rate.
- OptiView™ issues the VSD Soft Shutdown state command to the VSD over coms, which causes the VSD to ramp down to its minimum control frequency (50Hz)
- When VSD Output Frequency is less than the Minimum Chiller Frequency (85 Hz), OptiView™ issues the MBC Levitation ON command and MBC Rotation OFF command to the MBC over coms link.

Transition to Coastdown state

Transfer to Coastdown state occurs when any of the following are true:

- VSD Output Frequency < Soft Shutdown Frequency (50Hz) + 1.0 Hz
- Any fault (including Normal shutdowns) not in the soft shutdown list above occurs
- Time in the Soft Shutdown state > Max Soft Shutdown Time as calculated above

COASTDOWN

Actions performed in Coastdown state

- The VGD Shutdown relay is de-energized, which sets the VGD in Quick Shutdown Mode
- If no VSD fault is active:
 - OptiView™ issues the VSD Soft Shutdown state command to the VSD over coms, which causes the VSD to ramp down to its minimum control frequency (50Hz)
 - OptiView™ disables the VSD hardware Run signal (hardware only), and maintains the coms run command. This signifies the VSD to maintain precharge for 60 seconds unless a VSD fault or VSD Stop command occurs.

- If any VSD fault is active, OptiView™ commands the VSD to Stop over coms link.
- OptiView™ issues the MBC Levitation ON command and MBC Rotation OFF command to the MBC over coms.
- If VSD Soft Shutdown Command is Enabled and a VSD Fault occurs, OptiView™ commands the VSD to Stop.

Transition to Stopped state

Transfer to Stopped state occurs when any of the following are true:

- MBC Motor Speed reported by the MBC over coms is 0 Hz for 2 continuous seconds (Note: Loss of MBC comms or invalid MBC Motor Speed data does not constitute this condition being met)
- Time in the Coastdown state exceeds 60 seconds

STOPPED

Actions performed entering Stopped state including initial entry on power-up of the panel:

- Hot Gas Bypass Valve is commanded to *HGBP START POSITION* if Hot Gas Bypass is Enabled
- VGD is commanded to 0% (full closed)
- VSD Acceleration and Deceleration rates are set to 43.50 Hz/sec

Actions performed in Stopped state

- OptiView™ retains the MBC Levitation ON command for the first 30 seconds in Stopped state except on initial power up of the panel. Then when motor speed indicated from the MBC is zero for 10 continuous seconds, Opti-View issues MBC Levitation OFF command.
- OptiView™ issues the VSD Soft Shutdown Command for first 60 seconds in Stopped state except on initial power up of the panel.
- OptiView™ issues the VSD Stop Command when any of the following are true:
 - Time in the Stopped state $\geq$ 30 seconds
 - Entry to the Stopped state was from initial power up of the panel
 - Any VSD Fault is active

- The VGD Shutdown relay is de-energized for the first 30 seconds in Stopped state except on initial power up of the panel. This sets the VGD in Quick Shutdown Mode
- The VGD Shutdown relay is energized after 30 seconds in the Stopped state or on initial power up of the panel. This sets the VGD in Standard Control Mode.

Transition to MBC Startup state

Transfer to MBC Startup state occurs when all of the following are true:

- Run request is received (if run request is received while VSD Pre-Charge Command is active the Pre-Charge command will persist when entering MBC Startup).
- No fault or start inhibit is active.
- Speed indicated from the MBC is 0 Hz for 2 continuous seconds.

START/SOFT STOP CONTROL

Start/Soft Stop Key

These keys only display in LOCAL control mode. When the chiller does not have a standing local run request, the Start key is displayed on the Home screen. Pressing the Start Key on the Panel will allow the operator to enable the local run request or cancel run request.

When the chiller has a standing local run request, the Soft Stop key is displayed on the Home screen. Pressing the Soft Stop Key while local run request (run permissive) is active will allow the operator to accept Soft Stop or Cancel.

When the chiller control source is changed to LOCAL from any other source, it will remain in RUN if already running or remain in STOP if already stopped.

Clear Fault Key

This key on the Home screen will only show when a Safety Fault is present but fault conditions have ceased (fault has been released). Pressing this key is required to clear the Safety fault and allow a start to be accepted.

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SECTION 20 - CAPACITY CONTROL

The YMC² Chiller controls capacity by adjusting the compressor Variable Geometry Diffuser (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 Leaving Chilled Liquid Temperature at setpoint. Motor speed is additionally and simultaneously adjusted as necessary to maintain the minimum compressor lift required to prevent surge as a function of existing speed, VGD position and condenser to evaporator pressure difference.

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's final output comparator.

The sequence for operation of the control devices is as follows to achieve the best chiller efficiency:

- Conditions require capacity increase: HGBP (if present) driven toward closed. Then when HGV full closed, VGD driven toward open. Then when VGD full open, VSD speed increased.
- Conditions require capacity decrease: VSD speed decreased. Then when VSD speed at minimum limit, VGD driven toward closed. Then when VGD reach minimum limit, HGBP (if present) driven toward open.

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 each cycle of the capacity control routine as follows:

$$\text{AntiSurgeMinimumFrequency} = \text{SurgeFrequency} * \text{MinFrequencyAminMultiplier} * \text{MinFrequencyMultiplier} + \text{MinFrequencyOffset}$$

SurgeFrequency is determined from Omega and VGD position throughout operation.

Where:

$$\text{Omega} = \text{IsentropicHead} / (\text{SpeedOfSound})^2$$

Speed of Sound is determined from Evaporator Pressure, based on R134a.

Isentropic Head is determined from Evaporator Pressure and Condenser Pressure, based on R134a.

The MinFrequencyAminMultiplier, MinFrequencyMultiplier and MinFrequencyOffset are values used to ensure appropriate margin to the calculated anti-surge minimum frequency to account for instrument and chiller variation. Their default values do not add any additional margin. None is typically required. See the programming section of this manual.

Additionally, the control calculates an additional increase to the anti-surge minimum frequency during chiller head increase transient events, such as occurs during pulldown. The rate of change of Omega is monitored and the control applies a proportional temporary offset when Omega is changing rapidly. This prevents driveline speed increase from lagging the speed required due to sensing and processing time.

Increases in Anti-Surge Minimum Frequency: The Active Anti-Surge minimum frequency is immediately increased as required. Compressor speed is continuously increased as necessary to prevent operation below the Active Anti-Surge Minimum Frequency, regardless whether capacity increase or decrease is otherwise required. This can result in additional capacity, but the logic will respond to LCHLT and override controls and operate the other control devices as needed to maintain setpoint or compliance with limits.

Decreases in Anti-Surge Minimum Frequency: The Active Anti-Surge minimum frequency is ramped to the new calculated anti-surge minimum frequency. The ramp rate depends how far the active antisurge minimum is above the present antisurge minimum. When the active minimum is 10 Hz above the present value, the ramp rate is 10 Hz/second. This rate is decreased linearly to 0.1 Hz/second as the difference between the active and present minimum frequencies decreases to within 2 Hz. These are the default ramp rates. The values are only changeable in ADMIN access. See the programming section of this manual. When the Active Anti-Surge Minimum Frequency is reduced, additional opportunity exists to reduce speed. The affect on speed is as follows:

- The VSD speed will decrease into the additional operating band if the capacity control logic calls for unloading.
- The VSD speed will remain constant if setpoint is met or loading is required and the requirement can be met closing the HGBP or opening the VGD.
- The VSD speed will increase as necessary if loading is required and the other control devices have been positioned to their limits.

AUTOMATIC CAPACITY CONTROL

When the chiller is stopped, the following conditions are set:

- HGBP control signal (if present) shall be set to the Hot Gas Startup Position
- VGD position shall be set to its programmed Startup position

The control logic begins applying its leaving chilled liquid temperature (LCHLT) Proportional, Integral, Derivative (PID) controller immediately upon entering the run state. Each control cycle, the Capacity Control uses PID logic to determine a desired percent change to chiller capacity, positive for loading or negative for unloading, based on LCHLT compared to the LCHLT active setpoint.

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 – a programmable offset, default 5°F, with a minimum value of the programmed LCHLT setpoint. 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. Output limiters and overrides are also available immediately. These are:

- High Condenser Pressure limit and override,
- Low Evaporator Pressure limit and override,
- Motor Current limit and override, and
- Input Current limit and override.

Leaving chilled liquid temperature also has a low temperature override control. The minimum of the calculated capacity change from the leaving liquid temperature PID

and each of the load limiter and override values is determined. The resulting output is directed to as many of the control devices (VSD, VGD, or Hot Gas Bypass Valve) as necessary to effect the full desired change in the appropriate order for loading (capacity increase) and unloading (capacity decrease).

A desired capacity change is effected by applying the calculated output change to each device necessary per the efficiency sequence so the summation equals the full change desired. If the full magnitude of change cannot be applied to the priority device due to a limit, the remainder of the change is applied to subsequent devices in order. Each device has an associated operating gain (selectable as its Output Gain setpoint) that relates a desired percent change in capacity to the device's response in percent position or Hertz. Magnitude of change is determined for each of the devices according to their individual output gains.

Additionally, the capacity control accounts for the capacity increase due to any simultaneous speed increase caused by the anti-surge control when it determines remaining net output to effect through all the control devices. For instance, if the desired capacity increase is 10% and the speed has increased due to antisurge control an amount that equals a 6% capacity increase (determined from the VSD gain), the VGD and/or HGBP would react only enough to effect the remaining 4% capacity increase.

Note that specific scenarios such as a reduction in the minimum allowable VSD speed for surge or return to automatic from Manual override of an output device's position may create a gap between an output device's position and the present most efficient position. As the control applies subsequent capacity adjustments, the logic closes the gaps as it adheres to the proper order for loading and unloading.

The VGD is commanded by sending current through an open or close winding in the actuator. The actuator is given a constant command until the feedback signal equals the command signal. In order to reduce dithering, once the Position reaches the command position, the open and close signals cease (Hold). In order to reposition the device, a threshold magnitude of change must be requested by the control.

Automatic Temperature Shutdown

The temperature below the LCHLT setpoint at which the chiller is desired to automatically cycle off when load is less than the chiller minimum capability is programmed from the panel as Leaving Chilled Liq-

uid Temperature Cycling Offset; 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 64°F. However the actual shutdown temperature will never be calculated to lower than 36°F (water), 34°F (water with Smart Freeze enabled) or 6°F (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 = 1/2 the programmed LCHLT Setpoint Ramp Rate. This allows time for the chiller to change temperature without shutting down first.

Automatic Temperature Restart

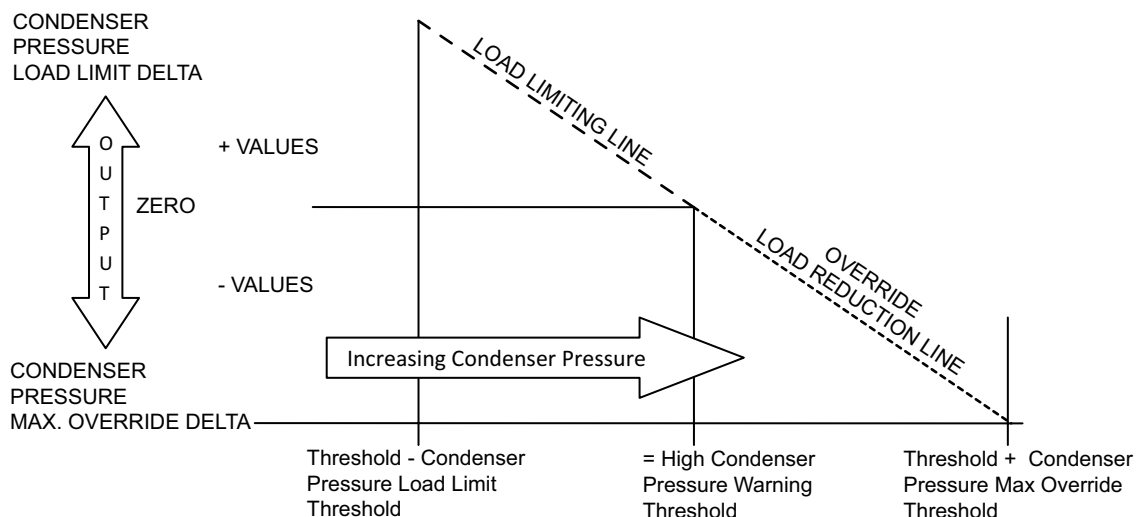
The temperature above the LCHLT setpoint at which the chiller is desired to automatically restart after a low LCHLT shutdown per above is programmed from the panel as Leaving Chilled Liquid Temperature Cycling Offset; Restart. This setting defines the temperature

offset above the LCHLT setpoint where automatic restart is expected. It is programmable over a range of 0°F to 70°F. However, the restart temperature will never be calculated above 80°F. This setpoint can be used to reduce chiller cycling by delaying the chiller restart until the cooling load has increased sufficiently.

LIMITS AND OVERRIDES

The output limiting portion of the override controls maintain a limit on the maximum permitted increase in percent capacity throughout operation. Each limit control has a specific value before its control threshold where it reduces its limit proportionally to zero at the threshold. When conditions exceed the threshold, the override portion generates a proportionally increasing unload (negative) output. As stated previously, the final output to the control devices is determined as the minimum (least loading or most unloading) of the temperature control PID output and the output limiters and overrides value.

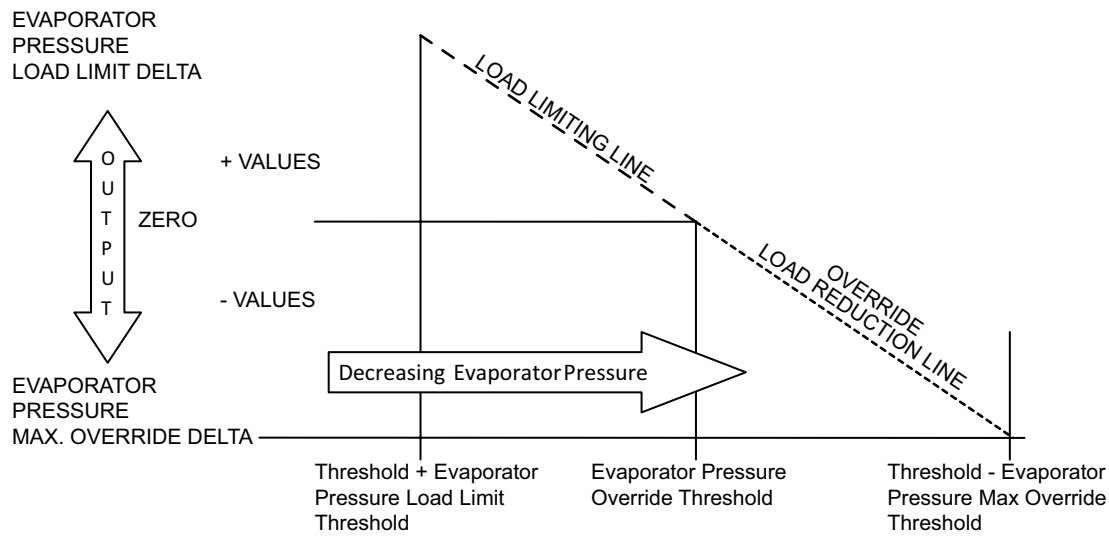
The following figures diagram each of the limits and overrides.



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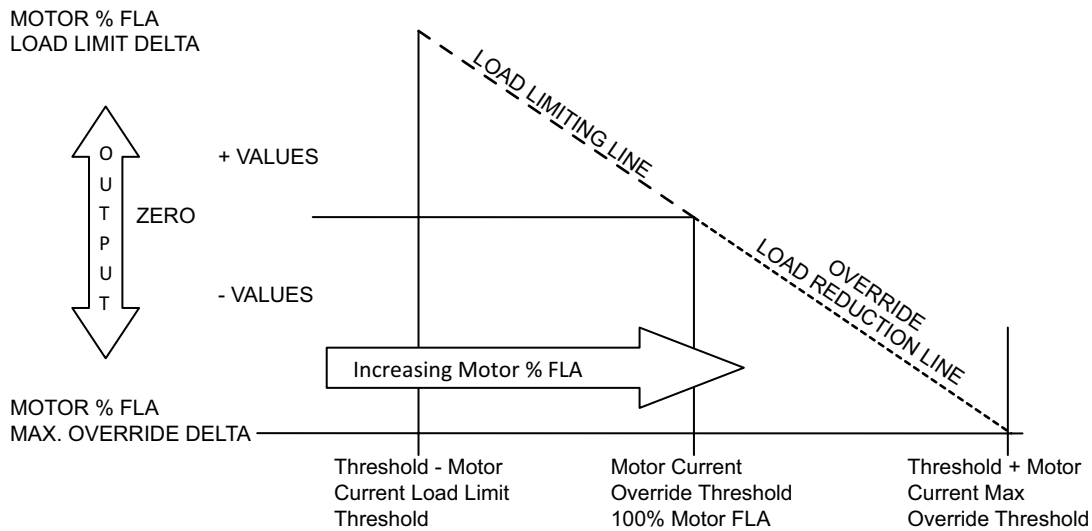
Thresholds and deltas are listed in the program settings table in the System Calibration, Service Setpoints, and Reset Procedures section of this manual

FIGURE 48 - HIGH CONDENSER PRESSURE LIMIT AND OVERRIDE



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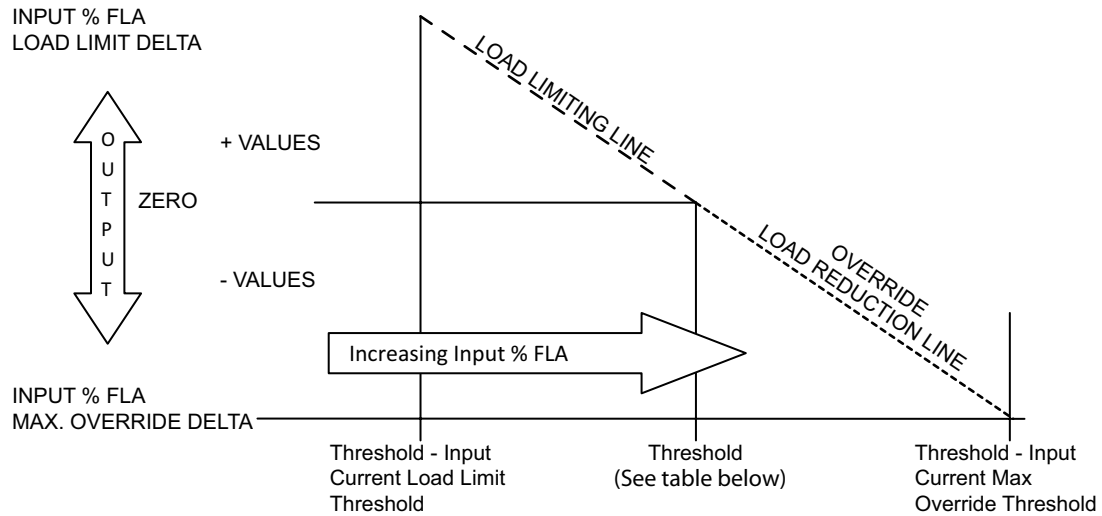
Evaporator Pressure Override Threshold = 27 PSIG for water, as programmed for brine
Thresholds and deltas are listed in the program settings table in the System Calibration,
Service Setpoints, and Reset Procedures section of this manual

FIGURE 49 - LOW EVAPORATOR PRESSURE LIMIT AND OVERRIDE

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Thresholds and deltas are listed in the program settings table in the System
Calibration, Service Setpoints, and Reset Procedures section of this manual

FIGURE 50 - MOTOR CURRENT LIMIT AND OVERRIDE



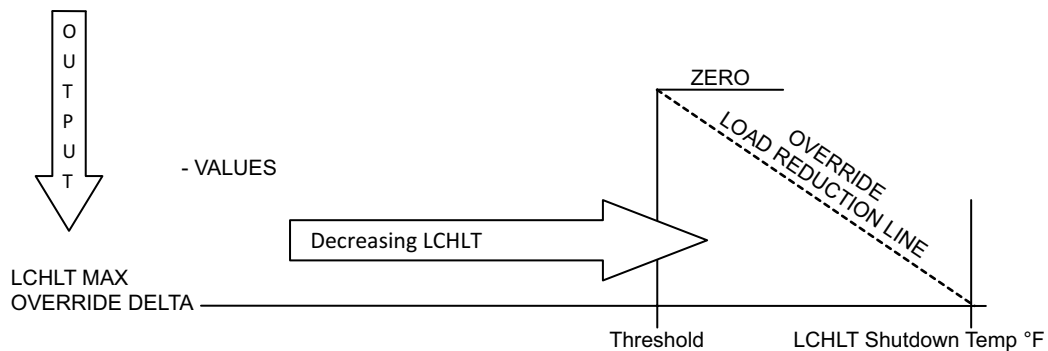
LD15163a

The Input Current limit threshold value is determined from several settings, depending on the chiller control source selected according to the table below:

Control Source	Active Input Current Limit Threshold
Local	Lowest of: Local Input Current Limit Setpoint (Input Job FLA) Pulldown Input Current Limit (when active)
ISN	Remote Input Current Limit Setpoint (comms)
Analog Remote	Lowest of: Local Input Current Limit Setpoint (Input Job FLA) Analog Remote Input Current Limit Setpoint Pulldown Input Current Limit (when active)
Digital Remote	Lowest of: Local Input Current Limit Setpoint (Input Job FLA) Digital Remote Input Current Limit Setpoint Pulldown Input Current Limit (when active)

Thresholds and deltas are listed in the program settings table in the System Calibration, Service Setpoints, and Reset Procedures section of this manual

FIGURE 51 - INPUT CURRENT LIMIT AND OVERRIDE



LD15164a

LCHLT Override Threshold = LCHLT Shutdown Temperature + 2 °F (The maximum value is 1 °F below LCHLT Setpoint)

LCHLT Max Override Delta is listed in the program settings table in the System Calibration, Service Setpoints, and Reset Procedures section of this manual

FIGURE 52 - LOW LEAVING CHILLED LIQUID OVERRIDE

Leaving Chilled Liquid Temperature PID Controller

This Direct-Acting Incremental PID Controller (Output increases with positive error difference ($e(n-1) - e(n)$)) is defined as follows:

$$\text{PresentValueDelta}(n) = \text{PtermDelta} + \text{ItermDelta} + \text{DtermDelta};$$

where;

$$\text{PtermDelta}(n) = -K_p (e(n) - e(n-1))$$

$$\text{ItermDelta}(n) = -K_p (e(n) + e(n-1)) * \text{deltaT} / (2T_i)$$

$$\text{DtermDelta}(n) = (\text{DtermDelta}(n-1) - 8(-K_p)(\text{PV}(n) - 2*\text{PV}(n-1) + \text{PV}(n-2)))*T_d / (T_d + 8*\text{deltaT})$$

The terms in the formula above are defined as follows:

PresentValueDelta = Output of the Incremental PID controller

PtermDelta = Proportional Incremental Term

ItermDelta = Integral Incremental Term

DtermDelta = Derivative Incremental Term

K_p = proportional gain

T_i = Integration time

T_d = Derivative time. Zero means it is disabled

$e(n)$ = error signal $SP - PV$; $LCHLTsetpoint - LCHTL$

SP = Setpoint; $LCHLTsetpoint$

PV = process variable; $LCHLT$

deltaT = Sampling period in seconds for I and D.

$e(n-1)$ = error acquired during the last period.

$PV(n-1)$ = process variable during the last period.

$PV(n-2)$ = process variable two periods back.

This variable “PresentValueDelta” is distributed among active control elements of VSD speed, VGD command position, and HGBP command position to move the control element in response to the error from the desired setpoint.

MANUAL CONTROL

Manual control of any output device (HGBP, VGD or VSD) is available from the capacity Control Screen when logged in at the Keypad with SERVICE access level using password 1 3 8 0.

When any device (HGBP, VGD or VSD) is switched to Manual, the manual control signal is set to equal the present automatic signal to provide a bump-less transfer. A manual value for each device can be set independently with corresponding “Set” key. Upon pressing the Enter Key, the value will take effect. Up/Down keys can also be used to change the output values by the corresponding increment amount. Set values will be entered as % in integers for Hot Gas and VGD, but as Hz in hundredths for VSD. When any device is under manual control, the automatic capacity control will skip the device in sequencing.

TABLE 16 - IMPELLER SPEED LIMITS

SS/LS IMPELLER DIAMETER	164	174	186	197	205	218	233	246	275	295	331
MAX IMPELLER FREQUENCY (HZ)	430.60	405.00	380.80	358.40	345.40	324.00	303.50	286.70	257.20	239.30	213.20

The output signals for each controller (Hot Gas Valve, VGD, and VSD Frequency Output) will be set to their manual values when the Mode returns to Automatic from Manual. This will provide a bump-less transfer from Manual to Auto. If VSD frequency or VGD position is less than its Anti-surge minimum limit, then the output signal is set to the Anti-surge minimum limit upon return to Automatic rather than the manual value.

RANGE LIMITS

The minimum VSD speed is the lowest of minimum operational chiller speed and anti-surge minimum frequency. Minimum operational chiller speed is set at 85Hz.

The maximum VSD speed is the minimum of VSD, Motor and Impeller limits determined from the compressor model in the Sales Order Screen, multiplied by an ADMIN setpoint Max Frequency Multiplier (0.400 to 1.050, default 1.000).

Maximum Impeller frequency is determined from the single stage (low side) impeller diameter (SS/LS IMP DIAM) extracted by the control from the Compressor Model entered on the Sales Order screen. These limits are defined by the following table. Since the low stage impeller will always be larger (lower max frequency) than the high stage impeller used on two stage chillers, only the low stage impeller will factor in to the maximum chiller frequency.

Maximum Motor Frequency is based on the motor model extracted by the control from the Compressor Model entered on the Sales Order screen. These limits are defined by the following table.

The rated motor voltage and current is determined from the motor code in the compressor model number on the Sales Order screen. The values used are shown in the following table:

TABLE 17 - MOTOR SPEED LIMITS

MOTOR MODEL	M1	M2	M4	M6
MAXIMUM MOTOR FREQUENCY (HZ)	433.3 Hz (26,000 rpm)	341.7 Hz (20,500 rpm)	283.3 Hz (17,000 rpm)	258.3 Hz (15,500 rpm)
RATED VOLTAGE	507V	530 V	530 V	530 V
RATED CUR- RENT	525 A	653 A	future	1362 A

Maximum VSD Frequency is fixed in the VSD logic. The VSD will not exceed its limit regardless of the command from the chiller control.

- The limit for the HYP490 is 433 Hz
- The limit for the HYP774 is 343 Hz

CAPACITY CONTROL PROGRAMMABLE VALUES

See *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* regarding capacity control tuning.

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SECTION 21 - MAGNETIC BEARING CONTROL

21

OVERVIEW

The Magnetic Bearing Control (MBC) is a pair of circuit boards mounted to a plate on the compressor motor housing. The control board contains the hardware and software that processes operating parameters and commands changes to the bearings to keep the motor shaft in proper position. It is mounted to the power board, which contains the amplifier circuits to drive the magnets in the bearings. The power board mounts to a plate that serves as a heat sink from the board to the cooled motor housing. This section describes the MBC function in relation to the OptiView™ control center. A description of the rotor and bearings is included in the YMC² OptiView™ Unit Service Manual.

POWER SUPPLY

The MBC is powered from a dedicated source of 160VDC from the chiller control power cabinet. This 160VDC supply is created from the 120VAC output of an Uninterruptible Power Supply (UPS) with battery back up in the power cabinet. The tolerance on the output is $\pm 1\%$. Upon loss of line power, the UPS and battery provide uninterrupted transfer to keep the MBC continually powered. The 160VDC supply is conditioned by a filter in the control power cabinet to meet the quality required for MBC operation.

MBC INITIALIZATION

Each time the MBC is powered up from off as indicated by transition of the MBC Alive digital contact from open to closed, the OptiView™ validates the MBC software versions, sets MBC date and time, and signifies the control parameter set to be used by the MBC for the motor and compressor combination entered on the OptiView™ Sales Order screen.

OPERATION

The magnetic bearing control has three states of operation:

- De-levitated - The motor shaft is resting on the physical touchdown bearings, no current is supplied to magnetize the magnetic bearings.
- Levitation - The motor shaft is levitated (suspended) by the magnetic bearings. The controller is maintaining shaft position by controlling bearing currents in relation to feedback from displacement sensors.

- Rotation - This is the same as levitation state but enables a safety interlock to prevent de-levitating the motor shaft unless the drive speed is below a touchdown threshold (10 Hz). Also, this state enables the automatic anti-vibration reduction system (AVR) which counteracts vibration at rotation frequency while passing through the system natural frequency and automatic balancing system (ABS), which filters the rotational speed out of the MBC bearing control loop to prevent imbalance and runout forces from transmitting to the stationary driveline hardware.
- The AVR function engages at 70 Hz speed reference. The radial ABS function engages above 255 Hz. The axial ABS function engages above 225 Hz.

SPEED REFERENCE

The magnetic bearing control receives a speed signal reference from the Variable Speed Drive, from which all of its speed related functions are determined. This is a digital pulse signal to the magnetic bearing control at one pulse per revolution, the minimum and maximum pulse widths are 0.2m second and 1m second, respectively. The MBC accepts a pulse amplitude greater than 4.2VDC and considers the pulse released at less than 0.3VDC. The MBC will automatically transition from Levitation state to Rotation state when it detects a speed reference signal is greater than 10 Hz, regardless of the OptiView™ modbus command for MBC state. If this state transfer is inconsistent with the modbus command from OptiView™, OptiView™ will recognize this discrepancy by the state reported from the MBC over modbus and display a warning. The MBC will not transition from Rotation or Levitation state to De-levitated state until it detects a speed signal less than 10 Hz, regardless of the OptiView™ state command.

STATUS CONTACTS

The magnetic bearing control has three dry contact digital outputs that are wired to the OptiView™ I/O board to indicate significant conditions about the MBC status.

- The MBC Fault contacts, MBC control board J12 contacts 9 and 10 switch 120VAC to OptiView™ I/O board TB3-70 and are open when the MBC is in a faulted state or not powered.
- The MBC Rotation Allowed contacts, MBC control board J12 contacts 11 and 12 switch 120VAC to OptiView™ I/O board TB3-30 and are closed when the MBC considers the motor shaft levitated properly to allow motor operation.

- The MBC Alive contacts, MBC control board J12 contacts 13 and 14 switch 120VAC to OptiView™ I/O board TB3-71 and are closed when the MBC is powered and ready for serial communication.

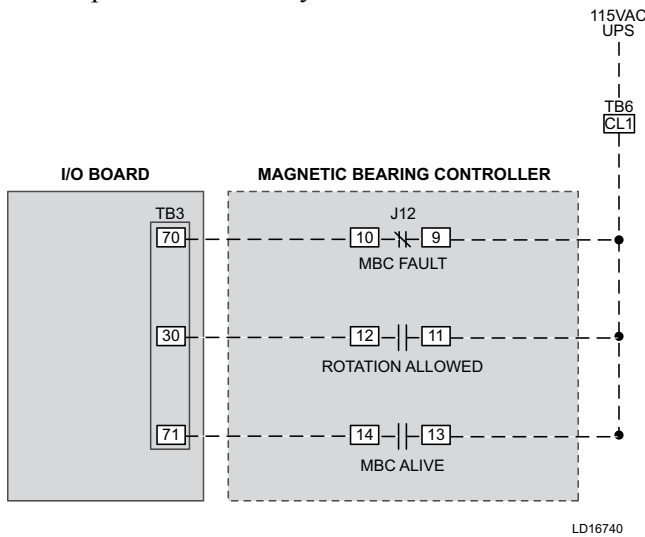


FIGURE 53 - MBC DIGITAL I/O

MANUAL CONTROL

The MBC state can be changed between De-levitated and Levitation to levitate or rest the rotor in Service level access with the chiller stopped, as a troubleshooting tool.

The MBC can be commanded to perform an automated clearance check in Service level access with the chiller stopped. During this procedure, the MBC will levitate the motor shaft and move it along each of its control axes at both shaft ends and axially. It will determine the measured clearances from the centered rotor landing journal to where the touchdown bearing limits motion in each direction along each axis. Then it reports the results to the OptiView™ control. The readings for the last occurrence of this process are saved in OptiView™ for reference on the MBC Diagnostics screen.

The MBC can be commanded to perform an automated axial centering process in ADMIN level access with the chiller stopped. This process is done at the factory during chiller assembly and is not normally required to be performed in the field. It is necessary in the field only in an unusual circumstance to establish offset values where the motor or the MBC boards are replaced. During this procedure, the MBC determines the offset for the axial positioning between the location where the position sensor signals equal zero and the geometric center between the limits of the touchdown bearings. It then saves these offsets in the MBC and applies them to the levitation control system during normal

operation to maintain to geometric center. The values are also transmitted to OptiView™ and available for reference on the MBC Diagnostics screen.

Refer to *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual for specific steps required to perform the MBC manual manipulations.

COMMUNICATIONS

MBC communications to the OptiView™ microboard are on COM 6, using the Modbus serial protocol, with RTU framing. The serial port parameters are 38400 baud, 8 data bits, 2 stop bits, and no parity. The physical protocol is half-duplex RS-485. The microboard issues state change commands and fault status requests to the MBC and the MBC issues operating data, state status, and fault data to the microboard. The OptiView™ panel only polls the MBC communications when the MBC Alive digital input to the OptiView™ I/O board TB3-71 is high, otherwise signals or errors on MBC coms are ignored.

The MBC clock is commanded to re-set to match OptiView™ on power-up and time-change events.

**TABLE 18 - MBC PARAMETER INFORMATION
READ BY OPTIVIEW™**

NAME	UNITS
V13 Position	µm
W13 Position	µm
V24 Position	µm
W24 Position	µm
Z12 Position	µm
A13 Unbalance	µm
B13 Unbalance	µm
A24 Unbalance	µm
B24 Unbalance	µm
Az Vibration	µm
Bz Vibration	µm
Rotor Elongation	µm
Motor Speed	Hz
V1 Current	Amps
V3 Current	Amps
W1 Current	Amps
W3 Current	Amps
V2 Current	Amps
V4 Current	Amps
W2 Current	Amps
W4 Current	Amps
Z1 Current	Amps
Z2 Current	Amps
MBC Input Voltage	Volts
Z1 Temperature	°C
Z2 Temperature	°C
MBC Amplifier Temp	°C

TABLE 19 - MBC STATUS INFORMATION READ BY OPTIVIEW™

DESCRIPTION	POSSIBLE STATUS
Ready To Levitate	Not Ready to Levitate
	Ready to Levitate
Ready To Rotate	Not Ready to Rotate
	Ready to Rotate
Ready to Commu- nicate	Not Ready to Communicate
	Ready to Communicate
MBC Ready	MBC Not Ready
	MBC Ready
Shutdown Request (SDR) Indicates Level 2+ Alarm or Levitation Off	Unknown
	Not Realized / Realized
	Off / On
Clear Alarms	Unknown
	Not Realized / Realized
	Off / On
Clear Warnings	Unknown
	Not Realized / Realized
	Off / On
Customer Control	Unknown
	Not Realized / Realized
	Off / On
Hardwire Control	Unknown
	Not Realized / Realized
	Off / On
Levitation Mode	Unknown
	Not Realized / Realized
	Off / On
Rotation Mode	Unknown
	Not Realized / Realized
	Off / On
Servicing Control	Unknown
	Not Realized / Realized
	Off / On
Centering Proce- dure Mode	Unknown
	Not Realized / Realized
	Off / On
Backup Bearing Clearance Check	Unknown
	Not Realized / Realized
	Off / On
MBC Operation Time	Time spent in levitation in days.
SDR Counter	Total Number of Level 2 or 3 Alarms over the life of the MBC. Incremented each time a Level 2 or 3 Alarm is set.
Max. Alarm Level	Highest Alarm level presently set.
First Alarm Code	First Alarm detected after Clear Alarm

DESCRIPTION	POSSIBLE STATUS
All Alarm Registers	Alarm Level of all alarms:
	No Alarm
	Warning (Level 1)
	Trip (Level 2)
Shutdown Request (SDR)	Trip (Level 3)
	Not Requested
	State Not Ready
	Protection Not Ready
	Device Not Ready
	Processing
Clear Alarms	Done
	Failed
	Not Requested
	State Not Ready
	Protection Not Ready
	Device Not Ready
Clear Warnings	Processing
	Done
	Failed
	Not Requested
	State Not Ready
	Protection Not Ready
Customer Control	Device Not Ready
	Processing
	Done
	Failed
	Not Requested
	State Not Ready
Hardwire Control	Protection Not Ready
	Device Not Ready
	Processing
	Done
	Failed
	Not Requested
Levitation Mode	State Not Ready
	Protection Not Ready
	Device Not Ready
	Processing
	Done
	Failed

TABLE 19 - MBC STATUS INFORMATION READ BY OPTIVIEW™ (CONT'D)

DESCRIPTION	POSSIBLE STATUS	DESCRIPTION	POSSIBLE STATUS
Rotation Mode	Not Requested	Backup Bearing Clearance Check	Not Requested
	State Not Ready		State Not Ready
	Protection Not Ready		Protection Not Ready
	Device Not Ready		Device Not Ready
	Processing		Processing
	Done		Done
	Failed		Failed
Servicing Control	Not Requested	Live Snapshot	Not Requested
	State Not Ready		State Not Ready
	Protection Not Ready		Protection Not Ready
	Device Not Ready		Device Not Ready
	Processing		Processing
	Done		Done
	Failed		Failed
Centering Procedure Mode	Not Requested	Parameter Set Change	Not Requested
	State Not Ready		State Not Ready
	Protection Not Ready		Protection Not Ready
	Device Not Ready		Device Not Ready
	Processing		Processing
	Done		Done
	Failed		Failed

TABLE 20 - MBC COMMANDS WRITTEN BY OPTIVIEW™

Bearing control stiffness parameter set based on compressor model	
Date and Time	
State Commands	
Centering and Clearance Check Commands	
Warning and Alarm Acknowledge and Clear	

MBC WARNINGS

OptiView™ monitors the serial com port for an MBC Warning reported by Modbus. If received, the OptiView™ polls the MBC Warnings and Faults Register for Warning conditions.

MBC FAULTS

The OptiView™ Control Panel monitors two sources for MBC faults:

- Serial com port reports a fault by Modbus.

If a fault was reported by the serial Modbus communication, it is processed as a cycling or safety shutdown according to the fault.

- Digital MBC fault input to the I/O Board terminal TB3-70 goes low.

If a fault was indicated as input low on the I/O Board terminal TB3-70 (MBC Fault), it is processed as cycling shutdown while the OptiView™ polls the MBC for fault data over Modbus communications. The OptiView™ displays MBC SHUTDOWN – REQUESTING FAULT DATA... while it polls the MBC for the fault. If the OptiView™ does not receive the cause of the fault within 10 seconds, the MBC – FAULT CONTACTS OPEN message is displayed. Once the faults are reported, the shutdown is reprocessed as a safety shutdown, if necessary, and the generic MBC Fault message is replaced with the actual fault detail.

Upon recognition of fault, a snapshot of all of the MBC Modbus Data is captured from the last buffer entry before the fault and stored with the fault information. If any additional MBC faults occurred at the same time, the other faults are captured and reported in the History report as MBC All Faults below the initiating fault type.

The OptiView™ then issues a clear fault request command to the MBC over the serial communications. The OptiView™ waits to receive confirmation of no MBC alarms present. The command and receive cycle continues on 10 second intervals until the MBC reports no alarms present. The OptiView™ then releases the shutdown. If the shutdown was a Safety Shutdown, it requires the Clear Fault key on the OptiView™ Control Panel be pressed to clear it, once the fault condition is released.

Upon receipt of an MBC fault, a fast soft shutdown is initiated. This will power the driveline from the existing speed down to 0 Hz. The VSD run signal is then removed.

Table 19 on page 117 lists the faults and warnings that are generated by the MBC and reported on the OptiView™ panel

The MBC logs state changes and events. These are transferred to the OptiView™ panel each software cycle and listed in the MBC Event Log screen. If the chiller faults on an MBC driveline position fault, the MBC Event Log should be viewed. It is accessed from the MBC Screen. This log may contain MBC warnings that were a pre-cursor to the trip event. These should be evaluated against the MBC troubleshooting instructions in Form 160.84-M1.

The MBC buffers its parametric data every tenth of a second when running and saves the data during an MBC shutdown event for 5 seconds before to 5 seconds after the event. This is presented to the OptiView panel for reporting.

TABLE 21 - MBC FAULTS LIST

OPTIVIEW FAULT MESSAGE	MBC FAULT	OV FAULT TYPE
MBC – Speed Signal Fault	SpeedSensor	*Cycling/Safety
MBC – V13 Position	Position_V13	Cycling
MBC – V24 Position	Position_V24	Cycling
MBC – W13 Position	Position_W13	Cycling
MBC – W24 Position	Position_W24	Cycling
MBC – Z12 Position	Position_Z12	Cycling
MBC – V13 Low Frequency Displacement	Surge_V13	Cycling
MBC – V24 Low Frequency Displacement	Surge_V24	Cycling
MBC – W13 Low Frequency Displacement	Surge_W13	Cycling
MBC – W24 Low Frequency Displacement	Surge_W24	Cycling
MBC – VW13 Vibration	Unbalance_VW13	Cycling
MBC – VW24 Vibration	Unbalance_VW24	Cycling
MBC – Z12 Vibration	Harmonic_Z12	Cycling
MBC – Z12 Low Frequency Displacement	Surge_Z12	Cycling
MBC – Initialization Failure	HandshakeFailure	Cycling
MBC – Unknown Parameter File	ParamFileUnknow	Cycling
MBC – High Amplifier Temperature	**AmplifierTemperature_V13	Safety
MBC – High Bearing Z1 Temperature	**BearingTemperature_Z1	Safety
MBC – High Bearing Z2 Temperature	**BearingTemperature_Z2	Safety
MBC – Rotor Elongation	Elongation	Safety
MBC – Rotor Contraction	Contraction	Safety
MBC – AMP Communication	CommunicationAMP	Safety
MBC – AMP Watchdog	WatchdogAMP	Safety
MBC – DSP Communication	CommunicationDSP	Safety
MBC – DSP Unauthorized Rotation	RotationWithoutLevitationDSP	Safety
MBC – DSP Watchdog	WatchdogDSP	Safety
MBC – Fault Code XXX		
[XXX = Fault Code]	[Unknown MBC Fault]	Safety
MBC – High Axial Oscillator Voltage	OverVoltOscillatorAxial	Safety
MBC – High Input Voltage	PowerOvervoltage	Safety
MBC – High Radial Oscillator Voltage	OverVoltOscillatorRadial	Safety
MBC – Low Axial Oscillator Voltage	UnderVoltOscillatorAxial	Safety
MBC – Low Input Voltage	PowerUndervoltage	Safety
MBC – Low Radial Oscillator Voltage	UnderVoltOscillatorRadial	Safety
MBC – Overspeed Fault	Overspeed	Safety
MBC – SPV Unauthorized Rotation	RotationWithoutLevitationSPV	Safety
Warning - MBC - VW13 Landing	Landing_VW13	Warning
Warning - MBC - VW24 Landing	Landing_VW24	Warning
Warning - MBC - Z12 Landing	Landing_Z12	Warning
Warning – MBC – VW13 Landing Counter High	CounterLanding_VW13	Warning
Warning – MBC – VW24 Landing Counter High	CounterLanding_VW24	Warning
Warning – MBC – Z12 Landing Counter High	CounterLanding_Z12	Warning

SECTION 22 - REFRIGERANT LEVEL CONTROL

22

The chiller is provided with a Condenser **Refrigerant Level Control** valve located in the refrigerant liquid line between the Evaporator and Condenser. It is used to control the refrigerant level in the Condenser. It is modulated by an **Actuator** that is positioned by a 0-10VDC signal from the LTC I/O Board. The control decision originates at the Microboard. This signal positions the valve over the range of 0% (fully closed) to 100% (fully opened) from 0 to 10VDC, respectively. Positions between these extremes are linearly scaled (a 50% position would be achieved with a 5VDC signal). The power for the actuator is 24VAC. Automatic or Manual level control is allowed. If Automatic control is selected, the Program modulates the level control valve to maintain the Condenser refrigerant to a programmable Setpoint level. If Manual control is selected, the level control valve can be manually controlled with the Keypad keys. This Manual control can also be used to place the level control valve in a fixed position.

Programming of Setpoints described below, is performed on the Refrigerant Level Control/Tuning Screen using instructions in *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual.

A Liquid Level Sensor (LLS) detects the **Refrigerant Level** in the condenser and outputs an analog voltage to the Microboard that represents this level. The level is expressed as a percentage and is displayed on the Condenser Screen and the Refrigerant Level Control Screen as the REFRIGERANT LEVEL = XX.X%. The Level Sensor is factory-calibrated so that the refrigerant level is displayed as 0% when the level is at minimum; 100% when the level is at maximum. Levels between these extremes are linearly scaled. The level is at minimum when the when the level sensor is fully uncovered. The level is at maximum when the level sensor is fully immersed. Maximum usually corresponds to level over the top of the sight-glass. If the sensor ever requires recalibration due to incorrect indication at the uncovered or fully covered endpoints. The Level Sensor calibration procedure is in *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual.

The desired refrigerant level to be maintained in the condenser is the **Refrigerant Level Setpoint** and is displayed as REFRIGERANT LEVEL SETPOINT on the Condenser Screen and ACTIVE SETPOINT on the Refrigerant Level Control Screen.

The operating Setpoint is programmed by a Service Technician at chiller commissioning using the Refrigerant Level Control Screen. It is programmable over the range of 20% to 80%.

AUTOMATIC OPERATION

While the chiller is shut down, a fixed signal is applied to the Actuator, driving the level control valve to the startup position. With the chiller shutdown, the compressor is NOT driving any gas flow. This causes the Condenser refrigerant level to be subject to shutdown pressure difference.

At startup the Level control valve is held in the startup position until the programmed Condenser Level Control Startup Delay Time has elapsed (0 to 120 sec, default 15 sec) or refrigerant level is greater than the Refrigerant Level Setpoint. During this period, the Level Control State displays STARTUP HOLD and the STARTUP DELAY REMAINING displays the time remaining in the countdown timer. After the timer elapses if the level is greater than or equal to the Refrigerant Level Setpoint, it begins controlling to the Setpoint.

However, if level is less than the programmed Refrigerant Level Setpoint, a linearly increasing ramp limit, is applied to the Refrigerant Level Setpoint. This ramp limit allows the level to go from the present level to the Refrigerant Level Setpoint over a period of time programmed as the Ramp Time setpoint (1 to 5 minutes; default 1). During this ramp-up period, the Active Setpoint, which is used to control the refrigerant level in the condenser is based on the ramp. While the ramp is in effect, RAMP TIME REMAINING displays the time remaining to ramp to the programmed Setpoint. After the ramp period has elapsed, the refrigerant level is controlled by the programmed Refrigerant Level Setpoint for the remainder of chiller run.

The Program applies a position signal, as required, from the Microboard to the actuator to maintain the level to the Active Level Setpoint. When the chiller is given a soft shutdown command, the level control valve is given a 100% open command.

The control uses a single set of PID gains.

The control PID defaults and ranges are listed in the Programmable Settings section of this manual.

The level control valve movement is animated on the Refrigerant Level Control Screen as follows:

- when 0-20% open, shown fully closed
- 20 - 40% open, shown as 20% open
- 40 - 60% open, shown as 40% open
- 60 - 80% open, shown as 80% open
- 80 - 100% open, shown as 100% open.

MANUAL OPERATION

The level control valve Actuator can be manually controlled from the Keypad using the Refrigerant Level Control Screen after logging in at **SERVICE** access level. Open, Close, Set and Auto keys are used to control the level control valve. Using the Open, Close

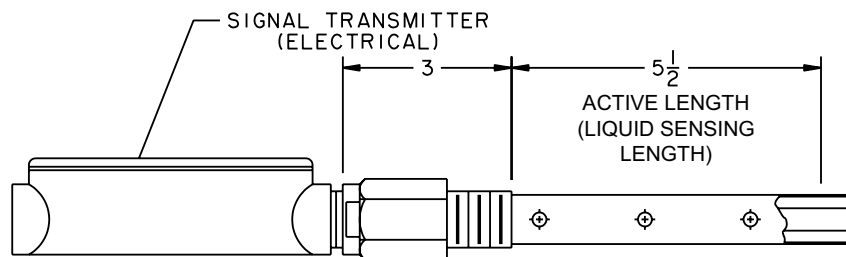
or Set keys, the level control valve can be placed in a fixed position. Pressing the Auto key returns Level Control to Automatic operation.

ACTUATORS

Units use an actuator that operates from 24VAC and is controlled by a 0-10VDC positioning input. 0VDC commands full closed and a 10VDC commands full open. Actuator should be set for clockwise opening. The interface for the actuator is shown in *Figure 55 on page 123*. The description of the operation of the control signal is in *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003* of this manual.

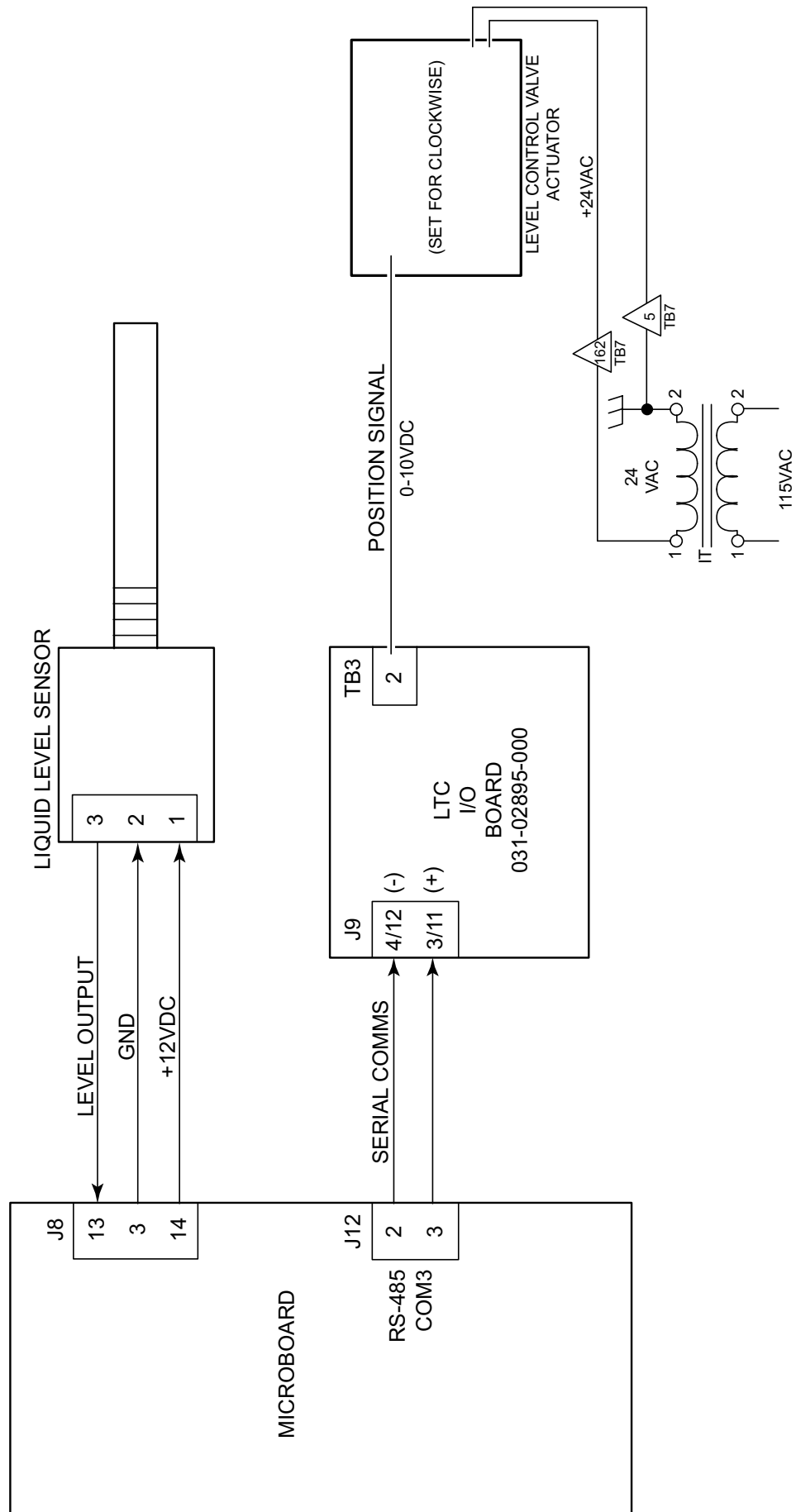
LEVEL SENSOR

The level sensor includes a static rod portion in the condenser and an electronic head where all of the measuring and transmitting circuitry is located. The level sensor is not expected to need recalibration in the field, so instructions for that for an unusual circumstance are available in a separate Service Instruction Manual covering variations used in manufacturing and updated as required. Refer to *Refrigerant Level Sensor Troubleshooting and Replacement - Service Instructions (Form 50.40-M1)*.



