

LHP-1

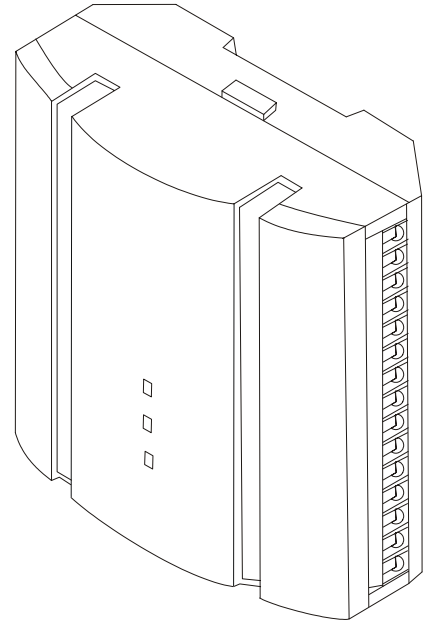
The iWorX LHP-1 is a self-contained interoperable controller for controlling the loop temperature in a liquid source heat pump installation. The LHP-1 controls heating and cooling of a loop with one or two boilers and one cooling tower.

Application

The LHP Series controllers feature analog inputs for supply, return, heat pump supply, and heat pump return water temperatures. Basic to each unit is a removable electronics module with LED indicators. Coupled to this module is a DIN rail or panel-mount base module with wiring terminal blocks.

Controllers function as part of a LONWORKS® Network using the intergal FTT-10 free topology communications transceiver. The network interface enables the LHP Series to be integrated with the iWorX system and provide heating and cooling in response to demand from other controllers.

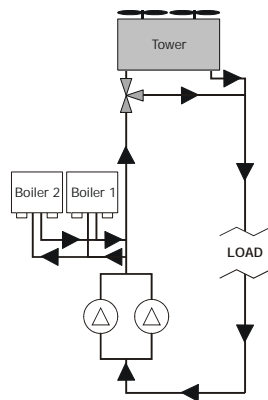
The LHP-1 also monitors pump flow, tower fan, basin water level and boiler flow proof switches to ensure proper operation of the loop.



Applicable Documentation

Description	Audience	Purpose
iWorX LCI User's Guide	<ul style="list-style-type: none"> - Application Engineers - Installers - Service Personnel - Start-up Technicians - End user 	Provides instructions for setting up and using the iWorX Local Control Interface.
iWorX LHP-1 Application Manual	<ul style="list-style-type: none"> - Application Engineers - Wholesalers - Contractors 	Provides specific application information about the LHP-1, including sequence of operation and configuration information.
Additional Documentation	<i>LonWorks FTT-10A Free Topology Transceiver User's Guide</i> , published by Echelon Corporation. It provides specifications and user instructions for the FTT-10A Free Topology Transceiver.	

Typical Use



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511 Braddock Avenue
Turtle Creek, PA 15145
www.innovextechnologies.com

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Precautions

General



This symbol is intended to alert the user to the presence of important installation and maintenance (servicing) instructions in the literature accompanying the equipment.



CAUTION: Risk of explosion if battery is replaced by an incorrect type. Contains lithium type battery, dispose of properly.



WARNING: Electrical shock hazard. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Make all wiring connections in accordance with these instructions and in accordance with pertinent national and local electrical codes. Use only copper conductors that are suitable for 167 °F (75 °C).

Static Electricity

Static charges produce voltages that can damage this equipment. Follow these static electricity precautions when handling this equipment.

- Work in a static free area.
- Touch a known, securely grounded object to discharge any charge you may have accumulated.
- Use a wrist strap when handling printed circuit boards. The strap must be secured to earth ground.

Location

Avoid locations where corrosive fumes, excessive moisture, vibration or explosive vapors are present.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.

This equipment is suitable for indoor or outdoor use. Preferably, or as required by National Electrical Code, the unit is intended to be installed within an electrical control enclosure. Operate where ambient temperatures do not exceed 185 °F (85 °C) or fall below -40 °F (-40 °C) and relative humidity does not exceed 90%, non-condensing.

