

TC



INSTALLATION, OPERATING AND MAINTENANCE INSTRUCTIONS

ELECTRIC BOILER

FOR HYDRONIC HEATING APPLICATIONS

6 kW to 54 kW, 208 Vac to 600 Vac, Single or Three Phase

WARNING

Risk of electric shock. This unit may be connected to more than one electrical circuit. Disconnect all electrical circuits before servicing.

IMPORTANT

- The boiler must be installed in accordance with all related national and/or local codes.
- This manual must be left with owner and should be hung adjacent to the boiler for reference.
- Ensure boiler is full of water before turning on electricity. Elements will burn out immediately without water in the boiler.
- A boiler installed above radiation level, or as required by an Authority having jurisdiction, must be provided with a low-water cut-off device at the time of boiler installation.
- Overcurrent protection between the power supply and the boiler must be provided in accordance with the related national and/or local codes.
- Always ensure power switch is turned off before servicing.
- Under no circumstances should any electrical wiring or internal controls be touched, except by a qualified electrician or any heating system be adjusted, except by a qualified service technician.

Post these instructions in a visible place.

DATE OF INSTALLATION :

INSTALLED BY :

PHONE :

Featuring our New State of the Art

"TempTronic Controller"



MAY 3, 2001

Manufactured by
Allied Engineering Company
Division of E-Z-Rect Manufacturing Ltd.

Manufacturers of Gas and Electric Boilers, Stainless Steel Tanks, Tankless Coils, Electric Boosters
94 Riverside Drive, North Vancouver, B.C. V7H 2M6 • Telephone (604) 929-1214 • FAX (604) 929-5184
Branches: Calgary • Edmonton • Toronto



(OPTIONAL)

OT

1.1 TECHNICAL SPECIFICATIONS

Maximum Operating Pressure 90 p.s.i.
 Maximum Operating Water Temperature 210°F
 Water Capacity in boiler 6.6 US Gallons
 Inlet and Outlet Pipe Size 1 1/4" NPT
 Controller Pump Switch Capacity 5A Maximum

Table 1: Super Hot Electric Boiler Specifications. (Flange Type Elements)

Super Hot Electric Boilers			Single Phase		Three Phase			
			208 Vac	240 Vac	208 Vac	240 Vac	480 Vac	600 Vac
Model	kW	Btu/Hr	Amp	Amp	Amp	Amp	Amp	Amp
6TC	6	20,474	28.9	25.0	16.7	14.4	7.2	5.8
9TC	9	30,708	43.3	37.5	25.0	21.6	10.8	8.7
12TC	12	40,848	57.7	50.0	33.3	28.8	14.4	11.5
15TC	15	51,185	72.1	62.5	41.6	36.0	18.0	14.4
18TC	18	61,422	86.5	75.0	54.6*	47.3*	23.7*	18.9*
20TC	20	68,240	96.2	84.3	63.6*	55.1*	27.6*	22.0*
24TC	24	81,895	115	100	66.5	57.7	28.8	23.1
27TC	27	92,124	130	113	74.9	64.9	32.4	26.0
30TC	30	102,369	144	125	83.2	72.1	36.0	28.8
34TC	34	116,008	164	142	100*	87.0*	43.5*	34.8*
38TC	38	129,656	183	158	118*	102*	50.5*	40.4*
42TC	42	143,304	202	175	116	101	50.5	40.4
45TC	45	153,540	216	188	125	108	57.7*	46.2*
48TC	48	163,776	231	200	138*	119*	59.6*	47.7*
54TC	54	184,248	260	225	150	130	64.9	52.0

Note:

1. Approximate shipping weight is 115 lbs (53 kg). Add 15 lbs (7 kg) for package models.
2. Other models of the Electric Boiler may be available subject to inquiry.
3. * Delta connection (unbalanced load) amperage of high leg indicated.

2.1 RECEIVING

INSPECT SHIPMENT FOR POSSIBLE DAMAGE. All goods are carefully manufactured, inspected, checked and packed by experienced workers. The manufacturer's responsibility ceases upon delivery of goods to the carrier in good condition. Any claims for damage, shortage in shipment or non-delivery must be filed immediately against the carrier by the consignee.

