Marvair®

SCHOLAR V

MAINTENANCE & SERVICE MANUAL

Scholar V Classroom Units: 2 to 5 Ton Cooling Capacity

Models VAIVA36 (14-42 BTUH) & VAIVA60 (22-60 BTUH)
with Variable Refrigerant Flow Compressor

⚠ WARNING - SAFETY REQUIREMENTS

- If the information in these instructions is not followed exactly, a fire may result causing property damage, personal injury or loss of life.
- Read all instructions carefully prior to beginning the installation. Do not begin installation if you do not understand any of the instructions.
- Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life.
- Installation and service must be performed by a qualified installer or service agency in accordance with these instructions and in compliance with all codes and requirements of authorities having jurisdiction.
- Follow all safety codes.

MODEL NUMBER: _____

SERIAL NUMBER: _____

DATE OF START-UP: _____

Scholar V with Free Blow Plenum

Intertek NSF Designed, Engineered & Assembled In the USA

Manufactured By:

Marvair® Division of AIRXCEL™, Inc.
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The most current version of this manual can be found at www.marvair.com.

Marvair Scholar V VAIVA Maintenance & Service Manual 10/2017 Rev. 2
Part #03152

How To Use This Manual

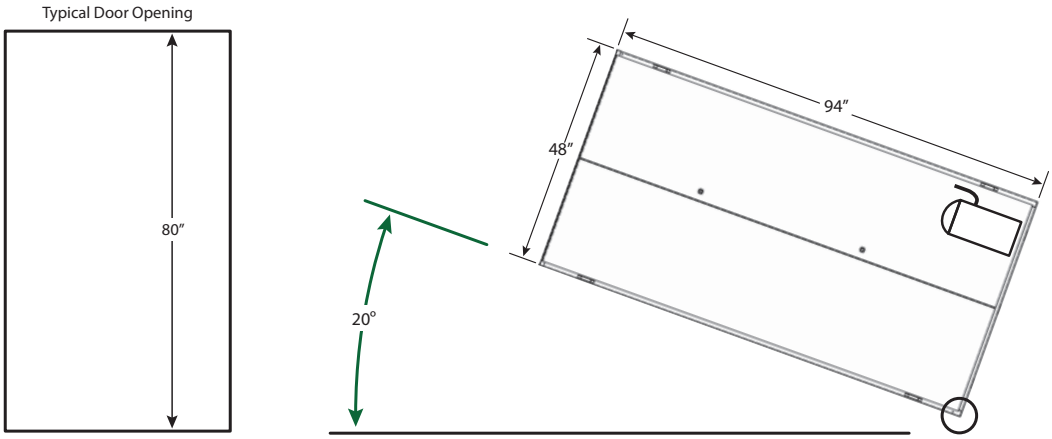
The purpose of this manual is to provide instructions for maintenance and service for the Marvair® Scholar V series of heat pumps and air conditioners. In addition to this manual, there are other pieces of literature available from Marvair. The Engineering and Design Manual details the design and selection of HVAC systems using the Scholar V series. The Installation and Start-Up section of this manual covers the installation of the unit and various accessories and the initial start-up of the unit. An overview of the product line can be found in the Heat Pump and Air Conditioner Product Data Sheets. The current version of this literature can be found and downloaded from the Marvair website at www.marvair.com.

To minimize sound levels within the classroom, certain options should be selected. These options are designated by QUIET ZONE throughout this manual.

Please read the following "Important Safety Precautions" before beginning any work. Failure to follow these rules may result in death, serious bodily harm, property damage and damage to the equipment.

Important SafetyPrecautions

1. USE CARE when LIFTING or TRANSPORTING equipment.
2. TRANSPORT the UNIT UPRIGHT. Laying it down on its side may cause oil to leave the compressor, resulting in DAMAGE upon START-UP. If the unit must be tilted to fit through a doorway, tilt toward the left to prevent oil draining from the compressor and do not exceed 20º from horizontal. Return the unit to upright as soon as possible and do not apply power for at least 6 hours after returning to upright.



3. TURN ELECTRICAL POWER OFF AT THE breaker or fuse box BEFORE installing or working on the equipment. LINE VOLTAGES ARE HAZARDOUS or LETHAL.
4. OBSERVE and COMPLY with ALL applicable PLUMBING, ELECTRICAL, and BUILDING CODES & ordinances.
5. SERVICE may be performed ONLY by QUALIFIED and EXPERIENCED PERSONS.
   - *** Wear safety goggles when servicing the refrigeration circuit**
   - *** Beware of hot surfaces on refrigerant circuit components**
   - *** Beware of sharp edges on sheet metal components**
   - *** Use care when reclaiming or adding refrigerant**
6. **Use COMMON SENSE - BE SAFETY CONSCIOUS**

Specifications subject to change without notice.

This is the safety alert symbol ⚠ . When you see this symbol on the Scholar unit and in the instruction manuals be alert to the potential for personal injury. Understand the signal word DANGER, WARNING and CAUTION. These words are used to identify levels of the seriousness of the hazard.

⚠ **DANGER**	Failure to comply will result in death or severe personal injury and/or property damage.
⚠ **WARNING**	Failure to comply could result in death or severe personal injury and/or property damage.
⚠ **CAUTION**	Failure to comply could result in minor personal injury and/or property damage.
IMPORTANT	Used to point out helpful suggestions that will result in improved installation, reliability or operation.

HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT
MAINTENANCE & SERVICE MANUAL
FOR SCHOLAR V HEAT PUMP & AIR CONDITIONER, MODEL VAIVA

TABLE OF CONTENTS

1.1 GENERAL OPERATION

A. Scholar V heat pumps and air conditioners are designed to provide quiet comfort to the classroom.

In cooling mode, the compressor will modulate its speed to match the cooling requirements of the room. The system provides cooling, dehumidification and air circulation.

In heating mode the compressor (heat pump only) will modulate its speed to match the heating requirements of the room. The system provides heating and air circulation. At lower outdoor temperatures, additional heating capacity may be provided by an optional electric resistance heater or a hot water/steam coil.

Ventilation air may be provided by the manual or motorized fresh air vent, power vent, GreenWheel® ERV or GreenCube® ERV. These ventilation systems operate when there is a call for cooling or heating or independently to provide fresh air. Note that with the manual, motorized fresh air vent and the power vent options, if the compressor is not operating and the indoor blower is running, unconditioned outside air is being introduced into the classroom. The GreenWheel and GreenCube ERV dehumidify and cool the outside air in the summer. They humidify and heat the outside air during the winter.

Temperature and Humidity are monitored by transmitters which may be wall mounted or mounted in the return air stream. Setpoints are adjusted with a Human Machine Interface (HMI) screen provided as standard with the unit or with an optional Building Automation Interface which allows connection with a customer provided Building Automation System (BAS).

Hot Gas Reheat (HGR) Dehumidification. To provide on demand dehumidification, the Scholar V heat pump or air conditioner have a factory installed hot gas reheat coil to allow dehumidification through continued cooling with discharge air reheated to avoid over cooling the classroom. The operation of the HGR is controlled by a three-way heat reclaim valve. The HGR coil is sized to provide a heating capacity approximately equal to the sensible capacity of the unit When the demand for cooling is satisfied and the humidity controller calls for dehumidification, hot gas is directed to a reheat coil downstream from the evaporator coil to add heat to the dehumidified, chilled air supplied to the classroom.

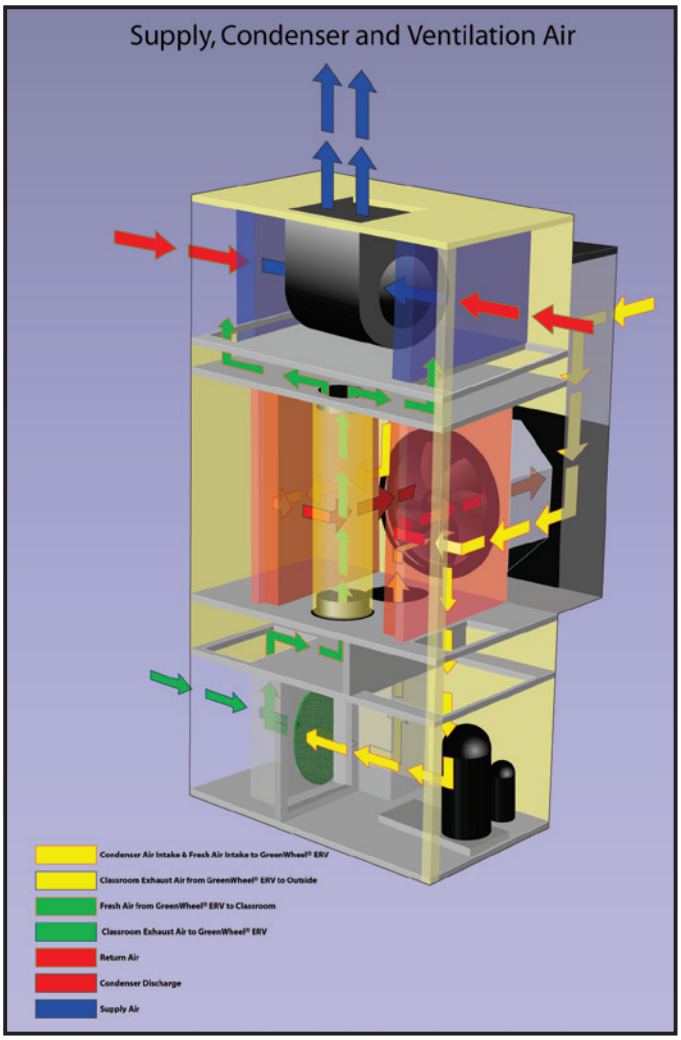


Figure 1. Typical Conditioned Air Flow and Fresh Air Flow (GreenWheel Option Shown)

IMPORTANT

WHEN SCHOLAR V SYSTEMS ARE INSTALLED, MODEL NUMBER AND SERIAL NUMBERS ARE TO BE RECORDED AND MAINTAINED IN A LOCATION FOR IMMEDIATE ACCESS WHEN REQUESTING FURTHER INFORMATION.

2.1 VENTILATION SYSTEM CALIBRATION

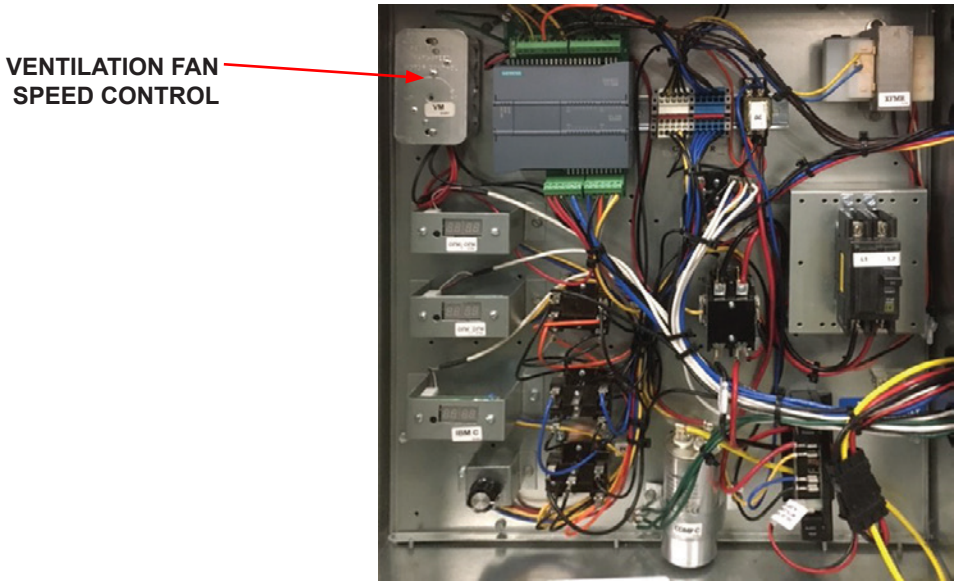
The ventilation system requires calibration to ensure the appropriate amount of fresh air is delivered to the classroom. Refer to the appropriate following ventilation system and use the instructions to calibrate the system for correct air delivery.

A. Manual Fresh Air System. Fresh air ventilation by means of a damper with pressure relief (opening to outside, but no exhaust blower), a ventilation intake blower and a fan speed controller provides up to 450 cfm of outside air. The damper can be manually adjusted at installation to provide the required ventilation airflow.

The fresh air door should be set in accordance with the amount of fresh air flow required, up to a maximum of 450 CFM. Figure 2 illustrates the fresh air door settings and air flow rates.

Follow the directions in Figure 2 to ensure proper air flow rate settings.

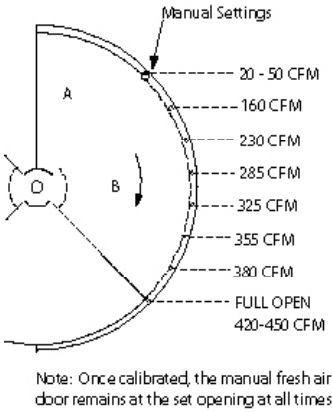
B. Motorized Fresh Air - Configuration B. This ventilation option includes a motorized damper, a fresh air intake blower and motor, and a blower motor speed controller. This ventilation option can provide up to 450 CFM of outside air (but not to exceed 40% of rated airflow) and includes pressure relief (opening to outside, but no exhaust blower). The motorized damper and blowers are controlled by a Programmable Logic Controller (PLC). The PLC will operate the damper and ventilation motors ONLY when the Indoor/Evaporator blower is operating. The damper is adjusted after installation for the required rate of ventilation. A filter on the incoming outside air is standard.



PowerVent - Configuration J (Optional). This ventilation option includes a motorized damper, a fresh air intake blower and motor, an exhaust air blower and motor and one blower motor speed controller. The blower speed controller operates both blowers in tandem. (An optional blower speed control for the exhaust air blower can be factory installed to provide independent control of the exhaust air blower motor and allow pressurization of the classroom).The PowerVent can provide up to 450 CFM of outside air (but not to exceed 40% of rated airflow) and includes active pressure relief. The motorized damper and blowers are controlled by a Programmable Logic Controller (PLC). The PLC will operate the damper and ventilation motors ONLY when the Indoor/Evaporator blower is operating. The PLC is factory wired for this operation by a 24 VAC signal to an input terminal on the PLC. The damper is adjusted after installation for the required rate of ventilation. A filter on the incoming outside air is standard.

The fresh air door is opened and closed by the motorized drive. Calibration, as shown in Figure 3, will ensure the required amount of air, up to a maximum of 450 CFM, is delivered to the classroom.

Follow the directions in Figure 3 to ensure the proper air flow rate setting. After calibrating the ventilation system, replace the lower front cabinet panel.

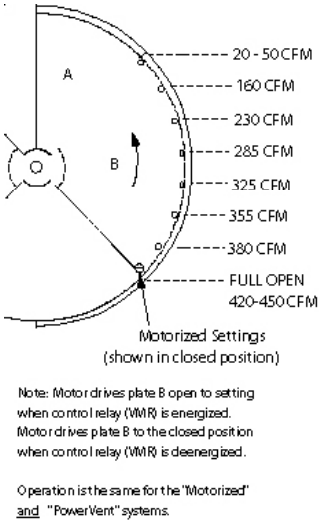


Inside the lower section, locate the circular calibration plates as noted in the drawing ("A" is fixed, "B" is movable). Remove the screw shown by the arrow from "Manual Settings."

Rotate plate B in a clockwise direction until the hole from which the screw was removed aligns with the hole adjacent to the desired air flow rate, in CFM.

Reinsert the screw into the hole in plate B and firmly drive the screw through the appropriate air flow rate hole, so plate B is securely fastened at the desired opening.

Figure 2. Manual Fresh Air System Calibration Procedure



Inside the lower section, locate the circular calibration plates as noted above in the drawing ("A" is fixed, "B" is movable). Remove the screw shown by the arrow from "motorized settings."

Reinsert the screw into the hole in plate B adjacent to the desired air flow rate, in CFM, and firmly drive the screw in until it bottoms out at the screw head.

Figure 3. Motorized and PowerVent System Calibration Procedure

C. GreenWheel® and GreenCube® ERV. Using best industry standards and practices, observe that fresh air is being brought into the classroom. For units with one speed controller (std.), adjust the speed of the intake and exhaust blowers by inserting a slotted screw driver into the opening on the controller. The speed controller is located in the control box. Measure the intake air again and adjust the speed of the blowers. Repeat as necessary to meet the fresh air requirements.

For units with the optional variable fan speed controller for the exhaust blower on the GreenWheel or GreenCube ERV, first measure the air being introduced into the classroom using best industry standards and practices. Adjust the speed of the intake air blower until the required outside air is being brought into the classroom.

Now observe the exhaust air from the classroom. Adjust the speed of the exhaust air blower until the required air is being exhausted from the classroom. The exhaust air controller is in the control box. It is usual practice to pressurize the classroom by exhausting slightly less air than is being brought into the classroom.

3.1 MAINTENANCE

⚠ WARNING

BEFORE PERFORMING MAINTENANCE ON THE SCHOLAR V, SWITCH ELECTRIC POWER OFF AT THE DISCONNECT LOCATED BEHIND THE RIGHT FRONT DOOR. FAILURE TO DO THIS COULD RESULT IN PROPERTY DAMAGE, BODILY INJURY OR DEATH.

A. **Air filters** on the Scholar V model VAIVA require scheduled inspection and maintenance. They should be inspected and cleaned or replaced twice a year, as a minimum, before the heating and cooling season.

They should be inspected more often, as necessary.

Please refer to Chapter 7.1 for instructions on accessing the return air filters.

The GreenWheel® or GreenCube® ERV Media can be checked visually for excessive dirt build-up. If there is residue build-up on the GreenWheel or GreenCube media, it can be vacuum-cleaned, in place, as necessary. See Chapter 7F for access to the GreenWheel or GreenCube ERV for cleaning. Check it and vacuum clean as necessary. Also check to see that the rubber drive belt is properly engaged on the GreenWheel ERV and drive motor pulley.

B. **Cabinet Panels/Indoor Grilles** may be cleaned with a sponge and warm, soapy water or a mild detergent. Do not use bleach, abrasive chemicals, or harmful solvents.

C. If the **Indoor Coils** becomes clogged or dirty, it may be cleaned by careful vacuuming or with a Marvair® approved evaporator cleaning spray. DO NOT use a solvent containing bleach, acetone, or flammable substances. Turn off power before cleaning. Be careful not to wet any of the electrical components. Be sure the unit has dried before restarting. See Chapter 7D for instructions on cleaning the indoor coils.

D. **Outdoor Coils.** Periodically inspect the outdoor condenser coil and the cabinet air reliefs for dirt or obstructions. Remove foreign objects such as leaves, paper, etc. If the condenser coil is dirty, it may be washed off with a commercial-grade non-abrasive evaporator cleaning spray. TURN OFF POWER BEFORE CLEANING! Be sure that all electrical components are thoroughly dry before restoring power. See Chapter 7.4 for information on cleaning the outdoor coils.

E. **Condensate Lines**. Each evaporator coil in the Scholar V air conditioner or heat pump has one condensate line. These are connected to a tee, which exits the unit. The condensate line for the indoor and outdoor drain pans are tied together and the condensate is discharged either through the base of the unit into a floor drain or out of the back of the unit at the bottom of the unit.

4.1 FUNCTION AND DESCRIPTION OF PRIMARY COMPONENTS

A. **Compressor.** The compressor, reversing valve and coil, and the Schrader fittings are located behind the hinged control box. See figure below.

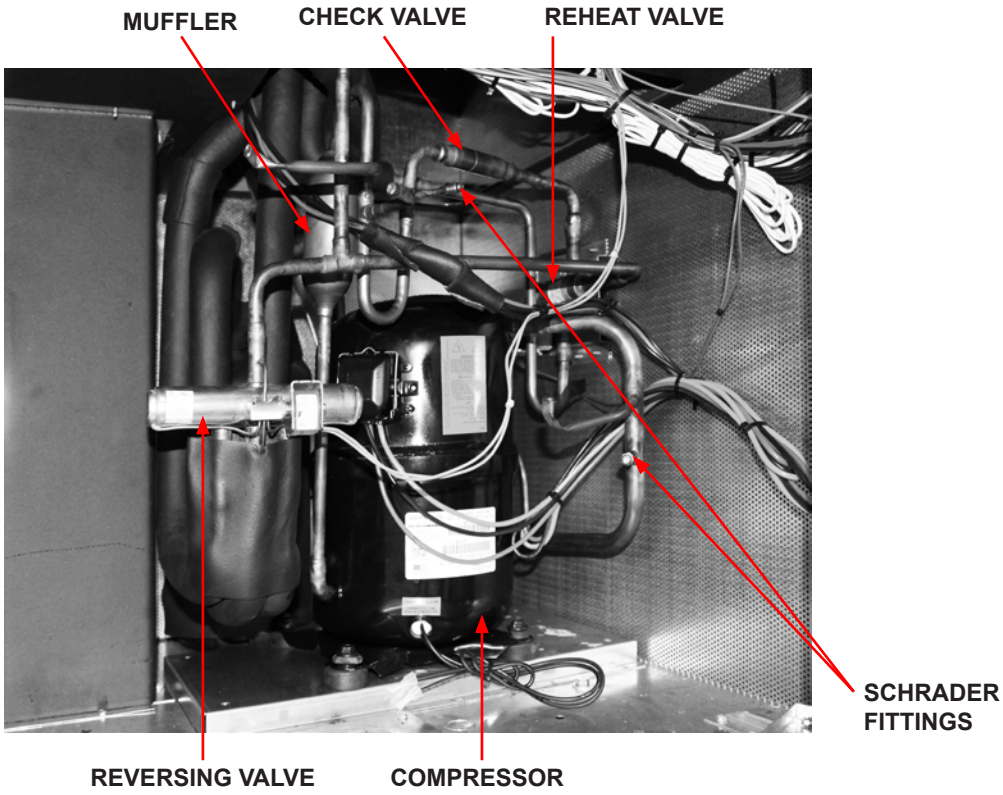


Figure 4. Scholar V Compressor Location

B. **Indoor Blower and Motor.** All Scholar V air conditioners and heat pumps use an electronically commutated (EC) blower motor and a single axial fan. The motor speed is controlled by a PLC and will modulate with the compressor.

C. 

Outdoor Air Mover. The outdoor air mover is an axial fan with an asynchronous external rotor motor on the 2 and 3 ton heat pumps and all air conditioners. Scholar V heat pumps, models VAIVA use two blowers with electronically commutated motors (ECM). Anytime the unit is in cooling mode and the compressor is on, the fan or blowers are cycled on and off as needed by the PLC to control condenser pressure.

Each blower motor is factory set at 55% and does not need any field adjustment.

The outdoor coils, filter drier, high pressure switch, loss of charge switch outdoor orifice, defrost sensor are located behind the large middle front panel.

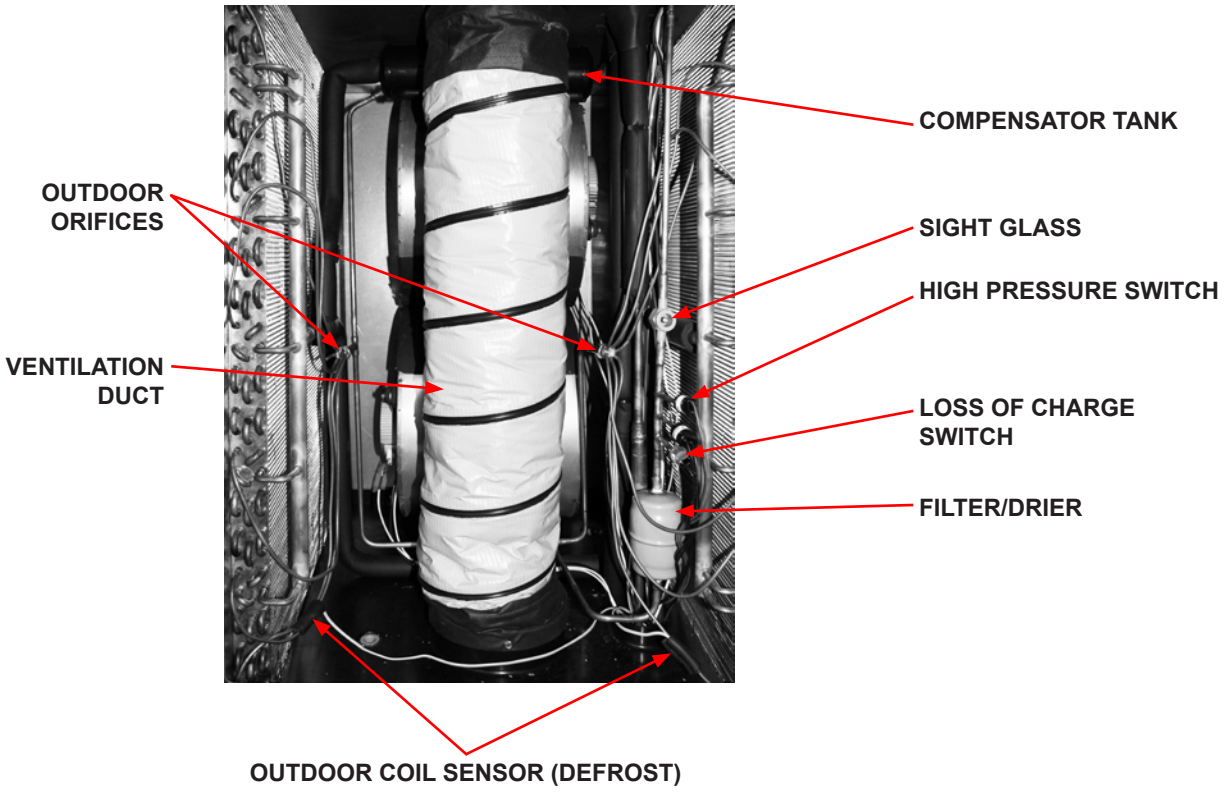


Figure 5. Scholar V Component Locations

D. **Indoor/Outdoor Coils.** The coils are constructed of lanced, aluminum fins mechanically bonded to rifled, seamless copper tubes.

