APPLICATION GUIDE
FOR USE WITH

HEATING ONLY - 125, 165
&
COMBI - 115, 150, 205

This manual has been prepared for use with the appropriate Installation, Operation and Maintenance Manual.

ECR international

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1. *Become familiar with symbols identifying potential hazards.*

This is the safety alert symbol. Symbol alerts you to potential personal injury hazards. Obey all safety messages following this symbol to avoid possible injury or death.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, WILL result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

2. *General*

Boiler installation shall be completed by qualified agency. See Installation, Operation & Maintenance Manual for additional information.

⚠ WARNING

Fire, explosion, asphyxiation and electrical shock hazard. Improper installation could result in death or serious injury. Read this manual and understand all requirements before beginning installation.

⚠ WARNING

Fire, Explosion, Asphyxiation, Electrical shock hazard! Flooding will result in damages such as electrical problems, corrosion, inoperative parts, mold and other unforeseen issues which can occur over time. Any equipment determined by a professional as damaged by a flood, defined as excess of water or other liquid, shall be replaced. Failure to follow these directions will result in a Hazardous Situation.

3. *Installation shall conform to requirements of authority having jurisdiction or in absence of such requirements:*

- *United States*
  - National Fuel Gas Code, ANSI Z223.1/NFPA 54.
  - National Electrical Code, NFPA 70.
- *Canada*
  - Natural Gas and Propane Installation Code, CAN/CSA B149.1.
  - Canadian Electrical Code, Part I, Safety Standard for Electrical Installations, CSA C22.1

4. *Where required by authority having jurisdiction, installation shall conform to Standard for Controls and Safety Devices for Automatically Fired Boilers, ANSI/ASME CSD-1.*

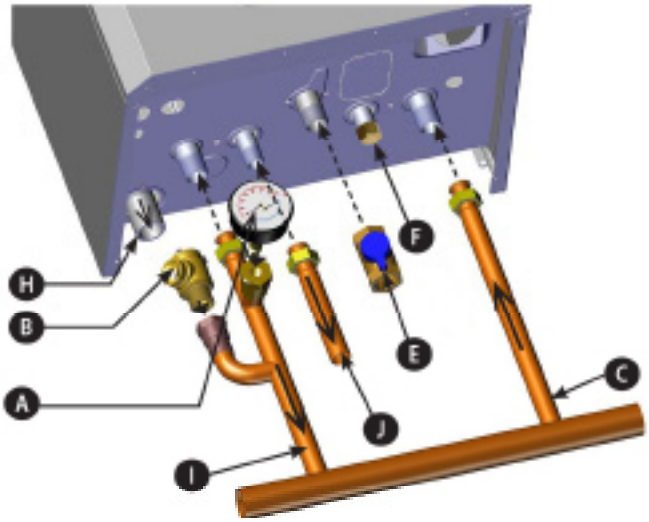
Additional manual reset low water cutoff and/or high limit may be required.

5. *Requirements for Commonwealth of Massachusetts:*

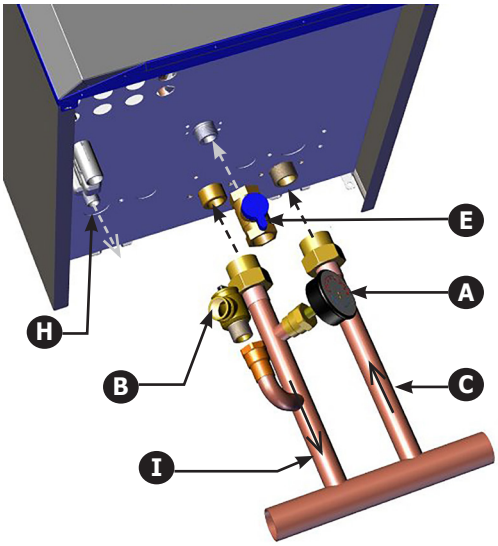
Boiler installation must conform to Commonwealth of Massachusetts code 248 CMR which includes but is not limited to:

- Installation by licensed plumber or gas fitter.

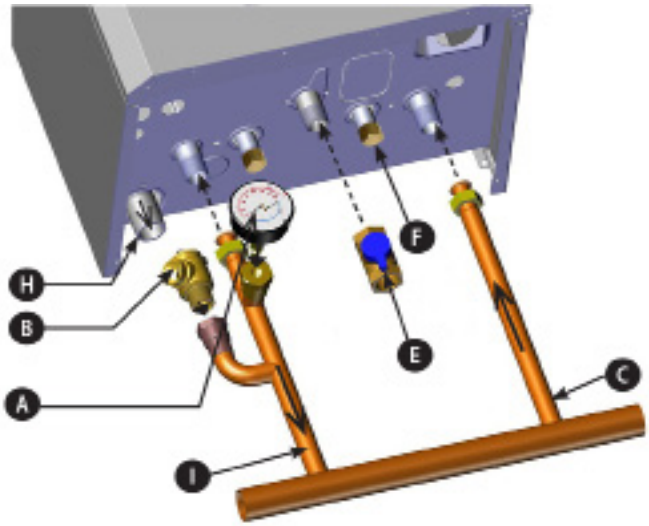
125 HEATING ONLY *WITH* OPTIONAL INDIRECT DHW CONNECTION



165 HEATING ONLY



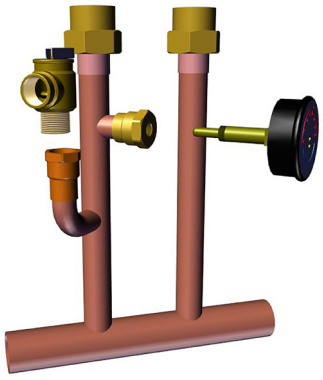
125 HEATING ONLY *WITHOUT* OPTIONAL INDIRECT DHW CONNECTION



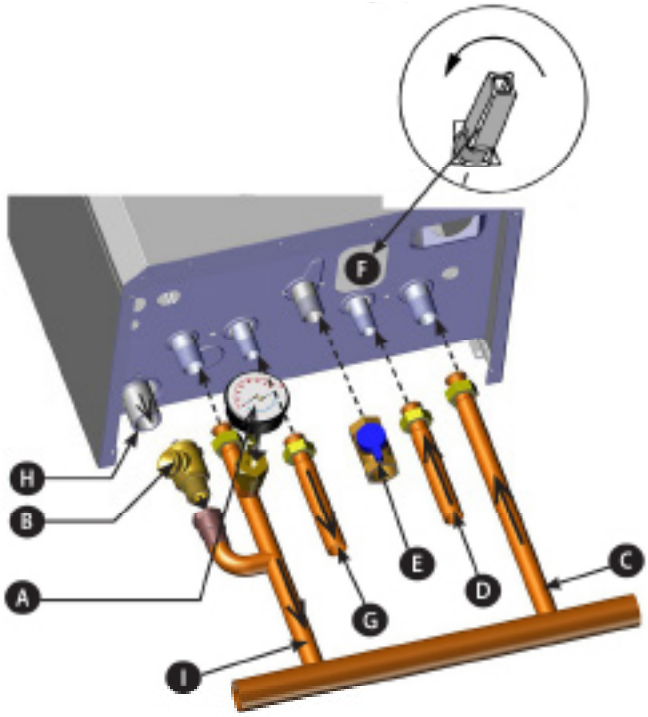
LEGEND		125	165
A	Pressure Gauge	-	
B	Pressure Relief Valve	30.00 psi [2.11 bar]	
C	Heating return connection	3/4" [22.2mm]	1" [25.4mm]
E	Gas shutoff connection	3/4" [22.2mm]	
F	Boiler filling connection (some models)	1/2" [15.9mm]	na
H	Drain connection for condensate	13/16" [21mm] ID Hose	3/4 NPT
I	Heating supply connection	3/4" [22.2mm]	1" [25.4mm]
J	Optional Indirect DHW connection	3/4" [22.2mm]	na

MANIFOLD 115/125/150

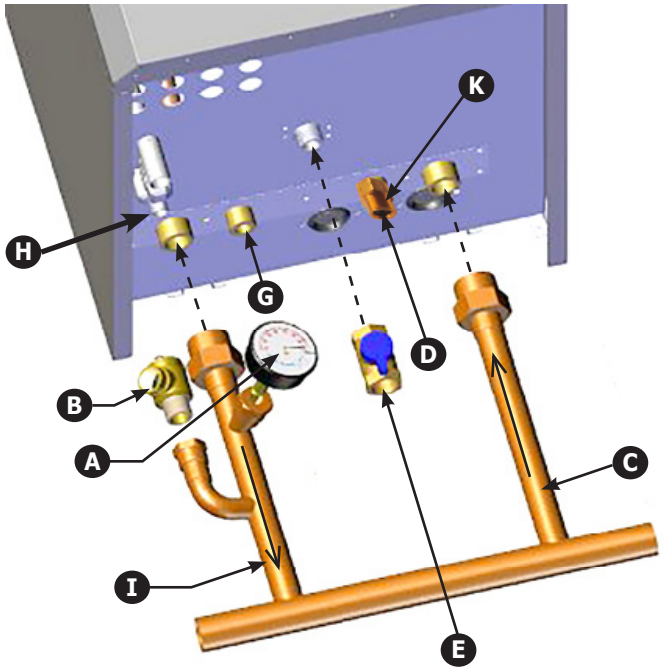
MANIFOLD 165



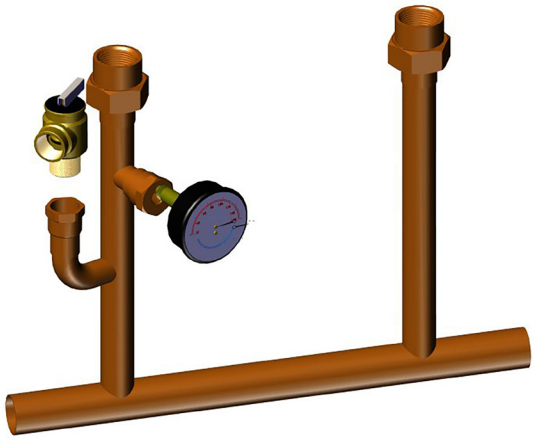
115 & 150 COMBI



205 COMBI



MANIFOLD
115/150/205



	LEGEND	115 & 150	205
A	Pressure Gauge	-	
B	Pressure Relief Valve	30.00 psi [2.11 bar]	
C	Heating return connection	3/4" [22.2mm]	1" [25.4mm]
D	Cold DHW inlet tap	1/2" [15.9mm]	3/4" NPT
E	Gas shutoff connection	3/4" [22.2mm]	
F	Boiler filling connection (some models)	1/2" [15.9mm]	na
G	DHW outlet	1/2" [15.9mm]	3/4" NPT
H	Drain connection for condensate	13/16" [21mm] ID Hose	3/4 NPT
I	Heating supply connection	3/4" [22.2mm]	1" [25.4mm]
K	5 gpm DHW flow restrictor (Factory installed) (205 only)	na	3/4" [22.2mm]

⚠ WARNING

Burn and scald hazard! Manufacturer requires installation of field supplied anti-scald valve. Failure to follow these instructions could result in death or serious injury.

General Information:

Piping installation, materials, and joining methods shall conform to requirements of authority having jurisdiction or in absence of such requirements:

- ***USA*** - National Fuel Gas Code, ANSI Z223.1/NFPA 54
- ***Canada*** - Natural Gas and Propane Installation Code, CAN/CSA B149.1

Manufacturer Requirements/Recommendations:

- **Manufacturer requires all domestic hot water (DHW) installations use an anti-scald valve**. Local codes may require additional equipment (expansion tank, relief valves, etc.) Select and size equipment to suit installation and meet code requirements.
- Use of a water filter on incoming water supply line.
- Manufacturer recommends use of a magnetic dirt separator in the hydronic system where there are cast iron or steel components, or where the previous boiler was a cast iron heat exchanger. The abrasive, extremely fine sediment is difficult to remove and can deposit onto heat exchanger surfaces and accumulate in pump cavities causing reduced efficiency and premature wear.
- If the piping manifold is not used the ASME temperature and pressure relief valve and temperature and pressure gauge shall be installed to conform to requirements of the authority having jurisdiction. Refer to appropriate manufacturer instructions for installation requirements.
- If the piping manifold is not used, a primary / secondary piping arrangement is manufacturer required. A maximum of 12" of separation between the supply and return pipe (closely spaced tees) of the boiler shall be maintained.
- Limit combined supply and return pipe lengths to maximum linear lengths of 20 ft (6.1 m) between boiler and closely spaced tees, when minimum ¾" NPT pipe size is used. Linear length may be increased if supply and return pipe size is increased to limit pressure drop.
- Manufacturer recommends installing a shutoff and purge valve to use during commissioning to ensure the boiler does not shut down due to over temperature. Do not install shutoff between boiler and LWCO or pressue relief valve.

FOR YOUR SAFETY READ BEFORE OPERATING

⚠ DANGER

Hot Water Can Scald!

Water heated to temperature for clothes washing, dish washing and other sanitizing needs can scald and cause permanent injury. Children, elderly, and infirm or physically handicapped persons are more likely to be permanently injured by hot water. Never leave them unattended in bathtub or shower. Never allow small children to use a hot water tap or draw their own bath.

If anyone using hot water in the building fits the above description, or if state laws or local codes require certain water temperatures at hot water taps, you must take special precautions:

- Use lowest possible temperature setting.
- Install some type of tempering device, such as an automatic mixing valve, at hot water tap or water heater. Automatic mixing valve must be selected and installed according to manufacturer's recommendations and instructions.
- Water passing out of drain valves may be extremely hot. To avoid injury:
  - Make sure all connections are tight.
  - Direct water flow away from any person.

Water Temperature Setting	1st Degree Burn Exposure Time For An Adult	2nd and 3rd Degree Burn Exposure Time For An Adult
120° F	1 minute	5 minutes
130° F	5 seconds	30 seconds
140° F	2 seconds	5 seconds
150° F	1 second	1.5 seconds
160° F	Instantaneous	0.5 seconds

Note: Warning for Infants, Children, and Elderly: Great care must be taken when exposing the aforementioned groups to warm or hot water as they can be badly burned in exposure times less than half of the time for an adult.

Note Provided Wiring and Piping illustrations are meant to show system concepts only. Installer is responsible for all equipment required by authority having jurisdiction.

Note Arrange piping to prevent water dripping onto boiler.

All piping diagrams are shown with optional DHW Indirect Tank where applicable.

Use of Indirect Storage Tank (DHW):

Note Sensors supplied with this boiler are proprietary to the manufacturer. Use of alternate sensors *WILL* diminish boiler performance.

- ☐ Use either DHW sensor or Indirect Tank Thermostat to interface with boiler. Wire to M2 terminals #3 and #4.
- ☐ Use of booster pump to increase flow rate to indirect tank is not recommended by manufacturer.
- ☐ Locate tank as close to boiler as possible.
- ☐ Size DHW tank, piping, and system to use only internal boiler pump.
- ☐ See available pump/flow rate chart, page 35 of this manual.
- ☐ Change P03 on boiler for application as specified on the wire diagram and Boiler Control section of Installation, Operation & Maintenance Manual supplied with the boiler.

The Labor Saver Piping Manifold, which is supplied with each boiler, is shown with most of the following piping diagrams.

Electrical Wiring Information:

All field wiring shall conform to the authority having jurisdiction or, in the absence of such requirements to:

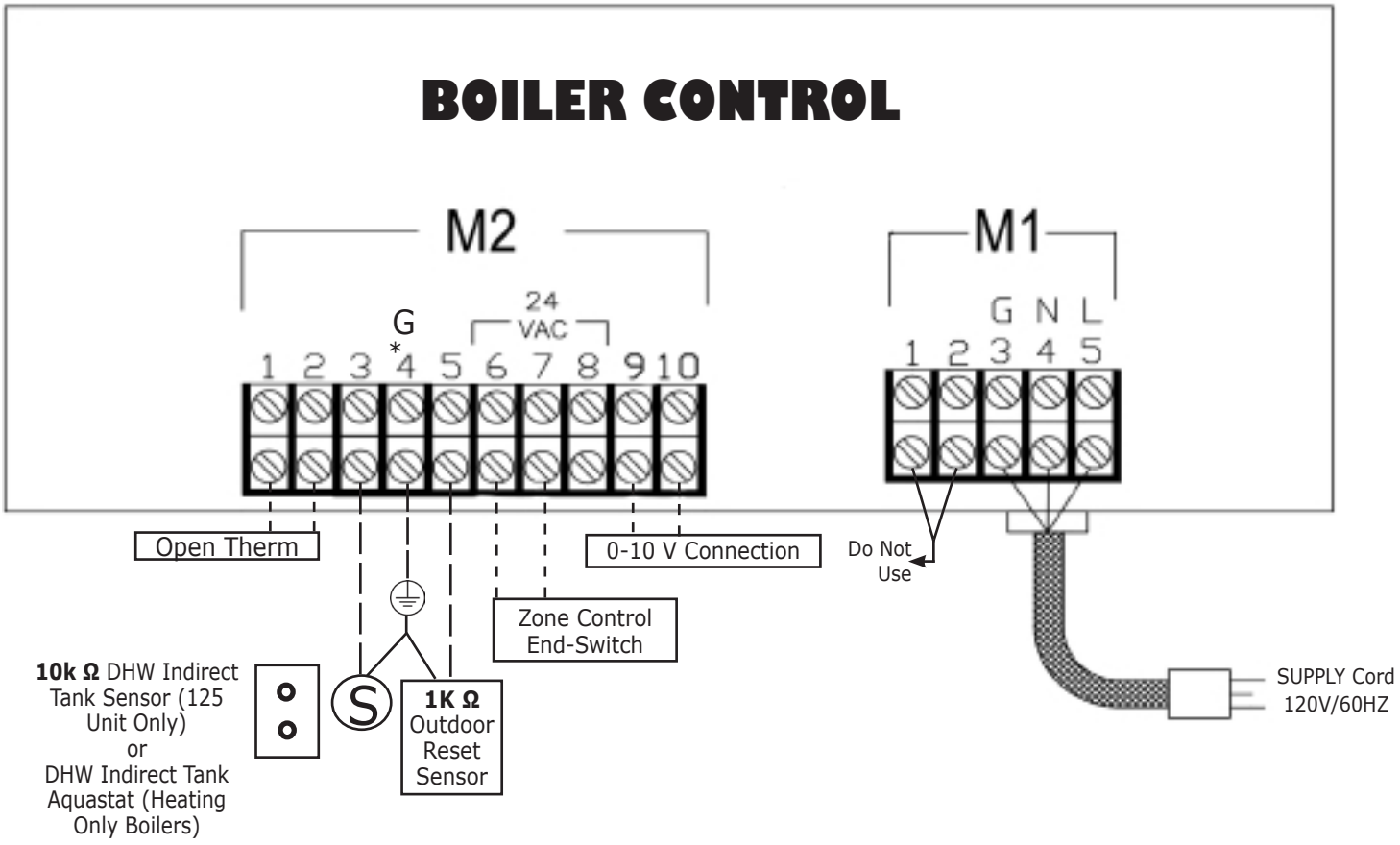
- ***USA***: National Electrical Code, ANSI/NFPA 70,
- ***Canada***: Canadian Electrical Code, Part I, CSA C22.1: Safety Standard for Electrical Installations.

Wiring diagrams shown in this manual utilize the ARGO™ Universal Control, the optional use of an Indirect Domestic Hot Water Tank, and optional use of a H2O Buffer Tank.

Reference the zone control manufacturer instruction manual for control operation and priority setting of DHW zones.

