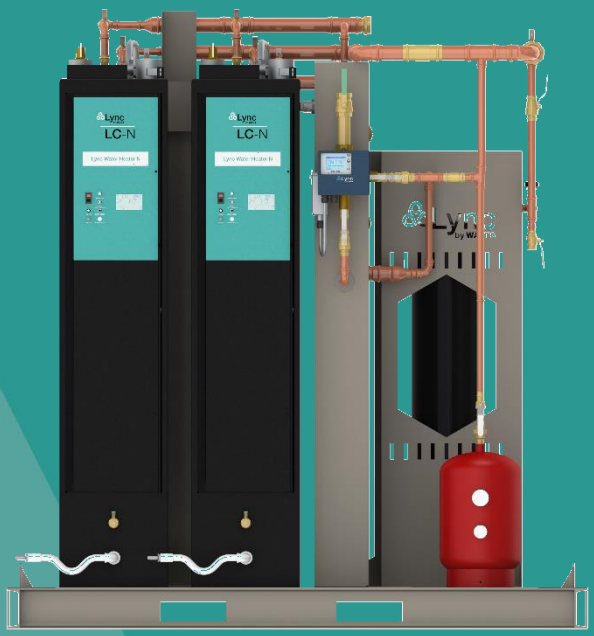
Lync by WATTS

Installation, Operation, and Maintenance Manual

Lync LC-N Water Heating Solution

Water Heater, AquaSolve Anti-Scale, and DigiTemp Mixing Valve



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Engineered Solutions

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Lync • 425 W Everman Pkway, St. 101 • Fort Worth, TX 76134
USA: T: (817) 335-9531
Technical Support • (800) 433-5654 (ext. 3) • Mon-Fri, 8 am - 5 pm CST

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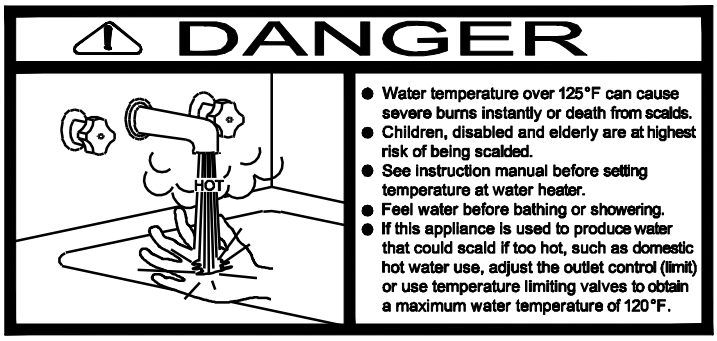
1. SAFETY CONSIDERATIONS

IMPORTANT SAFETY NOTE

It takes only 5 seconds of skin contact with 140°F water to cause a second degree burn! You must protect against high water temperatures in all lavatories, tubs, showers and other points of hot water contact.

Accidental scalding from hot water is a greater risk in some types of installations. Some examples are:

- Homes For The Mentally Handicapped
- Homes For The Physically Handicapped
- Hospitals And Nursing Homes
- Elder Care Facilities And Rest Homes
- Orphanages And Child Care Facilities
- Any installation where response to contact with hot water may be slower or where the danger of hot water contact is greater



IMPORTANT!

- Thermostatically controlled mixing valves must be used in the design of the potable hot water system.
- Potable hot water should be tempered to no more than 110°F (43.3°C) when used for bathing or other personal uses.
- Good engineering practice mandates thermostatically controlled mixing valves set at 120°F (48.8°C) or less to keep the delivered water temperature below scalding temperatures.

WARNING!

If the information in this manual is not followed exactly, a fire, explosion or exposure to hazardous materials may result, causing property damage, personal injury or death.

FOR YOUR SAFETY
Do not store or use gasoline or other flammable liquids near this or any other appliance.

WHAT TO DO IF YOU SMELL GAS
Do not try to light any appliance. Do not touch any electric switch; do not use any phone in your building. Immediately call your gas supplier from a location away from your building and the smell of gas. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer or gas supplier.

This product contains, or may come to contain materials that have been identified as carcinogenic, or possibly carcinogenic to humans. Before installing, servicing or removing this product, read and follow the supplied instructions

Clearance must be in accordance with local installation codes and the requirements of the gas supplier.

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the Lync LC-N Water Heating Solution.

WARNING!

Installation and service must be performed by a qualified installer, service agency or the gas supplier, who must read and follow the supplied instructions before installing, servicing or removing the Lync LC-N Water Heating Solution.

Refer to the information contained in this manual. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury, exposure to hazardous materials or death.

WARNING!

Do not use the Lync LC-N Water Heating Solution if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system, all gas controls and all other items affecting safe appliance operation and which has been under water.

WARNING!

In an emergency shut the main gas supply valve to the Lync LC-N Water Heating Solution from a location safely away from the emergency. Failure to follow these instructions can cause property damage, personal injury, and exposure to hazardous materials or death.

PRODUCT SAFETY INFORMATION

REFRACTORY CERAMIC FIBER PRODUCT WITH CRYSTALLINE SILICA

WARNING!

This product contains or may come to contain crystalline silica, which has been identified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans. This product also contains refractory ceramic fibers, which have been identified by the IARC as possibly carcinogenic to humans. Avoid breathing fiber particulates and dust.

RISKS:

- Air borne fibrous insulation is a possible cancer hazard by inhalation.
- Airborne crystalline silica may cause silicosis (lung disease) by inhalation.
- May cause temporary irritation to eyes, skin, and respiratory tract.

PRECAUTIONARY MEASURES:

- Minimize airborne fibers with engineering controls.
- Use NIOSH/MSHA approved respirators as required (see MSDS).
- Wear long sleeved, loose-fitting clothing, eye protection and gloves.

FIRST AID MEASURES:

- Eyes: Flush with water.
- Skin: Wash with soap and warm water.
- Ingestion: Do not induce vomiting; get medical attention for gastrointestinal symptoms.
- Inhalation: Remove to fresh clean air.
- If any of the irritations listed persists, seek medical attention

WARNING!

If you are unfamiliar with the safe handling of refractory ceramic fiber products, or if you wish additional information prior to beginning any disassembly of the water heater that might expose refractory ceramic fiber materials, contact: Unifrax Corporation, 2351 Whirlpool Street, Niagara Falls, NY 14305-2413, 1-800-322-2293.

IDENTIFICATION OF REFRACTORY CERAMIC FIBER MATERIALS (RCF):

The burner assembly utilizes RCF material. (The RFC materials are located within the product and not generally exposed except during service, disassembly or assembly.)

WARNING!

If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

IMPORTANT: This manual contains information required for installation, operation and maintenance of the Lync LC-N Water Heating Solution. Read and follow the information in this manual and all other provided instructions, labels and markings before installing, operating or servicing this equipment.

1.1. FOR MASSACHUSETTS INSTALLATIONS

Water heater Installations within the Commonwealth of Massachusetts must conform to the following requirements:

- Heater must be installed by a plumber or a gas fitter who is licensed within the Commonwealth of Massachusetts.
- Prior to unit operation, the complete gas train and all connections must be leak tested using a non-corrosive soap.
- The vent termination must be located a minimum of 4 feet (1.2m) above grade level. If side-wall venting is used, the installation must conform to the following requirements **extracted from 248 CMR 5.08 (2):**

(a) For all side wall horizontally vented gas fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet (2.1m) above finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1. INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall horizontal vented gas fueled equipment, the installing plumber or gasfitter shall observe that a hard-wired carbon monoxide detector with an alarm and battery back-up is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery operated or hard-wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall horizontal vented gas fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard-wired carbon monoxide detectors.

a. In the event that the side wall horizontally vented gas fueled equipment is installed in a crawl space or an attic, the hard-wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b. In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery-operated carbon monoxide detector with an alarm shall be installed.

2. APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3. SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet (2.4m) above grade directly in line with the exhaust vent terminal for the horizontally vented gas fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, **"GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS".**

4. INSPECTION. The state or local gas inspector of the side wall horizontally vented gas fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a)1 through 4.

(b) EXEMPTIONS: The following equipment is exempt from 248 CMR 5.08(2)(a)1 through 4:

1. The equipment listed in Chapter 10 entitled "Equipment Not Required To Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and

2. Product Approved side wall horizontally vented gas fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

(c) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM PROVIDED. When the manufacturer of Product Approved side wall horizontally vented gas equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1. Detailed instructions for the installation of the venting system design or the venting system components; and

2. A complete parts list for the venting system design or venting system.

(d) MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED. When the manufacturer of a Product Approved side wall horizontally vented gas fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems", the following requirements shall be satisfied by the manufacturer:

1. The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2. The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

(e) A copy of all installation instructions for all Product Approved side wall horizontally vented gas fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.

_____

[End of Extracted Information From 248 CMR 5.08 (2)]

2. PRODUCT DESCRIPTION

The Lync LC-N Water Heating Solution consists of two to five high efficiency LC2N water heaters, plus the AquaSolve Anti-Scale System and the DigiTemp Mixing Valve, all pre-assembled on a single skid.

The following Lync LC-N Water Heating Solution models are available:

Lync LC-N Model	Water Heater Qty	Max Input BTU
LC-N-400-2	2	398,000
LC-N-600-3	3	597,000
LC-N-800-4	4	796,000
LC-N-1000-5	5	995,000

2.1. Dimensions

The following applies to all Lync LC-N Water Heating Solution models:

- Neutralizer kit (provided) and relief valve piped to drain by contractor.
- Lync reserves the right to modify dimensions without prior notice.
- Piping locations are approximate. Final dimensions may vary due to manufacturing tolerances.
- Do NOT rig from system piping.
- For clearances to combustible materials and to service the equipment, see Section 3.2: *Clearances.*

