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.
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PN 240011430 REV. N [10/31/2020]
1. Become familiar with symbols identifying potential hazards.

![Safety Alert Symbol]

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 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.
### LEGEND

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<td>Pressure Relief Valve</td>
<td>30.00 psi [2.11 bar]</td>
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<td>Heating return connection</td>
<td>3/4&quot; [22.2mm] 1&quot; [25.4mm]</td>
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<td>Gas shutoff connection</td>
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<td>Boiler filling connection (some models)</td>
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<td>Drain connection for condensate</td>
<td>13/16&quot; [21mm] ID Hose 3/4 NPT</td>
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### MANIFOLD 115/125/150

### MANIFOLD 165

### PN 240011430 REV. N [10/31/2020]
LABOR SAVING PIPING MANIFOLDS / NEAR BOILER PIPING CONNECTIONS

115 & 150 COMBI

205 COMBI

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<td>I</td>
<td>Heating supply connection</td>
<td>3/4” [22.2mm] 1” [25.4mm]</td>
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<td>K</td>
<td>5 gpm DHW flow restrictor (Factory installed) (205 only)</td>
<td>na 3/4” [22.2mm]</td>
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</table>
GENERAL INFORMATION - HYDRONIC PIPING

**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.

**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.

**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 pressure relief valve.
Provision 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.

<table>
<thead>
<tr>
<th>Water Temperature Setting</th>
<th>1st Degree Burn Exposure Time For An Adult</th>
<th>2nd and 3rd Degree Burn Exposure Time For An Adult</th>
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</thead>
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<tr>
<td>120° F</td>
<td>1 minute</td>
<td>5 minutes</td>
</tr>
<tr>
<td>130° F</td>
<td>5 seconds</td>
<td>30 seconds</td>
</tr>
<tr>
<td>140° F</td>
<td>2 seconds</td>
<td>5 seconds</td>
</tr>
<tr>
<td>150° F</td>
<td>1 second</td>
<td>1.5 seconds</td>
</tr>
<tr>
<td>160° F</td>
<td>Instantaneous</td>
<td>0.5 seconds</td>
</tr>
</tbody>
</table>

**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.

- Water Temperature Setting
  - 120° F: 1 minute
  - 130° F: 5 seconds
  - 140° F: 2 seconds
  - 150° F: 1 second
  - 160° F: Instantaneous

Exposure Time For An Adult
- 1 minute
- 5 minutes
- 30 seconds
- 5 seconds
- 1.5 seconds
- 0.5 seconds
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,

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.

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**BOILER CONTROL**

- **Open Therm**
- **10k Ω** DHW Indirect Tank Sensor (125 Unit Only) or DHW Indirect Tank Aquastat (Heating Only Boilers)
- **1K Ω** Outdoor Reset Sensor
- **Zone Control End-Switch**
- **0-10 V Connection**
- **Do Not Use**

**Supply Cord**

120V/60HZ

* Ground Sensors using terminal 4
125 with Zone Circulator Pumps

Locate shut off valve after any field installed LWCO.

MAGNETIC DIRT SEPARATOR

Shut off & Purge Valve

HOT WATER SUPPLY TEMPERED

COLD WATER SUPPLY

10 WITH ZONE CIRCULATOR PUMPS
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.
If adding an indirect tank with \textbf{Thermostat} to a \textbf{Heating Only Boiler}, change P03 from 08 to 04. See Section 9, Parameter Settings in Boiler Installation, Operation & Maintenance Manual for details.
125 with Zone Valves

1 Locate shut off valve after any field installed LWCO.
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 Indirect Zone Valves, 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 Circulator Pumps - Piping Diagram

- Locate shut-off valve after any field installed LWCO.

- Shut off & purge valve

- Magnetic dirt separator

- FROM SYSTEM

- TO SYSTEM

- Heating Load

- Z1 DHW Pump

- HOT WATER SUPPLY TEMPERED

- COLD WATER SUPPLY

- 165 with Zone Circulator Pumps
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.
165 WITH ZONE VALVES - PIPING DIAGRAM

- Locate shut off valve after any field installed LWCO.