For Installation in the United States

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference. This equipment can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to a power source different from that to which the receiver is connected.
- Consult the equipment supplier or an experienced radio/TV technician for help.

You are cautioned that any changes or modifications to this equipment not expressly approved in these instructions could void your authority to operate this equipment.

For Installation in the European Community

This equipment meets the requirements of the European Community Directives for Electromagnetic Compatibility (EMC Directive 89/336/EE).

Before Installing

About this Document

The instructions in this manual are for the LHP-1 module, which supports heating and cooling of a loop with one or two boilers, and one cooling tower..

Inspecting the Equipment

Inspect the shipping carton for damage. If damaged, notify the carrier immediately. Inspect the equipment for damage. Return damaged equipment to the supplier.

What is Not Included with this Equipment

- A power source for the equipment electronics and peripheral devices.
- Tools necessary to install, troubleshoot and service the equipment.
- The screws or DIN rail needed to mount the device.
- Peripheral devices, such as sensors, actuators, etc.
- Cabling, cabling raceway, and fittings necessary to connect this equipment to the power source, FTT-10A network and peripheral devices.

Equipment Location



Abide by all warnings regarding equipment location provided earlier in this document.

Optimally, the equipment should be installed within a secure enclosure.

The equipment must be installed indoors unless contained within a protective enclosure. The enclosure must maintain internal temperature and humidity within the ranges specified for this equipment.

The equipment must be installed within 500 feet of all input peripherals (flow proof switches, sensors, etc.) that will be connected to the equipment.

Selecting a Power Source

This equipment requires a UL recognized or CE marked (as appropriate) external power source (not supplied) to operate. The controller power input requires a voltage of 24 Volts AC.

To calculate power source current requirements, add the power consumption of all peripheral devices to that of the controller.

The controller and triac output loads can use the same power source. If both are using the same power source, the loads must have EMF protection. This protection can be integral to the load, or installed in the 24 VAC wiring across the load's coil.

To provide necessary RFI and transient protection, the controller's ground (GND) pin (T28) must be connected to earth ground or the earth ground of the packaged unit's enclosure ground. Failure to properly ground the controller may cause it to exceed FCC & CE limits. Excessive noise could also produce inaccurate sensor data. The power source must be capable of operating with the connection to ground described under "Grounding the Device" on page 4.

Installation

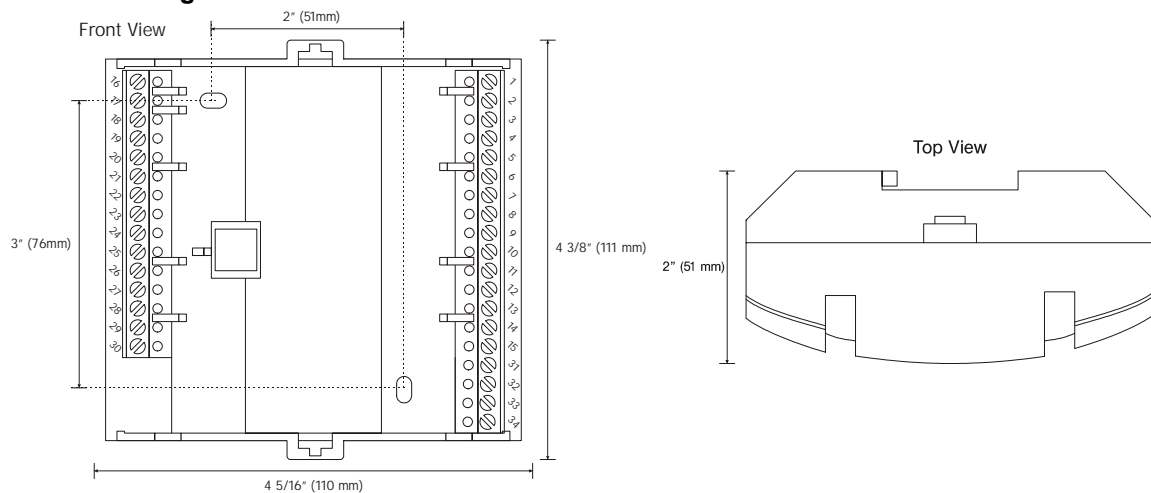


Warning: Electrical shock hazard. To prevent electrical shock or equipment damage, disconnect **ALL** power sources to controllers and loads before installing or servicing this equipment or modifying any wiring.

