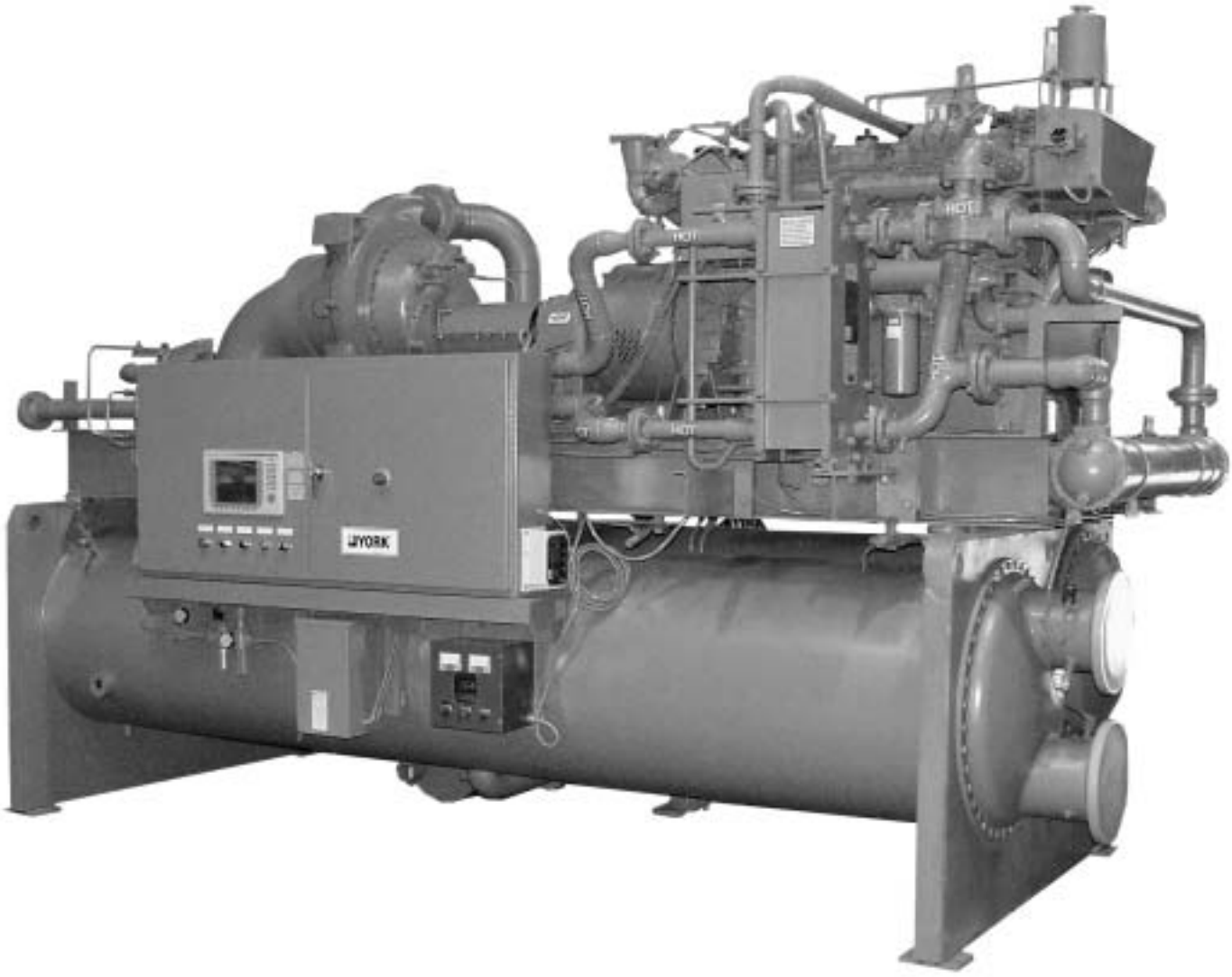
YORK®	CONTROL CENTER CENTRIFUGAL LIQUID CHILLERS	
OPERATION MANUAL	Supersedes: Nothing	Form 160.60-O2 (1004)

FLEXLOGIX CONTROL CENTER

MODEL YB & YG

GAS ENGINE LIQUID CHILLER

Design Level B



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, oils, 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 possesses 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 areas of potential hazard:

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

CAUTION identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution. Usually an instruction will be given, together with a brief explanation.

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

NOTE is used to highlight additional information which may be helpful to you.

All wiring must be in accordance with YORK's published specifications and must be performed ONLY by qualified YORK personnel. YORK will not be responsible for damages/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this will void the manufacturer's warranty and cause serious damage to property or injury to persons.

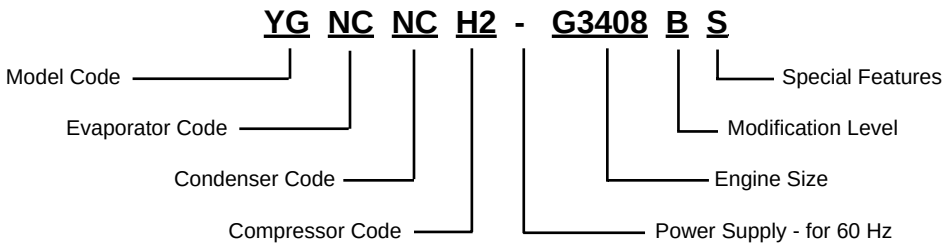
CHANGEABILITY OF THIS DOCUMENT

In complying with YORK's policy for continuous product improvement, the information contained in this document is subject to change without notice. While YORK 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 YORK Applied Systems Service office.

It is the responsibility of operating/service personnel as to the applicability of these documents to the equipment in question. If there is any question in the mind of operating/service personnel as to the applicability of these documents, then, prior to working on the equipment, they should verify with the owner whether the equipment has been modified and if current literature is available.

NOMENCLATURE

The model number denotes the following characteristics of the unit.



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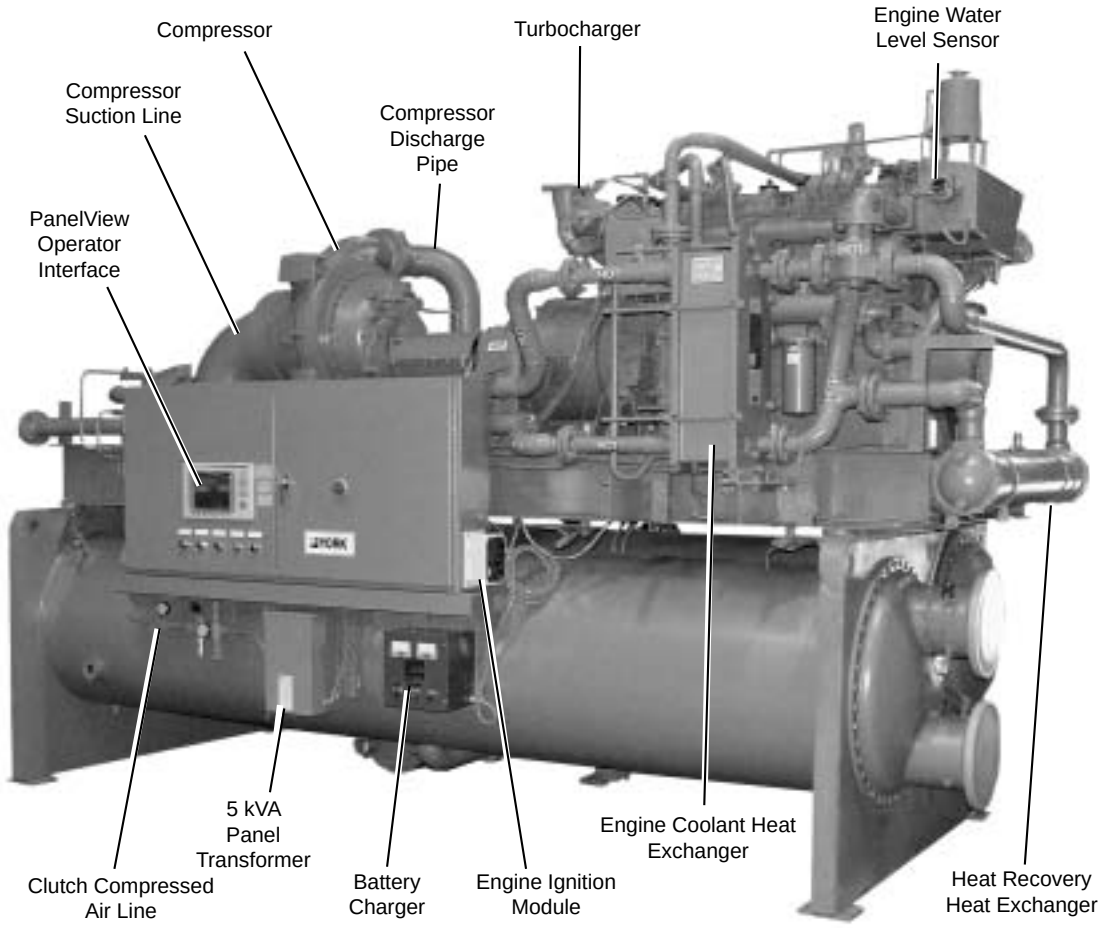


FIG. 1 – MODEL YG GAS ENGINE CHILLER

GENERAL SYSTEM DESCRIPTION

The YORK Model YG Gas Engine Chiller is commonly applied to large air conditioning systems, but may be used on other applications. The chiller is completely factory packaged including: the evaporator, refrigerant condenser, compressor, gas engine, lubrication systems, power panel, control center and all interconnecting unit piping and wiring.

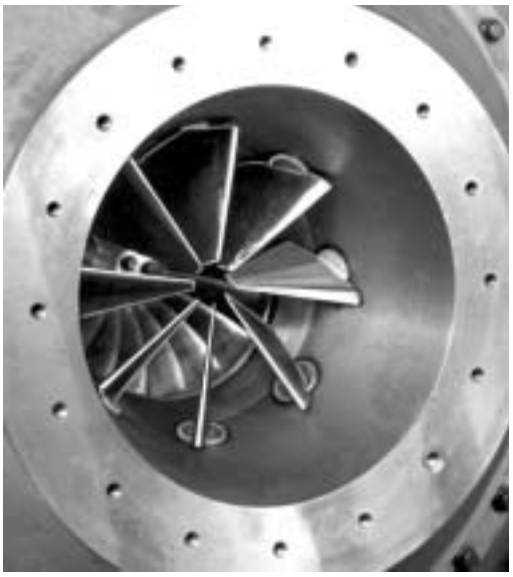
The chiller is controlled by a modern state-of-the-art Control Center that monitors its operation. The Control Center is programmed by the operator to suit job specifications.

The chiller control panel provides control of the entire system, including the gas engine starting and monitoring. The control panel includes a color TFT display surrounded by "soft" keys that are redefined based on the screen displayed at the time. A keypad is provided on the panel to enter and/or modify system parameters and setpoints.

SYSTEM OPERATION

In operation, liquid water flows through the evaporator where boiling refrigerant absorbs heat from the water. The chilled water is then piped to fan coil units or other air conditioning terminal units, where it absorbs heat from the air. The warmed water is then returned to the evaporator to complete the chilled liquid circuit.

The refrigerant vapor, which is produced by the boiling action in the evaporator, flows into the compressor where the rotating impeller increases its pressure and temperature and discharges it into the condenser. Water flowing through the condenser removes heat from the refrigerant vapor, causing it to condense into a liquid state. The condenser water is supplied to the condenser from an external source, usually a cooling tower. The condensed refrigerant drains from the condenser into the subcooler, where additional heat is removed, lowering its temperature. In the subcooler, the refrigerant liquid



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DETAIL A – COMPRESSOR PREROTATION VANES

level is maintained by the subcooler level control valve, which meters liquid refrigerant into the evaporator to complete the refrigerant circuit.

The subcooler liquid level is continuously monitored to provide optimum subcooler, refrigerant condenser and evaporator performance. The level control valve automatically adjusts to all "real world" operating conditions, providing the most efficient and reliable operation of refrigerant flow control.

CAPACITY CONTROLS

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

During part-load operation at off-design conditions, the chiller capacity is reduced to maintain a constant leaving chilled liquid temperature by first decreasing the speed and closing the compressor pre-rotation vanes (PRV) (See Detail A), then opening the hot gas bypass valve.

The hot gas bypass valve admits hot, high-pressure refrigerant from the compressor discharge back into the condenser, partially short-circuiting the refrigeration cycle. This practice prevents compressor surging under low part-load conditions.

