

# **OPERATIONS MANUAL**

## **TELCOM CLIMATEWATCH SYSTEM**

**MODEL  
TCS20-\*\*\*-001**

MANUAL	2100-270-001A
SUPERSEDES	2100-270-001
FILE	VOL. III, TAB 19
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# **1. INTRODUCTION**

## **1.1 Shipping Damage**

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. If damage is found, the receiving party must contact the carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

## **1.2 Package Contents**

- 1 - TCS20
- 1 - Outdoor Humidity Sensor
- 1 - Outdoor Temperature Sensor
- 1 - TCS20 Operations Manual
- 1 - TCS Software Package

## **1.3 Additional Requirements**

This controller is suitable for use with 1 1/2 ton through 6 ton Bard WallMount® air-conditioners. The Bard WallMount® must be equipped with the "V" control module and economizers for proper operation of the TCS20. Air-conditioner model numbers used with the TCS20 should contain the letter "D" in the 10th position of the model number and the letter "V" in the 15th position of the model number.

Additionally, to utilize the Power Failure Management portion of the controller an Inverter and battery backup system should be installed in the shelter. This provides for ventilation of the structure in case of utility power failure, alarming of the power failure condition, and acts as an uninterruptible power supply for the TCS20. Bard Manufacturing Co. offers separately an inverter for use with the TCS20 System for shelters that are not already equipped with an inverter system.

Order Bard Part Number - 8301-024 Inverter

## **1.4 Copyright Notice**

All materials contained in this manual originated from and are the property of Bard Manufacturing Co. Any reproduction of the text, drawings, or wiring diagrams contained in this manual is forbidden without the written consent of Bard Manufacturing Co.

All SOFTWARE supplied with this product is the property of Bard Manufacturing Co. You may not modify, disassemble, decompile, reverse engineer, or create derivative works from this SOFTWARE. Bard Manufacturing Co. licenses the purchaser of this product to use two copies of this SOFTWARE on two computer systems, one remote computer system and one on site computer system.

If installed on a network server, additional copies of the software should be purchased for each computer on the network using the SOFTWARE.

## **1.5 General**

The Telcom Climate Watch System (TCS) is a building monitoring and control system used in conjunction with two (2) Bard Wall-Mount ® air-conditioners. The system consists of a state of the art direct digital controller, the TSC20, two (2) Bard Wall-Mount ® air-conditioners, and a special "V" control module that is added to the Bard Wall-Mount ® air-conditioners. This system provides the following features.

### ***1.5.1 BUILDING POINTS TO BE MONITORED:***

- Space Temperature
- Space Humidity
- Outdoor Temperature
- Outdoor Humidity
- Occupancy Override Switch
- Main Power to Building
- Door Alarm

### ***1.5.2 WALLMOUNT POINTS TO BE MONITORED FOR EACH UNIT:***

- Blower Airflow
- Discharge Air Temperature
- Valid Compressor Current Sensor
- Compressor Lockout Relay
- Dirty Filter Sensor

### ***1.5.3 BUILDING POINTS TO BE CONTROLLED:***

- Power Transfer Relay
- Shelter Alarm Circuit

### ***1.5.4 SYSTEM POINTS TO BE CONTROLLED:***

- Modem Power

**1.5.5 WALLMOUNT POINTS TO BE CONTROLLED:**

Blower Unit #1  
Economizer Unit #1  
Compressor Unit #1  
Heating Unit #1  
Blower Unit #2  
Economizer Unit #2  
Compressor Unit #2  
Heating Unit #2

**1.5.6 ALARM POINTS:**

High Space Temperature  
Low Space Temperature  
High Space Humidity  
Low Space Humidity  
Blower Failure Unit #1  
Blower Failure Unit #2  
Compressor Lockout Unit #1  
Compressor Lockout Unit #2  
Compressor Current Failure Unit #1  
Compressor Current Failure Unit #2  
Dirty Filter Unit #1  
Dirty Filter Unit #2  
Main Power Failure  
Door Alarm

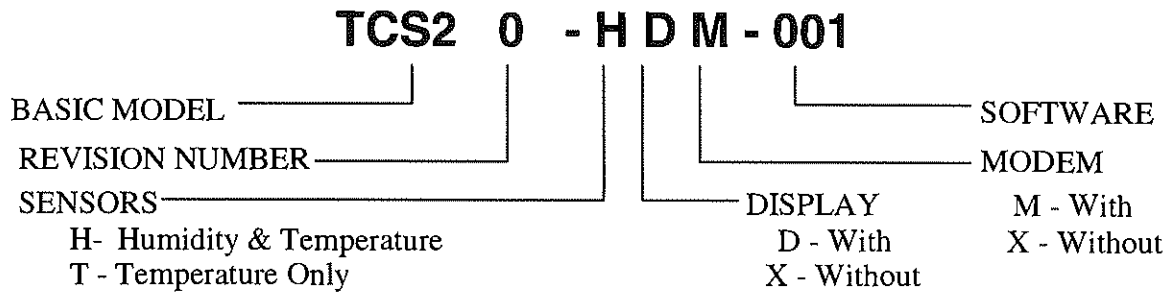
## INPUTS

1 Indoor Temperature Sensor	Required	(Standard in TCS20)
2 Indoor Humidity Sensor	Optional	(Optional in TCS20)
3 -0 Unit #1 Blower Airflow Sensor	Required	(Standard in "V" Module)
-1 Unit #1 Compressor Lockout Relay	Required	(Standard in "V" Module)
-2 Unit #1 Dirty Filter Sensor	Optional	(Standard in "V" Module)
4 Unit #1 Discharge Air Sensor	Optional	(Standard in "V" Module)
5 -0 Unit #2 Blower Airflow Sensor	Required	(Standard in "V" Module)
-1 Unit #2 Compressor Lockout Relay	Required	(Standard in "V" Module)
-2 Unit #2 Dirty Filter Sensor	Optional	(Standard in "V" Module)
6 Unit #2 Discharge Air Sensor	Optional	(Standard in "V" Module)
7 Unit #1 Compressor Current Switch	Required	(Standard in "V" Module)
8 Unit #2 Compressor Current Switch	Required	(Standard in "V" Module)
9 Spare		
10 Spare		
11 Spare		
12 Door Switch	Optional	
13 Main Power Sensor	Optional	
14 Occupied Override Switch	Required	(Standard in TCS20)
15 Outdoor Temperature Sensor	Required	(Standard in TCS20)
16 Outdoor Humidity Sensor	Required	(Standard in TCS20)

## OUTPUTS

- 1 Spare
- 2 Cycle Power To Modem
- 3 Power Transfer Switch
- 4 Unit #1 Economizer (Y1)
- 5 Unit #1 Compressor (Y2)
- 6 Unit #1 Heater (W1)
- 7 Unit #1 Blower (G)
- 8 Unit #2 Economizer (Y1)
- 9 Unit #2 Compressor (Y2)
- 10 Unit #2 Heater (W1)
- 11 Unit #2 Blower (G)
- 12 Shelter Alarm Circuit
- 13 Unit #1 is Lead Unit
- 14 Unit #2 Is Lead Unit
- 15 Free Cooling
- 16 Power Failure

## 1.6 Model Nomenclature



## 2.0 SPECIFICATIONS

### 2.1 Electrical Specifications

Supply Voltage	208/240 VAC +/- 10% 50/60 HZ
Minimum Circuit Ampacity	3 Amp
Overcurrent Protection	Internal Circuit Breaker - 3 Amp

Controller Analog Inputs	16
Resolution	8 bits/ 0.4% Full Scale
Voltage Range	0 Vdc to +10 Vdc
Current Rating	5.0 mA at +10 Vdc

Binary Relay Outputs	12
Type	Form "A" Relay SPST N.O.
Contact Rating	24 VAC, 5 A Resistive 24 VAC, 2 A Inductive

### 2.2 Mechanical Specifications

Height	26.25 in., (667 mm.)
Width	17.00 in., (432 mm.)
Depth	5.50 in., (140 mm.)
Material	18 ga galvanized steel with Beige baked polyester enamel.
Mounting	Vertical
Mounting Area Required	27 in. high by 18 in wide, (686 mm. high by 457 mm. wide)
Weight	27 lb., (12.3 kilograms)

### 2.3 Environmental Specifications

Operating Temperature Range	32 to 130 ° F (0 to 55° C)
Operating Humidity Range	10 to 95%, non condensing
Storage Temperature Range	-35 to 180 ° F (-37 to 82° C)
Storage Humidity Range	5 to 95%, non condensing



## 2.4 Sensor Specifications

### 2.4.1 TEMPERATURE SENSORS

Indoor and Outdoor

Type	Thermistor
Ohms	3000 $\Omega$ at 77° F (25° C)
Temperature Range	-40 to 302 ° F (-40 to 150° C)
Interchangeability	.2 Deg Celsius

Discharge

Type	Thermistor
Ohms	10000 $\Omega$ at 77° F (25° C)
Temperature Range	-40 to 302 ° F (-40 to 150° C)
Interchangeability	.2 Deg Celsius

### 2.4.2 HUMIDITY SENSORS

Type	Bulk Polymer
Output	0-5 Vdc
Supply Voltage	24 Vac, +/- 15%
Accuracy	+/- 5%
Sensitivity	0.1% RH
Repeatability	0.5% RH
Long Term Stability	Less than 1% per year
Interchangeability	+/- 3%
Temperature Range	-40 to 130 ° F (-40 to 76° C)
Humidity Range	0 to 99%, non condensing

### 2.4.3 COMPRESSOR CURRENT SENSOR

Type	Solid State DC Switch
Output	Form "A" solid state DC switch
Supply Voltage	Self Powered
Trip Current Range	1 to 175 Amps
Maximum Load	150 mA, at 30 VDC
Temperature Range	-58 to 149 ° F (-50 to 65° C)
Dimensions	2.125 in. high, 3.25 in. wide, 1 in. deep (54 mm. high, 83 mm. wide, 26 mm. deep)

### 2.4.4 DIRTY FILTER SENSOR

Type	Mechanical Airflow Switch
Output	Form "A" Contact
Supply Voltage	Self Powered
Maximum Load	1.5A, at 24 VAC
Temperature Range	0 to 170 ° F (-18 to 77° C)
Pressure Range	0.1 to 0.7 in. wc.
Dimensions	3 1/4 in. high, 2 1/4 in. wide, 2 in. deep (83 mm. high, 57 mm. wide, 51 mm. deep)

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#### 2.4.5 *BLOWER AIRFLOW SWITCH*

Type	Mechanical Airflow Switch
Output	Form "C" Contact
Supply Voltage	Self Powered
Maximum Load	300 VA, at 24 VAC
Temperature Range	-40 to 180 ° F (-40 to 82° C)
Pressure Range	0.07 to 0.12 in. wc
Dimensions	6.125 high, 4.125 wide, 3.188 deep (156 mm. high, 105 mm. wide, 81 mm. deep)

Figure 1

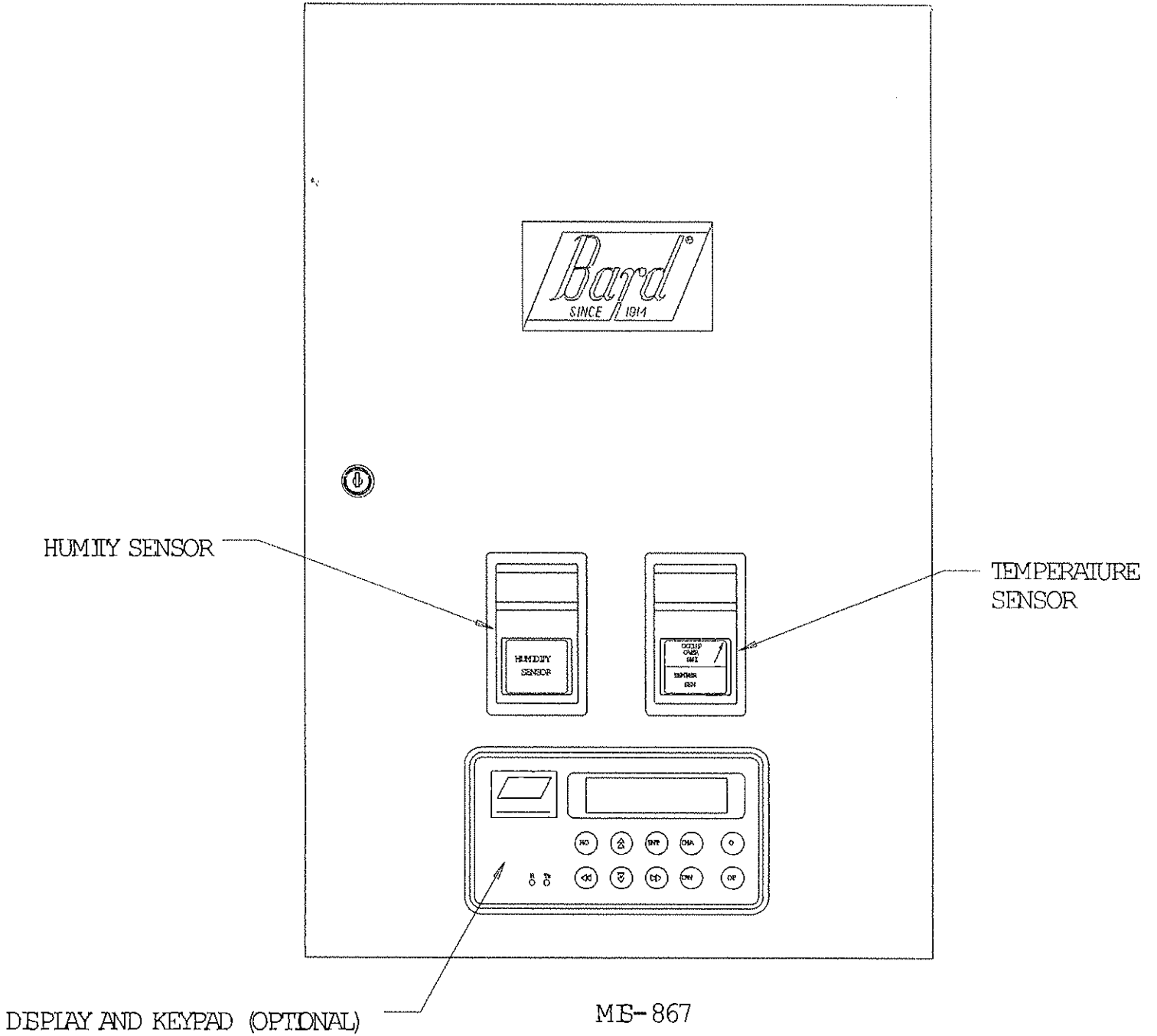
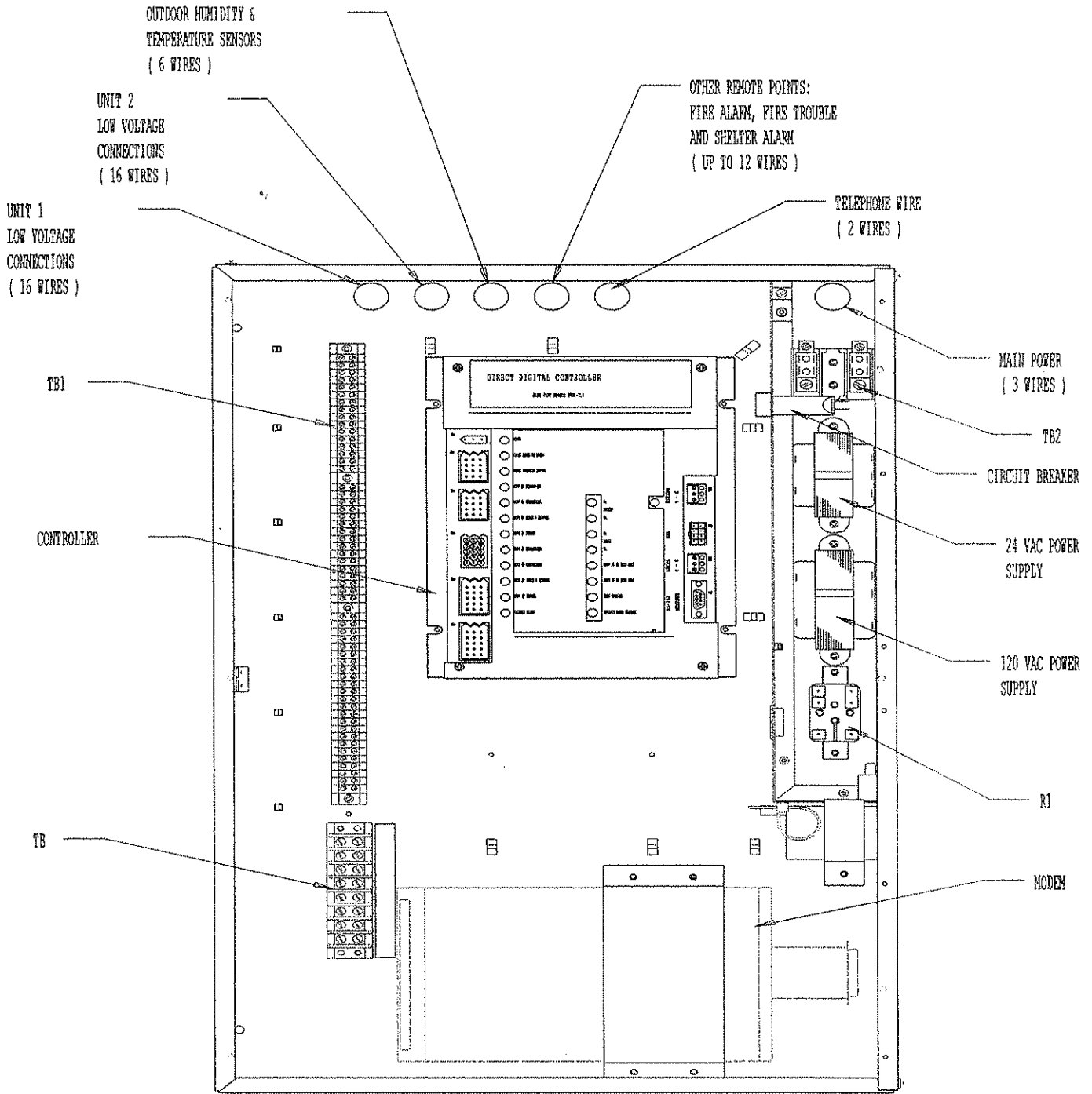


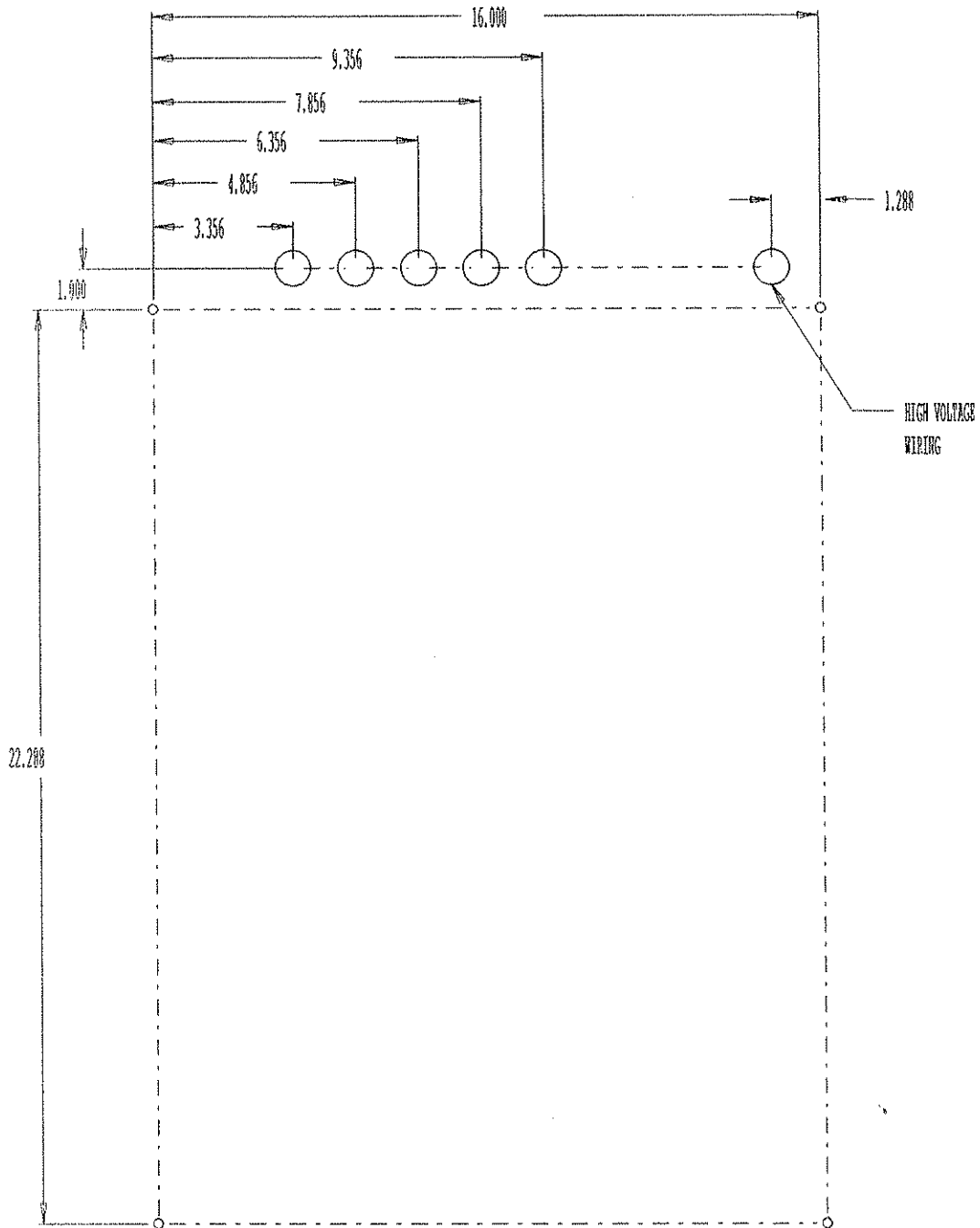
Figure 2



MIS-868

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**Figure 3**



HIS-866

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### 3. INSTALLATION

This section discusses mounting and wiring of the TCS20 into the building. Also included is an installation checklist to be completed by the installing contractor. See installation instructions supplied with the Bard Wall-Mount air conditioners for information on installing the air conditioners.

**This controller should be installed and serviced by a qualified service technician only.**


#### 3.1 Mounting

TCS20 should be mounted on a flat vertical surface four (4) to six (6) feet from the floor of the building. When choosing a suitable location take into consideration that the electrical connections can be made from the back or top of the TCS20. See Figure 3 for rear electrical entrance locations.

