

**QLCI**™   
*Designed by TROX®*

*Displacement Induction Ventilation*

**QLCI with REAR FIN TUBE HEATER ELEMENTS INSTALLATION,  
OPERATION, & MAINTENANCE (IOM) MANUAL**

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### 1.1 INTRODUCTION

**Important!**  
You must read all instructions prior to the installation, operation, or maintenance of this product!

The QLCI displacement induction ventilation diffusers are designed to provide air quality and acoustical performance similar to conventional displacement systems but are designed specifically for the North American climate. Units are fitted with a series of air induction nozzles that allow the supply of conventional air (50° to 55°F) to the terminal. These nozzles induce room air through a cooling and/or reheat hydronic coil to pre-condition the air prior to mixing with the primary nozzles. The result is a constant volume (variable temperature) displacement type supply of air to the space.

The QLCI displacement induction ventilation diffusers, when applied with optional rear fin tube heating elements, delivers warm air to the space along the exterior wall or large window exposures. Room air migrates through air pathways to the fin tube elements and the heated air travels upward due to radiation or buoyant heat forces. No primary air is used to drive air upward across the fin tube heating elements. Ventilation air from the central station air handler, coupled with induced room air provides the necessary ventilation requirements and total airflow to the space via the lower face diffuser panel outlets.

The integral hydronic coil within the unit is sized to allow the QLCI terminal to condition the room while the central system air handler supplies air at (or near) the mandated space ventilation rate. Therefore, the central station air handler can supply 100% outside air while all of the return air from the space is exhausted.

The diffuser uses the primary air energy to induce air through the hydronic coil and does not contain any moving parts such as, fans, motors, or compressors to be maintained.

### 1.2 SAFETY




The customer must use qualified personnel and follow all applicable building codes and safety regulations when installing, commissioning and performing maintenance of this product. Eye protection and gloves should be worn at all times when handling the product.


Consult all local building, occupational safety and other codes applicable to the installation.

Please pay particular attention to the symbols used throughout the manual that indicate safety related issues, warnings and important notices or information; read the complete manual before installation and be familiar with the meaning of the safety symbols in the next section 1.3.

### 1.3 SYMBOLS USED IN THIS MANUAL

When reading this manual, particular attention must be given to the parts marked with the following symbols:

	<b>Warning!</b> Indicates a potentially dangerous situation for the product and the environment
	<b>Important!</b> Designation of a danger that can cause personal injury or damage to property
	<b>Note!</b> Indicates important notices or information

 **Fragile!**  
Handle with care. The diffuser should not be handled using the water pipes which may cause damage to the unit.


### 1.4 RECEIVING, INSPECTION AND STORAGE

All Carson Solutions products are inspected and tested prior to shipment to ensure the highest quality. Carson Solutions products are packed and labeled in individual cardboard cartons.

Upon receipt of the product shipment, conduct a thorough inspection of the outer packaging and pallets for possible damage. If damage has occurred during shipping, indicate the damaged items on the delivery papers immediately and inspect the product contained in those containers for damage.

If damage has occurred during shipping, immediately file a claim with the carrier.

Refer to the Manufacturer's Representations and Warranties on pages 15-16 of this manual for detailed handling instructions and damage reporting procedures.

 **Note!**  
Carson Solution products should not be removed from its individual carton for storage. Do not unpack units until they have been moved to the installation location and just before installation is to begin.

Carson Solutions products should be stored in a clean and dry location. If products remain packaged as delivered (strapped and wrapped on pallet), they can be stored as delivered (do not stack pallets). If the packaged products are removed from pallet, they should not be stacked more than four high.

**Packaging is not suitable for outside storage**



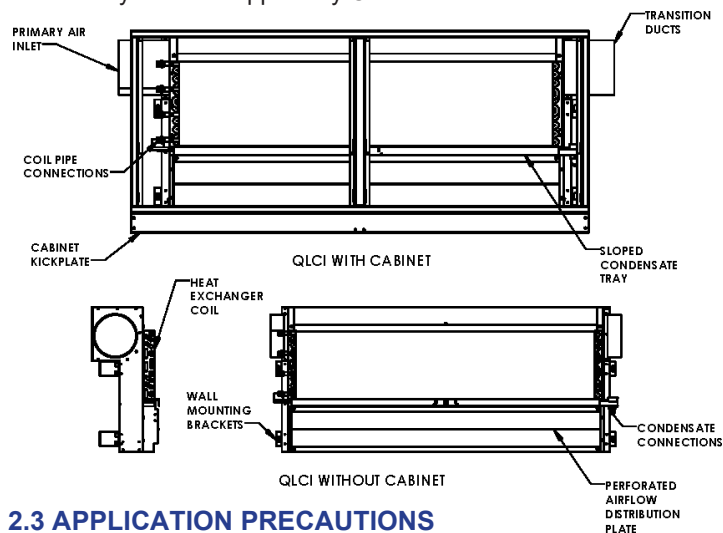
## 2.1 PRODUCT OVERVIEW

The QLCI displacement induction ventilation diffusers are designed specifically for classroom applications. Units can operate in cooling, heating, and or ventilation modes. In standard cooling or heating modes, primary air is delivered through a series of induction nozzles. As ventilation or primary air is fed to the round OA plenum, the air passes through a series of nozzles, producing both a relatively high velocity airstream and an area of low pressure thereby inducing room air through the assembly's return grill and across its integral hydronic coil. The air is reconditioned and then mixed with the primary air prior to being discharged back into the space via a grill mounted on the lower face of the QLCI unit. In certain circumstances designers have elected to apply optional rear fin tube heating elements for either primary or supplemental heating in the space. Please consult your local Representative or Carson Solutions directly to evaluate what heating approach is best suited for your application.