The position of the vanes is automatically controlled through a lever arm attached to an electric motor located outside the compressor housing. The automatic adjustment of the vane position in effect provides the performance of many different compressors to match various load conditions from full load with vanes wide open to minimum load with vanes completely closed.

The combination of PRV position manipulation, speed reduction and hot gas bypass valve function provides capacity reduction from 100% to 15% of design capacity. The speed is controlled by an electro-mechanical throttle actuator attached to the engine throttle linkage, and is managed by the capacity control logic.

REFRIGERANT FLOW DIAGRAM

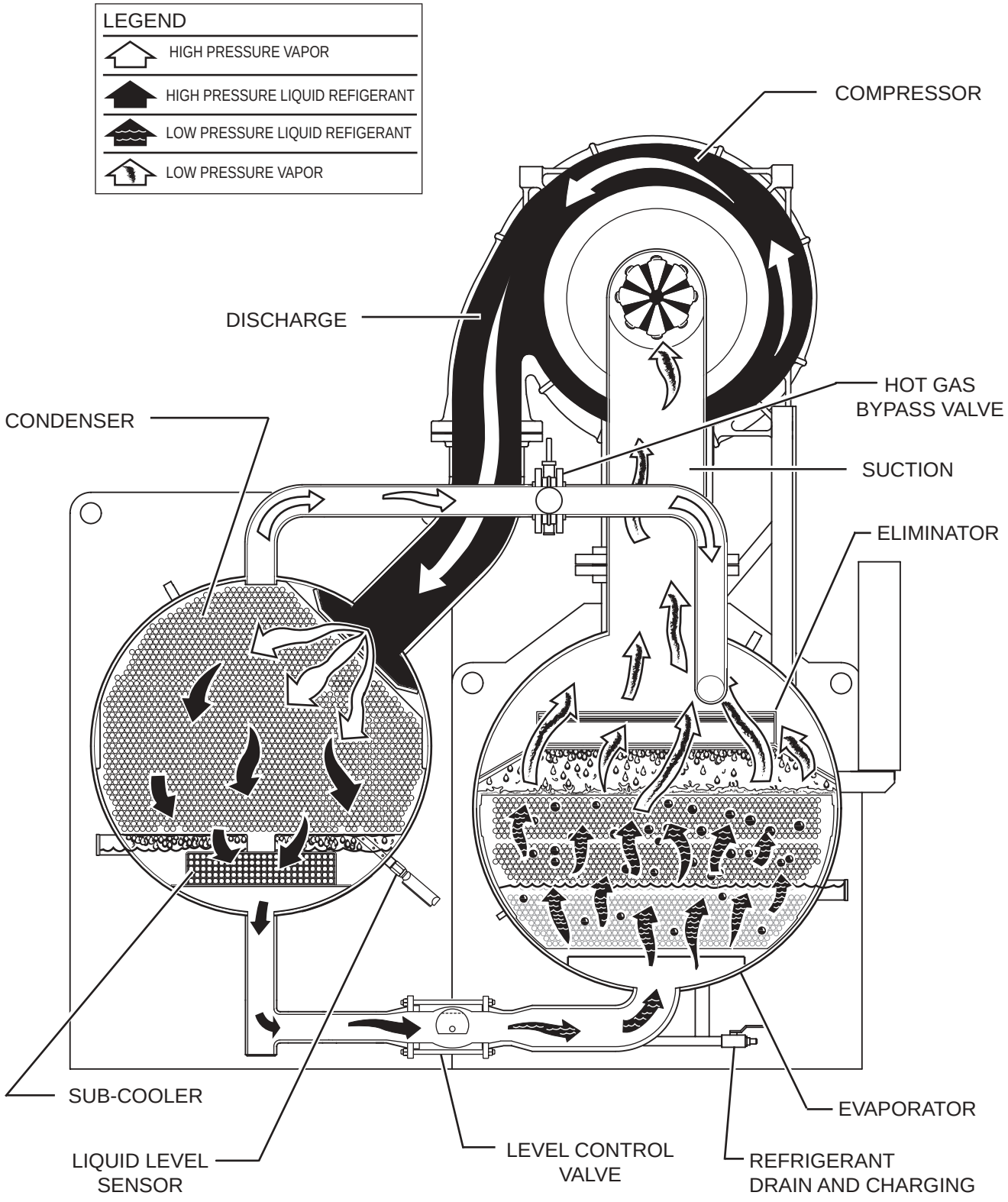

FIG. 2 – REFRIGERANT FLOW-THRU CHILLER

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SECTION 2
PANELVIEW PLUS 1000 CONTROL CENTER INTRODUCTION

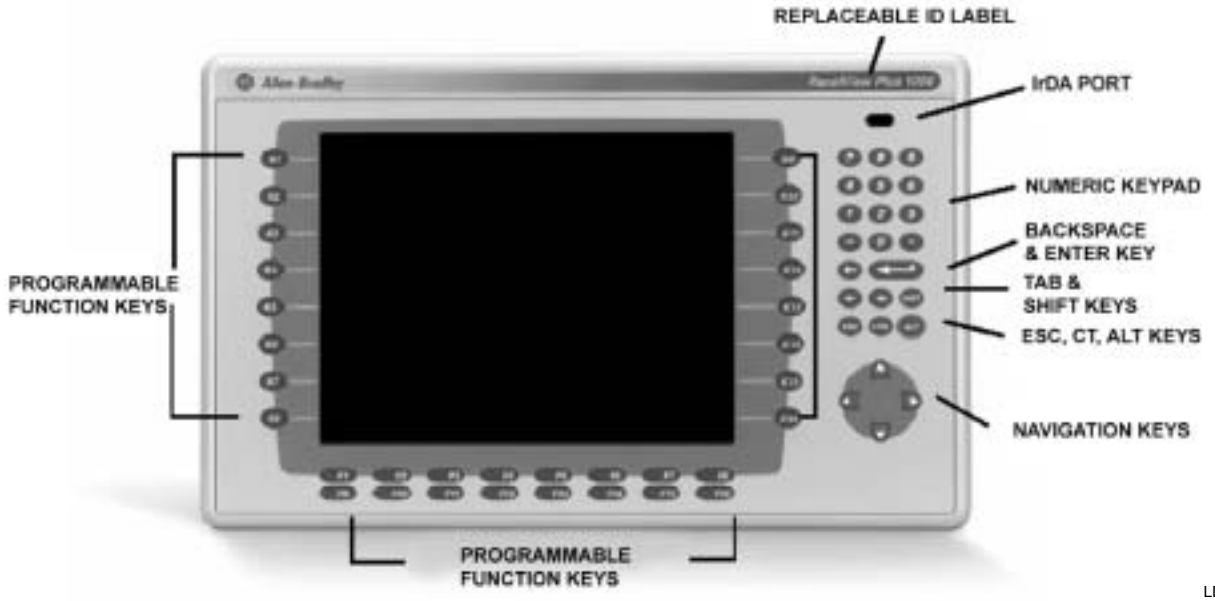

FIG. 3 – PANELVIEW PLUS 1000

GENERAL PANEL DESCRIPTION

The Allen-Bradley PanelView Plus 1000 operator interface is furnished standard on the chiller and provides the ultimate in efficiency, automation, monitoring, data recording and chiller protection. The Control Center is a factory-mounted, wired and tested control system for R134a centrifugal chillers. The panel is configured with a color TFT display surrounded by "soft" keys that are redefined based on the screen being displayed. This makes chiller operation quicker and easier with a single button revealing a wide array of information on a large, full-color illustration of the appropriate component.

The TFT display features graphic animated display of the chiller, chiller subsystems and system parameters, allowing the presentation of several operating parameters at once.

During engine startup, operation and shutdown, the system will display vital information available at any time. The locations of various chiller parameters are clearly marked and instructions for specific operation are provided on many of the screens.

NAVIGATING THE CONTROL PANEL

Navigating through the various screens of the operator interface panel is highly intuitive. Soft keys to the left, right and bottom of the Display Screen allows the user to select from the available screen displays and make setpoint adjustments.

Setpoint values are entered with the keypad at the right of the operator interface panel. Arrow keys on the keypad allow the user to page up, page down and move to the beginning and end of the available screens.

SCREEN SELECTION

Graphical, animated screens provide a means of data display and service for various system components. Screens indicate all aspects of operation and sensor data pertaining to the particular component depicted.

At the top of each main screen is displayed the system status, present date and time, local or remote control source and system access level. (See below)

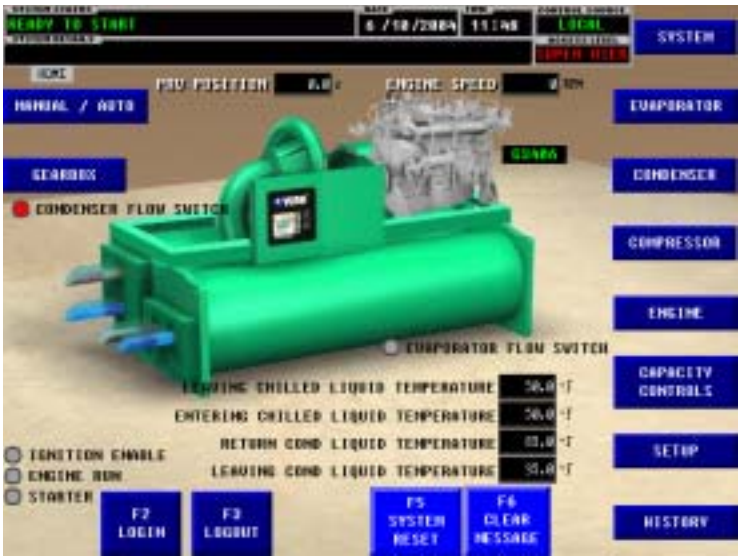

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FIG. 4 – MAIN SCREEN

Sub-screens may also be available for some system components, providing additional data access. Screens are selected by selecting the appropriate tabs on the sides of the display. Press the soft button corresponding to a particular screen tab.

INTERACTIVE SCREEN FEATURES

Various aspects of chiller operation may be adjusted by the operator within the appropriate screen. Function keys (**F1 -F16 and K1 – K16**) allow the operator to select a tab appropriate to the adjustment he wishes to make. Some interactive controls are depicted graphically while others, such as setpoints, appear as entry fields in which the operator may enter values directly.

The operator may move between entry fields using the tab keys on the keypad, ⇤ and ⇥. When an entry field is highlighted, pressing any key on the keypad opens a window on the display depicting the keypad itself. The operator may then enter a value on the keypad by pressing the return key (↵). An entry may be voided by pressing the ESC key.

NOTE

The chiller Control System has four access levels: VIEW, OPERATOR, SERVICE and SUPER USER. This instruction is intended only as an operator manual. As such, depicted here are the system parameters available at the VIEW and OPERATOR levels of access. Additional parameters are accessible at the service level under SERVICE and SUPER USER authorization, which require user login. See the service manual for login instruction and details relating to system service.

CAUTION

System adjustments should be performed only by a qualified operator. Read all instructions carefully before making adjustments

OPERATOR LOGIN

In order to gain access to operator authorized features, it is necessary to log into the system. On the home screen is the **F2 LOGIN** tab. Selecting this tab brings up a display depicting the control panel keypad. Enter the user access code and press the return key on the keypad. The System Status display at the top of the screen shows the current login access level.

When the chiller system is first powered on, the default display is the Home Screen. The primary values that must be monitored and controlled are shown on this screen. The Home Screen display depicts a visual representation of the chiller itself.