Note **DO NOT** use 120 V thermostat terminals (m1- #1 and #2).

Note Provided Wiring and Piping illustrations are meant to show system concepts only. Installer is responsible for all equipment required by authority having jurisdiction.



* Ground Sensors using terminal 4

PIPING LEGEND

ZONE VALVE

BALL VALVE

AIR SEPERATOR

CIRCULATOR

DRAIN

COMBINATION FILL

FLOW CHECK VALVE

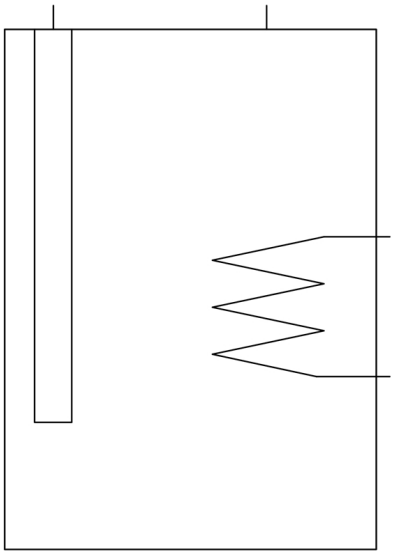
BYPASS VALVE

DIVERTER VALVE

T&P OR RELIEF VALVE

THERMOSTATIC MIXING VALVE

PURGE VALVE



INDIRECT DHW TANK

INDIRECT TANK AQUASTAT

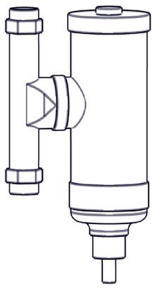
10K Ω INDIRECT DHW TANK SENSOR

TEMPERATURE & PRESSURE GAUGE

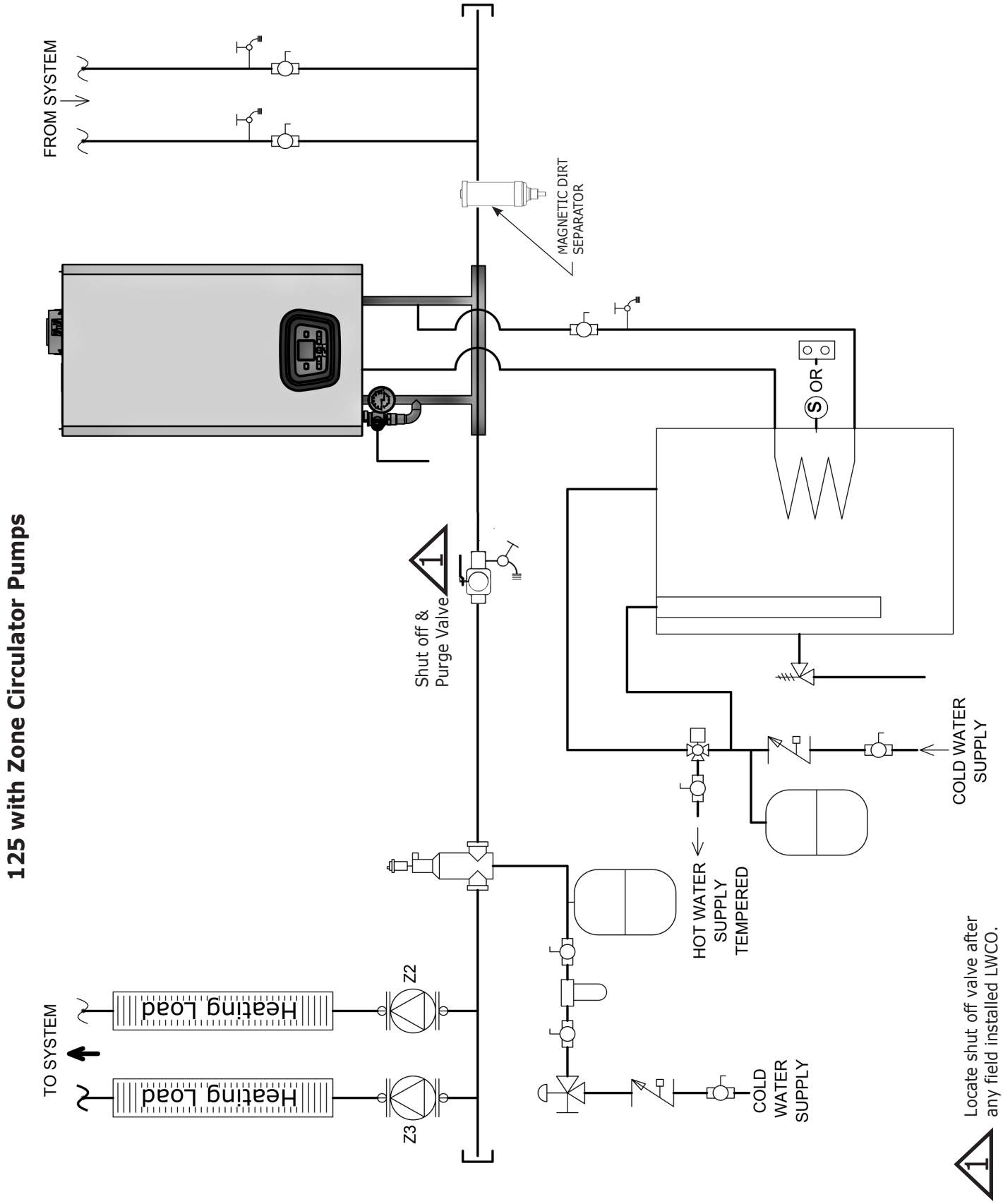
EXPANSIONTANK

FLAT PLATE HEAT EXCHANGER
(COMBI ONLY)

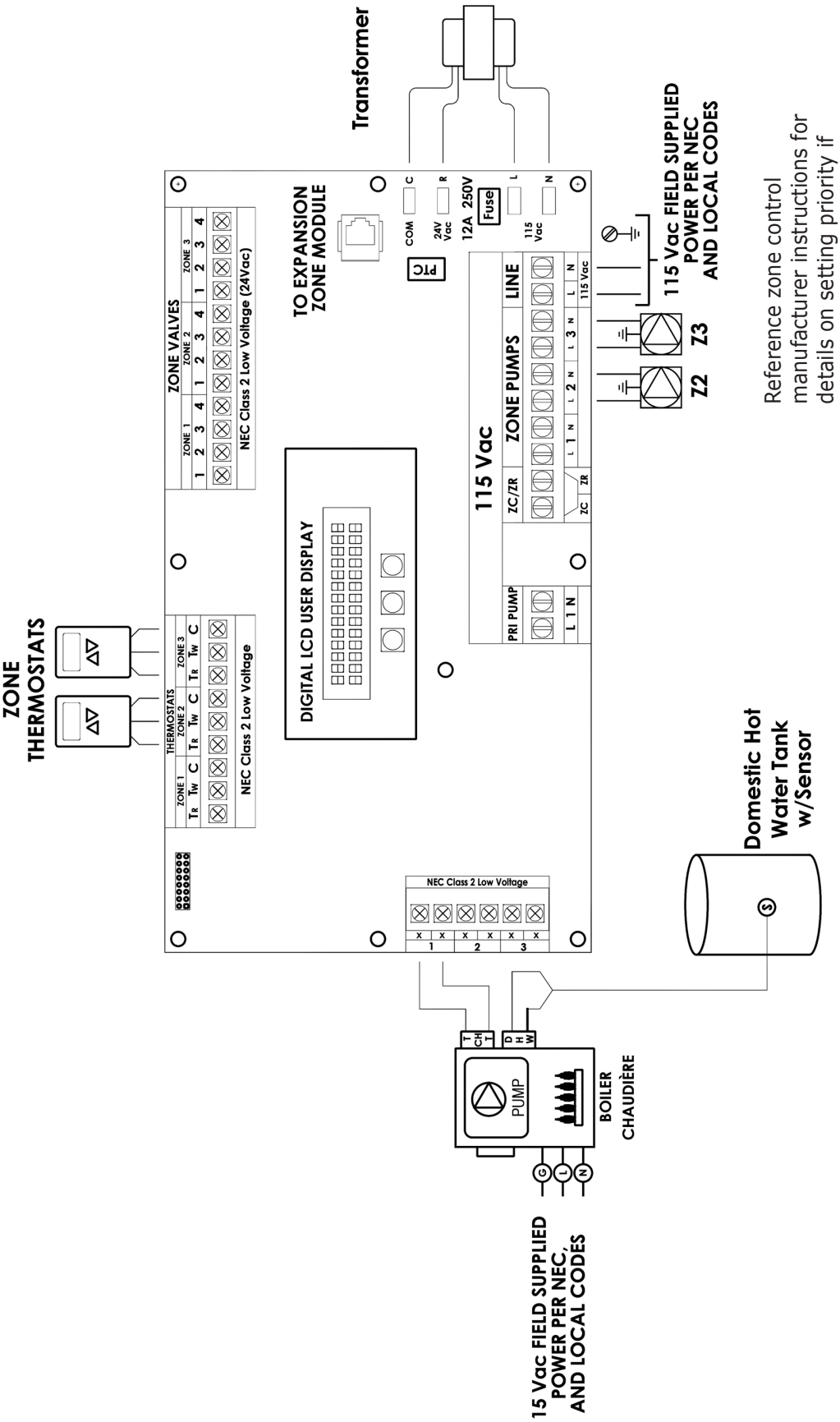
STRAINER



MAGNETIC DIRT SEPARATOR


125 with Zone Circulator Pumps
FROM SYSTEM
MAGNETIC DIRT SEPARATOR
OR
S
Shut off & Purge Valve
1
COLD WATER SUPPLY
HOT WATER SUPPLY TEMPERED
COLD WATER SUPPLY
TO SYSTEM
Heating Load
Heating Load
Z2
Z3
1
Locate shut off valve after any field installed LWCO.

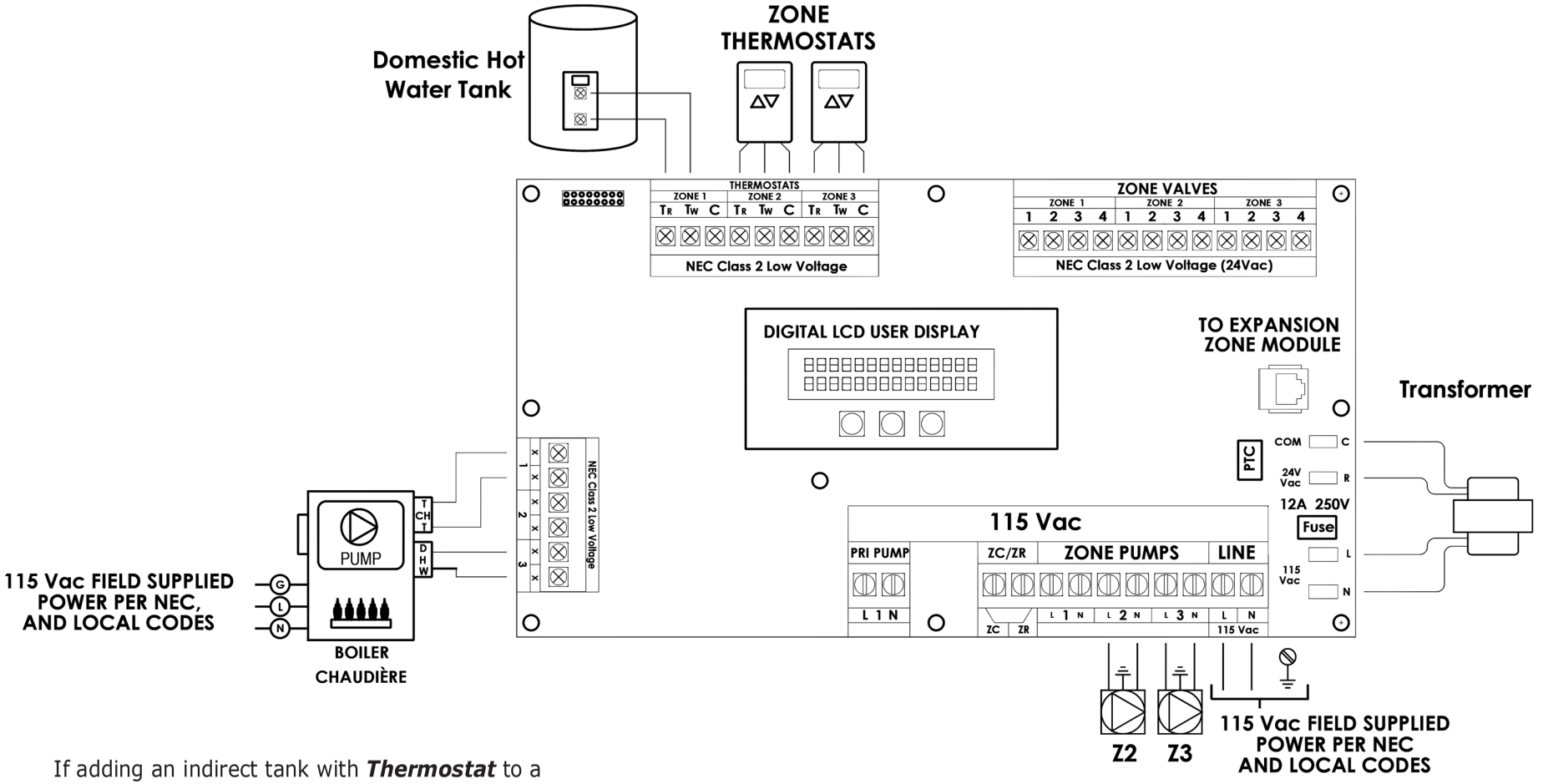
125 WITH INDIRECT ZONE PUMPS & DHW TANK W/ TANK SENSOR



Reference zone control manufacturer instructions for details on setting priority if necessary.

If adding an indirect tank with ***sensor*** to a **Heating Only Boiler**, change P03 from 08 to 05. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.

125 W/ INDIRECT ZONE PUMPS & DHW TANK W/TANK T-STAT - WIRING DIAGRAM



If adding an indirect tank with ***Thermostat*** to a **Heating Only Boiler**, change P03 from 08 to 04. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.

Reference zone control manufacturer instructions for details on setting priority if necessary.

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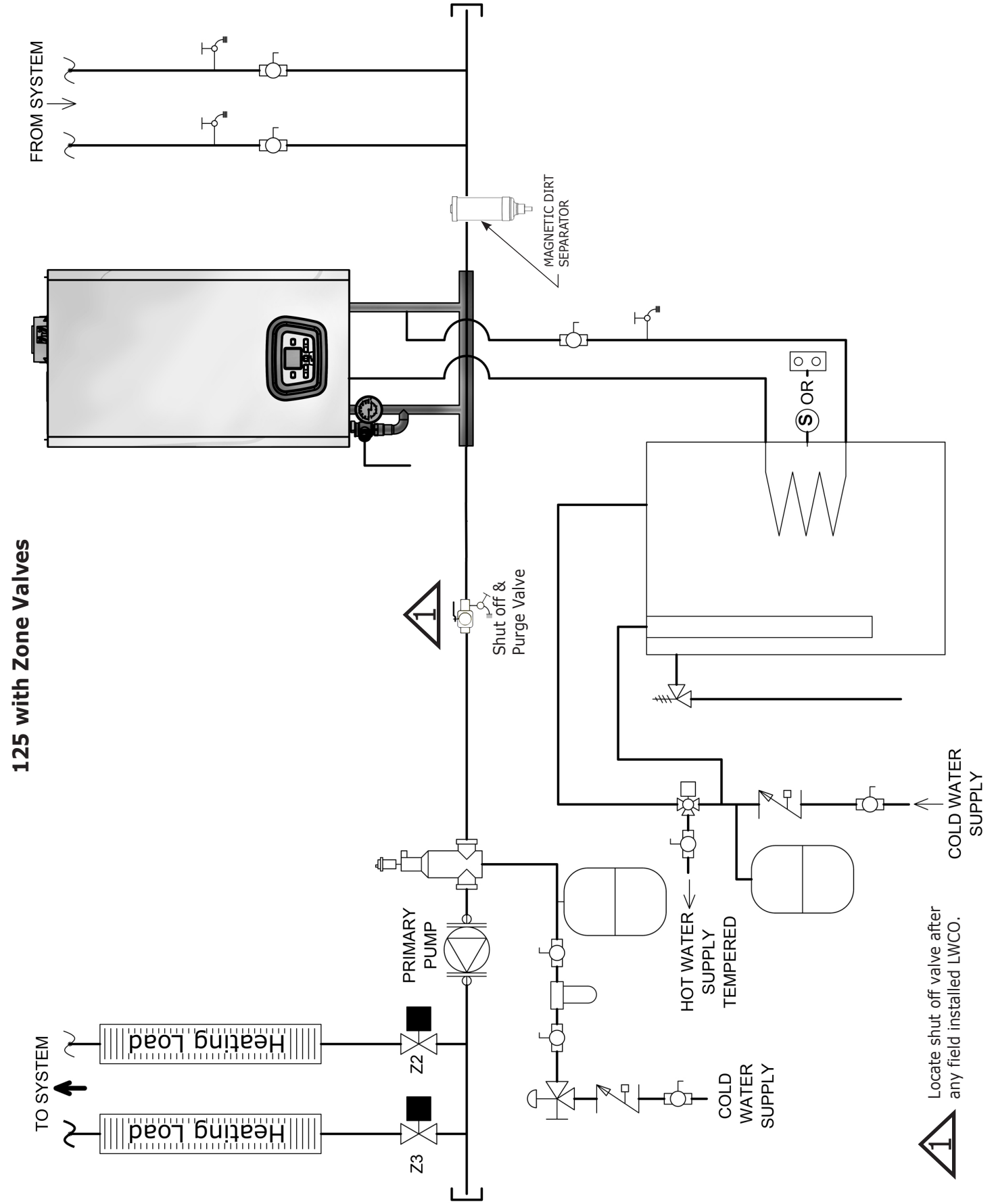
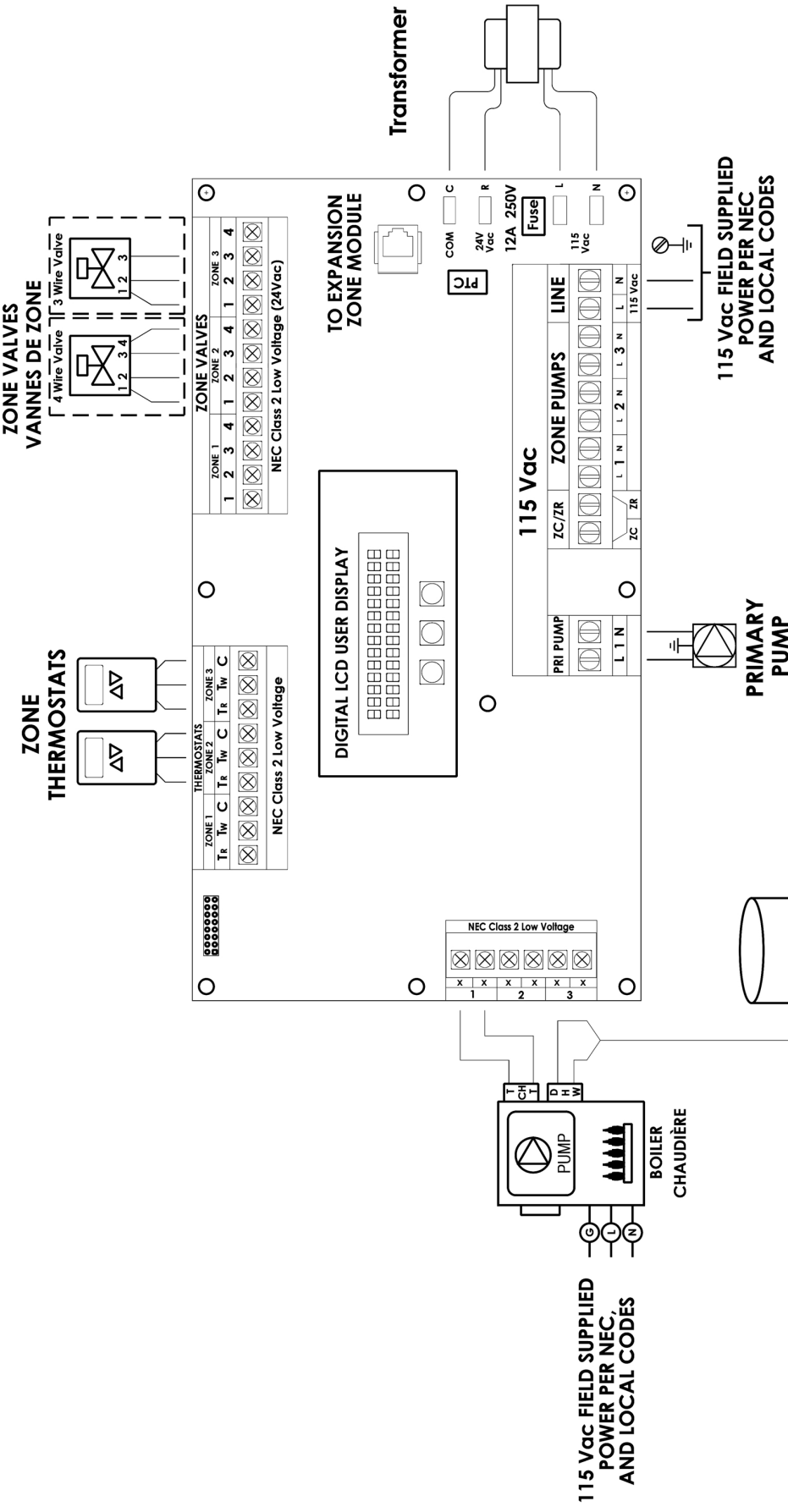
125 W/ INDIRECT ZONE PUMPS & DHW TANK W/TANK T-STAT - WIRING DIAGRAM


