LC6000™ Controller

Bard Manufacturing's revolutionary MEGA-TEC™, MULTI-TEC™, and FUSION-TEC™ WALL-MOUNT products set the industry standard for flexibility. Engineered to cool virtually any equipment building or shelter, the PLC technology inside the unit and controller provides unmatched cooling and unparalleled control over your misson critical application. The LC6000 controller allows for control of up to 14 units with 3 zones of operation. Special features including emergency vent, continuous ventilation, generator monitoring, and emergency off are standard features. Alarming, remote monitoring, and Modbus control give the technician piece of mind that units are operating efficiently and the air is conditioned inside the building.

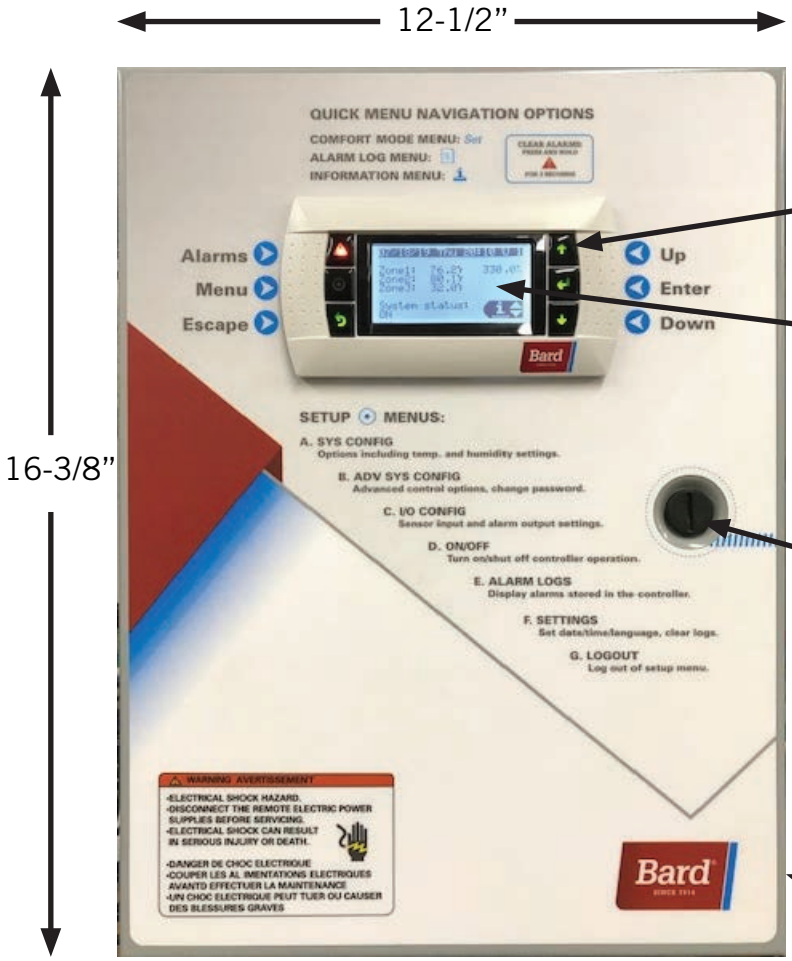
- Intertek ETL Listed to conform to ANSI/UL Std. 916 / CSA C 22.2 No. 205

Intertek

Bard SINCE 1914

/////// ENGINEERED FEATURES - EXTERIOR

The exterior of the LC6000 is an industrial grade NEMA 1 enclosure. An ANSI 61 gray polyester paint design eliminates sharp edges on the door and inside the controller. 16GA. and 14GA. construction with various knockout sizes. A cleanable vinyl front surface with graphics identifies key features of the controller.

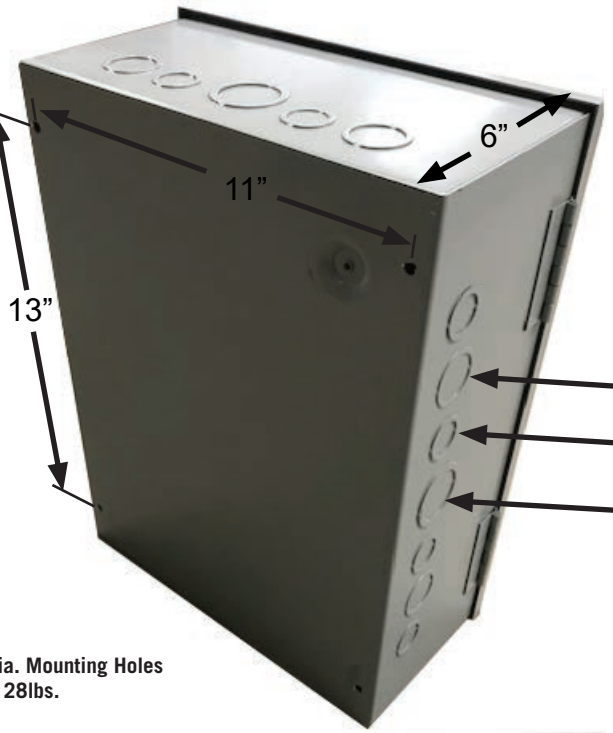


Illuminated Interface buttons:
6 button interface allows for easy setup and menu selection.

Backlit Display:
The controller includes a large 132 x 64 pixel graphic backlit display. An intuitive menu system provides settings, zone conditions, and alarms.

Quarter Turn Fastener:
Access to the inner control area is provided through a hinged door held closed with a quarter turn fastener.

Grounding Lugs:
Grounding lugs are provided with bare cabinet contact for conductivity.



Double Knockout: 3/4” to 1”Conduit

Double Knockout: 1/2” to 3/4” Conduit

Double Knockout: 1” to 1-1/4” Conduit

(4) .28 Dia. Mounting Holes
Weight = 28lbs.

/////// ENGINEERED FEATURES - INTERIOR

The interior of the LC6000 provides many features for use, installation and setup. Industrial grade factory wiring is numbered for ease of wire tracing. Field wire connection screw terminals are numbered and correspond to documentation inside the controller. Fused protection is used for power supplied to the controller. Ethernet CAT 6 connection is provided for user remote interaction with the LC6000 using built-in webpages or Modbus.

Display Cable:
An RJ11 cable is used to connect the PLC board to the display interface located on the front door.

Transformer:
The transformer converts high voltage input power into 24VAC output power to the PLC board.

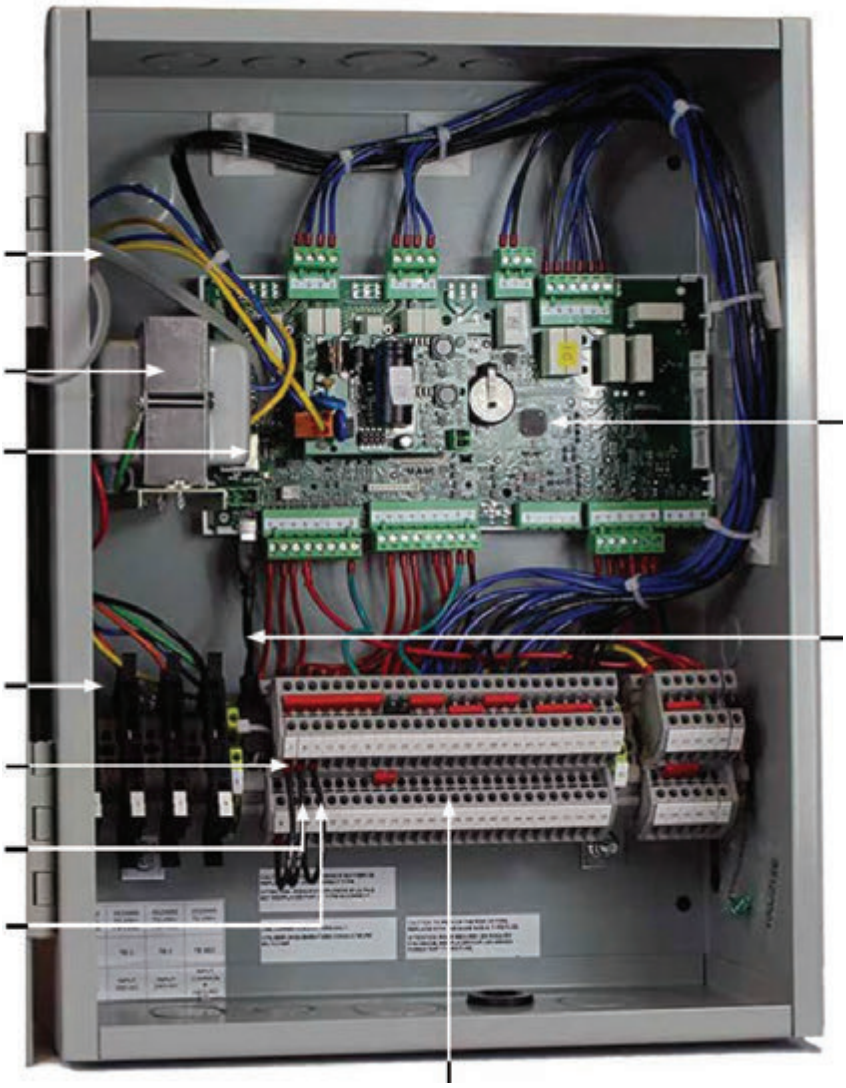
Ethernet Cable Connection:
An ethernet CAT 6 port is provided to connect to built-in webpages or communicate via Modbus.