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HOME SCREEN

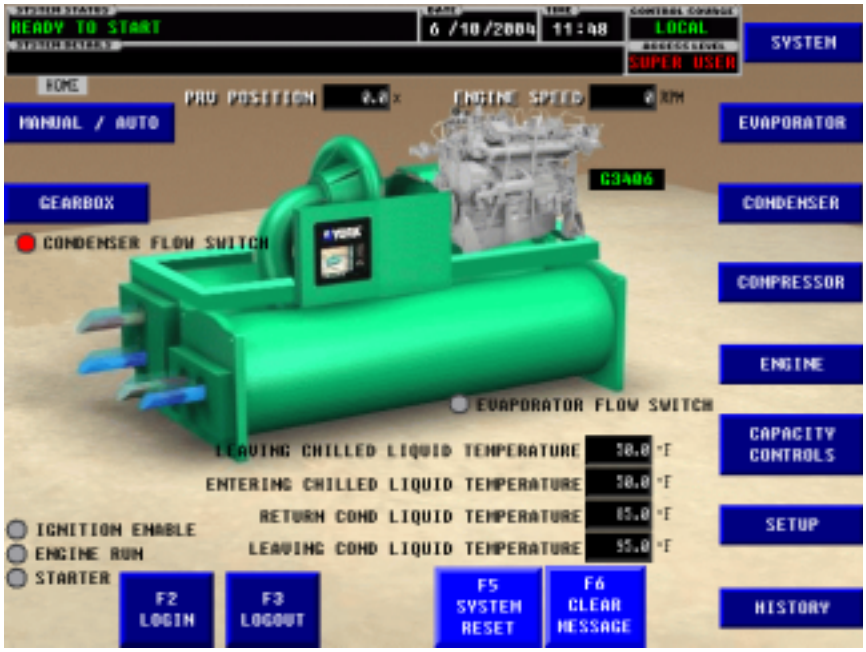

FIG. 5 - HOME SCREEN LD09879

DISPLAY

Leaving Chilled Liquid Temperature
Displays the temperature of the chilled liquid leaving the evaporator

Entering Chilled Liquid Temperature
Displays the temperature of the liquid entering the evaporator

Return Condenser Liquid Temperature
Displays the temperature of the liquid leaving the condenser

Leaving Condenser Liquid Temperature
Displays the temperature of the liquid leaving the condenser

PRV Position
Displays the position of the pre-rotation vanes in percent

Engine Speed
Displays the engine speed in RPM

Condenser Flow Switch
Indicates that liquid is flowing through the condenser

Evaporator Flow Switch
Indicates that liquid is flowing through the evaporator

Ignition Enable
Indicates that the engine is ready to start

Engine Run
Indicates that the engine is running

Starter
Indicates that the engine starter motor is operating
The System Screen is essentially an extension of the Home Screen, providing additional system information to the operator

SYSTEM SCREEN

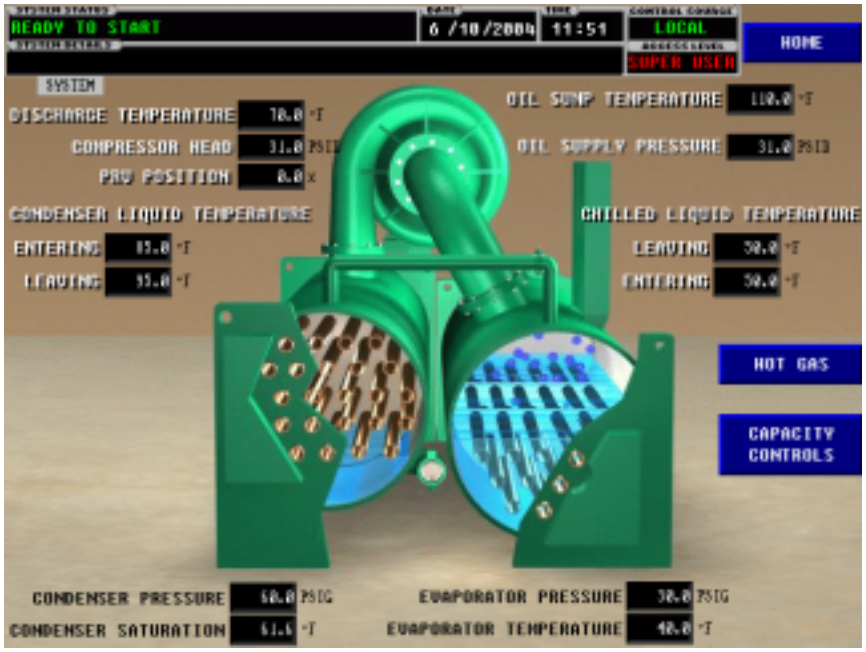

FIG. 6 - SYSTEM SCREEN LD09880

DISPLAY

Discharge Temperature
Displays the temperature of the refrigerant gas leaving the compressor

Compressor Head
Displays the head pressure, expressed as the difference between the compressor suction pressure and the compressor discharge pressure

Condenser Liquid Temperature
Entering/Leaving
Displays the temperature of the cooling liquid both entering and leaving the condenser

Oil Sump Temperature
Displays the temperature of the oil in the compressor oil sump

Oil Supply Pressure
Displays the pressure of the compressor oil system

Chilled Liquid Temperature Entering/Leaving
Displays the temperature of the chilled liquid both entering and leaving the condenser

Condenser Pressure
Displays the operational pressure of the condenser

Condenser Saturation (Temperature)
Displays the current saturation temperature of the refrigerant in the condenser

Evaporator Pressure
Displays the operational pressure of the evaporator

Evaporator Temperature (Saturation)
Displays the current saturation temperature of the refrigerant in the evaporator

EVAPORATOR SCREEN

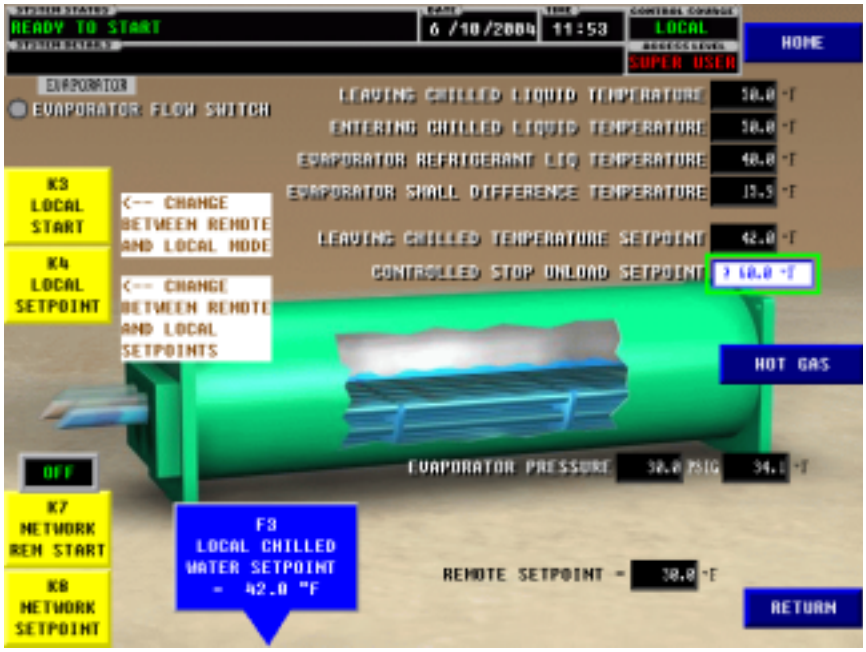

FIG. 7 - EVAPORATOR SCREEN

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DISPLAY

Leaving Chilled Liquid Temperature
Displays the temperature of the chilled liquid leaving the evaporator

Entering Chilled Liquid Temperature
Displays the temperature of the liquid entering the evaporator

Evaporator Refrigerant Liquid Temperature
Displays the current temperature of the refrigerant in the evaporator

Evaporator Small Temperature Difference
Displays the temperature expressed as the differential temperature between the chilled liquid temperature entering and leaving

Leaving Chilled Temperature Setpoint
Displays the current chilled liquid temperature setpoint

Evaporator Pressure and Temperature
Displays the pressure and temperature of the evaporator refrigerant

Remote Setpoint
Displays the remotely set chilled water setpoint

Evaporator Flow Switch
Indicates that chilled liquid is flowing through the evaporator

PROGRAMMABLE

Controlled Stop Unload Setpoint
Designated chilled water temperature at which the engine disengages from the drive train during shutdown.

INTERACTIVE

(F3) Local Chilled Water Setpoint
Selecting this tab allows the operator to enter the local chilled water temperature setpoint

(K3) Local Start
Selecting this tab toggles the start mode from local to remote

(K4) Local Setpoint
Selecting this tab toggles between local and remote setpoints

(K7) Network Remote Start
Selecting this tab toggles between network remote start and hardwire remote start features

(K8) Network Setpoints
Selecting this tab toggles between hardwire and network chilled water setpoint

CONDENSER SCREEN

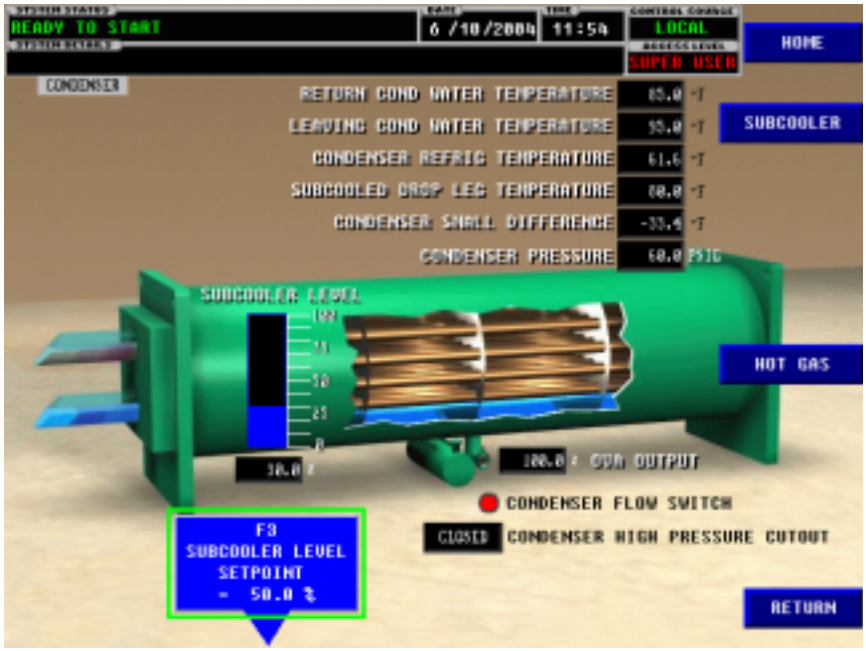

FIG. 8 - CONDENSER SCREEN LD09882

DISPLAY

Return Condenser Water Temperature
Displays the temperature of the cooling water returning to the condenser

Leaving Condenser Water Temperature
Displays the temperature of the cooling water leaving the condenser

Condenser Refrigerant Temperature
Displays the temperature of the condenser refrigerant

Subcooled Drop Leg Temperature
Displays the temperature of the refrigerant in the drop leg of the subcooler

Condenser Small Temperature Difference
Displays the temperature expressed as the differential between the water entering and the water leaving the condenser

Condenser Pressure
Displays the current operating pressure of the condenser

Subcooler Level (Graphical)
Displays the level of refrigerant inside the subcooler

OVA Output
Displays the status of the subcooler level control valve from fully open to fully closed in percent

Condenser High Pressure Cutout
Indicates the status of the high pressure cutout switch

INTERACTIVE

(F3) Subcooler Level Setpoint
Allows the operator to adjust the subcooler refrigerant level setpoint

SUBCOOLER SCREEN

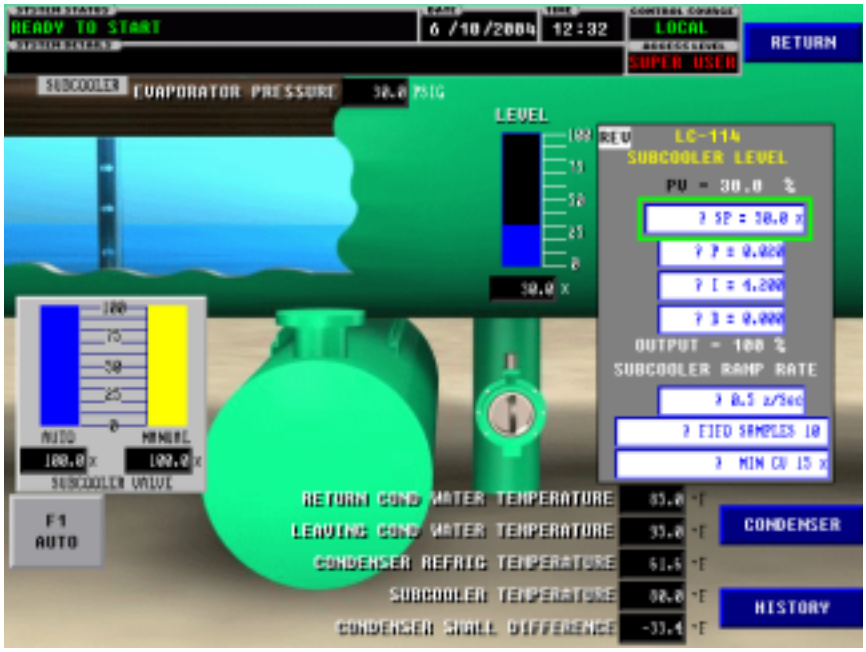

FIG. 9 - SUBCOOLER SCREEN LD09883

DISPLAY

Return Condenser Water Temperature
Displays the temperature of the condenser water returning to the condenser

Leaving Condenser Water Temperature
Displays the temperature of the condenser water returning to the condenser

Condenser Refrigerant Temperature
Displays the current temperature of the condenser refrigerant

Subcooler Temperature
Displays the temperature of the refrigerant in the subcooler

Condenser Small Temperature Difference
Displays the temperature expressed as a differential temperature between the water leaving and the water entering the condenser

Evaporator Refrigerant Level (Graphical)
Displays the evaporator refrigerant level in percent

INTERACTIVE

WARNING

The programmable portion of the Subcooler Screen contains settings that should only be changed by a qualified service person

(F1) Subcooler Valve
Allows the operator to manually adjust the subcooler valve to the desired setting

Pressing the F1 Auto tab allows the operator to adjust the subcooler level valve from 0 – 100% open using the F2 and F10 keys on the bottom of the display.