Shut off & Purge Valve

Magnetic Dirt Separator

165 with Zone Valves
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.
115, 150 & 205 with Zone Circulator Pumps

115, 150 & 205 WITH ZONE CIRCULATOR PUMPS - PIPING DIAGRAM

Locate shut off valve after any field installed LWCO.
115, 150 & 205 with Zone Valves

Locate shut off valve after any field installed LWCO.
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.
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

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<td>3,748</td>
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<td>68.0</td>
<td>12,483</td>
<td>122.0</td>
<td>3,608</td>
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<td>69.8</td>
<td>11,935</td>
<td>123.8</td>
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<td>71.6</td>
<td>11,414</td>
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<td>73.4</td>
<td>10,919</td>
<td>127.4</td>
<td>3,222</td>
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<td>75.2</td>
<td>10,447</td>
<td>129.2</td>
<td>3,104</td>
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<td>77.0</td>
<td>9,999</td>
<td>131.0</td>
<td>2,991</td>
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<td>78.8</td>
<td>9,572</td>
<td>132.8</td>
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<td>80.6</td>
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<td>82.4</td>
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<tr>
<td>84.2</td>
<td>8,411</td>
<td>138.2</td>
<td>2,583</td>
</tr>
</tbody>
</table>
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 override 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.

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.

- 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.

**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.
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.

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 00 requires no change.

### 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.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Temp Setting</th>
<th><strong>P78=1</strong></th>
<th><strong>P78 = 2</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>°F</td>
<td>kW</td>
<td>MBH</td>
</tr>
<tr>
<td></td>
<td></td>
<td>115</td>
<td>125/150</td>
</tr>
<tr>
<td>0-3</td>
<td></td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>4.9</td>
<td>16.6</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>6.4</td>
<td>22.0</td>
</tr>
<tr>
<td>4</td>
<td>32</td>
<td>8.4</td>
<td>28.9</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>10.7</td>
<td>36.5</td>
</tr>
<tr>
<td>5</td>
<td>40</td>
<td>12.0</td>
<td>40.8</td>
</tr>
<tr>
<td></td>
<td>104</td>
<td>14.9</td>
<td>51.0</td>
</tr>
<tr>
<td>6</td>
<td>49</td>
<td>15.4</td>
<td>52.4</td>
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<tr>
<td></td>
<td>120</td>
<td>19.2</td>
<td>65.5</td>
</tr>
<tr>
<td>7</td>
<td>57</td>
<td>18.5</td>
<td>63.1</td>
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<tr>
<td></td>
<td>135</td>
<td>23.4</td>
<td>80.0</td>
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<tr>
<td>8</td>
<td>65</td>
<td>22.2</td>
<td>75.7</td>
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<tr>
<td></td>
<td>149</td>
<td>27.7</td>
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<td>9</td>
<td>73</td>
<td>25.3</td>
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<td></td>
<td>163</td>
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<td>10</td>
<td>80</td>
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<td>176</td>
<td>36.9</td>
<td>125.0</td>
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</tbody>
</table>
MODEL 165 - Heat Only

165 - HEAT ONLY WIRING DIAGRAM

PN 240011430 REV. N [10/31/2020]
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)

<table>
<thead>
<tr>
<th></th>
<th>1st HOUR RATING</th>
<th>CONTINUOUS RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(GAL/HR)</td>
<td>(GAL/HR)</td>
</tr>
<tr>
<td><strong>H2O30</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>94</td>
<td>67</td>
</tr>
<tr>
<td>115 F</td>
<td>106</td>
<td>79</td>
</tr>
<tr>
<td><strong>H2O40 / H2O40L</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>103</td>
<td>67</td>
</tr>
<tr>
<td>115 F</td>
<td>115</td>
<td>79</td>
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<tr>
<td><strong>H2O50</strong></td>
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<td></td>
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<tr>
<td>140 F</td>
<td>112</td>
<td>67</td>
</tr>
<tr>
<td>115 F</td>
<td>124</td>
<td>79</td>
</tr>
<tr>
<td><strong>H2O60 / H2O60L</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>121</td>
<td>67</td>
</tr>
<tr>
<td>115 F</td>
<td>133</td>
<td>79</td>
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### BOILER OUTPUT (BTUH/HR)

