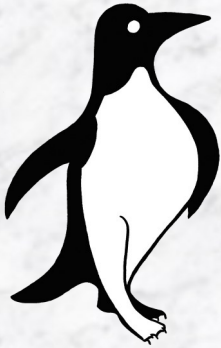
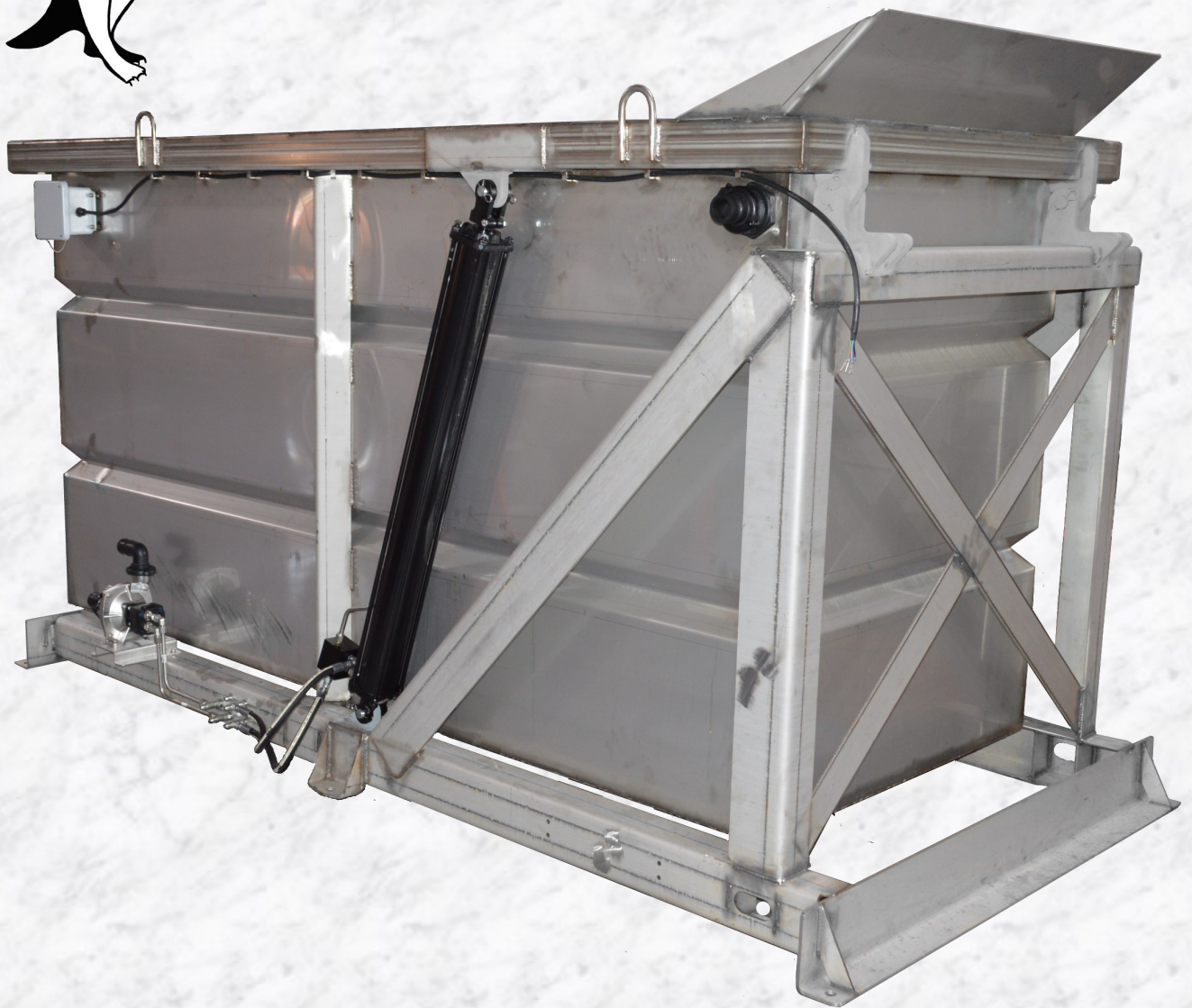


HYDRAULIC BRINE SYSTEM



SS-PLC3000-HYD-T
HYDRAULIC BRINE MAKER
WITH AUTOMATIC SALINITY AND
PLC CONTROL



**INSTALLATION, START-UP, and MAINTENANCE
MANUAL**

Rev. 3.3 2-11-2021

PENGWYN

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!! WARNING !!

The Pengwyn Hydraulic Brine System Has an Automatic mode that starts and stops equipment automatically.

Maintenance must **NOT** be performed while power is applied to the unit. Failure to follow proper Lock-Out/Tag-Out procedures can result in damage to equipment and cause severe or even fatal injury.

Unit must only be operated by properly trained personnel.

Maintenance must only be performed by properly trained technicians. This manual is not a replacement for proper training. For additional training and information on the Hydraulic Brine System, please Contact PENGWYN.

LIMITED WARRANTY

PENGWYN warrants Hydraulic Automatic Brine Maker to be free of defects in material and workmanship, under normal use and service for a period of one (1) year from date of shipment. PENGWYN's obligation under this warranty is limited to repairing or replacing at its factory, or other location designated by PENGWYN, any part or parts thereof which are returned within thirty (30) days of the date when failure occurs or defect is noted, with transportation charges prepaid, and which upon examination appears to PENGWYN's satisfaction to have been defective. **Such free repair or replacement does not include transportation charges, or the cost of installing the new part or any other expense incident thereto. Pengwyn will not be liable for other loss, damage, or expense directly or indirectly arising from the use of its products, nor will PENGWYN be liable for special, incidental or consequential damages.**

Ordinary wear and tear, and damage from abuse, misuse, neglect or alteration are not covered by this warranty. PENGWYN assumes no liability for expenses incurred or repairs made outside PENGWYN's factory except by written consent. PENGWYN's warranty also does not cover the requirement of calibration. All calibration is to be performed by the end user after receiving training and with the use of the technical manual. This warranty is null and void if instructions and operating procedures are not followed.