125 with Zone Valves
FROM SYSTEM
MAGNETIC DIRT SEPARATOR
OR
Shut off & Purge Valve
1
COLD WATER SUPPLY
HOT WATER SUPPLY TEMPERED
PRIMARY PUMP
Z2
Z3
Heating Load
Heating Load
TO SYSTEM
COLD WATER SUPPLY
Locate shut off valve after any field installed LWCO.
1

125 with Zone Valves

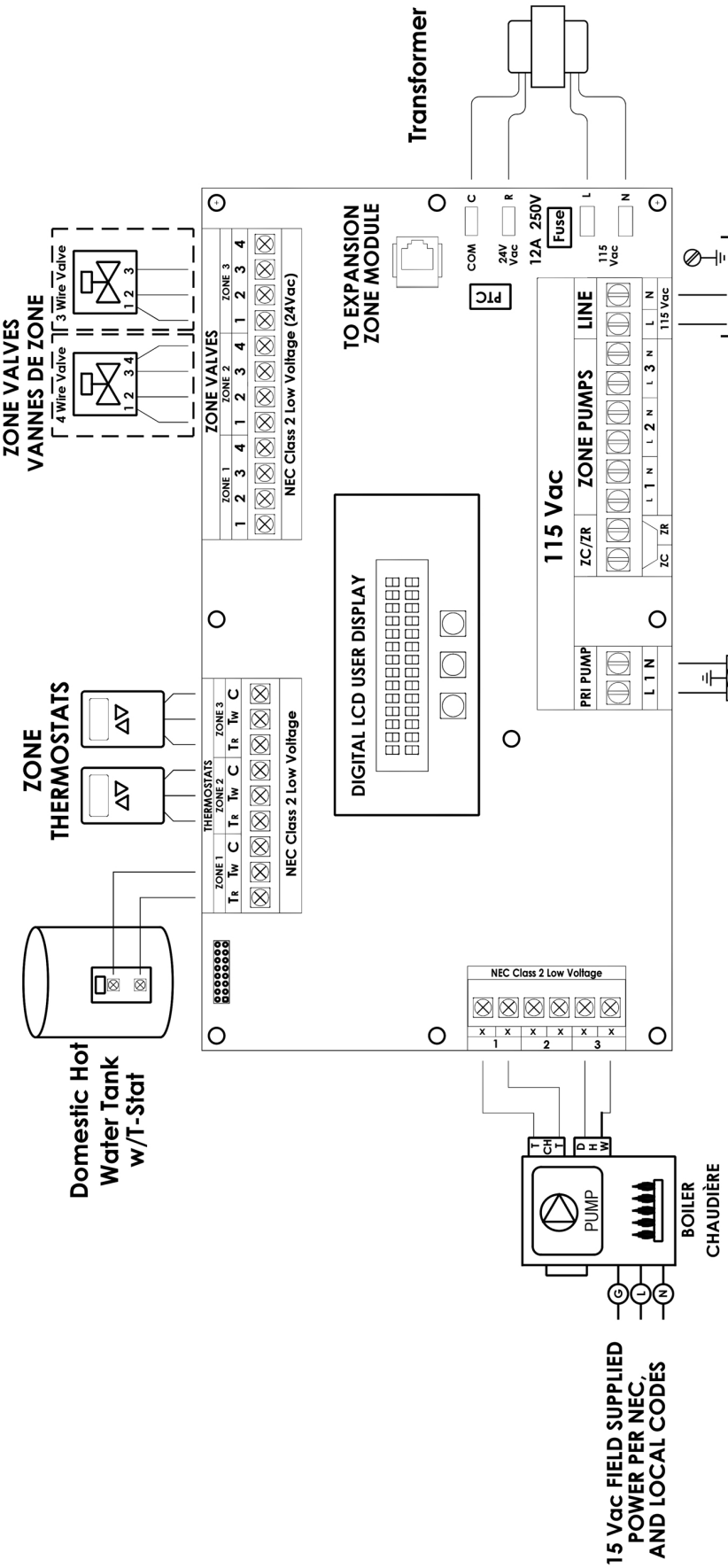
125 With Zone Valves, DHW Tank & Tank Sensor



Reference zone control manufacturer instructions for details on setting priority if necessary.

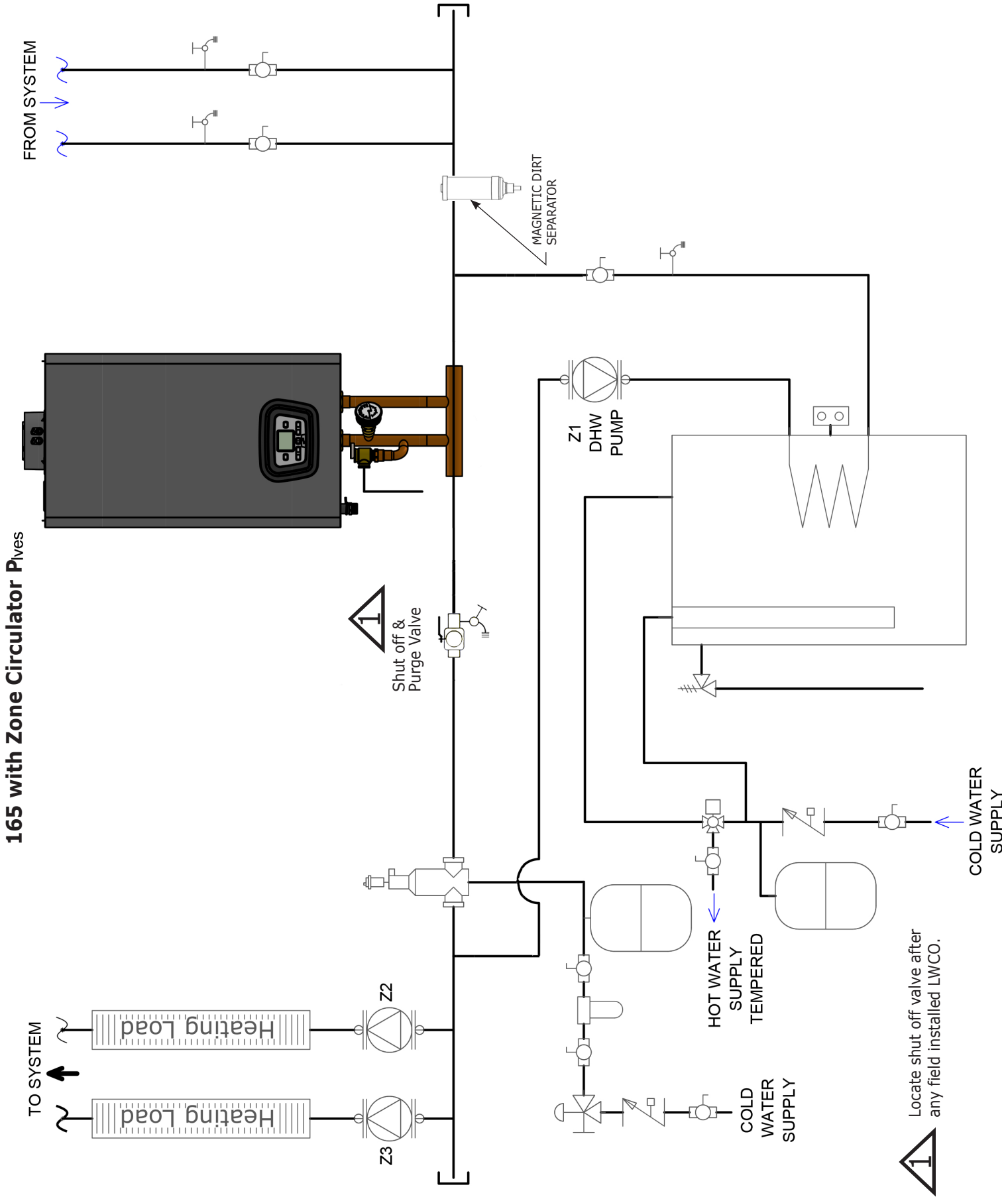
If adding an indirect tank with ***sensor*** to a **Heating Only Boiler**, change P03 from 08 to 05. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.

125 with Zone Valves

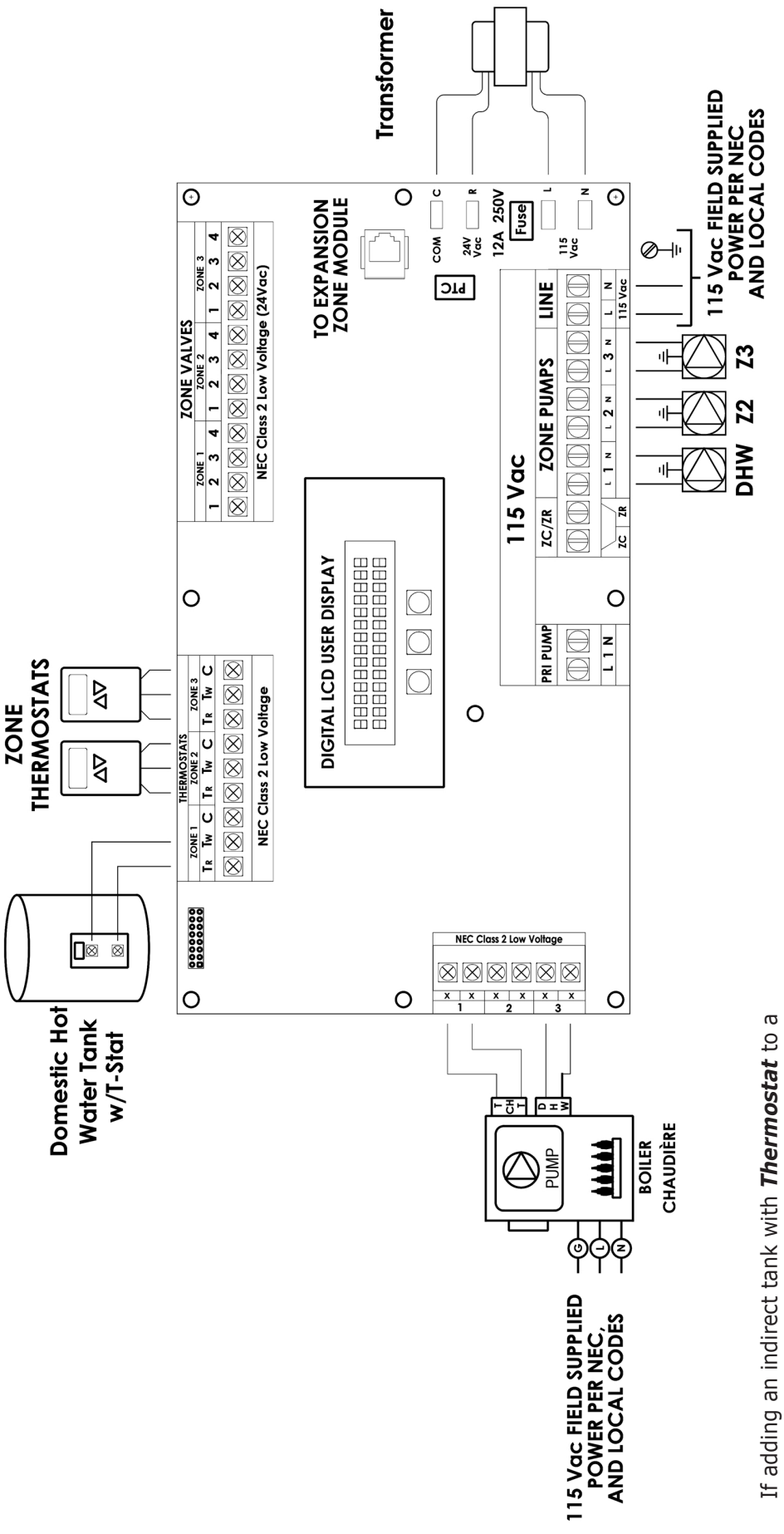


Reference zone control manufacturer instructions for details on setting priority if necessary.

If adding an indirect tank with ***Thermostat*** to a **Heating Only Boiler**, change P03 from 08 to 04. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.

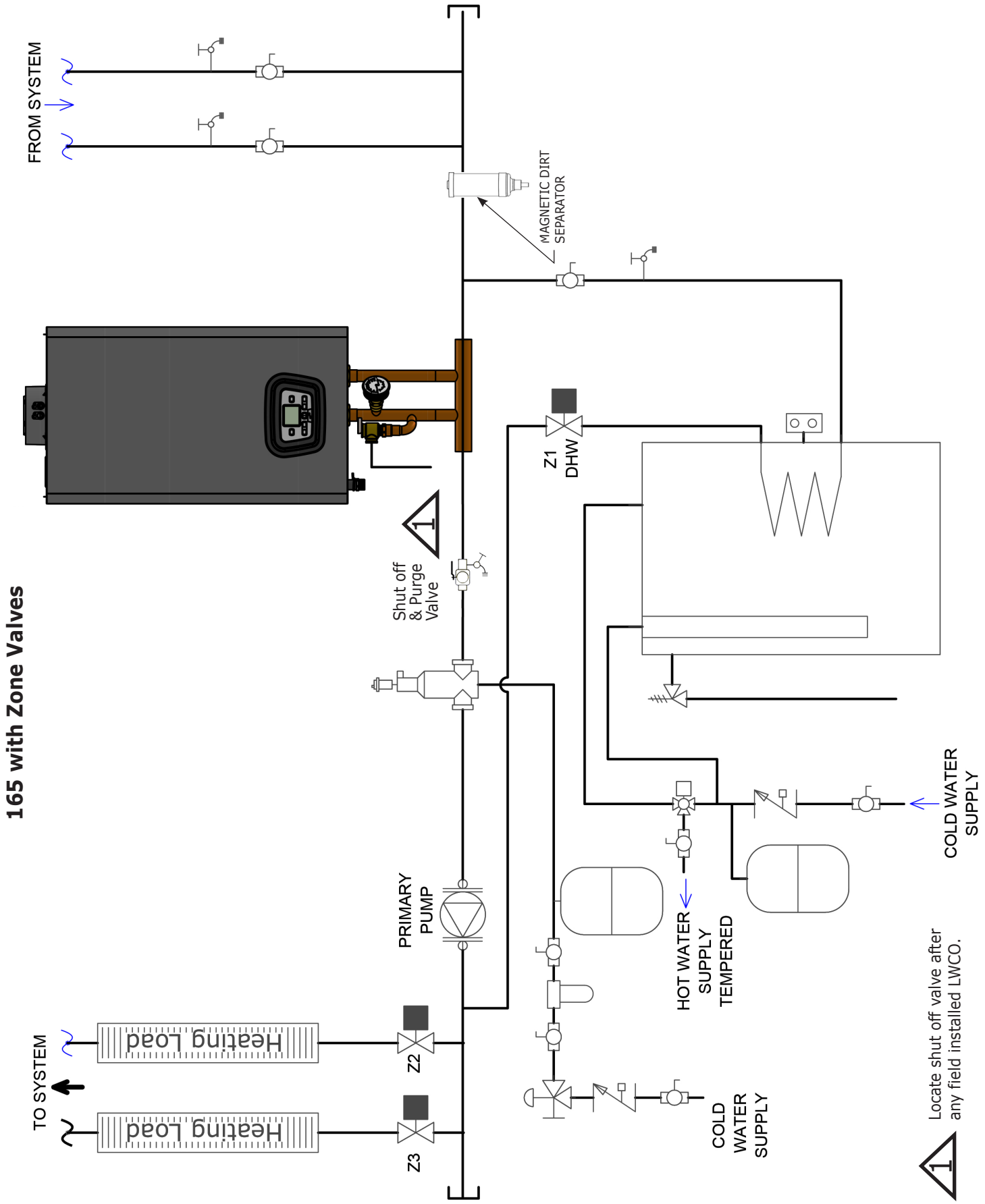

165 with Zone Circulator Pvves
FROM SYSTEM
MAGNETIC DIRT SEPARATOR
Z1 DHW PUMP
1
Shut off & Purge Valve
COLD WATER SUPPLY
HOT WATER SUPPLY TEMPERED
COLD WATER SUPPLY
Locate shut off valve after any field installed LWCO.
1
TO SYSTEM
Heating Load
Heating Load
Z2
Z3

165 Indirect Zone Pumps, DHW Tank, Tank T-Stat

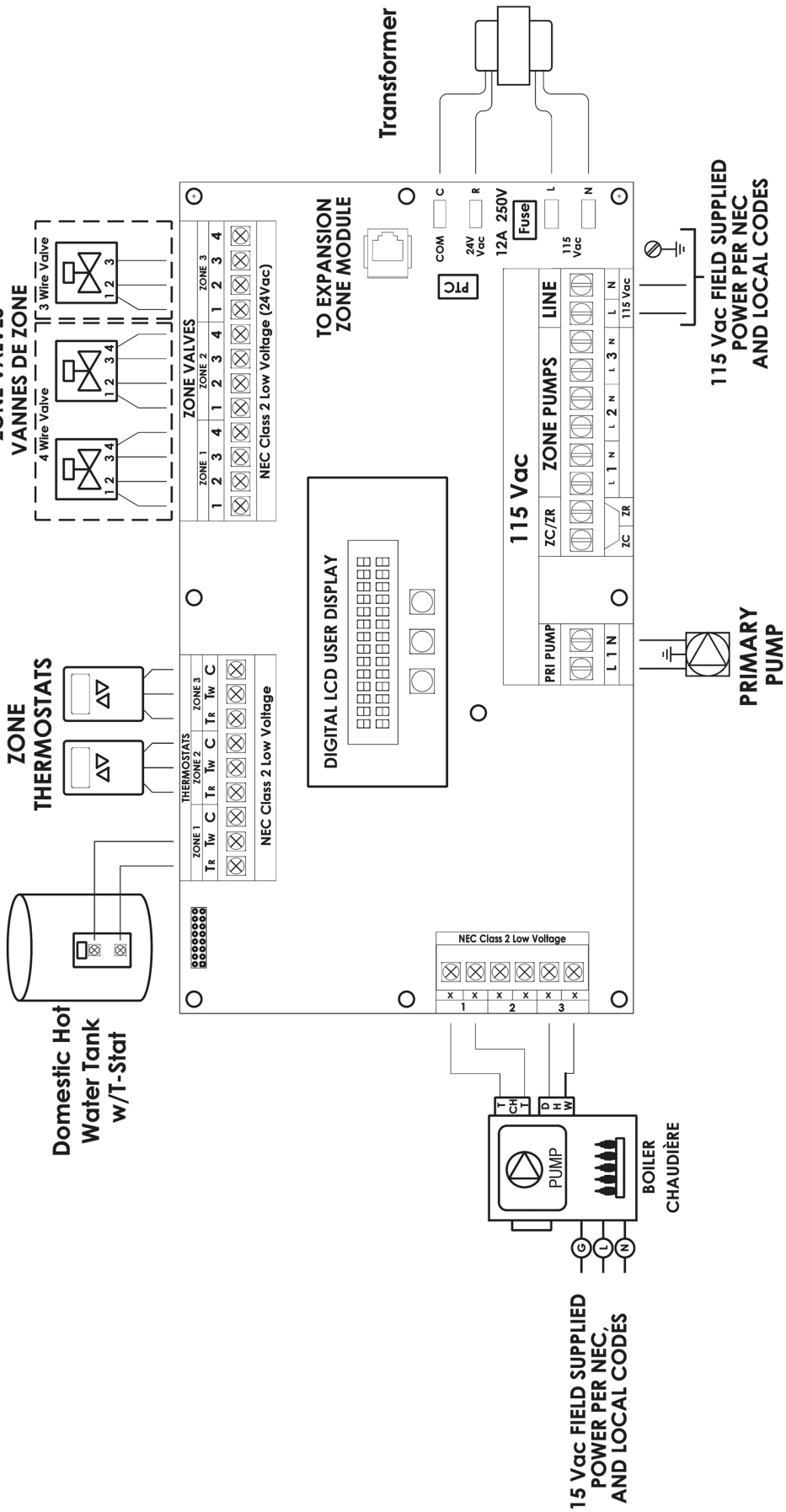


Reference zone control manufacturer instructions for details on setting priority if necessary.