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FIGURE 54 - REFRIGERANT LIQUID LEVEL SENSOR



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FIGURE 55 - REFRIGERANT LIQUID LEVEL CONTROL - INTERFACE

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SECTION 23 - HOT GAS BYPASS VALVE

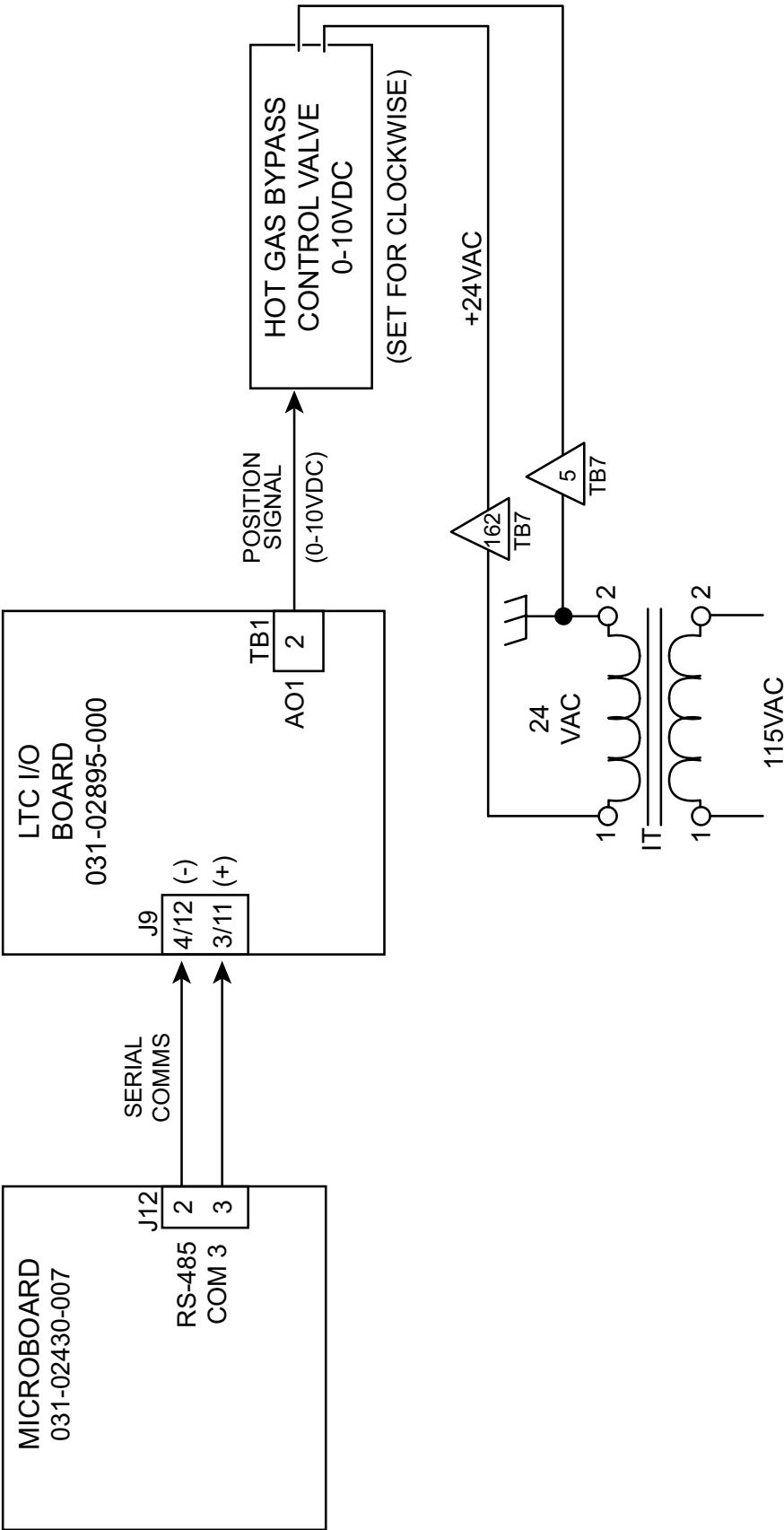
With the optional Hot Gas Bypass feature, a valve located in the Hot Gas Bypass connection between the condenser and the evaporator controls the flow of bypass gas to the evaporator. The valve is modulated in response to load according to the capacity control scheme described in *SECTION 20 - CAPACITY CONTROL*. Hot Gas Bypass allows greater turndown in chiller capacity.

If the chiller is equipped with the optional Hot Gas Bypass it must be Enabled from the OPERATIONS Screen using a procedure in *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual. If Disabled, the valve is driven to the fully closed position.

The control parameters for the Hot Gas Bypass can be accessed from the Capacity Control Setpoints Screen in Service level access.

The Microboard controls the Hot Gas Valve by sending a positioning command over the COM3 RS-485 serial communications link to the optional LTC I/O Board that is mounted inside the control center. This board converts the command into a 0-10VDC positioning signal, which is input to the valve actuator. 0VDC commands full closed and 10VDC commands full open. The actuator receives power from 24VAC. The interface is shown in *Figure 56 on page 126*. The description of the operation of the control signals are in *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003* of this manual.

A control command of 0% sends a full closed (0VDC) command to the valve. A control command of 100% sends a full open (10VDC) command to the valve. Actuator should be set for clockwise opening.



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FIGURE 56 - INTERFACE, HOT GAS BYPASS (I/O BOARD 031-02895-000)

SECTION 24 - VARIABLE GEOMETRY DIFFUSER

The YMC² compressor is equipped with a Variable Geometry Diffuser (VGD). It is a mechanical ring located in the diffuser passage after the impeller discharge that is mechanically operated through linkages by an external electric actuator. It is closed (extended) to narrow the diffuser gap. It is opened (retracted) to open the diffuser gap. It is used as a capacity control device when required to reduce compressor gas flow when compressor speed can not be further reduced due to the lift required. It also is effective for mitigating aerodynamic stall conditions and associated stall noise at lower required flow because it increases diffuser velocity as it narrows the flow gap. Stall is most prevalent at low load conditions with high head.

VGD ACTUATOR

The VGD actuator is a linear positioner with internal position feedback. It is connected to an arm on the VGD control shaft to cause necessary rotation to move the VGD ring. The VGD shaft full travel moves the internal VGD ring from fully retracted to full extended, stopping when the ring itself reaches mechanical interference on either end. Normal operating stroke time approaches 20 seconds for a full stroke, depending on compressor.

The VGD position calibration procedure causes the actuator to find the full open and full closed position by driving with reduced force to each end stop and detecting the torque change at the stop as change in current. The actuator registers these stroke positions. During normal operation it limits stroke to within a fixed marginal value of the full travel stops.

The VGD feedback calibration procedure establishes to OptiView™ the VGD actuator feedback output that coincides with the beginning and end of its active travel. The position for most open gap is designated 100%. The position for most closed diffuser gap is designated 0%. The VGD calibration procedures are described in *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual.

VGD ACTUATOR COMMUNICATION

The VGD actuator includes an electronic interface used for its internal operation and to receive position commands and communicate position feedback, fault and calibration state information with the OptiView™ panel. It communicates these on OptiView™ RS485

COM 5, using the Modbus RTU protocol. OptiView™ Microboard jumpers JP30 and JP31 should be installed across the two pins for each to use the board biasing resistors to increase noise immunity.

VGD ACTUATOR FAULT

The actuator communicates a faulted state with a digital output that goes to OptiView™ LTC I/O board DI12, TB20-3,4. The actuator normally supplies +24VDC to terminal 3. Upon fault, the input ceases. Terminal 4 is tied to OptiView™ Power Supply DC common. On two-stage chillers, the high stage actuator fault signal goes to OptiView™ LTC I/O board DI13, TB19-1,2. The high stage actuator normally supplies +24VDC to terminal 1. Upon fault the input ceases. Terminal 2 is tied to OptiView™ Power supply DC common. The VGD actuator communicates fault conditions to the Microboard using a 16 bit Modbus word. Each bit represents an individual fault condition. The VGD Actuator screen displays the VGD Fault Code with bit 15 on the left and 0 on the right. A "1" will be displayed in a bit when a fault is active otherwise, a "0" will be displayed.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

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Table 22 on page 128 details the VGD Actuator Fault Codes

VGD ACTUATOR QUICK SHUTDOWN

The VGD actuator has a Quick Shutdown Mode that is enabled when the +24VDC digital signal from the VGD Shutdown relay K6 on the OptiView™ panel I/O board (Terminals 152 to 153) is removed. The microboard communicates this through J19-44. When this mode is enabled, the VGD Actuator will rapidly close to 0% position to prevent compressor backspin. The quick shutdown rate is 3 seconds for a full 3" actuator stroke, which equates to about 2 to 2.5 seconds full travel for the length used on the YMC² compressors. A low output (relay opened / de-energized) commands the VGD Actuator to do a Quick Shutdown. A high output (relay close / energized) commands the VGD Actuator to perform normal control utilizing the analog position command. On two-stage chillers, the high stage VGD shutdown signal is through relay K7 on the OptiView™ panel I/O board (Terminals 154 to 155). The microboard communicates this through J19-43.

TABLE 22 - VGD ACTUATOR FAULT CODES

BIT	CODES	DESCRIPTION
15	Restart	Actuator restarted its software process
13 & 14	User and Factory Parameters	This fault indicates the check sum of the factory or user parameters did not match the expected value. This is an indication that the non-volatile memory has failed. It is normal to see this fault after a firmware flash upgraded. If the fault persists the actuator needs to be replaced.
Bit 11	IH – Hardware Overcurrent	A Hardware Overcurrent fault occurs when current sensing circuitry detects extremely high current on the actuator DC bus. This fault can sometimes be cleared with a resetting of the faults, however, if not, the actuator will need replaced. This fault could mean the actuator motor stator has a short or a component internally has failed and is shorting.
Bit 9	LOS – Loss of Signal	A Loss of Signal fault is generated when an analog input detects a value that is below its low trip value or above its high trip value. Check connections and supply voltage.
Bit 8	AT – Actuator Temperature	An Actuator Temperature fault occurs when the drive detects a stator temperature that exceeds the factory set limit (130 °C). This can be caused by unusually high ambient temperatures or extreme loading and cycling of the actuator or from a high torque condition that inhibits travel momentarily.
Bit 7	BT – Board Temperature	A Board Temperature fault occurs when the drive detects a processor temperature that exceeds the factory set limit (105 °C). This can be caused by unusually high ambient temperatures or extreme loading and cycling of the actuator.
Bit 6	FE – Positional Following Error	A Positional Following Error fault occurs when the feedback position does not match the commanded position, within a position and time range programmed in the actuator by the supplier. This could be a physical bind or restriction that did not cause overcurrent, but prevented the actuator achieving position soon enough, or a situation where insufficient power was available to the actuator motor to drive to the commanded position for some duration.
Bit 5	VHIGH – High DC Bus Voltage	A High DC Bus Voltage fault occurs whenever the DC bus voltage rises above the maximum allowable voltage. High DC Bus Voltage faults may occur when the supply voltage to the actuator exceeds 85 VDC. It could also occur if the bus voltage is elevated from the actuator motor regeneration energy if something external drove the actuator against its static position.
Bit 4	VLOW – Low DC Bus Voltage	A Low DC Bus Voltage fault occurs when the actuator drive is enabled and the DC bus voltage falls below the minimum, 9 Volts DC. Check input voltage supply for proper voltage. The 120VAC to 48 VDC power supply output to the VGD is expected to be within $\pm 1\%$ (47.5 to 48.5 VDC).
Bit 2	POS – Position Tracking	A Position Tracking fault is generated internally when the feedback is delivering signals to the processor that do not match what the processor expects to see. This is not necessarily a position discrepancy, but more of a signal quality issue. This likely indicates a problem with the device requiring replacement.
Bit 1	IC – Continuous Current	A Continuous Current fault occurs when the output current to the actuator motor exceeds the rated limit set by the supplier for a given time duration. The trip is a function of current squared times duration, so the higher the current, the faster the time to trip. This could occur if the actuator stroke becomes obstructed by binding in the actuator linkages or VGD itself, the stroke calibration failed to set the limits properly that operation resulted in contact with a hard stop, during normal operation.
Bit 0	IPK – Peak Current	A Peak Current fault occurs when the output current to the actuator motor instantaneously exceeds the peak limit set by the supplier. This could occur if the actuator stroke becomes obstructed by binding in the actuator linkages or VGD itself, the stroke calibration failed to set the limits properly that operation resulted in contact with a hard stop, during a high speed stroke event.

STALL DETECTION

Stall noise in the compressor discharge is detected as gas pressure pulsations. A Stall Pressure Transducer, mounted in the discharge scroll of the compressor, detects the pressure pulsations and outputs DC voltage pulsations to the Stall Detector Board. This board converts the voltage pulsations into two analog voltages that represent the magnitude of the stall noise in two distinct frequency bands and transmits these to the microboard. The High Stall Voltage is derived from data in the 300-600 Hz range. The Standard Stall Voltage is derived from data in the 10-300 Hz range. When broadband flow noise exists, the High Stall Voltage signal increases along with the Standard Stall Voltage signal. The VGD Stall determination distinguishes between stall and flow noise. The control determines a value, Enhanced Stall Voltage, as Standard Stall Voltage minus High Stall Voltage and decides how to evaluate based on this value compared to a programmable limit called Broadband Threshold (0.00V to 0.40V, default 0.18V).

When Enhanced Stall Voltage $\leq$ Broadband Threshold and VGD position $> 75\%$:

Broadband flow noise exists and the Active Stall Voltage is set equal to the calculated Enhanced Stall Voltage

When Enhanced Stall Voltage $>$ Broadband Threshold:

Active Stall Voltage is set equal to the Standard Stall Voltage

The control uses the derived value called Active Stall Voltage to compare to the Active Low Limit and Active High Limit thresholds to evaluate the presence of stall noise. The type of signal in use is indicated on the VGD screen next to the Active Stall Voltage value as Standard or Enhanced.

AUTOMATIC OPERATION

In the run state, the VGD is used for capacity control according to the description in the Capacity Control section of this manual. Operation of the VGD is used as the primary control means generally when Hot Gas Bypass is closed and Speed is at its minimum allowed.

Capacity Control

The VGD is controlled by the output of the capacity control logic as needed to maintain leaving chilled liquid temperature in conjunction with the operation of the VSD speed and optional Hot Gas Bypass, if installed and enabled. It remains in this state while the chiller is running.

STALL SENSOR VALIDATION

This feature verifies the operation of the Stall Pressure Transducer by comparing its voltage output to the voltage output of the Condenser Pressure Transducer. Since both transducers are measuring essentially the same pressure, both outputs should be within an acceptable range of each other. If the Stall Transducer is not reading accurately, a warning message is displayed.

While the chiller is running, the outputs of the Stall Transducer and Condenser Transducer are compared. If the difference between them exceeds 21 PSID for 3 continuous minutes, "WARNING – CONDENSER OR VGD SENSOR FAILURE" is displayed.

The Stall Pressure Transducer unprocessed DC voltage output passes through the Stall Detector Board J2-2 and is connected to the Microboard at J8-1. This value is then used for comparison to the condenser transducer.

MANUAL OPERATION

The VGD can be manually controlled from the Capacity Control Screen in Service access level, 30 seconds after chiller stop, in MBC startup or running state. The actuator is locked to automatic upon exit of run state during soft shutdown, coastdown, and for the first 30 seconds of stop state.

STALL TRANSDUCER

Detects stall noise as high frequency pressure fluctuations in the discharge scroll of the compressor. It converts the pressure pulsations to DC voltage pulsations and applies them to the Stall Detector Board.

Transducer

pin 1 - +5VDC supply voltage - RED
pin 2 - ground - BLK
pin 3 - signal out - WHT

STALL DETECTOR BOARD

The Stall Detector Board converts the Stall Transducer DC voltage pulsations to two analog DC voltage outputs (TB1-HI and TB1-STD) that represents the magnitude of stall noise and applies it to the Microboard (J8-15 and J7-23). This board also provides a path for the Stall Transducer unprocessed DC voltage pulsations output to be connected from J2-2 to the Microboard (J8-1). This output is used for the Stall Sensor Validation feature.

This board contains a filter that separates the noise associated with high gas flow/low head conditions. The output from TB1-HI is with a filter allowing 300-600 Hz data. The output from TB1-STD is the 10-300 Hz signal. The control software uses both signals to determine stall conditions.

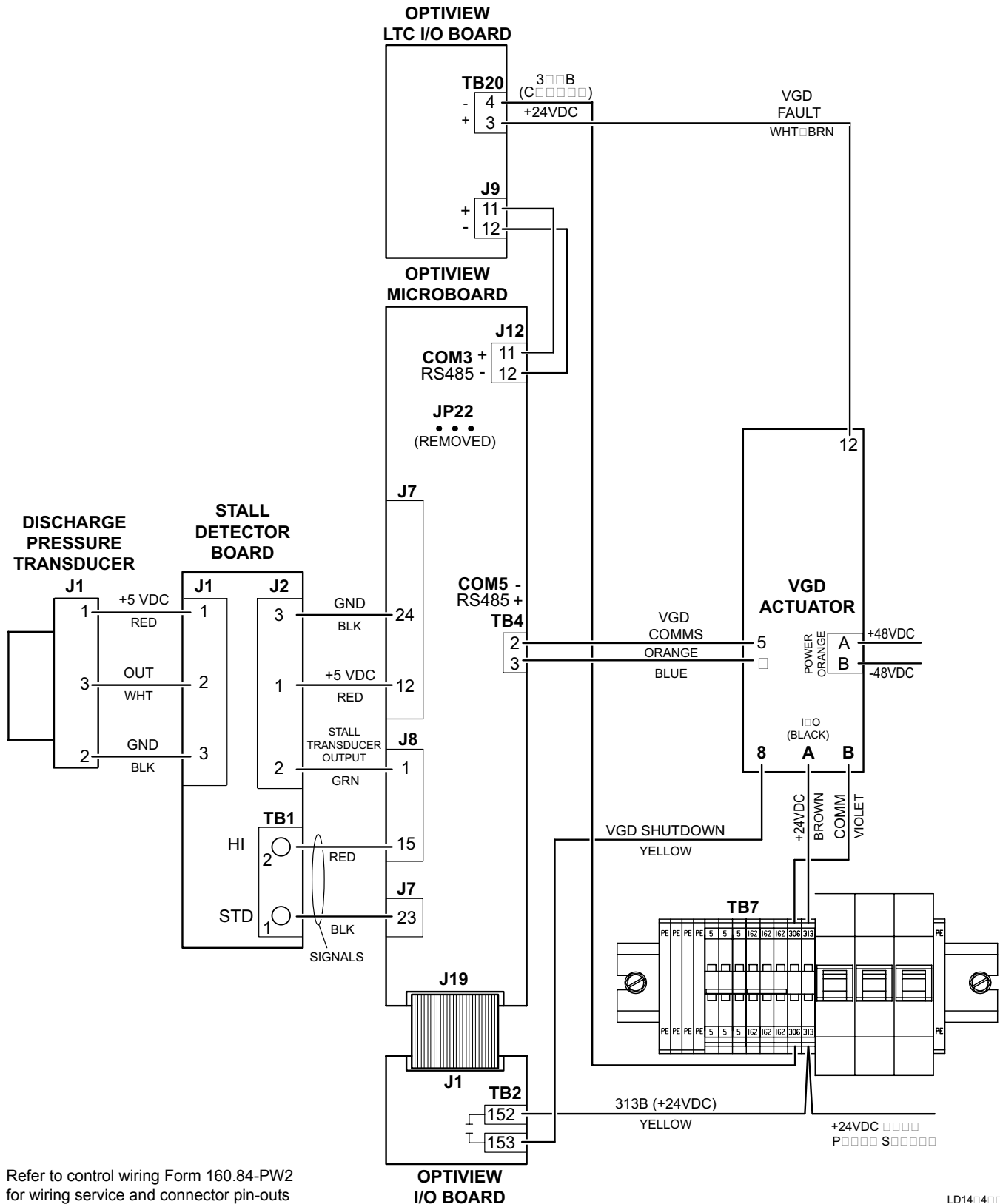


FIGURE 57 - VARIABLE GEOMETRY DIFFUSER BLOCK DIAGRAM (SINGLE OR LOW STAGE)

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SECTION 25 - MOTOR COOLING CONTROL VALVE

A controlled electronic expansion valve mounted on the top of the motor exists in the motor cooling path to maintain a controlled minimum motor housing temperature.

Motor Cooling Control is an incremental PID. The gains are set in ADMIN access level on the Motor Details Screen and listed in the Programming section of this manual. They define the response of the PID. The Motor Housing Temperature is controlled with this valve to a target called Motor Housing Temperature Setpoint, defined as Ambient Dewpoint Temperature (if enabled) or Entering Condenser Liquid Temperature + Setpoint Offset. Setpoint Offset is programmable (-10 to 50 deg F, default 10). The control continually calculates this target, with the minimum allowed as the Min Housing Temperature setpoint (55 to 100 def F, default 55). The maximum allowed setpoint is 130.0 °F. Setpoint changes are rate limited to 0.1 °F / sec. The PID operates with a 1.0 °F deadband (setpoint +/- 0.5 °F). Ambient Dewpoint temperature sensor is Enabled if supplied, or Disabled on the Motor Details Screen in Service access.

Motor Cooling Control contains an override based on the highest of the 6 Motor Winding Temperatures. The Override Threshold is defined by the Max Winding Temp. When the highest Motor Winding Temperature exceeds the Max Winding Temp the Override Control will override the PID output and increase the Motor Cooling Valve Command. This will result in the valve opening more to provide additional cooling.

A second override is based on a calculated value called Estimated Rotor Temperature described in the Motor Monitoring section of this manual. Estimated Rotor Temperature is determined from the rotor elongation from the MBC, motor housing temperature, motor speed and constants associated with the motor code in compressor model on the Sales Order screen. If Estimated Rotor Temperature exceeds 230°, the Override Control will override the PID output and increase the Motor Cooling Valve Command. This will result in the valve opening more to provide additional cooling. This override control is limited such that the Motor Housing Temperature will not go more than 20°F below entering condenser temperature.

Figure 59 on page 134 shows the motor cooling interface board. The OptiView™ LTC I/O board outputs a 0 to 10 VDC signal from TB4 Terminal 2 to the interface

board. The terminal on the interface board is labeled +4-20, although this terminal accepts the voltage input for our application. The interface board terminal -4-20 is the DC reference for this signal, tied back to LTC I/O board terminal TB4-3. The interface board converts this control signal into step pulses to the valve to position it proportionally to the control signal. The interface board is supplied with 24 VDC from the OptiView™ dedicated 2T, 120VAC to 24VDC transformer. If power from the board to the valve is lost, the valve will remain in the last position. When the board is initially powered up, it will initialize by driving the valve with enough steps to ensure it is fully closed. This requires approximately 16 seconds. The board does not respond to input command during that time.

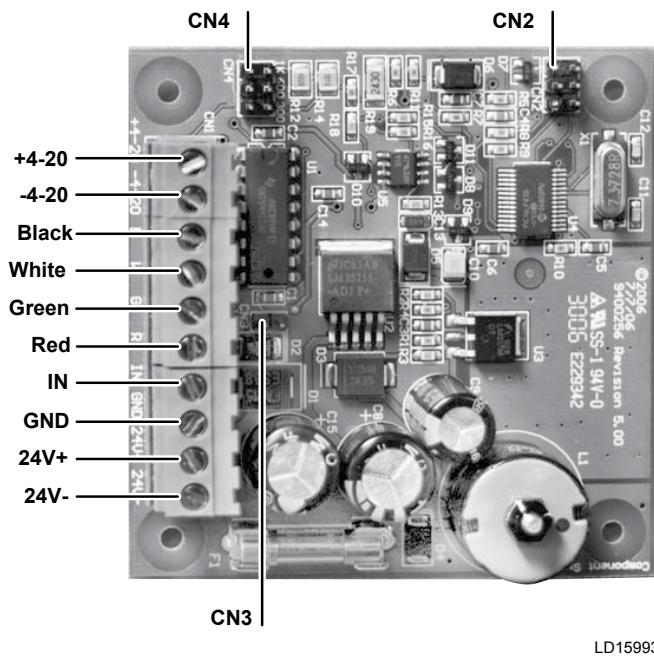
Troubleshooting

The valve motor can be checked through resistance of the valve motor winding as follows:

- Remove power from the interface board.
- Remove the valve leads from the interface board terminals B, W, G and R.
- Measure the resistance between the black and white leads to the valve. The resistance should be approximately 100 ohm at room temperature.
- Measure the resistance between the green and red leads to the valve. The resistance should be within $\pm 5\%$ of the resistance measured between the black and white leads at room temperature.
- Measure the resistance between each lead to the valve body. Resistance should show open circuit.

Steps to assess the interface board are listed below

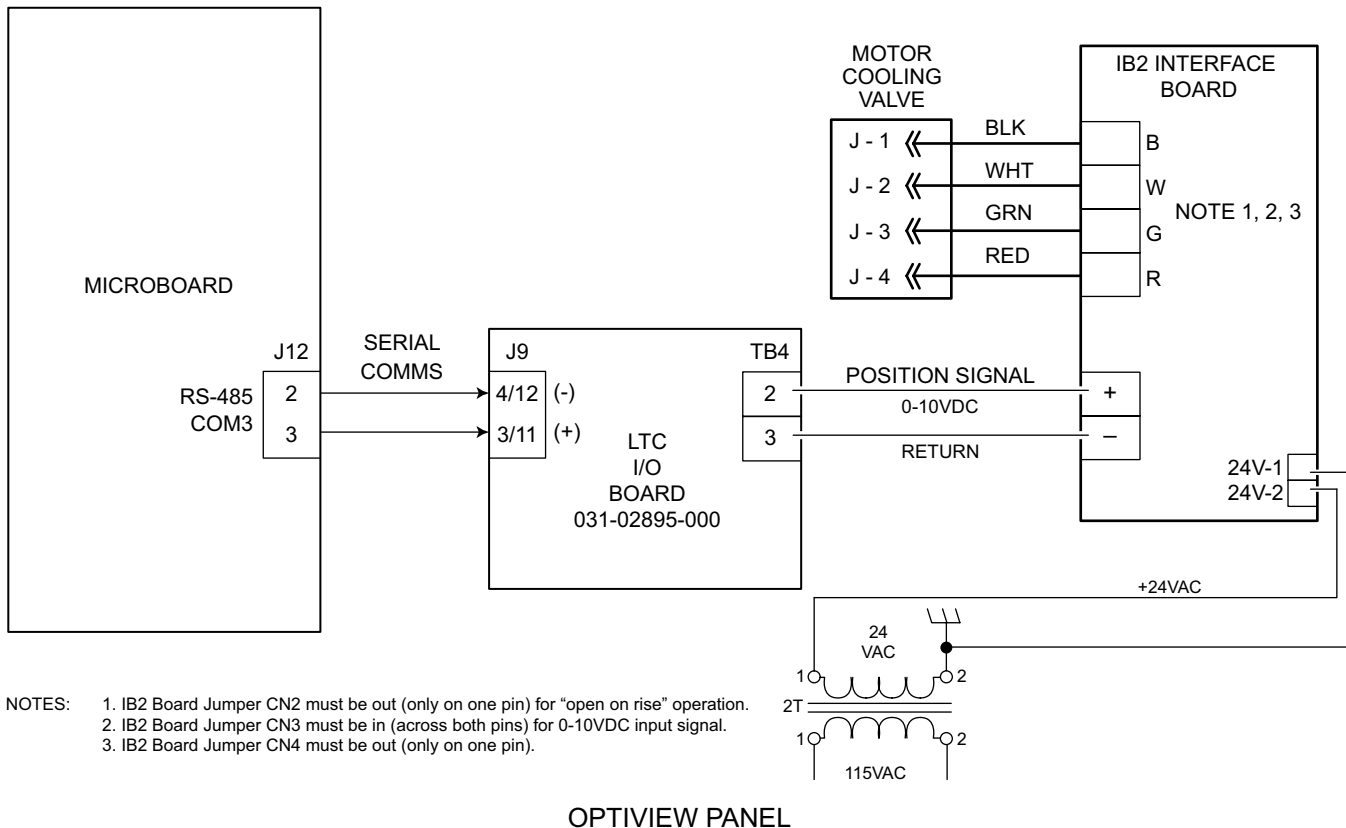
- Check for 24VAC supply at terminals 24V+ and 24V-.
- Check that interface board jumpers are properly positioned according to *Figure 58 on page 134*.
- Check that the control signal wires are connected to board terminals +4-20 and -4-20.
- Check that the 0-10 VDC command signal from the LTC I/O board is present when the valve is commanded open or closed.
- Check that the board fuse is intact.



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FIGURE 58 - MOTOR COOLING VALVE INTERFACE BOARD IB-2

- Check that the valve wires are connected appropriately as Black to B, White to W, Green to G, Red to R.
- Connect an AC voltmeter to the B and W terminals. Interrupt and restore power to the interface board so that it goes into the mode where it drives the valve closed for 16 seconds. Check for the meter to show 12 to 14 VAC.
- Connect an AC voltmeter to the G and R terminals. Interrupt and restore power to the interface board so that it goes into the mode where it drives the valve closed for 16 seconds. Check for the meter to show 12 to 14 VAC.



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FIGURE 59 - MOTOR COOLING VALVE - INTERFACE

SECTION 26 - SMART FREEZE PROTECTION

The **Smart Freeze** feature prevents nuisance chiller shutdowns due to brief periods of chilled liquid flow fluctuations or other brief operating conditions that would normally cause Low Evaporator Pressure Safety shutdowns. With this feature enabled and activated, the chiller is permitted to ride through these temporary conditions. Also, this feature allows the Leaving Chilled Liquid Temperature Setpoint to be set as low as 36.0°F (2.2°C). **Smart Freeze** protection can be enabled or disabled at the Keypad, by a Service Technician, using a procedure detailed in the *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual. It **cannot** be used in Brine cooling mode.

The basis of this feature is that the chilled liquid contains an amount of heat, which cannot be eliminated immediately. Therefore, it requires a certain amount of time for the liquid to change to a solid. During this period of time, those parameters that determine when solidification will occur, are evaluated and the appropriate Low Evaporator Temperature shutdown threshold is applied. This threshold could be lower, but not higher than the normal Safety threshold.

Smart Freeze protection uses the Evaporator Refrigerant Temperature as one of the variables to determine when freezing is imminent. If the chiller is equipped with the Evaporator Refrigerant Temperature Sensor (RT7), and the sensor is enabled using *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual, this value is used as the refrigerant temperature. Otherwise, the Evaporator Saturation Temperature (as derived from the output of the Evaporator Pressure Transducer. The pressure is converted to a temperature via the appropriate refrigerant “pressure/temperature lookup table”) is used as the refrigerant temperature.

When **Smart Freeze** protection is Enabled, the Leaving Chilled Liquid Temperature Setpoint can be set as low as 36.0°F (2.2°C). If set to less than 38.0°F (3.3°C), the **LEAVING CHILLED LIQUID – LOW TEMPERATURE** cycling shutdown threshold becomes a minimum of 34.0°F (1.1 °C).

Unless **Smart Freeze** protection is **activated**, the fixed Low Evaporator Pressure Safety thresholds (R134a – 25.0 PSIG, 28.7°F (-1.8°C)) is used. SMART FREEZE

protection is **activated** only when the feature is enabled **AND** the Leaving Chilled Liquid Temperature Setpoint is less than 38°F (3.3°C). Once activated, the total number of seconds that the evaporator refrigerant temperature is below the freeze threshold is counted. The freeze threshold is 32.8°F (0.4°C) (refrigerant temperature sensor RT7) or 34.0° (1.1°C) (evaporator saturation temperature See Note 1 below.). The count is incremented once for every second the evaporator refrigerant temperature is below the freeze threshold and decremented once for every second it is above the freeze threshold (but is never decremented below zero). Thus if the evaporator refrigerant temperature goes below the freeze threshold for 30 seconds, then goes above it for 10 seconds, then goes below the threshold for 5 seconds, the total number of seconds the evaporator refrigerant temperature was below the freeze threshold was 25 seconds. If Smart Freeze is no longer activated due to the Leaving Chilled Liquid Temperature Setpoint being raised to greater than or equal to 38.0°F (3.3°C), the total number of seconds being tracked is set to zero.

The number of seconds it will take the chilled liquid to freeze is based on how far the evaporator refrigerant temperature is below the freeze threshold as follows:

$$\text{Number of seconds to freezing} = \frac{4053.7}{(\text{freeze threshold} - \text{evaporator refrigerant temperature})}$$

Thus, if the Evaporator Saturation Temperature is being used as the evaporator refrigerant temperature and that temperature is 26.0°F (-3.3°C), it would take 8 minutes and 26 seconds for the chilled liquid to freeze.

When the total number of seconds the evaporator refrigerant temperature is below the freeze threshold exceeds the “Number of seconds to freezing”, a safety shutdown is performed and **EVAPORATOR – LOW PRESSURE – SMART FREEZE** is displayed on the System details line of the display.

Even though **Smart Freeze** protection is enabled and activated, the low evaporator pressure load limit still occurs at the same thresholds as with normal operation; 27.0 PSIG (R134a).

SMART FREEZE DISABLED

- Minimum Leaving Chilled Liquid Setpoint: 38.0°F (3.3°C).
- Low Chilled Liquid Temp cycling shutdown threshold: 1° to 34.0°F (1.1°C) below the Leaving Chilled Liquid temp Setpoint, as programmed, or a minimum of 36.0°F (2.2°C).
- Low Evaporator Pressure safety shutdown threshold: R134a – 25.0 PSIG (28.7°F) (-1.8°C).
- Low evaporator pressure load limit threshold = 27.0 PSIG.

SMART FREEZE ENABLED

- Minimum Leaving Chilled Liquid Setpoint: 36.0°F (2.2°C)
- If the Leaving Chilled Liquid Temperature Setpoint is greater than or equal to 38.0°F (2.2°C):
 1. The Low Leaving Chilled Liquid Temperature Cycling shutdown threshold: 1 to 34.0°F (1.1°C) below the Leaving Chilled Liquid Temperature Setpoint, as programmed, or a minimum of 36.0°F (2.2°C).
 2. The Low Evaporator Pressure Safety shutdown threshold is the same as **Smart Freeze Disabled** above.

- If the Leaving Chilled Liquid Temperature Setpoint is less than 38.0°F (3.3°C):
 1. The Low Leaving Chilled Liquid Temperature Cycling shutdown threshold: 1 to 3.0°F (-16.1°C) below the Leaving Chilled Liquid Temperature Setpoint, as programmed, or a minimum of 34.0°F (1.1°C).
 2. Low Evaporator Pressure shutdown threshold: Determined by how far the evaporator refrigerant temperature is below the freeze threshold of 32.8°F (0.4°C) (refrigerant temperature sensor RT7) or 34.0°F (1.1°C) (Evaporator Saturation Temperature.) and the total number of seconds it remains there. Refer to explanation above.
- Low evaporator pressure load limit threshold same as **Smart Freeze Disabled** above.

SECTION 27 - 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, it can be configured to shutdown the chiller.

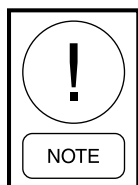
The Surge Protection Screen, accessible from the Compressor Screen, displays all parameters relevant to this feature. All setpoints for this feature are maintained on this screen.

SURGE DETECTION

Surge events are detected by monitoring the relationship between the Condenser pressure and Evaporator pressure while the chiller is running.

The Evaporator pressure transducer output is subtracted from the Condenser pressure output to determine the differential. If either of the following negative transitions occur in the differential followed by a 0.061VDC positive differential transition within 15 seconds a surge event is detected:

- If the differential decreases greater than or equal to 0.6VDC for greater than or equal to 0.260 seconds.
- If the differential decreases greater than or equal to x.xVDC for greater than or equal to 0.390 seconds.



x.xVDC is calculated as [(surge sensitivity setpoint x 300) x 1.22] ÷ 1000

The surge detection sensitivity for the Surge Protection feature is set with the SURGE SENSITIVITY setpoint on the Surge protection Screen. It is adjustable over the range of 0.3 (default) to 1.3. Smaller values increase the sensitivity.

Each time a surge is detected by the Surge Protection feature, the SURGE AVOIDANCE SURGE DETECTED indicator illuminates momentarily.

The SURGE AVOIDANCE SURGE COUNT is the total number of surges detected by the Surge Protection feature. The SURGE AVOIDANCE SURGE COUNT can be cleared using an ADMIN password following procedure in *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual.

The SURGE WINDOW COUNT accumulates the number of surges that occur within the SURGE WINDOW TIME. This time is programmable over the range of 1 to 5 minutes using the COUNT WINDOW setpoint. The number of surges that occur within the SURGE WINDOW TIME are compared to the COUNT LIMIT setpoint (4 – 20) to determine if an excess surge condition exists, as explained below.

EXCESS SURGE DETECTION

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 5) exceed the threshold programmed as the COUNT LIMIT setpoint (4 to 20; default 4) an excess surge condition has been detected.

Unless the SHUTDOWN features have been enabled, as explained below, the chiller will continue to run 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.

SURGE PROTECTION

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.

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SECTION 28 - HEAD PRESSURE CONTROL

YMC² chillers are capable of operation within a wide range of condenser water temperatures. However, a minimum condenser water temperature, as specified in the *YMC² Engineering Guide (Form 160.84-EG1)*, is required to maintain sufficient pressure differential (head) between the condenser and evaporator for proper refrigerant management in the chiller.

Should colder condenser water temperatures be anticipated at the cooling source, a field mounted facility control means may be provided to ensure adequate head pressure exists. The preferred means would be a cooling tower bypass circuit that maintains a constant flow rate through the condenser, since this would maintain adequate tube velocity in the condenser, while regulating the return cooling water to the condenser. However, a two-way condenser water throttling valve, a variable speed cooling tower pump, or tower fan control circuit might also be employed.

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 output is direct acting (as the Head Pressure increases above the setpoint, the valve is driven more open to provide less tower bypass or more flow through the condenser).

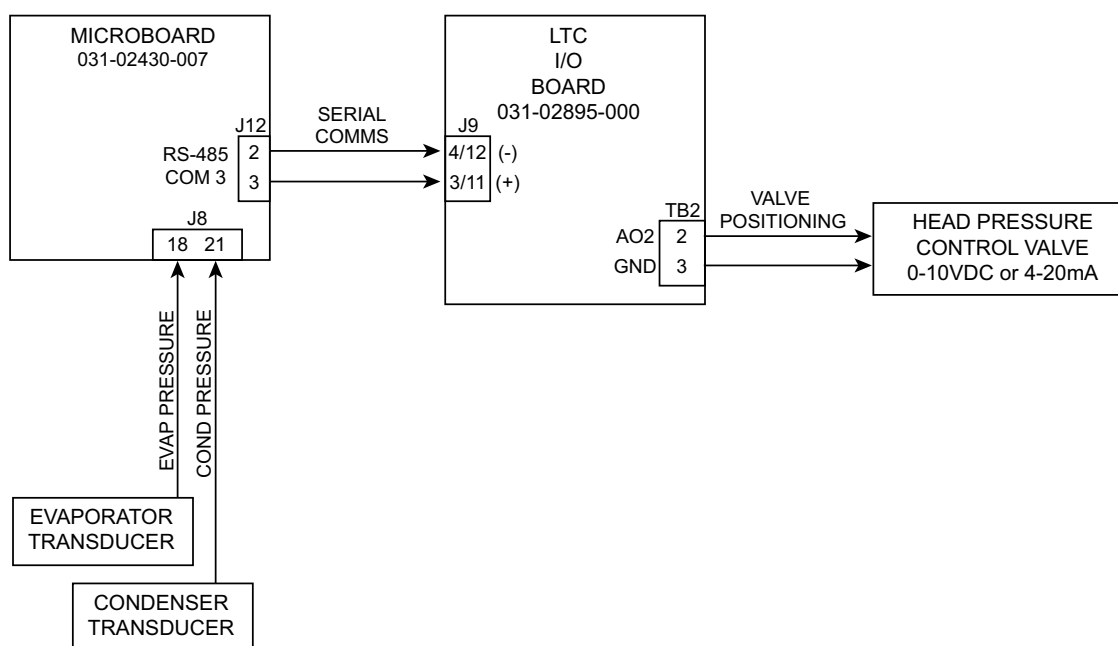
If the chiller is equipped for Head Pressure Control, the feature must be ENABLED on the SETUP Screen using the Head Pressure Control Setpoint. Otherwise it must be DISABLED. Once enabled, the Head Pressure Control Screen is available from the Condenser Screen. All of the Head Pressure Control parameters are displayed on this screen.

INPUTS/OUTPUTS

The I/O used for Head Pressure Control feature is:

- Evaporator Transducer
- Condenser Transducer
- Head Pressure Control Valve output (0-10VDC or 4-20mA)

The Evaporator Transducer and Condenser Transducer are connected to the Microboard as shown in *Figure 60 on page 139*. This provides the head pressure (condenser minus evaporator) to the Microboard. The Head Pressure Control Valve is driven from the LTC I/O Board 031-02895-000. The operation of this board is explained in *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003*. The Microboard communicates with this board using RS-485 Modbus serial communications.



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FIGURE 60 - HEAD PRESSURE CONTROL BLOCK DIAGRAM

It sends the valve positioning command, via this serial link, to the I/O Board where it is converted to a 0-10VDC or 4-20mA positioning signal that is applied to the valve as described below.

CONTROL

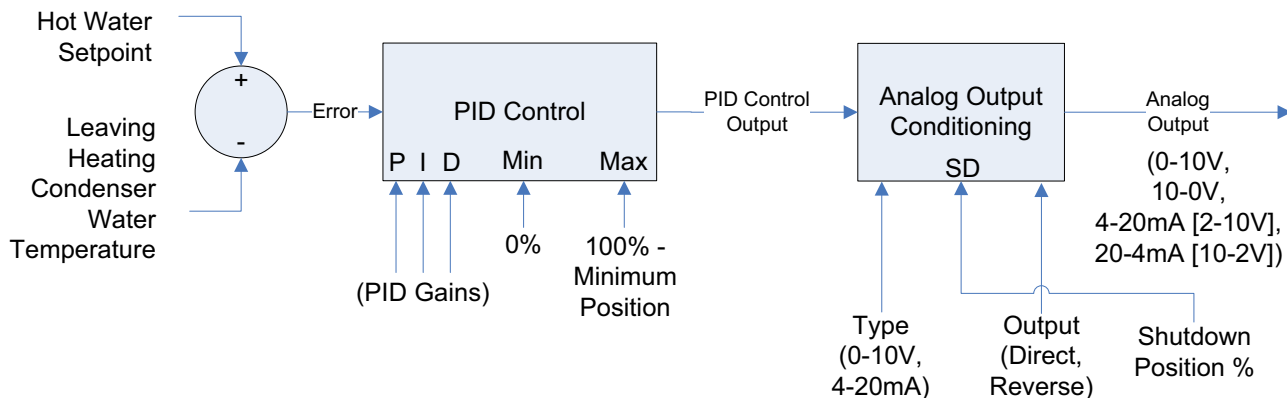
When Head Pressure Control is enabled, all the following programmable settings and applicable parameters are available on the Head Pressure Control Screen.

Setpoints

- Head Pressure Setpoint (15.0 PSID to 60.0 PSID; default 23 PSID) - Sets the Head Pressure that the control will control to. Value entered is displayed as Head Pressure Setpoint.
- Control Valve Output Settings:
 - a. TYPE – Makes the control signal to the Head Pressure Control Valve either 0-10VDC or 4-10mA (default 0-10VDC).
 - b. DIRECTION – Makes the control signal to the Head Pressure Control Valve either Direct or Reverse acting (default Direct). Set to Direct for this application.
 - c. SET – Is used to manually set the Head Pressure Control Valve to any position between 0.0% and 100%.
 - d. AUTO – Returns the Head Pressure Control Valve to automatic control mode (default Auto).

- Head Pressure Control – Sets the proportional gain of the control:
 - a. P – Sets the proportional gain of the control over the range of 0.00 to 5.00 (default 2.00).
 - b. I – Sets the integral gain of the control over the range of 0.0 to 5.00 (default 2.00).
 - c. D – Sets the derivative gain of the control over the range of 0.0 to 5.00 (default 0.00).
- Minimum Position – Defines a minimum command output during operation that can be used to restrict flow turndown. This minimum is active all times the chiller has the condenser pump run contacts closed.
- Shutdown Position – Defines the control command when the condenser pump run contacts are open that can be used to enhance customer use of their valve or controller.

When Head Pressure Control is enabled, the Control Valve Output is modulated by a direct acting PID control. The inputs to the PID control are the chiller Head Pressure (Condenser Pressure – Evaporator Pressure) and the Head Pressure Setpoint. The PID control error is defined as Head Pressure Setpoint – Head Pressure. The PID control's proportional, integral and derivative gains are programmable using the CHANGE SETPOINTS key. The Control Valve position is displayed as 0.0% to 100% in the box labeled CONTROL VALVE OUTPUT. The control output to the valve is direct acting (as the Head Pressure increases above the setpoint, the valve is driven more open to provide less tower bypass or more flow through the condenser). The following diagram shows the PID controller:



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FIGURE 61 - HEAD PRESSURE CONTROL FLOW DIAGRAM

The Control Valve Output Settings keys are used to configure the output signal to the Head Pressure Control Valve. The TYPE setpoint is used to make the control signal either 0-10VDC or 4-20mA.

The AUTO Setpoint is used to place the control in automatic mode. The SET Setpoint places the valve control in manual. It is used to manually position the control valve at any position between 0.0% and 100%. The Control Valve Control Mode shall be reset to Auto upon logging out of Service Level Access. The CONTROL VAVE CONTROL MODE data box displays the operating mode as “Manual” or “Auto” as appropriate.

The PID OUTPUT setpoint is used to configure the signal to the Control Valve to be DIRECT or REVERSE acting (default DIRECT). In this application, it should be set to DIRECT. The output for each setting is per the following table:

Remote Head Pressure Setpoint

This setpoint cannot be set from a remote input.

TABLE 23 - PID SETPOINT

CONTROL VALVE OUTPUT TYPE	PID OUTPUT	PID CONTROL 0% OUTPUT	PID CONTROL 100% OUTPUT
0-10V	Direct	0V	10V
0-10V	Reverse	10V	0V
4-20mA	Direct	4mA (2V)	20mA (10V)
4-20mA	Reverse	20mA (10V)	4mA (2V)

ISOLATION VALVES FOR BRINE APPLICATIONS

An option exists to install motorized isolation valves on the discharge and the liquid line. The option allows the valves to automatically close to isolate the condenser during shutdown to prevent the condenser pressure going below water freeze point when cold brine is circulated through the idle evaporator. The outputs to both valves are in parallel. The valves include feedback that is placed in series. When this option is disabled, the valve OPEN output is energized, the CLOSE output de-energized and the inputs ignored.

If the Isolation Valves option is enabled

When the chiller enters MBC Startup and while the compressor is running:

- Isolation Valves Open output is energized.
- Isolation Valves Close output is de-energized.

When the chiller is stopped, after coastdown:

- Isolation Valves Open output is de-energized.
- Isolation Valves Close output is energized.

If the Isolation Valves option is disabled:

- Isolation Valves Open output remains energized.
- Isolation Valves Close output remains de-energized.
- Status of the Isolation Valves Opened or Closed inputs ignored.

Faults

The “Isolation Valves - Not Closed” cycling fault is set when the following conditions exist for 3 continuous seconds:

- Isolation Valves Close output is energized > 40 seconds.
- Isolation Valves Closed input is not energized.

This cycling fault is released when the isolation valves closed input is energized

The “Isolation Valves - Not Opened” safety fault is set when the following conditions exist for 3 continuous seconds:

- Isolation Valves Open output is energized > 40 seconds.
- Isolation Valves Opened input is not energized.

This safety fault is released when the chiller is in stopped state and the chiller run command is removed.

TABLE 24 - ISOLATION VALVE I/O

BOARD	REFERENCE	HEADER / TERMINAL	ITEM
I/O Board	K11	J19-39 / 29	Isolation Valves Open
I/O Board	K12	J19-38 / 61	Isolation Valves Close
I/O Board	U11C	J19-19 / 82, 1	Isolation Valves Opened Limit Switch
I/O Board	U11D	J19-20 / 95, 1	Isolation Valves Closed Limit Switch

SECTION 29 - VSD OPERATION

OPTISPEED COMPRESSOR DRIVE OVERVIEW

The new YORK OptiSpeed Compressor Drive (OSCD) is specifically designed for the application of driving a permanent magnet high speed motor with magnetic bearings used on the YORK Model YMC² Centrifugal Liquid Chiller. This type of design allows the chiller to be design as a complete system, and take full advantage of the strengths of each major component within the system. This method of design is a superior approach to using general purpose components off the shelf that may not work well together.

This new OSCD design builds on the successes of previous designs of being chiller mounted, provide for high levels of energy savings, great integration with the chiller control center, liquid cooled, shell and tube heat exchanger, use of fast switching insulated gate bipolar transistors (IGBT's), high reliability, and ease of service.

New features include:

- The option of a circuit breaker or disconnect switch.
- Ground fault detection even when a disconnect switch is selected.
- Direct liquid cooling.
- A more accessible cooling system.
- Variable voltage input.
- High speed direct drive motor.
- The harmonic filter is standard on all models.
- Modular lighter weight power units that can be repaired in the field without complete replacement.
- Ease of maintenance.

OPTISPEED COMPRESSOR DRIVE FEATURES

For the first time, the OSCD is offered with a disconnect switch without giving up the ability to detect a ground fault. The OSCD contains 3 input current sensors that will provide the information for the drive logic board to detect a ground fault condition.

Direct liquid cooling is much more efficient way of removing heat from the OSCD. This method also reduces the cooling load on the internal cooling coil. In

the past, YORK developed direct liquid cooling for the inverter IGBT modules, but today York is direct liquid cooling the rectifier, inverter, and the output filter inductor.

The cooling system for the OSCD is greatly modified to improve serviceability of the power electronics. Repair of the power electronics no longer requires access to the back of the drive except to drain the cooling system. Also the use of a shell and tube heat exchanger is standard on all models.

The OSCD can now be configured for many different input voltage levels. Lower input voltages may de-rate the input power rating of the OSCD, but the OSCD will produce the same output voltage and will use the same motor.

The harmonic filter is no longer an option, and the function of the harmonic filter is included in a new rectifier module. This type of arrangement for the rectifier no longer requires a separate power unit for the harmonic filter. Also this rectifier is part of the power unit for the inverter, thus reducing the number of parts required and increasing reliability.

The new OSCD control system allows for high speed operation of the compressor motor. This improvement eliminates the need for a gear system between the compressor motor and the compressor. Without a gear system reliability and efficiency are improved.

The new power unit consists of a newly designed bus capacitor, new light weight plastic cooling blocks, new IGBT gate driver design, new rectifier IGBT module, and the cooling system is connected to the front of the power unit for reduce service cost.

The new bus capacitor is the core of the power unit. The new capacitor is made of a material that is much more robust and has a longer lifetime than bus capacitors commonly used in the past. Also, this capacitor contains all of the hardware required to mount all of the other parts to the power unit.

The harmonic filter operation is now part of the input to the OSCD. This feature is no longer an option when the OSCD is used with the YMC² chiller.

New special plastic cooling blocks were designed for this OSCD. These plastic cooling blocks provide a light weight solution by replacing heavy copper or alu-

minum cooling blocks, while providing direct liquid cooling for the rectifier and inverter IGBT's. They also provide a method for mounting the IGBT assemblies to the bus capacitor within the power unit.

The power unit contains all of the items needed for the output of the OSCD in a highly integrated, but modular design. The bus capacitor is the core of the assembly. All of the other items are attached to the bus capacitor. On top of the bus capacitor is the laminated bus structure and the gate driver board. The rectifier and inverter assemblies are attached to each side of the bus capacitor. The rectifier or inverter assemblies can be replaced in the field.

Ease of maintenance is provided by using the communications link between the OptiView™ panel and the OSCD. The cooling pumps and fans can be turned on from the OptiView™ panel. This provides for a safer annual coolant changes. The gate driver test is also started from the OptiView™ panel.

OPTISPEED COMPRESSOR DRIVE DETAILS

An electronic circuit breaker or disconnect switch connects the three phase input power to input fuses and then onto the AC line inductor, and input filter. Three phase power continues onto the rectifier IGBT's to the bus capacitor to the inverter, then onto the output filter and the compressor motor.

The AC line inductor provides isolation between the 3 phase power source and the input to the drive. The AC line inductor improves the input current waveform so that it appears more like a sine wave. The input filter reduces the effects of the high frequency switching of the rectifier and provides the inductance for boosting the bus voltage above the peak of the line voltage.

The higher bus voltage is required for harmonic current correction at the input of the OSCD, and to provide the correct output voltage for high speed operation of the compressor motor.

The AC to DC rectifier uses several power devices. Each phase has one or more modules arranged in a parallel connection depending on the amount of input current required. Each rectifier module contains 3 power devices that are called the Upper, Lower, and Aux. device. All three devices are required to rectify and boost the 3 phase input AC voltage into DC voltage in a modified new three-phase bridge configuration. The use of the modified new three-phase bridge configuration in the rectifier permits pre-charge of the DC bus filter capacitors when the chiller enters the start mode, and

provides a fast disconnect from the AC line when the chiller enters the stopped mode. This new bridge configuration also provides the harmonic filtering without the need of separate power unit, precharge circuit, and control board.

The DC to AC inverter also uses several power devices. Each phase has one or more modules arranged in a parallel connection depending on the amount of output current required. Each inverter module contains an Upper and Lower device. The Aux. device is not needed in the inverter.

The permanent magnet motor used on the YMC² chiller requires a near sine wave of voltage. Typically, drives provide a pulse of voltage at the amplitude of the bus voltage for a varying period of time. This waveform is typically known as a square wave. This OSCD contains a direct water cooled output filter.

A new drive logic board was designed to provide all of the logic required to turn on and turn off all of the power devices, turn on and off the cooling fans and pumps, evaluate data from the input and output current sensors, evaluate data about the input and output voltage, and communicated to the OptiView™ panel.

Other sensors and boards are used to convey information back to the OSCD Logic board, and provide safe operation of the OSCD. Each power module contains a temperature sensor that provides temperature information back to the OSCD logic board. Three Current Transformers monitor the output current from the OSCD power unit and are used to protect the drive and motor from overcurrent conditions. Another 3 Current Transformers monitor the input current to the OSCD to provide current limit, and harmonic current filtering.

Harmonic Filter Benefits

The OptiSpeed Compressor Drive (OSCD) system now includes an input harmonic filter and high frequency filter trap designed to meet the IEEE Std 519 -1992, "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems". The harmonic filter provides a means to improve the input current waveform drawn by the OSCD from the AC line, thus reducing the possibility of causing electrical interference with other sensitive electronic equipment connected to the same power source, and reduce power loss in the customer's switch gear.

In addition, the power factor of the system with this harmonic filter corrects the OSCD's input power factor to nearly unity.

