
SERVICE INSTRUCTIONS WITH REPLACEMENT PARTS LIST

LV1000-200 CONTROLLER *Part of the Bard Free Cooling Unit System*

**NOTE: LV1000 Controller is required for operation when multiple
FUSION-TEC™ HR**AP wall-mount units are used.**



Climate Control Solutions

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NOTICE

It is important to check the software version during installation to ensure that the latest version has been installed. Current software versions, change log and installation instructions are available on the Bard website at <http://www.bardhvac.com/software-download/>

GENERAL INFORMATION

Free Cooling Unit System

This Bard Free Cooling Unit system is composed of FUSION-TEC wall-mount air conditioners matched with an LV1000 first on/next on controller. The wall mount units are specifically engineered for telecom/motor control center rooms.

NOTE: *The LV1000 controller and FUSION-TEC wall-mount units are designed specifically to work together. The LV1000 controller cannot run other Bard models or other brands of systems, nor can other controllers run the FUSION-TEC wall-mount units. They are a complete system, and must be used together.*

Controller

LV1000 controller and accessories included shown below.

LV1000 Series



LV1000 Series
Programmable Logic
Controller



TEC-EYE™ Hand-Held
Diagnostic Tool
Bard P/N 8301-059



Remote Temperature/
Humidity Sensor*
(with 35' shielded cable)
Bard P/N 8403-079



Communication
EMI Filters
Bard P/N 8301-055

* One remote temperature/humidity sensor and 35' of 5-wire shielded cable are included with the LV1000 controller. Up to two additional remote temperature/humidity sensors can be purchased and installed. Temperature-only sensors (Bard P/N 8301-058) may be used instead of the additional temperature/humidity sensors, but will also need to be purchased separately. Temperature-only sensors require field-supplied 2-wire shielded cable.

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians.

These instructions should be carefully read before beginning the installation. Note particularly any tags and/or labels attached to the equipment.

While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities having jurisdiction should be consulted before the installation is made. See **Additional Publications** on page 4 for information on codes and standards.

Shipping Damage

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

Additional Publications

These publications can help when installing the air conditioner. They can usually be found at the local library or purchased directly from the publisher. Be sure to consult the current edition of each standard.

National Electrical CodeANSI/NFPA 70
Standard for the Installation of Air Conditioning
and Ventilating SystemsANSI/NFPA 90A
Standard for Warm Air Heating
and Air Conditioning SystemsANSI/NFPA 90B
Load Calculation for Residential Winter
and Summer Air Conditioning ACCA Manual J
Duct Design for Residential Winter and Summer
Air Conditioning and Equipment Selection
..... ACCA Manual D

For more information, contact these publishers:

Air Conditioning Contractors of America (ACCA)

1712 New Hampshire Ave. N.W.
Washington, DC 20009
Telephone: (202) 483-9370 Fax: (202) 234-4721

American National Standards Institute (ANSI)

11 West Street, 13th Floor
New York, NY 10036
Telephone: (212) 642-4900 Fax: (212) 302-1286

American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc. (ASHRAE)

1791 Tullie Circle, N.E.
Atlanta, GA 30329-2305
Telephone: (404) 636-8400 Fax: (404) 321-5478

National Fire Protection Association (NFPA)

Batterymarch Park
P. O. Box 9101
Quincy, MA 02269-9901
Telephone: (800) 344-3555 Fax: (617) 984-7057

ANSI Z535.5 Definitions:

DANGER: Indicate[s] a hazardous situation which, if not avoided, will result in death or serious injury. The signal word “DANGER” is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.

WARNING: Indicate[s] a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.

CAUTION: Indicate[s] a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.

NOTICE: [this header is] preferred to address practices not related to personal injury. The safety alert symbol shall not be used with this signal word. As an alternative to “NOTICE” the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.



NOTE: Screenshots shown in this manual reflect default settings (when applicable).

Alarm Adjustment

Acknowledging/Clearing Alarms

Alarm conditions activate a red LED indicator that backlights the ALARM function key. As an option, an alarm condition may also be enunciated by an audible alarm signal. An alarm is acknowledged by pressing the ALARM key. This calls up alarm display screen(s) that provide a text message detailing the alarm condition(s). After an alarm condition is corrected, the alarm can be cleared by pressing the ALARM key for 3 seconds.

Sensor Failure Alarms

The controller is capable of determining if a sensor has failed. If the temperature or humidity measurement is outside the following ranges, the controller will consider the sensor as failed.

The sensor failure alarms are self clearing.

TABLE 1
Temperature and Humidity Sensors

Sensor	Range
Indoor Temperature 1	-41°F to 303°F
Indoor Temperature 2	-41°F to 303°F
Indoor Temperature 3	-41°F to 303°F
Indoor Humidity 1	0-100%
Indoor Humidity 2	0-100%
Indoor Humidity 3	0-100%

Temperature Alarms (Low Temp, High Temp, High Temp 2)

Low Temperature Alarm

The LV will indicate an indoor low temperature alarm when any of the connected sensors that are enabled read a value below the low temperature limit of 45°F (factory default). This alarm **does not** use the average of the sensors if more than one space sensor is used.

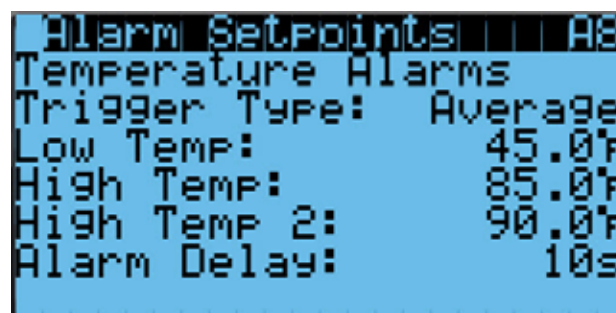
The low temperature alarm is self clearing.

To adjust the low temperature alarm setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A8)**.

5. Press ENTER key to scroll to **Low Temp** (see Figure 1).
6. Press UP or DOWN keys to adjust setpoint.

FIGURE 1
Adjusting Temperature Alarm Setpoints



High Temperature Alarm

The LV will indicate a high temperature alarm when any of the connected sensors that are enabled read a value above the high temperature limit of 85°F. This alarm **does not** use the average of the sensors if more than one space sensor is used.

The high temperature alarm is self clearing.

To adjust the high temperature alarm setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A8)**.
5. Press ENTER key to scroll to **High Temp** (see Figure 1).
6. Press UP or DOWN keys to adjust setpoint.

High Temperature 2 Alarm

The LV will indicate a high temperature 2 alarm when any of the connected sensors that are enabled read a value above the high temperature 2 limit of 90°F. This alarm **does not** use the average of the sensors like other functions do. In addition to the alarm being generated, this event will put the system into emergency vent mode. See **Emergency Vent** on page 12 for more information.

To adjust the high temperature 2 alarm setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.

3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A8)**.
5. Press ENTER key to scroll to **High Temp 2** (see Figure 1).
6. Press UP or DOWN keys to adjust setpoint.

The trigger type for the low temperature, high temperature and high temperature 2 alarms can be changed to reference either the displayed average or the lowest value (for low temperature alarm) and the highest value (for high temperature alarms). This only applies to multiple sensor installations. If only one sensor is used, this does not affect operation.

The default setting is **Average**.

To adjust the temperature alarms trigger type:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A8)**.
5. Press ENTER key to scroll to **Trigger Type** (see Figure 1).
6. Press UP or DOWN keys to change from **Average** to **Hi/Low**.

A delay of 10 seconds is applied to each alarm. This can be adjusted by:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A8)**.
5. Press ENTER key to scroll to **Alarm Delay** (see Figure 1).
6. Press UP or DOWN keys to adjust the delay.

Humidity Alarms (Low Hum, High Hum)

Low Humidity Alarm

The LV will indicate an indoor low humidity alarm when any of the connected sensors that are enabled read a value below the low humidity limit of 5% RH (factory default). This alarm **does not** use the average of the sensors if more than one space sensor is used.

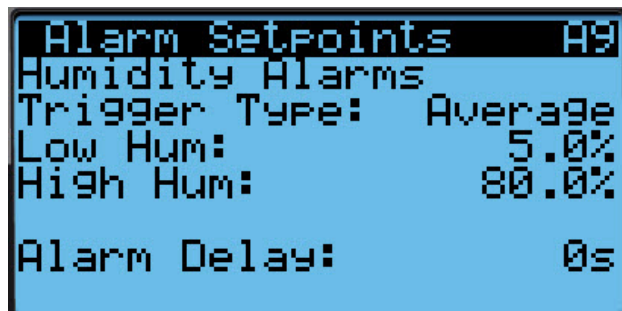
The low humidity alarm is self clearing.

To adjust the low humidity alarm setpoint:

1. Press MENU key to go to the Main Menu screen.

2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A9)**.
5. Press ENTER key to scroll to **Low Hum** (see Figure 2).
6. Press UP or DOWN keys to adjust setpoint.

FIGURE 2
Adjusting Humidity Alarm Setpoints



High Humidity Alarm

The LV will indicate a high humidity alarm when any of the connected sensors that are enabled read a value above the high humidity limit of 80% RH. This alarm **does not** use the average of the sensors if more than one space sensor is used.

The high humidity alarm is self clearing.

To adjust the high humidity alarm setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A9)**.
5. Press ENTER key to scroll to **High Hum** (see Figure 2).
6. Press UP or DOWN keys to adjust setpoint.

The trigger type for the low humidity and high humidity alarms can be changed to reference either the displayed average or the lowest value (for low humidity alarm) and the highest value (for high humidity alarm). This only applies to multiple sensor installations. If only one sensor is used, this does not affect operation.

The default setting is **Average**.

To adjust the temperature alarms trigger type:

1. Press MENU key to go to the Main Menu screen.

2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A9)**.
5. Press ENTER key to scroll to **Trigger Type** (see Figure 2).
6. Press UP or DOWN keys to change from **Average** to **Hi/Low**.

A delay is available to be applied to each humidity alarm (default is 0 seconds). This can be adjusted by:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Alarm Setpoints (A9)**.
5. Press ENTER key to scroll to **Alarm Delay** (see Figure 2).
6. Press UP or DOWN keys to adjust the delay.

Smoke Alarm

The LV will indicate a smoke alarm when the smoke detector input is activated in the shelter. This input is enabled by default. To utilize this input, connect the detector alarm relay to the smoke detector input and smoke detector common. The alarm will be communicated to all of the wall-mount units. The LV1000 will disable all operations and all connected wall-mount units will be disabled so that no operations occur. See smoke alarm installation instructions for specific wiring information. This alarm will automatically clear when the smoke detector no longer indicates smoke is present.

NOTE: The variable provided in the Direction column of the Digital In Config (C1) screen (as shown in Figure 3) displays either NO (Normally Open) or NC (Normally Closed). This column lists the type of signaling contact connected the LV1000. If connected to an NO contact on the smoke detector, the input circuit will be closed if there is a smoke event. Therefore, in this case the LV1000 must be set to look for NO.

