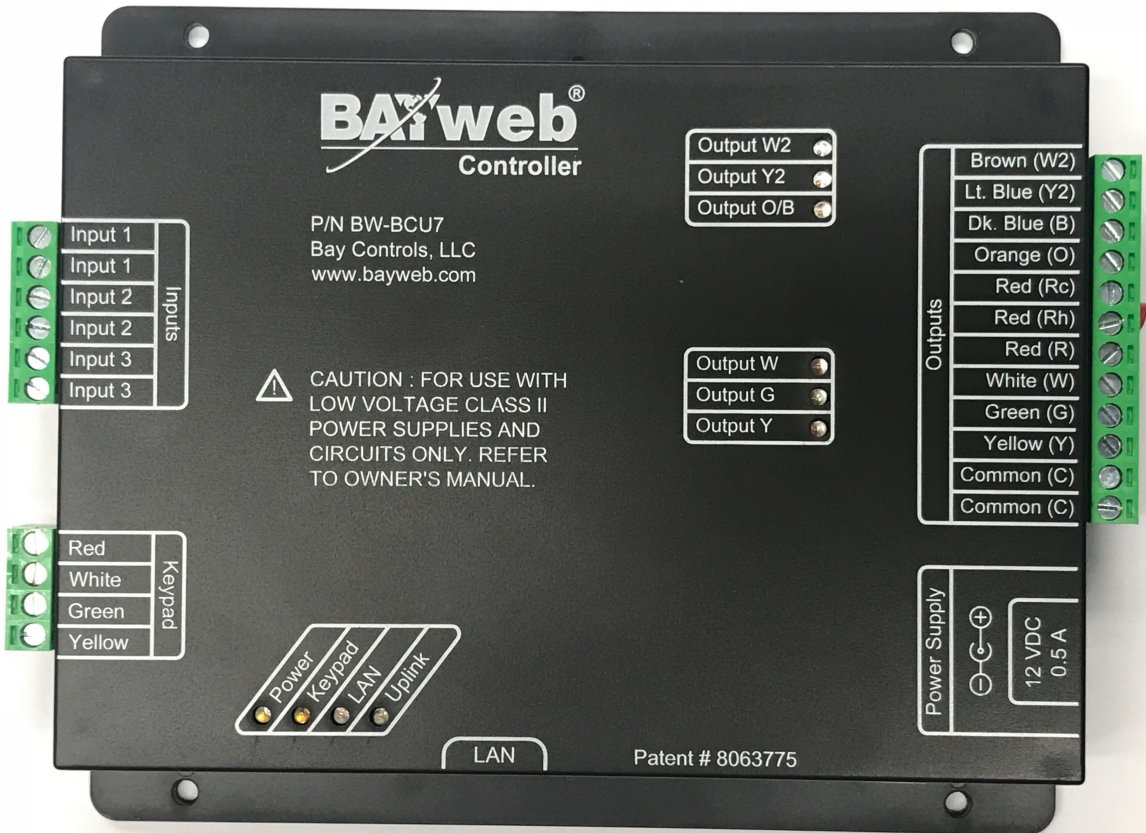




# Controller Version 7 Owner's Manual



**BAYweb Controller Owner's Manual**  
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This product utilizes patented technologies of Bay Controls, LLC. U.S. Patent No. 8,063,775

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## Introduction

Thank you for purchasing the BAYweb Controller. You have one of the most advanced Heating, Ventilating, and Air Conditioning (HVAC) control systems available today.

This controller is easily installed by an HVAC professional. It can be used to replace an existing controller or for installation with new heating or cooling equipment.

This model of the BAYweb Controller (Version 7) is designed for use with conventional or heat pump based systems that use single or multistage stage control. The controller is also utilized for lighting control when packaged in the BAYweb LightBox product.

## About This Manual

This manual contains the information necessary for installing and operating the BAYweb Controller. However, since installations may vary, these instructions may not cover all details or variations in the equipment supplied or every question that may possibly arise during use.