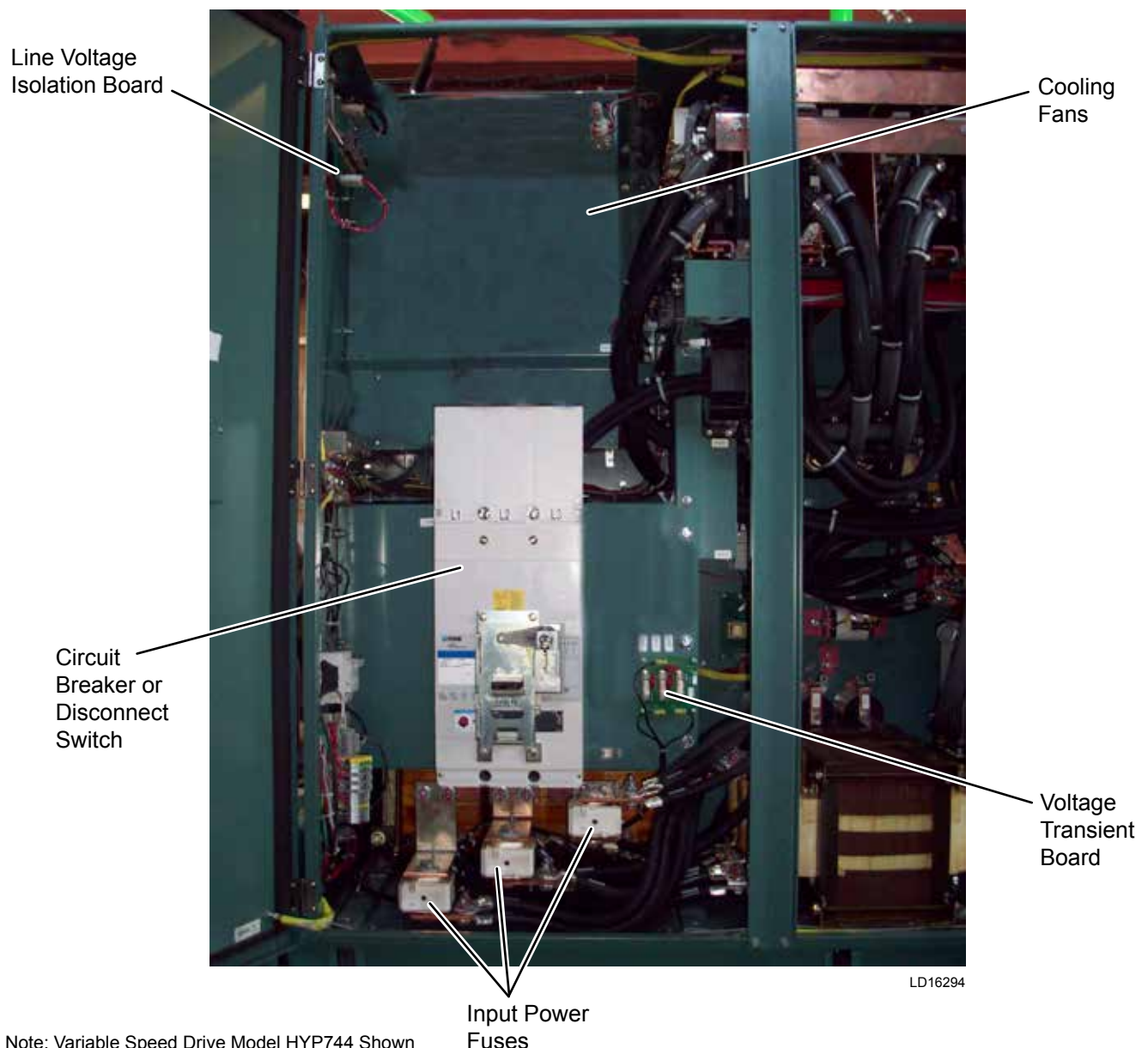
Harmonic Filter General Information

The Harmonic Filter is no longer an option for this style of OSCD. The function of the Harmonic Filter is now integrated into the input of the OSCD. The input rectifier has fast switching transistors instead of SCR's and diodes. The OSCD can now control the input current waveform to a near sine wave shape by controlling how the rectifiers are turned on and off. The Harmonic Filter of the past injected harmonic current into the input of the OSCD to correct the current waveform.

Since the Harmonic Filter is basically the input to the OSCD there is no need for the additional, pre-

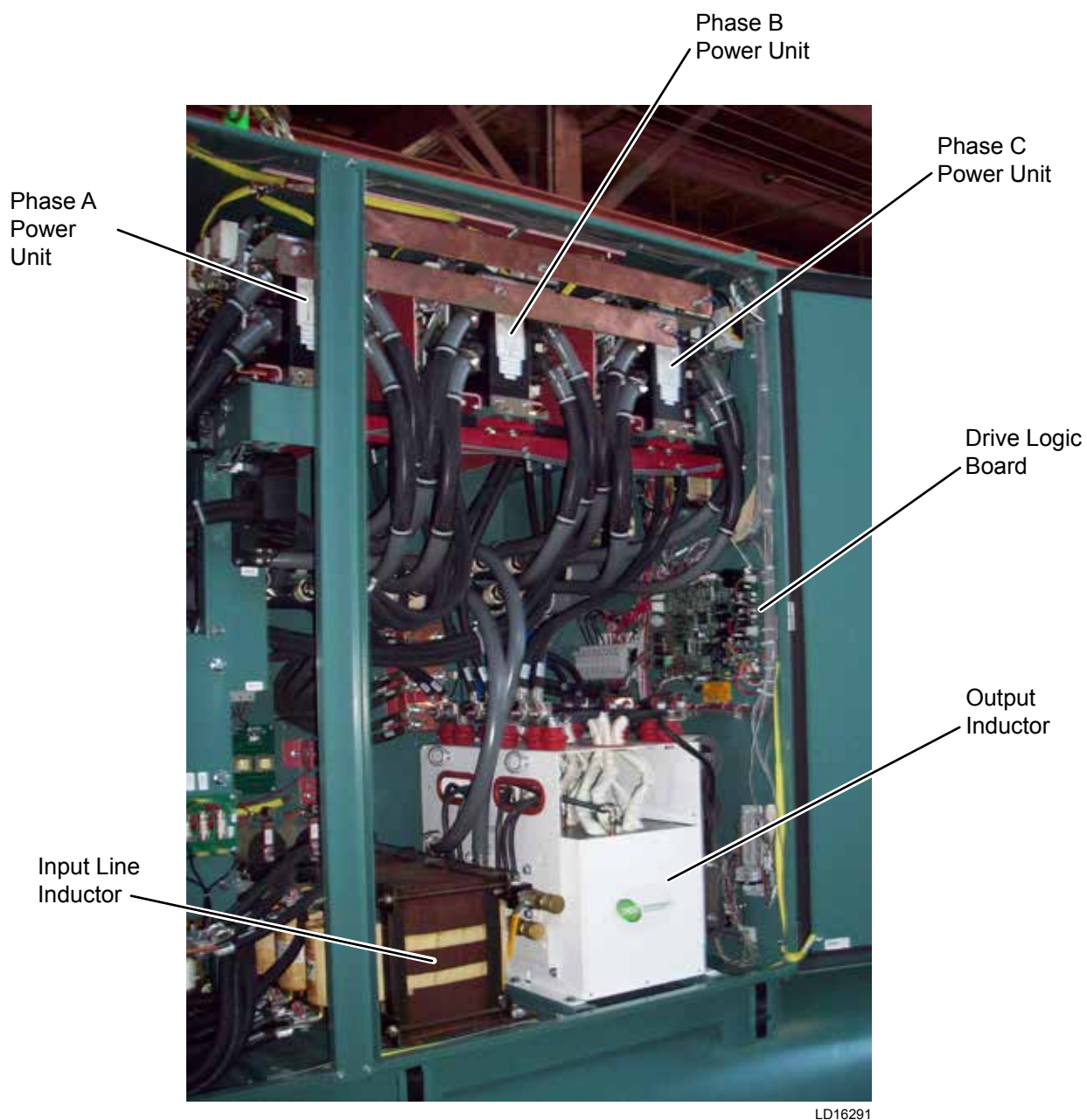
charge, power unit, Harmonic Filter logic board, and contactors for the harmonic filter of yesterday. The Harmonic Filter does not require its own pre-charge time, thus allowing the chiller to start or restart sooner. This is an important benefit to many customers. The reductions in parts counts will improve the reliability of the OSCD, and ease of repair.

A line inductor is still needed to limit the rate of change in the input current. Without the line inductor the input current cannot be properly controlled and harmonic currents would be generated.



Note: Variable Speed Drive Model HYP744 Shown

FIGURE 62 - LEFT SIDE OF DRIVE CABINET



Note: Variable Speed Drive Model HYP744 Shown

FIGURE 63 - RIGHT SIDE OF DRIVE CABINET.



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FIGURE 64 - DRIVE LOGIC BOARD

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LD16292

Note: Variable Speed Drive Model HYP744 Shown

FIGURE 65 - RECTIFIER SIDE OF THE POWER UNIT.

OPTISPEED COMPRESSOR DRIVE AND CHILLER OPERATION

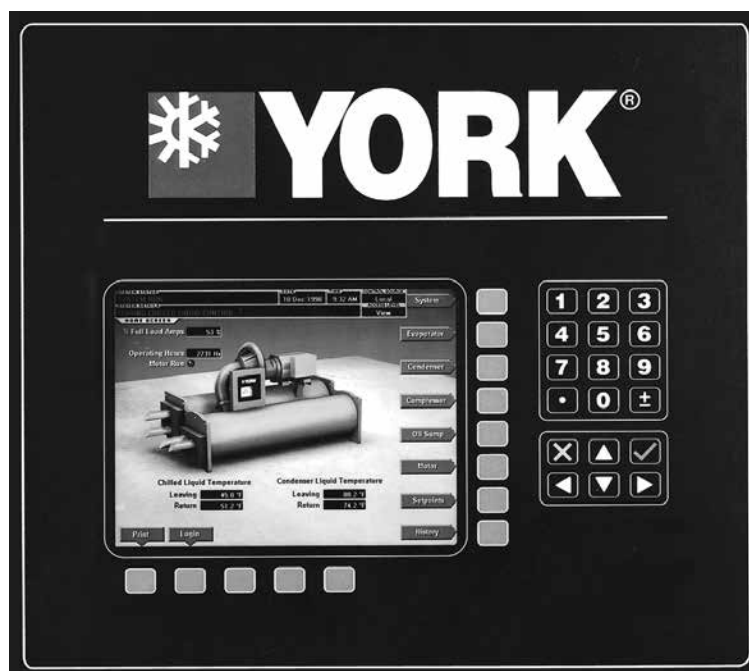
When the chiller enters a start command, the OSCD is commanded to pre-charge, the Aux. power devices are gradually turned on to slowly charge the DC bus capacitors. This is called the pre-charge period, which will last for 12-seconds. After the 12-second time period has expired, the AUX. power devices are gated fully on. The OSCD logic board provides the turn on, and turns off commands for the AUX. power devices during precharge, and during normal running condition. After precharge is complete the AUX. power device will remain turned on for the duration of the run cycle.

During normal chiller run conditions the OptiView™ panel provides a speed command to the OSCD. The speed command must take into account minimum speed command from the anti-surge control, and the speed required by the leaving chilled liquid control. The OSCD logic board will determine the proper turn-

on and turn-off commanded to the IGBT's to provide the correct RPM.

When the chiller enters a normal stop command the OSCD will continue to follow the speed command from the OptiView™ panel. The OptiView™ panel begins to unload the chiller. As the load and pressure across the compressor starts to go down, the output speed of the OSCD will go down. When the capacity control devices (VGD and sometimes hot gas bypass valve) reaches minimum load position, the OSCD will start to decelerate the motor to 50 Hz. When 50 Hz is reached all rectifier and inverter power devices will be turned off except for the AUX. The OSCD will remain in a precharge state for 60 seconds, and then the AUX. is turned off. The DC link capacitors will start to discharge through the bleeder resistors.

SECTION 30 - OPTIVIEW™ CONTROL CENTER



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FIGURE 66 - OPTIVIEW™ CONTROL CENTER

The OptiView™ control center display is surrounded by “soft” keys which are redefined based on the currently displayed screen. Eight buttons are available on the right side of the panel, and are primarily used for navigation between the system screens. At the base of the display are 5 additional buttons. The area to the right of the keypad is used for data entry with a standard numeric keypad 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 also allows numerical information to be represented in both English (temperatures in °F and pressures in PSIG) and Metric (temperatures in °C and pressures in kPa) mode. It has the ability to display many languages.

The control center continually monitors the system operation and records the cause of any shutdowns (Safety, Cycling or Normal). This information is recorded in memory and is preserved even through a power failure condition. The user may recall it for viewing at any time. During operation, the user is continually advised of the operating conditions by various status and warning messages. In addition, it may be configured to notify the user of certain conditions via alarms. A complete listing of shutdown, status, and warning messages is attached in the Display Messages tables starting on *Page 232* of this manual.

START AND STOP

The Start/Stop control is operated:

- via the keypad when the chiller is set to local mode,
- remotely through digital inputs in digital or analog remote mode, or
- by the E-Link Gateway in BAS (ISN) remote mode.

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 also located on the side of the panel.

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, which bypasses the programmed controlled shutdown.

INTERFACE CONVENTIONS

Each screen description in this document will begin with a section entitled **Overview** which will describe the graphical elements on the screen and give a short summary of the functions available. Each element on the screen will then be categorized into three distinct groups: Display Only, Programmable, and Navigation. Below is a short description of what types of information are included in these groups.

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

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 operat-

ing 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 Login Password would be entered as 9 6 7 5, using the numeric keypad. **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 of the chiller functions and allows calibration of many of the chiller controls. The access levels are listed above in hierarchical order beginning with the lowest level and proceeding to the highest level. Users logged in under higher access levels may perform any actions permitted by lower access levels.

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. 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 login, 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 could be numeric values (such as 45.0°F for the Leaving Chilled Liquid Temperature), or they could 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 (i.e. 45.0).

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 VGD, compressor speed, level control and hot gas valves. 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 amount of values which the panel can display to the user, and in order 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 154*)

- System Screen (*Page 156*)
- Evaporator Screen (*Page 158*)
- Condenser Screen (*Page 160*)
 - Head Pressure Control Screen (*Page 162*)
 - Condenser Refrigerant Level Control Screen (*Page 164*)
- Compressor Screen (*Page 166*)
 - Magnetic Bearing Controller Screen (*Page 168*)
 - MBC Details Screen (*Page 170*)
 - MBC Event Log Screen (*Page 172*)
 - MBC Diagnostics Screen (*Page 173*)
 - Surge Screen (*Page 175*)
 - Variable Geometry Diffuser Screen (*Page 177*)
 - VGD Actuator Screen (*Page 179*)
 - Power Panel Screen (*Page 181*)
- Capacity Control Screen (*Page 183*)
 - Capacity Control Setpoints Screen (*Page 196*)
 - Anti-Surge Tuning (*Page 187*)
 - Override Tuning (ADMIN only)
- VSD Screen (*Page 188*)
 - VSD Details Screen (*Page 190*)
 - VSD Waveform (*Page 192*)
 - Setpoints (ADMIN only)
 - Motor Details Screen (*Page 194*)
- Setpoints Screen (*Page 196*)
 - Setup Screen (*Page 198*)
 - Schedule Screen (*Page 200*)
 - User Screen (*Page 202*)
 - COMMS Screen (*Page 204*)
 - Printer Screen (*Page 206*)
 - Sales Order Screen (*Page 208*)
 - Operations Screen (*Page 210*)
 - Diagnostics (*Page 211*)
- History Screen (*Page 212*)
 - History Details Screen (*Page 214*)
 - Security Log Screen (*Page 215*)
 - Security Log Details Screen (*Page 217*)
 - Custom Screen (*Page 219*)
 - Custom Setup Screen (*Page 220*)
 - Trend Screen (*Page 222*)
 - Trend Setup Screen (*Page 224*)
 - Advanced Trend Setup Screen (*Page 226*)
 - Common Slots Screen (*Page 228*)

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. Not all languages are available. English is the default lan-

guage. If a language other than English is being displayed, an English speaking person should 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,

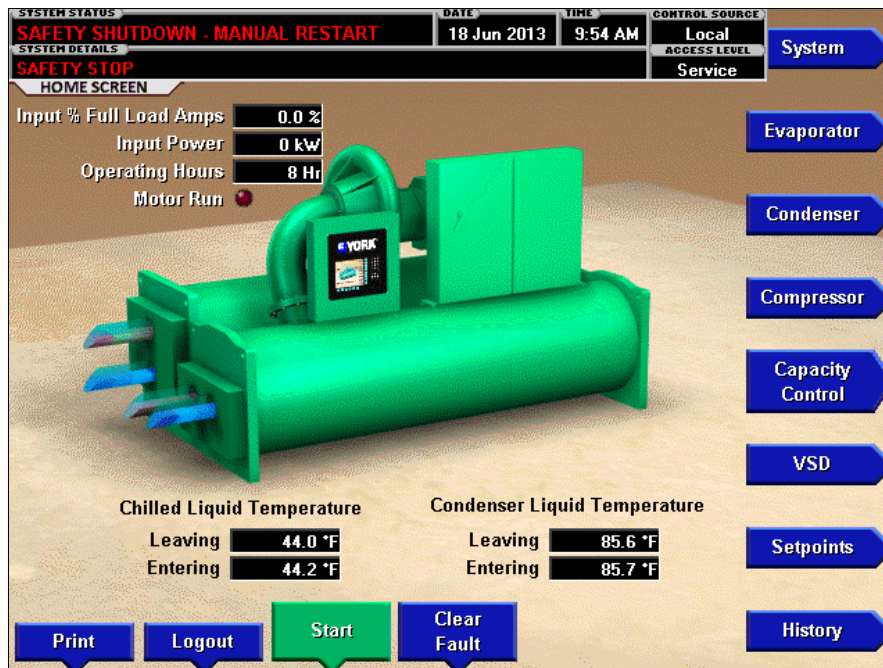
the < or > symbols will be displayed beside the minimum or maximum value, respectively.

TABLE 25 - ANALOG INPUT RANGES

ANALOG INPUT	ENGLISH RANGE			METRIC RANGE		
	LOW	HIGH	UNITS	LOW	HIGH	UNITS
Leaving Chilled Liquid Temperature	0.0	82.0	°F	-17.7	27.7	°C
Return Chilled Liquid Temperature	0.0	94.1	°F	-17.7	34.5	°C
Leaving Condenser Liquid Temperature	8.0	133.5	°F	-13.3	56.3	°C
Return Condenser Liquid Temperature	8.0	133.5	°F	-13.3	56.3	°C
Evaporator Refrigerant Temperature (Optional)	0.0	126.1	°F	-17.7	52.3	°C
Discharge Temperature	31.8	226.3	°F	-0.1	107.9	°C
Condenser Pressure (R134a)	0.0	300.0	PSIG	0.0	2069	KPAG
Condenser Temperature (R134a)*	-98.7	160.1	°F	-72.6	71.7	°C
Evaporator Pressure (R134a)	0.0	125.0	PSIG	0	862	KPAG
Evaporator Temperature (R134a)*	-44.9	64.7	°F	-42.7	18.1	°C
Refrigerant Level	0.0	100.0	%	0.0	100.0	%
Drop Leg Refrigerant Temperature	0.0	121.7	°F	-17.7	49.8	°C
Motor Housing Temperature	31.8	226.3	°F	-0.1	107.9	°C

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

HOME SCREEN



LD17916

FIGURE 67 - HOME SCREEN

OVERVIEW

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

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

Login

Access Level Required: VIEW

This key allows the user to change the USER ID and Access Level when the proper password is entered at the prompt. When the login window opens, first enter the user ID and checkmark (existing ID is retained if nothing is entered). Then enter Access password and checkmark.

Logout

Access Level Required: 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**.

Print

Access Level Required: 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

Access Level Required: 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

Access Level Required: OPERATOR

Use of this key acknowledges a warning condition and resets the message display associated with it.

Start

Access Level Required: 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 control source is any remote.

Soft Stop

Access Level Required: OPERATOR

This key is only available when the chiller has a local run request. 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.

NAVIGATION

System

Used to provide additional system information.

Evaporator

A detailed view of all evaporator parameters, including the programmable Leaving Chilled Liquid Setpoints.

Condenser

A detailed view of all condenser parameters, including control of the liquid level functions.

Compressor

A detailed view of all the compressor parameters. This includes surge protection, Magnetic Bearing Control, Variable Geometry Diffuser, and calibration.

Capacity Control

A detailed view of all the parameters associated with capacity control.

VSD

A detailed view of the motor and VSD parameters. This allows programming of the Current Limit and the Pulldown Demand Limit values.

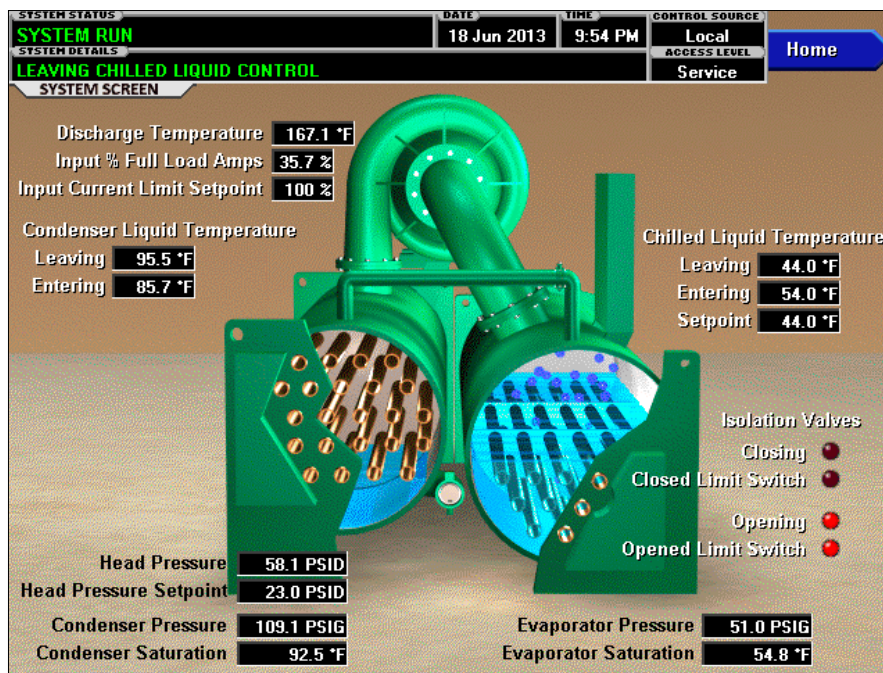
Setpoints

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 10 shutdown conditions, and provides for trending operating parameters.

SYSTEM SCREEN



LD17917

FIGURE 68 - SYSTEM SCREEN

OVERVIEW

This screen gives a general overview of common chiller parameters for both shells.

DISPLAY ONLY

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 - 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.

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.

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.

Condenser Pressure

Displays the refrigerant pressure in the condenser.

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.

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.

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.

PROGRAMMABLE

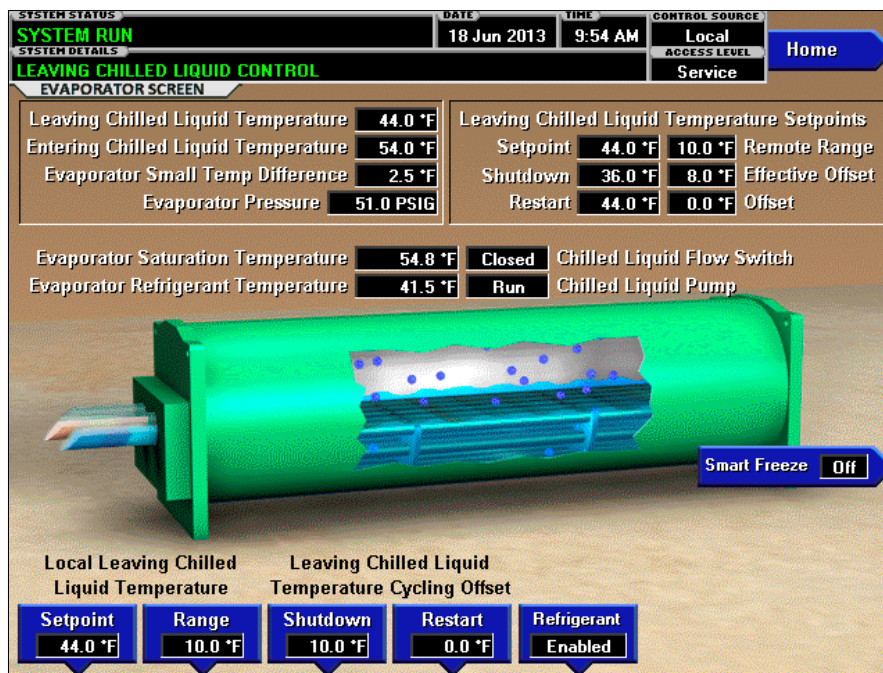
There are no programmable fields on this screen.

NAVIGATION

Home

Causes an instant return to the Home Screen.

EVAPORATOR SCREEN



LD17918

FIGURE 69 - EVAPORATOR SCREEN

OVERVIEW

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

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.

Leaving Chilled Liquid Temperature Setpoints – Remote Range

Displays the temperature range proportional to a remote analog input used to reset the Leaving Chilled Liquid temperature upward by this amount remotely.

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.

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**).

Evaporator Refrigerant Temperature

Displays the temperature of the refrigerant in the evaporator.

PROGRAMMABLE

Local Leaving Chilled Liquid Temperature - Setpoint

Access Level Required: 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 38.0°F to 70.0°F (water) or 10.0°F to 70.0°F (brine). If Smart Freeze (see below) is enabled, the range is 36.0°F to 70.0°F (water).

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.

Local Leaving Chilled Liquid Temperature - Range

Access Level Required: OPERATOR

This is the range over which an analog or a digital signal (PWM) can reset the Leaving Chilled Liquid Temperature setpoint above the operator programmed **Base Setpoint**.

Leaving Chilled Liquid Temperature Cycling Offset - Shutdown

Access Level Required: 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 64°F.

Leaving Chilled Liquid Temperature Cycling Offset - Restart

Access Level Required: 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 70°F.

Refrigerant (Enabled / Disabled)

Access Level Required: SERVICE

The Evaporator Refrigerant Sensor must be enabled via this toggle before the system will utilize the input.

Smart Freeze (Off / On)

Access Level Required: SERVICE

This value is only available if the chiller is not in Brine mode. It allows the user to enable the Smart Freeze Point Operation which allows the chiller to run closer to the freeze point without shutting down.

Brine Low Evaporator Cutout

Access Level Required: SERVICE

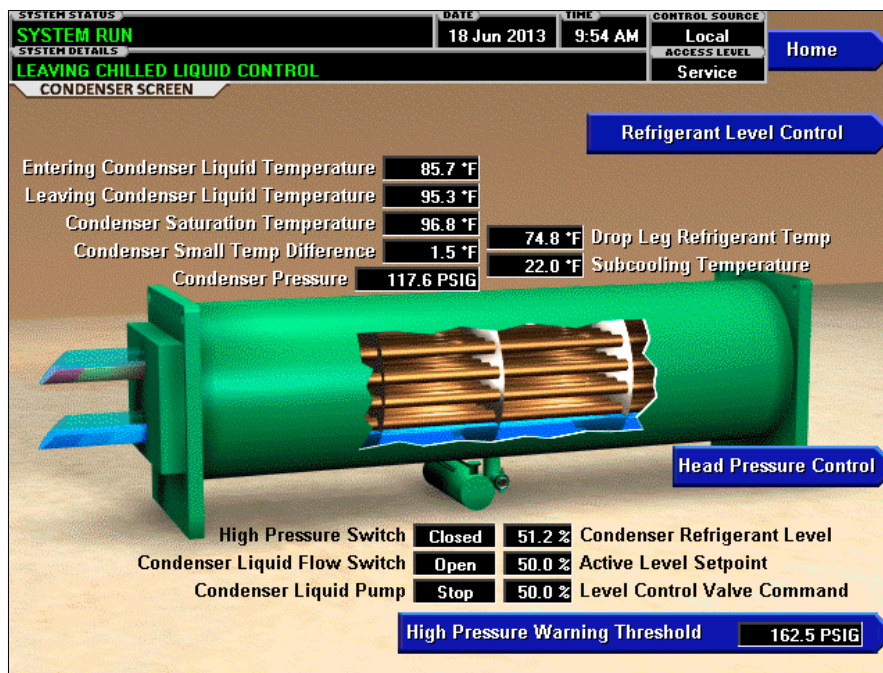
This value is only available in Brine mode. It allows the user to specify the Evaporator Pressure at which a safety shutdown is initiated.

NAVIGATION

Home

Causes an instant return to the Home Screen.

CONDENSER SCREEN



LD17919

FIGURE 70 - CONDENSER SCREEN

OVERVIEW

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

DISPLAY ONLY

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.

Refrigerant Level

Displays the present position of the refrigerant level.

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.

PROGRAMMABLE

High Pressure Warning Threshold

Access Level Required: SERVICE

This value allows the user to define the condenser pressure at which the chiller will initiate a warning and initiate high condenser pressure capacity control override.

Fault Acknowledge

Access Level Required: SERVICE

This allows clearing of the High Condenser Pressure Fault while Shutdown (*Condenser-High Pressure Stopped*).

NAVIGATION

Home

Causes an instant return to the Home Screen.

Refrigerant Level Control

Access Level Required: SERVICE

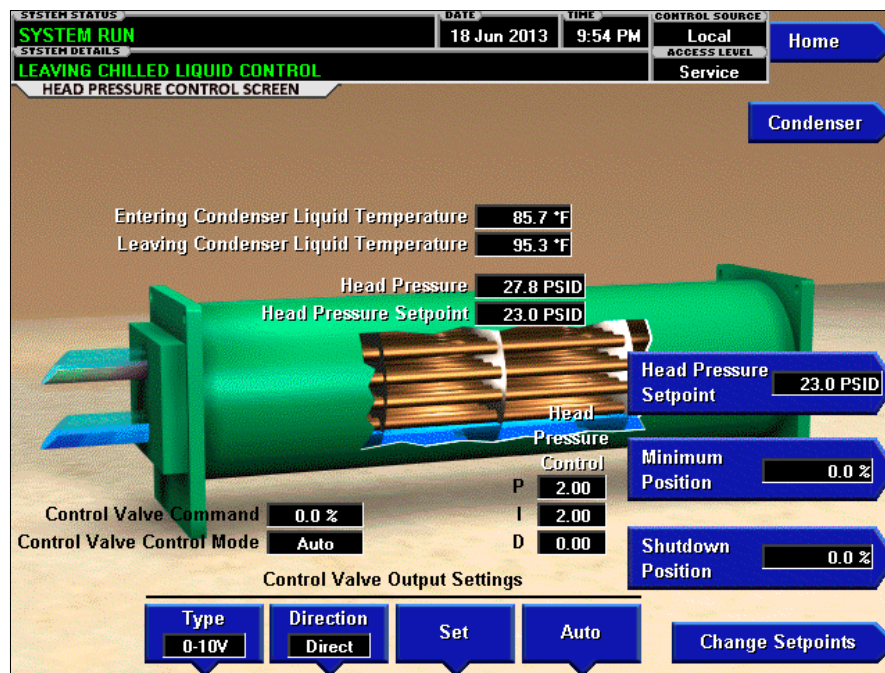
Moves to the subscreen allowing programming of the refrigerant liquid level control setpoints.

Head Pressure Control

Access Level Required: SERVICE

Moves to a subscreen allowing programming and viewing of the Head Pressure Control setpoints and parameters. Only appears when Head Pressure Control is enabled.

HEAD PRESSURE CONTROL SCREEN



LD17920

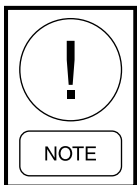
FIGURE 71 - HEAD PRESSURE CONTROL SCREEN

OVERVIEW

This screen displays all parameters related to the Head Pressure Control feature. It also allows for setting of the setpoints applicable to this feature.

If equipped with this optional feature, it must be enabled on the SETUP Screen. Once enabled, this screen is accessible from the CONDENSER Screen.

The Condenser water flow animation will show flow when the Condenser Liquid Flow Switch senses flow is present.



*The following fields require login access level of **SERVICE**. Service technicians refer to SECTION 28 - HEAD PRESSURE CONTROL of this manual for operation instructions and explanations of all programmable setpoints, zone parameters and displayed values.*

DISPLAY ONLY

Entering Condenser Liquid Temperature

Displays the temperature of the liquid as it enters the standard condenser tube bundle.

Leaving Condenser Liquid Temperature

Displays the temperature of the liquid as it leaves the standard condenser tube bundle.

Head Pressure

Displays the pressure difference between the condenser and evaporator (condenser minus evaporator).

Head Pressure Setpoint

Displays the active Head Pressure Setpoint to which the head pressure is being controlled.

Control Valve Command

Displays the position command being sent to the control valve. Displayed over the range of 0.0% to 100%. The actual value of the output signal for a given error depends on whether the DIRECTION setpoint is set to DIRECT or REVERSE. If set to DIRECT, the output at 0% will be at minimum; the output at 100% will be at maximum. If set to REVERSE, the output at 0% will be at maximum; the output at 100% will be at minimum.

Control Valve Control Mode

Displays whether the Control valve is in automatic or manual control.

PROGRAMMABLE

Head Pressure Setpoint

Sets the pressure differential to which the Control Valve will control the Head Pressure. (15.0 to 60 PSID; default 23.0 PSID)

Minimum Position

Sets a minimum position in percent that the valve can be commanded to when the condenser pump run contacts are commanded closed (Operation).

Shutdown Position

Sets the position the valve is commanded to when the condenser pump run contacts are commanded open (shutdown).

Control Valve Output Settings - Type

Sets the output signal to the Control Valve to be in the form of either 0-10VDC or 4-20mA. (default 0-10v)

Control Valve Output Settings - Direction

Allows the output signal to the Control Valve to be set to DIRECT or REVERSE acting. When set to DIRECT, the voltage or current signal to the Control Valve is at minimum for a 0% command and at maximum for a 100% command. When set to REVERSE, the voltage or current signal to the Control Valve is at maximum for a 0% command and at minimum for a 100% command. The configuration should be set so the customer's valve or control increases condenser temperature when the chiller lowers the control valve command percent.

Control Valve Output Settings - Set

Allows the Control Valve to be manually set to a pre-determined position between 0.0% and 100%. (default 0.0%)

Control Valve Output Settings - Auto

Places the Control Valve in automatic control.

Change Setpoints

Used to enter the Head Pressure Control PID variables. Pressing this key places a green box around the first changeable setpoint. Use the up/down, left/right arrows to place the selection box around the desired setpoint. With the setpoint selected, press the ENTER ✓ key. A dialog box appears with the range of settings. Using the numeric keys, enter desired value and then, press the ENTER ✓ key.

Head Pressure Control - P

Sets the Proportional Gain of the Head Pressure Control (0.00 to 5.00; default 2.00). Use the Change Setpoints key as described above to select/enter this setpoint.

Head Pressure Control - I

Sets the Integral Gain of the Head Pressure Control (0.00 to 5.00; default 2.00). Use the Change Setpoints key as described above to select/enter this setpoint.

Head Pressure Control - D

Sets the Derivative Gain of the Head Pressure Control (0.00 to 5.00; default 0.00). Use the Change Setpoints key to select/enter this setpoint.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Condenser

Returns to the Condenser Screen.

CONDENSER REFRIGERANT LEVEL CONTROL SCREEN

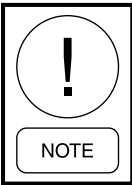


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FIGURE 72 - CONDENSER REFRIGERANT LEVEL CONTROL SCREEN

OVERVIEW

This screen displays a cutaway view of the chiller condenser, along with the liquid refrigerant level sensor and level control valve. Setpoints relating to the liquid level control are maintained on this screen. Through animation, the level control valve position is displayed. Also, the refrigerant flow control valve can be manually operated.



The following fields require login access level of SERVICE. Service technicians refer to SECTION 22 - REFRIGERANT LEVEL CONTROL of this manual for operation instructions and explanations of all programmable setpoints, zone parameters and displayed values.

RAMP TIME REMAINING

Displays the time remaining in the Ramp Up time countdown timer while a Refrigerant Level target ramp is in effect.

DISPLAY ONLY

Condenser Refrigerant Level

Displays the present level of refrigerant in percent over the length of the condenser refrigerant level sensor. 0% is at or below the bottom of the sensor. 100% is at or above the top of the sensor. The refrigerant level is animated in the cutaway view of the condenser. When the actual level is 0% to 15%, the level is shown about 50% full. When the actual level is 16% to 31%, the level is shown about 60% full. When the actual level is 32% to 47%, the level is shown about 70% full. When the actual level is 48% to 63%, the level is shown about 80% full. When the actual level is 64% to 79%, the level is shown as about 90% full. Actual levels above 79% shown as 100% full.

Active Level Setpoint

Displays the refrigerant level target that the chiller is controlling to. This value is determined as level setpoint or ramp up target, depending on state.

Level Control State

Indicates the zone control state currently in effect for the Refrigerant Level control.

MANUAL	CONTROL IN MANUAL
Inactive	Control not in effect
Startup Hold	Control in the Hold Period
Setpoint Ramp	Control in the Ramp Period
PID Control	Normal Running Auto Control

Startup Delay Remaining

Displays the time remaining in the Startup Delay time countdown timer while Startup Delay is in effect.

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.

Kp, Ti, Td

These are gain settings used for valve control. ADMIN access is required to change them.

Su cooler Effectiveness

Displays a value that indicates (Condenser Saturation temperature - Drop Leg temperature) / (Condenser Saturation temperature - Entering condenser water temperature). The value is typically near 0.800 at design conditions.

Hi Threshold

Defines a Subcooler Effectiveness threshold over which the liquid seal detection logic presents a warning.

Low Threshold,

Defines a Subcooler Effectiveness threshold under which the liquid seal detection logic presents a warning.

PROGRAMMABLE

Level Setpoint

Specifies the desired refrigerant level to be maintained in the condenser, as a percent of the level sensor span.

Startup Position

Access Level Required: SERVICE

Specifies the position commanded to the level control valve during shutdown. Automatic valve control begins from this position upon chiller run.

Startup delay

Access Level Required: ADMIN

Specifies a delay time from the start of chiller run until automatic control of refrigerant level begins.

Ramp Time

Access Level Required: ADMIN

After the chiller has been running for the level control startup delay time, if the refrigerant level is less than the Level Setpoint, a linearly increasing ramp is applied to the Level Setpoint. This ramp allows the level to go from the present level to the programmed Level Setpoint over a period of time programmed as the Ramp Up Time. This setpoint can only be changed with ADMIN level access.

[Refrigerant Level Control] Open (Manual)

This key puts the Level Control into manual mode and changes the command to the level control valve, toward open by the manual increment value.

[Refrigerant Level Control] Close (Manual)

This key puts the Level Control into manual mode and changes the command to the level control valve toward close by the manual increment value.

[Refrigerant Level Control] Manual Increment

This key enables the change increment to be set for manual control. It displays the increment in a textbox.

[Refrigerant Level Control] Auto

Returns the Level Control to automatic mode.

[Refrigerant Level Control] Set (Manual)

This key allows manual programming of a fixed level control valve command percentage. This key puts level valve control in manual mode, fixed to the value specified.

NAVIGATION

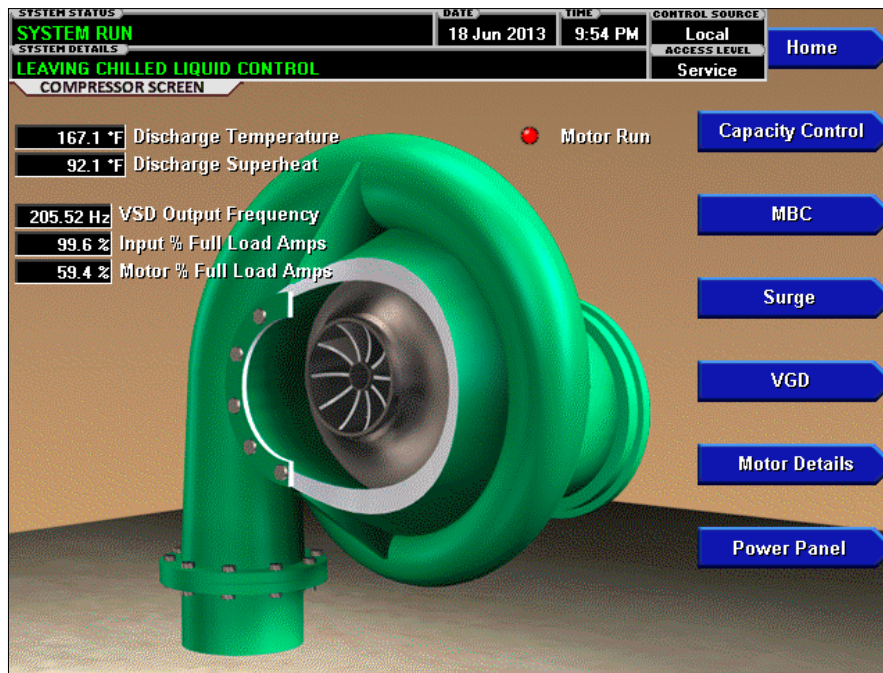
Home

Causes an instant return to the Home Screen.

Condenser

Returns to the Condenser Screen.

COMPRESSOR SCREEN



LD17922

FIGURE 73 - COMPRESSOR SCREEN

OVERVIEW

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

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.

PROGRAMMABLE

There are no programmable fields on this screen.

NAVIGATION

Home

Causes an instant return to the 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.

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.

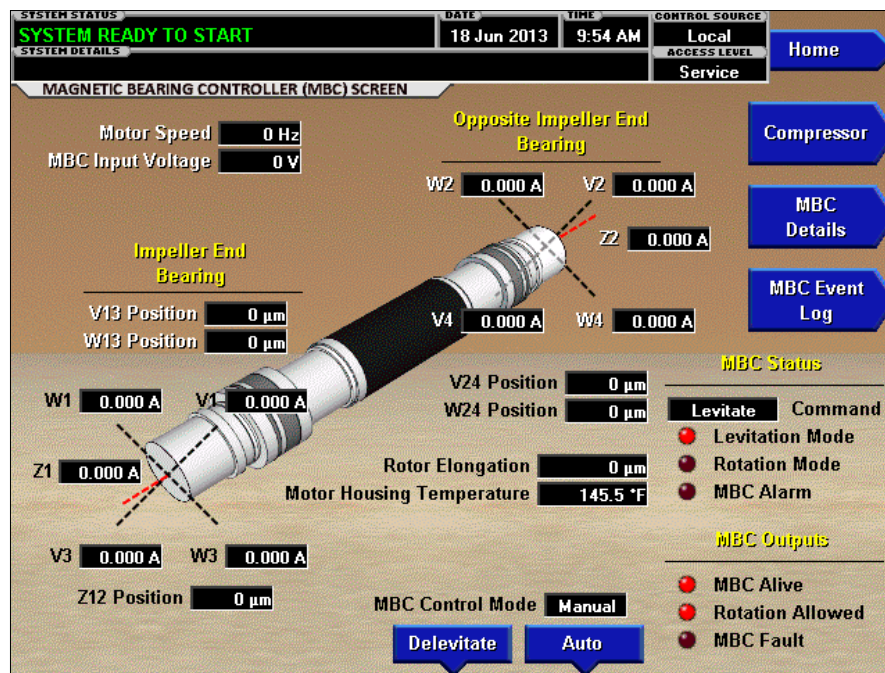
Motor Details

Moves to the screen showing motor operating details.

Power Panel

Moves to the subscreen that allows viewing power panel status and parameters.

MAGNETIC BEARING CONTROLLER SCREEN



LD17923

FIGURE 74 - MAGNETIC BEARING CONTROLLER SCREEN

OVERVIEW

This screen displays the orientation of the magnetic bearing axis 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 (single stage) Impeller End Bearing. The right end of the motor shaft graphic represents the Opposite End Bearing.

DISPLAY ONLY

V13 Position

Displays the shaft position in micrometers from center along the radial axis designated “V” for the Impeller End Bearing.

W13 Position

Displays the shaft position in micrometers from center along the radial axis designated “W” for the Impeller End Bearing.

W1 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “W” for the Impeller End.

W3 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “W” for the Impeller End.

V1 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “V” for the Impeller End.

V3 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “V” for the Impeller End.

Z1 (Current)

Displays the magnetizing current to the axial bearing at the Impeller End.

Z12 Position

Displays the shaft position in micrometers from center along the axial axis.

V24 Position

Displays the shaft position in micrometers from center along the radial axis designated “V” for the Opposite Impeller End Bearing.

W24 Position

Displays the shaft position in micrometers from center along the radial axis designated “W” for the Opposite Impeller End Bearing.

W2 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “W” for the Opposite Impeller End.

W4 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “W” for the Opposite Impeller End.

V2 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “V” for the Opposite Impeller End.

V4 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “V” for the Opposite Impeller End.

Z2 (Current)

Displays the magnetizing current to the axial bearing at the Opposite Impeller End.

MBC Control Mode

Displays whether the MBC is in Manual or Automatic Control.

Command

Displays the OptiView state command to the MBC.

[MBC Status] Levitation Mode (LED)

Indicates the MBC is reporting itself in Levitated status via Modbus Data.

[MBC Status] Rotation Mode (LED)

Indicates the MBC is reporting itself in Rotation mode via Modbus Data.

[MBC Status] MBC Alarm (LED)

Indicates the MBC is reporting a shutdown fault via Modbus Data.

[MBC Outputs] MBC Alive (LED)

Indicates the MBC alive allowed contacts are closed by the control Digital Input.

[MBC Outputs] Rotation Allowed (LED)

Indicates the MBC rotation allowed contacts are closed by the control Digital Input.

[MBC Outputs] MBC Fault (LED)

Indicates the MBC fault contacts are opened, indicating a fault, by the control Digital Input.

Motor Speed

Indicates the compressor motor rotational speed.

MBC Input Voltage

Indicates voltage supply to the MBC.

Rotor Elongation

Indicates the thermal growth of the motor shaft as determined by the difference in the low stage impeller end position sensor and the opposite end position sensor.

Motor Housing Temperature

Indicates the motor housing temperature measured from a thermistor inserted in the motor housing.

PROGRAMMABLE

Levitate/Delevitate

Access Level Required: SERVICE

Allows the technician to manually levitate or delevitate the shaft when the MBC is powered. Sets the control mode to MANUAL.

Auto

Access Level Required: SERVICE

Returns MBC Control to Automatic as required to run the chiller.

NAVIGATION

Home

Causes immediate return to the Home Screen.

Compressor

Causes immediate transfer to the Compressor Screen.

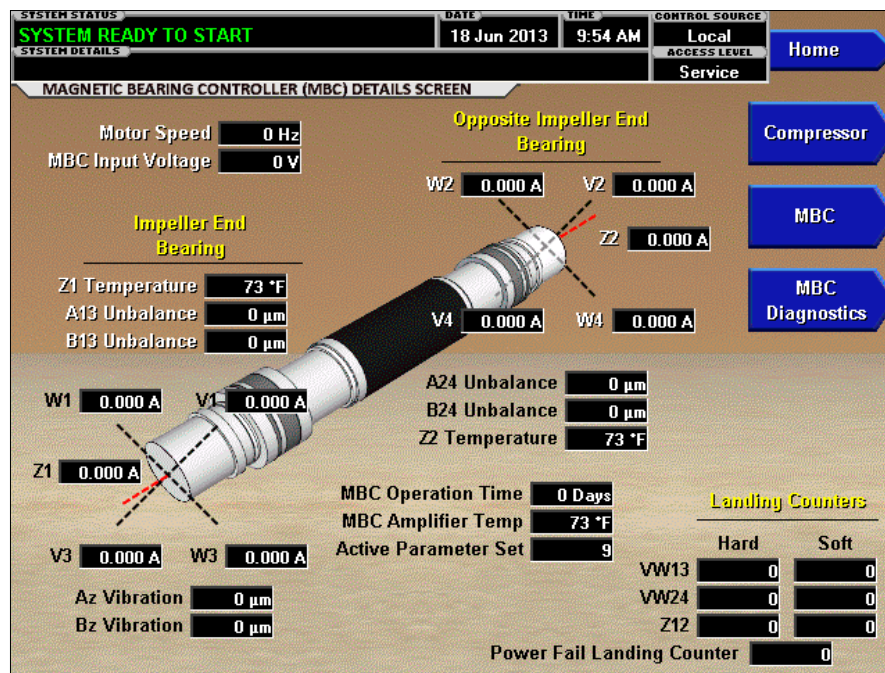
MBC Details

Moves to the subscreen showing additional detailed MBC parameters.

MBC Event Log

Moves to the subscreen showing the MBC collection of event history logs. This button is only displayed in Service Mode access.

MAGNETIC BEARING CONTROLLER DETAILS SCREEN



LD17924

FIGURE 75 - MAGNETIC BEARING CONTROLLER DETAILS SCREEN

OVERVIEW

This screen displays the orientation of the magnetic bearing axes relative to the compressor driveline similar to the MBC Screen. Additional 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 (single stage) Impeller End Bearing. The right end of the motor shaft graphic represents the Opposite End Bearing.

DISPLAY ONLY

Z1 Temperature

Displays the temperature measured at the impeller end bearing assembly.

A13 Unbalance / B13 Unbalance

Magnitude of motion at 1x rotation in each of two vectors at the 1-stage impeller end.

A24Unbalance / B24 Unbalance

Magnitude of motion at 1x rotation in each of two vectors at the opposite 1-stage impeller end.

Z2 Temperature

Displays the temperature measured at the opposite impeller end bearing assembly.

Z12 Vibration

Displays the vibration amplitude for specific frequencies measured axially by the position sensors.

Magnetic bearing currents as described for the MBC Screen are repeated on this screen:

- W1 (Current)
- V1 (Current)
- Z1 (Current)
- V3 (Current)
- W3 (Current)
- W2 (Current)
- V2 (Current)
- Z2 (Current)
- V4 (Current)
- W4 (Current)

[MBC Status] AVR (LED)

Indicates the MBC is reporting its automatic vibration reduction feature is active via Modbus Data.

[MBC Status] ABS (LED)

Indicates the MBC is reporting its automatic balancing system feature is active via Modbus Data.

Motor Speed

Indicates the compressor motor rotational speed.

DC Bus Voltage

Indicates the voltage of the DC Bus, which supplies the MBC.

MBC Operation Time

Indicates the cumulative time of operation of the MBC since initial power up.

MBC Amplifier Temp

Displays the temperature measured at the MBC bearing current amplifier board.

Active Parameter Set

Displays a code number for the bearing stiffness parameter set the MBC is using, as commanded by OptiView on power up. This is based on the compressor model number on the Sales Order Screen.

AZ Vibration / BZ Vibration

Magnitude of runout motion in each of two vectors.

Landing Counters

Display the number of time the MBC counted a displacement beyond 80% of the nominal bearing gap when running in each of the indicated directions or planes. Hard or Soft relates to dwell time.

Power Fail Landing Counter

Indicates the number of times Optiview has determined upon power up that the last power down occurred while speed was still indicated from the MBC.

PROGRAMMABLE

There are no programmable fields on this screen.

NAVIGATION

Home

Causes immediate return to the Home Screen.

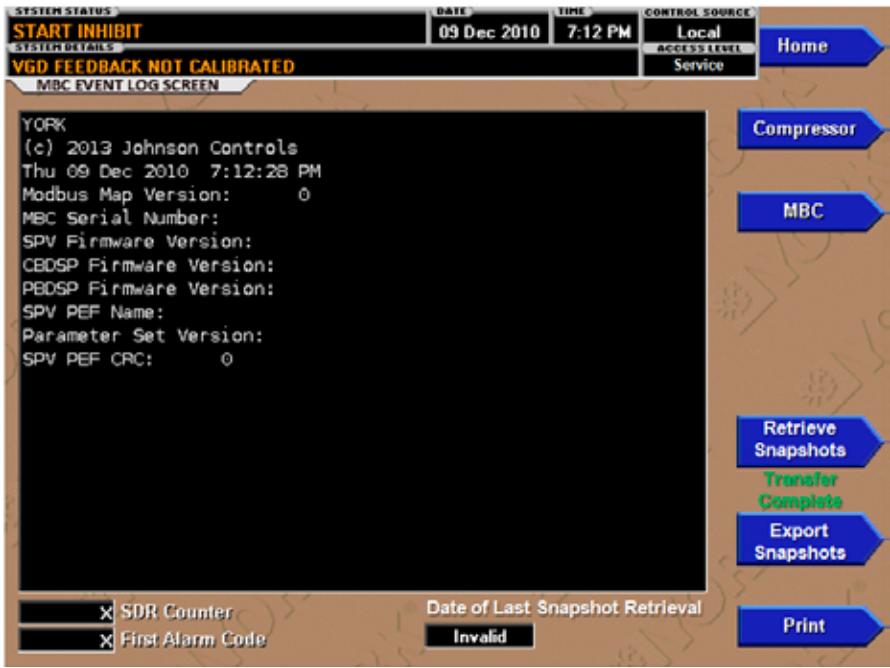
Compressor

Causes immediate transfer to the Compressor Screen.

MBC

Causes immediate return to the MBC Screen.

MBC EVENT LOG SCREEN



LD17995

FIGURE 76 - MBC EVENT LOG SCREEN

OVERVIEW

This screen displays the event history logs saved in the Magnetic Bearing Control Program.

DISPLAY ONLY

SDR Counter

Displays the number of shut down events.

First Alarm Code

Identifies the event that sent the shutdown for events coincident in time.

PROGRAMMABLE

PRINT

Generates a hard copy output at the Event Log.

NAVIGATION

Home

Causes immediate return to the Home Screen.

Compressor

Causes immediate transfer to the Compressor Screen.

MBC

Causes immediate return to the MBC Screen.

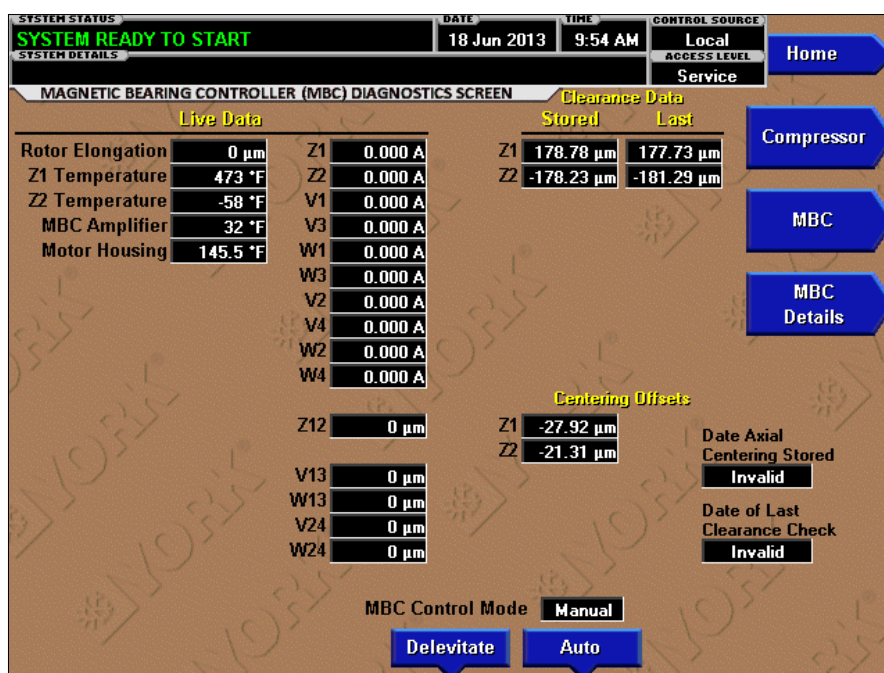
RETRIEVE SNAPSHOTS

Pressing this button causes the Microboard to retrieve the last 8 sets of MBC data snapshots from MBC controller. The message "Retrieving Snapshots" is displayed during the transfer and "Transfer Complete" is displayed for 60 seconds afterwards. This data is stored in BRAM in the Microboard. If an error occurs during the data transfer a "Transfer Error" message will be displayed for 60 seconds.