If adding an indirect tank with ***Thermostat*** to a **Heating Only Boiler**, change P03 from 08 to 04. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.


165 with Zone Valves
FROM SYSTEM
MAGNETIC DIRT SEPARATOR
Z1 DHW
Shut off & Purge Valve
PRIMARY PUMP
Z2
Z3
Heating Load
Heating Load
TO SYSTEM
HOT WATER SUPPLY TEMPERED
COLD WATER SUPPLY
COLD WATER SUPPLY
1
Locate shut off valve after any field installed LWCO.
1

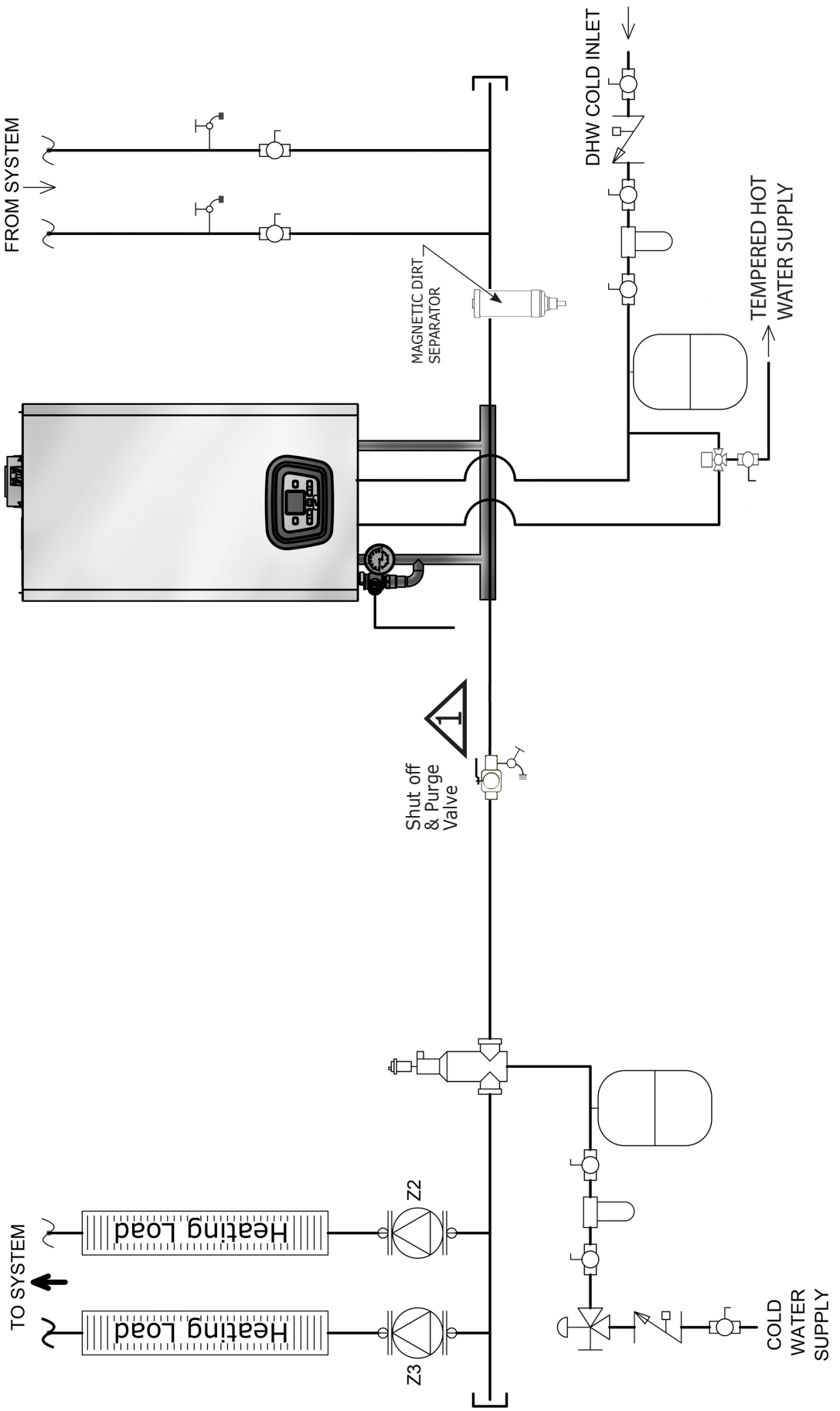
165 Indirect Zone Valves, DHW Tank, Tank T-STAT -Wiring Diagram



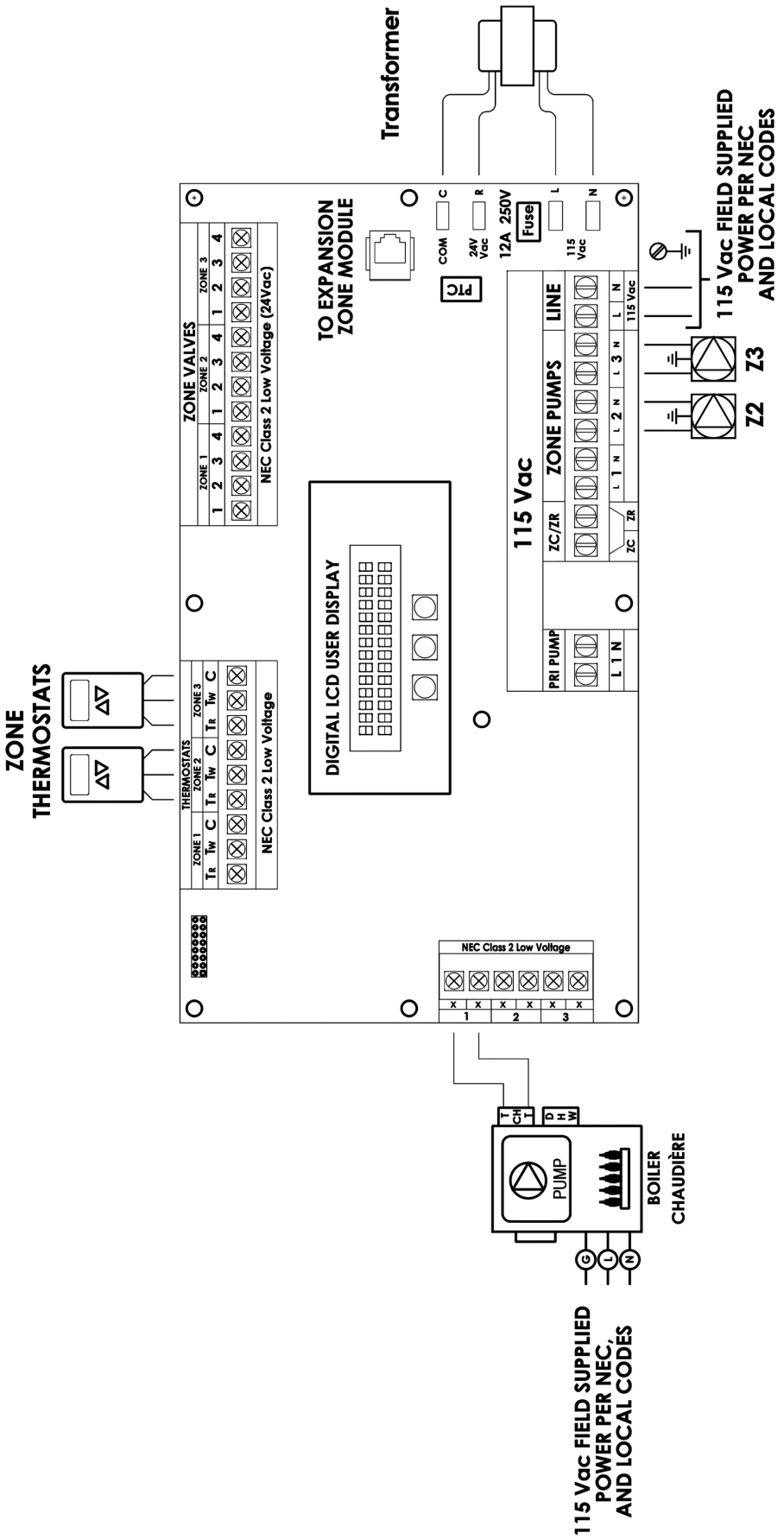
If adding an indirect tank with ***Thermostat*** to a **Heating Only Boiler**, change P03 from 08 to 04. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.

Reference zone control manufacturer instructions for details on setting priority if necessary.

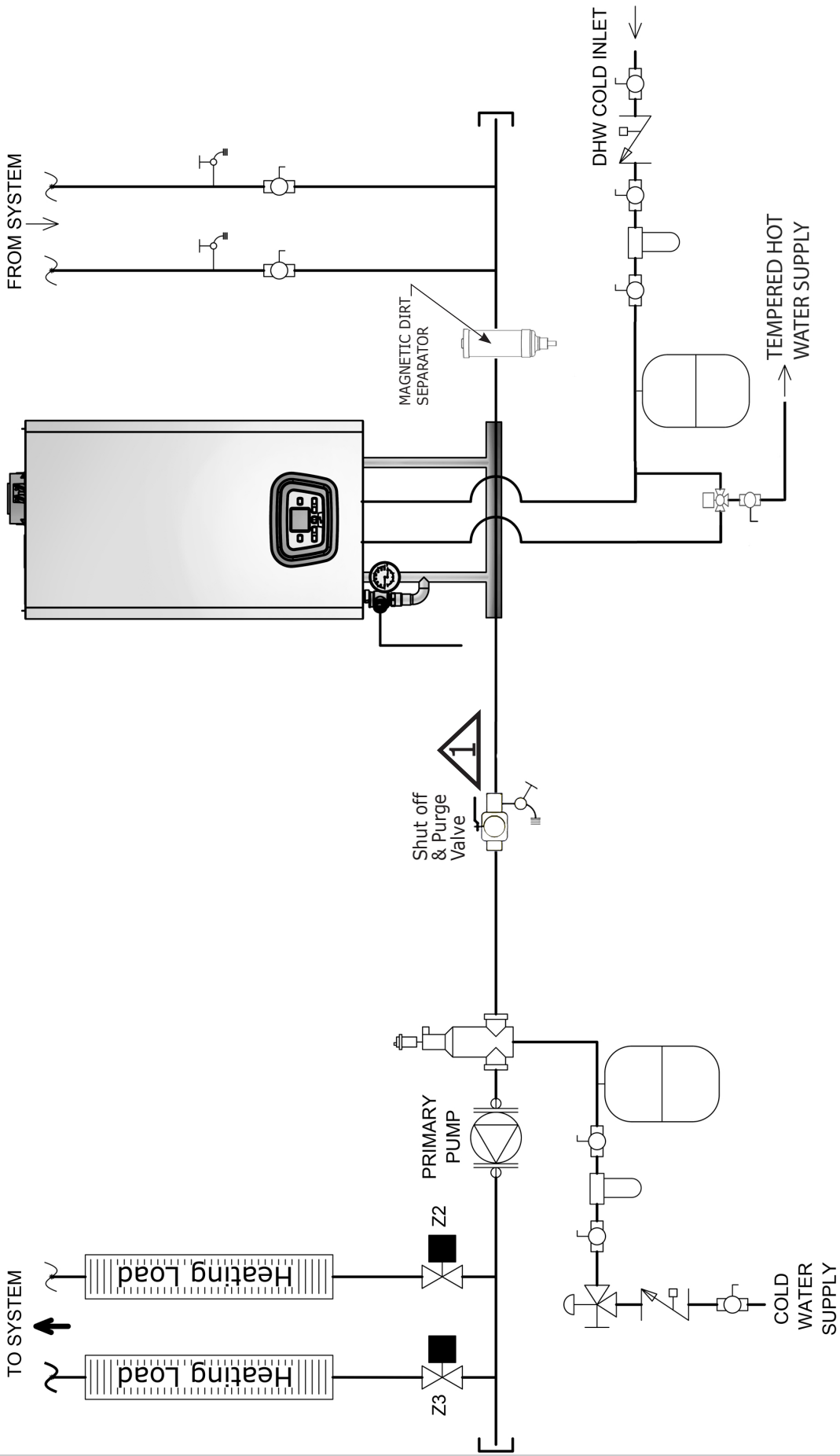
115, 150 & 205 with Zone Circulator Pumps



