BTH Electric Boilers

Models ranging from 8 kW to 36 kW :
240 Volts (1 phase) & 600 Volts (3 phases).

USE & CARE MANUAL

WITH INSTALLATION INSTRUCTIONS FOR THE CONTRACTOR

Your *BTH Electric Boiler* has been carefully assembled and factory tested to provide years of trouble-free service. The following information and safety measures are provided to enable proper installation, operation, and maintenance of this product.

It is imperative that all persons who are expected to install, operate or adjust this boiler should read these instructions carefully.

Any questions regarding the operation, maintenance, service or warranty of this electric boiler should be directed to the supplier.

When all installation steps have been completed, insert this installation manual in its original envelope, and keep in a safe place (close to the boiler) for future reference.

THERMO 2000 INCORPORATED revision: Oct. 2015
Printed in Canada

Ratings & Specifications

Electric Ratings for 240 VAC /1 ph* (3 wire copper conductors)

Model No.	Electric Elements (in Watts) at 240V				Total at 240V*			Suggested Wires 90C*	Suggest. Breakers*
	A	B	C	D	Watts	Amp.	BTU	CU	Amp.
BTH 8	**5 000**	**3 000**	**------**	**------**	**8 000**	**33.3**	**27 296**	**8**	**50**
BTH 10	**5 000**	**5 000**	**------**	**------**	**10 000**	**41.6**	**34 120**	**6**	**60**
BTH 12	**3 000**	**3 000**	**3 000**	**3 000**	**12 000**	**50**	**40 944**	**6**	**70**
BTH 15	**3 000**	**4 500**	**3000**	**4 500**	**15 000**	**62.5**	**51 180**	**6**	**80**
BTH 18	**4 500**	**4 500**	**4500**	**4 500**	**18 000**	**75**	**61 416**	**4**	**100**
BTH 20	**5 000**	**5 000**	**5000**	**5 000**	**20 000**	**83.4**	**68 240**	**3**	**110**
BTH 24	**6 000**	**6 000**	**6000**	**6 000**	**24 000**	**100**	**81 888**	**3**	**125**
BTH 27	**3 x 4 500**		**3 x 4 500**		**27 000**	**112.5**	**92 124**	**2**	**150**
BTH 30	**3 x 5 000**		**3 x 5 000**		**30 000**	**125**	**102 360**	**1**	**175**
BTH 33	**3 x 5 000**		**3 x 6 000**		**33 000**	**138**	**112 596**	**1**	**175**

***** Boilers could be operated at 208Vac/1ph. The resulting capacity will be 75% of the nominal capacity at 240V and the amperage at 87%.

* The wire size and breaker may be different upon specific installation (local electrical codes have priority).

Electric Ratings for 600 VAC / 3 ph (3 wire copper conductors) :

Model	Electric Elements		Electric Elements		Total			Suggested wire 90C	Suggested breaker
No.	Quantity	Watts	Quantity	Watts	kW	Amp.	BTU	RW-90	HRC “D”
BTH 9	**3**	**3 000**	**-------**	**------**	**9**	**8.7**	**30 708**	**14**	**15 A**
BTH 13	**3**	**4 500**	**-------**	**------**	**13.5**	**13**	**46 062**	**12**	**20 A**
BTH 18	**6**	**3 000**	**-------**	**-------**	**18**	**17**	**61 416**	**10**	**30 A**
BTH 22	**3**	**3 000**	**3**	**4 500**	**22.5**	**22**	**76 770**	**10**	**30 A**
BTH 27	**6**	**4 500**	**-------**	**-------**	**27**	**26**	**92 124**	**8**	**40 A**
BTH 30	**6**	**5 000**	**-------**	**-------**	**30**	**29**	**102 360**	**8**	**40 A**
BTH 36	**6**	**6 000**	**-------**	**-------**	**36**	**35**	**122 832**	**8**	**50 A**

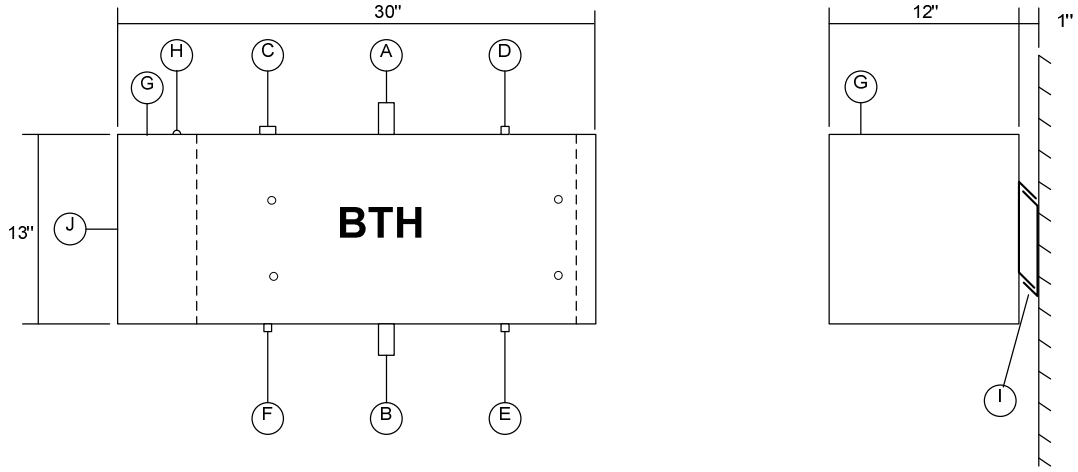
* The wire size and breaker may be different upon specific installation (Local electrical codes have priority).

Connections sizes & overall dimensions

Connections sizes		Boiler overall dimensions	
Boiler return	**1 “ NPT M**	**Height**	**12 inches**
Boiler feed	**1 “ NPT M**	**Depth**	**12 inches**
Waterworks	**1/2 “ NPT F**	**Width**	**30 inches**
Safety valve	**3/4 “ NPT F**	**Shipping weight**	**99 lbs.**
Drain valve	**1/2 “ NPT F**		

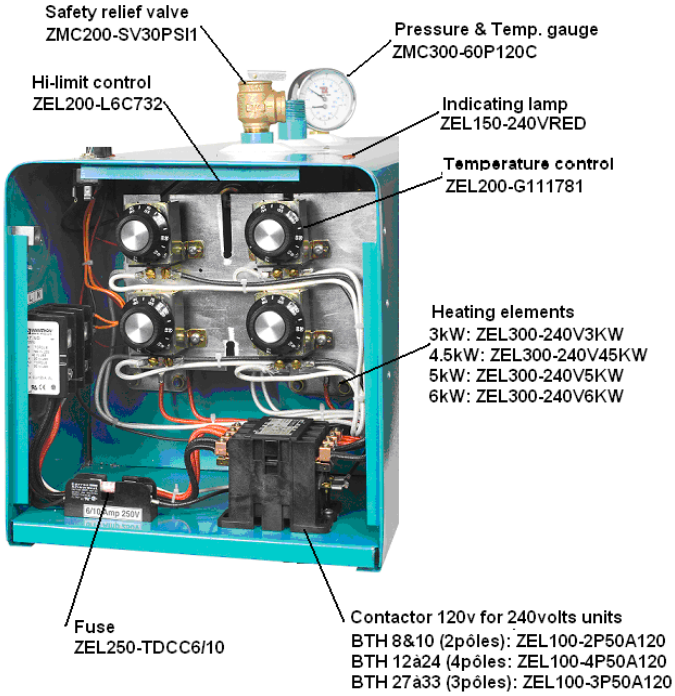
Operating temperature : from 50°F to 190°F. Maximum operating pressure: 30 p.s.i.

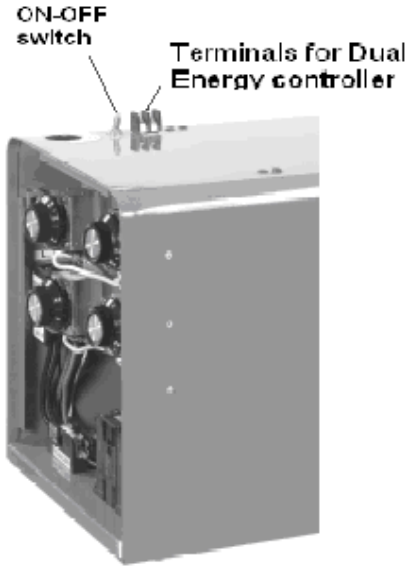
Unit description:



Legend :

A. Boiler Water Supply Connection (1 inch diameter, NPT male)
B. Boiler Water Return Connection (1 inch diameter, NPT male)
C. Safety Relief Valve (¾ inch NPT female)
D. Temperature & Pressure Gage (1/2 inch NPT female)
E. Drain Valve (1/2 inch NPT female)
F. Fill Water Connection (1/2 inch NPT female)
G. Electric Line Knock-Out (1 inch)
H. Pilot Light
I. Boiler Wall Hanging Brackets
J. Electrical Compartment (left or right depending on the location of the hanging bracket on the boiler)





General Safety Precautions

Be sure to read and understand the entire Use & Care Manual before attempting to install or to operate this water heater. Pay particular attention to the following General Safety Precautions. Failure to follow these warnings could cause property damage, bodily injury or death. Should you have any problems understanding the instructions in this manual, STOP, and get help from a qualified installer or technician.