EXPORT SNAPSHOTS

Pressing this button transmits the MBC Snapshot data out the RS-232 Printer Port. The data has an identify-inf header and then the 8 sets of data follows with set number 8 being the most recent data.

MBC DIAGNOSTICS SCREEN



LD17926

FIGURE 77 - MBC DIAGNOSTICS SCREEN

OVERVIEW

This screen displays MBC operating data and measurements recorded during the automated driveline clearance check and centering procedure. It also allows performance of a clearance check in SERVICE access according to the process defined in the MBC section of this manual.

DISPLAY ONLY

Rotor Elongation

Indicates the thermal growth of the motor shaft as determined by the difference in the low stage impeller end position sensor and the opposite end position sensor.

Z1 Temperature

Displays the temperature measured at the impeller end bearing assembly.

Z2 Temperature

Displays the temperature measured at the opposite impeller end bearing assembly.

MBC Amplifier

Displays the temperature measured at the MBC bearing current amplifier board.

Motor Housing Temperature

Indicates the motor housing temperature measured from a thermistor inserted in the motor housing.

Z1 (Current)

Displays the magnetizing current to the axial bearing at the Impeller End.

Z2 (Current)

Displays the magnetizing current to the axial bearing at the Opposite Impeller End.

V1 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated "V" for the Impeller End.

V3 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated "V" for the Impeller End.

W1 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “W” for the Impeller End.

W3 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “W” for the Impeller End.

V2 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “V” for the Opposite Impeller End.

V4 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “V” for the Opposite Impeller End.

W2 (Current)

Displays the magnetizing current to the upper bearing on the radial axis designated “W” for the Opposite Impeller End.

W4 (Current)

Displays the magnetizing current to the lower bearing on the radial axis designated “W” for the Opposite Impeller End.

Z12 (Position)

Displays the shaft position in micrometers from center along the axial axis.

V13 (Position)

Displays the shaft position in micrometers from center along the radial axis designated “V” for the Impeller End Bearing.

W13 (Position)

Displays the shaft position in micrometers from center along the radial axis designated “W” for the Impeller End Bearing.

V24 (Position)

Displays the shaft position in micrometers from center along the radial axis designated “V” for the Opposite Impeller End Bearing.

W24 (Position)

Displays the shaft position in micrometers from center along the radial axis designated “W” for the Opposite Impeller End Bearing.

MBC Control Mode

Displays whether the MBC is in Manual or Automatic Control.

Clearance Data (stored/Last)

Displays the axial clearance measurements in micrometers from the clearance check procedure for each end of the shaft for the most recent execution and prior execution.

Centering Offsets

Displays the rotor axial centering offset values determined during the factory setup process.

PROGRAMMABLE**Levitate/Delevitate**

Access Level Required: SERVICE

Allows the technician to manually levitate or delevitate the shaft when the MBC is powered. Sets the control mode to MANUAL.

Auto

Access Level Required: SERVICE

Returns MBC Control to Automatic as required to run the chiller.

Start Axial Clearance Check

Access Level Required: SERVICE

Allows a service technician to begin the Axial Clearance check automatic procedure when the chiller is in the proper condition as described in the MBC and Programming sections of this manual.

NAVIGATION**Home**

Causes immediate return to the Home Screen.

Compressor

Causes immediate transfer to the Compressor Screen.

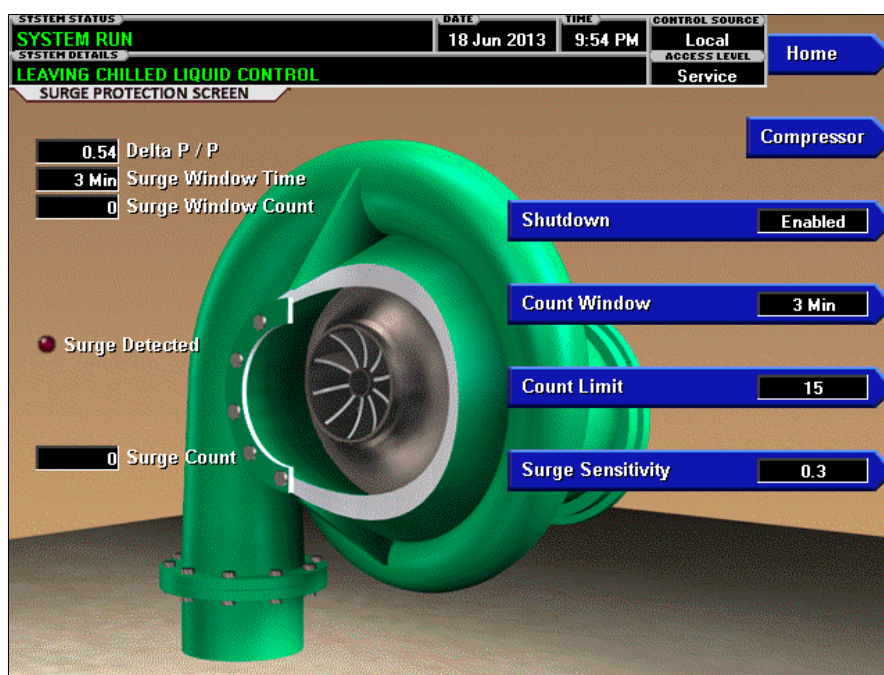
MBC

Causes immediate return to the MBC Screen.

MBC DETAILS

Causes immediate return to the MBC Details Screen.

SURGE SCREEN



LD17927

FIGURE 78 - SURGE SCREEN

OVERVIEW

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. The sensitivity of this surge detection is set by the Sensitivity Setpoint on this screen.

DISPLAY ONLY

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 Count

This is the total number of surges accumulated by the Surge Protection feature.

PROGRAMMABLE

Shutdown (Enabled/Disabled)

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

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

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.

Surge Sensitivity

Access Level Required: SERVICE

Allows the user to define the surge detection sensitivity of the Surge Protection feature.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Compressor

Causes an instant return to the Compressor Screen.

VARIABLE GEOMETRY DIFFUSER SCREEN



LD17928

FIGURE 79 - VARIABLE GEOMETRY DIFFUSER SCREEN

OVERVIEW

This screen displays information pertinent to the VGD operation.

DISPLAY ONLY

Active Stall Voltage

Displays the Stall Detector output voltage (x.xxVdc), as received by the Microboard, from the stall board.

Active Stall Voltage Type

Displays STANDARD or ENHANCED to indicate whether the Active Stall Voltage has enhanced filtering applied when necessary to normalize flow noise.

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

Home

Causes an instant return to the Home Screen.

Compressor

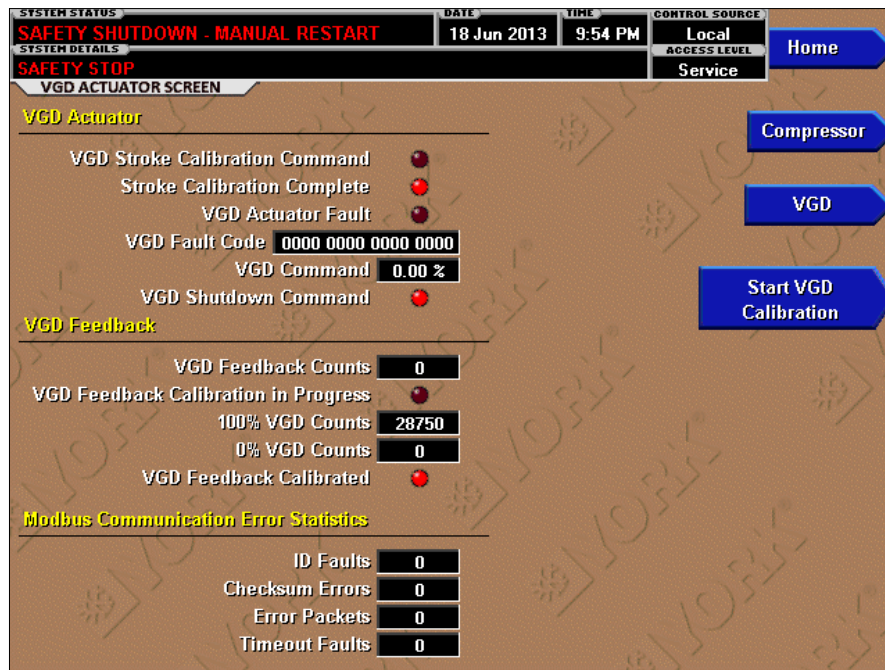
Causes an instant return to the Compressor Screen.

VGD Actuator

Access Level required: SERVICE

Move to the subscreen that allows the VGD calibration procedure to be performed.

VGD ACTUATOR SCREEN



LD17929

FIGURE 80 - VGD ACTUATOR SCREEN

OVERVIEW

This screen provides instructions and means to set the VGD position and feedback calibration for full open and full closed. This is normally done at the chiller factory and is required prior to chiller start.

The following fields require a login access level of SERVICE. Service Technicians refer to *YORK YMC² Service Manual (Form 160.84-M2)* for operation instructions and explanation of all programmable setpoints and displayed values.

DISPLAY ONLY

VGD Stroke Calibration Command (LED)

Indicates the VGD stroke calibration command is being sent to the actuator.

Stroke Calibration Complete (LED)

Indicates the VGD stroke calibration has been performed successfully on the chiller.

VGD Actuator Fault

Indicates the VGD actuator fault contacts are open.

VGD Fault Code

Indicates the numeric code of any prevailing VGD fault, communicated by Modbus link.

VGD Command

Indicates the present position command to the VGD.

VGD Shutdown Command (LED)

Indicates the fast close command is active to the VGD.

VGD Feedback Counts

Indicates the present VGD actuator feedback.

VGD Feedback Calibration in Progress (LED)

Indicates the VGD is performing a feedback calibration routine.

100% VGD Counts

Indicates VGD feedback accepted as the 100% (full open) calibration value.

0% VGD Counts

Indicates VGD feedback accepted as the 0% (full closed) calibration value.

VGD Feedback Calibrated (LED)

Illuminated when calibration has been performed with 0% and 100% counts within the range required by the control logic (Refer to VGD Calibration in *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual).

Modbus Communication Error Statistics

Shows cumulative count of each type of comms error.

PROGRAMMABLE**Start VGD Calibration**

Access Level Required: SERVICE

Initiates the automatic VGD Calibration procedure. When the automatic VGD Calibration procedure is in process, this button shall be disabled until the VGD stroke calibration is successfully completed. This button shall only be shown and enabled when the VGD Feedback Calibration is not in progress, the chiller is stopped, and the Safety Stop DI is low. See *SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES* of this manual for details of the process.

NAVIGATION**Home**

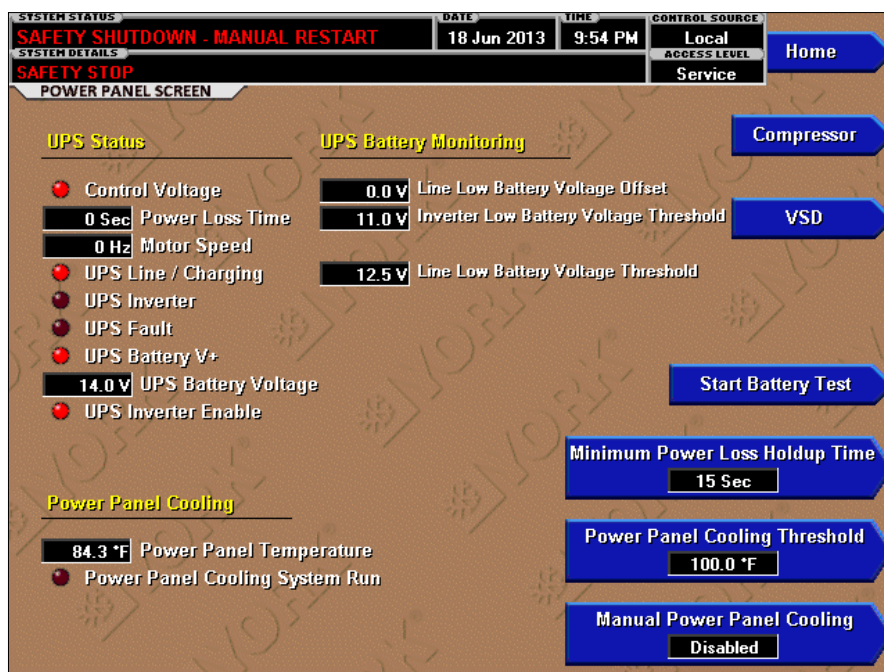
Causes an instant return to the Home Screen.

VGD

Access Level Required: SERVICE

Causes an instant return to the Variable Geometry Diffuser Screen.

POWER PANEL SCREEN



LD17930

FIGURE 81 - POWER PANEL SCREEN

OVERVIEW

This screen displays information pertaining to the power panel, which includes the Uninterruptible Power Supply (UPS) and storage battery for essential loads necessary for shutdown during a line power loss.

DISPLAY ONLY

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.

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 input.

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.

Power Panel Temperature

Indicates the ambient temperature inside the power panel.

Power Panel Cooling System Run (LED)

Indicates the power panel coolant pump and coil fan are commanded to run.

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**Start Battery Test**

Access Level Required: Operator

Initiates a battery load test. Only applies when chiller is shutdown and manual operation of power supply to the chiller can be performed.

Minimum Power Loss Holdup Time

Access Level Required: SERVICE

Indicates and sets the minimum allowable time that the UPS will continue to draw power from the battery and supply critical loads during line power loss, from the onset of power loss.

Power Panel Cooling Threshold

Access Level Required: SERVICE

Sets the minimum temperature at which the power panel cooling system will run. The pump and fan will run above this setpoint and shut off at 2 degrees F below this setpoint.

Manual Power Panel Cooling

Access Level Required: SERVICE

Initiates run of the power panel cooling pump and fan.

NAVIGATION**Home**

Causes an instant return to the Home Screen.

Compressor

Causes an instant return to the Compressor Screen.

VSD

Causes an instant return to the Variable Speed Drive Screen.

CAPACITY CONTROL SCREEN

The screenshot displays the 'CAPACITY CONTROL SCREEN' interface. At the top, it shows 'SYSTEM STATUS' as 'SYSTEM RUN', 'DATE' as '18 Jun 2013', 'TIME' as '9:54 AM', and 'CONTROL SOURCE' as 'Local'. There are buttons for 'Home' and 'Service'. The main section is divided into several panels: 'Override Control' with fields for Evaporator Pressure (50.9 PSIG), Condenser Pressure (78.7 PSIG), Input Current % FLA (99.9 %), and Motor Current % FLA (59.4 %); 'Temperature Control' with fields for Entering Chilled Liquid (54.0 °F), Leaving Chilled Liquid (44.0 °F), Active LCHLT Setpoint (44.0 °F), Delta T (0.0 °F), Control State (Temperature Control), Load Limit (None), Head Pressure (27.7 PSID), and Entering Condenser Liquid (85.7 °F); 'Capacity Control Output Devices' with a table for VSD, VGD, and HGBP; and a 'Manual Control - VGD' section with a 'Manual Increment' of 1.00 % and buttons for Increase, Decrease, Set, and Auto. On the right side, there are buttons for 'Compressor', 'VSD', 'Setpoints', 'Select VSD Control', 'Select VGD Control', and 'Select HGBP Control'.

Override Control	
Evaporator Pressure	50.9 PSIG
Override Threshold	27.0 PSIG
Condenser Pressure	78.7 PSIG
Override Threshold	162.5 PSIG
Input Current % FLA	99.9 %
Override Threshold	100.0 %
Motor Current % FLA	59.4 %
Override Threshold	100.0 %

Temperature Control	
Entering Chilled Liquid	54.0 °F
Leaving Chilled Liquid	44.0 °F
Active LCHLT Setpoint	44.0 °F
Delta T	0.0 °F
Control State	Temperature Control
Load Limit	None
Head Pressure	27.7 PSID
Entering Condenser Liquid	85.7 °F

Capacity Control Output Devices				
Active Output	Command	Feedback	Active Min	Control Mode
VSD	205.52 Hz	205.52 Hz	177.62 Hz	Auto
VGD	100.00 %	100.00 %	10.00 %	Manual
HGBP	0.0 %			Auto

Manual Control - VGD	
Manual Increment	1.00 %

LD17931

FIGURE 82 - CAPACITY CONTROL SCREEN

OVERVIEW

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 maintenance or service.

DISPLAY ONLY

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 (ISN) 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.

[Motor Current % FLA] Override Threshold

Displays the active motor current percent limit, which is a percentage of the minimum of VSD and motor maximum current limits.

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.

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.

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.

PROGRAMMABLE

Select VSD Control

Access Level Required: SERVICE

Pressing this button causes VSD Control to be selected for manual control, the LED to be lit and the heading over the manual control buttons to display MANUAL CONTROL – VSD.

Select VGD Control

Access Level Required: SERVICE

Pressing this button causes VGD Control to be selected for manual control, the LED to be lit and the heading over the manual control buttons to display MANUAL CONTROL – VGD. The VGD can not be commanded below the Active Min (0% when stopped, program point otherwise).

Select HGBP Control

Access Level Required: SERVICE

Pressing this button causes HGBP Control to be selected for manual control, the LED to be lit and the heading over the manual control buttons to display MANUAL CONTROL – HGBP.

Manual Increment

Access Level Required: SERVICE

This key enables the change increment to be set for manual control of the selected device. It also contains a text box displaying the manual increment for manual control. The value shall display in tenths when VSD Control is selected, integers when VGD Control is selected and integers when HGBP Control is selected.

Increase

Access Level Required: SERVICE

Pressing this button will set the selected device's state to Manual if it had been in Auto and will increase the device's present control command by an amount equal to the Manual Increment.

Decrease

Access Level Required: SERVICE

Pressing this button will set the selected device's state to Manual if it had been in Auto and will decrease the device's present control command by an amount equal to the Manual Increment.

Set

Access Level Required: SERVICE

Pressing this button will open a dialog box where the user can manually enter a command value for the selected device. Once a legitimate value has been entered and the Enter key pressed, the Selected device's state shall be set to Manual if it had been in Auto and the Selected device's control command shall be set to the entered value.

Auto

Access Level Required: SERVICE

Pressing this button will set the selected device's control state to Auto. This button shall only be shown when the selected device's state is Manual.

NAVIGATION

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.

Setpoints

Access Level Required: SERVICE

Moves to the Capacity Control Setpoints subscreen that allows the Service Technician to verify and edit values significant to capacity control. This button will only be shown and enabled when the Access Level is Service or greater. The functions and ranges of the settings are listed in the Calibration and Programming section of this manual.

CAPACITY CONTROL SETPOINTS SCREEN



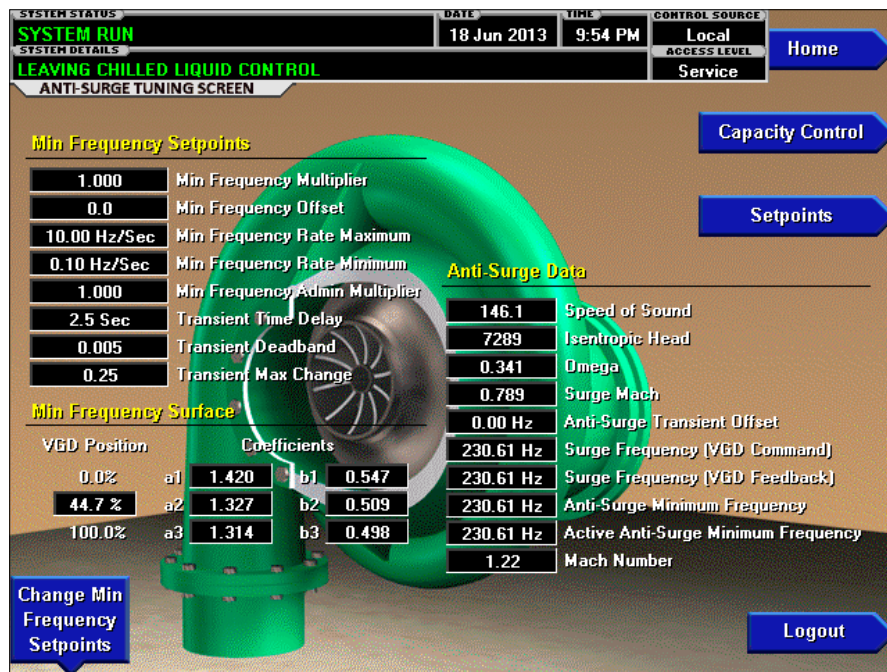
LD17953

FIGURE 83 - CAPACITY CONTROL SETPOINTS SCREEN

OVERVIEW

This screen shows service-level setpoints related to Capacity Control logic. The setpoints and button functions are described in the Programming section of Form 160.84-M2. Refer to *Table 37 on page 268*.

ANTI-SURGE TUNING SCREEN



SYSTEM STATUS
SYSTEM RUN
18 Jun 2013 9:54 PM
Local
ACCESS LEVEL
Service
Home

LEAVING CHILLED LIQUID CONTROL
ANTI-SURGE TUNING SCREEN

Capacity Control
Setpoints

Min Frequency Setpoints

1.000	Min Frequency Multiplier
0.0	Min Frequency Offset
10.00 Hz/Sec	Min Frequency Rate Maximum
0.10 Hz/Sec	Min Frequency Rate Minimum
1.000	Min Frequency Admin Multiplier
2.5 Sec	Transient Time Delay
0.005	Transient Deadband
0.25	Transient Max Change

Min Frequency Surface

VGD Position	Coefficients			
0.0%	a1	1.420	b1	0.547
44.7 %	a2	1.327	b2	0.509
100.0%	a3	1.314	b3	0.498

Anti-Surge Data

146.1	Speed of Sound
7289	Isentropic Head
0.341	Omega
0.789	Surge Mach
0.00 Hz	Anti-Surge Transient Offset
230.61 Hz	Surge Frequency (VGD Command)
230.61 Hz	Surge Frequency (VGD Feedback)
230.61 Hz	Anti-Surge Minimum Frequency
230.61 Hz	Active Anti-Surge Minimum Frequency
1.22	Mach Number

Change Min Frequency Setpoints
Logout

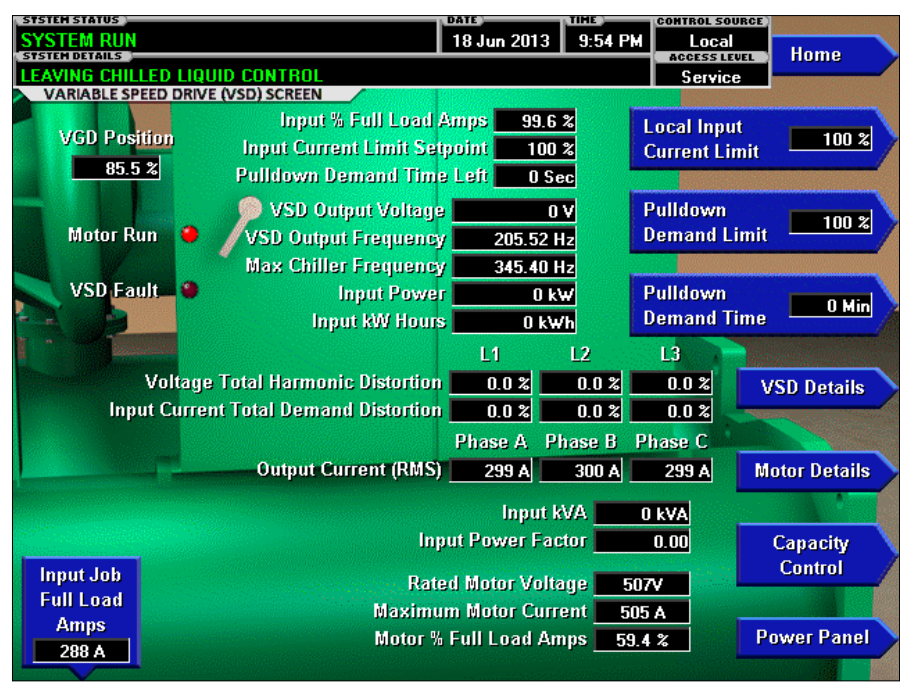
LD17954

FIGURE 84 - ANTI-SURGE TUNING SCREEN

OVERVIEW

This screen shows service-level setpoints related to Capacity Control anti-surge logic. The setpoints and button functions are described in the Programming section of Form 160.84-M2. Refer to *Table 37 on page 268*.

VARIABLE SPEED DRIVE SCREEN



LD17932

FIGURE 85 - VARIABLE SPEED DRIVE SCREEN

OVERVIEW

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

DISPLAY ONLY

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 over the communications link or by logic low at 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 could come from a 0-20mA, 4-20 mA, 0-10VDC or 2-10VDC input in Analog Remote mode, PWM signal

in Digital Remote mode, E-Link Gateway interface in BAS (ISN) mode, or a locally programmed value.

Pulldown Demand Time Left

Displays the time remaining in the programmed pulldown period if the value is nonzero.

VSD 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%.

Input kVA

Displays the supply kva measured by the VSD.

Input Power Factor

Displays the relationship between the Input Power and the Supply kVA.

Rated Motor Voltage

Displays the motor voltage rating, based on configuration.

Maximum Motor Current

Displays the maximum motor current, based on configuration.

Motor % Full Load Amps

Displays the percentage of maximum motor current presently delivered, based on highest phase.

Voltage Total Harmonic Distortion - (L1, L2, L3)

Displays the Total Harmonic Distortion (THD) for each of the voltage lines as calculated by the VSD.

Input 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.

PROGRAMMABLE

Local Input Current Limit

Access Level Required: 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

Access Level Required: 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 (ISN) 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

Access Level Required: OPERATOR

Allows the user to set a period of time for which the pulldown demand limit will be in effect after the chiller starts.

kWH Reset

Access Level Required: ADMIN

Allows the user to reset the cumulative Kilowatt Hours to zero (0).

Input Job Full Load Amps

Access Level Required: SERVICE

Allows entry of the job input full load amp limit within a range limited from 10% to 100% of the VSD nominal input current at nominal line voltage.

NAVIGATION

Home

Causes an instant return to the Home Screen.

VSD Details

Moves to the subscreen which provides more information about the Variable Speed Drive.

Capacity Control

Moves to the Capacity Control Screen.

Motor Details

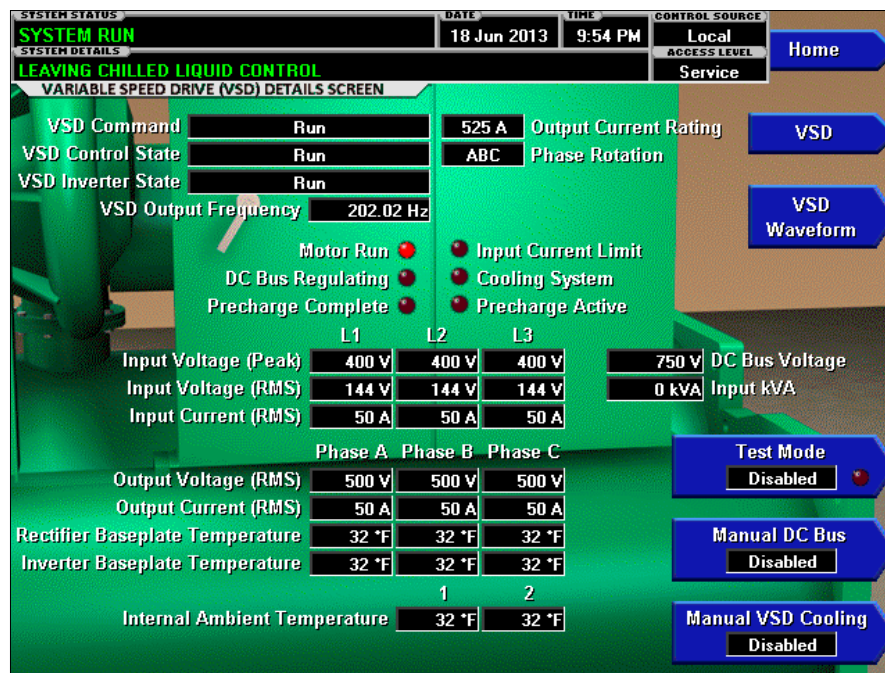
Access Level Required: SERVICE

Moves to a subscreen that provides information and setpoints pertinent to the Motor Monitoring feature.

Power Panel

Moves to the power Panel Screen.

VARIABLE SPEED DRIVE (VSD) DETAILS SCREEN



LD17933

FIGURE 86 - VARIABLE SPEED DRIVE (VSD) DETAILS SCREEN

OVERVIEW

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 or control the DC Bus manually for maintenance or service.

DISPLAY ONLY

VSD Command

The command from OptiView™ control to the VSD. Commands are as follows:

- 0 = Off
- 1 = Pre-Regulate
- 2 = Run
- 3 = Manual Precharge
- 4 = Manual Pre-Regulate
- 5 = Soft Shutdown

VSD Control State

Displays the control state of the VSD. States are as follows:

- 0 = Idle
- 1 = Precharge
- 2 = Pre-Regulate

- 3 = Waiting for Run
- 4 = Run
- 5 = Stop
- 6 = Unit trip
- 7 = Water Pump
- 8 = Test Mode
- 9 = Manual Precharge
- 10 = Man Pre-Regulate
- 11 = Soft Shutdown
- 12 = Precharge Re-init
- 13 = Check DCCT

VSD Inverter State

- 0 = Stop
- 1 = Dwell
- 2 = Run
- 3 = Run Voltage Control
- 4 = Test Mode
- 5 = Faulted
- 6 = Check DCCT

VSD Output Frequency

Displays the present output frequency to the motor.

Phase Rotation

Displays the phase rotation sequencing.

Output Current Rating

Indicates VSD size reported from VSD.

Motor Run (LED)

Indicates the digital output from the controls is commanding the motor to RUN.

DC Bus Regulating (LED)

Indicates the VSD is regulating the DC bus.

Precharge Complete (LED)

Indicates the VSD DC bus has been pre-charged.

Input Current Limit (LED)

Indicates the chiller input current is at the Job FLA limit.

Cooling System (LED)

Indicates the relay controlling the VSD water pump output is energized.

Precharge Active (LED)

Indicates the VSD is pre-charging the DC bus.

DC Bus Voltage

Displays the DC Bus voltage.

Total Supply kVA

Displays the total kilovolt-Amps measured by the VSD.

Input Voltage Peak (L1, L2, L3)

Displays the three-phase input peak voltages measured by the VSD (Neutral to Line).

Input Voltage RMS (L1, L2, L3)

Displays the three-phase input RMS voltages across each line.

Input Current RMS (L1, L2, L3)

Displays the three-phase input current values measured by the VSD.

Output Voltage RMS (Phase A, B, C)

Displays the three-phase output RMS voltages across each line.

Output Current RMS (Phase A, B, C)

Displays the three-phase output current values measured by the VSD.

Rectifier Baseplate Temperature (L1, L2, L3)

Displays the VSD input rectifier baseplate temperatures at each phase.

Inverter Baseplate Temperature (Phase A, B, C)

Displays the VSD output inverter baseplate temperatures at each phase.

Internal Ambient Temperature

Displays the ambient temperature inside the VSD cabinet from two sensors as reported by the VSD.

PROGRAMMABLE

Manual DC Bus

Access Level Required: SERVICE

Provides a means to set manual Precharge or Preregulate of the VSD DC Bus while the chiller is stopped with no VSD faults present. The selection Disabled returns to automatic.

Manual Cooling

Access Level Required: SERVICE

Enabled provides a means to operate the VSD coolant pump and fans while the chiller is stopped. The selection Disabled returns to automatic.

Test Mode

Enables the Service Technician to check for proper gating of the IGBTs in the inverter. The inverter's PWM modulator shall repetitively gate the inverters's IGBTs in the following manner while the test mode is enabled: three upper IGBTs on for one second, all IGBTs off for one second, three lower IGBTs on for one second, all IGBTs off for one second.

The following conditions must all be met for test mode to initiate:

- The VSD must be OFF (not in pre-charge or run);
- DC link voltage must be less than 50 V.
- No VSD faults exist
- The Test mode lockout timer is not timing. The Test mode lockout timer shall time four minutes, after being initiated by either of the following two conditions:
 1. The system has transitioned from Run to Stop mode; or
 2. The VSD logic board has just powered up.

NAVIGATION

Home

Causes an instant return to the Home Screen.

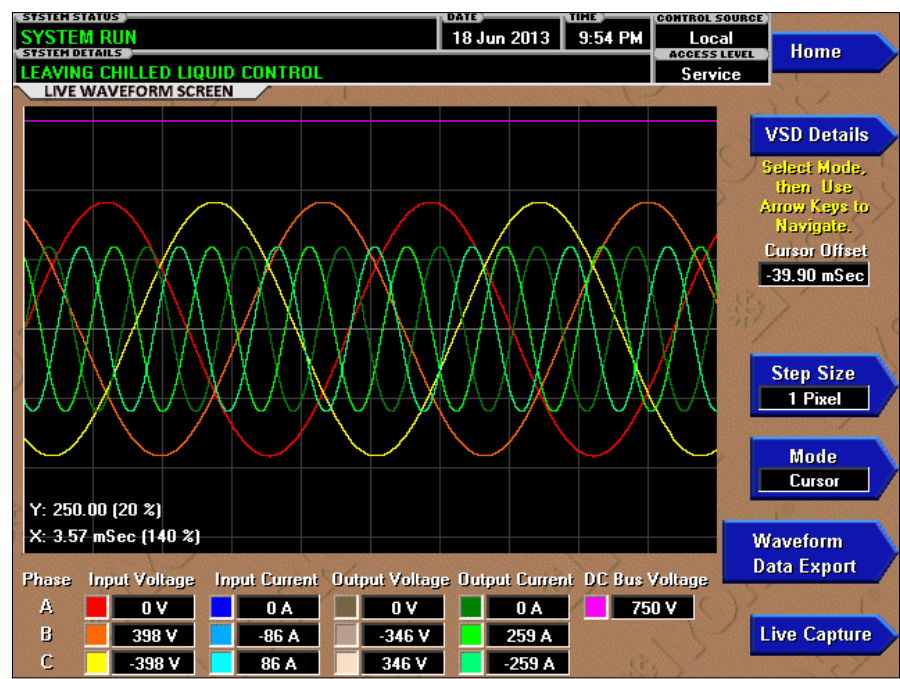
VSD

Causes an instant return to the VSD Screen.

VSD Waveform

Moves to the VSD Waveform screen, which presents simulated scope capture data.

VSD WAVEFORM SCREEN



LD17957

FIGURE 87 - VSD WAVEFORM SCREEN

OVERVIEW

The waveform screens display in oscilloscope format the values of three phase input voltages, input currents, phase input voltages, output currents and DC bus voltage as selected, during run and associated with a fault for 40ms before and 10ms after a fault, at 0.1ms intervals (i.e. 500 samples per channel). The screen allows for manipulation of a cursor to display X and Y axis values and to zoom and pan the display horizontally and vertically.

The Live Waveform screen is accessed from the VSD Details screen, and the Fault Waveform screen is accessed from the History Details Screen.

DISPLAY ONLY

Waveform Scope Capture

This area of the screen allows the user to view the graphical traces of the selected parameters and a movable cursor with its X and Y axis intersecting values.

Data Values

The read box associated with phase A, B or C input voltage, input current, output current and the DC bus voltage displays the value of the channel at the intersection of its trace and the cursor line.

Cursor Offset

This field displays during a fault capture. It displays the time offset of the cursor from the fault event, in milliseconds.

Following is the list of messages that would be displayed on these screens when applicable:

- Requesting Live Data
- Receiving Live Data
- Live Transfer Failed
- Live Transfer Complete
- Requesting Fault Data
- Receiving Fault Data
- Fault Transfer Failed
- Fault Transfer Complete

PROGRAMMABLE:

Live Capture

Access level Required: Service

This button manually initiates a waveform transfer of normal acquisition data. The button is not visible when a waveform transfer (Fault or Live data) is in progress.

Mode

The Mode of the arrow keys is selectable by pressing the Mode button. Pressing the button will increment through the options in a loop, rather than displaying an edit box. Each Mode is described below.

Waveform Data Export

Send the captured waveform in display to the printer port as a text file for review offline.

Select Signals

In this mode, a selection rectangle is enabled which allows the user to navigate the selection color boxes next to each data channel. Pressing the check button shall select a channel; pressing the X button shall deselect it for display.

Move Cursor

In this mode, pressing the left and right arrow keys moves the vertical cursor by the number of pixels shown in the Step Size box. Pressing the Step Size button will increment through the options in a loop, rather than displaying an edit box.

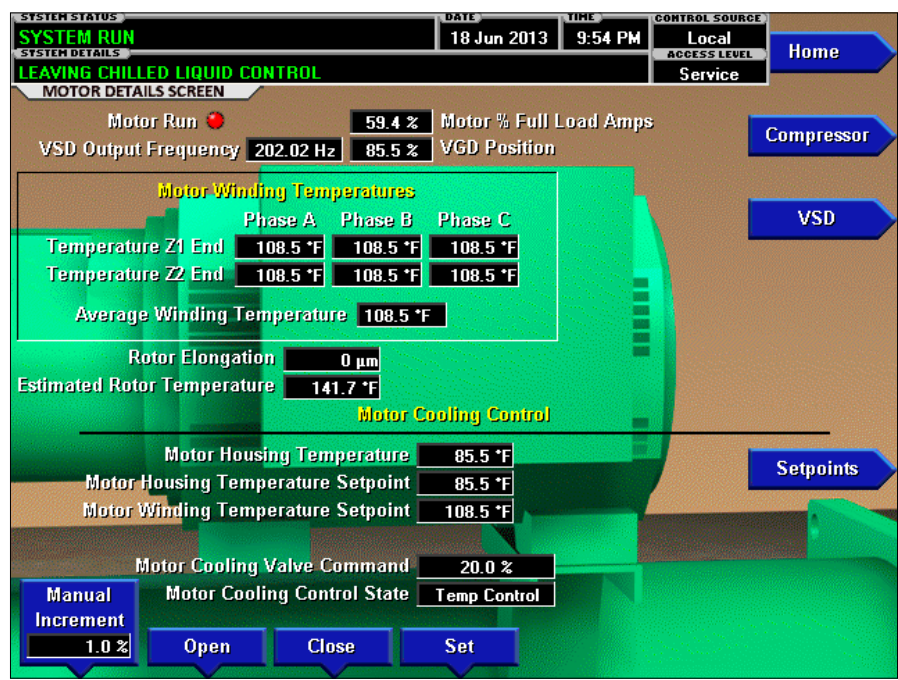
Zoom Display

In this mode, pressing the left and right arrow keys will decrease or increase, respectively, the horizontal zoom by the percentage shown in the Step Size box. Pressing the up and down arrow keys will increase or decrease, respectively, the vertical zoom by the percentage shown in the Step Size read box. Pressing the Step Size button will increment through the options in a loop, rather than displaying an edit box.

Scroll Display

In this mode, pressing the arrow keys will scroll the display in the direction selected by the percentage shown in the Step Size read box (e.g. if the Step Size is 50%, the display shall shift by half its width). Pressing the Step Size button will increment through the options in a loop, rather than displaying an edit box.

MOTOR DETAILS SCREEN



LD17934

FIGURE 88 - MOTOR DETAILS SCREEN

OVERVIEW

This screen displays information pertinent to the Motor Temperature Monitoring feature. The feature consists of motor winding temperature and motor housing temperature. Also, individual winding temperature sensors can be disabled on this screen when logged in with Admin access level.

DISPLAY ONLY

Motor Run (LED)

Illuminates when the OptiView™ control center is commanding the motor to run.

%Input Full Load Amps

Displays the input current as a percentage of chiller full load amps.

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 is considered invalid and displays as XXX.X.

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.

Rotor Elongation

Displays the calculated change in distance from the two axial position sensors for the rotor shaft versus the shutdown baseline set at the factory. This indicates thermal growth and torque effect.

Estimated Rotor Temperature

Displays the temperature derived from physical parameters, elongation, and housing temperature.

Motor Housing Temperature

Display 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.

Ambient Dew Point Temperature

When the optional Ambient Dew Point Temperature sensor is Enabled, its reading is indicated 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 or Manual control.

PROGRAMMABLE

Winding Temperature Protection

The winding displays can be individually disabled using the TEMPERATURE DISABLE setpoint (ADMIN access level) on this Screen. The software prevents more than 2 of the 3 sensors at either end of the motor to be disabled.

Setpoint Offset

Access Level Required: SERVICE

Determines the target motor housing temperature above condenser entering temperature. (-10 to 50°F, default 10)

Dew Point

Allows the service technician to enable or disable the optional Ambient Dew Point temperature sensor.

Minimum Housing Temperature

Access Level Required: SERVICE

Sets the minimum allowable motor housing temperature. (55.0 to 100.0°F, default 55)

Maximum Winding Temperature

Access Level Required: ADMIN

Sets the maximum winding temperature which enlists an over-ride of the motor cooling valve control to open further to not exceed this value. Set at 200°F.

Kp, Ti, TD

Access Level Required: ADMIN

Control gains for the motor cooling valve.

Manual Increment

Access Level Required: SERVICE

Sets the increment by which the motor cooling valve command will be adjusted when in manual control.

Open/Close

Access Level Required: SERVICE

Changes the motor cooling valve command by one unit of the manual increment setting. Changes control to Manual.

Set

Access Level Required – SERVICE

Allows for input of a specific command percentage to the motor cooling valve. Changes control to Manual.

Auto

Access Level Required – SERVICE

Shown only when motor cooling is in Manual. Changes back to Automatic control.

NAVIGATION

Home

Causes an instant return to the Home Screen.

VSD

Returns to the VSD Screen.

SETPOINTS SCREEN

LD17935

FIGURE 89 - SETPOINTS SCREEN

OVERVIEW

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

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.

Input Current Limit Setpoint

Displays the active Input Current Limit setpoint. This is the minimum of the locally or remote (received via 0-10VDC, 2-10VDC, 0-20mA or 4-20mA input or PWM) programmed Current Limit setpoint or pulldown limit. In BAS (ISN) remote mode, the remote setpoint is received from the E-Link Gateway interface.

PROGRAMMABLE

Local Leaving Chilled Liquid Temperature - Range

Access Level Required: OPERATOR

This is the range over which an analog signal or a digital signal (PWM) can reset the Leaving Chilled Liquid Temperature setpoint above the operator programmed **Base** Setpoint. Programmable as either 10°F, 20°F, 30°F or 40°F, with a default of 10°F, it is added to the **BASE** value to create a range over which the remote device can reset the setpoint.

Local Leaving Chilled Liquid Temperature - Setpoint

Access Level Required: 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 38.0°F to 70.0°F (water) or 10.0°F to 70.0°F (brine). If Smart Freeze is enabled, the range is 36.0°F to 70.0°F (water).

Leaving Chilled Liquid Temperature Cycling Offset - Shutdown

Access Level Required: 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 64°F.

Leaving Chilled Liquid Temperature Cycling Offset - Restart

Access Level Required: 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 70°F.

Remote Analog Input Range

Access Level Required: OPERATOR

This setpoint defines, for the control center, the remote signal range applied for remote reset of the Leaving Chilled Liquid temperature Setpoint and Current Limit Setpoint in ANALOG remote mode. If the remote signal is 0-10VDC or 0-20mA, this setpoint must be programmed for 0-10VDC. If the remote signal is 2-10VDC or 4-20mA, this setpoint must be programmed for 2-10VDC.

Local Input Current Limit

Access Level Required: 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.

Pulldown Demand Limit

Access Level Required: 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 (ISN) 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

Access Level Required: OPERATOR

Allows the user to set a period of time for which the pulldown demand limit will be in effect after the chiller starts.

Print

Generates **Setpoints** print report.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Setup

Moves to the subscreen allowing setup of general system parameters.

SETUP SCREEN

LD17936

FIGURE 90 - SETUP SCREEN

OVERVIEW

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). In addition, the chiller configuration, as determined by the state of the Microboard Program Jumpers and Program Switches is displayed. A qualified Service Technician, following instructions in *YORK YMC² Service Manual (Form 160.84-M2)*, establishes this configuration per the desired operation. This screen also serves as a gateway to more subscreens for defining general system parameters.

DISPLAY ONLY

Liquid Type

Displays Water or Brine.

Refrigerant Selection

Shows R134a selected at factory level.

PROGRAMMABLE

Present Date

Access Level Required: 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

Access Level Required: 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.

Clock (Enabled / Disabled)

Access Level Required: OPERATOR

Allows the user to enable or disable the real-time clock in order to conserve battery life. The clock will be disabled during manufacturing and must be enabled at system commissioning. In addition, when preparing for prolonged shutdown the clock should once again be disabled.

12/24 Hr

Access Level Required: 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 Settings

Access Level Required: OPERATOR or higher

Used to enter the following setpoints. Pressing this key places a green selection box around the first changeable setpoint. The access level determines which setpoints can be changed. Use the ▲ and ▼ keys to place the selection box around the desired setpoint. With the setpoint selected, press the ENTER "✓" key. A dialog box appears with the range of settings.

Chilled Liquid Pump Operation

Access Level Required: SERVICE

Allows a Service Technician to select chilled liquid pump control contacts (I/O Board TB2-44/45) operation as either Standard or Enhanced. Service Technicians refer to *YORK YMC² Service Manual (Form 160.84-M2)*.

Line Voltage

Access level Required: SERVICE

Allows a Service Technician to program the applicable supply line voltage.

Line Frequency

Access level Required: SERVICE

Allows a service technician to program the line frequency to 50 or 60Hz.

Power Failure Restart

Access Level Required: OPERATOR

Allows the user to select Manual or Automatic restart after power failure.

Head Pressure Control

Access Level Required: SERVICE

Allows the Service Technician to enable or disable the Head Pressure Control feature. Service Technicians refer to *YORK YMC² Service Manual (Form 160.84-M2)*.

Hot Gas Control (Enabled/Disabled)

Access level required: SERVICE

Enables and disables the optional Hot gas Bypass Control feature.

Flow Switch

Access Level Required: SERVICE

Used to enter the applicable Flow Switch type. YMC² chillers could be equipped with either Paddle-type or Thermal-Type Flow sensors. The actual type installed must be entered to allow the program to read the correct input.

NAVIGATION

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.

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 information for the chiller system.

Operations

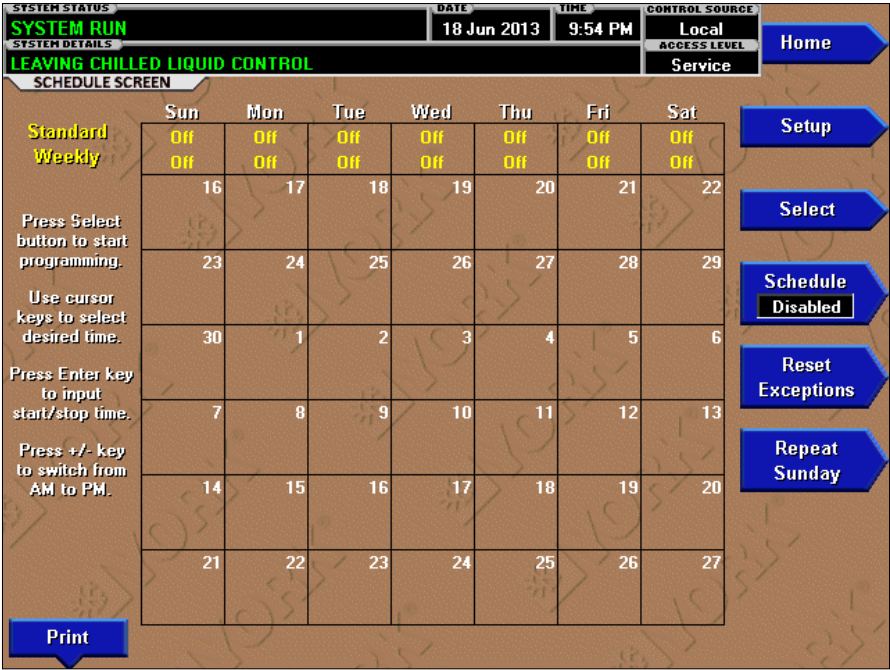
Moves to the subscreen displaying operating parameters of the chiller system.

Diagnostics

Access Level Required: SERVICE

Moves to the subscreen allowing limited diagnostic capability while operating.

SCHEDULE SCREEN



LD17937

FIGURE 91 - SCHEDULE SCREEN

OVERVIEW

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.

DISPLAY ONLY

This screen displays the chiller schedule. There are no other display options.

PROGRAMMABLE

Standard Week Start/Stop Times

Access Level Required: 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

Access Level Required: 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. 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.

Schedule (Enabled / Disabled)

Access Level Required: OPERATOR

Allows the user to enable or disable the monitoring function which enforces the scheduled starting and stopping of the chiller.

Repeat Sunday Schedule

Access Level Required: OPERATOR

Duplicates the schedule defined for Sunday for the remainder of the standard weekdays.

Reset All Exception Days

Access Level Required: OPERATOR

Deletes all programming for exception days within the next 6 weeks.

Select

Access Level Required: 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.

Print

Generates a **Schedule** print report.

NAVIGATION

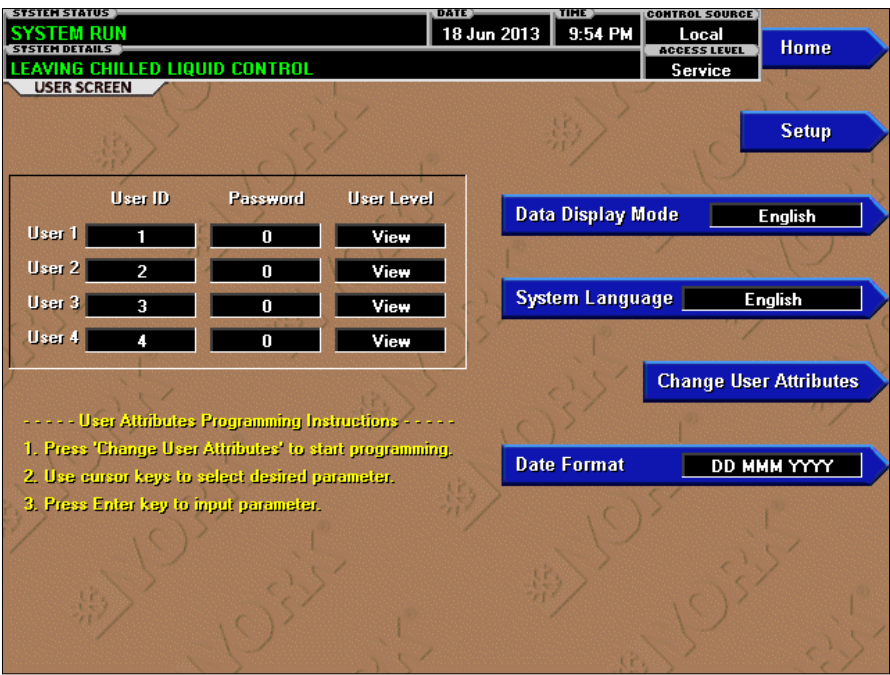
Home

Causes an instant return to the Home Screen.

Setup

Return to the previous Setup Screen.

USER SCREEN



LD17938

FIGURE 92 - USER SCREEN

OVERVIEW

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.

DISPLAY ONLY

This screen displays attributes assigned to User IDs. There are no other display options.

PROGRAMMABLE

System Language

Access Level Required: 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, and Traditional Chinese.

English / Metric Units

Access Level Required: OPERATOR

Define the unit system (English or Metric) used by the chiller display.

Custom User ID (4)

Access Level Required: SERVICE

This allows the user to specify up to four (4) Custom User ID values. Each user ID will then require a corresponding Password and User Level. A User ID can be defined for various maintenance personnel.

Custom User Password (4)

Access Level Required: **SERVICE**

This allows the user to specify up to four (4) Custom Password values. Each Password will then require a corresponding User ID and User Level.

Custom User Access Level (4)

Access Level Required: **SERVICE**

This allows the user to specify up to four (4) Custom User Access Levels. Each Access Level will then require a corresponding Password and User ID.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Setup

Return to the Setup Screen.

COMMS SCREEN



LD17939

FIGURE 93 - COMMS SCREEN

OVERVIEW

This screen allows definition of the necessary communications parameters. Refer to *SECTION 33 - PRINTING* of this manual for details on the Printer connections and setup. Presently, there are no COM 2 communications features available.

DISPLAY ONLY

This screen displays attributes assigned to COMMS IDs. There are no other display options.

PROGRAMMABLE

Chiller ID

Access Level Required: 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

Access Level Required: 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

Define the baud rate at which the panel shall communicate to the printer.

Printer Data Bit(s)

Define the number of data bits with which the panel shall communicate to the printer.

Printer Parity Bit(s)

Define the number of parity bits with which the panel shall communicate to the printer.

Printer Stop Bit(s)

Define the number of stop bits with which the panel shall communicate to the printer.

COM 2 Setup

COM2 button is shown only in TESTOP or ADMIN access levels. COM2 serial port is used for VSD communications.

COM 2 Baud Rate

Define the baud rate at which the panel shall communicate through the modem port.

COM 2 Data Bit(s)

Define the number of data bits with which the panel shall communicate to the modem port.

COM 2 Parity Bit(s)

Define the number of parity bits with which the panel shall communicate through the modem port.

COM 2 Stop Bit(s)

Define the number of stop bits with which the panel shall communicate through the modem port.

