

# **OPERATION AND MAINTENANCE MANUAL**

## **DATAGUARD 4.0 TECH COOL SERIES MICROPROCESSOR CONTROLLER PL800162 March 6, 1996**

This manual provides information for installation, operation and preventative maintenance. The user should observe the guidelines and procedures presented herein to promote satisfactory performance.

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## **NOTICE**

This controller is specifically designed for special applications described in this manual. It will provide years of service if it is installed, operated and maintained in accordance with these instructions. Damage to the unit from improper installation, operation or maintenance is not covered in the warranty.

STUDY the instructions contained in this manual. They must be followed to avoid difficulties. Spare parts are available from AIRFLOW COMPANY, and it is the responsibility of the user to have an ample supply of parts available to ensure continuous unit operation. Using substitute parts or bypassing electrical components in order to continue operation is not recommended and will **VOID THE WARRANTY**.

The following are not manufacturing defects or results of manufacturing defects and are not covered by the AIRFLOW COMPANY factory warranty; they are the responsibility of the owner:

- 1) Damage resulting from handling during installation or damage resulting from transportation.
- 2) Incorrect or fluctuating power supply.
- 3) Operation outside of the operating conditions as specified in this manual.
- 4) Inaccessibility of the unit for service or parts installation that prevents the equipment from operating with an adequate supply of air or water.
- 5) Damage resulting from the use of the unit in a corrosive atmosphere.
- 6) Damage caused by not cleaning or replacing filters.
- 7) Damage caused by accident, alteration of the unit design, or tampering.

## **FACTORY FIELD SERVICE**

**AIRFLOW COMPANY** maintains a competent technical service group to assist our customers in any maintenance, service or repair problems which might arise. For information regarding factory assistance, call or write to:

AIRFLOW COMPANY  
295 Bailes Lane  
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**WARRANTY**

We warrant that your Airflow Company product shall be free from defects in materials manufactured by us and in our workmanship for a period of two (2) years following shipment (the "Warranty Period") for new equipment and ninety (90) days following shipment for spare parts. This limited warranty shall apply only in favor of Buyer, shall expire on the last day of such two (2) year or ninety (90) day period, whichever the case may be, and shall be subject to the following:

- (a) This warranty shall not apply to Goods which have been (i) repaired or altered by any Person other than Airflow Company; (ii) subjected to unreasonable or improper use or use beyond rated conditions, improper storage, negligence or accident; (iii) damaged because of use of the Goods, or the incorporation of any Goods into or use of any Goods with other materials or equipment after Buyer (or any other Person using the Goods has or reasonably should have knowledge of any defect; (iv) manufactured, fabricated or assembled by any Person other than Airflow Company (We shall assign to Buyer, to the extent same is assignable, any warranty we have received from the manufacturer of such Goods); or (v) improperly installed by any Person (including Buyer) other than Airflow Company.
- (b) This warranty shall not be effective unless we receive a written claim within thirty (30) days after discovery of any defect with respect to which a claim is made.
- (c) Airflow Company shall have the right (but not the obligation) to verify, with its own representatives, the nature and extent of any claimed defect prior to return of the Goods to us. Upon request by Airflow Company, Buyer shall, at its own risk and expense, promptly return the Goods in question to our Plant in Frederick, Maryland.
- (d) Buyer covenants to inform all subsequent buyers of the Goods of the limitation on and exclusion of warranties provided for herein. Buyer hereby indemnifies and agrees to hold Airflow Company harmless from and against all losses, costs and expenses, including reasonable attorney's fees, incurred by Airflow Company as a result of any third party claim relating to the purchase, sale or use of, or otherwise relating to, the Goods covered by this Agreement.
- (e) Airflow Company's liability for any breach of warranty shall be limited either to (i) repair or replacement (whichever we shall elect) at our Plant of any Goods determined by us to be defective, or (ii) payment of an amount equal to the invoiced cost to Buyer of the part or material which is defective, as we may elect. In no event shall Airflow Company be required to repair, replace or reimburse Buyer for more than the part or material that is found to be defective and Airflow Company's liability shall in no event be greater than the invoiced price of the items and shall not include labor, shipping or other costs incurred in connection with the reshipment of defective Goods to us or the reinstallation of such Goods after any repair or replacement. The Goods, as a whole, shall not be construed to be a "part" or "material" for the purpose of the immediately preceding sentence. Any Goods that are repaired or replaced by us shall be re-delivered to Buyer F.O.B. our Plant and shall be warranted for the remaining term of the original Warranty Period for such Goods. THE REMEDY SET FORTH IN THIS PARAGRAPH IS EXPRESSLY AND AGREED TO BE THE SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.
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## I. INTRODUCTION

The DataGuard 4.0 microprocessor based control system is the nerve center of the air conditioning unit.

The DataGuard 4.0 microprocessor system has been designed with the needs of the engineer, operator, owner and installation in mind. It encompasses a wide array of innovative features designed to make it easy to use and reliable to the user.

Although it ultimately controls temperature and humidity, the DataGuard 4.0 monitors and controls many internal and external functions. Some of the parameters controlled or monitored are temperature and humidity setpoints, multiple stages of heating, cooling and humidification, input power, delays, run time history and alarm status.

The display shows the actual temperature and humidity and all current active functions such as heat, cool, dehumidify and humidify, setpoints, alarms, and parameter modifications using a series of easily accessed menus.

The controller retains configuration information in a nonvolatile memory which can be accessed and changed by using a password.

### A. Features

#### Easy to Read Display

The DataGuard 4.0 control system is a microprocessor based control system with a 4 line by 20 character back lighted LCD alphanumeric display. The panel displays all controller functions and alarms as well as operator instructions.

#### Field Programmable

The DataGuard 4.0 microprocessor can be field programmed all configuration selections; the user can match the unique needs of any conditioned space simply by following the prompts built into the controller.

#### Operator Instructions

The DataGuard 4.0 uses text for display - no look up tables or additional equipment are needed.

#### Run Times

The DataGuard 4.0 keeps track of the actual running hours of all the motor devices and operational cool times. These hours are displayed on demand. The microprocessor also notifies the operator that maintenance is due at preset times. This benefit helps keep the environmental control equipment in peak condition to minimize down time.

#### Security

The flexibility, reliability and control offered by the DataGuard 4.0 microprocessor is extensive. However, these benefits need to be reserved for operators that understand their proper use. DataGuard 4.0 provides 2 levels of restricted entry into the configuration options to ensure that the operating parameters are not changed by unauthorized operators.

### Nonvolatile Memory

The DataGuard 4.0 is equipped with a nonvolatile memory that retains the current configuration and alarm status in the event of a power loss.

### Alarm Control

The controller can have up to twelve (12) external inputs/alarms which are defined by internal programming. In addition to these 12 digital inputs, internal alarms are provided for high and low return air temperature and humidity, loss of power and low voltage as well as up to 4 additional analog sensors as needed.

In the standard Tech Cool configuration, the external inputs/alarms are system enable, smoke monitor, fire monitor, water detector, airflow, filter, compressor low and high pressure fault, change humidifier canister, and water flow. In the event of a fire or smoke alarm, the unit is shut down. In the event of an airflow alarm, the unit is shut down except for the blower.

Upon receipt of any alarm, the alarm condition is displayed along with suggested operator actions to be taken. An audible alarm is also generated.

Custom alarm messages may be programmed. Consult the factory on your special alarm needs.

### Setpoints

Adjustable setpoints for temperature, humidity, temperature band, humidity band, high temperature alarm, low temperature alarm, high humidity alarm and low humidity alarm are made through configuration options. The alarm setpoints are adjustable as a function of the band selected and vary as the setpoint is varied. The controller automatically computes the reasonable alarm setpoint ranges based on the actual setpoint and band.

### Cool Inhibit

All cool functions are automatically inhibited in the event that the temperature drops 4° below the heating setpoint and dehumidification is called for. Cooling functions are automatically restored when the temperature returns to the heating setpoint. During inhibit, the controller displays "COOL INH".

### Short Cycle Protection

The controller prevents the compressor from starting in less than a user settable interstage delay after its last operation.

### Small Room Operation

If selected, this feature inserts a time delay between heat and cool cycles to prevent excessive cycling. The time delay is adjustable.



Temperature Display Mode

The controller may be configured to display all temperature readings in degrees Fahrenheit or Celsius.

Common Alarm Output

The controller has available at the field wiring connector a dry contact that will activate if an alarm was programmed to activate it. The contact closes upon the receipt of the alarm and opens when the alarm has been acknowledged.

Interstage Delay

The interstage delay between stages of heat and cool is field adjustable.

Hydronics Sensors

The controller can monitor and use temperature sensors on optional chilled water and hot water supplies in determining if it is sensible to use chilled water for cooling or hot water for heating. It also provides for high and low alarm functions on these inputs.