E. **Filter Drier** - The filter drier performs two functions in the refrigerant circuit. First, it removes foreign particulate matter, e.g. dirt, scale, solder particles from the refrigerant to protect the compressor and other components in the refrigerant system with small openings or close tolerances. Second, it helps to absorb any moisture in the refrigerant with a desiccant.

F. **High and Low Refrigerant Pressure (Air Conditioner) or Loss of Charge (Heat Pump) Switches & Optional (Heat Pump Only) Indoor Coil Freeze Stat.** These switches render the compressor and outdoor fan motor inoperative whenever the limits of the high or low pressure switches are exceeded or indoor coil freeze up. In the event of high pressure, the Scholar V unit will turn off and lockout. The high pressure switch opens at 650 psig and resets at 420 psig.

The system has a High Pressure Switch (HPS) that indicates a high system pressure. When this occurs, the system will immediately set a High Pressure Lockout. This lockout condition shuts the system off and displays a fault on the HMI.

The Low Pressure (air conditioner) or Loss of Charge (heat pump) switches are designed is designed to guard against the operation of the system in the event of a total loss of refrigerant. If the Pressure (air conditioner) or Loss of Charge (heat pump) switch opens for more than eight minutes, the system will turn off and a Low Pressure Lockout fault will be indicated on a fault message on the HMI.

In cold weather the pressure in the refrigerant system is low prior to operation. When the Scholar V unit starts in the heat pump mode during cold weather, low pressure could cause the system to lock out. To prevent nuisance lockouts, the Scholar V unit will not shut off if the Low Pressure Switch (LPS) comes on during a user adjustable time frame (60 seconds by default) and the switch has not cycled more than three times in an hour. In other words, by default the compressor will start and operate for 60 seconds even with the LPS switch open three times before causing a lockout on low pressure. A user login is required to change the default setting.

The high pressure switch opens at 650 psig and close at 420 psig. The low pressure switch opens at 40 psig and closes at 60 psig. After a time delay, both switches will automatically reset twice. The unit will enter lockout mode if a switch is triggered a third time.

The high and low pressure switches can be reset at the HMI or by turning power off and then on to the Scholar V unit. The HMI will display a fault message to indicate a Low or High Pressure Lock Out.

G. **Metering Devices.** The Scholar V uses an electronic expansion valve (EEV) on the indoor (cooling) circuit and a fixed orifice on each evaporator coil.Refer to photos on pages 26 and 51.

H. **Reversing Valve.** The reversing valve reverses the refrigerant's direction of flow in a heat pump, allowing the heat pump to switch from cooling to heating or heating to cooling.

I. **Exhaust Air Ventilation Blower** is used to exhaust classroom in the GreenWheel® ERV and Power Vent ventilation options. The blower can exhaust up to 450 CFM of air from the classroom. In the standard configuration, both the exhaust and the intake ventilation blowers are controlled by a single speed controller. This speed controller permits the motor speed to be adjusted for the correct cfm of ventilation air. As an option, a second motor controller may be factory installed to allow independent control of the intake and exhaust air blowers. This allows pressurization of the classroom. All ventilation options have an intake air blower.

J. **Intake Ventilation Air Blower** is used to introduce outside air into the classroom. In the standard configuration, both the exhaust (GreenWheel ERV and PowerVent only) and the intake ventilation blowers are controlled by a single speed controller. This speed controller permits the motor speed to be adjusted for the correct cfm of ventilation air. As an option, a second motor controller may be factory installed to allow independent control of the intake and exhaust air blowers. This allows pressurization of the classroom.

K. **Electric Resistance Heat** is installed above the indoor blower outlet. Electric heat is field installed on all Scholar V units. Electric heat can be used with the freeblow plenum or with optional ducted air distribution options. The heaters are available in nominal kW of 5, 7.5, 10 & 15 kW for operation on 208/230v. 1Ø, 208/230 v. 3Ø, and 460v, 3Ø. The model number of the heat pump or air conditioner indicates the power supply and kW.

L. **Electric Resistance Heat Safery Controls.** Included with the electric heat assembly are built in temperature switches designed to turn power off to the heaters if the temperature is too high. There are two types of temperature switches. The first is an auto-reset type that turns power off to the heater if it senses an excessive temperature. When the temperature drops, power is restored to the heaters. This auto-reset switch is in the low voltage circuit.

The second type of switch is a line current one time limit switch. If it senses an excessive temperature, power is turned off to the elements. This switch does NOT reset when the temperature drops and must be replaced if it activates.

The number and location of both switches is determined by the power supply and the kW of the heaters.

M. **Programmable Logic Controller (PLC) Microprocessor.**

The control logic of the Scholar V is handled by a Siemens S7-1200 1215C Programmable Logic Controller (PLC). This device is powered by 24 volts DC and has 14 digital inputs, 10 digital outputs, two analog inputs and two analog outputs. The PLC has a model SM 1231 expansion module which provides four type K thermocouples for measuring various temperatures throughout the unit.

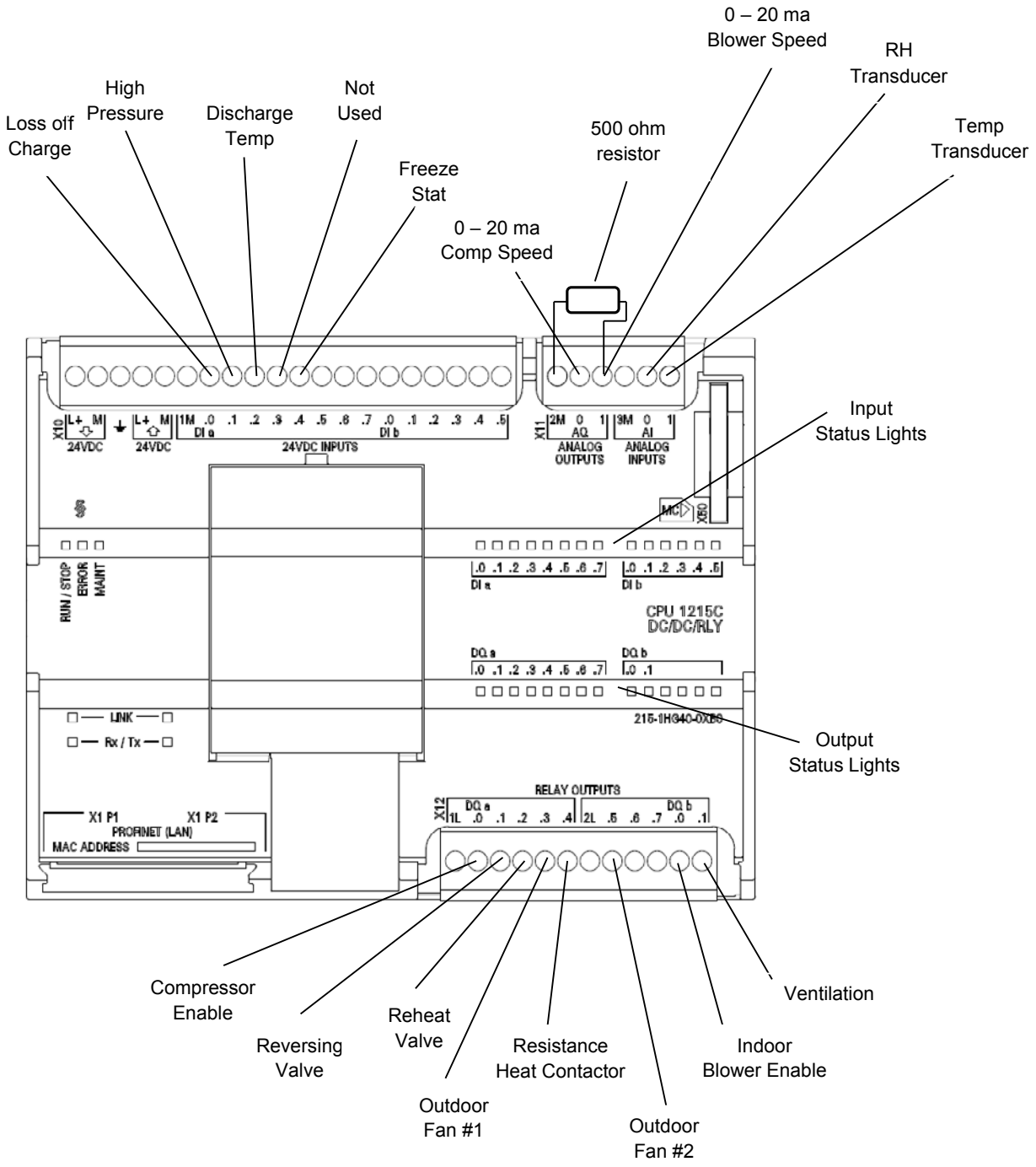


Figure 6. Scholoar V PLC

A. Digital Inputs: All digital inputs are powered by 24 VDC

- DI 0.0 – *Low Refrigerant Pressure Switch:* Opens on refrigerant evaporator pressure drop
- DI 0.1 – *High Refrigerant Pressure Switch*: Opens on refrigerant condenser pressure rise
- DI 0.2 – *High Compressor Discharge Temperature:* Opens on temperature rise of the compressor discharge refrigerant line

- DI 0.3 – *CO2 Sensor*: Opens when the CO2 content of the room gets above set-point of the sensor
- DI 0.4 – *Evaporator Coil Freeze-Stat:* Opens when temperature of the evaporator coil fins falls below 28°F. This is an indication that the evaporator coil may be freezing up.

B. Digital Outputs

- DO 0.0 – Provides 24 VAC ON signal for Electronic Expansion Valve and for Variable Speed Compressor Driver Board
- DO 0.1 – *24 VAC to Reversing Valve:* Valve is energized in Cooling Mode.
- DO 0.2 – *24 VAC to Reheat Valve*: Valve is energized in the Dehumidification Mode when the supply air temperature is below the cooling set-point
- DO 0.3 – *24 VAC to Condenser Fan Head Pressure Control*
- DO 0.4 – *24 VAC to Heater Contactor*
- DO 1.0 – *24 VAC to Indoor Blower Controller*
- DO 1.1 – *24 VAC to Ventilation Control Relay*

C. Analog Inputs

- AI 0 – *0-10 VDC modulating signal from indoor Relative Humidity Transmitter:* 0 Volts = 0 %RH 10 volts = 100 %RH
- AI 1 – *2-10 VDC modulating signal from indoor Temperature Transmitter:* 2 Volts = 50°F 10 volts = 150°F

D. Analog Outputs

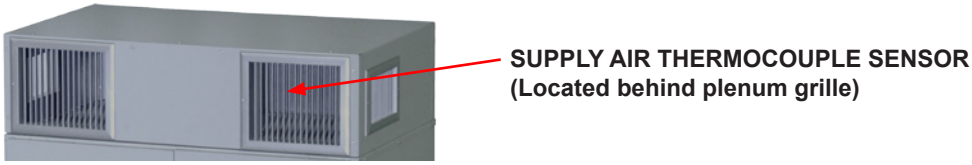
- AO 0 – *0 – 20 ma current signal to Variable Speed Compressor driver board:* This signal is converted to voltage with a 500 ohm resistor at the board. The voltage varies between 1 VDC and 9.4 VDC. 1 VDC drives the compressor at 1200 RPM. 9.4 VDC drives the compressor at 4800 RPM.
- AO1 – *0-20 ma current signal to EC Indoor Blower Motor control board:* This signal is converted to voltage with a 500 ohm resistor at the board. The Indoor Blower speed modulates linearly with the compressor speed. A maximum and minimum blower speed can be set to correspond linearly with the maximum and minimum compressor speeds.

E. Thermocouple Module

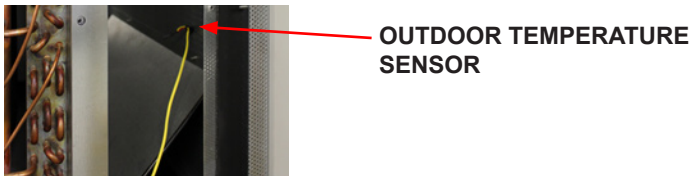
- Used to control defrost in heating mode.
- Used to control condenser fan cycling in cooling mode.

The Thermocouple Module has 4 channels. Type K thermocouples are used.

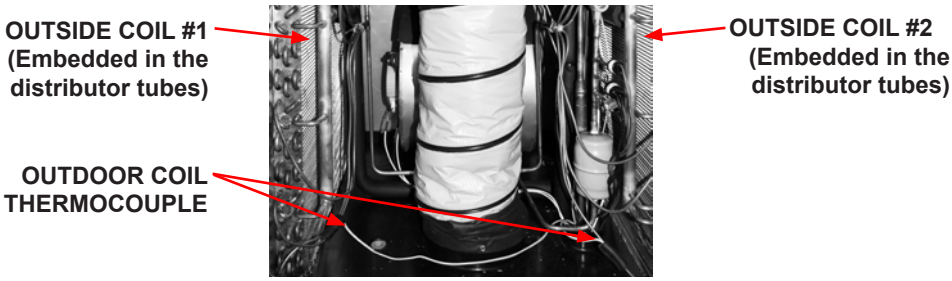
- **Channel 0** – *Supply Air (treated air discharged from unit to the room)*
  - Supply air temperature information
  - Used to control hot gas reheat



- **Channel 1** – *Outdoor Air (ambient outdoor air entering condenser compartment)*
  - Supply air temperature information
  - Used to switch heat pump off and electric resistance on if outdoor air gets too cold for satisfactory heat pump heating



- **Channel 2, 3** – *Outdoor Coil #1 & #2: T*his thermocouple is located in the distributor tube bundle for Coils #1 & #2 and measures refrigerant temperature.
  - Used to control defrost in heating mode
  - Used to control condenser fan cycling in cooling mode



F. Variable Speed Control Methodology

The variable speed compressor is capable of operating at speed from 1200 rpm to 3600 rpm in cooling and 4800 rpm in heating. Cooling or heating capacity is basically proportional to the compressor speed. All limits are programmable.

A control band is established by assigning a differential (+ or -) to the cooling set point or heating set point. This differential is adjustable but comes factory set at 0.25°F. For example, if the cooling setpoint is 75°F, the differential establishes a “deadband” from 74.75°F to 75.25 °F. If the heating setpoint is 65°F, the “deadband” would be 64.75 °F to 65.25 °F.

In Cooling, if the room temperature is outside of this deadband on the high side, the compressor speed (and cooling capacity) slowly ramps up. This cools the room more and lowers the room temperature. When the room temperatures enters the “deadband”, the compressor speed and capacity stop modulating and hold constant at their established values. If the room temperature falls below the “deadband” on the low side, the compressor speed and capacity slowly ramp down until the room temperature climbs and re-enters the “deadband”, at which point the compressor speed and capacity stop modulating and hold constant at their established values. The following drawing shows this process in graphical form.

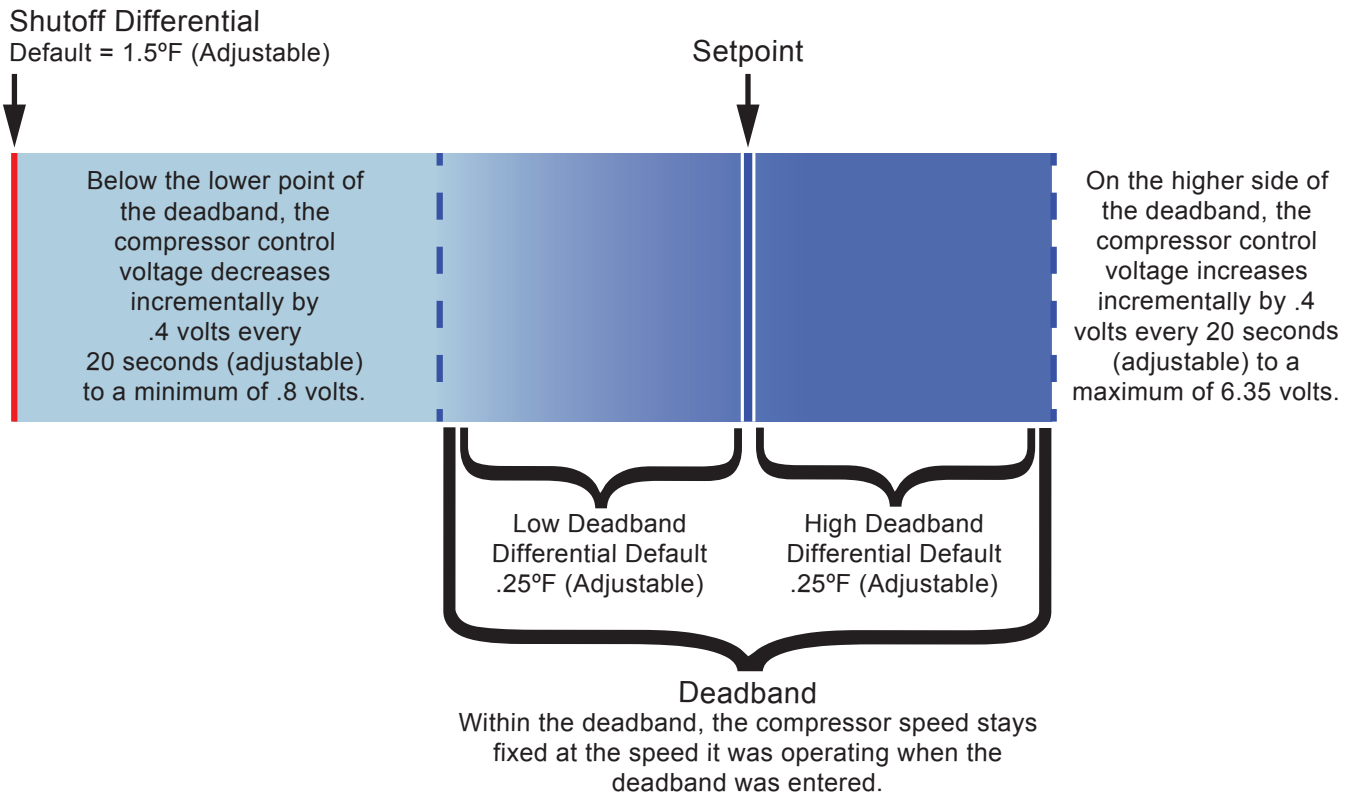


Figure 7. Scholar V Cooling Control Method

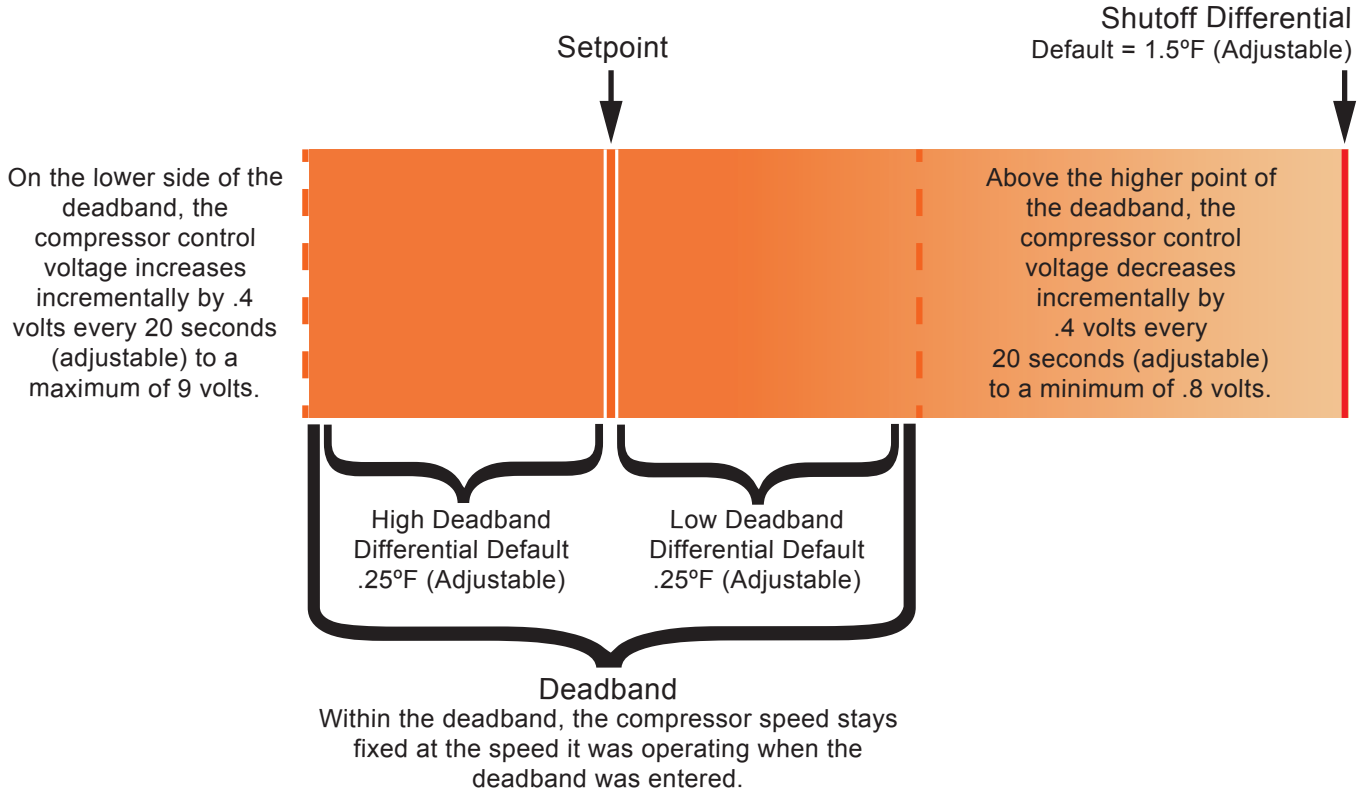


Figure 8. Scholar V Heating Control Method

5.1 OPERATION GUIDE

THERMOSTAT

The Scholar V does not use a conventional wall mounted thermostat and sub base. Instead, an internal Temperature and Relative Humidity transmistter sends room condition information directly to the PLC in the unit for processing.

Figure 9. Internal Temperature/Humidity Transmitter

Temperature and Relative Humidity set-point adjustments are made on the HMI (Human-Machine-Interface) screen typically located on the front of the unit. The HMI contains several screens with parameters that can be changed by the end user. There are other parameters designed for use by qualified service personnel and these are accessible with a User Name and Password only.

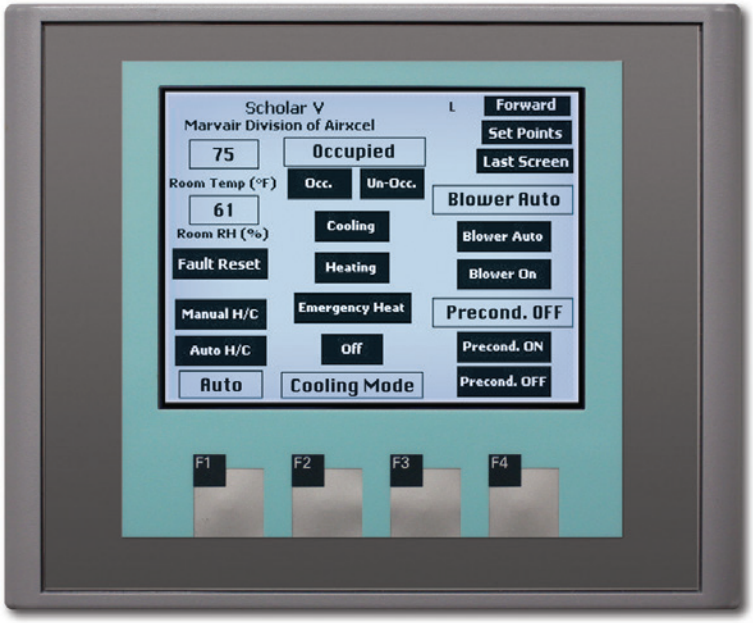
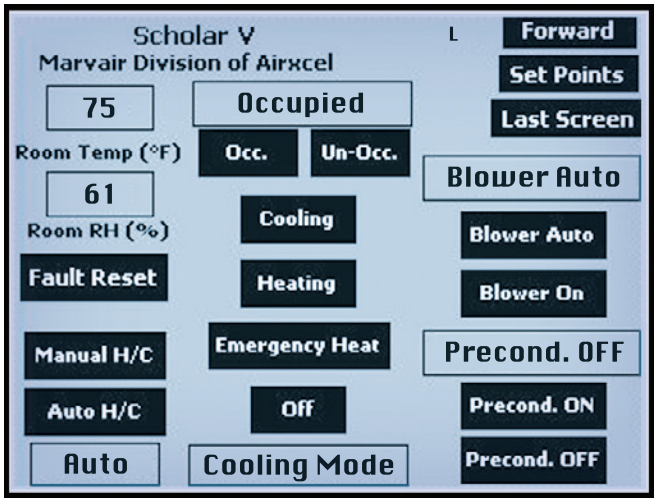


Figure 10. HMI Touchscreen Controller

The HMI uses touch Screen Technology. All screen manipulation and set-point changes can be made just by touching the appropriate virtual buttons on the screen.