2.2 INTRODUCTION

Super Hot Electric Boilers are controlled by a three-stage electronic temperature controller. The controller controls the boiler water temperature with three stages and turns stages on based on the heating demand and the preset boiler outlet water temperature. The controller also can control 120Vac circulating pumps rated up to 5A or 600VA. When the thermostat calls for heat, the controller will operate the boiler to regulate the water temperature at a pre-selected setpoint. The system pump is on whenever there is a thermostat calling for heat.

Multi-stage electric boilers have a number of advantages over conventional on/off single stage boilers. Instead of switching on/off all heating elements using sequencers, each stage of a multi-stage boiler is controlled directly by the controller to minimize both temperature fluctuations and reduce the number of on/off operations of the contactors/heating elements. The on/off times of each of the stages are separated by a pre-determined minimum time interval to avoid a surge in line current. The average "cycle time" of each of the heating elements shall be greatly increased. This ensures better temperature stability, extends the life of the boiler and increases energy efficiency.

2.3 BOILER LOCATION

The boiler is intended for indoor installation only and not subject to water spray or leakage. It may be installed in an enclosed space and attached directly to a combustible surface. Allow ample space around the boiler to insure all connections and controls are readily accessible. Minimum suggested clearances for piping and service are: left side 18"; right side 12". The removable front panel provides access to the electrical controls. It may be preferred to locate the boiler close to the electrical supply panel.

2.4 WALL MOUNTING

The wall mounting brackets on the boiler feature a "key-hole" opening suitable to fit over the head of two previously installed 5/16" lag screws. The key-hole openings are located on 16" centers (i.e. standard stud spacing) on the top side of the hangers. The lag screws must be suitably anchored to safely support the weight of the boiler including water content, piping and wiring. It is critical that the boiler be installed level and oriented as showing in the drawing (i.e. Figure 2).

2.5 PIPING

The recommended piping arrangement is shown in Figure 2. Attach pump, expansion tank, drain valve, pressure relief valve, air vent, pressure temperature gauge and flow switch (as required). Air vents should be installed at points just upstream from all drops in elevation of the piping system (high points).

A boiler installed above radiation level, or as required by an Authority having jurisdiction, must be provided with a low-water cut-off device at the time of boiler installation.

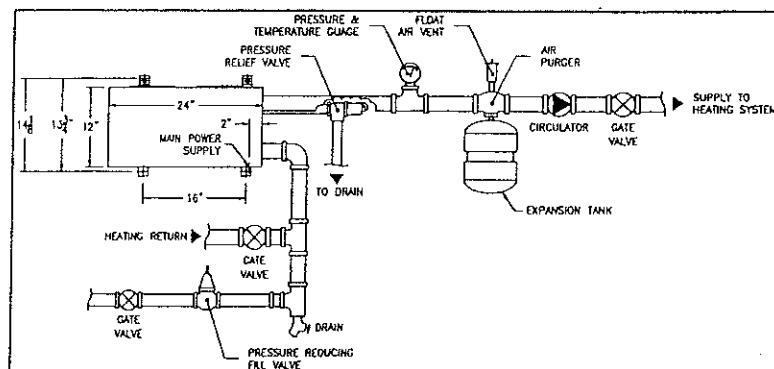


Figure 2 – Piping Arrangement

3.1 ELECTRICAL WIRING

All electrical wiring is to be done in accordance with the Canadian Electrical Code, CSA C22.1 Part 1, and/or any local regulations and codes in Canada, or the National Electrical code, ANSI/NFPA 70 (latest edition) and/or any local regulations and codes in U.S.A.. Verify the nameplate rating and check the related codes to properly size conductors, switches and overcurrent protection. Several openings are provided on the right and bottom of the cabinet for different voltage connections. For wire connections refer to the wiring diagram sticker on the back of the boiler front cover.

All circuit breakers ahead of and at the boiler must be OFF. Remove the boiler front cover by removing 4 screws from the sides.

a. Wiring on Controller

Line Voltage:

Connect (if not pre-wired) only 120 Vac, 60 Hz, single phase power to terminals L1 and L2 on the controller. Strip wire ends before inserting into terminal block. Tighten terminal screw clamps.

Pump:

Connect only 120 Vac, 1/6 HP (maximum) pump to terminals P1 and P2 on the controller. Strip wire ends before inserting into terminal block. Tighten terminal screw clamps. If a pump horsepower larger than 1/6 HP is used, change the pump fuse on the controller based on the pump rating. Do not use a pump requiring greater than 5A or 600 VA.

