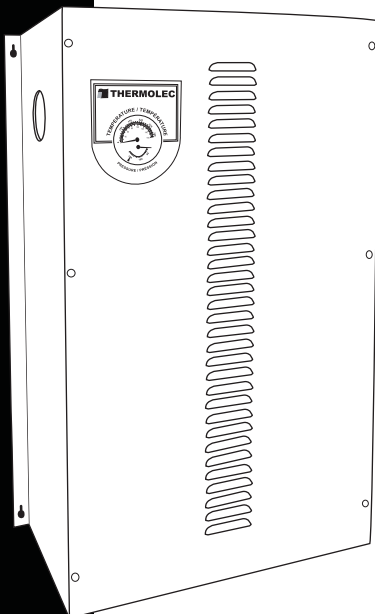
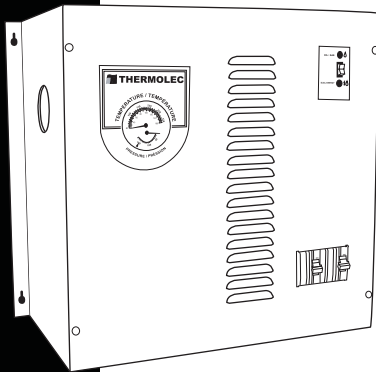
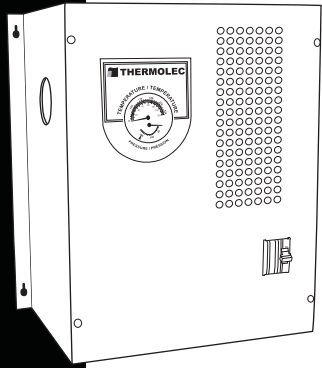


THERMOLEC



Installation Instructions for Electric Boilers (USA)

**DECEMBER 2010
VERSION 11**

Cost Per Million Btu

| Electricity | 3412 BTU / kWh | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0.038 | 0.040 | 0.042 | 0.044 | 0.046 | 0.048 | 0.050 | 0.052 | 0.054 | 0.056 | 0.058 | 0.060 | 0.062 | 0.064 | 0.066 | 0.068 | 0.070 | 0.072 | 0.074 | 0.076 | 0.078 | 0.080 | 0.090 | 0.100 |
| 100% | 11.14 | 11.72 | 12.31 | 12.90 | 13.48 | 14.07 | 14.65 | 15.24 | 15.83 | 16.41 | 17.00 | 17.58 | 18.17 | 18.76 | 19.34 | 19.93 | 20.52 | 21.10 | 21.69 | 22.27 | 22.86 | 23.45 | 26.38 | 29.31 |
| 150% | 7.42 | 7.82 | 8.21 | 8.60 | 8.99 | 9.38 | 9.77 | 10.16 | 10.55 | 10.94 | 11.33 | 11.72 | 12.11 | 12.50 | 12.90 | 13.29 | 13.68 | 14.07 | 14.46 | 14.85 | 15.24 | 15.63 | 17.58 | 19.54 |
| 200% | 5.57 | 5.86 | 6.15 | 6.45 | 6.74 | 7.03 | 7.33 | 7.62 | 7.91 | 8.21 | 8.50 | 8.79 | 9.09 | 9.38 | 9.67 | 9.96 | 10.26 | 10.55 | 10.84 | 11.14 | 11.43 | 11.72 | 13.19 | 14.65 |
| 250% | 4.45 | 4.69 | 4.92 | 5.16 | 5.39 | 5.63 | 5.86 | 6.10 | 6.33 | 6.57 | 6.80 | 7.03 | 7.27 | 7.50 | 7.74 | 7.97 | 8.21 | 8.44 | 8.68 | 8.91 | 9.14 | 9.38 | 10.55 | 11.72 |
| 275% | 4.05 | 4.26 | 4.48 | 4.69 | 4.90 | 5.12 | 5.33 | 5.54 | 5.76 | 5.97 | 6.18 | 6.39 | 6.61 | 6.82 | 7.03 | 7.25 | 7.46 | 7.67 | 7.89 | 8.10 | 8.31 | 8.53 | 9.59 | 10.66 |
| 300% | 3.71 | 3.91 | 4.10 | 4.30 | 4.49 | 4.69 | 4.88 | 5.08 | 5.28 | 5.47 | 5.67 | 5.86 | 6.06 | 6.25 | 6.45 | 6.64 | 6.84 | 7.03 | 7.23 | 7.42 | 7.62 | 7.82 | 8.79 | 9.77 |
| 325% | 3.43 | 3.61 | 3.79 | 3.97 | 4.15 | 4.33 | 4.51 | 4.69 | 4.87 | 5.05 | 5.23 | 5.41 | 5.59 | 5.77 | 5.95 | 6.13 | 6.31 | 6.49 | 6.67 | 6.85 | 7.03 | 7.21 | 8.12 | 9.02 |
| 350% | 3.18 | 3.35 | 3.52 | 3.68 | 3.85 | 4.02 | 4.19 | 4.35 | 4.52 | 4.69 | 4.86 | 5.02 | 5.19 | 5.36 | 5.53 | 5.69 | 5.86 | 6.03 | 6.20 | 6.36 | 6.53 | 6.70 | 7.54 | 8.37 |
| 400% | 2.78 | 2.93 | 3.08 | 3.22 | 3.37 | 3.52 | 3.66 | 3.81 | 3.96 | 4.10 | 4.25 | 4.40 | 4.54 | 4.69 | 4.84 | 4.98 | 5.13 | 5.28 | 5.42 | 5.57 | 5.72 | 5.86 | 6.59 | 7.33 |

System Efficiency (C.O.P. or EF)

Natural Gas 100,000 BTU / therm

| | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 75% | 0.90 | 0.95 | 1.00 | 1.05 | 1.10 | 1.15 | 1.20 | 1.25 | 1.30 | 1.35 | 1.40 | 1.45 | 1.50 | 1.55 | 1.60 | 1.65 | 1.70 | 1.75 | 1.80 | 1.85 | 1.90 | 1.95 | 2.00 | 2.05 |
| 80% | 12.00 | 12.67 | 13.33 | 14.00 | 14.67 | 15.33 | 16.00 | 16.67 | 17.33 | 18.00 | 18.67 | 19.33 | 20.00 | 20.67 | 21.33 | 22.00 | 22.67 | 23.33 | 24.00 | 24.67 | 25.33 | 26.00 | 26.67 | 27.33 |
| 82% | 11.25 | 11.88 | 12.50 | 13.13 | 13.75 | 14.38 | 15.00 | 15.63 | 16.25 | 16.88 | 17.50 | 18.13 | 18.75 | 19.38 | 20.00 | 20.63 | 21.25 | 21.88 | 22.50 | 23.13 | 23.75 | 24.38 | 25.00 | 25.63 |
| 85% | 10.98 | 11.59 | 12.20 | 12.80 | 13.41 | 14.02 | 14.63 | 15.24 | 15.85 | 16.46 | 17.07 | 17.68 | 18.29 | 18.90 | 19.51 | 20.12 | 20.73 | 21.34 | 21.95 | 22.56 | 23.17 | 23.78 | 24.39 | 25.00 |
| 90% | 10.59 | 11.18 | 11.76 | 12.35 | 12.94 | 13.53 | 14.12 | 14.71 | 15.29 | 15.88 | 16.47 | 17.06 | 17.65 | 18.24 | 18.82 | 19.41 | 20.00 | 20.59 | 21.18 | 21.76 | 22.35 | 22.94 | 23.53 | 24.12 |
| 92% | 10.00 | 10.56 | 11.11 | 11.67 | 12.22 | 12.78 | 13.33 | 13.89 | 14.44 | 15.00 | 15.56 | 16.11 | 16.67 | 17.22 | 17.78 | 18.33 | 18.89 | 19.44 | 20.00 | 20.56 | 21.11 | 21.67 | 22.22 | 22.78 |
| 95% | 9.78 | 10.33 | 10.87 | 11.41 | 11.96 | 12.50 | 13.04 | 13.59 | 14.13 | 14.67 | 15.22 | 15.76 | 16.30 | 16.85 | 17.39 | 17.93 | 18.48 | 19.02 | 19.57 | 20.11 | 20.65 | 21.20 | 21.74 | 22.28 |
| 95% | 9.47 | 10.00 | 10.53 | 11.05 | 11.58 | 12.11 | 12.63 | 13.16 | 13.68 | 14.21 | 14.74 | 15.26 | 15.79 | 16.32 | 16.84 | 17.37 | 17.89 | 18.42 | 18.95 | 19.47 | 20.00 | 20.53 | 21.05 | 21.58 |

System Efficiency

Propane 95,500 BTU / gallon

| | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 75% | 1.00 | 1.10 | 1.20 | 1.30 | 1.40 | 1.50 | 1.60 | 1.70 | 1.80 | 1.90 | 2.00 | 2.10 | 2.20 | 2.30 | 2.40 | 2.50 | 2.60 | 2.70 | 2.80 | 2.90 | 2.95 | 3.00 | 3.05 | 3.10 |
| 80% | 13.96 | 15.36 | 16.75 | 18.15 | 19.55 | 20.94 | 22.34 | 23.73 | 25.13 | 26.53 | 27.92 | 29.32 | 30.72 | 32.11 | 33.51 | 34.90 | 36.30 | 37.70 | 39.09 | 40.49 | 41.19 | 41.88 | 42.58 | 43.28 |
| 82% | 13.09 | 14.40 | 15.71 | 17.02 | 18.32 | 19.63 | 20.94 | 22.25 | 23.56 | 24.87 | 26.18 | 27.49 | 28.80 | 30.10 | 31.41 | 32.72 | 34.03 | 35.34 | 36.65 | 37.96 | 38.61 | 39.27 | 39.92 | 40.58 |
| 85% | 12.77 | 14.05 | 15.32 | 16.60 | 17.88 | 19.15 | 20.43 | 21.71 | 22.99 | 24.26 | 25.54 | 26.82 | 28.09 | 29.37 | 30.65 | 31.92 | 33.20 | 34.48 | 35.76 | 37.03 | 37.67 | 38.31 | 38.95 | 39.59 |
| 90% | 12.32 | 13.55 | 14.78 | 16.01 | 17.25 | 18.48 | 19.71 | 20.94 | 22.17 | 23.41 | 24.64 | 25.87 | 27.10 | 28.33 | 29.57 | 30.80 | 32.03 | 33.26 | 34.49 | 35.73 | 36.34 | 36.96 | 37.57 | 38.19 |
| 92% | 11.63 | 12.80 | 13.96 | 15.13 | 16.29 | 17.45 | 18.62 | 19.78 | 20.94 | 22.11 | 23.27 | 24.43 | 25.60 | 26.76 | 27.92 | 29.09 | 30.25 | 31.41 | 32.58 | 33.74 | 34.32 | 34.90 | 35.49 | 36.07 |
| 95% | 11.38 | 12.52 | 13.66 | 14.80 | 15.93 | 17.07 | 18.21 | 19.35 | 20.49 | 21.63 | 22.76 | 23.90 | 25.04 | 26.18 | 27.32 | 28.45 | 29.59 | 30.73 | 31.87 | 33.01 | 33.58 | 34.15 | 34.71 | 35.28 |
| 95% | 11.02 | 12.12 | 13.23 | 14.33 | 15.43 | 16.53 | 17.64 | 18.74 | 19.84 | 20.94 | 22.04 | 23.15 | 24.25 | 25.35 | 26.45 | 27.56 | 28.66 | 29.76 | 30.86 | 31.96 | 32.52 | 33.07 | 33.62 | 34.17 |

