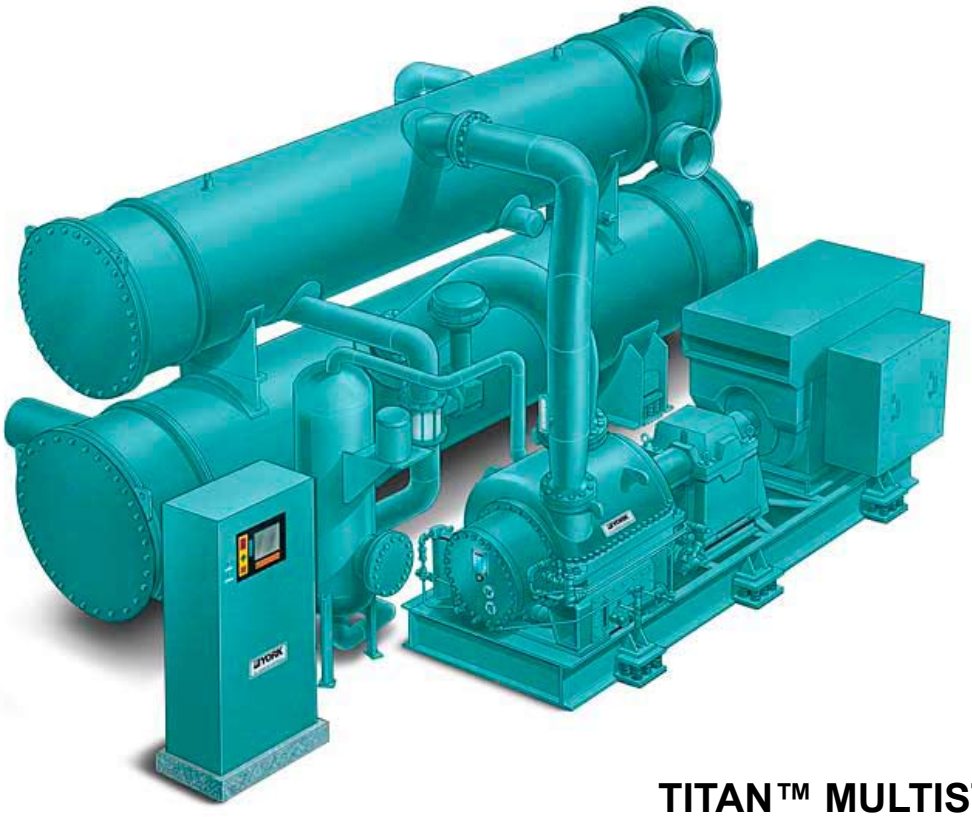
YORK BY JOHNSON CONTROLS	OM TITAN™ MULTI-STAGE CHILLER	
OPERATING INSTRUCTIONS	NEW RELEASE	Form 160.72-O1 (810)



TITAN™ MULTISTAGE CHILLER WITH RETROFIT OPTIVIEW CONTROL CENTER KIT AND ELECTRO-MECHANICAL STARTER

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 this individual posseses 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.

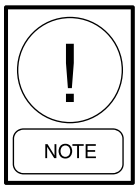
SAFETY SYMBOLS

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 not proper care is not taken.

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

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



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

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

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. While Johnson Controls makes no commitment to update or provide current information automatically to the manual owner, that information, if applicable, can be obtained by contacting the nearest Johnson Controls Service office.

Operating/service personnel maintains the responsibility of the applicability of these documents to the competitive equipment the kit is installed on. 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 with the owner of the equipment prior to performing any work on the chiller.

ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
Service Instructions for YORK Titan Multi-Stage Chiller with Retrofit OptiView Controls	160.72-M1
Renewal Parts for YORK Titan Multi-Stage Chiller with Retrofit OptiView Controls	160.72-RP1

NOMENCLATURE

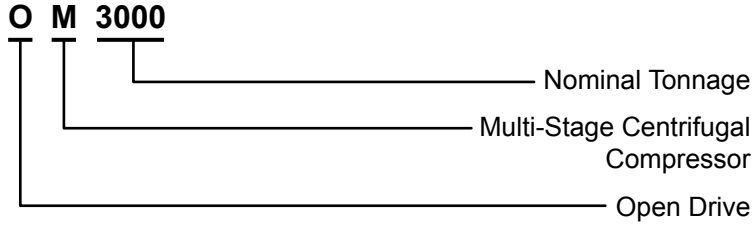


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FIGURE LIST

TABLE LIST

SECTION 1 - INTRODUCTION

The following instructions outline the procedures to be followed for the operation of the YORK OM Titan™ retrofitted with OptiView Controls.

After the installation and during the Initial Start-Up, the Johnson Controls Start-Up Engineer will instruct the operators in the operation and necessary maintenance to be performed to maintain the YORK OM Titan™ retrofitted with OptiView Controls. This instruction should be thoroughly read by the operators to familiarize themselves with the operation of the unit.

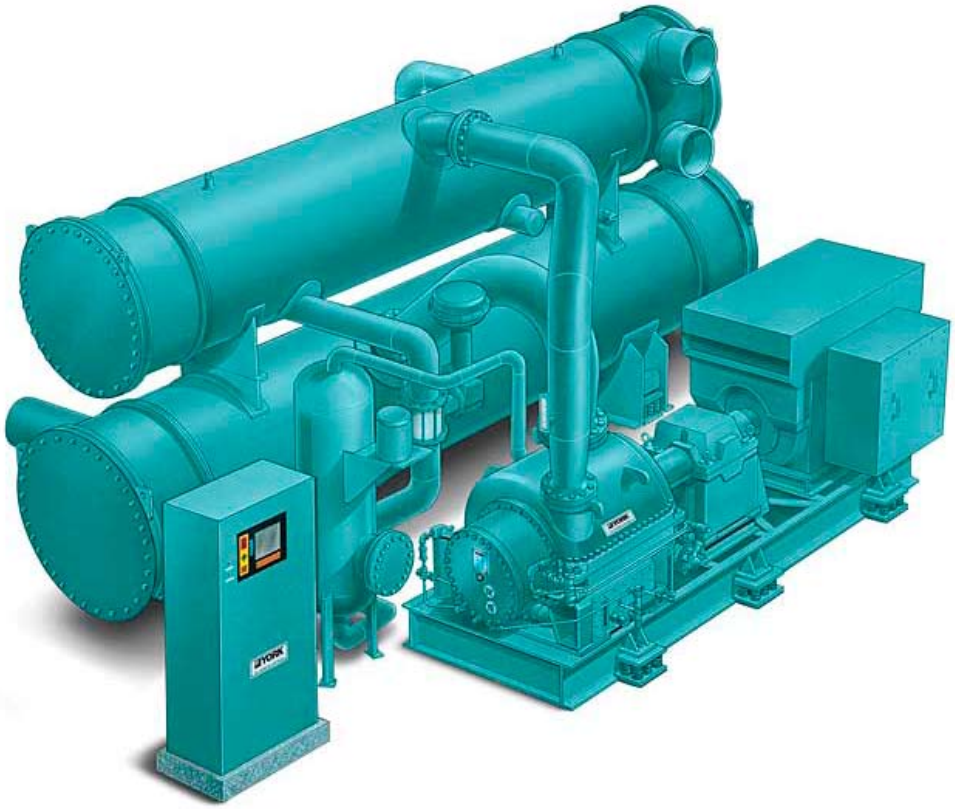
It is important that those responsible for the installation, operation and maintenance of this system be provided with a copy of this manual so that they may thoroughly study its contents. This will help ensure successful operation of the system.

Standard Johnson Controls operating instructions are included in this manual. Where the specific instruction is different than the standard instructions, the specific instruction should be followed. On matters not covered by the specific instruction, the standard instruction may be used.

It is suggested that a factory-trained representative of Johnson Controls supervise any major service or maintenance operation. This is especially recommended should it be necessary to open the compressor or heat exchangers for any reason.

To obtain a service representative contact:

Your local Johnson Controls Service office at 1-800/524-1330.



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SECTION 2 - PRINCIPLES OF OPERATION

The OM Titan Chiller operates under the following principles:

The fluid (to be cooled) flows through the tube side (inside the tubes) of the evaporator. Liquid refrigerant is located in the shell side of the evaporator, and is maintained at its saturation temperature by the compressor. The liquid refrigerant is at a lower temperature than the circulated fluid. Sensible heat flows from the fluid, through the evaporator tube walls to the refrigerant, thereby cooling the fluid. The heat transferred to the refrigerant causes it to boil.

In order to sustain this process, the refrigerant is held at the correct saturation temperature by drawing refrigerant vapor from the shell side of the evaporator. This is achieved through the use of the 'M' series multistage centrifugal compressor. The vapor drawn from the evaporator is compressed by the compressor to a sufficiently high pressure so that the superheated temperature of the discharge vapor is higher than that of the condenser water. The high pressure refrigerant is contacted to the condenser water (on the tube side of the condenser) and is condensed to a high pressure liquid. This liquid is flashed in one or two stages, cooling each time and returning back to the evaporator to complete the cycle. Flashing is the process by which the high pressure liquid is exposed to a lower pressure causing the refrigerant to boil, cooling the condensed refrigerant liquid. The vapor created in this process (flash gas) is drawn back into the compressor through the compressor side load (inter-stage) port or ports and the colder refrigerant liquid is used to provide cooling.

The M Series multistage compressor operates on the centrifugal principle. The compressor consists of two or more impellers which draw gas into the center (suction) and accelerates the vapor to high velocity (kinetic energy) at the discharge of the impeller. As the vapor exits the impeller, the velocity of the gas reduces as it passes through the diffuser (located around the circumference of the impeller), and the kinetic energy is transformed into potential (pressure) energy. This process is repeated for each impeller (compression stage). The compressor shaft is rotated by means of either, an electric motor (via a speed increasing gearbox), a direct drive steam turbine, a gas turbine (via a speed reducing gearbox) or a reciprocating gas engine (via a speed increasing gearbox).

OM SUBCOOLING

Description and Operation

The OM Titan uses a two or more staged compressor with flash type intercooler. The liquid is flashed off at an intermediate pressure, to lower the enthalpy of the liquid refrigerant as it enters the evaporator, thus providing a greater refrigeration effect in the evaporator.

The OM Titan utilizes liquid subcooling in addition to the interstage cooling cycle for better efficiency. By passing liquid refrigerant over tubes in a subcooler section, the refrigerant temperature is lowered from the saturation temperature, to a subcooled temperature closer to the entering condenser water temperature. By lowering the refrigerant temperature ahead of the high stage expansion device, the amount of flash gas in the intercooler is lowered, thus reducing the gas flow through the second or possibly third stage impeller and therefore lowering overall horsepower.

The OM Titan chiller utilizes a subcooler bundle integral to the main condenser located in the bottom section of the condenser shell. As liquid refrigerant condenses in the main condenser, it drains to the bottom of the main condenser section. At the bottom, the refrigerant is channeled to the subcooler inlet area, located at the return water box end of the condenser (opposite from the water inlet nozzle). Refrigerant liquid enters the subcooler section from the sides and bottom (there is a plate blocking the top). Dual subcoolers are utilized in condensers with tube lengths 20 feet or longer.

The level of refrigerant in the subcooler is adjusted at full load to provide a liquid level an inch or two above the subcooler at the inlet area. This level needs to be sufficient at full load to prevent refrigerant gas from entering the subcooler. The refrigerant liquid flows axially down the shell length over the subcooler tubes, and exits out the bottom at the condenser water inlet end.

A pneumatic ball valve is mounted in the piping leaving the subcooler. This valve responds to the subcooler inlet level transmitter signal to maintain the refrigerant level above the subcooler tubes. A ball valve was selected for its ability to control over a wide range of chiller loads and "head" or differential pressure conditions. The valve is selected to fail open and opens on chiller shutdown, primarily to drain liquid from the

subcooler section. This is a precaution against tube freezing, by ensuring that liquid refrigerant is not present in the subcooler during chiller pump down operations or if a major leak occurs.

OM INTERCOOLING

Description

There may be one or two stages of liquid intercooling furnished with the OM Titan chiller in the primary refrigeration circuit between the condenser and the evaporator. The intercooler performs several functions. The primary function is to flash the high pressure condensed refrigerant to an intermediate pressure corresponding to the M series multistage compressor's inter-stage pressure. Flashing the high pressure liquid at the intermediate pressure reduces the horsepower required to compress the flash gas. This portion of the flash gas is only compressed from an intermediate pressure (inter-stage) to condensing pressure rather than from evaporator (low pressure) to condensing pressure. Secondary functions are the separation of the flash gas from the liquid refrigerant and providing a liquid seal between the high and low sides of the system.

The intercooler consists of a pressure vessel with internally mounted mesh eliminators, a float assembly, and baffles. The eliminators, located in the top of the vessel, separate droplets of liquid refrigerant from the flash gas before it flows to the compressor inter-stage port. A low pressure rectangular vane type float valve assembly maintains a liquid seal between the high and low side of the system. The pressure drop across the float valve causes the refrigerant to flash to an intermediate pressure lowering the refrigerant's temperature to the corresponding temperature. A baffle is installed in the intermediate chamber over the float ball to minimize the effect of turbulence on the float ball and to aid in maintaining steady float operation.

Sight glasses and a hand operating device are provided to permit visual float valve inspection and manual float valve operation. A thermometer well, located near the float valve, is used for checking liquid temperatures. A manway with sight glasses allows for access to the float valve assembly and adjusting arm.

Operation

Liquid refrigerant leaving the level control valve flashes to the intercooler pressure (and temperature). Upon entering the intercooler the liquid refrigerant separates from the flash gas. The flash gas returns to the compressor inter-stage port after passing through the mist eliminators. The liquid refrigerant, at intermediate pressure, flows to the float valve. The float valve will open, maintaining a liquid level in the intercooler, and allowing refrigerant flow to the evaporator. As the liquid refrigerant flows through the float valve it is exposed to evaporator pressure and flashes to the corresponding pressure and temperature.

If the OM Titan chiller is equipped with a second stage intercooler then the liquid leaving first stage intercooler is supplied to the second stage intercooler before allowing refrigerant to flow to the evaporator.

Maintenance and Service

Maintenance on intercooler consists primarily of keeping the float valve free to assure steady valve operation. Service consists of replacing an occasional float ball and arm assembly.

If the system capacity suddenly decreases as indicated by an increase in secondary refrigerant temperature, check float valve operation as follows:

If the low pressure float valve sticks in the open position, the liquid seal between the compressor intermediate pressure and evaporator pressure will be broken and gas at intermediate pressure, will flow directly into the evaporator. This will cause a reduction in capacity with possible increase in suction pressure and possible refrigerant carryover back to the compressor and increased current (amperage) readings.

If the float valve sticks, move the float up and down by means of the hand operation device. If this does not correct the condition it will be necessary to remove system refrigerant charge before removing the float through the manway opening to check the working parts and mechanisms. Inspect the float ball to be sure it is not collapsed or leaking. A collapsed or leaking ball (filled with refrigerant) will cause the valve to remain closed.

SECTION 3 - OPTIVIEW CONTROL CENTER

INTRODUCTION

The Optiview™ Control Center is a microprocessor based control system for R-22 or R134a centrifugal chillers. It controls the leaving chilled liquid temperature via pre-rotation vane controls and has the ability to limit motor current via control of the pre-rotation vanes. It is compatible with Electro-mechanical starter applications.

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. For the novice user, the locations of various chiller parameters are clearly and intuitively marked. Instructions for specific operations are provided on many of the screens.

The graphic display also allows information to be represented in both English (temperatures in °F and pressures in PSIG) and Metric (temperatures in °C and pressures in kPa) mode.

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.

There are certain screens, displayed values, programmable setpoints and manual control shown in this manual that are for Service Technician use only. They are only displayed when logged in at **SERVICE** access level or higher. The setpoints and parameters displayed on these screens are explained in detail in the *Service Instructions (Form 160.72-M1)*. **These parameters affect chiller operation and should NEVER be modified by anyone other than a qualified Service Technician. They are shown in this manual for reference only.**

Advanced Diagnostics and troubleshooting information for Service Technicians are included in the *Service Instructions (Form 160.72-M1)*. Also included in the service manual are detailed descriptions of chiller features, such as the Hot Gas Bypass Control, Interstage Valve control, PID Tuning control, Remote Setpoints, and Input/Output Sensor tuning.

The control center expands the capabilities of remote control and communications. By providing a common networking protocol through the Building Automation System (BAS), YORK Chillers not only work well individually, but also as a team. This new protocol allows increased remote control of the chiller, as well as 24-hour performance monitoring via a remote site. In addition, compatibility is maintained with the present network of BAS communications. The chiller also maintains the standard digital remote capabilities as well. Both of these remote control capabilities allow for the standard Energy Management System (EMS) interface:

- Remote Start
- Remote Stop
- Remote Leaving Chilled Liquid Temperature Setpoint adjustment (0-10VDC, 2-10VDC, 0-20mA or 4-20mA) or Pulse Width Modulation
- Remote Current Limit Setpoint adjustment (0-l0VDC, 2-10VDC, 0-20mA or 4-20mA) or Pulse Width Modulation
- Remote “Ready to Start” Contacts
- Safety Shutdown Contacts
- Cycling Shutdown Contacts

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OPTIVIEW CONTROL CENTER

FIGURE 1 - OPTIVIEW CONTROL CENTER

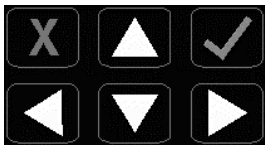
The OptiView Control Center display is highlighted by a full screen graphics display. This display is nested within a standard keypad and is surrounded by "soft" keys which are redefined based on the currently displayed screen. Eight buttons are available on the right side of the panel and are primarily 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 Start/Stop control is operated via a three-position spring loaded selector type switch. When positioned all the way to the right, it is considered in the **STOP/ RESET** position. When in the middle position, this is considered the **RUN** state.

When moved to the left-most position, it is considered in the **START** state. Each state is described in detail below:

- **STOP / RESET (O)**

  When in this position, the chiller will not run under any condition. For safety reasons, this position is required for many maintenance tasks to be completed (such as proximity probe and vane calibration). In addition, the switch must be placed in this state following a safety shutdown before

the chiller is allowed to restart. This guarantees that manual intervention has taken place and the shutdown has been acknowledged

- **START (◄)**

  The switch can only remain in this position when being acted upon by a manual force. Once the user has released the switch, it automatically reverts to the **RUN** position. Generally, this state only occurs momentarily as the operator attempts to locally start the unit. Once this position has been sensed, if all fault conditions are cleared, the unit will enter the system prelube (start sequence).

- **RUN (▌)**

  When in this position, the chiller is able to operate. The switch spring-returns to this state after it has been moved to the **START** position. When in this state, the chiller is allowed to function normally and will also allow the chiller to automatically restart following a cycling shutdown. The switch must be in this state to receive a valid remote start signal when operating under a remote control source.

INTERFACE CONVENTIONS OVERVIEW

The new graphical display on each control panel allows a wide variety of information to be presented to the user. 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 operating range, the high limit value will be displayed along with the '>' symbol; if it is below the normal operating range, the low limit value will be displayed along with the '<' symbol. In some cases, the value may be rendered invalid by other conditions and the display will use X's to indicate this.

PROGRAMMABLE

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

Access Level

In order to program any setpoints on the system, the user must first login with an appropriate access level. When power is applied to the chiller, the system begins with an Access Level of **VIEW**. This will allow the user to navigate to most screens and observe the values displayed there. However, the user will not be allowed to change any values. To change any values, the user must return to the **Home Screen** (shown by default when power is applied to the system) and use the **LOGIN** button or utilize the **CHANGE SETPOINTS** key described below. At this point, the user will be prompted to enter a User ID and the corresponding Password. By default, the User ID is zero (0). In order to gain standard **OPERATOR** level access, the Password would be entered as **9 6 7 5**, using the numeric keypad. **OPERATOR** access reverts to the **VIEW** level after 10 continuous minutes without a keypress. If a custom User ID and Password have been defined (see User Screen), the user may enter that User ID and the corresponding Password value.

If the correct password is received, the user is authorized with the appropriate Access Level. If an incorrect password is entered, the user is notified of the failure and prompted again. At this point the user may retry the password entry or cancel the login attempt. The letters Y-O-R-K will display whether the correct or incorrect code is entered.

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 pre-rotation vanes, variable orifice or hot gas bypass valve. 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.

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.

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 1 - ANALOG INPUT RANGES

ANALOG	LOW	HIGH	UNITS
Analog Input Chilled Liquid Supply Temperature	30	130	°F
Chilled Liquid Return Temperature	30	130	°F
Condenser Water Entering Temperature	30	130	°F
Condenser Water Leaving Temperature	30	130	°F
Evaporator Refrigerant Liquid Temperature	30	130	°F
Condenser Temperature (Compressor Discharge)	30	250	°F
Gear Oil Cooler Leaving Water Temperature	30	130	°F
Compressor Shaft End Oil Return Temperature	30	250	°F
Condenser Refrigerant Temperature	30	130	°F
Compressor Thrust Bearing Oil Return Temperature	30	250	°F
Compressor Oil Cooler Entering Water Temperature	30	130	°F
Compressor Oil Cooler Leaving Water Temperature	30	130	°F
Intercooler Refrigerant Liquid Temperature	30	130	°F
Compressor Main Oil Temperature	30	250	°F
Evaporator Refrigerant Pressure	0	200	PSIG
Compressor Sump Oil Temperature	30	250	°F
Condenser Pressure (Compressor Discharge)	0	300	PSIG
Intercooler Refrigerant Pressure	0	200	PSIG
Compressor Main Oil Pressure	0	300	PSIG
Compressor Sump Oil Pressure	0	200	PSIG
Compressor Thrust Bearing Oil Pressure	0	300	PSIG
Compressor Balance Piston Pressure	0	200	PSIG
Gear Supply Oil Pressure	0	100	PSIG
Compressor Oil Pressure After Filter	0	300	PSIG
Chilled Water Flow	0	12,000	GPM
Compressor Motor Current	0	200	AMPS
Compressor Oil Cooler Water D/P	0	168	"WG
Gear Oil Cooler Water D/P	0	168	"WG
Condenser Oil Cooler Water D/P	0	528	"WG
Gear Supply Oil Temperature	30	250	°F
Chilled Water Entering Pressure	0	300	PSIG
Supply Air Pressure	0	200	PSIG
Condenser Water Entering Pressure	0	200	PSIG

TABLE 1 - ANALOG INPUT RANGES (CON'T)

ANALOG	LOW	HIGH	UNITS
Condenser Water Leaving Pressure	0	200	PSIG
Condenser Water Flow	0	12,000	GPM
Subcooler Liquid Level	0	100	%
Subcooler Liquid Temperature	30	130	°F
Gear Shaft Pump Oil Pressure	0	100	PSIG
Gear Hi Speed Shaft End Bearing Temperature	30	250	°F
Gear Hi Speed Blind End Bearing Temperature	30	250	°F
Gear Lo Speed Shaft End Bearing Temperature	30	250	°F
Gear Lo Speed Blind End Bearing Temperature	30	250	°F
Motor Shaft End Bearing Temperature	30	250	°F
Motor Blind End Bearing Temperature	30	250	°F
Compressor Oil Temperature After Oil Cooler	30	250	°F
Chilled Water Leaving Pressure	0	300	PSIG
Compressor Motor kW	0	5000	kW

HOME SCREEN

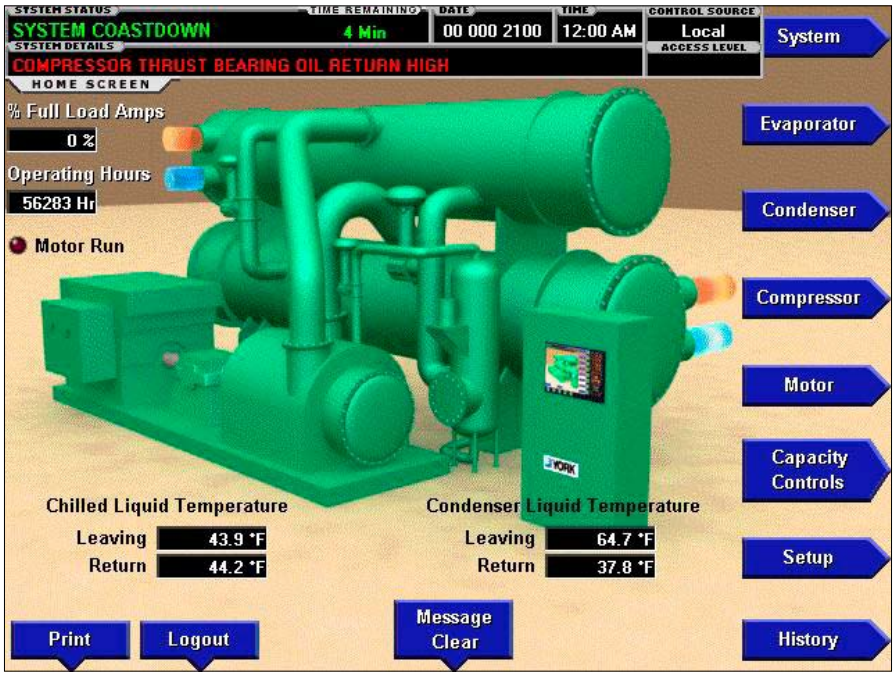


FIGURE 2 - HOME SCREEN

OVERVIEW

When the chiller system is powered on, the above default display appears. The primary values which must be monitored and controlled are shown on this screen. The Home Screen display depicts a visual representation of the chiller itself. Animation indicates chilled liquid flow.

DISPLAY ONLY

% Full Load Amps

This displays the percentage of full load amps utilized by the compressor motor.

Operating Hours

Displays the cumulative operating hours of the chiller.

Motor Run (LED)

Is **ON** when the digital output controlling the Motor Starter contact is on.

Chilled Liquid Temperature - Leaving

Displays the temperature of the liquid as it leaves the evaporator.

Chilled Liquid Temperature - Return

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 - Return

Displays the temperature of the liquid as it enters the condenser.

PROGRAMMABLE

Login

Access Level Required: VIEW

The Control Center 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.

The **OPERATOR** access level reverts to the **VIEW** level after 10 continuous minutes without a keypress. **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.

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 below.)

Message Clear

Access Level Required: SERVICE

When certain safety or cycling conditions have been detected and the chiller has been shutdown, the main status display of the chiller will continue to display a message indicating the cause of the shutdown. Using this key, the message can be cleared once the condition has been removed.

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 purge functions.

Compressor

A detailed view of all the compressor parameters. This includes Hot Gas Bypass Control and the compressor lubrication system.

Motor

A detailed view of the motor controller parameters, specific to the controller type presently utilized on the chiller system. This allows programming of the Current Limit and the Pulldown Demand Limit values.

Capacity Controls

The primary control of the chiller is shown on this screen that includes the temperature control, motor limit control, pressure overrides, and anti-surge setpoints. It also provides access to the majority of setpoints, alarms, and trips for the system, as well as the PID tuning and calibration of actuators.

Setup

This screen displays the current configuration of the system and provides for changing options such as temperature sensors, flow transmitters, and valves. It is also the gateway to many of the general system setup parameters such as Date/Time, Display Units, Printer Setup, etc.

History

This screen provides access to a snapshot of system data at each of the last 10 shutdown conditions, all trending functions and custom screens.