COMPRESSOR SCREEN

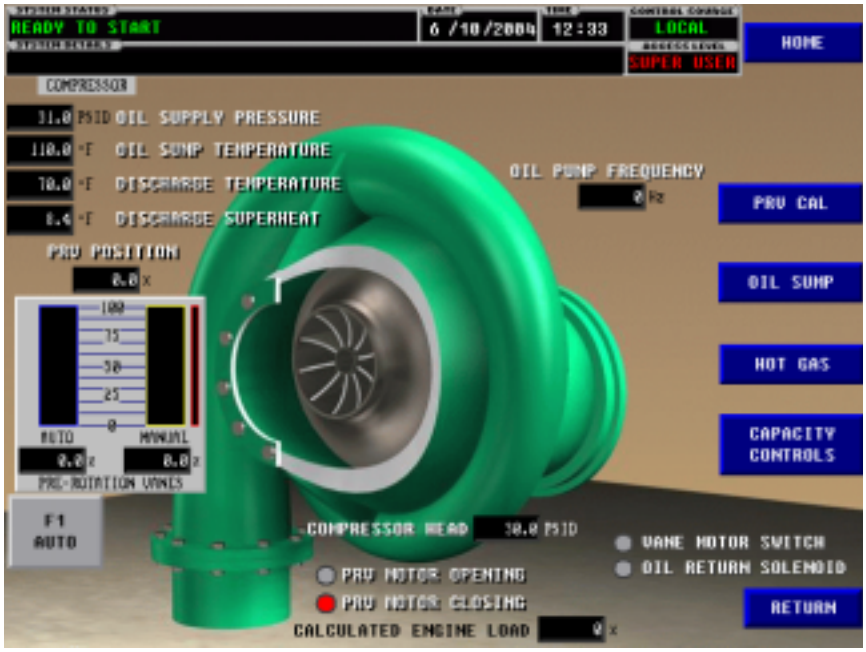

FIG. 10 - COMPRESSOR SCREEN LD09884

DISPLAY

Oil Supply Pressure
Displays the oil supply pressure

Oil Sump Temperature
Displays the oil sump temperature

Discharge Temperature
Displays the temperature of the refrigerant gas at the compressor outlet

Discharge Superheat
Displays the temperature expressed as the differential between the discharge temperature and the condenser saturation temperature

Compressor Head
Displays the head pressure expressed as a differential between the compressor suction and discharge

Oil Pump Frequency
Displays the operating frequency of the variable-speed oil pump drive

PRV Motor Opening/Closing
Indicates the status of the pre-rotation vane actuator

PRV Position
Displays the position of the pre-rotation vanes in percent

Vane Motor Switch
Indicates the status of the vane motor switch

Oil Return Solenoid
Displays the status of the oil return solenoid

Calculated Engine Load
Displays the engine load in percent

INTERACTIVE

(F1) Pre-rotation vanes
Operator may manually adjust the position of the pre-rotation vanes

Pressing the F1 Auto tab allows the operator to adjust the pre-rotation vane setting from 0 – 100% open using the F2 and F10 keys on the bottom of the display.

OIL SUMP SCREEN

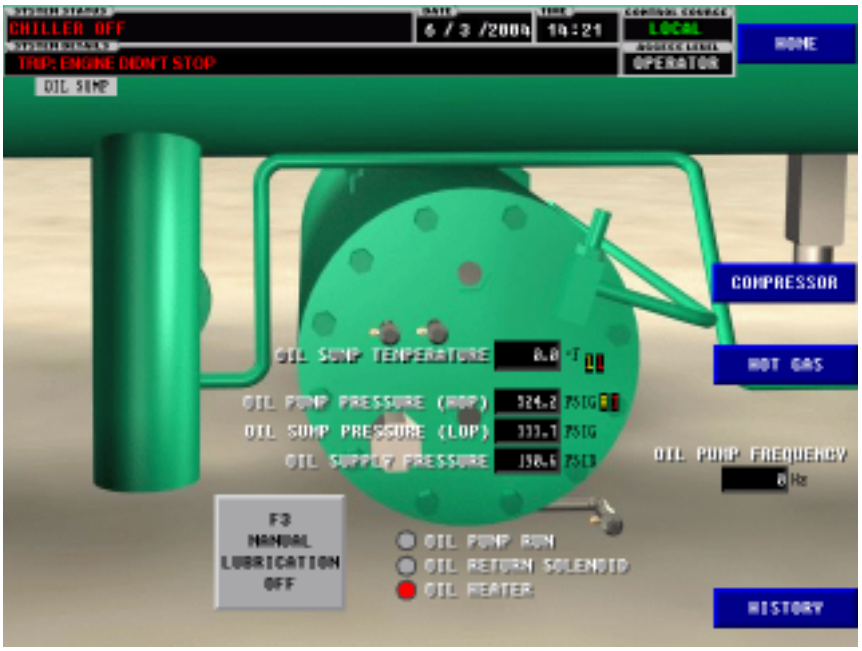

FIG. 11 - OIL SUMP SCREEN

DISPLAY

Oil Sump Temperature
Displays the oil sump temperature

Oil Sump Pressure (HOP)/(LOP)
Displays the pressure at the high and low pressure sides of the oil sump

Oil Supply Pressure
Displays the oil supply pressure

Oil Pump Frequency
Displays the variable-speed oil pump drive frequency

Oil Pump Run
Indicates the operational status of the oil pump

Oil Return Solenoid
Indicates the status of the oil return solenoid

Oil Heater
Indicates the operational status of the oil heater

INTERACTIVE

(F3) Manual Lubrication Off
Toggles the oil pump off/on

PRE-ROTATION VANES CALIBRATION SCREEN

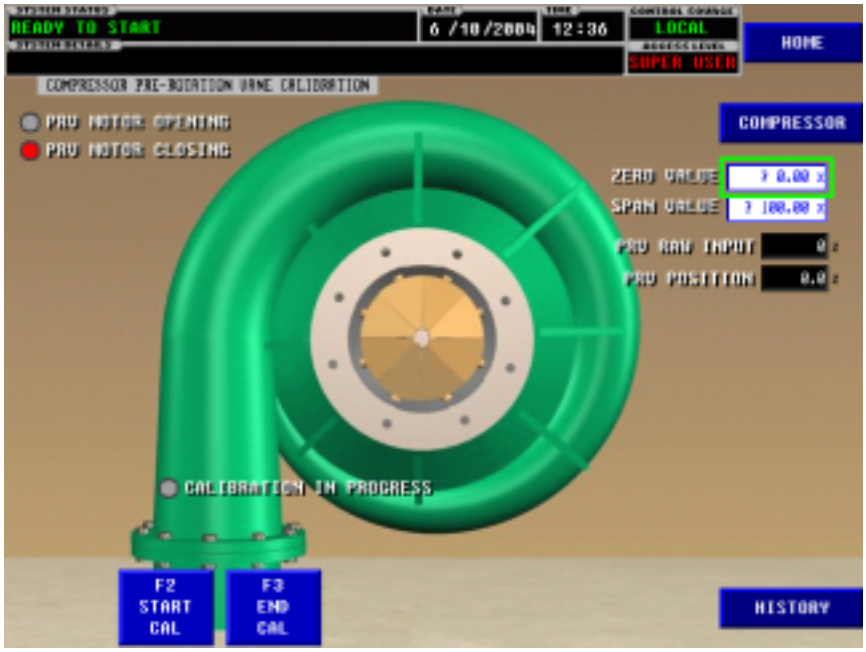

FIG. 12 - PRE-ROTATION VANES CALIBRATION SCREEN LD09886

DISPLAY

PRV Raw Input
Displays the vane position signal provided by the Control System

PRV Position
Displays the real-time position of the vanes

PRV Motor Opening/Closing
Displays the status of the vane actuator

PROGRAMMABLE

Zero Value Setpoint
For manual calibration of the PRV; corresponds to the raw PRV potentiometer input with the vanes fully closed

Span Value
For manual calibration of the PRV; corresponds to the raw PRV potentiometer input with the vanes fully open

INTERACTIVE

(F2) Start Calibration
Selecting this tab initiates a vane position calibration algorithm.

(F3) End Calibration
Selecting this tab accepts the automated vane calibration

When F2 START CALIBRATION is selected, a message "Vane motor stroking; please wait" appears. Press F3 END CALIBRATION to accept calibration

HOT GAS VALVE SCREEN

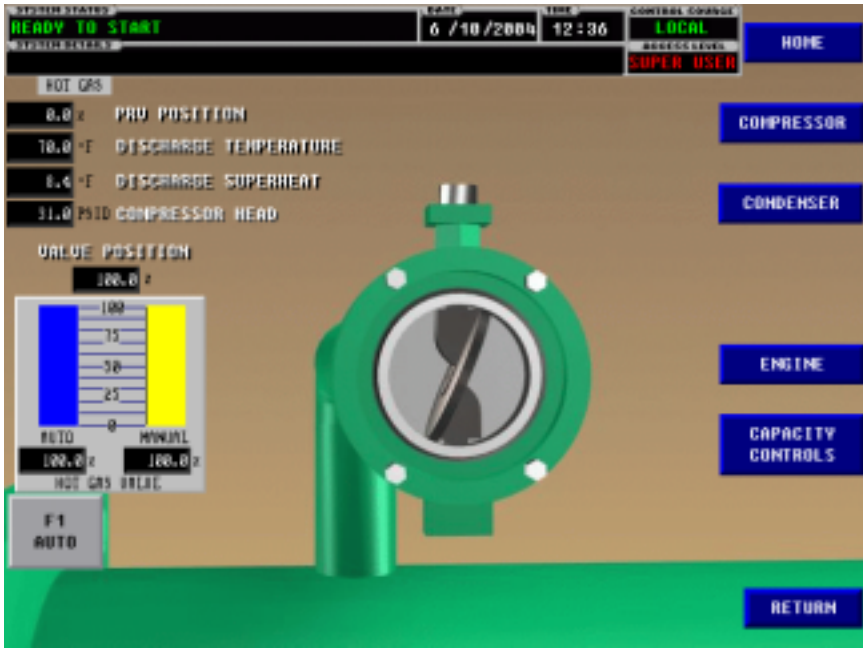

FIG. 13 - HOT GAS VALVE SCREEN LD09887

DISPLAY

PRV Position
Displays the position of the pre-rotation vanes in percent

Discharge Temperature
Displays the compressor discharge temperature

Discharge Superheat
Displays the temperature expressed as a differential between the discharge temperature and the condenser saturation temperature

Compressor Head
Displays the pressure expressed as a differential between the compressor suction and compressor discharge pressures

Valve Position
Displays the position of the valve in terms of percentage open

INTERACTIVE

(F1) Hot Gas Valve
Allows the operator to manually adjust the position of the hot gas bypass valve

Pressing the F1 Auto tab allows the operator to adjust the hot gas valve position from 0 – 100% open using the F2 and F10 keys on the bottom of the display.