Equipment or parts not manufactured by this company, but which are furnished in connection with PENGWYN products, are covered directly by the warranty of the manufacturer supplying them. However, PENGWYN will assist in obtaining adjustment on such equipment or parts when necessary.

THIS WARRANTY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND OF ANY OTHER OBLIGATION OR LIABILITY OF PENGWYN.

PRODUCT IMPROVEMENT LIABILITY DISCLAIMER

PENGWYN reserves the right to make any changes in or improvements on its products without incurring any liability or obligation whatever and without being required to make any corresponding changes or improvements in products previously manufactured or sold.

Field plumbing and wiring is the responsibility of the customer and should be done in accordance with PENGWYN's circuit requirements and applicable building codes.

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Hydraulic System Benefits

The PENGWYN Hydraulic Brine System incorporates fifteen plus (15+) years of experience in brine making machinery. The hydraulic powered brine maker has some major advantages over the electric powered models.

- The only high voltage electric power to the brine maker is located at the hydraulic power unit which is remote from the operator's push button station.
- The push button station is operated with 24 volt DC current which is inherently safe for the operator eliminating troublesome GFI circuits.
- The variable speed hydraulic pumps allow infinitely variable flow adjustment via hydraulic flow controls. This eliminates troublesome globe valves in the brine lines which plug up, leak and put non-productive back pressure on the brine system.
- The system includes hydraulic power and control for the cleanout dumping cylinders eliminating the need for dump truck hydraulic jumper hose disconnects which rust.
- The system includes as standard a 150 GPM hydraulic driven truck fill station. PENGWYN can supply a wired remote control box if desired.
- Pipe thread connections have been eliminated. Those who have had experience with salt brine and pipe threads are familiar with how brine will creep around these connections and present a perpetual housekeeping problem due to leakage.
- The hydraulic brine pumps have silicon carbide seals with four (4) times the expected life of ceramic seals. In the event of a pump problem the pumps are easy to remove for maintenance.

Brine Maker Requirements

Electrical:

- 3ph 208v, 60hz 60A **MINIMUM** electrical service

Control Room Temperature:

Dedicated enclosure:

- 50° F **MAXIMUM** room temperature for frequent or continuous operation.

NOTE: While continuous brine making operations generally take place in cold weather, Ventilation may be required in small or well insulated spaces to remove excess heat generated by brine making equipment

- 33° F **MINIMUM** to prevent fresh water from freezing.
 - A small heater may be required to maintain minimum temperature of the fresh water pipe

Larger enclosure/garage:

- Larger Spaces allow for more air circulation for cooling, and can be held at higher ambient temperatures without causing Over temp conditions.

Fresh Water:

- 1-1/2" tap water supply line **MINIMUM**
- Fresh water inlet **MUST** have a back-flow preventer
- 60PSI **MAXIMUM** inlet pressure
- Ensure that unit is protected from over pressure and water hammer potentially caused by other systems

NOTE: Water Pressure directly affects Brine Production. Too little water pressure, or small inlet pipe, will slow brine production. High water pressure will make it difficult to balance transfer operations, and may damage equipment.

Control Room Requirements:

- Location for the control adjacent to the Hopper and in line of sight for dumping and truck loading.
- Low salinity light must be located where it can be seen by yard personnel while performing their normal duties.

Hopper/Frame Requirements:

WARNING: THE HOPPER COULD WEIGH FROM 10,000 LBS TO 15,000 LBS WHEN IT IS BEING DUMPED, THEREFORE, THE LIFTING FRAME MUST BE WELL ANCHORED FOR SAFETY.

- A pad 14FT by 24FT is adequate for most installations with one 6,000 gallon storage tank.
- 8" thick concrete pad **MINIMUM**
- 3/4" -10 galvanized all-thread epoxied into a 6" to 7" deep hole in the concrete.
 - The anchor bolts should be either the J bolt style put in when the concrete is poured or epoxy style.
- Access to the brine maker Hopper on two sides.
 - A long side for loading salt, and a short side for clean out to a front-end loader.
- Overhead clearance of 16'6" **MINIMUM** for hopper cleanout.
- All carbon steel framework and fittings located in the brine hopper area will eventually corrode, therefore, it is recommended that proper plastic, stainless steel and brass materials be used.
- The centrifugal pumps will not self prime and therefore must be mounted as low as possible so that their suction ports are flooded.

Storage Tanks:

- The 2" bulkhead for the storage tank transfer pump inlet should be located as high on the tank as possible to prevent back flow to the hopper through the Centrifugal Pump.
- The storage tank float wire bulkhead and strain relief should be installed as high as possible in the storage tank.
- The float weight should be adjusted to about 6" from the float.
- The storage tank shut down float must be adjusted to shut off the transfer pump before the brine level reaches the transfer pump inlet.

NOTE: Filling above the bulkhead would back flow upon transfer pump shut down, so tank volume above the transfer bulkhead is not useable.

Salt requirements:

- All Road Salt contains insoluble materials such as sand, small rocks/gravel, etc., but excessive debris (Wood Chips, Asphalt, Sticks & Leaves, large amounts of gravel, construction debris, etc.) can damage brine maker.

Brine Pumps:

- The Centrifugal Brine Pumps are **NOT** self priming. While they will often Prime with gravity, it may be necessary to loosen the top plug in order to release trapped air and properly prime pumps before running the system.

