Modulating, Condensing, Hot Water Boiler Models:
- MLX-303
- MLX-454
- MLX-606
- MLX-757
- MLX-909
- MLX-1060

Modulex MLX Series
(90psi High Pressure)
Gas Fired Boiler System

Other manuals for this product include:
- GF-115-C MLX E8 Controller/ BCM Manual
- GF-115-G MLX Gas Supply Guide
- GF-115-V MLX Venting Guide
- GF-115-E MLX Electrical Power Guide

Revised: 05/05/2011
Technical Support:
(Mon–Fri, 8am-5pm EST)
1-800-526-0288

www.aerco.com

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</table>
IMPORTANT!

Local codes and authorities should be consulted prior to installation.

- AERCO requires that the boiler loop to be de-coupled from the system loop. This can be achieved by one of the following:
  - Employing primary-secondary piping.
  - Installation of a hydraulic separator between the boiler and the system loop.
  - Installation of a heat exchanger (for example, plate heat exchanger) between the boiler and the system loop. **If water treatment used in the system is not Aluminum compatible, the use of a heat exchanger between the system and the boiler piping is MANDATORY.**

- AERCO requires cleaning of the whole system and to fit a mandatory Y-strainer on the return pipe to the boiler, equipped with isolation valves (See Figures 16 to 23 at the end of this document; see Section 1.4 for Flushing, Treatment, and Cleansing tips and guidelines).

- For boiler replacement installations, cleaning of the whole system is required before connecting the Modulex boiler (See Section 1.4 for Flushing, Treatment, and Cleansing tips and guidelines).

- Failure to clean a system will limit it from the full benefits offered by the high efficiency Modulex boiler.

- Boiler drain valve and condensate drain trap should be arranged to permit the fluids to drain freely, by gravity, to a convenient floor drain.

- Relief valve must be installed vertically in the top, side, or to a valveless header connected to the water supply outlet.

- Locate water supply and return fittings (i.e. unions, elbows, etc.) a minimum of 6 inches (from the boiler fittings to prevent interference with the removal of the boiler panels and covers).

- All piping and electrical connections (i.e. service switches, conduit boxes, etc.) should be located at a minimum of 6 inches from the boiler panels and covers.

- See **Table 1 (Section 3)** for sizing guidelines for the mandatory primary pump and boiler strainer.

A discharge pipe must be used and must not have an internal cross-sectional area less than the outlet of the relief valve. The discharge pipe must be installed so that there will be no danger of scalding to the boiler attendants. See Figure 1, below, for discharge pipe example on the Modulex boiler. The relief valve point of discharge piping must have provisions for proper drainage.

---

**Figure 1: Relief Valve Point of Discharge Example**
1 BOILER WATER QUALITY AND MAINTENANCE

1.1 Modulex Boiler Water Chemistry

1.1.1 - Reaction of Metals to Water Chemistry
Acidic condensates with a pH of 3.0 to 5.0 are commonly produced by the burning of natural gasses within hydronic heating systems. It is very important to maintain a neutral chemistry of the water because although the aluminum alloys used in the construction of Modulex boilers resist acidic conditions, they are still vulnerable to highly alkaline environments (pH of 9.0 and above).

Metals, including aluminum, steel, iron, and copper used in hydronic heating systems are highly reactive to acidic and alkaline chemical environments, so the water must be treated with protectants and buffers to prevent corrosion of these metals. Because of this, most chemical water treatments have been developed to protect an array of metals.

1.1.2 - Scale and Corrosion
Free oxygen can cause the formation of rust (iron oxides), which degrades metallic materials. Magnetite is formed in uninhibited water if there is electrolytic action in the presence of oxygen. Sludge is formed when calcium compounds, primarily CaCO3, are heated. Rust and magnetite, when combined with sludge, can form a very hard scale, which significantly reduces system efficiency and life expectancy of the heating system. Scale reduces heat exchange due to its low heat conductivity and so may cause very dangerous localized overheating. Waterside corrosion of all heating circuit surfaces is also a major concern.

1.1.3 - Make-up or Feed Water Quality
Make-up or feed water is water added to a closed hydronic system to replenish water lost through evaporation, maintenance, or leakage. The quality of make-up or feed water, which may contain dissolved oxygen, minerals and other dissolved contaminants, is extremely important. Such introduced water must be chemically treated or strictly limited when ensuring neutral chemical conditions in boiler system water. Generally, any closed hydronic heating system should be restricted from receiving untreated makeup water of no more than 5% of the total volume of system water per year.

1.1.4 - Treating Water to Prevent Freezing
When using anti-freeze solutions, their compatibility with the AERCO Modulex aluminum heat exchanger and other components of the heating system must be determined prior to use. Traditional HVAC propylene glycol is not suitable for aluminum heat exchangers: the pH of the glycol at various dilutions is in excess of 9.5, whereas the pH must be within 6.5 and 8.0 for use with aluminum. There are several suitable aluminum safe propylene glycols available that can provide the same levels of burst, freeze and corrosion inhibiting protection as traditional propylene glycols. Consult your local AERCO representative for recommendations on glycol solutions. If a glycol solution is used as anti-freeze protection, a backflow preventer must be installed upstream of the fill/makeup valve.

