

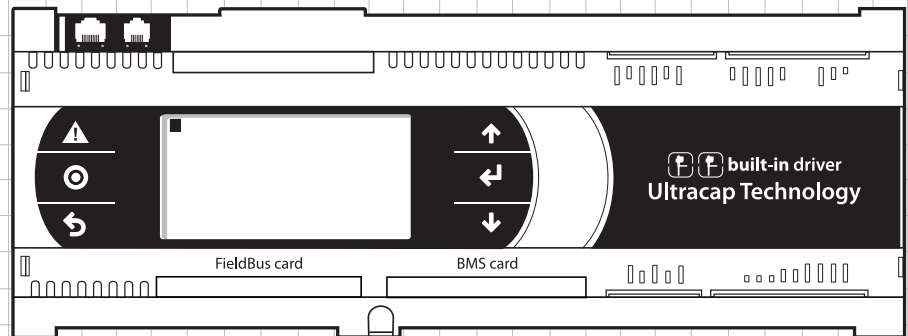


- Controls specific to Controlled Environment Agriculture
- Monitoring of temperature, RH, dew point, and VPD
- Photocell input allows for feedback of light cycle
- Optional CO₂ monitoring and automated control
- Capability to link units for coordinated control in a single space
- Cloud-based logging, alarms, and control when used with AireGuard™

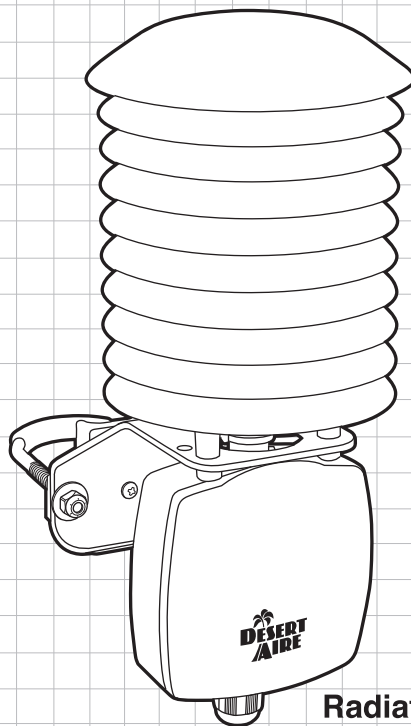


CM3550 Series Controller

*Installation and Operation Manual
for GA, GS and GV Units*



CM3550 Controller



Radiation Shield

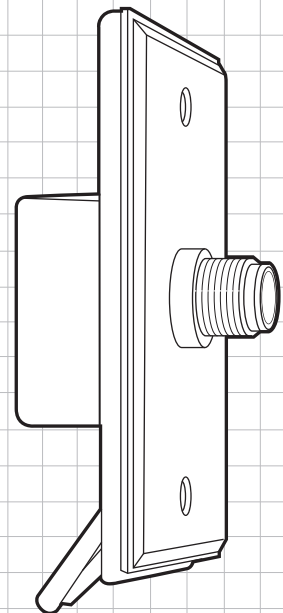


Photo Control

DANGER

ONLY TRAINED, QUALIFIED PERSONNEL SHOULD INSTALL AND/OR SERVICE DESERT AIRE EQUIPMENT. SERIOUS INJURY, DEATH AND PROPERTY DAMAGE CAN RESULT FROM IMPROPER INSTALLATION/SERVICE OF THIS EQUIPMENT. HIGH VOLTAGE ELECTRICAL COMPONENTS AND REFRIGERANT UNDER PRESSURE ARE PRESENT.

Desert Aire Dehumidification Equipment Standard Limited Warranty

Desert Aire warrants the dehumidifying unit to be free from defects in materials and workmanship subject to the terms, conditions and limitations stated herein.

TERMS

Desert Aire warrants all components (except as noted) for a period of two (2) years from the date of shipment. This warranty shall be limited to the supply of new or rebuilt parts for the part which has failed because of defects in workmanship or material, and does not include the cost for labor, transportation or other costs not herein provided for. Replaced parts are warranted only for the remaining portion of the original warranty period.

CONDITIONS

The warranty is subject to the following conditions:

1. The unit must be properly installed and maintained in accordance with the Desert Aire "Installation and Operation Manual" provided with each unit and/or other documentation provided.
2. **The Start-Up Report must be completed and returned to Desert Aire Service for evaluation. If no deficiencies are identified a Warranty Validation Letter will be issued that provides all warranty dates and coverage. If installation or start-up deficiencies are present, these must be corrected and communicated to Desert Aire in order to activate warranty.**
3. This warranty shall not apply to any part that has been tampered with, or has been subject to misuse, negligence or accident. A warranty can be obtained for altered equipment but only with written consent from Desert Aire.
4. The following parts and components are excluded from the warranty: belts, filters, driers, fuses and refrigerant.
5. Refrigerant coils or other components that corrode due to improperly balanced pool chemistry or corrosive air quality will not be warranted.
6. All replacements or repairs will be FOB Germantown, WI.
7. This warranty shall be null and void if defects or damages result from unauthorized opening of the refrigerant circuit, tampering with factory set controls, or operating outside the original design conditions.
8. Desert Aire shall not be liable for labor costs incurred in diagnosing the problem, or the removal or replacement of the part or parts being repaired.
9. Desert Aire must preauthorize all warranty coverage described herein.

Extended Warranty:

Your Desert Aire unit may have extended warranties beyond this Standard Limited Warranty document. Extended warranties are only available at the time of the purchase of the original equipment. These extended warranties are covered under a separate document and their terms and conditions are separate from this document. It is mentioned in this document for informational purposes only. Any Extended Warranties will be identified on the Warranty Validation letter.

Any and all incidental or consequential damages are expressly excluded from this warranty. Some states do not allow the exclusion of incidental or consequential damages for personal injury, so the above limitations may not apply to you for certain damages. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. No person or representative is authorized to make any warranty or assume any liability not strictly in accordance with the aforementioned.

Inquiries regarding warranty matters should be addressed to:

Desert Aire Corp
c/o Service Manager
N120 W18485 Freistadt Road
Germantown, WI 53022
PH: (262) 946-7400
FAX: (262) 946-7401
E-MAIL: service@desert-aire.com

Additional copies of this manual can be purchased for a nominal fee from Desert Aire. Desert Aire also posts the most current revision of our I/O Manuals on our website. For a digital copy of the I/O Manual for your unit revision, please submit request to the contact information listed above.

Product Warning for the State of California



WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

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1 Installation

1.1 Introduction

Your Desert Aire controller is designed for precise monitoring and control of air temperature, relative humidity (RH) and Dew Point (DP) within a conditioned environment.

This CM3550 control system is easy to install and operate. The controller itself is installed in the electrical cabinet of the dehumidifier and features either an internal display terminal (IDT) or a remote display terminal (RDT). This display allows viewing and adjustment of the unit's sensors and set points. It also indicates the operating status of major components inside the dehumidifier.

Most sensors and devices have been factory-installed and wired inside the dehumidifier. In most cases, only connection to a remote condenser, electrical power connection, zone and supply air sensors are required. Connection to the facilities computer network or building management system may also be required.

The CM3550 controller features optional building automation access. This includes options for network communication ability including BACnet IP, BACnet MS/TP, ModBus RTU and ModBus IP.

1.2 Sensor Installation

The CM3550 control system requires a zone mounted combination relative humidity and temperature sensor. Mount this sensor in the conditioned space away from any hot spots but in an area that is representative of the zone. Constant air flow across this sensor will help insure proper readings. A supply air temperature sensor is also required. Mount this sensor in the air duct supply conditioned air to the zone.

1.3 Auxiliary Air Heating Control Wiring

Note: you must use the Desert Aire CM3550 control system to control or interlock with the room heating system. This prevents wide fluctuations in room air temperature. It also prevents the heater from trying to heat the room while the dehumidifier is running in the cooling mode.

1.3.1 Auxiliary Heating - Dry Contact Closure

The standard Desert Aire CM3550 Controller provides a dry contact closure to operate the auxiliary space heater. The contact closes to energize a heater (may be supplied by others) which has its own power source.

Install two wires from the thermostat blocks on the heater to the terminals H1 and H2 in the control panel of the dehumidifier. See your wiring schematic for connection details.

Note: Units with an internal electric air heater have an airflow proving switch installed between the heater and the control enclosure. If an air heater is installed external to the unit, provide an external airflow proving switch for protection of the heater.

1.3.2 Auxiliary Heating - Proportional Signal

Desert Aire will provide a proportional 0-10 VDC direct-acting signal to modulate a heating coil control valve or other auxiliary modulating heater. This signal may be changed to reverse acting. Contact Desert Aire's service department for help with this option.

Most proportional valves have either three (3) or four (4) terminals for field installed wiring.

- Four-terminal valves have two terminals for 24 VAC power and two terminals for the signal input.
- Three-terminal valves have one terminal for the "hot" 24 VAC input, a second terminal for the "positive" signal input and a third, common terminal for the "neutral" 24 VAC input and the "negative" signal input.

You must follow the instructions included with any heating valve used. Observe the proper polarity or you may damage both the valve and the controller. See your wiring schematic for connection details.

1.4 CM3550 Controller Overview







Desert Aire's CM3550 microprocessor controller is a powerful, flexible controller with many useful features including:

- Display of zone air conditions and refrigerant pressures.
- Display of equipment operating status such as dehumidification, cooling and heating.
- Display of alarms for abnormal conditions such as sensor failures or tripped safety controls.
- Remote setpoint option as well as lights on and lights off setpoints.
- A convenient, easy-to-understand display interface which allows the operator to view and change setpoints and time schedules.







2 CM3550 Controller Details

2.1 Menu Overview and General Instructions (Figure 1)

Your Desert Aire controller is pre-programmed and configured at the factory for use in the application you have specified. The internal display terminal (IDT, see Figure 1) allows the operator to monitor and adjust the setpoints of your Desert Aire system. The IDT has an LCD screen and six keys. These keys are labeled as below:

-  - ALARM Key
-  - PROGRAM (Prg) Key
-  - ESCAPE (Esc) Key
-  - DOWN Key
-  - UP Key
-  - ENTER Key

The remote display terminal (RDT) has an LCD screen and six keys. These keys are labeled as below:

-  - ALARM Key
-  - PROGRAM (Prg) Key
-  - ESCAPE (Esc) Key
-  - DOWN Key
-  - UP Key
-  - ENTER Key

The Home Screen (Figure 1) displays the Desert Aire logo and shows the dehumidifier status, intake temperature and relative humidity and the operational state of the unit. The right side of the display shows “Esc → Menu” which indicates that if the **Esc** key is pressed, the Main Menu will be displayed. Pressing **Esc** on any other screen will take you back one screen. The “Prg → Stpt” indicates that if the **Prg** key is pressed, the setpoints can be changed. The “↑ ↓ → Help” indicates that if the **UP** or **DOWN** keys are pressed, the help screens will be shown. The **UP** and **DOWN** keys will now scroll through the help screens.

Menu screens allow the user to select from a series of actions. The action that is capitalized on the screen is selected by pressing the **ENTER** key. To cycle through the selections on a menu screen, use the **UP** and **DOWN** keys.

If setpoints or selections can be altered on a screen, the **ENTER** key will cycle through those items. Once the cursor is over an item, the **UP** and **DOWN** arrow keys will modify the setting. Numeric values require that the **ENTER** key be pressed to accept

the value. An “on” or “off” selection is altered as soon as the **UP** or **DOWN** keys are pressed.

When an alarm is triggered, the red LED behind the **ALARM** key will light and will remain on until the alarm is reset.

To view the alarms from any menu, simply press the **ALARM** key. If no alarm is active, the display will state NO ALARMS. If an alarm is present, it will be displayed along with the date and time it was triggered. The bottom two lines will display two data points recorded when the alarm was triggered.

To reset the alarm, use the **DOWN** key until the reset instructions are shown. Pressing the **ALARM** key for three seconds will reset all active alarms. See Section 3 for further alarm and alarm data logging information.

Screens which display a small up arrow in the upper right and a small down arrow in the lower right are part of a series of screens which can be accessed by pressing either the **UP** or **DOWN** arrow keys. If the operator has not pressed a key for an hour, the display will return to the Home Screen.

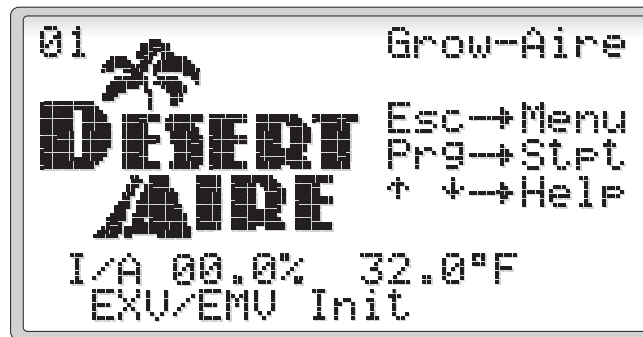


Figure 1

2.2 Zone Setpoints (Figure 2)

Pressing the **Prg** key from the Home Screen displays the ZONE SETPOINTS (Figure 2). This menu allows for modifications of the temperature and humidity setpoints specific to the unit in the Lights On or Lights Off mode. To modify the setpoints, press the **ENTER** key and use the arrow keys until the desired setting is shown. Press the **ENTER** key to accept the setpoint value.