To change the smoke inputs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital In Config (C1)**.

5. Press ENTER key to scroll to the variable in the table that intersects **Smoke** and **Dir** (see Figure 3).
6. Press UP or DOWN key to change direction.
7. Press ENTER key to save the value and move cursor to variable in the table that intersects **Smoke** and **En**.
8. Press UP or DOWN keys to change the value from **ON** to **OFF**.

FIGURE 3
Changing Input Values

Digital In Config C1			
DI#	Dir	En	Val
1 Smoke	NO	ON	OFF
2 Hydro	NC	ON	OFF
3 Gen	NC	ON	OFF
4 Theft	NC	OFF	OFF
5 Invert	NC	OFF	OFF

Hydrogen Alarm

The LV will indicate a hydrogen alarm when the hydrogen detector indicates high levels of hydrogen inside the shelter. This input is enabled by default but comes with a factory-installed jumper. To utilize this input, remove the jumper and connect the sensor in place of the jumper. In addition to the alarm being generated, this event will put the system into emergency vent mode. See **Emergency Vent** on page 12 for more information. This alarm will automatically clear when the hydrogen detector no longer indicates hydrogen is present.

NOTE: The variable provided in the Direction column of the Digital In Config (C1) screen (as shown in Figure 3) displays either NO (Normally Open) or NC (Normally Closed). This column lists the type of signaling contact connected the LV1000. If connected to an NC contact on the hydrogen detector, the input circuit will be open if there is a hydrogen event. Therefore, in this case the LV1000 must be set to look for NC.

To change the hydrogen inputs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital In Config (C1)**.
5. Press ENTER key to scroll to the variable in the table that intersects **Hydro** and **Dir** (see Figure 3).
6. Press UP or DOWN key to change direction.

7. Press ENTER key to save the value and move cursor to variable in the table that intersects **Hydro** and **En**.
8. Press UP or DOWN keys to change the value from **ON** to **OFF**.

Generator Alarm

The LV will indicate a generator run alarm when the generator run input indicates that the generator is running. This input is enabled by default but comes with a factory-installed jumper. To utilize this input, remove the jumper and connect the generator in place of the jumper.

NOTE: The variable provided in the Direction column of the Digital In Config (C1) screen (as shown in Figure 3) displays either NO (Normally Open) or NC (Normally Closed). This column lists the type of signaling contact connected the LV1000. If connected to an NC contact on the generator, the input circuit will be open when the generator is running. Therefore, in this case the LV1000 must be set to look for NC.

To change the generator inputs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital In Config (C1)**.
5. Press ENTER key to scroll to the variable in the table that intersects **Gen** and **Dir** (see Figure 3).
6. Press UP or DOWN key to change direction.
7. Press ENTER key to save the value and move cursor to variable in the table that intersects **Gen** and **En**.
8. Press UP or DOWN keys to change the value from **ON** to **OFF**.

While the generator is running, the system will only allow selected units to run. This selection is customizable by the end user. This limitation is in place to match the unit power requirements to the shelter generator capacity.

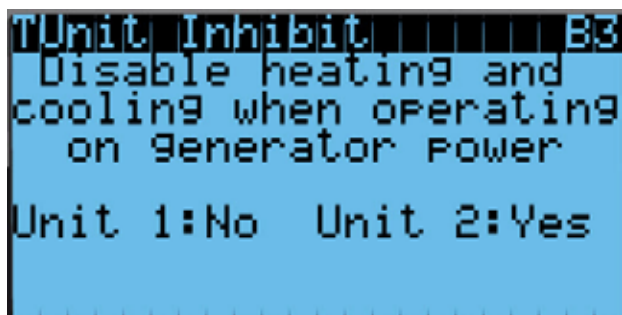
The default for this setting is 1 unit is permitted to run if 1, 2, or 3 is selected for the number of units installed on the shelter. If the shelter is configured for 4 units, the default will be 2 units. If a different strategy is required, the end user can select which units by address are allowed to run when the generator run input is active.

To change which units run when the generator run input is active:

1. Press MENU key to go to the Main Menu screen.

2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **Adv System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Inhibit (B3)**.
5. Press ENTER key to scroll to **Unit 1** (see Figure 4).
6. Press UP or DOWN key to change **Enabled on Gen** to **Disabled on Gen**.
7. Press ENTER key to save the value and move cursor to **Unit 2**.
8. Press UP or DOWN keys and ENTER key to change units to **Disabled on Gen** as needed.

FIGURE 4
Adjusting Units Running When Generator is Active



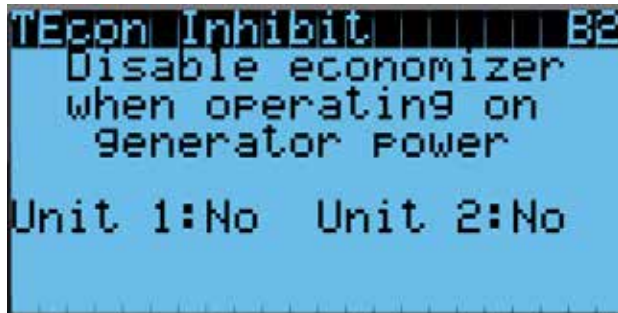
The system will also disable economizer operation of all wall-mount units when the generator is running. This setting can be changed per wall-mount unit by the end user to allow the economizer to operate if the exhaust of the generator is far enough away from the wall-mount unit's fresh air intake.

To change which units can use the economizer when the generator run input is active:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **Adv System Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Econ Inhibit (B2)**.
5. Press ENTER key to scroll to **Unit 1** (see Figure 5).
6. Press UP or DOWN key to change **Enabled on Gen** to **Disabled on Gen**.
7. Press ENTER key to save the value and move cursor to **Unit 2**.
8. Press UP or DOWN keys and ENTER key to change units to **Disabled on Gen** as needed.

This alarm will clear and operation will return to normal when the generator run input no longer indicates the generator is running.

FIGURE 5
Adjusting Economizers Running
When Generator is Active



Utility Power Loss Alarm

The LV will indicate a utility power loss alarm if equipped with inverter-ready wall-mount units. When utility power is not present, the wall-mount unit controller will detect a power loss and communicate the event to the LV. The LV will then indicate a utility power loss alarm. When the power loss alarm is no longer present, the alarm will automatically clear.

Inverter Failure Alarm

The LV has the ability to monitor the VIC Series inverter (sold separately) for a failure. Once wired from the inverter fault relay in the VIC inverter to terminals 16 and 17 in the LV1000-200, the LV will alarm on inverter failure.

NOTE: The variable provided in the Direction column of the Digital In Config (C1) screen (as shown in Figure 3) displays either NO (Normally Open) or NC (Normally Closed). This column lists the type of signaling contact connected the LV1000. If connected to an NC contact on the inverter, the input circuit will be open when the inverter reports a fault. Therefore, in this case the LV1000 must be set to look for NC.

HVAC Fail Alarm

The LV monitors all connected wall-mount unit alarms. If any of the units communicate specific alarms, the LV will actuate an HVAC fail alarm relay output. The following wall-mount unit events have the possibility of actuating an HVAC failure: High pressure (always), low pressure (always), blower failure (always), high temperature warning (user selectable), high temperature alarm (user selectable) and low temperature alarm (user selectable). Each event will be displayed individually on the LV. However, any of these alarms (when enabled) will actuate the alarm relay for HVAC failure. This output is connected to the NOC for remote notification. When all of these events are no longer present, the alarm relay output will close, signaling there are no HVAC failure alarms.

The LV will actuate a relay output when this alarm occurs. The output is set up to open when an alarm occurs by default. The direction of this alarm output can be changed if required.

To change the direction of the HVAC fail alarm output:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital Out Config (C2)**.
5. Press ENTER key to scroll to the variable in the table that intersects **HVACfail** and **Dir** (see Figure 6).
6. Press UP or DOWN key to change direction.

FIGURE 6
Changing Output Values

DO#	Var	Dir	Val
1	Hum	NO	OFF
2	HVACfail	NC	ON
3	HVACmaint	NC	ON
4	AntiTheft	NC	ON

To change the alarms that actuate an HVAC fail alarm:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **HVAC Fail Config (C3)**.
5. Press ENTER key to scroll to the failure type enable (see Figure 7).
6. Press UP or DOWN key to change value.
7. Press ENTER key to save.

FIGURE 7
Changing HVAC Fail Outputs

Failure Type	Enable
High Pressure	Enabled
Low Pressure	Enabled
Blower Fail	Enabled
Hi Temp Warn	Disabled
Hi Temp Alarm	Disabled
Low Temp	Disabled

HVAC Maintenance Alarm

The LV monitors all connected wall-mount unit alarms, and if any of the units communicate specific alarms, the LV will actuate an HVAC maintenance alarm relay output. The following alarms/events have the possibility of actuating an HVAC failure: Dirty filter alarm (always), dirty condenser coil alarm (always), lead +1/lag unit running (user delectable), economizer fail (user selectable), communications failure (user selectable).

For all cases except lead +1, each of the alarms will be displayed individually on the LV. However, any of these alarms (when enabled) will actuate the alarm relay for HVAC maintenance, which is connected to the NOC for remote notification. When all of these events are no longer present, the alarm relay output will close signaling there are no HVAC maintenance alarms.

The LV is will actuate a relay output when this alarm occurs. The output is set up to open when an alarm occurs by default. The direction of this alarm output can be changed if required.

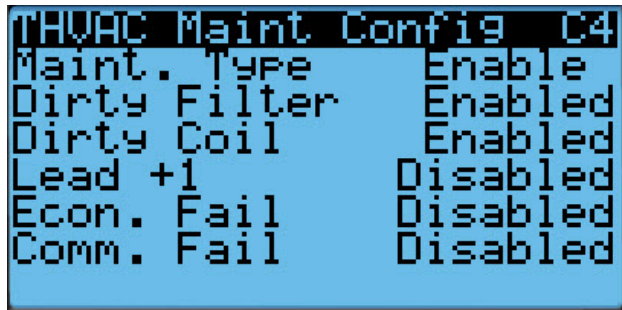
To change the direction of the maintenance alarm output:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital Out Config (C2)**.
5. Press ENTER key to scroll to the variable in the table that intersects **HVACmaint** and **Dir** (see Figure 6).
6. Press UP or DOWN key to change direction.

To change the alarms that actuate an HVAC maintenance alarm:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **HVAC Maint Config (C4)**.
5. Press ENTER key to scroll to the maintenance type enable (see Figure 8).
6. Press UP or DOWN key to change value.
7. Press ENTER key to save.

