



neptronic®

SKH High-Pressure Atomizer



Installation Instructions and User Manual

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Foreword

Neptronic Company Overview

Founded in 1976, Neptronic is a private corporation that designs, manufactures and distributes products for the HVAC industry. Our product line includes intelligent controllers, electronic actuators, actuated valves, humidifiers and electric heaters.

Our products are designed and manufactured by over 250 dedicated employees in our 7,500 m² (80,000 ft²) state-of-the-art facility located in Montreal, Canada. Our entire manufacturing chain is under one roof from software and hardware development to SMT circuit board assembly, to sheet metal fabrication, to product testing ensuring that our products are engineered to last using a vertical integration model.

We currently hold several national and international patents, and with our continued commitment to research and development, we provide innovative products and technologies for the ever-evolving challenges of the HVAC industry. Exporting over 85% of our sales, we have an exclusive distribution network around the globe that provides comprehensive solutions to our worldwide customers.

About the Manual

These installation and operation instructions have been developed to facilitate the installation of the SKH High-Pressure Atomizer humidifier.

- The strict application of these instructions ensures conformity of your installation and operation as per the manufacturer's recommendations.
- The application of these instructions is one of the conditions for the application of the warranty.
- The application of these instructions does not ensure, at any time, conformity to procedures, regulation or local codes, regarding electric connections and installation to local water supply.

This product has been declared to conform to the applicable Canadian and American safety standards and directives and bear the ETL (c) & (us) mark. The Certificate of Conformity for ETL is available, upon request with the manufacturer.

This product has been declared to conform to the applicable European safety and electromagnetic compatibility standards and directives and bear the CE mark. The Certificate of Conformity for CE is available, upon request to the manufacturer.

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Health and Safety Instructions

General

This manual has been written to ensure correct, safe and sustainable operation of the SKH High-Pressure Atomiser and is intended for use by engineers and technical personnel trained by or their official agents. This manual must be read thoroughly before specifying, designing, installing or operating a SKH High-Pressure Atomizer. Please retain for reference and contact Neptronic should you have any questions.



The triangular symbol with the word **WARNING**: is used to designate danger of severe or lethal consequence.



The circular symbol with the word **CAUTION**: is used to designate danger of injury, or to warn of the hazardous operating condition, or other relevant information.

Electrical Warning Message



WARNING

- Risk of electric shock. Do not access. Disconnect SKH High-Pressure Atomizer before opening the access door.
- All work concerned with electrical installation **MUST** only be performed by skilled and qualified technical personnel (such as an electrician or a technician with appropriate training). The customer is always responsible for ensuring the suitability of the technical personnel.
- Please observe the local regulations concerning the provision of electrical installations.

Health & Safety

Installation, maintenance, repair work or de-commissioning should only be carried out by appropriately qualified technical personnel. Any risks or hazards relating to the system, including during installation and maintenance, should be identified by a qualified Health & Safety representative who shall be responsible for introducing effective control measures, as necessary. The customer is responsible for ensuring that the installation of the equipment complies with all local regulations.



CAUTION: Maintenance personnel must be trained by Neptronic or their official agent, and it is the customer's responsibility to ensure their suitability. Failure to use a qualified personnel may lead to a hazardous operating condition.



WARNING: Danger of Electrocution! Danger of contact with live parts when the unit is open. Always isolate all water and electrical supplies to the system before commencing any maintenance or repair. Isolate power and water immediately if there is any sign of water leaking from the unit.

Protective Equipment

Please refer to the Health and Safety Executive for recommendations about Personal Protective Equipment and information on the Control of Substances Hazardous to Health (COSHH).



Hygiene

IMPORTANT:

Refer to local Health and Safety regulation and codes on the control of Legionellosis in water systems. In the absence of such, ASHREA guideline 12-2000 does provide recommendations. If not adequately maintained, water systems can support the growth of microorganisms including the bacterium that causes Legionnaires' disease.

The SKH has been designed to reduce the potential risk of legionellosis growth. Users also share the responsibility for reducing the risk of legionellosis; users are required to:

- Conduct a risk assessment of the complete water system.
- Implement proper control of the water system.
- Connect the SKH to a clean and chlorinated water supply main.
- Avoid stagnant water.
- Avoid water temperatures that increase the risk of Legionella growth.
- Clean and disinfect the system regularly.



WARNING: Risk of Legionnaires' disease, which can be fatal. Install and operate the SKH High-Pressure Atomizer as per the instructions given in this Installation Instructions and User Manual.



WARNING: If the SKH High-Pressure Atomizer is turned off for prolonged periods (more than 24 hours), ensure that any piping supplying the unit is drained, unless they supply other systems which ensure a regular renewal of water in the system. Failure to do so may result in stagnation of the water and contamination that might cause Legionnaires' disease, which can be fatal.

It is the responsibility of the person on whom the statutory responsibility falls to determine all control and preventative measures outlined in this manual.

Correct Use

Neptronic systems and products are designed only for humidification use. Any other application is not considered appropriate for the intended purpose. The manufacturer cannot be made liable for any damage resulting from incorrect use.

Important Start-Up Information

Before turning on and operating the SKH High-Pressure Atomizer:

- Read all instructions and installation procedures outlined in this manual. Ensure that the operation of the system is properly understood before commencing the start-up procedure.
- Ensure that all wiring is properly installed and that all connections have been made correctly, including the network communication cable between the pump station and the EZC controller(s). Proper termination and shield wiring is critical to the operation of the system.
- Verify all piping before starting up the system. As each zone may have a different capacity and the system has been configured as such, connecting the wrong EZC output to a zone may lead to erratic operation.

General Warranty

This product is subject to the terms and conditions described at www.neptronic.com/sales-conditions.aspx.



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Overview

Product Description

The SKH High-Pressure Atomizer uses water through a high-pressure system to produce a fine mist with a droplet size of less than 20µm. The ambient air absorbs the fine mist, and the SKH adapts to seasonal changes to provide direct evaporative cooling in summer and humidification in winter. Additionally, the SKH provides BACnet MS/TP communication, multi-zone operation (up to 10 zones) and remote connection to the entire system from any zone.

Benefits

- Very low energy consumption
- Free cooling up to 21.5°F (12°C)
- Hygienic operation
- Environmentally friendly
- Low pressure drop
- All parts in contact with water are made of stainless steel and designed for life

Features

The following are the features of the SKH High-Pressure Atomizer:

- 5 microns PP pre-filter and silver ion dosing cartridges prevent microbial growth
- BACnet communication (optional)
- Master/Slave configuration for up to 4 pump stations
- User-friendly, menu-driven LCD (128 x 64)
- Real-time clock and SD card for schedule, trending, and history log
- Firmware upgrade using an SD card
- Water overflow outlet (optional)



SKH Pump Station Overview

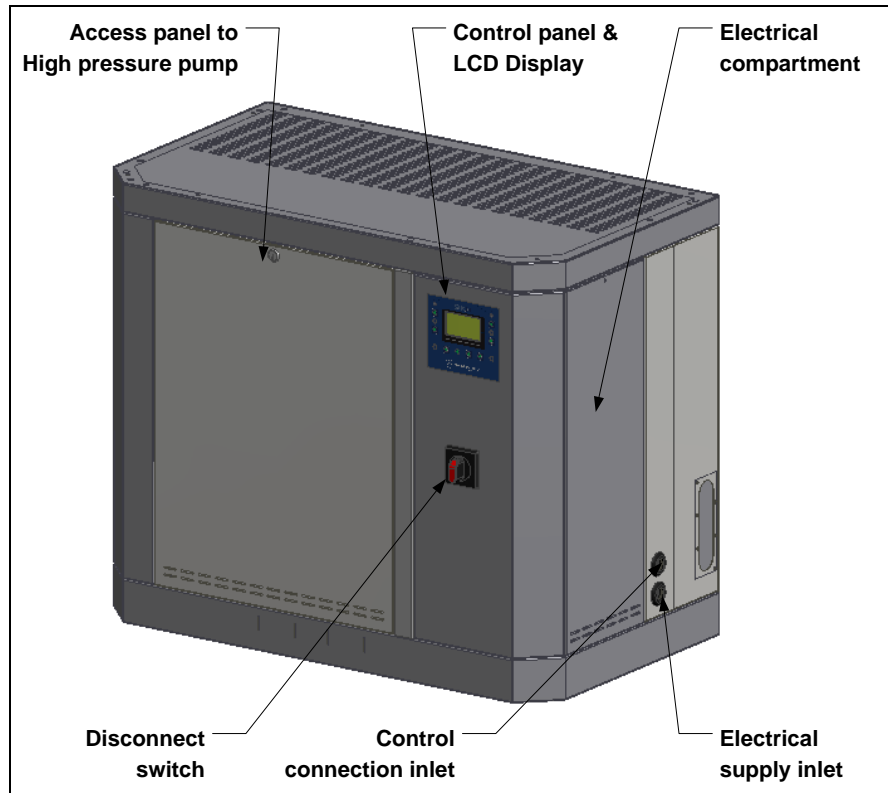


Illustration 1 - SKH Pump Station Visual Overview

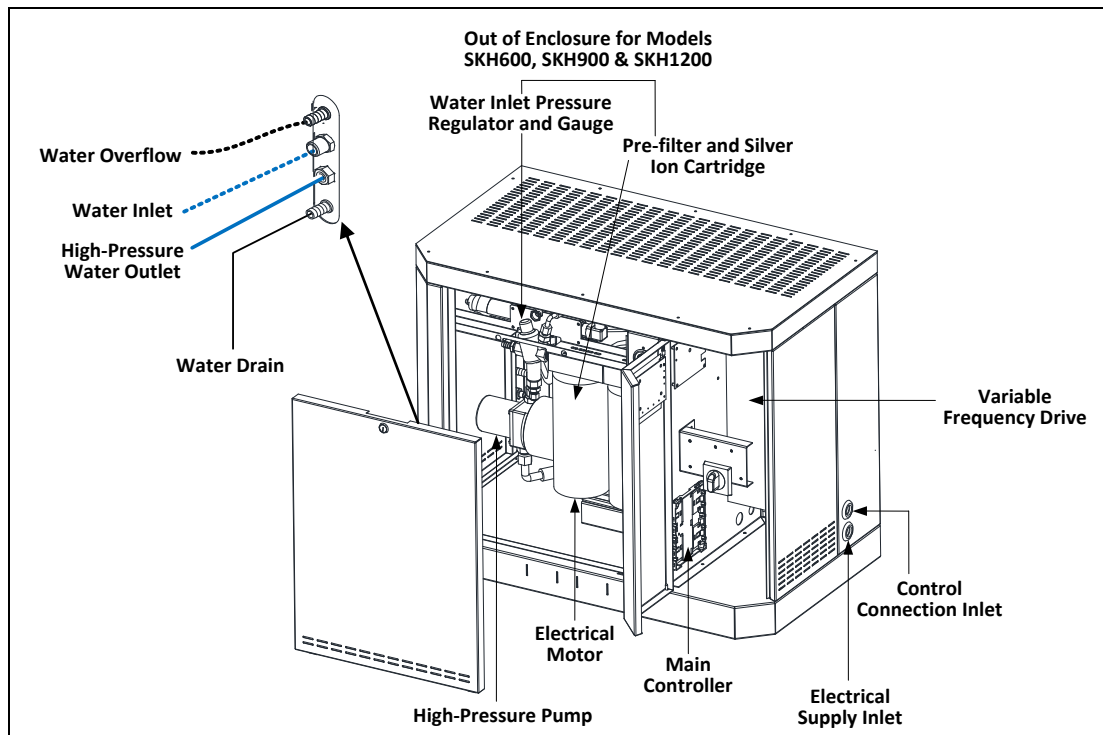


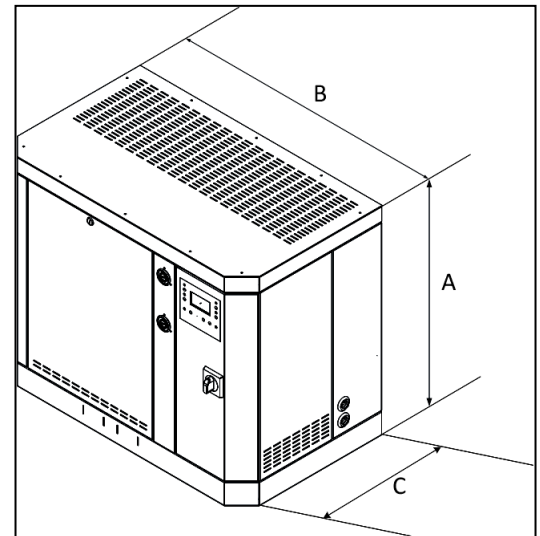
Illustration 2 - SKH Pump Station Overview



Specifications

Table 1 - Pump Station Dimensions & Weight

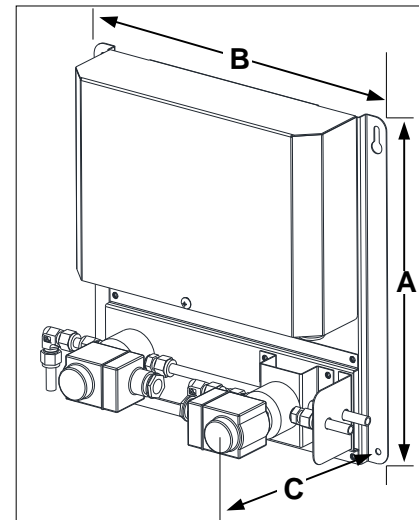
Model	Capacity range lb/hr (kg/hr)	Dimensions in (mm)			Weight lb (kg)
		A	B	C	
SKH100	66 (30) to 660 (300)	30 (763)	36 (915)	20 (508)	187 (85)
SKH200	141 (64) to 1126 (512)				
SKH300	231 (105) to 1454 (661)	34 (871)	46 (1156)	24 (622)	209 (95)
SKH600	453 (206) to 2343 (1065)				
SKH900	585 (266) to 3645 (1657)				
SKH1200	805 (366) to 4738 (2108)				220 (100)



**Illustration 3 - Pump Station
Dimensions & Weight**

Table 2 - Electronic Zone Controller (EVC) Dimensions & Weight

Model	No. supply	Dimensions in (mm)			Weight lb (kg)
		A	B	C	
EVC1	1	14.3 (362)	13.9 (353)	6 (152)	7 (3)
EVC2	2	17.1 (434)	13.9 (353)	6 (152)	11 (5)
EVC3	3	19.9 (505)	13.9 (353)	6 (152)	15 (7)
EVC4	4	22.6 (575)	13.9 (353)	6.1 (154)	20 (9)



**Illustration 4 - Electronic Zone Controller (EVC)
Dimensions & Weight**



Handling and Packaging

Handling and Lifting

Lifting or Handling **MUST** be carried out by trained and qualified personnel. Ensure that the lifting operation has been properly planned, assessed for risk and that the equipment is checked by a qualified Health & Safety representative, and effective control measures are in place.



It is the customer's responsibility to ensure that the operators are trained in handling heavy goods and to enforce the relevant lifting regulations.

The SKH High-Pressure Atomizer **MUST** always be handled and lifted with care and should remain in its original packaging for as long as possible before installation.

The SKH High-Pressure Atomizer package may be carried using a forklift from the underside. Caution should be exercised to ensure balanced load before lifting.

Correct Lifting Method

Any personnel handling or lifting the SKH High-Pressure Atomizer must follow the Lifting Operations and Lifting Equipment Regulations 1998 and Approved Code of Practice L113. The regulation imposes duties on employers and self-employed persons and authorities who have control, to any extent of lifting equipment.

Refer to Dimensions and Weights as indicated on the nameplate and the submittal drawing for system dry weights.

Inspection

Upon receipt, and once packaging material is removed, carry out an inspection to ensure that no damage occurred during transit. Report any damage immediately to your Neptronic representative.

Unpacking

The SKH pump station is delivered in a crate. The Electronic Zone Controller, Mist Distribution Ramps, and the Nozzles are delivered in a carton.



Installation Overview



WARNING: Failure to observe manufacturer's installation recommendations voids the manufacturer's warranty.

Local Regulations

Lifting or Handling **MUST** be carried out by trained and qualified personnel. Ensure that the lifting operation has been properly planned, assessed for risk and that the equipment is checked by a qualified Health & Safety representative, and that effective control measures are in place.



It is the customer's responsibility to ensure that the operators are trained in handling heavy goods and to enforce the relevant lifting regulations.

The SKH pump station **MUST** always be handled and lifted with care and should remain in its original packaging for as long as possible before installation.

The SKH pump station package may be carried using a forklift from the bottom. Caution should be exercised to ensure a balanced load before lifting.

List of Supplied Accessories

- Water filter assembly
- 5 microns PP pre-filter
- Silver ion dosing anti-bacterial cartridges or UV light (depending on model)
- Installation Instructions and User Manual



Installation Method Statement

- Step 1 – SKH Pump Station Installation
- Step 2 – Electronic Zone Controller (EVC) Installation
- Step 3 – Mist Distribution Ramp and Nozzle Installation
- Step 4 – Water and Drain Connections
- Step 5 – Power Supply Connections
- Step 6 – Electrical Control Connections
- Step 7 – Controller Installation and Configuration

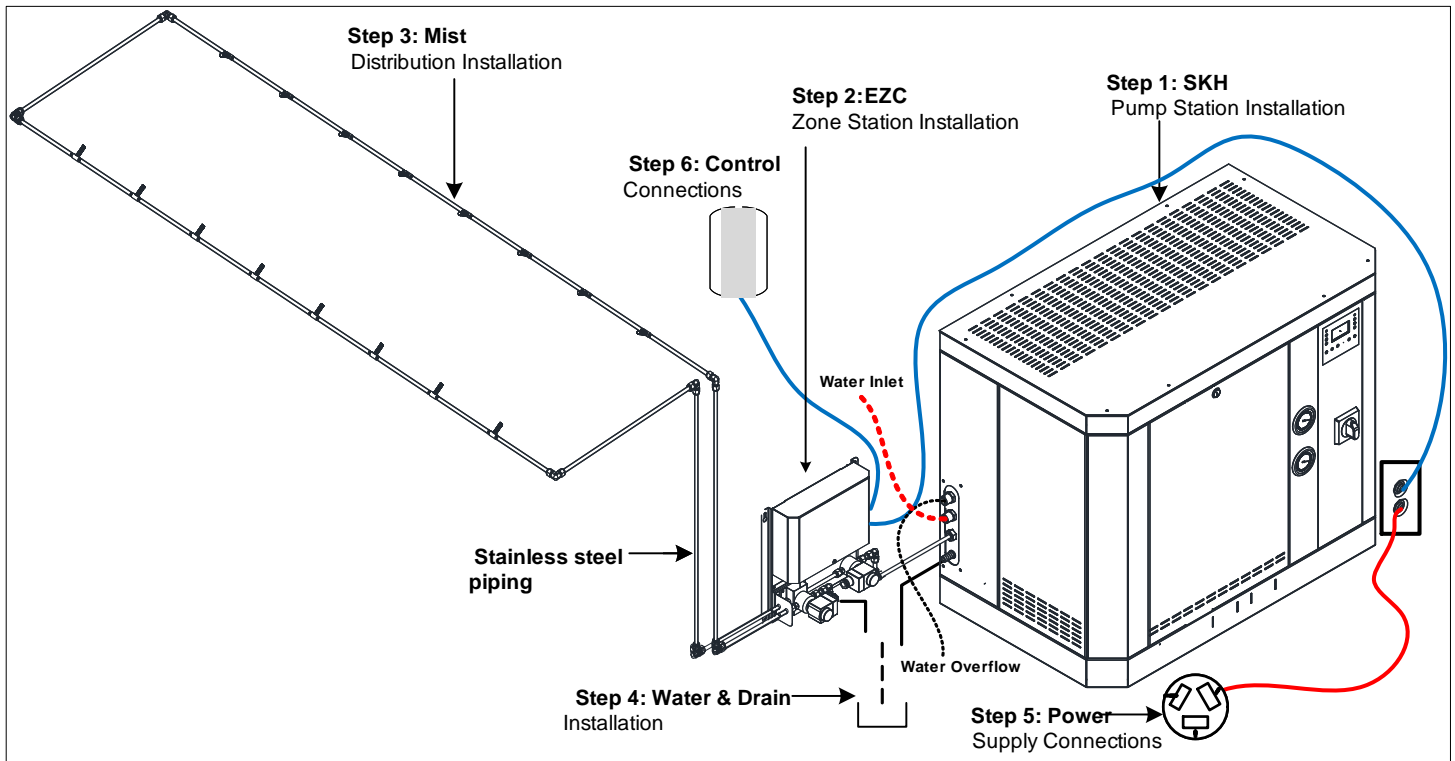


Illustration 5 - Installation Steps



Step 1 – SKH Pump Station Installation

General Recommendations



WARNING: Risk of electric shock. Disconnect the appliance from the electric supply before commencing installation.



