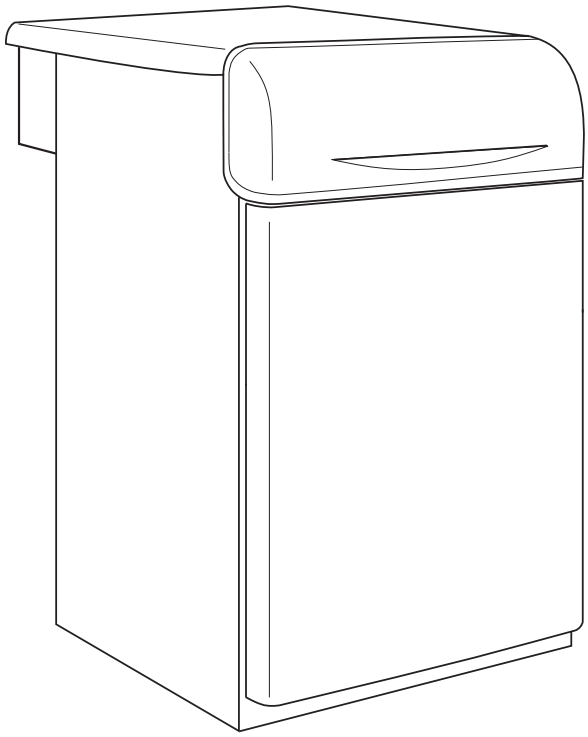
Natural Draft, Gas Fired Water Boiler with Electronic Ignition

TGBWF090A93AVA
TGBWF130A94AVA
TGBWF173A95AVA
TGBWF215A96AVA



PUB. NO. 22-1809-04

Features Summary

GAS BOILER MODELS
Annual Fuel Utilization Efficiencies (AFUE) and I=B=R® performance ratings are certified in accordance with US Department of Energy test procedures and the Hydronics Institute Division of the Gas Appliance Manufacturer's Association. Efficiency and performance ratings are listed in the Consumer Directory of Certified Efficiency Ratings for Heating and Water Heating Equipment and follow Federal Trade Commission labeling regulations. Gas boilers are listed in accordance with ANSI Z21.13-2004 and CSA 4.9-2004.

CAST IRON HEAT EXCHANGER
Boiler heat exchanger assemblies are constructed and hydrostatically tested to three times working pressure in accordance with American Society of Mechanical Engineers (ASME) and Pressure Vessel Code Section IV for cast iron heating boilers Sections are assembled with steel push nipples.

BURNERS
Stainless steel tubular burners give years of quiet and efficient service. All models can be converted to L.P. with accessory pilot and main burner orifice kit.

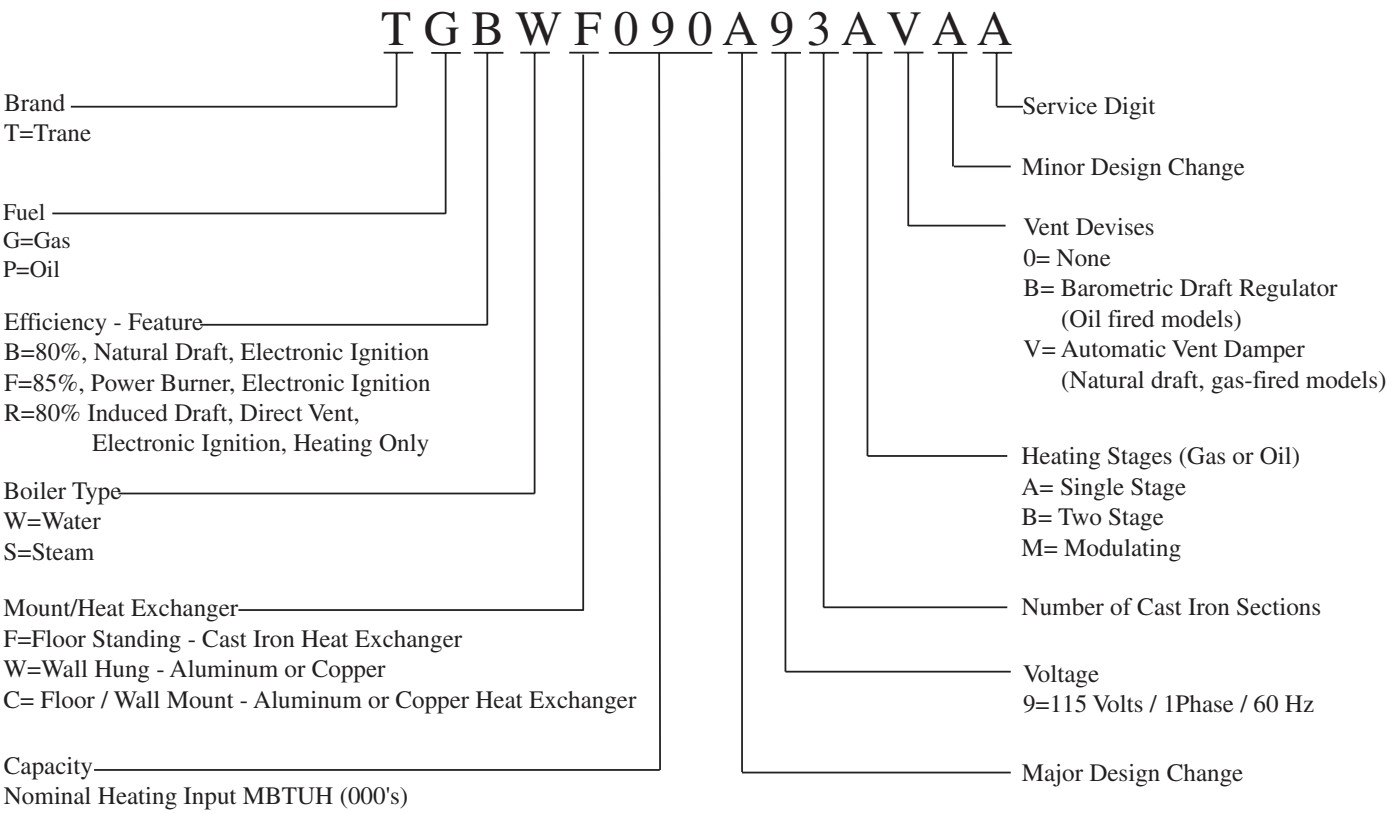
CONTROLS
Control panel mounted power disconnect switch with factory installed temperature-pressure gauge, flame lockout – service required indicator light and factory installed adjustable supply water thermostat (fixed 18º F differential). An automatic temperature limit control is factory installed inside the control panel. Circulator and burner operation are field configurable. Electronic ignition system control lights burners and regulates gas flow for safe, efficient operation.

APPLICATIONS
Natural draft gas fired boilers are available in four sizes with heating inputs of 90,000 to 215,000 BTU/hr and AFUE of up to 83.6%. Boilers may be used in a wide variety of applications including radiant floor heating, baseboard heating, zoned heating systems, snow melt and indirect domestic hot water
Compact size allows easy installation in most basements or utility rooms. All boilers are factory assembled with all controls installed and wired with in the cabinet.

STYLING
Jacket constructed of heavy 20 gauge steel. Powder painted Trane polyslate gray. Tool-less top and front access panels. Easy to disassemble jacket for handling and maintenance

Contents

Model Nomenclature



Features and Benefits

NATURAL DRAFT BOILER STANDARD EQUIPMENT

- Power supply 115/1/60
- Intermittent electronic ignition (spark to pilot)
- Built in draft diverter
- Automatic vent damper included
- Factory installed boiler drain
- Rear utilities - easy connections
- NPT pipe threads
- Simplified field connections to high and low voltage terminal strip
- Controls and components enclosed in jacket
- Powder painted polyslate gray jacket
- Tool-less top and front access panel removal
- Control panel mounted power disconnect switch
- Tubular stainless steel burners
- Cast iron sections assembled with steel push nipples
- Field configurable circulator/burner operation
- Factory installed temperature pressure gauge
- Factory installed adjustable water thermostat
- Factory installed automatic resetting water temperature limit
- Factory installed 30 PSI ASME relief valve
- Insulated heat exchanger
- Convertible to LP gas with accessory orifice conversion kit
- Optional manual reset high water temperature limit accessory (installation required)
- Annual fuel efficiency up to 83.6%
- **5 Year limited parts warranty**
- **Limited lifetime heat exchanger warranty**
- **Optional extended warranties**