System Efficiency

Fuel Oil 138,900 BTU / gallon

| | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 75% | 3.20 | 3.25 | 3.30 | 3.35 | 3.40 | 3.45 | 3.50 | 3.55 | 3.60 | 3.65 | 3.70 | 3.80 | 3.90 | 4.00 | 4.10 | 4.20 | 4.30 | 4.40 | 4.50 | 4.60 | 4.70 | 4.80 | 4.90 | 5.00 |
| 80% | 30.72 | 31.20 | 31.68 | 32.16 | 32.64 | 33.12 | 33.60 | 34.08 | 34.56 | 35.04 | 35.52 | 36.48 | 37.44 | 38.40 | 39.36 | 40.32 | 41.28 | 42.24 | 43.20 | 44.16 | 45.12 | 46.08 | 47.04 | 48.00 |
| 82% | 28.80 | 29.25 | 29.70 | 30.15 | 30.60 | 31.05 | 31.50 | 31.95 | 32.40 | 32.85 | 33.30 | 34.20 | 35.10 | 36.00 | 36.90 | 37.80 | 38.70 | 39.60 | 40.50 | 41.40 | 42.30 | 43.20 | 44.10 | 45.00 |
| 85% | 28.10 | 28.53 | 28.97 | 29.41 | 29.85 | 30.29 | 30.73 | 31.17 | 31.61 | 32.05 | 32.49 | 33.36 | 34.24 | 35.12 | 36.00 | 36.88 | 37.75 | 38.63 | 39.51 | 40.39 | 41.26 | 42.14 | 43.02 | 43.90 |
| 90% | 27.10 | 27.53 | 27.95 | 28.37 | 28.80 | 29.22 | 29.64 | 30.07 | 30.49 | 30.92 | 31.34 | 32.19 | 33.03 | 33.88 | 34.73 | 35.57 | 36.42 | 37.27 | 38.11 | 38.96 | 39.81 | 40.66 | 41.50 | 42.35 |
| 92% | 25.60 | 26.00 | 26.40 | 26.80 | 27.20 | 27.60 | 28.00 | 28.40 | 28.80 | 29.20 | 29.60 | 30.40 | 31.20 | 32.00 | 32.80 | 33.60 | 34.40 | 35.20 | 36.00 | 36.80 | 37.60 | 38.40 | 39.20 | 40.00 |
| 95% | 25.04 | 25.43 | 25.82 | 26.22 | 26.61 | 27.00 | 27.39 | 27.78 | 28.17 | 28.56 | 28.95 | 29.74 | 30.52 | 31.30 | 32.08 | 32.87 | 33.65 | 34.43 | 35.21 | 36.00 | 36.78 | 37.56 | 38.34 | 39.13 |
| 95% | 24.25 | 24.63 | 25.01 | 25.39 | 25.77 | 26.15 | 26.52 | 26.90 | 27.28 | 27.66 | 28.04 | 28.80 | 29.56 | 30.31 | 31.07 | 31.83 | 32.59 | 33.34 | 34.10 | 34.86 | 35.62 | 36.38 | 37.13 | 37.89 |

System Efficiency

Energy Efficiency Terms

Annual Fuel Utilization Efficiency (AFUE) - The measure of annual efficiency of a residential heating furnace or boiler. Accounts for operation energy losses of the heating unit
 Co-efficient of Performance (C.O.P.) - The same as the efficiency stated as a ratio of work or useful energy output of a system vs. the amount of energy inputted into the system.
 Energy Factor (EF) - The efficiency or measure of overall efficiency of a variety of appliances. Water heater efficiencies are rated by EF.

1 Components

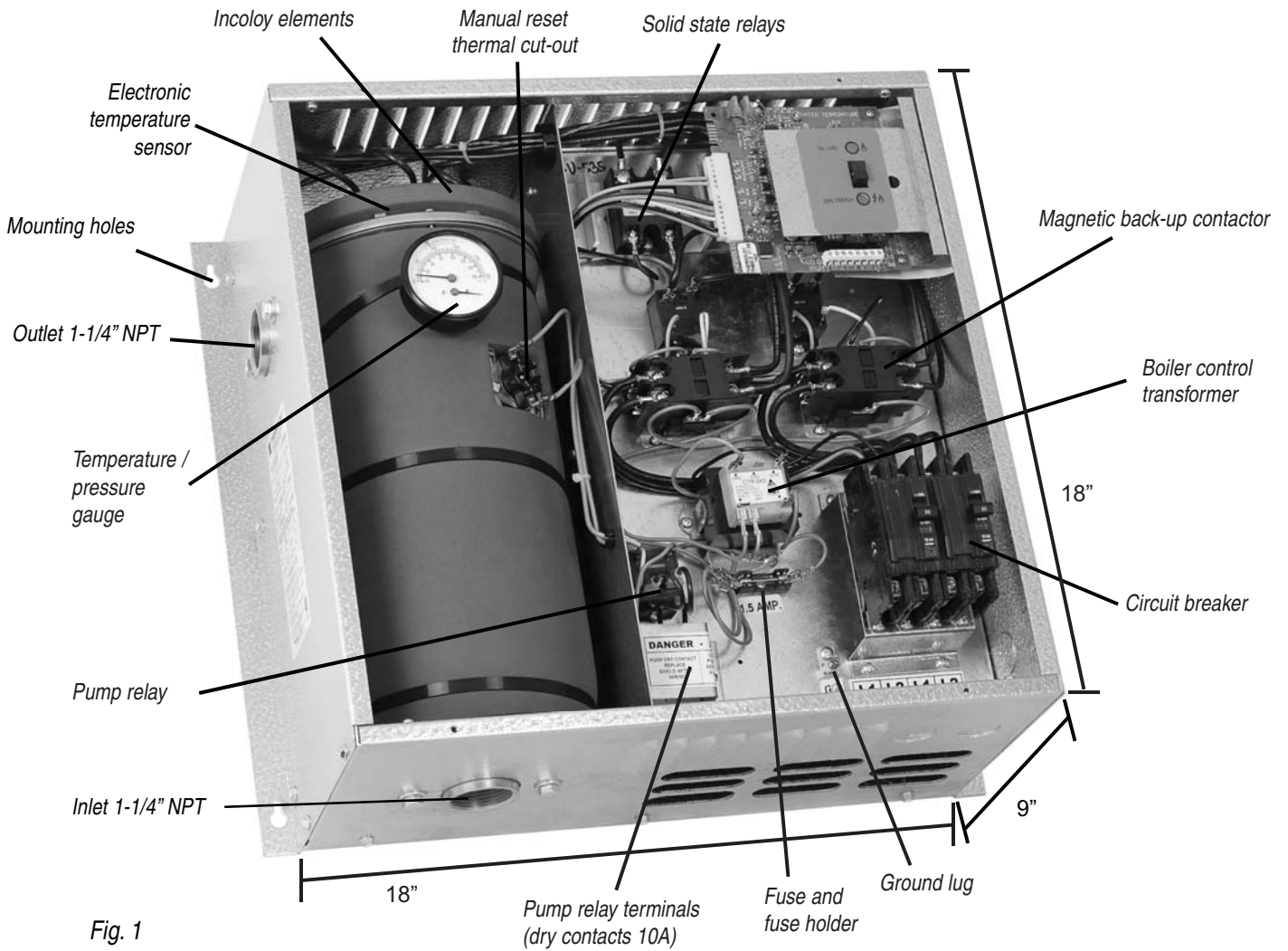
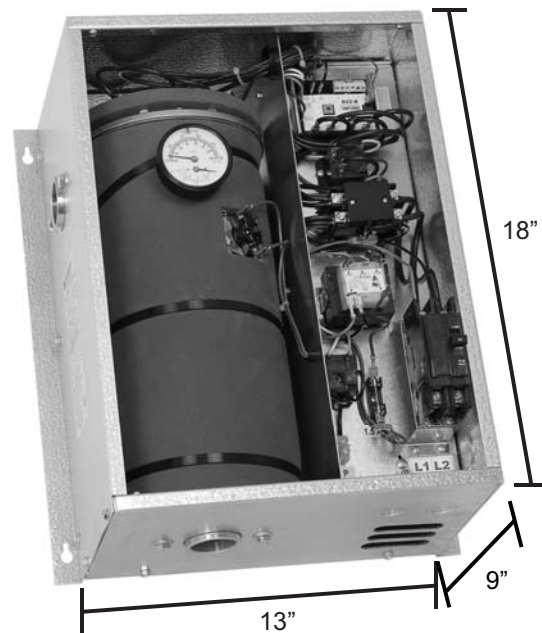


Fig. 1

Note : The model shown above is a typical FFB boiler 15kW / 240 Volts / 1 phase.

Model shown below is a TMB boiler 11kW / 240 / 1 phase.



Outdoor reset sensor Fig. 3

2 Standard specifications for all models

Table 2

| Standard Models Specifications @ 240V / 1ph (U.S.A.) | | | | | | | |
|--|----------|----------|----------|----------|-----------|-----------|--------------------|
| Dual-Energy Models | B-5U-FFB | B-6U-FFB | B-8U-FFB | B-9U-FFB | B-10U-FFB | B-12U-FFB | B-15U-FFB |
| kW | 5 | 5.75 | 8 | 9 | 10 | 11.5 | 15 |
| BTU / H | 17,060 | 19,619 | 27,296 | 30,708 | 34,120 | 39,238 | 51,180 |
| Total Amps | 20.83 | 23.96 | 33.33 | 37.50 | 41.67 | 47.92 | 62.50 |
| No. Of Power Supplies (Breaker Size) | 1 x 30A | 1 x 30A | 1 x 50A | 1 x 50A | 1 x 60A | 1 x 60A | 1 x 60A 1 x 30A |

| Dual-Energy Models | B-18U-FFB | B-20U-FFB | B-23U-FFB | B-27U-FFB | B-30U-FFB | B-35U-FFB | B-40U-FFB |
|--------------------------------------|--------------------|-----------|-----------|--------------------|-----------|-----------|-----------|
| kW | 18 | 20 | 23 | 27 | 30 | 35 | 40 |
| BTU / H | 61,416 | 68,242 | 78,479 | 92,128 | 102,360 | 119,420 | 136,480 |
| Total Amps | 75.00 | 83.37 | 95.83 | 112.50 | 125.00 | 145.83 | 166.67 |
| No. Of Power Supplies (Breaker Size) | 1 x 60A 1 x 50A | 2 x 60A | 2 x 60A | 2 x 50A 1 x 60A | 3 x 60A | 4 x 50A | 4 x 60A |

| TMB MONO Model Specifications @ 240V / 1ph (U.S.A.) | | | | |
|---|---------|---------|---------|----------|
| Mono Models | B-3TMBU | B-6TMBU | B-9TMBU | B-11TMBU |
| kW | 3 | 6 | 9 | 11 |
| BTU/H | 10,236 | 20,472 | 30,708 | 37,532 |
| Total Amps | 12.5 | 25.0 | 37.5 | 45.8 |
| Breaker size | 1 x 20A | 1 x 40A | 1 x 50A | 1 x 60A |

| Standard Model Specifications @ 3ph (U.S.A.) | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|
| Dual-Energy Models | B-18U-FFB | B-24U-FFB | B-30U-FFB | B-35U-FFB | B-40U-FFB |
| kW | 18 | 24 | 30 | 35 | 40 |
| BTU / H | 61,416 | 81,888 | 102,360 | 119,420 | 136,480 |
| Amps @ 208V / 3ph | 48.00 | 66.69 | 83.37 | 96.00 | n/a |
| No. Of Power Supplies (Breaker Size) | 1 x 60A | 2 x 50A | 2 x 60A | 2 x 60A | |
| Amps @ 480V / 3ph | 21.68 | 28.90 | 36.13 | 42.15 | 48.00 |
| Disconnect Switch | 30A | 30A | 60A | 60A | 60A |

NOTE: Other models, voltages and capacities available upon request. Please contact the factory.