GPIC Report

Access Level Required: ADMIN

Allows view of GPIC objects.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Setup

Return to the Setup Screen.

PRINTER SCREEN

LD17993

FIGURE 94 - PRINTER SCREEN

OVERVIEW

This screen allows definition of the necessary communications parameters for the printer. Refer to *SECTION 33 - PRINTING* of this manual for details on Printer connections and setup.

DISPLAY ONLY

Time Remaining Until Next Print

Displays the time until the next print log will occur, if the function is enabled.

PROGRAMMABLE

Log Start Time

Access Level Required: OPERATOR

Set the time at which scheduled print logs will begin.

Output Interval

Access Level Required: OPERATOR

Define the interval at which log printing will occur.

Automatic Printer Logging (Enabled/Disabled)

Access Level Required: OPERATOR

Enable the printer to begin printing status reports beginning at the programmed start time and recurring at the interval defined above.

Printer Type

Access Level Required: SERVICE

Define the printer type connected to the chiller system.

Print Report

Access Level Required: 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). Export all Waveforms from the VSD or Export Snapshots from the MBC. A print report is generated upon completion of selection.

Print All Histories

Access Level Required: OPERATOR

Generate a report of the system data at the time of all stored shutdowns.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Setup

Return to the Setup Screen.

SALES ORDER SCREEN

SYSTEM STATUS

SYSTEM RUN

SYSTEM DETAILS

LEAVING CHILLED LIQUID CONTROL

SALES ORDER SCREEN

DATE

18 Jun 2013

TIME

9:54 PM

CONTROL SOURCE

Local

ACCESS LEVEL

Service

Home

Order Information

Commissioning Date

00 000 0000

Job Name

System Model

York Order Number

Unit Serial Number

Compressor Model

M2C-205FAC

Evaporator Model

Condenser Model

VSD Model

Nameplate Information

Capacity [Tons]

Refrigerant

Refrig Weight [lbs]

RPM

Input kW

Voltage

Phases

Frequency

Input Job FLA

Min Circuit Ampacity

Design Conditions

Evaporator

Condenser

Pressure Drop [ft]

Flow [GPM]

Leaving Liquid [°F]

Entering Liquid [°F]

Fouling [hr-ft²-F/Btu]

Liquid Type

Brine Percent

Setup

Set Order Info

Print

LD17941

FIGURE 95 - SALES ORDER SCREEN

OVERVIEW

This screen allows definition of the sales order parameters. The Commissioning date is entered by the YORK/Johnson Controls Service Technician at the time of chiller commissioning. These values should never be changed or entered by anyone other than a qualified Service Technician. Entry instructions are included in the *YORK YMC² Service Manual (Form 160.84-M2)*. The remainder of the values are entered at the YORK Factory during the manufacturing of the chiller.

DISPLAY ONLY

Model Number

Factory defined model number of the chiller system.

YORK Order Number

Factory defined order number under which the chiller was sold.

Chiller Serial Number

Factory defined serial number for the chiller system.

Compressor Model

Factory defined model number of the Compressor. Critical entry for proper Chiller Operation. Technicians see *YORK YMC² Service Manual (Form 160.84-M2)*.

Evaporator Model

Factory defined model number of the Evaporator.

Condenser Model

Factory defined model number of the Condenser.

VSD Model

Factory defined model number of the VSD.

Condenser and Evaporator Design Load Information

Factory defined description of the condenser and evaporator parameters according to the original rating.

Nameplate Information

Factory defined information about the chiller configuration.

PROGRAMMABLE

Commissioning Date

Access Level Required: SERVICE

Define the date at which the chiller was commissioned.

Job Name and Location

Access Level Required: SERVICE

Factory defined job name and location the chiller is destined for.

Print

This generates a listing of the Sales Order data.

NAVIGATION

Home

Causes an instant return to the Home Screen.

Setup

Return to the Setup Screen.

OPERATIONS SCREEN

LD17942

FIGURE 96 - OPERATIONS SCREEN

OVERVIEW

This screen allows definition of general parameters having to do with the operation of the chiller.

DISPLAY ONLY

Chiller 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”.

PROGRAMMABLE

Control Source

Access Level Required: OPERATOR

Define whether the control of the chiller will be Local, Digital Remote, Analog Remote, Modem Remote or BAS (ISN) Remote.

Number of Starts

Access Level Required: ADMIN

Displays the number of the starts the chiller has initiated. This may be reprogrammed to a desired value, (generally when this value has been reset due to a Microboard replacement), but should not be done so arbitrarily.

Operating Hours

Access Level Required: ADMIN

Displays the total accumulated run time of the chiller. This may be reprogrammed to a desired value (generally when this value has been reset due to a Microboard replacement), but should not be done arbitrarily.

Edit Phone Numbers

Access Level Required: SERVICE

Displays up to two service phone numbers. The Regional service phone number is displayed as the first number. Although the label and number can be changed appropriately, the default for this entry is “Johnson Controls North American Toll Free Number 1-800-861-1001”. The Local service phone number is displayed as the second number. Although blank by default, the appropriate label and number can be entered by a Service Technician. Service Technicians refer to *YORK YMC² Service Manual (Form 160.84-M2)*.

NAVIGATION

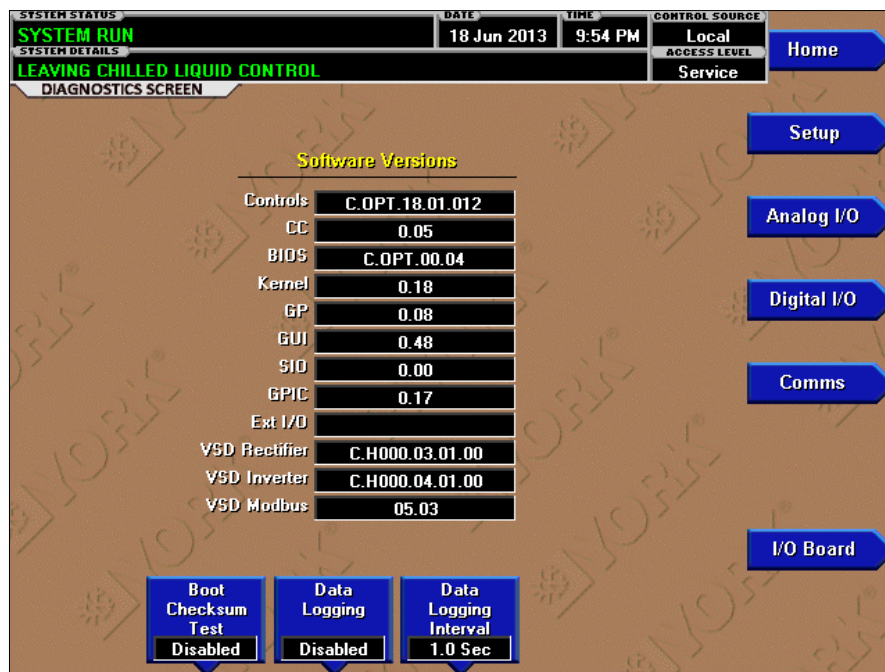
Home

Causes an instant return to the Home Screen.

Setup

Return to the Setup Screen.

DIAGNOSTICS SCREEN



LD17956

FIGURE 97 - DIAGNOSTICS SCREEN

OVERVIEW

This screen displays diagnostic information about the chiller controls systems. It is also the gateway to advanced diagnostic data.

NAVIGATION

Home

Returns to Home Screen.

Setup

Returns to Setup Screen.

Analog I/O

Navigates to a subscreen showing each analog value being read by the microboard. The screen detail is shown in the Diagnostics and Troubleshooting section in this manual.

Digital I/O

Navigates to a subscreen showing the state of each digital channel command from the microboard. The screen detail is shown in the Diagnostics and Troubleshooting section in this manual.

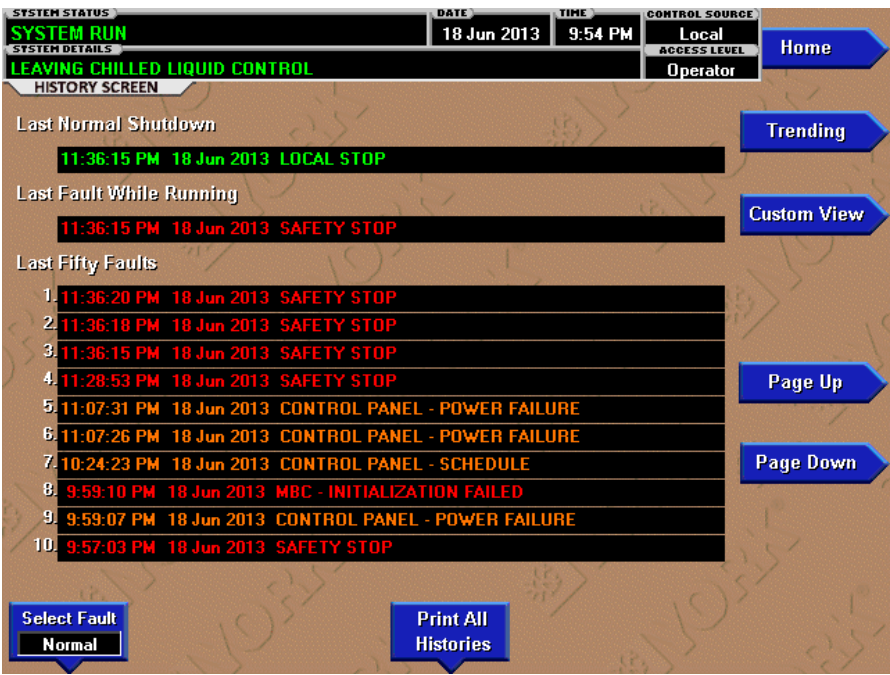
Comms

Navigates to a subscreen showing Error statistics for the communication ports on the microboard. The screen detail is shown in the Diagnostics and Troubleshooting section in this manual.

I/O Board

Navigates to a subscreen showing the status of each channel on the LTC I/O board. The screen detail is shown in the Diagnostics and Troubleshooting section in this manual.

HISTORY SCREEN



LD17994

FIGURE 98 - HISTORY SCREEN

OVERVIEW

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

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 (Panel rocker switch)
- Remote (Digital, Analog or BAS (ISN))

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 fifty safety or cycling shutdowns that occur while the system is running or stopped.

PROGRAMMABLE

Print History

This generates a report listing the status of the chiller parameters at the time of the selected shutdown.

Print All Histories

This generates a report listing the status of the chiller parameters at the time of each of the stored shutdowns.

NAVIGATION

Home

Causes an instant return to the Home Screen.

View Details

Causes a move to a subscreen containing the value of select chiller parameters at the time of the associated shutdown.

Trending

Causes a move to a subscreen allowing the user to view trending data on selected chiller parameters.

Custom View

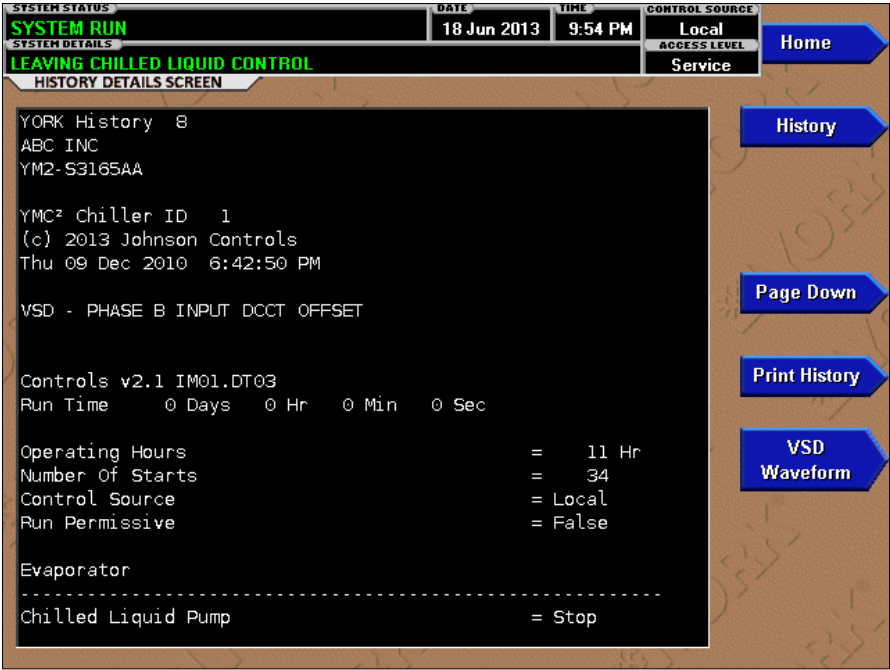
Causes a move to a subscreen allowing the user to view the Custom Setup Screen.

Security Log

Access Level Required: SERVICE

Causes a move to a subscreen allowing the user to view a record of the last 75 setpoint changes.

HISTORY DETAILS SCREEN



LD17944

FIGURE 99 - HISTORY DETAILS SCREEN

OVERVIEW

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

History Printout

This is the on-screen printout of the system parameters.

PROGRAMMABLE

Page Up / Page Down

Scroll up in the displayed data (if applicable).

Print History

This generates a report listing the status of the chiller parameters at the time of the selected shutdown.

NAVIGATION

Home

Causes an instant return to the Home Screen.

History

Causes a return to the History Screen.

SECURITY LOG SCREEN

Category	Setpoint	New Value
1 System	Schedule	Disabled
2 System	Schedule	Enabled
3 System	Head Pressure Control	Disabled
4 System	Flow Switch Input	J14
5 Evaporator	Shutdown Offset	4.0 °F
6 Evaporator	Leaving Chilled Local Setpoint	44.0 °F
7 Evaporator	Leaving Chilled Local Setpoint	45.0 °F
8 System	Start	Run
9 System	Clear Fault	Yes
10 System	Start	Run
11 System	Clear Fault	Yes
12 System	Start	Run
13 System	Soft Stop	Stop
14 System	Start	Run
15 System	Clear Fault	Yes

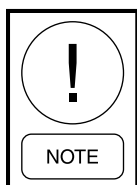
LD17945

FIGURE 100 - SECURITY LOG SCREEN

OVERVIEW

This screen displays a listing of the last 75 setpoint changes. They are listed and numbered in reverse order in which they were changed, with the most recent listed as number 1. Multiple pages are necessary to display all 75 changes. Not all setpoints are logged. Service technicians refer to list in *YORK YMC² Service Manual (Form 160.84-M2)*.

The details of any setpoint change can be viewed by navigating to a subscreen that displays the date and time of the change, Access Level and USER ID used to make the change, the old setpoint value and the new setpoint value.



The following fields require login access level of SERVICE. Service technicians refer to YORK YMC² Service Manual (Form 160.84-M2) for operation instructions and explanations of all programmable setpoints, zone parameters and displayed values.

DISPLAY ONLY

Category

Displays the category of the setpoint (motor, evaporator, condenser, etc.).

Setpoint

Displays the setpoint that was changed.

New Value

Displays the value that was entered at the time of the setpoint change.

PROGRAMMABLE

Log Entry

Allows the user to select a particular setpoint change for detail viewing.

Print

Generates a detailed report of all setpoint changes listed in the setpoint change log.

Page Up

Scroll up in the displayed data (if applicable).

Page Down

Scroll down in the displayed data (if applicable).

NAVIGATION**Home**

Causes an instant return to the Home Screen.

History

Access Level Required: SERVICE

Causes an instant return to the History Screen.

View Details

Access Level required: SERVICE

Causes a move to a subscreen containing the details of the setpoint change selected with the Log Entry key.

SECURITY LOG DETAILS SCREEN

SYSTEM STATUS: SYSTEM RUN
SYSTEM DETAILS: LEAVING CHILLED LIQUID CONTROL
SECURITY LOG DETAILS SCREEN

DATE: 18 Jun 2013
TIME: 9:54 PM
CONTROL SOURCE: Local
ACCESS LEVEL: Service

Category: System
Setpoint: Schedule

Time: 10:24:26 PM
Date: 18 Jun 2013
Access Level: Service
User Id: 0

Old Value: Enabled
New Value: Disabled

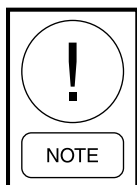
Buttons: Home, Security Log, Print

LD17946

FIGURE 101 - SECURITY LOG DETAILS SCREEN

OVERVIEW

This screen allows the user to view the details of a logged setpoint change, selected from the list on the Security Log Screen. The date and time the setpoint was changed, the new and old setpoint value and access level and user ID used to make the change are displayed. The data on this screen can be printed.



The following fields require login access level of SERVICE. Service technicians refer to YORK YMC² Service Manual (Form 160.84-M2) for operation instructions and explanations of all programmable setpoints, zone parameters and displayed values.

DISPLAY ONLY

Description

Displays the setpoint/category that was changed.

Time

Displays the time the setpoint was changed.

Date

Displays the date the setpoint was changed.

Access Level

Displays the Login Access Level used to make the setpoint change.

User ID

Displays the login User ID used to make the setpoint change.

Old Value

Displays the previous setpoint value.

New Value

Displays the value entered at the time of the setpoint change.

PROGRAMMABLE

Print

Generates a report of change parameters displayed on this screen.

NAVIGATION

Home

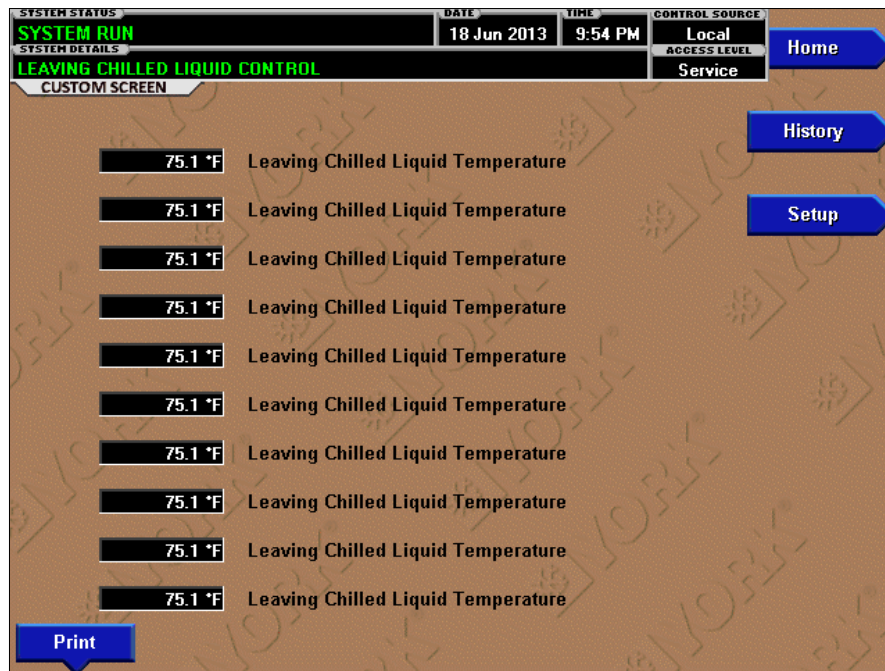
Causes an instant return to the Home Screen.

History

Access Level Required: SERVICE

Causes an instant return to the History Screen.

CUSTOM SCREEN



LD17947

FIGURE 102 - CUSTOM SCREEN

OVERVIEW

This screen allows up to 10 Service Technician selected parameters to be displayed. These parameters are selected from a 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.

DISPLAY ONLY

This screen display attributes assigned to Custom screen. There are no other display options.

PROGRAMMABLE

Print

This generates a listing of the parameters displayed on this screen.

NAVIGATION

Home

Causes an instant return to the Home Screen.

History

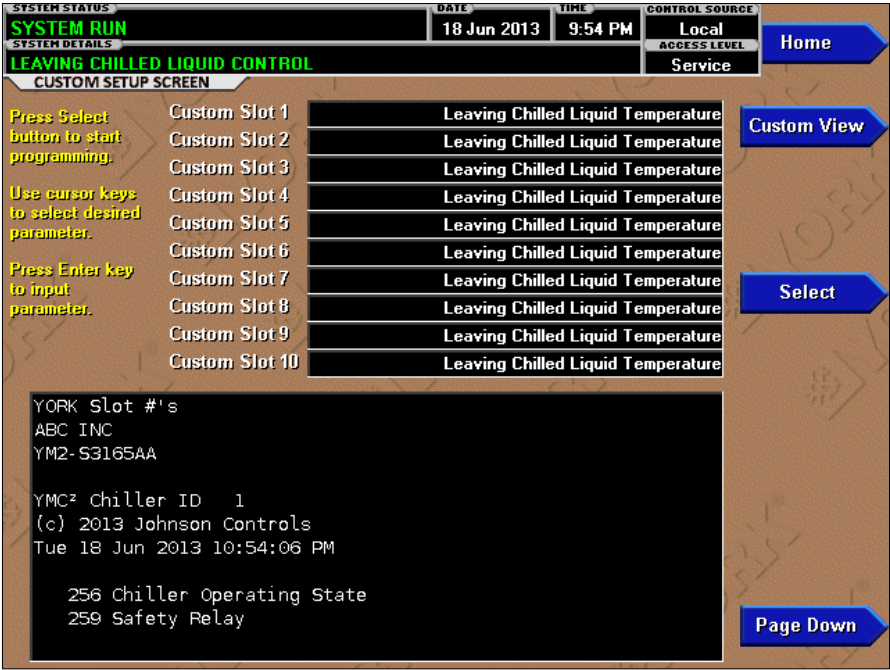
Causes an instant return to the History Screen.

Setup

Access Level Required: OPERATOR

Causes a jump to the subscreen that allows selection of the parameters to be displayed.

CUSTOM SETUP SCREEN

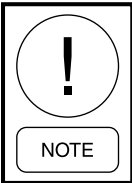


LD17948

FIGURE 103 - CUSTOM SETUP SCREEN

OVERVIEW

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



The following fields require login access level of SERVICE. Service technicians refer to YORK YMC² Service Manual (Form 160.84-M2) for operation instructions and explanations of all programmable setpoints, zone parameters and displayed values.

DISPLAY ONLY

Slot Numbers

Lists the available parameters that can be displayed. The desired parameters for display are selected from this list.

PROGRAMMABLE

Page Up

Scroll up through list of available parameters.

Page Down

Scroll down through list of available parameters.

Select

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)

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

Home

Causes a return to the Home Screen.

Custom View

Access Level Required: SERVICE

Causes a return to the Custom View Screen.

TREND SCREEN



LD17949

FIGURE 104 - TREND SCREEN

OVERVIEW

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 DATA SELECT key is used to display all trended data points simultaneously or select a single data point for display.

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 param-

eter, 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:

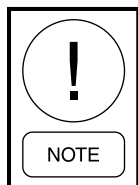
- ONE SCREEN,
- CONTINUOUS
- TRIGGERED

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

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 with the words 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.

PROGRAMMABLE

Start

Access Level Required: 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

Access Level Required: 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

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. Refer to *SECTION 33 - PRINTING* of this manual for printout examples.

Data Select

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

This key toggles the Y-Axis labels of the graph. Each key press changes the label to another of the selected parameters.

X-Axis

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

Home

Causes a return to the Home Screen.

History

Causes a return to the History Screen.

Trend Setup

Access Level Required: OPERATOR

Only displayed if the trending is stopped. Causes a jump to a subscreen for configuring the trending display.

TREND SETUP SCREEN



LD17950

FIGURE 105 - TREND SETUP SCREEN

OVERVIEW

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.

DISPLAY ONLY

This screen displays chiller trend setup fields. There are no display only field.

PROGRAMMABLE

Chart Type

Access Level Required: OPERATOR

Selects CONTINUOUS, ONE SCREEN or TRIGGERED.

Collection Interval

Access Level Required: 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. For example, if the **Data Collection Interval** is programmed for 900 seconds, the parameter would be sampled every 900 seconds, with the last 112.5 hours (4.7 days) of data viewable on the screen. Therefore, the selected interval is a compromise between resolution and full screen time display. Select the desired **Data Collection Interval** as follows:

4. Determine the desired time interval (in seconds), between data samples.
5. Calculate the full screen time display as follows:
 - $450 \times \text{Data Collection Interval} = \text{full screen seconds}$
 - $\text{full screen seconds} / 60 = \text{full screen minutes}$
 - $\text{full screen minutes} / 60 = \text{full screen hours}$
 - $\text{full screen hours} / 24 = \text{full screen days}$
6. Decide if the resultant sample interval and full screen display meet the requirements. If not, select a different sample interval.

Select

Access Level Required: 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)

Access Level Required: 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)

Access Level Required: 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)

Access Level Required: 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

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.

ADVANCED TREND SETUP SCREEN

00474VIP

FIGURE 106 - ADVANCED TREND SETUP SCREEN

OVERVIEW

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.

DISPLAY ONLY

This screen displays trending start/stop fields. There are no display only fields on this screen.

PROGRAMMABLE

Primary Trigger

Access Level Required: 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

Access Level Required: 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

Access Level Required: 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

Access Level Required: 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

Access Level Required: 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

Access Level Required: 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 selected: Both Primary AND Secondary are true
- If OR selected: Either Primary OR Secondary (or both) are true
- If XOR selected: Either Primary OR Secondary (but not both) are true

Secondary Trigger

Access Level Required: 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

Access Level Required: 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

Access Level Required: 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

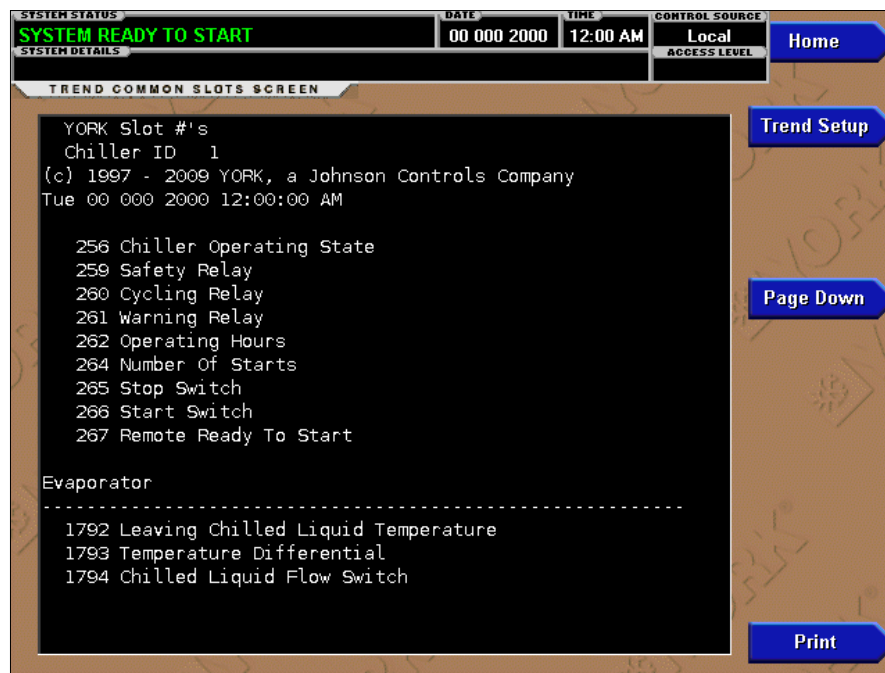
Home

Causes an instant return to the Home Screen.

Trend Setup

Causes an instant return to the Trend Setup Screen.

COMMON SLOTS SCREEN



LD14869

FIGURE 107 - COMMON SLOTS SCREEN

OVERVIEW

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

Slot Numbers

These are the slot numbers of the most commonly used parameters.

PROGRAMMABLE

Page Down

Access Level Required: OPERATOR

Scroll down in the displayed data.

Page Up

Access Level Required: OPERATOR

Scroll up in the displayed data.

Print

Access Level Required: OPERATOR

Generates a list of the slot numbers of the available parameters.

NAVIGATION

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
257	Coastdown Time Remaining
259	Safety Relay
260	Cycling Relay
261	Warning Relay
262	Operating Hours
263	Run Time (in seconds)
264	Number Of Starts
427	Run Permissive
267	Remote Ready To Start
EXTERNAL CONTACT	
281	Remote Run / Stop
282	Is MultiUnit Cycling Closed
283	Is Remote Cycling Closed
284	Is Auxiliary Safety Open
JUMPER	
287	Is Diagnostics Enabled
288	Liquid Type
289	Chilled Liquid Pump Operation
291	Power Failure Restart
OPTIONS	
304	Control Mode
305	System Language
306	Chiller ID Number
307	Display Mode
SECURITY	
336	Log in Level
337	Log in User ID
SCHEDULE	
512	Is Schedule Enabled
EVAPORATOR	
1792	Leaving Chilled Liquid Temperature
1793	Temperature Differential
1794	Chilled Liquid Flow Switch
1795	Chilled Liquid Pump
1806	Shutdown Temperature
1807	Return Chilled Liquid Temperature
1808	Evaporator Pressure
1809	Evaporator Saturation Temperature
1810	Evaporator Small Temp Difference
1812	Evaporator Refrigerant Temperature
17920	Active LCHLT Setpoint

SLOT #	DESCRIPTION
CONDENSER	
2048	Leaving Condenser Liquid Temperature
2049	Condenser Liquid Flow Switch
2050	Condenser Liquid Pump
2051	Return Condenser Liquid Temperature
2052	Condenser Pressure
2053	Condenser Saturation Temperature
2054	Condenser Small Temperature Difference
2057	High Pressure Switch
SUBCOOLING	
2059	Sub Cooling Temperature
DROP LEG REFRIGERANT	
2061	Drop Leg Refrigerant Temperature
HEAD PRESSURE CONTROL	
19108	Head Pressure
19040	Head Pressure Setpoint
19085	PID Control Mode
19075	Control Valve Command
COMPRESSOR	
1296	Discharge Temperature
1299	Discharge Superheat
SURGE	
1813	Delta P / P
8236	Surge Detected
8238	Surge Count
REFRIGERANT LEVEL CONTROL	
8205	Refrigerant Level Position
8206	Refrigerant Level Setpoint
8207	Active Refrigerant Level Setpoint
18376	Level Control State
8208	Level Control Valve Command
2062	Subcooler Effectiveness
LEAVING CHILLED LIQUID	
1792	Temperature
1793	Temperature Differential
1794	Is Flow Switch Closed
1795	Is Pump On
1796	Local Temperature Setpoint
1797	Remote Analog Temperature Setpoint
1798	Remote BAS (ISN) Temperature Setpoint
1799	Remote Modem Temperature Setpoint
1800	Selected Temperature Setpoint
1802	Remote Temperature Range

SLOT #	DESCRIPTION
1803	Restart Temperature Offset
1804	Restart Temperature Offset
1805	Shutdown Temperature Offset
1806	Shutdown Temperature Setpoint
1818	Remote Digital Temperature Setpoint
SMART FREEZE PROTECTION	
1815	Is Control Enabled
VARIABLE GEOMETRY DIFFUSER	
8280	Active Stall Voltage
18305	Active Stall Voltage Type
18135	Mach Number
18137	Active High Limit
18138	Active Low Limit
8337	Stroke Calibration Complete
8338	VGD Stroke Calibration Command
8352	VGD Fault Code
8353	VGD Actuator Fault
8354	VGD Shutdown Command
17408	Discharge Pressure
VARIABLE SPEED DRIVE	
2305	Motor Run
2306	Motor % FLA
3047	VSD Fault
18085	Input % Full Load Amps
2823	VSD Output Voltage
2822	VSD Output Frequency
20788	Max Chiller Frequency
2818	Input Power
2819	Input kW Hours
2878	L1 Voltage Total Harmonic Distortion
2879	L2 Voltage Total Harmonic Distortion
2880	L3 Voltage Total Harmonic Distortion
3014	L1 Input Current Total Demand Distortion
3015	L2 Input Current Total Demand Distortion
3016	L3 Input Current Total Demand Distortion
3017	Input kVA
2869	Input Power Factor
2306	Motor % Full Load Amps
20784	VSD Command
3051	VSD Control State
3050	VSD Inverter State
3058	Precharge Active
3044	Precharge Complete
3057	DC Bus Regulating
3027	DC Bus Voltage
2829	Cooling System

SLOT #	DESCRIPTION
3053	L1 Input Voltage (Peak)
3054	L2 Input Voltage (Peak)
3055	L3 Input Voltage (Peak)
2872	L1 Input Voltage (RMS)
2873	L2 Input Voltage (RMS)
2874	L3 Input Voltage (RMS)
3008	L1 Input Current (RMS)
3009	L2 Input Current (RMS)
3010	L3 Input Current (RMS)
3018	Phase A Output Voltage (RMS)
3019	Phase B Output Voltage (RMS)
3020	Phase C Output Voltage (RMS)
3021	Phase A Output Current (RMS)
3022	Phase B Output Current (RMS)
3023	Phase C Output Current (RMS)
3031	Phase A Rectifier Baseplate Temperature
3032	Phase B Rectifier Baseplate Temperature
3033	Phase C Rectifier Baseplate Temperature
3034	Phase A Inverter Baseplate Temperature
3035	Phase B Inverter Baseplate Temperature
3036	Phase C Inverter Baseplate Temperature
3029	Internal Ambient Temperature 1
3030	Internal Ambient Temperature 2
MOTOR MONITORING	
3059	Motor Temperature 1
3060	Motor Temperature 2
3061	Motor Temperature 3
3062	Motor Temperature 4
3063	Motor Temperature 5
3064	Motor Temperature 6
19148	Average Winding Temperature
2362	Motor Housing Temperature
18361	Motor Housing Temperature Setpoint
18371	Motor Winding Temperature Setpoint
18362	Motor Cooling Valve Command
18396	Motor Cooling Control State
18397	Estimated Rotor Temperature
CAPACITY CONTROL	
2822	VSD Output Frequency
18023	HGBP Command
18041	Condenser Pressure Override Threshold
18042	Evaporator Pressure Override Threshold
18058	Head Pressure
18093	Active Anti-Surge Minimum Frequency
18122	VSD Frequency Command
18143	Input Current Override Threshold

SLOT #	DESCRIPTION
18251	Motor Current Override Threshold
18273	Control State
18274	Active Load Limit
18288	Speed of Sound
18289	Isentropic Head
18290	Omega
18291	Surge Mach
18292	Surge Frequency
18293	Anti-Surge Minimum Frequency
18295	Leaving Chilled Liquid Temperature (Filtered)
18296	Condenser Pressure (Filtered)
18297	Evaporator Pressure (Filtered)
18300	VGD Command
18332	Anti-Surge Transient Offset
18342	VGD Position
MAGNETIC BEARING CONTROLLER	
20992	Axial Clearance Check
20996	Axial Cenetring
20998	Levitation Mode
20999	Rotation Mode
21001	MBC Alarm
21002	Position V13
21003	Position W13
21004	Position V24
21005	Position W24
21006	Position Z12
21010	Current V1
21011	Current V2
21012	Current V3
21013	Current V4
21014	Current W1
21015	Current W2
21016	Current W3
21017	Current W4
21018	Current Z1A
21019	Current Z2A
21020	Z1 Temperature
21021	Z2 Temperature
21022	MBC Amplifier Temp
21024	Rotor Elongation
21025	Motor Speed
21041	MBC Fault
21042	First Alarm Code
21043	Rotation Allowed
21045	Control Mode

SLOT #	DESCRIPTION
21072	VW13 Soft Landing Counter
21073	VW24 Soft Landing Counter
21074	Z12 Soft Landing Counter
21075	VW13 Hard Landing Counter
21076	VW24 Hard Landing Counter
21077	Z12 Hard Landing Counter
21049	A13 Unbalance
21050	B13 Unbalance
21051	A24 Unbalance
21052	B24 Unbalance
21053	Az Vibration
21054	Bz Vibration
21078	SDR Counter
21079	MBC Input Voltage
21154	MBC Max Alarm Level
21055	MBC Alive
21152	MBC Levitation Command
21153	MBC Rotation Command
POWER PANEL	
17940	Control Voltage
17938	Power Loss Time
17941	UPS Line / Charging
17942	UPS Inverter
17943	UPS Fault
17950	UPS Battery Voltage
17948	UPS Inverter Enable
17937	Power Panel Cooling Threshold
17939	Power Panel Temperature
17947	Power Panel Cooling System Run

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 26 - 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 transitioned 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 27 - 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 (ISN) 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 28 - 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 MBC 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 De-levitated mode is OFF, Levitated mode is ON, and the input from the digital Rotation Allowed contacts on the MBC is high at OptiView™ I/O board terminal TB3-30. This message precedes "Waiting for Chilled Liquid Flow".
WAITING FOR VSD PREREGULATION	The OptiView™ has issued a VSD Pre-Charge/Pre-Regulate 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".

TABLE 29 - 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 BRAM 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 BRAM until programmed.
VGD STROKE NOT CALIBRATED	The Variable Geometry Diffuser stroke calibration procedure has NOT yet been performed.
VGD FEEDBACK NOT CALIBRATED	The Variable Geometry Diffuser feedback calibration has not yet been performed since last stroke calibration.
MBC - INITIALIZATION FAILURE	OptiView was unable to read a valid validation key code over serial communications from the MBC after prompted by voltage present on the MBC Alive contacts (I/O board TB3-71).

TABLE 30 - 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. 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.																			
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 – EVAPORATOR – LOW PRESSURE LIMIT	The Evaporator pressure has decreased to the Warning threshold. This threshold is fixed in Water cooling applications. In Brine cooling applications, the threshold is a fixed amount above the programmable safety shutdown threshold. The Safety threshold in Brine applications is determined by the Brine solution and is determined by the YORK Factory. While this condition is in effect, the chiller capacity control is in override to increase suction pressure. This message automatically clears and normal LCHLT capacity control restored when the Evaporator pressure increases to the reset value. <table><tr><th colspan="5">EVAPORATOR PRESSURE THRESHOLDS</th></tr><tr><th rowspan="2"></th><th colspan="2">Warning Threshold (PSIG)</th><th colspan="2">Reset Threshold (PSIG)</th></tr><tr><th>Water</th><th>Brine</th><th>Water</th><th>Brine</th></tr><tr><td>R134a</td><td>27.0</td><td>+2.0>Safety Setpoint</td><td>28.0</td><td>+3.0>Safety Setpoint</td></tr></table>	EVAPORATOR PRESSURE THRESHOLDS						Warning Threshold (PSIG)		Reset Threshold (PSIG)		Water	Brine	Water	Brine	R134a	27.0	+2.0>Safety Setpoint	28.0	+3.0>Safety Setpoint
EVAPORATOR PRESSURE THRESHOLDS																				
	Warning Threshold (PSIG)		Reset Threshold (PSIG)																	
	Water	Brine	Water	Brine																
R134a	27.0	+2.0>Safety Setpoint	28.0	+3.0>Safety Setpoint																
WARNING – EXCESS SURGE DETECTED	(Applies only if Surge Protection SHUTDOWN feature is Disabled) The Surge Window Count has exceeded the Count Limit. Message can be manually cleared after the Surge Window Count is less than or equal to the Count Limit, or the SHUTDOWN feature is Enabled or the chiller is stopped. To clear message press WARNING RESET key on HOME Screen when logged in at OPERATOR (or higher) access level.																			
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 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.																			

TABLE 30 - WARNING MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
WARNING – MBC – CHECKSUM CENTERING	This warning appears when the MBC Axial Centering process was never performed, or not correctly realized internally. The centering process as found in the calibration section of Form 160.84-M2 will need to be done in ADMIN access. Then this message will clear when the WARNING RESET key is pressed in OPERATOR (or higher) access mode.
WARNING – MBC – DSP WATCHDOG	A software reboot has occurred on the control board due to processor problem, but reset with the reboot. This message will clear when the WARNING RESET key is pressed in OPERATOR (or higher) access mode.
WARNING – MBC – AMP WATCHDOG	A software reboot has occurred on the amplifier (power) board due to processor problem, but reset with the reboot. This message will clear when the WARNING RESET key is pressed in OPERATOR (or higher) access mode.
WARNING – MBC – HIGH AXIAL OSCILLATOR VOLTAGE	This manual reset warning is set when the internal oscillator that drives the axial position sensor coil is overloaded for one continuous second. This is typically the result of an open in the connection to the shaft position sensor. It could also be a failure of the MBC control board. This message will clear when the voltage is normal and the WARNING RESET key is pressed in OPERATOR (or higher) access mode.
WARNING – MBC – HIGH RADIAL OSCILLATOR VOLTAGE	This manual reset warning is set when the internal oscillator that drives the radial position sensor coil is overloaded for one continuous second. This is typically the result of an open in the connection to the shaft position sensor. It could also be a failure of the MBC control board. This message will clear when the voltage is normal and the WARNING RESET key is pressed in OPERATOR (or higher) access mode.
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.
WARNING – MBC – ROTATION MODE OFF	During the time the MBC Rotation Mode is commanded ON by the microboard via serial comms this warning is set if the MBC reports Rotation Mode is OFF by serial comms. This warning is inhibited if MBC communication is not initiated and during the first 15 seconds after the Rotation Mode is commanded ON. This warning is released when Rotation Mode status matches the microboard command to the MBC.
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 override 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 158°F (70°C).
WARNING - MOTOR - HIGH ROTOR TEMPERATURE	This warning occurs when the estimated rotor temperatures exceeds 230°F (110°C) for 3 continuous seconds. This warning will automatically clear when all winding temperatures decrease below the warning threshold
WARNING - MOTOR – HIGH WINDING TEMPERATURE	This warning occurs when any of the enabled motor winding temperatures exceeds 275°F (135°C) for 3 continuous seconds. This warning will automatically clear when all winding temperatures decrease below the warning threshold. Also it will not act on any individual winding temperature sensor that has been disabled with the TEMPERATURE DISABLED Setpoint on the Motor Details Screen.
WARNING – REAL TIME CLOCK FAILURE	During the initialization process that occurs when power is applied to the control center, test data is written to a location in the BRAM battery backed memory device (IC location U52 on Microboard). This data is then read from the BRAM and compared to the test data. If the read data is not the same as that which was written to the device, it is assumed the BRAM and Real time Clock operation is defective and this message is displayed. The BRAM should be replaced by a qualified Service Technician. This message automatically clears when the BRAM problem has been solved.

TABLE 30 - WARNING MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
WARNING – SETPOINT OVERRIDE	A blank BRAM battery-backed memory device (IC location U52 on Microboard) or a failure of this device was detected during the initialization process that occurs when power is applied to the control center. Due to this failure, any or all of the programmed Setpoints could have been corrupted. Therefore, all Setpoints have been automatically changed to their Default values. All Setpoints will have to be programmed to their desired values. This message will clear when the WARNING RESET key is pressed in OPERATOR (or higher) access mode.
WARNING – UPS – BATTERY NOT CONNECTED	This is an auto reset warning. The minimum and maximum Battery Voltage that occurs within each 10 second window is 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.
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 – VSD – INPUT VOLTAGE IMBALANCE	Line voltage imbalance shall be calculated, for every VSD communications cycle, as: $V_{imb\%} = \frac{\max(V_{ab} - V_{avg} , V_{bc} - V_{avg} , V_{ca} - V_{avg})}{V_{avg}} \times 100\%$ where V_{ab}, V_{bc} and V_{ca} are line-to-line total rms voltages received from the drive, max is the function which selects the largest of its arguments, and: $V_{avg} = \frac{ V_{ab} + V_{bc} + V_{ca} }{3}$ If $V_{imb\%}$ exceeds 5% continuously for 45 seconds, the warning will be displayed. The 45 second timer shall reset and the warning shall clear if three consecutive imbalance readings fall below the 5% threshold.

TABLE 31 - 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 Digital Remote mode via I/O Board TB4-7/8 or in BAS (ISN) (Integrated Systems Network) Remote mode via the E-Link Gateway serial communications. If the chiller is running when this occurs, the chiller performs a soft shutdown.

TABLE 32 - 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 • 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 • Condenser Flow Switch is Closed												
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 following instructions in YORK YMC ² Service Manual (Form 160.84-M2).												
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	The evaporator pressure, as sensed by the Evaporator Transducer, has decreased to the shutdown threshold. 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. It should not be changed by anyone other than a qualified Service Technician following instructions in YORK YMC² Service Manual (Form 160.84-M2). The chiller will restart after the evaporator pressure increases to the restart threshold. If this shutdown occurs 3 times in a 90 minute period, an EVAPORATOR-LOW PRESSURE safety shutdown is initiated. <table><tr><th colspan="3">SHUTDOWN</th></tr><tr><th></th><th>SHUTDOWN (PSIG)</th><th>RESTART (PSIG)</th></tr><tr><td>Water Cooling -R134a</td><td>25.0</td><td>25.1</td></tr><tr><td>Brine Cooling -R134a</td><td>6.0 to 25.0 as programmed</td><td>+0.1> Shutdown threshold</td></tr></table>	SHUTDOWN				SHUTDOWN (PSIG)	RESTART (PSIG)	Water Cooling -R134a	25.0	25.1	Brine Cooling -R134a	6.0 to 25.0 as programmed	+0.1> Shutdown threshold
SHUTDOWN													
	SHUTDOWN (PSIG)	RESTART (PSIG)											
Water Cooling -R134a	25.0	25.1											
Brine Cooling -R134a	6.0 to 25.0 as programmed	+0.1> Shutdown threshold											

TABLE 32 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
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.
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 – FAULT CONTACTS OPEN	Refer to “MBC Shutdown – Requesting Fault Data” message above. If the control center’s microboard does not receive the cause of the MBC fault over the serial link within 10 seconds after the fault contacts open is recognized, it is assumed it is not forthcoming and that message is replaced with this message.
MBC - LOW INPUT VOLTAGE	Main DC supply voltage to the MBC decreased below 135VDC (150-10%)
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.
MBC SHUTDOWN – REQUESTING FAULT DATA	The MBC has shutdown the chiller and the control center has not yet received the cause of the fault from the MBC via the serial communications link. The MBC shuts down the chiller by opening the MBC Fault contacts (located on the MBC control board and connected to TB3-70 in the control center). The microboard in the control center then sends a request for the cause of the fault to the MBC control board over the serial link. Since serial communications are initiated every 2 seconds, this message is typically displayed for a few seconds and then replaced with one of the other MBC fault messages in this section.
MBC – SPEED SIGNAL FAULT	This Cycling Shutdown is set when the MBC loses the speed signal that is expected from the VSD or speed signal is less than 10 Hz. while the MBC is commanded in Rotation Mode. 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 MBC is out of Rotation mode or speed greater than 10 Hz is transmitted. A 10 second bypass exists when the initial command to Rotation Mode occurs.
MBC – STARTUP FAILURE	This Shutdown is set when the chiller fails to exit the MBC startup state within 60 seconds, during a chiller start. Refer to the Basic Operation section of this manual for conditions necessary to complete MBC startup successfully. Check fault history details to determine which specific conditions were not met.
MBC – V13 LOW FREQUENCY DISPLACEMENT	The MBC has measured shaft displacement is greater than 90 µm from center in the orthogonal radial axis designated V at the impeller end radial magnetic bearing during Levitation or Rotation mode over a 7 second window (approximately 2/3 of the air gap space to the touchdown bearing). 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 displacement is less than 90 µm.
MBC - UNKNOWN PARAMATER FILE	This Cycling shutdown is set when the bearing setup parameter file received from OptiView is not an expected file format. The fault is released when the error is corrected. This fault could be corrupted data transfer between OptiView and the MBC.
MBC – V13 POSITION	The MBC has measured shaft displacement is greater than 100 µm from center in the orthogonal radial axis designated V at the impeller end radial magnetic bearing during Levitation or Rotation mode (approximately 2/3 of the air gap space to the touchdown bearing). 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 displacement is less than 100 µm.

TABLE 32 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
MBC – V24 LOW FREQUENCY DISPLACEMENT	The MBC has measured shaft displacement is greater than 90 µm from center in the orthogonal radial axis designated V at the opposite-impeller end radial magnetic bearing during Levitation or Rotation mode over a 7 second window (approximately 2/3 of the air gap space to the touchdown bearing). 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 warning is released when displacement is less than 90 µm.
MBC – V24 POSITION	The MBC has measured shaft displacement is greater than 100 µm from center in the orthogonal radial axis designated V at the opposite-impeller end radial magnetic bearing during Levitation or Rotation mode (approximately 2/3 of the air gap space to the touchdown bearing). 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 displacement is less than 100 µm.
MBC – W13 LOW FREQUENCY DISPLACEMENT	The MBC has measured shaft displacement is greater than 90 µm from center in the orthogonal radial axis designated W at the impeller end radial magnetic bearing during Levitation or Rotation mode over a 7 second window (approximately 2/3 of the air gap space to the touchdown bearing). 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 warning is released when displacement is less than 90 µm.
MBC – W13 POSITION	The MBC has measured shaft displacement is greater than 100 µm from center in the orthogonal radial axis designated W at the impeller end radial magnetic bearing during Levitation or Rotation mode (approximately 2/3 of the air gap space to the touchdown bearing). 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 displacement is less than 100 µm.
MBC – W24 LOW FREQUENCY DISPLACEMENT	The MBC has measured shaft displacement is greater than 90 µm from center in the orthogonal radial axis designated W at the opposite-impeller end radial magnetic bearing during Levitation or Rotation mode over a 7 second window (approximately 2/3 of the air gap space to the touchdown bearing). 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 warning is released when displacement is less than 90 µm.
MBC – W24 POSITION	The MBC has measured shaft displacement is greater than 100 µm from center in the orthogonal radial axis designated W at the opposite-impeller end radial magnetic bearing during Levitation or Rotation mode (approximately 2/3 of the air gap space to the touchdown bearing). 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 displacement is less than 100 µm.
MBC – VW13 VIBRATION	The MBC has measured synchronous speed (first harmonic) shaft vibration at the impeller end radial magnetic bearing is greater than 45 µm peak amplitude in Rotation mode. This condition is monitored only when the AVR and ABS filter is on, which occurs for speed above 70 Hz. 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 fault is released when vibration is less than 45 µm.
MBC – VW24 VIBRATION	The MBC has measured synchronous speed (first harmonic) shaft vibration at the opposite-impeller end radial magnetic bearing is greater than 45 µm peak amplitude in Rotation mode. This condition is monitored only when the AVR and ABS filter is on, which occurs for speed above 70 Hz. 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 fault is released when vibration is less than 60 µm.

TABLE 32 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
MBC – Z12 LOW FREQUENCY DISPLACEMENT	The MBC has measured shaft displacement is greater than 100 µm axially from the design running position over a 7 second window (approximately 1/3 of the air gap space to the touchdown bearing axially). 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 fault is released when displacement is less than 100 µm.
MBC – Z12 POSITION	The MBC has measured shaft displacement is greater than 100 µm axially from the design running position (approximately 1/2 of the air gap space to the touchdown bearing axially). 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 displacement is less than 100 µm.
MBC - Z12 VIBRATION	The MBC has measured a vibration in axial position at one times the rotating frequency whose amplitude exceeds 60 µm. This frequency axially can be the image of the rotor axial run-out. This fault is available when AVR or ABS are activated. 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 fault is released when this displacement is less than 60 µm.
MULTIUNIT CYCLING – CONTACTS OPEN	The Multiunit Cycling contacts connected to I/O Board TB4-9, have opened to initiate a cycling shutdown. If the chiller is running when this occurs, the Pre-rotation Vanes are driven fully closed prior to shutting down the chiller. The chiller will automatically restart when the contacts close.
SYSTEM CYCLING – CONTACTS OPEN	The System Cycling contacts connected to I/O Board TB4-13, have opened to initiate a cycling shutdown. If the chiller is running when this occurs, the Pre-rotation Vanes are driven fully closed prior to shutting down the chiller. The chiller will automatically restart when the contacts close.
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.
VSD – DC BUS PRE-REGULATION	The dc link voltage has not attained within +/-20 V of the dc link voltage setpoint defined by the motor and line voltages (785V for YMC ²) within 2 seconds after the boost rectifier's closed loop control has been enabled. The VSD logic board shall disable boost rectifier's IGBT gating signals during this fault. The VSD logic board shall time 10 seconds before clearing the fault and allowing another pre-charge to start. The VFD'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 or pre-regulation-related faults to occur. After the third consecutive pre-charge-related fault, Safety Shutdown message “VSD – DC BUS PRE-REGULATION LOCKOUT” is generated.
VSD – HIGH DC BUS VOLTAGE	The VSD's DC link voltage is continuously monitored and if the level exceeds 878VDC, ± 28VDC a Bus Over-Voltage shutdown is initiated. If this shutdown occurs, it will be necessary to look at the level of the 460VAC applied to the drive. The specified voltage range is 414 to 508VAC. If the incoming voltage is in excess of 508VAC, steps should be taken to reduce the voltage to within the specified limits.

TABLE 32 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
VSD – HIGH INTERNAL AMBIENT TEMPERATURE	The VSD logic board contains two inputs from two temperature sensors, which monitor the unit's internal ambient temperature. This shutdown is generated when the higher of the two ambient temperatures exceeds a high limit of 158°F (70°C). The unit's fan(s) and water pump(s) remain energized until the internal temperature drops below 148°F (64°C), after which they shall be de-energized and the fault can be cleared. Some potential causes for this shutdown are internal VSD fan failure, VSD water pump failure, entering condenser water temperature higher than design, condenser water flow lower than required, fouled VSD heat exchanger, or restriction of condenser water to the VSD.
VSD – HIGH PHASE A INPUT CURRENT	Phase A input current exceeded 1446A peak. The three input currents are monitored with Hall-effect current sensors, and their instantaneous values compared to the limit. A current in excess of the limit causes this cycling shutdown. If three high input current cycling shutdown faults occur on any phase within 90 minutes, the third fault in the 90 minute period causes a Safety Shutdown. If the safety shutdown occurs, the chiller can be restarted after the CLEAR FAULTS key is pressed.
VSD – HIGH PHASE B INPUT CURRENT	See "VSD – HIGH PHASE A INPUT CURRENT" message preceeding.
VSD – HIGH PHASE C INPUT CURRENT	See "VSD – HIGH PHASE A INPUT CURRENT" message preceeding.
VSD – HIGH PHASE A MOTOR CURRENT	Phase A motor current exceeded 1086A peak. The three motor currents are monitored with Hall-effect current sensors, and their instantaneous values compared to the limit. A current in excess of the limit causes this cycling shutdown. If three high motor current cycling shutdown faults occur on any phase within 90 minutes, the third fault in the 90 minute period causes a Safety Shutdown. If the safety shutdown occurs, the chiller can be restarted after the CLEAR FAULTS key is pressed.
VSD – HIGH PHASE B MOTOR CURRENT	See "VSD – HIGH PHASE A MOTOR CURRENT" message preceeding.
VSD – HIGH PHASE C MOTOR CURRENT	See "VSD – HIGH PHASE A MOTOR CURRENT" message preceeding.
VSD INITIALIZATION FAILED	Upon application of power, all boards go through the initialization process. At this time, memory locations are cleared, program jumper positions are checked and serial communications links are established. There are several causes for an unsuccessful initialization as follows: • The control center and the VSD must be energized at the same time. The practice of pulling the fuse in the control center to remove power from the control center will create a problem. Power-up must be accomplished by closing the main disconnect on the VSD cabinet with all fuses in place. A power interruption to the VSD Logic board will also generate this message. • The Eproms must be of the correct version for each VSD board and they must be installed correctly. The eproms are created as a set, and cannot be interchanged between earlier and later versions. • Serial data communications must be established. Refer to VSD – Serial Communications fault. If communications between the VSD Boards, and control center Microboard does not take place during initialization, this message will be generated. The Serial communications can be verified by selecting the VSD DETAILS screen from the MOTOR screen and observing the Full Load amps value. A zero displayed for this and other VSD parameters, indicates a serial communications link problem.
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 boards 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 480 to 120VAC control power transformer. This message usually means the power to the VSD has been removed.