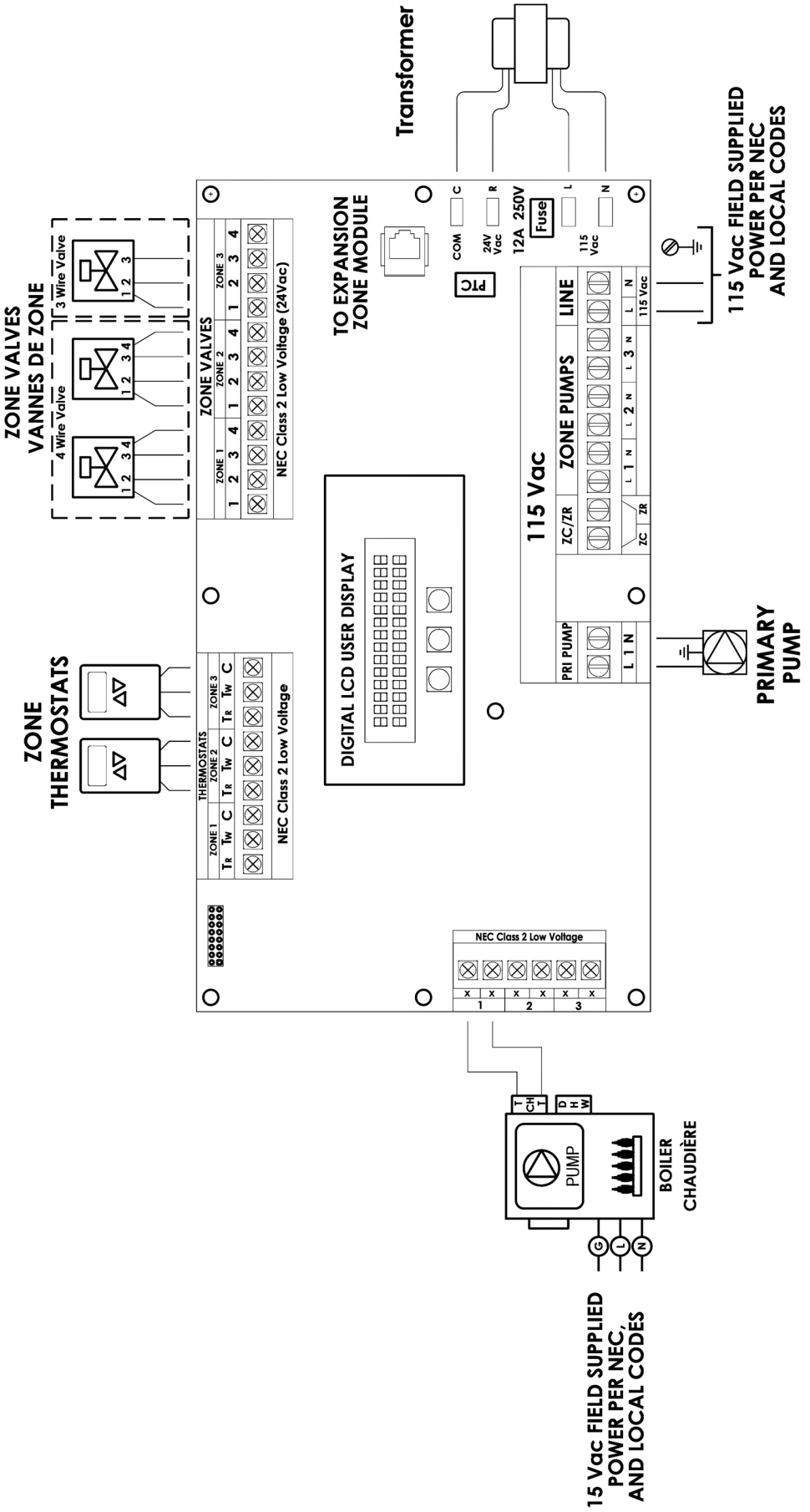
150 & 205 With Zone Pumps



115, 150 & 205 with Zone Valves



115, 150 & 205 With Zone Valves



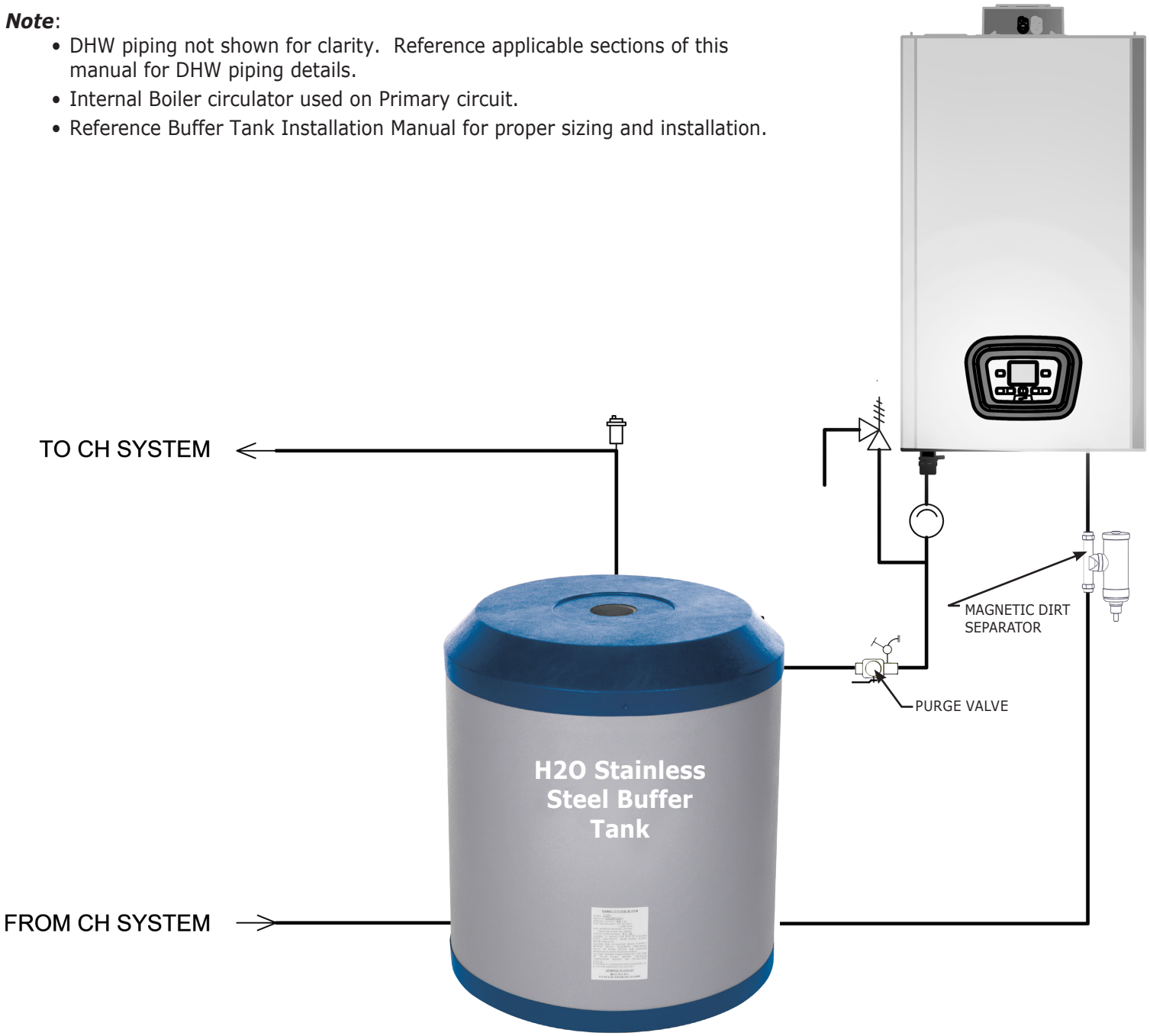
Buffer Piping

When installing low mass systems, additional water mass may be required to avoid short cycling by the boiler. In these applications it is recommended that a buffer tank be installed.

Buffer Tank on Central Heat Circuit

Note:

- DHW piping not shown for clarity. Reference applicable sections of this manual for DHW piping details.
- Internal Boiler circulator used on Primary circuit.
- Reference Buffer Tank Installation Manual for proper sizing and installation.



Low Mass Boiler Wiring with Buffer Tank

Connect the buffer tank aquastat to terminals 6 and 7 on terminal block M2.

System wiring remains as shown in the previous wiring diagrams.

Optional Equipment

IMPORTANT: Sensors supplied with this boiler are proprietary to the manufacturer. Use of alternate market sensors *WILL* diminish boiler performance.

1. **1k Ω** Outdoor Air Sensor, if used.
   A. Boiler automatically recognizes sensor when used.
   B. See Chart 1 for sensor data. Sensor part number BD710487302V
   C. Locate outdoor sensor to protect against wind and direct sunlight. Mounting instructions provided with sensor.
   D. Maximum wire length is 100 ft (30m) for 22 ga. wire, or 150 ft (45m) for 18 ga. wire.
   E. Connect wires to M2 OUTDOOR SENSOR terminals 4 & 5. Wires are interchangeable. See Accessories.

2. **10k Ω** Sensor for Indirect DHW Tank (Heating Only Boiler).
   A. See Chart 2 for sensor data.
   See Accessories section of this manual for wiring diagram.

CHART 1 -1k Ω OUTDOOR AIR SENSOR DATA

T [°F]	R [Ohm]	T [°F]	R [Ohm]
-4.0	7,578	53.6	1,690
-2.2	7,193	55.4	1,621
-0.4	6,831	57.2	1,555
1.4	6,489	59.0	1,492
3.2	6,166	60.8	1,433
5.0	5,861	62.6	1,375
6.8	5,574	64.4	1,321
8.6	5,303	66.2	1,268
10.4	5,046	68.0	1,218
12.2	4,804	69.8	1,170
14.0	4,574	71.6	1,125
15.8	4,358	73.4	1,081
17.6	4,152	75.2	1,040
19.4	3,958	77.0	1,000
21.2	3,774	78.8	962
23.0	3,600	80.6	926
24.8	3,435	82.4	892
26.6	3,279	84.2	858
28.4	3,131	86.0	827
30.2	2,990	87.8	796
32.0	2,857	89.6	767
33.8	2,730	91.4	740
35.6	2,610	93.2	713
37.4	2,496	95.0	687
39.2	2,387	96.8	663
41.0	2,284	98.6	640
42.8	2,186	100.4	617
44.6	2,093	102.2	595
46.4	2,004	100.4	617
48.2	1,920	102.2	595
50.0	1,840	104.0	575
51.8	1,763	106.0	556

CHART 2 -10k Ω INDIRECT TANK SENSOR DATA

T [°F]	R [Ohm]	T [°F]	R [Ohm]
32.0	32,505	86.0	8,060
33.8	30,898	87.8	7,726
35.6	29,381	89.6	7,407
37.4	27,946	91.4	7,103
39.2	26,590	93.2	6,813
41.0	25,308	95.0	6,537
42.8	24,094	96.8	6,273
44.6	22,946	98.6	6,021
46.4	21,859	100.4	5,781
48.2	20,829	102.2	5,551
50.0	19,854	104.0	5,332
51.8	18,930	105.8	5,123
53.6	18,054	107.6	4,923
55.4	17,223	109.4	4,732
57.2	16,436	111.2	4,549
59.0	15,689	113.0	4,374
60.8	14,980	114.8	4,207
62.6	14,306	116.6	4,047
64.4	13,667	118.4	3,894
66.2	13,060	120.2	3,748
68.0	12,483	122.0	3,608
69.8	11,935	123.8	3,473
71.6	11,414	125.6	3,345
73.4	10,919	127.4	3,222
75.2	10,447	129.2	3,104
77.0	9,999	131.0	2,991
78.8	9,572	132.8	2,882
80.6	9,166	134.6	2,778
82.4	8,779	136.4	2,679
84.2	8,411	138.2	2,583

Accessories:

1. 1k Ω Outdoor Temperature Sensor Kit - BD710487302V

Use Outdoor Sensor Kit with Heating Only or Combi Boilers. Wire Control to boiler M2 terminal strip terminals 4 and 5 as shown below.
Install/locate Control according to instructions supplied with sensor kit and Installation, Operation and Maintenance Manual (IOM).

Setting "**Kt**" Climate Curve:

Start boiler in CH mode. Depress CH control button once.

Boiler control will recognize installed OAS sensor. Display will change to show current default "**Kt"** value. Note display value.

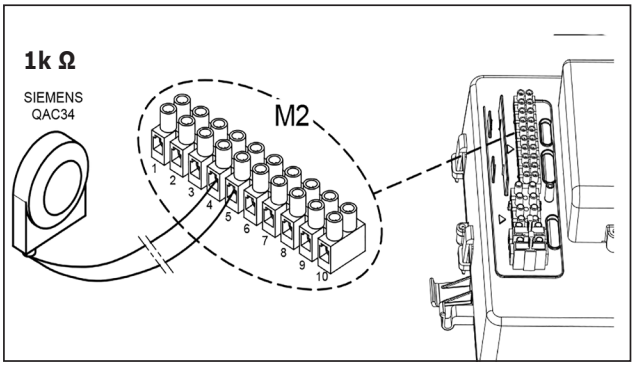
When operation in CH mode, **Kt** value setting will over ride maximum CH boiler control set point based on current outdoor temperature.

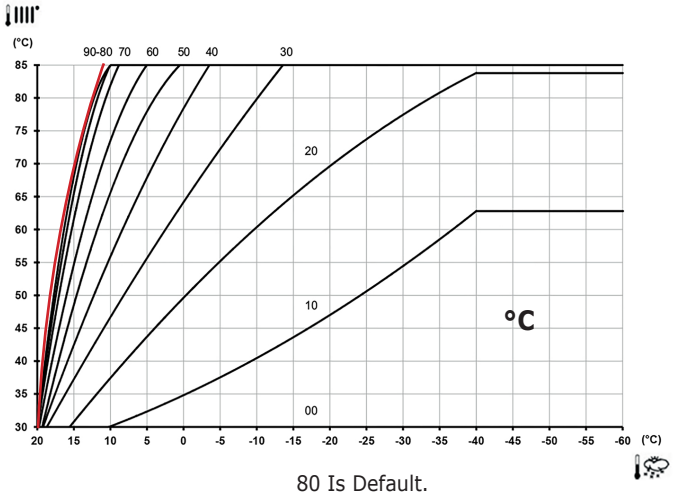
- Refer to applicable °F (or °C) chart,
- Identify **Kt** range that will satisfy the desired boiler delivery temperature based on average (extreme) outdoor temperature range expected for climate location.
- Use lower value of range as the desired **Kt** value.
  (example): to deliver 176°F water @ OT of -20°F = **Kt** range is 90 thru 25. Select 25.
- To change"default" **Kt** value on boiler control use +/- CH Heating buttons.

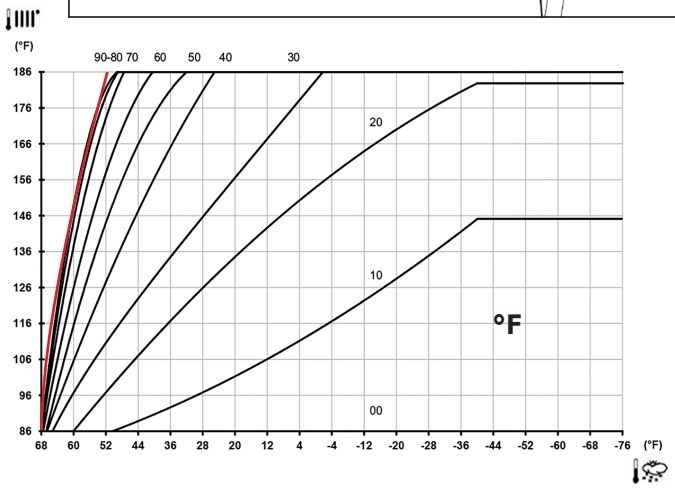
When scrolling has stopped, boiler will automatically "SAVE" value as new **Kt** default value and automatically return to CH mode when no **Kt** adjustment activity is sensed. **Kt** values can be changed in +/- 1 point increments.

To return to check or change current **Kt** "default value - depress one of the CH setpoint adjustment buttons (once), while in any heating or standby mode. Adjust **Kt** value to obtain desired comfort level.

	Flow Temp		Outside Temp







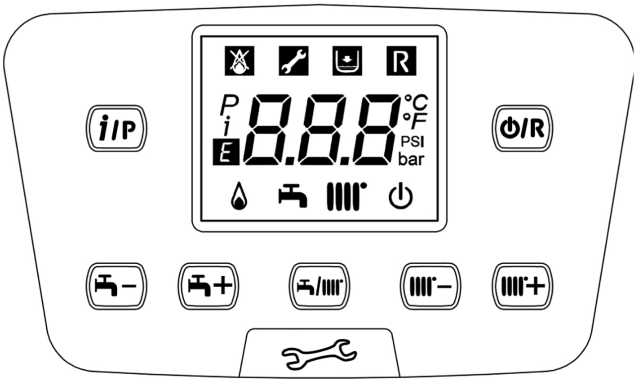
80 Is Default.

Note For temperatures below -40°F (-40°C), maximum heating flow temperature set point no longer increases and curves on the graph become horizontal. Boiler set point will override sensor setpoint.

BUTTONS Key

	DHW temperature adjustment *(+ to increase the temperature and – to decrease it)*
	Heating water temperature adjustment *(+ to increase the temperature and – to decrease it)*
i/P	Boiler operating information
	Operating mode: *DHW – DHW & Heating – Heating Only*
⏻/R	Off – Reset – Exit menu/functions

Boiler Control Panel



2. 10k Ω Indirect Storage Tank Sensor Kit

Heating Only boiler can be electrically connected to Indirect Storage Tank.

Diagram of hydraulic connection of external indirect storage tank is shown below.

Connect DHW priority sensor to terminals 3 and 4 on terminal block M2. The element of the sensor must be inserted in the sensor well located on the indirect storage tank.

Verify the exchange capacity of the storage boiler coil is appropriate for power of the boiler. Adjust DHW temperature (+95°F...+140°F / +35°C...+60°C) by pressing  buttons on boiler control panel.

Note

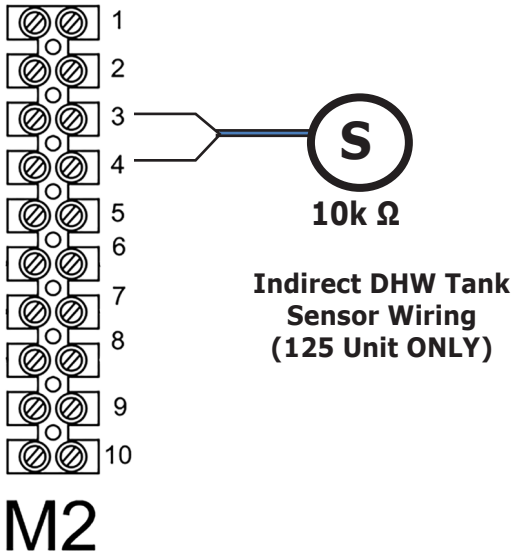
Parameter PO3 for **Heating Only** boiler, with no indirect tank remains Factory Set at 08. No change is required.

If adding an Indirect Tank with a sensor to **Heating Only Boiler** - change PO3 parameter from 08 to 05.

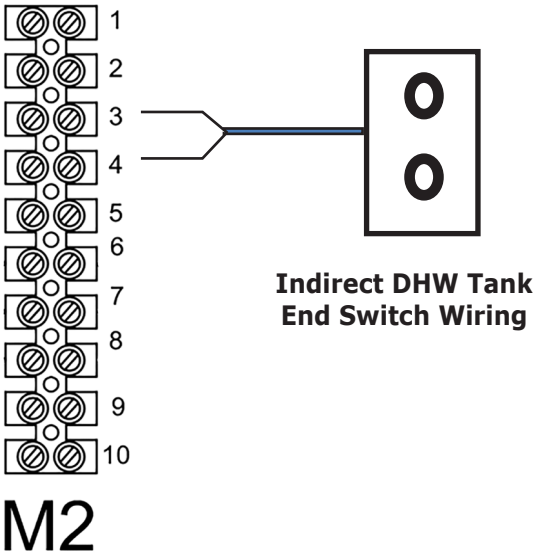
If adding an Indirect Tank with a thermostat to **Heating Only Boiler** - change PO3 parameter from 08 to 04.

See Section 9, Parameter Settings, in boiler's Installation, Operation, and Maintenance Manual.

Parameter PO3 for **COMBI** boiler factory set at OO requires no change.



Indirect DHW Tank Sensor Wiring (125 Unit ONLY)



