

# INSTALLATION, START-UP AND MAINTENANCE INSTRUCTIONS

HLR-01  
OCTOBER 21, 2016

## HLR 1000

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### INTRODUCTION

The York HVAC Load Reduction (HLR) module is a “smart CO<sub>2</sub> scrubber” that replaces outdated, inefficient and costly ventilation methods with a practical, proven, energy saving approach that has not been available to the market before. Advances in materials, chemical engineering, and digital technology allow us to treat the indoor air for CO<sub>2</sub> and Volatile Organic Compounds minimizing the amount of outdoor air required for indoor air quality when using a dilution approach. This vastly reduces the load on the HVAC system and reduces its energy consumption.

The HLR offers the benefits of double digit energy savings while maintaining indoor air quality (IAQ) and is an “all season” system automatically managing HVAC cooling and heating loads. The HLR is a Closed-loop design with each module having an integrated heating mechanical electrical and communication system.

#### The problem the HLR solves

Widely adopted approach to maintaining Indoor Air Quality by diluting the CO<sub>2</sub> built up in a space has reached its efficiency limits. Rather than the costly practice of continuously taking in outdoor air to maintain IAQ the HLR module directly treats the indoor air by ‘scrubbing’ out contaminants with its patented sorbent\* technology.

\*Sorption is the combined process of Adsorption and Absorption. Adsorption is when a molecule adheres to the surface of a solid body, while Absorption is when that molecule is taken up inside the body because of pores or spaces between molecules. Because the HLR uses both of these processes the more general Sorption term will be used.

#### USGBC—LEED

The HLR 1000E module qualifies for U.S. Green Building Council LEED (Leadership in Energy & Environmental Design) credits. The HLR 1000E module is relevant for the Indoor Environmental Quality (EQ) credit category, one of nine credit categories in the best-in-class building strategies and practices that are part of the green building certification program.

**LEED Pilot Credit EQpc68** is an alternative path to earn LEED points. This alternative compliance path grants LEED credits based on Indoor Air Quality Performance (IAQP).

Installation of the HLR module earns the prerequisite IAQ performance credits as the credits are not achievable without air cleaning. With ongoing air testing, additional LEED points can be earned from installation of the HLR 1000E module.

## SAFETY

Read this entire manual prior to receiving or performing any work on the unit. This manual is provided to you as the manufacturer's recommendations to ensure personal safety, proper installation, operation, optimal performance and maximum longevity of the unit. Improper installation could result in poor operation, property damage and personal injury. **Do not alter or puncture the unit at any location without first consulting with the manufacturer.** It is important to follow the manufacturer's recommendations and employ common sense (general and engineering) when handling the unit. Only authorized and trained personnel should handle, install, maintain and work on any part of the unit. Only qualified licensed electricians should perform any work with the electrical components. All work performed on the unit (installation, operation, maintenance, service and repair) must comply with local, state and national codes, standards, laws, rules and regulations in conjunction with the manufacturer's recommendations. The unit is operated by high voltage that might cause serious injury or death if improperly handled.

- Comply with all national, state and local electrical codes and regulations.
- Ensure that all wires and electrical components are well-insulated, covered and protected.
- Do not attempt to perform electrical work with bare or wet hands or feet.
- Take special care when handling the unit in wet conditions
- Prior to servicing the unit, ensure that the unit is turned off and the power disconnected.

## OVERVIEW: THE HLR SYSTEM, MODULE AND SORBENTS

### The HLR System

The system is a group of HLR 1000E Modules installed in the mechanical rooms or indoor air plenums in a building. The HLR system uses wireless technology to add enhanced real-time monitoring, reporting and system results validation of VOCs and CO<sub>2</sub> to existing HVAC systems. The HLR system controls the ventilation of the area treated but not the Heating or Cooling demand.

### The HLR 1000E Module

A closed-loop mechanical design designed to easily retrofit existing HVAC infrastructure. **See Figure 1.**

### The Sorbents

The Sorption and regeneration cycles sequentially operate to scrub the inside air and purge the captured contaminants to maintain indoor air quality. CO<sub>2</sub>, formaldehyde and VOCs are captured during the sorption process as air travels through the cartridge set. Sensors monitor the sorbents in the cartridge set for saturation, when saturated the regeneration process is launched by the controls to purge the sorbents of the captured CO<sub>2</sub> and VOCs, releasing the contaminants to the outside air. The system may be set up to regenerate automatically or during off hours to lower the cost of energy consumption further, but the controls are designed to automatically adapt to the schedule of the building in order to optimize performance and indoor air quality.