A. Main Screen

The first screen is the main screen and contains the following:



Room Temperature Readout:
Displays real time room temperature

Room Relative Humidity Readout:
Displays real time room relative humidity

Fault Reset:
Press this button once to clear any faults that may have occurred

Manual H/C:
Press this button one time to manually select heating or cooling.

Auto H/C:
Press this button one time to have the unit automatically switch between cooling and heating. If the room gets above the cooling set point, space cooling will be operated. If the room gets below the heating set point, space heating will be operated. There is no dehumidification in the heating mode.

Set-Points:
Press this button to go to another screen with the set points

Cooling:
Press this button once to enter the cooling mode. The chosen operating mode is shown at the bottom of the screen.

Heating:
Press this button once to enter the heating mode. The chosen operating mode is shown at the bottom of the screen.

Occupied:
The occupied mode should be set when school is in session. Specific set points will be installed when this button is pressed.

Unoccupied:
The Un-occupied setting should be set when the classroom is not being used. Specific set-points will be installed when this button is pressed.

Preconditioning ON/OFF:
When pre-conditioning ON is active, the ventilation mode is turned off. This is to allow the room to achieve the desired set point without having to compensate for an additional load caused by fresh air. Emergency Heat
In this mode, all compressor functions are disabled and heating is provided with electric resistance heating elements.

Emergency Heat
In this mode, all compressor functions are disabled and heating is provided with electric resistance heating elements.

Operating Mode Readout
This box shows the mode that the unit is running in.

Forward
Advances to the next screen

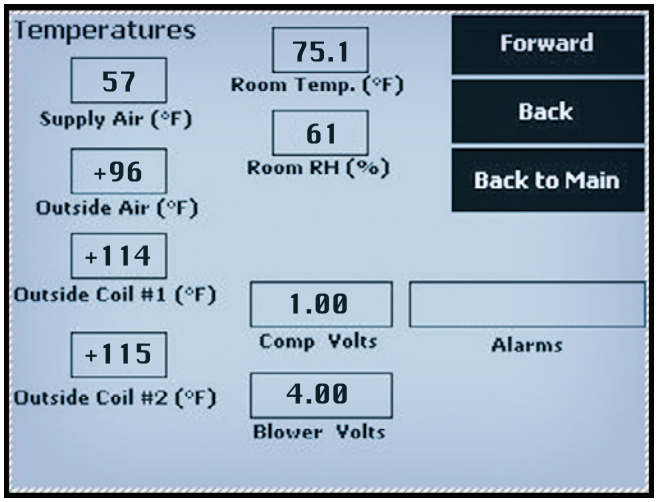
Blower Auto
Press this to run the indoor blower only when a cooling or heating function is required. The selection you make is shown in the box below.

Blower ON
Press this to run the indoor blower continually. The selection you make is shown in the box below.

Blower On/Auto Readout
This box shows which blower operation technique is being used.

B. Temperature Screen

The next screen is the Temperature screen and shows several important temperature values, as well as the compressor and blower control voltages



Supply Air

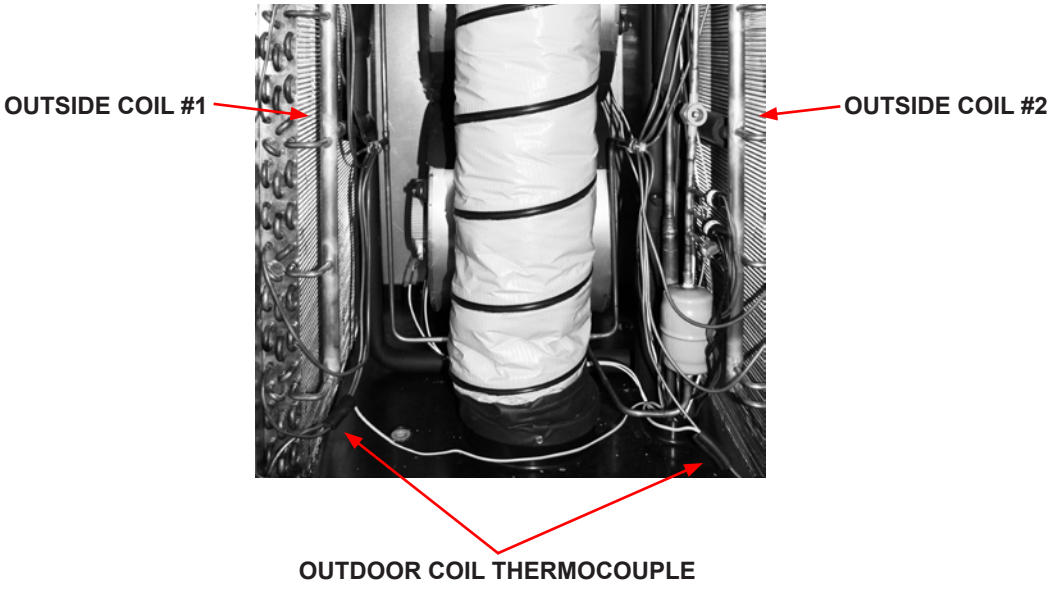
This is the real-time temperature of the air coming out of the unit.

Outside Air

This is the real-time temperature of the ambient outside air.

Outside Coil #1

This is the temperature read by a thermocouple buried in the feeder tubes of Outside Coil #1.



Outside Coil #2

This is the temperature read by a thermocouple buried in the feeder tubes of Outside Coil #2

Room Temperature
This is the real-time temperature being transmitted by the temperature transmitter located in the inlet to the evaporator coil.

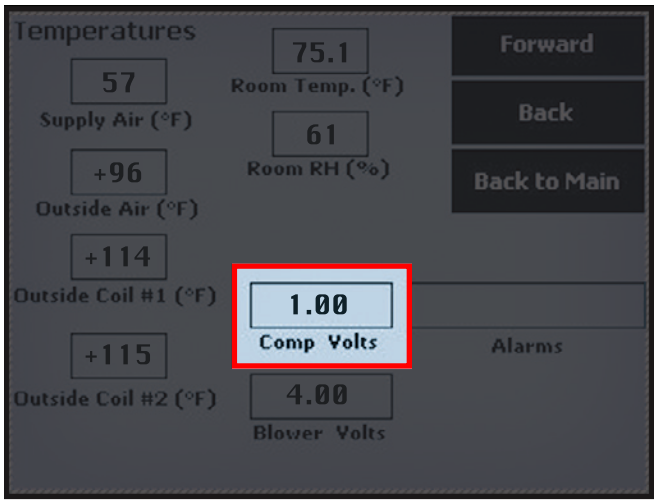
Room RH
This is the real time relative humidity being transmitted by the RH transmitter located in the inlet to the evaporator coil.

Forward
Press this button to go forward one screen.

Back
Press this button to go back one screen.

Back to Main
Press this button to go back to the main screen.

Compressor Volts
This box shows the speed control voltage being sent to the compressor.

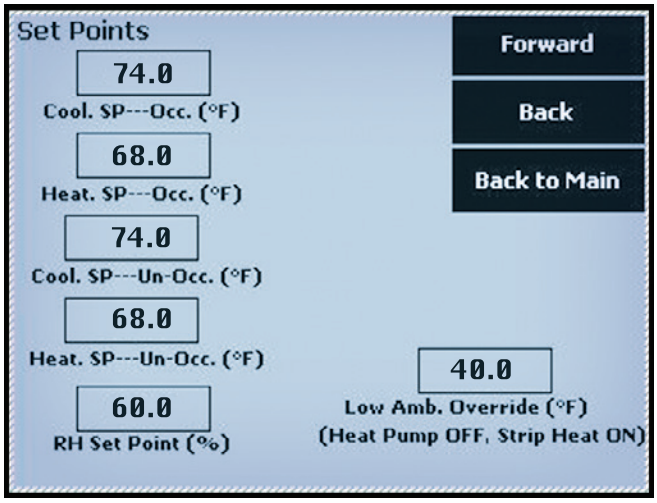


Blower Volts
This box shows the speed control voltage being sent to the indoor blower.

⚠ CAUTION
DO NOT SET BELOW 4V FOR COOLING, AND 8V FOR HEATING.

C. Set-Points Screen

The Set-Points Screen is where the desired room conditions are set.



Cooling Set-Point

In the Cooling Mode or Auto Cool/Heat Mode, this is the user adjustable temperature the unit runs to try and achieve while cooling the space.

Humidity Set-Point

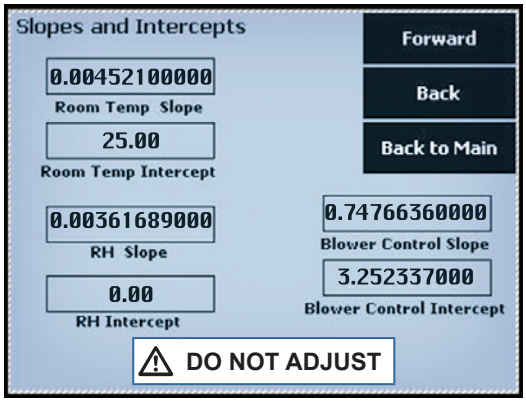
This is the user adjustable relative humidity the unit runs to try to achieve in the Cooling Mode or in the Dehumidification with Reheat mode. The Dehumidification with Reheat mode will automatically come on if the temperature is satisfied in cooling but the relative humidity is still high. Cooling is forced on for dehumidification with hot gas reheat to keep from overcooling the space.

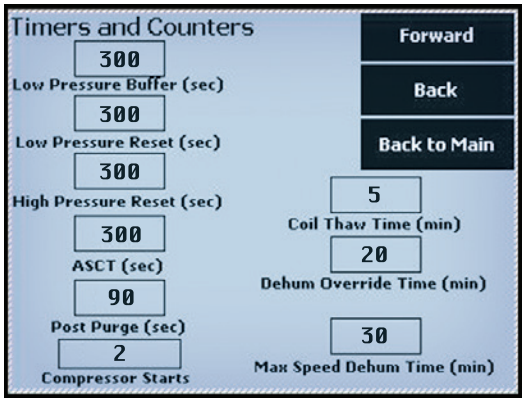
Low Ambient Override

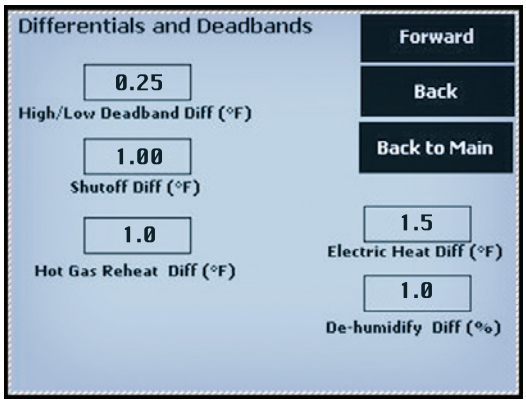
This is the outside temperature at which heat pump heating operation is discontinued and resistance heating is used. It is Password Protected

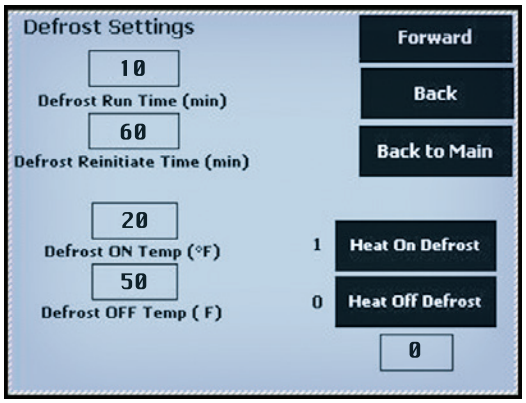
D. Other Screens

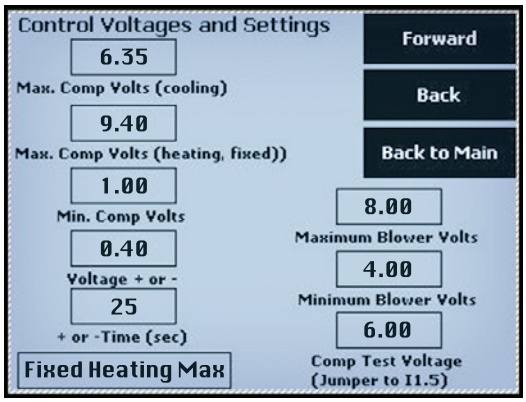
There are several other screens used for diagnostics. The screens are shown below but detailed discussion is not provided in this document. See Appendix A for details.

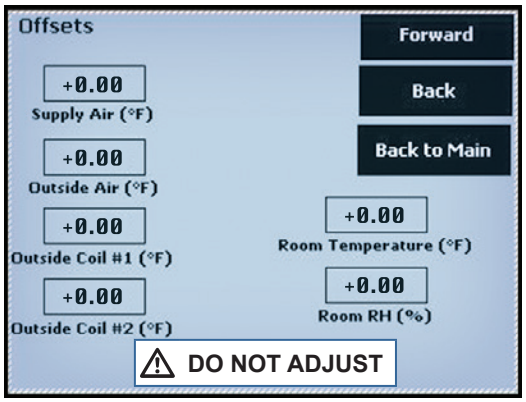


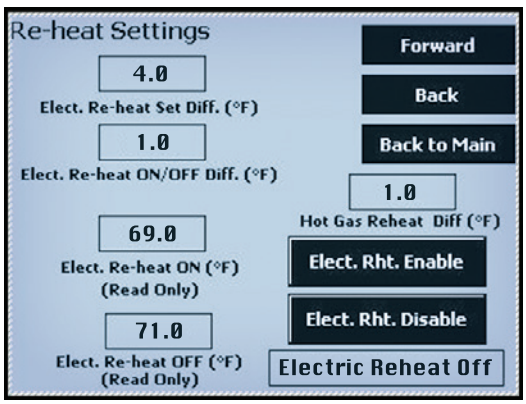


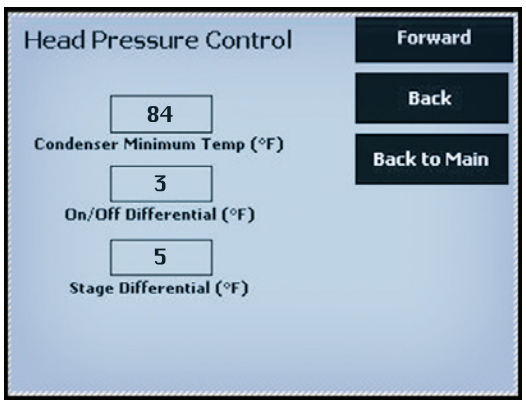










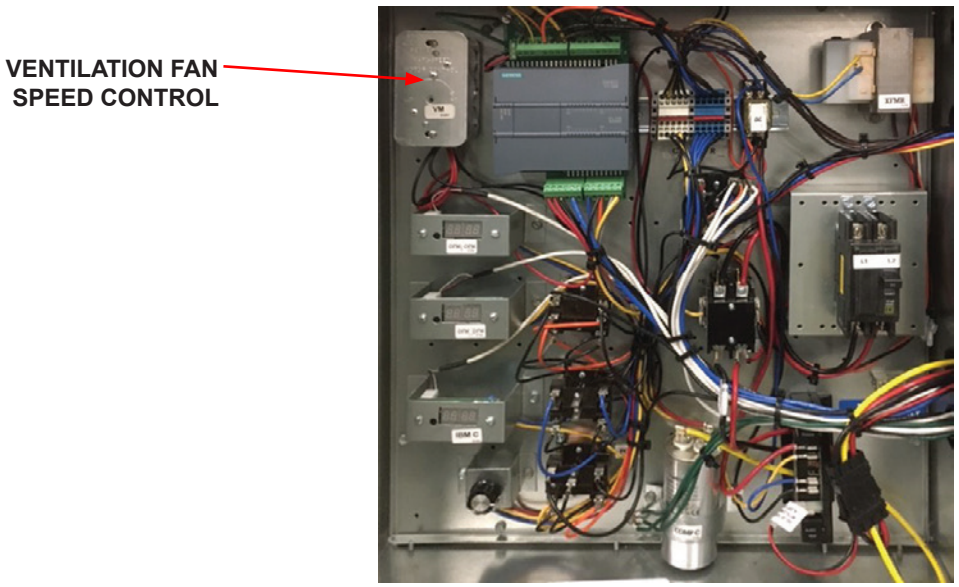


Low Pressure Lockout
The Low Pressure (air conditioner) or Loss of Charge (heat pump) is designed to guard against the operation of the system in the event of a loss of refrigerant. If the Low Pressure Switch stays open for more than 60 seconds, the system will turn off and a Low Pressure Lockout fault will be displayed on the HMI. The loss of charge and low pressure switch open at 40 psig and close at 60 psig.

In cold weather the pressure in the refrigerant system is low prior to operation. When the Scholar V unit starts in the heat pump mode during cold weather, low pressure could cause the system to lock out. To prevent nuisance lockouts, the Scholar V unit will not shut off if the Loss of Charge Switch (LPS) opens during the first 60 seconds of operation and the switch has not cycled more than three times in an hour. In other words, the compressor will start and operate for 60 seconds even with the LPS switch open three times before causing a lockout on low pressure. This interval is adjustable (requires user login).

High Pressure Switch
The system has a High Pressure Switch (HPS) that indicates a high system pressure. When this occurs, the system will immediately set a High Pressure Lockout. This lockout condition shuts the system off and displays a fault message on the HMI. The high pressure switch opens at 650 psig and resets at 420 psig.

Ventilation Blower Fan Speed Control
See section 2.1 for Ventilation Settings.



Standard Ventilation Control
The **motorized fresh air damper with PowerVent and GreenWheel® ERV** ventilation options are equipped with a **fresh air fan speed control**. The fresh air fan speed control operates both the ventilation intake and exhaust blowers together.

The **motorized fresh air damper with PowerVent and GreenWheel® ERV** ventilation options can be equipped with an exhaust fan air speed control, which controls the ventilation exhaust blower independently of the fresh air intake blower.

Demand Control Ventilation
A field or factory installed carbon dioxide sensor controls the ventilation damper and only opens the damper when CO_2 levels exceed a specified level. Demand control ventilation saves energy and utility costs by ventilating the classroom based upon occupancy.
Note: Not available on manual fresh air damper ("B") configuration.

Outdoor Temperature Sensor
This sensor determines the outdoor temperature at which the supplemental electric heat turns on and is user adjustable. This may be field adjusted to the desired temperature setting in the PLC. Please note that when the outdoor sensor activates wet heat, the compressor does not operate.

The outdoor thermostat is located in the inlet to the condenser coil. Outside air temperature information is used to switch heat pump off and electric resistance on if outdoor air gets too cold for satisfactory heat pump heating.

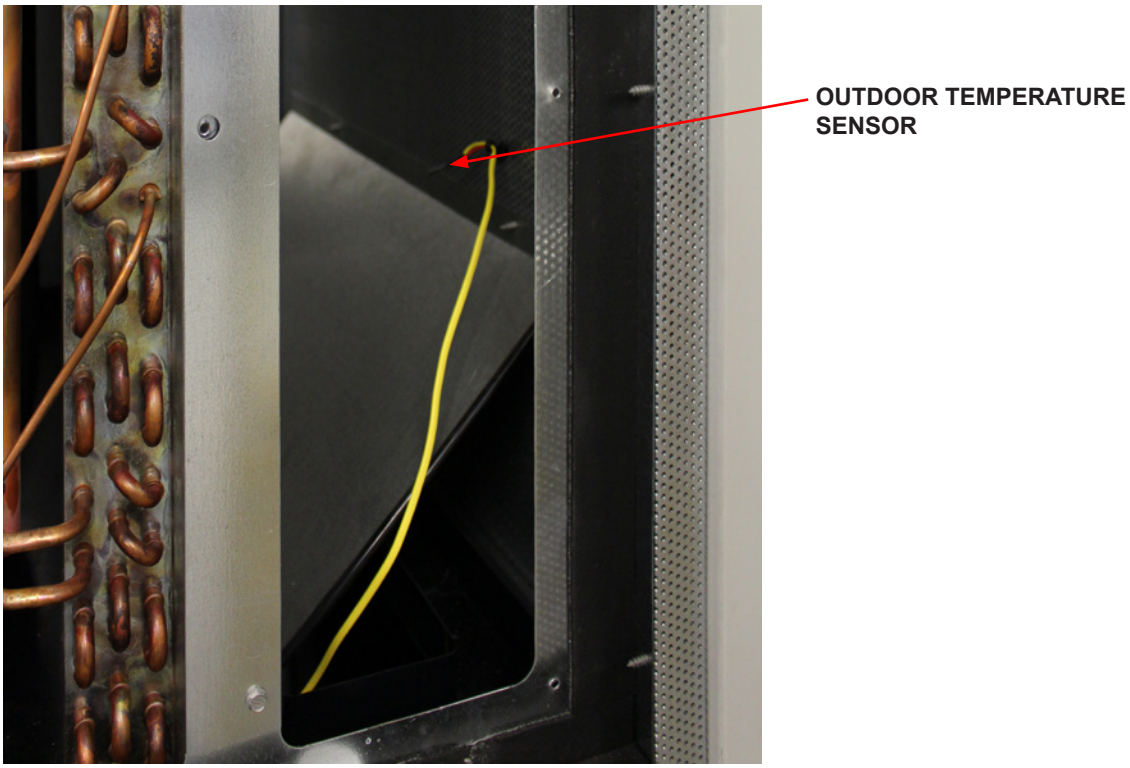


Figure 11. Outdoor Temperature Sensor

6.1 TROUBLESHOOTING

IMPORTANT

Disconnect any control logic from the unit prior to troubleshooting to eliminate a false signal. Instead, Rely only on the internal program of the unit for mode function .

In diagnosing common faults in the Scholar V system, develop a logical thought pattern as used by experienced technicians. The charts and diagrams which follow are not intended to be an answer to all problems but only to guide the technician's thinking.

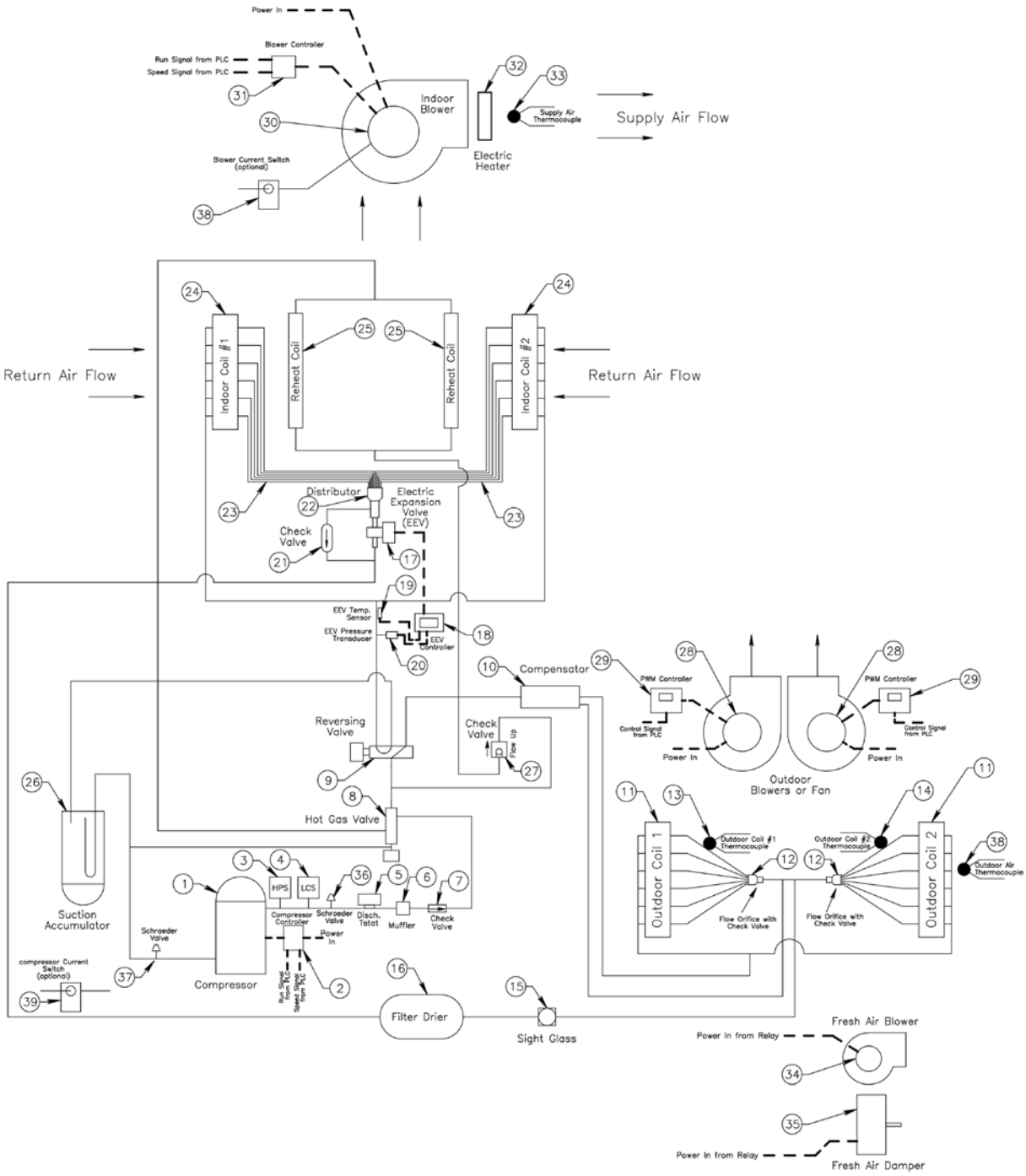


Figure 12. Scholar V Refrigeration Schematic (See Parts Description on Next Page)

Item No.	Description
1	Compressor---permanent magnet motor--variable speed.
3	Compressor Controller---electronic controller used to control speed of compressor. Takes a 24 VAC signal from PLC for On-Off and a 10 VDC signal from PLC for speed.
3	High Pressure Switch---input to PLC---open on pressure rise of the condenser.
4	Loss of Charge Switch---input to PLC---open on pressure fall when there is a significant loss of refrigerant.
5	Discharge Thermostat---input to PLC--open on temp. rise.
6	Muffler---helps reduce pulsations and vibration.
7	Check Valve---prevents high pressure gas from flowing backwards on off cycle.
8	Hot Gas Valve---controls flow of hot gas into reheat coil during dehumidification.
9	Reversing Valve---switches refrigerant flow direction for cooling and heating modes.
10	Compensator---stores excess refrigerant in heating mode.
11	Outdoor Coils---heat exchangers to reject heat during cooling and absorb heat during heating.
12	Outdoor Distributors with Orifice---fixed expansion device during heating---balances refrigerant flow through individual coil circuits---internal check valve for cooling mode.
13	Coil #1 Thermocouple---measures temperature of Coil #1 distributor tube bundle for head pressure and defrost control---analog input to PLC.
14	Coil #2 Thermocouple---measures temperature of Coil #2 distributor tube bundle for head pressure and defrost control---analog input to PLC.
15	Sight Glass---used for observing refrigerant flow---helpful in charging the system.
16	Filter Drier---used to remove moisture and debris from the refrigeration system.
17	Electronic Expansion Valve (EEV)---stepper motor driven valve to accurately control superheat.
18	EEV Controller---electronic controller to provide signal to EEV to drive stepper motor.
19	EEV Temperature Sensor---measures temperature of evaporator outlet pipe---Sends temperature value to EEV controller for superheat calculation.
20	EEV Pressure Transducer---measures pressure at outlet of evaporator---Sends pressure value to EEV controller for superheat calculation.
21	Check Valve---allows condensed refrigerant to bypass EEV during heating mode.
22	Indoor Distributor---mixes and distributes two phase refrigerant to indoor coils during cooling.
23	Distributor Tubes---used to transfer two phase refrigerant during cooling and condensed liquid during heating.
24	Indoor Coils---heat exchangers to abosrb heat during cooling and reject heat during heating.
25	Suction Accumulator---storage vessel to prevent liquid from flowing to compressor. Used primarily during defrost cycle.
26	Reheat Coils---used during dehumidification to heat air back to room temperature so overcooling of space is not a problem.
27	Reheat Check Valve---used when reheat is not active to prevent refrigerant from entering reheat coils.
28	Outdoor Blowers (fans)---air movers used to pull air through outdoor coils to reject heat in cooling and absorb heat in heating. ECM type motor for speed control.
29	Outdoor Blower Controllers---used to set the speed of outdoor blower motors with pulse width modulation (PWM).
30	Indoor Blower Motor---air movers used to pull air through indoor coils to reject heat in heating and absorb heat in cooling. ECM type motor for speed control.
31	Indoor Blower Motor Controller---used to set speed of the indoor motor. Receives speed input from PLC---uses puls width modulation (PWM).
32	Electric Resistance Heater---electric heater in the supply air stream---used as backup heater and to provide heating during the defrost cycle.
33	Supply Air Thermocouple---measures temperature of supply air leaving the unit to control hot gas reheat
34	Ventilation Blower---motorized blower that pulls outside air and puts it in the room
35	Motorized Damper---damper which cloes when no ventilation is required---opens to a preset position when ventilation is desired in the room.
36	High Side Schraeder Valve---used to attach refrigeration gauges to the high pressure side of the unit.
37	Low Side Schraeder Valve---used to attach refrigeration gauges to the low pressure side of the unit.
38	Blower Current Switch (optional).
39	Compressor Current Switch (optional).