FIGURE 8
Changing HVAC Maintenance Outputs



Maint. Type	Enable
Dirty Filter	Enabled
Dirty Coil	Enabled
Lead +1	Disabled
Econ. Fail	Disabled
Comm. Fail	Disabled

Anti-Theft Alarm

The LV will indicate a theft alarm when the Bard Guard anti-theft controller (sold separately) indicates an alarm to the anti-theft input on the LV. This alarm will open an alarm relay output to the NOC for remote notification. When the input no longer indicates a theft, the alarm will automatically clear and the alarm relay will return to its normal state.

NOTE: The variable provided in the Direction column of the Digital In Config (C1) screen (as shown in Figure 3) displays either NO (Normally Open) or NC (Normally Closed). This column lists the type of signaling contact connected the LV1000. If connected to an NC contact on the Bard Guard Anti-Theft Alarm, the input circuit will be open when the Bard Guard reports a theft event. Therefore, in this case the LV1000 must be set to look for NC.

To change the anti-theft alarm inputs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital In Config (C1)**.
5. Press ENTER key to scroll to the variable in the table that intersects **Theft** and **Dir** (see Figure 3).
6. Press UP or DOWN key to change direction.
7. Press ENTER key to save the value and move cursor to variable in the table that intersects **Theft** and **En**.
8. Press UP or DOWN key to change the value from **OFF** to **ON**.

The LV is will actuate a relay output when this alarm occurs. The output is set up to open when an alarm occurs by default. The direction of this alarm output can be changed if required.

To change the direction of the anti-theft output:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital Out Config (C2)**.
5. Press ENTER key to scroll to the variable in the table that intersects **AntiTheft** and **Dir** (see Figure 6).
6. Press UP or DOWN key to change direction.

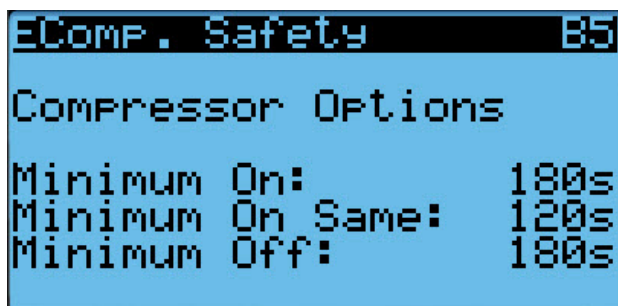
Compressor Safety Timers

The LV1000 has the ability to adjust compressor safety timers to all unit's communication with the LV1000. These timers include Minimum On Time (minimum compressor run time), Minimum On Same (minimum time between two starts) and Minimum Off Time (minimum time off between compressor operation).

To change the compressor safety timer values:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter ENGINEER password 9254.
3. Press UP or DOWN keys to scroll to **Adv Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Comp Safety (B5)**.
5. Press ENTER key to scroll to the desired timer value (see Figure 9).
6. Press UP or DOWN key to change value.
7. Press ENTER key to save.

FIGURE 9
Changing Compressor Safety Timer Values



Humidifier Output

The LV has the option to control a humidifier (sold separately) through a relay output. The output will close when a humidity call from the LV is active and open when the call is no longer present. The output can be configured to operate in reverse where the contacts will open when a humidity call is present and close when the call is no longer present.

To change the direction of the humidifier output:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **IO Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Digital Out Config (C2)**.
5. Press ENTER key to scroll to the variable in the table that intersects **Hum** and **Dir** (see Figure 6).
6. Press UP or DOWN key to change direction.

CONTROL OPERATION

NOTE: Screenshots shown in this manual reflect default settings (when applicable).

Temperature Control

Control Value Averaging

The system requires one temperature and humidity sensor (included with LV) to operate. It allows a **total** of three temperature sensors and three humidity sensors to be connected to the LV for better representation of what is happening in the shelter. When more than one sensor is used, the value is averaged and then used for temperature control operations and humidity control operations.

Comfort Mode

The LV has a feature that allows a temporary override of the temperature control settings. When “comfort mode” is activated, the system will control to 72°F. The system will stay in this mode for 60 minutes and is intended to provide a more comfortable space for a technician during a service call or scheduled maintenance.

Emergency Vent

When the high temperature alarm 2 or the hydrogen input indicate an alarm, the system will enter emergency vent mode. The LV will communicate to each wall-mount unit that emergency vent mode is active. The wall-mount units will then override the damper position to 100% open and turn the blower on. These two items will stay in this state until both the high temperature alarm 2 and the hydrogen detector are no longer in an alarm state.

Cooling

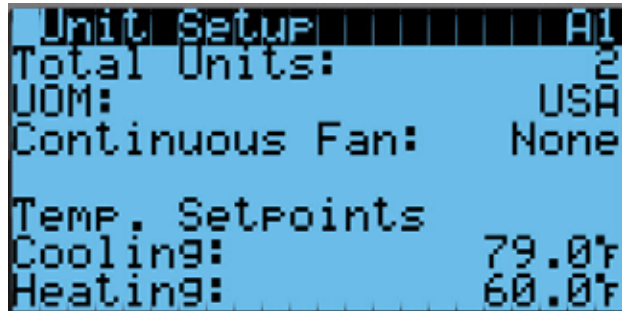
When the wall-mount units are connected to the LV, the economizer and compressor are commanded off and on by the LV. This allows the supervisory controller to consider the most effective and efficient order to bring cooling functions on using all of the available equipment installed on the shelter. At the same time, the LV will be able to match the load requirements of the shelter.

To adjust the cooling setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Setup (A1)**; press ENTER key.
5. Press ENTER key to scroll to **Cooling** (see Figure 10).
6. Press UP or DOWN keys to adjust value.
7. Press ENTER key to save.

8. Press the ESCAPE key several times to return to Main Menu screen.

FIGURE 10
Adjusting Setpoints



The LV monitors the space temperature and compares the value to the space cooling setpoint. The system will compare how far above or below the space temperature is when compared to the cooling setpoint. The LV will also consider how long the shelter temperature has been above or below the setpoint. Using these two considerations, the controller will generate a cooling demand. The cooling demand is a value between 0 and 100%. 0% represents no cooling demand and 100% representing full cooling demand.

The system will consider all of the available cooling stages and distribute the number of stages across the cooling demand range. As the demand rises, the system will stage on equipment every 2 minutes. As the demand lowers, the system will stage off equipment every 2 minutes.

The system will stage the equipment on in the order shown in Table 2.

Unit Rotation

The system is also capable of rotating the order in which the units are brought on. This is done to distribute the equipment run time to each unit. This prevents one unit from providing all of the cooling for the shelter and shorting the lifespan of the wall-mount unit.

The system is set to switch the unit rotation order every 7 days from the factory. This timeframe is adjustable. In addition to the time-based auto rotation, the system can be manually rotated on site for troubleshooting purposes.

The system has two different modes for staging unit operation: FIFO (First In/First Out) or FILO (First In/Last Out). With FIFO staging, the first unit on will be the first unit to turn off as demand decreases. In FILO staging, the first unit to turn on will be the last unit to turn off.

TABLE 2
Cooling Staging

1 Unit		
Order	Freecooling Available	Freecooling Not Available
1	Unit 1 Freecooling	Unit 1 Compressor Stage 1
2	Unit 1 Compressor Stage 1	Unit 1 Compressor Stage 2
3	Unit 1 Compressor Stage 2	--

2 Units		
Order	Freecooling Available	Freecooling Not Available
1	Unit 1 Freecooling	Unit 1 Compressor Stage 1
2	Unit 2 Freecooling	Unit 1 Compressor Stage 2
3	Unit 1 Compressor Stage 1	Unit 2 Compressor Stage 1
4	Unit 1 Compressor Stage 2	Unit 2 Compressor Stage 2
5	Unit 2 Compressor Stage 1	--
6	Unit 2 Compressor Stage 2	

3 Units		
Order	Freecooling Available	Freecooling Not Available
1	Unit 1 Freecooling	Unit 1 Compressor Stage 1
2	Unit 2 Freecooling	Unit 1 Compressor Stage 2
3	Unit 3 Freecooling	Unit 2 Compressor Stage 1
4	Unit 1 Compressor Stage 1	Unit 2 Compressor Stage 2
5	Unit 1 Compressor Stage 2	Unit 3 Compressor Stage 1
6	Unit 2 Compressor Stage 1	Unit 3 Compressor Stage 2
7	Unit 2 Compressor Stage 2	--
8	Unit 3 Compressor Stage 1	
9	Unit 3 Compressor Stage 2	

4 Units		
Order	Freecooling Available	Freecooling Not Available
1	Unit 1 Freecooling	Unit 1 Compressor Stage 1
2	Unit 2 Freecooling	Unit 1 Compressor Stage 2
3	Unit 3 Freecooling	Unit 2 Compressor Stage 1
4	Unit 4 Freecooling	Unit 2 Compressor Stage 2
5	Unit 1 Compressor Stage 1	Unit 3 Compressor Stage 1
6	Unit 1 Compressor Stage 2	Unit 3 Compressor Stage 2
7	Unit 2 Compressor Stage 1	Unit 4 Compressor Stage 1
8	Unit 2 Compressor Stage 2	Unit 4 Compressor Stage 2
9	Unit 3 Compressor Stage 1	--
10	Unit 3 Compressor Stage 2	
11	Unit 4 Compressor Stage 1	
12	Unit 4 Compressor Stage 2	

To view the lead unit and make adjustments to the unit rotation and staging:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Rotation (A2)**; press ENTER key.
5. Press ENTER key to scroll to **Time Based** (see Figure 11).
6. Press UP or DOWN key to change the value from **ON** to **OFF**.
7. Press ENTER key to save the value and scroll to **Num. of Days**.
8. Press UP or DOWN keys to change the value.
9. Press ENTER key to save the value and scroll to **Manual Rotate**.
10. Press UP or DOWN key to change the value from **OFF** to **ON**.
11. Press ENTER key to save the value and scroll to **Staging Order**.
12. Press UP or DOWN keys to change the value from **FIFO** to **FILO**.
13. Press ENTER key to save.
14. Press the ESCAPE key several times to return to Main Menu screen.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Setup (A1)**; press ENTER key.
5. Press ENTER key to scroll to **Heating** (see Figure 10 on page 12).
6. Press UP or DOWN keys to adjust value.
7. Press ENTER key to save.
8. Press the ESCAPE key several times to return to Main Menu screen.

The LV monitors the space temperature and compares the value to the space heating setpoint. The system will compare how far above or below the space temperature is when compared to the heating setpoint. The LV will also consider how long the shelter temperature has been above or below the setpoint. Using these two considerations, the controller will generate a heating demand. The heating demand is a value between 0 and 100%. 0% represents no heating demand and 100% representing full heating demand.

