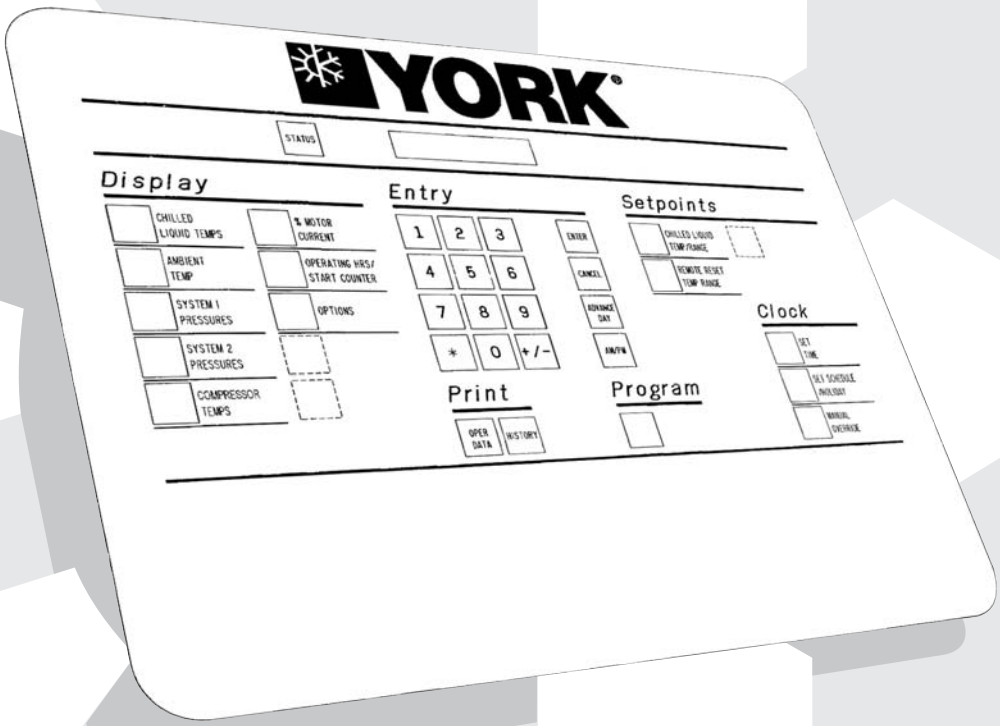
MICRO BASED CONTROL SYSTEM

YLCS-SA/HA/AA
YAES-SA 2 System
YAES-SA 3 System
YAES-DSA 4 System

OPERATION INSTRUCTION



YLCS-SA/HA/AA: R134a - Software Version **B.A05.01.01** and higher version levels
YAES-SA 2 System: R134a - Software Version **B.A05.01.01** and higher version levels
YAES-SA 3 System: R134a - Main Software Version **B.A06.12.01** and higher version levels
R134a - Slave Software Version **B.A05.13.01** and higher version levels
YAES-DSA 4 System: R134a - Main Software Version **B.A06.14.07** and higher version levels
R134a - Slave Software Version **B.A05.15.07** and higher version levels

CE

YORK INTERNATIONAL

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This manual contains a description of the operation of the Microprocessor Control System for a range of York Chillers.

All work must be carried out in accordance with this manual and the relevant Installation, Commissioning, Operation and Maintenance Documents for the specific Chiller.

This manual is essential as it contains information on Safety issues that relate to the product.

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1 LOGIC SECTION

1.1 Introduction

The YORK Microprocessor Based Control System (MBCS) is capable of multi-circuit control to maintain chilled liquid temperature. On YLCS HA units heatpump operation is also possible to maintain a hot liquid temperature, see section 14 for details.

A 40 character display (2 lines of 20 characters) allows the operator to display system operating parameters as well as access programmed information already in memory. A keypad for programming and accessing setpoints, pressures, temperatures, motor current, cutouts, daily schedule, options, and fault information is provided.

A unit 1/0 (Auto/Off) (lockable in the off position) switch is available to activate or de-activate the chiller system. Separate system (SYS) switches for each refrigerant system are provided on the Microprocessor Board.

Remote cycling, unloading and liquid temperature reset can be accomplished by voltage free customer contacts.

Compressor starting/stopping and loading/unloading decisions are performed by the microprocessor to maintain leaving water temperature. These decisions are a function of temperature deviation from setpoint and rate of change of temperature.

1.2 Microprocessor Board

The Microprocessor Board is the controller and decision maker in the control panel. System inputs from pressure transducers and temperature sensors are connected directly to the Microprocessor Board.

The Microprocessor Board circuitry multiplexes these analogue inputs, digitises them, and constantly scans them to keep a constant watch on the chiller operating conditions. From this information, the microprocessor then issues commands to the Relay Output Board to control contactors, solenoids, etc. for water temperature control and to react to safety conditions.

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

A +12 V REG supply voltage from the Power Supply Board is converted to +5 V REG by a voltage regulator located on the Microprocessor Board. This voltage is used to operate integrated circuitry on the board.

Four system switches located on the Microprocessor Board activate or deactivate the individual systems (compressors). These switches are also used to reset electrical lockout conditions.

1.3 Power Supply Board

The on-board switching power supply (protected by fuse –F5) converts 24 Vac from the logic transformer to +12 V REG which is supplied to the Microprocessor Board, Relay Board and 40 Character Display to operate the integrated circuitry.

A rectifier and filtering circuit for each motor current transformer (CT) rectifies and filters these current signals to a proportional dc voltage.

This dc voltage representing motor current is then passed to the Microprocessor Board as an analogue input for processing into digital values.

1.4 Relay Output Board

This board is fitted with relays to operate as outputs. Output 1 to 24 are directly connected to output drivers on the micro board. For these outputs the board convert the 12 V dc signal from the micro board into a 220/230 V level used by the motor contactors, solenoid valves, etc. to control system operation. The common side of all relays are connected to 12 Vdc unregulated.

The open collector outputs of the Micro Board drivers energise the DC relays by pulling the other side of the relay coil to 0 Vdc. When not energised, both sides of the relay coils will be at 12 Vdc potential. Outputs 25 to 32 are controlled by relay drivers which in turn are controlled by a data latch. The latch is connected to 3 address, one enable and one data line from the micro board. The common side of all relays are connected to 12 Vdc unregulated.

The open collector outputs of the relay board drivers energise the DC relays by pulling the other side of the relay coil to 0 Vdc. When not energised, both sides of the relay coils will be at 12 Vdc.

The relay board has customer terminals for the connection of the customer voltage free contacts. The output relay board also has a seperate customer terminal block which is connected to voltage free contacts on the output relays to provide remote signalling.

1.5 Current Transformer (-TC)

A Current Transformer on the 3 Ø power wiring of each motor sends ac signals proportional to motor current to the Power Supply Board which rectifies and filters the signal to variable dc voltage (analogue). This analogue level is then fed to the Microprocessor Board to allow it to monitor motor current.

1.6 40 Character Display

The 40 Character Display (2 lines of 20 characters) is a liquid crystal display used for displaying system parameters and operator messages. The display has back lighting for night viewing as well as a special feature which intensifies the display for viewing in direct sunlight.

YAES 3 & 4 System Units

On the YAES 3 & 4 system units a second panel a Slave control panel is fitted. This panel contains the power contactors for the compressor and fans for system 3/4. It also contains a slave micro board powered from its own power board and controls its own relay board. The slave micro board is responsible for the control and safety routines for system 3/4 and receives data such as capacity demand step and other operating instruction from the main panel micro board via a R485 communications link. The slave panel is not fitted with a keypad or display the required data being transmitted to the main panel where this data is available along with system 1 and 2 data on a single key pad and display. Due to the communication link data for system 3/4 is only updated every 10 second instead of 2 seconds for systems 1 and 2.

1.7 Emergency Stop Device

The EMEGENCY STOP DEVICE takes the form of a red/yellow switch. This switch performs two functions. The first function of the switch is an EMERGENCY STOP DEVICE. In the 0 (OFF) position the EMERGENCY STOP DEVICE will remove the 220/230V control supply and supply to the electronics. All devices are de-energised including compressor and on air cooled units fan contactors. The loss of supply to the Power Board results in the display going off.

To conform with the requirement of EN 418 and EN 60204-1 that re-setting the EMERGENCY STOP DEVICE will not initiate a restart, MANUAL RESTART should be programmed under the PROGRAM key. MANUAL RESTART requires a reset using the unit switch under the key pad. The second function of the switch is as a common control circuit disconnector. The switch can be locked in the 0 (OFF) position using a padlock.

YAES 3 & 4 system units Emergency Stop Device

The main panel Emergency Stop Device is as described above and only affects systems 1 and 2. The slave panel is fitted with its own Emergency Stop Device and has the same features as the main panel Emergency Stop Device but for system 3/4 only.

1.8 Unit 1/0 (Auto/Off) Switch

A unit 1/0 (Auto/Off) Switch is located control section door. This switch allows the operator to turn the entire chiller OFF if desired. The switch must be placed in the 1 (AUTO) position for the chiller to operate.

Whenever the switch is placed in the 0 (OFF) position, a STATUS display indicating the condition will be displayed. This message is shown below.

UNIT SWITCH IS IN THE OFF POSITION

On YAES 3 & 4 system unit the unit switch is fitted to the main panel only.

1.9 System Switches

SYSTEM 1-4 SWITCHES are located on the Microprocessor Board.These switches allow the operator to selectively turn ON or OFF a given system as desired.

The System Switch for a designated system must be ON, switch to right for the system to operate.

Whenever a switch is placed in the OFF position, a STATUS display indicating this is displayed. A sample of this message is shown below.

SYS # 1 SYS SWITCH OFF
SYS # 2 SYS SWITCH OFF

This message will not appear if Anti-recycle or Anti-coincident timers are in effect and are being displayed.

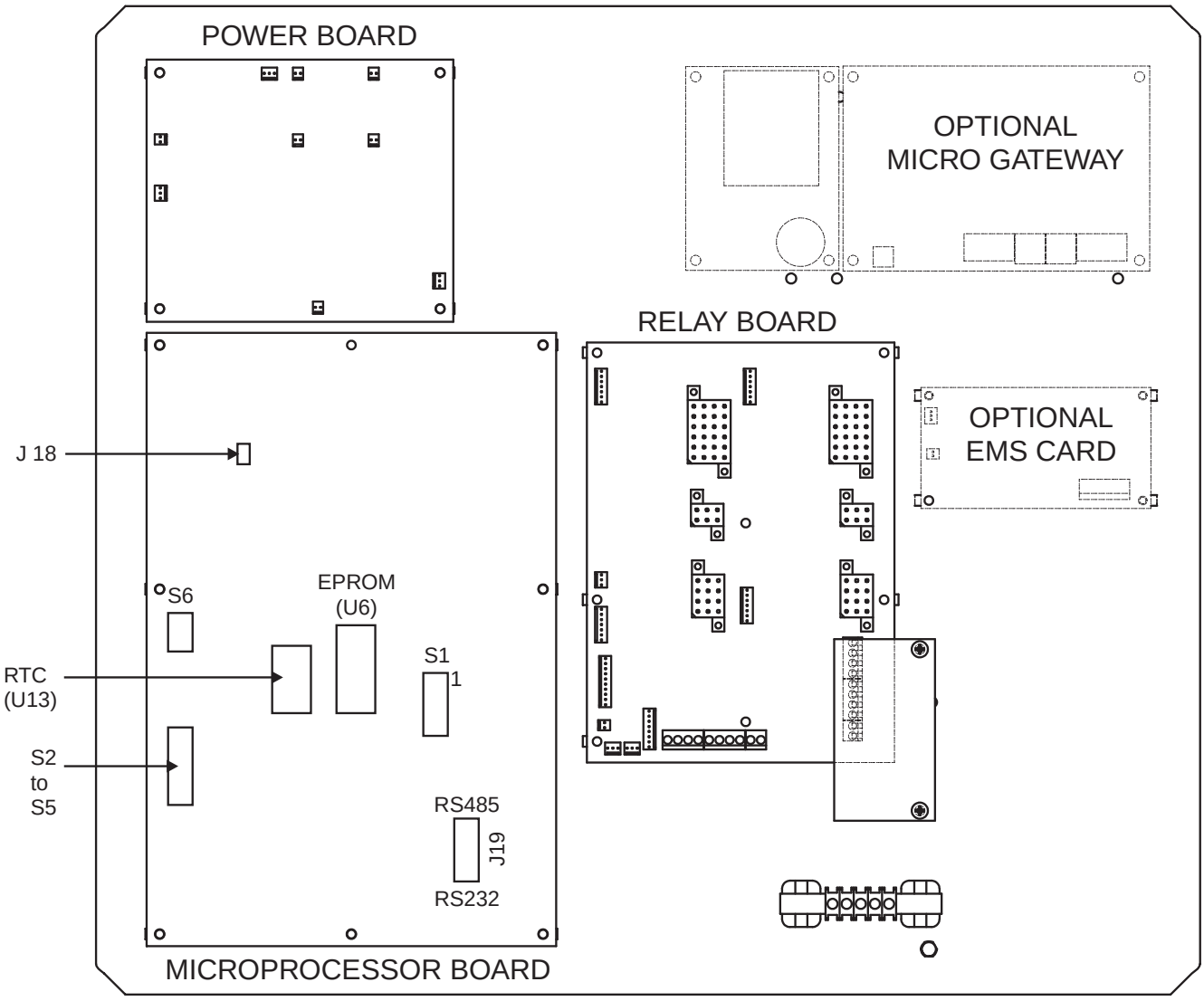
On YAES 3 system unit there are two system 3 system switches, SYS 3(S4) on the main micro board and SYS 1 (S2) on the slave micro board. Both these switches must be in the On position for system 3 to be allowed to run. Either switch in the Off position will shutdown system 3. In the same way on YAES 4 system unit system 4 uses SYS 4(S5) on main micro board and SYS2 (S3) on the slave micro board.

1.10 Keypad

The operator keypad allows complete control of the system from a central location. The keypad offers a multitude of commands available to access displays, program setpoints, and initiate system commands.

1.11 Battery Back-up

The Microprocessor Board contains a Real Time Clock integrated circuit chip with an internal battery back-up. The purpose of this battery back-up is to assure any programmed values (setpoints, clock, cutouts, etc.) are not lost during a power failure regardless of the time involved in a power cut or shutdown period.

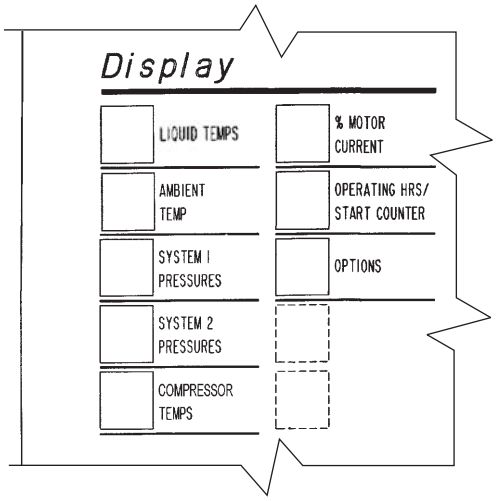


Microprocessor Board

J18	Clock On/Off
J19	Set to RS485
RTC	Real Time Clock / Battery Backup IC
EPROM	Software IC (Label shows Version)
S1	Dip Switch
S1-5	Display - SI or Imperial
S2	System 1 Switch
S3	System 2 Switch
S4	Not used
S5	Not used
S6	ISN Mode Selection Switch

NOTE

On YAES 3 & 4 system units main micro board S4 is system 3 system switch. On YAES 4 system units main micro board S5 is system 4 system switch. Slave micro board DIP switch S1 is not used, S2 is system 3 system switch, S3 is system 4 system switch and S5 and S6 are not used. When fitted optional micro gateway or optional EMS card are only fitted to the main panel.



2 DISPLAY KEYS

2.1 General

The DISPLAY keys allow the user to retrieve system pressures, system motor currents, chilled liquid temperature, ambient temperature, compressor running times, number of compressor starts, and option information on the chiller package. This data is useful for monitoring chiller operation, diagnosing potential future problems, troubleshooting, and commissioning the chiller.

Displayed data will be real-time data displayed on a 40 character display consisting of two lines of 20 characters. The display will update all information at a rate of about 2 seconds. For YAES 3/4 system units due to the communication delay with the slave panel the display of system 3 information is at a rate of about 10 seconds.

When a DISPLAY key is pressed the corresponding message will be displayed and will remain there until another key is pressed.

The display message may show characters indicating “greater than”(>) or “less than” (<) as an out of range value. These characters indicate the actual values are greater than or less than the limit and thus out of range.

For YAES 3 system units System 1 pressures becomes System 1 & 2. System 2 pressures becomes System 3 and on YAES 4 system units system 3 & 4.

Each of the keys and an example of the typical corresponding display messages is detailed below.

2.2 Chilled Liquid Temps

Displays chiller leaving water temperature from the cooler.

LWT = 8.2 DEG C

Or on YAES 4 system units

LWT1 = 8.2 DEG
LWT2 = 8.1 DEG C

The minimum limit is -20.6°C
The maximum limit is 61.0°C

2.3 Ambient Temp

Displays the ambient temperature.

AMBIENT AIR
= 14.2 DEG C

The minimum limit on the display is -18.4°C.
The maximum limit on the display is 56.2°C.

2.4 System 1 Pressures

On YAES 3/4 system units press the System 1 & 2 Pressures key a second time to display System 2 pressures.

Displays oil pressure, suction pressure, and discharge pressure on System 1 when this key is pressed.

SYS # 1 OIL = 4.7 BARD
SP = 4.18 DP = 17.4 BARG

The minimum limits are:

Oil Pressure: 0 BAR_D (Differential)
Suction Pressure: 0 Bar
Discharge Pressure: 0 BAR

The maximum limits are:

Oil Pressure: 27.5 – Suction Pressure BAR_D (Differential)
Suction Pressure: 13.79 BAR
Discharge Pressure: 27.5 BAR

2.5 System 2 Pressures

On YAES 3 system units this key is for system 3 pressures. On YAES 4 system units this key is for system 3 & 4 pressures. On YAES 4 system units press the System 3 & 4 Pressures key a second time to display System 4 pressures.

Displays oil pressure, suction pressure, and discharge pressure on System 2 when this key is pressed.

SYS # 2 OIL = 4.9 BARD
SP = 4.21 DP = 18.3 BARG

The minimum limits are:

Oil Pressure: 0 BAR_D (Differential)
Suction Pressure: 0 Bar
Discharge Pressure: 0 BAR

The maximum limits are:

Oil Pressure: 27.5 – Suction Pressure BAR_D (Differential)
Suction Pressure: 13.79 BAR
Discharge Pressure: 27.5 BAR

2.6 Compressor Temperatures

Displays compressor oil and discharge temperature for system 1 when this key is pressed and system 2 when this key is pressed a second time.

SYS1 OIL = 34.7 DEG C
SYS1 DSCH = 37.8 DEG C

The minimum limit oil is -17.7°C discharge 29.6°C
The maximum limit oil is 122.4°C discharge 144.4°C

On YAES 3 system units pressing the key a third time displays system 3 compressor temperatures.

On YAES 4 system units pressing the key a fouth time displays system 4 compressor temperatures

2.7 Motor Current

Displays motor currents and %FLA when this key is pressed.

COMP1 = 105 A 53% FLA
COMP2 = 120 A 64% FLA

The minimum limit is “0" amps 0% FLA.
The maximum limit is dependant on unit size.

On YAES 3 system units pressing the key a second time displays system 3 motor current data as well as system 4 data on YAES 4 system units.

2.8 Operating Hours Start Counter

Displays accumulated running hours and starts on each compressor when this key is pressed.

The hours counters for an individual system count to a total of 99,999 hours before rollover. A total of 99,999 starts can be logged on a system before the counter will roll over.

HRS 1 = 462, 2 = 718
STR 1 = 37, 2 = 48

The numbers “1” and “2” on the display message indicate compressor #1 and compressor #2.

These counters are “zeroed” at the factory or will indicate only run time and number of starts logged during factory testing at the time of shipment.

On YAES 3 system units pressing the key a second time displays system 3 operating hours and starts counter as well as the data for system 4 on YAES 4 system units.

2.9 Options

The Options key provides a display of options factory set based on customer order.

When the OPTIONS key is pressed, the following message will first be displayed for 3 seconds:

THE FOLLOWING
ARE PROGRAMMED

Option Messages will then follow. Each will be displayed for 3 seconds before the next display is automatically indexed. When all messages are displayed, the display message will automatically change to show a chiller “STATUS” message, just as if the STATUS key was pressed.

Below is a list and explanation of the messages in the order they appear. For all messages, two

possible variations may appear for each of the messages depending on the customer order.

MESSAGE 1

GLYCOL COOLING

The chilled liquid temperature setpoint can be programmed from -12.2 to 21.1°C and cutout set in the range of -13.3°C to 2.2°C

OR

WATER COOLING

The chilled liquid temperature setpoint can only be programmed from 3.5 to 21.1°C and the cutout is set to 2.2°C

MESSAGE 2 (2 System Units Only)

STANDARD UNITS

This message STANDARD UNITS indicates that the unit is configured to cover YAES and YLCS SA/AA units

YLCS HA UNITS

This message indicates the unit is configured for YLCS HA units. See section 14.

OR

MESSAGE 2 (3 System Units Only)

DIP SW 2 SPARE

MESSAGE 3

REMOTE CONTROL MODE

Standard mode. When connected to a York I.S.N system the I.S.N is allowed to take control of the systems operation and remotely monitor the machine.

OR

LOCAL CONTROL MODE

May be displayed as an alternative to remote control mode. When connected to a York I.S.N system the I.S.N is only allowed to remotely monitor the machine.

MESSAGE 4

DIP SW 4 SPARE

MESSAGE 5

IMPERIAL UNITS

Display messages will show units of measure in Imperial units (°F and PSI).

OR

SI UNITS

Display messages will show units of measure in SI units (°C and Bar).

MESSAGE 6

SEQUENCE COMMANDER OPTION DISABLED

This message shows that switch 6 of S1 DIP switch on the microprocessor board is set to open. With this selection the unit is set for single unit operation using its own controls.

OR

SEQUENCE COMMANDER OPTION ENABLED

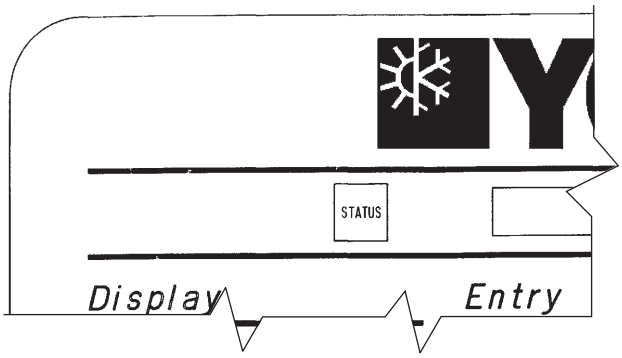
This message shows that switch 6 of S1 DIP switch on the microprocessor board is set to closed. With this selection the unit will operate under multiple unit control using York Sequence Commander concept.

MESSAGE 7

USE ALL COMPRESSOR LOADING STEPS

MESSAGE 8

REFRIGERANT TYPE R134a



3 STATUS KEY

3.1 General

Pressing the STATUS key will enable the operator to determine current chiller operating status as a whole and as individual systems. The messages displayed will include running status, cooling demand, fault status, external cycling device status, and anti-recycle timer status. The display will be a single message relating to the highest priority message as determined by the microprocessor. Status messages fall into the categories of General and Fault Status with each of the categories discussed below.

On YAES 3 system units pressing the Status key a second time displays system 3 Status messages as well as system 4 on YAES 4 system units.

3.2 General Status Message

Each of the general status messages with a description of it's meaning will follow. In the case of messages which apply to individual systems, SYS 1 and SYS 2 messages will both be displayed and may be different.

For YAES 3 system units and YAES 4 system units where the status messages are the same as for system 1 & 2, they will not be given, only the messages unique to system 3 or system 4 will be included.

REPROGRAM TYPE OF REFRIGERANT TO RUN

This message should never appear, if it does consult your local York office. This message is a warning that the setting for the type of refrigerant used with the unit has been tampered with and the unit will not run.

UNIT SWITCH IS IN THE OFF POSITION

This message informs the operator that the unit 1/0 (AUTO/OFF) switch on the main control panel is in the 0 (OFF) position which will not allow the chiller to run.

POWER FAILURE MANUAL RESET

Or on YAES 3/4 system units:

MASTER POWER FAILURE MANUAL RESET

or

SLAVE POWER FAILURE MANUAL RESET

These messages inform the operator that a supply interruption or under voltage condition has occurred and that manual reset after power failure has been programmed under the PROGRAM key. A reset using the unit switch is then required.

On YAES 3 & 4 system units leave the unit switch in the Off position for at least 10 seconds to allow the reset to be transmitted to the slave panel. Or alternatively the Slave panel power failure can be reset by setting the main panel micro board system switch 3 (SYS 3(S4)) and switch 4 (SYS 4(S5)) to Off, thus resetting the slave panel without interrupting systems 1 and 2's operation.

DAILY SCHEDULE SHUTDOWN

The DAILY SCHEDULE SHUTDOWN message indicates that the schedule programmed into the "CLOCK" "SET SCHEDULE/HOLIDAY" is keeping the chiller from running.

SYS#1 NO RUN PERM
SYS#2 NO RUN PERM

No Run Permissive shows that a remote contact is open either the flow switch terminals 10 & 13 or the remote Off/Auto contacts/terminals 11 & 14 No. 1 system and No. 2 system terminals 12 & 15.

On YAES 3 system units a flow switch with two separate normally open contacts or two separate

flow switches are required, the second contact wired to terminals 10 & 13 in the slave panel. With this contact open or the remote Off/Auto contact terminals 11 & 14 No 3 system slave panel a SYS#3 NO RUN PERM message will be given.

On YAES 4 system units a second flow switches is required. No Run Permissive messages shows that a remote contact is open either the slave flow switch slave panel terminals 10 & 13 or the remote Off/Auto contacts slave panel terminals 11 & 14 No. 3 system and No. 4 system terminals 12 & 15.

SYS#1 SYS SWITCH OFF
SYS#2 SYS SWITCH OFF

This message informs the operator that a system switch on the micro board in the logic section is set to OFF.

SYS#1 OIL TEMP INHIB
SYS#2 OIL TEMP INHIB

This message informs the operator that a minimum safe oil temperature above ambient has not been reached, prior to allowing the system to start.

As the crankcase heater boils off the refrigerant from the oil, the oil heats up until the required oil / ambient temperature differential is reached and the system is available to start if required.

SYS#1 OIL LEVEL INHIB
SYS#2 OIL LEVEL INHIB

This message informs the operator that the oil level in the compressor is below the minimum safe oil level thus preventing the system from starting.

SYS#1 NO COOL LOAD
SYS#2 NO COOL LOAD

This message informs the operator that the chilled liquid temperature is below the point (determined by the setpoint and control range) that the microprocessor will bring on a system, or that the microprocessor has not yet loaded far enough into the loading sequence to be ready to bring on the indicated system ON. The lag system will display this message until the loading sequence is ready for the lag system to start.

SYS#1 START SEQUENCE
SYS#2 START SEQUENCE

The start sequence messages indicate that the system is in the 12 second start sequence. On units fitted with a starting bypass valve this valve opens at the start of the start sequence and closes when the starter goes into delta .

SYS#1 COMP RUNNING
SYS#2 COMP RUNNING

The COMP RUNNING message indicates that the respective compressor is running due to demand.

SYS#1 PUMPING DOWN
SYS#2 PUMPING DOWN

This message shows that a system is pumping down before stopping. When system shut down is initiated by fall in demand the liquid line solenoid valve will close.

The system will continue to run and only shut down when the suction pressure falls to below the suction pressure cutout value programmed under the PROGRAM key.

A system does not pump down on a fault shutdown or if the unit switch is set to off. This message is overwritten by the SYS SWITCH OFF and DAILY SCHEDULE SHUTDOWN messages.

SYS#1 AR TMR 240 S
SYS#2 AR TMR 120 S

The anti-recycle timer message shows the amount of time left on the respective anti-recycle timer. This message is displayed when demand requires the respective system to start but is being held off due to the timer.

SYS#1 AC TMR 13 S
SYS#2 AC TMR 13 S

The anti-coincident timer is a software feature that guards against 2 compressors starting simultaneously. This assures instantaneous starting current does not become excessively high due to simultaneous starts.

The microprocessor limits the time between compressor starts to 1 minute regardless of demand of the anti-recycle timer being timed out. The time shown on the anti-coincident timer is the time left on the timer before the respective system will start. Demand must be present for the message to be displayed and will only appear when the anti-recycle timer has timed out.

SYS#1 CURR LIMITING
SYS#2 CURR LIMITING

Current limiting takes effect when the current nears the point at which the high current cutout will shutdown the system down. When this message appears the current has exceeded the programmed threshold and the micro is unloading the affected system to prevent shutdown, until load conditions moderate to allow reloading. This would typically occur on high pull down conditions. (Refer to Data section).

SYS#1 DSCH LIMITING
SYS#2 DSCH LIMITING

Discharge Pressure Limiting takes affect when discharge pressure nears the point at which the high pressure cutout will shut the system down causing total loss of cooling. When this message appears, discharge pressure has exceeded the programmed threshold and the microprocessor is unloading the affected system to prevent shutdown on a manual high pressure cutout, until load conditions moderate to allow reloading. Refer to Data Section.

MANUAL
OVERRIDE

If the MANUAL OVERRIDE key is pressed, the STATUS display will display the message shown above. This will indicate that the Daily Schedule is being ignored and the chiller will start-up when water temperature remote contacts, unit Auto/Off switch and SYSTEM switches permit.

This is a priority message and cannot be overridden by anti-recycle messages, fault messages, etc. when in the STATUS Display mode. Therefore, do not expect to see any other STATUS messages when in the MANUAL OVERRIDE mode. MANUAL OVERRIDE is to only be used in emergencies or for servicing.

3.3 Fault Status Messages

A number of possible fault messages may appear when the STATUS key is pressed. Whenever a fault message appears, the safety thresholds on the chiller have been exceeded and the entire chiller or a single system will be shut down and in some cases locked out.

A detailed explanation of the shutdown thresholds and associated information related to each fault is covered in the SYSTEM SAFETIES Section.

Chiller shutdown faults will shut the entire chiller down, while system shutdown faults will only shut down and lock out the affected system (compressor).