If a question or situation develops which is not answered directly in this manual, contact BAYweb support for specific answers and advice.

You should become familiar with the contents of this manual before the controller is put into service. This is particularly important with regard to the safety precautions listed in the Introduction section, and those included at relevant points in other sections of this manual.



**CAUTION:** Read, be sure to clearly understand, and then carefully follow all of the directions and procedures included in this manual. Failure to adhere to the guidelines and specific instructions provided could cause equipment damage and serious personal injury or death.

## ***Safety Precautions***

Low voltage class II controllers, including the BAYweb Controller, use 24 VAC control signals limited to 3.2 amperes to interface to the Heating, Ventilating, and Air Conditioning (HVAC) equipment. These low voltage control signals do not normally represent an electric shock hazard unless used in an environment which the Controller was not designed for, such as a wet location.

Bay Controls, LLC. expressly disclaims responsibility or liability for any injury or damage caused by failure to observe specified or other common safety precautions or failure to exercise ordinary caution, common sense, and due care required in installing and operating the controller even though not specified herein.

The alert message shown here appears throughout this manual to indicate those situations and times when special care is necessary to prevent equipment damage or personal injury.



**CAUTION:** This indicates that there *could* be the possibility of equipment damage or personal injury.



**CAUTION:** If this equipment is used in a manner not specified by Bay Controls, LLC., there may be a risk of equipment damage, serious personal injury, or death.

### ***Limited Warranty***

Subject to the limitations contained below, and except as otherwise expressly provided herein, Seller warrants to the Buyer that all tangible articles supplied by Seller or services provided by Seller will be free of defects in materials or workmanship under normal use and care until the expiration of the applicable warranty period. Goods are warranted for five (5) years from the date of purchase. If Buyer discovers any defects and notifies Seller thereof in writing during the applicable warranty period, Seller shall at its option promptly correct, repair, or replace F.O.B. point of manufacture that portion of the good found by Seller to be defective, or refund the purchase price of the defective portion of the goods/services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources, unsuitable environmental conditions, accident, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense. Seller shall not be obligated to pay any costs or charges incurred by Buyer except as may be agreed upon in writing in advance by an authorized Seller representative. Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer.

THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, OR ANY OTHER MATTER WITH RESPECT TO ANY GOODS OR SERVICES.

### ***Limitation on Liability***

THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF WARRANTY HEREUNDER SHALL BE LIMITED TO REPAIR, CORRECTION, REPLACEMENT OR REFUND OF PURCHASE PRICE AS PROVIDED UNDER THE FOREGOING LIMITED WARRANTY. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, TORT OR OTHERWISE), SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE TO THE BUYER OF THE SPECIFIC GOODS SUPPLIED OR SERVICES PROVIDED BY SELLER GIVING RISE TO THE CLAIM OR CAUSE OF ACTION.

BUYER AGREES THAT IN NO EVENT SHALL SELLER'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS INCLUDE "CONSEQUENTIAL DAMAGES". FOR THIS PURPOSE, "CONSEQUENTIAL DAMAGES" SHALL INCLUDE, BUT NOT BE LIMITED TO, LOSS OF ANTICIPATED PROFITS, LOSS OF USE, LOSS OF REVENUE AND LOSS OF CAPITAL.

### ***Unauthorized Repair***

In the event that the owner allows the Web Controller to be serviced or repaired by unauthorized personnel, the coverage of the original warranty policy will be automatically terminated.

# Installation

## Overview

Installation of the controller is similar to that of any standard thermostat, with the addition of connecting it to the local area network.

The controller should be located where convenient for access for service, for wiring to the HVAC equipment, local network, and any additional sensors.

The controller utilizes temperature sensors and/or keypad to sense room temperature. At least one source of indoor temperature is required to operate the HVAC equipment.