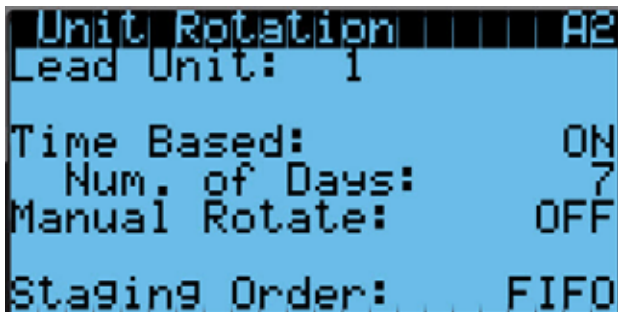
The system will consider all of the available heating stages and distribute the number of stages across the heating demand range. As the demand rises, the system will stage on equipment every 2 minutes. As the demand lowers, the system will stage off equipment every 2 minutes.

The system will stage the equipment on in the order shown in Table 3.

The system is also capable of rotating the order in which the units are brought on. This is done to distribute the equipment run time to each unit. This prevents one unit from providing all of the heating for the shelter and shortening the lifespan of the wall-mount unit.

See **Unit Rotation** on page 12 for information on unit rotation and staging.

FIGURE 11
Adjusting Unit Rotation Parameters



Heating

When the wall-mount units are connected to the LV, the heat strips are commanded off and on by the LV. This allows the supervisory controller to match the required load of the shelter using all of the available equipment installed on the shelter.

To adjust the heating setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.

TABLE 3
Heating Staging

1 Unit	
Order	Heat Method
1	Unit 1 Heat Strip

2 Units	
Order	Heat Method
1	Unit 1 Heat Strip
2	Unit 2 Heat Strip

3 Units	
Order	Heat Method
1	Unit 1 Heat Strip
2	Unit 2 Heat Strip
3	Unit 3 Heat Strip

4 Units	
Order	Freecooling Available
1	Unit 1 Heat Strip
2	Unit 2 Heat Strip
3	Unit 3 Heat Strip
4	Unit 4 Heat Strip

Humidity Control

The LV will monitor the indoor humidity of the space and compare the value to the indoor humidity lower and upper setpoints.

Humidification

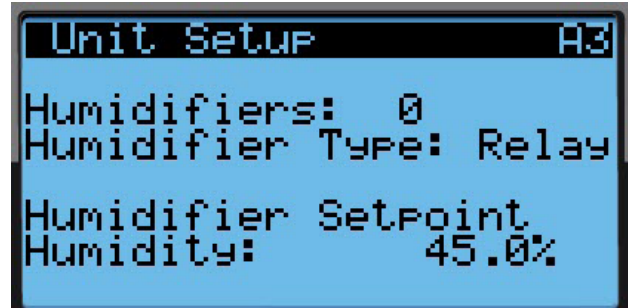
When the humidity is below the lower setpoint of 20% RH and a humidifier output is configured, the shelter will begin to humidify using the relay output to control a third party humidifier.

To change the number of humidifiers, type and setpoint:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Setup (A3)**; press ENTER key.
5. Press ENTER key to scroll to **Humidifiers** (see Figure 12).

6. Press UP or DOWN keys to adjust value.
7. Press ENTER key to scroll to **Humidifier Type**.
8. Press UP or DOWN keys to adjust value.
9. Press ENTER key to scroll to **Humidifier Setpoint Humidity**.
10. Press UP or DOWN keys to adjust value.
11. Press the ESCAPE key several times to return to Main Menu screen.

FIGURE 12
Adjusting Humidifiers Settings



Dehumidification

The system will take several actions to limit the indoor humidity level. At 70% RH, the economizer will be disabled to prevent outdoor air from being used to cool the shelter which may have a high moisture content. This mode will remain active until the shelter humidity level is below 60% RH. The system will switch from high sensible to standard mode when the indoor humidity is above 75% RH which will slow the blower down to remove more moisture. This mode will remain active until the shelter humidity level is below 65%. If the shelter reaches 80% RH, the system will switch the units into dehumidification mode. This mode will cool the shelter down to the heating setpoint and the compressor will turn off. Then the heat strip will activate and heat it back up to the cooling setpoint, then turn off. This will continue until the indoor humidity level is below 70% RH.

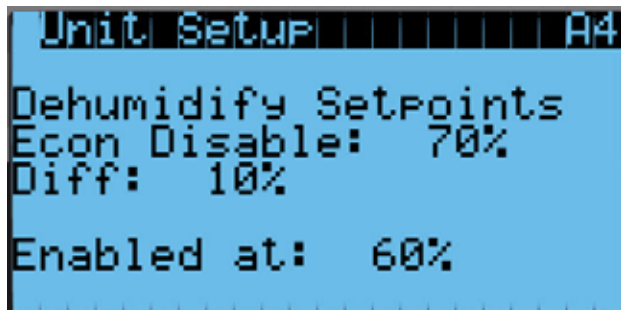
The economizer disable setpoint and differential (difference between disable setpoint and enable setpoint) are adjustable. The differential is limited to a minimum 10%.

To adjust the dehumidify economizer disable setpoint and differential:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Setup (A4)**; press ENTER key.

5. Press ENTER key to scroll to **Econ Disable** (see Figure 13).
6. Press UP or DOWN keys to adjust value.
7. Press ENTER key to scroll to **Diff.**
8. Press UP or DOWN keys to adjust value.
9. Press ENTER key to save.
10. Press the ESCAPE key several times to return to Main Menu screen.

FIGURE 13
Adjusting Dehumidify Setpoints



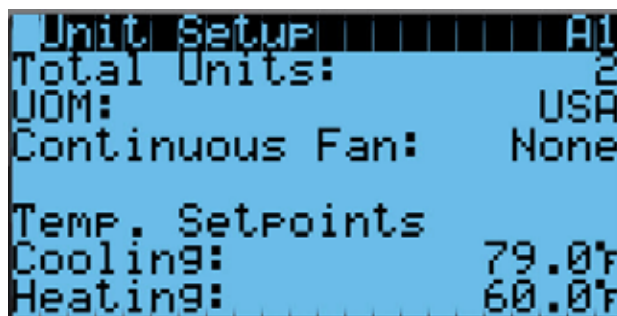
Fan Control

The LV has the option to change the continuous blower setting of the units connected to it. The options are All, Lead and None. If the option is set to All, then all of the units connected will run the blower continuously. If the option is set to Lead, only the unit in the lead position will run the blower continuously. If the option is set to None, then none of the units will run the blower continuously. When continuous blower doesn't apply to a unit, it will cycle the blower based on heating or cooling calls.

To adjust the continuous fan setting:

1. Press MENU key to go to the Main Menu screen.
2. Press UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Setup (A1)**; press ENTER key.
5. Press ENTER key to scroll to **Continuous Fan** (see Figure 14).
6. Press UP or DOWN keys to adjust value.
7. Press ENTER key to save.
8. Press the ESCAPE key several times to return to Main Menu screen.

FIGURE 14
Adjusting Continuous Fan Setting



Hour Counting

The LV will keep track of each unit's heating and cooling method run times for last 24 hours. In addition to how long an item was on, it will also track how many times a method started. These screens are located in the Quick Menu Info screens.

FIGURE 15
Last 24 Hours Tracking

Info		
Unit 1 Last 24 Hours		
	Run	ST
Free Cool:	0m	0
Cooling 1:	1377m	24
Cooling 2:	344m	26
Heating 1:	0m	0
Heating 2:	0m	0

ADDITIONAL INFORMATION

LV1000 Menus/Screens

Main Menu

Press the MENU key from any screen to return to the Main Menu. Press the UP or DOWN keys to scroll through the available menus. When the desired menu is highlighted, press the ENTER key to access that menu. Press the ESCAPE key or MENU key to return to the Status screen from the Main Menu.

Status Screen

The Status screen is the default start-up screen and also the return screen after 5 minutes of no activity. The screen can be accessed any time by pressing the ESCAPE key repeatedly. The LV1000 Status screen displays the current date, time, unit displayed, zone and unit status.

Quick Menu

The Quick Menu is available on the Status screen. Use UP or DOWN keys while on the Status screen to scroll between the three Quick Menu options; press ENTER key.

Data Log

The data log displays the record number, time of alarm event, date of alarm event, description of alarm event and whether the entry is the beginning or end of event. The data log will have as many screens as events occurred.

Info

Info displays unit status for each wall-mount unit connected to controller, last hour tracking (shelter), last hour tracking (for each wall-mount unit connected, last hour averages (zone temperatures, OA temperature and OA humidity) and additional LV1000 information.

Setpoints

Setpoints allows setting and enabling of comfort mode.

Menu Screens and Password Levels

- A** System Config: A1-A10 User (2000)
- B** Adv Sys Config: B1-B4 Technician (1313)
- C** I-O Config: C1-C18 Technician (1313)
- D** On/Off: User (2000)
- E** Alarm Logs: User (2000)
- F** Settings
 - Date/Time: Technician (1313)
 - Language: User (2000)
 - Network Config: Technician (1313)
 - Serial Ports: Technician (1313)

Initialization

- Clear Logs: User (2000)
- System Default: Engineer (9254)
- Restart: User (2000)
- Parameter Config: Engineer (9254)
- Alarm Export: User (2000)

- G** Logout: Used to log out of the current password level. Entering back into the menu requires password.

TABLE 4
LV1000 Passwords (Defaults)

User	2000
Technician	1313
Engineer	9254
Use UP or DOWN keys and ENTER key to enter password	

TABLE 5
LV1000 Status Messages

Message	Description
Ready	System is on and waiting for heat, cooling, etc.
Freecooling	System is actively economizing
Cooling	System is actively mechanical cooling
Heating	System is actively heating
Off by Alarm	System has major system fault preventing operation
Off by BMS	System has been turned off by network supervisor
Off by Keyboard	System has been turned off by local user
Manual Mode	A unit in the system has an active override
Comfort Mode	System is operating in comfort mode
Emergency Vent	System has active hydrogen alarm and is actively exhausting the air to outside
Emergency Cool	System has active hi temp 2 alarm and is calling for 100% cooling demand
Emergency Off	System has active smoke alarm and has commanded all units off

Additional Programming

Calibrating Sensors

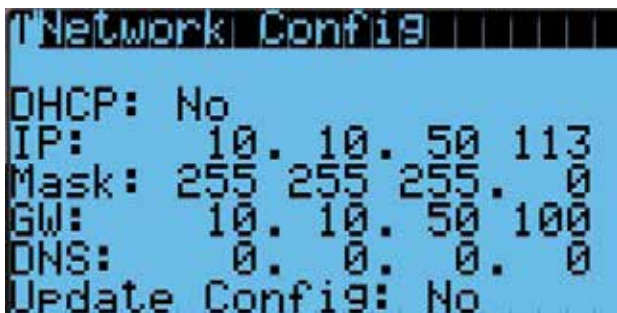
1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **I/O Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to sensor to be adjusted.
5. Press ENTER key to scroll to **Offset**.
6. Press UP or DOWN keys to add or subtract to the sensor offset value.
7. Press ENTER key to save.