Only virgin glycol should be used for systems requiring freeze protection, and it must be treated with an inhibitor compatible with the particular chemical treatment being used in the system. Note that glycol must be changed from time to time due to its limited useful life.

1.1.5 - Water Treatment Certification
When using chemical treatments in hydronic systems, it is necessary to ensure that the chosen treatment is appropriate and certified by the manufacturer for such environments. The manufacturer should also guarantee that the treatment, when applied according to the manufacturer's recommendations, will not cause harm to the boiler, pumps, piping, and other components of the hydronic boiler system.
1.2 Testing and Maintenance of Water Quality

Water in the installation should be checked, monitored, and treated for the following conditions and characteristics:

- **Hardness** - High hardness of the available water is measured in grains of hardness and indicates the quantity of minerals (mostly calcium and magnesium) which are dissolved in the water. Hardness substantially contributes to the formation of scaling, which is highly undesirable. The total hardness must be less than 200 ppm (11.7 grains/gallon).

- **Artificial Softness** – Do NOT use artificially softened water. Artificial softening agents generally use salt, which creates a chloride water chemistry, a major contributor to the corrosion of the types of metals used in hydronic systems. Elevated salt levels also contribute to higher conductivity levels, another undesirable characteristic in hydronic systems.

- **Chloride** - Chlorides are salts resulting from the combination of the gas chlorine with a metal and are instrumental in accelerating corrosion in the types of metals used in hydronic systems. Chlorides may be introduced into the water naturally. Concentrations of chlorides in system water should be less than 150 ppm.

- **Conductivity** – Dissolved metals and minerals increase the conductivity of water and indicate not only the presence of undesired corrosive agents, but also contribute to the transfer and migration of ions and charged particles in the water that contribute to fouling of sensors, valves, and other devices used in the system. Additionally, high conductivity contributes to galvanic corrosion, in which one metal will preferentially corrode when in contact with another type of metal, when both are in contact with an electrolyte. Conductivity should be less than 3000 μS.

- **pH** - The pH, a measure of the acidic, neutrality, and alkalinity of the water, MUST always be within 6.5 and 8.0 for boilers using aluminum alloys, such as the Modulex boiler system.

- **Oxygen** - All precautions should be taken to avoid the formation and localization of oxygen in the water of a heating system. Water that is low in minerals (soft water) absorbs oxygen much more readily than mineralized (hard) water. For this reason it is necessary that in heating systems using floor radiant heating, the plastic pipes used are impermeable to oxygen.

- **Scale and Corrosion** - The use of an inhibitor is advisable to treat feed and make-up water and to protect heating systems against scale, corrosion and microbiologic growth. To prevent freezing, the use of an anti-freezing agent together with the inhibitor is advisable. Qualified companies can also provide boiler de-scaling.

- **Total Solids** - preferably less than 500 ppm, but a requirement of less than 1000 ppm

- Water treatment is also advisable in the following cases:
  - Very large heating systems
  - High quantities of replenished water due to leakages or maintenance works
1.3 System Flushing, Treatment, and Cleansing

Note that prior to cleaning the heating system, the boiler **MUST** be isolated from the piping to prevent infusion of containments, including sludge, into the boiler. Instruction 1.3, below, shows recommendations for flushing, cleaning, and treating the water used in the Modulex boiler system.

**IMPORTANT!**

Cleaning solution and inhibitors used must be compatible with heat exchanger material. Corrosion/scale inhibitor will be ineffective if added to a dirty system; therefore, it is very important to clean the system first.

Water treatments used must be compatible with EPDM gaskets used in the Modulex Boiler. (EPDM = Ethylene Propylene Diene Manomer).

AERCO recommends the following cleaning solution, inhibitor, and antifreeze products. Visit www.aerco.com for Product Fact sheet and Material Safety Data Sheets:

**Cleaning solution — Sentinel X400 Liquid System Restorer**
- 4 x 1 gallon case – part number 99155-2
- 5 gallon jug – part number 99155-1

**Corrosion/Scale Inhibitor — Sentinel X100 Liquid Inhibitor**
- 4 x 1 gallon case – part number 99153-2
- 5 gallon jug – part number 99153-1

**Antifreeze — Sentinel X500 Liquid Inhibited Antifreeze**
- 5 gallon jug – part number 99156-1
- 55 gallon jug – part number 99156-2
- 275 gallon tote – part number 99156-3

When cleaning, treating, and maintaining, a heating system, consult a qualified professional. The following are AERCO’s tips/guidelines for cleaning a heating system – these do NOT take precedence over detailed instructions from qualified professionals.

