HPS Controls Ltd.

Series 600 LFI / CFI
Series 700 HFS
Zone Control Stations

Heating and Radiant Floor Zone Control Stations

Installation Instructions

Thank you for purchasing the finest in heating and radiant floor Control Stations. We are confident that you will enjoy years of trouble free service from this Station. As with any product requiring specific installation guidelines, a good understanding of **ALL** the system components and final product is necessary to achieve the optimum results. This manual has been kept as short and uncomplicated as possible.

Please read the ENTIRE manual before beginning your installation as this will help avoid costly mistakes.

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Applications & Features

Zone Control Stations

- Consist of a pre-piped and pre-wired unit to be used with Primary/Secondary piped hydronic systems.
- Available with multiple “High” and “Low” temperature zones, and is supplied with up to four circulator pumps.
- Each circulator pump is able to operate a specific zone each independent of each other.

High Temperature Zones

Used for:

- Fancoils
- Indirect Hot Water Tanks
- Base Board heating

Low Temperature Zones

Used for:

- In-Floor Heating

- The LFI / CFI series 600 Stations are supplied with a variable speed injection pump to optimize the efficiency and temperature control of the “low” temperature zones.

Circuit Board Technology

New circuit board technology enables the optimum in complete boiler system control, and simplifies wiring of the system.

Features within the circuit board include:

- boiler control contacts
- various timer settings for pump exercise
- low water cut off contacts with indicator
- zone one priority setting
- post purge feature

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Zone Control Station Installation

Important

All local code requirements must be followed.

Contact your Local Plumbing Inspection Department for requirements necessary for your area.

Installation Instructions

Refer to your shipping list and confirm that all of the components have been received and are undamaged. If you received damaged material, please notify the freight forwarder and the supplier immediately.

1. The Zone Control Station should be installed close to the heating appliance to simplify the piping installation.
   - Fasten the Station to the wall using a minimum of eight #10 size screws.
   - When possible fasten a wood backing of either 2x4 or plywood in place to support the Station.
   - Attach a 2x4 to the wall for resting the station from underneath to hold the station when mounting. Remove after mounting.
2. The “Main Supply” and “Main Return” lines to the Zone Control Station are 1 ¼” copper.

   1 ¼“ ball valves **must** be installed on the main **supply and return** line to isolate it from the boilers primary loop. This will assist in purging of the system.
   - The secondary supply and return pipes to the Station should be installed **no more** than 4 (Primary loop) pipe diameters apart when leaving and returning to the Primary loop.
   - The individual zone supply and return lines are 1” copper and come with attached ball valves on each supply and return.
3. Measure the tube or copper pipe length required for both the supply and return lines from the station to the manifolds and install. Measure each zone separately.
4. If using “Pex” pipe, cut tubing longer (4" to 6"). Trim before the final connection.

Caution

The “main supply” and “main return” connections on the station are designed to be piped into the boiler system as the “**SECONDARY**” piping.

- The whole operation of the Zone Control Station is designed around Primary/Secondary piping.
- If the Zone Control Station is installed in any other manner, the panel may not operate properly and this will void any warranty.

Refer to Diagram “A” which shows an example of a Zone Control Station installed in a Primary/Secondary manner.

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Wiring a Panel

Refer to Diagrams “B and C” for illustrated circuit boards.

Main Power Supply

Each Zone Control Station comes complete with a:
- Printed Circuit Board
- Main Disconnect Switch

Both are located in the top left hand corner of the Station.

The Zone Control Station is designed to use 110V/60HZ/1PH power supply.

The power should be connected to the factory installed black and white line voltage wires, and ground wire attached to the green wire

Thermostats

The thermostats(24v) are wired directly to the circuit board.
- On the larger stations, there is a total of six thermostat connections on the board, each corresponding to a specific zone.
- When the connections are closed between terminals “**R”** and **“W1”**, pump number 1 will be energized. The same applies for zones 2 thru 6 if equipped. An 18-2 LVT thermostat wire be installed.
- Thermostats that require 24 volts AC, terminal connections **“R”** and **“C”** must be used. An 18-3 LVT thermostat wire must be installed.

Within the building, locate the thermostats in the desired location of the zone on an inside wall. The thermostat must be located where it will not be affected by heat sources such as a fireplace, TV, sun, or heat/ventilation duct.

Note: Check that the thermostat heat anticipator is set for 0.40 amps.

