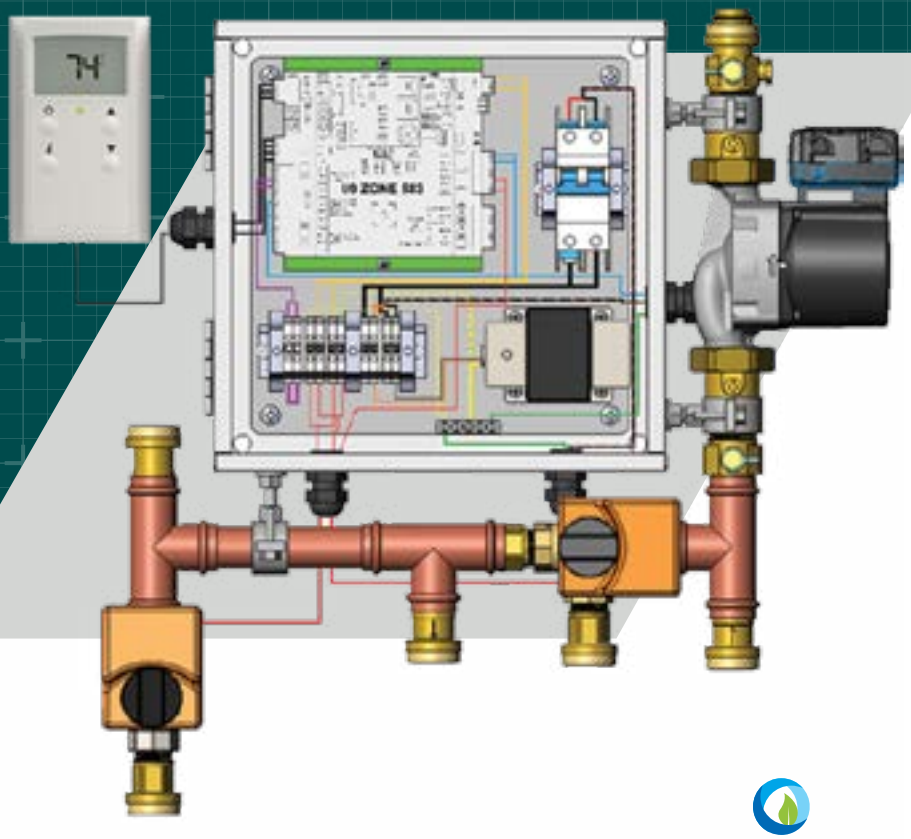
FläktGroup®

SEMCO®

NEUTON®

CONTROLLED CHILLED BEAM PUMP MODULE

OWNER'S MANUAL



NEUTON™

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WARNING

To prevent injury or death, or property damage, read and follow all instructions and warnings. Improper installation, adjustment, alteration, service maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified installer or service agency for information or assistance. The qualified installer or agency must use factory-authorized accessories when modifying this product.

Electric shock hazard. Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit to OFF at disconnect switch(es). Unit may have multiple power supplies. Follow lock out-tag out procedures when servicing.

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U.S. patented technology: 6,199,388; 6,751,964; 9,625,222

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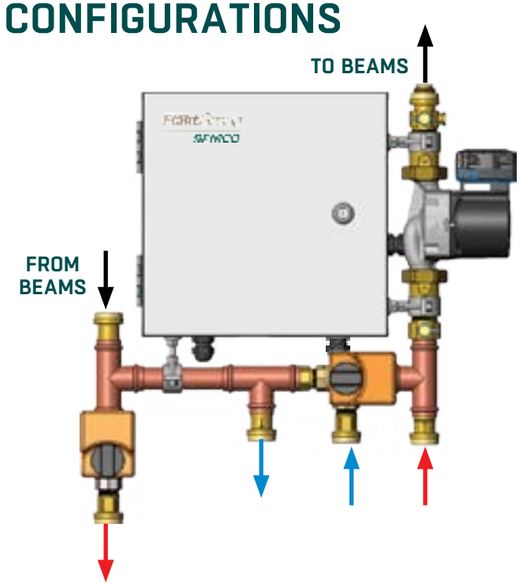
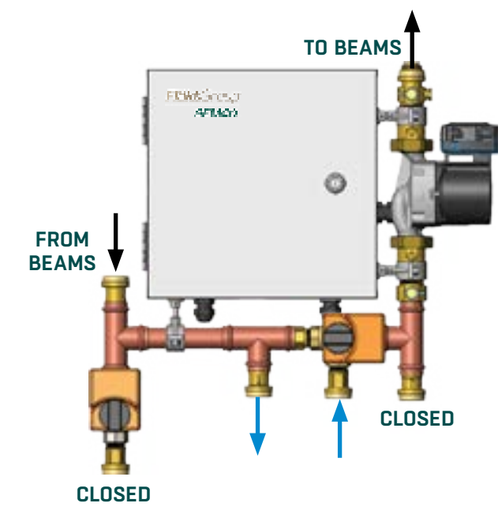
INTRODUCTION

This manual describes the installation and maintenance of the NEUTON® controlled chilled beam pump module. The descriptions include all optional equipment and devices for the unit currently available from FläktGroup® SEMCO®. If optional equipment is required after receiving the unit, please contact FläktGroup® SEMCO®.

Before proceeding with handling and installing the NEUTON®, review the important features and devices on the unit as described and explained in the following pages of this manual.

CONFIGURATIONS





NEUTON®, DUAL VALVE PUMP MODULE

- Utilized as dynamic zone operation with simultaneous heating and cooling demand
- 2 pipe primary system – return water from pump module is returned to same loop downstream from supply, on both cooling and heating loops. Requires only one actuator for both cooling and heating.
- 4 pipe primary system – return water is piped to dedicated return line, one for cold water and one for hot water. Requires only one actuator for both cooling and heating.

NEUTON®, SINGLE VALVE PUMP MODULE

- Utilized as only cooling or only heating
- 2 pipe primary system (supply/return) - requires primary system to have a summer/winter switch over
- 4 pipe primary system (cold supply/ cold return, hot supply/ hot return) - requires one actuator per circuit (one for cooling, one for heating)

PRINCIPLE OF OPERATION

NEUTON® is the HVAC industry's first smart, plug-and-play controlled chilled beam pump module (CCBPM) for reducing chilled beam system installation and operational costs.

NEUTON® is a factory-built and pre-tested CCBPM package complete with its own powered integrated direct digital controller, chilled and hot water connections, valves, variable-speed electronically commutated motor (ECM) pumps, zone sensors, and other unique features. The device provides active condensation control effectively addressing one of the key design concerns regarding active chilled beams.

The intuitiveness of NEUTON® eliminates the expense of a separate chiller, boiler and secondary water distribution system associated with conventional chilled beam HVAC designs. Instead of expensive secondary piping loops, each NEUTON® blends and re-circulates return water within its zone to convert typical 42°F and 140°F primary loop water temperatures to optimal 58°F or 100°F chilled beam discharge temperatures, which prevents cooling mode condensation and heating season heat stratification.

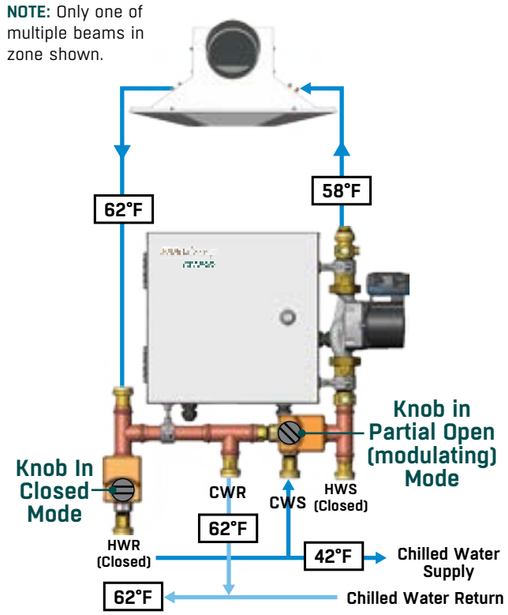
Each NEUTON® can control up to 10 chilled beams, depending upon the water flow rate required.

Numerous important design advantages are provided by the combination of Pinnacle systems with active chilled beams including:

- Very high energy efficiency
- Very low primary airflow requirements
- Low noise levels
- Reduced filter maintenance – central location not room by room
- Ideal air distribution
- Improved indoor air quality – excellent outdoor air delivery
- Ideal humidity control
- Active condensation control

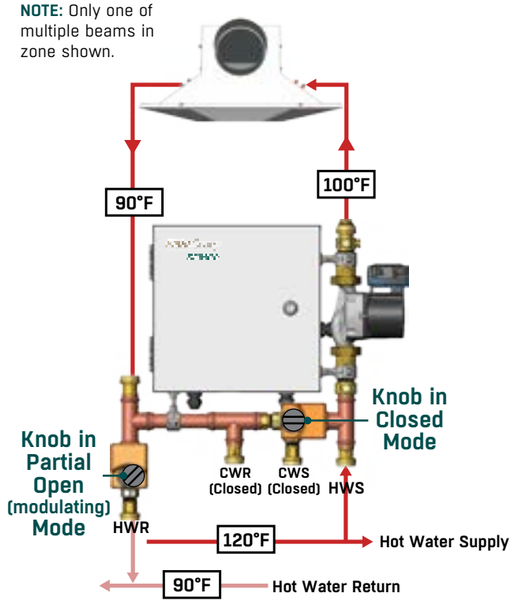
COOLING MODE
(4 pipe primary loop shown)

NOTE: Only one of multiple beams in zone shown.



HEATING MODE
(4 pipe primary loop shown)

NOTE: Only one of multiple beams in zone shown.



SEQUENCE OF OPERATION

NEUTON® receives space conditions and setpoints from either a communicating wall mount ZS Pro Zone Sensor or from the Building Automation System (BAS). The sequence begins when power is applied to the controller. The BAS can override the controller operation with a stop command.

The controller modulates the chilled and hot water valves to maintain the desired supply water temperature to the chilled beams. The water flow is modulated to maintain the desired space temperature setpoint. The controller accepts occupied and unoccupied setpoints, which may be entered either at the zone sensor, or through the BAS.

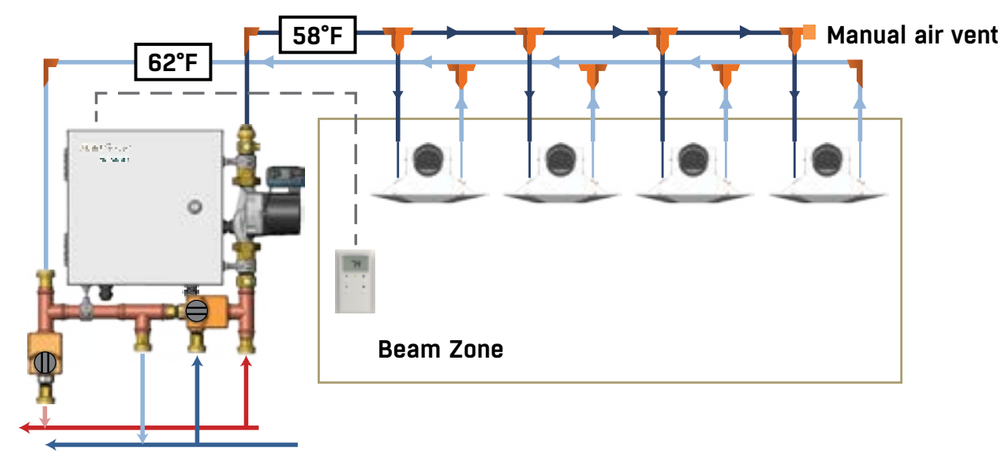
Occupied mode is initiated either by a digital input, a call from the BAS, by space CO_2 exceeding the "CO_2 force occupied mode setpoint," or by the override button on the thermostat.