Figure 1

### Capacity Performance

The HLR 1000E is capable of cleaning 700 CFM (cubic feet per minute) of air in the return air path of the HVAC system. Although installation conditions can differ, a rule of thumb is to have one HLR 1000E for every 20,000 square-feet of area to be treated. Using this rule of thumb allows the HLR 1000E to maintain safe CO<sub>2</sub> levels while enabling the closure of the outside air damper.

## COMPONENT LOCATION AND DESCRIPTION

The HLR 1000E is a closed loop solution to indoor air quality that works in all climates. Each HLR 1000E module is a self contained preassembled cabinet with the following components.

**Cartridge Bank** - The cartridge bank is the heart of the HLR 1000E system, each cartridge contains the sorbents that collect select contaminants (including formaldehyde, VOCs and CO<sub>2</sub>) during the sorption cycle and release the captured contaminants during the regeneration cycle. A set consists of 12 cartridges and is field installed after the installation of the HLR module.

**Heater** - The integrated heater raises the internal temperature of the HLR to initiate the regeneration process releasing the captured contaminants from the sorbents. During the regen cycle external dampers close, the internal damper opens and air is recirculated inside the cabinet to accelerate the regen process.

**Fans** - Integrated DC brushless fans control the airflow through the HLR during the sorption and regeneration cycles. Due to the slipstream design they are not sized for applications with static pressure above .32" or duct runs longer than about 25'. The HLRs controller has speed control and active feedback from the fans to verify proper operation.

