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L7224A,C; L7248L 2012 Compliant Oil Electronic Aquastat® Controllers

INSTALLATION INSTRUCTIONS

APPLICATION

The L7224A,C and L7248L 2012 Compliant Oil Electronic Aquastat® Controllers provide electronic temperature sensing in a UL limit-rated control with a single sensing probe. The L7224A,C and L7248L control the circulator, oil burner and boiler temperature. The L7224/L7248 is "Outdoor Temperature Reset" ready which is enabled when connected to the OCP with Reset Card. Outdoor Reset with the L7224/L7248 is intended for all applications except for tankless coil systems for domestic hot water.

Compliance to 2012 DOE regulation ensures efficiency is maximized without interfering with domestic hot water demand. The L7224A,C and L7248L series controls provide status and diagnostic information through an LED display combined with LED lights as well as EnviraCOM™ communications enabled thermostats and diagnostic tools to enhance the diagnostic process.

L7224/L7248 Aquastat Controllers are intended for use in residential-type applications.

IMPORTANT

Use of Outdoor Temperature Reset on a tankless coil application requiring a Low Limit setting will result in reduced system effectiveness and efficiency.

SPECIFICATIONS

Electrical Ratings:
Voltage: 120 Vac, 60 Hz.
Power: 7 VA maximum at 120 Vac plus external loads.
Thermostat current: 100 mA nominal at 24 Vac.
Burner Relay:
7.4 A at 120 Vac Full Load Amperage (FLA);
44.4 A inrush Locked Rotor Amperage (LRA);
Less Ignition Load: 360 VA.
Circulator Relay:
7.4 A at 120 Vac FLA; 44.4 A inrush LRA.
Zone Controller (ZC): 7.4 A at 120 Vac FLA;
44.4 A inrush LRA.

NOTE: All loads combined cannot exceed 2000 VA.

Environmental Ratings:
Temperature: -30 °F to +150 °F (-34 °C to +66 °C).
Humidity: 0 to 95% relative humidity, noncondensing.

Approvals:
Underwriters Laboratories Inc. Component Recognized.
Canadian Underwriters Laboratories Inc. Component Recognized.

Accessories:
BCP7000A Option Control Panel
BCP7000B Aquastat Card
BCP7000D Outdoor Reset Control Card
W8735G GatewayA
TH9421C IAQ Thermostat
Sensor (See Table 2).
14,000,485-016 1/4 in. (6.35 mm) diameter, 1-1/4 in. (31.75 mm) long glass cartridge Fuse, 1A, Slow-Blow.
120650 Heat Conductive Compound.
121371AA Sensor Well Clamp.

Table 1. Wells for L7224A,C; L7248L Controllers.

Part Number	Spud Size in. (mm)	Insertion in. (mm)	Insulation in. (mm)
123869A	1/2 (12.7) NPT	3 (76.2)	1-1/2 (38.1)
123870A	3/4 (19.05) NPT	3 (76.2)	1-1/2 (38.1)

Table 2. Sensors for L7224A,C and L7248L Controllers.

Part Number	Length in. (mm)	Application
50001464-001	12 (304.8)	Well-mounted controls
50001464-003	24 (609.6)	Flush-mounted controls
50001464-004	36 (914.4)	
50001464-005	48 (1219.2)	

INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. The installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

5. Set High Limit, Low Limit and Low Limit Differential to the settings recommended by the boiler OEM.
6. Record the maximum High Limit setting from the replaced controller in the text box provided on the cover insert label.
7. Record the High Limit setting at time of installation in the text box provided on the cover insert label.

⚠ WARNING

Electrical Shock Hazard.
Can cause severe injury, death or property damage.
Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

Mounting

The L7224A,C and L7248L models are available in a well-mount, horizontal position, vertical position, or flush mounted remote from the well versions. Dimensions for the variety of mounting options are shown in Fig. 1. Note that each identity will have only a single mounting option.

