# SENSORI® CONTROL MANUAL FOR STANDALONE

## VERSION 1.0

***03/2021***


# OXFORD ENERGY SOLUTIONS

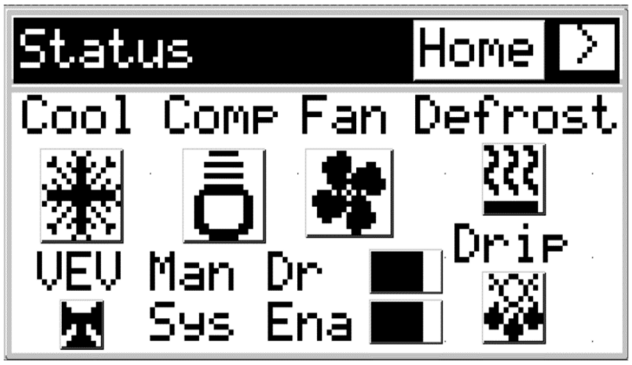
# Contents

# 1. SENSORI CASE MANAGEMENT FOR STANDALONE

(M172-42 I/O)

## STATUS

**Status Indication Screen** SYMBOLS THAT ARE VISIBLE MEANS THAT STATE IS ACTIVE.

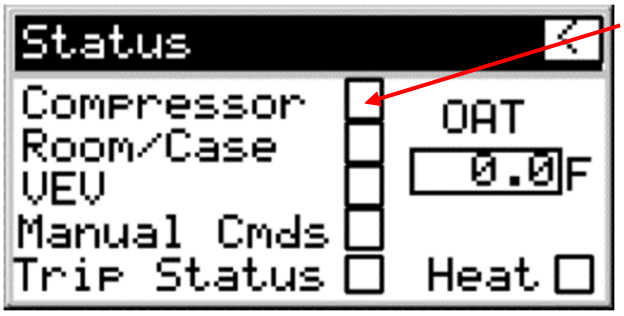



**Man Dr** – Manual Door Open Indication (*Refer to pg.7, Manual Commands for Operation*)

**Sys Ena** – System Enabled Indication: System enabled by Digital Input (*refer to wiring schematic*)

**VEV Command active** = Digital Output 5 active. This is used for a wired Refrigeration Command.

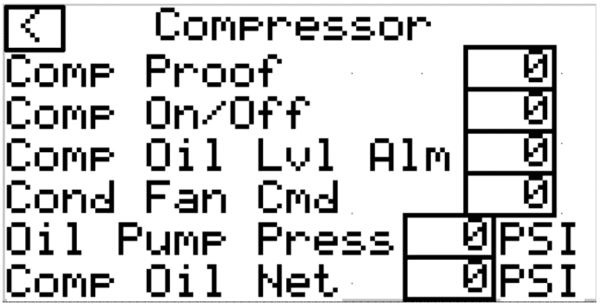
## Status Menu Screen



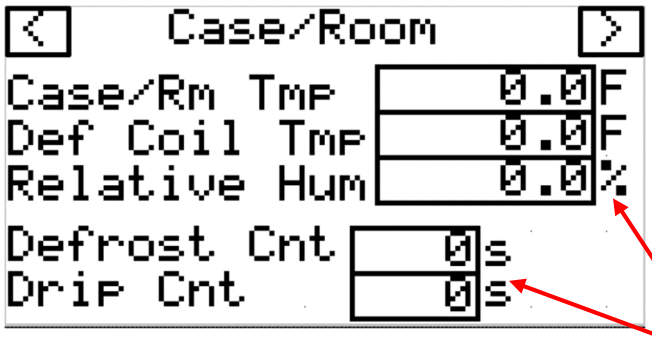

**Compressor** Status Screen (*refer to **Sensori Compressor Safety Control Manual** section 2 for more info*)

See **Page 6** for Trip Status and Heat (*Room Heat Ctrl*)

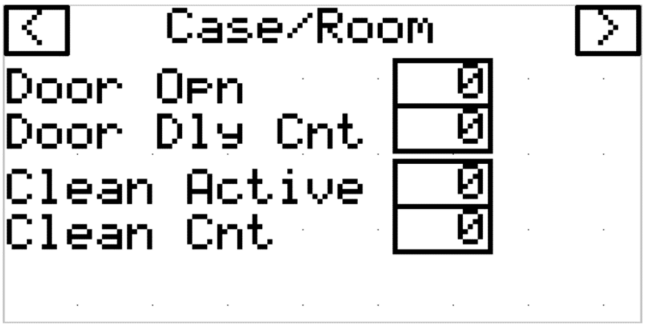
## Compressor Proof, Condenser Fan Command



## Case/Room Status Screen

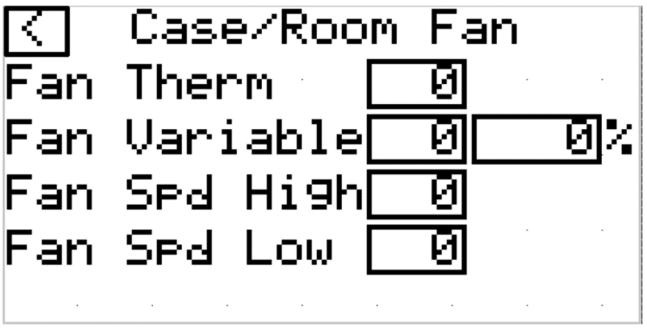



**Relative Humidity** only if present, 0 if not. Count Delays until **Defrost/Drip** expires based on time set in Setpoints menu.




**Door Open**: displays when physical Digital input (*Door Switch*) is active. **Door Delay** is based on time set in setpoints for open and close for counting.

**Clean Active**: displays when system in clean mode. **Clean Count** until clean has expired.

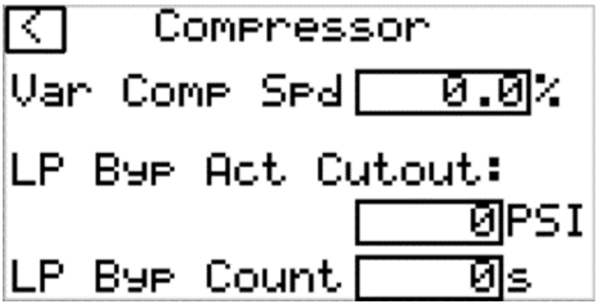



Evaporator **Fan Thermal** (*If Present*) – 1 = okay, 0 = Trip or not present (*Physical DI*)

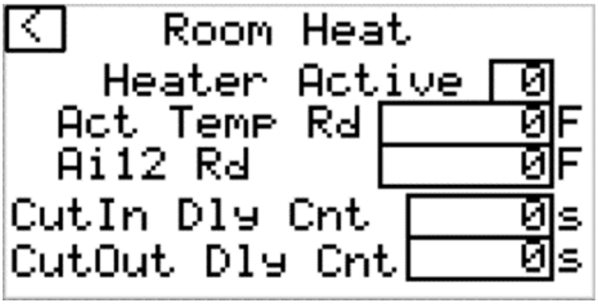
**Fan Variable Speed** indicates if it is enabled and the percent active(*0-10vdc = 0-100%*)

**Fan Speed High/Low** Indication (*Further info in "Setpoints"*)

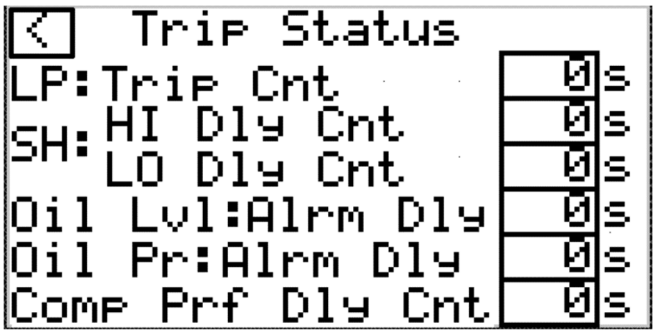
**Case/Rm Tmp** – depending on number sensors and "Temp Rd Md" selected in Setpoints. This will show the combined method of case/product temps. If only one temp active, **Temp 1** will display the same, and all other temps will display 0.




**Var Comp Spd** – Variable Compressor Speed Output from 0-100% being controlled through 0-10vdc Analog Output. See **Setpoints** for further information.



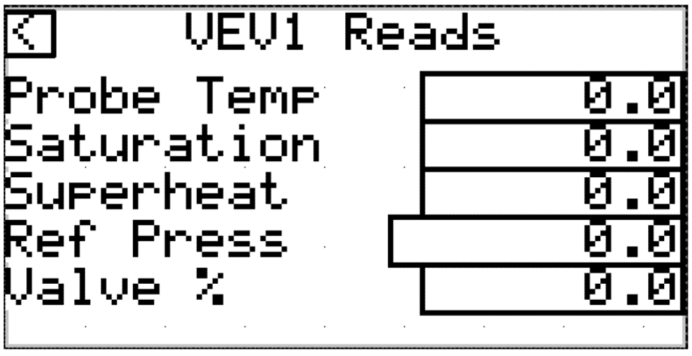

**Room Heat Control** – Simply used for controlling heat in room/case.
**Active Temperature Read** is either from the Case/Room temperature that is being used to control the cooling or **AI12** depending on if AI12 is present.
**Heater Cut in and Out Delay** counts in seconds.




**Trip Status** – Refer to **Sensori Compressor Safety Manual** *(section 2)* for more info on delay counts.

**Compressor Proof Delay Count**, time set in Room/Case Setpoints. If Count ever expires, Compressor Proof Alarm will occur and must be reset to return normal operation.

## Vev Status




**Probe temp** – Temperature probe located on suction line at outlet of evaporator as installed by contractor.

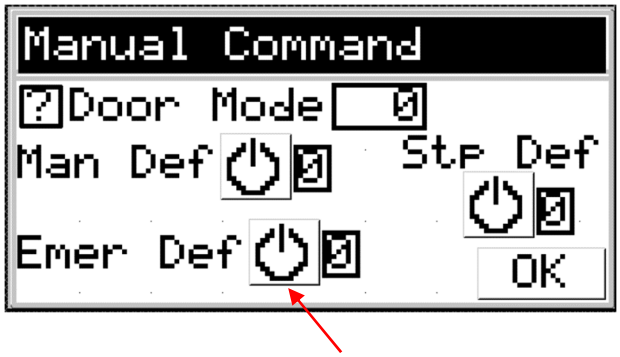
**Saturation** – The SST of the selected refrigerant based on its current pressure.

**Superheat** – The calculated superheat in real time.

**Ref Press** – The pressure of the suction line where the suction line transducer was installed by contractor.

**Valve %** – EXV valve operating % in real time.

## MANUAL COMMANDS




**Door Mode** – 0 = Auto mode. This mode is waiting for the physical Door switch (DI), to be active before the count will start. When a count has expired, based on setpoints set for Door open/Close delays, the system will shut off.
1 = Manual Door open mode. Set this to 1 if system is to manually be shut down.

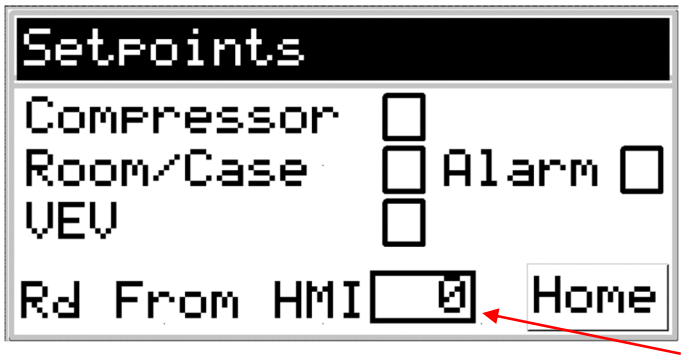
Push Button and indication for being active.

**Manual Defrost** – Listens to both time and defrost coil temperature, whichever comes first. Minimum defrost will be active.

**Emergency Defrost** – Only listens to the maximum time set in Setpoints menu. This will not look at defrost coil temp.

**Stop Defrost** – Can be used anytime the system automatically or manually is put into defrost. Drip time will occur after this is pressed.

## SETPOINTS

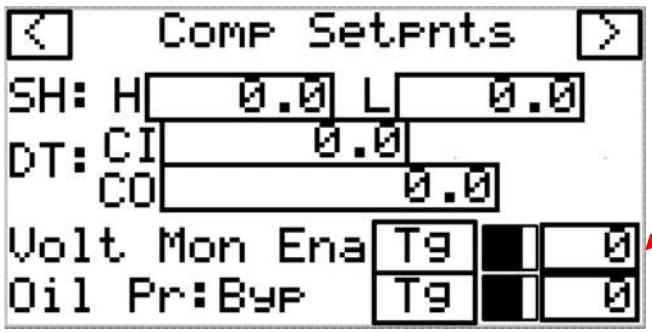



Refer to **Sensori Compressor Safety Control Manual** *(section 2)* for Information on Compressor Setpoints.

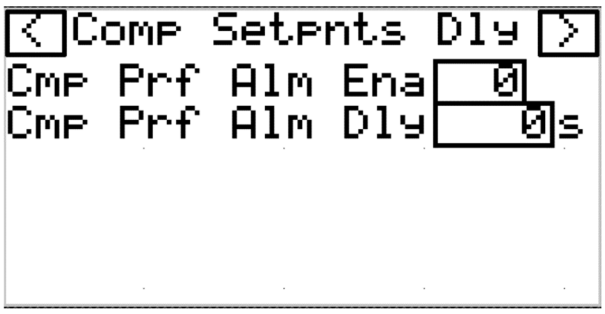
Refer to **Sensori Control with VEV Driver** *(section 3)* for Information on **VEV** Setpoints.

****NOTE: This value must be set to "0" if setpoint changes (that also have access from the remote HMI (DCL)) are being made. If Value is set to "0", certain setpoints will not allow you to change!!!****

### Voltage Monitor Present and Compressor Proof (*See Below*)




If Toggled to select "1", system will look for Physical DI (***see wiring schematic***). If this input is not active, System will alarm and shut down.