Dry Contact for Boiler

The “**Boiler**” terminals can be used in series with the Boiler Control Circuit to turn on the boiler when only a need for heat arises. This can save on costly standby losses from the boiler firing for no reason.

These contacts should be wired to the boiler thermostat terminals.

Some boilers may not be equipped with thermostat terminals.
- If this is the case, the dry contact terminals can be wired in series with the control circuitry of the boiler (i.e. gas valve).

While any pump is activated, the “Dry Contacts to Boiler” terminals on the Circuit Board will close. This in turn will send a signal to the boiler that there is a demand for heat, and the boiler should fire according to the temperature setting on the boiler aquastat or outdoor reset control.

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Wiring a Panel, Continued

Low Water Cutoff

Note: This connection on the circuit board is optional and does not have to be wired in. If a sensor is not going to be wired to the board, the jumper next to the Low Water Level connection terminals must remain in place.

A Low Water Level Sensor is commonly installed on Boiler piping, and can be wired directly into the circuit board.

The circuit board is also equipped to provide a “24V HOT” connection to the Low Water sensor if required. The Switch mechanism within the sensor should be wired to the connections labelled “WAT LVL” and “24V COM”.

In the event of a Low water situation, the sensor will open and in turn, open the dry contact to boiler shutting the boiler down

The board is also equipped with an LED light that will turn off, if a low water situation should arise.

Caution: Do not apply any power source to the water sensor switch mechanism other than that from the circuit board

Boiler Protection Sensor Series 700

Note: This connection on the circuit board is also optional and does not have to be wired in. If a sensor is not going to be wired to the board, the jumper must remain in place. If a sensor is desired, it must be a specific sensor only supplied by HPS Controls Ltd.

This sensor is beneficial when used with cast iron boilers. It prevents cool fluid from returning to the boiler, which reduces the risk of any condensation forming on the boiler heat exchanger.

If the sensor is used, the sensor itself should be installed on the primary loop return line to the boiler.

The boiler protection temperature can be adjusted between 125 and 175 °F.

- To set, adjust the setscrew labelled “R26” on the circuit board.
- If the boiler return sensor reads a temperature below the dialled setting, it will not allow any of the circulating zone pumps to come on until the minimum temperature setting is reached from the sensor.

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Wiring a Panel, Continued

Boiler Protection Sensor Series 600

The injection pump comes with 3 sensors:
- zone supply sensor
- boiler return sensor
- outdoor sensor

The supply sensor is already mounted inside the Station at the factory. The return and outdoor sensor have to be mounted after the piping and station are installed in the field.

- Refer to the enclosed installation instructions on the injection pump for mounting/wiring suggestions.

Other features of the Circuit Board that *do not* have to be field wired

Timer Settings

To prolong the life of the circulators within the Station, it is equipped with pump exercise timers.

- There are four different timer settings that can be chosen depending on preference.

- The various timing settings are set by adding or removing H8 on the circuit board (bottom right corner of the board).

  Refer to Circuit Board Diagrams “B and C” for the different timer settings available.

When the timer is activated, it will cycle all pumps within the station.

Jumpered	Time Cycle
AB	OFF
BC	5 min every 24 hours
CD	3 min every 10 days
DE	3 minutes every 24 hours

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Wiring a Panel, Continued

Zone Priorities

Located on peg terminal “H9”.

When Zone 1 priority is jumpered, it will shut down Zones 2 thru 6 if there is a demand on Zone 1.

This feature would be used if Zone 1 was being used as a “high” temperature zone with an indirect hot water heater. This would direct all of the boilers capacity into heating the domestic water, which in turn would result in a higher recovery rate.

Note: The Zone 1 priority feature does have a “Priority Safe” control that will only allow Zone 1 to prioritise for 1 hour.

Purge Delay

Also located on peg terminal “H9”.

When jumpered, it allows the “last zone circulator running” to cycle for 2 minutes after the zone is satisfied. The purpose of this is to extract all the heat from the boiler system rather than letting it sit in the boiler itself and become wasted energy.

Printed Circuit Board Caution

The Printed Circuit Board is protected by a 2 Amp fuse.

A multimeter is to be used for all testing required.

Do not short contacts for testing as this may burn the fuse or damage the Printed Circuit Board.

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System / Station Purging

Refer to Diagrams “D” for illustrated Zone Stations.

