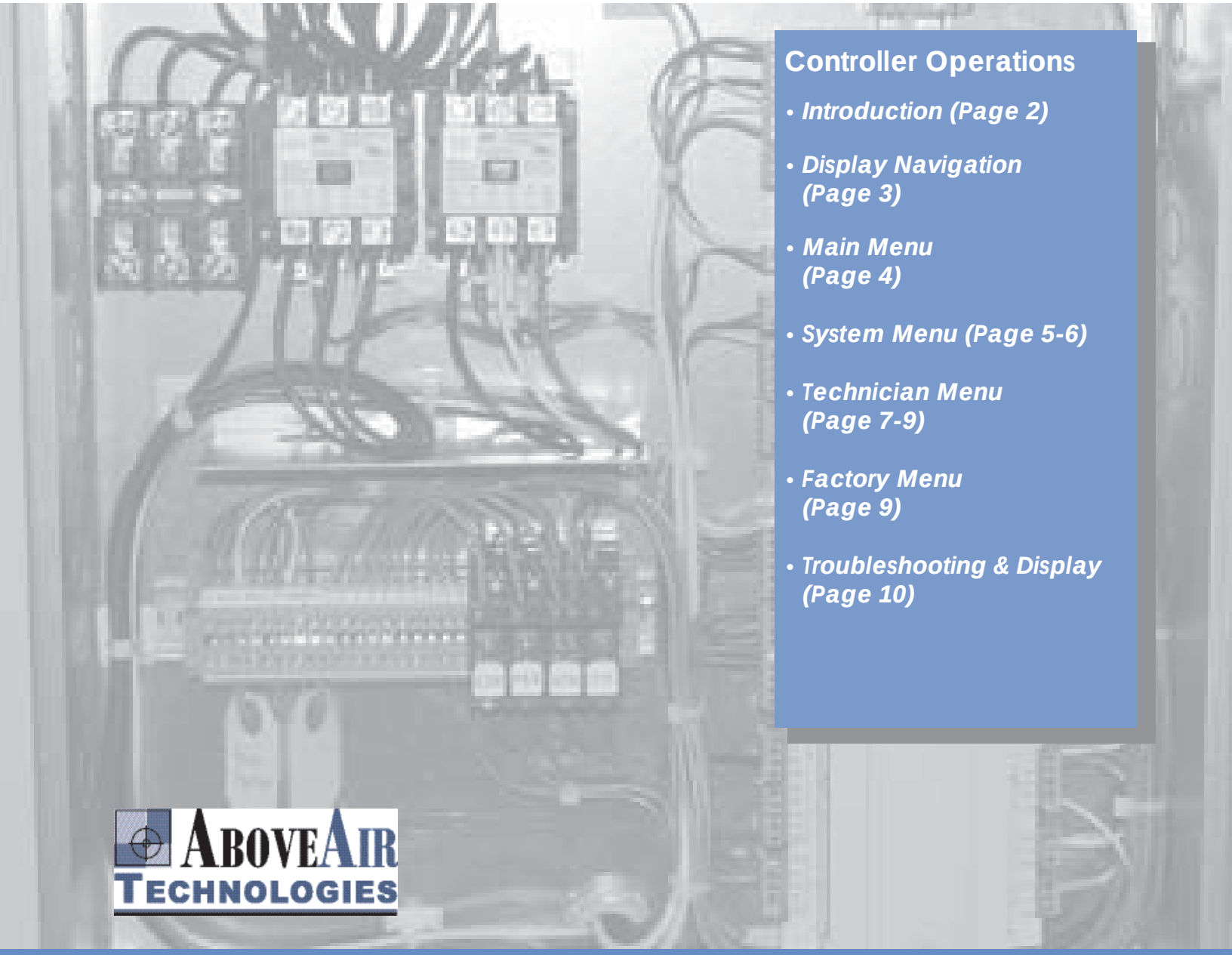
Operations Manual

MC-2000, 3000, & 4000

Advanced Microprocessor Controls

HVAC Controller Operations Manual

Ver 2.1 / May 1, 2013



Controller Operations

AboveAir Technologies

MC™-Advanced Microprocessor Control

This manual has been provided as one component of the documentation package for your equipment. The product data sheet and unit wiring diagram should be referenced for specific features and performance information. Refer to the unit's wiring diagram and other supplemental manuals for sensor placement and wiring information.