SYSTEM SCREEN

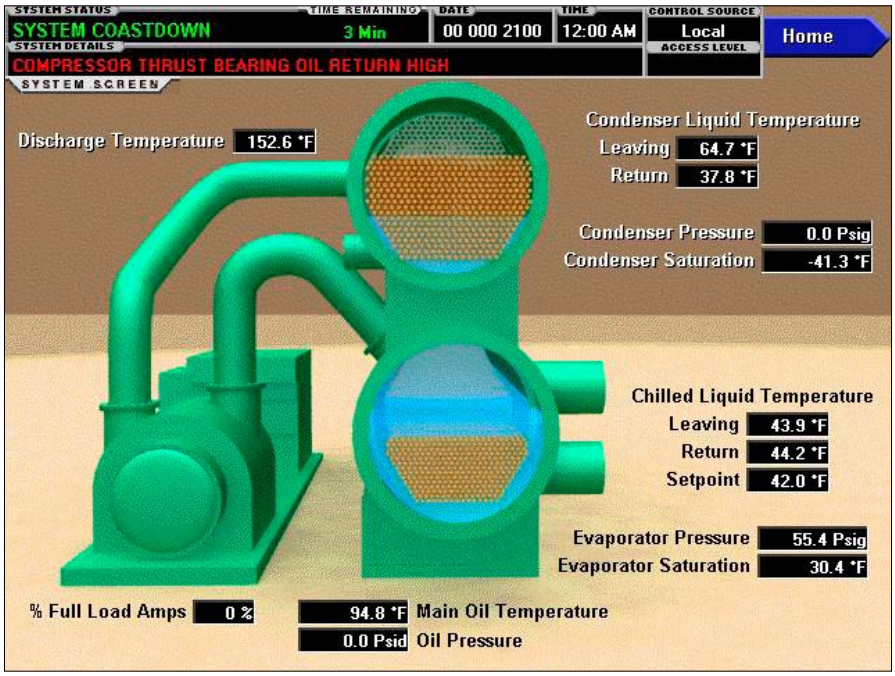


FIGURE 3 - SYSTEM SCREEN

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.

Condenser Liquid Temperature - Leaving

Displays the temperature of the liquid as it leaves the condenser.

Condenser Liquid Temperature - Return

Displays the temperature of the liquid as it enters the condenser.

Condenser Pressure

Displays the refrigerant pressure in the condenser.

Condenser Saturation

Displays the present saturation temperature in the condenser.

Chilled Liquid Temperature - Leaving

Displays the temperature of the liquid as it leaves the evaporator.

Chilled Liquid Temperature - Return

Displays the temperature of the liquid as it enters the evaporator.

Chilled Liquid Temperature - Setpoint

Displays the active temperature setpoint to which the chiller is controlling the evaporator liquid. This value could come from a 0-20mA or 4-20mA, 0-10VDC or 2-10VDC input in Analog Remote mode, PWM signal in Digital Remote mode, E-Link gateway interface in the BAS mode or a locally programmed value in local mode.

Evaporator Pressure

Displays the present refrigerant pressure in the evaporator.

Evaporator Saturation

Displays the present saturation temperature in the evaporator.

Main Oil Temperature

Displays the temperature of the oil being supplied to the compressor.

Oil Pressure

Displays the pressure differential between the high side oil pressure transducer (output of oil filter) and the low side oil pressure transducer (sump compressor housing). If either of the transducers used to calculate this differential is out of range, the display field will show XX.X.

% Full Load Amps

Displays the percentage of full load amps utilized by the compressor motor.

PROGRAMMABLE

None

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

EVAPORATOR SCREEN

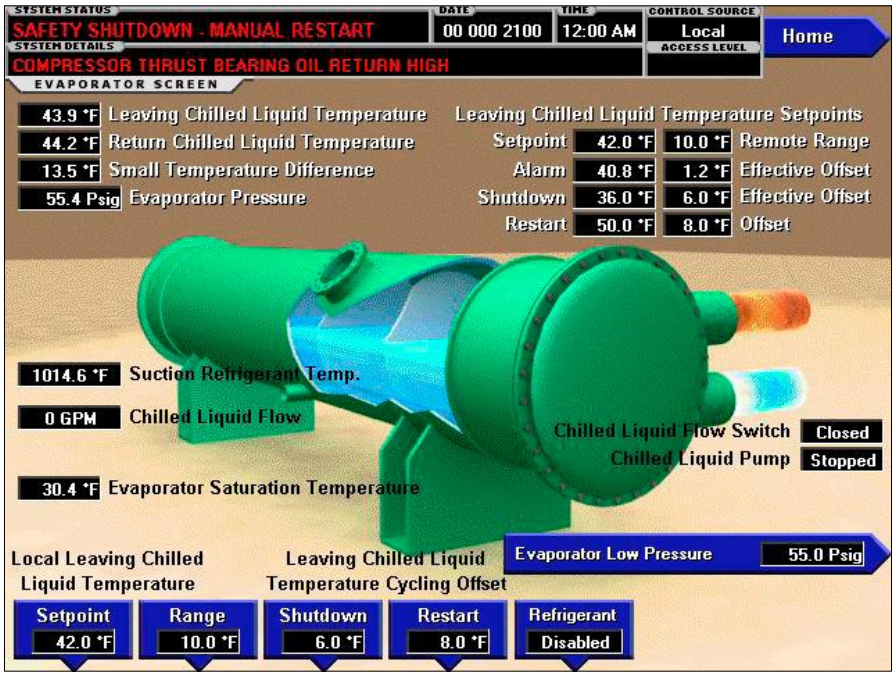


FIGURE 4 - EVAPORATOR SCREEN

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.

Return Chilled Liquid Temperature

Displays the temperature of the liquid as it enters the 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 present, 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 -Alarm

Displays the temperature at which a warning alarm will be displayed on the system details message bar.

Leaving Chilled Liquid Temperature Setpoints -Shutdown

Displays the Leaving Chilled Liquid Temperature at which the chiller will shut down to avoid over-cooling the building. By default this value is 4°F below the Leaving Chilled Setpoint.

Leaving Chilled Liquid Temperature Setpoints -Restart

Displays the Leaving Chilled Liquid Temperature at which the chiller will restart after it has shut down due

to over-cooling temperature. By default, the chiller will restart at the Leaving Chilled Liquid Temperature Setpoint.

Chilled Liquid Flow Switch (Open / Closed)

Displays whether the liquid flow is present in the evaporator.

Chilled Liquid Pump

Displays the command presently sent by the control center to the Chilled Liquid Pump (**RUN** or **STOP**).

Evaporator Low Pressure

Displays the low pressure setpoint in the evaporator.

Evaporator Saturation Temperature

Displays the present Saturation Temperature in the evaporator.

Chilled Liquid Flow

Displays the Chilled Liquid Flow, in GPM, if the sensor is present.

Suction Refrigerant Temperature

Displays the present suction refrigerant vapor temperature leaving the evaporator. If the sensor is present and enabled under Options on the Configuration screen. The service access level is required to enable/disable this display.

Evaporator Refrigerant Temperature (Not Shown)

Displays the sensor is present refrigerant liquid temperature in the evaporator. If the sensor is present and enabled at the soft key toggle on this screen. The service access level is required to enable/disable this display.

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). A remote device can provide an analog signal (0-20mA or 4-20mA, 0-10VDC or 2-10VDC) in Analog Remote mode or PWM signal in Digital Remote mode that changes the setpoint by creating an offset above the operator programmed **Base** Leaving Chilled Liquid Temperature setpoint. This offset may be defined up to 10.0°F or 20.0°F above the **Base** setpoint (see the Remote Leaving Chilled Liquid Temperature Setpoint Range description above). Additionally, the E-Link gateway (in BAS Remote mode) can define the setpoint through a serial data stream. In this case, the incoming setpoint is not an offset that is applied to the locally programmed **Base** setpoint value, but rather is the setpoint value itself.

Local Leaving Chilled Liquid Temperature - Range

Access Level Required: OPERATOR

This is the range over which an analog (0-20mA or 4-20mA, 0-10VDC or 2-10VDC) in Analog Remote Mode or a digital signal (PWM) in Digital remote mode can reset the Leaving Chilled Liquid Temperature setpoint above the operator programmed **Base** Setpoint (see below). Programmable as either 10°F or 20°F, with a default of 20°F, it is added to the **Base** value to create a range over which the remote device can reset the setpoint. For example, if this setpoint is programmed for 10°F and the operator programmed value is 45°F, then the remote device can set the Leaving Chilled Liquid Temperature setpoint over the range 45.0° - 55.0°F.

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 below the setpoint, to a minimum cutout of 36°F (water), 34°F (water with Smart Freeze enabled) or 6°F (brine). It establishes the minimum allowable temperature for the Leaving Chilled Liquid Temperature and prevents over-cooling of the building. Anytime the Leaving Chilled Liquid Temperature setpoint is increased, the shutdown threshold is 36.0°F (water) or 6.0°F (brine) for the next ten (10) minutes. If Smart Freeze (see below) is enabled, the threshold is 34.0°F for the next 10 minutes. After ten (10) minutes have elapsed, the shutdown threshold becomes the programmed setpoint value.

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 above the setpoint, to a maximum restart value of 80°F. The chiller will automatically restart when this temperature is reached. This setpoint can be used to reduce chiller cycling by delaying the chiller restart until the cooling load has increased.

PROGRAMMABLE

Refrigerant (Enabled / Disabled)

Access Level Required: SERVICE

When an Evaporator Refrigerant Temperature Sensor has been installed it must be enabled via this toggle before the system will utilize the new, enhanced resolution input. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

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CONDENSER SCREEN

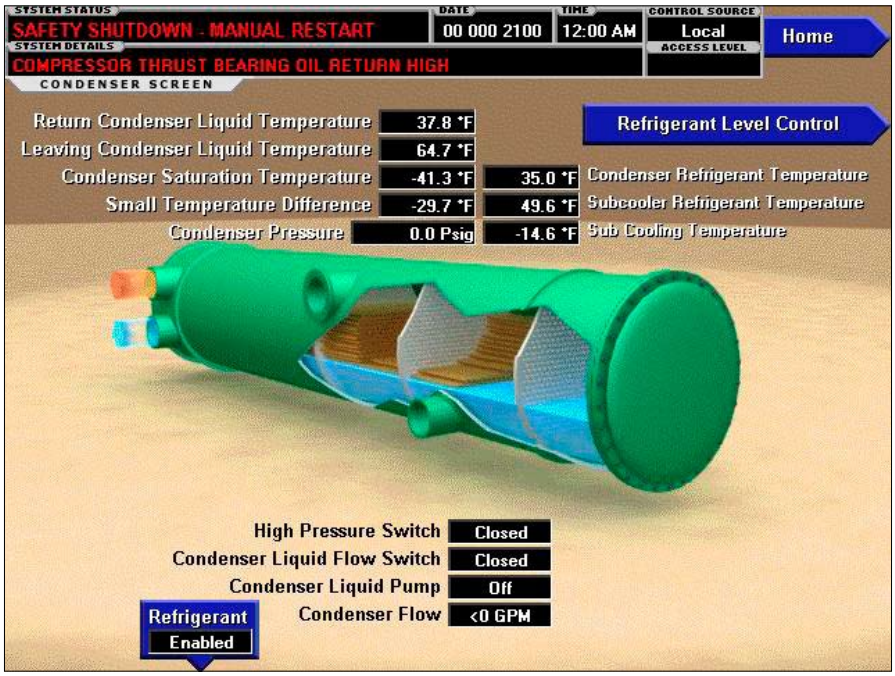


FIGURE 5 - CONDENSER SCREEN

3

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

Return 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.

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.

Condenser Refrigerant Temperature

Displays the temperature of the refrigerant in the condenser, If the sensor is present and enabled at the soft key toggle on this screen. The service access level is required to enable/disable this display.

Subcooler Refrigerant Temperature

Displays the temperature of the subcooler refrigerant in the condenser. If the sensor is present and enabled under Options on the Configuration screen. The service access level is required to enable/disable this display.

Sub Cooling Temperature

This display will only appear if either one of the following applies.

Displays the difference between the Condenser Saturated Temperature and Subcooled Refrigerant Temperature. If the Subcooler Refrigerant Temperature is present and enabled under Options on the Configuration screen. The service access level is required to enable/disable this display.

Displays the difference between the Condenser Refrigerant Temperature and Subcooled Refrigerant Temperature. If both the Condenser Refrigerant Temperature and Subcooler Refrigerant Temperature sensors are present and enabled.

See information above concerning **Condenser Refrigerant Temperature** and **Subcooler Refrigerant Temperature.**

The service access level is required to enable/disable these displays

High Pressure Switch (Open / Closed)

Displays the present position of the High Pressure Switch. This will indicate whether a high pressure fault is present.

Condenser Liquid Flow Switch (Open / Closed)

Indicates whether flow is present in the condenser.

Condenser Liquid Pump (Run / Off)

Indicates whether Condenser Liquid Pump is operating.

Condenser Flow

Displays the Condenser Water Flow, in GPM, if the sensor is present.

PROGRAMMABLE

Refrigerant (Enabled / Disabled)

Access Level Required; SERVICE

When a Condenser Refrigerant Temperature Sensor has been installed it must be enabled via this toggle before the system will utilize the new, enhanced resolution input. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Refrigerant Level Control

Access Level Required; SERVICE

Moves to the sub-screen allowing programming of the Refrigerant Level Control setpoints.

REFRIGERANT LEVEL CONTROL SCREEN

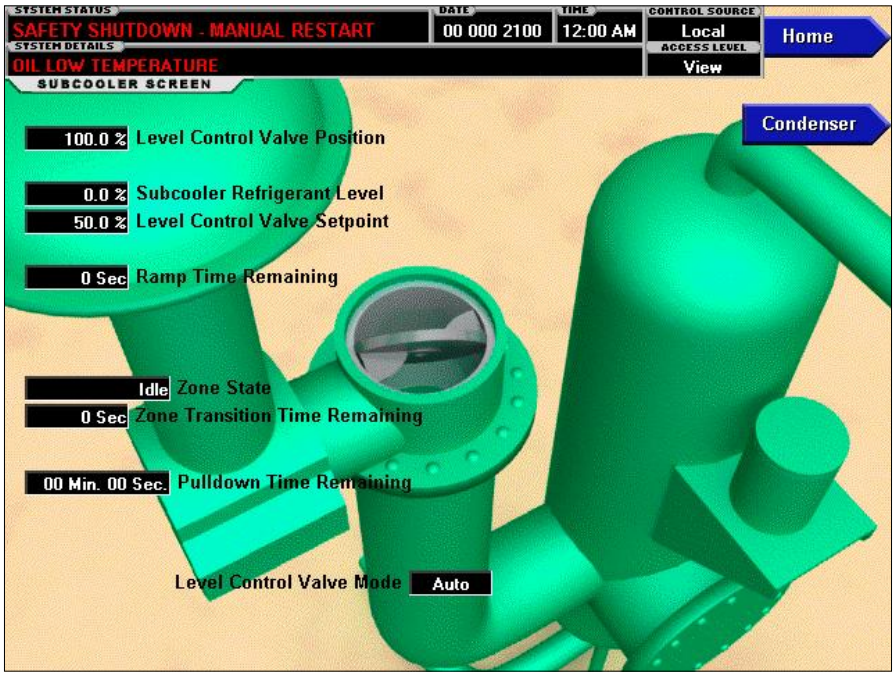


FIGURE 6 - REFRIGERANT LEVEL CONTROL SCREEN

OVERVIEW

This screen displays a cutaway view of the refrigerant level control valve. All setpoints relating to the refrigerant level control are maintained on this screen. Through animation, the level control valve position is displayed. In addition, the refrigerant flow control valve can be manually operated.

DISPLAY ONLY

Level Control Valve Position (CV)

Displays the current liquid control valve position

Subcooler Refrigerant Level (PV)

Displays the current refrigerant level

Level Control Valve Setpoint (SP)

Displays the current liquid control valve setpoint

Ramp Time Remaining (RR)

Displays countdown ramp time that is applied to the level control valve. The ramp time will begin counting at the end of the "Pulldown Time Remaining". During the ramp time the level control valve will move from its start position to control position.

Zone State

Displays the state of control applied to level control valve. Zone-1 / Zone-2 / Idle / Pulldown / Zone-2 to Zone-1 / Manual. There are two PID calculations that are set up on the PID Tuning Screen.

Zone-1 - Operates when the difference between the Subcooler Refrigerant Level and Refrigerant Control Valve Setpoint is less than the "Zone Transition Delta".

Zone-2 - Operates when the difference between the Subcooler Refrigerant Level and Refrigerant Control Valve Setpoint is greater than the "Zone Transition Delta".

Idle - When the chiller is not running.

Pulldown - When the Level Control Valve is being held at its startup position.

Zone-2 to Zone-1 - When the PID is transitioning from Zone-2 to Zone-1 while delayed by the "Zone Transition Time" delay.

Manual - When the Level Control Valve is in manual control position.

Zone Transition Time Remaining

Displays the delay time between transitions from Zone-2 to Zone-1.

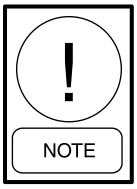
Pulldown Time Remaining

Displays the time remaining from start-up before the liquid valve will modulate to maintain the refrigerant level setpoint. This setpoint is set by the Johnson Control Service Technician at commissioning.

Level Control Valve Mode

Indicates whether the liquid level control is under manual or automatic control.

PROGRAMMABLE



Requires access level of SERVICE. Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

[Level Control Valve] Raise (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to open the valve in increments of 1% or more from its current position.

[Level Control Valve] Lower (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to close the valve in increments of 1% or more from its current position.

[Level Control Valve] Set (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to input a specific value from 0 to 100 % to position the valve.

[Level Control Valve] Switch to Manual

Access Level Required: SERVICE

This key toggles between Switch to Manual and Switch to Auto to allow for control of the Level Control Valve. The Level Control Valve Mode display will indicate the control mode of the valve and prevent transfer of the mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red

Operation

Access Level Required: SERVICE

The mode of operation of the Level Control Valve may be set for PID control or fixed position.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Condenser

Access Level Required: VIEW

Returns user to the Condenser Screen.

COMPRESSOR SCREEN

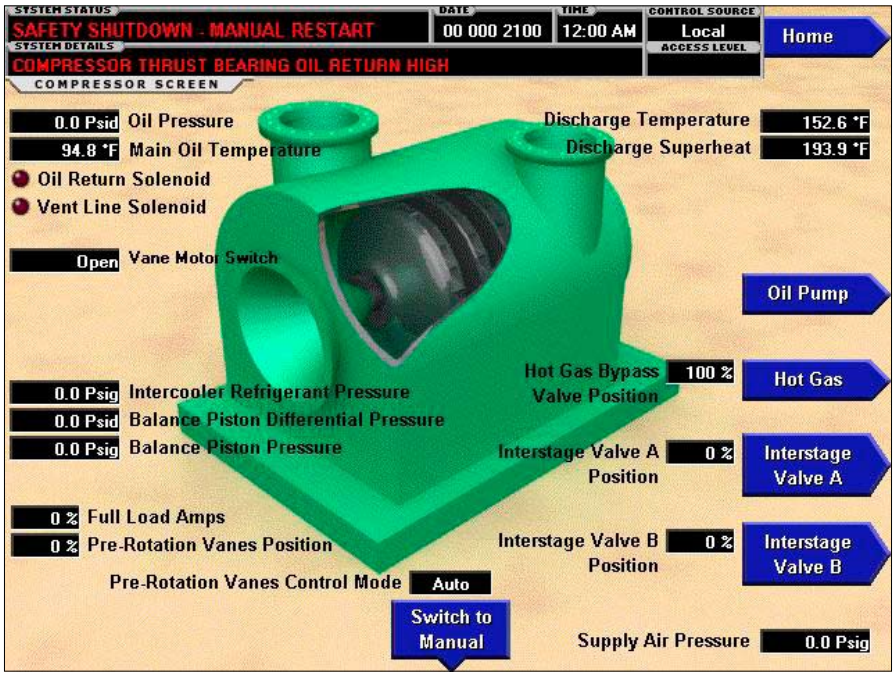


FIGURE 7 - COMPRESSOR SCREEN

OVERVIEW

This screen displays a cutaway view of the chiller compressor, revealing the impeller and shows all conditions associated with the compressor. In addition, with the proper Access Level, the pre-rotation vanes may be manually controlled. 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 the Compressor Lubrication System and for configuring the Hot Gas Bypass and the Interstage Valve.

DISPLAY ONLY

Oil Pressure

Displays the pressure differential between the high side oil pressure transducer and the low side oil pressure transducer (oil sump). If either of the transducers used to calculate this differential is out of range, the display field will show XX.X.

Main Oil Temperature

Displays the temperature of the main oil supply feeding the compressor bearings.

Oil Return Solenoid (LED)

Illuminates when the solenoid is energized.

Vent Line Solenoid (LED)

Illuminates when the solenoid is energized.

Vane Motor Switch

Indicates whether the vanes are completely closed. (only when option is enable) Start will be inhibited if vanes are in the open position.

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 temperature, calculated as (Discharge temperature - Condenser Saturated temperature).

Intercooler Refrigerant Pressure

Displays the pressure of the refrigerant in its gaseous state in the intercooler.

Balance Piston Differential Pressure

Displays the pressure differential between the intercooler and the balance piston.

Balance Piston Pressure

Displays the pressure of the refrigerant in its gaseous state at the Balance Piston.

Full Load Amps

This value displays the present motor current as a percentage of the Full Load Amps (FLA) utilized by the compressor motor.

Pre-Rotation Vanes Position

This value displays the present position of the Pre-Rotation Vanes as a percentage between 0 and 100%.

Pre-Rotation Vanes Control Mode

Indicates whether the vanes are under manual or automatic control.

Hot Gas Bypass Valve Position

This value displays the present position of the Hot Gas Valve as a percentage from 0 to 100 percent closed.

Interstage Valve Position

This value displays the present position of the Interstage Valve as a percentage from 0 to 100 percent open.

Supply Air Pressure

This value displays the main Supply Air Pressure being supplied to all pneumatic devices.

PROGRAMMABLE

[Pre-Rotation Vanes] Raise (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to open the valve in increments of 1% or more from its current position.

[Pre-Rotation Vanes] Lower (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to close the valve in increments of 1% or more from its current position.

[Pre-Rotation Vanes] Set (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to input a specific value from 0 to 100 % to position the valve.

[Pre-Rotation Vanes] Switch to Manual

Access Level Required: SERVICE

This key toggles between Switch to Manual and Switch to Auto to allow for control of the Pre-rotation vanes. The Pre-Rotation Vanes Control Mode display will indicate the control mode of the valve and prevent transfer of the mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Oil Pump

Access Level Required: VIEW

Moves to the compressor lubrication screen that shows temperatures and pressures for the compressor oil lubrication system and allow manual control of the auxiliary oil pump.

Hot Gas

Access Level Required: VIEW

Moves to the subscreen that allows programming of the Hot Gas Bypass control setpoints and manual control of the Hot Gas Bypass valve. Only displayed if Hot gas Bypass feature has been enabled on the CONFIGURATION Screen. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

Interstage Valve Screens

Access Level Required: VIEW

Moves to the subscreen that allows programming of the Interstage Gas Valve control setpoints and manual control of the Interstage Gas Valve. Only displayed if Interstage Gas Valve feature has been enabled on the CONFIGURATION Screen. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

COMPRESSOR LUBRICATION SCREEN

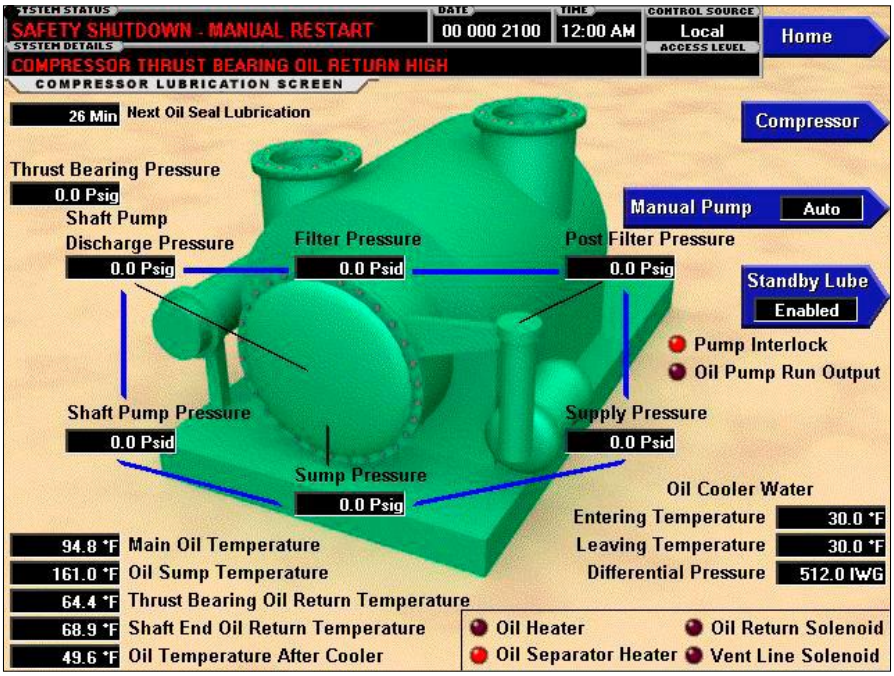


FIGURE 8 - COMPRESSOR LUBRICATION SCREEN

OVERVIEW

This screen displays the major components as well as the temperatures, pressures, and outputs for the oil pump compressor lubrication system. In addition, this screen allows manual control of the auxiliary oil pump for up to 10 minutes.

DISPLAY ONLY

Next Oil Seal Lubrication

Displays in minutes when the oil seal will be lubricated.

Thrust Bearing Pressure

Displays the oil pressure at the thrust bearing as measured by a transducer, if available.

Shaft Pump Discharge Pressure

Displays the oil pressure supplied to the filter as measured by the output of the shaft oil pump.

Filter Pressure

Displays the pressure differential between the Shaft Pump Discharge pressure transducer and the Post Filter Pressure transducer in the oil line after the filter.

Post Filter Pressure

Displays the pressure of the oil being supplied to the compressor after the filter.

Shaft Pump Pressure

Displays the pressure differential between the Shaft Pump Discharge pressure transducer (input to the filter) and the Sump Pressure transducer in the compressor housing.

Sump Pressure

Displays the low side oil pressure measured at the sump in the compressor housing.

Supply Pressure

Displays the pressure differential between the high side oil pressure transducer (output of oil filter) and the low side oil pressure transducer (sump compressor housing).

Main Oil Temperature

Displays the temperature of the main oil supply being supplied to the compressor, after the oil cooler.

Oil Sump Temperature

Displays the temperature of the oil in the sump in the compressor housing.

Thrust Bearing Oil Return Temperature

Displays the temperature of the oil being returned from the compressor thrust bearings.

Shaft End Oil Return Temperature

Displays the temperature of the oil being returned from the shaft end of the compressor.

Oil Temperature After Cooler

Displays the temperature of the oil after the water cooled oil cooler.

Oil Cooler Water - Entering Temperature

Displays the entering water temperature to the oil cooler, if available.

Oil Cooler Water - Leaving Temperature

Displays the leaving water temperature to the oil cooler, if available.

Oil Cooler Water - Differential Pressure

Displays the pressure differential between the entering and leaving water to the oil cooler, in inches of water if available.

Pump Interlock (LED)

Display the status of the interlock signal from the Auxiliary Oil Pump, if available.

Oil Pump Run Output (LED)

Indicates whether the Oil Pump is being commanded to operate.

Oil Heater (LED)

Indicates whether the Oil Heater output is energized.

Oil Separator Heater (LED)

Indicates whether the oil separator heater output is energized, if available.

Oil Return Solenoid (LED)

Indicates whether the oil return solenoid is energized.

Vent Line Solenoid

Indicates whether the vent line solenoid is energized.

Balance Piston Differential Pressure

Displays the pressure differential between the intercooler and the balance piston.

PROGRAMMABLE

Manual Pump

Access Level Required: OPERATOR

This key puts the Oil Pump control in Manual Mode and forces it to RUN. Manual Oil Pump control is disabled during system prelube, system run, and system coastdown.

Standby Lube (Enable/Disable)

Access Level Required: SERVICE

This key allows the Service Technician to enable or disable the standby lubrication system.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Compressor

Access Level Required: VIEW

Returns user to the Compressor Screen.