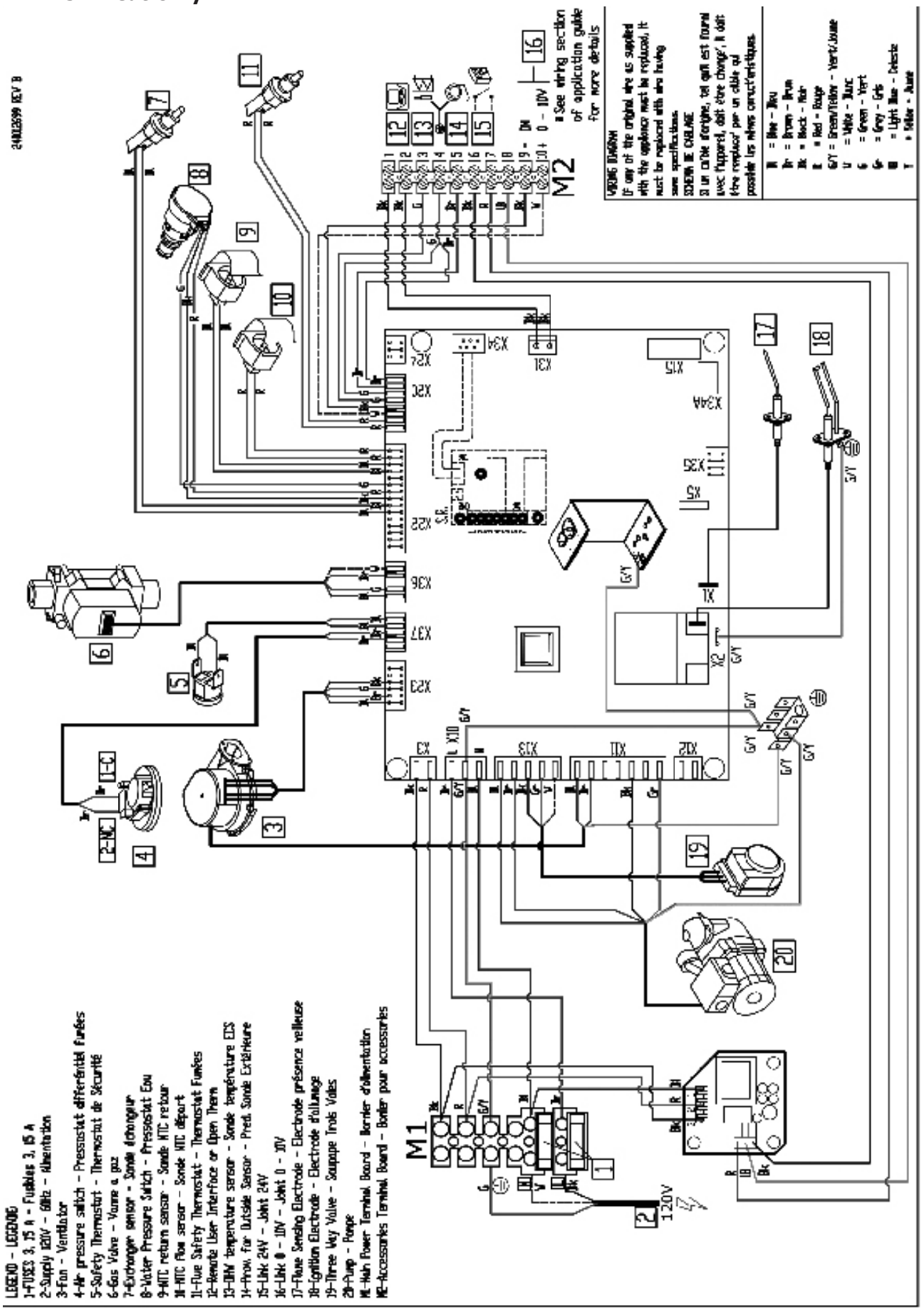
Indirect DHW Tank End Switch Wiring

Management of 0-10V Input

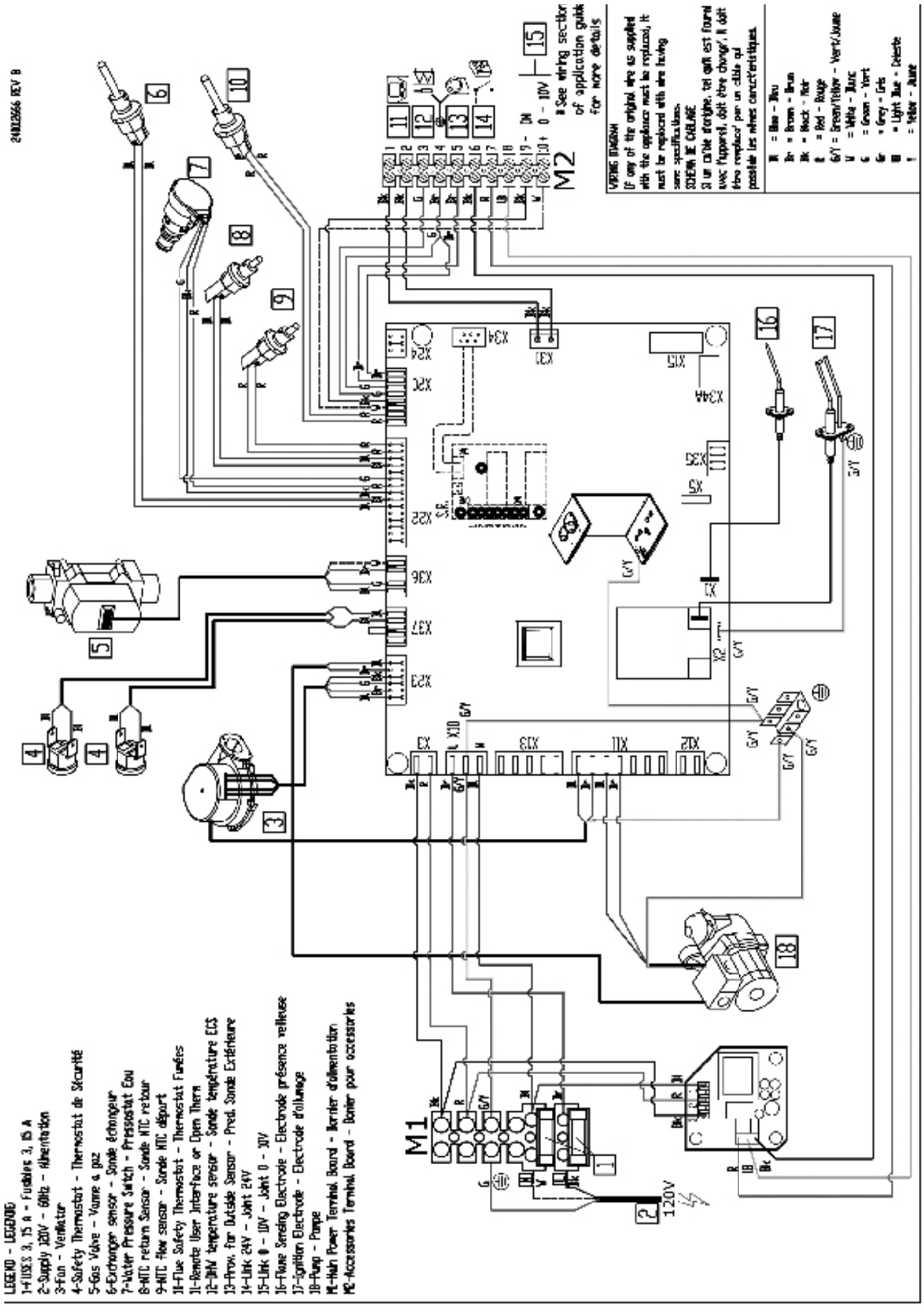
The functions with 0...10V regulator are activated by means of their parameters. When the function is enabled (**P82**=3) and **P78**=1, the input manages the heating set point temperature directly; when **P78**=2, the input manages the heating power input directly. Demand is activated above 3V and the heating setpoint is calculated in proportion to deviation from 3 to 10 V DC, to give a setpoint that goes from minimum to maximum.

	P78=1		**P78 = 2**					
Voltage	Temp Setting		115		125/150		165/205	
	°C	°F	kW	MBH	kW	MBH	kW	MBH
0-3	OFF							
3	25	77	4.9	16.6	6.4	22.0	8.6	29.5
4	32	90	8.4	28.9	10.7	36.5	14.4	49.0
5	40	104	12.0	40.8	14.9	51.0	19.9	68.0
6	49	120	15.4	52.4	19.2	65.5	25.5	87.0
7	57	135	18.5	63.1	23.4	80.0	31.1	106.0
8	65	149	22.2	75.7	27.7	94.5	36.6	125.0
9	73	163	25.3	86.2	31.9	109.0	42.5	145.0
10	80	176	27.4	93.6	36.9	125.0	48.1	164.0

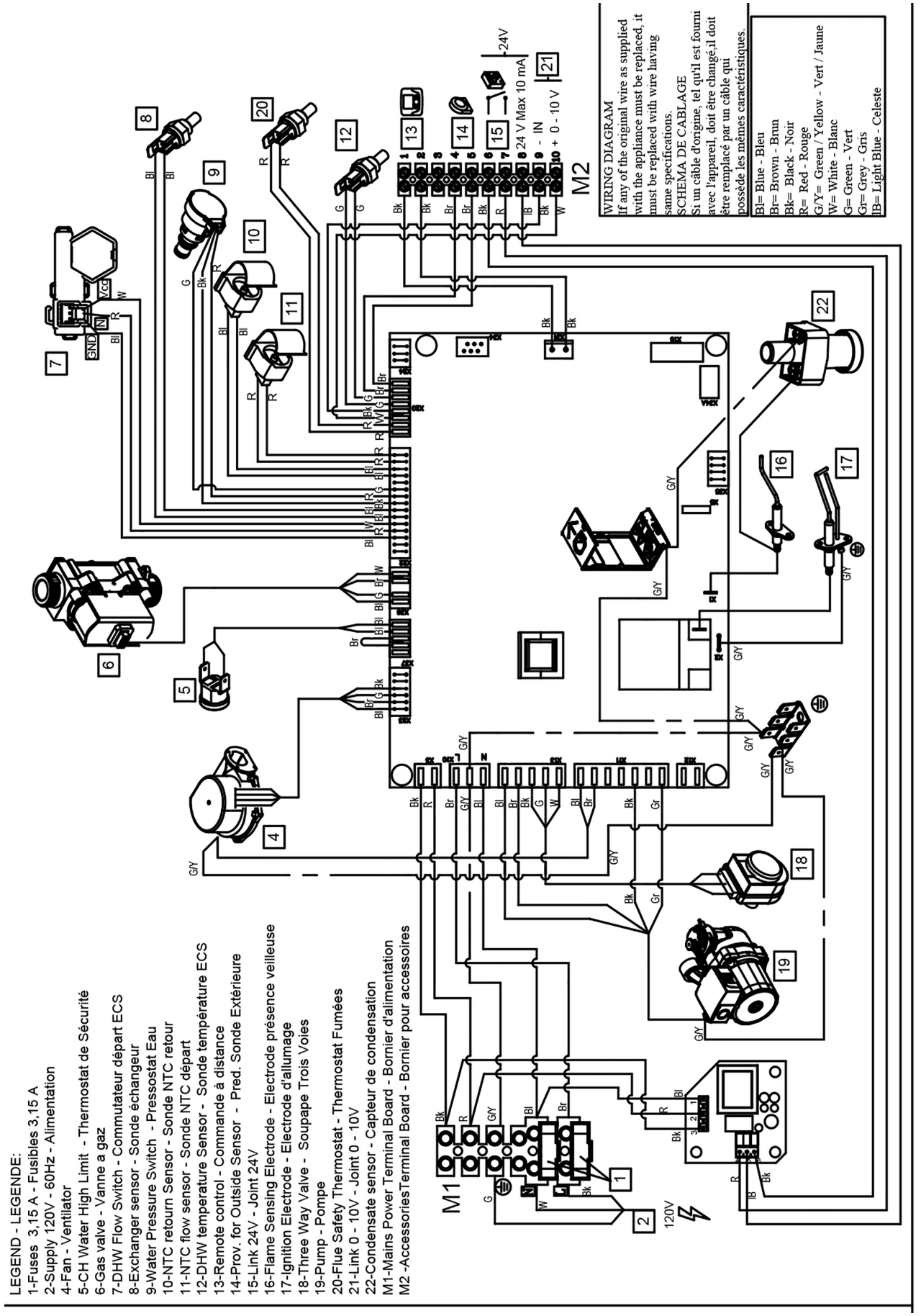
MODEL 125 - Heat Only



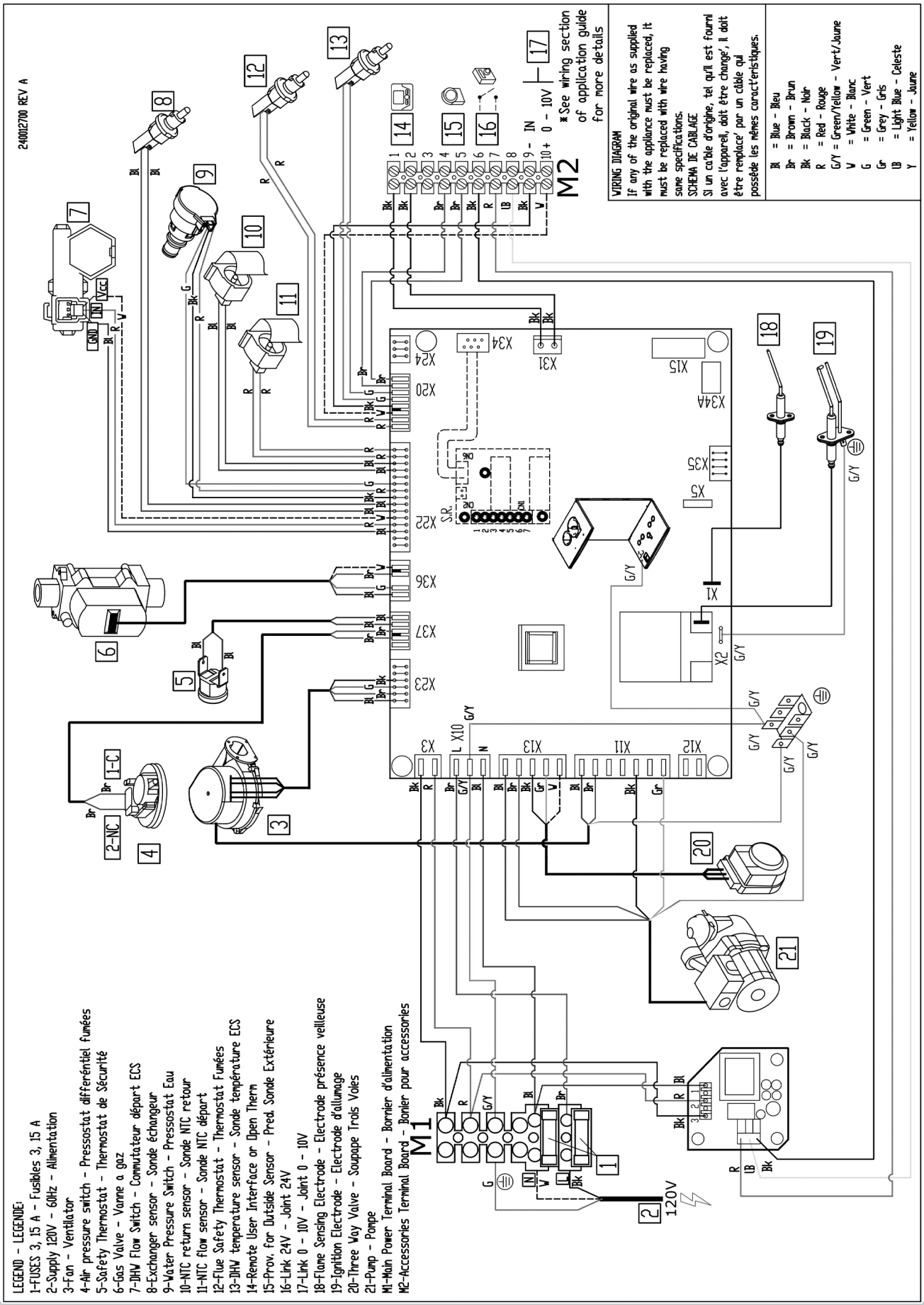
MODEL 165 - Heat Only



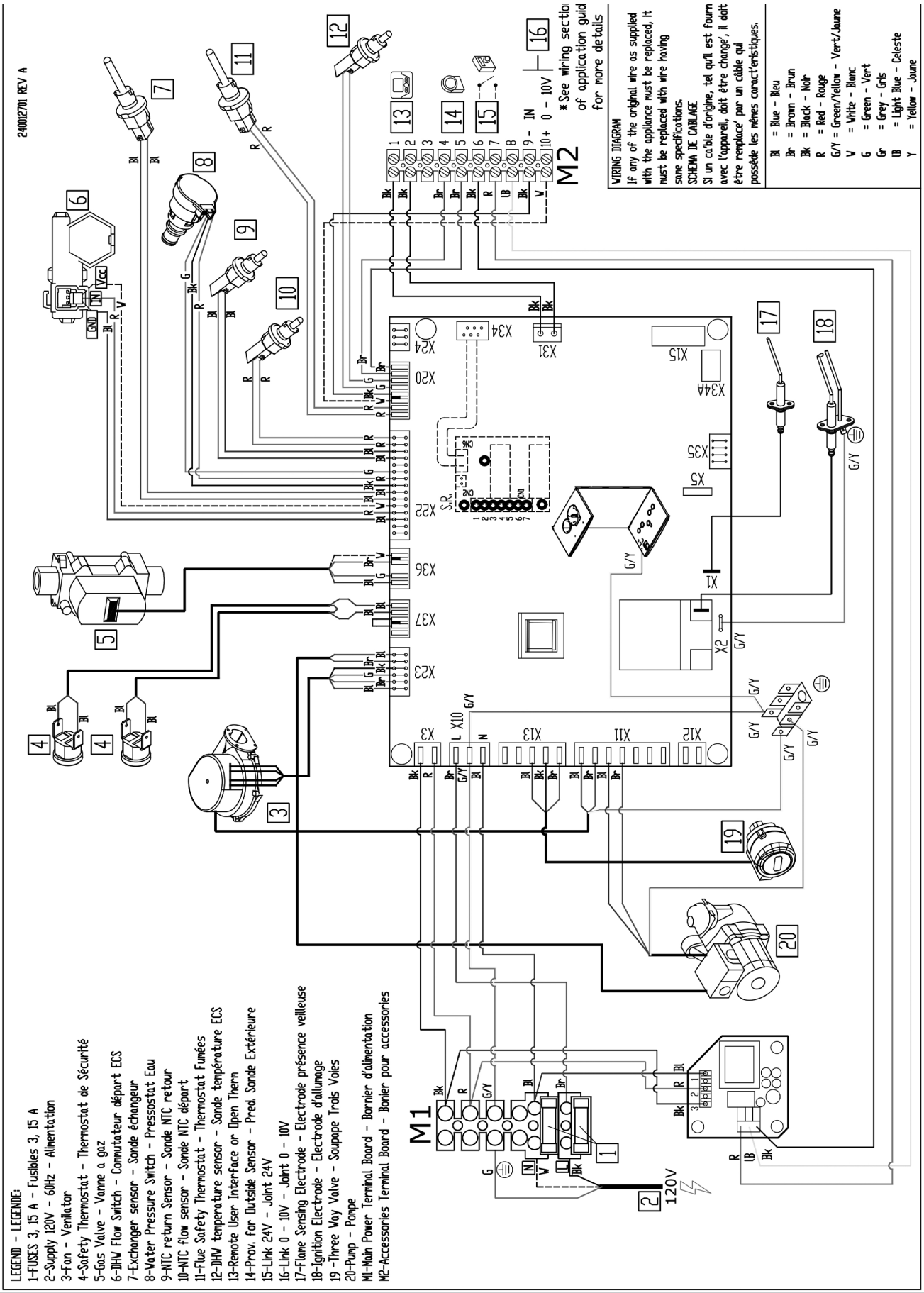
MODEL 115-Combi



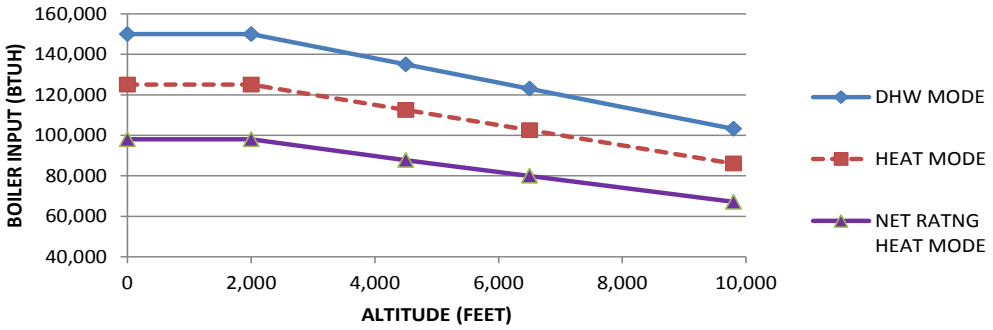
MODEL 150 - Combi



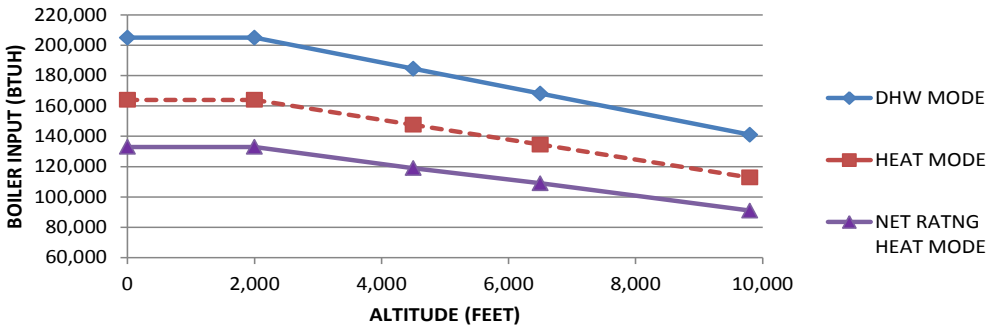
MODEL 205 - Combi



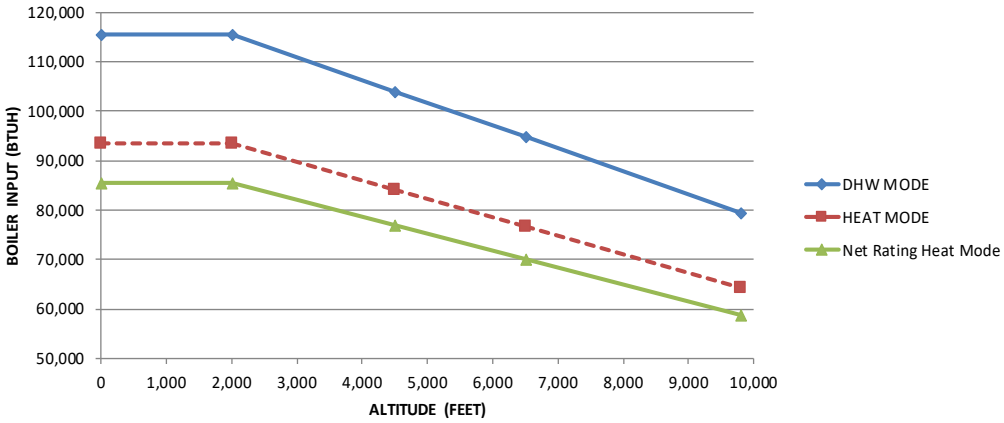
MODELS 125/150
CALCULATED EFFECTS OF HI-ALTITUDE ON BOILER PERFORMANCE



MODELS 165/205
CALCULATED EFFECTS OF HI-ALTITUDE ON BOILER PERFORMANCE



MAC-115
CALCULATED EFFECTS OF HI-ALTITUDE ON BOILER PERFORMANCE



'HEATING ONLY' BOILER (125,000 BTUH)

		BOILER OUTPUT (BTUH/HR)			
		50,000	60,000	80,000	100,000
H2O30					
1st HOUR RATING (GAL/HR)	**140 F**	94	106	106	106
	115 F	119	138	158	158
CONTINUOUS RATING (GAL/HR)	**140 F**	67	79	79	79
	115 F	92	111	131	131
H2O40 / H2O40L					
1st HOUR RATING (GAL/HR)	**140 F**	103	115	119	119
	115 F	128	147	174	174
CONTINUOUS RATING (GAL/HR)	**140 F**	67	79	83	83
	115 F	92	111	138	138
H2O50					
1st HOUR RATING (GAL/HR)	**140 F**	112	124	133	133
	115 F	137	156	192	192
CONTINUOUS RATING (GAL/HR)	**140 F**	67	79	88	88
	115 F	92	111	147	147
H2O60 / H2O60L					
1st HOUR RATING (GAL/HR)	**140 F**	121	133	147	147
	115 F	146	165	208	208
CONTINUOUS RATING (GAL/HR)	**140 F**	67	79	93	93
	115 F	92	111	154	154

Notes:
176 °F Boiler Supply Water Temperature
AHRI Rating Conditions - 50 °F Inlet Water
@ 4.0 GPM FLOW RATE

Boiler output over 100,000 BTU does not effect tank performance.