**INSTRUCTION 1.3**

System Flushing Recommendations
Starts on the Next Page
INSTRUCTION 1.3

System Flushing Recommendations

• Make sure to use appropriate amount of cleaning solution, carefully following the manufacturer’s instructions. Follow the chemical manufacturer’s recommendations when introducing cleaning agents into the system.

• Ensure that the cleaning solution is circulated thoroughly in the system.

• Flush the system thoroughly to remove the maximum amount of contaminants. When emptying the system, make sure it is done as quickly as possible using all drain off points and ensuring all low lying pipework is fully drained. Opening all bleed valves ensures the system will be completely emptied.

• A reliable test to determine if a system is clean is if the Total Dissolved Solids (TDS) of the water being drained is within 10% of the make-up water TDS. This indicates that sufficient contamination has been flushed from the system. If the difference in TDS is more than 10%, it is recommended to repeat the cleaning process until that is achieved. Turbidity test can be used as an alternate way to determine if a system is clean.

• For boiler retrofit/replacement installation, it will be necessary to repeat the cleaning process until the draining water appears to be clear. Once clear, the above TDS comparison (or a turbidity test) should be performed.

• If a flushing machine is used in the cleaning process, carefully follow the manufacturer’s instructions. If the flushing machine is designed to flush individual zones, the TDS comparison must be made between each zone and the make-up water, or the turbidity test performed for each zone.

• Add corrosion and scale inhibitor after the system has been declared clean, using the appropriate amount recommended by the manufacturer. Introduce the Multi-Metal protector/scale inhibitor to the system following the chemical treatment manufacturer’s instructions. Adding inhibitor to a dirty system reduces its effectiveness. It is better to add more inhibitor than less – that is, it is better to exceed the recommended amount than less.

• When refilling the system, ensure the boiler is not air-bound by opening the pressure-relief valve located at the rear of the boiler. Leave the relief valve open until a steady flow of water is observed. Close the valve and finish filling the system.
1.4 Water Quality Maintenance and Boiler Warranty

Heat exchanger failures due to improperly cleaned/treated and poorly maintained water are not covered under warranty. Scheduled system/boiler water maintenance is required to maintain the heat exchanger warranty. AERCO shall reserve the right to require maintenance records when evaluating warranty claims.

1.5 Water Treatment Certification

When using chemical treatments in hydronic systems, it is necessary to ensure that the chosen treatment is appropriate and certified by the manufacturer for such environments. The manufacturer should also guarantee that the treatment, when applied according to the manufacturer’s recommendations, will not cause harm to the boiler, pumps, piping, and other components of the hydronic boiler system.

1.6 Water Treatment Analysis and Scheduling

The proper mixture of water, chemical treatment and glycol (if used) should be ascertained based on a sample of the system water and the make-up water. Your local water treatment company, or one of the manufacturers listed below, may analyze your sample. Adjust the chemical composition of your system water based on the analysis. After this initial analysis, the chemical composition of your system water should be tested at the beginning of the heating season for boilers operated to provide comfort heat. However, for boilers operating year round, this analysis should be made at least twice a year.

1.7 Hydronic System Water Testing and Treatment Resources

On the internet at www.awt.org, you may find a listing of water treatment firms and manufacturers of chemical treatments developed for use in multi-metal hydronic systems. Click on the “Find a Water Treater” button to access this list.

Below is a list of companies providing water treatment systems certified as safe for use in multi-metal hydronic systems, including aluminum boilers. Contact any of the individuals listed for more information.

Fernox

Hydronic Agencies Ltd.
Sean Leonard
Edmonton, AB, CANADA
Phone: (780) 452-8661
Toll Free: (877) FERNOX4U
(877-337-6694)
Fax: (780) 488-2304
Email: sales@hydronicagencies.com
www.hydronicagencies.com

Fernox USA

Cookson Electronics
Brian Conrad
Altoona PA
Phone: (814) 946-1611
Toll Free: (800) 289-3797
Fax: (814) 944-8094
Email: fernox_americas@cooksonelectronics.com
www.fernox.com

H-O-H Water Technology, Inc.

Steve Sadowski
Greendale, WI
Phone: (414) 421-2070,
Toll Free: (800) 944-9746
Fax: (414) 421-2077
Email: ssadowski@hohwatertechnology.com
www.hohwatertechnology.com

Rhomar Water Management, Inc.

Dwight Hedgepeth
Springfield, MO
Phone: (417) 862-2600,
Toll Free: (800) 543-5975
Fax: (417) 862-6410
Email: peggy@rhomarwater.com
www.rhomarwater.com
2 MAXIMUM ALLOWABLE WORKING PRESSURE

CAUTION

The Modulex boiler has a maximum allowable working pressure of 92 psi (345kPa, 3.5 bar), and a minimum of 15 psi (103 kPa, 1 bar).