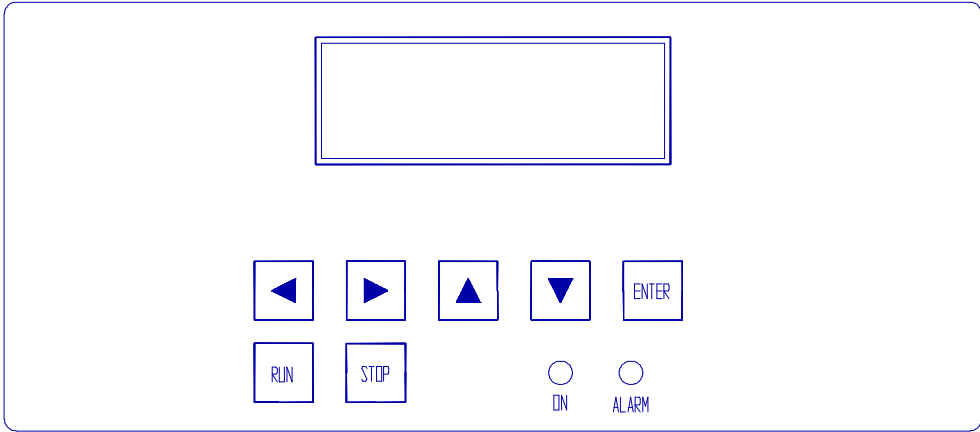
C. Specifications Summary

Note: Values do not reflect the capability of the equipment to achieve the control values, only what the controller itself can perform. The values listed below are designed to cover standard as well as equipment designed for special applications. Consult the factory or your representative for specific control range values for the actual equipment.

Control Temperature Range:	55.0° to 80.0°F or 12.7° to 26.6°C
Control Temperature Resolution:	0.1°F
Control Temperature Tolerance:	1°
All Temperature Inputs:	NTC, 10K
Control Humidity Range:	30.0% to 70.0% RH
Control Humidity Resolution:	0.1%
Control Humidity Tolerance:	3%
Control Humidity Input:	0-1 volt or 4-20ma
Number of Compressor Stages:	1 maximum
Number of Heater Stages:	3 maximum
Operating Temperature Range:	0° to 50.0° C
Input Power:	24 VAC ± 3V @ 30VA

**DataGuard 4.0 Tech Cool Series O & M**

**March 6, 1996**



**Figure 0**  
DataGuard 4.0 Front Panel

### III. GETTING STARTED

#### A. Display and Switches

The DataGuard 4.0 displays messages on the 4 line by 20 character alphanumeric display on the front panel (see Figure 1). The display is used to show the operating conditions of the air conditioning unit, any alarms that may be present and prompting the operator through all steps required to configure the system. There is a cursor in the form of an underline indicating the field currently selected. If the cursor is in the upper left hand corner of the display, no field is currently selected. A green LED labeled ON is on the display panel indicating the unit is in the run mode. The fan may or may not be running, depending on internal delay timers. A red led labeled alarm indicates an alarm condition exists if it is illuminated. Also on the front panel are three keys labeled **RUN**, **STOP**, **ENTER**, and four arrows keys, **UP**, **DOWN**, **LEFT** and **RIGHT**.

**RUN** is used to start the unit locally when it is in the UNIT STOPPED mode.

**STOP** is used to stop the unit locally when it is in the UNIT RUN mode. This shuts down the outputs and puts the unit into the UNIT STOPPED mode. The controller remains powered up and to communicate with the monitoring system if that feature is used. The unit cannot be started from the monitoring system when it is in the UNIT STOPPED mode.

**ENTER** is used to acknowledge alarm conditions and lock in selections when making changes to the configuration. It is also used to enter into menus and to move to the next modifiable field in a menu.

The **LEFT** arrow key is used to move to the previous menu if the cursor is in the upper left hand corner or to move the cursor left in a numeric field.

The **RIGHT** arrow key is used to move to the next menu if the cursor is in the upper left hand corner and to move the cursor right in a numeric field.

The **UP** arrow key is used to immediately move to the MAIN MENU if the cursor is not in a modifiable field. When the cursor is in a field that can have one of two values, it toggles the value (such as between OFF and ON). In a numeric field, it increments the digit the cursor is underlining. Note that a 9 is incremented to a 0. No other digits are modified even on the wrap from 9 to 0. If the cursor is at the sign digit on signed numbers, it toggles the value between positive and negative. No + sign is displayed on positive numbers, but negative numbers have a - sign in front of them. Also note that the DataGuard 4.0 will not allow a negative sign to be placed on a value of 0.

The **DOWN** arrow key is used to immediately move to the Alarm menus if the cursor is not in a modifiable field. When the cursor is in a field that can have one of two values, it toggles the value (such as between OFF and ON). In a numeric field, it decrements the digit the cursor is underlining. Note that a 0 decrements to a 9. No other digits are modified even on the wrap from 0 to 9. If the cursor is at the sign digit on signed numbers, it toggles the value between positive and negative. No + sign is displayed on positive numbers, but negative numbers have a - sign in front of them. Also note that the DataGuard 4.0 will not allow a negative sign to be placed on a value of 0.

#### C. Menus and Fields

The DataGuard 4.0 screens are structured as a system of menus. Selecting a menu may present another layer of menus or individual screens displaying information that may or may not be modifiable. Movement from screen to screen is done by using the **LEFT** and **RIGHT** arrow keys. Menus are entered by pressing the **ENTER** key when the screen is showing the menu title screen. A menu title screen shows the menu name and instructions to use the **LEFT**, **RIGHT** and **ENTER** switches. The exception is the Main Menu screen. The Main Menu is the top menu, showing six selections.

```
*****  MENU  *****
>STATUS      SECURITY
  ALARMS      CONFIGURE
  SETPOINT    RUN HOURS
```

By using the **RIGHT** or **LEFT** arrow key, the cursor can be moved from one selection to another. Pressing the **ENTER** key will change the screen to the selection indicated by the cursor. The six selections are:

1. STATUS - where a series of screens show the status of critical points.
2. SECURITY - where passwords can be modified (password protected).
3. ALARMS - where current alarms can be viewed.
4. CONFIGURE - where options and all setpoints can be modified (password protected).
5. SETPOINT - where the temperature and humidity setpoints can be modified (password protected).
6. RUN HOURS - where accumulated run hours can be viewed.

When a screen is displayed that contains modifiable fields, pressing the **ENTER** key will move the cursor to the next field in the screen.

#### E. Modifiable Fields

##### 1. Binary Fields

If a field is one that can have one of two values, pressing the **UP** or **DOWN** arrow key when the cursor is on that field, will cause the value of that field to be toggled to the other value.

##### 3. Numeric Fields

Numeric fields can be signed or unsigned, as well as integer or analog. Signed fields can have positive or negative values. Unsigned fields can have only positive values. Integer fields can have only whole numbers, that is numbers such as 1, 2, 10, and 999. Analog fields can have fractional values and will have a decimal point in the display. The decimal point cannot be moved. Examples of analog field values are 0.00, 81.3 and -7.0. The cursor moves to the left hand digit or the sign digit when **ENTER** is pressed to go to the next field. The cursor can be moved back and forth in the numeric field with the **LEFT** and **RIGHT ARROW** keys. The value of the digit underlined by the cursor can be incremented and decremented with the **UP** and **DOWN ARROW** keys.

#### G. Initial Conditions

### 1. Power up Screen

At power up, the display shows an initial message identifying the program. For instance, in CG units, the message is:

```
DataGuard 4.0  
Airflow Company  
Tech Cool 4001  
Version 1.07
```

This message remains on the display until a key is pressed. The last two lines contains information that is useful when calling the factory for service. The 4 digits after TC Series contain information about the software. The first digit (2) indicates this is DataGuard 4.0 software (versus DataGuard 3, or 3.2 software). The second digit is the display language with 0 for English, 1 for French and 2 for Spanish. The remaining two digits indicate the device this software is designed to control: 1 is for the Tech Cool series, 02 is for the CG series and 03 is for chilled water units. Other numbers are assigned as special applications are accommodated. The Version (1.00) on the bottom line may be different and reflects changes that may have been made in the software.

### 3. Handling Alarms

New alarms cause the ALARM LED to be illuminated and the alarm buzzer to sound. Alarms are not automatically displayed and must be explicitly requested to be displayed by pressing the **DOWN** arrow key when the cursor is not on a modifiable field. When the **DOWN** arrow key is pressed, the first existing alarm condition is displayed. For instance, if the Power Loss alarm is enabled at power up, the alarm buzzer will sound, the ALARM LED will illuminate and the display will change to the following when the **DOWN** arrow key is pressed:

```
***ALARM***  
POWER LOSS  
  
ENTER TO RESET
```

This is an alarm condition indicating that a power loss has occurred. To reset this alarm, press the **ENTER** key. If there are no more alarms, the display will then show:

Security Access

Enter DataGuard 4.0 Tech Cool Series O & M  
0000

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```

**No More Alarms**
Press ENTER to
Silence Alarms

```

If there are alarms that still exist and the alarm buzzer is on and it is desired to silence the buzzer, press **ENTER** when this screen is displayed and the alarm buzzer will stop. Pressing **ENTER** on an alarm screen while the alarm still exists will re-enable the alarm buzzer. The alarm LED will stay illuminated as long as any alarm condition still exists.

#### I. Display During Key Inactivity

Key inactivity will cause the display to step through the screens in a predetermined order. The display will step back to the Main Menu one screen every 60 seconds. Once at the Main Menu for 60 seconds, the display will change to the default screen showing the cooling and heating setpoints.