The TCS20 is secured to the wall with four (4) - 1/4 inch fasteners with flat washers. Hollow wall anchors or lag bolts are suitable as dictated by the wall construction. See Figure 3 for a bolt pattern layout drawing.

#### 3.2 Wiring

Electrical connections can be made from the back or top of the TCS20. All wiring should exit the TCS20 in conduit. Use the supplied wire ties and cable holders to route unit low voltage, communication, and sensor wiring neatly. Avoid looping excess wire. See Figure 2 for suggested conduit connections.



## WARNING

---

- HAZARD OF ELECTRIC SHOCK.
- ELECTRIC SHOCK CAN RESULT IN SERIOUS INJURY OR DEATH.
- DISCONNECT THE REMOTE ELECTRIC POWER SUPPLIES BEFORE SERVICING.

Never connect or disconnect wiring from the controller with power connected to the controller or to either of the Bard Wall-Mount® air-conditioners.

#### 3.2.1 HIGH VOLTAGE WIRING

**IMPORTANT: High voltage wiring must not be run in the same conduit as low voltage control or sensor wiring.** Failure to comply with this requirement will result in poor or no remote communication and/or in inaccurate sensor reading.

Supply power is 208/240 VAC, 50/60 Hz, 1 Phase at 3 amps minimum circuit ampacity. A 3 amp circuit breaker is supplied as part of the TCS20. This circuit breaker is for internal circuit protection only and cannot be used as a disconnect. Supply wire size should be 18 ga. or larger. Use Copper Conductors Only. All wiring must comply with the applicable sections of the National Electrical Code ( NEC) and any applicable local codes.

The TCS20 is shipped for 240 VAC operation . For 208 Volt operation change both transformer primaries in the TCS20 to the 208 volt tap. See Wiring Diagram. The acceptable operating voltage ranges for the 240 and 208 volt taps are:

Tap	Range
240	253-216
208	220-187

Connect the high voltage power supply to Terminal Block TB2. Connect ground wire to the ground connector provided. TCS20 must be grounded for proper operation. Failure to ground the controller may cause erratic controller operation and inaccurate sensor operation. See Figure 2 and the wiring diagram.

### 3.2.2 WIRING - LOW VOLTAGE

**IMPORTANT: High voltage wiring must not be run in the same conduit as low voltage control or sensor wiring.** Failure to comply with this requirement will result in poor or no remote communication and/or in inaccurate sensor reading.

Sixteen (16) wires should be run from each Bard Wall-Mount® to the low voltage terminal block in the TCS20. An eight pair shielded cable with 20 gauge copper conductors, such as National Wire & Cable Corporation NQP series cable or equivalent, is recommended for distances up to 45 feet. See Table 1 for distances more than 45 feet. The connection points are shown in Figure 5.

Wire Gauge	Maximum Distance in Feet ( meter)
20 gauge, 0.50 mm <sup>2</sup>	45 (14)
18 gauge, 0.75 mm <sup>2</sup>	60 (18)
17 gauge, 1.00 mm <sup>2</sup>	75 (23)
16 gauge, 1.50 mm <sup>2</sup>	100 (30)
14 gauge, 2.50 mm <sup>2</sup>	160 (49)
12 gauge, 4.00 mm <sup>2</sup>	250 (76)

TABLE 1

### 3.2.3 WIRING - SENSORS

**IMPORTANT: High voltage wiring must not be run in the same conduit as low voltage control or sensor wiring.** Failure to comply with this requirement will result in poor or no remote communication and/or in inaccurate sensor reading.

#### 3.2.3.1 Outdoor Temperature Sensor (OTS)

The Outdoor Temperature Sensor (OTS) is supplied as part of the TSC20 package. The Outdoor Temperature Sensor (OTS) is a thermistor type device. The sensor is mounted in a weatherproof junction box suitable for connection to conduit. This sensor is a two (2) wire device.

The Outdoor Temperature Sensor (OTS) should be mounted on the exterior of the structure at a height above any expected accumulation of snow. It is recommended that the box be mounted

securely to the outside wall of the structure and all wiring to the sensor be made through conduit. A one (1) pair shielded cable with 20 gauge copper conductors, such as National Wire & Cable Corporation NQP series cable or equivalent, is recommended for connection to the sensor for distances up to 45 feet. See Table 1 for distances more than 45 feet.

Use wire nuts to connect the cable to the blue and yellow sensor leads in the sensor housing. Polarity is not critical with this sensor. The connection points for the sensor inside the TCS20 are shown in Figure 4.

#### 3.2.3.2 Outdoor Humidity Sensor (OHS)

The Outdoor Humidity Sensor (OHS) is supplied as part of the TSC20 package. The Outdoor Humidity Sensor (OHS) is a bulk polymer type device. The sensor is mounted in a weatherproof junction box suitable for connection to conduit. This sensor is a four (4) wire device, 1 to 5 Vdc output.

The Outdoor Humidity Sensor (OHS) should be mounted on the exterior of the structure at a height above any expected accumulation of snow. It is recommended that the box be mounted securely to the outside wall of the structure and all wiring to the sensor be made through conduit. A two (2) pair shielded cable with 20 gauge copper conductors, such as National Wire & Cable Corporation NQP series cable or equivalent, is recommended for connection to the sensor for distances up to 45 feet. See Table 1 for distances more than 45 feet.

Connect the cable to the terminal blocks in the sensor housing. Polarity is critical with this sensor. The connection points for the sensor inside the TSC20 are shown in Figure 4.

#### 3.2.3.3 Zone Temperature Sensor (ZTS)

The Zone Temperature Sensor (ZTS) is supplied as part of the TSC20 package. The Zone Temperature Sensor (ZTS) is a thermistor type device. The sensor is premounted to the front door of the TCS20. No wiring is required.

### **3.2.3.4 Zone Humidity Sensor (ZHS) (Optional)**

The Zone Humidity Sensor (ZHS) is supplied as part of the TSC20 package (Optional). The Zone Humidity Sensor (ZHS) is a bulk polymer type device. If so equipped, the sensor is premounted to the front door of the TCS20. No wiring is required.

## **3.2.4 WIRING - INPUTS & OUTPUTS**

A shielded cable with 20 gauge copper conductors, such as National Wire & Cable Corporation NQP series cable or equivalent, is recommended for connection to the inputs and outputs of the TCS20 for distances up to 45 feet. See Table 1 for distances more than 45 feet.

### **3.2.4.1 Shelter Alarm Output**

The Shelter Alarm Output (SA) is a normally open set of contacts that closes whenever an alarm condition exists as sensed by the TCS20 controller. See the alarm section of this manual for an explanation of the various conditions that will send a shelter alarm.

The Form "A" contacts are SPST N.O. rated at 24 VAC, 5 A Resistive, or 24 VAC, 2 A Inductive. These rating should not be exceeded under any conditions.

These contacts may be used to trigger an alarm in the shelter or a remote alarm.

### **3.2.4.2 Power Transfer Switch Output (PTS)**

The Power Transfer Switch Output is a normally open set of contacts that closes two (2) minutes after a power failure is sensed by the TCS20 controller. See the alarm section of this manual for an explanation of the power failure alarm.

The Form "A" contacts are SPST N.O. rated at 24 VAC, 5 A Resistive, or 24 VAC, 2 A Inductive. These rating should not be exceeded under any conditions.

These contacts can be use to energize a power transfer switch when used in conjunction with an inverter to provide emergency ventilation of the shelter during power failures. Consult the power management sequence, section 4.28, for more details.

### **3.2.4.3 Power Failure Sense Input**

The Power Failure Sense is an input into the Controller. A normally open set of contacts is connected across these inputs. When power is lost to the shelter these contacts should close indicating that the building has lost normal utility power. These contacts can be used in conjunction with an inverter and power transfer switch to provide emergency ventilation of the shelter during power failures. Consult the power failure management section of this manual for more details..

This is a dry contact input only. Do not connect any voltage source to these terminals. Do not connect utility power to these terminals.

### **3.2.4.4 Door Alarm Input**

The Door Alarm is an input into the Controller. A set of normally open contacts is connected across these inputs. These contacts should close when door is closed.

This is a dry contact input only. Do not connect any voltage source to these terminals. Do not connect utility power to these terminals.

## **3.2.5 WIRING - TELEPHONE LINE**

When the TSC20 is equipped with a modem, an analog phone line should be connected to the back of the modem in the jack labeled LINE. This jack accepts a standard a RJ-11 six (6) position modular phone plug.



# Figure 4

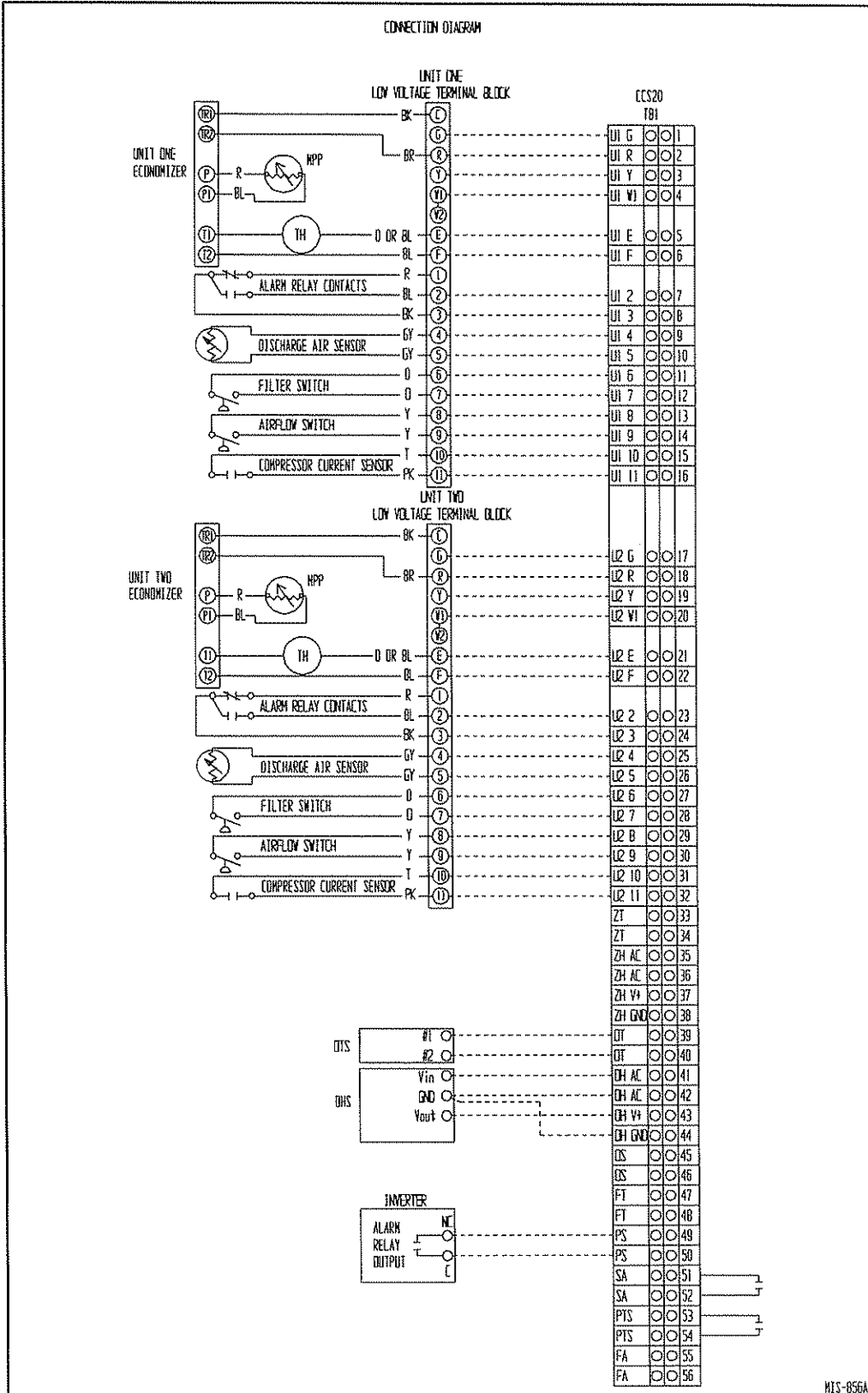
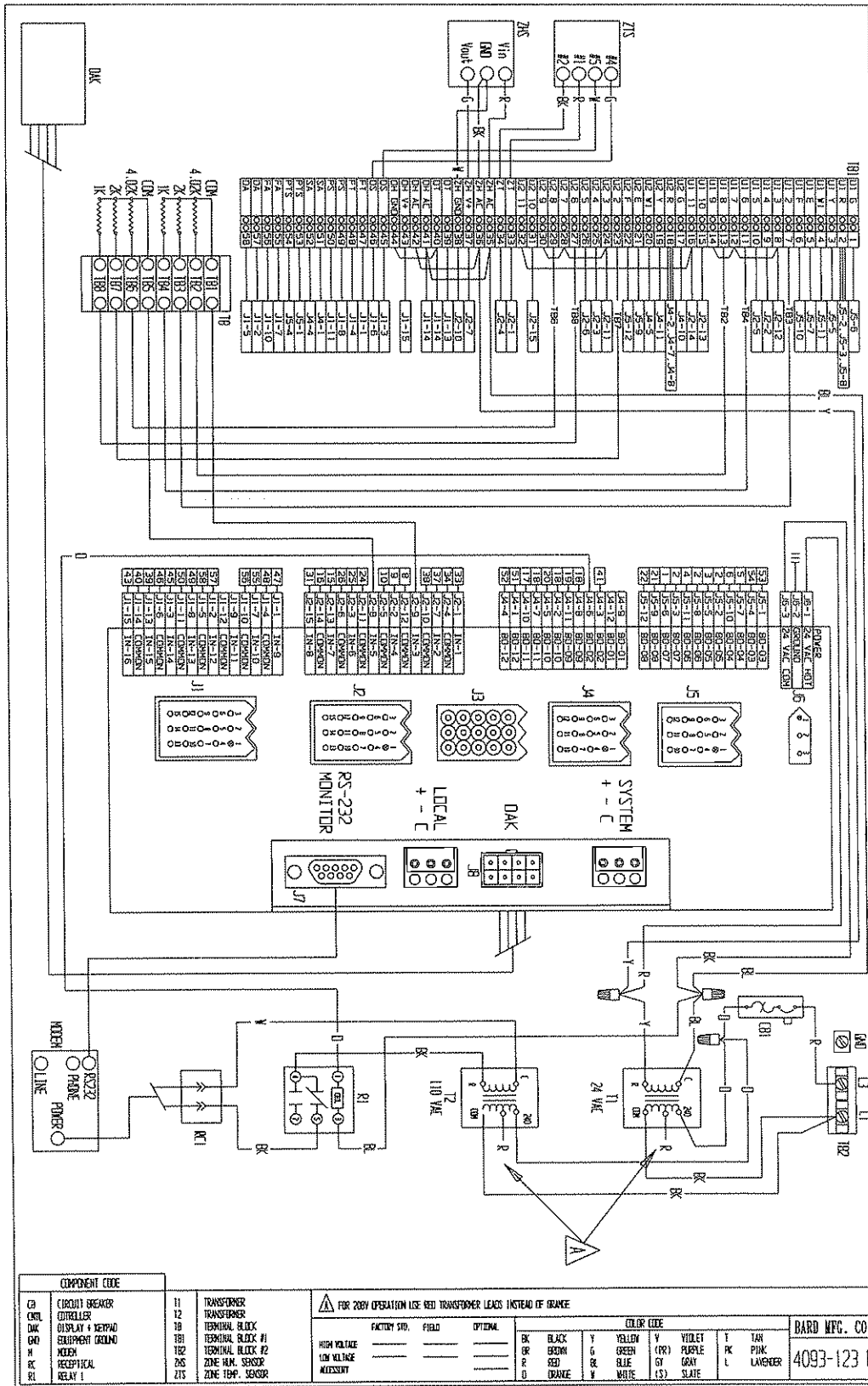


Figure 5



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# TCS20 SYSTEM BLOCK DIAGRAM

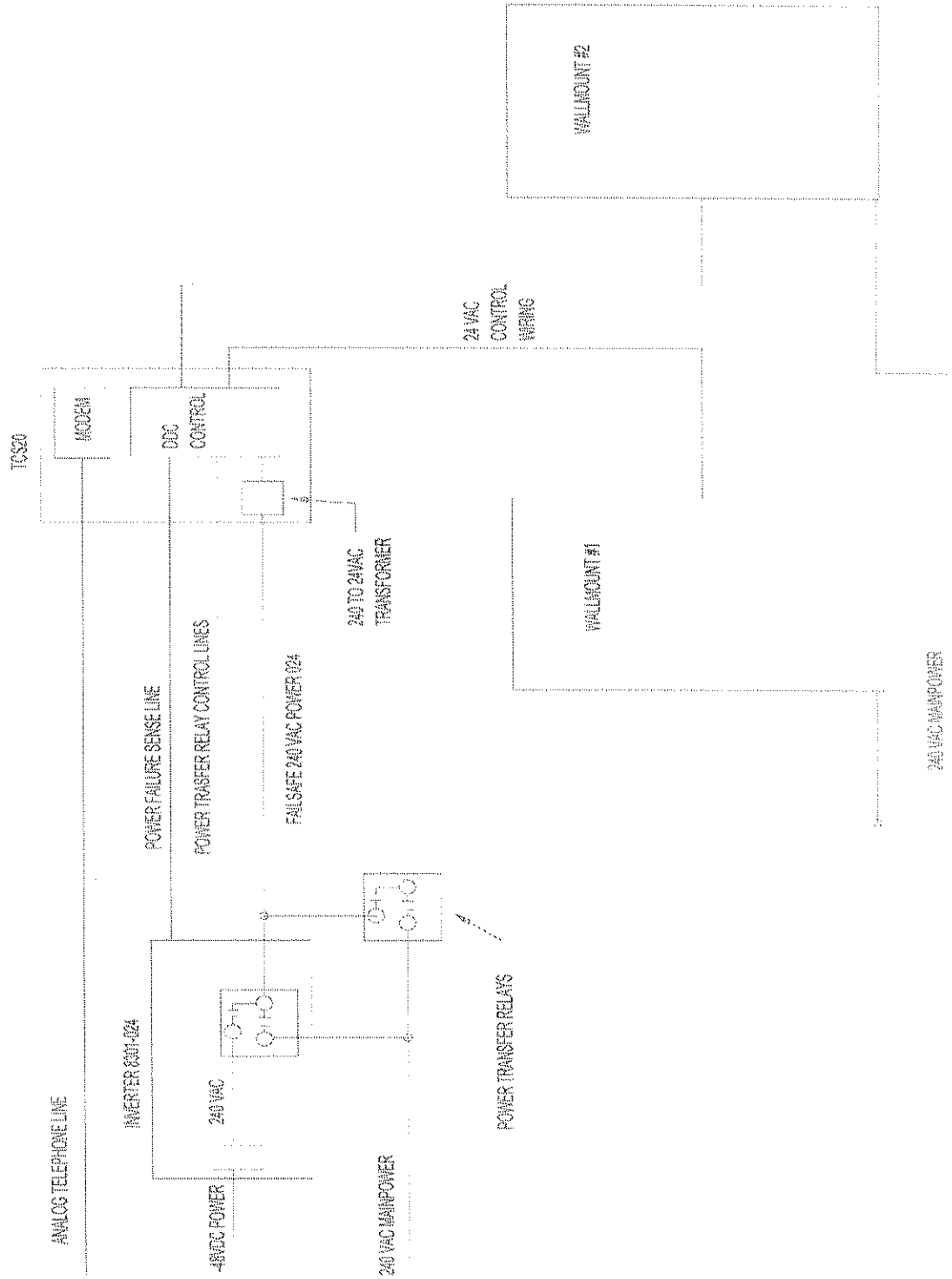


Figure 6

### 3.3 Installation Check List

TCS20 securely mounted to wall and all conduit connections tight.	
Main power wiring is <b>NOT</b> in same conduit as low voltage or sensor wiring	
Main power wires are copper conductors	
TCS20 is grounded.	
Check supply voltage. Change both transformer taps if necessary. See Sec. 3.21	
Carefully recheck all low voltage wiring for correct connection points .	
Carefully recheck all sensor connections for correct connection points.	
Recheck analog telephone wire connection to modem if so equipped.	
Make sure modem power switch is on if so equipped.	

## 3.4 System Startup

### 3.4.1 WALLMOUNT STARTUP CHECKLIST

Operation	Procedure	
Bypassing TCS20 Controller	Disconnect power to the TCS20. Unplug the plug in connectors J4 and J5 from the controller	
Apply power to both Wall-mounts	Follow recommended startup procedure in the WallMount® installation instructions. <u>Compressor damage could occur if startup procedures are not followed.</u>	
Compressor Test	Connect jumper wire on A/C unit low voltage terminals from R to Y and observe Compressor operation (There will be a Time delay between the installation of the jumper and the starting of the Compressor. The Compressor Time Delay relay will determine the time delay period.). After the Compressor starts, the jumper wire can be removed.	
Blower Test	Connect a jumper wire on A/C unit low voltage terminals R to G and observe Blower operation (The Blower will continue to run for One (1) minute after the jumper is removed).	
Economizer Test	Connect a jumper wire on A/C unit low voltage terminals R to G and observe Blower operation. After Blower operation is confirmed, the Economizer can be tested. Leave the jumper in place from the previous step. Connect a separate jumper on the A/C unit low voltage terminals from E to F and observe the Economizer operation (Never connect power to terminals E or F).	
Heater Test	Connect a jumper wire on A/C unit low voltage terminals R to W1. The Heating contactor will engage when the jumper is connected. The Blower will also operate while this jumper is in place. To check the operation of the Heater, you will have to check the Discharge Air temperature of the A/C unit.	
Disconnect Power to WallMount® Air-Conditioners	Disconnect power to WallMount® air conditioners. Reconnect plug-in connectors J4 and J5 to the controller. Go to TCS20 Startup Checklist	

### 3.4.2 TSC20 STARTUP CHECKLIST

Disconnect power to WallMount® air-Conditioners	Disconnect power to WallMount® air-Conditioners	
Apply power to TCS20	<p>Apply power to TSC20 and monitor LEDs on the front of the controller. The controller performs a self test on startup. Upon application of power, 9 LEDs will light.</p> <p>System Power led will light and stay lit</p> <p>Unit #1 is Lead Unit, Unit #2 is Lead Unit, Free Cooling, Power Failure LEDs will light for 5 seconds and then resume normal operation</p> <p>System Rx and Tx and Local Rx and Tx will all flash on, flash off, flash on and then flash off during this five seconds and will then resume normal operation .</p> <p>This completes the self test and controller will now start controlling per the sequence of operation.</p>	
Reapply Power to WallMounts®	Power to the WallMounts® should be reapplied within 2 minutes of the completion of the self test. Failure to energize the WallMounts® within the two minutes will result in alarm conditions within the controller that will have to be cleared before normal operation of the controller can resume.	
Connect to Controller	<p>Use the DAK or Laptop PC to connect to controller to change setpoints.</p> <p>See Section 4.3 for DAK operation procedures.</p> <p>See Section 5.0 for direct connect PC operation.</p>	

## **4.0 OPERATION**

This section describes the sequence of operation of the controller. The tools available for monitoring and controlling the air-conditioners for both on-site and remote operations are explained. The remote trending, alarming, and site setup software are detailed.