Input Power Connection:
Power supplied can be 120V/208V/230V 50hz or 60hz. Connection must be 14GA. - 16 GA. wire with a reliable earth ground. 1A fuse protection.

Emergency Off Input:
Input normally open/normally closed contacts are provided for shutdown of all units.

Emergency Ventilation Input:
Input normally open/normally closed contacts are provided for ventilation of all units.

Generator Input:
Input normally open/normally closed contacts are provided for a generator run alarm and limitation of units running in generator mode.



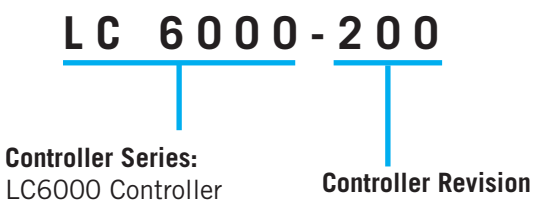
PLC Board:
The PLC board inside the LC6000 controller provides the logic for lead/lag unit control, staging, and local or remote alarming. Plug connectors and din rail mounting are used for easy board removal.

PLC Board MicroUSB Connection:
Software updates are completed using the microUSB connection. A 6' cable is provided to connect to a laptop using a standard USB connection.

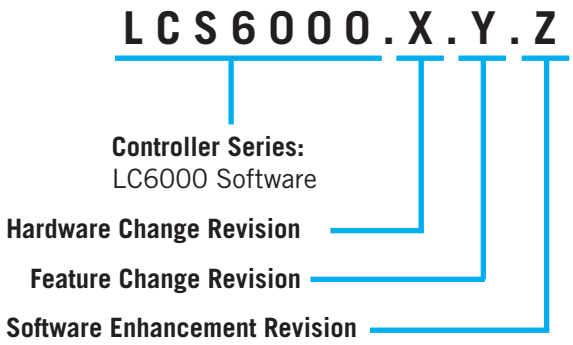
Connection Blocks for Inputs/Outputs:
Screw terminal connections are supplied for input and output connectivity. Outputs can be configured as Normally Open or Normally Closed. The following connections are supplied:

- Zone 1 Temp/Humidity Sensor Input
- Zone 1 Temp Sensor Input
- Zone 2 Temp/Humidity Sensor Input
- Zone 3 Temp/Humidity Sensor Input
- Outdoor Temp/Humidity Sensor Input
- Generator Run Input
- Emergency Shutdown Input
- Emergency Ventilation Input
- Unit Modbus Daisychain Connection
- Zone 1 Unit Alarm Output
- Zone 2 Unit Alarm Output
- Zone 3 Unit Alarm Output
- Zone 1 Humidifier Output
- Zone 2 Humidifier Output
- Zone 3 Humidifier Output
- Indoor Low Temp Alarm Output
- Indoor Hi Temp Alarm Output
- Indoor Humidity Alarm Output
- Bard Guard Alarm Output
- Generator Run Alarm Output

/////// CONTROLLER NOMENCLATURE



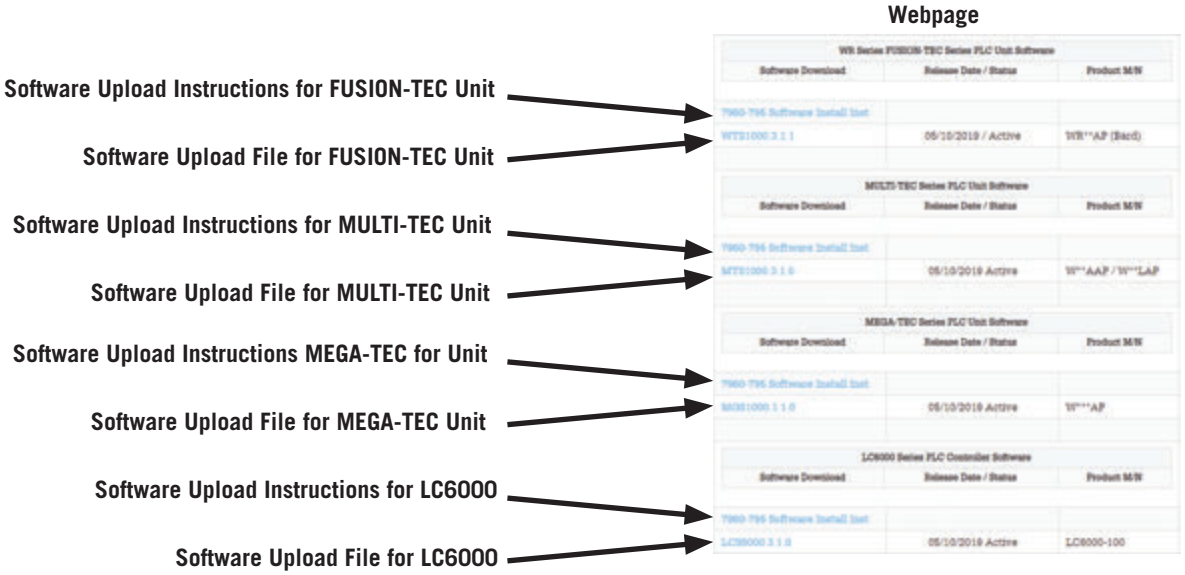
/////// SOFTWARE NOMENCLATURE



/////// SOFTWARE UPDATES

Software Use:
The Bard PLC Wall Mount units contain an advanced programmable logic board with on-board software similar to a computer. When buying additional PLC Wall Mount units for an existing project, it is important for all units and the LC controller to contain the same software version. The easiest method of ensuring all the units and the Bard-Link™ controller have the same software is to use a computer to download the latest software for the new PLC unit or LC controller from the internet and using the USB cable provided with the LC controller to reprogram all existing equipment. Additional USB cables can be found at most stores carrying phones and electronics equipment.

Software Downloads:
Software for the Bard unit and LC6000 controller can easily be found on the Bard website at the following address: **www.bardhvac.com/software-download/** . Software upload instructions are provided at the Bard Internet Site.



/////// LC6000 UNIT CONNECTIVITY

Control 1 to 3 zones:
1 to 3 zones of indoor temperature and humidity can be controlled with a single LC6000 controller. Each zone can have its own temperature and humidity setting and a temperature/humidity sensor in each zone monitors the indoor conditions in each area.

Control 1 to 14 units:
Each zone of operation can control multiple units for a total of 14 units in all combined zones. During setup, each unit is assigned to a zone. A zone may contain 1 to 14 units (not to exceed 14 total units per LC6000 control). Each zone will operate independenty in lead/lag for equal unit run time. FUSION-TEC, MULTI-TEC, and MEGA-TEC units can be used connected to the same LC controller. It is important to know that different product families can be grouped into the same zone. FUSION-TEC, MULTI-TEC, and MEGA-TEC products can be used in the same zone, or divided up into different zones defined by separate building areas.

Orphan Mode:
Each wall mount unit includes a PLC that communicates with the LC6000 controller. In the event that a wall mount unit loses communication with the LC6000, it will use the return air sensor to monitor indoor conditions and continue to cool and heat the area. By running inpendently from the controller, the unit will continue to provide cooling or heating to the zone until a technician can be dispatched to the site.