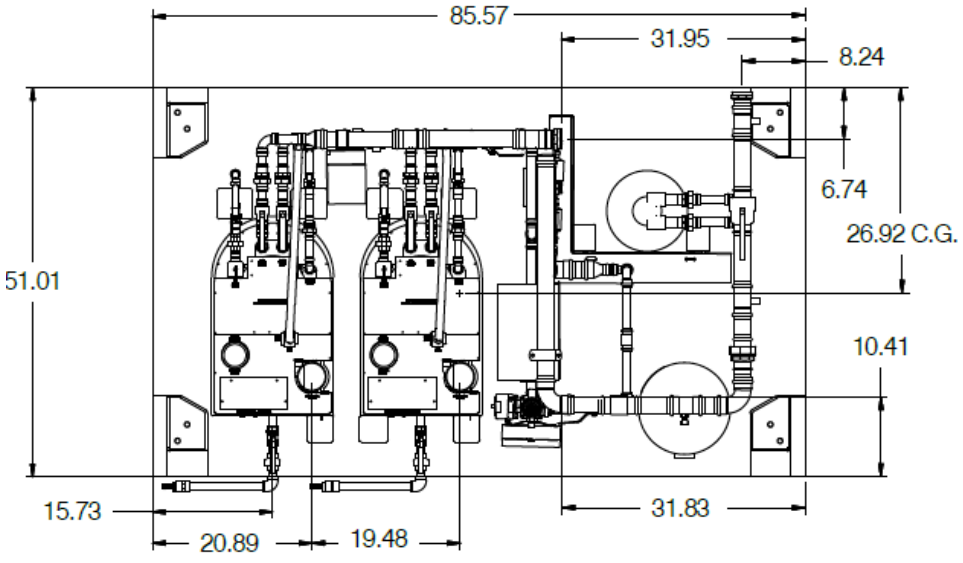


Figure 2-1 LC-N-400-2 Dimensional Drawing – Overhead

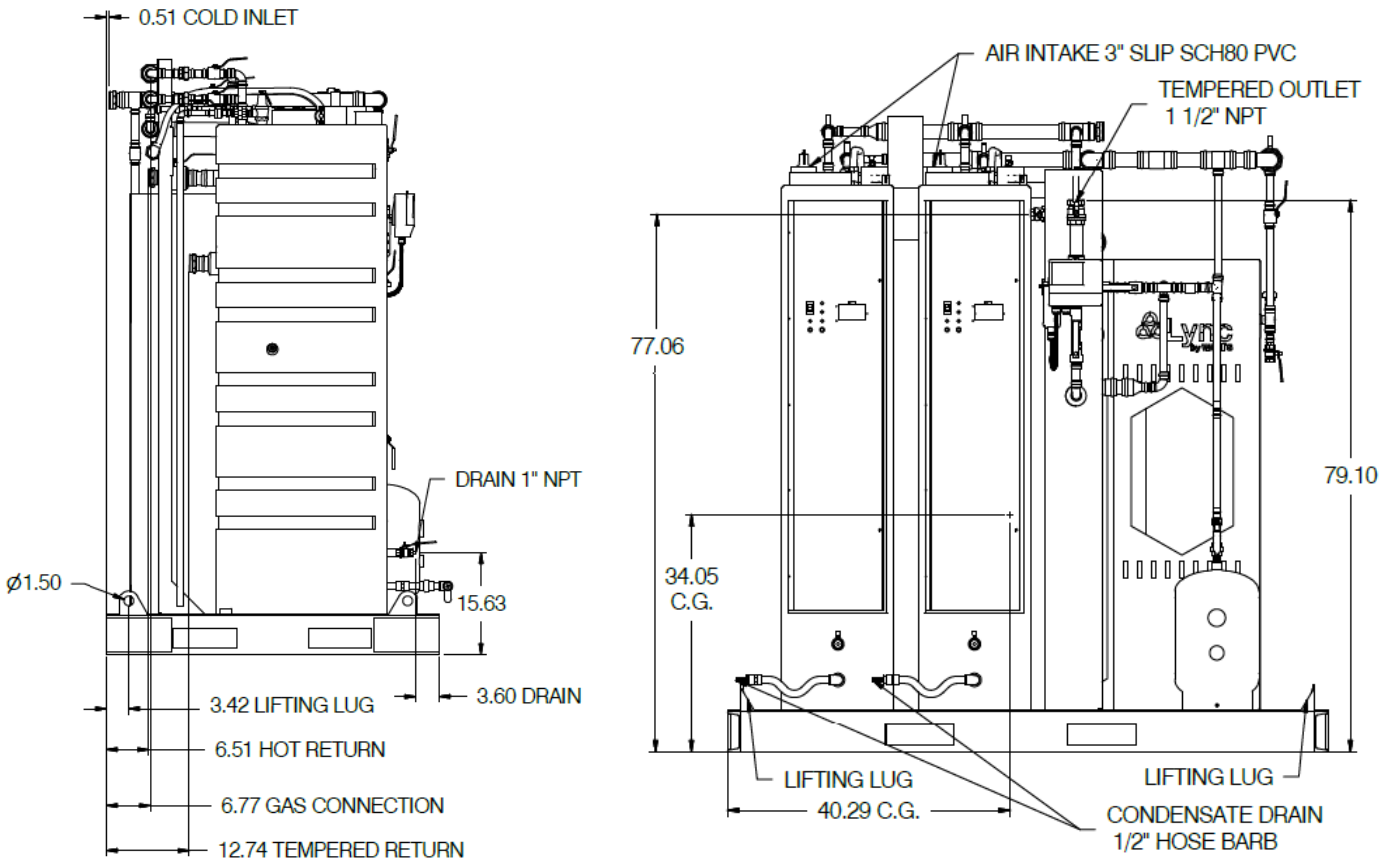


Figure 2-2 LC-N-400-2 Dimensional Drawing – Left Side & Front View

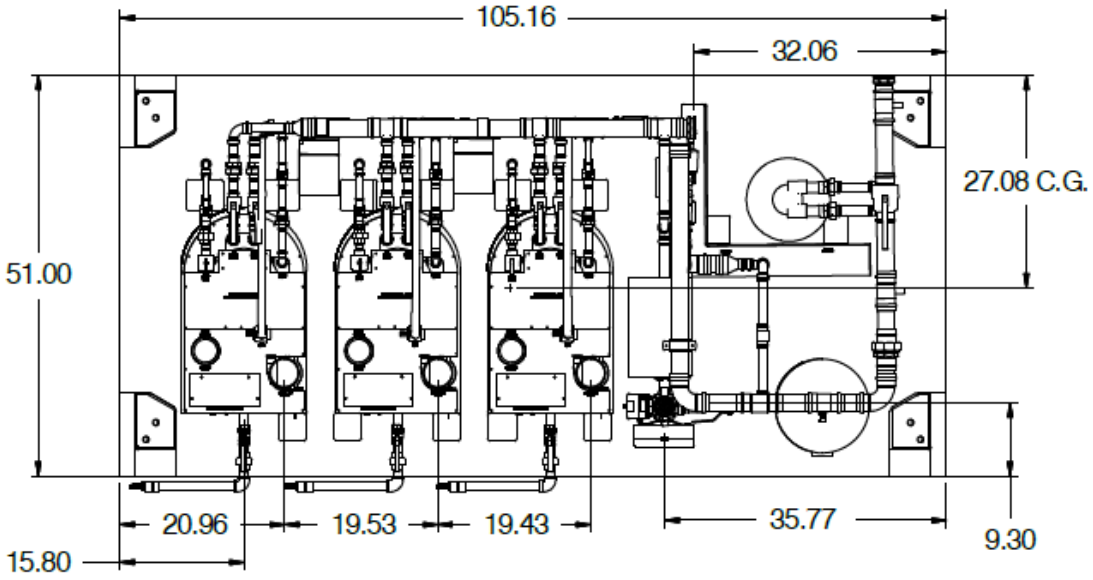


Figure 2-3 LC-N-600-3 Dimensional Drawing – Overhead

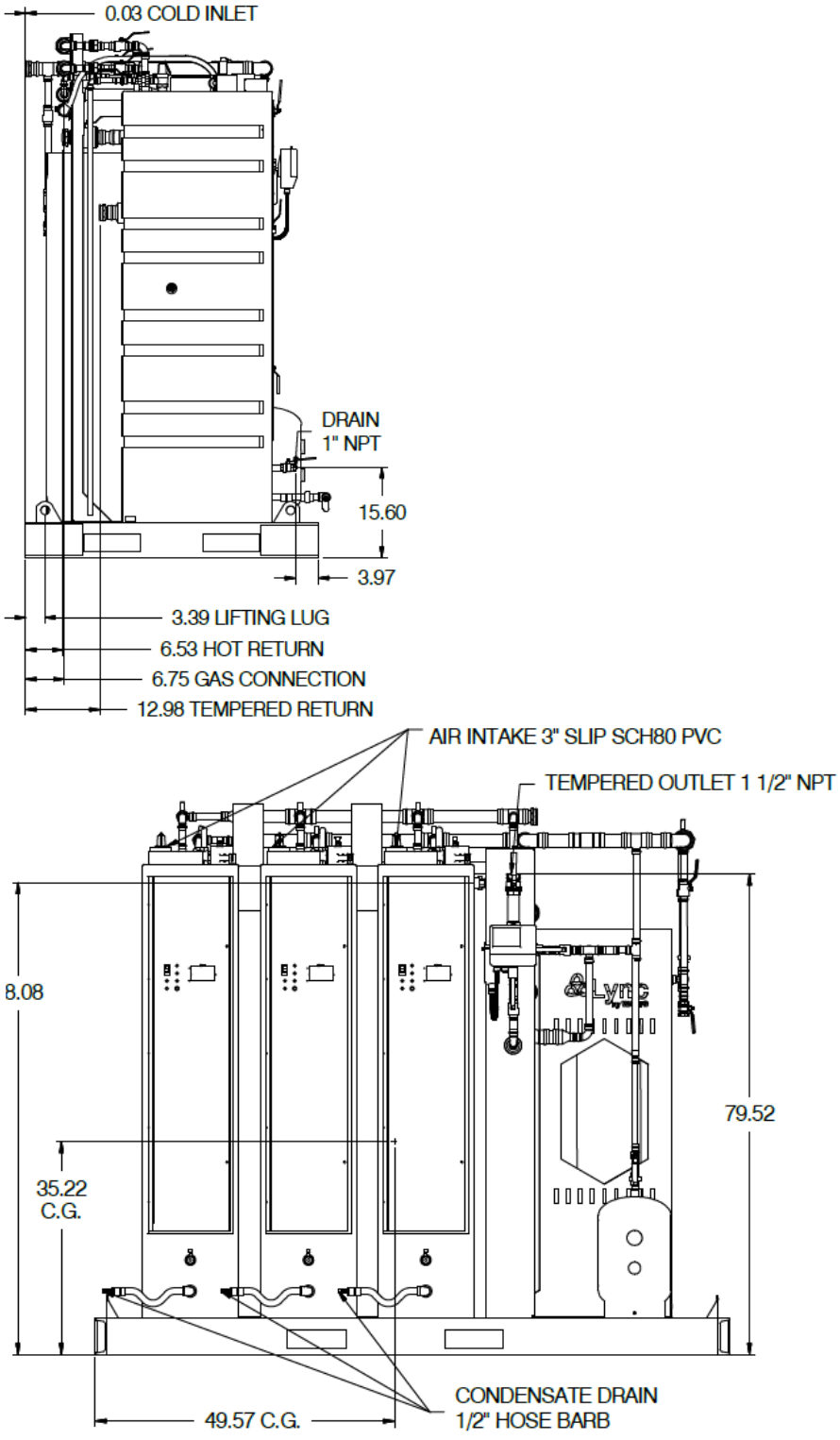


Figure 2-4 LC-N-600-3 Dimensional Drawing – Left Side & Front View

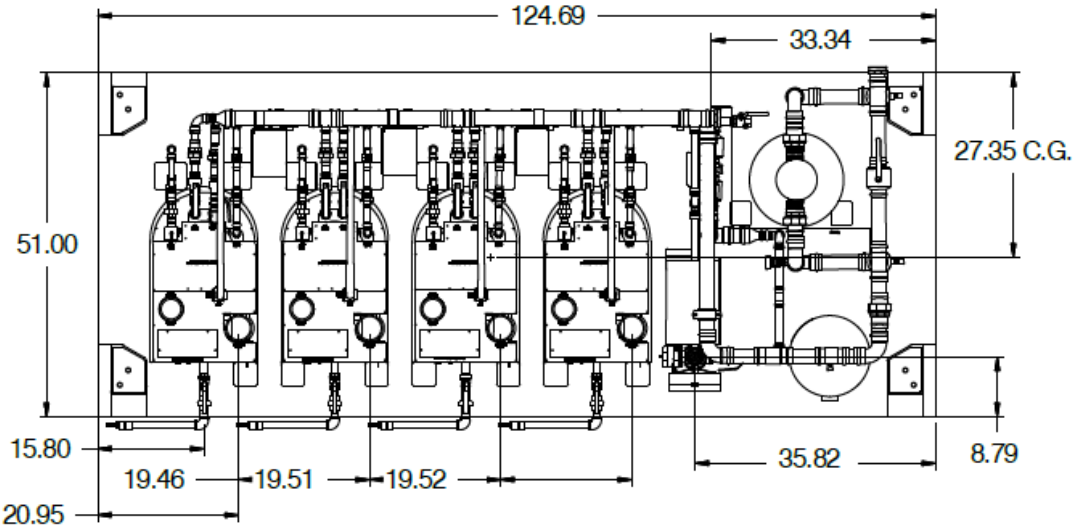


Figure 2-5 LC-N-800-4 Dimensional Drawing – Overhead View

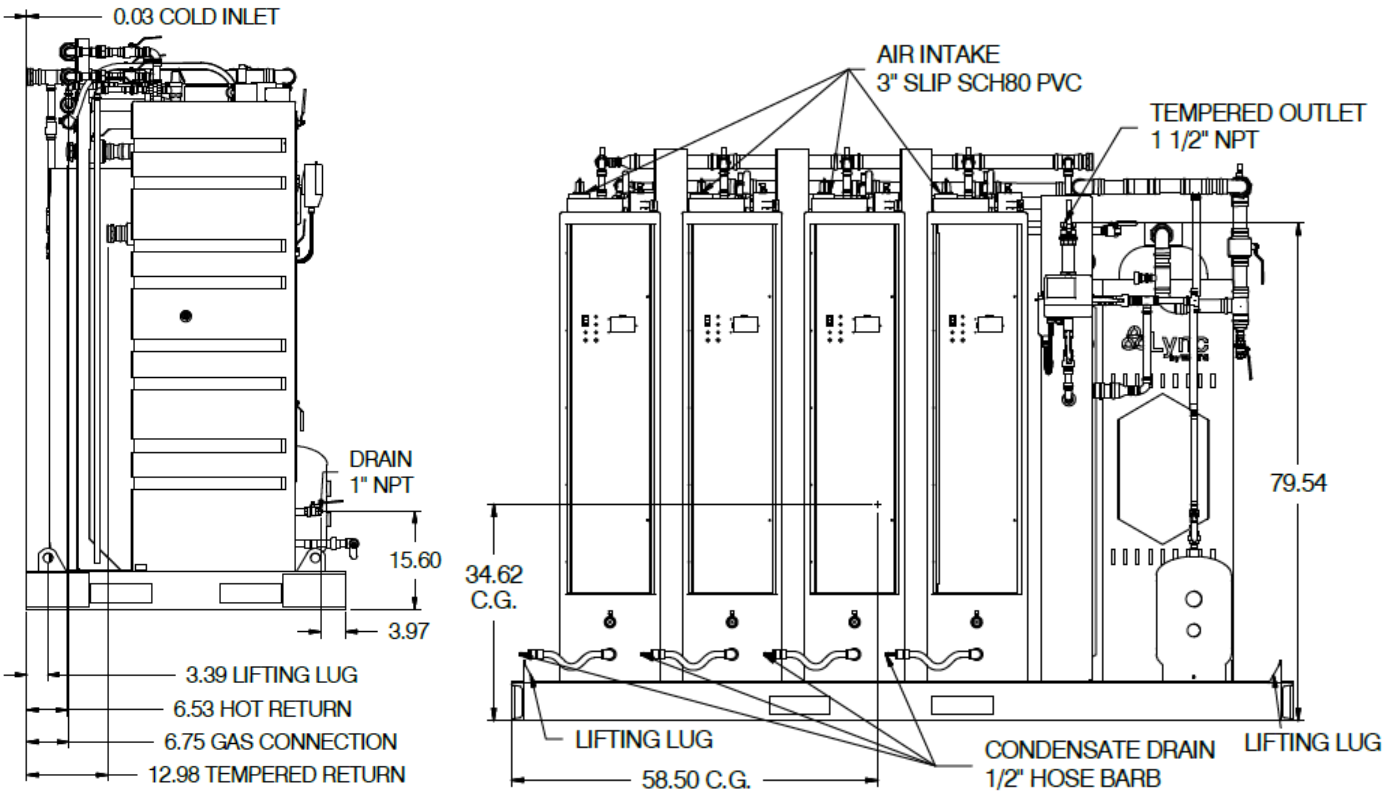


Figure 2-6 LC-N-800-4 Dimensional Drawing – Left Side & Front View

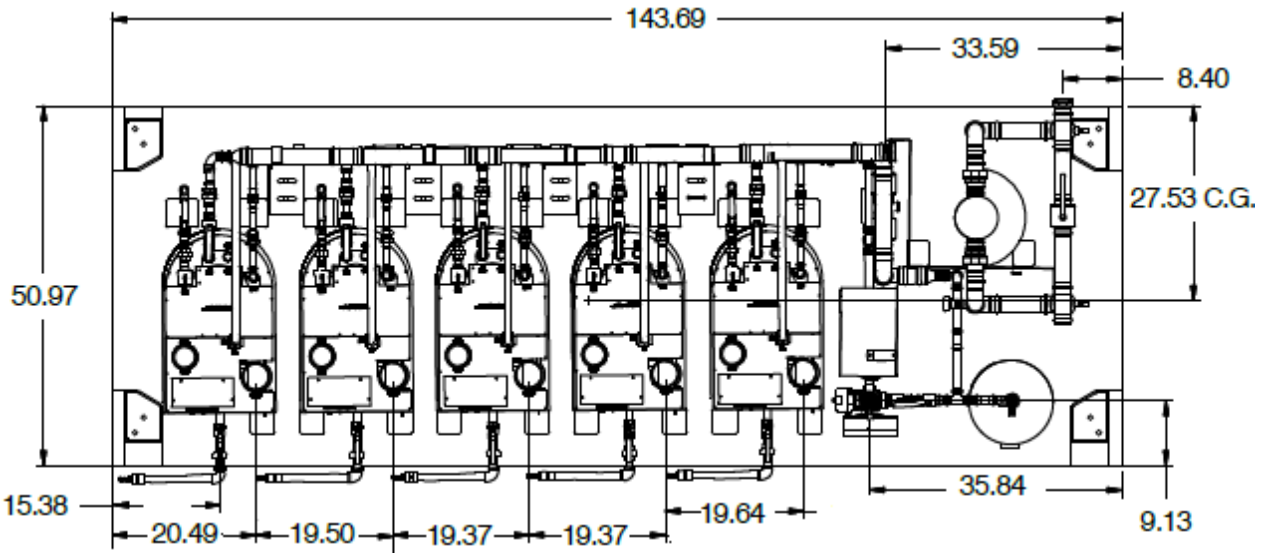


Figure 2-7 LC-N-1000-5 Dimensional Drawing – Overhead View

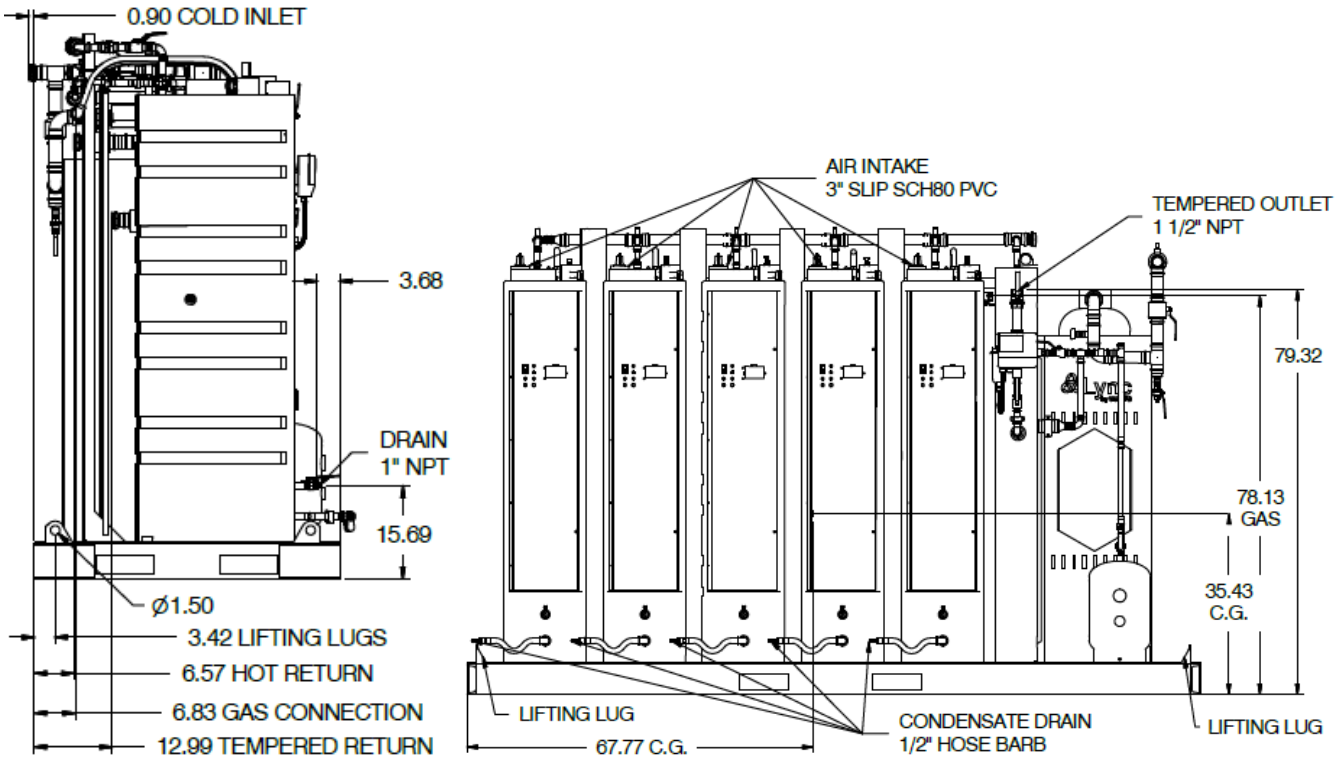


Figure 2-8 LC-N-1000-5 Dimensional – Left Side & Front View

2.2. Isometric Drawings

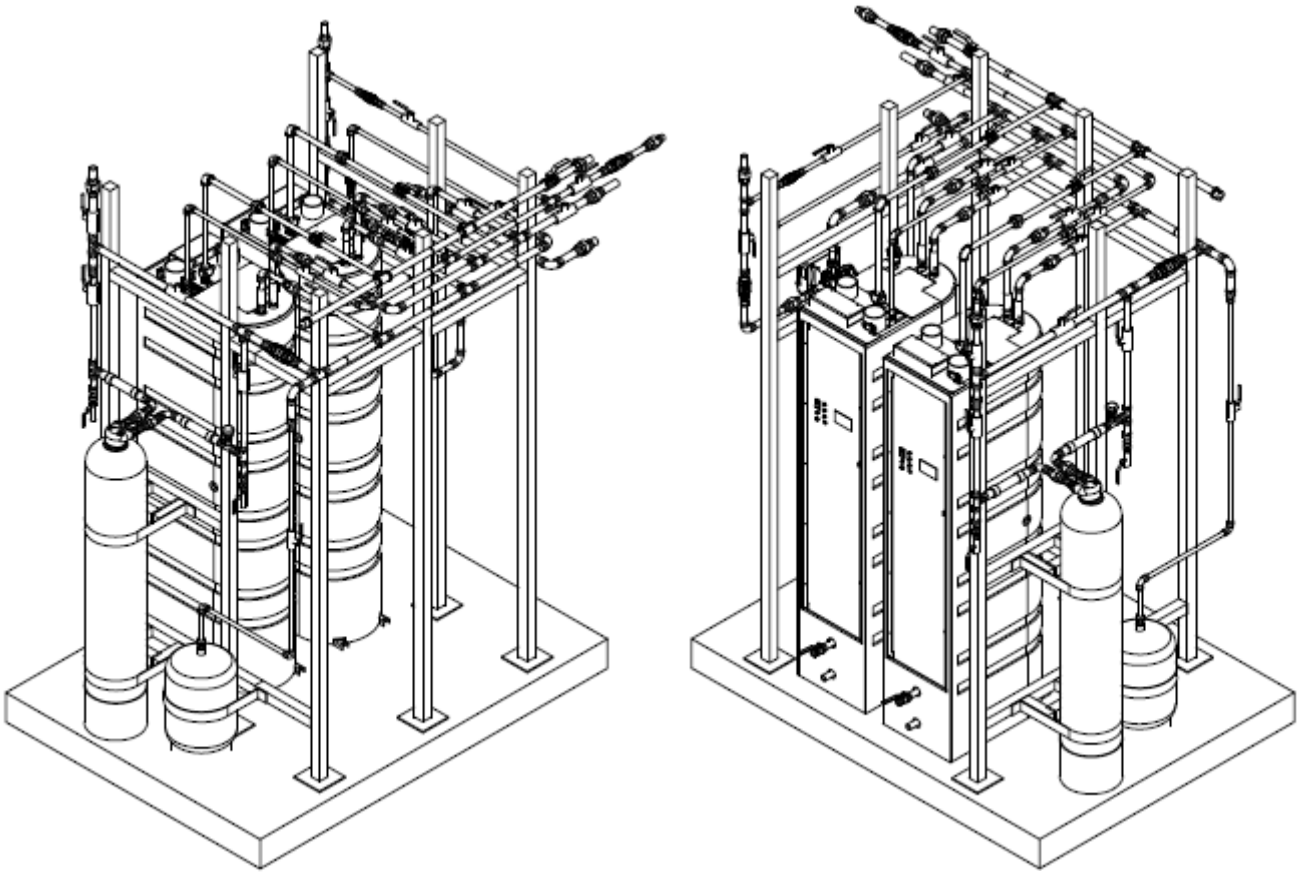


Figure 2-9 LC-N-400-2 Isometric Drawings

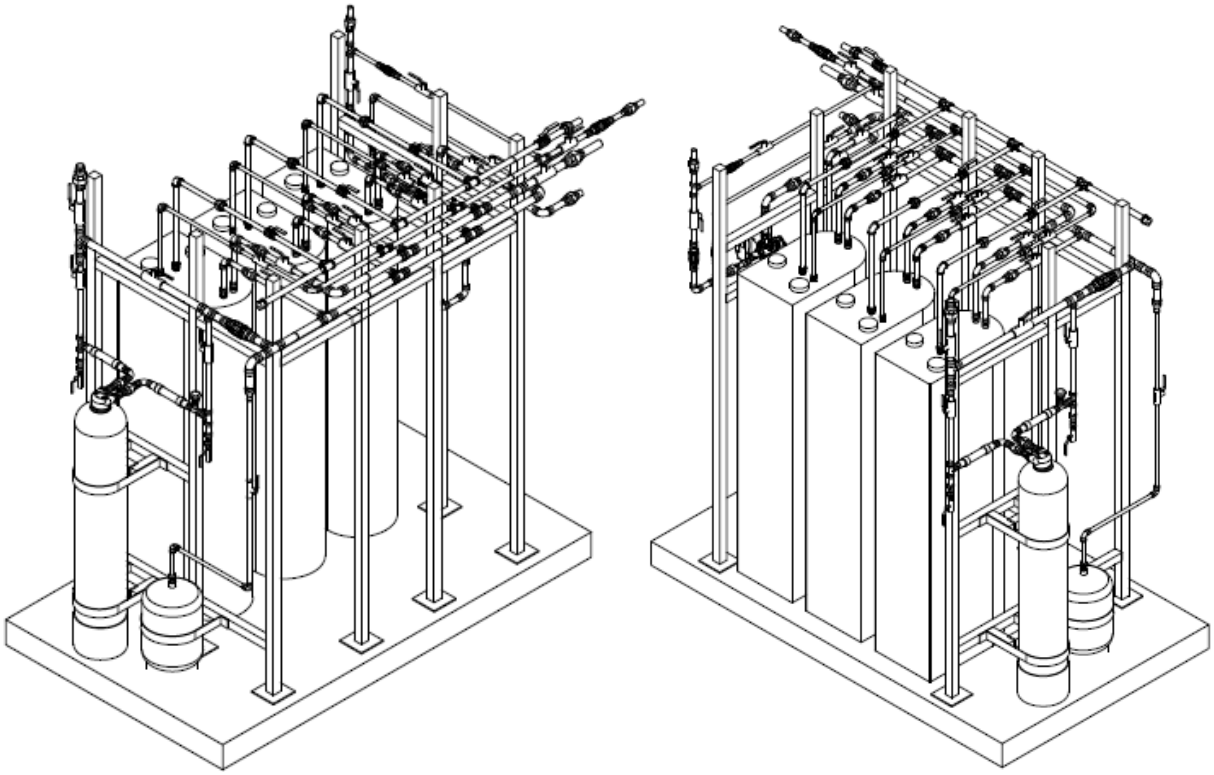


Figure 2-10 LC-N-600-3 Isometric Drawings

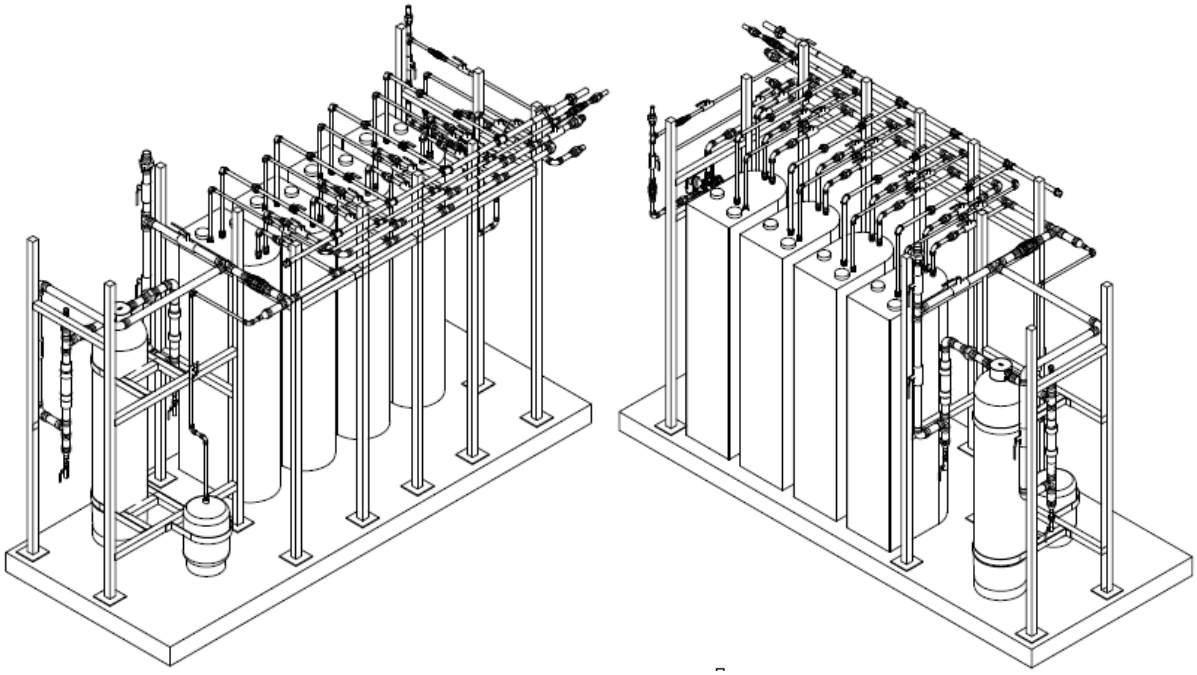


Figure 2-11 LC-N-800-4 Isometric Drawings

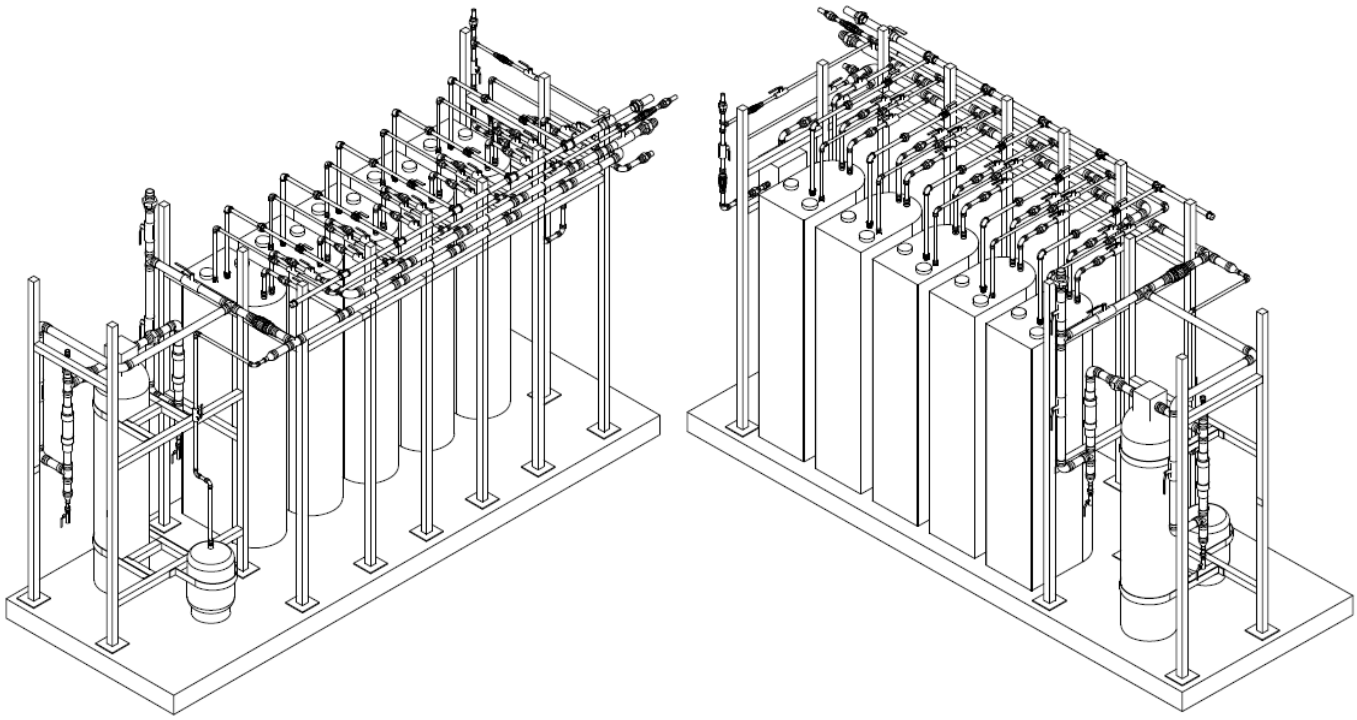


Figure 2-12 LC-N-1000-5 Isometric Drawings

3. Lync LC-N Water Heating Solution Installation

3.1. Checking the Unit Before Installation

- Upon receipt from the freight carrier, completely inspect the Lync LC-N Water Heating Solution before signing the bill of lading. Inspect the unit and all accompanying parts for signs of impact or mishandling. Verify the total number of pieces shown on packing slips with those actually received. Contact the freight carrier immediately if any damage or shortage is detected.
- Check the data decal on the unit. Be sure the electrical, water and gas supply is adequate for the installation.
- Carefully remove all side and top shipping supports and bracing. If possible, do not remove the wooden base/skid assembly until the product has been moved to its final location for installation and operation (see Section 3.5: Handling and Locating the Lync LC-N Water Heating Solution).

3.2. Clearances

The location in which the Lync LC-N Water Heating Solution is installed must comply with the following clearance requirements:

Minimum Clearance from Combustibles:	Zero clearance from sides and rear of skid, 24” from front of skid, 15” from top. It can be installed directly on a combustible floor.
Recommended Service Clearances:	Zero clearance from rear, 18” from all other sides of skid. Check local and national codes for additional clearance requirements.

Additional clearance beyond the minimum required to combustible material should be considered to facilitate easy access for inspection and service of items such as: the burner, gas controls and plumbing connections. Allow enough space for installing and servicing building water, gas, vent, combustion air, electrical, pump and other auxiliary/optional equipment and connections.

3.3. Other Codes and Regulatory Clearances/Requirements

Additional clearance beyond the minimum required to combustible materials and other requirements may be required in order to comply with local, state or national codes and regulations. It is the responsibility of the installer to comply with these requirements.

Examples of codes or regulations that may apply are the National Electric Code, State/Regional/National drain water and flue emissions regulations, the National Fuel Gas Code, Building Construction and Safety Codes, the Americans with Disabilities Act (ADA) and, in states where water heaters above a certain input or storage capacity is considered a boiler, the applicable boiler code requirements, the applicable boiler installation requirements in “Safety Code for Controls and Safety Devices for Automatically Fired Boilers” (CSD-1) and other regulatory requirements.

The Lync LC-N Water Heating Solution must be installed in accordance with the installation regulations in force in the local area where it is installed. Authorities having jurisdiction must be consulted before installation is made. In the absence of such requirements, the installation must be in accordance with the instructions in this manual, unit markings and supplemental instructions, and in compliance with the latest edition of the National Fuel Gas Code, ANSI

Z223.1/NFPA 54. Where required by the Canadian authority having jurisdiction, the Lync LC-N Water Heating Solution must be installed in accordance with the latest edition of the CSA B149.1 Natural Gas and Propane Installation Code and applicable Provincial Regulations. This equipment conforms to the current edition of the ASME Boiler and Pressure Vessel Code, Section IV, Part HLW.

3.4. Lifting Lug & Anchor Locations

Use the following diagrams to locate anchors or attachment points, when connecting the Lync LC-N Water Heating Solution to the floor. Commonly used concrete anchors: 5/16" x 1-3/4" double expansion shield.

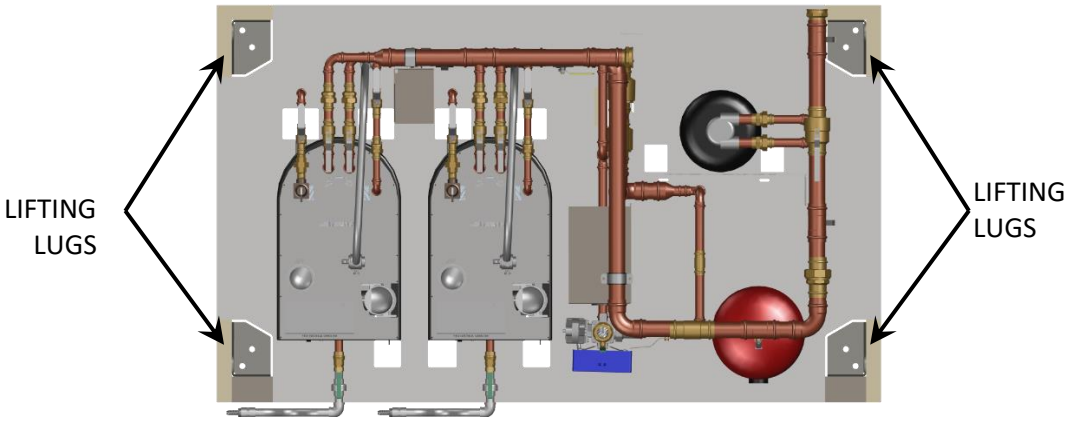


Figure 3-1 LC-N-400-2 Lifting Lug Locations

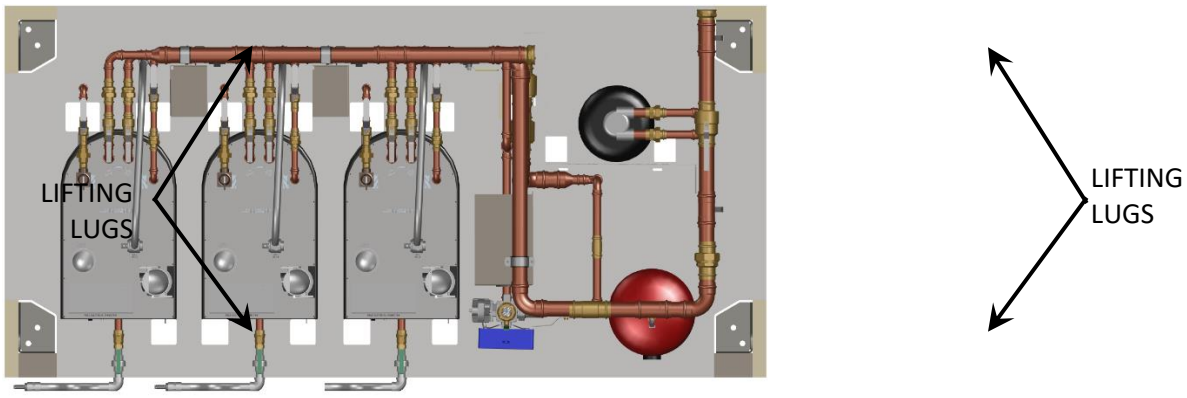


Figure 3-2 LC-N-600-3 Lifting Lug Locations

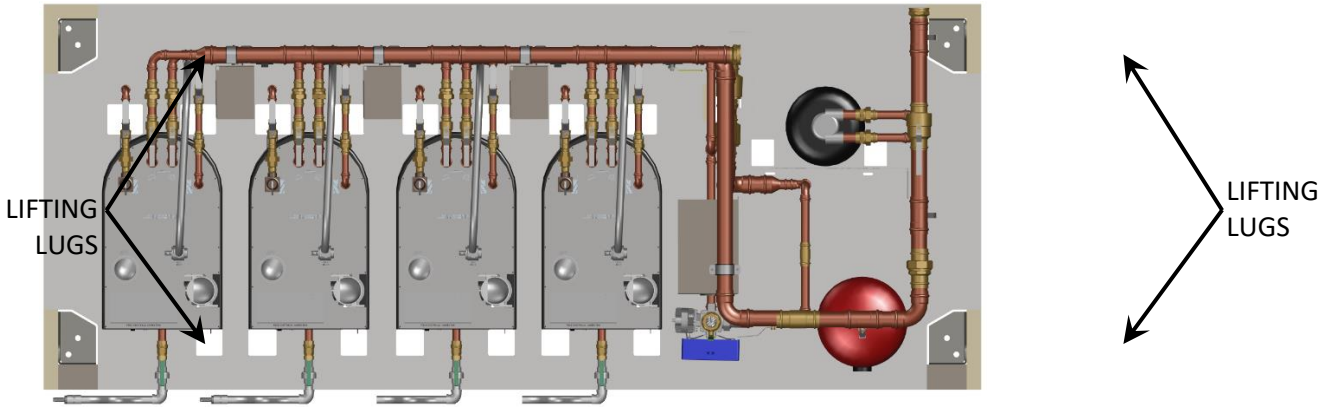


Figure 3-3 LC-N-800-4 Lifting Lug Locations

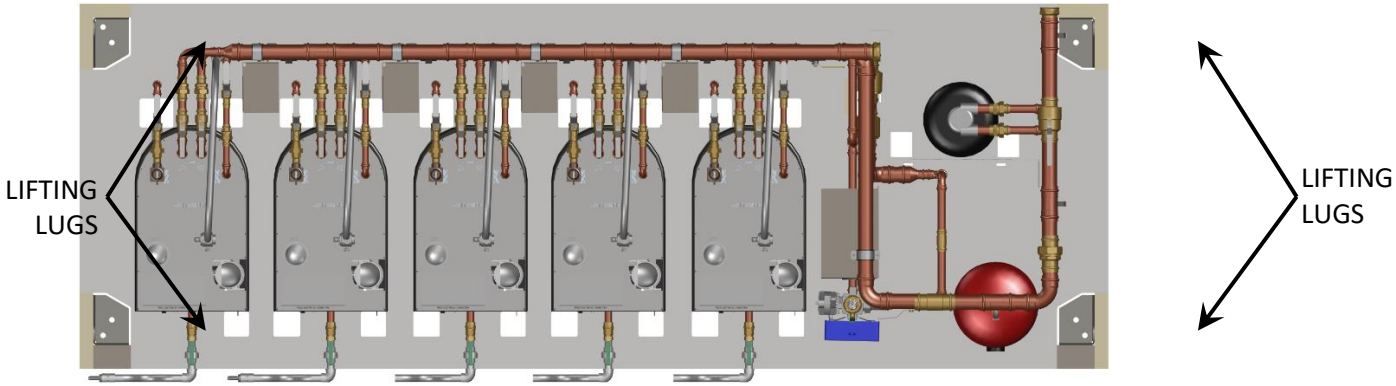


Figure 3-4 LC-N-1000-5 Lifting Lug Locations

3.5. Electrical Requirements

See the Lync LC-N Water Heating Solution's rating decal for electrical service requirements. The unit must be electrically supplied and grounded in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code ANSI/NFPA No. 70. In Canada, the electrical service must conform to local electrical codes and/or CSA C22.1, Canadian Electrical Code, Part 1.

- All wiring between the unit and installed devices must be made with type T copper wire.
- Line voltage wire exterior to the unit must be enclosed in approved conduit or approved metal clad cable.
- To avoid damage, DO NOT energize the unit until the system and unit is full of water.

3.6. Handling and Locating the Lync LC-N Water Heating Solution

WARNING!

Use industry standard safe rigging methods, such as strapping around the Lync LC-N Water Heating Solution's base/skid assembly and using spreader bars, when attempting to lift or move the unit. Failure to follow industry standard safe rigging methods can result in property damage, serious injury or death.

To the greatest extent possible, install the Lync LC-N Water Heating Solution in accordance with the following guidelines:

1. It must be located indoors.
2. It can be installed directly on a combustible floor.
3. Locate it in an area that is not exposed to freezing temperatures.
4. Locate it on a level surface.
5. Locate it near a floor drain.
6. Locate it so if a water tank or connection leaks, water damage will not spread to an adjacent area or to lower floors of the building. Lync recommends the installation of an FM approved wireless leak detection system. The manufacturer's warranty does not cover water damage.
7. Locate it where the vent and air intake piping, when installed, will remain within the maximum equivalent lengths allowed. See *Section 8: Venting* for details.
8. Protect associated electrical components and electrical connections from water (dripping, spraying, rain, etc.) during the unit's operation and service.

4. GENERAL PIPING GUIDELINES

WARNING!

Hot outlet and cold-water piping materials connected to this product must be suitable for temperatures up to 212ºF at normal operating water pressures.

4.1. Inlet and Outlet Connections

1. Use only non-ferrous water piping and fittings. Do not use galvanized pipe or fittings. Use of ferrous or galvanized pipe or fittings can cause rust to form. Do not use di-electric couplings.
2. Insulate hot water and return circulation lines. Insulate cold-water supply lines if subject to freezing during shutdown periods. IMPORTANT: Do not use the plumbing connected to Lync LC-N Water Heating Solution as a ground for welding or any other purpose.
3. Pipe the drain valves to a suitable open drain capable of receiving discharge temperatures up to 212ºF.

IMPORTANT: For maximum efficiency, the inlet water to Water Heaters should not exceed 100ºF. The package utilizes cold inlet water to help extract most of the heat energy from the products of combustion, which lowers the vent temperature to allow the use of PVC vent pipe. Higher cold inlet water temperatures will reduce water heater efficiency and increase the vent temperature. If the vent temperature approaches the maximum allowed, a vent temperature limit switch will cycle the Water Heaters off to protect the PVC vent.

4.2. Gas and Water Connections

All Lync LC-N Water Heating Solution models contains a total of five (5) gas and water connections, as shown below.

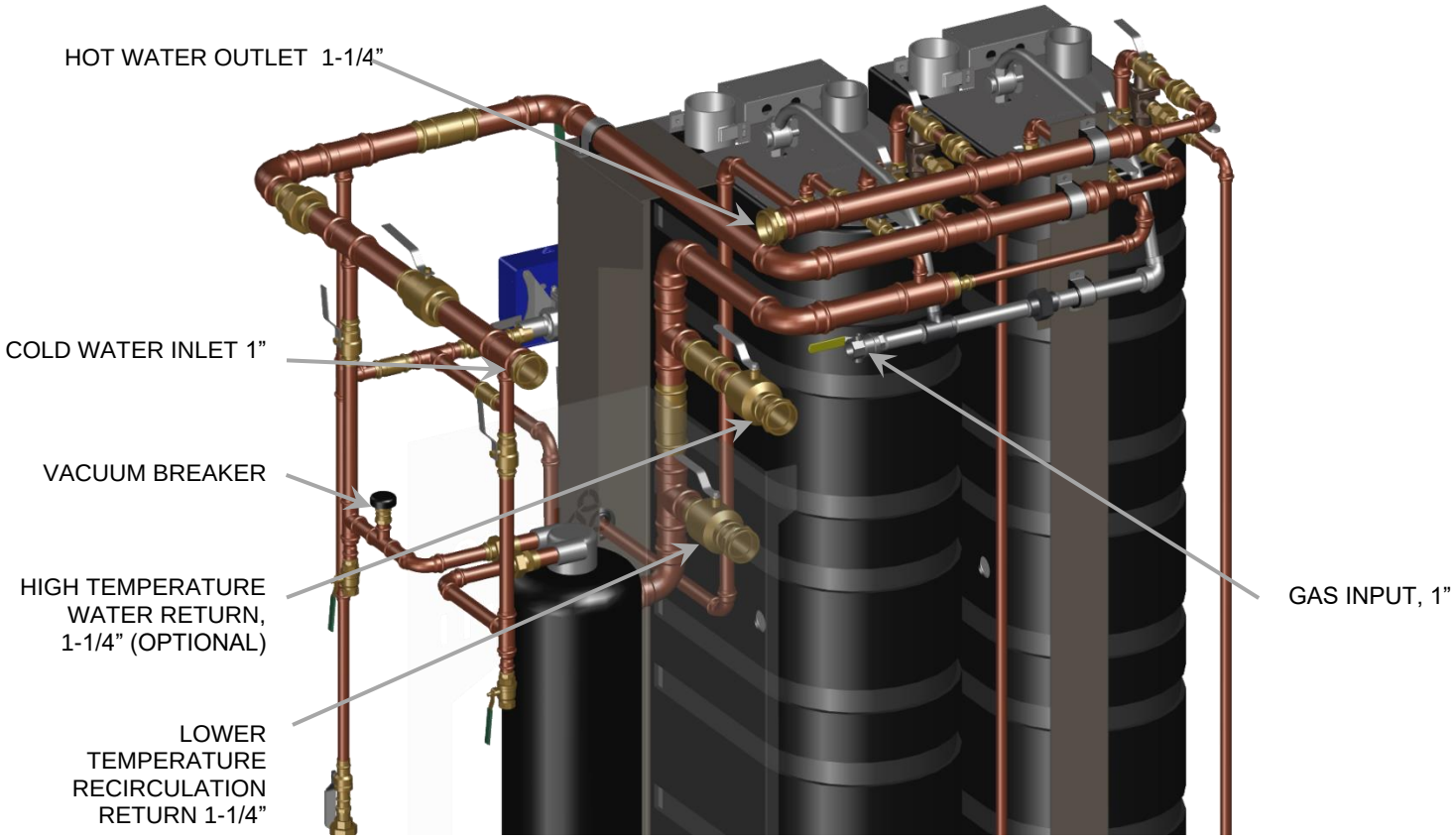


Figure 4-1 Gas and Water Connections – Stanchion Transparent

The Lync LC-N Water Heating Solution contains two (2) water drain valves, as shown below. These should be directed to or connected directly to nearby floor drains. In addition, each water heater has its own individual drain valve, also shown below.

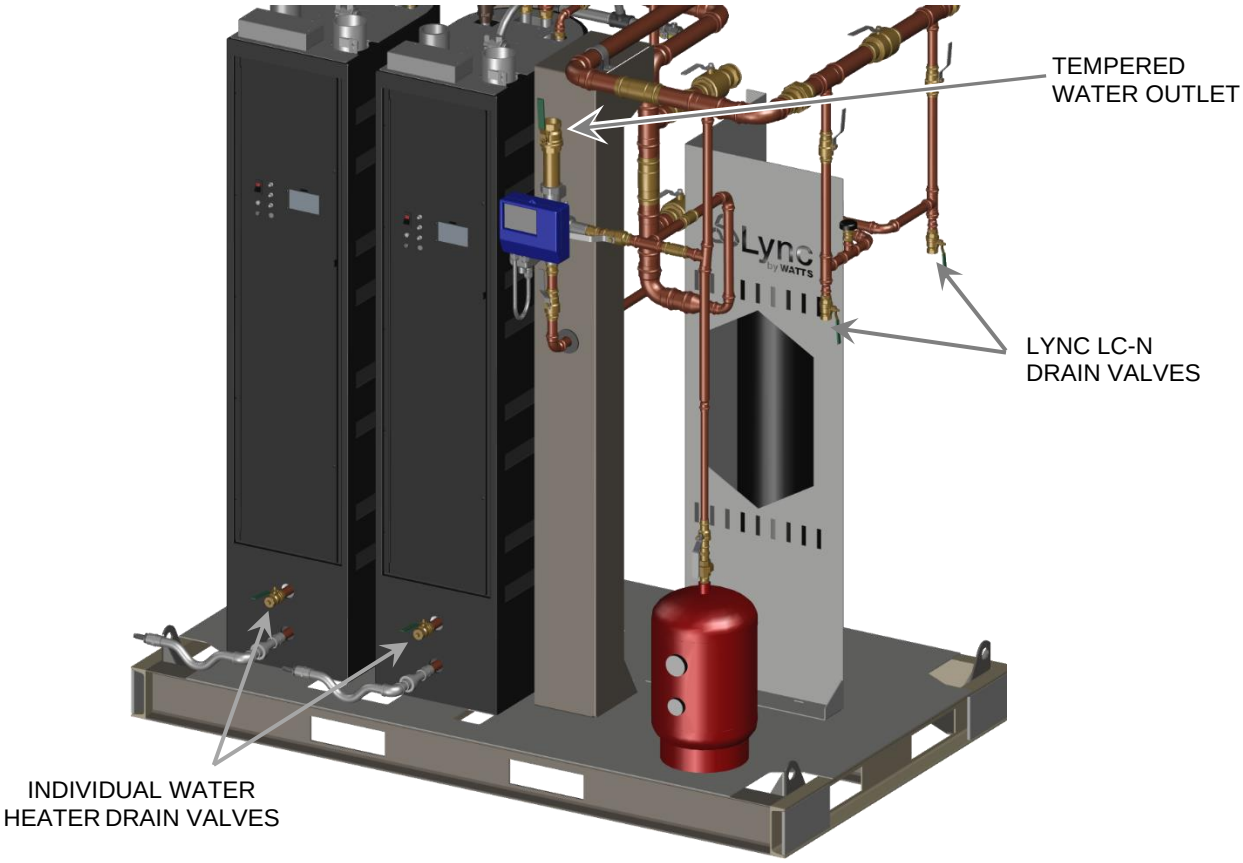


Figure 4-2 Drain Valves

5. CONDENSATE DRAIN, TRAP & DISPOSAL

Water Heaters are designed for operation with normal cold inlet water temperatures of less than or equal to 110°F and produce a significant amount of condensate. The condensate drain is under slightly positive flue pressure, so the provided 3/4" PVC condensate trap must always be used. This trap is sized and designed to fill with the proper amount of condensate to create a liquid barrier to prevent flue gases escaping through the condensate drain into the installed space.

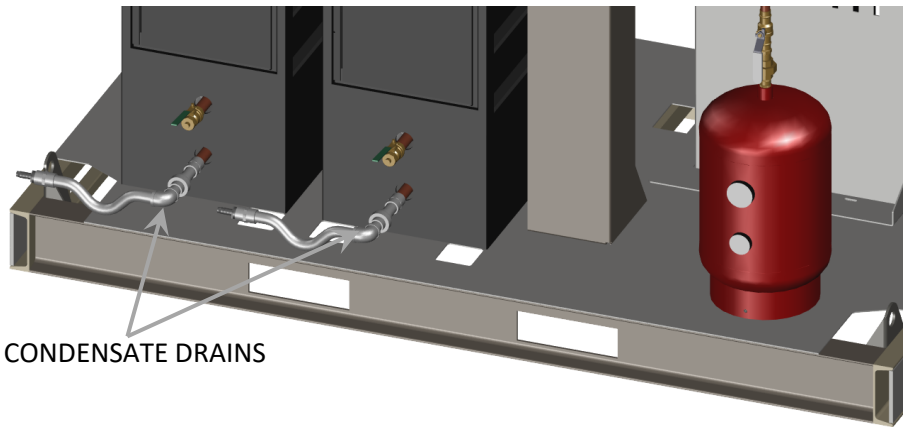


Figure 5-1: Condensate Drains – FRONT VIEW

WARNING!

The condensate traps included with the Lync LC-N Water Heating Solution must be installed on each Water Heater and maintained as described in these instructions and must be included as part of the condensate piping system. This trap is required to keep potentially hazardous products of combustion from continually entering the installed space where the condensate piping terminates. Failure to properly install this trap can cause, personal injury, exposure to hazardous materials or death.

5.1. Connect Condensate Trap

1. The condensate drains are located at the front of each Water Heater, as shown above. Attach the 3/4" PVC fitting from the union on the condensate trap assembly to the PVC pipe exiting the flue collector. Additional PVC fittings and pipe can be added to the flue collector connection to relocate the condensate trap assembly only if all added parts are at the same elevation. After attachment, the trap must be rotated so the offset in the pipe aims down toward the floor. Do not rotate the offset toward the ceiling. Do not use tools to tighten the PVC union. Hand-tighten the PVC union to seat the internal gasket.
2. Do **not** combine the Lync LC-N Water Heating Solution condensate drain to the condensate drains of other condensing appliances into a single drain line. Route separate drain lines into a drain suitable for condensate and confirm the end of the drain lines are not submerged or otherwise blocked.
3. All condensate plumbing must be protected from freezing. Do not locate the condensate piping such that any frozen condensate can block condensate from leaving the outlet.
4. The condensate is only slightly acidic (3-5 PH), however, local codes may require it to be neutralized prior to entering the drainage system. An optional, field installed, Condensate Neutralization System is available from the factory.

5. Connect a condensate drain line or the Condensate Neutralization System (CNS) to the barbed hose connection, sized for 1/2" ID heavy wall Vinyl tubing rated for 170ºF or higher, located at the end of the condensate trap. All piping from the condensate trap to the suitable drain must remain below the highest point (top of the condensate outlet pipe) on the properly attached condensate trap.

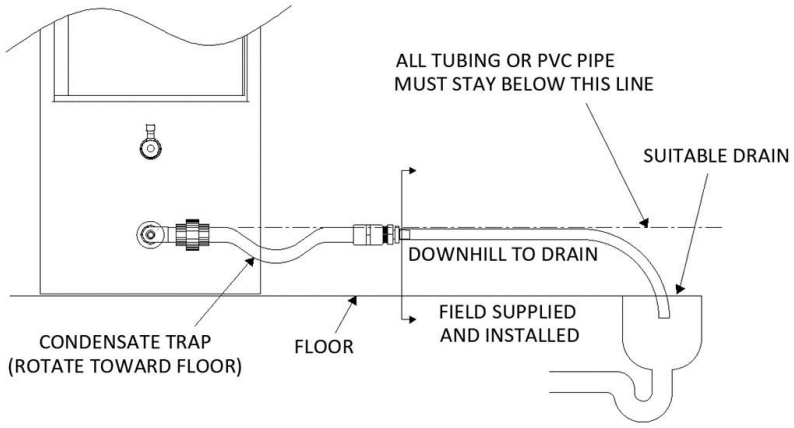


Figure 5-2 Condensate Trap without Condensate Neutralizer

5.2. Condensate Neutralization System

Condensate is only slightly acidic (3-5 PH), however this slight acidity can be neutralized by routing it through the Condensate Neutralization System (CNS). Some “authorities having jurisdiction” require such neutralization before condensate disposal through a suitable drain. Condensate is neutralized while slowly flowing through a container filled with renewable neutralizing media. The condensate neutralizer reduces or avoids the need for separate chemical treatment or dilution using substantial quantities of tap water. Follow the instructions below for assembly and connection.

Lync offers an optional a Condensate Neutralization System (CNS), sized for the specific system, and shipped separately. For additional information on the Condensate Neutralization System, contact your local Lync representative.

Condensate Neutralization Systems Installation Requirements

Complete the instructions below to connect the CNS to the Lync LC-N Water Heating Solution.

1. Follow the steps in Section 5.1: *Connect Condensate Trap* section, above.
2. Locate the CNS in a convenient place between the condensate outlets and a suitable drain and where the threaded end cap can be removed to recharge the Neutralizer. Use only the replacement materials specified by the supplier of the CNS.
   a) The CNS must be located such that condensate will flow downhill from the condensate trap outlet to the inlet on one end of the CNS and downhill from the other end of the CHS to the drain. If this continuous downhill flow is not maintained, the trap will not properly operate and condensate could back up into a water heater.
   b) Follow the instructions included in the Condensate Neutralization System for connecting the Vinyl tubing.
   c) The CNS must be mounted horizontally and level.
3. Keep the CNS system closed at all times, except when the Water Heaters are turned off for maintenance to recharge the condensate neutralizer with replacement media.

WARNING!
Keep the Condensate Neutralization System closed at all times when the Water Heater is operating. The system must remain closed to prevent potentially hazardous products combustion from continually enter the room. Failure to keep the Condensate Neutralization System closed during operation can cause property damage, exposure to hazardous material, personal injury or death.

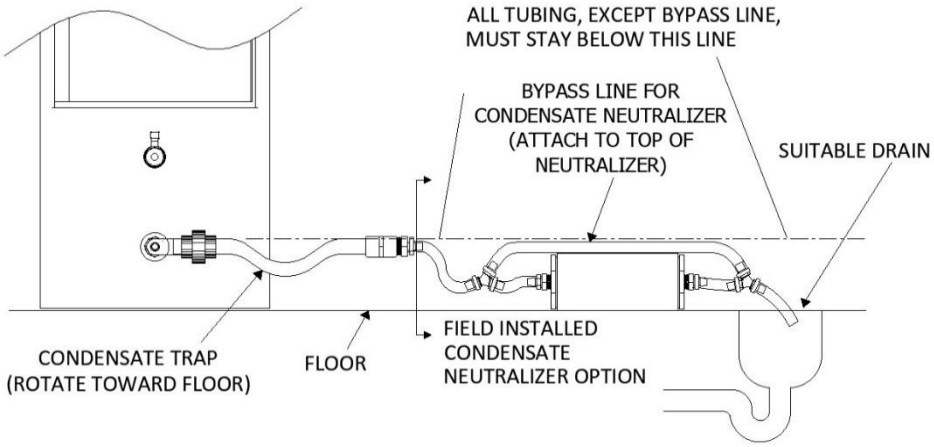


Figure 5-3 Condensate Trap with Condensate Neutralizer Located On the <u>SAME LEVEL</u> as the Water Heaters

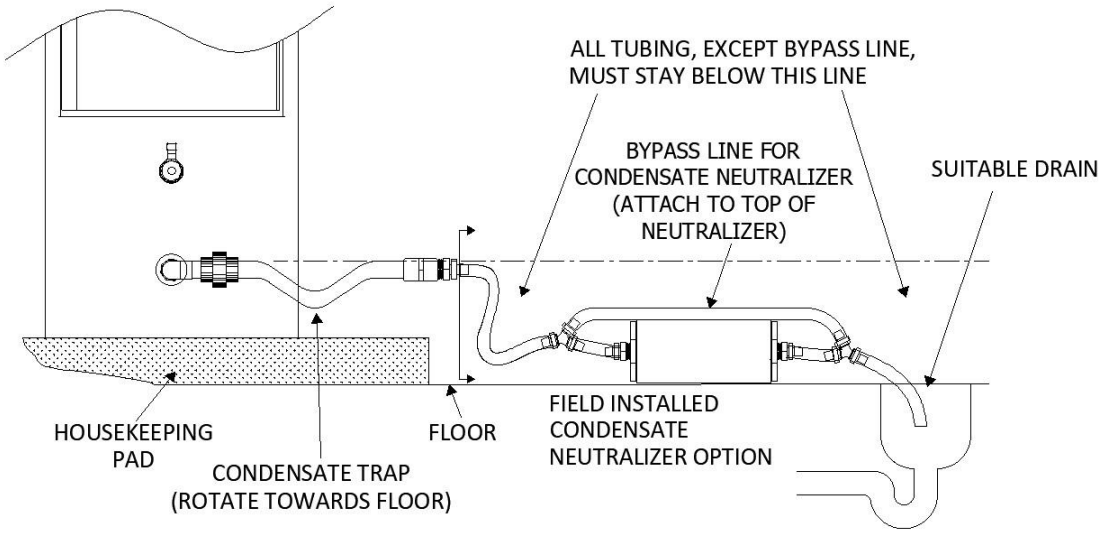


Figure 5-4 Condensate Trap with Condensate Neutralizer Located <u>BELOW</u> the Water Heaters

6. GAS SUPPLY AND PIPING

Verify the type of gas specified on rating plate is supplied to the Water Heater. It is designed for operation up to 2000 feet altitude. The Lync LC-N Water Heating Solution's Btu/h input derates 4% per 1000 feet elevation above sea level. Consult Factory for installations above 2000 feet elevation.