The QLCI displacement induction ventilation diffusers should be installed in the quantities, sizes and configurations shown on the project plans and performance schedules.

## 2.2 CONSTRUCTION DESCRIPTION

The assembly (figure 1) of the QLCI consists of a heat transfer coil (2- or 4-pipe), primary air inlet (top or side), induction nozzles, transition connecting duct and sloped condensate tray with connection. Cabinet structure is constructed of heavy gauge steel and powdercoated with a fingerprint proof texture paint. Optional accessories such as bookshelves, utility cabinets, and OA duct covers may also be supplied by Carson Solutions.



## 2.3 APPLICATION PRECAUTIONS

When in cooling mode, the entering water temperature to the QLCI displacement induction ventilation diffuser coil should be maintained warmer than the space dew point temperature in order to prevent condensation.

Extreme latent load applications may, however, require lower chilled water temperatures be used to condense moisture from the recirculated air during the reconditioning process. Please consult with a local Representative or Carson Solutions directly for review of design approaches.



### Important!

Installation must be performed by properly trained and authorized personnel only! Read all instructions before beginning installation.

## 2.4 PREPARATION FOR INSTALLATION

The QLCI displacement induction ventilation diffuser is manufactured by Carson Solutions with the following details:

- Single or dual duct connections
- A series of induction nozzles
- Integral heat exchange coil
- Rear wall mounted fin tube elements
- Perforated discharge baffle plate
- Mounting brackets with a 3/8" x 1" slot
- Sloped condensate trays with capped 1/2" drain
- Architectural cabinets

### 2.4.1 ITEMS PROVIDED BY INSTALLER

Installer to provide (according to all applicable local building codes):

- Proper PPE should be used by the installer
- Level and measure equipment
- Tools such as wrenches, pliers, screw drivers, and drills
- A mounting system including 2x4's and all mounting hardware for installation
- Hydronic piping system with NPT fittings
- Water flow regulators and strainers if applicable
- Manual shut-off valve for each pipe run (recommended) supply and return water circuits (unless factory furnished flexible hoses are included with product order) or hard connections
- Air-side balancing and/or control devices as specified in the project plans and specifications
- Recommended hardware to attach each unit to each other is (4) 5/16-18 x 1" Phillips head truss screws and (4) 5/16" serrated nuts per QLCI. End wall units only require 2 of each per QLCI

### 2.4.2 UNIT WEIGHTS



### Caution!

Machinery recommended for movement and installation of QLCI's. Refer to table below for unit weights and use caution when removing from packaging.

Add 7% for to values below for water weight

QLCI Unit Size	Weight without Cabinet	Weight with Cabinet
4ft	68 lbs	128 lbs
5ft	84 lbs	160 lbs
1500	95 lbs	180 lbs
6ft	101 lbs	192 lbs
2000	122 lbs	232 lbs
8ft	135 lbs	255 lbs

Fin Tube Length	Weight with Packaging
3ft	2.25 lbs
4ft	3.00 lbs
5ft	3.75 lbs
6ft	4.50 lbs
7ft	5.25 lbs
8ft	6.00 lbs

### 3.1 GENERAL PROCEDURE

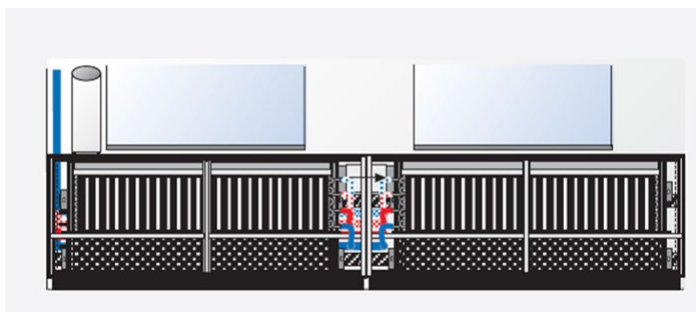
The QLCI displacement induction ventilation diffusers should be installed in quantities, sizes and configurations shown on the project plans, schedules, and submittals. Deviation from the designed plan should be avoided as the QLCI unit locations and configurations is critical to the comfort of the conditioned space. Units are designed for easy installation and access for maintenance.

### 3.2 INSTALLATION CONSIDERATIONS



**Note:**  
The locations of the 2x4's is very important to install in the locations provided in the dimensions in **Section 3.3**.

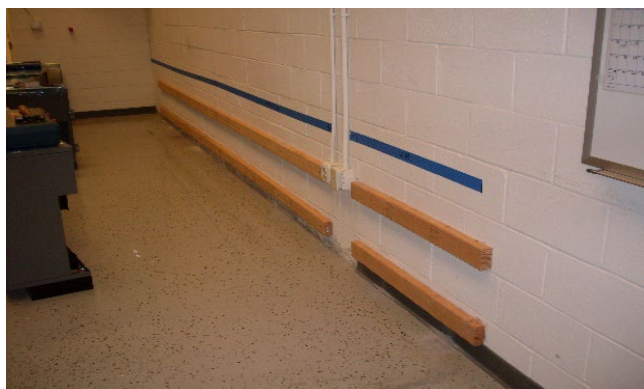
Most classrooms will require the QLCI units are installed along 75% to 80% of the exterior exposure to provide adequate space conditioning at noise levels that are compliant with ANSI S12.60. The supply air duct and vertical pipe runs can be housed in the class- room walls or may be covered using optional architectural duct covers and can be accessed through the utility cabinets provided by Carson Solutions.



