ENER-SAVE SDN BHD
HYDROCARBON SCREW CHILLER

TITLE	:	**User Manual for** **ENER-SAVE Hydrocarbon Screw Chiller Control System** **ESWC135C50SHC2**
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Revision History

Rev	Revision Date	Description	Section (Page)	Revised By
0	23/11/17	1. Fault Code	1. 15 - 16	Ferdinand
1	23/11/17	1. Add remark	1. 16	Ferdinand

TABLE OF CONTENT

1 Introduction

1.1 System Overview

ENERSAVE Screw Chiller Control System consists of microprocessor controller and LCD display. When the control panel's external panels are opened, there are

1. Digital power meter
2. LCD display
3. E-stop button
4. Push on button

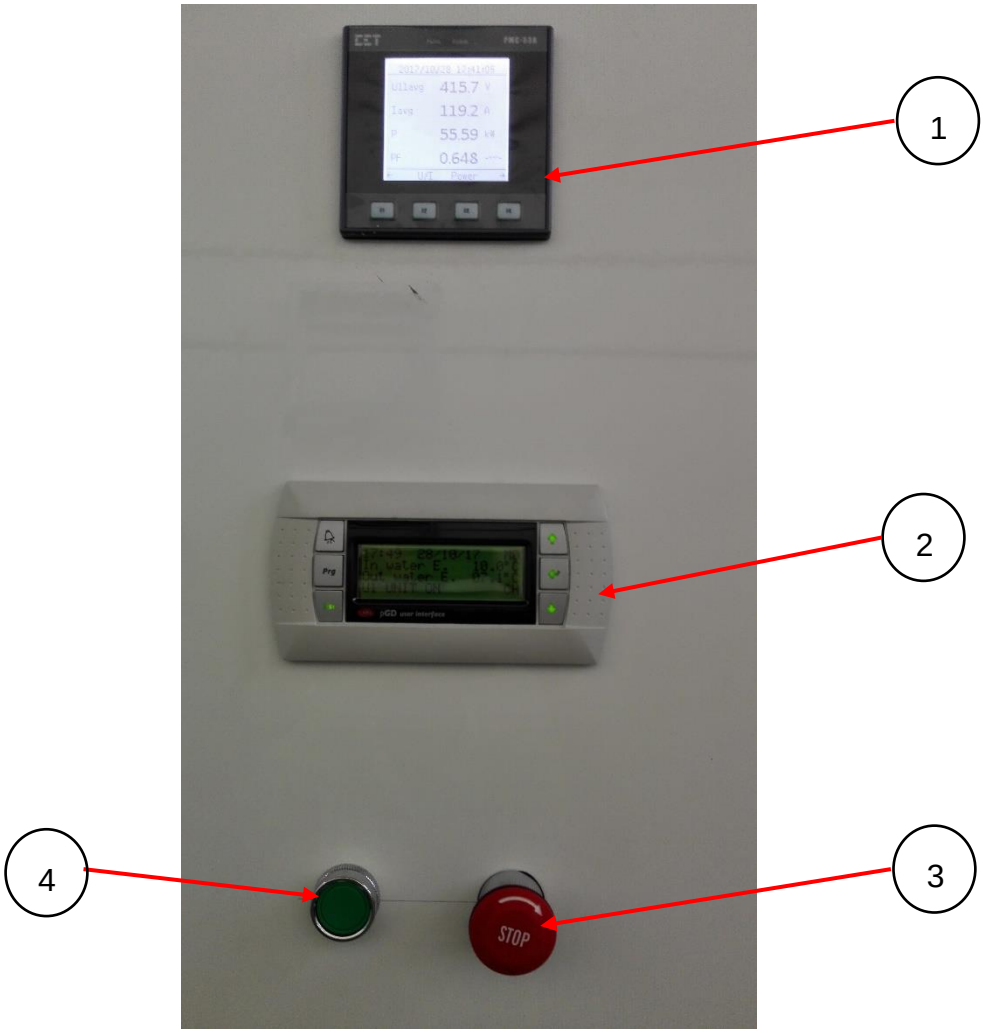


Figure 1: Front panel overview

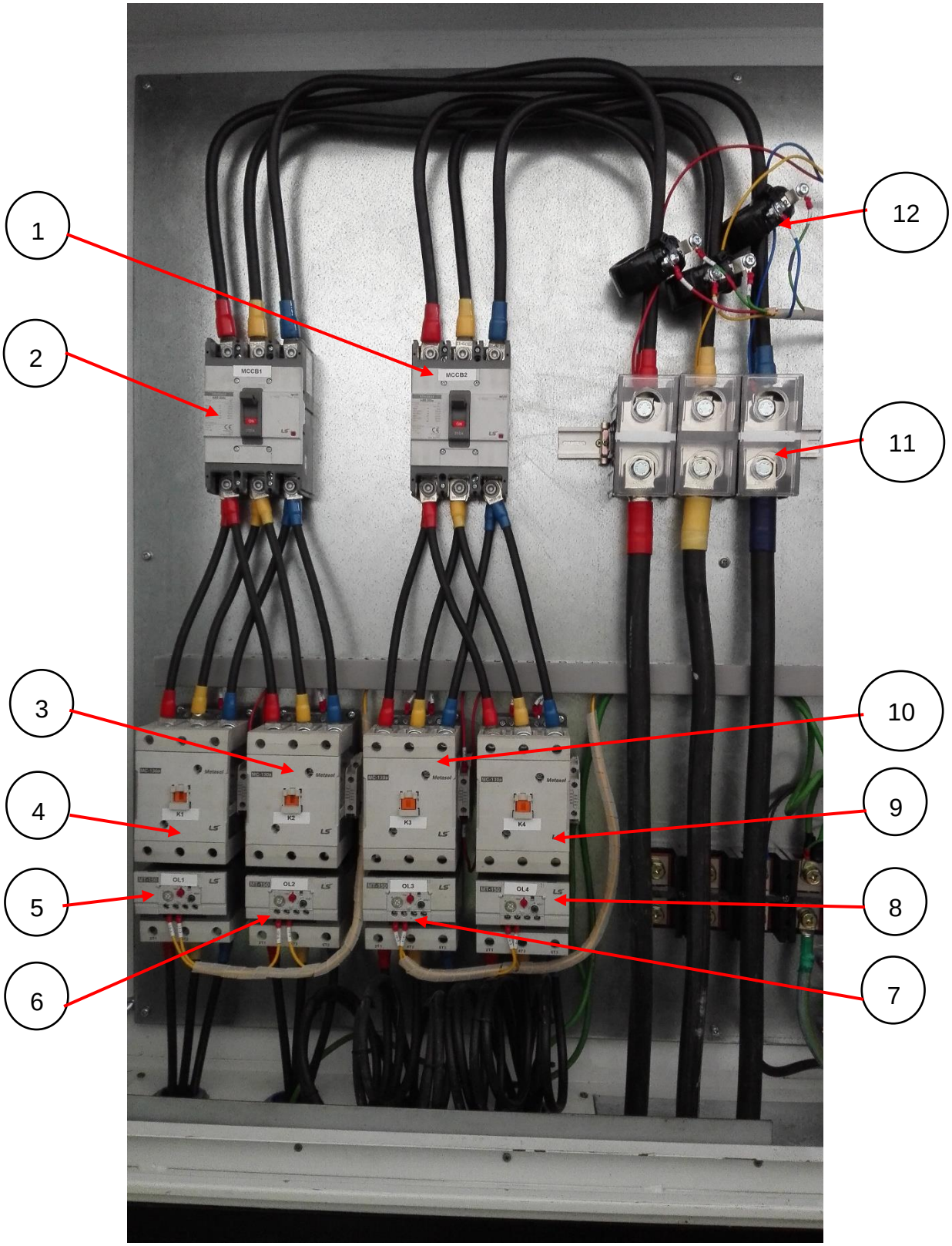


Figure 2: Left side control panel overview

Main components at left side of control panels (as shown in Figure 2)

1. MCCB2: MCCB for compressor B
2. MCCB1: MCCB for compressor A
3. K2: Triangle contactor for compressor A
4. K1: Line contactor for compressor A
5. OL1: Compressor A Overload 1
6. OL2: Compressor A Overload 2
7. OL3: Compressor B Overload 1
8. OL4: Compressor B Overload 2
9. K4: Triangle contactor for compressor B
10. K3: Line contactor for compressor B
11. Terminal block for main power supply
12. Current transformer