6.1. Gas Train and Controls Certification

NOTE: The **Water Heater**'s gas train and controls assembly have been tested under the applicable Nationally Recognized Standard to comply with safety and performance criteria such as ignition, combustion and safety shutdown operation.

6.2. Gas Control Trains

All Water Heater models include the following gas control train components:

- Manual shutoff valve
- Two safety shutoff valves
- Zero governor type regulator
- Manual test valve
- Manifold pressure taps

These components may be separate or combined in a common housing.

WARNING!

Do not adjust or remove any screws or bolts on gas train control components which are secured with a red or blue sealing compound. In addition to voiding warranties and certification listings, such adjustment or disassembly can cause improper operation which could result in property damage, personal injury or death.

6.3. Inlet Pressure

Measure at the inlet pressure tap located at the main gas cock. The inlet pressure must remain within the minimum and maximum values while the Water Heater is at rest and while it is operating at maximum firing rate.

INLET PRESSURE	NAT. GAS
Maximum Static Pressure (Inches-Water Column)	14.0"
Minimum Flow Pressure (Inches-Water Column)	3.5"

6.4. Manifold Pressure

Measure at the pressure tap located on the downstream side of the manual valve closest to the burner. The rated manifold pressure appears on the product data label located near the front of Water Heaters.

6.5. Gas Piping Size

Do not use the gas pipe connection size to determine the gas supply piping. Designing and sizing a gas supply piping system requires consideration of many factors and must be done by a gas supply piping expert. Always follow NFPA 54 National Fuel Gas Code for gas pipe sizing and gas pipe system design. The following charts provide examples of some of the information used by the gas supply piping expert to determine proper pipe sizes.

Use the values in the following table to add the equivalent straight pipe for each elbow or tee to obtain the total distance from the meter:

CONVERT FITTINGS TO EQUIVALENT STRAIGHT PIPE*								
Diameter Fitting (inches)	¾"	1"	1¼"	1½"	2"	3"	4"	5"
Equivalent Length of Straight Pipe (feet)	2'	2'	3'	4'	5'	10'	14'	20'

MULTIPLE WATER HEATER INSTALLATIONS, SCHEDULE 40 METALLIC GAS PIPE SIZE*														
Nominal Iron Pipe Size	*Length of Pipe in Straight Feet*													
	10	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**	**125**	**150**	**175**	**200**
3/4"	369	256	205	174	155	141	128	121	113	106	95	86	79	74
1”	697	477	384	328	292	267	246	256	210	200	179	164	149	138
1 1/4"	1400	974	789	677	595	543	502	472	441	410	369	333	308	287
1 1/2"	2150	1500	1210	1020	923	830	769	707	666	636	564	513	472	441
2”	4100	2820	2260	1950	1720	1560	1440	1330	1250	1180	1100	974	871	820

**Maximum Capacity of Pipe in Thousands of Btu/hr's per hour for gas pressures of 14 Inches Water Column (0.5 PSIG) or less and a pressure drop of 0.05 Inch Water Column (Based on NAT GAS, 1025BTU's per Cubic Foot of Gas and 0.60 Specific Gravity).*

6.6. Water Heater Isolation During Gas Supply Piping Pressure Test

1. Water Heaters and their provided manual shutoff valves must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ PSI (3.5 kPa).
2. Water Heaters must be isolated from the gas supply piping system by closing their individual manual shutoff valves during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ PSI (3.5 kPa).
3. Water Heaters and their gas connections must be leak-tested before operation.

6.7. Gas Connection

1. Safe operation of Water Heaters require adequate gas supply with the required static and dynamic (flow) pressures. Actual piping selection depends on many variables that must be carefully considered by the gas piping system designer.

2. Do not select gas pipe sizes based only on the supplied tables. These tables are for use by the gas piping system designer as a reference in checking pipe size selections.
3. Gas pipe size may be larger than the Water Heater's connection.
4. Installation of a union is suggested for ease of service.
5. Install a manual main gas shutoff valve on the gas supply piping connected to each Water Heater to isolate the burner and gas train from the main supply gas in compliance with NFPA 54 National Fuel Gas Code and most local Codes.
6. The gas system installer must clearly identify the emergency shut-off device.
7. A sediment trap (drip leg) MUST be provided in the inlet of the gas connection to the Lync LC-N Water Heating Solution.

The combination gas valve contains an internal venter. Venting to outdoors is not allowed.

7. COMBUSTION AND VENTILATION AIR

Provisions for adequate combustion and ventilation air to the mechanical room must be in accordance with Section “Air for Combustion and Ventilation” in the latest edition of the NFPA 54 National Fuel Gas Code, ANSI Z223.1 and/or CSA B149.1, Natural Gas and Propane Installation Code or applicable provisions of the local building codes. Any method addressed in NFPA 54 National Fuel Gas Code section “Air for Combustion and Ventilation is acceptable and several are outlined below.

7.1. Equipment Located In Confined Spaces

A Lync LC-N Water Heating Solution located in a confined space requires two openings, one commencing within 12" (30.5 cm) from the top of the enclosure/room and one commencing within 12" from bottom of the enclosure/room to assure adequate combustion air and proper ventilation. The total input of all gas utilization equipment installed in the room must be used to determine the required minimum air volume needed for combustion, ventilation and dilution of flue gasses. Also consider makeup air requirements from other equipment within the mechanical room or other rooms that are pressure connected with the mechanical room. Some examples of other makeup air requirements are from kitchen exhaust hoods, clothes dryers, powered exhaust fans, etc.

All Air From Outdoors: Each opening requires a minimum free area of 1 square inch per 4000 Btu/hr. of the total input rating of all Water Heaters in the enclosure, if directly communicating with the outdoors or communicating to the outdoors through vertical ducts.

Each opening requires a minimum free area of 1 square inch per 2000 Btu/hr. of the total input rating of all Water Heaters in the enclosure, if communicating with the outdoors through horizontal ducts.

All Air From Inside The Building: Follow the requirements of NFPA 54 National Fuel Gas Code, ANSI Z223.1 section “Indoor Combustion Air”.

Combination Of Air From Indoors and Outdoors: Follow the requirements of NFPA National Fuel Gas Code, ANSI Z223.1 section “Combination Indoor and Outdoor Combustion Air”.

From Outdoors Through One Opening: Follow the requirements of NFPA National Fuel Gas Code, ANSI Z223.1 section “One Permanent Opening Method”.

NOTE: The Lync LC-N Water Heating Solution may be installed with a remote air intake system, which uses a make-up air duct to draw combustion air directly from outdoors.

WARNING!

Adequate clean combustion air must be provided to the Water Heaters. They must never operate under a negative pressure. Particular care must be taken when exhaust fans, compressors, air handling units, etc. may rob air from the Water Heaters. The combustion air supply must be completely free of any chemicals or fumes, which may be corrosive to Water Heaters. Some common chemical fumes to avoid are fluorocarbons and other halogenated compounds, most commonly present as refrigerants or solvents, such as Freon, trichloroethylene, perchlorethylene, chlorine, etc. These chemicals, when in contact with the equipment or when burned, form acids which quickly attack the tubes, flue collector, stack and other appliance and auxiliary equipment. Failure to provide adequate clean combustion air or operating under negative pressure can cause premature, unwarranted product failure or unsafe operation producing carbon monoxide that could escape into the building. Exposure to carbon monoxide can lead to personal injury or death.

7.2. Maximum Allowed Remote Combustion Air Inlet Length (Equivalent Length)

A vertical or horizontal remote air inlet system can be connected to the Water Heaters without modification. The maximum length of field supplied single wall pipe, such as galvanized ventilation pipe, is shown in the chart below titled Maximum Air Inlet Duct Equivalent Length. Use metal tape or RTV sealant to seal each pipe joint.

Maximum Air Inlet Duct Equivalent Length / Max Elbows			
Duct Size	**3" Duct**	**4" Duct**	**6" Duct**
Max Equivalent Length Model 20	100 feet / 5	140 feet /6	180 feet /6

To determine the maximum straight length of duct allowed, use the Duct Fitting Equivalent Length chart below to find the total equivalent length for all duct fittings in your combustion air system. Then subtract this number of fee from the total equivalent length allowed in Maximum Air Inlet Duct Equivalent Length chart above. The sum of this calculation is the maximum length of straight duct allowed. If a longer length is required, repeat the calculation using a larger duct size. No additional deduction is required for the addition of the duct system terminal.

Duct Fitting Equivalent Length for Individual Ducting			
Duct Pipe:	**3" Duct**	**4" Duct**	**6" Duct**
90º Elbow	9 feet	7 feet	5 feet
90º Long Radius Elbow	6 feet	5 feet	3 feet
45º Elbow	5 feet	4 feet	3 feet

The following remote air duct information is provided for use in design calculations, if needed.

Remote Air Duct Specifications	
Input MBtu/hr.	**Required Air (SCFM)**
199	**44**

7.3. Remote Combustion Air Cap

A suitable remote air termination must be used to prevent water, debris, animals or obstructing material from entering the remote air supply.

7.4. Vertical or Horizontal Remote Air Duct Termination

- Air inlet must be located no less than 3 feet (0.91m) below the exhaust terminal if they are within 10 feet (3.05 m) of each other, unless the flue outlet terminates with a straight discharge. If the flue outlet terminates with a straight discharge, the air inlet can be located no less than 18 inches (0.46m) below the exhaust terminal.
- If terminating through the roof, the air inlet must terminate at least 12 inches (0.3 m) above roof level and at least 12 inches (0.3 m) above snow levels.
- If terminating through a sidewall, the air inlet must terminate at least 12 inches (0.3 m) above grade and/or at least 12 inches (0.3 m) above possible snow levels.

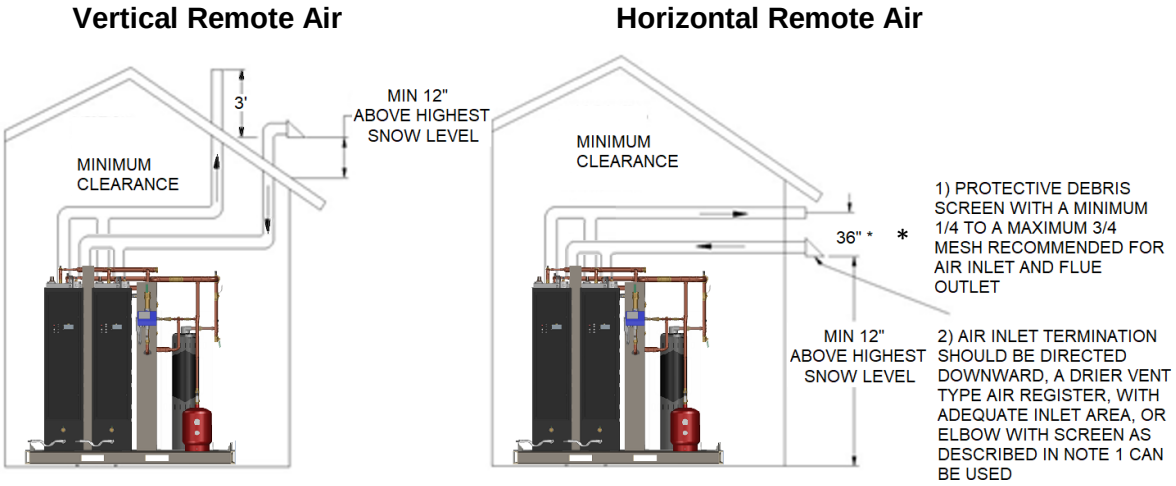


Figure 7–1 Venting Options

***** When the flue outlet is terminated with a straight discharge, separation of terminations must be a minimum of 18".

** **CAUTION**: Remote air and flue outlet should be terminated on the same pressure zone.

7.5. Combining Remote Air Ducting

The Lync LC-N Water Heating Solution **must** have **separate** intake piping, unless the air inlet piping, exhaust duct and other system considerations have been fully evaluated by Lync Systems Engineering. Before operation of a combined remote air ducting system, all of the duct design firm's system installation and operation requirements must be in place, their instructions followed and the system must be properly maintained.

The Lync LC-N Water Heating Solution air intake piping must incorporate a variable speed blower capable of providing and regulating positive pressure air supplied to all Water Heaters in the system. The pressure of the supplied air must not be less than 0.0" W.C. and must not exceed 0.25" W.C.

The common combustion air supply system must be interlocked, so the Water Heaters will not begin operation until the common combustion air supply is proved to be within the range of 0.0 to 0.25" W.C.

WARNING!

Do not combine remote air ducting of multiple Water Heaters into a single remote air duct unless isolation dampers have been installed and the combined remote air duct system is installed, operated and maintained following manufacturer instructions. Combining remote air ducting without following these requirements can result in failure of Water Heaters and venting system and/or exposure to carbon monoxide and can result in property damage, personal injury or death.

8. VENTING

8.1. Venting Water Heaters

All LC-N Water Heater models use the positive pressure generated by the burner system blower to push combustion products out of the vent. Since the vent system is under positive pressure and must be capable of containing condensate, it must be constructed of schedule 40 solid PVC or CPVC pipe. Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenylsulfone) in nonmetallic venting systems is prohibited. Polypropylene or single or double wall stainless steel venting listed by ETL, UL, ULC or CSA for Category IV positive pressure gas appliance venting may be used instead of solid PVC or CPVC plastic pipe venting.

WARNING!

If the cold inlet water temperature is above 100°F, then solid CPVC or ETL, UL, ULC or CSA listed polypropylene or stainless steel venting is required and the vent limit switch must be adjusted for the higher temperature rating allowed by these vent materials. (See Section 10.6 – Changing the Vent Material Type.)

Follow the instructions below for installing solid PVC or CPVC pipe. For other listed vent materials, follow the vent manufacturer's instructions for installation, sealing, supporting and terminating their vent system. Covering non-metallic vent pipe and fittings with thermal insulation is prohibited.

The 3" CPVC vent pipe that exits the top of each Water Heater can be connected to 3" PVC or CPVC pipe coupling or elbow. A reducer coupling may also be used to accommodate larger vent pipe. (See Maximum Vent Length tables). Do not use a barometric damper with the positive pressure vent.

Water Heaters can be vented either vertically, through a ceiling or roof, or horizontally through a wall. Water Heaters are a Category IV positive pressure gas appliance venting and can be routed to the outdoors in any direction, from the flue outlet of the water heater, except down. The vent must be installed and supported at least every four feet to slope downward toward the water heater's vent connection with at least ¼ inch drop per linear foot of horizontal vent run, to allow proper drainage of accumulated condensation. The venting system shall also have a means for collection and disposal of condensate. All penetrations through walls and roofs must be weather and gas tight, such that rain and products of combustion cannot pass from outdoors back indoors.

Additional steps required when venting with solid PVC or CPVC pipe:

1. Read and follow the information, instructions and warnings above.
2. Do not insulate the plastic vent pipe.
3. Design the vent pipe route so that normal expansion (pipe getting longer) and contraction (pipe getting shorter), due to on and off temperatures, does not bind or put stress on cemented pipe fittings.
4. A 3" pipe coupling or elbow must always be the first fitting attached to the water heater's vent connection when using a PVC or CPVC vent system. If a listed stainless steel or polypropylene Category IV vent system is used, the correct adapter for attaching and sealing to the 3.5" O.D. vent connection must be obtained from the manufacturer of the vent system to be installed.
5. For PVC or CPVC, dry-fit the 3" pipe coupling onto the water heater's vent connector. Then remove the coupling and apply a primer and glue suitable for CPVC and the chosen vent material to create an air tight seal.

6. Clean and deburr all solid PVC or CPVC pipe ends, then trial assemble the entire vent system vent before joining with cement. Mark the pipe and fittings to identify their locations, then disassemble. Reassemble the vent system using fresh PVC cement to connect PVC pipe and fresh CPVC cement to connect CPVC pipe. If both solid PVC and solid CPVC pipe are used in the same vent system, all joints between the two types of pipe must be made with fresh cement suitable for both materials. Follow the cement manufacturer's instructions for making sound air and water tight joints.
7. **Vent support** – For PVC or CPVC, the vent system must be supported at intervals no greater than four feet, to prevent sagging, distortion and stress on pipe fittings. Vertical pipe must also be supported to avoid stress on all cemented pipe fittings and to prevent putting excessive weight on the Water Heater's vent connection. For listed stainless steel or polypropylene vent system, follow the vent system manufacturer's instructions.
8. **Testing for leaks** – Once the vent system is installed, it must be checked to confirm all joints in the vent system are air and water tight. After the vent is assembled, close the end of the vent with a taped plastic bag or some other temporary closure. With the gas supply turned off, energize the Water Heater's combustion blower to apply air pressure to the vent system. Spray each joint and vent connection with commercially available leak detection liquid to confirm no air is escaping from any point. Repair any leaks and retest. After testing is complete, de-energize the combustion blower, wipe clean the leak detection liquid and REMOVE the temporary vent closure.
9. The vent pipe must be sealed at the point where it passes through a wall or roof, to prevent rain, insects or flue products from entering the living space or interior of the building.
10. For proper vent operation and to protect the gas vent from wind and weather, attach a UL listed vent termination to the outdoor end of the vent or otherwise provide suitable termination to prevent wind, water, debris or animals from obstructing or entering the vent. The vent for Water Heaters shall not terminate:
    - Over public walkways; or
    - Near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property damage; or
    - Where condensate vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.
11. Do not use a barometric damper with the Water Heater's venting system. Barometric dampers are designed for use with certain Category I negative pressure vent systems. Water Heaters use certain Category IV positive pressure vent systems and will not operate safely with a barometric damper.

WARNING!

Use only solid PVC or CPVC pipe or use Polypropylene or stainless steel venting (single or double wall) listed by a nationally recognized testing laboratory for Category IV positive pressure gas appliance venting. Use of ABS pipe, or use of PVC or CPVC pipe with cell/foam type construction or use of use of venting materials other than specified in these instructions can result in failure of the venting system and/or exposure to carbon monoxide or other toxic fumes, which can result in property damage, personal injury or death.

Do **not** vent Water Heaters into an existing or traditional gas vent or chimney, do not combine the vent with any other appliance and do not use a barometric damper in the vent. Such venting could result in failure of the venting system and/or exposure to carbon monoxide which can result in property damage, personal injury or death.

8.2. Maximum Vent Length (Equivalent Length)

The maximum length of field supplied Category IV vent is shown in the chart below:

Maximum Allowable Equivalent Vent Length / Max Elbows			
Duct Size	**3" Duct**	**4" Duct**	**6" Duct**
Max Equivalent Length Model 20	90 feet / 5	140 feet / 6	180 feet / 6

Pipe fittings reduce the maximum allowable vent length. Use the Category IV vent manufacturer's equivalent length deduction for all elbows, terminations, etc. If the information is not readily available from the vent manufacturer, use the Vent Fitting Equivalent Length chart below to find the total equivalent length for all vent fittings in your combustion air system. Then subtract this number of feet from the total equivalent length allowed in Maximum Category IV Vent Equivalent Length chart above. The sum of this calculation is the maximum length of straight vent allowed. If a longer length is required, repeat the calculation using a larger vent size. When using this chart, no additional deduction is required for the addition of the vent system terminal.

Vent Pipe Fitting Equivalent Length					
Vent Pipe:	**PP * 3" Vent**	**Other ** 3" Vent**	**PP * 4" Vent**	**Other ** 4" Vent**	**PP * 6" Vent**
90º Elbow	10 feet	9 feet	8 feet	7 feet	6 feet
90º Long Radius Elbow	7 feet	6 feet	6 feet	5 feet	4 feet
45º Elbow	6 feet	5 feet	5 feet	4 feet	4 feet

* PP = polypropylene ** Other = PVC, CPVC or Stainless Steel

The following vent information is provided for use in design calculations, if needed:

Venting Specifications		
Input MBtu/h	**Combustion Air Volume (cfm)**	**Max Vent Press. " W.C.**
199	**68**	**0.3**

8.3. Vertical or Horizontal Vent Termination Requirements

1. The vent terminal must have a minimum clearance of 4 feet (1.22 m) horizontally from, and in no case be located above or below, unless a 4 foot (1.22 m) horizontal distance is maintained from electric meters, gas meters, regulators and relief equipment.
2. The vent cap must terminate at least 3 feet (0.91 m) above any forced air inlet within 10 feet (3.05 m).
3. The vent shall terminate at least 4 feet (1.22 m) below, 4 feet (1.22 m) horizontally from or 1 foot (0.3 m) above any door, window or building air inlet to the building.
4. The vent system shall terminate at least 1 foot (0.3 m) above grade and at least 1 foot (0.3m) above possible snow accumulation levels and shall terminate at least 7 feet (2.13 m) above grade when located adjacent to public walkways or gathering areas.
5. To avoid a blocked flue condition, keep the vent cap clear of snow, ice, leaves, debris, etc.

6. The vent must not exit over a public walkway, near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property or could be detrimental to the operation of regulators, relief valves or other equipment.
7. A horizontal vent must extend one foot beyond the wall.
8. A horizontal vent terminal must not be installed closer than 3 feet (0.91m) from an inside corner of an L-shaped structure.
9. A vertical vent must exhaust outside the building at least 3 feet (0.91m) above the point of the exit and at least 2 feet (0.61 m) above the highest point of the roof within a 10-foot (3.05 m) radius of the termination.
10. A vertical termination less than 10 feet (0.91 m) from a parapet wall must be a minimum of 2 feet (0.61 m) higher than the parapet wall.

8.4. Combining Category IV Vents

1. Combined water heater Category IV gas vent systems must incorporate an Exhaust to Tjernlund, or US Draft variable speed, modulating, mechanical draft inducer capable of maintaining the appropriate negative draft at the end of the common flue, to assure that all water heaters in the combined vent system operate with a negative draft. **Do not exceed negative 0.25" W.C.** See “Combining Vents with a Draft Inducer” illustration below.
2. Combining the exhaust vents of multiple Water Heaters into a common, unpowered or “gravity” vent (i.e. venting as Category II) is *NOT* recommended unless approved by Lync System Engineering. Water Heaters are too efficient and their flue products are too cold to generate the natural buoyancy required for such combined vent systems to function reliably and safely.
3. The common mechanical draft vent system must be interlocked, so the water heaters will not begin operation until the common mechanical draft vent system negative pressure is proved to be within the range of 0.04" and 0.25" W.C. When combining the exhausts of multiple Water Heaters, do not use individual remote ducts to provide outdoor combustion air.
4. When exhaust vents are combined, it is necessary to either:
   a) Draw all combustion air for each Water Heater from the mechanical room in which they are installed, or
   b) Use a common air supply system designed and installed by a qualified professional that meets all the requirements contained in Subsection **Combining Remote Air Ducting**, which is located in Section 7: **COMBUSTION AND VENTILATION AIR** of this manual.

WARNING!

Do **not** connect multiple Water Heater vents into a single unpowered or fixed speed powered vent unless specifically approved by Lync Systems Engineering. This could cause unsafe operation and the potential for poisonous carbon monoxide to enter occupied areas. Such improper installation can cause property damage, exposure to hazardous materials, personal injury or death.

8.5. Concentric Vent for Combustion Air and Exhausting Flue Products

To provide a single sidewall or roof penetration that can provide both combustion air and flue exhaust termination, each Water Heater must be installed using an IPEX System 636™ Concentric Vent Termination Kit. Both the IPEX System 636™ PVC and CPVC Flue Gas

Venting Systems are third party tested and listed to ULC S636 and comply with the non-metallic vent listing requirements in CSA B149.1 Natural Gas and Propane Installation Code.

The following IPEX System 636™ Concentric Vent Termination Kits are available from your local Lync representative:

Part No.	Description	
150862	KIT,VENT CONCENTRIC 4 PVC	IPEX #196021 for PVC (4" x 36")
150862	KIT,VENT CONCENTRIC 4 CPVC	IPEX #397713 for CPVC (4" x 36")
150863	KIT,VENT CONCENTRIC 3 PVC	IPEX #196106 for PVC (3" x 32")
150863	KIT,VENT CONCENTRIC 3 CPVC	IPEX #397711 for CPVC (3" x 32")

Each IPEX 636 System vent kit includes or specifies the required pipe, fittings, hardware, adhesives and Installation instructions. Follow the IPEX Installation instructions and use only the materials and adhesives it specifies. Additional copies of the Installation Guide for the IPEX System concentric vent kit and additional information is available from your local Lync representative.

When using concentric vent termination kits, all combustion air duct, all exhaust vent pipes and the IPEX concentric vent kit material types must be the same. If the Lync LC-N Water Heating Solution is installed with a PVC exhaust vent pipe, then the combustion air duct and the IPEX concentric vent kit must also be made of PVC. If the Lync LC-N Water Heating Solution is installed with a CPVC exhaust vent pipe, then the combustion air duct and the IPEX concentric vent kit must also be made of CPVC.

WARNING!

Follow the Installation instructions, termination requirements and, if applicable, multiple concentric vent kit spacing requirements provided with the listed IPEX Concentric Vent Kit. Also, must use only the pipe, fittings and cement included or specified in the IPEX installation instructions. Failure to follow the IPEX installation instructions or to use pipe, fittings or cement not included or specified in the IPEX installation instructions could result in an unreliable vent assembly or installation that can cause the potential for hazardous products of combustion to enter occupied areas and can cause property damage, exposure to hazardous materials, personal injury or death.

The following information describes the components for the IPEX System Concentric Vent Termination Kit:

ITEM NO.	DESCRIPTION
1.	Wye-(Concentric)
2.	Rain Cap
3.	Exhaust Vent Pipe (Inner)
4.	Fresh Air Intake Pipe (Outer)
5.	Stainless Steel Screw & Nut

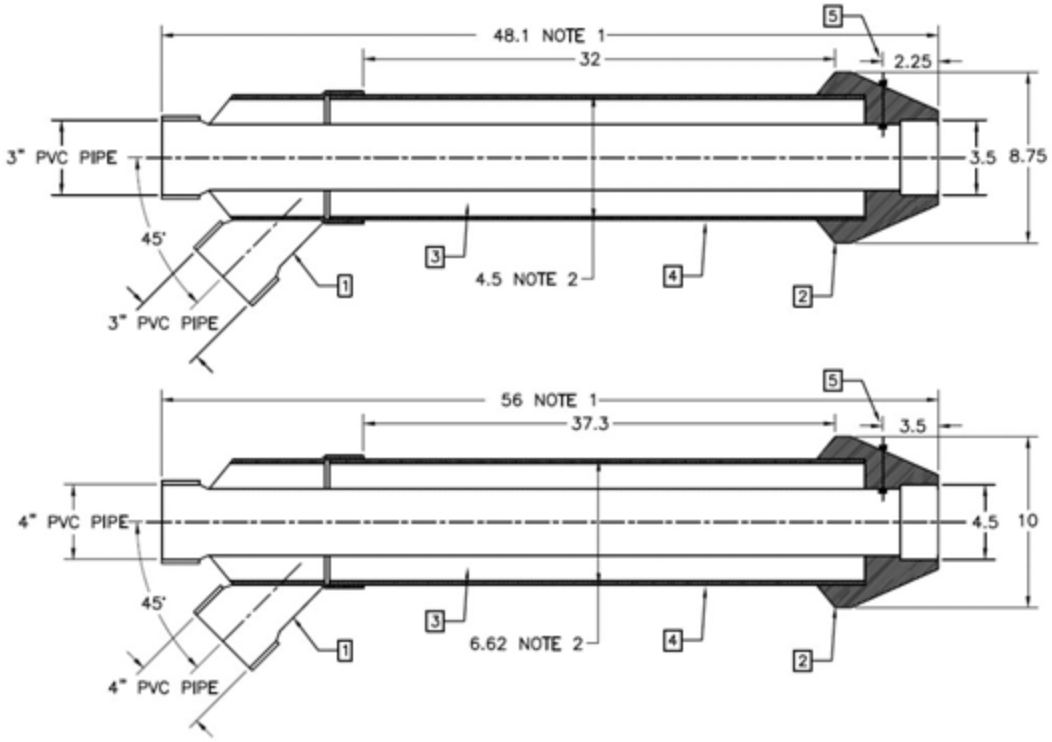


Figure 8-1 Concentric Vent Dimensions

NOTE: Dimension may be shortened to a minimum of 12". Inner pipe (item 3) must remain 10 inches longer than the outer pipe (item 4). Cut pipe ends square and solvent cement as outlined in the System 636 installation manual.

NOTE: Installation cutout should be at least 7 1/8". Lengthening the units is not permitted.

Concentric Vent Connections to the Vent pipe and Remote Air Inlet Duct

1. Water Heaters can obtain combustion air and exhaust products of combustion through 3, 4 or 6" exhaust IPEX System 636 Concentric Vent Termination Kit.
2. Do not exceed the maximum allowed combustion air duct and vent pipe equivalent lengths provided in this Installation & Maintenance Manual. Remember to include the IPEX System 636 Concentric Vent Termination Kit in the maximum equivalent calculation. When calculating the additional length added by the IPEX kit, use the diameter of the IPEX kit combustion air duct connection as the combustion air duct diameter.
3. Select a concentric vent kit from the list above that matches the material type of the water heater's flue gas pipe, as described above, and is the same size as the flue gas pipe, except that six inch venting can be used with a 4" IPEX concentric vent kit when installed as described in the following instruction.
4. When using an IPEX System 636 Concentric Vent Termination Kit connected to 6" PVC or CPVC vent and remote air duct, use locally available fittings of the same material as the Kit to reduce from 6" to 4", immediately before connecting to a 4" IPEX Concentric Vent termination Kit. The reduction from 6" to 4" does not change the maximum allowed equivalent vent length or the maximum number of elbows for 6" pipe.

Concentric Vent Kit Assembly, Installation and Support

1. Follow the concentric vent kit instructions to properly assemble the kit.
2. Follow the concentric vent kit instructions to locate and cut a hole in the roof or wall large enough to accommodate the largest dimension of the kit. The size of the hole can vary greatly, depending on the roof pitch.
3. For the IPEX System 636 Concentric Vent Kit, following the procedures outlined in the System 636 Installation Guide:
   a) Use the solvent cement specified in the installation guide to connect the inner pipe to the concentric Wye fitting, then connect the outer pipe to the concentric Wye fitting using the specified solvent cement.
   b) Slide the assembly through the roof or wall penetration. (Install flashing if needed)
   c) Kits must be securely fastened to structure, to ensure dimensions shown below are maintained.
   d) Straps are field supplied. Use straps, clamps or equivalent that will not score or damage the pipe. Do not constrain or clamp the vent system anywhere between the Water Heater and the vent termination point such that it is unable to expand or contract as it heats and cools during operation.
   e) The weight of the concentric kits must be supported by clamps/straps and not by the vent system it connects to.
   f) All penetrations must be sealed according to local building codes. Caulking for side wall terminations and flashing for roof penetrations are typical. Use only PVC/CPVC compatible sealing material, contact IPEX for a complete list
   g) Attach the rain cap. To mechanically attach the rain cap to allow for removal and cleaning the cap, follow the instructions located in the section titled **Mechanically Fastened Rain Cap**. The rain cap can also be permanently attached to the inner pipe with the solvent cement specified in the Installation Guide. Whether mechanically or permanently attached, the outer pipe is only a friction fit with the cap.
   h) Once the rain cap is installed and the kit secured, the kit can be connected to the venting system.
   i) For multiple horizontal installations, keep Concentric Vent Kit gaps close (up to 4" apart) or over 24" apart.
   j) When installing three or more horizontal vents, consult the IPEX 636 installation manual.
   k) If additional System 636 Concentric Vent Termination Kit assembly or installation guidance is needed, contact IPEX at **www.ipexinc.com**.

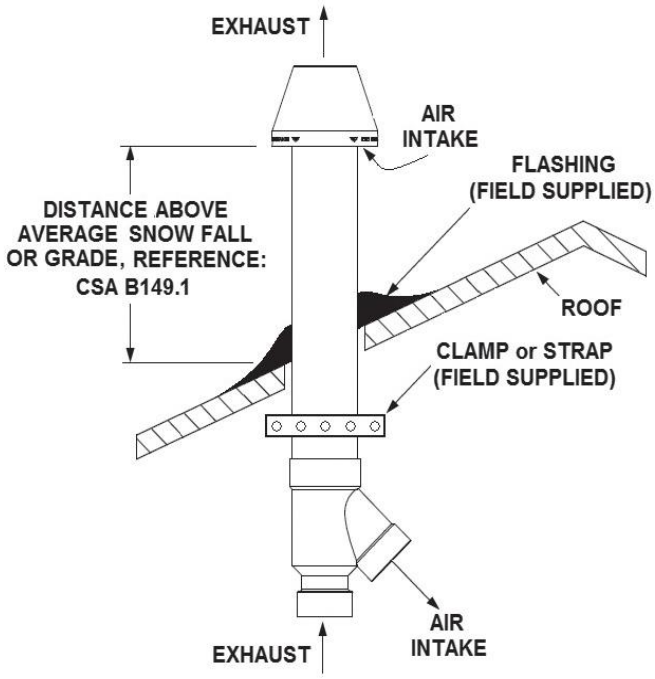


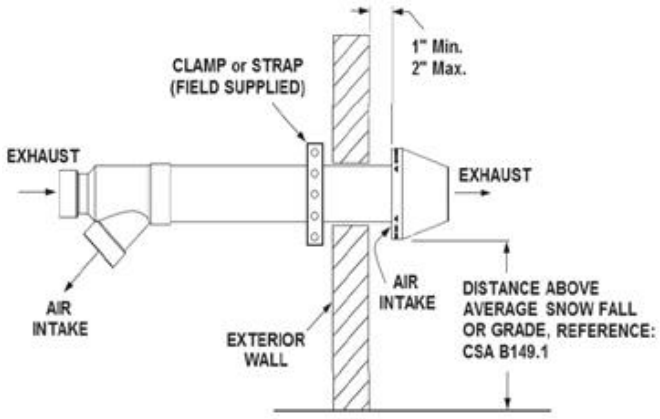
Figure 8-2 Roof Termination

Mechanically Fastened Rain Cap

The Rain Cap must be installed with the supplied stainless-steel screw and lock nut, and in accordance with instructions and diagram below.

1. Locate the drill location dimple on the outside of the rain cap.
2. At this location, drill through the cap and the inner pipe wall. Ensure that the path of the hole is perpendicular to the inner pipe NOT the outside of the cap. For the 3" kit, drill a 3/16" hole, for the 4" kit, a 1/4" hole.
3. Insert the screw and tighten the bolt, do not over tighten.

Wall Termination



Sidewall Termination for Multiple **Horizontal Concentric Vent**

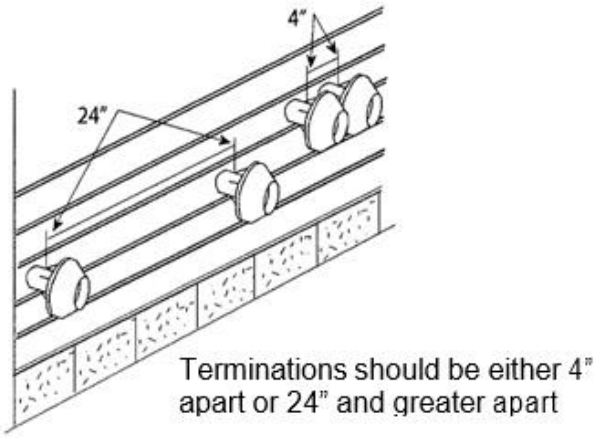


Figure 8-3 Rain Caps

NOTE: Keep gaps up to 4" apart or over 24" apart as shown above. See instructions with kit.

8.6. Connecting to an Existing Vent System

Do not connect the Lync LC-N Water Heating Solution to an existing vent system until it has been confirmed that the existing vent system complies with all requirements for a new vent system. A venting system in full compliance with the instructions provided in this manual is required for safe and reliable operation of Water Heaters. Do not connect the Lync LC-N Water Heating Solution to a masonry chimney.

WARNING!

Before operating Water Heaters connected to an existing vent system, confirm the vent system complies with all guidance and requirements for a new vent system specified in this manual. Failure to confirm the existing vent system complies can result in unsafe operation and the potential for poisonous carbon monoxide to enter occupied areas and can cause property damage, personal injury, exposure to hazardous materials or death.

9. OPERATING AND SAFETY CONTROLS

9.1. Temperature and Pressure Relief Valve(s)

A Temperature and Pressure Relief Valve(s) sized in accordance with the ASME Boiler and Pressure Vessel Code, Section IV HLW is installed in the tank.

WARNING!

Secure the relief valve discharge pipe to a suitable floor drain so hot water does not splash during discharge. If relief valve discharge pipe is not routed and secured to a suitable drain, hot water discharge can result in property damage, scalding and personal injury or death.

- Follow the temperature and pressure relief valve manufacturer's installation instructions and all local, regional and national codes applicable to temperature and pressure relief valve installation and discharge piping.
- The relief valve discharge pipe must not be smaller than the relief valve opening and must be secured to prevent it from lifting out of the drain under discharge pressure and must be routed to allow complete drainage of the valve and line.
- Do not plug the relief valves or install a reducing coupling, valve or other restriction in the relief valves discharge lines, as this will eliminate the critical water temperature and pressure protection it provides.
- Thermal Expansion - A relief valve may periodically discharge due to thermal expansion if installed in a system closed by components, such as a backflow preventer or check valve in the cold water supply. These systems must be provided with means to control expansion. Contact a water heater or plumbing professional to resolve this situation.

WARNING!