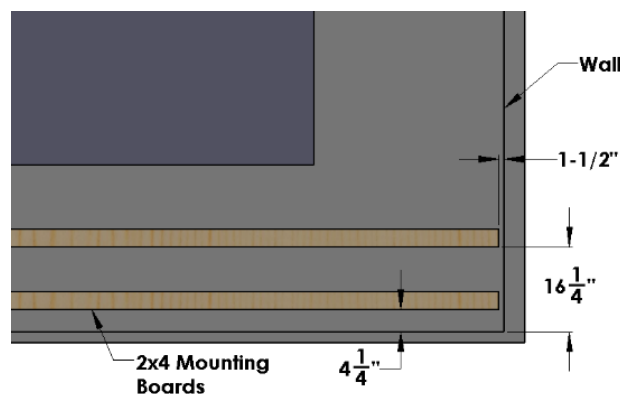
### 3.3 INSTALLING THE QLCI WITH REAR FIN-TUBE ELEMENTS

#### STEP 1: INSTALL 2X4'S MOUNTING BOARDS

- a.) Secure two **2x4 Mounting Boards** to the perimeter wall making sure they are securely mounted to wall framework as shown below. (Fasteners supplied by others).

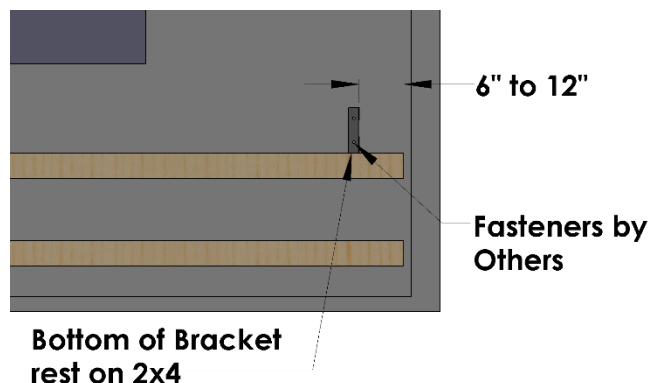


- b.) The **2x4 Mounting Boards** should run the length of the QLCI installation (not individual units). The **2x4 Mounting Boards** should stop 1.5" from edge of wall to allow end unit side panel to set flush against the wall.

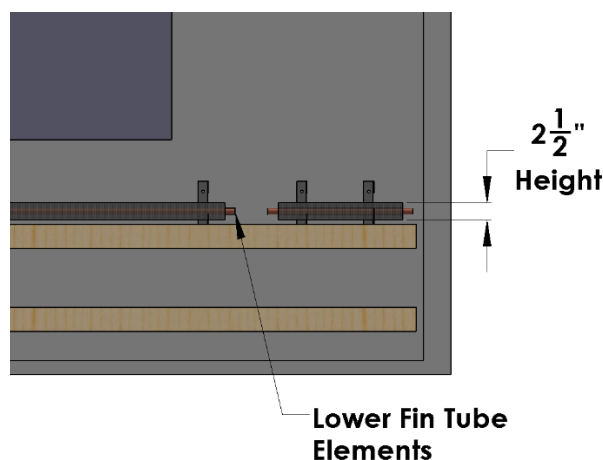


#### STEP 3: INSTALLING REAR FIN TUBE ELEMENTS

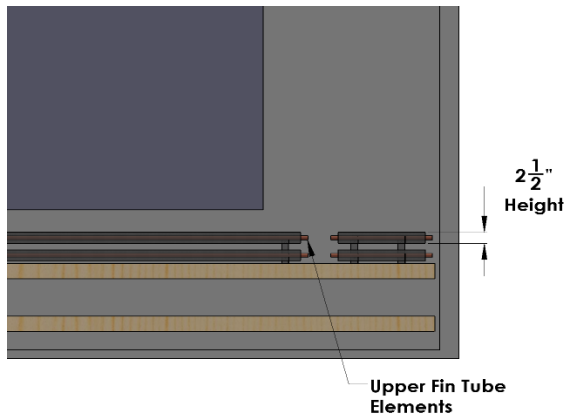
- a.) Attached **Fin Tube Mounting Brackets** to the wall using wall anchors (Supplied by others). Position each **Fin Tube Mounting Bracket** 6"-12" inwards from the **Fin Tube Element** pipe ends. Example: A 6ft element would have the first bracket at 6"-12" and the second bracket would be located at 60"-66" from the other end. The **Fin Tube Mounting Brackets** should rest directly on top of the **2x4 Mounting Boards** before securing to wall. Refer to project plans for the appropriate fin tube elements installation lengths and locations.



- b.) Hang the lower **Fin Tube Elements** by placing it gently onto the **Fin Tube Mounting Brackets**. The tubes of the **Fin Tube Elements** will rest in the V-Groove of the **Fin Tube Mounting Brackets**. The **Fin Tube Elements** are 2.75" fin width and 2.50" fin height. Make sure the **Fin Tube Elements** are positioned in the correct orientation.