```

Heat/Cool Setpoints
Cool      72.0°F
Heat      70.0°F
^ for Main Menu

```

If an alarm screen is shown, the display steps through the remaining alarms every 20 seconds to the NO MORE ALARMS screen and then to the Main Menu.

#### K. Changing the Setpoints

To change the setpoints, Press the **UP** arrow key at any screen when the cursor is at the upper left hand corner. If the cursor is not at the upper left hand corner, press the **ENTER** key until it is. At the Main Menu, press the **RIGHT** arrow key until the cursor is beside the SETPOINT selection, then press the **ENTER** key.

If password protection is enabled for the setpoints, this screen will appear. Press **ENTER** to move the cursor to the password field and use the **LEFT**, **RIGHT**, **UP** and **DOWN** arrow keys to enter in the correct password. When the correct password is displayed, press the **ENTER** key.

Heat/Dehumidify Setpoints	Cooling Setpoints
Humidify 45.0%RH	45.0°F
Dehumidify 55.0%RH	55.0°F
Heat 70.0°F	

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The screen will now show the cooling and heating setpoints. Press **ENTER** to move the cursor to the field to be modified and use the **UP, DOWN, LEFT** and **RIGHT** arrow keys to move in the field and modify the values. When the value is correct, press **ENTER** to move to the next field. The humidification and dehumidification setpoints are on the next screen. Press the **ENTER** key until the cursor is in the upper right hand corner of the screen and then press the **RIGHT** arrow key to go to the humidity setpoint screen. The **LEFT** and **RIGHT** arrow keys will toggle between the two screens at this point. To return to the Main Menu, press the **UP** arrow key. The microprocessor is provided with automatic setpoint overlap protection. If the cool setpoint is below the heat setpoint the heat setpoint value will be automatically reset to equal the cool setpoint.

The humid/dehumid setpoint screen allows modification of the humidifying and dehumidifying setpoints in the same manner. The microprocessor is provided with automatic setpoint overlap protection. If the dehumid setpoint is below the humid setpoint the humid setpoint value will be automatically reset to equal the dehumid setpoint.

```

Hch:W05FATS60Lu$NHIB
@HHP@D@C@U@H@70.DF@h
H@V@E@Y@D@N@E@A@G@S@O@R@
Humidifier: OFF
    
```

Chill Cool Series O & M

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M. Displaying the Status

The system status is available by entering the Status group of screens from the **Main Menu**. These are display only screens and no password is required to view the status.

The basic status screen displays the current temperature and humidity. The operating modes and fan status are also displayed. Status screens do not contain user adjustable fields.

This screen displays only if the blower is not running. It shows the reason the unit is shut down. FATAL ALARM is any alarm that shuts down all of the units such as SMOKE or WATER DETECTOR (if enabled to be FATAL). TRANSFER ALARM is any alarm that has occurred and the transfer function has been enabled for that alarm. FRONT PANEL STOP is the condition that occurs when the STOP button on the front panel has been pressed. SYSTEM ENABLE OFF is the lack of 24 VAC at the remote shut down input DI5. STANDBY READY is displayed when the unit is shut down by the Master unit on redundant systems. STARTUP DELAY is the power on delay timer. REMOTE STOP indicates the unit is shut down from a supervisor system.

The extended status screen provide additional information on the operating modes. COOL INHIB will appear on the display if the temperature drops four degrees below heat setpoint minus heat band. This feature prevents over cooling of the conditioned spaced during periods of dehumidification. DEH appears when the unit is dehumidifying.

The PC/ECWS screen will only appear if PC or ECWS is turned on in the configuration section. The value 'PC' shown in the screen to the left will be either 'PC' or 'ECWS' depending on the configuration. Information includes the current coolant supply temperature and the valve position percent open based on cooling or dehumidification demand.

The Hot Water screen will only appear if hot water sensor is turned on in the configuration section. Information includes the current hot water supply temperature and the valve position percent open based on heating demand.



System	Heat Setpoint	Cool Setpoint
Humidifier	40.00	55.00
Compressor	55.00	55.00
Humidifier	00.00	00.00

### Heat/Cool Series O & M

The heat/cool setpoint display screen indicates the current heating and cooling setpoints.

The humidification / dehumidification setpoint display screen indicates the current humidifying and dehumidifying setpoints.

### O. Viewing Run Hours

The **System Run Hours** screen provide indication of the number of hours that the unit has been powered.

The component run hours screen display the number of hour the **blower** and **compressors** have operated. This information may be useful in establishing maintenance schedules.

## V. START UP

The DataGuard 4.0 controller stores configuration information in a non-volatile memory. This configuration information contains all of the adjustable parameters such as temperature setpoints. The configuration also depends on the options purchased with the unit. The program has a default set of values for the configuration memory used when a unit is initially started, or software is changed. Changing from Celsius or Fahrenheit to the other mode of temperature display also requires resetting the configuration to the defaults.

Any time the default settings are invoked, the installer must go through the configuration and set the parameters to match the unit options and the site requirements.

### A. Resetting the Controller

To set the controller to the default values, power the unit off and back on. At the initial display, press the UP ARROW and the ENTER key simultaneously. The following screen will appear:

```
CLEAR PERMANENT
MEMORY: READY
UP TO CLEAR TO °C
DOWN TO CLEAR TO °F
```

Press the **ENTER** key to put the cursor on the word READY. Press the **UP ARROW** key to set the unit to Celsius defaults or the **DOWN ARROW** key to set the unit to Fahrenheit defaults. The word READY will change to WAIT while the controller changes the configuration to the default values. When it is complete, the display will change to the POWER LOSS RESET alarm screen.