BAYweb provides comprehensive health monitoring of HVAC equipment when installed with supply temperature sensors. Supply sensors are economical, easily installed, and recommended for all types of HVAC installations.

Information on temperature sensors is available online at <https://store.bayweb.com>.

## Wiring

All wiring to the controller shall be 18 AWG 4, 5, or 7 Conductor 300V, Type CL2 (UL) 105 Deg C, or equivalent.

## HVAC Equipment Connections

The following table shows the controller terminals and associated functions.

Terminal	Function	Standard Wire Color
R	24 VAC Supply (heat & cool)	Red
Rh	24 VAC Supply (heat)	Red
Rc	24 VAC Supply (cool)	Red
W	Heat	White
G	Fan	Green
Y	Cool	Yellow
C	24 VAC Common	Blue or Black
W2	Stage 2 Heat	Pink or other color
Y2	Stage 2 Cool	Blue or Pink
O	Reversing Valve (Heat Pump)	Orange, Blue, or Black

If you do not have a wire attached to terminal “C”, you will need to use the included power supply to power the controller. The power supply requires a standard 120VAC outlet.

If your system uses separate Rh and Rc wires, be sure to remove the jumper wire between the Rh and Rc terminals. If your system uses a single Red wire, make sure the jumper wire between terminals Rh and Rc is installed, and the Red wire is connected to the “R” terminal.

### **HVAC Control Methods**

The following table shows what terminals are used by the different control methods.

#	System Type	Terminals				
		W or W1 or Aux	Y	W2	Y2	O or B
1	Conventional Heat Only	Y				
2	Conventional Cool Only		Y			
3	Conventional One Heat/One Cool	Y	Y			
4	Conventional Two Heat/One Cool	Y	Y	Y		
5	Conventional Two Heat/Two Cool	Y	Y	Y	Y	
6	Conventional One Heat/Two Cool	Y	Y		Y	
7	Heat Pump One Heat/One Cool		Y			Y
8	Heat Pump Two Heat/One Cool	Y	Y	*		Y
9	Heat Pump Two Heat/Two Cool		Y		Y	Y
10	Heat Pump Three Heat/Two Cool	Y	Y	*	Y	Y

If you have a wire connected to terminal “E”, you have a heat pump with an emergency heat function. If you do not also have a wire connected to terminal “W” you will need to connect the wire connected to “E” to terminal “W”.

\* Some heat pump installations may use a white wire on W2 instead of W1 for auxiliary heat. If you have a white wire attached to terminal W2 on the HVAC equipment it should be connected to the W terminal of the BAYweb Controller.

### **Keypad**

The optional keypad is wired to the controller using standard 4 conductor thermostat cable. Match the wire color and terminal designation on the Keypad connector (Red, White, Green, Yellow).



**CAUTION:** The Keypad utilizes a low voltage communications interface that will be damaged if connected to HVAC control wiring. Be sure to connect the keypad to the “Keypad” connector of the controller and not to any HVAC equipment.



## Inputs

The BAYweb Controller has three input channels that can be used for a variety of purposes. This section describes the optional monitoring and control functions that are available. To enable and configure the option, refer to the “Inputs” section on the “Settings” page on the web site.



**CAUTION:** Do not connect an input channel to any external voltage source. Dry contacts or temperature sensors only. Connections to an external circuit may cause equipment damage.



**CAUTION:** Only temperature sensors supplied by Bay Controls are supported. Use of other sensors may damage the controller.

## Digital

The digital input type is used to monitor sensors and switches for alerting and/or occupancy sensing. Any sensor with “dry contacts” can be used. The term “dry contact” means that there is no voltage or current present on the contacts of the sensor.

## Temperature

The temperature input type is used for general purpose temperature monitoring and alerting. Refer to <https://store.bayweb.com> for information on available sensors. Only temperature sensors supplied by Bay Controls are supported.