Do not plug relief valve(s), use discharge piping smaller than relief valve opening or install a reducing coupling, valve or other restriction in relief valve discharge line. Failure to comply with these requirements can prevent the relief valve from providing its intended temperature and pressure protection, which can result in a sudden loss of pressure containment that can cause property damage, exposure to hazardous materials, personal injury or death.

9.2. Cathodic Protection

Water Heaters do not utilize cathodic protection. However, in hot water systems utilizing cathodic protection, hydrogen gas can be produced when the hot water system has not been used for a long period of time (generally two weeks or more). **Hydrogen gas is extremely flammable.** To prevent the possibility of injury under these conditions, one of the hot water system faucets should be opened for several minutes before using any electrical device connected to the hot water system. If hydrogen is present, there will be an unusual sound such as air escaping through the pipe as the hot water begins to flow. Do not smoke, have open flames or turn electrical switches on or off near the faucet at the time it is open.

9.3. Electronic Low Water Cut-Off

When the water level is above the electrode position in the tank, the Reset pushbutton will energize the control (LED will be lit). The control remains energized until the water level drops below the electrode position (LED will not be lit). Unless otherwise specified, there is a three-second time delay on decreasing level. Water level must be below tank probe location for full three seconds before control de-energizes. In the event that a low water condition occurs, a failure message will be displayed on the controller touch-screen. This failure lockout can be

reset by pressing the LWCO RESET button located on the front control panel. Once the LWCO control board has been reset, the Main Reset button located on the front control panel can be reset as well.

The Electronic Low Water Cut-Off probe is located in the top head of each Water Heater.

WARNING!

Turn off all electrical service when accessing the limit or other controls located inside the control cabinet or inside the burner vestibule inside the top of the Water Heaters. Close and fasten the control cabinet and burner vestibule cover before restoring electrical service to Water Heaters. The cabinet and burner vestibule contain High Voltage wiring and terminals. If electrical service is not turned off and these terminals are touched, a dangerous shock causing property damage, personal injury or death may occur.

9.4. Operating Temperature Control

An adjustable digital operating control is located in the front control panel. The control is factory pre-set at approximately 120°F. See the Electronic Operating System section in this manual for more information.

9.5. High Water Temperature Limit

The Electronic Operating Control System (EOS) includes a single probe that contains the limit and the operating sensor. Since both sensors are in the same location in the heated storage tank, the EOS checks to be sure their output is within a degree or two of each other. If not, or if the maximum water temperature exceeds 200ºF, the EOS will lockout and the manual reset button on the control panel must be pressed before the water heater will resume operation.

10. THE ELECTRONIC OPERATING SYSTEM (EOS)

The electronic operating system (EOS) on each Water Heater consists of three components:

- The Platform Ignition Module (PIM)
- A plug-in ID card,
- The Control Display.

The PIM is connected to the control display using an RJ485 patch cable. All communication between the PIM and control display as well as the power to the control display is through this cable.

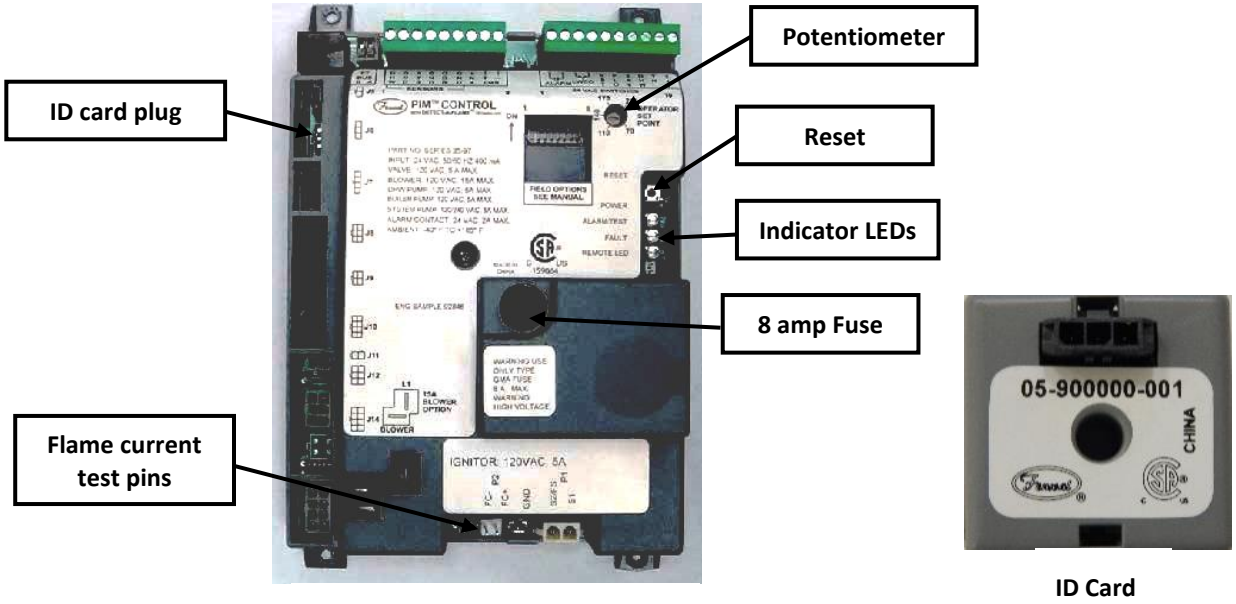


***Figure 10-1** Platform Ignition Module (PIM)*

Home Button
Return to the 'Home' Screen from any menu. Press and hold for 3 seconds to access the programming menus.

Digital Control Display with Touch Screen User Interface

Figure 10-2 Touch Screen User Interface (BTC II)

10.1. Touch Screen User Interface

The touchscreen of the EOS provides one touch access to view and adjust various Menu set points. The touchscreen displays Status Fields, Items, Water Heater Output and Number Fields. It also contains buttons for navigation & adjustment, and the Home Button to access menu selections.

10.2. Status Field Display

The Status Field displays the current operating status of the control display. Most items in the status field are only visible when in the View Menu or an alarm condition is present.

Item	Description
SANI	Sanitation Mode is active. Momentarily energizes a field installed sanitation pump and operates the water heater at an elevated set-point temperature.
HAND	Hand Mode has been activated in the Manual Override Menu. This function allows the user to manually control the operation and firing rate of the burner.
OFF	Indicates that the system has been disabled in the Manual Override Menu.
PURG	Purge mode - individual pumps have been activated in the Manual Override Menu.
IDLE	EOS is Idle due to no demand for heat.
ARSW	EOS is attempting to purge but waiting for the air proving switch to prove blower air flow.
PREP	The EOS is Pre-Purging the burner system.
IGN	Hot Surface Igniter is hot, gas valve has opened to attempt burner ignition (4 seconds).
BURN	The Burner has ignited and the flame has been sensed.
POST	The Call for Heat has ended and the EOS is Post-Purging the burner system.

10.3. Operational Sequence Field Display

Item	Value Displayed	Description
SATISFIED	**ºF**	No Call For Heat based on temperature sensed at control sensor at the top of the tank
CALL FOR	**HEAT**	Initiated when the temperature sensed at the control sensor at the top of the tank is 5° less than the setpoint temperature.
BLOWER	**mm:ss**	Displays the pre-purge time countdown until the igniter heat up begins
IGNITION	**mm:ss**	Displays heat up time until gas valve opens
CURRENT	**0 - 10.0 µA**	Flame Current (µA)
CTRL TEMP	**ºF**	Flame is established and the temperature sensed at the control sensor at the top of the tank is displayed.
BLOWER	**mm:ss**	When the call for heat has ended, the post purge time countdown is displayed.

10.4. View Menu

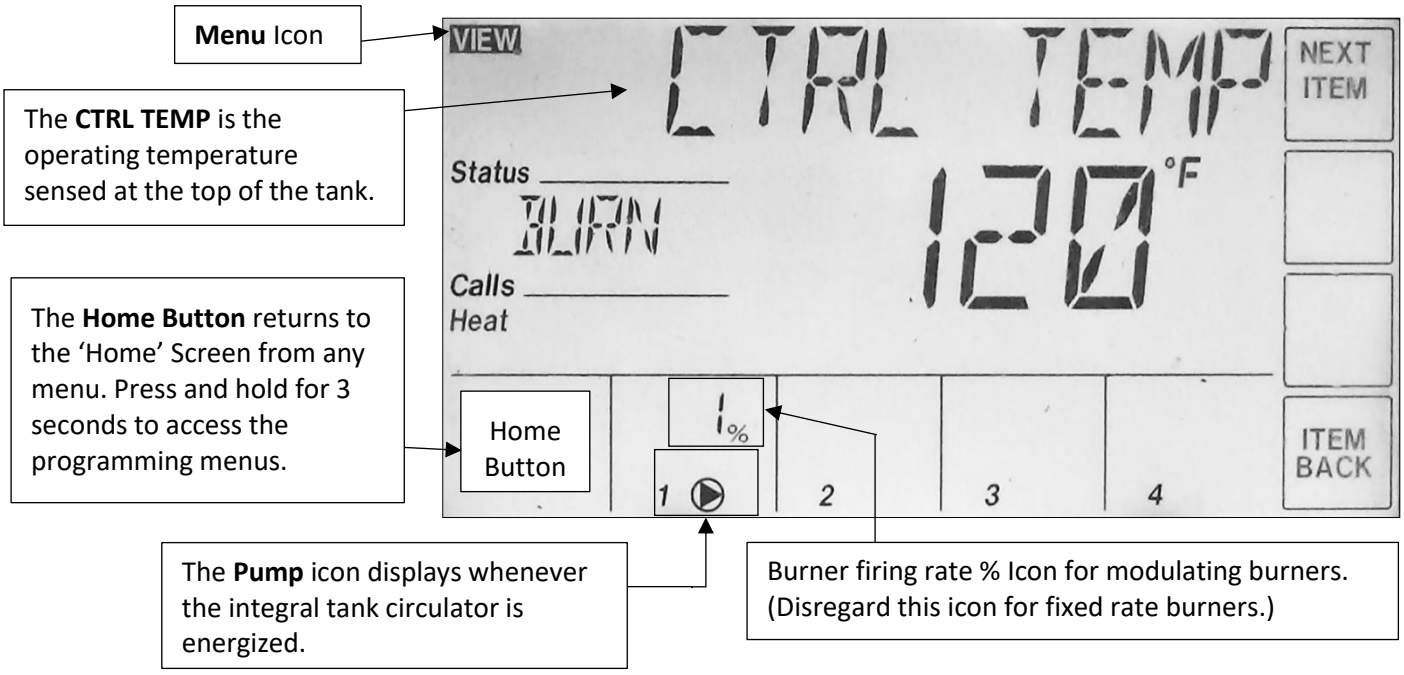


Figure 10-3 Home Screen - Default Display

The **VIEW** menu is the default display (home screen) of the EOS control system. The **View** menu displays general information about Water Heater operation and status. The default display includes a **Burner** firing rate % icon for modulating Water Heaters (disregard this icon for fixed rate burners), a **Pump** icon that is visible whenever the integral tank circulator is energized and Failure Messages if the unit is in an alarm or error condition.

Use the **NEXT ITEM** and **ITEM BACK** buttons to scroll and view the View Menu Item Fields and their associated values. The Item Field descriptions are listed below:

Item Field	Description
SETPOINT	Displays current operating set point (does not allow user to make changes in menu).
VENT	Displays flue gas temperature as measured by flue gas sensor in the flue outlet.
TANK TOP	Displays the current temperature at the top of the water heater tank as measured by the operating control sensor located near the hot outlet.
TANK BOT	Displays current temperature near bottom of water heater tank as measured by control sensor responsible for regulating operation of the integral tank circulator.
TANK ΔT	Displays temperature difference between TANK TOP and TANK BOT sensors.
FLAME CUR	Displays burner flame current in approximate µA dc. Since this is an approximation it is recommended that a flame current measurement be taken at the PIM control board using a micro-amp meter.
TIME	Displays the real time as programed in the TIME menu.

10.5. Control System Menus

The control display has multiple access levels. System critical settings will not be available for adjustment. The settings which can be adjusted by the user will display UP and DOWN adjustment arrows on the right side of the display screen. These programmable menu items are located in the Control System Menu.

To access the Control System Menu:

1. Press and hold the **HOME** button for 3 seconds.
2. Press **NEXT ITEM** to navigate to the next menu. Press **ITEM BACK** to go reverse.
3. Press **ENTER** to enter and change menu item settings in the control system menus.
4. Most settings are in the USER access level. Other settings will be located in the INSTaller or ADVanced access level depending on the need for field adjustment. See Section 10.12: *Using Tool Box Menu* for details.

Control System Menu Descriptions

Menu	Description
SETUP	Displays and modifies the temperature control set points for the burner, integral tank circulator and the SANI functions
SOURCE	Displays many factory programmed settings which can be adjusted by the user, indicated by the appearance of the up and down adjustment arrows
MONITOR	Displays operational information such as water and vent temperatures, hours of operation, and number of cycles
TIME	Sets time, day and year. Setting the clock is necessary when using the scheduled setback
SCHEDULE	Allows the user to create a schedule for reducing the water heater set point when a building is unoccupied for a period of time
NETWORK	Displays and modifies parameters for creating a Modbus communication connection with the water heater
OVERRIDE	Allows the user to assume manual control of the burner operation and pumps
TOOLBOX	Displays alarm message history. Changes User access level and reset to default settings

10.6. Changing the Vent Material Type (ADVanced Level Access)

If the cold inlet water temperature is above 100°F, the use of solid CPVC, Polypropylene or Stainless Steel venting is required and the vent limit switch must be adjusted for the higher temperature rating allowed by these vent materials.

1. From the **VIEW** menu, press and hold the **HOME** button for 3 seconds to enter the **CONTROL SYSTEM** menu. The first menu displayed is **SETUP** menu.
2. Press the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **TOOLBOX** menu.
3. Press the **ENTER** button to display the ACCESS screen.
4. Depending on the software version the ADVANCED level can be selected using the **UP** and **DOWN** arrow buttons. Subsequent software revisions will require that button #4 in the bottom right corner, be pressed and held in order to place the control in the ADVANCED access level.
5. Exit the menu by pressing the **HOME** button.

6. Use the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **SOURCE** menu.
7. Enter the **SOURCE** menu.
8. Use the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **VENT TYPE** menu.
9. Using the **UP** or **DOWN** arrow buttons, select between the four choices: PVC (default setting), PPS, CPVC or SS.
10. To save the new value press **NEXT ITEM** or **ITEM BACK** buttons or **HOME** button.

10.7. Changing the Operating Set Point (USER Level Access)

Water Heaters operate to satisfy the stored water temperature set point of the EOS control. The value of the controls' set point is the desired stored tank water temperature. The unit ships with a factory set point of 120ºF.

Water Heaters operate to satisfy the stored water temperature setpoint of the EOS control. The value of the controls' setpoint is the desired stored tank water temperature. Water Heaters ship with a factory setpoint of 120ºF.

Although the set point can be displayed in the VIEW menu, it is necessary to enter the **CONTROL SYSTEM** menu in order to make adjustments to the water heater set point and other operational parameters.

To Change the Water Heater Set Point:

1. From the **VIEW** menu, press and hold the **HOME** button for 3 seconds to enter the Control System Menu. The first menu displayed is the **SETUP** menu.
2. Press the **ENTER** button to display the **SETPOINT** menu.
3. Adjust the set point value using the **UP** and **DOWN** arrow buttons.
4. To save the new value, press the **NEXT ITEM** or **ITEM BACK** buttons or exit the menu by pressing the **HOME** button.

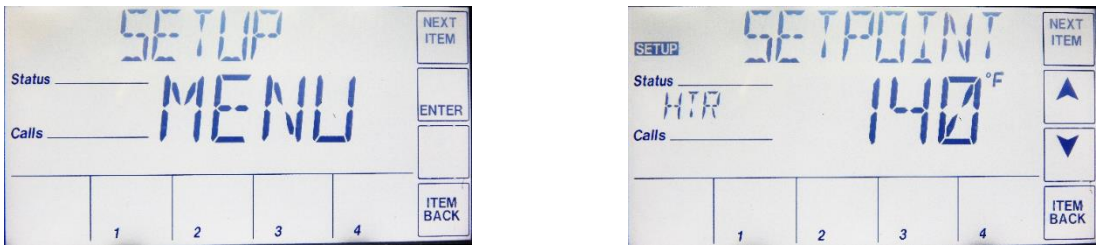


Figure 10-4 Changing the Setpoint

10.8. Setting the Real Time Clock (User & Installer Level Access)

The TIME MENU allows the user to program the time of day, the date and the year. A 12 or 24 hour time clock as well as daylight saving time can be selected. When selected, the time clock can be displayed in the VIEW MENU.

1. Press and hold the **HOME** button for 3 seconds to enter the **CONTROL SYSTEM** menu. Use the **NEXT ITEM** button to scroll to the **TIME** menu. Press the **ENTER** button to enter the **TIME** menu.
2. Use the **NEXT ITEM** button to move to the first screen. Use the **UP** & **DOWN** arrow buttons to set the hour, then press the **NEXT ITEM** button to enter the value and move to the minute. Once the parameters for the time screen have been entered, move to the date and year screen and enter settings in the same manner.

3. To display the real time clock in the **VIEW** menu, select daylight saving time or choose between a 12 and 24 hour clock, use the **NEXT ITEM** button to move to the correct screen and then the arrow button to select. Save and exit the menu by pressing the **HOME** button.

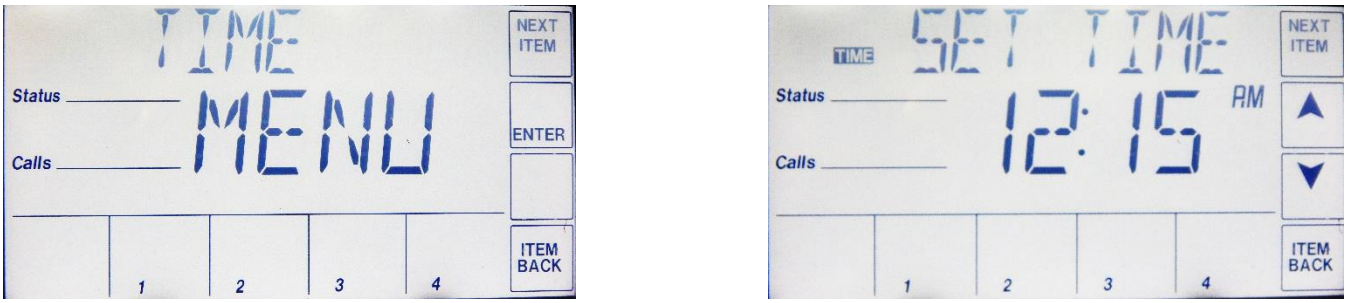


Figure 10-5 Setting the Clock

10.9. Scheduled Setback (USER Level Access)

The **SCHEDULE** menu allows the user to program this water heater to automatically lower the operating set point for times when a facility is not occupied or the use of hot water is curtailed.

1. Press and hold the HOME button for 3 seconds to enter the Control System Menu. Use the NEXT ITEM button to scroll to the SCHEDULE menu. Activate the schedule function by first turning on the HEAT SCHD using the arrow buttons.
2. There are four setback schedule types. 24hr, 5-2, 5-11 and 7DAY. The 24hr schedule is a daily schedule that will follow the same program every day of the week. The default schedule on the SCHD TYPE screen is the 24hr. All other schedule types are selected using the arrow buttons. The 24hr schedule allows for a 2 or a 4 EVENT/DAY. With the 2 event day, the user can have one occupied time and one unoccupied time per day. The 4 event day will allow for two occupied times and two unoccupied times per day.

> **NOTE:** The unoccupied set points are programed in the SETUP menu in the same manner that the occupied set point is adjusted.

For example, a 24hr type and a 4 event day schedule might look like this:

a) The 1st occupied time begins at 6:00am and the 1st unoccupied time begins at 11:00am, therefore, between the hours of 6:00am and 11:00am the occupied set point will be used.

b) The 2nd occupied period begins at 4:00pm and the 2nd unoccupied time begins at 10:00pm.

c) Between the 1st unoccupied time of 11:00am and the beginning of the 2nd occupied period, the unoccupied set point will be used.

d) At 4:00pm the 2nd occupied period will begin and the occupied set point will be used until the 2nd unoccupied period begins at 10:00pm.

e) From 10pm until 6:00am, the unoccupied set point will then be used.

Notice that schedule times and set points are identified as occupied (**Occ**) or unoccupied (**UnOcc**) here.

3. The 5-2 schedule type allows the user to program a 2 or 4 EVENT/DAY but will also allow for one schedule to be followed Monday – Friday and then another Saturday and Sunday.
4. The 5-11 schedule type gives the user the ability to program a 2 or 4 EVENT/DAY but will also allow for one schedule to be followed Monday – Friday and then separate schedule Saturday and another Sunday.

5. The 7DAY schedule type gives the user the ability to program a 2 or 4 EVENT/DAY for each day of the week, Monday through Sunday.

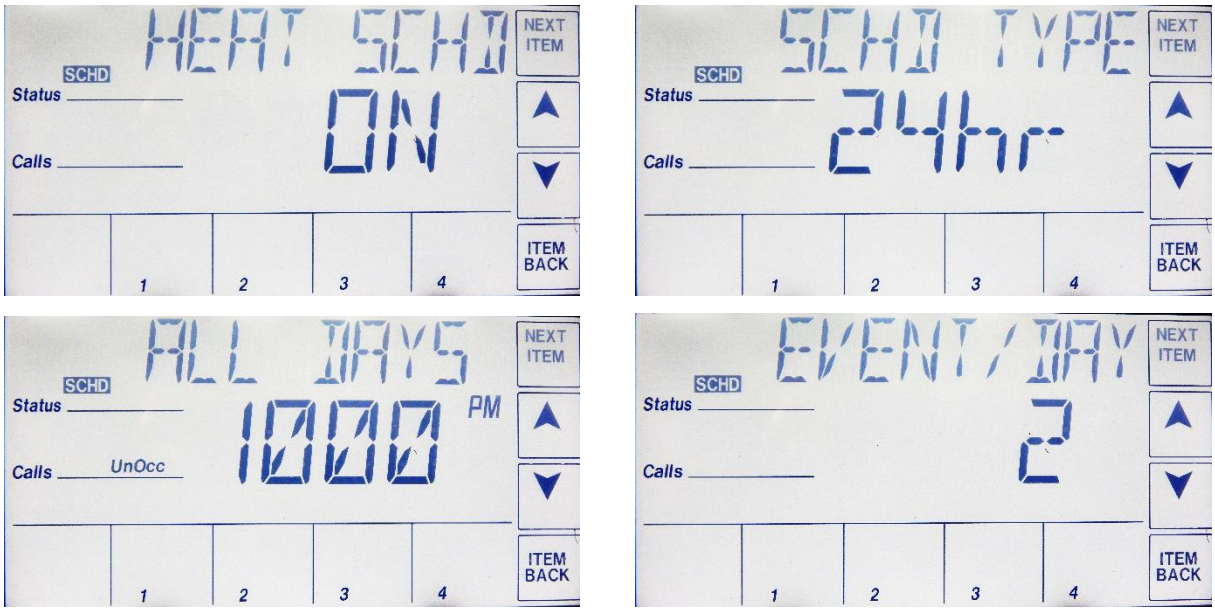


Figure 10-6 Scheduled Setback

10.10. Using the Manual Override Menu (ADVanced Level Access)

The **OVERRIDE** MENU is helpful during the initial commissioning as well as anytime burner adjustment is necessary. Manual override controls for the integral tank circulator and the optional SANI pump.

To access the manual override menu and enter the advanced level access:

1. Press and hold the **HOME** button for 3 seconds.
2. Press the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **TOOLBOX** menu.
3. Press the **ENTER** button to display the ACCESS screen.
4. Depending on the controls software version, the ADVANCED level can be selected using the **UP** and **DOWN** arrow buttons. Subsequent software revisions will require that button #4 in the bottom right corner, be pressed and held in order to place the control in the ADVANCED access level.
5. Exit the menu by pressing the **HOME** button.
6. Use the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **OVERIDE** menu.
7. Enter the OVERRIDE MENU. Using the arrow buttons, select between the three choices. The default setting is **AUTO**. In the **AUTO** position the operating temperature control will work to control the water temperature based on the active set point. When manual control of water heater operation is complete, always return this parameter to the **AUTO** setting.
8. The second setting is **OFF**. This setting will stop all control function and prevent the burner from operating.
9. The third setting is **HAND**. Once enabled, use the **NEXT ITEM** button to scroll to the next screen. The **TIMEOUT** setting is a safety precaution that will disable the override function at the end of the specified time period if the MAN OVR setting is not returned to **AUTO**.
10. The next screen is **SAN PUMP**. To force on the SANI pump, turn to **ON**.

11. The next screen is **HTR PUMP**. To force on the integral tank circulator, turn to **ON**.
12. The next screen is **HTR MOD**. This setting will override the operating control and using the up and down arrow buttons, force the burner to fire at the selected firing rate. This function is useful when tuning the operation of the burner at a range of firing rates.

NOTE: If the HTR MOD control is activated while the burner is firing, the burner will shut down and recycle.

WARNING!

When adjustments are complete, before putting the water heater into service return MAN OVR function to “AUTO”. Failure to return the function to “AUTO” can cause high water temperatures that can result in property damage, scalding, other serious injury or death.

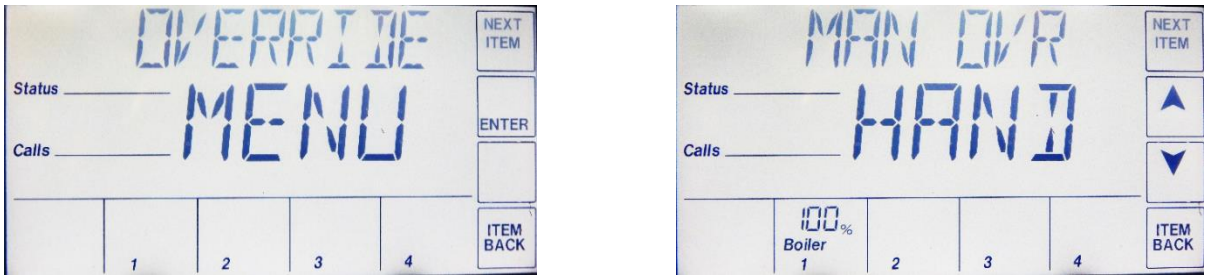


Figure 10-7 Manual Override Menu

10.11. Potentiometer (Operating Set Point for Standalone Operation)

The PIM Ignition Control will continue to operate the Water Heater at a 120° internal setpoint should the touch screen control fail, or communication between the two devices is interrupted. This internal setpoint can be adjusted using the potentiometer to maintain a different operating temperature if desired. This feature is intended to be used on a temporary basis, since accuracy of temperature control is dependent upon the touch screen control.

IMPORTANT: At commissioning the startup technician should adjust the potentiometer to the desired setpoint displayed in the **OPERATOR** screen located in the **SOURCE** control system menu. The standalone setpoint can be adjusted independently of the touch screen but a specific setting may be difficult to achieve using the temperature index on the PIM.

NOTE: If the operating setpoint is ever changed after initial commissioning, the potentiometer should be readjusted as well.

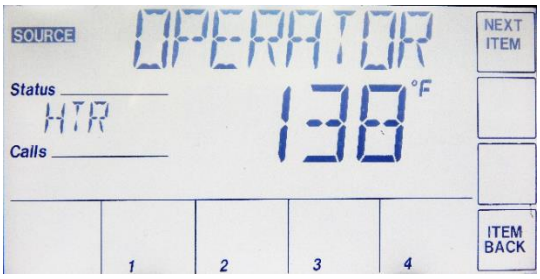


Figure 10-8 Setting the Setpoint

10.12. Using Tool Box Menu

The **TOOL BOX** menu contains several adjustable parameters as well as up to the 15 past alarm messages logged.

1. The first screen in the Tool Box is for the **ACCESS** level. The three choices available here are USER, INSTaller and ADVanced. Depending on the controls software revision, the ADVanced level can be selected using the UP and DOWN arrow buttons for the first revision. Subsequent software revisions require that button #4 in the bottom right corner be pressed and held in order to place the control in the ADVanced access level. Consult factory before changing any settings requiring an ADVanced access level. Depending on the access level selected, different parameters will become visible and adjustable. Selecting the appropriate access level will make menu navigation easier and minimize the possibility that parameters will be unintentionally changed, resulting in improper operation.
2. The second screen displays the touch panel display software revision. Press **ENTER** to view.
3. The third screen allows the user to turn the display backlight ON continuously, OFF or TMPY will keep the backlight on only during use.
4. The fourth screen allows the user to choose between Fahrenheit and Celsius.
5. The following screens will display the 15 most recent alarm messages. The Status field will show messages beginning with the most recent. This screen will display the time and date of the failure.

10.13. Basic Operational Reference Information

Ext Enable: Terminals R1 – R2, Jumper to enable. Heater ships with jumper on this. An external enable/disable can be attached to this. You can monitor the state of this input. 1 = enabled.

- **Upper Tank Temp:** is a temperature probe in the top of the tank.
- **High Limit Temp:** is a 2nd sensor in the same mechanical probe as the **Upper Tank Temp** probe. This is used as a safety.
- **Lower Tank Temp:** Temperature of the mid-section of the tank, this sensor controls the integral tank circulator pump.
- **Vent Temp:** Temperature of the Flue gasses exiting the heater.
- **Modulation:** Represents the signal sent to fan motor. *(Not used on 40 prefix models)*
- **Pump Status:** This is the integral circulating pump ON/OFF.
- **Pump Runtime:** Hours on for integral circulating pump.

Discrete connections:

Enable/Disable: R1 – R2 (Input to heater) Closed = ENABLE.

Alarm: A1 & A2 (Output from Heater) Closed = ALARM.

Remote Equipment / Burner ON: P1 – P2 (Output from Heater) Closed – Heater is heating.

Remote Proving: C1 – C2 (Input to heater).

- **Closed** = Remote device is ready, it is OK to operate the burner.
- **Open** = Remote device is not ready. If the heater has a call for heat, this will cause an error if not resolved within a few minutes.

11. COMMUNICATIONS AND DIAGNOSTICS

11.1. Indicators

The PIM has three LED indicators to display operational status and to help diagnose system error conditions:

- **Green LED** – **Power:** Indicates the PIM module is receiving 24 VAC power.
- **Amber LED – Alarm/Test:** Indicates the PIM is in Commission Test Mode or that a diagnostic alarm (fault) is present.
- **Red LED – Diagnostic Code:** Normally off. During a control or system fault condition, this LED flashes the error codes.

11.2. Alarm Messages – Diagnostic Codes (Flashes)

ALARM MESSAGE	DESCRIPTION OF ALARM	LED Flashes	MODBUS CODE #
ID CARD	The ID card is connected to the PIM control board when the system is initialized for the first time, the ID card selects the control profile to be used. An ID card error may occur when the original card is replaced with an incorrect card or has been disconnected from the PIM control board.	Red LED ON, Green LED OFF	20
INTERNAL FAIL	PIM control board may have failed. Replace the control board if manually resetting the control does not correct the fault.	Red LED ON	21
CTL SETUP FAIL	Try resetting the defaults in the TOOL BOX menu. If unable to correct, replace the control display	N/A	1
VENT LIM	The vent temperature sensor is approaching the programmed limit. This will force the burner to operate at a reduced firing rate to prevent overheating.	N/A	5
AIR FLOW FAIL	During purge and burner operation, the blower speed tachometer is not reaching the minimum blower speed for operations. This could be caused by a faulty blower.	1	9
FLAME FLSE	A false flame signal is usually cause by a leaky gas valve which propagates a flame after the call for heat cycle has ended. Check for leakage through the gas valve. If no mechanical cause can be found, replace flame control.	2	19
FLAME FAIL	Flame failure indicates that during the burner ignition process, the burner either failed to light or it did light but no flame signal was detected. If the burner fails to light it is likely that the hot surface igniter (HSI) is faulty or the burner fuel/air mixture is too far out of adjustment to ignite. If the burner lights but immediately go out, check for an inadequate gas supply, faulty gas valve or regulator or poorly adjusted combustion.	3	15
FLAME LOSS	Flame loss indicates that sometime after flame has been established and the burner is operating, the flame signal is lost. This can be caused by a faulty igniter, damaged refractory or combustion that becomes poorly adjusted as the burner modulates to higher inputs.	3	16

ALARM MESSAGE	DESCRIPTION OF ALARM	LED Flashes	MODBUS CODE #
LOW 24VAC	The 24VAC supply to the PIM control is below the threshold for reliable control operation. This may be caused by low voltage to the heater or a faulty 120/24VAC supply transformer.	5	17
VENT MAX	The vent temperature sensor is used to protect low temperature vent systems from damage caused by high flue gas temperatures. When this alarm occurs, first confirm that the vent material is suitable for the application as well as the limit setting for this control. When this product is operated with high return or inlet water temperature, the flue gas can exceed the rating of low temperature vent systems.	6	18
HTR MAX	The heater high limit temperature safety has exceeded its limit. This condition may be caused by a sensor failure or a faulty control board.	7	11
HTR TOP	Indicates problem with top temperature sensor, possibly a broken or shorted sensor wire or failed sensor. **NOTE**: Top sensor and high limit sensor or located in the same probe body.	8	14
HI LIMIT	Indicates problem with high limit temperature sensor, possibly a broken or shorted sensor wire or failed sensor. **NOTE**: Top sensor and high limit sensor or located in the same probe body.	8	14

11.3. Replacing the Fuse

The 24 VAC input and output circuits of the PIM are protected by an 8.0 Amp fuse.

11.4. Self-Check/Control Failure

The PIM confirms the integrity of the gas valve relay contacts to insure safety. It also monitors the processor memory and software execution for proper program flow. If the control detects an error in its software or hardware, all outputs are turned off and the LED displays a steady ON condition. If this condition persists after an attempt to restart then the control must be replaced.

11.5. System Safety Checks

The PIM monitors the safety switches, temperature sensors, supply voltage, and blower speed and will go to soft lockout until the error is corrected. Individual LED diagnostic codes or messages on the RS485 communications help identify the problem for efficient troubleshooting.

11.6. Flame Current Measurements

The PIM supports direct measurement of flame signal strength using the flame current test pins (FC+, FC-) on connector P2. Flame current may be measured by a micro-ammeter, or alternately by using a standard digital voltmeter. The signal on P2 is calibrated to 1 micro-amp/volt, so flame current in micro-amps can be directly read on the volts scale.

The control display user interface is capable of displaying an approximation of flame current up to 5 micro-amps**.**

11.7. Non-Volatile Lockout/Manual Reset

The PIM normally allows for volatile ignition lockout where a lockout condition is reset by a loss in 24VAC power or the call for heat demand. In certain applications or where required by standards (such a CSD-1), it can be configured through the parameter settings for non-volatile lockout after ignition failure. In this case the lockout may only be reset by the on-board manual reset button, or the remote reset input.

11.8. ID Card

The PIM determines its operating parameters by reading the identification code of an external plug-in ID card. The ID card is connected to the PIM at the J6 connector.

NOTE: This ID card must be present for the PIM and **Water Heater** to operate. This card selects the proper settings in the PIM's memory for various Lync LC-N models. The first time a PIM is powered up attached to an ID card, the ID card setting is stored in non-volatile memory. Once set, the PIM only operates with the correct ID card installed that matches its internal ID settings. The PIM verifies the ID card at power-up and on each heating cycle.

12. NETWORK MENU

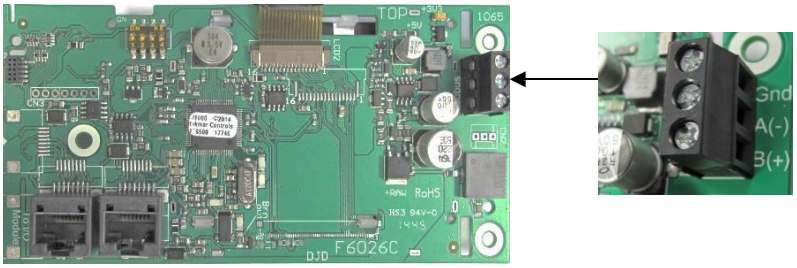
The Network Menu contains all of the settings necessary to configure a 2-wire, RS-485 communication link with this product. With no additional hardware, a Modbus RTU or BACnet® MSTP protocol can be established.

For complete Interface Guide and Points List, see Lync EOS Interface Guide (L-OMM-0008).

1. Enter the Network Menu as previously explained. The first screen, ADDRESS, allows the user to set the network address for each individual heater. There are up to 247 addresses beginning with number
2. If there are multiple heaters in the network, each heater should have a unique address. The default value 1.
3. The second screen, DATA, sets the data format. Select between RTU (8bit) and ASCI (7bit).
4. The third screen, BAUD RATE, 2400, 9600, 19K2, 57K6 and 115K.
5. PARITY, will select between NONE (2 Stop bits), EVEN (1 Stop bit) and ODD (1 Stop bit).

The table below details wire length using 18 AWG Shielded Twisted-Pair.