Water Temperature Control Sensors:

Connect thermostat or zone valve end switch to terminals T1 and T2 (do not apply any power to these terminals). Strip wire ends before inserting into terminal block. Tighten terminal screw clamps.

Pre-wired (factory wiring) high-limit temperature sensor to terminals HL and CL (common). Strip wire ends before inserting into terminal block. Tighten terminal screw clamps.

Pre-wired (factory wiring) operating temperature sensor to terminals OL and CL (common). Strip wire ends before inserting into terminal block. Tighten terminal screw clamps.

b. Power Supply to Heaters

The supply cable has to be sized based on the amperage in Table 1 and the cables used.

Connect only specified line voltage and phase power to main terminal block on the control panel. Strip wire ends before inserting into terminal block. Tighten terminal screw clamps. Attach ground wire to ground terminal block on the bottom control panel.

4.1 WARNING

WARNING

The following instructions are intended as a guide for qualified persons. Before switching the power on, fill the system with water and vent air. Check for and repair any leaks in the water piping.

4.2 STARTUP

a. Fill System

Figure 2 shows the suggested set-up for a make-up water supply using a pressure regulator (not supplied by manufacturer). Do not apply full line make-up water pressure to the system. Fill the system to approximately 12 psi (cold water) if the expansion tank is pressurized at 12 psi. The expansion tank establishes system reference and provides expansion space for heated water while allowing system operating pressures to increase with temperature within safe and reasonable limits. There should be no significant pressure fluctuations in systems having both an effective automatic fill valve and a properly sized expansion tank or expansion tank arrangement. The standard pressure relief valve supplied with the boiler is rated at 30 psi or as required by order, but the maximum working pressure can not exceed 90 psi for CSA or A.S.M.E. approved boiler. Once the system is filled with water, all trapped air must be removed to avoid air locks, which can reduce flow rate and cause thermal shock. Figure 2 also illustrates the connections to the air purger (not supplied by manufacturer) and expansion tank in the line from the boiler to the radiation units. Additional air purgers should be installed at high points in the system to assist in removing air which can accumulate from the water supply line. All high points must be vented.

b. Startup Procedure

Perform the following procedure as a check for proper boiler and system operation:

1. Set the boiler operating temperature to the designed heating water temperature by adjusting the dial of potentiometer located on the bottom-left of the controller (see Figure 3). Use a screwdriver to adjust the arrow on the temperature adjustment dial to the water temperature required. This boiler is also equipped with a non-adjustable, high-limit temperature device set at 230°F as safety limit control. The high limit temperature device has an automatic reset function.
2. Current may be checked by a qualified electrician at the feeder panel and compared to the values shown in Table 1.
3. Turn up all room thermostats above room temperature.
4. When power is supplied to the controller, the power indicator LED (green) is always on. When the thermostat calls for heat, the pump will be energized immediately and the pump indicator LED (yellow) will light up. Next, the three stages are energized along with the stage indicator LEDs (yellow), one after another, in sequence. Once the boiler water temperature reaches the set point on the temperature adjustment dial, the controller will regulate the boiler water temperature with three stages. The number of stages which stay on is based on the heating demand and the set point of the boiler water temperature. After all room thermostats are satisfied with the heat, the controller de-energizes the three stages one after another, in sequence, and then switches the pump off.

5.1 SERVICE HINTS

- a. This boiler has been designed to provide years of trouble free performance under normal operating conditions. However, the owner should conduct a general external examination at the beginning of each heating season and at mid-heating season to assure good working performance is continued. In addition, a qualified service technician should examine the boiler at least once every year.
- b. Do not store anything against the boiler or allow dirt or debris to accumulate in the area immediately surrounding the boiler.
- c. Elements will burn out if the boiler is not filled with water when electrical power is turned on. Do not connect thermostat wires until system has been filled with water. Water should be drained out from system only when absolutely necessary to make repairs or prevent freeze-up during extended cold weather shutdown.
- d. The pressure & temperature gauge on the system should be checked frequently. During normal operating conditions, pressure should be relatively stable throughout the heating season. If pressure under normal operating conditions consistently rises and falls over a period of time, this can indicate a fill valve leak, system leak or compression tank malfunction. Leaks anywhere in the system must be repaired without delay. If any leaks or significant pressure fluctuations are observed, call for service immediately.