Introduction

WARNING

These important safeguards and instruction appearing in this manual are not meant to cover all possible conditions and situations that may occur. It should be understood that common sense, caution and care are factors which cannot be built into every product. These factors must be supplied by the person(s) caring for and operating the unit.

LOCAL INSTALLATION REGULATIONS

This electric boiler must be installed in accordance with these instructions and in conformity with local codes, or in the absence of local codes, with the National Plumbing Code and the National Electric Code, current edition. In any case where instructions in this manual differ from local or national codes, the local or national codes take precedence.

SECURITY CONSIDERATIONS

Domestic and commercial installations have a maximum design operating pressure limited to 30 psi by a safety relief valve.

Boiler maximum operating temperature is 190°F by design. This boiler is designed **to be used only** in a hot water heating system.

CAUTION

The heat transfer medium must be water or other non-toxic fluid having a toxicity rating or class of 1, as listed in clinical Toxicology of Commercial products, 5th edition. Concentration of propylene-glycol shall be limited to 50%

LOCATION

The electric boiler should be installed in a clean, dry location. Long hot water lines should be insulated to conserve water and energy. The electric boiler and water lines should be protected from exposure to freezing temperature.

The electric boiler must be installed horizontally directly on the wall. Use the hanging brackets for leveling the unit The electric boiler must be located or protected so as not to be subject to physical damage, for example, by moving vehicles, area flooding, etc. All models can be installed on combustible floors and in alcoves. Ambient temperature must not exceed 90°F.

CLEARANCE

For adequate inspection and servicing the following minimum clearance is necessary:

Right side	2 inches
Left side	14 inches
Top & Bottom of the boiler	6 inches
Front side of the boiler	2 inches
Back side of the boiler	1 inch

CAUTION

The electric boiler should not be located in an area where leakage of the tank or water connections will result in damage to the adjacent area or to lower floors of the structure. When such areas cannot be avoided, a suitable drain pan or non-flammable catch pan, adequately drained, and must be installed under the boiler. The pan must be connected to a drain. NOTE: Auxiliary catch pan MUST conform to local codes.

CORROSIVE ATMOSPHERE

The electric boiler should not be located near an air vent blowing a corrosive atmosphere or high humidity. The limited warranty is void when the failure of the electric boiler is due to a corrosive atmosphere.

CHECK LIST

Please check the identification tag on the unit to make sure you have the right model.

List of components shipped with the unit :

- **Pressure relief valve set at 30 PSI.**
- **Drain valve.**
- **Tridicator (temperature & pressure gage).**

SHIPMENT INSPECTION

Inspect the electric boiler for possible shipping damage. The manufacturer's responsibility ceases upon delivery of goods to the carrier in good condition. Consignee must file any claims for damage, shortage in shipments, or non-delivery immediately against carrier.

Installation

⚠ WARNING

The manufacturer's warranty does not cover any damage or defect caused by installation, or attachment, or use of any special attachment other than those authorized by the manufacturer into, onto, or in conjunction with the water heater. The use of such unauthorized devices may shorten the life of the boiler may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices

WIRING

Wiring must conform to the National Electrical Code and to state or local code requirements.

The electric boiler must be electrically grounded in accordance with local codes, or, in the absence of local codes, with the National Electrical Code.

120/240Vac models

Wiring must be from a 240 Volt (single phase, 60 Hz) circuit protected by a properly sized breaker. Wire gage (3 wires+ground) must be properly sized. Consult the boiler rating plate to select the proper breaker and wire gage.

600Vac models

Line wiring must be from a 600 Volt (3 phase, 60 Hz) circuit protected by a properly sized breaker. Wire gage (3 wires+ ground) must be properly sized. Consult the boiler rating plate to select the proper breaker and wire gage.

Circulator zoning wiring

Components must be wired to ensure that only the circulator corresponding to the zone calling for heat is actuated.

Zone valve zoning wiring

Connect the low voltage thermostat to the zone valve. Components must be wired to ensure that only the zone valve corresponding to the zone calling for heat is actuated and that the circulator is powered on a demand from any zone. The transformer used to power the zone valves must be sized for the load represented by all zone valves in the heating system.

BOILER WATER CONNECTIONS

This electric boiler may be connected individually or in parallel with other boilers. If two or more boilers are connected, the "reverse-return piping" method (whereby the boiler with the first return inlet also has the last supply outlet and so forth until the last return inlet corresponds to the first supply outlet) should be used to connect the boilers in parallel, to ensure an equal water flow rate through each boiler.

The boiler water supply, located on the top side, and the boiler water return, located on the bottom side of the boiler are steel pipes (male NPT threaded connection) where supply and return line connections are to be made.

Installing a union is recommended on the boiler water supply and return lines to facilitate boiler disconnection for servicing.

Dielectric unions are required for protection of the boiler and piping if dissimilar pipe material such as galvanized steel and copper are present.

Use only clean, new piping for boiler water lines. Local codes or regulations shall govern the exact type of material to be used.

Insulate all pipes containing hot water, especially in unheated areas.

Install shutoff (ball) valves for servicing convenience. Thermometer(s) should be installed on the boiler water supply and return lines.

Cap or plug unused connections on the boiler. **Do not cap the pressure relief valve** on the boiler since it will damage and shorten the life of the boiler and may endanger life and property.

Flow check valve

If the heating system includes a single pump, then to minimize flow by gravity and heat loss during non-draw periods, **a flow check valve must be installed.**

Pressure relief valve

An automatic pressure relief valve must be installed during boiler setup. The pressure rating of the relief valve must not exceed 30 psi. The safety relief valve must meet the requirements of

the *ASME Boiler and Pressure Vessel Code* and limit the maximum operating boiler pressure. It is a safety device, not an operating control.

The BTU per hour rating of the relief valve must equal or exceed the BTU per hour input of the boiler(s) or heat source(s) as marked on the boiler(s) rating plate.

Connect the outlet of the relief valve to a discharge line with its lower tip at most 6" above a floor drain, well clear of any live electrical parts. The discharge line must pitch downward from the valve to allow complete draining by gravity of the relief valve and discharge line, and be of a diameter no smaller than that of the valve outlet. The tip of the discharge line should not be threaded or concealed and should be protected from freezing. No valve of any type, restriction or reducer coupling should be installed on the discharge line. Local codes shall govern the installation of relief valves.

SYSTEM PRESSURE CONTROL

Expansion tank

Pressure control devices within the system ensure that each component operates within minimum and maximum allowable pressures and maintain minimum pressure for all normal operating temperatures. They also allow air bleeding, prevent cavitation at the pump inlet and prevent water from boiling within the system; all this is accomplished with minimal addition of new water.

The increase in boiler water volume resulting from higher temperature is stored in the expansion tank during periods of high operating temperature and is returned to the system when the temperature decreases.

The expansion tank must be able to store the required volume of boiler water during maximum design operating temperature without exceeding the maximum allowable operating pressure, and to maintain the required minimum pressure when the system is cold. Contact your installing contractor, plumbing supply house, or local plumbing inspector for assistance.

The point where the expansion tank is connected should be carefully selected to avoid the possibility that normal operation of automatic check or manual valves will isolate the tank from a hot boiler or any part of the system. Pre-charged diaphragm expansion tanks are preferable to air control.

These tanks incorporate a balloon-like bladder or diaphragm. It is inflated, prior to filling the system, to a pressure equal to the setting of the water pressure makeup regulator.

The expansion tank should be located on the suction or intake side of the pump. The pump can be located either just upstream or just downstream from the boiler.

Water pressure makeup regulator

Make-up systems **must be employed** as required by codes. An a**utomatic fill valve** must be used with a backflow preventer as required, to maintain minimum system pressure by supplying water to make up for leakage.

Air bleeder

Oxygen should be excluded from the system to prevent corrosion. As mentioned in the expansion tank paragraph above, this precludes the use of air in direct contact with the boiler water as a pressurization means.

Installation of manual or automatic air vent devices prevents air from accumulating in the system. Air vents should be installed at all high points to remove trapped air during initial setup and to ensure that the system is tight. Regularly purge the air out of the system while taking care to avoid personal injuries or property damage caused by hot boiler water spray.

Circulator zoning recommendations

The preferred location of the circulator pump for each zone is on the boiler supply side, with the expansion tank between the boiler and the pump.

A flow check valve must be installed in each zone, preferably on the outlet side of each circulator pump, to prevent water flow to other zones where no heat is required.

Zone valve zoning recommendations

The preferred location of the circulator pump is on the boiler supply side, with the expansion tank between the boiler and the circulator. Use zone valves with low pressure drop.