Please use Table 3 below to select the wire size for the power supply.

Table 3

| Cable Amps Capacity vs Wire Size | | | | | | | | | | | |
|----------------------------------|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
| Wire Size | 12 | 10 | 8 | 6 | 4 | 3 | 2 | 1 | 0 | 00 | 000 |
| Amps @ 75°C (167°F) | 20 | 30 | 45 | 65 | 85 | 100 | 115 | 130 | 150 | 175 | 200 |
| Amps @ 90°C (194°F) | 20 | 30 | 45 | 65 | 85 | 105 | 120 | 140 | 155 | 185 | 210 |

Notes :

- 1- This table should be used as a guide only. Always select the wire size according to the local Electrical Code.
- 2- Always use wire suitable for 75°C (167°F) minimum, 300V or 600V as required.
- 3- All models with suffix "U" over 12 kW at 240V / 1ph require two feeders. Divide the Total Amps by 2 to select the proper wire size.
- 4- COPPER WIRE ONLY.

Installation Guidelines for Thermolec Electric Boilers Model B

3 Important

- 3.1 These instructions should be used as a general guide only. Electrical Code and local utility requirements must be followed and take precedence over these instructions.
- 3.2 Thermolec electric boilers are manufactured with quality components for maximum life, durability and minimum service. To ensure a satisfactory installation it is imperative that you read these instructions carefully before installing and operating the heating system.
Failure to do so may result in breach of warranty.

4 Unpacking

- 4.1 Inspect the unit and check whether there are missing parts.
- 4.2 Report any damage or claims to the carrier immediately.
- 4.3 For all returns to be accepted they must be authorized by the manufacturer.

5 Location and dimensions

- 5.1 These boilers are designed for wall mounting. Please see [Table 1](#) below for overall dimensions. [Table 1](#) also gives the minimum clearances to combustible material as well as recommended distances for ease of service (e.g. replacement of tubular elements).

Table 1

| Dimensions and Clearances | | | | | | | | | |
|---|--------------------|--------|-------|------------|------|-----|-------|--------|--|
| Models | Overall dimensions | | | Clearances | | | | | |
| | Width | Height | Depth | Front | Back | Top | Right | Others | |
| <u>Short Models</u> up to 23 kW 1ph up to 18 kW 3ph | 18" | 18" | 9" | 36" | 0" | 12" | 6" | 12" | |
| <u>Long Models</u> up to 40 kW | 18" | 28" | 9" | 36" | 0" | 24" | 6" | 12" | |
| TMB | 13" | 18" | 9" | 36" | 0" | 12" | 6" | 12" | |

- 5.2 The boiler room should be well ventilated as to maintain the temperature below 77°F.
- 5.3 The unit must be mounted level on a vertical wall with the outlet fitting on the left side of the unit.

6 Water circulation and plumbing notes

- 6.1 The system is designed to operate with a maximum output temperature of 190°F or lower and a temperature rise across the unit of 20°F or lower.

Please refer to Table 4 for the minimum flow rate versus the capacity of the boiler.

Table 4

| Minimum Water Flow Rate vs Capacity | |
|--|-------------------------|
| Capacity (kW) | US Gallons / min |
| 3 | 1.1 |
| 5 | 1.8 |
| 6 | 2.0 |
| 8 | 2.8 |
| 9 | 3.1 |
| 10 | 3.5 |
| 11 | 3.9 |
| 12 | 4.2 |
| 15 | 5.3 |
| 18 | 6.2 |
| 20 | 7.0 |
| 23 | 8.0 |
| 27 | 8.8 |
| 30 | 10.4 |
| 35 | 12.2 |
| 40 | 13.9 |

- 6.2 In order to ensure an adequate flow rate :

- 6.21 Pressure loss (referred as "Head") caused by water friction in the system should not exceed the capacity of the pump.
- 6.22 Please refer to Table 5 below to find the copper pipe diameter (type L) recommended to accommodate the water flow found in Table 4 above.

Table 5

| Maximum Flow Rate @ 15 psi | |
|-----------------------------------|------------------------|
| Maximum Flow Rate | Pipe Diameter |
| US Gallons / min | (Type L Copper) |
| 4.3 | 3/4" |
| 10.1 | 1" |
| 17.3 | 1-1/4" |

- 6.23 Elbows and valves will greatly add to the head loss in the system. An appropriate water flow rate must be maintained to avoid tripping of the temperature limiter. Pipes with diameters larger than specified in Table 5 will not help to increase water flow.
- 6.24 Head loss through the boiler tank is negligible and should not affect calculations of flow rates.

- 6.3 The installation must have a drain valve, an expansion tank, maintenance valves and an automatic pressure reducing fill valve set at 15 PSI (104 kPA). A "T" fitting (1-1/4" NPT) must be installed at the supply outlet of the unit. This "T" must be equipped with a reducing bushing 1-1/4" to 3/4" NPT, facing upwards, to accept a 3/4" NPT pressure relief valve. This safety valve must be installed vertically. Except for the pressure relief valve, the above plumbing supplies are not supplied with the unit. Please refer to illustrations A, B and C at the end of this manual.

6.4 The automatic pressure relief valve supplied with the boiler is required to prevent dangerous pressure build-ups in the system in case of system malfunction and may under certain conditions vent hot water. Do not install the system where water could damage rugs, furniture, etc. When piping the relief valve to a drain, check with local authority for recommended method of installation. Do not open or tamper with the relief valve. If operated frequently or used to drain or flush the system, the valve could fail to seat properly and thus leak.

Important safety notice : This safety valve is mandatory and must be installed as shown in the illustrations A, B and C at the end of this manual. The omission of the safety valve installation will create a very serious safety hazard and will void all warranties.

6.5 Automatic air vents should be installed at the highest point of the installation and above the level of the boiler tank, ideally on all radiator units for best results or at points where air could possibly be trapped in the system.

Caution : Make sure the system has been properly vented before starting the unit.

6.6 Depending on water conditions, determine whether water additives are necessary.

7 Mechanical installation

7.1 Mounting brackets are located on the sides of the boiler. Depending on the size of the unit, four or six holes are provided. The unit may be attached directly to a combustible surface.

7.2 Use a circulator pump of appropriate capacity for the intended application. The pump should be placed as close as possible to the boiler. Ensure that the water direction is correct. An arrow indicating the circulation direction is generally visible on the pump casing.

7.3 Install inlet and outlet piping.

7.4 Install air vents, valves, the pressure relief valve supplied with the unit, expansion tank, etc.

7.5 When everything is finished, install the temperature / pressure gauge.

8 Electrical installation

8.1 Disconnect all power sources before opening the main panel and working within.

8.2 Read the nameplate and other markings carefully and wire strictly in accordance with the wiring diagram.

8.3 Wires and protective equipment must be sized according to the applicable Electrical Code.

8.4 Use only wires suitable for minimum 167°F.

8.5 Install the outdoor sensor on an exterior North wall and connect it with 18/2 wire to terminals "OT / OT" on the electronic board (TH-600 series controller).

8.6 On the electronic aquastat (marked "WATER TEMPERATURE"), select the **maximum** water temperature required (1-10) by the type of installation. Please see [Table 6](#) below for the temperature obtained according to the knob position. The **minimum** water temperature is reset automatically by the outdoor sensor. Please see the variation graph in [Fig 5](#).

Table 6

| Water Temperature controlled by Electronic Aquastat | | | | | | | | | | | |
|--|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Set-point | | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Maximum temperature | °C | 88 | 81 | 75 | 67 | 58 | 50 | 45 | 42 | 39 | 36 |
| | °F | 190 | 178 | 167 | 153 | 137 | 122 | 113 | 107 | 102 | 97 |
| Minimum temperature | °C | 48 | 48 | 48 | 45 | 40 | 38 | 34 | 31 | 29 | 28 |
| | °F | 118 | 118 | 118 | 113 | 104 | 100 | 93 | 88 | 84 | 82 |

Electronic Aquastat

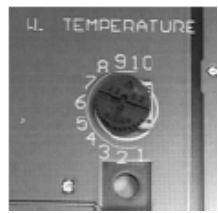


Fig. 4

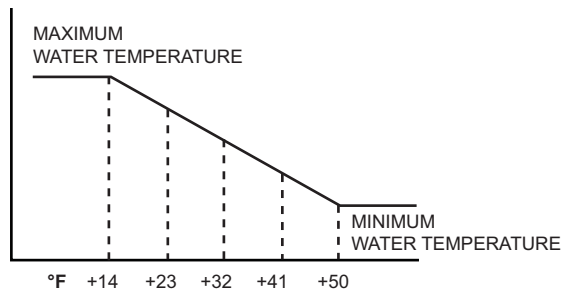


Fig. 5

- 8.7 The outdoor sensor will :
- Maintain the selected **maximum** water temperature when the outdoor temperature is at +14° F or colder.
 - Automatically and proportionally** compensate by varying the water temperature between the maximum and minimum when the outdoor temperature is between +14°F and +50°F.
 - Maintain the **minimum** water temperature when the outdoor temperature is between +50°F and +68°F.
 - Prevent boiler operation above +68°F.
- NOTE** : If you choose not to use the outdoor sensor, don't connect it to the "**OT / OT**" terminals nor jumper these terminals. You will not use this feature and the water will simply be maintained at the maximum selected temperature.
- 8.8 Connect the thermostat or the zone valve end switch wires to "**C**" and "**W1**" terminals on the electronic board. Power stealing thermostats require an isolation relay (not included).
- 8.9 **Circulating Pump Control**. The "**P / P**" terminals are connected to dry contacts of a relay (capacity up to 1 HP) and are used to start the pump. This relay is switched **ON** with the first heating step and **OFF** after the last one. A separate 120V / 1Ø service must be provided from the electrical panel to the boiler for the pump. For Electric Boiler only systems, refer to the wiring diagram. For Electric Boiler with fossil fuel backup, see the diagram on page 23 labeled 'PUMP WIRING WITH FOSSIL FUEL BACKUP BOILER' as the pump must also run when another source of heat is selected. Follow the extra steps dedicated to a FFB installation in the start-up sequence.
- 8.10 Set the room thermostat heat anticipator (when available) to **0.2** Amperes.
- 8.11 If the system is used with Load Management control, connect the Utility signal to "**S1 / S2**" terminals. A closed contact enables the boiler, an open contact disables the boiler.
- 8.12 The installation is now ready for start-up procedure and testing.