On call for cooling, the chilled water valve modulates to produce the "cooling beginning water temperature" setpoint. On continued call for cooling, the pump operates at the default mid-range pump speed for a short duration and the control valves modulate, as required, to achieve the desired beam supply water temperature setpoint.

After a default time delay, if the space cooling setpoint is not achieved or if it is exceeded beyond the deadband parameters set, the pump speed is modulated between the "cooling minimum pump output %" and the "max pump demand" setpoint until space conditions are achieved.

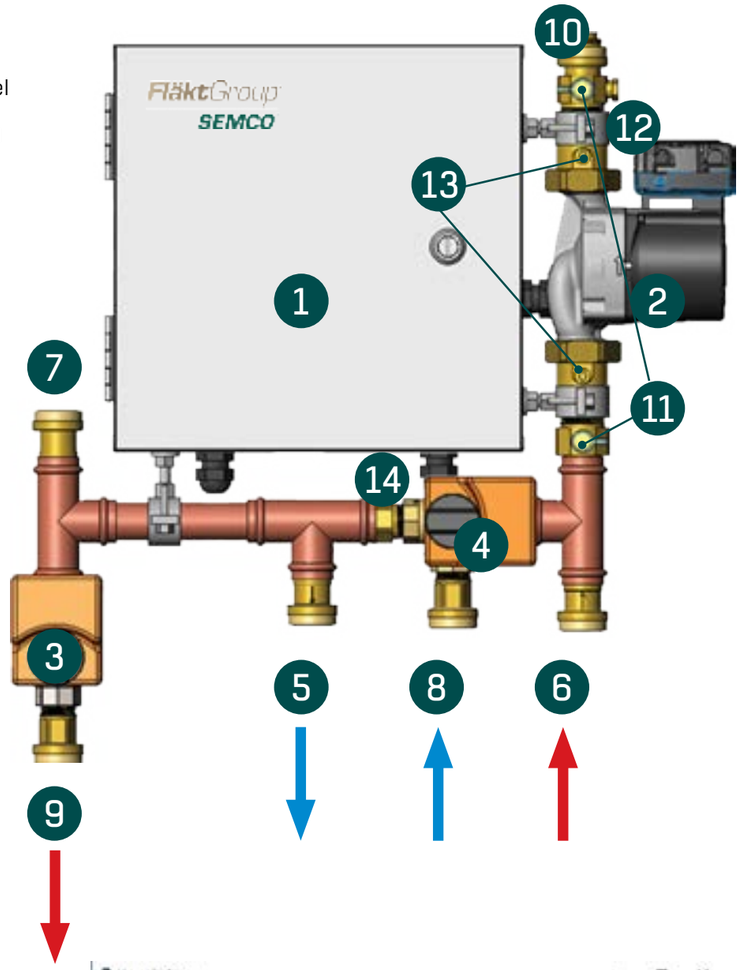
If after reaching maximum pump speed the space cooling setpoint is not achieved, after a time delay, and on continued call for cooling the water temperature delivered to the beams will be gradually reset until it is equal to the space dewpoint plus the "water offset above dew-point" setpoint.

On call for heating, the hot water valve modulates to produce the "heating beginning water temperature" setpoint. On continued call for heating the water temperature delivered to the beams will be gradually reset until it reaches 100°F. The pump is running at the "heating minimum pump output %" setpoint while the water temperature is being reset. When the water temperature reaches 100°F (adj.), and if the space heating setpoint is not reached, the pump demand will modulate from its heating minimum pump output % setpoint up to the "max pump demand" (if needed) to reach the space heating setpoint temperature.

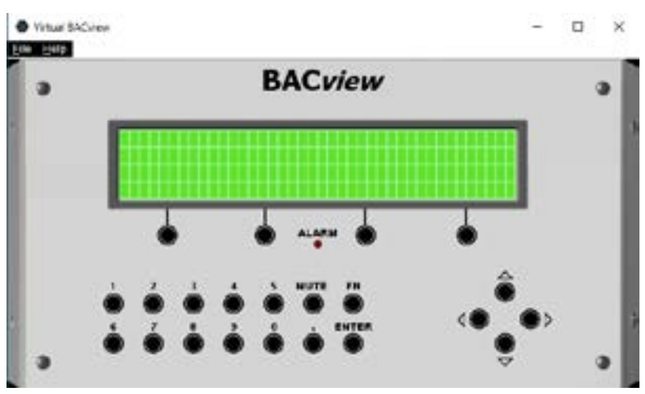


COMPONENT PARTS

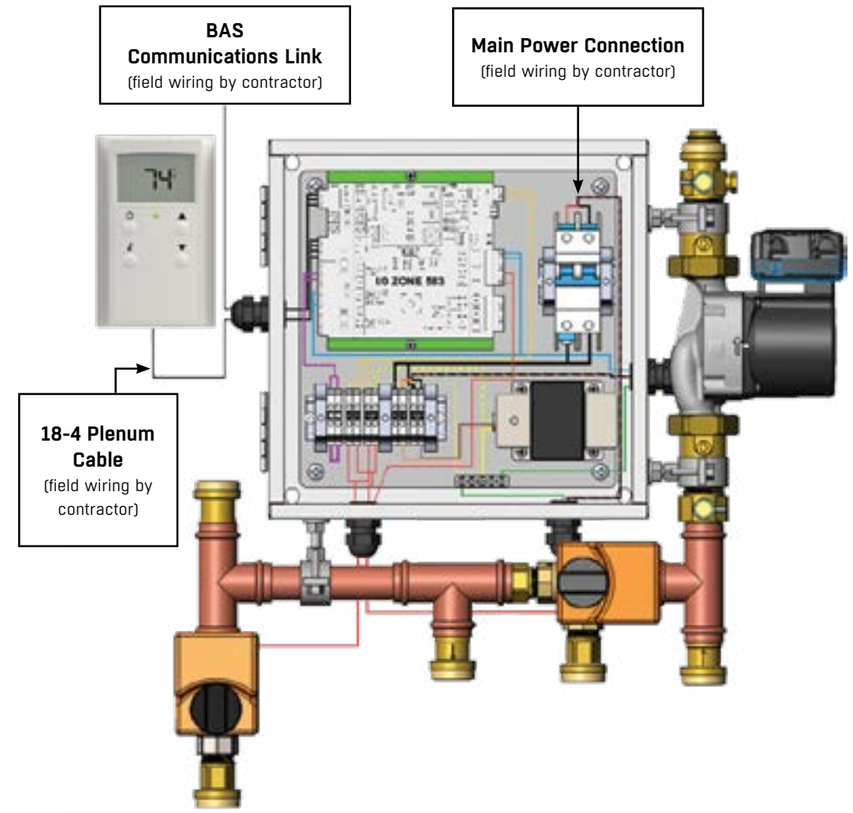
1) Integrated electrical, DDC controls panel
2) Electronically Commutated Motor (ECM) high efficiency, variable speed pump
3) Hot water control valve
4) Chilled water control valve
5) Chilled water return
6) Hot water supply
7) Zone loop return connection
8) Chilled water supply
9) Hot water return
10) Zone supply water connection
11) Pete's plugs for pressure and flow measurement
12) Zone supply water thermistor
13) Pump Isolation Valves
14) Optional Main Power Penetration and Bushing



ZS Pro Sensor Zone Controller. Temperature and Humidity standard, CO_2 optional



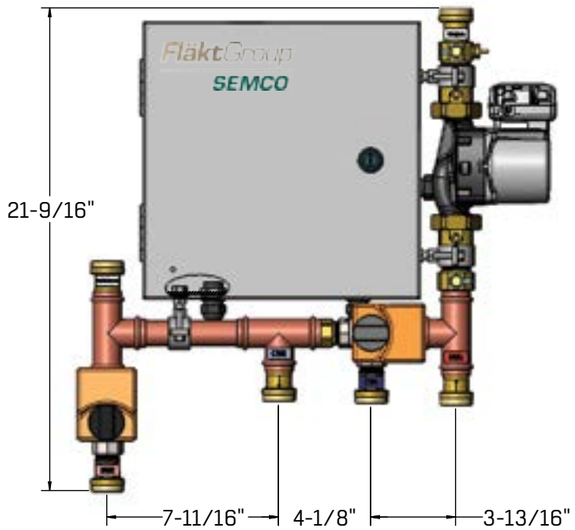
Optional Virtual BACview Keypad



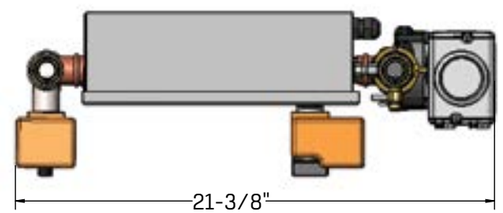
- The pump, water temperature sensor, control valves, associated electrical and controls are all factory wired and tested
- Only field connections required are main power (208/230/1Ph), zone sensor, and BAS (if used)
- On-board controls specifically developed and optimized for chilled beam zone control (plug and play)
- All pipe connections use swivel half-union adapters with face gasket designed to easily connect to standard 1" male fittings

DIMENSIONS: NEUTON® DUAL VALVE PUMP MODULE

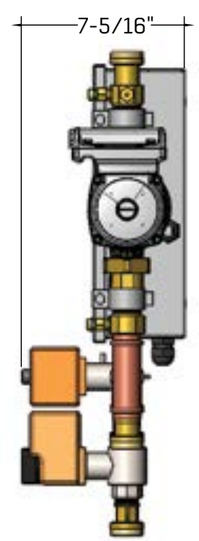
1A. FRONT



1B. TOP



1C. SIDE



1D. BACK

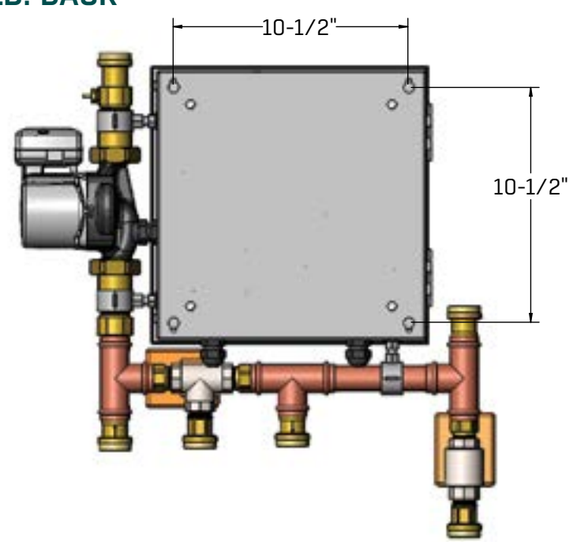
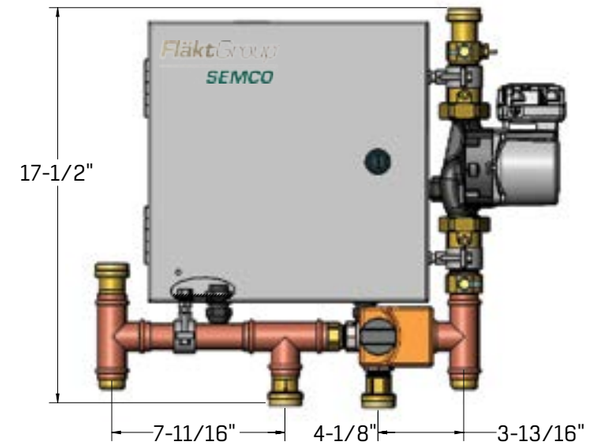


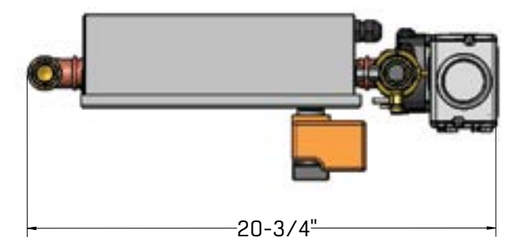
FIGURE 1. Dimensions of the NEUTON® Dual Valve Pump Module from the front (A), top (B), side (C), and back (D).