Low Water Cut Off - Heating Only and Combi Boilers
These guidelines are supplied when necessary to install an additional Low Water Cut Off (LWCO), for sensing a low water level condition in a boiler, as required by the Authority Having Jurisdiction.

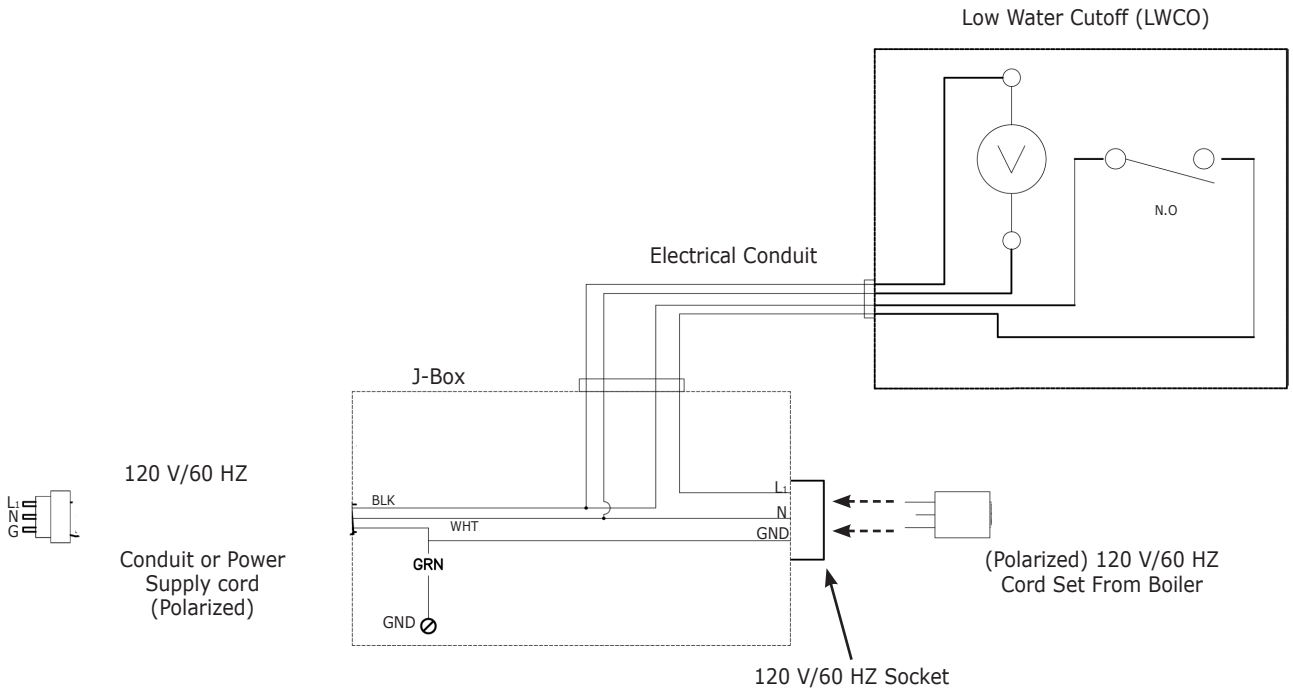
Follow LWCO manufacturer installation instructions for type of LWCO selected in addition to these instructions.

LWCO shall be 120V/60HZ control and dry contacts sized for load being connected. Wire control to boiler. See Figure 1.

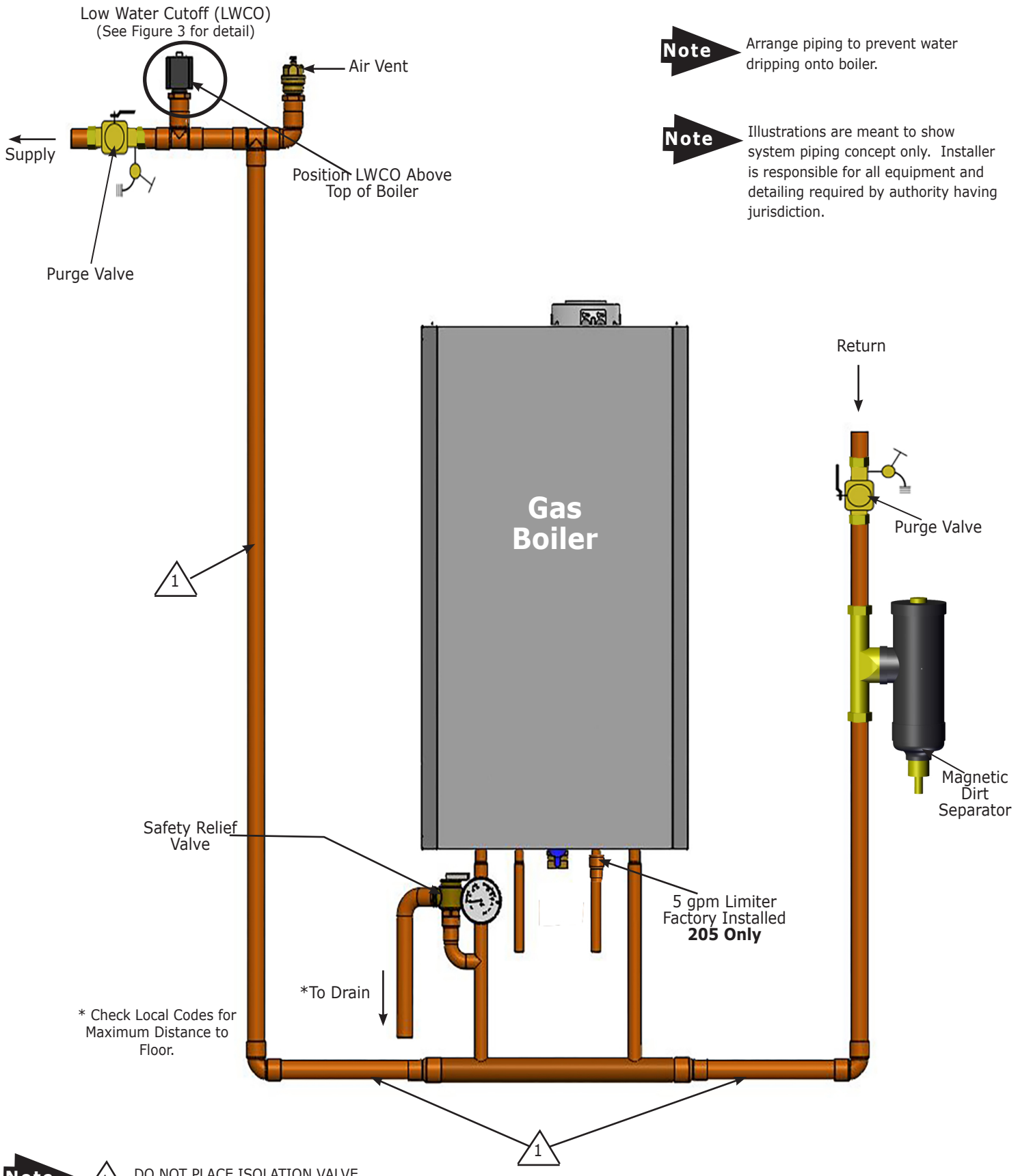
Connect LWCO device to the system ground. Ground in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the National Electrical Code (NEC) or Canadian Electrical Code CEC.

- Locate LWCO sensing device in the supply piping, above the minimum height of boiler. See Figure A-2, Piping Diagram.
- Position control in HORIZONTAL piping to assure proper boiler protection (upright or 90° rotation).
- For proper operation, sensing element of the LWCO control shall be positioned in the tee to sense the main water stream. Maintain minimum 1/4" spacing from pipe walls. Element shall NOT contact the rear, or side walls of the tee. See Figure A-3.
- Install an air vent using a tee to avoid nuisance shutdowns.
- Apply small amount of pipe sealant to threaded connections.
- Arrange piping to prevent water dripping onto boiler.
- DO NOT install water shutoff valve between boiler and LWCO sensing device.

LWCO Wiring Diagram



Piping Diagram - LWCO Location

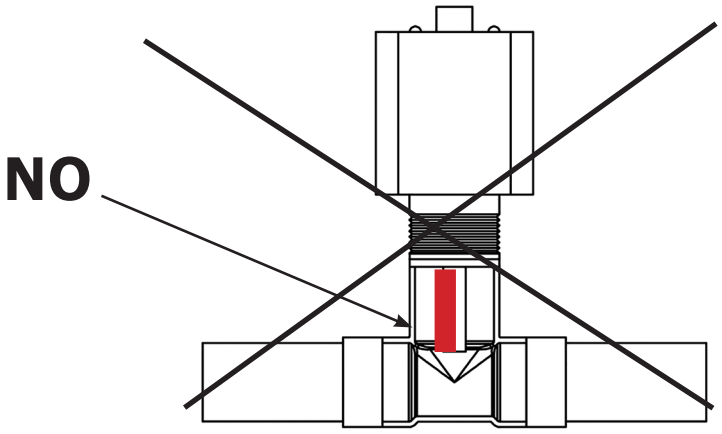


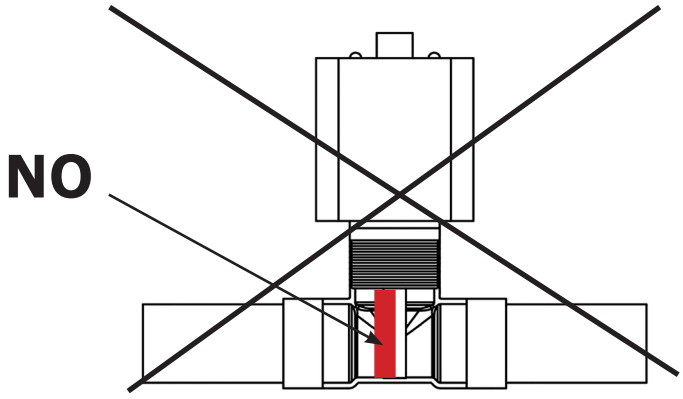
Note Arrange piping to prevent water dripping onto boiler.

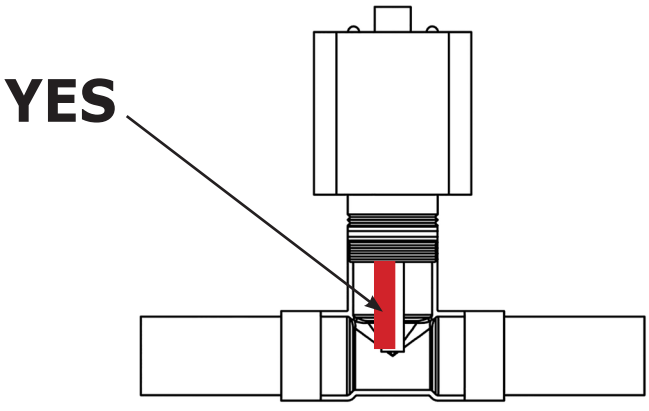
Note Illustrations are meant to show system piping concept only. Installer is responsible for all equipment and detailing required by authority having jurisdiction.

Note 1 DO NOT PLACE ISOLATION VALVE BEFORE TEE OR LWCO.

Low Water Cutoff - Detail







NOTE: When instructed press and hold the 'Reset' for between 1-3 seconds to reset the boiler.

Table Of Error Codes

E09	Gas valve connection cable
E10	External probe fault
E12	Water flow switch open
E13	Water flow switch close
E15	gas valve fault
E18	Water refill enabled
E19	Max time of water refill
E20	Central Heating Flow NTC Fault
E28	Flue NTC Fault
E40	Central Heating Return NTC Fault
E50	Hot Water NTC Fault (tank version)
E53	Obstruction on the flue pipe- combustion off
E55	PCB to be set by the "Calibration Function"
E71	Fan parameter Out of range in autocalibration
E72	Combustion test Out of range in autocalibration
E77	Current out of range
E78	Minimum gas valve current
E79	Maximunm gas valve current
E83-87	Communication error
E92	Combustion test alarm during auto-setting
E109	Pre-Circulation Fault
E110	Safety Thermostat Operated
E117	System Water Pressure Too High
E118	System Water Pressure Too Low
E125	Circulation Fault (Primary Circuit)
E128	Flame Failure
E129	Frequently loss of flame during the ignition
E130	Flue NTC Operated
E133	Interruption Of Gas Supply or Flame Failure
E134	Elapsed time Gas valve open without gas
E135	Interruption Of Gas Supply (internal error)
E160	Fan or Fan Wiring Fault
E321	Domestic Hot Water NTC sensor fault
E384	False flame
E385	Under voltage

Initial Fault Finding Checks

1. Check that gas, water and electrical supplies are available at the boiler.

2. Electrical supply = 120V ~60 Hz.

3. The preferred minimum gas pressure is 3.5"wc for Natural gas and 10"wc for LPG.

4. Carry out electrical system checks, i.e. Ground Continuity, Resistance to Ground, Short Circuit and Polarity with a suitable meter.

NOTE: These checks must be repeated after any servicing or fault finding.

5. Ensure all external controls are calling for heat and check all external and internal fuses. Before any servicing or replacement of parts, ensure the gas and electrical supplies are isolated.

1. If a fault occurs on the boiler an error code may be shown by the facia display.

E20, E28, E40, E50, E160, E321 and E431 indicate possible faulty components.

E53 shows possible obstruction in the flue duct.

E55 indicates that the pcb is not setting/calibrated.

E71, E72, E77, E78 e E92 indicate possible wrong calibration. A new calibration is needed.

E92 shows possible flue recirculation in the flue duct.

E83...87 shows possible error of communication with

thermostat (Goto section P)

E110 shows overheat of the primary.

E117 is displayed when the primary water pressure is more than 43 psi.

E118 is displayed when the primary water pressure is less than 7.25psi.

E125 is displayed in either of two situations:-
i) If within a time between 15..30 seconds of the burner lighting the boiler temperature has not changed by 2°F.
ii) If within 10 minutes of the burner lighting the boiler temperature twice exceeds the selected temperature by 80°F. In these instances poor primary circulation is indicated.

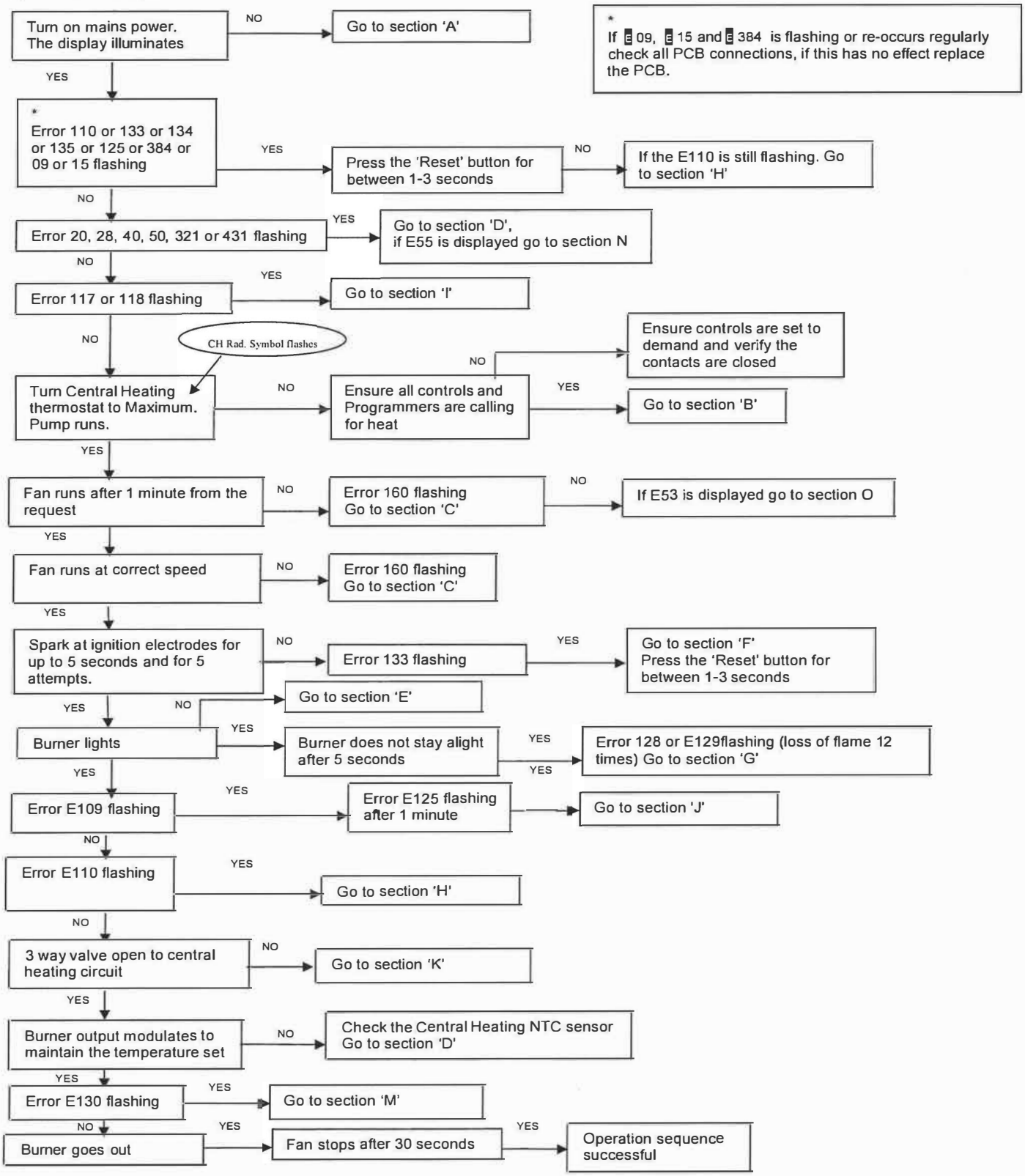
E128 is displayed if there has been a flame failure during normal burner operation.

