



Technical Service Bulletin

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Gen.2 HYDRAcube Assembly Instructions

This Technical Service Bulletin provides information required to assemble a HYDRAcube.

General Guidelines and Rack Design

The following rules are applicable to assemble a HYDRAcube:

1. The modules can ONLY be installed vertically. Each cube header has 6 connection points for: Air, feed/concentrate, and filtrate (See Figure 1 below).



	Component Name	
1	Cube Headers	
2	HYDRAcap [®] MAX Modules	
3	Sanitary Clamps and Gaskets	000
4	Row End Plugs	
5	Frame	
6	Row End Adapter	

2. Feed water should enter the bottom of the module through the feed header and filtrate will exit through the two filtrate headers on the opposite end (see Figure 2).



Figure 2: HYDRAcube Flow Path

	Component Name
1	Feed/Drain Row End Adaptor (6")
2	Feed/Drain Row End Plug 6"
3	Filtrate Row End Adaptors (6")
4	Filtrate Row End Plugs 4"
5	Air Row End Adaptor (3")
6	Air Row End Plug 3"

*If 9 or less modules are connected, 2 air row end adaptor is required. If more than 9 modules, 4 row end adaptors will be provided.

- The modules will sit on the frame(s) that is provided with each HYDRAcube system. Up to 4 modules may sit on each frame. Exception: Frames for containerized systems will vary.
- 4. Connections from plant headers to HYDRAcube system should be made to the row end adaptors that are provided with each system. Plugs are provided for all other unused connections. See Figure 2 for a list of HYDRAcube skid components.

5. HYDRAcap[®] MAX modules are preserved in a solution of 30.0% w/v calcium chloride. This solution is relatively non hazardous, with NFPA ratings of the following:

Upon the initial install, when end caps are removed from the modules, 1.5 - 2.5 L (0.4 – 0.7 gal) of *calcium chloride* solution will drain, depending on which module. If the modules are to be subsequently shipped, they must be re-preserved according to Hydranautics TSB331.



CAUTION: WEAR PERSONAL PROTECTIVE EQUIPMENT WHEN HANDLING CALCIUM CHLORIDE. CaCl2 CAN CAUSE SKIN AND EYE IRRITATION. 30% CALCIUM CHLORIDE IS ALSO CORROSIVE TO METALS. RINSE ANY SOLUTION OFF METALS.

Assembly Procedure

The following is the recommended assembly procedure for a HYDRAcube system:

- 1. Prior to module installation, clean the system and its piping sufficiently to prevent foreign matter from entering the modules, according to TSB 341.
- 2. HYDRAcap[®] MAX modules are shipped from the factory with a preservative solution. This solution may need to be flushed or collected for disposal (depending on local safety and environmental regulations) prior to installing the cube headers and modules on the frame to avoid corrosion of metallic parts on the UF rack. If required, flush each module with permeate or city water using a hose placed in the concentrate adaptor at a rate of 2 gpm/module to the filtrate side and 18 gpm/module to the feed side for 0.5 1 hour. The maximum feed pressure allowed is 73 psig (5 bar) at 68°F (20°C).
- 3. While the modules are being flushed, bolt the support structure(s)/frame(s) to ground in desired position. Be sure to keep bolts lightly tightened to allow for adjustments when installing cubes. The distance between each frame should be maintained about 5.75in (146 mm). A spacing bar is provided to be bolted on each frame. See Figure 3 for more details. Frames should be perfectly level. Failure to level frames may make HYDRAcube assembly impossible and/or extremely difficult.



Figure 3: Four module frame and space bar.

- 4. Once frames are in place, all Cube Headers for the bottom row can be assembled.
 - a) Carefully set a header on its side on a flat surface such that the the header is resting on the 3", 4" and 6" header openings, as shown in Figure 4. Clean off all gasket seating surfaces. Note: Do not rest cube on the side with extra lip.



CAUTION: BE CAREFULL NOT TO DAMAGE THE GASKET SEATING AREA WHILE RESTING THE MODULE ON ITS SIDE.



Figure 4: Cube header sitting right side up showing the 3", 4" and 6" headers.

 b) Carefully place the gaskets for the 3", 4", and 6" on the bottom cube. Next place a second header on top, lining up the gasket grooves from each header to fit over the gaskets. See Figure 5. Repeat this process for up to six cubes at a time.



Figure 5: 6", 4" and 3" Gaskets.