TABLE 32 - CYCLING SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
VSD – LOGIC BOARD PROCESSOR	This shutdown is generated if a communications problem occurs between the two microprocessors on the VSD Logic Board.
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 755VDC (30VDC below the calculated DC link voltage setpoint of 785VDC for both 60 Hz and 50 Hz units).
VSD – LOW PHASE A INPUT BASEPLATE TEMPERATURE	The temperature of the IGBT module of the input rectifier's phase A has decreased below the low limit of 37°F (2.7°C). All phase temperatures have to increase above the fault-reset threshold of 42°F (5.5°C), for this fault to be cleared.
VSD – LOW PHASE B INPUT BASEPLATE TEMPERATURE	See "VSD – LOW PHASE A INPUT BASEPLATE TEMPERATURE" message preceeding.
VSD – LOW PHASE C INPUT BASEPLATE TEMPERATURE	See "VSD – LOW PHASE A INPUT BASEPLATE TEMPERATURE" message preceeding.
VSD – LOW PHASE A MOTOR BASEPLATE TEMPERATURE	The temperature of the IGBT module of the inverter's phase A has decreased below the low limit of 37°F. All phase temperatures have to increase above the fault-reset threshold of 42°F, for this fault to be cleared.
VSD – LOW PHASE B MOTOR BASEPLATE TEMPERATURE	See "VSD – LOW PHASE A MOTOR BASEPLATE TEMPERATURE" message preceeding.
VSD – LOW PHASE C MOTOR BASEPLATE TEMPERATURE	See "VSD – LOW PHASE A MOTOR BASEPLATE TEMPERATURE" message preceeding.
VSD – NOT RUNNING	The VSD has not reported run state via serial communications for 8 seconds while the microboard issues a VSD run command. The fault is released when the microboard command is "Stopped State".
VSD – PHASE A INPUT DCCT OFFSET	Upon the assertion of a precharge command, the output voltage of each of the DCCTs which sense the input current will be monitored. The first value of each of those output voltages will be compared against an offset threshold level of +/- 24.4 mv. If this threshold level is not exceeded, an average of eight readings on each DCCT output will be taken and used for DCCT offset compensation. If the offset threshold at initialization exceeded this threshold, this shutdown is generated.
VSD – PHASE B INPUT DCCT OFFSET	See "VSD – PHASE A INPUT DCCT OFFSET" message preceeding.
VSD – PHASE C INPUT DCCT OFFSET	See "VSD – PHASE A INPUT DCCT OFFSET" message preceeding.
VSD – PHASE A INPUT GATE DRIVER	The VSD boost rectifier's IGBT gate driver boards monitor their power supply voltages, as well as the saturation voltage drop across each main IGBT while turned on. If a voltage on the Phase A boost rectifier IGBT gate driver board falls out of the prescribed limit, the gate driver board shall turn the rectifier's IGBTs off and send this shutdown.
VSD – PHASE B INPUT GATE DRIVER	See "VSD – PHASE A INPUT GATE DRIVER" message preceeding.
VSD – PHASE C INPUT GATE DRIVER	See "VSD – PHASE A INPUT GATE DRIVER" message preceeding.
VSD – PHASE A MOTOR GATE DRIVER	The VSD inverter's IGBT gate driver boards monitor their power supply voltages, as well as the saturation voltage drop across each IGBT while turned on. If a voltage on the Phase A gate driver board exceeds the prescribed limit, the gate driver board shall turn the inverter's IGBTs off and send this shutdown.
VSD – PHASE B MOTOR GATE DRIVER	See "VSD – PHASE A MOTOR GATE DRIVER" message preceeding.
VSD – PHASE C MOTOR GATE DRIVER	See "VSD – PHASE A MOTOR GATE DRIVER" message preceeding.

TABLE 32 - 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 VFD'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. <table> <tr> <th>LINE VOLTAGE</th><th>LOW THRESHOLD (VOLTS)</th></tr> <tr> <td>460</td><td>50</td></tr> <tr> <td>380/415</td><td>41</td></tr> <tr> <td>230</td><td>25</td></tr> </table>	LINE VOLTAGE	LOW THRESHOLD (VOLTS)	460	50	380/415	41	230	25
LINE VOLTAGE	LOW THRESHOLD (VOLTS)								
460	50								
380/415	41								
230	25								
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 15 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 VFD'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. <table> <tr> <th>LINE VOLTAGE</th><th>LOW THRESHOLD (VOLTS)</th></tr> <tr> <td>460</td><td>500</td></tr> <tr> <td>380/415</td><td>414</td></tr> <tr> <td>230</td><td>250</td></tr> </table>	LINE VOLTAGE	LOW THRESHOLD (VOLTS)	460	500	380/415	414	230	250
LINE VOLTAGE	LOW THRESHOLD (VOLTS)								
460	500								
380/415	414								
230	250								
VSD – RUN SIGNAL	Redundant RUN signals are generated by the control center; one via TB6-24 and the second via the Serial Communications link. Upon receipt of either of the two RUN commands by the VSD, a 5 second timer shall commence timing. 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 COMMUNICATIONS	This message is generated by OptiView™ when communications between the control center Microboard and the VSD Logic Board, causes no response over 3 attempts consecutively. This is generally indicative of defective wiring between 2TB on the VSD Logic Board and the Microboard J13.								
VSD – SERIAL RECEIVE	The VSD logic board does not receive valid communication from the control panel for 10 consecutive seconds.								
VSD SHUTDOWN – REQUESTING FAULT DATA	The VSD has shutdown the chiller and the control center has not yet received the cause of the fault from the VSD, via the serial communications link. The VSD shuts down the chiller by opening the Motor Controller VSD Stop Contacts (located on the VSD Logic Board and connected between TB6-16 and TB6-53 in the control center). The Microboard in the control center then sends a request for the cause of the fault to the VSD Logic Board over the serial link. Since serial communications are initiated every 2 seconds, this message is typically displayed for a few seconds and then replaced with one of the other VSD fault messages.								
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 200 Vrms in any one cycle, this shutdown is generated.								
VSD – STOP (FAULT) CONTACTS OPEN	Refer to "VSD Shutdown – Requesting Fault Data" message above. If the control center's Microboard does not receive the cause of the Fault over the Serial Link within 20 seconds, it is assumed it is not forthcoming and that message is replaced with "VSD – STOP CONTACTS OPEN" message.								

TABLE 33 - SAFETY SHUTDOWN MESSAGES

The chiller can be started after manual resets are performed as detailed below. Service and troubleshooting information is contained in the *YORK YMC² Service*

Manual (Form 160.84-M2) and Chiller service (Form 160.84-M1).

MESSAGE	DESCRIPTION
AUXILIARY SAFETY – CONTACTS CLOSED	The Auxiliary Safety shutdown input, connected to I/O Board TB4-31 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 is greater than 200 PSIG for shells with 235 PSIG DWP and 295 PSIG for shells with 350 PSIG DWP. The control determines the shell DWP by the condenser model number on the Sales Order Screen. The chiller can be started after the pressure decreases to is less than 140 PSIG for shells with 235 PSIG DWP and 235 PSIG for shells with 350 PSIG DWP and the CLEAR FAULT key is pressed.
CONDENSER – HIGH PRESSURE CONTACTS OPEN	The contacts of the electro-mechanical high pressure safety device, located on the condenser shell, have opened because this device has detected a pressure greater than 204±7 PSIG for shells with 235 PSIG DWP and 308±7 PSIG for shells with 350 PSIG DWP. The contacts will automatically close when the condenser pressure decreases to is less than 160±10 PSIG for the 235 DWP shells and 230±10 PSIG for the 350 DWP shells. The chiller can be started after the contacts close and the CLEAR FAULT key is pressed.
CONDENSER – HIGH PRESSURE – STOPPED	The condenser pressure exceeded 170 PSIG for shells with 235 PSIG DWP and 264 PSIG for shells with 350 PSIG DWP while the chiller was stopped. The control determines the shell DWP by the condenser model number on the Sales Order Screen. High temperature condenser water flowing through the condenser while the chiller is shutdown can cause a condenser high pressure condition resulting in loss of refrigerant. This safety fault anticipates this problem by annunciating the condenser high pressure condition. The chiller can be restarted after a Service Technician performs a special reset preset procedure contained in <i>SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES</i> .
CONDENSER – PRESSURE TRANSDUCER OUT OF RANGE	The Condenser Pressure Transducer is indicating a pressure that is less than 6.8 PSIG or greater than 300.0 PSIG. This is outside the normal operating range of the transducer. This 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 - INVALID BRAM	On bootup, the panel shall determine whether a 512K BRAM module is installed by a sequence of tests where data is written and read from address above and below 128K. IF the BRAM is not 512K, this shutdown is generated.
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.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION												
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 following instructions in YORK YMC² Service Manual (Form 160.84-M2).												
DISCHARGE – HIGH TEMPERATURE	The discharge temperature, as sensed by the Discharge Temperature Thermistor, has increased to greater than 220.0°F (104°C). The chiller can be started after the temperature decreases to less than 220.0°F (104°C) and the CLEAR FAULT key is pressed.												
DISCHARGE – LOW TEMPERATURE	The discharge temperature, as sensed by the Discharge Temperature Thermistor, has decreased to less than 30.0°F (-1.1°C). The chiller can be started after the temperature increases to greater than 30.0°F (-1.1°C) and the CLEAR FAULT key is pressed.												
EVAPORATOR – LOW PRESSURE	The evaporator pressure, as sensed by the Evaporator Transducer, has decreased to the shutdown threshold and caused cycling shutdown three times 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. It should not be changed by anyone other than a qualified Service Technician following instructions in YORK YMC² Service Manual (Form 160.84-M2). The chiller can be started after the evaporator pressure increases to the restart threshold and the CLEAR FAULT key is pressed. <table><tr><th colspan="3">SHUTDOWN</th></tr><tr><th></th><th>SHUTDOWN (PSIG)</th><th>RESTART (PSIG)</th></tr><tr><td>Water Cooling -R134a</td><td>25.0</td><td>25.1</td></tr><tr><td>Brine Cooling -R134a</td><td>6.0 to 25.0 as programmed</td><td>+0.1> Shutdown threshold</td></tr></table>	SHUTDOWN				SHUTDOWN (PSIG)	RESTART (PSIG)	Water Cooling -R134a	25.0	25.1	Brine Cooling -R134a	6.0 to 25.0 as programmed	+0.1> Shutdown threshold
SHUTDOWN													
	SHUTDOWN (PSIG)	RESTART (PSIG)											
Water Cooling -R134a	25.0	25.1											
Brine Cooling -R134a	6.0 to 25.0 as programmed	+0.1> Shutdown threshold											
EVAPORATOR – LOW PRESSURE – SMART FREEZE	Smart Freeze protection is activated and has shutdown the chiller because the evaporator temperature has been below the Smart Freeze threshold for greater than the allowable number of seconds. If the Evaporator Refrigerant Temperature sensor RT7 is Enabled, (using procedure in YORK YMC² Service Manual (Form 160.84-M2)), this parameter is used as the evaporator refrigerant temperature and the freeze threshold is 32.8°F (.4°C). If RT7 is not enabled, the evaporator refrigerant temperature used is the Evaporator Saturation Temperature, derived from the Evaporator Pressure Transducer and the freeze threshold is 34.0°F (1.1°C). The total count is incremented once for every second the evaporator refrigerant temperature is below the freeze threshold (but is never decremented below zero). The number of seconds it will take the chilled liquid to freeze is based on how far the evaporator refrigerant temperature is below the freeze threshold as follows: # seconds to freezing = (4053.7) / (freeze threshold – evap. refrigerant temp.) Smart Freeze is activated only if the feature has been Enabled by a Service technician (following instructions in YORK YMC² Service Manual (Form 160.84-M2)) and the Leaving Chilled Liquid temperature Setpoint is less than 38.0°F (3.3°C).												

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
EVAPORATOR – TRANSDUCER OR LEAVING LIQUID PROBE	A possible defective Evaporator pressure Transducer or Leaving Chilled Liquid temperature Thermistor has been detected. The pressure and temperature that these devices are indicating are not in the correct relationship to each other. The control center converts the evaporator pressure to a Saturated Temperature value and compares this value to the Leaving Chilled Liquid temperature (difference = chilled liquid temp – evaporator saturated temp). The difference should not be outside the range of –2.5°F (1.4°C) to +25.0°F (14.75°C). If the Transducer and Thermistor are accurate, the Evaporator Saturated temperature should not be greater than 2.5°F warmer nor greater than 25.0°F (14.75°C) colder than the leaving chilled liquid temperature. In order to initiate a shutdown, the difference must be outside the acceptable range continuously for 10 minutes. The chiller can be started after the CLEAR FAULT key is pressed.
EVAPORATOR – TRANSDUCER OR TEMPERATURE SENSOR	A possible defective Evaporator pressure Transducer or 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, 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) has been enabled by a Service technician using instructions in <i>YORK YMC² Service Manual (Form 160.84-M2)</i>. • NOT in Brine cooling mode • Smart Freeze is enabled • 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 another and the CLEAR FAULT key is pressed.
INTERNAL ERROR - INVALID BRAM	BRAM is detected to be a size other than 512K. Clears when proper size BRAM is detected upon boot up.
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 – CUSTOMER SERIAL LINK DISABLED	This Safety Shutdown is set when the MBC Local/Remote Modbus command is not reported from the MBC as set for panel control. This would be caused if the MBC were accessed via a computer using diagnostic software and the serial communication setting then changed in the Remote Command tab from Customer Serial Link to another choice. The chiller can be started when the MBC setting is restored and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC – DSP COMMUNICATION	This Safety Shutdown is set when the MBC control board detects a communication error within the control board of the MBC. 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 board-level communication failure is resolved. The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC - AMP COMMUNICATION	This Safety Shutdown is set when the MBC control board detects a communication error between the control and amplifier boards of the MBC. 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 board-level communication failure is resolved. The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
MBC - AMP WATCHDOG	This Safety Shutdown is set when the MBC determines a lapse in internal microprocessor activity on the Amplifier Board through its Watchdog device. The MBC Fault contacts open. The MBC will not react to a levitation mode change command via serial comms. The MBC remains in the levitation mode it was in when the fault occurred until power is removed. Power must be removed from the UPS to the MBC. The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC – DSP WATCHDOG	This Safety Shutdown is set when the MBC determines a lapse in internal microprocessor activity on the Control Board through its Watchdog device. The MBC Fault contacts open. The MBC will not react to a levitation mode change command via serial comms. The MBC remains in the levitation mode it was in when the fault occurred until power is removed. Power must be removed from the UPS to the MBC. 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 – HIGH AMPLIFIER TEMPERATURE	This Safety Shutdown is set when the MBC amplifier temperature exceeds 158 F (70 C) for 1 seconds continuous. The MBC Fault contacts open. The MBC remains in Levitation mode with the motor shaft levitated until the VSD rotation signal indicates less than 10 Hz. Then the MBC de-levitates the rotor. The shutdown is released when amplifier temperature drops below the trip value. Check the connection of the board to the heatsink and the response of the temperature sensor on the board. The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC – HIGH BEARING Z1 TEMPERATURE	This Safety Shutdown is set when the MBC detects a temperature is greater than 266°F (130°C) on the impeller end axial magnetic bearing. The MBC Fault contacts open. The MBC remains in Levitation mode with the motor shaft levitated until the VSD rotation signal indicates is less than 10 Hz. This shutdown is released when temperature is less than 266°F (130°C). The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC – HIGH BEARING Z2 TEMPERATURE	This Safety Shutdown is set when the MBC detects a temperature is greater than 266°F (130°C) on the opposite-impeller end axial magnetic bearing. The MBC Fault contacts open. The MBC remains in Levitation mode with the motor shaft levitated until the VSD rotation signal indicates is less than 10 Hz. This shutdown is released when temperature is less than 266°F (130°C). The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC - HIGH INPUT VOLTAGE	Main DC supply voltage to the MBC exceeded 165VDC (150+ 10%)
MBC – NO LEVITATION	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 - LOW RADIAL OSCILLATOR VOLTAGE	This Safety Shutdown is set when the internal oscillator that drives the radial position sensor coil is low for one continuous second. This is typically the result of a short in the connection to the shaft position sensor. It could also be a failure of the MBC control board. The MBC Fault contacts open. The shutdown is released when the Oscillator voltage drop is normal. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
MBC - LOW AXIAL OSCILLATOR VOLTAGE	This Safety Shutdown is set when the internal oscillator that drives the axial position sensor coil is low for one continuous second. This is typically the result of a short in the connection to the shaft position sensor. It could also be a failure of the MBC control board. The MBC Fault contacts open. The shutdown is released when the Oscillator voltage drop is normal. 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 of 360 Hz 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 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 < 5, 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 => 5, lockout occurs and must be reset by a Service Technician according to the procedure in the Calibration and Troubleshooting section of Form 160.84-M2.
MBC - ROTOR CONTRACTION	This Safety Shutdown is set when the MBC has calculated the algebraic difference between the displacement at shaft impeller end axial position sensor and the shaft opposite-impeller end axial position sensor is less than -100 um. 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 difference in displacements is over -100 um. The chiller can be started when the condition is released and the OptiView panel CLEAR FAULTS key is pressed.
MBC – ROTOR ELONGATION	This Safety Shutdown is set when the MBC has calculated the algebraic difference between the displacement at shaft impeller end axial position sensor and the shaft opposite-impeller end axial position sensor is greater than 700 um. 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 difference in displacements no longer exceeds 700 um. The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
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.
SAFETY STOP	This is set when the panel safety stop hardware pushbutton is depressed, removing input from the I/O Board terminal TB3-28 for > 500msec. continuous. It also sets the local command to STOP. The chiller can be started when the pushbutton is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC – STARTUP FAILURE	This Safety Shutdown is set when the chiller initiates three MBC-STARTUP FAILURE Cycling Shutdown in a 90 minute period. Refer to <i>YORK YMC² Service Manual (Form 160.84-M2)</i> for conditions necessary to complete MBC startup successfully. Check fault history details to determine which specific conditions were not met.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
MBC - SPV UNAUTHORIZED ROTATION	This Safety Shutdown is set when the MBC is commanded to Rotation mode while it is not indicating acceptable to rotate. 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 rotation mode command is coincident with MBC levitated and rotation allowed contacts closed. The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.
MBC – DSP UNAUTHORIZED ROTATION	This Safety Shutdown is set when the MBC detects a rotor speed signal from the VSD while the Levitation Mode is not activated. 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 MBC Levitation or Rotation mode is activated or the VSD speed signal indicates no shaft rotation. The chiller can be started when the condition 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 302°F (150°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 ROTOR TEMPERATURE	This safety shutdown occurs when the estimated rotor temperature exceeds 250.0 F for 3 continuous seconds. The fault is released and the chiller can be restarted when the estimated rotor temperature is below 230 F and the OptiView panel CLEAR FAULTS key is pressed.
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 158 °F (70 °C). The chiller can be started when the condition is released and the OptiView™ panel CLEAR FAULTS key is pressed.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION																																																														
SALES ORDER - INVALID COMPRESSOR MODEL	This safety shutdown is set when the Compressor Model field entered on the Setpoints – Setup –Sales Order screen does not conform to the format expected. The format is defined below and the data can be found on the compressor nameplate if it ever needs re-entry in the control:																																																														
	<table><tr><td>MOTOR</td><td>MOTOR REV</td><td></td><td colspan="3">SS/LS IMP DIAM</td><td>SS/LS ROTATION</td><td>SS/LS IMP REV</td><td>SS/LS FLOW REV</td><td></td><td colspan="3">HS IMP DIAM</td><td>HS ROTATION</td><td>HS IMP REV</td><td>HS FLOW REV</td><td>:CODE</td></tr><tr><td>1,2</td><td>3</td><td>-</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>-</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>:Position</td></tr></table>	MOTOR	MOTOR REV		SS/LS IMP DIAM			SS/LS ROTATION	SS/LS IMP REV	SS/LS FLOW REV		HS IMP DIAM			HS ROTATION	HS IMP REV	HS FLOW REV	:CODE	1,2	3	-	4	5	6	7	8	9	-	10	11	12	13	14	15	:Position																												
	MOTOR	MOTOR REV		SS/LS IMP DIAM			SS/LS ROTATION	SS/LS IMP REV	SS/LS FLOW REV		HS IMP DIAM			HS ROTATION	HS IMP REV	HS FLOW REV	:CODE																																														
	1,2	3	-	4	5	6	7	8	9	-	10	11	12	13	14	15	:Position																																														
The “Sales Order - Invalid Compressor Model” safety shutdown is set when any of the following are true: • MOTOR is anything other than M2 or M6 • MOTOR REV is anything other than ‘C’ • Character other than ‘-’ between position 3 and 4 • SS/LS IMP DIAM is anything other than 164, 174, 186, 197, 205, 218, 233, 246, 275, 295 or 331 • SS/LS ROTATION is anything other than ‘F’ • SS/LS IMP REV is anything other than the character ‘A’ • SS/LS FLOW REV is anything other than the character ‘C’ • Motor Model is Invalid • Invalid impeller / motor combination																																																															
The following table shows all valid impeller / motor combinations. <table><tr><td></td><td>COMPRESSOR</td><td colspan="4">MOTOR</td></tr><tr><td rowspan="8">SINGLE STAGE</td><td>197FA</td><td>M1</td><td>M2</td><td></td><td></td></tr><tr><td>205FA</td><td>M1</td><td>M2</td><td></td><td></td></tr><tr><td>218FA</td><td>M1</td><td>M2</td><td></td><td></td></tr><tr><td>233FA</td><td></td><td>M2</td><td>M4</td><td></td></tr><tr><td>246FA</td><td></td><td>M2</td><td>M4</td><td>M6</td></tr><tr><td>275FA</td><td></td><td></td><td>M4</td><td>M6</td></tr><tr><td>295FA</td><td></td><td></td><td>M4</td><td>M6</td></tr><tr><td>331FA</td><td></td><td></td><td></td><td>M6</td></tr><tr><td rowspan="3">TWO STAGE</td><td>233FA / 205RA</td><td>M1</td><td>M2</td><td></td><td></td></tr><tr><td>275FA / 241RA</td><td></td><td>M2</td><td>M4</td><td>M6</td></tr><tr><td>331FA / 291RA</td><td></td><td></td><td>M4</td><td>M6</td></tr></table>		COMPRESSOR	MOTOR				SINGLE STAGE	197FA	M1	M2			205FA	M1	M2			218FA	M1	M2			233FA		M2	M4		246FA		M2	M4	M6	275FA			M4	M6	295FA			M4	M6	331FA				M6	TWO STAGE	233FA / 205RA	M1	M2			275FA / 241RA		M2	M4	M6	331FA / 291RA			M4	M6
	COMPRESSOR	MOTOR																																																													
SINGLE STAGE	197FA	M1	M2																																																												
	205FA	M1	M2																																																												
	218FA	M1	M2																																																												
	233FA		M2	M4																																																											
	246FA		M2	M4	M6																																																										
	275FA			M4	M6																																																										
	295FA			M4	M6																																																										
	331FA				M6																																																										
TWO STAGE	233FA / 205RA	M1	M2																																																												
	275FA / 241RA		M2	M4	M6																																																										
	331FA / 291RA			M4	M6																																																										
	The fault is released when the values have been corrected. The chiller can be restarted after the CLEAR FAULTS key is pressed.																																																														
SURGE PROTECTION – EXCESS SURGE	(Applies only if Surge Protection SHUTDOWN feature is Enabled) The Surge Window Count surge events exceeded the Count Limit setpoint. The chiller shuts down as soon as the count exceeds the limit. The chiller can be started after the CLEAR FAULT key is pressed.																																																														
WATCHDOG – SOFTWARE REBOOT	The Microboard’s software Watchdog initiated a Microprocessor reset because it detected 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 COMPRESSOR switch is placed in the Stop-Reset (O) position.																																																														

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
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 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.
VSD – DC BUS LOCKOUT – DO NOT CYCLE POWER	When the unit is stopped in a mode where no command exists to energize the DC bus, the DC bus voltage is monitored and checked against a threshold level of 50V every five minutes. If the DC bus voltage is higher than the threshold value, this shutdown is generated. When the condition clears and VSD input modules tested and determined acceptable the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – DC BUS PRE-REGULATION LOCKOUT	If the unit fails to complete pre-regulation (due to VSD – DC BUS PRE-REGULATION fault), it shall have to repeat pre-charge in order to attempt another pre-regulation. The VSD logic board shall wait 10 seconds before clearing the dc-link voltage pre-regulation fault and allowing another pre-charge to start. The unit's fan(s) and water pump(s) shall remain energized during this wait time. The VSD logic board shall allow up to three consecutive pre-charge-related or pre-regulation-related faults (i.e. VSD-DC BUS REGULATION or any of the faults applicable to VSD-PRECHARGE LOCKOUT) to occur. After the third consecutive fault, this shutdown is generated. The VSD logic board shall disable boost rectifier's IGBT gating signals (if the third fault occurred during pre-regulation). When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – GROUND FAULT	The VSD logic board shall continuously monitor ground current $i_a + i_b + i_c$ (where i_a, i_b and i_c are three instantaneous input currents) and calculate its rms value with respect to line frequency. If rms ground current exceeds 120A for 1 second, this shutdown is generated. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – HIGH PHASE A INPUT BASEPLATE TEMPERATURE	The chiller has shutdown because the input rectifier baseplate temperature has exceeded the high limit of 170°F (76.6°C). After the unit trips, the VSD fan(s) and water pump(s) shall remain energized until the temperatures of all three rectifier's phases drop below the fault-reset threshold of 165°F (73.8°C). When this happens, the unit's fan(s) and water pumps shall be de-energized. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
VSD – HIGH PHASE B INPUT BASEPLATE TEMPERATURE	See “VSD – HIGH PHASE A INPUT BASEPLATE TEMPERATURE” message preceeding.
VSD – HIGH PHASE C INPUT BASEPLATE TEMPERATURE	See “VSD – HIGH PHASE A INPUT BASEPLATE TEMPERATURE” message preceeding.
VSD – HIGH PHASE A MOTOR BASEPLATE TEMPERATURE	The chiller has shutdown because the inverter baseplate temperature has exceeded the high limit of 190°F (87.7°C). After the unit trips, the VSD fan(s) and water pump(s) shall remain energized until the temperatures of all three inverter’s phases drop below the fault-reset threshold of 165°F (73.8°C). When this happens, the unit’s fan(s) and water pumps shall be de-energized. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – HIGH PHASE B MOTOR BASEPLATE TEMPERATURE	See “VSD – HIGH PHASE A MOTOR BASEPLATE TEMPERATURE” message preceeding.
VSD – HIGH PHASE C MOTOR BASEPLATE TEMPERATURE	See “VSD – HIGH PHASE A MOTOR BASEPLATE TEMPERATURE” message preceeding.
VSD – HIGH TOTAL DEMAND DISTORTION	This shutdown indicates the input current to the VSD is not sinusoidal. This shutdown will occur if the TDD 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)”. The displayed TDD is the total RMS value of all the harmonic current supplied by the main power to the VSD divided by the chiller Full Load Amps, in percent. The chiller can be started after the CLEAR FAULT key is pressed.
VSD – INVERTER PROGRAM FAULT	Inverter program fault – When some internal code exception of Inverter happens such as divide-by-zero, out-of-range parameter, etc., the unit shall trip and the Raptyr logic board shall indicate the inverter program fault and the error information including module number and line number via the communications link. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – INPUT CURRENT OVERLOAD	The highest of the three input RMS currents is monitored and compared against 105% of the job input current at 90% line voltage. Because the job input current setting is at nominal line voltage and this fault is based on power, and accounts for low-tolerance line voltage, its threshold is 105%/90%=116.7%. If this value is exceeded continuously for 10 seconds, this shutdown is generated. The 10 s timer is reset if three consecutive RMS current values fall below the overload threshold. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – INPUT DCCT OFFSET LOCKOUT	If three consecutive VSD – Phase A, B or C Input DCCT Offset cycling faults occur, this safety shutdown is generated to require investigation and manual reset. When the condition clears and VSD input modules determined acceptable, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – LOGIC BOARD PLUG	A jumper is located in the rectifier and inverter DCCT plugs to feedback a digital signal to indicate if the plugs are installed or not. If either plug is not installed, a low value is read on the digital input causing the unit to trip, and this shutdown is generated. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
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: $\text{lave} = (I_a + I_b + I_c) / 3$. The imbalance is calculated as: $\frac{(I_a - \text{lave}) + (I_b - \text{lave}) + (I_c - \text{lave})}{2(\text{lave})} \times 100$ 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.

TABLE 33 - SAFETY SHUTDOWN MESSAGES (CONT'D)

MESSAGE	DESCRIPTION
VSD – 105% MOTOR CURRENT OVERLOAD	The highest of the three motor RMS currents is monitored and compared against 105% of the motor current limit of 525A. If this value is exceeded continuously for 40 seconds, this shutdown is generated. The 40 second timer shall reset if three consecutive RMS current values fall below the overload threshold. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – MOTOR CURRENT THD FAULT	Motor current (inverter output) total harmonic distortion (THD) level is exceeded. The fault is based on a fixed value of measured harmonic current from the inverter. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – PHASE A INPUT DCCT	During precharge for 2.5 seconds after precharge starts, peak input current of each phase is monitored against a threshold of 15 A at two distinct times. If the peak precharge current is below this threshold in both comparisons, this shutdown is generated. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – PHASE B INPUT DCCT	See “VSD – PHASE A INPUT DCCT” message preceeding.
VSD – PHASE C INPUT DCCT	See “VSD – PHASE A INPUT DCCT” message preceeding.
VSD – PHASE A MOTOR DCCT	Upon the assertion of precharge command, the output voltage of each of the three DCCTs which sense the output current will be monitored and compared against an offset threshold level of +/- 66 mV around the nominal 1.5 V reading. If this threshold level is not exceeded, an average of eight readings on each DCCT output will be taken and used for DCCT offset compensation. During motor startup for 1.510 seconds after run command is asserted, peak output current of each phase shall be monitored against a threshold of 20A. If the offset threshold at initialization is exceeded, or peak motor start-up current is below its predetermined threshold, this shutdown is generated. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – PHASE B MOTOR DCCT	See “VSD – PHASE A MOTOR DCCT” message preceeding.
VSD – PHASE C MOTOR DCCT	See “VSD – PHASE A MOTOR DCCT” message preceeding.
VSD – PRECHARGE LOCKOUT	If the unit fails to complete pre-charge (due to VSD – PRECHARGE – LOW DC BUS VOLTAGE or VSD – PRECHARGE – HIGH DC BUS VOLTAGE), the VSD logic board shall time 10 seconds before clearing the fault and allowing another pre-charge to start. The unit'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, this shutdown is generated. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD – RECTIFIER PROGRAM FAULT	When some internal code exception of Rectifier happens such as divide-by-zero, out-of-range parameter, etc., the unit shall trip and the Raptyr Logic Board shall indicate the rectifier program fault and the error information including module number and line number via the communications link. When the condition clears, the chiller can be started after the CLEAR FAULTS key is pressed.
VSD SHUTDOWN – REQUESTING FAULT DATA	The VSD has shut down the chiller and the control center has not yet received the cause of the fault from the VSD, via the serial communications link. The VSD shuts down the chiller by opening the Motor Controller “VSD Stop Contacts” (located on the VSD Logic Board and connected between TB6-16 and TB6-53 in the control center). The Microboard in the control center then sends a request for the cause of the fault to the VSD Logic Board over the serial link. Since serial communications are initiated every 2 seconds, this message is typically displayed for a few seconds and then replaced with one of the other VSD fault messages.

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SECTION 31 - SYSTEM CALIBRATION, SERVICE SETPOINTS AND RESET PROCEDURES

The YMC² chiller is supplied from the factory with all factory mounted components fully calibrated. The following procedures are used to verify these calibrations or calibrate a component after it has been field replaced.

Most of the following procedures require the Service Technician to be logged in at SERVICE Access Level (Access Code 1 3 8 0). However, others require the ADMIN (Administration) Access Level. The ADMIN Password changes daily and is valid for 1 calendar day only. This password is obtained by contacting the local Johnson Controls service office which contacts Product Technical Support. When requesting this password, supply the “Controls” version of software (available on the DIAGNOSTIC Screen) and the calendar day on which you intend to use it.

The **ADMIN** access level can only be obtained at USER ID of 0 and 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. Proper procedure requires that after making necessary setpoint adjustments the user return to the Home Screen and logout.

PROGRAMMABLE SERVICE SETPOINTS

Programmable Service Setpoints are used by the Program to control critical chiller operation. Also, some of these Setpoints can be used to enable or disable certain features. Although they have been entered at the factory, they can be changed by a field Service Technician. If the BRAM battery backed memory device is field replaced, all of the programmed setpoints will be lost. They will have to be re-entered into the new BRAM. Each of these Setpoints is described below. In general, the following procedure is used to enter Setpoints in this section:

1. Log in with the appropriate access level.
2. Select the appropriate Display Screen.
3. Press the desired Setpoint key.
4. A dialog box appears, giving the minimum and maximum allowed values, Default value and present value. The dialog box can be canceled at any time by pressing the CANCEL (X) key. If the dialog box begins with the word “Enter”, use the numeric keys to enter the desired value. Leading

zeroes are not necessary. Press the • key to place a decimal point at the appropriate place. Pressing the ENTER (✓) key displays the Default value. Pressing the ENTER (✓) key clears the entry. The ◀ key is a backspace key and causes the entry point to move back one space. If the dialog box begins with “Select” or “Enable”, use the ◀ and ▶ keys to select the desired value. The ◀ key decreases the value, and the ▶ key increases the value.

5. 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 value. If out of range, the value is not accepted and a message describing why it is not acceptable is displayed momentarily.

The Parameters that set and tune the control logic are listed in *Table 36 on page 266*. The screen where each can be located is listed. The login access level required to edit the values is also listed. The table shows the range of values selectable and the defaults. These values should not be arbitrarily changed. Only a qualified Service Technician with knowledge of the effects of the parameter should change values when required. Incorrect values could leave the chiller inoperable until proper parameters are restored. These parameters refer to aspects of the operating and capacity control systems described in previous sections of this manual.

SERVICE PHONE NUMBERS

Two service phone numbers (Regional and Local), with labels, can be displayed on the OPERATIONS Screen. The Default value for the Regional number is the “North American Parts Center Toll Free Number” (1-800-861-1001). However, the label and number can be changed to any desired value. The Default value for the Local label and number is blank. The Service Technician enters the Local phone number and label.

The entry format consists of 4 fields (rows), vertically from the top. Up to 40 characters/numbers can be entered for each field.

Field 1 – Regional phone number label. Default value is “Johnson Controls North American Parts Center Toll Free Number 1-800-861-1001”.

Field 2 – Regional phone number. Default value is 1-800-861-1001.

Field 3 – Local service phone number label. Default value is blank.

Field 4 – Local service phone number. Default value is blank.

Use the following procedure to change any of the fields:

1. At the Keypad, login at SERVICE access level using access code 1 3 8 0.
2. Select OPERATIONS Screen.
3. Press EDIT PHONE NUMBERS Key.
4. Use ▲ and ▼ keys to move green selection box to the desired field to be changed.
5. Press the ENTER (✓) key.
6. In the Dialog box that appears, a red box appears over the first changeable value. Use the ◀ and ▶ keys to position the red box over the number character to be changed or entered. Use the ▲ and ▼ keys to scroll sequentially through numbers, alphabet characters and punctuation marks to select the desired value. When the desired value displayed, use the ◀ and ▶ keys to move the red box to the next value to be changed. The numeric keypad keys can also be used to enter numbers. Continue this process until all desired values have been entered.
7. After all desired values have been entered in previous step, press ENTER (✓) key.

CUSTOM USER ID AND PASSWORDS

When logging in, the user is requested to enter a User ID, followed by a Password. The universal and Default User ID is zero (0). The universal Password to log in at OPERATOR access level is 9 6 7 5. The universal Password to log in at SERVICE access level is 1 3 8 0. No log in is required for VIEW access level. However, if desired, the service technician can establish up to four custom User ID's and Passwords that can be used by Operations personnel to log in at VIEW, OPERATOR, or SERVICE level.

Up to four Custom Users can be established with User ID's from 1 to 9999. Each user can be assigned a Password of 0 to 9999 and an access level of VIEW, OPERATOR or SERVICE.

Use the following procedure to establish Custom Users:

1. At the Keypad, log in at SERVICE access level using 1 3 8 0.
2. From the SETPOINTS Screen, select SETUP Screen. From SETUP Screen, select USER Screen.
3. Press CHANGE USER ATTRIBUTES key. The first changeable area is outlined in a green selection box.
4. Use the ◀, ▶, ▲ or ▼ keys to move the green selection box to the desired value to be changed.
5. Press the ENTER (✓) key.
6. Using numeric Keypad keys, enter desired parameter as follows:

User ID – 1 to 9999 (numbers cannot be duplicated for more than one user)

Password – 0 to 9999

Access Level – 0 = View, 1 = Operator, 2 = Service
7. Press ENTER (✓) key.
8. After all values have been entered, press CANCEL key (X) to exit.

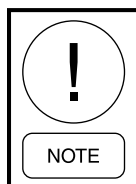
SALES ORDER DATA

All of the Sales Order Data, except the “Chiller Commissioning Date” is entered at the factory at the time of chiller manufacture. The Service Technician must enter the Chiller Commissioning Date and modify the Job Name or Job Location if necessary at the completion of commissioning. Normally, the remainder of the Sales Order Data should never be modified. However, if there is a change to the chiller design, in the field, this data can be modified. If the BRAM battery-backed memory device fails and requires field replacement, all of the data will be lost and will have to be manually programmed.

When replacing a microboard, it might be desirable to transfer the BRAM from the defective board to the replacement board to save stored Sales Order data. Since not all BRAM devices are compatible with all microboards, first determine if the BRAM can be transferred before making the transfer. Refer to *SECTION 4 - MICROBOARD 031-02430-007* of this manual.

There are three different Passwords used, depending on the circumstances, to change the Sales Order Data as follows:

- **Chiller Commissioning** - Service Technician must use password 1 3 8 0 to enter the Commissioning Date and modify Job Name and Job Location if necessary.
- **Modifying Sales Order Data** - Service Technician must use the ADMIN password. This password changes daily. Contact your local Johnson Controls Service Office.
- **BRAM Replacement** - If the BRAM is field replaced, the Service Technician must use password 0 2 2 8 to enter all Sales Order Data into a new blank BRAM. When logged in at this level, the ACCESS LEVEL shown will be TEST OP. This password only works with a blank BRAM.



*When using this password to enter data into a new blank BRAM, the **FINISH PANEL SETUP** procedure (listed at the end of the entry procedure below) must be performed after all data has been entered. Failure to perform Step 10 of this procedure will result in unreliable OptiView Control Center operation! If this procedure is performed prior to entering all data, the ability to enter more data will be terminated.*

Use the following procedure to enter data:

1. At the keypad, log in at the appropriate Access Level to change the desired values.
2. From the SETPOINTS Screen, select SETUP SCREEN. From the SETUP Screen, select SALES ORDER Screen.
3. If logged in at SERVICE Access level, press SET ORDER INFO key to enter Commissioning date, Job Name or Location and proceed to step 4. If logged in at ADMIN or Test Op level, Press SELECT key to select the data category (ORDER, DESIGN, NAMEPLATE, SYSTEM) to be entered.
4. Press CHANGE key. The first changeable area in the selected category will be outlined in a green selection box. The procedure can be terminated anytime after this by pressing the CANCEL (X) key.

5. Use the ▲ and ▼ keys to move the green selection box to the desired value to be changed, within the category selected.
6. Press ENTER (✓) key.
7. Enter the appropriate data. Use the numeric keypad keys to enter numbers. Use the • key to enter a decimal point. Use the ▲ and ▼ keys to scroll sequentially up and down through the alphabet to enter letters or a comma (,), slash (/) or minus sign (-). Each time the ▲ key is pressed, the next higher sequential alphabet letter is displayed. Each time the ▼ key is pressed, the next lower alphabet letter is displayed. The comma, slash and minus sign can be selected after scrolling through the entire alphabet. During the entry process, the ◀ key can be used to backspace and the ▶ key can be used to forward space.
8. Press ENTER (✓) key.
9. Use ▲ and ▼ keys to select another value to be changed within the same category or press CANCEL (X) key to exit and allow selection of another category.
10. **Extremely Important!** If the procedure above was performed using password 0 2 2 8 to enter data into a new blank BRAM, the following procedure must be performed after all the desired data is entered. If the following procedure is performed prior to entering all of the data, the ability to enter more data will be terminated. Failure to perform this procedure after all data has been entered will result in unreliable OptiView™ Control Center Operation!
 - a. On SALES ORDER screen, press FINISH PANEL SETUP key.
 - b. Use ◀ and ▶ key to select YES.
 - c. Press ENTER (✓) key.

COMPRESSOR MODEL

The field on the SETPOINTS – SETUP – SALES ORDER screen containing the Compressor Model is critically important for the operation of the controls. The model number must match the compressor nameplate and be entered in the format below:

TABLE 34 - COMPRESSOR CODE

MOTOR	MOTOR REV	SS/LS IMP DIAM				SS/LS ROTATION	SS/LS IMP REV	SS/LS FLOW REV	HS IMP DIAM				HS ROTATION	HS IMP REV	HS FLOW REV	:CODE
1,2	3	-	4	5	6	7	8	9	-	10	11	12	13	14	15	:Position

A typical entry would be:

Single Stage = M2C-205FAC

Two Stage = M6C-331FAC-291RAC

where

- M2 is the motor
- C is the motor revision level
- “-” is necessary separator
- 205 is impeller diameter
- F is rotation (Forward)
- A is impeller revision level
- C is gas path revision level

The “Sales Order - Invalid Compressor Model” safety shutdown is set when any of the following are true:

- MOTOR is anything other than M2 or M6
- MOTOR REV is anything other than ‘C’
- Character other than ‘-’ between position 3 and 4
- SS/LS IMP DIAM is anything other than 164, 174, 186, 197, 205, 218, 233, 246, 275, 295 or 331
- SS/LS ROTATION is anything other than ‘F’
- SS/LS IMP REV is anything other than the character ‘A’
- SS/LS FLOW REV is anything other than the character ‘C’
- Motor Model is Invalid
- Invalid impeller / motor combination

The following table shows all valid impeller / motor combinations.

TABLE 35 - VALID IMPELLER/MOTOR COMBINATIONS

	COMPRESSOR	MOTOR			
SINGLE STAGE	197FA	M1	M2		
	205FA	M1	M2		
	218FA	M1	M2		
	233FA		M2	M4	
	246FA		M2	M4	M6
	275FA			M4	M6
	295FA			M4	M6
	331FA				M6
TWO STAGE	233FA / 205RA	M1	M2		
	275FA / 241RA		M2	M4	M6
	331FA / 291RA			M4	M6

The control logic uses each part of this entry to determine operating characteristics such as anti-surge control and maximum allowable running speed.

CONDENSER MODEL

The field on the SETPOINTS – SETUP – SALES ORDER screen containing the Condenser Model is critically important for the automatic selection of the software high condenser safety shutdown setpoint. The hardware High Pressure Cutout Switch (HPCO) will protect the chiller from creating its own pressure close to the relief valve lift threshold, but the software limits are more restrictive to prevent exercising that cutout.

The value entered at position 11 defines the software high pressure safety trip setpoint and the associated warning level where the high condenser pressure capacity control limits and override act. The values are:

S or any other character = 235 psig condensers,

- 204±7 PSIG HPCO was installed
- 200 PSIG automatically selected for the software fault threshold
- 193.0 PSIG automatically selected for the warning maximum programmable value

U = 350 psi condensers,

- 308±7 PSIG HPCO was installed
- 295 PSIG automatically selected for the software fault threshold
- 284.0 PSIG automatically selected for the warning maximum programmable value

The model number must match the condenser nameplate and be entered in the format below:

Vessel Nomenclature Table																							
Logia Code	[EVAP] or [COND]			[ELG] or [CLG]		[EVAPTUBES] or [CNOTUBES]			[EVAPTB] or [CONDTB]		[ERSDWP] or [CRSDWP]		[EWSMDWP] or [CWSMDWP]		[EPASS] OR [CPASS]		[ENOCZCONN] or [CHOCZCONN]		[EMBTYPE] or [CMBTYPE]		[EVAPARR] or [CHDARR]		
Position:	1	2	3,4	5,6	-	7	8	9	-	10	#	12	-	13	14	15	16						
E																	Evaporator						
C																	Condenser						
*																	Heat Exchanger Mod Level						
XX																	Nominal Inside Diameter in inches, rounded						
YY																	Nominal Length in feet, preceding zero if needed						
#	#	#															3 Digit Marketing Tube Number						
B																	3/4" Tube count code 1						
C																	3/4" Tube count code 2						
D																	3/4" Tube count code 3						
E																	3/4" Tube count code 4						
2																	1" Tube count code 1						
3																	1" Tube count code 2						
4																	1" Tube count code 3						
5																	1" Tube count code 4						
R																	Vessel Refrigerant Side Pressure Code, 180						
S																	Vessel Refrigerant Side Pressure Code, 235						
T																	Vessel Refrigerant Side Pressure Code, 300						
U																	Vessel Refrigerant Side Pressure Code, 350						
V																	Vessel Refrigerant Side Pressure Code, 400						
1																	Water Side Pressure Code, 150 psi						
3																	Water Side Pressure Code, 300 psi						
#																	Number of passes, 1-6 as allowed by edit manual						
F																	Water connection type, Flanges						
G																	Water connection type, Grooved, Standard						
A																	Water connection type, Grooved, Victaulic AGS						
C																	Water box type, compact						
M																	Water box type, Marine						
R																	Inlet on Right (when viewing VSD)						
L																	Inlet on Left (when viewing VSD)						

FIGURE 108 - CONDENSER MODEL NUMBER

These fields are entered initially at the Factory before the chiller is shipped. If this requires re-entry at any time, refer to the nameplate for the correct information. Changes require login at ADMIN access level. The password changes daily. The Factory Authorized Service Technician must contact factory technical support for the daily code, based on date and software controls version number.

Program the Compressor or Shell Setpoints as follows:

1. At the Keypad, login at ADMIN access level using access code.
2. Select SETUP Screen from SETPOINTS Screen and Sales Order.
3. Press CHANGE SETTINGS key.
4. A green box will appear around the first changeable setpoint. Use ▲▼ keys to place the box around the setpoint to be changed.

5. Press ENTER (✓) key. A dialog box will appear with the range of settings.
6. Use ◀▶ keys to scroll to desired setting.
7. Press ENTER (✓) key.

CHILLER STARTS AND OPERATING HOURS RESET

The Number of Starts and the Operating Hours can be reset to zero or preset to a desired number. However, this should never be arbitrarily performed. Use the following procedure:

1. At the keypad, login at ADMIN access level. This password changes daily. Contact your local Johnson Controls Service Office.
2. Select OPERATIONS screen.
3. Press NUMBER of STARTS or OPERATING HOURS key as appropriate.
4. Using numeric keypad keys, enter desired number.
5. Press ENTER (✓) key.

Kilowatt Hours

1. At the Keypad, log in at ADMIN access level.
2. Select MOTOR Screen.
3. Press KWH RESET key.
4. Use numeric keypad keys to enter desired value.
5. Press ENTER (✓) key.

HIGH CONDENSER PRESSURE FAULT WHILE SHUTDOWN – RESET PROCEDURE

High temperature condenser water flowing through the condenser while the chiller is shutdown can cause a condenser high pressure condition in the condenser resulting in loss of refrigerant. This anticipatory safety fault annunciates condenser high pressure conditions when the chiller is not running as follows:

While the chiller is stopped, if the condenser pressure exceeds a safety fault threshold listed in the faults section of this manual, CONDENSER – HIGH PRESSURE - STOPPED is displayed. The chiller can be started after the condenser pressure decreases to less than the set threshold and a special reset procedure is performed as follows:

1. Stop the chiller.
2. At the keypad, log in at SERVICE access level using code 1 3 8 0.
3. Select Condenser screen.
4. Press the FAULT ACKNOWLEDGE key on the Condenser Screen. A dialog box appears displaying “Enter Password to Clear Fault”.
5. Enter 1 3 9 7 and press the ENTER key (✓).

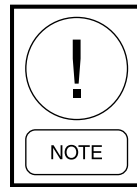
This anticipatory fault is only performed while the chiller is stopped. If a CONDENSER – HIGH PRESSURE fault is detected while the chiller is not in Stop state, the fault is handled in the normal way and does not require the special reset procedure.

MBC - POWER FAIL LANDING SAFETY SHUTDOWN - RESET PROCEDURE

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 >= 5, the chiller is locked out from clearing the fault so a qualified technician can determine and solve the issue causing the critical load bus from

the UPS to fail to power the unit until the motor speed is validated zero. This prevents unwanted running on back-up roller bearings. After resolving the issue, perform the following:

1. At the keypad, login at SERVICE access level using code 1 3 8 0.
2. Select MBC Details screen.
3. Press the FAULT ACKNOWLEDGE key on the MBC Details screen. A dialog box appears displaying "Enter the password to acknowledge the landing fault".
4. Enter 1 3 9 7 and press the ENTER key (✓).
5. Press the CLEAR FAULT key on the Home screen.

SURGE PROTECTION**Clear Surge Count**

Clearing the surge count should NOT be arbitrarily performed.

1. At the keypad, log in at ADMIN access level. Obtain ADMIN password from local service office. This password changes daily.
2. Select SURGE PROTECTION Screen from COMPRESSOR Screen.
3. Press CLEAR SURGE COUNT key.

Level Sensor Calibration

The calibration instructions for the Refrigerant Level Sensor is contained in Service Instruction SI0187.

VARIABLE GEOMETRY DIFFUSER

A complete description of the Variable Geometry Diffuser (VGD) operation is detailed in *SECTION 24 - VARIABLE GEOMETRY DIFFUSER* of this manual.

VGD CALIBRATION

The VGD calibration procedure initiates a VGD actuator stroke calibration followed by a calibration of the position feedback to OptiView. It can only be performed in Service access, when the chiller is stopped, the safety stop pushbutton depressed, and the VGD calibration is not in progress. The button is not available otherwise.

1. At the keypad, log in at Service access level using access level code 1 3 8 0.
2. Select COMPRESSOR - VARIABLE GEOMETRY DIFFUSER - VGD ACTUATOR screen.
3. On the VGD ACTUATOR screen, press the “Start VGD Calibration” button.

When the automatic VGD Calibration procedure is in process, this button changes to “Cancel VGD Calibration”. Pressing it at that time cancels the automatic VGD Calibration procedure.

The procedure performs the following steps:

Step 1 - Optiview commands the actuator into its stroke calibration whereby it extends then retracts the rod until a torque stop and then records the range internally. When the command is issued, Optiview waits to receive a calibration initiated response from the actuator over coms. If this is not received in 45 seconds, calibration fails.

Step 2 – The VGD is commanded to 100.00%. After a 5 second delay, the VGD Feedback A-to-D Counts is read. If the value is in the range of 22195 to 34297 counts, the VGD Feedback Counts value is temporarily stored. If the value is outside this range, calibration fails and is ended.

Step 3 – The VGD is command to 0.00%. After a 22 second delay, the VGD Feedback A-to-D Counts is read. If the value is 0 counts, the VGD Feedback Counts value is temporarily stored. If the value is outside this range, calibration fails and is ended.

Step 4 – If calibration has not failed, the Optiview 100% position is set to the value stored in Step 2 and the 0% position set to the value stored in Step 3.

When the VGD Calibration routine completes successfully, “VGD Calibration Passed” is displayed on the screen for 5 seconds. If the user cancels calibration, no message is displayed and the VGD Calibration Values are not changed. If Calibration fails any step, “VGD Calibration Failed – Step X” is displayed on the screen and the 0% VGD Voltage and 100% VGD values are set to 0. The “X” indicates the step number that failed. The message stays on the screen until acknowledged by the user pressing the Failure Acknowledge button.

VGD FEEDBACK CALIBRATION INDIVIDUALLY

The feedback calibration alone (Steps 2 through 4, above) can only be performed in ADMIN access, when the chiller is stopped, the safety stop pushbutton

depressed, and the general VGD calibration is not in progress. The button is not available otherwise. Normally the feedback calibration is only done as part of the overall VGD calibration in SERVICE access.

1. At the keypad, log in at ADMIN access level using access level code obtained from JCI Service Office through the chiller technical support group.
2. Select COMPRESSOR - VARIABLE GEOMETRY DIFFUSER - VGD ACTUATOR screen.
3. On the VGD ACTUATOR screen, press the “Start Feedback Calibration” button.

When the automatic VGD Feedback Calibration procedure is in process, this button changes to “Cancel Feedback Calibration”. Pressing it at that time cancels the automatic VGD Feedback Calibration procedure.

When the VGD Feedback Calibration is initiated, OptiView™ commands steps 2 through 4 from the VGD calibration described previously. The user can cancel calibration at any time during the VGD Feedback Calibration.

When the VGD Feedback Calibration routine completes successfully, “VGD Calibration Passed” is displayed on the screen for 5 seconds. If the user cancels calibration, no message is displayed and the VGD Calibration Values are not changed. If Calibration fails any step, “VGD Calibration Failed – Step X” is displayed on the screen and the 0% VGD Voltage and 100% VGD Voltage are set to 0. The “X” indicates the step number that failed. The message stays on the screen until acknowledged by the user pressing the Failure Acknowledge button.

