This Heat-Timer control is strictly an operating control; it should never be used as a primary limit or safety control. All equipment must have its own certified limit and safety controls required by local codes. The installer must verify proper operation and correct any safety problems prior to the installation of this Heat-Timer control.
**OVERVIEW OF THE OPERATING MODES**

The PLL control is a Lead-Lag Pump control. It is designed to operate in different modes that can satisfy many applications. It can provide lead-lag rotation to a dual or triple pump systems. In addition, it is capable of controlling two operating pumps and one auxiliary pump in boiler feed applications.

**ROTATION**

**1-CALL / 1-FLOW**

- **2-Pump Mode**
- **3-Pump Mode**

The PLL rotates the lead pump in a 2-pump system (See “2-Pump 1-Call 1-Flow” on page 8) or 3-pump system (See “3-Pump 1-Call 1-Flow” on page 12) either based on alternating demand/per call or timed rotation. Rotation can be field configured via dip switches. Alternating demand activates a different pump each time a pump call is initiated. The call must be initiated through *Pump1 Input terminals*. Timed rotation has two options; 24 hours and 7 days rotation. When rotation of the lead pump is to take place while it is in operation, the new lead pump relay will energize while the current lead pump is running. Thus, allowing both pumps to run at the same time for a few extra seconds to eliminate a no-flow period which may cause boiler short-cycling.

**1-CALL, 2-FLOW (2-PUMP)**

- **2-Pump Mode**

This mode is similar to the 1-Call/1-Flow Mode (See “2-Pump 1-Call 2-Flow” on page 10) with the exception of each pump having its own flow input. This mode is useful in VFD Pump applications where each of the VFD provides its own the flow feedback signal.

**ALARMING ON NO-FLOW**

If the lead pump fails to provide a flow signal for over 30 seconds, by shorting the *Flow1 input terminals*, the PLL will de-energize that pump’s relay, energize the alarm relay, turn on the respective pump alarm’s LED, and energize the next pump’s relay. If the new lead pump fails to provide flow for over 30 seconds while it is in alarm, the PLL will de-energize the 2nd pump’s relay, turn on the respective pump alarm’s LED. In a 3-Pump system, it will energize the third pump relay and so on. However, on a 2-Pump System, the PLL will not operate any pumps until the situation has been rectified and either the Manual Reset button is pushed.

**2-CALL, 2-FLOW (3-PUMP)**

- **3-Pump Mode**

This configuration is typically used in a two-Boiler Feed application (See “3-Pump 2-Call 2-Flow” on page 14). No rotation is available in this mode. The PLL control operates a single pump per boiler. A maximum of two boiler pumps can be connected to a single PLL. A third Auxiliary pump is used to replace any of the boiler pumps in no-flow situations. In that case, the PLL will de-energize the failing pump’s relay and energize the alarm outputs, the respective solenoid valve output, the auxiliary pump relay. In addition, it will turn on the the respective Pump Alarm LED. If the second primary pump flow fails for over 30 seconds while the first primary pump is in alarm, the PLL will de-energize the 2nd pump relay and energize its the relevant solenoid valve relay and Alarm LED. This allows the auxiliary pump to replace both primary pumps until the situation is rectified and the Reset button is pushed.

**ENDING THE ALARM**

When any of the pumps is in alarm, its pump relay will remain de-energized until the Manual Reset button is pressed. This will cause the Alarm Output Relays to de-energize and the Pump Alarm LEDs to turn off.
MOUNTING THE ENCLOSURE

- Locate the PLL near the equipment to be controlled but away from excessively high or low temperatures.
- The surface should be flat and sufficiently strong to hold the PLL.
- Screw the enclosure box to the surface using the external mounting tabs.
- Use the bottom knockouts. Do not drill any knockouts in the enclosure.
- Place the metal plate on the knockout from inside the enclosure for proper grounding and to prevent possible injury. Do not use rear knockouts.
- After installation, lock the enclosure with the screw and nut provided to prevent unauthorized access and for safety.