Mounting the Device

1. Select mounting location. Enclosure mounting is recommended.
2. Squeeze the controller at the top and bottom to release the cover tabs, and gently separate the controller base (back) from the electronics module (front).
3. Do one of the following:
 - a. Using two #6 pan head screws, mount base of controller to a panel.
 - b. Snap controller base on a 35 mm DIN mounting rail (not provided). Multiple units can be mounted on the same DIN mounting rail.
4. Wire controller base (See Routing Cabling to the Device).
5. After wiring:
 - a. Line up terminal pins with the correct sockets on the terminal blocks.
 - b. Insert cover tabs into brackets on the base of the controller.
 - c. Push gently until the cover snaps into place.

Figure 1: Mounting Dimensions.



Routing Cabling to the Device



Cabling used to connect the power source and cabling used to connect the FTT-10A network must remain separated within the control enclosure and wiring conduit.

Grounding the Device



The ground terminal (T28) must be securely connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock and may increase the possibility of interference with radio/TV reception.



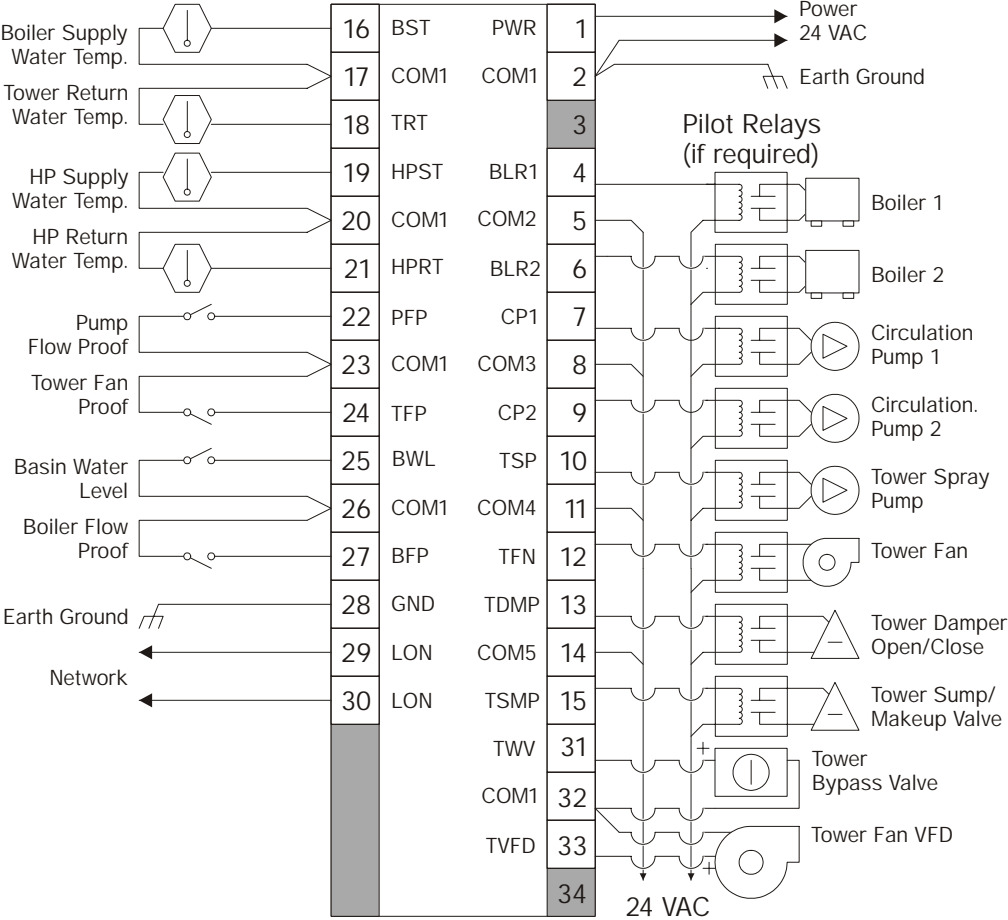
For best performance, connect the power supply common terminal (T2) to the same external point as the ground terminal (T28).