Max Cable Length Without Terminating Resistors	Max Cable Length with 2 x 120 Ohm Resistors
• 115200 baud --> 177 m (580 ft)	• 115200 baud --> 1,000 m (3,280 ft)
• 57600 baud --> 353 m (1,158 ft)	• 57600 baud --> 1,000 m (3,280 ft)
• 19200 baud --> 1,000 m (3,280 ft)	• 19200 baud --> 1,000 m (3,280 ft)
• 9600 baud --> 1,000 m (3,280 ft)	• 9600 baud --> 1,000 m (3,280 ft)
• 2400 baud --> 1,000 m (3,280 ft)	• 2400 baud --> 1,000 m (3,280 ft)



Connect RS-485 wires here. If you are unable to establish a connection reverse the + & - wires

Figure 12-1 RS-485 Connection

12.1. Error Codes

Code	Description
0	No Error
Control Display Errors	
1	EEPROM
2	Outdoor Sensor
3	Supply Sensor
4	DHW Sensor
5	Vent Limiting
6	FTBus Communication
PIM Errors	
7	LWCO
8	Remote Proof
9	Air Pressure
10	Low Gas Pressure
11	Boiler Outlet/Tank Top Sensor
12	Boiler Inlet/Tank Bottom Sensor
13	Vent Sensor
14	Hi-Limit Sensor
15	Ignition Failure
16	Flame Loss
17	Vent Hi-Limit
18	Boiler/Tank Hi-Limit
19	False Flame
20	OEM Card
21	Internal Failure
22	Hi-Delta
23	Not used
24	Low Voltage
25	Blower Speed
26	High Gas Pressure
tN4 Errors (related to the communication links between multiple heaters in a linked system)	
27	Master Lost
28	Device Lost
29	Device Duplicate
30	Device Error

13. REMOTE CONNECTIONS – TERMINAL STRIP

13.1. Making BMS/BAS Remote Connections for Analog and Binary (on/off) Signals

A terminal strip for the remote connection is located behind the bottom control panel door and is accessed removing the two thumb screws a lifting the hinged door.

IMPORTANT: Do not use single strand bell wire for remote field connections to terminals R1-R2 and C1-C2. Use only multi-strand copper wire. See table below for wire length and gauge:

Wire Gauge	18 GA	16GA	14 GA	12 GA
Maximum Length	30 FT	50 FT	75 FT	100 FT

WARNING!

Turn off all electrical service to Water Heaters when accessing the remote connections and close and fasten the control cabinet cover before restoring electrical service. The remote connection terminals are or may become High Voltage. If electrical service is not turned off and terminals are touched a dangerous shock could occur, causing personal injury or death.

13.2. Terminal Functions

The following describes the functions of each of these terminals and the proper method for interfacing with an Energy Management System

L1-L2: Used for incoming 120VAC power supply connection.Terminal **L1** is hot (Black) and **L2** is neutral (White). See the product catalog or specification document for circuit ampacity rating.

R1-R2: Used to activate / de-activate the water heater from remote master control. When switching this low current circuit, a relay with gold plated contacts or the use of two relay contacts in parallel must be used. Terminals are wired to a relay in a remote Energy Management System. When the relay closes, the circuit from R1 to R2 is completed and Water Heater controls are enabled. The Lync LC-N Water Heating Solution ships with a jumper between terminals. Remove the jumper when connecting to a remote controller.

A1-A2: Used to activate a remote alarm, signaling shutdown of combustion control.Provides a maximum 2 amp relay contact closure when the control system terminates operation due to a tripped safety interlock (i.e.: air proving switch, high limit switch or flame sensor, etc.).

P1-P2: Provides a 5 amp contact closure to control remote equipment (i.e. mechanical room air louvers, draft inducer or power vent, etc.). Do not directly energize pumps or motors through these terminals. If operation or repositioning of the remote equipment is required, the remote equipment must send a return proving signal to terminals C1-C2, via its proving switch, to confirming proper operation or repositioning to enable Water Heaters to energize.

C1-C2: Used for proving operation of remote device. Terminals are wired to a proving switch on a remote device such as a power venter, louvers or a combination of these in series. When all remote proving switches close, the circuit from C1 to C2 is completed and the Water Heater's controls are enabled. Water Heaters ship from the factory with jumper between terminals C1 and C2 that must be removed when a proving switch is connected.

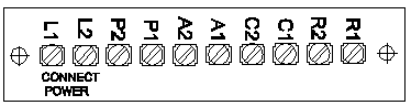
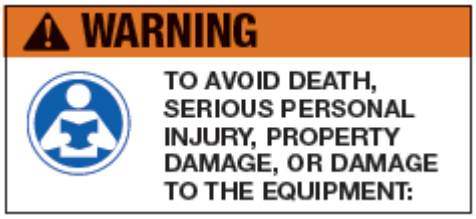


Figure 13-1 Terminal Functions

14. DigiTemp Mixing Valve

Reading & Understanding this section



- Read this section and all product labels and follow all safety and other information.
- Learn how to properly and safely use the equipment BEFORE installing set up, using, or servicing.
- Keep this material available for easy access and future reference.
- Replace missing, damaged, or illegible materials and product labels.

Understanding Safety Information

	This safety-alert symbol is shown alone or used with a signal word (DANGER, WARNING, or CAUTION), a pictorial and/or a safety message to identify hazards and alert you to the potential for death or serious personal injury.		This pictorial alerts you to the need to read the manual.
DANGER	Identifies hazards which, if not avoided, will result in death or serious injury.		This pictorial alerts you to scalding, burn and hot water hazards.
WARNING	Identifies hazards which, if not avoided, could result in death or serious injury.		This pictorial alerts you to burn and hot surfaces hazards.
CAUTION	Identifies hazards which, could result in minor or moderate injury.		This pictorial alerts you to electricity, electrocution, and shock hazards.
NOTE:	Identifies practices, actions, or failure to act which could result in property damage or damage to the equipment.		This pictorial alerts you to the need to perform appropriate Lock Out/ Tag Out procedures.

14.1. Description and Specifications

DigiTemp* is an electronic water mixing valve that provides user-directed control and monitoring water distribution. It includes an electronic Control Module featuring a touch screen digital display to set outlet water temperature, an electronically actuated valve that mixes hot and cold water, a quick response temperature sensor and check valves. DigiTemp monitors mixed outlet temperature and features a user-programmable high-temperature Sanitization mode to help limit water borne bacteria as part of a controlled thermal eradication protocol.

*The wetted surface of this product contacted by consumable water contains > 0.25% of lead by weight.

DigiTemp supports building automation system (BAS) communication with BACnet MSTP and Modbus protocol, allowing remote programing and data viewing.

Adjustment of DigiTemp is the responsibility of the owner and installer and must be done by qualified personnel in accordance with the manufacturer's instructions, and complying with all governmental requirements, building and construction codes and standards. It is recommended to install the Lync LC-N Water Heating Solution as part of an ASSE compliant water distribution system, including mixing valves and/or temperature limiting devices at all point-of-use fixtures (faucets, sinks, tubs, showers, etc.) that are approved to ASSE 1016, 1069, 1070 and 1071.

The DigiTemp owner/user is responsible for maintaining proper water quality and condition, and deciding what temperature is safe and appropriate for the water distribution users and facility.

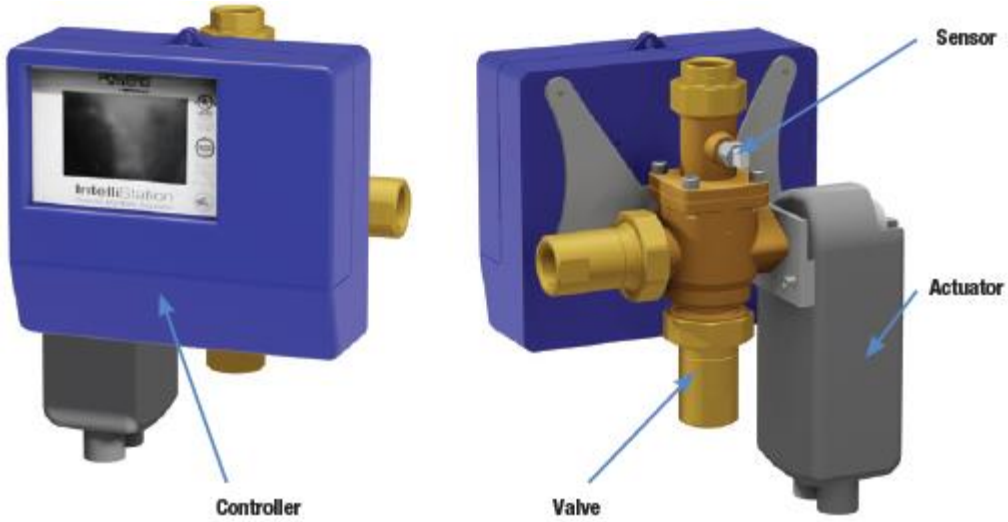


Figure 14-1 DigiTemp, Front and rear Views

Specifications

Maximum Operating Pressure	200psi (1379 kPa)
Maximum Hot Water Temperature	200°F (93°C)
Minimum Hot Water Supply Temperature**	2°F (1°C) Above Set Point
Hot Water Inlet Temperature Range	120 – 180°F (49-82°C)
Cold Water Inlet Range	39 – 60°F (4-16°C)
Minimum Flow***	0.5 gpm (1.89 lpm)
Temperature Adjustment Range****	60 – 180°F (16-82°C)
Listing/Compliance	ASSE1017®, cUPC®, NSF®, UL60730, CE, BACnet Testing Laboratories (BTL)
Weight	LFIS0100V 17lb (8kg))

*** With Equal Pressure*

**** Minimum flow with DigiTemp installed at or near hot water source recirculating tempered water with a properly sized continuously operating recirculating pump.*

***** Low limit cannot be less than the cold water temperature. For best operation, hot water should be at least 2°F above desired set point.*

Technical Specifications

Power..... 115-230 V (ac) ± 10%, 50/60 Hz, 20 VA
Actuator load:..... 24 V (dc), 0.55 A, 13 W
Ambient Temperature ..... 32°F (0°C) to 122°F (50°C)
Ambient Humidity ..... 0 - 90% RH non-condensing
Suitable for indoor use only

Capacity

Flow Capacity at 50-50 mixed ratio								
		Pressure Drop Across Valve						
Model	Min System Draw+	CV	5 psi 34 kpa	10 psi 69 kpa	20 psi 138 kpa	30 psi 207 kpa	45 psi 310 kpa	50 psi 345 kpa
LFIS100	0.5	17.5	39 gpm 148 lpm	55 gpm 208 lpm	78 gpm 295 lpm	96 gpm 363 lpm	117 gpm 443 lpm	124 gpm 469 lpm

+ With a properly sized pump

Installation

WARNING!

The procedure below exposes personnel to the following hazards:
- Hot water and scalding
- Burns and hot surfaces
- Electrical shock and electrocution

Failure to follow all installation requirements risks possible death, personal injury, property damage, and failure of DigiTemp to perform as intended.

- Use ONLY with a potable water distribution system free of debris, foreign materials, corrosive chemicals or substances, and other adverse conditions.
- DigiTemp is electrically powered. ALWAYS take proper precautions to recognize, evaluate, and control electricity hazards during use and service/maintenance.

To connect Power supply

a) Press down on top of the front cover and pull out and down
b) Lift the front cover up and away from the controller
c) Loosen the screws at the front of the wiring cover
d) Pull wiring cover straight out from the wiring chamber
e) Connect live wire to terminal marked “L” and neutral wire to terminal marked “N”.
f) Re-assemble in reverse order.

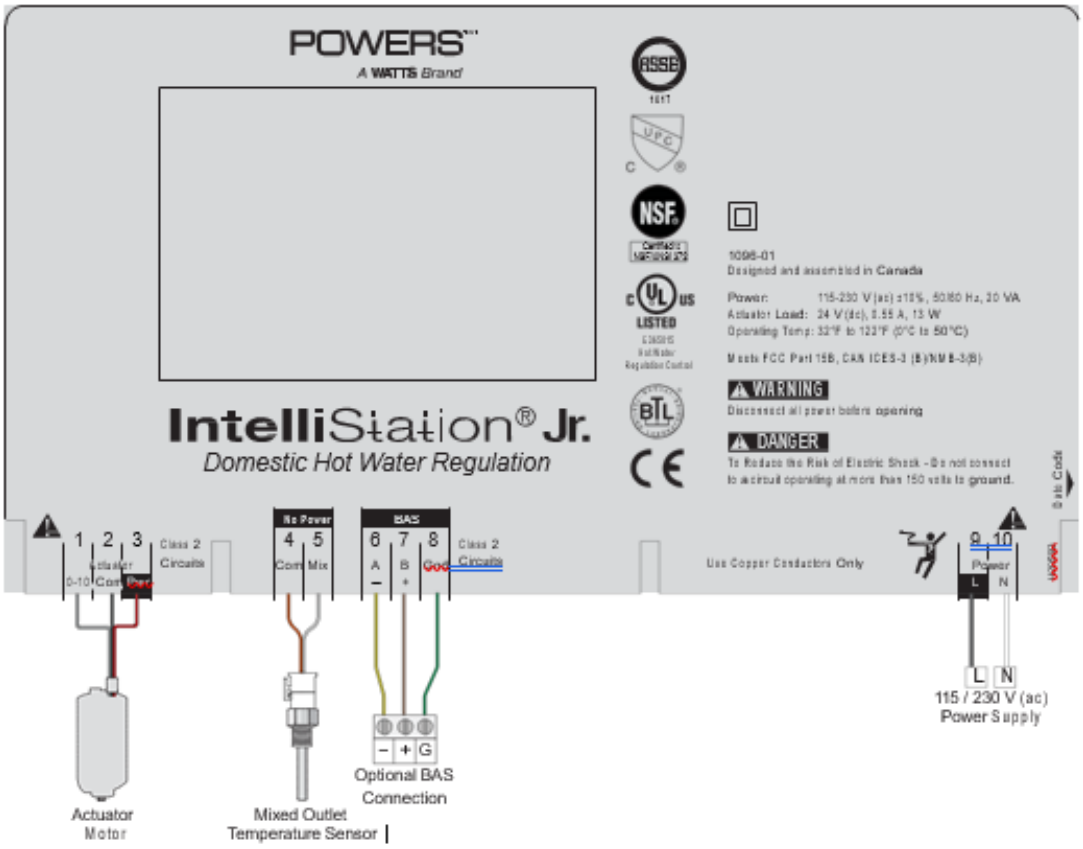
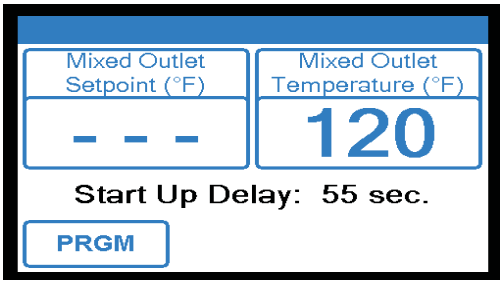


Figure 14-2 DigiTemp Control Unit Connections

14.2. Setup and Programming

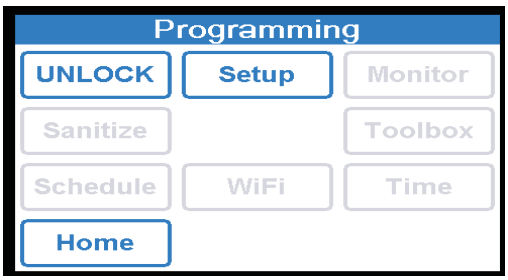
To turn on Power:

1. Turn DigiTemp's power **ON** by turning on the main switch.
2. When powered up, the display will show a 100 second countdown timer and read:



NOTE: The control will begin mixing operations automatically after 100 seconds. During the 100 seconds the user may adjust setting and configure the control by pressing the PRGM menu. If the user does nothing, the control will automatically route to the home screen after 100 seconds and begin normal operation. Efforts taken to program the device during the 100 second period resets the 100 second clock.

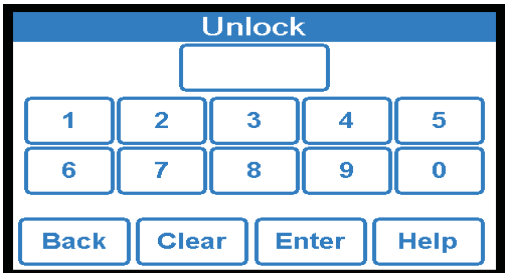
3. To program the system, press the **PRGM** button. The **Programming** screen appears.



To create a Passcode:

DigiTemp comes programmed with a factory default passcode (1017). For added security, and to help prevent unauthorized access, it is recommended that you create a unique 4 digit passcode as outlined below.

1. On the Programming menu, press the **UNLOCK** icon. The Unlock function screen appears and you are prompted to enter the passcode:



2. Enter the factory default passcode **1017** and press the **Help** icon in the lower right corner of the Unlock screen.
3. Enter a new 4-digit passcode and press Enter (make sure to keep your new code secure).
4. Re-enter the new passcode and press the **Enter** icon again to finalize the passcode change.

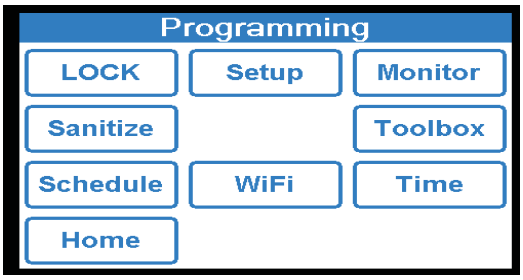
NOTE: If you make a mistake when re-entering your new passcode and it does not match your first entry, ???? appears.

To unlock the System:

1. To unlock the system, on the Unlock screen, enter your new passcode and press **Enter**.

NOTE: If you need to clear your entry and start again, press the CLEAR icon. If you want to go back to the Programming menu, press the BACK icon. If you did not set up your own passcode, you can enter the factory default passcode **1017**.

2. When the passcode is entered, you are directed to the liability acceptance screen: Press **ACCEPT** to proceed to the Programming screen; system functions now appear. Pressing the **DECLINE** icon means you will not be able to change system settings and you accept all default settings (including the outlet water temperature set point of 140° F/ 160° C) as safe and appropriate for the water distribution system users and the facility. You will be returned to the **Programming** screen.
3. When you press **ACCEPT**, the Programming screen appears.

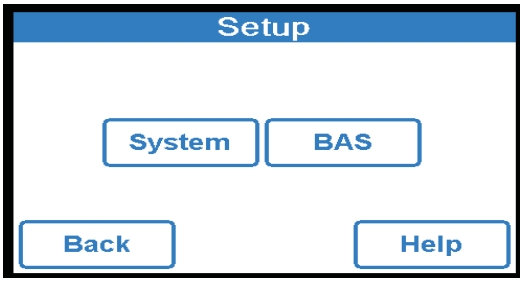


System Setup Menu

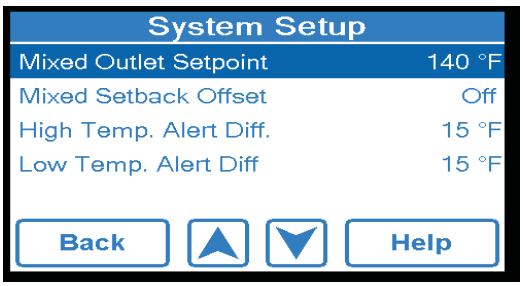
WARNING!

The next steps involve selecting or adjusting the mixed outlet water temperature – the hot water temperature in the water distribution system and delivered to point-of-use fixtures (faucets, sinks, tubs, showers, etc.). The owner or manager of the water distribution system is solely responsible for determining the safe and appropriate temperatures to protect people using, contacting or exposed to water or any parts of the water distribution system from scalding, burning, thermal shock or other hazards, and to control water- borne bacteria in the system. Only qualified and authorized personnel who fully understand each function's operation, output and risks, should use Programming Menu functions. Always read and follow the User Guide & Instruction Manual.

Press **SETUP**; the Setup screen now appears.



You can either setup the operation of the system by pressing the **System** button or configure the BAS connection by pressing the **BAS** button. To setup operation of the system, continue with the system setup. To turn on and configure the BAS connection (see Section 14.3: BAS Integration)



NOTE: Mixed Setback Offset is only available if a schedule is selected.

Selecting and Setting the Outlet Water Temperature Setpoint:

WARNING!

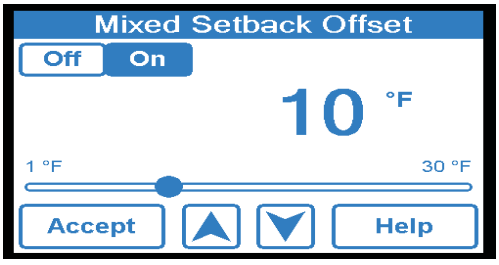
BEFORE setting mixed outlet water temperature or electing default temperature, point-of-use mixing valves and/or temperature limiting devices MUST be installed at all fixtures (faucets, sinks, tubs, showers, etc.)

Set the safe, appropriate and desired outlet water temperature for your users, application and facility by pressing **Mixed Outlet Setpoint** on the System Setup menu and then using the **SLIDER** or **UP** and **DOWN** arrows until the selected temperature is displayed. Press **Accept**.

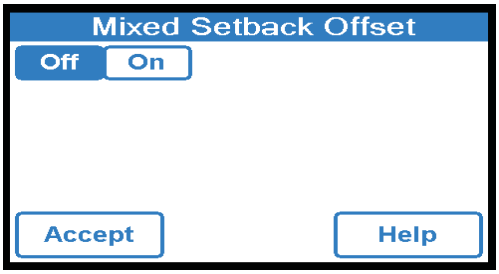
The owner or manager of the water distribution system is solely responsible for determining the safe and appropriate temperatures to protect people using, contacting or exposed to water or any parts of the water distribution system from scalding, burning, thermal shock or other hazards, and to control water-borne bacteria in the system.

Once the desired temperature is selected, press the **Accept** icon to apply the setting. The System Setup screen reappears.

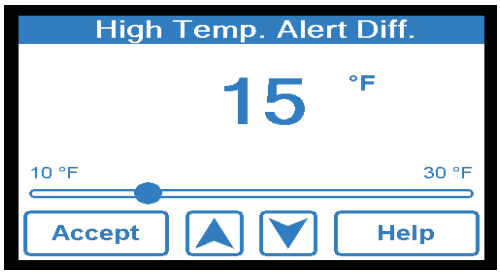
To turn on the **Mixed Setback Offset** feature (sets temperature lower during unoccupied period), press **On** and **Accept.** Change the temperature using the slider or by pressing the **UP** or **DOWN** arrows, then press **Accept** when done.



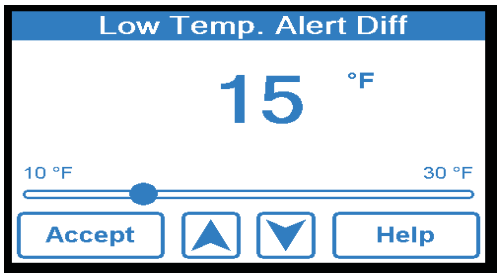
To turn the Mixed Setback Offset feature off, press **Mixed Setback Offset** on the **System Setup** menu and press **Off** and **Accept**.



To change the high temperature alert differential, press **High Temp. Alert Diff.** in the **System Setup** menu. Use the slider or **UP** or **DOWN** arrows to set the high temperature alert differential, then press **ACCEPT**.

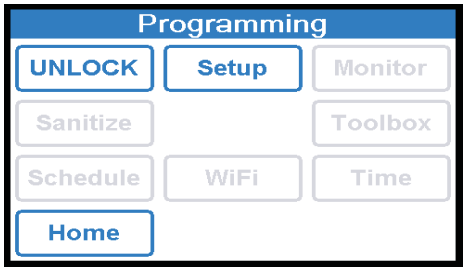


To change the low temperature alert differential, press **Low Temp. Alert Diff**. in the **System Setup** menu. Use the slider or **UP** or **DOWN** arrows to set the low temperature alert differential, then press **ACCEPT**.



NOTE: When finished, the system will return to a locked state if not touched for 100 seconds. Press the BACK icon twice to return to the Programming menu, then press LOCK.

When the system is locked, the **Programming** screen displays the **UNLOCK** icon.



14.3. BAS Integration

Configuring the Control for BAS communication

Configure the control to communicate using the “User Interface-BAS Menu” information within this manual and/or the “BAS Integration Manual.”

Introduction

DigiTemp can communicate with a Building Automation System (BAS) using BACnet MS/TP and Modbus RTU. This manual provides information about the measurements, control parameters, and error messages which can be assessed by building automation and/or management systems that use BACnet MS/ TP or Modbus RTU communication. DigiTemp can be configured to provide remote monitoring and remote temperature control.

BAS Connection Procedure

WARNING!

BEFORE attempting to connect BAS, a certified and qualified electrician MUST fully de-energize and dis- connect all electrical power.

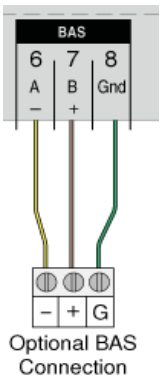
Perform required LOCK OUT/TAG OUT procedures.

BAS connection MUST be performed by certified and qualified electrician.

1. After completely de-energizing and disconnecting all power from DigiTemp and performing required LOCK OUT/TAG OUT, carefully open the DigiTemp control module to reveal BAS hook up terminals.

   NOTE: As an additional safety check, once the box is open confirm that the unit is de-energized by measuring the AC voltage across the “L” and “N” terminals (9 and 10) using the voltmeter. Alternatively, use a voltage detector to confirm unit is NOT energized.

2. With the control module open, the BAS connections are visible on bottom side, as shown.



Optional BAS Connection

3. The control module has a knock-out plug hole. Knock-out the plug hole and run the BAS wire to the controller.

   NOTE: A grommet or wire protector should be used to protect the wire from being damaged by the enclosure hole opening.

4. If connecting the controller to a BACnet MSTP system, run the A(-), B(+), GND terminals from the nearest BAS system component and connect to terminals 6, 7, and 8 (-, +, Gnd) of the DigiTemp control Module 1069.

WARNING!
DigiTemp and BAS connections must be properly grounded.

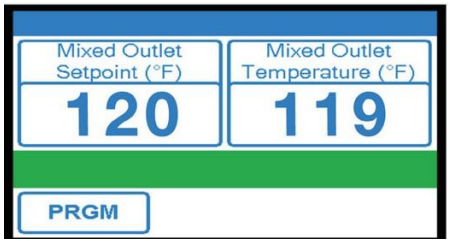
5. If connecting the controller to a Modbus BAS system, run the A(-), B(+), GND terminals from the nearest BAS system component and connect to terminals 6, 7, and 8 (-, +, Gnd) of the DigiTemp control Module 1096.

NOTE: Do **not** ground to the enclosure. Ground ("Gnd") terminal must be connected to terminal "A" marked "Gnd".

BAS Settings in the DigiTemp Control Module Menu

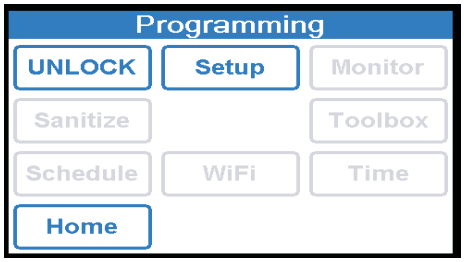
When DigiTemp powers up it displays a warning message for 100 seconds. After that, it will automatically redirect to the **Home** screen. The settings menu can be accessed prior to the time elapsing by touching anywhere on the screen.

From the home screen press the **PRGM** icon to access the **Programming** menu.



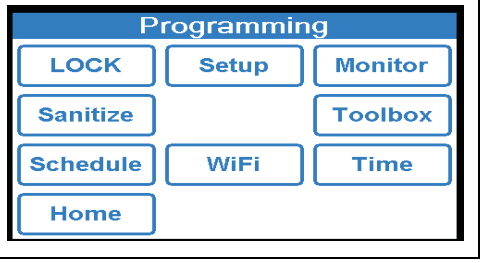
From within the **Programming** menu, only the **Home**, **Setup** and **UNLOCK** icons are active until the control is in the unlocked state. **NOTE:** After 100 seconds of inactivity the control automatically locks and returns to the **Home** screen.

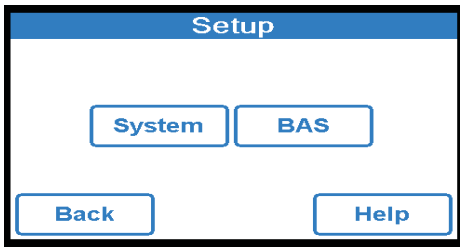
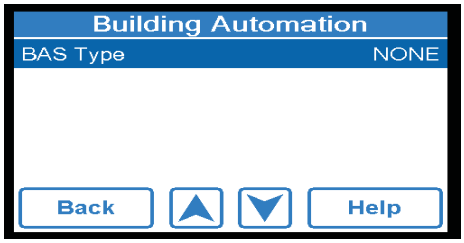
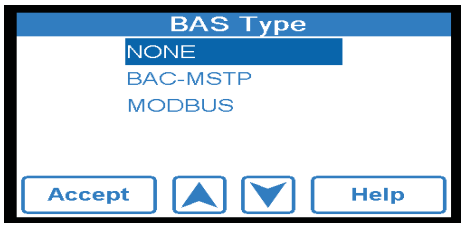
To unlock the control, press **UNLOCK**.



Unlock the control by entering your password and pressing the **ENTER** icon. If you have not yet set your password, see **To create a Passcode**, above. If the wrong code was entered select **Clear** to try again. Note that the **ENTER** icon will only work if the correct code is entered. Once unlocked, the control automatically redirects to the **Programming** menu but this time the **UNLOCK** icon will appear as **LOCK**, indicating that the control is unlocked, and the other icons (Setup, Monitor, Sanitize, Toolbox, Schedule, Wi-Fi, and Time) will now be active.

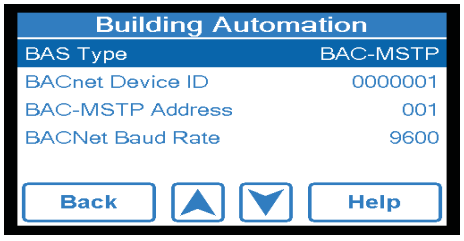
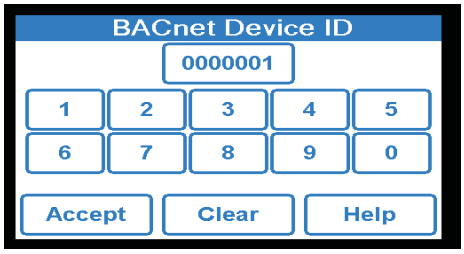
Select the **Setup** icon from the **Programming** menu to access the **Setup** menu.

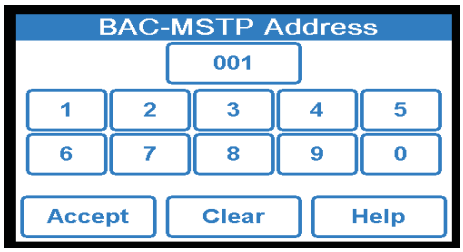
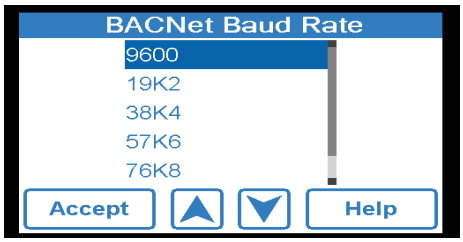


Select the **BAS** icon from within the **Setup** menu to access the **Building Automation** menu.	
The default **BAS Type** is **NONE,** as shown here.	
To change this setting, press **BAS Type**; the adjustment screen appears. Press the **UP** and **DOWN** arrows to scroll through the BAS types and depress the icon to configure the control to the highlighted type and return to the **Building Automation** menu.	

NOTE: Depending on the BAS Type selected, various user configurable items will appear within the Building Automation menu. A table of the user definable items is shown below.

BACnet Specific Settings

The **Building Automation** screen shows the default settings for each communication protocols supported by this control (BACnet MSTP and Modbus).	
To change the BACnet Device ID, press **BACnet Device ID**, enter the device ID number, and then press **Accept**.	

To change the BAC-MSTP Address, press **BAC-MSTP Address**, enter the address, and press **Accept**.	
To change the BACNet baud rate, press **BACNet Baud Rate**, select the baud rate using the **UP** and **DOWN** arrows, and then press **Accept**.	

BACnet Protocol Implementation Statement (PICS)

Vendor Name: Powers

Vendor ID: 834

Product Name: DigiTemp

Product Model Number: 109601

Application Software Version: J1277x

Product Description:

DigiTemp is a mixing control designed to deliver tempered water to plumbing fixtures. It uses a Proportional Integral (PI) logic to accurately maintain a target temperature by mixing a high temperature water source with a low temperature water source. It also offers advanced features including communication with a Building Automation System (BAS).

DigiTemp provides user-directed control and monitoring of water distribution systems. It is the user's responsibility to select and maintain water temperatures and pressures that are safe and appropriate for the water system users, guests and facility. DigiTemp's Sanitization mode is intended for use as part of a user-directed, controlled and supervised protocol that has been safely and properly designed. It is recommended to install DigiTemp as part of a ASSE 1070 compliant water distribution system, including point-of-use mixing valves. Always read and follow User Guide & Instruction Manual and all product warnings and labels, and comply with all governmental and safety requirements.

BAS Menu

BACnet Standardized Device Profile (ANNEX L)
BACnet Application Specific Controller (B-ASC)

Supported BIBBs (Annex K)	Name
DS-RP-B	Data Sharing-ReadProperty-B
DS-RPM-B	Data Sharing-ReadPropertyMultiple-B
DS-WP-B	Data Sharing-WriteProperty-B
DM-DDB-B	Device Management-Dynamic Device Binding-B
DM-DOB-B	Device Management-Dynamic Object Binding-B
DM-DCC-B	Device Management-Device Communication Control-B

NOTE: The device communication control password is **Powers1017**.

Segmentation Capability	Supported
Able to transmit segmented messages	No
Able to receive segmented messages	No

Standard Object Types Supported	Creatable	Deleteable
Analog Input	No	No
Analog Value	No	No
Binary Output	No	No

Data Link Layer	Supported
BACnet® IP (Annex J)	No
BACnet® MSTP	Yes

Device Address Binding	Supported
Static Device Address Binding	No

Network Security Options
Non-Secure Device

Character Set	Supported
ANSI X3.4	Yes

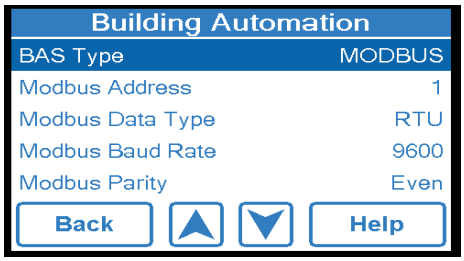
BACnet Analog Parameters

Objective_ Identifir	Objective _Type	Objective_ Name	Present Value	Status_ Flags	Description	Range/ Value	Event_State	Reliability	Out_ Of_ Service	Units
0	analog-Input	Mixed Outlet Temperature		FFF(F/T)	Mixed Outlet Temperature	0 to 266F	EVENT_ STATE_ NORMAL	0, 1, 4, 5	FALSE	UNITS_DEGREES_ FAHRENHEIT (64)
1	analog-Input	Valve Position		FFF(F/T)	Analog signal pro-vided to actuator	0.0 to 10.0 V	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_ VOLTS (5)
2	analog-Input	Mixed Outlet High		FFF(F/T)	Highest recorded mixed outlet temperature	0 to 266F	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_DEGREES_ FAHRENHEIT (64)
3	analog-Input	Mixed Outlet Low		FFF(F/T)	Lowest recorded mixed outlet temperature	0 to 266F	EVNT_ STATE_ NORMAL	0	ALSE	UNITS_DEGREES_ FAHRENHEIT (64)
4	analog-Input	High Temperature Alert Differential		FFF(F/T)	High Temperature Alert Differential	10 to 30 F	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_NO UNITS (95)
5	analog-Input	Low Temperature Alert Differential		FFF(F/T)	Low Temperature Alert Differential	10 to 30 F	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_NO UNITS (95)
6	analog-Input	High Temperature Alert Count		FFF(F/T)	High Temperature Alert Count	0 to 65535	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_NO UNITS (95)
7	analog-Input	Low Temperature Alert Count		FFF(F/T)	Low Temperature Alert Count	0 to 65535	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_NO UNITS (95)
8	analog-Input	Error Code		FFF(F/T)	Numerical error code (see error code table)	1 to 4	EVENT_ STATE_ NORMAL	0	FALSE	UNITS_NO UNITS (95)
Others	analog-Input	ERROR	ERROR	ERROR	Communicati on error	ERROR	ERROR	ERROR		

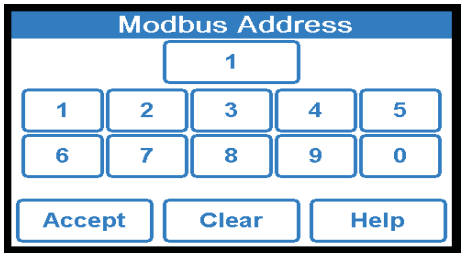
Analog Valve Objects

Objective_ Identifier	Objective_ Type	Objective _Name	Present Value	Status_ Flags	Description	Range/ Value	Event_ State	Out_Of_ Service	Units
0	analog-value	Mixed Outlet Setpoint		FFF(F/T)	Target Temperature	70 to 180F	EVENT_ STATE_ NORMAL	true to false	UNITS_DEGREES_ FAHRENHEIT (64)
Other	analog-value	ERROR	ERROR	ERROR	Communication error	ERROR	ERROR	ERROR	

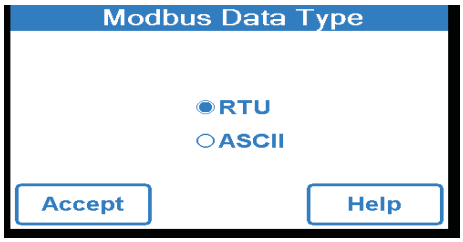
Modbus Specific Settings



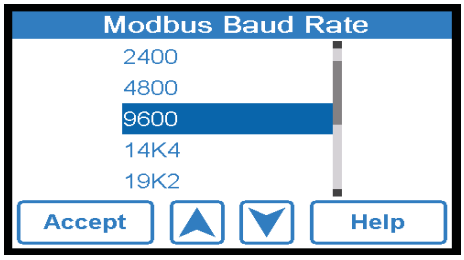
To enter the Modbus address, press **Modbus Address** on the **Building Automation** screen, enter the Modbus address then press **Accept**.