Applications

Your unit is configured with one of the following sequences of operation. Refer to the product data sheet to determine the control scheme used for your unit.

- **MC-2000 Series**: Comfort and Mission Critical
  MC-2000T: Temperature Control
  MC-2000H: Temperature and Humidity Control
- **MC-3000 Series**: Make-Up Air Control
  MC-3000N: Neutral Air Control
  MC-3000P: Primary Space Control
- **MC-4000**: Leaving Air VAV Control

Standard Functions

The full-featured AboveAir Technologies HVAC control program is designed for versatility and customizability. Notable standard features include:

- Four levels of password protection.
- Up to 4 digital or one analog (0-10 VDC) stage of cooling.
- Up to 4 digital or one analog (0-10 VDC) stage of heating.
- One digital or one analog (0-10 VDC) stage of preheat.
- Digital or analog (0-10 VDC) humidifier control.
- Up to 3 programmable alarm relays (subject to available outputs).
- BMS capable (with the purchase of an optional serial card).
- Alarm History for the 60 most recent alarms.
- Minimum and maximum sensor tracking for 30 days.

Main Control Board

The pCO main control board is based around a 16-bit microprocessor dedicated to the execution of the AboveAIr Technologies HVAC control program. The program and all of its parameters are saved permanently in onboard in FLASH memory to prevent data loss (without requiring battery backup) in the event of a power failure. The main control board is typically mounted in the electrical box.

Refer to the wiring diagram for the specific pCO model number installed in your unit.

Display Terminal

A pGD user interface is provided with every MC-2000, MC-3000, or MC-4000 equipped AboveAir unit. This display terminal may be shipped loose for remote mounting or pre-mounted on the unit. The display terminal allows the user to setup the unit, to change settings, and to view the current operating status. Each display terminal is equipped with an alarm buzzer; any system malfunction will cause an audible alarm to alert the user that the unit is in an alarm status.

Note: the pGD user interface is not a thermostat and contains no sensors. It may be mounted in the mechanical room, in the space served by the unit, or left in the electrical box depending on the project requirements.

Refer to Figure 1 for the display terminal layout and instructions for navigating the system display.

Changing the Terminal Address

AboveAir Technologies tests the terminals with the unit and ships them pre-programmed for the specific application. In the event that the terminal address must be changed, press and hold the up, down, and enter arrows simultaneously until the display changes to the network address screen (approximately 3 seconds). The display address should be set to 32 for a single installation. For networked units, refer to the supplemental pLAN document for wiring requirements and terminal setup directions.