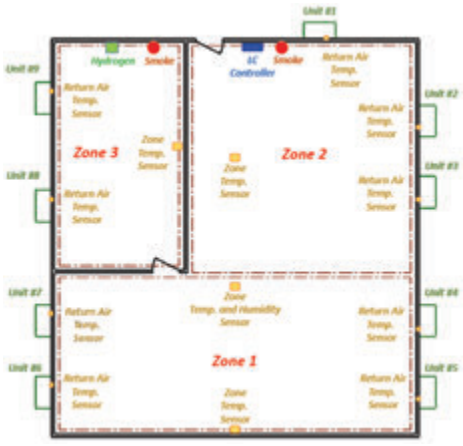
Zoning and unit control examples:

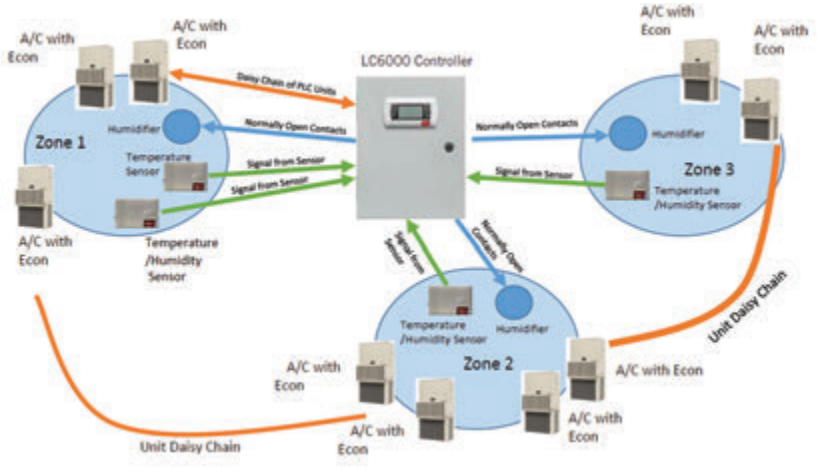
- A **battery storage room** in a large building has a different temperature and humidity setpoint than the other areas to increase equipment life. The battery room is set up as a separate zone of operation, and 2 units are assigned to cool the battery zone. A separate temperature/humidity sensor is installed in the battery zone. This allows for critical equipment in the battery zone to be kept at a different temperature than the rest of the building. The 2 MULTI-TEC Wall Mount units cooling the battery zone operate in lead/lag rotation, while 5 FUSION-TEC units in the electronics equipment cooling zone operate separately to control the temperature in the rest of the building in lead/lag rotation.

- An **occupied office area** in a large building has a different temperature and humidity setting than the other zones being cooled. The office area is set up as a separate zone of operation, and 1 Wall Mount unit is assigned to cool the office zone. A separate temperature/humidity sensor is installed in the office zone. This allows for occupants in the office area zone to be kept at a different temperature and humidity setpoint than the rest of the building. The Wall Mount unit cooling the office zone operates to cool the area, while the 6 units in separate zones operate with lead/lag functionality to control the temperature and humidity in the rest of the building.

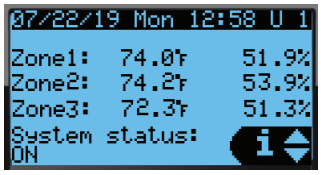
- A **large building** has a great amount of electronics equipment inside with 12 Wall Mount units on the outside walls. The building is divided into 3 zones, and each zone has a temperature/humidity sensor and 4 units assigned to it. Each zone operates with independent lead/lag unit functionality. When temperatures rise in certain zoned areas of the building due to equipment heat load, the units installed in that zone react to keep the area cool.

- A **small equipment shelter** has 2 wall mounts installed on the outside wall. A single zone is set up to cool the building. Both units are assigned to the single zone and operate in lead/lag for equal run time. When temperatures rise in the zoned area due to equipment heat load, the units installed react to keep the area cool.

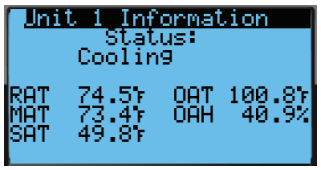




/////// LC6000 DISPLAY INFORMATION



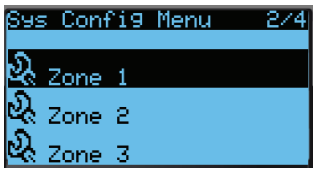
Main Display:
The main controller display shows the date, time, and system status. It will also display the temperature and humidity data for each zone. Under the Information Screen (i), the demand for free cooling, cooling, heating, and dehumidification will also be displayed. Outdoor air temperature and humidity is shown to indicate outdoor conditions. Information is also provided to show average indoor temperature, unit run time, and humidity operation for the past hour along with the LC6000 model number and software versions.



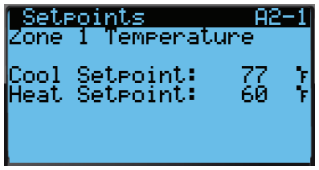
Unit Information:
Under the Information Screen (i), each unit connected to the LC6000 will have a set of data that includes Return Air Temperature (RAT), Mixed Air Temperatere (MAT), Supply Air Temperature (SAT), Outdoor Air Temperature (OAT), and Outdoor Air Humidity (OAH). It will show the status of the unit including blower, outdoor fan, and damper operation. Units equipped with Electronic Expansion Valves (EEV) will display Superheat, Subcooling, and refrigerant temperature and pressure data along with the open/closed position. Unit run time data will be provided, along with the unit model and serial number.

Alarm Data Logger:
Technicians and other personnel have the ability to review alarm log data in the controller. Alarm log data includes the time and date of the event, a description of the event, what unit had the event occur, and a start and stop time of the event. The data log can be cleared once reviewed, and is accessable through the LC6000 software using the MicroUSB cable connection.

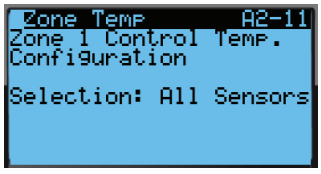
/////// LC6000 TEMPERATURE CONTROL



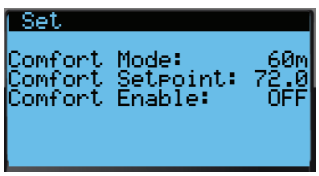
Individual Zone Temperature Control:
Each Zone has independent cooling and heating setpoints. Setpoints are user definable. By setting a cooling setpoint, the user is defining what temperature cooling operation should try to maintain in the zone. By setting a heating setpoint, the user is defining what temperature heating operation should try to maintain in the zone.



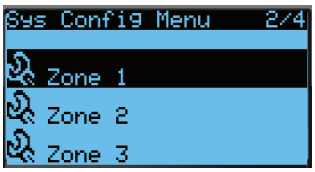
Temperature Setpoints:
For equipment zone temperature control, the temperature differential between heating and cooling is normally broad. The LC6000 ships with a default cooling setpoint of 77°F (25°C) and a heating setpoint of 60°F (15.5°C). This means that little or no cooling or heating operation will occur in the 17°F (9.5°C) temperature span between the cooling and heating setpoint. Above 77°F (25°C) will initiate cooling operation. Below 60°F will initiate heating operation. Non-Dehumidification units have a differential of 2°F (2°C).



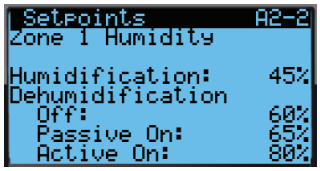
Temperature Measurement:
Several methods are available to monitor indoor room temperature in each zone. Wall mounted temperature sensor(s) and unit return air sensor(s) can be used to monitor indoor conditions. Settings for zone temperature monitoring are as follows:
All Sensors (Default): All wall mounted room sensors and unit return air sensors are used to calculate a room temperature average. This average is used to activate cooling and heating operation based on setpoints.
LC Only: Only Wall mounted room sensors will be used to calculate a room temperature average. Unit return air sensors will not be used for a temperature average. This average is used to activate cooling and heating operation based on setpoints.
Blower On: Only Wall mounted room sensors and unit return air sensors in units set to continuous fan will be used to calculate a room temperature average. This average is used to activate cooling and heating operation based on setpoints.



Comfort Mode:
Technicians and other personnel have the ability to activate comfort mode when first entering the building. Comfort mode will activate cooling and heating operation in all zones to reach the comfort mode setpoint, and stay at that setpoint for the alloted time period. The default temperature setting for comfort mode is 72°F (22.2°C). The default time setting for comfort mode is 60 minutes. Once the time period expires, all zones will revert back to previously defined temperature settings.



Individual Zone Humidity Control:
Each Zone has independent humidity setpoints. Zone humidity setpoints are measured in % Relative Humidity (%RH).Setpoints are user definable. By setting a humidification or dehumidification setpoint, the user is defining what humidity range the equipment should try to maintain in the zone. It is important to understand that to add humidity to a zone when humidity levels are low requires a humidifier. In order to reduce humidity levels in a zone, it is important to have the right options selected in the units purchased. The zone humidity between the humidification settings will have little to no unit humidity control operation.