**COMPONENT LOCATION**

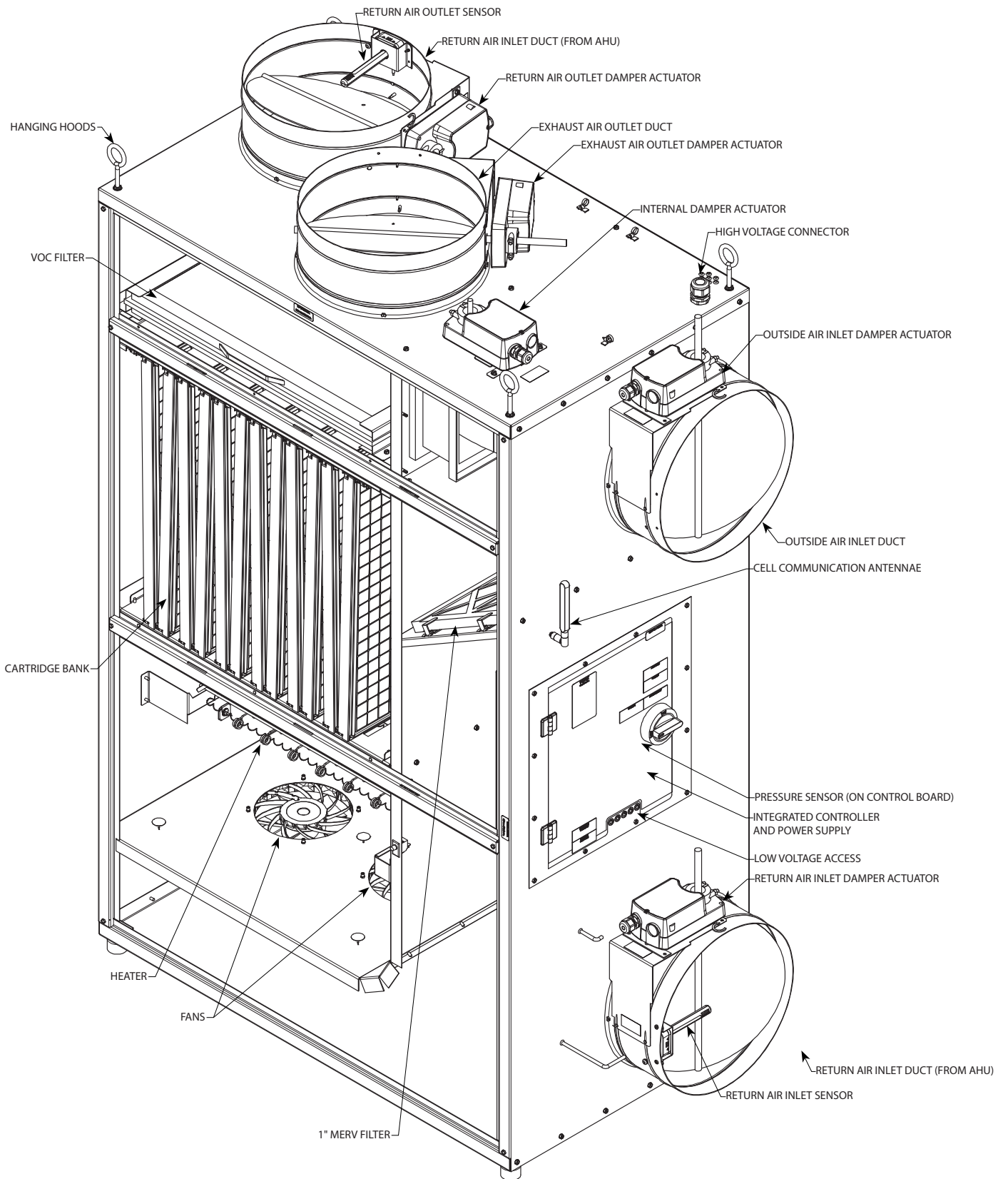


Figure 2

**Dampers** - The HLR has 5 dampers and damper actuators. Sorption dampers open to route the air through the unit during the sorption process. The Regen dampers open after the Regeneration process to clear the contaminants out of the system. The internal damper opens only during the regeneration cycle to facilitate the recirculation of heated air to release contaminants from the sorbents.

**Integrated Controller and Power Supply** - An electronics enclosure contains the HLRs controller and power supply. The power supply is integrated into the control board and converts incoming 208 to 277 volt single phase power to the required voltages for controls, fan motors, actuators and sensors. The Controller contains the system software, all controls, relays, sensor interfaces and well as a connector for the wireless and wired communication modules.

**Communication Modules** - The 3G cell communications module ships attached to the control board from the factory, a sim card is required to be installed during commissioning to activate it.

**Sensors** - The HLR 1000E is shipped with 3 internally installed sensors and 2 additional field installed sensors. The internal sensors measure internal temperature, humidity, CO<sub>2</sub> concentrations and VOCs, an additional pressure sensor attached to the controller measures pressure differential as feedback for the DC fan motors. External sensors are used to measure temperature and humidity of the outside air and supply air out of the AHU and are used to measure energy usage.

**High Voltage Connector** - A Heyco conduit connector is provided for high voltage connections on the top of the unit. This can be replaced if needed with an acceptable ¾" fitting of the electrical contractor's choice.

**Low voltage** - Access. 5 low voltage access holes with ¼ fittings are provided below the Controller access door for low voltage wires to pass through into the Controller.

**Cell Communication Antennae** - Shipped inside the controller section of the HLR the Cell communication antennae should be screwed on by hand after the HLR is installed. It is hinged so that the antennae can always point up no matter what orientation the HLR is installed in.

**High Voltage Disconnect** - The high voltage disconnect is integrated into the controller access door.

**Hanging Hooks** - 4 hanging hooks are provided on the top corners of the HLR, each is rated for 125 lbs. the two hooks on the left of the cabinet can be removed and the holes reused for the optional horizontal support bracket.

**Merv 8 Pre Filter** - need filter details

**INSTALLATION**

Follow the procedures below to install your HLR 1000E.

**Installation Requirements**

The units will be installed according instructions and mechanical plans. All installation work will be conducted according to acceptable work ethics and while observing all required safety procedures. HLR 1000E units will be installed in the mechanical rooms and next to the AHU as per the attached drawings.

The HLR 1000E will be connected with four round ducts with a 14" diameter in order to perform the regeneration and sorption processes. All ducts shall be insulated thermally. Two sorption ducts (inlet/outlet) will be connected to the return air duct of the AHU while two regeneration ducts (inlet/outlet) will be connected to the outdoor air duct and regeneration exhaust duct respectively. All control components and the power components will be laid in isolated conduits to separate high power wires from control and automation wires. All control components and sensors will be installed according to the principle installation plan attached to this document.

Verify that the following electrical requirements are available.

Voltage In (VAC)	MCA (Rating)=1.25 *(load1+load2+..)	MOCP (Rating)
240	26.66	30.00
208/230	23.28	25.00

**Table 1**

**Selecting a Location**

A location should be chosen in which a technician will have access to replace the pre-filter, sorbent cartridges and Carbon filter, as well as access to the integrated control and power supply access panel. In an application with ductwork there should be a path for the HLRs ductwork to the outside air and to the return duct with little or no obstructions or excessive bends.