CAUTION: Risk of injury. The SKH pump station is heavy; It **MUST** always be handled and lifted with care.

Location

Consider the following points before deciding the location for the pump station:

- Plan a location that is easy to access to permit an easy inspection and servicing of the pump station.
- Do not install the pump station where the failure of the appliance could cause damage to the building structure or other expensive equipment.
- Ensure that the location is ventilated appropriately and that the ambient temperature is less than 86°F (30°C).

Positioning

- There is no required minimum safety clearance.
- Provide a minimum clearance of 47" (1.20 m) on the front of the pump station, in order to permit access to connections and allow for servicing.
- It is recommended (but not mandatory) to allow some clearance on both sides and on the top of the SKH pump station for ease of service.
- The SKH pump station must be floor mounted.

Floor Mounting

- Provide a level, solid foundation for the SKH pump station.
- Ensure that the floor beneath the SKH pump station is waterproof to withstand any water spillage during servicing or if a problem occurs.
- Ensure that the SKH pump station is provided with adjustable legs to ensure proper level from the ground.
- Allow some space beneath the pump station for the drain pan connection, located below the bottom plate.



Step 2 – Electronic Zone Controller (EZC) Installation



WARNING: Risk of electric shock. Disconnect the appliance from the electric supply before commencing installation.

Location

- Plan a location that is easy to access and permits an easy inspection and servicing of the EZC zone controller.
- Do not install the EZC zone controller where failure of the valve could cause damage to the building structure or to other expensive equipment.
- Ensure that the location is ventilated appropriately and that the ambient temperature is less than 86°F (30°C).

Positioning

- There is no minimum clearance required for safety purposes.
- Provide a minimum clearance of 31" (0.80 m) on the front of the EZC zone controller, in order to permit access to connections and allow for servicing.
- It is recommended (but not mandatory) to allow some clearance on both sides and on the top of the EZC zone controller for ease of service.

Wall Mounting

- Use the keyholes located on the back of the EZC zone controller.
- Check the solidity of the chosen support or wall (brick, concrete, or stud partition wall) on which the EZC zone controller is mounted.
- Drill holes for the upper anchors (holes with keyholes) into the support or wall, as per dimensions specified in the below table (anchors not supplied):

Table 3 - Dimensions for Drilling Holes (EZC)

Model	Dimensions in (mm)	
	D	E
EZC1	13.2 (336)	13 (330)
EZC2	16 (408)	13 (330)
EZC3	19 (480)	13 (330)
EZC4	22 (550)	13 (330)

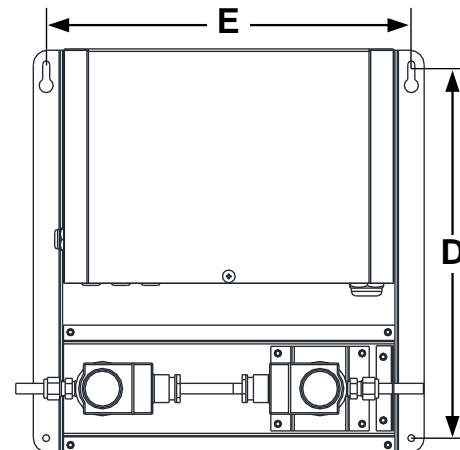


Illustration 6 - EZC Drilling Hole Dimensions (Back View)

- Ensure that the hole dimensions (diameter and depth) adhere to the recommendations of the chosen anchors. If required, you can install and then bolt the anchors.
- Affix two screws (not supplied) with a minimum diameter of 0.23" (6mm) to the top keyholes. Leave a clearance between the head screws and the wall to permit the mounting of the EZC zone controller.
- Hang the EZC zone controller on the two screws. Based on the size and weight of the EZC zone controller, you may need the assistance of another person.
- Tighten the screws to secure the EZC zone controller once it is positioned on the upper screws.
- Install and secure two screws (not supplied) onto the bottom screw holes of the EZC zone controller.



Step 3 – Mist Distribution Ramp and Nozzle Installation

Spraying in Space (Standard)

- Plan a location that is easy to access and permits an easy inspection and servicing of the nozzle.
- Do not install the ramp and nozzle where failure of the system could cause damage to the building structure or to other expensive equipment.
- Ensure that the mist is not directed and condensed on any electrical equipment.
- Construct the drain pipe in such a way that there is no water accumulation and stagnation.

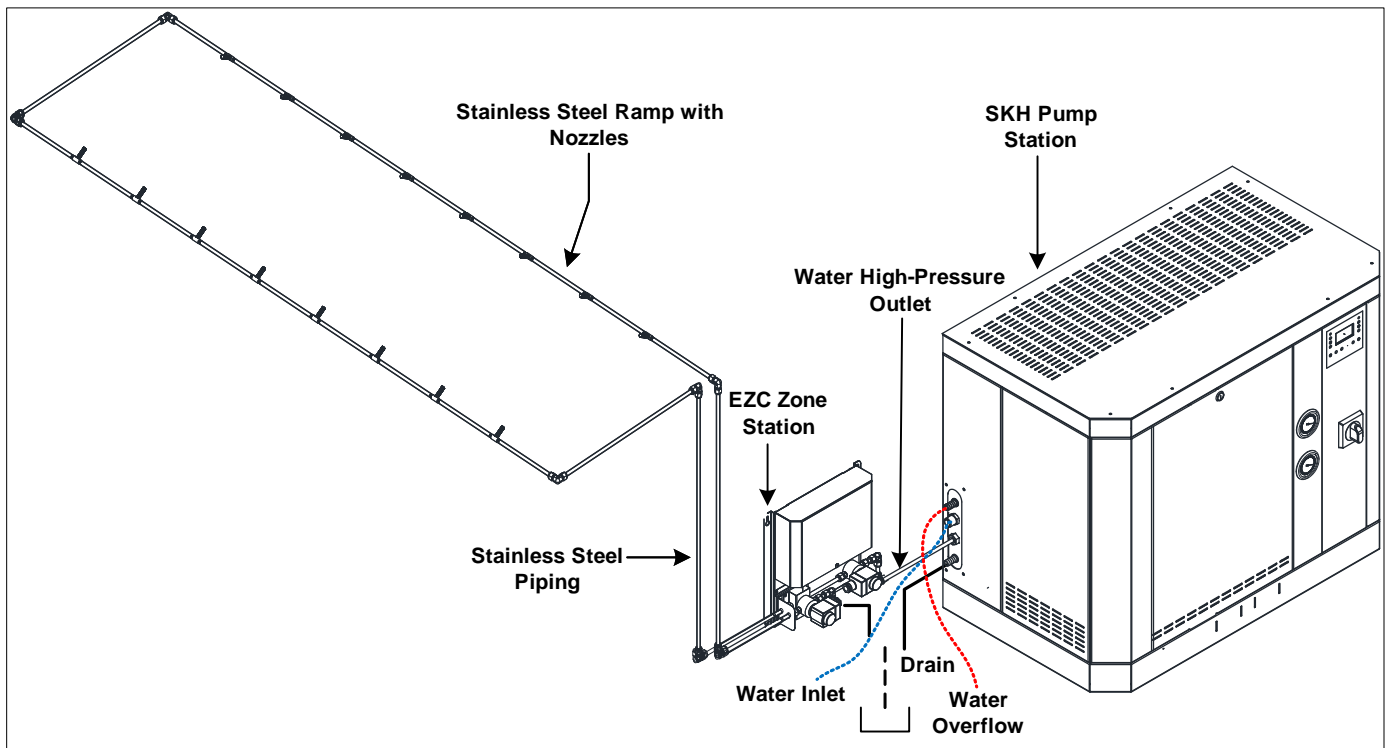


Illustration 7 - Typical Installation with Rigid Nozzle Ramp



Note: The flexible HP hose must be maintained/attached and should not move when pressure is applied.

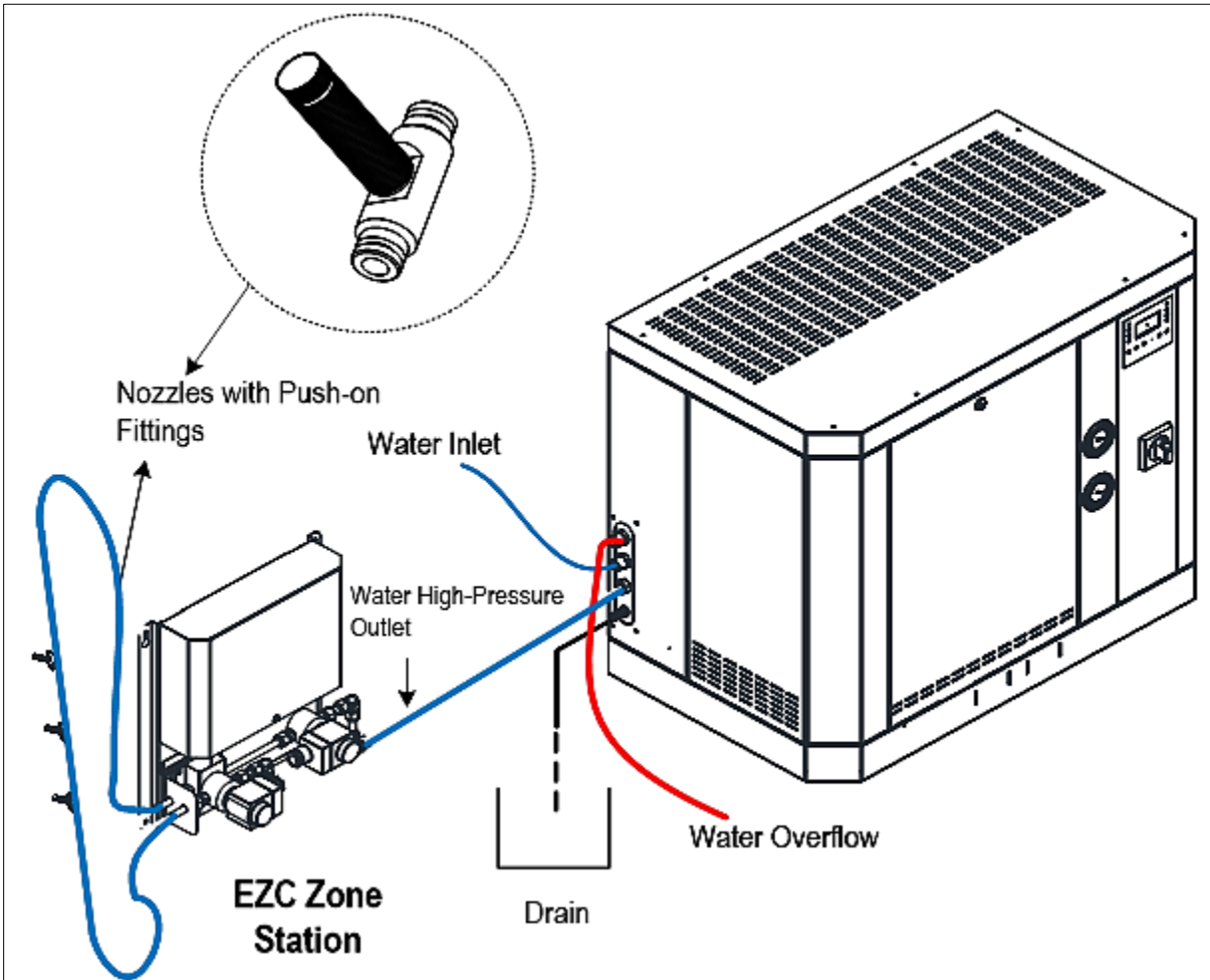


Illustration 8 - Typical Installation with Flexible Hose



Spraying in Space with MDU

- Plan a location that is easy to access and permits an easy inspection and servicing.
- Do not install the MDU where failure of the system could cause damage to the building structure or to other expensive equipment.
- Ensure that the mist is not directed and condensed on any equipment, particularly electrical equipment.
- Construct the drain pipe in such a way that there is no water accumulation and stagnation.

Ceiling Installation

To install the MDU to the ceiling, connect two metallic suspension cables (not supplied) to the three 0.213" (5.4mm) holes found around the unit as per the following steps. Verify the strength of the cables and ensure that they are capable of supporting the weight of the MDU (15 lb [6.8 kg]) before commencing installation.

- A. Attach a Y-fit suspension cable in any two of the three support holes. Ensure that the cable is securely and appropriately affixed to the MDU.
- B. Attach a suspension cable in the remaining third hole. Ensure that the cable is securely and appropriately affixed to the MDU.
- C. Connect the MDU to the ceiling using the ends of the two suspension cables. Ensure that the unit remains in balance and that it is firmly held in place by the two metal cables. Verify that all connections are secure.

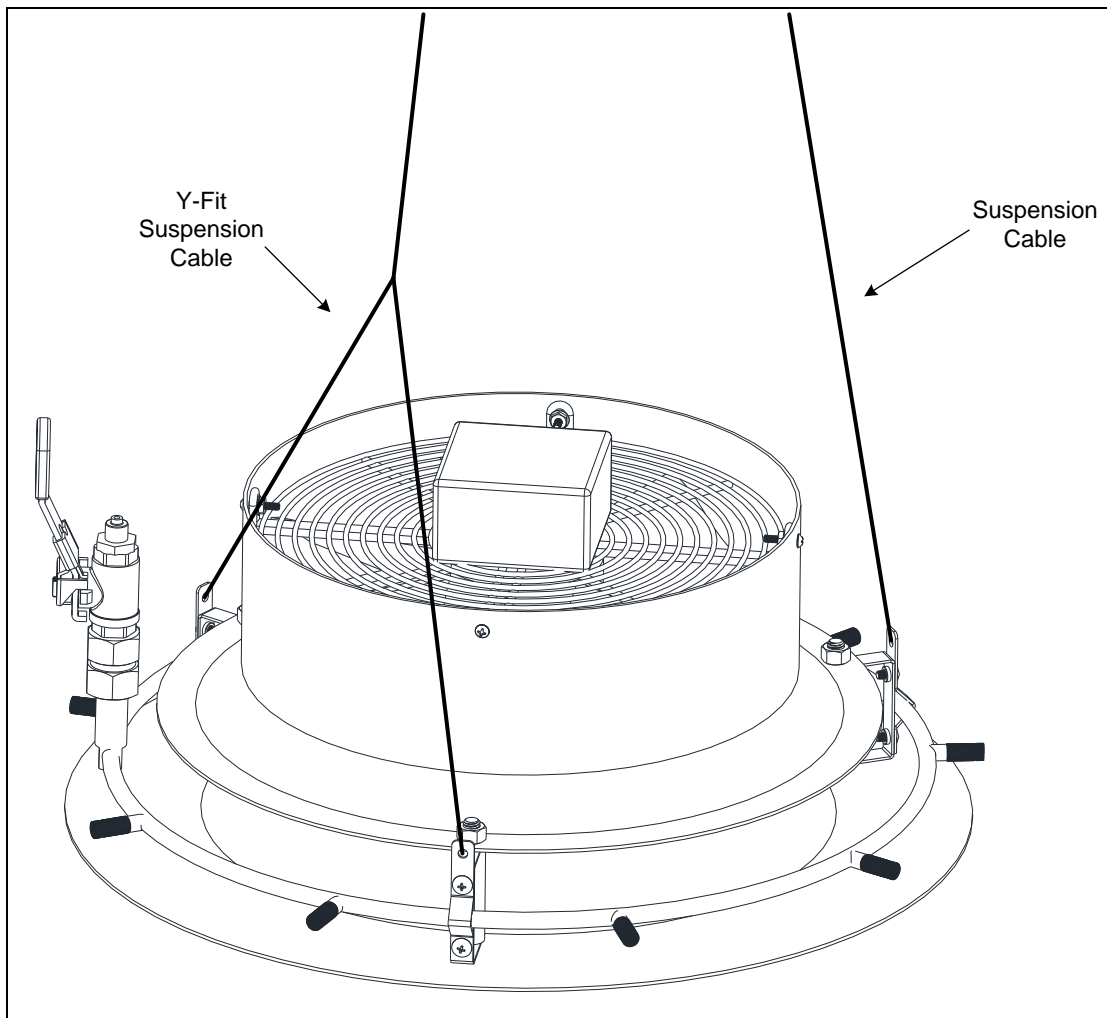


Illustration 9 - Installation of the MDU to the Ceiling



Connecting the MDU to the EZC Zone Station

- After completing the installation of the MDU(s) to the ceiling, connect piping from the EZC Zone Station to the MDU system using flexible hoses (not supplied), as illustrated in the following diagram.
- For systems comprised of multiple MDUs, connect each MDU in series along a flexible hose line.
- Connect each MDU to the flexible hose line using a T push-on fitting (supplied). Connect the bottom side of the T push-on fitting to the MDU using a 3/8" flexible hose with a 3/8" quick connect fitting (not supplied).
- Ensure that each MDU is separated by a radius of 10ft (3m) from any other device. Leave a distance of 20ft (6m) between two nearby MDUs.