## Supply Temperature

The supply temperature input type is used to monitor the air temperature of the heating and/or cooling of the HVAC unit using the supply temperature sensor. The temperature differential between the inside air temperature and the supply of the unit provides a direct measurement of equipment efficiency and often an early warning of problems.

## Outdoor Air Temperature

Typically the BAYweb Controller obtains the outdoor air temperature from a local weather station using the network connection. An optional outdoor temperature probe can be used for locations that do not have a local weather station that provides a representative outdoor temperature.

## Inside Air Temperature

The inside air temperature input type is used to control the HVAC equipment using an indoor temperature sensor instead of the keypad. Any one of the three input channels can be selected as the inside air temperature source in addition to the keypad temperature.

## Average Control

The average input type is used to control the HVAC based on an average temperature of different areas which can include the temperature at the keypad. Up to three additional areas may be used in addition to the keypad temperature.

## Outputs

The heat 2 (terminal W2) and cool 2 (terminal Y2) relays can be used if they are not required for HVAC control. The relays provide 24 VAC at a system total maximum of 3.2 amps. You must ensure that you do not connect an external power source directly to the outputs. Typically an additional relay or contactor will be required to use the output with other devices and appliances.



**CAUTION:** Do not connect an output channel to any external voltage source. Connections to an external circuit may cause equipment damage.

## Relay Control

The relay control output can be used to remotely control, and control based on a schedule, a variety of external devices and/or appliances. Typically used for lighting and control of water heaters and water valves. To configure a relay output, set the output type in the controller settings, and then setup the schedule on the relay tab on the schedule page on the web site.

## Humidifier Control

If the Heat 2 output (terminal W2) is not required for operation of the furnace, it can be configured as a humidifier control signal. Humidifier control also requires the use of the Controller Keypad with Humidity sensing, part number BW-T111.

## Damper Control

If the Heat 2 output (terminal W2) is not required for operation of the furnace, it can be configured as a damper control signal for zoned systems. The damper control is active whenever the system is heating, cooling, or when the fan is on.

## Lighting Control

The controller can be utilized for lighting control when packaged with the BAYweb LightBox product. In that application all of the outputs are used exclusively for lighting control. The equipment "System Type" must be configured as "Lighting" in the device settings. Refer to the LightBox product documentation for further information.

## **Internet Connection**

The BAYweb Controller is factory configured for system type 3, conventional one heat/one cool. If you have a multistage furnace, air conditioner, or heat pump, you will need to connect the controller to the Internet and configure it for the type of system that you have prior to use.

- 1) Connect the Controller to the Internet. Plug one end of an Ethernet cable into the LAN port on the bottom of the Controller and the other end into a port on a router or switch on your local network.
- 2) The BAYweb Controller does not require any configuration or programming of your networking equipment.
- 3) Power up the controller. The Power LED on the controller should illuminate.
- 4) In less than a minute the “Uplink” light should illuminate on the controller. If you do not see “Uplink” light up within a couple of minutes, refer to the Troubleshooting section of this manual.

## **Configuration**

The controller is configured using the BAYweb web site. The following steps will guide you through setting up your web site account and configuring the controller. If you have already setup your account, simply login, select “Account” and then “Devices” to add the new controller.

- 1) Go to the BAYweb site: <https://ems.bayweb.com/> using a web browser.
- 2) Click on the “Create an account” link.
- 3) Enter the requested information. You will need the serial number and key code from the controller label.
- 4) You will be sent an email to confirm you have entered a valid email address and validate your identity with the given email. You must follow the instructions in the email to activate your account.
- 5) Once your account has been activated, login to the web site at <https://ems.bayweb.com/> using your user ID and password.
- 6) Select the controller from the list view and select “Settings” to complete the configuration.



**CAUTION:** Confirm that the “System Type” is correctly set on the “Equipment” tab of the device settings to the type of HVAC equipment used. Failure to do so will result in incorrect operation and potential equipment damage.