Manual Control

The VGD can be manually controlled 30 seconds after chiller stop, in MBC startup or running state. The actuator is locked to automatic upon exit of run state during soft shutdown, coastdown, and for the first 30 seconds of stop state. as follows:

1. At the keypad, log in at Service access level using access level code 1 3 8 0.
2. Select Capacity Control Screen.
3. On the Capacity Control Screen, Select VGD Control. The use Increase, Decrease, or Set buttons to change the command to the VGD actuator. When any of those buttons was used, control goes to manual and the AUTO key becomes visible. Pressing the AUTO key invokes automatic operation.

VSD MANUAL PRE-CHARGE AND PRE-REGULATION

To energize the VSD DC bus for drive troubleshooting a means to manually command pre-charge or pre-regulate is provided on the VSD Details screen. At the keypad, login at SERVICE access level using access code 1380. The Manual DC Bus key can be set to DISABLED for normal run or PRE-CHARGE to pre-charge the DC bus or PRE-REGULATE to go to full voltage on the DC bus. After enabling manual Pre-charge or Pre-regulate and pressing ENTER, a second dialog box opens to enter the duration of the manual event (5 to 120 minutes, default 5). Once in manual, a timer appears on the screen counting down the time until the manual event is disabled. The same manual control can be enabled again while the timer is active to gain additional event time. In addition, if a VSD fault is indicated by serial communication or fault contacts, the message "A VSD Fault Condition Exists" will display instead of performing the manual BUS command. If a VSD Fault occurs while the bus is powered manually, control reverts back to DISABLED.

MBC-MANUAL LEVITATE/DE-LEVITATE ROTOR

To levitate the driveline rotor for troubleshooting with the chiller off, a means to manually command the MBC to levitate and then de-levitate the rotor is provided on the MBC screen. With the chiller stopped and logged in at SERVICE access level using access code 1380, the Levitate/De-Levitate key is available on the MBC screen. The MBC must have power to receive the command and function. To cause the rotor to levitate, press the manual Levitate key. To return the rotor to rest, press the De-Levitate key. Levitation control is returned to AUTO when the chiller is in any state other than stopped or when the AUTO button (appears during manual control) is pressed. It is not recommended to leave the rotor levitated indefinitely due to bearing cooling issues when the chiller is not operating.

MBC- CLEARANCE CHECK

The MBC Axial Clearance check can only be performed in Service access, when the chiller is stopped, the safety stop pushbutton depressed, and MBC Axial Centering is not in progress. The button is not available otherwise.

1. At the keypad, log in at Service access level using access level code 1 3 8 0.
2. Select COMPRESSOR - MBC - MBC Details – MBC Diagnostics screen.
3. On the MBC Diagnostics screen, press the "Start Axial Clearance Check" button.

When the automatic MBC Clearance Check procedure is in process, this button changes to "Cancel Axial Clearance Check". Pressing it at that time or closing the Safety Stop button cancels the automatic procedure.

When the routine completes successfully, "Clearance Check Successful" is displayed on the screen for 5 seconds. The date and axial clearance values at each end of the shaft are stored to BRAM. The measurements are displayed in the "Last" column on the screen. If the user cancels the calibration, no message is displayed. If the routine fails, "Clearance Check Failed" is displayed on the screen and stays on the screen until acknowledged by the user pressing the Failure Acknowledge button. This function times out if the routine fails to complete in 45 seconds.

MBC AXIAL CENTERING

The MBC Axial Centering procedure can only be performed in ADMIN access, when the chiller is stopped, the safety stop pushbutton depressed, and MBC Clearance Check is not in progress. The button is not available otherwise. This procedure is performed when the chiller is built and is only required in the field if the driveline or the MBC were replaced due to some failure.

1. At the keypad, log in at ADMIN access level using the daily password obtained from Product Technical Support.
2. Select COMPRESSOR - MBC - MBC Details – MBC Diagnostics screen.
3. On the MBC Diagnostics screen, press the "Start Axial Centering" button.

When the automatic MBC Axial Centering procedure is in process, this button changes to "Cancel Bearing Self Centering". Pressing it at that time or closing the Safety Stop button cancels the automatic procedure.

When the routine completes successfully, "Centering Successful" is displayed on the screen for 5 seconds. The date, centering offsets and axial clearance values at each end of the shaft are stored to BRAM. The centering offset values are updated on the screen. If the user cancels the calibration, no message is displayed. If the routine fails, "Self Centering Failed" is displayed on the screen and stays on the screen until acknowledged by the user pressing the Failure Acknowledge button. This function times out if the routine fails to complete in 45 seconds.

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 through 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 pushbutton 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 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

COM 2 SETUP

COM 2 port is used in RS485 configuration to communicate with the VSD. The port settings are configured at the factory initially and can only be changed on the SETPOINTS/SETUP/COMMS Screen in ADMIN level access. The settings required are the defaults as listed below:

- BAUD = 38400
- PARITY = NONE
- DATA BITS = 8 bits
- STOP BITS = 2 bits

MOTOR WINDING THERMISTOR

The Motor Details Screen shows motor temperature data and provides means for the service technician to disable individual thermistors. A sensor can be disabled if it is defective or for service reasons. Otherwise, it should be enabled. The software prevents disabling more than 4 of the 6 motor temperature sensors. The respective temperature data box on this screen reflects enabled or disabled status. When a sensor is disabled, the respective temperature data box does not appear on the Motor details Screen. This key is only shown when logged at ADMIN access level.

1. Login at ADMIN access level.
2. Press TEMPERATURE DISABLE key. A green box appears around the Motor Windings Phase A Temperature.
3. Use Left/Right arrow keys to place the green box around the sensor to be enabled or disabled.

4. When the desired sensor is selected, press the ENTER (✓) key. A dialog box appears allowing selection of enable or disable.
5. Use left/right arrow keys, select enable or disable, as desired.
6. Press the ENTER (✓) key.
7. Repeat steps 3 through 6 until all sensors have been enabled or disabled as desired.
8. Press CANCEL (X) key to exit.

DEFAULT SETPOINTS

A button on the SETPOINTS/SETUP/DIAGNOSTICS Screen in ADMIN level access, allows the technician to reset all of the chiller control setpoints to their factory default values. A reset to factory default does NOT effect the Sales Order Information, Input Job FLA, Line Voltage, Line Frequency, Impeller Diameter, Language Selection, Remote Analog Input Range, Time, Printer Setup, Local LCHLT Range, Shutdown and Restart Offset, Refrigerant Level Setpoint, Brine Low Evaporator Cutout, Head Pressure or Hot Gas Bypass Enable, Power Fail restart Preference, and Chilled Liquid Pump Run Preference.

RECORD SETPOINT CHANGES

This feature provides a record of the last 75 Setpoint changes. The date and time the Setpoint was changed, the new Setpoint value and the Access Level and User ID used to make the change are stored. The SECURITY LOG Screen and the SECURITY LOG DETAILS Screen display levels of this information.

On the SECURITY LOG Screen, accessible from the HISTORY Screen, the Setpoint, Setpoint Category and new Setpoint value are listed and numbered in reverse order in which they were changed. The most recent is listed as number 1; the next most recent as number 2, etc. A PRINT key allows printing this entire list. Since 15 changes can be displayed at one time, multiple pages could be necessary to display all the changes. PAGE-UP and PAGE-DOWN keys are provided to view the entire list. If it is desired to view the details of a particular Setpoint change, select the Setpoint change number with the LOG ENTRY key and then press the VIEW DETAILS key. This moves to the SECURITY LOG DETAILS Screen.

The SECURITY LOG DETAILS Screen displays the following Setpoint change details. The Setpoint is selected from the list on the SECURITY LOG Screen as explained in the previous paragraph.

- Setpoint Category
- Setpoint
- Date and time of change
- Access Level and User ID used to make the change
- Old Value
- New Value

The following Setpoint changes are not logged:

- Clock Mode
- Custom Screen Slot Numbers
- Advanced Diagnostics Communication Port Tests
- Advanced Diagnostics Secondary Multiplexer Freeze
- Soft Shutdown Initiated by Operator
- System Language
- Display Units
- Any Print Report
- Cancel any Print Report
- Schedule Clear
- Schedule Repeat Exception Days
- Schedule Start and Stop Times
- Log In/Log Out
- User Attributes for ID, Password and Level
- Trend Start/Stop
- Trend Slot Numbers, Minimums and Maximums
- Trend Trigger Data
- Trend Print Mode
- Trend View Mode

View the Setpoint changes as follows:

1. At the Keypad, login at SERVICE Access Level using access code 1 3 8 0.
2. From the HISTORY Screen, select SECURITY LOG Screen to view the complete list of setpoint changes.
3. To view the details of a particular setpoint change, select it with the LOG ENTRY key, then press VIEW DETAILS key. This causes a jump to the SECURITY LOG DETAILS Screen where the setpoint change details are displayed.

OPERATIONAL PROGRAMMABLE SETTINGS**TABLE 36 - CHILLER SETUP PROGRAMMABLE SETTINGS**

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Brine Evaporator Pressure Cutout	Evaporator Press the Brine Low Evaporator Cutout key	Service Access	6.0 PSIG	25.0 PSIG	25.0 PSIG	Defines the evaporator pressure at which a safety trip is performed. The actual percentage of Brine solution determines this threshold. It is calculated at the JCI Factory and programmed at the time of manufacture. If the BRAM memory device on the Microboard is replaced, the threshold will have to be programmed in the field. The threshold is logged on an adhesive label attached to the inside of the OptiView™ Control Center door.
Smart Freeze Protection	Evaporator Press the Smart Freeze key	Service Access	ON	OFF	OFF	Enables the smart freeze feature. When turned on, it allows the Leaving Chilled Liquid Temperature Setpoint to be as low as 36°F (2.2°C) for water cooling applications. Along with this feature is a correspondingly lower Low Water Temperature Cycling Shutdown threshold and Low Evaporator Pressure Safety Shutdown threshold.
Evaporator Refrigerant Temperature	Evaporator Press the Refrigerant key	Service Access	Enabled	Disabled	Enabled	Enables the Evaporator refrigerant thermistor. When enabled this temperature is displayed on the EVAPORATOR Screen, and is also used in the small temperature difference calculation and the Smart Freeze Protection Low Evaporator Pressure Safety Shutdown threshold calculation.
High Condenser Pressure Warning Threshold	Condenser Press the High Pressure Warning Threshold key	Service Access	44.9 PSIG	193.0 for condenser shells DWP=235 284.0 PSIG for condenser shells DWP=350 PSIG	162.5 PSIG	Defines the condenser pressure at which a High Pressure warning message is displayed and High Condenser Pressure capacity control override takes effect. The Warning message will clear and the override removed when the pressure decreases below the programmed value.
Input Job Full Load Amps	VSD Press the Input Job Full Load Amps key.	Service Access	10% of VSD Nominal Input Current at Nominal Line	VSD Nominal Input Current at Nominal Line	10% of VSD Nominal Input Current at Nominal Line	Defines the Full Load Amps (FLA) of the chiller according to the Sales Order. The control uses the programmed value to perform Current Limit functions and display chiller current in terms of %FLA.
Line Voltage	Setup Press the Change Settings key	Service Access	See Setup Section	See Setup Section	Invalid	Tells the controls what the nominal input AC voltage is (380/415 or 460). This is critical to VSD operation. It must be set other than default to release a start inhibit.

TABLE 36 - CHILLER SETUP PROGRAMMABLE SETTINGS (CONT'D)

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Line Frequency	Setup Press the Change Settings key	Service Access	50Hz	60Hz	Invalid	Tells the controls what the nominal input AC frequency is (50Hz or 60Hz). This is critical to VSD operation. It must be set other than default to release a start inhibit.
Chilled Liquid Pump Operation	Setup Press the Change Settings key	Service Access	Standard	Enhanced	Standard	Sets when the chiller commands the chilled water pump run contact closed in run transitions. See I/O board section of this manual.
Head Pressure Control	Setup Press the Change Settings key	Service Access	Enabled	Disabled	Disabled	Enables the Head Pressure Control output. This feature is described earlier in the manual.
Hot Gas Bypass	Setup Press the Change Settings key	Service Access	Enabled	Disabled	Disabled	Enables the Hot Gas Bypass control when the chiller is equipped with optional Hot Gas Bypass. This feature is used in the Capacity Control routine when enabled.
Flow Switch	Setup Press the Change Settings key	Service Access	TB4	J14	J14	Chillers are supplied with factory mounted thermal type flow sensors. User supplied Paddle type sensors can be connected to the I/O Board 115VAC digital inputs TB4-12 (evaporator) and TB4-11 (condenser). The thermal type sensors are connected to J14 on the Microboard. The control program will read the flow sensor input at the selected connection point and ignore the other connection points.
Power Failure Restart	Setup Press the Change Settings key	Operator Access	Auto	Manual	Auto	Determines if the chiller will automatically restart after a loss of panel power or if a Manual reset is required.
Isolation	Setup Press the change settings key	Service Access	Enabled	Disabled	Disabled	Implements automatic operation of discharge and liquid line motor-operated isolation valves (if installed). This feature closes the valves when the chiller is stopped to protect from condenser freezing due to transfer of heat from liquid stagnant in the condenser tubes to the evaporator when flowing cold liquid with chiller off.
Checksum Test	Setup - Diagnostics	Service Access	Enabled	Disabled	Disabled	Disabled allows the panel to omit the checksum test during panel boot-up after the existing software is once validated.
Data Logging	Capacity Control Setpoints	Service Access	Disabled	Enabled	Disabled	Turns on data logging of a fixed set of capacity control parameters to the printer communication port.
Data Logging Interval	Capacity Control Setpoints	Service Access	0.1 sec	60.0 sec	1.0 sec	Sets the data point interval for data logging output.

TABLE 37 - CAPACITY CONTROL PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Unit Control Mode	Capacity Control Setpoints	Operator Access	Choices: Heating Cooling Cooling & Heating	N/A	Cooling	Defines whether the chiller will be operated as a Chiller, controlling LCHLT to setpoint, or Heat Pump, controlling leaving condenser liquid to setpoint, or a combination of both.
LCHLT Setpoint Ramp Rate	Capacity Control Setpoints	Service Access	0.1 °F/s	2.0 °F/s	0.1 °F/s	Rate at which the Active LCHLT setpoint is ramped from an existing local or remote LCHLT setpoint value to a new value with the chiller running.
LCHLT Setpoint Start Offset	Capacity Control Setpoints	Service Access	0.0 °F (delta)	10.0 °F (delta)	5.0 °F (delta)	Defines the starting value for the Active LCHLT setpoint when the chiller is started as Entering Chilled Liquid Temperature minus this value, not to go below programmed LCHLT setpoint
HGBP Start Position	Capacity Control Setpoints	Service Access	0.0%	100.0%	0.0%	Position of the Hot Gas Bypass valve when the chiller is stopped and upon entering compressor run.
VGD Start Position	Capacity Control Setpoints	Service Access	0.0%	30.0%	10.0%	Position of the VGD when the chiller is stopped and upon entering compressor run.
Minimum VGD Position	Capacity Control Setpoints	Admin Access	0.0%	30.0%	10.0%	Minimum Position the VGD is commanded to during Capacity Control operation. This is limited to keep compressor stability and still meet specified turndown capability.
VSD Start Frequency	Capacity Control Setpoints	Service Access	85	See Description	Chiller Max Frequency/2	Initial frequency the VSD will achieve on startup and hold until acted upon by antisurge minimum frequency or PID controls. The VSD is ramped to chiller minimum of 85 Hz at the maximum drive internal ramp rate, 43.5 Hz/second. Then increases toward this programmed start frequency at 10Hz/second. Max Frequency per impeller diameter based on compressor model in sales order screen.
VSD Soft Shutdown Ramp Rate	Capacity Control Setpoints	Admin Access	20.0Hz/s	50Hz/s	20Hz/s	Rate at which the VSD will ramp down to zero speed from the prevailing antisurge minimum frequency upon soft shutdown command.
Temperature Control Kp	Capacity Control Setpoints	Admin Access	0.1	15.0	5.0	Proportional gain factor for the temperature control PID logic.
Temperature Control Ti	Capacity Control Setpoints	Admin Access	0.1	200.0	25.0	Integral gain factor for the temperature control PID logic.
Temperature Control Td	Capacity Control Setpoints	Admin Access	0.0	200.0	0.0	Derivative gain factor for the temperature control PID logic.
Temperature Control Max Loading Delta	Capacity Control Setpoints	Admin Access	0.1	100.0	1.0	The maximum allowed absolute value of increase change commanded from the Temperature Control logic PID.
Temperature Control Max Unloading Delta	Capacity Control Setpoints	Admin Access	0.1	100.0	1.0	The maximum allowed absolute value of decrease change commanded from the Temperature Control logic PID.

TABLE 37 - CAPACITY CONTROL PROGRAMMABLE SETTINGS (CONT'D)

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
VSD Output Gain	Capacity Control Setpoints	Admin Access	0.1	10.0	0.5	Operating gain that relates a desired percent change in capacity to the VSD response in Hertz.
VGD Output Gain	Capacity Control Setpoints	Admin Access	0.1	10.0	1.0	Operating gain that relates a desired percent change in capacity to VGD response in percent position.
HGBP Output Gain	Capacity Control Setpoints	Admin Access	0.1	10.0	1.0	Operating gain that relates a desired percent change in capacity to the HGBP response in percent position.
Default Capacity Control Setpoints	Capacity Control Setpoints	Service Access	N/A	N/A	N/A	This key allows confirmation to return all Capacity Control Programmable Setpoints to their default values at once. The values changed are listed in <i>Table 38 on page 269</i> .
Max Frequency Multiplier	Capacity Control Setpoints	Admin Access	0.400	1.050	1.000	Resets the maximum chiller operating speed to the value calculated from the configuration times this factor, with limit being VSD limit.

TABLE 38 - SETPOINTS AFFECTED BY CAPACITY CONTROL DEFAULT BUTTON

Manual Frequency Increment	Min Frequency Coefficient a2
Manual VGD Increment	Min Frequency Coefficient a3
Manual HGBP Increment	Min Frequency Coefficient b1
Unit Control Mode	Min Frequency Coefficient b2
VSD Start Frequency	Min Frequency Coefficient b3
VSD Soft Shutdown Ramp Rate	Transient Time Delay
VGD Start Position	Transient Deadband
Minimum VGD Position	Transient Max Change
HGBP Start Position	Evaporator Pressure Load Limit Threshold
LCHLT Setpoint Ramp Rate	Evaporator Pressure Load Limit Delta
LCHLT Setpoint Start Offset	Evaporator Pressure Max Override Threshold
Temperature Control Kp	Evaporator Pressure Max Override Delta
Temperature Control Ti	Condenser Pressure Load Limit Threshold
Temperature Control Td	Condenser Pressure Load Limit Delta
Temperature Control Max Loading Delta	Condenser Pressure Max Override Threshold
Temperature Control Max Unloading Delta	Condenser Pressure Max Override Delta
VSD Output Gain	Input Current Load Limit Threshold
VGD Output Gain	Input Current Load Limit Delta
HGBP Output Gain	Input Current Max Override Threshold
Max Frequency Multiplier	Input Current Max Override Delta
Min Frequency Multiplier	Motor Current Load Limit Threshold
Min Frequency Offset	Motor Current Load Limit Delta
Min Frequency Rate Max	Motor Current Override Threshold
Min Frequency Rate Min	Motor Current Max Override Threshold
Min Frequency Admin Multiplier	Motor Current Max Override Delta
Min Frequency Mid Position	LCHLT Max Override Delta
Min Frequency Coefficient a1	

TABLE 39 - ANTI-SURGE PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Min Frequency Multiplier	Anti-Surge Tuning	Service Access	0.950	1.100	1.000	Factor in the anti-surge minimum frequency calculation which raises the calculated minimum frequency as multiplied by its value.
Min Frequency Offset	Anti-Surge Tuning	Service Access	-5.0	20.0	0.0	Factor in the anti-surge minimum frequency calculation which raises the calculated minimum frequency by its value.
Min Freq Rate Maximum	Anti-Surge Tuning	Admin Access	0.01 Hz/sec	10.00 Hz/sec	10.00 Hz/ Sec	Defines the rate at which the Active Anti-Surge minimum frequency will ramp down to the present antisurge minimum when the active antisurge frequency is 10Hz above the present value. The rate decreases linearly between 10 Hz above and 2Hz above present antisurge minimum.
Min Freq Rate Minimum	Anti-Surge Tuning	Admin Access	0.01 Hz/sec	2.00 Hz/sec	0.10 Hz/sec	Defines the rate at which the Active Anti-Surge minimum frequency will ramp down to the present antisurge minimum when the active antisurge frequency is 2Hz above the present value. The rate decreases linearly between 10 Hz above and 2Hz above present antisurge minimum.
Min Frequency Admin Multiplier	Anti-Surge Tuning	Admin Access	0.950	1.100	1.000	Factor in the anti-surge minimum frequency calculation which raises the calculated minimum frequency as multiplied by its value.
*Min Frequency Mid Position	Anti-Surge Tuning	Admin Access	0.1 %	99.9 %	40.0 (197) 43.4 (205) 40.0 (218) 42.4 (233) 44.7 (246) 40.0 (default)	Defines the anti-surge speed control reference point in terms of VGD position where the coefficient definition changes slope.
*Min Frequency Coefficient a1	Anti-Surge Tuning	Admin Access	1.000	2.000	1.440 (default) 1.440 (197) 1.467 (205) 1.443 (218) 1.378 (233) 1.420 (246)	Defines the anti-surge speed control head multiplier at 0% VGD position. It is also required that Min Frequency Coefficient a1 > Min Frequency Coefficient a2 > Min Frequency Coefficient a3. The high and low limits are adjusted instantly to enforce this.
*Min Frequency Coefficient a2	Anti-Surge Tuning	Admin Access	1.000	1.990	1.320 (default) 1.320 (197) 1.318 (205) 1.336 (218) 1.326 (233) 1.327 (246)	Defines the anti-surge speed control head multiplier at Mid VGD position. It is also required that Min Frequency Coefficient a1 > Min Frequency Coefficient a2 > Min Frequency Coefficient a3. The high and low limits are adjusted instantly to enforce this.
*Min Frequency Coefficient a3	Anti-Surge Tuning	Admin Access	1.000	1.980	1.319 (default) 1.319 (197) 1.317 (205) 1.316 (218) 1.304 (233) 1.314 (246)	Defines the anti-surge speed control head multiplier at 100% VGD position. It is also required that Min Frequency Coefficient a1 > Min Frequency Coefficient a2 > Min Frequency Coefficient a3. The high and low limits are adjusted instantly to enforce this.

TABLE 39 - ANTI-SURGE PROGRAMMABLE SETTINGS (CONT'D)

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
*Min Frequency Coefficient b1	Anti-Surge Tuning	Admin Access	0.100	1.000	0.549 (default) 0.549 (197) 0.541 (205) 0.552 (218) 0.518 (233) 0.547 (246)	Defines the anti-surge speed control head exponent at 0% VGD position.
*Min Frequency Coefficient b2	Anti-Surge Tuning	Admin Access	0.100	1.000	0.494 (default) 0.494 (197) 0.502 (205) 0.496 (218) 0.501 (233) 0.509 (246)	Defines the anti-surge speed control head exponent at Mid Position VGD position.
*Min Frequency Coefficient b3	Anti-Surge Tuning	Admin Access	0.100	1.000	0.490 (default) 0.490 (197) 0.501 (205) 0.485 (218) 0.479 (233) 0.498 (246)	Defines the anti-surge speed control head exponent at 100% VGD position.
Transient Time Delay	Anti-Surge Tuning	Admin Access	0.0 sec	10.0 sec	2.5 sec	Defines the responsiveness of the anti-surge control which increases minimum speed to avoid surge during a head transient.
Transient Deadband	Anti-Surge Tuning	Admin Access	0.002	0.050	0.005	Defines the initiating threshold for the correction of the anti-surge control which increases minimum speed to avoid surge during a head transient.
Transient Max Change	Anti-Surge Tuning	Admin Access	0.01	0.25	0.25	Defines the maximum offset limit calculated for mach in the anti-surge control which increases minimum speed to avoid surge during a head transient.

TABLE 40 - CAPACITY CONTROL OVERRIDE PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Evaporator Pressure Load Limit Threshold	Override Tuning	Admin Access	1.0 PSID	50.0 PSID	20.0 PSID	Sets how much greater than the Evaporator pressure override threshold the load limiting begins effect.
Evaporator Pressure Load Limit Delta	Override Tuning	Admin Access	0.01	5.00	0.10	Sets the maximum capacity increase output permitted by the Evaporator Pressure Limit control.
Evaporator Pressure Max Override Threshold	Override Tuning	Admin Access	1.0 PSID	4.0 PSID	2.0 PSID	Sets how much lower than the Evaporator pressure override threshold the override control achieves maximum unload.
Evaporator Pressure Max Override Delta	Override Tuning	Admin Access	-5.00	-0.01	-0.20	Sets the maximum capacity decrease output effected by the Evaporator Pressure Override control.
Condenser Pressure Load Limit Threshold	Override Tuning	Admin Access	1.0 PSID	50.0 PSID	10.0 PSID	Sets how much lower than the Condenser pressure override threshold the load limiting begins effect.
Condenser Pressure Load Limit Delta	Override Tuning	Admin Access	0.01	5.00	0.10	Sets the maximum capacity increase output permitted by the Condenser Pressure Limit control.
Condenser Pressure Max Override Threshold	Override Tuning	Admin Access	1.0 PSID	20.0 PSID	10.0 PSID	Sets how much greater than the Condenser pressure override threshold the override control achieves maximum unload.
Condenser Pressure Max Override Delta	Override Tuning	Admin Access	-5.00	-0.01	-0.10	Sets the maximum capacity decrease output effected by the Condenser Pressure Override control.
Input Current Load Limit Threshold	Override Tuning	Admin Access	1.0%	50.0%	20.0%	Sets how much lower than the Input Current override threshold the load limiting begins effect.
Input Current Load Limit Delta	Override Tuning	Admin Access	0.01	5.00	0.10	Sets the maximum capacity increase output permitted by the Input Current Limit control.
Input Current Max Override Threshold	Override Tuning	Admin Access	1.0%	10.0%	5.0%	Sets how much greater than the input Current override threshold the override control achieves maximum unload.
Input Current Max Override Delta	Override Tuning	Admin Access	-5.00	-0.01	-0.10	Sets the maximum capacity decrease output effected by the Input Current Override control.
Motor Current Override Threshold	Override Tuning	Admin Access	30.0 %	100.0 %	100.0 %	Sets the Threshold value where Motor current load limiting and override reference from
Motor Current Load Limit Threshold	Override Tuning	Admin Access	1.0%	50.0%	20.0%	Sets how much lower than the Motor Current override threshold the load limiting begins effect.
Motor Current Load Limit Delta	Override Tuning	Admin Access	0.01	5.00	0.10	Sets the maximum capacity increase output permitted by the Motor Current Limit control.
Motor Current Max Override Threshold	Override Tuning	Admin Access	1.0%	10.0%	5.0%	Sets how much greater than the Motor Current override threshold the override control achieves maximum unload.
Motor Current Max Override Delta	Override Tuning	Admin Access	-5.00	-0.01	-0.10	Sets the maximum capacity decrease output effected by the Motor Current Override control.
LCHLT Max Override Delta	Override Tuning	Admin Access	-5.00	-0.01	-0.10	Sets the maximum capacity decrease output effected by the Low Leaving Chilled Liquid Temperature Override control.

* If the compressor model number is changed, the values marked in the table with * are reverted to the default appropriate for the model.

TABLE 41 - MOTOR COOLING CONTROL PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Motor Cooling Setpoint Offset	Motor Details	Service Access	-10.0 °F (differential)	30.0 °F (differential)	5.0 °F (differential)	Defines the temperature to which the motor housing temperature will be controlled, by manipulation of the motor cooling EEV. The control temperature is the entering condenser liquid temperature plus this offset. It should be set above the ambient dewpoint to avoid condensing water vapor on the motor.
Min Housing Temp	Motor Details	Service Access	80.0 °F	100.0 °F	80.0 °F	Sets the minimum extreme that the target motor housing temperature will go.
Max Winding Temp	Motor Details	Admin Access	150.0 °F	275.0°F	200.0 °F	Sets the winding temperature limit where override of the motor cooling control begins in effort to keep temperature below this limit.
Motor Cooling Primary Kp	Motor Details	Admin Access	0.1	15.0	10.0	Proportional gain factor for the temperature control PID logic.
Motor Cooling Primary Ti	Motor Details	Admin Access	0.1	1000.0	500.0	Integral gain factor for the temperature control PID logic.
Motor Cooling Primary Td	Motor Details	Admin Access	0.0	200.0	0.0	Derivative gain factor for the temperature control PID logic.
Motor Cooling Secondary Kp	Motor Details	Admin Access	0.1	15.0	1.0	Proportional gain factor for the temperature control PID logic.
Motor Cooling Secondary Ti	Motor Details	Admin Access	0.1	1000.0	100.0	Integral gain factor for the temperature control PID logic.
Motor Cooling Secondary Td	Motor Details	Admin Access	0.0	200.0	0.0	Derivative gain factor for the temperature control PID logic.
Motor Cooling Valve Start Position	Motor Details	Admin Access	0.0%	100.0%	0.0%	Position the motor cooling valve is commanded to when the chiller is not running prior to PID control.
Ambient Dew Point Temperature Enable	Motor Details	Service Access	Enabled	Disabled	Disabled	Enables use of the optional Ambient Dew Point Temperature sensor, if installed, for setpoint to control of the motor cooling valve.
Motor Winding Phase X Temp Y End Enable	Motor Details	Admin Access	Enabled	Disabled	Enabled	Allows technician to disable a single winding temperature sensor at either end of the motor at any time for troubleshooting. X = A, B, C and Y = Z1 or Z2.

TABLE 42 - CONDENSER LEVEL CONTROL PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Condenser Level Setpoint	Refrigerant Level Control Screen	Service Access	20.0%	80.0%	50.0%	Sets the level for the chiller control target. This need set to allow at least ½" coverage over the subcooler.
Condenser Level Control Valve Startup Position	Refrigerant Level Control Setpoints Screen	Service Access	0.0%	100.0%	50.0%	Defines the position the level control valve goes in stopped state, in preparation for startup.
Condenser Level Control Startup Delay	Refrigerant Level Control Setpoints Screen	Admin Access	0 sec	120 sec	15 sec	Specifies a delay time from the start of chiller run until automatic control of refrigerant level begins. Applies when level is below setpoint.
Condenser Level Control Ramp Time	Refrigerant Level Control Setpoints Screen	Admin Access	1 min	5 min	1 min	Specifies a time after the startup delay time in which refrigerant level is linearly ramped from present position to setpoint. Applies when level is below setpoint.
Condenser Level Control Kp	Refrigerant Level Control Setpoints Screen	Admin Access	0.1	15.0	1.0	Proportional gain factor for the condenser level control PID logic.
Condenser Level Control Ti	Refrigerant Level Control Setpoints Screen	Admin Access	0.1	200.0	100.0	Integral gain factor for the condenser level control PID logic.
Condenser Level Control Td	Refrigerant Level Control Setpoints Screen	Admin Access	0.0	200.0	0.0	Derivative gain factor for the condenser level control PID logic.
Subcooler Effectiveness Low Threshold	Condenser Level Control	Admin Access	0.0	0.6	0.4	Detection point for loss of liquid seal with increasing drop leg temperature.
Subcooler Effectiveness High Threshold	Condenser Level Control	Admin Access	1.0	6.0	1.5	Detection point for loss of liquid seal with decreasing drop leg temperature from flashing refrigerant.

TABLE 43 - ECONOMIZER LEVEL CONTROL PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Economizer Level Setpoint	Economizer Level Control Screen	Service Access	20.0%	80.0%	50.0%	Sets the level for the chiller control target. This need set to allow at least 1" coverage over the economizer outlet.
Economizer Level Control Valve Startup Position	Economizer Level Control Setpoints Screen	Service Access	0.0%	100.0%	50.0%	Defines the position the level control valve goes in stopped state, in preparation for startup.
Economizer Level Control Startup Delay	Economizer Level Control Setpoints Screen	Admin Access	0 sec	120 sec	15 sec	Specifies a delay time from the start of chiller run until automatic control of refrigerant level begins. Applies when level is below setpoint.
Economizer Level Ramp Time	Economizer Level Control Setpoints Screen	Admin Access	1 min	5 min	1 min	Specifies a time after the startup delay time in which refrigerant level is linearly ramped from present position to setpoint. Applies when level is below setpoint.
Economizer Level Control Kp	Economizer Level Control Setpoints Screen	Admin Access	0.1	15.0	1.0	Proportional gain factor for the Economizer level control PID logic.
Economizer Level Control Ti	Economizer Level Control Setpoints Screen	Admin Access	0.1	200.0	100.0	Integral gain factor for the Economizer level control PID logic.
Economizer Level Control Td	Economizer Level Control Setpoints Screen	Admin Access	0.0	200.0	0.0	Derivative gain factor for the t Economizer level control PID logic.

TABLE 44 - VGD PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
*High Limit	VGD Screen	Service Access	0.35 V	1.20 V	0.50 V (default) 0.65 V (197 Imp)	Defines the baseline value for determining compressor stall
*Low Limit	VGD Screen	Service Access	0.30 V	0.80 V	0.45 V (default) 0.60 V (197 Imp)	Defines the baseline value for determining compressor out of stall
0% VGD Voltage	VGD Calibration	Admin Access and Stopped	0.00 V	5.00 V	0.00 V	Set VGD closed feedback voltage, which should always be done through the automatic calibration routine instead.
100% VGD Voltage	VGD Calibration	Admin Access and Stopped	0.00 V	5.00 V	0.00 V	Set VGD opened feedback voltage, which should always be done through the automatic calibration routine instead.
Broadband Threshold	VGD Screen	Service Access	0.00 V	0.40 V	0.18 V	Sets the value used to determine the difference between stall and flow noise at the discharge pressure transducer according to the VGD section of this manual

TABLE 45 - BATTERY MONITORING PROGRAMMABLE SETTINGS

PROGRAM SETTING	SCREEN	CHANGE MODE	LOW LIMIT	HIGH LIMIT	DEFAULT	DESCRIPTION
Line Low Battery Voltage Offset	Power Panel	Admin Access	-1.0 V	0.2 V	0.0 V	Used to calculate the low battery voltage target when line voltage is available and the UPS is expected charging the battery. A fixed baseline voltage based on power panel temperature is modified by this setting for the warning and trip threshold.
Inverter Low Battery Voltage Threshold	Power Panel	Admin Access	10.5 V	12.0 V	11.0 V	A minimum battery voltage target when the line voltage is unavailable and the battery is powering the UPS inverter.
Battery Voltage Faults	Power Panel	Admin Access	Choices: Disabled Enabled		Enabled	Sets whether the battery monitoring chiller shutdown faults are active (enabled) or ignored (disabled).

When Data Logging is enabled, data values will be serially transmitted to the RS-232 port at an interval defined by the Data Logging Interval. The data will be comma separated with a carriage return and line feed transmitted at the end of each transmission interval. All data transmitted at each interval will be from the same snapshot in time.

Following is a list of all data values that are included in Data Logging:

TABLE 46 - DATA VALUES

DATA VALUE	HEADING TEXT
Date (DD/MM/YYYY format)	Date
Time (24 Hour format)	Time
Elapsed Time (seconds since data logging started)	Elapsed Time
Entering Chilled Liquid Temperature	ECHLT
Leaving Chilled Liquid Temperature Filtered	LCHLT
Active LCHLT Setpoint	LCHLT Setp
Entering Condenser Liquid Temperature	ECLT
Leaving Condenser Liquid Temperature Filtered	LCLT
Active Heating Setpoint	Heating Setp
Active Temp Control	Act Temp Ctrl
Evap Press Filtered	Evap Press
Cond Press Filtered	Cond Press
Input Current %FLA	Input Curr
Input Current Override Threshold	Input Curr OR Thresh
Motor Current %FLA	Motor Curr
Active Load Limit	Load Limit
Active Override	Override
VSD Active Control	VSD Act Ctrl
VSD Freq Command	VSD Freq Cmd
VSD Output Freq	VSD Output Freq
MBC Motor Speed	MBC Motor Speed
VSD Control Mode (Auto/Manual)	VSD Mode
Omega	Omega
Surge Mach	Surge Mach
Surge Freq from Pos	Surge Freq Pos
Anti-Surge Min Freq	AS Min Freq
Active Anti-Surge Min Freq	Act AS Min Freq
Anti-Surge Transient Offset	AS Trans Offset
Mach Number	Mach Number
VGD Active Control	VGD Act Ctrl
VGD Command	VGD Cmd

TABLE 46 - DATA VALUES (CONT'D)

DATA VALUE	HEADING TEXT
VGD Position	VGD Pos
VGD Control Mode	VGD Mode
Control Voltage	Control Voltage
HGBP Active Control	HGBP Act Ctrl
HGBP Command	HGBP Cmd
HGBP Control Mode	HGBP Mode
Condenser Refrigerant Liquid Level	Cond Liquid Level
Condenser Active Refrig Level Setp	Cond Act Level Setp
Condenser Level Control State	Cond Level Ctrl State
Condenser Level Control Valve Command	Cond Level Ctrl Cmd
Evap Small Temp Diff	Evap Small Temp Diff
Evap Sat Temp	Evap Sat Temp
Evap Refrig Temp	Evap Refrig Temp
Evap Flow Switch	Evap Flow
Cond Small Temp Diff	Cond Small Temp Diff
Cond Sat Temp	Cond Sat Temp
Cond Drop Leg Temp	Cond Drop Leg Temp
Subcooling	Subcooling
Cond Flow Switch	Cond Flow
Discharge Temp	Discharge Temp
Discharge Superheat	Discharge Sheat
Discharge Pressure	Discharge Press
Stall Detector Voltage	Stall Detector Voltage
Stall Detector High	Stall Detector High
Active Stall Voltage (from CC Output)	Act Stall Voltage
Active Stall Voltage Type (from CC Output)	Stall Voltage Type
Active Stall High Limit (from CC Output)	Act Stall High Limit
Active Stall Low Limit (from CC Output)	Act Stall Low Limit
Surge Detected	Surge Detected
Surge Count	Surge Count
Motor Run	Motor Run
VSD Command (Modbus 40003)	VSD Cmd
VSD Control State (Modbus 40169)	VSD State
VSD Fault	VSD Fault
VSD DC Bus Voltage	DC Bus Voltage
VSD Input Power	Input Power
MBC Commands (Bit 0 = MBC Levitation Command, Bit 1 = MBC Rotation Command)	MBC Cmds

TABLE 46 - DATA VALUES (CONT'D)

DATA VALUE	HEADING TEXT
MBC State (Bit 0 = Levitation Mode, Bit 2 = Rotation Mode)	MBC State
MBC Rotation Allowed	MBC Rot Allow
MBC Fault	MBC Fault
MBC Z1 Temperature	Z1 Temp
MBC Z2 Temperature	Z2 Temp
MBC V13 Position	V13 Pos
MBC W13 Position	W13 Pos
MBC V24 Position	V24 Pos
MBC W24 Position	W24 Pos
MBC Z12 Position	Z12 Pos
MBC Rotor Elongation	Rotor Elongation
Motor Housing Temp	Mtr Housing Temp
Estimated Rotor Temperature	Est Rotor Temp
Motor Housing Temperature Setpoint	Mtr Housing Temp Setp
Motor Cooling Valve Command	Mtr Cool Valve Cmd
Highest of the 6 Winding Temps	Winding Temp
UPS State (Bit 0 = UPS Line / Charging, Bit 1 = UPS Inverter, Bit 3 = UPS Fault, Bit 4 = UPS Inverter Enable)	UPS State
UPS Battery Voltage	Batt V
Power Panel Temperature	PP Temp
Power Panel Cooling System Run	PP Cool Run
Ambient Dew Point Temperature	Dew Point Temp
Surge Freq from Cmd	Surge Freq Cmd
Motor Winding Temperature Setpoint	Mtr Winding Temp Setp
Reserved - Economizer Pressure Filtered	Econ Press
Reserved - Economizer Refrigerant Liquid Level	Econ Liquid Level
Reserved - Economizer Active Refrig Level Setp	Econ Act Level Setp
Reserved - Economizer Level Control State	Econ Level Ctrl State
Reserved - Economizer Level Control Valve Command	Econ Level Ctrl Cmd

SECTION 32 - DIAGNOSTICS AND TROUBLESHOOTING

The problems that could be encountered in the OptiView™ Control Center are in the following categories:

- Keypad
- Display
- Serial Input/Output (I/O)
- Digital Input/Output (I/O)
- Analog Inputs

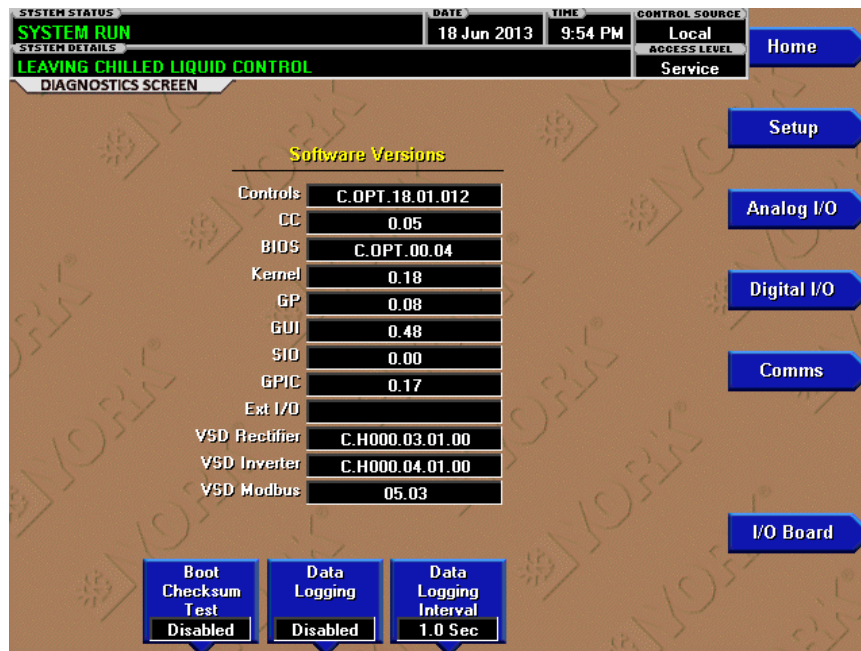
There is a Diagnostic and Associated Troubleshooting procedure for each category. They are described on the following pages. Each Diagnostic is accessed from the Main Diagnostics Screen, which is entered using the procedure below. If there is an OptiView™ Control Center problem, determine the category of the problem, then perform the applicable Diagnostic. If the Diagnostic reveals a malfunction, perform the Troubleshooting procedure to locate the defective component.

There are several documents that must be referred to while performing the Diagnostics and Troubleshooting procedures. Each procedure references the Section and figures of this manual that describe the operation of the component being tested. Also, the applicable OptiView™ Control Center wiring diagram must be used as listed in the Associated Literature table at the front of this manual.

There are two versions of the Diagnostics screens available as follows:

1. Shown in *Figure 109 on page 280* through *Figure 112 on page 286*. These screens are used during the Diagnostics and Troubleshooting process. They allow output states to be changed. Access the Diagnostics Main Screen as follows:
 - a. The chiller must be stopped.
 - b. Place Compressor Start/Stop switch in the Stop-Reset position (O).
 - c. Ensure the Compressor motor current is 0% FLA.
 - d. Log in at **SERVICE** access level using access code **1 3 8 0**.
 - e. Move Microboard Program Switch SW1-3 (Microboard 031-02430-007) to the ON position. A Watchdog reset will occur and the Boot-up process will commence. At the completion of the Boot-up process, the Diagnostics Main Screen will appear. (Note: if the Program Switch is moved to the ON position before step 4 above is performed, the **LOG IN** key will be displayed and Logging in at **SERVICE** access level must be performed before the Main Screen is displayed.
2. Not shown. Available when logged in at **SERVICE** access level, whether the chiller is running or not. Accessed from the **SETUP** screen via the **SETPOINTS** screen. There are two screens available that allow the Analog Inputs voltage levels and Digital I/O states to be monitored. These screens are preceded by a general screen that provides the installed software versions.

DIAGNOSTICS SCREEN



LD17956

FIGURE 109 - DIAGNOSTICS SCREEN

This screen shows all of the software that is loaded onto the microboard and the motor starter connected to the microboard via serial communications.

Controls – Software that controls the chiller. On 031-02430-007 microboards, the program resides in the non-removable flash memory chip (U35).

BIOS – BIOS eeprom on microboard.

Kernel – Software that is part of flash memory.

GUI – Software that is part of the flash memory.

SIO – Software that is part of flash memory.

GPIC – Eeprom in E-Link Gateway.

Ext I/O – Software in I/O Board 031-02895-000 (only displayed with Microboard software version C.OPT.01.21.307 and later).

SSS, VSD, MVSSS or MVVSD – software that is in the respective device.

Modbus UI - Motor Monitoring – Software in Motor Monitoring Board (only displayed with Microboard software version C.OPT.01.22.307 and later).

Each of the Diagnostics is accessed from this screen. Press the appropriate key to select the desired diagnostic. After each diagnostic is performed, return to this **MAIN** Screen, from which the next diagnostic can be selected.

Some of the diagnostics have sub-screens that are accessed from the selected diagnostic screen. The sub-screens are shown indented below:

Main Screen

- I/O Board
- Keypad test
- Display test
 - Bit patterns test
 - All red
 - All green
 - All blue
 - All white
 - All black
- Serial I/O test
- Digital I/O test
- Analog Inputs

The **ADVANCED SECURITY** key is used during the manufacturing process and has no field service use.

ANALOG INPUTS TEST SCREEN



LD17968

FIGURE 110 - ANALOG INPUTS TEST SCREEN

This diagnostic is used to analyze the Analog Inputs to the Microboard. The voltage level of each Analog input, as interpreted by the Microboard, is displayed. The “Counts” listed for each parameter is the Analog-to-Digital (A/D) converter value and is for manufacturing and engineering use only.

This screen can also be viewed in Service Access in normal operating mode. Advance Diagnostics mode is required to freeze the inputs. If the chiller is shutting down on an Analog Safety or is prevented from starting because of an Analog input, there is probably an Analog Input problem. This Screen can be used in the investigation of this problem.



Important! This test does not apply to the Leaving Chilled Liquid Temperature analog input, Proximity Probe DC Voltage reference or a 0-10VDC Remote Setpoint input at channels 27 and 28.

The following is a list of the Analog inputs displayed. Refer to the appropriate Section of this manual for an explanation of each:

- SECTION 15 - PRESSURE TRANSDUCERS
- SECTION 16 - TEMPERATURE THERMISTORS
- SECTION 22 - REFRIGERANT LEVEL CONTROL

CHANNEL

- 0 - +2.5VDC Analog supply voltage reference. Microboard TP6.
- 1 - Leaving Chilled Liquid Temperature
- 2 - Return Chilled Liquid Temperature
- 3 - Leaving Condenser Liquid Temperature
- 4 - Return Condenser Liquid Temperature
- 5 - Drop Leg Refrigerant Temperature
- 6 - Discharge Temperature
- 7 - Motor Housing Temperature
- 8 - Evaporator Refrigerant Temperature
- 9 - Condenser Pressure
- 10 - Evaporator Pressure
- 11-13 - Not Used
- 14 - Stall Voltage High
- 15-22 - Not Used
- 23 - Refrigerant Level Position
- 24 - Discharge Pressure
- 25 - Stall Voltage Standard

- 26 - Not Used
- 27 - Remote Leaving Chilled Liquid Temperature Setpoint (0-20mA or 4-20mA)
- 28 - Remote Current Limit Setpoint (0-20mA or 4-20mA)
- 29 - Not Used
- 30 - Not Used

PROCEDURE

- From the chart above, select the analog input that is malfunctioning. All inputs except channel 0, 15 through 22, 27 and 28 are sensors that connect directly to the Microboard via shielded cable. Channel 0 is a reference voltage for the Analog circuits on the Microboard. Channels 27 and 28 are Remote Setpoint inputs used in Analog Remote mode.
- Refer to Wiring Diagrams listed in front of this Section to identify the device that performs this function and the jack and pin connection to the Microboard.
- Channel 0**

Using a Voltmeter, measure the voltage between Microboard TP6 (+2.5VDC) and TP1 (Gnd).

Compare this measured value to the displayed value. If the value is not within +10%, replace the Microboard.

All channels except 0, 1, 15-22

Using a Voltmeter, measure the analog input to the Microboard. Make the measurement between the device output and Ground connection to the device. For example, measure the output of the Evaporator Transducer at Microboard J8-18 (signal) to J8-9 (Gnd).

Channels 15-22

Channels 27, 28



IMPORTANT! *This procedure only applies to 4-20mA inputs. It does not apply to 0-10VDC inputs. Using a Voltmeter, measure the Remote Current Limit setpoint input at J22-2 (signal) or Remote Leaving Chilled Liquid Temperature setpoint input at J22-4 (signal) to J22-5 (Gnd).*

- Compare the measured value in the previous step with the value displayed on the Analog Inputs Screen for that value.

- If the measured value is not within +15% of the displayed value, replace the Microboard. Otherwise, proceed to the troubleshooting procedure below to find the cause of the problem.
- When all desired tests have been performed, press DIAGNOSTICS key to return the MAIN DIAGNOSTICS Screen.

TROUBLESHOOTING

All Channels except 0, 1, 15-22, 27, 28

- Disconnect both ends of the cable of the Analog input that is malfunctioning. Using an Ohmmeter, perform a continuity test on all conductors in the cable. An open circuit would indicate the cable is defective.
- Using a Voltmeter, measure the +12VDC supply voltage input at the Microboard J1-3 (+12VDC) to J1-2 (Gnd). If voltage is less than 11.5VDC, check wiring to Power Supply. If wiring is OK, the Power supply is most likely defective.
- Using a Voltmeter, measure the supply voltage (+5VDC, +1 2VDC or +24VDC) to the sensor. If voltage is not within +10% of specified voltage, disconnect J7, J8 and J9 from the Microboard. This disconnects all analog devices from the Microboard. If the voltage increases to the correct level, a Thermistor or Transducer is shorted. Locate the shorted device and replace. If, after disconnecting the connectors the supply voltage is still not within 10% of the specified value, the voltage supply source (Microboard or Power Supply) is most likely defective.
- Verify sensor accuracy using appropriate test device. Replace sensor if necessary.
- Channels 15 - 22 Not Used

Channels 27, 28

- Refer to *Table 3 on page 32* and verify Program Jumpers JP23 and JP24 are configured correctly for the type of input (0-10VDC or 4-20mA).
- Disconnect both ends of the cable of the remote input that is malfunctioning. Using an Ohmmeter, perform a continuity check on all conductors in the cable. An open circuit would indicate the cable is defective.
- If steps are OK, problem most likely is in the remote device that supplies the remote signal.

DIGITAL INPUTS/OUTPUTS TEST SCREEN



LD17964

FIGURE 111 - DIGITAL INPUTS / OUTPUTS TEST SCREEN

This diagnostic is used to analyze the digital inputs and outputs of the Microboard. Refer to *SECTION 6 - I/O BOARD* of this manual.

This screen can also be viewed in Service Access in normal operating mode. Advance Diagnostics mode is required to manipulate outputs.

The state of each Microboard Digital Input, Program Jumper and Program DIP Switch, as interpreted by the Microboard, is depicted by an LED. If the Microboard interprets its input as being at a Logic Low (less than 1.0VDC) level, the LED is illuminated. If interpreted as being at a Logic High (greater than 4.0VDC) level, the LED is extinguished.

The state of the Microboard's intended drive signals to each of the Relays on the I/O Board is depicted by an LED. If the intended output is a Logic Low level (less than 1.0VDC), the LED is illuminated. If the intended output is a Logic High level (greater than 10.0VDC), the LED is extinguished. Logic Low outputs energize the Relays. Logic High outputs de-energize the Relays. The state of any output can be manually set to either the ENABLED (Logic Low) or DISABLED (Logic High) state.

PROCEDURE

Digital Inputs

1. The Digital Inputs are listed on this screen according to a) Terminal number on the I/O Board and b) Microboard Program Jumpers and Program DIP Switches. *Figure 12 on page 50* shows the devices connected to these terminals.
2. With 115VAC applied to a particular I/O Board Digital Input, the applicable LED should be illuminated. If the LED is not illuminated, perform appropriate Troubleshooting procedure below.
3. With 0VAC applied to a particular I/O Board Digital Input, the applicable LED should be extinguished. If the LED is not extinguished, perform appropriate Troubleshooting procedure below.
4. If a Program Jumper is present, the applicable LED should be extinguished. If the LED is not extinguished, the Microboard is defective.
5. If a Program Jumper is not present, the applicable LED should be illuminated. If the LED is not illuminated, the Microboard is defective.

6. If a Program Switch (DIP) is in the ON position, the applicable LED should be illuminated. If the LED is not illuminated, the Microboard is defective.
7. If the Program Switch (DIP) is in the OFF position, the applicable LED should be extinguished. If the LED is not extinguished, the Microboard is defective.
8. When all desired tests have been performed, press **DIAGNOSTICS** key to return to **MAIN DIAGNOSTICS Screen**.

Digital Outputs

1. **IMPORTANT!** - The following steps cannot be performed until the Motor Controller connection between TB6-15 and TB6-53 has been removed. This connection could be a jumper or it could be a connection from external devices in the starter. The Program will prevent manual control of Digital Output devices until this connection is removed.
2. The Digital Outputs are listed on this Screen according to Relay and Triac number (KI, Q3, etc). *Figure 15 on page 52* shows the external devices that are connected to these Relays and Triacs and the functions of each one.
3. Press **SELECT** key. An arrow will appear adjacent to Relay KO.
4. Select a relay or triac for manual control by using the ◀ and ▶ keys to place the arrow adjacent to the desired device.
5. Press the **ENABLE OUTPUT** key to enable the selected output. The LED adjacent to the selected output should illuminate. If it does not, perform **KEYPAD** Diagnostics test. If a relay is selected, it should energize, closing its contacts. If a triac is selected, it will turn on, energizing the device it is connected to. If the relay does not energize or triac does not turn on, perform appropriate troubleshooting procedure below.
6. Press the **DISABLE OUTPUT** key to disable the selected output. The LED adjacent to the selected output should extinguish. If it does not, perform **KEYPAD** diagnostic test. If a relay is selected, it should de-energize, opening its contacts. If a triac is selected, it will turn off, de-energizing the device it is connected to. If relay does not de-energize or triac does not turn off, perform appropriate troubleshooting procedure below.
7. When all desired tests have been performed, press **DIAGNOSTICS** key to return to the **MAIN DIAGNOSTICS Screen**.
8. Install Motor Controller connection from TB6-I to TB6-53 removed in step 1.