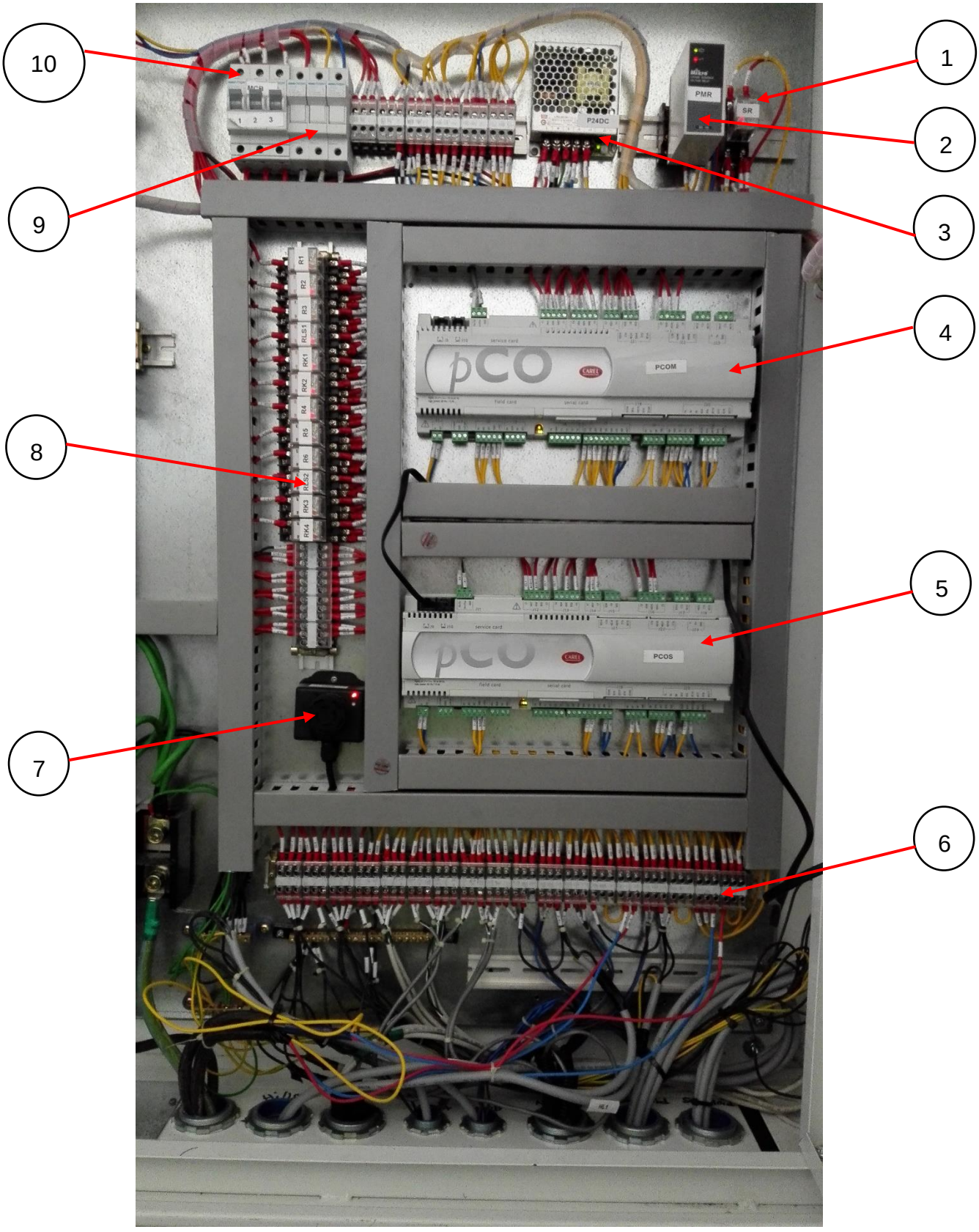


Figure 3: Right side control panel overview

Main components at right side of control panels (as shown in Figure 3)

1. SR: Unit start relay
2. PMR: Phase monitor relay
3. P24DC: Switching power supply 24Vdc
4. PCOM: Microprocessor controller – master
5. PCOS: Microprocessor controller – slave
6. Terminal blocks for sensor and devices connections
7. HCS: Propane leakage detect sensor
8. Relays for solenoid coils and contactors

   R1: Relay capacity control compressor A-1

   R2: Relay capacity control compressor A-2

   R3: Relay capacity control compressor A-3

   RLS1: Relay liquid solenoid circuit A

   RK1: Relay line contactor compressor A

   RK2: Relay line contactor compressor A

   R4: Relay capacity control compressor B-1

   R5: Relay capacity control compressor B-2

   R6: Relay capacity control compressor B-3

   RLS2: Relay liquid solenoid circuit B

   RK3: Relay line contactor compressor B

   RK4: Relay line contactor compressor B
9. Fuse cartridge for digital power meter
10. MCB

    MCB1: PCO Control MCB

    MCB2: Circuit A power supply

    MCB3: Circuit B power supply

1.2 System Features

- Interactive screen
- User friendly interface
- Simple operation
- Major components run time
- Component's maintenance warning
- Active alarm
- History alarm logging
- Easy to change system set-point
- The program and the parameters are saved permanently in the flash memory, preventing data loss in the event of power failure (without requiring a backup battery).
- Multi-level password protection can eliminate the control system from being accessed by unauthorized personnel.

2 System Functionality

2.1 Unit on/off

To on/off the unit, it can be carried out at front panel of the control panel.

Figure 4: On-off buttons at front panel

A. To on unit, press the green colour push button.

B. To off unit, press the red colour “e-stop” button.

C. To resume from the unit off, turn the red colour knob clockwise for locking release, then press the green colour push button to on the unit.