### **4.1 General**

This section will describe the sequence of operation of the controller, the display and keypad operation and software operation

### **4.2 Sequence of Operation**

This sequence of operation is for the TCS20 -001 software package. Different software packages have different sequences of operation. Check the last three numbers of the TCS20 model number on the serial plate to verify that the sequence installed is "001"

#### ***4.2.1 COOLING SEQUENCE***

Outdoor Enthalpy is calculated from Outdoor Temperature and Outdoor Humidity. If the calculated outdoor enthalpy is below the free cooling enthalpy setpoint, free cooling is enabled and Output #15, Free Cooling is lit.

Active Cooling Setpoint is compared to Space Temperature . If Space temperature is above Active Cooling Setpoint, stage 1 cooling is enabled. If Free Cooling is enabled, Economizer and Blower of the Lead Unit are energized. If Free Cooling is inhibited, Compressor and Blower of the Lead Unit are energized.

If the Space Temperature is above Active Cooling Setpoint plus 2 deg C°, stage 2 cooling is enabled. If Free Cooling is enabled, Economizer and Blower of the Lag Unit are energized. If Free Cooling is inhibited, no action is taken.

If the Space Temperature is above Active Cooling Setpoint plus 4 deg C°, stage 3 cooling is enabled. If Free Cooling is enabled, Compressor and Blower of the Lead Unit are energized. Economizer of the lead unit and Blower and Economizer of the lag unit are de-energized. If Free Cooling is inhibited, no action is taken.

#### ***4.2.2 HEATING SEQUENCE***

Active Heating Setpoint is compared to Space Temperature. If Space temperature is below Active Heating Setpoint , Stage 1 heating is enabled. Heater and Blower of the Lead Unit are energized.

#### ***4.2.3 LEAD / LAG SEQUENCE***

The controller will switch lead and lag units to equalize wear on the units. Changeover period is user changeable. Default is 24 Hours. Range is 24 to 168 Hours in increments of 12 hours. Changeover

will occur when lead unit hours equal changeover hours. Lead unit may be changed manually from the DAK. Lead unit will also change when certain failure conditions are met. Either Output 12, Lead Unit #1 or Output 13, Lead Unit #2 will be lit corresponding to the lead unit.

#### **4.2.4 FAN SEQUENCE**

The Lead Unit Evaporator Fan is programmed for continuous operation. Operator can change continuous operation to cycle on demand. Lag unit fan will cycle on demand.

#### **4.2.5 OCCUPIED / UNOCCUPIED MODE SEQUENCE**

In heating mode, activation of the Occupancy Override Button will change the Active Heating Setpoint from Unoccupied Heating Setpoint to Occupied Heating Setpoint for a period of two hours. In cooling mode, activation of the Occupancy Override Button will change the Active Cooling Setpoint from Unoccupied Cooling Setpoint to Occupied Heating Setpoint for two hours.

#### **4.2.6 FAILURE SEQUENCE**

The controller will alarm on the following failures.

##### High Space Temperature

When Space Temperature is above High Temperature Alarm Setpoint a critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. This is a self clearing alarm.

##### Low Space Temperature

When Space Temperature is below Low Temperature Alarm Setpoint a critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. This is a self clearing alarm.

##### High Space Humidity

When Space Humidity is above High Humidity Alarm Setpoint a critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. This is a self clearing alarm.

##### Low Space Humidity

When Space Humidity is below Low Humidity Alarm Setpoint a critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. This is a self clearing alarm.



### Blower Failure Unit #1

If Blower operation is called for the blower airflow sensor is checked. If the airflow sensor does not confirm that there is airflow, Output 7, Unit #1 Blower, is de-energized. After 30 seconds the blower is energized again. If airflow is not sensed, Output 7, Unit #1 Blower, is de-energized. After another 30 seconds the blower is energized again. If airflow is not sensed, Output 7, Unit #1 Blower, is de-energized and locked out. A critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. Lead unit switches to lag unit. The Output Alarm must be cleared to resume operation.

### Blower Failure Unit #2

If Blower operation is called for the blower airflow sensor is checked. If the airflow sensor does not confirm that there is airflow, Output 11, Unit #2 Blower, is de-energized. After 30 seconds the blower is energized again. If airflow is not sensed, Output 11, Unit #2 Blower, is de-energized. After another 30 seconds the blower is energized again. If airflow is not sensed, Output 11, Unit #2 Blower, is de-energized and locked out. A critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. Lead unit switches to lag unit. The Output Alarm must be cleared to resume operation.

### Compressor Lockout Failure Unit #1

If Compressor operation is not verified because the High or Low Pressure Lockout Relay has been energized, Output 5, Unit #1 Compressor, is de-energized and locked out. A critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. Lead unit switches to lag unit. The Output Alarm must be cleared to resume operation. Verify is tried 3 times before the output is locked out. Compressor Operation is verified by Unit #1 Compressor Lockout Relay and Unit #1 Compressor Current Switch.

### Compressor Lockout Failure Unit #2

If Compressor operation is not verified because the High or Low Pressure Lockout Relay has been energized, Output 9, Unit #2 Compressor, is de-energized and locked out. A critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. Lead unit switches to lag unit. The Output Alarm must be cleared to resume operation. Verify is tried 3 times before the output is locked out. Compressor Operation is verified by Unit #2 Compressor Lockout Relay and Unit #2 Compressor Current Switch.

### Compressor Current Failure Unit #1

If Unit #1 Compressor is on and Unit #1 Compressor Current Switch is not valid, a critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. Lead unit switches to lag unit. The Output Alarm must be cleared to resume operation. Verify is tried 3 times before the output is locked out. Compressor Operation is verified by Unit #1 Compressor Lockout Relay and Unit #1 Compressor Current Switch.

## Compressor Current Failure Unit #2

If Unit #2 Compressor is on and Unit #2 Compressor Current Switch is not valid , a critical alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. Lead unit switches to lag unit. The Output Alarm must be cleared to resume operation. Verify is tried 3 times before the output is locked out. Compressor Operation is verified by Unit #2 Compressor Lockout Relay and Unit #2 Compressor Current Switch.

## Dirty Filter Unit #1

If Unit #1 Dirty Filter Switch is closed, a low priority alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. This alarm must be reset at the unit.

## Dirty Filter Unit #2

If Unit #2 Dirty Filter Switch is closed, a low priority alarm is logged in the Event List and Output 12, Shelter Alarm, is energized. This alarm must be reset at the unit.

## Utility Power Failure

If Input #13, Power Sense, is closed indicating a utility power failure, a critical priority alarm is logged in the Event list and Output 12, Shelter Alarm, is energized. All unit outputs are de-energized. Two minutes after the alarm, Output #3, Power Transfer Switch, is energized . Three minutes after the alarm, Lead Unit Blower and Lead Unit Economizer are energized continuously until Utility Power Failure Alarm is cleared. This is a self clearing alarm.

## Door Alarm

If Input #9,Door Alarm, is open indicating an open door, a medium priority alarm is logged in the Event list and Output 12, Shelter Alarm, is energized.

### **4.2.7 MODEM SEQUENCE**

The power to the modem will be cycled off for one minute every day at midnight.

### **4.2.8 SETPOINTS**

The default setpoint for all points are listed below. All setpoints are user changeable within the ranges listed.

Occupied Heating Setpoint	Default	22.0	C°	Range	21.0 - 23.0 C°
Unoccupied Heating Setpoint	Default	21.0	C°	Range	19.0 - 22.0 C°
Occupied Cooling Setpoint	Default	25.0	C°	Range	24.0 - 25.5 C°
Unoccupied Cooling Setpoint	Default	26.5	C°	Range	25.5 - 28.0 C°
High Temperature Alarm Setpoint	Default	33.0	C°	Range	29.5 - 38.0 C°
Low Temperature Alarm Setpoint	Default	14.5	C°	Range	10.0 - 19.5 C°

High Humidity Alarm Setpoint	Default	80 % RH	Range	60 % - 85 % RH
Low Humidity Alarm Setpoint	Default	20 % RH	Range	10 % - 35 % RH
Changeover Hours	Default	24 Hrs	Range	24 - 168 Hrs

### 4.3 Display & Keypad Operation (DAK)

The display and keypad (DAK) is used to monitor and change parameters in the controller. The DAK can be ordered as part of the TCS20 or ordered separately as a carry in diagnostic tool for the shelter maintenance technician.

#### 4.3.1 DISPLAY & KEYPAD PHYSICALS

The display and keypad (DAK) consists of a 2 line by 16 character backlit LCD display, 10 key keypad and 2 indicating LEDs.

All messages displayed on the DAK are uploaded from the 7040 controller at power up. The LCD display uses a tree style menu system to display all functions.

The keypad consists of keys labeled <Home>, <UP>, <Enter>, <Change>, <On>, <Left>, <Down>, <Right>, <Cancel>, and <Off>. The specific function of these keys is preprogrammed and not user configurable.

The <On> and <Off> keys are not programmed and serve no function in this application. A key press to either of these keys will turn on the backlit display for a short time but will do nothing else.

In general the keys have the following functions. The <Home > key is used to backup one level in the menu tree. The <UP>, <Left>, <Down>, <Right> keys are used to navigate through choice lists and menus in the menu tree. The <Enter> key is used to select a choice or menu in the menu tree. The <Change> key is used to enter change mode to change setpoints, passwords, or lead/ lag units. The function of each of the keys depends on where you are in the menu tree.

The Rx and Tx LEDs are lit when the DAK is receiving or transmitting data respectively. These are used in troubleshooting to determine if data is being sent or received.

The DAK plugs into the 7040 controller through a prewired cord set. All power and communication signals are sent through this cord set to the DAK. The display and keypad (DAK) communicates with the 7040 controller via an RS485 communication bus using a proprietary communication protocol. The DAK will only function when plugged into the 7040 controller.

### 4.3.2 POWER UP

Upon applying power, the DAK will establish communications with the controller and begin requesting data. The first information screen to appear will be the Time and Date display. The current controller date and time will be displayed on the first line of the display. Alarm status is shown on the second line. This line indicates the status of any alarms. If there are no alarms the line will say "NO ALARMS". If one or more alarms are present it will show the priority level of the highest priority alarm that is present, either CRITICAL ALR (alarm) or ALARM NOW. CRITICAL ALR will be displayed if the alarm has critical priority. ALARM NOW will be displayed if the alarm has medium or low priority.

12/01/96 8:45 AM NO ALARMS
-------------------------------

The Time and Date display will be displayed for 5 seconds. The display will then scroll to the first display list entry of the Building Status menu. The name of the point being displayed will on the first line of the display, in this case Zone Temperature. The current zone temperature will be displayed in the second line of the display. This screen will also be displayed for 5 seconds and then the display will scroll back to the time & date. These two displays will continue to scroll until a key is pressed.

ZONE TEMP VAL 25.00 DegC
-----------------------------

### 4.3.3 MENU TREE

The DAK consists of seven main menus.

<u>Menu Name</u>	<u>Menu Type</u>
Building Status,	Status
Unit Status	Status
Setpoints	Parameters
Overrides	Override
Alarms	Alarm
Password Menu	Password
Option Menu	Special

Each of these main menus has many menu items beneath it. Study the Keypad Map in section 4.3.11 on page 47 to become familiar with the menu tree structure. This is a handy reference and includes all keystrokes needed to get to any display or function.

Pressing the <Home> key once from the Time & Date display brings up the Building Status menu. The Menu Name will be displayed on the first line. The Menu Type will be displayed on the second line.

BUILDING STATUS  
STATUS

From this display press the <Down> key to scroll down the menu list. Pressing the <Down > key six times will result in the Building Status menu being displayed again. The Alarm menu displays "Alarms" on the first line and the highest current alarm status on the second line. The Option menu is a Special Menu and access to this menu will be discussed later.

Not all items in every menu are available to every user to change. Some menus are password protected. If your password gives you the required authority level, you will be able to access the menu to make changes. See the Password section for a discussion of the authority levels.

**4.3.4 BUILDING STATUS MENU**

Authority Level Required to Make Changes - Does not apply. No changes can be made from this menu set.

The Building Status menu set displays the following information about the shelter environment.

- Zone Temperature
- Zone Humidity
- Outdoor Temperature
- Outdoor Humidity
- Active Cooling Setpoint
- Active Heating Setpoint
- Free Cooling is Enabled/Disabled
- Lead Unit is number 1/2
- Utility power is OK/Alarm
- After Hours Override is On/Off

The values displayed for each of these points is updated every five seconds. To enter the Building Status Menu press the <Enter> key. This will enter the Building Status menu list and display the following.

BUILDING STATUS  
Zone Temp

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list. Once the desired item is shown on line two of the display, pressing enter will display the current value of the item. This Value will be updated every 5 seconds.

Zone Temp  
VAL 21.00 DegC

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list displaying the list item on line one and the current value on line two.

#### ***4.3.4.1 Zone Temperature***

The zone temperature item displays the current temperature inside the structure.

#### ***4.3.4.2 Zone Humidity***

The zone humidity item displays the current humidity inside the structure. This is an optional sensor and may or may not be present in your system. The current value will read one percent, "1 %" if no sensor is present.

#### ***4.3.4.3 Outdoor Temperature***

The outdoor temperature item displays the current temperature outside the structure.

#### ***4.3.4.4 Outdoor Humidity***

The outdoor humidity item displays the current humidity outside the structure.

#### ***4.3.4.5 Active Cooling Setpoint***

The Active Cooling Setpoint displays the current cooling setpoint that the controller uses to determine whether cooling is required or not. If the Zone temperature is above the Active Cooling Setpoint, Stage One Cooling will be on.

The Active Cooling Setpoint will be one of two values. If the controller is in occupied mode, the Active Cooling Setpoint will be the same as the Occupied Cooling Setpoint. If the controller is in unoccupied mode, the Active Cooling Setpoint will be the same as the Unoccupied Cooling Setpoint. Occupancy is determined from the After-hours Occupancy Override Button located on the temperature sensor on the front of the TCS20.

#### ***4.3.4.6 Active Heating Setpoint***

The Active Heating Setpoint displays the current heating setpoint that the controller uses to determine whether heating is required or not. If the Zone Temperature is below the Active Heating Setpoint, Stage One Heating will be on.

The Active Heating Setpoint will be one of two values. If the controller is in occupied mode, the Active Heating setpoint will be the same as the Occupied Heating Setpoint. If the controller is in unoccupied mode, the Active Heating Setpoint will be the same as the Unoccupied Heating Setpoint. Occupancy is determined from the After-hours Occupancy Override Button located on the temperature sensor on the front of the TCS20.

#### ***4.3.4.7 Free Cooling is Enabled/Disabled***

This display item indicates whether outside conditions are suitable to allow the use of outside air to provide free cooling inside the structure. The controller calculates the outside enthalpy from the Outdoor Temperature and Outdoor Humidity and compares this value with the Enthalpy Setpoint. If the enthalpy of the outside air is less than the Enthalpy setpoint then Free Cooling is Enabled. If the enthalpy of the outside air is more than the Enthalpy setpoint then Free Cooling is Disabled.

#### ***4.3.4.8 Lead Unit is number 1/2***

This display item indicates which unit is the current lead unit. If a one (1 ) is displayed, the unit connected to the "U1" low voltage terminals of the controller is the lead unit. If a two (2 ) is displayed, the unit connected to the "U2" low voltage terminals of the controller is the lead unit.

#### ***4.3.4.9 After Hours Override is On/Off***

This display indicates the status of the After-hours Occupancy Override Button. If the display shows "OFF", the controller is in the unoccupied mode and the unoccupied setpoints prevail. If the display shows "On", the controller is in the occupied mode and the occupied setpoints prevail. Depressing the Occupancy Override Switch on the Zone Temperature Sensor for one second triggers the Occupied mode for two (2) hours.

### ***4.3.5 UNIT STATUS MENU***

Authority Level Required to Make Changes - Does not apply. No changes can be made from this menu set.

The Unit Status menu set displays the following information about both air-conditioners.

Unit #1 Economizer	On/Off
Unit #1 Compressor	On/Off
Unit #1 Heater	On/Off
Unit #1 Blower	On/Off
Unit #1 Discharge Air Temperature	Value DegC
Unit #2 Economizer	On/Off
Unit #2 Compressor	On/Off
Unit #2 Heater	On/Off
Unit #2 Blower	On/Off
Unit #2 Discharge Air Temperature	Value DegC

The values displayed for each of these points is updated every five seconds. To enter the Unit Status Menu press the <Enter> key. This will enter the Unit Status menu list and display the following.

UNIT STATUS  
Unit#1 Econ

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list. Once the desired item is shown on line two of the display, pressing enter will display the current value of the item. This value will be updated every 5 seconds.

Unit #1 Econ  
VAL Off

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list displaying the list item on line one and the current value on line two.

**4.3.5.1 Unit #1 Economizer**

This display item will show "Off" if the unit #1 economizer output of the controller is not energized. This display item will show "On" if the unit #1 economizer output of the controller is energized.

**4.3.5.2 Unit #1 Compressor**

This display item will show "Off" if the unit #1 compressor output of the controller is not energized. This display item will show "On" if the unit #1 compressor output of the controller is energized.

**4.3.5.3 Unit #1 Heater**

This display item will show "Off" if the unit #1 heater output of the controller is not energized. This display item will show "On" if the unit #1 heater output of the controller is energized.

**4.3.5.4 Unit #1 Blower**

This display item will show "Off" if the unit #1 blower output of the controller is not energized. This display item will show "On" if the unit #1 blower output of the controller is energized.

**4.3.5.5 Unit #1 Discharge Air Temperature**

This display will show the current discharge air temperature in the supply air duct of Unit #1 in C°.

**4.3.5.6 Unit #2 Economizer**

This display item will show "Off" if the unit #2 economizer output of the controller is not energized. This display item will show "On" if the unit #2 economizer output of the controller is energized.



#### 4.3.5.7 Unit #2 Compressor

This display item will show "Off" if the unit #2 compressor output of the controller is not energized. This display item will show "On" if the unit #2 compressor output of the controller is energized.

#### 4.3.5.8 Unit #2 Heater

This display item will show "Off" if the unit #2 heater output of the controller is not energized. This display item will show "On" if the unit #2 heater output of the controller is energized.

#### 4.3.5.9 Unit #2 Blower

This display item will show "Off" if the unit #2 blower output of the controller is not energized. This display item will show "On" if the unit #2 blower output of the controller is energized.

#### 4.3.5.10 Unit #2 Discharge Air Temperature

This display will show the current discharge air temperature in the supply air duct of Unit #2 in C°.

### 4.3.6 SETPOINTS MENU

The Setpoints menu set displays the following information about the controller.

Occupied Cooling Setpoint	Current Setpoint
Unoccupied Cooling Setpoint	Current Setpoint
Occupied Heating Setpoint	Current Setpoint
Unoccupied Heating Setpoint	Current Setpoint
High Temperature Alarm Setpoint	Current Setpoint
Low Temperature Alarm Setpoint	Current Setpoint
High Humidity Alarm Setpoint	Current Setpoint
Low Humidity Alarm Setpoint	Current Setpoint
Changeover Hours	Current Setpoint
Enthalpy Setpoint	Current Setpoint

From this menu you can display the current setpoint and, with the proper authorization, change the current setpoints. The values displayed for each of these points is updated every ten (10) seconds. To enter the Unit Setpoints Menu press the <Enter> key. This will display the following.

SETPOINTS Occ Cooling Setpoint
-----------------------------------

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list. Once the desired item is shown on line two of the display, pressing enter will display the current value of the item. This value will be updated every ten (10) seconds.

Occ Cooling SP  
VAL 25.00 DegC

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list displaying the list item on line one and the current value on line two.

To change the displayed setpoint press the <Change> key. If you do not have authority to change the setpoint the display will read;

Req: Required Level  
Pwd: Current Level

A supervisor authority level is required to change any setpoints. If you have authority to change the setpoint the display will read.

VAL Current Setpoint  
^ New Setpoint

Use the <UP> and <Down> keys to move the setpoint up or down. Once the new setpoint is displayed press the <Enter> key to accept the new setpoint. The DAK will respond briefly with:

---Downloaded---  
---Successfully---

The display will then revert to the list item display and within 10 seconds the new setpoint will be updated. There are limits to the range of the setpoints. These are detailed in the list items below.

#### **4.3.6.1 Occupied Cooling Setpoint**

The occupied cooling setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Occupied Cooling Setpoint Range is from 24.0 to 25.5 C°. The default value is 25.0 C°

#### **4.3.6.2 Unoccupied Cooling Setpoint**

The unoccupied cooling setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Unoccupied Cooling Setpoint Range is from 25.5 to 28.0 C°. The default value is 26.5 C°

#### **4.3.6.3 Occupied Heating Setpoint**

The occupied heating setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Occupied Heating Setpoint Range is from 21.0 to 23.0 C°. The default value is 22.0 C°

#### **4.3.6.4 Unoccupied Heating Setpoint**

The unoccupied heating setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Unoccupied Heating Setpoint Range is from 19.0 to 22.0 C°. The default value is 21.0 C°

#### **4.3.6.5 High Temperature Alarm Setpoint**

The high temperature alarm setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The High Temperature Alarm Setpoint Range is from 29.5 to 38.0 C°. The default value is 33.0 C°. The high alarm setpoint should always be set at least 4 degrees higher than the unoccupied cooling setpoint. Nuisance alarms could occur if this requirement is not followed.

#### **4.3.6.6 Low Temperature Alarm Setpoint**

The low temperature alarm setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Low Temperature Alarm Setpoint Range is from 10.0 to 19.5 C°. The default value is 14.5 C°. The low alarm setpoint should always be set at least 4 degrees lower than the unoccupied heating setpoint. Nuisance alarms could occur if this requirement is not followed.

#### **4.3.6.7 High Humidity Alarm Setpoint**

The high humidity alarm setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The High Humidity Alarm Setpoint Range is from 60.0 to 85 % RH. The default value is 80.0 % RH.

#### **4.3.6.8 Low Humidity Alarm Setpoint**

The low humidity alarm setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Low Humidity Alarm Setpoint Range is from 15.0 to 35 % RH. The default value is 20.0 % RH.

#### **4.3.6.9 Changeover Hours**

The changeover hours setpoint is used to control the switching of the lead and lag units. After power is applied to the controller, the lead unit will switch to lag after the changeover hours have been reached. The timer then restarts and the units will switch back after the changeover hours been reached. These are clock hours not run time hours.