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<th>60,000</th>
<th>80,000</th>
<th>100,000</th>
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<tr>
<td><strong>H2O30</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>94</td>
<td>106</td>
<td>106</td>
<td>106</td>
</tr>
<tr>
<td>115 F</td>
<td>119</td>
<td>138</td>
<td>158</td>
<td>158</td>
</tr>
<tr>
<td><strong>H2O40 / H2O40L</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>103</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>112</td>
<td>124</td>
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<tr>
<td>115 F</td>
<td>137</td>
<td>156</td>
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<td>192</td>
</tr>
<tr>
<td><strong>H2O60 / H2O60L</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140 F</td>
<td>121</td>
<td>133</td>
<td>147</td>
<td>147</td>
</tr>
<tr>
<td>115 F</td>
<td>146</td>
<td>165</td>
<td>208</td>
<td>208</td>
</tr>
</tbody>
</table>

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
Low Water Cutoff (LWCO) (See Figure 3 for detail)

- Air Vent
- Supply
- Purge Valve
- Position LWCO Above Top of Boiler

**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.

* Check Local Codes for Maximum Distance to Floor.

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

5 gpm Limiter Factory Installed 205 Only

Gas Boiler

Return

Purge Valve

Magnetic Dirt Separator

PN 240011430 REV. N [10/31/2020]
Low Water Cutoff - Detail

Diagram showing the LOW WATER CUTOFF with 'NO' and 'YES' markings.

PN 240011430 REV. N [10/31/2020]
NOTE: When instructed press and hold the 'Reset' for between 1-3 seconds to reset the boiler.

Table Of Error Codes

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>09</td>
<td>Gas valve connection cable</td>
</tr>
<tr>
<td>10</td>
<td>External probe fault</td>
</tr>
<tr>
<td>12</td>
<td>Water flow switch open</td>
</tr>
<tr>
<td>13</td>
<td>Water flow switch close</td>
</tr>
<tr>
<td>15</td>
<td>Gas valve fault</td>
</tr>
<tr>
<td>18</td>
<td>Water refill enabled</td>
</tr>
<tr>
<td>19</td>
<td>Max time of water refill</td>
</tr>
<tr>
<td>20</td>
<td>Central Heating Flow NTC Fault</td>
</tr>
<tr>
<td>28</td>
<td>Flue NTC Fault</td>
</tr>
<tr>
<td>40</td>
<td>Central Heating Return NTC Fault (tank version)</td>
</tr>
<tr>
<td>50</td>
<td>Hot Water NTC Fault</td>
</tr>
<tr>
<td>53</td>
<td>Obstruction on the flue pipe- combustion off</td>
</tr>
<tr>
<td>55</td>
<td>PCB to be set by the &quot;Calibration Function&quot;</td>
</tr>
<tr>
<td>71</td>
<td>Fan parameter Out of range in autocalibration</td>
</tr>
<tr>
<td>72</td>
<td>Combustion test Out of range in autocalibration</td>
</tr>
<tr>
<td>77</td>
<td>Current out of range</td>
</tr>
<tr>
<td>78</td>
<td>Minimum gas valve current</td>
</tr>
<tr>
<td>79</td>
<td>Maximum gas valve current</td>
</tr>
<tr>
<td>83-87</td>
<td>Communication error</td>
</tr>
<tr>
<td>92</td>
<td>Combustion test alarm during auto-setting</td>
</tr>
<tr>
<td>109</td>
<td>Pre-Circulation Fault</td>
</tr>
<tr>
<td>110</td>
<td>Safety Thermostat Operated</td>
</tr>
<tr>
<td>117</td>
<td>System Water Pressure Too High</td>
</tr>
<tr>
<td>118</td>
<td>System Water Pressure Too Low</td>
</tr>
<tr>
<td>125</td>
<td>Circulation Fault (Primary Circuit)</td>
</tr>
<tr>
<td>128</td>
<td>Flame Failure</td>
</tr>
<tr>
<td>129</td>
<td>Frequently loss of flame during the ignition</td>
</tr>
<tr>
<td>130</td>
<td>Flue NTC Operated</td>
</tr>
<tr>
<td>133</td>
<td>Interruption Of Gas Supply or Flame Failure</td>
</tr>
<tr>
<td>134</td>
<td>Elapsed time Gas valve open without gas</td>
</tr>
<tr>
<td>135</td>
<td>Interruption Of Gas Supply (internal error)</td>
</tr>
<tr>
<td>160</td>
<td>Fan or Fan Wiring Fault</td>
</tr>
<tr>
<td>321</td>
<td>Domestic Hot Water NTC sensor fault</td>
</tr>
<tr>
<td>384</td>
<td>False flame</td>
</tr>
<tr>
<td>385</td>
<td>Under voltage</td>
</tr>
</tbody>
</table>