NOTE: Pumps must be fully primed in order to calibrate/Setup the system. Calibrating with pumps that are not fully primed can result in incorrect current readings and cause over-amp or Overtemp conditions.

- Brine Pumps must be plumbed in the factory configuration for Automatic mode operations.

NOTE: Pump outputs must not be plumbed together. This can cause over current issues at the hydraulic pump, and damage to the Brine Maker.

Hydraulic Oil:

- Hydraulic Oil is not provided with the Hydraulic Brine System, and must be provided by the Customer/Installer. AW-32 Hydraulic oil must be added to the "Full" or "High" line on the sight gage and must be free of contaminants.

NOTE: Running the system with low oil can cause overheating and/or damage to the hydraulic pump.

Thermostat Requirements:

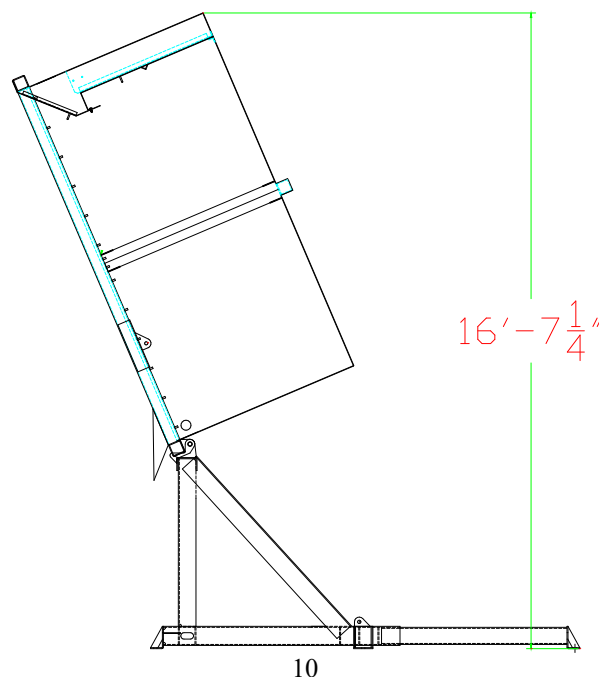
- The thermostat sensor must be mounted outside of the brine room, and out of direct sunlight in order to read accurate outside temp
- Thermostat must be set at 22° F to prevent freezing
 - a higher setting may cause difficulty in maintaining maximum control room Temp and waste energy.
 - A lower setting may allow brine hoses to freeze if salinity is allowed to remain low for extended periods

Make A Layout Diagram of Your Brine Site

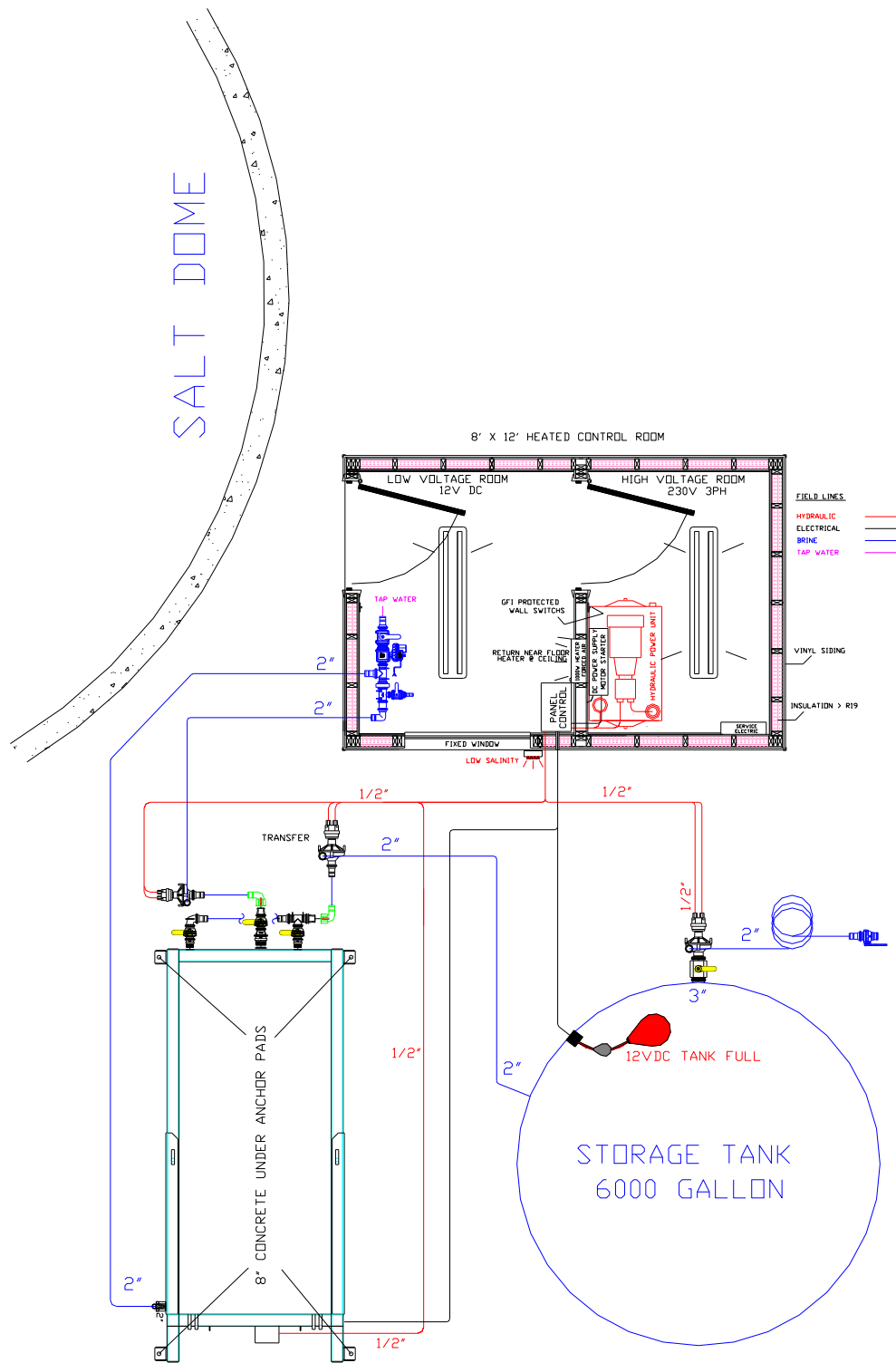
Note: All brine sites are different. The following steps are general in nature and will be adjusted to suit the site's specific requirements.