9 Start-up procedure and test sequence

Do not energize electrical elements prior to purging system and verifying proper water circulation

Double check the following carefully :

- All wiring and plumbing is complete.
- Pipes have been cleaned, the system has been flushed and filled again.
- Without powering the entire unit, install a jumper between the "**P / P**" terminals (using proper gauge of wire) and switch the pump breaker **ON** as to let the pump run alone. Verify that the pump is running freely and check for leaks. During this test, a lot of bubbles will travel through the system and air will be eliminated by the automatic vents. You can accelerate the process by purging the radiators manually. Shut off the pump breaker at the panel, then remove the jumper between the "**P / P**" terminals.
- The pressure in the system has been stabilized at approximately 15 PSI (104 kPA).
- The entire system is now almost free of air.
- The room thermostat anticipator (when available) has been set at **0.2** Amperes.
- Switch the boiler breaker **ON** at the main panel.

- 9.8 Set the thermostat above the room temperature. The system should start.
- 9.9 Make sure the pump starts running as soon as the system starts.
- 9.10 Heating stages will be switched **ON** in sequence at 30 second intervals, confirmed by green lights on the left hand side of the PC board on the **TH600** or by red lights on the right hand side on the **D22-B**.
- 9.11 Wait for two minutes and measure the current drawn by the boiler and compare it with the one shown on the nameplate.
- 9.12 When the required maximum water temperature selected on the aquastat (**0-10**) or controlled by the outdoor sensor is reached, the electronic controller will modulate the boiler capacity to maintain the water temperature, as long as the demand for heating is not satisfied. The bottom green light flashes continuously on the **TH600** or one of the red lights on the **D22-B** to indicate that the boiler is maintaining the setpoint. When the room thermostat is satisfied, the heating stages will come **OFF** in sequence at 5 second intervals.
- 9.13 Set the room thermostat to the desired set point.
- 9.14 The boiler is now ready and functional.

Extra test steps for Electric with Fossil Fuel Backup Boiler installation

- 9.15 Disconnect the room thermostat wires from the existing boiler and connect them to "C" and "W1" terminals on the electronic board of the electric boiler.
- 9.16 Connect two (2) wires from "B / B" control terminals of the electronic board on the electric boiler to the (T)(T) (thermostat) terminals of the existing boiler.
- 9.17 Terminals "S1 / S2" on the electronic board should receive the utility **Load Management Control** wires.
- 9.18 Connect the pump terminals "P / P" in parallel to the existing thermostatic pump control as per wiring diagram on page 23 to allow the operation of the pump in any of the "**Dual-Energy**" modes selected.
- 9.19 When the system is operating in Fossil Fuel mode, the supply water temperature of the fossil fuel boiler should **never exceed 190°F** which may trip the manual high limit in the electric boiler.

10 Test sequence for FFB Boiler systems

- 10.1 An FFB boiler is supplied with a three-position mode selector switch. Because of differences in regional regulations, the electronic board has been factory set so as to allow the activation of the electric mode depending on the unit destination. In the "**Gas / Oil**" position the thermostat will call upon the gas or oil boiler or furnace to maintain the house temperature at the desired level. The "**Dual-Energy**" mode gives automatic control to the outdoor sensor or alternate switching signals from the local utility for **Load Management** control. When the **Load Management** contacts are closed, the "**Electric**" mode is selected. When these contacts are open, the "**Gas / Oil**" mode is selected. A green pilot light indicates the mode that has been selected.

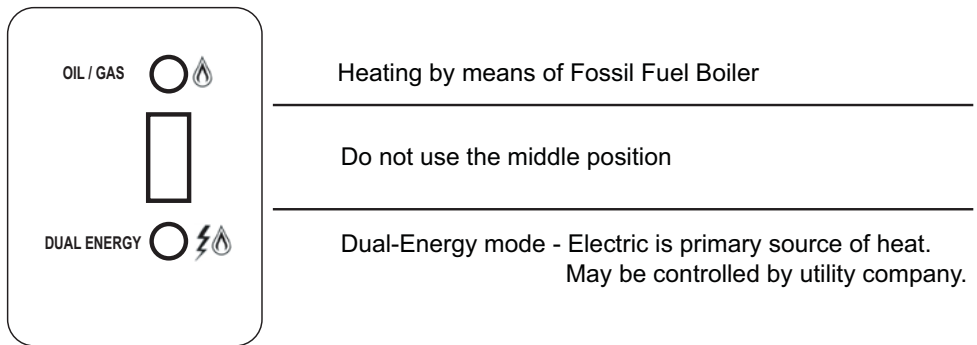




Fig. 6

- 10.3 Simulate a heating demand by setting the thermostat higher than the room temperature.
- 10.4 Switch the mode selector to position  and check that the burner responds to the thermostat demand.
- 10.5 Switch the mode selector to the "**Dual-Energy**" position . Install a jumper between terminals "**S1 / S2**"; the electric mode is automatically selected. The pump will start and the heating stages will be switched **ON** in sequence at 30 second intervals. Measure the current drawn by the boiler and compare it with the one shown on the nameplate. If you remove the jumper from terminals "**S1 / S2**", the system should switch back to the "**Oil / Gas**" mode.
- 10.6 Switch the mode selector to the desired position and set the room thermostat to the desired temperature.
- 10.7 Your boiler is now ready and functional.

11 Installation examples

- 11.1 **Installation A** shows a Thermolec electric boiler in a Full-Electric Configuration.
- 11.2 **Installation B** shows a Thermolec electric boiler in a FFB-Series Configuration.
Water is always passing through both boilers even if only one heat source is selected at a time.
- 11.3 **Installation C** shows a Thermolec electric boiler in a Primary/Secondary Piping Configuration.
Water is pumped through multiple zones (more than two equally sized zones).

12 Position and electric values of heating elements

Standard values of heating elements at 240 Volts are 3kW, 5kW, 5.75kW, 8.75kW & 10 kW. Please refer to the following sketches and tables to find the position and test value in ohms of each element. Please ensure you disconnect the element wires completely before you make the resistance reading.

13 Replacement of heating elements

Heating elements nuts and cover bolts have been factory torqued with a calibrated tool. Please make sure you have a torque driver and the proper sockets handy before you open the boiler tank.

Elements nuts should be torqued at :

130 inch-pound (in-lbs) or equivalent

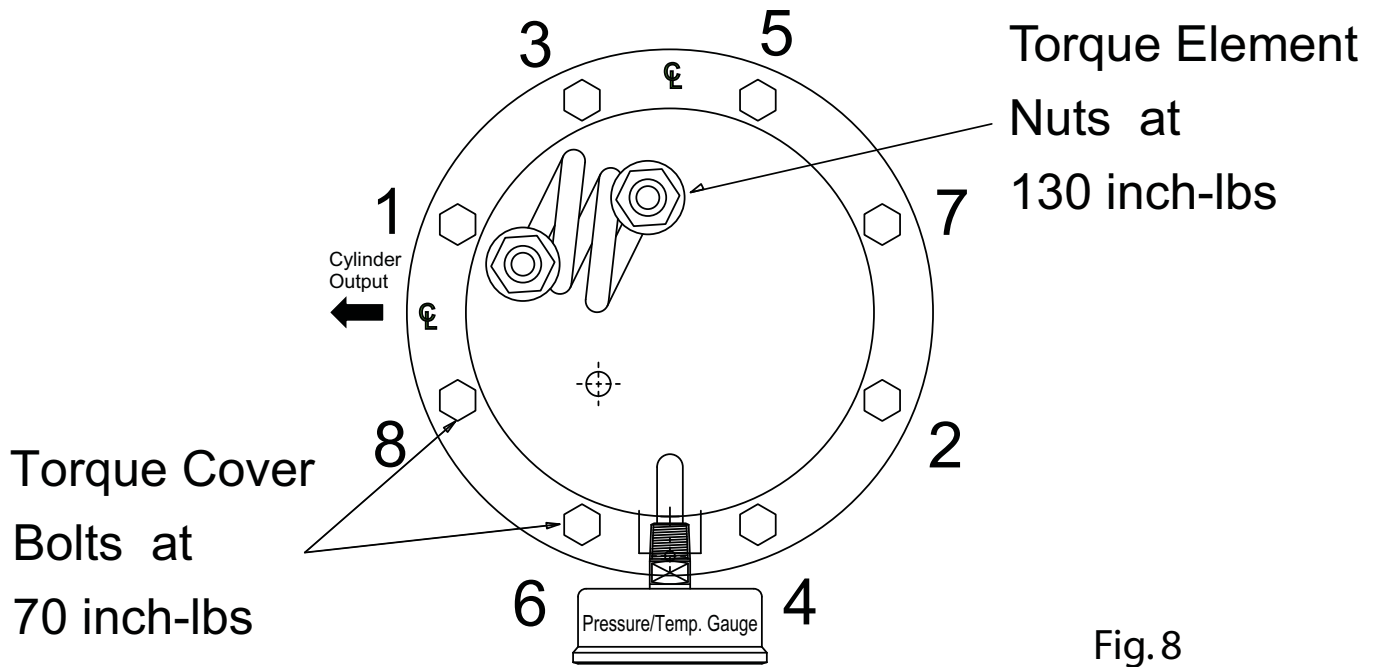
Please ensure you use the double wrench method (i.e. an open key inside of the tank to hold the element hexagon flange firmly and the torque wrench outside). Don't let the element turn while tightening or it may become damaged.

Cover hex bolts should be torqued at :

70 inch-pound (in-lbs) or equivalent

Please make sure to tighten all nuts by hand first, then tighten them as per fig. 8 and finally apply the proper torque with the torque wrench. Resist the feeling that the bolts could get torqued more (even if possible) because that action would simply squash the silicone gasket to the point where it would eventually lose all its resiliency and sealing properties.

Keep in mind that an equal torque is far more important.



14 Warranty

Thermolec Ltd. warrants against defects in materials and workmanship the heat generator casing of its boiler and the heating elements for ten (10) years and all other components for two (2) years after date of original installation.

Any claim under this warranty shall be considered only if the product has been installed and operated in accordance with Thermolec's written instructions.

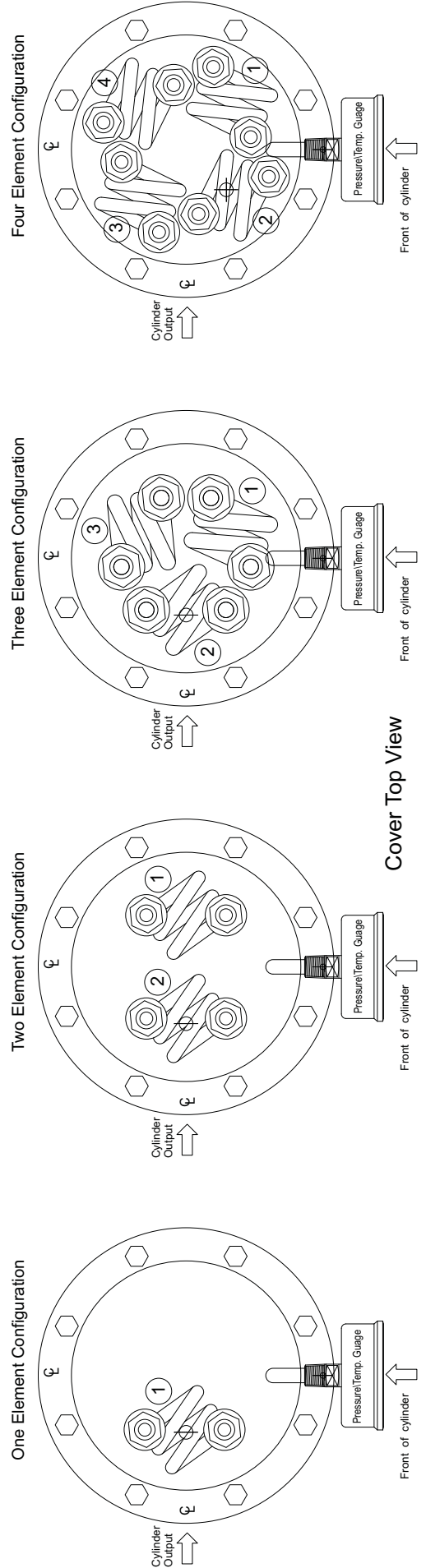
Any misuse of the system or any repair by persons other than those authorized by Thermolec, carried out without its written consent, voids this warranty.