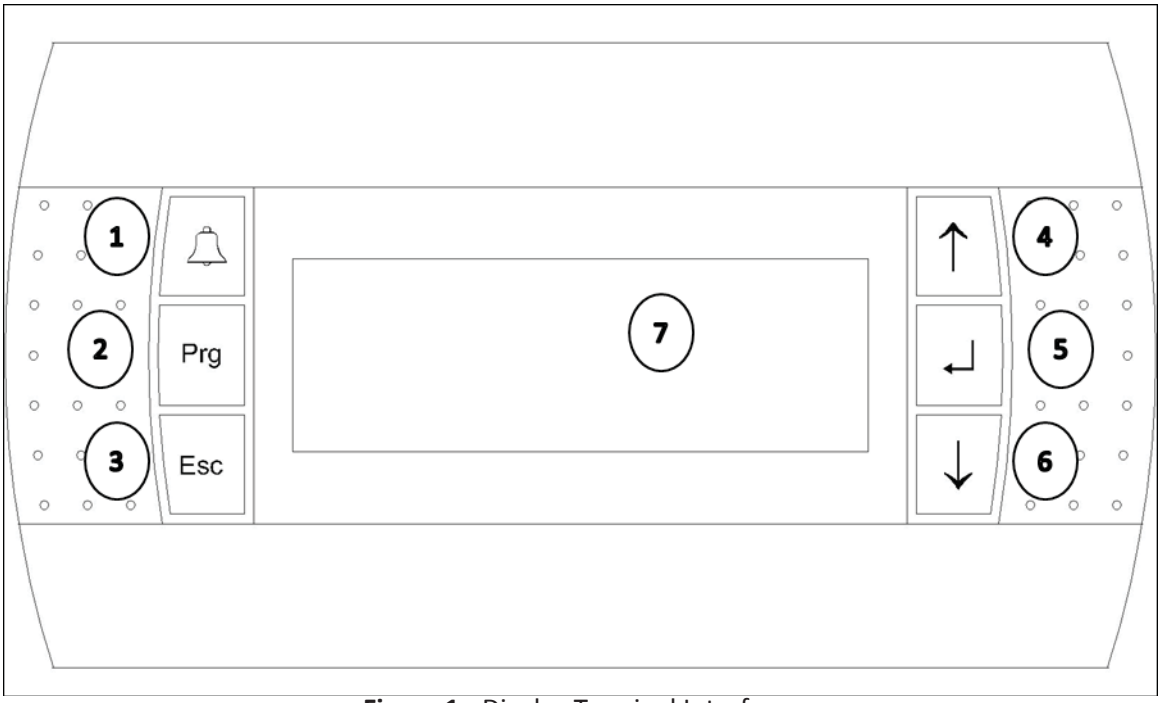


Figure 1 - Display Terminal Interface

Navigating the Display

1. The Alarm button, located at the top left of the display, is used to access current alarms. If the system is currently in alarm, the display buzzer will be active and the alarm bell on the button will be lit with a red LED.

   Press the Alarm button to access the alarms and silence the buzzer. Use the Up/Down buttons to scroll through the active alarms. After determining the cause of the current alarms and resolving the issues with your system, scroll to the screen stating "End of Alarms - Press Enter to Clear." Press Enter to clear the current alarm state. The system can then be re-enabled and resume normal operation.

2. The Program button, located at the center left of the display, is used to access the menu screens. From the system home screen, press the Program button once to access the main menu. The menu options will be described later in this manual.

3. The Escape button, located at the bottom left of the display, is used to move back one menu level while accessing the menu, or to abandon changes when a system point is selected.

4. The Up arrow button is used for several functions. On the menu screens, the Up button moves the black bar indicating the current selection. If a flashing cursor is in the top left hand corner of the screen, the Up button can be used to access additional screens within that menu section. If the flashing cursor has been moved to select a system point, the Up button will increase or change the value of the selection.

5. Like the arrow buttons, the Enter button is used for several functions. On menu screens, the Enter button will select the option highlighted by the black bar. If the flashing cursor is located in the top left hand corner of the screen, the Enter button will move it to the first selectable field. If the flashing cursor is on a selectable field, the Enter button will confirm the value currently shown and move the cursor to the next selectable field, or return it to the top left hand corner of the screen if no fields remain.

6. The Down arrow button duplicates the function of the Up button, only decreasing or moving in the opposite direction.

7. The 120x32 backlit display area provides the means of communication with the microprocessor based controller installed in your unit.

Security Levels

The controller software utilizes four levels of security. System features are organized to protect vital system functions, while making frequently accessed options easily available for technicians and building personnel.

Main Menu - This menu allows access to system histories, statuses, and clock features. These features can be accessed without affecting system operation.

System Menu - Basic features, such as set points, deadbands, and system enables are contained within the system menu. These features control system function and may be password protected to prevent unauthorized access, if desired. By default, this level is not password protected.

Technician Menu - This menu allows a qualified service technician to adjust sensor calibration, setup communication options, and to modify other parameters associated with the control of the unit. Because these items are accessed infrequently and should only be accessed by a qualified service technician, this level is password protected by default (0002).

Factory Menu - The factory menu contains I/O settings and fundamental controls setup. Changing factory level settings can cause improper unit operation and may void system warranties if altered without the guidance of factory technical support. This menu is password protected by default; contact technical support if you believe you require access.

Main Menu

The main menu (shown below) is the entry point to access the functions described in this manual. Each of the items shown in the main menu will be discussed in this section.

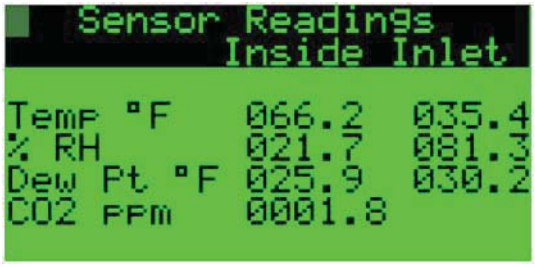
System Status

The main system status screen is displayed during normal unit operation. The current unit status (on/off) and operating mode(s) are displayed, in addition to the current temperature (room or supply air, depending on sensor configuration), and temperature set point.