IP Configuration

To set an LV IP address:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Network Config**; press ENTER key.
5. Press ENTER key to scroll to desired value to be changed (see Figure 16).
6. Press UP or DOWN keys to change selected value.
7. Press ENTER key to save and scroll to next value.
8. When finished, press ENTER key until cursor is on the **Update Configure** value; press ENTER key to update **Network Configuration**.
9. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 16
IP Configuration



Changing to Celsius

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Sys Config**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Unit Setup (A1)**.
5. Press ENTER key to scroll to **UOM**.
6. Press UP and DOWN keys to change value to **SI**.

Reset to Factory Defaults

To reset the LV controller to factory default settings:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter ENGINEER password 9254.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press UP or DOWN keys to scroll to the **Default Installation** screen; press ENTER key.
6. Press ENTER key to scroll to **Reset to Factory Defaults** (see Figure 17).
7. Press UP or DOWN key to value to **YES**; press ENTER key.
8. System will restart with default values.

FIGURE 17
Restoring Factory Default Settings

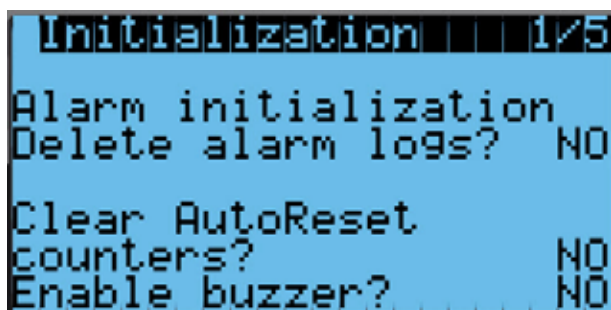


Clear Alarm Logs

To clear the LV controller alarm logs:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter USER password 2000.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Initialization**; press ENTER key.
5. Press ENTER key to scroll to **Delete Alarm Logs?** (see Figure 18).
6. Press UP or DOWN key to value to **YES**; press ENTER key.
7. Press ESCAPE key several times to return to Main Menu screen.

FIGURE 18
Clearing LV1000 Alarm Logs



Modbus TCP Configuration

LV1000 version 1.1.0 and higher include Modbus RTU over TCP included on the Ethernet connection. This is a Modbus Slave device and requires a Modbus Master device to properly communicate. Modbus Register list can be found on page 26 of this manual.

To make changes to the Modbus setup:

1. Press MENU key to go to the Main Menu screen.
2. Use UP or DOWN keys and ENTER key to enter TECHNICIAN password 1313.
3. Press UP or DOWN keys to scroll to **Settings**; press ENTER key.
4. Press UP or DOWN keys to scroll to **Serial Ports**; press ENTER key.
5. Press ENTER key to scroll to **Address** (see Figure 19).
6. Press UP or DOWN keys change the Modbus address.
7. Press ENTER key to scroll to **Port**.
8. Press UP or DOWN keys change the Port number if needed. (Default is port 502.)
9. Press ENTER key to scroll to **UOM**.
10. Press UP or DOWN keys change the Unit of Measure for Modbus values (see Table 6).

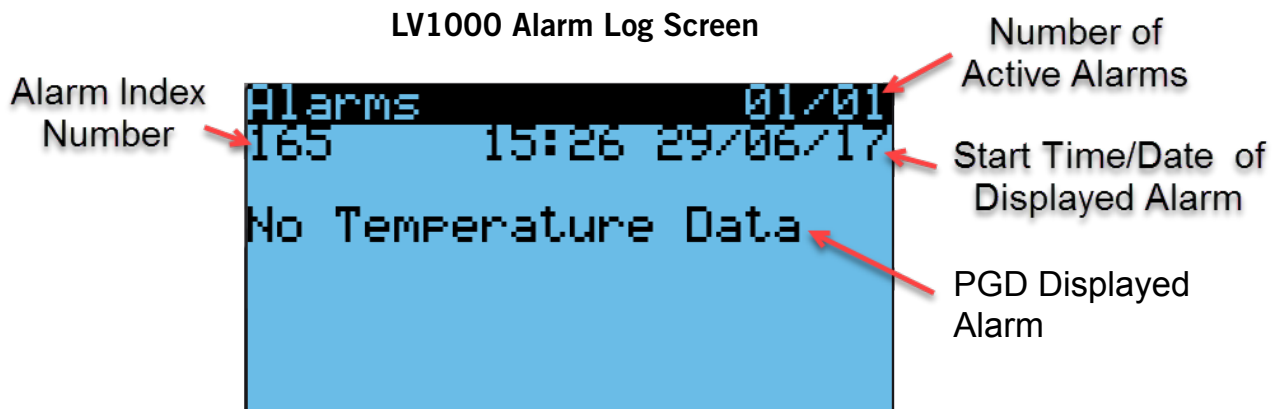
FIGURE 19
Modbus TCP Setup



TABLE 6
Modbus Unit of Measure (UOM) Values

UOM Type	Temperature UOM	Pressure UOM
SI	°C	KPA
USA (Default)	°F	PSI
UK	°F	BAR
CAN	°C	PSI
LON	°C	KPA

ALARM LOG INDEX



NOTE: All LV1000 alarms reset automatically.

LV – LV1000 Service Instructions 2100-673
FT – FUSION-TEC Service Instructions 2100-670

Index	Alarm Tag (as displayed in Alarm Log)	PGD Displayed Alarm	Description Includes manual reference with page number
0	Al_retain	Too many mem writings	
1	Al_Err_retain_write	Retain mem write error	
2	Al_IndoorT1	Indoor 1 Temp Sens	Indoor Temp Sensor 1 Failure (LV p. 5)
3	Al_IndoorT2	Indoor 2 Temp Sens	Indoor Temp Sensor 2 Failure (LV p. 5)
4	Al_IndoorT3	Indoor 3 Temp Sens	Indoor Temp Sensor 3 Failure (LV p. 5)
5	Al_IndoorH1	Indoor 1 Hum Sens	Indoor Humidity Sensor 1 Failure (LV p. 5)
6	Al_IndoorH2	Indoor 2 Hum Sens	Indoor Humidity Sensor 2 Failure (LV p. 5)
7	Al_IndoorH3	Indoor 3 Hum Sens	Indoor Humidity Sensor 3 Failure (LV p. 5)
8	Al_RetainU1	Unit 1 Ret Mem Err	
9	Al_ErrRetainWriteU1	Unit 1 Mem Write Err	
10	Al_MixedAirInU1	Unit 1 Disch Temp Sens	Unit 1 Liquid Line Temp Sensor Failure (FT p. 20)
11	Al_OutdoorAirInU1	Unit 1 Outdoor Sens	Unit 1 Outdoor Temp Sensor Failure (FT p. 27)
12	Al_ReturnAirInU1	Unit 1 Return Sens	Unit 1 Return Temp Sensor Failure (FT p. 10)
13	Al_OutdoorHumInU1	Unit 1 Outdoor Hum	Unit 1 Outdoor Humidity Sensor Failure (FT p. 27)
14	Al_SupplyAirHighU1	Unit 1 Supply Air High	Unit 1 High Supply Air Temp (FT p. 27)
15	Al_SupplyAirLowU1	Unit 1 Supply Air Low	Unit 1 Low Supply Air Temp (FT p. 28)
16	Al_LowPressU1	Unit 1 Low Pressure	Unit 1 Low Refrigerant Pressure (LV p. 9/FT p. 23)
17	Al_DamperOpenU1	Unit 1 Damper Open Fail	Unit 1 Damper Failed to Open (FT p. 25)
18	Al_DamperCloseU1	Unit 1 Damper Close Fail	Unit 1 Damper Failed to Close (FT p. 26)
19	Al_FreezeU1	Unit 1 Freeze Stat	Unit 1 Evaporator Temp Reached Freeze Condition (FT p. 18)
20	Al_AirflowU1	Unit 1 Airflow	Unit 1 Blower Failure (LV p. 9/FT p. 15)
21	Al_HighPressU1	Unit 1 High Pressure	Unit 1 High Refrigerant Pressure (FT p. 22)
22	Al_SmokeU1	Unit 1 Smoke	Unit 1 Smoke Input Tripped (FT p. 30)

Index	Alarm Tag	PGD Displayed Alarm	Description
23	Al_LowTempZ1	Indoor Low Temp	Indoor Temp Reached Lower Limit (LV p. 5)
24	Al_HighTempZ1	Indoor High Temp	Indoor Temp Reached High Limit (LV p. 5)
25	Al_HighTemp2Z1	Indoor High2 Temp	Indoor Temp Reached High Limit 2 (LV p. 5)
26	Al_Smoke	Smoke	LV1000 Smoke Alarm Active (LV p. 7)
27	Al_RetainU2	Unit 2 Ret Mem Err	
28	Al_ErrRetainWriteU2	Unit 2 Mem Write Err	
29	Al_MixedAirInU2	Unit 2 Disch Temp Sens	Unit 2 Liquid Line Temp Sensor Failure (FT p. 20)
30	Al_OutdoorAirInU2	Unit 2 Outdoor Sens	Unit 2 Outdoor Temp Sensor Failure (FT p. 27)
31	Al_ReturnAirInU2	Unit 2 Return Sens	Unit 2 Return Temp Sensor Failure (FT p. 10)
32	Al_OutdoorHumInU2	Unit 2 Outdoor Hum	Unit 2 Outdoor Humidity Sensor Failure (FT p. 27)
33	Al_SupplyAirHighU2	Unit 2 Supply Air High	Unit 2 High Supply Air Temp (FT p. 27)
34	Al_SupplyAirLowU2	Unit 2 Supply Air Low	Unit 2 Low Supply Air Temp (FT p. 28)
35	Al_LowPressU2	Unit 2 Low Pressure	Unit 2 Low Refrigerant Pressure (LV p. 9/FT p. 23)
36	Al_DamperOpenU2	Unit 2 Damper Open Fail	Unit 2 Damper Failed to Open (FT p. 25)
37	Al_DamperCloseU2	Unit 2 Damper Close Fail	Unit 2 Damper Failed to Close (FT p. 26)
38	Al_FreezeU2	Unit 2 Freeze Stat	Unit 2 Evaporator Temp Reached Freeze Condition (FT p. 18)
39	Al_AirflowU2	Unit 2 Airflow	Unit 2 Blower Failure (LV p. 9/FT p. 15)
40	Al_HighPressU2	Unit 2 High Pressure	Unit 2 High Refrigerant Pressure (FT p. 22)
41	Al_SmokeU2	Unit 2 Smoke	Unit 2 Smoke Input Tripped (FT p. 30)
42	Al_RetainU3	Unit 3 Ret Mem Err	
43	Al_ErrRetainWriteU3	Unit 3 Mem Write Err	
44	Al_MixedAirInU3	Unit 3 Disch Temp Sens	Unit 3 Liquid Line Temp Sensor Failure (FT p. 20)
45	Al_OutdoorAirInU3	Unit 3 Outdoor Sens	Unit 3 Outdoor Temp Sensor Failure (FT p. 27)
46	Al_ReturnAirInU3	Unit 3 Return Sens	Unit 3 Return Temp Sensor Failure (FT p. 10)
47	Al_OutdoorHumInU3	Unit 3 Outdoor Hum	Unit 3 Outdoor Humidity Sensor Failure (FT p. 27)
48	Al_SupplyAirHighU3	Unit 3 Supply Air High	Unit 3 High Supply Air Temp (FT p. 27)
49	Al_SupplyAirLowU3	Unit 3 Supply Air Low	Unit 3 Low Supply Air Temp (FT p. 28)
50	Al_LowPressU3	Unit 3 Low Pressure	Unit 3 Low Refrigerant Pressure (LV p. 9/FT p. 23)
51	Al_DamperOpenU3	Unit 3 Damper Open Fail	Unit 3 Damper Failed to Open (FT p. 25)
52	Al_DamperCloseU3	Unit 3 Damper Close Fail	Unit 3 Damper Failed to Close (FT p. 26)
53	Al_FreezeU3	Unit 3 Freeze Stat	Unit 3 Evaporator Temp Reached Freeze Condition (FT p. 18)
54	Al_AirflowU3	Unit 3 Airflow	Unit 3 Blower Failure (LV p. 9/FT p. 15)
55	Al_HighPressU3	Unit 3 High Pressure	Unit 3 High Refrigerant Pressure (FT p. 22)
56	Al_SmokeU3	Unit 3 Smoke	Unit 3 Smoke Input Tripped (FT p. 30)
57	Al_RetainU4	Unit 4 Ret Mem Err	
58	Al_ErrRetainWriteU4	Unit 4 Mem Write Err	
59	Al_MixedAirInU4	Unit 4 Disch Temp Sens	Unit 4 Liquid Line Temp Sensor Failure (FT p. 20)
60	Al_OutdoorAirInU4	Unit 4 Outdoor Sens	Unit 4 Outdoor Temp Sensor Failure (FT p. 27)

