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ELECTROPURE™ EDI MODULE INSTALLATION CHECKLIST

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4. Module Orientation
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1. Safety

Please read and understand the Safety Section of the Electropure™ EDI OEM Technical Manual before installation. Please **train your colleagues** regarding the safe design and operation of EDI modules. Key safety topics are the use of electricity around water and the handling of the gases produced at the electrodes. Include a safety section in the customer site maintenance manual.

2. Handling the Module

The module is designed to be compact and lightweight. However, **do not lift by the plumbing or electrical connections**. Do not lift by the end covers. There are 4 lifting and 8 mounting points on the aluminum frames.

3. Mounting Options

Mount the modules so that the bolt heads are accessible for if re-torquing is required.

The module can be mounted in different ways. The most popular way is to install L-or U- brackets on the skid, which provide a secure track for the module(s). Alternately, the module may rest on a single, central rectangular rail. The module must then be secured at the top via two of the mounting holes on the top, either at the front or the back, but not both. See the “Mounting Methods” drawing in the Electropure™ EDI OEM Technical Manual.

Do not bolt both the front and rear of the module to fixed points, this will constrain and stress the module hardware when torquing. One of the endplates needs to be able to move to allow unrestricted torquing.

4. Module Orientation

Electropure™ EDI modules are designed to be installed in an upright, vertical position. In the horizontal position, gas can become trapped in the chambers and interfere with ion removal.

5. Pipe and Tubing Connections

The standard modules are provided with 1" female pipe thread fittings (US Standard FNPT) for the main feed and the product. Ladish fittings are provided for the Sanitary product option (this option is complete with EPDM Class VI seals, endcaps and clamps for sealing and protection.

> *SnowPure recommends using the high strength filled-nylon clamps provided. Avoid using steel clamps which are designed for metal flanges. The clamps provided by SnowPure apply an even pressure around the circumference of the flange.*

Use Teflon® tape for sealing the threads. **Do not use normal pipe sealants made for metal threads as they often contain solvents that will weaken the plastic.** Even "FDA-approved" pipe sealants may contain these solvents. The use of such pipe sealant will void the SnowPure, LLC Limited Warranty. SnowPure can recommend/provide compatible pipe sealants.

It is very important that the threads are protected before installation to prevent damage and subsequent leaks. Secure the fittings with a tool to prevent twisting them during threading. If the fittings are not "backed up" during tightening, they may crack and the module will need to be returned to the factory for repair.

Do not over-tighten the fittings. Starting with the first thread of the fitting, wrap pipe tape three full wraps, continuing over the length of the threads. Wrap Teflon™ thread tape in the direction of the threads overlapping each wrap by one-half the width of the tape. Screw the male fitting into the 1" female port (be sure to backup this fitting) on the module and tighten by hand. Use a strap wrench to hold the fitting, tighten the connection an additional ½ to 1 full turn. Avoid over-tightening the fittings, as this may cause manifold or fitting damage.

The tube connections for the concentrate and electrode stream are 3/8" and 1/4" "push-to-connect fittings. The electrode outlet tubing is colored "yellow" and should be directed to waste.

There is a **metric conversion kit** available which converts the 3/8 inch and ¼ inch tube to metric tubing sizes (8 mm). Contact SnowPure for details and pricing.

6. Power Connection & Wire Conventions

The connection between the module and the power supply is a water-tight gold-plated, three-connector fitting. The module is provided with a keyed male fitting at the bottom of one face of the module. A 12-foot (4 meter) power cord, with female connector, is provided with each module. The GREEN (o), BLACK (-), and RED (+) wires at the end of the power cord should be connected to the appropriate terminals and ground of the regulated DC power supply.

The **(DC -) cathode** is always **BLACK**.
The **(DC +) anode** is **RED** (on older models it was WHITE).
The **Ground** is always **GREEN**.

7. Module and Water Stream Grounding

The module should be grounded in 3 distinct ways.