HOT GAS BYPASS SCREEN

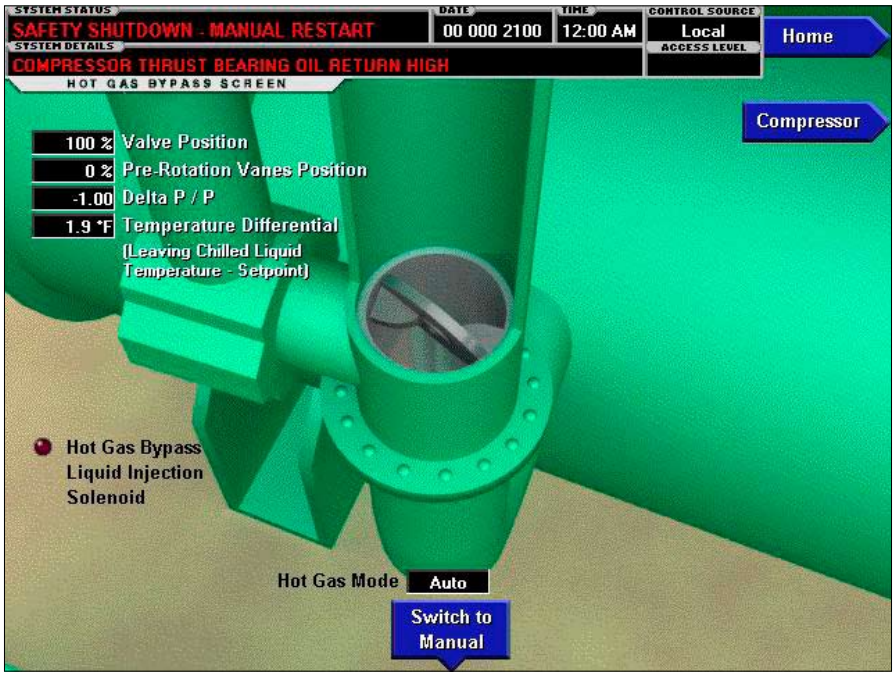


FIGURE 9 - HOT GAS BYPASS SCREEN

OVERVIEW

This screen displays a cutaway view of the Hot Gas Bypass Valve. All setpoints relating to Hot Gas Bypass control are maintained on this screen. Also, related Hot Gas Bypass control parameters are displayed for reference. Through animation, the relative valve position is displayed. In addition, the valve can be manually operated.

DISPLAY ONLY

Hot Gas Bypass Valve Position

Displays the position of the Hot Gas Valve over the range of 0% (closed) to 100% (fully open). The valve position is animated, as well as the hot gas flow, if the chiller is running and the hot gas valve is open. When the actual position is 0% to 19%, the valve is shown fully closed and no gas flow is displayed. When actual position is 20% to 39% the valve is shown 25% open. When actual position is 40% to 59%, the valve is shown 50% open. When actual position is 60% to 79%, the valve is shown as 75% open. Positions greater than 79% are shown as full open.

Pre-rotation Vanes Position

Displays the position of the Pre-Rotation Vanes over the range of 0% (closed) to 100% (fully open).

Delta P/P

A parameter that represents system differential or HEAD. It is calculated as [(condenser pressure – evaporator pressure) / evaporator pressure].

Temperature Differential

Displays the difference between the Leaving Chilled Liquid Temperature and the Leaving Chilled Liquid Temperature Setpoint. It is calculated by subtracting the Leaving Chilled Liquid Temperature from the Leaving Chilled Liquid Temperature Setpoint.

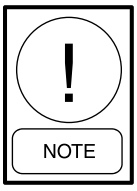
Hot Gas Bypass Liquid Injection Solenoid (LED)

Indicates whether the Hot Gas Bypass Liquid Injection Solenoid is energized. This should be energized whenever the hot gas bypass valve is open.

Hot Gas Mode

Indicates whether the Hot Gas Bypass is under automatic or manual control.

PROGRAMMABLE



Requires access level of SERVICE. Service Technicians refer to Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

[Hot Gas Bypass Control] Raise (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to open the valve in increments of 1% or more from its current position.

[Hot Gas Bypass Control] Lower (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to close the valve in increments of 1% or more from its current position.

[Hot Gas Bypass Control] Set (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to input a value from 0 to 100 % to position the valve immediately.

[Hot Gas Bypass Control] Switch to Manual

Access Level Required: SERVICE

This key toggles between Switch to Manual and Switch to Auto to allow for control of the Hot Gas Bypass Valve. The Hot Gas Bypass Valve Control Mode display will indicate the control mode of the valve and prevent transfer of the mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Compressor

Access Level Required: VIEW

Returns user to the Compressor Screen.

INTERSTAGE VALVE SCREEN

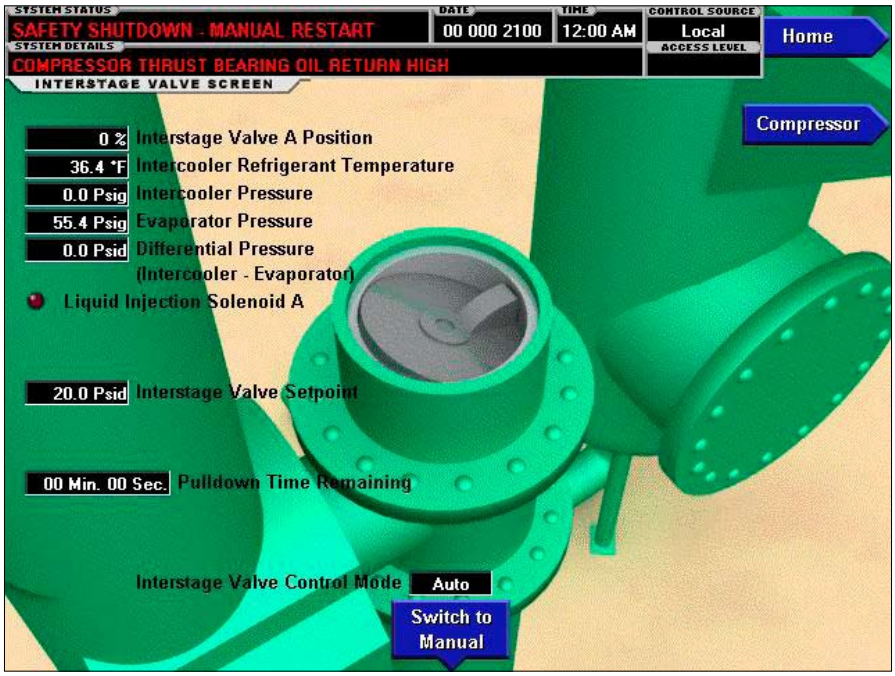


FIGURE 10 - INTERSTAGE VALVE SCREEN

OVERVIEW

These screens display a cutaway view of the Interstage Valves. All setpoints relating to Interstage Valve control are maintained on this screen. Also, related Interstage Valve control parameters are displayed for reference. Through animation, the relative valve position is displayed. In addition, the valve can be manually operated.

DISPLAY ONLY

Interstage Valve Position

Displays the position of the Interstage Valve over the range of 0% (closed) to 100% (fully open). The valve position is animated. When the actual position is 0% to 19%, the valve is shown fully closed. When actual position is 20% to 39% the valve is shown 25% open. When actual position is 40% to 59%, the valve is shown 50% open. When actual position is 60% to 79%, the valve is shown as 75% open. Positions greater than 79 % are shown as full open.

Intercooler Refrigerant Temperature

Displays the present refrigerant temperature in the intercooler. If the sensor is present and enabled under Options on the Configuration screen. The service access level is required to enable/disable this display.

Intercooler Pressure

Displays the present refrigerant pressure in the intercooler.

Evaporator Pressure

Displays the present refrigerant pressure in the evaporator.

Differential Pressure

A parameter that represents system differential, or HEAD. It is calculated as (Intercooler pressure – Evaporator pressure).

Liquid Injection Solenoid A (LED)

Indicates when the Liquid Injection Solenoid is energized.

Interstage Valve Setpoint

Displays the control point pressure the valve will operate to maintain.

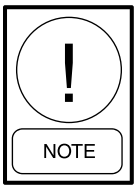
Pulldown Time Remaining

Displays the amount of time remaining from start for pulldown before the Interstage valve control will modulate to maintain the interstage pressure setpoint.

Interstage Valve Control Mode

Indicates whether the Interstage Valve is under automatic or manual control.

PROGRAMMABLE



Requires access level of SERVICE. Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

[Interstage Valve Control] Raise (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to open the valve in increments of 1% or more from its current position.

[Interstage Valve Control] Lower (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to close the valve in increments of 1% or more from its current position.

[Interstage Valve Control] Set (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to input a value from 0 to 100 % to position the valve immediately.

[Interstage Valve Control] Switch to Manual

Access Level Required: SERVICE

This key toggles between Switch to Manual and Switch to Auto to allow for control of the Hot Gas Bypass Valve. The Interstage Valve Control Mode display will indicate the control mode of the valve and prevent transfer of the mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Compressor

Access Level Required: VIEW

Returns user to the Compressor Screen.

MOTOR SCREEN

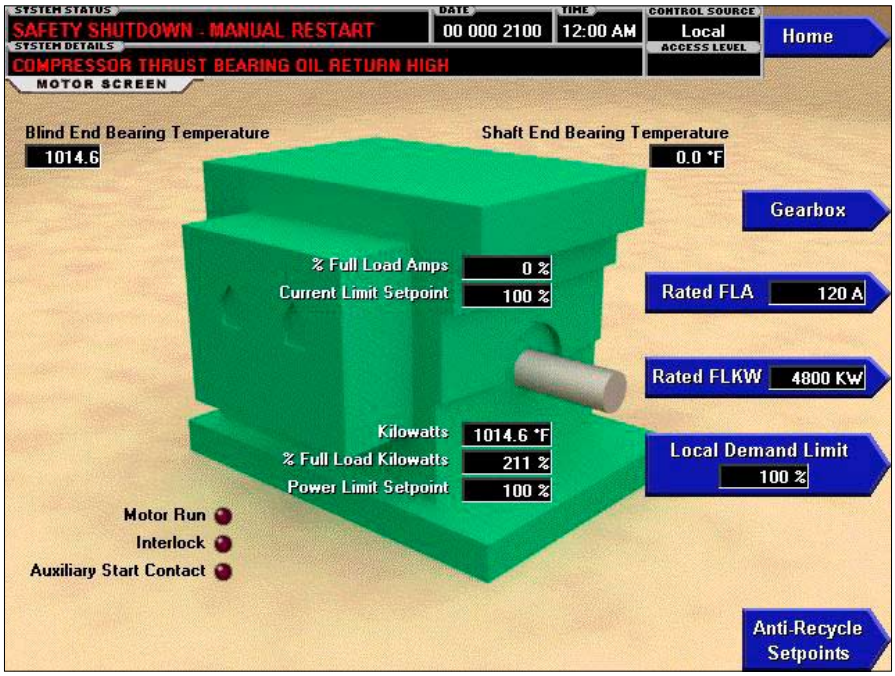


FIGURE 11 - MOTOR SCREEN

OVERVIEW

This screen displays all information pertaining to an Electro-Mechanical Starter. The demand limit setpoint may be changed from this screen. This screen also serves as a gateway to subscreen for the Gearbox.

DISPLAY ONLY

Blind End Bearing Temperature

Displays the motor blind end bearing temperature, if the sensor is enabled.

Shaft End Bearing Temperature

Displays the motor shaft end bearing temperature, if the sensor is enabled.

% Full Load Amps

Displays the motor current as a percentage of the Full Load Amps (FLA) value. For the Electro-Mechanical Starter this is the data returned by the CM-2 board.

Current Limit Setpoint

Displays the current limit value in use. This value could come from a 0-20mA, 4-20mA, 0-l0VDC or 2-10VDC input in Analog Remote mode, PWM signal in Digital Remote mode, E-Link gateway interface in BAS mode, or a locally programmed value.

Kilowatts

Displays the motor kilowatts, if the sensor is enabled.

% Full Load Kilowatts.

Displays the motor kilowatts as a percentage of the Full Load Kilowatts (FLKW) value, if available.

Power Limit Setpoint

Displays the power limit value in use if the chiller is configured to use KW for demand limit.

Motor Run (LED)

Indicates whether the digital output from the controls is commanding the motor to **RUN**.

Time Since Last Shutdown

Displays the time since the last chiller shutdown in Day:Hr:Min:Sec format.

Interlock (LED)

Indicates when the safety contact in the starter is closed.

Auxiliary Start Contact (LED)

A back-up LED that indicates when the safety contact in the starter is closed.

Length of Last Run

Displays the time of the last chiller run in Day:Hr:Min:Sec format.

PROGRAMMABLE

Rated FLA

Access Level Required: SERVICE

The rated FLA of the compressor motor used to determine the percentage of full load amps displayed. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

Rated FLKW

Access Level Required: SERVICE

The rated Full Load Kilowatts used to determine the percentage of full load kilowatts displayed. This calculation will only be present if the Kilowatts sensor has been enabled. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

Local Demand Limit

Access Level Required: OPERATOR

Allows the operator to change the Demand Setpoint from 0 % to 100 %. This will be the Current Limit Setpoint or the Power Limit Setpoint depending on the configuration established at commissioning. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Gearbox

Access Level Required: VIEW

Moves to the gearbox screen that shows temperatures and pressures for the gearbox oil lubrication system and allows manual control of the auxiliary oil pump, if equipped.

Anti-Recycle Setpoints

Access Level Required: VIEW

Moves to the anti-recycle setpoints screen that shows timers and counters for Anti-Recycle operation.

GEARBOX SCREEN

FIGURE 12 - GEARBOX SCREEN

OVERVIEW

This screen displays the major components as well as the temperatures, pressures, and outputs for the gearbox lubrication system. In addition, this screen allows manual control of the auxiliary oil pump, if available, for up to 10 minutes.

DISPLAY ONLY

Low Speed Shaft End Bearing Temperature

Displays the temperature of the bearing at the shaft end of the low speed side of the gearbox, if present and enabled.

Low Speed Blind End Bearing Temperature

Displays the temperature of the bearing at the blind end of the low speed side of the gearbox, if present and enabled.

High Speed Shaft End Bearing Temperature

Displays the temperature of the bearing at the shaft end of the high speed side of the gearbox, if present and enabled.

High Speed Blind End Bearing Temperature

Displays the temperature of the bearing at the blind end of the high speed side of the gearbox, if present and enabled.

Oil Pump Run Output (LED)

Indicates whether the digital output from the controls is commanding the pump to run.

Pump Interlock (LED)

Indicates whether the auxiliary run contacts in the pump starter are closed. (MADE)

Oil Temperature

Displays the temperature of the oil being supplied to the gearbox.

Shaft Pump Oil Pressure

Displays the oil pressure supplied to the gearbox as measured by the output of the shaft oil pump.

Supply Oil Pressure

Displays the oil pressure after the oil cooler and filter that is supplied to the gear box bearings.

Differential Pressure

Displays the pressure difference between the shaft pump pressure and the supply oil pressure. Pressure drop across oil cooler and oil filter.

Oil Cooler Water - Leaving Temperature

Displays the Leaving water temperature to the oil cooler, if available.

Differential Pressure

Displays the pressure drop in inches of water across the gear box oil cooler, if available.

PROGRAMMABLE

Manual Pump

Access Level Required: OPERATOR

This key puts the Oil Pump control in Manual Mode and forces it to RUN. Manual Oil Pump control is disabled (and the button hidden) during system prelube, system run, and system coastdown.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Motor

Access Level Required: VIEW

Returns user to Motor Screen.

ANTI-RECYCLE SETPOINTS SCREEN

FIGURE 13 - ANTI-RECYCLE SETPOINTS SCREEN

OVERVIEW

This screen displays all start counters and timers in the anti-recycle operation as described below. All points are adjustable. For further discussion, see the Anti-Recycle section later.

DISPLAY ONLY

Cold Start Downtime

The amount of time the motor must be shutdown before any attempt to start will be considered a Cold Start.

Cold Start Uptime

The amount of time the chiller must running before any further starts will be considered hot starts.

Cold Start Recycle Time (1st Start)

The time the motor must be given to cool down (anti-recycle) after the first cold start attempt assuming the chiller has not run for the **Cold Start Uptime**.

Cold Start Recycle Time (2nd Start)

The time the motor must be given to cool down (anti-recycle) after the second cold start attempt assuming the chiller has not run for the **Cold Start Uptime**.

Hot Start Maximum Recycle Time

The maximum amount of time the motor must be shutdown before any hot start attempt will be allowed.

Allowed Starts Per Day

The total number of cold and hot starts allowed in any 24 hour period.

Excessive Start Lockout Time

The amount of time the operator is prevented from a restart of the motor when the number of starts per day has been exceeded.

PROGRAMMABLE

NOTE

Requires access level of SERVICE. Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Change Setpoints

Access Level Required: SERVICE

Allows a qualified Service Technician to change any of the anti-recycle setpoints shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Motor

Access Level Required: VIEW

Returns user to Motor Screen.

CAPACITY CONTROLS SCREEN

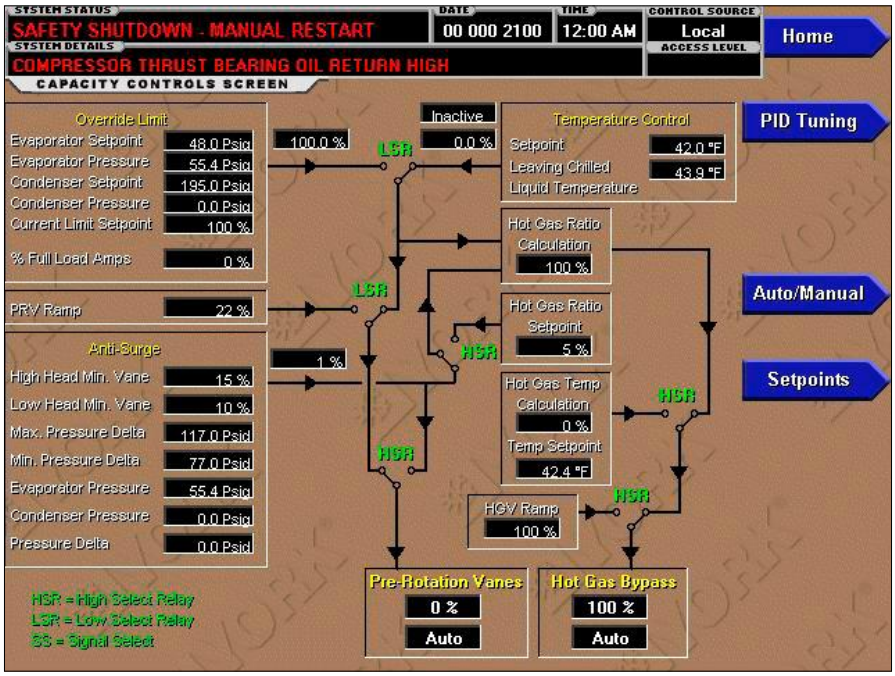


FIGURE 14 - CAPACITY CONTROLS SCREEN

OVERVIEW

This screen displays the present state of the capacity controls for the system. Each section of the display controls the PRV or HGBV according to the setpoints configured within that section. The output to the PRV or HGBV will follow the flow chart lines on this display. Each selector switch line is animated and will toggle between the connecting points to indicate the control point for that switch. For a more complete discussion of the sequence for this display, see the Capacity Control Section.

DISPLAY ONLY

Evaporator Setpoint – Override Limit

Pressure at which the PRV's will begin to close in order to prevent the chiller from tripping off or low evaporator pressure.

Evaporator Pressure – Override Limit

Displays the present refrigerant press evaporator.

Condenser Setpoint – Override Limit

Pressure at which the PRV's will begin to close to prevent the chiller from tripping off or high condenser pressure.

Condenser Pressure – Override Limit

Displays the present refrigerant pressure in the condenser.

Current Limit Setpoint – Override Limit

Displays the present demand limit setpoint value in use.

% Full Load Amps – Override Limit

Displays the motor current as a percentage of the Full Load Amps (FLA) value. For the Electro-Mechanical Starter this is the data returned by the CM-2 board.

PRV Ramp

Displays the ramp rate for the PRV during the startup of the chiller. The system status will display CONTROLS RAMPING when this rate is in effect.

High Head Min. Vane – Anti-Surge

Displays the minimum pre-rotation vane position setpoint required for stable operation at high head conditions.

Low Head Min. Vane – Anti-Surge

Displays the minimum pre-rotation vane position setpoint required for stable operation at low head conditions.

Max Pressure Delta – Anti-Surge

Displays the maximum compressor differential pressure allowed for stable operation.

Min Pressure Delta – Anti-Surge

Displays the minimum compressor differential pressure allowed for stable operation.

Evaporator Pressure – Anti-Surge

Displays the refrigerant pressure in the evaporator.

Condenser Pressure – Anti-Surge

Displays the refrigerant pressure in the condenser.

Delta Pressure – Anti-Surge

Display the current head pressure defined as the Compressor Discharge Pressure minus Evaporator Pressure.

Setpoint – Temperature Control

Displays the present setpoint to which the chiller is operating, whether controlled locally or remotely.

Leaving Chilled Liquid Temperature – Temperature Control

Displays the temperature of the liquid as it leaves the evaporator.

Hot Gas Ratio Calculation

Displays the calculated hot gas valve position required.

Hot Gas Ratio Setpoint

The PRV position below which the Hot Gas valve will begin to open if the value is greater than the Anti-Surge value.

Hot Gas Ratio Calculation

The proportional translation of the following:

1. Hot Gas Ratio Setpoint or Anti-Surge value
2. Vane Position

Hot Gas Temperature Setpoint

Temperature at which the Hot Gas valve will begin to open if the leaving chilled liquid goes below this setpoint.

HGV Ramp

Displays the ramp rate for the Hot Gas Valve during the startup of the chiller. The system status will display CONTROLS RAMPING when this rate is in effect.

Hot Gas Bypass - Position

Displays the current Hot Gas Bypass position in a percentage.

Hot Gas Bypass - Mode

Displays the mode of operation of the Hot Gas Bypass activator as either Auto or Manual.

Pre-Rotation Vanes - Position

Displays the current PRV position in a percentage

Pre-Rotation Vanes — Mode

Displays the mode of operation of the PRV actuator as either Auto or Manual.

PROGRAMMABLE

Override Limits

Access Level Required: Service

Allows the operator to change the demand limit setpoint between 0 % and 100 % amps for current or kilowatts for power.

Leaving Chilled Local Setpoint

Access Level Required: Operator

Allows the operator to change the local leaving chiller liquid setpoint.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

PID Tuning

Access Level Required: VIEW

Moves to the PID Tuning Screen.

Auto/Manual

Access Level Required: VIEW

Moves to the Auto/Manual Screen.

Setpoints

Access Level Required: VIEW

Moves to the subscreen for the display of the Setpoints Screens.

PID TUNING SCREEN

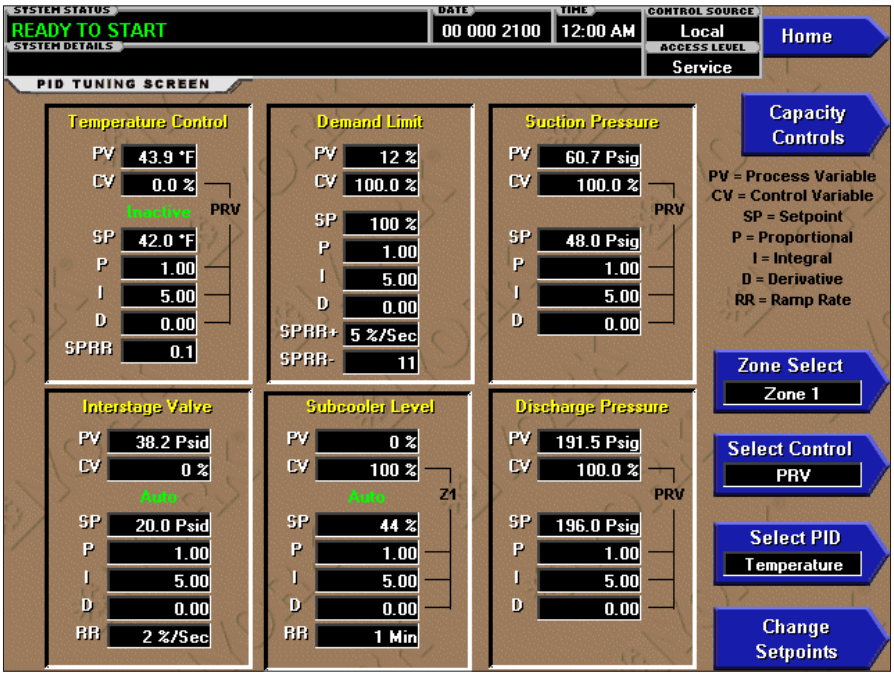


FIGURE 15 - PID TUNING SCREEN

OVERVIEW

This screen allows the PID tuning parameters to be set for each device configured for the system. All tuning is to be performed by the 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 *Service Instructions (Form 160.72-M1)*.

DISPLAY ONLY

All devices will have the following parameters which may be viewed:

- Process Variable (PV)
- Control Variable (CV)
- Setpoint (SP)
- Proportional term (P)
- Integral term (I)
- Derivative term (D)

In addition, one or two ramp rates are required for proper operation of certain devices.

Temperature Control

Controls the Pre-Rotation Vanes and the Hot Gas Bypass Valve to maintain the leaving chilled liquid temperature setpoint.

Demand Limit

Controls the Pre-Rotation Vanes in order to prevent the current or power limit from being exceeded.

Suction Pressure

Controls the Pre-Rotation Vanes and the Hot Gas Bypass Valve to maintain the Suction pressure setpoint.

Interstage Valve

Controls the Interstage Valve maintain the pressure setpoint in the intercooler.

Subcooler Valve

Controls the Subcooler Valve to maintain the refrigerant level setpoint in the Subcooler.

Discharge Pressure

Controls the Pre-Rotation Vanes and the Hot Gas Bypass Valve to maintain the Discharge pressure setpoint.

PROGRAMMABLE

Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Change Setpoints

Allows a qualified Service Technician to change any of the setpoints shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Capacity Controls

Access Level Required: VIEW

Returns to the Capacity Controls Screen.

AUTO / MANUAL CONTROL SCREEN

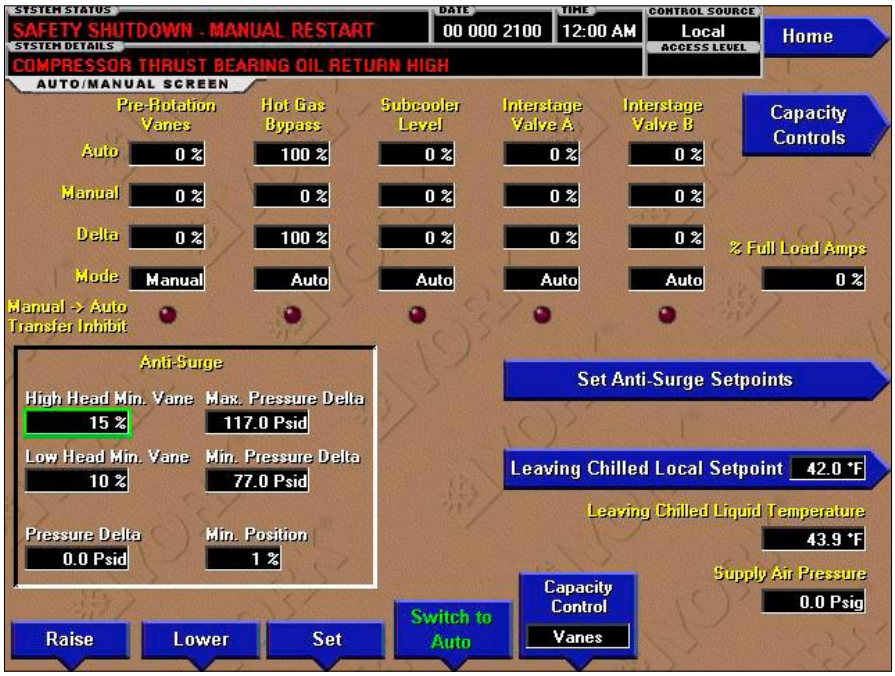


FIGURE 16 - AUTO / MANUAL CONTROL SCREEN

OVERVIEW

This screen allows the manual control of the Pre-Rotation Vanes, Hot Gas Bypass Valve, Subcooler Valve, and Interstage Valve. Each device may be set for automatic control or manual control between 0% and 100%. This display also allows the setting of Anti-Surge points and the Leaving Chilled Local Setpoint.