**Receiving the Unit**

**Shipping Damage**

Check unit for shipping damage. Receiving party should contact last carrier immediately if shipping damage is found.

Bring the HLR 1000E and cartridges to the installation area. The HLR 1000E and cartridge set are shipped in separate containers and should be transported in these separate containers until the cartridges are ready to be installed. The box of cartridges should only be opened and the cartridges installed in the HLR when the rest of the installation is complete and before the unit is commissioned.

Unpack the HLR 1000E and place in the orientation required for the particular installation.

The HLR 1000E operates in either vertical or horizontal configurations

**Storing the Unit and Cartridges**

When the HLR 1000E is not to be installed immediately upon delivery store the unit in its original shipment packaging.

HLR cartridge sets should be stored indoors away from direct sunlight between 14°F and 95°F. Cartridges should remain sealed in their original shipping package to protect them from moisture prior to installation.

**Transporting the HLR 1000E**

HLR 1000E is delivered in cardboard packaging. We recommend unloading the unit close to the installation site or placing it on corner dollies for easy transport.

See **Storing the Unit and Cartridges on the previous page** for more information.

- H (Height): 75.68"
- W (Width): 55.41"
- D (Depth): 34.32"
- Shipping Weight: 240 lb

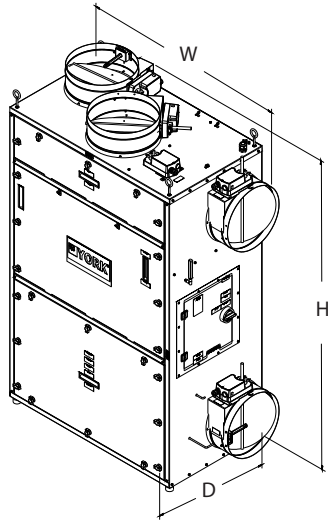


Figure 3

### Setting the unit in place

The HLR 1000E uses a versatile design that allows it to be installed in several different orientations. It can be mounted horizontally on a field supplied base frame or on factory supplied brackets hanging from the ceiling, or it can be mounted vertically using the integrated adjustable stands.

When installing the unit horizontally and using the factory supplied brackets carefully place the HLR 1000E on its side (with the O/A and Return ducts pointing up) and remove the bottom 2 floor stands as well as the bottom two lifting eyelets. Mount the bracket on the "bottom" end of the HLR using supplied bolts, lock washers and washers supplied with the bracket kit instead of the floor stand. On the "top" end of the HLR reuse the eyelet and its hardware as a bolt. These brackets can now be used to hang the HLR using 3/8" all thread or set the unit on the floor using field supplied stands.

**See Figure 4.**

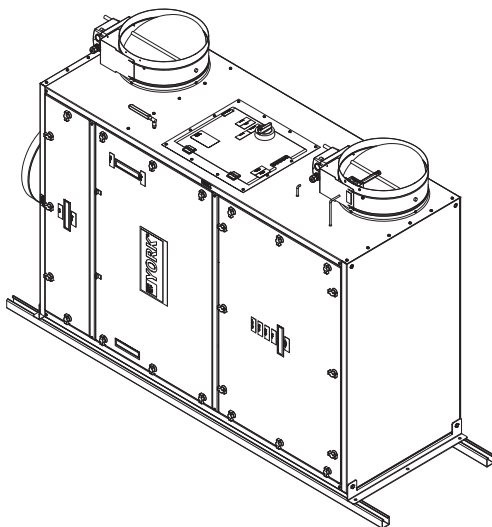


Figure 4

When installing the unit vertically use the integrated adjustable stands to level the unit as much as possible, making sure all 4 stands have solid contact with the floor.

### Integrating the Units

Once the HLR 1000E has been placed in the base frame it is integrated into the AHU. Modularly integrating two or more units together TBD.

### Ductwork Connections

The following instructions show how to integrate the HLR 1000E into the AHU ducting system using either a plenum return or a ducted return method. Because the HLR uses a slipstream topology for the treated air only the regeneration and exhaust ducts are required to be connected, this increases the HLR systems flexibility (...with different types of plenum return or ductless systems).

Duct connections should be 14" metal duct, Teflon lined spiral duct or snap fit duct are acceptable, duct connectors should have an integrated gasket to prevent leakage, and all duct connections should be sealed with a water based mastic to ensure a leak free connection. Flex duct should not be used due to pressure drops causing excessive SP.