Digital Inputs Troubleshooting

If any of the Digital Inputs tests fail to perform as described above, perform the following steps in sequence. Refer to *Figure 12 on page 50* and applicable wiring diagram referenced at the beginning of *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003*. If a defective component is found during any of the following steps, replace the component as instructed and repeat the digital Inputs Procedure above to determine if the problem has been resolved.

1. Remove I/O Board ribbon cable. Using an Ohmmeter, perform a continuity check on I/O Board ribbon cable J1-21 to J19-21, J1-22 to J19-22 and applicable output pin of function that failed in Procedure above. If an open circuit is detected, replace ribbon cable. Otherwise, install ribbon cable and proceed to next step.
2. Measure the +5VDC supply voltage to the I/O Board on I/O Board between J1-21 and J1-22. If greater than 4.5VDC, proceed to next step. If less than 4.5VDC, disconnect ribbon cable at I/O Board J1 and repeat the measurement at J1. If less than 4.5VDC, replace the Microboard. Re-install the ribbon cable.
3. With 115VAC ($\pm 10\%$) applied to the I/O Board digital input that failed in Procedure above, the applicable I/O Board output at J1 should be at a Logic low level (less than 1.0VDC). If it is greater than 1.0VDC, replace the I/O Board. If the output is at a Logic Low level, the applicable LED should be illuminated. If the LED is not illuminated, replace the Microboard.
4. With 0VAC applied to the I/O Board digital input that failed in Procedure above, the applicable I/O Board output at J1 should be at a Logic High level (greater than 4.0VDC). If it is less than 4.0VDC, replace the I/O Board. If the output is at a Logic High level, the applicable LED should be extinguished. If it is not extinguished, replace the Microboard.

Digital Outputs Troubleshooting

If any of the Digital outputs tests fail to perform as described above, perform the following steps in sequence. Refer to *Figure 15 on page 52* and applicable wiring diagram referenced at the beginning of *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003*. If a defective component is found during any of the steps, replace the component as instructed and repeat the Procedure above to determine if the problem has been resolved.

1. Remove I/O Board ribbon cable. Using an Ohmmeter, perform a continuity test on the cable J1-25 to J19-25, J1-26 to J19-26 and applicable output pin of function that failed in Procedure above. If an open circuit is detected, replace ribbon cable. Otherwise, install ribbon cable and proceed to next step.
2. Measure the +12VDC supply voltage to the I/O Board on I/O Board between J1-26 (+12VDC) and J1-25 (Gnd). If greater than 11.0VDC, proceed to next step. If less than 11.0VDC, disconnect ribbon cable at I/O Board J1 and repeat measurement at J1. If less than 11.0VDC, replace the Microboard. Re-install the ribbon cable.
3. Using the Digital Outputs Procedure above, select the output that failed the digital Output test above.
4. Press **ENABLE OUTPUT** key. The LED adjacent to the selected output will illuminate. The appropriate Microboard output pin at J19 for the selected output should be at a Logic Low level (less than 1.0VDC). If it is greater than 1.0VDC, replace the Microboard. With the output at a Logic Low, the following should occur:
 - f. If a Relay is selected as the output, the contacts of the relay should be closed. If they are not closed, replace the I/O Board.
 - g. If a Triac is selected as the output, the Triac should be turned on. If the Triac has not turned on, replace the I/O Board. See note 1 below for Triac testing.
5. Press **DISABLE OUTPUT** key. The LED adjacent to the selected output will extinguish.
 - a. If a Relay is selected as the output, the appropriate Microboard output pin at J19 for the selected output should be at a Logic High (greater than 10.0VDC) level. With the out-

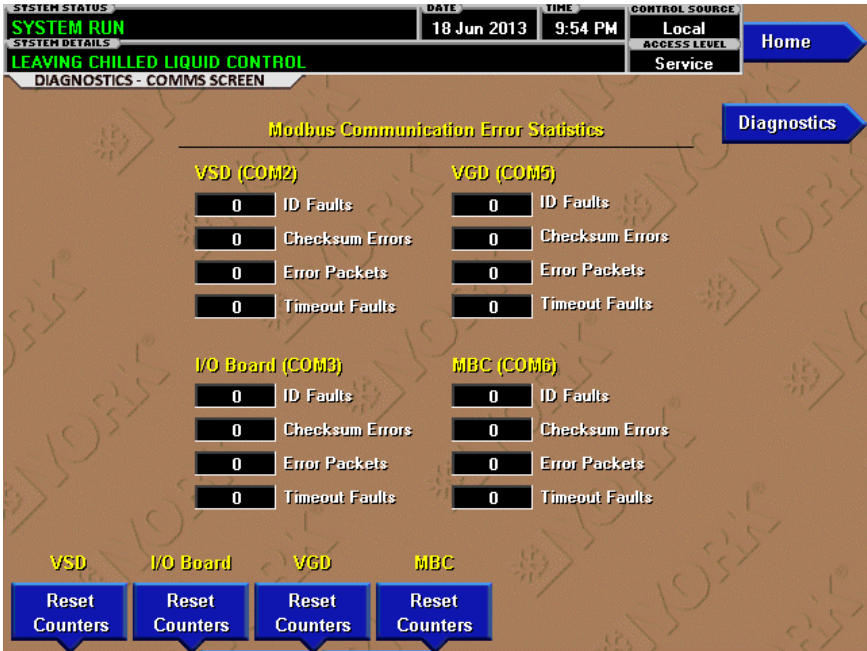
put at a Logic High level, the relay contacts should be open. If they are not open, replace the I/O Board. If it is less than 10.0VDC, remove the ribbon cable from J1 of the I/O Board. On the I/O Board, measure the resistance from J1-26 to the appropriate pin of J1 on the I/O Board for the selected relay. If the resistance is greater than 100 Ohms, replace the I/O Board. If the resistance is less than 100 Ohms, replace the Microboard.

- b. If a Triac is selected as the output, the appropriate Microboard output pin at J19 for the selected output should be at a Logic High (greater than 10.0VDC) level. If it is less than 10.0VDC, replace the Microboard. With the output at a Logic High level, the Triac should be turned off. If the Triac has not turned off, replace the I/O Board. See note 1 below for Triac testing.

Notes

The load (actuator) must be connected across the Triac to determine the on/off state of the Triac. The on/off state of the Triac can be determined by measuring across the device (for example, TB1-3 to TB1-59 or TB1-58 to TB1-59) with an AC Voltmeter. If the Triac is turned on, the voltage will be less than 10VAC. If the Triac is turned off, the voltage will be greater.

MBC VSD COMMS SCREEN



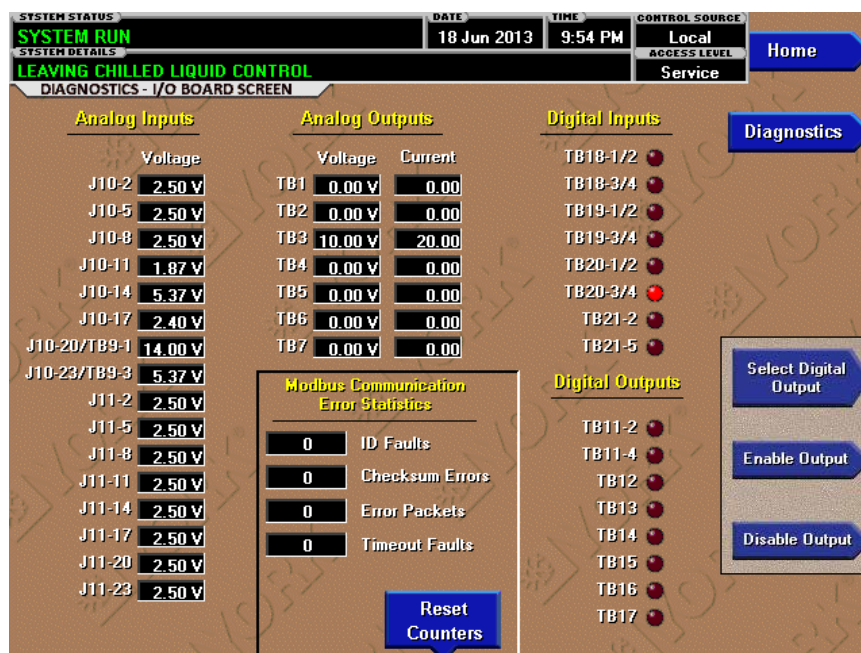
LD17967

FIGURE 112 - MBC VSD COMMS SCREEN

This diagnostic is used to review the type and number of communication errors between the OptiView™ microboard and the VSD, VGD Actuator, LTC I/O Board, and MBC. This screen can also be viewed in Service Access in normal operating mode.

The error statistics can be reset with the appropriate keys, when necessary.

I/O BOARD DIAGNOSTIC SCREEN



LD17966

FIGURE 113 - I/O BOARD DIAGNOSTIC SCREEN

This diagnostic screen is used to analyze the analog and digital inputs and outputs of I/O Board. This screen can also be viewed in Service Access in normal operating mode. Advance Diagnostics mode is required to manipulate outputs. The outputs can be manually set to a desired level from here. Serial communications error statistics are also displayed here. Refer to the description of this board in *SECTION 7 - LARGE TONNAGE CHILLER (LTC) I/O BOARD 031-02895-002 or 003*.

ANALOG INPUTS

The voltage level of each analog input at the indicated input terminals is displayed as x.xxVDC.

ANALOG OUTPUTS

The analog outputs are in the form of 0-10VDC or 0-20mA at each of the listed connectors. The values displayed are the values the I/O Board is intending to provide at the output connector. The voltage output is at terminal 2 of each output connector and is displayed as x.xxVDC. The current output is at terminal 1 of each output connector and is displayed a xx.xxmA

The voltage value and the current value are directly scaled over their respective ranges of 0-10VDC and 0-20mA. For example, when the voltage output (ter-

минаl 2) is at 0VDC, the current output (terminal 1) is at 0mA. A 10VDC output produces a 20mA output. a 5VDC output produces a 10mA output, etc.

To test an output, each output can be manually set to any desired value within its range limits. The desired value is set in terms of a voltage value. For example, if the voltage is set to 5VDC, the current value will automatically be set to 10mA. When Diagnostic Mode is exited (DIP Switch 3 is set back to OFF position), outputs revert to program control.

To manually set the output: (In Advanced Diagnostic mode only)

1. Press the SELECT ANALOG OUTPUT Key, A green box will be placed around the first changeable output.
2. Use the keypad UP and DOWN arrow keys to place the green box around the desired output.
3. Press the ENTER (✓) Key. A box will appear showing the range of allowed voltage values.
4. Using the Keypad keys, enter the desired voltage value.

5. Press the ENTER (✓) Key. The entered voltage value and corresponding current value will be shown in the selected output box. The voltage value is at terminal 2 of the selected output. The current value is at terminal 1 of the selected output.

DIGITAL INPUTS

The state of each digital input is directly depicted by an LED. When the input is high (120VAC or +5VDC), the LED is illuminated. Otherwise, it is extinguished.

DIGITAL OUTPUTS

The state of each output is depicted by an LED. When the output is ON, it is illuminated. Otherwise, it is extinguished.

To test an output, each output can be manually set to ON or OFF. The motor controller circuit must be opened before manual control is allowed. Removing J2 from the I/O Board opens this circuit. When Diagnostic mode is exited (DIP Switch 3 is set back to the OFF position), outputs revert to program control.

To manually set the output:

1. Press SELECT DIGITAL OUTPUT Key. A yellow arrowhead will appear to the right of the first digital output.
2. Use the UP and DOWN arrow keys to place the arrowhead at the desired output.
3. Press ENABLE OUTPUT key to turn the output on. Press the DISABLE OUTPUT key to turn the output off.

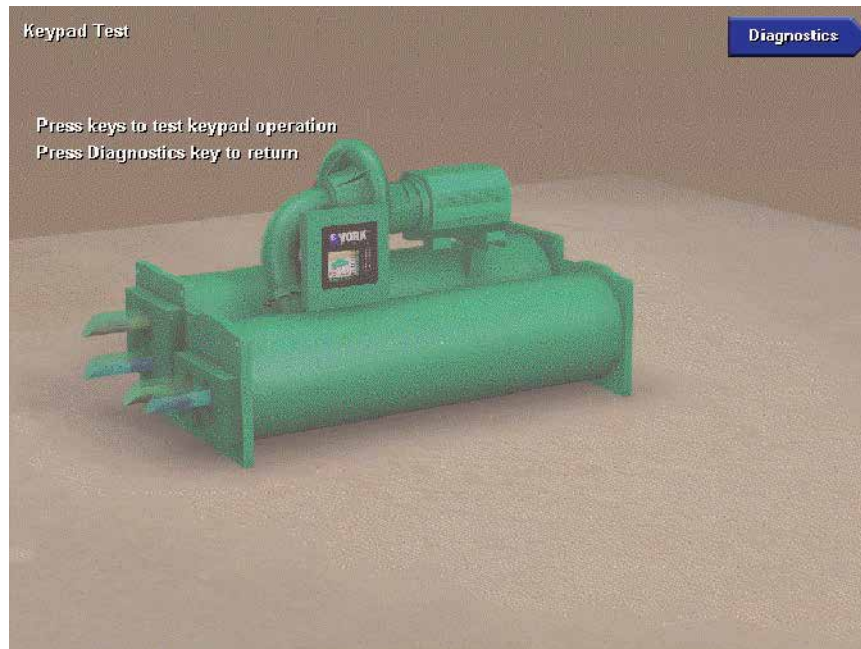
MODBUS COMMUNICATION ERROR COUNTERS

The following error counts are displayed:

- ID Faults
- Checksum Errors
- Error Packets
- Timeout Faults

Press the RESET ERROR COUNTERS key to reset these counters to zero.

KEYPAD TEST



00336VIP

FIGURE 114 - KEYPAD TEST SCREEN

This diagnostic is used to verify Keypad operation and the Microboard's ability to respond to a pressed key. Refer to the description of Keypad operation in *SECTION 11 - KEYPAD*.

PROCEDURE

1. Press each keypad key. As the key is pressed, an illuminated LED is displayed corresponding to the key location on the keypad.
2. Press the **DIAGNOSTICS** key to return to the **MAIN DIAGNOSTICS** Screen.

TROUBLESHOOTING

If an LED is not displayed when a key is pressed, the Keypad, Keypad Ribbon Cable or Microboard could be defective. Use the following procedure to locate the defective component.

1. **Keypad**
 - a. Disconnect the Ribbon Cable from the Keypad.
 - b. Identify row/column coordinate of the key to be tested. Refer to *Figure 38 on page 78*.

- c. In the Keypad connector, locate the pins of the row/column coordinate of the key of the key to be tested.
- d. Insert the leads of an Ohmmeter into the pins identified in step "C" above.
- e. Press the key to be tested. If the contact resistance is greater than 100 Ohms, the Keypad is defective.
- f. Release the key. If the contact resistance is less than 1 Meg Ohm, the Keypad is defective.

2. Ribbon Cable

Using an Ohmmeter, perform a continuity test on all conductors in the ribbon cable. An open circuit would indicate the Ribbon Cable is defective.

3. Microboard

There are no checks or measurements to be made on the Microboard. If the Keypad and Ribbon Cable check OK per the above procedures, the Microboard is most likely the cause of the problem.

DISPLAY TEST MAIN SCREEN



FIGURE 115 - DISPLAY TEST MAIN SCREEN

Each of the Display Diagnostics is accessed from this screen. After each diagnostic is performed, return to this screen, from which the next diagnostic can be selected. Refer to description of Display operation in *SECTION 8 - LIQUID CRYSTAL DISPLAY*, *SECTION 9 - DISPLAY INTERFACE BOARD*, and *SECTION 10 - DISPLAY BACKLIGHT INVERTER BOARD* of this manual.

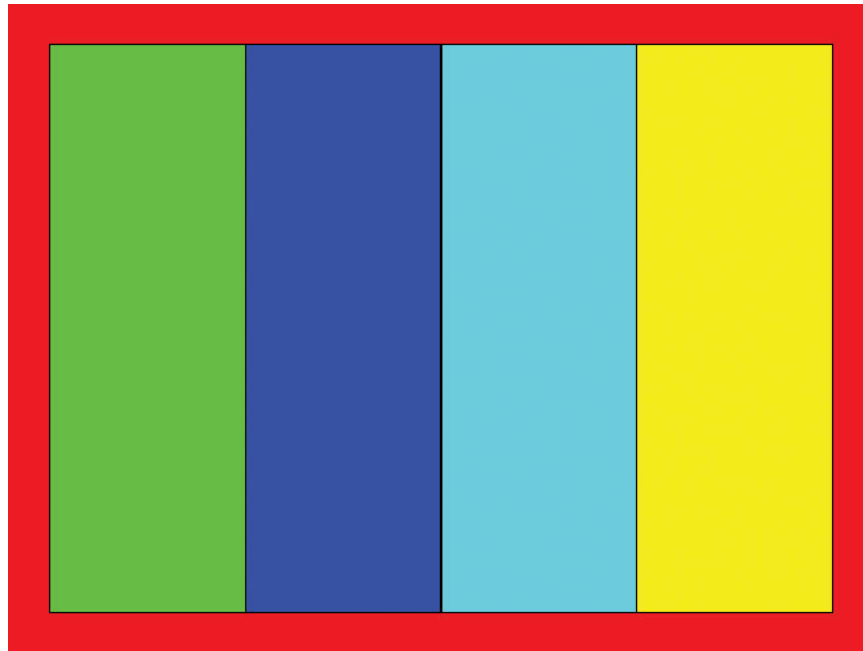
PROCEDURE

1. Press the appropriate keypad key to perform the desired test from the list below.
 2. Press the **CANCEL** (X) or **ENTER** (✓) key to terminate test and return to **DISPLAY TEST MAIN** screen, from which another test can be selected.
 3. When all the desired tests have been performed, press the **DIAGNOSTICS** key to return to the **MAIN DIAGNOSTICS** screen.
- **Bit Patterns** - This test is used to detect jitter and alignment defects. It verifies proper operation and compatibility of the Microboard Display Controller with the display. Four vertical bars of green, dark blue, light blue and yellow, outlined by a red border are displayed. If the vertical bars are not stable or straight, or the red border is not com-

pletely visible, then either the Microboard Program Jumpers are not configured correctly for the installed display or the Microboard Display controller is defective.

- **All Red** - This test verifies the operation of all of the red pixels. All of the red pixels are turned on to create a completely red screen. Any red pixels that do not turn on will appear as black dots on the display. If any black dots appear, first ascertain it is not caused by dirt that is lodged between the display surface and the protective plastic cover. It is normal for a small number of randomly spaced pixels to not illuminate. It is not necessary to replace the display if a small number of black dots appear. They will not be visible on the normal screens displayed outside of this diagnostic mode. However, large black areas would be indicative of a defective display.
- **All Green** - This test verifies the operation of all of the green pixels. All of the green pixels are turned on to create a completely green screen. Refer to description of “All Red” test above.
- **All Blue** - This test verifies the operation of all of the blue pixels. All of the blue pixels are turned on to create a completely blue screen. Refer to description of “All Red” test above.

- **All White** - This test verifies the display's ability to turn on all pixels to display a completely white screen. Any pixel that does not turn on will appear as a black dot. Refer to description of "All Red" test above.
- **All Black** - This test verifies the display's ability to turn off all pixels to display a completely black screen. Any pixel that does not turn off will appear as a red, green, blue or white dot. Refer to description "All Red" test above.

BIT PATTERNS TEST SCREEN

00338VIP

FIGURE 116 - BIT PATTERNS TEST SCREEN**TROUBLESHOOTING**

If any of the above tests do not perform correctly as described above, perform the applicable procedure below:

Test Failed

Bit Patterns - If the vertical bars are not straight or if the red border is not completely visible, either the Microboard Program Jumpers are not configured correctly or for the installed Display or the Microboard is defective.

All Red, All Green, All Blue, All White or All Black

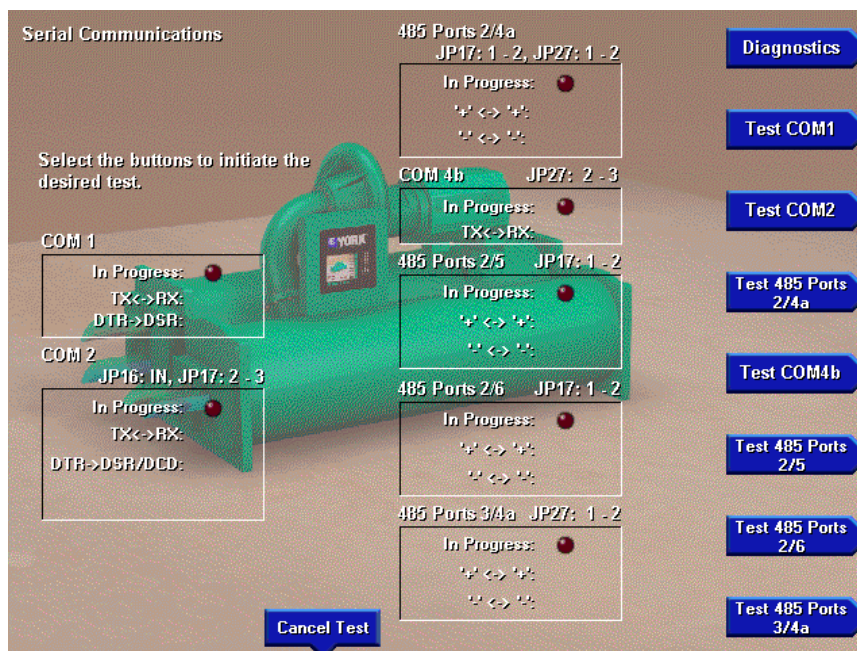
If these tests do not produce appropriate solid color screens, the Display Ribbon Cable, Display Interface Board, Microboard or Display could be defective. To locate the defective component perform tests in the following order:

1. **Display Ribbon Cable:** Using an Ohmmeter, perform a continuity test on all conductors in the ribbon cable. An open circuit would indicate the ribbon cable is defective.
2. **Display Interface Board:** Using an Ohmmeter, perform a continuity test on all conductors of the Interface Board. An open circuit would indicate the Interface Board is defective.

3. Microboard

- A. With the "All Red" test selected, the voltage at Microboard J5-6 through J5-11 (Red drivers bits 0-5), as measured to Gnd, should be greater than 3.0VDC. If not, the Microboard is defective.
 - B. With the "All Green" test selected, the voltage at Microboard J5-13 through J5-18 (Green drivers bits 0-5), as measured to Gnd, should be greater than 3.0VDC. If not, the Microboard is defective.
 - C. With the "All Blue" test selected, the voltage at Microboard J5-20 through J5-25 (Blue drivers bits 0-5), as measured to Grid, should be greater than 3.0VDC. If not, the Microboard is defective.
 - D. With the "All White" test selected, the voltage at Microboard J5-6 through J5-11, J5-13 through J5-18 and J5-20 through J5-25 should be greater than 3.0VDC. If not, the Microboard is defective.
 - E. With the "All Black" test selected, the voltage at Microboard J5-6 through J5-11, J5-13 through J5-18 and J5-20 through J5-25 should be greater than 1.0VDC. If not, the Microboard is defective.
4. **Display:** If the Display Ribbon Cable, Display Interface Board and Microboard check OK per the above procedures, the Display is most likely the cause of the problem.

SERIAL INPUTS/OUTPUTS TEST SCREEN



LD17963

FIGURE 117 - SERIAL INPUTS / OUTPUTS TEST SCREEN

This diagnostic is used to verify correct operation of the Serial Data Ports. There is a test for each of the five Serial Data Ports. Each RS-232 port (COM 1 and 4b) is tested by transmitting serial test data from outputs to inputs of each port. Both the transmit and receive functions as well as the control lines are tested. The RS-485 ports (COM 2, 3, 4a, and 6) are tested by transmitting serial test data from one RS-485 port to another. The TX/RX opto-coupled port (COM 5) is tested by transmitting serial test data from the TX output to the RX input. If the received data matches the transmitted data, PASS is displayed, indicating the serial port is OK. Otherwise, FAIL is displayed, indicating the serial port is defective. Prior to performing each test, the Service Technician must install a wire loop-back connection as described below.

PROCEDURE

1. Using small gauge wire, fabricate loop-back connections and install as follows for each port to be tested. Failure to install the loop-back connection or configure the Microboard Program jumper as noted will result in a FAIL outcome for the test.

	From	To
COM 1	J2-4 (TX)	J2-3 (RX)
	J2-5 (DTR)	J2-2 (DSR)

Microboard Program Jumper JP17 must be installed in position 2 and 3 for Com 2 RS-232.

	From	To
COM 2	J13-5 (TX)	J13-3 (RX)
	J13-7 (DTR)	J13-1(DCD) and J13-2(DSR)
	J13-4 (RTS)	J13-6 (CTS) and J13-8 (RI)

	From	To
RS-485 (COM 2/4a)	J13-8 (+)	J11-3 (+)
	J13-10 (-)	J11-2 (-)

Microboard Program Jumpers JP17 and JP27 must be installed in position 1 and 2.

	From	To
RS-485 (COM 3 and 4a)	J12-3 (+)	J11-3 (+)
	J12-2 (-)	J11-2 (-)

Microboard Program Jumper JP27 must be installed in position 1 and 2 for port 4a RS-485.

	From	To
COM 2 and 6	J13-8	TB2-3
	J13-10	TB2-2

Microboard Program Jumper JP17 must be installed in position 1 and 2 for port 2 RS-485.

	From	To
COM 4b	J2-7 (GTX)	J2-6 (GRX)

Microboard Program Jumper JP27 must be installed in position 2 and 3 for port 4b.

	From	To
COM 5	J15-1 (TX)	J15-4
	J15-2 (RX)	J15-5
	J15-3 (Common)	J15-6

- After connecting appropriate loop-back connections above, press the appropriate key to initiate the desired test. An LED will illuminate indicating the test is in progress. If it is desired to terminate the test, press the CANCEL TEST key. Test data is sent from an output to an input as described below. At the completion of each test, if the data received matches the data sent, the Serial Port operates properly and "PASS" is displayed. Otherwise, "FAIL" is displayed, indicating the Serial Port is defective. A "FAIL" result would be indicative of a defective Microboard. The following is a description of each test.

COM 1 – Two tests are performed. Test data is sent from TX (J2-4) to RX (J2-3) at 9600 Baud and DTR (J2-5) is set to a Logic High level and read at DSR (J2-2). If any test fails, COM 1 tests are terminated.

COM 2 – Three tests are performed. Test data is sent from TX (J13-5) to RX (J13-3) at 19200 Baud. DTR (J13-7) is set to a Logic High and read at DSR (J13-2) and DCD (J13-1). RTS (J13-4) is set to a

Logic High and read at CTS (J13-6) and R1 (J13-8). If any test fails, COM 2 tests are terminated.

RS-485 (COM 2 and 4a) – Test data is sent from COM 2 RS-485 port to COM 4a RS-485 port at 19200 Baud. Test data is then sent from COM 4a to COM 2 at the same rate. If either test fails, the test is terminated.

RS-485 (COM 3 and 4a) – Test data is sent from COM 3 RS-485 port to COM 4a RS-485 Port at 19200 Baud. Test data is then sent from COM 4a to COM 3 at the same rate. If either test fails, RS-485 tests are terminated.

RS-485 (COM 2 and 6) – Test data is sent from COM 2 RS-485 port to COM 6 RS-485 Port at 19200 Baud. Test data is then sent from COM 6 to COM 2 at the same rate. If either test fails, RS-485 tests are terminated.

COM 4b – Test data is sent from GTX (J2-7) to GRX (J2-6) at 19200 Baud.

COM 5 – Test data is sent from TX (J15-1) to J15-4 at 1200 Baud. This output turns the Microboard's loop-around test Transistor on and off, applying 0/+5VDC pulses from J15-5 to RX (J15-2) input.

- After all desired tests have been performed, press the **DIAGNOSTICS** key to return to the **MAIN DIAGNOSTICS** Screen.

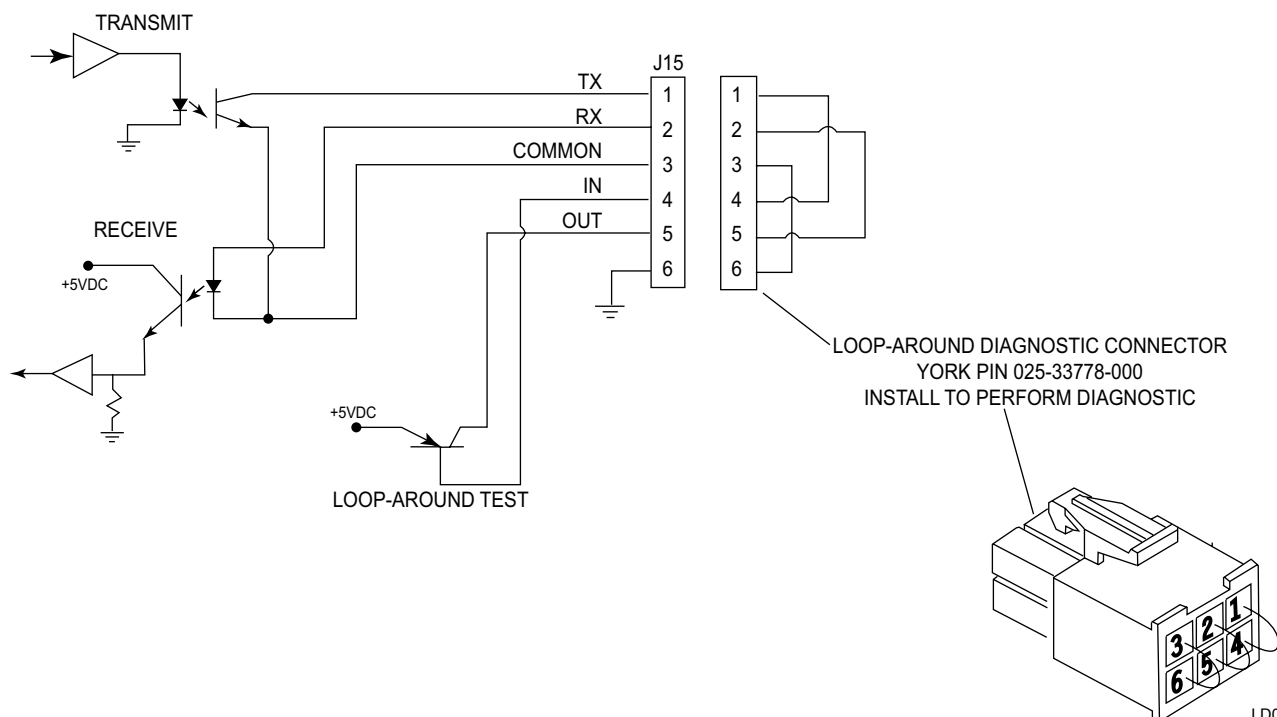


FIGURE 118 - MICROBOARD - COM 5 SERIAL DATA PORT

SECTION 33 - PRINTING

PRINTING OVERVIEW

A printer 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 in parenthesis.

- **Status** - Present system parameters (Printer, Home)
- **Setpoints** - Present programmed values of all setpoints (Printer, Setpoints)
- **Schedule** - Present 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.
- **Adaptive Capacity Control (ACC) Surge Map** - System conditions at instant all surge points were mapped. (Compressor Motor Variable Speed Drive applications; requires SERVICE access level) (Printer, ACC)
- **Trend** - Prints a snapshot of the existing TREND Screen data or prints new data collected after the TREND PRINT key is pressed.

The printer can be permanently connected to the Control Center or connected as required to produce 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.

The following figures are examples of the different print reports. Solid State Starter application print reports shown. Electro-Mechanical Starter and Variable Speed Drive reports are similar but print parameters applicable to those devices.

- Status or History - *Figure 123 on page 300*
- Setpoints - *Figure 124 on page 302*
- Schedule - *Figure 125 on page 304*

- Sales Order - *Figure 126 on page 304*
- Security Log - *Figure 127 on page 306*
- Trend - *Figure 128 on page 306*
- CUSTOM Screen - *Figure 129 on page 306*

ACCEPTABLE PRINTERS

The following printers can be used. Printers must be equipped with an RS-232 Serial interface.

- Okidata OKIPOS 441
- Brecknell CP130

The Control Center provides the required formatting control codes for the printers above when the printer is selected on the PRINTER Screen. These codes are transmitted through the serial interface to the printer to provide a proper print format.

Different printers require different formatting control codes. Other printers might provide proper operation when connected to the Control Center. However, the print format may not be correct or as desired.

Proceed with caution and use the following guidelines if an unlisted printer is selected:

1. All must be capable of RS-232 serial communications.
2. Primary differences between printers involve the formatting control codes required by the printer. These codes are sent from the Control Center to the printer. For example, Weigh-Tronix printers require a control code to select 40 column width. This same code is interpreted by the Okidata printer as an instruction to print wide characters. In some instances, a printer will ignore a code it cannot interpret.
3. The Control Center requires a busy signal from the printer when the printer receive buffer is full. This causes the Control Center to momentarily terminate data transmission until the printer can accept more data. The busy signal polarity must be asserted low when busy.

Okidata –**Models: OKIPOS 441**

- Dimensions:
6.9". wide x 9.64". deep x 5.98". high
- Paper: 3.0 in. wide
- Type: Dot Matrix Impact
- Purchase: 800-OKIDATA
Spare printer Ribbon Okidata 52119001 Black
- P/N Charcoal P/N 62113901
Beige P/N 62113601

**FIGURE 119 - OKIPOS PRINTER****PRINTER CONNECTIONS**

Connect the printer to the Control Center Microboard as follows. Only one printer can be connected at a time.

TABLE 47 - OKIDATA OKIPOS 441

MICROBOARD	PRINTER	FUNCTION
J2-4	pin 3	Tx (data to printer)
J2-2	pin 20	DSR (busy signal from printer)
J2-9	pin 7	Gnd
Cabinet		Shield

Hardware required:**Cable**

- #18 AWG stranded 50 ft. maximum length.

Connectors**Microboard**

- None. Strip 1/4" insulation from wire and insert into screw terminal block.

Printers

- Okidata - 25 pin plug DB-25P or equivalent; Shell DB-C2-J9 or equivalent.

PRINTER SETUP

The selected printer must be configured as follows. Refer to manual provided by printer manufacturer.

OKIDATA OKIPOS 441

1. With the printer power off, remove the two screws which hold the RS232 Interface Module.
2. Pull the RS232 Interface Module out of the printer.
3. Set DIP switch SW2-2 to OFF to select 19200 BPS. Do not change any other switch settings.
4. Re-install the RS232 Interface Module and two mounting screws.
5. Load paper and install the printer ribbon into the printer.
6. Connect the printer cable to the printer and the microboard.
7. Connect the printer power cable to the printer and plug into a 100 to 240VAC power source.

Brecknell –**Models: Brecknell CP130**

- Dimensions:
5.25" Long x 3.75" Wide x 2.5" High
- Paper: Thermal 57mm (2.25")
- Type: Dot Matrix
- Purchase: 800-637-0529 (North America)
+44 (0) 845-246-6717 (Europe & ME)
- P/N AWT 05-505788 (printer, cable, 1 roll of paper)
- P/N AWT 05-505594 (power supply)
- P/N AWT 05-505671 (case, 20 rolls of paper)

PRINTER CONNECTIONS

Connect the printer to the Control Center Microboard as follows. Only one printer can be connected at a time.

TABLE 48 - BRECKNELL CP130

Modify the cable and connect as shown below.

MICROBOARD	PRINTER	FUNCTION
J2-4	Pin 3	TX Data to the printer
J2-2	Pin 5	Busy signal from the printer
J2-9	Pin 6	Signal Common



LD17609

FIGURE 120 - BRECKNELL PRINTER

CONTROL CENTER SETUP

Chiller ID

Access Level Required: OPERATOR

Using the COMMS Screen, assign an identification number to the chiller. This number will appear at the top of each report.

Printer Setup

Access Level Required: OPERATOR

Using the COMMS Screen, the Control Center must be configured to transmit data in the same format as the printer is configured to receive the data. The following values must be entered.

- Baud Rate - Set to 9600 for Brecknell
19200 for OKIPOS
- Data Bits - 8
- Parity - None
- Stop Bits - 1

Printer Type

Access Level Required: OPERATOR

Using the PRINTER Screen, set the printer type to Weigh-Tronix.

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.

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	9 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.

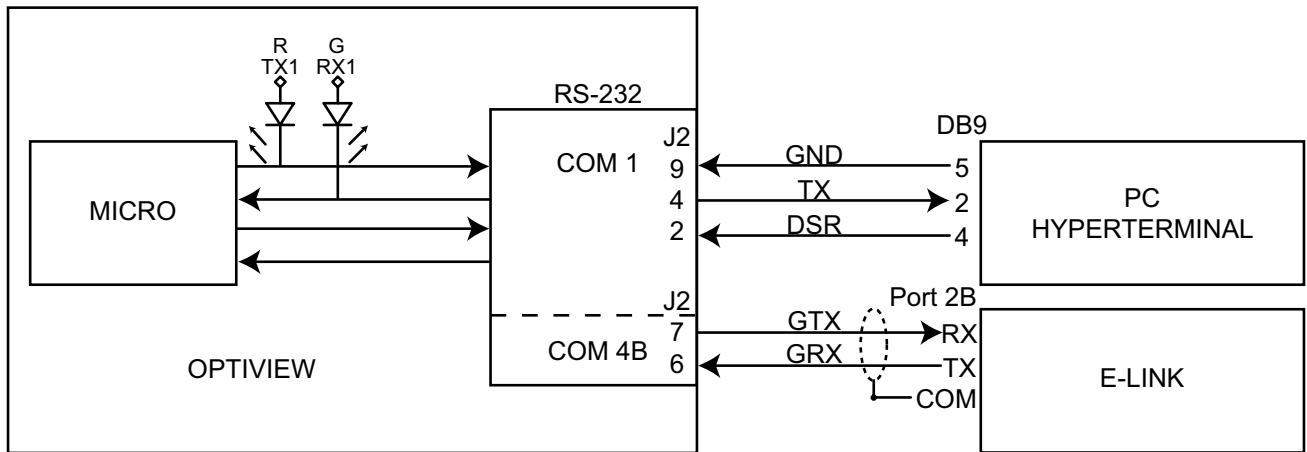
The following additional RS232 connections, are used to wire up serial devices for desktop and laptop computers.

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

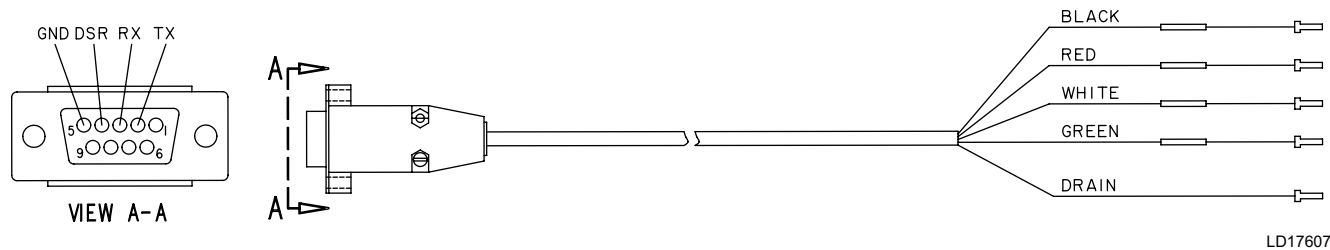
The connector on the PC has male pins; therefore, the mating cable needs to terminate DB9/F (female pin) connector.



LD14492

FIGURE 121 - 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).



LD17607

FIGURE 122 - OPTIVIEW PANEL TO PC SERIAL CABLE

YORK UPDATE

Status or History
 YORK History 1 (line only displayed for History Report)
 YORK Live Data (line only displayed for Status Report)
 -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
 YMC2 Chiller ID 1
 (c) 2010 Johnson Controls
 Sun 05 Dec 2010 8:04:27 AM

SAFETY SHUTDOWN - MANUAL RESTART

MBC - SPEED SIGNAL FAULT
 VSD - DC BUS ACTIVE

Controls C.OPT.18.00.213

Run Time 0 Days 1 Hr 14 Min 6 Sec

Operating Hours = 83 Hr
 Number Of Starts = 41
 Control Source = Digital
 Run Permissive = True

Evaporator

Chilled Liquid Pump = Run
 Chilled Liquid Flow Switch = Closed
 Active LCHLT Setpoint = 44.0 ~F
 Shutdown Temperature = 40.0 ~F
 Leaving Chilled Liquid Temperature = 44.8 ~F
 Entering Chilled Liquid Temperature = 50.3 ~F
 Evaporator Pressure = 46.4 PSIG
 Evaporator Saturation Temperature = 50.9 ~F
 Evaporator Refrigerant Temperature = 50.9 ~F
 (when sensor is Enabled)
 Evaporator Small Temp Difference = -6.1 ~F

Condenser

Condenser Liquid Pump = Stop
 Condenser Liquid Flow Switch = Closed
 Leaving Condenser Liquid Temperature = 70.6 ~F
 Entering Condenser Liquid Temperature = 67.9 ~F
 Condenser Pressure = 68.3 PSIG
 Condenser Saturation Temperature = 68.1 ~F
 Condenser Small Temp Difference = -2.5 ~F
 Drop Leg Refrigerant Temp = 68.5 ~F
 Subcooling Temperature = -0.4 ~F
 Head Pressure = 2.7 PSID
 (when HPC is Enabled)
 Head Pressure Setpoint = 23.0 PSID
 (when HPC is Enabled)
 PID Control Mode = Inactive
 (when HPC is Enabled)
 Control Valve Command = 0.0 %
 (when HPC is Enabled)
 Isolation Valves Opening = On
 (when Iso Vlv is Enabled)
 Isolation Valves Opened Limit Switch = On
 (when Iso Vlv is Enabled)
 Isolation Valves Closing = Off
 (when Iso Vlv is Enabled)
 Isolation Valves Closed Limit Switch = Off
 (when Iso Vlv is Enabled)

Compressor

Discharge Temperature = 79.0 ~F
 Discharge Superheat = 14.0 ~F

Surge

Surge Count = 0
 Delta P / P = 1.23
 Surge Window Time = 0 Min
 Surge Window Count = 0

Condenser Refrigerant Level Control

Condenser Refrigerant Level = 7.3 %
 Condenser Active Level Setpoint = 7.3 %
 Condenser Level Control State = Inactive
 Condenser Level Control Valve Command = 25.0 %
 Subcooler Effectiveness = 0.100
 Subcooler Effectiveness High Threshold = 1.500
 Subcooler Effectiveness Low Threshold = 0.400

Variable Geometry Diffuser

Active Stall Voltage = 0.22 V
 Active Stall Voltage Type = Standard
 Mach Number = 1.25
 Sec
 Discharge Pressure = 46.3 PSIG
 VGD Feedback Counts = 23456
 VGD Fault Code = 0000 0000 0000 0000

Variable Speed Drive

VSD Inverter = C.H035.04.01.02
 VSD Rectifier = C.H035.03.01.02
 Motor Run = Off
 VSD Fault = Off
 Input % Full Load Amps = 0.0 %
 Input Job Full Load Amps = 200 A
 VSD Output Voltage = 0 V
 VSD Output Frequency = 0.00 Hz
 Max Chiller Frequency = 345.00 Hz
 Input Power = 0 kW
 Input kW Hours = 5543 kWh
 L1 Voltage Total Harmonic Distorti = 8.0 %
 L2 Voltage Total Harmonic Distortion = 8.0 %
 L3 Voltage Total Harmonic Distortion = 3.0 %
 L1 Input Current Total Demand Distortion = 0.0 %
 L2 Input Current Total Demand Distortion = 0.0 %
 L3 Input Current Total Demand Distortio = 0.0 %
 Input KVA = 1 kVA
 Input Power Factor = 0.00
 Motor % Full Load Amps = 0.0 %
 VSD Command = Run
 VSD Control State = Run
 VSD Inverter State = Run
 Phase Rotation = ABC
 Precharge Active = On
 Precharge Complete = False
 DC Bus Regulating = Off
 DC Bus Voltage = 696 V
 Input Current Limit = Off
 Cooling System = On
 L1 Input Voltage (peak) = 698 V
 L2 Input Voltage (Peak) = 707 V
 L3 Input Voltage (Peak) = 696 V
 L1 Input Voltage (RMS) = 698 V
 L2 Input Voltage (RMS) = 707 V
 L3 Input Voltage (RMS) = 696 V
 L1 Input Current (RMS) = 1 A
 L2 Input Current (RMS) = 1 A
 L3 Input Current (RMS) = 0 A
 Phase A Output Voltage (RMS) = 0 V
 Phase B Output Voltage (RMS) = 0 V
 Phase C Output Voltage (RMS) = 0 V
 Phase A Output Current (RMS) = 0 A
 Phase B Output Current (RMS) = 0 A
 Phase C Output Current (RMS) = 0 A
 Phase A Rectifier Baseplate Temperature = 81 ~F
 Phase B Rectifier Baseplate Temperature = 80 ~F
 Phase C Rectifier Baseplate Temperature = 77 ~F
 Phase A Inverter Baseplate Temperature = 87 ~F
 Phase B Inverter Baseplate Temperature = 82 ~F
 Phase C Inverter Baseplate Temperature = 80 ~F
 Internal Ambient Temperature 1 = 77 ~F
 Internal Ambient Temperature 2 = 77 ~F
 Test Mode = Disabled
 Manual DC Bus = Disabled
 Manual VSD Cooling = Disabled
 ID Faults = 0
 Checksum Errors = 0
 Error Packets = 0
 Timeout Faults = 0
 VSD Fault Waveform Available = Yes

FIGURE 123 - SAMPLE PRINTOUT (STATUS OR HISTORY)

Variable Speed Drive - Fault Snapshot			

VSD Output Voltage	= 0 V	VGD Position	= 25.00 %
VSD Output Frequency	= 0.00 Hz	VGD Control Mode	= Auto
Input Power	= 0 kW	HGBP Command	= 25.0 %
L1 Voltage Total Harmonic Distortion	= 8.0 %	(when HGBP enabled)	
L2 Voltage Total Harmonic Distortion	= 8.0 %	HGBP Control Mode	= Auto
L3 Voltage Total Harmonic Distortion	= 3.0 %	(when HGBP enabled)	
L1 Input Current Total Demand Distortion	= 0.0 %	Head Pressure	= 0.0 PSID
L2 Input Current Total Demand Distortion	= 0.0 %	Evaporator Pressure	= 46.40 PSIG
L3 Input Current Total Demand Distortion	= 0.0 %	Condenser Pressure	= 68.30 PSIG
Input KVA	= 1 kVA	Leaving Chilled Liquid Temperature	= 44.80 ~F
VSD Control State	= Run	Magnetic Bearing Controller	
VSD Inverter State	= Run	-----	
Phase Rotation	= ABC	MBC Control Mode	= Auto
Precharge Active	= On	MBC Levitation Command	= On
Precharge Complete	= False	MBC Rotation Command	= On
DC Bus Regulating	= Off	Levitation Mode	= On
DC Bus Voltage	= 696 V	Rotation Mode	= On
Input Current Limit	= Off	MBC Alarm	= On
Cooling System	= On	MBC Alive	= On
L1 Input Voltage (Peak)	= 698 V	Rotation Allowed	= On
L2 Input Voltage (Peak)	= 707 V	MBC Fault	= On
L3 Input Voltage (Peak)	= 696 V	Motor Speed	= 44 Hz
L1 Input Voltage (RMS)	= 698 V	MBC Input Voltage	= 150 V
L2 Input Voltage (RMS)	= 707 V	V13 Position	= 14 ~m
L3 Input Voltage (RMS)	= 696 V	W13 Position	= 13 ~m
L1 Input Current (Peak)	= 1 A	V24 Position	= 13 ~m
L2 Input Current (Peak)	= 1 A	W24 Position	= 12 ~m
L3 Input Current (Peak)	= 0 A	Z12 Position	= 2 ~m
L1 Input Current (RMS)	= 1 A	V1 Current	= 1.803 A
L2 Input Current (RMS)	= 1 A	V2 Current	= 1.772 A
L3 Input Current (RMS)	= 0 A	V3 Current	= 0.878 A
Phase A Output Voltage (RMS)	= 0 V	V4 Current	= 0.972 A
Phase B Output Voltage (RMS)	= 0 V	W1 Current	= 1.992 A
Phase C Output Voltage (RMS)	= 0 V	W2 Current	= 1.788 A
Phase A Output Current (Peak)	= 0 A	W3 Current	= 0.721 A
Phase B Output Current (Peak)	= 0 A	W4 Current	= 0.894 A
Phase C Output Current (Peak)	= 0 A	Z1 Current	= 1.082 A
Phase A Output Current (RMS)	= 0 A	Z2 Current	= 1.443 A
Phase B Output Current (RMS)	= 0 A	Rotor Elongation	= 102 ~m
Phase C Output Current (RMS)	= 0 A	VW13 Soft Landing Counter	= 0
Phase A Rectifier Baseplate Temperature	= 81 ~F	VW24 Soft Landing Counter	= 0
Phase B Rectifier Baseplate Temperature	= 80 ~F	Z12 Soft Landing Counter	= 0
Phase C Rectifier Baseplate Temperature	= 77 ~F	VW13 Hard Landing Counter	= 0
Phase A Inverter Baseplate Temperature	= 87 ~F	VW24 Hard Landing Counter	= 0
Phase B Inverter Baseplate Temperature	= 82 ~F	Z12 Hard Landing Counter	= 0
Phase C Inverter Baseplate Temperature	= 80 ~F	Power Fail Landing Counter	= 0
Internal Ambient Temperature 1	= 77 ~F	A13 Unbalance	= 0 ~m
Internal Ambient Temperature 2	= 77 ~F	B13 Unbalance	= 0 ~m
Test Mode	= Disabled	A24 Unbalance	= 0 ~m
Motor Monitoring		B24 Unbalance	= 0 ~m
-----		Az Vibration	= 0 ~m
Motor Winding Phase A Temp Z1 End	= 71.0 ~F	Bz Vibration	= 0 ~m
Motor Winding Phase B Temp Z1 End	= 71.0 ~F	Z1 Temperature	= 91 ~F
Motor Winding Phase C Temp Z1 End	= 71.0 ~F	Z2 Temperature	= 77 ~F
Motor Winding Phase A Temp Z2 End	= 71.0 ~F	MBC Amplifier Temp	= 88 ~F
Motor Winding Phase B Temp Z2 End	= 71.0 ~F	MBC Operation Time	= 3 Days
Motor Winding Phase C Temp Z2 End	= 71.0 ~F	SDR Counter	= 1
Average Winding Temperature	= 71.0 ~F	First Alarm Code	= 16
Estimated Rotor Temperature	= 123.4 ~F	Active Parameter Set	= 0
Motor Housing Temperature	= 71 ~F	ID Faults	= 0
Motor Housing Temperature Setpoint	= 71 ~F	Checksum Errors	= 0
Motor Winding Temperature Setpoint	= 121 ~F	Error Packets	= 0
Ambient Dew Point Temperature	= 71 ~F	Timeout Faults	= 0
(when Dew Point Enabled)		Power Panel	
Motor Cooling Valve Command	= 25.0 %	-----	
Motor Cooling Control State	= Inactive	Coolant Voltage	= On
Capacity Control		Power Loss Time	= 15 Sec
-----		UPS Line / Charging	= On
Control State	= Inactive	UPS Inverter	= Off
Load Limit	= Inactive	UPS Fault	= Off
VSD Frequency Command	= 0.00 Hz	UPS Battery V+	= On
VSD Output Frequency	= 0.00 Hz	UPS Battery Voltage	= 12.0 V
VSD Control Mode	= Auto	UPS Inverter Enable	= On
Active Anti-Surge Minimum Frequency	= 0.00 Hz	Power Panel Temperature	= 79.0 ~F
Anti-Surge Minimum Frequency	= 0.00 Hz	Power Panel Cooling System Run	= On
Anti-Surge Transient Offset	= 0.00 Hz	Manual Power Panel Cooling	= Disabled
VGD Command	= 25.00 %	Line Low Battery Voltage Offset	= 0.0 V
		Inverter Low Battery Voltage Threshold	= 11.0 V
		Battery Voltage Faults	= Enabled

FIGURE 118 - SAMPLE PRINTOUT (STATUS OR HISTORY) (CONT'D)

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
 YMC2 ~Chiller ID 1
 (c) 2010 Johnson Controls
 Mon 01 Nov 2010 9:25:18 AM

Software Versions

Controls	= C.OPT.18.01.213
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	= 23.0 PSID
(when HPC is Enabled)	
Type	= 0-10V
(when HPC is Enabled)	
PID Output	= Direct
(when HPC is Enabled)	
Minimum PID Output	= 0.0 %
(when HPC is Enabled)	
Shutdown Position	= 0.0 %
(when HPC is Enabled)	
Head Pressure Control P	= 2.00
(when HPC is Enabled)	
Head Pressure Control I	= 2.00
(when HPC is Enabled)	
Head Pressure Control D	= 0.00
(when HPC is Enabled)	
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 124 - 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 %	
Pulldown Demand Limit	=	70 %	
Pulldown 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

FIGURE 119 - 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

FIGURE 125 - SAMPLE PRINTOUT (SCHEDULE)**YORK SALES ORDER****YMC2 -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 = YMC2XXXXXX

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)

FIGURE 126 - 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

FIGURE 121 - SAMPLE PRINTOUT (SALES ORDER)
(CONT'D)

YORK SETPOINT CHANGE LOG	
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

FIGURE 127 - SAMPLE PRINTOUT (SECURITY LOG REPORT)

YORK TREND	
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

FIGURE 128 - 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 %

FIGURE 129 - SAMPLE PRINTOUT (CUSTOM SCREEN REPORT)

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

TABLE 49 - SI METRIC CONVERSION

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

TEMPERATURE

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

Example: $(45.0^{\circ}\text{F} - 32^{\circ}) \times 0.5556 = 27.2^{\circ}\text{C}$

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

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



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