Both end plates of the module are grounded with the green wire in the main DC electrical power connection. This should be grounded to the bus or suitable ground by a qualified electrician. The system frame should have a common ground.

The module may also be physically grounded to the system frame via its mounting, providing the frame is properly grounded to a grounding grid or ground rod per local code. All paint/powder coating must be cleaned from the module and the frame to ensure a good bond. DO NOT GROUND TO WATER OR SPRINKLER PIPE.

The water streams, with the exception of the product/dilute stream, are also conductive. Current from the anode and cathode can flow through the various water streams looking for ground. It is good practice to provide a “T” connection in various water streams, through which a conductive piece can be connected directly to ground (e.g., stainless steel rod with wire attached). Without grounding, current in the water may cause metal pieces remote from the EDI system to present a high voltage, causing a safety concern and/or damage to instrumentation.

SnowPure recommends the following streams be thus grounded:

1. Feed between the module and any instrumentation or sensors in the RO permeate.
2. Concentrate outlet.
3. Both the electrode inlet and outlet (these have the highest potential for transmitting voltage.

NOTE: Do not ground the high resistivity EDI product stream. Byproducts from electrochemistry may introduce undesirable trace iron or other metal ions into the product stream.

NOTE: Electrical measuring devices like conductivity, resistivity, and pH probes can give erroneous readings if their streams either measure stray current/voltage or measure resistance to ground via the conductive piece.

8. SnowPure XL EDI Torque Specifications and Procedure

Continuing improvements in SnowPure materials and manufacturing processes require SnowPure to update Specifications and Procedures

Torque is critical for the SnowPure EDI module. Proper torque maintains internal pressure to achieve water quality, and prevents internal and external leakage.

Check the torque at the following milestones/events and re-torque if necessary:

1. Initial installation - after the module has been mounted to the skid, and prior to start-up and after initial testing at customer site,
2. periodically for the first month until all of the internal plastic parts have fully compressed, or
3. if there is a decline in product water quality.

Prior to either checking or applying torque, make sure that all pressure to the SnowPure EDI module has been relieved. The torque should be set with NO INTERNAL WATER PRESSURE. Follow all safety rules and procedures as required.

Refer to the illustration and table below for the proper torque sequence and values. The procedure requires a 9/16-inch (14 mm) hex socket and a torque wrench.

Refer to Figure 8-1: Tighten the first eight (center) bolts in sequence and then measure the Distance X between the end plates near the four center bolts. Tighten the remaining 11 bolts, in sequence, measuring between the plates as torque is applied. Tighten only enough to keep an even distance between the plates while measuring Distance X1 and Distance X2. Do not exceed the recommended torque values. When complete the end plates should be parallel to each other and not bowed.

TABLE 8-1

Recommended Torque Settings

Module	Normal Torque
XL, -SR, -R	20 ft-lbs (27 N-m)
XL-HTS (all)	10 ft-lbs (13 N-m)