```

FAN Menu Access
Startg...
FanDelay00prev
ENTER for settings

```

### C. Configuring the Controller

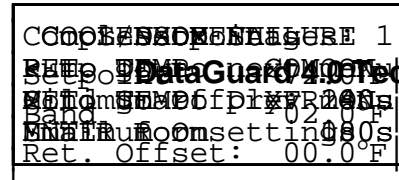
The configuration of the controller depends on the options purchased with the unit as well as specific applications. The controller allows a wide range of values for parameters to cover the various applications. The default values and the range of values are given in the Configuration Checklist found on Page 42. Since the temperatures can be entered in Celsius or Fahrenheit, the allowable ranges for temperatures includes both. However, it is the responsibility of the installer and owner to set all values that are within the actual operating limits of the unit.

The security access screen will appear after the configuration selection has been chosen from the **Main Menu**. The microprocessor has a factory default code of 0000. Press the **ENTER** key to move to the security code field and enter the appropriate code. Once the correct code is displayed press **ENTER** and the screen will update to the **FAN Menu** which is the first configuration menu.

#### 1. Configuring Operating Parameters

The **ENTER** key on the control panel will allow access to the fan settings when the **Fan Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The fan delay screen allows modification of the power loss start up delay and the fan delay.



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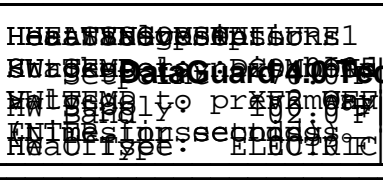
The **ENTER** key on the control panel will allow access to the main cooling settings when the **DX Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The cool setpoint screen allows modification of current the cooling setpoint and dead band. The microprocessor is provided with automatic setpoint overlap protection. If the cool setpoint is below the heat setpoint the heat setpoint value will be automatically reset to equal the cool setpoint. The band is the error between setpoint and signal necessary to activate the first stage of cooling. This screen also allows adjustment of the temperature sensor offset to compensate for small errors in the indicated temperature. Do not attempt to compensate for sensor failure with a large offset.

The return air temperature sensor is monitored for a failed (open or short) condition. Setting COM to ON will close the common alarm contacts when the sensor fails. Setting XFR to ON will shut down the unit when a temperature sensor failure is detected.

The number of stages screen allows modification of the number of heating and cooling stages. If the stages field is set to 0 the function will no longer be available. The Cold Start Delay is the time the low pressure sensor is ignored after starting the compressor. The Small Room delay may also be adjusted at this screen. The Small Room delay will prevent rapid cycling between cooling and heating. The small room feature will be disabled if the value is set to 0.

The pump down screen allows the pump down function to be turned on or off. Only units with a liquid line solenoid should have the pump down function enabled. This screen also allows the adjustment of the compressor minimum off and minimum on times.



The **ENTER** key on the control panel will allow access to the heating settings when the **Heating Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The heating setpoint mask allows the modification of the heating setpoint and the heating band. Details on the relationship of these two values is given in the Theory of Operations. The type of heating can be selected between electric or proportional valve.

The heat mode mask allows the setting of the number electric heating stages if electric heat is enabled. The delay between activation of heat stages may also be set.

This screen will only be available if valve is selected for the heat type. The hot water sensor may be enabled or disabled. With the sensor disabled the temperature will show 000.0°F. The offset is for the hot water temperature sensor to compensate for small errors in the indicated temperature. Do not attempt to compensate for sensor failure with a large offset.

The hot water temperature sensor is monitored for a failed (open or short) condition. Setting COM to ON will close the common alarm contacts when the sensor fails. Setting XFR to ON will shut down the unit when a temperature sensor failure is detected.

The heat valve mask allows the setting of the proportional valve operating parameters. The stroke time is the time the valve takes to go from fully closed to fully open. The valve type can be selected to be either 2 way or 3 way.

ANALOG HUMIDIFIER
Humidity Control
Dehumidification
ENTER Offset

The **ENTER** key on the control panel will allow access to the humidity settings when the **Humidity Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

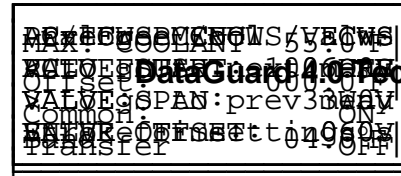
The humidification / dehumidification processes can be individually enabled from this screen.

The humidification / dehumidification setpoint screen allow modification of the current humidifying and dehumidifying setpoints. The microprocessor is provided with automatic setpoint overlap protection. If the dehumid setpoint is below the humid setpoint the humid setpoint value will be automatically reset to equal the dehumid setpoint. Humidification and dehumidification may also be enabled or disabled.

The humidification / dehumidification band screen allows modification of the humidifying and dehumidifying bands. The band is the error between setpoint and signal necessary to activate the humidifier or dehumidification. This screen also allows adjustment of the humidity sensor offset to compensate for small errors in the indicated humidity. Do not attempt to compensate for sensor failure with a large offset.

This screen sets up the optional proportional humidifier. Setting the ANALOG HUM. to ON enables the proportional humidifier. The START is the starting voltage for 0% and the SPAN is the voltage range from 0% to 100% humidification. The Offset is used to adjust the starting output voltage to agree with the START voltage in this screen.

The return humidity sensor is monitored for a failed (open or short) condition. Setting COM to ON will close the common alarm contacts when the sensor fails. Setting XFR to ON will shut down the unit when a sensor failure is detected.



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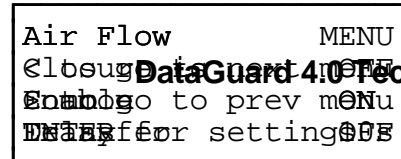
The **ENTER** key on the control panel will allow access to the PC/ECWS settings when the **PC/ECWS Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The PC/ECWS Setpoint screen allows the unit to be set for PC or ECWS operation by toggling between PC and ECWS. The use of PC/ECWS may also be enabled or disabled in the on/off field. Valve selection may be toggled between two and three way. Band is the error between setpoint and signal that will cause the valve travel to full stroke.

The auto flush field allows adjustment to the time interval for coil flushing. The valve will temporarily open to 100 percent at the interval specified. The valve stroke time is the period of time it takes the actuator to travel full stroke. Improper setting will cause a loss of accuracy of the valve position.

The max coolant field allows adjustment to the highest coolant temperature that the PC/ECWS may function. The offset field allows for compensation of small errors in the indicated coolant temperature. Setting COM to ON will close the common alarm contacts when the sensor fails. Setting XFR to ON will shut down the unit when a temperature sensor failure is detected.

The analog mask allows the setting of the starting voltage for 0% cooling, the span or voltage range from 0% to 100% and the offset to adjust the actual voltage to match the start voltage. The chilled water temperature sensor is monitored for a failed (open or short) condition. Setting COM to ON will close the common alarm contacts when the sensor fails. Setting XFR to ON will shut down the unit when a temperature sensor failure is detected.



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### 3. Digital Alarm Configuration

The Digital Alarm Configuration Menus follow the same format as shown for the Airflow Alarm below. The Menus appear in the order:

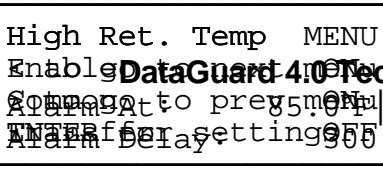
Airflow, Clogged Filter, Water Detector, Compressor Low Pressure, Water Flow, FireStat, Smoke Detector, Humidifier, and Compressor High Pressure.

The **ENTER** key on the control panel will allow access to the digital alarm settings when the alarm configuration menu screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The **Common** field may be toggled between **ON** and **OFF**. With this field **ON** the common alarm output will be activated when the alarm is active. The **Transfer** field may also be toggled between **ON** and **OFF**. The unit will stop operating if **Transfer** is **ON** and the alarm is active.