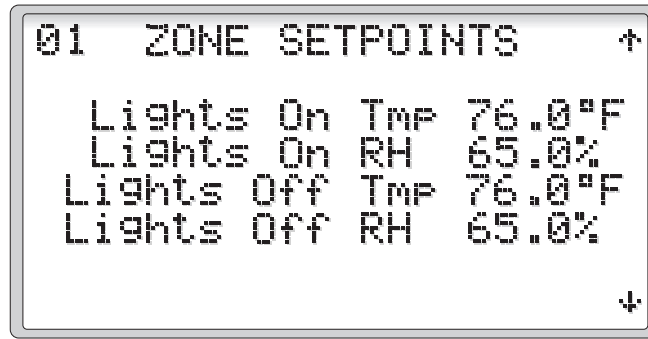


Figure 2

To return to the Home Screen, press the **Esc** key.

Pressing the **DOWN** key from the Zone Setpoints screen will display the Zone Alerts screen shown in Figure 3. If the zone sensor readings fall below the Min settings or rise above the Max settings, a Zone Alert will be triggered. Any alert will be recorded as an alarm and will require the alarm to be reset. Alerts will not affect the operation of the dehumidifier. This alarm point will be recorded in the Alarm pool condenser is supplied with the dehumidifier.

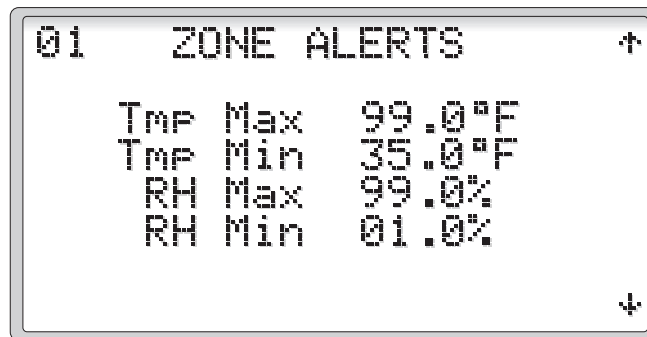


Figure 3

To return to the MAIN MENU, press the **Esc** key.

2.3 Main Menu (Figure 4)

Pressing the **Esc** key from the Home Screen displays the MAIN MENU (Figure 4). This menu allows the operator to select the STATUS MENU, set an Occupancy Schedule, enter the Service Menu and view the Unit Revision.

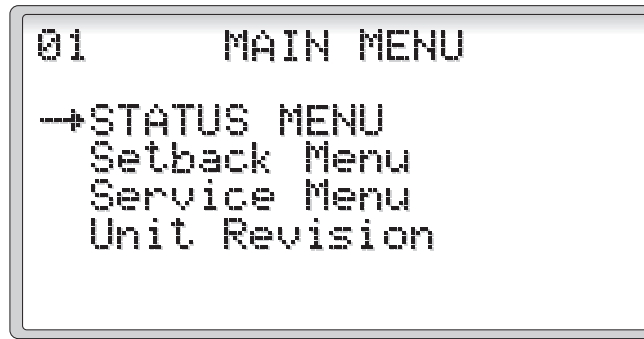


Figure 4

To return to the Home Screen, press the **Esc** key.

2.3.1 Status Menu (Figure 5)

Selecting the Status Menu will display the screen shown in Figure 5. The Modes and Time may be selected as well as the status of the Analog and Digital inputs and outputs and the electronic valve status.

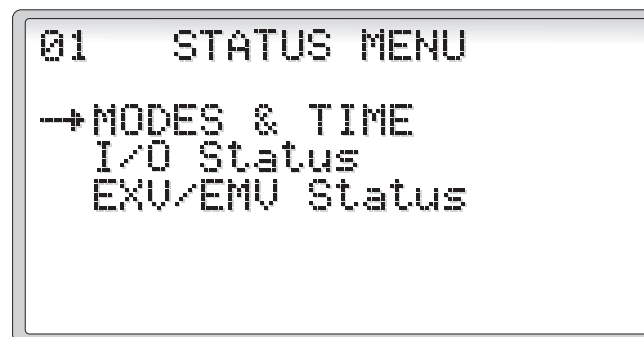


Figure 5

2.3.1.1 Modes and Time (Figure 6)

Selecting MODES & TIME from the STATUS MENU displays a text explanation of the unit. The Blower On or Off and the status of the System Switch is shown on the first line of this display. The Compressor Off or the number of the compressors running and the Lights On or Off is shown on the second line. The third line shows the Unit Status, which will be one of the following states:

- Off/Satisfied
- Heating Req.
- Cooling Req.
- Dehum Req.
- Dehum & Heat
- Dehum & Cool
- EXV Initialization

- Discharge Pressure Limiting

The fourth line will show any compressor that is required but delayed due to its non-short cycling timer. The bottom line displays the date and time.

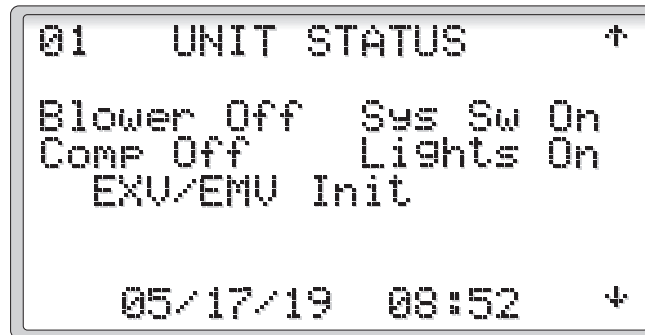


Figure 6

To return to the STATUS MENU, press the **Esc** key.

2.3.1.2 I/O Status (Figure 7)

Selecting the I/O Status from the STATUS MENU displays Digital Inputs, Analog Inputs, Digital Outputs, Analog Outputs and pLAN Data selection menu. Use the **UP** or **DOWN** key to make a selection and press the **ENTER** key.

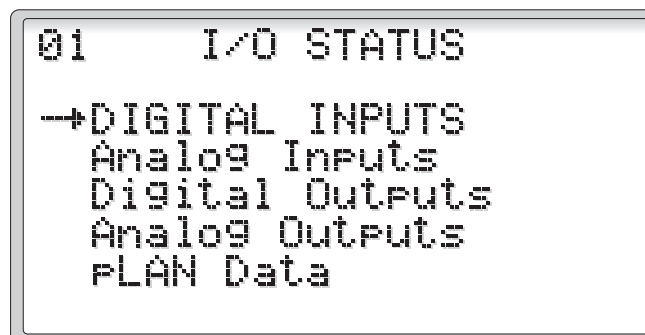


Figure 7

To return to the STATUS MENU, press the **Esc** key.

2.3.1.2.1 Digital Inputs (Binary) (Figures 8-10)

Selecting the Digital Inputs Screen shows the state of the digital contacts used by the control system. The first page shows the state of the first five inputs. These screens are provided for troubleshooting the control system.

- The first line will show the status of ID1, the digital

setback input, "On" if the contact is closed, and "Off" if the contact is open.

- The second line will show the status of ID2, the supply blower motor starter overload contacts, "OK" if no overload is present, and "Flt" if an overload exists.
- The third line will show the status of ID3, compressor 1 motor starter overload contacts, "OK" if no overload is present, and "Flt" if an overload exists.
- The fourth line will show the status of ID4, compressor 2 motor starter overload contacts, "OK" if no overload is present, and "Flt" if an overload exists.
- The fifth line will show the status of ID5, the Voltage Monitor, or jumper, "OK" if the system voltage is stable, and "Flt" if the system voltage is unstable.

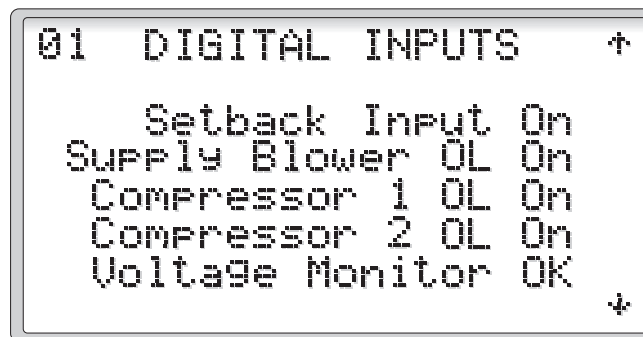


Figure 8

The second page of the Digital Inputs shows the status of the next 5 contacts wired to the controller.

- The first line will show the status of ID6, the condensate level switch, or jumper, "OK" if the level is normal, and "Flt" if the level is high.
- The second line will show the status of ID7, the water flow switch, "On" for flow and "Off" for no flow.
- The third line will show the status of ID8, the Smoke Alarm/General Fault Input, "OK" when the contact is closed and "Flt" when the contact is open.
- The fourth line will show the status of ID9, the water coil t'stat, "OK" if the contact is closed, and "Flt" if the contact is open.
- The fifth line will show the status of the ID10, the system switch "On" if the switch is on and "Off" if the switch is off.

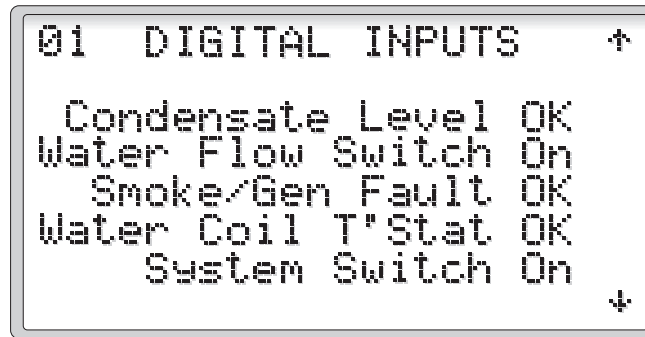


Figure 9

The third page of the Digital Inputs shows the status of the last four contacts wired to the controller.

- The first line will show the status of ID11, the photo cell, “On” if there is no light, and “Off” if there is light.
- The second line will show the status of ID12, compressor 3 motor starter overload contacts, “OK” if no overload is present, and “Flt” if an overload exists.
- The third line will show the status of ID13, compressor 4 motor starter overload contacts, “OK” if no overload is present, and “Flt” if an overload exists.
- The fourth line will show the status of ID14, the filter switch, “OK” if the pressure drop is low, and “Flt” if the pressure drop is high.

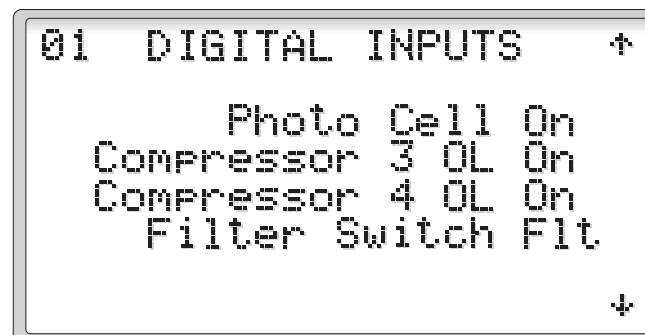


Figure 10

The return to the I/O STATUS MENU, press the **Esc** key.

2.3.1.2.2 Analog Inputs (Figures 11-15)

Selecting the Analog Inputs Screens shows the state of the sensors used by the control system. The first page shows the suction and discharge pressure, the intake sensor RH and Temperature readings as well as the supply air temperature sensor.

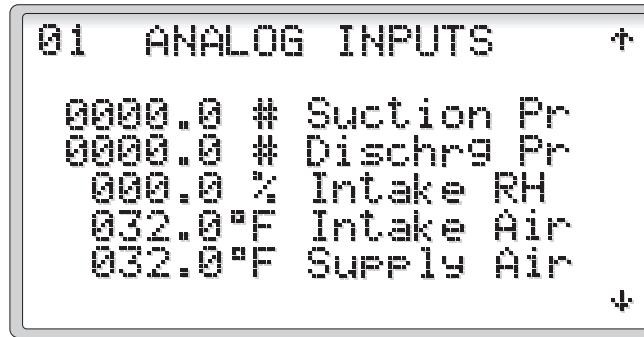


Figure 11

The second page of Analog Inputs shows the readings of the zone sensor RH and temperature readings; as well as the off evaporator temperature and the differential air pressure drop for airflow proving.

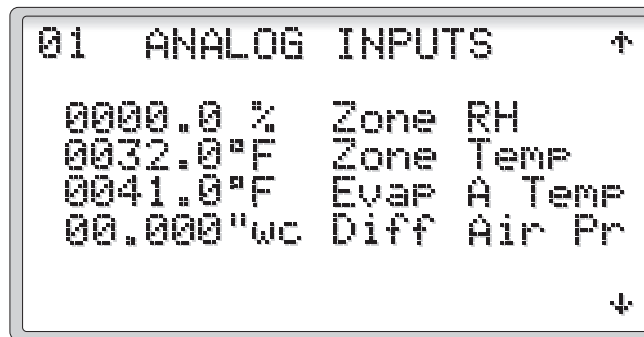


Figure 12

The third page of Analog Inputs shows the calculated dew point readings of the intake and zone sensors.