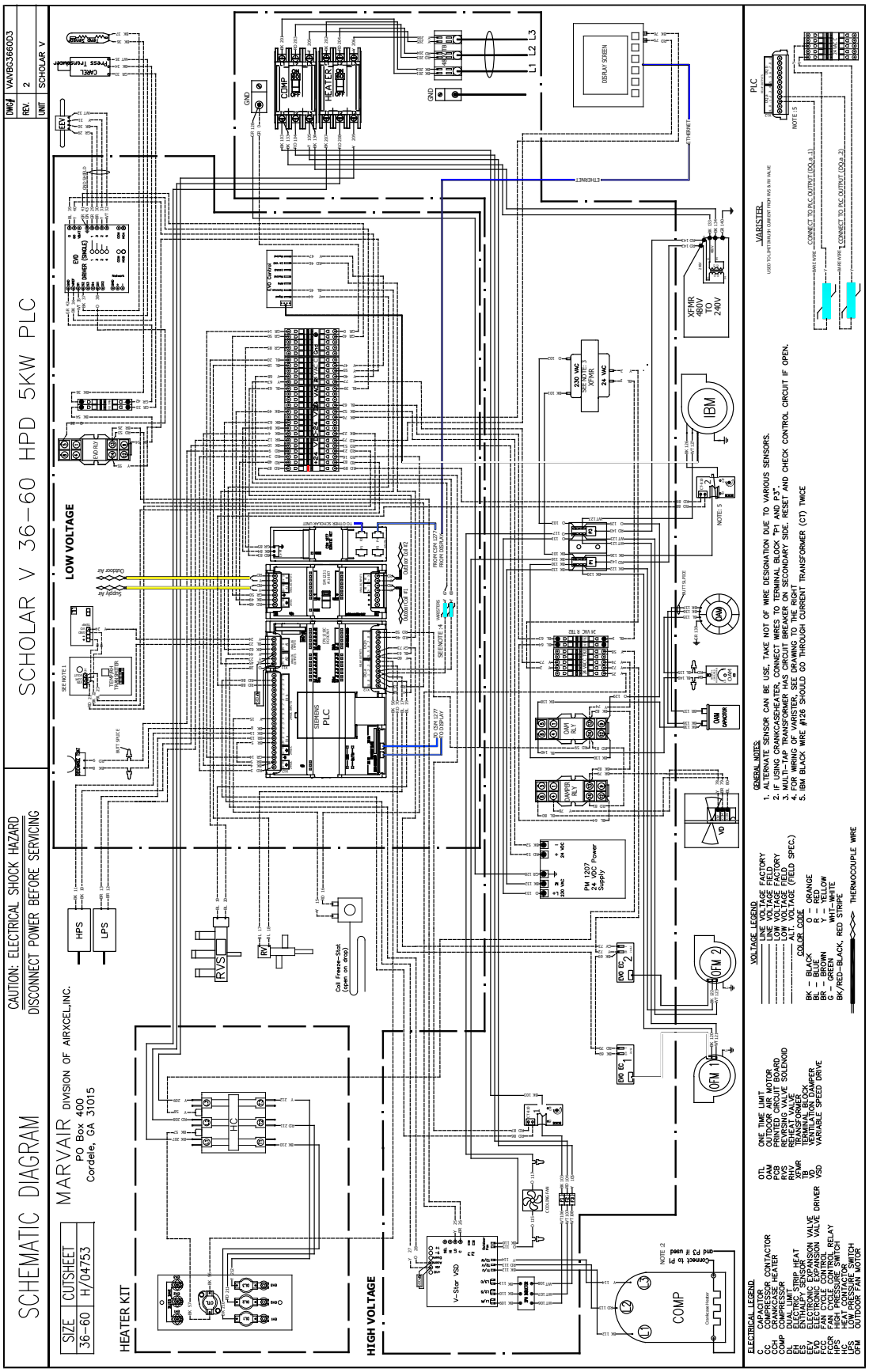


Figure 13a. Scholar V Electrical Diagram w/Motorized Damper

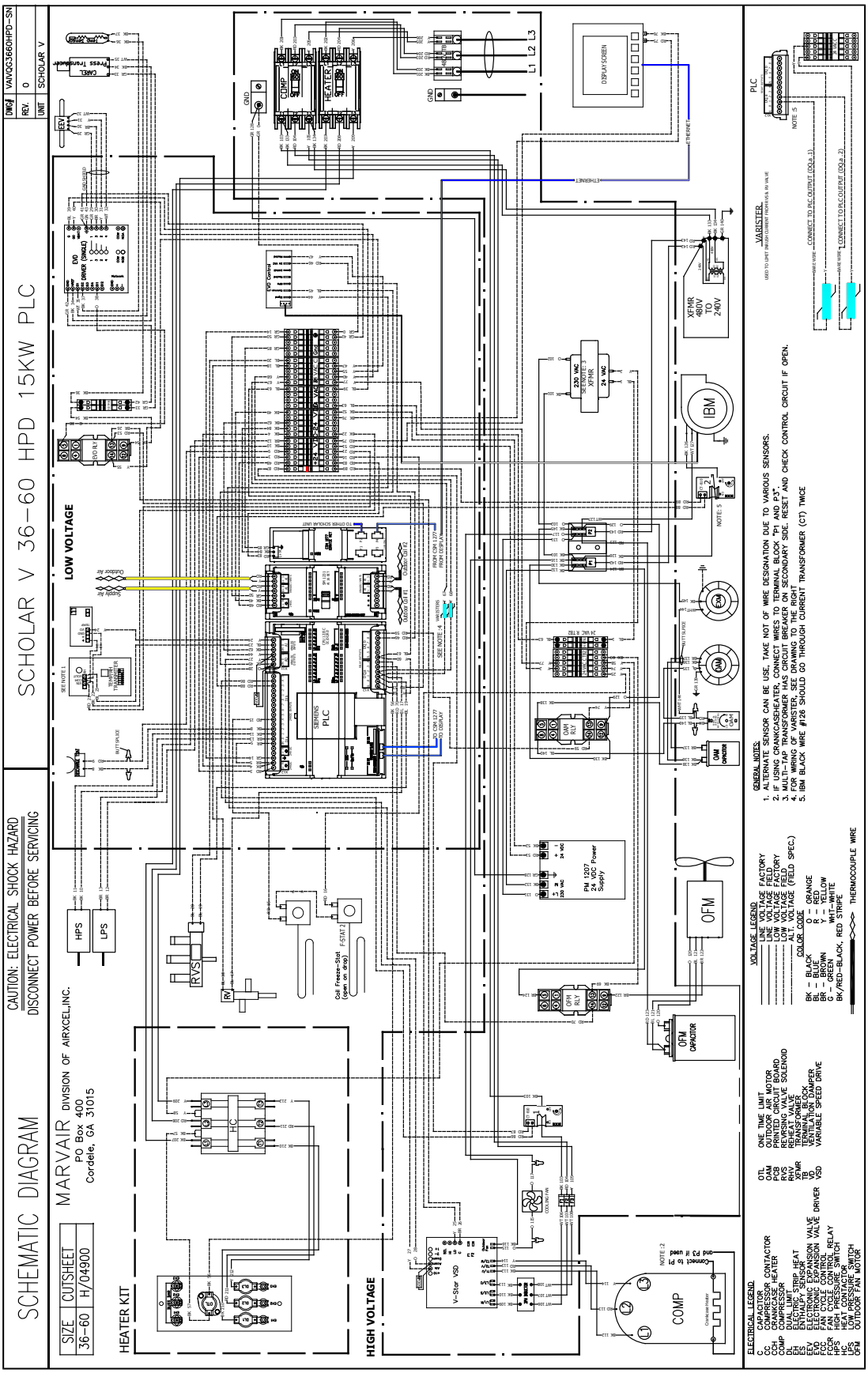


Figure 13b. Scholar V Electrical Diagram w/GreenCube

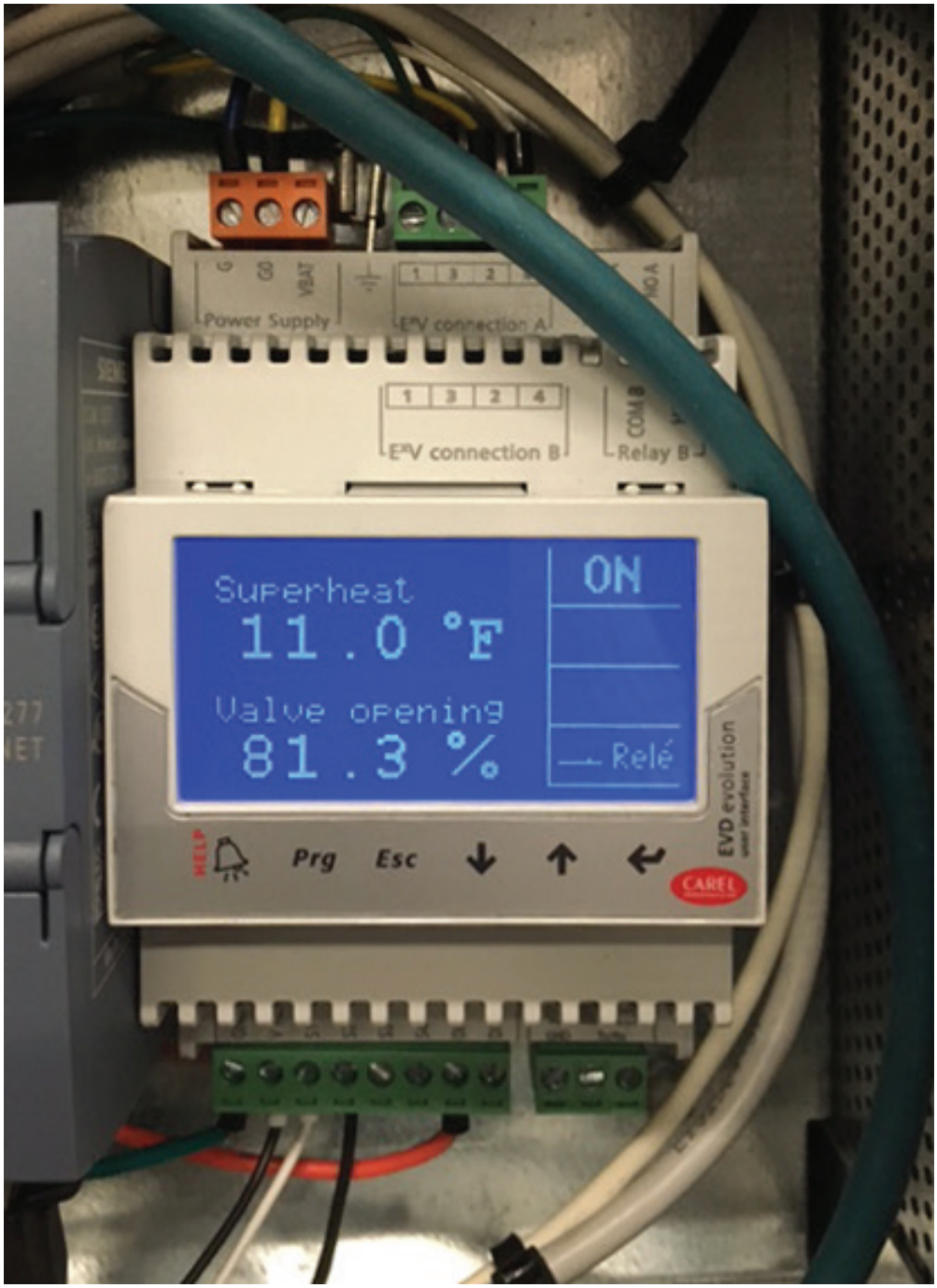


Figure 14. EEV Controller Display

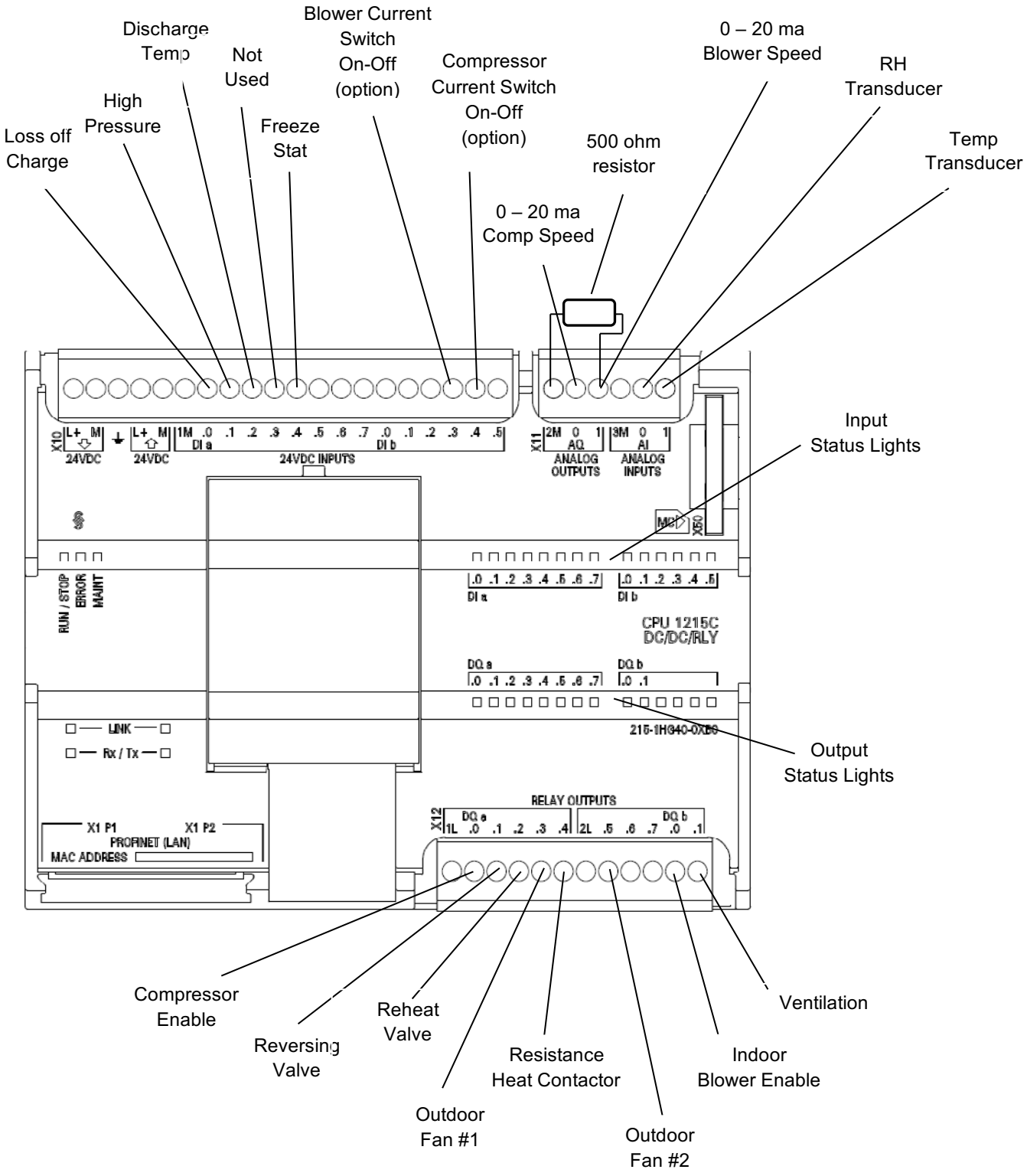


Figure 15. PLC Connections and Indicator Lights

The driver board conditions the power going to the compressor to allow speed control and capacity variation.

A 24 VAC run signal comes from the PLC to tell the compressor to operate. A 4-20 milliamp analog signal comes from the PLC to set the correct speed. Since the driver board requires a DC voltage for the speed signal, the milliamp signal is converted to a voltage signal with a 500 ohm resistor. It is important that this resistor is in the system and securely connected.

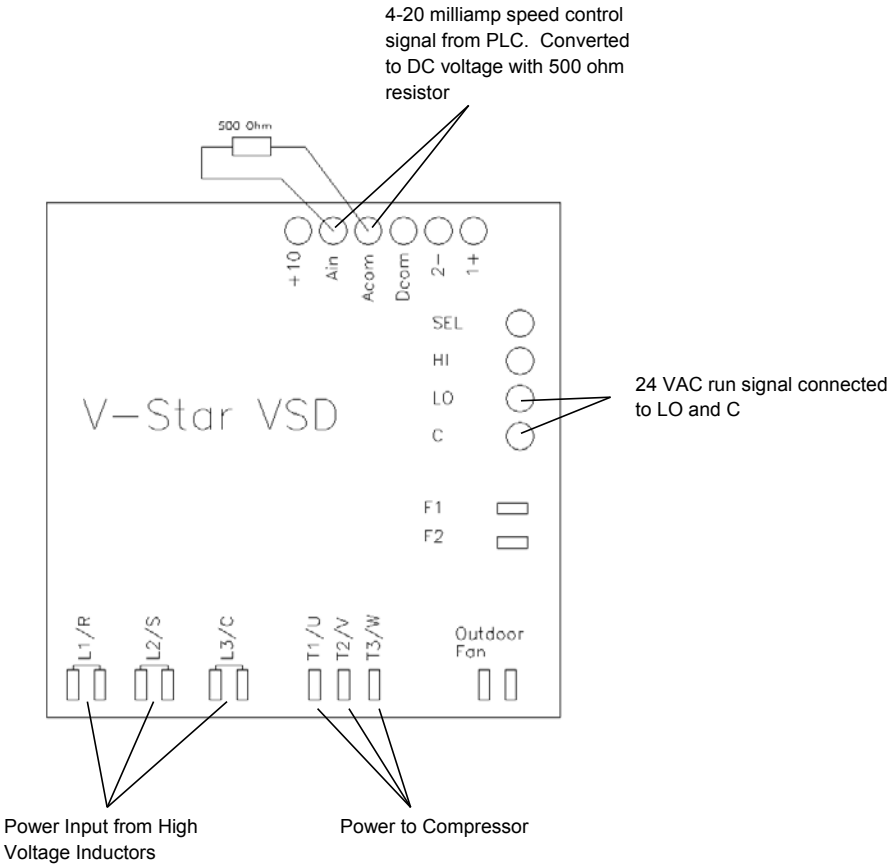


Figure 16. PLC Compressor Driver Board

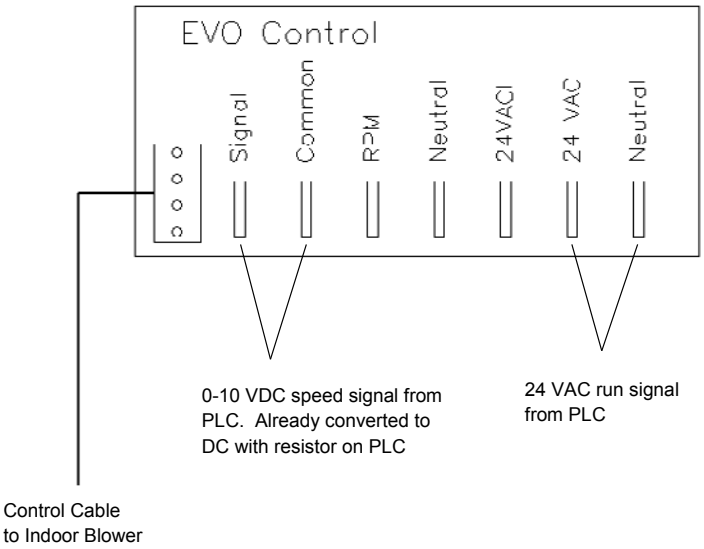


Figure 17. Indoor Blower Controller

Permanent Magnet Motor Drive Fault List/LED Flash Code Operation

LED falsh codes are viewed through the sight glass in the electrical panel cover. Note that Fault Code 1 is technically an exception, as it is the ***Not Ready*** state:

The ***Not Ready*** state is signaled by a 1 blink count. This state signifies that the drive is not faulted, but it is in a "wait" state, due to one of the following reasons:

- The drive has just powered-up and is awaiting a run request
- The drive's DC bus voltage (thereby the input voltage) is too low
- The drive's heatsink is below the allowed starting temperature
- The drive's heatsink is above the allowed starting temperature
- The drive did not detect all 3 phases of the PM motor
- The drive is waiting the ASCD

The drive may or may not have a run request from its hardware inputs or the serial link, and as soon as the condition causing the ***Not Ready*** state goes away, the drive will return to the ***Ready*** state or the ***Run*** state, dependent upon a run request.

The following is a list of fault codes defined for the Bristol compressor drive:

Fault		LED	Fault Description
1	Not Ready	1	See the "Not Ready" description above
2	DI LO input	2	"LO" input status invalid (based on control mode)
3	DI HI input	3	"HI" input status invalid (based on control mode)
4	Output Phase	4	Motor phase lost or OLP opened during a Run state
5	*Communication	5	Serial communication lost (based on control mode)
6	AI Range	6	0-10V Analog Input is less than 0.5V or greater than 9.5V (if AI board), or Drive hardware mode does not support control mode selection
7	Over Current	7	Current output to motor exceeded hardware limit
8	Motor Stall	8	Motor failed to start, or stalled due to overload
9	Underload	9	Compressor is operating at a continued light load, ex: loss of charge
10	*Heatsink (or IGBT) Over Temp	10	Drive temperature, per on-board sensor or IGBT calculation, was too high
11	Under voltage	11	Input voltage was too low, as detected by low DC Bus
12	Over voltage	12	Input voltage was too high, as detected by low DC Bus
13	Rotor Loss	13	Motor failed to start
14	Motor temp	14	Motor temperature, per drive calculation, was too high
15	*Ground fault	15	Drive detected excessive current imbalance in motor phases
16 & Up	*Drive Internal Fault	16	Drive has encountered a non-serviceable drive error
*Fault does not Auto-Reset			

6.1 Troubleshooting Recommendations

⚠ WARNING

DISCONNECT ALL POWER TO UNIT BEFORE SERVICING. CONTACTOR MAY BREAK ONLY ONE SIDE. FAILURE TO SHUT OFF POWER CAN CAUSE ELECTRICAL SHOCK RESULTING IN PERSONAL INJURY OR DEATH.