The Changeover Hours Setpoint requires an authority level of Supervisor or higher to change. Anyone may view the setpoint value. The Changeover Hours Setpoint Range is from 24.0 to 168 hours in 12 hour increments. The default value is 24 hours.

### 4.3.6.10 Enthalpy Setpoint

The Enthalpy Setpoint is used to determine if the outside air is suitable to use for cooling the structure. The default value for this point is 14.00 kCal/ kg. of dry air. Consult the enthalpy lookup table to adjust this value for the specific conditions that you wish to maintain in the structure. Read down the relative humidity column under the percentage RH you wish to maintain. Read across the inside temperature row to where it intersects the RH column. Enter this value into the Enthalpy Setpoint Display. This will ensure that economizer will never bring in outside air that is too humid.

Table 2. *Enthalpy* Lookup Table

Desired Indoor Temp.	Desired Indoor % Relative Humidity							
	35%	40%	45%	50%	55%	60%	65%	70%
29.50	12.75	14.00	15.25	16.50	17.50	18.50	19.75	21.00
29.00	12.50	13.50	14.75	16.00	17.00	18.25	19.50	20.50
28.25	12.25	13.25	14.5	15.75	16.75	17.75	19.00	20.50
27.75	12.00	13.00	14.00	15.25	16.25	17.50	18.50	19.50
27.25	11.50	12.50	13.75	14.75	16.00	17.00	18.00	19.00
26.50	11.25	12.25	13.50	14.50	15.75	16.75	17.75	18.50
26.00	11.00	12.00	13.25	14.25	15.50	16.25	17.25	18.00
25.50	10.75	11.75	12.75	14.00	15.00	15.75	16.75	17.75
25.00	10.50	11.50	12.50	13.75	14.50	15.50	16.50	17.25
24.50	10.25	11.25	12.25	13.25	14.25	15.25	16.00	16.75
23.75	10.00	10.75	12.00	13.00	13.75	14.75	15.75	16.50

### 4.3.7 OVERRIDES

The Overrides menu set displays the following information about the controller.

Change Lead Unit	Reset Only
#1 Blower Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#1 Economizer Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#1 Compressor Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#1 Heater Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#2 Blower Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#2 Economizer Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#2 Compressor Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
#2 Heater Override	O/R On, O/R Off, Clr Verify Alr, Clr O/R
Continuous Blower	On, Off

From this menu you can display the current status of the item and ,with the proper authorization, override the item. The values displayed for each of these points is updated every ten (10) seconds. To enter the Unit Setpoints Menu press the <Enter> key. This will display the following.

OVERRIDES  
Change Lead Unit

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list. Once the desired item is shown on line two of the display, pressing enter will display the current value of the item. This value will be updated every ten (10) seconds.

Change Lead Unit  
VAL 1.

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list displaying the list item on line one and the current value on line two.

To override the displayed item press the <Change> key. If you do not have authority to override the item the display will read;

Req: Required Level  
Pwd: Current Level

If you have authority to override the item the display will read.

VAL Current Setpoint  
^ New Setpoint

To override the displayed item press the <Change> key again. There are seven (7) actions now available, On, Off, Reset, O/R On, O/R OFF, Clr Verify Alr, and Clear O/R. Use the <Up> and <Down> keys to choose 1 of the 7 actions available. Not all actions are available each item. the available actions are shown above. Once the desired action is displayed press the <Enter> key to initiate the action. The DAK will respond briefly with:

---Downloaded---  
---Successfully---

The display will then revert to the list item display and within 10 seconds the new action will be updated.

#### **4.3.7.1 Change Lead Unit**

This list item uses the reset action only. Upon pressing the enter key the reset action is sent to the controller. This switches the current lead unit to the lag unit and resets the changeover hour timer.

An operator authority level is needed to use this item.

#### **4.3.7.2 #1 Blower Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr action clears a blower failure alarm in the alarm object. In the event of a unit #1 blower failure alarm, the output of the controller will be disabled until the problem is corrected and the alarm is cleared. Once the problem is corrected use the Clr Verify Alr action to re-enable normal operation of the output.

Any alarm of the Unit #1 Blower must be cleared before an override is accepted. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Entering the O/R On action will turn on the blower output to unit #1 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #1 blower and it will remain disabled until cleared. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.3 #1 Economizer Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr has no effect on this item.

Entering the O/R On action will turn on the economizer output to unit #1 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #1 economizer and it will remain disabled until cleared. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.4 #1 Compressor Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr action clears a compressor failure alarm in the alarm object. In the event of a unit #1 compressor failure alarm, the output of the controller will be disabled until the problem is corrected and the alarm is cleared. Once the problem is corrected use the Clr Verify Alr action to re-enable normal operation of the output.

Any alarm of the Unit #1 compressor must be cleared before an override is accepted. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Entering the O/R On action will turn on the compressor output to unit #1 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #1 compressor and it will remain disabled until cleared. Use the Clr O/R to cancel an override action and resume normal operation. A supervisor authority level is needed to use this item.

#### **4.3.7.5 #1 Heater Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr has no effect on this item.

Entering the O/R On action will turn on the heater output to unit #1 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #1 heater and it will remain disabled until cleared. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.6 #2 Blower Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr action clears a blower failure alarm in the alarm object. In the event of a unit #2 blower failure alarm, the output of the controller will be disabled until the problem is corrected and the alarm is cleared. Once the problem is corrected use the Clr Verify Alr action to re-enable normal operation of the output.

Any alarm of the Unit #2 Blower must be cleared before an override is accepted. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Entering the O/R On action will turn on the blower output to unit #2 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #2 blower and it will remain disabled until cleared. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.7 #2 Economizer Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr has no effect on this item.

Entering the O/R On action will turn on the economizer output to unit #2 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #2 economizer and it will remain disabled until cleared. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.8 #2 Compressor Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr action clears a compressor failure alarm in the alarm object. In the event of a unit #2 compressor failure alarm, the output of the controller will be disabled until the problem is corrected and the alarm is cleared. Once the problem is corrected use the Clr Verify Alr action to re-enable normal operation of the output.

Any alarm of the Unit #2 compressor must be cleared before an override is accepted. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Entering the O/R On action will turn on the compressor output to unit #2 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #2 compressor and it will remain disabled until cleared. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.9 #2 Heater Override**

This list item uses the Clr Verify Alr, O/R On, O/R Off, and Clr O/R actions. The Clr Verify Alr has no effect on this item.

Entering the O/R On action will turn on the heater output to unit #2 and it will remain on until cleared. Entering the O/R Off action will disable the output to the unit #2 heater and it will remain disabled until cleared. Once overridden the output will remain overridden until the Clr O/R action is sent to the output or power is interrupted to the controller. Use the Clr O/R to cancel an override action and resume normal operation.

A supervisor authority level is needed to use this item.

#### **4.3.7.10 Continuous Blower**

This item uses the On and Off action items. Overriding the continuous blower item to On causes the Blower Output to the lead unit to be energized continuously. Overriding the continuous blower item to Off causes the Blower Output to the lead unit to cycle on and off as there are calls for heating or cooling.

An operator authority level is needed to use this item.

#### **4.3.8 ALARMS**

The Alarm menu set displays the following information about the controller.

- Space Temp Alarm
- Space Humidity Alarm
- #1 Blower Fail
- #1 Compressor Alarm
- #1 Filter Alarm
- #2 Blower Fail
- #2 Compressor Alarm
- #2 Filter Fail
- Utility Power Fail
- Door Alarm
- Outdoor Temperature Alarm
- Outdoor Humidity Alarm



From this menu you can display the current alarm status of an item and, with the proper authorization, acknowledge the item. The values displayed for each of these points is updated every ten (10) seconds. To enter the Alarm menu press the <Enter> key. This will display the following.

```
ALARMS
Space Temp Alarm
```

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list. Once the desired item is shown on line two of the display, pressing enter will display the current alarm priority level, alarm condition, and whether it has been acknowledged. This value will be updated every ten (10) seconds.

```
Space Temp Alarm
P3 Alarm(Low)ACK
```

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above list displaying the list item on line one and the current value on line two.

To acknowledge the displayed item press the <Change> key. If you do not have authority to override the item the display will read;

```
Req: Required Level
Pwd: Current Level
```

If you have authority to override the item the display will read.

```
Space Temp Alarm
Acknowledge
```

An operator authority level is needed to acknowledge any alarm. To acknowledge the displayed alarm item press the <ENTER> key again. To acknowledge all current alarms press the <Down> key. The display will respond with;

```
Space Temp Alarm
Acknowledge All
```

Press the <Enter> key to acknowledge all alarms. The DAK will respond briefly with:

```
---Downloaded---
---Successfully---
```

The display will then revert to the list item display and within 10 seconds the new action will be updated.

All alarm items have a priority level. There are four (4) levels of priority.

P0- No Alarm

P1 - Low Priority

P2 - Medium Priority

P3 - Critical Priority

P0 alarm will always display None as the alarm message type. The priority levels will display other alarm messages. There are four (4) other types of alarms messages, Fault, Alarm, Alarm (High), and Alarm (Low).

#### ***4.3.8.1 Space Temp Alarm***

The space temperature alarm item will show one of four different alarm messages. A No alarm message indicates that the Zone Temperature Sensor is functioning normally. A Fault alarm message indicates that the Zone Temperature Sensor is sensing a value above 49 C° or below -29 C°. This probably indicates a faulty sensor. When a Space Temperature Fault alarm is detected the Zone Temperature value defaults to 23 degrees effectively shutting down heating and cooling until the sensor is replaced.

An Alarm (High) or Alarm (Low) message indicates that the sensor is sensing a temperature above or below, respectively, the High Temperature Alarm Setpoint or Low Temperature Alarm Setpoint.

The Fault alarm takes precedence over the Alarm (High) or Alarm (Low) message. If the Sensor is failed high or low the Alarm (High) or Alarm (Low) alarms will also be activated but only the Fault alarm will be displayed because this is the actual condition causing the other alarms.

These are all self-clearing alarms and will reset themselves when the alarm condition no longer exists. This is a critical alarm.

#### ***4.3.8.2 Space Humidity Alarm***

The Space Humidity Alarm item will show one of four different alarm messages. A No alarm message indicates that the Zone Humidity Sensor is functioning normally. A Fault alarm message indicates that the Zone Humidity Sensor is sensing a value above 99 % RH or below 2 % RH. This probably indicates a faulty sensor. When a Space Humidity Fault alarm is detected, the Zone Humidity value defaults to 50 % RH until the sensor is replaced.

An Alarm (High) or Alarm (Low) message indicates that the sensor is sensing humidity above or below, respectively, the High Humidity Alarm Setpoint or Low Humidity Alarm Setpoint.

The Fault alarm takes precedence over the Alarm (High) or Alarm (Low) message. If the Sensor is failed high or low the Alarm (High) or Alarm (Low) alarms will also be activated but only the Fault alarm will be displayed because this is the actual condition causing the other alarms.

These are all self-clearing alarms and will reset themselves when the alarm condition no longer exists. This is a medium priority alarm.

#### **4.3.8.3 #1 Blower Fail**

The Blower Fail alarm item will show one of two different alarm messages. A "No Alarm" message indicates that the blower airflow sensor contacts have closed and the blower is functioning normally. A Fault alarm message indicates that the blower airflow sensor contacts have not closed. A faulty blower motor, wheel or sensor could cause this alarm.

This alarm must be cleared before operation of the blower can resume. Use the Clr Verify Alr action in the Override menu to clear the alarm. This is a critical alarm.

#### **4.3.8.4 #1 Compressor Alarm**

The Compressor Alarm item will show one of two different alarm messages. "No Alarm" message indicates that the compressor verify circuit contacts have closed and the compressor is functioning normally. A Fault alarm message indicates that the compressor verify circuit contacts have not closed. A Trip on High or Low pressure, no compressor current, failed blower, or faulty compressor current sensor could cause this alarm.

This alarm must be cleared before operation of the compressor can resume. Use the Clr Verify Alr action in the Override menu to clear the alarm. This is a critical alarm.

#### **4.3.8.5 #1 Filter Alarm**

The Filter alarm item will show one of two different alarm messages. "No Alarm" message indicates that the filter is clean enough to operate. A Fault alarm message indicates that the filter is dirty and needs replaced.

This is a self-clearing alarm and will reset itself when the alarm condition no longer exists. The filter sensor is a manually reset device and must be reset once the filter is changed to clear the alarm condition. This is a low priority alarm.

#### **4.386 #2 Blower Fail**

The Blower Fail alarm item will show one of two different alarm messages. A "No Alarm" message indicates that the blower airflow sensor contacts have closed and the blower is functioning normally. A Fault alarm message indicates that the blower airflow sensor contacts have not closed. A faulty blower motor, wheel or sensor could cause this alarm.

This alarm must be cleared before operation of the blower can resume. Use the Clr Verify Alr action in the Override menu to clear the alarm. This is a critical alarm.

#### **4.3.8.7 #2 Compressor Alarm**

The Compressor Alarm item will show one of two different alarm messages. "No Alarm" message indicates that the compressor verify circuit contacts have closed and the compressor is functioning normally. A Fault alarm message indicates that the compressor verify circuit contacts have not closed. A Trip on High or Low pressure, no compressor current, failed blower, or faulty compressor current sensor could cause this alarm.

This alarm must be cleared before operation of the compressor can resume. Use the Clr Verify Alr action in the Override menu to clear the alarm. This is a critical alarm.

#### ***4.3.8.8 #2 Filter Alarm***

The Filter alarm item will show one of two different alarm messages. "No Alarm" message indicates that the filter is clean enough to operate A Fault alarm message indicates that the filter is dirty and needs replaced.

This is a self-clearing alarm and will reset itself when the alarm condition no longer exists. The filter sensor is a manually reset device and must be reset once the filter is changed to clear the alarm condition. This is a low priority alarm.

#### ***4.3.8.9 Utility Power Fail***

The Utility Power Fail alarm item will show of two different alarm messages. A "None" alarm message indicates that no alarm is present and that utility power is present at the site. A "Fault" alarm message indicates that an alarm is present and the system is operating on backup power. This feature will operate only if the TCS20 is connected to an uninterruptible power supply.

This is a self-clearing alarm and will reset itself when the alarm condition no longer exists. This is a critical priority alarm.

#### ***4.3.8.10 Door Alarm***

The Door Alarm item monitors the door switch in the structure. A "None" alarm message indicates that no alarm is present and that the door is closed. A "Fault" alarm message indicates that an alarm is present and that the door in the structure is open.

This is a self-clearing alarm and will reset itself when the alarm condition no longer exists. This is a critical priority alarm.

#### ***4.3.8.11 Outdoor Temp Alarm***

The Outdoor temperature alarm item will show one of two different alarm messages. A No alarm message indicates that the Outdoor Temperature Sensor is functioning normally. A Fault alarm message indicates that the Outdoor Temperature Sensor is sensing a value above 49 C° or below -29 C°. This probably indicates a faulty sensor.

These are all self-clearing alarms and will reset themselves when the alarm condition no longer exists. This is a critical alarm.

#### ***4.3.8.12 Outdoor Humidity Alarm***

The Outdoor Humidity Alarm item will show one of two different alarm messages. A No alarm message indicates that the Outdoor Humidity Sensor is functioning normally. A Fault alarm message indicates that the Outdoor Humidity Sensor is sensing a value above 99 % RH or below 2 % RH. This probably indicates a faulty sensor. When a Outdoor Humidity Fault alarm is detected, the Outdoor Humidity value defaults to 50 % RH until the sensor is replaced.

These are all self-clearing alarms and will reset themselves when the alarm condition no longer exists. This is a medium priority alarm.

### 4.3.9 PASSWORD MENU

The Password menu is used to control the active change authorization level of the DAK and to change passwords within the controller. There are four security levels within the DAK.

- Display Only
- Operator
- Supervisor
- Engineer

Each level has eight passwords associated with it. Everyone has some access to the DAK. All current values can be looked at by anyone. All of these points have the "Display Only" security level by default. Display Only level has passwords associated with it but they are not used because they do nothing. Higher levels of authority are required to change setpoint, overrides, alarms, and passwords.

#### 4.3.9.1 Changing Authority Levels

To change the current authorization level of the DAK press the <Change> key from the following display.

Password Menu  
PASSWORDS

The DAK will respond with the screen;

\*\*\*Password\*\*\*  
0000

Use the arrow keys to enter your password. The <Right> key will increment the first digit on the left. The <Down> key will increment the second. The <Up> key will increment the third digit. The <Left> key will increment the fourth digit. Once your password is displayed press <Enter> to enter the password. The DAK will respond with the screen;

--AUTHORITY--  
New Authority Level

If an invalid password is entered the authority level will remain as "Display Only". If a proper password is entered the authority granted by the password will be displayed, either Operator, Supervisor, or Engineer. Access will now be granted to all items that can be changed with your authority level. See the Setpoints, Alarms, and Override sections above for the required authority level required to make changes.

To return the authority level to Display Only, reenter the Password as "0000" this is the default

password for display only and is an invalid password in any other level.

Passwords may be changed by the individual who uses the password or their superiors. Passwords for Operator authority level may be changed by anyone having Supervisor authority. Passwords for Supervisor authority level may be changed by anyone having Engineer authority.

The eight Engineering passwords are pre-entered. The eight Engineering level passwords are 4441 though 4448. These may be changed individually. See the Changing Individual Passwords section of this manual for details. Default values are not set up for the other security levels they are all set at zero. Take care to record the engineering passwords. If these passwords are lost or changed and not remembered access to the DAK by the engineer would not be possible. Contact Bard if this should ever occur.

#### 4.3.9.2 Changing Lower Level Passwords

To enter the Password menu press the <Enter> key. This will display the following.

```
PASSWORDS
Display Only
```

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above Display Only, Operator, Supervisor and Engineer items. Once the desired item is shown on line two of the display, pressing the <Enter> key enter will display the first password of that security level.

```
Operator
2221
```

The passwords can only be viewed if you have a higher authority level then the level you are trying to access.

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the eight passwords. Press the <Change> Key to change the displayed password. the DAK will respond with;

```
Old Password
New Password
```

Use the arrow keys to enter the new password. The <Right> key will increment the first digit on the left. The <Down> key will increment the second. The <Up> key will increment the third digit. The <Left> key will increment the fourth digit. The second line of the display will change as the keys are pressed. Once the new is displayed press <Enter> to enter the password. The DAK will respond with the screen;

```
---Downloaded---
---Successfully---
```

#### 4.3.9.3 Changing Individual

*Passwords*

Passwords may be changed by the individual who uses the password. To enter the Password menu press the <Enter> key. This will display the following.

PASSWORDS  
Display Only

Pressing the <Up> or <Down> key will scroll forward or backward respectively through the above Display Only, Operator, Supervisor and Engineer items. Once the desired item is shown on line two of the display, pressing the <Enter> key enter will display the following.

KEY OLD PASSWORD  
0000

Use the arrow keys to enter the old password.

The <Right> key will increment the first digit on the left. The <Down> key will increment the second. The <Up> key will increment the third digit. The <Left> key will increment the fourth digit. The second line of the display will change as the keys are pressed. Once the new password is displayed press <Enter> to enter the password. The DAK will respond with the screen;

Key in Your New  
Password Now

Use the arrow keys to enter the new password. The <Right> key will increment the first digit on the left. The <Down> key will increment the second. The <Up> key will increment the third digit. The <Left> key will increment the fourth digit. The second line of the display will change as the keys are pressed. Once the new is displayed press <Enter> to enter the password. The DAK will respond with the screen;

---Downloaded---  
---Successfully---

#### 4.3.10 OPTION MENU

Pressing the <Cancel> key three times from the Time & Date display brings up the Cancel Key Option.

\*\*\*Cancel Key\*\*\*  
Arrow For Option

Pressing the <Up> or <Down >Key will display the Option Menu. The Option Menu is a default menu that includes entries for standard DAK configuration and troubleshooting tasks.

OPTION MENU  
No Operation

Options are:

- No operation
- Disable KeyBeep
- Enable Keybeep
- Which Asic/2?
- Who Are We ?
- Back Light Off
- Back Light On
- Fresh Startup
- Disable Rolling
- Enable Rolling
- Disable Alarm Beep
- Enable Alarm Beep

Pressing the <Up> or <Down >Key from this display will scroll through the above list of options. Pressing the <ENTER> key while the option is displayed performs the function. After pressing the enter key the display will confirm operation. For instance if the display is as shown:

OPTION MENU  
Disable KeyBeep

Pressing enter will result in the display:

Disable KeyBeep  
ACTION COMPLETE

The Display will then revert to scrolling between the Time & Date Display and the Zone Temperature Display.

#### ***4.3.10.1 No Operation***

This option has no function and exits the Option Menu

#### ***4.3.10.2 Disable KeyBeep***



Pressing the <Enter> key here turns off the key beep feature.

#### ***4.3.10.3 Enable Keybeep***

Pressing the <Enter> key here turns on the key beep feature. Every time a key is pressed a beep will be heard. This enables the user to know when a key press has been received by the DAK.

#### ***4.3.10.4 Which Asic/2?***

Pressing the <Enter> key here returns the ASIC/2 address of the controller that the DAK is connected to. The address returned should match the address returned when the "Who are we ?" option is used. This is a troubleshooting command.

#### ***4.3.10.5 Who Are We ?***

Pressing the <Enter> key here returns the ASIC/2 address of the DAK. The address returned should match the address returned when the "Which Asic/2?" option is used. This is a troubleshooting command.

#### ***4.3.10.6 Back Light Off***

Pressing the <Enter> key here turns off the back lighting on the DAK LCD display.

#### ***4.3.10.7 Back Light On***

Pressing the <Enter> key here turns on the back lighting on the DAK LCD display.

#### ***4.3.10.8 Fresh Startup***

Pressing the <Enter> key here returns all values set in the option menu back to the default values saved in the controller.

#### ***4.3.10.9 Disable Rolling***

This option is not functional in this version of Climatewatch.

#### ***4.3.10.10 Enable Rolling***

This option is not functional in this version of Climatewatch.

#### ***4.3.10.11 Disable Alarm Beep***

Pressing the <Enter> key here turns off the alarm beep feature.