WIRING POWER INPUTS

- Bring the power wires through the bottom knockouts of the enclosure.
- A metal plate is provided for grounding. Install the metal plate on the inside of the bottom knockouts. The conduit fitting shall hold this plate.
- Attach 120V 60 Hz to the Line and Neutral terminals.
- Heat-Timer recommends the installation of a Surge Suppressor and a Power Switch before the Power Line connection for safety and ease of service.

WARNING

Class 1 voltage wiring must use a different knockout and conduit from any Class 2 voltage wiring.

INPUT WIRING

WIRING THE PUMP CALL INPUTS

- The PLL accepts dry contact inputs only. If voltage is placed across these terminals, the PLL may be damaged.
- Depending on the Dip Switch mode selected, the PLL may require the use of one or two Pump Call Inputs. See “Dip Switches” on page 6. Wire each Pump input into the corresponding input terminals of the PLL. See “Overview of the Operating Modes” on page 3.

WIRING THE FLOW SWITCH INPUTS

- The Flow Input wiring must be dry contacts only. If voltage is placed across the PLL input terminals, the PLL may be damaged.
- Wire each Flow input into the corresponding input terminals of the PLL. A single PLL can accept up to two Flow inputs, depending on the configuration requirements. See “Overview of the Operating Modes” on page 3.
- If the lead pump fails to provide a flow signal for over 30 seconds, by shorting the Flow1 input terminals, the PLL will de-energize that pump’s relay, energize the alarm relay, turn on the respective pump alarm’s LED, and energize the next pump’s relay.

ALERT

If no flow switch is used, use a jumper on the flow input terminals. (Heat-Timer recommends using a flow switch for better system response and operation.)
OUTPUT WIRING

**ALERT**
The PLL Pump Lead Lag control DOES NOT source any power for pumps, alarms, or solenoid valves. A separate power source must provide the power to the equipment used. The PLL relays switch the power to the equipment.

**WIRING THE PUMP OUTPUTS**
- Wire the Pump 1 and Pump 2 terminals to the pumps or pump’s starters.
- When in any of the 3 Pump Modes, wire the Aux Pump terminals to the Auxiliary Pump or pump starter. See “Dip Switches” on page 6
- Each set of contacts is capable of switching 1 Amp Inductive, 6A Resistive at 120VAC.

**WIRING THE VISUAL/AUDIO ALARM OUTPUT**
- The Visual/Audio Alarm output terminals do not source any power. A separate power source must be supplied.
- Connect the Visual/Audio Alarm relay outputs to an alarm. The Heat-Timer Vis-U-Larm (HT #925011-00) is a visual audio alarm that is designed to work with the PLL. It has both a Red Alarm light in addition to a sound alarm.
- Each set of contacts is capable of switching 1A Inductive, 6A Resistive at 120VAC.

**WIRING THE WEB OR EMS ALARM OUTPUT**
- Connect the other Alarm output to any of the Aux Temp Inputs on a Heat-Timer Platinum heating control with the Internet communication package.
- The Web Alarm output allows a Platinum heating control with Internet communication package to notify the user of an alarm status either through the web (Web Alarm), E-Mail, or a cellular phone text message.
- An EMS alarm output allows an EMS system to receive an alarm notification.
WIRING THE SOLENOID VALVE OUTPUTS
- The Solenoid outputs are only available in 2-Call 2-Flow 3-Pump Mode.
- The solenoids are used to switch the flow of the system from the failed pump to the Auxiliary pump. See “3-Pump 2-Call 2-Flow” on page 14
- The Solenoid output terminals do not source any power. A separate power source must be supplied.
- Connect the Solenoid1 Output to the solenoid valve to be activated when Flow1 terminals are open during Call1 for more than 30 seconds. Connect the Solenoid2 Output to the solenoid valve to be activated when Flow2 terminals are open during Call2 for more than 30 seconds.
- Each set of contacts is capable of switching 1A Inductive, 6A Resistive at 120VAC.

DIP SWITCHES
The control is designed to operate in one of the four available modes (See “Overview of the Operating Modes” on page 3).

Note that the older model had only two operating Modes; 2-Pump/1-Call 1- flow and 3-Pump/2-Call 2-Flow. The Dip Switch functions differ from the new model. The following will only explain the newer Dip Switch operation. However, the Old Dip Switch Diagram is self explanatory.