2.2 Display

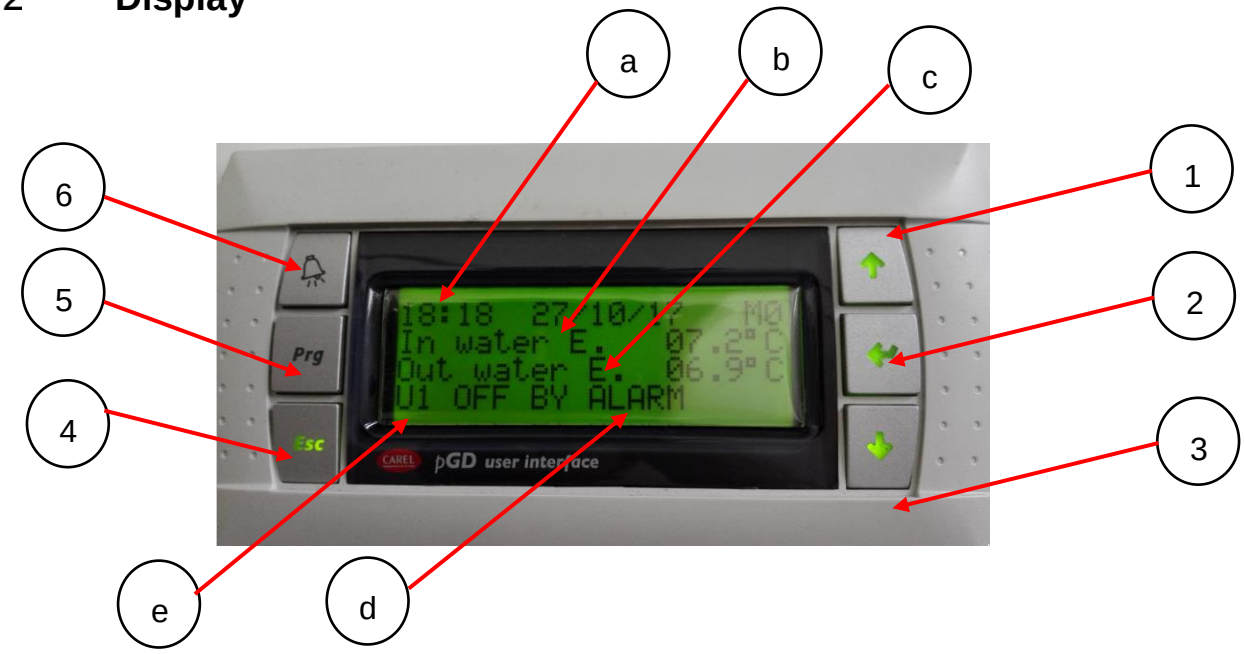


Figure 5: LCD Display with 6 buttons

At the display, there are six access buttons:

1. UP key
2. ENTER key
3. DOWN key
4. ESC key
5. PRG key
6. ALARM key

At front page, below information is available.

a. Date and time

b. Evaporator water inlet temperature (*show at U1 only*)

c. Evaporator water outlet temperature (*show at U1 only*)

d. Unit status

e. Unit number (*U1: master unit; U2: slave unit*)

2.3 Component run hours

To access to the component run hours, press “PRG” key -> a-maintenance.

From here, you can check the major components run hour and alarm is activated when the run hour threshold is exceeded.

2.4 Input / output status

The input/output status of the controller can be checked by press “PRG” key -> i-input/output, then use “UP” or “DOWN” key to check analogue input, digital input and digital output status of the controller.

2.5 Clock

To change the date or time of the controller, press “PRG” key -> k-clock, then can input the new date or time whichever is necessary.

Figure 6: Clock configuration page

2.6 Setpoint

To change the control temperature setpoint, press “PRG” key -> s-setpoint, then press “DOWN” key to next page to change the setpoint. The setpoint limit is 5ºC to 22ºC

2.7 Alarm

When there is alarm activated, the “ALARM” key shall light in red colour, refer to Figure 7 below. To check what the active alarm is, press the “ALARM” key. To reset the alarm, “ALARM” key has to be pressed provided that the alarm can be cleared.

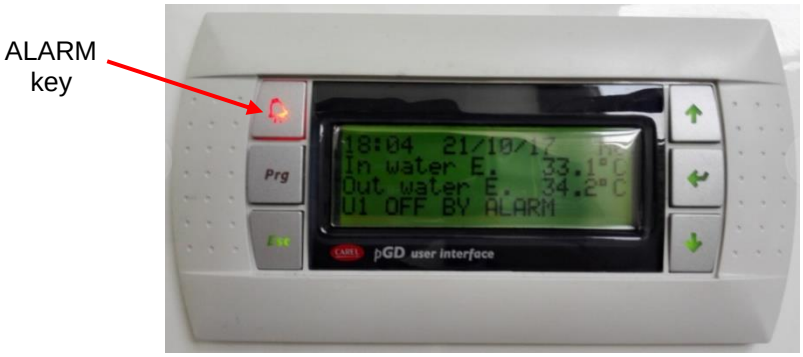


Figure 7: Unit with active alarm

2.8 Alarm history

To view the alarm history, press “PRG” key -> q-history, then press “UP” or “DOWN” key to view the alarm history event.