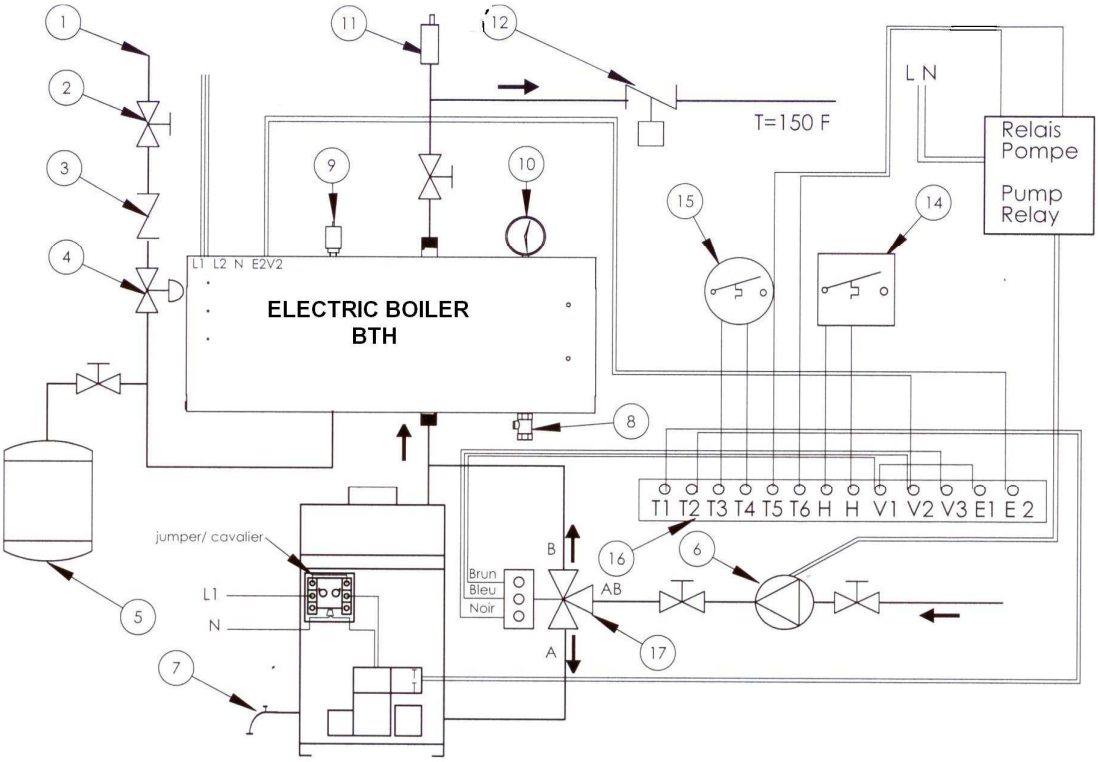
Dual energy installation

In order to obtain a special rate from your electric utility for residential use, your BTH boiler can be hooked-up to an existing oil heater. Contact your electric utility to find out if your property is eligible for such rates and how to register for them.

The CBE-EM dual-energy control (an available option, three-way, motorized valve (1'' NPT F standard) included) is specially designed to electric utility standards. The CBE-EM control selects the least expensive energy source based on outside temperature, user choice or a signal from your utility.

The CBE-EM dual-energy control will start up the oil burner upon receiving the appropriate signal and if the thermostat in the house is calling for heat. It will shut off when the temperature in the boiler reaches its target or when the thermostat in the house is not calling for heat.

A three-way, motorized valve (1'' NPT F standard) will direct the water flow either to the oil-fired heater or to your BTH electric boiler, depending on the signal received. This way, your oil heater will cool down and eliminate any energy loss, either through the chimney or by way of conduction in the boiler room.



THERMO 2000 inc.
BTH 240V

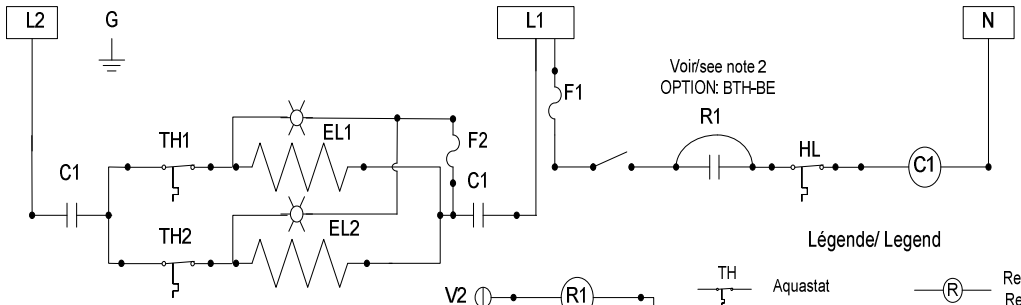
Schéma d'installation général/
General installation

Bi-Énergie avec valve 3 voies/
Dual-energy with 3-way valve

Legeng/Légende:
1) Main water supply / Alimentation d'eau
2) Maintenance valve/ Valve d'entretien
3) Check valve/ Clapet anti-retour
4) Pressure reducer/ Réducteur de pression
5) Expension tank/ Réservoir d'expansion
6) Circulating pump/ Pompe circulatrice
7) Purge valve/ Robinet élimination d'air
8) Drain valve/ Valve drainage
9) Safety valve/ Valve de sécurité
10) T & P Gage/ Tridicateur
11) Automatic air vent/ Purgeur d'air
12) Flow check valve/ Clapet antigravité
(required on systems without motorised zone valves)
(requise sur les systèmes n'ayant pas de valves motorisées)
14) Dual energy outside sensor/ Sonde ext. Bi-energie
15) Thermostat/ Thermostat
16) Dual energy control CBE-EM/ Contrôle Bi-énergie CBE-EM
17) Motorised 3 way valve/ Valve motorisée 3 voies

ELECTRIC BOILER WIRING DIAGRAM

Diagramme électrique/ Wiring diagram
BTH 240V
Modèle/Model 6 - 10 KW



Note 1: Bloc terminal (24 VAC) pour une installation avec le controleur bi-énergie Thermo 2000 modèle: "CBE-EM"/
Terminal block (24 VAC) for an installation with Thermo 2000 dual energy controller model: "CBE-EM"

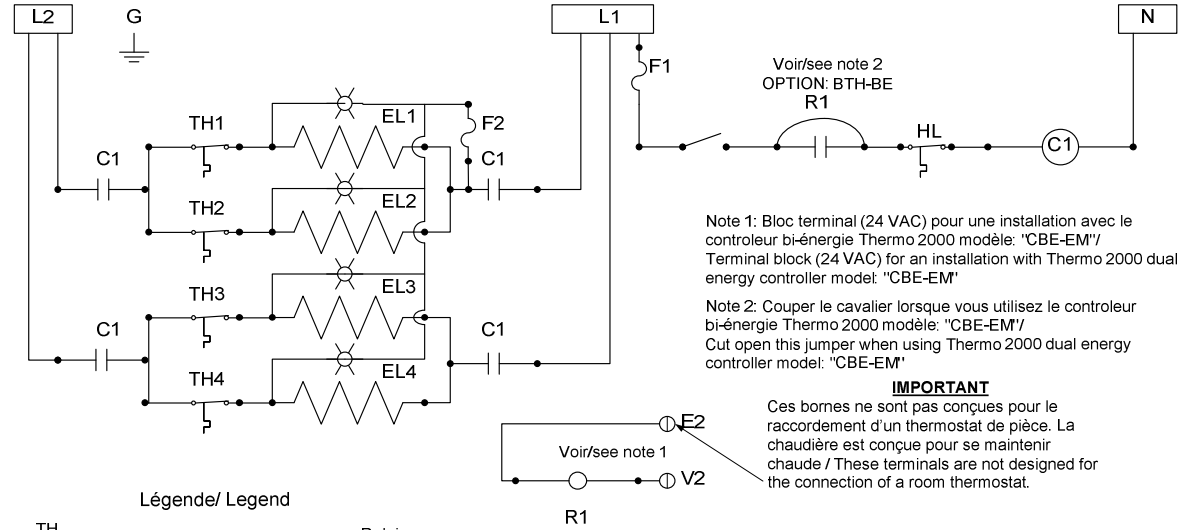
Note 2: Couper le cavalier lorsque vous utilisez le controleur bi-énergie Thermo 2000 modèle: "CBE-EM"/
Cut open this jumper when using Thermo 2000 dual energy controller model: "CBE-EM"

IMPORTANT
Ces bornes ne sont pas conçues pour le raccordement d'un thermostat de pièce. La chaudière est conçue pour se maintenir chaude / These terminals are not designed for the connection of a room thermostat.