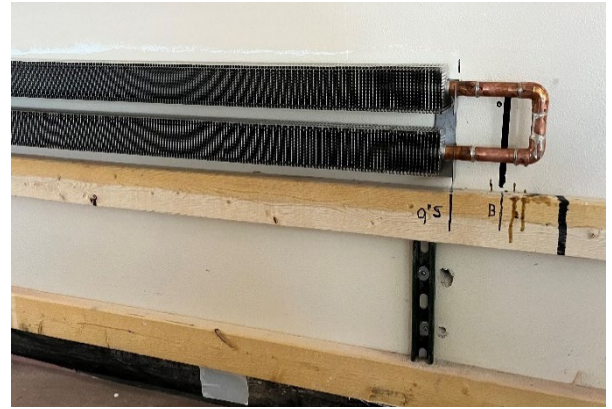
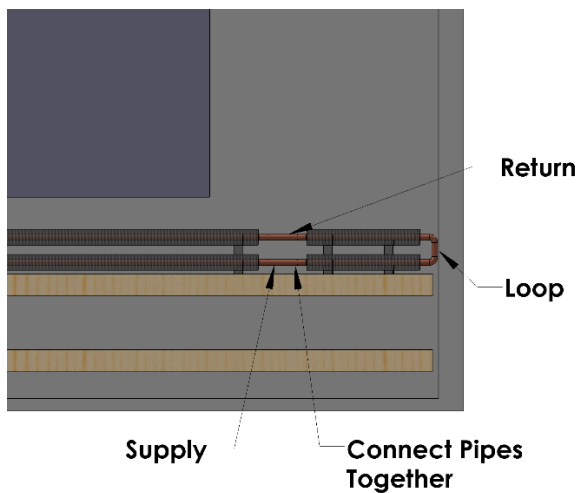
- c.) Hang the upper **Fin Tube Elements** by placing it gently onto the **Fin Tube Mounting Brackets**. The tubes of the **Fin Tube Elements** will rest in the V-Groove of the **Fin Tube Mounting Brackets**. The **Fin Tube Elements** are 2.75" fin width and 2.50" fin height. Make sure the **Fin Tube Elements** are positioned in the correct orientation.



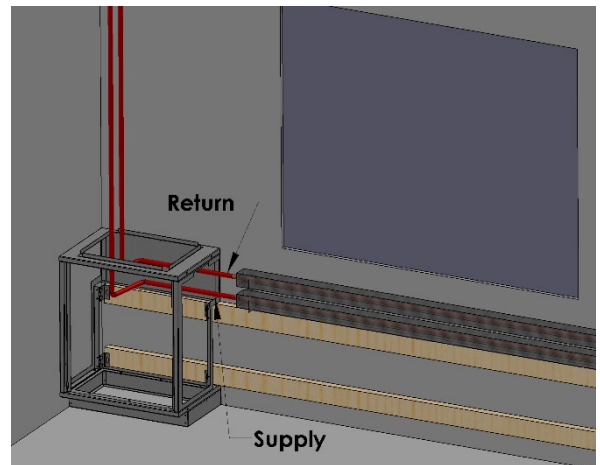
- d.) Repeat Steps (a-c) for additional **Fin Tube Elements** according to the room layout of the project plans. **Note:** There may be plastic clips on the **Fin Tube Elements** from the manufacture, these can be discarded.



- e.) Once all **Fin Tube Elements** are installed, begin joining all piping together (Straight pipe and fittings supplied by others). The lower **Fin Tube Elements** are to be the **Supply** run, and the upper **Fin Tube Elements** are to be the **Return** run. A **Loop** should be used to connect the last lower **Fin Tube Element** to the upper return row of **Fin Tube Elements**.



- f.) Connect the **Supply** and **Return** piping to complete the circuit. If using a **BUC**, it will be necessary to install the **BUC** first before the main **Supply** and **Return** piping is ran and connected.



**STEP 2: Example install QLCI hydronic water piping**

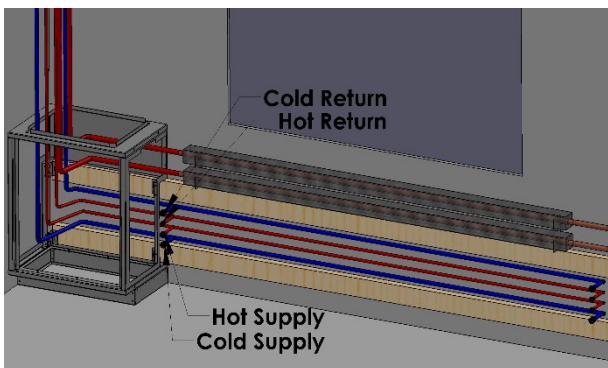
- a.) Typically, a **BUC** is used where the water pipes are dropped from the ceiling along a wall perpendicular to the exposure and are secured to the wall between the mounting boards as shown below. **Additional valves, regulators, and strainer may be required. See project plans and specifications for more information.**



b.) Install threaded 1/2" NPT connections (provided by others) on each pipe or solder straight end connections 2" to 3" from the point where the QLCI units connect to each other along the wall as shown below.



c.) Once all the piping is connected, test for leaks and insulate piping. Refer to project plans for insulation specifications. Use standard plumbing practices and test for leaks once the piping is complete. See **Section 4.1** for pressure ratings.