DISPLAY ONLY

All devices will have to following parameters that may be viewed:

- Auto calculated percentage
- Manual percentage
- Delta (differential) between auto and manual.
- Control Mode

In addition, the Anti-Surge setpoints are also displayed. See the Anti-Surge setpoints section for a detailed explanation.

Pre-Rotation Vanes

Displays the current PRV position.

Hot Gas Bypass

Displays the current Hot Gas valve position.

Subcooler Level

Displays the current Subcooler Liquid Level.

Interstage Valves

Displays the current Interstage valve position of valve "A" or "B".

Anti-Surge-High Head Min. Vane

Minimum vane position in percent for stable operation at high head condition.

Anti-Surge-Low Head Min. Vane

Minimum vane position in percent for stable operation at low head condition.

Anti-Surge-Pressure Delta

Condenser pressure minus Evaporator pressure.

Anti-Surge Max.Pressure Delta

Maximum compressor differential pressure in PSID for stable operation.

Anti-Surge Min.Pressure Delta

Minimum compressor differential pressure in PSID for stable.

Anti-Surge Min. Position

Minimum vane position for stable operation

% Full Load Amps

Displays the present operating current of the compressor motor as a percent of the full load amperage value.

Leaving Chilled Local Setpoint

Displays the present setpoint to which the chiller is operating, whether controlled locally or remotely.

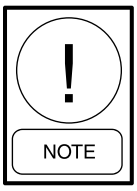
Leaving Chilled Liquid Temperature

Displays the temperature of the liquid as it leaves the evaporator.

Supply Air Pressure

Displays the present supply air pressure being supplied to each of the devices.

PROGRAMMABLE



Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Raise (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to open the valve 1% from its current position.

Lower (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to close the valve 1% from its current position.

Set (Manual)

Access Level Required: SERVICE

This key allows the Service Technician to input a specific value from 0 to 100 % to position the valve.

Switch to Manual

Access Level Required: SERVICE

This key toggles between Switch to Manual and Switch to Auto to allow for control selected device. The Control Mode display will indicate the control mode of the valve and prevent transfer of the mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by the SWITCH TO AUTO button color changing from green to red and the Manual to Auto Transfer Inhibit LED will illuminate.

Capacity Controls

Access Level Required: SERVICE

This key scrolls through each device to select which valve or actuator to set manually.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Capacity Controls

Access Level Required: VIEW

Returns user to Capacity Controls Screen.

SETPOINTS SCREEN

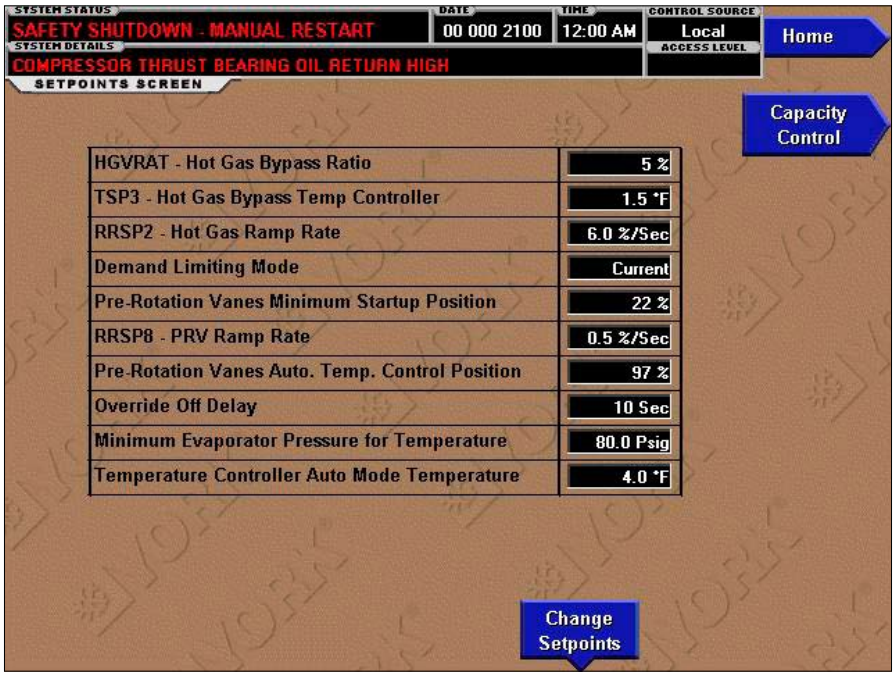


FIGURE 17 - SETPOINTS SCREEN

HGVRAT – Hot Gas Bypass Ratio

The percent the Hot Gas valve will open for each percent the PRV's goes below the Hot Gas Ratio Calculation

TSP3 - Hot Gas Bypass Temperature Controller

Degrees below the Leaving Chilled Liquid Temperature Setpoint that the Hot Gas Valve will begin to open.

RRSP2 – Hot Gas Ramp Rate

Rate in Percent per second the Hot Gas valve will open.

Demand Limit Mode

Current / Power

Determines the source of motor limit control

Current – By CT's on the motor leads

Power - KW meter

Pre-rotation Vane Minimum Startup Position

The minimum position for the vanes at startup

RRSP8 – PRV Ramp Rate

Rate in Percent per second the PRV's will open.

Override Off Delay

Displays the time delay required for pressure overrides to clear

Minimum Evaporator Pressure for Temperature

This setpoint defines the minimum evaporator pressure required at startup before the leaving chilled liquid is considered valid for temperature control of the Pre Rotation Vanes (PRV's)

Temperature Controller Auto Mode Temperature

Displays the temperature difference between the leaving chilled liquid setpoint and the leaving chilled liquid temperature required to begin automatic control of the Pre Rotation Vanes (PRV's) to maintain setpoint.

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TEMPERATURE SETPOINTS SCREEN

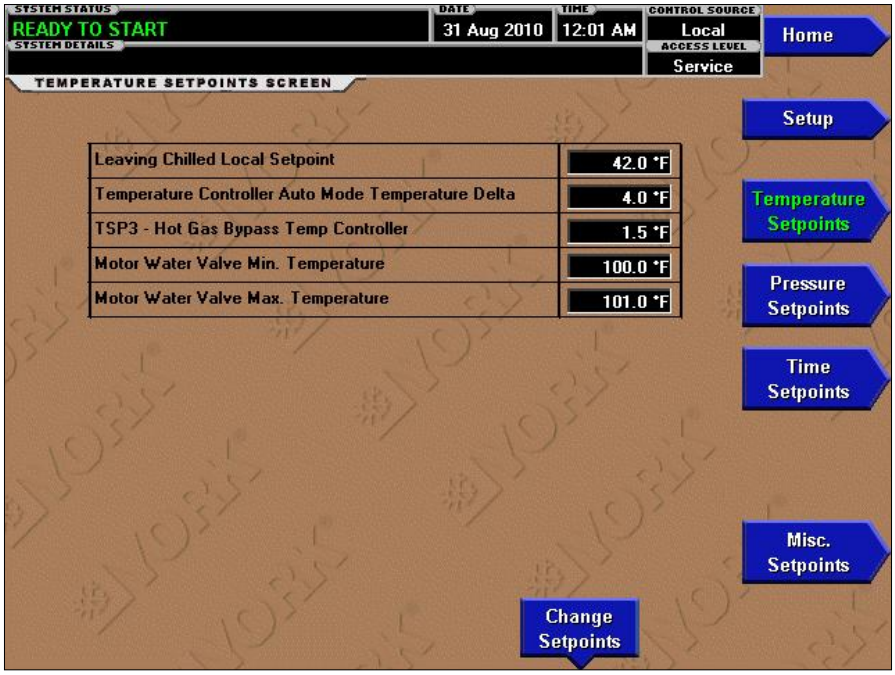


FIGURE 18 - TEMPERATURE SETPOINTS SCREEN

OVERVIEW

This screen displays the temperature setpoints. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Leaving Chilled Liquid Setpoint

Displays 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).

Temperature Controller Auto Mode Temperature Delta

Displays the temperature difference between the Leaving Chilled Liquid Setpoint and the Leaving Chilled Liquid Temperature required to begin automatic control of the Pre-Rotation Vanes to maintain setpoint.

TSP3 Hot Gas Bypass Temperature Controller

Displays the temperature offset for Hot Gas Valve operation.

Motor Water Valve Minimum Temperature

The temperature which will generate a 4 mA signal to the output that controls the motor cooling valve.

Motor Water Valve Maximum Temperature

The temperature which will generate a 20 mA signal to the output that controls the motor cooling valve.

PROGRAMMABLE

NOTE

Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Change Setpoints

Allows a qualified Service Technician to change any of the setpoints shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Pressure Setpoints

Access Level Required: VIEW

Moves directly to the Pressure Setpoints Screen.

Time Setpoints

Access Level Required: VIEW

Moves directly to the Time Setpoints Screen.

Misc Setpoints

Access Level Required: VIEW

Moves directly to the Miscellaneous Setpoints Screen.

PRESSURE SETPOINTS SCREEN

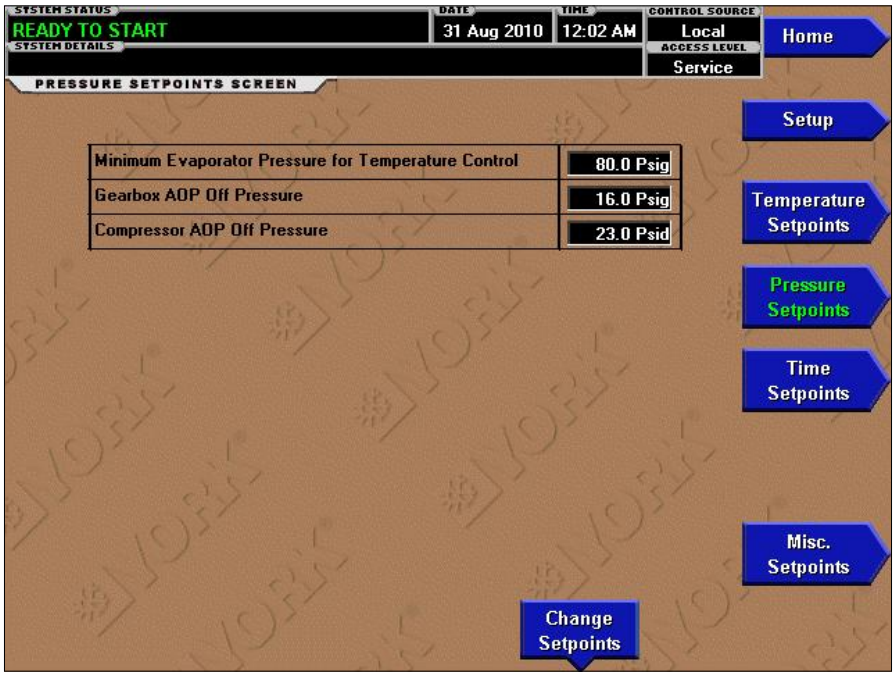


FIGURE 19 - PRESSURE SETPOINTS SCREEN

OVERVIEW

This screen displays the pressure setpoints. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Minimum Evaporator Pressure for Temperature Control

This setpoint defines the minimum evaporator pressure required at startup before the leaving chilled water temperature is considered valid for temperature control of the Pre-Rotation Vanes.

Gearbox AOP OH Pressure

The minimum oil pressure that must be maintained below which the Auxiliary Oil pump will be used for gearbox supply oil.

Compressor AOP Oil Pressure

The minimum oil pressure that must be maintained below which the Auxiliary Oil pump will be used for compressor supply oil.

PROGRAMMABLE

NOTE

Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Change Setpoints

Allows a qualified Service Technician to change any of the setpoints shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Temperature Setpoints

Access Level Required: VIEW

Moves directly to the Temperature Setpoints Screen.

Time Setpoints

Access Level Required: VIEW

Moves directly to the Time Setpoints Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Setpoints Screen.

TIME SETPOINTS SCREEN

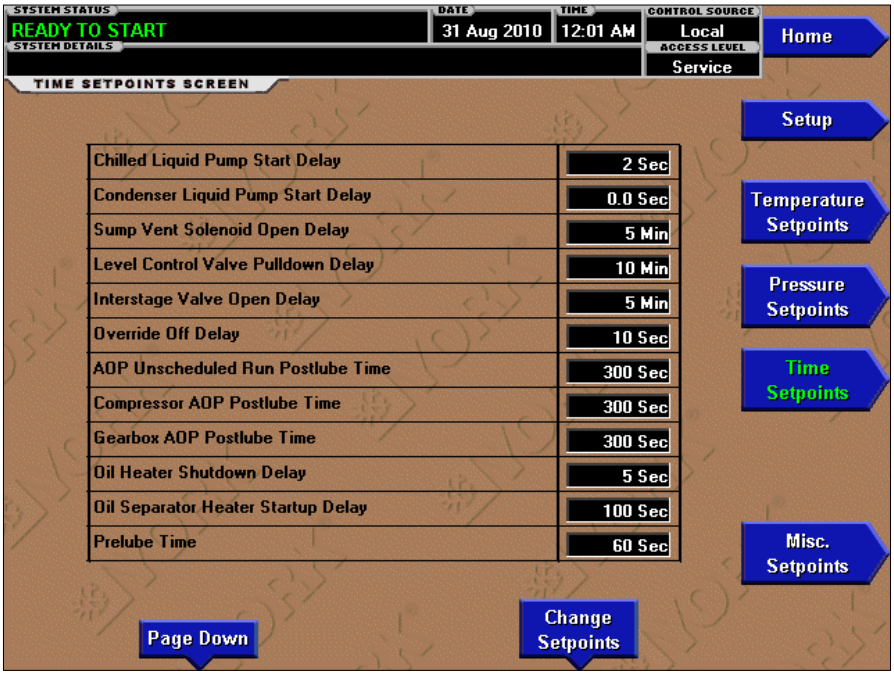


FIGURE 20 - TIME SETPOINTS SCREEN

OVERVIEW

This screen displays the time setpoints. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Chilled Liquid Pump Start Delay

Displays the delay time for the start of the chilled liquid pump after the start sequence has been initiated.

Condenser Liquid Pump Start Delay

Displays the delay time for the start of the condenser liquid pump after the start sequence has been initiated.

Sump Vent Solenoid Open Delay

Displays the delay time for opening the vent line solenoid on startup.

Subcooler Level Valve Pulldown Delay

Displays the delay time on startup before control of the subcooler level valve is initiated.

Interstage Valve Open Delay

Displays the delay time on startup before control of the Interstage valve is initiated.

Override Off Delay

Displays the delay time required for pressure overrides to be cleared.

AOP Unscheduled Run Postlube Time

The time after an Unscheduled Run that the compressor and gear auxiliary lubrication pumps will run before the system is ready to start.

Compressor AOP Postlube Time

The time after shutdown that the compressor auxiliary lubrication pump will run before the system is ready to start.

Gearbox AOP Postlube Time

The time after shutdown that the gearbox auxiliary lubrication pump will run before the system is ready to start.

Oil Heater Shutdown Delay

Displays the amount of time the oil separator heater will be enabled after shutdown is complete.

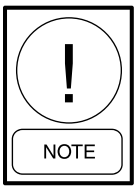
Oil Separator Heater Startup Delay

The time required during the startup sequence during which the compressor and gear auxiliary lubrication pumps will run before starting the motor.

Prelube Time

The time the auxiliary oil pump of the compressor and if present the gear box will run to establish proper oil pressure before the compressor motor starter will be energized.

PROGRAMMABLE



Requires access level of SERVICE, Service Technicians refer to Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Change Setpoints

Allows a qualified Service Technician to change any of the setpoints shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Temperature Setpoints

Access Level Required: VIEW

Moves directly to the Temperature Setpoints Screen.

Pressure Setpoints

Access Level Required: VIEW

Moves directly to the Pressure Setpoints Screen.

Misc Setpoints

Access Level Required: VIEW

Moves directly to the Miscellaneous Setpoints Screen.

MISCELLANEOUS SETPOINTS SCREEN

FIGURE 21 - MISCELLANEOUS SETPOINTS SCREEN

OVERVIEW

This screen displays the miscellaneous setpoints. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

PRV Ramp Rate

The rate at which Pre-Rotation vanes will ramp open to 100 % from the Minimum Startup Position once motor interlock is detected at startup.

Hot Gas Ramp Rate

The rate at which the hot gas bypass valve will ramp closed at startup.

Hot Gas Ratio Bypass Setpoint

The Hot Gas Bypass Ratio setpoint as a scaled ratio of the desired PRV position to the anti-surge PRV position.

Pre-Rotation Vanes Minimum Startup Position

The minimum position for the Pre-Rotation vanes at startup.

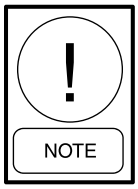
Pre-Rotation Vanes Auto Temp Control Position

The minimum position for the Pre-Rotation vanes at startup.

Level Control Valve Min Position

The minimum position for the subcooler level valve at startup.

PROGRAMMABLE



Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Change Setpoints

Allows a qualified Service Technician to change any of the setpoints shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Temperature Setpoints

Access Level Required: VIEW

Moves directly to the Temperature Setpoints Screen.

Pressure Setpoints

Access Level Required: VIEW

Moves directly to the Pressure Setpoints Screen.

Time Alarms/Trips

Access Level Required: VIEW

Moves directly to the Time Setpoints Screen.

Page Down

Access Level Required: VIEW

Moves to the Anti-Recycle Setpoints Screen.

SETUP SCREEN

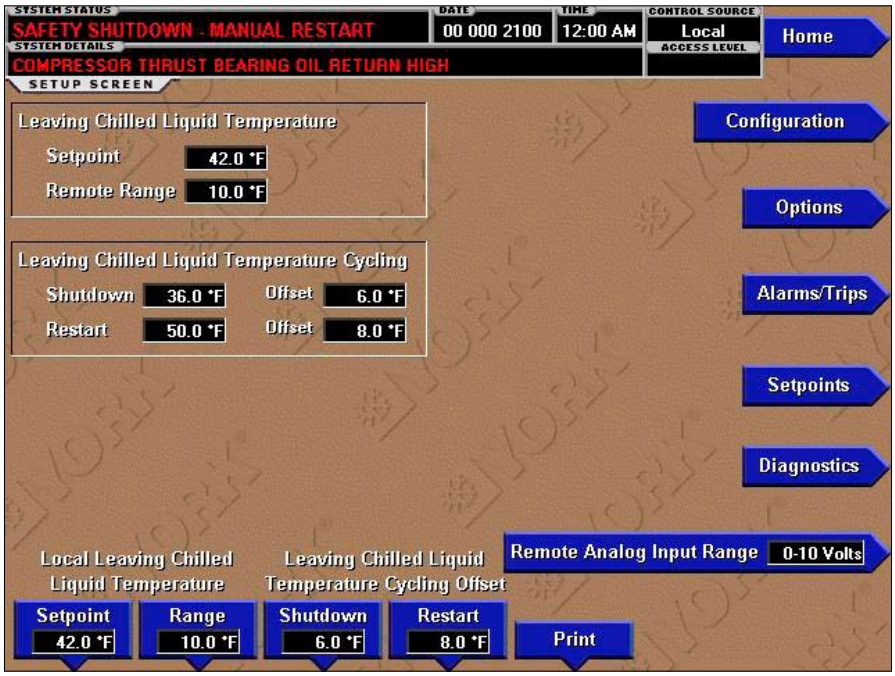


FIGURE 22 - SETUP SCREEN

OVERVIEW

This screen provides a convenient location for programming the most common setpoints involved in the chiller control.

DISPLAY ONLY

Leaving Chilled Liquid Temperature

Displays the present setpoint to which the chiller is operating whether controlled remotely or locally. This value could come from a 0-20 mA, 4-20 mA, 0-10VDC or 2-10VDC input in Analog Remote mode, PWM signal in Digital Remote mode, remote interface in ISN mode, or a locally programmed value.

Leaving Chilled Liquid Temperature Cycling – Shutdown

Displays the Leaving Chilled Liquid Temperature at which the chiller will shut down to avoid over-cooling the building. This value is calculated by subtracting the Leaving Chilled Liquid Temperature Cycling Offset - Shutdown from the Leaving Chilled Liquid Temperature - Setpoint. If this value is below the absolute minimum allowed shutdown temperature the minimum value is displayed.

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. This value is calculated by adding the Leaving Chilled Liquid Temperature Cycling Offset - Restart to the Leaving Chilled Liquid Temperature - Setpoint.

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). A remote device can provide an analog signal (0-20mA or 4-20mA, 0-10VDC or 2-10VDC) in Analog Remote mode or PWM signal in Digital Remote mode that changes the setpoint by creating an offset above the operator programmed **Base** Leaving Chilled Liquid Temperature setpoint. This offset may be defined up to 10.0°F or 20.0°F above the **Base** setpoint (see the Remote Leaving Chilled

Liquid Temperature Setpoint Range description above). Additionally, the E-Link gateway (in BAS Remote mode) can define the setpoint through a serial data stream. In this case, the incoming setpoint is not an offset that is applied to the locally programmed **Base** setpoint value, but rather is the setpoint value itself.

Local Leaving Chilled Liquid Temperature – Range

Access Level Required: OPERATOR

This is the range over which an analog (0-20mA or 4-20mA, 0-10VDC or 2-10VDC) in Analog Remote Mode or a digital signal (PWM) in Digital remote mode can reset the Leaving Chilled Liquid Temperature setpoint above the operator programmed **Base** Setpoint (see below). Programmable as either 10°F or 20°F, with a default of 20°F, it is added to the **Base** value to create a range over which the remote device can reset the setpoint. For example, if this setpoint is programmed for 10°F and the operator programmed value is 45°F, then the remote device can set the Leaving Chilled Liquid Temperature setpoint over the range 45.0° - 55.0°F.

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 below the setpoint, to a minimum cutout of 36°F (water), 34°F (water with Smart Freeze enabled) or 6°F (brine). It establishes the minimum allowable temperature for the Leaving Chilled Liquid Temperature and prevents over-cooling of the building. Anytime the Leaving Chilled Liquid Temperature setpoint is increased, the shutdown threshold is 36.0°F (water) or 6.0°F (brine) for the next ten (10) minutes. If Smart Freeze (see below) is enabled, the threshold is 34.0°F for the next 10 minutes. After ten (10) minutes have elapsed, the shutdown threshold becomes the programmed setpoint value.

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 above the setpoint, to a maximum restart value of 80°F. The chiller will automatically restart when this temperature is reached. This setpoint can be used to reduce chiller cycling by delaying the chiller restart until the cooling load has increased.

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.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Configuration

Access Level Required: SERVICE

Returns user to Configuration Screen.

Options

Access Level Required: SERVICE

Returns user to Options Screen.

Alarms/Trips

Access Level Required: SERVICE

Returns user to Alarms/Trips Screen.

Setpoints

Access Level Required: SERVICE

Returns user to Setpoints Screen.

Diagnostics

Access Level Required: SERVICE

Returns user to Diagnostics Screen.

CONFIGURATION SCREEN

FIGURE 23 - CONFIGURATION 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 the *Service Instructions (Form 160.72-M1)*, establishes this configuration per the desired operation. This screen also serves as a gateway to more subscreens for defining general system parameters.

PROGRAMMABLE

Present Date

Access Level Required: OPERATOR

Allows the user to specify the present date. This value is critical to logging system shutdowns accurately. 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. 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 to the user. This setpoint will affect the display of the time on the chiller panel and on all reports generated. 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.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: OPERATOR

Moves to the Setup Screen.

User

Access Level Required: OPERATOR

Moves to the User Screen.

Comms

Access Level Required: OPERATOR

Moves to the Comms Screen.

Printer

Access Level Required: OPERATOR

Moves to the Printer Screen.

Sales Order

Access Level Required: OPERATOR

Moves to the Sales Order Screen.

Operations

Access Level Required: OPERATOR

Moves to the Operations Screen.

USER SCREEN

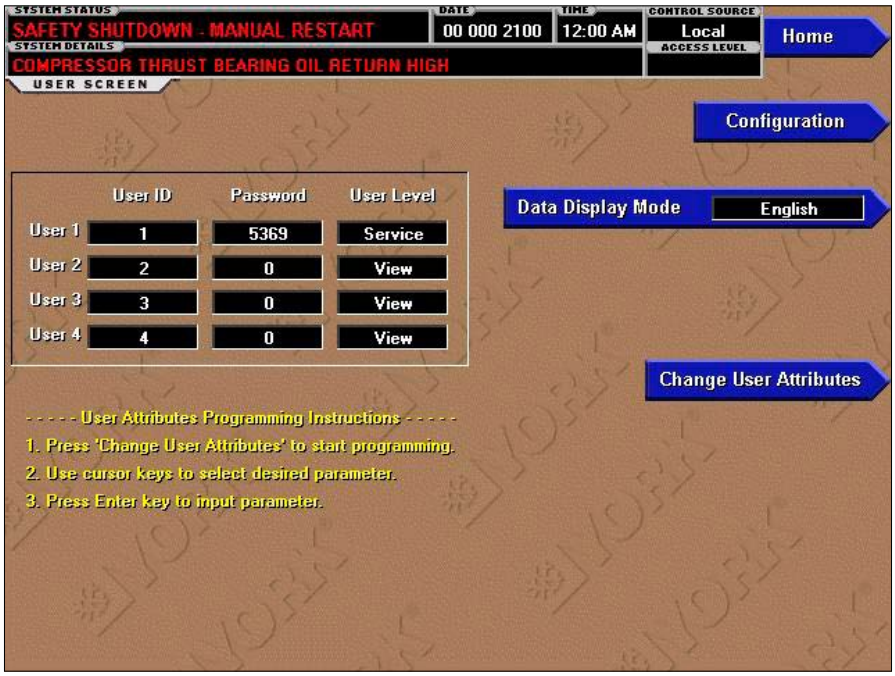


FIGURE 24 - USER SCREEN

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**) button is pressed and the value may be entered.

DISPLAY ONLY

None

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.

Data Display Mode (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. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

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. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

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. Service Technicians refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Configuration

Access Level Required: VIEW

Return to the Configuration Screen.

COMMS SCREEN

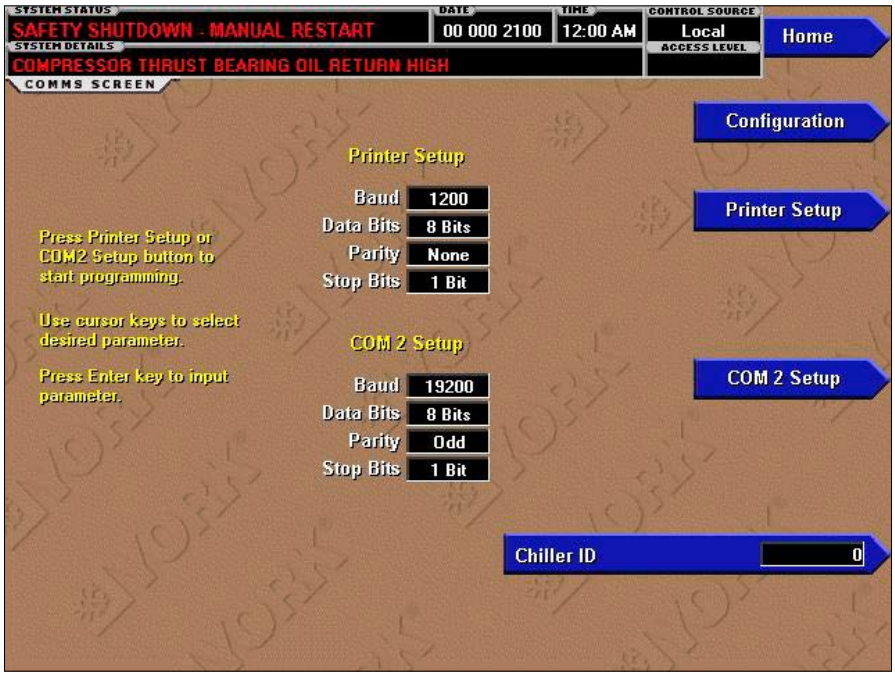


FIGURE 25 - COMMS SCREEN

OVERVIEW

This screen allows definition of the necessary communications parameters. Presently, there are no COM 2 communications features available.