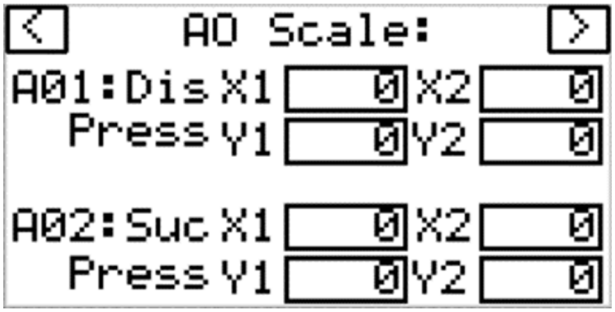



**Compressor Proof Alarm Enable** if using compressor feedback to the Physical DI (*see wiring schematic*).

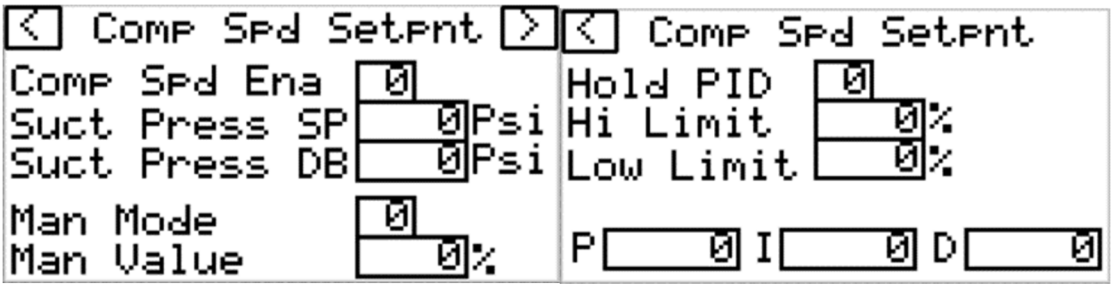
Set **Compressor proof alarm delay** in seconds, that it will wait for an input to be active. Generally, this input is switched from a compressor contactor auxiliary, or a relay on a VFD.

## AO Scaling

**AO1:Discharge Pressure** analog output 0-5VDC
**AO2:Suction Pressure** analog output 0-5VDC

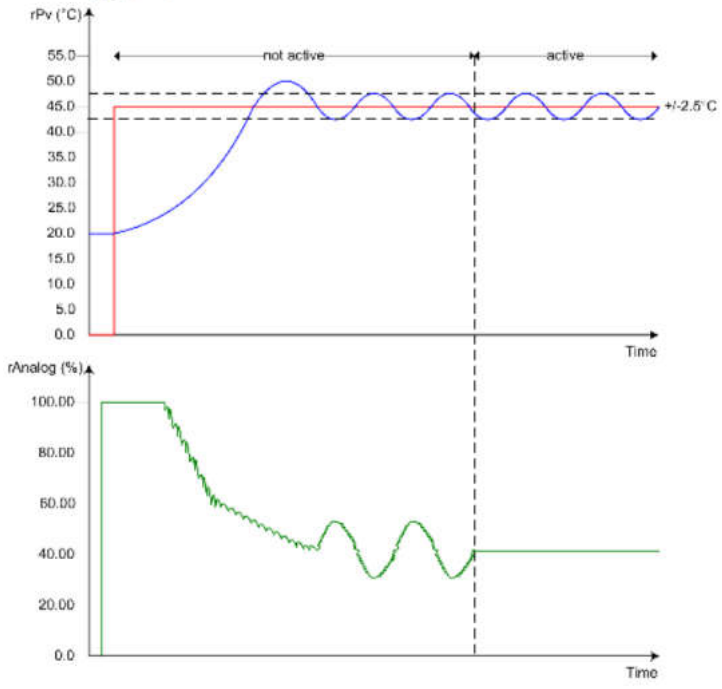



## Compressor Speed Control Setpoints




**Compressor Speed Enable** – Set to "1" to activate 0-100% variable speed control.
**Suction Pressure Setpoint** – Setpoint used to maintain a steady Saturated Suction Temperature in PSI.
**Suction Pressure Deadband** – Used to smooth out control behaviour PSI +/-. See Graphic.

The following graphic presents the dead band function:



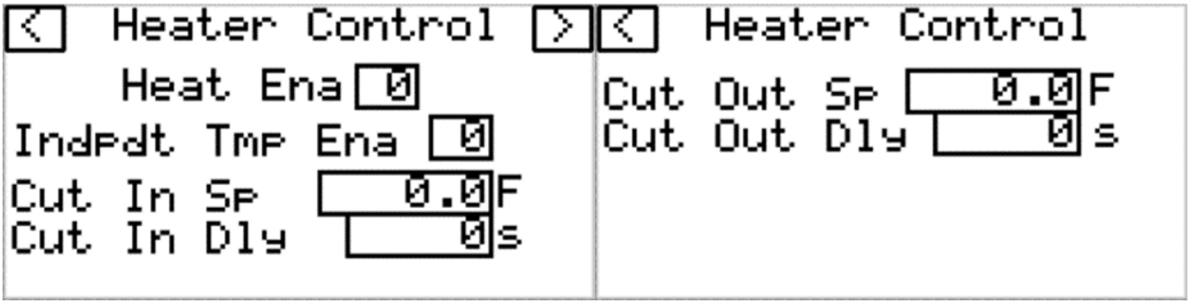
**Manual Mode and Manual Value –** Set to manually override to a set value/speed.

**Hold PID** – The internal calculation of the integral term also freezes.
1: Holds the PID action
0: Resumes the PID action

**High and Low Limit** – Limits for PID Outputs

**P I D** – Proportional, Integral, and Derivative Values for Control Behaviour. Setting longer ramp-up times on variable frequency drives helps smooth out control of pressure as well.

## Room Heat Control Setpoints – *Only Available on Standalone 42IO*




**Heat Enable** – Enables heater control for Room/Case.

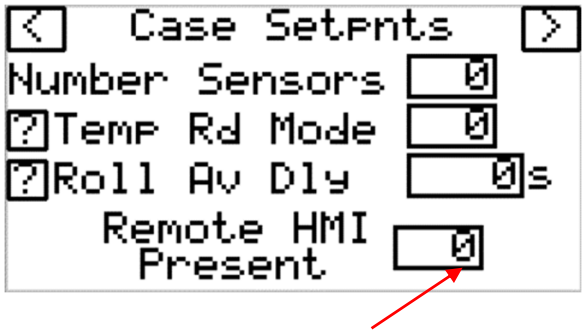
**Independent Temperature Enable** – Enables AI12 to be used for Heat control. If set to 0, then temperature read for Case/Room that controls cooling will be used to control Heat. If set to 1 and a failed temperature sensor occurs, it will also automatically control based on cooling read.

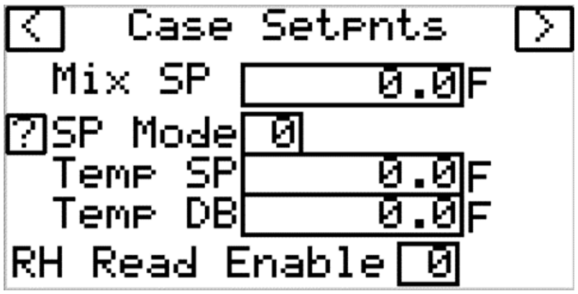
**Cut In and Out Setpoints** – Used to control heater on/off.

Set **Cut in and Out Delays** to avoid anti short cycling of heater from doors being opened, etc.

## Case/Room Setpoints

Setpoints on both the M172-42IO and M172-18IO are the same, however, the screen configuration is different. *The M172-18IO has added functions for* ***Number of Sensors*** *and* ***Anti Sweat Heaters****.*




If using the M172DCL display HMI select 1. If no remote display is used, select 0 and reboot PLC! **THIS IS SET IN AN INITIALIZE TASK AND SYSTEM MUST HAVE POWER RESET IF SET TO 0.**

**Number Sensors** used for Selected Temp Rd Mode. ****4 SENSORS MAX** for Case Control M172-42IO. 3 Sensors below Setpoint

**Temp Rd Mode**

0 = Actual Average Value (No Roll Average)
1 = Average (Roll)
2 = Max (Roll)
3 = Min (Roll)
4 = Mix (Roll) *MUST ONLY SELECT 2 SENSORS*
*Mix Temperature used primarily with a Product Temperature probe. Set Mix Setpoint to the % of Probe Read 2 (*Product*) for which the combined temperature will use to read for Control Temp.

*Example:*

Temp Rd 1 (Room Temp) = 40F
Temp Rd 2 (Product) = 50F
Mix SP = 25%
Value Out Combined = 42.5F

**Roll Average Delay** used for smoothing out quick temperature variations. Set delay for a smooth "Roll" into temperature change.

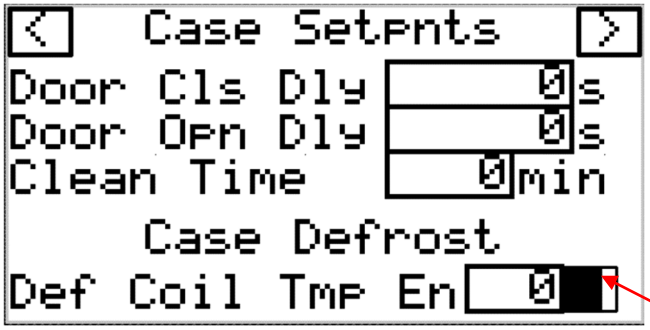
**Mix SP** When "Temp Rd Mode" = 4

**Setpoint Mode**

0 = Deadband is Centered of Setpoint
1 = Deadband is equally above and ***Max for Case Control 18IO****
2 = Setpoint plus Deadband
3 = Setpoint minus Deadband

**Relative Humidity** only if using. This is read out only and has no effect on system operation.

This will indicate a failed sensor alarm and flash the red LED if open.

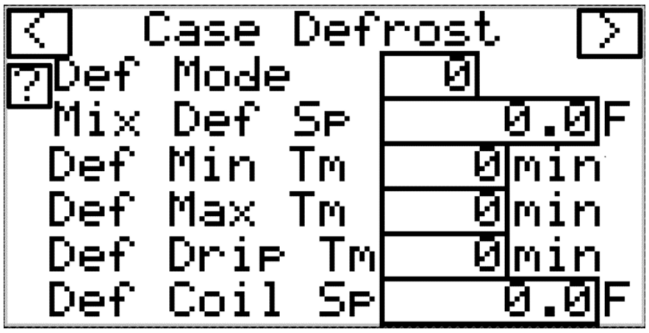



Set to 1 if a **Defrost Coil Temperature** is being used.

**Door Delays** – Set delays in seconds. When Door open Delay has expired its set time, the system will turn off the compressor and fans, and a door open will appear on both the status screen and home screen of the remote HMI (*if used*).

**Door Open** = Digital Input is TRUE/active state. When the door is closed (*DI open*) and **Door Cls Dly** has expired its time delay set, the system returns to normal operation. At any point during the count, the door changes state, we resume our normal running state. Defrost is still active when the door is open. This is to insure we do not miss a defrost cycle.

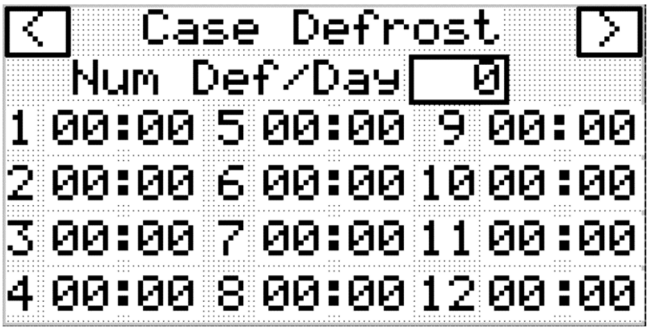
**Clean Time –** amount of time the system will be in clean mode, when either the Digital Input is True/active, or the manual pushbutton on the DCL remote HMI is pressed.



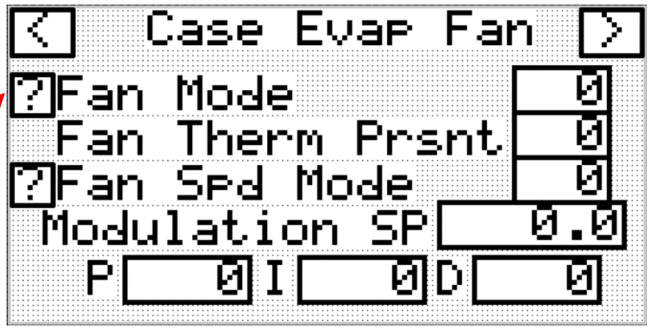

**Defrost Mode**
0 = Positive Defrost (Electric, Hot Gas, Etc)
1 = Air Defrost
2 = Mixed Defrost

**Mixed Defrost** – Used for increase energy savings.
Set **Mix Def SP** to desired setpoint at which the system will use this value to enable air/electric defrost. If the Case temperature (*combined value if applicable*) is above or equal to the **Mix Def SP**, the system will activate air defrost. If below, the system will activate electric defrost.
**** USE ONLY IN MEDIUM/HIGH TEMP APPLICATIONS! ****

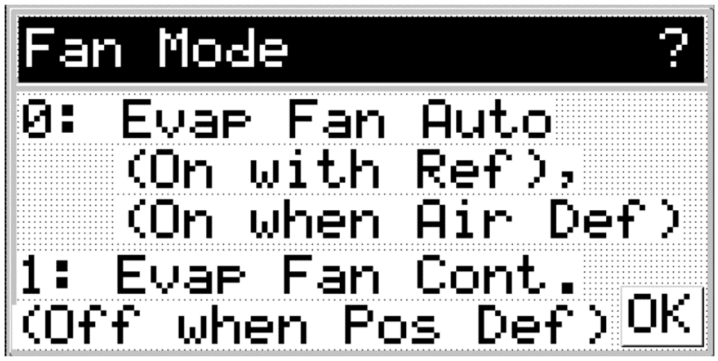
**Defrost Minimum Time** – Minimum time the system will be in defrost when either manually activated or automatically through scheduled times. (Set in minutes)
**Defrost Maximum Time** – Maximum time the system will be in defrost when either manually activated or automatically through scheduled times. (Set in minutes)
**Defrost Drip Time** – Time that the system is in "Drip" mode, no Cooling active. Evaporator Fans will be off in this mode unless air defrost is active.
**Defrost Coil Termination Setpoint** – Setpoint at which system will terminate defrost when value is reached. Minimum Defrost time must be reached before this is true.