Wiring Information



WARNING: Terminals 2, 17, 20, 23, 26, and 32 are connected internally on all LHP Series controllers. Disconnect **ALL** power sources when installing or servicing this equipment to prevent electrical shock or equipment damage.

Figure 2: LHP-1 Terminal Connections



Connecting Input Devices

Boiler Supply Water Temperature (BST)

To connect the boiler supply water thermistor to the unit, attach one wire from the thermistor to BST (T16) and the other wire to the adjacent common (T17). The thermistor used must be a 10K Precon Type III.

Tower Return Water Temperature (TRT)

To connect the return water thermistor to the unit, attach one wire from the thermistor to RWT (T18) and the other wire to the adjacent common (T17). The thermistor used must be a 10K Precon Type III.

Heat Pump Supply Water Temperature (HPST)

To connect the heat pump supply water thermistor to the unit, attach one wire from the thermistor to HPST (T19) and the other wire to the adjacent common (T20). The thermistor used must be a 10K Precon Type III.

Heat Pump Return Water Temperature (HPRT)

To connect the heat pump return water thermistor to the unit, attach one wire from the thermistor to HPST (T21) and the other wire to the adjacent common (T20). The thermistor used must be a 10K Precon Type III.

Pump Flow Proof (PFP)

To connect the pump flow switch to the digital input, attach one wire of the contact to PFP (T22) and the other wire to the adjacent common (T23). This must be a dry contact, normally open switch which closes when flow is detected. If a flow proof switch is not installed, the terminals should be connected with a jumper wire.

Tower Fan Proof (TFP)

To connect the tower fan 1 switch to the digital input, attach one wire of the contact to TFP1 (T24) and the other wire to the adjacent common (T23). This must be a dry contact, normally open switch which closes when the fan is operating. If a fan 1 proof switch is not installed, the terminals should be connected with a jumper wire.

Basin Water Level (BWL)

To connect the optional basin water level switch to the digital input, attach one wire of the contact to BWL (T25) and the other wire to the adjacent common (T26). This must be a dry contact, normally open switch which closes when the basin is filled to the desired level. If a basin water level switch is not installed, the terminals should be connected with a jumper wire.

Boiler Flow Proof (BFP)

To connect the boiler flow switch to the digital input, attach one wire of the contact to BFP (T27) and the other wire to the adjacent common (T26). This must be a dry contact, normally open switch which closes when flow is detected. If a flow proof switch is not installed, the terminals should be connected with a jumper wire.

Connecting Output Devices

Boilers 1 & 2 (BLR1, BLR2)

The outputs for the boilers must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See Figure 2 on page 5 for details. If the load is less than 1 Amp, connect the boiler 1 to BLR1 (T4) and COM2 (T5), and connect boiler 2 to BLR2 (T6) and COM2 (T5). If only one boiler is used, wire it to both outputs in parallel.

Circulation Pumps 1 & 2 (CP1, CP2)

The outputs for the circulation pumps must be connected to 24 VAC pilot relays if the load is greater than 1 Amp for each pump. See Figure 2 on page 5 for details. If the load is less than 1 Amp, connect pump 1 to CP1 (T7) and COM3 (T8), and connect pump 2 to CP2 (T9) and COM3 (T8). If only one pump is used, wire it to both outputs in parallel.

Tower Spray Pump (TSP)

The output for the cooling tower spray pump must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See Figure 2 on page 5 for details. If the load is less than 1 Amp, connect the the chiller's low limit input to TSP (T10) and COM2 (T11).

Tower Fan (TFN)

The outputs for the cooling tower fans must be connected to 24 VAC pilot relays if the load is greater than 1 Amp for each fan. See Figure 2 on page 5 for details. If the load is less than 1 Amp, connect the fan to TFN (T12) and COM4 (T11).