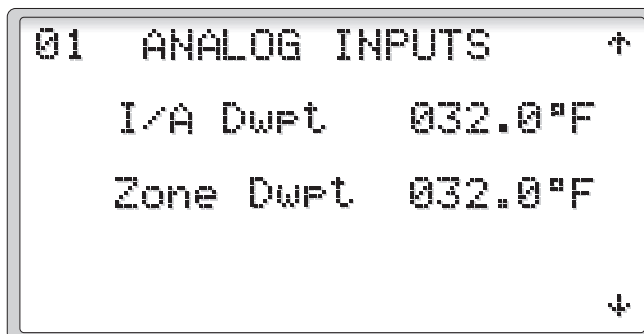


Figure 13

The fourth page of Analog Input shows the suction pressure and temperature. The suction P2T is also shown. The superheat shown is a calculated value derived from the P2T less the suction temperature.

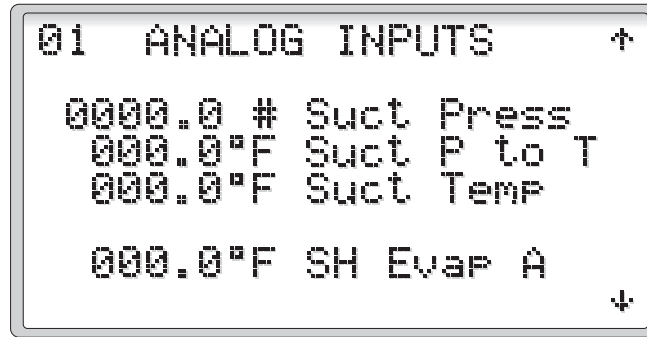


Figure 14

The fifth page of Analog Inputs shows the readings of the liquid pressure and temperature. The liquid P2T is also shown. The subcooling shown is a calculated value derived from the P2T less the liquid temperature.

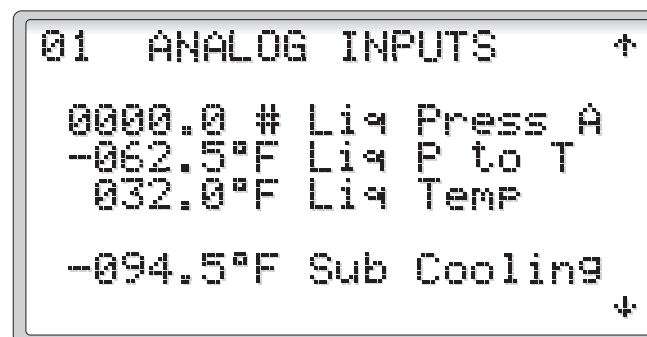


Figure 15

To return to the I/O STATUS screen, press the **Esc** key.

2.3.1.2.3 Digital Outputs (Binary) (Figures 16 and 17)

The Digital Outputs screen shows the state of the devices turned on and off by the control system. The first page shows the state of the first 4 relay outputs of the controller.

- The first line will show the status of Compressor 1 motor starter, “On” and “Off”.
- The second line will show the status of Compressor 2 motor starter, “On” and “Off”.
- The third line will show the status of Compressor 3 motor starter, “On” and “Off”.
- The fourth line will show the status of Compressor 4 motor starter, “On” and “Off”.

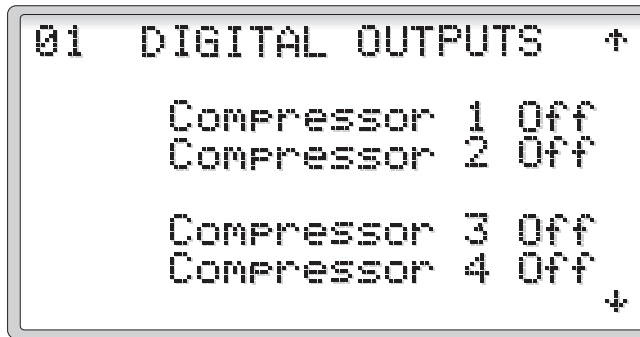


Figure 16

The second page shows the state of the last 4 outputs of the controller.

- The first line will show the status of Auxiliary Heater, “On” and “Off”.
- The second line will show the status of the Alarm contact, “On” and “Off”.
- The third line will show the status of the Water Pump, “On” and “Off”.
- The fourth line will show the status of the Supply Blower, “On”, and “Off”.

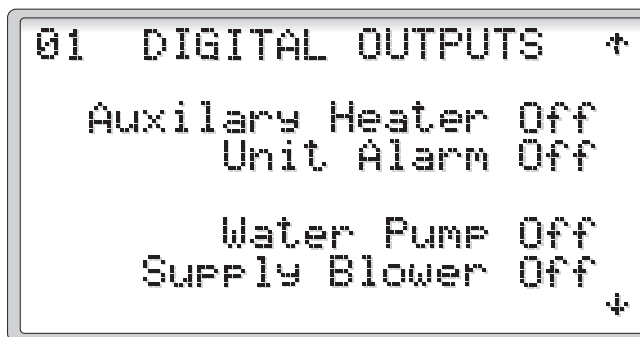


Figure 17

To return to the I/O STATUS screen, press the **Esc** key.

2.3.1.2.4 Analog Outputs (Figure 18)

This screen is provided for troubleshooting the control system.

The Analog Outputs screen shows the following:

- Supply Air Speed Command
- Air Heat Modulating Command

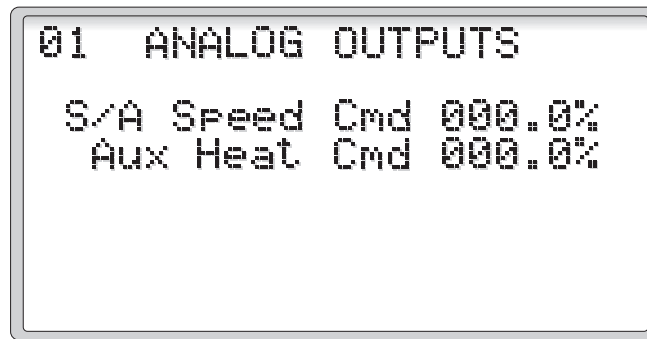


Figure 18

To return to the I/O STATUS screen, press the **Esc** key.

2.3.1.2.5 pLAN Data (Figures 19-21)

Selecting the pLAN Data screens shows the readings of the zone sensors connected to the other dehumidifiers connected via the pLAN serial network. These values may be shared by any dehumidifier used to condition the air in that zone.

The first page shows the zone temperature and RH of the dehumidifiers at pLAN addresses 1 through 5.

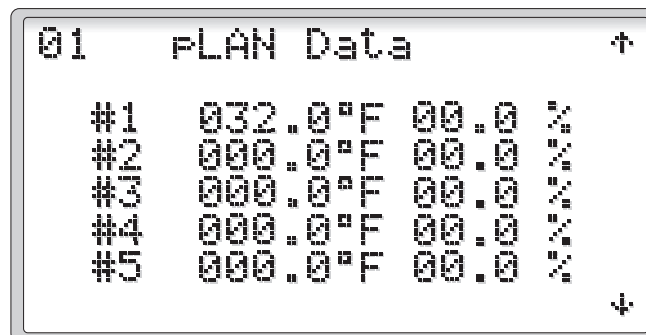


Figure 19

The second page shows the zone temperature and RH of the dehumidifiers at pLAN addresses 6 through 10.

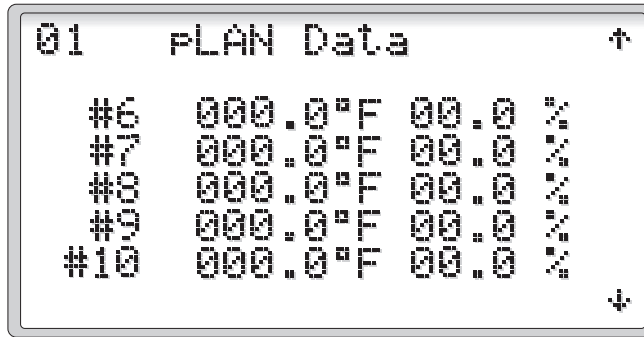


Figure 20

The third page, first line shows the Network value of a zone sensor sent over the BACnet or ModBus network. The second line shows the current value of the zone sensor being used to control the local dehumidifier. The third line allows the operator to select which zone sensor to use for this local dehumidifier.

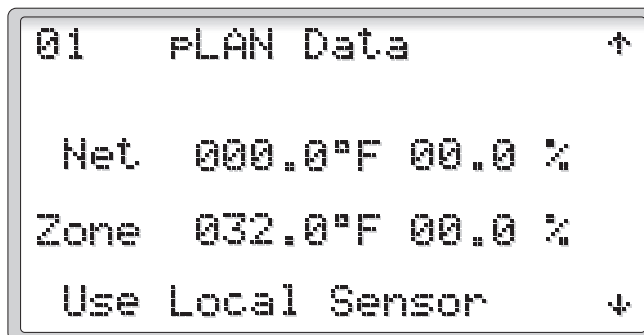


Figure 21

To return to the I/O STATUS screen, press the **Esc** key.

2.3.1.3 EXV/EMV Status (Figures 22-24)

Selecting the EXV/EMV Status from the STATUS MENU displays the screen shown in Figure 22. This screen shows the status of the circuit A superheat control. To return to the STATUS MENU, press the **Esc** key.

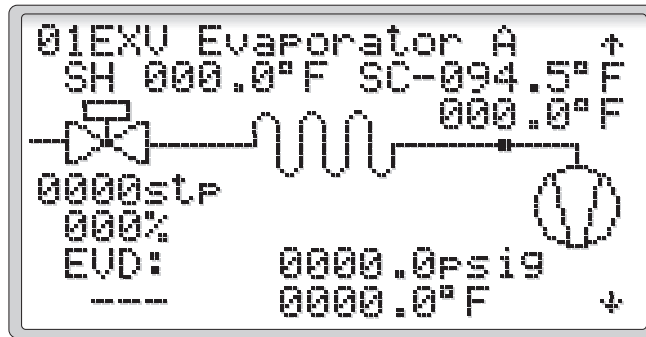


Figure 22

Pressing the **DOWN** key from Figure 22 displays Figure 23. This screen shows the position of the bypass and through reheat valves.

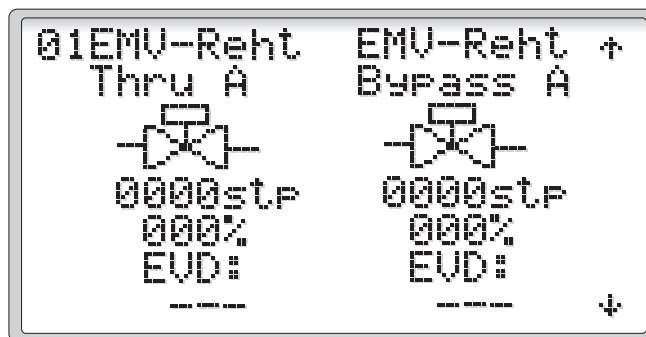


Figure 23

To return to the STATUS MENU, press the **Esc** key.

Pressing the **DOWN** key from Figure 23 displays Figure 24. This screen shows the position of the ROC liquid valve.

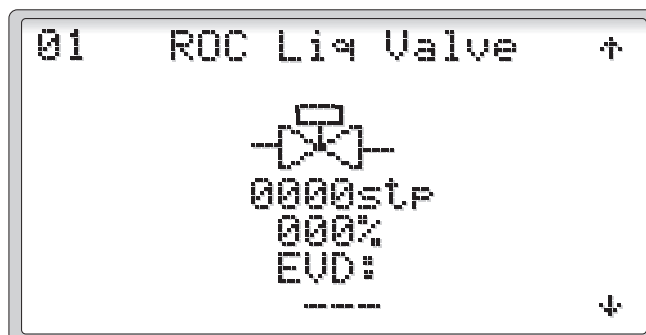


Figure 24

To return to the STATUS MENU, press the **Esc** key.

2.3.2 Setback Menu (Figure 25)

Selecting the Setback menu displays the screen shown in Figure 25. This allows selecting the Schedule Options, Temporary Holidays, Annual Holidays, Temporary Setback or a screen for setting the Time and Date.