Removing Air from the System

All the air in the system must be removed during the filling of the system, by purging each circuit of each zone independently in turn. The Zone Control Station comes equipped with 2 hose bib purge valves. One for the “Hi” temperature zones (V1), and one for the “low” temperature zones (V2).

1. Place a garden hose on the purge valve (V1 or V2) within the Station, run to a convenient drain, and open the purge valve (V1 or V2).
2. The globe valve between the low and high temperature manifolds within the Station (V3) must be closed for purging. Also close valve (V4) to isolate the main supply from the main return headers within the Station.
3. Ensure that the ball valve is closed on the main return to the boiler primary loop.
4. Close all ball valves on all zone supplies and returns.
5. Open Zone #1 supply and return ball valves. Allow the water to flow through Zone #1 until the water coming out from the hose has no air showing. Continue this for each circuit, purging one zone at a time.

Note:

Close all the circuits after purging so that only one circuit flows at a time.

In some instances, if running a zone supply to a distribution manifold for in-floor piping, purge each individual floor loop before purging back to the panel.

When all zones have been filled and purged:

- With all of the manifold valves closed, open valve V3 and the main return valve to the boiler primary loop
- Purge the boiler return piping

After the piping to the boiler has been filled and purged, open all valves.

Caution: Do not forget to open the valves at the Zone Control Station supply and returns, and all valves at the zone manifolds.

If using a Floor Drain

Place the hose into the floor drain approximately 3" to 4" below the water line to allow for the bubbles to be seen as they rise to the surface. Doing the purging procedure twice will reduce the chance of air in the system

Cold Weather Startup Caution

When doing cold weather start up, it is possible that areas of the slab may be below freezing even with temporary heat being provided. The system should not be filled and purged until it is ready to have the system circulating with the boiler in operation applying heat to the slab. Depending on the starting temperature of the slab, it may take hours to days for the slab to reach radiant floor operational temperature due to the large thermal mass.

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Injection Control, CV Valve & Pump Settings

Once all the piping, wiring, and purging has been done, the injection control curve and globe valve must be set properly (only applicable to **Series 600** Stations). Pump settings should be set for both 600, and 700 series Stations.

Injection Pump

The injection control curve is located on the side of the injection pump. This should be set on the system as it allows varied amounts of injection depending upon climate location.

Refer to the enclosed installation instructions on the injection pump for information on setting the heating curve dial.

Setting Globe Valves CV Value (Valve V3)

The globe valve should be set in order to create a balance between the amount of fluid being injected and the amount of fluid being returned from the zone.

To calculate the CV Setting:

Fi: gpm
Ti: temp of injection water
Tr: temp of water returning from zone
Load: required heat transfer to distribution circuit at design conditions
490: constant for water (use 470 for 30% glycol, 450 for 50% glycol)

Fi = Load divided by 490 (Ti-Tr)

Example:
The injection flow rate of 180 degrees F water required to transfer 140,000 Btu/hr into the secondary circuit that operates with a return water temperature of 100 degrees F would be Fi=140,000 divided by 490 (180-90) = 3.17 gpm.

CV = Total design gpm divided by square root of system pressure drop (PSI)

Example:
(Fi)gpm=3.17, system head loss=6.93 fthd (3psi), therefore CV=3.17 gpm divided by the square root of 3 psi (1.732)=1.83.

Set the globe valve CV setting at 2

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Injection Control, CV Valve & Pump Settings, Continued

Setting Speed of Zone Circulators

Once all the piping, wiring, and purging has been done, the pumps within the Station have an adjustable speed setting that needs to be set.

Zone Circulators provided within the Station are Grundfos UPS 15-58FC. These pumps are very flexible due to the option of setting 3 different operating speeds to match the head loss / g.p.m. of the specific zone.

Adjust the Circulator by turning the set screw (located on the side of the circulator housing) to required setting 1, 2, or 3.

To determine the speed setting, refer to “Grundfos Pump Curves” diagram.

- Find the curve which best matches your zone head loss and flow rate up best, and set the speed accordingly.

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Powering up the Station

Powering up the Station

To power up the station follow these instructions:

1. Turn on the power from the main electrical disconnect.
2. Turn on the ON/OFF switch located on the Zone Control Station.
3. Be sure the power indicator light is ON, showing power to the Zone Control Station.

   Note: Any time power is applied to the Zone Control Station the timer system will activate if the jumper on the circuit board is in the ON position.