### Use the SMACNA standard for all ducts and transition parts.

The Maximum length of the ductwork should not cause the static pressure to exceed .32" sp. A maximum of 25' per run is a good rule of thumb, excessive turns should be avoided.

Ductwork should be insulated in accordance with the return duct in the mechanical room where the HLR 1000E is installed. If the humidity or temperature conditions in the mechanical room would cause condensation to form on the duct (inside or out) insulation is required.

### Plenum Return

In plenum-based return air systems, the HLR 1000E module can be positioned inside the plenum with no ductwork for the indoor air. The module pulls in air from the plenum and ejects treated air back into the plenum. However, in this type of installation, the purge air inlets and outlets must be ducted to an appropriate outside air source and exhaust, respectively. The Regen In duct and Regen out duct to the outdoor air should still follow the ductwork connections standards listed above as well as being sealed completely where they penetrate the return plenum and the location where they access the outdoor air.

### Ducted Return

The HLR 1000E module is designed for a slipstream topology, and the air flow through the module is, by design, a small fraction of the total circulation.

The slipstream topology, as shown in the schematic above, is a unique feature of the HLR solution. Among other things, it allows the system to go "off-line" for regeneration or for maintenance without any disruption to the building ventilation systems. The inlet and the outlet of the HLR 1000E module are independently ducted to the indoor air return ducts. The flow rate through the HLR 1000E is a small fraction of the total circulation and varies by indoor contaminant load.

## Installing External Sensors

The HLR 1000E includes six embedded sensors.

Sensor	Sensor Function	Location	Measurement*
Quad Sensor	Measures incoming air	HLR 1000E	T, Rh, C, VOC
Triple Sensor	Measures outgoing air	HLR 1000E	T, Rh, C
Dual Sensor - AHU Supply Air	These sensors measure energy use	AHU - Output Duct	T, Rh
Dual Sensor - OA		Outside Air Duct	T, Rh
Pressure Sensor	Measure Pressure	HLR 1000E	P
Cartridge Temp	Measures temperature during regeneration	HLR 1000E	T

**Table 2**

Two externally mounted sensors are installed in the AHU's ductwork to provide the HLR 1000E with temperature and relative humidity of the outdoor and conditioned air conditions. They are provided separately during installation, and are required for proper operation of the HLR System. The T6H6 sensor is installed in the AHU's outdoor air inlet duct and is used to measure outdoor air conditions. The T2H2 sensor is installed in the AHU's supply duct and is used to measure conditioned air conditions. See Table 2

Using a step bit drill  $\frac{5}{8}$ th inch holes in the center of the widest part of the AHUs supply duct away from the supply outlet of the AHU, as well as the AHUs outside air duct. Mount the sensors on a flat surface of the ducts using two #6 x  $\frac{3}{4}$ " sheet metal screws. If mounting the sensors on a spiral or round duct use a field supplied bracket. Use caulk or water based mastic to seal the sensor in the duct making sure not to block or foul the sensor openings in the sensor housing.

The site contractor is responsible for installing the sensors in the ducts and running 22 AWG four-lead wire from the sensor to the electrical cabinet of the HLR 1000E in a manner that prevents damage to exposed sensor wires. A typical installation may use flex conduit, a junction box and an EMT conduit to route the sensor wiring to the HLR 1000E. Follow local codes for running wire in a mechanical room or return plenum.

### Installing Outdoor Air Damper and Actuator

The AHU must be provided with an outdoor air damper such that that the HLR 1000E can manipulate and control the outside air intake.

The outdoor air damper actuator is connected to the HLR 1000E control cabinet.

The contractor is responsible for the following:

- Next to each damper a service hatch should be supplied.
- Dampers will be corrosion resistant aluminum based (see attached typical model).
- On all dampers a spring return actuator with 24 VDC dry contact feedback will be installed as well.
- Actuators will be 24 VDC operated. Feedback and actuation wires will be connected to the HLR 1000E control cabinet with 22 AWG four lead wire used for actuation and feedback. **See HLR 1000E Connectivity below** for more information.

- It is the responsibility of the contractor to provide actuators that will have the required torque to actuate the dampers if these do not exist on site.

### HLR 1000E Connectivity

The HLR 1000E interfaces to the AHU using the required built-in connections listed below.