Controller Information

Section 6

6.1 TEMPTRONIC CONTROLLER INFORMATION

Temptronic Controller Specifications

Controller layout:	see figure 3
Dimensions:	8 1/2" (L) x 3 1/4" (W) x 1 3/4" (H)
High Limit Control Outlet Water Temperature:	230 °F (fixed)
Operating Control Outlet Water Temperature:	100 - 210 °F (adjustable)
Controller Input Voltage:	120 Vac
Controller Output Voltage:	24 Vac (stage relays) 120 Vac (pump terminal)

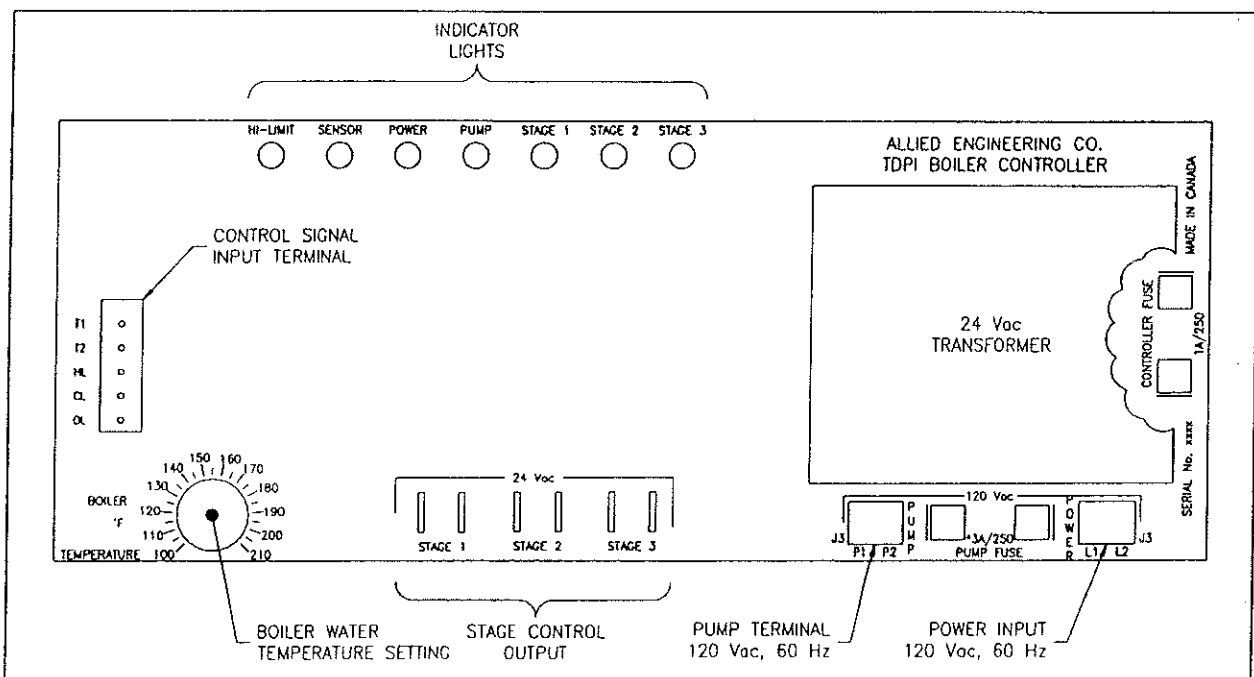


Figure 3 – Temptronic Controller Layout

Transformer:

Power Rating: 40 VA
 Input Voltage: 120 Vac, 60 Hz, single phase
 Output Voltage: 24 Vac, 60 Hz

Power Output:

1. Three 24 Vac, 3 AMP relays drive stage 1, stage 2 and stage 3. Maximum load of the individual drive or the total load of three relays should not exceed 1.33 A or 32 VA.
2. One 120 Vac pump output is switched by using a 10A relay. The load current of this output is also limited by the pump fuse selected (controller supplied with 3 A fuse) and must not exceed 5 A or 600 VA.