3 BOILER LOOP DESIGN GUIDELINES

For proper and safe operation of the water tube Modulex boiler, the primary (boiler) loop piping and the associated fittings and accessories must be designed/selected as discussed in the following sections. Table 1 shows the required minimum flow rates at various system designed temperature rises. Also shown are pressure drops through strainers typically needed in the boiler loop (see paragraph 4.2 for strainer requirement details).

Table 1: Flow Rate and Pressure Drops

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<tr>
<th>50°F Water Flow</th>
<th>MLX-303</th>
<th>MLX-454</th>
<th>MLX-606</th>
<th>MLX-757</th>
<th>MLX-909</th>
<th>MLX-1060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Flow @ 50°F ΔT</td>
<td>11 (G)</td>
<td>17 (G)</td>
<td>22 (G)</td>
<td>28 (G)</td>
<td>34 (G)</td>
<td>39 (G)</td>
</tr>
<tr>
<td>G = Gallons per Min</td>
<td>41.6 (L)</td>
<td>64.3 (L)</td>
<td>83.3 (L)</td>
<td>106.0 (L)</td>
<td>128.7 (L)</td>
<td>147.6 (L)</td>
</tr>
<tr>
<td>Water Pressure Drop (Ft. (m) of Hd.) @ Min. Flow</td>
<td>1.2 Ft. (.366 m)</td>
<td>1.5 Ft. (.457 m)</td>
<td>1.4 Ft. (.427 m)</td>
<td>1.6 Ft. (.488 m)</td>
<td>1.7 Ft. (.518 m)</td>
<td>1.7 Ft. (.518 m)</td>
</tr>
<tr>
<td>Strainer ΔP (Ft. of Hd.) – (Y Strainer, 20 mesh)</td>
<td>0.36 Ft</td>
<td>0.46 Ft</td>
<td>0.77 Ft</td>
<td>0.37 Ft</td>
<td>0.54 Ft</td>
<td>0.72 Ft</td>
</tr>
<tr>
<td>0.110 m</td>
<td>0.140 m</td>
<td>0.235 m</td>
<td>0.113 m</td>
<td>0.165 m</td>
<td>0.165 m</td>
<td></td>
</tr>
<tr>
<td>ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)</td>
<td>1.09 Ft</td>
<td>0.81 Ft</td>
<td>1.47 Ft</td>
<td>0.65 Ft</td>
<td>0.96 Ft</td>
<td>1.23 Ft</td>
</tr>
<tr>
<td>0.332 m</td>
<td>0.247 m</td>
<td>0.448 m</td>
<td>0.198 m</td>
<td>0.293 m</td>
<td>0.375 m</td>
<td></td>
</tr>
<tr>
<td>Total Primary Loop ΔP (Ft. of Hd.) @ ΔT of 50°F</td>
<td>2.64 Ft</td>
<td>2.77 Ft</td>
<td>3.65 Ft</td>
<td>2.62 Ft</td>
<td>3.21 Ft</td>
<td>3.64 Ft</td>
</tr>
<tr>
<td>0.805 m</td>
<td>0.844 m</td>
<td>1.11 m</td>
<td>0.799 m</td>
<td>0.978 m</td>
<td>1.109 m</td>
<td></td>
</tr>
<tr>
<td>Strainer, Pipes, Valves and Fittings Sizes used to estimate above piping configurations</td>
<td>1-1/4&quot;</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding the above example</td>
<td>99127-1</td>
<td>99127-1</td>
<td>99127-1</td>
<td>99127-2</td>
<td>99127-2</td>
<td>99127-3</td>
</tr>
<tr>
<td>Kit includes: Pump Flange Size</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
</tr>
<tr>
<td>Kit includes: Circuit Setter Size (NPT)</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
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Table 1: Flow Rate and Pressure Drops (Continued)