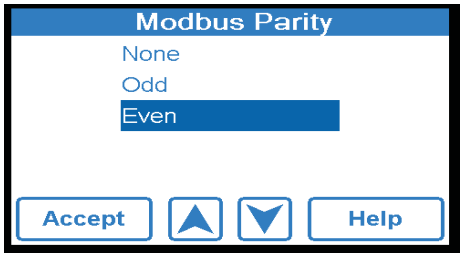
To select the data type, press **Modbus Data Type** from **Building Automation** screen, enter the desired data type and press **Accept**.



To select Modbus baud rate, press **Modbus Baud Rate** on the **Building Automation** screen. Select the desired Modbus Baud Rate using the **UP** or **DOWN** arrows and then press **Accept.**



To enter the Modbus parity, press **Modbus Parity** on the Building Automation screen and select the desired Modbus parity using the **UP** or **DOWN** arrows, then press **Accept**.



Modbus Specifications

Communication Protocol	Modbus over RS485
Physical Layer	RS485 Two-Wire plus Signal Ground
Baud Rate	2400, 9600, 19200, 57.6k, 115k) (default 19200 bps)
Recommended Cable	18 AWG Shielded Twisted-Pair (STP)
Transmission Mode	RTU or ACSII (default RTU)
Maximum Cable Length	Without terminating resistors
	- 115,000 baud --> 177 m (580 ft)
	- 57,600 baud --> 353 m (1,158 ft)
	- 19,200 baud --> 1,000 m (3,280 ft)
	- 9,600 baud --> 1,000 m (3,280 ft)
	- 2,400 baud --> 1,000 m (3,280 ft)
	With 2 x 120 Ohm resistors
	- 115,000 baud --> 1,000 m (3,280 ft)
	- 57,600 baud --> 1,000 m (3,280 ft)
	- 19,200 baud --> 1,000 m (3,280 ft)
	- 9,600 baud --> 1,000 m (3,280 ft)
	- 2,400 baud --> 1,000 m (3,280 ft)
Start Bit	1 Bit
Data Length	8 Bits for RTU Mode
	7 Bits for ACSII Mode
Parity	None (2 Stop Bits)
	Even (1 Stop Bit)
	Odd (1 Stop Bit)
	(default Even)
Addressing	1 to 247 (default 1)

Modbus Parameters

Read= R Read/Write= R/W

Analog Input Objects

Parameter	Read/Write	Units	Range	Type	Register	Format
Holding Registers						
Mixed Outlet Setpoint	R/W	ºF	70 to 80°F	Holding	1	U16
Input Registers						
Mixed Outlet Temperature	R	ºF	0 to 266°F	Input	1	U16
Valve Position	R	Vdc X 10	0 to 100	Input	2	U16
Mixed Outlet High	R	ºF	0 to 266°F	Input	3	U16
Mixed Outlet Low	R	ºF	0 to 266°F	Input	4	U16
High Temperature Alert Differential	R	ºF	10 to 30°F	Input	5	U16
Low Temperature Alert Differential	R	ºF	10 to 30°F	Input	6	U16
High Temperature Alert Count	R	Counts	0 to 65535	Input	7	U16
Low Temperature Alert Count	R	Counts	0 to 65535	Input	8	U16
Error Code	R	Enum	Numerical Error Code (See Error Code List)	Input		U16
Model	R	Num	1096	Input	10	U16
Firmware Revision	R	Num	SVN Revision	Input	11	U16

Modbus Troubleshooting

If there is no communication, check the following:

- Check that the polarity on the Modbus + and - terminals is correct
- Check that the Modbus GDN terminal is securely connected.
- Check that the Baud Rate on both devices is the same.

If the communication is intermittent, check the following:

- Check that the communication cable is twisted pair type.
- Reliable communication depends on the cable length & Baud Rate used. Long cable length may require a lower baud rate.

Error Codes

Code	Description
1	NVM Error
2	Faulty Mixed Outlet temperature sensor
3	High Temperature Alert
4	Low Temperature Alert

14.4. SANITIZATION

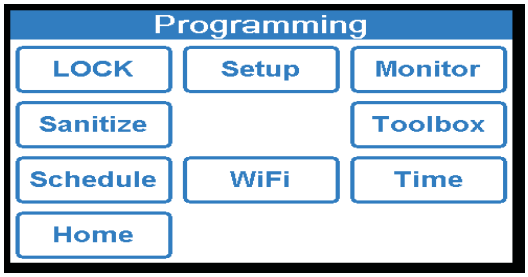
The Sanitization function produces high water temperatures and is intended ONLY for use as part of a user- directed, controlled and supervised thermal eradication protocol that has been safely and properly designed to help limit water-borne bacteria within the tempered water distribution system. The instructions contained in this Manual for the Sanitization function are not intended to be a thermal eradication protocol.

Selecting, directing, and controlling a safe and properly designed thermal eradication protocol is the sole responsibility of the people who own, manage or control the water distribution system. It is their responsibility to protect water distribution end-users, facility employees or contractors, and bystanders from scalding, burning, thermal shock, or other hazards from possible exposure to water or any parts of the water distribution system during Sanitization and cool.

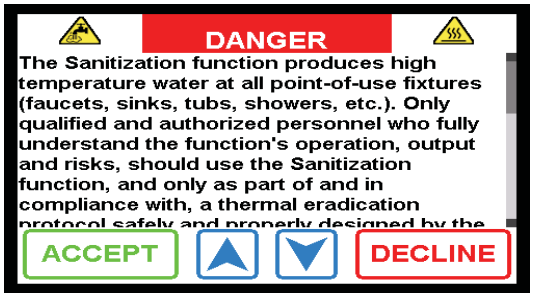
WARNING!

The Sanitization function produces high temperature water at all point-of-use fixtures (faucets, sinks, tubs, showers, etc.). Only qualified and authorized personnel who fully understand the function's operation, output and risks, should use the Sanitization function, and only as part of and in compliance with, a thermal eradication protocol safely and properly designed by the owner or man- ager of the water distribution system.
The owner or manager of the water distribution system has sole responsibility to protect end-users, facility employees or contractors, personnel performing the Sanitization, and bystanders from scalding, burning, thermal shock, or other hazards from possible exposure to water or any parts of the water distribution system during Sanitization and cool down period, until system water returns to a safe and proper outlet water temperature set point.
Always read and follow the User Guide & Instruction Manual.

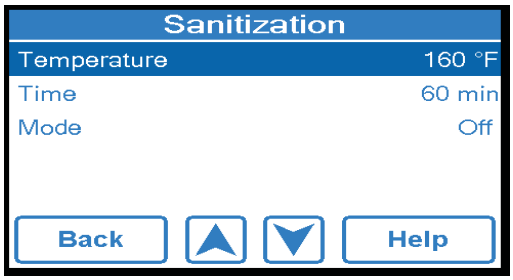
1. On the **Programming** screen, press **Sanitize**; you are direct to the Responsibility And Liability Acceptance page.



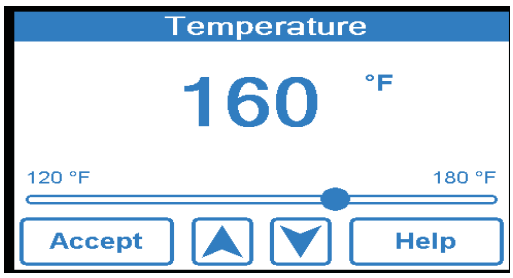
2. Press **ACCEPT** to proceed with Sanitization. Pressing **DECLINE** means you will not be able to utilize the Sanitization function and you will be returned to the **Programming** menu. When you press **ACCEPT**, you are directed to the **Sanitization** screen.



3. Select the sanitization setpoint by pressing **Temperature** on the **Sanitization** screen.



4. Use the slide bar or **Up** and **Down** arrows to select the desired outlet water temperature. Press **Accept** to confirm the adjustment.



5. Next, select the run time by pressing **Time** from the **Sanitization** menu.

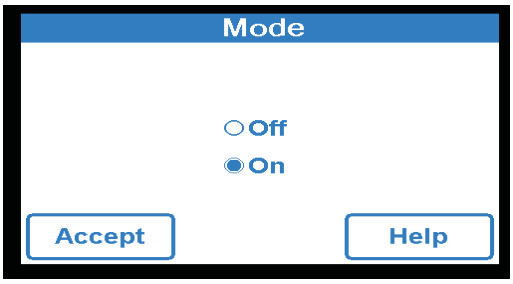
6. Use the slide bar or up and down arrows to select the desired run time. Press **Accept** to confirm the adjustment.

WARNING!

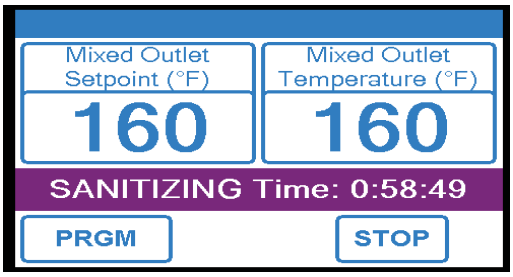
BEFORE starting the Sanitization function, make sure you are in full compliance with a safely and properly designed thermal eradication protocol, protecting end-users, facility employees or contractors, personnel performing the Sanitization, and bystanders from scalding, burning, thermal shock, or other hazards.

7. To start the sanitization function, select **Mode** from the **Sanitization** menu.

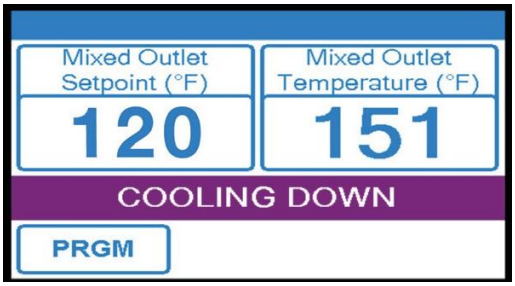
8. Once in the Mode menu, toggle the radio button to **ON** and then press **Accept**.



9. The Sanitization Mode is now fully functional. **NOTE:** The **HOME** screen will indicate you are Sanitizing the water delivery system and indicate Mixed Outlet Temperature.



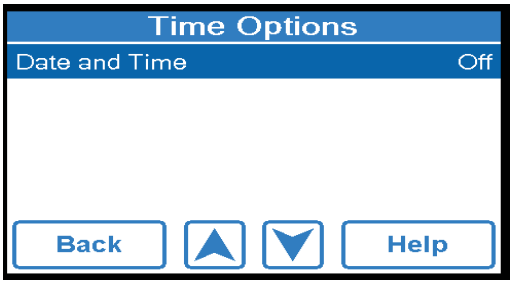
10. After Sanitization Mode has completed (user selected run time has elapsed), DigiTemp goes into Cool Down Mode to return to the Mixed Outlet temperature prior to returning to normal operation.



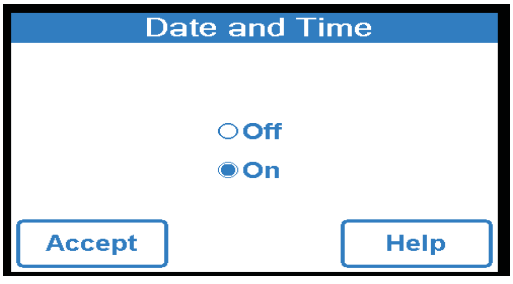
14.5. TIME FUNCTION

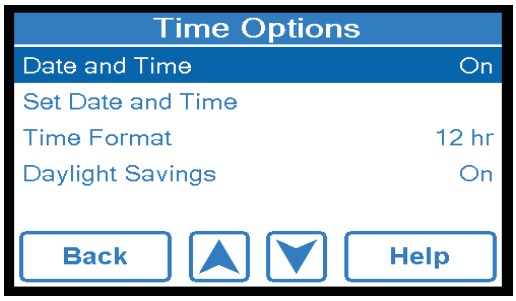
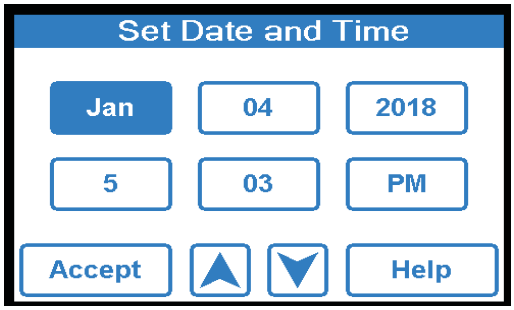
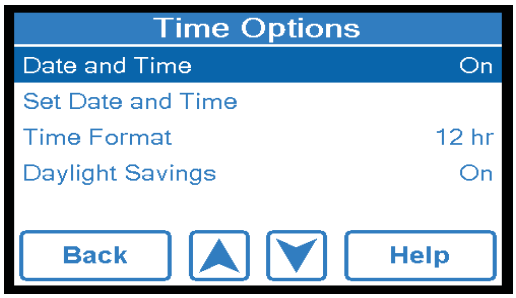
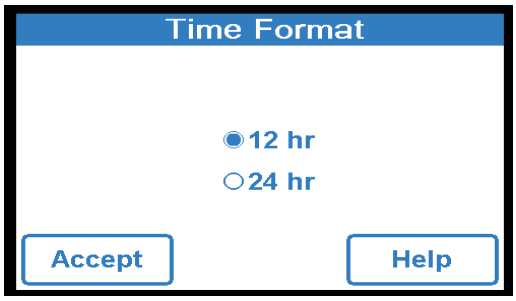
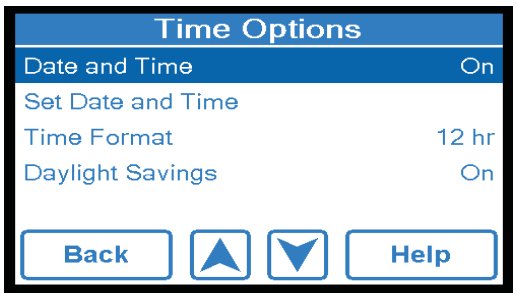
Press the **TIME** icon on the **Programming** Menu to access the Time Function.

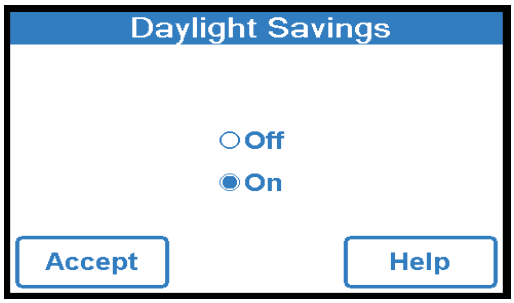
To turn on the **Date & Time** functionality, press **Date & Time** from the Time Options menu.



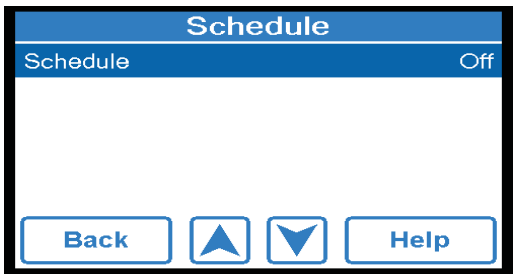
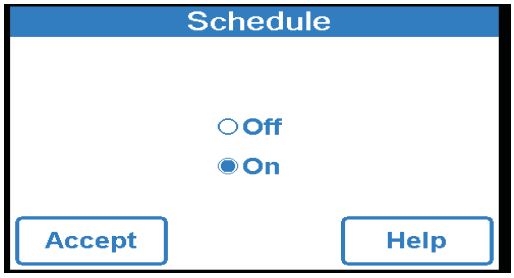
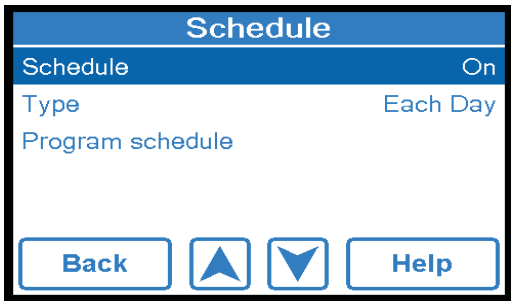
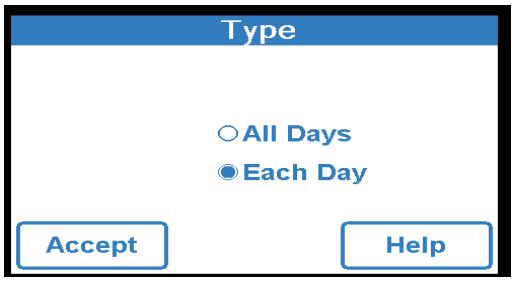
Once in the **Date and Time** menu, toggle the radio button to **ON** and then press **Accept**.

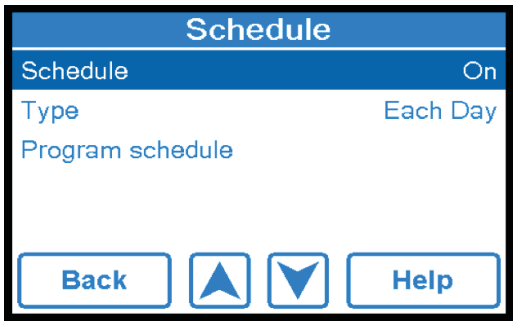
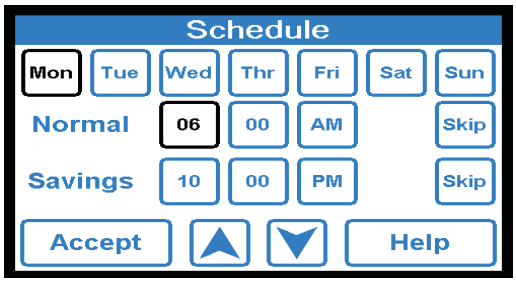
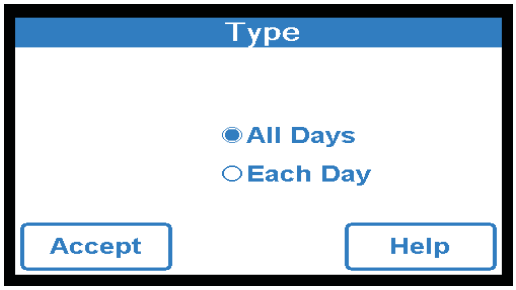
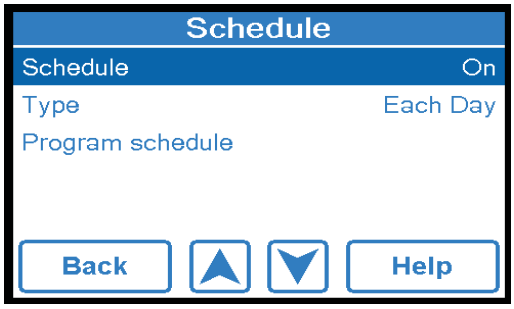


To set date and time, press **Set Date and Time** from the **Time Options** menu.	
To set date and time, select month, date, year, hour, minute and AM/PM icons one at a time and change with **UP** or **DOWN** arrows, then press **Accept**.	
To select the time format, press **Time Format** from the **Time Option** menu.	
To select time format, toggle to the **12hr** or **24hr** radio button and press **Accept**.	
To select daylight savings time, press **Daylight Savings** from the **Time Options** menu.	

Once in the **Daylight Savings** menu, toggle the **On** radio button and press **Accept**.	

14.6. SCHEDULE FUNCTION

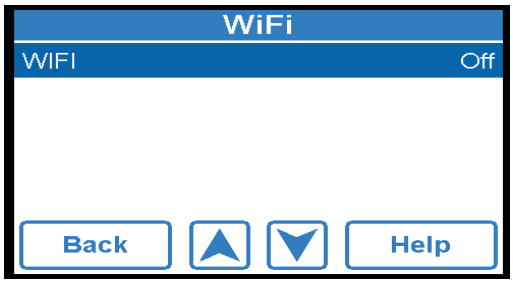
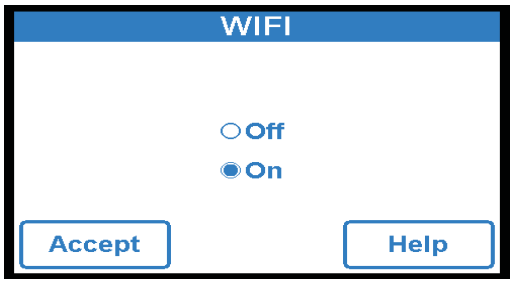
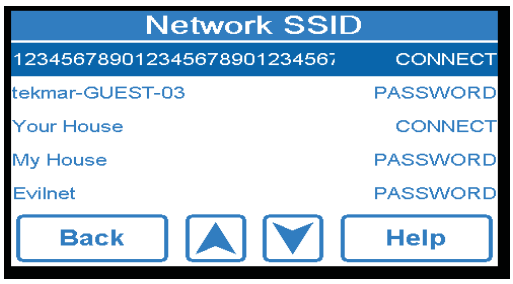
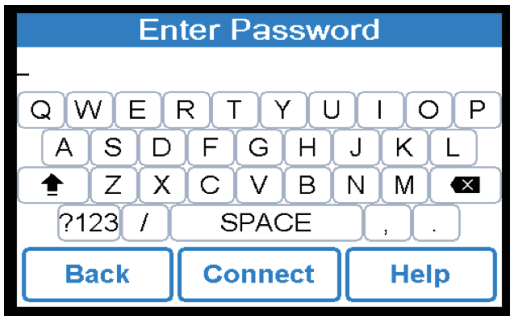
Pressthe **SCHEDULE** icon on the **Programming** Menu to access the Schedule function. To turn on **schedule**, press **Schedule** from the **Schedule** menu.	
Once in the schedule menu, toggle the radio button to **On** and then press **Accept**.	
To select the type, press **Type** from the **Schedule** menu.	
Once in the **Type** menu, toggle to the **Each Day** radio button and then press **Accept**.	

To program **Each day**, press **Program Schedule** from the **Schedule** menu.	
Schedule **Normal** and **Savings** time and then press **Accept**.	
If you prefer all day, toggle to the All Day radio button and then press **Accept**.	
To program **All day**, press **Program Schedule** from the **Schedule** menu.	

Schedule **Normal & Savings** time and then select **ACCEPT**

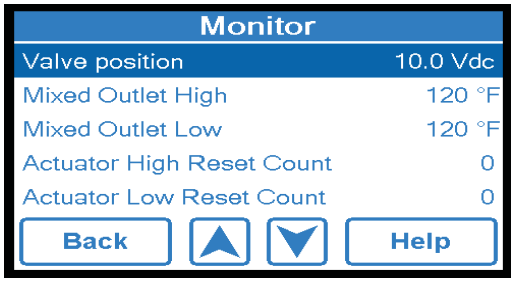
14.7. Wi-Fi Function

NOTE: The Wi-Fi function should only be enabled to complete software updates. It should not otherwise be turned on.

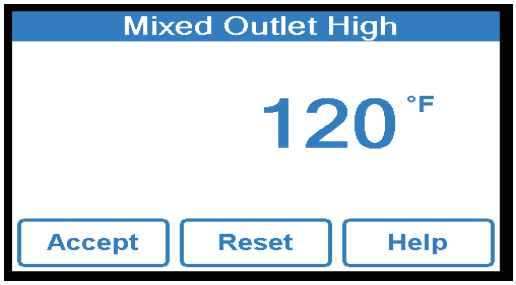
Press the **Wi-Fi** icon on the **Programing** menu to access the **Wi-Fi** screen.	
In the Wi-Fi menu, toggle the radio button to **On** and then press **Accept**.	
At this point Wi-Fi is on. Press **Network SSID** from the **WI-Fi** menu.	
Select the network from the list you want to connect.	
Once connected, enter password and press **Connect**. Once the connection is verified it will say **Ok**.	

14.8. Monitor Function

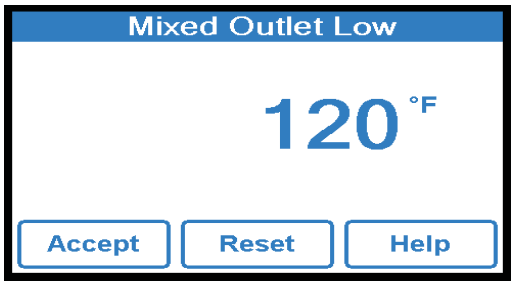
Press the **MONITOR** icon on the **Programming** menu to access the Monitor function.



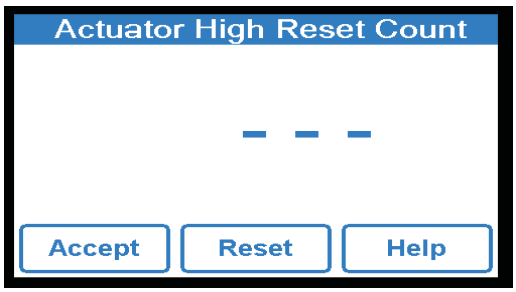
For mixed outlet high, press **Mixed Outlet High** from the Monitor menu, then press **Accept** or **Reset** to zero.



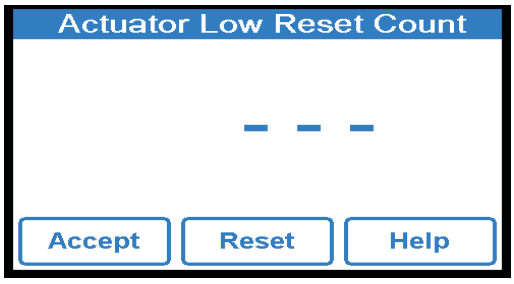
For mixed outlet low, press **Mixed Outlet Low** from the **Monitor** menu then press **Accept** or **Reset** to zero.

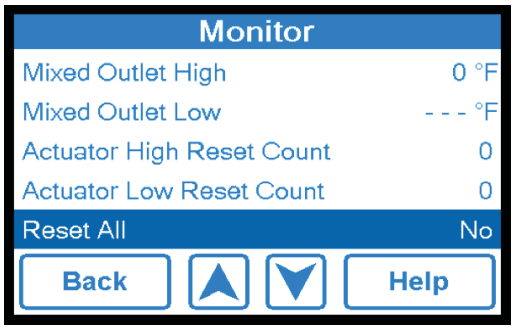
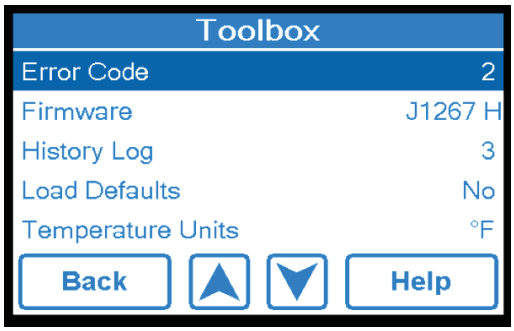
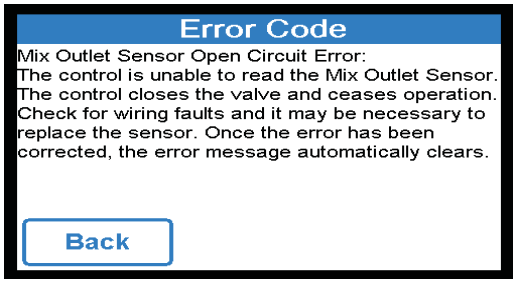
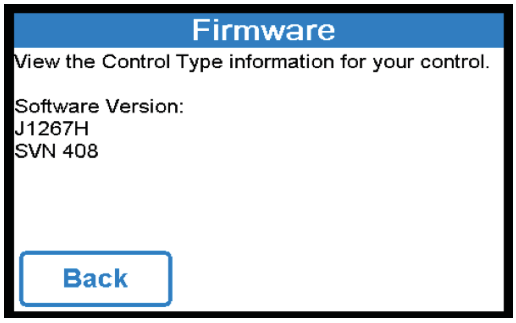
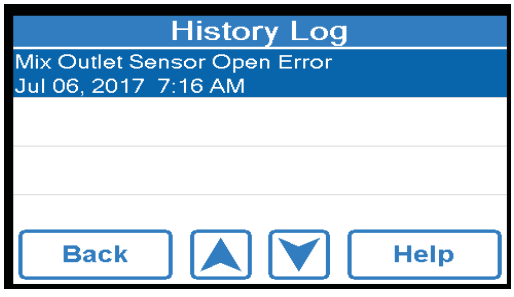


To monitor actuator high reset count, press **Actuator High Reset** Count from the **Monitor** menu then press **Accept** or **Reset** to zero.

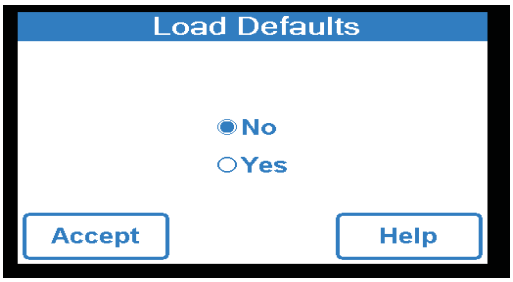


To monitor actuator low reset count, press Actuator Low Reset Count from the Monitor menu, then press Accept or Reset to zero.

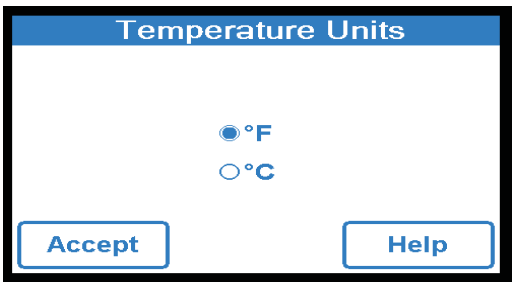


To select reset all, scroll down through the **Monitor** menu and press **Reset All**.	
Press the **TOOLBOX** icon on the **Programming** menu to access the Toolbox Function. Scroll through the Toolbox menu using the **UP** and **DOWN** buttons to access each option.	
To find out error code, press **Error Code** from the **Toolbox** menu. When done press **Back**.	
To view the control type information for your controls, press **Firmware** from the **Toolbox** menu and then press **Back**.	
To access the history log, press **History Log** from the **Toolbox** menu then press **Back**.	

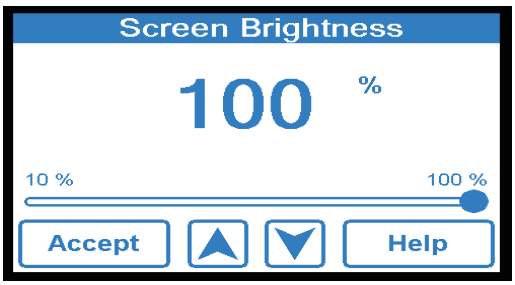
To select load default, press **Load Defaults** from the **Toolbox** menu. Toggle the radio button to **No** for no load or **Yes** for Load Defaults, then press **Accept**.



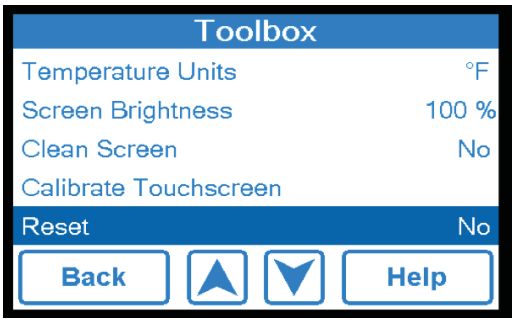
To select load temperature units of measure, press **Temperature Units** in the **Toolbox** menu. Toggle the radio button to °**F** for Fahrenheit or °**C** for Celsius, then press **Accept**.



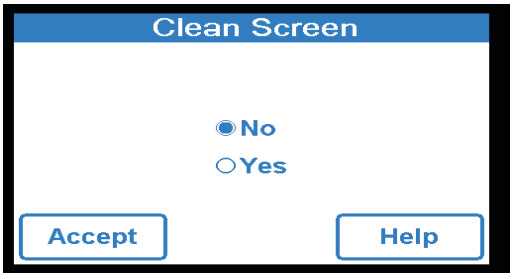
To adjust the screen brightness, press **Screen Brightness** from the **Toolbox** menu. Move the slider or use the **Up** or **Down** arrows to adjust the brightness, then press **Accept**.

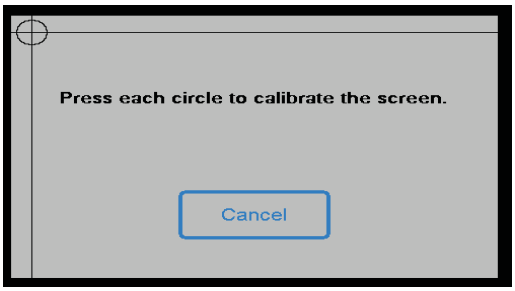
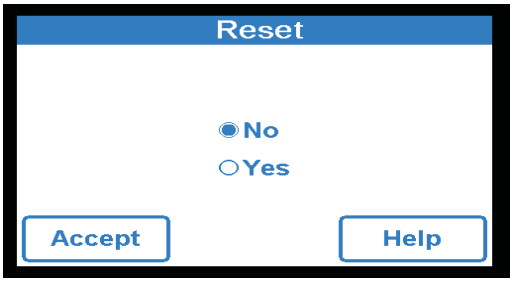


To clean dirty screen, press **Clean Screen** on the **Toolbox** menu.



Toggle the radio button to **Yes** to lock the screen to clean, or press **No** to keep it unlocked, then press **Accept**.



To calibrate the touch screen, press **Calibrate Touchscreen** on the **Toolbox** menu. Press each circle to calibrate the touch screen.	
To reset all, press **Reset** on the **Toolbox** menu. Toggle the radio button to **Yes** or toggle to **No** to retain the current settings.	

Problem:

Outlet temperature is below set point temperature and/or the low temperature alarm has been activated

Solution:

1. Depending on the heating plant plumbing and location, it may take several minutes for the hot water to reach the Water Heater. Ensure that you have allowed enough time (5 minutes) for the system to come up to temperature.
2. On the Home screen, check **Mixed Outlet Setpoint** and the hot water supply temperature. The hot water supply temperature needs to be above the set-point or the unit will not be able to reach the set- point.
3. If the hot water supply temperature is BELOW **Mixed Outlet Setpoint**:
   a) Raise the hot water supply temperature at least 2°F (1°C) above the mixed outlet set-point temperature.
   b) Ensure that the hot water is flowing.
   c) Check the hot water source set-point temperature and ensure that the hot supply line has no obstructions or closed valves restricting flow to DigiTemp
4. If the hot water supply temperature is ABOVE the **Mixed Outlet Setpoint**, there are no obstructions preventing hot water from reaching the unit, and there is sufficient flow through the unit, reset the control by pressing the PRGM icon to access the **Programming** menu. Unlock the control and then select the “Toolbox” to navigate to the “Toolbox” menu. From within the “Toolbox” menu use down arrow to high- light “Reset” then press enter. This will access “Reset” menu. Press **YES** and then press **Accept**. The controller will reset and begin a startup sequence.

NOTE: Alternately, the control can be reset by opening and closing the circuit breaker switch and waiting 100 seconds to resume normal operation. Always use proper precautions when accessing circuit breaker box.

If problem persists after conducting the above outlined problem solving procedures, contact Powers, Technical Support at 800-669-5430 or info@PowersControls.com.

15. Lync AquaSolve Anti-Scale Operation and Maintenance

15.1. Introduction

The Lync AquaSolve Anti-Scale system provides protection from scale formation on internal plumbing surfaces. It prevents scale by transforming the normal dissolved hardness minerals into undissolved crys-tal microparticles. These crystals stay suspended in the water and have a greatly reduced ability to react and attach to surfaces like dissolved hardness does. Therefore the problem of internal buildup of scale in pipes, water heaters and on fixtures and glass is greatly reduced.

AquaSolve Anti-Scale is not a water softener or a chemical additive (like antiscalants or sequestrants). It is a scale prevention device with proven third party laboratory test data and years of successful residential and commercial installation. AquaSolve Anti-Scale is the one water treatment device that effectively provides scale protection and is a great salt free alternative to water softening (ion exchange) or scale sequestering chemicals. Laundry and warewashing chemistry will like-wise require adjustments.

15.2. AquaSolve Anti-Scale Benefits

AquaSolve Anti-Scale provides chemical-free scale prevention and protection by converting hardness minerals into harmless, inactive microscopic crystals, thus making it an effective alternative water softener technology for the prevention of scale due to water hardness. Its advantages include:

- Virtually maintenance free – no control valve.
- Uses environmentally friendly technology by using no salt or other chemicals to constantly add, no electricity and no wastewater.
- Improves efficiency of all water using appliances – both hot** and cold.
- Safe for landscaping and lawn watering, no need for costly bypass plumbing.
- Compatible with all on-site and community wastewater treatment systems.
- Perfect system for towns or communities where water softeners are banned or restricted.
- AquaSolve Anti-Scale does not remove minerals or add sodium to the water supply.
- AquaSolve Anti-Scale can be installed as pre-treatment to commercial reverse osmosis systems (contact your Lync representative for further details).

** For hot water applications where feed water temperature is 100° - 140°F (38° - 60°C), please contact your local Lync representative .

WARNING!

Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system. Systems are certified through WQA against NSF/ANSI Standard 61, CSAB483.1, and to 372 for Lead Free compliance.

15.3. Specifications

The AquaSolve Anti-Scale system must operate in an upflow manner and does not require additional water to backwash, flush, or regenerate once put into service. The system does not require any chemical additives and does not require electricity for operation.

15.4. Standards

Independent scientific testing has confirmed Media Assisted Crystallization (MAC) technology provides scale reduction of over 95+%. Testing was conducted under protocol based on DVGW W512 test to access control of scale formation.