CAUTION: CHECK GASKET CONDITIONS BEFORE INSTALLATION. DO NOT DAMAGE GASKETS WHILE INSTALLING 2ND HEADER ON TOP.



Figure 5a: Cube header being placed one on top of the other.



Figure 5b: Headers aligned and gaskets sitting within the grooves of the gasket sitting area.

c) Once headers are sitting in place, secure 6" clamp first. It is best to slide the clamp between the 3" and 6" headers and rotate the clamp around to fit the 6" clamp. See Figure 6. Repeat for the 4" and 3" clamps while making sure that the modules and gaskets are still in line.



Figure 6a: Installing 6" clamp.



Figure 6b: Installing 6" and 4" clamps

d) Tighten all clamps and ensure gaskets are properly set. To expedite assembly, Hydranautics recommends using a universal wing nut socket or Gator Grip. These tools will also help to ensure the clamps are tightened properly. See Figure 7.



Figure 7: Universal wing nut socket or Gator Grip

 e) Continue this process for all headers. <u>NOTE:</u> It may be best to connect 2 headers at a time. <u>PRECAUTION:</u> Each header weighs 20 lbs (9.09kg) not including the clamps. Please plan accordingly and observe proper lifting techniques when lifting multiple Cube Headers.

CAUTION: WHEN LIFTING ENDS OF HEADERS, ENSURE THE MIDDLE OF THE HEADERS DO NOT BOW AND CREATE STRESS ON THE SANITARY CLAMPS WHILE LIFTING. DO NOT PUT EXCESSIVE WEIGHT OR DAMAGE HEADERS BY MISHANDLING AND DROPPING THE HEADERS.



Figure 8: 2 connected headers slid into place on the 4 module frame.

f) Once atleast two cubes are tightly secured and clamped (Max six), carefully place the cubes on the frame ensuring that the "Nitto" and "HYDRAcube" logos are facing towards the front of the frame and slide into place. Place the center brackets into position by aligning the holes of the bracket and frame. Bolt together the bracket and frame using a stainless steel nut and bolt.



Figure 9: Second pair of cubes properly adjusted and bolted into place.

g) While connecting two, 2 x 2 frames together, use of silicone on the 3" connection can help hold the seal in place.



h) Carefully align and position the headers ensuring gaskets are in the correct position and properly sealed and not pinched.



Figure 11: Back angle brace on frame shown on left. Clamp position and front brace shown on right.



Figure 12: Bottom headers with no adaptors installed.

- 5. Once the headers are in place, the modules will need to be installed into each header one by one.
 - a) To first prepare the modules, after the modules have been flushed of preservative and drained the end caps must be first removed. To remove the end caps, view the "To Dismantle Module" section in TSB 336 and follow steps 6 12. It is possible to leave one bolt and nut on while removing the clamp, but loosen as much as possible to facilitate assembling the clamp on to the cube header.



- b) Thoroughly clean all surfaces that contact the o-ring on both the module and adaptors.
- c) Visually check all o-rings for damage. If required, replace damaged o-rings. <u>NOTE</u>: Large o-rings on the module/header interface when stretched will roll and pinch easier and thus should be changed out.
- d) Apply a thin layer of silicon based lubricant over all o-ring surfaces.



CAUTION: DO NOT USE PETROLEUM OR OIL BASED LUBRICANTS.

e) Engage feed end adaptor into the air inlet of the diffuser as shown in Figure 13 and note the position of the air inlet on the feed end adaptor. This will be crucial to note when sliding on to the cube header.



Figure 13: Feed adaptor and diffuser connection points.

 f) Once the feed adaptor is properly installed into the diffuser on the module, the air inlet must be oriented properly into the cube header. You can see in Figure 14a the opening in the header for the air inlet. The feed adaptor shall be oriented such that the air inlet hole is facing the opening of the air inlet header as shown in Figure 14b.



Figure 14a: Feed adaptor and diffuser connection points.



Figure 14b: Air inlet on feed adaptor orientation respective to air inlet header.

g) Lift the module and slide module with feed adaptor into module taking note of the orientation of the air inlet hole on the feed adaptor as shown in Figure 14b. Using a lifting device to lift modules into Cube Headers, see Figure 15. Contact Hydranautics for other recommended lifting devices if necessary.



Figure 15: Example of strap to lift module.