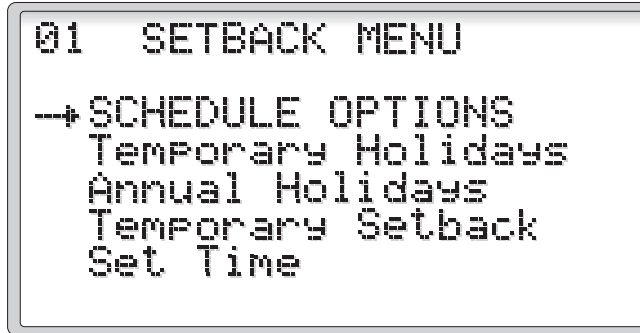


Figure 25

2.3.2.1 Schedule Options (Figure 26)

The schedule options screen allows the number of active occupancy schedules to be set. Setting at least one active schedule allows the setback schedule timing to be set from the Current Schedule screen. If the number of active schedules is left at zero, no setback scheduling will be active.

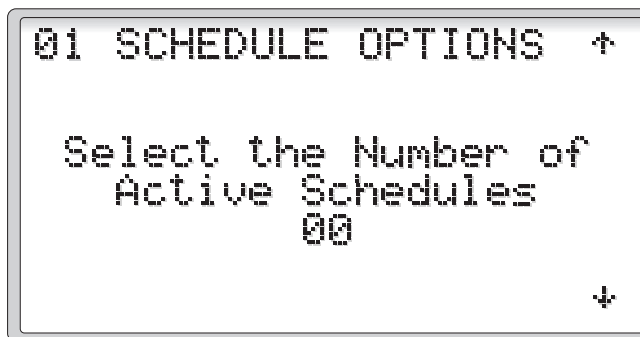


Figure 26

To return to the SETBACK MENU, press the **Esc** key.

2.3.2.2 Current Schedule (Figure 27)

The current schedule screen allows for setback timing for the selected day of the week (DOW) at the bottom of the screen. Select the schedule to modify the start time and stop time. This is the time span that the unit will be in for Lights Off mode. All times are set in the 24 hour format. As the DOW is selected, the **UP** and **DOWN** keys allow

for Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday and any holiday to be setback during that time. Up to 10 schedules can be active at any time. These allow for different start and stop times on various days of the week, weekends or programmed holidays.

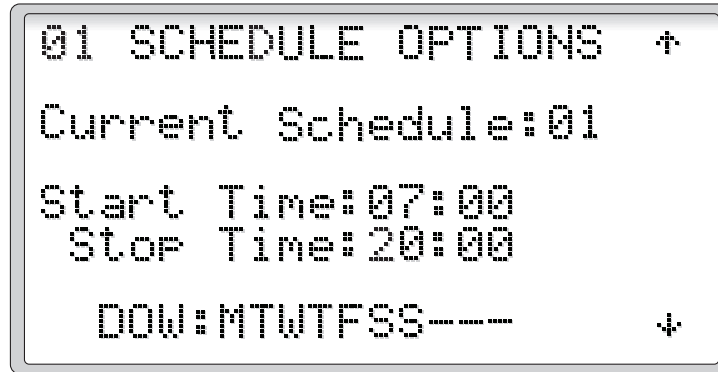


Figure 27

To return to the SETBACK MENU, press the **Esc** key.

2.3.2.3 Temporary Holidays (Figure 28)

The Temporary Holiday settings are for holidays that change dates from year to year, such as Memorial Day or Thanksgiving. Up to 10 different temporary holidays can be set from this screen. Select the number to assign to the Annual Holiday and then select the Start Date and the End Date for that holiday. To return to the SETBACK MENU, press the **Esc** key.

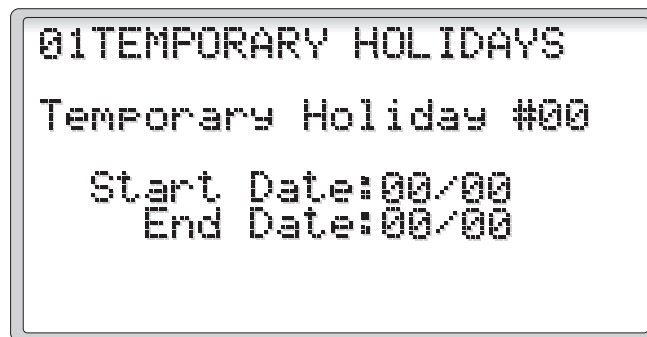


Figure 28

2.3.2.4 Annual Holidays (Figure 29)

The Annual Holiday settings are for holidays with dates that remain constant year to year, such as New Year's Day and the 4th of July. Up to 10 different annual holidays can be set from this screen. Select the number to assign to the Annual Holiday and then select the Start Date and the End Date for that holiday. To return to the SETBACK MENU, press the **Esc** key.

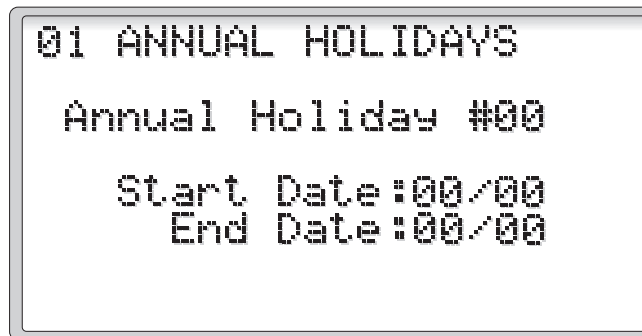


Figure 29

2.3.2.5 Temporary Setback (Figure 30)

Selecting the Temporary Setback screen allows the unit to be setback for a preset amount of time. Press the **ENTER** key and enter the hours you would like the unit to be temporarily in the Light Off mode. Press the **ENTER** key and enter the minutes you would like the unit to be temporarily in the Lights Off mode. Press the **ENTER** key and the cursor will be blinking over the "Press Prg to set" message. Pressing the **Prg** key will override the schedule and allow the unit to be temporarily setback. The screen will now show "Override On". To clear this override, set the hours and minutes to zero and press the **Prg** key. The screen will now show "Override Off".

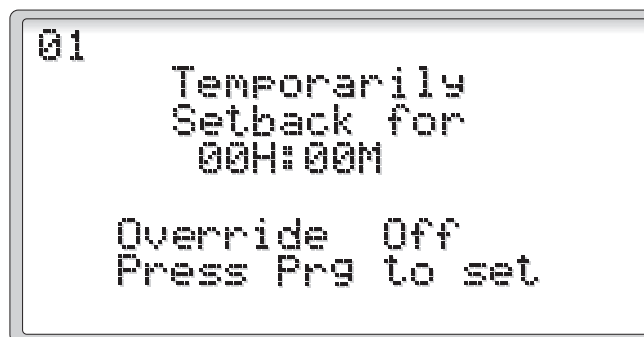


Figure 30

To return to the MAIN MENU, press the **Esc** key.

2.3.2.6 Set Time (Figure 31)

This screen allows the time, date and day of the week to be set. To modify these settings, press the **ENTER** key until the cursor is over the appropriate item and use the arrow keys until the desired setting is shown. All times are set in the 24 hour format. Pressing the **ENTER** key will step to the next item. If any item was modified, the message "Enter to Set" will be shown. Press the **ENTER** key to accept the time and date values.

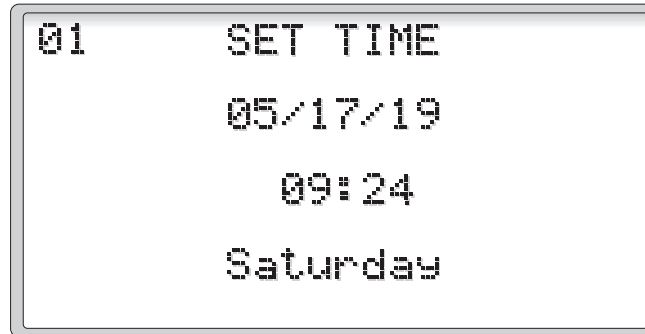


Figure 31

To return to the SETBACK MENU, press the **Esc** key.

2.3.3 Service Menu (Figures 32-33)

Selecting the SERVICE MENU will display the Login Screen (Figure 32). Enter the service password, 1234, and press **ENTER**.

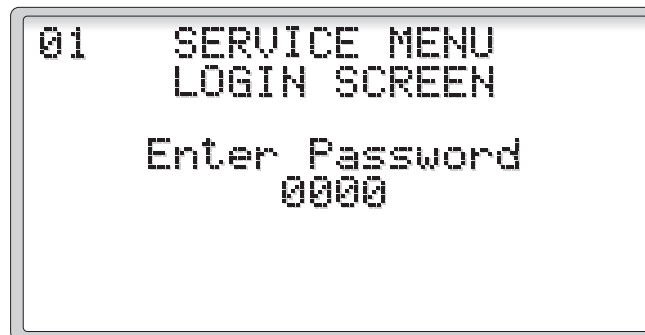


Figure 32

The SERVICE MENU allows access to Unit Setup, Parameter Settings, Sensor Offsets and Pressure Cutouts.

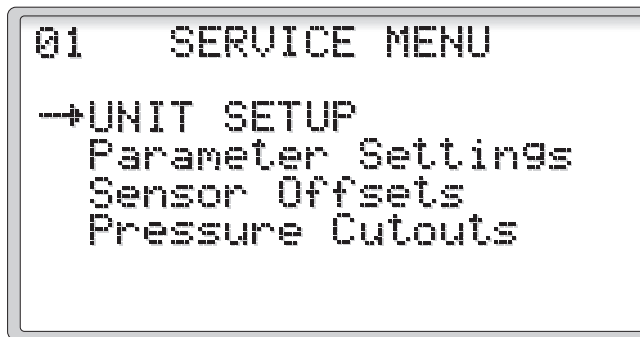


Figure 33

To return to the Main Menu, press the **Esc** key. The user remains logged in for 30 minutes after the password is entered. During this time, the Login Screen reads “Still Logged In – Press Prg to Enter”. To login without entering the password, while this message is shown, press the **Prg** key.

2.3.3.1 Unit Setup (Figure 34)

Selecting the UNIT SETUP from the Service Menu displays the SETUP MENU. This menu allows the operator to modify the Intake Air Dew Point and Temperature settings, as well as the Timer Settings. The Blower Setup is configured here as well as the Remote Setpoints.

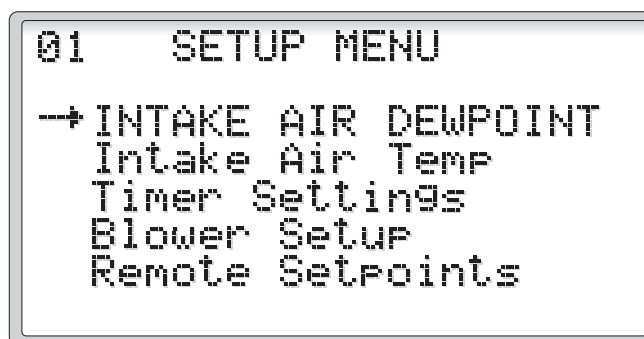


Figure 34

To return to the Service Menu, press the **Esc** key.

2.3.3.1.1 Intake Dew Point (Figure 35)

Selecting the Intake Air Dew Point will display the screen shown in Figure 35. The dew point dead bands are set here as well as switching differential. These settings may depend on other dehumidifiers conditioning the zone. Check the settings of the other dehumidifiers before altering these settings.

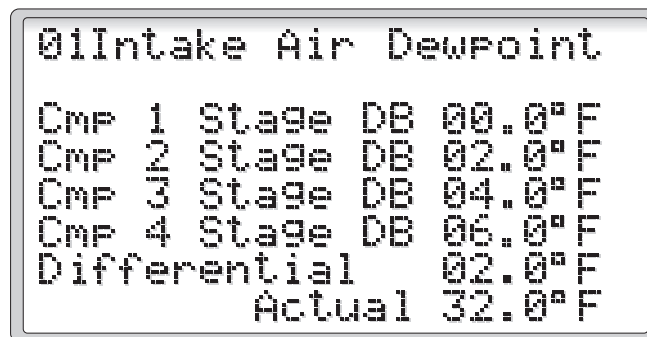


Figure 35

To return to the Setup Menu, press the **Esc** key.

2.3.3.1.2 Intake Air Temperature (Figures 36 and 37)

Selecting the Intake Air Temperature will display the screens shown in Figure 36 and 37. The temperature dead bands are set here as well as switching differential. These settings may depend on other dehumidifiers conditioning the zone. Check the settings of the other dehumidifiers before altering these settings.

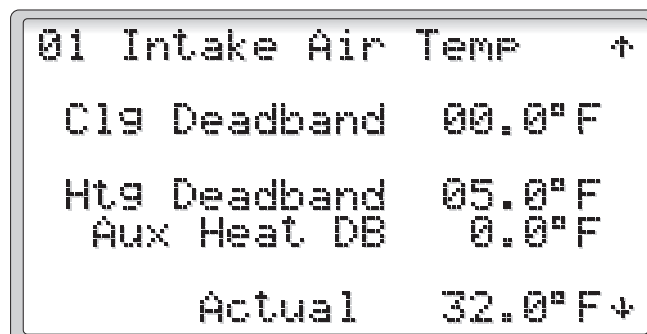


Figure 36

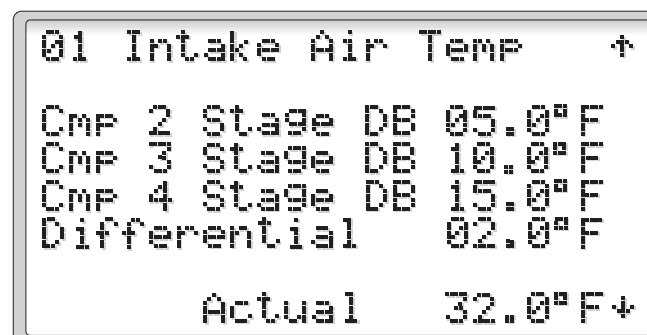


Figure 37

To return to the Setup Menu, press the **Esc** key.