NOTE: Spotting may occur on external plumbing surfaces.

The AquaSolve Anti-Scale system performs best in single pass potable water applications with NO additional chemical additives. Depending on hardness, soft scale spotting may occur. Soft scale spots in most cases can be easily wiped down with a damp cloth and will not form hard scale deposits. A Point of Use (POU) Water Softener should be used on mandatory spot-free applications (e.g. glass stemware, dishware).

CAUTION

- Not for use on closed loop systems.
- Do not let the system freeze. Damage to the tank may result.
- System must be operated in a vertical position. Do not lay it down during operation. The system may be placed in any position for shipping and installation but must be operated in the vertical position.
- Place the system on a smooth, level surface. Because the sys-tem operates in an upflow, fluidized bed mode, having a level surface is more important than with a softener or media filter.
- A bypass valve should be installed on every system to facili-tate installation and service.
- Observe all local plumbing and building codes when installing the system.

WARNING!

Due to the unique properties of AquaSolve Anti-Scale, there are some unique requirements for using AquaSolve Anti-Scale in conjunction with other forms of water treatment:

1. AquaSolve Anti-Scale must be the last stage in the treatment chain. Do not install any filters after AquaSolve Anti-Scale or before any devices for which scale prevention is required. POU filters, e.g. carbon, RO or Ultraviolet (UV) are exempt from this requirement.
2. Do not apply any other antiscalants before or after AquaSolve Anti-Scale.
3. The addition of soaps, chemicals, or cleaners, before or after AquaSolve Anti-Scale treatment, may reverse its anti-scale treatment effects and/or create water with a heavy residue or spotting potential. Any adverse conditions caused by the addition of soaps, chemicals, or cleaners are the sole responsibility of the end user.
4. AquaSolve Anti-Scale is not a water softener and does not soften the water. Water treatment chemistry (e.g. antiscalants, sequetrants, soaps, chemicals or cleaners etc.) will most likely have to be changed to be compatible with AquaSolve Anti-Scale treated water. Laundry and ware-washing chemistry will likewise require adjustments.

15.5. Equipment Specifications

AquaSolve Anti-Scale systems are complete, self-contained, loaded with media, and ready to use. Review operating pressures, temperatures and water chemistry limitations for compatibility.

LC-N Feed Water Chemistry Requirements	
pH	6.5-8.5
Hardness (maximum)	30 grains (513 ppm CaCo3)*
Alkalinity	100 ppm
Water Pressure	15 psi to 150 psi (1.03 to 10.34 bar)
Temperature	40°F to 100°F (5°C to 38°C)
Free Chlorine	≤ 1 ppm
Chloride	≤ 200 ppm
Iron (maximum)	0.3 ppm**
Manganese (maximum)	0.05 ppm**
Copper	1.3 ppm***
Oil & H2S	Must be Removed Prior to AquaSolve Anti-Scale
Total Phosphates	< 3.0 ppm
Sulfate	< 250 ppm
Silica (maximum)	20 ppm****
TDS	500 mg/l*****

NOTE: Water known to have heavy loads of dirt and debris may require pre-filtration prior to AquaSolve Anti-Scale.

* Systems using AquaSolve Anti-Scale technology are effective at controlling lime-scale formation inside the plumbing system at influent hardness levels up to 75 grains per gallon (1282 mg/l) of calcium carbonate. Due to variances in water chemistry, 30 grains per gallon is a recommended hardness maximum due to potential aesthetic issues related to soft scale residue formation outside of the plumbing system. Testing should be performed to determine proper application where hardness levels exceed 30 grains per gallon.

** Just as with conventional water softening media, AquaSolve Anti-Scale media needs to be protected from excess levels of certain metals that can easily coat the active surface, reducing its effectiveness over time. Public water supplies rarely, if ever, present a problem, but if the water supply is from a private well, confirm that the levels of iron (Fe) and manganese (Mn) are less than 0.3 mg/L and 0.05 mg/L, respectively.

*** Pursuant to the EPA drinking water standards, the copper concentration permitted is up to 1.3 ppm. Typically originating from new copper plumbing, high levels of copper can foul AquaSolve Anti-Scale media. For appli-cations with copper concentration greater than 1.3 ppm, please consult Watts Water Quality Technical Service. To further minimize any problem with

excess copper, avoid applying excessive flux on the inner surfaces of the pipe and use a low-corrosivity water soluble flux listed under the ASTM B813 standard.

**** AquaSolve Anti-Scale media does not reduce silica scaling. While silica tends to have a less significant effect on scale formation than other minerals, it can act as a binder that makes water spots and scale residue outside the plumbing system difficult to remove. This 20 ppm limitation is for aesthetic purposes.

***** All other contaminants must meet the requirements of the USEPA Safe Drinking Water Act. Specific Mineral and Metal MCL's, identified in Watts published Feed Water Chemistry Requirements, supersedes the USEPA SDWA.

NOTE: Systems using AquaSolve Anti-Scale technology prevent hard water scale formation inside the plumbing system at influent hardness levels of 30 grains per gallon of calcium carbonate and less. Due to vari-ances in water chemistry, certain aesthetic conditions external of the plumbing system may not be attained. AquaSolve Anti-Scale is designed for the treatment of potable water that meets the requirements of the current USEPA Safe Drinking Water Act.

All Lync LC-N Water Heating Solution models use AquaSolve model number LM8414TM-COM.

Mechanical Specifications	
Dry Weight	124 lbs / 56 kg
Service Weight	458 lbs / 208 kg
Inlet/Outlet Connection	2" FNPT

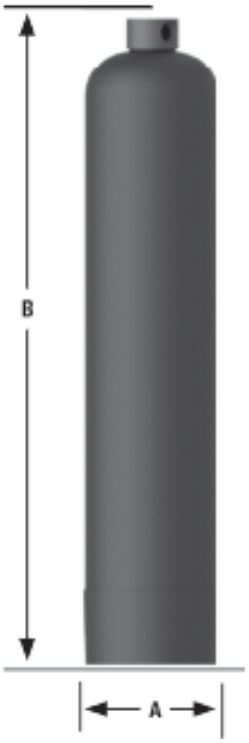
Replacement Media
Replace media every 3 years

Dimensions (nominal - inches)	
A	14
B	73.1

Max. Service Flow (gpm) vs. Water Temp. (ºF)							
System	40º	45º	50º	55º	60º	65º	70º
LM8414TM	40	44	48	50	50	50	50

Intermittent Duty Systems
50 gpm at all temperatures

Max. Flow Rate***	
50 gpm	189 lpm



*** Exceeding maximum flow can reduce effectiveness and void warranty.

Pressure drop at peak flow rate is less than 22 psi.

Pressure drop reading taken with inlet and outlet gauges installed at a common elevation and 80 degree feed water.

16. SEQUENCE OF OPERATION

The following is the sequence of operation for each Water Heater in the Lync LC-N Water Heating Solution:

1. Incoming 120VAC
    a) Full time power to the Fuse
    b) Full time power to the Main Control Switch
2. **Power On** - When the main control switch is turned on:
    a) 120V is applied to fuse, if fuse is good, lamp in control switch is lit.
    b) 120V is applied to the step-down transformer (24V)
    c) 120V is applied to the L.W.C.O. terminal L1
    d) 24V and 120V is applied to the Platform Ignition Module (PIM). The circulator, blower and HSI circuits are 120V.
    e) The PIM performs a processor and memory self-test to insure proper operation. The PIM confirms the presence of a valid ID card which matches the configuration previously stored in memory. If the valid ID card is not present, the PIM generates a diagnostic fault. The non- volatile memory is checked for an active lockout condition. A lockout indicates the previous attempt to light was unsuccessful, or a hi-limit or other system fault occurred. The PIM stays in lockout until a manual reset is performed.
3. **Control Device Pre-check** – The following control circuits are checked for closer before the control system will initiate a Call for Heat.
    a) The PIM continuously monitors the flame status to verify no flame is present during Standby. If an erroneous flame is detected, the PIM generates a flame error fault.
    b) The Electronic Low Water Cut-Off control is a self-contained electronic device which senses the presence of water at the top of the storage tank. When the presence of water is confirmed, the contacts close on the ELWCO and is sensed by PIM control.
    c) The High Temperature Limit is combined in a common probe body with the upper tank sensor. The PIM will compare the high limit thermistor temperature with the upper tank thermistor temperature. If the two temperatures are not the same, a sensor failure will result.
    d) When the High Temperature Limit operation has been verified by comparison, the limit temperature will then be confirmed to be under the maximum allowable temperature.
    e) Terminals P1-P2 are closed to activate any connected remote devices.
    f) The circuit between Terminals C1-C2 is closed by any connected remote proving switches, enabling the water heater to continue the sequence of operation. With no proving devices, this is jumpered.
    g) The enable circuit between Terminals R1 – R2 must be closed for the heater to start operation. With no external enable, terminals jumpered.
4. **Call For Heat** - If the operating control senses that the temperature at the upper tank sensor is below the heater set point and the previous control interlocks and safeties are satisfied, the following sequence will begin:
    a) Terminals P1-P2 are closed to activate any connected remote devices.
    b) The circuit between Terminals C1-C2 is closed by any connected remote proving switches, enabling the water heater to continue the sequence of operation.

c) When the burner blower is energized the blower speed is verified to be within the operational range for ignition.

d) The ignition pre-purge delay takes place.

e) The voltage level of the 24 VAC supply input is confirmed to be above 18.0 VAC.

f) The Ignition cycle begins.

5. **Ignition** - When dwell time is completed a 4-second Trial for Ignition (TFI) period is initiated:

a) The spark ignition transformer is energized

b) The Gas Safety Valve is energized.

c) During TFI the flame safeguard control will monitor the flame using flame rectification through the flame sensing electrode.

d) If the flame control senses the presence of flame before the end of the TFI period, the spark transformer will be de-energized and the flame control will continue to monitor the flame until the operating thermostat ends the call for heat condition.

6. Heating

a) The flame status, LWCO switch, blower motor speed and other safety switches are continually monitored for proper state.

b) The High Limit sensor is confirmed to read below the High Limit set-point.

c) The temperature of water in the tank is compared to the temperature control set point to determine when to begin firing in heating mode.

d) The water heater remains in heating mode and, with extended operation, condensation begins to fill the condensation trap and drain line; (a normally operating booster heater does not create condensation). The water heater stops firing when the tank water temperature matches the temperature control set point.

e) The gas valve(s) are immediately disabled.

f) A Blower Post-purge is completed and the control proceeds to Standby mode.

7. **Integral Circulating Pump** – The circulating pump is controlled independently of the call-for-heat.

a) When the main control switch is turned on, the control system will continuously monitor the water temperature in the tank and attempt to maintain a uniform water temperature within the tank by using the integral circulating pump.

b) If the temperature sensed in the tank mid-section drops 3° or more below the temperature setpoint, the pump is energized and a pump circulator icon will illuminate on the control display touch screen.

c) The operation of the circulating pump is independent of the burner operation and may occur before, during or after the call-for-heat period.

8. Flame Failure / Flame Loss

a) If the flame rod fails to sense flame during an attempt to light the burner (Ignition Trial Fail), the ignition control will end the ignition sequence and the gas valve will be closed. Immediately following the end of the first failed ignition cycle, a new ignition sequence will be initiated to attempt to relight the burner. The standard Water Heater configuration allows for three ignition failures before lockout.

b) If the burner successfully lights and operates but the flame is lost, the gas valve will be closed and the blower will continue to operate in order to purge any remaining

combustion products from the water heater. The standard Water Heater configuration allows for three (Main Flame Loss) occurrences before lockout. Following each (Main Flame Loss) the PIM will purge and initiate the ignition sequence until the maximum of three flame loss events occur.

17. INITIAL STARTUP

17.1. Initial Startup Requirements

Installation must be complete prior to performing initial startup; and the startup must be complete prior to placing the Lync LC-N Water Heating Solution into service. Starting Water Heaters without proper piping, combustion air, venting or electrical connections or control settings can be dangerous and may void the product warranty. The following startup instructions must be followed precisely in order to achieve proper and efficient operation to assure trouble-free service life.

WARNING!

Proper startup must be made by a qualified installer or service agency, who must read and follow the supplied instructions and markings. Failure to complete proper startup before use, tampering with controls or not following all instructions and markings may damage this equipment, void the warranty and may result in property damage, personal injury or death.

17.2. Tools and Instrumentation Required

- Stack Temperature Gauge
- Electronic Combustion Analyzer
- Manometer or pressure gauge
- AC/DC Multi-meter (with 20,000 OHM/Volt rating)
- Amp Meter
- Normal Hand Tools

17.3. Resources

- Product Installation & Maintenance Manuals
- Start-up Report with instructions
- Local, State, & Federal Codes
- Website: https://lyncbywatts.com/support
- Technical Support: 1-800-433-5654

17.4. On Site Considerations

- Electrical Supply in accordance with the Nameplate Rating
- Adequate uncontaminated indoor or outdoor combustion air
- Adequate Fuel Supply
- Adequate Water Supply
- Exhaust Vent that complies with the installation instructions
- Condensate drainage that complies with the installation instructions

17.5. Pre-Startup Checklist

IMPORTANT: Before starting the Water Heaters, ensure that they are properly and completely installed. If a unit is not installed properly, DO NOT attempt startup. Contact your installer immediately.

Before starting each unit, check for adequate electrical service, confirm if any external control wiring connections exist, confirm the tank is filled with water, check all tank connections for leaks, and ensure the condensate trap is installed properly and that the gas supply meets the product rating decal requirements as follows:

Check Electrical Service:

1. Start by checking the electrical service to each Water Heater. The standard electrical service required is a 120 volt, single phase, 60 Hertz power supply that is also electrically grounded. See the rating decal on the front of the Water Heater for the electrical service requirements for your specific product.
2. Next, shut off the electrical service to the Lync LC-N Water Heating Solution and turn the power switch on each water heater to the **OFF** position.
3. Unscrew and remove two top cover plates to access control enclosure. Locate the document packet containing the control circuit fuse and fuse cap. A wiring diagram is also included.
4. Remove fuse and fuse cap from packet and install them into the fuse holder on the front panel.
5. Visually check that all components are intact, and no damage has occurred during transit and installation. Check all wire connections within the control cabinet. A loose connection could cause damage or intermittent shutdowns.

Check For External Control Wiring Connections

Before initial startup, the heater must be isolated from any remote controlling device. On the field access terminal strip, check to see if terminals **R1** and **R2** are jumped. If they are, nothing more needs to be done. If the terminals are not jumped but have wires connected to them, this indicates that a remote on/off relay is controlling the water heaters from the Building Automation System. These wires must be removed prior to startup and the terminals must be jumped. Before bypassing the R1 & R2 terminals, ensure it is safe to operate the equipment. Remember to remove the jumper and reconnect the remote wires after startup is complete.

Check the back of the digital control display board on the back of the front panel to see if a 2-wire, RS-485 communication cable is connected. These wires must be removed to isolate the water heaters from the Building Automation System during startup. Remember to reconnect the communication cable to the digital control display board after startup is complete.

Confirm The Tanks Are Completely Filled With Water

NOTE: T&P Relief valve alone will NOT completely fill tank!

1. Close each individual water heater's drain valve (see Figure 4-2).
2. Fully open the shutoff valves on the cold water inlet and hot water outlet piping to the unit.
3. Open the T&P valve to vent the tank. Close the valve when flow is observed.
4. Open a nearby hot water faucet(s) to allow trapped air to escape from the piping.
5. A steady flow from the hot water faucet(s) indicates the tank is full. Close faucet(s).

Check Tank Flanges And Plumbing Connections For Leaks

With the tank filled, check the pipe thread connections to ensure they are water tight and tighten as necessary to avoid leaks that will damage the tank insulation.

Check Condensate Trap

A condensate trap assembly ships with the Lync LC-N Water Heating Solution, which must be installed on the condensate drain to prevent flue gasses from escaping and creating a hazardous condition in the installed space. The condensate drain is located at the bottom rear of the water heater near the flue outlet.

Connect the condensate trap assembly to the PVC fitting on the condensate drain pipe. Then rotate the trap so that it contacts the floor. Connect 1/2" ID clear vinyl tubing, rated for 170° or higher, or an optional Condensate Neutralization System to the barbed hose connection at the end of the condensate trap.

Confirm Gas Type

Confirm the gas type supplied matches the rating label requirement on the front of the water heater. Water Heater require **Natural Gas**.

Confirm Supply Gas Pressure

WARNING!

If you smell gas: Do not try to light Water Heater. Do not try to touch any electrical switch or use a phone in your building. Immediately call your gas supplier and follow their instructions.

For **Natural Gas**, the maximum inlet static gas pressure must not exceed **14.0** inches water column and must not drop below **3.5** inches water column during operation.

To check the supply gas pressure:

1. First, shut off the main gas supply to the Lync LC-N Water Heating Solution.
2. Ensure that the manual gas valve at the inlet of the gas train is closed.
3. Connect manometer to the 1/8” NPT test port on the manual shutoff valve at the inlet of the gas train
4. Now open the main gas supply to the Lync LC-N Water Heating Solution and check for gas leaks on all joints upstream of the manual shutoff gas valve.
5. Open the 1/8” pilot shut-off test valve and measure the supply gas pressure.

IMPORTANT: If the supply gas pressure is outside of the allowable range, notify the building maintenance personnel or installer to reduce the gas pressure to the water heaters!

6. With the manual gas shut off valve open, check the gas train for leaks using a soap solution. If any bubbles are detected, close the manual gas valve and tighten the leaking connection.

Aquasolve Start-Up

NOTE: Check the head on top of the tank. It’s common for it to loosen during shipment. If necessary, tighten the head with a strap wrench as needed.

In systems with new copper piping, such as new construction or recently repaired domestic hot water piping, copper and flux may temporarily increase the copper content of the supply water above the recommended operating limits for the AquaSolve scale prevention system. In these cases it is highly recommended to put the AquaSolve in bypass mode for the first 6 weeks of operation to allow the new copper piping to develop a natural protective oxide layer. After 6 weeks the AquaSolve should be returned to normal operation as per below.

Connect a hose to the hose bibb on the outlet of the tank. Run the hose to a drain and open the hose bibb.

Slowly/partially open the supply water ball valve. Allow the tank to slowly fill with water. When a steady stream of water appears at the drain, close the supply valve and hose bibb.

Open the inlet and outlet valves on the system. Transfer the bypass valves from Bypass to the Service position. Open a nearby faucet downstream from the AquaSolve Anti-Scale system to relieve any air.

Check for leaks. Repair as needed.

NOTE: Fill in install date and revise the due date on product label located on front of each tank as reminder to replace AquaSolve Anti-Scale media every 3 years. The system is now ready for service. AquaSolve Anti-Scale media should be replaced every 3 years.

17.6. Startup Procedure

1. Begin by turning the Lync LC-N Water Heating Solution power switch to the **OFF** position.
2. If the vent system does not have a combustion testing port, drill a small test hole in the flue vent approximately two feet from the Water Heater‘s vent connection. Insert the combustion analyzer probe into the vent test hole.

   IMPORTANT: Before restarting Water Heaters, ensure there is a way for the system to dissipate heat, such as opening one or more nearby hot water faucets.
3. With the gas valve **E-Box** switch in the **OFF** position (see Section 20.1 *Blower, Burner, & Gas Train Assembly* for E-Box location), connect electrical service to the Lync LC-N Water Heating Solution and then turn its power switch to the **ON** position.

   The EOS Temperature control touch screen will energize. If the tank temperature is 3° or more below the factory setpoint of 120 degrees, the Call-For-Heat sequence will initiate.

   - With no gas pressure, the ignition control will attempt to ignite the burner three times before proceeding to a safety shutoff. Following the third failed attempt, the display screen immediately shows a **LOCKOUT** condition has occurred.
   - In a few seconds an **ERROR** code flashes in the Status field, and a **FLAME FAIL** alarm message is displayed followed by the troubleshooting message **“IGNITION TRIAL FAIL”** which scrolls across the top of the screen.
4. Now turn the **E-Box** switch to the **ON** position. Then push and release the **MAIN RESET** button on the front panel of the water heater to recover from the lockout condition. If all control interlocks and safeties are satisfied the control will automatically reset and attempt to start a new heating cycle.
5. When the call for heat sequence begins, the burner blower is energized. The status field of the display screen shows that the blower operation is waiting to be proved.

   - When the BLOWER operation is verified by the tachometer, the **Ignition Pre-Purge** sequence begins. The **BLOWER** message is displayed as the pre-purge countdown begins.
   - Following a pre-purge, a 4-second trial for Ignition period is initiated. During this sequence the screen displays **IGNITION** while the spark ignition transformer and gas valves are being energized.
   - When ignition occurs, and flame is proven, the Status field shows the **BURNER** is firing and the flame **CURRENT** is displayed in microamps for about 8 seconds.

- The burner will continue to fire until the Water Heater reaches its set point temperature. The **CONTROL TEMPERATURE** sensed at the top of the tank will continue to display throughout the burner run cycle and after shutdown when the Water Heater is satisfied and idle.

6. Burner Combustion Adjustment - General:

WARNING!

If at any point carbon monoxide is in excess of 200 ppm, do not continue to operate Water Heaters and contact your Lync representative for assistance.

Carbon monoxide is a colorless, odorless and poisonous gas that commonly results from gas combustion. High concentrations of Carbon Monoxide are extremely dangerous to humans and animals. Operation of an appliance at carbon monoxide levels above 200 ppm can cause unsafe operation and the potential for poisonous carbon monoxide to enter occupied areas. Such improper installation can cause property damage, personal injury, exposure to hazardous materials or death.

a) With the burner firing, measure the flow gas pressure at the beginning of the gas train. If the inlet flow gas pressure for Natural Gas is equal to or greater than the 3.5-inch water column, continue with the startup. If the inlet flow gas pressure drops below these minimum requirements, a supply gas volume or piping problem may exist and must be corrected before the startup can continue.

b) With the burner firing, monitor the combustion analyzer readings. The desired Carbon Dioxide (CO2) level, in the combustion products must be between 8.0% and 9.5% for Natural Gas. If the level is in this range, no adjustment is required or recommended. If the level must be adjusted, turn the slotted brass gas valve orifice screw counter-clockwise to increase gas flow and increase CO2, or clockwise to decrease gas flow and decrease CO2.

NOTE: Do not attempt to adjust combustion based on manifold pressure. Manifold pressure should only be used as a reference point. Do not adjust the regulator for this model. See Gas Train Illustrations for details.

7. **Optimizing Combustion**:

Water Heaters use a modulating burner control system. The CO2 level must be checked at both Low Fire and High Fire. The firing rate adjustment is done in the **Manual Override** menu, accessed through the EOS Touch Screen Digital Control.

To access the Manual Override Menu:

a) Press and hold the **HOME** button for 3 seconds.

b) Press the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **TOOLBOX** menu.

c) Press the **ENTER** button to display the **ACCESS** screen.

d) Now use the **UP** or **DOWN** arrow buttons to select the **ADVANCED** setting.

e) Exit the menu by pressing the **HOME** button.

f) Use the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **OVERIDE** menu.

g) Press the **Enter** button to display the **MANUAL OVERRIDE** screen and use **UP** or **DOWN** arrow buttons to select the **HAND** setting.

h) Use the NEXT ITEM or ITEM BACK buttons to navigate to the HEATER MODULATION (HTR MOD) menu.

i) This setting will override the operating control, and using the up or down arrow buttons, force the burner to fire at a selected firing rate. **NOTE**: If the **HTR MOD** program is activated while the burner is firing, the burner will shut down and recycle.

j) Using the **UP** or **DOWN** arrow buttons adjust the firing rate from **OFF** to the minimum firing rate of 15% for Low Fire. With the burner firing rate stabilized at **Low Fire**, adjust the Gas Regulator screw clockwise to increase gas flow and increase CO2, or counter-clockwise to decrease flow and decrease CO2.

k) Only make combustion adjustments if the CO2 falls outside the prescribed range.

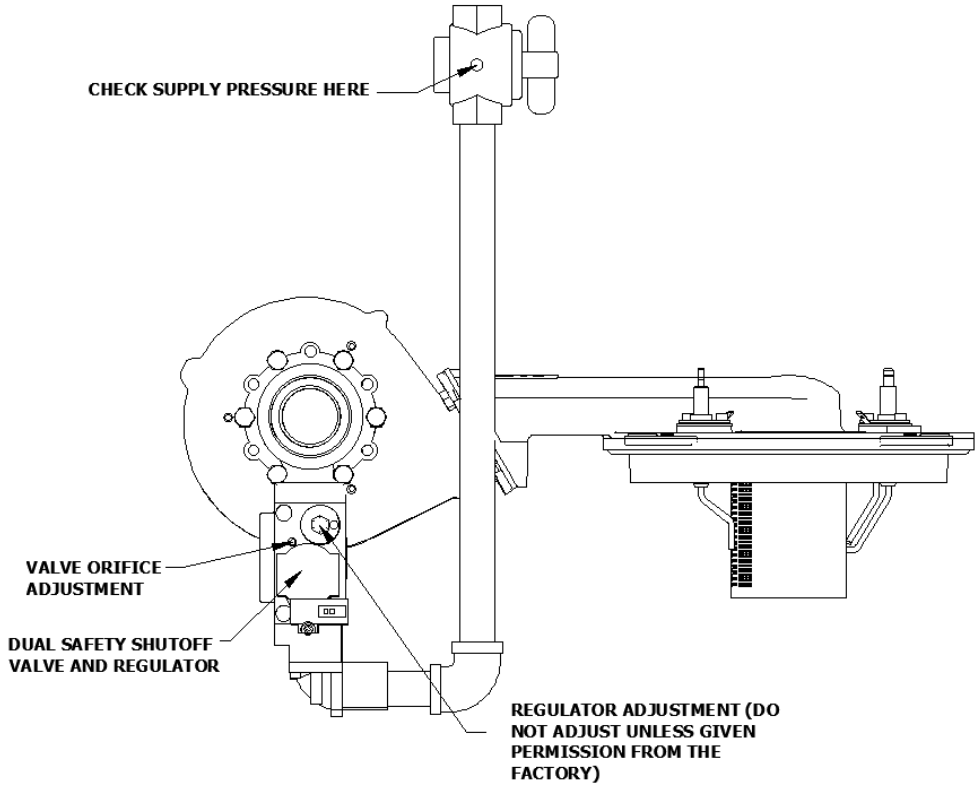
l) Once the desired combustion levels are achieved at **Low Fire**, return to the touch screen and increase the **HTR MOD** firing rate to the maximum **High Fire** firing rate setting allowed for this product. With the burner firing rate now stabilized at **High Fire**, turn the Gas Valve Orifice Adjustment screw clockwise to decrease gas flow and decrease CO2, or counter- clockwise to increase gas flow and increase CO2.

m) Only make combustion adjustments if the CO2 falls outside the prescribed range.

n) Once the desired combustion is reached at **High Fire**, return to **Low Fire** to confirm the settings again.

o) When all combustion adjustments are complete, go back to the **MANUAL OVERRIDE** screen and return the function back to the "**AUTO**" setting.

8. Check the Vent Pressure. With the combustion properly adjusted, now use the same vent opening that was used for the combustion analyzer probe to measure the vent pressure. With the burner firing, confirm the vent pressure does not exceed .3" W.C. Pressure in excess of .3" W.C. indicates high vent restriction, possibly a venting sizing issue that must be addressed by the installer before operating the water heater.



(Optional components may not be shown)

Figure 17-1 Gas Train Illustration

17.7. POTENTIOMETER (Adjusting the Setpoint)

The PIM Ignition Control will continue to operate the Water Heater at a 120 degree internal factory setpoint should the touch screen control fail, or communication between the two devices is interrupted. This internal setpoint can be adjusted using the potentiometer to maintain a different operating temperature under these circumstances if desired.

To Adjust The PIM Potentiometer Set-point:

1. From the View Menu, press and hold **HOME** button for 3 seconds to display the SETUP Menu.
2. Using the **NEXT ITEM** or **ITEM BACK** buttons navigate to the **TOOLBOX** menu, then press the **ENTER** button to display the **ACCESS** menu.
3. Now use the **UP** or **DOWN** arrow buttons to select the **INSTALLER** setting.
4. Press the **HOME** button to return to the **TOOLBOX** menu, then use the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **SOURCE** menu.
5. Press **ENTER** to enter the source menu and use the **NEXT ITEM** or **ITEM BACK** buttons to navigate to the **OPERATOR** screen to display the potentiometer set-point.
6. Open the hinged upper panel of the control enclosure and locate the potentiometer on the PIM Ignition Module.
7. Using a small blade screwdriver, adjust the PIM Potentiometer to a desired stand-alone setpoint temperature as you view the adjusted temperature setting in the **OPERATOR** screen.
8. Exit the menu by pressing the **HOME** button.

18. NSF FOOD SERVICE INSTALLATION GUIDELINES

This section provides additional information for architects, designers, and contractors in food service installations requiring compliance with NSF codes. NSF/ANSI 5 establishes health and sanitation requirements for the materials, design and construction of commercial water heaters. Water Heaters are certified for compliance with NSF-5 by ETL Intertek and are therefore recognized as suitable for installation and use in commercial food service appllications when installed and used according to these instructions.

WARNING!

Do not use pressurized water to clean the water heaters. If the food service installation requires pressurized washing, the water heaters must be isolated from water spray. Failure to isolate the heater from pressurized water may cause a hazardous condition resulting in property damage or high voltage electrical shock, causing personal injury or death.

Water Heaters can be adjusted to operated at temperatures up to 187ºF. Refer to Section 9.4: *Operating Temperature Control*, above, for instructions to adjust the thermostat to the desired temperature.

NSF Installation - The NSF 5 listed Water Heater requires no modification to become NSF 5 compliant, is designed to supply potable hot water and is not intended or suitable for other purposes. Where feasible, the Lync LC-N Water Heating Solution should be located separate from food and utensil handling areas. When this is not possible in a food service installation, the Lync LC-N Water Heating Solution must be equipped with a leak detection system, such as the Trident system from The Detection Group. The floor must be clean, smooth and level for adequate sealing. Seal the water heater to the floor using an RTV sealant (such as Red Devil 0826, Saf-T-Lok 732 or RTV 102 or an equivalent). Follow the sealant manufacturer's instructions to lay a bead of sealant between the edge of the heater base and the floor. The supplied covers over the four floor bolting access openings must be installed.

NSF Service and Maintenance - NSF 5 for food service installations require the appliance and its installation to prevent harborage of vermin. Tight construction of the properly installed and assembled heater enclosure does not provide a haven for pests. If the floor bolting access covers do not seal completely, they must be replaced, available from Lync.

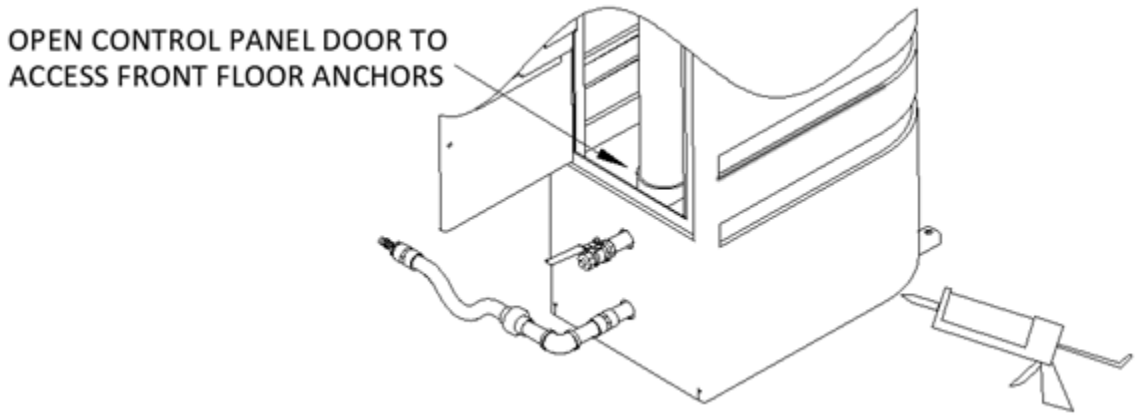


Figure 18-1 Control Panel Door

19. TROUBLESHOOTING PROCEDURE

Before troubleshooting the system, check the following items:

Verify that all mechanical and electrical connections are secure and tight.

- Verify that all system wiring is correct.
- Verify that there is a proper system ground. The tank, LWCO, igniter, flame sensor, and ignition module must share a common ground with the burner. Nuisance shutdowns are often caused by a poor or erratic ground.
- Follow the “Initial Startup” instructions in section 15 as the first step in any troubleshooting.
- Verify that the system is powered and that the control is calling for heat.
- If the control displays an error code on the red diagnostic LED, troubleshoot per **Section 10.2 Alarm Messages – Diagnostic Codes.**

The LED will flash on for 1/10 second, then off for 2/5 second during a fault condition. The pause between fault codes is 8 seconds.

19.1. General Troubleshooting

Symptom	Probable Cause	Corrective Action
Starting Or Pre-purge Failure	Power Supply	Check fuse and/or circuit breaker.
	On-Off Switch	Check if On-Off switch is illuminated when on. If not check panel fuse or incoming power.
	Temperature Control	Check that the operating temperature control is set higher than the temperature of the water heater.
	Remote enable/disable open	Enable water heater or place jumper between terminals R1-R2.
	Electronic Low Water Cut-off	Check internal ELWCO board for indication of failure. Solid red LED indicates good water level. Blinking indicates high resistivity (possibly low water, dirty probe, poor electrical connections). Off indicates failure or loss of power. Manual reset is required.
	Gas Pressure Switches (when installed)	Gas pressure switches not an option on this heater. Inspect wires at J8 of PIM.
	High Temperature Limiting Device	The high limit device is set at 200°F. This device is located at the control flange on the top head of the tank. A high temperature condition may be caused by a failure of the Temperature Control sensors or the circulation pump. This failure requires manual reset.
	Combustion Air blower Remote Proving Interlock	Check if fan control relay is providing 120VAC to motor
		Blower motor may have failed. Check signal connection to blower motor.
	Loose Wire Connections	Check connections to all components
Flame Failure	Power Supply	120 VAC is required for operation. Low voltage can cause failure. Voltage below 110 VAC must be investigated.

	Spark Ignition Transformer	Transformer may be faulty or ignitions cable could be damaged causing a short to ground.
	Gas Pressure	Check for proper inlet static and dynamic gas pressure, 3.5" W.C. minimum.
	Combustion	Inadequate flame signal may result from improper combustion. Adjust to proper CO2 levels. Inability to achieve proper CO2 levels may be caused by a defective gas valve, a defective regulator or blockage in the in the burner or combustion air supply.
	Grounding	Check for proper ground from flame control to burner housing.
	Condensate Accumulation	Check that the condensation path from the heater to the drain is not blocked. For a Water Heater applied as a booster heater, verify inlet water general purpose water heater is 140°F or higher.

19.2. LED Error Code Listing

The following table lists the errors detected by the Platform Ignition Module (PIM) control and the associated LED indications.

Error Mode	LED Code	Recommended Troubleshooting
Normal Operation	Off	
ID Card Fault	Red LED Steady ON, Green Power LED OFF	Check that the proper ID card is securely connected. Perform a power and system reset.
Internal Control Failure	Steady ON	Perform a power and system reset. If fault remains, replace the PIM.
Airflow Fault	1 flash	Check Blower operation.
False Flame Error	2 flashes	Check for proper gas valve closure. Clean burner and electrodes.
Ignition Lockout Fault	3 flashes	Check the gas supply. For more information, see Section 6.
Not Used	4 flashes	Not Used
Low Voltage Fault	5 flashes	Check the 24 VAC input voltage. The voltage must be above 18.0 VAC.
Vent Temperature Fault	6 flashes	Check for a blocked flue. Check the vent sensor and connections.
Hi-Limit Fault	7 flashes	Check for proper water flow. Check hi-limit and outlet sensors.
Sensor Fault	8 flashes	See the digital control display for fault identification. Check sensors and wiring.
Safety #1 Fault	9 flashes	Check gas pressure. Verify proper safety switch operation.
Water Pressure Fault	10 flashes	Check piping for leaks. Check pressure switch and connections.
Blower Speed Fault	11 flashes	Verify tachometer signal and connection on J5.

LWCO Fault	12 flashes	Check LWCO switch and connections. Check the water level.
Hi-Temperature Delta Fault	13 flashes	Check pump operation. Confirm proper water flow across heat exchanger.
Ft-bus Communications Fault	14 flashes	Verify the digital control display is connected and operating. Check the cable between the control display and J4.
Safety #2 Fault	15 flashes	Check gas pressure. No gas switches on this heater, so inspect J8 Wires.

19.3. DigiTemp Troubleshooting

PROBLEM: Outlet temperature above set point

SOLUTION:

1. Ensure flow is above the minimum rated flow by opening the hot water valve on two to four fixtures being supplied with tempered water from the panel.
2. Ensure that the cold supply is flowing.
3. Check cold water temperature and ensure that it is lower than the set point temperature and supply line has no obstructions or closed valves restricting flow to DigiTemp
4. Unlock the control and then select the “Toolbox” to navigate to the “Toolbox” menu. From within the “Toolbox” menu use down arrow to highlight “Reset” then press enter. This will access “Reset” menu. Press the “YES” and then press accept. The controller will reset and begin start up sequence.

NOTE: Alternately, the control can be reset by opening and closing the circuit breaker switch and waiting 100 seconds to resume normal operation. Always use proper precautions when accessing circuit breaker box.

5. If problem persists after conducting the above outlined problem solving procedures, contact Powers, Technical Support at 800-669-5430 or info@PowersControls.com.

PROBLEM: If screen displays "---" instead of a measured value

SOLUTION:

1. Sensor is not connected or functioning properly.
2. Check the connection at the sensor and the connection within the control module.