4. Check that the Timer-LED light on the circuit board is **flashing**. This is the Normal Condition.

   If light is ON continuously, this is an Abnormal Condition.
   - Circuit Board may need to be replaced.

   If light is OFF, this is also an Abnormal Condition.
   - Check 2AMP Fuse on the Circuit Board.

5. Wait for the pump timer override period to finish. Turn up the thermostat for each zone in turn. Confirm that each zone is operating properly.
   - On a demand from the thermostat, the circulator will start, giving flow to the specified zone.
   - The LED light for each zone will light up on the Circuit Board.

Note:

To troubleshoot possible problems, check operating temperature of pumps. If a pump seems to be running much hotter than any of the others, there may be too much head pressure within that zone or the zone may be air locked.

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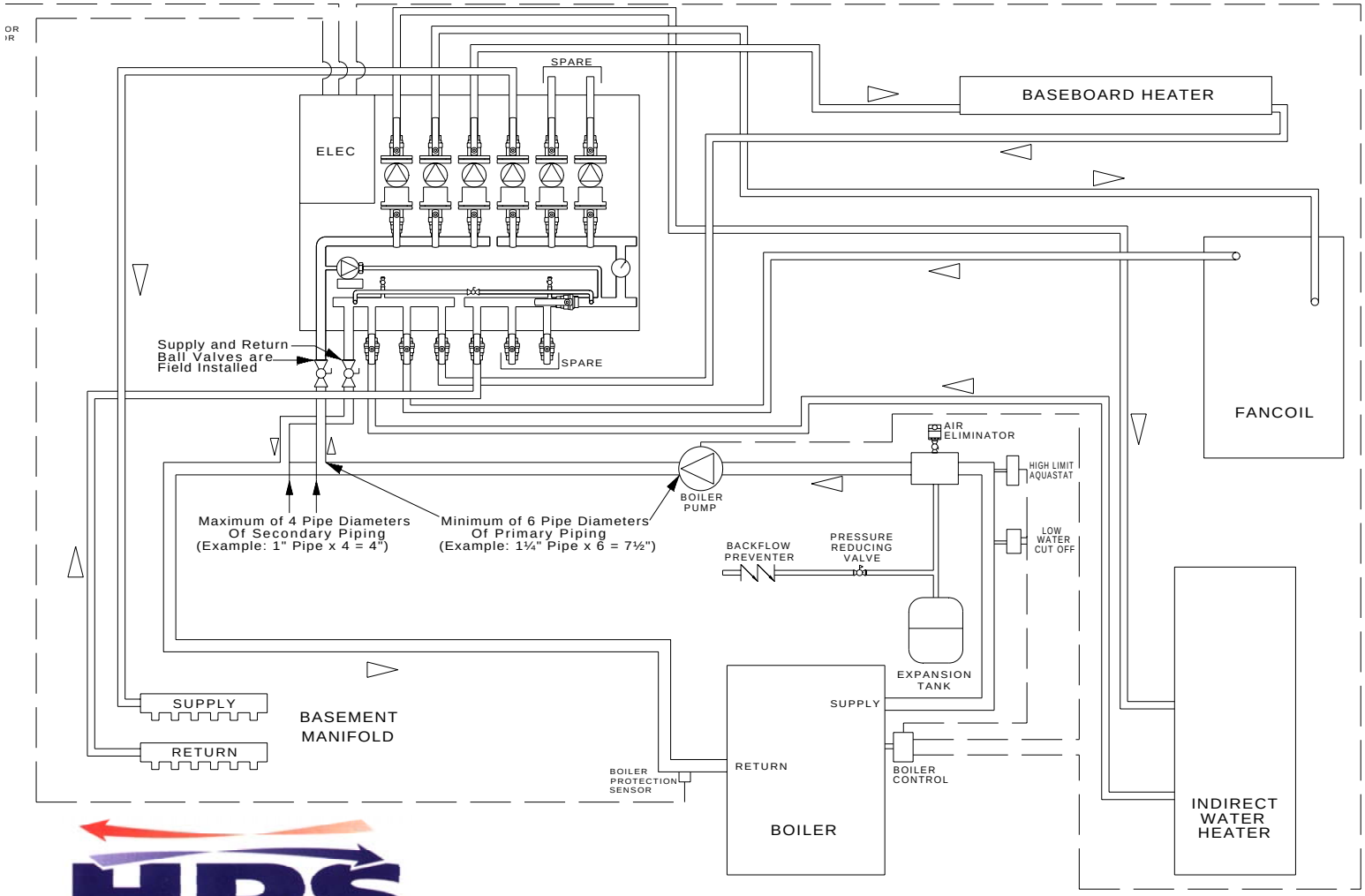
Diagram A (Generic Hydronic Heating Schematic)