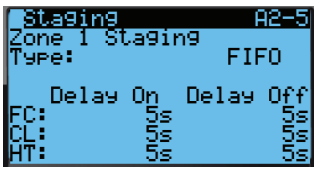
Humidification (Default 45%): The humidification setpoint is the low humidity limit for the zone. When the humidification low limit is reached, NO/NC contacts for a humidifier are energized. NO/NC Contacts are provided for (1) humidifier to be installed in each zone. The use of a Carel humidifier offers modulating humidification. Humidifiers are installed separately from the Wall Mount unit inside the zone.

Dehumidification Types: Dehumidification options are available for the MULTI-TEC, FUSION-TEC, and MEGA-TEC units to help control humidity in each zone. Options are as follows:
Balanced Climate: This option slows the indoor fan down to remove additional moisture while cooling the zone. The FUSION-TEC and MEGA-TEC units have this mode of operation as a standard feature in all models.
Electric Reheat: This option uses compressor cooling and electric heat concurrently to remove moisture from the air while limiting overcooling of the zone. The MULTI-TEC and MEGA-TEC unit models have this mode as an optional feature that can be ordered with the unit.
Mechanical Reheat: This option uses compressor cooling operation and a hot gas reheat coil to remove moisture from the air while limiting overcooling of the zone. Mechanical Reheat is an efficient and effective way to remove moisture from the zone. The MULTI-TEC unit models have this mode as an optional feature that can be ordered with the unit.
Cycle Reheat: This option alternates compressor cooling and electric heat to remove moisture from the air while limiting overcooling of the zone. The FUSION-TEC units have this mode of operation. It is the least effective way of removing moisture from the zone.

Dehumidification Settings: The dehumidification setpoints indicate the high humidity limit for the specified zones. A maximum number of units running in dehumidification setting is available, and also a delay On/Delay off timer. Three dehumidification (%RH) settings are provided and are as follows:

Off (Default 60%RH): When the zone humidity level is below this setting, no action is required of the units in the zone to dehumidify.
Passive On (Default 65%RH): When the zone humidity level is above this setting, the units in the zone will operate in passive dehumidifcation until the humidity level drops to the Dehumidification Off setpoint. Passive dehumidification disables the optional economizer and runs the unit in Balanced Climate (lower indoor fan speed) mode if the unit is equipped with the feature. Units with Balanced Climate operation are the MEGA-TEC and FUSION-TEC products.
Active On (Default 80%RH): When the zone humidity level is above this setting, the units in the zone will operate in active dehumidifcation until the humidity level drops to the Passive On setpoint. Active dehumidification runs the unit in Electric or Mechanical Reheat, or Cycle Dehumidification mode. The MEGA-TEC and MULTI-TEC units may be ordered with optional electric reheat dehumidification. The MULTI-TEC units may be ordered with optional mechanical hot gas reheat dehumidification.

/////// LC6000 COOLING AND HEATING UNIT STAGING



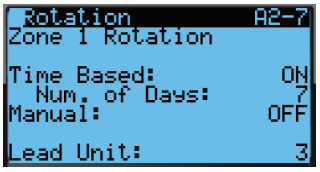
Individual Zone Unit Staging:
Each Zone has the ability to stage the units assigned to the zone on and off in cooling, heating, and dehumidification. Staging logic uses a PID loop to anticipate demand and turn units on or off accordingly to meet setpoints that are user defined in the LC6000. Each zone includes a LEAD unit that will operate first when cooling or heating is called for. The other LAG units in the zone will be called upon for operation as necessary to reach temperature setpoints (Example: LEAD, LAG1, LAG2, LAG3). The following unit staging options are available:

FIFO (Default): First In First Out setting allows the LEAD unit when called into cooling or heating operation to be the first unit disabled when no longer needed.

LIFO: Last In First Out setting allows the last LAG unit to be called into cooling or heating operation to be the first unit disabled when no longer needed.

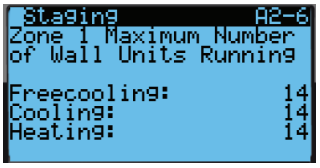
Demand: Demand cooling (Intuitive Load Balance) brings on units based on the return air temperature sensed at the unit. The unit with the highest return air temperature would be used in LEAD cooling mode first, followed by the LAG units with lower return air temperature readings. A strategy of reducing unit usage would be used to remove units from cooling operation starting with the unit that has the lowest return temperature sensor reading. A similar strategy would be used to remove units from heating operation, starting with the unit that has the highest return air temperature sensor reading. This mode of operation will not use the unit rotation feature.

/////// LC6000 UNIT ROTATION



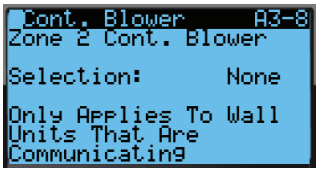
Individual Zone Unit Rotation:
Each Zone has the ability to rotate the lead unit during staged heating or cooling operation for a more consistent amount of run time for all units in the zone. When the rotation time expires, the lead unit status advances numerically to the next unit address. Time Based rotation is set to 7 days by default, but can be adjusted from 1 to 99 days. The lead unit in rotation can also be manually advanced to a different unit in the zone.

/////// LC6000 MAXIMUM UNIT RUN LIMIT



Maximum Unit Run Limit:
Each Zone has the ability to limit the number of units that are allowed to run in Free Cooling, Cooling, and Heating. Setting this number to meet cooling or heating capacity needs of the zone may extend unit run times when additional installed units are not currently needed. Units that are in the zone, but exceed the maximum run limit are still in unit rotation and will operate if needed during a unit lockout condition.

/////// LC6000 UNIT CONTINUOUS BLOWER SETTINGS



Unit Continuous Blower:
The continuous blower setting allows for indoor air to be continuously circulated in the zone when cooling or heating operation is not being used. Continuous air circulation will create a more even temperature in the zone, and a more consistent temperature reading by the unit return air sensor. However, additional power (watts) will be used by the indoor fan and it is important to make sure all air leaks between the wall surface and unit are sealed. The following settings are available for continuous fan:

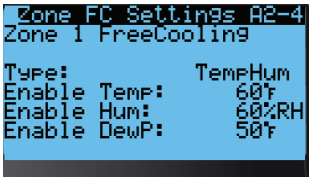
None (Default): All indoor fans are disabled when the unit is not being used for heating, cooling, or dehumidification operation.

Lead: The LEAD unit fan only is enabled when the unit is not being used for heating, cooling, or dehumidification operation.

All: All indoor fans are enabled when the unit is not being used for heating, cooling, or dehumidification operation.

Custom: The user can define individual units to operate in continuous blower operation based on unit address.

/////// LC6000 OPTIONAL FREE COOLING ECONOMIZER FEATURES



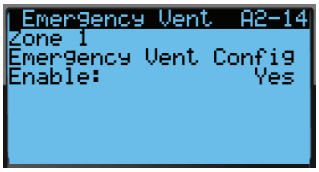
Free Cooling Settings (economizer equipped units only):
Economizer free cooling provides energy savings by using outdoor air to cool the zone of operation when outdoor conditions are acceptable. The free cooling settings allow for adjustment of optional economizer operation in the zone. When adjusting economizer settings, it is important to maximize free cooling, but also limit humidity intake if necessary. Emergency vent and emergency cool features will be available regardless of outdoor conditions and economizer settings.

None: Disables economizer free cooling operation.

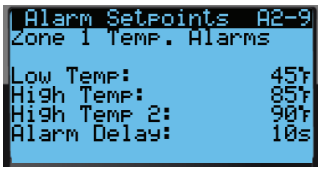
TempHum: The outdoor sensor in the unit will be used to monitor outdoor dry bulb temperature (default setting is 60°F (15.5°C)) and outdoor humidity (default is 60%RH). If conditions are higher than the setpoints, the economizer will be disabled.

Enthalpy: The outdoor sensor in the unit will be used to monitor outdoor dry bulb temperature (default setting is 60°F (15.5°C)) and outdoor dewpoint (default is 50°F (10°C)) If conditions are higher than the setpoints, the economizer will be disabled.

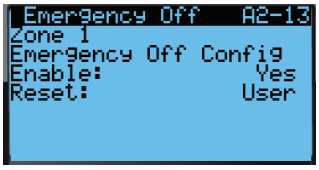
Dry Bulb: The outdoor sensor in the unit will be used to monitor outdoor dry bulb temperature (default setting is 60°F (15.5°C)) only. Outdoor humidity monitoring will not be used. If conditions are higher than the outdoor temperature setpoint, the economizer will be disabled.