Tower Damper Open/Close (TDMP)

The output for the cooling tower damper must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See Figure 2 on page 5 for details. If the load is less than 1 Amp, connect the the damper to TDMP (T13) and COM5 (T14).

Tower Sump / Makeup Valve (TSMP)

The output for the cooling tower sump or makeup valve must be connected to a 24 VAC pilot relay if the load is greater than 1 Amp. See Figure 2 on page 5 for details. If the load is less than 1 Amp, connect the the sump to TSMP (T15) and COM5 (T14).

Tower Bypass Valve (TWV)

The cooling tower bypass valve output can be set to 0-10 VDC max through the control logic. Connect the positive wire from the valve actuator to TWV (T31) and the other wire to the adjacent common (T32).

Tower Fan VFD (TVFD)

The cooling tower fan output can be set to 0-10 VDC max through the control logic. Connect the positive wire from the fan actuator to TVFD (T33) and the other wire to the adjacent common (T32).

Other Connections

Network (LON)

Network wiring must be twisted pair. One network wire must be connected to one LON (T29) terminal and the other network wire must be connected to the other LON (T30) terminal. Polarity is not an issue since an FTT-10A network is used for communications.

Power (PWR)

Connect one output wire from a 24 VAC power supply to PWR (T1) and the other output wire from the power supply to the adjacent common terminal (T2).

Ground (GND, COM1)



Terminals COM1 (T2) and GND (T28) must be connected to earth ground. Failure to properly ground this equipment will result in improper operation. Improper grounding may also increase the risk of electrical shock, and may increase the possibility of interference with radio and TV reception.

Specifications

Electrical

Inputs

- Cabling: twisted shielded pair, 18 AWG recommended—500 feet max. (152 meters)
- Resolution: 10 bit

Boiler Supply Water Temperature, Tower Return Water Temperature, Heat Pump Supply Water Temperature, Heat Pump Return Water Temperature

- Precon Type III 10K thermistor

Pump Flow Proof, Tower Fan Proof, Basin Water Level, Boiler Flow Proof

- Dry Contact
- Normally Open
- 5 Volts DC Max

Outputs

Boiler 1 & 2, Tower Spray Pump, Circulation Pump 1 & 2, Tower Fan, Tower Damper Open/Close, Tower Sump/Makeup Valve

- 24 Volts AC
- 1 Amp at 50 °C, 0.5 Amps at 85 °C

Tower Bypass Valve, Tower Fan VFD

- 0-10 Volts DC
- 2K Ohm minimum load
- 8 bit resolution

FTT-10A Network

- Speed: 78 KBPS
- Cabling: Maximum node-to-node distance: 1312 feet (400 meters)
- Maximum total distance: 1640 feet (500 meters)
- 42.4 Volts DC max

Table 1: Network Wire Specifications

Cable Type	Pairs	Details	Connect Air Catalog No.
Level 4 22AWG (0.65mm)	1	Unshielded, Plenum, U.L. Type CMP	W221P-2001
Level 4 22AWG (0.65mm)	1	Unshielded, Non-Plenum, U.L. Type CM	W221P-1002

For detailed specifications, refer to the FTT-10A Free-Topology Transceiver User's Guide published by Echelon Corporation. For information on ordering Connect Air items, contact Connect Air International; 4240 B Street; Auburn, WA 98001 <www.connect-air.com>.

Power

Power Requirements

- 24 VAC nominal (requires an external supply)

Power Consumption

- With no external loads: 15 VA

Mechanical

Housing

- Dimensions: 4 3/8" high, 4 5/16" wide, 2" deep (111 mm high, 110 mm wide, 51 mm deep)
- ABS Polycarbonate

Weight

- Controller Weight: 0.45 pounds (0.22 kilograms)
- Shipping Weight: 0.60 pounds (0.28 kilograms)

Electronics

- Processor: 3150 Neuron 10 MHz
- Flash: 48 Kilobytes
- SRAM: 8 Kilobytes
- Termination: 0.197" (5.0 mm) Pluggable Terminal Blocks, 14-22 AWG