Sensor readings for all installed sensors are displayed on the second screen under this section. Sensor labels are set in the Technician Menu.

Alarm History

The alarm history screen displays allows the user to scroll through the most recent 60 alarms recorded by the system. The data and time of the alarm is displayed at the top of the screen and the sensor readings at the time of the alarm are displayed at the bottom.

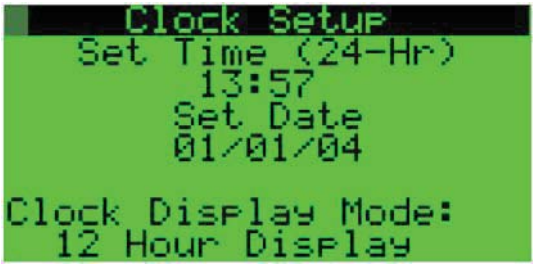


Daily Min/Max

The system logs the daily minimum and maximum sensor readings for the space/supply temperature, relative humidity, and CO2 sensors, if installed. The measured extremes and the times of their occurrences for the most recent 30 days are available.

Clock Setup

Clock setup allows the current time and date to be set. Note that the current time must be set based on 24-hour clock mode. The clock display mode for the home screen may be changed from 24-hour to 12-hour notation here.



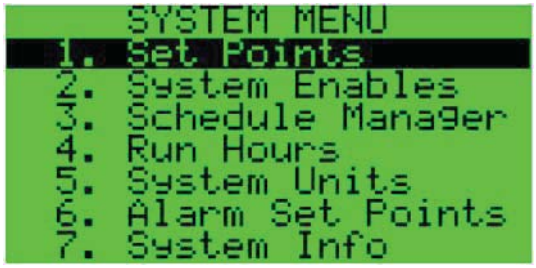
System, Technician, & Factory Menu

These selections allow access to their respective menu levels. If a password is required, you will be directed to enter the password in the screen as shown.

After successfully entering the appropriate password, you will not be required to enter the password again for 5 minutes. After 5 minutes have elapsed, the password must be entered again if you wish to re-enter the menu.

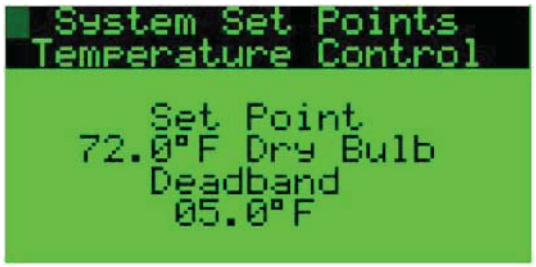
System Menu

The system menu (shown below) contains the functions that control the basic unit operation and configuration.



Set Points

The unit's set points and dead bands are set under this menu. Separate set points and dead bands for temperature, dehumidify, humidify, and preheat control are found here, as well as heat/cool/dehumidify mode selection options, if applicable.



System Enables

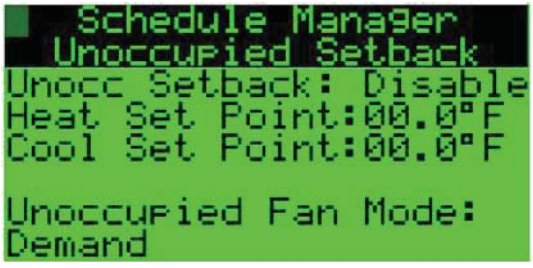
The system enable menu contains the master system enable. In order for the unit to operate in either continuous fan mode or in demand fan mode, this must be set to ON. Each subsystem installed in the unit contains an individual enable, which can be set to AUTO or OFF. AUTO allows the controller's built-in logic to control the device; OFF disables the device.

After a critical alarm, components and/or the master system enable may be turned to the OFF setting and require manual re-enable. Prior to re-enabling any device or the system, always check the system alarms, verify that any issues have been addressed, and clear the alarm.