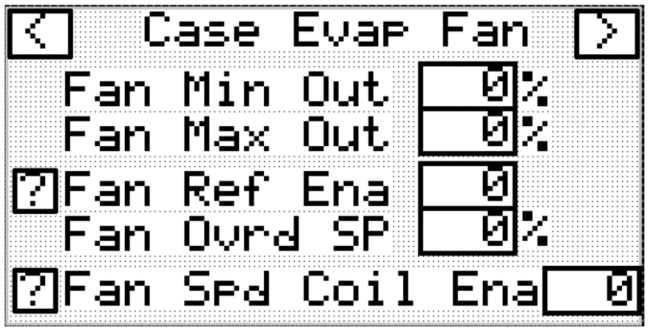

**Number Defrosts per Day** - Select how many defrosts will be active per day (maximum 12). If "4" is selected, then system will only listen to times 1-4. If "8" is selected, then system will only listen to times 1-8.




**Fan Mode**
0: Evaporator Fan Auto
1: Evaporator Fan Continuous




**Fan Thermal Present** – Set to 1 if Evaporator Thermals are present. (*See wiring schematic for DI, On= system ok*) If no thermals are used, set value to 0. Alarm will be activated if set to 1 and the Evaporator fan thermal switch is not closed.




**Fan Speed Mode** (*see wiring schematic*)
0: Modulating Fan
1: Two Speed Fan

***0 : MODULATION***

If Modulation is selected, Then the evaporator Fan will be controlled from a 0-10vdc signal out from the Sensori. This will be based on either Room Temperature or Coil Temperature.

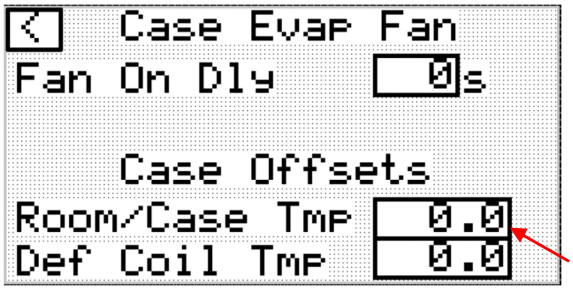
*Values that Correspond to Modulation*

Fan Speed Setpoint: Used For "PID" to modulate to maintain.
Proportional Band(P)
Integral Time (I)
Derivative Time (D)

**Fan Minimum Percent Out** – Minimum percentage that the fan will run.
**Fan Maximum Percent Out** – Maximum percentage that the fan will run.
**Fan Refrigeration Enable** – If set to 1, Fan will override PID and run at "Fan Override Setpoint" value, when Cooling is active. If set to 0, the value will be based on PID only.
**** IF "Fan Refrigeration Enable" IS SET TO 0, PRECAUTION MUST BE TAKEN WHEN MINIMUM PERCENTAGE IS SELECTED, THAT THE COIL WILL NOT FREEZE WHEN COOLING IS ACTIVATED!!****
**Fan Override Setpoint** – Set this value if "Fan Refrigeration Enable" is set to 1. When Cool is active, this will be the override value the fan will run.
**Fan Speed Coil Enable**
0: Case/Room Temperature to control fan speed (Combined value is applicable).
1: Evaporator Coil Temperature (same probe as defrost termination temperature) Only set to 1 if "**Def Coil Tmp En**" is enabled.

***1 : TWO SPEED***

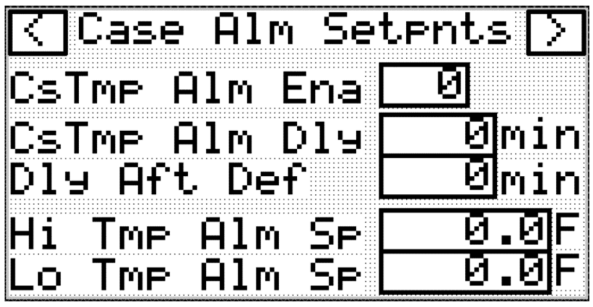
If "Fan Speed Mode" is set to 1, Fan speed high will be active when Cool is active. Fan Speed Low will be active when there is no call for cooling. (*See wiring schematic for normally open and closed contacts*)



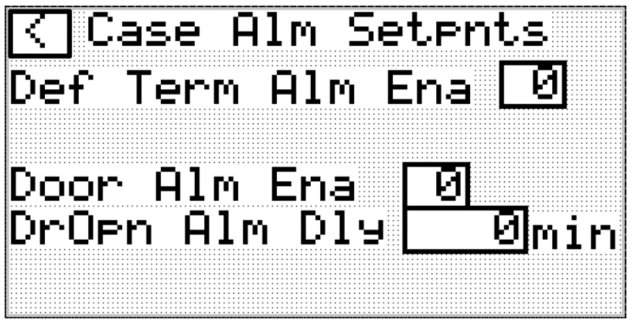

**Fan On Delay** – When Evaporator Fan is initially activated, it will delay for set time. Set this value low when using EXV to avoid valve from closing fully. If set too long on the M172-**42IO**, system could trip on low pressure. (0-45 SECONDS MAX)

**Temperature 1(AI1), NOT combined**.

## Alarm Setpoints




**Case Temp Alarm Enable** – Set to 1 if monitoring temperature for alarm state using the **High and Low Temp alarm setpoints**.
When system initially terminates defrost mode, the **Cs Tmp Alm Dly** does not start to count until the **Dly Aft Def** time has been reached.



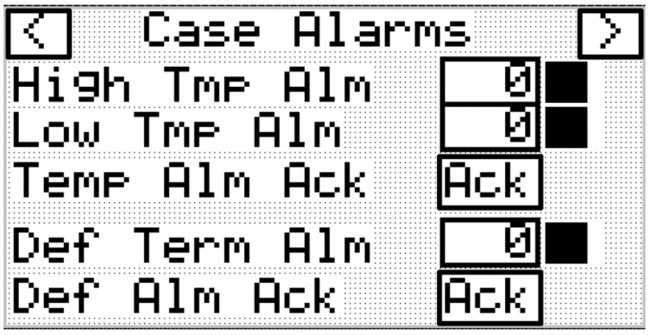

**Defrost Termination Alarm Ena** – Set to 1 if alarm is being used. If a coil temperature is present and maximum time is reached/do not terminate based on Coil temperature setpoint, in defrost, this alarm will be active.
**Door Alarm Enable** – Set to 1 if alarm is being used. If the "Door open" is true and the "**Dr Opn Alm Dly**" time has expired, this alarm will be active.

****NOTE:** When a door alarm becomes active, the system will override the case management thinking that the door is closed. This is to avoid a prolonged period for the system to be off when the door is left open and saves product from going bad.

If "**Door Alm Ena**" is set to 0, the system will be off when the door is open.**

# ALARMS

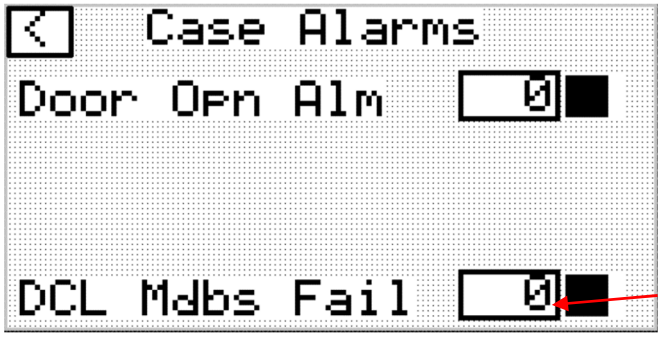

Indicates what alarms are present.




**High Temperature Alarm**
**Low Temperature Alarm** → **Temperature Alarm Acknowledge** Button: Eliminates alarm and starts count again if temperature above or below setpoint.

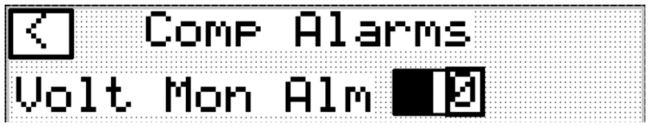
**Defrost Termination Alarm** – *see pg.14*, "*Alarm Setpoints*". → **Defrost Alarm Acknowledge**

****NOTE:** No Alarm Acknowledges can be made from the Local Case management Sensori screen if the Remote HMI/DCL has access. Control must be taken from Remote. *See "Setpoints" pg.14.*



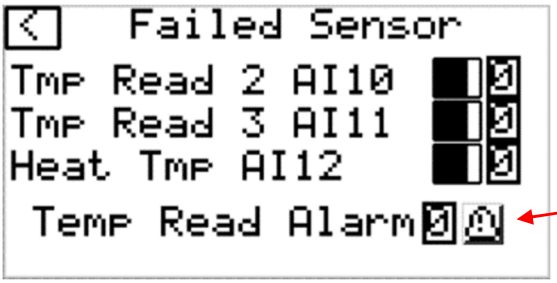

**Door Open Alarm** – See "*Alarm Setpoints*" Pg. 14.

Remote **HMI/DCL Modbus com error**



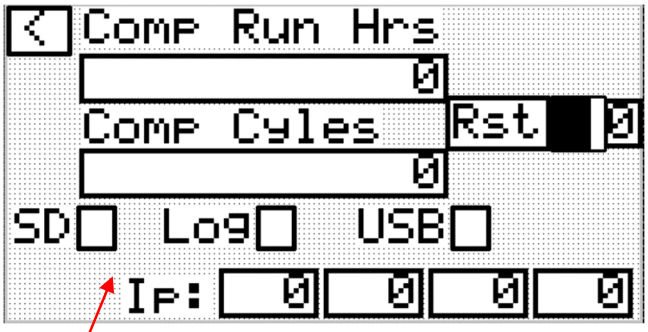

If Voltage Monitor is present and there is no active input made (*see wiring schematic*), then this alarm will be active.

**NOTE: For information on VEV and Compressor Alarms,** *refer to related manuals***.**




**Temp Read Alarm** Indicates failed sensor for "Tmp Reads" when selecting "Number of Sensors". Also, can indicate if "Temp Rd Mode" 4 is selected and number of sensors DOES NOT equal 2!

## EXTENDED INFORMATION




Refer to "***Sensori Compressor Safety Control***" (section 2) for more information.

## Data Logging Inputs 42IO

1. Discharge Temperature
2. High Pressure
3. Low Pressure
4. Oil Pressure
5. Oil Level Alarm
6. Compressor Superheat
7. Oil Net Pressure
8. Room/Case Temperature
9. Coil Temperature
10. Voltage Monitor
11. VEV Error
12. Compressor Suction Temperature

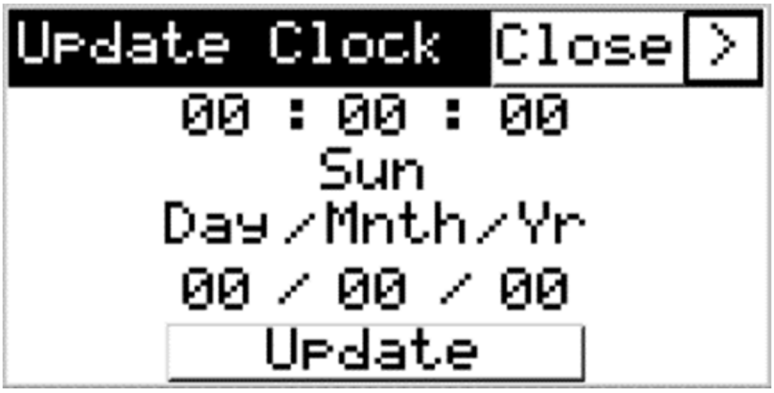
*Example of Excel Data Sheet*

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Date Time | State | AI 1 | AI 2 | AI 3 | AI 4 | AI 5 | AI 6 | AI 7 | AI 8 | AI 9 | AI 10 | AI 11 | AI 12 |
| 2 | 2018-06-14 12:59 | 1 | 71.1 | 0 | 0 | 0 | 71.1 | 71.4 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 3 | 2018-06-14 13:00 | 1 | 71.4 | 0 | 0 | 0 | 71.4 | 71.6 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 4 | 2018-06-14 13:01 | 1 | 71.3 | 0 | 0 | 0 | 71.3 | 71.6 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 5 | 2018-06-14 13:02 | 1 | 71.2 | 0 | 0 | 0 | 71.2 | 71.5 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 6 | 2018-06-14 13:03 | 1 | 71.1 | 0 | 0 | 0 | 71.1 | 71.4 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 7 | 2018-06-14 13:04 | 1 | 71.1 | 0 | 0 | 0 | 71.1 | 71.4 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 8 | 2018-06-14 13:05 | 1 | 71 | 0 | 0 | 0 | 71 | 71.3 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 9 | 2018-06-14 13:06 | 1 | 71 | 0 | 0 | 0 | 71 | 71.3 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 10 | 2018-06-14 13:07 | 1 | 71 | 0 | 0 | 0 | 71 | 71.3 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 11 | 2018-06-14 13:08 | 1 | 70.9 | 0 | 0 | 0 | 70.9 | 71.3 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 12 | 2018-06-14 13:09 | 1 | 70.9 | 0 | 0 | 0 | 70.9 | 71.3 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 13 | 2018-06-14 13:10 | 1 | 70.9 | 0 | 0 | 0 | 70.9 | 71.2 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 14 | 2018-06-14 13:11 | 1 | 70.9 | 0 | 0 | 0 | 70.9 | 71.2 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |
| 15 | 2018-06-14 13:12 | 1 | 70.9 | 0 | 0 | 0 | 70.9 | 71.2 | 0.1 | 0 | 0.1 | 0 | 0.1 | 25.6 |

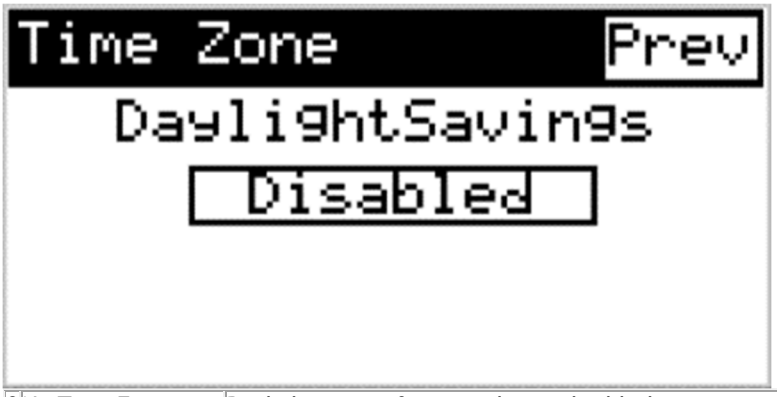
Commands are indicated as a “0.1” since written as an integer in program to extract. AI12 indicates a code error when any number is present based on the bit value that is indicating. All Logging deletes previous yearly.