GENERIC HYDRONIC HEATING SCHEMATIC

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Diagram B (4-Zone Hydronic Controller)

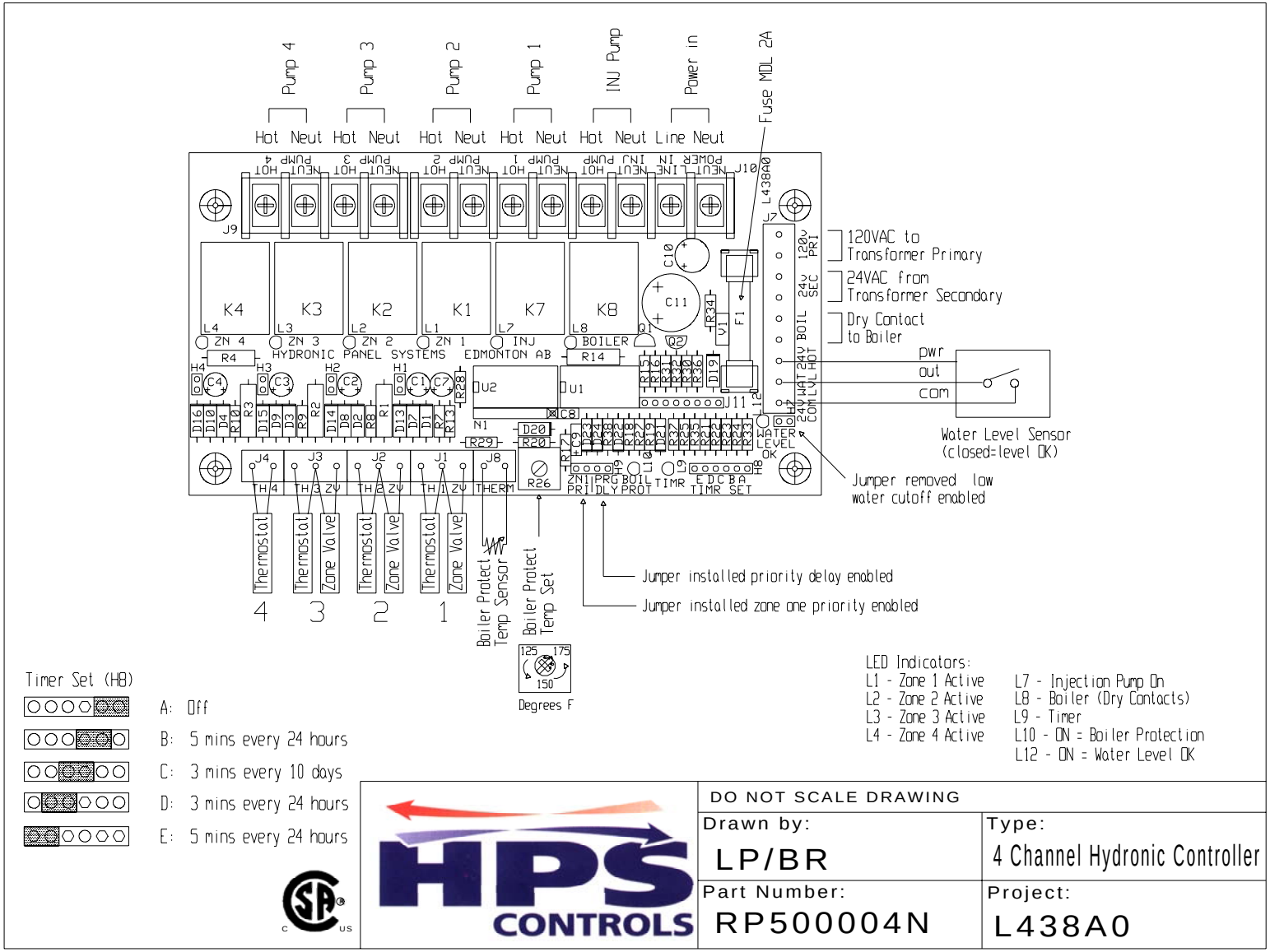

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Diagram C (6-Zone Hydronic Controller)