GEARBOX SCREEN

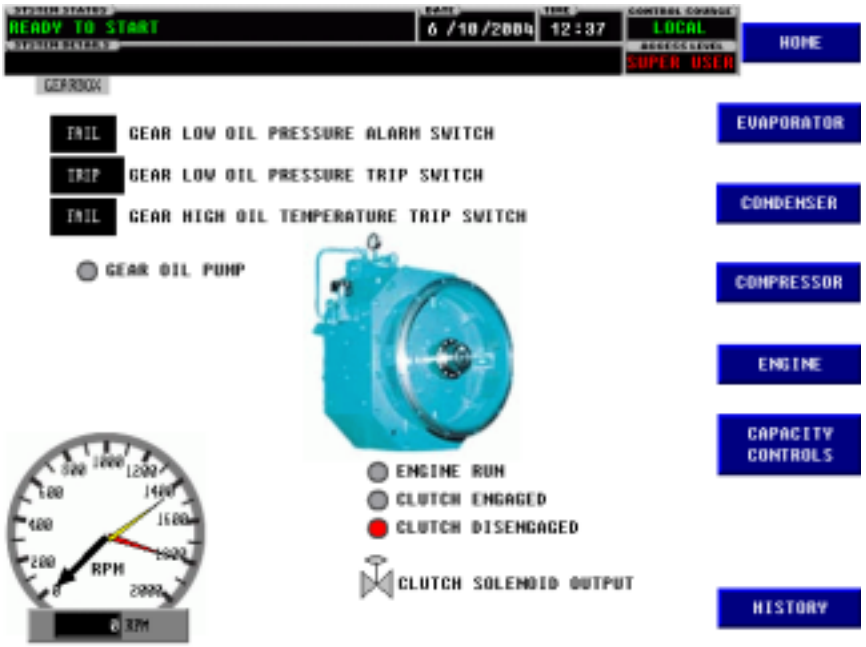

FIG. 14 - GEARBOX SCREEN LD09888

DISPLAY

RPM (Graphical)
Displays gearbox operating speed

Gear Low Oil Pressure Alarm Switch
Indicates the status of the low oil pressure alarm switch

Gear Low Oil Pressure Trip Switch
Indicates the status of the low oil pressure trip switch

Gear High Oil Temperature Trip Switch
Indicates that status of the high gear oil temperature trip switch

Gear Oil Pump
Indicates the operational status of the gear oil pump

Engine Run
Indicates operation of the engine

Clutch Engaged/Disengaged
Indicates the status of the clutch

Clutch Solenoid Output
Indicates the status of the clutch solenoid

ENGINE SCREEN

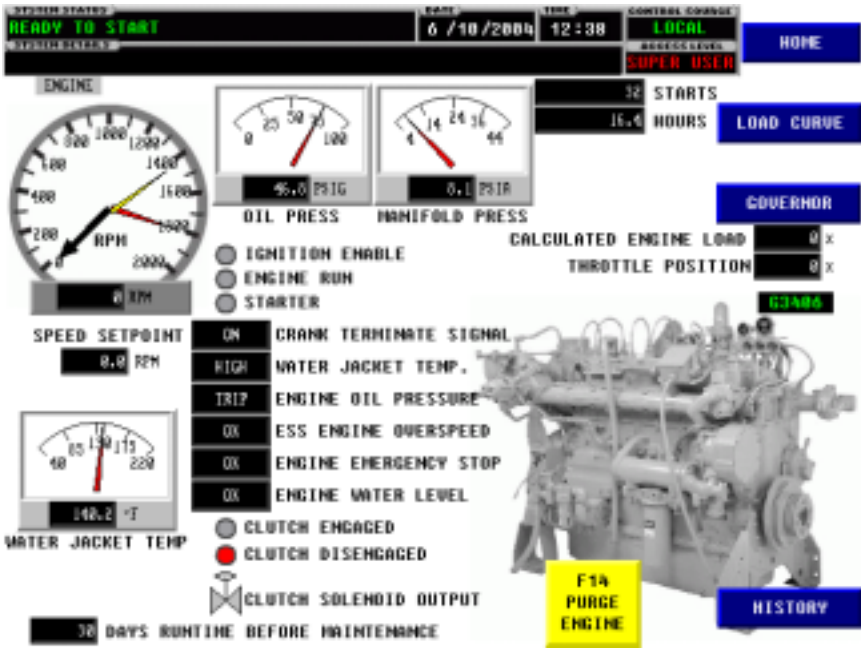

FIG. 15 - ENGINE SCREEN LD09889

DISPLAY

Starts/Hours
Displays the total number of engine starts and total hours of operation to date

Calculated Engine Load
Displays the engine load calculated from manifold pressure and RPM readings, in percent

Throttle Position
Displays the throttle position from fully open to fully closed in percent

Oil Pressure (Graphical)
Displays the engine oil pressure in psig

Manifold Pressure (Graphical)
Displays the engine manifold pressure in psia

RPM
Displays engine rpm

Water Jacket Temperature (Graphical)
Displays the water jacket temperature in ° F

Days Run Time Before Maintenance
Displays the number of days operational time remaining before scheduled maintenance

Clutch Solenoid Output
Indicates the status of the clutch solenoid

Clutch Engaged/Disengaged
Indicates the status of the clutch

Ignition Enable
Indicates that the engine ignition system is active

Engine Run
Indicates the engine is operating

Starter
Indicates that the starter motor is operating

Crank Terminate Signal
Indicates that the engine control panel has issued a signal to the main panel to terminate engine crank

Water Jacket Temperature Signal
Indicates whether or not the water jacket temperature has exceeded safe limits

Engine Oil Pressure Signal
Indicates whether or not the engine oil pressure has exceeded safe limits

ESS Engine Overspeed Signal
Indicates whether or not the engine is in an overspeed condition

Engine Emergency Stop Signal
Indicates that the emergency stop switch on the engine panel has been depressed

Engine Water Level Signal
Indicates whether or not the engine water level is within safe limits

LOAD CURVE SCREEN

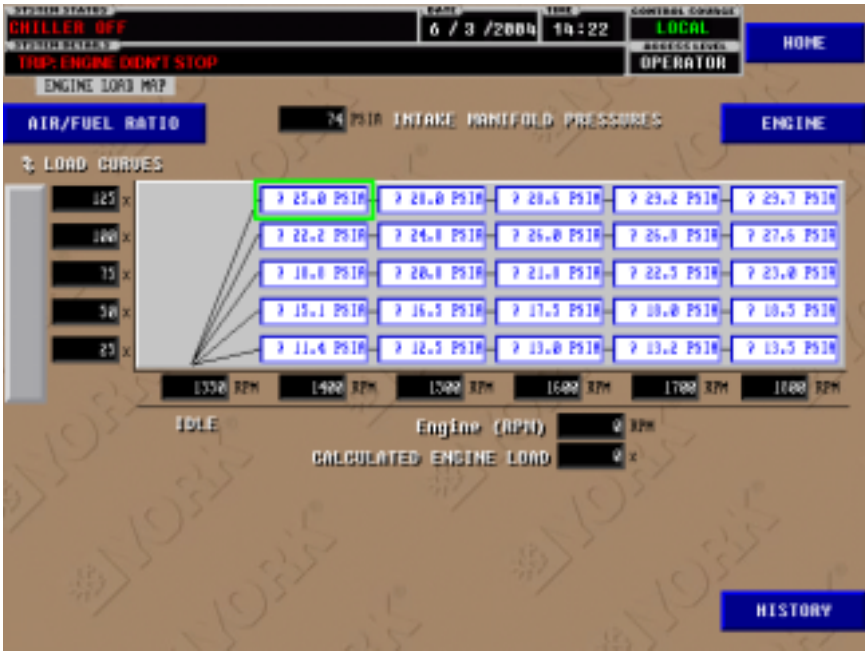

FIG. 16 - LOAD CURVE SCREEN

The engine load map graphically illustrates an approximated engine load based on manifold pressure and rpm. The calculation is based on a family of performance curves from the engine manufacturer.

CAUTION

Engine manifold pressure entry fields are factory set and correspond to figures provided by the engine manufacturer. Do not modify manifold pressure entries without factory consultation

DISPLAY

Intake Manifold Pressure
Displays the current engine intake manifold pressure

Percent Load Curves (Graphical)
Displays the engine load based on manifold pressure and rpm in percent

Engine RPM
Displays current engine speed

Calculated Engine Load
Displays the engine load based on manifold pressure and rpm in percent

CAPACITY CONTROLS SCREEN

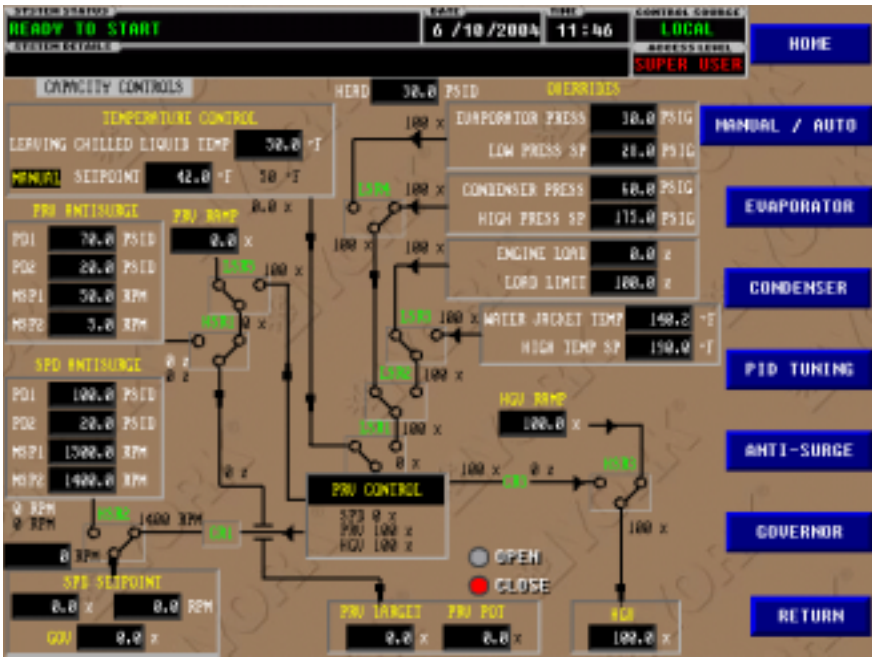

FIG. 17 - CAPACITY CONTROLS SCREEN LD09891

The Capacity Controls Screen schematically illustrates the logical operations of chiller capacity control. Sensor readings are linked with setpoint values and compared. PID loops, depicted in each box, pass signals through high or low-pass relay (HSR/LSR) junctions. The relay makes a simple comparison of two signals and passes the higher or lower of the two depending on whether the relay is high or low pass. The PRV CONTROL box links the PID signals to system logic in order to determine the correct sequencing of output signals to the appropriate actuators.

OVERRIDES

Evaporator Pressure
Displays the current evaporator pressure

Low Pressure Setpoint
Displays the system low evaporator pressure setpoint

Condenser Pressure
Displays the current condenser pressure

High Pressure Setpoint
Displays the system high condenser pressure setpoint

Engine Load
Displays the current engine load

Load Limit
Displays the engine load limit setpoint

Water Jacket Temperature
Displays the current engine water jacket temperature.

Displays the engine water jacket high temperature setpoint.

HGV Ramp
Displays the hot gas valve ramp rate in percent

HGV
Displays the current hot gas valve position from opened to closed in percent

PRV Pot
Displays the current position of the pre-rotation vanes from opened to closed in percent

PRV Target
Displays the control-system intended position of the pre-rotation vanes

SPD SETPOINT

Displays engine speed setpoint from maximum allowable speed to minimum allowable speed, speed setpoint in rpm, and governor valve setpoint from fully open to fully closed in percent

RPM
Displays current engine speed in rpm

SPD ANTI-SURGE

Displays the minimum and maximum head pressure setpoints in the engine speed anti-surge band (PD1, PD2), along with their corresponding minimum and maximum allowable anti-surge speed setpoints (MSP1, MSP2).