Schedule Manager

A 7 day schedule can be enabled via the schedule manager. After enabling the system schedule, hours for unit activation/deactivation can be set on the following screens.

Unoccupied setback options are also available within the schedule manager. If unoccupied setback is turned on, the system will operate only to maintain the cool and heat set points set on this screen. The fan can also be set to operate continuously in unoccupied mode, if required for ventilation.



Run Hours

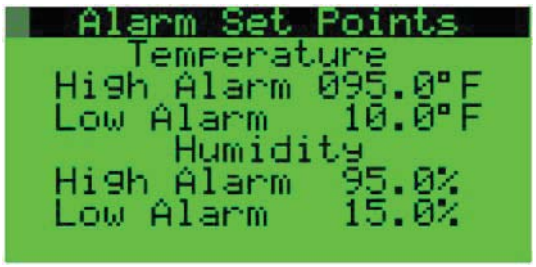
Run hours for each system component is displayed here. If used to track maintenance, the run hour timers can be reset each time maintenance is performed.

System Units

System units allows the unit display temperatures in either degrees Fahrenheit or Centigrade.

Alarm Set Points

Set points for high and low temperature (based on supply or room temperature sensor), high and low humidity (based on supply or room temperature sensor), and high CO2 (based on space CO2 sensor) alarms can be set here. These set points will enunciate an alarm locally, as well as transmitting the alarm to the BMS, if selected and applicable.If the unit is set to operate in unoccupied mode, ensure that alarm set points are set beyond the points used for setback to avoid nuisance alarms.



System Info

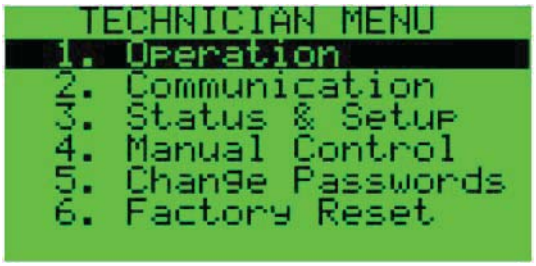
The system BOOT, BIOS, and software version are displayed on this screen. When contacting AboveAir for technical support, it is important to note this information so the support staff can be aware of the software version your unit uses and any special programming that was performed for your application.

Technician Menu

The technician menu (shown below) contains the functions that control the basic unit operation and configuration.

Operation

The operation sub-menu contains functions relating to fan and economizer control.



Fan Control

The fan control menu allows operation parameters for the fan to be set.

The fan can be set for continuous or demand mode. In continuous mode, the fan will always operate. In demand mode, the fan will only operate if the system set points are calling for heating, cooling, humidification, or dehumidification.

Fan start delay creates a delay before the fan initiates operation to allow dampers, pumps, or other auxiliary components to activate prior to operation. Heat purge delay allows the fan to continue to operate to cool heaters prior to shut down.

AF Alarm delay creates a delay on the airflow alarm; the alarm can be set to either shut the system down or simply enunciate the alarm.

Analog fan control, if routed through the microprocessor, can be set to work on CO2 demand, static pressure demand, or maximum temperature demand.

CO2 Control

If the system is set to utilize CO2 control through the microprocessor, then the CO2 set point and operation mode (analog damper, analog fan, or on/off control) can be set here.

Airside Econ

If the system is set to utilize built-in airside economizer control, the airside economizer menu allows economizer operation to be set for differential enthalpy or dry bulb mode. Low limit economizer lockout can also be set here.

Waterside Econ

If the system is set to utilize the built-in waterside economizer control, then the waterside economizer set point and operation mode can be set here.

Communication

The communication sub-menu contains settings for communication between a building manager system and for networking muliple units through a pLAN network.

BMS Options

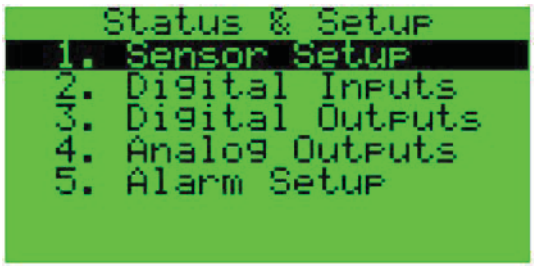
BMS options set the parameters for communication between the microprocessor and the factory-supplied serial card (if applicable). Communication is available through Bacnet, Modbus, or LonWorks protocols at a variety of baud rates. Refer to the BMS setup document and points list for setup information.