- Design the concrete pad. The concrete must be at least 8" thick under the salt hopper. A pad 14FT by 24FT is adequate for most installations with one 6000 gallon storage tank.
- Locate the salt hopper towards one corner of the pad so that salt can be loaded from one side and clean out can be accomplished at the end opposite the brine plumbing.
- Determine the location of the control console so the operator can visually and safely control the dumping. Also, the control panel should be handy for operating the switch for turning on the truck loading pump (See Sample Layout Diagram).
- Locate the storage tank and the bottom port 3" plumbing to keep the suction plumbing as short as practical.
- Locate the hydraulic power unit and tap water supply as close as possible to the inside wall adjacent the out side brine equipment.
- Determine where to locate the penetrations for plumbing to go from inside to outside.

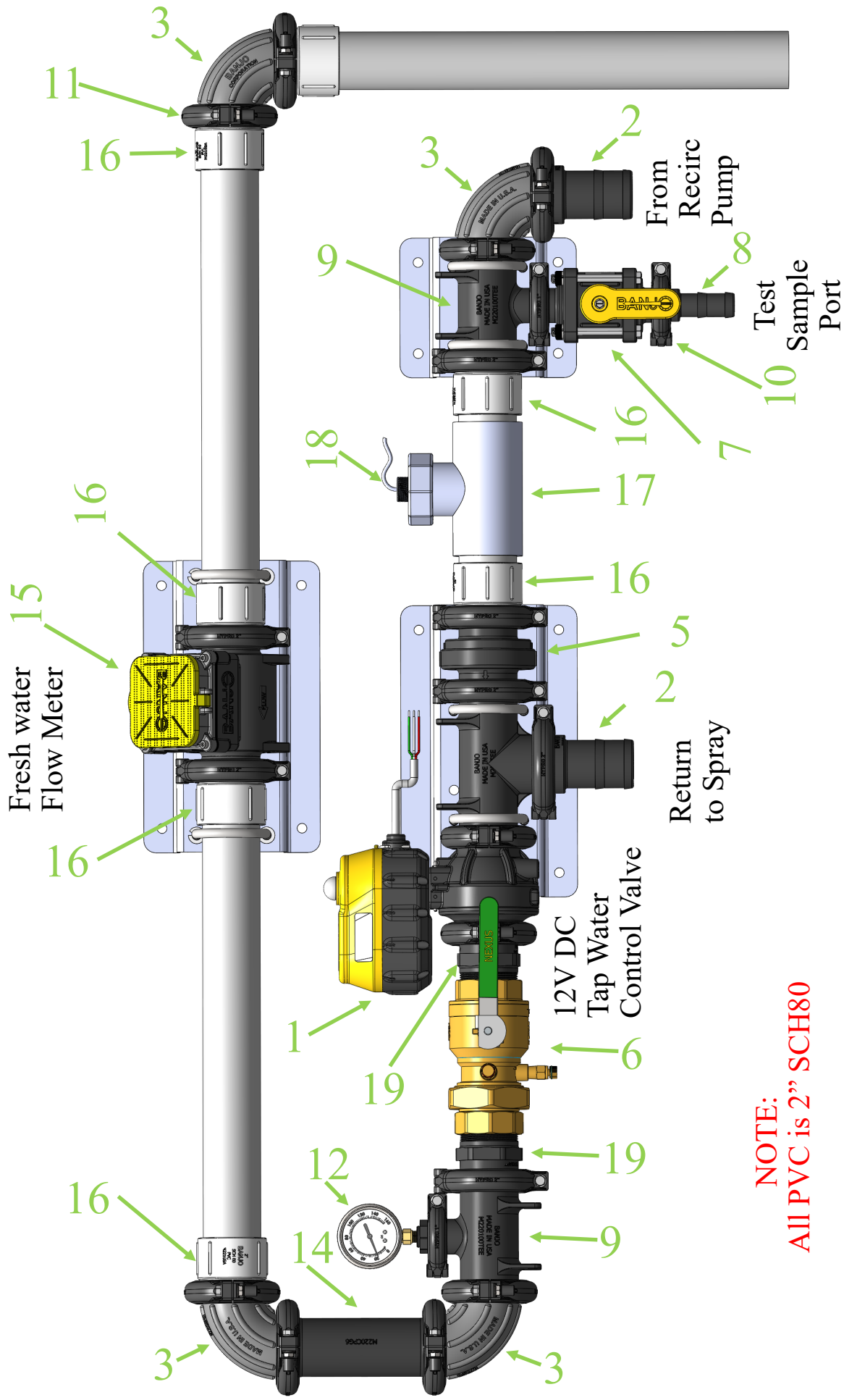
Dump Clearance



Sample Layout Diagram



Tap Water Plumbing



Tap Water Inlet

NOTE:
All PVC is 2" SCH80
Unmarked Clamps are either #10 or #11 in the parts list