The minimum number of connections in order to operate the HLR 1000E with an AHU are as follows:

**Outside Air Damper Control:** The HLR 1000E must take control of the Outside Air Damper position. This is the key factor that enables the energy savings when using the HLR 1000E.

**Outside Air Damper Position:** The HLR 1000E requires the position signal from the OA damper to ensure that the HLR 1000E is setting the damper to the correct position.

**Air Handler Mode:** The HLR 1000E operates in conjunction with the AHU using a close contact at the "C/T" terminal on the AHUs VFD.

**Fire Signal:** The fire signal is commonly generated from the fire panel or building automation system in the event of a fire in the building and is used to put the outside air damper and the HLR 1000E and other air handling devices in a mode that would inhibit smoke/fire from spreading throughout the building through the air ducts.

**Energy Metering:** Ultrasonic BTU meters are externally mounted on the conditioned unit's hydronic lines in all HLR 1000E installations.

**Note: See Low Voltage Connection Section**

### Electrical Integration

The HLR 1000E uses single phase 208/230 power, check panel voltage to determine the proper breaker size.

### High Voltage

A fusible disconnect is provided in the access door of the HLR 1000E, an external fusible disconnect is not required.

Three 10 gauge wires (Black, White, Ground/Green) should be run from the electrical panel to the HLRs power disconnect, a Heyco conduit connector is provided on the top of the HLR. If a different type of conduit is being used this connector can be easily replaced. From the Heyco connector High voltage wire should be run through the provided grommet next to the disposable filter, and into the top of the controls compartment using the provided grommet. **See Figure H.**

A lug is provided to ground the Green wire to the body of the HLR before it is connected to one of the 3 terminals on the fusible power disconnect along with the hot and common wires.

\*The integrated power supply and control board is grounded to the body of the HLR at every mounting point

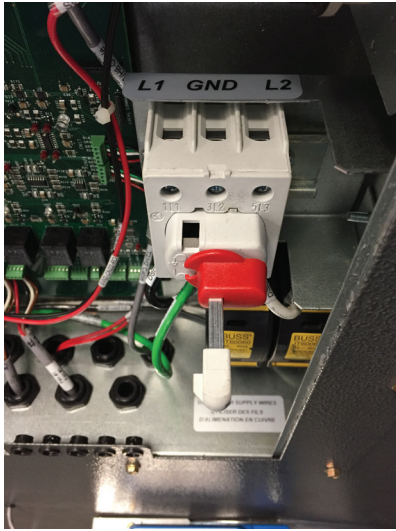


Figure H

### HLR 1000E low voltage connections

The HLR 1000E interfaces with the AHU using the AHU\_MODE connection on the bottom of the control board. On constant volume air handlers without Variable Frequency Drives the jumper should be removed and two field installed wires should be connected from the AHU\_MODE and 5V terminals (CN18) on the HLR to a field installed relay set to close a contact when the air handler's blower is on. If the Blower has a VFD the C/T terminal on the VFD can be used for this operation, the C/T terminal is a normally open contact that closes when the VFD is enabled.

The Interface with the Fire signal or smoke detector is wired to FIRE\_IN1 and FIRE\_IN2 (CN20). The jumper should be removed from these terminals and two wires should be connected to the normally closed contacts on the smoke detector or fire alarm system.

### Energy metering

The Outside Air Damper position and control interface is located at the OA terminals (CN10). The HLR uses the standard 4 wires for actuator control (field installed), black, red, white and orange 18 gauge wires should be run to the actuator for Common, 24vAC, 0-10vDC actuator control and Actuator feedback respectively, and connected to the corresponding terminals on the HLR control board.

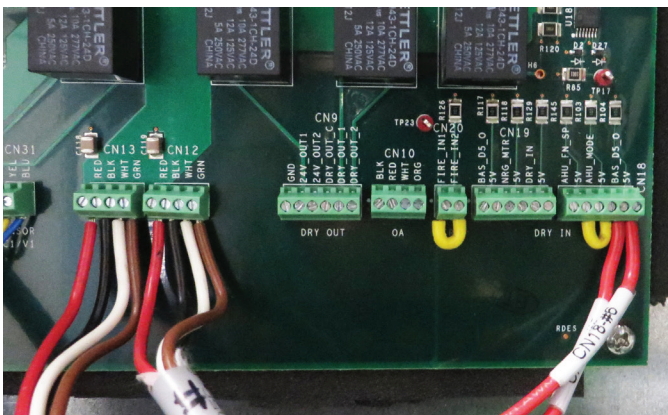


Figure I

## Installing the Cartridges

1. Turn the latches on the cartridge bank door counterclockwise to access the Cartridge back section of the HLR. **See Figure A.**



Figure A

2. Once all knobs are turned pull down on the two spring latches on the top of the door and pull out. **See Figure B.**



Figure B

3. Pivot the top of the door outward and lift the door up and set it aside. **See Figure C.**
4. Continue in the same manner to remove the Top Compartment door and set it aside.
5. Open the cartridge carton and remove the packaging, set aside.