The **Closure** field allows the input be set for normally open or normally closed circuits. **OFF** will result in alarm indication if the voltage is not present. **ON** will result in alarm indication if the voltage is present. This alarm may be turned **ON** or **OFF** at the **Enable** field. If a delay is programmable, it will appear here. The airflow alarm delay is from the time the blower starts.





**DataGuard 4.0 Tech Cool Series O & M**

5. Analog Alarm Configuration

The analog alarm configuration menus follow the same format as shown for the High Return Temperature shown below. The Menus appear in

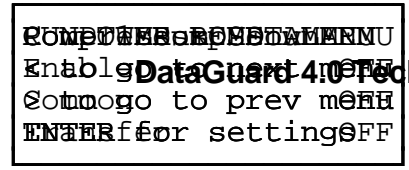
the order:

- High Return Temperature, Low Return Temperature, High Chilled Water Temperature, Low Chilled Water Temperature, High Hot Water Temperature, Low Hot Water Temperature, High Return Humidity, and Low Return Humidity.

The **ENTER** key on the control panel will allow access to the analog alarm settings when the analog alarm configuration menu screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The **Common** field may be toggled between **ON** and **OFF**. With this field **ON** the common alarm output will be activated in the event of the analog value exceeding the alarm trip point. The **Transfer** field may also be toggled between **ON** and **OFF**. The unit will stop operating if **Transfer** is **ON** and there is an alarm.

This alarm feature may be turned **ON** or **OFF** at the **Enable** field. **Alarm At** is the setpoint that the alarm will occur. **Alarm Delay** is the time period the alarm will be ignored after starting the unit.



### 7. Other Alarms

The **ENTER** key on the control panel will allow access to the alarm settings when the alarm configuration menu screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

The **Common** field may be toggled between **ON** and **OFF**. With this field **ON** the common alarm output will be activated when the alarm is active. The **Transfer** field may also be toggled between **ON** and **OFF**. The unit will stop operating if **Transfer** is **ON** and the alarm is active.

The **ENTER** key on the control panel will allow access to the power loss alarm settings when the **Power Loss Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

This alarm feature may be turned **ON** or **OFF** at the **Enable** field.

The **ENTER** key on the control panel will allow access to the run time alarm settings when the **Run Time Reset Menu** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

SUPERVISOR NETWORK  
 ADDRESS 00000000000000000000000000000000  
 CHANGEVERY 000000 HRS  
 ENTER for settings

March 6, 1996

This alarm feature may be turned **ON** or **OFF** at the **RUN ALARM** field. The **ALARM EVERY HRS** field is the run time interval between activation of the alarm.

This alarm feature may be turned **ON** or **OFF** at the **RUN ALARM** field. The **ALARM EVERY HRS** field is the run time interval between activation of the alarm.

This alarm feature may be turned **ON** or **OFF** at the **RUN ALARM** field. The **ALARM EVERY HRS** field is the run time interval between activation of the alarm.

The **ENTER** key on the control panel will allow access to the run time alarm settings when the **SUPERVISOR MENU** screen is displayed. The **LEFT** and **RIGHT** arrow key will allow access to the other configuration menus.

This screen allows the setup of the address of the device when a supervisor network is installed. The address must be from 1 to 16 to be a valid device on the supervisor network. Each device on a segment must have a unique number. Two devices with the same address will cause the network to malfunction.

## E. Changing Passwords

The security screen allows modification of the security passwords. If the setpoint password is set to 0000 the setpoints and clock functions may be changed without use of the security access screen. The service password is used for access to the configuration screen. Should the password be lost call the factory with the EPROM version number for assistance.

## VII. THEORY OF OPERATIONS

This Section gives a detailed explanation of the operation of the controller.

### A. Blower

The blower runs continuously if the following conditions are met:

1. 24 Volts is present on DI 5 (Enable)
4. The start up delay timer is not running
5. The unit is not in "STANDBY" (if a redundant group unit)
6. There are no FIRE or SMOKE alarms
7. The unit has not been placed in the "STOP" mode

The blower runs when there is an "AIRFLOW ALARM". All other functions are shut down, but the unit continues to try to circulate air. If a belt is broken, this prevents potential damage to the unit. If the airflow is marginal due to a slipping belt, this keeps air circulating around the equipment the air conditioner is protecting. If the "AIRFLOW ALARM" goes away and stays cleared for 5 minutes, then normal operations will resume.

### C. Cooling Cycle

#### 1. Compressor Cooling

In the cooling mode, the compressor stage comes on when the return air temperature reaches a value equal to or greater than the cool setpoint plus the cool band. If the unit has hot gas bypass, the hot gas bypass is enabled if the unit is cooling and not dehumidifying. At a return air temperature equal to or less than the cool setpoint, the compressor will turn off if its minimum on time has expired. If the unit is configured as an ECWS (External Chilled Water System), the cooling cycle with compressors is inhibited when the chilled water sensor indicates the chilled water is below its setpoint and there is chilled water flow. The compressor is further governed by two timers, a minimum off timer and a minimum on timer, each set to 300 seconds (5 minutes) at the factory. Unless there is a failure, the compressor will run the minimum on time regardless of the room conditions. When the compressor turns off, it will remain off for the minimum off time regardless of the room conditions. This is done to comply with the compressor manufacturer's conditions for warranty. If the unit is an air cooled unit, the pump down option should be set to ON. When pump down is set to ON, the low pressure alarm is ignored for the first 240 seconds (cold start delay) after the compressor turns on in case the air cooler is in a cold environment.

#### 3. Proportional Cooling

Proportional cooling occurs to assist the compressor cooling if the proportional cooling input is enabled, the proportional cool output is selected for PC ( as opposed to ECWS), the chilled water sensor indicates that the chilled water temperature is below the maximum usable temperature, there is water flow, and the return air temperature rises above the cool setpoint. Valve positioning is accomplished through a series of open and close pulse commands to the chilled water valve actuator. Upon power up, the valve is run closed by turning on the CLOSE output for 125% of the stroke programmed in the valve option screen to ensure the valve is fully closed. When the temperature increases above the cool setpoint, the valve is driven

toward the open point by a timed pulse of the OPEN output. The amount of time the valve is driven is proportional to the percent opening desired and the configured time for a full stroke. The proportional output is controlled by proportional-integral logic that increases or decreases the output over time as long as the error signal is non-zero. The error is the difference between the return air temperature and the setpoint with the PI band equal to the cooling band. The integral time is the valve stroke time. Whenever the required percentage cooling reaches 0% or 100%, the valve is run for 125% of the programmed run time to ensure the valve is indeed fully closed or open. If the valve is commanded to either 0% or 100% and has run the 125% of the stroke time, the appropriate OPEN or CLOSE output is periodically pulsed to keep it there. An analog voltage is also available on analog output 1. The start voltage corresponds to 0% cooling and the start voltage plus the span voltage corresponds to 100% cooling.

## 5. ECWS Cooling

When the unit is configured for ECWS, proportional cooling is mutually exclusive of compressor cooling.

When the proportional cooling input is enabled, the proportional cool output is selected for ECWS ( as opposed to PC), the chilled water sensor indicates that the chilled water temperature is below the maximum usable temperature, there is water flow, and the return air temperature rises above the setpoint, ECWS cooling occurs. Valve positioning is accomplished through a series of open and close pulse commands to the chilled water valve actuator. Upon power up, the valve is run closed by turning on the CLOSE output for 125% of the stroke programmed in the valve option screen to ensure the valve is fully closed. When the temperature increases above the cool setpoint, the valve is driven toward the open point by a timed pulse of the OPEN output. The amount of time the valve is driven is proportional to the percent opening desired and the configured time for a full stroke. The proportional output is controlled by proportional-integral logic that increases or decreases the output over time as long as the error signal is non-zero. The error is the difference between the return air temperature and the setpoint with the PI band equal to the cooling band. The integral time is the valve stroke time. Whenever the required percentage cooling reaches 0% or 100%, the valve is run for 125% of the programmed run time to ensure the valve is indeed fully closed or open. If the valve is commanded to either 0% or 100% and has run the 125% of the stroke time, the appropriate OPEN or CLOSE output is periodically pulsed to keep it there. An analog voltage is also available on analog output 1. The start voltage corresponds to 0% cooling and the start voltage plus the span voltage corresponds to 100% cooling.