Thermolec's responsibility shall be limited in any case to the replacement or repair, in its factory or in the field, by others chosen by Thermolec, at its option, of such boiler or parts thereof, as shall prove to be defective within the warranty period.

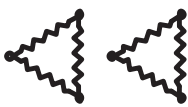
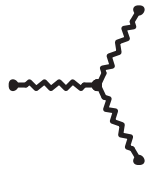
Thermolec Ltd. will not be held responsible for labor, accidental or consequential damages, nor for delays, nor for damages caused by the replacement of the said defective boiler.

Elements Position, Electric Data and Part

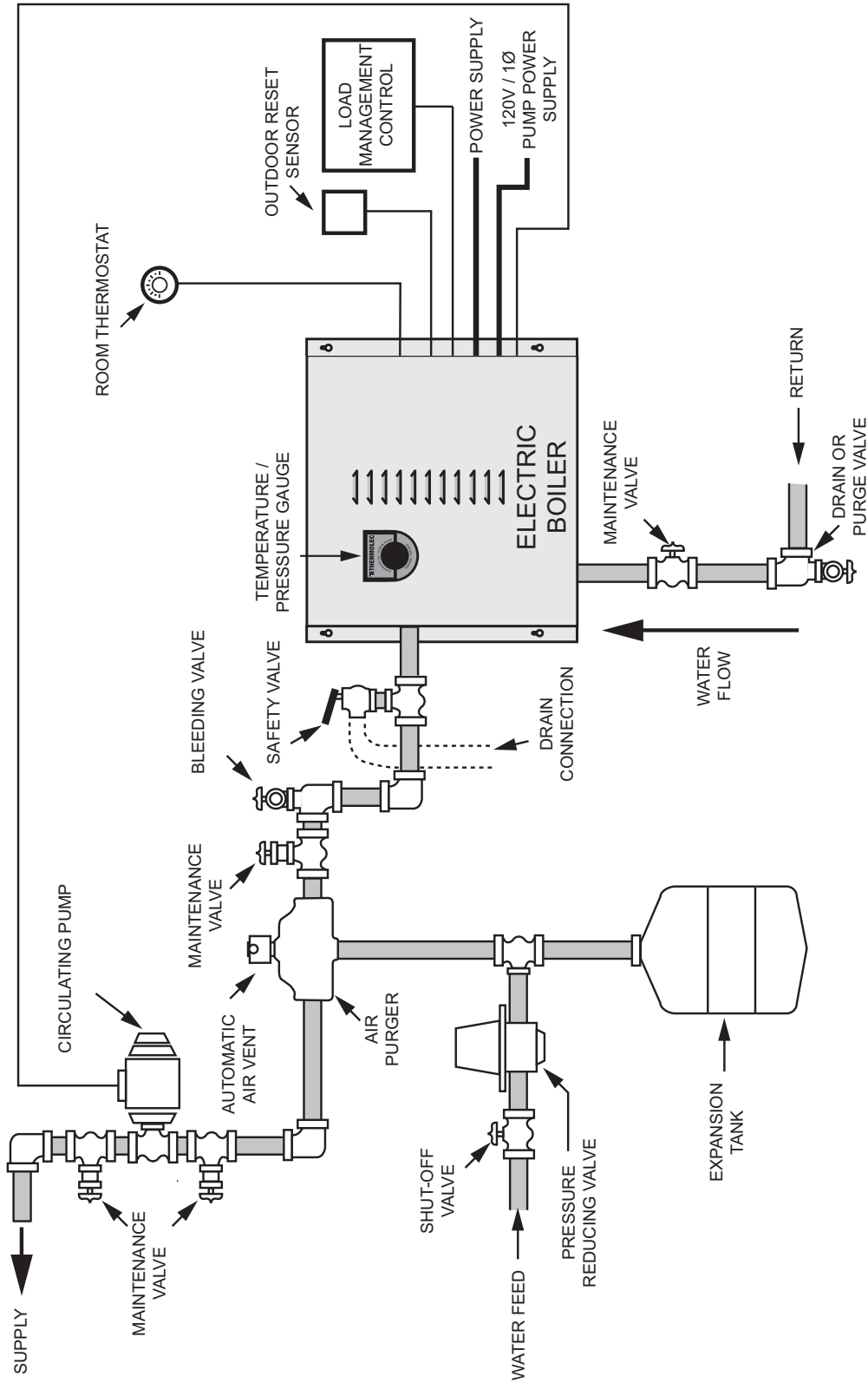
| Height | Volts / Phases | Total KW | Position 1 | | | Position 2 | | | Position 3 | | | Position 4 | | | | | | | |
|------------------------|----------------|----------|------------|------|---------|------------|------|---------|------------|------|---------|------------|------|---------|---------|------|---------|--|--|
| | | | Watts | Ohms | Part # | Watts | Ohms | Part # | Watts | Ohms | Part # | Watts | Ohms | Part # | | | | | |
| 13" Cylinder | 240/1 | 3.00 | 3000 | 19.2 | CBLR065 | | | | | | | | | | | | | | |
| | | 5.00 | 5000 | 11.5 | CBLR055 | | | | | | | | | | | | | | |
| | | 6.00 | 5750 | 10.0 | CBLR060 | | | | | | | | | | | | | | |
| | | 8.00 | 5000 | 11.5 | CBLR055 | 3000 | 19.2 | CBLR065 | | | | | | | | | | | |
| | | 9.00 | 5750 | 10.0 | CBLR060 | 3000 | 19.2 | CBLR065 | | | | | | | | | | | |
| | | 10.00 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | | | | | | | | | | | |
| | | 12.00 | 5750 | 10.0 | CBLR060 | 5750 | 10.0 | CBLR060 | | | | | | | | | | | |
| | | 15.00 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | | | | | | | | |
| | | 18.00 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 3000 | 19.2 | CBLR065 | | |
| | | 20.00 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | 5000 | 11.5 | CBLR055 | | |
| 23.00 | 5750 | 10.0 | CBLR060 | 5750 | 10.0 | CBLR060 | 5750 | 10.0 | CBLR060 | 5750 | 10.0 | CBLR060 | 5750 | 10.0 | CBLR060 | | | | |
| 23" Cylinder | 240/1 | 27.00 | 8750 | 6.6 | CBLR058 | 8750 | 6.6 | CBLR058 | | | | | | | | | | | |
| | | 30.00 | 10000 | 5.8 | CBLR059 | 10000 | 5.8 | CBLR059 | | | | | | | | | | | |
| | | 35.00 | 8750 | 6.6 | CBLR058 | 8750 | 6.6 | CBLR058 | 8750 | 6.6 | CBLR058 | 8750 | 6.6 | CBLR058 | 8750 | 6.6 | CBLR058 | | |
| | | 40.00 | 10000 | 5.8 | CBLR059 | 10000 | 5.8 | CBLR059 | 10000 | 5.8 | CBLR059 | 10000 | 5.8 | CBLR059 | 10000 | 5.8 | CBLR059 | | |
| TMB 13" Cylinder | 240/1 | 3.00 | 3000 | 19.2 | CBLR065 | | | | | | | | | | | | | | |
| | | 6.00 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | | | | | | | | | | | |
| | | 9.00 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | | | | | |
| | | 11.00 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | 3000 | 19.2 | CBLR065 | | | | | |



Elements Position, Electric Data and Part

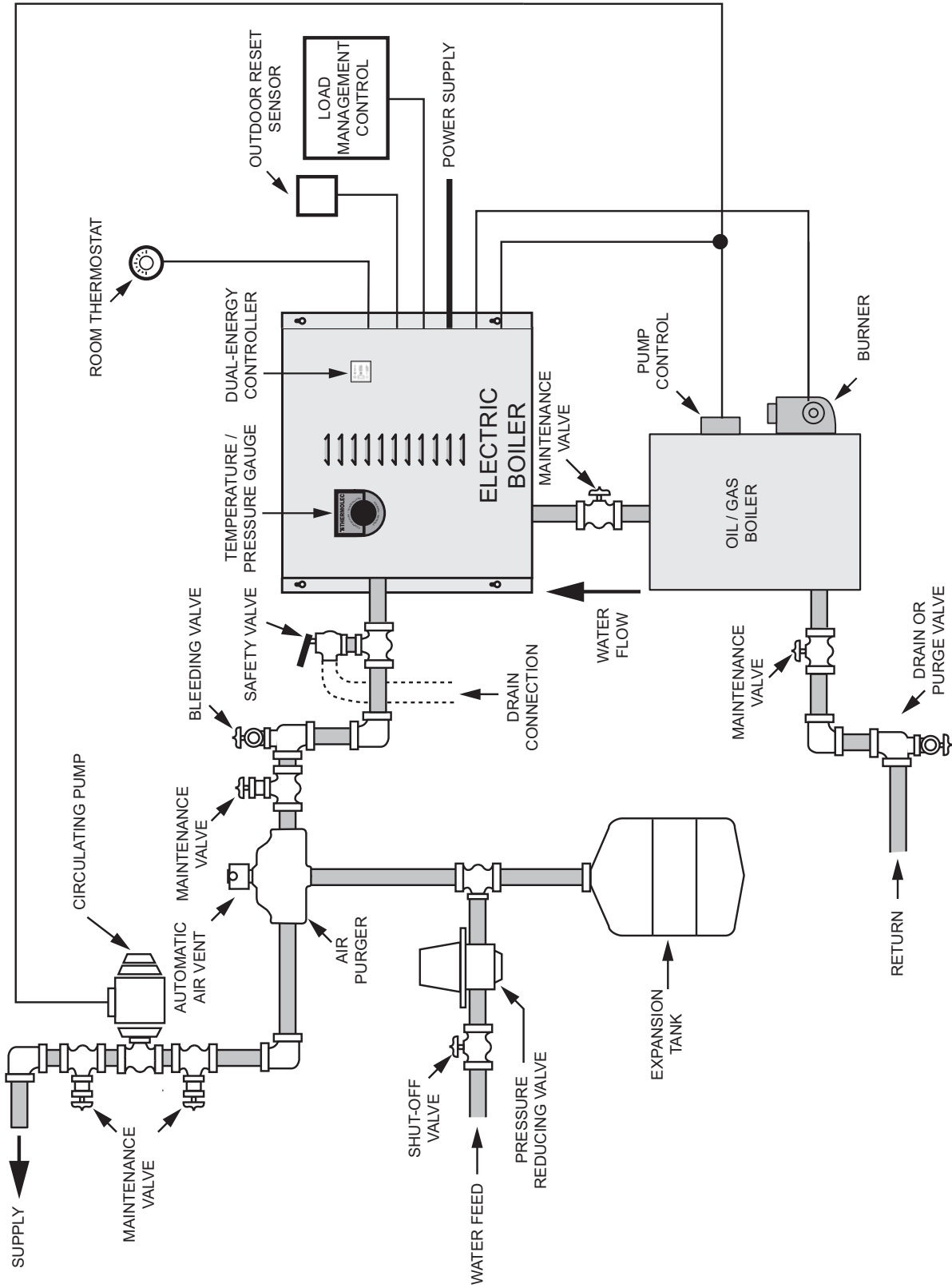
| Height | Volts / Phases | Total KW | Volt / element | # élém. | Position 1, 2, 3 | | | Configuration |
|----------|----------------|----------|----------------|---------|------------------|------|---------|---|
| | | | | | Watts | Ohms | Part # | |
| 13" Cyl. | 208/3 | 18.00 | 208 | 6 | 3000 | 14.4 | CBLR051 |  |
| 23" Cyl. | | 24.00 | | 6 | 4000 | 10.8 | CBLR052 | |
| | | 30.00 | | 6 | 5000 | 8.7 | CBLR053 | |
| | | 36.00 | | 6 | 5750 | 7.5 | CBLR054 | |
| 13" Cyl. | 480/3 | 18.00 | 277 | 3 | 6000 | 12.8 | CBLR056 |  |
| 23" Cyl. | | 24.00 | | 3 | 8000 | 9.6 | CBLR061 | |
| | | 30.00 | | 3 | 10000 | 7.7 | CBLR062 | |
| | | 35.00 | | 3 | 11600 | 6.6 | CBLR063 | |
| | | 40.00 | | 3 | 13300 | 5.8 | CBLR064 | |