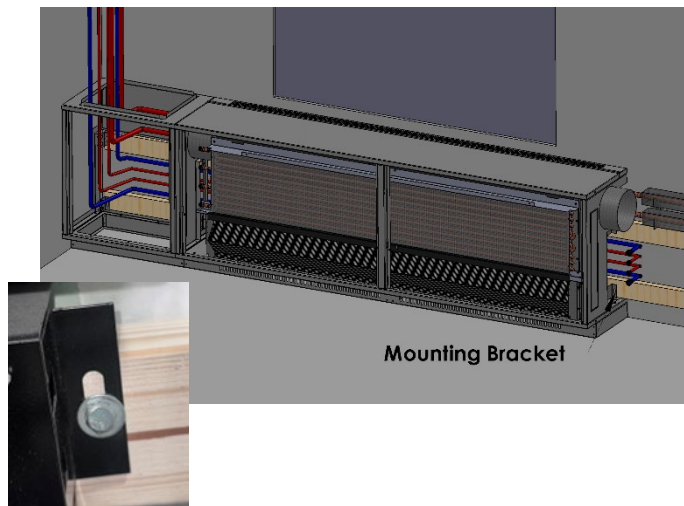


**STEP 3: Attaching the QLCI units to the wall**

a.) Locate the (2) socket head screws on the face of each upper face panel. Loosen the locking screws using an 5/32" Allen Wrench and remove the units upper face panels (as shown below). Do not use a power driver to loosen or tighten latches. Do not allow the upper face panels to fall as this could cause damage to the panel surface. Remove lower panel as needed by removing the (2) TEK screw.

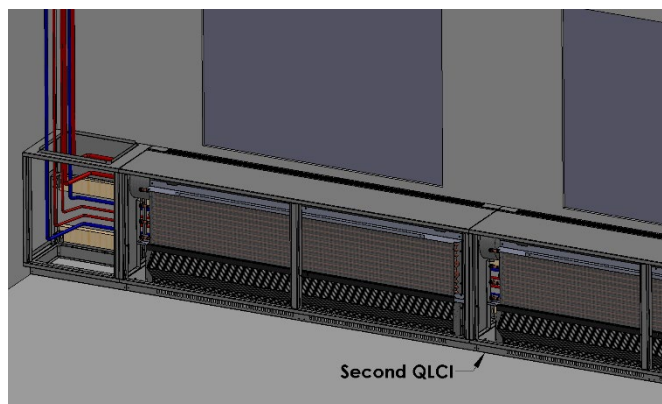


b.) Position the first QLCI unit (nearest the supply air duct) against the wall. Secure units to the **2x4 Mounting Boards** by driving 3/8" lag bolts and 3/8" flat washers through the unit's four (4) **Mounting Brackets** as shown below.



**STEP 4: Positioning and connecting the remaining units**

a.) Repeat **Step 3** to mount the remaining units to the wall and to make water connections.



b.) Connect the QLCI units together by sliding the connector sleeve from the adjacent QLCI unit onto the entry spigot and seal the connection as described below in **Section 3.5**.



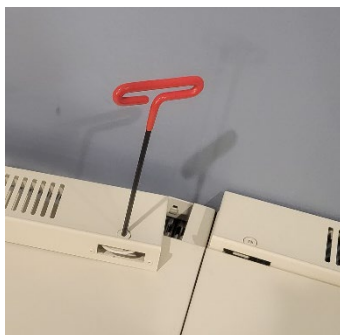
- c.) Attached each QLCI to another using (4) 5/16-18 x 1" Phillips head truss screws and (4) 5/16" Serrated nuts per QLCI. End wall units only require 2 of each per QLCI. Locate the upper and lower holes as shown. Insert hardware and tighten the units together.



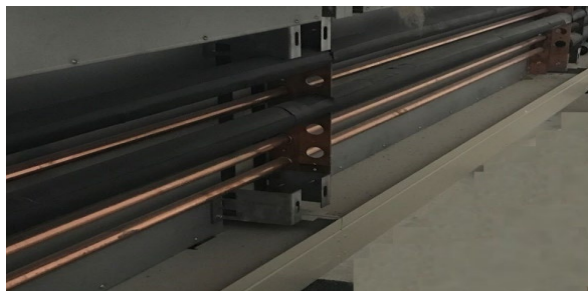
It is recommended to use these holes on the QLCI top and bottom panels to attach each unit together.



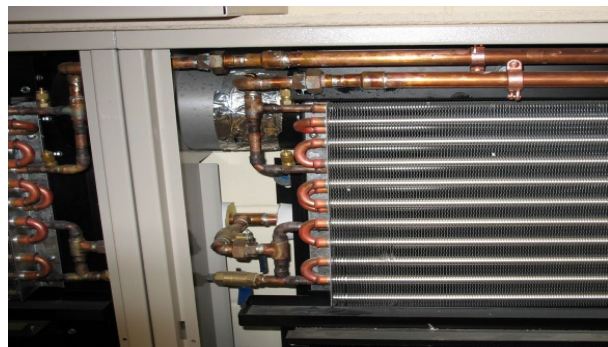
- d.) If inspection of the **Fin Tube Elements** is needed, remove the **Rear Fin Tube Element Grill** on the back of the QLCI. Locate the (2) socket head screws on the top of each **Rear Fin Tube Element Grill**. Loosen the locking screws using an **5/32"** Allen Wrench and remove the QLCI **Rear Fin Tube Element Grill** as shown below. Make sure when placing the QLCI **Rear Fin Tube Element Grill** back in place that the side tabs interlock with the metal flanges.