## E. Humidification

Humidification occurs when the relative humidity is less than the humidity setpoint minus the humidity band. Assuming that humidification is enabled and analog humidity control is set to OFF, the humidity relay output will turn on and remain on until the humidity reaches the humidity setpoint. If the analog humidity control is set to ON, the proportional output will increase linearly from the start voltage for any return air humidity reading equal to or greater than the humidity setpoint to the start voltage plus span voltage for a return air humidity reading equal to or less than the humidity setpoint minus the humidity band.

## G. Dehumidification

Dehumidification with no cooling requirements (i.e. the return air temperature remains below the cool

setpoint plus the cool band) uses the compressor to provide the latent cooling and the reheat (if enabled) is used to maintain the return air temperature. When the return air humidity reaches the dehumidify setpoint plus the dehumidify band and the minimum off time of the compressor is met, the compressor is turned on without the hot gas enabled and the temperature is maintained using the heating algorithm. When the return air humidity reaches the dehumidify setpoint and the minimum on time of the compressor is met, the compressor is turned off and normal temperature control is resumed.

Dehumidification when there is a need to cool is similar in operation to the dehumidification with no cooling requirements. The cooling operates in the traditional manner. That is, the compressor comes on when the temperature reaches a value equal to or greater than the cool setpoint plus the cool band assuming the minimum off time has been met. Hot gas is not enabled, though. At a return air temperature equal to or less than the cool setpoint, the first compressor stage will turn off, assuming the minimum on time is met. The heaters remain off in this mode.

Dehumidification using the optional chilled water coil operates in conjunction with the operation described above. The use of the PreCool or ECWS coil for dehumidification occurs when the calculated valve position for dehumidification is greater than the calculated valve position for cooling - cooling has precedence over dehumidification. The valve position is closed (0%) when the humidity is less than or equal to the dehumidification setpoint and increases proportionally to the open position (100%) until the humidity reaches the dehumidification setpoint plus the proportional dehumidification end point.

## I. Heating Cycle

### 1. Electric Reheat

Electric Heating occurs when the return air temperature is below its heating setpoint and the heaters are enabled. When the temperature falls below the heat setpoint minus the heat band, the first stage of heat will come on. If there are more stages of heat, they will turn on one at a time for each degree the return air further drops. If a three stage option for heat has been selected, output 2 has a bank of heat that is twice the size of the bank connected to output 3. Output 3 is turned on for stage 1 of heat, output 3 is turned off and output 2 is turned on for stage 2, and both outputs are turned on for stage 3. All stages of heat remain on until the return air temperature rises back to the setpoint.

During dehumidification, the heat is used to reheat the air after it is cooled to drop out moisture using its normal algorithm.

### 3. Proportional Valve Reheat

When the reheat is selected to be supplied by a proportional floating valve, the two outputs normally used for the two stages of electric heat are used as OPEN and CLOSE signals to a floating valve. Heating occurs when the return air temperature is below its heat setpoint and the heater is enabled. Upon power up, the valve is run closed by turning on the CLOSE output for 125% of the run time programmed in the valve option to ensure the valve is fully closed. When the temperature falls below the heat setpoint, the valve is driven toward the open point by a timed pulse of the OPEN output. The amount of time the valve is driven is proportional to the percent opening desired and the configured time for a full stroke. The proportional output is controlled by proportional-integral logic that increases or decreases the output over time as long as the error signal is non-zero. The error is the difference between the return air temperature and the setpoint with the PI band equal to the proportional heat band. The integral time is the valve stroke time. Whenever the required percentage heat reaches 0% or 100%, the valve is run for 125% of the programmed run time to ensure the valve is indeed fully closed or open. If the valve is commanded to either 0% or 100% and has run the 125% of the stroke time, the appropriate OPEN or CLOSE output is periodically pulsed to keep it there.

During dehumidification, the heat is used to reheat the air after it is cooled to drop out moisture using its normal algorithm for heating.

The display will show the percentage of heating. Each time a new value is calculated that will cause the valve to move, the move is initiated and completed before a new value is calculated. This also applies to the closing at power up - the closing must complete before the valve is commanded to another setting.



\*\*\*ALARM\*\*\*  
Replace Filter  
Call Engineering  
ENTER to reset

Model DataGuard 4.0 Tech Cool Series O & M

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K. Alarms

Several alarms have additional impact on the operation of the controller other than just informing the operator of the condition. The following are all the possible alarms for the Tech Cool series and may or may not be present in any given unit. The actions these alarms can cause are also given.

In the event of a loss of air flow the adjacent message will be displayed within the alarm loop. All functions of the unit will terminate at the activation of the air flow loss alarm. Functions will remain disabled until ten minutes after the air flow has been restored. Check air flow switch adjustment and verify filters and coil are clean.

In the event of a clogged filter condition the adjacent message will be displayed within the alarm loop. Replace or clean the return air filter as needed. Check filter switch adjustment. Operations will continue normally if this alarm is present unless the Transfer function is set.

In the event of a detection of water condition the adjacent message will be displayed within the alarm loop. Operations will continue normally if this alarm is present unless the Transfer function is set. Check condensate drain line and trap for obstructions. Verify float is properly positioned in the condensate pan.

In the event of a low compressor suction pressure on the compressor, the adjacent message will be displayed within the alarm loop. The compressor will be disabled until the alarm condition has been cleared. Check refrigerant system for possible leaks.

In the event of a loss of PC/ECWS water flow the adjacent message will be displayed within the alarm loop. The ECWS function will be disabled and cooling will be provided by the mechanical refrigeration system. Check water flow switch adjustment and verify coolant flow to the unit.

\*\*\*ALARM\*\*\*  
Call Engineering  
ENTER to reset

If the OHE/DOOR alarm input is configured for OHE, then this alarm will serve as a warning of an OHE failure. If this alarm input is configured for DOOR, then the compressor is shut down immediately to turn off the condenser fan. The display will show OHE FAILURE or it will show DOOR OPEN depending on the configuration.

In the event of firestat activation the adjacent message will be displayed within the alarm loop. The fan and all other functions in the unit will be terminated at the activation of the firestat alarm.

In the event of smoke deactivation the adjacent message will be displayed within the alarm loop. The fan and all other functions in the unit will be terminated at the activation of the smoke detector alarm.

In the event of high water level in the humidifier canister the adjacent message will be displayed within the alarm loop. The humidifier will continue to operate, however capacity may be reduced due to depletion of electrode surface. This alarm may also occur during initial start up of the humidifier if the water is not sufficiently concentrated.