2.3.3.1.3 Timer Settings (Figure 38)

The Timer Settings allows adjustments to the Compressor Delay, the Fan Delay, the Air Flow Delay, the Water Flow Delay and the Pump Off Delay. The Compressor Delay is the amount of time the fan must run before the compressor starts. The Fan Delay is the initial amount of time the Fan runs before the Air Flow Alarm is active. This allows slower moving fans time to build up normal air flow. The Air Flow Delay is the amount of time the Air Flow can be low, after the initial start, before the Air Flow Alarm is active. The Water Flow Delay allows the water pump a chance to run before an alarm is triggered. The Pump Off Delay allows the pump to run for this time after the pump is no longer required to run.

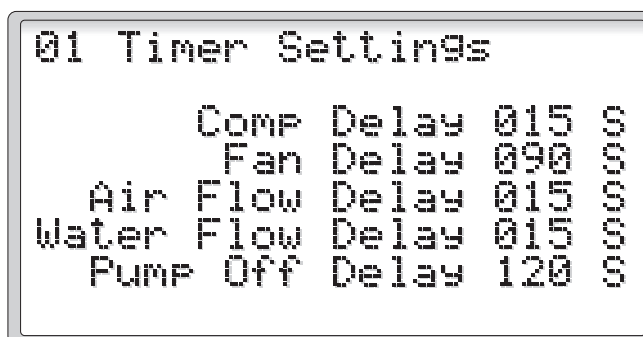


Figure 38

To return to the Setup Menu, press the **Esc** key.

2.3.3.1.4 Blower Setup (Figure 39-46)

The Blower Setup will allow the blower to run at a higher CFM during the cooling only mode and a lower CFM during the dehumidification modes. When dehumidification is required, the CFM will vary based upon the off evaporator temperature sensor and the setpoint of the dew point reset loop or 37°F in dehumidification only. The screen shown in Figure 39 allows modification to the air flow proving value of 0.050" wc and display of the actual differential pressure drop. The Filtering can be set from 1 to 99, with 1 being the quickest value. The bottom screen can be set for a "Std Motor" or an "EC Motor". When set for a "Std Motor" the screen shown in Figure 40 will be visible to allow setting of the Max CFM, the Max DP, the Min DP and the Dehum Stpt.

```

01 BLOWER SETUP ↑
Alarm Stpt 0.050"wc
Airflow DP 00.000"wc

Filtering 08 Sec

Std Motor ↓

```

Figure 39

```

01 TEST & SETPOINTS ↑
Max CFM 00000
Max DP 0.000"wc
Min DP 0.000"wc
Rht DP 00.000"wc
Unit CFM 00000
Dehum Stpt 37.0°F ↓

```

Figure 40

When the "EC Motor" is selected, the screens shown in Figure 41 and 42 are shown. These screens allow EC blower type to be set along the Altitude, the Max CFM, the Min CFM and the Dehum Stpt.

```

01 EC BLOWER SETUP ↑
Fan RH35
Altitude 00850 ft

Fan DP 00.000"wc

00000 CFM ↓

```

Figure 41

```

01EC BLOWER SETPOINTS↑
    Max CFM 00000
    Min CFM 00000

    Dehum Stpt 37.0°F
                        00000 CFM  ↵

```

Figure 42

After the Maximum and Minimum values and the Dehum Stpt have been selected, the next three screens allow for tuning of the PID loops which will control the speed of the Fan. Refer to Figures 43, 44 and 45 below.

```

01 EC MAXIMUM SPEED  ↵
    Gain (PB) 1175.0
    Reset (I) 00200Sec
    Rate (D) 00002Sec
        Stpt 00.000"wc
    Current DP 00.000"wc
    Loop Output 050.0% ↵

```

Figure 43

```

01 BLOWER TEMP PID  ↵
    Gain (PB) 0100.0
    Reset (I) 00050Sec
    Rate (D) 00000Sec
        Stpt 45.0°F
        Evap T 041.0°F
    Loop Output 050.0% ↵

```

Figure 44

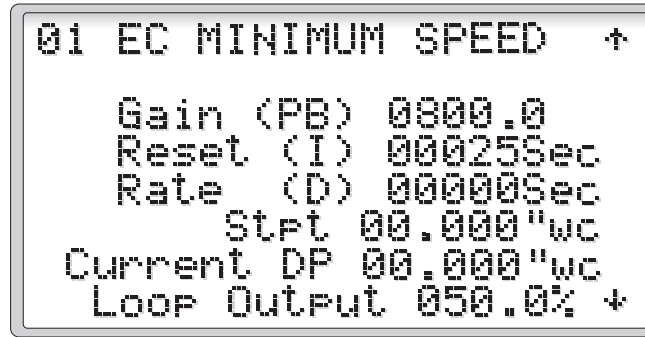


Figure 45

The last screen in the Blower Setup is the Manual Settings, shown in Figure 46. This screen allows the Blower to be set to Manual or Automatic Control. In Manual Control, the Manual Command will set the speed of the Blower.

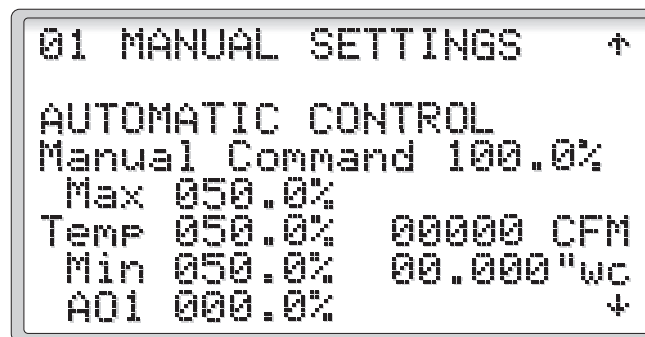


Figure 46

To return to the Setup Menu, press the **Esc** key.

2.3.3.1.5 Remote Setpoints (Figures 47-52)

Selecting the Remote Setpoints allows for analog inputs 7 and 8 to be set for either 0-10VDC or 4-20mA input values. Analog Input 7 will vary the temperature setpoint from temperature values corresponding to the inputs as shown in Figures 49 and 50. Analog Input 8 will vary the RH setpoint from RH values corresponding to the input as shown in Figures 51 and 52. The bottom line of the screens in Figure 47 and 48 allow the dehumidifier to use the system setpoints as shown in Figure 40, or the remote setpoints as defined below.

```
01 REMOTE SETPOINTS  ↑
    Set A1 7 to 4-20 mA
    Set A1 8 to 4-20 mA
    Use System Setpoints
                               ↓
```

Figure 47

```
01 REMOTE SETPOINTS  ↑
    Set A1 7 to 0-10VDC
    Set A1 8 to 0-10VDC
    Use System Setpoints
                               ↓
```

Figure 48

```
01      SET A17      ↑
    4 mA =  15.0
    20 mA = 030.0
                               ↓
```

Figure 49

```
01      SET A17      ↑
    0 VDC =  15.0
    10 VDC = 030.0
                               ↓
```

Figure 50

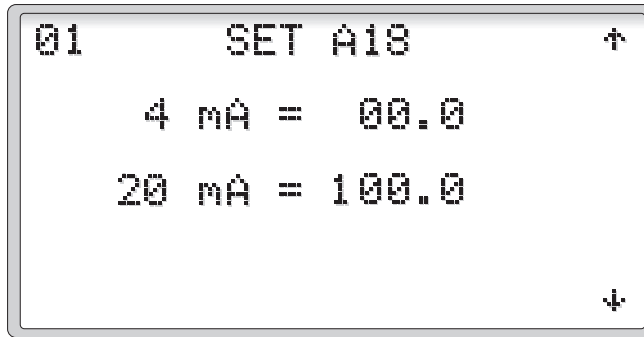


Figure 51

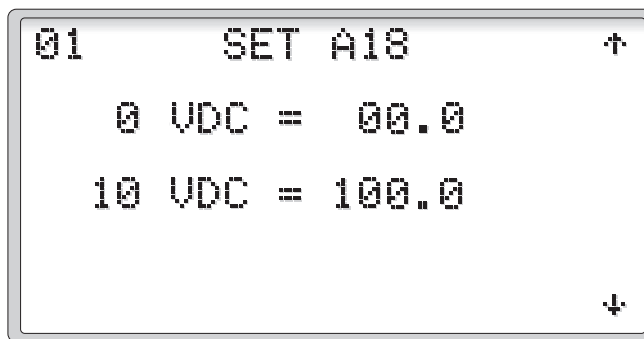


Figure 52

To return to the Setup Menu, press the **Esc** key.

2.3.3.2 Parameter Settings (Figure 53)

Selecting the PARAMETER SETTINGS from the Service Menu displays the Parameter Settings Menu as shown in Figure 53. This menu allows the operator to modify the Reheat Settings, Auxiliary Heat Settings, Extended Heat Settings and the Zone Reset Settings.

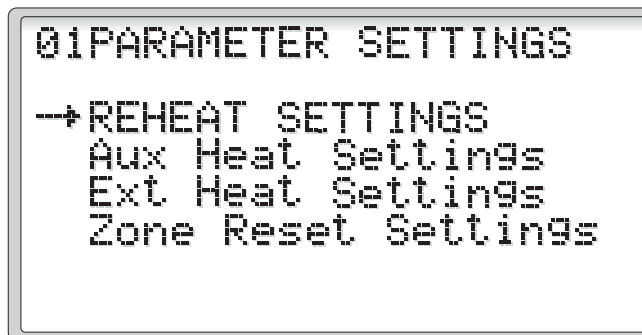


Figure 53

To return to the Setup Menu, press the **Esc** key.

2.3.3.2.1 Reheat Settings (Figures 54 and 55)

Selecting the Reheat Settings from the Parameter Settings Menu displays the Reheat Transition PID parameters shown in Figure 54. The Transition parameters are used by the control system every time the transition is made from Lights On to Lights Off or Lights Off to Lights On. After the transition time, typically 10 minutes, the Reheat Run PID parameters are used. Press the **DOWN** key for the Run parameters, see Figure 55.

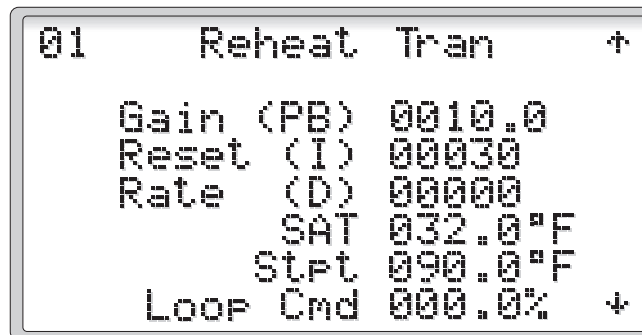


Figure 54

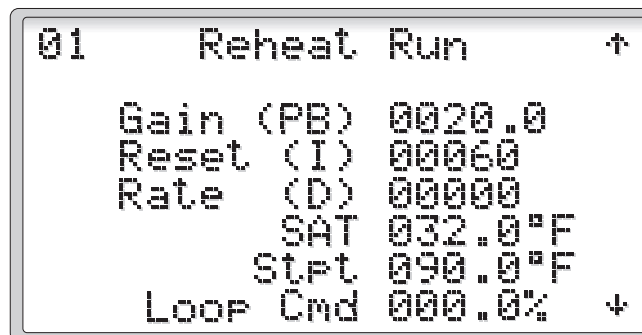


Figure 55

To return to the Service Menu, press the **Esc** key.

2.3.3.2.2 Aux Heat Settings (Figure 56 and 57)

Selecting the Aux Heat Settings from the Parameter Settings Menu displays the Aux Heat Transition PID parameters shown in Figure 56. The Transition parameters are used by the control system every time the transition is made from Lights On to Lights Off or Lights Off to Lights On. After the transition time, typically 10 minutes, the Reheat Run PID parameters are used. Press the **DOWN** key for the Run parameters, see Figure 57.

```

01    Aux Heat Tran    ↑
      Gain (PB) 0020.0
      Reset (I) 00300
      Rate  (D) 00000
                SAT 032.0°F
                Stpt 090.0°F
      Loop Cmd 000.0%  ↓

```

Figure 56

```

01    Aux Heat Run     ↑
      Gain (PB) 0040.0
      Reset (I) 00150
      Rate  (D) 00000
                SAT 032.0°F
                Stpt 090.0°F
      Loop Cmd 000.0%  ↓

```

Figure 57

To return to the Service Menu, press the **Esc** key.

