

L4006A,B,E,H AquaStat® Controllers

Honeywell

INSTALLATION INSTRUCTIONS

APPLICATION

These boiler-mounted, immersion type controllers operate in response to temperature changes in hydronic heating systems.

L4006A breaks the circuit on a temperature rise to the control setting. It is used for high limit or low limit control. When used as a controller or as a low limit, a separate high limit must be used.

L4006B makes the circuit on a temperature rise. It is used as a circulator controller, delaying circulator operation when boiler water temperature is below the control setting.

L4006E,H includes a trip-free manual reset switch. These models are designed to break the control circuit whenever the temperature of the controlled medium reaches the high limit setting. A reset button on the front of the case must be pressed to re-establish the control circuit. L4006H also includes bracket and clamp for surface mounting on pipe or tank.

A plastic bag of heat-conductive compound is included with the L4006A,B,E AquaStat® Controllers for use when the sensing bulb is inserted into a well designed for a large bulb than the one used on the L4006A,B,E. A 124904 Well Adapter, for use on old wells that do not fit the L4006A,B,E immersion well clamp, can be ordered; see form 68-0040, Wells and Fittings for Temperature Controllers. A setting stop is included to prevent setting above a desired temperature on limit.

If a well adapter or other accessories are needed, refer to form 68-0040, Wells and Fittings for Temperature Controllers, for part numbers and ordering information.

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. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

WARNING

Electrical Shock Hazard.

Can cause serious injury, death or equipment damage.

Disconnect the power supply before beginning installation to prevent electrical shock or equipment damage.

Installing Immersion Well Models (L4006A,B,E)

IMPORTANT

Obtain the best thermal response with a well that snugly fits the sensing bulb. The bulb should be inserted until it rests against the bottom of the well. Use a well of correct length and bend the tubing, if necessary, to provide enough force to hold the bulb against the bottom of the well. Do not make a sharp bend in the tubing. A sharp bend can produce a break in the tubing and cause a loss of fill. This condition will cause the high and low limit controls to be made continuously.

If the well is not a snug fit on the bulb, use the heat-conductive compound as follows. Fold the plastic bag of compound lengthwise and twist gently. Snip the end of the bag and insert into the well. Slowly pull out the bag while squeezing firmly to distribute the compound evenly in the well. Insert the bulb into the well. Bend the tubing, if necessary, to provide force to hold the bulb against the bottom of the well and to hold the out end of the bulb in firm contact with the side of the well. Wipe off any excess compound.

NOTE: Some models have an adjustable capillary tubing length to 3 inches (76 mm). In these models, pull out extra tubing from inside the case, if needed.

Follow the boiler manufacturer instructions, if available; otherwise, proceed as follows.



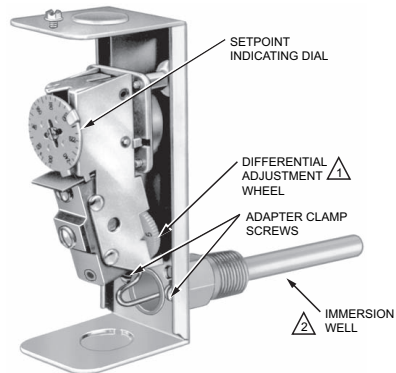
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1. Remove the old control.
2. Refer to the cover insert of the old control to identify and tag each lead as it is disconnected.
3. Leave the old well in place if it is suitable.

If Well is Otherwise Suitable But Does Not Fit The L4006 Immersion Well Clamp

Use a 124904 Well Adapter (order separately, see form 68-0040) to secure the L4006 to the old well. The adapter has a flange at one end for fastening the L4066 adapter clamp.

1. Loosen, but do not remove, the two adapter clamp screws (see Fig. 1).
2. Slide the adapter onto the capillary and short tube; see Fig. 2 inset.
3. Make sure the flanged end of the adapter fits into the hole in the case. Position the adapter well clamp snugly over the flange on the adapter, then tighten the clamp screws.
4. Insert the bulb into the well, as shown in Fig. 2. If necessary, use the heat-conductive compound as instructed in the IMPORTANT statement on page 1.
5. Tighten the setscrew (if one is present in the old well spud) against the adapter.