Power Consumption:

Controller (internal): 4 watts maximum
 24 Vac contactor drive: depends on the contactors

LED Displays:

A total of seven indicator lights display the following information:

1. Hi-limit (red): High-limit or high-limit sensor error. LED is lit when either the boiler water temperature reaches the high-limit of 230°F or the high-limit sensor is faulty, disconnected or misconnected.
2. Sensor (red): Operating sensor error. LED is lit when operating sensor is faulty, disconnected or misconnected.
3. Power (green): Power on/off.
4. Pump (yellow): Pump relay on/off.
5. Stage 1 (yellow): Boiler first stage on/off (low heat).
6. Stage 2 (yellow): Boiler second stage on/off (medium heat).
7. Stage 3 (yellow): Boiler third stage on/off (high heat).

Signal/Control Input:

T1 and T2: Thermostat or zone valve end switch, switching input, closed is activation.
 HL: High-limit temperature sensor.
 CL: Common return of the high-limit and the operating temperature sensors.
 OL: Operating temperature sensor.

Temperature Control Ranges:

Temperature notation:	degrees Fahrenheit
Pre-set operating temperature range:	100°F to 210°F
Fixed high-limit temperature:	230°F
All stages on/off temperature differential:	±4°F

Operating Temperature Adjustment:

Internal temperature potentiometer on the controller or external temperature potentiometer (optional extra).

2. Controller Operation

When the controller is powered-up, the green "Power" light will come on. If no errors are present, the controller enters the operating mode. Once in operating mode, the controller uses the operating sensor to continuously monitor the boiler water temperature.

When the thermostat calls for heat, the controller will switch on the system pump and the yellow "Pump" light. Then the yellow "Stage" light(s) and three stages of the boiler will switch on in sequence, and stay on until the supply water temperature reaches the temperature dial setting. When the water temperature set point is reached, the control will cycle the three stages of boiler to maintain the supply water temperature. The required number of stages which are activated is determined by the heating demand (difference between boiler water temperature and the operating temperature setpoint.) After the call for heat has been satisfied, the stage(s) of the boiler, along with the "Stage" light(s), will shut off in sequence and followed by the pump.

Controller Information

Section 6

All drive outputs will shut off within 15 seconds upon error in sensor circuits. The shut down sequence will be one activated element at a time and then the pump. All drive outputs will shut off immediately if the high-limit temperature is reached. The controller has a built-in automatic reset function upon power interruption.

3. Temperature Setting

The water temperature adjustment dial on the controller should always be set at the designed boiler water temperature. NOTE: A screwdriver should be used to adjust the arrow on the temperature adjustment dial.

4. Mounting

The controller mounts on the boiler control panel using six #6 sheet metal screws and 1/2" high plastic standoffs. The indicator LEDs are visible on the top of the boiler casing.

Troubleshooting Guide

Section 7

7.1 TROUBLESHOOTING

This section is meant to assist the service technician when troubleshooting the electric boiler. As in any troubleshooting procedure, it is important to isolate a problem as much as possible before proceeding. Often the controller error message LEDs can be a great help in identifying the cause of a problem. If you suspect a wiring fault, carefully check all external wiring and wiring connections following the wiring diagram sticker on the back of the boiler's door. **TO AVOID RISK OF HIGH VOLTAGE - ALWAYS SHUT OFF MAIN POWER TO THE ELEMENT HEATING CIRCUIT BEFORE TROUBLESHOOTING!** Also, be careful of 115V power while troubleshooting near Line-in terminals (L1 & L2), Pump terminals (P1 & P2) and the Controller.

PROBLEM	CAUSE	SOLUTION / CHECK
Power LED (green) is not lit.	• Incorrect supply power.	• Check for 115V (AC) across L1 and L2.
	• Controller fuse blown.	• Check fuse and replace if necessary.
	• Internal control fault.	• Replace controller.
High-Limit LED (red) on controller is lit.	• High-limit wire is disconnected or misconnected	• Red wire of sensor must be connected to HL.
	• Operating sensor fault (allows water temperature to reach the high-limit)	• Replace sensor.
	• High-limit sensor fault	• Replace sensor.
	• Internal control fault	• Replace controller.
Sensor LED (red) on controller is lit.	• Operating sensor wire is disconnected or misconnected.	• White wire of sensor must be connected to OL.
	• Operating sensor fault.	• Replace sensor.
	• Internal control fault.	• Replace controller.
Both High-Limit and Sensor LEDs (red) on controller are lit.	• Neutral wire of sensors is disconnected or misconnected.	• Black wire of sensors must be connected to CL.
	• High-limit or operator sensor fault.	• Replace sensor.
	• Internal control fault.	• Replace controller.
No heat when called by thermostat and stage LEDs are <u>NOT</u> lit.	• Thermostat fault.	• Disconnect thermostat from controller, turn thermostat to maximum setting, and check continuity.
	• Internal control fault.	• With thermostat disconnected from board, voltmeter should read 24V (DC) across terminals T1 and T2.