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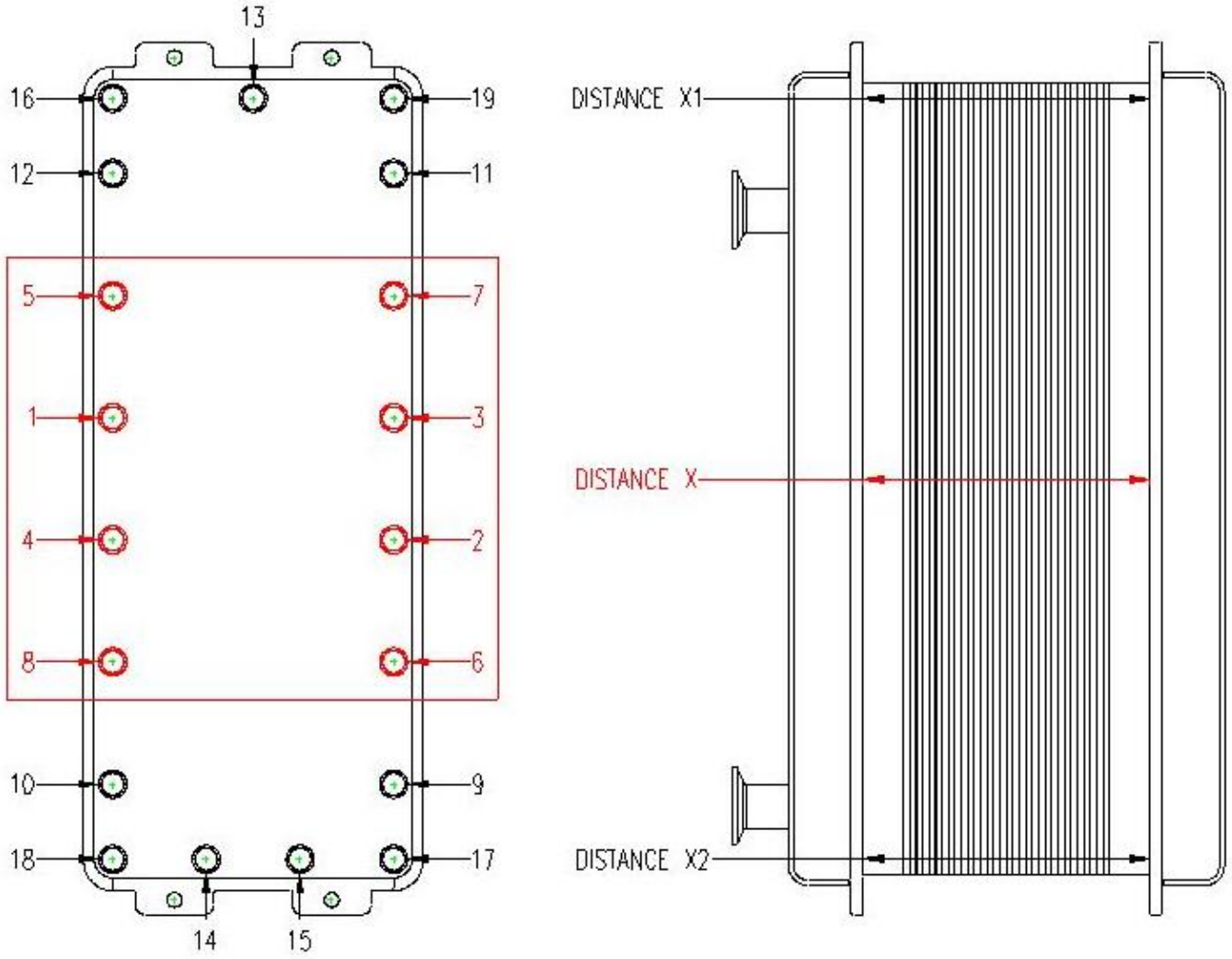
FIGURE 8-1

RECOMMENDED TORQUE SEQUENCE



9. Module Startup Considerations

Before connecting the EDI module(s) to the system plumbing:

- Perform system hydrostatic pressure check(s),
- Thoroughly flush system piping,

If the EDI is **NOT** connected directly to the RO permeate, installation of a 5 to10 micron filter on the EDI feed system is **strongly recommended** to prevent any debris from entering and fouling the EDI module(s).

Make all mechanical, plumbing, and electrical connections

The key to a proper EDI startup is to run as little water through the module(s) as possible during the plumbing checkout before applying power. The more water and ions that enter the module(s) the more time the initial regeneration will require.

Bleed all air out of plumbing system by first filling the manifold(s) slowly with water. If possible, bleed air out through sample valves. Then "pulse" feed water to all three streams to knock bubbles loose. The manifold(s) should be designed to have no dead legs that can trap air. Removing the air at start-up is important because airlocks in only some of the modules will prevent all modules from getting the same flow of water.

There may be bacteria in the module(s), after storage and shipments, which can be dislodged at this point. (Initial sanitization to come later.)

Check all plumbing connections for leaks, repair as required.