NATURAL DRAFT BOILER OPTIONAL EQUIPMENT

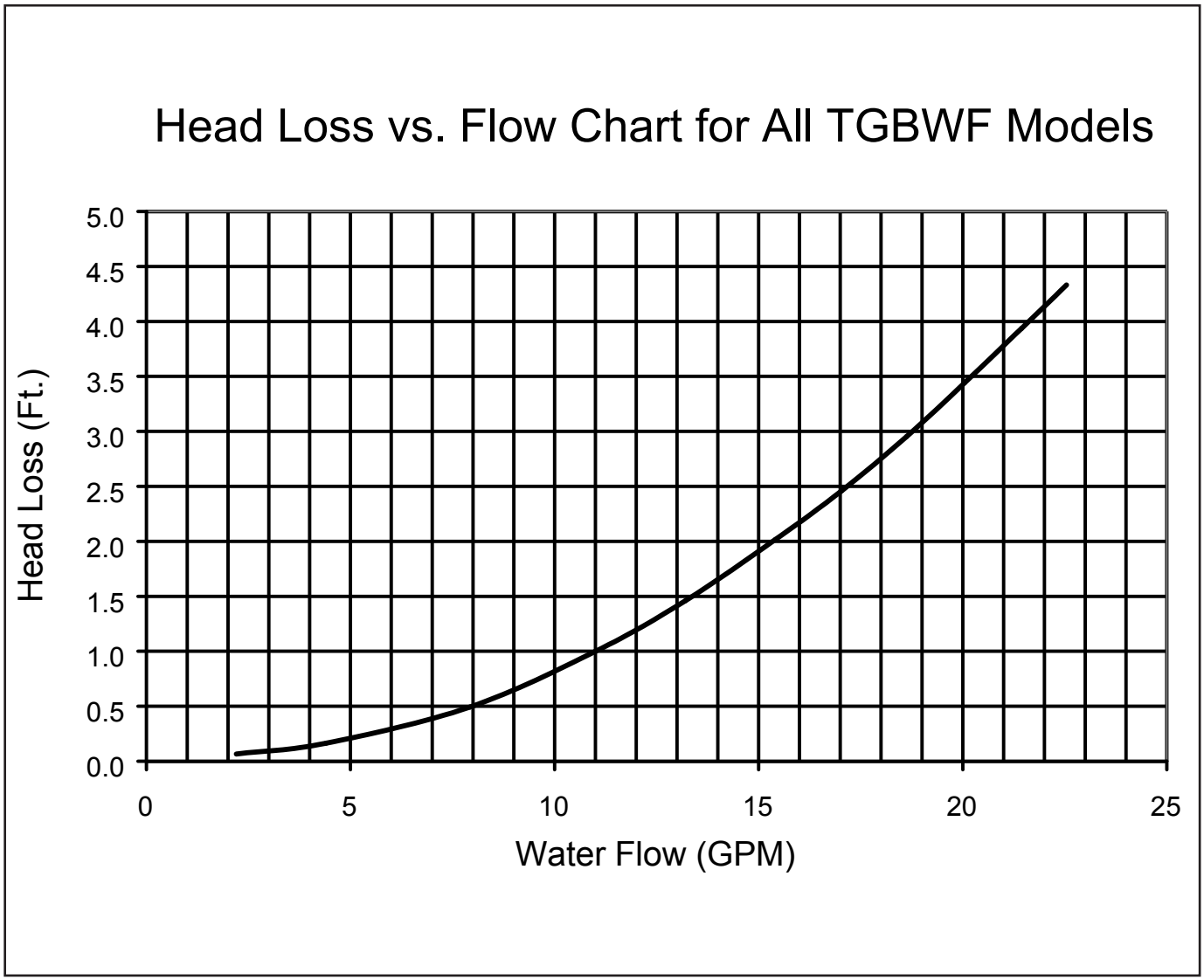
Thermostat, Mechanical 2-Stage Heating/ 1-Stage Cooling.....TAYSTAT241 [ ]
Thermostat, Mechanical Heating Only With Fan Switch ..... BAYSTAT303 [ ]
Thermostat, Mechanical Heating Only..... BAYSTAT388 [ ]
Thermostat, Heating/Cooling Single Stage (Mounts Horizontally) .....AY28X092 [ ]
Thermostat, Electronic Non-programmable 1-Stage Heating/1-Stage Cooling..... BAYSTAT370 [ ]
Thermostat, Electronic Programmable (5-2) 1-Stage Heating/1-Stage Cooling..... BAYSTAT340 [ ]
Thermostat, Heating/Cooling Single Stage (Mounts Vertically) ..... BAYSTAT305 [ ]
Thermostat, Electronic Programmable 2-Stage Heating/2-Stage Cooling ..... TAYSTAT302C [ ]
Thermostat, Electronic Programmable 1-Stage Heating/1-Stage Cooling ..... TAYSTAT300C [ ]

Natural Gas to Liquid Propane Conversion Kit .....BAYLPK01AWBLRA [ ]
Manual Reset High Limit Temperature Control..... BAYLMT10AMRSTA [ ]
Trim Kit including 4.4 Gallon Expansion Tank, Fill Valve with Fast Fill Feature, Backflow Preventer (1"NPT), and Air Eliminator .....BAYTRM10AVTVPA [ ]
Trim Kit including 4.4 Gallon Expansion Tank, Fill Valve with Fast Fill Feature, Backflow Preventer (1-1/4"NPT), and Air Eliminator .....BAYTRM20AVTVPA [ ]
4.4 Gallon Expansion Tank.....BAYEXP30ATANKA [ ]

General Data

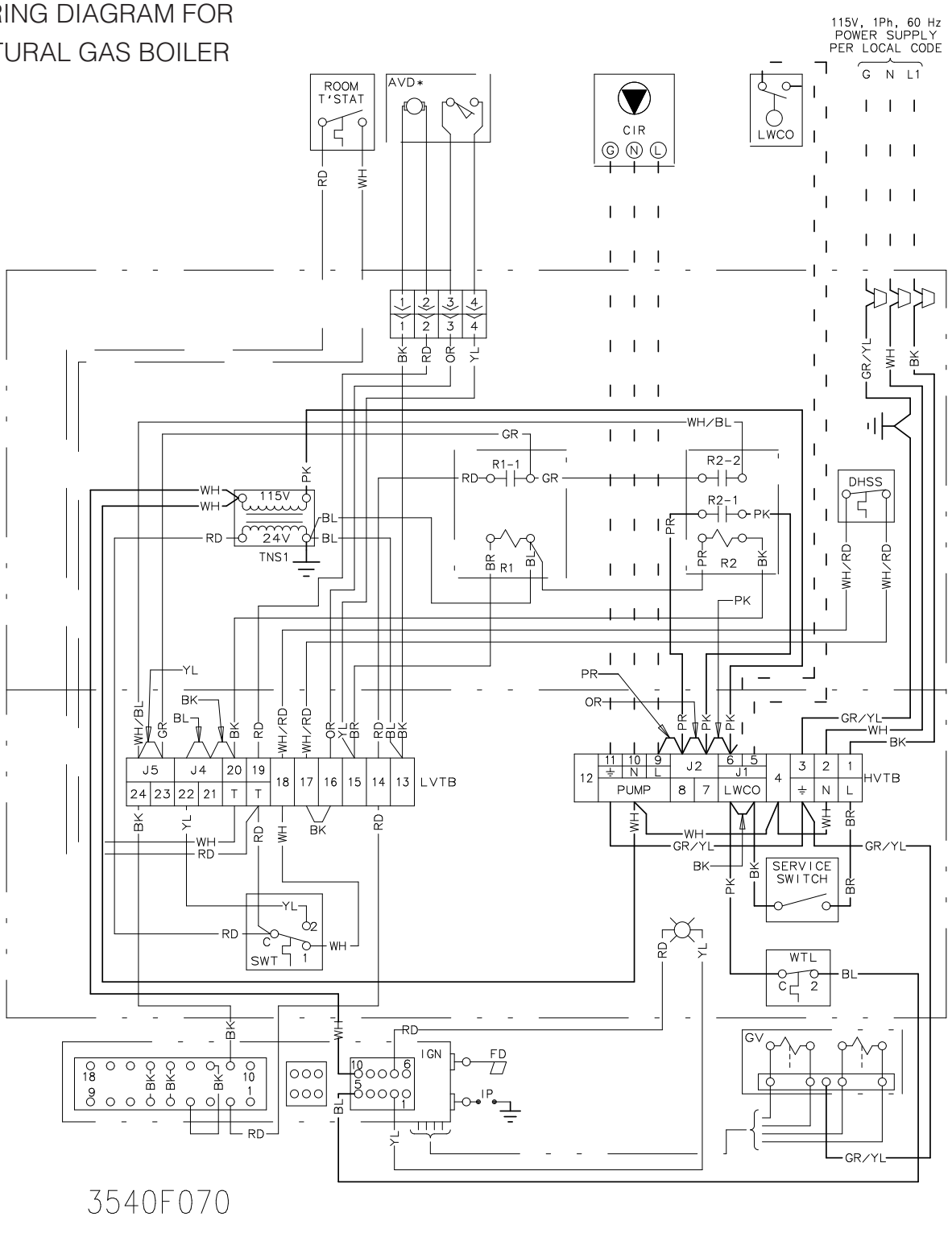
Product Specifications				
Model[1]	TGBWF090	TGBWF130	TGBWF173	TGBWF215
Ratings				
Input BTUH	90,000	130,000	173,000	215,000
DOE Output BTUH	76,000	111,000	145,000	180,000
Net (I=B=R®) Water BTUH	66,000	96,000	126,000	156,000
AFUE	83.6	83.5	83.4	83.3
Natural Gas Supply				
Pilot gas orifice Qty X ID	1 x 0.40mm	1 x 0.40mm	1 x 0.40mm	1 x 0.40mm
Main gas orifices Qty X ID	2 x 3.10mm	3 x 3.10mm	4 x 3.10mm	5 x 3.10mm
Supply pressure (in. w.c.)	7.0	7.0	7.0	7.0
Manifold pressure (in. w.c.)	3.6	3.6	3.6	3.6
LP Gas Supply				
Pilot gas orifice Qty X ID	1 x 0.24mm	1 x 0.24mm	1 x 0.24mm	1 x 0.24mm
Main gas orifices Qty X ID	2 x 1.90mm	3 x 1.90mm	4 x 1.90mm	5 x 1.90mm
Supply pressure (in. w.c.)	11.0	11.0	11.0	11.0
Manifold pressure (in. w.c.)	10.6	10.6	10.6	10.6
Heating				
Max working temperature °F	230	230	230	230
Maximum working pressure (psig)	60	60	60	60
Number of Sections	3	4	5	6
Number of burners	2	3	4	5
Boiler water content (gal.)	2.40	3.06	3.72	4.38
Dimensions				
Height (inches)	33.46	33.46	33.46	33.46
Width (inches)	15.75	19.69	19.69	23.62
Depth (inches)	24.21	24.21	24.21	24.21
Shipping Weight (lb.)	276	345	406	468
Net Weight (lb.)	234	300	362	421
Gas system connection (NPT male)	1/2”	1/2”	1/2”	1/2”
Heating water supply (NPT male)	1”	1”	1”	1”
Heating water return (NPT female)	1”	1”	1”	1”
Electrical power supply V / Hz / Ph	115 / 60 / 1	115 / 60 / 1	115 / 60 / 1	115 / 60 / 1
Minimum Circuit Ampacity (amps)	less than 2.0	less than 2.0	less than 2.0	less than 2.0
Max Overcurrent Protection (amps)	15	15	15	15