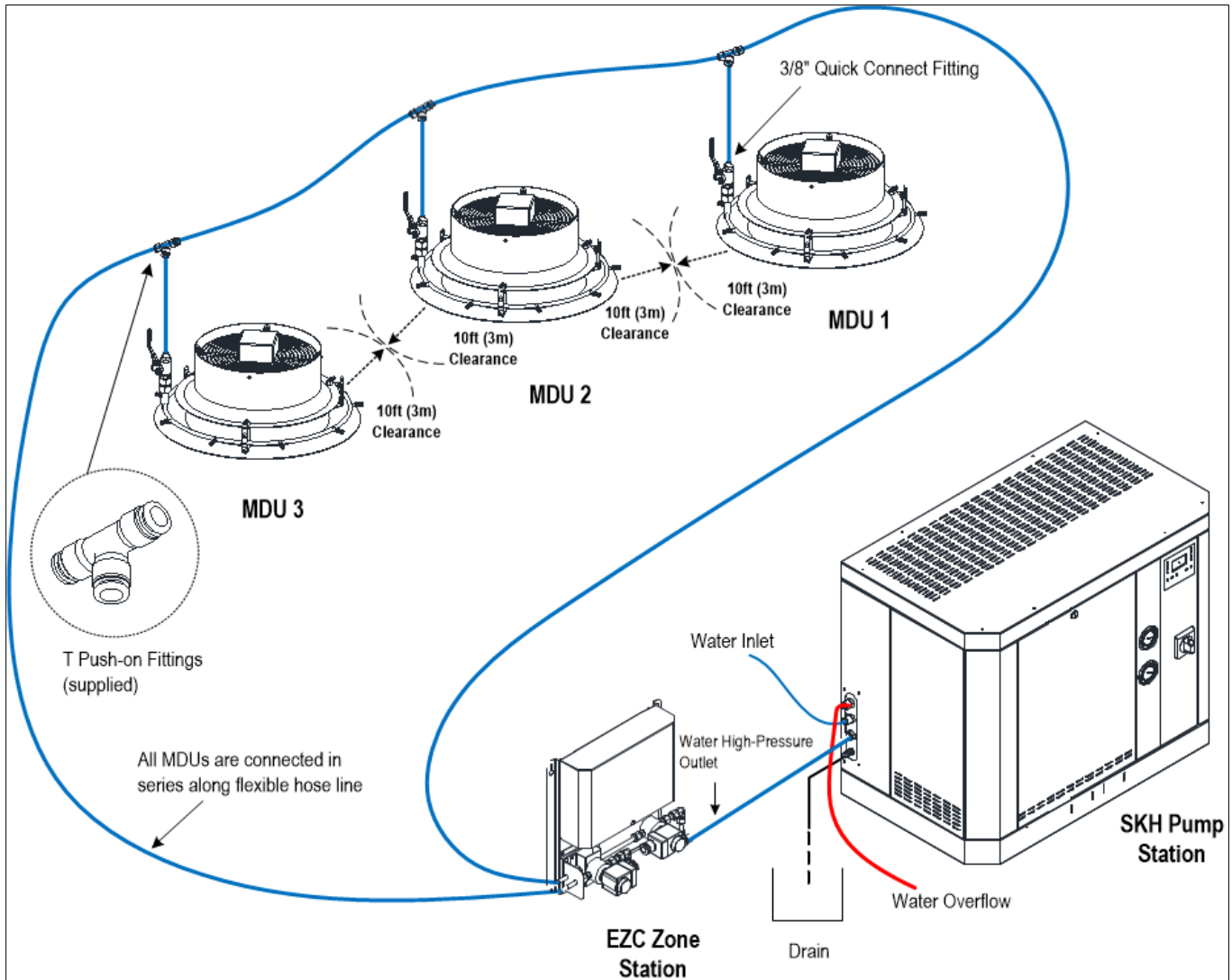


Illustration 10 - Typical Installation of MDU to EZC



Spraying in Duct

- Plan a location that is easy to access and permits an easy inspection and servicing of the nozzle.
- Do not install the ramp and nozzle where failure of the system could cause damage to the building structure or to other expensive equipment.
- Ensure that the mist is not directed and condensed on any electrical equipment.
- Construct the drain pipe in such a way that there is no water accumulation and stagnation.

Assembling the Racks



WARNING: Risk of electric shock. Ensure that you take precautions to prevent electrostatic discharge (ESD) damage.



Note: Ensure that tools such as a screwdriver, adjustable wrench, and so on are available before assembling the racks.

- A. Affix the female brackets to the male bracket using 4x 8-32 self-tapping screws and tighten securely.
- B. Affix the feet at the top and at the bottom of the racks. When attaching the feet to a female bracket, use 4x 8-32 screws with 4x 8-32 nuts. When attaching the feet to a male bracket, use 4x 8-32 self-tapping screws and tighten securely.
- C. Use 2x 8-32 screws to affix the cross angles.
- D. Affix the piping and spray nozzles with push-on fittings using an 8-32 self-tapping screw and grommets.

The following diagram describes how to affix the rack assembly within a duct:

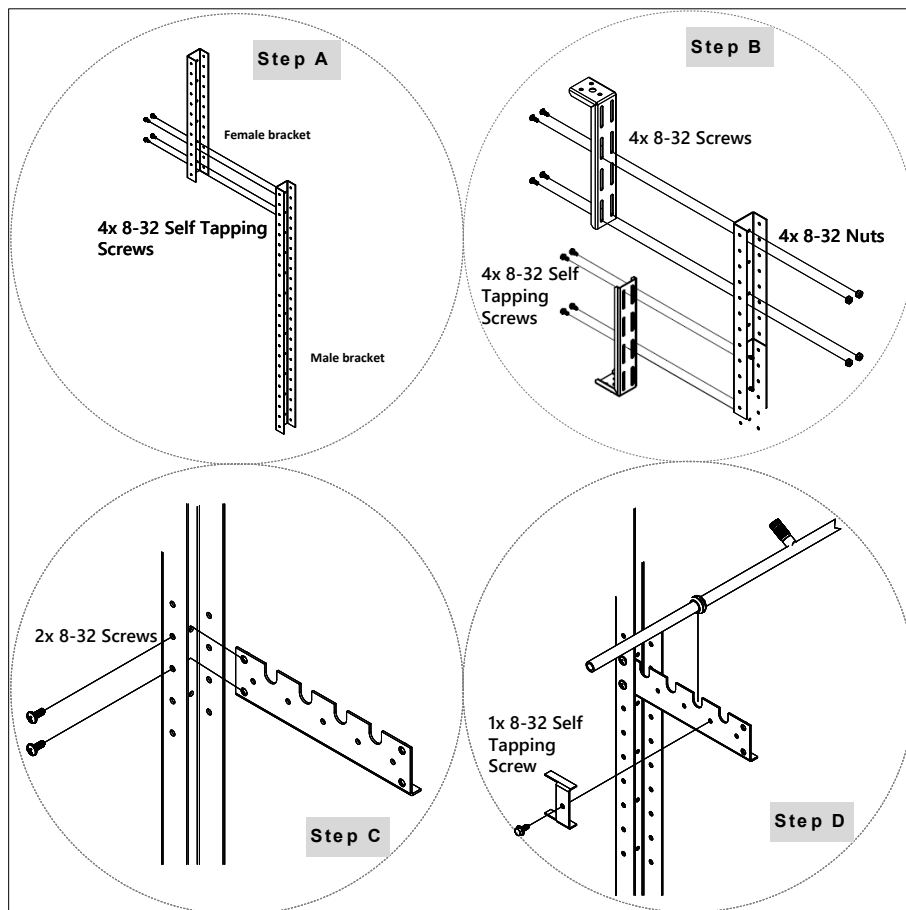


Illustration 11 - Assembling the Racks



Ensure that the nozzles with push-on fittings are fixed at an angle of 30°, as shown in the following diagram:

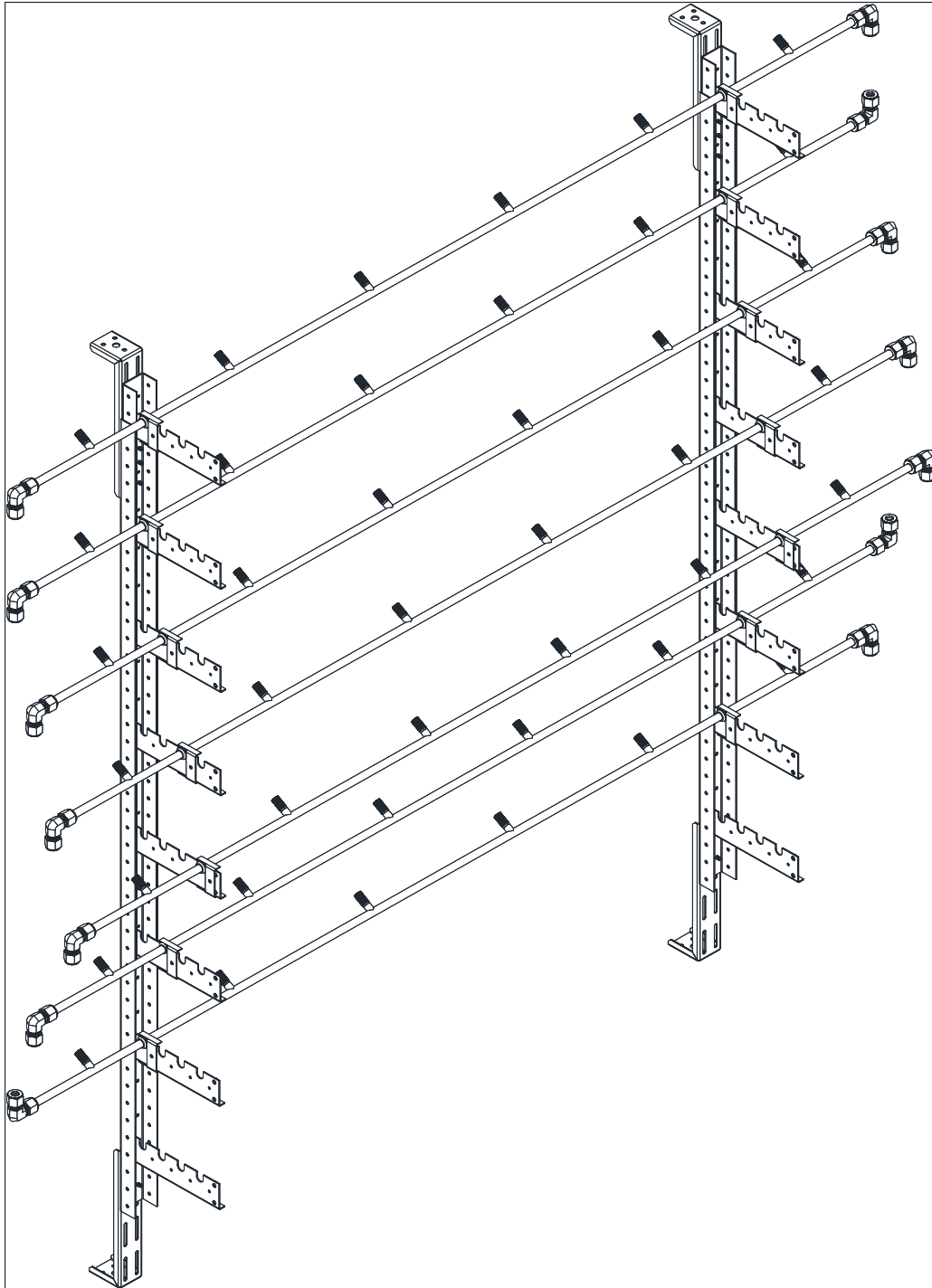


Illustration 12 - Rack Assembly within a Duct



After completing the rack assembly within the duct, connect piping from the EZC Zone Station to the appropriate rack assembly inlets, as illustrated in the following diagram:



Note: Parts of the rack assembly described in the following diagram are provided by Others/Third-party vendors and are not supplied by Neptronic.

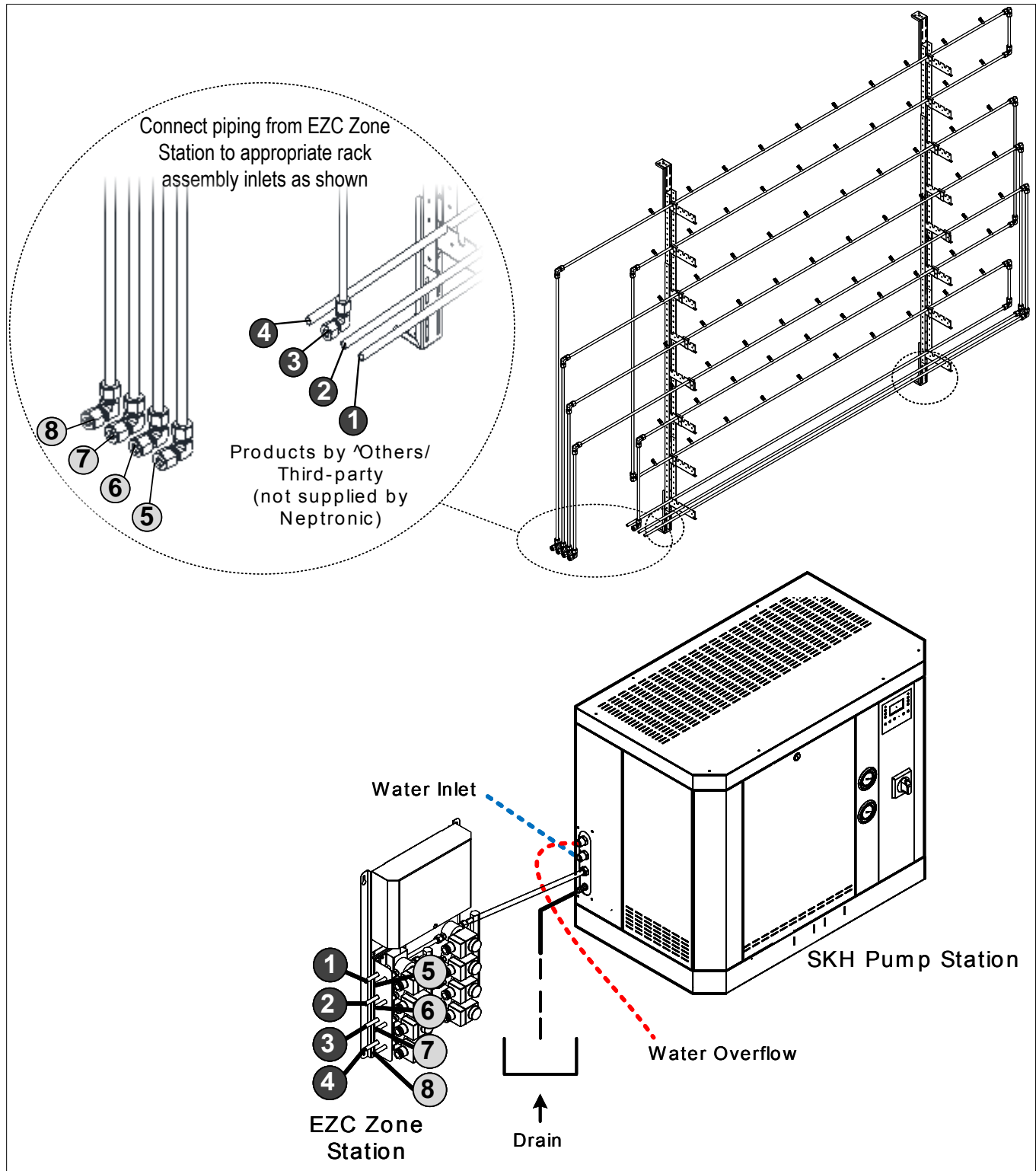


Illustration 13 - Typical Installation – Connecting to the EZC Zone Station



Installing a Droplet Separator (Optional)

An optional droplet separator can be added at any time during the life of the SKH to prevent any possible carryover. If no trap is included, install a separate trap that can adequately handle the condensate load.



Note: Neptronic recommends the use of a droplet separator when the air velocity is above 600FPM (3m/sec).

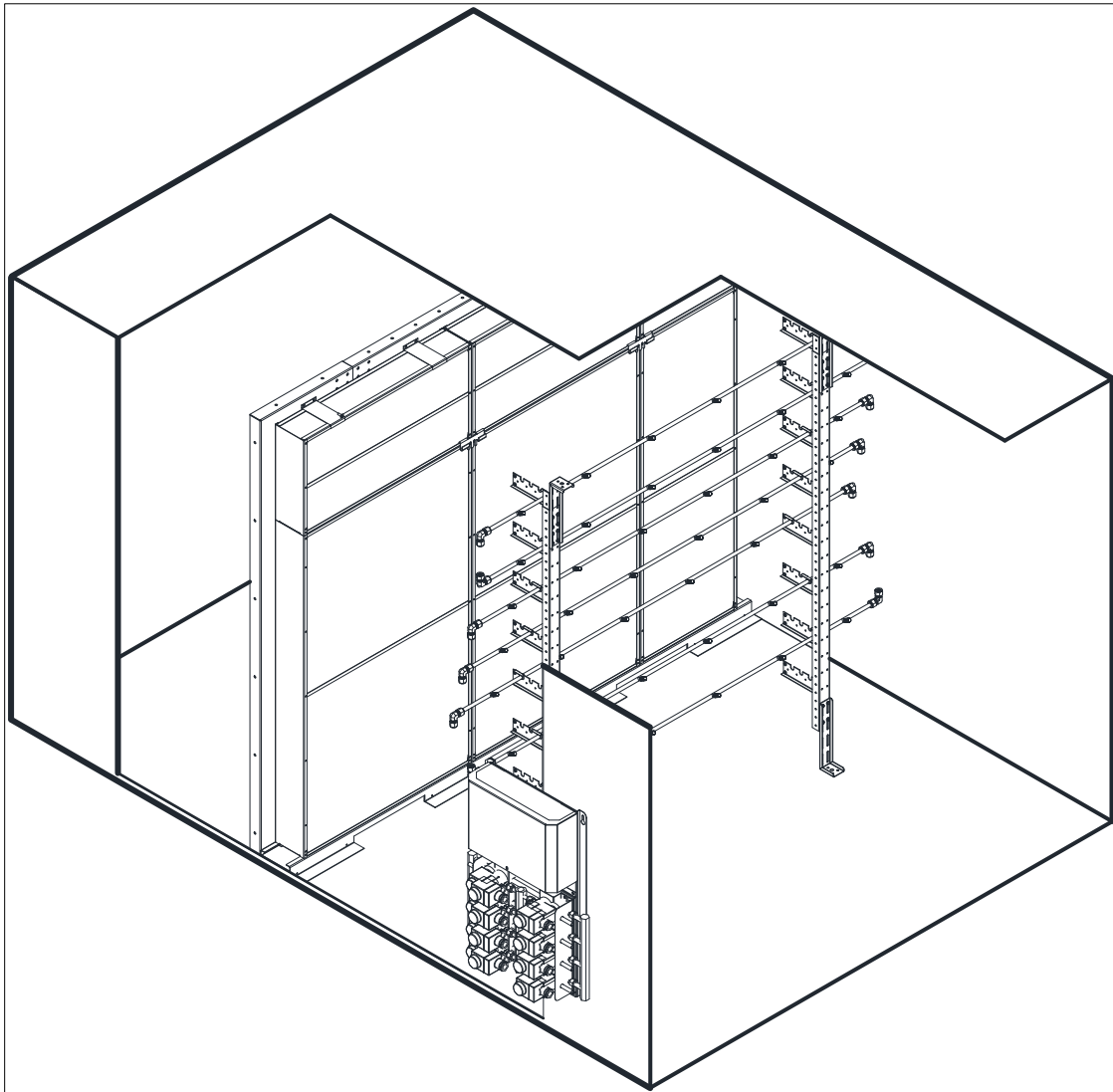


Illustration 14 - Droplet Separator



Step 4 – Water and Drain Connections

Water Connections for SKH Pump Station – Overview

- Install an isolation valve (not supplied) on the water line near the evaporative module's inlet for ease of maintenance and servicing.
- Flush the water line thoroughly before connecting the feed water pipe-work to the evaporation module.