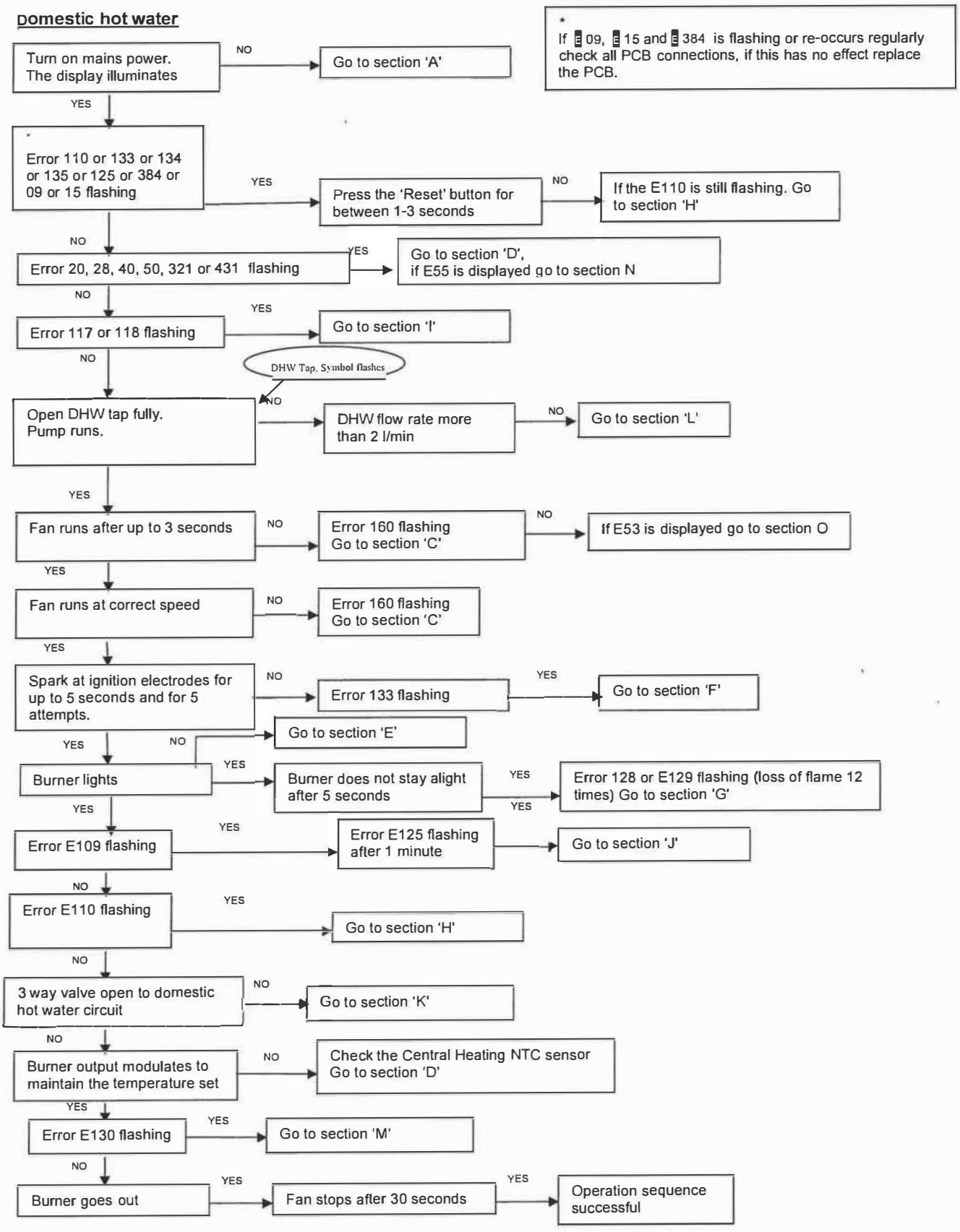
E 133 , E 134 and E 135 indicate that the gas supply has been interrupted, ignition has failed or the flame has not been detected.

2. By pressing the 'Reset' button for between 1-3 seconds when E 110, E 125, E 133, E 134, E 135 , E 09, E 15, E128 and E 384 are displayed it is possible to relight the boiler.

3. If this does not have any effect, or error codes are displayed regularly further investigation is required.

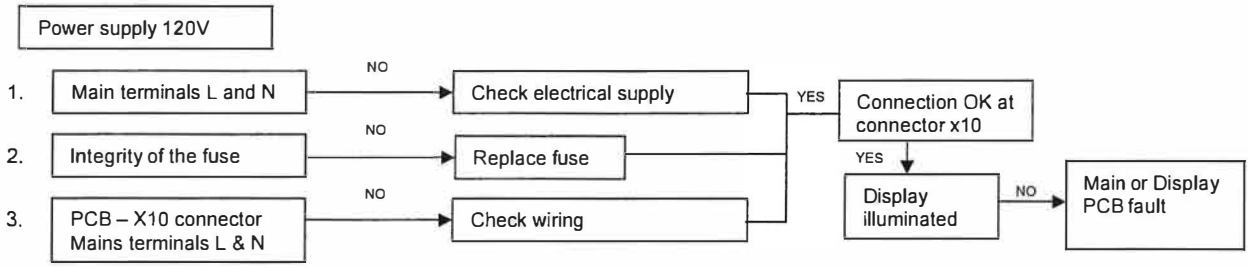
Central Heating



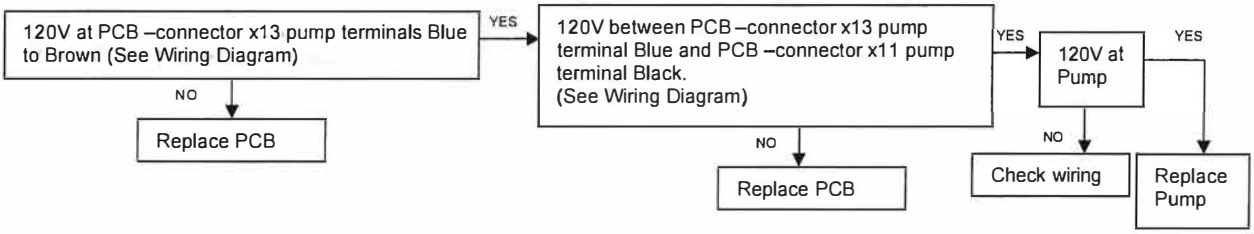

pomestic hot water
Turn on mains power. The display illuminates
NO
Go to section 'A'
YES
Error 110 or 133 or 134 or 135 or 125 or 384 or 09 or 15 flashing
YES
Press the 'Reset' button for between 1-3 seconds
NO
If the E110 is still flashing. Go to section 'H'
NO
Error 20, 28, 40, 50, 321 or 431 flashing
YES
Go to section 'D', if E55 is displayed go to section N
NO
Error 117 or 118 flashing
YES
Go to section 'I'
NO
DHW Tap. Symbol flashes
Open DHW tap fully. Pump runs.
NO
DHW flow rate more than 2 l/min
NO
Go to section 'L'
YES
Fan runs after up to 3 seconds
NO
Error 160 flashing Go to section 'C'
NO
If E53 is displayed go to section O
YES
Fan runs at correct speed
NO
Error 160 flashing Go to section 'C'
YES
Spark at ignition electrodes for up to 5 seconds and for 5 attempts.
NO
Error 133 flashing
YES
Go to section 'F'
Go to section 'E'
YES
NO
Burner lights
YES
Burner does not stay alight after 5 seconds
YES
Error 128 or E129 flashing (loss of flame 12 times) Go to section 'G'
YES
YES
Error E109 flashing
YES
Error E125 flashing after 1 minute
Go to section 'J'
NO
Error E110 flashing
YES
Go to section 'H'
NO
3 way valve open to domestic hot water circuit
NO
Go to section 'K'
NO
Burner output modulates to maintain the temperature set
NO
Check the Central Heating NTC sensor Go to section 'D'
YES
Error E130 flashing
YES
Go to section 'M'
NO
Burner goes out
YES
Fan stops after 30 seconds
YES
Operation sequence successful
If E09, E15 and E384 is flashing or re-occurs regularly check all PCB connections, if this has no effect replace the PCB.

Fault Finding Solutions Sections

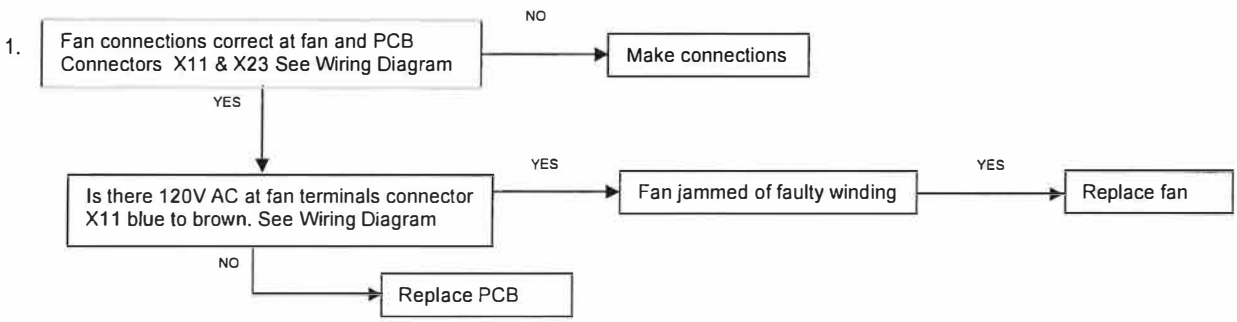
A



B



C



D

Temperature sensor faulty.
Check correct location and wiring

YES

Temperature sensors faulty.
Coil resistance are approximately
10kΩ @ 77° F (CH sensor)
20kΩ @ 77° F (Flue sensor)
(resistance reduces with increase in temp.)

NO → Replace sensor

E

Gas at burner → NO → Ensure gas is on and purged

Check wiring & PCB – X3B and X2 connector.
See Wiring Diagram.

Check the resistance of the coils:
Pin 1 and 3 = 20 - 30 Ohm
Pin 2 and 4 = 60 - 70 Ohm

NO → Replace gas valve

YES → Replace PCB

F

1.

Check and correct if necessary
1. Inlet gas pressure
2. Ignition electrode and lead
3. Electrode connection
4. Spark gap and position
5. continuity between burner and earth
6. Condensate trap blocked

YES → Check wiring.
See Wiring Diagram

NO → Replace PCB

2.

Check and correct if necessary
1. Proper operation of the condensate sensor
2. Ground wires attached to condensate switch
3. Flame sensing wires attached to condensate switch

→ Replace condensate sensor or wires

G

1.

Check the gas supply pressure:
For Natural Gas greater than 3.5"wc
For LPG greater than 9"wc

2.

Check and correct if necessary
1. Flame sensing electrode position
2. Flame sensing electrode and lead connections
3. Recirculation drum
4. Calibration
(CO2 values - see instruction)

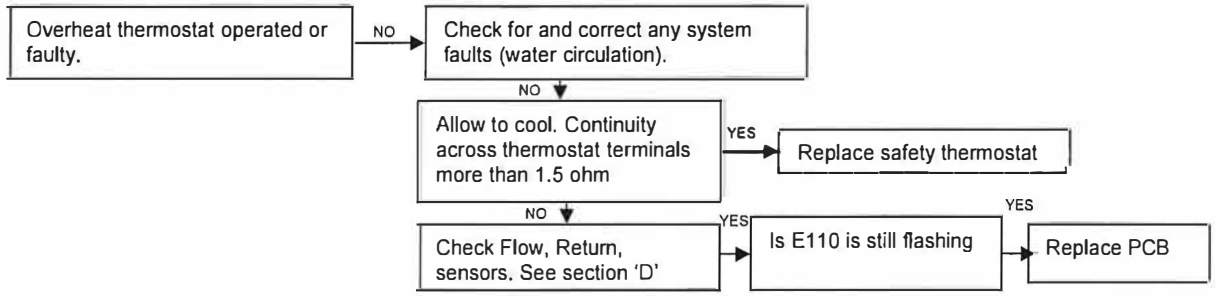
→ Replace flame sensing electrode or gas valve

3.

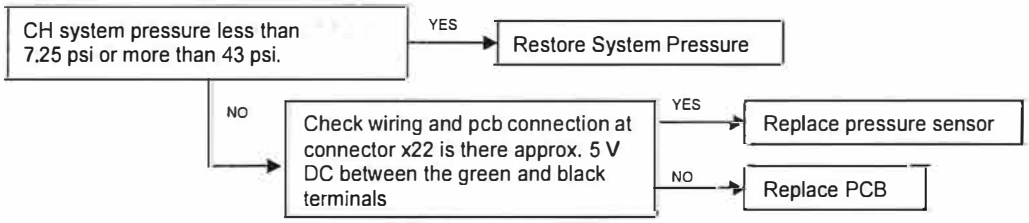
Check and correct if necessary
1. Proper operation of the condensate sensor
2. Ground wires attached to condensate switch
3. Flame sensing wires attached to condensate switch

→ Replace condensate sensor or wires

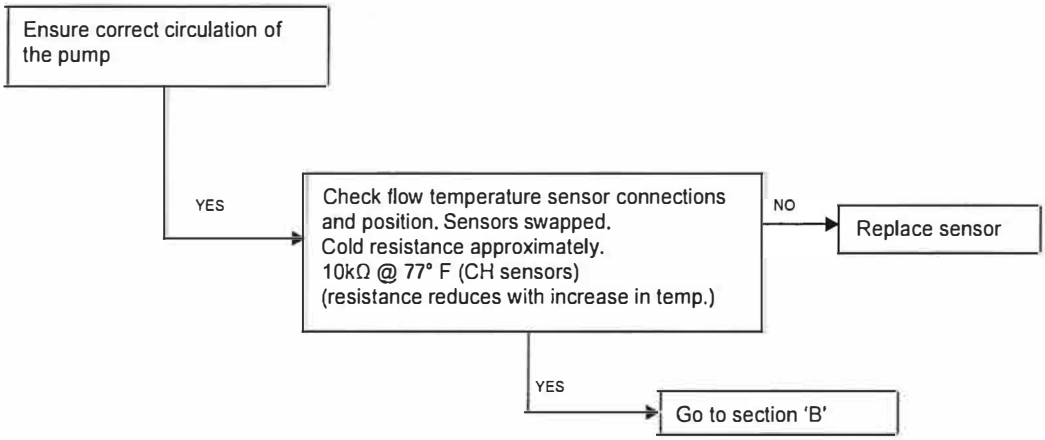
H


Overheat thermostat operated or faulty.
NO
Check for and correct any system faults (water circulation).
NO
Allow to cool. Continuity across thermostat terminals more than 1.5 ohm
YES
Replace safety thermostat
NO
Check Flow, Return, sensors. See section 'D'
YES
Is E110 is still flashing
YES
Replace PCB

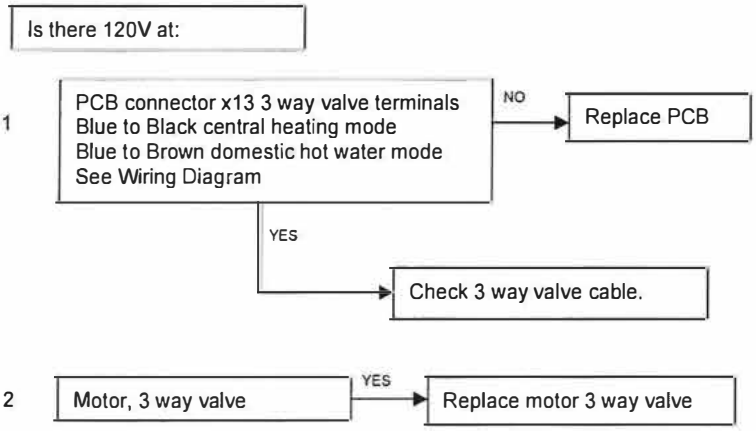
I


CH system pressure less than 7.25 psi or more than 43 psi.
YES
Restore System Pressure
NO
Check wiring and pcb connection at connector x22 is there approx. 5 V DC between the green and black terminals
YES
Replace pressure sensor
NO
Replace PCB

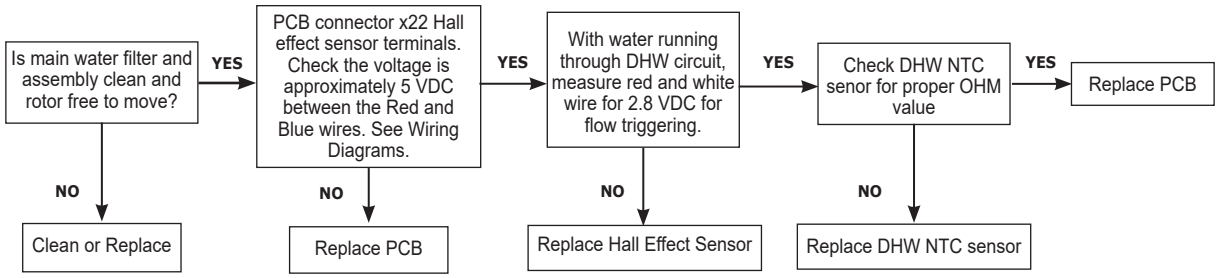
J


Ensure correct circulation of the pump
YES
Check flow temperature sensor connections and position. Sensors swapped.
Cold resistance approximately.
10kΩ @ 77° F (CH sensors)
(resistance reduces with increase in temp.)
NO
Replace sensor
YES
Go to section 'B'

K


Is there 120V at:
1
PCB connector x13 3 way valve terminals
Blue to Black central heating mode
Blue to Brown domestic hot water mode
See Wiring Diagram
NO
Replace PCB
YES
Check 3 way valve cable.
2
Motor, 3 way valve
YES
Replace motor 3 way valve

L



M

1. Temperature sensors faulty.
   Cold resistance approximately
   10kΩ @ 77° F (CH sensor)
   20kΩ @ 77° F (Flue sensor)
   (resistance reduces with increase in temp.)
   NO → Replace sensor

2. If pump is running the heat exchanger could be obstructed
   YES → Replace heat exchanger

N

Performs the autocalibration function (see the Service manual)

Display blank
YES → Verify the position of the Service key

O

1. Check obstruction in the flue duct
   YES → Remove the obstruction on the flue pipe
   NO → Performs the calibration function (see the Service manual)

2. Check and correct if necessary
   1. Proper operation of the condensate sensor
   2. Ground wires attached to condensate switch
   3. Flame sensing wires attached to condensate switch

   → Replace condensate sensor or wires

P

Check the electrical connection between Ru and pcb

PARAMETER CHANGE HISTORY

Parameter ID	Changed From	Changed To	Date	Reason

NOTES

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