Légende/ Legend

- TH — Aquastat
- Élément chauffant/ Heating element
- C — Contacteur de puissance / Power relay
- HL — Haute limite / Hi-Limit
- R — Relais / Relay
- Lampe témoin / Pilot light
- Commutateur ON/OFF / ON/OFF switch
- Fusible / Fuse
- Cablage en usine/ Factory wiring
- Cablage par l'installateur/ Wiring by others

Diagramme électrique/ Wiring diagram BTH 240V
modèle/ model 12 - 24 KW



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Légende/ Legend

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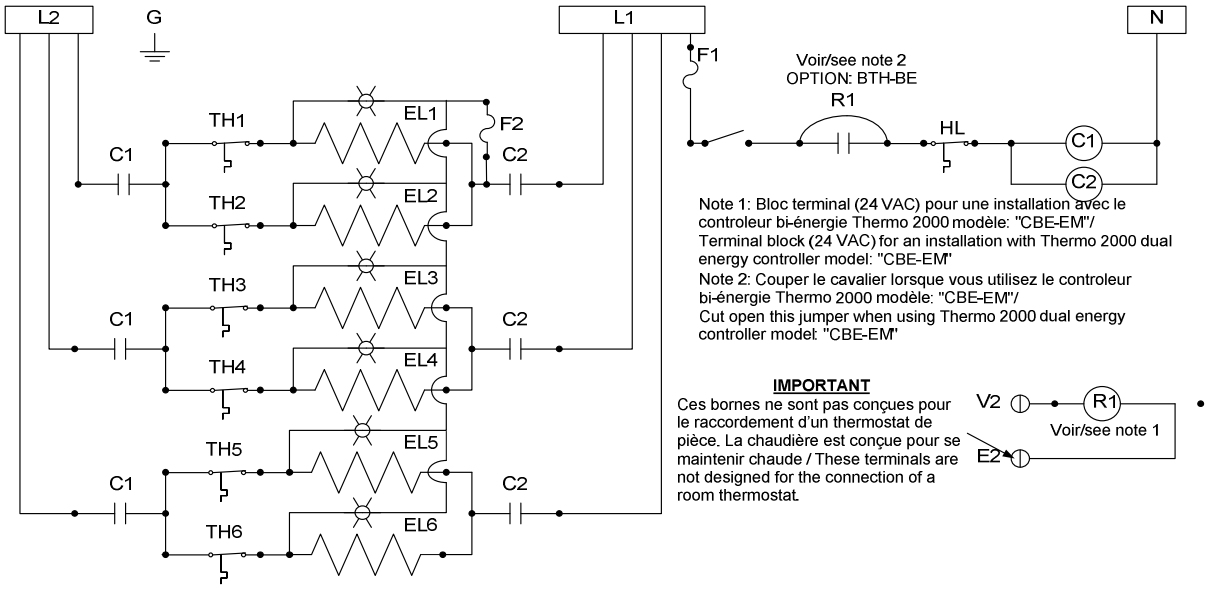
- Élément chauffant/ Heating element
- C — Contacteur de puissance / Power relay
- HL — Haute limite / Hi-Limit
- Disjoncteur / Braker
- R — Relais / Relay
- Lampe témoin / Pilot light
- Commutateur ON/OFF / ON/OFF switch
- Fusible / Fuse
- Cablage en usine/ Factory wiring
- Cablage par l'installateur/ Wiring by others

Diagramme électrique/ Wiring diagram BTH 240V
modèle/ model 27 KW



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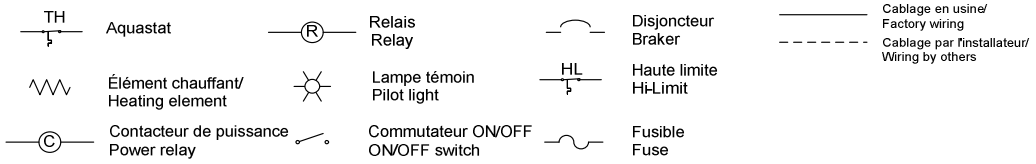
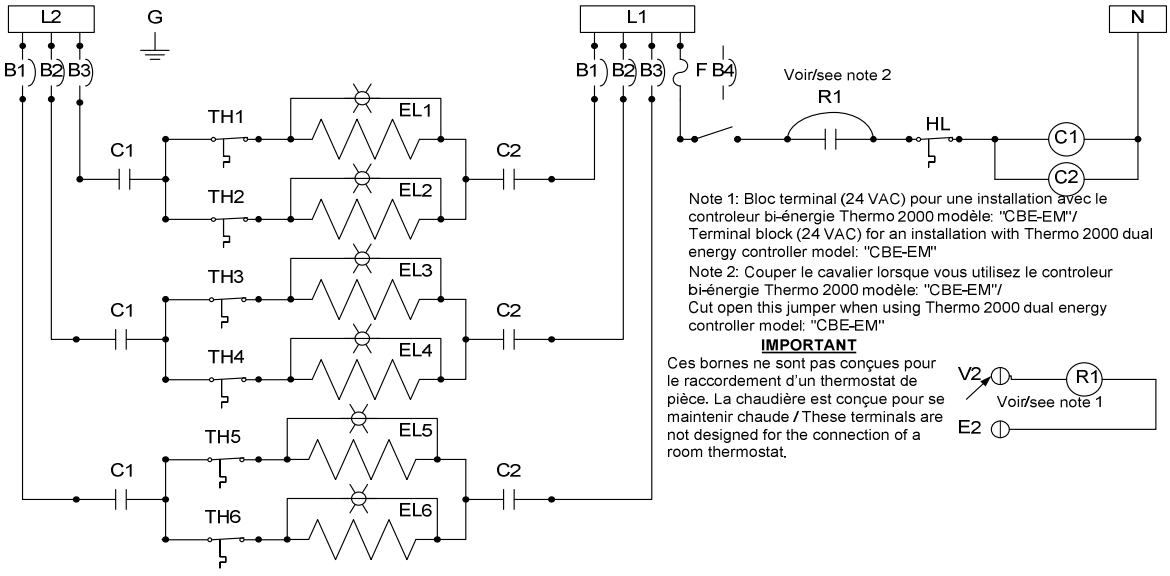


Diagramme électrique/ Wiring diagram BTH 240V
modèle/ model 30-33 KW



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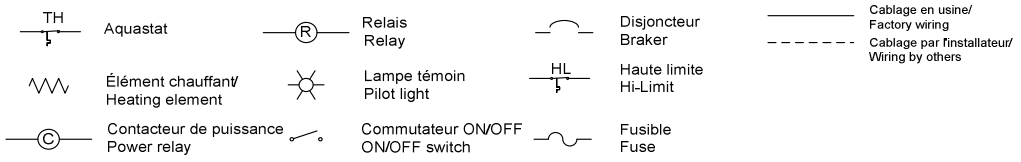
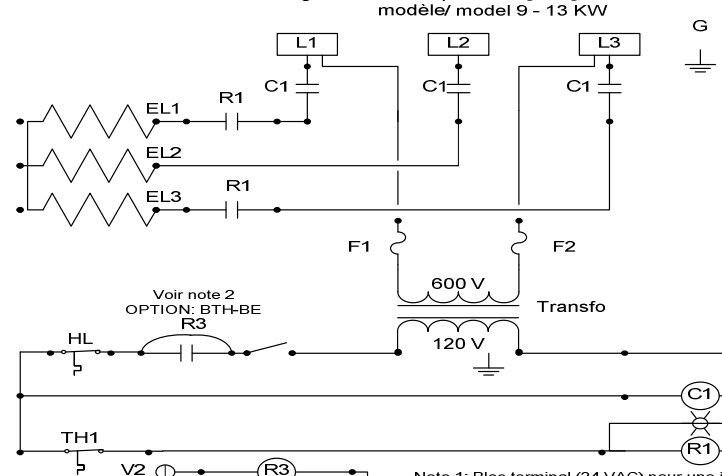


Diagramme électrique/ Wiring diagram BTH 600V
modèle/ model 9 - 13 KW



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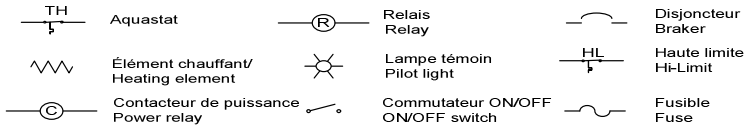
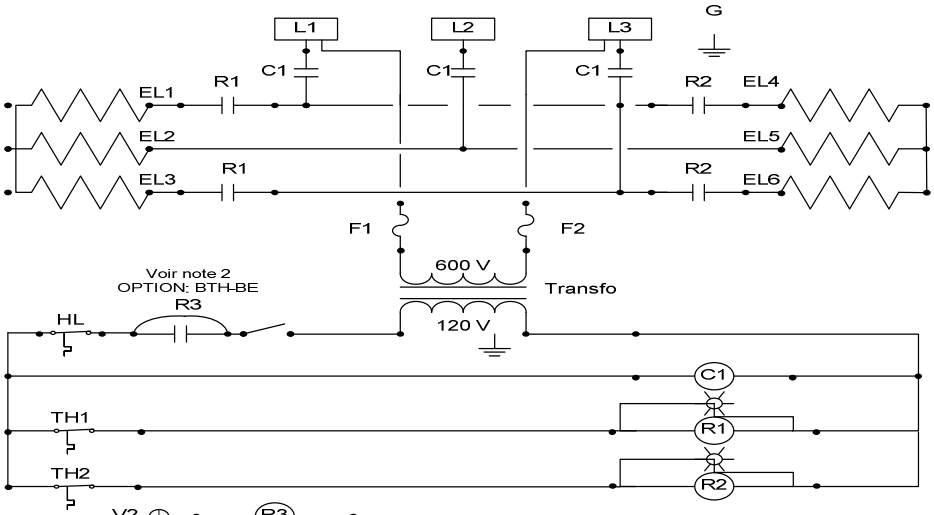


Diagramme électrique/ Wiring diagram BTH 600V
modèle/ model 18 - 36 KW



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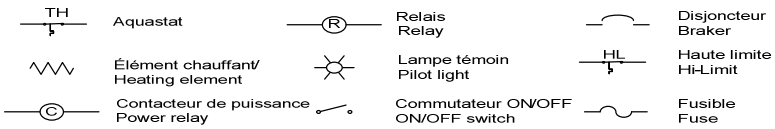