**Parameter USB Backup and Restore**- Insert USB and select “**To**” to backup all Eeprom parameters/Setpoints in Sensori PLC. Recommended to leave copy on site with PLC in case of future problems. To Restore Setpoints into a new PLC, simply insert USB with backup file and select “**Frm**” Usb to input USB eeprom files.

## RTC – Real Time Clock



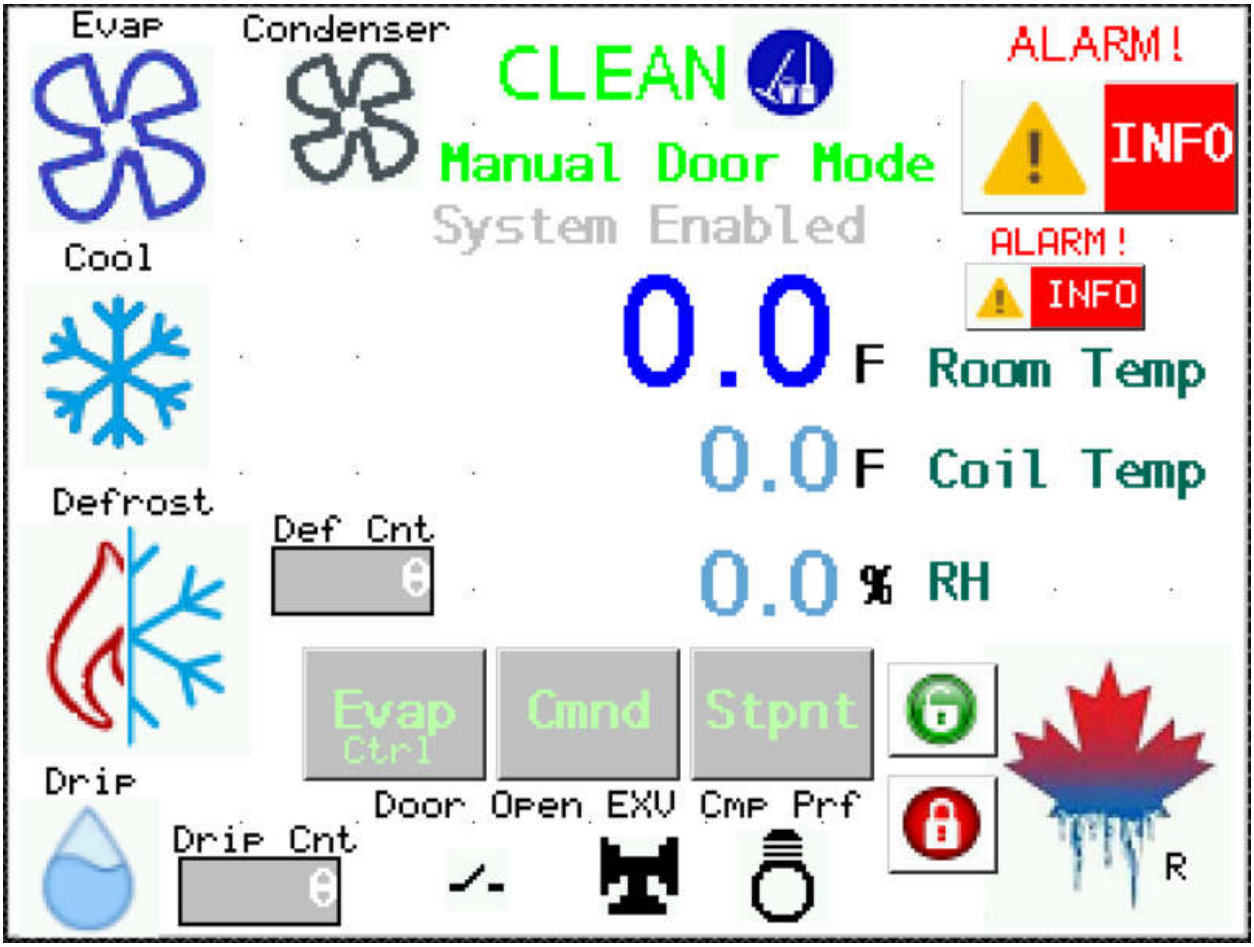

**Set Real Time Clock for defrost to be accurate time settings!**




| | | |
|---|---|---|
| 0 | No Time Zone specified | Daylight saving functionality is disabled. |
| 1 | Europe | Daylight saving functionality will start on last Sunday of March at 1:00 a.m. DST and end on last Sunday of October at 2:00 a.m. |
| 2 | US/Canada | Daylight saving functionality will start on second Sunday of March at 2:00 a.m. local time and end on first Sunday of November at 3:00 a.m. |

# M172DCL/HMI Remote Display

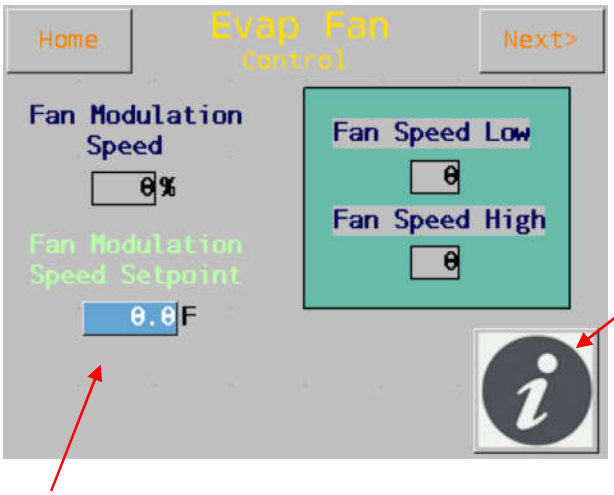
## Home Screen*:* ONLY DISPLAYS WHAT IS ACTIVE




**Green unlock button** will open access to the following buttons.
**Password is** "**19**" and cannot be changed.
Pressing the Red lock will hide access to these buttons.

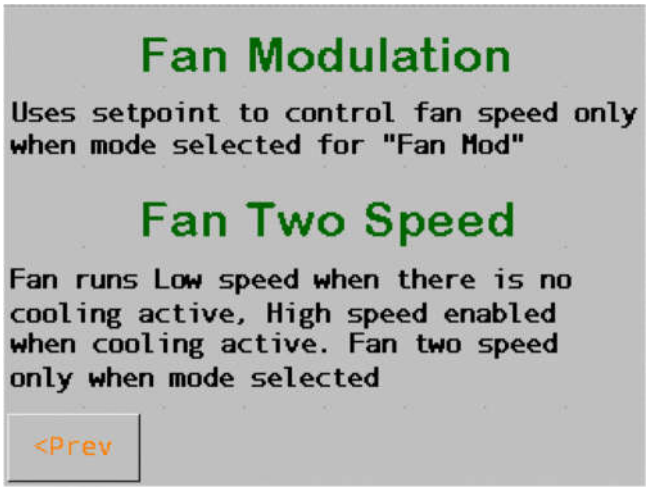

****NOTE:** NO SETPOINTS, COMMANDS, OR CHANGES CAN BE MADE WHEN YOU ARE NOT READING FROM HMI, SELECTED IN SETPOINTS!!!
IF "Remote HMI Enabled" is reading "NO", only changes can be made from the Sensori Case Management PLC. If Set to "Yes" these changes can only be set from the HMI.**

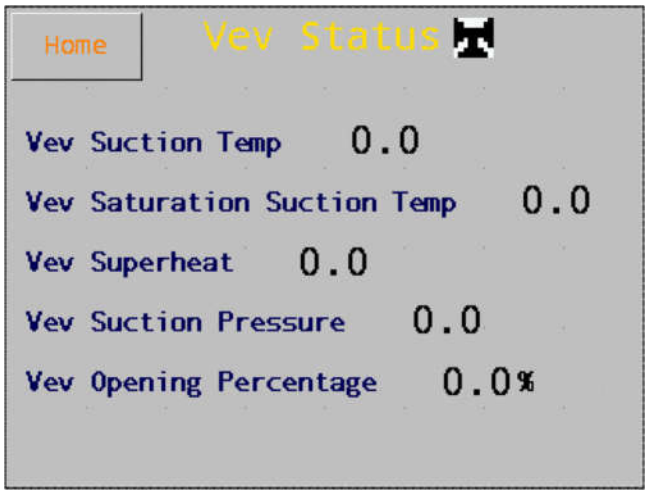
## Evaporator Control




Information Button about Page (*See Picture Below*)

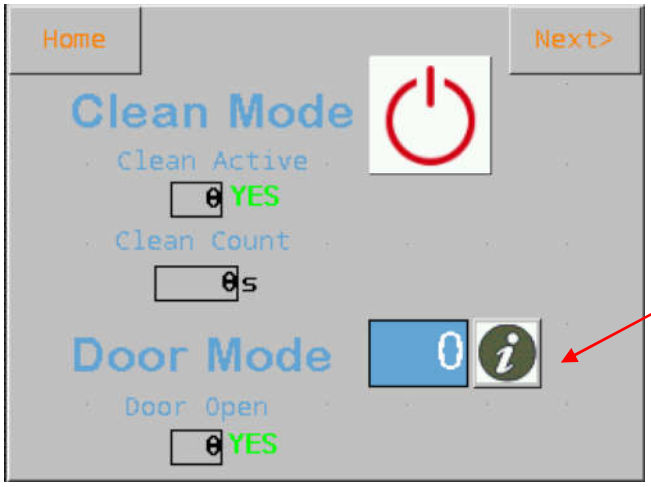
**Fan Modulation Speed Setpoint** can only be set/selected, when "Remote HMI Enabled" (*YES*)




**Vev Status Screen** will not change from Celsius or Fahrenheit based on using the HMI degree change. This will always show the same status as what the Sensori Case Management PLC is Showing from the VEV parameter, dL08.

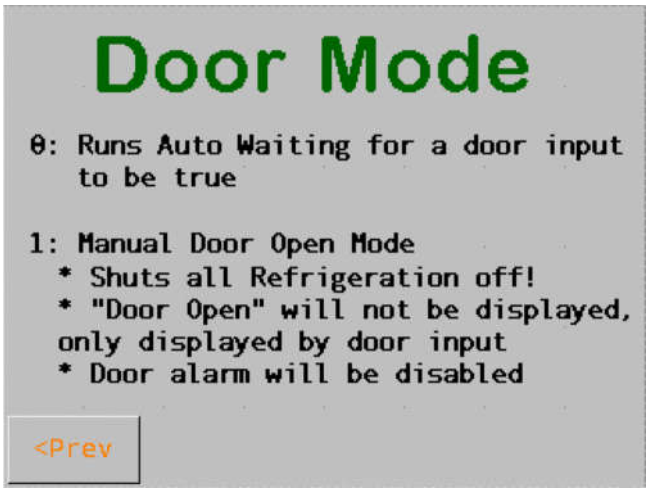
## Commands



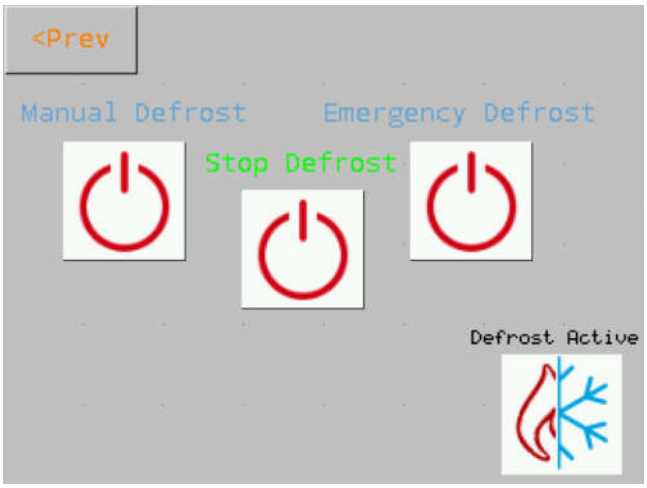

**Information Button** (*See Picture Below*)

**Clean Mode Push Button** will illuminate green when pressed and red after 4 seconds of being released. This will force the system into **Clean Mode** and count to time set from PLC.

****NOTE**: IF READING FROM HMI, THIS BUTTON CAN BE ACTIVE, HOWEVER THE PHYSICAL DI CLEAN BUTTON WIRED IN WILL NOT WORK! Again, Only ONE command can be sent. "Remote HMI Enabled" must be set to "NO" if using a remote button Input.