DIMENSIONS: NEUTON® SINGLE VALVE PUMP MODULE

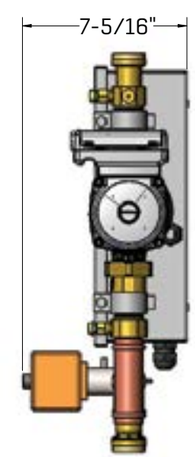
2A. FRONT



2B. TOP



2C. SIDE



2D. BACK

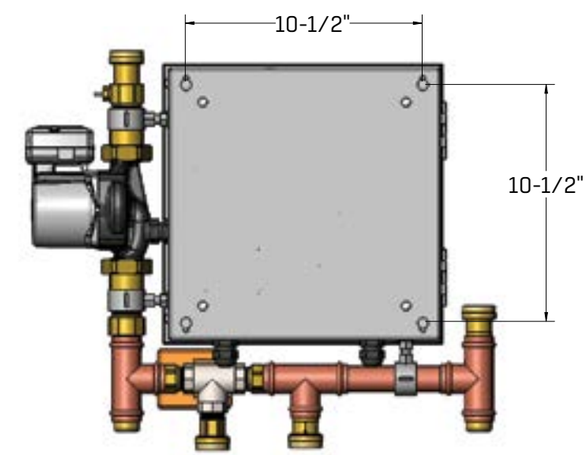


FIGURE 2. Dimensions of the NEUTON® Single Valve Pump Module from the front (A), top (B), side (C), and back (D).

RECEIVING & INSPECTION

Upon delivery, confirm that the quantity and model(s) received matches the bill of lading. If there is any discrepancy, immediately notify FläktGroup® SEMCO®.

Inspect the packages for signs of damage. If damage is suspected, contact FläktGroup SEMCO® immediately. If no visible damage is apparent, the unit should be properly stored until installation.

INSTALLATION & WIRING

1) A control panel penetration/bushing will need to be inserted to accommodate the BAS and/or zone sensor wiring. Installer should determine optimal positioning per final installation orientation. The use of a knockout punch is recommended for penetration(s). Install bushing. **NOTE:** Take care to keep the inside of the control panel free of metal shavings when installing hole.

2) Mount unit to an appropriate bracing system. The pump module can be mounted in any position that allows the pump shaft to be oriented horizontally while not allowing the terminal box to be oriented in a downward position (See **FIGURE 3**). See the dimensional drawings in **FIGURES 1D and 2D** for the dimensions between the four (4) mounting holes for each configuration. At a minimum, 12" should be added to the width and 12" to the depth of the panel shown to allow reasonable service access to the pump and the valves and to allow for a full swing of the electrical panel door. Correct wiring to the control panel will be hampered if the panel door cannot swing fully open.

3) Infrastructure piping to the Neuton (See **ITEMS 5,6,8,** and **9** in the components drawing on **PAGE 6**) can be either hard connected or flexible braided hoses (highly recommended) can be used. If hard connecting the infrastructure piping directly to the Neuton, first disconnect the o-rings that are attached to the unit and place on each pipe connection. (See **FIGURE 4**) Ensure that the installation piping is cut and located properly, so that all o-rings are compressed evenly across all hard connections, and that the swivel adapters are not used to "pull" the pipe to the Neuton. Stress due to over-tightening, thermal expansion or under compression can result in nuissance leaks.

FIGURE 4. Place provided o-rings on all pipe connections.

See the dimensional drawings in **FIGURES 1A** and **2A** on **PAGES 8** and **9** for the dimensions between pipes. All piping connection ports on the Neuton are 1" female National Pipe Tapered (NPT) swivel half-union adapters with face gaske, designed to connect to standard 1" male National Pipe Tapered Fittings (NFT) to be provided by the installing contractor. Tighten the swivel nut by hand and then gently snug with pliers (1/8 to ¼ turn) for a leak-free joint.

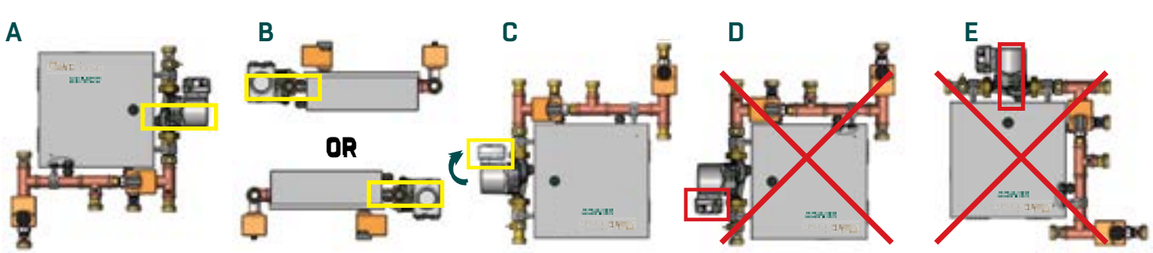


FIGURE 3. Acceptable (A, B, C) and unacceptable (D, E) mounting orientations. **NOTE:** that orientation D can be utilized provided that the pump motor is field rotated to an acceptable position (C).

4) When using flexible braided hoses (recommended), substantial flexibility is provided with regard to the alignment and length of the infrastructure piping required. Stress is removed, the risk of nuisance leaks is greatly reduced, and the installation time (labor) can be substantially less than when hard connections are made. Flexible, stainless steel braided hoses can be provided from the factory or sourced, as specified, by the contractor. Flexible hoses can and should integrate the necessary isolation valves to facilitate the servicing or replacement of all Neuton key operating components. Details are discussed in more detail within the maintenance section of this document.

5) **WARNING!** Air in the system will damage the pump: air must be completely eliminated from the pump module and chilled beam loop using a vent at the high point. The actuator control valves must be manually opened to facilitate filling the system (See **FIGURE 5**). After the system is filled, the valve should be returned to automatic operation. Be sure the knob has "popped" out to the engaged position to return to automatic mode. See **FIGURE 6** for position of valve knob and rotation direction switch after venting is complete.

FIGURE 5. Actuator control valve with the dial shown in closed/bypass mode. Press and rotate 90 degrees for open mode.

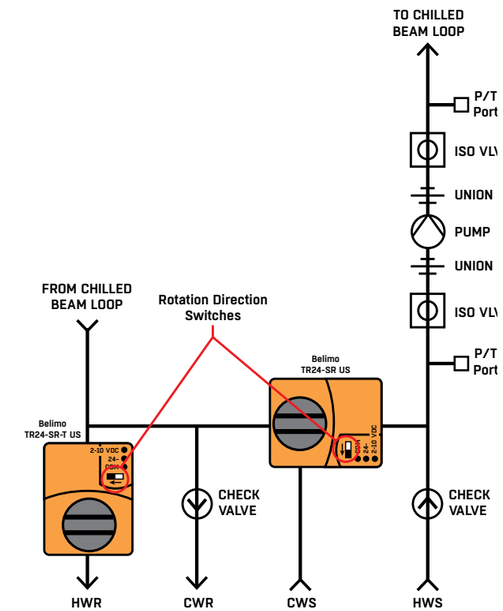


FIGURE 6. Position of valve knob and rotation direction switch **AFTER** venting.

VENTING THE PUMP

Venting the pump prior to operation ensures that all air is out of the pump rotor can, and the back bearings are lubricated with water. The pump is vented by rotating the center screw on the pump a single turn counterclockwise (See **FIGURE 7**) and allowing a drop of water to escape. Tighten the vent screw when complete.

FIGURE 7 If the pump air locks, manually rotate the center cap on the pump to vent.

ELECTRICAL WIRING

Make electrical connections as shown in the appropriate electrical schematic for your configuration rung 103 (See **PAGES 13-14**).

Power Requirements:

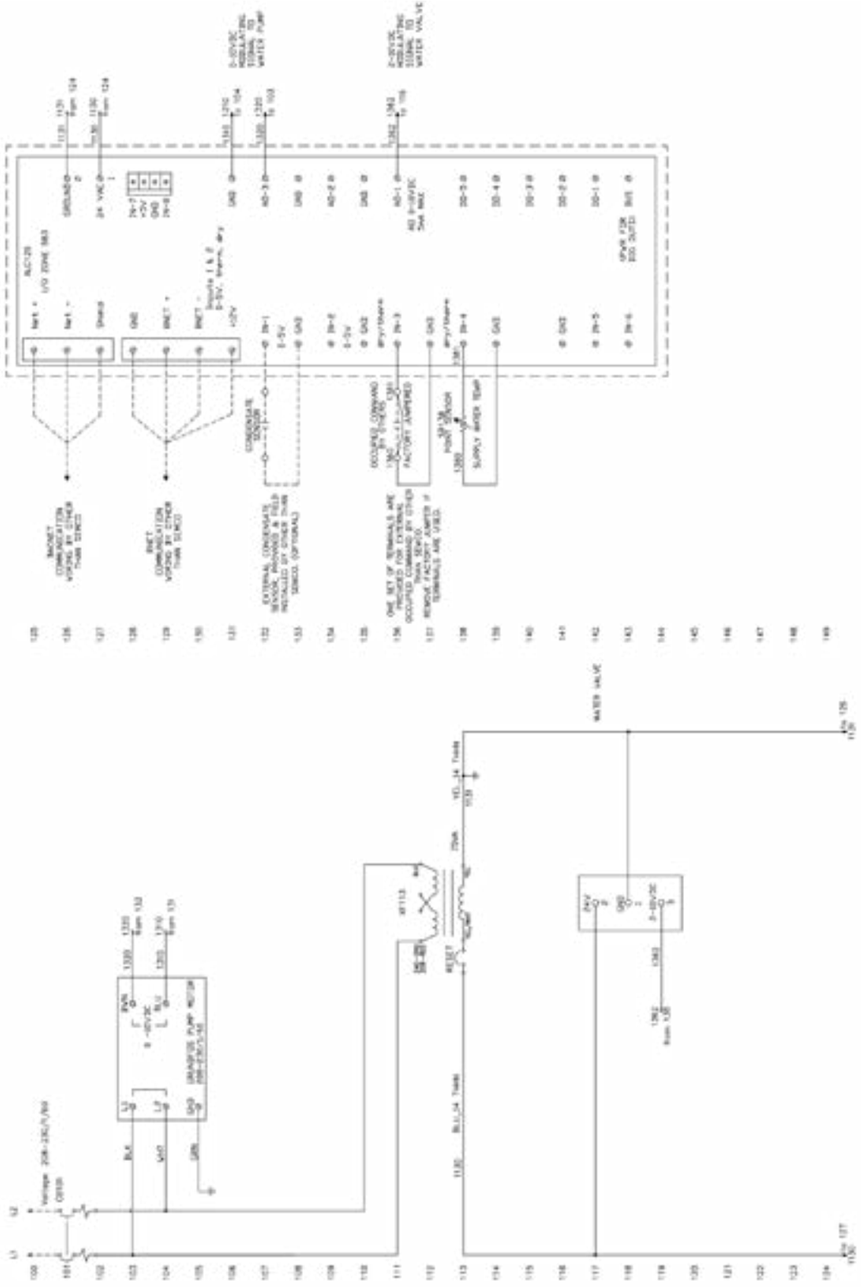
- Voltage: 208-230/1/60
- Amp Draw: 1.2 FLA

It is highly recommended that when wiring between the zone valves and the Neuton control panel (especially for Neutons serving multiple zone valves) wire markers are used to number the individual control wires so that when connections are made to the Neutons the proper wire is landed at the proper zone designation. An important step in commissioning will be to ensure that the zone valve feeding chilled beams cycles with changes made at the corresponding thermostat.