PROBLEM	CAUSE	SOLUTION / CHECK
No heat when called by thermostat and stage LEDs are lit.	• Main fuses blown (if applicable).	• Check main fuses and replace if blown.
	• Internal control fault.	• Turn stage LEDs on by adjusting thermostat to maximum setting and check for 24V (AC) across stages 1, 2, and 3.
	• Main contactor(s) fault.	• Check each contactor coil's terminals for a supplied voltage of 24V (AC). If present, main contactor(s) are faulty and must be replaced. If not present, wiring continuity fault exists – check and repair.
	• Element fault.	• CAUTION: RISK OF ELECTROCUTION – MAIN POWER TO ELEMENTS MUST BE DISCONNECTED! Next, disconnect element wires from main contactor(s) and check for continuity. If no continuity, replace element. If continuity, the contactor is defective. (To confirm contactor defect, check for continuity across main contactor when closed.)
Pump runs constantly when there is no call for heat.	• Internal control fault.	• Replace controller.
Pump will not run.	• Pump ceased or burnt out.	• Repair or replace.
	• Pump wiring fault.	• Check and repair wiring.
	• Pump fuse blown.	• Check pump fuse and replace if necessary.
	• Internal control fault.	• Replace controller.
Controller does not operate normally.	• Internal control fault.	• Replace controller.
Pressure relief valve discharges water.	• Relief valve not reseating properly.	• Quickly lift and release manual discharge lever on relief valve to assist proper reseating. If this fails, replace pressure relief valve.
	• Pressure reducing valve set too high.	• Reduce setting of pressure reducing valve.
Water leaking from electric boiler.	• Element or sensor threads leaking.	• Turn off all electricity to the boiler. Remove wires from element terminals and tighten elements (with correct socket wrench). Turn off water, drain, remove and apply sealant if necessary.
	• Plumbing connections leaking.	• Tighten incoming pipes and pressure relief valve. Turn off water, drain and remove and apply sealant if necessary. (Be sure to turn off electricity before draining or elements will burn out.)

8.1 ORDERING

Replacement parts or a replacement electric boiler may be purchased through any Allied Engineering Company distributor – call us if you need help locating a distributor near your area. If you require any technical assistance or have any comments about our product, please write or phone us at:

Service Department
 Allied Engineering Company
 94 Riverside Drive
 North Vancouver, B.C., V7H 2M6
 Tel (604) 929-1214 Fax (604) 929-5184