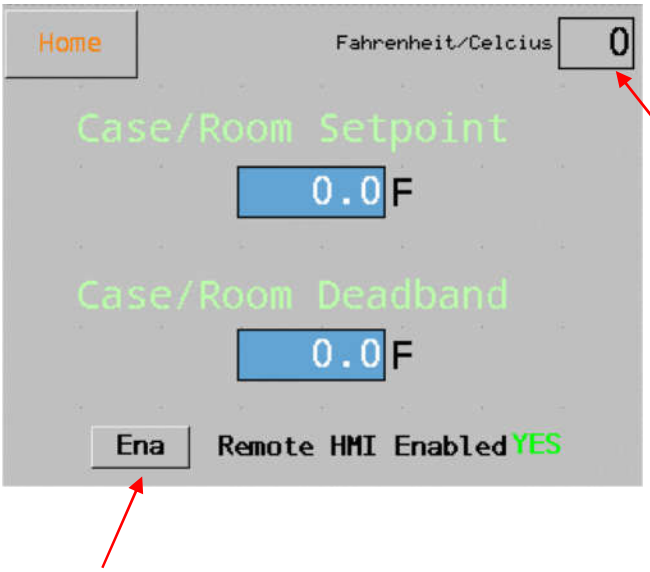



Door Mode – "**Door Open**" only displays from the physical DI door switch that is wired to PLC. This will not say that it is open if manual Door Mode is selected.




*See explanation of manual commands in* **Sensori Case Management** *section 1.*

****NOTE**: NO COMMANDS CAN BE MADE WHEN YOU ARE NOT READING FROM HMI SELECTED IN SETPOINTS!!




1 = **Fahrenheit, 0 = Celsius** (*see important note below*)

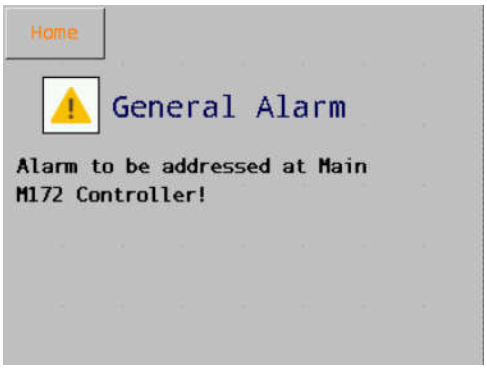
Once Enabled, this may only be removed by cycling power or taking control by the PLC!
If Remote HMI and Sensori Case Management have two different power sources and power is cycled on either unit, The **Remote HMI Enabled** always defaults to the Sensori Case Management PLC.

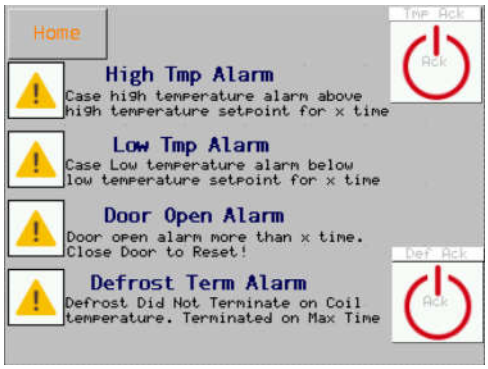
****IMPORTANT!!!**** When control is taken by the "DCL Display" (**Remote HMI Enabled = YES**), always make sure to set the **Case/Room Setpoint** AND **Case/Room Deadband** to CORRECT setpoint values when converting the Fahrenheit to Celsius and inverse! Taking control of the device and converting the values DOES NOT automatically convert setpoint changes, due to the control being at the display!

# ALARMS


**Large Alarm Button** – Address at Sensori PLC (See Picture below)

**Small Alarm Button** – Can Acknowledge Alarms from Remote (See Picture below)




****NOTE:** NO ALARM ACKNOWLEDGE CAN BE MADE WHEN YOU ARE NOT READING FROM HMI SELECTED IN SETPOINTS!!

# 2. SENSORI COMPRESSOR SAFETY MANUAL

## HOME PAGE

Using up and down arrows on Sensori, select one of the four menus and select "**ok.**"

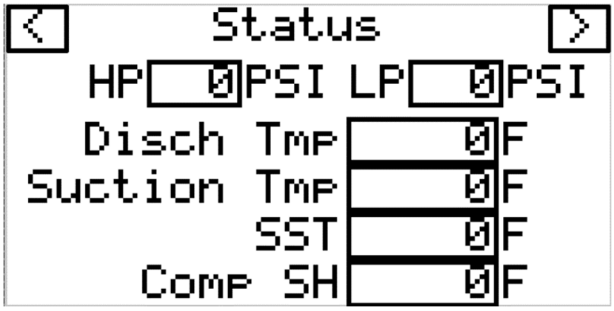
Simply select the next or previous arrow (**>**)/ (**<**) on the screen, to scroll through pages. At any given point that this is not an option, press and hold the left arrow on the Sensori to return to previous page.

1. Status
2. Setpoints
3. Alarms
4. Extended Information
5. RTC and Data logging

## STATUS

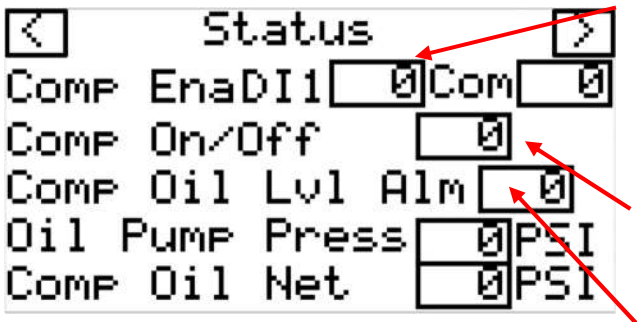
### Page 1

**High Pressure** (Discharge Pressure), **Low Pressure** (Suction Pressure), **Discharge Temperature**, **Suction Temperature**, **SST** (Saturated Suction Temperature), **Compressor Superheat**




### Page 2

**Compressor Enable** status (**Digital Input** or **Communication Enable over Modbus**), **Compressor On/Off** state, **Compressor Oil level Alarm** state, **Compressor Oil Pump Pressure** (status to read 0 if Oil Pump Bypass is set to 1), **Compressor Oil Net Pressure**.



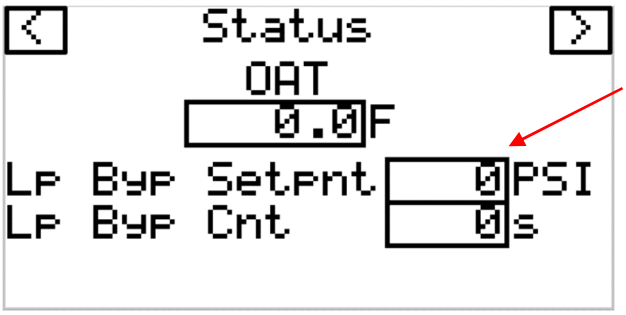

**Communication Enable**, used over Modbus protocol RS-485. This is only used when a Compressor Management Device is present. *See **Sensori Compressor Management** (section 1) for further details*.

**Compressor Physical Digital Output** 1 (DO1) – *See wiring schematic*.

**Compressor Oil Level Alarm** Shows value of Physical Digital Input 2. (DI2)- *See wiring schematic.*

### Page 3

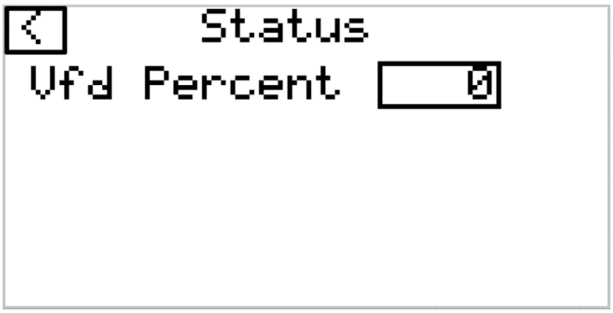
**Outdoor Air Temperature** (Only shows value when Low Pressure Bypass is enabled or through communication of Sensori Management*, see below* "*Setpoints*"), **Low Pressure Bypass Current Setpoint** (This value changes depending on ambient temperature), **Low Pressure Bypass Count**.



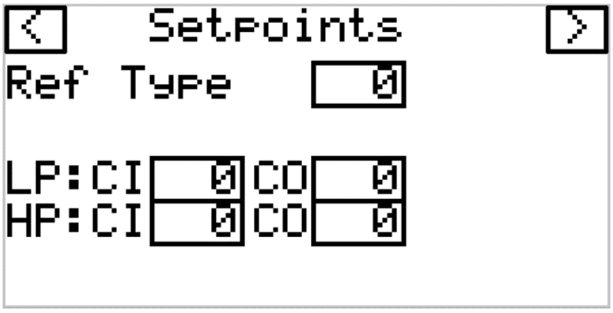

*See Below "Setpoints" For description of how LP Bypass works*.

### Page 4

**Variable Frequency Drive Percentage**. This is only used when a Compressor Management Device is present. *See* ***Sensori Compressor Management*** *(section 1) for further details*.




# SETPOINTS

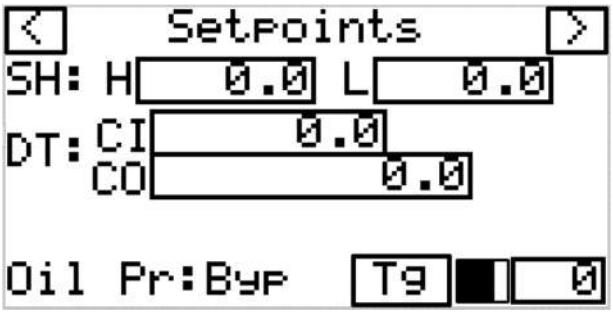



**LP: Cut In, Cut out** – Set low pressure cut out setting at which the compressor must shut off for a low side safety. Select the cut in for what the pressure must build to, before the compressor switches back on after the set delays) **DEFAULT: CUT IN=20PSI, CUT OUT=5PSI**

**HP: Cut in, Cut out** – Set the **High Pressure cut out** setting at which the compressor must shut off for a high side safety. The cut in value must be set at which the compressor will be able to be reset at. Set this value where the compressor can be reset by a technician. If in a state of "Trip", the high side pressure must be below the cut in value to be manually reset in "Alarms". **DEFAULT: CUT IN=250PSI, CUT OUT=375PSI**

**Refrigerant Type** – Select which refrigerant is being used 1-24. 255 is Custom(R515B). **Default=2(R404a)**

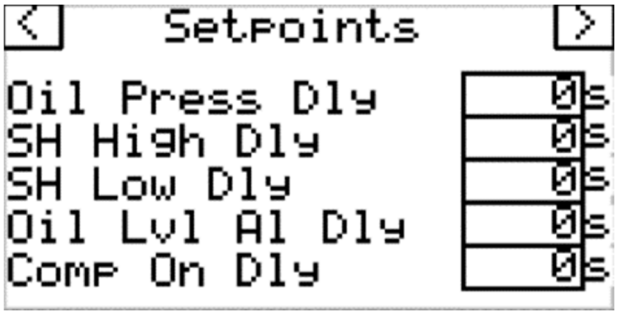
**0** = R22
**1** = R134a
**2** = R404A
**3** = R407C
**4** = R410A
**5** = R407A
**6** = R407F
**7** = R290
**8** = R507A
**9** = R717
**10** = R723
**11** = R1234ze
**12** = R744
**13** = R448A
**14** = R427A
**15** = R450(N13)
**16** = R513A
**17** = R449A
**18** = R1234yf
**19** = R454B
**20** = R454C
**21** = R455A
**22** = R434A
**23** = R442A
**24** = R32
**255** = R515B




**Suction SH: High, Low** – Range 0-50F. ***Superheat High*** is the value at which you want to protect the compressor from overheating. Overheating the compressor occurs above 20F and RE and efficiency is lost. **Superheat Low** must be set to protect the compressor from flood back. AN INITIAL DELAY IF HIGH SUPERHEAT OR LOW SUPERHEAT, IS 60 SECONDS BEFORE IT LISTENS TO THE SETTABLE HIGH AND LOW SUPERHEAT DELAYS. **DEFAULT: HIGH=30F, LOW=0F**

**DT: Cut in, Cut out** – Discharge Temperature **Cut out** must be set at which the compressor will shut down if too hot. Exceeding 225F discharge temperature can result in carbonation and oil breakdown. Set the **Cut in** value at which the compressor must be cooled down to before the compressor will be able to start, after the manual reset. **DEFAULT: CUT IN=150F, CUT OUT=200F**

**Oil Pressure Bypass** – Set this value to **0** using "toggle" if an oil pump is present. **Default=1** (No Oil Pump present)




**Oil Pressure Delay** – Set this value only if "Oil Pressure Bypass" is set to **0**. This will be an oil net pressure delay. When the compressor is initially on, this will be set to a time at which it will count before the compressor alarms, if the net pressure does not exceed 10psi. On initial compressor start (*DI1=TRUE*), The value will count regardless of the net pressure. After the time has expired at any given point, if the net pressure is <10PSI, the compressor will trip an alarm immediately. This must be manually reset. Value set in seconds. **DEFAULT=90 seconds**

**Superheat High and Low Delay** – Delay that must expire after the "Superheat high" or "Superheat Low" has been reached, before an alarm is triggered, and compressor will switch to off. AN INITIAL DELAY IF HIGH SUPERHEAT OR LOW SUPERHEAT, IS 60 SECONDS BEFORE IT LISTENS TO THE SETTABLE HIGH AND LOW SUPERHEAT DELAYS. Value set in seconds. **DEFAULT=600 seconds HIGH, 300 seconds LOW**

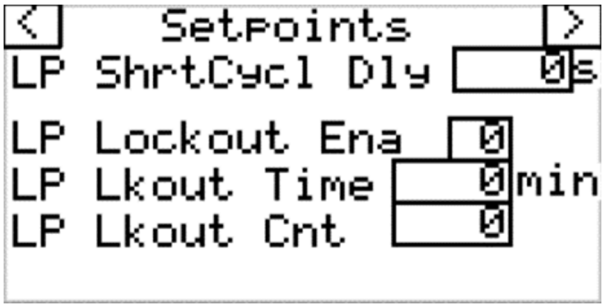
**Oil Level Alarm Delay** – Delay that must expire after the oil level alarm input is true, before an alarm is triggered, and compressor will switch to off. When using Emerson's OMB Electronic Oil Level Managing System, be sure to set this delay long enough to allow the OMB to reset and not lockout Sensori. *See below for Emerson's LED Codes and Alarm Delays on OMB*. Value set in seconds. **DEFAULT=300 seconds**

**LED Codes When Lit:**

***Green*** – 24 VAC power is supplied to OMB.
***Yellow*** – Float sensor determined that the oil level has been below ½ sight glass for over 10 seconds. Fill solenoid has been activated.
***Red (continually lit)*** – Oil level has remained below ½ sight glass for over two minutes after fill solenoid has been activated. Alarm has been activated and compressor is prevented from operating until oil level reaches ½ sight glass when alarm automatically resets.
***Red (flashing)*** – There have been five auto reset alarms registered within a 30 minute period. Alarm circuit is now locked on and compressor locked off. Fill solenoid is de-energized. Alarm remains locked in until 24 VAC power lead is manually unplugged and again plugged back into device.