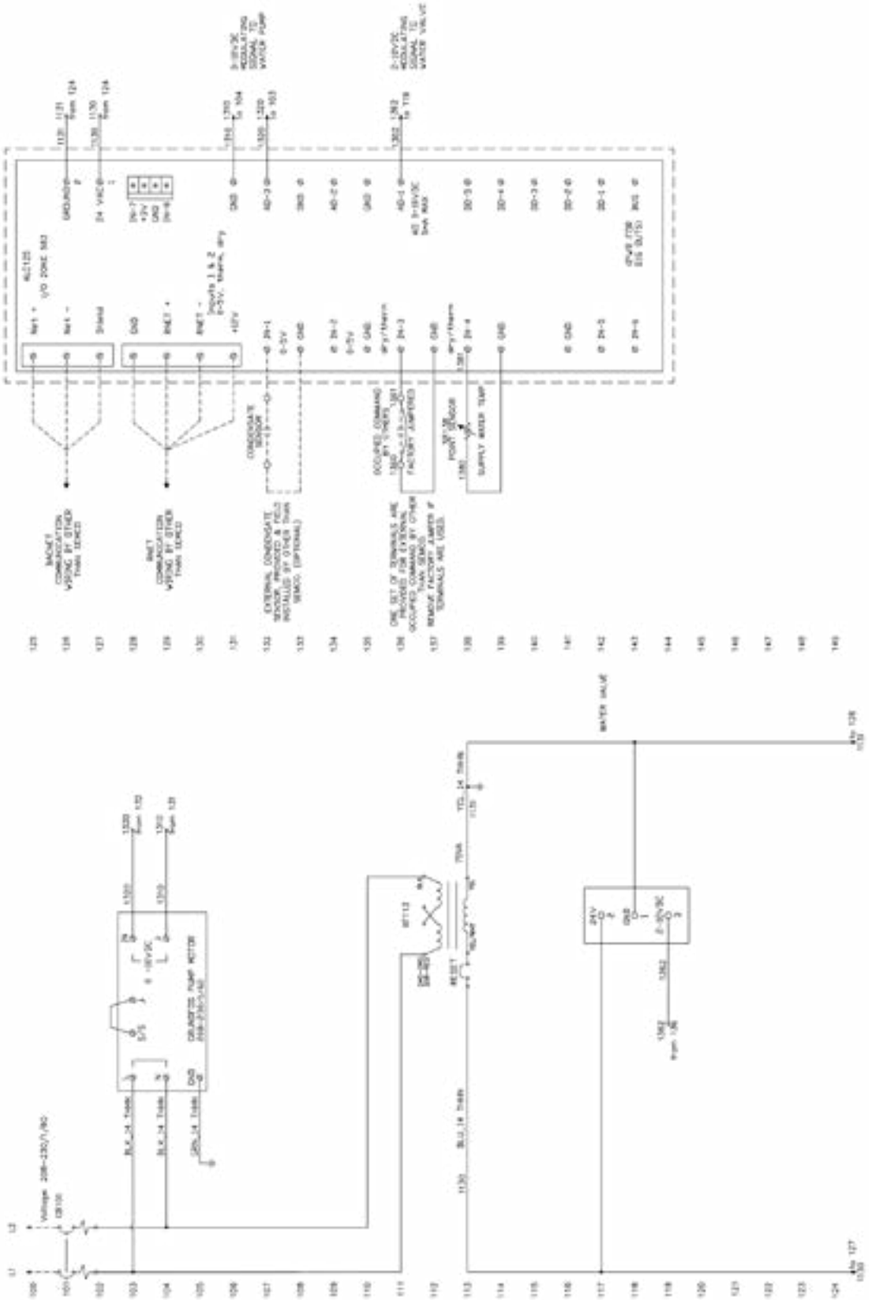
⚠ WARNING

ELECTRIC WIRING MUST BE CARRIED OUT BY A QUALIFIED ELECTRICIAN.

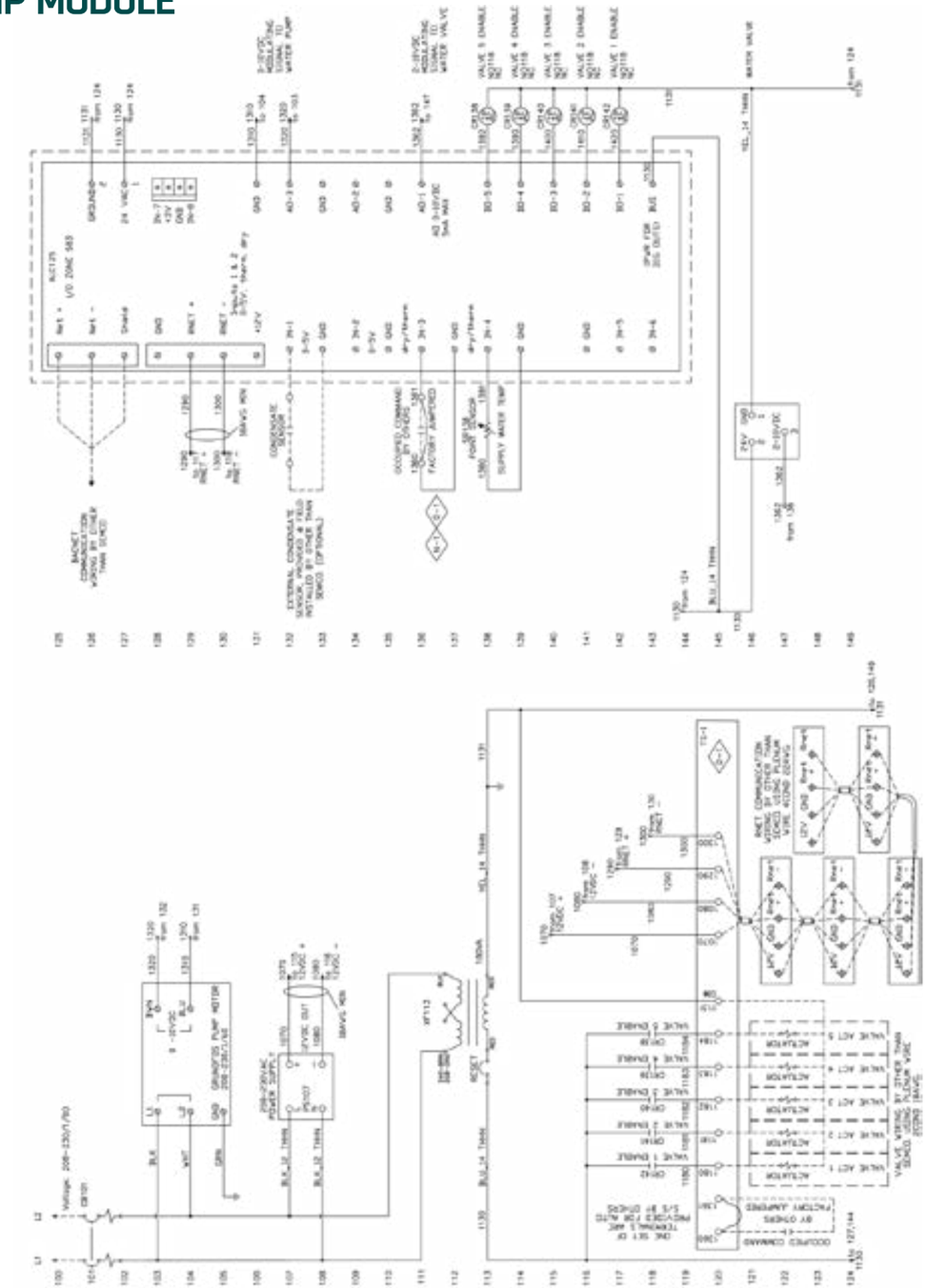
ELECTRICAL SCHEMATIC: NEUTON®, SINGLE ZONE, SINGLE VALVE PUMP MODULE



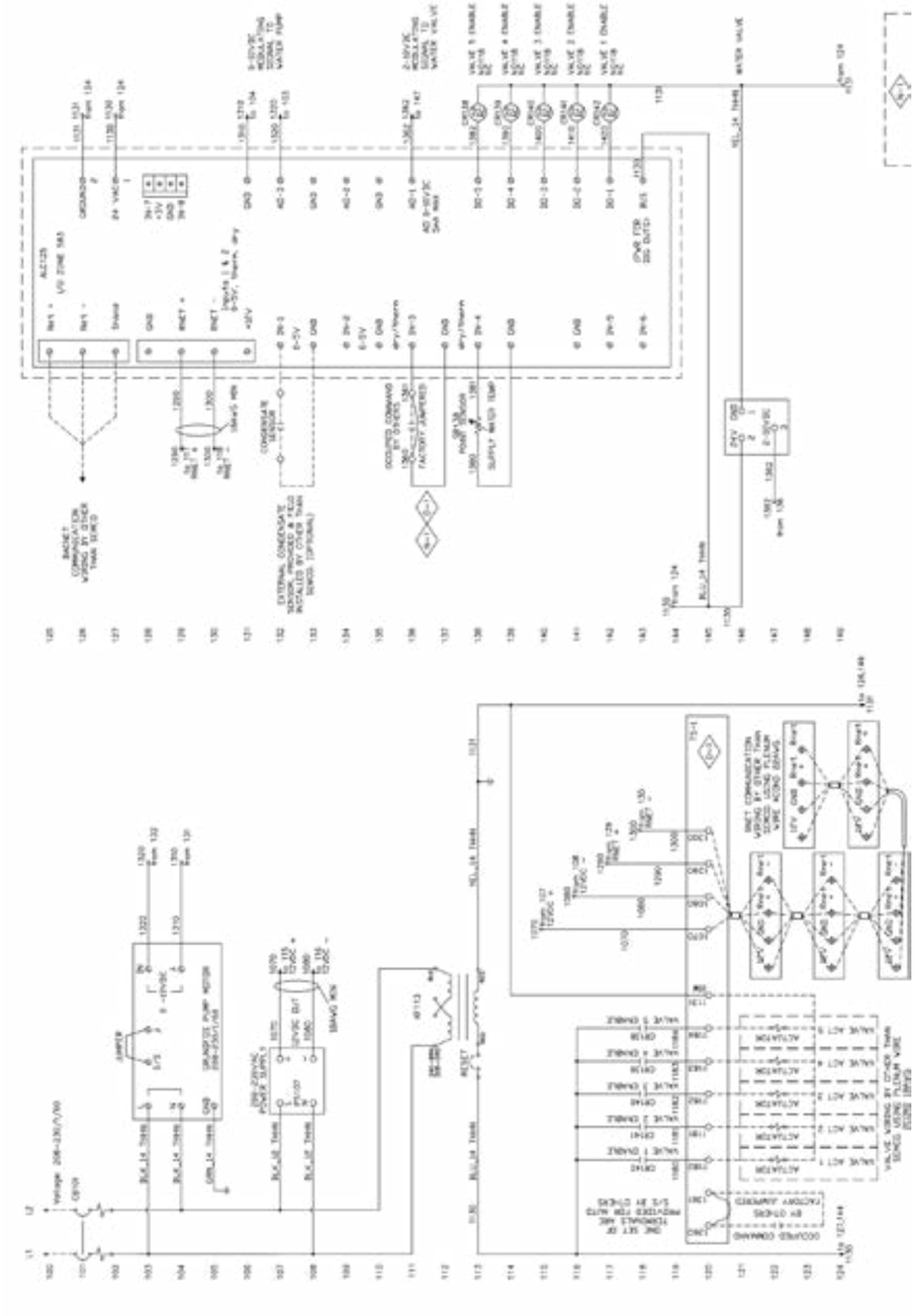
ELECTRICAL SCHEMATIC: NEUTON®, SINGLE ZONE, SINGLE VALVE HIGH CAPACITY PUMP MODULE