PRV ANTI-SURGE

Displays the minimum and maximum head pressure setpoints in the pre-rotation vane position anti-surge band (PD1, PD2) along with their corresponding minimum and maximum allowable anti-surge PRV position setpoints

PRV Ramp
Displays the ramp rate signal strength in percent

TEMPERATURE CONTROL

Leaving Chilled Liquid Setpoint
Displays the current chilled liquid temperature

Setpoint
Current manual, automatic, remote, or network remote chilled liquid setpoint

MANUAL/AUTO STATION (CAPACITY CONTROLS) SCREEN

FIG. 18 - MANUAL/AUTO STATION (CAPACITY CONTROLS) SCREEN

LD09892

DISPLAY

Leaving Chilled Liquid Temperature
Displays the temperature of the leaving chilled liquid

Leaving Chilled Liquid Temperature Setpoint
Displays the leaving chilled liquid temperature setpoint

Compressor Head
Displays the head pressure expressed as a differential pressure between the compressor suction and discharge

Engine Speed
Displays current engine speed in rpm

Engine Speed Setpoint
Displays the engine speed setpoint

Hot Gas Valve
Displays the current position of the hot gas valve

PRV Position
Displays the current pre-rotation vane position from open to closed in percent

PRV Open/Close
Indicates whether the pre-rotation vane actuator is opening or closing

INTERACTIVE

(F1) Hot Gas Valve
Allows the operator to manually adjust the position of the hot gas valve from fully open to fully closed

(F3) Pre-rotation Vanes
Allows the operator to manually adjust the position of the pre-rotation vanes from fully open to fully closed

(F5) Speed Setpoint
Allows the operator to manually adjust the engine speed setpoint from minimum allowable to maximum allowable speed

Hot gas, pre-rotation vanes and engine speed setpoints may be changed by pressing the F1, F3 and F5 buttons respectively. Press the appropriate function keys to increase or decrease the setting depicted in the graphic.

NOTE

If the Hot Gas Valve is switched to manual control using the F1 AUTO tab and the valve is manually moved more than 5% away from the automatic setting, it will not be possible to toggle back to automatic control. The message "Manual/Auto Transfer Inhibit" will appear in the bottom left-hand corner of the screen. Manually adjust the Hot Gas Valve to match the automatic setting before re-engaging automatic control.

TRENDING SCREEN

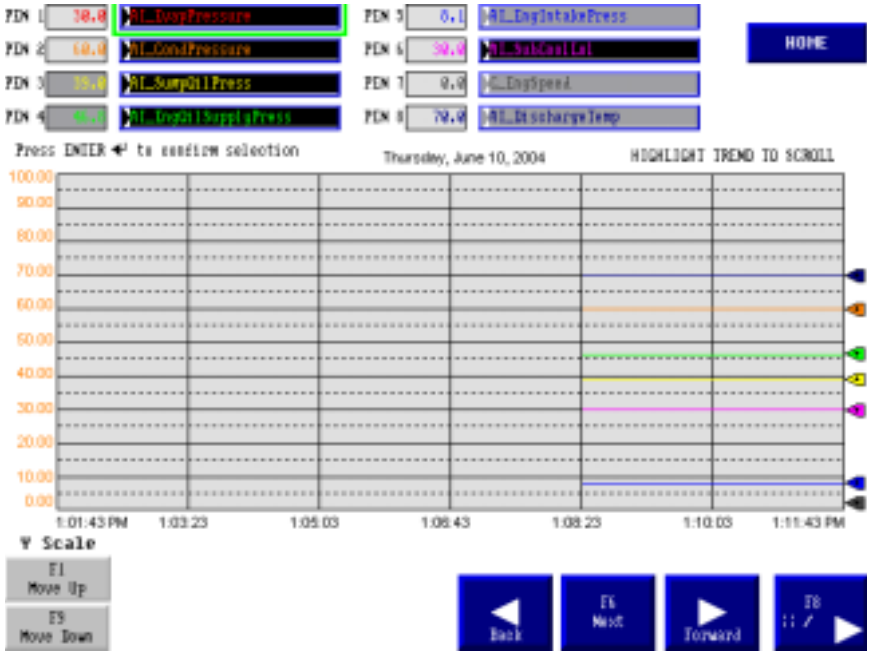

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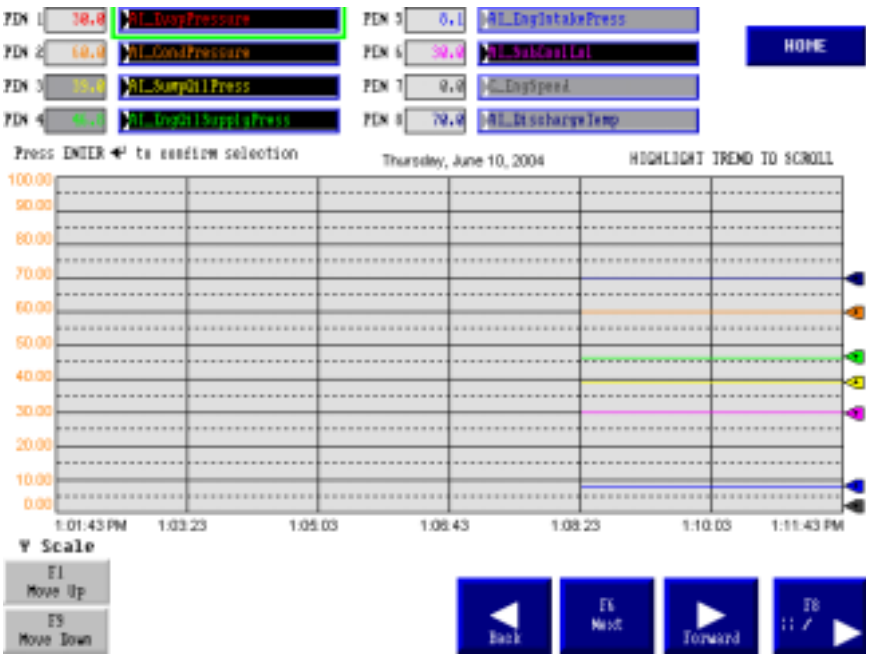
FIG. 19 - TRENDING SCREEN

The Trending Screen provides a graphical display of sensor values over the entire period of operation of the chiller. Use the tab keys on the keypad to select between Pens 1 – 8. When a pen has been selected, use the arrow keys on the keypad to assign the desired sensor to that Pen.

When the graph itself is highlighted, the F1 and F2 keys allow the user to move along the vertical scale of the graph. The F5 and F7 keys move along the horizontal scale of the graph, which depicts time in five-minute increments. The F8 function key toggles the trace on or off. Pens are color coded for clarity.

PID TUNING SCREEN (CAPACITY CONTROLS)



LD09907

FIG. 20 - PID TUNING SCREEN

The PID Tuning Screen allows the operator to adjust capacity controls tuning parameters. The screen depicts four sensors and their corresponding PID control variables.:

- TC-100 Chilled Water Out
- PC-111 Evaporator Pressure
- PC-113 Compressor Discharge Pressure
- JC-160 Engine Manifold Pressure
- TC-160 Engine Water Temperature

Move between entry fields using the keypad tab keys on the keypad, ⇤ and ⇥.

CHILLED WATER OUT TEMPERATURE

PV
Process variable; actual sensor reading in ºF

LOC SP
Local chilled water setpoint; also available on the Evaporator Screen.

Output
Control variable output signal from 0 to 100%

LOW PRESSURE OVERRIDE

PV
Process variable; actual evaporator pressure sensor reading in psig

Output
Control variable output signal from 0 to 100%

ENGINE LOAD LIMITER

PV
Process variable; calculated engine load in percent

Output
Control variable output signal from 0 to 100%

HIGH PRESSURE OVERRIDE

PV
Process variable; actual compressor discharge pressure in psig

Output
Control variable output signal from 0 to 100%

HIGH ENGINE TEMPERATURE OVERRIDE

PV
Process variable; actual engine temperature in ºF

Output
Control variable output signal from 0 to 100%

The following tables list the default factory values for the PID control loops.

CHILLED WATER OUT TEMPERATURE

	SPEED	PRV	HGV
P	0.400	0.300	0.500
I	0.060	0.102	0.103
D	0.000	0.000	0.000

Setpoint Ramp Rate: 0.5 ºF/sec

LOW PRESSURE OVERRIDE

Setpoint: 28.0 psig

P: 1.000
I: 2.000
D: 0.000

ENGINE LOAD LIMITER

Setpoint: 100.0

P: 0.800
I: 1.500
D: 0.000

HIGH PRESSURE OVERRIDE

Setpoint: 175.0

P: 1.000
I: 2.000
D: 0.005

HIGH ENGINE TEMPERATURE OVERRIDE

Setpoint: 190.0

P: 0.900
I: 2.000
D: 0.000

ADDITIONAL ENTRY FIELDS

HGV Ramp Time:
60.0 sec

PRV Minimum Start Position:
2.0%

PRV Ramp Time:
100.0 sec

PRV Response Gain:
4800

ANTI-SURGE TUNING SCREEN

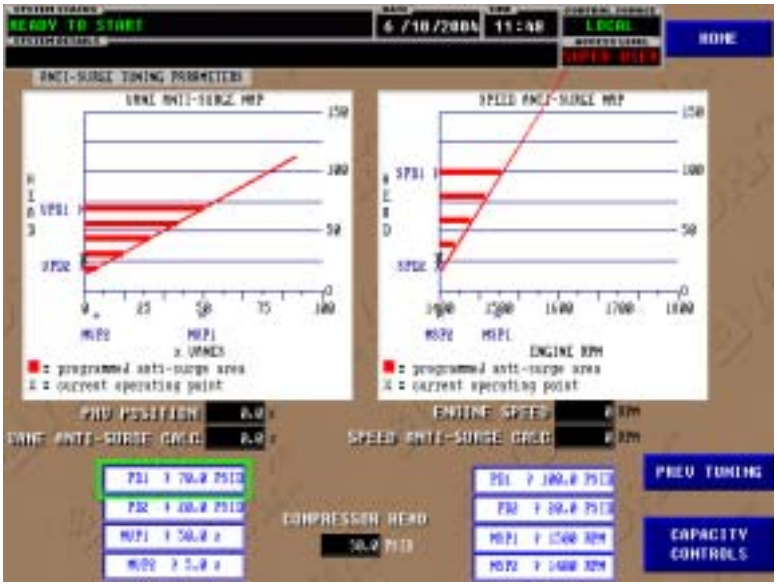


FIG. 21 - ANTI SURGE TUNING SCREEN LD09908

DISPLAY

Depicted on the Anti-surge tuning parameters screen are two plots showing the surge band as a function of compressor head versus PRV position and engine speed. The area above the line, highlighted in red, are the conditions under which surge can be expected to occur.

VANE ANTI-SURGE MAP

VPD1 is the maximum system head pressure as defined by the entry fields below the Surge Map.

VPD2 is the minimum system head pressure as defined by the entry fields below the Surge Map.

MVP1 is the minimum allowable vane position at the maximum system head pressure, VPD1

MVP2 is the minimum allowable van position at the minimum system head pressure, VPD1

An “X” on the plot shows the current anti-surge operating point.

SPEED ANTI-SURGE MAP

SPD1 is the maximum system head pressure as defined by the entry fields below the Surge Map.

SPD2 is the minimum system head pressure as defined by the entry fields below the Surge Map.

MSP1 is the minimum allowable anti-surge speed at the maximum system head pressure, SPD1

MSP2 is the minimum allowable anti-surge speed at the minimum system head pressure, SPD2

The actual Compressor Head pressure is shown near the bottom of the screen in the middle.

VANE ANTI-SURGE

(PD1) Maximum System Head:
70.0 psid

(PD2) Minimum System Head
20.0 psid

(MVP1) Minimum Vane Position @ Maximum System Head
50.0%

(MVP2) Minimum Vane Position @ Minimum System Head
5.0%

SPEED ANTI-SURGE

(PD1) Maximum System Head:
100.0 psid

(PD2) Minimum System Head
20.0 psid

(MSP1) Minimum Engine Speed @ Maximum System Head
1500 rpm

(MSP2) Minimum Engine Speed @ Minimum System Head
1400 rpm

SECTION 3
SYSTEM OPERATING PROCEDURES

Chiller operation is purposely designed to be fully automated and intuitive. All sequencing and system monitoring is done by the system processor. What follows is a description of the normal sequence of operations used to run the chiller.

MODE SELECT SWITCH POSITIONS

OFF

When the mode switch is in the off position, the chiller cannot be started under any circumstances. The switch should be turned to this position any time maintenance is performed on any system component. As an additional safety measure, it is recommended that the emergency stop button be pulled open during equipment maintenance.

AUTO

When the mode switch is in the auto position, the chiller operation is controlled by the Allen-Bradley Control System. The mode switch must be in the auto position in order for the chiller to operate.

MAINTENANCE

The maintenance position is intended to be used to enable the operator to run the engine independently from the compressor. In this position the clutch cannot be inadvertently engaged.

CHILLER OPERATION

The engine oil level must be verified to be within limits before a startup is attempted.