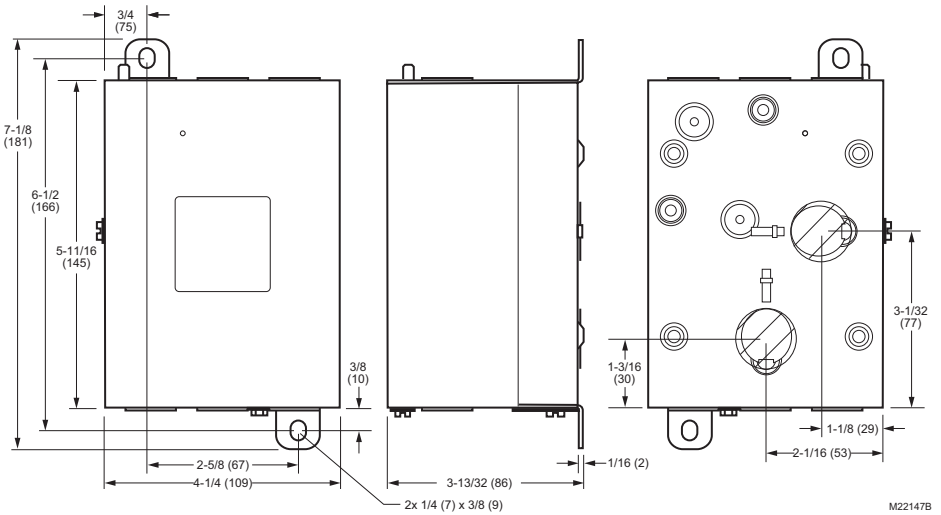

Fig. 1. L7224A,C; L7248L mounting dimensions in inches (mm).

IMPORTANT

Immersion well must fit sensing element and sensor must rest against bottom of well.

New Installation

Order well assemblies separately; see Table 1 and form no. 68-0040, Immersion Wells and Compression Fittings for Temperature Controllers. Boilers usually have tappings that allow the well to be mounted horizontally so boiler water of average temperature can circulate freely over the well.

1. Turn off all power and drain the boiler, if applicable.
2. If no tapping is provided, prepare properly sized and threaded tapping near the top of the boiler.
3. Sparingly coat the well threads with pipe dope.

NOTE: Do not attempt to tighten by using the case as a handle.

4. Install the well in the boiler tapping and tighten securely.
5. Refill boiler and check for water leakage.
6. Loosen but do not remove the well clamp screw.
7. Fit the case into the well so the clamp on the case slides over the flange on the well.
8. Securely tighten the clamp screw.
9. Insert the sensor element into the well until it bottoms. See Replacement Sensor Installation section for details. (If necessary, slightly bend the wire inside the case to hold the sensor against the bottom of the well.)
10. Turn power ON.
11. Set High Limit, Low Limit and Low Limit Differential to the settings recommended by the boiler OEM. (See "OPERATION" on page 4.) (See "INSTALLATION" on page 1 steps 6 and 7.)
12. On L7248L models, adjust ELL option to match your configuration (see "OPERATION" on page 4).

IMPORTANT

Best thermal response is obtained with a well that snugly fits the sensor. Insert the sensor until it rests against the bottom of the well. Use a well of correct length and bend the wiring, if necessary, to hold the bulb against the bottom of the well.

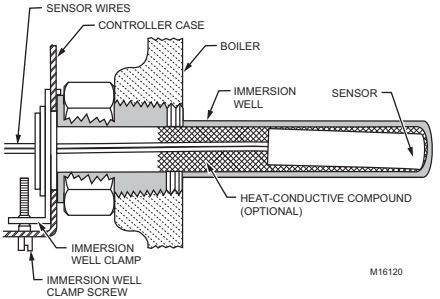

Fig. 2. Position of sensor in immersion well.

Flush-Mounted Aquastat Replacement

Turn off all power and remove the old control. Refer to the cover insert of the old control to identify and tag each external lead as it is disconnected. If the old well is unsuitable for the new installation, remove it and replace it with a suitable new well. If the old well is suitable, use it.

Well-Mounted Aquastat Replacement

Turn off all power and remove the old control. Refer to the cover insert of the old control to identify and tag each external lead as it is disconnected. If the old well is unsuitable for the new installation, remove it and proceed with instructions for new installation. If the old well is suitable, use it.

1. Loosen, but do not remove, the well clamp screw on the side of the control case.
2. Position immersion well clamp snugly over the flange of the adapter and tighten the clamp screw.
3. Insert the sensor into the well as shown in Fig. 2 or 3. (See "Replacement Sensor Installation" for details.)

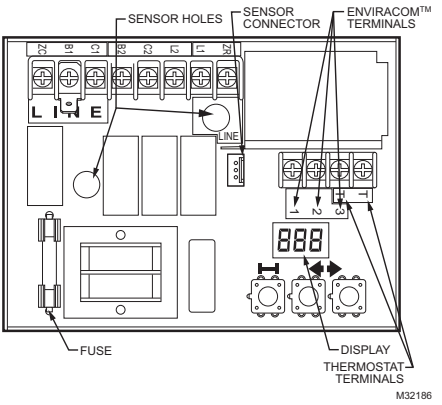

Fig. 3. Circuit board, showing sensor connection and well holes for horizontal mount models.