Figure C

6. Remove the VOC filter from the packaging and install it into its rails with the fabric handle facing out. **See Figure D.**

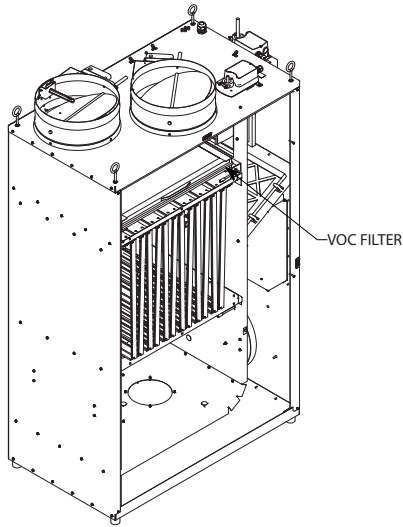


Figure D

7. One cartridge at a time remove the end bracket from the cartridge frame using a #2 phillips screw driver. **See Figure E.**
8. Insert the Cartridge into its frame and secure the bracket before moving on to the next cartridge. **See Figure E.**



Figure E

9. Handle the cartridges by the ends only, do not touch the Sorbent cells as they are delicate and can become easily damaged. Slide the cartridge into its rails making sure the sides remain in the cartridge grooves. **\*\*Do not use lubricants or soap on the flexible seals as it will contaminate the sorbents in the cartridge.\*\*** See Figure F.

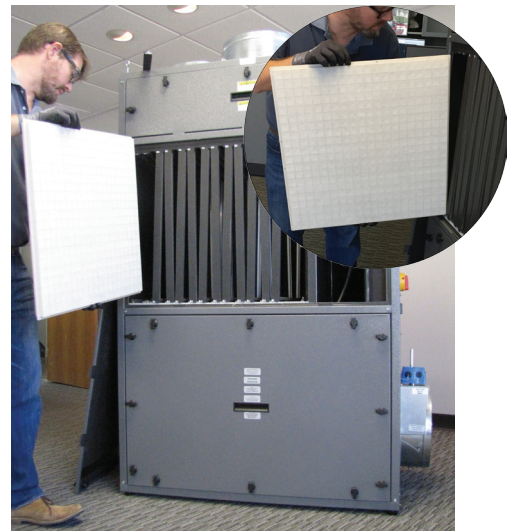


Figure F

10. Once the cartridge is securely in both grooves and pushed firmly to the back of the frame reinstall the bracket that holds it in place. **\*\*use the lowest torque setting on your drill gun when tightening. Do not use any impact tool to tighten screw.\*\*** See Figure G.



Figure G

11. Once this is done continue with the remaining eleven cartridges.

### Unit Communication

- The cell Antenna ships in the controls section of the HLR. Remove the Antenna and screw it on to the brass screw above the control panel by hand. Point the Antenna up. **\*\*Do not over tighten, do not use any tool to tighten the Antenna\*\***

### Specification

Communications Cellular Link 2.5G/3G

Wireless Link 915 MHz

BACnet over MSTP ISO-RS485

Each HLR 1000E module includes wireless communication capabilities for ongoing monitoring and reporting of indoor air quality, sorbent performance and system operating conditions. This wireless solution is a state-of-the-art solution with a reach of 10 miles. BACnet communications protocol enables HLR 1000E to communicate with 95% of building management systems.

### Initial Unit Start-up Procedure

Follow the procedures below to perform the initial start-up and to commission the HLR 1000E. **\*\* This procedure should only be taken by an individual with the proper training, tools and a laptop with up to date communications software.\*\***

**\*\*The commissioning process requires operating the unit with the Controls section access door open. All safety procedures should be followed.**

### Start-up Procedure Toolkit

Have the following tools available when beginning the commissioning procedure:

- 6-pin serial to USB cable for communication with controller.
- Hyperterminal or other terminal program on PC (115,000 – 8- N – 1 , NO FLOW CONTROL settings)
- List of commands for controlling the HLR 1000E through the terminal program. See

### Power Check

Follow the procedure below to do the power check.