Unit is not running but you think it should be

1. Is power connected?
    - o Look at HMI screen. If blank, power to unit may be off. Check circuit breaker. Check voltage to unit.
    - o If power is connected
        - ■ Check HMI for correct operating mode and setpoints.
        - ■ Look at status lights on PLC and see if compressor operation is called for. If status light for compressor is ON:
            - » Check for 24 VAC run signal on compressor driver board.
            - » Check voltage on 500 ohm resistor on driver board. Should be between 1.0 and 6.35 VDC in cooling and between 1.0 and 9.4 VDC in heating (adjustable if needed in mild ambients to limit head pressure).
2. If compressor will not run, look through plastic sight glass on controls cover and count the flash code. The flash code can give information regarding conditions the driver has seen that can stop compressor operation. See the list of flash codes previously discussed in this manual.

Compressor is running but cooling or heating capacity seems to be inadequate

1. Possibly low on refrigerant. If this turns out to be the case, there is likely a leak in the system.
    - o Look at EEV display (Part 18). Is superheat being controlled? If superheat is very high or valve is open 100%, a leak may be indicated.
    - o Look at refrigeration sight glass (Part 15). If lots of bubbles are continuously visible with compressor running, a leak may be indicated.
    - o Before adding any refrigerant, a meaningful attempt should be made to isolate and repair leak, using acceptable refrigeration practices.
        - ■ Be sure Schraeder caps are in place and are tight (Items 37 and 38).
        - ■ Look for signs of refrigerant oil on components. This can often pinpoint a leak.
        - ■ Use an electronic leak detector. Large leaks can sometimes be found with soap bubbles.
2. Cooling or heating set-point set too high or low respectively.
    - o When the set-point is reached, the compressor does not typically shut off but runs at a lower than maximum speed. Check set-points on the HMI screen. Toggle to the second screen on the HMI display and see what speed control voltage is being sent to the compressor driver board.
    - o In cooling, if the voltage is showing 6.35 VDC, that means that the PLC should be sending the maximum speed signal for cooling to the driver board. In heating, the maximum voltage is 9.4 VDC. Check this voltage on the driver board with a VOM. It should measure the same voltage as indicated on the HMI screen. If the proper voltage is not being delivered, that could indicate an issue with the analog output on the PLC. Be sure to check the resistor to be sure the terminals are tight. Check the resistance value with a VOM to be sure it is 500 ohms +/- 10%.

Indoor air runs continuously

1. Indoor blower set to ON instead of Auto. This selection can be made on main screen.
2. Post -Purge timer allowing the blower to run for 90 seconds on off cycle.
    - This time period can be adjusted on the HMI screen. A user name and password may be required.

Indoor air flow appears to be insufficient

1. The indoor air flow is automatically adjusted by the PLC to correspond with the compressor speed. This allows the evaporator temperature to remain fairly constant.
2. When the compressor is running full speed,10 volts is sent by the PLC to the indoor blower controller to set the speed. When the compressor is at minimum speed, 5 volts is sent to the controller.
    - Check this voltage on the analog output resister on the PLC and on the speed control terminals of the indoor blower controller.
3. Check for dirty filters.
    - The ECM motors will automatically try to compensate to some extent for dirty filters, but if filters are extremely dirty, the compensation is insufficient.

Unit cuts out on High Condenser Pressure (See Page 76)

1. This condition presents a message on the HMI screen.
    - A high pressure condition will reset automatically twice and then will lock out. A hard lock out must be manually reset by pressing the Reset button on the main screen.
    - If the problem continues, the condenser blower(s) may be running improperly. On a condenser system with dual blowers, one of the blowers is cycled on and off based on the thermocouples embedded in the distributor tubes on the outdoor coils. See the discussion of the HMI screens to change the settings on cycling the outdoor fans for head pressure control.

Unit cuts out on Loss of Charge switch (See Page 76)

1. This condition presents a message on the HMI screen.
    - A significant loss of charge must be in play if this switch actuates.
    - Check the EEV and refrigerant sight glass as mentioned above to check for symptoms of a refrigerant leak.
        - Be sure Schraeder caps are in place and are tight (Items 37 and 38).
        - Look for signs of refrigerant oil on components. This can often pinpoint a leak.
        - Use an electronic leak detector. Large leaks can sometimes be found with soap bubbles.

Unit cuts out on High Discharge Temperature Switch (See Page 76)

1. This condition presents a message on the HMI screen.
    - A snap disc thermostat is located on the compressor discharge line (Item 5). This switch opens an input to the PLC when the temperature reaches approximately 225°F.
    - If this condition occurs, press the Reset button on the main screen of the HMI.
        - If the problem persists, there could be a low refrigerant charge.
            - » This may be accompanied with a high superheat and the EEV opened close to 100%.
            - » Low suction pressure may also be seen and can be read on the EEV display (Screen #2)

Unit Overcools Room

1. When in the dehumidification mode, the unit stays in cooling but cycles the hot gas valve to put hot refrigerant into the reheat coils. This valve cycles on and off to keep the supply air temperature close to the cooling set-point.
    - o This mode is active when the humidity has not been satisfied but the room temperature has been satisfied OR, when the humidity has not been satisfied for 30 minutes (adjustable on HMI).
    - o Check the hot gas valve (Item 8) to be sure it is cycling on and off. Hot gas should be flowing when the valve gets energized. The cycle rate is controlled by the PLC and the supply air thermocouple.

Water is on the floor

1. This is likely a condensate drainage issue
    - o Check all condensate hoses and traps. Be sure connections are tight and not leaking.
    - o Traps are made from either PVC plastic or loops of PVC reinforced tubing. Clean drain tubes and traps by blowing out with compressed air or by running appropriate solvent through them.

Unit makes excessive noise

1. Rattles?
    - o Check for loose fasteners on cover panels.
    - o Check for missing panels.
2. Compressor noisier than usual?
    - o Check for loose panels.
    - o Check for refrigerant leak. This could cause compressor to run faster than normal to compensate for capacity loss.
    - o Air noise.
        - ■ Grill louvers have been closed off.
        - ■ Extremely dirty air filter makes blower run faster.

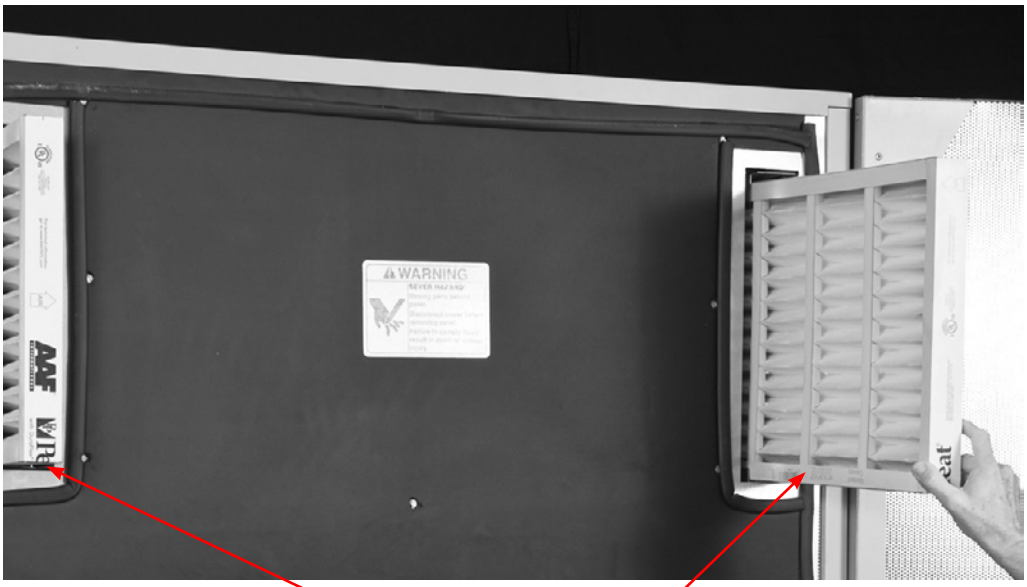
7.1 SERVICE

A. Changing the Return Air Filters

Tools Required

- Slotted screw driver or key for opening front doors

There are two return filters in the upper (indoor) section of the unit. A filter is located behind each of the return grilles. To remove the filters, open both doors and slide the filters out as shown below.



B. Changing the Ventilation Air Filters

Tools Required

- Slotted screw driver

The ventilation filter(s) are located in the left section of the bottom compartment behind a panel.

1. Remove the two screws at the top and bottom of each panel to access the filters.

2. Slide the filters out to inspect/replace. After inspecting/replacing of the filters, replace filter access panel.

C. Access to the Indoor Coils for Cleaning

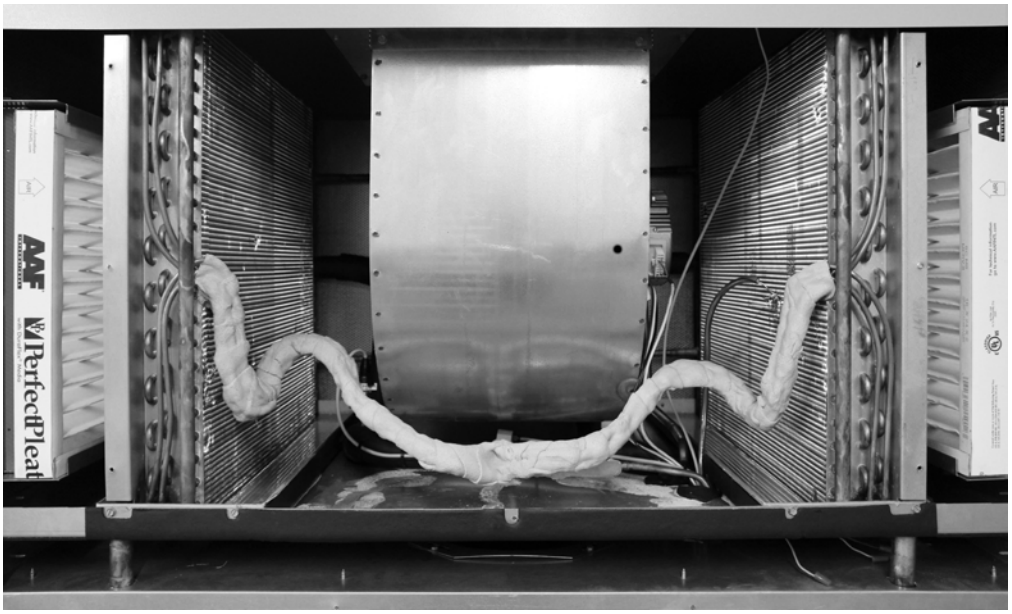
Tools Required

- 5/16” Nut Driver

1. Remove the top cover – fifteen screws.

2. Remove the filters.

3. Carefully spray the coils with Marvair® approved cleaning solution. Use care NOT to spray the electrical connections for the indoor motor.

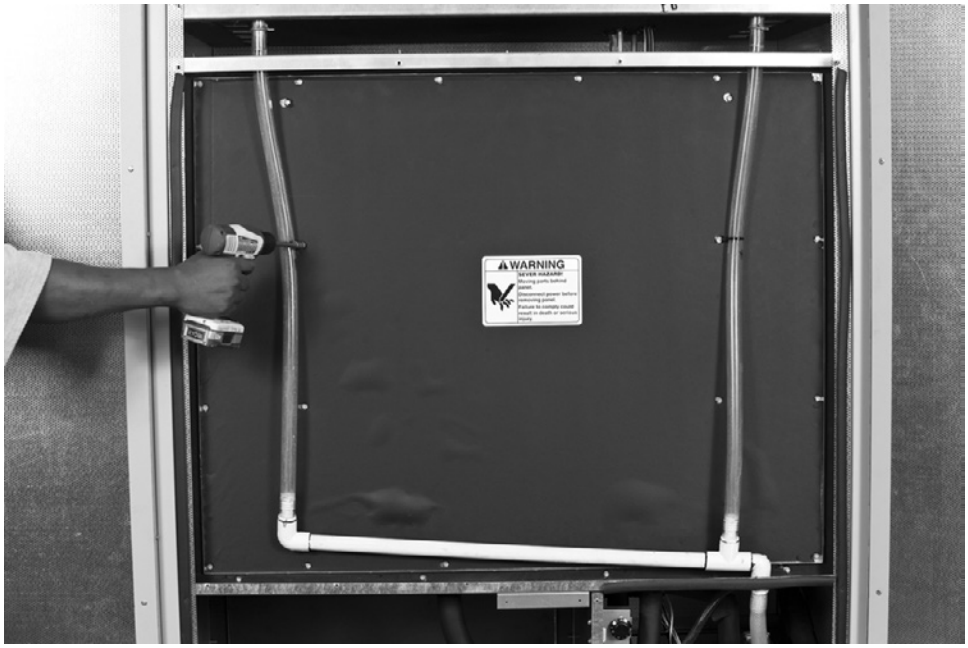


D. Access to Outdoor Coils for Cleaning

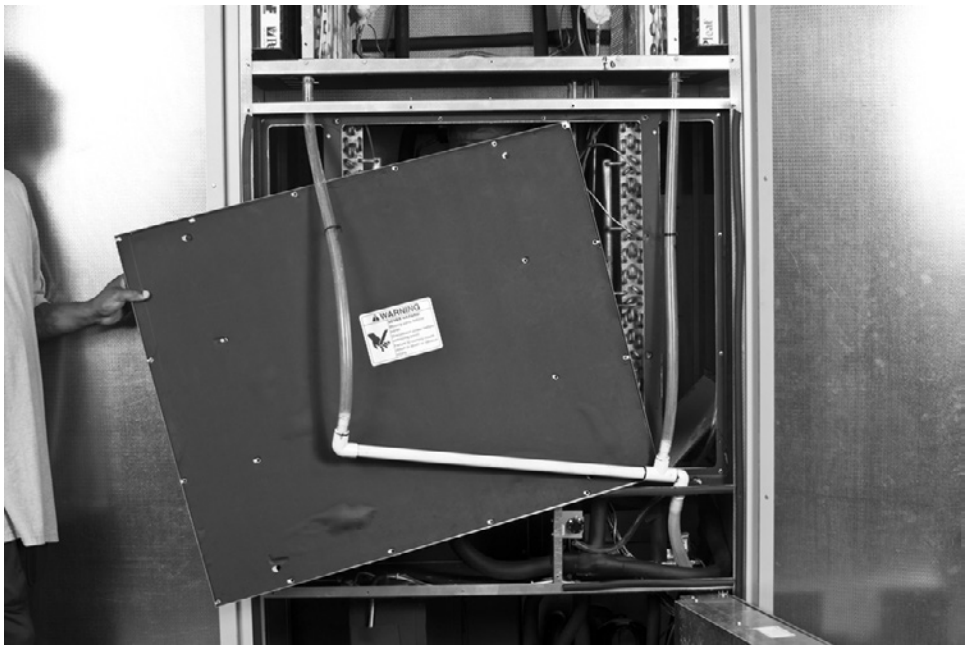
Tools Required

- 5/16” Nut Driver

1. Remove the two screws that hold the condensate line to the middle front door. Note: Do not remove or disconnect the condensate tubing.

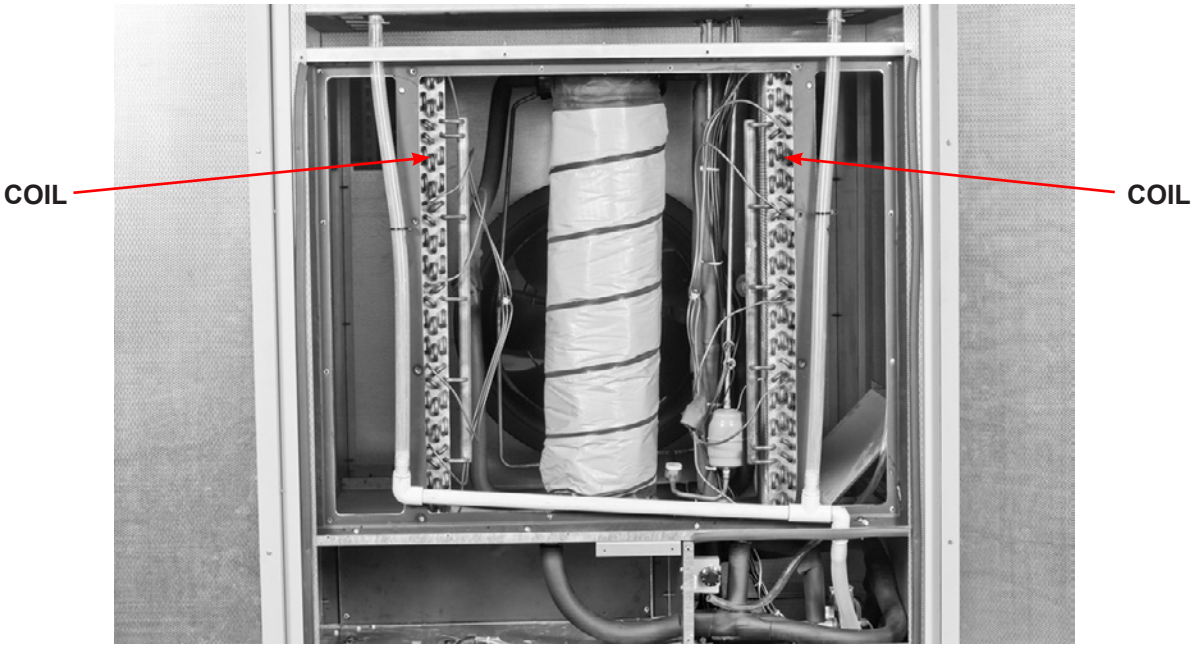


2. Remove the eighteen screws that hold the door.



3. Carefully remove the door.

4. With the door removed, carefully spray the coils with an industry approved cleaning solution.



E. Removal of Fresh Air Intake Blower Motor

Tools Required

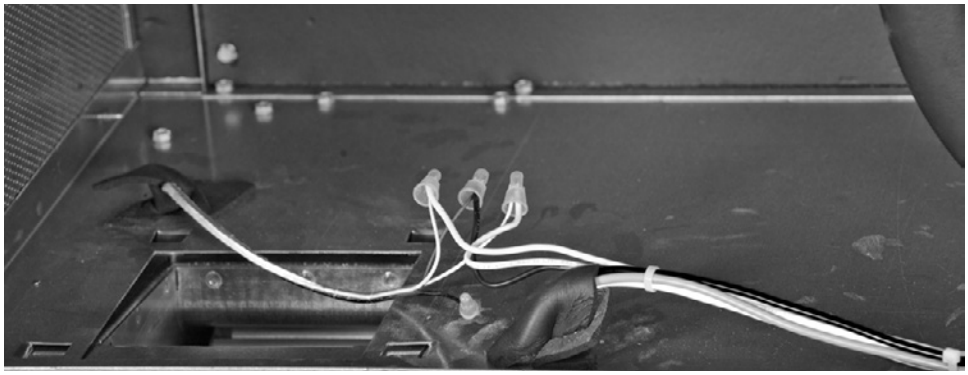
- 5/16” Nut Driver
- Slotted Screw Driver
- Clippers to Cut Wire Tie

1. Remove the two screws that hold the blower in place.

2. Remove the eight screws that hold the lower plenum front cover.

3. Cut tie wrap that hold wires.

4. Disconnect the four wires at the butt splice.



5. Slide the blower motor out.

F. Access to the GreenWheel Drive Motor and the GreenWheel and the Damper Motor for the "B" Ventilation Option, and access to 460v. transformer and to fresh air exhaust motor.

Tools Required

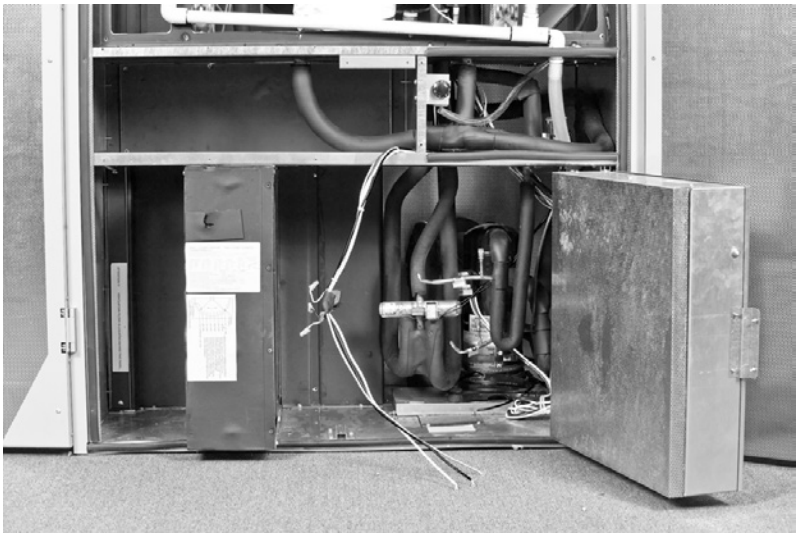
- 5/16" Nut Driver
- 5/16" Socket Wrench or Open End Wrench
- Clippers to Cut Wire Tie

1. Remove ventilation filters.
2. Remove ventilation fresh air intake blower motor. (See instructions for removing this blower/motor.)
3. Remove the filter cover holder – seven screws.

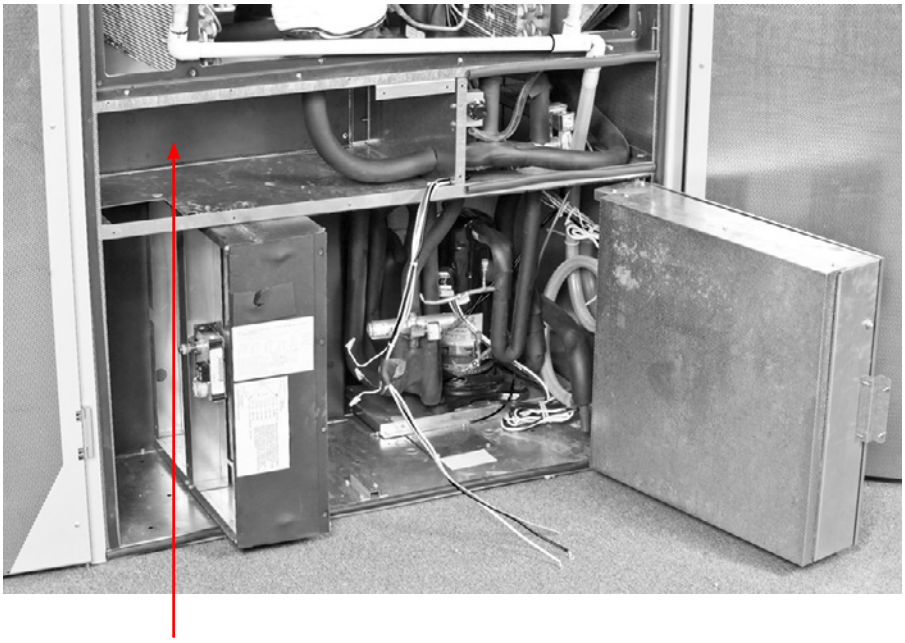
4. Remove the filter rack assembly – thirteen screws.

5. Remove the two GreenWheel dividers – one on the left and one on the right. Each divider has two screws.

6. Disconnect wires to the GreenWheel drive motor or the damper motor.



7. While lifting up on the horizontal divider panel that rests on the ventilation module, pull the ventilation module out of the unit..



Access to 460v. transformer and to fresh air exhaust motor is behind this panel.

G. Removal of the Indoor Blower Motor

Tools Required

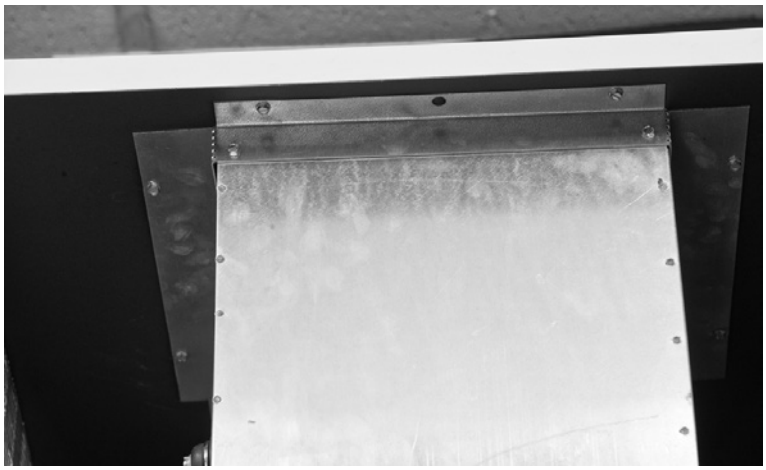
- 5/16” Nut Driver
- Clippers to Cut Wire Tie

1. Remove the top cover – fifteen screws.

2. Disconnect the two electrical harnesses on the blower motor.

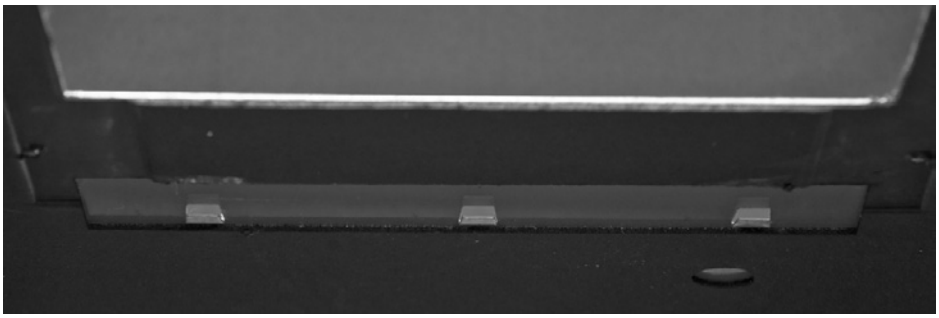
3. Cut the tie wrap that holds the wires to the blower housing.