<table>
<thead>
<tr>
<th>40°F Water Flow</th>
<th>MLX-303</th>
<th>MLX-454</th>
<th>MLX-606</th>
<th>MLX-757</th>
<th>MLX-909</th>
<th>MLX-1060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Flow @ 40°F ∆T (G = Gallons per Min, L = Liters per Min)</td>
<td>14 (G) 52.99 (L)</td>
<td>21 (G) 74.49 (L)</td>
<td>28 (G) 105.98 (L)</td>
<td>35 (G) 132.48 (L)</td>
<td>42 (G) 158.97 (L)</td>
<td>49 (G) 185.87 (L)</td>
</tr>
<tr>
<td>Water Pressure Drop (Ft. of Hd.) across the Boiler @ 40°F ∆T Flow</td>
<td>2.0 Ft 0.610 m</td>
<td>2.4 Ft 0.732 m</td>
<td>2.4 Ft 0.732 m</td>
<td>2.5 Ft 0.762 m</td>
<td>2.5 Ft 0.762 m</td>
<td>2.6 Ft 0.792 m</td>
</tr>
<tr>
<td>Strainer ∆P (Ft. of Hd.) – ('Y' Strainer, 20 mesh)</td>
<td>0.58 Ft 0.177 m</td>
<td>0.70 Ft 0.213 m</td>
<td>0.37 Ft 0.113 m</td>
<td>0.58 Ft 0.177 m</td>
<td>0.83 Ft 0.293 m</td>
<td>1.13 Ft 0.314 m</td>
</tr>
<tr>
<td>∆P (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)</td>
<td>1.63 Ft 0.497 m</td>
<td>1.30 Ft 0.396 m</td>
<td>0.65 Ft 0.198 m</td>
<td>1.01 Ft 0.308 m</td>
<td>1.49 Ft 0.454 m</td>
<td>1.89 Ft 0.576 m</td>
</tr>
<tr>
<td>Total Primary Loop ∆P (Ft. of Hd.) @ ∆T of 40°F</td>
<td>4.21 Ft 1.283 m</td>
<td>4.41 Ft 1.344 m</td>
<td>3.42 Ft 1.042 m</td>
<td>4.09 Ft 1.247 m</td>
<td>4.82 Ft 1.469 m</td>
<td>5.62 Ft 1.713 m</td>
</tr>
<tr>
<td>Strainer, Pipes, Valves and Fittings Sizes used to estimate above piping configurations</td>
<td>1-1/4&quot;</td>
<td>1-1/2&quot;</td>
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<td>2&quot;</td>
<td>2&quot;</td>
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<tr>
<td>Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding the above example</td>
<td>99127-1</td>
<td>99127-1</td>
<td>99127-2</td>
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<td>99127-3</td>
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<td>Kit includes: Pump Flange Size</td>
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<tr>
<td>Kit includes: Circuit Setter Size (NPT)</td>
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<td>1-1/2&quot;</td>
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<td>2&quot;</td>
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</table>
Table 1: Flow Rate and Pressure Drops (Continued)

<table>
<thead>
<tr>
<th>30°F Water Flow</th>
<th>MLX-303</th>
<th>MLX-454</th>
<th>MLX-606</th>
<th>MLX-757</th>
<th>MLX-909</th>
<th>MLX-1060</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Flow @ 30°F ∆T G = Gallons per Min  L = Liters per Min</td>
<td>19 (G) 71.9 (L)</td>
<td>28 (G) 106.0 (L)</td>
<td>37 (G) 140.0 (L)</td>
<td>46 (G) 174.1 (L)</td>
<td>56 (G) 212.0 (L)</td>
<td>65 (G) 246.0 (L)</td>
</tr>
<tr>
<td>Water Pressure Drop (Ft. of Hd.) across the Boiler @ 30°F ∆T Flow</td>
<td>3.8 Ft 1.16 m</td>
<td>4.2 Ft 1.28 m</td>
<td>4.2 Ft 1.28 m</td>
<td>4.3 Ft 1.31 m</td>
<td>4.5 Ft 1.37 m</td>
<td>4.5 Ft 1.37 m</td>
</tr>
<tr>
<td>Strainer ∆P (Ft. of Hd.) – (‘Y’ Strainer, 20 mesh)</td>
<td>0.58 Ft 0.177 m</td>
<td>0.37 Ft 0.113 m</td>
<td>0.64 Ft 0.195 m</td>
<td>1.00 Ft 0.305 m</td>
<td>0.72 Ft 0.219 m</td>
<td>0.97 Ft 0.296 m</td>
</tr>
<tr>
<td>∆P (Ft. of Hd.) – (20° SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve) NOTE: Reducing coupling not applied to MLX-909 and MLX-1060 because boiler line size is already 2-1/2&quot;</td>
<td>1.08 Ft 0.329 m</td>
<td>0.65 Ft 0.198 m</td>
<td>1.12 Ft 0.341 m</td>
<td>1.70 Ft 0.518 m</td>
<td>0.92 Ft 0.280 m</td>
<td>1.24 Ft 0.378 m</td>
</tr>
<tr>
<td>Total Primary Loop ∆P (Ft. of Hd.) @ ∆T of 30°F</td>
<td>5.46 Ft 1.66</td>
<td>5.22 Ft 1.59 m</td>
<td>5.97 Ft 1.82 m</td>
<td>7.00 Ft 2.13 m</td>
<td>6.14 Ft 1.871 m</td>
<td>6.72 Ft 2.05 m</td>
</tr>
<tr>
<td>Strainer, Pipes, Valves and Fittings Sizes used to estimate △P for above piping configurations</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td>Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding the above example</td>
<td>99127-1</td>
<td>99127-2</td>
<td>99127-3</td>
<td>99127-3</td>
<td>99127-4</td>
<td>99127-4</td>
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<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
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<tr>
<td>Kit includes: Circuit Setter Size (NPT)</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
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### Table 1: Flow Rate and Pressure Drops (Continued)