NOTES:
1. Boiler is shipped with 30 psi ASME Pressure Relief Valve


Head Loss vs. Flow Chart for All TGBWF Models
Head Loss (Ft.)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
5
10
15
20
25
Water Flow (GPM)

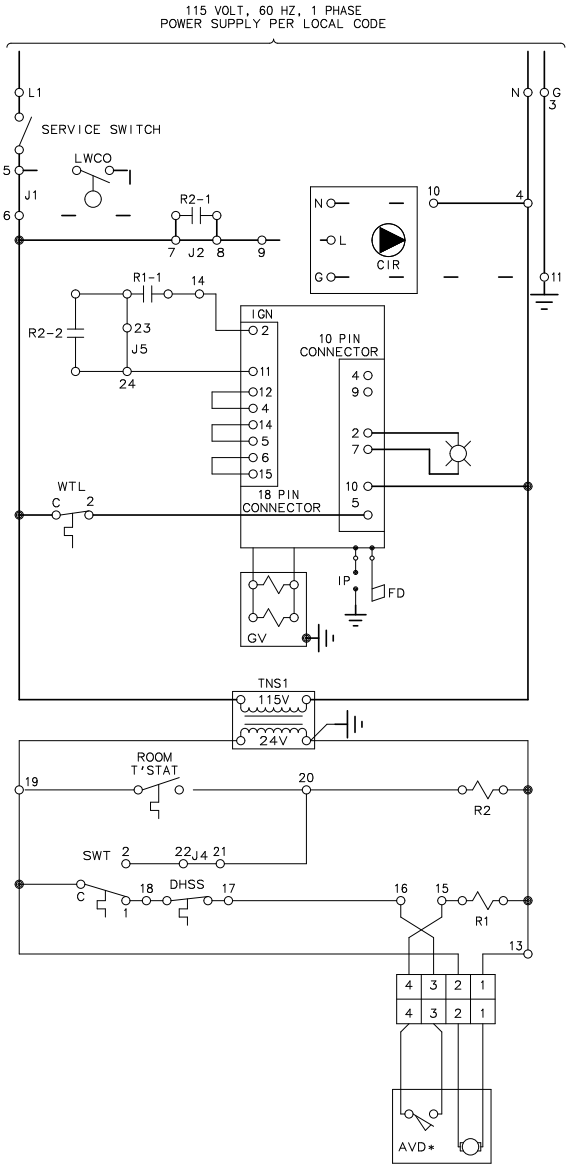
Electrical
Wiring Diagram

WIRING DIAGRAM FOR
NATURAL GAS BOILER



Schematic Diagram

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAMS FOR NATURAL GAS BOILER

LEGEND-EQUIPMENT DIAGRAM

- 24 V. / LINE V. — FACTORY WIRING
- 24 V. / LINE V. — FIELD WIRING
- GROUND
- JUNCTION
- WIRE NUT OR CONNECTOR
- COIL
- CAPACITOR
- RELAY CONTACT (N.O.)
- RELAY CONTACT (N.C.)
- THERMISTOR
- INTERNAL OVERLOAD PROTECTOR
- PS PRESSURE ACTUATED SWITCH
- TEMP. ACTUATED SWITCH
- FLUID LEVEL ACTUATED SWITCH
- POL. PLUG FEMALE HOUSING (MALE TERM.)
- POL. PLUG MALE HOUSING (FEMALE TERM.)
- RESISTOR OR HEATING ELEMENT
- MOTOR WINDING
- TERMINAL
- COLOR OF WIRE — BK/BL BLACK WIRE WITH BLUE MARKER
- COLOR OF MARKER

BK BLACK, OR ORANGE, YL YELLOW
BL BLUE, RD RED, GR GREEN
BR BROWN, WH WHITE, PR PURPLE
PK PINK

- FUSIBLE LINK
- LIMIT (POSITION) SWITCH
- LIGHT
- CIRCULATOR PUMP

BLACK J1 LWCO JUMPER (REMOVE WHEN CONNECTING FIELD SUPPLIED LWCO).
ORANGE J2 PUMP CONTROL JUMPER
(SHORT = CONTINUOUS, OPEN = ONLY DURING HEAT DEMAND).
BLUE J4 PUMP OVER RUN JUMPER
(SHORT = OVER RUN WITHOUT HEAT DEMAND, OPEN = NO OVER RUN).
YELLOW J5 JUMPER (SHORT = BURNER CYCLED BY SWT ONLY;
OPEN = BURNER STARTS ONLY WHEN BOTH SWT AND ROOM THERMOSTAT ARE CLOSED AND BURNER STOPS WHEN EITHER ROOM THERMOSTAT OR SWT OPENS).
LWCO - LOW WATER CUT OFF
(FIELD SUPPLIED - CONNECT PER MANUFACTURERS INSTRUCTIONS).
*AVD - AUTOMATIC VENT DAMPER (ATMOSPHERIC MODELS ONLY) - FACTORY PROVIDED, FIELD INSTALLED.
PS - PRESSURE SWITCH (INDUCED DRAFT ONLY)
IP - IGNITOR PROBE
FD - FLAME DETECTOR
IGN - IGNITION CONTROL MODULE
SWT - SUPPLY WATER THERMOSTAT
WTL - WATER TEMPERATURE LIMIT SWITCH
CIR - CIRCULATOR PUMP (FIELD SUPPLIED)
CFM - COMBUSTION FAN MOTOR (INDUCED DRAFT ONLY)
FL - FUSIBLE LINK
GV - GAS VALVE
TNS1 - 24V CONTROL POWER TRANSFORMER
DHSS - DRAFT HOOD SPILLAGE SWITCH (ATMOSPHERIC MODELS ONLY)
HVTB - HIGH VOLTAGE TERMINAL BLOCK (115V)
LVTB - LOW VOLTAGE TERMINAL BLOCK