ALL-ELECTRIC INSTALLATION (Illustration A)



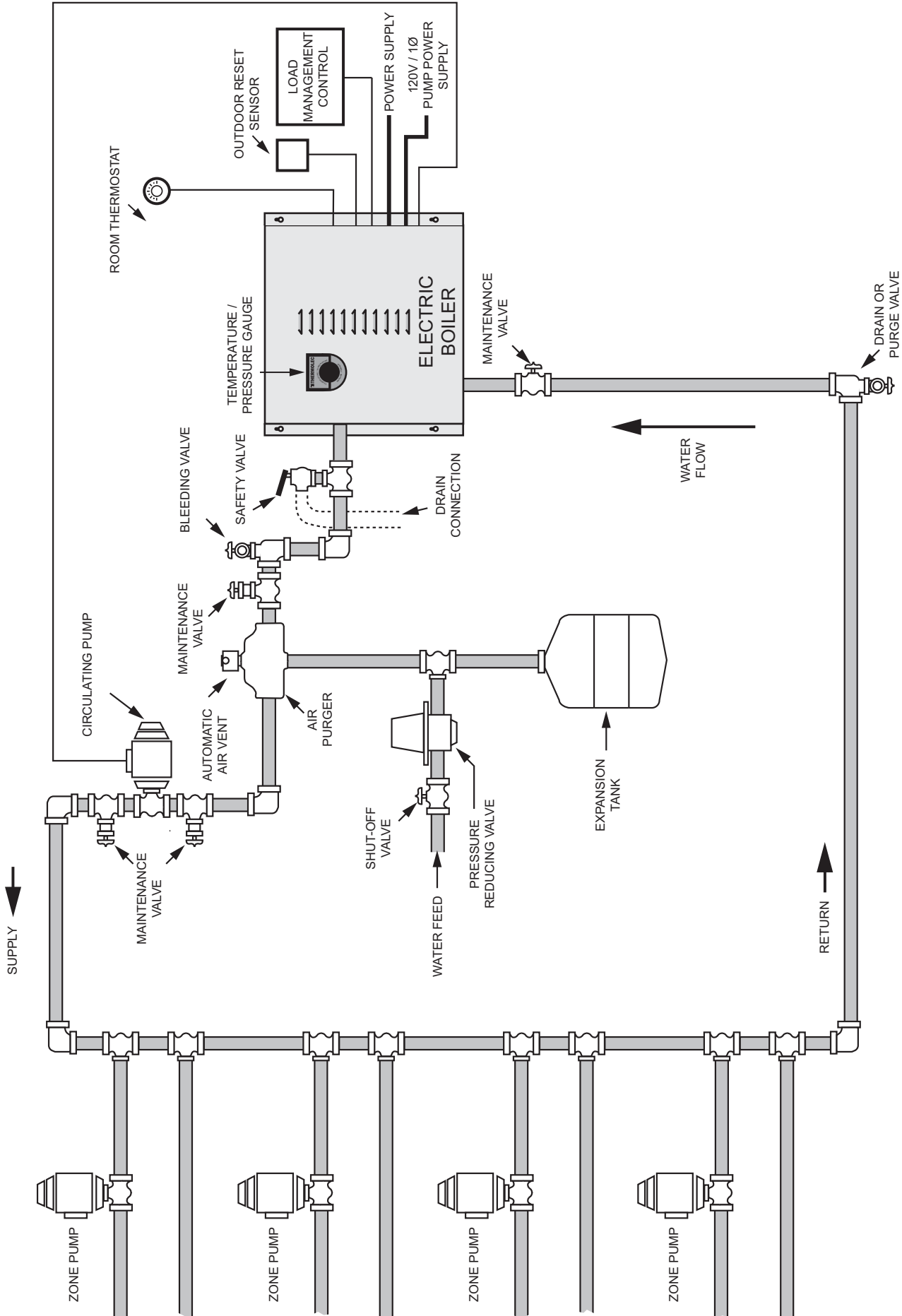
NOTE: Refer to table 4 for minimum flow rates based on boiler kW. Primary/secondary boiler piping is recommended when system has more than two equally sized zones.

DUAL-ENERGY SERIES INSTALLATION (Illustration B)



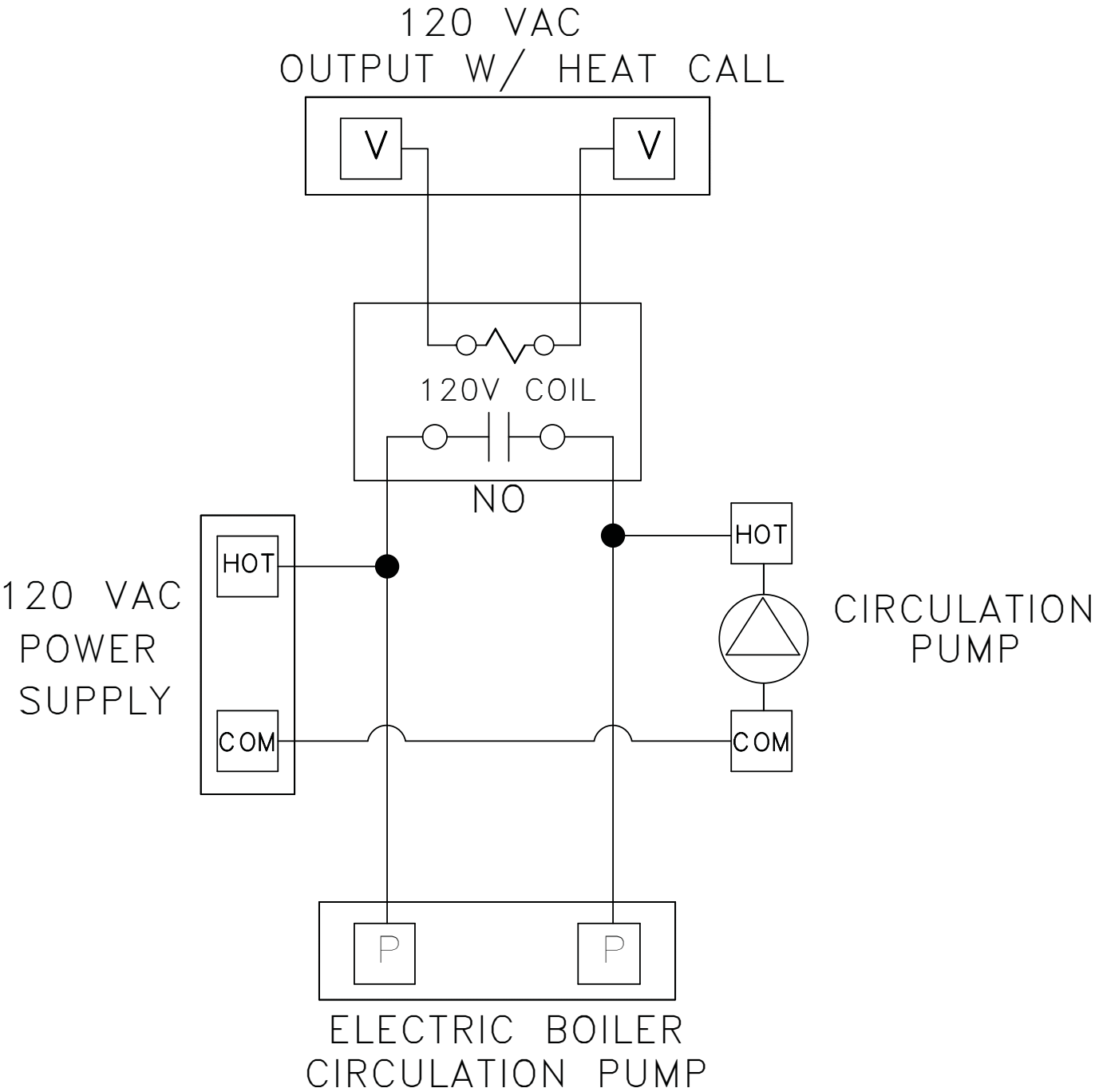
NOTE: Refer to table 4 for minimum flow rates based on boiler kW. Primary/secondary boiler piping is recommended when system has more than two equally sized zones.

**PRIMARY / SECONDARY PIPING INSTALLATION
(Illustration C)**



NOTE: Refer to table 4 for minimum flow rates based on boiler kW. Primary/secondary boiler piping is recommended when system has more than two equally sized zones.

PUMP WIRING WITH FOSSIL FUEL BACKUP BOILER



IMPORTANT:
WIRE IN ACCORDANCE TO LOCAL & NATIONAL ELECTRIC CODES. READ CAREFULLY INSTALLATION INSTRUCTION BEFORE WIRING AND OPERATING.

LEGEND

- MANUAL RESET CUT-OUT
- BACK-UP CONTACTOR
- CIRCULATION PUMP RELAY
- E1...E4 HEATING ELEMENTS
- FU-1 FUSE #1
- PCT-1 PRINTED CIRCUIT BOARD TH600
- PLI PILOT LIGHTS & 3 POSITION SWITCH
- T TRANSFORMER, CLASS 2
- SSR SOLID STATE RELAY
- V1 VALVE CONTROL RELAY
- CB1,2 CIRCUIT BREAKER #1,2

FFB Boiler

Note: If power stealing thermostat is used, thermostat must be powered by separate 24V source and add relay

ROOM THERMOSTAT (SET ANTICIPATOR (0.2AMP.))