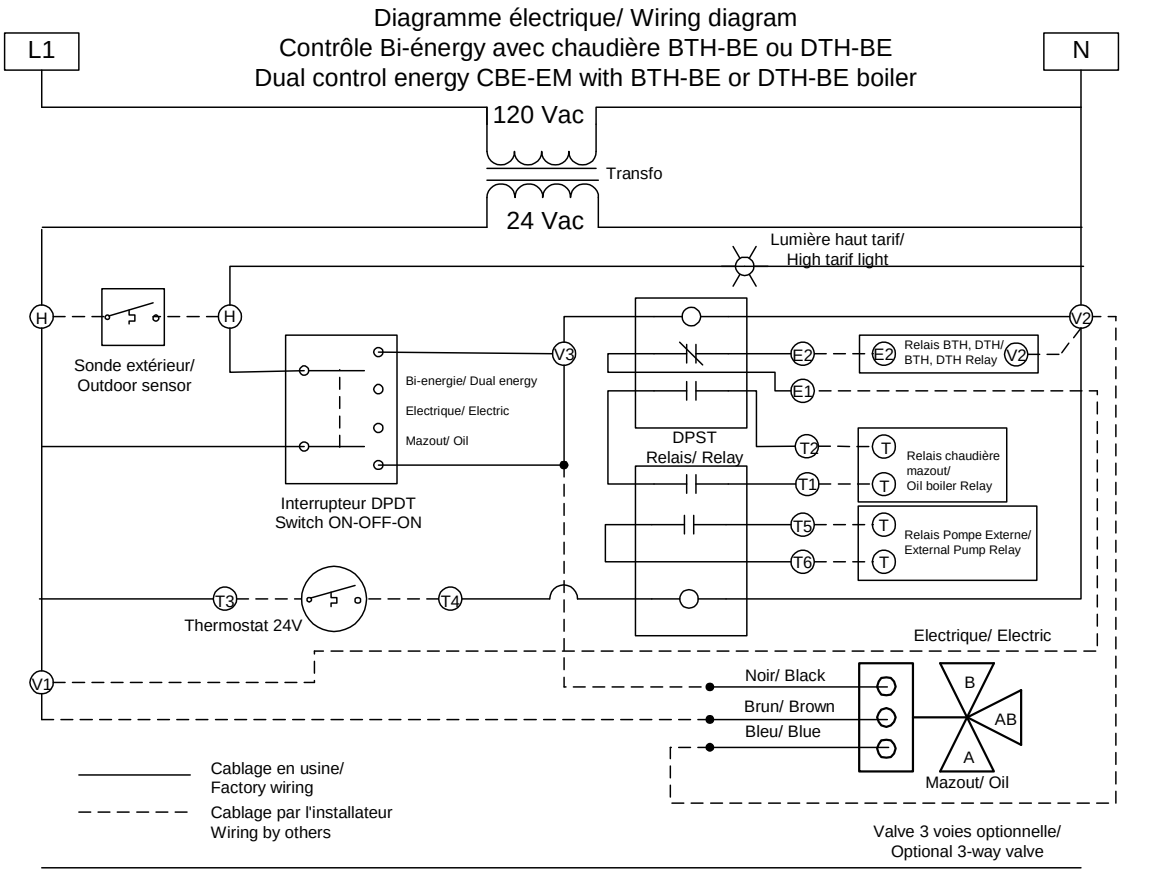
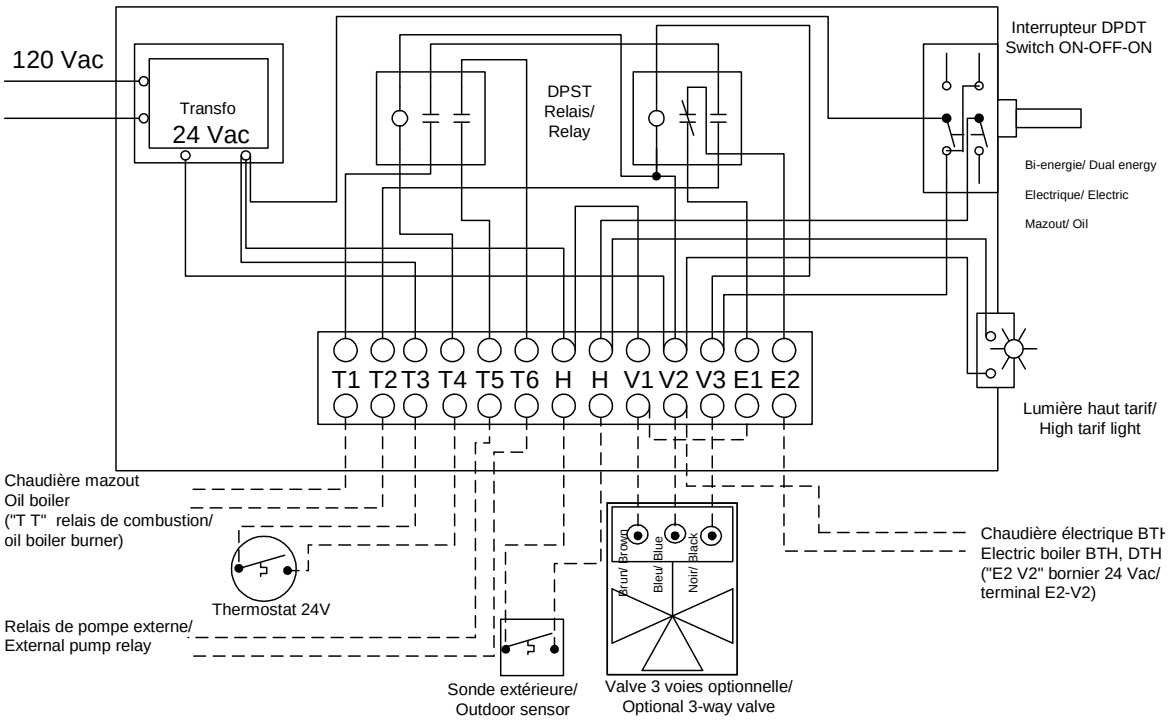


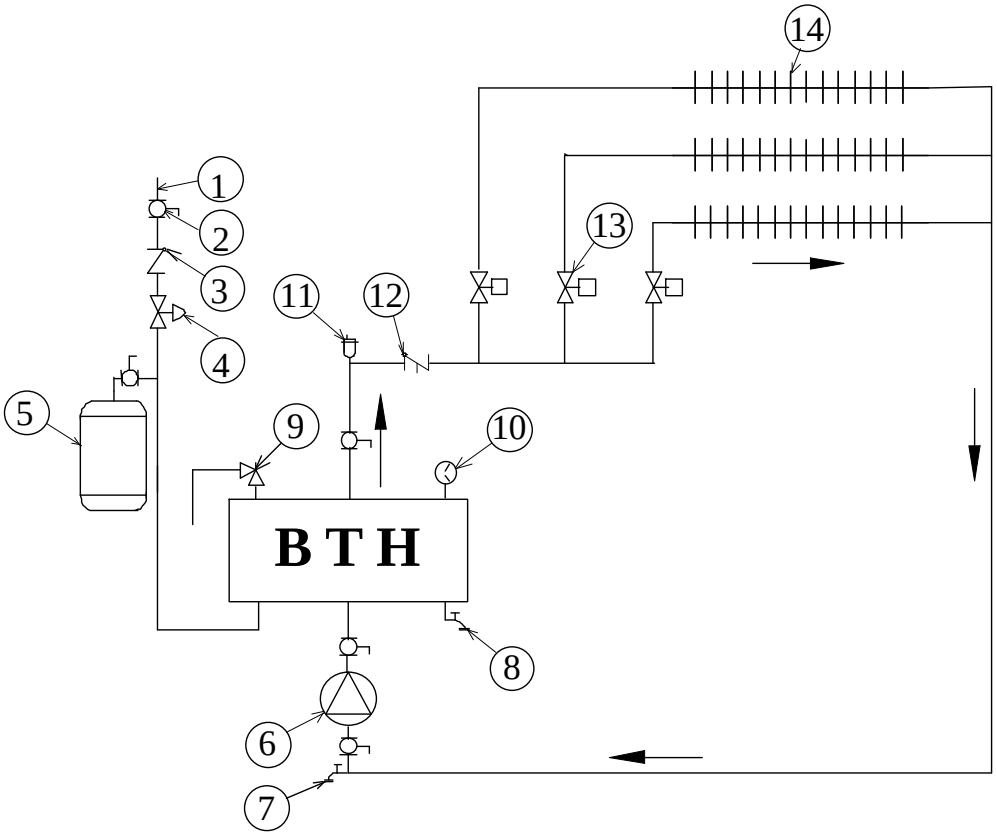
Diagramme électrique/ Wiring diagram
Contrôle Bi-énergy avec chaudière BTH-BE ou DTH-BE
Dual control energy CBE-EM with BTH-BE or DTH-BE boiler
L1
N
120 Vac
Transfo
24 Vac
Lumière haut tarif/
High tarif light
H
H
Sonde extérieur/
Outdoor sensor
V3
Bi-energie/ Dual energy
Electrique/ Electric
Mazout/ Oil
Interrupteur DPDT
Switch ON-OFF-ON
DPST
Relais/ Relay
E2
E2
Relais BTH, DTH/
BTH, DTH Relay
V2
V2
E1
T2
T
Relais chaudière
mazout/
Oil boiler Relay
T1
T
T5
T
Relais Pompe Externe/
External Pump Relay
T6
T
T3
Thermostat 24V
T4
Electrique/ Electric
V1
Noir/ Black
Brun/ Brown
Bleu/ Blue
B
AB
A
Mazout/ Oil
Cablage en usine/
Factory wiring
Cablage par l'installateur
Wiring by others
Valve 3 voies optionnelle/
Optional 3-way valve