SAFETY NOTE: MAKE SURE TO AVOID PINCHING FINGERS OR HANDS BY KEEPING HAND CLEAR WHEN POSSIBLE FROM BETWEEN MODULE AND HEADER AS HEADER MAY FALL AT ANY TIME.

h) When sliding module into header, the header will eventually sit on the large o-ring of the module. Ensure lubricant has been applied on the large o-ring and push module into header with even pressure around the module such that the o-ring does not roll and pinch. A pinched or rolled

o-ring can potentially cause a leak and require the module to be removed and o-ring replaced. See example in Figure 16.



CAUTION: DO NOT ROTATE HEADER ON FEED SIDE ONCE INSTALLED



Figure 16: Example of module sitting on o-ring, pinched o-ring, and module sitting properly in header,

i) Loosely attach stainless steel clamp half sections such that there is some resistance, but still movable with slight pressure. If end cap is correctly oriented, then clamp half sections should fit easily over end cap and shell. Attach bolts, washers, and nuts. Use wrenches to completely tighten upper and lower clamps. Ensure the clamps are placed perpendicular to the direction of the headers, see Figure 17. This is important for step 6f below when using the ratcheting straps.



Figure 17: Bolt positions shown perpendicular to direction of the headers.

j) Repeat steps in point 5 for all modules. See Figure 18 for a set of completed installation up to step 5.



Figure 18: Modules installed and completed up to step 5.

6. Once modules are installed, it is now time to connect and install the top headers.



SAFETY NOTE: MAKE SURE MODULES ARE SECURED BEFORE MOVING ON.

- a) Repeat step 4 to assemble top headers. Connecting no more than 6 headers together at a time.
- b) You will need to install all concentrate adaptors into the top header as shown in Figure 19.



Figure 19: Concentrate adaptors installed on Cube Headers for top of module.

- c) If 6 headers need to be connected, it is highly recommended to use a mechanical lifting device if one is available.
- d) Once all the top cube headers are connected, the header must be positioned into place. Place the headers such that the concentrate



adaptor is resting on the module and the header is a mirror image of the bottom header. See Figure 20 for an example.

Figure 20: Top and bottom header should be a mirror image of each other.

e) The concentrate adaptors will then need to be placed inside the diffuser central port for each module. See Figure 21. This may require for the module to be adjusted slightly to align the concentrate adaptors. When done properly all modules should sit flush with the headers. <u>NOTE</u>: It is important that the bottom clamps are not tightened to ensure that the modules can be moved slightly if necessary. It is best to start on one end and place all concentrate adaptors into the module such that the header will slowly come down.



SAFETY NOTE: MAKE SURE TO AVOID PINCHING FINGERS OR HANDS BY KEEPING HAND CLEAR FROM BETWEEN MODULE AND HEADER AS HEADER MAY FALL AT ANY TIME.



Figure 21: Picture shows gap between header and module as concentrate adaptor and diffuser central port are not properly aligned.

f) When headers are properly aligned, it is time to install headers. To do so, use ratcheting straps on every other module. You can see in Figure 22 the straps are hooked onto the clamps. Ratchet straps down as evenly as possible such that the header comes straight down to avoid pinching o-rings. <u>NOTE</u>: Ensure all large o-rings are lubricated properly to avoid pinching o-rings. Non-lubricated o-rings will have a higher propensity to pinch.



SAFETY NOTE: THERE MAY BE A GREAT DEAL OF TENSION ON THE STRAPS. WEAR PROPER SAFETY GLOVES, GLASSES, AND PPE TO AVOID INJURIES. CAREFULLY RELEASE TENSION AFTER TOP ROW OF CUBE HEADERS ARE IN POSITION



Figure 22: Ratcheting straps on every other module to pull down Cube Headers.

- g) Install and tighten all half shell clamps once headers are in place both on top and bottom.
- 7. Once all modules and headers are installed, connect the row end plugs and adaptors. See Figure 1 and 2 and point 4 in the "General Guidelines and Rack Design" above. Contact Hydranautics for row drawings if necessary.
- Slowly pressurize the system and check for connection leaks. The system should be pressurized to 30 psi (2 bar) or 1.5 times the regular feed pressure of operation, maximum of 73 psi (5 bar) at 68°F (20°C). <u>NOTE</u>: Pressure rating derates as temperature increases. Please contact a Hydranautics representative if there are any questions about the pressure limits.
- 9. Once the modules are loaded, if they will not be put into service immediately, the modules should be filled with a preservative solution. Please follow TSB 331, Storage In-Situ procedures.

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