DISPLAY ONLY

None

PROGRAMMABLE

Chiller ID

Access Level Required: OPERATOR

Define the numeric chiller ID when used within a BAS network of chillers. This ID number is also printed at the top of reports obtained with a local printer.

Printer Setup and COM 2 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 Bits

Define the number of data bits with which the panel shall communicate to the printer.

Printer Parity Bits

Define the parity (NONE-ODD-EVEN) with which the panel shall communicate to the printer.

Printer Stop Bits

Define the number of stop bits with which the panel shall communicate to the printer.

COM 2 Baud Rate

Define the baud rate at which the panel shall communicate through the modem port.

COM 2 Data Bits

Define the number of data bits at which the panel shall communicate through the modem port.

COM 2 Parity Bits

Define the parity (NONE-ODD-EVEN) at which the panel shall communicate through the modem port.

COM 2 Stop Bits

Define the number of stop bits at which the panel shall communicate through the modem port.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Configuration

Access Level Required: SERVICE

Returns user to the Configuration Screen.

Printer Setup

Access Level Required: VIEW

Returns user to the Printer Setup Screen.

Comm2 Setup

Access Level Required: SERVICE

Returns user to the Comm2 Setup Screen.

PRINTER SCREEN

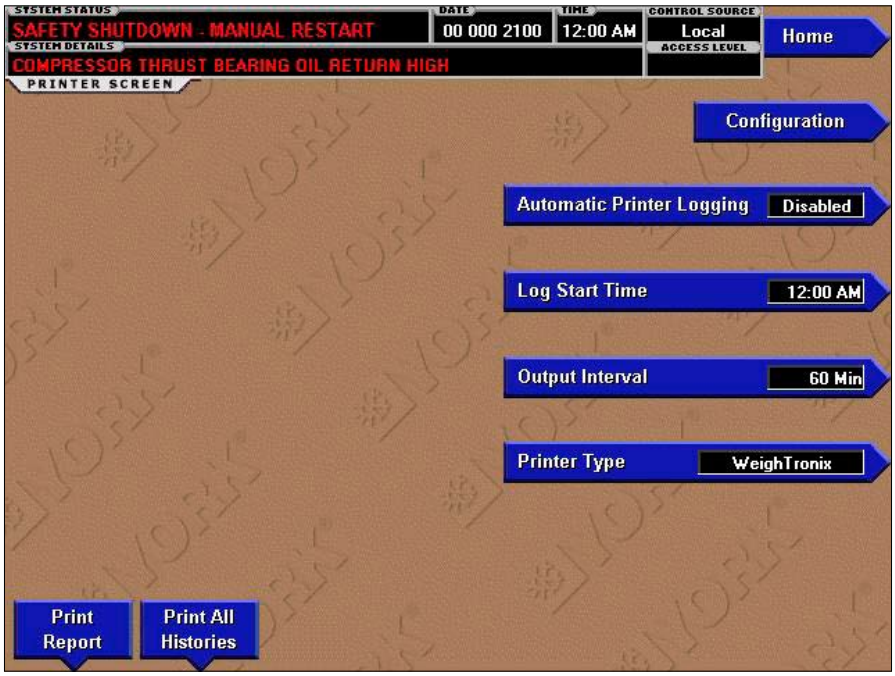


FIGURE 26 - PRINTER SCREEN

OVERVIEW

This screen allows definition of the necessary communications parameters for the printer.

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 togs 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: OPERATOR

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). 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

Access Level Required: VIEW

Returns user to Home Screen.

Configuration

Access Level Required: VIEW

Return to the Configuration Screen.

SALES ORDER SCREEN

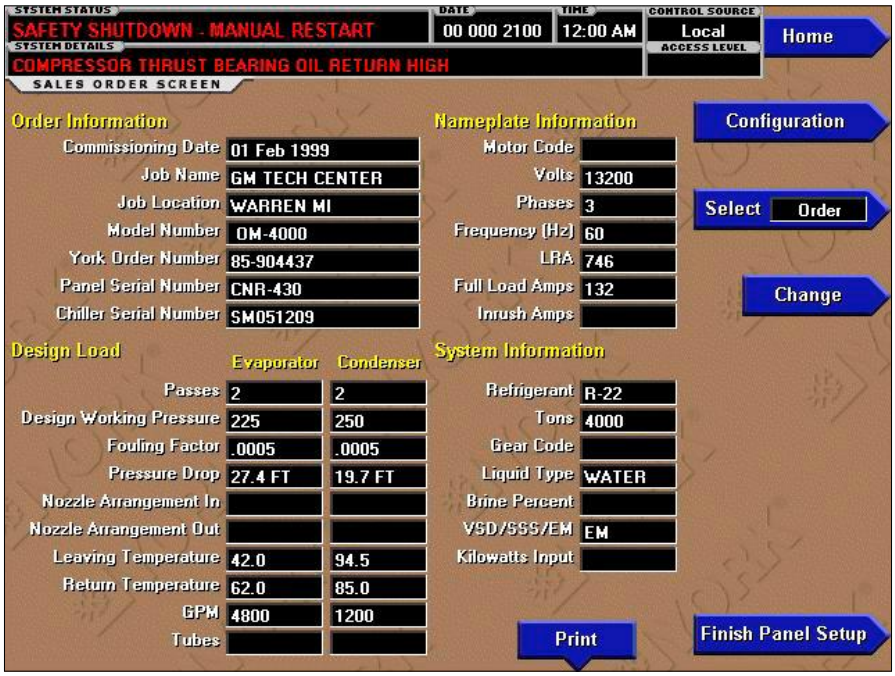


FIGURE 27 - SALES ORDER SCREEN

OVERVIEW

This screen allows definition of the sales order parameters. The following data may be entered by the 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. Data entry instructions are included in the *Service Instructions (Form 160.72-M1)*.

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.

Panel Serial Number

Factory defined serial number for the micropanel.

Chiller Serial Number

Factory defined serial number for the chiller system.

System Information

Factory defined conditions for which the chiller was originally rated and sold.

Condenser and Evaporator Design Load Information

Factory defined description of the condenser and evaporator configuration at time of shipment.

Nameplate Information

Factory defined information about the chiller motor configuration.

PROGRAMMABLE

Commissioning Date

Access Level Required: SERVICE

Define the date at which the chiller was commissioned.

Job Name

Access Level Required: SERVICE

Refine the job name where the chiller is located.

Job Location

Access Level Required: SERVICE

Define the location (City, State) Where the chiller is located.

Print

Access Level Required: VIEW

Generates a listing of the Sales Order data.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Configuration

Access Level Required: VIEW

Return to the Configuration Screen.

Change

Access Level Required: ADMIN

OPERATIONS SCREEN

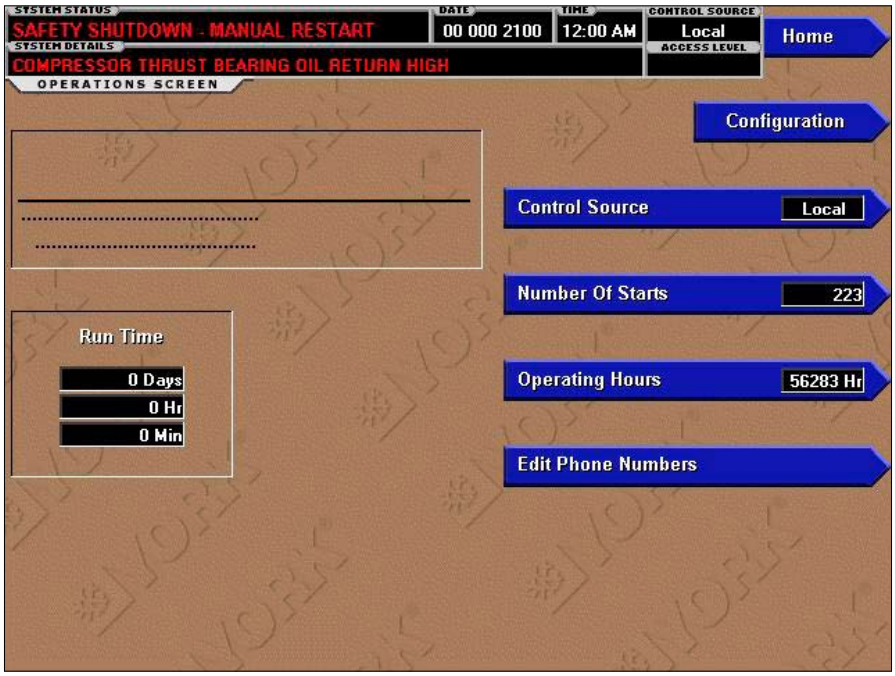


FIGURE 28 - OPERATIONS SCREEN

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 SYSTEM PRE-LUBE.

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 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

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 Parts Center 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 the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Configuration

Access Level Required: VIEW

Return to the Configuration Screen.

OPTIONS SCREEN

FIGURE 29 - OPTIONS 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 *Service Instructions (Form 160.72-Ml),* establishes this configuration per the desired operation. This screen also serves as a gateway to more subscreens for defining general system parameters

DISPLAY ONLY

Drive Type

Displays **Electric** or **Steam**

Liquid Type

Displays **Water** or **Brine**

Refrigerant Selection

Displays **R-22,** and **R134a**

Hot Gas Bypass

Displays **Disabled** or **Enabled**

Subcooler Valve

Displays **Disabled** or **Enabled**

Interstage Valve

Displays **Disabled** or **Enabled**

Compressor Stages

Displays **2** or **3**

Vibration Detection

Displays **Disabled** or **Enabled**
Digital input from a vibration monitor

Chilled Liquid Pressure Sensor Type

None – Gauge - Differential

Condenser Water Pressure Sensor Type

None – Gauge - Differential

Compressor Oil Cooler Water Temperature Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

Compressor Oil Cooler Water Differential Temperature Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

Intercooler Refrigerant Temperature Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

PROGRAMMABLE

Page Down

Moves to the second screen of the Options Screen.

Change Setpoints

Allows a qualified Service Technician to change any of the anti-recycle setpoints shown above. Refer to the Service Instructions (Form 160.72-M1).

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Drive Options

Access Level Required: VIEW

Returns to the Drive Options

OPTIONS SCREEN (CON'T)

FIGURE 30 - OPTIONS SCREEN (CON'T)

Thrust Bearing Oil Pressure Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

Chilled Liquid Flow Transmitter

Linear /Non-Linear

Condenser Water Flow Transmitter

Linear /Non-Linear

Oil Separator

Displays **Disabled** or **Enabled**
Depending on existence of an Oil Separator

Vane Motor Switch Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

Suction Refrigerant Temperature Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

Subcooler Refrigerant Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensor

PROGRAMMABLE

Page Down

Moves to the second screen of the Options Screen.

Change Setpoints

Allows a qualified Service Technician to change any of the anti-recycle setpoints shown above. Refer to the Service Instructions (Form 160.72-M1).

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Drive Options

Access Level Required: VIEW

Returns to the Drive Options

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DRIVE OPTIONS SCREEN

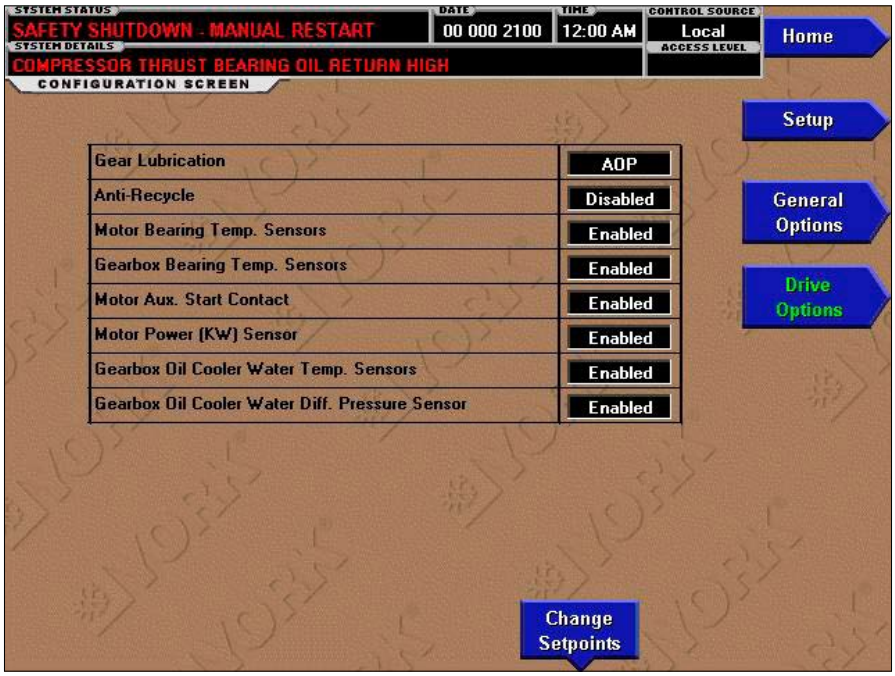

FIGURE 31 - DRIVE OPTIONS SCREEN

Gear Lubrication

AOP – Auxiliary Oil Pump
No AOP

Anti-Recycle

Displays **Disabled** or **Enabled**

Motor Bearing Temperature Sensors

Displays **Disabled** or **Enabled**
Depending on existence of sensors

Gear Bearing Temperature Sensors

Displays **Disabled** or **Enabled**
Depending on existence of sensors

Motor Auxiliary Start Contacts

Displays **Disabled** or **Enabled**
Depending on existence of starter contacts

This is an additional safety contact from starter in most cases is not required.

Motor Power (KW) Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensors

Gear Box Oil Cooler Water Differential Pressure Sensor

Displays **Disabled** or **Enabled**
Depending on existence of sensors

PROGRAMMABLE

Change Setpoints

Allows a qualified Service Technician to change any of the anti-recycle setpoints shown above. Refer to the Service Instructions (Form 160.72-M1).

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

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TEMPERATURE ALARMS AND TRIPS SCREEN

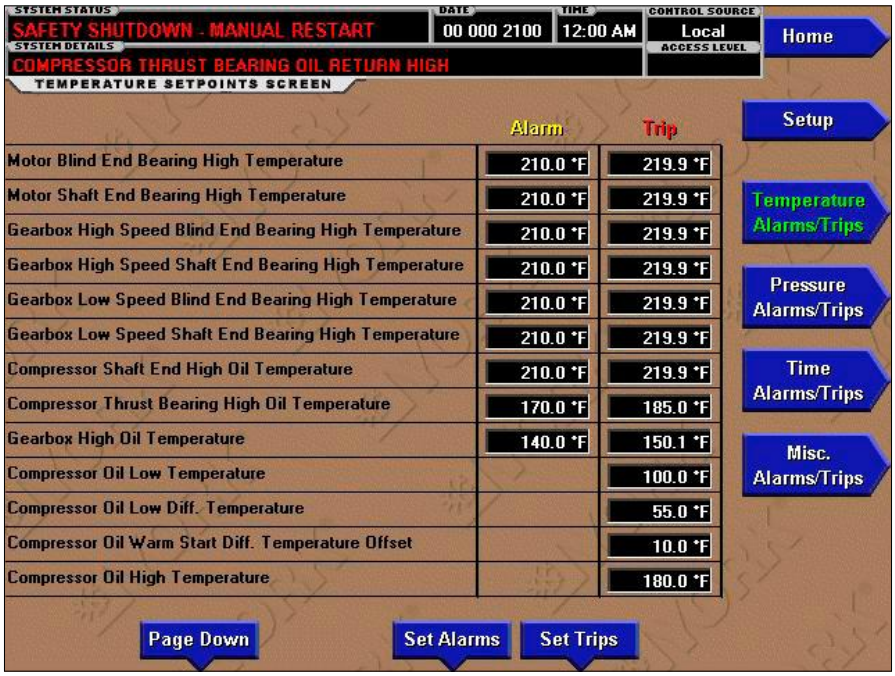


FIGURE 32 - TEMPERATURE ALARMS AND TRIPS SCREEN

OVERVIEW

This screen is the first of two displays for the temperature alarms and trips. Each point has either an alarm (warning) or a trip (shutdown) or both. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Motor Blind End Bearing High Temperature

Displays the High Bearing Temperature alarm and trip point for the Blind end of the motor, if the sensors are present and enabled.

Motor Shaft End Bearing High Temperature

Displays the High Bearing Temperature alarm and trip point for the Shaft end of the motor, if the sensors are present and enabled.

Gearbox High Speed Blind End Bearing High Temperature

Displays the High Bearing Temperature alarm and trip point for the Blind end of the high speed gear, if the sensors are present and enabled.

Gearbox High Speed Shaft End Bearing High Temperature

Displays the High Bearing Temperature alarm and trip point for the Shaft end of the high speed gear, if the sensors are present and enabled.

Gearbox Low Speed Blind End Bearing High Temperature

Displays the High Bearing Temperature alarm and trip point for the Blind end of the low speed gear, if the sensors are present and enabled.

Gearbox Low Speed Shaft End Bearing High Temperature

Displays the High Bearing Temperature alarm and trip point for the Shaft end of the low speed gear, if the sensors are present and enabled.

Compressor Shaft End High Oil Temperature

Displays the High Oil Temperature alarm and trip point for the Shaft end of the compressor.

Compressor Thrust Bearing High Oil Temperature

Displays the High Oil Temperature alarm and trip point for the Thrust Bearing of the compressor.

Gearbox High Oil Temperature

Displays the High Oil Temperature alarm and trip point for the oil in the gearbox.

Compressor Oil Low Temperature

Displays the Low Oil Temperature trip point for the main oil supply to the compressor.

Compressor Oil Low Differential Temperature

Displays the temperature differential between the sump oil and the condenser saturation pressure/temperature that will prevent the chiller from starting if the system has been shutdown for less than 30 minutes.

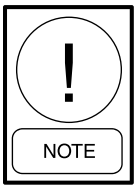
Compressor Oil Warm Start Differential Temperature Offset

Displays the temperature differential between the sump oil and the condenser saturation pressure/temperature that will prevent the chiller from starting if the system has been shutdown for more than 30 minutes.

Compressor Oil High Temperature

Displays the High Oil Temperature trip point for the oil in the compressor housing.

PROGRAMMABLE



Requires access level of SERVICE. Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Set Alarms

Allows a qualified Service Technician to change any of the alarm points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

Set Trips

Allows a qualified Service Technician to change any of the trip points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns the user to the Setup Screen.

Temperature Alarms/Trips

Access Level Required: VIEW

Returns to the Temperature Alarms/Trips Screen.

Pressure Alarms/Trips

Access Level Required: VIEW

Moves directly to the Pressure Alarms and Trips Screen.

Time Alarms/Trips

Access Level Required: VIEW

Moves directly to the Time Alarms and Trips Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Alarms and Trips Screen.

Page Down

Access Level Required: VIEW

Moves to the second screen of the Temperature Alarms and Trips Screen.

TEMPERATURE ALARMS AND TRIPS SCREEN (CON'T)

FIGURE 33 - TEMPERATURE ALARMS AND TRIPS SCREEN

OVERVIEW

This screen is the second of two displays for the temperature alarms and trips. Each point has either an alarm (warning) or a trip (shutdown) or both. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Discharge Low Temperature

Displays the Discharge Low Temperature trip point.

Discharge High Temperature

Displays the Discharge High Temperature alarm and trip points.

Compressor Oil Sump Temperature

Displays the Low Oil Temperature alarm and trip points for the oil in the compressor housing.

Evaporator Refrigerant Low Temperature

Displays the Low Refrigerant Temperature alarm and trip points for the evaporator.

Shutdown Offset

This value comes in operation when the low leaving chilled liquid temperature cutout setpoint is greater than the difference to the minimum allowable cutout temperature which is 36° for water or the value set for brine.

Restart Offset

Temperature that will permit a restart of the chiller that cycled off because of low leaving chilled liquid temperature.

PROGRAMMABLE

NOTE

Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Set Alarms

Allows a qualified Service Technician to change any of the alarm points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

Set Trips

Allows a qualified Service Technician to change any of the trip points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Setup

Access Level Required: VIEW

Returns to the Setup Screen.

Temperature Alarm and Trips

Access Level Required: VIEW

Returns to the Temperature Alarm and Trips Screen.

Pressure Alarms/Trips

Access Level Required: VIEW

Moves directly to the Pressure Alarms and Trips Screen.

Time Alarms/Trips

Access Level Required: VIEW

Moves directly to the Time Alarms and Trips Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Alarms and Trips Screen.

Page Up

Access Level Required: VIEW

Moves to the first screen of the Temperature Alarms and Trips Screen.

Page Down

Access Level Required: VIEW

Moves to the first display of the Pressure Alarms and Trips Screen.

PRESSURE ALARMS AND TRIPS SCREEN

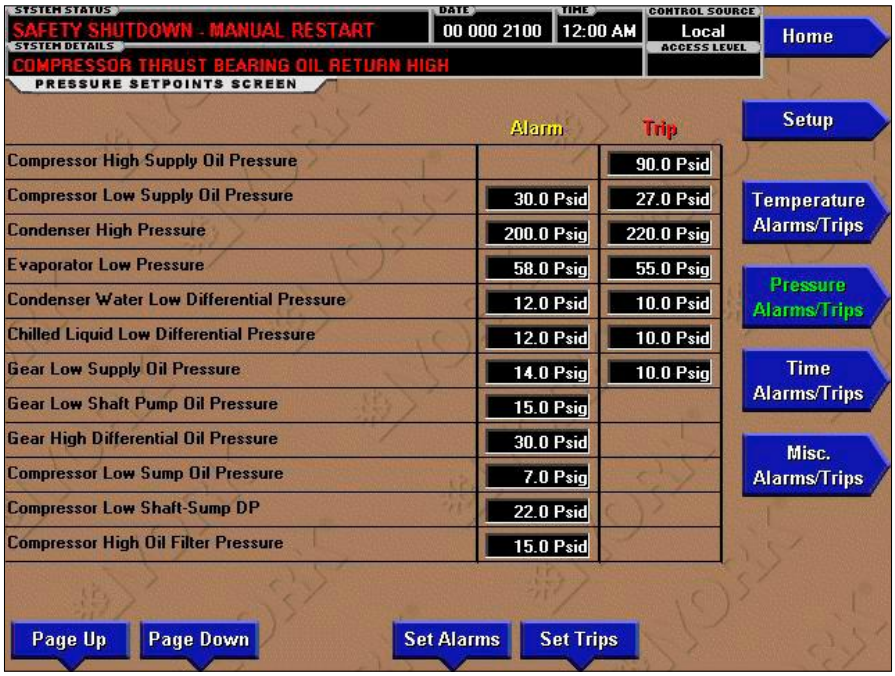


FIGURE 34 - PRESSURE ALARMS AND TRIPS SCREEN

OVERVIEW

This screen is the first of two displays for the pressure alarms and trips. Each point has either an alarm (warning) or a trip (shutdown) or both. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Compressor High Supply Oil Pressure

Displays the Compressor High Oil Supply Pressure trip point.

Compressor Low Supply Oil Pressure

Displays the Compressor Low Oil Supply Pressure alarm and trip points.

Condenser High Pressure

Displays the Condenser High Pressure alarm and trip points.

Evaporator Low Pressure

Displays the Evaporator Low Pressure alarm and trip points.

Condenser Liquid Low Differential Pressure

Displays the Condenser Water Low Differential Pressure alarm and trip points, if the sensors are present and enabled.

Chilled Liquid Low Differential Pressure

Displays the Chilled Liquid Low Differential Pressure alarm and trip points, if the sensors are present and enabled.

Gear Low Supply Oil Pressure

Displays the Gear Low Oil Supply Pressure alarm and trip points.

Gear Low Shaft Pump Oil Pressure

Displays the Gear Low Oil Shaft Pressure alarm point.

Gear High Differential Oil Pressure

Displays the Gear High Differential Oil Pressure alarm.

Compressor Low Sump Oil Pressure

Displays the Compressor Low Oil Supply Pressure alarm point.

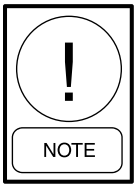
Compressor Low Shaft Pump Oil Pressure

Displays the Compressor Low Oil Shaft Pressure alarm point.

Compressor High OH Filter Pressure

Displays the Compressor High Oil Filter Pressure alarm point.

PROGRAMMABLE



Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Set Alarms

Allows a qualified Service Technician to change any of the alarm points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

Set Trips

Allows a qualified Service Technician to change any of the trip points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Capacity Controls

Access Level Required: VIEW

Returns to the Capacity Controls Screen.

Temperature Alarms/Trips

Access Level Required: VIEW

Moves directly to the Temperature Alarms and Trips Screen.

Time Alarms/Trips

Access Level Required: VIEW

Moves directly to the Time Alarms and Trips Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Alarms and Trips Screen.

Page Up

Access Level Required: VIEW

Moves to the second screen of the Temperature Alarms and Trips Screen.

Page Down

Access Level Required: VIEW

Moves to the second screen of the Pressure Alarms and Trips Screen.

PRESSURE ALARMS AND TRIPS SCREEN (CON'T)

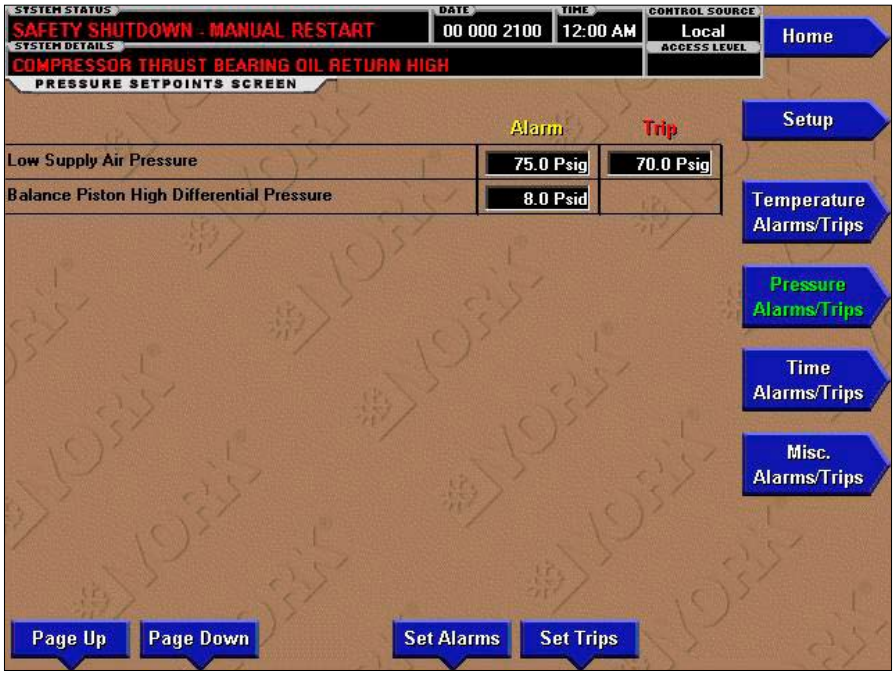


FIGURE 35 - PRESSURE ALARMS AND TRIPS SCREEN (CON'T)

OVERVIEW

This screen is the second of two displays for the pressure alarms and trips. Each point has either an alarm (warning) or a trip (shutdown) or both. These points will be configured at commissioning by a qualified Johnson Controls Service Technician.

DISPLAY ONLY

Low Supply Air Pressure

Displays the Supply Air Low Pressure alarm and trip points.