## **Testing**

- 1) Apply power to the equipment.
- 2) Verify that the “Power” light is illuminated on the controller. If not on, refer to the Troubleshooting section of this manual.
- 3) If installed, verify that the Keypad is showing the temperature. If it is showing an “E” with a number, this is an error code. Refer to the Troubleshooting section.
- 4) Verify that the controller is connected to the Internet. The “Uplink” LED should be on. If not On refer to the Troubleshooting section.
- 5) Using the web site, mobile site, App, or keypad: Test the FAN operation. If the fan did not operate, consult the Troubleshooting section of this manual.
- 6) Using the web site, mobile site, App, or keypad: Test HEAT operation. Select heat mode and raise the set point above the current temperature. Check the HVAC equipment and confirm that it is heating.

Note that once the heat turns on, it will remain on for a minimum of 1 minute and once it turns off, it will remain off for 1 minute as well.

If operating correctly, change the set point back to a normal level. If heating did not function, refer to the Troubleshooting section.

- 7) Using the web site, mobile site, App, or keypad: Test COOL operation. Select cool mode and lower the set point below the current temperature. Check the HVAC equipment is running and cooling. If operating correctly, change the set point back to a normal level. If cooling did not function, refer to the Troubleshooting section.

## **Operation**

### ***Using the Web Site***

This web site can be accessed anytime from anywhere via web browser and Internet enabled mobile phone or tablet. Unlimited use of the web site is included at no charge.

If you have not already done so, setup your account by going to the web site <https://ems.bayweb.com/> and create an account. You will need the serial number and key code from the label on the controller.

### ***Using the Mobile Site***

Once you have setup your account, you can also use the mobile web site that is optimized for use with web browsers on mobile phones and tablets.