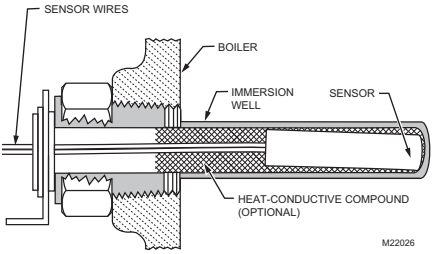

Fig. 4. Replacement sensor installation.

Replacement Sensor Installation

Turn off all power and:

1. Carefully disconnect sensor from circuit board by pulling gently on the connector.
2. Gently pull sensor from thermo well and through circuit board by pulling on leadwires.
3. Carefully align replacement sensor with hole in circuit board and guide through Aquastat case and into well.
4. Make sure sensor is fully seated to bottom of well. Use a small pencil to measure depth of sensor in well, if necessary.
5. Connect sensor to circuit board by pressing connector on sensor unit into mating connector on circuit board.
6. For remote sensors (flush-mounted Aquastat Controllers) be sure to use 121571AA Clamp (see Accessories) to securely hold sensor in place.

WIRING

⚠ WARNING

Electrical Shock Hazard.
Can cause serious injury or death.
Disconnect power supply before making wiring connections to prevent electrical shock or equipment damage.

All wiring must comply with local electrical codes and ordinances. Do not exceed the specifications in the Application section when wiring this control. Use wire rated for 194 °F (90 °C) or higher.

IMPORTANT

The terminals on these Aquastat Controllers are approved for use with copper wire only.

Follow the appropriate wiring diagrams shown on the inside of the front cover of the L7224A,C; L7248L.

OPERATION

General

The L7224A,C and L7248L Oil Electronic Aquastat Controllers are primary safety limit-rated devices designed for use with oil fired boilers with line voltage burners and circulators. Many boilers do not include wiring or control compartments as part of the design, but are provided with an integral, replaceable, immersion well that is the mounting hardware for the Aquastat Controllers. Wiring to the other controls is done through flexible metal conduit.

For boilers that do include a remotely (flush) mounted control, the wiring may be completed with conduit or routed behind the boiler sheet metal.

A separate electromechanical high-limit is not required in a system that uses this control to meet Underwriters Laboratories Inc. requirements for oil-fired boiler assemblies, UL 726.

On the L7224 models, the High Limit, Low Limit, Low Limit Differential, and Anti Short-Cycle time can be adjusted from OFF to five minutes. On the L7248 models, the High Limit, and Anti Short-Cycle time are also adjustable, see “Adjusting Settings”.

The overall range of the High Limit is from 130 °F to 240 °F (54 °C to 116 °C). Select devices may have different ranges. Some models have limited ranges on the High Limit setpoint; this limited range is listed on the device label.

Some models also have a Low Limit and Low Limit Differential adjustment. The range of the Low Limit is from 110 °F to 220 °F (43 °C to 104 °C). Select devices may have different ranges.

The DHW setting through the Zr terminal may be switched OFF. The range of the Anti Short-Cycle time is from OFF to five minutes.

The L7224A,C and L7248L are designed for use with 24 Vac electronic and electromechanical thermostats or EnviraCOM™ enabled thermostats, and have screw-type terminals for easy field connection.

Adjusting Settings

To discourage unauthorized changing of Aquastat settings, a procedure to enter the ADJUSTMENT mode is required. To enter the ADJUSTMENT mode, press the UP, DOWN, and I buttons simultaneously for three seconds. Press the I button until the feature requiring adjustment is displayed:

Table 3. Adjustable Features.

Display	Description	
hL	High Limit set-point (°F or °C)	
h dF	High limit differential (°F or °C)	
LL	Low Limit set-point (°F or °C) (L7224 model only)	
L dF	Low Limit differential (°F or °C) (L7224 model only)	
ZC	This item controls the function of the ZR and ZC terminals as follows:	
	ZC_ = DH	ZR input configured as Domestic Hot Water Heat Demand
	ZC_ = ZR	ZR input configured as ZR a Zone Request
	ZC_ = ELL	ZR input configured as an external low limit
Or	Pump Overrun Time (minutes) Do not show any units for this parameter.	
PP	Pump pre-purge Time (minutes) Do not show any units for this parameter.	
St	Start Temperature	
Pt	Priority Time on or off	
F C	Temperature units (°F or °C)	
bAC	If selected and up or down key is pressed, the display returns to reading mode immediately.	