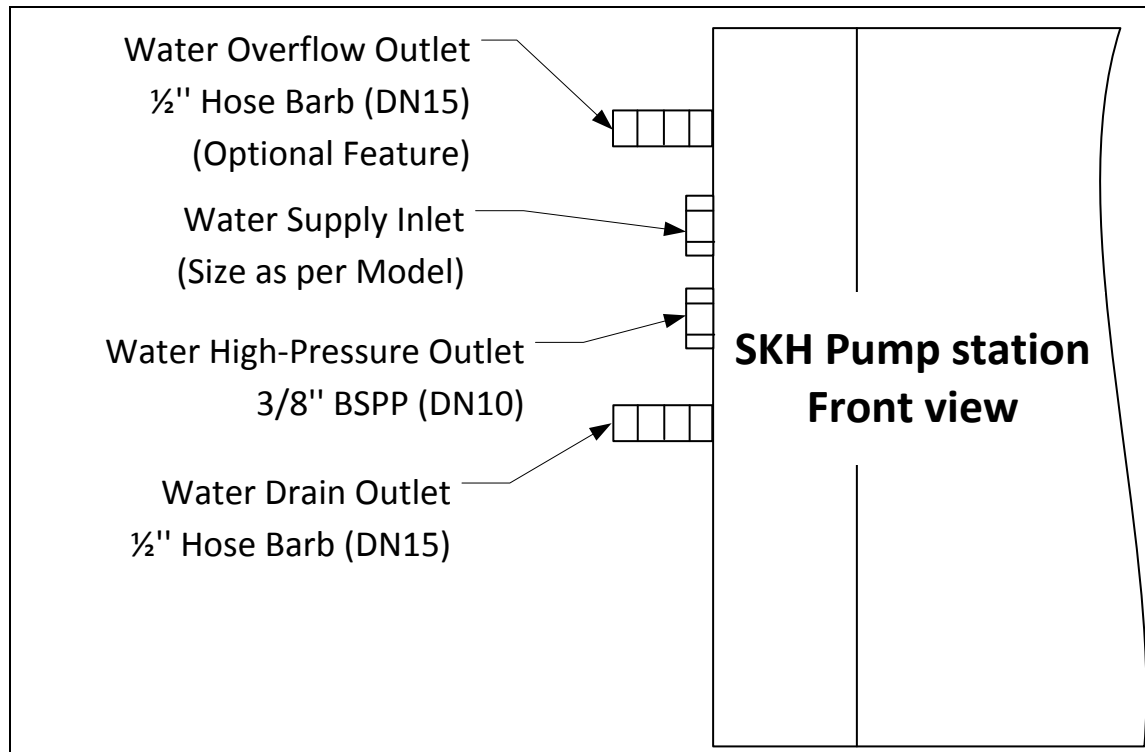


Illustration 15 - Water Connections – Pump Station



Note: Do not over tighten the hose fittings as this may damage the seals.

Table 4 - Water Supply and Drain Connection Specifications

Specification	Models					
	SKH100	SKH200	SKH300	SKH600	SKH900	SKH1200
Water overflow outlet type and size (Optional feature)	½" (DN15) Hose barb					
Water supply inlet type and size	Female NPT ½" (DN15)			Female NPT ¾" (DN20)		
Minimum water supply pressure	30 PSI (2.0 bar)					
Maximum water supply pressure	70 PSI (4.8 bar)					
Minimum water supply temperature	38°F (3°C)					
Maximum water supply temperature	77°F (25°C)					
Water supply quality	35 ppm TDS					
Main drain outlet type and size	½" (DN15) Hose barb					
Pan drain outlet type and size	¾" (DN20) Hydraulic tube					
High-pressure water outlet type and size	Female 3/8" (DN10) BSPP					



Water Supply

- Connect the female NPT connection of the water supply inlet of the humidifier to a clean drinking water supply.
- The SKH is capable of operating with water qualities such as reverse osmosis (RO) or tap water.
- If the humidifier is connected to hard water, it results in scale build-up and clogging of the spray nozzles, resulting in frequent replacement of nozzles. Furthermore, most of the minerals contained in the water are sprayed into the air.
- If the supplied water is treated with reverse osmosis or deionization filtration, control the total dissolved solid contents in the water, as there is no need for ultra-pure water.
- Ensure that the conductivity of water is between 1.92 and 5.12 PPM (30 and 80 $\mu\text{S}/\text{cm}$) at 68°F (20°C).

High-Pressure Water Outlet

- Connect the high-pressure water outlet from the SKH pump station to the high-pressure water inlet on the EZC controller using a flexible hose (not supplied), in order to dampen vibrations.
- Use a 3/8" (DN10) flexible high-pressure nylon hose or a high-pressure hydraulic hose (not supplied). The hose must use stainless steel quick connect fittings with one male 3/8" (DN10) BSPP and one male 1/4" (DN8) BSPP fitting (not supplied).
- Connect the male 3/8" (DN10) BSPP fitting of the hose to the female 3/8" (DN10) BSPP fitting of the high-pressure water outlet of the pump station.
- Connect the male 1/4" (DN8) BSPP fitting of the hose to the female 1/4" (DN8) BSPP fitting of the high-pressure water inlet of the EZC controller.



Note: Ensure that the rating of the flexible hose is appropriate for the operating pressure (1000PSI / 70 bar).

Water Drain

- Connect a 1/2" (DN15) flexible hose (not supplied) to the 1/2" (DN15) hose barb fitting of the main drain outlet, located on the side of the SKH pump station, and direct it to the main building open drain.
- Connect a 3/4" (DN20) flexible hose (not supplied) to the 3/4" (DN20) pan drain outlet tube, located below the base of the SKH pump station, and direct it to the main building open drain.



WARNING: Risk of flooding. Never connect drains to closed pipework.

Water Overflow (Optional Feature)

- Connect the 1/2" (DN15) hose barb fitting of the water overflow outlet, located on the side of the SKH pump station, to a 1/2" (DN15) flexible hose (not supplied).
- Do not combine the overflow and drain to a common pipe if you plan to drain the water. Install two independent traps for drain and overflow.
- Re-circulate the overflowing water as required by making appropriate connections.



Water Connections on EZC

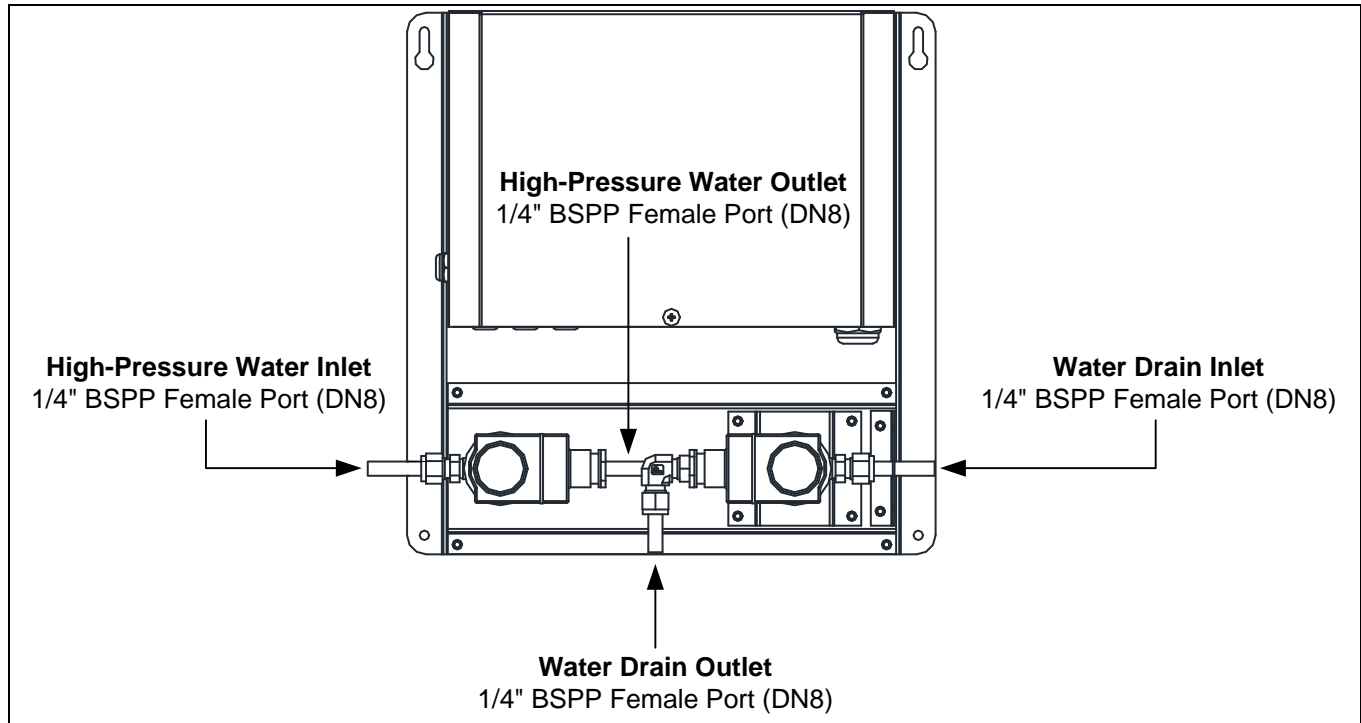


Illustration 16 - Water Connections on EZC (Back View)

High-Pressure Water Inlet from SKH Pump Station

- Connect the high-pressure water inlet on the EZC controller to the high-pressure water outlet from the SKH pump station using a flexible hose (not supplied), in order to dampen vibrations.
- Use a 3/8" (DN10) flexible high-pressure nylon hose or a high-pressure hydraulic hose (not supplied). The hose must use stainless steel quick connect fittings with one male 3/8" (DN10) BSPP and one male 1/4" (DN8) BSPP fitting (not supplied).
- Connect the male 1/4" (DN8) BSPP fitting of the hose to the female 1/4" (DN8) BSPP fitting of the high-pressure water inlet of the EZC controller.
- Connect the male 3/8" (DN10) BSPP fitting of the hose to the female 3/8" (DN10) BSPP fitting of the high-pressure water outlet of the pump station.



Ensure that the rating of the flexible hose is appropriate for the operating pressure (1000 PSI / 70 bar).

High-Pressure Water Outlet to Nozzle

- Connect the 1/4" (DN8) BSPP fitting of the high-pressure water outlet from the EZC controller to the nozzle ramps, MDU(s) or nozzles.
- For in-duct spray systems, ensure that the high-pressure water line is made up of 3/8" (DN10) rigid stainless steel pipes (not supplied).
- For standard in-space spray systems, ensure that the high-pressure water line is made up of 3/8" (DN10) flexible nylon hoses or rigid stainless steel pipes (not supplied).
- For in-space spray systems with MDU(s), ensure that the high-pressure water line is made up of 3/8" (DN10) flexible nylon hoses (not supplied).



Ensure that the rating of the flexible hoses is appropriate for the operating pressure.



Water Drain

- Connect a ¼" (DN8) flexible hose (not supplied) to the ¼" (DN8) BSPP fitting of the water drain outlet, located below the EZC controller, and direct it to a main building open drain.
- If an in-duct spray system is used, connect the ¼" (DN8) BSPP fitting of the water drain inlet to the nozzle rack assembly using a 3/8" (DN10) rigid stainless steel pipe with compression fittings (not supplied).
- If a standard in-space spray system is used, connect the ¼" (DN8) BSPP fitting of the water drain inlet to the nozzles using a 3/8" (DN10) flexible nylon hose with quick connect fittings or a 3/8" (DN10) rigid stainless steel pipe with compression fittings (not supplied).
- If an in-space spray system with MDU is used, connect the ¼" (DN8) BSPP fitting of the water drain inlet to the MDU(s) using a 3/8" (DN10) flexible nylon hose with quick connect fittings (not supplied).



WARNING: Risk of flooding. Never connect drains to closed pipework.



Step 5 – Power Supply Connections



WARNING: All work concerned with electrical installation **MUST** only be performed by skilled and qualified technical personnel, such as electricians or technicians with appropriate training. The customer is responsible for ensuring their suitability.



WARNING: Risk of electric shock. Isolate all power supplies before installation and maintenance of the SKH High-Pressure Atomizer or the EZC.



You **MUST** externally fuse all incoming power supplies for over current protection.
Observe local codes and regulations concerning the provision of electrical installations.

The installation engineer must ensure the following:

- Use copper power conductors only.
- Ensure that the size of the power conductors is suitable for the maximum current supplied.
- Secure incoming power cables using a suitably sized cable gland.
- Secure each terminal connection with a cable ferrule.
- Do not use the SKH pump station's frame to connect to ground. The SKH pump station cabinet has a continuous or unbroken electrical ground.

Power Supply Connections on MDU

When using an in-space distribution system with MDU, refer to the following specifications:

Table 5 - MDU Power Supply Specifications

Model	Voltage (Vac) / 1ph	Current (A)	Frequency (Hz)
MDU-120	120	1	60
MDU-230	230	1	50



Power Supply Connections on SKH Pump Station

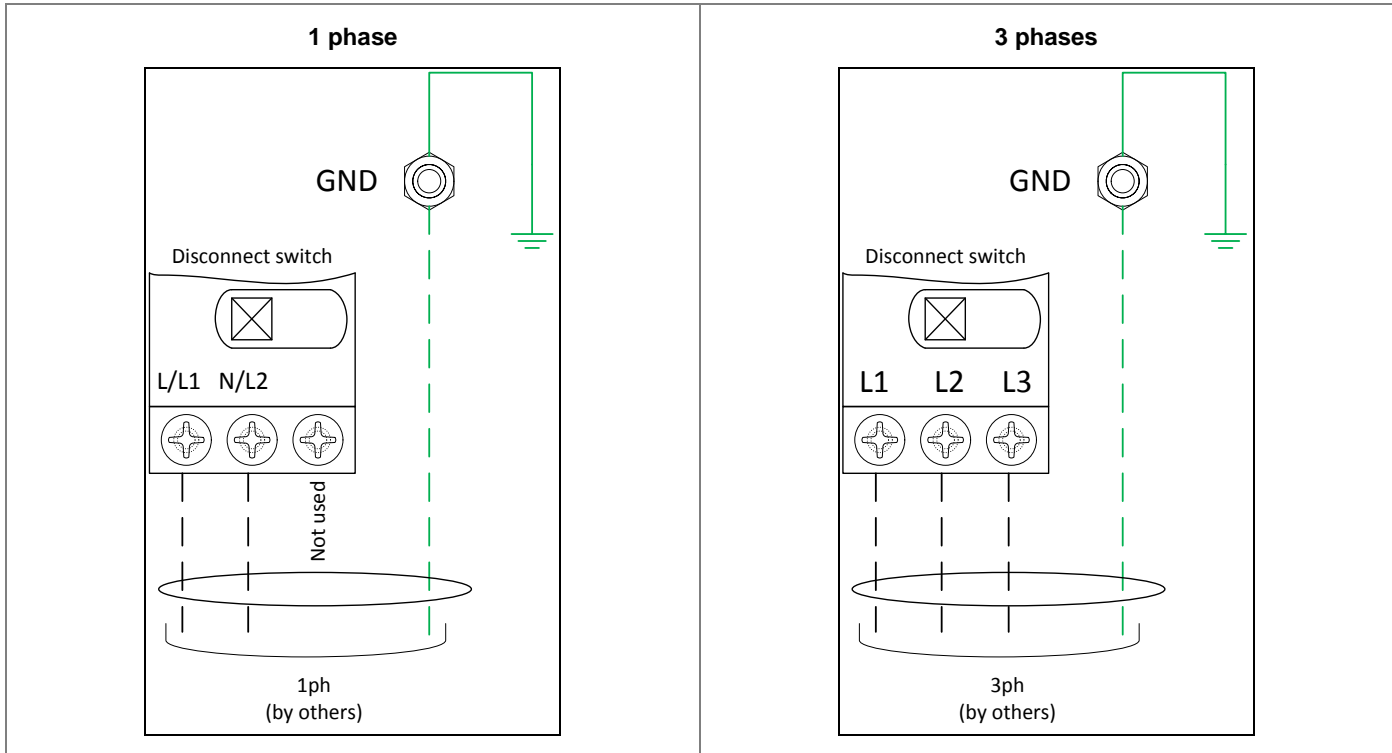


Illustration 17 - Power Supply Connections on SKH Pump Station

Table 6 - SKH Pump Station Power Supply Specifications

Phase	Voltage (V)	Models					
		SKH100	SKH200	SKH300	SKH600	SKH900	SKH1200
		Current (A)					
1 Phase	208 - 240	6.0	8.7	N/A	N/A	N/A	N/A
3 Phase	208 - 240	6.0	8.7	12.3	18.3	23.5	23.5
	380 - 480	3.1	4.4	6.2	9.2	11.8	11.8
	575 - 600	2.3	3.5	4.9	7.3	9.4	9.4
Power							
HP		2	3	5	7.5	10	10
kW		1.5	2.25	3.75	5.6	7.5	7.5



Power Supply Connections on Electronic Zone Controller (EZC)

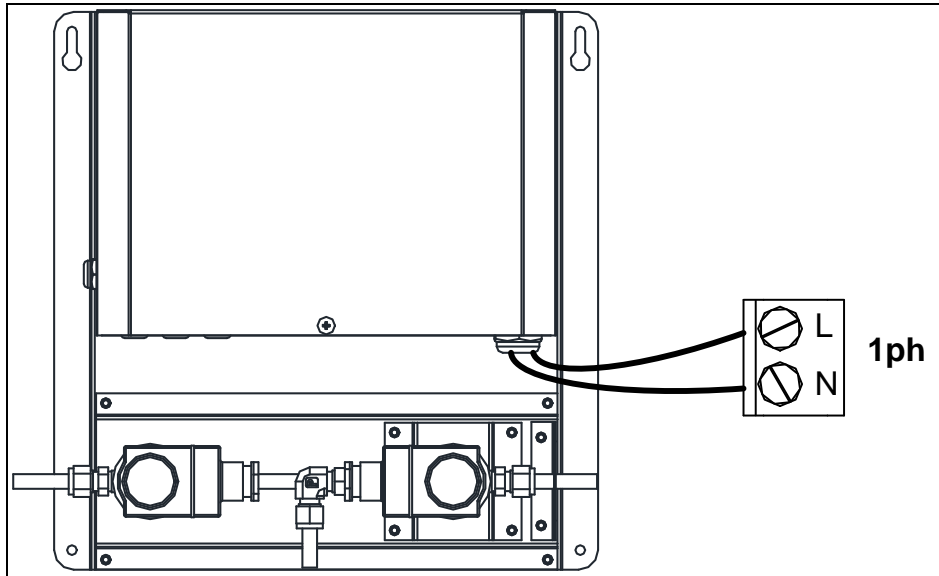


Illustration 18 - Power Supply Connections on EZC

Table 7 - EZC Power Supply Specifications

Model	Voltage (Vac) / 1ph	Current (A)	Frequency (Hz)
EZC1	120	1.4	60
	208/240	0.7	60
	230	0.7	50
	400	0.4	50
	480	0.4	60
	575/600	0.3	60
EZC2	120	2.0	60
	208/240	1.1	60
	230	1.1	50
	400	0.6	50
	480	0.6	60
	575/600	0.4	60
EZC3	120	2.7	60
	208/240	1.4	60
	230	1.4	50
	400	0.8	50
	480	0.8	60
	575/600	0.5	60
EZC4	120	3.4	60
	208/240	1.8	60
	230	1.8	50
	400	1.0	50
	480	1.0	60
	575/600	0.7	60
EZC MDU (with MDU)	120	11.4	60
	208/240	10.7	60
	230	10.7	50



Step 6 – Electrical Control Connections



WARNING: All work concerned with electrical installation **MUST** only be performed by skilled and qualified technical personnel, such as electricians or technicians with appropriate training. The customer is responsible for ensuring their suitability.



WARNING: Risk of electric shock. Isolate all power supplies before installation and maintenance of the SKH High-Pressure Atomizer.