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.

   20, 28, 40, 50, 60, 321 and 431 indicate possible faulty components.

   53 shows possible obstruction in the flue duct.

   55 indicates that the pcb is not setting/calibrated.

   71, 72, 77, 78 and 82 indicate possible wrong calibration. A new calibration is needed.

   92 shows possible flue recirculation in the flue duct.

   83...87 shows possible error of communication with thermostat (Goto section P)

   110 shows overheat of the primary.

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

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

   125 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.

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

   133, 134 and 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 110, 125, 133, 134, 135, 09, 15, 128 and 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

Turn on mains power. The display illuminates.

* Error 110 or 133 or 134 or 135 or 125 or 384 or 09 or 15 flashing

Press the 'Reset' button for between 1-3 seconds

If the E110 is still flashing. Go to section 'H'

Error 20, 28, 40, 50, 321 or 431 flashing

Go to section 'D', if E55 is displayed go to section N

Error 117 or 118 flashing

Go to section 'I'

Turn Central Heating thermostat to Maximum. Pump runs.

Fan runs after 1 minute from the request

If m 09, m 15 and m 384 is flashing or re-occurs regularly check all PCB connections, if this has no effect replace the PCB.

If m 09, m 15 and m 384 is flashing or re-occurs regularly check all PCB connections, if this has no effect replace the PCB.

If the E110 is still flashing. Go to section 'H'

Error 160 flashing Go to section 'C'

If E53 is displayed go to section O

Error 160 flashing Go to section 'C'

Error 133 flashing Go to section 'E'

Burner does not stay alight after 5 seconds

Error E125 flashing after 1 minute

Go to section 'H'

Error E110 flashing

Go to section 'H'

3 way valve open to central heating circuit

Burner output modulates to maintain the temperature set

Check the Central Heating NTC sensor Go to section 'D'

Error E130 flashing

Go to section 'M'

Buner goes out

Fan stops after 30 seconds

Operation sequence successful
Domestic hot water

Turn on mains power. The display illuminates

YES

NO

Error 110 or 133 or 134 or 135 or 125 or 384 or 09 or 15 flashing

YES

NO

Press the ‘Reset’ button for between 1-3 seconds

If the E110 is still flashing. Go to section ‘H’

Error 20, 28, 40, 50, 321 or 431 flashing

YES

NO

Go to section ‘D’, if E55 is displayed go to section N

Error 117 or 118 flashing

YES

NO

Go to section ‘I’

Open DHW tap fully. Pump runs.

YES

NO

DHW flow rate more than 2 l/min

Go to section ‘L’

Fan runs after up to 3 seconds

YES

NO

Error 160 flashing

Go to section ‘C’

Fan runs at correct speed

YES

NO

Error 160 flashing

Go to section ‘C’

Spark at ignition electrodes for up to 5 seconds and for 5 attempts.