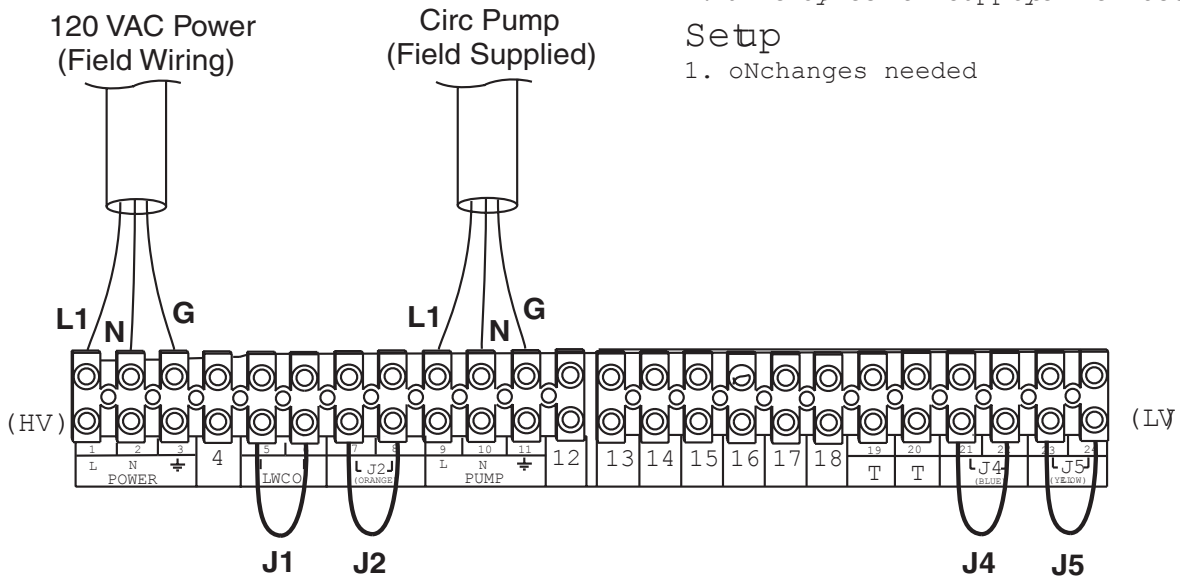
NOTES:

1. IF ANY OF THE ORIGINAL WIRE AS SUPPLIED IN THIS UNIT MUST BE REPLACED, REPLACE IT WITH APPLIANCE WIRING MATERIAL RATED AT 105°C.

Field Wiring

Option 1 Factory Jumpers Installed

Note: Boiler ships with wire jumpers in place.



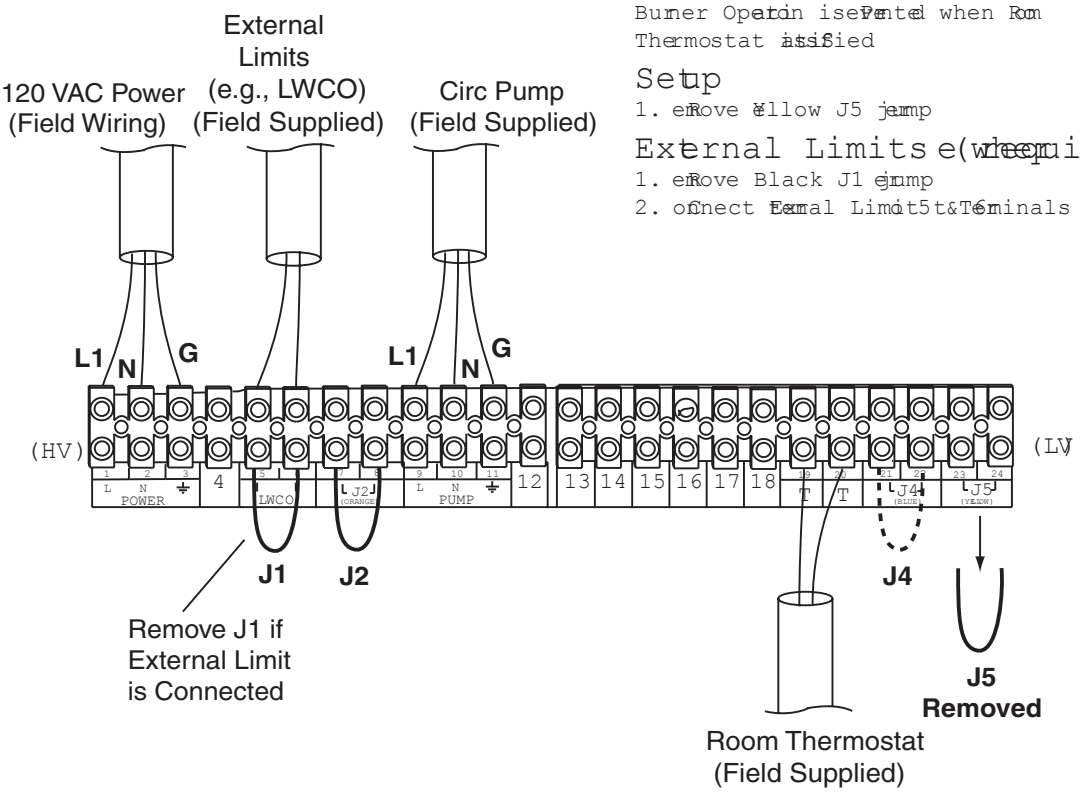
System Configuration

1. Continuous Pump Operation
2. Burner Cycles with Supply Water Thermostat

Setup

1. No changes needed

Option 2 - Field Installed Room Thermostat, Yellow J5 jumper removed



System Configuration

1. Continuous Pump Operation
2. Burner Cycles with Supply Water Thermostat when Call for Room Thermostat is present, Burner Operation is Prevented when Room Thermostat is Satisfied

Setup

1. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to T&T Terminals

Option 3 - Field Installed Room Thermostat, Orange J2 jumper removed

System Configuration

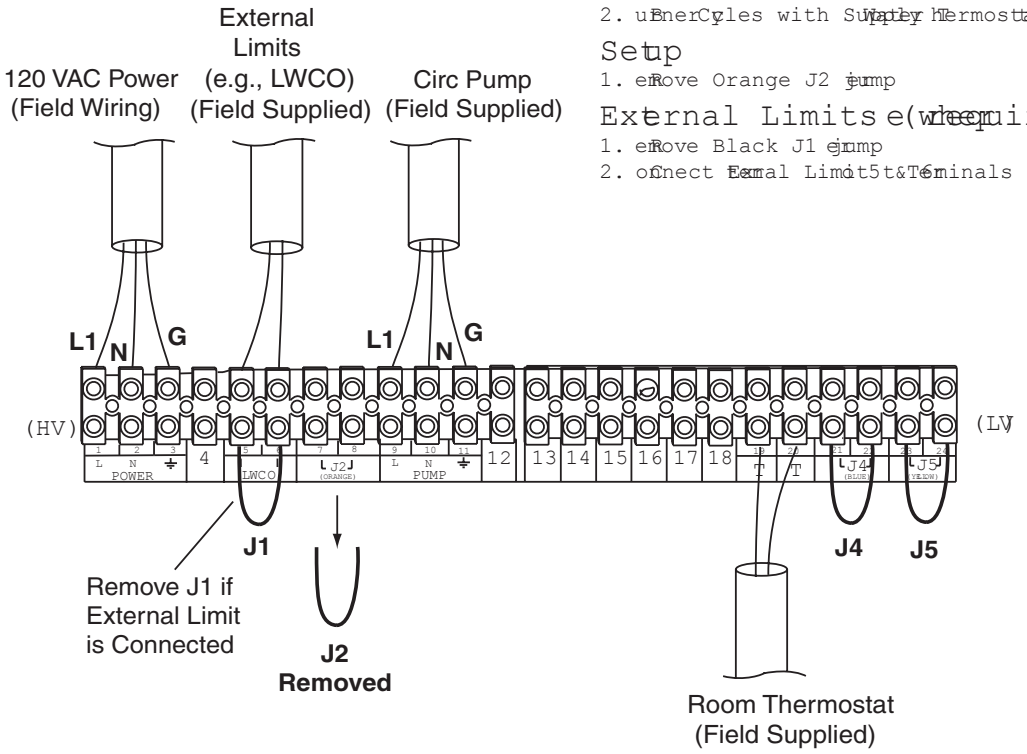
1. Pump Runs on call from Room Thermostat OR if Water Temperature is Above Supply Water Thermostat setting
2. Burner Cycles with Supply Water Thermostat