4. Remove the six screws – two on the left, two in the front and two on the right that hold the blower motor to the top panel. These screws penetrate the blower motor flange vertically into the top panel.



5. Pull forward on the blower. Use caution when removing the blower; it is heavy.

Note: when reinstalling the blower motor, the rear flange of the blower motor must engage the three clips in the top panel.



H. Removal of the Outdoor Fan Motor Assembly (2, 2-1/2, 3 & 3-1/2T Units Only)

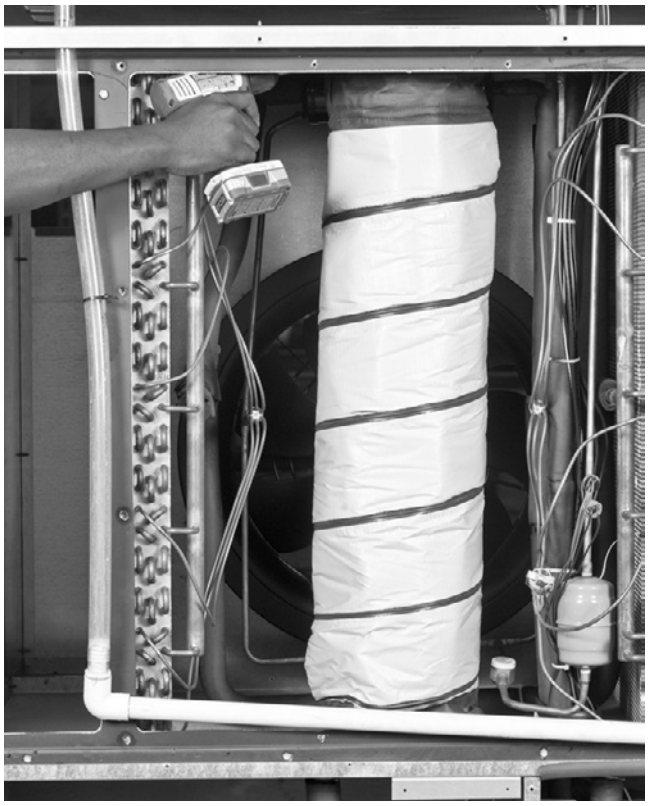
Tools Required

- 7/16” Socket
- 5/16” Nut Driver

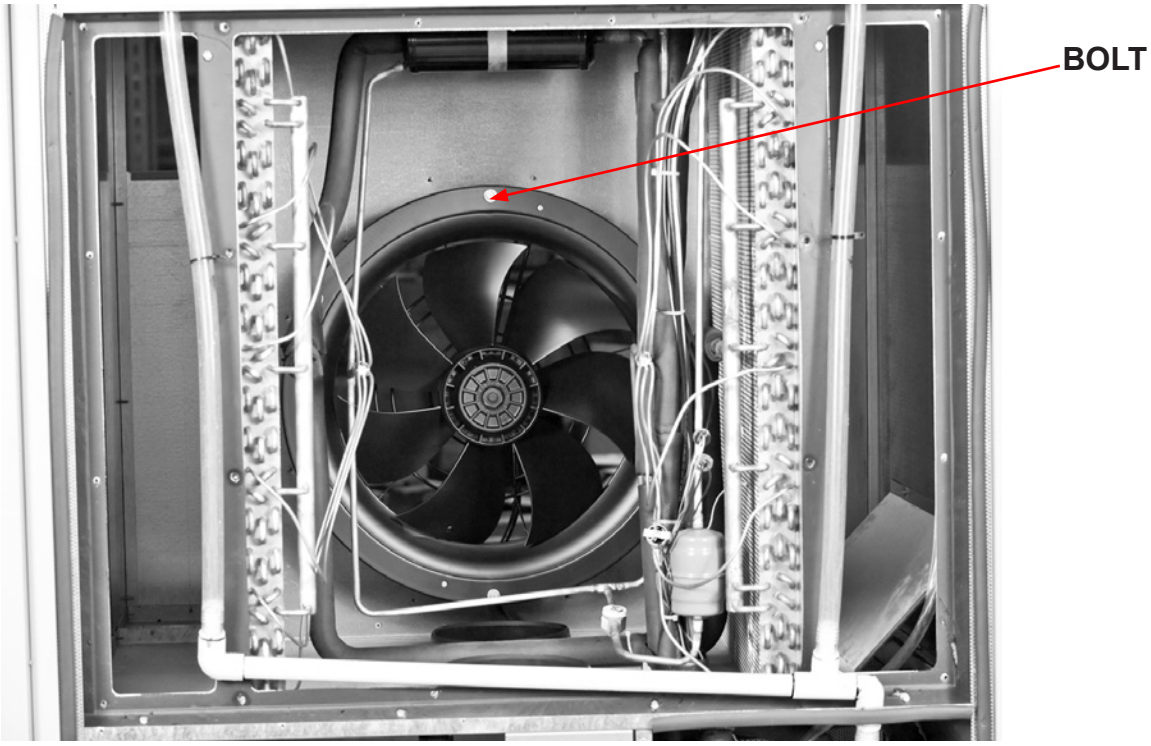
1. Remove the two screws that hold the condensate line to the middle front door. Note: Do not remove or disconnect the condensate tubing.

2. Remove the eighteen screws that hold the door and carefully remove the door.

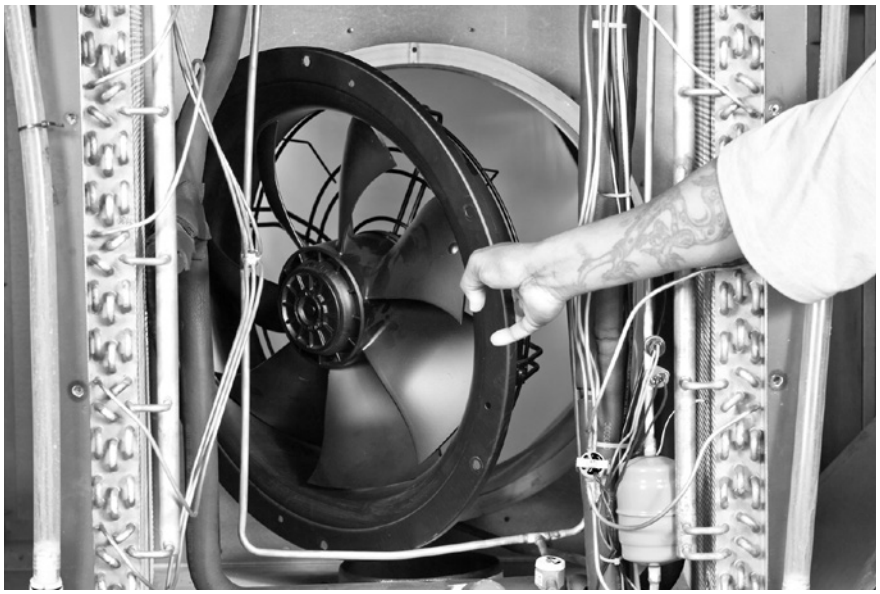
3. Disconnect the flexible duct by removing the screws at the top and bottom of the duct.



4. Remove the six bolts that hold the fan motor assembly. It is necessary to hold the nut on the backside of the flange when unscrewing the bolts.



5. Carefully rotate the fan motor assembly 90° and pull the assembly out of the machine. Use care not to damage the coil or a refrigerant line when removing the fan motor assembly.

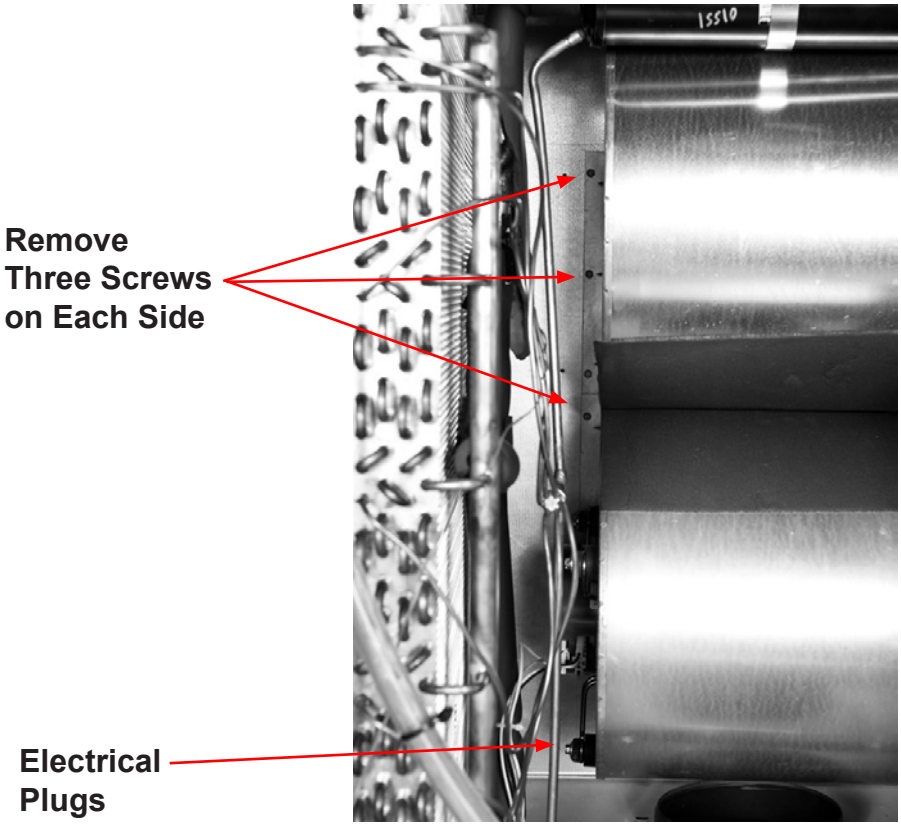


I. Removal of the Outdoor Fan Motor Assembly (4 & 5T Units Only)

Tools Required

- 7/16” socket
- 5/16” nut driver

1. Remove the two screws that hold the condensate line to the middle front door. Note: Do not remove or disconnect the condensate tubing.
2. Remove the eighteen screws that hold the door and carefully remove the door.
3. Disconnect the flexible duct by removing the screws at the top and bottom of the duct.
4. The two blowers can be removed individually. Disconnect the two electrical plugs to the blower assembly(s) that is to be removed.
5. Remove the three screws on each side of the assembly and pull the assembly out of the unit. Use care not to damage the coil or a refrigerant line when removing the fan motor assembly. Note: See photo on following page.



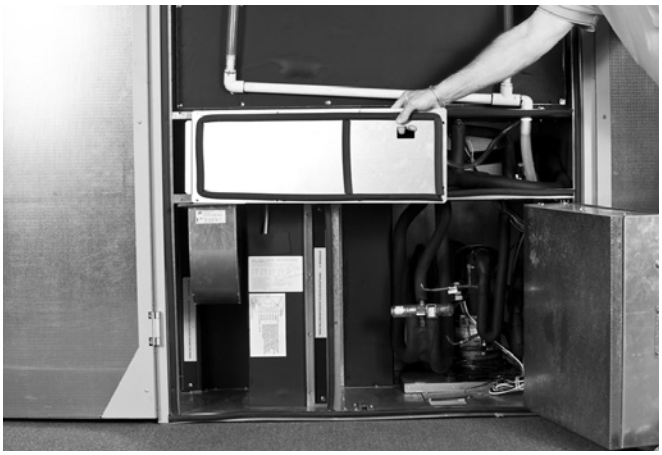
J. Removal of the Fresh Air Exhaust Fan Motor

Tools Required

- 5/16” Nut Driver
- No. 2 Phillips Head Screwdriver

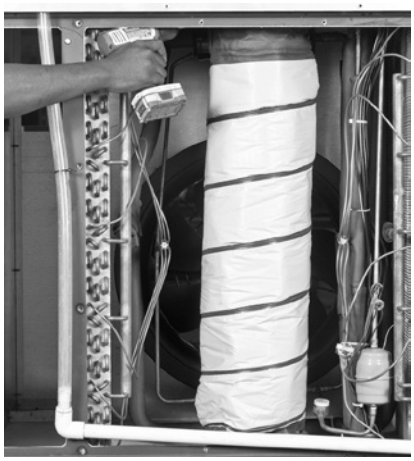
1. Remove the 18 screws that hold the middle door.

2. Remove the lower plenum front cover - eight screws.



3. Remove the lower plenum divider/access door – ten screws.

4. Remove yellow flexible duct.



5. Disconnect wires to the fan motor.

6. Remove fan motor – two Phillips head screws.

K. Access to Electrical Box

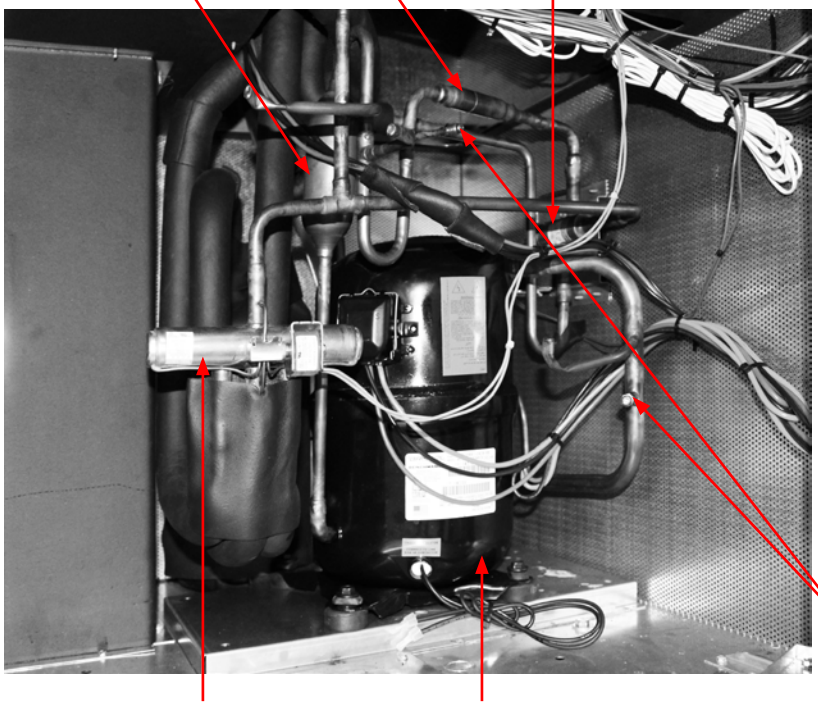
Tools Required

- 5/16” Nut Driver

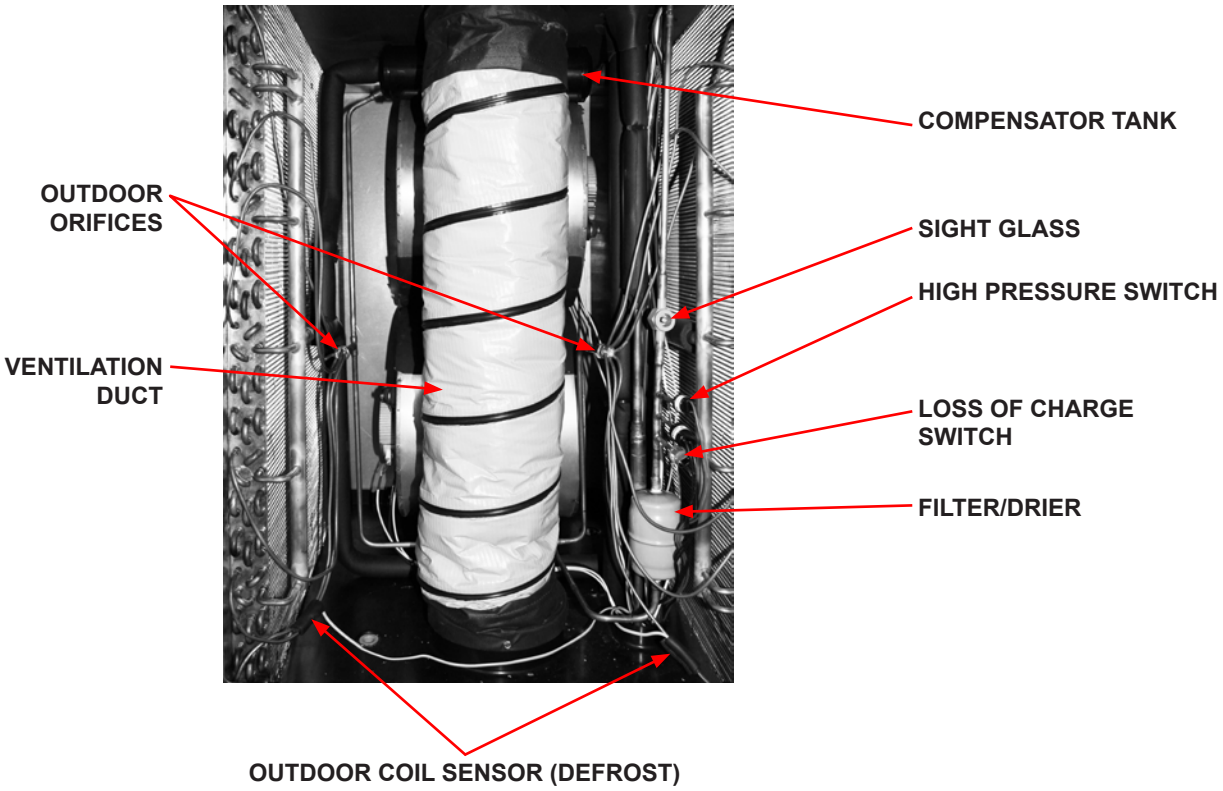
1. Remove the eight screws that hold the control box cover panel.

Location of major components

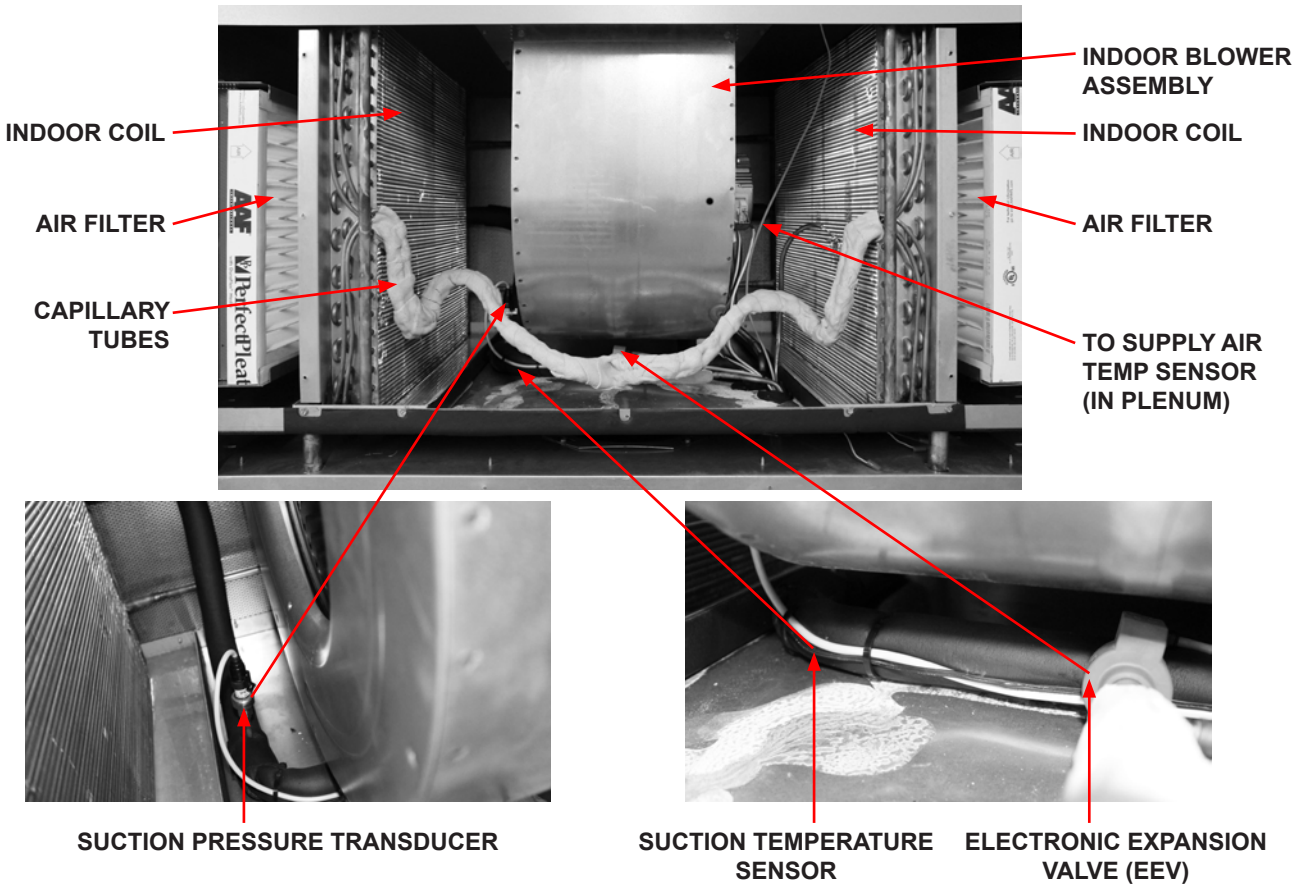
1. Compressor, reversing valve and coil, Schrader fittings and condensate drain hose.



2. Outdoor Coil, Filter drier, High pressure switch, Loss of charge switch, Outdoor orifice, Defrost sensor, Flexible duct for ventilation air.