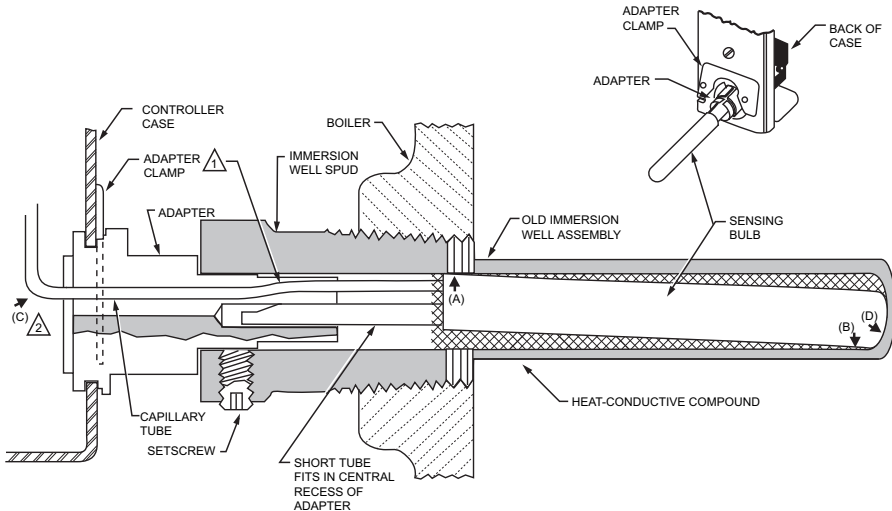


△ MODELS WITH FIXED DIFFERENTIALS DO NOT INCLUDE ADJUSTING WHEEL.

△ VERTICALLY MOUNTED IMMERSION WELL IS ATTACHED TO THE BOTTOM OF THE CASE.

M4679

Fig. 1. Internal view of L4006A,B with horizontal well. L4006E is the same with reset button added.



△ SLIGHTLY BEND IN TUBES SHOULD HOLD BULB IN GOOD THERMAL CONTACT WITH THE WELL AT TWO OPPOSITE POINTS, AS IN (A) AND (B).

△ ASSURE THAT TUBES FIT FREELY IN ADAPTER SO THAT TENSION OF THE CAPILLARY TUBE AT POINT (C) HOLDS THE SENSING BULB IN GOOD THERMAL CONTACT WITH THE BOTTOM OF WELL AT POINT (D).

M4678

Fig. 2. Bulb in immersion well and use of adapter.

If the Old Well Is Unsuitable.

1. Drain the system and remove the well.
2. Select a new well from form 68-0040 (order well separately).
3. Install the new well, refill the system and check for leaks.

4. Loosen, but do not remove, the two adapter clamp screws (Fig. 1).
5. Insert the sensing bulb into the well until it bottoms as show in Fig. 2. Add heat-conductive compound, if necessary, as instructed in the IMPORTANT statement on page 1.

6. Make sure the end of the well fits into the hole in the case. Position the immersion well clamp snugly over the well flange and tighten the clamp screw securely.

Mounting Surface Mount Model (L4006H)

The L4006H is designed for surface mounting on piping or tank and can be mounted in any position.

When mounting the L4006H on piping, the pipe should be 1 in. (25 mm) diameter or larger for accurate temperature sensing.

1. Remove any insulation from the pipe.
2. Thoroughly scrape off all scale, rust or paint.
3. Mount controller as shown in Fig. 3 using adjustable 12 in. (294 mm) pipe strap furnished.

When mounting the L4006H on a tank, use a pipe strap of appropriate length, approximately 6-10 ft (17.6- 29.4m) for the tank (not provided). Fit the pipe strap through the slot in the mounting bracket. See Fig. 3.

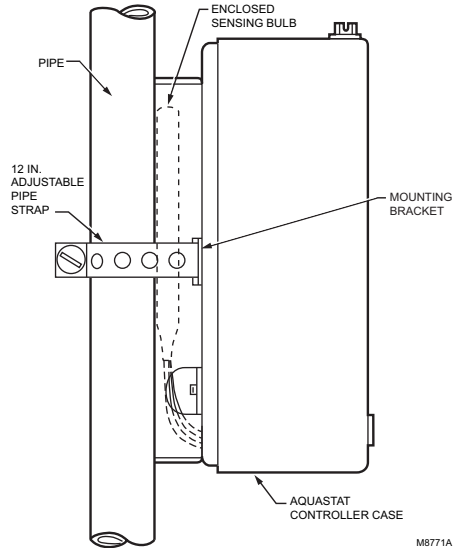


Fig. 3. Mount L4006H directly on surface.