Setup

1. Remove Orange J2 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limits to T&T Terminals



Option 4 - Field Installed Room Thermostat, Orange J2 jumper removed, Blue J4 jumper removed

System Configuration

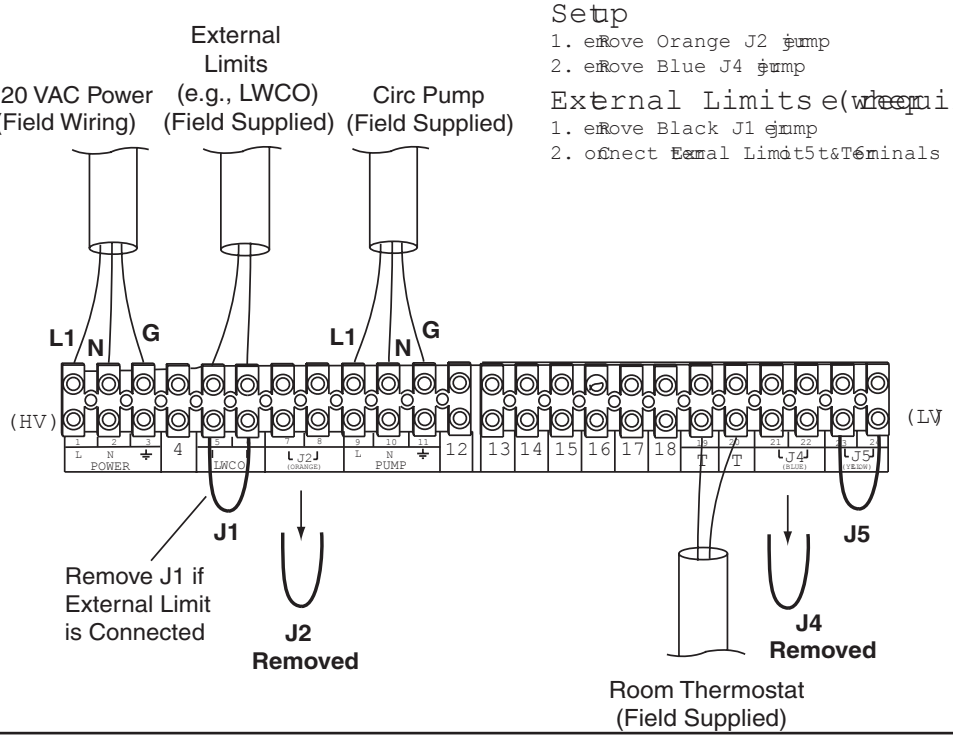
1. Pump Controlled by Room Thermostat
2. Burner Cycles with Supply Water Thermostat

Setup

1. Remove Orange J2 jumper
2. Remove Blue J4 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limits to T&T Terminals



Option 5 - Field Installed Room Thermostat, Orange J2 jumper removed, Yellow J5 jumper removed

System Configuration

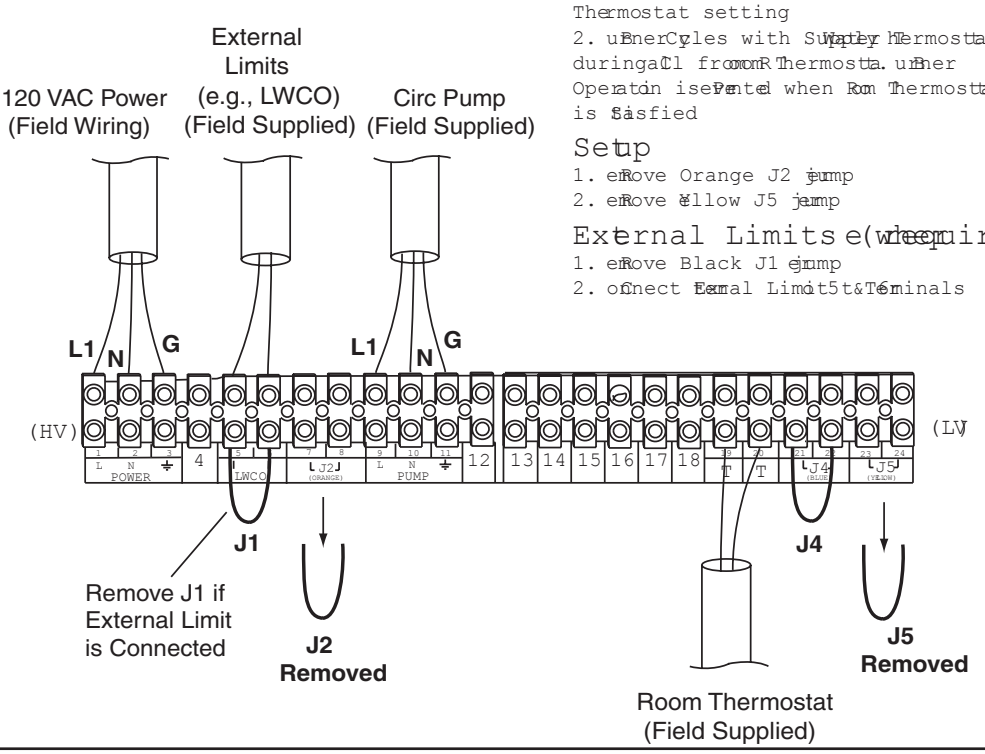
1. Pump Runs on a Call from Room Thermostat OR if Water Temperature is Above Supply Water Thermostat setting
2. Burner Cycles with Supply Water Thermostat during a Call from Room Thermostat. Burner Operation is Prevented when Room Thermostat is Satisfied

Setup

1. Remove Orange J2 jumper
2. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to T&T Terminals



Option 6 - Field Installed Room Thermostat, Orange J2 jumper removed, Blue J4 jumper removed, Yellow J5 jumper removed

System Configuration

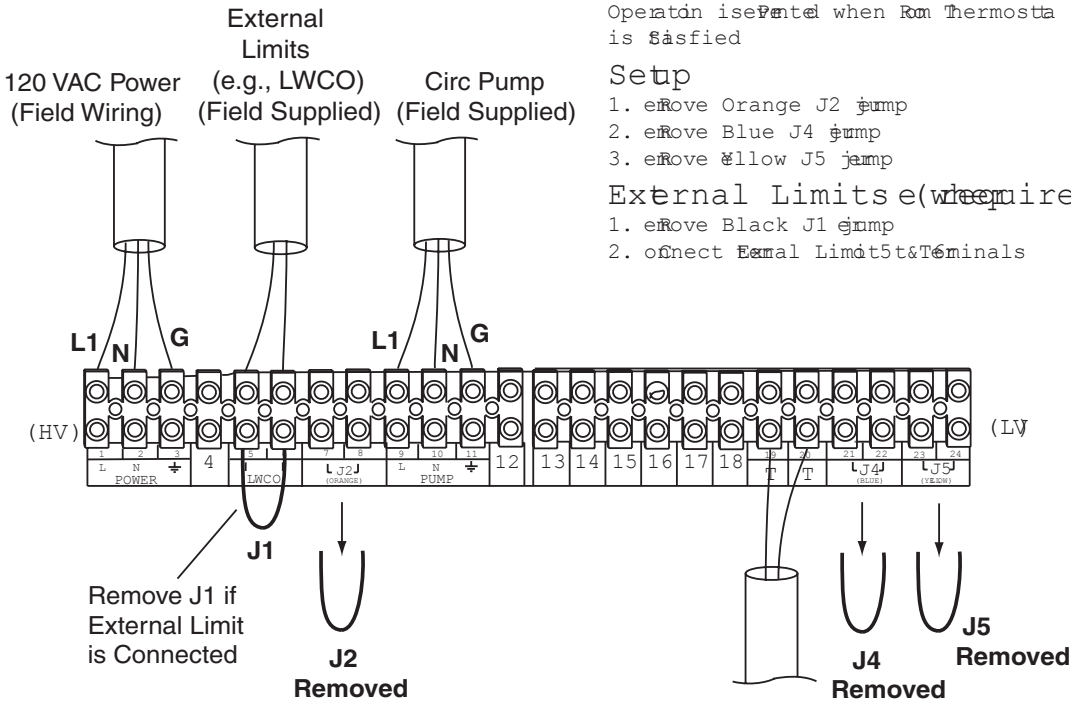
1. Pump Runs off of Room Thermostat
2. Burner Cycles with Supply Water Thermostat during a Call from Room Thermostat; Burner Operation is Prevented when Room Thermostat is Satisfied