Emergency Ventilation (economizer equipped units only):
Emergency ventilation is a feature that is operated by NO or NC (default) contacts terminals #8 and #9 that have a factory installed jumper. To use the feature, remove the jumper and connect to the device that will be operating emergency ventilation. When active, emergency ventilation will fully open all economizers in the zone, and activate the indoor blower. When the contacts are deactivated, the units will continue normal functionality. During activation, the main display screen will indicate emergency vent is active, and a NOC alarm at NO (default) or NC contact terminal #40 and #41 will be present. Remote notification is also available through the BardLink webpages and Modbus. Note: Communication between the LC6000 controller and the units connected to the controller may take up to 15 seconds. Economizer blade opening time may take up to 90 seconds to reach a fully open position.

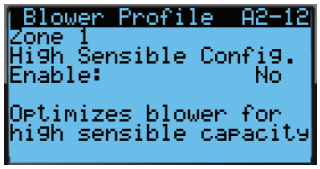


Emergency Cooling:
Emergency cooling is a feature that is operated by the High Temp 2 alarm setting. When conditions inside the shelter reach the High Temp 2 setpoint, and the outdoor temperature is lower than the indoor temperature, all economizers installed in the zone will operate to maintain a mixed air temperature of 55°F. All units in the zone will also operate in full load compressor cooling. During activation, the main display screen will indicate emergency cooling is active, and a Hi Temp 2 NOC alarm at NO (default) or NC contact terminal #46 and #47 will be present. Remote notification of a Hi Temp 2 alarm is also available through the BardLink webpages and Modbus.

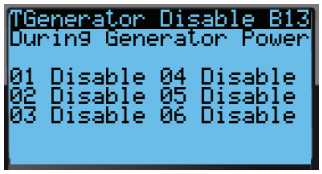


Emergency Off:
Emergency off is a feature that is operated by NO or NC (default) contacts terminals #6 and #7 that have a factory installed jumper. To use the feature, remove the jumper and connect to the device that will be operating the emergency off feature. When active, emergency off will fully close all economizers in the zones specified, and stop unit cooling, heating, dehumidification, and fan operation. When the contacts are deactivated, the user can select if the units will continue normal functionality or if a manual reset of the alarm is required. During activation, the main display screen will indicate emergency off is active, and a NOC alarm at NO (default) or NC contact terminal #38 and #39 will be present. Remote notification is also available through the BardLink webpages and Modbus. Note: Communication between the LC6000 controller and the units connected to the controller may take up to 15 seconds. Economizer blade closing time may take up to 90 seconds to reach a fully closed position. If immediate shutdown for smoke alarm signal is needed and economizer closure within 30 seconds is required, a field installed relay to remove power to the unit and economizer damper is recommended.

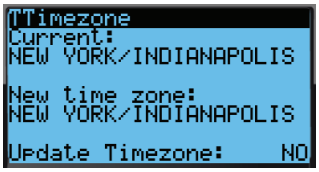
/////// LC6000 ADDITIONAL FEATURES



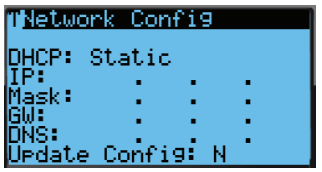
Hi Sensible Cooling Operation:
Hi sensible mode operates to increase sensible capacity when humidity RH% levels are below the Dehumidification Off setpoint. During hi sensible mode, the indoor blower speed increases to provide additional sensible capacity. Note: This feature is set to OFF by default, and must be enabled to be used. The hi sensible feature is available with FUSION-TEC and MEGA-TEC units.



Generator Disable Mode:
Generator disable is a feature that is operated by NO or NC (default) contacts terminals #10 and #11 that have a factory installed jumper. To use the feature, remove the jumper and connect to the device that will be operating the generator run feature. When active, generator disable will only use units assigned as "enable" in the zone to heat, cool, or dehumidify. When the contacts are deactivated, the units will continue normal functionality. During activation, the main display screen will indicate generator run is active, and a generator run NOC alarm at NO (default) or NC contact terminal #42 and #43 will be present. Remote notification is also available through the BardLink webpages and Modbus. Note: All units are set to "disable" from the factory. It is important to set up all units that are required to provide cooling and heating during a generator run event.

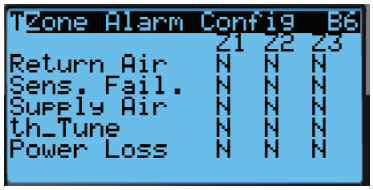


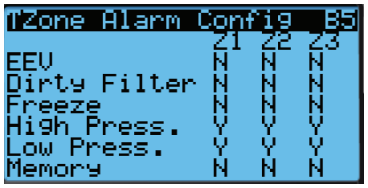
Time and Date Settings:
The LC6000 displays the time and date for alarm logging and reference. Daylight savings time features are enabled per time zone and location.

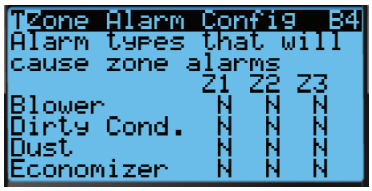


Remote Communication Via Ethernet:
The LC6000 has remote communication capability by using Bard-Link, which includes built-in webpages that offer setpoint adjustment, zone monitoring, unit monitoring, access to the display of the controller, a trend logger, and a technician log. Modbus communication is also available and a complete points list is listed at www.bardhvac.com containing all functionality. Communication uses IPV4 protocol.

/////// LC6000 ZONE ALARM CONFIGURATION







General Zone Alarm:
The LC6000 is capable of sending a general zone alarm for each zone through NO/NC contacts to a NOC system to indicate service is required. The General zone alarm is configurable for each zone to indicate events that energize the NO/NC contacts. Events that can be configured for each zone are as follows:

- Return Air Hi/Lo Alarm
- Supply air Hi/Lo Alarm
- Unit Power Loss Alarm
- Dirty Filter Alarm
- Hi Unit Refrigerant Pressure Alarm
- LC6000 Memory Issue Alarm
- Dirty Condenser Coil Alarm
- Temperature sensor fail Alarm
- tH Tune Failure Alarm (Not Used)
- Electronic Expansion Valve failure Alarm
- Evaporator Freeze Condition Alarm
- Low Unit refrigerant Pressure Alarm
- Indoor Blower Failure Alarm
- Dust sensor economizer disable Alarm

All alarm and additional information is available using the Bard-Link webpages and Modbus via the LC6000 ethernet port connection. All events are disabled as indicating a zone alarm by default except for Unit High Pressure and Unit Low Pressure Alarm.

/////// LC6000 FACTORY SUPPLIED AND OPTIONAL ACCESSORIES

The LC6000 controller includes (2) EMI filters part #8301-055, (1) remote temperature and humidity sensor part #8403-079 with 35' of 18ga. 5-wire shielded cable with drain, and (1) TEC-EYE service tool with 5ft communication cable part #8301-059. Multiple zone operation will require purchase of a remote sensor for each zone that will be connected to the LC6000. Additional parts can be ordered as service items, and service tools are also available. The following list is provided for reference and ordering information.

PART NO.	PART NAME	DESCRIPTION
8403-079	Zone Temperature/Humidity Sensor	A temperature/humidity sensor is required for each zone of operation. (1) temperature/humidity sensor is included with the LC6000. The remote temperature/humidity sensor requires 18ga. 5-wire shielded cable with drain.
8301-058	Zone Temperature Sensor	A an additional temperature sensor is optional for zone 1 temperature monitoring. Remote temperature sensors may be used in zones 2 and 3 instead of remote temperature/humidity sensors if humidity monitoring is not required in the zone. The remote temperature sensor is sold separately and requires 18ga. 2-wire shielded cable with drain.
8301-059	TEC-EYE Service Tool	The TEC-EYE service tool with 5 ft. communication cable is used to access software functions in the unit PLC board. The TEC-EYE is required for unit setup. (1) TEC-EYE service tool with 5 ft. communication cable is included with the LC6000 controller.
8301-053	Large Backlit Service Tool	The large backlit service tool is used to access software functions in the unit PLC board. Operation of the service tool is identical to the TEC-EYE, but provides a large display area (2.8"x1.4") and mechanical entry keys. The large backlit service tool is sold separately.
8301-055	EMI Ferrite Filter	(1) EMI Ferrite filter is required on each end of the daisy chain connection between the units and the LC6000 controller. (2) EMI Ferrite filters are included with the LC6000 controller.
2151-021	EEV Manual Adjustment tool	The EEV manual adjustment tool allows for adjustment of the EEV (Electronic Expansion Valve) without the use of the unit logic board. The service technician can use this tool by removing the electronic head of the valve and attaching the adjustment tool. The tool houses magnets that interact with the valve to open or close the EEV for charging or evacuating the system without system power. The EEV manual adjustment tool is sold separately.