In the event of a high head pressure trip on compressor 1, the adjacent message will be displayed within the alarm loop. The compressor will be disabled until the alarm condition has been cleared. Check condenser water or air flow and verify remote heat exchanger operation.

In the event of high return temperature after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the high temperature alarm setpoint and verify operation of the cooling system.

\*\*\*ALARM\*\*\*

How to reset the alarm

Check the sensor

ENTER to reset

# How to reset the alarm

March 6, 1996

In the event of low return temperature after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the low temperature alarm setpoint and verify operation of the heating system.

In the event of a failure of the return temperature sensor the adjacent message will displayed within the alarm loop. Check wiring to the sensor and replace the assembly if necessary.

In the event of high PC/ECWS temperature after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the high temperature alarm setpoint and verify operation of the cooling system.

In the event of low PC/ECWS temperature after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the low temperature alarm setpoint and verify operation of the chilled water supply system.

In the event of a failure of the PC/ECWS temperature sensor the adjacent message will displayed within the alarm loop. Check wiring to the sensor and replace the assembly if necessary.

In the event of high hot water temperature after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the high temperature alarm setpoint and verify operation of the hot water system.

\*\*\*AAARM\*\*\*

HowREH DataGuard 4.0 Tech Cool Series O & M  
C&S Engineering  
ENTER to reset

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In the event of low hot water temperature after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the low temperature alarm setpoint and verify operation of the hot water system.

In the event of a failure of the hot water temperature sensor the adjacent message will displayed within the alarm loop. Check wiring to the sensor and replace the assembly if necessary.

In the event of high return humidity after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the high humidity alarm setpoint and verify dehumidification is enabled in the configuration screen..

In the event of low return humidity after the initial start-up delay the adjacent message will be displayed within the alarm loop. Check the low humidity alarm setpoint and verify humidification is enabled in the configuration screen.. Check operation of the humidifier.

In the event of a failure of the return humidity sensor the adjacent message will displayed within the alarm loop. Check wiring to the sensor and replace the assembly if necessary.

\*\*\*SERVICEMANUAL\*\*\*  
Compressor Data Guard 4.0 Tech Cool Series O & M  
Run Time Reached  
Maintenance Point

March 6, 1996

In the event the blower run time reaches a multiple of the run time setting the adjacent message will be displayed within the alarm loop. Perform any necessary preventive maintenance and reset alarm.

In the event the compressor run time reaches a multiple of the run time setting the adjacent message will be displayed within the alarm loop. Perform any necessary preventive maintenance and reset alarm.

In the event of a EPROM failure the adjacent message will be displayed within the alarm loop. Contact factory for assistance.

After power has been removed and restored to the unit the adjacent message will be displayed within the alarm loop. Reset the alarm.

In the event of a compressor pump down failure the adjacent message will be displayed within the alarm loop. Check to assure the unit is equipped with a pump down solenoid and the solenoid is functioning properly.

At the end of the alarm loop or if no alarm conditions exist the adjacent message will be displayed. The audible alarm may be silenced at this screen for alarm conditions that have not cleared.

## VIII. MAINTENANCE

### A. Preventative Maintenance

The preventative maintenance requirements for the controller are minimal. It is suggested that every three months, the temperature and humidity calibration be checked. If it is found necessary to adjust the calibration, follow the directions in the Maintenance Section.

### C. Calibration & Maintenance

The temperature sensors and humidity sensor have no calibration procedures. An offset may be used to make minor adjustments in the field using the following procedures with a digital temperature/humidity meter.

#### 1. Temperature Calibrations

If the difference between the measured and displayed temperature is less than 10 degrees, adjust the appropriate offset found in the configuration section to compensate. This offset can be set to  $\pm 20.0$  degrees (For C). For instance, if the measured temperature is 72.5°F and the displayed temperature is 74.3°F, set the offset to -01.8 (assuming the offset was 0 initially). If the sensor appears to have a constant temperature regardless of the offset or measured temperature, check the wiring and replace the sensor if needed.

#### 3. Humidity Calibration

If the difference between the measured and displayed humidity is less than 10%, adjust the return humidity offset found in the HUMIDITY MENU in the configuration section to compensate. This offset can be set to  $\pm 20.0\%$ RH. For instance, if the measured humidity is 53.7%RH and the displayed humidity is 48.8%RH, set the offset to 04.9 (assuming the offset was 0 initially).

If the sensor appears to have a constant humidity reading regardless of the offset or measured humidity, check the jumper setting on J14, check the wiring and replace the sensor if needed.

#### 5. EPROM Replacement

In the event the microprocessor EPROM requires replacement a few simple precautions must be followed.

7. Check to assure all current configuration selections have been recorded on the configuration checklist at the back of this manual.

8. Disconnect power from the unit before performing any service.

9. Remove the old EPROM and install the new EPROM with the notch towards the edge of the board. Do Not Use The EPROM label as a reference.

10. Assure all pins of the EPROM are properly seated in the socket.

11. Always default the controller and reset all configuration options.

## X. DIAGRAMS AND EXTERNAL CONNECTIONS

This Section contains the diagrams and external connection information for the DataGuard 4.0 to assist in service and maintenance work.

### A. Pin Out and Signal Level Definitions

#### 1. Signal Level Definitions

##### Digital Input:

###### DI 1-10

Low level input range is 0 to .4 volts

High level input range is 20-32 VAC 50/60 Hz or DC

###### DI 11-12

Low level input range is 0 to .4 volts

High level input range is 250 VAC 50/60 Hz

##### Analog Inputs:

AI 1-4 10K Negative Temperature Coefficient Resistor (NTC) (0-200.0°F)

AI 5 and 6: 4-20 ma current loops or 0-1 volts selectable by jumpers J14 and J15

##### Analog Outputs:

Optoisolated, 24 VAC/DC external supply

Voltage Range: 0-10 volts DC

Load Impedance: 1Kohm load minimum

Resolution: 8 bits

##### Digital Outputs:

Maximum voltage: 250 V

Maximum load: 10A Resistive

## 3. Pin Out of Interface Board

<u>Pin</u>	<u>Levels</u>	<u>Default Signal Definition</u>
DI 1	Digital Input	Low = Airflow Alarm
DI 2	Digital Input	High = Clogged Filter Alarm
DI 3	Digital Input	High = Water Detector Alarm
DI 4	Digital Input	Low = Compressor Low Pressure Alarm
DI 5	Digital Input	High = System Enable
DI 6	Digital Input	OHE failure / Do or Open
DI 7	Digital Input	Low = Water Flow Alarm
DI 8	Digital Input	High = Firestat Alarm
DI 9	Digital Input	High = Smoke Detector Alarm
DI 10	Digital Input	High = Humidifier Alarm
DI 11	Digital Input	Low = Compressor High Pressure Alarm
DI 12	Digital Input	Not Used
AI 1	NTC Input	Return Temperature sensor
AI 2	NTC Input	Not Used
AI 3	NTC Input	Chilled Water sensor
AI 4	NTC Input	Hot Water sensor
AI 5*	Analog Input	0 to 1 volt Return Humidity sensor
AI 6*	Analog Input	Not Used
AI 7**	Analog Input	Not Used
AI 8**	Analog Input	Not Used
DO 1	Digital Output	Blower
DO 2	Digital Output	Electric Heat Stage 1 or Heat Valve Open
DO 3	Digital Output	Electric Heat Stage 2 or Heat Valve Close
DO 4	Digital Output	Humidifier
DO 5	Digital Output	Compressor Liquid Line Solenoid
DO 6	Digital Output	Compressor Contactor
DO 7	Digital Output	Compressor Hot Gas
DO 8	Digital Output	Not Used
DO 9	Digital Output	Chilled Water Valve Open
DO 10	Digital Output	Chilled Water Valve Close
DO 11	Digital Output	Common Alarm
DO 12	Digital Output	Not Used
DO 13	Digital Output	Not Used
AO 1	Analog Output	Analog Cooling Valve (option)
AO 2	Analog Output	Analog Humidification Output (option)

Note:

\* Analog inputs 5 and 6 are selectable for either 0-1 volt or 4-20 ma inputs. Jumper 2&3 for 0-1volt or 1&2 for 4-20ma. Also see Interface Board diagram.

\*\* Analog inputs 7 and 8 are 4-20 ma inputs only.





J14 controls A15  
J15 controls A16