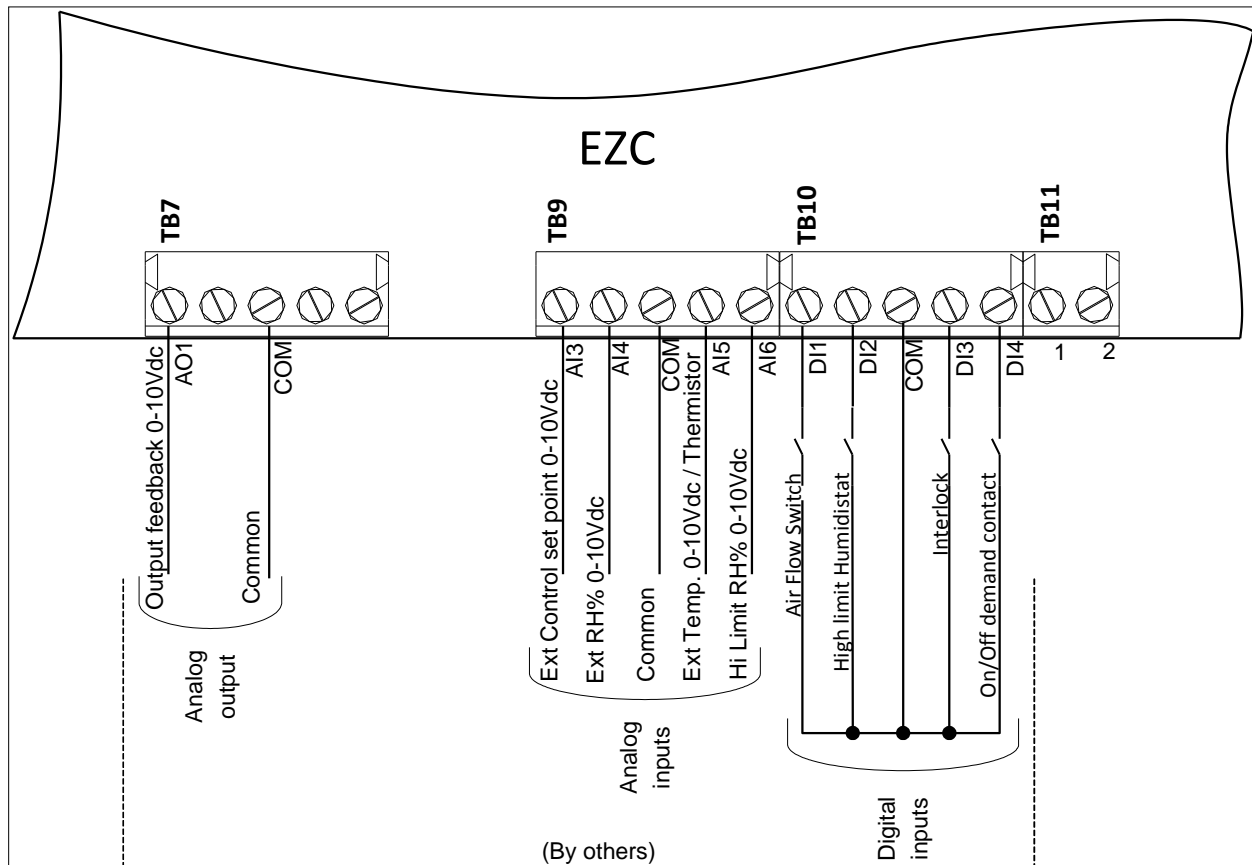


Illustration 19 - SKH Controller Wiring Diagram

Safety Contact Connections

- *Airflow Switch.* Wire the contact on the EZC between terminals TB10 1&3. If this contact opens, the operation of the SKH unit stops. The unit displays the Airflow Switch as 'open,' but will **not** generate an alarm.
- *High Limit Humidistat.* Wire the contact on the EZC between terminals TB10 2&3. If this contact opens, the operation of the SKH unit stops, and an **Alarm** will be displayed. If spraying in-space, High limit humidistat is not required, but a jumper must be installed between terminals TB10 2&3.
- *Interlock.* Wire the switch on the EZC between terminals TB10 3&4. If this contact opens, the operation of the SKH unit stops and an **Alarm** will be displayed. If Interlock is not used, install a jumper between terminals TB10 3&4.

On/Off Operation

For On/Off operation, connect the On/Off contact between TB10 3&5. If this contact opens, the SKH humidifier will turn off. If this contact closes, the SKH humidifier will operate.



Modulating Operation

Analog – External Signal

Irrespective of the source of the control signal (BMS, room or duct humidistat, room or duct thermostat, or a combination), the external control signal should be connected on the EZC between terminals TB9 1&3. These analog inputs are configurable at step 4A “Source” and 4B “Signal” of the Controls menu (see page 43).

BACnet – Network

The SKH master pump station may use BACnet to communicate with the EZC zones. If the control signal is a BACnet network, use terminals TB7 1&2 to connect to an external BMS integration system. Select network control signal at step 4A “Source” of the Controls menu (see page 43). Refer to step 5I “BACnet Network” of the Configuration menu (see page 44) to set up the communication parameters.

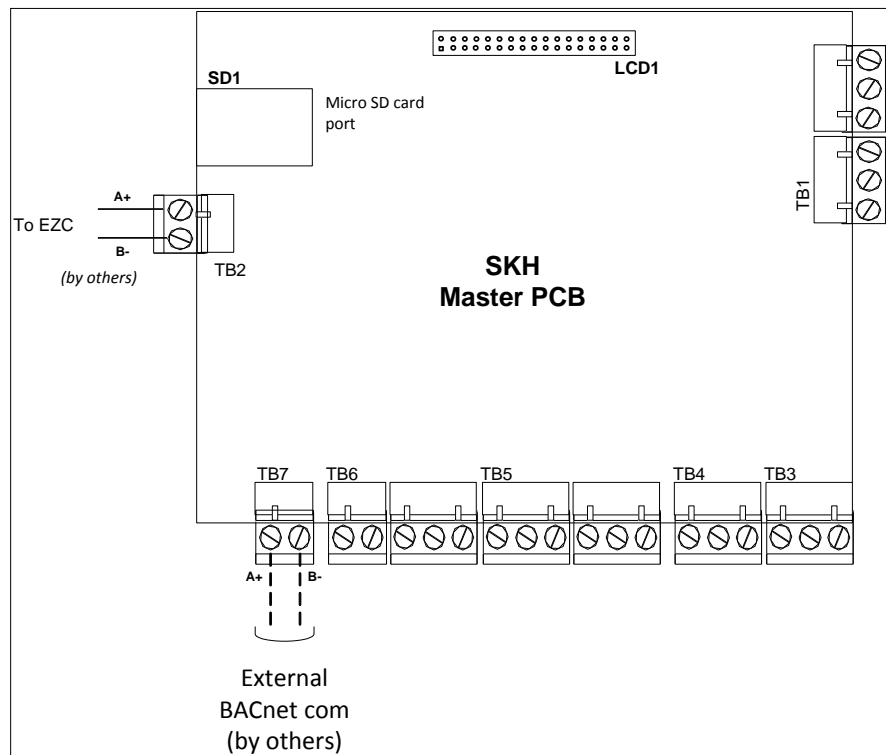


Illustration 20 - BACnet Connection



TRLH Control

When using a TRLH thermostat, connect the EZC controller to the TRLH as per the following diagram. For more details, consult the TRLH24-INT Thermostat Specification & Installation Instructions.

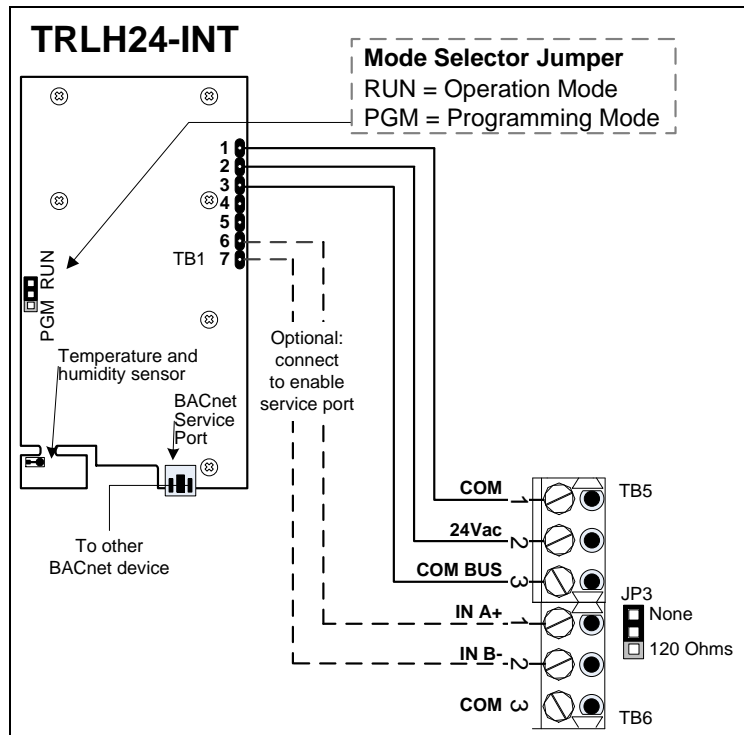


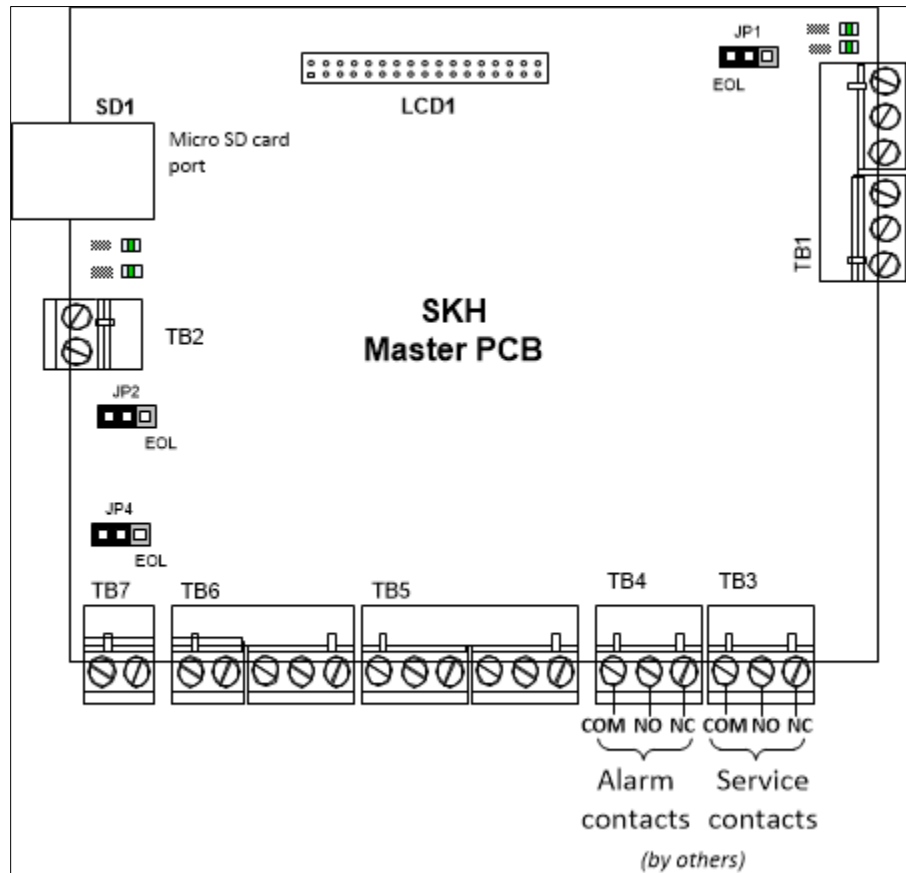
Illustration 21 - TRLH to EZC Control Connections



Dry Contacts

Two series of volt free contacts are provided on the SKH pump station master PCB:

1. Alarm Contacts (TB4)
 2. Service Contacts (TB3)
- These contacts are used to switch a low voltage, ideally 24V, with a switching current of no more than 3 Amps.
 - Each series has one Normally Closed contact and one Normally Open contact.
 - It is recommended to use the Normally Closed contact, as this contact will open in the event of a humidifier fault.





Pump Station to EZC Control Connections

The pump station PCB must be connected to the EZC controller using a network communication cable. Terminals TB2 1&2 on the SKH pump station master PCB must be connected with terminals TB6 1&2 on the EZC controller.



It is recommended to use 24 AWG shielded twisted pair cables (Belden 9841 or equivalent).

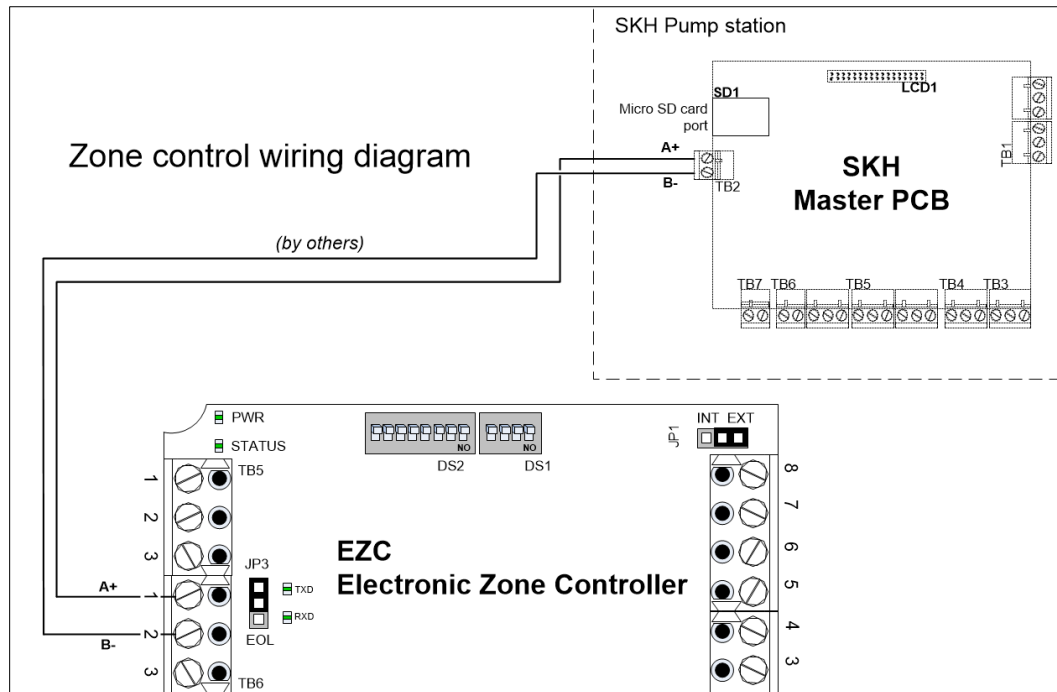


Illustration 22 - Pump Station to EZC Control Connections (Single EZC)

For systems comprised of more than one zone, each EZC controller must be connected in a daisy chain configuration, meaning that every controller must be connected in parallel directly along the path of the main communication cable. Connect terminals TB6 1&2 of every EZC controller along the chain with terminals TB6 1&2 of the previous EZC controller. It is important to keep the same color for all the A+ wiring and a different color for all the B- wiring.



It is recommended to use 24 AWG shielded twisted pair cables (Belden 9841 or equivalent).

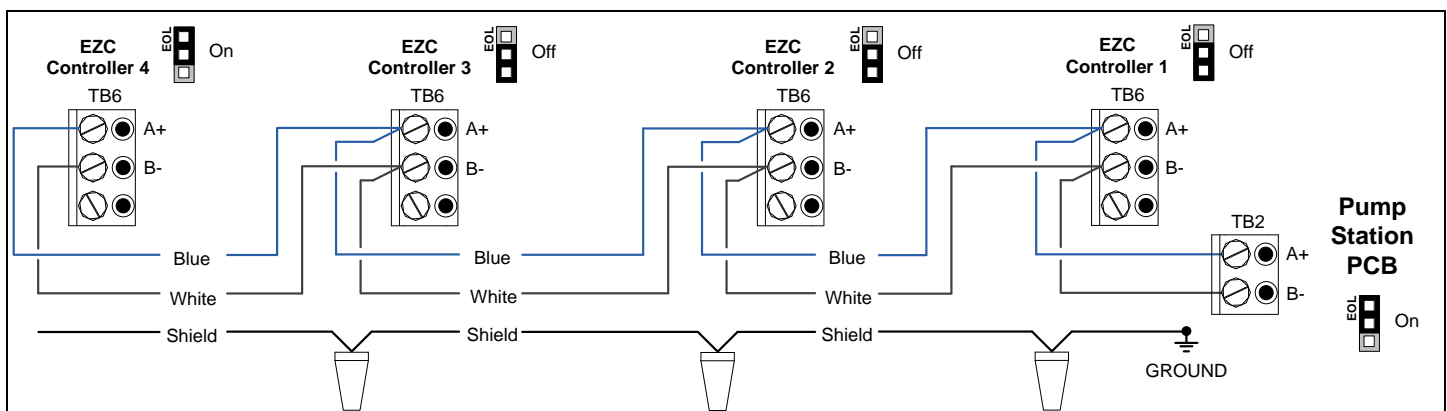


Illustration 23 - Pump Station to EZC Control Connections (Multiple EZCs)



Shield Wiring

Shields from each feed of the network connection to a controller must be wired together. Special attention must be taken to ensure that the shields are well-protected (ends tapped or covered) to prevent any connection to ground that could influence the shield reference. This could create ground loops and change the reference level of the network. The shield in a daisy chain format is then grounded at one end only. Do not ground the shield at more than one location, as this may induce ground loop noise.

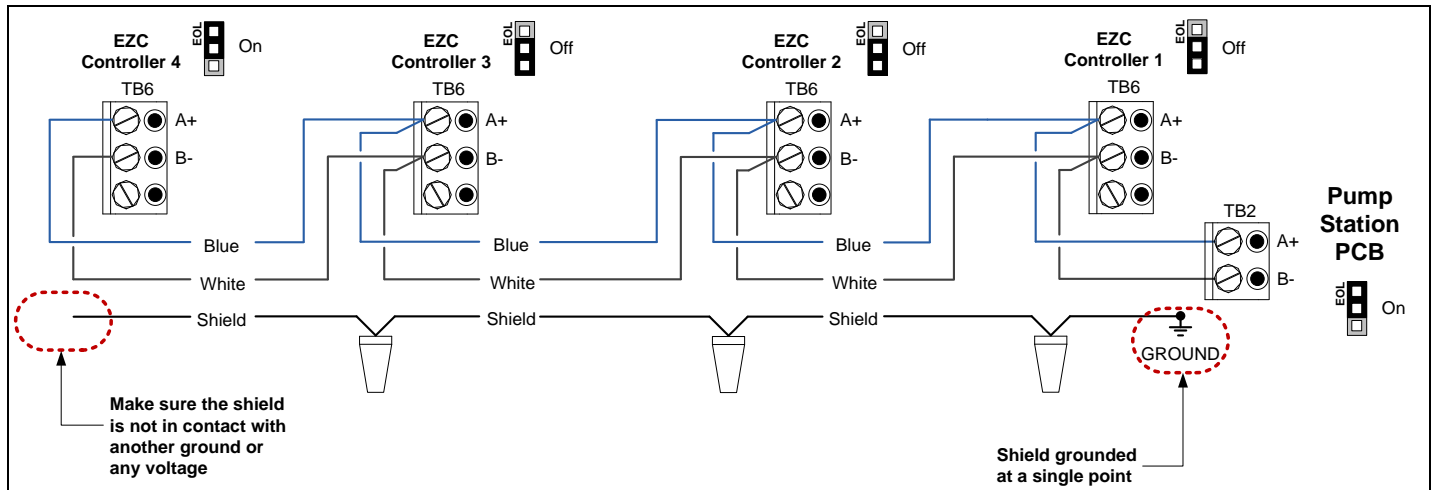


Illustration 24 - Pump Station to EZC Shield Wiring

End of Line (EOL) Termination

In order to avoid reflection issues, an End of Line (EOL) must be installed at both ends of the physical network wire (the pump station PCB and the last EZC controller). Set the EOL directly on the controller. Do not install an EOL at any intermediate EZC controller on the network. Communication is achieved by using an electrical pulse signal and when no EOLs are installed, the pulse signal reflects backwards and collides with other data pulses.