- Using a crescent wrench Turn on AC power by turning the disconnects shaft.
  - Sorption dampers will automatically open.
  - LED 10 will illuminate (24V indicator)
  - LED 11 will illuminate (5V indicator)
  - After the software three minute delay for sensor warm up the LED 9 (heart beat LED) will blink to indicate the software is running.
  - When 10 dots appear on the screen (a three minute delay) the unit is powered up.
- Enter the serial number of the unit, which is located on a sticker in the control cabinet.

### Software Verification

When the unit is first turned on the following string is printed to the terminal program. The first line printed is the software revision, in the example below it is "E".

"HLR 500/1000 Rev. E

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Please wait three minutes for CO<sub>2</sub> sensor warm-up."

### Requesting Startup

This section will describe how to send a startup request form and the requirements to check mark as completed prior to sending it (known as the Pre-Startup Checklist).

### Manual Startup and Commissioning

#### Damper Check

- Type "BUGON" to place the HLRE in Debug mode"
- OD1, CD1 – Verify that Regen in (Damper1) opens and closes.
- OD2, CD2 – Verify that Regen out (Damper2) opens and closes.
- OD3, CD3 – Verify that Sorp in (Damper3) opens and closes.
- OD4, CD4 – Verify that Sorp out (Damper4) opens and closes.
- OD5, CD5 – Outside air damper
- OD6, CD6 – Verify that Regen in (Damper6) opens and closes.
- Type "BUGOF" to exit debug mode

#### Sensor Check

- Quad Sensor – Type GT1,GH1,GV1,GC1 and verify the readings
- Triple Sensor - Type GT3,GH3,GC3 and verify the readings
- Supply Air Sensor - Type GT2, GH2 and verify the readings
- Outside Air Sensor - – Type GT6, GH6 and verify the readings
- Cartridge Temp Sensor - Type GT4 and verify the readings
- Pressure – Type GP1 and verify the reading (doors must be closed and fans must be running)

## Fan Check

1. Type SFN20 to set fans to 20%, verify speed
2. Type SFN50 to set fans to 50% verify speed
3. Type SFN80 to set fans to 80% verify speed
4. Type SFN100 to set fans to 100% verify speed

## Cellular Connection

1. Verify through the SCADA that the unit is connected
2. Look for the "CONNECT" printout through the hyperterminal with no error after it.

## Heater Safety Operation

Unit internal Heater Properties

Heater Power 6500 Watts

Heater Current @ 277V 23.47 Amps

Heater Resistance 11.80 Ohms

A Procedure to test the heater is not required at start up, if the 1<sup>st</sup> Regen cycle fails because of insufficient temperature rise trouble shoot the heater coils as you would any electric heater coil.

## Maintenance

Follow these maintenance procedures to assure the long life and efficacy of your HLR 1000E.

## Monitoring and Reporting

Each HLR 1000E Module has built-in electronics and software to record and report all aspects of the HLR system operation. A custom SCADA (supervisory control and data acquisition) interface enables users to view real-time and historical data to monitor IAQ and energy savings results. Approved users have a login with defined permission levels providing access to a website where results can be monitored. The data is uploaded via a cellular link.

## Regular Maintenance:

### Filter replacement

A 12 x 22 x 1" pleated Merv 8 filter is provided to filter outside air of dust and dirt. Quarterly replacement is recommended on the same schedule as other HVAC filters.

### Cartridge Set Replacement

The HLR 1000E module is designed to require minimal on-site routine maintenance. Annual cartridge set replacement is the standard maintenance. This can be performed by any certified technician. With ongoing maintenance, the HLR 1000E modules are designed for a long operating life of 20+ years.

Refer to the Installing cartridges section for info on how to replace Cartridge set. Cartridges should be replaced one at a time, old cartridges should be packed back into box and shipped back to the manufacturer for recycling.

### Handling Cartridge Sets

Wash hands thoroughly after handling. MSDS (Materials Safety Data Sheet) available upon request.

## Recycling of Cartridges

When cartridges are replaced, the used cartridges should be placed in the packaging from the replacement cartridges, sealed, and shipped back using the return mailing label provided in the cartridge packaging.

## Appendix

### Terminal Program List

Use these commands from a terminal program.