Then press the UP and/or DOWN buttons to move the set point to the desired value, to change between °F and °C, or to enable (On) or disable (Off) the External Low Limit. After 60 seconds without any button inputs, the control will automatically return to the RUN mode.

Display

In the RUN mode, the Aquastat will flash “StA” (State) followed by the state number (i.e., 8-RUN).

To read boiler settings, press the I key to read the parameter of interest. For example, press I and High Limit (HL) is displayed, followed by a three-digit number, i.e., 220, followed by °F or °C. Pressing the I button again (on L7224 models) will display the Low Limit (LL) followed by a three-digit number and the corresponding degree designator. See Display Readout, Table 4.

After approximately 60 seconds without any key presses, the display will enter a dim display mode. To return to the bright display mode, simply press any key.

Table 4. Display readout definitions.

Display	Description
SbA	Status (from EnviraCOM primary)
	0 Unknown State (after power up) 1 Idle 4 Prepurge 6 Trial for ignition 7 Carryover 8 Running 9 Postpurge 10 Recycle 14 Lockout 17 Factory Test 15 Limit Open 16 Flame out of Sequence 17 Self test
bt	Boiler Temperature (°F or °C)
SP	Operating Set-Point (°F or °C)
hL	High Limit (°F or °C)
hdF	High limit differential (°F or °C)
LL	Low Limit set-point (°F or °C) (L7224 model only)
LdF	Low Limit differential (°F or °C) (L7224 model only)
hr	Central Heat Request (TT, ECOM stat or ZC configured as ZR) (on / off)
dh	DHW request input (on / off)
CAd	Cad Cell Ohms (from EnviraCOM oil primary). Up to five digits displayed. Ohms only shown if an EnviraCOM enabled oil primary is connected via the 1, 2, 3 terminals.
run	Run Time Hours (from EnviraCOM oil primary) Hours only shown if an EnviraCOM enabled oil primary is connected via the 1, 2, 3 terminals.
CYC	Boiler Cycles (from EnviraCOM oil primary) Cycles only shown if an EnviraCOM enabled oil primary is connected via the 1, 2, 3 terminals.
Err	Aquastat Error code (only if a warning or error is active), Display switches to this value when an error occurs. The user may move away from this display using the “I” key.
ErP	External Error code (only if a warning or error is active) Aquastat will show the error reported via EnviraCOM by other devices (for example Oil Primary, Zone Panel etc.).

High Limit Controller

The High Limit opens and turns off the burner when the water temperature reaches the setpoint. The High Limit automatically resets after the water temperature drops past the setpoint and through the Differential. The L7248 models have High Limit Differential presets of 15 °F (8 °C). The L7224 models have High Limit Differential presets of 10 °F (6 °C).

Low Limit and Circulator Controller

On a temperature rise, with the adjustable Differential at the default setting of 10 °F (6 °C), the burner circuit breaks and the circulator circuit makes (assuming no call for heat is present) at the Low Limit setpoint. On a temperature drop of 10 °F (6 °C) below the Low Limit setpoint, the burner circuit makes and the circulator circuit breaks. See Fig. 5.

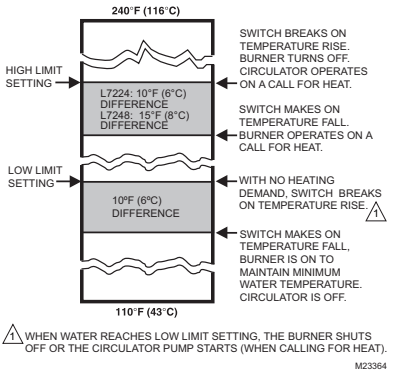

Fig. 5. Setpoints and differentials.

Security Warning

This product contains electronic hardware and software. No one is authorized to modify the hardware or software. Any modification or tampering could result in any or all of the following: incorrect operation of the product or the appliance, unsafe operation, personal injury, and property damage. Modification or tampering will also make the warranty null and void, and any liability, will have to be borne by the owner, installer, or facility manager.

Waste Warning

The product should not be disposed of with other household waste. Check for the nearest authorized collection centers or authorized recyclers. The correct disposal of end-of-life equipment will help prevent potential negative consequences for the environment and human health.

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