**Compressor on Delay** – Delay set to stage compressors (if more than one) in an event of a power cycle, or simply to add a compressor delay when called to be enabled. Value set in seconds.

***NOTE:*** When the compressor on delay is set, the oil level alarm, and delay and oil pressure alarm delay must be compensated for( Ex. If a 90 second delay for oil pressure is needed, and a 5 second compressor on delay is set, the oil pressure must be set to 95 seconds.) It is recommended to only use this delay when multiple compressors are used to prevent big inrush on a power cycle. (*Example. Rack systems, Tandom Chillers, Etc.*) **DEFAULT=0 seconds**



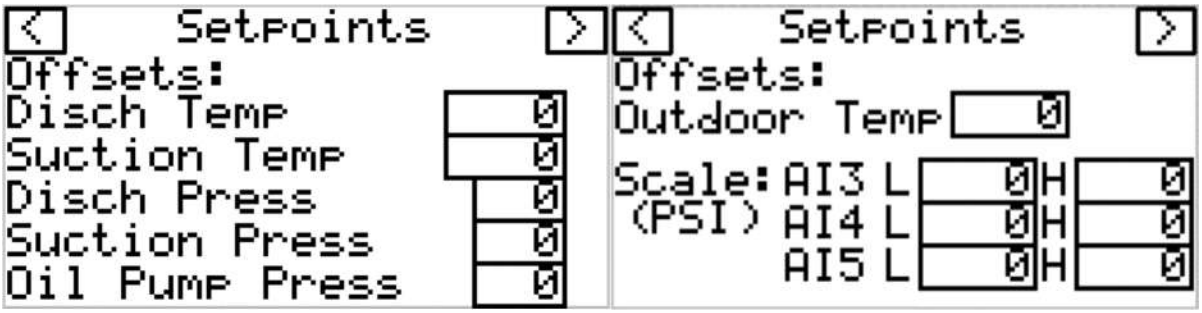

**LP Short Cycle Delay**- Delay at which the compressor will be off for, after the "cut in" value was reached. Set this value to avoid compressor start/stops on a low pressure alarm. Value set in seconds. **DEFAULT=180 seconds**

**LP Lockout Ena** – Set value of "1" if enabling this function. Low Pressure Lockout requires a manual reset to happen when this function is enabled when a compressor trips the "LP Lockout Count" times within the "LP Lockout Time" value set.
**LP Lockout Time** – Set The time allotted for a low pressure Lockout instance based on the count.
**LP Lockout Count** – Amount of times allowed for a trip instance before a full lockout exists.

Example: "LP Lockout Ena" = 1
"LP Lkout Time" = 60min
"LP Lkout Cnt" = 3

*Compressor Trips on low pressure (1 count). After 5 min the pressure builds in system to make the cut in setpoint and starts to time LP ShrtCycl Dly. The 3 min expires, and it tries to run, however trips again (2 count). Pressure builds after 5 min to make the cut in setpoint. System attempts to run for a third time (3 counts), and it trips low pressure again. It has now tripped 3 counts within 60 minutes and the system is off waiting for a manual reset to happen.*

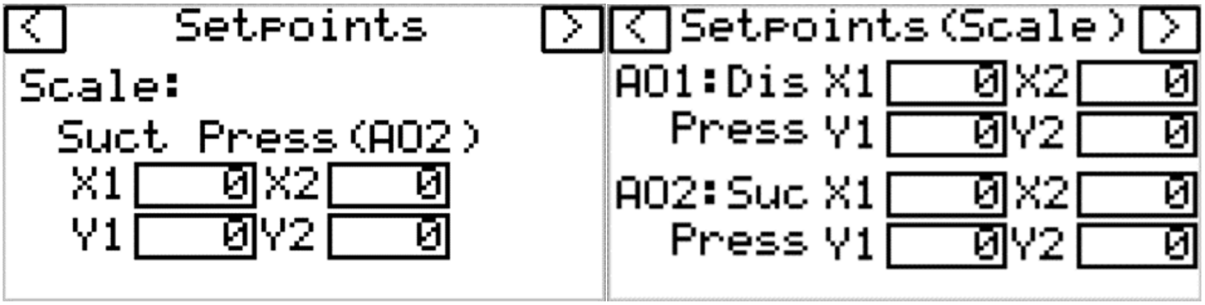
***NOTE:*** *When using OLPP system and connected to the HMI using SCADA, enabling this function will NOT email a low pressure alarm unless it is in lockout state.*




**Offsets - Discharge Temperature, Suction Temperature, Discharge Pressure, Suction Pressure, Oil Pump Pressure, Outdoor Temperature**.

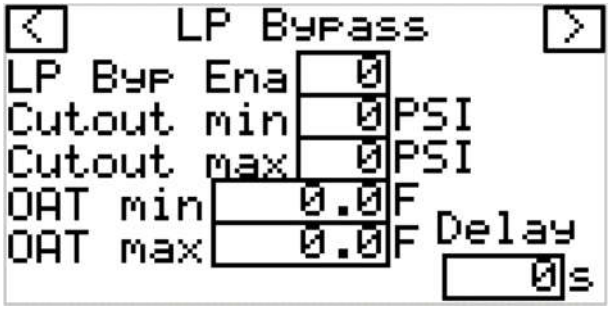
Temperature offsets are to the decimal. Ex. For every 10, we change our temperature, 1F. Pressure offsets are 1 to 1.

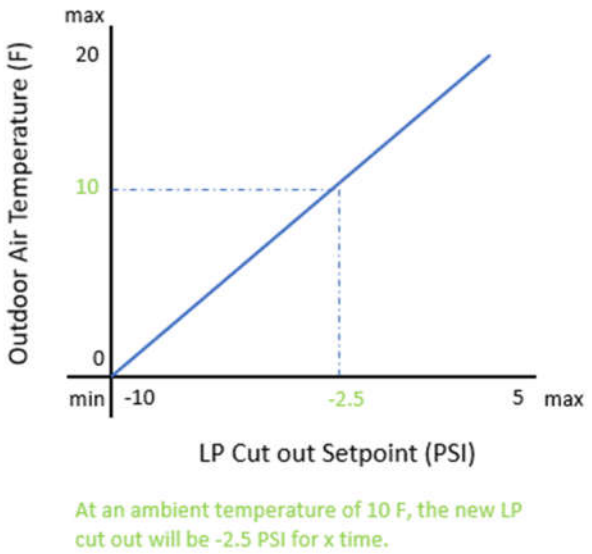
**Scale** - Scaling for pressure transducers analog input 3,4,5. *Must be a 4-20mA Pressure sensor*. Set scaling in PSI.

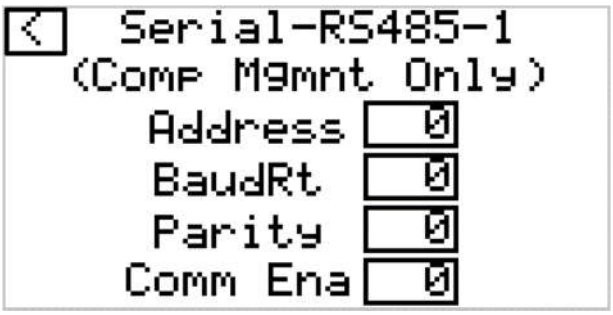



**Scale - Scaling for Analog Output 1 and 2** for Discharge / Suction Pressure Out. 0-5vdc output only. Set "**X**" as Pressure scaling in REAL value. Set "**Y**" as voltage scaling in integer format (*ex. 500 = 5vdc*)
***AO1** is preconfigured for a 0-10vdc output when using Compressor Safety for Modbus to Oxford LPP Sensori Management to control Compressor Speed 0-100%. This AO1 Scaling cannot be changed on Sensori Compressor Safety, **ONLY** for Compressor Safety with VEV!

**LP Bypass** - Use this function if problems occur in winter for initial starts. Set "**LP Byp Ena**" to value of **1** if using this function, and a value of **0** if using only the low pressure cut out setpoint that was set previous. This function is used mostly with low pressure refrigerants such as R513a, to offset the low pressure cut out. This function uses a linear graph to offset the cut out value depending on the outdoor air temperature min and max set. Set your "**Cut out min**" and "**Cut out max**" as a linear scaling reference setpoint. Set the "**Delay**" in seconds for how long the cut out value will be present for during initial start up. See below graph for example. **Default Values: LP Byp Ena=0, Cutout min=-10PSI, cutout max= 5PSI, OAT min=0F, OAT max=20F, Delay=60 seconds**



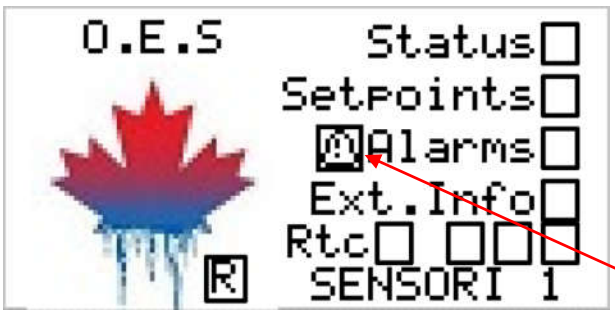



**Serial Communication- RS485** – Set "**Comm Ena**" to value of **1** when using this device with the Sensori Compressor Management, otherwise keep value to **0** or an alarm will occur. Set address to the number the compressor will be. *Example, compressor 1= address 1, compressor 2= address 2, etc.* **DO NOT CHANGE BAUDRATE AND PARITY SETTINGS! KEEP BOTH VALUES AT 2.**

Baudrate=38400, Parity = Even.

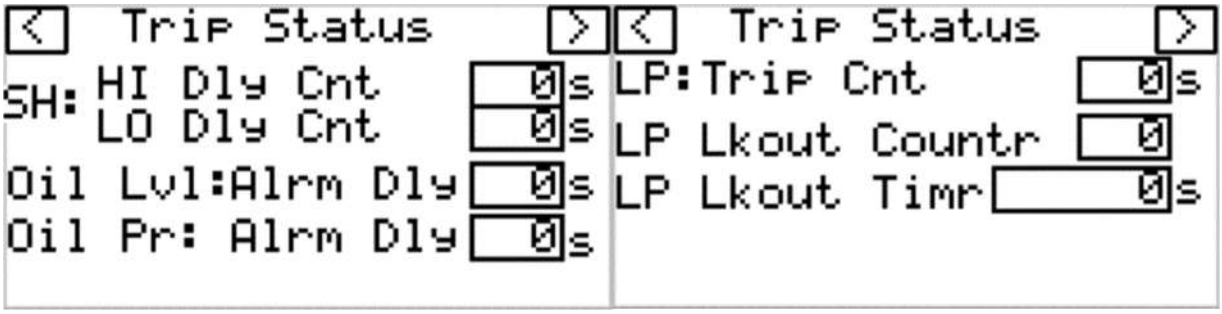
# ALARMS




Indication of an alarm present!


All **Manual Resets** located on first screen. **High Pressure**, **Discharge Temperature**, **Oil Pressure**, **Superheat High** and **Low**. These resets indicate beside "*toggle*" an indication of a trip status using the true value of **1**. **0** indicates no alarm present. *The toggle will also be highlighted black in a state of alarm.*

**Low pressure**, and **oil level alarm** status is shown the same as mentioned above, however no "*toggle*" manual reset is required. Low pressure is always auto reset with settable individual time delay. See next screen to see state of delay for reset count. THE OIL LEVEL ALARM INPUT MUST BE FALSE TO RESTART THE COMPRESSOR WHEN A LOCKOUT HAS OCCURRED. When using Emerson's OMB Electronic Oil Level Managing System, simply unplug the power connector to the device and plug it back.




**SH(Superheat) High and Low delay Count** – Delay Count, that was set in Setpoints, before we trip an alarm. If SH High or Low value is reached, this time must expire before we alarm and wait for manual reset.

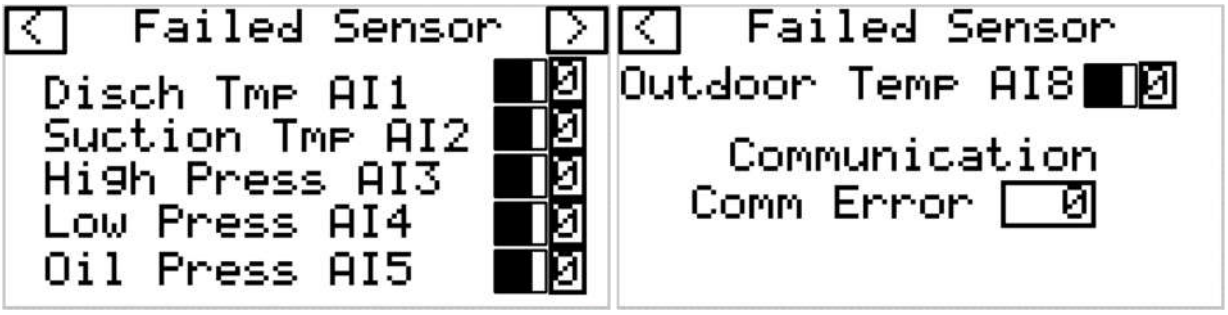
**Oil Level Alarm Delay** – Delay Count, that was set in Setpoints, before we trip an alarm. When this input is true, the count must expire before we lockout and alarm. This is reset only by resetting the alarm at the oil level device.