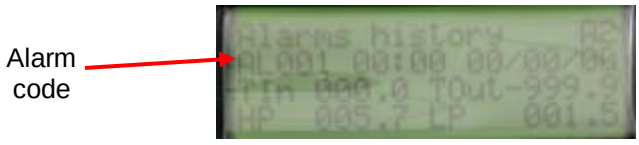


Figure 8: Alarm history page

Alarm code list:

AL:001 Unit No. 1 Offline

AL:002 Unit No. 2 Offline

AL:011 Serious alarm from digital input

AL:012 Phase monitor alarm

AL:013 Evaporator flow-switch alarm

AL:014 Condenser flow-switch alarm

AL:015 Oil level alarm

AL:016 High pressure alarm (pressure switch)

AL:017 Low pressure alarm (pressure switch)

AL:018 Evaporator Pump thermal Cutout

AL:019 Condenser Pump thermal cutout

AL:020 Compressor thermal cutout

AL:031 Antifreeze alarm

AL:032 Low pressure differential alarm

AL:033 High pressure alarm (transducer)

AL:034 Low pressure alarm (transducer)

AL:038 Compressor overload alarm

AL:039 Propane leakage detected alarm

AL:051 Evaporator pump maintenance

AL:052 Condenser pump maintenance

AL:053 Compressor Maintenance

AL:060 Probe B1 failed or not connected

AL:061 Probe B2 failed or not connected

AL:062 Probe B3 failed or not connected

AL:063 Probe B4 failed or not connected

AL:064 Probe B5 failed or not connected

AL:065 Probe B6 failed or not connected

AL:066 Probe B7 failed or not connected

AL:067 Probe B8 failed or not connected

2.9 Unit change

At the display, unit information for system A (U1) and system B (U2) can be swapped by pressing “PRG” key -> unit change. At below page, input the number for which unit to switch. For example from unit 1 to unit 2, input “2” at the field follow by “ENTER” key.

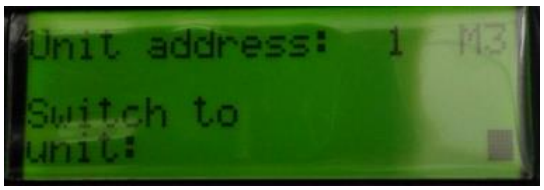


Figure 9: Switch to unit page

2.10 Outlet temperature control

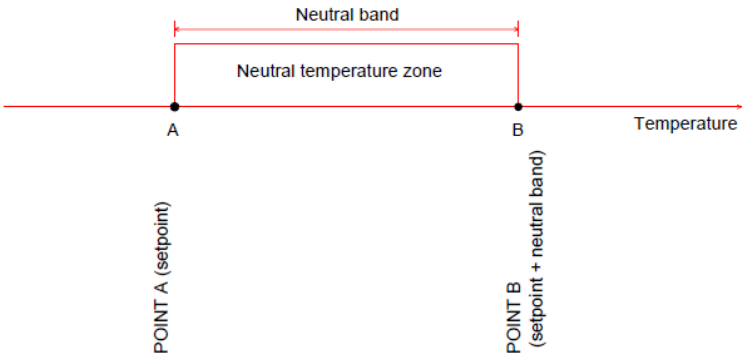


Figure 10: Outlet temperature control schematic

For chilled water temperature control, it is based on evaporator water outlet temperature. Refer to Figure 10 for the control algorithm, a neutral temperature zone is identified, based on the setpoint and neutral band values.

- Temperature values between the set point and set point + band (A < Temperature < B) shall not switch any compressor’s step On/Off.
- Temperature values above set point + band (Temperature > Point B) shall increase the number of

compressor's step.

- Temperature values below the set point (Temperature < Point A) shall decrease the number of compressor's step

If the temperature falls below forced off threshold, the compressors are stopped irrespective of the set delays, to avoid the activation of the antifreeze alarm

2.11 Troubleshooting

If there is any alarm activated, the alarm key shall on the "red" light, press the 'ALARM' key at display to check the alarm information. Then, refer to below table for possible causes, check and rectify it then reset the alarm.

CODE	Alarm / Error	Possible Cause	Solution
AL:039	Propane Leakage Detected Alarm	• Sensor detect gas leakage	• Check is there any leakage on system. • Ventilate the ambient with fresh air
AL:013	Evaporator Flow Switch Alarm	• No or very low water flow rate for evaporator	• Make sure the water flow rate for evaporator is sufficient. • Make sure the evaporator circulation pump is on. • Make sure there are no blockage at water strainer of evaporator's water pipe system.
AL:014	Condenser Flow Switch Alarm	• No or very low water flow rate for condenser	• Make sure the water flow rate for condenser is sufficient. • Make sure the cooling tower circulation pump is on. • Make sure there are no blockage at water strainer of condenser's water pipe system.
AL:012	Phase Fault	• Phase sequence reverse • Phase loss	• Check the phase sequence is correct • Check if any line wire is loss due to loose contact