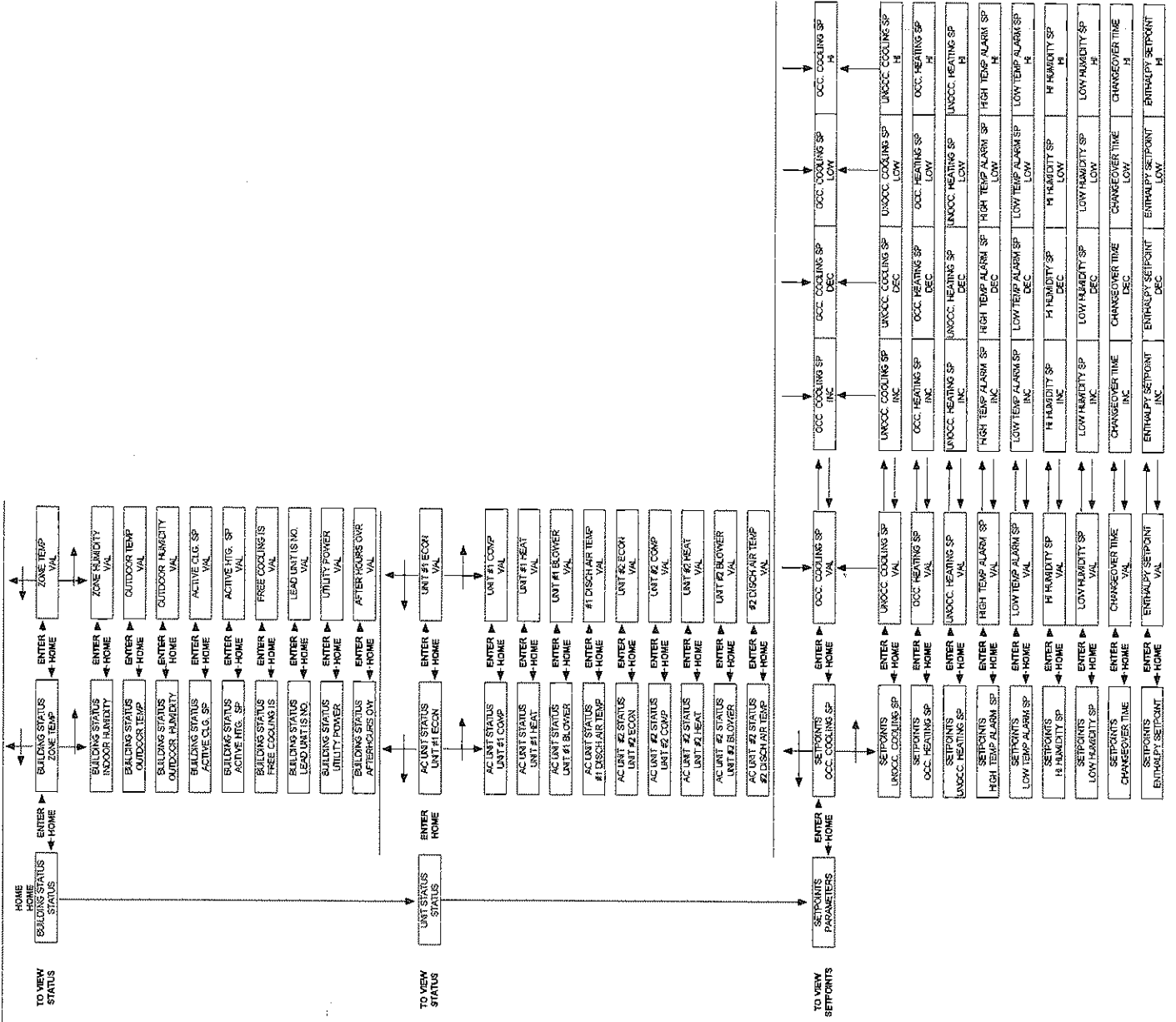
#### ***4.3.10.12 Enable Alarm Beep***

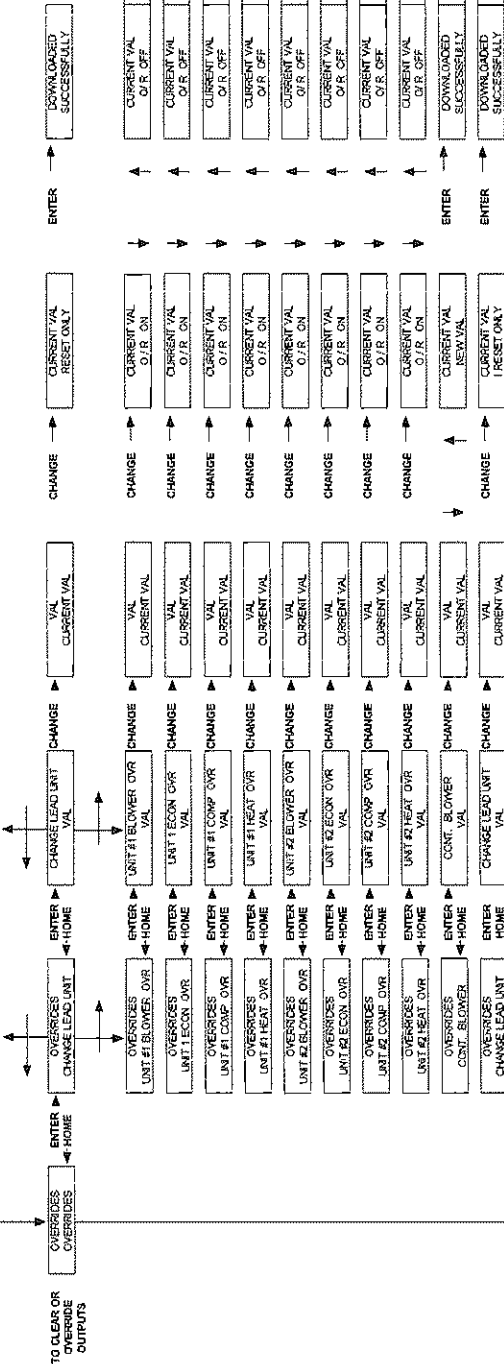
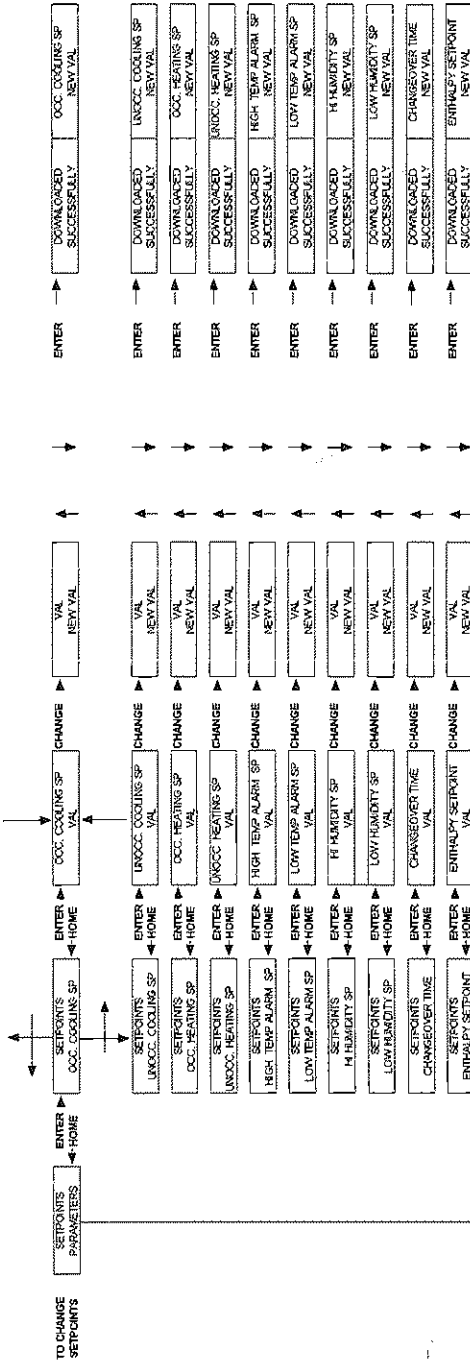
Pressing the <Enter> key here turns on the alarm beep feature. The DAK monitors the controller for alarms. Every time an alarm is sensed by the DAK a beep will be heard. The beep will be repeated every 5 seconds until the alarm is cleared. This provides an audible alarm inside the shelter that an alarm condition exists.

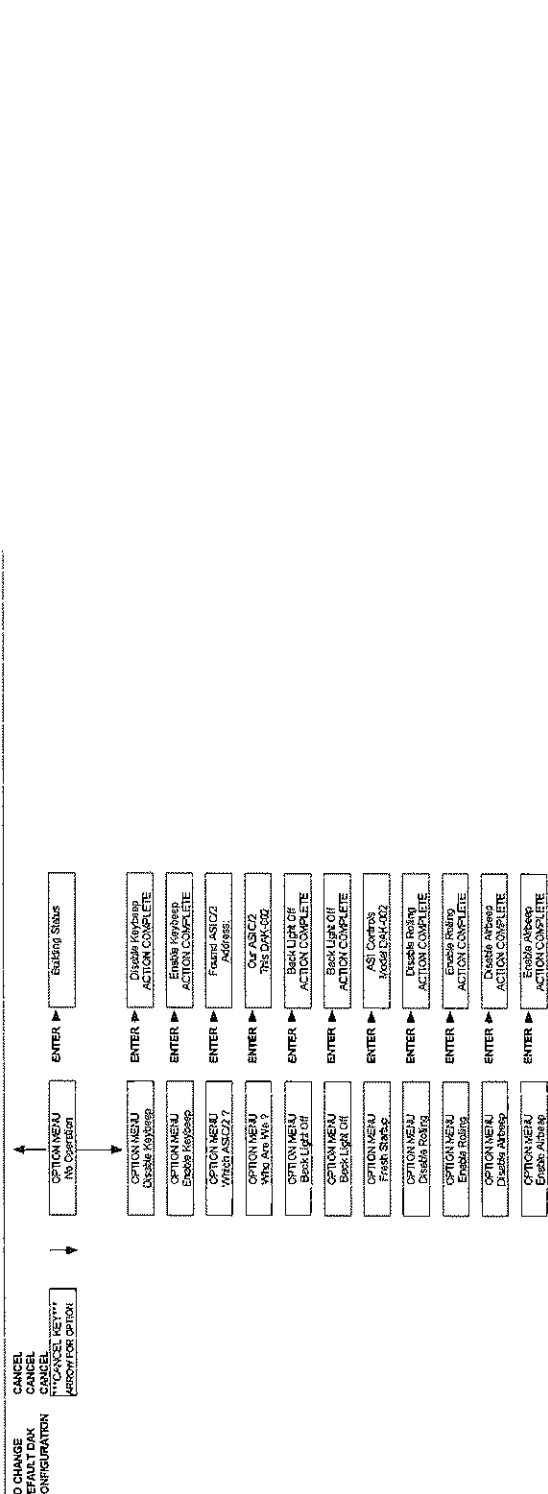
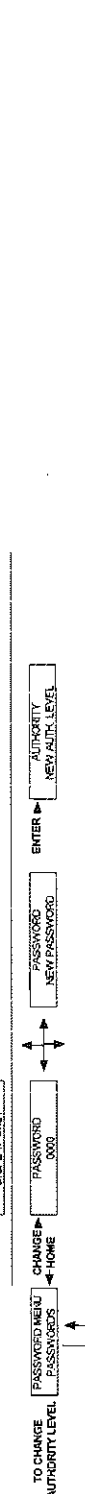
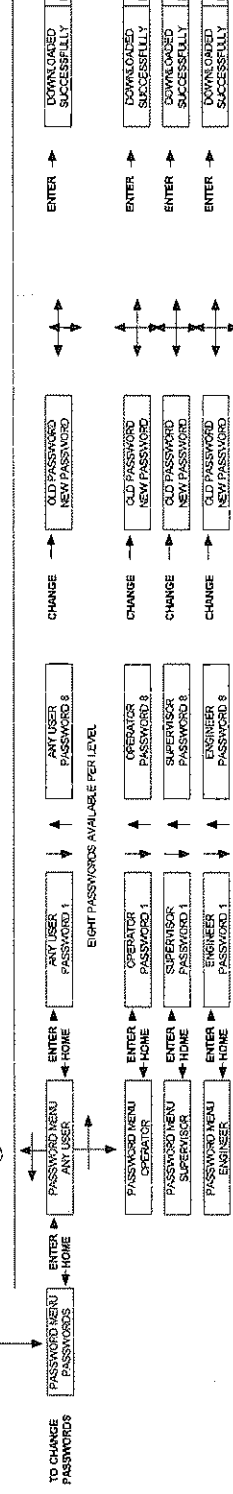
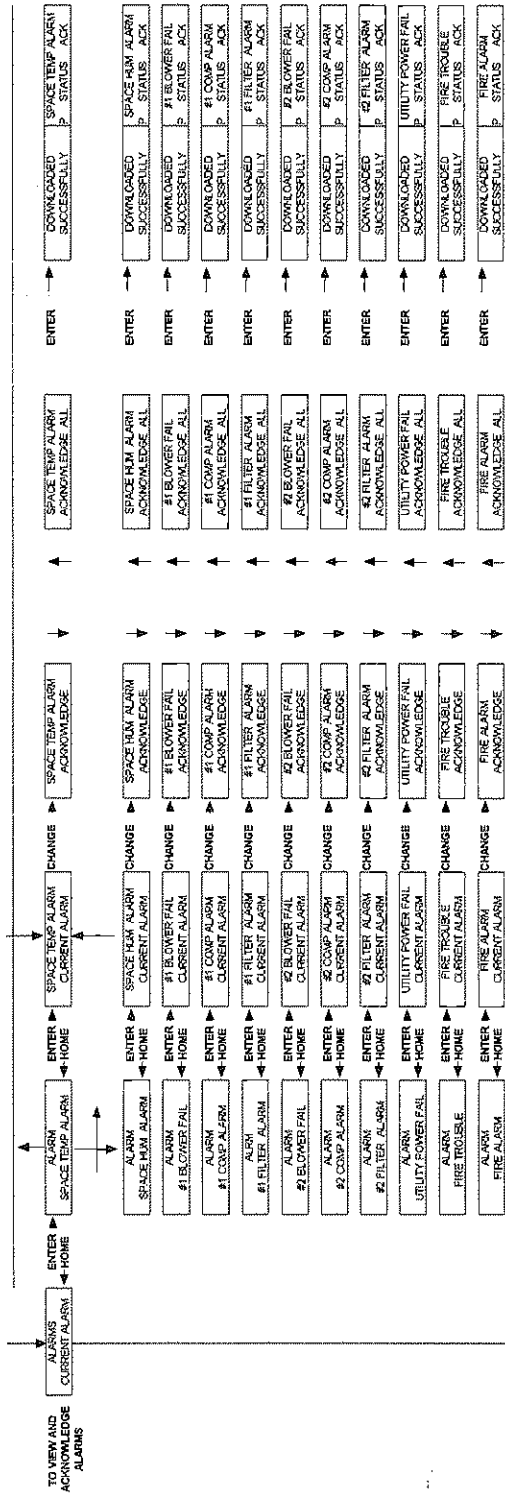
#### ***4.3.11 KEYBOARD MAP***

The Keyboard map shows all keystrokes needed to access all options and displays.

# KEYPAD MAP







## **5.0 REMOTE PC OPERATION**

The TCS20 system can be remotely or directly controlled through a personal computer. Bard supplies a software system, the Telcom ClimateWatch System Software, to communicate with and control the TCS20 controller from a personal computer.

### **5.1 ClimateWatch System Software Overview**

The Climatewatch system software consists of four (4) software programs designed to provide easy access to the features of the TCS20 controller. The four programs are the Site Manager, Climatewatch, Trend Logger, and Alarm Logger programs.

The Site Manager program allows setup of a control file that specifies site names and additional information for remote access. Site Manager also creates directories and sets up files for the storage of the trend information.

The ClimateWatch program is the program used to dial up, monitor and control the on-site air-conditioners.

The Trend Logger is used to upload trend information from the sites and store it in a database file to be viewed from Microsoft Access®.

The Alarm Logger program is used to display the alarm history for troubleshooting purposes.

### **5.2 Software Installation**

#### ***5.2.1 HARDWARE REQUIREMENTS..***

Personal Computer running Windows 3.\*\* or Windows 95

1 MB of Available RAM memory

5 MB of Available Hard disk space

Hayes Compatible modem operating at 9600 Baud capable of direct asynchronous communications with no error checking or data compression.

A 25 pin female to 9 pin male RS232 cable is needed for direct connection to the TCS20 with a Laptop or portable PC

#### ***5.2.2 INSTALLATION***

1. Start Windows
2. Insert Disk 1 into 3 1/2 Disk Drive
3. Choose the Run command from the File menu in Windows Program Manager

4. Type A:\Setup (or B:\Setup) and Click OK

5. Follow the on screen instructions to install the TCS software. The software must be installed in the default BARD directory

6. When the Setup is complete, click OK to return to Program Manager

### 5.3 Site Manager Software

Double click on the Site Manager icon to start the Site Manager software

#### 5.3.1 OVERVIEW

The Site Manager is used to enter Site information for storage and reference by other programs. The Site Manager stores the Site name, Site phone number, Site subdirectory, Password, and Alarm dial out information.

The program will prompt the user upon startup that a current file does not exist. The user will click the OK button and a new file will be created. The user will click the Add New Site button and enter the required information. Once the information is complete, the user should click the Save Site button to store the Site information.

The screenshot shows a window titled "C:\BARD\TCS.NAM: Record 1 of 1" with a menu bar containing "File" and "About". The main interface includes:

- A "Site" label next to a text box containing "Site1".
- Fields for "Site Name" (containing "Site1") and "Phone Number" (containing "1-614-752-7700").
- Buttons for "Add New Site", "Delete Site", and "Save Site" stacked vertically on the right.
- A checkbox labeled "Use Password" which is currently unchecked.
- A "Site Dial Out" section containing:
  - Two text boxes for "Primary Number" (containing "1-419-636-2640") and "Secondary Number" (containing "1-419-636-1197").
  - Two sections for "Primary Type" and "Secondary Type", each with radio buttons for "Pager" (selected) and "Printer".
  - A "Send to Both" section with radio buttons for "Yes" and "No" (selected).
  - A text box for "Initialization String" containing "E0".
- A "Download to Site" button on the right side of the "Site Dial Out" section.

The Site name is the name that will be used to identify the Site. This could be the site address or

a site identification number up to a maximum of 8 characters using any combination of letters or numbers. The program will create a directory with the same name as the site name.

The Site phone number is the phone number of the site for modem connection. This number can be up to 25 characters long. The number may contain hyphens or commas, but they are not necessary for operation.

If the Use Password check box is checked, a text box will become visible to enter the Site Password. This password must be entered before connection is made on all the programs that require access to the controller. The password can have up to eight (8) characters.

The Primary number is the first phone number that will be dialed for Alarm notification. This number can be up to 25 characters long. The number may contain hyphens or commas, but they are not necessary for operation.

The Secondary number is the second phone number that will be dialed for Alarm notification. This number can be up to 25 characters long. The number may contain hyphens or commas, but they are not necessary for operation.

The primary message format is the type of Alarm message that will be sent for Alarm notification. The message will be a printer message or pager message.

The secondary message format is the type of Alarm message that will be sent for Alarm notification. The message will be a printer message or pager message.

The Send to Both option will allow the controller to dial one or both of the phone numbers for Alarm notification.

The Initialization string is the initialization string setting of the modem.

### ***5.3.2 ADD NEW SITE COMMAND BUTTON***

The Add New Site button will allow the user to enter new site information.

### ***5.3.3 DELETE SITE COMMAND BUTTON***

The Delete Site button will remove a site from the file.

### ***5.3.4 SAVE SITE COMMAND BUTTON***

The Save Site button saves the site information to the file.

### ***5.3.5 DOWNLOAD TO SITE BUTTON***

The Download to Site button will establish a connection with the controller and load the Alarm dial out information to the controller.

### ***5.3.6 FILE MENU***



The File Menu contains Two (2) Options. These are Save File, And Exit.

#### ***5.3.6.1 SAVE FILE MENU COMMAND***

The Save File Menu Command has the same effect as clicking the Save Site Command button.

#### ***5.3.6.2 EXIT MENU COMMAND***

The Exit File Menu Command will save the file and exit the program.

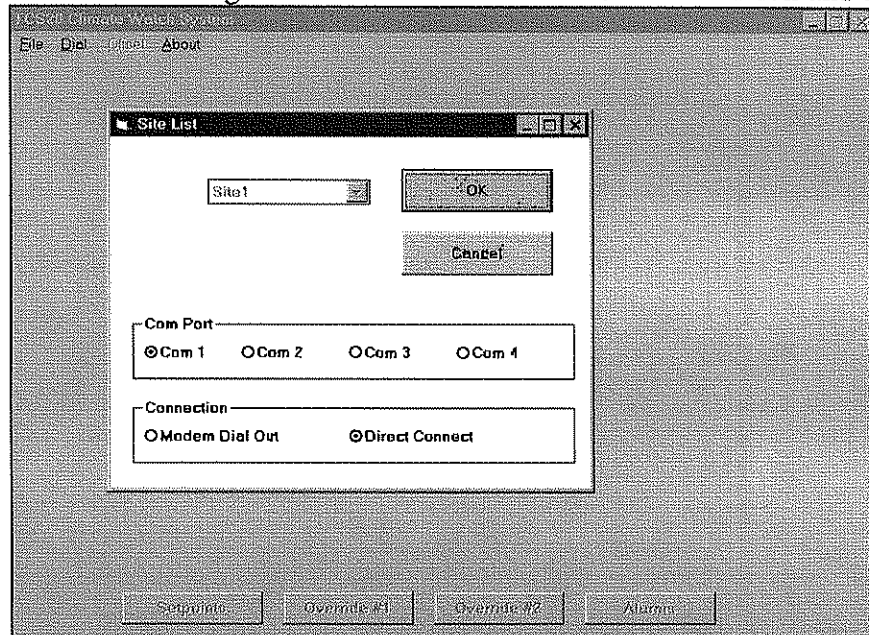
## 5.4 ClimateWatch Software

Start the ClimateWatch software by double clicking on the ClimateWatch icon in the Bard Program Group.

The climate watch program can be used to communicate remotely or directly with the TCS20 controller.

### 5.4.1 TCS20 MENU OPTIONS

The program will begin with the screen shown below. At the top of the TCS20 Main Screen, there are Five (5) Menu Items. The first item is File. Clicking on the File item will cause the word Exit to appear underneath. Clicking the word Exit will end the program. Clicking the Dial item will open a Site List screen prompting the user for site information. Clicking the Offset item will cause a box to appear on the screen to adjust the offsets of the temperature and humidity sensors. Clicking on the About item will open a window that gives Information about the software version and the revision level.