Balance Piston High Differential Pressure

Displays the Balance Piston High Differential Pressure alarm point.

PROGRAMMABLE

NOTE

Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Set Alarms

Allows a qualified Service Technician to change any of the alarm points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

Set Trips

Allows a qualified Service Technician to change any of the trip points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Temperature Alarms/Trips

Access Level Required: VIEW

Moves directly to the Temperature Alarms and Trips Screen.

Time Alarms/Trips

Access Level Required: VIEW

Moves directly to the Time Alarms and Trips Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Alarms and Trips Screen.

Page Up

Access Level Required: VIEW

Moves to the first screen of the Pressure Alarms and Trips Screen.

Page Down

Access Level Required: VIEW

Moves to the Time Alarms and Trips Screen.

TIME ALARMS AND TRIPS SCREEN

FIGURE 36 - TIME ALARMS AND TRIPS SCREEN

OVERVIEW

This screen displays the time alarms and trips. Each point has either an alarm (warning) or a trip (shutdown) or both. These points will be configured at commissioning by a qualified Johnson Controls Service Technician during the manufacturing of the chiller.

DISPLAY ONLY

Auxiliary Oil Pump Overrun Time

Displays the Auxiliary Oil Pump Overrun alarm point.

Auxiliary Oil Pump Shutoff Deadline

Displays the Auxiliary Oil Pump Shutoff Deadline alarm point.

Auxiliary Oil Pump Shaft Pump Uptime

Displays the Auxiliary Oil Shaft Pump Uptime alarm point.

Auxiliary Oil Pump Interlock Delay

Displays the Auxiliary Oil Pump Interlock Delay trip point, if enabled.

Motor Interlock Delay

Displays the Motor Interlock Delay trip point, if enabled.

Motor Start Contact Delay

Displays the Motor Start Contact Delay trip point, if enabled.

Digital Vibration Enable Delay

Displays the Vibration Enable Delay trip point, if enabled.

Chilled Liquid Flow Start Delay

Displays the Chilled Liquid Flow Switch Start Delay trip point.

Condenser Liquid Flow Start Delay

Displays the Condenser Water Flow Switch Start Delay trip point.

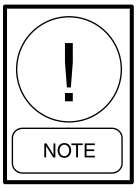
Startup Alarm/Trip Enable Delay

Displays the time during prelube startup that alarms will be bypassed to allow pressures to stabilize.

Gearbox Low Oil pressure Alarm/Trip Enable Delay

Displays the time during prelube the gearbox oil pressure alarm will be bypassed to allow the pressure to stabilize.

PROGRAMMABLE



Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Set Alarms

Allows a qualified Service Technician to change any of the alarm points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

Set Trips

Allows a qualified Service Technician to change any of the trip points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Temperature Alarms/Trips

Access Level Required: VIEW

Moves directly to the Temperature Alarms and Trips Screen.

Pressure Alarms/Trips

Access Level Required: VIEW

Moves directly to the Pressure Alarms and Trips Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Alarms and Trips Screen.

Page Up

Access Level Required: VIEW

Moves to the second screen of the Pressure Alarms and Trips Screen.

Page Down

Access Level Required: VIEW

Moves to the Miscellaneous Alarms and Trips Screen.

MISCELLANEOUS ALARMS AND TRIPS SCREEN

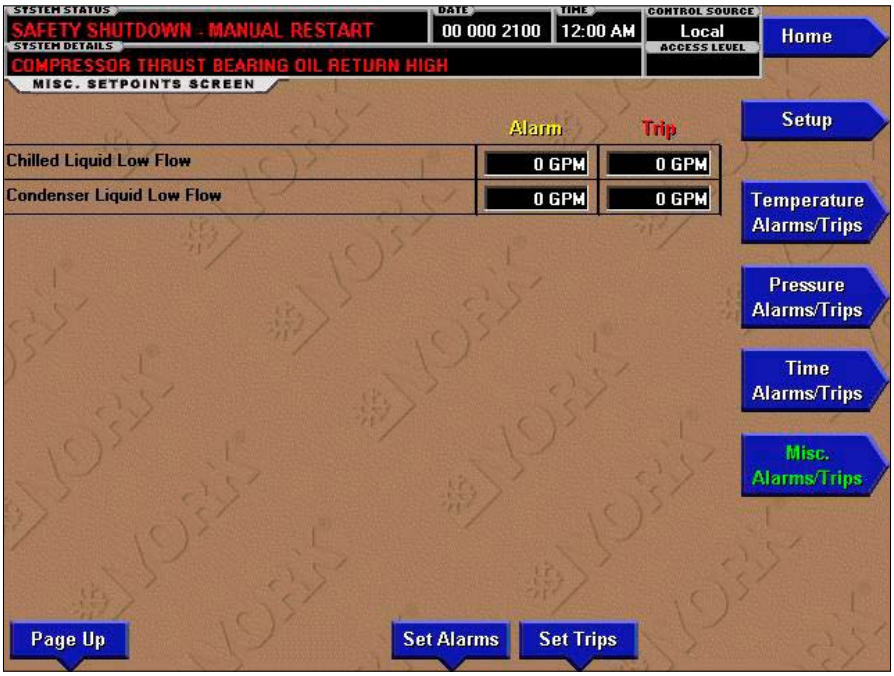


FIGURE 37 - MISCELLANEOUS ALARMS AND TRIPS SCREEN

OVERVIEW

This screen displays the time alarms and trips. Each point has either an alarm (warning) or a trip (shutdown) or both. These points will be configured at commissioning by a qualified Johnson Controls Service Technician during the manufacturing of the chiller.

DISPLAY ONLY

Chilled Liquid Low Flow

Displays the Chilled Liquid Low Flow Alarm and Trip points, if the sensors are present and enabled.

Condenser Liquid Low Flow

Displays the Condenser Water Low Flow Alarm and Trip points, if the sensors are present and enabled.

PROGRAMMABLE

NOTE

Requires access level of SERVICE, Service Technicians refer to the Service Instructions (Form 160.72-M1) for operation instructions and explanation of all programmable setpoints and displayed values.

Set Alarms

Allows a qualified Service Technician to change any of the alarm points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

Set Trips

Allows a qualified Service Technician to change any of the trip points shown above. Refer to the *Service Instructions (Form 160.72-M1)*.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Temperature Alarms/Trips

Access Level Required: VIEW

Moves directly to the Temperature Alarms and Trips Screen.

Pressure Alarms/Trips

Access Level Required: VIEW

Pressure Alarms and Trips Screen.

Misc Alarms/Trips

Access Level Required: VIEW

Moves directly to the Miscellaneous Alarms and Trips Screen.

Page Up

Access Level Required: VIEW

Moves to the Time Alarms and Trips Screen.

HISTORY SCREEN

FIGURE 38 - 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 subscreen **HISTORY DETAILS**. 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)

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 Ten Faults

This window displays a chronological listing (most recent first) of the date and time and the description of the last ten safety or cycling shutdowns that occur while the system is running or stopped.

PROGRAMMABLE

Print All Histories

Access Level Required: VIEW

This generates a report listing the status of the chiller parameters at the time of each of the stored shutdowns.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Trending

Access Level Required: VIEW

Moves user to a sub-screen allowing the user to view trending data on selected chiller parameters.

Custom View

Access Level Required: VIEW

Moves user to a sub-screen allowing the user to view the Custom Setup Screen.

Security Log

Access Level Required: SERVICE

Moves user to a sub-screen allowing the user to view a record of the last 75 setpoint changes.

Clear History

Access Level Required: ADMIN

HISTORY DETAILS SCREEN

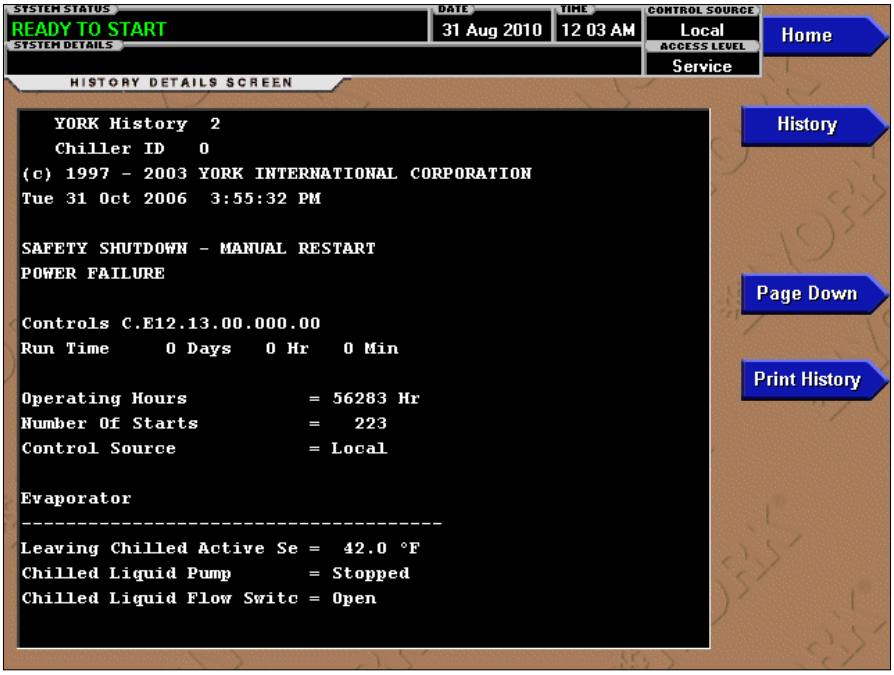


FIGURE 39 - HISTORY DETAILS SCREEN

OVERVIEW

This screen allows the user to see art 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 Down/Page Up

Access Level Required: VIEW

Scroll up or down in the displayed data (if applicable).

Print History

Access Level Required: VIEW

This generates a report listing the status of the chiller parameters at the time of the selected shutdown.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

History

Access Level Required: VIEW

Returns user to History Screen.

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TREND SCREEN

FIGURE 40 - 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.

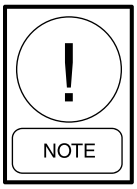
The parameters are sampled at the selected Data Collection Interval and plotted using 450 data points across the X-axis. If the actual value of the sampled parameter is less than the Y-axis label minimum for that parameter, the value will be plotted at the minimum value. Similarly, if the actual value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

There are three types of charts that can be created: **ONE SCREEN, CONTINUOUS** or **TRIGGERED.** When plotting reaches the end of the X-axis, if 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 as with 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 wilt 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.

Data Select

Access Level required: VIEW

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).

Print

Access Level Required: VIEW

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.

Y-Axis

Access Level Required: VIEW

This key toggles the Y-axis labels of the graph. Each key press changes the label to another of the selected parameters.

X-Axis

Access Level Required: VIEW

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

Access Level Required: VIEW

Returns user to Home Screen.

History

Access Level Required: VIEW

Returns user to Home Screen.

Trend Setup

Access Level Required:

Only displayed if the trending is stopped. Causes a jump to a subscreen for configuring the trending display.

TREND SETUP SCREEN

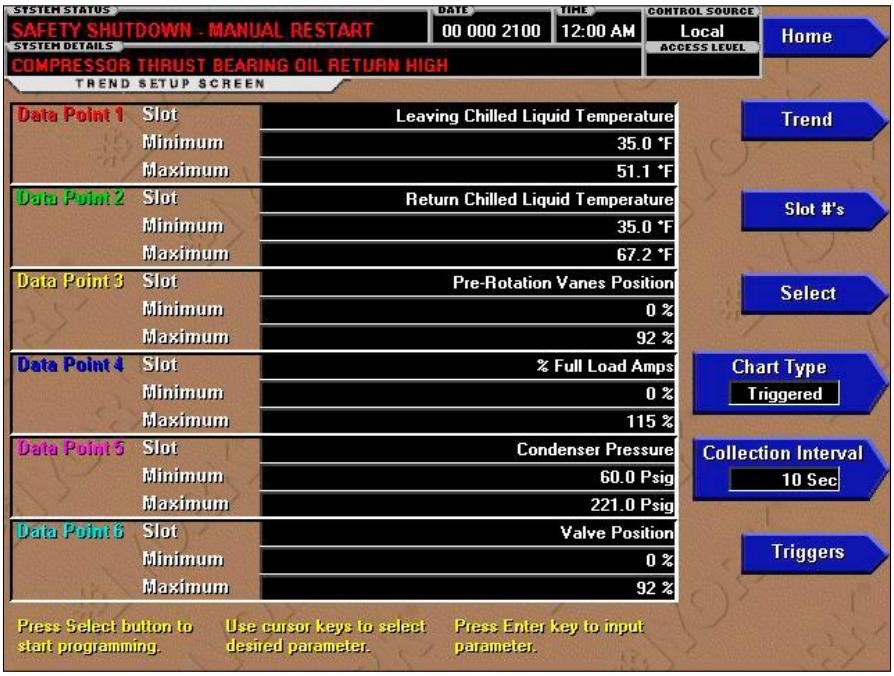


FIGURE 41 - TREND SETUP SCREEN

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

None

PROGRAMMABLE

Chart Type

Access level Required: OPERATOR

Selects CONTINUOUS, ONE SCREEN or TRIGGERED type of graph.

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:

1. Determine the desired time interval (in seconds), between data samples.
2. Calculate the full screen time display as follows:
   - 450 x Data Collection Interval = full screen seconds
   - full screen seconds/60 = full screen minutes
   - full screen minutes/60 = full screen hours
   - full screen hours/24 = full screen days
3. 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 ✓ 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

Returns user to Home Screen.

Trending

Returns user to 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.

TREND COMMON SLOTS SCREEN

FIGURE 42 - TREND COMMON SLOTS SCREEN

3

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.

NOTE

Requires a login access level of OPERATOR or higher.

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

Returns user to Home Screen.

Trend Setup

Returns user to Trend Setup Screen.

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CUSTOM SCREEN

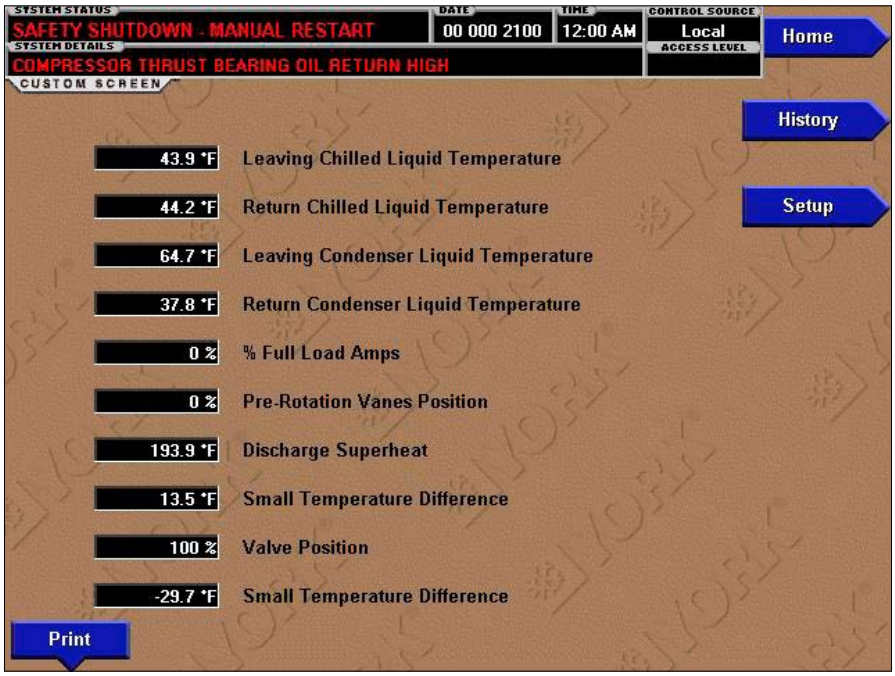

FIGURE 43 - CUSTOM SCREEN

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

None

PROGRAMMABLE

Print

Access Level Required: VIEW

This generates a listing of the parameters displayed on this screen.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

History

Access Level required: VIEW

Returns user to History Screen.

Setup

Access Level required: SERVICE

Causes a jump to the sub-screen that allows selection of the parameters to be displayed.

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CUSTOM SETUP SCREEN

FIGURE 44 - CUSTOM SETUP SCREEN

OVERVIEW

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

NOTE

Requires a login access level of SERVICE. Service Technicians refer to the YORK Service Manual 160.72-M1 for operation instructions and explanation of all programmable setpoints and displayed values.

DISPLAY ONLY

Custom Slot Numbers (1-10)

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.

Clear Display

Pressing this key clears all selected parameters from the Custom View screen.

NAVIGATION

Home

Access Level Required: VIEW

Returns user to Home Screen.

Custom View

Access Level Required: SERVICE

Returns user to Custom View Screen.

SECURITY LOG SCREEN

FIGURE 45 - SECURITY LOG 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.

NOTE

Requires a login access level of SERVICE.

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

Access Level Required: SERVICE

Returns user to Home Screen.

Security Log

Access Level Required: SERVICE

Returns user to Security Log Screen.

SECURITY LOG DETAILS SCREEN

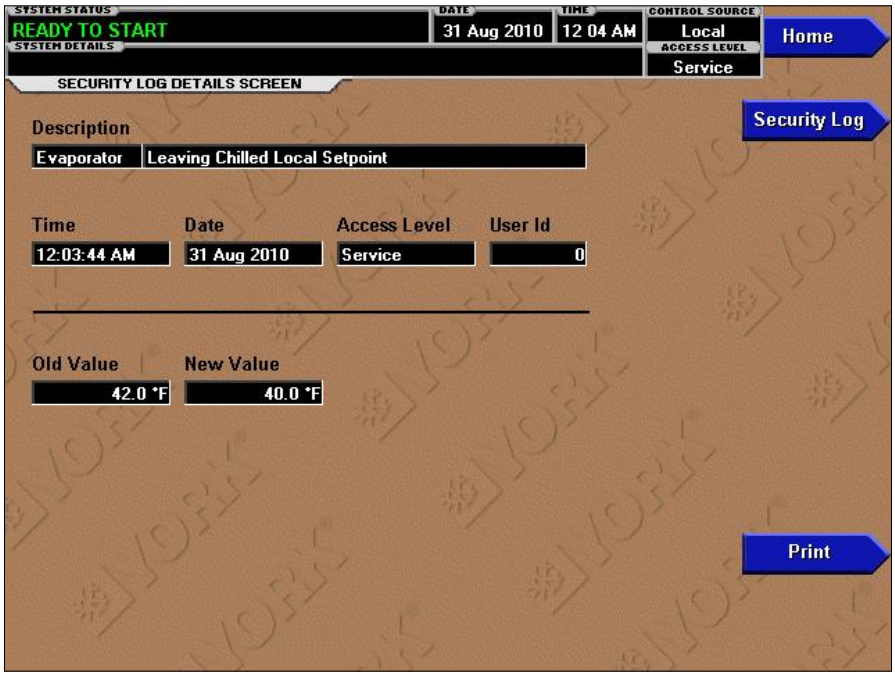

FIGURE 46 - SECURITY LOG DETAILS SCREEN

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 the *Service Instructions (Form 160.72-M1)*.

NOTE

Requires a login access level of SERVICE.

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

Access Level Required: SERVICE

Returns user to Home Screen.

History

Access Level Required: SERVICE

Returns user to History Screen.

View Details

Access Level Required: SERVICE

Moves user to a sub-screen containing the details of the setpoint change selected with the Log Entry key.

TABLE 2 - MASTER SLOT NUMBERS LIST FOR USE WITH TREND FEATURE

SLOT#	DESCRIPTION
1296	Condenser Temperature
1379	Supply Air Pressure
1380	Compressor Balance Piston Pressure
1537	Compressor Supply Oil Temperature
1548	Compressor Shaft End Oil Return Temperature
1549	Compressor Thrust Bearing Oil Return Temperature
1556	Compressor Shaft Pump Discharge Oil Pressure
1557	Compressor Sump Oil Pressure
1558	Compressor Oil Pressure After Filter
1562	Compressor Oil Temperature After Oil Cooler
1568	Compressor Thrust Bearing Oil Pressure
1579	Compressor Oil Cooler Entering Water Temperature
1580	Compressor Oil Cooler Leaving Water Temperature
1581	Compressor Oil Cooler Water DIP
1602	Compressor Sump Oil Temperature
1792	Leaving Chilled Liquid Temperature
1807	Return Chilled Liquid Temperature
1808	Evaporator Refrigerant Pressure
1812	Evaporator Refrigerant Liquid Temperature
2007	Leaving Chilled Liquid Pressure
2008	Return Chilled Liquid Pressure
2044	Chilled Liquid Flow
2048	Return Condenser Liquid Temperature
2051	Leaving Condenser Liquid Temperature
2052	Condenser Pressure
2056	Condenser Refrigerant Temperature
2080	Return Condenser Water Pressure
2081	Leaving Condenser Water Pressure
2306	%FLA
2344	Gear Supply Oil Pressure
2345	Gear Shaft Pump Oil Pressure
2353	Gear Supply Oil Temperature
2369	Gear Oil Cooler Leaving Water Temperature
2370	Gearbox Oil Cooler Water D/P
2420	% FLkW
19481	Intercooler Refrigerant Pressure
19483	Intercooler Refrigerant Liquid Temperature
1296	Condenser Temperature (Compressor Discharge)

DISPLAY MESSAGES INTRODUCTION

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

TABLE 3 - STATUS LINE MESSAGES AND COLORS

MESSAGE	COLOR
Normal Operation	Green
Warning	Yellow
Cycling Shutdown	Orange
Safety Shutdown	Red

STATUS MESSAGES

SYSTEM READY TO START

The chiller is shut down but will start upon receipt of a Local or Remote start signal.

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.

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 moves the **COMPRESSOR** switch to the **STOP/RESET** (O) position.

SYSTEM PRE-LUBE

A chiller start has been initiated and the pre-start lubrication is being performed. The Pre-lube duration is configured by a qualified Service Technician during commissioning and will be up to 150 seconds.

SYSTEM RUN

The chiller is running under the condition described in the Details Line of the Status Bar.

SYSTEM COASTDOWN

The chiller has shut down and the post-run lubrication is being performed. On electric motor drive applications, the post-lube duration is up to 150 seconds. On Steam Turbine applications, it is up to 15 minutes. The actual duration is determined by the post-lube setpoint timer, configured by a qualified Service Technician.

START INHIBIT

The chiller is prevented from being started due to the reason displayed on the Details Line of the Status bar.

RUN MESSAGES

CONTROLS RAMPING

The chiller is running under the Capacity Controls during the initial startup of the machine and the Pre-rotation Vane and Hot Gas Valve are being controlled by the configured ramp rates.

TEMPERATURE CONTROLLING (NORMAL)

The chiller is running under the Capacity Controls under normal conditions and all configured outputs are being controlled to maintain the temperature setpoint. There are no override conditions present.

SUCTION PRESSURE CONTROLLING

The Capacity Controls are functioning in a Suction Pressure override condition.

DISCHARGE PRESSURE CONTROLLING

The Capacity Controls are functioning in a Discharge Pressure override condition.

DEMAND LIMIT CONTROLLING

The Capacity Controls are functioning in a Demand Limit override condition.

ANTI-SURGE CONTROLLING

One of the Anti-Surge parameters is causing the Capacity Controls to function in an Anti-Surge override condition.

MOTOR - HIGH CURRENT LIMIT

The Compressor Motor current is greater than the Local or Remote Current Limit Setpoint. The Current Limit Setpoint is programmed over a range of 30 to 100% of the Chiller Full Load Amps (FLA).

LEAVING CHILLED LIQUID CONTROL

The chiller is running, controlling the Leaving Chilled Liquid to the Leaving Chilled Liquid Temperature Setpoint. There are no system conditions inhibiting this operation.

MOTOR PULLDOWN LIMIT

The Pulldown Demand Limit Setpoint timer is in effect and the Compressor Motor current is > the Pulldown Demand Current Limit Setpoint value. The Pre-rotation vane operation is being inhibited as described in **MOTOR - HIGH CURRENT LIMIT** message above.

START INHIBIT MESSAGES

INHIBIT - ANTI-RECYCLE

The chiller is inhibited from starting because one of the Anti-Recycle timers has not yet elapsed. See the explanation of the Anti-Recycle screen for details.

INHIBIT - MOTOR HIGH CURRENT

The OptiView Control Center has detected a Motor Current than 15% of the chiller Full Load Amps for 10 continuous seconds, while the chiller is shutdown. As long as this condition exists, the oil pump is turned on. This is generally indicative of a failure of the motor starter, Control Center start circuits or motor current feedback circuits. After motor current is no longer detected, a **SYSTEM COASTDOWN** is performed. The chiller can be started after motor current is no longer detected, the **SYSTEM COASTDOWN** has completed and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

INHIBIT - VIBRATION

The Vibration Detection option has been enable and the OptiView Control Center has detected an input from the Vibration system.

INHIBIT - UNEXPECTED MOTOR START CONTACT

The OptiView Control Center has detected a Motor Start Contact signal from the motor starter while the chiller is shutdown. As long as this condition exists, the oil pump is turned on. This is generally indicative of a failure of the Motor Starter Control Center start circuits or motor current feedback circuits. After the interlock signal is no longer detected, a SYSTEM COASTDOWN is performed. The chiller can be started after motor start contact is no longer detected, the SYSTEM COASTDOWN has completed and the COMPRESSOR switch is placed in the **STOP/RESET** (O) position.

INHIBIT - UNEXPECTED MOTOR INTERLOCK

The OptiView Control Center has detected a Motor Interlock signal from the motor starter while the chiller is shutdown. As long as this condition exists, the oil pump is turned on. This is generally indicative of a failure of the Motor Starter Control Center start circuits or motor current feedback circuits. After the interlock signal is no longer detected, a **SYSTEM COASTDOWN** is performed. The chiller can be started after motor interlock is no longer detected, the **SYSTEM COASTDOWN** has completed and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

INHIBIT - LOW OIL SUMP TEMPERATURE

The oil temperature in the sump is below the trip setting configured at commissioning. This is usually the result of a failure of the oil heater or a power failure that prevents maintaining the oil temperature.

WARNING MESSAGES

WARNING - REAL TIME CLOCK FAILURE

During the initialization process that occurs when power is applied to the OptiView Control Center, test data is written to a location in the BRAM battery backed memory device (1C 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.

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 Trans-

ducer failure. This message will be displayed until the condition clears and the **WARNING RESET** Keypad key is pressed on the home screen in **OPERATOR** (or higher) access mode. Condition not checked in Brine mode.

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 OptiView 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 on the home screen in **OPERATOR** (or higher) access mode.

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 Pre-rotation Vanes are inhibited from further opening. This message automatically clears and the Vanes are permitted to modulate open when the Condenser pressure decreases to 0.1 PSIA below the Setpoint.

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 Pre-rotation Vanes are inhibited from further opening. This message automatically clears and the vanes are permitted to modulate open when the evaporator pressure increases to the reset value.

WARNING - EXTERNAL I/O-SERIAL COMMUNICATIONS

Serial communications between the Microboard and one of the Analog I/O Boards or the Digital I/O Board has been interrupted for at least 20 seconds. Message automatically clears when communications are restored.

ROUTINE SHUTDOWN MESSAGES

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 remote mode via the E-Link gateway serial communications.

LOCAL STOP

A local shutdown command has been received by placing the Keypad Start-Run-Stop/Reset Switch in the stop (O) position.

PLACE COMPRESSOR SWITCH IN RUN POSITION

The OptiView Control Center is in either Digital or 1SN (Integrated Systems Network) Remote mode. The Operator is requested to place the **COMPRESSOR** Switch in the **RUN** position. The OptiView Control Center will not accept a Remote start/stop command unless the switch is in the **RUN** position.

CYCLING SHUTDOWN MESSAGES

MULTIUNIT CYCLING - CONTACTS OPEN

The Multiunit Cycling contacts connected to I/O Board TB4-9, have opened to initiate a cycling shutdown. 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. The chiller will automatically restart when the contacts close.