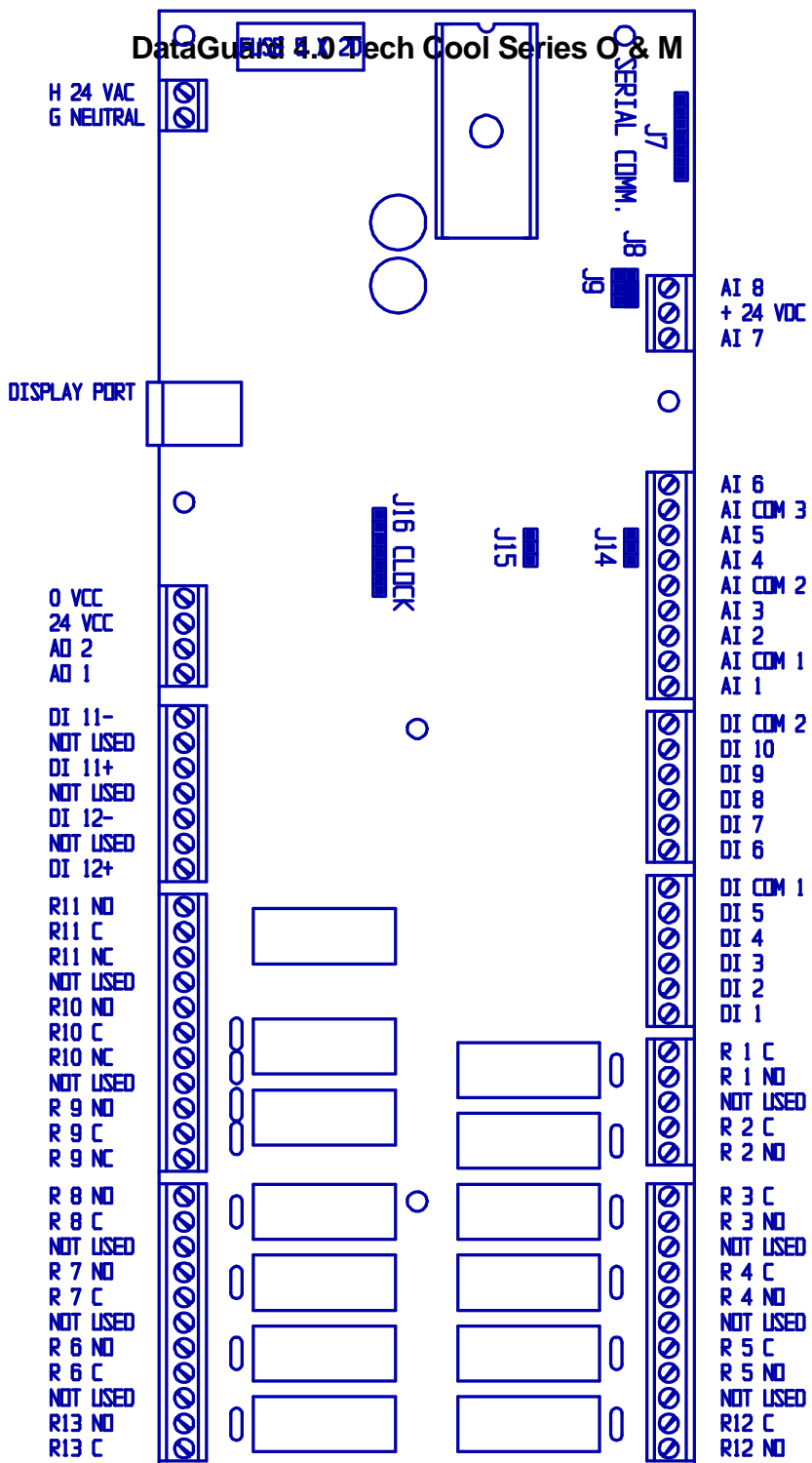
# MICROPROCESSOR LAYOUT

March 6, 1996

C.  
Interface Board

## J14 & J15 JUMPERS

0-1VDC	
	3 2 1
4-20MA	
	3 2 1



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PLUG DETAIL  
LEFT END

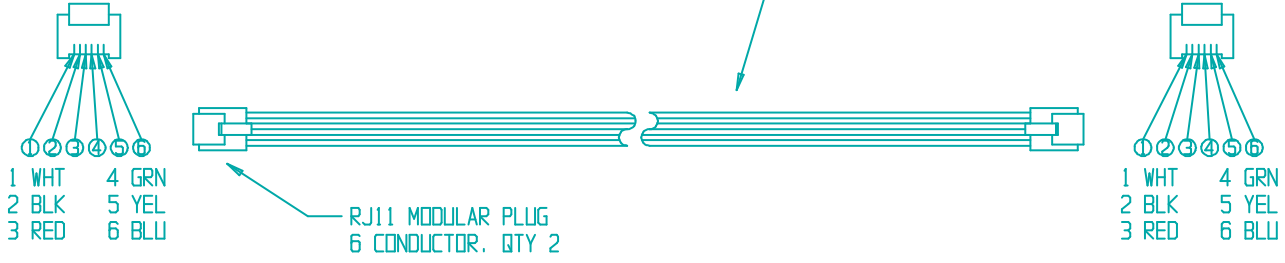
# DataGuard 4.0 Tech Cool Series O & M

DISPLAY CABLE DETAIL

FLAT CABLE 6 CONDUCTOR  
24 GAUGE 500' MAXIMUM

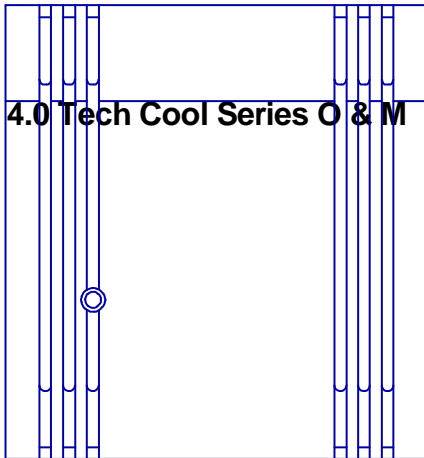
PLUG DETAIL  
RIGHT END

March 6, 1996

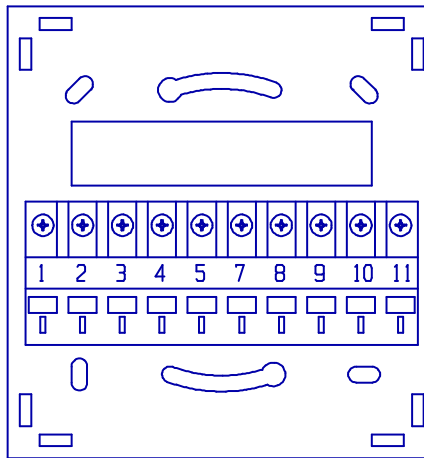


E. Display Cable

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T/H SENSOR



MOUNTING PLATE

G. Temperature/Humidity Transmitter

Pin Out

- 4 NTC signal
- 5 NTC return (tie to pin 9)
- 7 Supply voltage 24 Vac/dc
- 9 Signal and Supply Return
- 11 Humidity Output (0-1 volt)

Use Shielded Cable in all applications  
Maximum Cable length 100 meters (390 feet)

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## CONFIGURATION CHECKLIST

PB111005

DataGuard 4.0 1.14-4001

## Notes:

1. Numbers in parenthesis are Celsius
2. Ranges for Temperatures are scale independent (°F or °C).
- 3 The given ranges do not imply that the unit will function properly over all of the values. Refer to the unit Installation, Start-up, Operation and Maintenance Procedures Manual for the unit's actual limits.

<u>ACTUAL PARAMETER</u>	<u>DEFAULT</u>	<u>RANGE</u>	<u>SETTING</u>
Start Up Delay	000 secs.	0 to 600 secs.	_____
Fan Delay	11 secs.	0 to 600 secs.	_____
Cool Setpoint	72.0°F(22.0)	12.0 to 95.0	_____
Cool Band	2.0°F(1.0)	1.0 to 15.0	_____
Return Temperature Offset	00.0°F (00.0)	-20.0 to + 20.0	_____
DX Stages	1	0 to 1	_____
Small Room Delay	000 secs.	0 to 999 secs.	_____
Pump Down	OFF	ON or OFF	_____
Minimum DX Off Time	300 secs.	180 to 999 secs.	_____
Minimum DX On Time	300 secs.	180 tp 999 secs.	_____
Return Temperature Sensor Alarm Common	ON	ON or OFF	_____
Return Temperature Sensor Alarm Transfer	ON	ON or OFF	_____
Heat Setpoint	70.0°F(21.0)	0 to 85.0	_____
Heat Band	2.0°F(1.0)	1.0 to 15.0	_____
Heat Type	ELECTRIC	ELECTRIC or VALVE	_____
Heat Stages	1	0-2	_____
Stages Delay	15	5-99	_____
Hot Water Sensor	DISABLED	ENABLED or DISABLED	_____
Hot Water Sensor Offset	00.0°F(00.0)	-20.0 to + 20.0	_____
Heat Valve Stroke Time	60 seconds	10 to 180 seconds	_____
Heat Valve Type	2 Way	2 Way or 3 Way	_____
Hot Water Sensor Alarm Common	ON	ON or OFF	_____
Hot Water Sensor Alarm Transfer	OFF	ON or OFF	_____
Humidifier Control	ENABLED	ENABLED or DISABLED	_____
Dehumidification Control	ENABLED	ENABLED or DISABLED	_____
Humidification Setpoint	45.0%RH	10.0 to 85.0%RH	_____
Dehumidification Setpoint	55.0%RH	10.0 to 95.0%RH	_____
Humidification Band	5.0%RH	1.0 to 30.0%RH	_____
Dehumidification Band	5.0%RH	1.0 to 30.0%RH	_____
Humidity Sensor Offset	00.0%	-20.0% to +20.0%	_____
Analog Humidity Start Voltage	00.0V	0.0 to +10.0V	_____
Analog Humidity Span Voltage	10.0V	-10.0 to +10.0V	_____
Analog Humidity Offset Voltage	0.0V	-2.0 to +2.0V	_____
Return Humidity Sensor Alarm Common	ON	ON or OFF	_____
Return Humidity Sensor Alarm Transfer	OFF	ON or OFF	_____
PC/ECWS Type	PC	PC or ECWS	_____
PC/ECWS On/Off	OFF	ON or OFF	_____



Valve Type	3 Way	2 or 3 Way	_____
Band	4.0°F(2.0)	1.0 to 15.0	_____
Auto Flush Hours	100	10-999	_____
Cooling Valve Stroke Time	60 seconds	10 to 180 seconds	_____

<u>ACTUAL PARAMETER</u>	<u>DEFAULT</u>	<u>RANGE</u>	<u>SETTING</u>
Maximum Coolant Temperature	55.0°F(13.0)	1.0 to 85.0	_____
PC/ECWS Sensor Offset	00.0°F(00.0)	-20.0 to +20.0	_____
Analog PC/ECWS Start Voltage	06.0V	0.0 to +10.0V	_____
Analog PC/ECWS Span Voltage	03.0V	-10.0 to +10.0V	_____
Analog PC/ECWS Offset Voltage	0.0V	-2.0 to +2.0V	_____
Chilled Water Sensor Alarm Common	ON	ON or OFF	_____
Chilled Water Sensor Alarm Transfer	OFF	ON or OFF	_____
Airflow Alarm Common	ON	ON or OFF	_____
Airflow Alarm Transfer	OFF	ON or OFF	_____
Airflow Alarm Closure	OFF	ON or OFF	_____
Airflow Alarm Enable	ON	ON or OFF	_____
Airflow Alarm Delay	10 seconds	10-600	_____
Clogged Filter Alarm Common	ON	ON or OFF	_____
Clogged Filter Alarm Transfer	OFF	ON or OFF	_____
Clogged Filter Alarm Closure	ON	ON or OFF	_____
Clogged Filter Alarm Enable	ON	ON or OFF	_____
Water Detector Alarm Common	ON	ON or OFF	_____
Water Detector Alarm Transfer	OFF	ON or OFF	_____
Water Detector Alarm Closure	ON	ON or OFF	_____
Water Detector Alarm Enable	ON	ON or OFF	_____
Comp. Low Pressure Alarm Common	ON	ON or OFF	_____
Comp. Low Pressure Alarm Transfer	OFF	ON or OFF	_____
Comp. Low Pressure Alarm Closure	OFF	ON or OFF	_____
Comp. Low Pressure Alarm Enable	ON	ON or OFF	_____
OHE/DOOR Alarm Common	ON	ON or OFF	_____
OHE/DOOR Select	OHE	OHE or DOOR	_____
OHE/DOOR Alarm Transfer	OFF	ON or OFF	_____
OHE/DOOR Alarm Closure	OFF	ON or OFF	_____
OHE/DOOR Alarm Enable	OFF	ON or OFF	_____
Water Flow Alarm Common	ON	ON or OFF	_____
Water Flow Alarm Transfer	OFF	ON or OFF	_____
Water Flow Alarm Closure	OFF	ON or OFF	_____
Water Flow Alarm Enable	OFF	ON or OFF	_____
FireStat Alarm Common	ON	ON or OFF	_____
FireStat Alarm Transfer	OFF	ON or OFF	_____
FireStat Alarm Closure	ON	ON or OFF	_____
FireStat Alarm Enable	ON	ON or OFF	_____
Smoke Detector Alarm Common	ON	ON or OFF	_____
Smoke Detector Alarm Transfer	OFF	ON or OFF	_____
Smoke Detector Alarm Closure	ON	ON or OFF	_____
Smoke Detector Alarm Enable	ON	ON or OFF	_____
Humidifier Canister Alarm Common	ON	ON or OFF	_____
Humidifier Canister Alarm Transfer	OFF	ON or OFF	_____

Humidifier Canister Alarm Closure	ON	ON or OFF	_____
Humidifier Canister Alarm Enable	ON	ON or OFF	_____
Comp. High Pressure Alarm Common	ON	ON or OFF	_____
Comp. High Pressure Alarm Transfer	OFF	ON or OFF	_____
Comp. High Pressure Alarm Closure	OFF	ON or OFF	_____
Comp. High Pressure Alarm Enable	ON	ON or OFF	_____
Comp. Pump Down Alarm Common	ON	ON or OFF	_____
Comp. Pump Down Alarm Transfer	OFF	ON or OFF	_____

**ACTUAL**

<u>PARAMETER</u>	<u>DEFAULT</u>	<u>RANGE</u>	<u>SETTING</u>
High Return Temp. Alarm Common	ON	ON or OFF	_____
High Return Temp. Alarm Transfer	OFF	ON or OFF	_____
High Return Temp. Alarm Enable	ON	ON or OFF	_____
High Return Temp. Alarm At	85.0°F(30.0)	0 to 100.0	_____
High Return Temp. Alarm Delay	300 secs.	1 to 600 secs.	_____
Low Return Temp. Alarm Common	ON	ON or OFF	_____
Low Return Temp. Alarm Transfer	OFF	ON or OFF	_____
Low Return Temp. Alarm Enable	ON	ON or OFF	_____
Low Return Temp. Alarm At	55.0°F(12.7)	0.0 to 100.0	_____
Low Return Temp. Alarm Delay	300 secs.	1 to 600 secs.	_____
High ECWS Temp. Alarm Common	ON	ON or OFF	_____
High ECWS Temp. Alarm Transfer	OFF	ON or OFF	_____
High ECWS Temp. Alarm Enable	ON	ON or OFF	_____
High ECWS Temp. Alarm At	72.0°F(22.0)	0 to 100.0	_____
High ECWS Temp. Alarm Delay	120 secs.	1 to 600 secs.	_____
Low ECWS Temp. Alarm Common	ON	ON or OFF	_____
Low ECWS Temp. Alarm Transfer	OFF	ON or OFF	_____
Low ECWS Temp. Alarm Enable	ON	ON or OFF	_____
Low ECWS Temp. Alarm At	40.0°F(4.4)	0 to 100.0	_____
Low ECWS Temp. Alarm Delay	120 secs.	1 to 600 secs.	_____
High Hot Water Temp. Alarm Common	ON	ON or OFF	_____
High Hot Water Temp. Alarm Transfer	OFF	ON or OFF	_____
High Hot Water Temp. Alarm Enable	OFF	ON or OFF	_____
High Hot Water Temp. Alarm At	195.0°F(90.5)	0 to 200.0	_____
High Hot Water Temp. Alarm Delay	120 secs.	1 to 600 secs.	_____
Low Hot Water Temp. Alarm Common	ON	ON or OFF	_____
Low Hot Water Temp. Alarm Transfer	OFF	ON or OFF	_____
Low Hot Water Temp. Alarm Enable	OFF	ON or OFF	_____
Low Hot Water Temp. Alarm At	100.0°F(37.7)	0 to 200.0	_____
Low Hot Water Temp. Alarm Delay	120 secs.	1 to 600 secs.	_____
High Humidity Alarm Common	ON	ON or OFF	_____
High Humidity Alarm Transfer	OFF	ON or OFF	_____
High Humidity Alarm Enable	ON	ON or OFF	_____
High Humidity Alarm At	85.0%	0 to 100.0%RH	_____
High Humidity Alarm Delay	300 secs.	1 to 600 secs.	_____
Low Humidity Alarm Common	ON	ON or OFF	_____
Low Humidity Alarm Transfer	OFF	ON or OFF	_____
Low Humidity Alarm Enable	ON	ON or OFF	_____
Low Humidity Alarm At	30.0%	0 to 100.0%RH	_____

**DataGuard 4.0 Tech Cool Series O & M**

**March 6, 1996**

Low Humidity Alarm Delay	300 secs.	1 to 600 secs.	_____
Power Loss Alarm	ON	ON or OFF	_____
Blower Run Time Alarm	OFF	ON or OFF	_____
Blower Run Time Alarm Every	1000 hours	0 to 9999	_____
Comp. Run Time Alarm	OFF	ON or OFF	_____
Comp. Run Time Alarm Every	1000 hours	0 to 9999	_____
Humidifier Run Time Alarm	OFF	ON or OFF	_____
Humidifier Run Time Alarm Every	1000 hours	0 to 9999	_____
Setpoint Password	0000	0000-9999	_____
Service Password	0000	0000-9999	_____
Supervisor Address	00	00-30	_____



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**Revision History**

<u>Rev.</u>	<u>By</u>	<u>Date</u>	<u>Chk'd</u>	<u>Date</u>	<u>Description</u>
N.C.	RLB	09/11/95			Initial Release
A	RLB	11/2/95			Added shut down mask. Added PI description to reflect change to use of PI loop on analog outputs. Corrected misc. text errors. Added OHE/DOOR options.
B	RLB	11/15/95			Added airflow alarm delay to check list. PI description corrected. Spelling corrections.
C	RLB	3/6/96			Added sensor common and transfer options. Changes to several screen displays. Added DEH to Extended Status screen.