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<tr>
<th></th>
<th>MLX-303</th>
<th>MLX-454</th>
<th>MLX-606</th>
<th>MLX-757</th>
<th>MLX-909</th>
<th>MLX-1060</th>
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</thead>
<tbody>
<tr>
<td><strong>Water Flow @ 20°F ∆T</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G = Gallons per Min</td>
<td>28 (G)</td>
<td>42 (G)</td>
<td>55 (G)</td>
<td>70 (G)</td>
<td>84 (G)</td>
<td>98 (G)</td>
</tr>
<tr>
<td>L = Liters per Min</td>
<td>106.0 (L)</td>
<td>159.0 (L)</td>
<td>208.2 (L)</td>
<td>265.0 (L)</td>
<td>318.0 (L)</td>
<td>371.0 (L)</td>
</tr>
<tr>
<td><strong>Water Pressure Drop (Ft. of Hd.) across the Boiler @ 20°F ∆T Flow</strong></td>
<td>7.8 Ft 2.38 m</td>
<td>9.3 Ft 2.83 m</td>
<td>9.4 Ft 2.87 m</td>
<td>10 Ft 3.05 m</td>
<td>10.1 Ft 3.08 m</td>
<td>10.2 Ft 3.11 m</td>
</tr>
<tr>
<td><strong>Strainer ∆P (Ft. of Hd.) – ('Y' Strainer, 20 mesh)</strong></td>
<td>0.37 Ft 0.113 m</td>
<td>0.83 Ft 0.253 m</td>
<td>0.70 Ft 0.213 m</td>
<td>1.13 Ft 0.344 m</td>
<td>1.63 Ft 0.497 m</td>
<td>2.22 Ft 0.677 m</td>
</tr>
<tr>
<td><strong>ΔP (Ft. of Hd.) – (20' SCH.40, 4 x 90°, 2 x reducing couplings, 2 x Ball Valve)</strong></td>
<td>0.65 Ft 0.198 m</td>
<td>1.49 Ft 0.494 m</td>
<td>0.91 Ft 0.277 m</td>
<td>1.49 Ft 0.494 m</td>
<td>2.14 Ft 0.652 m</td>
<td>2.71 Ft 0.826 m</td>
</tr>
<tr>
<td><strong>Total Primary Loop ∆P (Ft. of Hd.) @ ∆T of 20°F</strong></td>
<td>8.82 Ft 2.69 m</td>
<td>11.62 Ft 3.54 m</td>
<td>11.00 Ft 3.35 m</td>
<td>12.62 Ft 3.85 m</td>
<td>13.87 Ft 4.23 m</td>
<td>15.13 Ft 4.61 m</td>
</tr>
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<td><strong>Strainer, Pipes, Valves and Fittings Sizes used to estimate above piping configurations</strong></td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td><strong>Recommended AERCO Pump+Circuit Setter Kit for piping configurations not exceeding the above example</strong></td>
<td>99127-2</td>
<td>99127-3</td>
<td>99127-4</td>
<td>99127-4</td>
<td>99127-5</td>
<td>99127-5</td>
</tr>
<tr>
<td><strong>Kit includes: Pump Flange Size</strong></td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>1-1/2&quot;</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td><strong>Kit includes: Circuit Setter Size (NPT)</strong></td>
<td>2&quot;</td>
<td>2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
<td>2-1/2&quot;</td>
</tr>
</tbody>
</table>
3.1 Primary Pump

The primary pump shall have a discharge pressure able to assure the water flow rate in accordance with the diagram shown in Figure 2. When selecting a pump, take into account the pressure drop across the boiler, fittings, accessories and piping. See Table 1. The primary pump electrical connection shall be made at terminals A10 and N as shown in Figure 3.

Pumps shall be calculated by installers or engineers according to boiler and system parameters. The waterside resistance curve of the boiler is shown in Figure 2. The pump is not an integral part of the boiler.

NOTE
Select the pump flow rate so that the boiler water outlet temperature is 190°F (87.8°C) or below.

Figure 2: Water Side Pressure Loss Chart
3.2 Strainers

AERCO requires the installation of a Y strainer to keep dirt out of the system and boiler. The valve should be installed in the return piping with isolation valves to allow for cleaning as necessary. The Y strainer shall have a 20 mesh or finer strainer. Such filter shall protect the boiler from the heating system dirt. It should be regularly cleaned to prevent problems.

3.3 Isolation Valves

It is MANDATORY that ball or other type of valves be installed in the system supply and return piping to isolate the boiler if necessary. In this case the boiler can be disconnected or drained without having to drain the whole system.