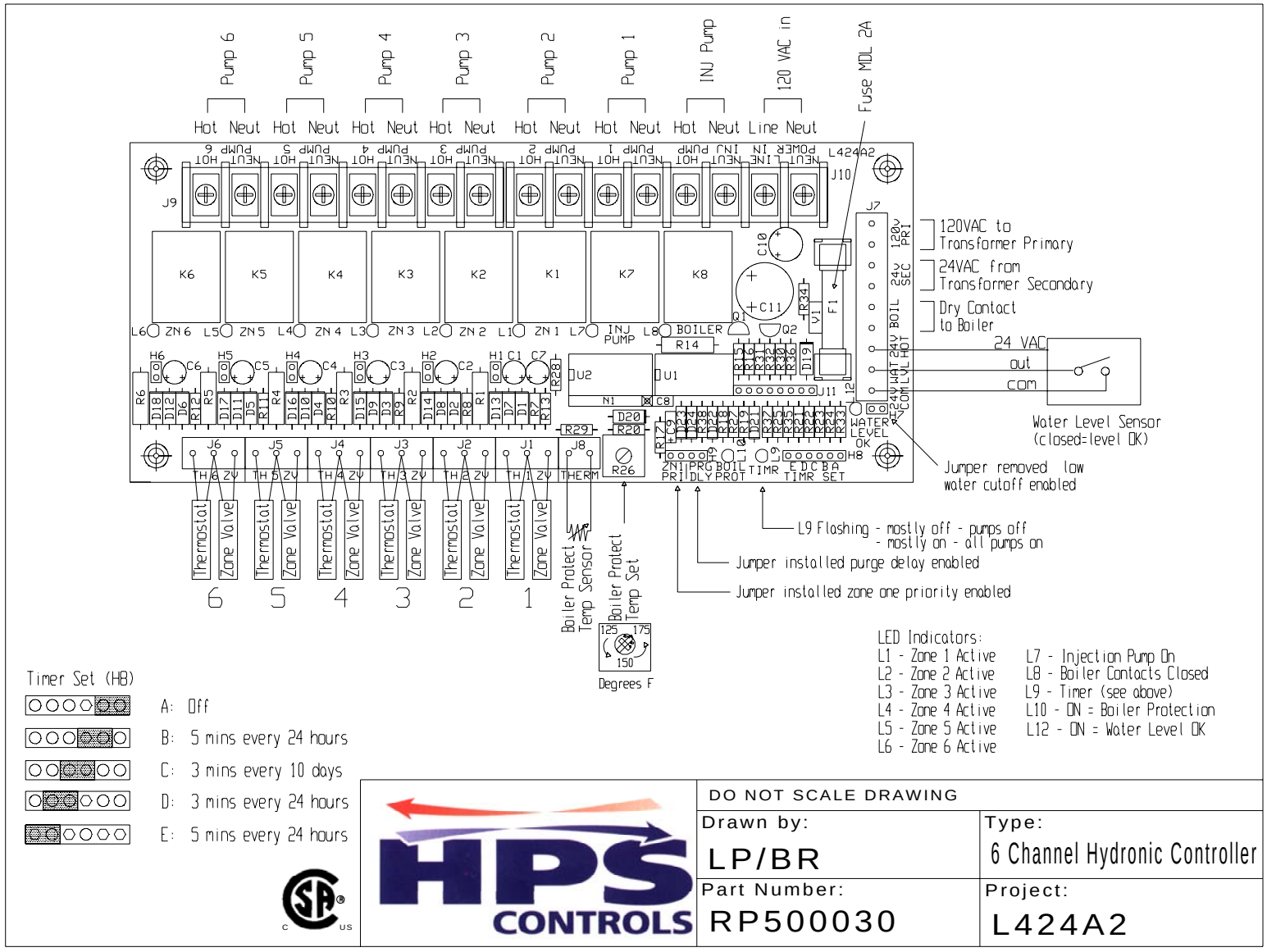

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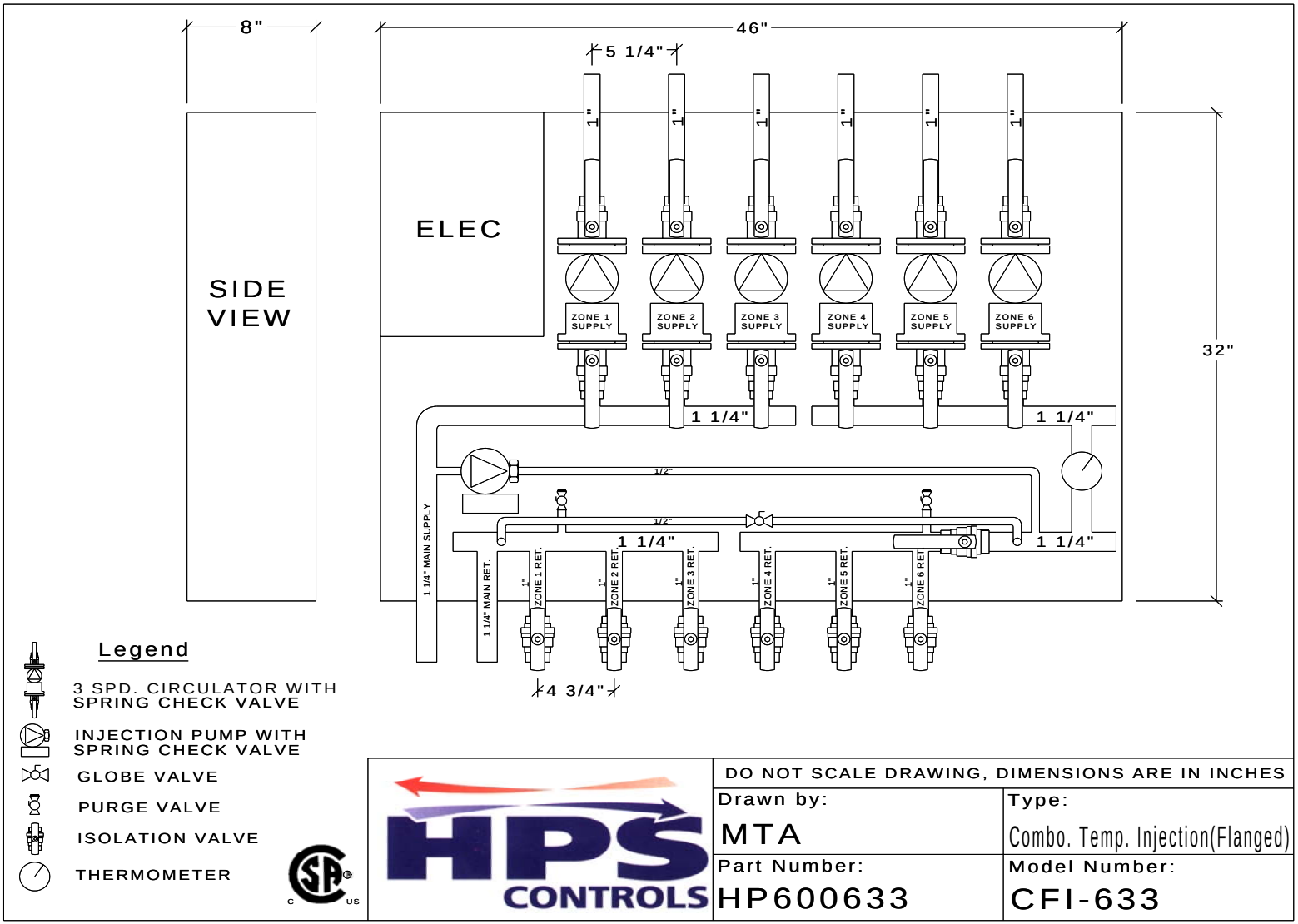
Diagram D [Combo Temp. Injection (Flagged)]