Wiring

! WARNING

Electrical Shock Hazard.
Can cause serious injury, death or equipment damage.
Disconnect power supply before connecting wiring to avoid electrical shock or equipment damage.

All wiring must comply with local codes and ordinances regarding wire size, insulation, enclosure, etc. See Fig. 4 and 5 for typical diagrams of Aquastat® Controllers used in heating systems.

Use these Aquastat Controllers with copper wire only.

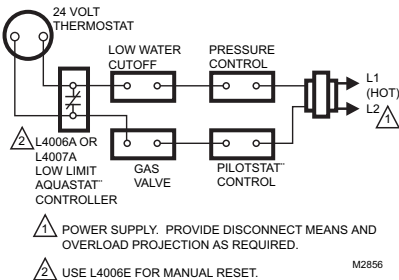


Fig. 4. Typical hookup for gas-fired system with domestic hot water.

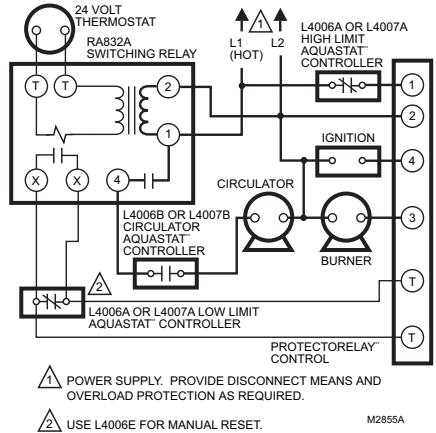


Fig. 5. Hookup for oil-fired, summer-winter, hydronic system with domestic hot water. This is typical where control for domestic hot water is added, or where each Aquastat Controller is mounted in a separate location.

OPERATION

For proper selections of settings, follow boiler manufacturer recommendations:

1. High limit controller: Shuts off burner when water temperature exceeds high limit setting. Burner restarts when temperature drops to high limit setting minus the temperature differential.

NOTE: If L4006E or H, see Manual Reset section.

2. Low limit controller: Maintains minimum boiler temperature for domestic hot water. Turns boiler on at temperature setting, less differential.
3. Circulator controller: Prevents circulation of water that is not hot enough. Breaks circulator circuit at temperature setting minus differential and remakes at setting.

ADJUSTMENT

Set the differential to correspond with the boiler manufacturer recommendations. To adjust models with adjustable differential, rotate the wheel on the back of the snap switch until the desired reading is aligned with the V notch in the frame. The wheel provides an adjustment from 5°F to 30°F (3°C to 17°C). Replace the cover on the Aquastat Controller.

Adjust the control point to correspond with the boiler manufacturer recommendations. To adjust, insert a screwdriver in the slotted screw type head located beneath the window in the cover. Turn the scale to the desired control point.

Manual Reset

When the device includes manual reset (L4006E and H), be sure to press the red reset button on the front of the case to make sure that the controller is not locked out on safety. When checking out the system, adjust the control point low enough so the temperature of the controlled medium reaches the high limit setting, the burner shuts off, and the Aquastat Controller locks out. When the temperature of the controlled medium drops to the high limit setting minus differential, push the manual reset button and the system should be operative again. Reset control to proper high limit setting.

CHECKOUT

Check to make certain that the Aquastat Controller has been installed and adjusted properly. Put the system into operation and observe the action of the device through several cycles to make certain that it provides proper control of the system as described in the Operations section. Further adjustments can be made to meet more exact comfort requirements.

MATERIAL SAFETY DATA SHEET

Section 1. Product And Company Identification

Product Name: Heat Conductive Compound

MSDS ID: DS9021

Synonyms: MS1699

Product Use: Heat conductive material used to enhance contact and heat transfer in temperature sensor applications.

Manufacturer: Honeywell Inc., 1985 Douglas Drive North, Minneapolis, MN 55422.