LOAD MANAGEMENT CONTROL

GAS/OIL BURNER

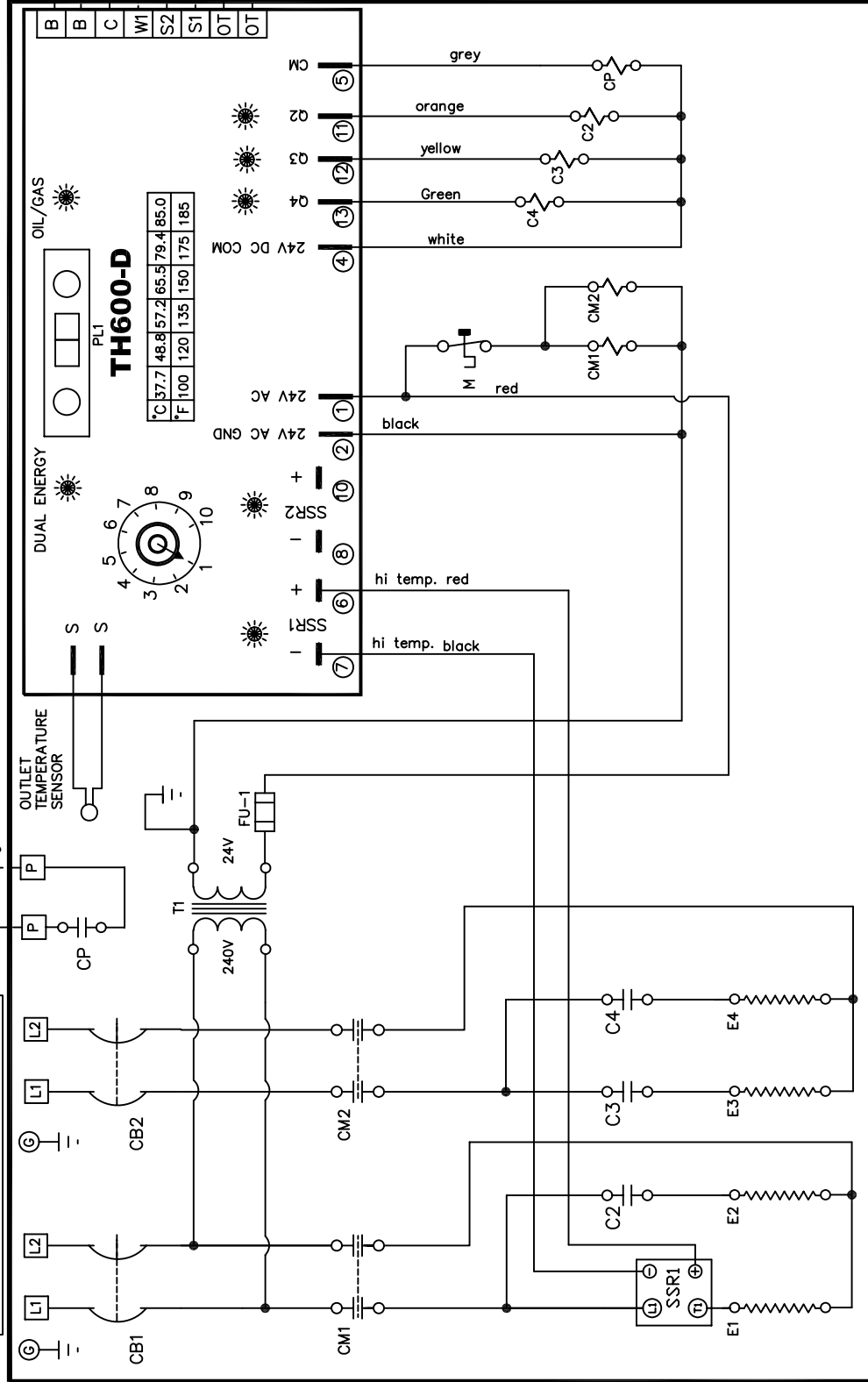
OUTDOOR TEMPERATURE SENSOR

120VAC

CIRCULATION PUMP

CONNECT TO PANELBOARD FEEDER#1

CONNECT TO PANELBOARD FEEDER#2



TH600-D

| | | | | | | |
|----|------|------|------|------|------|------|
| °C | 37.7 | 48.8 | 57.2 | 65.5 | 79.4 | 85.0 |
| °F | 100 | 120 | 135 | 150 | 175 | 185 |

TITLE/TITRE

B18-B20

LTEE LTD

THERMOLEC

MONTREAL - CANADA

DRAWING NO. B1-ENERGIE TH-600-B18-20 1SCR-3RLY - USA

DATE

PER

16-04-10

FULL BREAK

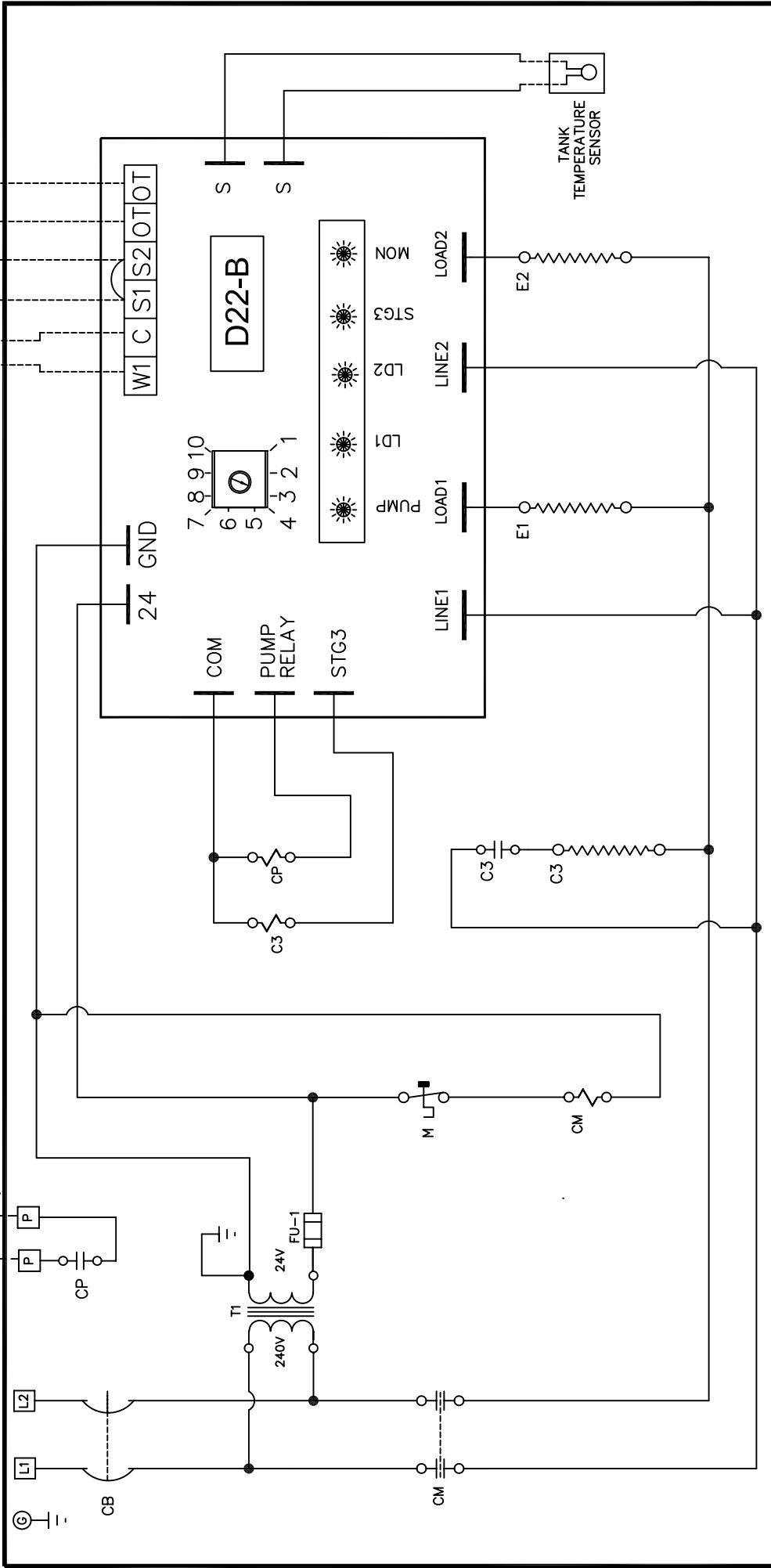
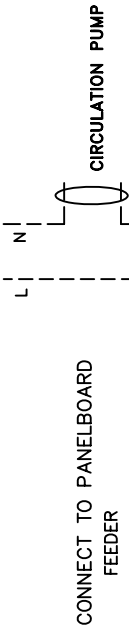
TMB

IMPORTANT:
 WIRE IN ACCORDANCE TO LOCAL & NATIONAL ELECTRIC
 CODES. READ CAREFULLY INSTALLATION INSTRUCTION BEFORE
 WIRING AND OPERATING.

LEGEND

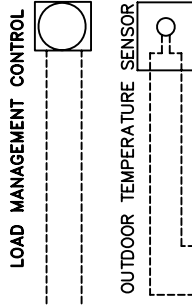
- M - MANUAL RESET CUT-OUT
- CM - BACK-UP CONTACTOR
- CP - CIRCULATION PUMP RELAY
- E1...E3 - HEATING ELEMENTS
- FU-1 - FUSE 2 AMP 24V
- T - TRANSFORMER, CLASS 2
- D22-B - ELECTRONIC CONTROLLER
- CB1 - CIRCUIT BREAKER

120VAC



Note: If power stealing thermostat is used, thermostat must be powered by separate 24V source and add relay

ROOM THERMOSTAT (SET ANTICIPATOR (0.2AMP.))



TITLE/TITRE

B9 - B11

LTEE LTD

THERMOLEC



MONTREAL - CANADA

DRAWING NO. D22-B TMB B9, B11

DATE

PER

29-06-10

FULL BREAK

Electric Boiler Troubleshooting Guide

Call for heat and boiler doesn't start, no lights on circuit board. Try the following:

1. Confirm that the boiler is connected to 240/1 power, main panel breakers are ON, breakers supplying boiler in panel are ON.
2. Boiler circuit breakers are ON.
3. Check line side of transformer for 240 volts. If yes, continue. If no, check for 240VAC at circuit breaker.
4. Check low voltage side of transformer for 24 VAC. If yes, continue. If no, change transformer.
5. Check for 24 VAC from fuse to circuit board. If yes, continue. If no, change fuse.
6. If outdoor sensor is attached to OT/OT on boiler circuit board, is outdoor temperature below 68°F? If outdoor temperature is 68°F or more, disconnect one leg of wires to OT/OT. Do not jumper OT/OT.
7. Confirm that load management control contact is wired to S1/S2 terminals on boiler circuit board and load management contact is closed, or jumper S1/S2. Boiler will not start if S1/S2 is open.
8. Confirm that thermostat or zone valve end switch is wired to C/W1 terminals on boiler circuit board and that boiler is getting a good call for heat, or jumper C/W1.
9. Turn OFF circuit breakers at boiler. On upper left corner of circuit board are two red wires connected to supply water sensor on boiler tank. Carefully disconnect red wire connections from board. Turn ON circuit breakers. If boiler starts, turn OFF circuit breakers and replace supply water sensor. If boiler doesn't start, replace circuit board.