/////// LC6000 POWER AND WIRING SPECIFICATIONS

When installing the LC6000 controller in a building, various supplies are required for proper installation. Wiring the units and the LC6000 controller are a critical part of the installation process. Specifications are provided for wiring, and maximum recommended wire lengths are given to help with component placement and shelter layout.

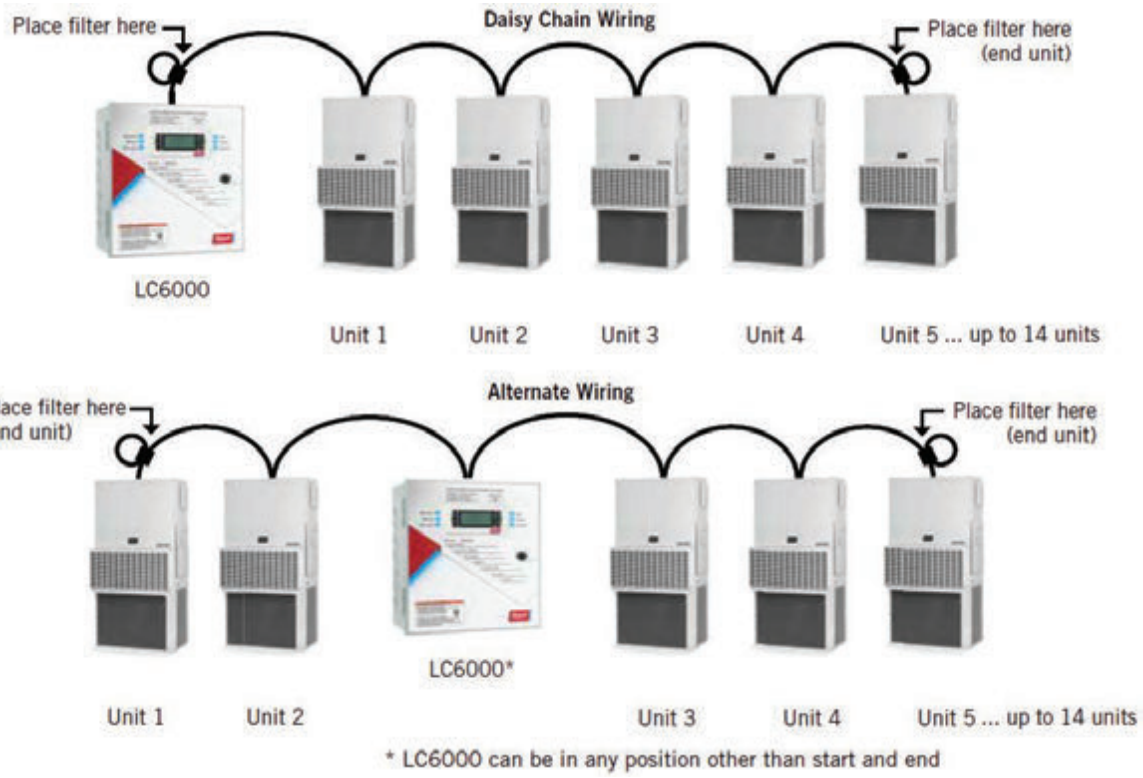
POWER REQUIREMENTS	LC6000
Voltage	115V/208V/230V - 50hz/60hz
Wire Size	14GA Maximum/16GA Minimum
Fuse Size	1.0 Amp

DAISY CHAIN COMMUNICATION WIRING	LC6000
Wire Size	18GA
Wire Type	Shielded Cable
Wire Conductors	2 - Wire with drain
Maximum Daisy Chain Wire Length	1640ft (500m)
Connections	+, - Polarity Sensitive

TEMP/HUMIDITY SENSOR COMMUNICATION WIRING	LC6000
Wire Size	18GA
Wire Type	Shielded Cable
Wire Conductors	5 - Wire with drain
Maximum Wire Length	100ft (30m)
Connections	NTC OUT, NTC OUT, OUT H, M(GO), +(G)

TEMP SENSOR COMMUNICATION WIRING	LC6000
Wire Size	18GA
Wire Type	Shielded Cable
Wire Conductors	2 - Wire with drain
Maximum Wire Length	100ft (30m)
Connections	NTC OUT (B7), NTC OUT (GND)

/////// LC6000 AND UNIT DAISY CHAIN CONNECTION DIAGRAM



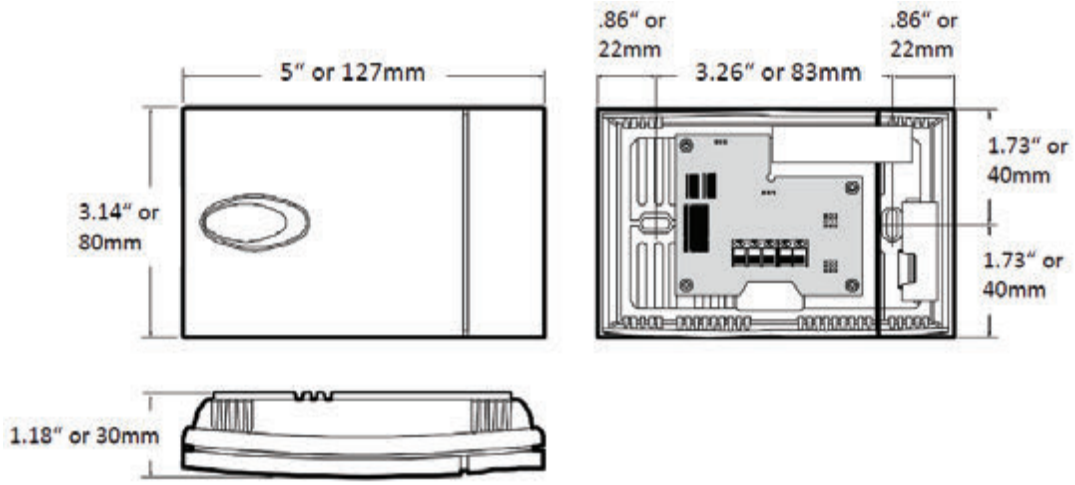
* LC6000 can be in any position other than start and end

/////// LC6000 PLC BOARD SPECIFICATIONS

SPECIFICATION	DESCRIPTION
PLC Board Power Specifications	24 Vac/Vdc +10%/-15% 50/60 Hz
Max. Power Input	28 VA
Storage Temperature	-40T70 °C, 90% rH non-condensing
Operating Temperature	-40T60 °C, 90% rH non-condensing
Battery Type	Removable, BR2032, 3 Vdc
Battery Life	Min. 8 years
TEC-EYE Connection	Telephone connector J10
Ethernet connection	1 shielded RJ45 Ethernet line.
Ethernet Cable Length	100m CAT-5 STP

/////// LC6000 TEMPERATURE SENSOR #8301-058 AND TEMP/HUMIDITY SENSOR #8403-079 SPECIFICATIONS

The remote indoor temperature and humidity or temperature only sensor is used to measure conditions inside the building. The indoor sensor is able to communicate with the LC controller and decide when conditions warrant unit operation in each zone. An additional temperature sensor may be used in zone 1 for temperature averaging and zone control.



SPECIFICATION	DESCRIPTION
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Temperature Range	-4°F to 158°F (-20°C to 70°C)
Temperature Sensor Type	NTC 10K OHM at 25°C 1%
Humidity Sensor Type	Capacitive
Maximum Wire Length	100ft (30m)

/////// TEC-EYE SERVICE TOOL #8301-059 SPECIFICATIONS

The TEC-EYE™ service tool is used to communicate with the MULTI-TEC, FUSION-TEC, or MEGA-TEC unit logic board.. By connecting directly to the logic board inside the unit control panel, it is possible to perform diagnostics on the unit, adjust certain settings and verify unit and economizer operation through a run test procedure. The TEC-EYE service tool is required for unit setup and operation, and is supplied with the LC controller.

SPECIFICATION	DESCRIPTION
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Operating Conditions	-4°F to 140°F (-20°C to 60°C)
Display Type	FSTN graphic
Display Backlighting	LED
Graphics Resolution	132 x 64 pixels
Size of Display Area	.75” x 1.5” (20mm x 38mm)
Connector	RJ12 (phone connector)
Maximum Wire Length	6ft. (2m)
Index of Protection	IP65, UL Type 1

/////// LARGE DISPLAY SERVICE TOOL #8301-053 SPECIFICATIONS

The large display service tool is used to communicate with the MULTI-TEC, FUSION-TEC, or MEGA-TEC unit logic board. Operation is identical to the TEC-EYE, with a larger display and mechanical entry keys. By connecting directly to the logic board inside the unit control panel, it is possible to perform diagnostics on the unit, adjust certain settings and verify unit and economizer operation through a run test procedure.