Date Released: October 8, 1999

Customer Response Center: 800-328-5111

Emergency Telephone Information: 888-809-3787

NFPA Ratings:

Health 0; Flammability 1; Reactivity 0; Personal Protection B

Section 2. Composition, Information on Ingredients

Ingredient	CAS Number	Percent	PEL	TVL
#2 Lithium Complex Grease (70%):				
Mineral Oil	64742-65-0	35-50	5 mg/m ³	5 mg/m ³
Mineral Oil	64742-62-7	20-25	5 mg/m ³	5 mg/m ³
Lithium Hydrostearate/Sebacate Complex	68815-49-6	4-9	—	—
Zinc Alkyldithiophosphate	68649-42-3	0-2	—	—
Aluminum Paste (30%):				
Aluminum, as Al	7429-90-5	20-25	15 mg/m ³	10 mg/m ³
Aliphatic Petroleum Distillates	8052-41-3	10-15	2900 mg/m ³	525 mg/m ³
Stearic Acid	57-11-4	1-2	—	—
Aromatic Petroleum Distillates	64742-95-6	1-2	5 mg/m ³	5 mg/m ³

Additional Information: Part No. 120650 (0.5 oz tube); Part No. 107408 (4 oz can); Part No. 197007 (5 gallon container). May also contain minute amounts of lithium and molybdenum lubricant compounds.

Section 3. Hazard Identification

Acute Health Effects:

Skin: Excessive contact may cause skin irritation and dermatitis.

Eye: Direct contact with eye will cause irritation.

Inhalation: No adverse effects are expected.

Ingestion: Ingestion of product may cause nausea, vomiting and diarrhea.

Chronic Health Effects:

Existing skin rash or dermatitis may be aggravated by repeated contact.

OSHA Hazard Classifications: None.

Carcinogenicity: Not considered to be a carcinogen by either OSHA, NTP, IARC, or ACGIH.

Section 4. First Aid Measures

Eye Contact: Flush eyes with water for 15 minutes. Remove any contact lenses and continue to flush. Obtain medical attention if irritation develops and persists.

Skin Contact: Remove excess with cloth or paper. Wash thoroughly with mild soap and water. Obtain medical attention if irritation develops and persists.

Ingestion: Contact physician or local poison control center *immediately*.

Inhalation: Remove patient to fresh air and obtain medical attention if symptoms develop.

Section 5. Fire Fighting Measures

Material Flash Point: > 383°F (195°C). Will burn if exposed to flame.

Extinguishing Media: Carbon dioxide, dry chemical or foam.

Special Fire Fighting Procedures: None.

Explosion Hazards: None. Aluminum powder can react with water to release flammable hydrogen gas. In the form of this product, this reaction is not expected.

Section 6. Accidental Release Measures

Scrape up and dispose of as solid waste in accordance with state and federal regulations.

Section 7. Handling and Storage

Store in dry place. Keep container closed when not in use.

Section 8. Exposure Controls and Personal Protection.

Ventilation: No special ventilation is required when working with this product.

Respiratory Protection: None required.

Eye Protection: Not normally required. However, use chemical safety goggles or faceshield if potential for eye contact exists, especially if material is heated.

Hand/Clothing Protection: Not normally required. Protective gloves and clothing are recommended, as material is difficult to remove from skin and clothing.

Other Protective Equipment: None required.

Section 9. Physical and Chemical Properties

Appearance/Odor: Aluminum color, semi-solid material, pleasant odor.

Solubility in Water: Negligible.

Specific Gravity: 0.86.

Section 10. Stability and Reactivity

Stability: Stable.

Reactivity: Hazardous polymerization will not occur.

Prepared by: PROSAR, 1295 Bandana Boulevard, Suite 335, St. Paul, MN 55108 (651-917-6100).

Incompatibilities: Strong oxidizing agents and halogens.

Hazardous Decomposition Products: Carbon dioxide, carbon monoxide.

Section 11. Toxicology Information.

No data available.

Section 12. Ecological Information

Chemical Fate Information: Hydrocarbon components will biodegrade in soil; relatively persistent in water.

Section 13. Disposal Consideration

Dispose of as solid waste in accordance with local, state and federal regulations.

Section 14. Transportation Information

DOT Classification: Not classified as hazardous.

Section 15. Regulatory Information

SARA Title III Supplier Notification: Include in Section 311/312 inventory reports if amounts exceed 10,000 pounds. Aluminum compounds are subject to the reporting requirements under Section 313 of Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372). Ingredients listed in TSCA Inventory.

Section 16. Other Information

This information is furnished without warranty, expressed or implied, except that is is accurate to the best of our knowledge.

APPLICATION

These boiler-mounted, immersion type controllers operate in response to temperature changes in hydronic heating systems.