Before starting the chiller, the operator should verify that the hot gas bypass valve is fully open. Do this by selecting the following screen tabs: HOME → COMPRESSOR → HOT GAS. The valve position graphic should indicate that the hot gas bypass valve is fully open.

The oil heater is thermostatically controlled and remains energized as long as the main power disconnect is engaged.

Under normal circumstances the chiller should be ready to start at any time.

First verify that the emergency stop button on the main panel and the engine panel are not activated. When this is done, turn the mode select switch to the **AUTO** position and press the start button on the main panel. The Control System will start the engine and commence engine warmup, engage the clutch and ramp to operating speed. All processes are fully automatic and safeguarded.

NORMAL STARTUP AUTOMATION SEQUENCE

1. **Engine Run/Chiller Run command**

   The engine run command is issued to the engine panel, activating the circuitry. The engine gas valve opens. If applicable, a chiller run signal is issued to an auxiliary control system.

   System Status indication: *Chiller Pre-lube*

2. **Compressor Pre-lube**

   The compressor oil pump and gearbox oil pump begin to circulate oil for 30 seconds in preparation for clutch engagement.

   System Status indication: Chiller Pre-lube

3. **Engine Ignition Enable**

   The engine ignition system is energized in preparation for engine crank.

   System Status indication: Engine Start Initiated

4. **Engine Crank**

   The starter motor pinion solenoid is engaged and the engine begins cranking. The motor disengages in 30 seconds or when the system logic registers engine idle speed, whichever happens first.

   System Status indication*: Engine Start Initiated*

5. Ramp to Minimum Speed

When the engine has started and the system logic detects a speed signal, the engine ramps to the minimum speed defined by the engine idle speed setpoint.

System Status indication: Ramping to Minimum Speed

6. Engine Warmup

The engine runs at idle speed until the engine water temperature reaches 120 ºF.

System Status Indication*: Engine Warmup*

7. Clutch Engage

The system logic signals the clutch to engage; the compressor is running.

System Status indication*: System Running*

When the System Status window shows the *System Running* message, the chiller logic switches to temperature and anti-surge control as depicted by the Capacity Controls Screen and the chiller begins to load, producing chilled water.

NORMAL SHUTDOWN

If, during operation, the system has fully unloaded and no chilling is required, the system enters normal shutdown mode. By this time the pre-rotation vanes will have fully closed, the hot gas bypass valve will have opened completely and the engine will be running at minimum operating speed. At this time the clutch will disengage and the system processor will initiate engine cooldown. When engine cooldown is complete, the fuel supply will be closed and the engine will stall. When the system logic no longer detects a speed signal from the engine, the ignition system will deactivate.

Manual Shutdown (Normal)

The operator may choose to shut the system down even though there still exists a demand for chilled water. Under these circumstances a manual shutdown is initiated by simply pressing the **STOP** button on the main panel. The Control System will then initiate are normal system shutdown.

Manual Shutdown (Emergency)

In the event that the emergency stop button on either the main panel or engine panel is activated, the system will initiate an emergency shutdown. The engine fuel supply and ignition are simultaneously cut and the clutch is disengaged. When this has occurred, it will be necessary to perform an engine purge before the chiller is restarted.

ENGINE PURGE INITIATION

When the chiller has been tripped off line either manually or automatically, the **PURGE ENGINE** tab will appear on the engine screen. Selecting **F14** will initiate an automated engine purge. When this purge has been performed, the chiller may be restarted normally as described in this section.

NORMAL SHUTDOWN AUTOMATION SEQUENCE

1. System Coastdown

The chiller automatically unloads as the engine returns to idle speed.

System Status indication*: System Coastdown*

2. Clutch Disengage

The system logic signals the clutch to disengage; the compressor stops rotating.

System Status indication*: Control Stop*

3. Chiller Post-lube

The compressor and gearbox oil pumps continue to circulate oil for one minute after the clutch disengages.

System Status indication*: Control Stop*

4. Engine Cooldown

The engine continues to run at idle speed for four minutes.

System Status indication*: Engine Cooldown*

5. Chiller Off

The engine fuel supply is closed and the engine stalls. When the system logic no longer detects an engine speed signal, the chiller is off.

System Status indication*: Chiller Off*

SECTION 4
SYSTEM STATUS DISPLAY MESSAGES

FIG. 22 - SYSTEM STATUS DISPLAY MESSAGE LD09893

At the top of each screen is a status display header showing the system status, applicable alarm messages, date and time, user access level and control source.

The System Status display reveals the current mode of operation of the chiller system, including any applicable alarms and trip messages. This section discusses the display messages and their meanings. Messages can be cleared by selecting the **F6 CLEAR MESSAGE** tab on the Home Screen.

ROUTINE MESSAGES

"READY TO START"
This is the system's standby mode as it awaits a remote or locally initiated prompting to start.

"REMOTE START ENABLED"
This message reveals that the system has been configured to accept prompting for a remote stop.

"ENGINE START INITIATED"
When the chiller system has cleared any and all faults and alarms, the engine start sequence may be initiated.

"REMOTE ENGINE START INITIATED"
The engine has received a remote prompting to start from a separate operator interface panel or control system.

"SYSTEM RUNNING"
Once the engine has finished warm-up and ramped to operating speed, the clutch engages and the chiller begins to operate.

"SYSTEM COASTDOWN"
As the chiller prepares to go off line, the coast down sequence gradually unloads the system.

"CONTROL STOP"
A controlled stop occurs when the operator manually takes the system off line.

"ENGINE WARMUP"
Before the engine can ramp to operating speed and the driveline can be engaged, the engine must reach an operating temperature defined by the system.

"RAMPING TO MINIMUM SPEED"
When the engine has started, it ramps to a preset minimum speed in order to maintain proper lubricant pressure.

"CHILLER PRE-LUBE"
Before the system can start, the compressor pre-lubrication sequence must be completed. This includes warming of the compressor oil and pressurization of the compressor oil system.

"REMOTE LOCKOUT"
When engaged, the remote lockout prohibits remote control of the chiller.

"ENGINE COOLDOWN"
In order to assure proper engine operation and a long service life, the engine must be taken off line gradually, slowing to allow proper cooling before shutdown.

“ENGINE PURGE”
In the event that the engine emergency stop has been tripped, the engine must be purged. The **F14** button on the panel display on the Engine Screen will initiate an automated purge routine in which the engine is cranked with the ignition system disabled.

“ENGINE MAINTENANCE STANDBY”
This message indicates that the system has been switched to engine maintenance standby condition, where it waits to be switched to engine maintenance run.

“ENGINE MAINTENANCE RUN”
When the engine maintenance run is initiated, the driveline is disabled.

“CHILLER OFF”
The system may be switched off to prevent automatic operation.

SECTION 5
ALARM AND TRIP MESSAGES

If a condition occurs at any time during chiller operation in which any system parameter exceeds limits, a system trip is initiated and a message appears in the System Status display in the System Details window.

In many instances a trip may be preceded or accompanied with an alarm message. When this occurs, an alarm window will appear over the current display screen listing the time and date of any and all applicable alarms, along with a description of the condition that caused the alarm to signal.

The window must be closed in order to regain control of the operator interface panel. While the alarm window is open, the operator has the following options:

(F1) Ack Alarm
Prompts user to acknowledge the alarm

(F2) Ack All Alarms
Prompts user to acknowledge all alarms

(F3) Silence Alarms
Causes alarm to be silenced until the system detects another alarm

(F4) Silence Horn
Silences the alarm horn

(F5/F6) Move Up/Move Down
Scrolls through all alarms listed, highlighting each in turn

(F7) Close
Closes alarm window

If the system has also tripped, it will be necessary to reset before the chiller can be restarted. A reset may be initiated by pressing the reset button on the main panel or by selecting the **F5 SYSTEM RESET** tab on the Home Screen.

A detailed report of any and all alarms and trip messages can be found by selecting the tab marked **HISTORY**. When this tab is selected, the display moves to the History Screen, which catalogs the date, time and description of every system alarm and fault.

What follows is a listing of possible trip and alarm messages and their meanings.

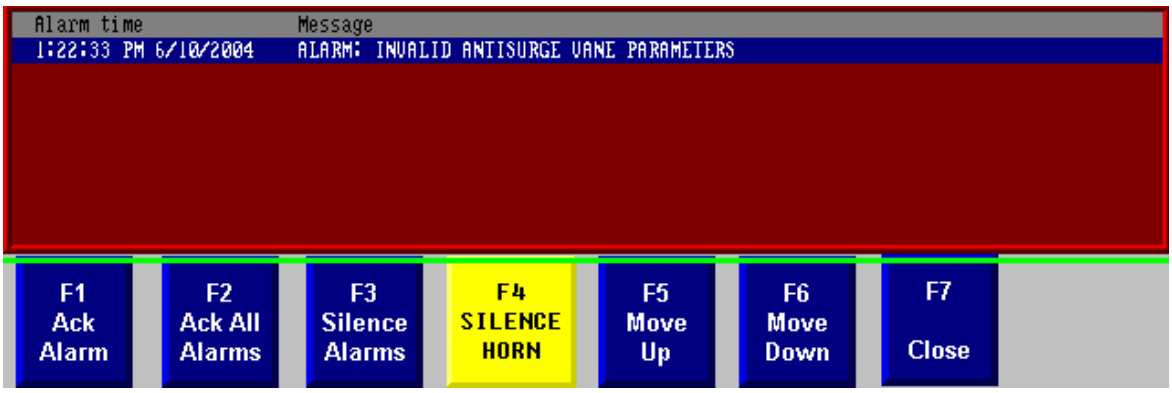


FIG. 23 - ALARM POPUP BOX SHOT

LD09894

FIG. 24 - HISTORY SCREEN

LD09895

5

ALARM MESSAGES

"VANE MOTOR SWITCH NOT CLOSED"
The actuator that controls PRV position is either off or on, and is controlled by a switch. This alarm indicates that the switch will not close in spite of a signal from the system logic commanding it to close.

"PERFORM MONTHLY 750 HOUR ENGINE MAINTENANCE"
The engine manufacturer specifies intervals for preventative maintenance. An alarm of this type indicates that the engine is due for maintenance.

"PLC BATTERY NEEDS REPLACING"
When the PLC battery will no longer hold a charge, the system alerts the operator that the battery needs to be replaced.

"REMOTE START DENIED"
This alarm signal if the Remote Start Lockout feature is enabled and a remote start is attempted.

"PURGE IS REQUIRED; PUT ENGINE IN MAINTENANCE MODE"
If the engine emergency stop switch is activated, the system alerts the operator that the engine needs to be purged in order to safely restart.

TAL-100 "LOW LEAVING CHILLED WATER TEMPERATURE"
If the leaving chilled water temperature falls below setpoint, a danger of line freeze exists.

TAL-140 "LOW SUMP OIL TEMPERATURE"
The sump oil needs to be maintained at a minimum temperature determined by setpoint for proper viscosity.

PAL-143 "LOW COMPRESSOR OIL PRESSURE"
If the compressor oil pressure drops below setpoint, the alarm is triggered.

PAL-111 "LOW EVAPORATOR PRESSURE"
Low evaporator pressure is associated with a low refrigerant temperature, and a danger of freezing exists. If the pressure drops below setpoint, the alarm sounds.

"INVALID ANTI-SURGE VANE PARAMETERS"
If the PD1, PD2, MVP1 or MVP2 values are entered out of field, the alarm is triggered.

"INVALID ANTI-SURGE SPEED PARAMETERS"
If the PD1, PD2, MSP1 or MSP2 values are entered out of field, the alarm is triggered.

TAH-140 "HIGH SUMP OIL TEMPERATURE"
High oil temperature can cause refrigerant to decompose, releasing corrosive gasses into the system and contaminating the refrigerant charge. The alarm is signaled if the measured oil temperature exceeds the setpoint value.

PDH-143 "HIGH COMPRESSOR OIL PRESSURE"
The high compressor oil pressure alarm is signaled if the measured oil pressure exceeds the setpoint value.

PAH-113 "HIGH DISCHARGE PRESSURE"
The chiller system is under high pressure during operation. If the pressure at the compressor discharge exceeds predetermined limits, the alarm sounds.

TAH-113 "HIGH DISCHARGE TEMPERATURE"
If the compressor discharge temperature exceeds setpoint limits, the alarm sounds.

"R1 HARDWIRE RELAY NOT RESET"
The R1 Hardwire Trip Relay is staged in series with the system reset switch. If the system trips off line, the reset switch must be engaged in order to bring the chiller back online.