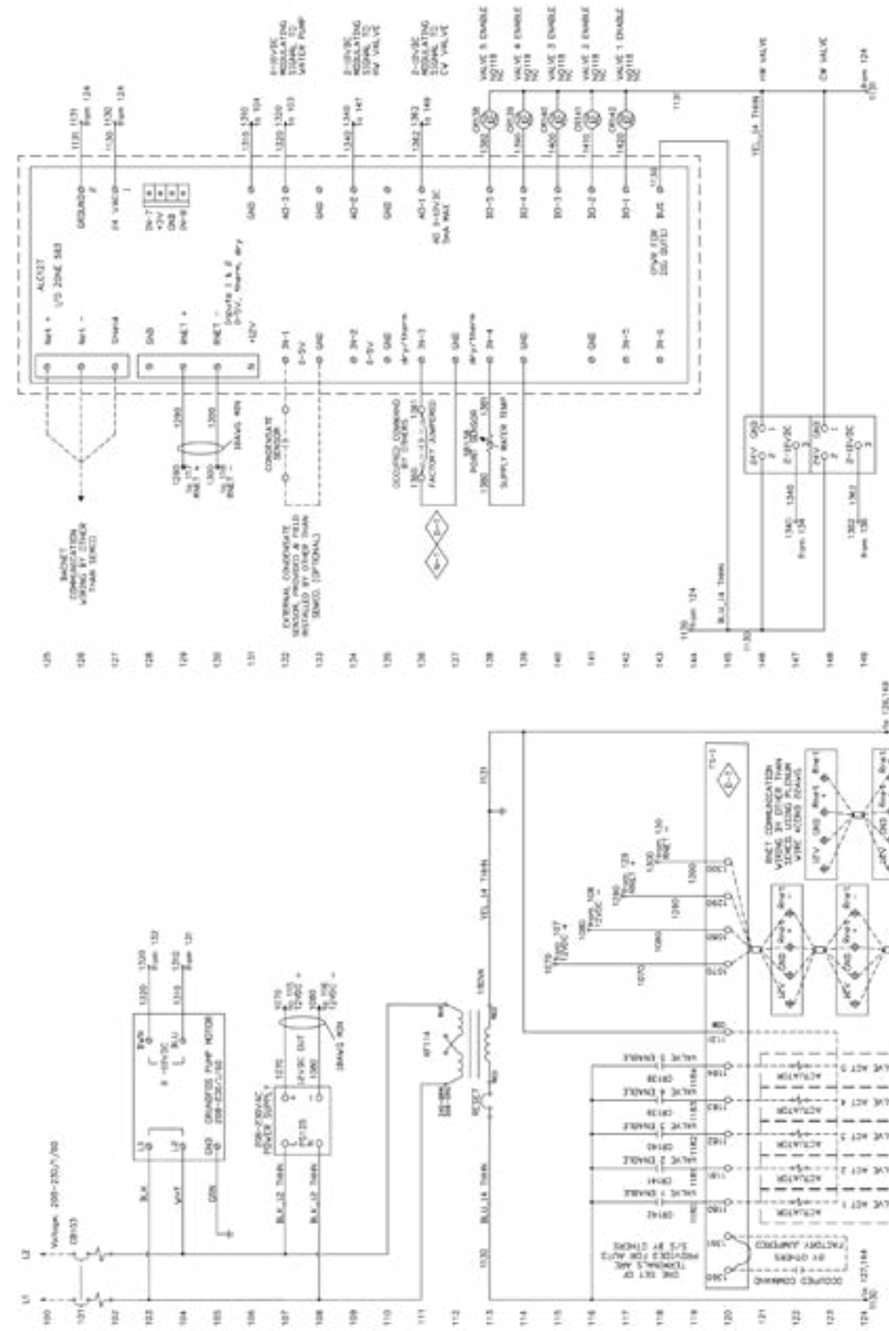
ELECTRICAL SCHEMATIC: NEUTON®, MULTI-ZONE , SINGLE VALVE PUMP MODULE



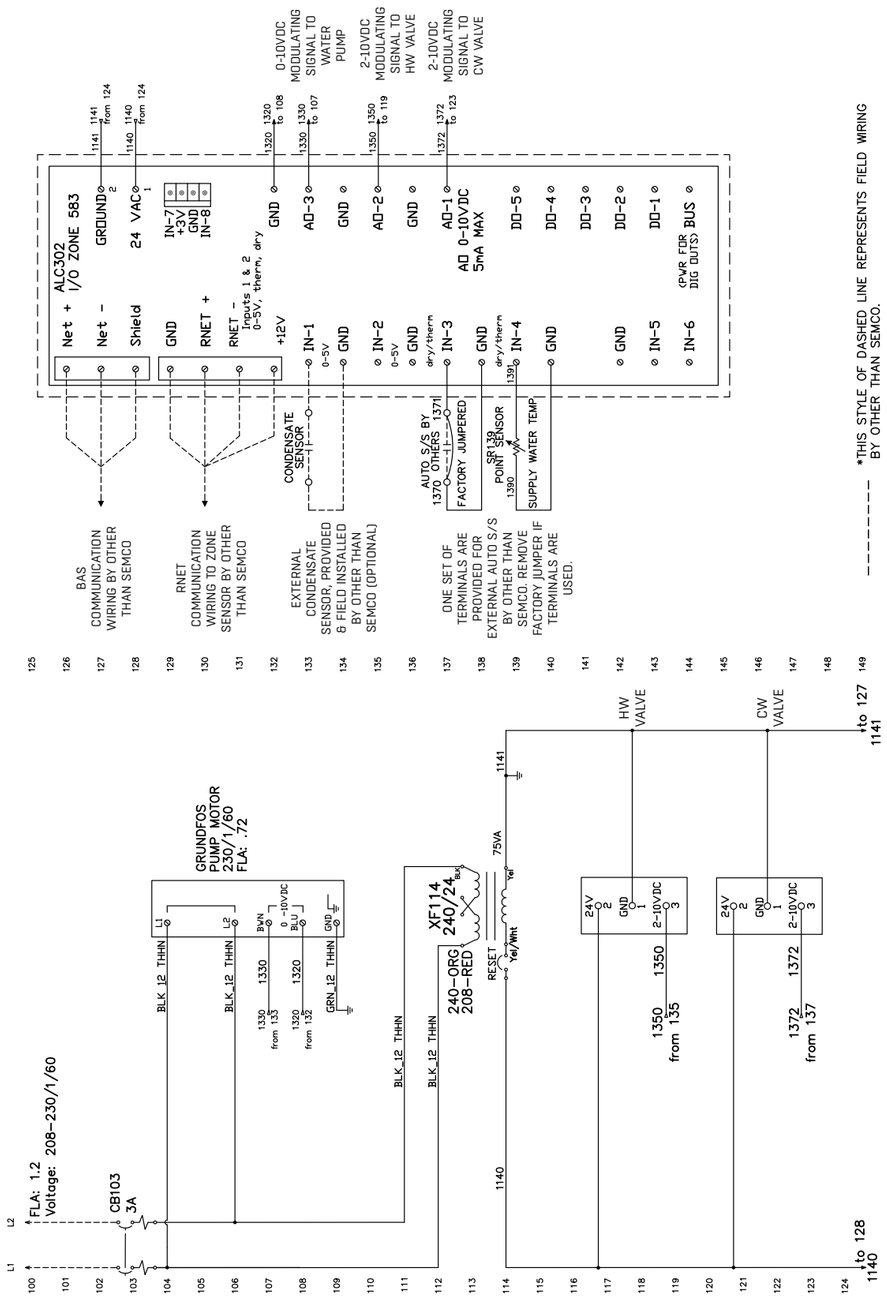
ELECTRICAL SCHEMATIC: NEUTON®, MULTI-ZONE, SINGLE VALVE HIGH CAPACITY PUMP MODULE



ELECTRICAL SCHEMATIC: NEUTON®, MULTI-ZONE, MULTI-VALVE PUMP MODULE



ELECTRICAL SCHEMATIC: NEUTON®, SINGLE ZONE, MULTI-VALVE PUMP MODULE



CONTROLS WIRING

The controller RS-485 communication ports accepts a 2 conductor plus shield connection for BACnet® MS/TP, N2, or Modbus® communications. ARC156 is also available.

1) A wall mount zone sensor is shipped loose for mounting in the space. The communicating sensor requires a four conductor cable. Wire the ZS Pro Zone Sensor in the chilled beam zone to the I/O Zone 583 Controller per electrical schematic rungs 129-132.
2) Connect the BACview[6] (optional).
3) Connect the start/stop contacts (optional) or jumper at terminals 1370 and 1371.

CONTROLS

BACnet® MS/TP communications are set up at the controller. See the legend in the center of the I/O Zone 583 for baud rate selection and protocol.

Available baud rates are 9600, 1.92 K, 38.4 K, and 75.8 K BPS.

Additional available protocols are N2 and Modbus.

The MAC address is set with the rotary dials on the upper left side of the controller (See **FIGURE 8**). The device ID will be 2400 + the MAC address.

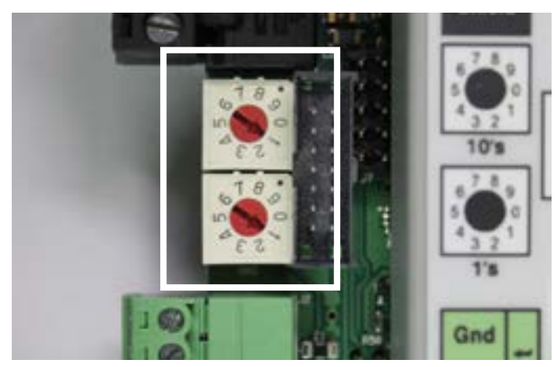


FIGURE 8. MAC Address rotary dials.