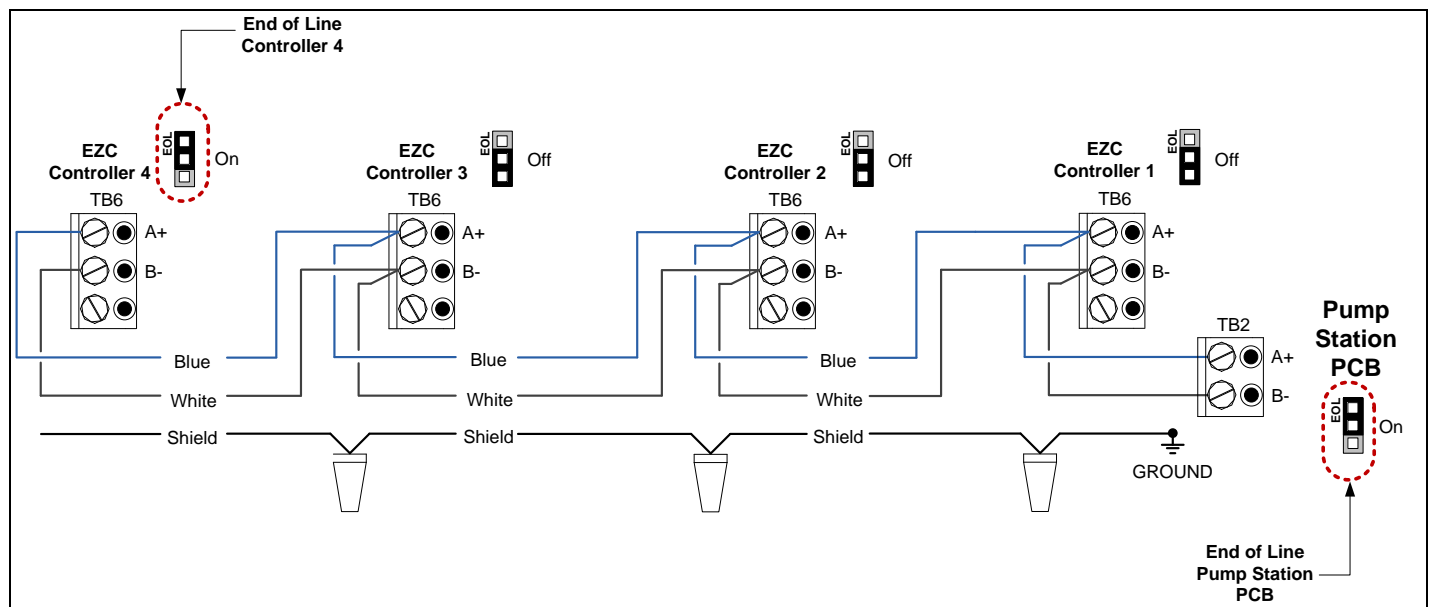


Illustration 25 - Pump Station to EZC EOL Setup



EZC Controller DIP Switches

DS1 (Network Options)

Baud Rate Selection		Auto Baud Rate	Network Type
1	2	3	1
1 OFF / 2 OFF = 9600			
1 ON / 2 OFF = 19200		OFF = Disabled	OFF = BACnet MS/TP
1 OFF / 2 ON = 38400		ON = Enabled	ON = Modbus
1 ON / 2 ON = 76800			

DS2 (MAC Address)

MSTP/MAC address for communication is selectable by DIP switch using binary logic. If the device instance is not changed using program mode, it will automatically be modified according to the MAC address.

MAC Address	DS.1 = 1	DS.2 = 2	DS.3 = 4	DS.4 = 8	DS.5 = 16	DS.6 = 32	DS.7 = 64	DS.8 = 128	Default Device Instance
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153000
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	153001
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	153002
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	153003
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	153004
...
126	OFF	ON	ON	ON	ON	ON	ON	OFF	153126
127	ON	ON	ON	ON	ON	ON	ON	OFF	153127

EZC to MDU Control Connections

For in-space spray distribution systems using one or multiple MDUs, connect the EZC controller to the MDU(s) as per the following diagram.

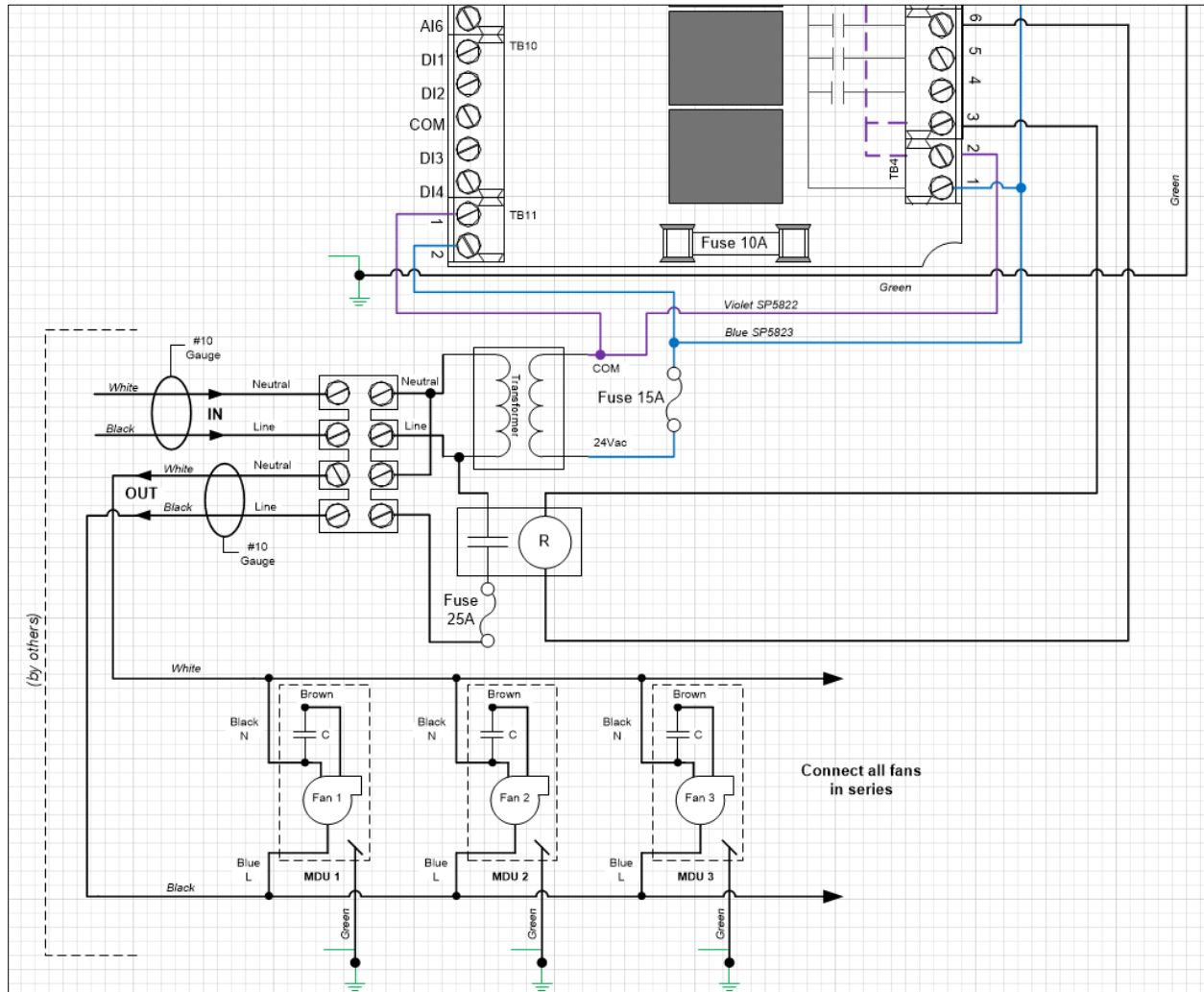


Illustration 26 - EZC to MDU Control Connection



Step 7 – Controller Installation and Configuration

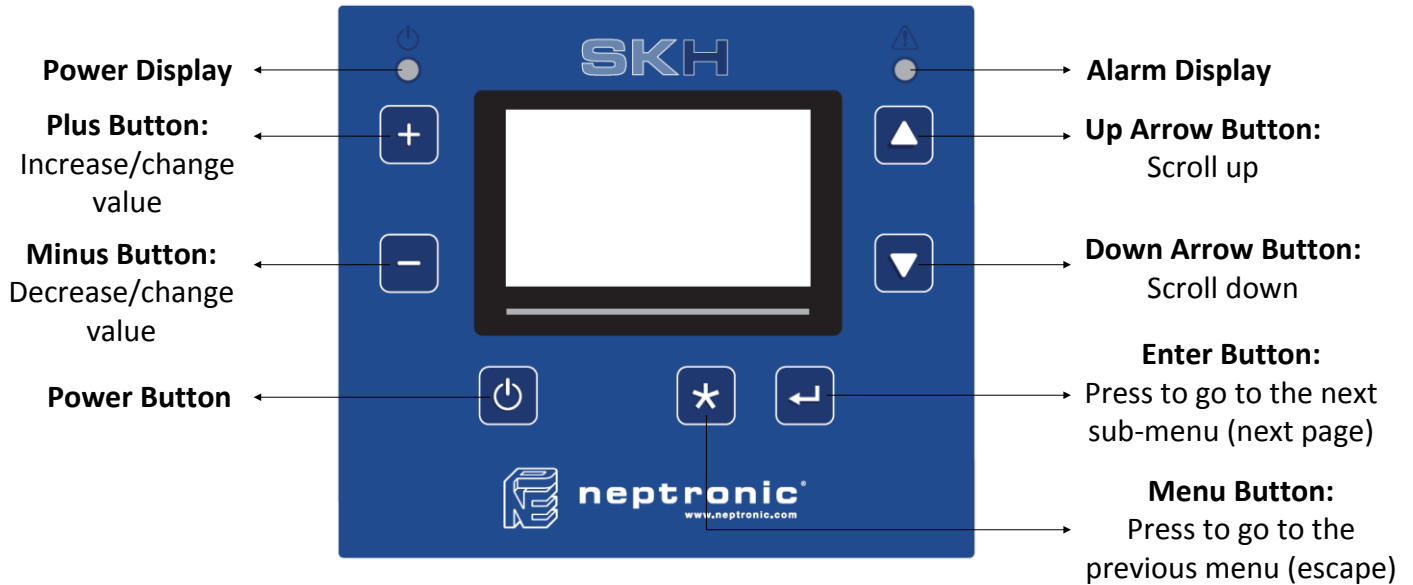


Illustration 27 - SKH Controller



The Power button is protected from accidental activation by a 3 second delay. **Press and hold the Power button for 3 seconds to perform the related action.**

Menu Overview

When the SKH controller is in operation, the unit displays two information screens. After the Model screen is displayed for 3 seconds, the controller displays and remains on the System Info screen. Press the ▲ and ▼ buttons located on the right of the screen to manually scroll through each screen.

Model	
Model	SKH
Firmware	1.0
Serial #	14H010001
SD ► 2015-06-02 15 :13 :23	

The first screen indicates the model #, firmware revision installed and the controller's serial #.

The SD icon appears if the controller detects a micro SD card. Current time and date are also displayed.

System Info	
Inlet water temp.	
Inlet Pressure	100.0%
Output Press.	1000kg/h
VFD	
In. Water Temp. High	
In. Water Temp. Low	
Output	
SD ► 2015-06-02 15 :13 :23	

The second screen displays information about the operation of the system.

The SD icon appears if the controller detects a micro SD card. Current time and date are also displayed.



Menu Navigation and Configuration

- A. Press the Menu * button.
- B. Use the ▲, ▼ buttons to select the desired main menu category and press Enter ↵.
- C. If a password is required (see table below), enter the password and press Enter ↵. If you enter the wrong password, the SKH controller displays an "invalid password" message.

Table 8 - Passwords

Mode/Menu	Password	Priority
User	None	1
Status	None	1
Service	637	2
Controls	757	3
Configuration	372	4



If a password of higher priority was already provided, individual passwords are not required. For example, if the Configuration Menu password was validated already, access to other menus such as Controls is unlocked automatically.

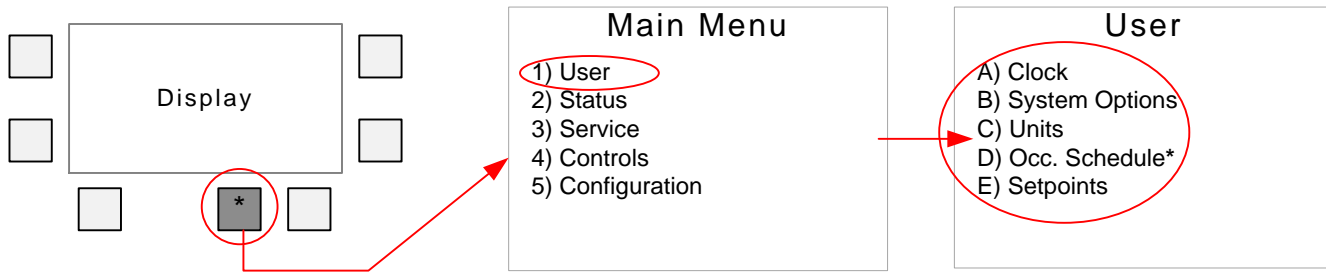
- D. Use the + and - buttons to increase and decrease the values. Use the ▲, ▼ buttons to scroll to the next or previous menu item. The entered values are saved immediately once the changes are done.
- E. Press the Menu * button to go back one menu. Press the Enter ↵ button to advance to the next sub-menu.
- F. To exit completely, press the Menu * button to exit until you return to the menu overview or after 60 seconds of inactivity, the controller will automatically return to the menu overview.



Available settings and range of selections may vary depending on current configuration. The tables in the following sections display all the possible selections. The Notes/Conditions column indicates the conditions required for the associated setting to appear.



Main Menu – User



Press [*] to access the Main Menu

Select User

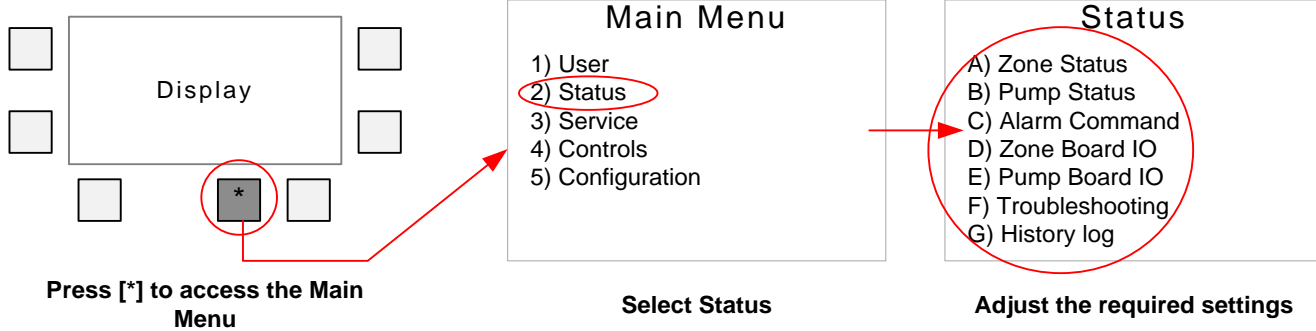
Adjust the required settings

*Option D only appears if an internal control mode has been selected in menu **4A) Source**.

USER	Settings	Default	Range	Notes/Conditions
1A) Clock	Time format:	24h	12h (AM/PM) or 24h	
	Actual time:	00:00	0 to 24 hours : 00 to 59 minutes	
	Date(YY-MM-DD):	YYYY-MM-DD	YYYY-MM-DD	
	UTC diff:	-300 min	-780 to +780 min	
	Daylight saving:	Off	On (Enable), Off (Disable)	
1B) Options	Language:	English	English	
	Contrast:	10	0 to 10	
	Alarm beep:	Off	On (Enable), Off (Disable)	
	Key press beep:	Off	On (Enable), Off (Disable)	
1C) Units	Temp. units:	°C	°C or °F	
	Press. units:	kPa	kPa, bar, psi	
	Mass flow units:	kg/h	kg/h, lb/h	
1D) Occ. Schedule	Zone Select:	1	1 to 10	Select zone before setup.
	Out of service:	Off	On (Enable), Off (Disable)	Appears if an internal control mode is selected in menu 4A) Source.
	Start Date:	YYYY-MM-DD	YYYY-MM-DD	
	End Date:	YYYY-MM-DD	YYYY-MM-DD	
	Sched. Default:	Off	Occup., Unoccup., Vacancy, Off, Null	
	Prio. For Writ.	1	1 to 16	
	a) Weekly schedule			
	Zone Select:	1	1 to 10	Select zone before setup.
	Day:	Monday	Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday	
	Event 1:	Off 00:00	Unused, Occup., Unoccup., Vacancy, Off 00:00 to 23:59	
	Event 2:	Off 00:00	Unused, Occup., Unoccup., Vacancy, Off 00:00 to 23:59	
	Event 3:	Off 00:00	Unused, Occup., Unoccup., Vacancy, Off 00:00 to 23:59	
	Event 4:	Off 00:00	Unused, Occup., Unoccup., Vacancy, Off 00:00 to 23:59	
	Event 5:	Off 00:00	Unused, Occup., Unoccup., Vacancy, Off 00:00 to 23:59	
	Event 6:	Off 00:00	Unused, Occup., Unoccup., Vacancy, Off 00:00 to 23:59	
1E) Setpoints	Zone Select:	1	1 to 10	Select zone before setup.
	Occupied:	22.0 °C or **40.0 %RH	10 to 40 °C or **5.0 to 95.0 %RH	Appears if an internal control mode is selected in menu 4A) Source.
	Unoccupied:	0.0 °C or **0.0 %RH	10 to 40 °C or **5.0 to 95.0 %RH	If “Setpoint source” setting is set to <i>Inter. stpnt</i> , Occupied setting will appear.
	Vacant:	0.0 °C or **0.0 %RH	10 to 40 °C or **5.0 to 95.0 %RH	If “Setpoint source” setting is set to <i>Network</i> , Occupied(ntwrk) setting will appear.
	Occupied(ntwrk):	0.0 °C or **0.0 %RH	10 to 40 °C or **5.0 to 95.0 %RH	**Setpoint is displayed as either temperature or humidity depending on the configuration selected in menu 4A) Source.