Item #	Pengwyn Part #	Description	Qty
1	MEVXR220	Electric Regulating Valve	1
2	M220BRB	220 Hose Barb, Straight	2
3	M220SWP90	220 Sweep, 90°	4
4	M220TEE	220-220-220 Tee	1
5	MCV220	220 Check Valve	1
6	XB-200-F-200-F-6A	2" Flow Control Valve	1
7	MV100CF	100 Ball Valve	1
8	M100BRB	100 Hose Barb	1
9	M220100TEE	220-100-220 Tee	2
10	BG-UFC0100E-A-S	1.0" Clamp and Gasket	3
11	BG-UFC0200E-A-S	2.0" Clamp and Gasket	17
12	PG-160	160PSI Gauge	1
13	M100PLG025	1" Flange Plug w/ 1/4" FPT	1
14	M220CPG6	2" X 2" Full Port Flange X 6" Long	1
15	MFM220	2" Full Port Manifold Flow Meter	1
16	M221GSA	2" Full Port Flange X 2" PVC Glue Socket Fitting	7
17	FC95C	2" CPVC Flow Cell FOR TCS sensor	1
18	TCS3020	Toroidal Conductivity Sensor	1
19	M220MPT	2" Flange to MPT	2

NOTE: Incoming Water Pressure MUST NOT EXCEED 60PSI

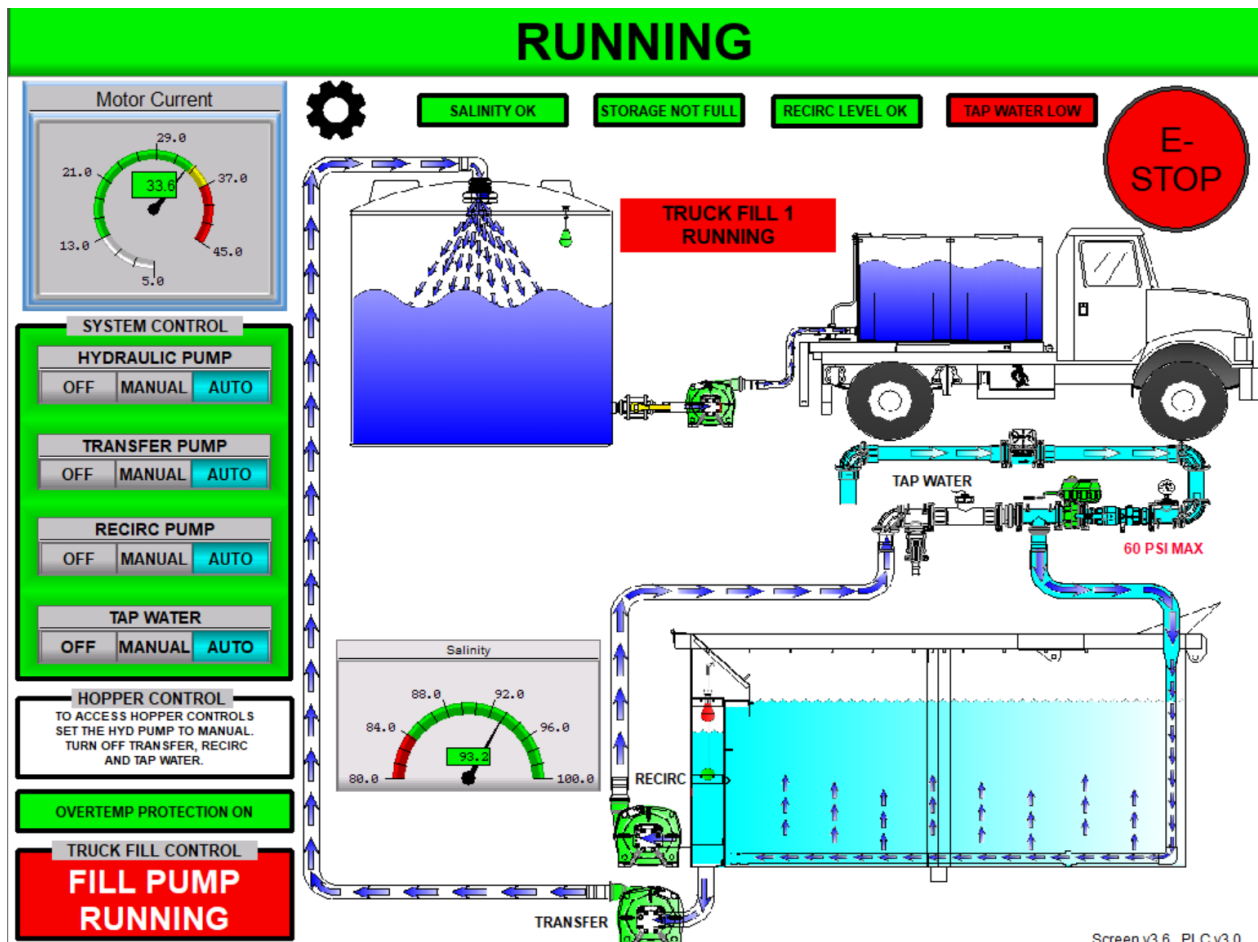
- Tap Water Valve can be installed facing right or left depending on space and Brine/Fresh Water inputs and output locations.
- Tap water, recirculation, and Spray bar connections MUST be made according to the drawing above regardless of the Valve mounting orientation (i.e. Tap Water Inlet PVC cannot be used for Recirculation pump inlet)
- Flow meter should be mounted horizontally, and tilted forward at a 45° angle (as shown above, and as received from the factory)
- A flanged PVC connection is provided for connection to fresh water, Fresh water should be installed by a plumbing professional to ensure codes are met.
- A back flow preventor must be installed before the Tap Water Valve

Electrical System Description

The electrical system has the following features:

- The system is PLC controlled allowing great flexibility in timing and logic in controlling the automatic brine maker.
- Salinity is measured with a durable, sealed Toroidal Conductivity Sensor for accuracy and reliability
- All electrical power to the operators control console and the hydraulic valves is inherently safe 24 or 12 V-DC.
- When the storage tank is full and there is no other function required of the hydraulic system and the motor switch is in Automatic, the electric motor on the hydraulic power unit will shut down after a period of time. This will allow sufficient time to circulate brine in the lines to prevent freezing. Also, this saves electrical power.
- The low voltage control eliminates the need for troublesome GFI components.
- A 24V-DC wired remote pendant is supplied for remote operation.
- Power for the brine maker is from an energy efficient single or three phase electric motor.