Network

The network options control communication and system rotation across a pLAN network. Refer to the pLAN setup document for information about the controls contained in this menu.

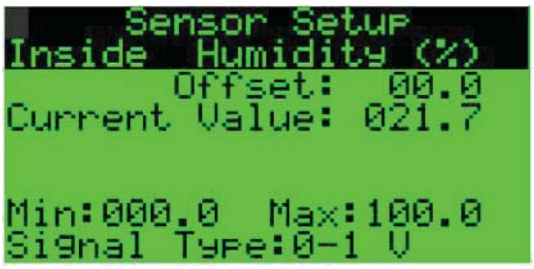
Status & Setup

Information regarding sensor and relay setup options and the current operating status of the system components can be accessed from the options here.



Sensor Setup

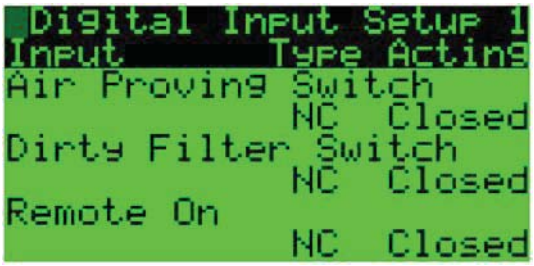
Sensor setup allows calibration offsets to be applied to the sensors, sensor signal type (NTC, 0-1Vdc, 4-20 mA, 0-10Vdc, or 0-5Vdc) to be set, and sensor minimum and maximum ranges to be established.



Note: Inside and inlet sensor names can also be changed on the temperature sensor screens to provide clarity for the end user. The available values for the inside sensor are: inside, supply, room, or return. The available values for the inlet sensor are: inlet, mix air, or OA.

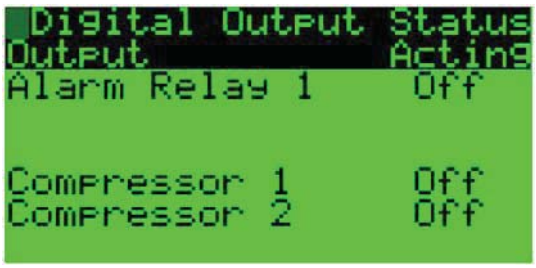
Digital Inputs

The digital inputs menu shows the current status of the digital inputs as detected by the microprocessor. Digital inputs can either be NC (will alarm on open) or NO (will alarm on close) types. AboveAir uses NC type devices and recommends that only NC digital inputs be used with your unit.



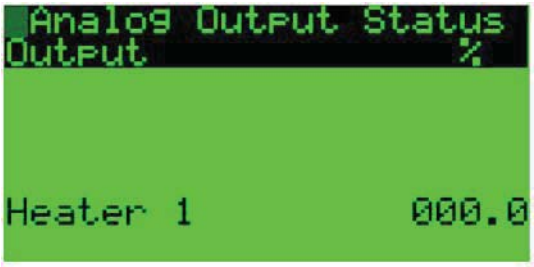
Digital Outputs

The digital outputs menu displays the current active status for the microprocessor's outputs. This display can be used to confirm that the controller is calling for components as expected and assist in troubleshooting.



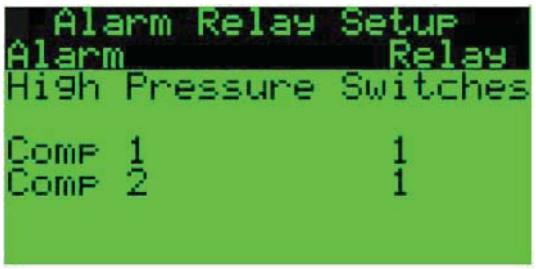
Analog Outputs

The analog outputs menu displays the current output to the analog devices as a percentage of the full range. Note that valves may be set to operate as either direct (0% = 0 V, 100% = 10 V) or reverse (0% = 10 V, 100% = 0 V). Confirm the operation of your valve if using these values to assist in troubleshooting.