Index	Alarm Tag	PGD Displayed Alarm	Description
61	AI_ReturnAirInU4	Unit 4 Return Sens	Unit 4 Return Temp Sensor Failure (FT p. 10)
62	AI_OutdoorHumInU4	Unit 4 Outdoor Hum	Unit 4 Outdoor Humidity Sensor Failure (FT p. 27)
63	AI_SupplyAirHighU4	Unit 4 Supply Air High	Unit 4 High Supply Air Temp (FT p. 27)
64	AI_SupplyAirLowU4	Unit 4 Supply Air Low	Unit 4 Low Supply Air Temp (FT p. 28)
65	AI_LowPressU4	Unit 4 Low Pressure	Unit 4 Low Refrigerant Pressure (LV p. 9/FT p. 23)
66	AI_DamperOpenU4	Unit 4 Damper Open Fail	Unit 4 Damper Failed to Open (FT p. 25)
67	AI_DamperCloseU4	Unit 4 Damper Close Fail	Unit 4 Damper Failed to Close (FT p. 26)
68	AI_FreezeU4	Unit 4 Freeze Stat	Unit 4 Evaporator Temp Reached Freeze Condition (FT p. 18)
69	AI_AirflowU4	Unit 4 Airflow	Unit 4 Blower Failure (LV p. 9/FT p. 15)
70	AI_HighPressU4	Unit 4 High Pressure	Unit 4 High Refrigerant Pressure (FT p. 22)
71	AI_SmokeU4	Unit 4 Smoke	Unit 4 Smoke Input Tripped (FT p. 30)
72	AI_LostUnit1	Unit 1 Comm Lost	Unit 1 No Modbus Communication
73	AI_LostUnit2	Unit 2 Comm Lost	Unit 2 No Modbus Communication
74	AI_LostUnit3	Unit 3 Comm Lost	Unit 3 No Modbus Communication
75	AI_LostUnit4	Unit 4 Comm Lost	Unit 4 No Modbus Communication
76	AI_Generator	Generator	Generator Run Active (LV p. 8)
77	AI_Hydrogen	Hydrogen	Hydrogen Alarm Active (LV p. 7)
78	AI_HumHiLo	Humidity level	Indoor Humidity Level Has Reached High or Low Limit Reached (LV p. 6)
79	AI_AntiTheft	Theft Alarm Activated	Theft Alarm (Bard Guard) Active (LV p. 10/FT p. 30)
80	AI_UtilPwrLoss	Utility Power Loss	Loss of Utility Power Alarm (LV p. 9)
81	AI_FilterU1	Unit 1 Filter	Unit 1 Dirty Air Filter (LV p. 10/FT pp. 16, 17)
82	AI_FilterU2	Unit 2 Filter	Unit 2 Dirty Air Filter (LV p. 10/FT pp. 16, 17)
83	AI_FilterU3	Unit 3 Filter	Unit 3 Dirty Air Filter (LV p. 10/FT pp. 16, 17)
84	AI_FilterU4	Unit 4 Filter	Unit 4 Dirty Air Filter (LV p. 10/FT pp. 16, 17)
85	AI_EEVLowSH_U1	Unit 1 EEV Low SuperHeat	Unit 1 Electronic Expansion Valve Low Superheat
86	AI_EEVLowSH_U2	Unit 2 EEV Low SuperHeat	Unit 2 Electronic Expansion Valve Low Superheat
87	AI_EEVLowSH_U3	Unit 3 EEV Low SuperHeat	Unit 3 Electronic Expansion Valve Low Superheat
88	AI_EEVLowSH_U4	Unit 4 EEV Low SuperHeat	Unit 4 Electronic Expansion Valve Low Superheat
89	AI_EEVLOP_U1	Unit 1 EEV LOP	Unit 1 Electronic Expansion Valve Low Operating Pressure
90	AI_EEVLOP_U2	Unit 2 EEV LOP	Unit 2 Electronic Expansion Valve Low Operating Pressure
91	AI_EEVLOP_U3	Unit 3 EEV LOP	Unit 3 Electronic Expansion Valve Low Operating Pressure
92	AI_EEVLOP_U4	Unit 4 EEV LOP	Unit 4 Electronic Expansion Valve Low Operating Pressure
93	AI_EEVMOP_U1	Unit 1 EEV MOP	Unit 1 Electronic Expansion Valve Maximum Operating Pressure
94	AI_EEVMOP_U2	Unit 2 EEV MOP	Unit 2 Electronic Expansion Valve Maximum Operating Pressure

Index	Alarm Tag	PGD Displayed Alarm	Description
95	AI_EEVMOP_U3	Unit 3 EEV MOP	Unit 3 Electronic Expansion Valve Maximum Operating Pressure
96	AI_EEVMOP_U4	Unit 4 EEV MOP	Unit 4 Electronic Expansion Valve Maximum Operating Pressure
97	AI_EEVHiTempCond_U1	Unit 1 EEV HiTempCond	Unit 1 Electronic Expansion Valve High Temperature Condition
98	AI_EEVHiTempCond_U2	Unit 2 EEV HiTempCond	Unit 2 Electronic Expansion Valve High Temperature Condition
99	AI_EEVHiTempCond_U3	Unit 3 EEV HiTempCond	Unit 3 Electronic Expansion Valve High Temperature Condition
100	AI_EEVHiTempCond_U4	Unit 4 EEV HiTempCond	Unit 4 Electronic Expansion Valve High Temperature Condition
101	AI_EEVLowSuct_U1	Unit 1 EEV LowSuct	Unit 1 Electronic Expansion Valve Low Suction Pressure
102	AI_EEVLowSuct_U2	Unit 2 EEV LowSuct	Unit 2 Electronic Expansion Valve Low Suction Pressure
103	AI_EEVLowSuct_U3	Unit 3 EEV LowSuct	Unit 3 Electronic Expansion Valve Low Suction Pressure
104	AI_EEVLowSuct_U4	Unit 4 EEV LowSuct	Unit 4 Electronic Expansion Valve Low Suction Pressure
105	AI_EEV_U1	Unit 1 EEV	Unit 1 Electronic Expansion Valve Fault
106	AI_EEV_U2	Unit 2 EEV	Unit 2 Electronic Expansion Valve Fault
107	AI_EEV_U3	Unit 3 EEV	Unit 3 Electronic Expansion Valve Fault
108	AI_EEV_U4	Unit 4 EEV	Unit 4 Electronic Expansion Valve Fault
109	AI_EEVSelfTune_U1	Unit 1 EEV SelfTune	Unit 1 Electronic Expansion Valve is in Self Tuning Mode due to Ineffective Adaptive Control
110	AI_EEVSelfTune_U2	Unit 2 EEV SelfTune	Unit 2 Electronic Expansion Valve is in Self Tuning Mode due to Ineffective Adaptive Control
111	AI_EEVSelfTune_U3	Unit 3 EEV SelfTune	Unit 3 Electronic Expansion Valve is in Self Tuning Mode due to Ineffective Adaptive Control
112	AI_EEVSelfTune_U4	Unit 4 EEV SelfTune	Unit 4 Electronic Expansion Valve is in Self Tuning Mode due to Ineffective Adaptive Control
113	AI_EEVEmergClose_U1	Unit 1 EEV EmergClose	Unit 1 Electronic Expansion Valve Emergency Close
114	AI_EEVEmergClose_U2	Unit 2 EEV EmergClose	Unit 2 Electronic Expansion Valve Emergency Close
115	AI_EEVEmergClose_U3	Unit 3 EEV EmergClose	Unit 3 Electronic Expansion Valve Emergency Close
116	AI_EEVEmergClose_U4	Unit 4 EEV EmergClose	Unit 4 Electronic Expansion Valve Emergency Close
117	AI_EEVTempDelta_U1	Unit 1 EEV TempDelta	Unit 1 Electronic Expansion Valve High Temperature Delta
118	AI_EEVTempDelta_U2	Unit 2 EEV TempDelta	Unit 2 Electronic Expansion Valve High Temperature Delta
119	AI_EEVTempDelta_U3	Unit 3 EEV TempDelta	Unit 3 Electronic Expansion Valve High Temperature Delta
120	AI_EEVTempDelta_U4	Unit 4 EEV TempDelta	Unit 4 Electronic Expansion Valve High Temperature Delta
121	AI_EEVPrDelta_U1	Unit 1 EEV PrDelta	Unit 1 Electronic Expansion Valve High Pressure Delta