Main Menu – Status



STATUS	Settings	Default	Range (* indicates no configuration; display only)	Notes/Conditions
2A) Zone Status	Zone Select:	1	1 to 10	Select zone station to review.
	State:	stand-by	*	
	Occupancy:	Occup.	* Occup., Unoccup., Vacancy, Off	Appears if an internal control mode is selected in menu 4A) Source .
	Zone demand:	0.0 %	*	
	Zone Output:	0.0 %	*	
	Ext sensor hum:	0.0 %RH	*	Appears if the “Humidity source” setting is set to <i>A/4</i> in menu 4A) Source .
	Ext sensor temp:	0.0 °C	*	Appears if the “Temp. source” setting is set to <i>A/5</i> in menu 4A) Source .
	TRLH Hum:	0.0 %RH	*	
	TRLH Temp:	0.0 °C	*	
	Network RH:	0.0 %RH	*	Appears if the “Humidity source” setting is set to <i>Network</i> in menu 4A) Source .
	Network temp.:	0.0 °C	*	Appears if the “Temp. source” setting is set to <i>Network</i> in menu 4A) Source .
	External setpoint:	0.0 °C or **0.0 %RH	*	Appear if the “Setpoint source” setting is set to <i>A/3</i> in menu 4A) Source , when using an internal control mode. **Setpoint is displayed as either temperature or humidity depending on the configuration selected in menu 4A) Source .
	High limit Hum:	0.0 %RH	*	Appears if the “High limit src” setting has been configured in menu 4A) Source .
	Interlock:	Closed	*(Opened or Closed)	
	Air flow cutout:	Closed	*(Opened or Closed)	
	High Lim. cutout:	Closed	*(Opened or Closed)	
	Drain countdown:	0 s	*	
	Inact countdown:	0 s	*	
	Stage 1:	Off	* On, Off	Appear if there is more than one stage.
	Stage 2:	Off	* On, Off	
	Stage 3:	Off	* On, Off	
	Stage 4:	Off	* On, Off	
2B) Pump Status	Board temp:	0.0°C	*	
	Micro temp:	0.0°C	*	
	State:	stand-by	*	
	Enable VFD:	On	* On, Off	
	Pump demand:	0.0 %	*	
	Pump feedback:	0.0 %	*	
	Inlet temp. sens:	0.0 °C	*	
	Inlet press. sens:	0.0 kPa	*	
	Output pressure:	0.0 kPa	*	
	Weight duty time:	0 h	*	



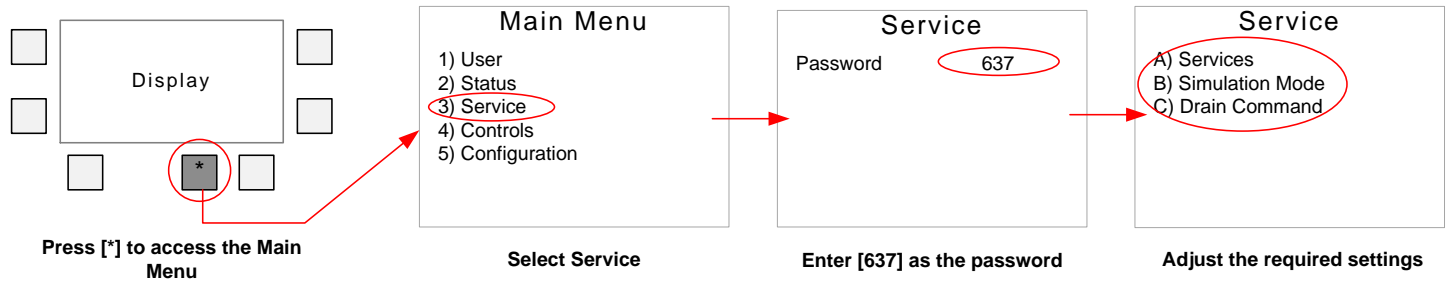
STATUS	Settings	Default	Range (* indicates no configuration; display only)	Notes/Conditions
2C) Alarm Command	Duty time:	0 h	*	
	Drain valve:	Closed	*	
	System			
	Reset Alarms:	No	Yes or No	
	Pump			
	Reset Alarms:	No	Yes or No	
	Zone Select:	1	1 to 10	Select zone before setup.
2D) Zone Board IO	Reset Alarms:	No	Yes or No	
	Zone Select:	1	1 to 10	Select zone station to review.
	AI3:	0 mV	* (mV)	Appears if the "Control mode" setting is set to <i>Ext. on A/3</i> , or set to an internal mode with the "Setpoint source" setting set to <i>A/3</i> , in menu 4A) Source .
	AI4:	0 mV	* (mV)	Appears if the "Humidity source" setting is set to <i>A/4</i> in menu 4A) Source .
	AI5:	0 mV	* (mV)	Appears if the "Temp. source" setting is set to <i>A/5</i> in menu 4A) Source .
	AI6:	0 mV	* (mV)	Appears if the "High limit src" setting is set to <i>A/6</i> in menu 4A) Source .
	DI1:	Closed	* (Opened or Closed)	Digital Input 1
	DI2:	Closed	* (Opened or Closed)	Digital Input 2
	DI3:	Closed	* (Opened or Closed)	Digital Input 3
	DI4:	Closed	* (Opened or Closed)	Digital Input 4
	Fan Low:	Off	* On, Off	Only appears depending on system configuration.
	Fan Med:	Off	* On, Off	
	Fan High:	Off	* On, Off	
	AO1:	Off	* On, Off	Analog Output 1
	DO1:	Off	* On, Off	Digital Output 1 (Only appears depending on configuration.)
	DO2:	Off	* On, Off	Digital Output 2 (Only appears depending on configuration.)
	DO3:	Off	* On, Off	Digital Output 3 (Only appears depending on configuration.)
	DO4:	Off	* On, Off	Digital Output 4 (Only appears depending on configuration.)
	TO1:	Off	* On, Off	TRIAC 1
	TO2:	Off	* On, Off	TRIAC 2
	TO3:	Off	* On, Off	TRIAC 3 (Only appears depending on configuration.)
	TO4:	Off	* On, Off	TRIAC 4 (Only appears depending on configuration.)
2E) Pump Board IO	AI5:	0 mV	* (mV)	Analog Input 5
	AI6:	0 mV	* (mV)	Analog Input 6
	AI7:	0 mV	* (mV)	Analog Input 7
	AI8:	0 mV	* (mV)	Analog Input 8
	DI1:	Closed	* (Opened or Closed)	Digital Input 1
	AO1:	0 mV	* (mV)	Analog Output 1
	K1:	Off	* On, Off	
	K2:	Off	* On, Off	
	K3:	Off	* On, Off	
2F) Troubleshooting	System			
	Alarm:	00000000	*	
	Latched Alarm:	00000000	*	
	Status:	00000000	*	
	Options:	00000000	*	
	Pump			
	Alarm:	00000000	*	



STATUS	Settings	Default	Range (* indicates no configuration; display only)	Notes/Conditions
	Latched Alarm:	00000000	*	
	Status:	00000000	*	
	Options:	00000000	*	
	Comm Status:	00000000	*	
	Zone Select:	1	1 to 10	Select zone station to review.
	Alarm:	00000000	*	
	Latched Alarm:	00000000	*	
	Status:	00000000	*	
	Options:	00000000	*	
	Comm Status:	00000000	*	
2G) History log	a) System Alarms			
	YYYY-MM-DD event name			Displays the last three alarms of the system.
	YYYY-MM-DD event name			
	YYYY-MM-DD event name			
	b) Zone Alarms			
	Zone Select:	1	1 to 10	Select zone station to review.
	YYYY-MM-DD event name			Displays the last three alarms of the selected zone.
	YYYY-MM-DD event name			
	YYYY-MM-DD event name			
	c) Pump Alarms			
	YYYY-MM-DD event name			Displays the last three alarms of the pump.
	YYYY-MM-DD event name			
	YYYY-MM-DD event name			
	Trend # days:	7 days	7-21 days	
	Trend interval:	5 min	1-30 min	
Events of last:	3 months	1-6 months		



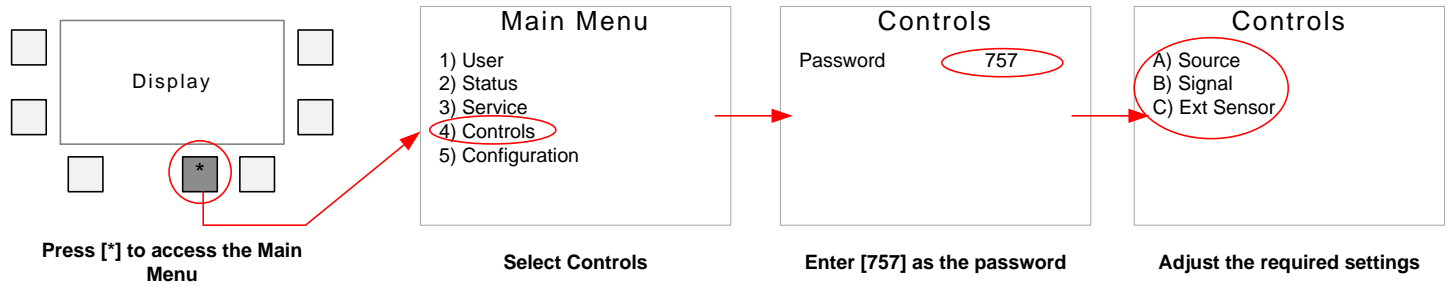
Main Menu – Service



SERVICE	Settings	Default	Range (* indicates no configuration; display only)	Notes/Conditions
3A) Services	System			
	UV lamp due on:	YYYY-MM-DD	*	Displays the date on which the UV Lamp will have to be replaced. Appears if using an UV lamp.
	Last UV lamp:	YYYY-MM-DD	*	Displays last date on which the "UV lamp changed?" was set to Yes. Appears if using an UV lamp.
	UV lamp changed?	No	* Yes or No	If the UV lamp has been changed, set this value to Yes to reset the "UV lamp due on".
	Pump			
	Silv. ion due on:	YYYY-MM-DD	*	Displays the date on which the Silver Ion cartridge will have to be replaced.
	Last silver ion:	YYYY-MM-DD	*	Displays the date on which the "Silv. ion changed?" was set to Yes.
	Silv. ion changed?	No	* Yes or No	If the Silver Ion cartridge is changed, set this value to Yes to reset the "Last silver ion" date.
	Zone Select:	1	1 to 10	Select zone before setup.
	Runtime Stage1:	0 h	*	Appear if there is more than one stage.
	Reset Runtime:	No	Yes or No	
	Runtime Stage2:	0 h	*	
	Reset Runtime:	No	Yes or No	
	Runtime Stage3:	0 h	*	
	Reset Runtime:	No	Yes or No	
3B) Simulation Mode	Sim. mode:	Off	On, Off	
	Duration:	5 min	5 to 60 min	
	Time Remaining:	0 s	*	
	Zone Select:	All	1 to 10 or All	
	Zone demand:	0 %	0 to 100 %	
	Pump			
	Pump override:	Off	On, Off	
	Pump demand:	0 %	0 to 100 %	
3C) Drain Command	Man. Prime Start:	Off	Off or Start	Set to <i>Start</i> to start the drain sequence.
	Man. Prime Stop:	Off	Off or Stop	Set to <i>Stop</i> to stop the drain sequence. Appears after "Man. Prime Start" has been set to <i>Start</i> .



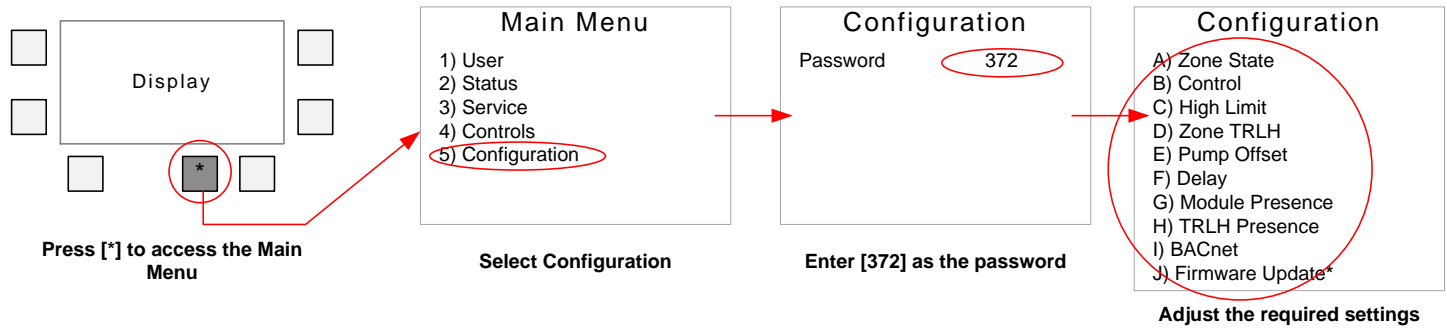
Main Menu – Controls



CONTROLS	Settings	Default	Range	Notes/Conditions
4A) Source	Zone Select:	1	1 to 10	Select zone before setup.
	Control mode:	Ext. on AI3	Ext. on AI3 Int. in RH Int. in temp Int. Altern. Network	External control mode using Analog Input 3 (AI3). Internal control mode using Thermostat humidity. Internal control mode using Thermostat temperature. Network option only applicable for BACnet models.
	Setpoint source:	AI3	AI3, Inter. stpnt, Network	Appears if an internal control mode is selected. Network option only applicable for BACnet models.
	Humidity source:	AI4	AI4, TRLH, Network, None	Network option only applicable for BACnet models.
	Temp. source:	AI5	AI5, TRLH, Network, None	Network option only applicable for BACnet models.
	High limit src:	AI6	AI6, Network, None	Network option only applicable for BACnet models.
4B) Signal	Zone Select:	1	1 to 10	Select zone before setup.
	AI3 signal:	0-10 Vdc	0-10Vdc, 2-10Vdc	Appears if the "Control mode" setting is set to <i>Ext. on AI3</i> , or set to an internal mode with the "Setpoint source" setting set to <i>AI3</i> , in menu 4A) Source .
	AI4 signal:	0-10 Vdc	0-10Vdc, 2-10Vdc	Appears if the "Humidity source" setting is set to <i>AI4</i> in menu 4A) Source .
	AI5 signal:	0-10 Vdc	0-10Vdc, 2-10Vdc	Appears if the "Temp. source" setting is set to <i>AI5</i> in menu 4A) Source .
	AI6 signal:	0-10 Vdc	0-10Vdc, 2-10Vdc	Appears if the "High limit src" setting is set to <i>AI6</i> in menu 4A) Source
	Feedback signal:	0-10 Vdc	0-10Vdc, 2-10Vdc	
4C) Ext Sensor	Zone Select:	1	1 to 10	Select zone before setup.
	AI3 setpoint min:	0.0 °C or **0.0 %RH	10.0 to max °C or **5.0 to max %RH	Appear if the "Setpoint source" setting is set to <i>AI3</i> in menu 4A) Source , when using an internal control mode. **Setpoint is displayed as either temperature or humidity depending on the configuration selected in menu 4A) Source .
	AI3 setpoint max:	0.0 °C or **0.0 %RH	Min to 40.0°C or **Min to 95.0%RH	
	AI3 setpnt offset:	0.0 °C or **0.0 %RH		
	AI4 RH min:	0.0%RH	5.0 to max %RH	Appear if the "Humidity source" setting is set to <i>AI4</i> in menu 4A) Source .
	AI4 RH max:	0.0%RH	Min to 95.0%RH	
	AI4 RH offset:	0.0%RH		
	AI5 Temp. min:	0.0°C	10.0 to max °C	Appear if the "Temp. source" setting is set to <i>AI5</i> in menu 4A) Source .
	AI5 Temp. max:	0.0°C	Min to 40.0°C	
	AI5 Temp. offset:	0.0°C		
	AI6 RH min:	0.0%RH		Appear if the "High limit src" setting is set to <i>AI6</i> in menu 4A) Source .
	AI6 RH max:	0.0%RH		
	AI6 RH offset:	0.0%RH		



Main Menu – Configuration



*Option J only appears when a micro SD card containing a new firmware version is inserted.

CONFIGURATION	Settings	Default	Range	Notes/Conditions
5A) Zone State	Zone Select:	1	1 to 10	Select zone before setup.
	Operation	On	On, Off	
5B) Control	Zone Select:	1	1 to 10	Select zone before setup.
	Auto PID:	On	On, Off	
	Output Limit:	100 %	0 to 100 %	
	Stage on thresh:	50 %	0 to 100 %	Appears if there is no modulating stage.
	Stage off thresh:	45 %	0 to 100 %	Appears if there is no modulating stage.
5C) High Limit	Zone Select:	1	1 to 10	Select zone before setup.
	Setpoint:	80.0 %RH	10 to 90 %RH	Appear if the "High limit src" setting has been configured in menu 4A) Source.
	High Lim. cutout:	90.0 %RH	50 to 95 %RH	
	Prop. band RH:	5.0 %RH	1.0 to 20.0 %RH	Proportional High limit humidity control. Not applicable for In-Space application.
	Integral Time:	60 s	0 to 600 sec	
5D) Zone TRLH	Derivative Time:	0.0 s	0.0 to 60.0 sec	
	Zone Select:	1	1 to 10	Select zone before setup.
	Occ. setpoint min:	10.0 °C or **5.0 %RH	10.0 to max °C or **5.0 to max %RH	Appear if an internal control mode is selected in menu 4A) Source.
	Occ. setpoint max:	40.0 °C or **95.0 %RH	Min to 40.0 °C or **Min to 95.0 %RH	**Setpoint is displayed as either temperature or humidity depending on the configuration selected in menu 4A) Source.
	Hum sens. offset:	0.0 %RH	-10.0 to 10.0 %RH	
	T sens. offset:	0.0 °C	-10.0 to 10.0 °C	
	Display Time:	Off	On, Off	
	Setpnt. Lock:	Off	On, Off	
	On/Off Lock:	Off	On, Off	
5E) Pump Offset	Time format:	24h	12h, 24h	
	Inlet temp. sens:	0.0 °C	* (sensor reading only)	
	- - - offset:	0.0 °C	-10.0 to 10.0 °C	
	Inlet press. sens:	0 kPa	* (sensor reading only)	
	- - - offset:	0 kPa	-500 to 500 kPa	
	Output pressure:	0 kPa	* (sensor reading only)	
5F) Delay	- - - offset:	0 kPa	-500 to 500 kPa	
	System			
	Inact delay:	4 h	4 to 72 h	Maximum allowable time of inactivity for the water inlet.
	Inact drain time:	1 min	1 to 255 min	Regulates water line drain time in the event that the Inlet Inactivity delay is attained.
	Pump			
	Inact delay:	4 h	4 to 72 h	
	Inact drain time:	1 s	1 to 255 s	
	Zone Select:	1	1 to 10	Select zone before setup.
	Fan control:	Off	On, Off	



CONFIGURATION	Settings	Default	Range	Notes/Conditions
	Fan on delay:	1 s	1 to 255 s	Appears if the "Fan control" setting is set to <i>On</i> .
	Fan off delay:	1 s	1 to 255 s	Appears if the "Fan control" setting is set to <i>On</i> .
	Inact delay:	4 h	4 to 72 h	
	Inact drain time:	1 s	1 to 255 s	
5G) Module Presence	Zone 1 to Zone 10	Off/On	On, Off	
5H) TRLH Presence	Zone Select:	1	1 to 10	Select zone before setup.
	Zone TRLH:	Off/On	On, Off	
5I) BACnet	System			
	MAC Address:	000	0 to 254	Available with BACnet models only.
	Fallback Timeout:	00000	0 to 65534	
	Device Instance:	0153000	0 to 4194302	
	Auto Baud Rate:	On	On (Enable), Off (Disable)	
	Baud Rate:	9600	9.6k, 19.2k, 38.4k, 76.8k	
	Zone Select:	1	1 to 10	Select zone before setup.
	Device Instance:	0153000	0 to 4194302	Available with BACnet models only.
	Network Number:	15300		
5J) Firmware Update	Modules From To Update?			
	Uploading pumps...	0 %	0 to 100% update progress	Appears if a micro SD card containing a new firmware version is inserted.
	Uploading zones...	0 %	0 to 100% update progress	
	Pump	No	Yes or No	
	Zone 1 To Zone 10	No	Yes or No	
	System x.xx	No	Yes or No	

Firmware Update

The firmware update function is available when the unit detects a new firmware version on the micro SD card and the "Firmware upgrade available" message appears.



Install the firmware files in a folder named "SKH_fw_pack" in the root of the micro SD card.

1. Press the Menu * button.
2. Use the ▲, ▼ buttons to select "5) Configuration" and press Enter ↵.
3. Enter the Configuration password [372]. Use the + and - buttons to increase and decrease the numbers, use the ▲, ▼ buttons to change a digit, and then press Enter ↵ to validate the password.
4. Use the ▲, ▼ buttons to select "5J) Firmware Upgrade" and press Enter ↵.
5. Start by updating the Slave pump firmware. To update, change the value from No to Yes.
6. The upgrade process can take a few minutes, and the unit will be offline for 60 seconds during the upgrade.