**Oil Pressure Alarm Delay** – Delay Count before we trip an alarm, if the oil net pressure is not greater than 10psig for the settable time limit that was set in Setpoints.

**LP Trip Count-** Counting of the low pressure short cycle delay, that was set in Setpoints, before the compressor will restart after the expired time.

**LP Lockout Counter** – Number of Counts recorded within the LP Lockout time set, when a low pressure trip occurs. Only Displayed if "Low Pressure Lockout Ena" = **1**.

**LP Lockout Timer** – Time count in seconds. If Low Pressure Lockout is enabled and a trip occurs, this variable will begin to count until the setpoint time expires OR reaches total number of trip counts allowed.




Displays/Indicates a **Failed Sensor** and which analog input it is. If oil pressure is not present and no sensor is installed, the value will remain to **0**, and no alarm will be present. If Low Pressure Bypass function is not used, this value will also remain **0** with no sensor installed.

If a **Comm Error** occurs, check wiring of both the Sensori Safety and Management controls. It is important to install the **120-ohm resistors** where properly indicated. *See wiring schematics*.

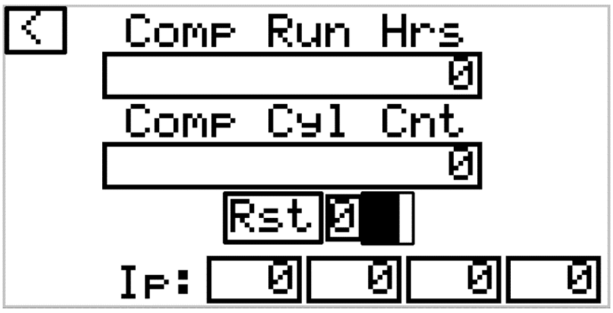
# EXTENDED INFORMATION

IP Address can be changed. **This address is default by 192.168.2.173**

**Compressor Running Hours Clock**

**Compressor Cycle Rate Counter** Note: Clock and Counter are based on Comp Output with no alarm.

**Reset**- Resets both Compressor Running Hours Clock and Compressor Cycle Rate Counter



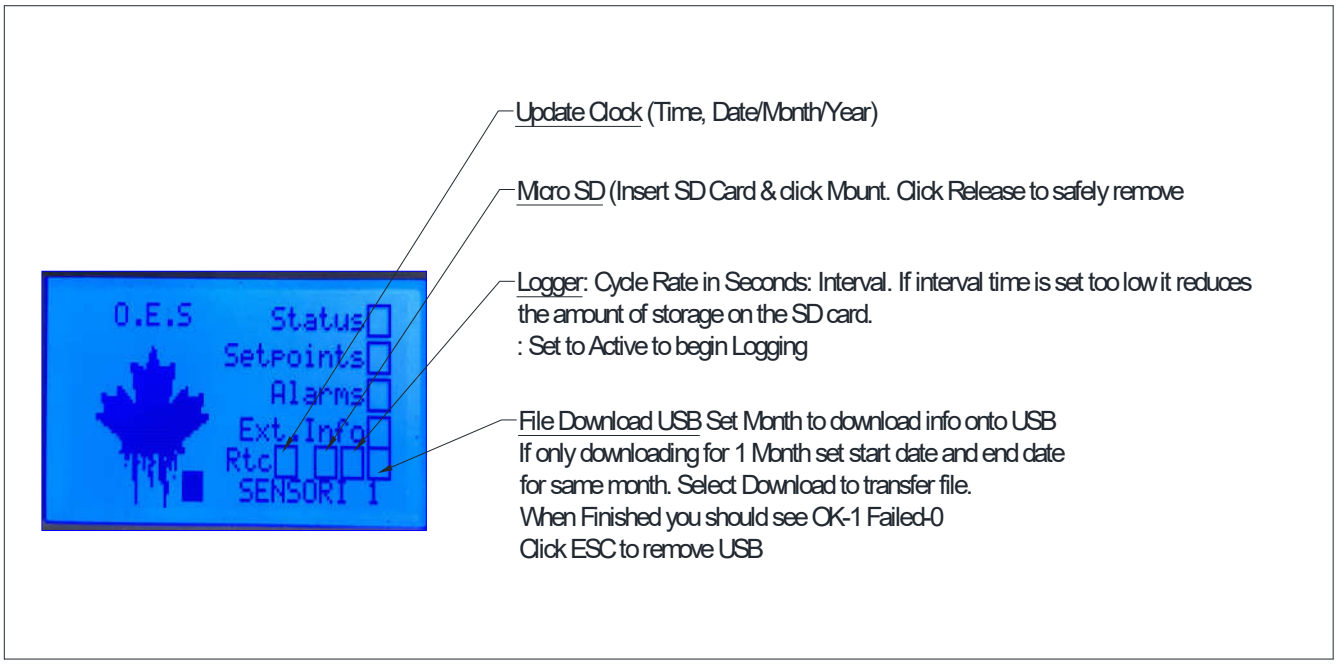

**Parameter USB Backup and Restore**- Insert USB and select "**To**" to backup all EEprom parameters/Setpoints in Sensori PLC. Recommended to leave copy on site with PLC in case of future problems. To Restore Setpoints into a new PLC, simply insert USB with backup file and select "**Frm**" Usb to input USB EEprom files.

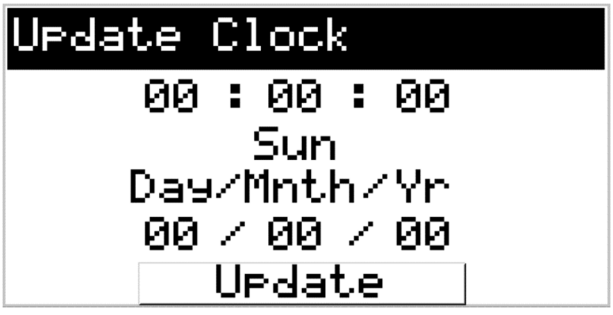
## Data Log

To start Data logging a micro-USB must be inserted, and "**Mount**" must be selected on the "**Micro SD**" page indicated below. Use USB to pull select info by the month.

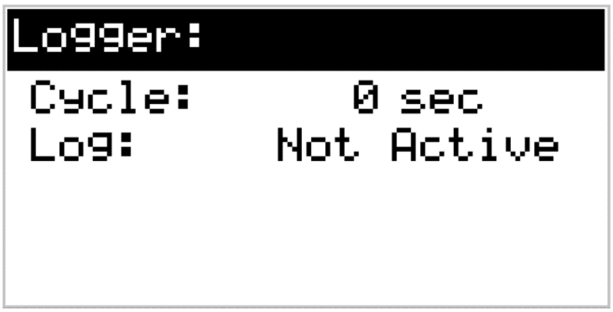
****SAFELY REMOVE SD TO PULL ALL DATA. (**CAN LOSE ALL DATA IF SD CARD NOT REMOVED SAFELY**)

When LED blinks yellow, it pulls info for logging from interval set, open info in Excel file, data can be converted into graph.




**Updating the RTC** is important when pulling data from the device. This will make it easy to trace a specific time and date at which an error has occurred in the system.

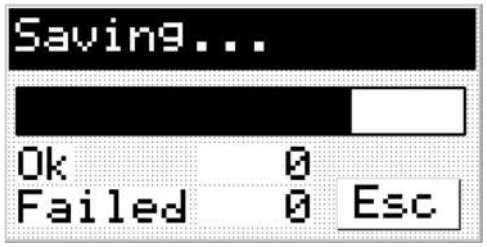



Set "**Log**" to active to start trending the below data every **x** seconds set in the "**Cycle**".

THE DATA WILL AUTOMATICALLY BE OVERWRITTEN EVERY 365 DAYS!

When viewing data in Excel, below are the column references.

| | |
|---|---|
| AI1 - Disch Temp | AI7 - Oil Net Press |
| AI2 - Disch Press | AI8 - Low Press Alarm |
| AI3 - Suction Press | AI9 - Comp Run Hrs |
| AI4 - Oil Press | A10 - Comp Cycle Rate |
| AI5 - Oil Level Alarm | A11 - Comp Enable |
| AI6 - Comp Suct SH | A12 - Suction Temp |


Select the **start** and **end date** at which you want to pull the above data to a USB. Set the same start and end date to pull data for that month. **OK = 1** means the data was successfully transferred to the USB.

## For Website

Website > IP Address> Password

User is **administrator**

Login **password**

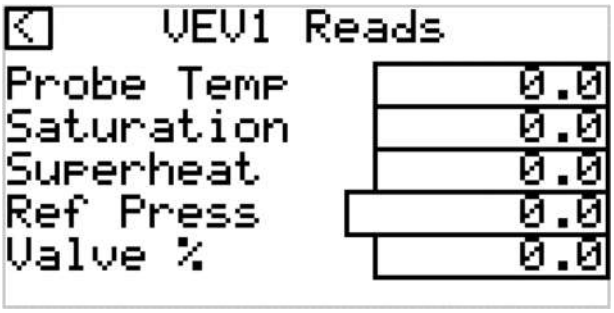
Password for Pages **19**

TO ACCESS FROM PHONE- use Schneider Wifi Dongle, Password is on back beside battery.

**NOTE:** If you encounter problems you may need to clear Browser History.

# 3. VEV DRIVER

**All default settings to be used on Emerson EXV bipolar stainless-steel valve.*




**Probe temp** – Temperature probe located on suction line at outlet of evaporator as installed by contractor.

**Saturation** – The SST of the selected refrigerant based on its current pressure.

**Superheat** – The calculated superheat in real time

**Ref Press** – The pressure of the suction line where the suction line transducer was installed by contractor.

**Valve %** – EXV valve operating % in real time.

## SETPOINTS

***NOT ALL SETPOINTS ARE ACCESSIBLE FROM THE M172 SENSORI CONTROL.**
Setpoints that need to be changed that are not listed below MUST be changed using the TM171DLED Terminal.

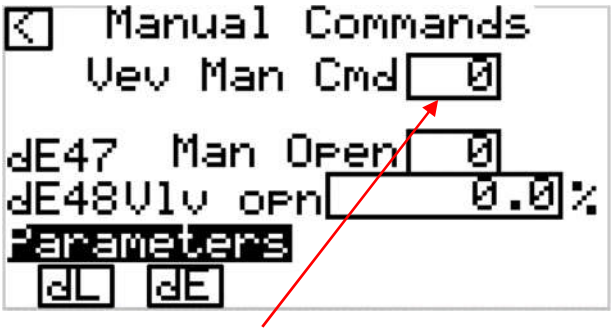
See **Schneider's Manual (Modicon M171 EEV)** for more information and selection of setpoints.
It is not recommended changing the PID settings, as this has been tested on multiple applications. The preconfigured PID settings (dE21) may be changed for desired applications and easier to work with as there are plenty options for speed and response times.

***NOTE:** Certain Parameters require a power cycle/Reset to the device for the change to take effect and save. Refer to **Schneider's Manual** to see list of parameters that need to be reset.

## Circuit Management and Vev

To manually open the valve using parameters **dE47** and **dE48**, DI1 MUST BE ON/TRUE.

If no command is sent to this device from external source, the simulation mode will give you ability to control the valve manually.



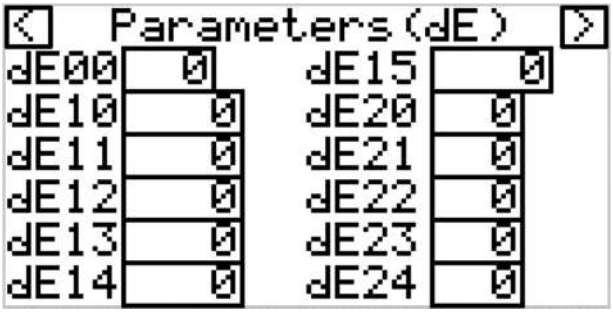

Like the previous screen – however, this is the internal command sent from the device to tell the valve to go into manual mode. Parameters **dE47** and **dE48** can only be used when there is a call for cooling/ the valve is active. When the valve is not active (*case is satisfied on temp, in defrost, or not enabled*), "Vev Man Cmd" may be used to force the valve using those selected parameters.

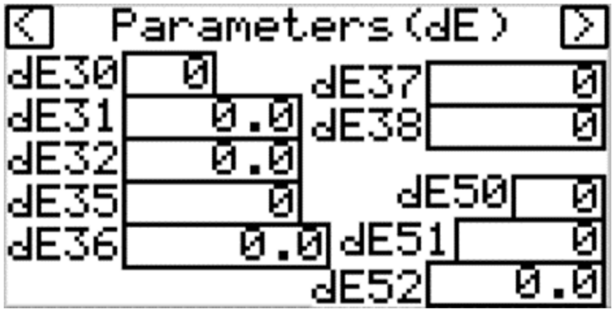
**dE47 Man Open** – Set to 0 for automatic/normal operation. Set to 1 for manual control.

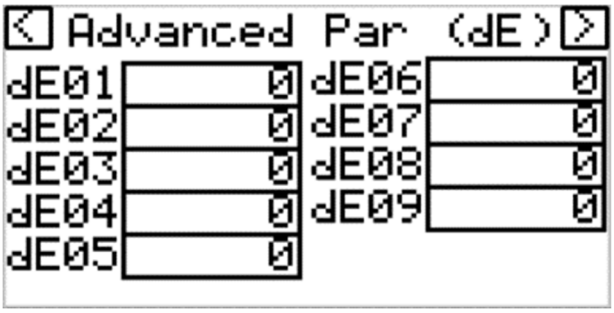
**dE48 Vlv Opn** – This is the Valve Open % that you set. This will immediately set the valve to the % you selected. This does not have automatic superheat control – it is a manual override of the valve.