The mobile site is located at <https://mobile.bayweb.com/>

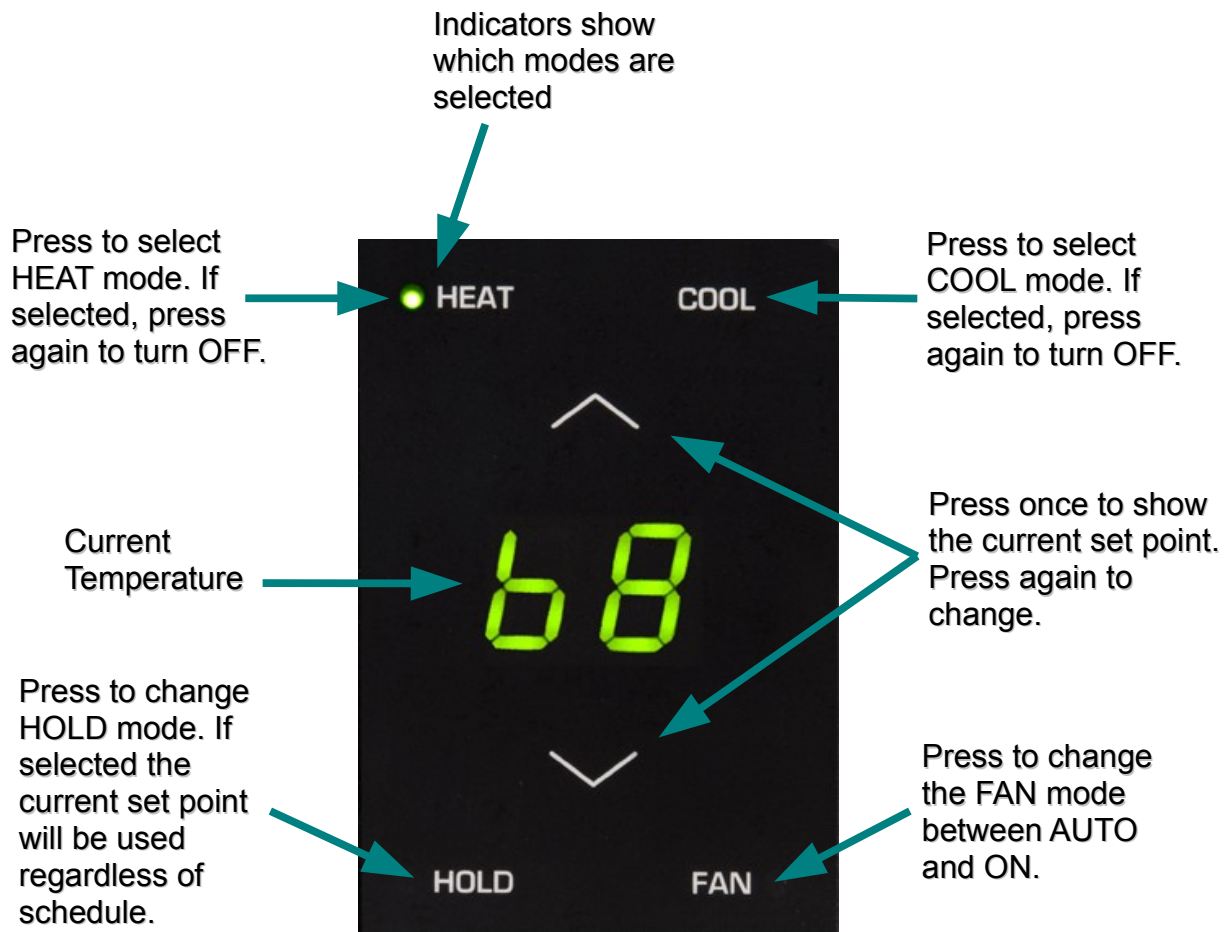
## Using the App

An App is available for Apple iPhones and iPads. Search for “BAYweb” in the App Store to install.

An App is available for Android based phones and tablets. Search for “BAYweb” in the Google Play App to install.

## Using the Keypad

The optional Keypad shows the current temperature, set point and modes, and allows you to manually control the equipment.



A dot displayed on the lower right of the two digits indicates the set point is being displayed.

## Status Indicators

Indicator	Description
Output W	For conventional systems, this LED indicates when the controller is signaling the furnace to produce stage one heat. For heat pump systems, this LED indicates when the controller is activating auxiliary heat.
Output W2	For conventional multistage systems, this LED indicates when the controller is signaling the furnace to produce stage two heat. For conventional single stage and heat pump systems, this LED indicates when controller is signaling for the zone damper to open.
Output Y	For conventional systems, this LED indicates when the controller is signaling the air conditioner to operate stage one cool. For heat pump systems, this LED indicates when the controller is signaling the heat pump to run the stage one compressor.
Output Y2	For conventional systems, this LED indicates when the controller is signaling the furnace to produce stage two cool. For heat pump systems, this LED indicates when the controller is signaling the heat pump to run both stages of the compressor.
Output G	Indicates when the controller is signaling the furnace, air conditioner, or heat pump to turn on the fan.
Output O/B	<p>Indicates that the controller is signaling the heat pump to activate the reversing valve. The “B” terminal is normally closed, it supplies power when the Rev LED is off. The “O” terminal is normally open, it supplies power when the Rev LED is illuminated.</p> <p>The use of the “O” and “B” terminals may vary by manufacturer of the heat pump. Typically, the “O” terminal supplies power to signal for cooling, and the “B” terminal supplies power to signal for heat. If your system appears to be operating opposite of what it should, move the reversing valve wire to the other terminal.</p>
Power	Indicates that there is power supplied to the controller.
LAN	Indicates that the controller is communicating on the local area network and has obtained a local IP address from the router. DHCP is working normally.
Keypad	Indicates that the controller is successfully communicating with the Keypad.
Uplink	Indicates that the controller is successfully communicating with the BAYweb servers.

## Troubleshooting

We encourage you to communicate any problems you have encountered to us, even if you are able to solve them on your own. We would also like to have any suggestions or comments about the installation procedure.