CHILLER FAULTS

CHILLER FAULT
LOW AMBIENT TEMP

CHILLER FAULT
LOW WATER TEMP

CHILLER FAULT
HIGH AMBIENT TEMP

POWER FAILURE
MANUAL RESET

Or on YAES 3/4 system units:

MASTER POWER FAILURE
MANUAL RESET

or

SLAVE POWER FAILURE
MANUAL RESET

CHILLER FAULT
LWT SENSOR FAULT

CHILLER FAULT
VAC UNDER VOLTAGE

For YAES 3/4 system units:

LOSS OF COMM LINK
TO SLAVE PANEL

SYS# 3/4 LOCKED OUT
LOSS OF COMM LINK

For YAES 4 system units:

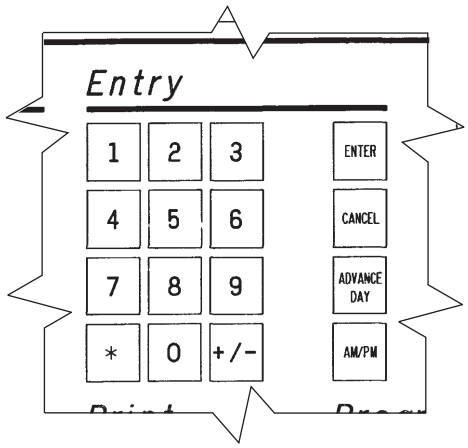
CHILLER FAULT
MWT SENS FAULT

MASTER PANEL FAULT
LWT SENS FAULT

SLAVE PANEL FAULT
LWT SENS FAULT

SYSTEM FAULTS

SYS#1 HIGH DSCH
SYS #2 HIGH DSCH
SYS #1 LOW OIL PRESSURE
SYS #2 LOW OIL PRESSURE
SYS #1 LOW SUCTION
SYS #2 LOW SUCTION
SYS #1 CURRENT/MP/HPX
SYS #2 CURRENT/MP/HPX
SYS #1 PUMP DOWN FAIL
SYS #2 PUMP DOWN FAIL
SYS #1 HIGH OIL TEMP
SYS #2 HIGH OIL TEMP
SYS#1 OIL LEVEL FAIL
SYS#2 OIL LEVEL FAIL
SYS#1 DSCH TEMP FAIL
SYS#2 DSCH TEMP FAIL



4 ENTRY KEYS

4.1 General

The ENTRY key allows the user to change numerical values programmed in as chiller setpoints, cutouts, clock, etc.

4.2 Numerical Keypad

The NUMERICAL keypad provides all keys needed to program numerical values as required.

The " * " Key is used to designate holidays when programming special start and stop times for designated holidays in the SET SCHEDULE /HOLIDAY display.

The " * " Key is also used when programming languages.

"The "+/-" key allows programming -°C setpoints and cutouts in the SI display mode.

4.3 Enter Key

The ENTER key must be pressed after any change is made to setpoints, cutouts or the system clock. Pressing this key tells the microprocessor to accept the new values into memory.

If this is not done, the new numbers entered will be lost and the original values will be returned.

The ENTER key is also used to scroll through available data after any one of the following keys is pressed:

PROGRAM
SET SCHEDULE/HOLIDAY
OPER DATA
HISTORY

4.4 Cancel Key

The CANCEL key allows the user to change errors in the data being programmed into memory.

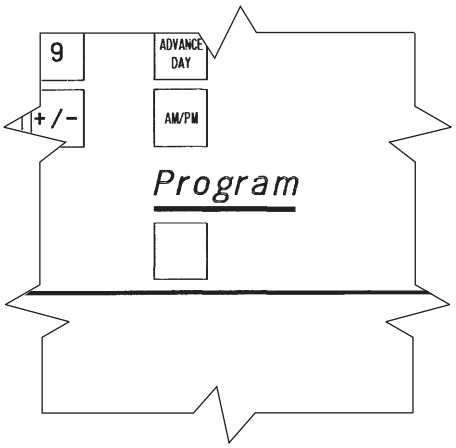
When the CANCEL key is pressed, any data which has been keyed in, but not entered, will be erased. The original values will re-appear on the display and the cursor will return to the first character to be programmed in the display message.

4.5 AM/PM Key

The AM/PM key allows the user to change AM/PM while programming the correct time in the SET TIME display. The same key allows changing the AM/PM schedule while programming daily chiller start and stop times in the SET SCHEDULE/HOLIDAY display.

4.6 Advance Day Key

The ADVANCE DAY key advances the day when the SET TIME display is being programmed. The day is normally advanced to correspond to the current day of the week. The day will advance a day at a time, each time the key is pressed.



5 PROGRAM KEY

PROGRAMMING OR VIEWING SAFETIES LIMITS

5.1 General

Pushing the PROGRAM key allows the user to program “selected” system operating limits. As well as the programmable values there are a number of operating limits to inspect. The display includes cutout points for safeties, and the reaction time of the microprocessor to abrupt changes in the chilled water temperatures.

After the PROGRAM key is pressed the microprocessor will respond by displaying:

PRESS ENTER TO PROGRAM DATA

Pressing the ENTER key will display the first setting. The ENTER key must be used to advance the display to the next setting. Settings may be reprogrammed using the 12 “ENTRY” keys. New values will be programmed into memory when the ENTER key is pushed.

If the operator attempts to enter an unacceptable value, the microprocessor will respond with a momentary message indicating the value selected has been ignored. This error message is shown:

OUT OF RANGE TRY AGAIN!

The programmable setting displays are shown and described below along with the range of values which the microprocessor will accept for each setting.

NOTE

These values must be checked and properly programmed when commissioning the chiller. Failure to properly program these values may cause damage to the chiller or operation problems.

5.2 Leaving Water Temperature Setpoint

YAES 4 system units only

LEAVING WATER TEMP SETPOINT = 4.5 DEG C

The LEAVING WATER TEMP SETPOINT is the minimum leaving water temperature from each of the two coolers. See section on PROGRAMMING LEAVING WATER CONTROL for further details. On chilled water applications, WATER COOLING is displayed when OPTION key is pressed, the setpoint is adjustable from 3.5 to 21.1°C. On glycol applications, GLYCOL COOLING is displayed when OPTION key is pressed, the setpoint is adjustable from -12.2°C to 21.1°C.

5.3 Local Control Range

YAES 4 system units only

LOCAL CONTROL RANGE 1 DEG C

The LOCAL CONTROL RANGE applies to each of the two coolers. Within the lower section of this range no further loading of its associated systems can occur at the dictates of the mixed leaving temperature. See section on PROGRAMMING LEAVING WATER CONTROL for further details. The LOCAL CONTROL RANGE can be set in the range of 0.6°C - 4.4°C.

5.4 Selected Refrigerant (Factory Set)

SELECTED REFRIGERANT R407C OR R134A = 134

Display the type of refrigerant the unit is designed to operate with.

DISPLAY LANGUAGE ENGLISH

The following display languages can be programmed: English, German, French, Italian, , Spanish and Portuguese. Press “ * ” repeatedly

until the desired language is displayed. Then press the ENTER key to accept the new language.

5.5 Discharge Cutout (Factory Set)

DISCHARGE CUTOUT = 20.80 BARG

The DISCHARGE CUTOUT is a software cutout in the microprocessor and is backed-up by a mechanical high pressure cutout located in the refrigerant circuit. See Data Section for settings.

5.6 Ambient Temp Low Cutout

AMBIENT TEMP LOW CUTOUT = -17.6 C

The AMBIENT TEMP LOW CUTOUT can be set to establish a chiller low ambient temperature cutout point. If the ambient falls below this point the chiller will shut down. Restart can occur, if demand allows, when temperature rises above the cutout.

For normal ambient applications, the cutout is set at –18.0°C.

5.7 Ambient Temp High Cutout (Factory set)

AMBIENT TEMP HIGH CUTOUT = 46.0 C

The AMBIENT TEMP HIGH CUTOUT is factory set to establish the high ambient cutout point. If the ambient rises above this point, the chiller will shut down. Restart can occur when temperature drops below the cutout. See Data Section for settings.

5.8 Discharge Pressure Unload (Factory set)

DISCHARGE PRESSURE UNLOAD = 20.80 BARG

The DISCHARGE PRESSURE UNLOAD point is a factory set limit to keep the system from faulting on the high discharge pressure cutout due to high load or pull down conditions. By unloading the compressors at high discharge pressures, the chiller is allowed to continue to run automatically at reduced capacity until the discharge pressure falls with moderating loads to allow reloading. See Data Section for settings.

Motor Current Unloading

MOTOR CURRENT UNLOAD = 101% FLA

The motor current unload point can be set in the range 85% to 101%. Set to 101% to keep the system from faulting on high motor current due to high loads or pull down conditions. By unloading the compressor at high motor currents, the chiller is allowed to continue to run automatically at reduced capacity until load conditions moderate to allow re-loading. Settings within the range 85% to 100% can be used to limit current demand on the building by unloading the systems.

5.9 Rate Control Temp

RATE CONTROL TEMP = 5.0 C

The RATE CONTROL TEMP establishes a temperature range over which the microprocessor may override normal system loading timers and react to actual rate of change of leaving water temperature. This temperature range starts at the top of the control range with its band width being programmable.

This control works in conjunction with the RATE SENSITIVITY which is also programmable. These controls allow the chiller to adapt to a full range of applications. Depending on how the controls are set up the chiller can be adapted to provide maximum response, demand limiting/energy saving, or reduced loader and compressor cycling.

Details for programming this control will be discussed under PROGRAMMING LEAVING WATER CONTROL Section. RATE CONTROL TEMP can be set in the range of 0.1 to 11.1°C.

5.10 Leaving Water Temp Cutout

LEAVING WATER TEMP CUTOUT = 2.2C

The LEAVING WATER TEMP CUTOUT protects the chiller from an evaporator freeze-up should the chilled liquid temp drop below the freeze point. This situation could occur under low flow conditions or if the micro panel SETPOINT values are improperly programmed.

Anytime the leaving chilled liquid temperature (water or glycol) drops to the cutout point the chiller

will lockout. The chiller can be reset using the unit 1/0 (AUTO/OFF) switch (not the system switches on the Microprocessor Board) when the temperature rises above the cutout, the system will restart if the anti-recycle timers are satisfied.

For chilled water applications WATER COOLING is displayed when OPTION key is pressed, the cutout is automatically set at 2.2°C. This covers applications where leaving water temperatures are not designed to go below 3.5°C.

For glycol applications GLYCOL is displayed when OPTION key is pressed. Glycol is a factory set option which allows the cutout set point to be programmed.

To program the LEAVING WATER TEMP CUTOUT for glycol, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next programmable limit.

The microprocessor will accept a range of programmable values between -13.3 to 2.2°C for this cutout.

5.11 Suction Pressure Cutout

SUCTION PRESSURE CUTOUT = 3.30 BAR G

The SUCTION PRESSURE CUTOUT protects the chiller from an evaporator freeze-up should the system attempt to run with a low refrigerant charge. Anytime the suction pressure drops below the cutout point, the system will shut down.

There are some exceptions, where suction pressure is permitted to temporarily drop below the cutout point. Details are outlined in the SYSTEM SAFETIES Section.

For chilled water applications, “Water Cooling” is displayed when OPTION key is pressed, the cutout is factory set (Refer to Data Section for setting).

For glycol applications “Glycol Cooling” displayed when OPTION key is pressed the cutout can be programmed based on GLYCOL concentration.

To program the SUCTION PRESSURE CUTOUT when in the Glycol Cooling mode, key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next programmable limit.

5.12 Rate Sensitivity

RATE SENSITIVITY = 2.0 C / MIN

The rate sensitivity is a customer programmable value which the microprocessor uses to compare with actual rate of change of leaving water temperature. Refer to Figure 1 - Leaving Water Control when reading the following descriptions.

Above the Rate Control Temperature Range the rate of change of leaving water temperature has no effect.

Between the target and the TOP OF THE RATE CONTROL TEMPERATURE RANGE a fall in the actual leaving water temperature at a rate higher than the programmed RATE SENSITIVITY will result in the unload timer being set down to 30 seconds if its value was higher than 30 seconds. If at this point the actual rate of fall increases to greater than two times RATE SENSITIVITY loading is prevented and the next step will unload when the unload timer reaches zero.

The only exception to this is if the next unload step would shut down the lead compressor.

Thus, it can be seen that despite the fact that the temperature is above the required value, the unit will unload. Based on the programmed RATE SENSITIVITY value and actual rate of fall in leaving water temperature the microprocessor determines that unloading is required to stem the fall in leaving water temperature and prevent overshoot, provide demand limiting and reduce cylinder and compressor cycling.

BETWEEN TARGET and SET POINT (LWT) if the actual leaving temperature falls faster than programmed RATE SENSITIVITY, steps will unload at 30 second intervals.

Below the SET POINT (LWT) is a zone 0.28°C wide in which if the actual leaving water temperature is rising faster than two times RATE SENSITIVITY then the next step will not unload when the timer reaches zero. RATE SENSITIVITY can be programmed by the customer in the range of 0.3°C to 8°C per minute.

5.13 Fan Discharge Pressure (Factory set)

YAES ONLY

```
FAN CNTRL DSCH PRESS
SETPOINT = 12.0 BAR G
```

This is the factory set discharge pressure at which the first stage of fan control operates on a rise of discharge pressure. See Data Section for details of setting and differential for each stage of fan operation against discharge pressure.

5.14 Fan On/Off Fan Differential (Factory set)

```
FAN ON/OFF PRESS
DIFF = 6.2 BAR G
```

This is the On/Off differential for each fan stage and is factory set depending on model size. See Data Section for details of setting and differential for each stage of fan operation against discharge pressure.

5.15 Fan Speed Control (Factory set)

```
FAN SPEED CONTROL
ONE = 1, TWO = 2 ACTUAL = 1
```

This is Factory set 1 for single speed fans, 2 for two speed fans.

5.16 Number of Fans (Factory set)

```
NUMBER OF
FANS
```

This is factory set for the number of fans per system.

5.17 Motor Current / % FLA (Factory set)

```
SYSTEM 1 MTR CURR
121 AMPS = 100% FLA
```

```
SYSTEM 2 MTR CURR
136 AMPS = 100% FLA
```

These messages show the value of Amps equal to 100% FLA of the compressor motor and is factory set. % FLA is used for motor current trip and current unloading. See Data Section for FLA value and motor codes.

5.18 Leaving Water Temperature Target Percent (Factory set)

```
LEAVING WATER TEMP
TARGET PERCENT = 90%
```

The position of the TARGET in the cooling range is expressed as a percentage. Example :For a given unit size the LEAVING WATER TARGET TEMP PERCENTAGE is set to 90% thus for a control range of 6-8°C the TARGET would be 7.8°C.

Different model sizes require different target percent as defined in Figure 1 - Leaving Water Control and the Data Section.

5.19 Heater Mat On Glycol

```
HEATER MAT ON BELOW
2.2 DEG C
```

The ability to program the on point of the heater mat is available on units designed to operate on glycol, GLYCOL COOLING is displayed when the OPTION key is pressed. The heater mat on point can be programmed between 2.2°C and the LEAVING WATER TEMP CUTOUT setting.

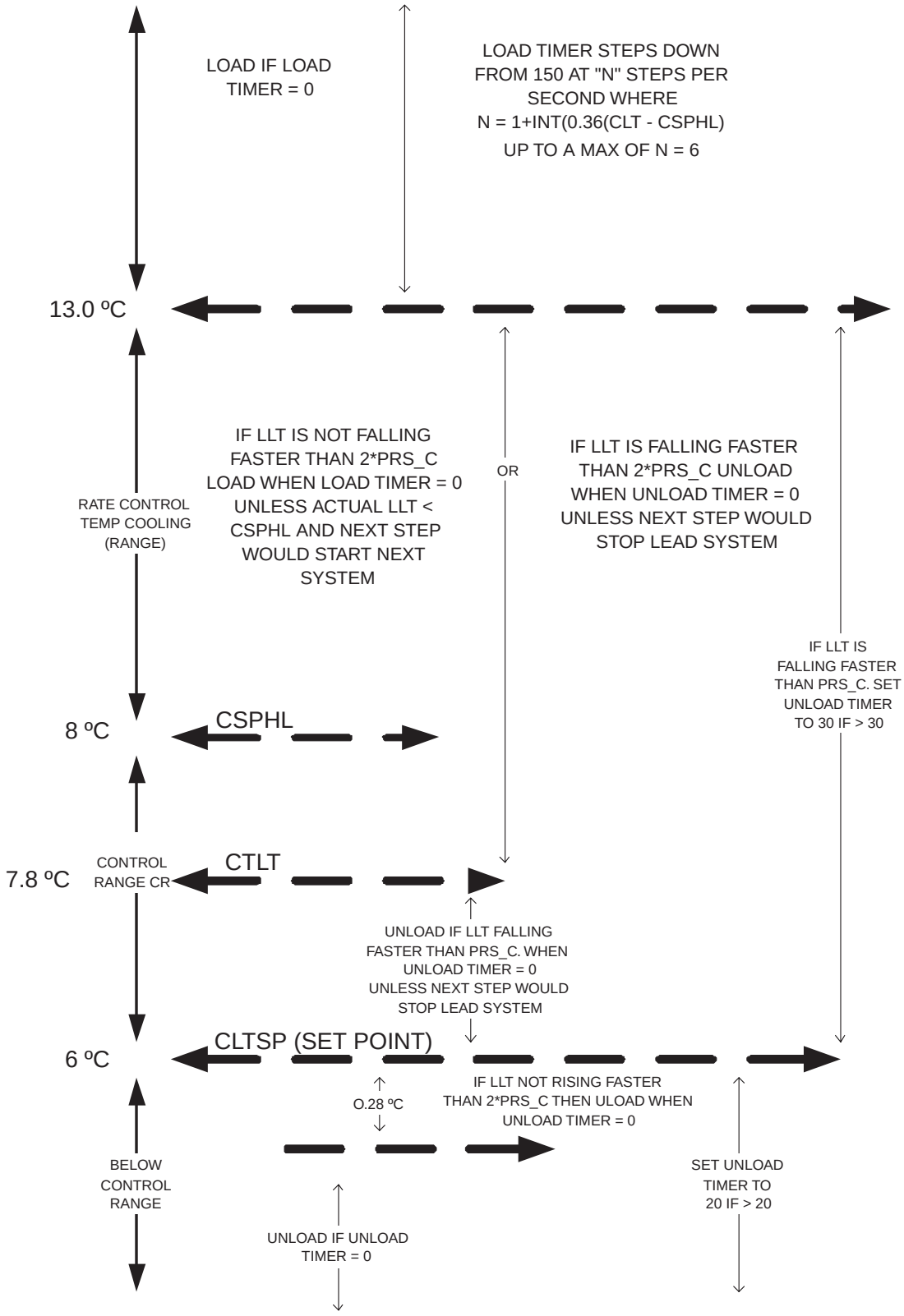
5.20 Manual/Auto Restart

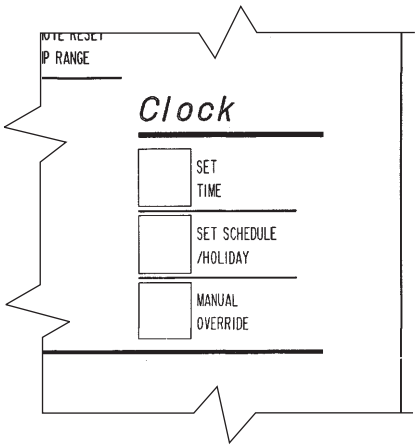
```
MANUAL RESTART = 1
AUTO = 2 ACTUAL = 1
```

The unit can be programmed for manual or auto restart after a power interruption or under voltage condition. The default is manual restart.

Programming manual restart ensures that re-setting the EMERGENCY STOP DEVICE will not initiate a re-start as required by EN 418 and EN 60204-1. A reset using the unit 1/0 (AUTO/OFF) switch under the key pad is required.

Figure 1 - Leaving Water Control





6 CLOCK KEYS

PROGRAMMING THE SYSTEM CLOCK & DAILY START/STOP SCHEDULE

6.1 General

The “CLOCK” is an internal system feature that allows the microprocessor to continuously monitor the time of the day. After programming the microprocessor will display actual time as well as the day of the week and the date.

This feature allows the microprocessor to provide an internal automatic time clock feature for starting and stopping the chiller for each individual day of the week. Also provided is a “HOLIDAY” feature which allows special start/stop programming for designated holidays.

The internal clock and schedule programming eliminates the need for an external time clock. Automatic chiller start and stop will occur according to the programmed schedule.

If the user desires not to utilise the schedule feature, the SET SCHEDULE/HOLIDAY can be programmed to run the chiller on demand as long as the unit 1/0 (AUTO/OFF) and SYS switches are ON.

Typical display messages will be shown which apply to each key.

6.2 Programming The Day, Time, and the Date Set Time

A message showing the day, time and date will be displayed when the SET TIME key is pressed.

TODAY IS MON 03:45 PM 17/03/97

To program the day, time and date, first press the ADVANCE DAY key until the appropriate day of the week is displayed. The day will advance each time the key is pressed.

The cursor will already be below the first digit of the time. Key in the new time, if required. Be sure to key in a “0” before the other digits for times before 10 o’clock., i.e. 08:01.

After the time is keyed in, the cursor will advance to the AM/PM designation. To reprogram, press the AM/PM key. When the key is pressed, the display will change to the opposite time period.

The AM/PM key can only be pressed once. If an error is made, press the CANCEL key and begin again.

If no change is required, begin keying in the required date (the cursor will automatically skip to the first digit of the date [Day] when a “number key” is pressed and the number will be placed in the first position).

The sequence of the message display is day, month and year. Two digits must be entered for each of these items. Therefore, a leading “0” may be required.Once the desired information is keyed in, it may be stored in memory by pressing the ENTER key. After the ENTER key is pressed, the cursor will move under the “T” of TODAY.

The microprocessor will accept any valid time or date. If an ‘out of range’ value is entered, the microprocessor will display the following message for 3 seconds before it reverts back to the SET TIME display message to let the user know that another try at reprogramming is necessary.

OUT OF RANGE - TRY AGAIN !

6.3 Programming the Daily Start/Stop and Holiday Schedule

Messages showing the start/stop schedule of each day of the week as well as the holiday start/stop schedule can be displayed after the SET SCHEDULE/HOLIDAY key is pressed.

The display can be scrolled through day-by-day simply by repetitively pressing the ENTER or ADVANCE DAY key. A typical daily schedule display is shown below:

```
MON START = 08:00 AM
STOP = 06:00 PM
```

To reprogram any of the daily schedules, key in the new START time. To change the AM/PM associated with the START time, press the “AM/PM” key. This will change the AM/PM message to the opposite time period.

The AM/PM key can only be pressed once. If an error is made, press the CANCEL key and begin again.

After the START time and the associated AM/PM have been programmed, the cursor will move to the STOP time. Key in the STOP TIME and press the “AM/PM” key if AM/PM requires changing.

When the ENTER key is pressed, the new START/STOP time is entered and the display will scroll to the next day. If an unacceptable time is entered, the following message will be displayed:

```
OUT OF RANGE -
TRY AGAIN !
```

For ease of programming, any values “ENTERED” for MONDAY will automatically be put in for the other days of the week. Be aware of this anytime the MONDAY SCHEDULE is changed, since it changes times previously programmed into other days.

For scrolling through the days to view times programmed use the ADVANCE DAY KEY, not the ENTER KEY.
This will assure that after viewing MONDAY, the ENTER KEY is not pressed changing times programmed for the rest of the week.

If the chiller is not required to run on a specific day enter a start time of **00:00 AM** and a stop time of **11:11** AM for those days.

If the chiller is not cycled by the DAILY SCHEDULE, but is required to run whenever the system switches are on, all **00.00’s** should be programmed into the daily schedule. This can be done manually for each day or by pressing CANCEL and ENTER when the MONDAY START/STOP schedule appears.

This will have no effect on the holiday schedule.

Continue to program each day as needed. After MON through SUN has been entered, the HOLIDAY message will be displayed:

```
HOL START = 08:30 AM
STOP = 12:00 PM
```

The Holiday (HOL) START/STOP allows the user to designate a specific day(s) for special requirements. This is provided so that day(s) needing special start/stop requirements can be programmed without disturbing the normal working schedule.

The start/stop times for the Holiday schedule are programmed just as for any other day.

Only one start/stop time can be programmed which will apply to each of the “HOLIDAY” days selected.

After the ENTER key is pressed, a new message will be displayed to designate which days of the week are to be holidays:

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

In the above sample display, an “ * ” designates Tuesday as a holiday.

When the display appears, the cursor will first stop behind Sunday. To designate a day as a holiday, press the “*” key. If a day is not to be a holiday, press the “0” key.

Whenever the " * " or the " 0 " keys are pressed, the cursor will advance to the next day. After all the holiday days are programmed, press ENTER to store the new data into memory. The display will then advance to the beginning of the Daily Schedule (MON).

The Holiday Schedule is only executed once by the microprocessor before it is erased from memory. This is done because in most cases a special Holiday Schedule is only necessary once in a several month period. It also eliminates the need for operator intervention to erase the schedule after the holiday passes.

If an error is made while programming, press CANCEL. This will clear all programmed (*) "holiday" days. The schedule can then be reprogrammed.The "0" key will not cancel out a "*" and cannot be used for correcting a programming error.

6.4 Units With Two Speed Fans

FAN ON 08:00 PM **INHIBIT OFF 07:00 AM**

A fan full speed inhibit ON and OFF time can also be programmed. During the inhibit period the fan maximum step of discharge pressure fan control is all fan running in slow speed to reduce unit noise. The unit will if necessary unload on discharge pressure unloading to ensure the unit continues to run. The ON OFF times can be programmed in the normal way. If both ON and OFF times are zero then no full speed fan inhibit is programmed.

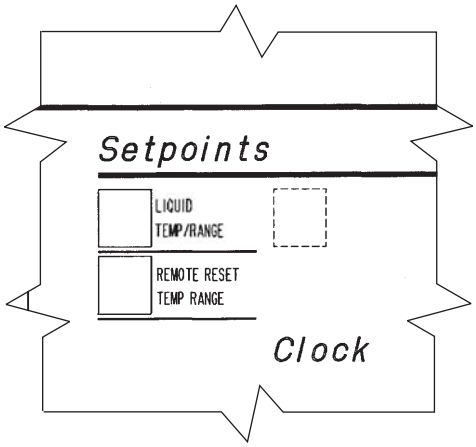
6.5 Manual Override

When the MANUAL OVERRIDE key is pressed, the Daily Schedule programmed into the chiller will be ignored and the chiller will start-up when water temperature allows, unit 1/0 (AUTO/OFF) switch permits, and SYS switches permit.

Normally this key is not used unless an emergency forces the chiller to require operation during a period where the programmed Daily Schedule is calling for the chiller to be OFF (Daily Schedule Shutdown).

MANUAL **OVERRIDE**

Once activated, MANUAL OVERRIDE is only active for a period of 30 minutes. It is for servicing only and is designed so that if left on accidentally, the microprocessor will automatically return to the Daily Schedule.



7 SETPOINT KEYS

7.1 Programming Leaving Water Control

When the CHILLED LIQUID TEMP/RANGE key is pressed, the following message will be displayed for 3 seconds:

LEAVING WATER
TEMP CONTROL

The display will then scroll to a second message and hold:

LWT = 6.0 C
CR = 6.0 TO 8.0 C

This message will display the Low-Limit Water Temperature (LWT) and the Control Range (CR). In the sample above, the LWT is 6°C and the CR is 6-8°C.

The Control Range (CR) is the variation in leaving water temperature which is acceptable in the system application. As long as leaving water temperature stays between the low limit (LWT) and (TARGET) the microprocessor will consider the temperature acceptable and will not initiate any loading/unloading reaction unless “Rate Control” requires.

The Low-Limit Water Temperature (LWT) is the minimum acceptable leaving water temperature, not the actual user desired leaving water temperature setpoint.

The “Target” temperature is the temperature the microprocessor will attempt to control to, as a top limit of desired leaving water temperature (unless next load step starts a system then top limit is SPHL (High limit of control range)). The “Target” temperature is factory programmed. See Data Section for settings.

The position of the TARGET in the cooling range is expressed as a percentage.This percentage can be checked by pressing the PROGRAM key and then ENTER key until LEAVING WATER TARGET TEMP PERCENTAGE is displayed.

For example: For a given unit size the LEAVING WATER TARGET TEMP PERCENTAGE is set to 90%. Thus for a CONTROL RANGE of 6-8°C the target would be 7.8°C. The microprocessor will be satisfied with a leaving temperature between 6-7.8°C unless the rate control is exceeded. Thus with unit running the mid-point of leaving temperature will be LWT +(0.9 x CR÷2) in our example 6+(0.9 x 2÷2)=6.9°C.

The microprocessor’s rate control is designed to be less responsive in the upper half of the Control Range (i.e.: 7.8-8°C) than in the lower half (i.e.: 6-7.8°C). This is to prevent overshoot.

To program the Low-Limit Water Temperature (LWT) and the Control Range (CR), press the CHILLED LIQUID TEMP/RANGE key.

On four system units these settings are for the mixed leaving water temperature, the settings for the individual coolers are under program.

This display will first exhibit a message that “LEAVING WATER TEMP CONTROL” is selected and 3 seconds later automatically scroll to the next display of LWT and CR.

The cursor will stop at the first digit of LWT. Key in the Low-Limit Water Temperature (LWT) that is acceptable in the system.

LWT = 6.0 C
CR = 6.0 TO 8.0 C

The microprocessor will accept a range of programmable values dependant on whether the unit was supplied for water (Water Cooling) or glycol (Glycol Cooling) which can be checked by viewing options after pressing “OPTION” key.

For water the programmable range is 3.5°C to 21.1°C. On Glycol the range is -12.2 to 21.1°C.

If values outside the factory set ranges are entered the following message will be displayed:

```
OUT OF RANGE
TRY AGAIN !
```

After the Low-Limit Water Temperature (LWT) is keyed in, the lower limit of the CR (Control Range) in the display message will automatically change to a value identical to the “LWT”.

The lower limit of the CR will always automatically equal LWT

```
LWT = 6.0 C
CR = 6.0 TO 8.0 C
```

The cursor will advance to the final entry which is the upper limit of the CR (Control Range). This value is programmed for the highest leaving water temperature which is acceptable in the system application. The microprocessor will accept a value 0.6°C to 4.4°C above the LWT for this value.

Key in the upper limit of the CR and press the ENTER key. Otherwise the new values will not be entered into memory. After pressing the ENTER key, the display will continue to show the LWT and Control Range message until another key is pressed.

Too small of a CR selection will cause compressor/cylinder cycling. If compressor cycling occurs, leaving water temperature may vary considerably as a result of a compressor that cannot restart due to the anti-recycle timer. To eliminate this, increase the ΔT (temperature differential) of the CR and/or program the anti-recycle timer for a minimum of 300 seconds if it isn’t already programmed for 300 seconds.