120 Vac
Transfo
24 Vac
DPST
Relais/
Relay
Interrupteur DPDT
Switch ON-OFF-ON
Bi-energie/ Dual energy
Electrique/ Electric
Mazout/ Oil
T1 T2 T3 T4 T5 T6 H H V1 V2 V3 E1 E2
Lumière haut tarif/
High tarif light
Chaudière mazout
Oil boiler
("T T" relais de combustion/
oil boiler burner)
Thermostat 24V
Relais de pompe externe/
External pump relay
Sonde extérieure/
Outdoor sensor
Brun/ Brown
Bleu/ Blue
Noir/ Black
Valve 3 voies optionnelle/
Optional 3-way valve
Chaudière électrique BTH
Electric boiler BTH, DTH
("E2 V2" bornier 24 Vac/
terminal E2-V2)

Basic Piping Schematics

SYSTEM PIPING LAYOUT:/
SCHEMA D'INSTALLATION GÉNÉRAL:

VALVE ZONING TO BASEBOARDS/
ZONAGE DE PLINTHES PAR ROBINETS MOTORISÉS



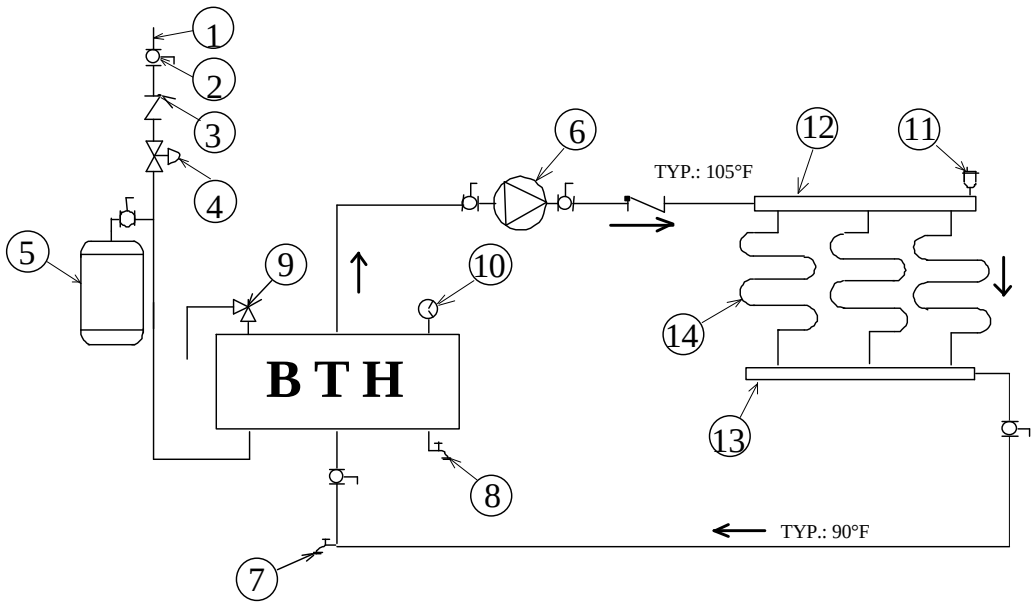
LEGEND/ LÉGENDE :

1- MAIN WATER SUPPLY/ ALIMENTATION D'EAU
2-MAINTENANCE VALVE/ VALVE D'ENTRETIEN
3-CHECK VALVE/ CLAPET ANTI-RETOUR
4-PRESSURE REDUCER/ RÉDUCTEUR DE PRESSION
5-EXPANSION TANK/ RÉSERVOIR DE DILATATION
6-CIRCULATING PUMP/ POMPE CIRCULATRICE
7-PURGE VALVE/ ROBINET D'ÉLIMINATION D'AIR
8-DRAIN VALVE/ VALVE DRAINAGE
9-SAFETY VALVE/ SOUPAPE DE SÛRETÉ
10-TEMPERATURE AND PRESSURE GAUGE/ THERMOMANOMÈTRE
11-AUTOMATIC AIR VENT/ PURGEUR D'AIR
12-FLOW CHECK VALVE (REQUIRED ON SYSTEMS WITHOUT MOTORIZED ZONE VALVES)/ CLAPET ANTI-GRAVITÉ (REQUIS SUR SYSTÈME N'AYANT PAS DE ROBINETS MOTORISÉS)
13-MOTORIZED ZONE VALVE/ ROBINETS MOTORISÉS
14-HOT WATER BASEBOARD/ PLINTHES CHAUFFAGE

Requirements:
1. The installation must conform to local, state, provincial, national codes. In any case where instructions conflict with the above, let those codes take precedence.
2. This is a basic piping schematic. Please consult the installation manual.
3. Install a pressure relief valve (safety relief valve) on the boiler.
4. Pipe all the safety relief valves and drain valves to the drain or according to the code

SYSTEM PIPING LAYOUT:/
SCHÉMA D'INSTALLATION GÉNÉRAL

DIRECT BOILER WATER SUPPLY TO RADIANT HEATING LOOP/
PLANCHER CHAUFFANT DIRECT



LEGEND/ LÉGENDE :

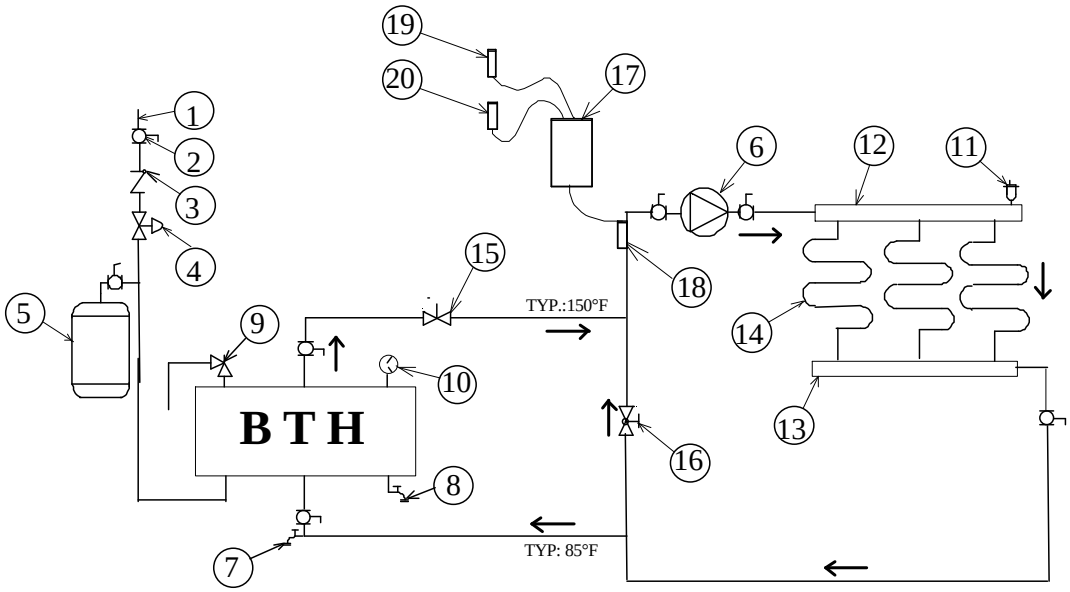
1- MAIN WATER SUPPLY/ ALIMENTATION D'EAU
2-MAINTENANCE VALVE/ VALVE D'ENTRTIEN
3-CHECK VALVE/ CLAPET ANTI-RETOUR
4-PRESSURE REDUCER/ RÉDUCTEUR DE PRESSION
5-EXPANSION TANK/ RÉSERVOIR DE DILATATION
6-CIRCULATING PUMP/ POMPE RECIRCULATION
7-PURGE VALVE/ ROBINET D'ÉLIMINATION D'AIR
8-DRAIN VALVE/ VALVE DE DRAINAGE
9-SAFETY VALVE/ SOUPAPE DE SÛRETÉ
10-TEMPERATURE AND PRESSURE GAUGE/ THERMOMANOMÈ
11-AUTOMATIC AIR VENT/ PURGEUR D'AIR
12-SUPPLY HEADER/ COLLECTEUR D'ALIMENTATION
13-RETURN HEADER/ COLLECTEUR DE RETOUR
14-RADIANT IN-FLOOR PIPING/ PLANCHER CHAUFFANT

Requirements:

1. The installation must conform to local, state, provincial, national codes. In any case where instructions conflict with the above, let those codes take precedence.
2. This is a basic piping schematic. Please consult the installation manual.
3. Install a pressure relief valve (safety relief valve) on the boiler.
4. Pipe all the safety relief valves and drain valves to the drain or according to the code.