Setup

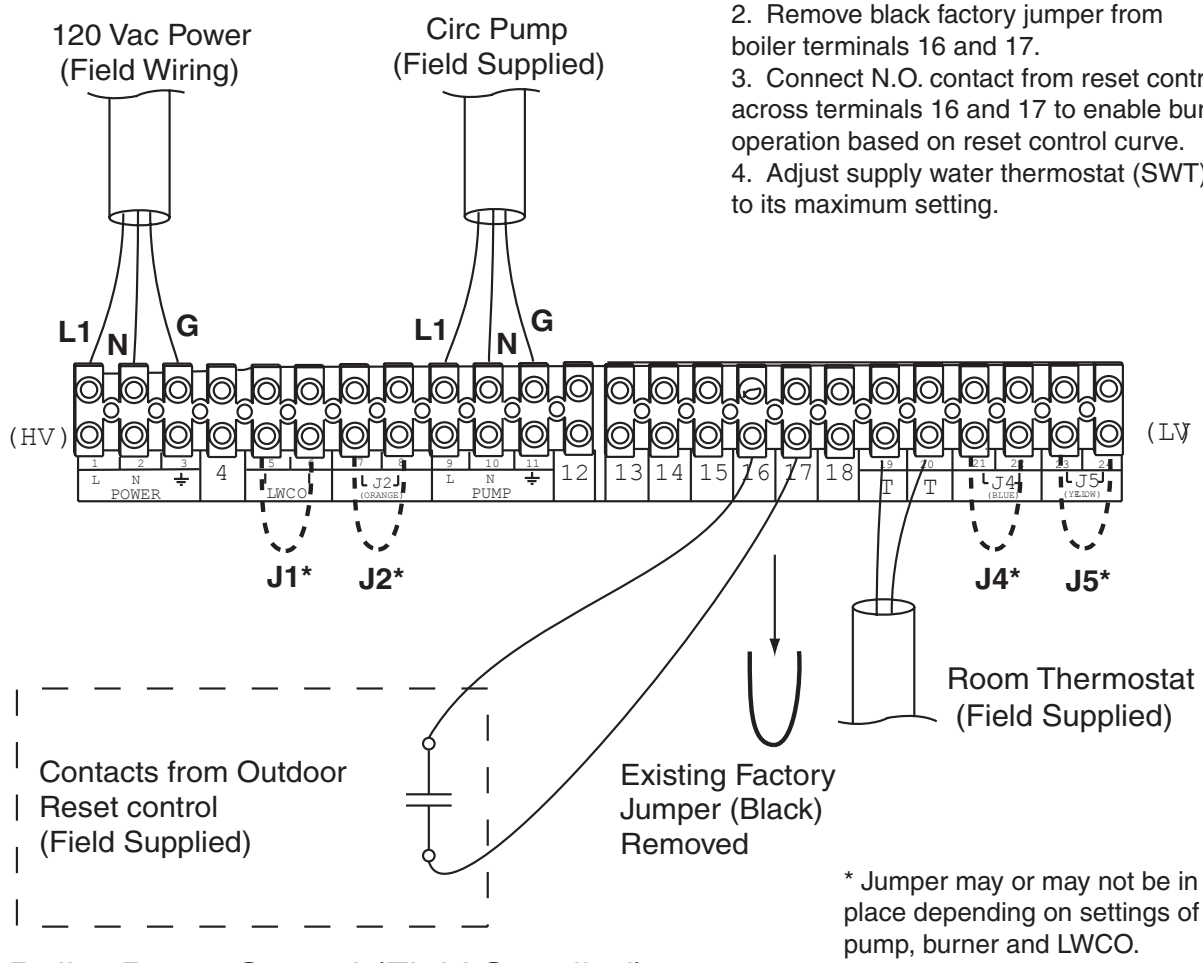
1. Remove Orange J2 jumper
2. Remove Blue J4 jumper
3. Remove Yellow J5 jumper

External Limits (where required)

1. Remove Black J1 jumper
2. Connect External Limit to T&T Terminals



Boiler Reset Option - Field Wiring for Field Supplied Boiler Temperature Reset Controls (to Decrease Boiler Water Temperature with Increasing Outdoor Temperature)



Boiler Reset Control (Field Supplied)

Boiler Reset Configuration

NOTE: This Boiler Reset option may be used in combination with any of the other system configuration options and jumper arrangements shown in this document.

1. Use field supplied boiler reset control with water temperature sensor and outdoor temperature sensor. Install according to manufacturer's instructions.
2. Remove black factory jumper from boiler terminals 16 and 17.
3. Connect N.O. contact from reset control across terminals 16 and 17 to enable burner operation based on reset control curve.
4. Adjust supply water thermostat (SWT) to its maximum setting.

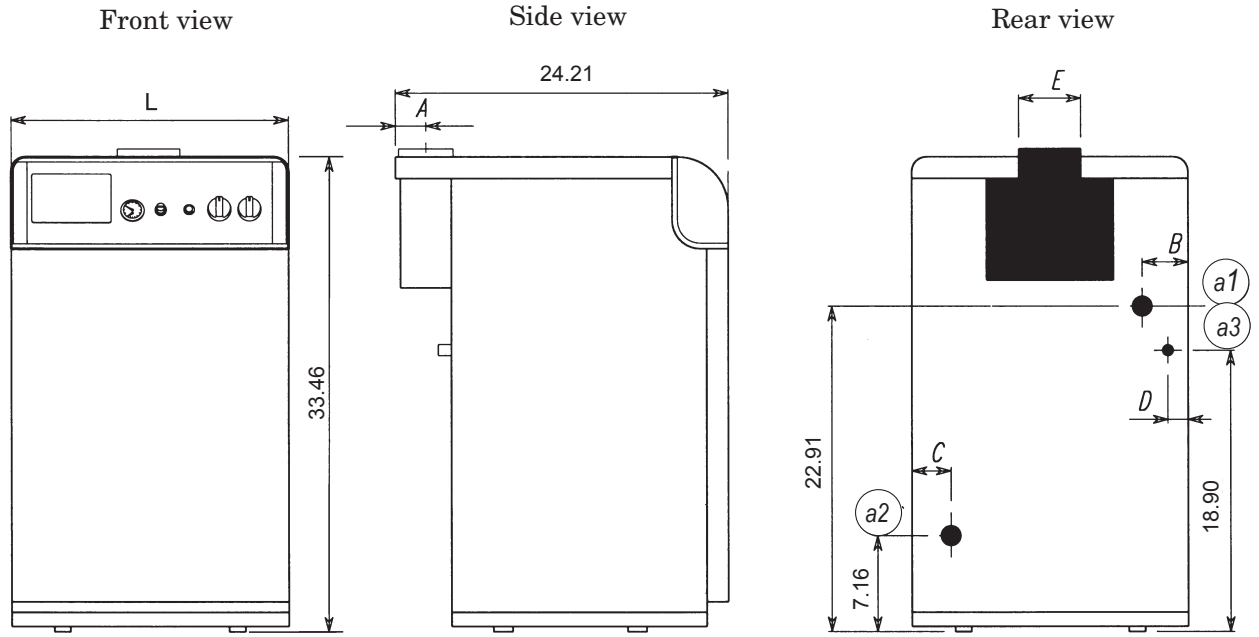
Dimensions

Table 1

	Minimum Clearance for Combustion	Clearance for Service
Top	6”	36”
Right Side	6”	See Note 1
Left Side	6”	See Note 1
Front	18”	30”
Back	6”	6”

Notes
1. Leave clearance on one side of the boiler for service access to back of the boiler. Minimum 24”