Whenever reprogramming the LWT & CR, keep in mind that the desired leaving water temp. should be equal to:
LWT + (Leaving Water Target Temp percentage x CR ÷ 2)

Normal Pull-down loading is limited by the loading timer; which, dependant on the actual leaving water temperature, may be reduced from the normal 150 seconds (100 seconds YAES 4 system units) per step to as little as 25 seconds (17 seconds YAES 4 system units)per stage whenever leaving water temperature is above the RATE CONTROL TEMP range.

However, on start-up, loading will be limited to a maximum of 1 stage per minute for the first 3 minutes on a system. The loading timer will be increased by the microprocessor to 150 seconds (100 seconds YAES 4 system units)when temperature falls to within the Rate Control Range or the upper half of the Control Range (Between Target and High Limit of the CR).

The unload timer is normally a 150 second (100 seconds YAES 4 system units) timer above the low limit (LWT) setpoint unless the leaving water temperature is falling faster than RATE SENSITIVITY programmed value, then the unload time is set down to 30 seconds if its value was higher than 30 seconds.

The Rate Control software causes unloading in the Rate Control Temp Range or the upper half of the Control Range if temperature drops faster than twice the programmed Rate Sensitivity when unload timer equals zero. This is to prevent overshoot.

In the lower half of the Control Range between the Low Limit and the Target, Rate Control will cause unloading if temperature falls faster than the programmed Rate Sensitivity when load timer equals zero. As before, this is to prevent overshoot.

Below the Control Range, unloading will be done at 20 second intervals until temperatures falls back into the Control Range. Unloading is controlled by a 20 second timer below the Control Range.

7.2 Programming Leaving Water Rate Control

Programmable RATE CONTROL is designed to limit compressor/loader cycling thus saving energy and reducing wear on mechanical components. RATE CONTROL will allow the microprocessor to react to fast changes in water temperature beyond normal responses dictated by loading and

unloading timer when temperature is in the Rate Control Temp Range or the Control Range.

RATE CONTROL requires programming the temperature range (RATE CONTROL TEMP) above the CONTROL RANGE (CR) where rate control is desired. Additionally, the actual rate of change (RATE SENSITIVITY) of water temperature which the microprocessor uses as a control reference must also be programmed.

Refer to Figure 1 - Leaving Water Control as you read the following text. A typical low limit water temperature of 6°C is used with a 6-8°C CONTROL RANGE (CR). A RATE CONTROL TEMP of 5°C, which is typical (5°C above high limit of the Control Range), is shown.

The RATE CONTROL TEMP establishes a temperature range (0.1°C to 11.1 °C) above the "High Limit of CONTROL RANGE" where the microprocessor will limit loading according to the rate of change of water temperature. In the above example a RATE CONTROL TEMP of 5°C is used.

In Leaving Water control, "Rate Control" is primarily designed to limit pulldown demand and limit cycling. In the Rate Control Temp Range, the microprocessor will cause unloading at 30 seconds intervals (except first step of demand) if the temperature drop exceeds 2 x the Rate Sensitivity regardless of whether the 150 seconds (100 seconds YAES 4 system units) loading timer and the deviation from setpoint is calling for loading.

Below the setpoint (LWT) in a zone 0.28°C wide if the actual leaving water temperature is rising faster than twice the rate sensitivity programmed then the next step will not unload when unload timer reaches zero.

At temperatures 0.28°C below the CONTROL RANGE, unloading will occur to bring temperatures back to within the CONTROL RANGE. The unloading timer will cause unloading at 20 second intervals until temperatures fall back into the CONTROL RANGE.

In the lower half of the Control Range between the Low Limit Water Setpoint (LWT) and the "Target" Temperature Rate Control software will cause unloading if temperature drops faster than the Rate Sensitivity. Otherwise, no other loading or unloading will result in this temperature range.

If rate controls is not in effect and the temperature is in the upper half of the controls range between the Target and the high limit of the controls range loading will take place at 150 seconds (100 seconds YAES 4 system units) intervals unless the next step would start a system.

If Rate Control is not in effect and the temperature is in the Rate Control Temp Range, loading will take place in 150 seconds (100 seconds YAES 4 system units) intervals until temperature drops below the TARGET temperature.

Above the RATE CONTROL TEMP RANGE, the microprocessor will attempt to load the chiller as fast as it can (Down to 25 seconds, 17 seconds YAES 4 system units, per stage) unless the chiller has not run for 3 minutes during which loading will occur at 1 minute intervals. This allows the chiller to gain control of the water temperature as quickly as possible while still avoiding overshoot and limiting pulldown demand as temperature drops and rate control is implemented.

Since LWT Control does not have the water loop for buffering after a load/unload response and utilises a narrow control (loading/unloading) range, compressor/loader cycling can be a problem. This makes the selection of RATE CONTROL TEMP and RATE SENSITIVITY values very critical.

Before programming the RATE CONTROL TEMP, the user should first determine if the fastest allowable pull-downs are required or whether pulldown demand limiting is desired. Programmable values from 0.1°C to 11.1°C are possible.

For fast pull-downs, and quick response, RATE CONTROL TEMPS of 1°C to 3°C are appropriate unless overshoot is noted.

For demand limiting, energy efficiency, elimination of overshoot, and minimum cycling, RATE CONTROL TEMPS of 5 to 11°C are advisable. This will cause the controls to react to water temperature rate of change well before the water temperature drops into the CONTROL RANGE. This is also a must for small water loops.

To program the RATE CONTROL TEMP, first press the PROGRAM key. Repetitively press the ENTER key until the display below appears:

RATE CONTROL TEMP = 5.0 C

Key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit. The microprocessor will accept a range of programmable values between 0.1°C to 11.1°C.

When programming values between 0.1°C to 0.9°C, it is required to first key in a “0”. Example: 0.5°C.

At this point the requirement for slow or fast pull-downs should have been established. The next item which will require programming is the RATE SENSITIVITY.

The RATE SENSITIVITY is a means of “overriding” the unloading timer when water temperatures are in the Rate Control Temp Range or the CONTROL RANGE. This allows the microprocessor to react to abrupt changes in leaving water temperatures. The ability to respond to “rate of change” variations in water temperatures gives the microprocessor “anticipation” capabilities to reduce the possibility of “overshoot” in leaving water temperature.

In demand limiting applications, to avoid cycling, or to avoid overshoot, RATE SENSITIVITY should be low. This allows the microprocessor to go into rate control to cause unloading whenever water temperatures drop too fast. Rate Control can go into effect whenever water temperatures are in RATE CONTROL Temp RANGE or the CONTROL RANGE. For these applications, a 1.6 to 3°C / min. RATE SENSITIVITY is recommended. This is also a must for small water loops.

Too small a RATE SENSITIVITY Selection may prevent loading and cause unloading due to varying flows or if the water system allows a slug of cold water to enter which falsely fools the microprocessor into thinking the RATE SENSITIVITY has been exceeded, allowing leaving water temperature to rise above the desired temperature.

For quick reaction in batch or process applications, a high RATE SENSITIVITY can be selected for up to 8°C / min. Before Rate Control can go into effect, the water temperature would have to change at a very high rate one or two times the programmed RATE SENSITIVITY dependant on temperature error from required value. This will assure loading will occur at the fastest possible speed. In most applications, 3°C / min. is suggested.

To program the RATE SENSITIVITY, first press the PROGRAM key. Repetitively press the ENTER key until the display below appears:

RATE SENSITIVITY = 2.0 C / MIN

Key in the desired value and press the ENTER key. The new value will be entered into memory and the display will advance to the next user programmable limit.

The microprocessor will accept a range of programmable values between 0.3 to 8°C/min.

7.3 Leaving Water Temperature Control

In leaving water temperature control, loading and unloading will take place as needed to keep water temperature in the CONTROL RANGE between the TARGET and LWT set point.

As mentioned earlier in this manual, the CONTROL RANGE is the temperature range of leaving water temperature that is acceptable to the user and has been previously programmed into memory using the CHILLED LIQUID TEMP RANGE KEY. The microprocessor will cause loading and unloading actions to occur as needed to keep leaving water temperatures in the lower half of this range. Refer to Figure 1 - Leaving Water Control to aid in understanding the loading and unloading scheme performed by the microprocessor.

Within the lower half of the CONTROL RANGE, the microprocessor will not call for any further loading or unloading unless the Rate Sensitivity is exceeded. If temperature drop exceeds the Rate Sensitivity, the microprocessor will unload the chiller in 30 second steps to prevent overshoot.

If leaving water temperature should fall 0.28°C below control range, the microprocessor will unload the chiller (unless this would stop a system)

in 20 second intervals until water temperature rises back into the CONTROL RANGE.

Below the setpoint (LWT) in a zone 0.28°C wide if the actual leaving water temperature is rising faster than twice the rate sensitivity programmed value then the next step will not unload when unload timer reaches zero. If temperature is in the upper half of CONTROL RANGE or in the RATE CONTROL Temp RANGE, the microprocessor will continue loading the chiller as needed in 150 seconds (100 seconds YAES 4 system units) intervals until temperatures pass into the lower half of the CONTROL RANGE.

If the rate of drop in water temperature exceeds twice the programmed Rate Sensitivity, unloading, at 30 second intervals, will result since the microprocessor sees the temperature dropping at an excessive rate anticipating temperature will soon fall into the CONTROL RANGE.

When temperatures are in the temperature range ABOVE THE RATE CONTROL Temperature RANGE, the microprocessor will load the chiller in intervals of down to 25 seconds (17 seconds YAES 4 system units)per step to bring the temperature down as quickly as possible.

YAES 4 System Units Only

On these units it is the mixed leaving water temperature which is the primary temperature that is required to be controlled. The strategy that was outlined earlier in this section and in Figure 1 - Leaving Water Control is not used to directly set the MAX DEMAND for system capacity but is used to set the MIXED TEMPERATURE DEMAND.

The value of the MIXED TEMPERATURE DEMAND is then shared out to the MASTER and SLAVE MAX DEMAND. Then the two groups, SYSTEMS one and two under the control to the master microprocessor and SYSTEMS three and four under the control of the slave microprocessor, attempt to reach the MAXIMUM DEMAND set for them. Each group under its own LEAVING WATER CONTROL sensing its own cooler leaving temperature follows the strategy outlined earlier in this section and in Figure 1 - Leaving Water Control. In following this strategy one or both groups may not be able to reach the maximum demand imposed on them by the mixed leaving control logic, due to their own individual leaving water temperatures. It is important to remember that the mixed setpoints are displayed and set under: SETPOINTS -CHILLED LIQUID TEMP/RANGE these being LWT and CR. The group setpoints are under:
PROGRAM and are LEAVING WATER SETPOINT and LOCAL CONTROL RANGE.

The RATE CONTROL TEMP and the RATE SENSITIVITY displayed and set under PROGRAM key are common to both the mixed and group leaving water control.

8 SYSTEM SAFETIES

There are five types of Safeties: the lockout type locks out after 1 fault, the manual reset type which locks out after 3 faults in 90 minutes, the automatic reset type, the start inhibit type and the anticipation safety controls. These safeties protect the chiller from damage any time a safety threshold is exceeded by either shutting the system(s) down or by altering system loading. A status display message will indicate when a system(s) or the entire chiller is shut down due to a fault or when anticipation safeties are operating.

An explanation of these safeties will follow.

8.1 Lockout Safeties (Lockout on first trip)

A lockout safety will shut the unit or affected system down whenever the safety threshold is exceeded and under status messages display a fault message. This is accessible by pressing the Status key.

Before returning a locked out unit or system to service, a thorough investigation of the cause of the fault should be made, failure to repair the cause of the fault while manually allowing repetitive restarts may cause further expensive damage to the system.

Control Circuit Supply

On supply returning after a power interruption, when programmed for automatic restart after power failure under the PROGRAM key, the display will read:

SYS#1 AR TMR 240 S **SYS# 2 AR TMR 240 S**

The 2 minute anti-recycle delay assures that the motor has a minimum of 2 minutes to cool under any circumstances allowing much of the internal heating due to starting to be dissipated before another start occurs. If the unit is programmed for manual restart under the program key, the display will read:

POWER FAILURE **MANUAL RESET**

Or on YAES 3/4 system units:

MASTER POWER FAILURE **MANUAL RESET**

or

SLAVE POWER FAILURE **MANUAL RESET**

Requiring a reset using the unit 1/0 (AUTO/OFF) switch. Any time remaining on the 2 minute anti-recycle timer will then be displayed.

On YAES 3 & 4 system units leave the unit switch in the Off position for at least 10 seconds to allow the reset to be transmitted to the slave panel. Or alternatively the Slave panel power failure can be reset by setting the main panel micro board system switch 3 (SYS 3(S4)) and switch 4 (SYS 4(S5)) to Off, thus resetting the slave panel without interrupting systems 1 and 2's operation.

Leaving Water Sensor Check

The check ensure that the sensor is reading values within the range -20 to +60C. If the value is outside this range the unit will lockout, the voltage free chilled liquid pump contact will close to run the pump. The leaving water temperature fault display is shown below.

CHILLER FAULT : **LWT SENSOR FAULT**

To reset a locked out unit, turn the unit 1/0 (AUTO/OFF) switch to ’0’ (OFF).

On YAES 3 system units leave the unit switch in the Off position for at least 10 seconds to allow the reset to be transmitted to the slave panel.

YAES 4 System Units Only

Leaving Water Sensor Check

There are three leaving water temperature sensors. One for the master panel evaporator, one for the slave panel evaporator and one for the mixed leaving water temperature. The checks ensure that each sensor is reading values within the range -20 to +60C. If the value is outside this range for an evaporator leaving water sensor the appropriate group of systems will lockout, for the mixed sensor the unit will lockout. In all cases the voltage free chilled liquid pump contact will close to run the pump. Examples of the leaving water temperature fault display is shown below.

CHILLER FAULT : **MWT SENSOR FAULT**

MASTER PANEL FAULT : **LWT SENSOR FAULT**

SLAVE PANEL FAULT : **LWT SENSOR FAULT**

To reset a locked out unit/group, turn the unit 1/0 (AUTO/OFF) switch to '0'. When using the unit switch to reset a slave panel lockout, leave the switch in the 0 (OFF) position for at least 10 seconds to allow for comm lag.

Loss of Communications Link

If communications is lost with the slave panel for more than two minutes the Status message for the slave panel reads.

LOSS OF COMM LINK **TO SLAVE PANEL**

If communications is lost with the slave panel 3 times in 90 minutes the slave panel will lock out. A 2 minute block of loss of communications is considered as one fault. Thus a loss of communications for 6 minutes would result in a lock out. A lockout gives the following message.

SYS# 3 LOCKED OUT **LOSS OF COMM LINK**

or

SYS# 3&4 LOCKED OUT **LOSS OF COMM LINK**

Discharge Pressure Safety

The discharge pressure safety ensure that the system pressure does not exceed safe working limits which could open a relief valve or other pressure relief device causing refrigerant loss. Any time the cutout point is exceeded, the system will shut down and lockout at the first attempt. The discharge cutout is factory set. See Data Section.

An example of a discharge pressure fault display is shown below.

SYS#1 HIGH DSCH **SYS#2 HIGH DSCH**

To reset a locked out system, turn the affected system switch on the microprocessor board to the off position.

On YAES 3 & 4 system units leave the system 3 or 4 switch in the Off position for at least 10 seconds to allow the reset to be transmitted to the slave panel.

Low Water Temperature Safety

The Low Water Temperature Safety assures that the evaporator is not damaged from freezing due to improperly set control points. If the unit is not required to run and the chilled liquid leaving temperature drops below the cutout setting, the control system ensures that the voltage free contact for the chilled liquid pump is closed to run the pump. The chiller is not locked out and no remote alarm is given. Under status display whilst low temperature condition exist the display will read:

CHILLER FAULT: **LOW WATER TEMP**

Whenever the chilled liquid temperature drops below the cutout temperature whilst running, the chiller will shut down and lockout.

For units designed for water chilling “Water Cooling” is displayed when “OPTION” key is pressed the cutout is set at 2.2°C.

On Glycol units “Glycol Cooling” is displayed when “OPTION” key is pressed, cutouts can be programmed in the range -13.3°C to 2.2°C.

An example of the Low Water Temperature fault display is shown below.

CHILLER FAULT: **LOW WATER TEMP**

To reset a locked out unit, turn the unit 1/0 (AUTO/OFF) switch-to ’0’ (OFF).

Low Water Temperature Safety on YAES 4 system units

On 4 system YAES units the systems are split into two groups. Systems 1 and 2 form one group,systems 3 and 4 the other. Each group has its own cooler and each cooler has its own low water temperature safety. One group locking out does not affect the other group.

An example of the Low Water Temperature fault display is shown below.

MASTER PANEL FAULT **LOW WATER TEMP**

Number 1 and 2 systems have locked out on low water temperature.

SLAVE PANEL FAULT **LOW WATER TEMP**

Number 3 and 4 systems have locked out on low water temperature.

To reset a locked out group, turn unit 1/0 AUTO/OFF) switch below keypad to off.

8.2 Manual Reset Safeties (Locks out after 3 faults in 90 minutes)

A Manual Reset Safety will shut the affected system down whenever the safety threshold is exceeded. Automatic restart will occur after the first 2 shutdowns when the anti-recycle timer times out, if temperature demand exists. After any combination of 3 Manual Reset Safety in a 90 minute time period, the affected system will shut down and lock out on a FAULT.

After a system has shut down 3 times and locked out, a fault display indicating the last system fault will appear on the STATUS display message. This is accessible by pressing the STATUS key.

To reset a locked out system, turn the affected system switch on the Microprocessor Board to the OFF position.

NOTE

Before returning a locked out system to service, a thorough investigation of the cause of the fault should be made. Failure to repair the cause of the fault while manually allowing repetitive restarts may cause further expensive damage to the system.

Each of the Manual Reset Safeties will be discussed in detail below.

Motor Current Safety (Figure 3)

The Motor Current Safety assures that the motor life is not compromised due to low or high motor current.

Low motor current may result from running with low or no refrigerant. The microprocessor looks at motor current to protect against this until the Low pressure bypass is de-activated. High motor current may result from power problems, too much refrigerant, very warm water, or other high pressure situations.

The microprocessor begins monitoring motor current shortly after the system starts. After 9 seconds of operation, motor current must be greater than 5% FLA but less than 115% FLA as long as the compressor continues to run or the compressor will shut down. (Note before revisions of software listed valve was 15%: 2 system, B.A02.01.01;3 system, MAIN B.A01.12.01, SLAVE B.A01.13.01; 4 system, MAIN B.A02.14.07, SLAVE B.A02.15.07). If motor current is > 105% for more than 30 seconds the compressor will shut down.

The above overload protection conforms to the requirements EN 60947-4-1 class 10A time-delay overload relays. It also meets the phase loss sensitivity requirements of this standard.

SYS#1 CURRENT/MP/HPX
SYS#2 CURRENT/MP/HPX

NOTE

The Motor Protector (MP), the mechanical High Pressure Cutout (HPX) and the phase rotation relay (KPR) will also cause the MOTOR CURRENT SAFETY to activate. The reason for this is that these devices cause the motor contactor to de-energise. Details of the operation of these devices are provided below.

Motor Protector (MP)

Three internal temperature sensors are built into the motor stator. These sensors are wired into the motor protector module located inside the Motor terminal box. As the motor windings heat and cool, the resistance of the motor temperature sensors will change. If the windings overheat, the change in resistance in the sensors will be sensed by the Motor protector module.

The module will open it's MP contacts breaking a 220/230 V fed to de-energising the motor contactors. When the motor contactor de-energises, motor current falls to zero. The low motor current is sensed by the microprocessor and the system is shut down. For more information, see Motor Current Safety above.

NOTE

Auto-restart will be permitted after a shutdown, when the motor sensors cool and the MP contacts close. A fault lock-out will result if safety thresholds are exceeded three times in a 90 minute period. The trip temperature of the module is 110°C, corresponding to 4.5 kilo ohms motor temperature sensor resistance. The reset temperature of the module is 75°C corresponding to 2.75 kilo ohms motor temperature sensor resistance.

An example of a motor protector (MP) fault message is shown below:

SYS#1 CURRENT/MP/HPX
SYS#2 CURRENT/MP/HPX

Mechanical High Pressure Cutout (Manual reset) (HPX)

A mechanical high pressure cutout is located on the unit. This is a backup to the primary high pressure cutout which uses the discharge pressure transducer and microprocessor.

If for any reason the microprocessor does not stop the system and the discharge pressure exceeds the setting shown in the Data Section for mechanical HP cutout, its contact will open which

will remove the feed to de-energise the motor contactors.

The motor contactor de-energises and motor current falls to zero. The low motor current is sensed by the microprocessor and the system is shut down. For more information see Motor Current Safety above.

A fault lock-out will result as the mechanical HP cutout is hand reset and thus with its contact open will hold the motor contactor off whilst the microprocessor attempts to start the unit and thus after 3 faults will lockout on motor current. An example of a mechanical HP (HPX) fault message is shown below.

SYS#1 CURRENT/MP/HPX
SYS#2 CURRENT/MP/HPX

Phase Rotation Relay –KPR

Each system is fitted with a phase rotation relay in its associated power section. The relay monitors each of the 3 phase voltages and it contact is open to de-energize the compressor motor contactor if an incorrect phase rotation is detected. With the motor contactors de-energized the current is zero. The low motor current is sensed by the microprocessor and the system is shut down.

A fault lock-out will result as the phase rotation relay will not close its contact until the phase rotation has been corrected and with its contact open will hold the motor contactor off whilst the microprocessor attempts to start the unit and after 3 faults will lock-out on low motor current.

Suction Pressure Safety (Figure 2)

The Suction Pressure Safety assures that the system is not run under low refrigerant conditions or due to a problem which will not allow proper refrigerant flow.

For the first 30 seconds of operation after the liquid line solenoid valve has opened, the low suction pressure bypass is in operation. After this 30 seconds of bypass, the microprocessor begins monitoring suction pressure and continues to do so as long as the compressor runs. From 30 to 120 seconds of run time, suction pressure must be greater than 80% of the Suction Pressure Cutout. After 120 seconds, suction pressure must be greater than the cutout.

A transient timer is built into software to assure that short term fluctuations in suction pressure due to fan cycling, loading, etc. do not cause nuisance trips on low suction pressure.
If the suction pressure reaches cutout plus 0.34 bar, the transient timer is readied for action. If suction pressure drops below the cutout point, the 30 second transient timer begins timing. As long as suction pressure doesn't drop below 80% of cutout during the 30 second period and rises above cutout before the timer times out, the system will continue to run.

An example of a suction pressure fault message is shown below:

SYS#1 LOW SUCTION
SYS#2 LOW SUCTION

Oil Level Safety (also see Automatic Reset Safeties Oil level Inhibit)

Each compressor is fitted with an oil level switch. If the oil level drops whilst the compressor is running and the oil level switch opens for more than 60 seconds the system will stop with the following message displayed.

SYSX LOW OIL LEVEL

When oil switch re-closes the message clears and a normal restart is allowed.

If the system has locked out , 3 trips in 90 minutes the displayed message reads.

SYSX OIL LEVEL FAIL

Oil Pressure Safety

The Oil Pressure Safety assures that the compressor's mechanical components receive proper lubrication. **If the compressor is running and the oil pressure differential (oil pressure – suction) is less than 2.5 BAR (36.3PSI) for more than 90 seconds the system will shutdown.**

An example of an oil pressure fault display message is shown below.

SYS#1 LOW OIL PRESS
SYS#2 LOW OIL PRESS

High Oil Temperature Safety

A system can only start if the oil temperature is less than 100°C. With the system running the oil temperature must be less than 100°C or after 120 seconds of run time the oil temperature must be less than 95°C or the system will shut down. See Figure 6, High Oil Temperature Safety Flow Chart.

An example of an high oil temperature fault display messages is shown below.

SYS #1 HIGH OIL TEMP **SYS #2 HIGH OIL TEMP**

High Discharge Temperature Safety(also see Automatic Reset Safeties High discharge Temperature Inhibit)

If the discharge temperature with the system running rises to above 105°C the system will shut down. When discharge temperature falls to below 80.0C the message is cleared and a normal restart allowed.

If the system has locked out , 3 trips in 90 minutes the displayed message reads.

SYSX DSCH TEMP FAIL

8.3 Automatic Reset Safeties

An Automatic Reset Safety will shut the entire chiller down on a fault when the safety threshold is exceeded and allows automatic restart after the condition causing the shutdown clears. Restart will occur only after anti-recycle timers are satisfied and demand requires.

A reset hysteresis is built in so repetitive faulting and clearing will not occur in a short time period. An example would be if ambient temperature dropped below the cutout, temperature would have to rise 2.8°C above the cutout before the fault lockout would clear and restart can occur.

When the chiller is shut down on one of these safeties, a message will appear on the STATUS display informing the operator of the problem. This is accessible by pressing the STATUS key.

Details concerning each of the Automatic Reset Safeties follow.

Low Ambient Temperature Safety

The Low Ambient Temperature Safety assures that the chiller does not run in a low ambient where potential damage could result due to low system pressures.

An example of a Low Ambient temperature fault is shown below:

CHILLER FAULT **LOW AMBIENT TEMP**

High Ambient Temperature Safety

The High Ambient Temperature Safety assures that the chiller does not run in ambient above its design limits. On standard ambient units the cutout is set to 46°C.

An example of the High Ambient Temperature Fault display message is shown below:

CHILLER FAULT: **HIGH AMBIENT TEMP**

Flow Switch

The microprocessor monitors the closure of the flow switch to assure that water flow is present in the evaporator which prevents freeze-ups. The flow switch voltage free contacts are connected between terminals 10 & 13. On YAES 3 system units a flow switch with two separate normally open contacts or two separate flow switches are required, the second contact wired to terminals 10 & 13 in the slave panel. If the flow switch opens, the chiller will shut down after a 5 second anti-flutter delay and the following status message will be displayed:

SYS#1 NO RUN PERM **SYS#2 NO RUN PERM**

Closure of the flow switch, when flow is present, will cause the message to disappear and auto-re-start will occur.

On YAES 4 system units a second flow switches is required. One connected to the main panel as above for main cooler (systems 1 and 2) and a second flow switch connected to the slave panel terminals 10 & 13 for slave cooler (systems 3 and 4). If the slave flow switch opens, systems 3 and 4 will shut down after a 5 second anti-flutter delay and the status message will read SYS 3 and 4 NO

RUN PERMissive. Systems 1 and 2 will continue to operate.

NEVER BYPASS A FLOW SWITCH. THIS WILL CAUSE DAMAGE TO THE CHILLER AND VOID ANY WARRANTIES.

The same message will be displayed for remote Auto/Off customer contacts. For No. 1 system the contact is connected to terminals 11 & 14 and for No. 2 system contact is connected to terminals 12 & 15.

On YAES 3 system units the system 3 Auto/Off customer contact is connected to slave panel terminal 11 & 14.

On YAES 4 system units the remote Off/Auto contacts are slave panel terminals 11 & 14 No. 3 system and No. 4 system terminals 12 & 15.

Vac Under Voltage

CHILLER FAULT **VAC UNDER VOLTAGE**

This message will not appear as a status message, but can appear as a reason for shutting down a running system, in the history buffer, on a power interruption or under voltage.

System Start Inhibits

If certain conditions occur whilst a system is in a normal shutdown then a inhibit message will be displayed. When the condition clears the system will be allowed to start.

Oil Temperature Inhibit

SYS#1 OIL TEMP INHIB **SYS#2 OIL TEMP INHIB**

This message informs the operator that a minimum safe oil temperature above ambient has been not been reached, prior to allowing the system to start. As the crankcase heater boils off the refrigerant from the oil, the oil heats up until the required oil/ambient temperature differential is reached and the system is available to start if required.

If a compressor has performed a pumpdown in the last 45 minutes and a cooling demand occurs oil / ambient temperature is not checked.

If there has been a power interruption detected or it has been longer than 45 minutes since the last pumpdown oil / ambient temperature is checked.

SYSX OIL LEVEL INHIB

This message informs the operator that the oil level is below the minimum safe oil level and is preventing a system start. If the oil level recovers to close the oil level switch the system will be allowed to start, if required.

SYSX DSCH TEMP INHIB

This message informs the operator that with the discharge temperature above 80.0C the system cannot start. When the Discharge temperature cools to below 80.0C the system will be allowed to start, if required.

8.4 Anticipation Safety Controls

Anticipation controls are built into the software to prevent safety shutdowns by automatically overriding temperature controls if system discharge pressures or compressor motor current near safety thresholds. This allows the chiller to continue to run under reduced capacity to avoid total loss of cooling resulting from a lockout on a safety.

Anticipation safeties monitor motor current and discharge pressure and unload the compressors as needed. The microprocessor will display a message on the STATUS DISPLAY whenever these controls are in operation.

Motor Current Unloading

The motor current unload point when set to 101% keeps the system from faulting on high motor current due to high loads or pull down conditions. When set to 85% to 100% the current demand on the building can be limited. Limiting is achieved by unloading the compressor by a maximum of two steps, one at a time; at 10 second intervals, at high motor currents, the chiller is allowed to continue to

run automatically at reduced capacity until load conditions moderate to allow re-loading.

A reload attempt occurs at 15 minute intervals, one step at a time, if more than one step has unloaded. See Figure 5 - Discharge/Current Unloading flow chart and the Data Section. An example of the message displayed when motor current unloading is in effect is shown below:

```
SYS#1 CURR LIMITING
SYS#2 CURR LIMITING
```

Discharge Pressure Unloading

If discharge pressure exceeds the factory set value, see Data Section, the compressor will unload by a maximum of two steps, one step at a time, at 10 second intervals. See Figure 5 Discharge/Current Unloading flow chart. The chiller is allowed to continue to run automatically at reduced capacity until load conditions moderate to allow reloading.

A reload attempt occurs at 15 minutes intervals, one step at a time, if more than one step has unloaded.An example of the message displayed when discharge pressure unloading in effect is shown below:

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

8.5 Discharge Pressure Step 1 Skip Routine

If the discharge pressure rises above 15.5 BAR compressor step 1 is skipped. If the compressor is operating on step 1 and the discharge pressure rises to above 15.5 BAR the compressor is loaded to 2 steps when load timer reaches zero. Preventing a compressor from running on 1 step above15.5 bar ensures that the compressor operational envelope is not exceeded. When pressure fall below 15.4 BAR the compressor is allowed to run on step 1. If compressor step 1 is being skipped the stages of loading message under OPER DATA changes from

```
SYS X STAGES
OF LOADING          X
```

TO

```
SYS X STAGES
OF LOADING  SKIP 1  X
```

9 CONTROLS

Anti recycle timer

The anti-recycle timer ensures a minimum start to start time of 10 minutes and minimum stop to start time of 5 minutes.