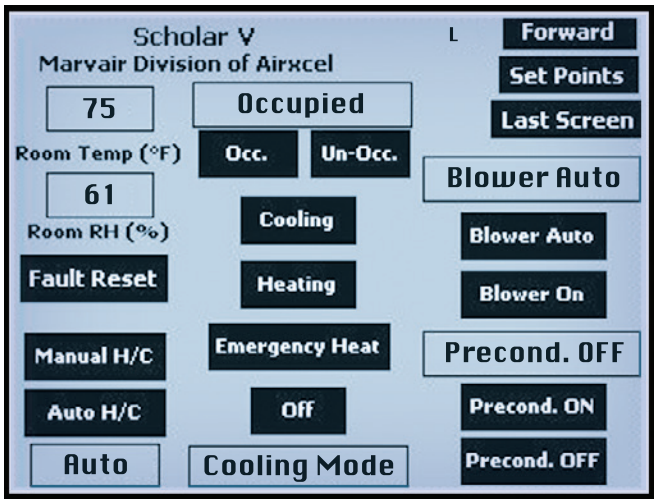


3. Indoor Coil, Indoor blower motor assembly and Thermal Expansion Valve.



8.1 SEQUENCE OF OPERATION AND HMI SCREEN NAVIGATION

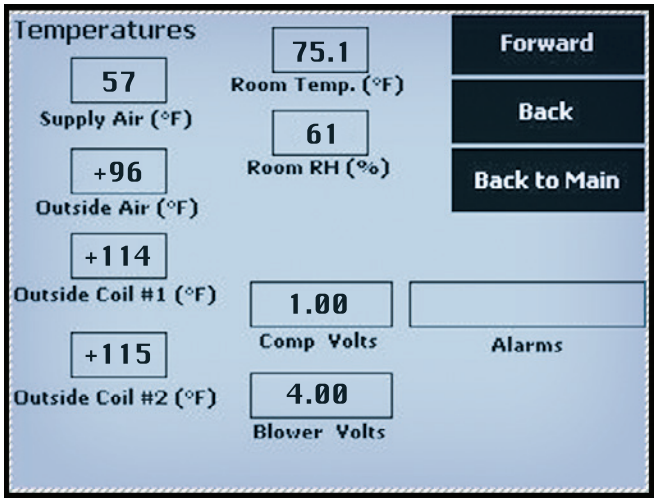
1. **SCREEN 1:** Main Screen *(Changes require username/password)*



   a. **Cooling (Manual H/C):** Press once to enter Cooling Mode. Selection shown in box at bottom of screen.
   b. **Heating (Manual H/C):** Press once to enter Heat Pump Heating Mode. Selection shown in box at bottom of screen.
   c. **Emergency Heat:** Press once to enter electric resistance heating mode. Selection shown in box at bottom of screen
   d. **Off:** Press once to turn unit OFF. Selection shown in box at bottom of screen.
   e. **Occ.:** Press once to enter Occupied Mode. In this mode, fresh air ventilation is active to give fresh air to room occupants. Set-points for occupancy are installed. Selection is shown above button.
   f. **Un-Occ.:** Press once to enter Unoccupied Mode. In this mode, fresh air is turned off and set points for an empty room are installed. Selection is shown above button.
   g. **Precond. ON:** Press once to allow for pre-conditioning of air. In this mode, fresh air is turned off. Selection is shown above button.
   h. **Precond. OFF:** Press once to disable pre-conditioning of the air. Fresh air into the room is enabled. Selection is shown above button.
   i. **Blower On:** Press once to turn blower ON continuously. Selection is shown above button
   j. **Blower Auto:** Press once to run blower with compressor operation. Selection is shown above button
   k. **Fault Reset:** Press once to clear faults, such as High Pressure, Low Pressure, High Discharge Temp, and Coil Freeze. These faults are shown on an overlay screen on HMI when they occur.
   l. **Set Points:** Press once to go directly to the screen to enter Cooling and Heating Set Points.
   m. Actual Room Temperature and Relative Humidity are shown in boxes at upper left of screen

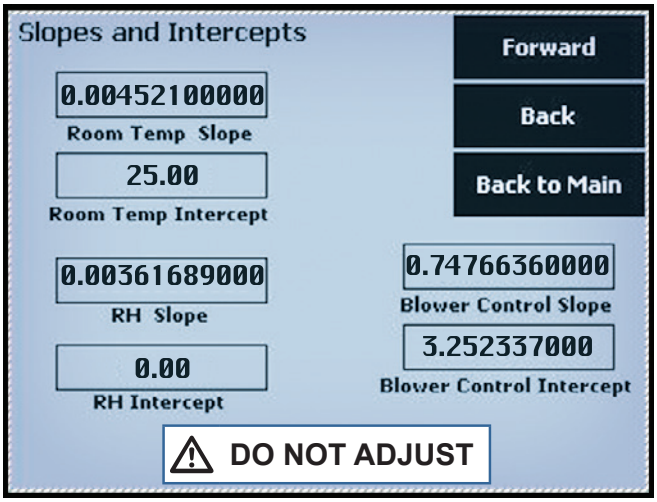
n. **Forward:** Press once to go to the next screen.
o. **Last Screen:** Press once to go to the last screen on the HMI
p. **Auto Heat/Cool:** Press once to switch automatically between cooling and heating, based on room temperature.
q. **Manual Heat/Cool:** Press once to manually switch modes by pressing Cooling or Heating

2. **SCREEN 2:** Temperatures *(Read only)*



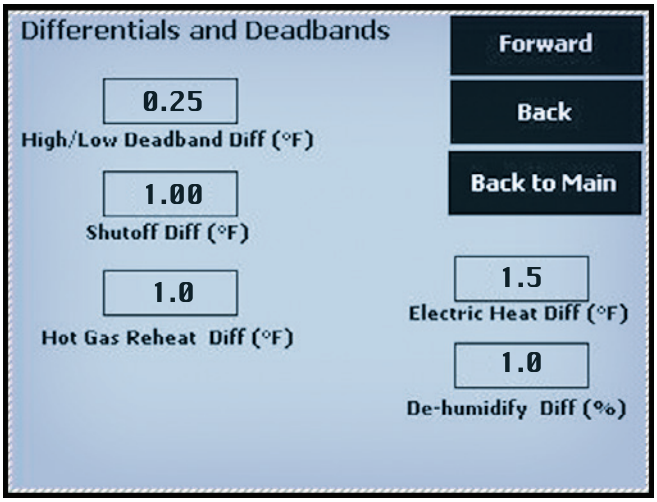
a. There are four thermocouples located in the unit:
    i. Supply air---Treated discharge air blowing into the room
    ii. Outside air---Ambient outside air entering outside coil enclosure.
    iii. Outside Coil #1---Located in distributor tube bundle serving Coil #2
    iv. Outside Coil #2--- Located in distributor tube bundle serving Coil #2
b. Temperature and Relative Humidity Transmitter (transmits information to PLC for control)
    i. Room Temperature---Actual room dry bulb temperature (°F)
    ii. Room Relative Humidity (RH)---Actual room relative humidity (%)
c. **Comp. Volts**: DC voltage being sent to compressor controller to set the compressor speed.
d. **Blower Volts**: DC voltage being sent to indoor blower controller to set the blower speed.
e. **Alarms**: Any alarms can be seen in this box. In addition to splash screen on HMI.
f. **Forward**: Press once to go to the next screen.
g. **Back**: Press once to go to the previous screen
h. **Back to Main**: Press once to go back to Main Screen.

3. **SCREEN 3:** Slopes and Intercepts *(Changes require username/password)*

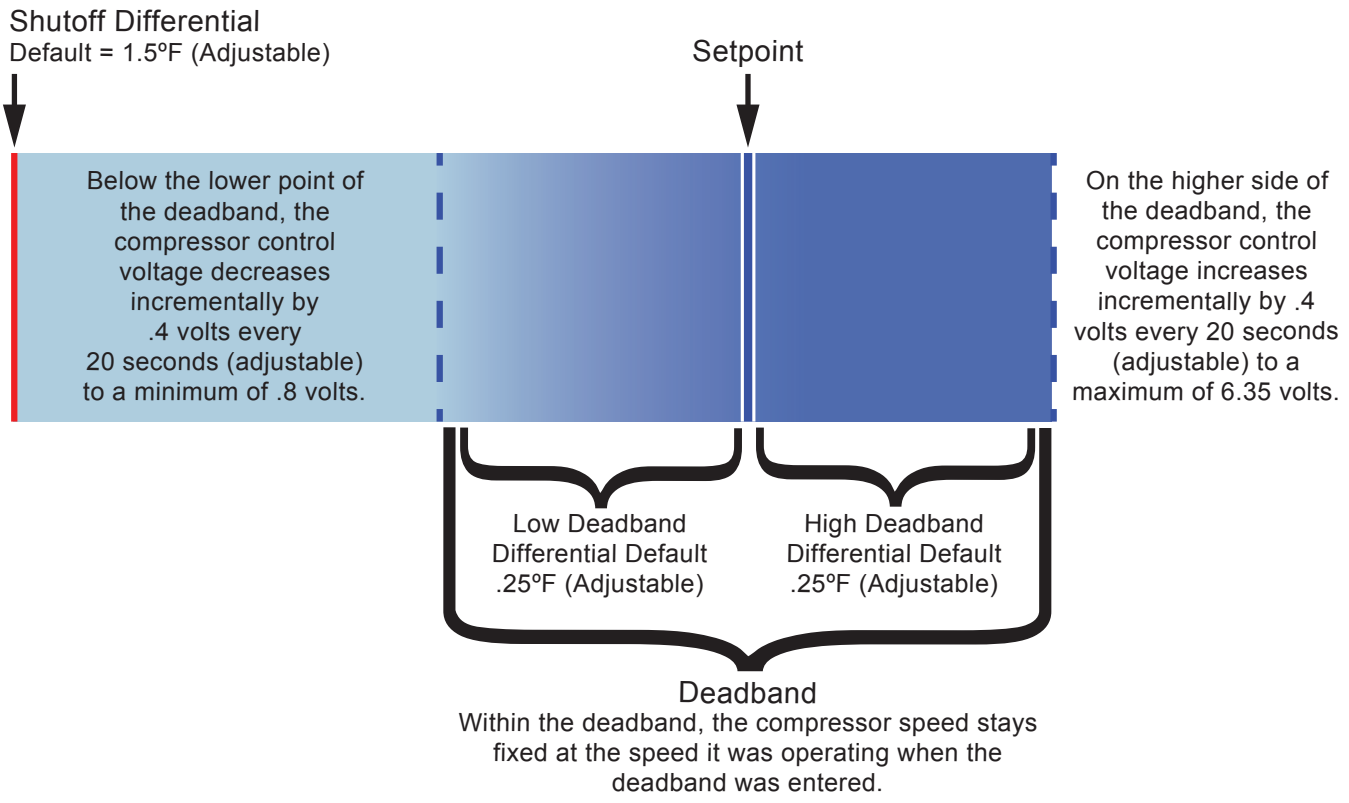


a. **Room Temp Slope**: This is a constant used to convert the output from the room temperature transmitter into a usable number for control. It is specific to the transmitter being used and should not be changed, unless a different transmitter is substituted.
b. **Room Temp Intercept**: This is a constant used to convert the output from the room temperature transmitter into a usable number for control. It is specific to the transmitter being used and should not be changed, unless a different transmitter is substituted.
c. **RH Slope**: This is a constant used to convert the output from the room relative humidity transmitter into a usable number for control. It is specific to the transmitter being used and should not be changed, unless a different transmitter is substituted.
d. **RH Intercept**: This is a constant used to convert the output from the room relative humidity transmitter into a usable number for control. It is specific to the transmitter being used and should not be changed, unless a different transmitter is substituted.
e. **Blower Control Slope**: is is a constant which is calculated by the PLC and is based on the maximum and minimum speeds set for the compressor. It cannot be changed from this screen.
f. **Blower Control Intercept**: This is a constant which is calculated by the PLC and is based on the maximum and minimum speeds set for the compressor. It cannot be changed from this screen.
g. **Forward**: Press once to go to the next screen.
h. **Back**: Press once to go to the previous screen
i. **Back to Main**: Press once to go back to Main Screen

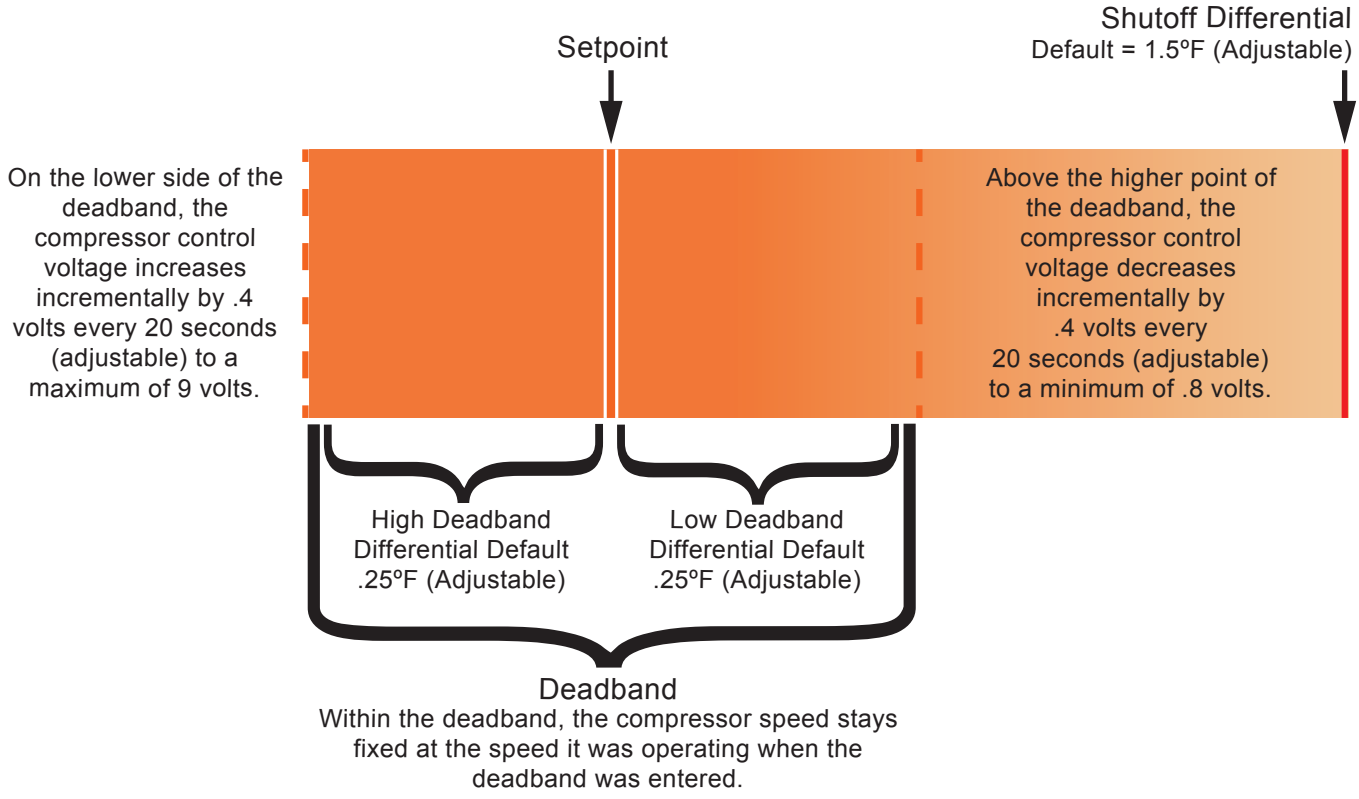
4. **SCREEN 4:** Differentials and Deadbands *(Changes require username/password)*



a. **High/Low Deadband Diff (°F)**: This is a number added to and subtracted from a set-point to form a control band. For example, if the setpoint is 75°F and the High/ Low Deadband Diff is .25, the control band would be from 74.75°F to 75.25 °F.
b. **Shutoff Differential (°F)**: In cooling, this is a differential applied to the low end of the control band to set the point where the compressor turns off. For example, if the control band is from 74.75 °F to 75.25°F and the shutoff differential is 1.5 °F, the compressor would turn off when the temperature reached 73.25 °F (74.75 minus 1.5). In heating, the differential is applied to the high end of the control band.
c. **Hot Gas Reheat Diff (°F)**: In the dehumidification mode, the hot gas reheat valve is controlled by a thermocouple located in the supply air stream. Based on the temperature of the supply air, during dehumidification when there is not a call for cooling, the hot gas reheat valve is turned on to heat the air back up to the set point. The Hot gas Reheat Diff is applied to the cooling set point to establish a temperature where the hot gas valve is energized and de-energized. For example, if the cooling set point is 75°F and the Hot Gas Reheat differential is 1°F, the hot gas valve turns on when the temperature is 74°F (75° - 1°) and turns off when the temperature is 76°F (75° + 1°).
d. **Electric Heat Diff (°F)**: This differential is applied to the heating set point to determine the temperature at which the resistance heat is turned on and off. For example, if the heating set point is 65° and the Electric Heat Diff is 1.5°, the heater will turn on at 63.5°F (65° - 1.5°) and will turn off at 66.5°F (65° + 1.5°).
e. **De-humidify Differential (%)**: This differential is applied to the relative humidity set point to establish at what point de-humidification will start and stop. For example, if the relative humidity set point is 50% and the De-humidify Differential is 1%, dehumidification will be enabled at 51% (50% + 1%) and disabled at 49% (50% - 1%).
f. **Forward**: Press once to go to the next screen.
g. **Back**: Press once to go to the previous screen
h. **Back to Main**: Press once to go back to Main Screen

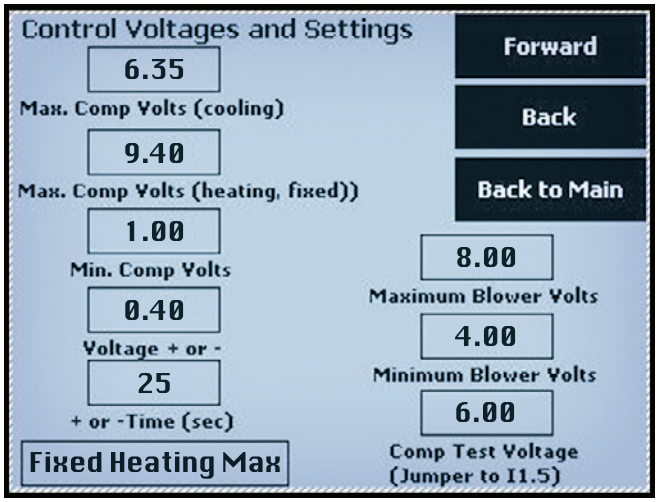


Scholar V Cooling Control Method



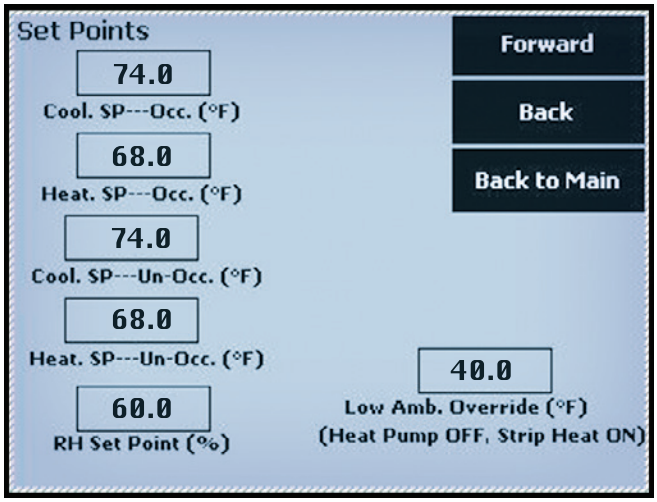
Scholar V Heating Control Method

5. **SCREEN 5:** Control Voltages and Settings *(Changes require username/password)*



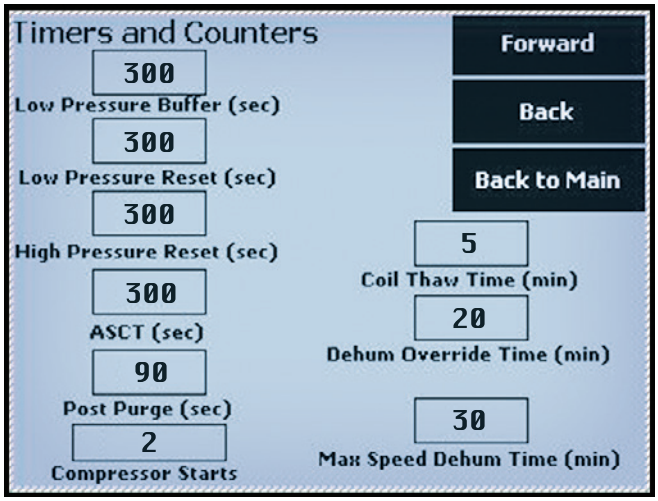
a. **Max Comp. Volts (cooling):** The compressor speed is controlled by applying a DC control voltage to the compressor driver board. This value is the maximum DC voltage that the PLC will deliver to the driver board in the cooling mode.
b. **Max Comp. Volts (heating)**: The compressor speed is controlled by applying a DC control voltage to the compressor driver board. This value is the maximum DC voltage that the PLC will deliver to the driver board in the heating mode.
c. **Min. Comp Volts**: This value is the minimum control voltage that the PLC will deliver to the compressor driver in any mode.
d. **Voltage + or -** : The compressor speed is matched to the room load by increasing or decreasing the speed until the room temperature moves into the control band (explained in Screen 5). The compressor speed is changed by incrementing or decrementing the control voltage by a small amount at a specified time interval until the room conditions move into the control band. Once the temperature is inside the control band, the speed control voltage remains fixed until the temperature again moves outside the band.
e. **+ or – Time (sec)**: This is the time increment that elapses between compressor control voltage changes (incrementing or decrementing).
f. **Maximum Blower Volts**: The indoor blower is an electronically commutated device that is controlled by a 0 – 10 VDC signal generated by the PLC. The PLC modulates the control voltage based on the compressor speed to try and maintain a relatively constant evaporator temperature in cooling and a relatively constant condenser temperature in heating. This parameter is the maximum voltage the PLC will deliver to the motor controller.
g. **Minimum Blower Volts**: The indoor blower is an electronically commutated device that is controlled by a 0 – 10 VDC signal generated by the PLC. The PLC modulates the control voltage (blower speed) based on the compressor speed to try and maintain a relatively constant evaporator temperature in cooling and a relatively constant condenser temperature in heating. This parameter is the minimum voltage the PLC will deliver to the motor controller
h. **Forward**: Press once to go to the next screen.
i. **Back**: Press once to go to the previous screen
j. **Back to Main**: Press once to go back to Main Screen

6. **SCREEN 6: Set Points** *(Changes require username/password)*



a. **Cool SP---Occ. (°F)**: Cooling set point for Occupied Mode
b. **Heat SP---Occ. (°F)**: Heating set point for Occupied Mode
c. **Cool SP---Un-Occ. (°F)**: Cooling set point for Unoccupied Mode
d. **Heat SP---Un-Occ. (°F)**: Heating set point for Unoccupied Mode
e. **RH Set Point (%)**: Relative humidity set point for all modes.
f. **Low Amb. Override (°F)**: Outside temperature at which heat pump operation is disabled and resistance heat is enabled.
g. **Forward**: Press once to go to the next screen.
h. **Back**: Press once to go to the previous screen
i. **Back to Main**: Press once to go back to Main Screen

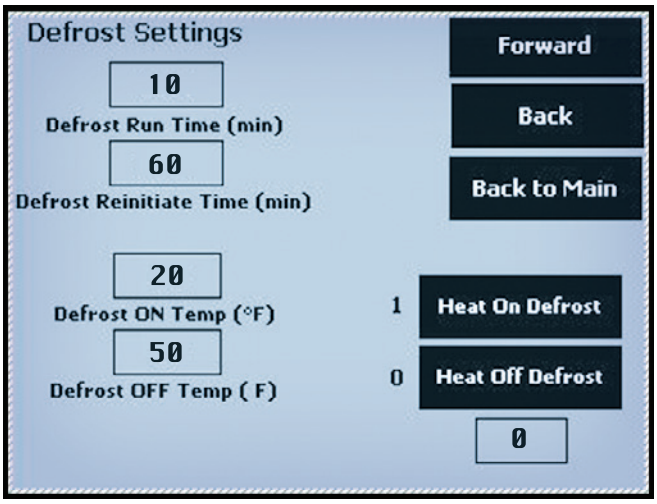
7. SCREEN 7: Timers and Counters *(Changes require username/password)*



a. **Low Pressure Buffer (sec)**: This is the time in seconds between when the low refrigerant switch opens due to a low pressure fault and when the PLC shuts off the compressor.
b. **Low Pressure Reset (sec)**: This is the time in seconds until the low refrigerant lockout resets automatically. The lockout will automatically reset two times. A third lockout will require a manual reset by pushing the Fault Reset button shown on Screen 1 (Main Screen).
c. **High Pressure Reset (sec)**: This is the time in seconds until the high refrigerant lockout resets automatically. The lockout will automatically reset two times. A third lockout will require a manual reset by pushing the Fault Reset button shown on Screen 1 (Main Screen).
d. **ASCT (sec)**: ASCT stands for Anti Short Cycle Timer. This timer starts timing when the compressor turns off and prohibits it from running again until the time period elapses.
e. **Post Purge (sec)**: This is a timer which runs the indoor blower a specific time after the compressor shuts off. The purpose is to allow the room air flow to extract any cooling or heating benefit from the refrigerant stored in the indoor coil. This is only active if the Blower Auto mode is chosen on Screen 1 (Main Screen).
f. **Coil Thaw Time (min)**: A freeze stat is located in contact with the fins of the indoor coil. This device is set for about 30°F and stops the compressor operation for the stated time period if the coil begins to ice up. This is not a normal condition and should only happen infrequently, if ever. During this compressor off period, the blower remains on in an effort to thaw any ice accumulation on the coil. There are two auto reset attempts before a lock out that requires a manual reset.
g. **Dehumid Override Time (minutes)**: During normal cooling, if the humidity set-point has not been achieved in this time setting, the compressor speed is driven to maximum cooling allowed. If this action should drive the room temperature below the cooling control band (See Shutoff Diff, Screen 4, Differentials and Deadbands), the dehumidification mode becomes active with hot gas reheat heating the supply air to the set-point to keep from overcooling the room.
h. **Max. Speed Dehum. Time:** This is the time that the compressor will run at maximum speed in an attempt to de-humidify. When the time expires, the Dehum Override timer is reset and the system resumes normal operation.
i. **Compressor Starts Since Reset:** This is the number of times the compressor has started since the Fault Reset button was last pressed on Screen 1 (Main Screen).

j. **Forward**: Press once to go to the next screen.
k. **Back**: Press once to go to the previous screen
l. **Back to Main**: Press once to go back to Main Screen

8. **SCREEN 8: Defrost Settings** *(Changes require username/password)*



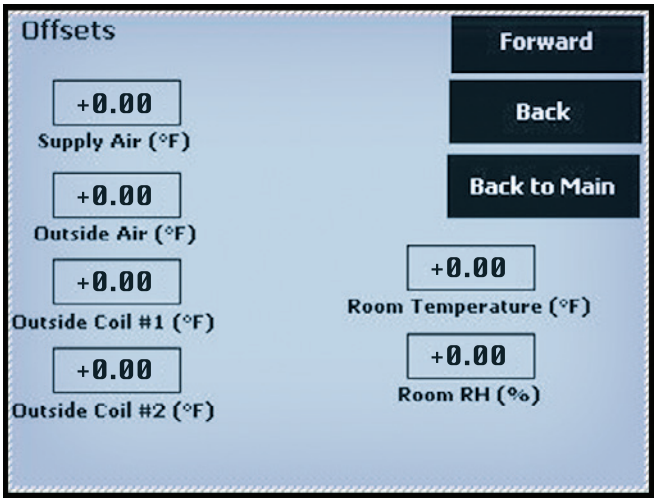
All air source heat pumps require a defrost cycle in the heating mode. As the unit runs in heating and extracts heat from the outside air, which may be well below 50°F, ice will often accumulate on the outside coils. A defrost cycle is required to melt this ice periodically.