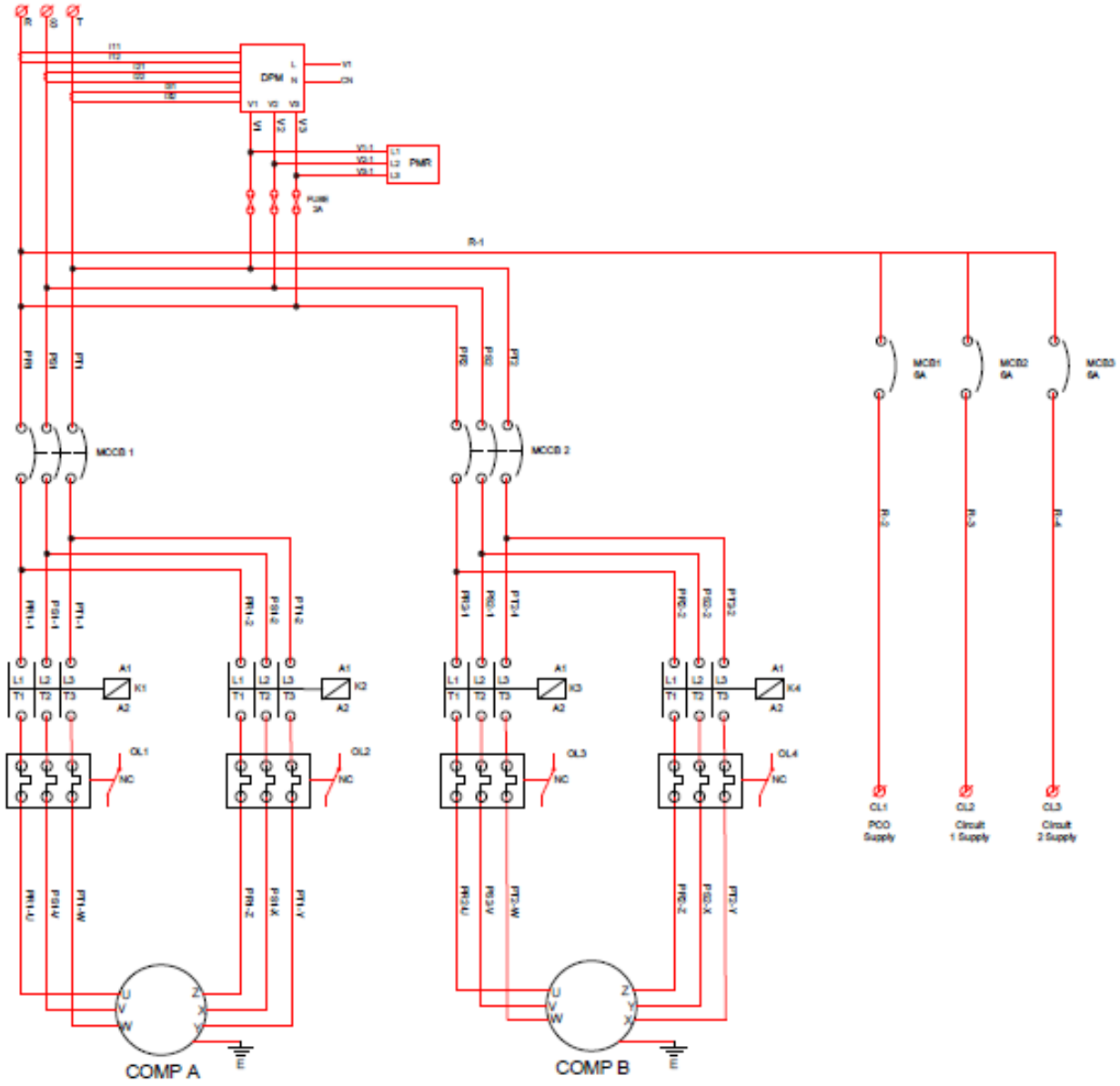
AL:017 AL:034	Compressor Low Pressure Alarm	• Evaporator flow rate is low • Evaporator is dirty • Refrigerant leak at system	• Check evaporator flow rate is sufficient • Clean evaporator • Check any leak at system
AL:016 AL:033	Compressor High Pressure Alarm	• Condenser flow rate is low • Condenser is dirty	• Check condenser flow rate is sufficient • Clean condenser
AL:031	Low Suction Temperature Alarm	• Evaporator temperature low	• Check if system is over-charge • Check if control setpoint is set too low • Check evaporator flow rate is sufficient
AL:038	Compressor Overload Alarm	• Compressor high running current	• Check compressor running current and compare to previous data • Check compressor operating pressure and compare to previous data
AL:020	Compressor Thermal Cutout Alarm	• Thermistor inside compressor has exceeded threshold	• Check the error blink codes of compressor module at compressor terminal box for the root cause and rectify it. • If the module is lockout, need to reset at MCB 2 or 3 by off and on the MCB, depends on system A or B.