If a power failure occurs, the anti-recycle timers will reset to 2 minutes after power is re-applied.

If the anti-recycle timer is preventing a start, the timer position in seconds may be viewed by pressing the STATUS key. A sample display is shown below:

```
SYS#1 AR TMR 132
SYS#2 AR TMR 55
```

Anti-Coincidence Timer

The Anti-coincidence timer assures that 2 compressors can never start simultaneously. This assures that excessive current demand will never result. A one minute time delay will always separate compressor starts. Anti-coincidence timers can be viewed when it is active, by pressing the STATUS key.

A sample display is shown below:

```
SYS #1  AC TMR 56S
SYS #2  AC TMR 56S
```

Pumpdown Control

On a normal shutdown a system will pumpdown by closing the liquid line solenoid valve. The system will continue to run and only stop when the suction pressure falls to below the suction pressure cutout value programmed under the PROGRAM key or the pumpdown time exceeds 10 seconds. A system does not pump down on a fault shutdown or if the unit switch is set to off.

During pumpdown the following status message will be displayed:

```
SYS#1 PUMPING DOWN
SYS#2 PUMPING DOWN
```

This message is overwritten by the SYS SWITCH OFF and DAILY SHUTDOWN MESSAGES.

Liquid injection Rotor (low temperature units only)

To prevent excessive discharge temperatures with the system running on certain application a Liquid Injection Rotor solenoid valve will open if the discharge temperature rises to above 90 ^{O}C. The valve will close if the discharge temperatures falls below 80 ^{O}C or the system stops.

SYS X LIQUID INJECT ROTOR SV STATUS ON

Economiser Solenoid Valve (YLCS only, when fitted) / TEV Bypass Solenoid Valve (when fitted)

The Economiser / TEV Bypass solenoid valve output is on then the system is running at step 3 (75%) or step 4 (100%). The Economiser solenoid valve if fitted on systems equipped with an economiser. The TEV Bypass solenoid value if fitted to systems where the range of the TEV needs extending by fitting a bypass solenoid valve.

SYS X ECONOMISER/TEV BYPASS SV STATUS ON

Oil cooling solenoid valve. (YAES UNITS only)

When the system is running its oil cooling solenoid is open. The feed to this valve is via the relay board compressor start contact, manual HP switched and motor protector contact, the valve is not controlled from a separate micro output.

Transient Timer Control

The appropriate system transition timer will come on 4 seconds after it's system starts. The relay controlled by this output will initiate the transition from star to delta on the compressor. It will go off when it's system stops.

Starting Bypass Solenoid Control (when fitted)

The starting bypass solenoid is opened 12 seconds before the compressor starts, as indicated by the start sequence message. The starting bypass solenoid closes 1 seconds after the star delta transition.

Evaporator Heater Mat Control (YAES UNITS only)

The evaporator Heater Mat prevents liquid standing in the evaporator from freezing. On water chilling applications when the ambient falls below 2.2°C the heater turns on and turned off when the ambient rises above 4.5°C. The ability to program the on point of the heater mat is available on units designed to operate on glycol, GLYCOL COOLING is displayed when the OPTION key is pressed. The heater mat on point can be programmed between 2.2C and the LEAVING WATER TEMP CUTOUT setting.

Crankcase Heater Control

If the system is running the crankcase heater is off.

With the system off, the crankcase heater is on unless the oil temperature rises above 60 ^{o}C and does not fall below 55 ^{o}C.

9.1 Condenser Fan Control

Each system has a number of fans (dependant on unit size) controlled by discharge pressure. The first fan is allowed to run 4 seconds after the compressor starts. The delay between turning fan stages on and off is 10 seconds. The number of stages required is under discharge pressure control.

Standard And High Head Single Speed Fans

These fans have direct on line starting. The following table shows the ON and OFF conditions for each stage of fan control:

Programmable Range

Set under program key (bar)	min	max
Fan control discharge pressure setpoint	5	14
Fan on/off pressure differential	2	10.4

Fan Stage Pressure Table

Fan Stages		Pressure (bar)
1	ON	DP > FPSP
	OFF	DP < FPSP - FPD
2	ON	DP > FPSP + 1.38
	OFF	DP < FPSP + 1.38 - FPD
3	ON	DP > FPSP + 2.41
	OFF	DP < FPSP + 2.41 - FPD
4	ON	DP > FPSP + 3.1
	OFF	DP < FPSP + 3.1 - FDP
5	ON	DP > FPSP + 3.79
	OFF	DP < FPSP + 3.79 - FDP

FPSP = Fan Cntrl Dsch Press setpoint under program key

FPD = Fan On/Off Press Diff under the program key

Fan Outputs

Systems are fitted with either 2, 3, 4, 5 or 6 fans, dependent on model size.

The number of fans programmed under the program key for a unit relates to the system with the largest number of fans.

System with 6 Fans

Fan Stages	Digital outputs			Contactors -KF#	Fans -MF#
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2		
1	ON	OFF	OFF	1	1
2	OFF	OFF	ON	2, 5, 6	2, 5, 6
3	ON	OFF	ON	1, 2, 5, 6	1, 2, 5, 6
4	OFF	ON	ON	2 to 6	2 to 6
5	ON	ON	ON	1 to 6	1 to 6

On units with 5 and 4 fans per system: for the system with 4 fans, only 1 fan runs on fan stages 1 and 2.

System with 5 Fans

Fan Stages	Digital outputs			Contactors -KF#	Fans -MF#
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2		
1	ON	OFF	OFF	1	1
2	OFF	OFF	ON	2, 5	2, 5
3	ON	OFF	ON	1, 2, 5	1, 2, 5
4	OFF	ON	ON	2 to 5	2 to 5
5	ON	ON	ON	1 to 5	1 to 5

On units with 4 and 3 fans per system: for the system with 3 fans, only 1 fan runs on fan stages 1 and 2.

System with 4 Fans

Fan Stages	Digital outputs			Contactors -KF#	Fans -MF#
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2		
1	ON	OFF	OFF	1	1
2	OFF	OFF	ON	3, 4	3, 4
3	ON	OFF	ON	1, 3, 4	1, 3, 4
4	ON	ON	ON	1 to 4	1 to 4

System with 3 Fans

Fan Stages	Digital outputs			Contactors -KF#	Fans -MF#
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2		
1	ON	OFF	OFF	1	1
2	ON	ON	OFF	1, 2	1, 2
3	ON	ON	ON	1 to 3	1 to 3

System with 2 fans

Fan Stages	Digital outputs			Contactors -KF#	Fans -MF#
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2		
1	ON	OFF	OFF	1	1
2	ON	ON	OFF	1, 2	1, 2
3	ON	ON	ON	1, 2	1, 2

System with 2 reversing fans

Fan Stages	Digital outputs			Contactors -KF#	Fans -MF#
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2		
1	ON	OFF	OFF	3	1 Reverse
2	ON	ON	OFF	2	2
3	ON	ON	ON	1 & 2	1 & 2

Optional Two Speed Fans

For low noise applications two speed fans are employed. Slow speed and thus low noise is achieved by running the fans in star. Fast speed is achieved by running the fans in delta.

Fan Stage Pressure Table

Fan Stages		Fan State	Pressure (bar)
1	ON	SLOW	DP > FPSP
	OFF	OFF	DP < FPSP - FPD
2	ON	SLOW	DP > FPSP + 1.72
	OFF	SLOW	DP < FPSP + 1.72 - FPD
3	ON	SLOW	DP > FPSP + 3.1
	OFF	SLOW	DP < FPSP + 3.1 - FPD
4	ON	FAST	DP > FPSP + 4.14
	OFF	SLOW	DP < FPSP + 4.14 - (0.5*FDP)

FPSP = Fan Cntrl Dsch Press setpoint under program key

FPD = Fan On/Off Press Diff under the program key

Fan Outputs

Systems are fitted with either 2, 3, 4, 5 or 6 fans, dependent on model size.

Systems with 6 fans

Fan Stages	Digital outputs			Contactors			Fans
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2	-KF#	-KFL#	-KFH#	-MF#
1	ON	OFF	OFF	1, 4	1, 4		1, 4 (Slow)
2	OFF	ON	OFF	2, 3, 5, 6	2, 3, 5, 6		2, 3, 5, 6 (Slow)
3	ON	ON	OFF	1 to 6	1 to 6		1 to 6 (Slow)
4	ON	ON	ON	1 to 6		1 to 6	1 to 6 (Fast)

System with 5 fans

Fan Stages	Digital outputs			Contactors			Fans
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2	-KF#	-KFL#	-KFH#	-MF#
1	ON	OFF	OFF	1, 4	1, 4		1, 4 (Slow)
2	OFF	ON	OFF	2, 3, 5	2, 3, 5		2, 3, 5 (Slow)
3	ON	ON	OFF	1 to 5	1 to 5		1 to 5 (Slow)
4	ON	ON	ON	1 to 5		1 to 5	1 to 5 (Fast)

System with 4 fans

Fan Stages	Digital outputs			Contactors			Fans
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2	-KF#	-KFL#	-KFH#	-MF#
1	ON	OFF	OFF	1	1		1 (Slow)
2	OFF	ON	OFF	2, 3	2, 3		2, 3 (Slow)
3	ON	ON	OFF	1 to 4	1 to 4		1 to 4 (Slow)
4	ON	ON	ON	1 to 4		1 to 4	1 to 4 (Fast)

System with 3 fans

Fan Stages	Digital outputs			Contactors			Fans
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2	-KF#	-KFL#	-KFH#	-MF#
1	ON	OFF	OFF	1	1		1(Slow)
2	OFF	ON	OFF	2, 3	2, 3		2, 3 (Slow)
3	ON	ON	OFF	1 to 3	1 to 3		1 to 3 (Slow)
4	ON	ON	ON	1 to 3		1 to 3	1 to 3 (Fast)

System with 2 fans

Fan Stages	Digital outputs			Contactors			Fans
	Sys1(3) J9-1 Sys2(4) J9-3	Sys1(3) J9-2 Sys2(4) J9-4	Sys1(3) J10-1 Sys2(4) J10-2	-KF#	-KFL#	-KFH#	-MF#
1	ON	OFF	OFF	1	1		1(Slow)
2	ON	ON	OFF	1 & 2	1 & 2		1 & 2 (Slow)
3	ON	ON	ON	1 & 2		1 & 2	1 t& 2 (Fast)

Fan star delta dwell time

When changing from fan stage 3 to fan stage 4 all the fan motors are reconnects from Star (Slow speed) to Delta (full speed). Similarly when reverting from fan stage 4 to stage 3 all the fan motors are reconnects from Delta (full speed) to Star (Slow speed). To ensure that arcing on the contactors is cleared on switching between states the following dwell times are set. The transition from stage 3 to 4 requires the following sequence based on time.

Fan Outputs

Time	Digital outputs		
	Sys1(3) J9-1 Sys2(4) J9-3	**Sys1(3) J9-2 Sys2(4) J9-4**	**Sys1(3) J10-1 Sys2(4) J10-2**
STAGE 3	ON	ON	OFF
0 (Transition start)	OFF	OFF	OFF
500 ms	OFF	OFF	ON
1000 ms (Transition complete)	ON	ON	ON

Time	Digital outputs		
	Sys1(3) J9-1 Sys2(4) J9-3	**Sys1(3) J9-2 Sys2(4) J9-4**	**Sys1(3) J10-1 Sys2(4) J10-2**
STAGE 4	ON	ON	ON
0 (Transition start)	OFF	OFF	OFF
1000 ms (Transition complete)	ON	ON	OFF
STAGE 3	ON	ON	OFF

Stage 3 is the maximum fan stage when the remote fan speed inhibit contact is closed. If a fan inhibit time period is set (under the SET SCHEDULE /HOLIDAY key) and the time of day is in the inhibit on zone.

9.2 Imperial Display

The control panel is capable of providing displays of pressure and temperature in imperial values. Temperatures will be displayed in °F and pressures in PSI.

To obtain panel displays in imperial units, set switch 5 of S1 dip switch to open (note switch position closed for SI units).

Do not alter the position of the other 7 switches on the 8 way dip switch as this will cause incorrect operation and may damage the unit, invalidating its warranty. Switch positions are recorded by the microprocessor.