SPECIFICATION	DESCRIPTION
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Operating Conditions	-4°F to 140°F (-20°C to 60°C)
Display Type	FSTN graphic
Display Backlighting	LED
Graphics Resolution	132 x 64 pixels
Size of Display Area	1.4” x 2.8” (36mm x 72mm)
Connector	RJ12 (phone connector)
Maximum Wire Length	6ft. (2m)
Index of Protection	IP65, UL Type 1

/////// LC6000 CONTROLLER AND UNIT FEATURE MATRIX

MULTI-TEC Unit

FUSION-TEC Unit

MEGA-TEC Unit

FEATURE	MULTI-TEC	FUSION-TEC	MEGA-TEC
Unit Airflow Path	Upflow	Counterflow	Upflow
Cooling Stages	1	2	3
Cooling Refrigerant Circuits Per Unit	1	1	2
Indoor and Outdoor Fan Control	Select Speed	0-10V	Modbus
Heating Stages	2	2	2
Electric Reheat Dehumidification	Optional	No	Optional
Mechanical Hot Gas Dehumidification	Optional	No	No
Balanced Climate Humidity Removal Mode	Yes	Yes	Yes
High Sensible Cooling Mode	No	Yes	Yes
Economizer Free Cooling	Optional	Yes	Optional
Orphan Mode	Yes	Yes	Yes
Emergency Ventilation Mode	Economizer model only	Yes	Economizer model only
Emergency Cooling Mode	Economizer model only	Yes	Economizer model only
Emergency Off	Yes	Yes	Yes
Superheat Display	No	Yes	Yes
Subcooling Display	No	Yes	Yes
Low Pressure Display	No	Yes	Yes
High Pressure Display	No	Yes	Yes
Electronic Expansion Valve Display	No	Yes	Yes
Bard Guard Alarm	No	Optional	No
Dirty Filter Alarm	Yes	Yes	Yes
Indoor Fan Failure Alarm	No	Yes	Yes
High Refrigerant Pressure Alarm	Yes	Yes	Yes
Low Refrigerant Pressure Alarm	Yes	Yes	Yes
Supply Air Temperature	No	Yes	Yes
Return Air Temperature	Yes	Yes	Yes
Mixed Air Temperature	Economizer model only	Yes	Yes
Outdoor Air Temperature	Economizer model only	Yes	Yes
Outdoor Air Humidity	Economizer model only	Yes	Yes

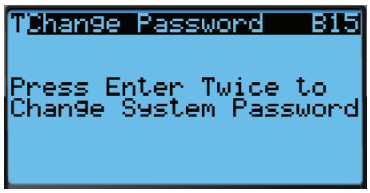
/////// L6000 I/O INPUT MATRIX

INPUTS	INPUT CONFIG	INPUT DEFAULT	DESCRIPTION
Zone 1 Temp/Humidity	5 - wire	NA	5 wire connections for temperature/humidity sensor
Zone 1 Temp Only	2- wire	NA	2 wire connections for temperature/humidity sensor
Zone 2 Temp/Humidity	5 - wire	NA	5 wire connections for temperature/humidity sensor
Zone 3 Temp/Humidity	5 - wire	NA	5 wire connections for temperature/humidity sensor
Outdoor Temp/Humidity	5 - wire	NA	5 wire connections for temperature/humidity sensor
Emergency Off	NO/NC Contacts	NC	Connection for unit shutdown
Emergency Vent	NO/NC Contacts	NC	Connection for economizer fully open ventilation
Generator Run	NO/NC Contacts	NC	Connection to signal a generator is running
Room Pressure Sensor	NO/NC Contacts	NO	Connection for room pressure sensor (future use)

/////// L6000 I/O OUTPUT MATRIX

OUTPUTS	OUTPUT CONFIG	INPUT DEFAULT	DESCRIPTION
Emergency Vent Alarm	NO/NC Contacts	NO	Emergency ventilation mode is currently active.
Generator Run Alarm	NO/NC Contacts	NO	Generator run mode is currently active.
Emergency Off Alarm	NO/NC Contacts	NO	Emergency off mode is currently active.
Humidity Alarm	NO/NC Contacts	NO	Humidity Hi/Lo alarm is active in a zone.
Hi Indoor Temp Alarm	NO/NC Contacts	NO	High temp 2 alarm is currently active in a zone.
Low Indoor Temp Alarm	NO/NC Contacts	NO	Low temp alarm is currently active in a zone.
Zone 1 Alarm	NO/NC Contacts	NO	An alarm event is active in zone 1.
Zone 2 Alarm	NO/NC Contacts	NO	An alarm event is active in zone 2.
Zone 3 Alarm	NO/NC Contacts	NO	An alarm event is active in zone 3.
Bard Guard Alarm	NO/NC Contacts	NO	A Bard Guard Alarm event is active.

/////// L6000 PASSWORD CONTROL



The LC6000 offers 3 levels of password protection. This allows for general user access to certain areas of the system software, and limits access to critical software features to advanced users. The three access levels are User, Technician, and Engineer. User password setting access is as follows:

User:
- System Config Menu
- Unit On/Off
- Alarm log access
- Language setting
- Clear logs
- Restart system
- Alarm export
- Zone 1 setpoints
- Zone 2 setpoints
- Zone 3 setpoints

Technician additional access:
- I/O Configuration
- Date/Time Settings
- Network Configuration
- Serial Port Configuration
- Advanced system configuration

Engineer additional access:
- Restore system defalts
- Parameter configuration menu

/////// L6000 SETUP SHEET

The following is meant to help plan out the setup options of the LC6000 for installation. By filling out the data, the installer and setup technician can make changes and review the LC6000 setup. A copy of this document may be left at the jobsite for review by the end customer.

Zone Information: **Record the following information based on the setup blueprints/job specifications:**

Zone:	# of total units	Max # of units running	Zone Cooling Setpoint	Zone Heating Setpoint	Zone Dehum. Setpoint	Zone Humidify Setpoint	Zone Free cooling Temp.	Zone Free cooling Hum. RH%	Zone free cooling Dew point
Zone 1									
Zone 2									
Zone 3									

Zone:	Staging type	Rotation sched. days	Continuous Blower	Hi Temp 1 setpoint	Hi temp 2 setpoint	Low temp alarm	Hi humidity alarm	Low humidity alarm	Dehum Config.	Hi sensible config.
Zone 1										
Zone 2										
Zone 3										

Controller Software Alarming: **Record the following information based on the setup blueprints/job specifications:**

Alarm	Zone 1	Zone 2	Zone 3	Alarm	Zone 1	Zone 2	Zone 3
Blower				Hi Press			
Dirty Cond.				Memory			
Dust				Return Air			
Economizer				Sens. Fail			
EEV				Supply Air			
Dirty Filter				TH-Tune			
Freeze				Power Loss			

Controller Unit Operation Features: **Record the following information based on the setup blueprints/job specifications:**

List any units that are **not being used** for temperature averaging:	
List any units that **are disabled** during a generator alarm:	

Sensors Connected to Controller: **Record the following information based on the setup blueprints/job specifications:**

Zone Wired Accessory/Alarm	Zone 1	Zone 2	Zone 3
Zone Temp/Humidity Sensor			
Zone Temp Sensor (Zone 1 only)			

/////// L6000 SETUP SHEET CONTINUED

Inputs Connected to Controller: Record the following information:			
Digital Input Configuration	**Wired in controller?**	**Contact Direction**	**Config. (Enabled)**
Smoke Alarm			
Hydrogen Alarm			
Generator Alarm			