- e.) **Alternative piping method 1:** Units can be placed on roller carts and connected to each other first. The pipework can be connected to the back of the QLCI's, and piping connections can be connected to each other before mounting the entire run of QLCI's to the wall mounted 2x4's as shown below.



- f.) **Alternative piping method 2:** QLCI units can allow the piping runs to be in the front of the units above the hydronic coil. This allows the QLCI to be mounted to the 2x4's first, then connect the ductwork before making the piping connections. The feeding pipework can be routed through the side wall knockouts. QLCI's and piping connections can be connected in the front as shown below.



**STEP 5: Connecting to water supply**

- a.) Connect the unit's hydronic coil to the water piping using flexible braided stainless-steel hoses (1/2" female NPT's to connect to coil). In most applications, flexible braided stainless-steel hoses require 90° elbows. Hard copper piping may also be used. Proper sealing techniques should be applied. Refer to Division 23 Section 23 21 13 "Hydronic Piping", connect coils to supply with shutoff valve, strainer, control valve, and union or flange, and to return with balancing valve and union or flange.



- b.) The vertical chilled/hot water pipes are connected via flexible hoses run through a pipe work knockout on the top or side of the unit.



- c.) Piping should be insulated and properly labeled in accordance with local building codes as shown below.





### 3.4 WATER CONNECTIONS

The QLCI unit is fitted with four water pipes which terminate in 1/2" NPT threaded male connections. Each coil is factory tested for leakage and provided clean and capped. Caps shall not be removed until piping installation is in process.

**Note:**  
When installing a two-pipe design, connect only the outside pipes if four-pipe coil was supplied.

**STEP 1:**

Identify the warm and/or chilled water supply connections on the QLCI unit. See Section 3.4.1.



**STEP 2:**

Remove the plastic caps before making the final water connections.

**STEP 3:**

Make the water connections to the hydronic coil piping using flexible braided stainless-steel hoses (1/2" female NPT's to connect to coil). Hard copper piping may also be used. Proper sealing techniques should be applied. Refer to Division 23 Section 23 21 13 "Hydronic Piping", connect coils to supply with shutoff valve, strainer, control valve, and union or flange, and to return with balancing valve and union or flange.

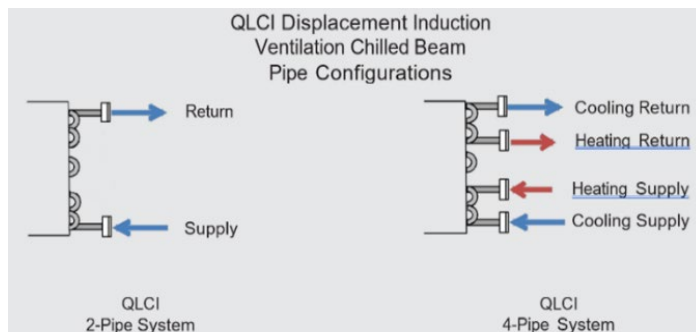
**Extreme Caution!**  
Do **NOT** over-tighten NPT fittings. Applying excessive force on the water pipes may damage the hydronic coil and is not covered under warranty.

**Carson Solutions optional Stainless Steel Flexible Hoses (contact your factory rep to purchase).**



### 3.4.1 WATER CONNECTIONS IDENTIFICATION

Piping connections for standard 2-pipe and 4-pipe QLCI displacement induction ventilation chilled beam Pipe Configurations to be operated and connected as shown below.



### 3.5 CONDENSATE DRAIN CONNECTION

The QLCI unit is fitted with a sloped condensate drain tray with an anti-clogging 1/2" plastic drainpipe fitting (1/2" OD). Each drainpipe is located on the right side of the QLCI when looking at the unit from the front. The drainpipe fitting should be connected to a condensate line or pumping system as specified in project documents. Each drain comes capped from the factory. Remove cap prior to pumping each drainpipe fitting.



### 3.6 AIR CONNECTION

**STEP 1:**



**Note:**  
QLCI displacement induction ventilation diffusers operate at higher terminal pressures than diffusers in standard VAV systems therefore the ductwork and connections feeding the diffuser must be thoroughly sealed to prevent excessive leakage.

The air connections should include a minimum of three duct diameter lengths of straight ductwork upstream of the QLCI connection to ensure laminar flow and prevent noise generation. Straight ductwork connections will yield a reliable pressure port measurement.

Air connections can be made with either hard-pipe (most common) or with flexible duct. If using flexible duct, limit duct length to a maximum of 5ft.

Using the supplied transition collar to connect each QLCI together. Properly seal ductwork with either foil HVAC aluminum tape or with duct sealant mastic. The inner duct connection must be fully sealed to prevent leakage and loss of performance.



Ensure there is an airtight connection between the supply duct and each QLCI duct interconnections. Duct connections should meet SMACNA class B standard up to 2 in. W.G. Refer to Division 23 – Heating, Ventilation and Air Conditioning (HVAC) Section 23 31 13.01 “Metal Ducts” and or Section 23 07 13 “Duct Insulation” for additional information.

### 3.7 FLUSHING THE WATER PIPING SYSTEM

Before flushing the water system, close all valves that isolate the QLCI units and flush the main piping system first. Refer to Division 23 Section 23 25 00 “Pipe Cleaning, Flushing, and Chemical Treatment”.

### 3.8 FILLING AND VENTING THE WATER SYSTEM

To ensure easy venting, the main pipes should be installed at a higher level than the QLCI units. The horizontal pipes should be installed rising slightly towards the venting points.