OIL LOW TEMPERATURE DIFFERENTIAL

The chiller is prevented from starting because for one of the following reasons. The chiller will automatically restart when the conditions have been satisfied.

The chiller has been shut down for <30 minutes and the oil temperature minus the condenser saturation temperature is <30°F.

-OR

The chiller has been shut down for > 30 minutes and the oil temperature minus the condenser saturation temperature is < 40°F.

-OR

Following a power failure, upon restoration of power, the oil temperature minus the condenser saturation temperature is < 40°F.

OIL SUMP LOW TEMPERATURE

The oil temperature has decreased to < 55°F. The chiller will automatically restart when the temperature increases to>71.0°F.

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. However, if the power failure duration was < the duration of the applicable COASTDOWN period (2.5 minutes standard; 15 minutes steam turbine) when power is restored, the remainder of the COASTDOWN will be performed, prior to the chiller starting. This message can indicate a Cycling (auto-restart after power failure) or Safety (manual restart after power failure) shutdown, depending upon OptiView Control Center configuration. It indicates a cycling shutdown when displayed in orange characters; safety shutdown when displayed in red characters.

LEAVING CHILLED LIQUID - LOW TEMPERATURE

The Leaving Chilled Liquid Temperature has decreased to the programmed Shutdown Temperature Setpoint. The chiller will automatically restart when the temperature increases to the programmed Restart Temperature Setpoint.

LEAVING CHILLED LIQUID - FLOW SWITCH OPEN

The Chilled Liquid Flow Switch has remained open for 2 continuous seconds while the chiller was running or failed to close during the **System Pre-lube** period. The chiller will automatically restart when the flow switch closes.

CONDENSER - FLOW SWITCH OPEN

The condenser water flow switch has remained open for 2 continuous seconds while the chiller was running. This check is bypassed for the first 30 seconds of SYSTEM RUN. The chiller will automatically restart when the flow switch closes.

MOTOR CONTROLLER - CONTACTS OPEN

The CM-2 Current module (Electromechanical starter applications) has shutdown the chiller. When detecting a fault condition that places the starter or motor at risk, these devices open the Motor Controller contacts “CM” (located on the respective device and connected between TB6-16 and TB6-53 in the OptiView Control Center) to initiate a shutdown. Since there are several different faults that are monitored, LED's on the respective device illuminate to identify the specific fault that has occurred. Refer to the *Service Instructions (Form 160.72-M1)* for CM-2 initiated shutdowns. The chiller will automatically restart when the Motor Controller contacts close. On some shutdowns, the respective device automatically closes the contacts when the fault condition clears. Other shutdowns require the operator to perform a Manual Reset at the respective device.

MOTOR CONTROLLER - LOSS OF CURRENT

The Compressor Motor current decreased to 10% Full Load Amps (FLA) for 25 continuous seconds while the chiller was running. This could be caused by the starter de-energizing during run or a defect in the motor current feedback circuitry to the OptiView Control Center, The chiller will automatically restart at the completion of SYSTEM COASTDOWN.

POWER FAULT

The CM-2 Current Module (Electro-mechanical starter applications) has shutdown the chiller because it detected a fault condition that places the motor at risk. These devices open and close the motor controller “CM” contacts (located on the respective device and connected between TB6-16 and TB6-53 in the OptiView Control Center) in < 3 seconds to initiate the shutdown and produce this message. An LED on the respective device illuminates to identify the specific fault that has occurred. Refer to the *Service Instructions (Form 160.72-M1)* for CM-2 initiated shutdowns. The chiller will automatically restart when the contacts close.

SAFETY SHUTDOWN MESSAGES

EVAPORATOR - LOW PRESSURE (ANALOG)

(This message is applicable only if the Smart Freeze feature is not activated. If Smart Freeze is activated and has initiated the shutdown, EVAPORATOR - LOW PRESSURE - SMART FREEZE is displayed as described next.) The evaporator pressure, as sensed by the Evaporator Transducer, has decreased to the safety shutdown threshold. For water cooling applications, the safety shutdown threshold is a fixed value for the respective refrigerant. For Brine cooling applications, the safety 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 ay one other than a qualified Service Technician following instructions in the *Service Instructions (Form 160.72-M1)*. The chiller can be started after the evaporator pressure increases to the restart threshold and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

EVAPORATOR - LOW PRESSURE - SMART FREEZE

Smart Freeze Protection is activated and has shut down 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 the *Service Instructions (Form 160.72-M1)*, this parameter is used as the evaporator refrigerant temperature and the freeze threshold is 32.8°F. 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. The 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: Number of seconds to freezing = (4053.7) / (freeze threshold-evaporator refrigerant temperature) Smart Freeze is activated only if the feature has been Enabled by a Service Technician (following instruction in the *Service Instructions (Form 160.72-M1)* **and** the Leaving Chilled Liquid temperature Setpoint is <38.0°F.

EVAPORATOR - TRANSDUCER OR LEAVING LIQUID PROBE

A possible defective Evaporator Pressure Transducer or Leaving Chilled Liquid temperature Transmitter has been detected. The pressure and temperature that these devices are indicating are not in the correct relationship to each other. The OptiView 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 to +25.0°F. If the transducer and transmitter are accurate, the evaporator saturated temperature should not be > 2.5°F warmer nor > 25.0°F 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. For Steam Turbine drive applications, this check is bypassed for the first 20 minutes of chiller operation. The chiller can be started after the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

EVAPORATOR - TRANSDUCER OR TEMPERATURE SENSOR

A possible defective Evaporator Pressure Transducer or Refrigerant Temperature Sensor has been detected. The OptiView 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 the Service Instructions for the *Service Instructions (Form 160.72-M1)*.
- Not in Brine cooling mode
- Smart Freeze is enabled
- Evaporator Temperature Sensor (RT7) or Evaporator Saturation Temperature is indicating a temperature of <32.0°F

The chiller can be started after the temperatures are within 3.0°F of one another and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

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 > 29.7 PSIA. The contacts will automatically close when the condenser pressure decreases to < 23.7 PSIA. The chiller can be started after the contacts close and the **COMPRESSOR** switch is placed in the **STOP/RESET**(O) position.

CONDENSER - HIGH PRESSURE

The condenser pressure, as sensed by the Condenser Transducer, has increased to >29.7 PSIA. The chiller can be started after the pressure decreases to <23.7 PSIA and the COMPRESSOR switch is placed in the **STOP/RESET** (O) position.

CONDENSER - PRESSURE TRANSDUCER OUT OF RANGE

The Condenser Pressure Transducer is indicating a pressure that is >35.3 PSIA. This is outside the normal operating range of the transducer. This is generally indicates a defective transducer. The chiller can be started after the transducer is indicating a pressure that is < 35.3 PSIA and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

EMERGENCY STOP

AUXILIARY SAFETY - CONTACTS CLOSED

The Auxiliary Safety shutdown contacts, connected to I/O Board TB4-31 have closed, 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 **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

DISCHARGE - HIGH TEMPERATURE

The discharge temperature, as sensed by the Discharge Temperature Transmitter, has increased to > 220.0°F. The chiller can be started after the temperature decreases to < 220.0°F and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

DISCHARGE - LOW TEMPERATURE

The discharge temperature, as sensed by the Discharge Temperature Transmitter, has decreased to < 30.0°F. The chiller can be started after the temperature increases to > 30.0°F and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

OIL - HIGH TEMPERATURE

The oil temperature, as sensed by the Oil Temperature Transmitter, has increased to > 180.0°F. The chiller can be started after the temperature decreases to < 180.0°F and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

OIL - LOW DIFFERENTIAL PRESSURE

The differential oil pressure decreased to < 15.0 PSID while the chiller was running or failed to achieve 20.0 PSID during the last 5 seconds of the SYSTEM PRELUBE period. The differential oil pressure is the difference between the output of the Sump Oil Pressure Transducer (system low pressure) and the output of the Pump Oil Pressure Transducer (system high pressure). The chiller can be started after the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

OIL - HIGH DIFFERENTIAL PRESSURE

The differential oil Pressure increased to > 60.0 PSID while the oil pump was running. The differential oil pressure is the difference between the output of the Sump Oil Pressure Transducer (system low pressure) and the output of the Pump Oil Pressure Transducer (system high pressure). The chiller can be started after the differential oil pressure decreases to <60.0 PSID and the **COMPRESSOR** switch is placed in the **STOP/RESET** (O) position.

CONTROL PANEL - POWER FAILURE

A Control Power failure has occurred. If the power failure duration was < the duration of the applicable COASTDOWN period (2.5 minutes standard; 15 minutes steam turbine), the remainder of the COASTDOWN is performed upon restoration of power. The chiller can be started after the **COMPRESSOR** switch is placed in the STOP/RESET (O) position. 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 OptiView Control center is configured for auto-restart or manual restart after power failure by a qualified Service Technician following instructions in the *Service Instructions (Form 160.72-M1)*.

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 reinitialization 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.

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SECTION 4 - GENERAL OPERATING SEQUENCE

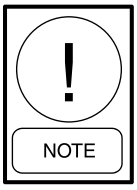
UNIT NOT OPERATING

1. Control power is available to the control panel.
2. Compressor oil heaters are enabled to maintain proper temperature at oil sump.
3. The capacity controls are disabled. The compressor pre-rotation vanes and the interstage control valve are closed. The hot gas bypass and subcooler level control valves are open.

SYSTEM STARTUP

1. All chiller safety logic must be satisfied prior to starting, with the exception of the compressor and gearbox low oil pressure, the chilled water and condenser water low differential pressure, and the Vibration Monitor Trip Contacts, if enabled. The oil pressure safeties are bypassed initially, until the auxiliary oil pumps can establish pressures. The differential pressure safeties are bypassed until the water pumps can establish flows. The Vibration Monitor Trip Contacts are bypassed at shutdown and until 2 seconds after the compressor motor has started to prevent nuisance trips caused by the temporary excessive vibrations during start-up and shutdown.

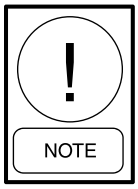
   The CLEAR MESSAGE button on the display must be pushed to clear any previous safety trips or power failures (if any).



A status indicator box in the upper left corner will display the GREEN text SYSTEM READY TO START. This display will change at various times during the start-up, operation, and shutdown of the chiller.

   If the chiller has been recently started and shut down, the motor must remain off for sufficient time to cool down. See ANTI-RECYCLE OPERATION for further details.

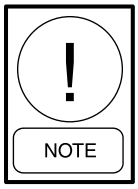
2. The chiller start may be initiated at this time by moving the COMPRESSOR SWITCH button to the start position. The switch is spring-loaded to return to the run position.



Local vs. Remote control of the start is established by the condition of the CONTROL SOURCE buttons on the OPERATIONS Screen, To enable a remote start, the source must be set to BAS, Analog, or Digital Control.

   When in LOCAL, the start sequence begins as soon as the operator moves the COMPRESSOR SWITCH button on the front of the chiller control panel to the start position.

   When in REMOTE with Remote Start Enabled, the REMOTE START CONTACT must close to initiate the chiller start sequence.



The chilled and condenser water flows must be established by the customer's pump control system or manually by the operator at least 5 seconds before the end of the pre-lube timer (an adjustable timer set on the timer setpoint screen, as described on page 63) in order to close the chilled and condenser water low differential pressure cutout contacts and continue with the start sequence.

3. With the above INITIATE START signal, the chiller controls start the compressor auxiliary oil pump and the gear auxiliary oil pump, if applicable, and their respective LED symbols on the display will illuminate in RED.

   If auxiliary run contacts are enabled and the pumps fail to start within the programmed time for feedback after the start signal is energized, an alarm signal will be transmitted to the DISPLAY for indication and recording.

   The compressor pre-rotation vanes are opened to their minimum position necessary to prevent SURGING during the initial acceleration at start-up. This value can be adjusted on the CAPACITY CONTROLS TUNING Screen.

4. Five seconds before the end of the pre-lube time, the compressor and gearbox, if applicable, low oil pressure signals and low pressure cutout switches are checked. The chilled and condenser water low differential pressure cutout switches are also checked.

If the minimum oil pressures are not established, startup will be prevented and an alarm signal will be transmitted to the DISPLAY for indication and recording. At this point, the operator would manually turn on the auxiliary oil pumps by pressing the AUTO MANUAL button on the appropriate DISPLAY screen. After adequate pressure is established, the starting may continue.

If the minimum water flows are not established, startup will be prevented and an alarm signal will be transmitted to the DISPLAY for indication and recording.

5. At the end of the pre-lube time, with the oil pressures and water flows established, a signal is provided to energize the compressor drive motor start control relay to close its contact and energize the motor starter control circuit.

6. If the starter auxiliary (start) contact does not close within the programmed (1 to 10 seconds) time after the start relay is energized, an alarm signal will be transmitted to the DISPLAY for indication and recording and the start relay will be de-energized.

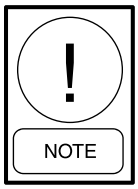
7. At 2 seconds (adjustable timer, if enabled) after the starter auxiliary (start) contact closes, the Vibration Monitor Trip Bypass contact is opened to allow vibration trips to occur.

8. When the starter has completed and the transition to full voltage operation, an auxiliary contact from the starter run (full voltage) contactor is input to the chiller control panel to operate the following:

   A. Enable the capacity control circuit compressor pre-rotation vanes and hot gas bypass valve will now begin to ramp open / closed at a predetermined rate. See CAPACITY CONTROL OPERATION for further details on the ramp-up of the controls.

   B. De-energize the compressor oil heaters, and energize the auxiliary cooling water solenoid valve.

   C. When the shaft pumps maintain the gearbox and compressor oil pressures for a 100 second time period (through the respective auxiliary oil pump control logic), the auxiliary motor driven oil pumps will be stopped.



Whenever the gearbox or compressor shaft pump oil pressure falls below the auxiliary oil pump control logic setting, the auxiliary pump motors will be restarted and an alarm signal will be transmitted to the DISPLAY for indication and recording.

If either pump does not produce sufficient oil pressure to satisfy the auxiliary oil pump control logic within five minutes after start, an alarm signal will be transmitted.

9. The compressor sump vent solenoid valve is energized 20 seconds (adjustable) after the compressor shaft oil pump maintains sufficient pressure. It then remains energized until the next shutdown.

   This allows the sump vent ball valve to slowly open at a rate determined by the setting of the needle valve located in the air supply line upstream of the solenoid valve.

   The needle valve must be adjusted so that the valve opens slowly enough to prevent foaming in the compressor sump caused by too rapid a sump pressure reduction on startup.

10. 100 Seconds after the motor starter auxiliary (run) contact closes, the oil separator heaters are energized. When the oil temperature in the separator reaches approximately 100°F, the temperature control switch closes to actuate the solenoid valve in the high pressure gas supply line to the eductor. The eductor will then pull a fresh oil and refrigerant mixture from the bottom of the evaporator, into the separator. The refrigerant is boiled off and returned to the evaporator. The oil level increases and flows out of the separator, to return to the compressor.

11. 5 Minutes after the motor starter auxiliary (run) contact closes, the subcooler level control valve, if enables, begins to ramp closed to allow liquid refrigerant to accumulate in the subcooler.

12. 10 minutes (adjustable) after the motor starter auxiliary (run) contact closes, the interstage valve, if enabled, begins to ramp open to reduce the pressure in the intercooler and the interstage liquid injection solenoid valve is energized.

13. After the ramp-up is completed, the capacity controls operate to control chiller capacity in response to chilled water outlet temperature.

SYSTEM SHUTDOWN

The chiller may be shutdown normally by momentarily closing the REMOTE STOP CONTACT or by moving the Compressor Switch to the STOP position. The chiller may also be stopped via a safety control determined by software. In this event it will display and record the cause of shutdown.

The following safeties are HARDWIRED to stop the chiller regardless of the condition of the Output controlling the motor starter:

- Emergency Stop-Pull to Stop Push button
- Compressor Discharge High Pressure Cutout
- Chilled Water Low Differential Pressure Cutout
- Condenser Water Low Differential Pressure Cutout
- All Compressor Motor Starter Safeties
- Compressor Oil Low Differential Pressure Cutout

On any shutdown, the sequence is as follows:

1. The Vibration Monitor Trip Bypass contact is closed to prevent nuisance alarms.
2. The compressor motor start relay is de-energized to open its contact and de-energize the motor starter control circuit.
3. Two “dump” solenoid valves are installed in the main air supply to the pre-rotation vanes and the hot gas valve to exhaust supply air from the actuators. The exhaust of the supply air will cause the compressor pre-rotation vanes to close and the hot gas valve to open to minimize back flow of gas through the compressor.
4. The interstage valve will be closed by software. The hot gas valve is opened and the interstage valve is closed to equalize the condenser pressure with the evaporator. These actions are taken to reduce backspin of the compressor on shutdown. If the chiller is shutdown by a stop command, an orderly shutdown occurs attempting to open the recycle gas valve and close the vanes and interstage valve before the stop sequence is completed.
5. The oil separator heaters and condenser gas supply to jet pump oil eductor solenoid valve are de-energized.
6. The water low differential pressure, and low oil pressure safety logic is inactivated to prevent nuisance alarms.
7. The anti-recycle timer is activated at this time. The anti-recycle (cool down) time depends on the number of previous starts attempted as described under anti-recycle operation at the end of this section.
8. During this time, further restarts of the motor are prevented.
9. The compressor sump vent solenoid is de-energized to close the sump vent line ball valve,
10. The interstage liquid injection and auxiliary cooling water solenoid valves are de-energized.
11. The compressor and gear auxiliary oil pump motors are started and the post-lube timing logic is enabled.

The chilled water flow may be shut off at this time.

If the shutdown is caused by Low Refrigerant Pressure, this could be an indication of a major refrigerant leak. In this event, the chilled water flow must be maintained to prevent freeze-up and damage to the tubes.

Five seconds after the shutdown, the compressor oil heaters are enabled for control by the temperature setpoint in software.

Approximately 120 Seconds the shutdown, the drive components will have coasted to a stop and the auxiliary oil pumps will be turned off.

ANTI-RECYCLE OPERATION

All start counters and timers in the anti-recycle operation described below are adjustable. The default values are used below as examples.

1. **Cold Starts**

   A. If the motor has been shutdown for **Cold Start Downtime** hours, the cool down (anti-recycle) time after the first start will be **Cold Start Recycle Time (1st Start)** minutes. If the chiller fails to start on the second try, the cool down time will be **Cold Start Recycle Time (2nd Start)** minutes.

   B. Any additional starts would be considered hot starts.

2. **Hot Starts**

   A. If the chiller has been running less than **Cold Start Uptime** minutes, the cool down time will be the difference between **Cold Start Uptime** minutes and the **Last Start Runtime**. For example:

   Cold Start Uptime = 30 minutes

   Last Start Runtime =10 minutes

   Cool Down Time - 20 minutes

   B. If the chiller has been running for **Cold Start Uptime** minutes or longer, the cool down time will be the **Hot Start Maximum Recycle Time**.

3. **Excessive Starts**

   When the motor is started, a 24-hour counter is enabled. During the next 24-hour period, the maximum number of starts allowed will be the **Allowed Starts Per Day**. Additional starts attempted in any 24-hour period will be locked out for **Excessive Start Lockout Time** hours.

CAPACITY CONTROL OPERATION

Refer to CAPACITY CONTROL DIAGRAM and the description for the applicable screens GRAPHIC DISPLAY DESCRIPTION, along with the following descriptions to best understand the operation.

Major capacity control devices

1. **Compressor Pre-rotation Vanes**

   The compressor pre-rotation vanes (PRVs) are internal guide vanes in the suction flow path to the first stage impeller wheel. The PRVs are used to throttle the refrigerant flow through the system as a means of controlling capacity in response to the leaving chilled water temperature. If the leaving chilled water temperature falls below the setpoint, the PRVs are partially closed until the net cooling is reduced and the leaving chilled water returns to setpoint.

   In the event of high motor power, the capacity control signal is over-ridden and the compressor PRVs are closed to keep the motor power down. On start-up, the PRVs are closed to reduce the starting load torque of the compressor.

   The compressor pre-rotation vanes are closed on shutdown to reduce backflow of high pressure gas from the condenser, which might otherwise cause the compressor to spin backwards at a high rate of speed.

   The mechanical pre-rotation vane linkage at the compressor is operated by a Conoflow piston operator, which has a pneumatic 3-15 psig / 0.2-1.0 bar direct acting positioner (increasing air signal opens the PRVs). The capacity control signal from the control panel is converted from 4-20 mA DC to a 3-15 psig / 0.2-1.0 bar pneumatic signal by an I/P transducer. The vanes will be fully closed at 4 mA DC, fully open at 20 mA DC.

2. **Hot Gas Bypass Valve**

   The hot gas bypass valve is used primarily at low loads to maintain a minimum suction gas flow required by the compressor for stability. When the compressor has reduced capacity to its minimum flow (via pre-rotation vane throttling), further capacity reductions are accomplished by opening the hot gas bypass valve. This maintains the flow to the compressor by bypassing the discharge gas back to the compressor suction.

   However, the hot gas flow replaces the useful evaporation in the cooler since the compressor flow is at minimum. Thus, the net chilling capacity is reduced (albeit not efficiently).

   The minimum suction flow or minimum compressor PRV position will vary. As the differential

HEAD pressure is lowered (due to colder condenser water) the compressor is capable of stable operation at lower loads. The programming in the chiller panel thus uses the differential HEAD pressure to establish when the hot gas may be needed.

This valve is opened at shutdown to allow the condenser pressure to equalize with the evaporator quickly, thus reducing backflow of high pressure gas through the compressor to the evaporator.

The hot gas valve is a pneumatic control valve with pneumatic positioner. The control signal from the control panel is 4-20 mA DC, which is converted to a 3-15 psig / 0.2-1.0 bar pneumatic signal by an I/P transducer. The valve will be fully open at 4 mA DC, fully closed at 20 mA DC.

3. **Subcooler Liquid Level Valve**

   The subcooler liquid level valve controls the refrigerant liquid level in the subcooler (located in the bottom of the condenser) to maintain the proper amount of subcooling and provide the most efficient operation at all loads.

   This valve is opened after shutdown to allow all the refrigerant liquid to drain through the intercooler and into the evaporator. It remains open for five minutes after start-up and then slowly closes until it reaches the position dictated by the liquid level control PID instruction in the control logic.

   The liquid level valve is a pneumatic rotary ball type control valve with pneumatic positioner. The control signal from the control panel is 4-20 mA DC, which is converted to a 3-15 psig / 0.2-1.0 bar pneumatic signal by an I/P Transducer. The valve will be fully open at 4 mA DC, fully closed at 20 mA DC.

4. **Interstage Gas Valve**

   The interstage valve controls refrigerant flash gas, from the intercooler to the second stage compressor impeller wheel when required to maintain a minimum pressure in the intercooler.

   At normal conditions, the interstage valve will modulate to control to setpoint and close on shutdown to reduce compressor backspin.

   This valve remains closed for ten minutes (adjustable) after start-up to allow the subcooler level controller to establish a liquid level in the subcooler and then slowly opens until it reaches the position dictated by the capacity controls.

   When the intercooler float differential pressure (intercooler pressure minus evaporator pressure) falls below the minimum allowed (due to colder than normal condenser water temperatures), the interstage valve is driven closed by the INTERCOOLER FLOAT MTN. DIFF. PRESS. CONTROL in software. This maintains a minimum pressure in the intercooler and ensures that the intercooler refrigerant float valve will have sufficient pressure drop to accommodate the design flow of liquid being expanded to the evaporator.

   The interstage valve is a pneumatic rotary butterfly type control valve with pneumatic positioner. The control signal from the control panel is 4-20 mA DC, which is converted to a 3-15 psig / 0.2-1.0 bar pneumatic signal by an I/P Transducer. The valve will be fully closed at 4 mA DC, fully open at 20 mA DC.

Programmed capacity control functions

1. **Manual Override (Manual/Automatic) Stations**

   The Auto/Manual Screen allows the operator to manually control the pre-rotation vanes, interstage valve, hot gas bypass valve, and subcooler level control valve. Normally these should be left in the AUTO mode.

   If during manual operation the unit is started or stopped, the manual control override logic returns the manual control outputs to their safe start-up or shutdown values so that die PRV and valves are in their proper positions for the transition, however, any actuator placed in the manual mode will remain there until reset by the operator.

   The Auto/Manual display will indicate the control mode of each actuator and prevent transfer of the mode from manual to auto when the calculated auto position and the manual position differ by more than 5%. This will be indicated by illumination of the TRANSFER INHIBIT LED for that actuator and the SWITCH TO AUTO button color changing from green to red.

2. **Leaving Chilled Water Temperature Control (Main Capacity Control)**

   Using the input signal from a temperature transmitter in the leaving chilled water line, this control provides an output signal which decreases as water temperature drops below set point to reduce the capacity of the chiller.

The PID Instruction is programmed to provide a proportional plus reset response to deviations in water temperature from the set point.

This control is forced to INACTIVE operation with its setpoint tracking the chilled water out temperature when the chiller is shutdown, during ramp-up, and when the MAX-POWER DEMAND LIMITER, or the EVAP. LOW PRESS. OVERRIDE, or the HIGH DISCHARGE PRESSURE OVERRIDE control signal is being used to control the capacity of the chiller. See ramp-up of capacity controls and override operation of chilled water out temperature control found later in this section for further details.

3. **Maximum Power Demand Limiter**

   This demand limit override control function uses the motor power input signal to limit capacity. When the motor power exceeds the setpoint, the control puts out a decreasing signal. The SS and LSR will then pass this lower signal on to close the compressor pre-rotation vanes, thus reducing the demand on the motor and returning the motor power to setpoint.

   The PID instruction is programmed to provide a proportional plus reset plus derivative response to deviations in motor power from the setpoint.

   The display will indicate if the chiller is currently in this override mode of operation.

4. **Evaporator Low Pressure Override / High Discharge Pressure Override**

   During startup, the condensing pressure may initially be low. This can cause the refrigerant to back up ahead of the intercooler expansion float valve. If this occurs, the low level of evaporator liquid uncovers a portion of the tube bundle, thereby reducing the heat exchanger performance, and lowering the evaporator pressure.

   The Evaporator Low Pressure Override Control provides an output signal which decreases as the evaporator falls below a set point which is slightly below design. When a low evaporator pressure is sensed, the lower output signal is passed on by the LSR to override the capacity signal and keep the compressor pre-rotation vanes closed.

   During run, conditions may occur that elevate the discharge pressure to near trip conditions. To attempt to keep the chiller online, the High Discharge Pressure Override control will decrease its output signal when its setpoint is exceeded. When a high condenser pressure is sensed, the lower output signal is passed on by the LSR to override the capacity signal and keep the compressor pre-rotation vanes closed.

   The PID instruction is programmed to provide a proportional plus reset response to deviations in evaporator pressure from the setpoint.

   The display will indicate if the chiller is currently in this override mode of operation.

5. **Intercooler Float Minimum Differential Pressure Control**

   This control senses when the differential pressure across the intercooler float valve is too low, and acts to close the interstage valve at differential pressures below the setpoint. This raises the intercooler pressure, and insures that the float valve will have sufficient pressure drop to accommodate the flow of liquid being expanded to the evaporator, thus ensuring that any refrigerant collects in the subcooler upstream of the liquid level control valve. Otherwise, if the refrigerant were to back up in the intercooler, large amounts of liquid could enter the compressor interstage connection causing potential damage.

   The PID Instruction is programmed to provide a proportional plus reset response to deviations in float differential pressure from the setpoint.

   The Control Output Signal is sent to the interstage valve at the conclusion of the programmed delay (0 to 10 minutes) after start-up when the ramped valve control signal has increased to equal the PID instructions output signal. At shutdown, the output signal to the valve will decrease to 0 to close the interstage valve.

   The display will indicate if the chiller is currently in this override mode of operation.