#### 5.4.1.1 Dial Menu Item

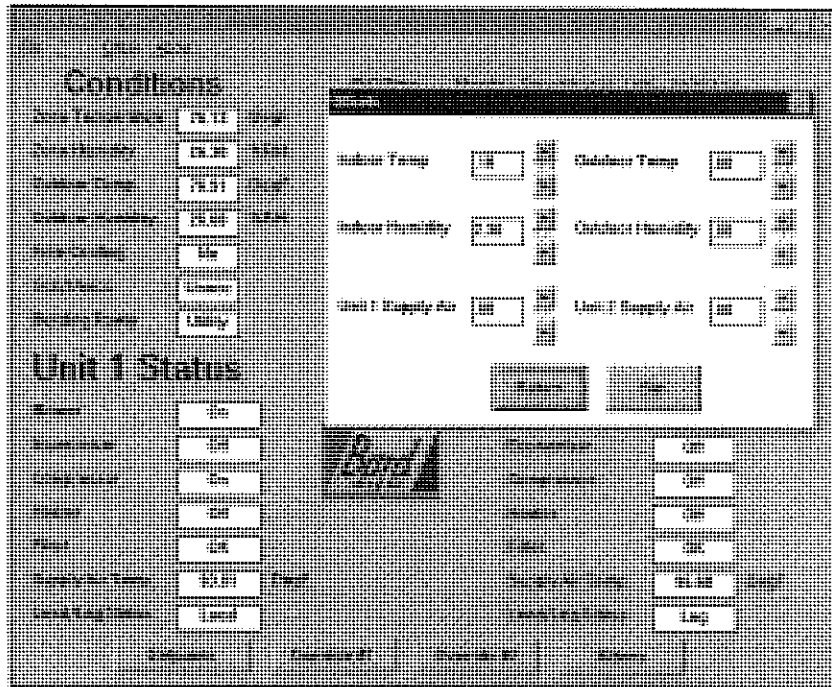
Click on the Dial item to establish a connection to a site. The Site List screen will appear. The Site List contains information that was entered in the Site Manager program. The site may be selected in the list of site names. This screen also gives the user the option of which COM port to use and the method of connection, either direct or modem. If the user is going to connect directly to the controller with a PC, they must make sure that the cable is connected before clicking the OK button. The program should start gathering data immediately.

For remote connection the user will select the Site that they wish to connect with and Click the OK button. The user will then be prompted to enter the Password for that Site, if there is a password for the site. If the Password is not correct, the user will be notified that the Password was not correct and

the program will return to the Main Screen. Once the Password has been entered and the OK button has been Clicked, the program will dial the modem and try to establish communication with the remote site. Once the connection has been made, the program will begin gathering data from the controller.

#### 5.4.1.2 Offsets

The Offset screen will allow the User to adjust the sensor offsets to calibrate for sensor tolerances.



#### 5.4.1.2.1 Zone Temperature Offset

The Zone Temperature will add or subtract the value seen in the textbox from the Zone Temperature to Calibrate the sensor. The Zone Temperature Offset may be adjusted by Clicking the Up or Down Arrows next to the Zone Temperature Offset Textbox. Clicking on the Up Arrow will Increase the Zone Temperature Offset by 0.01 Degrees Centigrade until the Maximum allowed Offset of 1.00 Degrees is reached. Clicking on the Down Arrow will Decrease the Zone Temperature Offset by 0.01 Degrees Centigrade until the Minimum allowed Offset of -1.00 Degrees is reached.

Once the desired Zone Temperature Offset has been selected, the Operator may Load this new Setpoint information to the Controller by Clicking the Set Command Button at the bottom of the Offset Screen. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen.

#### 5.4.1.2.2 Zone Humidity Offset

The Zone Humidity Offset will add or subtract the value seen in the textbox from the Zone Humidity to Calibrate the sensor. The Zone Temperature Offset may be adjusted by Clicking the Up or Down Arrows next to the Zone Humidity Offset Textbox. Clicking on the Up Arrow will Increase the Zone Humidity Offset by 0.10 Percent Relative Humidity Level until the Maximum allowed Offset of 10.00 Percent Relative Humidity is reached. Clicking on the Down Arrow will Decrease the Zone Humidity Offset by 0.10 Percent Relative Humidity until the Minimum allowed Offset of -10.00 Percent Relative Humidity is reached.

Once the desired Zone Humidity Offset has been selected, the Operator may Load this new Setpoint information to the Controller by Clicking the Set Command Button at the bottom of the Offset Screen. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen.

#### ***5.4.1.2.3 Outdoor Temperature Offset***

The Outdoor Temperature Offset will add or subtract the value seen in the textbox from the Outdoor Temperature to Calibrate the sensor. The Outdoor Temperature Offset may be adjusted by Clicking the Up or Down Arrows next to the Outdoor Temperature Offset Textbox. Clicking on the Up Arrow will Increase the Outdoor Temperature Offset by 0.01 Degrees Centigrade until the Maximum allowed Offset of 1.00 Degrees Centigrade reached. Clicking on the Down Arrow will Decrease the Outdoor Temperature Offset by 0.01 Degrees Centigrade until the Minimum allowed Offset of -1.00 Degrees Centigrade is reached.

Once the desired Zone Temperature Offset has been selected, the Operator may load this new Setpoint information to the Controller by Clicking the Set Command Button at the bottom of the Offset Screen. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen.

#### ***5.4.1.2.4 Outdoor Humidity Offset***

The Outdoor Humidity Offset will add or subtract the value seen in the textbox from the Outdoor Humidity to Calibrate the sensor. The Outdoor Humidity Offset may be adjusted by Clicking the Up or Down Arrows next to the Outdoor Humidity Offset Textbox. Clicking on the Up Arrow will Increase the Outdoor Humidity Offset by 0.10 Percent Relative Humidity Level until the Maximum allowed Offset of 10.00 Percent Relative Humidity is reached. Clicking on the Down Arrow will Decrease the Outdoor Humidity Offset by 0.10 Percent Relative Humidity until the Minimum allowed Offset of -10.00 Percent Relative Humidity is reached.

Once the desired Outdoor Humidity Offset has been selected, the Operator may Load this new Setpoint information to the Controller by Clicking the Set Command Button at the bottom of the Offset Screen. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen.

#### ***5.4.1.2.5 Unit #1 Supply Air Temperature Offset***

The Unit #1 Supply Air Temperature Offset will add or subtract the value seen in the textbox from the Unit #1 Supply Air Temperature to Calibrate the sensor. The Unit #1 Supply Air Temperature Offset may be adjusted by Clicking the Up or Down Arrows next to the Unit #1 Supply Air Temperature Offset Textbox. Clicking on the Up Arrow will increase the Unit #1 Supply Air Temperature Offset by 0.01 Degrees Centigrade until the Maximum allowed Offset of 1.00 Degrees is reached. Clicking on the Down Arrow will Decrease the Unit #1 Supply Air Temperature Offset by 0.01 Degrees Centigrade until the Minimum allowed Offset of -1.00 Degrees is reached.

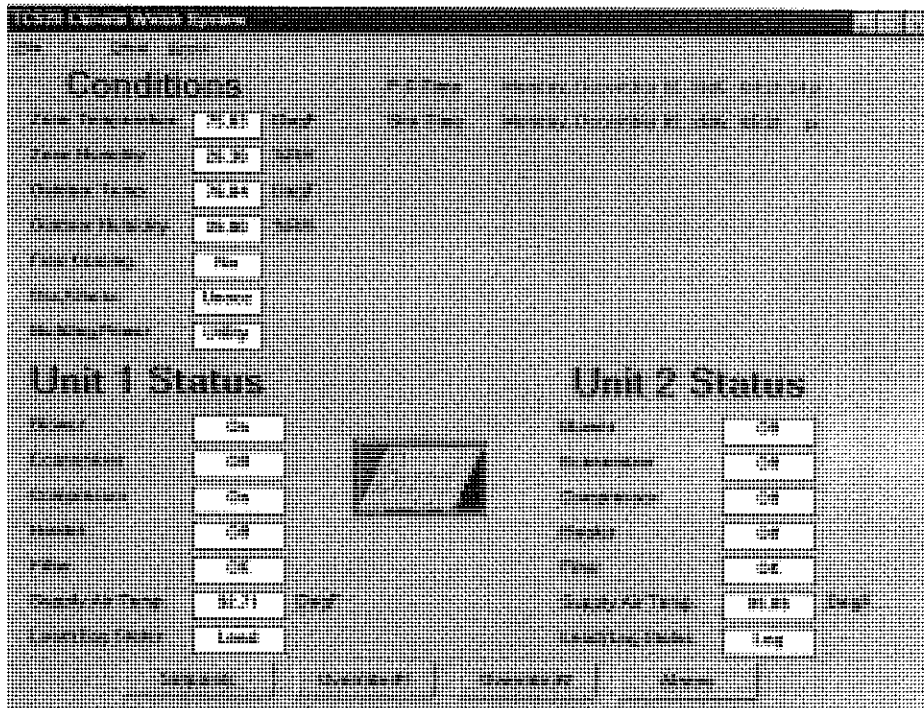
Once the desired Unit #1 Supply Air Temperature Offset has been selected, the Operator may Load this new Setpoint information to the Controller by Clicking the Set Command Button at the bottom of the Offset Screen. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen.

#### ***5.4.1.2.6 Unit #2 Supply Air Temperature Offset***

The Unit #2 Supply Air Temperature Offset will add or subtract the value seen in the textbox from the Unit #2 Supply Air Temperature to Calibrate the sensor. The Unit #2 Supply Air Temperature Offset may be adjusted by Clicking the Up or Down Arrows next to the Unit #2 Supply Air Temperature Offset Textbox. Clicking on the Up Arrow will increase the Unit #2 Supply Air Temperature Offset by 0.01 Degrees Centigrade until the Maximum allowed Offset of 1.00 Degrees is reached. Clicking on the Down Arrow will Decrease the Unit #2 Supply Air Temperature Offset by 0.01 Degrees Centigrade until the Minimum allowed Offset of -1.00 Degrees is reached.

Once the desired Unit #2 Supply Air Temperature Offset has been selected, the Operator may Load this new Setpoint information to the Controller by Clicking the Set Command Button at the bottom of the Offset Screen. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen.

## 5.4.2 TCS20 MAIN SCREEN



### 5.4.2.1 Conditions

The Zone Temperature is the current Temperature inside the structure. This, and all the other points being monitored on this screen are updated once a second. The Zone Humidity is the Humidity Level inside of the structure. The Outdoor Temperature and Humidity are the current outdoor conditions at the structure being monitored.

The Free Cooling is a Yes or No condition based on an Enthalpy calculation of the Outdoor conditions. This is used to determine if the Economizer can be opened to take advantage of a Free Cooling condition.

When a Technician enters the structure, he/she may decide to press the Occupancy Override button on the front of the TCS20. This changes the active setpoint to that of an Occupied Mode that is set to make conditions in the structure more comfortable for the Technician inside.

The Building Power condition is monitoring the power source to the Controller. This condition will show Utility, for Utility power, or Battery, for Battery backup power if there is a Utility Power failure.

### 5.4.2.2 Unit #1 Status

The Blower status will show if Blower operation is On or Off.

The Filter status will show if the Filter is OK or Dirty.

The Economizer will show if Economizer operation is On or Off.

The Compressor status will show if the Compressor is On or Off.

The Heater status will show the status of the Electric Heat Strip, either On or Off.

The Supply Air Temperature is the temperature of the Air leaving the unit. This temperature will be Cooler than Zone Temperature when the unit is in the Cooling Mode, and Warmer than the Zone

Temperature when the unit is in the Heating Mode.

The Lead/Lag status indicates if the unit is the Lead or the Lag unit. The Lead unit is the Primary conditioning unit for the structure. The Lag unit will be the Secondary conditioning unit for the structure. The units will maintain present Lead/Lag status for the set Lead/Lag Changeover period. Once the Lead/Lag period has expired, the units will swap Lead/Lag status and the Lead/Lag timer will be reset. If there is a failure of the Lead unit, it will be forced to the Lag unit and the secondary unit will now become the Lead unit so that the failed unit can be repaired.

#### ***5.4.2.3 Unit #2 Status***

Same as Unit #1 status above except for Unit #2

#### ***5.4.2.4 Setpoint Command Button***

Click on the SetPoint Command Button to open the Setpoint screen containing the SetPoint information for the Controller. The Setpoint screen will allow the User to adjust the Occupied Heating and Cooling, Unoccupied Heating and Cooling, High and Low Temperature and Humidity Setpoints. The Lead/Lag Changeover hours and the Enthalpy SetPoint can be adjusted from this screen. The Continuous Blower may be Enabled or Disabled from this screen.

#### ***5.4.2.5 Override #1 Command Button***

The Override #1 Command Button will Open the Window containing the Override information for the Controller. The Override screen will allow the User to override Blower, Economizer, Compressor, and Heater operation of Unit #1.

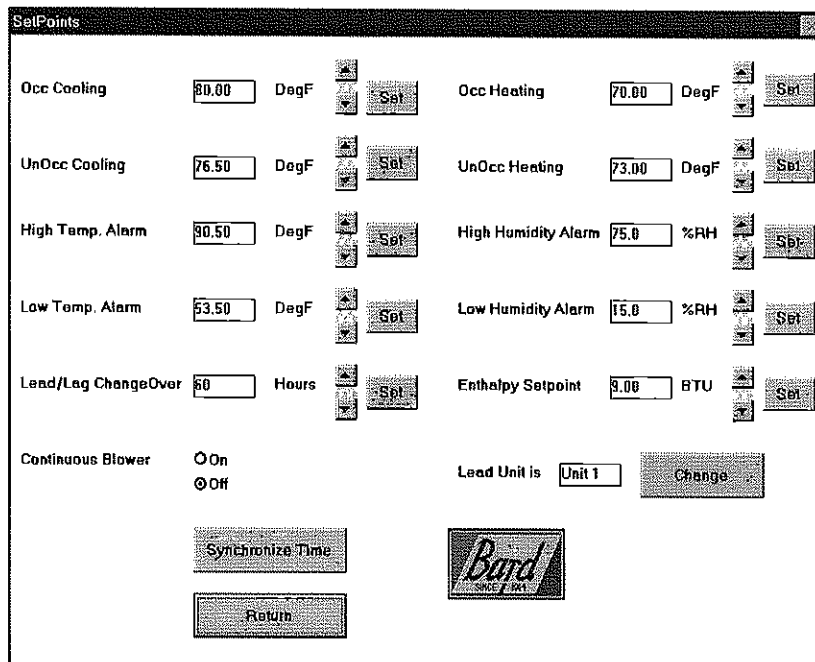
#### ***5.4.2.6 Override #2 Command Button***

Same as the Override #1 Command Button above. All references to Unit #1 become Unit #2

#### ***5.4.2.7 Alarm Command Button***

Clicking the Alarm Command Button will open the Alarm screen containing the Alarm information from the Controller. The Alarm screen will allow the User to Check the Alarm status of the Zone Temperature, Zone Humidity, Blowers, Compressors, Filters, and Main Power of the conditioning units.

### 5.4.3 SetPoint Screen



The Setpoint screen will allow the User to adjust the Occupied Heating and Cooling, Unoccupied Heating and Cooling, High and Low Temperature and Humidity Setpoints. The Lead/Lag Changeover hours and the Enthalpy SetPoint can be adjusted from this screen. The Continuous Blower may be Enabled or Disabled from this screen.

The Occupied Cooling Setpoint is used to lower the Cooling Setpoint to a lower Temperature if the Structure is Occupied. The Occupied Cooling will be the Active Setpoint if the Occupancy Override Timer has been triggered and if the Zone Temperature is above the Occupied Cooling Setpoint. Once the Occupied timer is started the Occupied Cooling Setpoint will be Active for Two (2) Hours and then will reset to the Unoccupied Cooling Setpoint

The Unoccupied Cooling Setpoint is the default Cooling Setpoint for a Normally Unoccupied structure. This is the Setpoint above which Cooling of the Structure will begin.

The Occupied Heating Setpoint is used to Raise the Heating Setpoint to a higher Temperature if the Structure is Occupied. The Occupied Heating will be the Active Setpoint if the Occupancy Override Timer has been triggered and if the Zone Temperature is below the Occupied Heating Setpoint. Once the Occupied timer is started the Occupied Heating Setpoint will be Active for Two (2) Hours and then will reset to the Unoccupied Heating Setpoint

The UnOccupied Heating Setpoint is the default Heating Setpoint for a Normally Unoccupied structure. This is the Setpoint below which Heating of the Structure will begin.



The High Alarm Setpoint is the Temperature at which Alarming will begin for the Structure. If the Zone Temperature of the Structure exceeds the High Alarm Setpoint then an Alarm event is Logged in the Alarm List and a Shelter Alarm is generated.

The Low Alarm Setpoint is the Temperature at which Alarming will begin for the Structure. If the Zone Temperature of the Structure is below the Low Alarm Setpoint then an Alarm event is Logged in the Alarm List and a Shelter Alarm is generated.

The High Humidity Setpoint is the Humidity Level at which Alarming will begin for the Structure. If the Zone Humidity of the Structure exceeds the High Humidity Setpoint then an Alarm event is Logged in the Alarm List and a Shelter Alarm is generated.

The Low Humidity Setpoint is the Humidity Level at which Alarming will begin for the Structure. If the Zone Humidity of the Structure is below the Low Humidity Setpoint then an Alarm event is Logged in the Alarm List and a Shelter Alarm is generated.

#### ***5.4.3.1 Occupied Cooling Setpoint***

The Occupied Cooling Setpoint will be the Active Setpoint whenever the Occupancy Override Switch has been pushed and for two (2) hours after activation. Next to the Occupied Cooling Setpoint value is a scroll bar. Clicking on the Up Arrow will Increase the Occupied Cooling Setpoint by 0.50 degrees Centigrade until the maximum allowed setpoint of 25.5 Degrees is reached. Clicking on the Down Arrow will decrease the Occupied Cooling Setpoint by 0.50 degrees Centigrade until the minimum allowed setpoint of 24.0 Degrees is reached.

Once the desired Occupied Cooling Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the Occupied Cooling Setpoint text box. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen

#### ***5.4.3.2 UnOccupied Cooling Setpoint***

The UnOccupied Cooling Setpoint will be the Active Setpoint whenever the Occupied Override not been started. The UnOccupied Cooling Setpoint may be adjusted by clicking the Up or Down Arrows next to the UnOccupied Cooling Setpoint Text box. Clicking on the Up Arrow will Increase the UnOccupied Cooling Setpoint by 0.50 degrees Centigrade until the maximum allowed setpoint of 28.0 degrees is reached. Clicking on the Down Arrow will decrease the UnOccupied Cooling Setpoint by 0.50 degrees Centigrade until the minimum allowed setpoint of 25.5 degrees is reached.

Once the desired UnOccupied Cooling Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the UnOccupied Cooling Setpoint text box. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen.

#### ***5.4.3.3 Occupied Heating Setpoint***

The Occupied Heating Setpoint will be the Active Heating Setpoint whenever the Occupancy Override Switch has been started and for Two (2) hours after Activation. Next to the Occupied Heating Setpoint value is a scroll Bar. Clicking on the Up Arrow will Increase the Occupied Heating Setpoint by 0.50 degrees Centigrade until the maximum allowed setpoint of 23.0 degrees is reached. Clicking on the Down Arrow will decrease the Occupied Heating Setpoint by 0.50 degrees Centigrade until the minimum allowed setpoint of 21.0 degrees is reached.

Once the desired Occupied Heating Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the Occupied Heating Setpoint text box. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen

#### ***5.4.3.4 Unoccupied Heating Setpoint***

The UnOccupied Heating Setpoint will be the Active Setpoint whenever the Occupied Override has not been started. The UnOccupied Heating Setpoint may be adjusted by Clicking the Up or Down Arrows next to the UnOccupied Heating Setpoint Text box. Clicking on the Up Arrow will Increase the UnOccupied Heating Setpoint by 0.50 degrees Centigrade until the maximum allowed setpoint of 22.0 Degrees is reached. Clicking on the Down Arrow will decrease the UnOccupied Heating Setpoint by 0.50 degrees Centigrade until the Minimum allowed Setpoint of 19.0 degrees is reached.

Once the desired UnOccupied Heating Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the UnOccupied Heating Setpoint text box. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen.

#### ***5.4.3.5 High Temperature Alarm SetPoint***

The High Temperature Alarm Setpoint will be the temperature at which alarming will begin for the structure. Next to the High Temperature Alarm value is a scroll bar. Clicking on the Up Arrow will increase the High Temperature Alarm Setpoint by 0.50 degrees Centigrade until the maximum allowed setpoint of 38.0 degrees is reached. Clicking on the Down Arrow will decrease the High Temperature Alarm Setpoint by 0.50 degrees Centigrade until the minimum allowed setpoint of 29.5 degrees is reached.

Once the desired High Temperature Alarm Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the High Temperature Alarm Setpoint textbox. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen

#### ***5.4.3.6 Low Temperature Alarm SetPoint***

The Low Temperature Alarm Setpoint will be the temperature at which alarming will begin for the structure. Next to the Low Temperature Alarm value is a scroll bar. Clicking on the Up Arrow will increase the Low Temperature Alarm Setpoint by 0.50 degrees Centigrade until the maximum allowed Setpoint of 19.5 degrees is reached. Clicking on the Down Arrow will decrease the Low Temperature

Alarm Setpoint by 0.50 degrees Centigrade until the minimum allowed Setpoint of 10.0 degrees is reached.

Once the desired Low Temperature Alarm Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the Low Temperature Alarm Setpoint textbox. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen.

#### ***5.4.3.7 High Humidity Alarm SetPoint***

The High Humidity Alarm Setpoint will be the humidity level at which alarming will begin for the structure. Next to the High Humidity Alarm value is a scroll bar. Clicking on the Up Arrow will increase the High Humidity Alarm Setpoint by 1 percent relative humidity until the maximum allowed setpoint is reached. Clicking on the Down Arrow will decrease the High Humidity Alarm Setpoint by 1 percent relative humidity until the minimum allowed setpoint is reached.

Once the desired High Humidity Alarm Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the High Humidity Alarm Setpoint textbox. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen

#### ***5.4.3.8 Low Humidity Alarm SetPoint***

The Low Humidity Alarm Setpoint will be the humidity level at which alarming will begin for the structure. Next to the Low Humidity Alarm value is a scroll bar. Clicking on the Up Arrow will increase the Low Humidity Alarm Setpoint by 1 percent relative humidity until the maximum allowed setpoint is reached. Clicking on the Down Arrow will decrease the Low Humidity Alarm Setpoint by 1 percent relative humidity until the minimum allowed setpoint is reached.

Once the desired Low Humidity Alarm Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the Low Humidity Alarm Setpoint textbox. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen

#### ***5.4.3.9 Lead/Lag ChangeOver SetPoint***

The Lead/Lag ChangeOver SetPoint is the time at which the Lead/Lag operation of the Units will be swapped. Next to the Lead/Lag ChangeOver value is a scroll bar. Clicking on the Up Arrow will increase the Lead/Lag ChangeOver Hours by 12 hours until the maximum allowed setpoint of 168 hours is reached. Clicking on the Down Arrow will decrease the Lead/Lag ChangeOver Hours by 12 hours until the minimum allowed Setpoint of 24 Hours is reached.