SYSTEM PIPING LAYOUT:/
SCHÉMA D'INSTALLATION GENERAL

MODULATING BOILER WATER SUPPLY TO RADIANT HEATING LOOP/
PLANCHER CHAUFFANT MODULANT



LEGEND :

1- MAIN WATER SUPPLY/ ALIMENTATION D'EAU
2-MAINTENANCE VALVE/ VALVE D'ENTRETIEN
3-CHECK VALVE/ CLAPET ANTI-GRAVITÉ
4-PRESSURE REDUCER/ RÉDUCTEUR DE PRESSION
5-EXPANSION TANK/ RÉSERVOIR DE DILATATION
6-CIRCULATING PUMP/ POMPE RECIRCULATION
7-PURGE VALVE/ ROBINET D'ÉLIMINATION D'AIR
8-DRAIN VALVE/ VALVE DE DRAINAGE
9-SAFETY VALVE/ SOUPAPE DE SÛRETÉ
10-TEMPERATURE AND PRESSURE GAUGE/ THERMOMANOMÈTRE
11-AUTOMATIC AIR VENT/ PURGEUR D'AIR
12-SUPPLY HEADER/ COLLECTEUR D'ALIMENTATION
13-RETURN HEADER/ COLLECTEUR DE RETOUR
14-RADIANT IN-FLOOR PIPING/ PLANCHER CHAUFFANT
15-INJECTION VALVE (SLOW OPENNING)/ VALVE D'INJECTION
16-CIRCUIT BALANCING VALVE/ VALVE DE BALANCEMENT
17-INDOOR / OUTDOUR CONTROLLER/ CONTRÔLEUR MODULANT INT.-EXT.
18-BOILER WATER SUPPLY TEMP. SENSOR/ SONDE DE TEMPÉRATURE D'EAU
19-EXTERIOR TEMPERATURE SENSOR/ SONDE TEMP. EXT.
20-AMBIANT TEMPERATURE SENSOR/ SONDE TEMP. AMBIANTE

Requirements:
1. The installation must conform to local, state, provincial, national codes. In any case where instructions conflict with the above, let those codes take precedence.
2. This is a basic piping schematic. Please consult the installation manual.
3. Install a pressure relief valve (safety relief valve) on the boiler.
4. Pipe all the safety relief valves and drain valves to the drain or according to the code.

PUMP AND PUMP SIZING

Boiler water temperature drop (BWTD) through the heating loop

A simplified design method based on a 20°F temperature drop (BWTD) between boiler outlet and inlet is commonly used. Although such a method is widely used and generates satisfactory system performance when applied properly, it does not determine the system operating point. The pipe size is often uneconomically large, and the actual system flow rate is likely to be much higher than intended. Such design methods seldom consider temperature drops higher than 20°F, which results in overdesign.

Another method by which the boiler water temperature drop (BWTD) could be calculated is to assume a constant supply boiler water temperature minus the return boiler water temperature. For example a boiler might have a return temperature of 140 °F. Assuming a constant supply boiler temperature of 180 °F, the BWTD would be 40 °F (= 180 °F – 140 °F). Second example: If the boiler water has a return temperature of 120 °F and the boiler supply is at 140 °F, then the temperature drop is 20 °F (=140 °F – 120 °F).

By design the boiler water supply temperature cannot be higher than 190°F. Also, when the boiler surfaces are hot due to previous loads such as domestic hot water generation, the large temperature difference between the boiler and its return water can cause the boiler to become thermally shocked.

An experienced designer could work with other values than those proposed by looking into the performance tables and using the guidelines stated above to design a state of the art system.

The following chart suggests the temperature drop (BWTD) to be used to calculate the pump flow rate.

PROPOSED BOILER WATER TEMPERATURE DROP THROUGH THE HEATING CIRCUIT (BWTD)

System type	Boiler water **Supply** tempera-ture	Boiler water **Return** tempera-ture	**BWTD**
Baseboards	190°F to 140°F	170°F to 120°F	20°F to 40°F
Cast Iron Radiators	160°F to 130°F	140°F to 110°F	20°F to 40°F
Radiant In-Floor	120°F to 75°F	110°F to 65°F	10°F to 20°F

Pump flow rate calculation

The boiler's output rating must correspond to the heating load calculations or be within the sizing guide recommendations. Use the equation below to calculate the pump flow rate.

Pump flow rate = Boiler output ÷ BWTD ÷ 500

- Pump flow rate is express in U.S. gallons per minute or GPM.
- The Boiler output (in net BTU per hour) is the maximum heat to be transferred through the heating loop to meet the heating demand.
- BWTD is the boiler water temperature drop through the heating loop.

For example, a BTH 24 as an output rated at 81,888 BTU per hour. The system is designed for a temperature drop (TD) of 20°F.

Pump flow rate = 81,888 ÷ 20 ÷ 500 = 8.2 GPM.

Pipe sizing criteria
Proper selection of pipe size is important to efficient system operation. A large pipe size results in lower friction losses and may allow the selection of smaller, more economical pump. The increased pipe size, however, costs more initially and must be balanced against the cost savings realized be smaller pump. Likewise, small pipe costs less initially but must be balanced against the increased operating cost of pumping water through a system with high friction losses. An economical balance should be reached between pump size, operating costs, and pipe diameter.

The ASHRAE fundamentals handbook states the general range of pipe friction loss used for the design of hydraulic systems and upper limits of water velocity in piping.

A variety of upper limits of water velocity and/or pressure drop in piping and piping systems are used. One recommendation places a velocity limit of 4 feet per second for 2 inch and smaller diameter pipe, and a pressure drop limit of 4 feet of water per hundred feet for piping over 2 inches. These limitations are imposed either to control the levels of pipe and valve noise, erosion and water hammer pressure or for economic reasons.

Please note that in the smaller pipe sizes, this velocity limit permits the use of friction loss rates higher than 4 feet per 100 feet.

Fluid velocity should be above 1-1/2 to 2 feet per second in order to carry entrained air along to a high point in the system where it can be purged.

It is generally accepted that if proper air control is provided to eliminate air and turbulence in the system, the maximum flow rate can be established by a piping friction loss rate of 4 feet of water per 100 feet. This allows velocities greater than 4 feet per second in pipe sizes 2 inches and larger.

As piping ages, friction losses increase. It is recommended that for most commercial design purposes a safety factor of 10 to 15 % be added to the values in the tables.

What is a “foot of water”? A column of water at 60°F, 5 feet tall, creates a constant pressure of 5 feet of water at the bottom of the column. If the water column is 2.31 feet tall, the mass of water creates a constant pressure (head) of one (1) psi (pound per square inch). Pressure losses are expressed either in “feet of water” or in psi. Pump manufacturers usually prefer feet of water units.

Pump or circulator selection
Performance characteristics of centrifugal pumps are described by pump curves, which plot flow versus head or pressure together with other information such as efficiency and power. Consult the manufacturer’s pump curves to select the proper model or ask your pump dealer or your HVAC wholesaler for a recommendation.

Operation

⚠ SAFETY PRECAUTIONS

Before operating this boiler, be sure to read and follow these instructions, as well as the warnings printed in this manual. Failure to do so can result in unsafe operation of the boiler resulting in property damage, bodily injury, or death. Should you have any problems reading, following or difficulty in understanding the instructions in this manual, STOP, and get help from a qualified person.

Do not turn on the boiler unless it is filled with water. Do not turn on the boiler if the cold water supply shut-off valve is closed.

After the boiler has been plumbed and wired, it is now ready to be set for automatic operation.

FILLING THE BOILER

Open the shutoff valve (and on a zone valve system, manually open zone valve) on the supply piping from the boiler. Open cold water supply valve (fill or makeup water valve) to boiler.

To let the air out of the boiler tank during the fill process open the relief valve on top of the boiler. Leave all shutoff valves open. Return zone valves to automatic operation. Check system for leaks and repair. Purge air from the remaining zones, if necessary. Check boiler pressure gage reading. 15 to 20 psi is normal for most installations.

ADJUSTING THE AQUASTATS

After the system has been manually purged of air, and all components (valves, vents, controllers) have been set properly, the boiler can be started. Never operate this boiler until this has been done.

Safety and energy conservation are factors to be considered when setting the boiler water temperature by using the aquastats. The most energy efficient operation will result when the temperature setting of each aquastat is the lowest that satisfies the needs consistent with the application. **Please refer to the BWTD table for more details.**

Each electric element has it own aquastat. Set the temperature on the aquastat using the knob graduated in degrees Celsius and Fahrenheit.

Set the temperature on the first aquastat to the highest supply temperature required by the heating system.

Set the temperature on the second aquastat from 1°F to 5°F below the setpoint of the first aquastat. Usually 2°F below the setpoint of the first aquastat is adequate.

Proceed in a similar manner for the 3rd, 4th and any supplementary aquastats, lowering the set point by approximately 2°F each time. The elements will thus be activated (and de-activated) in the number required by the set points and the drop (or rise) in boiler water temperature.

On initial start up (on the first day of the heating season) with a cold tank, a considerable amount of time may be required for the tank to reach desired temperature. Check the temperature on the boiler temperature gage.

Adjust the boiler aquastats as needed. Note that setting the aquastat to a lower setting will not have an immediate effect. The stored boiler water heat will first have to be consumed. Additional checks of the water temperature should follow completion of a cycle. Further adjustments may be necessary as you use your boiler and space heating system.

Note: The maximum setting for the boiler water supply to the heating system is 190°F.