PS-150 "GEAR OIL PRESSURE SWITCH MALFUNCTION"
The gear oil pressure switch has two states: open and closed. Two simultaneous signals from the switch would indicate a malfunction, sounding the alarm.

PSL-150 "LOW GEAR OIL PRESSURE"
The Gearbox requires proper oil pressure to ensure proper lubrication. If the sensor indicates pressure below setpoint, the alarm sounds.

SAH-160A "ENGINE OVERSPEED"
The maximum allowable engine speed is manufacturer specified and defined by setpoint. If the setpoint engine speed is exceeded, the alarm sounds.

PAL-160 "ENGINE LOW OIL PRESSURE"
If the engine oil pressure drops below safe limits, the alarm is triggered.

ZAL-140 "COMPRESSOR PROX FORWARD (J-SERIES ONLY)"
The compressor proximity thrust probe protects the impeller from damage as a result of thrust bearing wear. If the proximity probe detects the impeller is too far forward, the system trips off line.

ZAL-140 "COMPRESSOR PROX REVERSE (J-SERIES ONLY)"
The compressor proximity thrust probe protects the impeller from damage as a result of thrust bearing wear. If the proximity probe detects the impeller is too far backward, an alarm is signaled.

TRIP MESSAGES

In the event of a system trip, the operator will need to verify the cause of the trip and take action to correct the fault. When the fault has been cleared, the system may be restarted by pressing the **RESET** button on the control panel or by selecting the **F5 SYSTEM RESET** tab on the Home Screen. If the **EMERGENCY STOP** switch has been depressed on either the main panel or the engine panel, it will have to be manually opened before the system can be brought back on line.

"5 VOLT SUPPLY REFERENCE FAILED"
Some system sensors require a 5 volt reference signal for proper measurement. Failure of this reference signal trips the system.

"AUXILIARY SAFETY SHUTDOWN INITIATED"
In some installations there may be additional safety sensors or switches tied into the system, as specified by the customer. If one of these sensors or switches signals a shutdown, the system will trip off line.

FSL-100 "LOW CHILLED WATER FLOW"
A sensor in the chilled liquid pipes registers whether or not the liquid is flowing. If this sensor does not detect flow, the system trips off line.

PS-151 "CLUTCH PRESSURE SWITCH MALFUNCTION"
The clutch pressure switch has two states: open and closed. If the system logic detects two simultaneous signals, a switch malfunction is indicated and the system will fall off line.

PS-151 "CLUTCH FAILED TO DISENGAGE"
If the system logic detects that the clutch engaged pressure switch is closed --- meaning the clutch is engaged --- the system will trip during shutdown.

PS-151 "CLUTCH FAILED TO ENGAGE"
If the system logic detects that the clutch pressure switch is open --- meaning the clutch is not engaged --- the system will trip during startup.

ZAHH-140 "COMPRESSOR PROX FORWARD"
The compressor proximity thrust probe protects the impeller from damage as a result of thrust bearing wear. If the proximity probe detects the impeller is too far forward, the system trips off line.

ZALL-140 "COMPRESSOR PROX REVERSE"
The compressor proximity thrust probe protects the impeller from damage as a result of thrust bearing wear. If the proximity probe detects the impeller is too far backward, the system trips off line.

FS-102 "LOW CONDENSER WATER FLOW"
A sensor in the condenser water pipes registers whether or not the liquid is flowing. If this sensor does not detect flow, the system trips off line.

"CHILLER PANEL EMERGENCY STOP"
If the emergency stop switch on the chiller panel is closed, the system will trip. The reset switch will have to be engaged in order to restart the machine.

"ENGINE DIDN'T START; PURGE ENGINE"
When the engine is shut down in a trip or emergency situation, the ignition and gas flow are stopped simultaneously, and the possibility exists that there may be uncombusted fuel in the cylinders. If the system has been tripped manually or automatically and system start is attempted without an engine purge, the system alerts the operator by faulting the startup attempt. The condition is remedied by selected the F14 tab on the Engine Screen.

TSHH-162 "ENGINE HIGH WATER JACKET TEMPERATURE"
This trip corresponds to an engine overheat condition.

TSLL-161 "ENGINE LOW OIL PRESSURE"
If the engine oil pressure drops below 40 psig, the system trips off line.

"ESS ENGINE OVERSPEED"
If the engine speed exceeds 1950 rpm, the system trips off line.

STH-160A "ENGINE OVERSPEED"
If the system logic detects an engine overspeed condition, the system drops off line.

"ENGINE PANEL EMERGENCY STOP"
If the emergency stop switch on the engine panel is triggered, the system drops off line.

PSLL-150 "LOW GEAR OIL PRESSURE"
If the gear oil pressure drops below allowable limit, the system trips off line.

PS-150 "GEAR OIL PRESSURE SWITCH MALFUNCTION"
The gear oil pressure switch supplies one of two possible input signals. If the system logic detects two signals simultaneously, it signals an alarm indicating a switch malfunction.

PS-150 "GEAR OIL TEMPERATURE SWITCH MALFUNCTION"
The gear oil temperature switch supplies one of two possible input signals. If the system logic detects two signals simultaneously, it signals an alarm indicating a switch malfunction.

TSHH-150 "HIGH GEAR OIL TEMPERATURE"
If the gear oil temperature exceeds limits, the system triggers an alarm.

TAHH-113 "HIGH DISCHARGE TEMPERATURE"
In the event that the compressor discharge temperature exceeds safe limits, the system is tripped off line.

PAHH-113 "HIGH DISCHARGE PRESSURE"
In the event that the compressor discharge pressure exceeds safe limits, the system is tripped off line.

PDHH-143 "HIGH COMPRESSOR OIL PRESSURE"
This trip indicates compressor oil pressure above safe limits.

TAHH-140 "HIGH SUMP OIL TEMPERATURE"
High oil sump temperature will cause the system to trip off line.

PSHH-113A "HIGH PRESSURE CUTOUT (HARDWIRED)"
The compressor discharge temperature cannot be allowed to exceed limits.

PDHH-143 "HIGH COMPRESSOR OIL PRESSURE"
In the event that the compressor oil temperature exceeds limits, the system will trip off line. This switch is hardwired.

PALL-111 "LOW EVAPORATOR PRESSURE"
Low evaporator pressure can lead to system freeze. If the RTD in the evaporator detects pressure below allowable limits, the system trips off line.

PALL-143 "LOW COMPRESSOR OIL PRESSURE"
Lubrication is vital to the protection of the compressor. Low oil pressure will cause the system to trip off line.

TALL-140 "LOW SUMP OIL TEMPERATURE"
The oil temperature must be maintained for proper viscosity. If the oil temperature falls below a preset limit, the system trips off line.

TALL-100 "LOW LEAVING CHILLED WATER TEMPERATURE"
The chilled water must not be permitted to freeze. In the event that the chilled water temperature sensor detects an abnormally low temperature, the system trips off line.

"OPERATION MODE SWITCH MALFUNCTION (BOTH INPUTS HIGH)"
The mode switch on the control panel should not, under normal circumstances, provide two conflicting signals. In the event of mode switch malfunction, the system processor signals a system trip.

"VS OIL PUMP DIDN'T START"
If the variable speed oil pump motor faults, the system trips off line.

"POWER FAILURE"
If the electrical service is interrupted, the system will trip off line. It will be necessary to initiate an engine purge before the chiller can be restarted.

"PROGRAM FAULT"
If any aspect of the system logic fails or faults, a program fault will occur and the system will trip off line.

"PURGE ENGINE IN MAINTENANCE MODE"
If the system trips off line without a proper engine shutdown being done, the engine will need to be purged before restarting.

"PROXIMITOR ZE-140 UNCALIBRATED (J-SERIES COMPRESSORS ONLY)"
The compressor thrust probe protects the impeller from damage as the forward thrust bearing wears. On the J-Series compressors, this probe is calibrated prior to commissioning. If the system has not been calibrated and a start is attempted, the system trips off line.

"ENGINE SPEED LOSS"
If the engine's fuel supply or ignition system is interrupted or faulted and the engine stalls, the system will detect engine speed loss and trip the system off line.

"COMPRESSOR THRUST BEARING SWITCH"
The trust bearing switch protects the compressor impeller from damage as the thrust bearing wears. If the bearing wear becomes excessive, the thrust bearing switch will cause the system to trip off line.

Consult the factory prior to restoring the system to operational status. Continuing to operate the compressor could result in equipment damage.

"LOW WATER JACKET LEVEL"
Proper cooling of the engine is essential to safe engine operation. If the engine cooling water level in the water jacket drops below allowable limits, the system will trip off line.

"ENGINE RUNNING NO SPEED PICKUP SIGNAL"

In order to assure proper chiller capacity control and safe engine operation, the system monitors the engine's speed. If a speed signal is not detected during engine operation, the system trips off line.

"ENGINE DIDN'T STOP"

If the system logic commands engine shutdown and the engine does not respond, the system trips off line.

"ENGINE STARTER MOTOR ANTIRECYCLE"

This feature prevents the engine starter motor from overheating. If the starter motor cranks for 30 seconds continuously, it requires a two-minute cooldown period before it can be run again. If the motor is resting and a restart is attempted, the system signals a trip off line.

SECTION 6
RESTARTING THE CHILLER AFTER SYSTEM TRIP

A number of conditions can occur during chiller operation or startup that may cause an alarm or a system trip. A detailed description of possible alarm and trip messages is contained in Section 5 of this manual. This section discusses how to restore the chiller to operational status after the system has been tripped off line.

CORRECTING ALARMS AND SYSTEM TRIPS

ACKNOWLEDGING ALARMS

In general, when a system parameter is approaching prescribed limits, an alarm will sound and the Alarm Box will appear superimposed over the current Display Screen. Refer to Figure 20.

The window must be closed in order to regain control of the operator interface panel. While the alarm window is open, the operator has the following options:

(F1) Ack Alarm
Prompts user to acknowledge the alarm

(F2) Ack All Alarms
Prompts user to acknowledge all alarms

(F3) Silence Alarms
Causes alarm to be silenced until the system detects another alarm

(F4) Silence Horn
Silences the alarm horn

(F5/F6) Move Up/Move Down

Scrolls through all alarms listed, highlighting each in turn

(F7) Close
Closes the alarm window

If an alarm occurs during system startup, it is almost always accompanied with a system trip that will need to be cleared before a restart can be attempted. Other alarms and system trips may occur during operation, and the engine will need to be purged before a restart can be attempted.

EXECUTING AN ENGINE PURGE

Navigate to the engine screen by selecting the following screen tabs: **HOME → ENGINE → (F14) PURGE ENGINE**

The **PURGE ENGINE** screen tab will turn green to **PURGE**, indicating that the engine purge is in progress, and the message "Engine Purge" will appear in the ***System Status*** display window at the top of the screen. The engine purge will execute for approximately 20 seconds.

When the engine purge is complete, navigate back to the Home Screen by selecting the **HOME** tab. Clear any alarm or trip messages in the ***System Details*** display window by selecting the **(F6) CLEAR MESSAGE** tab.

Select **F5 SYSTEM RESET** to initiate a system reset. When the reset has cycled, the message "Ready to Start" will appear in the ***System Status*** display window. The chiller is now ready to be started.

SI METRIC CONVERSION

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

MEASUREMENTS	MULTIPLY THIS *ENGLISH* VALUE	BY	TO OBTAIN THIS *METRIC* VALUE
CAPACITY	TONS REFRIGERATION EFFECT (ton)	3.516	KILOWATTS (kW)
POWER	KILOWATTS (kW)	NO CHANGE	KILOWATTS (kW)
	HORSEPOWER (hp)	0.7457	KILOWATTS (kW)
FLOW RATE	GALLONS / MINUTE (gpm)	0.0631	LITERS / SECOND (L/s)
LENGTH	FEET (ft)	304.8	MILLIMETERS (mm)
	INCHES (in)	25.4	MILLIMETERS (mm)
	MILS (0.001 inch)	25.4	MICROMETERS (μm)
WEIGHT	POUNDS (lb)	0.4536	KILOGRAMS (kg)
VELOCITY	FEET / SECOND (fps)	0.3048	METERS / SECOND (m/s)
PRESSURE DROP	FEET OF WATER (ft)	2.989	KILOPASCALS (kPa)
	POUNDS / SQ. 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.

To convert a temperature range (i.e., 10°F or 12°F chilled water range) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

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