The preferred method of communicating with us is via email. We use an automated tracking system to ensure that we respond to your messages in the quickest possible time, and provide the shortest path to problem resolution. Our support email address is [support@bayweb.com](mailto:support@bayweb.com).

When contacting us for support, please provide your name and your controller serial number. We may also request your key code to validate that you own a given piece of equipment. The serial number and key code are located on the controller and on the Settings page on the web site.

### Solutions to Problems

Problem	Solution
No controller power indication.	<ul style="list-style-type: none"><li>✓ Check for 24VAC power between terminals "R" and "C" on the Outputs connector, or if using the power supply, check for power at the outlet.</li><li>✓ Unplug Inputs and Keypad connectors, if power light comes on there is a short or improper connection on one or both of these connections.</li><li>✓ Contact support.</li></ul>
Keypad is dark, no power at keypad.	<ul style="list-style-type: none"><li>✓ Check controller has power.</li><li>✓ Check wiring between Keypad and controller.</li><li>✓ Check for power (3.3 VDC) on the red and white terminals of the Keypad connector of the controller, and on the wires on the Keypad.</li><li>✓ Contact support.</li></ul>
Fan control does not function.	<ul style="list-style-type: none"><li>✓ Verify on the Keypad or web site that the Fan is selected ON.</li><li>✓ Verify on the controller that the Output G light is ON.</li><li>✓ Check the red and green wires between the Outputs connector on the controller and your HVAC equipment.</li><li>✓ Check that the HVAC equipment has power.</li></ul>

Problem	Solution
Heat does not function. (not applicable to Heat Pump)	<ul style="list-style-type: none"> <li>✓ Verify that Heat mode is selected using the Keypad or web site.</li> <li>✓ Verify that the set point is higher than the current inside temperature.</li> <li>✓ Verify on the controller that the Output W light is ON.</li> <li>✓ Check the red and white wires between the Outputs connector on the controller and the HVAC equipment.</li> <li>✓ Check that the HVAC equipment has power.</li> </ul>
Cool does not function. (not applicable to Heat Pump)	<ul style="list-style-type: none"> <li>✓ Verify that the outside temperature is greater than 40° F.</li> <li>✓ Verify that Cool mode is selected using the Keypad or web site.</li> <li>✓ Verify that the set point is lower than the current temperature.</li> <li>✓ Verify on the controller that the Y light is ON.</li> <li>✓ Check the red and yellow wires between the Outputs connector on the controller and the HVAC equipment.</li> <li>✓ Confirm that the jumper wire between “Rh” and “Rc”, or a wire is attached to terminal “Rc” on the Outputs connector.</li> <li>✓ Check that the HVAC equipment has power.</li> </ul>
Controller Keypad shows error code “E1”:  The Controller Keypad is not communicating with the controller.	<ul style="list-style-type: none"> <li>✓ Check the wiring and connections between the Keypad and controller. <b>Make sure all 4 wires are connected</b> regardless of system type.</li> <li>✓ Try wiring the Keypad directly to the Keypad connector of the controller. If the code does not appear, the problem is somewhere in the wiring.</li> <li>✓ Check the Keypad light on the controller.</li> <li>✓ Contact support.</li> </ul>
Controller Keypad shows error code “E2”:  The temperature sensor has failed in the Keypad Module.	<ul style="list-style-type: none"> <li>✓ The controller can not operate in this condition.</li> <li>✓ Contact support.</li> </ul>