L4006A,C; L4007A break the circuit on a temperature rise to the control setting. They are used for high limit or low limit control. When used as a controller or as a low limit, a separate high limit must be used.

L4006B, L4007B make the circuit on a temperature rise. They are used as a circulator controller, delaying circulator operation if boiler water temperature is below the control setting.

L4006E (horizontal well with vertical option) models include trip-free manual reset switch. Whenever the temperature of the controlled medium reaches the high limit setting, these models are designed to break the control circuit. A reset button at the front of the case must be pressed to re-establish the control circuit.

L4006G includes two switches which break simultaneously on temperature rise to the control setting. This model is used for high limit and circulator control.

Depending on the model, the Aquastat controllers may include:

- bulb compression fitting (L4006C only),
- immersion well for mounting vertically, or
- immersion well for mounting horizontally.

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. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

CAUTION

Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

MOUNTING

The boiler manufacturer generally provides a tapping for insertion of the Aquastat controller's sensing element. This tapping is located in a representative point where typical boiler water temperature can be measured. Depending on model, the element is either inserted in an immersion well or through a bulb compression fitting.

If immersion well or bulb compression fitting must be ordered, refer to form 68-0040 "Wells and Fittings for Temperature Controllers," for part numbers and ordering information.

FOR MODELS USING AN IMMERSION WELL

The well of the Aquastat controller must always be exposed to average temperature circulating water, and must never be located close to a hot or cold inlet or steam coil. Where the tapping is on the side of the boiler, use an Aquastat controller in which the well can be mounted

horizontally. Where the tapping is on top of the boiler, use a model in which the well can be mounted vertically. Some models include an adapter for vertical or horizontal mounting. See Fig. 2.

IMPORTANT

Controller may be used with or without immersion well. Well, if used, must fit sensing bulb snugly for good thermal response. Bulb should be inserted until it rests against bottom of well, then hold it there while tightening the tubing clamp.

NOTE: Some models have an adjustable tubing length to 3 in. [76 mm]. In these models, extra tubing inside the case may be pulled out, if needed.

Follow the mounting instructions furnished by the system manufacturer if available; otherwise, proceed as follows.

INSTALLING THE IMMERSION WELL

On existing installations, shut off the power and remove the old control. If the old immersion well appears suitable, and if the adapter clamp on the Aquastat controller fits the old well spud, this well need not be replaced.

To install new well:

1. If the system is filled, drain system to a point below the boiler tapping.
2. Remove old well from boiler tapping.
3. Install the immersion well. Both 1/2 and 3/4 inch x 1/4 NPT wells are available. Depending on size of boiler tapping and model ordered, a reducer fitting may be required.
4. Fill the system. Make sure that the well is screwed in tightly enough to prevent leakage. Do NOT use the case as a handle to tighten well after controller is secured to well.

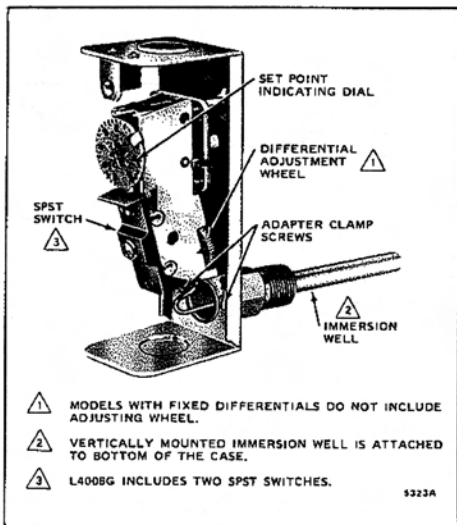


Fig. 1—Internal view showing L4006 (model with horizontal well).

FOR INSTALLATION OF SENSING BULB IN IMMERSION WELL

1. Loosen screw (at top of case, above scale setting), and remove cover. Loosen 2 screws that secure adapter clamp. See Fig. 1.
2. Insert the sensing element into the immersion well.
3. Fasten the case of the Aquastat controller to the well with the adapter clamp. Make certain that the clamp is properly positioned over the groove of the well spud. Also be sure the flange at the opening of the well fits snugly into the opening of the case. The sensing bulb must bottom in the well for best temperature response.