Call for heat, circuit board lights come on but no heat or insufficient heat. Try the following:

1. Check amp draw at boiler circuit breakers. If amp draw is less than rating on boiler label, continue to next step. If amp draw is correct, turn OFF circuit breakers and check pump operation, confirm system design, heat loss, boiler sizing, system water level, etc.
2. Check back-up contactor. Set meter to volts AC and measure for voltage on power wires out of contactor going to elements/relays. If 240VAC, go to next step. If not 240VAC, check for 24VAC at coil of back-up contactor. If no 24VAC, check for 24VAC across high limit sensor on tank. If 24VAC, reset manual high limit or, if auto high limit, change high limit. If no 24VAC, check wiring at high limit.
3. Check for 24V DC from circuit board to coil of element relays - smaller two screws on solid state relay, terminals labeled coil on DC relays. Make sure + probe on meter to + terminal on SSR and – to –. If no DC voltage to relays, check wiring harness connection to circuit board. If DC voltage at relay, set meter to volts AC and check contact side of relay. If solid state relay, put probes on SSR L1 and T1 – larger two screws on SSR. If DC relays, put probes on terminals labeled contacts. If 0 voltage, relay contact is closed, go to step 4. If 240VAC at relay contact, it is failed open, change relay.
4. Turn OFF circuit breakers. Check for continuity at boiler elements. If no continuity, change element.

Call for heat, boiler starts and back-up contactor is noisy. Try the following:

1. Check for 24VAC out of transformer to contactor. If less than 24VAC, change transformer. If 24VAC, contactor is defective or contacts are dirty. Continue.
2. Turn OFF boiler circuit breakers. Disconnect wires to contactor, remove contactor from boiler, remove two screws from bottom metal plate on contactor, carefully remove coil and magnetic core, carefully clean surface of magnetic contacts with emery cloth. Reassemble and reinstall contactor. Remove all debris, metal shavings, etc. from inside of boiler cabinet. Restart boiler. If contactor noise continues, replace contactor.

Call for heat, boiler starts but pump doesn't run. Try the following:

1. Check for 120VAC from main electrical panel to pump. Pump must get power from the panel.
2. Route 120VAC from panel to pump through boiler. Run line leg of 120VAC through PP terminal on boiler. When boiler starts, relay connected to PP will close and start pump.
3. If pump is powered from panel and run through PP as described above and pump does not start when boiler starts, check for continuity on contact side of PP relay. If not closed, replace PP relay.

Call for heat, boiler starts, call for heat ends (no lights on board) and boiler continues to heat. Try the following:

1. Confirm that the call for heat has ended, disconnect wires to C/W1.
2. Check for amp draw at each element circuit. If there is amp draw, check for 240V AC on contact side of element relay. If there is 0 voltage, relay has failed closed, change relay.
3. Check for amp draw and if some amp draw but less than full rated amp draw: Set meter to ohms and check element drawing amps. If element reads less than rated ohms, change element. If element reads proper ohms, change relay.

Call for heat and boiler tank is "noisy". Hissing, percolating or knocking noise from tank:

1. Most common cause of boiler tank noise is improper flow. Refer to installation manual for proper GPM based on kW size of boiler.
2. If proper GPM flow rate through boiler, noise can be caused by sediment build-up on elements. Check for build-up on outside surface of elements.

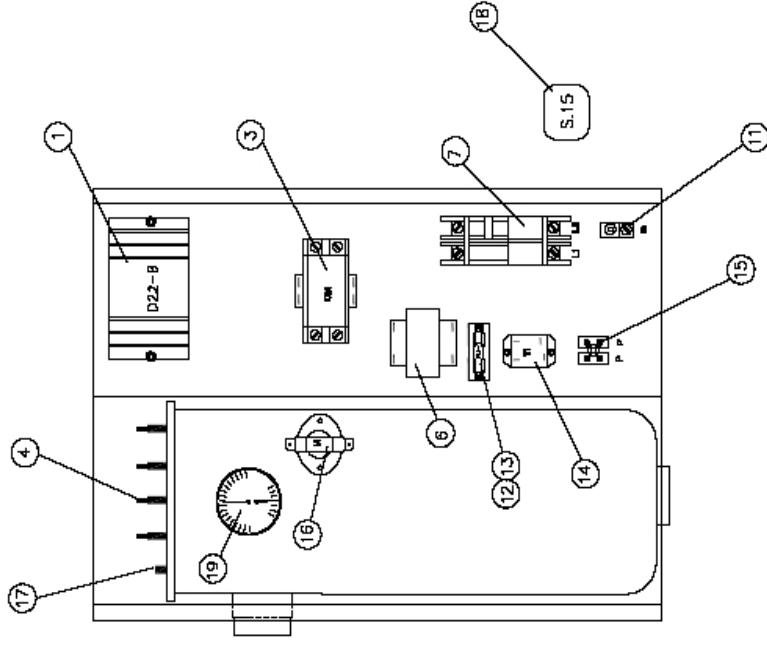


| Part Number | Description | FFB Parts | | | | | | | | | | | | | TMB Parts | | | | | |
|-------------|------------------------------------|-----------|-----|-----|-----|------|------|------|------|------|------|------|------|------|-----------|-----|-----|-----|------|---|
| | | B-5 | B-6 | B-8 | B-9 | B-10 | B-12 | B-15 | B-18 | B-20 | B-23 | B-27 | B-30 | B-35 | B-40 | B-3 | B-6 | B-9 | B-11 | |
| 16-04-001 | TMB D-22 Control Board | | | | | | | | | | | | | | | 1 | 1 | 1 | 1 | |
| 10-02-0049 | B/U Contactor 50 amp (lug style) | | | | | | | | | | | | | | | | | | 1 | 1 |
| 10-02-005 | B/U Contactor 50 amp (spade style) | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | | 1 | 1 | | | |
| 10-02-006 | Element Activation Relay | | | | | | | | | | | | | | | | | | | |
| 10-02-006 | Pump Relay | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17-02-101 | 3 kw element | | | | 3 | | | | | | | | | | | | | | | |
| 17-02-102 | 5 kw element | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | | 2 | 2 | | | | | | | | 1 |
| 17-02-103 | 5.75 kw element | | 1 | | | 2 | | | | 4 | | | | | | | | | | |
| 21-00-001 | 8.75 kw element | | | | | | | | | | | 2 | | 4 | | | | | | |
| 21-00-002 | 10 kw element | | | | | | | | | | | | | | 4 | | | | | |
| 17-02-104 | Temperature Pressure Gauge | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17-02-105 | Pressure Relief Valve | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 10-02-004 | Manual Hi Limit Reset | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17-02-107 | Tank Temp. Sensor | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17-02-109 | TH-600D FFB Control Board | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | |
| 17-02-10959 | (Upgrade) FFB Dual Temp. Board | | | | | | | | | | | | | | | | | | | |
| 17-02-110 | TH-600M Mono Control Board | | | | | | | | | | | | | | | | | | | |
| 17-02-11095 | (Upgrade) Mono Dual Temp. Board | | | | | | | | | | | | | | | | | | | |
| 17-02-1115 | Circuit Breaker 20 amp | | | | | | | | | | | | | | | | | | | |
| 17-02-111 | Circuit Breaker 30 amp | 1 | 1 | | | | | | | | | | | | | | | | | 1 |
| 17-02-112 | Circuit Breaker 40 amp | | | | | | | | | | | | | | | | | | | |
| 17-02-113 | Circuit Breaker 50 amp | | | 1 | 1 | | | | | | | | | | | | | | | 1 |
| 17-02-114 | Circuit Breaker 60 amp | | | | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 3 | 4 | 4 | | | | | | 1 |
| 17-02-11440 | SSR Relay 40 amp | 1 | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 4 | | | | | | | | | | |
| 17-02-115 | SSR Relay 50 amp | | | | | | | | | | | | | | | | | | | |
| 17-02-116 | Control Transformer 30 VA | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | | | | | | | | |
| 21-00-006 | Control Transformer 50 VA | | | | | | | | | | | | | | | | | | | |
| 17-02-117 | Control Fuse 2 amp | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 17-02-119 | Outdoor Sensor | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21-00-004 | Stainless Steel Tank Gasket | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Diagrams on next page are for parts identification and terminology purposes.

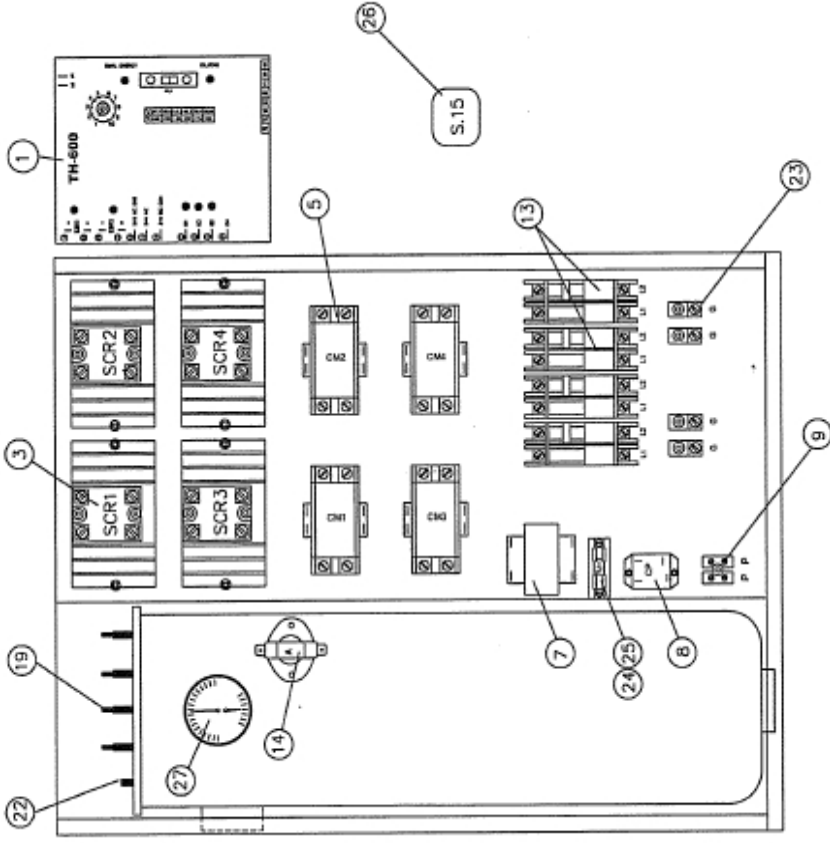
All Boilers contain different parts and parts breakdown should be used to identify exact part number and quantity in each unit.

TMB Style Boiler



- 1 Control Board/Module
- 3 Back Up Contactor
- 4 Elements
- 6 Transformer
- 7 Circuit Breaker
- 12 Fuse
- 14 Pump Relay
- 16 Manual Hi Limit Reset
- 17 Tank Temperature Sensor
- 18 Outdoor Reset

FFB Style Boiler



- 1 Control Board
- 3A SSR Relays
- 3B Element Activation Relay
- 5 Back Up Contactors
- 7 Control Transformer
- 8 Pump Relay
- 13 Circuit Breakers
- 14 Manual Hi Limit Reset
- 19 Elements
- 22 Tank Temperature Sensor
- 24 Fuse
- 26 Outdoor Reset
- 27 Temperature Pressure Gauge

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