Environmental

- Temperature: -40 °F to 185 °F (-40 °C to 85 °C)
- Humidity: 0 to 90%, non-condensing

Agency Listings

- UL916

Agency Compliances

- FCC Part 15 Class A
- CE

Troubleshooting

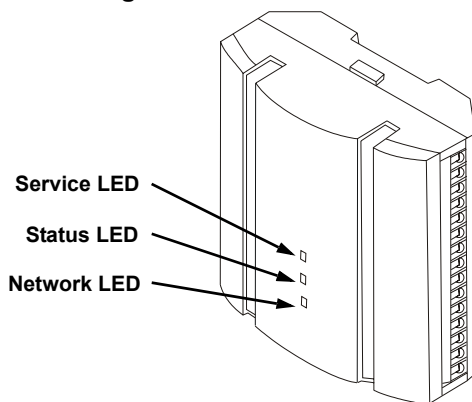
Diagnostic LEDs

The controller has 3 LED indicators. These indicators can aid in troubleshooting equipment operation problems. The following table lists the functions of the controller's LEDs in the order they appear from top to bottom on the unit.

Table 2: Diagnostic LEDs

LED	Indication
Service	– Illuminated when the service pin is pushed
Status	– Solid green when running and configured by an LCI – Flashing green when running and NOT configured by an LCI – Solid red when a fault condition exists
Network	– Yellow while the controller is transmitting data onto the FTT-10A network – Green when there is network activity – Off when there is no network activity

Figure 3: Diagnostic LEDs



Troubleshooting Tips

Controller is not running and Status LED is not illuminated.

No power to controller. Verify the voltage on the controller's power connector (24 VAC).

How do I reset the controller?

The controller can be reset by the LCI, or you can cycle power to the controller. Refer to the LCI documentation for more information on resetting the controller using the LCI.

Can my iWorX system contain multiple LHP controllers?

No, the system can only recognize one.

Thermistor readings fluctuate rapidly, sometimes by several degrees.

The controller is not properly grounded. The controller's ground (GND) pin (T28) must be connected to earth ground. Also ensure that the controller's digital inputs are dry contacts and that no voltage is being applied or switched to the inputs.

How do I associate my other controllers with the LHP Series?

Use the LHP Series's grouping mechanism, specifically **Add New Device** on the LHP Series Setup screen of the LCI. Only HPU Series controllers may be associated with the LHP Series.

What is Send Grouping for, and when do I press it?

This button stores network information into the LHP Series about the controllers in its group. Press this button when you have made any changes to the grouping.

What iWorX controllers can be part of a LHP's group?

Only HPU-1 controllers can be part of the LHP's group and demand cooling or heating from it.

Several controllers are requesting cooling or heating, but the circulation pump has not been enabled.

The "Zone Limit" setting may be set higher than the number of zones that are currently requesting cooling or heating. The circulation pump will not be enabled until the number of zones requesting cooling or heating is greater than the Zone Limit setting.

If the number of controllers requesting cooling or heating exceeds the Zone Limit setting, but the circulation pump is still not enabled, the outside air temperature may be less than the "Outdoor Air Temp. Lockout" setting.

I only have one circulation pump and/or boiler; how can I disable lead/lag operation?

The lead/lag function is built into the controller and cannot be disabled. However, you can wire both circulation pump outputs in parallel from the controller to the existing pump and the system will operate normally. Do the same for the boiler if the system only has one boiler.

The cooling tower staging does not follow the setpoints that are defined.

Verify that the Tower Bypass Setpoint is lower than the Cooling Tower Setpoints. Remember, staging will not occur until the tower bypass valve has reached the 100% open position. If staging is turning off before the defined OFF setpoints, the tower bypass valve is most likely not fully open.

Does the LHP require a reset if a single pump fails?

No, only a dual pump failure requires a reset.

Under what conditions does the LHP require a reset for normal operation.

There are three conditions that require a reset:

- Dual pump failure
- Tower fan failure
- Dual boiler failure