Control Panel Layout



Control Panel Descriptions

Power:

Power to the control panel is supplied from the Hydraulic Power Unit's Starter Panel.

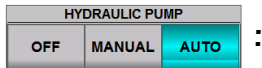
To power up the Control Box:

Plug in the battery on the side of the Power Unit. Then, turn the disconnect handle to the ON position.

To power down the Control Box:

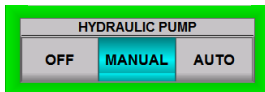
Turn off the power. Then, unplug the battery.

Hydraulic Pump:



:

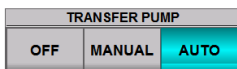
The hydraulic power unit will start and stop depending on the requirements of the PLC control panel. The Background will appear green when the hydraulic pump is running.



:

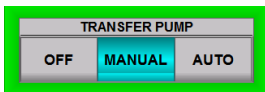
The hydraulic power unit will remain on until either the Auto or Off button is selected. There is a built in delay, once motor starts The Background will appear green indicating the hydraulic pump is running.

Transfer Pump:



:

Transfer of brine from the salt hopper to the storage tank is controlled by the salinity float and the storage tank float. Brine will only be transferred when the salinity is above the user set minimum, and the storage tank float is low (Room is *available for more brine solution*). Transfer will cease when either of these two conditions is not met. The Background will appear green when the transfer pump is running.



:

Transfer of brine from the salt hopper to the storage tank will not be based on positioning of float. Typically it is used to pump down remaining solution in the salt hopper in preparation for clean out. Care must be taken to ensure that the storage tank is not over filled. The Background will appear green when the transfer pump is running.

Control Panel Descriptions

(Continued)

Recirc Pump:



Recirculation of brine solution is enabled by the recirculation float (The lower of the two red clean well floats, located behind the baffle plate). The brine solution will be recirculated through the hopper Spray Bars when the recirc float is high to achieve the desired level of concentration. When the storage tank becomes full and salinity is above the user set minimum, recirculation will run for a short time to ensure all brine plumbing contains with saturated brine then shut down. The Background will appear green when the pump is running.

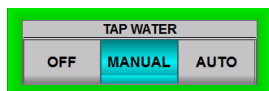


Recirculation in manual mode is not based upon the recirc float position. Recirculation of brine solution will continue as long as the switch remains in this position. Care must be taken to ensure that the pump does not run dry when operating in this mode. The Background will appear green when the pump is running.

Tap Water:



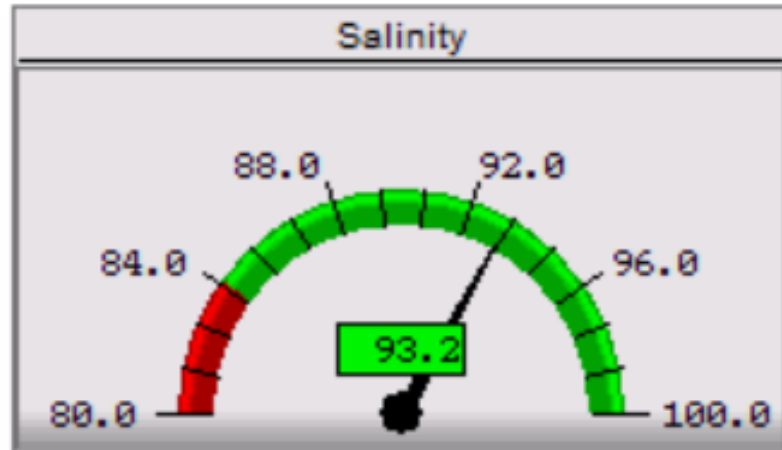
Tap water is added to the system based upon the position of the tap water float (The lower of the two red clean well floats, located behind the baffle plate). When the float is down, tap water will automatically be added to the system until the level that operates the float is reached, turning the tap water off.



Tap water is continuously added to the system in the Manual ON position. Care must be taken when setting tap water to MANUAL mode as there is the potential for over filling and spillage. A green light will appear indicating Tap Water Valve is OPEN.

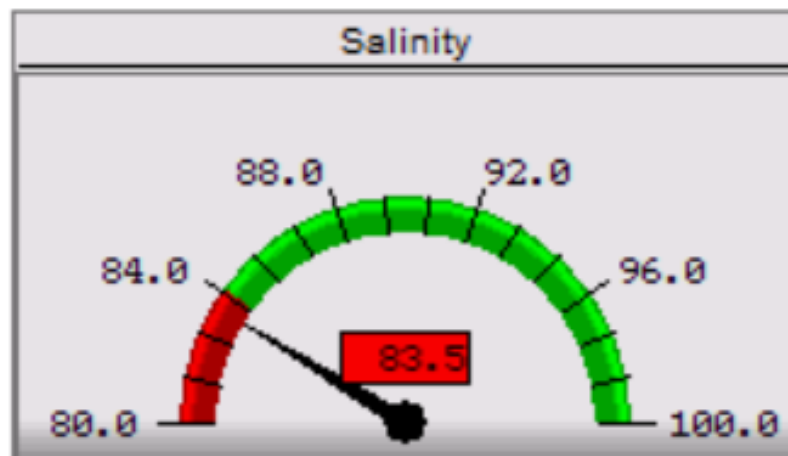
Control Panel Descriptions

(Continued)



Salinity:

Brine salinity is displayed on a gauge on the screen. This analog style gauge shows both the gauge needle and a digital reading of actually salinity. When Salinity is above user specified minimum the background of the digital readout is green. When salinity is low the background turns red as seen below.