2.3.3.2.3 Ext Heat Settings (Figure 58)

Selecting the Ext Heat Settings from the Parameter Settings Menu displays the Extended Heat Control screen shown in Figure 58. These PID parameters control the extended heat function of the reheat bypass and through valves.

```

01Ext Heat Control
      Gain (PB) 0020.0
      Reset (I) 00300
      Rate  (D) 00000
                SAT 032.0°F
                Stpt 090.0°F
      Loop Cmd 000.0%

```

Figure 58

2.3.3.2.4 Zone Reset Settings (Figures 59-64)

Selecting the Zone Reset Settings from the Parameter Settings Menu displays the Temperature Reset Transition PID parameters shown in Figure 59. The Transition parameters are used by the control system every time the transition is made from Lights On to Lights Off or Lights Off. After the transition time, typically 10 minutes, the Temperature Reset Run PID parameters are used. Press the **DOWN** key for the Run parameters, see Figure 60. Pressing the **DOWN** key again will display setpoint reset limits as shown in Figure 61.

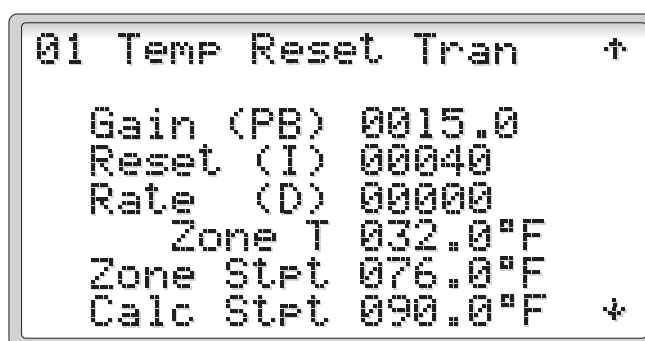


Figure 59

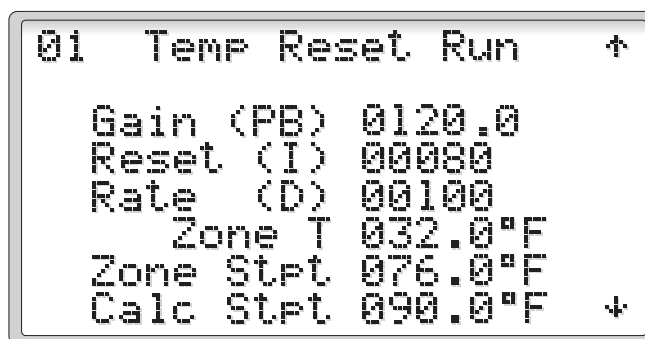


Figure 60

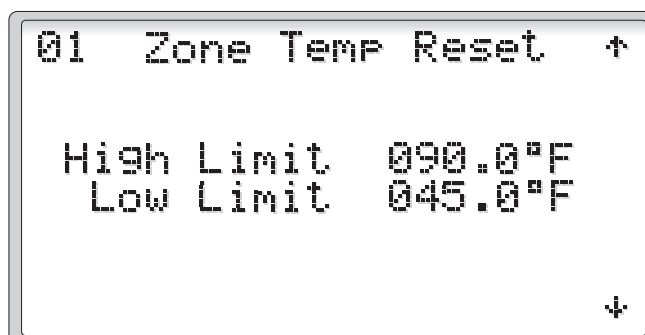


Figure 61

Pressing the **DOWN** key again displays the Dewpt Reset Transition PID parameters shown in Figure 62. The Transition parameters are used by the control system every time the transition is made from Lights On to Lights Off or Lights Off to Lights On. After the transition time, typically 10 minutes, the Dewpt Reset Run PID parameters are used. Press the **DOWN** key for the Run parameters, see Figure 63. Pressing the **DOWN** key again will display the Dewpt Reset Limits as shown in Figure 64.

```

01 Dewpt Reset Tran  ↑
Gain (PB)0025.0
Reset (I) 00300
Rate (D) 00000
Zone Dwpt 032.0°F
Zone Stpt 063.0°F
Calc Stpt 045.0°F  ↓

```

Figure 62

```

01 Dewpt Reset Run  ↑
Gain (PB)0200.0
Reset (I) 00300
Rate (D) 00000
Zone Dwpt 032.0°F
Zone Stpt 063.0°F
Calc Stpt 045.0°F  ↓

```

Figure 63

```

01 Zone Dewpt Reset  ↑
High Limit=SP-Factor
Factor          01.0°F
Low Limit       45.0°F

```

Figure 64

To return to the Service Menu, press the **Esc** key.

2.3.3.3 Sensor Offsets (Figures 65-67)

These screens allow the control valves of the analog input points to be adjusted if calibration shows these devices to be inaccurate. The range of these offsets is - 99.9 to 99.9. Care must be used when applying an offset to an analog value as erratic operation can result. To modify the offsets, press the **ENTER** key until the desired offset is selected and use the arrow keys until the desired setting is shown. Press the **ENTER** key to accept the offset value.

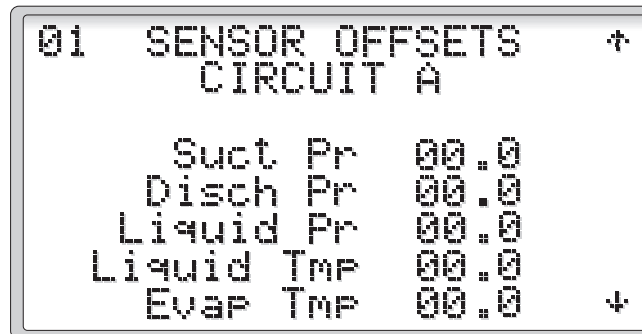


Figure 65

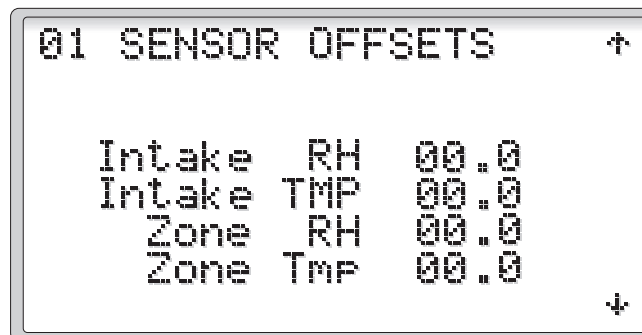


Figure 66

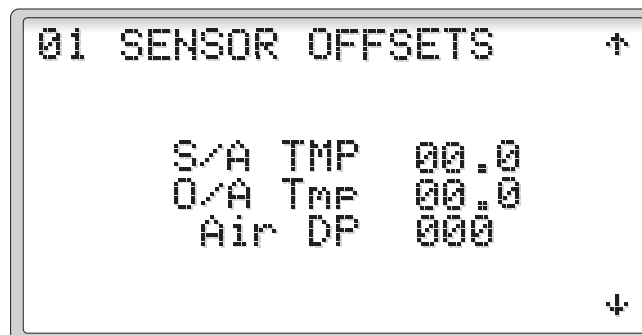
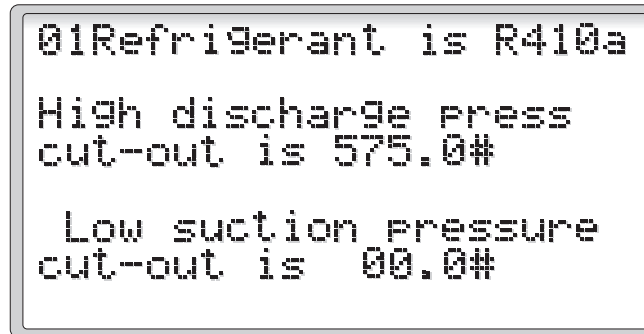


Figure 67

To return to the SERVICE MENU, press the **Esc** key.

2.3.3.4 Pressure Cutouts (Figure 68)

Selecting the Pressure Cutouts displays the screen shown in Figure 68. The Low Suction Pressure cutout values will vary depending on how long the compressor is running.

A monochrome LCD screen displaying the following text:

```
01 Refrigerant is R410a
High discharge press
cut-out is 575.0#
Low suction pressure
cut-out is 00.0#
```

Figure 68

To return to the SERVICE MENU, press the **Esc** key.

2.3.3.5 CO₂ Setup (Figures 69-72)

When the Dehumidifier is purchased with CO₂ control, the Service Menu will appear as shown in Figure 69, allowing the setup of the CO₂ control.

A monochrome LCD screen displaying the following text:

```
01 SERVICE MENU
->UNIT SETUP
Parameter Settings
Sensor Offsets
Pressure Cutouts
CO2 Setup
```

Figure 69

Selecting the CO₂ Setup displays the screen in Figure 70. This allows the number of CO₂ sensors to be selected and the High Alarm and Low Alarm setpoints to be modified. The bottom line on this screen sets the control to average the sensors or use the lowest reading of the active sensors.

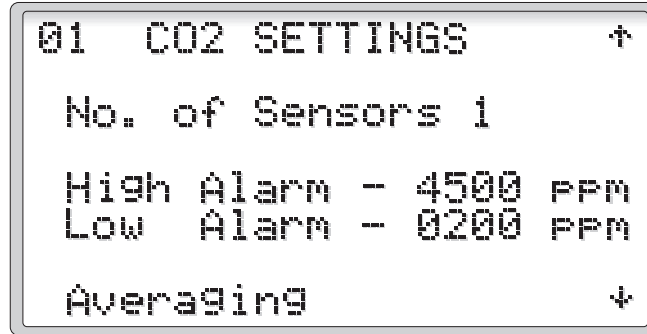


Figure 70

Pressing the **DOWN** key displays the screen shown in Figure 71. This screen shows the readings of the four channels dedicated to the CO₂ sensors. The Current reading is either the average of the active sensors or the lowest active sensor. This reading is the process control variable for activating the CO₂ valve. The bottom line of this screen allows the number of sensors to be selected.

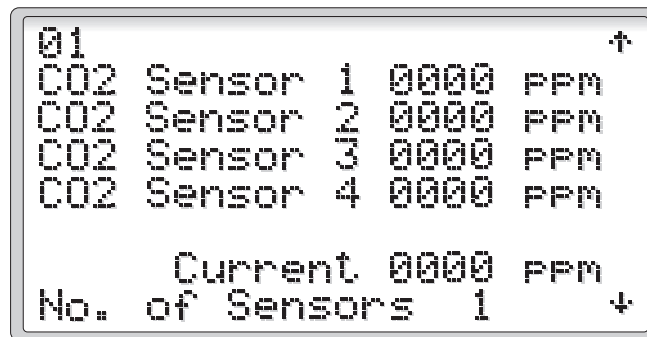


Figure 71

To return to the SERVICE MENU, press the **Esc** key.

When the Dehumidifier is purchased with CO₂ control, the Setpoint string of screens will also include the screens shown in Figure 72. This screen allows modifying the setpoints for the CO₂ valve. When the CO₂ level rises above the setpoint plus the differential, the valve will turn off. The valve will turn back on when the CO₂ level falls below the setpoint. The current valve of the CO₂ sensors is also shown on this screen.

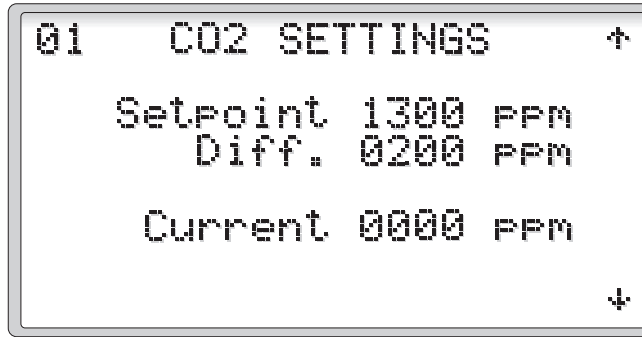


Figure 72

To return to the SERVICE MENU, press the **Esc** key.

2.3.4 Unit Revision (Figure 73)

The Unit Revision screen shows the version of the application program that is running along with the release date of the software, see Figure 73. This information should be passed to Desert Aire in the event a service call is necessary.

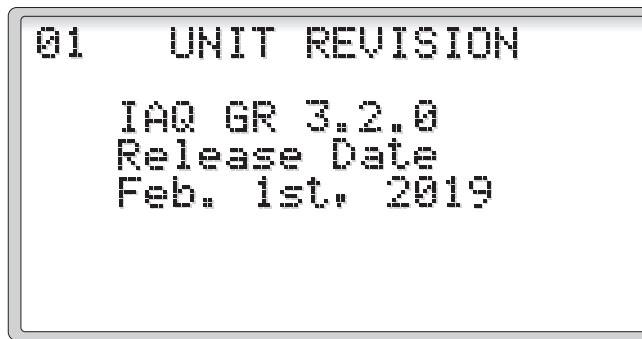


Figure 73

3 Alarm Menu (Figure 74)

Alarms are either Automatic Reset or Manual Reset. Automatic Reset Alarms are alarms that allow the unit and/or circuit to return to operation once the operating parameter has been returned to acceptable operating conditions. The unit and/or circuit will restart automatically; however, the red Alarm LED will remain illuminated until acknowledged to alert the operator the alarm occurred. Manual Reset Alarms are alarms that stop the unit and/or circuit and do not restart until the alarm is acknowledged and the alarm condition is reset manually on the alarm screen. The red Alarm LED will stay illuminated until the alarm acknowledged AND the alarm condition is reset.