PUMP POWER SUPPLY

Use a relay (Honeywell #RA-889, RA-89A) or the secondary contact of a zone valve (if the heating system is zoned using 4-wire zone valves). When a thermostat calls for heat, the relay will power either the boiler pump or the zone valve (the zone valve will power the boiler pump upon opening fully).

If the heating system is designed to use only a single pump, then to minimize flow by gravity and heat loss during non-draw periods, **a flow check must be installed.**

Diagramme électrique/ Wiring diagram
Raccordement de pompe BTH/ Wiring pump for BTH
Relais de pompe/pump relay

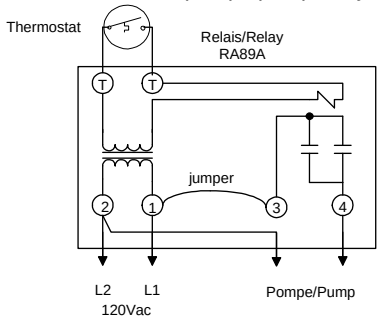


Diagramme électrique/ Wiring diagram
Raccordement de zone valves/ Wiring for zoned valves system

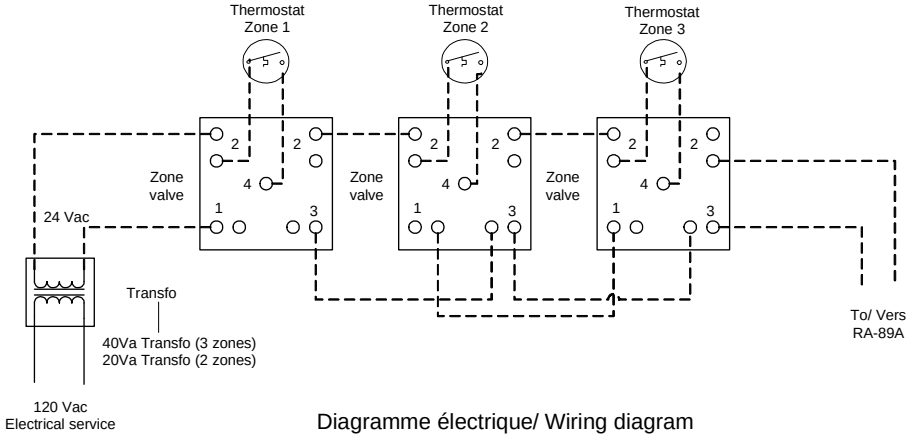
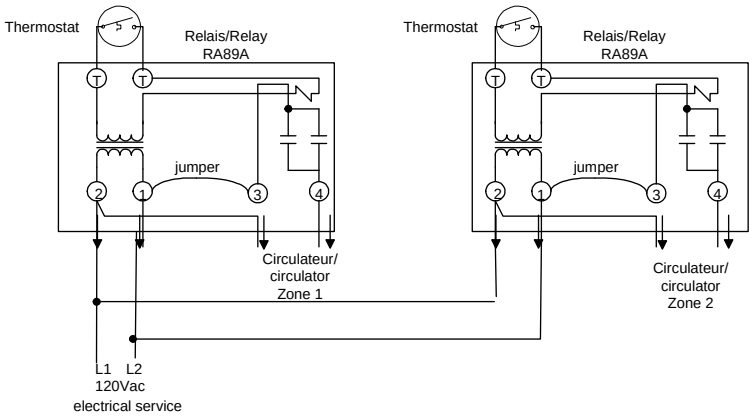


Diagramme électrique/ Wiring diagram
Raccordement de multiples circulateurs/ Wiring for multiple circulators



Maintenance

INTRODUCTION

Properly maintained, your boiler will provide years of dependable, trouble free service. It is recommended that a regular routine maintenance program be established and followed by the user. Components are subject to eventual failure that requires service. Failure to use the correct procedures or parts in these circumstances may make the unit unsafe or reduce the life of the boiler.

The owner should have the following inspection and maintenance procedures performed:

At all time an immediate inspection shall be made if:

- An odor of melted plastic or overheating material is detected
- If a leak coming from the unit is observed

BOILER WATER PIPING:

- Yearly visual inspection.

Check all piping for signs of leakage near joints, unions and shut-off valves. Repair as needed.

PRESSURE RELIEF VALVE ON TOP OF BOILER:

- Bi-annual inspection.

Make sure that the discharged water is directed to a suitable drain or other collection device, and will not spray onto anyone.
If the safety valve leaks and the boiler pressure is under 28psi, it must be replaced with the same model or its equivalent.
If the pressure is above 28psi ask our heating specialist to determine the cause of the high pressure and have the problem repaired.
Do not plug the outlet of this valve if a dripping condition occurs.

⚠ WARNING

The manufacturer's warranties DO NOT cover tank failure due to improper installation or maintenance. If the pressure relief valve on the heater discharges periodically, this may be due to thermal expansion. Immediately call a qualified service technician to inspect and to remedy as needed.

AIR ELIMINATION

- Bi-annual inspection

Check the operation of the automatic air eliminators and manually open the manual air vents located on your distribution system to eliminate the air that could be present.

ELECTRIC INSPECTION

- Annually

It is recommended that a visual inspection be made on the electrical compartments of the boiler to check the seal of the gasket on the element flange an also check for any overheating signs of the components and wires. Required corrections shall be made as soon as possible.
Parts used for replacement shall be the same as the original equipment.

⚠ WARNING

Make sure that the power on the unit has been turn off before opening the electrical compartments of the boiler.

BTH LIMITED WARRANTY

Warranty Coverage for Residential Installation.

Thermo 2000 Inc. hereby warrants to the original residential purchaser that the BTH tank installed in a residential setting shall be free of leaks during normal use and service for a period of fifteen (15) years from the date of purchase as long as the original residential purchaser owns the home in which the unit was originally installed. Residential setting shall mean usage in a single-family dwelling in which the consumer resides on a permanent basis. Also, residential setting shall mean use in multiple family dwellings in which one (1) BTH tank is to be use in only one (1) dwelling. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original residential purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from manufacturing plant. The replacement unit will be warranted for the remaining portion of the original Warranty.

Warranty Coverage for Commercial Installation.

Thermo 2000 Inc. warrants to the original purchaser that the BTH tank installed in a commercial setting for fifteen (15) years.

Commercial setting shall mean use in other than residential setting stated above in the residential setting definition. In the event that a leak should develop and occur within this limited warranty period due to defective material or workmanship, such leak having been verified by an authorized company representative, Thermo 2000 inc. will repair or replace at our sole option the failed unit with the nearest comparable model at the time of replacement.

The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The replacement unit will be warranted for the remaining portion of the original Warranty.

Limited two years warranty on all BTH *components & parts*

All other BTH components & parts are warranted for a period of two (2) years against defects due to defective material or workmanship. The original purchaser is responsible for all costs associated with the removal and reinstallation, shipping and handling to and from Manufacturer. The components, repaired or replaced are warranted for the residual period of the initial warranty on the unit.

Exclusions.

This warranty is void and shall not apply if:

1. Defects or malfunctions resulting from installation, repair, maintenance and/or usage that are not done in conformity with the manufacturer's installation manual; or
2. Defects or malfunctions resulting from installation, maintenance, or repair that are not done in accordance with regulations in force; or
3. Defects or malfunctions resulting from improper installation, maintenance or repair done carelessly or resulting from consumer damage (improper maintenance, misuse, abuse, accident or alteration); or
4. Installation in which a relief valve (pressure) is not installed or if it is not functioning properly, or when it is not connected to a drain to avoid damage to the property; or
5. Installation in which liquid circulating in the tank does not remain in closed circuit or installation in which piping is leaking; or
6. A polybutylene pipe or radiant panel installation without an oxygen absorption barrier is used; or
7. Installation where the acidity of water is not within the normal Environmental Protection Agency (EPA) (between pH 6.5 – 8.5) guidelines or the domestic water contains abnormal levels of particulate matter or water exceeding 10.5 gpg; or
8. Your home contains any type of water softener system and the unit is not installed and maintained in accordance with the manufacturer specifications; or
9. The BTH unit is being subject to non authorized modifications; or
10. Defects or malfunction resulting of storing or handling done elsewhere than Thermo 2000's manufacturing plant; or
11. Units on which the serial number is removed or obliterated.

Limitations.

Thermo 2000 shall not be responsible for any damage, loss, and inconvenience of any nature whatsoever, directly or indirectly, relating to the breakdown or malfunction of the unit. This warranty limits its beneficiary's rights. Nevertheless, the beneficiary may have other rights, which vary from state to state.

This warranty replaces any other expressed or implicit warranty and constitutes the sole obligation of Thermo 2000 towards the consumer. The warranty does not cover cost of removal, reinstallation or shipping to repair or replace the unit, nor administration fees incurred by the original consumer purchaser.

Thermo 2000 reserves its rights to make changes in the details of design, construction, or material, as shall in its judgment constitute an improvement of former practices.

This warranty is valid only for installations made within the territorial limits of Canada and the United States.

Warranty service procedure

Only authorized BTH dealers are permitted to perform warranty obligations. The owner or its contractor must provide Thermo 2000's head office or authorized depot with defect unit together with the following information: BTH model and serial number, copy of the original sales receipt and owner's identification certificate.

THERMO 2000 INC.

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