Figure 1 - Outline Drawings
Dimensions and Connections



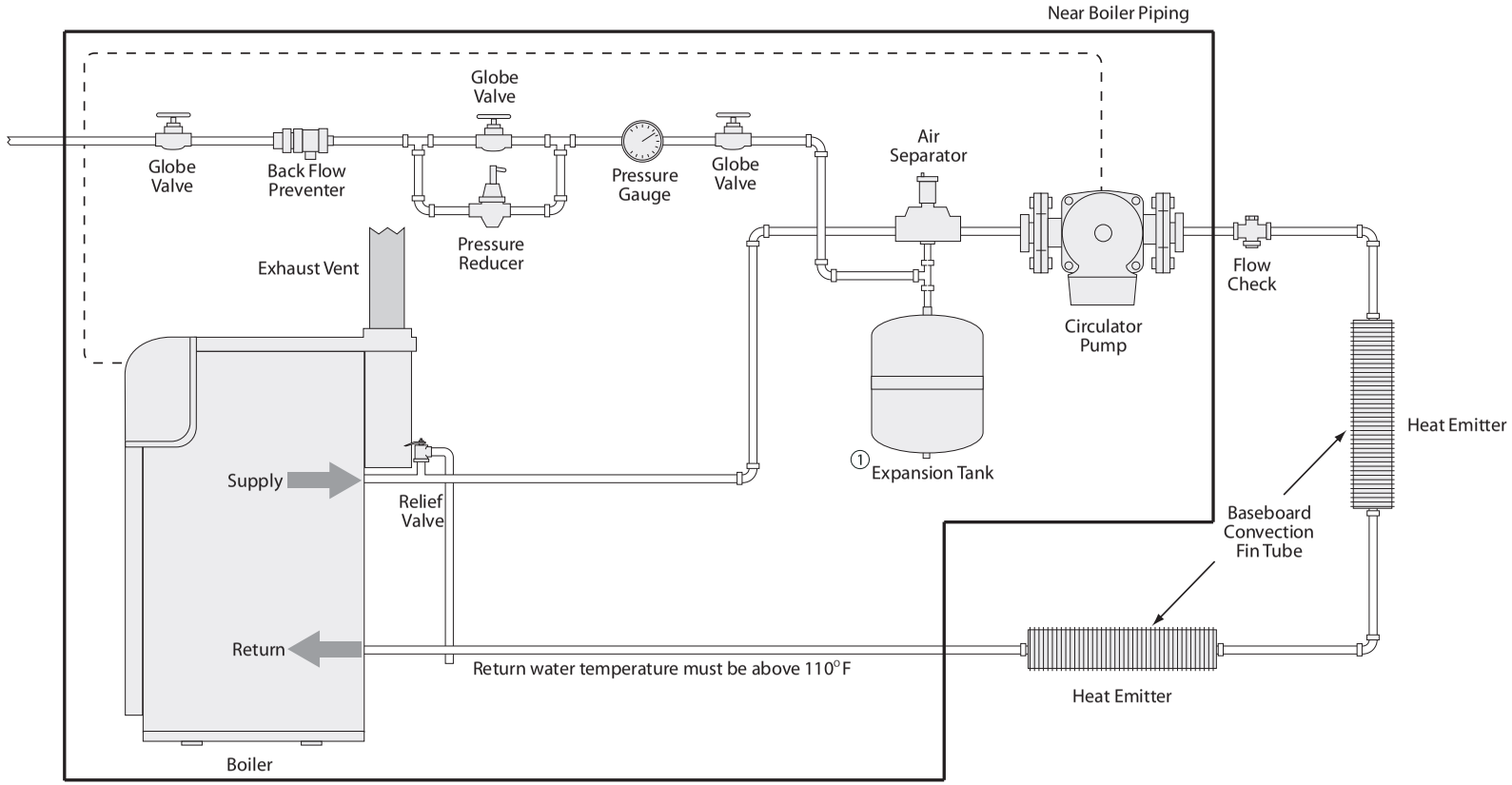
All dimensions are in inches

Type and model	A	B	C	D	E	L	(a1) Supply	(a2) Return	(a3) Inlet gas	Effikel Automatic Vent Damper
TGBWF090A93AVA	2.75	4.29	4.41	1.57	5.0	15.75	1" male	1" female	1/2"	KS-5BKF-PP5
TGBWF130A94AVA	3.15	4.57	4.69	1.85	6.0	19.68	1" male	1" female	1/2"	KS-6BKF-PP5
TGBWF173A95AVA	3.15	2.88	3.00	1.42	6.0	19.68	1" male	1" female	1/2"	KS-6BKF-PP5
TGBWF215A96AVA	3.74	3.15	3.27	1.57	7.0	23.62	1" male	1" female	1/2"	KS-7BKF-PP5

NOTES:
1. All threads are NPT
2. Vent Damper included with boiler.
Field installation required

Typical System Piping Diagram

Single Zone System - High Temperature with Low Mass Heat Emitters

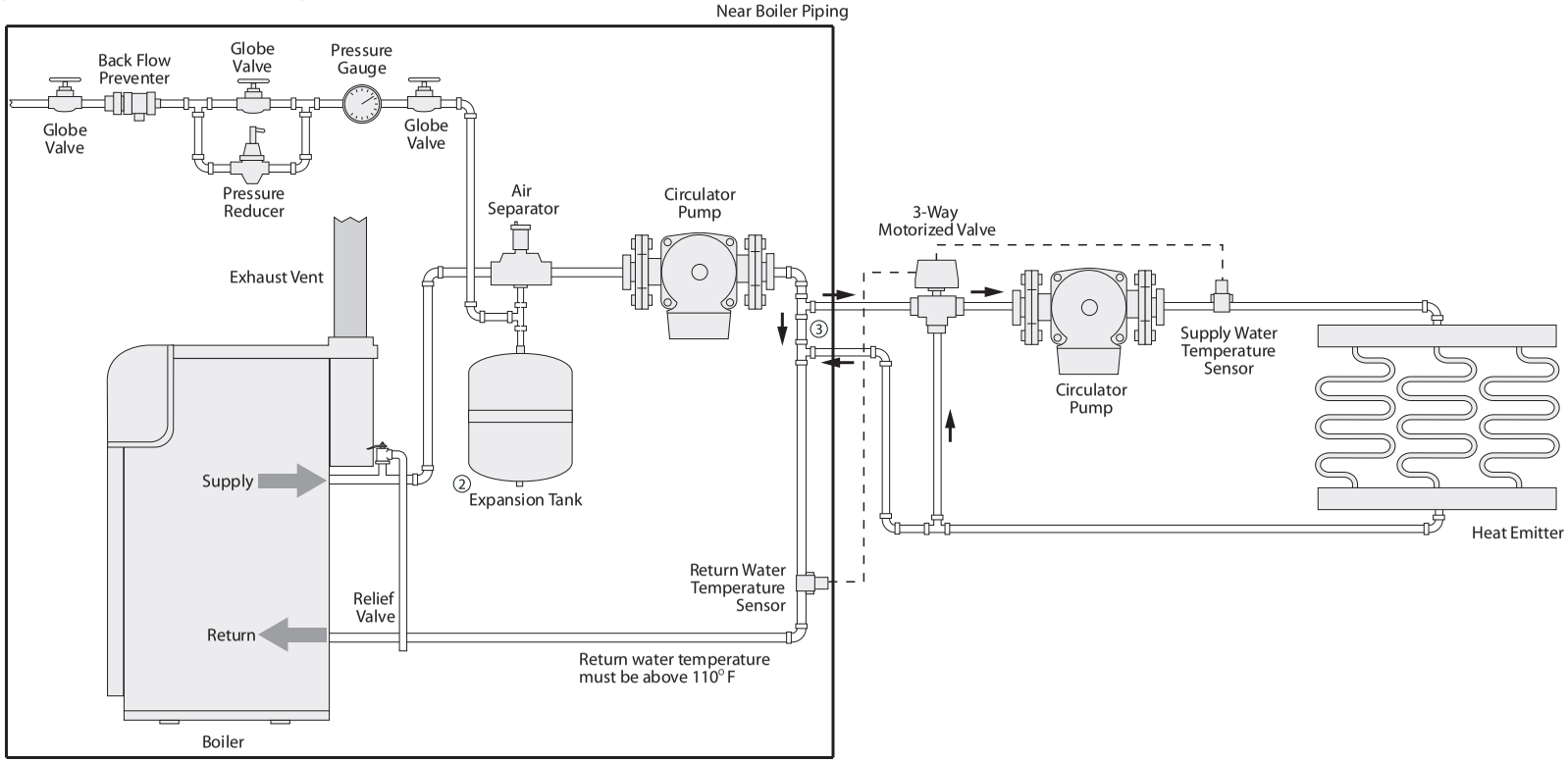


NOTES:

① Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.