SETTING OPERATION MODE (DIP SWITCH 1, 2, AND 3)
- Dip Switch 1 function remained the same on both new and old Dip Switch settings. It affects the number of pumps used.
  Dip Switch 1 On = 2 Pump Mode, Off = 3 Pump Mode OLD and New
- Dip Switch 2 function affects the 2-Pump Mode only.
  Dip Switch 2 On = 1-Call/2-Flow Mode, Off = 1-Call/1-Flow Mode
- Dip Switch 3 function affects the 3-Pump Mode only.
  Dip Switch 3 On = 1-Call/1-Flow Mode, Off = 2-Call/2-Flow Mode

SETTING PUMPS ROTATION SCHEDULE (NOT AVAILABLE IN 2CALL-2FLOW 3-PUMP MODE)
Dip Switch 4 On = Per Call Rotation, Off = No Per Call Rotation.
Dip Switch 5 On = 1 Day Rotation, Off = No 1 Day Rotation.
Dip Switch 6 On = 7 Day Rotation, Off = No 7 Day Rotation.
- The PLL can rotate the lead pump based on demand or time.
- When several rotation Dip Switches are set to ON, the higher Dip Switch number takes priority over lower number ones.

SETTING PUMP EXERCISE
Dip Switch 7 On = Exercise Pump, Off = No Pump Exercise
- When Dip Switch 7 is set to On, the PLL will energize the pump relay for 10 seconds for every week of no-operation.
- This feature is helpful in reducing pump rotor lock due to sediment deposit and rust in the system pipes.
- In vacuum pump applications, it assist in periodic vacuum pump lubrication.
LEDS

Relay LEDs
• A LED is assigned to each of the relays to show its operation status. When the relay is energized, its relay is lit.

Power LED
• The upper left LED is used to indicate the control power in all modes except 3-Pump/1-Call 1-Flow. See “Overview of the Operating Modes” on page 3

Alarm LEDs
• Each of Pump1 and Pump2 has their own Alarm LED. The LED will be lit whenever the respective pump fails to have flow for 30 seconds.
• The upper left LED is used to indicate Pump3 Alarm in 3-Pump/1-Call 1-Flow Mode. See “Overview of the Operating Modes” on page 3

WARRANTY

WARRANTIES AND LIMITATIONS OF LIABILITY AND DAMAGE: Heat-Timer Corporation warrants that it will replace, or at its option, repair any Heat-Timer Corporation manufactured product or part thereof which is found to be defective in material workmanship within one year from the date of installation only if the warranty registration has been properly filled out and returned within 30 days of the date of installation. Damages to the product or part thereof due to misuse, abuse, improper installation by others or caused by power failure, power surges, fire, flood or lightning are not covered by this warranty. Any service, repairs, modifications or alterations to the product not expressly authorized by Heat-Timer Corporation will invalidate the warranty. Batteries are not included in this warranty. This warranty applies only to the original user and is not assignable or transferable. Heat-Timer Corporation shall not be responsible for any maladjustments of any control installed by Heat-Timer Corporation. It is the users responsibility to adjust the settings of the control to provide the proper amount of heat or cooling required in the premises and for proper operation of the heating or cooling system. Heat-Timer Corporation shall not be required to make any changes to any building systems, including but not limited to the heating system, boilers or electrical power system, that is required for proper operation of any controls or other equipment installed by Heat-Timer Corporation or any contractor. Third Party products and services are not covered by this Heat-Timer Corporation warranty and Heat-Timer Corporation makes no representations or warranties on behalf of such third parties. Any warranty on such products or services is from the supplier, manufacturer, or licensor of the product or service. See separate Terms and Conditions of Internet Control Management System (“ICMS”) services, including warranties and limitations of liability and damages, for ICMS services.