WARNING!

BEFORE attempting to open the Control Module, a certified and qualified electrician MUST fully de-energize and disconnect all electrical power from DigiTemp.

Perform required LOCK OUT/TAG OUT procedures.

When done, reconnecting and reenergizing DigiTemp MUST be performed by certified and qualified electrician.

3. Disconnect all power and fully de-energize DigiTemp BEFORE opening the control module. Open the Control Module and locate the sensor.
4. Unlock the control and power up the system and then select the “Toolbox” to navigate to the “Toolbox” menu. From within the “Toolbox” menu use down arrow to highlight “Reset” then press enter. This will access “Reset” menu. Press the **YES** and then press **Accept**. The Controller will reset and begin start up sequence.

NOTE: Alternately, the control can be reset the control by opening and closing the circuit breaker switch and waiting 100 seconds to resume normal operation. Always use proper precautions when accessing circuit breaker box.

5. Wait 1 to 5 minutes for the control to resume normal operation. Also, ensure that there is a load (at least one tap on the mixed outlet system) present while the control is resuming normal operation.
6. If problem persists after conducting the above outlined problem solving procedures, contact your Lync representative.

Error Codes

If the control detects a problem, an error will display on the Home screen and from within the “Toolbox” menu. To navigate to the “Toolbox” menu unlock the control and select “Toolbox”. Resolution is in the chart below.

Code	Description	Resolution	Control Behavior during Error Condition
1	NVM Error	Verify settings in applicable menu and / or load defaults.	Valve closes and operation ceases.
2	Mixed Outlet Sensor Error	Check the sensor wiring. Sensor may need to be replaced.	Valve closes and operation ceases.
3	High Temperature Alert	Check valve position. Considering increasing corresponding differential setting.	Operation continues.
4	Low Temperature Alert	Check valve position. Considering increasing corresponding differential setting.	Operation continues.

20. REPLACEMENT PARTS

20.1. Blower, Burner and Gas Train Assembly

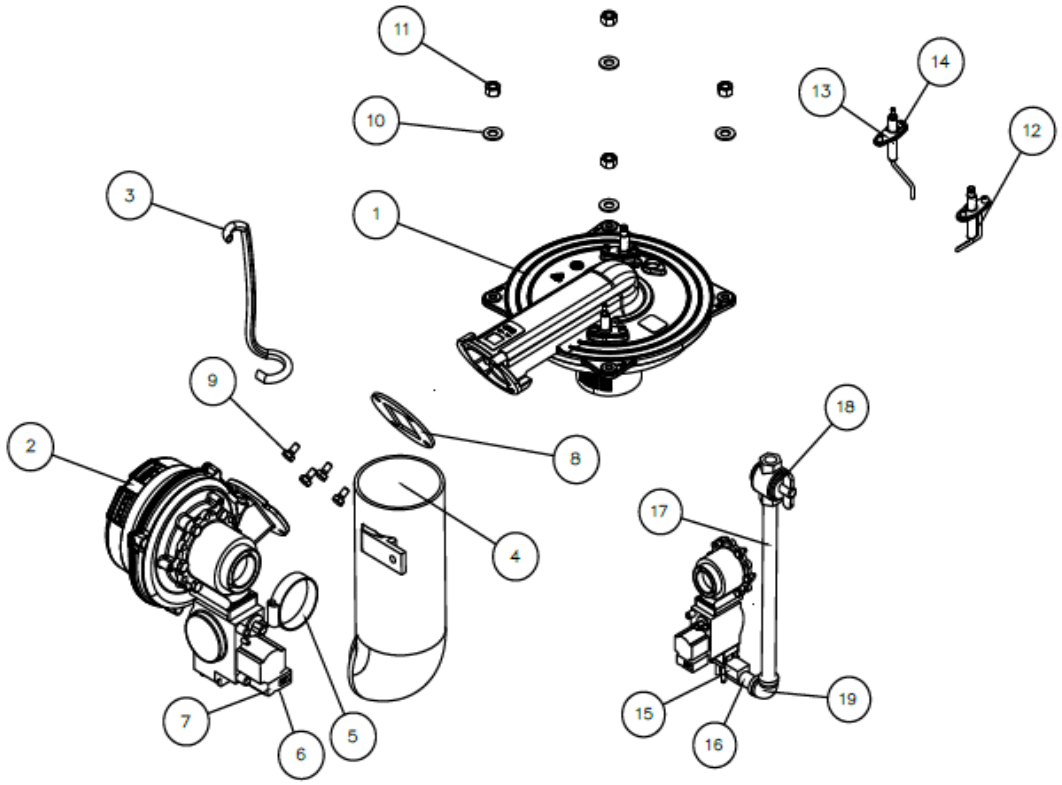


Figure 20-1 Blower, Burner and Gas Train Exploded Drawing

ITEM	DESCRIPTION	20 L 25R- GCL
1	HOUSING BURNER 70 X 217 MM ALUMINUM BULKHEAD	147198
2	BLOWER WITH GAS SAFETY VALVE AND VENTURI, EBM	148429
3	TUBING, SILICONE 3/16 ID X 5/16 CDX.0625 WALL SILICON	101923
4	ADAPTER, AIR INTAKE 3.5”	148587
5	CLAMP, HOSE STAINLESS 1 ¼ X 2 1/4 OD	103420
6	E-BOX, EBM 24VRAC &120VRAC	148513
7	SCREW, E-BOX EBM	148445
8	BLOWER OUTLET FLANGE GASKET EBM NRV 118	148588
9	SCREW,M5 X 0.8 X 14 SOCKET HEAD CAP BLACK	64330
10	WASHER,FLAT 1/4 PLT	15607
11	NUT,HEX 1/4 X 20 NC STEEL ZINC PLT	3475
12	ELECTRODE, IGNITION	150718
13	ELECTRODE, FLAME DETECTION	150719
14	GASKET, ELECTRODE	150720
15	FLANGE 90 DEG ½ NPT EBM #27458.36057	148446
16	NIPPLE, BLACK ½ X 3	5983
17	NIPPLE, BLACK ½ X 13	6095
18	VALVE, SHUTOFF ½” KEY GAS	5334
19	ELL, BLACK 90DEG ½ “	6158

20.2. Control Panel Components

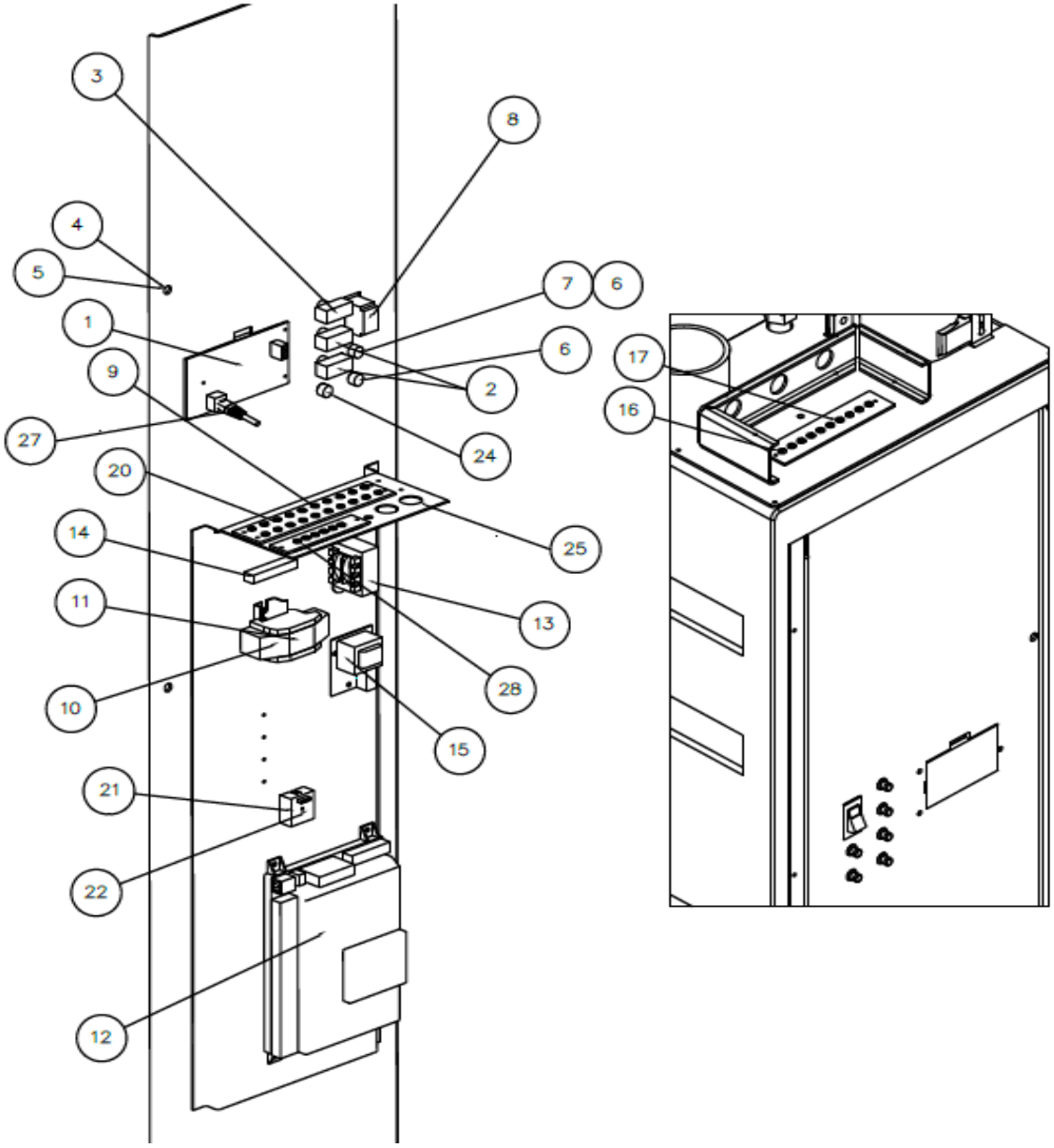


Figure 20-2 Control Panel Drawing

ITEM	DESCRIPTION	20 L 25R GCL
1	HMI,BTCII #106502 TEKMAR REV060119	151239
2	Switch, SPST N.C. Momentary Contact Selecta #SS229	70573
3	Switch, SPST N.O. Momentary Contact Selecta #SS228	75908
4	Plastic Retainer	70834
5	Thumbscrew	121323
6	Fuseholder, Panel Type #HTB-28I	5613
7	Fuse, MDA 15 Amp Buss 250V	5742
8	Switch, Carling Amber Light	70565
9	Board, Terminal Elec-Tron 20 Pole Feed	122346

10	Block, Terminal 600V 20A DIN	122319
11	Jumper, Terminal Block 23A	122320
12	Flame Control PIM Fenwal 24VAC SPARK	148192
13	Transformer, Step Down Triad 115VAC 24VCT 12.0VA	126865
14	Bar, Ground Square D #PK5GTA 5 Pole	122321
15	LWCO, Protodesign #LW-3-C-1-A-03 120V	129013
16	Board, Terminal Elec-Tron 10 Pole Feed Thru Type	140328
17	Jumper, Elec-Tron	102467
18	High Limit/Upper Operator Thermistor Sensor Dual (not shown)	126090
19	Lower Operator/Flue Temp Thermistor Sensor Single (not shown)	126089
20	Jumper, Elec-Tron	122746
21	Profile ID Card Fenwal #05-900000-006 WATERHEATER	128259
22	Card Cable Fenwal #05-900001-018	126537
23	Probe, LWCO w/1/8 MPT 316 SST (not shown)	58154
24	LIGHT, INDICATOR AMBER SELECTA #SL53216-6 120V	70567
25	BUSHING, HEYCO #2126 STRAIGHT 7/8 MOUNTING HOLE DIA	5627
26	LUG, GROUND ILSCO #TA-6-S (not shown)	48341
27	CABLE, PATCH MOLDED CAT 6 ETHERNET 3 FT ALLIED P/N 70080865	119388
28	BOARD, TERMINAL ELEC-TRON #ES-70X PV04075 6 POLE FEED THRU TYPE	103259

20.3. Drain Valve, T&P Relief Valve and Integral Circulating Pump Assembly Control Panel Components

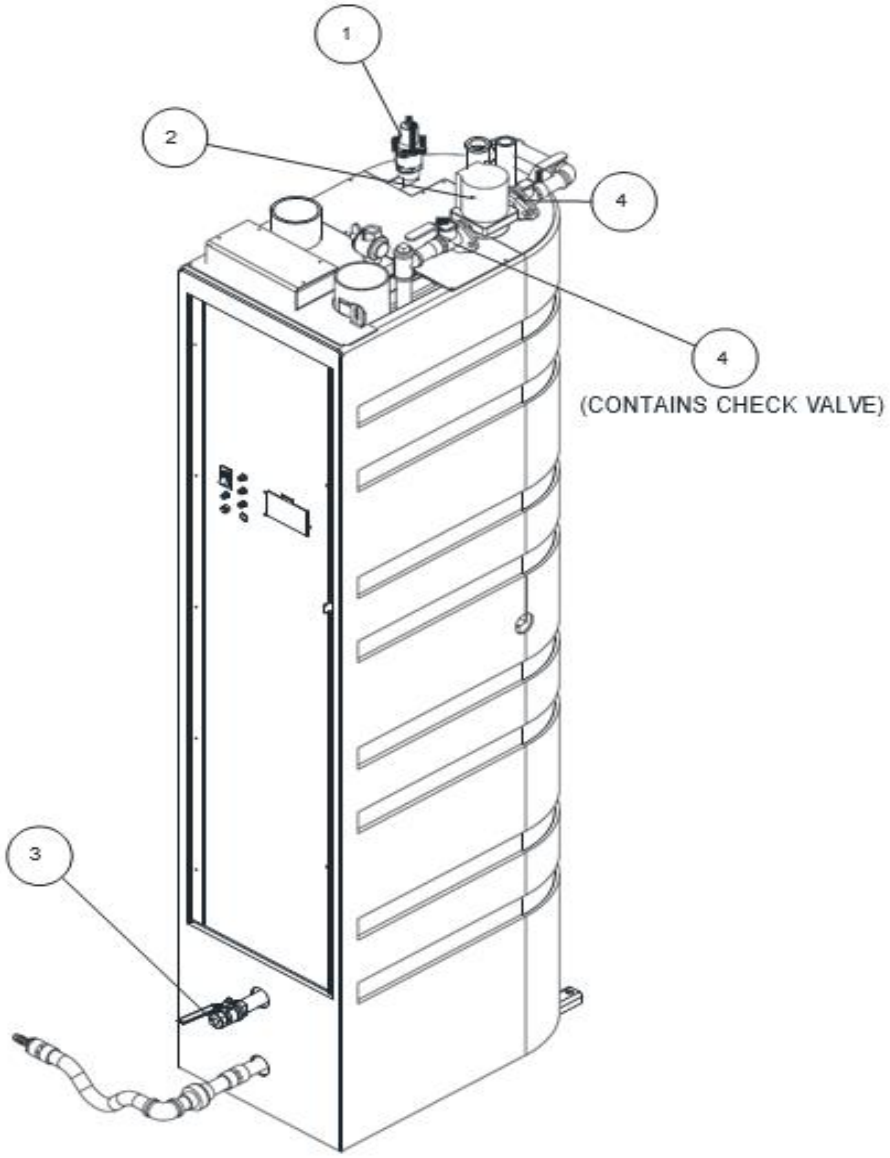


Figure 20-3 Water Heater

ITEM	DESCRIPTION	20 L 25 ARGC
1	VALVE, T&P RELIEF ¾ 150 PSI 205 M 1437	143727
2	PUMP, CIRCULATING 1/10 HP 115V/1 60HZ	139697
3	VALVE, BALL ¾ WATTS BRASS THREADED X	143732
4	FLANGE, ISOLATION ¾ NPT 2400-10,-20,	139708

20.4. Condensate Drain Trap & Condensate Neutralizer

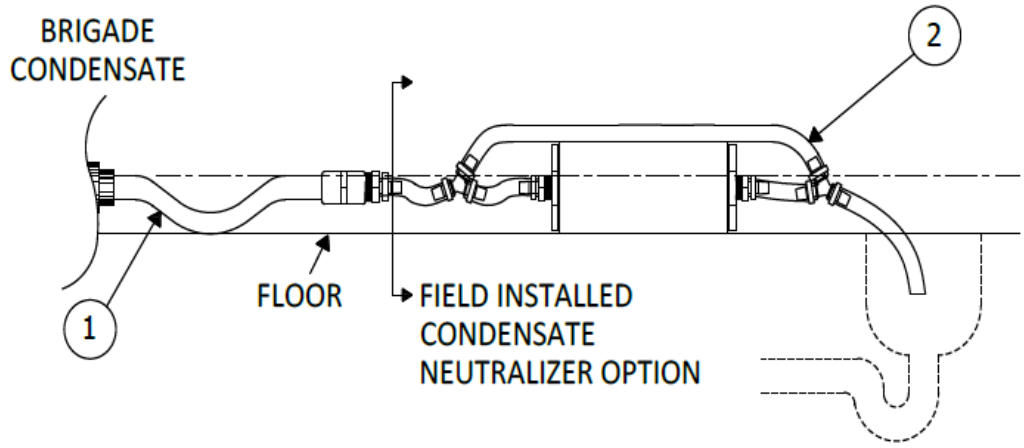


Figure 20-4 Water Heater Condensate Drain

ITEM	DESCRIPTION	All Models
1	ASSY, COND DRAIN RGC 3/4 PVC	150713
2	ASSY, CONDENSATE DRAIN NEUTRALIZATION 1/2	150772

20.5. Component Wiring and Routing Details

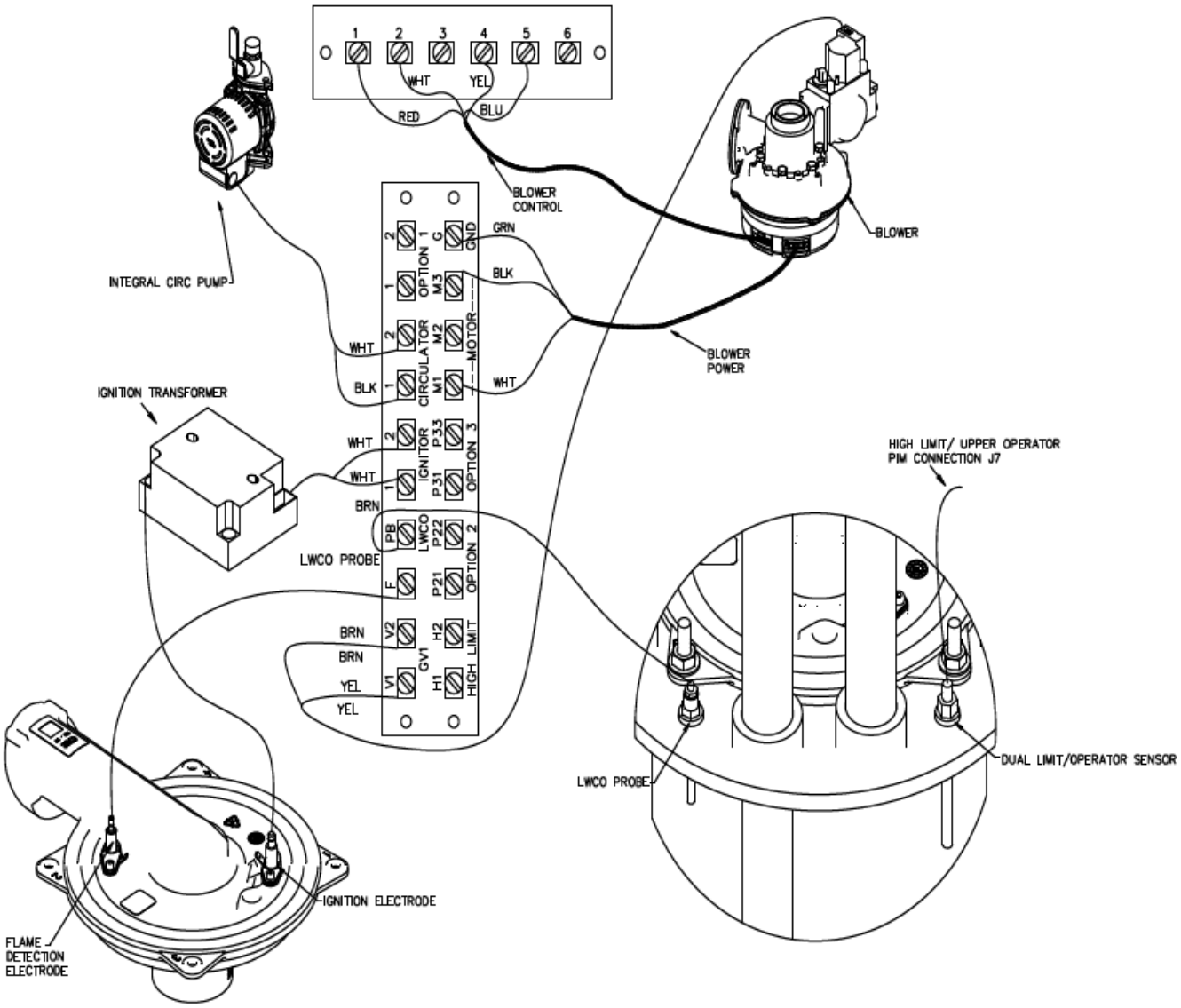


Figure 20-5 Wiring and Routing

20.6. AquaSolve Anti-Scale Part List

The AquaSolve Anti-Scale water treatment device consists of the following parts:

Item	Qty.	Part #	Description
1	1	149692	Tank head only basket assembly is separate basket
2	2	144065	Flex hose 2” x 12”
3	1	144066	Riser and bottom distributor assembly
4a	1	144067	14” X 65” tank 4” top
4b	1	144068	16” X 65” tank 4” top

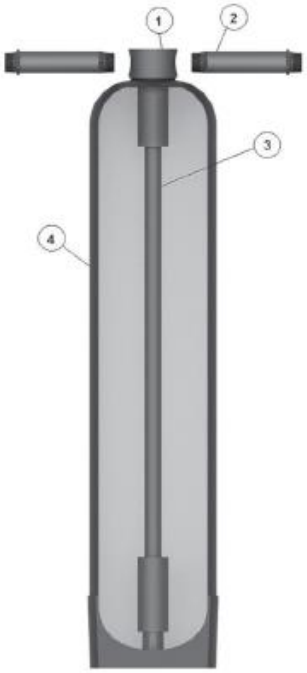


Figure 20-6 AquaSolve Anti-Scale Parts

For AquaSolve maintenance procedures, see Section 21.1: *AquaSolve Anti-Scale Maintenance*

○ DigiTemp Mixing Valve Part List

Replacement Part#	Description
6551290	Actuator Kit
6551291	High speed temperature sensor with wire kit
6551292	Controller kit

21. REQUIRED AND PERIODIC MAINTENANCE

21.1. General Periodic Maintenance

Listed below are items that must be checked periodically to ensure reliable operations. Maintenance must be performed by a qualified service or maintenance provider. To ensure proper maintenance, the following instructions should be posted near the Water Heater and maintained in legible condition. Verify proper operation after servicing.

WARNING!

When servicing controls, use exact Factory-authorized replacement parts and label all wires prior to disconnection. Verify proper operation after servicing. Incorrect parts substitution and wiring errors can cause damage, improper operation, fire, carbon monoxide, exposure to toxic fumes or other unsafe conditions that can cause injury or death.

1. Examine the Water Heater and venting system at least once a year. Check more often in first year to determine inspection interval.
    a. Check all joints and pipe connections for tightness, corrosion or deterioration.
    b. Check the electronic-ignition system for quick ignition and a proper flame signal.
    c. Check all safety controls including thermostats for proper operation.
    d. Check safety shut-off valves for operation and tightness.
    e. Keep the unit area clear and free from combustible materials, gasoline and other flammable vapors and liquids.
    f. Have the entire system, including, but not limited to, the burner, heat exchanger and venting system, periodically inspected by a qualified service agency.
2. Exposure to Dusty or Dirty Combustion Air: A unit installed in a dust or dirt contaminated atmosphere will require more frequent inspection and cleaning of the burner to prevent nuisance shutdowns or premature burner failure.
3. Any sign of soot on the heat exchanger or in the flue indicates the need for a combustion inspection. Properly installed and adjusted units seldom need heat exchanger cleaning. If soot has formed, the most common causes are restricted combustion air or excessive gas. A blocked heat exchanger can cause unsafe operation and will reduce efficiency. To inspect and clean the heat exchanger, a qualified service agent or installer should use the procedures described in steps 4 and 5 below.
4. All gaskets on disassembled components must be replaced with specific factory-authorized replacement parts only. Gasket kits are available from your Lync representative.
5. Burner and/or Heat Exchanger Inspection and Cleaning Procedure:
    a. Turn off main power to unit.
    b. Turn off gas supply.
    c. Write notes and/or take pictures during this process to aid in correct reassembly.
    d. Disconnect electrical the components by disconnecting the wires going to terminal strip in the top control enclosure and the respective conduit connections on the back of the control enclosure. If a wiring diagram is not attached to the back of the enclosure door or otherwise provided with the water heater, make note of the locations for all the wires.
    e. Remove the metal cover by disconnecting the fasteners holding it to the plastic jacket.
    f. Remove the spark igniter from the burner. Be careful not to damage the igniter.

21.2. Periodic Maintenance Schedule

Regular service by a qualified service agency and routine maintenance must be performed to ensure safe, reliable and efficient operation.

Yearly (Every 12 Months):

Schedule annual service call by qualified service agency.

1. Check for piping leaks around pumps, relief valves, and tank connections. Repair, if found.
2. Check that area is free from combustible materials, gasoline, and other flammable liquids.
3. Visually inspect venting system for proper function, deterioration or leakage.
4. Check temperature and pressure relief valve. Refer to manufacturer's instructions on valve.
5. Inspect condensate drain and ensure condensate is directed to an appropriate condensate system or drain, as required by local codes.
6. Check all operation of safety devices. Refer to manufacturer's instructions.
7. Inspect burner and gas train components for wear or deterioration.
8. Check the electronic-ignition system for quick ignition and proper flame signal.
9. Check gas safety shut-off valves for proper operation and tightness.
10. Follow startup procedure in the Installation & Maintenance Manual.

Semi-Annually (Every Six Months):

1. Test Low-water-cut-off (if equipped). Refer to manufacturer's instructions and reset.
2. Test electronic-ignition flame failure detection. Refer to manufacturer's instructions and reset.

Monthly:

1. Check condensate drain system and refill the condensate neutralizer with replacement media (change interval as needed).
2. Visually inspect venting system for proper function, deterioration or leakage.
3. Confirm the low-water cutoff and alarm are operating.

Daily:

1. Check for and remove any obstruction to the flow of combustion or ventilation air to the Water Heater.
2. Check to ensure area is free from combustible materials, gasoline, and other flammable vapors or liquids.
3. Check gauges, monitors and indicators.

As Required:

Flush and clean tank as required.

21.3. AquaSolve Anti-Scale Maintenance

Replacing the AquaSolve Anti-Scale Media

1. Shut off the primary feed supply going to the AquaSolve Anti-Scale tank.
2. Open up a downstream spigot or faucet to release pressure in the tank and in the distribution lines before and after the system.
3. Shut the isolation valves immediately before and after the tank.
4. Disconnect the unions on the inlet and outlet of the tank, and then disconnect flex connectors from head.
5. Using a step ladder and strap wrench, remove the threaded head assembly connection (turning counter-clockwise) and remove the complete upper assembly including grey-colored PVC strainer. Rinse these parts in a nearby sink or bucket of water. Do not drain the tank.
6. Remove the distributor tube with the bottom strain-er. Rinse these parts in a nearby sink or bucket of water.
7. Get a 6 ft. length of 3/4” sch. 40 PCV and a length of 1” polyvinyl hose. The length of hose depends on the distance to the nearest floor drain. (Both can be obtained at chain hardware stores.)
8. Insert one end of the pipe inside the hose and put the other end of the pipe into the top of the tank and down into the media. Put the other end of the hose inside a rice bag and put the rice bag on the floor drain.
9. Get a garden hose and put it on the open end of the poly hose to fill the hose and pipe with water. Air will bubble out of the tank. Once all the air is out of the hose and pipe, you can start a siphon to remove the media. Put the garden hose in the top of the tank and turn it on to keep the tank full of water. Push the pipe up and down in the media to get it all out. The rice bag will catch the media and allow the water to go down the drain.
10. Try not to be too aggressive when extracting the media. You need to take it out in small bites. If you let the whole pipe/ hose fill with media it will plug up. You need to let slugs of water flush out the pipe as you go.
11. When all the old media is removed turn off the garden hose and continue to siphon until the tank is about half full with water.
12. Using the step ladder again, reinstall the distribut-er tube with bottom strainer that was removed in step #6. Center the distributor tube in the bottom of the tank. Keeping any and all media from enter-ing the distributor tube, carefully pour-in a new bag(s) of media that specifically meets the replace-ment requirement of the tank. For example, an M8416TM-COM system requires (x1) M8416-COM-RM Replacement Media.
13. Inspect the threaded connection on the top of the tank to ensure no loose beads of media are stuck to the internal threads. If visible, wipe away the beads with a damp cloth.
14. Re-attach the head assembly onto the distributor tube and thread the head assembly back onto the tank. Hand-tighten until the final turn when a strap wrench can help tighten the connection.
15. Reconnect the flex connectors and union connections.
16. Open the feed water inlet (slowly) to fill the tank.
17. Purge the air at a downstream faucet close to the system.
18. Once the tank is full, wait 4 hours for media to “hydrate”.
19. Put the tank in service.

Alternative Method for Replacing AquaSolve Anti-Scale Media

Follow steps 1 – 6, above, then:

- Remove center distributor tube and lower basket, and then siphon all water from the tank.
- Lay tank down on its side and tip upside down while using hose to flush media out.
- When all the old media is removed, stand tank back up and install in original position. Fill the tank so that it is about half full with water.

Then continue with steps 12 – 19.

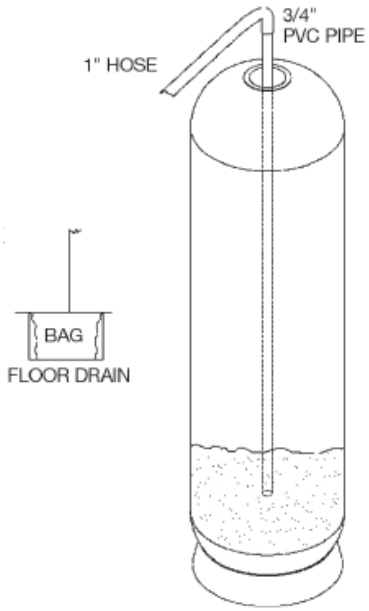


Figure 21-1 AquaSolve Anti-Scale Media

21.4. DigiTemp Testing, Inspection and Maintenance

Testing/Inspection

WARNING!

Need for Periodic Inspection/Maintenance: This product must be tested periodically in compliance with local codes, but at least once per year or more as service conditions warrant. All products must be retested once maintenance has been performed. Corrosive water conditions and/or unauthorized adjustments or repair could render the product ineffective for the service intended. Regular checking and cleaning of the product's internal and external components helps assure maximum life and proper product function.

Maintenance: Actuator and/or Valve Removal

NOTE: Valves and actuators are not field serviceable. They must be removed and replaced.

Tools Required:

- 10mm and 3/8" sockets, elbow and torque wrench. Not required if replacing both valve and actuator
- T30 Torx driver. Not required if replacing both valve and actuator
- 2.5mm Allen key. Not required if replacing both valve and actuator
- 1/8" (3.2mm, #2) slot screwdriver. Not required for valve only replacement
- Wire Stripper and snips. Not required for valve only replacement
- AC Voltmeter. Not required for valve only replacement
- Five to ten 4" zap straps (cable ties)
- 4" monkey wrenches (gas grips)
- 3" adjustable wrenches (shifting spanner)
- Teflon Tape. Not required for actuator only replacement

WARNING!

BEFORE attempting to open the Control Module, a certified and qualified electrician MUST fully de-energize and disconnect all electrical power from DigiTemp

Perform required LOCK OUT/TAG OUT procedures.

When done, reconnection and reenergizing of DigiTemp MUST be performed by certified and qualified electrician.

1. Disconnect all power and fully de-energize the DigiTemp system.
2. Once de-energized and disconnected, the display becomes inactive and the control box can be opened.

NOTE: Skip step 3 and 4 if only removing actuator for valve replacement.

3. Open the controller cover and then loosen two screw to expose actuator connection.

NOTE: As an additional safety check, once the box is open, use a voltmeter to confirm that the **Water Heater** is de-energized by measuring the AC voltage across the "L" and "N" terminals (46 and 45 respectively). Alternatively, use a voltage detector to confirm that the unit is NOT energized.

4. Using the slot screwdriver loosen terminals 1 to 3 in the upper left side of the control module. Take note of the wire colors connected to each of the terminals. This connection should be 1 – Grey; 2 – Black; 3 – Red.
5. Remove the Actuator Cables from the control box.
6. Remove the actuator from the valve as follows:
   a) Using the T30 Torx driver, remove the two actuator support plate T30 Torx screws b. Using the 10mm wrench loosen the actuator armature clamping nut
   b) Using the T30 Torx driver completely remove the support plate T30 Torx screws
   c) At this point the actuator should be free to slide off the valve stem away from the valve. If not, further loosen the actuator armature clamping nut
   d) Carefully remove the actuator and set it aside.

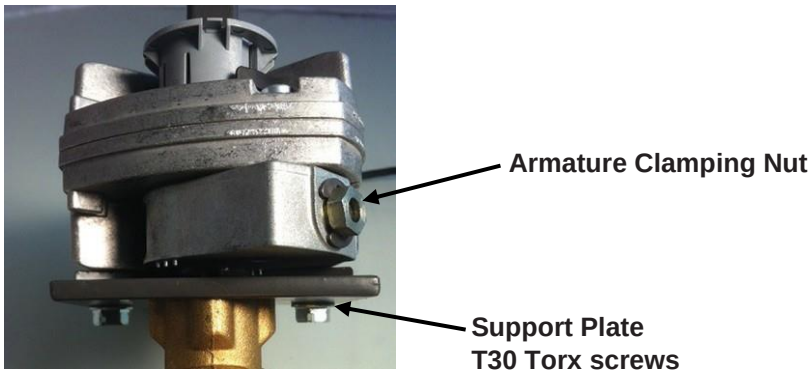


Figure 21-2 Actuator

Valve Replacement

1. Follow actuator replacement above.
2. Remove bracket and controller from the valve
3. Un-plug sensor from the valve.
4. Remove valve and replace. Install bracket, controller and plug sensor.
5. **Install actuator**. Using the T30 Torx driver, install the support plate T30 Torx screws (see below) until snug. Ensure that the support plate bolts are sufficiently loose to allow for very slight movement between the support plate and the actuator. This play will allow the actuator to find the proper position when the armature clamping nut is tightened down.

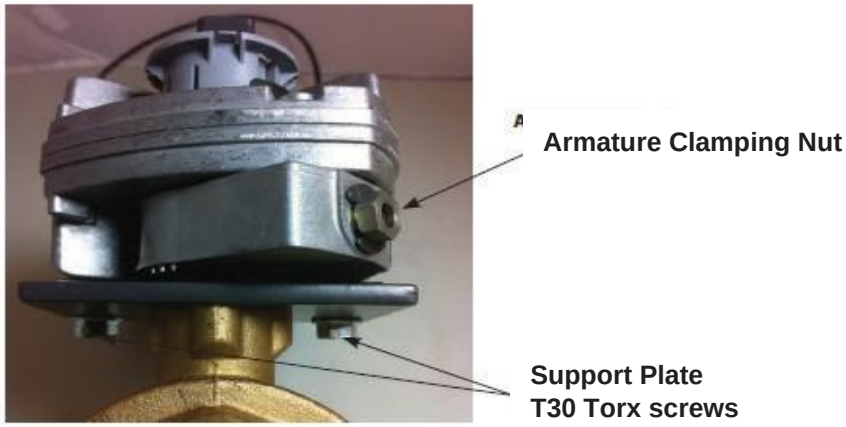


Figure 21-3 Actuator Installation

6. The actuator armature must be positioned in the un-powered rest position. Make sure "T" marking on the valve stem is pointing towards mixed outlet. See picture below.

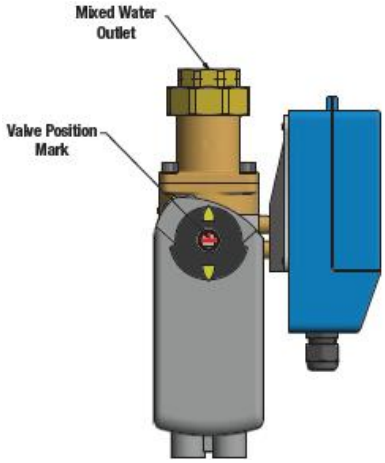


Figure 21-4 Actuator Armature Position

7. Tighten down the armature clamping nut using the 10mm socket and torque wrench to 50 in-lbs (5.65 N-m)
8. Using 3/8" socket, elbow and torque wrench, torque down the support plate nut to 50 in-lbs.

NOTE: Take caution not to over tighten and strip these nuts

9. Run the control wires up to the control along the same path as when removed.
10. Wire to terminal blocks as follows:
    1. Grey
    2. Black
    3. Red

NOTE: Pink and orange actuator wires are not used by this control

11. Utilize cable ties to secure the wires and close the control module. Once the box is closed, re-energize the Water Heater.
12. Resume normal operation and observe that the actuator and valve are now working properly