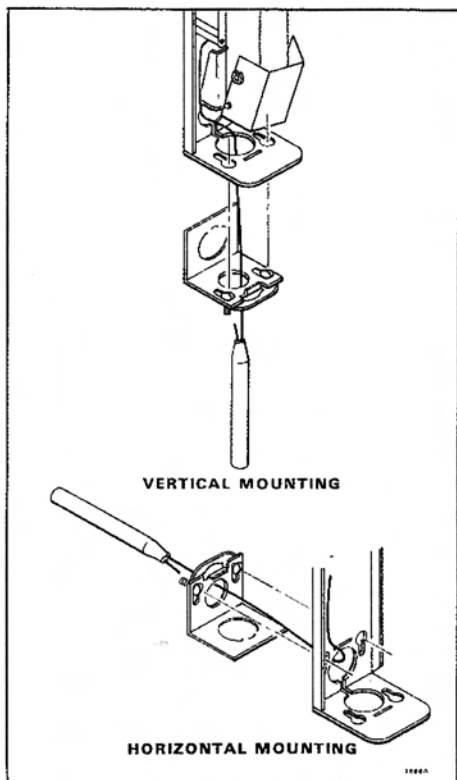


Fig. 2—Mounting bracket placement for vertical or horizontal mounting.

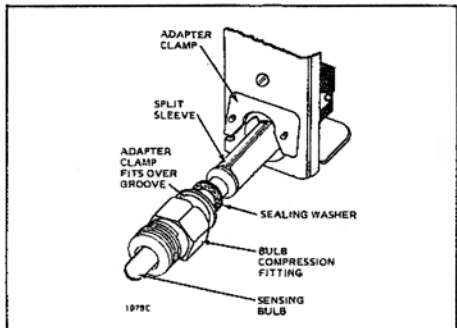


Fig. 3—Direct immersion model with bulb compression fitting partially removed.

MODELS DESIGNED FOR DIRECT IMMERSION (without well)

For either horizontal or vertical placement of the mounting bracket, see Fig. 2. Some models, which provide for direct immersion of the sensing element into the boiler, include a bulb compression fitting instead of an immersion well. Install fitting in boiler tapping. Be sure sealing washer is in place as shown in Fig. 3. Make sure that spud of fitting is screwed in tightly enough to prevent leaking. Insert sensing bulb through fitting. Adjust the adapter clamp so that it fits over the groove at the opening of the fitting. Tighten adapter clamp screws so that Aquastat controller is firmly attached to fitting.

WIRING

Disconnect power supply before connecting wiring to avoid electrical shock or equipment damage.

All wiring must comply with local electrical codes and ordinances.

Refer to Figs. 4-9 for typical diagrams of Aquastat controllers used in heating systems.

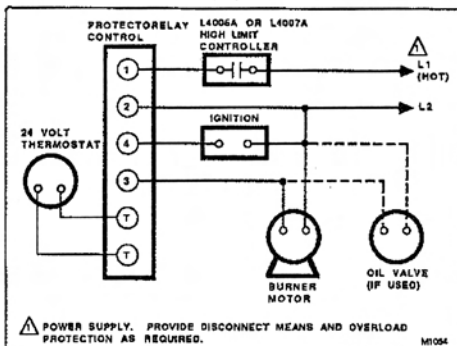


Fig. 4—Typical hookup for oil-fired gravity system, using L4006A or L4007A.

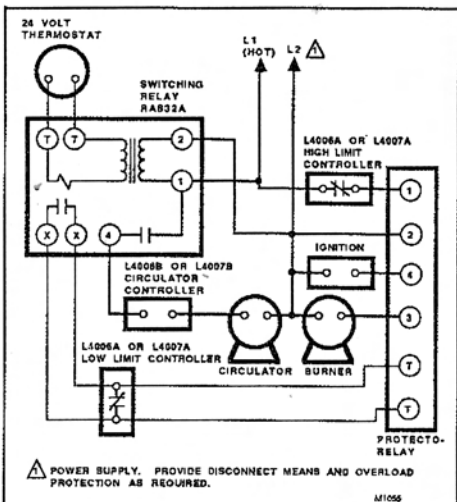


Fig. 5—Hookup for oil-fired, summer-winter hydronic system with domestic hot water using L4006A or B, L4007A or B. This is typical where control for domestic hot water is added, or where each Aquastat controller is mounted in a separate location.