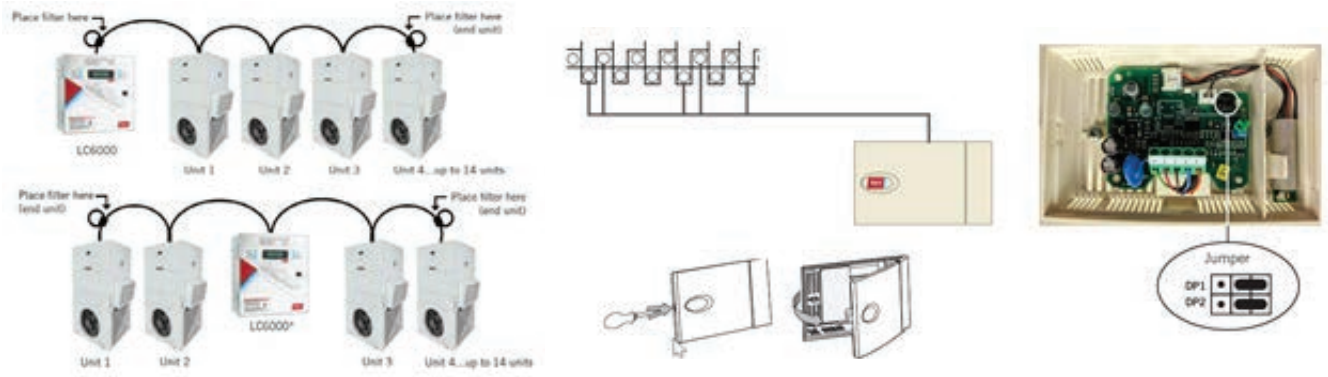
Outputs Connected to Controller: Record the following information:		
Digital Output Configuration	**Wired/Used in Controller?**	**Contact Direction**
Humidifier Zone 1		
Humidifier Zone 2		
Humidifier Zone 3		
Humidity Alarm		
Generator		
Hydrogen		
Humidity Alarm		
Hi Temp Alarm		
Low Temp Alarm		
Zone 1 Alarm		
Zone 2 Alarm		
Zone 3 Alarm		

/////// LAYOUT OF BUILDING

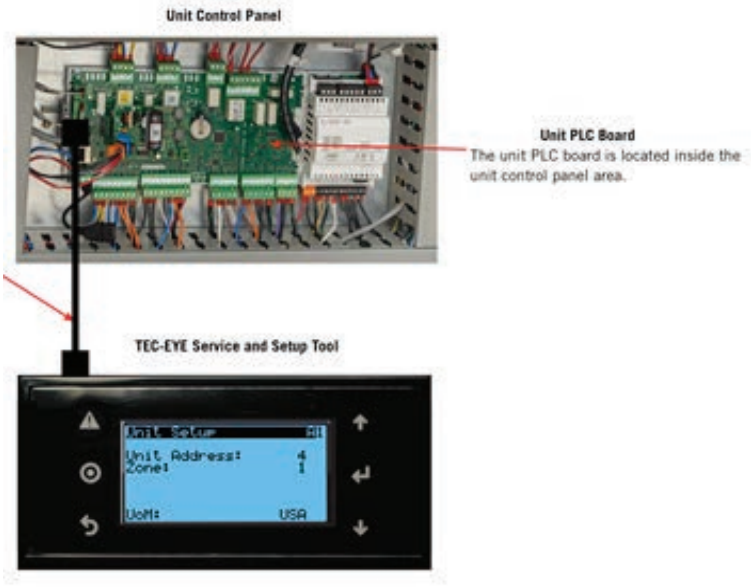
/////// LC6000 BASIC SETUP

Software setup to allow communication between the LC6000 and the PLC controlled units is a very simple process. The following basic setup steps are used to establish unit and sensor communication with the LC6000:

- Make sure wiring is completed per the installation instructions between the units and the LC6000 controller. Make sure the remote temperature and humidity sensor(s) are connected per the installation instructions to the LC6000.



- Using the TEC-EYE to connect to each unit PLC board, give each unit a unique address (1 to 14) and assign it a zone (1 to 3).



- Review the software in both the wall mount units and the LC6000 controller and verify you are using the latest versions. To find the latest software, go to www.bardhvac.com and navigate to the software downloads section from the main page. Follow the included instructions in the download on software updating.

- In the LC6000 controller software, Set the total number of wall mount units (1-14) that are connected to the LC6000 controller. Enable each humidity and temperature sensor used in each zone. Verify that the values shown for each sensor connected to the LC6000 match the values in each zone.

/////// LC6000 BASIC SETUP CONTINUED

- Verify each unit is online in the LC6000 software. Set required zone cooling and heating setpoints.

- Review application and all requirements needed. Make needed software changes including:
  - Setpoints for optional dehumidification.
  - Continuous indoor fan operation requirements.
  - Enable or disable Balanced Climate and Hi Sensible Mode.
  - Requirements for local and remote wired alarming, emergency shutdown, and emergency ventilation.
  - Special needs for generator use including power limitations.
  - Addressing the controller for remote connectivity to webpages/Modbus.
  - Special economizer and ventilation settings.
  - Any other needed settings including passwords, unit rotation period, unit staging sequence, humidifier setup, etc...
  - Follow LC6000 setup with a good commissioning plan and ensure both the LC6000, the wall mount units, and any form of external communication are functioning properly per the application. Review the unit and LC6000 installation and verify the installation is per the instructions provided with all equipment used.

/////// LC6000 FACTS AND ANSWERS TO COMMON QUESTIONS

- The LC6000 is used with the MULTI-TEC, MEGA-TEC, and FUSION-TEC products.
- The LC6000 controller must be installed inside the building and not exposed to outdoor weather conditions. The controller does not need to be located inside the zone being conditioned, as it does not have an onboard temperature or humidity sensor.
- Remote communication to the LC6000 and the units connected to it is achieved by using a CAT5 or CAT6 ethernet connection to PLC board inside the LC6000 controller. Once connected, webpages and Modbus communications are available. SNMP and BACnet communications require a field bus kit part #8620-350.
- The best temperature and humidity sensor location will be dependent on building design. The LC6000 can use just the remote sensors, the unit return air sensors, or all the sensors to determine the temperature and humidity level in the room. Avoid placing sensors in areas with direct sunlight or where supply air may influence the sensor reading. Adjust wall mount unit supply registers to evenly spread supply air throughout the zone.
- The I/O configuration menu in the LC6000 and the wall mount units can be used to simulate alarms and verify local and remote alarming. Review installation instructions provided with the unit and controller and reference the I/O configuration menu.
- Wiring the daisy chain communication wire between the wall mount units and the LC6000 requires 18ga. 2-wire shielded cable with a drain (field supplied). Remote temperature and humidity sensors require 18ga. 5-wire shielded cable with a drain (35' supplied with LC6000).
- Emergency unit shutdown, if required, can take place at either the wall mount unit or the LC6000 controller. Review the installation instructions for both the wall mount and the LC6000 controller to ensure the best method is used for the application.
- Factory training and commissioning are both available for the LC6000 and the wall mount units that use the controller. Go to www.bardhvac.com for more information.

/////// COMMONLY ASKED QUESTIONS AND ANSWERS

Question: Where should I install the LC6000 controller?
Answer: The LC6000 must be installed inside the building, and is not rated for outdoor use. The LC6000 does not contain a temperature or humidity sensing device, and should be located where convenient for the technician. Avoid placing the LC6000 in areas where it will be exposed to heavy amounts of dirt and dust, moisture, and extreme heat or cold.

Question: Where should I install the remote mount temperature/humidity sensors?
Answer: The temperature/humidity sensors must be installed inside the zone that they are assigned to (zone 1, 2, or 3). The intent of the sensor is to measure the average temperature of the zone, so placement should be in an area where it will not be in the direct stream of air leaving a wall mount unit supply. Typical installation of the sensor is at mid level on a wall surface where units are located. It is important to design or arrange the zone area so that proper air circulation is able to reach all equipment in the zone. Sensor installation is acceptable at ceiling level, but since heat rises the air temperature being monitored by the sensor will typically be warmer than at equipment level increasing run time.

Question: Can I run MULTI-TEC, MEGA-TEC, and FUSION-TEC units on a single LC6000 controller?
Answer: Yes, all of the products can be ran from the same controller. Units can now be installed in the same zone as well. An example would be having (2) MEGA-TEC units installed in the same zone as (4) MULTI-TEC units.

Question: How do I update software in the LC6000 controller?
Answer: The LC6000 is shipped with a microUSB to USB connector and a 6ft cable to connect to a laptop computer (Mac or Windows). files are then trasferred between the laptop and controller. Software for the LC6000 can be found at **http://www.bardhvac.com/software-download/** (Bard website). It is important to update software in the LC6000 controller and the wall mount units when making software updates.

Question: Is training and commissioning available for the LC6000 and the PLC unit products?
Answer: Training and factory commissioning are available for the LC6000 and the MULTI-TEC, MEGA-TEC, and FUSION-TEC. Visit **http://www.bardhvac.com** (Bard website) for more details.

/////// MEGA-TEC UNIT NOTES:

Bard Manufacturing Company, Inc.
1914 Randolph Dr., Bryan, OH 43506
419-636-1194
www.bardhvac.com

Due to our continuous product improvement policy, all specifications subject to change without notice.

Before purchasing this appliance, read important energy cost and efficiency information available from your retailer.