Figure 2 - Suction Pressure Safety Flow Chart

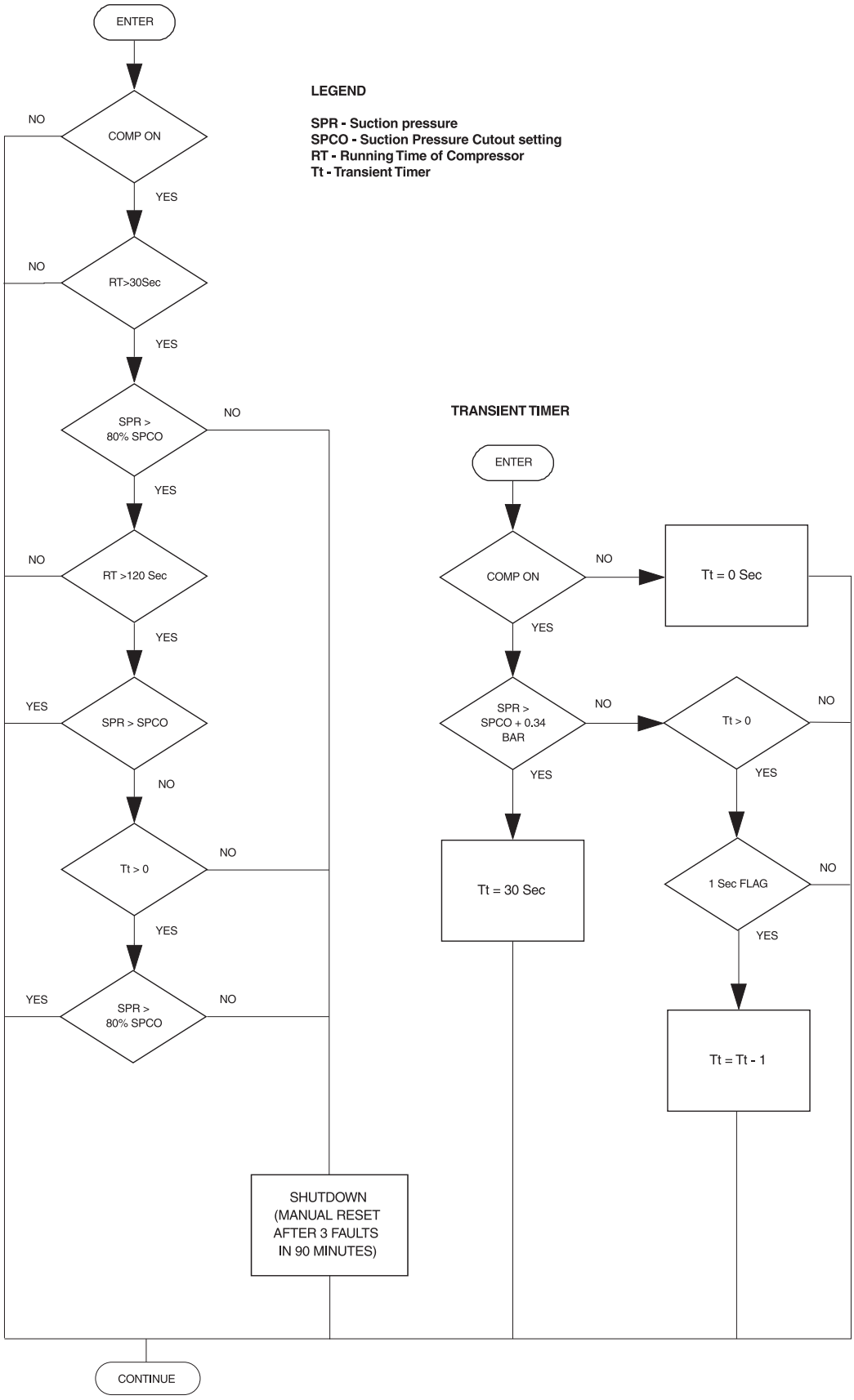


Figure 3 - Electronic Overload Flow Chart

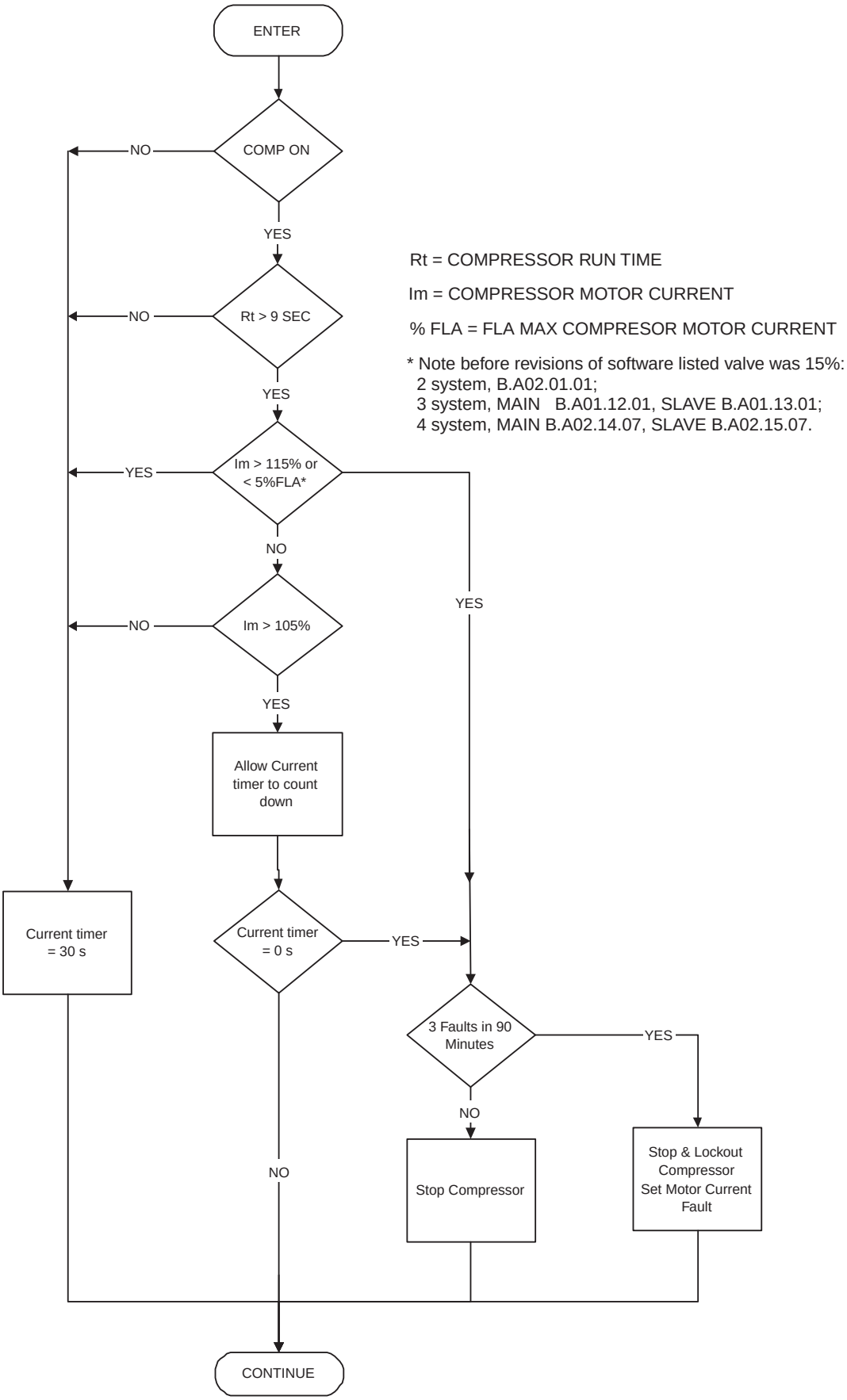


Figure 4 - Oil Pressure Safety Flow Chart

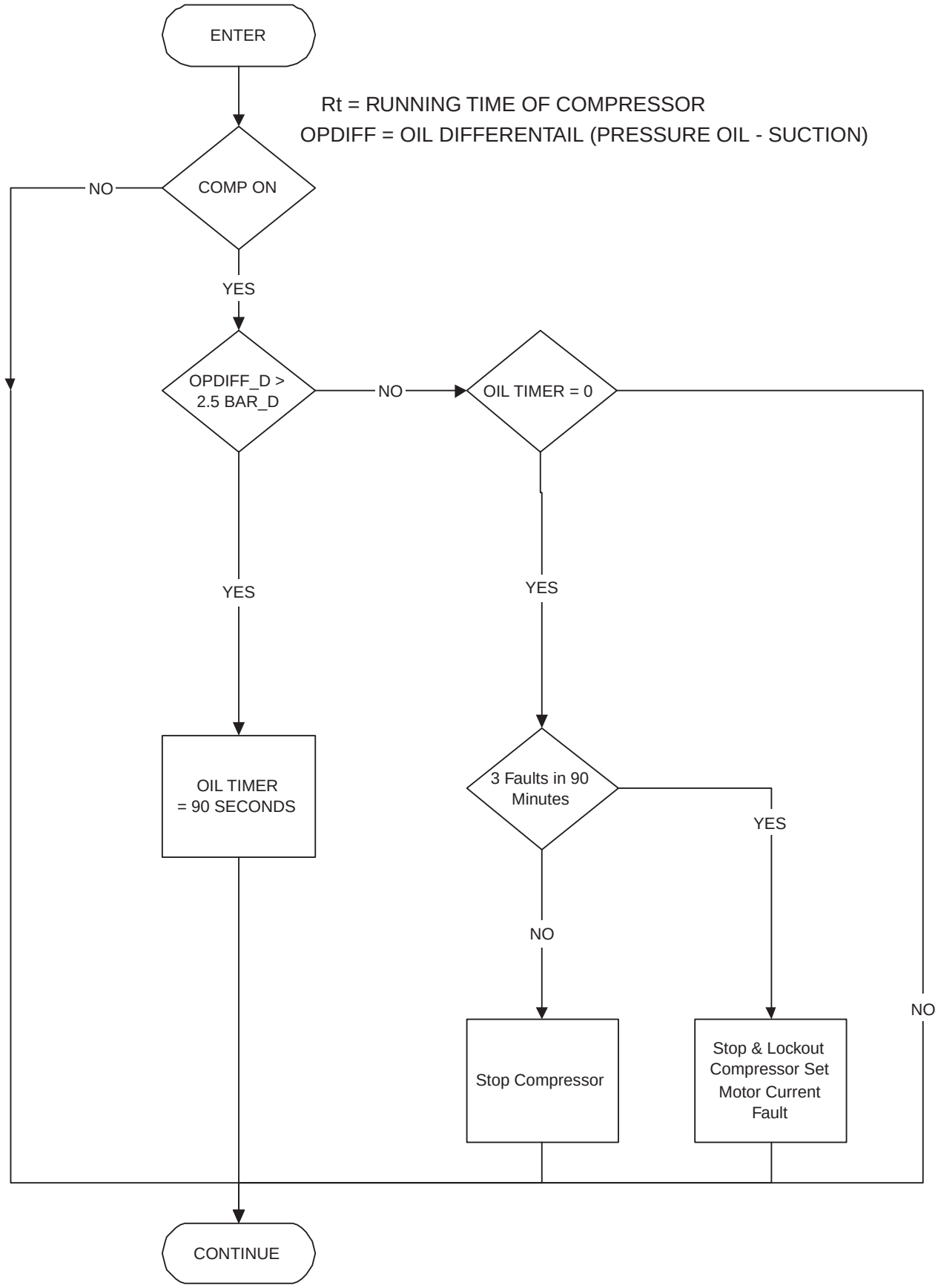


Figure 5 - Discharge/Current Unloading Flow Chart

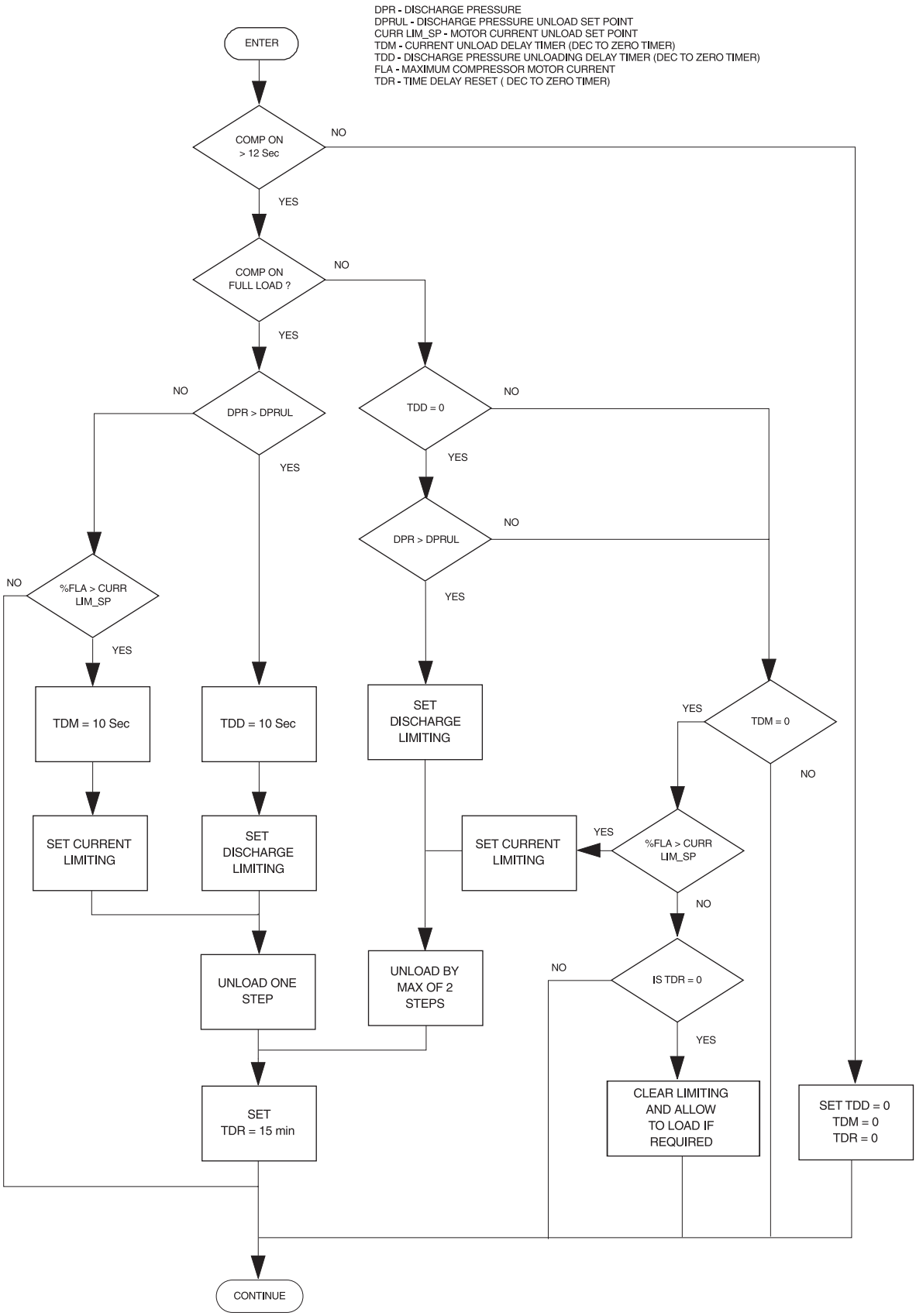


Figure 6 - High Oil Temperature Safety Flow Chart

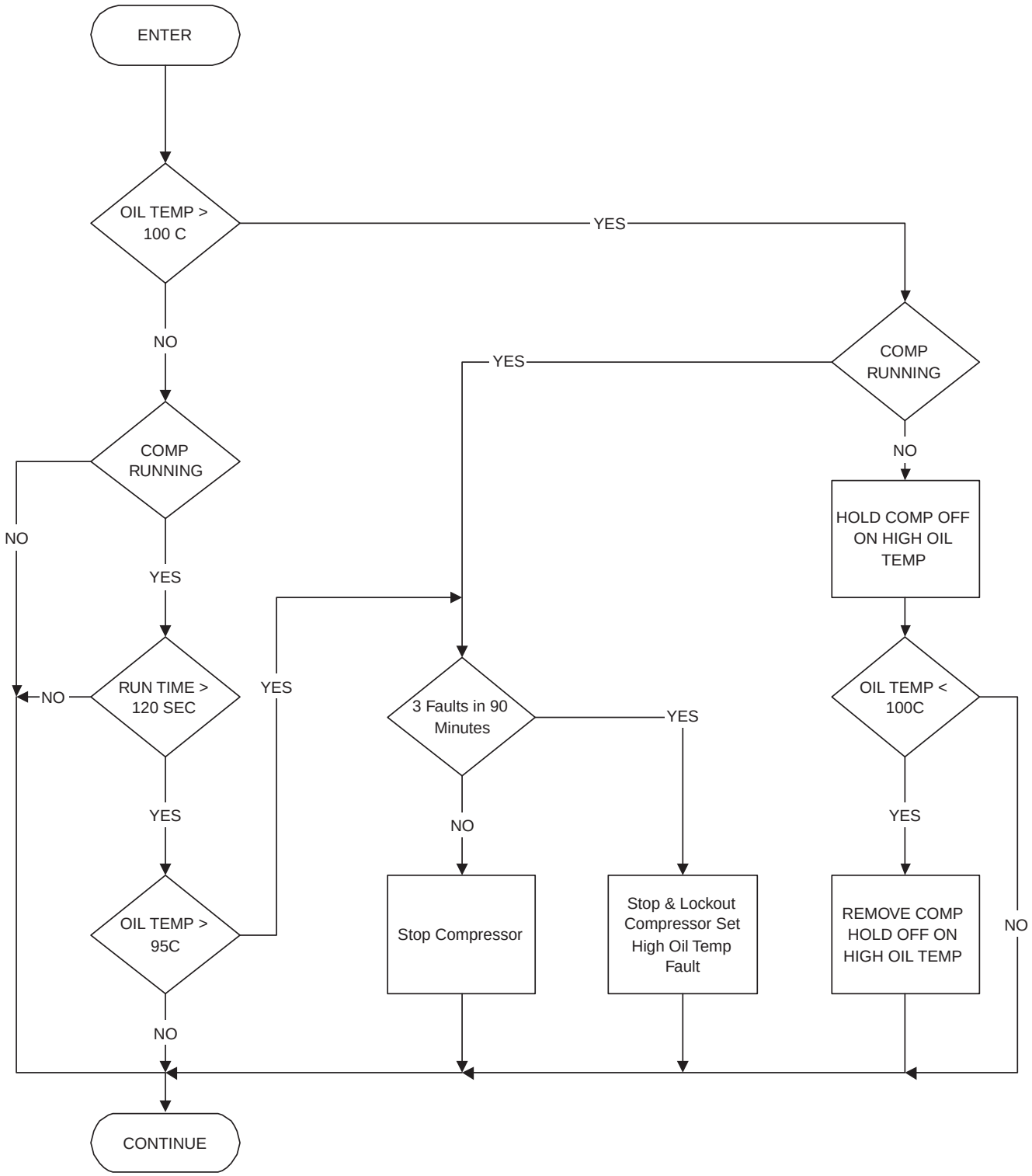


Figure 7 - Oil Temperature Inhibit Flow Chart

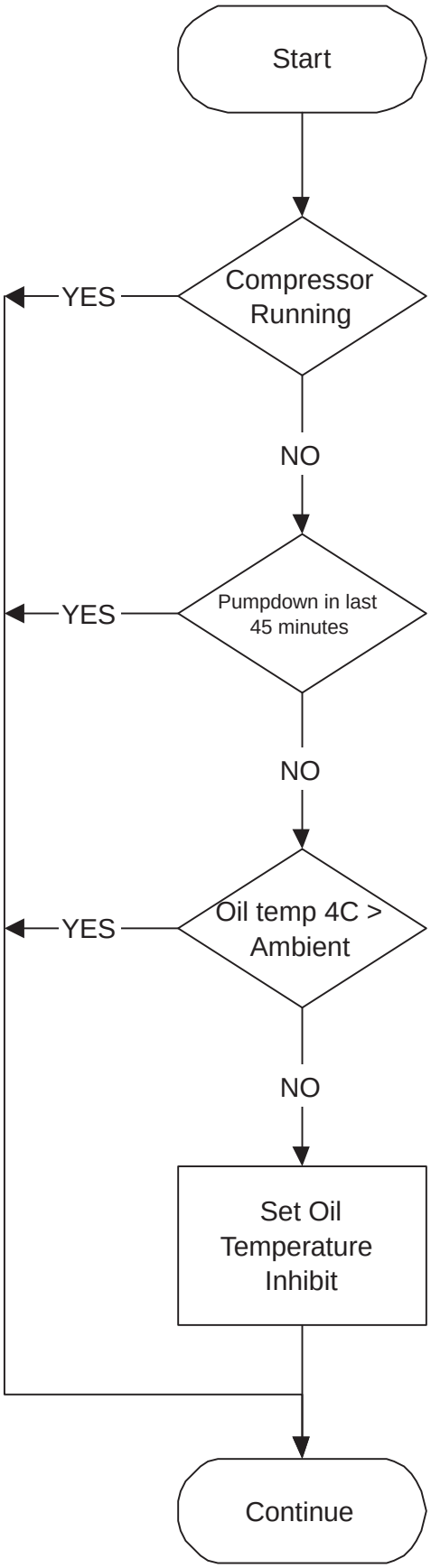


Figure 8 - Oil Level Safety Flow Chart

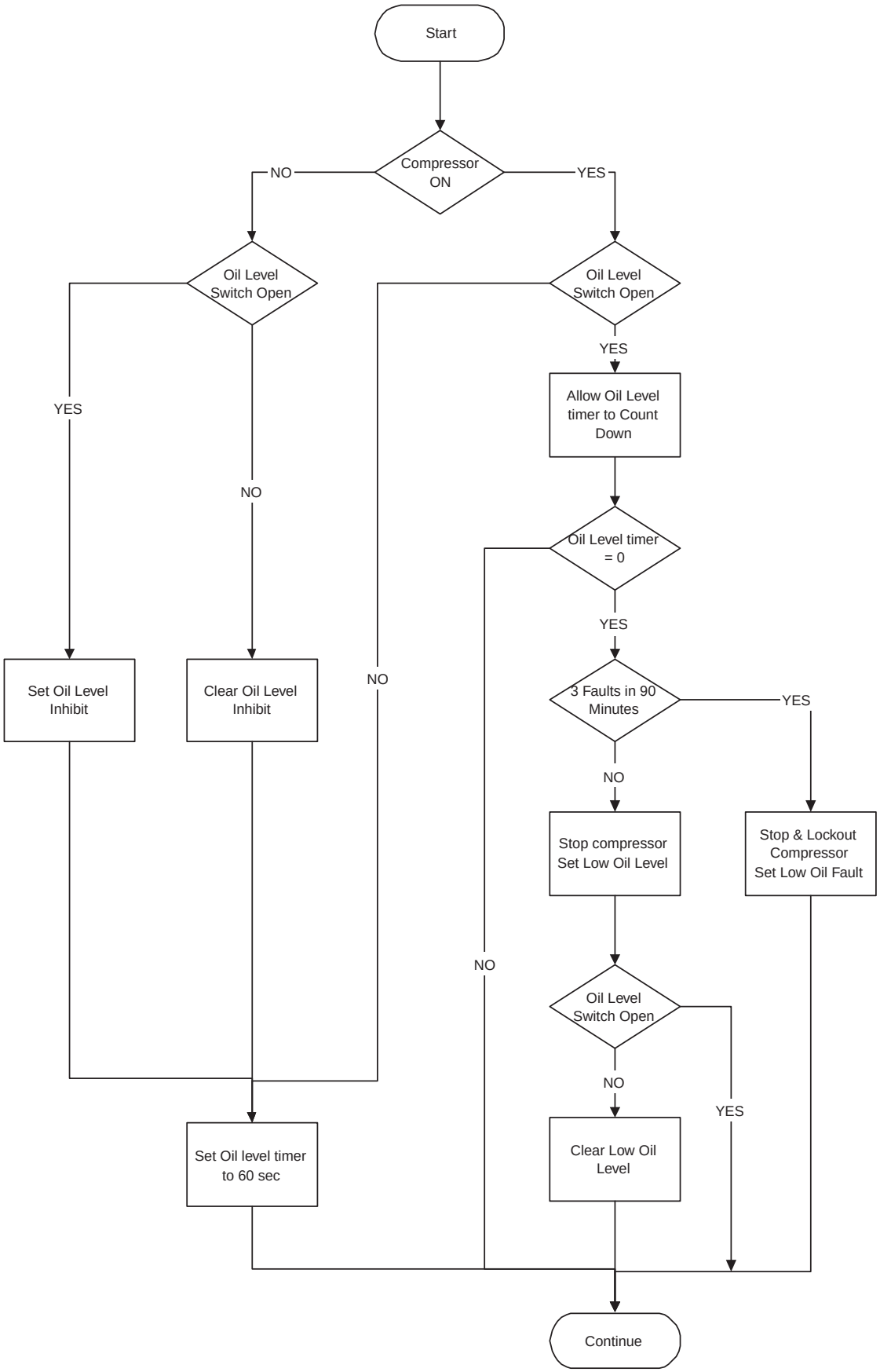
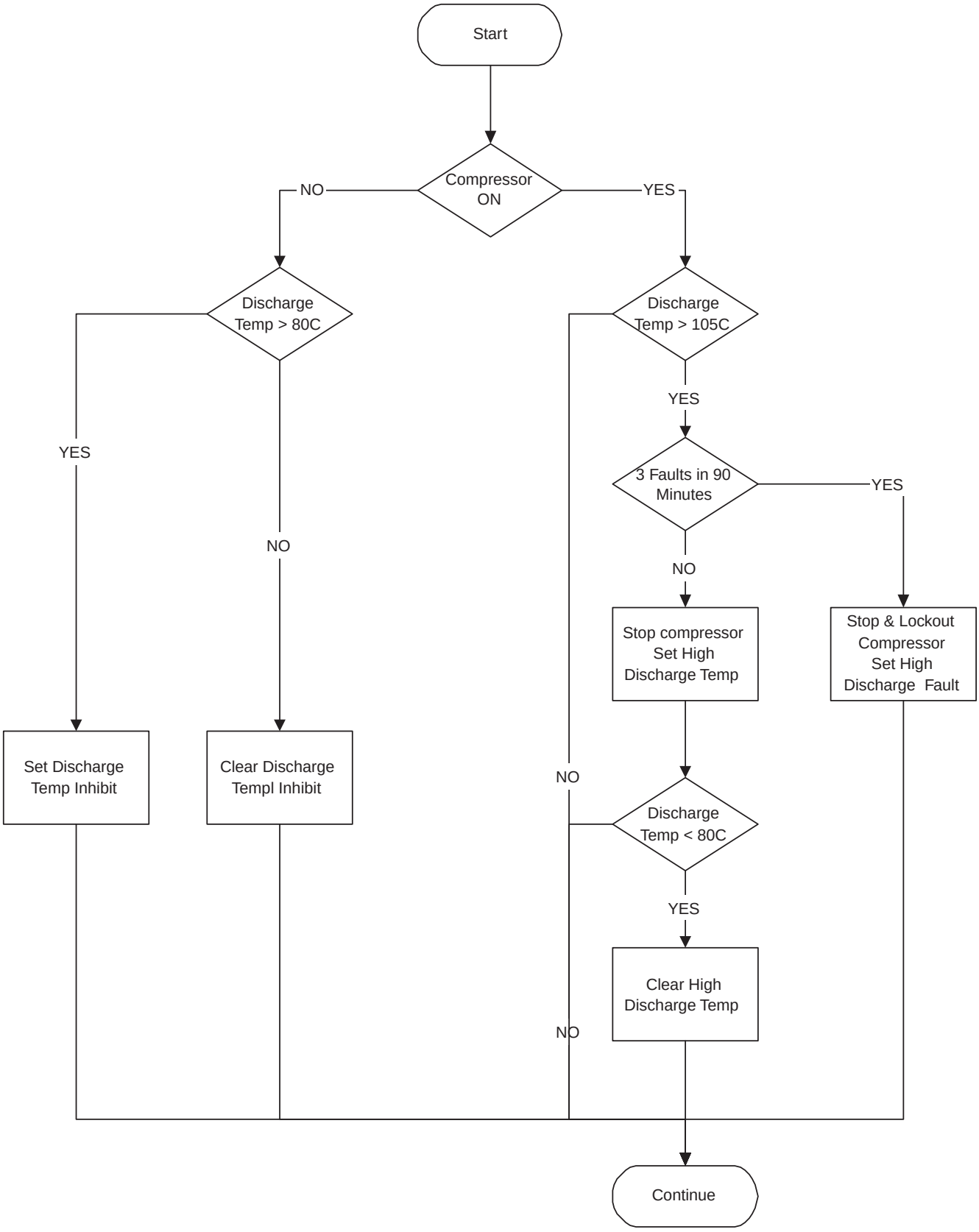
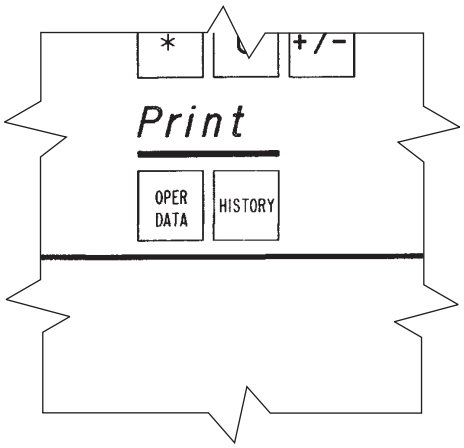


Figure 9 - High Discharge Temperature Safety Flow Chart





10 PRINT KEYS

10.1 General

The PRINT keys allow the operator to obtain a remote printout of real-time system operating data and a print out of system data at the “instant of the fault” on the last three faults which occurred on the chiller. If a remote printer is not being used, or the desire is to obtain data locally at the panel, the same keys allow access to identical fault data.

Identical and additional real-time information is available by using a combination of the PRINT keys and the other keys on the keypad. An explanation of the use of the keys for remote printer or local data retrieval will follow. An optional printer will be required for printout.

10.2 Remote Printout Oper Data

The OPER DATA key allows the operator to remotely obtain a printout of current system operating parameters. When the key is pressed, a snapshot will be taken of system operating conditions and panel programming selections. This data will be temporarily stored in memory and transmission of this data will begin to the remote printer. As the data is transmitted, it will be erased from memory. A printout is shown in Figure 10.

10.3 Remote Printout History

The HISTORY key allows the operator to remotely obtain a printout of information relating to the last 3 Safety Shutdowns which occurred. The information is stored at the instant of the fault regardless of whether the fault caused a lockout to occur. The information is also not affected by power failures (long term internal memory battery back-up is built into the circuit board) or manual resetting of a fault lock-out.

When the HISTORY key is pressed, a Printout is transmitted of all system operating conditions which were stored at the “instant the fault occurred” for each of the 3 SAFETY SHUTDOWN BUFFERS. There is one buffer (storage area) for data related to each of the last 3 safety shutdowns.

The printout will begin with the most recent fault which occurred. The most recent fault will always be stored as SAFETY SHUTDOWN NO. 1 (see printout Figure 11a). Identically formatted fault information will then be printed for SAFETY SHUTDOWN NO. 2 and SAFETY SHUTDOWN NO. 3 (see printouts Figures 11b and 11c).

There are three history buffers containing information on both systems. There is a total of three history buffers not 3 buffers per system. Thus on a fault, shutdown on say, No. 2 system, the normal operating condition of No. 1 system will also be recorded.

Information contained in the SAFETY SHUTDOWN Buffers is very important when attempting to troubleshoot a system problem. This data reflects the system conditions at the instant the fault occurred and often reveals other system conditions which actually caused the safety threshold to be exceeded. (See Figures 11a to 11c).

If the printer is left on-line when a safety shutdown occurs, an automatic printout of the safety shutdown buffers will result.

10.4 Local Display Readout Oper Data

The OPER DATA key also allows the user to scroll through additional real time display information about the chiller system which is not available from the DISPLAY keys. This information covers a wide range of data which includes fan status, loading status, liquid line solenoid status, run time, etc. When the OPER DATA key is pressed, the following message will appear:

PRESS ENTER TO DISPLAY DATA

Pressing the '*' key will give the following display:

SOFTWARE VERSION B.ACS.ZZ.YY

OR

SOFTWARE VERSION B.AXX.ZZ.YY

This shows the version of software the unit is operating on. Where:
B is the Product Classification and stands for Basildon unit
A or ACS is the Family Code
XX = The field Revision Number
ZZ = The Product Code
(01 or 11 = 2 System R134a Units)
(02 or 12 = 3 System R134a Main Units)
(03 or 13 = 3 System R134a Slave Units)
(04 or 14 = 4 System R134a Main Units)
(05 or 15 = 4 System R134a Slave Units)
YY = Version number

Pressing the ENTER key instead of the '*' gives the following message:

OPERDATA = 1 INPUTS/OUTPUTS = 2

The default entry is 1, thus pushing the ENTER key will allow the normal operational data to be viewed.

Repetitively pressing the ENTER key allows the operator to scroll through the available data.

Pushing 2 then ENTER key takes the operator into an input/output display which will be covered at the end of this section.

In the information that follows, a sample message along with an explanation of its meaning is provided for all messages.

LOAD TIMER 67 SEC

This message provides a real time display of the time left on load timer. The load timer is a constantly recycling timer that the microprocessor utilises in conjunction with RATE CONTROL and temperature deviation from SETPOINT to determine when loading should occur.

This timer, under certain conditions, can count faster than one count per second; display is only updated every two seconds.

YAES 4 System Units Only

LOAD TIMER MIXED 67 SEC

This message provides a real time display of the time left on the mixed load timer. The mixed load timer is a constantly recycling timer that the microprocessor utilises in conjunction with RATE CONTROL and temperature deviation from setpoint to determine when the value of MIXED TEMPERATURE DEMAND should be increased. This timer, under certain conditions, can count faster than one count per second; display is only updated every two seconds. The two load timers, one for the master and one for the slave, leaving water control strategies are not displayed.

UNLOAD TIMER 67 SEC

This message provides a real time display of the time left on the unload timer. The unload timer is a constantly recycling timer that the microprocessor utilises in conjunction with RATE CONTROL and temperature deviation from SETPOINT to determine when unloading should occur.

This timer under certain conditions can jump down to 20 seconds to reduce unload time. Display is only updated every two seconds.

YAES 4 System Units Only

```
UNLOAD TIMER
MIXED 67 SEC
```

This message provides a real time display of the time left on the mixed unload timer.The mixed unload timer is a constantly recycling timer that the microprocessor utilises in conjunction with RATE CONTROL and temperature deviation from setpoint to determine when the value of MIXED TEMPERATURE DEMAND should be decreased. This timer under certain conditions can jump down to 30 seconds to reduce unload time. Display is only updated every two seconds. The two unload timers, one for the master and one for the slave, leaving water control strategies are not displayed.

```
TEMPERATURE DEMAND
        3
```

Or on YAES 4 system units

```
MIXED TEMPERATURE
DEMAND     4
```

This message informs the operator of the number of stages required by the microprocessor but does not always show the number of steps obtained as other control features may prevent the loading of extra steps.

YAES 4 System Units Only

```
MASTER MAX LOAD = 7
SLAVE MAX LOAD = 7
```

This message informs the operator how the MIXED TEMPERATURE DEMAND is shared out to the master and slave microprocessors. These may add up to more than the MIXED TEMPERATURE DEMAND figure when a system step 1 is being skipped.

YAES 4 System Units Only

```
MAS TEMP MAX DEMAND = 6
SLA TEMP MAX DEMAND = 5
```

The Master Temperature Demand shows the operator the maximum number of steps allowed by the master leaving water control strategy (looking at No.1 cooler leaving temperature) in its attempt to equal the value of MASTER MAX LOAD determined by the mixed leaving water strategy. This does not always show the number of steps obtained as other control features may prevent the loading of extra steps. The Slave Temperature Demand shows the operator the maximum number of steps allowed by the slave leaving water control strategy (looking at No.2 cooler leaving temperature) in its attempt to equal the value of SLAVE MAX LOAD determined by the mixed leaving water strategy. This does not always show the number of steps obtained as other control features may prevent the loading of extra steps.

YAES 4 System Units Only

```
ACTUAL S1 = 3 S2 = 2
LOADED S3 = 2 S4 = 1
```

This message informs the operator of the actual steps of loading for each system.

```
TEMPERATURE RATE
        3.7 DEG C/MIN
```

This message provides a real time display of the average rate of change of leaving chilled water as seen by the microprocessor. A (-) or (+) sign is also shown to indicate a temperature fall or a temperature rise.

YAES 4 System Units Only

```
TEMP RATE : MIXED
2.8 DEG C / MIN
```

This message provides a real time display of the average mixed rate of change of leaving water as seen by the microprocessor. A (-) or (+) sign is also shown to indicate a temperature fall or a temperature rise. The values of the two temp rate calculations, one for the master and one for the slave, leaving water control strategies, are not displayed.

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

For 3 system units:

```
LEAD/LAG1/LAG2
SEQUENCE   3,1,2
```

For 4 system units

```
LEAD, LAG
MASTER 2, 1 SLAVE 3, 4
```

These messages inform the operator of the lead/lag sequence.

EVAPORATOR WATER PUMP STATUS ON

This message informs the operator that the microprocessor has commanded the auxiliary contacts (terminals on customer relay board) for the chilled water pump to close.

YAES UNIT only

EVAPORATOR HEATER STATUS OFF

This message informs the operator that the microprocessor senses the outdoor ambient temperature is below 2.2°C and is commanding the Evaporator Heater to turn on. Once turned on, the heater will turn off at 4.5°C.

On Glycol units the on temperature can be programmed under the PROGRAM key between 2.2°C and the leaving water temperature cut out setting.

CONDENSER WATER PUMP STATUS ON

This message informs the operator that the microprocessor has commanded the auxiliary contact (terminals on the customer relay board) for the condenser water pump YLCS units only, to close. Contact can also be used for a remote run signal for unit.

SYS 1 LIQUID LINE SOLENOID STATUS ON

“OFF”: SYS 1 Liquid Line Solenoid De-energised (Closed).
“ON”: SYS 1 Liquid Line Solenoid Energised (Open).

SYS 1 LIQUID INJECT ROTOR SV STATUS ON

Low temperature units only.

“OFF”: SYS 1 Liquid Injection Rotor Solenoid De-energised (Closed).

“ON”: SYS 1 Liquid Injection Rotor Solenoid Energised (Open).

SYS 1 ECONOMISER/TEV BYPASS SV STATUS ON

When fitted

"OFF" SYS 1 Economiser/TEV Bypass SV de-energised (Closed).

"ON" SYS 1 Economiser/TEV Bypass SV energised (Open).

SYS 1 STAGE OF LOADING 4

This message informs the operator of the number of stages of loading which are active on SYS 1.

YAES UNIT only

This message informs the operator on which stage of fan discharge pressure control SYS 1 is operating on. Refer to Data section.

Single speed fans

SYS 1 CONDENSER FANS STATUS OFF

Two speed fans

SYS1 FANS 1&4 = SLOW 2&3&5&6 = SLOW

SYS 1 PRESSURE EQUAL VALVE STATUS OFF

When fitted. This message shows when the microprocessor turns the starting bypass solenoid valve ON or OFF.

SYS 1 RUN TIME 0-0-26-38 D-H-M-S

The Run Time for SYS 1 since the last start is displayed.

SYS 2 LIQUID LINE SOLENOID STATUS ON

“OFF”: SYS 2 Liquid Line Solenoid De-energised (Closed).

“ON”: SYS 2 Liquid Line Solenoid Energised (Open).

SYS 2 LIQUID INJECT ROTOR SV STATUS ON

Low temperature units only.

“OFF”: SYS 2 Liquid Injection Rotor Solenoid De-energised (Closed).

"ON": SYS 2 Liquid Injection Rotor Solenoid Energised (Open).

```
SYS 2 ECONOMISER/TEV
BYPASS SV STATUS   ON
```

When fitted.

"OFF": SYS 2 Economiser/TEV Bypass SV de-energised (Closed).

"ON": SYS 2 Economiser/TEV Bypass SV energised (Open).

```
SYS 2 STAGES
OF LOADING      3
```

This message informs the operator of the number of stages of loading which are active on SYS 2.

YAES UNIT only

This message informs the operator on which stage of fan discharge pressure control SYS 2 is operating on. Refer to Data section.

```
SYS 2 CONDENSER FANS
STATUS          OFF
```

Two speed fans

```
SYS2 FANS       1&4 = SLOW
2&3&5&6 = SLOW
```

```
SYS 2 PRESSURE EQUAL
VALVE STATUS OFF
```

When fitted.This message shows when the micro turns the starting bypass solenoid valve on or off.

The valve is turned off by a contact on the compressor contactor not a microprocessor output.

```
SYS2 RUN TIME
0 - 0 - 3 - 28      D-H-M-S
```

The Run Time for SYS 2 since the last start displayed.

On YAES 3 system units the next press of the ENTER key displays system 3 data, then on YAES 4 system units 4 system data. Following the system data the display reads.

```
OPERDATA = 1
INPUTS/OUTPUTS = 2
```

If key 2 followed by the ENTER key is pressed and input/output display routine is entered. The display will read

```
DIGITAL INPUT 1
CLOSED
```

Or on YAES 3 & 4 system units

```
MASTER PANEL = 1
SLAVE PANEL = 2
```

Press 1 for main panel, 2 for slave panel, followed by the ENTER key.

Repetitively pressing the ENTER key allows the operator to scroll through all eight digital inputs, showing there state OPEN or CLOSED. Following the input state further ENTER key pushes will display.

```
DIGITAL OUTPUT 01
OFF
```

Repetitively pressing the ENTER key allows the operator to scroll through all 32 digital outputs, showing their state ON or OFF.

Input and output tables are provided in the Data Section.

For inputs these tables show the device description, relay board input terminals or input plugs -XP, relay board output plugs -XP, microboard input, plug J and input devices.

For outputs the tables show the path between microprocessor and final controlled device. The output numbers are followed by the device descriptions, input relay board plug -XP, output microprocessor J plug number, the output relay plug number -XP, the relay board output relay number -K and finally the output device.

10.5 Local Display Readout History

The HISTORY key also allows the user to scroll through the SAFETY SHUTDOWN buffers to display information relating to the last 3 Safety Shutdowns which occurred.

The three history buffers contain information on both systems. There is a total of 3 history buffers not 3 buffers per system. Thus on a fault shutdown on say No. 2 system the normal operating condition of No.'s 1, system will also be recorded.

Information contained in the SAFETY SHUTDOWN Buffers is very important when attempting to troubleshoot a system problem. This data reflects system conditions at the instant the fault occurred.

Information is stored in the SAFETY SHUTDOWN Buffers on every fault regardless of whether the fault caused a lockout to occur. The information is also not affected by power failures (long term internal memory battery back-up is built into the circuit board) or manual resetting of a fault lock-out.

When the HISTORY key is pressed, the following message will appear:

SAFETY SHUTDOWN
NUMBER 1

The operator must then select which SAFETY SHUTDOWN Buffer is desired. When deciding this, keep in mind that Buffer No. 1 is always the most recent fault. As new fault information is stored, it is always placed in Buffer No. 1, No. 1 is loaded to No. 2, No. 2 is loaded to No. 3, and information previously in No. 3 is discarded.

To select a buffer, simply press the "1", "2", or "3" key and press ENTER. Repetitively pressing the ENTER key will allow the operator to scroll through the information available in the SAFETY SHUTDOWN Buffer.

In the information that follows, a sample message along with an explanation is provided for all available messages:

SHUTDOWN OCCURRED
10:39AM 18/03/97

This message informs the operator of the time and date of the fault.

SYS#1 NO FAULTS
SYS#2 NO FAULTS

This message informs the operator of the nature of the fault which occurred.

LEAVING WATER TEMP
6.4 DEG C

This message indicates the Leaving Water Temperature at the time of the fault.

Or on YAES 4 system units

LEAVING WATER TEMP1
6.4 DEG C

and

LEAVING WATER TEMP2
6.1 DEG C

and

MIXED WATER TEMP
6.4 DEG C

Where Leaving Water Temp 1 is master cooler leaving temperature (systems 1 and 2), Leaving Water Temp 2 is slave cooler leaving temperature (systems 3 and 4) and Mixed Water Temp is the mixed leaving water temperature, all at time of the fault.

LOW WATER CUTOUT
2.2 DEG C

This display shows the Low Water Cutout (Leaving) which was programmed at the time of the fault.

SETPOINT TEMP
5.0 DEG C

This display shows the Setpoint Temp which was programmed at the time of the fault.

OUTSIDE AIR TEMP
5.2 DEG C

This message indicates the Ambient Temperature at the time of the fault.

LOW AMBIENT CUTOUT
-3.9 DEG C

This display shows the Low Ambient Cutout programmed at the time of the fault.

LOW PRESSURE CUTOUT
3.30 BAR G

This display shows the Low Pressure Cutout programmed at the time of the fault.

```
LEAD SYSTEM
SYS 1
```

For 3 system units:

```
LEAD/LAG1/LAG2
SEQUENCE 3,1,2
```

For 4 system units

```
LEAD, LAG
MASTER 2, 1 SLAVE 3, 4
```

This message indicates which system was in the lead at the time of the fault.

```
LOCAL REMOTE SETTING
REMOTE
```

This message should always read “REMOTE”, but can read “LOCAL” if connected to a York I.S.N Network on some applications.

```
COOLING RANGE
5.0 TO 7.0 DEG C
```

This message shows the cooling range (Control Range CR) which was selected at the time of the fault.

```
SYS 1 COMPRESSOR
ON
```

This message indicates whether Compressor 1 was ON or OFF at the time of the fault.

```
SYS 1 MOTOR AMPS
97 AMPS
```

This message indicates SYS 1 motor current at the time of the fault.

```
SYS 1 OIL TEMP
47 DEG C
```

This display shows the oil temperature of SYS 1 at the time of the fault.

```
SYS 1 DISCHARGE TEMP
50 DEG C
```

This display shows the discharge temperature of SYS 1 at the time of the fault.

```
SYS 1 SUCTION PRESS
5.59 BAR G
```

This display shows the suction pressure of SYS 1 at the time of the fault.

```
SYS 1 DSCH PRESS
17.76 BAR G
```

This message indicates SYS 1 discharge pressure at the time of the fault.

```
SYS 1 OIL PRESSURE
6.01 BAR D
```

This display shows the oil pressure of SYS 1 at the time of the fault.

```
SYS 1 LIQ LINE
ON
```

This display informs the operator whether SYS 1 liquid line solenoid was energised (ON) or de-energised (OFF) at the time of the fault.

```
SYS 1 LIQUID INJECT
ROTOR STATUS ON
```

On low temperature units only this message informs the operator whether SYS 1 liquid injection rotor valve was energised (ON) or de-energised (OFF) at the time of the fault.

```
SYS 1 ECONOMISER/TEV
BYPASS SV STATUS ON
```

When fitted this message informs the operator whether SYS 1 Economiser/TEV Bypass SV de-energised was energised (ON) or de-energised (OFF) at the time of the fault.

```
SYS 1 RUN PERMISSIVE
ON
```

This message informs the operator if SYS 1 Run Permissive (flow switch, remote Auto/Off) was in the RUN mode (ON) or (STOP) mode (OFF).

```
SYS 1 LOADING STAGES
2
```

This message indicates the number of stages which were loaded on SYS 1 at the time of the fault.

YAES UNITS ONLY

```
SYS 1 COND FANS
3
```

This display indicates the number of fan stages on SYS 1 which were on at the time of the fault.

SYS 1 RUN TIME
0-0-8-13 D-H-M-S

This message indicates runtime since last start up to fault on SYS1.

SYS 1 PRS EQ VALVE
OFF

If fitted this message indicates whether SYS1 pressure equalising (starting bypass) solenoid is on or off at time of fault.

SYS 2 COMPRESSOR
ON

This message indicates whether Compressor 2 was ON or OFF at the time of the fault.

SYS 2 MOTOR AMPS
127 AMPS

This message indicates SYS 2 motor current at the time of the fault.

SYS 2 OIL TEMP
34 DEG C

This message indicates SYS 2 oil temperature at the time of the fault.

SYS 2 DISCHARGE TEMP
50 DEG C

This display shows the discharge temperature of SYS 2 at the time of the fault.

SYS 2 SUCTION PRESS
5.38 BAR G

This display shows the suction pressure of SYS 2 at the time of the fault.

SYS 2 DSCH PRESSURE
14.2 BAR G

This message indicates SYS 2 discharge pressure at the time of the fault.

SYS 2 OIL PRESSURE
7.65 BAR G

This display shows the oil pressure of SYS 2 at the time of the fault.