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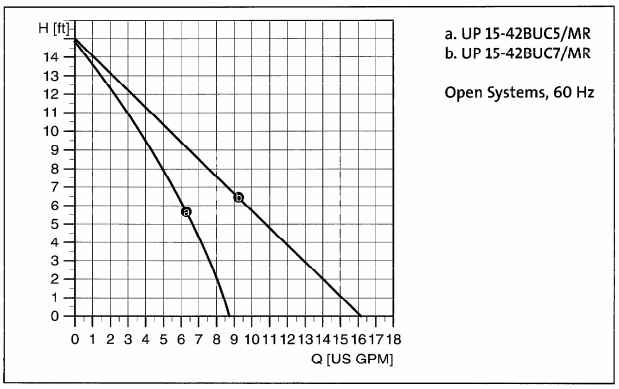
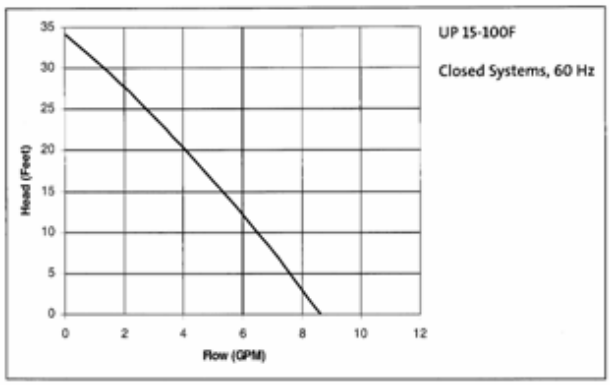
Grundfos Pump Curves