Index	Alarm Tag	PGD Displayed Alarm	Description
122	AI_EEVPrDelta_U2	Unit 2 EEV PrDelta	Unit 2 Electronic Expansion Valve High Pressure Delta
123	AI_EEVPrDelta_U3	Unit 3 EEV PrDelta	Unit 3 Electronic Expansion Valve High Pressure Delta
124	AI_EEVPrDelta_U4	Unit 4 EEV PrDelta	Unit 4 Electronic Expansion Valve High Pressure Delta
125	AI_EEVRangeErr_U1	Unit 1 EEV RangeError	Unit 1 Electronic Expansion Valve Parameter Out of Range
126	AI_EEVRangeErr_U2	Unit 2 EEV RangeError	Unit 2 Electronic Expansion Valve Parameter Out of Range
127	AI_EEVRangeErr_U3	Unit 3 EEV RangeError	Unit 3 Electronic Expansion Valve Parameter Out of Range
128	AI_EEVRangeErr_U4	Unit 4 EEV RangeError	Unit 4 Electronic Expansion Valve Parameter Out of Range
129	AI_EEVServPositPerc_U1	Unit 1 EEV ServPositPerc	Unit 1 Electronic Expansion Valve Position Override by Controls
130	AI_EEVServPositPerc_U2	Unit 2 EEV ServPositPerc	Unit 2 Electronic Expansion Valve Position Override by Controls
131	AI_EEVServPositPerc_U3	Unit 3 EEV ServPositPerc	Unit 3 Electronic Expansion Valve Position Override by Controls
132	AI_EEVServPositPerc_U4	Unit 4 EEV ServPositPerc	Unit 4 Electronic Expansion Valve Position Override by Controls
133	AI_EEVValveID_U1	Unit 1 EEV ValveID	Unit 1 Electronic Expansion Valve ID Error
134	AI_EEVValveID_U2	Unit 2 EEV ValveID	Unit 2 Electronic Expansion Valve ID Error
135	AI_EEVValveID_U3	Unit 3 EEV ValveID	Unit 3 Electronic Expansion Valve ID Error
136	AI_EEVValveID_U4	Unit 4 EEV ValveID	Unit 4 Electronic Expansion Valve ID Error
137	AI_SuctTsensor_U1	Unit 1 Suction Temp Sens	Unit 1 Suction Temp Sensor Failure
138	AI_SuctTsensor_U2	Unit 2 Suction Temp Sens	Unit 2 Suction Temp Sensor Failure
139	AI_SuctTsensor_U3	Unit 3 Suction Temp Sens	Unit 3 Suction Temp Sensor Failure
140	AI_SuctTsensor_U4	Unit 4 Suction Temp Sens	Unit 4 Suction Temp Sensor Failure
141	AI_SuctPrSensor_U1	Unit 1 Suction Pr Sens	Unit 1 Suction Pressure Sensor Failure (FT p. 12)
142	AI_SuctPrSensor_U2	Unit 2 Suction Pr Sens	Unit 2 Suction Pressure Sensor Failure (FT p. 12)
143	AI_SuctPrSensor_U3	Unit 3 Suction Pr Sens	Unit 3 Suction Pressure Sensor Failure (FT p. 12)
144	AI_SuctPrSensor_U4	Unit 4 Suction Pr Sens	Unit 4 Suction Pressure Sensor Failure (FT p. 12)
145	AI_SupplyTsensor_U1	Unit 1 Supply Temp Sens	Unit 1 Supply Temp Sensor Failure (FT p. 27)
146	AI_SupplyTsensor_U2	Unit 2 Supply Temp Sens	Unit 2 Supply Temp Sensor Failure (FT p. 27)
147	AI_SupplyTsensor_U3	Unit 3 Supply Temp Sens	Unit 3 Supply Temp Sensor Failure (FT p. 27)
148	AI_SupplyTsensor_U4	Unit 4 Supply Temp Sens	Unit 4 Supply Temp Sensor Failure (FT p. 27)
149	AI_DustSensor_U1	Unit 1 Dust Sensor	Unit 1 Dust Sensor Failure (FT p. 25)
150	AI_DustSensor_U2	Unit 2 Dust Sensor	Unit 2 Dust Sensor Failure (FT p. 25)
151	AI_DustSensor_U3	Unit 3 Dust Sensor	Unit 3 Dust Sensor Failure (FT p. 25)
152	AI_DustSensor_U4	Unit 4 Dust Sensor	Unit 4 Dust Sensor Failure (FT p. 25)
153	AI_DischPrSensor_U1	Unit 1 Disch Pr Sensor	Unit 1 Discharge Pressure Sensor Failure (FT p. 20)

Index	Alarm Tag	PGD Displayed Alarm	Description
154	AI_DischPrSensor_U2	Unit 2 Disch Pr Sensor	Unit 2 Discharge Pressure Sensor Failure (FT p. 20)
155	AI_DischPrSensor_U3	Unit 3 Disch Pr Sensor	Unit 3 Discharge Pressure Sensor Failure (FT p. 20)
156	AI_DischPrSensor_U4	Unit 4 Disch Pr Sensor	Unit 4 Discharge Pressure Sensor Failure (FT p. 20)
157	AI_DustHigh_U1	Unit 1 High Dust Level	Unit 1 High Dust Level at Economizer Inlet (FT p. 25)
158	AI_DustHigh_U2	Unit 2 High Dust Level	Unit 2 High Dust Level at Economizer Inlet (FT p. 25)
159	AI_DustHigh_U3	Unit 3 High Dust Level	Unit 3 High Dust Level at Economizer Inlet (FT p. 25)
160	AI_DustHigh_U4	Unit 4 High Dust Level	Unit 4 High Dust Level at Economizer Inlet (FT p. 25)
161	AI_CondDirty_U1	Unit 1 Dirty Condensor	Unit 1 Dirty Condensor Coil (FT p. 21)
162	AI_CondDirty_U2	Unit 2 Dirty Condensor	Unit 2 Dirty Condensor Coil (FT p. 21)
163	AI_CondDirty_U3	Unit 3 Dirty Condensor	Unit 3 Dirty Condensor Coil (FT p. 21)
164	AI_CondDirty_U4	Unit 4 Dirty Condensor	Unit 4 Dirty Condensor Coil (FT p. 21)
165	AI_NoTempData	No Temperature Data	No Indoor Temperature Sensor Connected
166	AI_EmergencyMode	Emergency Vent Active	Emergency Ventilation Mode Active (LV pp. 5, 7, 12, 17)
167	AI_EmergencyCool	Emergency Cooling Active	Emergency Cooling Mode Active (LV p. 17)

LV1000-200 MODBUS TCP REGISTER LIST (PRELIMINARY)

Version 1.1

For use with the following devices: LV1000.1.1.0

Input Registers (Read Only)

The following input registers reflect system inputs, operation variables and alarm setpoints for read-only purposes. (Units are represented as a whole number but include a single decimal place, i.e., a value of 600 through Modbus equals a value of 60.0 in the LV1000 system.)

Input Registers (Read Only System Values and Setpoints)	
Index	Description
0	Indoor Temperature Sensor 1
1	Indoor Temperature Sensor 2 (if used)
2	Indoor Temperature Sensor 3 (if used)
3	Indoor Temperature Average
4	Indoor Humidity Sensor 1
5	Indoor Humidity Sensor 2 (if used)
6	Indoor Humidity Sensor 3 (if used)
7	Indoor Humidity Average
10	Cooling Setpoint
11	Heating Setpoint
12	High Temperature Warning Setpoint
13	High Temperature Alarm Setpoint
14	Low Temperature Setpoint
16	Number of Units in System
17	Lead Unit in Rotation
18	Lag Unit 1 in Rotation
19	Lag Unit 2 in Rotation
20	Lag Unit 3 in Rotation

Holding Registers (Read/Write)

The following holding registers reflect system setpoints that can be changed via Modbus TCP. (Units are represented as a whole number but include a single decimal place, i.e., a value of 600 through Modbus equals a value of 60.0 in the LV1000 system.)

Holding Registers (Writable Setpoints)	
Index	Description
0	Cooling Setpoint
1	Heating Setpoint
2	Low Temperature Setpoint
3	High Temperature Warning Setpoint
4	High Temperature Alarm Setpoint
5	Low Humidity Alarm Setpoint
6	High Humidity Alarm Setpoint
7	Free Cooling Outdoor Temperature Setpoint
8	Free Cooling Outdoor Humidity Setpoint
9	Free Cooling Outdoor Dew Point Setpoint
10	Modbus TCP Unit of Measure 0 = No Conversion 1 = SI 2 = US Customary 3 = Imperial 4 = Canadian Customary 5 = LON Units
11	1 = Unit Manual Rotation (Resets back to 0 after rotation)

Discrete Inputs (Read Only)

The following discrete inputs reflect system alarms, major unit alarms and unit staging operations.

Discrete Inputs (Read Only Alarms and System Operation)	
Index	Description
0	= 1 when smoke alarm is active
1	= 1 when hydrogen alarm is active
2	= 1 when generator is running
3	= 1 when anti-theft (Bard Guard) is alarming
5	= 1 when indoor temp falls below Low Temp Alarm setpoint
6	= 1 when indoor temp rises above High Temperature Warning setpoint
7	= 1 when indoor temp rises above High Temperature Alarm setpoint
8	= 1 when HVAC Fail is detected on any unit
9	= 1 when HVAC Fail is condition is active on Unit 1
10	= 1 when HVAC Fail is condition is active on Unit 2
11	= 1 when HVAC Fail is condition is active on Unit 3
12	= 1 when HVAC Fail is condition is active on Unit 4
13	= 1 when any unit requires maintenance
14	= 1 when Unit 1 is detected by the LV1000
15	= 1 when Unit 2 is detected by the LV1000
16	= 1 when Unit 3 is detected by the LV1000
17	= 1 when Unit 4 is detected by the LV1000
20	= 1 when Unit 1 has a call for Free Cooling (if available)
22	= 1 when Unit 1 has a call for Cooling Stage 1
23	= 1 when Unit 1 has a call for Cooling Stage 2
26	= 1 when Unit 1 has a call for Free Heating Stage 1 (if available)
27	= 1 when Unit 1 has a call for Free Heating Stage 2 (if available)
28	= 1 when Unit 1 has a call for Free Heating Stage 3 (if available)
31	= 1 when Unit 2 has a call for Free Cooling (if available)
33	= 1 when Unit 2 has a call for Cooling Stage 1
34	= 1 when Unit 2 has a call for Cooling Stage 2
37	= 1 when Unit 2 has a call for Free Heating Stage 1 (if available)
38	= 1 when Unit 2 has a call for Free Heating Stage 2 (if available)
39	= 1 when Unit 2 has a call for Free Heating Stage 3 (if available)
42	= 1 when Unit 3 has a call for Free Cooling (if available)
44	= 1 when Unit 3 has a call for Cooling Stage 1
45	= 1 when Unit 3 has a call for Cooling Stage 2

Discrete Inputs (Read Only) cont.