3.4 Air Venting of the Heating System

The Modulex boiler comes standard with an air vent inside the boiler (see Figure 4). This vent is for the boiler only and not the entire heating system. An effective air vent for air removal for the entire heating system must be installed in the highest point of the system piping.
**CSD-1 MANIFOLD ASSEMBLY (SUPPLIED)**

The installation of a low water cutoff, manual reset high limit aquastat and an ASME compliant safety pressure relief valve designed for the boiler output capacity are required. These major components along with a manifold and several others are supplied with the boiler and must be assembled and wired when installing the boiler at the site. The manifold assembly components supplied are:

- 3/4" Pressure Relief Valve
- Manifold Assembly [2-1/2" x 16" long (64 mm x 406 mm)]
- 2-1/2" NPT Union
- Low Water Cut-Off Switch
- Aquastat
- Pressure/Temperature Gauge

The pressure relief valve and all other manifold components are shown in Figures 5 and 6 for right-hand and left-hand applications respectively.

---

**Figure 4: Modulex Main Components**
Figure 5: CSD-1 Manifold Assembly and Components for Right-Hand Application

Figure 6: CSD-1 Manifold Assembly and Components for Left-Hand Application
To install the pressure relief valve and the other components shown, proceed as shown in Instruction 4.0, below.

NOTE
Use Teflon tape or a suitable pipe joint compound for component and piping connections described in the following steps. Refer to Figure 5 and 6 for component identification.

INSTRUCTION 4.0
Installing the Pressure Relief Valve and Other Components

1. Attach 2-1/2" NPT union and manifold assembly to the outlet supply connection on the boiler (Figure 7).

2. Connect the following components to the tapped holes in the manifold assembly (Figure 5 or 6):
   - Pressure Relief Valve
   - Low Water Cut-Off Switch
   - Aquastat
   - Pressure/Temperature Gauge
   - Check to ensure that all components are securely tightened.

3. For electrical connections and wiring the CSD-1 manifold assembly in Figures 5 and 6, see the separate CSD-1 wiring diagram included with the manual package.

Figure 7: Manifold Assembly and Components Installed on Right-Hand Side
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5 CONNECTING SUPPLY AND RETURN PIPING

5.1 Boiler Connections

Upon delivery, the Modulex Boiler has all the connections fitted on its right-hand side (Figure 8). Note that the right-hand orientation is the right hand side when viewed facing the front of the boiler. These connections include: water supply and return, gas, combustion air intake and flue collector outlet.

5.2 Primary-Secondary Piping

Primary-secondary piping must be utilized. This can be accomplished by using a common pipe (see Figures 16 through 19) or a hydraulic separator (see Figures 20 through 23). Primary – secondary piping decouples the boiler loop from the system loop, making it independent from system loop pressure fluctuations associated with opening/closing of zone valves or 3-way valves.

5.3 Additional Supply And Return Piping (PER ANSI Z21.13A)

- The boiler, when used in connection with a refrigeration system, must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.

  The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of boiler water during the cooling cycle.

- A hot water boiler installed above radiation level or as required by Authority having jurisdiction, must be provided with a low water cutoff device either as a part of the boiler or at the time of the installation.
5.4 Changing Left-Hand Connections to Right-Hand

The locations of the air intake and/or the flue collector outlet can be changed on site by removing knock-outs on the boiler right, left or back side panels. To attach the exhaust connector to the flue collector, use the screws and the gaskets supplied inside the plastic bag and use a cross-tip (Phillips) screwdriver at least 12 in. (300 mm) long.

Water supply and return and gas connections can also be moved to the boiler’s left-hand side by inverting the flow and return manifolds to the left side.

To switch boiler connections from the standard right-hand side to the left-hand side, follow the steps in Instruction 5.5 on the next page.

---

**Figure 8: Boiler Connections**
Inverting Flow & Return Manifold Assemblies from Right to Left Side

1. Remove the boiler top panel, then front, side and rear panels.

2. For reversal of the water flow (supply) and return manifolds from the right-hand to the left-hand side, remove the small plates securing the flow (supply) and return global temperature sensors (Figure 9).

3. Disassemble the flow (supply) and return manifolds (Figure 9), leaving the rubber gaskets in place on the upper holes of the aluminum sections and the rubber gaskets/diaphragms in place on the lower holes. The diaphragms on the end sections have a hole diameter of .866 in. (22 mm).

4. Reassemble the manifolds with the threaded connection on the opposite side as shown in Figure 9. Change the position of the drain cock and the automatic air vent (Figure 10 and 11).

5. Reposition Global Flow Temperature Sensor (white & red leads) onto the new flow (supply) manifold and the Global Return Temperature Sensor (white & green leads) onto the new return manifold.

6. For the gas connection, it is possible to keep the gas manifold inlet on the right-hand side, or it can be rotated 180° to have it on the left-hand side. In case of reversal from right-hand side to left-hand side of the gas manifold, only on the Modulex Model 303 will it be necessary to reverse plug C with the gas valve fitting A (see gas manifold connections in Figure 9 at top).
Figure 10: Right Hand Connection

Figure 11: Left Hand Connection

Figure 12: Sensor Assemblies Relocated When Switching Manifold Direction
5.4 - Changing Left-Hand Connections to Right-Hand (Cont.)