If a different device ID is required, a BACview[6] keypad must be used to either enter a specific ID or change the Base ID.

ZS PRO ZONE SENSOR

The ZS Pro Zone Sensor monitors space temperature and dewpoint to provide active condensation control while continuing to provide space heating and cooling. Information such as zone temperature, setpoints, outside air temperature, and equipment status can be viewed on the display. The controls allow you to make the zone warmer or cooler or override the schedule to put the zone in an occupied state. When the green LED is lit, the zone is in an occupied state.

The ZS Pro Zone Sensor is designed for integration with the I/O Zone 583 DDC controller. Communications are established using the Rnet communications port and only a 4 wire connection is required.

If the CCBPM is connected to a network via BACnet® and/or the zone conditions are provided to the pump module in this manner, an additional connection is easily made at the BACnet® communications port standard at the 583 DDC controller. See electrical diagram provided.

The control program determines what screens you see, what information is in each screen, and what you can adjust. The type of sensor also determines what you see. For example, if the sensor reads temperature, humidity, and CO_2, the Home screen may cycle through the current values.

FIGURE 9. ZS Pro Zone Sensor

Screen	Display Conditions
Home	The sensor has had no user interaction for 5 seconds.
Setpoint adjustment	Press the ▲ or ▼ buttons.
Information	Press the *i* button. Tap the button to cycle through various information.
Diagnostic	Hold the *i* button for 3 seconds. Tap the button to cycle through various information to troubleshoot your system.

ZONE SENSOR METRICS

- Temperature and Humidity (standard), CO_2 (optional)
- Occupied indicator
- Sensing Element Range Accuracy: Temperature 50° F to 104° F (10° C to 40° C) ±0.5° F (0.3° C) Humidity 10% to 90% ±1.8% typical CO2 ±30PPM or +/±3% of reading
- Power Requirements/Supply: DDC controller supplies the Rnet zone sensor with 12 Vdc @ 210 mA. (no additional power required)
- Communication: 115 kbps Rnet connection between sensor(s) and controller
- Local Access Port: For connecting a laptop computer to the local equipment for maintenance and commissioning
- Mounting Dimensions: Standard 4"x 2" electrical box using provided 6/32" x 1/2" mounting screws
- The ZS Pro sensor is designed for integration with the I/O Zone 583 DDC controller.
- Communications are established using the Rnet communications port and only a 4 wire connection is required even if the combined temperature, relative humidity and CO_2 sensor is utilized.
- If the NEUTON® is connected to a network via BACnet® and/or the zone conditions are provided to the pump module in this manner, an additional connection is easily made at the BACnet communications port standard at the 583 DDC controller. See electrical diagram provided.

READING THE DISPLAY: ZS PRO ZONE SENSOR

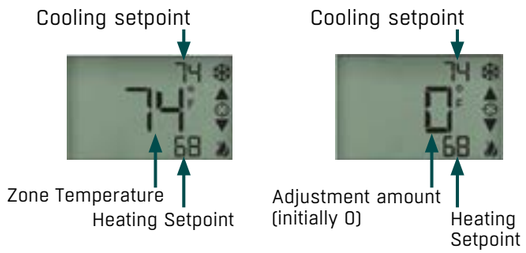
Depending on the control program and the type of sensor, you may see any of the following items in the sensor's screens.

This item...	Indicates...
°F or °C	The temperature is Fahrenheit or Celsius.
%	The value shown is percent relative humidity.
	The value shown is outside air temperature or humidity.
	Cooling
	Heating
▲ ⊕ ▼	The value(s) in the display, typically setpoints, are editable using the ▲and ▼ buttons. If the control program specifies that the value is not editable, you will see ⊕ without arrows. See: *To make the zone warmer or cooler* (page 17) and *To edit displayed values* (page 18)
	The sensor is in a timed override. See *To override the schedule* (page 17).
	The sensor's buttons are locked either because the control program specifies it or because a user locked them at the sensor. See *To lock the sensor buttons* (page 18)
OCC	The displayed setpoint is an occupied setpoint.
UnOCC	The displayed setpoint is an unoccupied setpoint.
CO2	The value shown is CO_2.
UOC	The value shown is VOC.
EFF	The value shown is the effective setpoint.
A number in the bottom left corner	A value in the control program that does not have an associated icon.

NOTE If a number on the display flashes, this indicates that the sensor cannot display the correct value (for example, the value exceeds the maximum value that the sensor can show).

MAKING THE ZONE WARMER OR COOLER

1) From the "home" screen, press the ▲ or ▼ button to show the "setpoint adjustment" screen. This screen typically shows one of the following:



2) Press the ▲ or ▼ button to adjust the zone temperature setpoint. The control program determines how much you can adjust the setpoint.

3) Wait a few seconds until the display returns to the home screen before you press any other buttons.

TO OVERRIDE THE SCHEDULE

Timed override to an occupied state

1) Press the ⏻ button one time to override the schedule and put the zone in an occupied state for a length of time specified in the control program's **INCREMENT** field.

2) Press the ▲ button to incrementally increase the time. The maximum length of time that you can override the schedule is specified in the control program's **MAXIMUM DURATION** field.

3) Wait a few seconds until the display returns to the home screen before you press any other buttons.

During the override, the bottom of the display shows the time (minutes) remaining in the override and an hourglass to indicate the override state.

NOTES:

- If programmed, you can override the schedule for an indefinite amount of time. To do this, press the ⏻ button one time, then press the ▲ button until the display shows **999**. The override remains in effect until the schedule transitions to occupied or until you cancel it.
- To cancel an override and return control to the schedule, press the ⏻ button twice.

TO LOCK THE SENSOR BUTTONS

Simultaneously press and hold the 2 buttons shown below for 5 seconds to lock the sensor's buttons. The display shows a lock icon to indicate the locked state.

Press and hold the 2 buttons again for 5 seconds to unlock the buttons.

NOTE: If you press the ⏻ button slightly before the *i* button, the sensor will go into an override state instead of locking the buttons. But, if you press the *i* button first, the buttons will lock.

TO EDIT DISPLAYED VALUES

If the display shows a value other than a zone temperature setpoint with to the ▲ ⊕ ▼ right of it, the value is editable from the sensor.

1) Press the ▲ or ▼ button to adjust the value.

2) Wait until the display returns to the home screen before you press any other buttons.

NOTE: If the control program specifies that the value is not editable, you will see ⊕ without arrows.

POINT DESCRIPTION	TYPE	RNET TAG	UNITS
INPUTS - HOME SCREEN			
Zone Temp	Analog Input	1	degF
Zone RH	Analog Input	2	% RH
OUTPUTS - INFORMATION SCREEN			
CHW Signal	AV/Output	312	%
HW Signal	AV/Output	313	%
Pump Signal	AV/Output	1300	%
Effective CHW Temp Setpoint	Analog Value	EFF ❄	degF
Effective HW Temp Setpoint	Analog Value	EFF 🔥	degF
ANALOG SETPOINTS - DIAGNOSTIC SCREEN			
CO_2 Occ Override Setpoint	Analog Setpoint	CO2	PPM
Occupied Cooling Setpoint	Analog Setpoint	OCC ❄	degF
Occupied Heating Setpoint	Analog Setpoint	OCC 🔥	degF
Unoccupied Cooling Setpoint	Analog Setpoint	UNOCC ❄	degF
Unoccupied Heating Setpoint	Analog Setpoint	UNOCC 🔥	degF

VIRTUAL KEYPAD

The BACview keypad is now virtual and can be accessed by plugging a laptop into the ZS Pro Sensor Zone controller with a USB-L cable. (See **FIGURES 10 & 11**) The virtual keypad may be used to adjust setup parameters. If the CO_2 option on the sensor is included, it may be necessary to plug a laptop, with the virtual BACview installed, directly into the wall mount sensor. (See **FIGURE 11**)

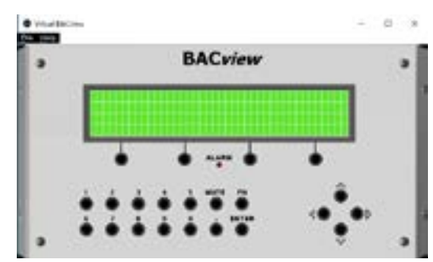


FIGURE 10. Virtual BACview Keypad (Optional - not included with module)

FIGURE 11. Plug the laptop with the virtual BACview keypad directly into the bottom of the ZS Pro Sensor zone controller.

POINTS LIST

Name	Description	Type	Object ID	Device ID	Object Name	Exp:-Num	I/O Type
Setpoint / Cooling Occupied Setpoint	Status of occupied cooling setpoint read from the Zone Sensor and after limits applied by BAS. Effective setpoint in use by controller.	BAV	AV:20	DEV:2402	occ_clg_sp_1		
Setpoint / Heating Occupied Setpoint	Status of occupied heating setpoint read from the Zone Sensor and after limits applied by BAS. Effective setpoint in use by controller.	BAV	AV:21	DEV:2402	occ_htg_sp_1		
Setpoint / Cooling Unoccupied Setpoint	Status of unoccupied cooling setpoint read from the Zone Sensor and after limits applied by BAS. Effective setpoint in use by controller.	BAV	AV:22	DEV:2402	unocc_clg_sp_1		
Setpoint / Heating Unoccupied Setpoint	Status of unoccupied heating setpoint read from the Zone Sensor and after limits applied by BAS. Effective setpoint in use by controller.	BAV	AV:23	DEV:2402	unocc_htg_sp_1		
Setpoint / Cooling Setpoint Adjust	not used - inaccessible Setblock block internal value	BAV	AV:16	DEV:2402	clg_adj_1		
Setpoint / Heating Setpoint Adjust	not used - inaccessible Setblock block internal value	BAV	AV:19	DEV:2402	htg_adj_1		
Setpoint / Effective Cooling Setpoint	not used - inaccessible Setblock block internal value	BAV	AV:17	DEV:2402	eff_clg_sp_1		
Setpoint / Effective Heating Setpoint	not used - inaccessible Setblock block internal value	BAV	AV:18	DEV:2402	eff_htg_sp_1		
Water Temp	Loop water temperature sensor wired to analog input #4	BAI	AI:1	DEV:2402	water_temp_1	0:04	Thermistor
Zone CO_2	CO_2 value from Zone Sensor	ASVI	AI:2	DEV:2402	zone_co2_1		
Zone RH	RH value from Zone Sensor	ASVI	AI:3	DEV:2402	zone_rh_1		
Zone Temp	Temperature value from Zone Sensor	ASVI	AI:4	DEV:2402	zone_temp_1		
Condensate sensor	If a sensor is wired to input #1, and a contact closure is made, the condensation alarm is ON, and all outputs are OFF or 0 demand.	BBI	BI:1	DEV:2402	condensate_sensor_1	0:01	Dry Contact
Occupied (DC)	If a sensor or contact closure is wired to input #3, and the contact is made, the occupied setpoints are used.	BBI	BI:2	DEV:2402	occupied_dc_1	0:03	Dry Contact
Pump CS	Status (only) of pump current switch if included and wired to input #2. Not an alarm point.	BBI	BI:3	DEV:2402	pump_current_switch_1	0:02	Dry Contact
Chilled Water Valve Signal	Status of signal delivered to chilled water valve from analog output # 1. Status only, not R/W	BAV	AV:1	DEV:2402	chw_sig_1		
CHW Temperature Setpoint	The active CW temperature setpoint as adjusted by demand	BAV	AV:2	DEV:2402	chw_temp_setpt_1		
CO_2 Force OCC Mode Setpoint	If CO_2 override is enabled, and the space CO_2 exceeds this value, then Occupied Mode is ON. The minimum setpoint value is 500 PPM.	BAV	AV:3	DEV:2402	co2_override_setpt_1		
Cooling Max Water Temp	The highest temperature desired for water temperature in cooling mode. Factory setting is 60°F.	BAV	AV:4	DEV:2402	chw_max_temp_1		