List of Alarms

Display	Origin	Description	Alarm Reset
High limit cutout	Zone	Indicates that the high limit item is open. Verify that the signal from the high limit (duct) sensor is present at the SKH controller's input on the PCB (see schematic).	Automatic
Air flow cutout	Zone	Indicates that the airflow sensor is open. Verify that the signal from the airflow sensor is present at the SKH controller's input on the PCB (see schematic).	Automatic
Interlock cutout	Zone	Indicates that the interlock and the cut-out circuitry are open. Verify that the signal from the interlock contact is present at the SKH controller's input on the PCB (see schematic).	Automatic
Board temperature failure	Zone	EFC PCB temperature is above the maximum temperature.	Automatic
TRL timeout	Zone	Communication delay is too long between EZC and TRL.	Automatic
Network timeout	Zone	Communication delay is too long.	Automatic
Invalid config	Zone	Communication configuration is incorrect.	Automatic
External humidity failure	Zone	Humidity signal is absent or incorrect.	Automatic
External temperature failure	Zone	Temperature signal is absent or incorrect.	Automatic
High Limit humidity failure	Zone	High limit humidity signal is absent or incorrect.	Automatic
TRL humidity failure	Zone	TRL humidity signal is absent or incorrect.	Automatic
TRL temperature failure	Zone	TRL temperature signal is absent or incorrect.	Automatic
Water inlet temperature failure	Pump	Water inlet temperature sensor is absent or incorrect.	Automatic
Water inlet pressure failure	Pump	Water inlet pressure sensor is absent or incorrect.	Automatic
Pump output pressure failure	Pump	High-Pressure sensor is absent or incorrect.	Automatic
VFD failure	Pump	VFD is out of operation.	Automatic
Water inlet temperature too high	Pump	Water inlet temperature is above the maximum temperature.	Automatic
Water inlet temperature too low	Pump	Water inlet temperature is below the minimum temperature.	Automatic
Water inlet pressure too low	Pump	Water inlet pressure is below the minimum pressure.	Automatic
Water inlet pressure too high	Pump	Water inlet pressure is above the maximum pressure.	Automatic
Pump output pressure too low	Pump	High-Pressure is below the minimum pressure.	Automatic
Pump output pressure too high	Pump	High-Pressure is above the maximum pressure.	Automatic
Cooling Timeout	Pump	Drain valve opens.	Automatic
Drain fault	Pump	Drain operation is out of order.	Automatic
Oper Temp High	Pump	Pump operating temperatures is too high.	Automatic
Service alarm	Pump	Pump requires servicing.	Automatic
Pressure Timeout	Pump	Communication delay is too long.	Automatic
Cooling Timeout	Pump	Communication delay is too long.	Automatic
Invalid configuration	Pump	Configuration is invalid.	Automatic
Service warning	System pump	System will require service soon.	Manual
Service alarm	System pump	System requires service.	Manual
Pump timeout	System pump	Communication delay is too long.	Automatic
Zone timeout	System pump	Communication delay is too long.	Automatic



Start-Up Procedure

Once the installation is complete, follow this start-up procedure in order to ensure that the SKH High-Pressure Atomizer is ready for normal operation. We strictly recommend following this procedure in order to avoid any anomaly resulting from inaccurate installation of the components.



Initial verification and start-up must be carried out by suitably qualified personnel.

Initial Verification

Clearance

1. Ensure that the humidifier cabinet and the EZC controller are installed in a location where they can be serviced correctly. ☐

2. Ensure that the pump station is installed in a temperature controlled environment of less than 86°F (30°C). Verify that the pump station is fixed securely to the ground and that it remains stable. ☐

Mechanical

3. Ensure that the EZC controller is installed in a temperature controlled environment of less than 86°F (30°C). Verify that the EZC controller is fixed securely to a support or wall. ☐

4. If an in-duct spray system is used, ensure that the nozzle rack assembly is correctly installed within the AHU. ☐

5. If an MDU is used for in-space spray distribution, ensure that it is correctly installed and secured onto the ceiling. ☐

6. Verify that the pump station water connections are installed properly:

- a) Ensure that water is supplied to the humidifier and that an isolation valve is installed on the water line. With the water isolation valve turned on, verify that there are no apparent leaks. ☐

- b) Ensure that the high-pressure water outlet of the pump station is connected properly to the high-pressure water inlet of the EZC controller. ☐

- c) Ensure that the main drain and pan drain outlets are properly connected to flexible hoses and that they are directed towards an open drain. Verify that the water drainage is not obstructed. ☐

- d) If the humidifier has the optional water overflow outlet feature, ensure that it is connected properly to a flexible hose. ☐

Hydraulic

7. Verify that the EZC controller water connections are installed properly:

- a) Ensure that the high-pressure water inlet of the EZC controller is connected properly to the high-pressure water outlet of the pump station. ☐

- b) Ensure that the high-pressure water outlet of the EZC controller is connected properly to the nozzle ramps, MDU(s) or nozzles. ☐

- c) Ensure that the water drain inlet is properly connected to the nozzle ramps, MDU(s) or nozzles. ☐

- d) Ensure that the water drain outlet is properly connected to a flexible hose and that it is directed towards an open drain. Verify that the water drainage is not obstructed. ☐

8. Verify that the zone hydraulic connections are installed properly:

- a) If an in-duct spray system is used, ensure that all nozzle ramps are properly connected and assembled onto the rack assembly. ☐



b) If a standard in-space spray distribution system is used, ensure that all nozzles within the ramp have been connected in series and that they are properly secured. ☐

c) If an in-space spray distribution system with MDU(s) is used, ensure that all MDUs are connected in series and that they are properly secured. ☐

Electrical

9. Verify that the power supply (voltage) conforms to the appliance name plate on the side of the humidifier. ☐

10. Confirm that 24Vac is present between tab 1&2 of terminal block TB11 on the EZC controller. ☐

11. Ensure that the communication cable between the pump station PCB and the EZC controller is properly installed and connected. For multi-zone systems, ensure that all EZC controllers are connected in a proper daisy chain format. Verify that shield wiring and EOL termination has been done correctly. ☐

12. Ensure that the Airflow switch is properly installed and connected to the EZC controller. If an Airflow switch is not used, verify that a jumper is connected between terminals TB10 1&3. ☐

13. Ensure that the High limit duct humidistat is properly installed and connected to the EZC controller. Verify that the setpoint is properly adjusted. If a High limit duct humidistat is not used, verify that a jumper is connected between terminals TB10 2&3. ☐

Controls

14. Ensure that the Interlock is properly connected to the EZC controller. If Interlock is not used, verify that a jumper is connected between terminals TB10 3&4. ☐

15. If a room or duct humidistat is used, verify that it is fixed securely to the wall or duct respectively and ensure that it is properly connected to the EZC controller. Verify that the setpoints are properly adjusted. ☐

16. If a TRLH thermostat is used, verify that it is fixed securely to a support or wall located within the desired zone and ensure that it is properly connected to the EZC controller. Verify that the setpoints are properly adjusted. ☐

17. Turn the power on using the circuit breaker disconnect switch. ☐

18. Confirm the control set-up of the humidifier by accessing the **4A) Source** option, located in the **Controls** menu. If a password is required, enter **757**. ☐

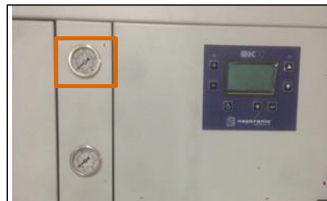
19. Confirm that the type of signal (0-10Vdc or 2-10Vdc) of each analog input corresponds to the type set by accessing the **4B) Signal** option, located in the **Controls** menu. ☐




Start-Up

1. Proceed to start-up the humidifier, as follows:
 - a) Turn on the water supply valve that is connected to the humidifier and verify that water is flowing directly to the water supply inlet of the pump station. Ensure that the water isolation valve is turned off. ☐
 - b) Remove the access panel located on the left side of the front of the humidifier cabinet, in order to gain access to the high-pressure pump. ☐
 - c) Loosen the 2 Allen screws located on the top and the bottom of the pump. ☐
 - d) Press the Menu button * to access the Main Menu screen. Navigate to the **Service** menu and enter the password **637** (if required). Then, select the **C) Drain Command** option. ☐
 - e) Set the value of the **Man. Prime Start** setting to **Start**, in order to start the drain sequence. The pump will then start draining. ☐
 - f) After 3 minutes have passed and the air from the pump has drained, retighten the 2 Allen screws located on the top and the bottom of the pump. ☐
 - g) Set the value of the **Man. Prime Stop** setting to **Stop**, in order to stop the drain sequence. ☐
 - h) In order to drain the air from the zone(s) and run a zone test, press the Menu button * to return to the **Service** menu screen. Then, navigate to and select the **B) Simulation Mode** option. ☐
 - i) Set the value of the **Pump demand** setting to **30%**. ☐
 - j) Select the appropriate zone(s) using the **Zone Select** setting (**1, 2 ...10 or All**) and set the value of the **Zone demand** setting to **100%** for each zone that will be used. ☐
 - k) Set the value of the **Duration** setting to **10 min.** ☐
 - l) Once steps (i) to (k) have been completed, set the value of the **Sim. Mode** setting to **On**. ☐
 - m) After 3 minutes have passed and the air from the zone(s) has drained, slowly increase the value of the **Pump demand** setting until a value of 1000psi is displayed on the high-pressure manometer located on the front of the unit. ☐

Start-up



- n) Verify that all nozzles or MDUs within the zone(s) are spraying correctly and that the pressure is at 1000psi. Then, set the value of the **Sim. Mode** setting to **Off** and press the Menu button * to return to the Main Menu screen. ☐
- o) Turn on the humidifier by pressing and holding the Power button  for 3 seconds. Verify that the Power Display LED light is turned on. ☐
- p) Verify that there is a humidity demand displayed on the LCD screen. If there is a humidity demand, the pump station will begin pumping water to the zones and each configured zone will be activated. ☐
- q) Observe the pump station and each zone for water leaks. ☐



Safety test

2. Check the location of the Airflow switch in the system and its operation by stopping the fan. With no air movement in the air duct, the humidifier should automatically stop. ☐

3. Reset the Airflow switch if needed. ☐

End

4. The humidifier is now ready for normal operation. ☐
-



Servicing and Maintenance



This humidifier must be installed, operated, and maintained by suitably qualified personnel and in accordance with this manual.

Preventative Maintenance

Component	How Often is Maintenance Required	Maintenance Steps
Pressure manometers	Every 2000 hours	<ul style="list-style-type: none"> - Inspect the high pressure and low pressure manometers in front of the unit and verify that the pressure is the same as the ones indicated under the <i>Inlet press. sens</i> and <i>Output pressure</i> settings in the menu 2B) Pump Status. - If the pressure is not the same, replace the high pressure or low pressure manometer.
Hydraulic pipes		<ul style="list-style-type: none"> - With the unit turned on, check for leaks coming from the water supply inlet, high-pressure outlet and zone distribution piping. - If a leak is observed, replace the leaking pipes or fittings.
Nozzles		<ul style="list-style-type: none"> - With the unit turned on, verify whether the nozzles are blocked during normal operation, or whether there is scale accumulation. - If there is presence of scale, replace the nozzles.
MDU fan (only for MDU option)		<ul style="list-style-type: none"> - With the unit turned on, verify whether the MDU fan is operating correctly and without any problems. - Replace the motor fan if faulty operation is observed.
Droplet separator (option)	<ul style="list-style-type: none"> - If operated with regular tap water, every 2500 hours. - If operated with treated water, every 5000 hours. 	<ul style="list-style-type: none"> - Verify that the droplet separator is not being obstructed by scale. - If there is scale, proceed to de-scale the droplet separator as per the steps described in the De-scaling the Droplet Separator section on page 52.
Danfoss PAHT pump	Every 8000 hours	<p><u>Verifying the conditions of the pump:</u></p> <ul style="list-style-type: none"> - Measure the noise level of the pump while the unit is operating. Ensure that it is below 76db. <p><u>Disassembling and inspecting the pump:</u></p> <ul style="list-style-type: none"> - Remove the pump from the pump station by disconnecting the four screws that secure the pump to the station and by disconnecting the hydraulic hoses. - Disassemble the pump (refer to the Danfoss <i>PAH/PAHT/PAHT G 10-12.5 Disassembling and assembling</i> service guide for more details). - If the measured noise level of the pump was found to be higher than 76db, ensure that this is not due to any malfunctioning parts. - Replace any damaged or worn parts as necessary. - Reassemble the pump (refer to the Danfoss <i>PAH/PAHT/PAHT G 10-12.5 Disassembling and assembling</i> service guide for more details) and re-attach it to the pump station. <p><u>Restarting the unit:</u></p> <ul style="list-style-type: none"> - Follow the steps outlined in the Start-Up section on page 49 to restart the humidifier and ensure that it is operating correctly before resuming normal operation.



Standard Maintenance

Component	How Often is Maintenance Required	Maintenance Steps
Pre-filter and silver ion cartridges	Every 1500 hours (<i>Service alarm</i> will be displayed)	- Replace the pre-filter and silver ion cartridges. - Modify the value of the <i>Silv. ion changed?</i> setting to Yes in the menu 3A) Services , in order to reset the servicing date for the pre-filter and silver ion cartridges.
UV lamp (<i>option</i>)		- Replace the UV lamp. - Modify the value of the <i>UV lamp changed?</i> setting to Yes in the menu 3A) Services , in order to reset the servicing date for the UV lamp.

De-scaling the Droplet Separator

Step 1 - Preparation

- Refer to the manufacturer's recommendations for concentrations to apply and the method of preparation of the solution. When using phosphoric acid, do not exceed a concentration of 1 volume of acid for 10 parts water.
- Ensure that the air system (central air or ventilation system) is stopped.
- Ensure that the SKH is stopped.



CAUTION: When working with de-scaling solutions, always wear appropriate personal protective clothing, protective gloves, and eye protection.

Step 2 - Dismantle the Droplet Separator

- Turn off and isolate electrical supplies to the unit.
- Remove all media cassettes.

Step 3 - Prepare the De-scaling Solution



CAUTION: Risk of emanation of gas irritants, ensure to perform these tasks in a well-ventilated area. It is recommended to perform the following steps outside.

- Mix the de-scaling solution according to the manufacturer's recommendations.
- Use a clean container of a suitable size to completely immerse each media cassette.
- Ensure that a second clean container of a suitable size is within reach and has been filled with clean, clear water to immerse each cassette after de-scaling.

Step 4 - Remove Scale from Individual Cassettes

- Using a soft brush, lightly brush any loose scale from the surface of the media.
- Lower the individual cassettes into the de-scaling solution.
- Keep each matrix cassette in the solution until the reaction between the calcium on the matrix and the de-scaling solution is complete.



Note: The effect of the de-scaling solution will vary depending on the condition of the media's material. For an improved effect, the above process may have to be repeated.

- Clean and if necessary apply the de-scaling solution on all parts which are covered with scale.

Step 5 - Rinse

- Lift the individual cassettes out of the acid solution, while allowing any excess de-scaling solution to drip, and directly submerge them into the clean water container.
- If necessary, rinse a second time while profusely wetting the media.

Step 6 - Re-assemble and Restart

- Replace the media cassettes and media frames on the droplet separator.
- Reconnect the power supply.



Replacement Part Numbers

Component	Model	Part Number
<i>Pump</i>	SKH100	SPH2011
	SKH200	SPH2012
	SKH300	SPH2013
	SKH600	SPH2014
	SKH900	SPH2015
	SKH1200	SPH2016
<i>5 microns PP pre-filter</i>	All models	VP PF05-10
<i>Silver ion cartridge</i>	All models	VP NS-10
<i>Pressure relief valve</i>	All models	SPH2021
<i>Low pressure manometer</i>	All models	SPH2100
<i>High pressure manometer</i>	All models	SPH2101
<i>Low pressure check valve</i>	SKH100 to SKH600	SPH2102
	SKH900 & SKH1200	SPH2130
<i>Low pressure regulator</i>	SKH100 to SKH600	SPH2104
	SKH900 & SKH1200	SPH2105
<i>High pressure check valve</i>	All models	SPH2023
<i>Solenoid valve</i>	All models	SPH2024
<i>Solenoid coil</i>	60Hz models	SPH6031
	50Hz models	SPH6032
<i>Nozzle</i>	Nozzle cap	SPH2050-1
	6 lb/h (2.7 kg/h) nozzle	SPH2050-3
	8.8 lb/h (4 kg/h) nozzle	SPH2050-4
	10.8 lb/h (4.9 kg/h) nozzle	SPH2050-5
<i>Variable frequency drive</i>	SKH100 (208, 230, 240V - 1ph)	SPH6212
	SKH100 (208, 230, 240V - 3ph)	SPH6213
	SKH100 (400, 480V - 3ph)	SPH6214
	SKH100 (600V, 3ph)	SPH6215
	SKH200 (208, 230, 240V - 1ph)	SPH6216
	SKH200 (208, 230, 240V - 3ph)	SPH6217
	SKH200 (400, 480V - 3ph)	SPH6218
	SKH200 (600V, 3ph)	SPH6219
	SKH300 (208, 230, 240V - 3ph)	SPH6228
	SKH300 (400, 480V - 3ph)	SPH6229
	SKH300 (600V, 3ph)	SPH6230
	SKH600 (208, 230, 240V - 3ph)	SPH6221
	SKH600 (400, 480V - 3ph)	SPH6222
	SKH600 (600V, 3ph)	SPH6223
	SKH900 & 1200 (208, 230, 240V - 3ph)	SPH6224
	SKH900 & 1200 (400, 480V - 3ph)	SPH6225
	SKH900 & 1200 (600V, 3ph)	SPH6226



Component	Model	Part Number
<i>Motor</i>	SKH100 (208 to 240V, 380 to 480V)	SPH6108
	SKH100 (585 to 600V)	SPH6109
	SKH200 (208 to 240V, 380 to 480V)	SPH6104
	SKH200 (585 to 600V)	SPH6105
	SKH300 (208 to 240V, 380 to 480V)	SPH6113
	SKH300 (585 to 600V)	SPH6114
	SKH600 (208 to 240V, 380 to 480V)	SPH6106
	SKH600 (585 to 600V)	SPH6112
	SKH900 & SKH1200 (208 to 240V, 380 to 480V)	SPH6107
	SKH900 & SKH1200 (585 to 600V)	SPH6110
<i>High speed fuse</i>	DFJ-6A	SPH6001
	DFJ-10A	SPH6003
	DFJ-15A	SPH6004
	DFJ-20A	SPH6005
	DFJ-25A	SPH6002
	DFJ-30A	SPH6007
	DFJ-35A	SPH6008
	DFJ-60A	SPH6009
	DFJ-80A	SPH6010
<i>Low voltage circuit fuse</i>	All models	SP5109
<i>Temperature sensor</i>	All models	SPH2601
<i>Pressure transmitter (0-87 psi [0-6 bar])</i>	All models	SPH2602
<i>Pressure transmitter (0-2321 psi [0-160 bar])</i>	All models	SPH2603
<i>Main PCB</i>	All models	NW SKH-MASTERSS
<i>Pump unit PCB</i>	All models	NW SKH-SLAVESS
<i>EZC PCB</i>	All models	NW SKH-EZCSS
<i>Pump unit display board</i>	All models	NW SKV-DISPLAYSS
<i>MDU motor fan</i>	MDU-120	SPH4401
	MDU-230	SPH4402



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