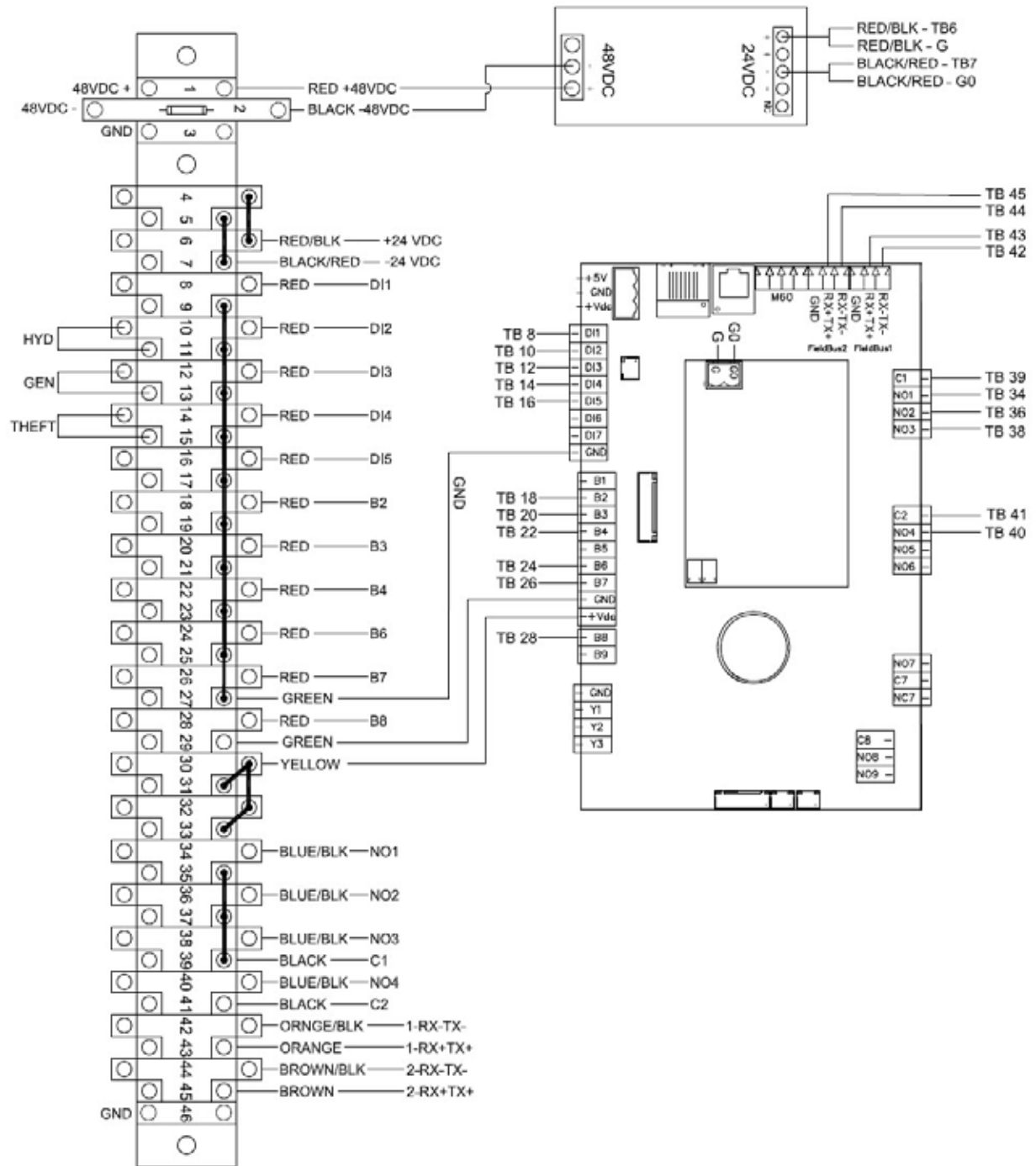
Discrete Inputs (Read Only Alarms and System Operation)	
Index	Description
48	= 1 when Unit 3 has a call for Free Heating Stage 1 (if available)
49	= 1 when Unit 3 has a call for Free Heating Stage 2 (if available)
50	= 1 when Unit 3 has a call for Free Heating Stage 3 (if available)
53	= 1 when Unit 4 has a call for Free Cooling (if available)
55	= 1 when Unit 4 has a call for Cooling Stage 1
56	= 1 when Unit 4 has a call for Cooling Stage 2
59	= 1 when Unit 4 has a call for Free Heating Stage 1 (if available)
60	= 1 when Unit 4 has a call for Free Heating Stage 2 (if available)
61	= 1 when Unit 4 has a call for Free Heating Stage 3 (if available)
100	= 1 when Unit 1 Low Pressure Alarm is active
101	= 1 when Unit 1 High Pressure Cut-Out is active
102	= 1 when Unit 1 economizer damper failed to close
103	= 1 when Unit 1 economizer damper failed to open
104	= 1 when Unit 1 blower failure
200	= 1 when Unit 2 Low Pressure Alarm is active
201	= 1 when Unit 2 High Pressure Cut-Out is active
202	= 1 when Unit 2 economizer damper failed to close
203	= 1 when Unit 2 economizer damper failed to open
204	= 1 when Unit 2 blower failure
300	= 1 when Unit 3 Low Pressure Alarm is active
301	= 1 when Unit 3 High Pressure Cut-Out is active
302	= 1 when Unit 3 economizer damper failed to close
303	= 1 when Unit 3 economizer damper failed to open
304	= 1 when Unit 3 blower failure
400	= 1 when Unit 4 Low Pressure Alarm is active
401	= 1 when Unit 4 High Pressure Cut-Out is active
402	= 1 when Unit 4 economizer damper failed to close
403	= 1 when Unit 4 economizer damper failed to open
404	= 1 when Unit 4 blower failure

TABLE 7
LV1000-200 Terminal Block Index

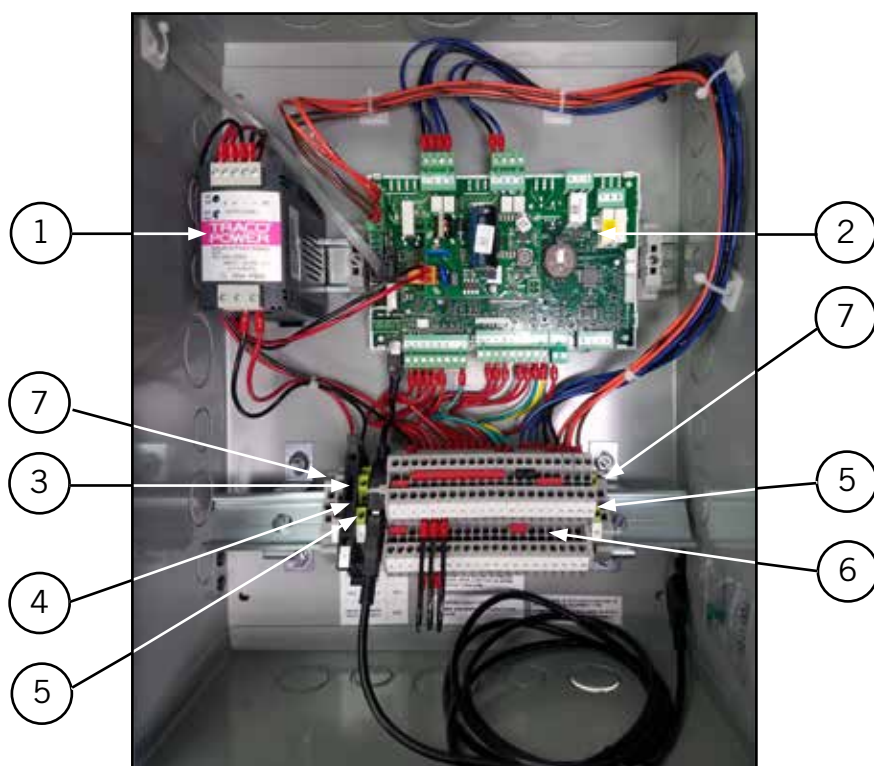
TB#	Wire Mark	Description
1	48+	48VDC +Input
2	48-	48VDC - Input
3	GND	Ground
4	24+	24VDC +
5	24-	24VDC -
6	24+	24VDC +
7	24-	24VDC -
8	DI1	Smoke Detector Input
9	GND	Smoke Detector Common
10	DI2	Hydrogen Detector Input
11	GND	Hydrogen Detector Common
12	DI3	Generator Run Input
13	GND	Generator Run Common
14	DI4	Anti Theft Input
15	GND	Anti Theft Common
16	DI5	Inverter Fault Input
17	GND	Inverter Fault Common
18	B2	Humidity Sensor 1
19	GND	Ground
20	B3	Humidity Sensor 2
21	GND	Ground
22	B4	Humidity Sensor 3
23	GND	Ground

TB#	Wire Mark	Description
24	B6	Remote Temperature Sensor 1
25	GND	Ground
26	B7	Remote Temperature Sensor 2
27	GND	Ground
28	B8	Remote Temperature Sensor 3
29	GND	Ground
30	VDC+	Humidity Sensor 1 +24VDC (B2)
31	VDC+	Humidity Sensor 2 +24VDC (B3)
32	VDC+	Humidity Sensor 3 +24VDC (B4)
33	VDC+	Spare Power +24VDC
34	NO1	Humidifier Output Relay
35	C1	Common
36	NO2	HVAC Fail
37	C1	Common
38	NO3	HVAC Maintenance
39	C1	Common
40	NO4	HVAC Anti Theft
41	C2	Common
42	FB1R-	RS485 RX- / TX- (Fieldbus 1)
43	FB1R+	RS485 RX+ / TX+ (Fieldbus 1)
44	FB2R-	RS485 RX- / TX- (Wall Units)
45	FB2R+	RS485 RX+ / TX+ (Wall Units)
46	-	Ground

FIGURE 20
LV1000-200 Wiring Diagram



LV1000 REPLACEMENT PARTS



Dwg.
No.

Part Number

Description

LV1000

1	8301-082	17 – 75VDC to 24VDC Converter 2.5 Amps	1
2	8301-085-001*	UPC3-LV1000	1
3	8614-059	1.0 Amp Fuse	1
4	8607-039	Fused Terminal Block	1
5	8607-052	Grounded Terminal Block	2
6	8607-058	Terminal Block Double Level	21
7	8611-144	End Clamp (for din rail)	4
NS	8301-053	Panel Mounting Display Flush, pGDEvolution 132x64, Black Buttons with Cable	1
NS	3020-010	35' 2 Conductor 18 Gauge Cable	1
NS	8301-055	EMI Ferrite Filter	2
NS	8301-058	Remote Temperature Sensor ①	1
NS	8403-079	Remote Temperature/Humidity Sensor	1
NS	8301-059	TEC-EYE (Service Tool), 5' Telephone Cable	1
NS	3000-1587	5' Telephone Cable	1

* Replacement part will have a letter attached to the end of the part number to designate software version (Example: 8301-085-001**A**). A software upgrade of all PLCs onsite (units and controllers) should accompany any PLC replacement. Latest revisions of software, change log and instructions are available on the Bard website at <http://www.bardhvac.com/software-download/>

① Optional

NS – Not Shown