SYS 2 LIQ LINE
ON

This display informs the operator whether SYS 2 liquid line solenoid was energised (ON) or de-energised (OFF) at the time of the fault.

SYS 2 LIQUID INJECT
ROTOR STATUS ON

On low temperature units only this message informs the operator whether SYS 2 liquid injection rotor valve was energised (ON) or de-energised (OFF) at the time of the fault.

SYS 2 ECONOMISER/TEV
BYPASS SV STATUS ON

When fitted this message informs the operator whether SYS 2 Economiser/TEV Bypass SV de-energised was energised (ON) or de-energised (OFF) at the time of the fault.

SYS 2 RUN PERMISSIVE
ON

This message informs the operator if SYS 2 Run Permissive (flow switch, remote START/STOP) was in the Run Mode (ON) or STOP mode (OFF).

SYS 2 LOADING STAGES
3

This message indicates the number of stages which were loaded on SYS 2 at the time of the fault. Refer to Data section.

YAES UNITS ONLY

SYS 2 COND FANS
3

This display indicates on which stage of fan discharge pressure control SYS 2 was on at the time of the fault.

SYS 2 RUN TIME
0 - 0 - 1 - 7 D-H-M-S

This message indicates run time since last start up to fault on SYS 2

SYS 2 PRS EQ VALVE
OFF

If fitted this message indicates whether SYS 2 pressure equalising (starting bypass) solenoid is on or off at time of fault.

On YAES 3 system units the next press of the ENTER key displays system 3 data.

10.6 Memory Battery Back-up

The Microprocessor Board contains a Real Time Clock (RTC) I.C. Chip with an internal battery back-up. The battery back-up assures that any programmed values, clock, all fault information, accumulated information such as starts/run time, etc. stored in the RTC memory is not lost when a power failure occurs regardless of the time period.

The battery is a 10-year lithium type. The life of the battery with power removed will depend upon whether the Real Time Clock's internal clock circuit is energised. With the clock OFF, approximately 10 years can be expected, with the clock ON, approximately 5 years.

The clock is turned ON and OFF by a jumper on the Microprocessor Board. While a chiller is operating, the clock must be ON. Otherwise the internal clock on the microprocessor will not be active and the microprocessor cannot keep track of time, although all other functions will operate normally.

This could result in the chiller not starting due to the time frozen on the clock falling outside the START/STOP time window that is programmed in the DAILY SCHEDULE.

If the chiller is shut-down for extended periods of months, it may be desirable to disable the clock to save battery life. The clock can then be reactivated and reprogrammed when the chiller is returned to service.

All Programmed Values and Stored Data, other than the Internal Clock Time-Keeping, Will be maintained in Memory regardless of whether the Clock is On or Off and regardless of the length of the power failure.

To disable the clock, place the jumper (refer to Logic Section) in the OFF position. To activate it, place the jumper in the ON position.

On power-up, the microprocessor will check the Real Time Clock (RTC Chip) battery to assure that the internal battery is still operational. This is accomplished by performing an RTC RAM location check. As long as the battery checks out, the microprocessor will continue on with business without interruption.

If a check is made and the battery has failed, the microprocessor will not allow the chiller to run and the following STATUS message will appear:

!!WARNING!!
!!LOW BATTERY!!

The only way to run the chiller is to press the MANUAL OVERRIDE key. Under low battery conditions, the manual override key will function differently than it normally does in service situations where it overrides the daily schedule for only 30 minutes.

In a low battery condition, the MANUAL OVERRIDE key will zero out the daily schedule to allow unlimited operation regardless of the time on the internal clock. Default values will also be loaded into memory for all setpoints and cutouts. These may require reprogramming to assure they meet chiller operating requirements. In addition, the low battery message which is displayed for this condition will disappear.

If a power failure should again occur, the above process will again need to be repeated to bring the chiller back on line.

In the unlikely event the low battery message should ever appear, it will require the RTC Chip U13 on the Microprocessor Board (Refer to Logic Section) to be replaced.

Care should be taken to assure that the chip is properly installed. Pin 1 (dimple in the top of the chip) must be oriented as shown (Refer to Logic Section).

Figure 10 - Typical System Status

```
 YORK INTERNATIONAL CORPORATION
     SCREW LIQUID CHILLERS
      ISN OPTION ENABLED

SOFTWARE VERSION     B.A15.62.00

         SYSTEM STATUS
       10:29PM  03/04/04

SYS 1          COMPRESSOR RUNNING
SYS 2   SYS SWITCH IS TURNED OFF

LEAVING WATER TEMP     21.4 DEGC
LOW WATER CUTOUT        2.2 DEGC
SETPOINT TEMP           7.8 DEGC
OUTSIDE AIR TEMP       34.6 DEGC
LOW AMBIENT CUTOUT    -18.0 DEGC
LOW PRESSURE CUTOUT    1.50 BARG
LEAD SYSTEM                SYS 1
LOCAL REMOTE SETTING      REMOTE
REFRIGERANT TYPE           R134A
COOLING RANGE   7.8 TO  8.9 DEGC
COOLING RANGE   7.8 TO  8.9 DEGC

         SYSTEM 1 DATA

COMPRESSOR STATUS             ON
MOTOR AMPS               196 AMPS
OIL TEMPERATURE         44.8 DEGC
DISCHARGE TEMPERATURE   54.7 DEGC
SUCTION PRESSURE        5.67 BARG
DISCHARGE PRESSURE     14.10 BARG
OIL PRESSURE           17.93 BARD
LIQUID LINE SOLENOID          ON
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              4
FAN       SLOW FAN SPEED INHIBIT
RUN TIME      2-20-16-25 D-H-M-S
PRESSURE EQUAL VALVE         OFF

         SYSTEM 2 DATA

COMPRESSOR STATUS             OFF
MOTOR AMPS                93 AMPS
OIL TEMPERATURE         74.1 DEGC
DISCHARGE TEMPERATURE   65.0 DEGC
SUCTION PRESSURE        6.72 BARG
DISCHARGE PRESSURE      4.93 BARG
OIL PRESSURE           18.83 BARD
LIQUID LINE SOLENOID          OFF
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              0
FAN                1=OFF  2=OFF
RUN TIME      0- 0- 0- 0 D-H-M-S
PRESSURE EQUAL VALVE         OFF


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

Figure 11a - Typical Safety Shutdown No. 1

```
 YORK INTERNATIONAL CORPORATION
     SCREW LIQUID CHILLERS
      ISN OPTION ENABLED

SOFTWARE VERSION     B.A15.62.00

   SAFETY SHUTDOWN NUMBER 1
  SHUTDOWN @ 1:41AM  05/04/04

SYS 1  LOW OIL PRESSURE SHUTDOWN
SYS 2 STATUS:           NO FAULTS

LEAVING WATER TEMP      3.9 DEGC
LOW WATER CUTOUT        2.2 DEGC
SETPOINT TEMP           7.2 DEGC
OUTSIDE AIR TEMP       34.6 DEGC
LOW AMBIENT CUTOUT    -18.0 DEGC
LOW PRESSURE CUTOUT    1.50 BARG
LEAD SYSTEM                SYS 1
LOCAL REMOTE SETTING       LOCAL
REFRIGERANT TYPE           R134A
COOLING RANGE   7.2 TO  8.3 DEGC
COOLING RANGE   7.2 TO  8.3 DEGC

         SYSTEM 1 DATA

COMPRESSOR STATUS             ON
MOTOR AMPS               196 AMPS
OIL TEMPERATURE         94.7 DEGC
DISCHARGE TEMPERATURE   54.7 DEGC
SUCTION PRESSURE        5.54 BARG
DISCHARGE PRESSURE     14.10 BARG
OIL PRESSURE            2.07 BARD
LIQUID LINE SOLENOID          ON
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              2
FAN                1=SLOW 2=OFF
RUN TIME      0- 0- 1-12 D-H-M-S
PRESSURE EQUAL VALVE         OFF

         SYSTEM 2 DATA

COMPRESSOR STATUS             OFF
MOTOR AMPS                93 AMPS
OIL TEMPERATURE         74.1 DEGC
DISCHARGE TEMPERATURE   65.0 DEGC
SUCTION PRESSURE        6.73 BARG
DISCHARGE PRESSURE       .00 BARG
OIL PRESSURE           18.83 BARD
LIQUID LINE SOLENOID          OFF
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              0
FAN                1=OFF  2=OFF
RUN TIME      0- 0- 0- 0 D-H-M-S
PRESSURE EQUAL VALVE         OFF
```

Figure 11b - Typical Safety Shutdown No. 2

```
 YORK INTERNATIONAL CORPORATION
     SCREW LIQUID CHILLERS
      ISN OPTION ENABLED

SOFTWARE VERSION     B.A15.62.00

   SAFETY SHUTDOWN NUMBER 2
  SHUTDOWN @ 1:38AM  03/04/04

SYS 1     HIGH OIL TEMP SHUTDOWN
SYS 2 STATUS:           NO FAULTS

LEAVING WATER TEMP      10.1 DEGC
LOW WATER CUTOUT         2.2 DEGC
SETPOINT TEMP            7.2 DEGC
OUTSIDE AIR TEMP        34.6 DEGC
LOW AMBIENT CUTOUT     -18.0 DEGC
LOW PRESSURE CUTOUT     1.50 BARG
LEAD SYSTEM                SYS 1
LOCAL REMOTE SETTING       LOCAL
REFRIGERANT TYPE           R134A
COOLING RANGE   7.2 TO  8.3 DEGC
COOLING RANGE   7.2 TO  8.3 DEGC

         SYSTEM 1 DATA

COMPRESSOR STATUS             ON
MOTOR AMPS               196 AMPS
OIL TEMPERATURE         94.6 DEGC
DISCHARGE TEMPERATURE   54.7 DEGC
SUCTION PRESSURE        5.54 BARG
DISCHARGE PRESSURE     14.10 BARG
OIL PRESSURE           18.07 BARD
LIQUID LINE SOLENOID          ON
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              2
FAN       SLOW FAN SPEED INHIBIT
RUN TIME      0- 0- 2- 3 D-H-M-S
PRESSURE EQUAL VALVE         OFF

         SYSTEM 2 DATA

COMPRESSOR STATUS            OFF
MOTOR AMPS                93 AMPS
OIL TEMPERATURE         74.1 DEGC
DISCHARGE TEMPERATURE   65.0 DEGC
SUCTION PRESSURE        6.72 BARG
DISCHARGE PRESSURE      4.93 BARG
OIL PRESSURE           18.83 BARD
LIQUID LINE SOLENOID         OFF
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              0
FAN                 1=OFF  2=OFF
RUN TIME      0- 0- 0- 0 D-H-M-S
PRESSURE EQUAL VALVE         OFF
```

Figure 11c - Typical Safety Shutdown No. 3

```
 YORK INTERNATIONAL CORPORATION
     SCREW LIQUID CHILLERS
      ISN OPTION ENABLED

SOFTWARE VERSION     B.A15.62.00

   SAFETY SHUTDOWN NUMBER 3
  SHUTDOWN @ 3:32PM  02/04/04

SYS 1     HIGH OIL TEMP SHUTDOWN
SYS 2 STATUS:           NO FAULTS

LEAVING WATER TEMP       9.6 DEGC
LOW WATER CUTOUT         2.2 DEGC
SETPOINT TEMP            6.2 DEGC
OUTSIDE AIR TEMP        34.6 DEGC
LOW AMBIENT CUTOUT     -18.0 DEGC
LOW PRESSURE CUTOUT     1.50 BARG
LEAD SYSTEM                SYS 1
LOCAL REMOTE SETTING        REMOTE
REFRIGERANT TYPE           R134A
COOLING RANGE   6.2 TO  7.3 DEGC
COOLING RANGE   6.2 TO  7.3 DEGC

         SYSTEM 1 DATA

COMPRESSOR STATUS             ON
MOTOR AMPS               196 AMPS
OIL TEMPERATURE         114.2 DEGC
DISCHARGE TEMPERATURE   54.7 DEGC
SUCTION PRESSURE        5.54 BARG
DISCHARGE PRESSURE     12.36 BARG
OIL PRESSURE           18.14 BARD
LIQUID LINE SOLENOID         OFF
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              2
FAN                1=SLOW 2=OFF
RUN TIME      0- 0- 0-14 D-H-M-S
PRESSURE EQUAL VALVE         OFF

         SYSTEM 2 DATA

COMPRESSOR STATUS            OFF
MOTOR AMPS                93 AMPS
OIL TEMPERATURE         74.1 DEGC
DISCHARGE TEMPERATURE   65.0 DEGC
SUCTION PRESSURE        1.43 BARG
DISCHARGE PRESSURE       .00 BARG
OIL PRESSURE           18.83 BARD
LIQUID LINE SOLENOID         OFF
LIQUID INJECT ROTOR SOLENOID OFF
LIQUID INJECT MOTOR SOLENOID OFF
RUN PERMISSIVE                ON
STAGES OF LOADING              0
FAN                 1=OFF  2=OFF
RUN TIME      0- 0- 0- 0 D-H-M-S
```

11 SYSTEM COMPONENTS

11.1 Control Panel

No controls (Relays etc.) should be mounted in any section of the control panels. Additionally control wiring not connected to the York Control Panel should not be run through the Control Panel. If these precautions are not followed, electrical noise could cause malfunctions or damage to the unit and its controls.

11.2 Remote Emergency Stop Device

A remote emergency stop device can be connected to terminals 3 and 4 after removing a link. When operated it removes the 220/230 V control supply and supply to the electronics. All devices are de-energised including compressor and on YAES units fan contractors. The loss of supply to the Power Board results in the display going off.

To conform with the requirement of EN 418 and EN 60204-1 that re-setting the emergency stop device will not initiate a restart, MANUAL RESTART should be programmed under the PROGRAM key. MANUAL RESTART requires a reset using the unit 1/0 (AUTO/OFF) switch on the control section door.

On YAES 3 and 4 system units opening a remote emergency stop device terminals 3 and 4 in the main panel only stops systems 1 and 2. To stop system 3/4 a second contact is required wired to terminals 3 and 4 in the slave panel.

11.3 Voltage Free Contacts

All wiring to the control section voltage free contacts terminal block on the ARB board requires a supply provided by the customer maximum voltage 254 Vac, 28 Vdc. The customer must take particular care deriving the supplies for the voltage free terminals with regard to a common point of isolation. Thus, these circuits when used must be fed via the common point of isolation so the voltage to these circuits is removed when the common point of isolation to the unit is opened. This common point of isolation is not supplied by York.

In accordance with EN 60204 it is recommended that the customer wiring to these terminals uses orange wires. This will ensure that circuits not switched off by the units supply disconnecting device are distinguished by colour, so that they can easily be identified as live even when the unit disconnecting devices are off.

The York voltage free contacts are rated at 125 VA.

All inductive devices (relays) switched by the York voltage free contacts must have their coil suppressed using standard R/C suppressors. If these precautions are not followed, electrical noise could cause malfunctions or damage to the unit and its controls.

11.4 Alarm Contacts

Each system has a voltage free change over contact which will operate to signal an alarm condition whenever a system locks out or there is a power failure. To obtain a system alarm signal, connect alarm circuit to voltage free terminals 32 and 31 close on alarm or 32 and 30 open on alarm for No. 1 system and terminals 39 and 38 close on alarm or 39 and 37 opens on alarm for No.2 system.

On YAES 3 and 4 system units to obtain a system 3 alarm signal connect alarm circuit to voltage free terminals 32 and 31 close on alarm or 32 and 30 open on alarm in the slave panel. On YAES 4 system units to obtain a system 4 alarm signal connect alarm circuit to voltage free terminals 39 and 38 close on alarm or 39 and 37 open on alarm in the slave panel.

11.5 Chilled Liquid Pump Contact

York provides a voltage free contact terminals 33 and 34 which close to start a pump. This contact can be used as a master start/stop for the pump in conjunction with the daily start/stop schedule. If no schedule is set and the customer has master control of the pump, the York contact must be used to override the customer master start/stop so that the York contact can start the pump in the event of a low temperate liquid condition.

11.6 Run Contact

York provides a run contact which closes terminals 35 & 36 to indicate that the unit is running. This contact closes when any system runs. On YLCS units this contact can be used to start the condenser pump or fan.

11.7 Customer Voltage Free Contacts

All wiring to the customer terminal blocks on the ARB board are nominal 30 Vdc and must be run in screened cable, with the screen earthed at panel end only. Run screen cable separately from mains cable to avoid electrical noise pick-up. Use the gland plate on the back/side or bottom (dependant on unit type) of the control section to avoid the mains cables.

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

If voltage free contacts form part of a relay or contactor, the coil of this device must be suppressed by using a standard R/C suppressor.

The above precautions must be taken to avoid electrical noise which could cause a malfunction or damage to the units and its controls.

The microprocessor based control system can accept remote signals to start and stop the chiller and to adjust the chilled liquid leaving temperature setpoint and remotely unload each system. On units fitted with two speed fans, remote fan full speed inhibit. These functions can easily be controlled by connecting user supplied 'voltage free' contacts to the customer terminals on the relay board.

11.8 Remote Start/Stop

Remote start/stop can be accomplished using a time clock, manual contact or other 'voltage free' contact, terminals 11 and 14 with terminals 14 and 15 linked in the control section of the control panel. On YAES 3 and 4 system units a second contact is required connected to terminals 11 and 14 with on 4 system units terminals 14 and 15 linked in the slave panel. The contact must be closed to allow the chiller to run. Any time the contact opens, the chiller will shutdown and the 'NO RUN PERM' message will be displayed.

For individual system start stop contacts connect No1 system to terminals 11 and 14 and No2 system to terminals 12 and 15. On YAES 3 and 4 system units connect a contact to terminals 11 and 14 in the slave panel for system 3 remote stop/start. On YAES 4 system units connect a contact to terminals 12 and 15 in the slave panel for system 4 remote stop/start. With the associated contact open the 'NO RUN PERM' message will be displayed and the associated systems will not run.

11.9 Flow Switch

The customer must wire a chilled liquid flow switch into terminals 13 -10 to provide adequate protection against loss of flow.

On YAES 3 system units a flow switch with two separate normally open contacts or two separate flow switches are required, the second contact wired to terminals 10 & 13 in the slave panel.

On YAES 4 system units a second flow switches is required. One connected to the main panel as above for main cooler (systems 1 and 2) and a second flow switch connected to the slave panel terminals 10 & 13 for slave cooler (systems 3 and 4).

The flow switch should never be by-passed. This will cause damage to the chiller and invalidate the warranty.

11.10 Remote Unloading (Feature not available when Remote Setpoint Reset is used)

This feature is inoperative if the unit is connected to an I.S.N network and under the OPTIONS key message 3 is local control mode.

The microprocessor is capable of remote unloading or Pull-down demand limiting in two steps.

The first contact imposes a maximum load step of two on the lag system. The second step imposes a maximum load of two steps on the lead system. For the first step of unloading a voltage free contact can be fitted to terminals 16 & 13 for the second step to terminals 13 &17.

The following two cautions should be observed when using these functions to assure that undesirable operation does not result.

Terminals 13 & 17 contact should always be closed after or simultaneous with those on 13 & 16, when two steps of unloading are required. Otherwise, the microprocessor may mistake the closed

contacts on 13 & 17 as a signal for a setpoint reset.

Terminals 13 & 17 contact should always be opened before or simultaneous with those on 13 & 16 when loading is desired. Otherwise, the microprocessor may mistake the closed contacts on 13 & 17 as a signal for a setpoint reset.

SYS#1 COMP RUNNING
SYS#2 2 STAGE LIMIT

This message informs the operator that the second stage of remote unload limit is in effect.

SYS#1 LIMIT BOTH SYS
SYS#2 TO TWO STAGES

This message informs the operator that the second stage of remote unload limit is in effect.

On YAES 3 system units the first stage of unloading unloads the lag system by two stages. The second step unloads all systems by two stages.

On YAES 4 system units the first stage of unloading unloads system 3 and 4 by two stages. The second step unloads all systems by two stages.

11.11 Remote Setpoint Reset (REMOTE RESET TEMP RANGE)

This feature is inoperative if the unit is connected to a I.S.N network and under the options key message 3 is LOCAL CONTROL MODE.

Remote Setpoint Reset allows resetting the setpoint upward from the programmed value in memory. This is accomplished by connecting a voltage free contact between terminals 13 & 17.

Closing the contact for a defined period of time allows reset of the setpoint upward from the programmed value in memory. The maximum desired reset must be programmed into memory and can be a value of 2° to 22 °C. This value will vary according to the users requirements.

To program the reset press the REMOTE SETPOINT TEMP RANGE key.

The following message will appear:

REM SETPOINT = 6.0
REM RANGE = 10C

The display will indicate the REM SETPOINT which is always equal to the chilled liquid setpoint plus the offset from the reset signal. The display will also show the REM RANGE which is the same as the maximum reset required. Key in the maximum reset for the REM RANGE and press the ENTER key to store the new value in memory.

Once the maximum reset is programmed, it will require a contact closure of 21 seconds to achieve the maximum reset. Closure for less than 21 seconds will provide a smaller reset. For noise immunity, the microprocessor will ignore closures of less than 1 second.

To compute the offset for a given timer closed, use the formula below:

1. $\frac{\text{Programmed Max. Reset}}{20 \text{ seconds}}$ = Reset per/sec

2. (Time Close - 1) x Reset per second = Reset

Example

Programme Max. Reset = $10^{o}C$;
Time closed = 9 seconds

1. $\frac{10}{20 \text{ seconds}}$ = $0.5^{o}C$/s (per second)

2. (9 seconds -1) x $0.5^{o}C$/s = $4^{o}C$ Reset

To determine the new setpoints, add the reset to the setpoint programmed into memory. In the example above, if the programmed setpoint = 6°C, the new setpoint after the 9 second contact closure would be 6°C + 4°C = 10°C.

This new setpoint can be viewed on the display by pressing the REMOTE RESET TEMP/RANGE key.

To maintain a given offset, the microprocessor must be refreshed every 30 minutes with a contact closure of the required time period. It will not accept a refresh sooner than 30 seconds after the end of the last PWM signal, but must be refreshed before a period of 30 minutes expires from the end of the last PWM signal.

After 30 minutes, if no refresh is provided, the setpoint will change back to it's original value. A refresh is nothing more than a contact closure for the period required for the desired offset.

NOTE

After an offset signal, the new setpoint may be viewed on the REMOTE RESET TEMP RANGE DISPLAY. However, if this display is being viewed when the reset pulse occurs, the setpoint will not change on the display. To view the new offset, first press any other display key on the keypad and then press the REMOTE RESET TEMP RANGE key. The new setpoint will then appear.

If the "CHILLED LIQUID TEMP/RANGE" key is pressed the normal display message is :

LEAVING WATER TEMP CONTROL

Which is displayed for 3 seconds. However if remote reset is in operation this message would read:

REMOTE LEAVING WATER TEMP CONTROL

To alert the operator that remote reset is in effect.

11.12 Fan Full Speed Inhibit (units with optional two speed fans)

Connect a contact to terminals 13 and 14 to prevent the fans from running at full speed. The contact should be closed for fan full speed inhibit.

11.13 Local Printer Option

The microprocessor panel is capable of supplying a printout of chiller conditions or fault shutdown information at any given time. This allows operator and service personnel to obtain data and system status with the touch of a key.

In addition to manual print selection, the microprocessor panel will provide an automatic printout whenever a fault occurs. An explanation of the keypad use to obtain a printout is discussed in the "PRINT" KEY Section.

YORK offer a kit which includes a printer which has an internal Ni-cad battery, a roll of paper, a 'D' type connector, one meter lead and a charger. This is a

compact low cost printer that is ideal for service work and data logging.

Paper is in the form of a compact roll and is easily handled compared to larger printers using wider business form style paper. The paper is 58 mm wide desktop calculator paper that can be easily and inexpensively purchased at most stationery stores.

NOTE

The printout is made to be universal to all types of chillers both air and water cooled with or without options. Items may be indicated on the printout which may not be present on the chiller.

Installation Limitations

NOTE

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

The printer option is adaptable to all versions and revisions of Microprocessor Boards and EPROM's. No modifications are necessary to the panel.

Maximum cable length between the printer and the Microprocessor Board is 7.5m. Twisted pair shielded cable is required (1m with optional printer).

Serial printer should be set for data bits=8 parity=none and baud rate=1200.

The printer may be left connected to the microprocessor panel.

Parts

The following parts are required:

Printer kit, York part number:
362L11330-002 UK
362L11330-003 EUROPE

NOTE

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

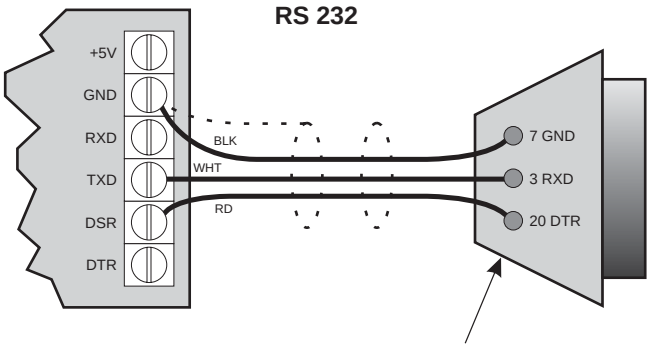
58 mm wide desk top calculator paper.

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

Spare Ink Ribbon York part number:
025L01993-000

Assembly and Wiring

Connect the printer to the microprocessor as shown below. Connect the shield of the cable as shown on the Microprocessor Logic Board. Do not connect at the printer end of the cable.



25 PIN 'D' TYPE (MALE) CONNECTOR

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

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

Obtaining a Printout

A printout of current operating data may be obtained by pressing the OPER DATA key.

A snapshot will be taken by the microprocessor of current operating conditions. These conditions will be stored in memory until they can be transmitted to the printer and printed. A sample printout is shown in figure 10.

A printout of the fault shut-down history may be obtained by pressing the HISTORY key. A printout showing the last 3 faults with all system conditions at the time of the fault will be transmitted. Sample printouts are shown in figure 11.

An automatic printout will be sent to the printer whenever the chiller shuts down on a fault, regardless of whether the fault causes a system or the entire chiller to lockout or whether restart is permitted.

This is the same printout that is obtained when the OPER DATA key is pressed, however it will be a snapshot of system operating conditions at the instant that the fault occurred. Additionally, the Status indication that is noted in the printout will note the specific fault that occurred.

Using Other Printers

Control codes vary from printer to printer. This will result in unusual formatting of printed data from many printers. In addition, “handshaking” lines and “handshaking” sequence will differ between printers. This makes the equipment susceptible to operation problems or mis-wiring which may cause damage to the printer or the Microprocessor Board. YORK assumes no responsibility for assistance or damage in the use of non-specified printers.

Warranty

YORK assumes no warranty responsibility in the use of the printer. This includes damages to the printer and the Microprocessor Board or chiller operation problems which may result.

12 OPERATING SEQUENCE

The operating sequence described below relates to operation after power has been applied on a hot water start (such as start-up commissioning). Under these circumstances, loading will deviate from normal sequence and timing previously described. When a compressor starts, internal timers limit minimum time before another compressor can start to 1 minute. Time between stages of loading is also limited by internal timers to a minimum of 1 minute, although the microprocessor would like to load at faster intervals this which may cause the lag compressor to start before the lead system has loaded to its usual step. If rate control dictates, time between stages of loading may be up to 100 seconds or may not occur at all. This will be determined by rate control programming and actual water temperature rate of change.

The Following sequence relates to the start sequence for one of the systems.

For the system compressors to run, all Manual Reset Cutouts must be reset, the Flow Switch must be closed, any remote Auto/Off contacts must be closed, the unit and the System Switch must be ON, the Daily Schedule must be scheduling the chiller to run, and temperature demand must be present.

As long as power is applied, the Crankcase Heaters will be on and stay on as long as the compressor is not running unless turned off on oil temperature.

When power is applied to the system, the microprocessor will start a 2 minute timer. This is the same timer that prevents an instantaneous start after a power failure.

At the end of the 2 minute timer, the microprocessor will check to see if the unit is set to manual restart. If so it will wait until the unit AUTO/OFF switch is set to 0 and then I. The microprocessor will then check the oil temperature inhibit, then for cooling demand as well as check to see if any system safeties are exceeded. If all conditions allow for start, the compressor will start unloaded.

On units fitted with starting bypass solenoid valves this valve will have opened 10 seconds before compressor start and will close when starter goes into Delta.

Coincident with the start, the programmable anti-recycle timer will be set and begin counting downward to “0”. The liquid line solenoid valve will open when the system starts.

After 9 seconds the current of the compressor must be >5% and <115% FLA. (Note before revisions of software listed valve was 15%: 2 system, B.A02.01.01;3 system, MAIN B.A01.12.01, SLAVE B.A01.13.01; 4 system, MAIN B.A02.14.07, SLAVE B.A02.15.07). If this condition is not met the compressor will shut down.

After 30 seconds of run time the suction pressure must be a minimum of 80% of cutout 30 seconds after system start.

After 60 second of run time if cooling demand requires and no safeties have been exceeded, the compressor will load, if cooling demand (temperature and rate control) requires.

After 90 seconds of run time the oil pressure of the compressor must be a minimum of 2.5 BAR

After 2 minutes of run time the compressor will continue to load, if cooling demand (temperature and rate control) requires.

After 3 minutes of run time the Lag compressor will start, if cooling demand (temperature and rate control) requires.

13 I.S.N RELATED STATUS MESSAGES

When a I.S.N controller is connected, the chiller microprocessor panel provides the operator with status messages relating to I.S.N commands sent to the chiller. These commands are for :

CHILLER SHUTDOWN
CHILLER DEMAND LIMIT
CHILLER SET POINT
CHILLER LEAD SYSTEM

These commands will only be accepted by the chiller when the chiller dip switch is set to remote, not local control mode, as defined under OPTIONS display.

The status messages are as follows :

REMOTE CONTROLLED SHUTDOWN

This message informs the operator that the I.S.N controller has shut down the chiller.

SYS#1 ISN LIMIT XX%
SYS#2 ISN LIMIT XX%

OR

SYS#1 LIMIT-COMP OFF
SYS#2 LIMIT-COMP OFF

These messages inform the operator that the I.S.N is sending a load limit between 0 and 100%. The effect of this limit is defined in the following table. The LIMIT-COMP OFF message can overwrite other status messages such as NO COOL LOAD when the system is not running.

Thus the LIMIT-COMP OFF message should not be interpreted as exclusively meaning the I.S.N LOAD LIMIT value has shut down the system. The I.S.N LIMIT XX% message is overwritten by the CURRENT and DISCHARGE LIMIT messages.

The figures in the table define the maximum demand step imposed on the chiller by the I.S.N load limit. See loading charts in the Data Section to determine the relationship between demand step and system capacity. If for a given chiller model the demand step defined by the table is skipped then the next non-skipped demand step down is used.

Under SET POINT CHILLED LIQUID TEMP/RANGE the first message changes from:

LEAVING WATER TEMP CONTROL

TO

REMOTE LEAVING WATER TEMP CONTROL

This message change informs the operator that the I.S.N controller is in control of the chiller set point and thus the values contained in the second message for LWT set point is not being used.

2 System Units	
ISN DEMAND LIMIT	**MAX. DEMAND STEP**
<13%	0
<25%	1
<38%	2
<50%	3
<63%	4
<75%	5
<88%	6
<100%	7
=100%	8

3 System Units	
ISN DEMAND LIMIT	**MAX. DEMAND STEP**
<8%	0
<17%	1
<25%	2
<33%	3
<42%	4
<50%	5
<58%	6
<67%	7
<75%	8
<83%	9
<92%	10
<100%	11
=100%	12

4 System Units	
ISN DEMAND LIMIT	**MAX DEMAND STEP**
<6%	0
<13%	1
<19%	2
<25%	3
<31%	4
<38%	5
<44%	6
<50%	7
<56%	8
<63%	9
<69%	10
<75%	11
<81%	12
<88%	13
<94%	14
<100%	15
=100%	16

The CR (control range) is used by the remote set point.

The actual set point is shown under SETPOINT REMOTE RESET TEMP RANGE.

REM SETPOINT = X.X
REM RANGE = XX DEGC

This display is not updated whilst it is being viewed, therefore to check if a new reset value has been received by the chiller press STATUS key then repress REMOTE RESET TEMP RANGE key.

Remote set point messages will also appear if hard wired set point reset signals PWM, 0-10 V, 4-20 ma or discrete contact closure reset are being used. These hard wired signals can be used when the chiller is connected to a I.S.N regardless of whether the chiller DIP

switch is set to remote or local control mode.

If I.S.N is connected with chiller DIP switch set for remote the I.S.N controller determines the chiller set point unless I.S.N is sending 99. 99 instructs the chiller to use the local set point or hard wire signal even though chiller is set for remote control mode.

Under OPER DATA key one of the messages is:

LEAD SYSTEM
SYS X

On two system units only the lead system is selected by the I.S.N unless that system is locked out on a fault. In which case the chiller will re-select another system as the lead system. In all other cases the lead system is selected by the I.S.N. and will not be re-selected by the chiller.

This could mean that the lag system(s) will not be able to run, for example if lead system is turned off on chiller system switch. In this case the I.S.N is responsible for re-selecting the lead system.

The responsibility for selecting the lead system can be handed back to the chiller if the I.S.N sends 0 as the lead system.

13.1 I.S.N. Pages

Details of ISN pages are given below. Pages 3 to 10 relate to commands sent to the unit by the remote ISN. Pages 11 onward relate to data sent by the unit to the remote ISN.

ISN Pages Transmitted from ISN to Unit (pages 3 to 10)

Page	Description
P03	Setpoint (99 to Hand Back to Unit; For YLCS HA units use 999 to Hand Back to Unit). For YLCS HA units operating in the heatpump mode the setpoint changes from cold to hot setpoint.
P04	ISN Load Limit 10-100
P05	Lead System 1 or 2. (Page not used on 3 & 4 system YAES units). (0 hands back to unit)
P06	YLCS HA units only Mode selection 0 = Chiller, 1 = Heatpump, 99 hand back to unit.
P07	Start / Stop Command 1 = Start, 0 = Stop
P08	Load chiller = 1, Do not Load chiller = 0 (P08 = 1 & P09 = 0 hands back to unit)
P09	Unload chiller =1, Do not Unload chiller = 0 (P08 = 1 & P09 = 0 hands back to unit)
P10	History Buffer Request 1 = Send History, 0 = Live Data

ISN Pages Transmitted from Unit to ISN (pages 11 to 84)

ISN Page	Type	Description
P11	Analog	Leaving Chilled Liquid Temp
P12	A	Not Used
P13	A	Leaving Hot Liquid Temperature YLCS HA units only
P14	A	Not Used
P15	A	Not Used
P16	A	Ambient Air Temperature
P17	A	Sys 1 Oil Temperature
P18	A	Sys 1 Oil Pressure
P19	A	Sys 1 Suction Pressure
P20	A	Sys 1 Discharge Pressure
P21	A	Sys 1 Actual Full Load Amps
P22	A	Sys 1 Total Run Hours
P23	A	Sys 1 Total Number of Starts
P24	A	Sys 1 Anti-Recycle Timer
P25	A	Anti-Coincident Timer
P26	A	Sys 2 Oil Temperature
P27	A	Sys 2 Oil Pressure
P28	A	Sys 2 Suction Pressure
P29	A	Sys 2 Discharge Pressure
P30	A	Sys 2 Actual Full Load Amps
P31	A	Sys 2 Total Run Hours
P32	A	Sys 2 Total Number of Starts
P33	A	Sys 2 Anti-Recycle Timer
P34	A	Not Used
P35	A	Not Used
P36	Digital	Chiller Run (Systems 1 & 2)
P37	D	Chiller Alarm (Systems 1 & 2)
P38	D	Evaporator Heater Status
P39	D	Evaporator Pump Status
P40	D	Not Used
P41	D	Sys 1 Oil Level Switch
P42	D	Sys 1 Liquid Line Solenoid Valve Status
P43	D	Not Used
P44	D	Sys 1 Pressure Equalization Valve
P45	D	Sys 2 Oil Level Switch
P46	D	Sys 2 Liquid Line Solenoid Valve Status
P47	D	Not Used
P48	D	Sys 2 Pressure Equalization Valve
P49	D	Not Used
P50	D	S1-1 Cooling Type: 0=Water, 1=Glycol
P51	D	Not Used
P52	D	S1-3 control 0 = Local, 1= Remote
P53	D	Not Used
P54	D	S1-5 0 = Imperial, 1 = SI Units
P55	D	S1-6 0 = SCon No 1 = Scon YES
P56	Coded	*Sys 1 Operational Code
P57	C	*Sys 1 Fault Code
P58	C	*Sys 2 Operational Code
P59	C	*Sys 2 Fault Code
P60	C	Sys 1 Stages of Loading
P61	C	Sys 1 Condenser Fan Stages Running
P62	C	Sys 2 Stages of Loading
P63	C	Sys 2 Condenser Fan Stages Running
P64	C	Lead Compressor Number
P65	C	Not Used
P66	Analog	Leaving Chilled Liquid Setpoint
P67	A	Low Leaving Chilled Liquid Temp Cutout
P68	A	Low Ambient Cutout
P69	A	High Ambient Cutout
P70	A	Low Suction Pressure Cutout
P71	A	High Discharge Pressure Cutout
P72	A	Remote Leaving Chilled Liquid Setpoint

Cont

ISN Pages Transmitted from Unit to ISN (pages 11 to 84) YAES 3 System Units - system 3

ISN Page	Type	Description
P11	Analog	Not Used
P12	A	Not Used
P13	A	Not Used
P14	A	Not Used
P15	A	Not Used
P16	A	Not Used
P17	A	Sys 3 Oil Temperature
P18	A	Sys 3 Oil Pressure
P19	A	Sys 3 Suction Pressure
P20	A	Sys 3 Discharge Pressure
P21	A	Sys 3 Actual Full Load Amps
P22	A	Sys 3 Total Run Hours
P23	A	Sys 3 Total Number of Starts
P24	A	Sys 3 Anti-Recycle Timer
P25	A	Anti-Coincident Timer
P26	A	Not Used
P27	A	Not Used
P28	A	Not Used
P29	A	Not Used
P30	A	Not Used
P31	A	Not Used
P32	A	Not Used
P33	A	Not Used
P34	A	Not Used
P35	A	Not Used
P36	Digital	Chiller Run (System 3)
P37	D	Chiller Alarm (System 3)
P38	D	Not Used
P39	D	Not Used
P40	D	Not Used
P41	D	Sys 3 Oil Level Switch
P42	D	Sys 3 Liquid Line Solenoid Valve Status
P43	D	Not Used
P44	D	Sys 3 Pressure Equalization Valve
P45	D	Not Used
P46	D	Not Used
P47	D	Not Used
P48	D	Not Used
P49	D	Not Used
P50	D	Not Used
P51	D	Not Used
P52	D	Not Used
P53	D	Not Used
P54	D	Not Used
P55	D	Not Used
P56	Coded	*Sys 3 Operational Code
P57	C	*Sys 3 Fault Code
P58	C	Not Used
P59	C	Not Used
P60	C	Sys 3 Stages of Loading
P61	C	Sys 3 Condenser Fan Stages Running
P62	C	Not Used
P63	C	Not Used
P64	C	Not Used
P65	C	Not Used
P66	Analog	Not Used
P67	A	Not Used
P68	A	Not Used
P69	A	Not Used
P70	A	Not Used
P71	A	Not Used
P72	A	Not Used
P73	A	Not Used
P74	A	Not Used

Cont

ISN Page	Type	Description
P73	A	Remote Range for PWM Temperature Offset Input
P74	A	Actual Set Point or YAES 4 sys cooler Set Point
P75	A	Sys 1 Run Time (in Seconds)
P76	A	Sys 2 Run Time (in Seconds)
P77	A	Sys 1 Discharge Temperature
P78	A	Sys 2 Discharge Temperature
P79	A	Not Used
P80	Digital	S1-7 0 = Full Cap Steps, 1 = Reduce Cap Steps
P81	D	S1-8 0 = R134A, 1 = R22 Refrigerant
P82	D	Load Permissive
P83	D	Not Used
P84	D	Not Used

ISN Page	Type	Description
P75	A	Sys 3 Run Time (in Seconds)
P76	A	Not Used
P77	A	Sys 3 Discharge Temperature
P78	A	Not Used
P79	A	Not Used
P80	Digital	Not Used
P81	D	Not Used
P82	D	Not Used
P83	D	Not Used
P84	D	Not Used

Operational and fault codes:

P56/58	Operational Code	P57/ 59	Fault Code
0	No Abnormal Condition	0	No Fault
1	Unit Switch Off	1	VAC Under Voltage
2	System Switch Off	2	Low Ambient Temperature
3	Lock - Out	3	High Ambient Temperature
4	Unit Fault	4	Low Leaving Chilled Liquid Temp
5	System Fault	5	High Discharge Pressure
6	Remote Shutdown	6	Low Oil Pressure
7	Daily Schedule Shutdown	7	Low Suction Pressure
8	No Run Permissive	8	Motor Current
9	No Cool Load	9	Not Used
10	Anti-Coincidence Timer Active	10	Low Battery Warning
11	Anti-Recycle Timer Active	11	Oil Temperature Inhibit
12	Manual Override	12	Leaving Water Temp Sensor Fault
13	Not Used	13	Pump Down Fault
14	Discharge Limiting	14	High Oil Temperature Fault
15	Current Limiting	15	High Discharge Temperature
16	Load Limiting	16	Low Oil Level

Operational code 5 can only appear for fault codes 11, 14, 15 or 16 if inhibit is preventing a start. All other system fault, fault codes, do not result in a operational code 5 as code 5 is replaced by another operational code as the system prepares itself for a new start.

On a fault type, SYSTEM FAULT, system fault code clears when system restarts.

ISN Pages Transmitted from Unit to ISN
(pages 11 to 84) YAES 4 System Units - system 4

ISN Page	Type	Description
P11	Analog	Leaving Chilled Liquid Temp slave
P12	A	Not Used
P13	A	Not Used
P14	A	Not Used
P15	A	Not Used
P16	A	Not Used
P17	A	Sys 3 Oil Temperature
P18	A	Sys 3 Oil Pressure
P19	A	Sys 3 Suction Pressure
P20	A	Sys 3 Discharge Pressure
P21	A	Sys 3 Actual Full Load Amps
P22	A	Sys 3 Total Run Hours
P23	A	Sys 3 Total Number of Starts
P24	A	Sys 3 Anti-Recycle Timer
P25	A	Anti-Coincident Timer
P26	A	Sys 4 Oil Temperature
P27	A	Sys 4 Oil Pressure
P28	A	Sys 4 Suction Pressure
P29	A	Sys 4 Discharge Pressure
P30	A	Sys 4 Actual Full Load Amps
P31	A	Sys 4 Total Run Hours
P32	A	Sys 4 Total Number of Starts
P33	A	Sys 4 Anti-Recycle Timer
P34	A	Not Used
P35	A	Not Used
P36	Digital	Chiller Run (Systems 3 & 4)
P37	D	Chiller Alarm (Systems 3 & 4)
P38	D	Not Used
P39	D	Not Used
P40	D	Not Used
P41	D	Sys 3 Oil Level Switch
P42	D	Sys 3 Liquid Line Solenoid Valve Status
P43	D	Not Used
P44	D	Sys 3 Pressure Equalization Valve
P45	D	Sys 4 Oil Level Switch
P46	D	Sys 4 Liquid Line Solenoid Valve Status
P47	D	Not Used
P48	D	Sys 4 Pressure Equalization Valve
P49	D	Not Used
P50	D	Not Used
P51	D	Not Used
P52	D	Not Used
P53	D	Not Used
P54	D	Not Used
P55	D	Not Used
P56	Coded	*Sys 3 Operational Code
P57	C	*Sys 3 Fault Code
P58	C	*Sys 4 Operational Code
P59	C	*Sys 4 Fault Code
P60	C	Sys 3 Stages of Loading
P61	C	Sys 3 Condenser Fan Stages Running
P62	C	Sys 4 Stages of Loading
P63	C	Sys 4 Condenser Fan Stages Running
P64	C	Not Used
P65	C	Not Used
P66	Analog	Not Used
P67	A	Not Used
P68	A	Not Used
P69	A	Not Used
P70	A	Not Used
P71	A	Not Used
P72	A	Not Used

Cont

ISN Page	Type	Description
P73	A	Not Used
P74	A	Not Used
P75	A	Sys 3 Run Time (in Seconds)
P76	A	Sys 4 Run Time (in Seconds)
P77	A	Sys 3 Discharge Temperature
P78	A	Sys 4 Discharge Temperature
P79	A	Not Used
P80	Digital	Not Used
P81	D	Not Used
P82	D	Not Used
P83	D	Not Used
P84	D	Not Used

14 HEATPUMP OPERATION ON YLCS HA UNITS

The YLCS HA unit can operate as a standard chiller or as a heatpump. The mode selection can be made at the panel or remotely by a voltage free contact or a signal from a remote York ISN controller. If the units is intended to only operate as a chiller ensure that the Mode under the program key is set to CHILLER and is left unaltered.

14.1 Mode Selection.

Pressing the Program key and then the Enter key three times, gives the following display.