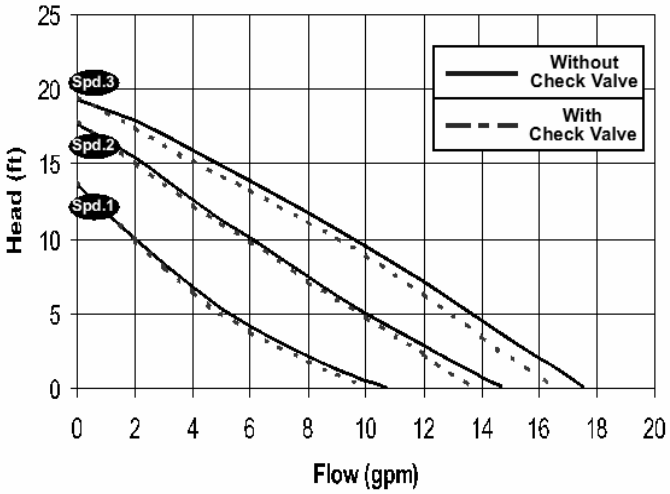
UP 15-42BUCX/MR



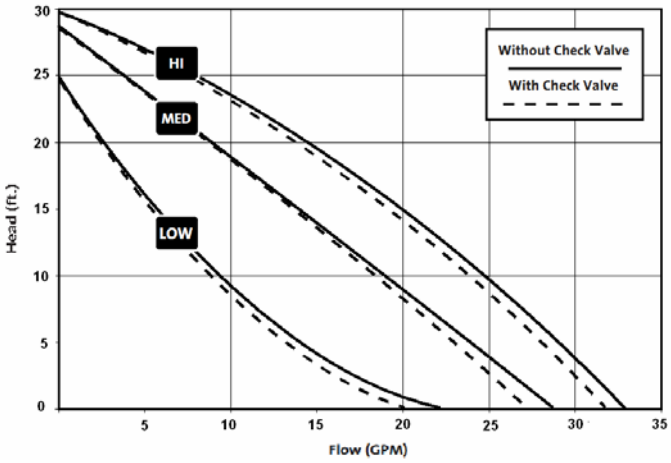
UP 15-100F



UPS15-58F/FC SUPERBRUTE



UPS 26-99FC/BFC SUPERBRUTE



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Warranty

Hydronic Zone Control Stations

LIMITED MANUFACTURER'S WARRANTY

We warrant products manufactured by HPS Controls to be free from defects in material and workmanship for a period of two years from the date of manufacture or one year from the date of installation, which ever occurs first. In the event of any claim under this warranty or otherwise with respect to our products which is made within such period, we will at our options, repair or replace such products or refund the purchase price paid to us by you for such products. In no event shall HPS Controls be liable for any other loss or damage, whether direct, indirect, incidental, or consequential. This warranty is your exclusive remedy and shall be in place of any other warranty or guarantee, express or implied, including, without limitation, any warranty of merchantability or fitness for a particular purpose. This warranty may not be assigned or transferred and any unauthorized transfer or assignment thereof shall be void and of no force or effect.

CONDITIONS OF SALE

TERMS: Net 30 days. Invoice date is the date of shipment. Subject to credit approval. Past due invoices are subject to 2% per month (24% per annum) late charge.

RETURNS: Factory authorization is required prior to any return, the return must be made within (60) days of such authorization. Product to be returned must be shipped freight prepaid, and is subject to a 25% handling charge. RGA form required with serial number, purchase date and a detailed description of problem.

CLAIMS: Claims for shortage or error in shipment must be made within (5) days of receipt. Claims for damage or loss in transit must be made directly to the delivering carrier.

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