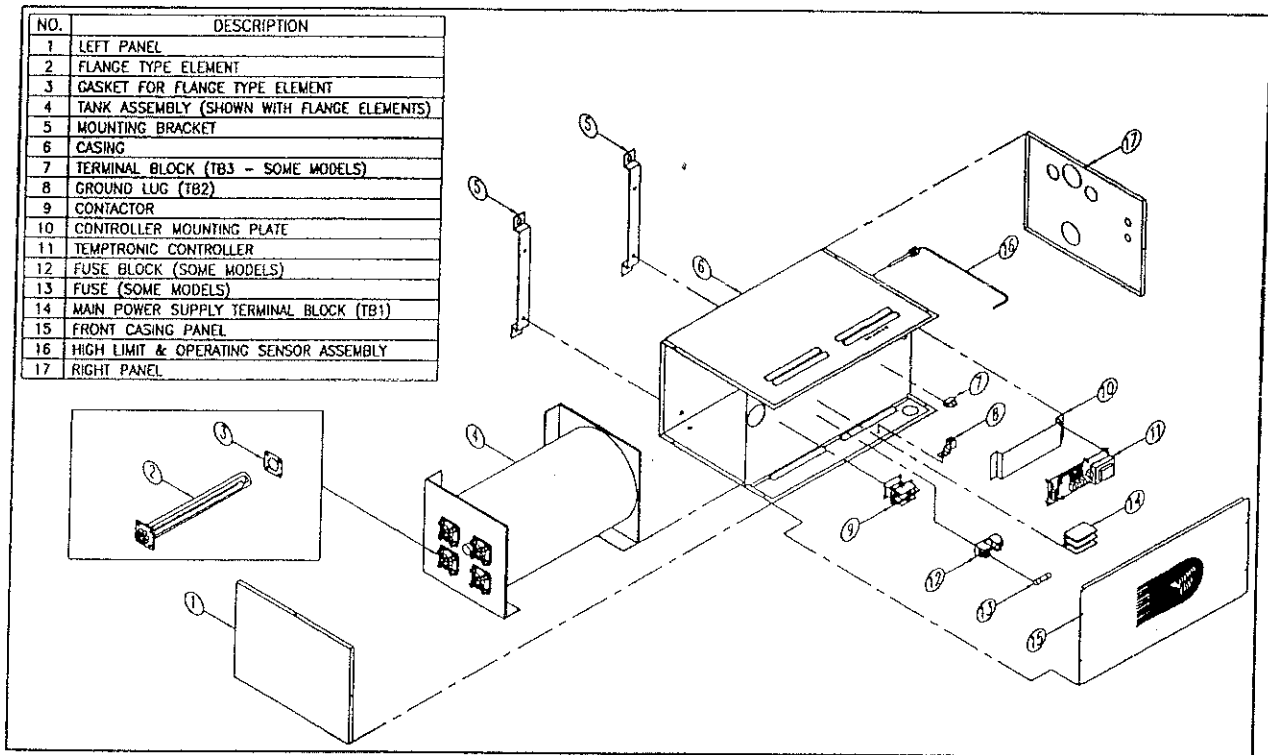


Figure 4 – Replacement Parts



Ten Year Warranty

SUPER HOT TEMPTRONIC ELECTRIC BOILERS

We, Allied Engineering Company, guarantee this boiler to the original owner against defects in material and workmanship under normal use and service. Our obligation under this warranty shall be limited to replacing in kind or at our option repairing any part of said equipment, found to be defective, for a period of one year from the original date of installation, provided that proper evidence of such installation is recorded at the factory in the Warranty Registration card within 30 days of installation.

We further agree that should the boiler tank assembly fail due to defective material or workmanship within 10 years of the original installation date we will replace or repair the tank free of charge at our plant.

All repairs and replacements, furnished under this guarantee, shall be EX works the Factory, North Vancouver, and we shall not be liable for freight, drayage or labor costs in removing or reinstalling the said boiler or any part thereof and we shall assume no liability for damage to person or property.

This guarantee does not apply to the boiler or any part thereof unless properly installed in accordance with local plumbing or building codes by a licensed tradesman, and in accordance with the instructions and limitations specified for the boiler, or if the boiler has been subject to accident, alterations or abuse and only if the boiler is kept free of all lime or silt deposits and free from a corrosive atmosphere. The guarantee applies only to the original owner at the original address. This guarantee is void if working pressure exceeds that noted on the rating plate or if the boiler is used for any nonstandard and/or industrial appliances.

Items not covered under the terms of warranty: Failures due to lime or silt deposits and calibration of thermostats and high limit switches, following installation and acceptance, nor damage to elements from overheating due to lack of water or air pocket within the boiler during or after startup.

Controls, relays/contactors, and elements are guaranteed for a period of one year only.

The guarantee shall be effective only if any part or portion shall prove upon examination by the company to be defective in either material or workmanship, or defects in other parts do not arise as the result of improper use, negligence or operation, accident or because of repairs, adjustments or replacements outside our Factory.

This guarantee is in lieu of all other warranties, expressed or implied and of all other obligations or liabilities on our part and we neither assume nor authorize any person to assume for us any other obligations or liability in connection with the sale of this boiler.

Owner's Name _____

Serial No. _____ Model _____ Date of Installation _____

ALLIED ENGINEERING COMPANY

DIVISION OF E-Z-RECT MANUFACTURING LTD.

94 RIVERSIDE DRIVE, NORTH VANCOUVER, B.C., V7H 2M6, CANADA • TELEPHONE (604) 929-1214

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