Once the desired Lead/Lag ChangeOver Hours have been selected, the Operator may Load this new Setpoint information to the Controller by Clicking the Set Command Button next to the Lead/Lag ChangeOver textbox. If the Operator does not wish to Load this information to the Controller, the Operator may Click the Return Command button to Return to the Main Screen

#### **5.4.3.10 Enthalpy Setpoint**

The Enthalpy Setpoint will be the Enthalpy Level at which Free Cooling will begin for the Structure. Next to the Enthalpy value is a scroll bar. Clicking on the Up Arrow will increase the Enthalpy Setpoint by .25 kCal / Kg. until the Maximum allowed Setpoint of 25 is reached. Clicking on the Down Arrow will decrease the Enthalpy Setpoint by .25 kCal / Kg. until the Minimum allowed Setpoint of 0 kCal / Kg. is reached.

Once the desired Enthalpy Setpoint has been selected, the operator may load this new setpoint information to the controller by clicking the Set Command Button next to the Enthalpy Setpoint textbox. If the operator does not wish to load this information to the controller, the operator may click the Return Command button to return to the Main Screen

#### **5.4.3.11 Continuous Blower**

The Continuous Blower operation will run the Lead unit blower continuously for the entire Lead/Lag period. This means that one of the blowers will always be running. The Continuous Blower operation is either set to Off (with the Off button selected), or set to On (with the On button selected).

#### **5.4.3.12 Lead Unit**

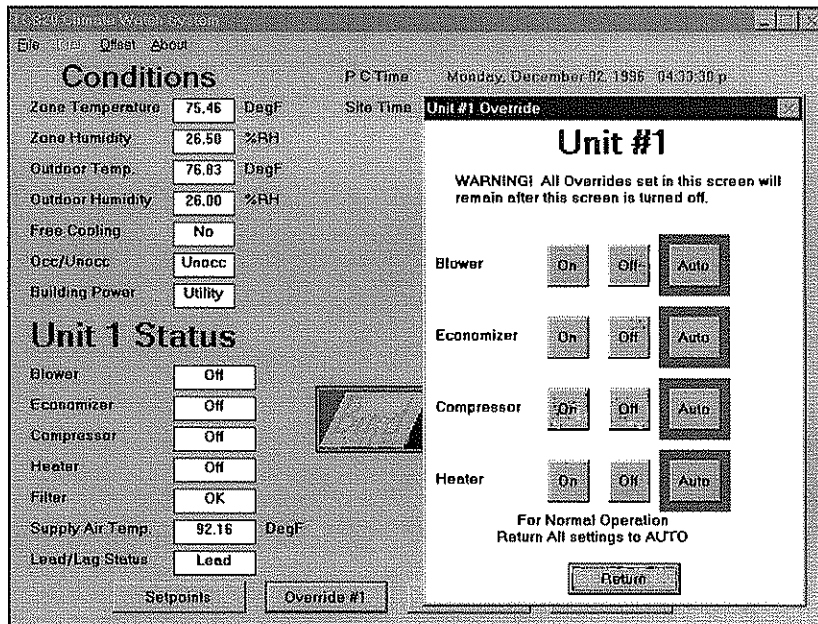
The Lead unit can be changed manually. The current Lead unit is displayed in the Textbox next to the "Lead Unit is" label. By clicking on the Change button, the Lead unit status will be changed to the other unit, and will be updated in the Textbox. This "Change" button should be used carefully, as swapping Lead/Lag could cause the Compressor to momentarily fail, and send a Shelter Alarm.

#### **5.4.3.13 Return button**

Clicking on this button will return to the Main Screen. If no changes have been made, then there will no update to the controller. If a change has been made, but the Set button has not been clicked, then there will be no update to the controller.

### **5.4.4 OVERRIDE #1 SCREEN**

The Override #1 Command Button will Open the Window containing the Override information for the Controller. The Override screen will allow the User to override Blower, Economizer, Compressor, and Heater operation of Unit #1. There are three (3) possible override modes. The first mode would be Automatic (Auto). This mode allows the operations to be controller automatically by the controller. The second mode would be the Override Off mode. This means that when operation is called for by the controller, the operation has been suspended manually in the Off mode, and cannot operate. The third mode is the Override On mode. When is mode is selected, the operation is manually set to the On mode. The controller cannot turn the operation Off automatically when in this mode.



#### 5.4.4.1 Blower On

This button will set the Blower operation to the On mode. The controller can no longer turn the Blower On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### 5.4.4.2 Blower Off

This button will set the Blower operation to the Off mode. The controller can no longer turn the Blower On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### 5.4.4.3 Blower Auto

This button will set the Blower operation to the Automatic mode. The controller can turn the Blower On or Off automatically. This will be the normal mode of operation. When this mode is active, a Red outline will appear behind the button.

#### 5.4.4.4 Economizer On

This button will set the Economizer operation to the On mode. The controller can no longer turn the Economizer On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### 5.4.4.5 Economizer Off

This button will set the Economizer operation to the Off mode. The controller can no longer turn the Blower On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.6 Economizer Auto**

This button will set the Economizer operation to the Automatic mode. The controller can turn the Blower On or Off automatically. This will be the normal mode of operation. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.7 Compressor On**

This button will set the Compressor operation to the On mode. The controller can no longer turn the Compressor On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.8 Compressor Off**

This button will set the Compressor operation to the Off mode. The controller can no longer turn the Compressor On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.9 Compressor Auto**

This button will set the Compressor operation to the Automatic mode. The controller can turn the Compressor On or Off automatically. This will be the normal mode of operation. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.10 Heater On**

This button will set the Heater operation to the On mode. The controller can no longer turn the Heater On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.11 Heater Off**

This button will set the Heater operation to the Off mode. The controller can no longer turn the Heater On or Off automatically. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.12 Heater Auto**

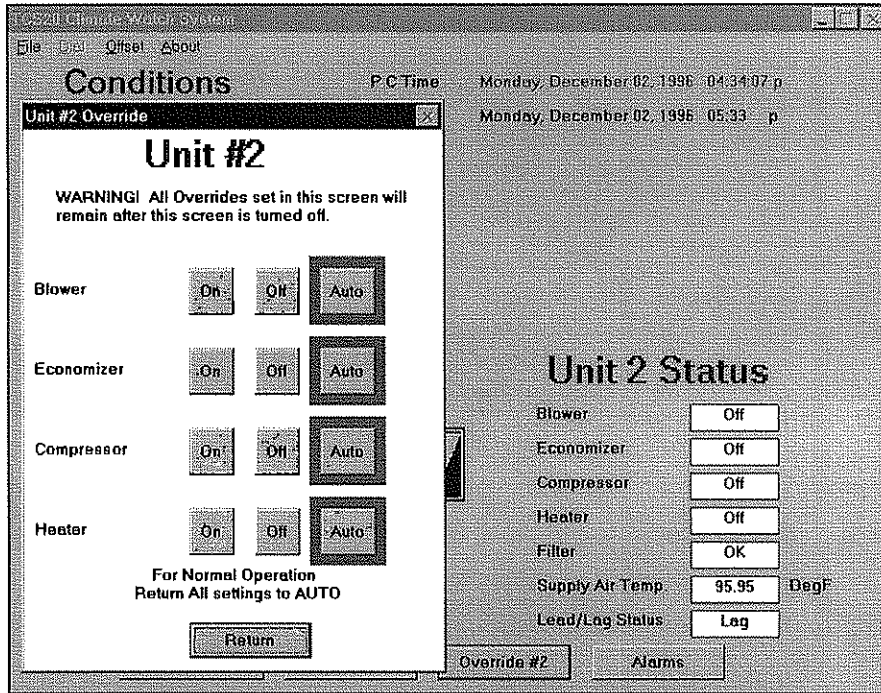
This button will set the Heater operation to the Automatic mode. The controller can turn the Heater On or Off automatically. This will be the normal mode of operation. When this mode is active, a Red outline will appear behind the button.

#### **5.4.4.13 Return button**

This button will remove the Override screen from the Main screen. All Override settings in the Override screen will remain after the Override screen is removed. For normal operation, all Overrides should be set to Auto.

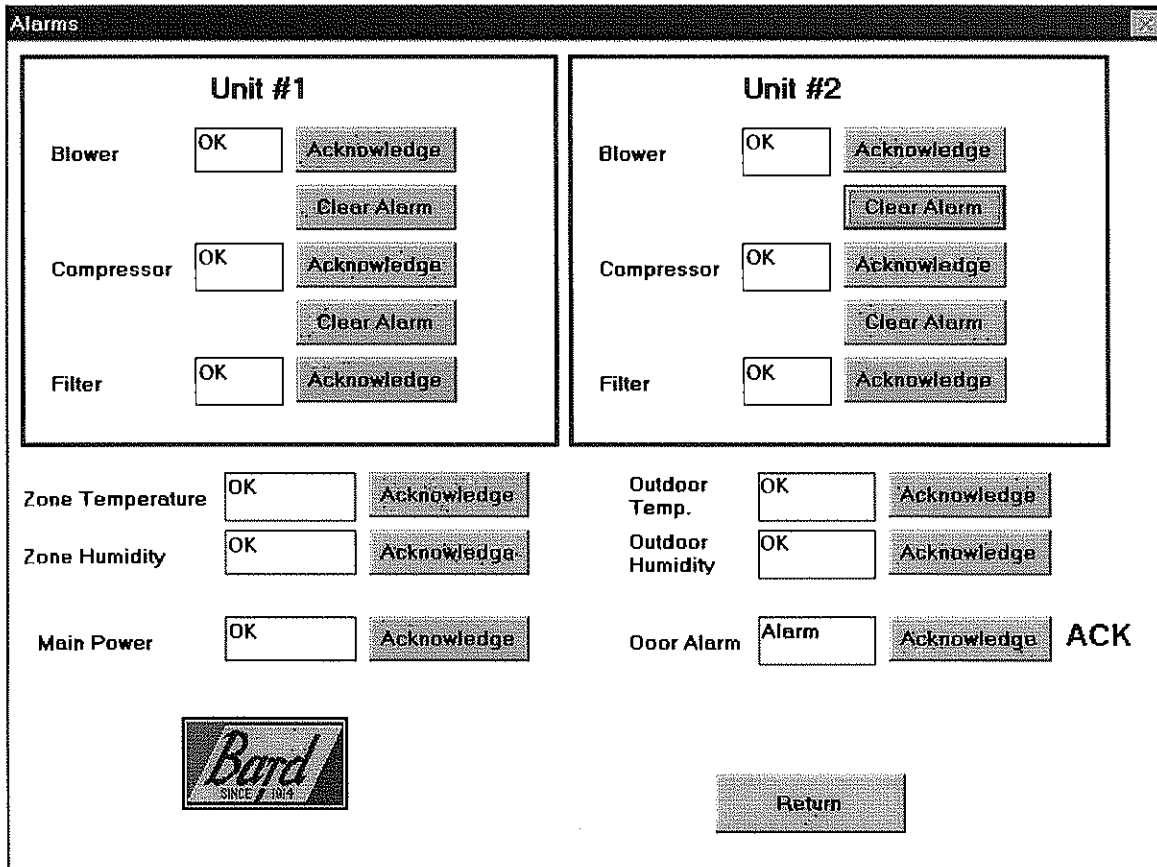
### 5.4.5 OVERRIDE #2 SCREEN

Same as the Override #1 Command Button above. All references to Unit #1 become Unit #2



### 5.4.6 ALARM SCREEN

The Alarm Command Button will Open the Window containing the Alarm information from the Controller. The Alarm screen will allow the User to Check the Alarm status of the Zone Temperature, Zone Humidity, Blowers, Compressors, Filters, and Main Power of the conditioning units. The Zone Temperature and Humidity have three possible states. The first of which is OK and indicates that the values are within the set ranges. The second state would be a High Alarm condition, stating that the value is above the High Alarm setpoint for that value. The last possible state would be the Low Alarm condition, stating that the value is below the Low Alarm setpoint. The Blower, Compressor, and Filter Alarms mean the same thing but for either Unit #1 or Unit #2. The Blower will show either OK, meaning normal operation, or Alarm, meaning that the Blower operation has been suspended due to an Alarm condition. The Compressor will also show OK or Alarm. The Filter will indicate OK or Alarm, if the Filter is dirty. The Main Power will indicate OK or Alarm, in the event of a Utility power failure.



#### 5.4.6.1 Zone Temperature Acknowledge button

If the Zone Temperature exceeds the High or Low Alarm Temperature setpoints, then the Shelter Alarm indicator or the Main Screen will flash. A High or Low Alarm will be shown in the Alarm status textbox on the Alarm Screen. The Shelter Alarm indicator on the Main Screen will flash until the Alarm has been acknowledged or the Zone Temperature is no longer in Alarm. Once the alarm has been acknowledged, the Shelter Alarm will no longer flash for the Zone Temperature Alarm. This allows the Shelter Alarm indicator to be reset to capture and indicate any new incoming Alarms.

#### 5.4.6.2 Zone Humidity Acknowledge button

If the Zone Humidity exceeds the High or Low Alarm Humidity setpoints, then the Shelter Alarm indicator or the Main Screen will flash. A High or Low Alarm will be shown in the Alarm status textbox on the Alarm Screen. The Shelter Alarm indicator on the Main Screen will flash until the Alarm has been acknowledged or the Zone Humidity is no longer in Alarm. Once the alarm has been acknowledged, the Shelter Alarm will no longer flash for the Zone Humidity Alarm. This allows the Shelter Alarm indicator to be reset to capture and indicate any new incoming Alarms.



#### ***5.4.6.3 Outdoor Temperature Acknowledge button***

If the Outdoor Temperature exceeds the High or Low Alarm Temperature setpoints, then the Shelter Alarm indicator or the Main Screen will flash. A High or Low Alarm will be shown in the Alarm status textbox on the Alarm Screen. The Shelter Alarm indicator on the Main Screen will flash until the Alarm has been acknowledged or the Outdoor Temperature is no longer in Alarm. Once the alarm has been acknowledged, the Shelter Alarm will no longer flash for the Outdoor Temperature Alarm. This allows the Shelter Alarm indicator to be reset to capture and indicate any new incoming Alarms.

#### ***5.4.6.4 Outdoor Humidity Acknowledge button***

If the Outdoor Humidity exceeds the High or Low Alarm Humidity setpoints, then the Shelter Alarm indicator or the Main Screen will flash. A High or Low Alarm will be shown in the Alarm status textbox on the Alarm Screen. The Shelter Alarm indicator on the Main Screen will flash until the Alarm has been acknowledged or the Outdoor Humidity is no longer in Alarm. Once the alarm has been acknowledged, the Shelter Alarm will no longer flash for the Outdoor Humidity Alarm. This allows the Shelter Alarm indicator to be reset to capture and indicate any new incoming Alarms.

#### ***5.4.6.5 Unit #1 Blower Acknowledge button***

If a Blower failure occurs, the Shelter Alarm indicator on the Main Screen will flash. The Blower Acknowledge button will clear the Shelter Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. This should be used to recognize the existing Blower failure and Repair personnel should be dispatched to the Site to repair the Blower. Acknowledgment of the failure does not Clear the Alarm. Once the Blower has been fixed, the Alarm should be cleared to allow the Blower to resume normal operation.

#### ***5.4.6.6 Unit #1 Blower Clear Alarm button***

If a Blower failure occurs, the Shelter Alarm indicator on the Main Screen will flash. The Blower Clear Alarm button will clear the Shelter Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. Clearing the Alarm before the Blower can be fixed will cause the Blower to fail again and another Shelter Alarm to be sent. This should be used to clear the Alarm and return the Blower to normal operation after the Blower has been fixed.

#### ***5.4.6.7 Unit #1 Compressor Acknowledge button***

If a Compressor failure occurs, the Shelter Alarm indicator on the Main Screen will flash. The Compressor Acknowledge button will clear the Shelter Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. This should be used to recognize the existing Compressor failure and Repair personnel should be dispatched to the Site to repair the Compressor. Acknowledgment of the failure does not Clear the Alarm. Once the Compressor has been fixed, the Alarm should be cleared to allow the Compressor to resume normal operation.

#### ***5.4.6.8 Unit #1 Compressor Clear Alarm button***

If a Compressor failure occurs, the Shelter Alarm indicator on the Main Screen will flash. The Compressor Clear Alarm button will clear the Shelter Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. Clearing the Alarm before the Compressor can be fixed will cause the Compressor to fail again and another Shelter Alarm to be sent. This should be used to clear the Alarm and return the Compressor to normal operation after the Compressor has been fixed.

#### ***5.4.6.9 Unit #1 Filter Acknowledge button***

If a Filter becomes too Dirty, the Shelter Alarm indicator on the Main Screen will flash. The Filter Acknowledge button will clear the Shelter Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. This should be used to recognize the existing Dirty Filter condition and Repair personnel should be dispatched to the Site to service the Unit. This is a Self Clearing Alarm. Once the Filter has been replaced, the Alarm will be removed, and there is no need to Clear the Alarm.

#### ***5.4.6.10 Unit #2 Blower Acknowledge button***

Same as Unit #1 Blower Acknowledge button except applies to Unit #2.

#### ***5.4.6.11 Unit #2 Blower Clear Alarm button***

Same as Unit #1 Blower Clear Alarm button except applies to Unit #2.

#### ***5.4.6.12 Unit #2 Compressor Acknowledge button***

Same as Unit #1 Compressor Acknowledge button except applies to Unit #2

#### ***5.4.6.13 Unit #2 Compressor Clear Alarm button***

Same as Unit #1 Compressor Clear Alarm button except applies to Unit #2.

#### ***5.4.6.14 Unit #2 Filter Acknowledge button***

Same as Unit #1 Filter Acknowledge button except applies to Unit #2.

#### ***5.4.6.15 Main Power Acknowledge button***

If Main Power fails, the Shelter Alarm indicator on the Main Screen will flash. The Main Power Acknowledge button will clear the Shelter Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. This should be used to recognize the existing Power Failure condition and appropriate steps should be taken to fix the problem. This is a Self Clearing Alarm. Once the Main Power has been restored, the Alarm will be removed..

#### ***5.4.6.16 Door Alarm Acknowledge button***

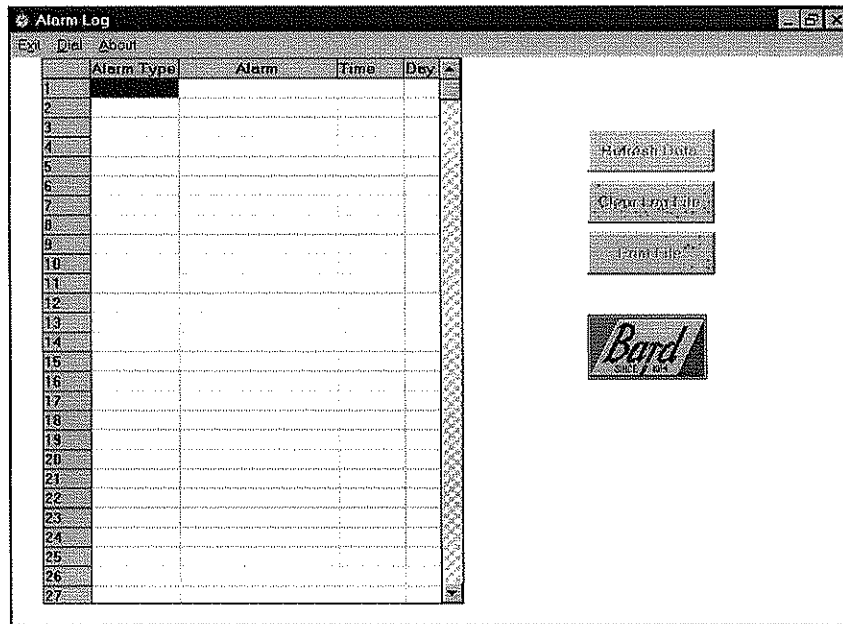
If a Door Alarm occurs, the Shelter Alarm indicator on the Main Screen will flash. The Door Alarm Acknowledge button will clear the Door Alarm indicator and allow it to be reset to capture and indicate any new incoming Alarms. This is a Self Clearing Alarm. Once the Door Alarm system has been reset the Alarm will be removed.

#### ***5.4.6.17 Return button***

This button will remove the Alarm screen and Return to the Main Screen.

## 5.5 Alarm Logger Software

The Alarm Logger has the capability to acquire the last thirty (30) Alarm conditions that the controller has sensed. The alarm file is a rotating file. This means that the oldest data will be overwritten by the newest data if the file is full. The alarm conditions are brought into the Alarm Logger screen for viewing and analysis. Once the data has been gathered, the user may leave the program or the user can clear the log file in the controller before leaving.



### 5.5.1 ALARM MENU OPTIONS

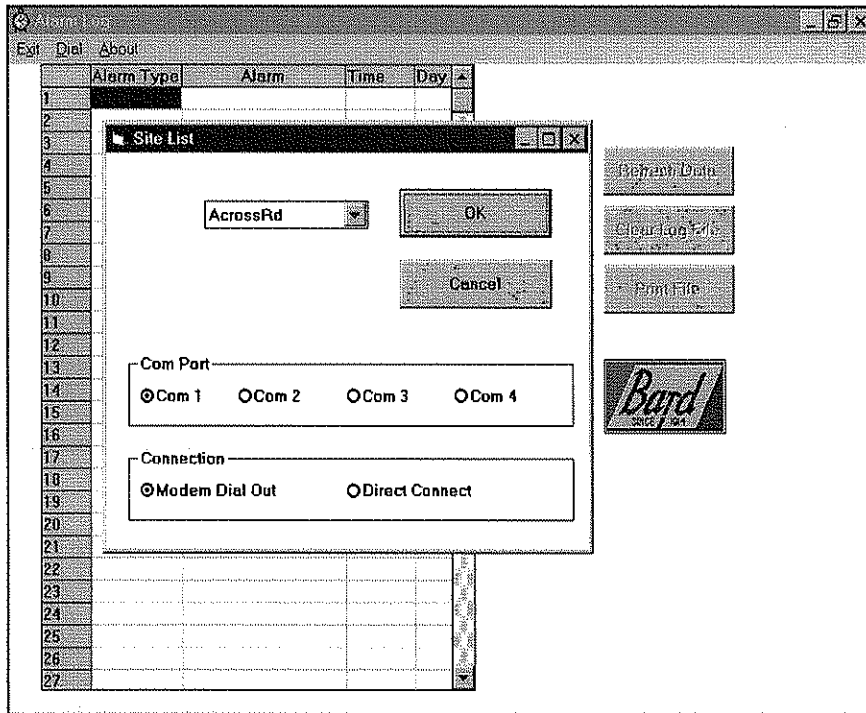
At the top of the Alarm Logger Screen, there are three (3) Menu items. The first option is Exit. Clicking on the word Exit will disconnect from the controller and end the program. Clicking the Dial Menu will Open a Site List screen prompting the user for Site information. The last Menu is the About Menu item. This contains information about the program and revision level.