**Note:**  
There should be no high points to create air pockets within the system.

Before filling, all shut-off and control valves must be in the fully open position. The pumps should not be running during the filling processes (static filling). Continuous venting is necessary during this process. The installation of both manual and automatic venting systems is recommended. The pump should only be started when filling is complete. To remove all air from the system, the majority (>75%) of the system should be closed so that the water can circulate at a sufficient rate. When each section is full, it should be closed, and the procedure repeated throughout the system.



**Note:**  
Use ONLY non-chilled water when filling up the system! Cold water can cause immediate condensation on the pipes. Warm water contains less oxygen which can limit venting to some extent.

### 4.1 WATERSIDE COMMISSIONING



**Important:**  
Commissioning is to be performed by properly trained and authorized personnel only!

- Fully purge the complete hydronic system of air prior to commissioning.
- Carefully inspect the system for leaks, paying particular attention to the connections.
- Carefully inspect flexible hose for leaks, if applicable.
- For the face coils normal operating pressure is rated at 250 psig max up to 300°F. The maximum working pressure should not exceed 360 psi.
- If equipped, the fin-tube elements the minimum flow rate of 1GPM ranging from 110°F to 220°F at a pressure drop of 47 Millinches per foot. Maximum flowrate at 4GPM at the same operation temperature ranges at a pressure drop of 525 Millinches per foot. The maximum working pressure is 200 psig.



**Note:**  
The QLCI unit is not provided with any water flow control or measuring devices, therefore the pipe work system should be fitted with sufficient balancing aids to enable adjustment of the flow rate.

### 4.2 AIRSIDE COMMISSIONING



**Note:**  
Do not attempt to read the total discharge airflow rate using a hood or any other device that adds downstream pressure to the unit, as it will reduce the amount of induction and give false readings. The total supply air flow (primary + induced) cannot be measured.

**NOTE:** Using a traverse duct calculation of the supply duct before the QLCI will not guarantee that the diffuser is properly balanced because performance is based on internal plenum pressure.

### 4.2.1 AIRSIDE COMMISSIONING AND K-FACTOR TABLE



**Note:**  
The constraints detailed in the tables below are for standard QLCI. For QLCI's with non-standard nozzle configurations, contact Carson Solutions directly.

#### STEP 1

Locate the (2) socket head screws on the top of the upper left face panel. Loosen the locking screws using an **5/32"** Allen Wrench and remove the units upper face panels (as shown below). Do not use a power driver to loosen or tighten latches. Do not allow the upper face panels to fall as this could cause damage to the panel surface.



#### STEP 2

Use the commissioning tube to measure the internal pressure of the plenum.



**STEP 3**

The primary air volume in CFM can be calculated with this formula and the K-Factor value in the charts below: Data on the charts below are given at Standard Atmosphere at sea level.

The primary air volume in CFM can be calculated with this formula:

$$CFM = K \times \sqrt{\Delta P}$$

CFM = primary airflow (CFM)

K = constant - read from Table below

$\Delta P$  = static pressure measured in primary air chamber (in. W.G.)

K-Factor Chart 8" Inlet		Steps
DIU Size	Nozzle Size 2R (U)	
4'	143	<ol style="list-style-type: none"> <li>1. Measure nozzle pressure using the pressure tap port located behind the front left upper panel.</li> <li>2. Use a 1/4" hose to attached to the low pressure side of the Manometer.</li> <li>3. Measure and record the nozzle pressure <math>P_{TAP}</math> in. W.G.</li> <li>4. Calculate the primary airflow rate by inserting the constant K for the DIU size and the pressure measurement <math>P_{TAP}</math> into the equation below:</li> </ol>
5'	190	
1500mm	221	
6'	236	
2000mm	298	
8'	333	

**CARSON SOLUTIONS**  $CFM = K \times \sqrt{P_{TAP}}$  [www.carsonsolutions.com](http://www.carsonsolutions.com)

**Volume Flow Controller (optional) general information:**

If a volume flow rate control is required, a volume flow controller (supplied by others) may be installed in a constant volume system. See manufactures information specifications for further details.

Carson Solutions offers a range of volume flow rate controllers. Please contact Carson Solutions for more information.



**Example:** Size 1500mm QLCI, 2R-nozzle

measured static pressure of 0.295 in. W.G.

K = 221 (from Table 2)

$$CFM = 213 \times \sqrt{0.295}$$

$$= 120.0 \text{ CFM}$$

**STEP 4**

Make necessary adjustments to the balancing damper for the desired scheduled static pressure to the measured result. Adjusting the balancing damper should be used for trimming only.

Re-installed front face panels.

Refer to Division 23 Section 23 05 93 "Testing, Adjusting, and Balancing" for additional procedures for displacement unit, adjusting and balancing.

## 5.1 CLEANING INSTRUCTIONS

QLCI units contain no moving or consumable parts, therefore the maintenance requirements are limited to periodic inspection for leakage and occasional cleaning of the hydronic coil, front face panel and the condensate tray.

The accumulation of dust on the hydronic coil will eventually restrict the airflow through the coil, reducing cooling and heating performance.

The inspection frequency is subject to the environmental conditions and occupancy levels. It is recommended that the QLCI units be inspected on an annual basis until a scheduled maintenance pattern is established.



### Important!

Maintenance is to be performed by properly trained and authorized personnel only!

Properly maintain water conditions which prevent corrosion of copper tubing. If included in the system design, check the condensate sensors or humidity sensors according to sensor manufacturer's methods and schedule.