Have data sheets and startup notebook on hand. Record initial data and any observations. Call SnowPure Technical Support with any questions.

Apply DC power to the EDI system as soon as possible. If too much water (with ions) is sent through the module(s) before power is applies it will take the regeneration process a longer time to remove the excess ions.

Check to be sure all three (3) streams for all modules are flowing at the recommended design flows.

Check that the pressure drops of all three (3) streams are approximately correct.

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Check all modules for startup current. The amperage may be higher than normal on startup and should drop to a nominal level within 1 to 2 hours. This is dependent on how much water passed through the modules prior to the application of DC power. The current should be approximately the same in all modules. If they are not similar this may mean that different modules have different concentrate flows and therefore different concentrate conductivities. Verify flows and concentrate conductivity for each module.

Check that the ion concentrations in the concentrate stream(s) are all high. If the module(s) are running at 90% recovery, then the concentrate should have about 11 times the concentration of the feed. Perform a mass balance on the inlet and outlet ions to determine if the module(s) are regenerating (excess ions in the concentrate outlet) or underpowered (too few ions in the concentrate outlet).

Check all system permissions and interlocks. Check all flow and pressure sensors, and switches to ensure that minimum flows are set properly and the correct signals are presented to the control system.

Product resistivity should rise to the design criteria within 1-2 hours of start-up. If excess ions were introduced during the startup procedure, then regeneration may be required before quality is achieved. Consult the O&M Manual for the proper regeneration procedure.

Check torque in the **unpressurized** state (with no pressure) and, if need, retorque using he recommended torque procedure.

Perform a sanitization, especially if the site is for USP Purified Water. Consult the O&M Manual for the proper sanitization procedure.

Leave a maintenance manual and maintenance log at the site with the customer.

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EDI Operating Feed Water Specifications:

The following are requirements to operate within SnowPure's limited warranty. Optimum performance from Electropure™ EDI modules will result if values that are more stringent are set as design goals.

Specification	Notes	Working Range	Optimum Performance
Feedwater Source	RO water, direct feed, or with intermediate break tank plus filter		
EDI Feed Conductivity	Ionic load determines size of the working bed and polishing bed within the EDI	**1-20 µS/cm**	1-6 µS/cm
Feedwater Conductivity Equivalent**	FCE = Conductivity + 2.79*CO_2+1.94*SiO_2 *see note below***	**< 33 µS/cm**	< 9 µS/cm
pH	Low pH feedwater typically indicates the presence of CO_2 which will decrease quality.	**5.0-9.5**	7.0-7.5
Total CO_2	Combined CO_2 and HCO_3^-	**<5 mg/l as CO_2**	<2 mg/l
Operating Temperature	Standard XL-Models XL-HTS Models	**5°C to 35°C** **5°C to 45°C**	20 to 30°C 20 to 30°C
Hardness	Ca^{+2} and Mg^{+2} as $CaCO_3$	**<1.0 ppm at 90% recovery**	
Organics	TOC	**< 0.5 ppm**	Not Detectable
Metals	Fe, Mn, transition metals	**< 10 ppb**	Not Detectable
Silica, SiO_2	Typically dissolved, reactive	**< 0.5 ppm**	< 0.2 ppm
Oxidizers	Cl_2 and O_3, typically	**Not Detectable**	Not Detectable
Particles	Recommended direct feed particle-free RO permeate, or 5-10 µm pre-filtration of feed from intermediate tank		
Inlet Pressure	Depends on flow and temperature	**5 bar (75 psi) max**	2-3 bar typical
Outlet Pressure	Concentrate and Electrode outlet pressures to be lower than the Product outlet pressure		

** FCE example:

FCE = Conductivity + 2.79(CO_2) + 1.94*(SiO_2), so if conductivity=5.0 µS/cm, CO_2=3.5 mg/l, SiO_2=0.5 mg/l, then FCE = 5.0 + 2.79*(3.5) + 1.94*(0.5) = 15.7 µS/cm.*