The ALARM MENU can be accessed anytime by pressing the **ALARM** key. The main alarm screen includes the instructions for viewing and resetting the alarms, as well as a means to access the alarm history page. Pressing the **ENTER** key while viewing this alarm screen or the active alarm will reset any alarm that has returned to its safe state. Any active alarm can be viewed by pressing the **DOWN** key from this page. If no active alarms are shown, no alarms are active. To view the Alarm History screen, press the **ALARM** key.

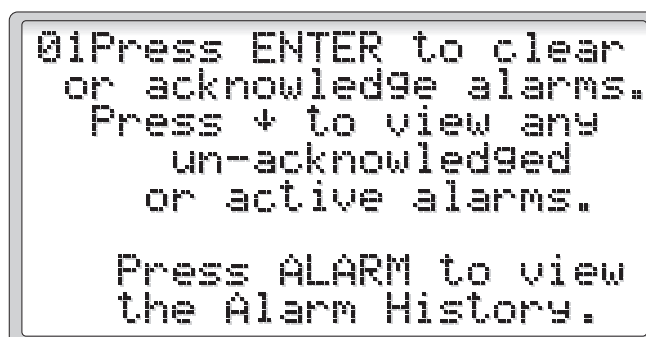


Figure 74

To return to the Home screen, press the **Esc** key.

3.1 Blower Motor Fault

This is a Manual Reset Alarm. The Blower Motor Fault is activated when the blower motor overload device indicates an overloaded condition. In this state, the blower will stop and not restart until the alarm condition is reset manually. Typically, the motor starting hardware will need to be reset along with a control system reset. The red Alarm LED on the display will stay lit until the alarm is reset.

3.2 Very Low Suction Pressure Alarm

This is a Manual Reset Alarm. The Very Low Suction Pressure Alarm is activated when the suction pressure falls below 22.0 psig. This condition may indicate a leak in the refrigerant circuit. The refrigerant circuit affected will stop and not restart until the alarm condition is reset manually. The red Alarm LED on the display will stay lit until the alarm is reset.

3.3 Low Suction Pressure Alarm

This is a Manual Reset Alarm. The Low Suction Pressure Alarm will only be activated when the suction pressure falls below the suction pressure cutout point three times in a one hour period. The refrigeration circuit affected will stop and not restart until the suction pressure rises above 60.0 psig and the alarm is reset manually. The red Alarm LED on the display will stay lit until the alarm is reset.

The suction pressure trip setpoint is normally 58.0 psig. When the compressor is started and for the first 90 seconds of the compressor running, the suction pressure trip setpoint is set to 22.0 psig. This is to avoid any nuisance tripping due to low ambient conditions. The first and second conditions of the suction pressure falling below the suction pressure trip setpoint in a one hour period will stop the compressor but not activate the alarm. The compressor will restart when the suction pressure rises above 60.0 psig.

3.4 High Discharge Pressure

This is a Manual Reset Alarm. The Discharge Pressure is activated when the discharge pressure rises above the high pressure cutout point, 575 psig. The refrigerant circuit affected will stop and not restart until the alarm condition is reset manually. The red Alarm LED on the display will stay lit until the alarm is reset.

3.5 Compressor OL

This is a Manual Reset Alarm. The Compressor Overload is activated when the compressor motor overload device indicates an overloaded condition. In this state, the refrigerant circuit affected will stop and not restart until the alarm condition is reset manually. Typically, the motor starting hardware will need to be reset along with the control system reset. The red Alarm LED on the display will stay lit until the alarm is reset.

3.6 Temperature Sensor Failure

This is an Automatic Reset Alarm. The Temperature Sensor Failure Alarm is activated when the supply or intake air temperature sensors are in a shorted or open condition. In this state, the refrigeration circuits will stop and not restart until the alarm condition is cleared. The red Alarm LED on the display will stay lit until the alarm is reset.

3.7 Low Voltage Monitor Tripped

This is an Automatic Reset Alarm. The optional Low Voltage Monitor is required to activate this alarm. The Low Voltage Monitor Tripped is activated when the monitor senses a below normal voltage – low enough to damage the equipment. The unit will stop and not restart until this condition is reset. The red Alarm LED on the display will stay lit until the alarm is reset.

3.8 High Condensate Level

This is an Automatic Reset Alarm. The optional Condensate Level Switch is required to activate this alarm. The High Condensate Level Alarm is activated when the condensate drain is plugged for any reason. The unit will stop and not restart until this condition is reset. The red Alarm LED on the display will stay lit until the alarm is reset.

3.9 Smoke Alarm

This is an Automatic Reset Alarm. The Smoke Alarm is activated if the alarm contact wired to digital input ID8 is opened. In this state, the unit will stop and not restart until the smoke alarm contact closes. The red Alarm LED on the display will stay lit until the alarm is reset.

3.10 Low Air Flow Condition

This is an Automatic Reset Alarm. The Low Air Flow Condition is activated if the air flow falls below the air flow proving value for the air flow time delay. In this state, the blower will continue to run, the refrigeration circuits and heating will stop and not restart until the air flow rises above the proving switch value. The red Alarm LED on the display will stay lit until the alarm is reset.

3.11 Low Water Flow Condition

This is an Automatic Reset Alarm. The optional Water Flow Switch is required to activate this alarm. The Low Water Flow Condition is activated if the water in the water cooled condenser stops flowing. In this state, the blower will continue to run, the refrigeration circuits will stop and not restart until the water flow switch closes. The red Alarm LED on the display will stay lit until the alarm is reset.

3.12 Freeze 'Stat Alarm

This is a Manual Reset Alarm. The optional Freeze 'Stat is required to activate this alarm. The Freeze 'Stat Alarm is activated when the temperature across the water coil drops. In this state, the unit will stop and not restart until the temperature rises to close the switch contact. The red Alarm LED on the display will stay lit until the alarm is reset.

3.13 Condenser Fan OL

This is an Automatic Reset Alarm. The Condenser Fan OL is activated if any condenser fan overload device opens. In this state, the unit will continue to run normally while activating additional condenser fans. The red Alarm LED on the display will stay lit until the alarm is reset.

3.14 Air Filter Service Required

This is an Automatic Reset Alarm. The optional Air Pressure Switch is required to activate this alarm. The Air Filter Service Required is activated when the pressure differential across the air filter exceeds the normal pressure. In this state, the unit will continue to run. The red Alarm LED on the display will stay lit until the alarm is reset.

3.15 Modbus Sensor Fault

This is an Automatic Reset Alarm. The ModBus Sensor Fault is activated when data is no longer received from the sensor by the controller. In this state, the unit will continue to run and the intake sensor values will be used to control the zone. The red Alarm LED on the display will stay lit until the alarm is reset.

3.16 Maximum / Minimum Zone Temperature / RH Alert

This is an Automatic Reset Alarm. These four Alerts can be set by the operator. See Section 2.2. If any Alert is active, the unit will continue to run. The red Alarm LED on the display will stay lit until the alarm is reset.

3.17 Sensor Fault High / Low CO₂

This is an Automatic Reset Alarm. The optional CO₂ sensor is required to activate this alarm. The CO₂ Faults will be activated by the CO₂ sensor and the high and low CO₂ level setpoints. In this state, the CO₂ valve will close. The red Alarm LED on the display will stay lit until the alarm is reset.

3.18 Alarm History Screen (Figure 75)

The Alarm History screen is accessible from the Alarm screen by pressing the **ALARM** key. This screen lists a history of the last 100 alarms, by time and date. The most recent alarm will be displayed as 001 along with the Zone Air Temperature, Zone Relative Humidity, Supply Air Temperature, Circuit A & B Suction and Discharge Pressure and the status of the unit when the alarm occurred. To access the history of alarms, press the **DOWN** key. The last 100 alarm conditions are saved in this history with the 101st being overwritten.

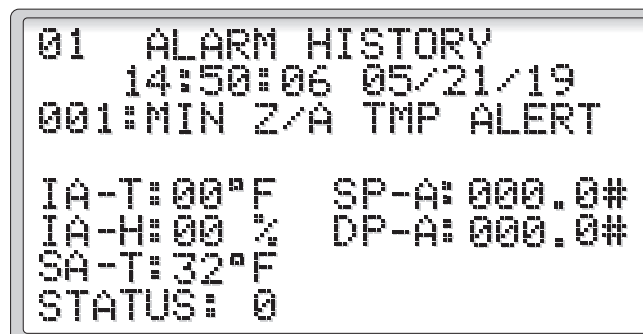


Figure 75

4 Hardware Details

4.1 Programmable Controller

The programmable controller is preprogrammed by Desert Aire for the control of your unit. The Desert Aire replacement part number for both of these controllers is available by calling our service department.

4.2 Suction Pressure Transducer

The Suction Pressure Transducer is a 0.5-4.5 VDC to 0-250 psig ratio metric device. The body is brass with a 1/4 SAE female refrigerant connection. This transducer must be supplied with 4.5 to 5.5 VDC power. A display reading of 0.0 psig for the transducer indicates the device is disconnected or defective. For this device to function, 5.0 VDC must be present from the black to green wires on the transducer. To verify the output of the transducer, measure the DC voltage (should read between 0.5 to 4.5 VDC) from the white to green wires on the transducer and use this voltage in the following formula to determine the pressure (0-250 psig).

$$\text{Pressure (psig)} = (62.5) * (V) - 31.25$$

Example, if $V = 2.50$ VDC, then;

$$\begin{aligned}\text{Pressure (psig)} &= (62.5) * (2.50) - 31.25 \\ &= 156.25 - 31.25 \\ &= 125 \text{ psig}\end{aligned}$$

The Suction Pressure Transducer's replacement part number is available from Desert Aire by calling our service department.

4.3 Discharge and Liquid Pressure Transducer

The Discharge & Liquid Pressure Transducers are 0.5-4.5 VDC to 0-652 psig ratio metric devices. The body is brass with a 1/4 SAE female refrigerant connection. This transducer must be supplied with 4.5 to 5.5 VDC power. A display reading of 0.0 psig for the transducer indicates the device is disconnected or defective. For this device to function, 5.0 VDC must be present from the black to green wires on the transducer. To verify the output of the transducer, measure the DC voltage (should read between 0.5 to 4.5 VDC) from the white to green wires on the transducer and use this voltage in the following formula to determine the pressure (0-652 psig).

$$\text{Pressure (psig)} = (163) * (V) - 81.5$$

Example, if $V = 2.50$ VDC, then;

$$\begin{aligned}\text{Pressure (psig)} &= (163) * (2.50) - 81.5 \\ &= 407.5 - 81.5 \\ &= 326 \text{ psig}\end{aligned}$$

The Desert Aire replacement part number for the Discharge or Liquid Pressure Transducer is available by calling our service department.

4.4 Suction Line, Liquid and Supply Air Temperature Sensor

These temperature sensors are a resistive NTC Bulb type device with a 10 foot cable. The temperature range is -58.0° to 212.0° F and the environmental rating is IP67. The failure mode of this device will display a reading of -623.3° F if the sensor is open, and display a reading of 687.3° F if the sensor is shorted. The Desert Aire replacement part number for the Supply Air Temperature Sensor is available by calling our service department.

4.5 Zone Air Temperature and Relative Humidity Sensor

This sensor is a communicating device which sends ModBus data out from address 190. If communication is lost from this device, an alarm is activated. The Desert Aire replacement part number for the Zone Air Temperature and Relative Humidity Sensor is available by calling our service department.

4.6 Air Flow Proving Differential Pressure Sensor

This sensor has a range of 0.0" wc to 2.0" wc, 10.0" wc or 25.0" wc. The output of this device is a 0.25 VDC at 0.0" wc and 4 VDC at the high range. The Desert Aire replacement part number is available by calling our service department.

5 Appendix

5.1 Remote Communication

5.1.1 BACnet Ethernet

Setting IP Address Via the PGD

- Hold the alarm button and the enter button for 5 seconds. The following screen will appear.

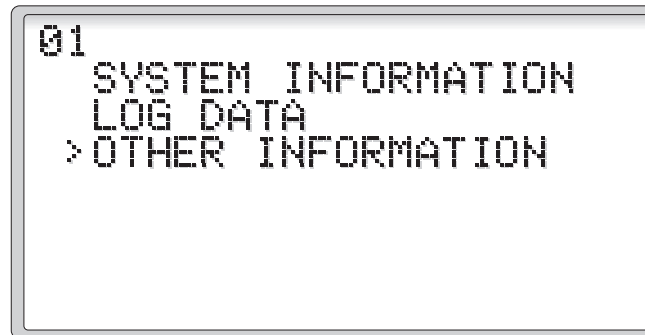


Figure 76

- Select OTHER INFORMATION and the following screen will appear.