Thermocouples are embedded in the refrigeration distributor coils of the outside coil. These tubes are essentially at the refrigerant temperature inside the tubes of the coil. When the temperature of one of the thermocouples reaches a particular set point, the defrost cycle in initiated. The reversing valve changes and allows hot gas to enter the outside coil which removes the ice. During this cycle, the outdoor fan(s) or blower(s) turn off to maximize the heat forced into the coil.

a. **Defrost Run Time (min)**: This is the maximum time that the unit will run in a defrost cycle.
b. **Defrost Reinitiate time (min)**: This time must elapse before another defrost cycle occurs. It is measured in the run time of the compressor since the end of the previous defrost cycle.
c. **Defrost On Temperature (°F)**: This is the temperature of either of the two outside coil thermocouples (See Screen 2, Temperatures). A defrost cycle will begin when either thermocouple reaches this value.
d. **Defrost Off Temp (°F)**: This is the temperature at which the defrost cycle terminates. If the run time expires before the off temperature is reached, the defrost cycle will terminate. Another cycle will not be attempted until the Reinitate Time expires.
e. **Heat On Defrost**: Press this button once to enable electric resistance heat operation during a defrost cycle to keep cold air from being introduced into the room. It is indicated by a 1 in the box at the bottom of the screen.

f. **Heat Off Defrost**: Press this button once to disable electric resistance heat operation during a defrost cycle. It is indicated by a 0 in the box at the bottom of the screen.
g. **Forward**: Press once to go to the next screen.
h. **Back**: Press once to go to the previous screen
i. **Back to Main**: Press once to go back to Main Screen

9. **SCREEN 9: Offsets** *(Changes require username/password)*

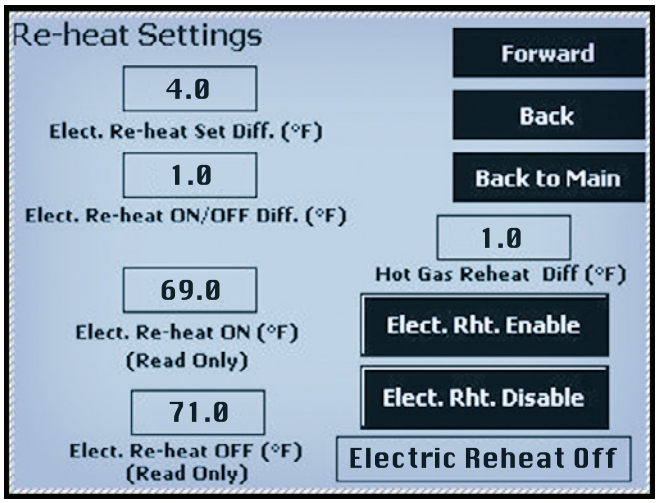


The offset screen provides a way to calibrate the various measured temperatures, if required. The offset number can be either positive or negative and is added to the value being measured by the sensing element. For example, if the Outside Air was reading too low of a temperature, a positive offset would be used which would increase the temperature displayed. If the value was reading too high, a negative offset would be used.

It should be noted that any values corrected with offsets are also used internally in the PLC for calculations.

a. **Forward**: Press once to go to the next screen.
b. **Back**: Press once to go to the previous screen
c. **Back to Main**: Press once to go back to Main Screen

10. SCREEN 10: Reheat Settings *(Changes require username/password)*

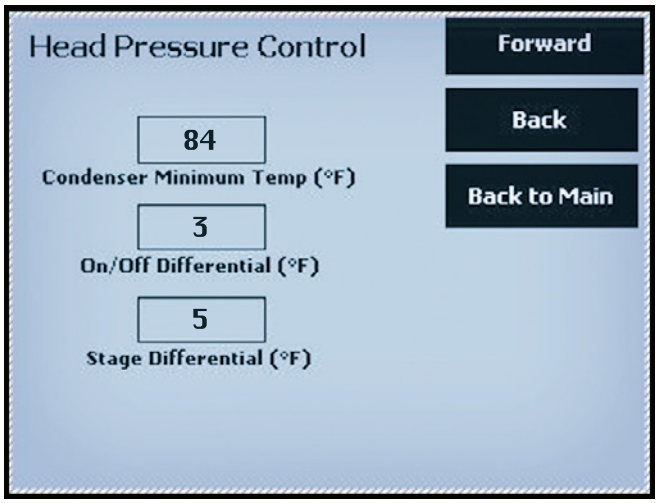


Supply air reheat is used during dehumidification to heat the supply back to the cooling set-point. This allows for moisture removal (latent cooling) by cooling the air as it passes through the evaporator, but inhibits sensible cooling by reheating the air, adding back the sensible component.

Both hot gas reheat and electric reheat can be used. Hot gas reheat is always provided, but electric reheat may be enabled or disabled based on user preference.

a. **Elect. Rht. Enable**: Press this button to enable electric reheat. The status can be seen in the box below the buttons.
b. **Electric Rht. Disable**: Press this button to disable electric reheat. The status can be seen in the box below the buttons.
c. **Hot Gas Reheat Diff (°F)**: This is the same setting as earlier described in Screen 4 (Differentials and Deadbands)
d. **Electric Re-heat Set Diff. (°F)**: This value establishes the temperature at which the electric heat will come on, if enabled. The electric heat ON point is calculated by subtracting the differential from the cooling set point. For example, if the cooling set point is 75°F and the Elect. Re-heat Set Diff. is 5°F, the heat will come on when the supply air is cooled down to 70°F (75°F - 5°F).
e. **Elect. Re-heat ON/OFF differential**: This value is added to the ON temperature setting to determine the OFF setting. Going back to the above example, if the ON temperature is 70°F and the Elect. Re-heat On/OFF Diff. is 2°F, the heat would turn off at 72°F (70°F + 2°F). Then would come back on at 70°F and cycle on and off accordingly.
f. **Elect. Reheat ON (°F), elect Reheat OFF (°F) (Read Only)**: These boxes show the calculated values for the ON and OFF temperatures explained above. They are “Read Only” and cannot be changed.
g. **Forward**: Press once to go to the next screen.
h. **Back**: Press once to go to the previous screen
i. **Back to Main**: Press once to go back to Main Screen.

11. SCREEN 11: Head Pressure Control *(Changes require username/password)*

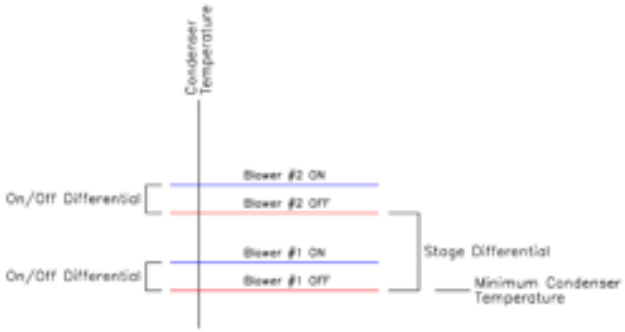


Condenser blower cycling is used to control head pressure (condenser temperature).

Proper operation in cooling requires that the condenser temperature (pressure) be maintained above a certain minimum value. This can become a problem in cooler weather as the cool ambient temperatures tend to drive the condenser temperature below an acceptable minimum value. Head pressure control (control of condenser pressure and saturated temperature) is used to keep the values at or above an acceptable minimum value.

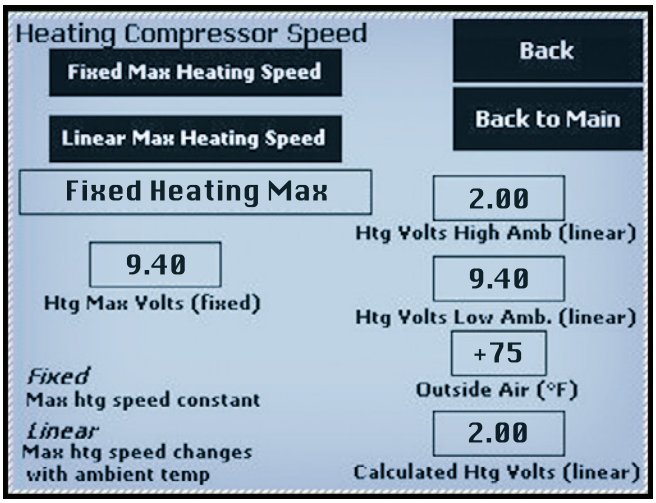
The purpose of the condenser coils is to transfer rejected heat to the outside ambient air. Two condenser blowers are used to move outside air over the outdoor heat exchanger coils. The condenser pressure drops as airflow increases and increases as airflow is reduced. Two thermocouples are embedded in the condenser distributor tube bundles, one for each of the two condensers. The temperature measured by these thermocouples closely approximates the condenser temperature (which is in correspondence with condenser pressure). As the temperature falls to a predetermined level (OFF point), the PLC cycles off one or both blowers. When a blower cycles off, the condenser temperature (head pressure) begins to rise. When the temperature rises to the ON point, the blowers operate again.

Settings example:



a. **Condenser Minimum Temperature (°F)**: This is the minimum condenser temperature for satisfactory operation of the unit.
b. **On/OFF Differential (°F)**: This is the separation between the ON temperature and OFF temperature of one blower or the other.
c. **Stage Differential (°F)**: This is the difference between the OFF point of Blower #1 and Blower #2.
d. **Forward**: Press once to go to the next screen.
e. **Back**: Press once to go to the previous screen
f. **Back to Main**: Press once to go back to Main Screen

12. SCREEN 12: Heating Compressor Speed *(Changes require username/password)*



There are two ways to control the speed of the compressor during space heating.

Fixed Heating Max: with this method, the maximum speed of the compressor is fixed by applying a fixed DC voltage to the compressor controller. Even if the ambient temperature is high, if Fixed is chosen, the compressor will ramp up to the maximum speed associated with the Heating Max Volts.

Linear Heating Max: With this method, the maximum speed of the compressor is calculated, based on the outdoor ambient. A calculation is made in the PLC and in cold weather, the compressor control voltage is higher than in warmer weather. The endpoints of this control curve can be set. High ambient applies to temperatures >= 70°F. Low ambient applies to temperatures <= 30°F. Between these values the temperature varies linearly.

a. **Fixed Max Heating Speed:** Press this once to set the max heating speed to a fixed constant.
b. **Linear Max Heating Speed:** Press this once to set the max heating speed to be a function of the outdoor ambient.
c. **Back**: Press once to go to the previous screen
d. **Back to Main**: Press once to go back to Main Screen

The actual ambient temperature is shown, as well as the associated linear heating compressor voltage. When in the Linear control mode, a small letter “L” is shown at the top of the Home Screen.

9.1 HMI MODES OF OPERATION

Be sure all installation steps have been completed and double checked. Check the voltage and phasing to be sure they are correct. Be sure breakers have been sized properly. Be sure wire has been sized properly. Turn on the circuit breakers to provide power to the unit. After a few seconds, the HMI display will activate.

Refer to the HMI Screen Navigation section shown above.

Start with HMI showing Screen 1 (Main Screen)

- Set Occupied or UnOccupied as desired
- Set Pre-Conditioning On or Off as desired
- Set Blower Auto or Blower ON as desired
- Be sure desired set points have been entered for all modes

Cooling

- Press the Cooling button on Screen 1. If the room temperature is greater than or equal to the cooling set point, the compressor should start. This may take up to 60 seconds, based on the setting of the ASCT setting.
- One or both outdoor coil blowers should come on. This may take a few seconds, especially if the outdoor air is cool. (See Head Pressure Control).
- The indoor blower should come on. It will run continuously if the blower is set to ON, It will cycle with the compressor if set to AUTO. If set to AUTO, it will run for a period of time after the compressor turns off, based on the Post Purge time setting.
- If the room temperature is considerably higher than the cooling set point, the compressor speed will ramp up slowly until the maximum control voltage is provided to the compressor controller. This sets the maximum compressor speed and maximum unit cooling.
- If the room temperature is slightly below the cooling set point, the compressor speed will ramp down until the minimum voltage is provided. This sets the minimum compressor speed.
- When the room temperature is approximately equal to the set point (inside the control band explained in Screen 4), the compressor speed stops changing and stays fixed.
- As the compressor speed changes, the indoor blower speed will also change. The higher the compressor speed, the higher the indoor blower speed.
- The reversing valve is energized in cooling.
- If the Occupied Mode has been set, the ventilation fan will come on. This will stay on continually.
- If pre-conditioning has been set to ON, outside air ventilation is disabled.
- The control logic allows the compressor speed to fluctuate normally unless the relative humidity does not drop to the RH set-point in a reasonable amount of time. This time is the Dehum Override Time set on Screen 7 (Timers and Counters) and is adjustable.
- If, when the compressor is running full speed to satisfy humidity, the room is cooled below the cooling set point and the relative humidity is still not satisfied, the compressor continues to run at full cooling speed. Hot gas reheat (and electric reheat, if chosen), is activated to keep from overcooling the room to an uncomfortable level.

Heating

- Press the Heating button on Screen 1. If the room temperature is less than or equal to the heating set point, the compressor should come on. This may take up to 60 seconds, based on the setting of the ASCT setting.
- Both outdoor coil blowers should come on.
- The indoor blower should come on. It will run continuously if the blower is set to ON, It will cycle with the compressor if set to AUTO. If set to AUTO, it will run for a period of time after the compressor turns off, based on the Post Purge time setting.
- If the room temperature is considerably lower than the heating set point, the compressor speed will ramp up slowly until the maximum control voltage is provided to the compressor controller. This sets the maximum compressor speed and maximum unit heating.
- If the room temperature is slightly above the heating set point, the compressor speed will ramp. down until the minimum voltage is provided. This sets the minimum compressor speed and minimum unit heating capacity.
- When the room temperature is approximately equal to the set point (inside the control band explained in Screen 4), the compressor speed stops changing and stays fixed.
- As the compressor speed changes, the indoor blower speed will also change. The higher the compressor speed, the higher the indoor blower speed. This is to maintain a relatively constant supply air temperature.
- The reversing valve is de-energized in heating.
- If the Occupied Mode has been set, the ventilation fan will come on. This will stay on continually.
- If pre-conditioning has been set to ON, outside air ventilation is disabled.
- No active relative humidity control is used in the heating mode.

Emergency Heat

- Press the Emergency Heat button on Screen 1.
- The heat pump heating mode is disabled.
- Heating is now provided by electric resistance heat. The same set-points are used for resistance heat as heat pump heat.
- The compressor does not run.
- Indoor air flow is set to the maximum.

OFF

- Press the OFF button on Screen 1.
- All equipment in the unit turns off.

Auto Heat/Cool

- When Auto Heat/Cool is pressed, the system will automatically switch from cooling to heating whenever the inside temperature drops below the heating set point, and vice-versa

Manual Heat/Cool

- When Manual Heat/Cool is pressed the desired operating mode must be chosen by pressing Cool, or Heat.

MODE	FUNCTION/STATUS									
	Compressor	Condenser Blower #1	Condenser Blower #2	Indoor Blower	Reversing Valve	Hot Gas Re-heat Vavle	Electric Heater	Ventilation Fan	Ventilation Damper Motor	Electronic Expansion Valve
Cooling Mode	ON	ON[1]	ON[1]	ON	ON	OFF	OFF	Either[3]	Either[3]	ON[2]
Heating Mode (Heat Pump)	ON	ON[4]	ON[4]	ON	OFF	OFF	OFF[5]	Either[3]	Either[3]	ON[2]
Emergency Heat	OFF	OFF	OFF	ON[6]	OFF	OFF	ON	Either[3]	Either[3]	ON[2]
Defrost	ON[7]	OFF	OFF	ON	ON	OFF	Either[8]	Either[3]	Either[3]	ON[2]
Dehumidification with Reheat	ON[9]	ON[1]	ON[1]	ON	ON	ON[10]	ON[11]	Either[3]	Either[3]	ON[2]
Off	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON[2]

[1]Condenser blowers may cycle off to control head pressure

[2]Electronic Expansion Valve controller is autonomous and is always active

[3]Ventilation is a customer choice. See Occupied/Unoccupied, and Pre-conditioning

[4]Blowers run continuously in heating. Head Pressure control is disabled

[5]When outdoor temperature gets low, the heat pump is disabled and electric resistance heat is enabled.

[6]In electric resistance heating, blower runs at full speed.

[7]Maximum compressor speed during defrost

[8]The customer may choose to run electric resistance heating during defrost

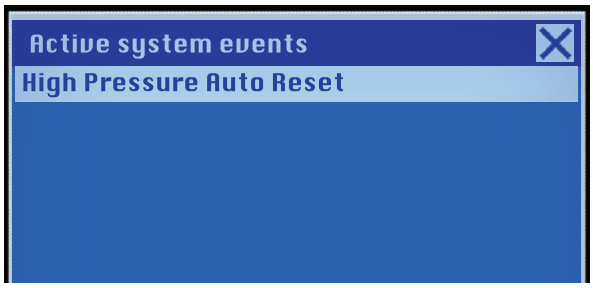
[9]The compressor typically runs at full speed during dehumidification with reheat

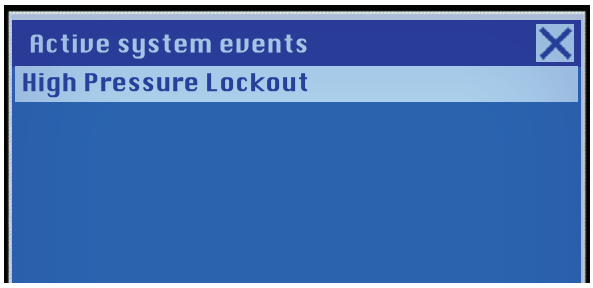
[10]Reheat valve cycles to control the supply air temperature

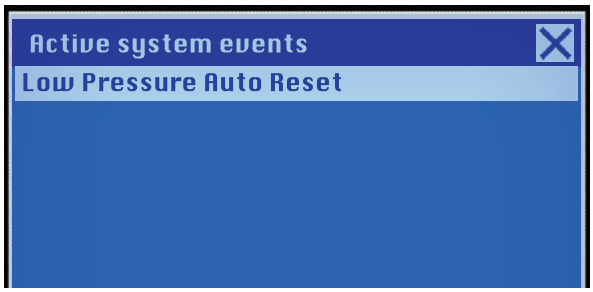
[11]The customer may choose to run electric resistance heating during hot gas reheat to be sure the air gets heated to the desired value.

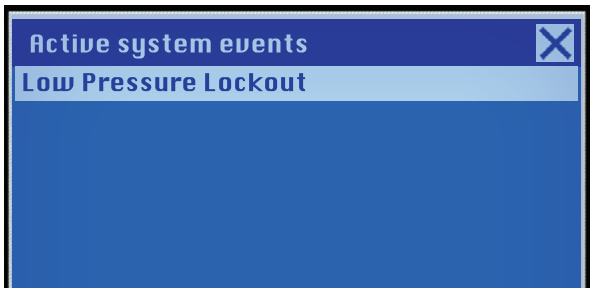
APPENDIX A HMI FAULT SCREENS

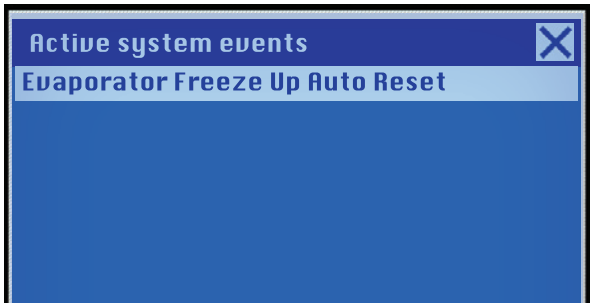
These splash screens appear on the HMI when faults occur in the unit. Auto Reset will attempt operation again after a time out period. Lock-out requires a manual reset from Screen 1.

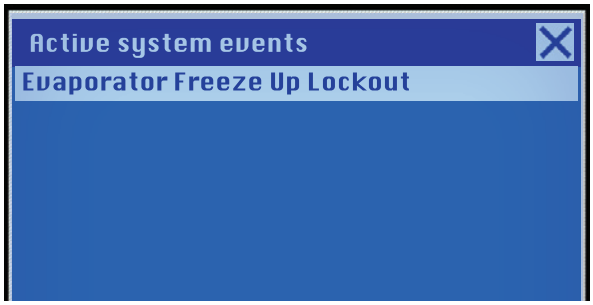


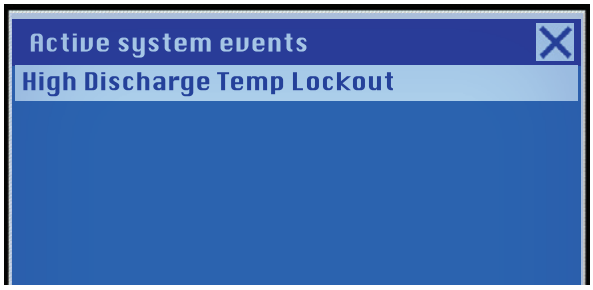












APPENDIX B ELECTRONIC EXPANSION VALVE (EEV) USER MANUAL

To download a PDF of the complete user's manual for the EEV used in the Scholar V, use the link below:

http://www.carelusa.com/documents/10191/0/+0300005EN/9875a8da-b605-48c0-be52-7cd22612f66c?version=1.4

APPENDIX C AIRXCEL COMMERCIAL GROUP LIMITED PRODUCT WARRANTY

If any part of your Airxcel Commercial Group Air Conditioner, Heat Pump or Unit Ventilator fails because of a manufacturing defect within the time frame in the table below, the Airxcel Commercial Group will furnish without charge, EXW Cordele, Georgia, the required replacement part. Any transportation, related service labor, diagnosis calls, filter, driers, and refrigerant are not included. The owner must provide proof of the date of the original start-up. The contractor's invoice, the certificate of occupancy, or similar documents are examples of proof of the date of the original start-up.

Marvair, ICE, Eubank	**Suburban Applied Products**
90 Days DOA w/Flat Rate Labor	1 Year Parts/Labor – Flat Rate
1 Year Parts	5 Years Heat Exchanger
5 Years Compressor	5 Years Compressor

The following extra cost warranties are available from Airxcel Commercial Group:

Bronze	**Silver**	**Gold**	**Diamond**
Any Special Warranty Written for a Job	1 Year Parts/Labor	2 Years Parts/Labor	5 Years Parts/Labor

Any related service labor, diagnosis calls, filter, driers and refrigerant are not included. Airxcel Commercial Group will pay for non-priority shipping costs of the compressor during the first twelve months of the warranty period. After the first twelve months of the warranty period, all costs of shipment and risk of loss during the shipment of the compressor shall be the responsibility of the owner.

The owner of the product may ship the allegedly defective or malfunctioning product or part to Airxcel Commercial Group, at such owner's expense, and Airxcel Commercial Group will diagnose the defect and, if the defect is covered under this warranty, Airxcel Commercial Group will honor its warranty and furnish the required replacement part. All costs for shipment and risk of loss during shipment of the product to Airxcel Commercial Group and back to the owner shall be the responsibility and liability of the owner. Upon written request by an owner, Airxcel Commercial Group may arrange for remote diagnosis of the allegedly defective or malfunctioning product or part but all costs for transportation, lodging and related expenses with regard to such diagnostic services shall be the responsibility and liability of the owner.

An owner requesting performance under this Warranty shall provide reasonable access to the allegedly defective or malfunctioning product or part to Airxcel Commercial Group and its authorized agents and employees.

This warranty applies only to products purchased and retained for use within the U.S.A., Canada, and Mexico. This warranty does not cover damage caused by improper installation, misuse of equipment or negligent servicing.

THIS WARRANTY CONSTITUTES THE EXCLUSIVE REMEDY OF ANY PURCHASER OF AN AIRXCEL COMMERCIAL GROUP HEAT PUMP OR AIR CONDITIONER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE, TO THE FULLEST EXTENT PERMITTED BY LAW. IN NO EVENT SHALL ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE EXCEED THE TERMS OF THE APPLICABLE WARRANTY STATED ABOVE AND AIRXCEL COMMERCIAL GROUP SHALL HAVE NO OTHER OBLIGATION OR LIABILITY. IN NO EVENT SHALL AIRXCEL COMMERCIAL GROUP BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OR MONETARY DAMAGES.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE-TO-STATE. Some states do not allow limitations or exclusions, so the above limitations and exclusions may not apply to you.

09/2017 Rev.5
Supersedes 06/2004

APPENDIX D PROCEDURE FOR FILING A WARRANTY CLAIM

156 Seedling Drive • Cordele, GA 31015 • P.O. Box 400 • Cordele, GA 31010-0400
Phone 800-841-7854 • 229-273-3636 • Fax 229-276-1479 • Svc Pager 800-204-8210

MARVAIR SERVICE REQUEST / PURCHASE ORDER FOR SERVICE

DATE RECEIVED	TIME NOTIFIED	DATE DISPATCHED	TIME DISPATCHED	CUSTOMER PO#	MARVAIR SERVICE PO #
		Marvair Use	Marvair Use		Marvair Use

Person requesting service:_____

Company requesting service:_____

Phone #:_____ Fax #:_____

Site Information:

Point of Contact:_____ Company:_____

Phone:_____ Alt. Name & Phone:_____

Site Address:_____ Site# / Bldg# / Name:_____

City:_____ ST._____ Zip:_____

Site Access Information:_____

Equipment Repair Information:

MODEL #	SERIAL NUMBER	NATURE OF PROBLEM

Marvair Use - Service Company Information:

Service Company:_____ Contact:_____

Phone #:_____ Fax:_____

Address:_____ Labor Rate:_____

City:_____ ST._____ Zip:_____

If included here, please review and sign our service centers Warranty Policy Information/Agreement then fax back to 229-273-5154. Invoices will be paid in accordance with Labor Allowance Guidelines included with this PO. Failure to follow these guidelines and labor allowances may result in delayed payment. All over time work must be approved in advance. All times allowed for entry into the refrigerant circuit include evacuation, recharge, refrigerant and drier change. Service centers are required to notify Marvair if site travel will exceed 1 hour each way – additional travel time must be approved in advance. Detailed invoices or service tech call sheet/work orders are required to be submitted with invoices for payment. Service Tech's should document work in detail and include/verify model(s) and serial number(s) of the equipment and include Marvair's PO on all documentation. Marvair will provide contractors with warranty replacement parts for service calls please contact us at 800-841-7854.