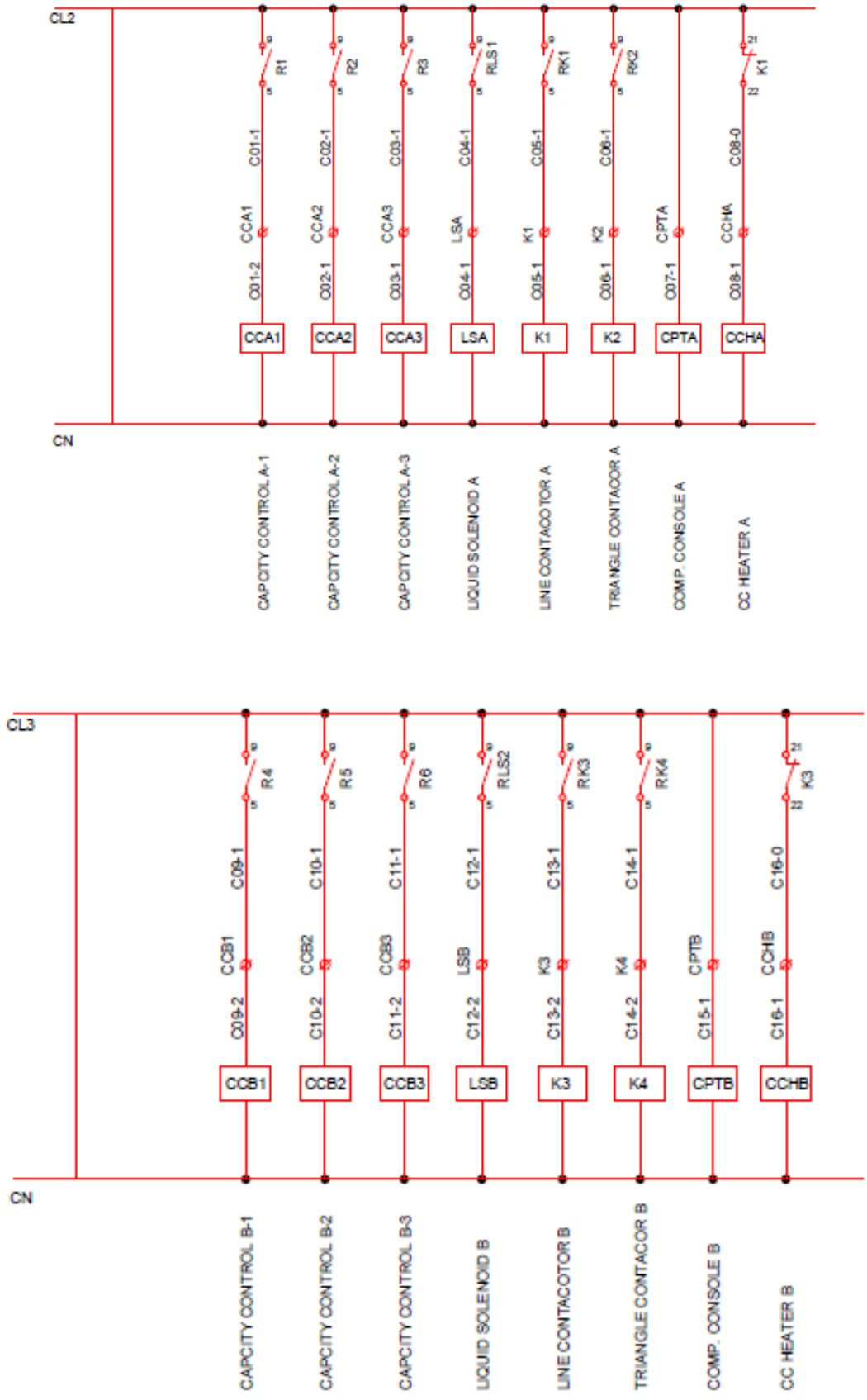
Remark:

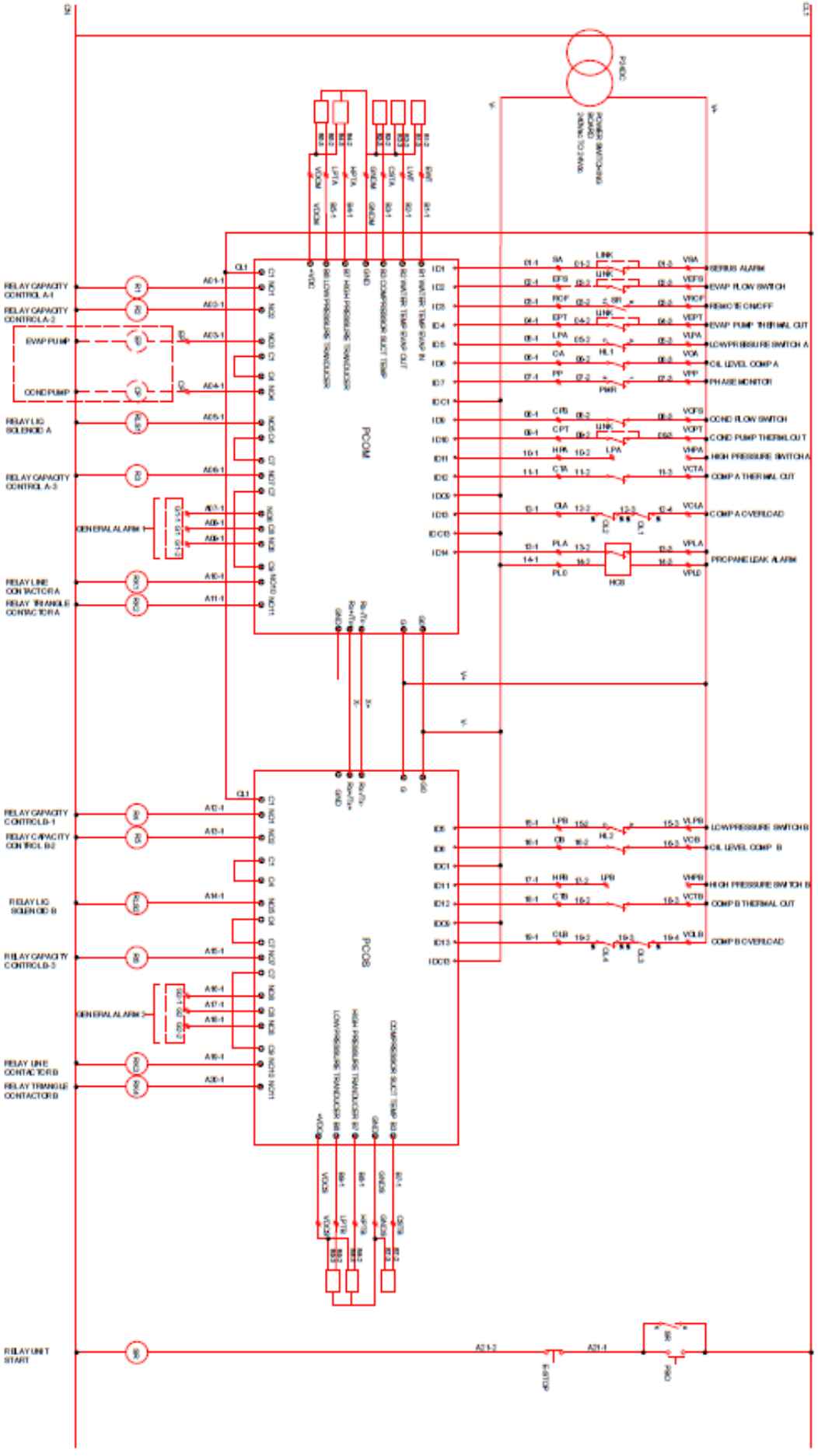
The active alarm and alarm code shown is for individual system. In order to swap between unit information, it can be done using “Unit Change” function (refer to section 2.9 for details). U1 is showing alarm history and active alarm for system A while U2 is showing alarm history and active alarm for system B. When unit status shows “off by alarm”, need to check, rectify and reset the alarm(s) at U1 and U2 display respectively.

3 Appendices

3.1 Wiring diagram




CL2
CN
R1
R2
R3
RLS1
RK1
RK2
K1
C01-1
C02-1
C03-1
C04-1
C05-1
C06-1
C08-0
CCA1
CCA2
CCA3
LSA
K1
K2
CPTA
CCHA
C01-2
C02-1
C03-1
C04-1
C05-1
C06-1
C07-1
C08-1
CCA1
CCA2
CCA3
LSA
K1
K2
CPTA
CCHA
CAPCITY CONTROL A-1
CAPCITY CONTROL A-2
CAPCITY CONTROL A-3
LIQUID SOLENOID A
LINE CONTACOTOR A
TRIANGLE CONTACOR A
COMP. CONSOLE A
CC HEATER A
CL3
CN
R4
R5
R6
RLS2
RK3
RK4
K3
C09-1
C10-1
C11-1
C12-1
C13-1
C14-1
C16-0
CCB1
CCB2
CCB3
LSB
K3
K4
CPTB
CCHB
C09-2
C10-2
C11-2
C12-2
C13-2
C14-2
C15-1
C16-1
CCB1
CCB2
CCB3
LSB
K3
K4
CPTB
CCHB
CAPCITY CONTROL B-1
CAPCITY CONTROL B-2
CAPCITY CONTROL B-3
LIQUID SOLENOID B
LINE CONTACOTOR B
TRIANGLE CONTACOR B
COMP. CONSOLE B
CC HEATER B


RELAY CAPACITY CONTROL A-1
RELAY CAPACITY CONTROL A-2
EVAP PUMP
COND PUMP
RELAY LIQ SOLENOID A
RELAY CAPACITY CONTROL A-3
GENERAL ALARM 1
RELAY LINE CONTACTOR A
RELAY TRIANGLE CONTACTOR A
RELAY CAPACITY CONTROL B-1
RELAY CAPACITY CONTROL B-2
RELAY LIQ SOLENOID B
RELAY CAPACITY CONTROL B-3
GENERAL ALARM 2
RELAY LINE CONTACTOR B
RELAY TRIANGLE CONTACTOR B
RELAY UNIT START
PCOM
PCOB
SERIUS ALARM
EVAP FLOW SWITCH
REMOTE ON/OFF
EVAP PUMP THERMAL CUT
LOW PRESSURE SWITCH A
OIL LEVEL COMP A
PHASE MONITOR
COND FLOW SWITCH
COND PUMP THERMAL CUT
HIGH PRESSURE SWITCH A
COMP A THERMAL CUT
COMP A OVERLOAD
PROPANE LEAK ALARM
LOW PRESSURE SWITCH B
OIL LEVEL COMP B
HIGH PRESSURE SWITCH B
COMP B THERMAL CUT
COMP B OVERLOAD