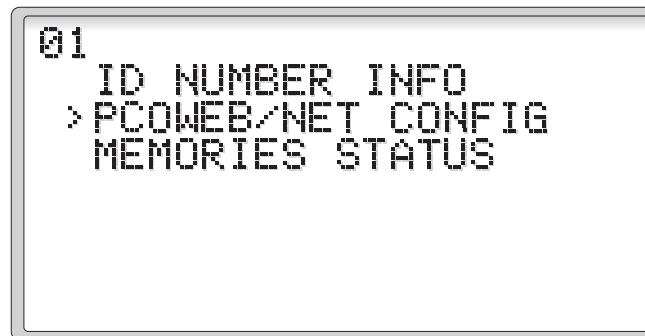


Figure 77

- Select PCOWEB/NET CONFIG and the following screen will appear.

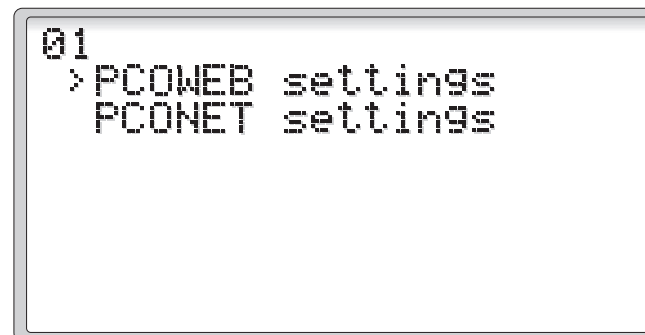


Figure 78

- Select PCOWEB settings and the screen will prompt you to set the DHCP and the IP address. DHCP should be set to off. Set IP address as instructed by Controls contractor.

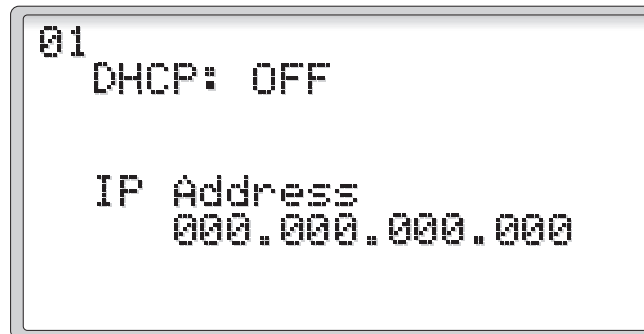


Figure 79

- After the IP address has been set the screen will switch to the following page. Set the Netmask as well as the Gateway addresses. The Netmask and the Gateway addresses will be provided by the Controls contractor.

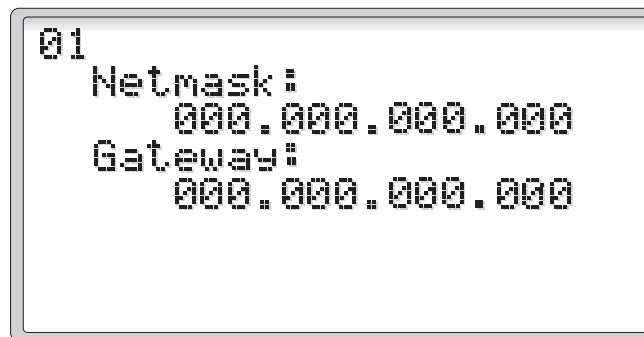


Figure 80

- After this is complete the screen will switch to the following page. If multiple DNS addresses are required they would be entered here. This is not common. The Controls contractor would also need to provide these addresses.

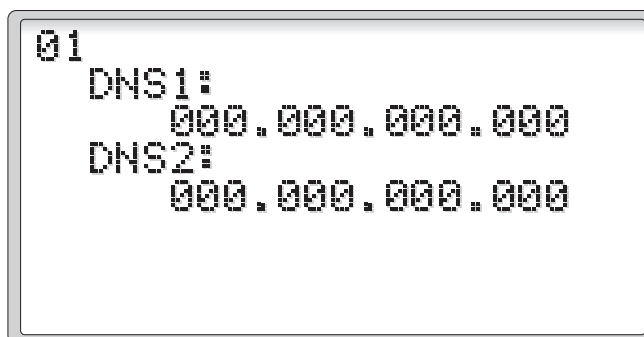


Figure 81

- Next you will see the BACnet ID and BACnet Type screen. This is also very rarely used however, if necessary, needs to be provided by the Control contractor. Set appropriately.

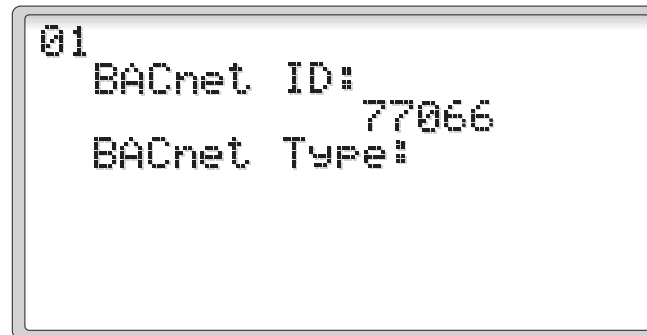


Figure 82

- The controller will then prompt you to save the changes. Select YES and hit enter.

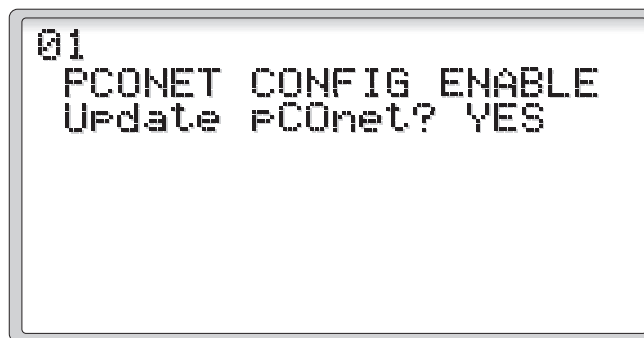


Figure 83

- The controller will then verify that the update was complete and ask you to reboot the pCOnet. Cycle power to the dehumidifier.

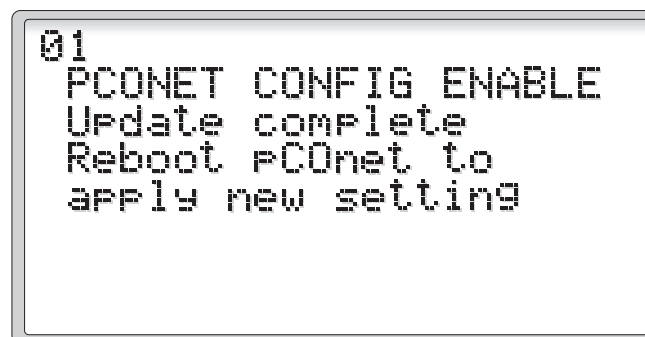


Figure 84

- Addressing is now complete

5.1.2 BACnet MS/TP

Setting MS/TP Addressing Via the PGD

- Hold the alarm button and the enter button for 5 seconds. The following screen will appear.

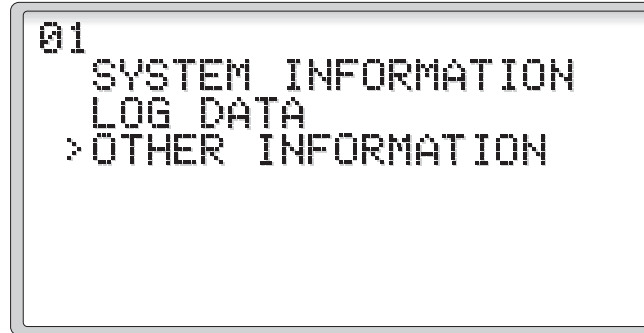


Figure 85

- Select OTHER INFORMATION and the following screen will appear.

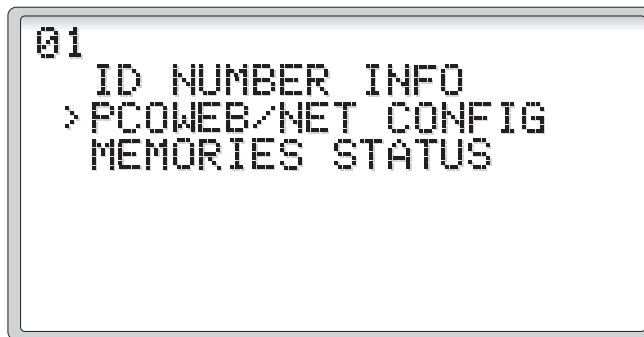


Figure 86

- Select PCOWEB/NET CONFIG and the following screen will appear.

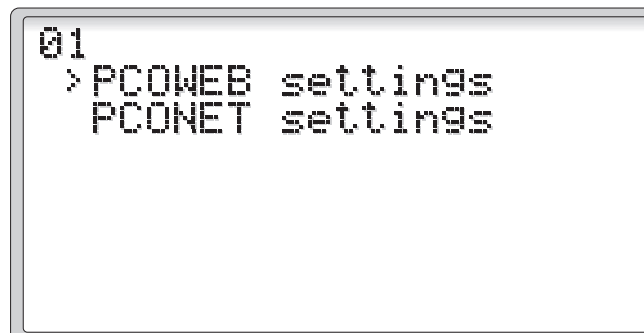


Figure 87

- Select PCONET settings and the screen will prompt you to set the Device Instance and Baud Rate. Set as instructed by Controls contractor.

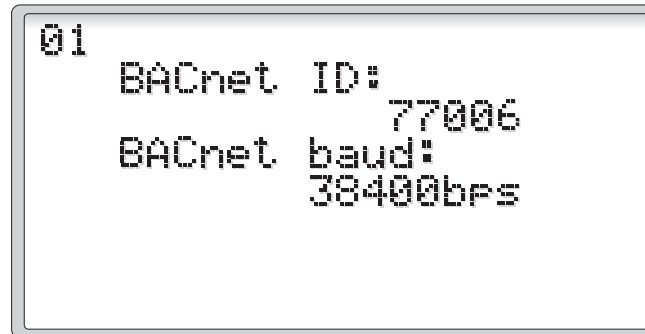


Figure 88

- After the baud rate has been set the screen will switch to the following page. Set the BACnet MAC address as well as the Max Master and Max Info Frames. The MAC address will be provided by the Controls contractor. Default values for the Max Master is 127 and Max Frames is 20

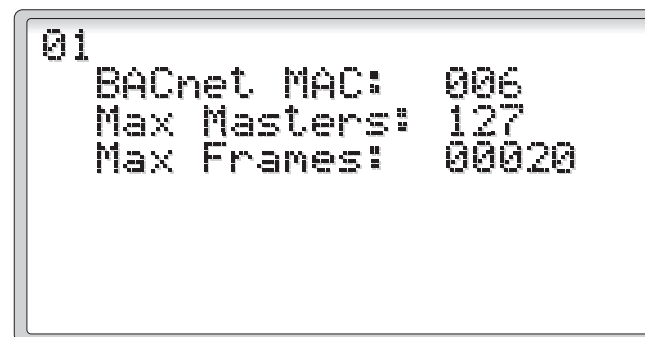


Figure 89

- The controller will then prompt you to save the changes. Select YES and hit enter.

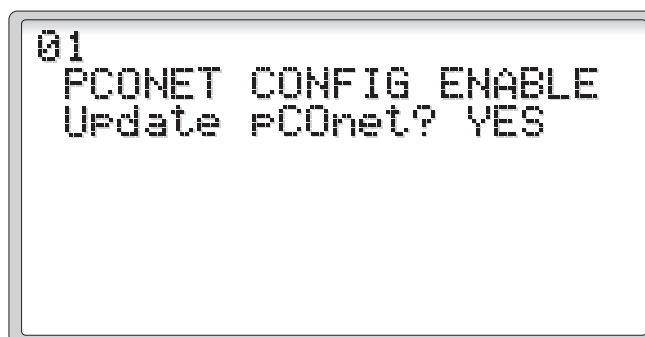


Figure 90

- The controller will then verify that the update was complete and ask you to reboot the pCOnet. Cycle power to the dehumidifier.

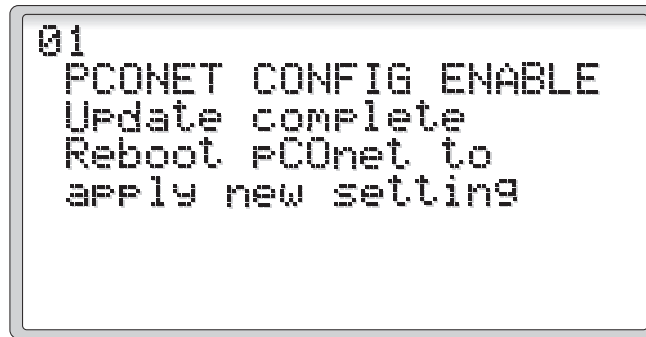


Figure 91

- Addressing is now complete



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