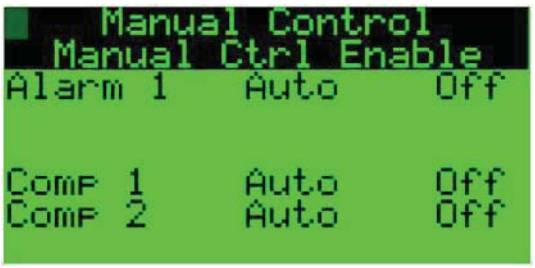
Alarm Setup

Each system alarm can be assigned to one of three different relays or to a combination of three alarm relays. Refer to your wiring diagram to determine the number of alarm relays available on your system.



Manual Control

The components in your unit can be set in either "in-hand" or "auto" mode under the manual control menu. When a component is set to operate in the in-hand mode, it can be manually set to its on or off position. Note that units should not be operated in-hand continuously.



Change Passwords

The system passwords can be changed here. Base Menu and System Menu passwords are not set by default. The Technician Menu has a password of 0002 by default.

Factory Reset

The unit can be reset to factory settings here. Resetting the unit will delete all previous settings.

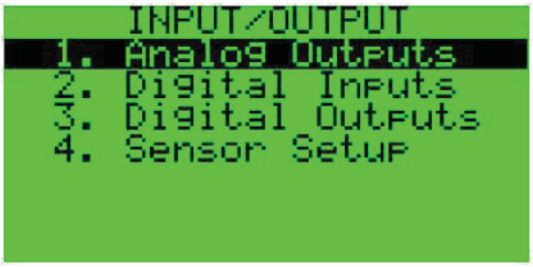
Factory Menu

AboveAir Technologies ships all of its units with the features contained in the factory menu setup according the specific application. The features contained in this menu level are set up at the factory during the test and validation process. All inputs, outputs, and control features are confirmed prior to unit shipment. During the startup process, a qualified technician may need to consult with the factory to adjust PID settings contained within this menu.

WARNING: This section describes the features set in the factory menu and is provided as a reference to assist a technician working in conjunction with factory support. Adjusting settings under the factory menu without the guidance of AboveAir Technologies support staff may result in unsatisfactory unit operation and can void the warranty

Input/Output

The input/output menu is utilized to define the control points for the particular application. These selections are made and tested at the factory in accordance with the requirements of the project submittal. Your unit will utilize only some of the features listed in this section; refer to your unit's wiring diagram and submittal for information on the specific features installed on your unit.



Analog Outputs
The analog output connections on the control board (Y1-Y3 or Y1-Y4 depending on the board configuration) are assigned to the specific components installed in your unit.

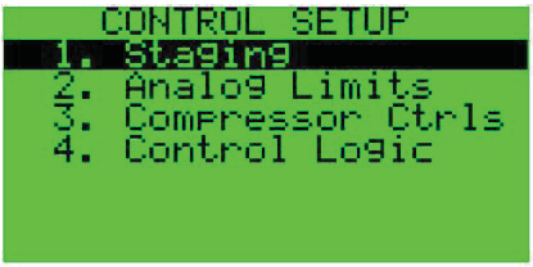
Digital Inputs
The digital input connections on the control board (ID1-6, ID1-ID8, or ID1-ID14 depending on the board configuration) are assigned to the specific components installed in your unit.

Digital Outputs
The digital output connections on the control board (NO1-NO5, NO1-NO8, or NO1-NO13 depending on the board configuration) are assigned to the specific components installed in your unit.

Sensor Setup
The sensor connection on the control board (B1-B4, B1-B5, or B1-B8 depending on the board configuration) are assigned to the specific components installed in your unit.

Control Setup

The control setup menu contains options that determine the fundamental functioning of the unit, include selection of the control scheme, analog limits, and PID settings.



Staging
Control information for staging the unit's digital (on/off) components is contained here. Inlet enable controls, inter-stage differentials, and heat pump set up are factory set based on the information provided through the selection and submittal process.

Analog Limits
Minimum and maximum limits for critical analog components such as hot gas bypass valves or dampers are factory set here.

Compressor Ctrls
Compressor controls contains system settings intended to protect the compressor from poor operating conditions and prevent short cycling.

Control Logic
The control logic for the system is factory set here. Included in this menu are the control scheme selection, PID control parameters, analog on/off settings.