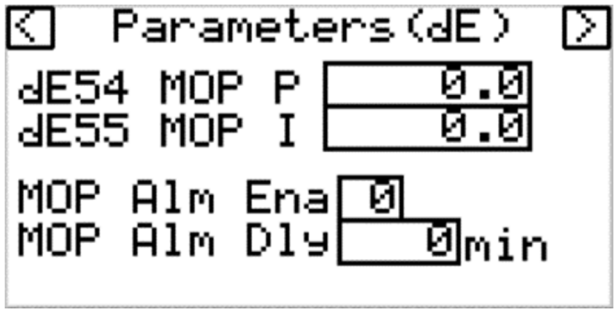
***Note:** IT IS RECOMMENDED TO USE THIS FEATURE ONLY WHEN SERVICING EQUIPMENT. *VALUE MUST BE SET BACK TO 0 FOR NORMAL OPERATION.*

## Parameters dE



**MOP Function**

When **dE50** = 1 (*enabled*), This function works as a Superheat Setpoint "Shift", changing the dynamic superheat setpoint on a PID control.

**MOP** is used mostly on a OLPP system when having an evaporator case SST above the normal operating OLPP system SST. This is used to prevent spiking of suction pressure and causing unnecessary compressor cycling.

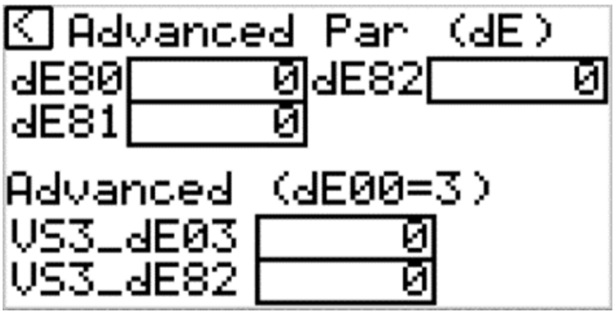
To prevent too high of a superheat, **dE31** (*overheating upper threshold*) must be set where a max superheat setpoint will be seen by the PID control algorithm (**dE54**, **dE55**). Superheat will float between **dE31** and **dE32** if the SST is above the Setpoint **dE52** and **dE51** set time has expired. Set **dE51** (*MOP disable time at start up*), to prevent MOP cycling from fast temperature/pressure fluctuations.

## Valve Type Settings (Alco / Danfoss Colibri ETS)

### *Danfoss Colibri Expansion Valve ETS12C – ETS100C*

When **dE00** = 3, **dE01-dE09** settings are as follows. These settings will not change.

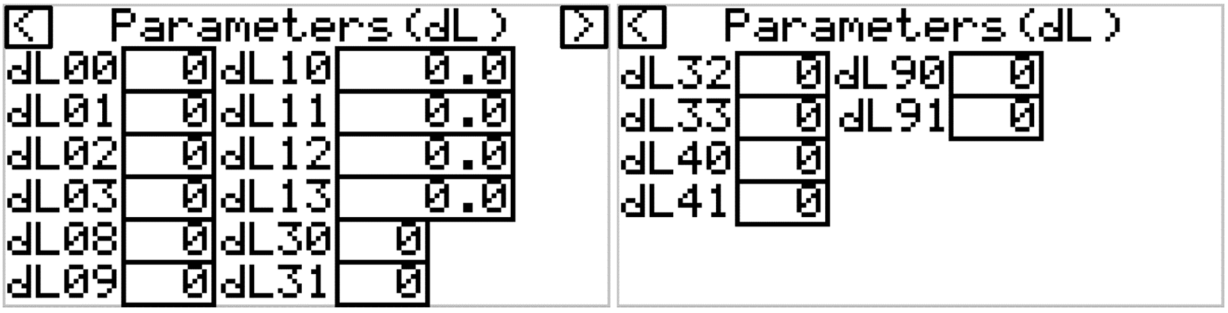
| DANFOSS | ALCO |
|---|---|
| dE00 = 0 ( CUSTOMIZABLE ) | dE00 = 3 ( EX4-6 ) |
| dE01 = 240 STEPS / SEC | dE01 = 500 STEPS / SEC |
| dE02 = 600 | dE02 = 750 |
| dE03 = 6 STEPS | dE03 = 100 |
| dE04 = 600 mA RMS ( 800 mA PEAK ) | dE04 = 500 mA |
| dE05 = 10 Ω | dE05 = 13 Ω |
| dE06 = 100 mA | dE06 = 100 mA |
| dE07 = MICROSTEP - ( RECOMMENDED ) ( 2 ) - FULL STEP CAN BE USED | dE07 = 0 ( FULL STEP ) |
| dE08 = 100% | dE08 = 100% |
| dE09 = 50 ms x 10 / STEP | dE09 = 50 ms x 10 / STEP |




dE80-dE82 parameters MUST be set to manufacturer specifications and max values. **DAMAGE TO VALVE CAN OCCUR IF SETTINGS ARE NOT CORRECT!** These changes can only be made when **dE00** = 0 (customizable)

**VS3_dE03** (*stepper motor extra steps in total closure*) and **VS3_dE82** (*extra steps in total closing every 24hrs of valve running*) only take effect when **dE00** = 3 (*Alco EX4-6*).

## Parameters dL




**dE20** – Refrigerant Selection: 0 = R404A, 1 = R448A, 2 = R410A, 3 = R134a, 4 = R744, 5 = R407C, 6 = 427A, 7= R513a, 8 = R515B.

**NOTE:** *selection 7 and 8 are both "Customizable Refrigerants" selected in VEV.*

## ALARMS!

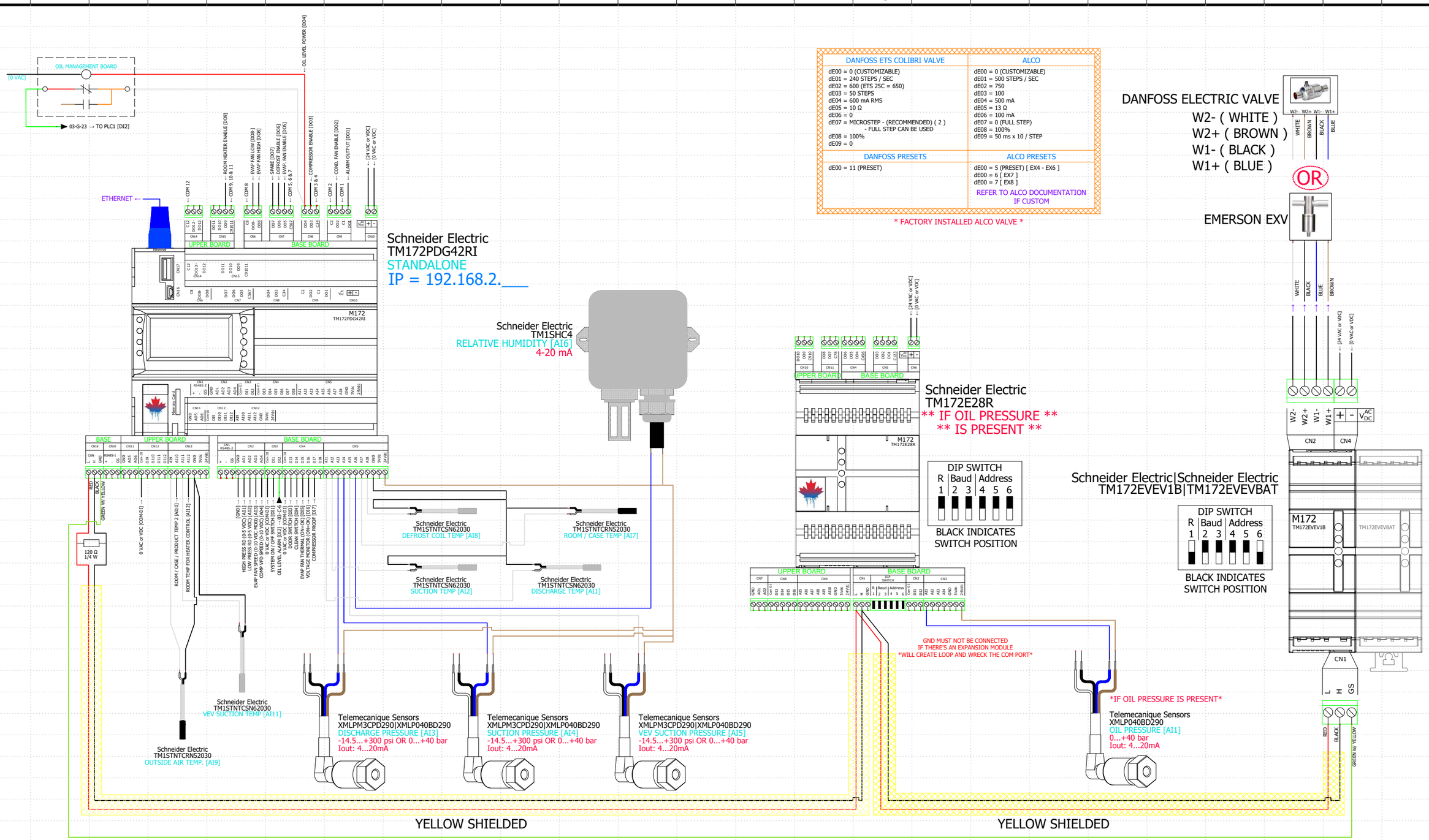
Indication that an alarm is present. Follow the Image to find which alarm is present.

This Screen lists all the **VEV Alarm Codes** that could be present.


A value of **0 = no alarm**. A value of **1 indicates an alarm for that feature is present**.

See **Schneider's Manual (*Modicon M171 EEV*)** for more information and probable causes for alarms indicated. If a Modbus error occurs, check wiring (*see schematic*) and ensure that resistors are installed in appropriate spots. (Start and End of line) Interferences may also be an issue with high voltages and improper grounding of devices.

***NOTE**: A Modbus error will occur when unplugging or unwiring the valve when power is on to device!! Make sure to disconnect power to device when valve is being changed or wired. If an error occurs. A power reset is required to clear this alarm.




SOLIDWORKS Electrical


Oxford Energy Solutions Inc.
505082 Old Stage Road
Woodstock, ON, N4S 7V8, Canada
226-242-5674


# STANDALONE WIRING DIAGRAM

CONTRACT:

LOCATION: OES SENSORI DRAWINGS

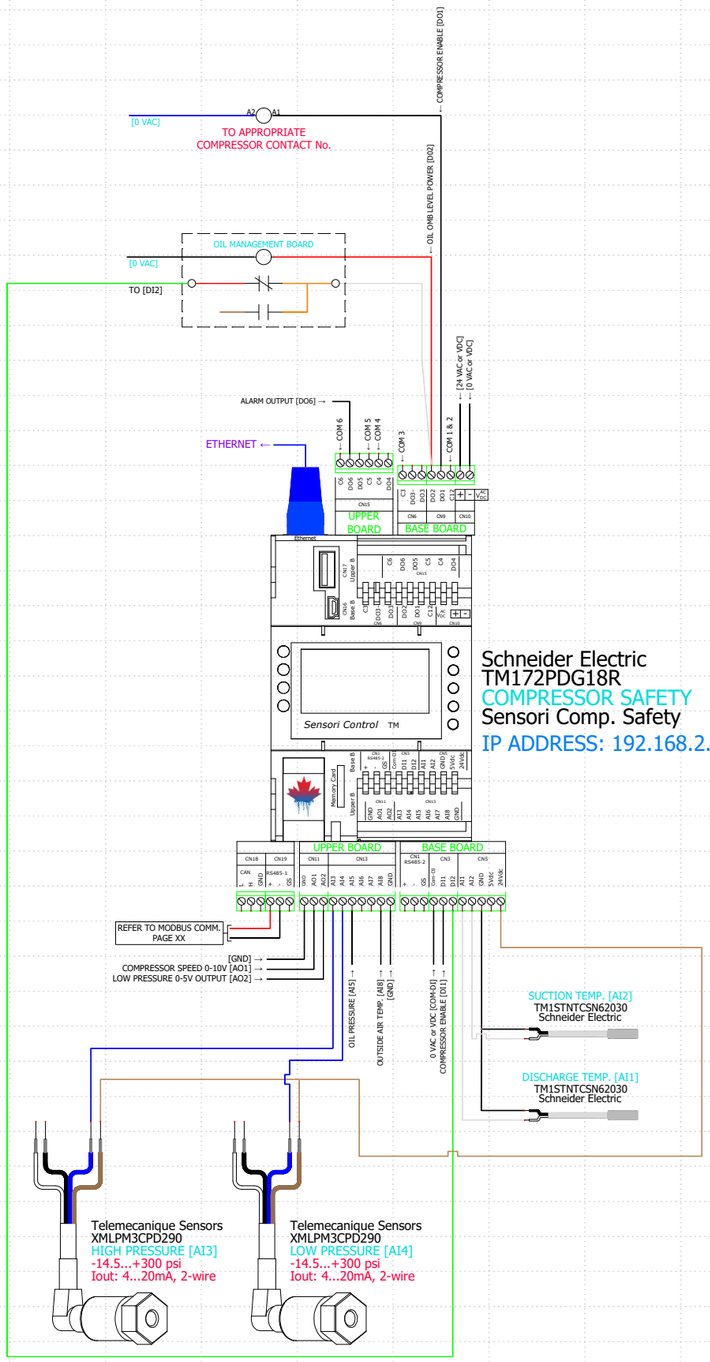
| REV. | DATE | NAME | CHANGES |
|---|---|---|---|
| 0 | 2025-06-05 | Michael D | INITIAL RELEASE |

Drawn By: Michael D

Date: 2025-04-16

REVISION: 0

SCHEME: 03




Schneider Electric
TM172PDG18R
COMPRESSOR SAFETY
Sensori Comp. Safety
IP ADDRESS: 192.168.2.___

SOLIDWORKS Electrical


Oxford Energy Solutions Inc.
505082 Old Stage Road
Woodstock, ON, N4S 7V8, Canada
226-242-5674


# COMPRESSOR SAFETY

CONTRACT:

LOCATION: OES SENSORI DRAWINGS

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|---|---|---|---|
| 0 | 2025-06-05 | Michael D | INITIAL RELEASE |

Drawn By: Michael D

Date: 2025-04-16

REVISION 0

SCHEME 05