YES

NO

Error 133 flashing

Go to section ‘E’

Burner lights

YES

NO

Burner does not stay alight after 5 seconds

YES

NO

Error E125 flashing after 1 minute

Go to section ‘J’

Error E109 flashing

YES

NO

Error E110 flashing

Go to section ‘H’

3 way valve open to domestic hot water circuit

YES

NO

Burner output modulates to maintain the temperature set

YES

NO

Check the Central Heating NTC sensor

Go to section ‘D’

Error E130 flashing

YES

NO

Go to section ‘M’

Burner goes out

YES

NO

Fan stops after 30 seconds

Operation sequence successful

TROUBLESHOOTING CHART

PN 240011430 REV. N [10/31/2020]
Fault Finding Solutions Sections

A

Power supply 120V

1. Main terminals L and N
   
   - NO: Check electrical supply
   
   - NO: Connection OK at connector x10
   
   - YES: Display illuminated
   
   - NO: Main or Display PCB fault
   
2. Integrity of the fuse
   
   - NO: Replace fuse
   
   - YES: Display illuminated
   
   - NO: Main or Display PCB fault
   
3. PCB - X10 connector

Mains terminals L & N

- NO: Check wiring
- YES: Display illuminated

B

120V at PCB - connector x13 pump terminals Blue to Brown (See Wiring Diagram)

- NO: Replace PCB
- YES: 120V between PCB - connector x13 pump terminal Blue and PCB - connector x11 pump terminal Black. (See Wiring Diagram)

- NO: Replace PCB
- YES: 120V at Pump

C

1. Fan connections correct at fan and PCB
   
   - NO: Connectors X11 & X23 See Wiring Diagram
   
   - YES: Make connections
   
   - YES: Fan jammed of faulty winding
   
   - NO: Replace PCB
   
   - YES: Replace fan
FAULT SOLUTION SECTIONS

D
Temperature sensor faulty.  
Check installation and wiring  

- Temperature sensor faulty  
  Condensate tank approximately  
  130°F @ 77°F C (CH version)  
  29°F @ 77°F F (Plus sensor)  
  (installation not correct with indicated temp.)  

- Replace sensor  

E
Gas at burner → Engineer gas line and purged  

- Check wiring & PCA - X38 & X2 connector.  
  See Wiring Diagram.  
  1. Check the resistance of the ends:  
     Pin 1 and 3 = 20 - 20 Ohm  
     Pin 2 and 4 = 80 - 70 Ohm  
  2. Replace gas valve  
  3. Replace PCA  

F
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  

1. Check wiring,  
   See Wiring Diagram  
2. Replace condensate sensor or wires  

G
Check the gas supply pressure.  
For Natural Gas greater than  
3.8" wc  
For LP greater than 9.4" wc  

1. Check and correct if necessary  
   1. Flame sensing electrode position  
   2. Flame sensing electrode and lead connections  
   3. Round tip at line  
   4. Calibration  
      (CO2 Values - see installation)  

2. 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.  
→ Check for and correct any system faults (water circulation).  
→ Allow to cool. Continuity across thermostat terminals more than 1.5 ohm  
→ Replace safety thermostat  
→ Check Flow, Return, sensors. See section ‘D’  
→ Is E110 is still flashing  
→ 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  
→ 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.)  
→ Replace sensor  
→ NO  
→ 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  
→ Replace motor 3 way valve
**FAULT SOLUTION SECTIONS**

**L**

Is main water filter and assembly clean and rotor free to move?

- **YES**
  - PCB connector x22 Hall effect sensor terminals. Check the voltage is approximately 5 VDC between the Red and Blue wires. See Wiring Diagrams.
  - With water running through DHW circuit, measure red and white wire for 2.8 VDC for flow triggering.
  - Check DHW NTC sensor for proper Ohm value
  - Replace PCB

- **NO**
  - Clean or Replace
  - Replace PCB
  - Replace Hall Effect Sensor
  - Replace DHW NTC sensor

**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
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