```
MODE: CHILLER=1 HP=2
REMOTE=3  ACTUAL = X
```

To change the mode of operation press key 1 CHILLER, 2 HP (HEATPUMP) or 3 REMOTE to configure unit operation. Selecting Chiller will mean that the operation of the unit is described in the other sections of this manual. Selecting HP, Heatpump means that primary capacity control of the unit is under leaving hot liquid control with a secondary capacity control related to leaving cold liquid temperature. The remaining operation of the unit is as describe in the other sections of the manual. Selecting remote means that the mode is determined either by a voltage free contact connected to relay board terminals 13 and 20, closed for HeatPump operation or by a signal from a remote York ISN controller. Pressing the Liquid Temp key displays the Leaving Liquid Temperature Cold and the Leaving Liquid Temperature Hot.

```
LLTC =  6.2 DEG C
LLTH = 48.7 DEG C
```

The range of the LLTH is -12.7C to 68.4C. In the Heatpump mode if the Leaving Liquid Temperature Hot sensor reads outside this range the unit will shut down and lockout on a UNIT FAULT LLTH SENSOR FAULT and give the following Status message.

```
UNIT FAULT:
LLTH SENSOR FAULT
```

The alarm voltage free contacts will operate and a unit fault will be recorded in the history. Once the fault is rectified the lockout can be reset using the unit switch.

14.2 LIQUID TEMP/RANGE KEY

Pressing the Liquid Temp key results in the following display.

```
CLTSP =  6.0 DEG C
CR =  6.0  TO   9.0 C
```

For setting the Cold Leaving Temperature Set Point and its Control Range. In Heatpump mode pressing the Liquid Temp key a second time displays.

```
HLTSP =  60.0 DEG C
CR =  60.0  TO   58.0 C
```

For setting the Hot Leaving Temperature Set Point and its Control Range. The HLTSP range can be set in the range 30 to 65C. The control range can be set 0.5 to 5 C.

Remote Temperature Reset
When in the heatpump mode the REM SETPOINT REM RANGE apply to the HLTSP not the CLTSP set point. Any PWM reset or ISN reset signals set the actual HLTSP DOWN by the offset figure.

14.3 Leaving Liquid Temperature Control

Leaving liquid control is based on Hot leaving liquid temperature against a Hot Leaving Liquid Temperature Set Point and Control Range (Heating) to determine compressor loading. The Cold Leaving Liquid Temperature Set Point and Control Range (cooling) are used to ensure that whilst the capacity step of the compressor is set to meet the heating demand too low a cold liquid temperature will first prevent further loading and if necessary unload the compressor.

The RATE CONTROL TEMP (RCT), RATE SENSITIVITY (PRS) and LEAVING WATER TEMP TARGET PERCENT programmed under the Program key are common to both cooling and heatpump modes. There are two rates of change displayed under the OPER DATA key, one for the COLD leaving liquid temperature and one for the HOT leaving liquid temperature:

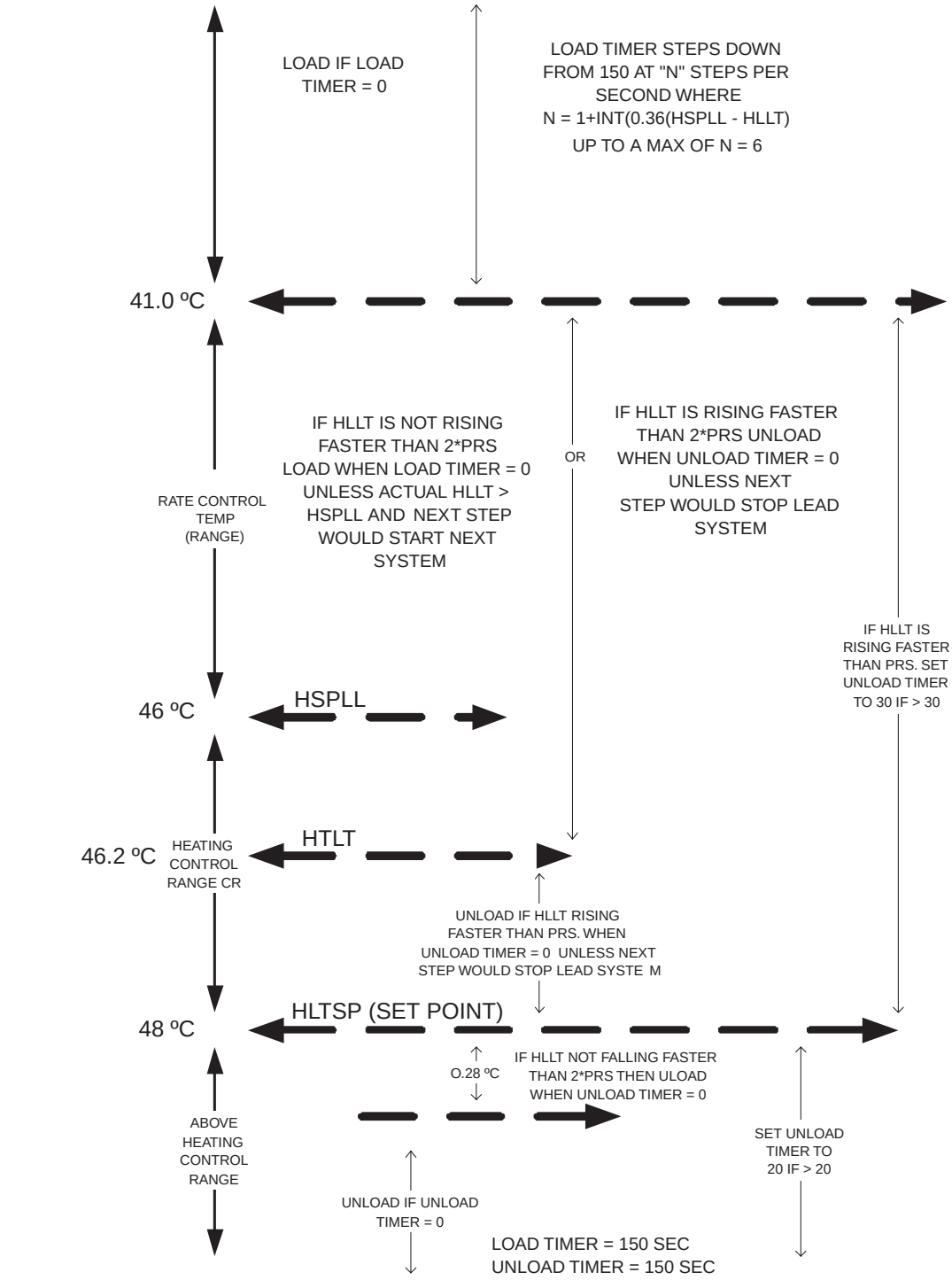
```
TEMPERATURE RATE   XX.X DEGC/ MIN
HOT
```

Followed by:

```
TEMPERATURE RATE   XX.X DEGC/ MIN
COLD
```

The basic principles for heating capacity control are the same as for cooling capacity control, therefore first see Section 5. Figure 12 covers heating capacity control and can be compared to Figure 1 for cooling.

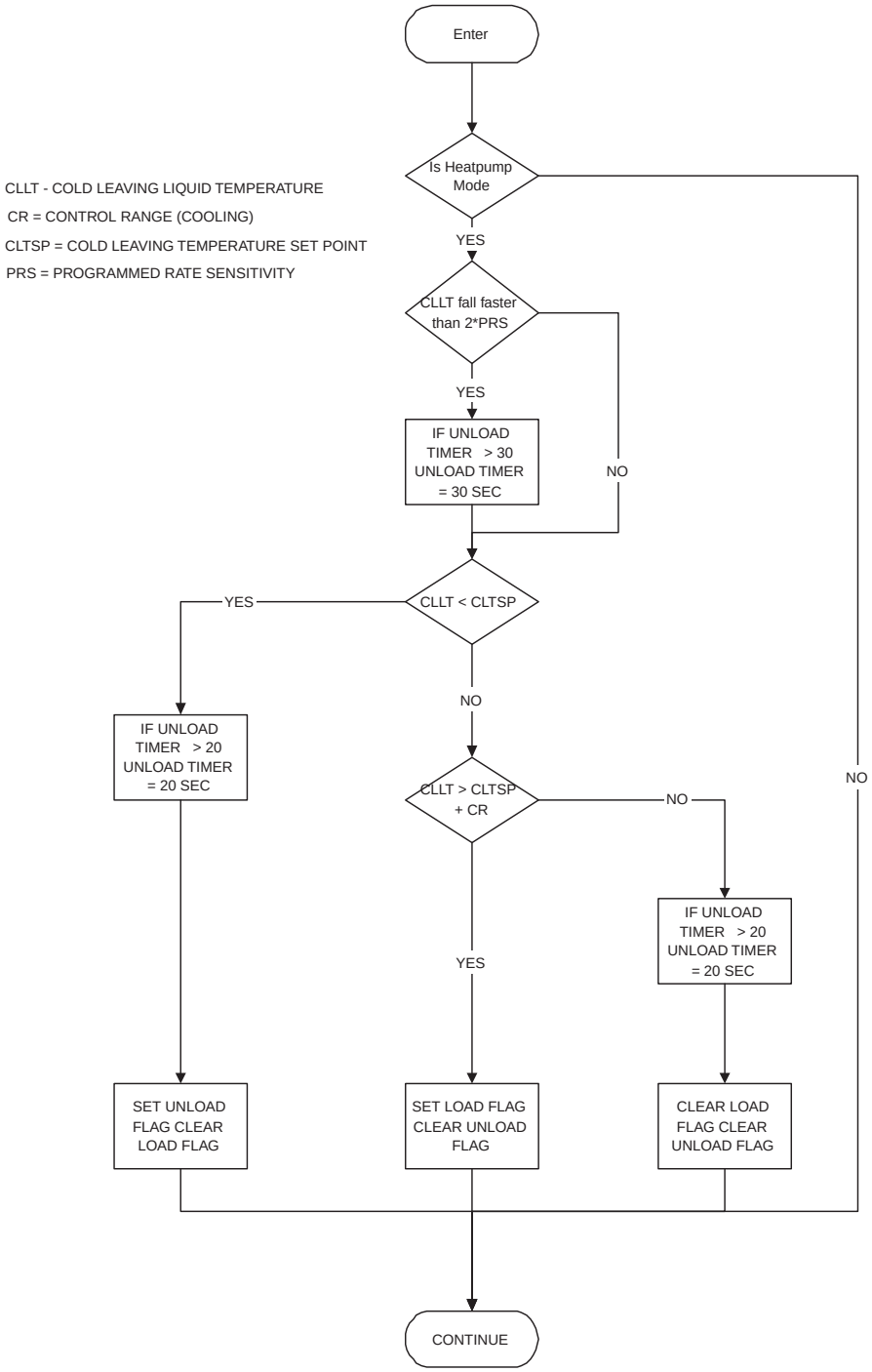
Figure 12 - Heatpump ModeLeaving Water Control



HEATING COLD OVERRIDE
If unload flag set unload at 20 second intervals
If load flag is not set, do not load

HLLT = HOT LEAVING WATER TEMP
HSPLL = HEATING SET POINT LOW LIMIT
PRS = PROGRAMMED RATE SENSITIVITY
HTLT = HEATING TARGET LEAVING TEMP
HLTSP = HOT LEAVING TEMP SET POINT

Figure 13 - Heating Cold Override Routine



In heat pump mode heat is taken from the cold water and transferred to heat the hot water. As the capacity demand step is controlled from the hot liquid temperature it is possible to over cool the cold liquid temperature and trip on low water temperature cutout. To prevent this a heating cold override is included, see Figure 13.

If the cold leaving liquid temperature fall to within the cooling control range any further loading required by the Heatpump mode leaving water control is ignored. If the cold leaving liquid temperature continues to fall and drops below the Chilled Liquid Temperature Set Point then unloading will occur under the control of the unload timer at 20 second intervals.

14.4 Leaving Liquid Hot\Cold Differential Skip Step 1 Routine

This routine applies to both chiller and heatpump mode. If the difference between leaving liquid temperatures cold and hot is greater than 55C then compressor step 1 is skipped. If the compressor is operating on step 1 and the difference between leaving liquid temperatures cold and hot is greater than 55C then the compressor is loaded to 2 steps when load timer reaches zero. Preventing a compressor from running on 1 step above 55C difference ensures that the compressor operational envelope is not exceeded. When the differential fall below 55C the compressor is allowed to run on step 1.

If compressor step 1 is being skipped the stages of loading message under OPER DATA changes from:

SYS X STAGES **OF LOADING X**

TO

SYS X STAGES **OF LOADING SKIP 1 X**

15 TECHNICAL DATA

15.1 Pressure, Temperature and Motor Current Tables

YLCS

R134a		FACTORY SETTINGS	PROGRAMMABLE RANGE
First Mechanical Discharge Cutout		18.9 BAR SA, 24.8 BAR AA/HA	
Second Mechanical Discharge Cutout		19.3 BAR SA, 24.8 BAR AA/HA	
Micro Discharge Cutout	Standard Units	18.0 BAR SA, 22.0 BAR AA/HA	
Ambient Temp low Cutout		-18°C	-18°C to +10°C
Ambient Temp high Cutout		46 °C Standard	
Discharge Pressure Unload		16.5 BAR SA, 20.0 BAR AA/HA	
Motor Current Unload		101% FLA	85 % to 101%
Rate Control Temp		5,0 °C	0,1 to 11 °C
Leaving Temperature Cutout	Water Cooling	2,2 °C	
	Glycol Cooling	2,2 °C	-13,3 to 2,2 °C
Suction Pressure Cutout	Water Cooling	1.4 BAR	
	Glycol Cooling	1.4 BAR	0,28 to 2,5 BAR
Rate Sensitivity		2,0 °C/min	0,3 to 8,0 °C/min
Fan Control Dsch Pressure Setpoint		10.0	
Fan On/Off Press Diff		3.5	
System Motor Currents		Table 14.3	
Motor Current Electronic Overloads		<5% >115% >105% for 30 sec (see note)	
Leaving Water Temp Target %		50	
Oil Pressure Cutout		< 2.5 BAR G for 90sec	
Oil Temperature Inhibit		4°C Oil above ambient	
LWT Setpoint	Water Cooling	6,0 °C	3,5 to 21,1 °C
	Glycol Cooling	6,0 °C	-12,2 to 21,1 °C
CR (Control Range)		3,0 °C	0,6 to 4,4 °C

(Note before revisions of software listed valve was 15%: 2 system, B.A02.01.01;
3 system, MAIN B.A01.12.01, SLAVE B.A01.13.01; 4 system, MAIN B.A02.14.07, SLAVE B.A02.15.07).

YAES

R134a		FACTORY SETTINGS	PROGRAMMABLE RANGE
Standard Mechanical Discharge Cutout		24.0 BAR	
Dutch First Mechanical Discharge Cutout		24.0 BAR	
Second Mechanical Discharge Cutout		25.0 BAR	
Micro Discharge Cutout		20.8 BAR	
Ambient Temp low Cutout		-18°C	-18°C to +10°C
Ambient Temp high Cutout		46 °C Standard	
Discharge Pressure Unload		19,8 BAR	
Motor Current Unload		101% FLA	85 % to 101%
Rate Control Temp		5,0 °C	0,1 to 11 °C
Leaving Temperature Cutout	Water Cooling	2,2 °C	
	Glycol Cooling	2,2 °C	-13,3 to 2,2 °C
Suction Pressure Cutout	Water Cooling	1,5 BAR	
	Glycol Cooling	1,5 BAR	0,28 to 2,5 BAR
Rate Sensitivity		2,0 °C/min	0,3 to 8,0 °C/min
Fan Control Dsch Pressure Setpoint		10.0 BAR	
Fan On/Off Press Diff		3.5 BAR	
System Motor Currents		Table 14.3	
Motor Current Electronic Overloads		<5% >115% >105% for 30 sec (see note)	
Leaving Water Temp Target %		50	
Oil Pressure Cutout		< 2.5 BAR G for 90sec	
Oil Temperature Inhibit		4°C Oil above ambient	
LWT Setpoint	Water Cooling	6,0 °C	3,5 to 21,1 °C
	Glycol Cooling	6,0 °C	-12,2 to 21,1 °C
CR (Control Range)		3,0 °C	0,6 to 4,4 °C

(Note before revisions of software listed valve was 15%: 2 system, B.A02.01.01;
3 system, MAIN B.A01.12.01, SLAVE B.A01.13.01; 4 system, MAIN B.A02.14.07, SLAVE B.A02.15.07).

15.2 Fan Pressure Settings

SINGLE SPEED FANS

FPSP = FAN CNTRL DSCH PRESS SETPOINT 10.0 bar programmed under PROGRAM key
FPD = FAN ON/OFF PESS DIFF 3.5 bar programmed under the PROGRAM key.
DP = DISCHARGE PRESSURE

Fan Stages		PRESSURE BAR	
STAGE 1	ON	10	DP > FPSP
	OFF	6.5	DP < FPSP - FPD
STAGE 2	ON	11.38	DP > FPSP + 1.38
	OFF	7.88	DP < FPSP + 1.38 - FPD
STAGE 3	ON	12.41	DP > FPSP + 2.41
	OFF	8.91	DP < FPSP + 2.41 - FPD
STAGE 4	ON	13.1	DP > FPSP + 3.1
	OFF	9.6	DP < FPSP + 3.1 - FDP
STAGE 5	ON	13.79	DP > FPSP + 3.79
	OFF	10.29	DP < FPSP + 3.79 - FDP

TWO SPEED FANS

FPSP = FAN CNTRL DSCH PRESS SETPOINT 10.0 bar programmed under PROGRAM key
FPD = FAN ON/OFF PESS DIFF 3.5 bar programmed under the PROGRAM key.
DP = DISCHARGE PRESSURE

FAN STAGES		FAN STATE	PRESSURE BAR	
STAGE 1	ON	SLOW	10	DP > FPSP
	OFF	OFF	6.5	DP < FPSP - FPD
STAGE 2	ON	SLOW	11.72	DP > FPSP + 1.72
	OFF	SLOW	8.22	DP < FPSP + 1.72 - FPD
STAGE 3	ON	SLOW	13.1	DP > FPSP + 3.1
	OFF	SLOW	9.6	DP < FPSP + 3.1 - FPD
STAGE 4	ON	FAST	14.14	DP > FPSP + 4.14
	OFF	SLOW	12.39	DP < FPSP + 4.14 – (0.5*FDP)

15.3 Motor Current Program Values

YLCS	PROGRAMMED CURRENT SYSTEM 1 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP5 (SYS1) OHMS	PROGRAMMED CURRENT SYSTEM 2 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP6 (SYS2) OHMS
0350 (YTS F)	83	102	83	102
0415 (YTS H, YTS F)	116	73.2	83	102
0480 (YTS H)	116	73.2	116	73.2
0530 (YTS I, YTS H)	137	107	116	73.2
0575 (YTS I)	137	107	137	107
0620 (YTS J, YTS I)	162	90.9	137	107
0660 (YTS J)	162	90.9	162	90.9
0725 (YTS L)	178	82.5	178	82.5
0840 (YTS M, YTS L)	232	63.4	178	82.5
0955 (YTS M)	232	63.4	232	63.4
1050 (YTS N)	249	59	249	59
1110 (YTS N)	262	56.2	262	56.2

YLCS HA/AA	PROGRAMMED CURRENT SYSTEM 1 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP5 (SYS1) OHMS	PROGRAMMED CURRENT SYSTEM 2 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP6 (SYS2) OHMS
0350 (YTS F)	125	68.1	125	68.1
0415 (YTS H, YTS F)	183	46.4	125	68.1
0480 (YTS H)	183	46.4	183	46.4
0530 (YTS I, YTS H)	206	71.5	183	46.4
0575 (YTS I)	206	71.5	206	71.5
0620 (YTS J, YTS I)	243	60.4	206	71.5
0660 (YTS J)	243	60.4	243	60.4
0725 (YTS L)	268	54.9	268	54.9
0840 (YTS M, YTS L)	348	42.2	268	54.9
0955 (YTS M)	348	42.2	348	42.2
1050 (YTS N)	375	39.2	375	39.2
1110 (YTS N)	375	39.2	375	39.2

YAES	PROGRAMMED CURRENT SYSTEM 1 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP5 (SYS1) OHMS	PROGRAMMED CURRENT SYSTEM 2 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP6 (SYS2) OHMS
0405 (YTS H, YTS F)	179	82	125	118
0475 (YTS H)	179	82	182	80.6
0525 (YTS I, YTS H)	206	71.5	182	80.6
0575 (YTS I)	206	71.5	206	71.5
0645 (YTS J)	238	61.9	238	61.9
0685 (YTS L, YTS J)	268	54.9	238	61.9
0715 (YTS L)	268	54.9	268	54.9
0785 (YTS M,YTS L)	348	42.2	268	54.9
0905 (YTS M)	348	42.2	348	42.2
0985 (YTS N)	375	39.2	375	39.2
1075 (YTS L)	268	54.9	268	54.9
1245 (YTS M, YTS M, YTS L)	348	42.2	348	42.2
1405 (YTS N)	375	39.2	375	39.2
1505 (YTS, L)	268	54.9	268	54.9
1575 (YTS M,YTS L,YTS L,YTS L)	348	42.2	268	54.9
1645 (YTS M,YTS L, YTS M, YTS L)	348	42.2	268	54.9
1715 (YTS M,YTS L,YTS M,YTS M)	348	42.2	268	54.9
1785 (YTS N,YTS N,YTS M,YTS L)	375	39.2	375	39.2
1855 (YTS N,YTS N,YTS M,YTS M)	375	39.2	375	39.2
1925 (YTS N)	375	39.2	375	39.2

YAES	PROGRAMMED CURRENT SYSTEM 3 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP5 (SYS3) OHMS	PROGRAMMED CURRENT SYSTEM 4 MTR CURR	POWER BOARD PROGRAM RESISTOR -XP6 (SYS4) OHMS
1075 (YTS L)	268	54.9	-	-
1245 (YTS M, YTS M, YTS L)	268	54.9	-	-
1405 (YTS N)	375	39.2	-	-
1505 (YTS, L)	268	54.9	268	54.9
1575 (YTS M,YTS L,YTS L,YTS L)	268	54.9	268	54.9
1645 (YTS M,YTS L, YTS M, YTS L)	348	42.2	268	54.9
1715 (YTS M,YTS L,YTS M,YTS M)	348	42.2	348	42.2
1785 (YTS N,YTS N,YTS M,YTS L)	348	42.2	268	54.9
1855 (YTS N,YTS N,YTS M,YTS M)	348	42.2	348	42.2
1925 (YTS N)	375	39.2	375	39.2

NOTE

On YLCS 0350, 0415 and System 2 0530 the current transformer is measuring line currents same phase measured from line and delta contactors. All other units and systems line currents divided by 1.732 is measured. This is achieved by only measuring phase from line contactor.

15.4 Loading Charts

UNIT LOADING DEMAND STEPS

The interrelationship between the two systems is as follows. Lead system selected on lowest run hours.

Demand step	Lead system STEPS	Lag system STEPS	UNIT STEPS
1	1	0	1
2	2	0	2
3	3	0	3
4	3	1	4
5	3	2	5
6	3	3	6
7	4	3	7
8	4	4	8

Remote digital input unload, first step unloads lag system by 2 steps.
Second step of remote unload, unloads lead system by 2 steps.

YAES 3 SYSTEM UNITS

Demand step	Lead system	1st Lag system	2nd Lag system
1	25	0	0
2	50	0	0
3	75	0	0
4	75	25	0
5	75	50	0
6	75	75	0
7	100	75	0
8	100	75	25
9	100	75	50
10	100	75	75
11	100	100	75
12	100	100	100

Remote digital input unload, first step unloads lag system by 2 steps.
Second step of remote unload, unloads all system by 2 steps.

YAES 4 SYSTEM UNITS

		Lead Group			Lead Group	
Mixed Demand step	Lead group Demand step	Lead system	Lag system	Lag group Demand step	Lead system	Lag system
1	1	25	0	0	0	0
2	1	25	0	1	25	0
3	2	50	0	1	25	0
4	2	50	0	2	50	0
5	3	75	0	2	50	0
6	3	75	0	3	75	0
7	4	75	25	3	75	0
8	4	75	25	4	75	25
9	5	75	50	4	75	25
10	5	75	50	5	75	50
11	6	75	75	5	75	50
12	6	75	75	6	75	75
13	7	100	75	6	75	75
14	7	100	75	7	100	75
15	8	100	100	7	100	75
16	8	100	100	8	100	100

As now, remote digital input unload, first step unloads systems 3&4 by 2 steps.
Second step of remote unload, unloads all system by 2 steps.

15.5 Digital Input/Output Software Cross Reference Tables

The following abbreviation are used in the tables:

-ARB BOARD, -AMB MICROPROCESSOR BOARD

Device abbreviations are those used on the unit schematic diagrams.

The following tables cover all inputs and outputs although some units do not use all of these.YLCS does not use the fan outputs,-etc. See schematic wiring diagram for inputs and outputs used on specific product.

Digital Inputs

No.	DESCRIPTION	-ARB TERMINAL No.	-ARB INPUT PLUG	-ARB OUTPUT PLUG	-AMB INPUT PLUG	INPUT DEVICE
1	UNIT SWITCH 0/1 (OFF/AUTO)		-XP5-1	-XP11-1	J4-1	-SOA
			-XP5-2			
2	YAES: FAN SPEED INHIBIT YLCS HA: MODE SELECTION	13 - 20		-XP11-3	J4-3	FFSI
3	FLOW SWITCH	13 - 10				-SF
	SYS No 1 REMOTE OFF/AUTO	11 - 14		-XP11-5	J4-5	RPS1
4	FLOW SWITCH	13 - 10				-SF
	SYS No 2 REMOTE OFF/AUTO	12 - 15		-XP11-7	J4-7	RPS2
5	REMOTE UNLOAD	13-16		-XP11-2	J4-2	RU
6	TEMP RESET PWM	13-17		-XP11-4	J4-4	PWM
7	SYS 1 SWITCH OIL LEVEL		1-XP12-1	-XP11-8	J4-6	1-SLO
			1-XP12-2			
8	SYS 2 SWITCH OIL LEVEL		2-XP12-3	-XP11-6	J4-8	2-SLO
			2-XP12-2			

YAES 3 SYSTEM UNITS SLAVE PANEL

No.	DESCRIPTION	-ARB TERMINAL No.	-ARB INPUT PLUG	-ARB OUTPUT PLUG	-AMB INPUT PLUG	INPUT DEVICE
1	NOT USED			-		
2	NOT USED			-		
3	FLOW SWITCH	13 - 10				-SF
	SYS No 3 REMOTE OFF/AUTO	11 - 14		-XP11-5	J4-5	RPS1
4	NOT USED					
5	NOT USED					
6	NOT USED					
7	SYS 3 SWITCH OIL LEVEL		1-XP12-1	-XP11-8	J4-6	1-SLO
			1-XP12-2			
8	NOT USED					

YAES 4 SYSTEM UNITS SLAVE PANEL

No.	DESCRIPTION	-ARB TERMINAL No.	-ARB INPUT PLUG	-ARB OUTPUT PLUG	-AMB INPUT PLUG	INPUT DEVICE
1	NOT USED			-		
2	NOT USED			-		
3	FLOW SWITCH	13 - 10				-SF
	SYS No 3 REMOTE OFF/AUTO	11 - 14		-XP11-5	J4-5	RPS1
4	FLOW SWITCH	13 - 10				-SF
	SYS No 4 REMOTE OFF/AUTO	12 - 15		-XP11-7	J4-7	RPS2
5	NOT USED					
6	NOT USED					
7	SYS 3 SWITCH OIL LEVEL		1-XP12-1	-XP11-8	J4-6	3-SLO
			1-XP12-2			
8	SYS 4 SWITCH OIL LEVEL		2-XP12-3	-XP11-6	J4-8	4-SLO
			2-XP12-2			

Digital Outputs

No.	DESCRIPTION	-AMB OUTPUT PLUG	-ARB INPUT PLUG	RELAY BOARD OUTPUT PLUG / TERMINAL	-K RELAY	DEVICE
1	No 1 COMPRESSOR STARTER	J7-1	-XP8-6	1-XP1-1	-K6	1-ZCPR
2	No 1 COMPRESSOR CAPACITY SOL VALVE 1	J7-2	-XP7-6	1-XP1-20	-K14	1-YCCSV1
	No 1 EXPANSION BYPASS SOL VALVE N/O *					1-YEBSV
3	No 1 COMPRESSOR CAPACITY SOL VALVE 2	J8-1	-XP8-1	1-XP1-5	-K5	1-YCCSV2
4	No 1 COMPRESSOR CAPACITY SOL VALVE 3	J8-2	-XP7-2	1-XP1-24	-K1	1-YCCSV3
5	No 1 LIQUID LINE SOLENOID VALVE	J7-3	-XP7-3	1-XP1-9	-K4	1-YLLSV
6	No 1 STARTING BY-PASS SOLENOID VALVE *	J10-3	-XP7-4	1-XP1-17	-K2	1-YSBSV
7	COMMON RUN SIGNAL	J10-4	-XP9-3	35 - 36	-K28	CRS
8	EVAPORATOR HEATER *	J9-5	-XP7-5	1-XP1-13	-K3	-EEH
9	No 2 COMPRESSOR STARTER	J7-4	-XP10-6	2-XP1-2	-K19	2-ZCPR
10	No 2 COMPRESSOR CAPACITY SOL VALVE 1	J7-5	-XP9-6	2-XP1-20	-K31	2-YCCSV1
	No 2 EXPANSION BYPASS SOL VALVE N/O *					2-YEBSV
11	No 2 COMPRESSOR CAPACITY SOL VALVE 2	J8-3	-XP10-1	2-XP1-5	-K18	2-YCCSV2
12	No 2 COMPRESSOR CAPACITY SOL VALVE 3	J8-4	-XP9-2	2-XP1-24	-K15	2-YCCSV3
13	No 2 LIQUID LINE SOLENOID VALVE	J7-6	-XP9-1	2-XP1-9	-K17	2-YLLSV
14	No 2 STARTING BY-PASS SOLENOID VALVE *	J10-5	-XP9-5	1-XP1-17	-K16	2-YSBSV
15	NOT USED	J10-6				
16	CHILLED LIQUID PUMP	J8-5	-XP9-4	33 - 34	-K27	LP
17	1/1 FAN STEP YAES ONLY	J9-1	-XP8-2	1-XP2-1	-K10	SEE SECTION 9.1
18	1/2 FAN STEP YAES ONLY	J9-2	-XP8-3	1-XP2-2	-K11	
19	2/1 FAN STEP YAES ONLY	J9-3	-XP10-2	2-XP2-1	-K23	
20	2/2 FAN STEP YAES ONLY	J9-4	-XP10-3	2-XP2-2	-K24	
21	1/3 FAN STEP YAES ONLY	J10-1	-XP8-4	1-XP2-3	-K12	
22	2/3 FAN STEP YAES ONLY	J10-2	-XP10-4	2-XP2-3	-K25	
23	No 1 SYSTEM ALARM	J8-6	-XP8-5	32-31-30	-K30	SA1
24	No 2 SYSTEM ALARM	J9-6	-XP10-5	39-38-37	-K29	SA2
25	No 1 LIQUID INJECTION ROTOR SOLENOID VALVE *	LATCH ENABLE J5-5 / -XP4-5 DATA J5-6 / -XP4-3 ADRESS J5-7/-XP4-7, J5-8/-XP4-8 & J5-9/-XP4-9		1-XP1-4	-K9	1-YLIRSV
26	No 2 LIQUID INJECTION ROTOR SOLENOID VALVE *			2-XP1-4	-K22	2-YLIRSV
27	No 1 TRANSITION TIMER			1-XP3-6-1-2	-K13	
28	No 2 TRANSITION TIMER			2-XP3-6-1-2	-K26	
29	No 1 CRANKCASE HEATER			1-XP1-2	-K7	1-ECH
30	No 2 CRANKCASE HEATER			2-XP1-2	-K20	2-ECH
31	SYS 1 ECONOMISER/TEV BYPASS SOLENOID VALVE *			1-XP1-3	-K8	1-YESV/YEBSV
32	SYS 2 ECONOMISER/TEV BYPASS SOLENOID VALVE *			2-XP1-3	-K21	2-YESV/YEBSV

* IF FITTED

YAES 3 SYSTEM UNITS SLAVE PANEL

No.	DESCRIPTION	-AMB OUTPUT PLUG	-ARB INPUT PLUG	RELAY BOARD OUTPUT PLUG / TERMINAL	-K RELAY	DEVICE
1	No 3 COMPRESSOR STARTER	J7-1	-XP8-6	1-XP1-1	-K6	3-ZCPR
2	No 3 COMPRESSOR CAPACITY SOL VALVE 1	J7-2	-XP7-6	1-XP1-20	-K14	3-YCCSV1
3	No 3 COMPRESSOR CAPACITY SOL VALVE 2	J8-1	-XP8-1	1-XP1-5	-K5	3-YCCSV2
4	No 3 COMPRESSOR CAPACITY SOL VALVE 3	J8-2	-XP7-2	1-XP1-24	-K1	3-YCCSV3
5	No 3 LIQUID LINE SOLENOID VALVE	J7-3	-XP7-3	1-XP1-9	-K4	3-YLLSV
6	No 3 STARTING BY-PASS SOLENOID VALVE *	J10-3	-XP7-4	1-XP1-17	-K2	3-YSBSV
7	NOT USED					
8	EVAPORATOR HEATER	J9-5	-XP7-5	1-XP1-13	-K3	-EEH
9	NOT USED					
10	NOT USED					
11	NOT USED					
12	NOT USED					
13	NOT USED					
14	NOT USED					
15	NOT USED					
16	NOT USED					
17	3/1 FAN STEP	J9-1	-XP8-2	1-XP2-1	-K10	SEE SECTION 9.1
18	3/2 FAN STEP	J9-2	-XP8-3	1-XP2-2	-K11	
19	NOT USED					
20	NOT USED					
21	3/3 FAN STEP	J10-1	-XP8-4	1-XP2-3	-K12	
22	NOT USED					
23	No 3 SYSTEM ALARM	J8-6	-XP8-5	32-31-30	-K30	SA3
24	NOT USED					
25	No 3 LIQUID INJECTION ROTOR SOLENOID VALVE *	LATCH ENABLE J5-5 / -XP4-5 DATA J5-6 / -XP4-3 ADDRESS J5-7/-XP4-7, J5-8/-XP4-8		1-XP1-4	-K9	3-YLIRSV
26	NOT USED					
27	No 3 TRANSITION TIMER			1-XP3-6-1-2		
28	NOT USED			2-XP3-6-1-2		
29	No 3 CRANKCASE HEATER			1-XP1-2	-K7	3-ECH
30	NOT USED			2-XP1-2		
31	No 3 ECONOMISER/TEV BYPASS SOLENOID VALVE*			1-XP1-3	-K8	3-YESV / 1-YEBSV
32	NOT USED					

* IF FITTED

YAES 4 SYSTEM UNIT SLAVE PANEL

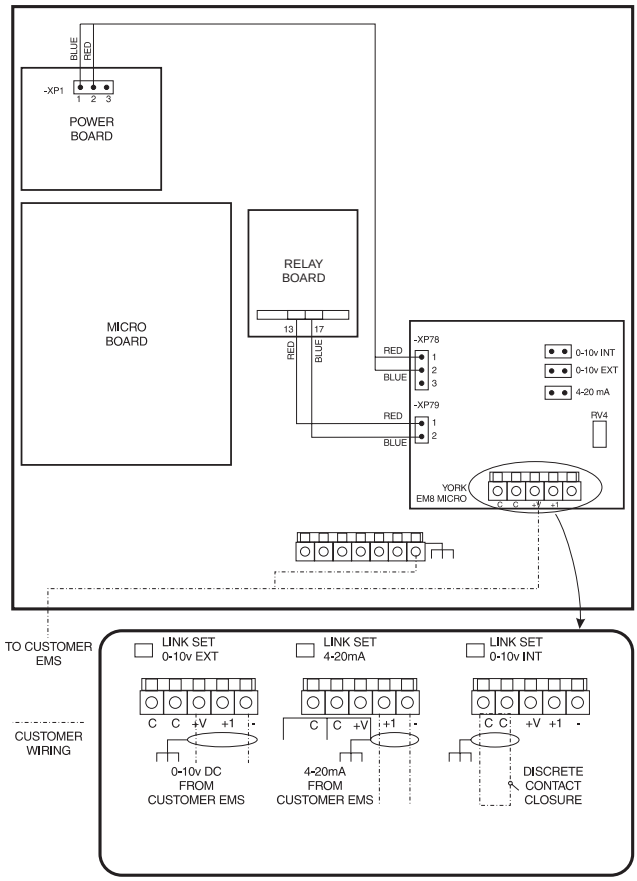
No.	DESCRIPTION	-AMB OUTPUT PLUG	-ARB INPUT PLUG	RELAY BOARD OUTPUT PLUG / TERMINAL	-K RELAY	DEVICE
1	No 3 COMPRESSOR STARTER	J7-1	-XP8-6	1-XP1-1	-K6	3-ZCPR
2	No 3 COMPRESSOR CAPACITY SOL VALVE 1	J7-2	-XP7-6	1-XP1-20	-K14	3-YCCSV1
	No 3 EXPANSION BYPASS SOL VALVE N/O *					3-YEBSV
3	No 3 COMPRESSOR CAPACITY SOL VALVE 2	J8-1	-XP8-1	1-XP1-5	-K5	3-YCCSV2
4	No 3 COMPRESSOR CAPACITY SOL VALVE 3	J8-2	-XP7-2	1-XP1-24	-K1	3-YCCSV3
5	No 3 LIQUID LINE SOLENOID VALVE	J7-3	-XP7-3	1-XP1-9	-K4	3-YLLSV
6	No 3 STARTING BY-PASS SOLENOID VALVE *	J10-3	-XP7-4	1-XP1-17	-K2	3-YSBSV
7	COMMON RUN SIGNAL	J10-4	-XP9-3	35 - 36	-K28	CRS
8	EVAPORATOR HEATER	J9-5	-XP7-5	1-XP1-13	-K3	-EEH
9	No 4 COMPRESSOR STARTER	J7-4	-XP10-6	2-XP1-2	-K19	4-ZCPR
10	No 4 COMPRESSOR CAPACITY SOL VALVE 1	J7-5	-XP9-6	2-XP1-20	-K31	4-YCCSV1
	No 4 EXPANSION BYPASS SOL VALVE N/O *					4-YEBSV
11	No 4 COMPRESSOR CAPACITY SOL VALVE 2	J8-3	-XP10-1	2-XP1-5	-K18	4-YCCSV2
12	No 4 COMPRESSOR CAPACITY SOL VALVE 3	J8-4	-XP9-2	2-XP1-24	-K15	4-YCCSV3
13	No 4 LIQUID LINE SOLENOID VALVE	J7-6	-XP9-1	2-XP1-9	-K17	4-YLLSV
14	No 4 STARTING BY-PASS SOLENOID VALVE *	J10-5	-XP9-5	1-XP1-17	-K16	4-YSBSV
15	NOT USED	J10-6				
16	NOT USED	J8-5				
17	3/1 FAN STEP YAES ONLY	J9-1	-XP8-2	1-XP2-1	-K10	SEE SECTION 9.1
18	3/2 FAN STEP YAES ONLY	J9-2	-XP8-3	1-XP2-2	-K11	
19	4/1 FAN STEP YAES ONLY	J9-3	-XP10-2	2-XP2-1	-K23	
20	4/2 FAN STEP YAES ONLY	J9-4	-XP10-3	2-XP2-2	-K24	
21	3/3 FAN STEP YAES ONLY	J10-1	-XP8-4	1-XP2-3	-K12	
22	4/3 FAN STEP YAES ONLY	J10-2	-XP10-4	2-XP2-3	-K25	
23	No 3 SYSTEM ALARM	J8-6	-XP8-5	32-31-30	-K30	SA3
24	No 4 SYSTEM ALARM	J9-6	-XP10-5	39-38-37	-K29	SA4
25	No 3 LIQUID INJECTION ROTOR SOLENOID VALVE *	LATCH ENABLE J5-5 / -XP4-5 DATA J5-6 / -XP4-3 ADRESS J5-7/-XP4-7, J5-8/-XP4-8 & J5-9/-XP4-9		1-XP1-4	-K9	3-YLIRSV
26	No 4 LIQUID INJECTION ROTOR SOLENOID VALVE *			2-XP1-4	-K22	4-YLIRSV
27	No 3 TRANSITION TIMER			1-XP3-6-1-2	-K13	
28	No 4 TRANSITION TIMER			2-XP3-6-1-2	-K26	
29	No 3 CRANKCASE HEATER			1-XP1-2	-K7	3-ECH
30	No 4 CRANKCASE HEATER			2-XP1-2	-K20	4-ECH
31	SYS 3 ECONOMISER/TEV BYPASS SOLENOID VALVE *			1-XP1-3	-K8	3-YESV/YEBSV
32	SYS 4 ECONOMISER/TEV BYPASS SOLENOID VALVE *			2-XP1-3	-K21	4-YESV/YEBSV

* IF FITTED

16 OPTIONAL ACCESSORIES

16.1 York EMS Micro Interface Card

Control Section



Models: All Micropanel Chillers

This card is capable of accepting a 0 to 10 Vdc, 4-20 mA, or a contact closure to offset the control setpoint by up to 22°C.

The card provides a means for interfacing standard YORK units with the customer's EMS (Energy Management System). On command from the customers EMS the YORK unit will reset the leaving water temperature upwards by the desired amount from the units setpoint. Thus the customers EMS system can save energy, when conditions permit, by signalling the YORK unit to deliver a higher leaving water temperature.

The standard YORK unit will accept a 1 to 21 second PWM (pulse width modulated) signal to reset the unit setpoint upwards to a programmable maximum value in the range of 2 to 22°C.

The EMS micro interface card will accept 3 types of signal from the customer's EMS:

Discrete contact closure
0-10 Vdc
4-20 mA dc

The card converts the customers signal into a 1 to 21 second pulse that the standard unit will accept. The length of pulse is displayed on the EMS card by a LED (Light Emitting Diode). The cards sampling is such that the pulse will occur at approximately 70 to 90 seconds intervals. Thus this is the maximum update rate the unit will accept.

Changes of input signal between these sampling points will be ignored. The conversion of the customer signal into a temperature offset is dependant on the value programmed under "REMOTE SETPOINT TEMP RANGE" on the unit panel.

PROGRAMMING UNIT "REMOTE SETPOINT TEMP RANGE"

The maximum desired reset must be programmed into the unit memory and can be a value of 2°C to 22°C. To program the maximum value of reset, press the "REMOTE SETPOINT TEMP RANGE" key. The following message will appear on the unit display:

REM SETPOINT = 6.0
REM RANGE = 10 DEG C

The display will indicate the REM SETPOINT which is always equal to the chilled liquid setpoint plus the offset from the reset signal. The display will also show the REM RANGE which is the same as the maximum reset required.

Key in the maximum reset for the REM RANGE and press the ENTER key to store the new value in memory.

Once the maximum reset is programmed, it requires a contact closure of 21 seconds to provide maximum reset. For noise immunity, the unit will ignore pulses of between 0 to 0,5 seconds, 0,5 to 1 second is taken as zero offset.

16.2 Discrete Contact Closure

For this type of interface the customer provides a voltage free contact. With the contact closed there is one discrete reset step which is field adjustable on the EMS card.

EMS CARD CONNECTION AND SET-UP

Connect the voltage free contact to the EMS terminals "C, C" located in the logic section of the YORK control panel using 2 core screened cable. Earth the screen at YORK control panel end only.

The screened cable must run separately from mains cables to avoid electrical noise which could cause a malfunction or damage to the unit and its controls. The contact should be rated for 5 mA 12 Vdc. Set the link on EMS card to 0-10V INT.

The amount of offset when the contact is closed is determined by the voltage set using RV4 potentiometer. To calculate the SET VOLTAGE for the required offset proceed as follows:

$$\text{SETVOLTAGE} = \frac{\text{OFFSET in °C} \times 10}{\text{PROGRAMMED MAX RESET}}$$

PULSE LENGTH seconds = (SET VOLTAGE x 2) + 1

Ensure the contact across terminals "C, C" is closed. Connect a voltmeter set for 10 Vdc to EMS card test point TP3 (TP2 REV- cards), negative lead, with positive lead on TP7 (REV- cards link 0-1 0 V INT). Adjust RV4 potentiometer until voltmeter reads calculated SET VOLTAGE.

Example

Required OFFSET with contact closed = 7°C

PROGRAMMED MAX RESET = 10°C
(a figure selected above the OFFSET required)

$$\text{SET VOLTAGE} = \frac{7 \times 10}{10}$$

SET VOLTAGE = 7

16.3 0-10 Vdc Customer EMS Signal

For this type of interface the customer provides a 0 - 10 Vdc signal. 0 Vdc represents no offset. From this minimum an increasing voltage results in a linear increase in offset up to the PROGRAMMED MAX RESET.

°C OFFSET = Vdc input x PROGRAMMED MAX RESET
10

PULSE LENGTH seconds =
(Vdc INPUT x 2) + 1

EMS CARD CONNECTION AND SET-UP

Connect 0 - 10 Vdc SIGNAL to the EMS card terminals “+V” and “-” located in the logic section of the YORK control panel using 2 core screened cable. Ensure that the signal polarity is correct. Earth screen at YORK control panel end only.

The screened cable must be run separately from mains cables to avoid electrical noise which could cause a malfunction or damage to the unit and its controls. Set link on EMS card to 0 -10 V EXT.

Opto-coupled isolation of the 0 to 10 Vdc signal may be required with some systems.

16.4 4-20 mA dc Customer EMS Signal

For this type of interface the customer provides a 4 - 20 mA dc signal. 0 - 4 mA represents no offset. From this minimum an increasing current results in a linear increase in offset up to the PROGRAMMED MAX RESET.

°C OFFSET = (mA dc input -4) x PROG. MAX RESET
16

PULSE LENGTH seconds =
((mA dc INPUT- 4) x 1.25) +1

EMS CARD CONNECTION AND SET-UP

Connect 4 - 20 mA dc SIGNAL to the EMS card terminals “+1" and - located in the logic section of the YORK control panel using 2 core screened cable. Ensure that the signal polarity is correct. Earth screen at YORK control panel end only.

The screened cable must be run separately from mains cables to avoid electrical noise which could cause a malfunction or damage to the unit and its controls. Set link on EMS card to 4 - 20 mA.

Opto-coupled isolation of the 4 to 20 mA signal may be required with some systems.

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