Change Passwords

All passwords, including the factory level password, can be viewed and changed here. Note that if changes are required to the default technician or factory passwords, you must carefully note them - AboveAir will not have a record of these values if you call in for technical support.

Default Setups

Default setups are used by the factory personnel to assist in programming the units.

Save Settings

After the unit has been programmed, AboveAir saves the factory settings so that they can be restored (via the Factory Reset function under the Technician Menu) in the event of tampering with settings in the factory or technician menu.

TROUBLESHOOTING & DISPLAY INFORMATION

PROBLEM	POSSIBLE CAUSE	CHECKS & SOLUTIONS
No Power to Display	No power to unit	Check disconnect position; refer to IOM for other power issues.
	Cord not attached	Verify 6-pin connector is firmly attached to both display terminal and controller.
	Cord is damaged	Verify cord was not pulled by plastic connector.
	Controller fuse is blown	Check fuse and replace.
Screen is blank but powered	Verify terminal address	Hold up, down, and enter simultaneously. Terminal address should be 32 or match pLAN Network Address (refer to pLAN manual)
	Cord is damaged	Verify cord was not pulled by plastic connector.
Unit off by Keypad	Unit locked out by alarm	Verify that there are no active alarms prior to re-enabling unit.
	System controlled by BMS	Verify that the BMS is not writing to the system enable point.
	Unit shut down by manual control	Check system enables.
No Cooling, Heating, or Humidification	No system calls	Verify system set points and deadbands. Adjust as required.
	System controlled by BMS	Verify BMS is not locking out system operation.
	System/components locked out from automatic control	Verify that there are no active alarms. Check system enables to re-enable system components.

SYSTEM MODE DISPLAY	MEANING
Off by Keypad	System turned off in System Enable submenu
Off by Sched	System is in unoccupied mode
Off by BMS	System deactivated by building management
Off by pLAN	System deactivated by network
Off by Interlock	Interlocked device failure
Off by Dig Input	Remote On/Off in off mode
No Dmnd	Demand fan mode - no current demand
Fan Delay	Fan delay prior to system activation
Fan On	Fan is currently on
Deh	Dehumidification active
Heat	Heating active
Cool	Cooling active
Hum	Humidification active
Rht	Reheat active

Innovative HVAC Solutions

AboveAir Technologies

Ceiling Air Conditioners

SpotCool™ - 2x4 T-Bar "Spot-Cooler" Comfort & Precision Ceiling Mounted A/C's

HK™ Horizontal - Hi-Static Ducted "Same-Face" Comfort & Precision Ceiling Mounted A/C's

HK-OA™ - Horizontal Up to 100% DOAS High-Percentage Outside Air Ceiling Mounted A/C's

Floor Air Conditioners

VK™ Vertical - SCAV, Vertical Floor Mounted Self-Contained & Split Comfort Constant Air Volume and Variable Air Volume (VAV) A/C's & Heat Pumps

VK-OA™ - Vertical Up to 100% DOAS High- Percentage Outside Air Vertical Floor Mounted A/C's

MissionCritical™ - Precision Vertical Floor Mounted Computer Room A/C's

VK™ Console - Vertical Floor Console Mounted Self-Contained & Split A/C's & Heat Pumps

Remote Heat Rejection

FluidCool™ - Indoor & Outdoor Remote Glycol Drycoolers

PumpAll™ - Single, Dual & Triplex Standard & Variable (VFD) Speed Glycol Pump Packages

2x4 "Spot-Cooler" Ceiling Mounted A/C's
(1 to 3 Tons)

Ducted "Same-Face" Ceiling Mounted A/C's
(1 to 30 Tons)

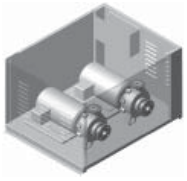
Comfort - Packaged & Split Vertical Floor Mounted Air Conditioners
(1 to 30 Tons)

Precision - Vertical Floor Mounted Computer Room Air Conditioners
(1 to 30 Tons)

VK-Console™ **- Up-Flow & Down-Flow Floor Console Mounted Air Conditioners**
(1 to 5 Tons)

Remote Air Cooled Condensers, Condensing Units & Glycol Drycoolers
(1 to 180 Tons of THR)

Single & Dual Glycol Pump Packages
(1/2 to 50 HP)



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