**NOTE**
When changing from right-hand to left-hand, note that an extra length of Gas Pressure Switch harness is looped inside the unit, which allows the harness to reach the switch after it is moved to the left-hand position.

The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 psi (14" W.C., 3.5 kPa).

The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 0.5 psi (3.5 kPa).

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement etc.).

Before operating the boiler, the complete gas train and all connections must be leak tested using a non-corrosive soap solution.
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6 SYSTEM FILLING AND DRAINING

- For filling-up the system, a filling tap has to be inserted on the system return pipe.

- The filling-up can also be made through the draining tap on the boiler return manifold (see Figure 4).

- In both cases, an approved hydraulic disconnection system has to be fitted.

- Before connecting the boiler, carefully rinse out the whole system with running water.

The boiler is equipped with its own drain (see Figure 4 for the drain position). NEVER USE IT TO DRAIN THE SYSTEM, since the system dirt could gather in the boiler and compromise its operation. The system itself shall be equipped with its own drain, whose size will depend on the system capacity. The application of a strainer on the return pipe to the boiler is required.

7 NOTES ON CONDENSATE DRAIN

To maintain proper flow of condensate the drain pipe must slope toward the drain of at least 3/8 in./ft. (30 mm/m). The liquid column inside the condensate siphon needs to be filled with water after installation. Its minimum height when all the fans are in operation must be at least 1 in. (25 mm). In order to prevent ice from forming, the condensate piping must be well insulated.

A typical condensate drain installation is shown in Figure 13. The parts required to fabricate the condensate drain system are shipped with the accessory kit which is packed separately.

Two (2) PVC pipes (Figure 14, item 6) are included in the accessory kit. It is important to note that this pipe must be cut to the appropriate length for the Modulex model and prevailing conditions at the installation site. If a pipe length longer than 18" (45.7 cm) is required, cut the second pipe (item 6) to the required length and join it using the coupling provided in the accessory kit (NOT shown in Figure 14).

Consult local codes with regard to condensate neutralization. Neutralization can be obtained by mixing it with the buildings drain water or with limestone, which normally have a base pH.

![WARNING]

Do not install the condensate drain where freezing may occur.
Figure 13: Typical Condensate Drain Installation

Figure 14: Condensate Drain Assembly Components

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>QTY.</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>93084</td>
<td>1-1/4&quot; PVC TEE</td>
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<td>2</td>
<td>1</td>
<td>93091</td>
<td>1-1/4&quot; PVC PIPE 6.5&quot;</td>
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<td>3</td>
<td>1</td>
<td>93087</td>
<td>1-1/4&quot; PVC JOINING CLAMP</td>
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<td>1</td>
<td>93083</td>
<td>1-1/4 ELBOW NPT-SOCKET-WELD</td>
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<td>1-1/4&quot; NPT PLUG</td>
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<td>2</td>
<td>93088</td>
<td>1-1/4&quot; PVC PIPE</td>
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<tr>
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<td>1</td>
<td>93090</td>
<td>1-1/4 PVC P-TRAP WITH UNION</td>
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<tr>
<td>8</td>
<td>1</td>
<td>93092</td>
<td>1-1/4 PVC STREET ELBOW</td>
</tr>
</tbody>
</table>
8 GAS MAINS AND CONNECTIONS

For the gas connection, it is possible to keep the gas manifold inlet on the right-hand side, if desired, or it can be rotated 180° to have it on the left-hand side. See step 6 of Instruction 5.5 in Section 5.

The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 0.5 psi (14” W.C., 3.5 kPa).

The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 0.5 psi (3.5 kPa).

The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service (circulator replacement, condensate trap, control replacement etc.).

Before operating the boiler, the complete gas train and all connections must be leak tested using a non-corrosive soap solution.

8.1 Gas Main Connection Notes

- Connect gas service meter to control assembly in accordance with the current version of the ANSI Z223.1 and the local codes or utility.
- For easy removal of gas control for servicing, a ground union can be installed.
- A drip leg (or trap) must be installed at the inlet of the boiler (see Figure 15).
- Check with local utility for required location of manual shutoff valve.
- Use pipe compound resistant to the action of liquid petroleum gases on all pipe thread connection.
- Prior to operation, the complete gas train and all connections must be leak tested using a non-corrosive soap.

![Figure 15: Gas Piping](image-url)
Figure 16: Single Modulex Boiler Piping System
Figure 17: Two Modulex Boiler Piping System
Figure 18: Modulex Boiler Piping System With Domestic Water Heating
Figure 19: Multiple Modulex Boiler Piping System with Domestic Water Heating
Figure 20: Modulex Gas Fired Boiler Single Unit Installation with Hydraulic Separator
Figure 21: Modulex Gas Fired Boiler Installation with Hydraulic Separator
Figure 22: Modulex Gas Fired Boiler Installation with Hydraulic Separator and Domestic Water Heating
Figure 23: Modulex Gas Fired Boiler Single Unit Installation with Hydraulic Separator and Domestic Water Heating