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WIRING AND PIPING DIAGRAMS

2-PUMP 1-CALL 1-FLOW

DIP Switch Settings:
Dip1 = ON (2-Pump Mode)
Dip2 = OFF (1-Call + 1-Flow Mode)
Dip4 - 6 = Choose Rotation option

ELECTRIC
Heat-Timer is aware that each installation is unique. Thus, Heat-Timer is not responsible for any installation related to any electrical or plumbing diagram generated by Heat-Timer. The provided illustrations are to demonstrate Heat-Timer's control operating concept only.
2-PUMP 1-CALL 2-FLOW

DIP Switch Settings:
Dip1 = ON (2-Pump Mode)
Dip2 = ON (1-Call + 2-Flow Mode)
Dip4 - 6 = Choose Rotation option

ELECTRIC

Grounding Plate
115 VAC

Earth Ground

115 VAC
Pump1

115 VAC
Pump2

To Heat-Timer Platinum Web Alarm Switch or EMS Alarm

Flow1 Input

Flow2 Input

115 VAC

Pump1 Call

Pump1

115 VAC

DIP switch settings:
Dip1 = On (2-Pump Mode)
Dip2 = On (1-Call + 2-Flow Mode)
Dip4 - 6 = Choose Rotation option

Power or Alarm3

Reset

Alarm1
Alarm2

Outputs

Inputs

Pump1
Pump2
Aux Pump
Solenoid1
Solenoid2
Visual/Audio Alarm
Visual Gold Alarm

8 7 6 5 4 3 2 1

On

Flow1 Input

Flow2 Input

115 VAC

Pump1

115 VAC
Pump2

115 VAC

Grounding Plate

115 VAC

Earth Ground

115 VAC

Pump1

115 VAC
Pump2
Heat-Timer is aware that each installation is unique. Thus, Heat-Timer is not responsible for any installation related to any electrical or plumbing diagram generated by Heat-Timer. The provided illustrations are to demonstrate Heat-Timer’s control operating concept only.
3-PUMP 1-CALL 1-FLOW

DIP Switch Settings:
Dip1 = OFF (3-Pump Mode)
Dip3 = ON (1-Call + 1-Flow Mode)
Dip4 - 6 = Choose Rotation option

ELECTRIC

DIP switch settings:
Dip1 = OFF (3-Pump Mode)
Dip3 = On (1-Call + 1-Flow Mode)
Dip4 - 6 = Choose Rotation option
Heat-Timer is aware that each installation is unique. Thus, Heat-Timer is not responsible for any installation related to any electrical or plumbing diagram generated by Heat-Timer. The provided illustrations are to demonstrate Heat-Timer’s control operating concept only.
3-PUMP 2-CALL 2-FLOW

DIP Switch Settings:
Dip1 = OFF (3-Pump Mode)
Dip2 = OFF (2-Call + 2-Flow Mode)

Grounding Plate
Earth Ground
115 VAC

Pump1
115 VAC

Pump2
115 VAC

Pump3
Solenoid Power

Solenoid1
Solenoid2

To Heat-Timer Platinum
Web Alarm Switch or EMS
Alarm

Flow2 Input
Pump2 Call

Flow1 Input
Pump1 Call

115 VAC

Pump Lead Lag Installation and Operation Manual
Multi-Boiler Feed Pump Application

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### SPECIFICATION

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
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<tr>
<td>Operating Temperature</td>
<td>20°F/-6°C to 120°F/49°C</td>
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<tr>
<td>Voltage Input</td>
<td>120 VAC 60 Hz</td>
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<tr>
<td>Maximum Input Rating</td>
<td>12 VA Max</td>
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<td>Pump Outputs</td>
<td>3 Pumps Relays (Relays are SPST)</td>
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<tr>
<td>Alarm Outputs</td>
<td>2 Alarm Relays (Relays are SPST)</td>
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<tr>
<td>Solenoid Valve Outputs</td>
<td>2 Solenoid Relays (Relays are SPST)</td>
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<tr>
<td>Output Relay Rating</td>
<td>1 Amp inductive, 6 Amp resistive at 120 VAC 60 Hz, 15A total for all circuits</td>
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<td>Operating Modes</td>
<td>4 (2-Pump 1-Call 1-Flow, 2-Pump 1-Call 2-Flow, 3-Pump 1-Call 1-Flow, 3-Pump 2-Call 2-Flow)</td>
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<td>LED</td>
<td>10 (7 (1 per Relay), 2 (1 per Pump Alarm), and 1 Power or Pump3</td>
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<td>Inputs</td>
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<td>Rotation Options</td>
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<td>Weight</td>
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