### Important!

Wear eye protection and gloves.  
Product includes sharp edges and burrs.

### To clean the hydronic coil:

#### STEP 1

Locate the (2) socket head screws on the top of each upper face panel. Loosen the locking screws using an **5/32"** Allen Wrench and remove the units upper face panels (as shown below). Do not use a power driver to loosen or tighten latches. Do not allow the upper face panels to fall as this could cause damage to the panel surface.



#### STEP 2

Using a soft nozzle brush attachment, gently vacuum in the direction of the coil fin to remove any accumulated dust. Be careful not to bend or damage any fins. A fin comb can be used to straighten any bent fins.



#### STEP 3

After cleaning the coils, replace the unit face panels by tightening locking screws with **5/32"** Allen Wrench.

### To clean the QLCI unit:

When necessary, the cabinet can be cleaned using a mild detergent diluted with warm water. Apply with a soft cloth, rinse, and wipe dry.



### Note!

Strong or abrasive chemical detergents should not be used as they may cause damage to the paint finish.

### To clean the condensate tray:

If necessary, the condensate drip tray can be cleaned using a small amount of disinfectant applied with a soft cloth. Wipe dry.

## 5.2 REPLACEMENT PARTS

The QLCI displacement induction ventilation diffuser contains no serviceable or consumable parts. Contact Carson Solutions for more information.

6.1 SYMPTOMS & SOLUTIONS

SYMPTOM	PROBABLE CAUSE	SOLUTION
<p><b>LOSS OF AIRFLOW</b></p>	<p>Obstruction on front face panel or hydronic coil</p>	<p>Remove front face panel and inspect/clean grill and hydronic coil as necessary</p>
	<p>Air connection detached from diffuser</p>	<p>Inspect attachment hardware and reconnect ductwork</p>
	<p>Obstruction in primary air plenum</p>	<p>Remove primary air connection and check for debris</p>
	<p>Air dampers incorrectly set</p>	<p>Inspect and adjust air damper as necessary</p>
	<p>Faulty or incorrectly set air handling unit</p>	<p>Inspect and re-commission air handling unit (by certified contractor)</p>
<p><b>REDUCED COOLING OR HEATING</b></p>	<p>Reduced cooling or heating performance</p>	<p>Confirm primary airflow is at designed CFM or above</p>
	<p>Obstruction on front face panel or hydronic coil</p>	<p>Remove front face panel and inspect/clean grill and hydronic coil as necessary</p>
	<p>Loss of water circulation through hydronic coil</p>	<p>Inspect control valves and check flow using system test points</p>
<p><b>CONDENSATION ON PIPE-WORK OR HYDRONIC COIL</b></p>	<p>Chilled water temperature too low</p>	<p>Measure chilled water temperature and reset to design value</p>
	<p>Incorrect primary air temperature or condition</p>	<p>Measure room humidity level. If humidity is higher than design condition, the primary air is failing to control room humidity. The air handling unit must be set so the primary air is dry enough to offset the latent gains.</p>
	<p>Primary air volume too low</p>	<p>Measure primary air volume using procedure described in section 4.2.1 Increase air volume design figure.</p>

## 7.1 MANUFACTURER'S REPRESENTATIONS & WARRANTIES

**CARSON DESIGN MANUFACTURING (CDM), INC. DBA (CARSON SOLUTIONS) TERMS & CONDITIONS OF SALE Version 01-01-22 ALL SALES ARE SUBJECT TO THESE TERMS AND CONDITIONS OF SALES ("TERMS") AND AS CONTAINED IN CDM'S INVOICE AND ARE ALSO SUBJECT TO CDM'S CREDIT AND OTHER POLICIES AND PROCEDURES, WHICH ARE HEREBY INCORPORATED BY REFERENCE AND SUBJECT TO CHANGE.**

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**5. SHIPMENT & RISK OF LOSS:** Shipment dates are estimates only, FOB factory. Title and risk of loss shall pass to Buyer upon Seller's delivery to carrier. Customers may only make their own shipping arrangements with Seller's agreement. Seller shall advise when the Products have been completed and send an invoice at that time. All Product must be picked up by Buyer within 30 days of Seller's completion of manufacture. Seller specifically rejects any order containing a time is of the essence clause or liquidated damage penalties for late shipments. Seller is not responsible for loss of goods from shortages, damages or transit delays. Any claims for damage in shipment, mis-delivery, loss of the Products or other damage shall be the responsibility of and filed by Buyer.

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**11. ASSIGNMENT:** Buyer may not assign or transfer this agreement. Seller may assign its rights or obligations under this Agreement in the event of a merger or change of control of Seller.

**12. GOVERNING LAW:** This Agreement shall be governed and construed in accordance with the laws State of Minnesota. Buyer consents to jurisdiction in the Circuit Court of Hennepin County, Minnesota. Each party consents to that choice of law and jurisdiction and irrevocably waives any objection to same.

**13. EXPORT CONTROLS:** Buyer shall comply with the export laws and regulations of the United States. Buyer agrees it shall not export or enter into an agreement for the export any goods from Seller to any prohibited or embargoed country or to any denied, blocked or restricted person or entity.

**14. MISCELLANEOUS:** Seller's waiver or failure to enforce the terms of this Agreement shall not constitute a waiver of Seller's rights. The prevailing party may recover their reasonable attorney fees and reasonable out-of-pocket expenses.