Name	Description	Type	Object ID	Device ID	Object Name	Exp:-Num	I/O Type
Cooling Minimum pump output (%)	Cooling Minimum pump output (%). Note: 0 - 100% pump demand is scaled to a 1.5 to 5 VDC signal which is the operating range of the pump.	BAV	AV:6	DEV:2402	clg_min_pump_output_1		
Cooling Minimum Water Temp	The minimum water temperature will be the greater of <1° above space dewpoint, Cooling Min Water Temp parameter>	BAV	AV:5	DEV:2402	chw_min_temp_1		
Dewpoint Alarm Limit	If any (space dewpoint-dewpoint setpoint) exceeds the "dewpoint alarm limit" then the Zone high dewpoint alarm is ON	BAV	AV:34	DEV:2402	dewpoint_alarm_limit_1		
Heating Max Water Temp	Max water temp setpoint. Default value is 130°F. Above this range the risk of stratification quickly rises.	BAV	AV:7	DEV:2402	hw_max_temp_1		
Heating Minimum pump output (%)	Heating Minimum pump output (%) Note: 0 - 100% pump demand is scaled to a 1.5 to 5 VDC signal which is the operating range of the pump.	BAV	AV:9	DEV:2402	htg_min_pump_output_1		
Heating Min Water Temp	Heating Min Water Temp	BAV	AV:8	DEV:2402	hw_min_temp_1		
Hot Water Valve Signal	Status of signal delivered to hot water valve from analog output # 2. Status only, not R/W	BAV	AV:10	DEV:2402	hw_sig_1		
HW Temperature Setpoint	The active HW temperature setpoint as adjusted by demand	BAV	AV:11	DEV:2402	hw_temp_setpt_1		
Maximum Pump Demand	The parameter will limit the pump speed for loops that do not require the full pump flow.	BAV	AV:12	DEV:2402	max_pump_demand_1		
Occupied Setpoint Lower Limit	Occupied setpoint lower limit (minimum heating) received from BAS via comm or set through the BACview keypad. Not adjustable at the Zone Sensor **.	BAV	AV:13	DEV:2402	occ_setpt_lower_limit_1		
Occupied Setpoint Upper Limit	Occupied setpoint upper limit (maximum cooling) received from BAS via comm or set through the BACview[6] keypad. Not adjustable at the Zone Sensor **.	BAV	AV:14	DEV:2402	occ_setpt_upper_limit_1		
Program Version	Status of FläktGroup® SEMCO® program revision	BAV	AV:15	DEV:2402	prog_ver_1		
Setpoint Adjustment Limit	Range of setpoint adjustment at the zone sensor received from BAS via comm or set through the BACview[6] keypad. Not adjustable at the zone sensor **.	BAV	AV:24	DEV:2402	setpt_adj_limit_1		
Space 2RH from BAS	BAS writes the space RH to this point, if the FläktGroup® SEMCO® wall mount zone sensor ** is not opted.	BAV	AV:225	DEV:2402	bas_space_2_rh_1		
Space 2 T from BAS	BAS writes the space temperature to this point, if the FläktGroup® SEMCO® wall mount Zone Sensor ** is not opted.	BAV	AV:226	DEV:2402	bas_2_space_temp_1		
Space 3 RH from BAS	BAS writes the space RH to this point, if the FläktGroup® SEMCO® wall mount Zone Sensor ** is not opted.	BAV	AV:325	DEV:2402	bas_space_3_rh_1		
Space 3 T from BAS	BAS writes the space temperature to this point, if the FläktGroup® SEMCO® wall mount Zone Sensor ** is not opted.	BAV	AV:326	DEV:2402	bas_space_3_temp_1		
Space 4 RH from BAS	BAS writes the space RH to this point, if the SEMCO wall mount zone sensor ** is not opted.	BAV	AV:425	DEV:2402	bas_space_4_rh_1		

POINTS LIST, CONTINUED

Name	Description	Type	Object ID	Device ID	Object Name	Exp:-Num	I/O Type
Space 4 T from BAS	BAS writes the space temperature to this point, if the SEMCO wall mount Zone Sensor ** is not opted.	BAV	AV:426	DEV:2402	bas_space_4_temp_1		
Space 5RH from BAS	BAS writes the space RH to this point, if the FläktGroup® SEMCO® wall mount zone sensor ** is not opted.	BAV	AV:525	DEV:2402	bas_space_5_rh_1		
Space 5 T from BAS	BAS writes the space temperature to this point, if the FläktGroup® SEMCO® wall mount zone sensor ** is not opted.	BAV	AV:526	DEV:2402	bas_space_5_temp_1		
Space RH from BAS	BAS writes the space RH to this point, if the FläktGroup® SEMCO® wall mount zone sensor ** is not opted.	BAV	AV:25	DEV:2402	bas_space_rh_1		
Space T from BAS	BAS writes the space temperature to this point, if the FläktGroup® SEMCO® wall mount zone sensor ** is not opted.	BAV	AV:26	DEV:2402	bas_space_temp_1		
Temperature Alarm Limit	If any (space temperature-current temperature setpoint) exceeds the "temp alarm limit" then the zone high temperature alarm is ON. If any (current temperature setpoint-space temperature) exceeds the "temp alarm limit" then the zone low temperature alarm is ON.	BAV	AV:35	DEV:2402	tempalarmlimit_1		
Unoccupied Setpoint Lower Limit	Unoccupied setpoint lower limit (minimum heating) received from BAS via comm or set through the BACview[6] keypad. Not adjustable at the zone sensor **.	BAV	AV:27	DEV:2402	unocc_setpt_lower_limit_1		
Unoccupied Setpoint Upper Limit	Unoccupied setpoint upper limit (maximum cooling) received from BAS via comm or set through the BACview[6] keypad. Not adjustable at the zone sensor **.	BAV	AV:28	DEV:2402	unocc_setpt_upper_limit_1		
Water Offset Above Dew-Point	The low water temperature limit as an offset above the space dewpoint. The controller clamps this value to no less than 1. Greater numbers provide additional protection against condensation.	BAV	AV:29	DEV:2402	water_temp_dewpt_offset_1		
Water Pump Signal	Status of signal delivered to water pump from analog output # 3. Status only, not R/W. Note - 30% of 5 VDC or 1.5 VDC constitutes an off command for the pump. A signal of 0 VDC cause the pump to run at a low speed.	BAV	AV:30	DEV:2402	pump_sig_1		
Zone 1 Dewpoint	zone dewpoint calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:131	DEV:2402	zone_1_dewpt_1		
Zone 1 Enthalpy	zone enthalpy calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:132	DEV:2402	zone_1_enth_1		
Zone 1 Grains	zone grains calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:133	DEV:2402	zone_1_grains_1		

Name	Description	Type	Object ID	Device ID	Object Name	Exp:-Num	I/O Type
Zone 2 Dewpoint	zone dewpoint calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:231	DEV:2402	zone_2_dewpt_1		
Zone 2 Enthalpy	zone enthalpy calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:232	DEV:2402	zone_2_enth_1		
Zone 2 Grains	zone grains calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:233	DEV:2402	zone_2_grains_1		
Zone 3 Dewpoint	zone dewpoint calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:31	DEV:2402	zone_3_dewpt_1		
Zone 3 Enthalpy	zone enthalpy calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:32	DEV:2402	zone_3_enth_1		
Zone 3 Grains	zone grains calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:33	DEV:2402	zone_3_grains_1		
Zone 4 Dewpoint	zone dewpoint calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:436	DEV:2402	zone_4_dewpt_1		
Zone 4 Enthalpy	zone enthalpy calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:437	DEV:2402	zone_4_enth_1		
Zone 4 Grains	zone grains calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:438	DEV:2402	zone_4_grains_1		
Zone 5 Dewpoint	zone dewpoint calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:539	DEV:2402	zone_5_dewpt_1		
Zone 5 Enthalpy	zone enthalpy calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:540	DEV:2402	zone_5_enth_1		
Zone 5 Grains	zone grains calculated based on the temperature and RH input from (selectable) the zone sensor or BAS comm input	BAV	AV:541	DEV:2402	zone_5_grains_1		
Zone RH 1		BAV	AV:711	DEV:2402	zone_rh_1_1		
Zone RH 2		BAV	AV:712	DEV:2402	zone_rh_2_1		
Zone RH 3							BAV
Zone RH 4		BAV	AV:714	DEV:2402	zone_rh_4_1		
Zone RH 5		BAV	AV:715	DEV:2402	zone_rh_5_1		
Zone Temp 1		BAV	AV:701	DEV:2402	zone_temp_1_1		
Zone Temp 2		BAV	AV:702	DEV:2402	zone_temp_2_1		

POINTS LIST, CONTINUED

Name	Description	Type	Object ID	Device ID	Object Name	Exp:-Num	I/O Type
Zone Temp 3		BAV	AV:703	DEV:2402	zone_temp_3_1		
Zone Temp 4		BAV	AV:704	DEV:2402	zone_tmp_4_1		
Zone Temp 5		BAV	AV:705	DEV:2402	zone_tmp_5_1		
Allow Co_2 Override	If this point is ON, and if the signal if valid from the Zone Sensor CO_2 sensor, then if the space CO_2 is greater than the "CO_2 force OCC mode setpoint", AV:3, then occupied mode is forced.	BBV	BV:1	DEV:2402	allow_co2_override_1		
CO_2 Option	This point must be set to ON if CO2 is included in the sensor	BBV	BV:2	DEV:2402	co2_opt_1		
CO_2 Override Status	If CO_2 option BV:2 is "ON" and conditions are met, this status point will be on and the mode will be "occupied".	BBV	BV:3	DEV:2402	co2_override_1		
Cooling Mode Status	Cooling Mode Status - if "heating mode" has been off for 1 minute, and shutdown mode is not active, and heat is called by the thermostat, then "cooling mode status" is ON.	BBV	BV:5	DEV:2402	clg_status_1		
Heating Mode Status	Heating Mode Status - if "cooling mode" has been off for 1 minute, and shutdown mode is not active, and heat is called by the thermostat, then "heating mode" status is ON.	BBV	BV:6	DEV:2402	htg_status_1		
OCC Command from BAS	If this point is ON, the controller uses the occupied setpoints	BBV	BV:7	DEV:2402	occupied_bas_1		
Occ Status	If an occupied command BV:7 is ON, or the occupied dry contact BI:2 is ON, or if the CO_2 override BV:3 is ON then the status is occupied and occupied setpoints are used	BBV	BV:8	DEV:2402	occ_status_1		
Override On	Status of the occupancy override button on the zone sensor	BBV	BV:9	DEV:2402	zs_override_on_1		
Run Status	If there is a call for heating or cooling, and there is no condensation or shutdown command active, then the pump will be on and either the cooling or heating valve will modulate	BBV	BV:10	DEV:2402	run_status_1		
Schedule	Communication based occupancy command received from BAS schedule or time clock.	BBV	BV:11	DEV:2402	schedule_1		
Shutdown from BAS	If this point is ON, all signals are forced to OFF or 0 demand	BBV	BV:12	DEV:2402	shutdown_bas_1		
Use BAS Inputs	If this point is ON, space temp and RH values are received from the BAS via comm. If the zone sensor is not opted, this point must be ON.	BBV	BV:14	DEV:2402	use_bas_inputs_1		
Condensation Alarm	Status of digital input #1, BI:1.	BALM	BV:504	DEV:2402	condensation_alarm_1		
Unit Alarm	If any alarm is ON, unit alarm is ON.	BALM	BV:13	DEV:2402	unit_alm_1		
Water Temperature Alarm	If the water temperature sensor is out of range (<30, >200) the alarm is ON.	BALM	BV:515	DEV:2402	water_temp_alarm_1		
Zone High Dewpoint Alarm	Zone high dewpoint alarm	BALM	BV:521	DEV:2402	zone_high_dewpoint_alarm_1		