Problem	Solution
<p>Controller Keypad shows error code “E3”: Your Internet router is not supplying a local address to use on your network (DHCP is inoperative).</p>	<ul style="list-style-type: none"> <li>✓ Try resetting or power cycling your Internet router.</li> </ul>
<p>Controller Keypad shows error code “E4”: The Internet connection was down for an extended period of time (It is unlikely that this is a problem with the controller).</p>	<ul style="list-style-type: none"> <li>✓ Check your Internet connection.</li> <li>✓ Check your Internet / LAN wiring.</li> <li>✓ Make sure you can browse the Internet using the controller network cable.</li> </ul>
<p>Controller Keypad shows error code “E5”: The non-volatile memory in the controller has been lost or corrupted.</p>	<ul style="list-style-type: none"> <li>✓ The controller can continue to operate.</li> <li>✓ Contact support.</li> </ul>
<p>Controller Keypad shows “LO”: The keypad has been locked.</p>	<ul style="list-style-type: none"> <li>✓ Login to the web site to unlock.</li> </ul>
<p>Controller not responding to the schedule at the correct time.</p>	<ul style="list-style-type: none"> <li>✓ Review the Settings page and make sure the timezone is set correctly.</li> </ul>
<p>Wired alert input not working.</p>	<ul style="list-style-type: none"> <li>✓ Verify the wired input settings – see the Settings page.</li> </ul>
<p>Controller not connecting to Internet, Uplink light does not come on.</p>	<ul style="list-style-type: none"> <li>✓ Verify that the green LED on the LAN connector (on the side of the controller) is illuminated.</li> <li>✓ Verify that the amber LED on the LAN connector is blinking.</li> <li>✓ Plug a laptop or PC into the connection you are using for the controller and verify that you can browse the Internet.</li> </ul>
<p>Heat or Cool does not turn off.</p>	<ul style="list-style-type: none"> <li>✓ The Heat or Cool outputs will stay on for a minimum time period (default of 1 minute). Check inside temperature vs set point.</li> </ul>

### **Keypad Error Codes**

The controller will display an error code on the Keypad (if installed) to alert you of problems. When an error code is displayed the temperature is replaced with “E#”, where the number represents an error described below. To clear the error code, press any key on the keypad.

<b>Code</b>	<b>Meaning</b>
E1	Indicates that the controller keypad is not communicating with the controller.
E2	Indicates that the temperature sensor in the keypad module has failed.
E3	Indicates that DHCP (Dynamic Host Configuration Protocol) is not functioning on your local network.
E4	Indicates that the controller has lost communication with the BAYweb servers.
E5	Indicates that the non-volatile memory was corrupted or lost.

## Obtaining Support

Customer support is available via email to [support@bayweb.com](mailto:support@bayweb.com). Be sure to include your product serial number in your message, we can not help you without it.

We typically respond to support emails within 24 hours, Monday through Friday, Eastern time.

## Specifications

Part Number:	BW-BCU7
Control Types:	Single and multistage heat/cool, heat pump with aux heat
Fan Control:	Auto, On, auto with minimum circulation
Set Points:	4 heat, 4 cool
Schedule:	7 day, up to 48 periods per day, automatically adapts with occupancy sensing
Control Features:	Automatic changeover, compressor protection, set point limiting, open door shutdown, average control, supply temperature monitoring
User Interface:	Web Browser, Mobile App, Keypad
Clock:	Synchronized with NIST atomic clock ( $\pm 1$ sec)
Memory:	All settings and data maintained in non-volatile memory indefinitely
Optional Inputs:	(3) Temperature sensor and/or dry contact.
Occupancy Inputs:	Wired dry contact input
Control Temperature Range:	35° to 90° F
Control Response:	$\pm 1^\circ$ F
Accuracy:	1° F
Storage Temperature Range:	-40° to 150° F
Operating Temperature Range:	0° to 120° F
Operating Relative Humidity:	5% to 90% (non-condensing)
Power Methods:	From HVAC unit using “C” wire, or external power supply (included)
Power Requirements:	24VAC 0.5 Amp, class 2 low voltage power supply
Control Electrical Rating:	Class 2, 20 – 30 VAC 3.2 Amp maximum
Dimensions:	Controller: 7.5” W x 5.65” H x 1.2” D
Weight:	Controller: 13 oz