Typical System Piping Diagram

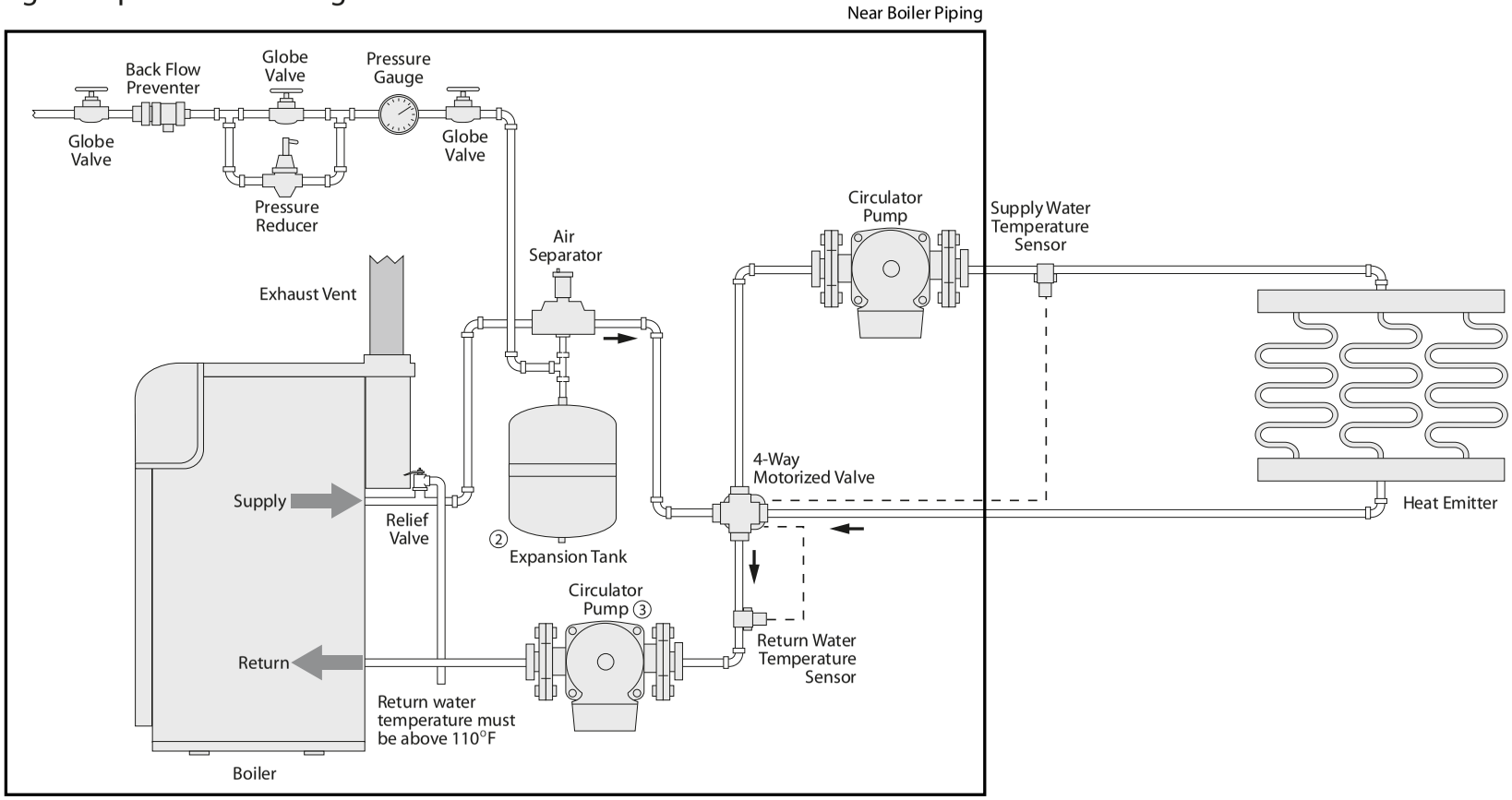
① Primary Secondary Loop with 3-way Motorized Valve
Low Temperature with Low Mass Heat Emitters
or High Temperature with High or Low Mass Heat Emitters



NOTES:
① Protects boiler from too low return water temperature and condensation.
② Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.
③ Close coupled Tees

Typical System Piping Diagram

① Primary Secondary Loop with 4-way Motorized Valve with Circulator in Secondary Loop
Low Temperarure with Low Mass Heat Emitters
or High Temperature with High or Low Mass Heat Emitters



NOTES:

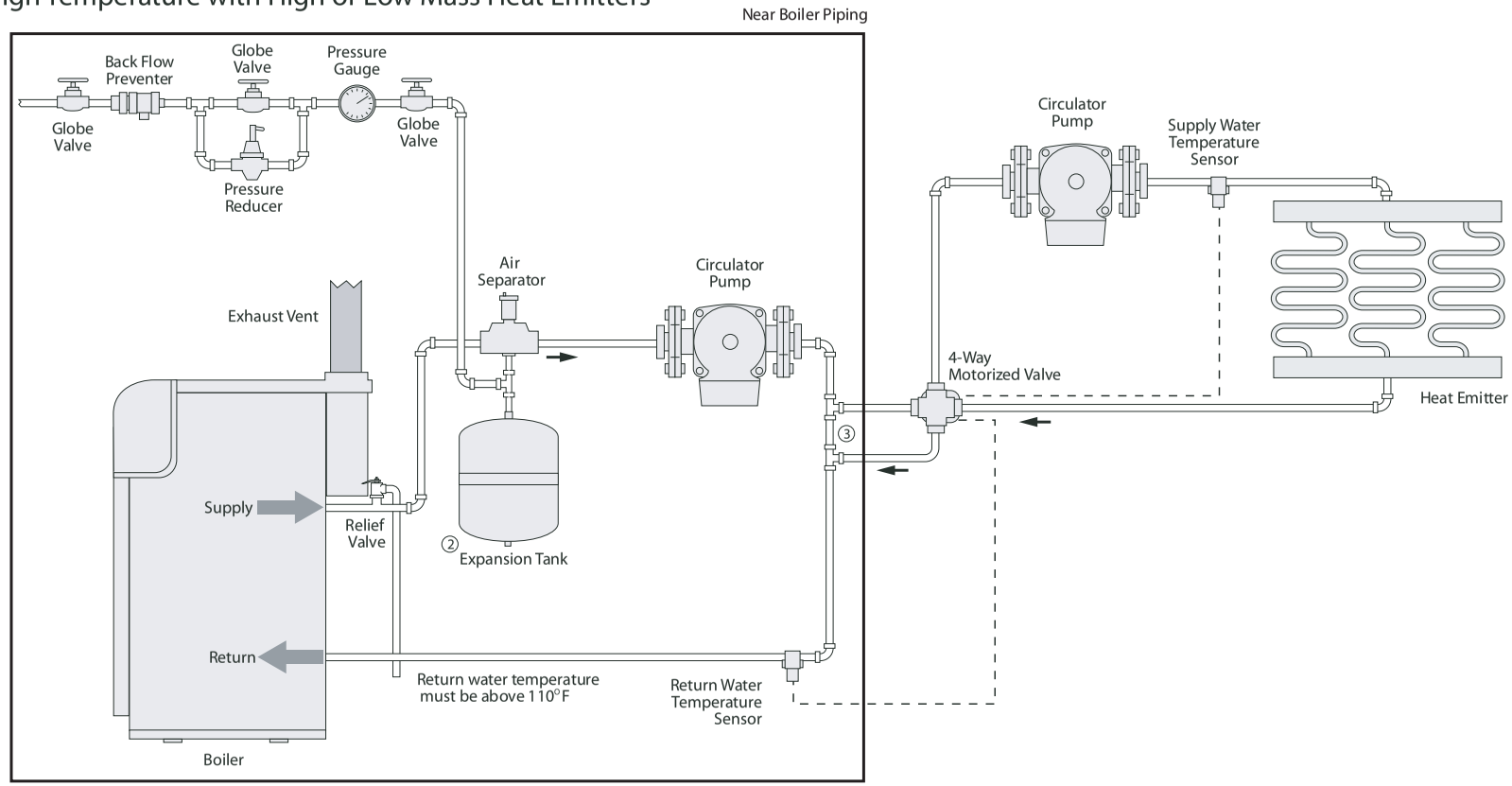
① Protects boiler from too low return water temperature and condensation.

② Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.

③ A circulator should be located in the return of the boiler loop to prevent serial pumping.

Typical System Piping Diagram

① Primary Secondary Loop with 4-way Motorized Valve
Low Temperarure with Low Mass Heat Emitters
or High Temperature with High or Low Mass Heat Emitters



NOTES:
① Protects boiler from too low return water temperature and condensation.
② Locate circulator inlet close to connection point of the expansion tank, but allow at least the equivalent of 10 to 12 pipe diameters between the circulator pump and the expansion tank to reduce the possibility of pump noise and facilitate air removal.
③ Close coupled Tees

Trane
6200 Troup Highway
Tyler, TX 75707
www.trane.com