### 5.5.2 DIAL MENU ITEM

Click on the Dial item to establish a connection to a site. The Site List screen will appear. The Site List contains information that was entered in the Site Manager program. The site may be selected in the list of site names. This screen also gives the user the option of which COM port to use and the method of connection, either direct or modem. If the user is going to connect directly to the controller with a PC, they must make sure that the cable is connected before clicking the OK button. The program should start gathering data immediately.

For remote connection the user will select the Site that they wish to connect with and Click the OK button. The user will then be prompted to enter the Password for that Site, if there is a password for

the site. If the Password is not correct, the user will be notified that the Password was not correct and the program will return to the Main Screen. Once the Password has been entered and the OK button has been Clicked, the program will dial the modem and try to establish communication with the remote site. Once the connection has been made, the program will begin gathering data from the controller.



### 5.5.3 ALARM SCREEN

Once the user has connected to the controller, the alarm information will begin to be brought into the program. As the information is collected, it will be displayed. Once all Thirty (30) Alarm points have been collected and displayed, the Command buttons will become Active. The user can End the program, Print the alarm log, or Clear the Log file

#### 5.5.3.1 Refresh Data Command button

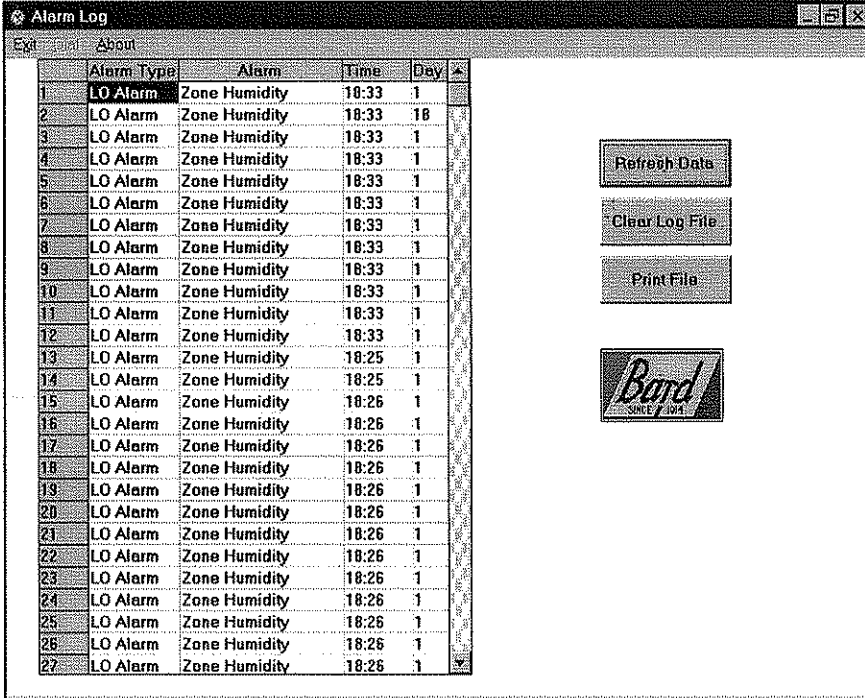
The Refresh Data Command button will become Active after the program has gathered all of the Alarm information from the controller. Clicking this button will gather the data again, if the data is corrupted or has changed.

#### 5.5.3.2 Print Program Command Button

The Print Command Button will become active after the program has gathered all of the Alarm information from the controller. Clicking this button will print the 30 alarm points to the default Windows printer.

### 5.5.3.3 Clear Log File Command button

The Clear Log File Command button will Clear the Alarm information that is currently stored in the controller. Clicking this button will not update the screen. The Refresh Data button can be clicked to update the data on screen.



The screenshot shows a software window titled "Alarm Log" with a menu bar containing "Exit", "Print", and "About". The main area contains a table with the following columns: "Alarm Type", "Alarm", "Time", and "Day". The table lists 27 entries, all of which are "LO Alarm" for "Zone Humidity". The times range from 18:33 to 18:26, and the days are either 1 or 18. To the right of the table are three buttons: "Refresh Data", "Clear Log File", and "Print File". Below these buttons is the "Bard" logo, which includes the text "SINCE 1974".

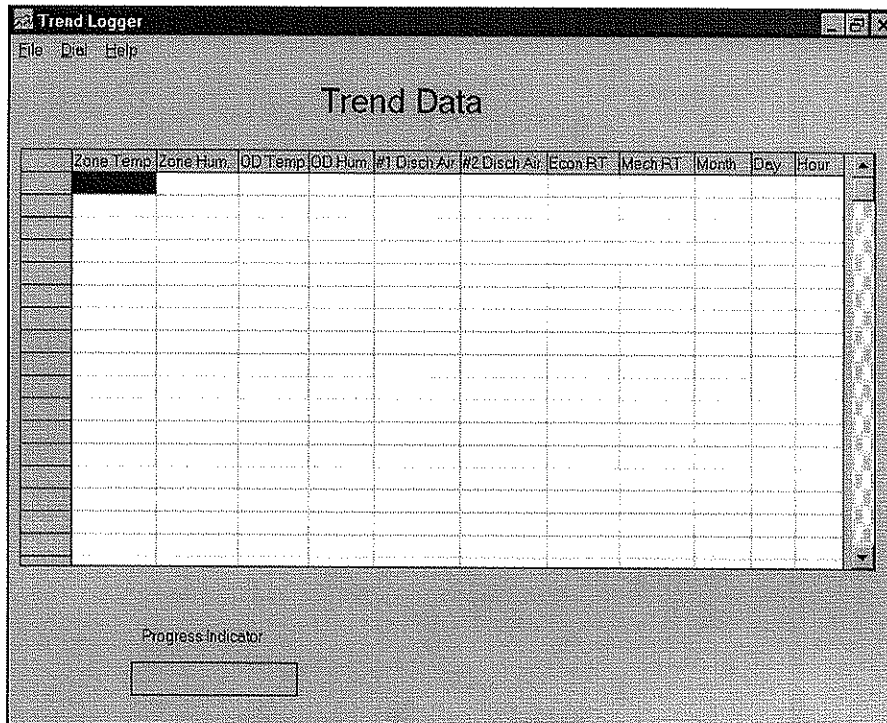
	Alarm Type	Alarm	Time	Day
1	LO Alarm	Zone Humidity	18:33	1
2	LO Alarm	Zone Humidity	18:33	18
3	LO Alarm	Zone Humidity	18:33	1
4	LO Alarm	Zone Humidity	18:33	1
5	LO Alarm	Zone Humidity	18:33	1
6	LO Alarm	Zone Humidity	18:33	1
7	LO Alarm	Zone Humidity	18:33	1
8	LO Alarm	Zone Humidity	18:33	1
9	LO Alarm	Zone Humidity	18:33	1
10	LO Alarm	Zone Humidity	18:33	1
11	LO Alarm	Zone Humidity	18:33	1
12	LO Alarm	Zone Humidity	18:33	1
13	LO Alarm	Zone Humidity	18:25	1
14	LO Alarm	Zone Humidity	18:25	1
15	LO Alarm	Zone Humidity	18:26	1
16	LO Alarm	Zone Humidity	18:26	1
17	LO Alarm	Zone Humidity	18:26	1
18	LO Alarm	Zone Humidity	18:26	1
19	LO Alarm	Zone Humidity	18:26	1
20	LO Alarm	Zone Humidity	18:26	1
21	LO Alarm	Zone Humidity	18:26	1
22	LO Alarm	Zone Humidity	18:26	1
23	LO Alarm	Zone Humidity	18:26	1
24	LO Alarm	Zone Humidity	18:26	1
25	LO Alarm	Zone Humidity	18:26	1
26	LO Alarm	Zone Humidity	18:26	1
27	LO Alarm	Zone Humidity	18:26	1

## 5.6 Trend Logger Software

The Trend Logger will access the Remote Site and Acquire the site information stored in the controller. This information is stored in a Microsoft Access® Database format. The information stored is the Zone Temperature, Zone Humidity, OutDoor Temperature, OutDoor Humidity, Unit #1 Supply Air Temperature, Unit #2 Supply Air Temperature, Mechanical Run Time, and Economizer Run Time. The controller will store all of these values once per hour and will hold up to 128 hours of data. Once the data register has been filled, the new data will overwrite the oldest data in the register. The Data should be acquired at least every 128 hours to make sure that none of the data is overwritten without being stored.

### 5.6.1 TREND LOGGER MENU OPTIONS

At the top of the Trend Logger Screen, there are three (3) Menu items. The first option is File. Clicking the word File will cause the word Exit to appear. Clicking the word Exit will disconnect from the controller and end the program. Clicking the Dial Menu will Open an Site List screen, prompting the user for Site information. The Help menu contains the About Trend Logger menu item The About menu item displays the software version of this program when clicked.

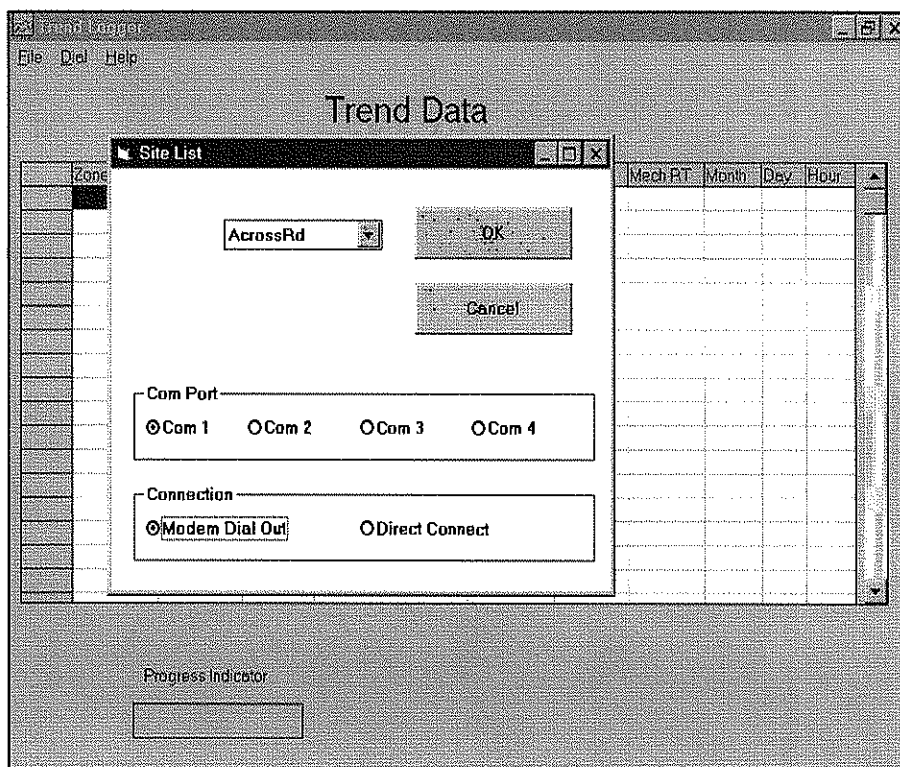


### 5.6.2 DIAL MENU

Click on the Dial item to establish a connection to a site. The Site List screen will appear. The Site List contains information that was entered in the Site Manager program. The site may be selected in

the list of site names. This screen also gives the user the option of which COM port to use and the method of connection, either direct or modem. If the user is going to connect directly to the controller with a PC, they must make sure that the cable is connected before clicking the OK button. The program should start gathering data immediately.

For remote connection the user will select the Site that they wish to connect with and Click the OK button. The user will then be prompted to enter the Password for that Site, if there is a password for the site. If the Password is not correct, the user will be notified that the Password was not correct and the program will return to the Main Screen. Once the Password has been entered and the OK button has been Clicked, the program will dial the modem and try to establish communication with the remote site. Once the connection has been made, the program will begin gathering data from the controller.

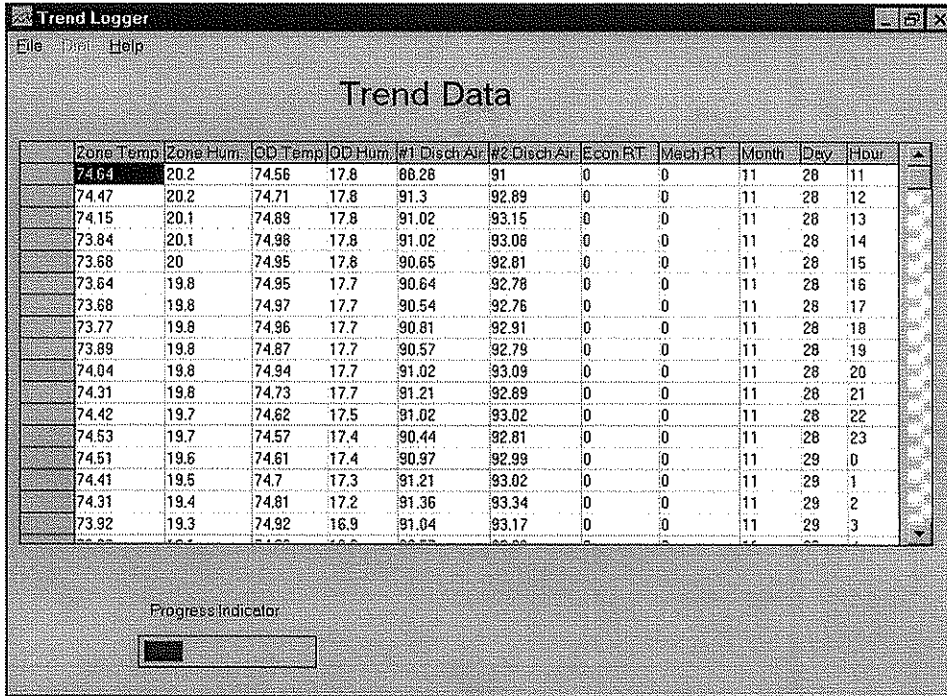


### 5.6.3 TREND LOGGER SCREEN

The data will be displayed on screen as it is being received from the controller. The data may not be in chronological order. The progress bar indicates the amount of data yet to be collected. The data is sorted by time and date and stored in a database file. A message will appear when all of the data has been acquired. The entire database file can be viewed using Microsoft Access®.

The database file is located in a subdirectory of the bard directory. The directory will have the same name as the site. The database will also have the same name as the site followed by a ".mdb", indicating that it is a database file.





## 6. MAINTENANCE & TROUBLESHOOTING

### 6.1 Routine Maintenance

The TCS20 requires minimal maintenance. Once every 4 years replace the battery under the controller cover. This battery powers the hardware clock during power outages.

Check sensor calibration once every two years.

### 6.2 Troubleshooting

#### 6.2.1 TCS20 TROUBLESHOOTING

Problem	Check Out Points	Procedure
TCS20 Fails to operate	Check 240 Volt Power	
	Check TCS20 Circuit breaker	
	Check 24 Volt Power	Remove power connector from controller and Check for 24 volt Power from pin 1 to pin 3
Blower #1 light is On but Blower fails to operate	Check Internal Fuse	Remove screws from the four corner of the front panel of the controller. The fuse is located in upper left hand corner of the controller.
	Check A/C unit 24 Volt power from C to G	
	Check controller switch	Remove junction connector J5. Check for continuity from pin #3 to pin #6 with the Blower light ON.
Compressor #1 light is On but Compressor fails to operate	Check wiring and connections	
	Check A/C unit 24 Volt power from C to Y	
	Check controller switch	Remove junction connector J5. Check for continuity from pin #2 to pin #5 with the Compressor light ON.
Heater #1 light is On but Heater fails to operate	Check wiring and connections	
	Check A/C unit 24 Volt power from C to W1	
	Check controller switch	Remove junction connector J5. Check for continuity from pin #8 to pin #11 with the Compressor light ON.
	Check wiring and connections	

Economizer #1 light is On but Economizer fails to operate	Check controller switch	Disconnect E from the terminal strip on the TCS20. Check for continuity from E to F on the terminal strip with the Unit #1 Economizer light ON.
	Check operation of the Economizer	Connect a jumper wire on the A/C unit low voltage terminal strip from R to G. Connect another jumper wire on the A/C unit low voltage terminal strip from E to F (Never connect power to these terminals) and check for Economizer operation.
Blower #2 light is On but Blower fails to operate	Check A/C unit 24 Volt power from C to G	
	Check controller switch	Remove junction connector J4. Check for continuity from pin #7 to pin #10 with the Blower light ON.
	Check wiring and connections	
Compressor #2 light is On but Compressor fails to operate	Check A/C unit 24 Volt power from C to Y	
	Check controller switch	Remove junction connector J4. Check for continuity from pin #8 to pin #11 with the Compressor light ON.
	Check wiring and connections	
Heater #2 light is On but Heater fails to operate	Check A/C unit 24 Volt power from C to W1	
	Check controller switch	Remove junction connector J4. Check for continuity from pin #2 to pin #5 with the Compressor light ON.
	Check wiring and connections	
Economizer #2 light is On but Economizer fails to operate	Check controller switch	Disconnect E from the terminal strip on the TCS20. Check for continuity from E to F on the terminal strip with the Unit #2 Economizer light ON.
	Check operation of the Economizer	Connect a jumper wire on the A/C unit low voltage terminal strip from R to G. Connect another jumper wire on the A/C unit low voltage terminal strip from E to F (Never connect power to these terminals) and check for Economizer operation.

Modem not responding	Check status of lights on Modem	
Zone Temperature Sensor	Check Sensor output	Determine the Temperature of the structure. Remove plug in connector J1 from the TCS20 controller. With a Digital VOM, check the resistance between pins #3 and #6 in the plug. The resistance will correspond with the Temperature of the sensor according to Table 6.
Zone Humidity Sensor	Check Sensor Input	Check the AC voltage supply to the Sensor output board, inside the door of the TCS20. The voltage should be 24 Volts AC
	Check Sensor Output	Check the DC output voltage from the sensor output board, inside the door of the TCS20. The voltage should be between 1 and 5 Volts DC. The Output voltage will correspond with the Humidity according to Table 7.
OutDoor Temperature Sensor	Check Sensor Output	Determine the Temperature of the structure. Remove plug in connector J1 from the TCS20 controller. With a Digital VOM, check the resistance between pins #13 and #14 in the plug. The resistance will correspond with the Temperature of the sensor according to Table 6.
OutDoor Humidity Sensor	Check Sensor Input	Check the AC voltage supply to the Sensor output board, inside the sensor housing. The voltage should be 24 Volts AC
	Check Sensor Output	Check the DC output voltage from the sensor output board, inside the sensor housing. The voltage should be between 1 and 5 Volts DC. The Output voltage will correspond with the Humidity according to Table 7.
Discharge Air Sensor	Check Sensor Output	Determine the Temperature of the discharge air. Remove plug in connector J2 from the TCS20 controller. With a Digital VOM, check the resistance between Terminal #4 and Terminal #5 on the low voltage terminal block of the A/C

		unit. The resistance will correspond with the Temperature of the sensor according to Table 6.
Dirty Filter Sensor	Check Output	Remove plug in connector J2 from the TCS20 controller. Observe Filter flag status of the A/C unit. If the Change Filter flag is not visible, then there should be no continuity between terminals #6 and #7 of the A/C unit low voltage terminal block. If the Change Filter flag is visible, then there should be continuity between terminals #6 and #7 of the A/C unit low voltage terminal block.
Compressor Current Sensor	Check Sensor Output	Remove plug in connectors J1, J2 and J4 from the TCS20 controller. Connect a jumper wire between R and G of the A/C unit low voltage terminal block to operate the blower. Observe the status of the compressor current sensor LED. The LED should not be on. Connect a jumper wire between R and Y of the A/C unit low voltage terminal block to operate the compressor. When the compressor is running, the LED should flash rapidly (Approx. 4 times per second). If the Led is flashing slowly (Approx. 2 times per second), adjust potentiometer on the sensor until the LED begins flashing rapidly when compressor is running.
Blower Airflow Sensor	Check Sensor Output	Remove plug in connectors J1, J2 and J4 from the TCS20 controller. Check continuity between terminal #8 and #9 of the A/C unit low voltage terminal block. This should be an Open circuit with the Blower off. Connect a jumper wire between R and G of the A/C unit low voltage terminal block to operate the blower. Check continuity between terminal #8 and #9 of the A/C unit low voltage terminal block. This should be a Closed circuit with the Blower running.

**TABLE 3**  
**VOLTS DC VS % RH**

Humidity % RH	Output Volts DC
5.00	0.25
10.00	0.50
15.00	0.75
20.00	1.00
25.00	1.25
30.00	1.50
35.00	1.75
40.00	2.00
45.00	2.25
50.00	2.50
55.00	2.75
60.00	3.00
65.00	3.25
70.00	3.50
75.00	3.75
80.00	4.00
85.00	4.25
90.00	4.50
95.00	4.75
100.00	5.00

**TABLE 4.**

***THERMISTOR RESISTANCE VS. TEMPERATURE TABLE***

Temp	Temp	10000 $\Omega$ Resistance	3000 $\Omega$ Resistance
Deg C	Deg F	Ohms	Ohms
-20.00	-4.00	79050	29,092
-15.00	5.00	61020	21,868
-10.00	14.00	47630	16,589
-5.00	23.00	37400	12,694
0.00	32.00	29560	9,795
5.00	41.00	23500	7,619
10.00	50.00	18790	5,971
15.00	59.00	15150	4,714
20.00	68.00	12290	3,748
25.00	77.00	10020	3,000
30.00	86.00	8206	2,417
35.00	95.00	6754	1,959
40.00	104.00	5599	1,597
45.00	113.00	4662	1,310
50.00	122.00	3898	1,080
55.00	131.00	3273	896.00
60.00	140.00	2759	746.00

**6.2.2 WALLMOUNT QUICK TROUBLESHOOTING GUIDE.**

Operation	Procedure
ByPassing TCS20 Controller	Disconnect power to the TCS20. Unplug the plug in connectors J4 and J5 from the controller
Compressor Test	Connect jumper wire on A/C unit low voltage terminals from R to Y and observe Compressor operation (There will be a Time delay between the installation of the jumper and the starting of the Compressor. The Compressor Time Delay relay will determine the time delay period.). After the Compressor starts, the jumper wire can be removed.
Blower Test	Connect a jumper wire on A/C unit low voltage terminals R to G and observe Blower operation (The Blower will continue to run for One (1) minute after the jumper is removed).
Economizer Test	Connect a jumper wire on A/C unit low voltage terminals R to G and observe Blower operation. After Blower operation is confirmed, the Economizer can be tested. Leave the jumper in place from the previous step. Connect a separate jumper on the A/C unit low voltage terminals from E to F and observe the Economizer operation (Never connect power to terminals E or F).
Heater Test	Connect a jumper wire on A/C unit low voltage terminals R to W1. The Heating contactor will engage when the jumper is connected. The Blower will also operate while this jumper is in place. To check the operation of the Heater, you will have to check the Discharge Air temperature of the A/C unit.
Restarting TCS20	Remove All jumper wires and reconnect the plug in connectors J4 and J5 to the controller. Reapply power to the TCS20