The SALINITY OK / SALINITY LOW Indicator changes based on this reading as well.

Control Panel Descriptions

(Continued)

Salinity/Storage/Recirc/Tap Water Floats:

Floats are at or above operating level:



Floats are below operating level:



**** NOTE: each indicator lists specific status with indicator text as pictured above.**

Hopper Control:

In order to access the Hopper Controls, the Hydraulic Pump must be in Manual mode and the Transfer, Recirc., and Tap Water pumps must all be turned Off. Once these conditions are satisfied, you must hold the appropriate function (up or down) for three seconds before either action will begin. Action will stop when button/switch is released.



Raises the salt hopper for cleaning out accumulated non-dissolvable particles that are a characteristic of road salt. Care must be taken to ensure that any brine plumbing that can be damaged by raising the salt hopper is disconnected.



Lowers the salt hopper after clean-out is finished. Keep a clear distance anytime the salt hopper is being raised or lowered to prevent personal injury.

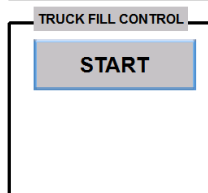
****NOTE: Hopper screen controls are deactivated when remote Hopper control pendant is installed.**

Control Panel Descriptions

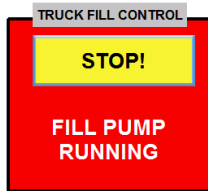
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Fill Control:

Transfers brine from storage tanks to the truck mounted unit. This control is only active when remote switch is disconnected. Filling of equipment should be monitored at all times to prevent over-filling and spillage.



: The pump will turn on and "Fill Pump Running" will be displayed.



: Pressing Stop will stop the Truck Fill pump.

Truck Fill Procedure:

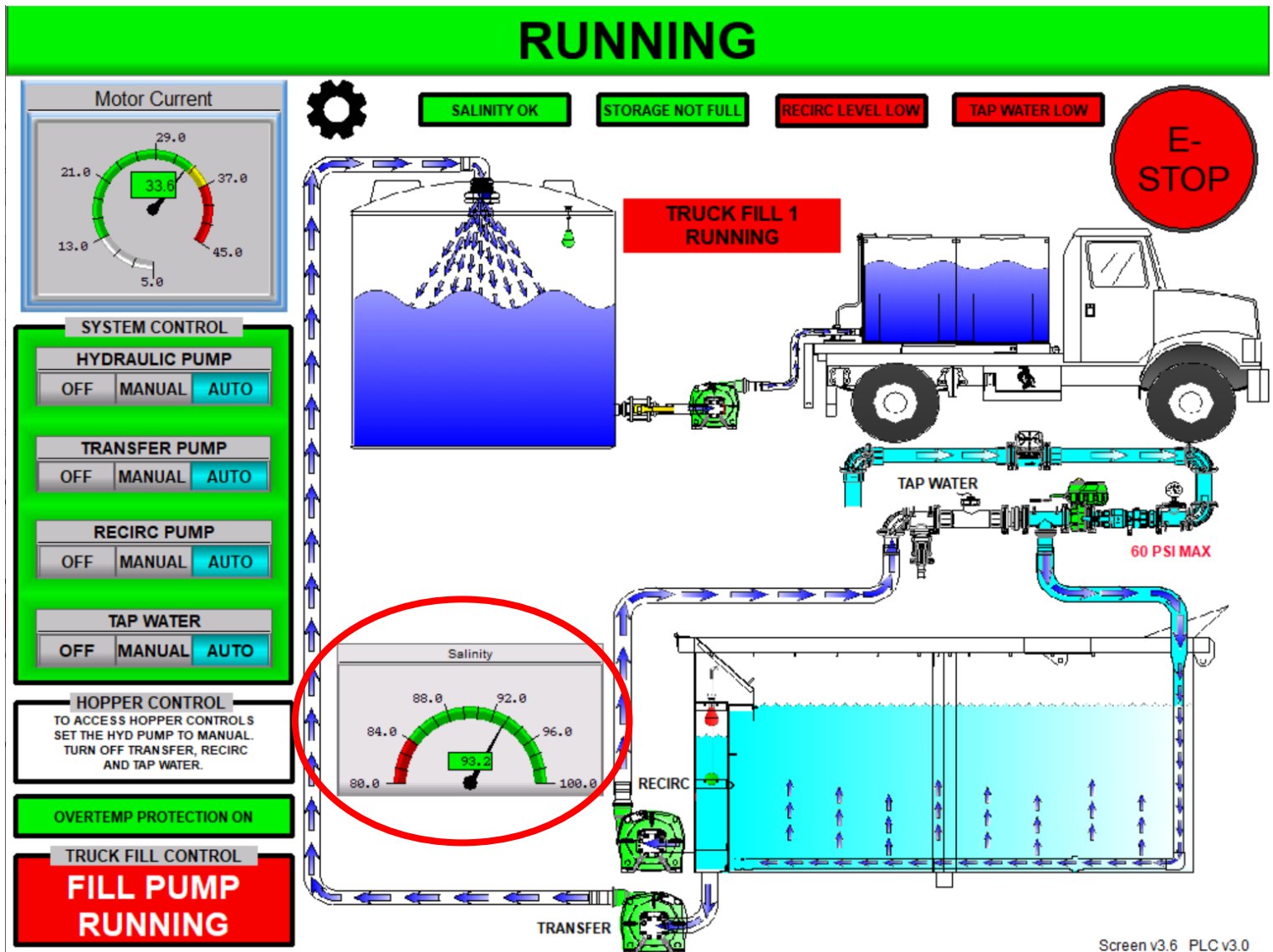
1. Connect fill hose to truck
2. ensure all valves in the truck fill line are open
3. Turn on hydraulic pump (in "Auto" pump will turn on automatically)
4. Turn on Truck Fill Pump
5. When tank is full, turn off Truck Fill pump
6. Close valve on truck fill line
7. Turn off hydraulic motor (in "Auto" pump will turn off automatically)

Control Panel Descriptions

(Continued)

Salinity:

Salinity can be read on the gauge pictured below when the TCS unit is installed. This reading is calibrated in the admin screen (instructions below):



When salinity is above the user set value the digital readout on the gauge and the salinity OK indicator turn green, and transfer functions are enabled.