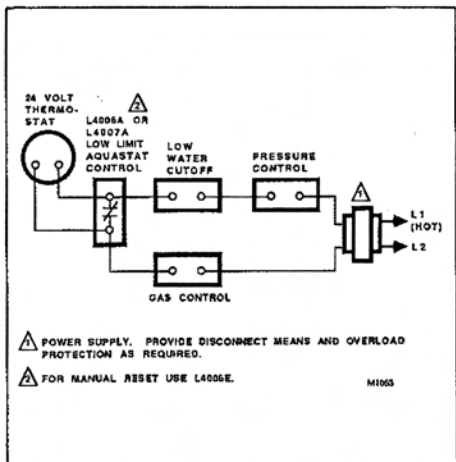


Fig. 6—Typical hookup for gas-fired system with domestic hot water, using L4006A, E or L4007A.

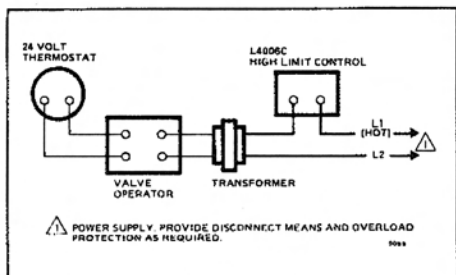


Fig. 7—Typical wiring diagram for 24 V gas system, using L4006C.

OPERATION

For proper selection of settings, follow the boiler manufacturer's recommendations.

1. High limit controller—shuts off burner if water temperature exceeds high limit setting. Burner restarts when temperature drops to high limit setting, less differential.

NOTE: If L4006E, see Manual Reset, below.

2. Low limit controller—maintains minimum boiler temperature for domestic hot water. Turns on burner at temperature setting, minus differential.

3. Circulator controller—prevents circulation of water that is not hot enough. Breaks circulator circuit at temperature setting minus differential, remakes at setting.

ADJUSTING

Set the differential to correspond with the boiler manufacturer's recommendations. To adjust models with adjustable differential, rotate the wheel on the back of the snap switch until the desired reading is aligned with the "V" notch in the frame. The wheel provides an adjustment from 5 F to 30 F [3 C to 17 C]. Replace the cover on the Aquastat controller.

Adjust the control point to correspond with the boiler manufacturer's recommendations. To adjust, insert a

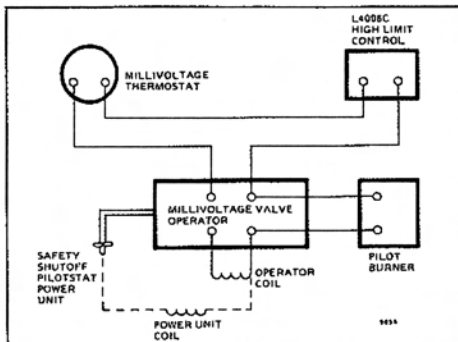


Fig. 8—Typical Powerpile system wiring diagram, using L4006C.

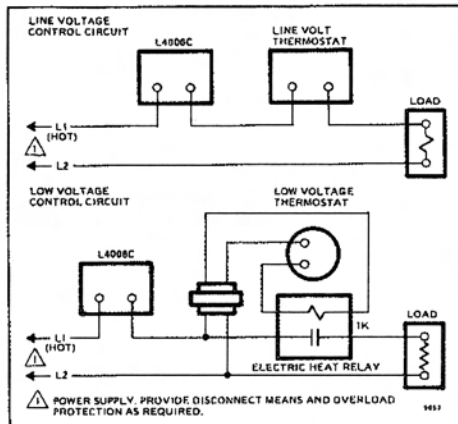


Fig. 9—Typical systems with 120 V electrical heat primaries, using L4006C.

screwdriver in the slotted screw type head located beneath the window in the cover. Turn the scale to the desired control point.

MANUAL RESET

If the device includes manual reset (model L4006E), be sure to press the red reset button on the front of the case to make sure that the controller is not locked out on safety. In checking out the system, adjust the limit setting low enough so that temperature of the controlled medium reaches the high limit setting. When the limit setting is reached, the Aquastat controller locks out and the burner shuts down. When temperature of the controlled medium drops to the high limit setting, minus differential, push the manual reset button and the system should again be operative. Reset control to proper high limit setting.

CHECKOUT

Check to make certain the Aquastat controller has been installed and adjusted properly. Put the system into operation and observe the action of the device through several cycles to make certain that it provides proper control of the system as described under OPERATION. Further adjustments then can be made to meet more exact comfort requirements.