6. **Anti-surge (Minimum PRV Position)**

   As the differential HEAD pressure falls, the compressor is capable of stable operation with less refrigerant gas flow (lower minimum compressor pre-rotation vane positions). From an energy standpoint, it is wise to use the compressor pre-rotation vanes for capacity control rather than hot gas bypass whenever possible. The anti-surge output signal to HSR provides a minimum closure

of the pre-rotation vanes to suite the measured HEAD pressure input This output also provides one of the input signals for the hot gas valve control to use in calculating the output to the hot gas valve.

The display will indicate if the chiller is currently in this mode of operation.

7. **Hot Gas Control**

   This control modulates the hot gas valve when the capacity control signal reaches the minimum PRV limit established by the ANTI-SURGE calculation. As long as the capacity signal from the TEMPERATURE CONTROL is above the ANTI-SURGE output signal, the hot gas valve remains closed.

   When the capacity signal falls below the anti-surge output (minimum vane position) signal, the output of this control decreases, which starts to open the hot gas bypass valve. Thus at low loads, the capacity is controlled by modulating the hot gas bypass valve. A ratio calculation compares the anti-surge calculation to the capacity control signal output When the capacity drive signal decreases below the anti-surge value the vanes no longer are able to close to control temperature. The hot gas ratio calculation opens the hot gas bypass valve as a scaled ratio of the available signal below the vane anti-surge value. This way the hot gas bypass valve operates completely automatically to maintain the reduced capacity demands of the chilled water system.

   The control software reverses the signal so that 0%=Closed and 100%=Open for Man/Auto Stations and displays on the screen.

   The display will indicate that the hot gas control is currently modulating the hot gas valve.

8. **Subcooler Level Control**

   This programmed control function uses an input signal from a level transmitter installed on the condenser. It uses proportional plus reset control to provide an output signal which increases as the level goes above the setpoint to open the liquid level control valve and maintain the level at setpoint

   The control output signal is selected by signal selector SS five minutes after start-up when the ramped valve control signal has decreased to equal the PID Instructions output signal. At shutdown, the output signal drives the valve to 100% to open the liquid level control valve.

RAMP-UP OF CAPACITY CONTROLS

The ramp-up feature is used to provide a gradual increase in chiller capacity during start-up.

Refer to the CAPACITY CONTROL DIAGRAM along with the following description to best understand the operation:

The display will indicate when the leaving chilled water TEMPERATURE CONTROL is in the manual mode.

This occurs when the unit is shut down, during ramp-up and when the DEMAND LIMITER or the EVAP LOW PRESS. OVERRIDE or the HIGH DISCHARGE PRESS. OVERRIDE control signal is being used to control the capacity of the chiller.

With the unit stopped, the TEMPERATURE CONTROL is in manual, its setpoint is equal to the leaving chilled water temperature and its output is equal to the PRV output signal. (When in manual, the controller drives its output to the same as the tieback value, which would be 0% with unit off.)

After the compressor motor starts, the PRV signal goes to the PRE-ROTATION VANES MINIMUM START-UP POSITION value. This value determines the position of the compressor pre-rotation vanes at the instant the main motor starts. It is adjusted to keep the starting load on the motor low but also allow enough gas flow through the compressor to prevent surging at start-up.

The HOT GAS RATIO CALCULATION output begins to decrease at this time to start closing the hot gas bypass valve.

After the motor power drops below the DEMAND LIMIT setpoint, its output signal increases rapidly to 100%. The Selector Switch (SS) and Low Selector Relay (LSR) will then select the lower PRV RAMP CONTROL output signal.

When the output signal from the PRV ramp rises above the PRV Minimum Startup Position, the selector switch (SS) will change position to control the PRV based on the temperature control or demand limit by the PRV ramp rate. The PRV signal will then track the primary LSR output signal until the next chiller start.

The hot gas valve will continue closing during the ramp-up period at a rate determined by the HGV RAMP setpoint as long as the HOT GAS CONTROL output remains below the HGV ramp output signal.

During the ramp-up period, the TEMPERATURE CONTROL setpoint will track the chilled water out temperature and its output will be driven to equal the PRV signal before HSR. The vanes will continue to open at a rate determined by the PRV RAMP setpoint as long as the TEMPERATURE CONTROL remains in MANUAL.

If, during ramp-up, the capacity increases sufficiently to lower the chilled water outlet temperature to within the programmed TEMPERATURE CONTROLLER AUTO MODE DELTA setpoint, the TEMPERATURE CONTROL is changed to the automatic mode and its output now changes in response to load changes.

If the load is very low and the control is changed to automatic before the PRV RAMP CONTROL output signal has increased to the MIN PRV SIGNAL value as described above, the higher signal selector HSR will select the higher of the two inputs. The PRV signal will decrease until it equals the capacity control signal.

If the chilled water temperature continues to fall, the TEMPERATURE CONTROL output will decrease causing the hot gas valve and PRV to move to whatever positions are required to maintain the chilled water at setpoint and provide stable compressor operation.

When the ramp-up is completed (PRV signal at 100%) and/or the TEMPERATURE CONTROL is changed to automatic, its setpoint will return to whatever setpoint is stored in the control panel at that time (if in LOCAL SETPOINT mode), or will change to the PROGRAMMED remote setpoint (if in REMOTE SETPOINT mode). The setpoint will change slowly at a rate determined by the SETPOINT RAMP rate value to the desired value.

The above tracking and reset tieback controls disable the TEMPERATURE CONTROL during shutdown and ramp-up when other logic is in control and provide for a smooth transition to automatic control as required.

The CAPACITY CONTROLS DIAGRAM Screen will indicate which signals are currently in control of the pre-rotation vanes and valves during start-up.

The total ramp times for the PRV and Hot Gas Valves are also shown. These values will change any time new ramp times are entered.

OVERRIDE OPERATION OF TEMPERATURE CONTROL

Maximum Power Demand Limiter Controlling

If this control is used to limit the power demand of the chiller, its output will drop below the TEMPERATURE CONTROL output. When this happens, SS will select the lower signal and the vanes will be positioned by the demand limiting controller.

During this time, the TEMPERATURE CONTROL is put in the manual mode with its setpoint tracking the actual chilled water out temperature and its output equal to the tieback value. The controller's own output as the tieback input, the output of the temperature control holds at the value it was when the demand limiter took control of the vanes.

If the chilled water out temperature falls below the desired setpoint of the temperature control it is switched back to the automatic mode, its output will begin to drop below the demand limiter signal to close the vanes and maintain the water at setpoint.

If the load increases, the temperature control's output will increase to open the vanes. If the demand limiter is still in control, the vanes will only open until SS selects the lower demand limiting signal. If the load increases and the demand limiter is preventing the vanes from opening, the chilled water out temperature will increase above the desired setpoint, and the control will return to the manual mode (at 0.5 degrees above desired setpoint) and operate as described above.

When the demand limiter has not been controlling for 10 seconds, the TEMPERATURE CONTROL is set back to the automatic mode and its setpoint ramps down to the desired setpoint.

Evaporator Low Pressure Override Controlling

The control logic detects when LSR is selecting this control output signal to limit the vane opening and prevent a low evaporator pressure trip.

During this time, the TEMPERATURE CONTROL is put in the manual mode and operates the same as described above, and returns to the automatic mode 10 seconds after the EVAP LOW PRESS OVERRIDE control is no longer controlling.

The above tracking and tieback controls disable the TEMPERATURE CONTROL whenever other logic is in control to prevent its output from winding up due to the Chilled Water Out Temperature rising above the setpoint during the override operation.

TABLE 4 - TITAN OPTIVIEW ANALOG INPUTS

BOARD	RANGE	UNITS	DESCRIPTION
A1	30-130 °F	4-20ma	Chilled Liquid Supply Temperature (Leaving)
A1	30-130 °F	4-20ma	Chilled Liquid Return Temperature (Entering)
A1	30-130 °F	4-20ma	Condenser Water Entering Temperature
A1	30-130 °F	4-20ma	Condenser Water Leaving Temperature
A1	30-130 °F	4-20ma	Evaporator Refrigerant Liquid Temperature
A1	30-250 °F	4-20ma	Discharge Temperature
A1	30-130 °F	4-20ma	Gear Oil Cooler Leaving Water Temperature
A1	30-250 °F	4-20ma	Compressor Shaft End Oil Return Temperature
A1	30-130 °F	4-20ma	Condenser Refrigerant Liquid Temperature
A1	30-250 °F	4-20ma	Compressor Thrust Bearing Oil Return Temperature
A1	30-130 °F	4-20ma	Compressor Oil Cooler Entering Water Temperature
A1	30-130 °F	4-20ma	Compressor Oil Cooler Leaving Water Temperature
A1	30-130 °F	4-20ma	Intercooler Refrigerant Liquid Temperature A (LP)
A1	30-250 °F	4-20ma	Compressor Supply Oil Temperature
A1	0-200 PSIG	4-20ma	Evaporator Refrigerant Pressure
A1	30-250 °F	4-20ma	Compressor Sump Oil Temperature
A1	30-130 °F	4-20ma	Intercooler Refrigerant Liquid Temperature B (HP)
A1	0-200 PSIG	4-20ma	Intercooler Refrigerant Pressure B (HP)
A2	0-300 PSIG	4-20ma	Condenser Pressure
A2	0-200 PSIG	4-20ma	Intercooler Refrigerant Pressure A (LP)
A2	0-300 PSIG	4-20ma	Compressor Main (Shaft) Oil Pressure
A2	O-200 PSIG	4-20ma	Compressor Sump Oil Pressure
A2	0-300 PSIG	4-20ma	Compressor Thrust Bearing Oil Pressure
A2	0-200 PSIG	4-20ma	Compressor Balance Piston Pressure
A2	0-100 PSIG	4-20ma	Gear Supply Oil Pressure
A2	0-300 PSIG	4-20ma	Compressor Oil Pressure After Filter
A2	0-12,000 GPM	4-20ma	Chilled Water Flow
A2	0-200 AMPS	4-20ma	Compressor Motor Current
A2	0-168" WG	4-20ma	Compressor Oil Cooler Water D/P
A2	0-168" WG	4-20ma	Gear Oil Cooler Water D/P
A2	30-250 °F	4-20ma	Motor Temperature
A2	30-250 °F	4-20ma	Gear Supply Oil Temperature
A2	0-200 PSIG	4-20ma	Chilled Water Entering Pressure/Chilled Water DP
A2	0-200 PSIG	4-20ma	Supply Air Pressure
A3	0-200 PSIG	4-20ma	Condenser Water Entering Pressure
A3	0-200 PSIG	4-20ma	Condenser Water Leaving Pressure
A3	0-12,000 GPM	4-20ma	Condenser Water Flow
A3	0-100%	4-20ma	Subcooler Liquid Level
A3	30-130 °F	4-20ma	Subcooler Liquid Temperature
A3	0-100 PSIG	4-20ma	Gear Shaft Pump Oil Pressure
A3	30-250 °F	4-20ma	Gear Hi Speed Shaft End Bearing Temperature
A3	30-250 °F	4-20ma	Gear Hi Speed Blind End Bearing Temperature
A3	30-250 °F	4-20ma	Gear Lo Speed Shaft End Bearing Temperature
A3	30-250 °F	4-20ma	Gear Lo Speed Blind End Bearing Temperature

TABLE 4 - TITAN OPTIVIEW ANALOG INPUTS (CON'T)

A3	30-250 °F	4-20ma	Motor Shaft End Bearing Temperature
A3	30-250 °F	4-20ma	Motor Blind End Bearing Temperature
A3	30-250 °F	4-20ma	Compressor Oil Temperature After Cooler
A3	0-300 PSIG	4-20ma	Chilled Water Leaving Pressure
A3	0-5000 kW	4-20ma	Compressor Motor kW
A3	30-250 °F	4-20ma	Suction Temperature

TABLE 5 - TITAN OPTIVIEW ANALOG OUTPUTS

BOARD	RANGE	UNITS	DESCRIPTION
A1	4-20ma	I/P	Compressor Vane (PRV)
A1	4-20ma	I/P	Interstage Valve A
A1	4-20ma	I/P	Interstage Valve B
A1	4-20ma	I/P	Hot Gas Bypass Valve
A2	4-20ma	I/P	Subcooler Liquid Level Valve
A2	4-20ma	I/P	Motor Cooler

TABLE 6 - TITAN OPTIVIEW DIGITAL INPUTS AND OUTPUTS

INPUTS	OUTPUTS
Hardwired Emergency Stop Shutdown (ALM=OPN)	Compressor Oil Heaters
Chiller Start Pushbutton	Compressor Auxiliary Oil Pump Start/Stop
Chiller Stop Pushbutton	Gas Solenoid to Oil Eductor Solenoid Valve
Oil Separator Temperature Switch	Compressor Sump Vent Solenoid Valve
System Reset Pushbutton	Oil Separator Heaters
Compressor AOP Motor Starter Run Interlock	Hot Gas Liquid Injection Solenoid Valve
Condenser Water Flow Switch	Compressor Motor Starter Relay
Chilled Liquid Flow Switch	Gear Auxiliary Oil Pump Start/Stop
Hardwired High Condenser Pressure Switch (ALM=OPN)	Interstage A Liquid Injection Solenoid
Hardwired Compressor Low Oil Pressure Switch (ALM=OPN)	Interstage B Liquid Injection Solenoid
Compressor Thrust Bearing Oil High Temp. Switch	Virbration Trip Multiply Output
Compressor Motor Starter Protective Relay Trip Contacts	
Hardwired Gear Low Oil Pressure Switch (ALM=OPN)	
Gear AOP Motor Starter Run Interlock	
Compressor Motor Starter Fault (CLO=ALM)	
Hardwired Evaporator Low Refrig Pres Switch (ALM=0PN)	
Spare	
Vibration Monitor Trip	
Compressor Motor Starter Run Interlock	
Vibration Monitor Alarm	
Vane Motor Close Switch	

SECTION 5 - SYSTEM COMMISSIONING

FORM 160.72-CL1 (810)

YORK BY JOHNSON CONTROLS | | **MODEL – TITAN**

YORK OM OPTIVIEW CONTROLS RETROFIT POINT-TO-POINT CHECKLIST

*TO:_____ JOB NAME: _____
_____ LOCATION:_____
_____ CUSTOMER ORDER NO. _____

YORK TEL. NO. _____ YORK ORDER NO. _____ YORK CONTRACT NO. _____

CHILLER

MODEL NO. _____ SERIAL NO._____

The work (as checked below) is in process and will be completed by _____/_____/_____
Month Day Year

GENERAL

☐ Field devices are installed and external control wiring to control panel completed in accordance with YORK wiring diagrams

☐ Control power supply available

☐ Pneumatic control piping completed and supply and control air pressure available

ANALOG INPUTS

DEVICE	DESCRIPTION	PASS
CT-1,2,3	Compressor Motor Current Transformers	☐
LT-114	Subcooler Refrigerant Liquid Level	☐
PT-111	Evaporator Refrigerant Pressure	☐
PT-113	Compressor Discharge Pressure	☐
PT-115	Intercooler Refrigerant Pressure	☐
PT-140	Compressor Supply Oil Pressure	☐
PT-143	Compressor Sump Oil Pressure	☐
PT-144	Compressor Shaft Pump Oil Pressure	☐
PT-146	Compressor Balance Piston Pressure	☐
PT-147	Compressor Thrust Bearing Oil Pressure	☐
PT-150	Gear Supply Oil Pressure	☐
PT-156	Gear Shaft Pump Oil Pressure	☐
PT-180	Supply Air Pressure	☐
TT-100	Chilled Water Leaving Temperature	☐
TT-101	Chilled Water Entering Temperature	☐
TT-102	Condenser Water Entering Temperature	☐
TT-103	Condenser Water Leaving Temperature	☐
TT-106	Intercooler Refrigerant Liquid Temperature	☐
TT-111	Evaporator Refrigerant Liquid Temperature	☐
TT-112	Compressor Suction Temperature	☐
TT-113	Compressor Discharge Temperature	☐
TT-114	Subcooler Refrigerant Liquid Temperature	☐
TT-115	Condenser Refrigerant Liquid Temperature	☐
TT-140	Compressor Supply Oil Temperature	☐
TT-142	Compressor Shaft End Bearing Oil Return Temperature	☐

FORM 160.72-CL1 (810)

ANALOG INPUTS (CONT'D)

TT-143	Compressor Sump Oil Temperature	☐
TT-147	Compressor Thrust Bearing Oil Return Temperature	☐
TT-150	Gear Supply Oil Temperature	☐
TT-151	Gear High Speed Shaft End Bearing Temperature	☐
TT-152	Gear High Speed Blind End Bearing Temperature	☐
TT-153	Gear Low Speed Blind End Bearing Temperature	☐
TT-154	Gear Low Speed Shaft End Bearing Temperature	☐
TT-161	Motor Shaft End Bearing Temperature	☐
TT-162	Motor Blind End Bearing Temperature	☐

BINARY INPUTS

DEVICE	DESCRIPTION	PASS
PDSLL-100	Chilled Water Low Differential Pressure	☐
PDSLL-102	Condenser Water Low Differential Pressure	☐
PDSLL-140A	Compressor Oil Low Differential Pressure	☐
PSHH-113A	Compressor Discharge High Pressure	☐
PSLL-111	Evaporator Low Pressure	☐
PSLL-150	Gear Oil Low Pressure	☐
TSHH-147	Compressor Thrust Bearing Oil High Temperature	☐
TS-120	Oil Separator Temperature Switch	☐
M2	Compressor Auxiliary Oil Pump Motor Starter Interlock	☐
M3	Gear Auxiliary Oil Pump Motor Starter Interlock	☐
MIR	Compressor Motor Full Voltage Run Contacts	☐
MPD	Compressor Motor Protection Device Contacts	☐
ZS-100A	Vane Motor Switch	☐

ANALOG OUTPUTS

DEVICE	DESCRIPTION	PASS
LY-114	Subcooler Liquid Level Control Valve	☐
PDY-115	Interstage Valve	☐
TY-100A	Compressor Pre-Rotation Vanes	☐
TY-100C	Hot Gas Bypass Valve	☐

FORM 160.72-CL1 (810)

BINARY OUTPUTS

DEVICE	DESCRIPTION	PASS
FCV-104	Auxiliary Cooling Water Solenoid Valve	☐
FCV-114	Interstage Liquid Injection Solenoid Valve	☐
FCV-120	Oil Eductor Solenoid Valve	☐
HTR-120A/B	Oil Separator Heaters	☐
HTR-143A/B	Compressor Oil Sump Heaters	☐
HTR-160A/B	Motor Space/Motor Exciter Heaters	☐
M1	Compressor Motor Start/Stop	☐
M2	Compressor Auxiliary Oil Pump Start/Stop	☐
M3	Gear Auxiliary Oil Pump Start/Stop	☐
PCV-100A	Compressor Pre-Rotation Vanes Air Dump Solenoid Valve	☐
PCV-100C	Hot Gas Bypass Valve Air Dump Solenoid Valve	☐
PCV-143	Compressor Sump Vent Solenoid Valve	☐

5

With reference to the terms of the above contract, we are requesting the presence of your Authorized Representative at the job site on Month _____ / Day _____ /Year _____ to start the system and instruct operating personnel HAVE CONTACT _____ Names

We understand that the services of the YORK/Johnson Controls Authorized Representative will be furnished in accordance with the contract for a period of time of not more than _____ consecutive normal working hours, and we agree that a charge of _____ per diem plus travel expenses will be made to Johnson Controls if services are required for longer than _____ consecutive normal hours or if repeated calls are required, through no fault of YORK/Johnson Controls.

Signed: _____

Title: _____

FORM 160.72-CL2 (810)

YORK BY JOHNSON CONTROLS

MODEL – TITAN

YORK OM OPTIVIEW CONTROLS RETROFIT START-UP CHECKLIST

*TO: _____ JOB NAME: _____

_____ LOCATION: _____

_____ CUSTOMER ORDER NO. _____

YORK TEL. NO. _____ YORK ORDER NO. _____ YORK CONTRACT NO. _____

CHILLER

MODEL NO. _____ SERIAL NO. _____

The work (as checked below) is in process and will be completed by _____ / _____ / _____
Month Day Year

A. GENERAL

- ☐ Review the Pre-functional Checklist verifying work required has been completed.
- ☐ Chiller is charged with refrigerant.
- ☐ Chiller is charged with oil.
- ☐ Oil sump heaters have been energized for a minimum of 12 hours.
- ☐ Verify all operating valves are open and service valves to atmosphere are closed.
- ☐ Verify supply air and control air pressure is available.

B. OPTIVIEW PANEL

To assure access to all setpoints, login at SERVICE access level before beginning. The setpoints are grouped under the display screen in which they appear. The indented screens are subscreens of the numbered screens and are accessed from the numbered screens. If any of the setpoints have to be changed, use the standard programming procedures in the *Operating Instructions (Form 160.72-O1)*. Thresholds, values and calibrations of items marked with an asterisk "*" are predetermined and entered/set at the YORK Factory at the time of manufacture.

1. EVAPORATOR Screen

Record the following setpoints:

Leaving Chilled Liquid Temp (except BAS remote mode) ..... ☐

Leaving Chilled Liquid Temp Remote Range (except BAS remote mode) ..... ☐

Leaving Chilled Liquid Temp Shutdown Temperature ..... ☐

Leaving Chilled Liquid Temp Shutdown Restart Temperature ..... ☐

Smart Freeze Protection On/Off ..... ☐

Refrigerant Temp Sensor Enable/Disable ..... ☐

2. CONDENSER Screen

Refrigerant Temp Sensor Enable/Disable ..... ☐

REFRIGERANT LEVEL CONTROL Screen

Record the following setpoints:

Control Valve Setpoint* ..... ☐

Manual or Auto Control (as desired) ..... ☐

3. COMPRESSOR Screen

Select Pre-rotation Vanes Manual or Auto control Mode (as desired) ..... ☐

HOT GAS BYPASS Screen:

If chiller is equipped with optional Hot Gas Bypass, enable operation on the OPERATIONS Screen and record the following setpoints:

Maximum Open ..... ☐

Hold Period ..... ☐

Close Percentage ..... ☐

Minimum Load ..... ☐

Manual or Auto Control (as desired) ..... ☐

INTERSTAGE VALVE Screen:

If chiller is equipped with an optional Interstage Valve(s), enable operation on the OPERATIONS Screen and record the following setpoints:

Control Valve Setpoint* ..... ☐

Manual or Auto Control (as desired) ..... ☐

4. MOTOR Screen:

Record the Current Limit Setpoint..... ☐

CM-2 board:

- ☐ Verify Switch S1 (Ydelta/57% or all others) setting*
- ☐ Verify Pot R16 (LRA/FLA ratio setting*
- ☐ Verify Slide Bar Resistor "RES" setting*
- ☐ Verify 105% FLA calibration*
- ☐ Verify 100% FLA display*

5. SETPOINTS Screen:

With the exception of the Remote Analog Input Range the setpoints listed on the SETPOINTS Screen have already been programmed above on Previous Screens. The values shown reflect the previously programmed values. However, the setpoints listed here can be changed on this screen if desired. This screen is used primarily as a central location from which most setpoints can be programmed. If it is not desired to change any of the listed setpoints, proceed to the SETUP Screen below.

Remote Analog Input Range..... ☐

SETUP Screen:

- ☐ Enable Clock
- ☐ Enter Clock time and Date
- ☐ Select 12 or 24 hour display mode

OPERATIONS Screen:

- ☐ Select desired control source (operating mode); LOCAL, BAS Remote, DIGITAL Remote or ANALOG Remote

C. OPERATION

- ☐ Check evaporator and condenser water flows are reasonably close to design (+/-10%)
- ☐ Confirm oil temperature is in standby range
- ☐ Manually run the oil pumps and check oil pressures
- ☐ Jog compressor and check for correct rotation (caution-insure compressor and gear has good oil pressure prior to jogging and Pre-rotation Vanes are closed as indicated by position of the control arm).
- ☐ Start chiller
- ☐ After the chiller has come up to full load at design leaving chilled water temperature, log chiller operation

CHILLER STARTING AND STOPPING PROCEDURE

GENERAL

The compressor driveline supplied with each liquid chilling unit will vary due to application preferences and requirements. Refer to the driveline manufacturer's starting and operating instructions for procedures that must be completed before the unit can be started.

PRE-START COMPRESSOR CHECK

The following paragraphs describe the procedures prior to starting and operating a TURBOMASTER Compressor.

OIL HEATER

If the heater is de-energized during a shutdown period, it must be energized for 12 hours prior to starting the compressor or the compressor oil charge must be replaced with new oil.

1. Before actually starting the compressor, the following steps should be carefully checked.

   ☐ (a) Check the compressor oil level (See CHECKING THE OIL LEVEL).

   ☐ (b) Add new oil, if necessary.

   ☐ (c) Completely open all shutoff water valves to the oil cooler. A full flow of water is required through the oil cooler at all times during starting and operation to inhibit foaming in the oil.

   ☐ (d) Check the compressor oil sump temperature. The oil temperature must be a minimum of 10°F above the condenser saturation temperature (50°F if the unit has been shut down for less than 30 minutes) before the unit will be allowed to start.

   ☐ (e) Open or adjust all shutoff valves necessary for the operation of the hot gas bypass and liquid injection systems and oil return systems

   ☐ (f) Verify the compressor pre-rotation vanes are closed to unload the motor during starting.

CHECKING THE OIL LEVEL

Two oil level sight glasses are located on the oil sump end of the compressor. During operation the oil level should be visible in approximately the middle of the lower sight glass or ¼ of the upper sight glass, but should not fill the upper sight glass.

If the oil level is excessively high, the compressor may tend to lose some oil under starting conditions or conditions of rapidly changing load. In this case, oil may be drained from the compressor oil charging valve, while the unit is running.

Rapid withdrawal of oil will cause jet pump cavitation.

If the oil level is too low, pump cavitation and low oil pressure may occur. The machine will then shut down automatically and oil should be added to the compressor.

When the unit has been shut down for a prolonged period oil level above the top sight glass is normal.

UNIT START-UP

The following step-by-step procedure should be used to start-up the system (Refer to *Operating Instructions (Form 160.72-O1)* for OptiView™ Control Center Operating Instructions):

☐ 1. Set the Pre-Rotation Vanes Control to AUTO.

☐ 2. Set the Hot Gas Control to AUTO.

☐ 3. Set the Interstage Valve Control to AUTO.

☐ 4. Set the Subcooler Level Valve Control to AUTO.

☐ 5. Select the desired Control Source (LOCAL or ANALOG REMOTE).

☐ 6. Set the Leaving Chilled Liquid Temperature Setpoint.

☐ 7. Set the Current Limit Setpoint to 100% (unless a percentage is desired to limit maximum current).

☐ 8. Start the chilled water pump(s) and condenser water pump(s) and verify evaporator and condenser flow switches are made.

☐ 9. Reset any existing safety trips or power failures by moving the panel switch to the STOP/RESET (O) position and press the CLEAR MESSAGE button on the display. If all chiller safeties are satisfied the display will indicate READY TO START.

☐ 10. Move the panel switch to the START (◄) position. The switch is spring-loaded and will return to the RUN (▌) position when released.

☐ 11. If a building automation system (BAS) is utilized to start and stop the chiller remotely via the System Cycling or Multi-Unit Cycling contacts, these contacts must be closed. A Cycling Shutdown message will appear on the display if the contacts are open.

The start sequence shall initiate. The display will indicate the operating state of the chiller as it transitions from start-up to run mode.

STOPPING UNIT

To stop the unit, proceed as follows:

☐ 1. Move the panel switch to the STOP/RESET (O) position or open the BAS Cycling contacts.

The chiller will shut down and the post-lubrication sequence will be initiated. The display will indicate that the unit is in COASTDOWN mode.

☐ 2. Shut down the chilled water pump(s) and condenser water pump(s).

☐ 3. Verify that the compressor oil sump heaters are energized.

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

TABLE 7 - 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)	304.8	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

TEMPERATURE

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

Example: (45.0°F - 32°) x 0.5556 = 27.2°C

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

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

BY JOHNSON CONTROLS

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Form 160.72-O1 (810)
Supersedes: Nothing