Name	Description	Type	Object ID	Device ID	Object Name	Exp:-Num	I/O Type
Zone High Temperature Alarm	Zone high temperature alarm	BALM	BV:519	DEV:2402	zone_high_temp_alarm_1		
Zone Low Temperature Alarm	Zone low temperature alarm	BALM	BV:520	DEV:2402	zone_low_temp_alarm_1		

TROUBLESHOOTING

Problem	Action
Pump Air Locks	The pump is vented by rotating the center screw on the pump a single turn counterclockwise (See **FIGURE 11**) and allowing a drop of water to escape. Tighten the vent screw when complete.
No Flow/Movement in Actuator	Check valve and actuator replacement to ensure valve and actuator are aligned properly.
Valve and Actuator Replacement	See the following section "Valve and Actuator Replacement" for instructions.

MAINTENANCE & SERVICING OF KEY NEUTON COMPONENTS

In addition to avoiding nuisance leaks and simplifying the installation, the recommended use of flexible stainless steel braided hoses integrates the isolation valves necessary to service and, if necessary, replace all the key components of the Neuton.

FIGURE 12 shows the location of the necessary isolation valves (total of 5 circled in **RED**). An optional isolation valve (circled in **GREEN**) is shown in the supply air piping leaving the Neuton pump. This is optional since there are integrated isolation valves (outlined in **LIGHT BLUE**) just before and after the pump housing to facilitate the replacement of the entire pump housing in the unlikely event that it is ever needed. These pump isolation valves are shown within the graphic on **PAGE 6** and labeled as **ITEM 11**, located before and after the pump housing.

There are two check valves located within the brass fitting labeled **ITEM 5** and **6** within the graphic shown on **PAGE 6**. The locations of the two check valves are circled in **DARK BLUE** withing **FIGURE 12**. These check valves seldom need service unless plugged with debris and are easily replaced once the brass fittings are accessible. The isolation valves previously discussed are necessary for any check valve maintenance.

As discussed on **PAGES 30** and **31**, the chilled and hot water control valve actuators are easily removed for service by simply loosing one screw located in the center of the actuator indicator knob once the power wiring is disconnected to avoid short circuiting, If replaced, makng sure the actuator rotation direction dip switch is properly set, which is critically important for proper operation (see **PAGE 11**).

In the unlikely event that the hot or cold control valve body needs to be replaced as discussed on **PAGES 30** and **31**, the entire Neuton can be removed once the isolation valves are closed and the NEuton valve train is drained. To avoid disconnecting the electrical wiring, the Neuton is designed to allow only the valve train to be removed (highlighted in **FIGURE 12** by the **YELLOW** dashed ine) once the flexible hoses are removed and drained.

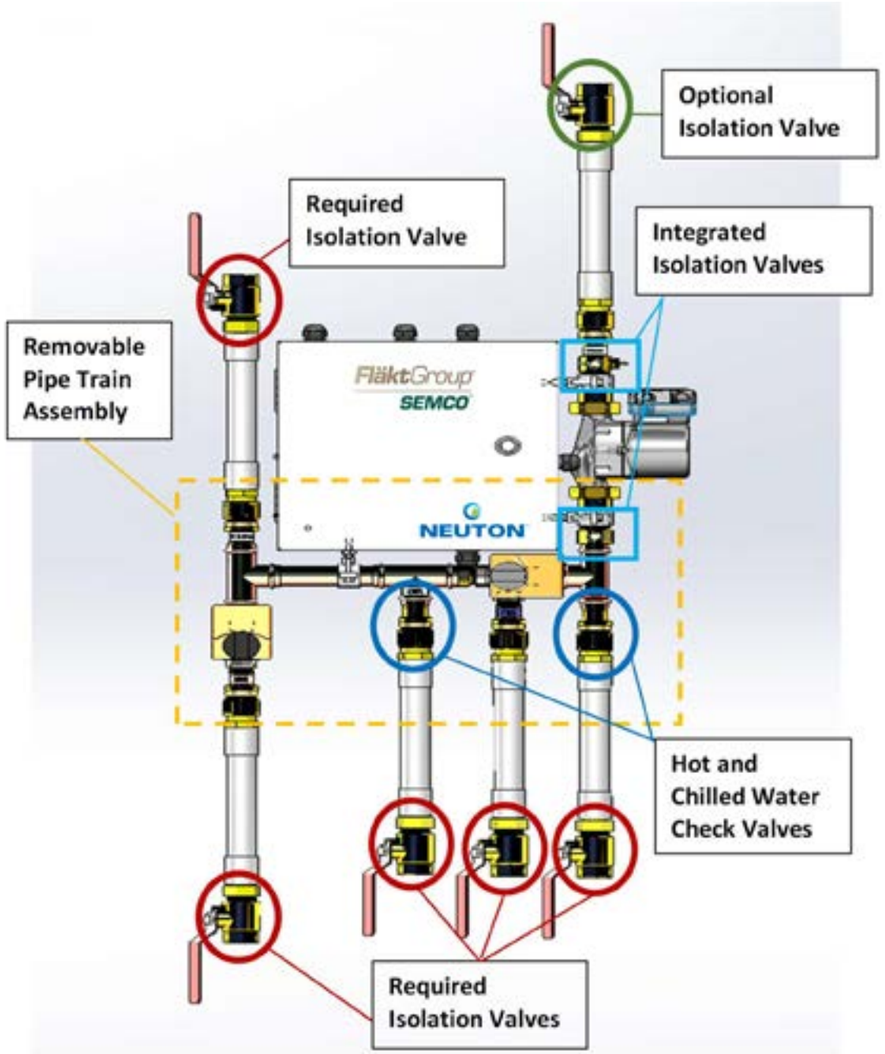


FIGURE 12

VALVE AND ACTUATOR REPLACEMENT

Should for any reason the control valves need replacing follow this procedure.

NOTE: the orientation and rotation of the valve bodies are not the same. Failure to install the valves and actuators properly will result in loss of functionality. **WHEN SERVICING THE UNIT BE SURE TO DISCONNECT POWER TO THE UNIT**.

HOT WATER ACTUATOR REPLACEMENT

The hot water valve is a one way mixing valve with a Belimo actuator. **WHEN REPLACING THE ACTUATOR BE SURE TO DISCONNECT POWER TO THE UNIT**. Next remove wiring from terminals. **BE SURE TO NOTE LOCATION AND COLOR OF CONDUCTORS.**

Remove the phillips screw in the center of the actuator knob (see **FIGURE 13**).

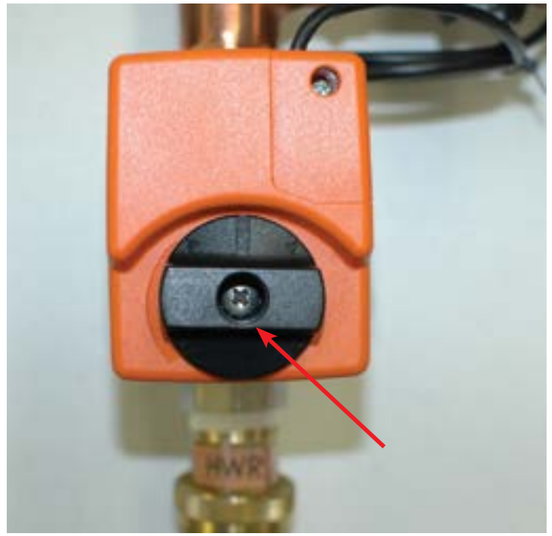


FIGURE 13. Hot water actuator knob.

Remove old actuator.

As shown in **FIGURE 14** the dial is horizontal indicating a zero flow position. The 0-10 Volt signal for this orientation is 0 volts.

FIGURE 14. Valve core position for reinstalling knob onto the hot water valve.

NOTE: The orientation of the notches on the center post at 9:00, 6:00 and 3:00 o'clock. This is the proper orientation of the valve to the actuator at a 0 volt signal. Again this only applies to the hot water 1-way valve. The valve must be oriented in this position when replacing to assure proper operation.

In operation the hot water valve rotates from the 0 volts position shown in **FIGURE 13**, clockwise 90°. By pushing in on the black knob the valve/actuator should move in this manner. If not the actuator is misaligned. To realign the actuator to the correct orientation remove the actuator from the valve. Pushing in on the knob, rotate the knob as far counter-clockwise as it will go. Now completely pull out the knob and re-insert it oriented as shown in **FIGURE 13**. Reinstall onto the valve with the valve core in the position shown in **FIGURE 14**.

CHILLED WATER 3-WAY VALVE ACTUATOR REPLACEMENT

As shown in **FIGURE 15** the chilled water valve is a 3 way mixing valve with the same type Belimo actuator as used on the hot water valve. **WHEN REPLACING THE ACTUATOR BE SURE TO DISCONNECT POWER TO THE UNIT**.

FIGURE 15. Chilled water actuator knob.

FIGURE 16. Valve core position for reinstalling knob onto the chilled water valve.

Remove the control wiring noting the placement and color of each conductor.

Orient the new actuator as shown in **FIGURE 15**. The actuator shown is in the full bypass mode, (no primary loop water entering) and the position brought about by a signal of 0 volts. This reorientation can be accomplished by removing the center screw and pulling out the black knob and reinserting it as shown. For the cold water valve the knob should rotate from the position (see **FIGURE 15**) 90° clockwise. If the actuator does not rotate in this manner the actuator is misaligned. With the actuator removed from the valve. Push in on the knob, rotate it as far as it will go in the clockwise direction. Remove the black knob and re-insert it as shown in **FIGURE 15**. Reinstall it onto the valve body being sure that the valve core is oriented as shown in **FIGURE 16**.

FIGURE 16 shows the chilled water valve with the actuator removed. Note the orientation of the notches in the center post are at 9:00, 12:00, and 3:00 o'clock. This orientation is required for the valve and actuator to operate properly. Install knob screw. Re-attach the wiring per schematic.

HOT AND/OR COLD VALVE REPLACEMENT

In the unlikely event that the valve body needs replacement it is suggested that the unit be drained and removed to facilitate the disassembly of the unit. Once the new valve is installed the essential step is again correct orientation of the valve stem with the correct orientation of the actuator as shown in **FIGURES 15** and **16**.

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