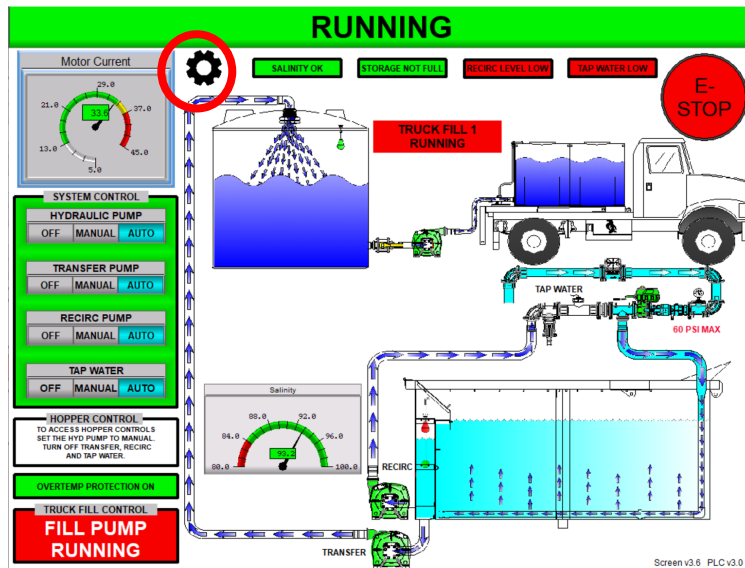
Salinity limits and calibration can be adjusted in the Admin Screen. Initial adjustment and calibration will be completed during startup by a qualified PENGWYN technician. If adjustments are needed in the future a password is required for entry.

Control Panel Descriptions

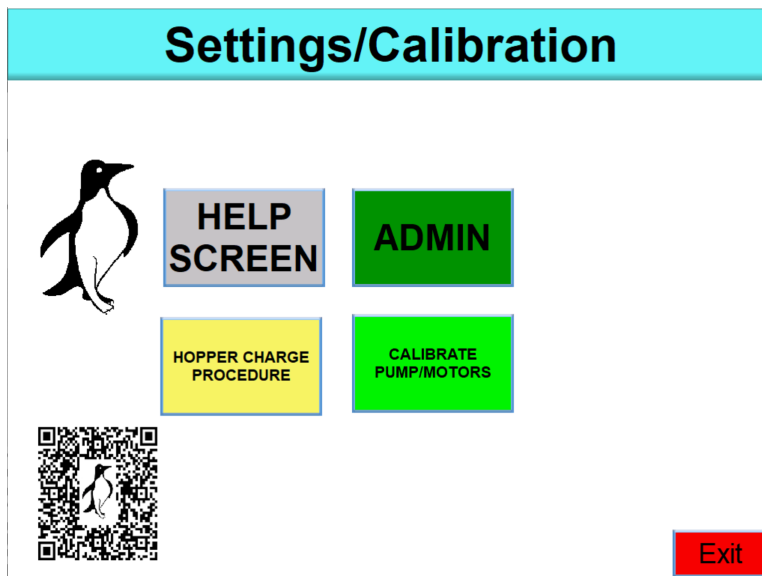
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Settings/Calibration:

Enter the Settings/Calibration screen by touching the sprocket icon "⚙" on the main screen:



Settings/Calibration Screen:



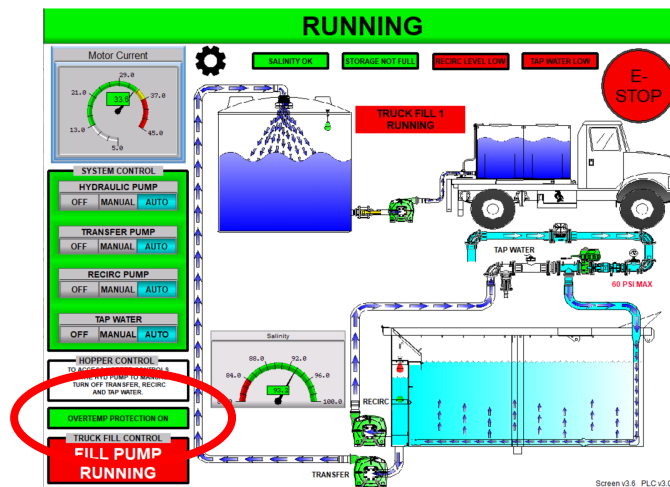
NOTE: All Brine Maker functions are disabled when entering Settings. Unit will have to be put back into production mode once unit is returned to the main screen.

Hydraulic Oil Over Temperature Protection

Overtemp Protection Indicator:

If Hydraulic oil goes over 190° F, Brine maker will be shut down. To reset alarm Oil temp must be brought below 190° F, and the system must be rebooted (power off for 30 seconds, then power on).

NOTE: If Oil Overtemp Protection is triggered, check that room temperature is below the maximum listed in "Brine Maker Requirements" for Frequent or Continuous operation of the Brine Maker.



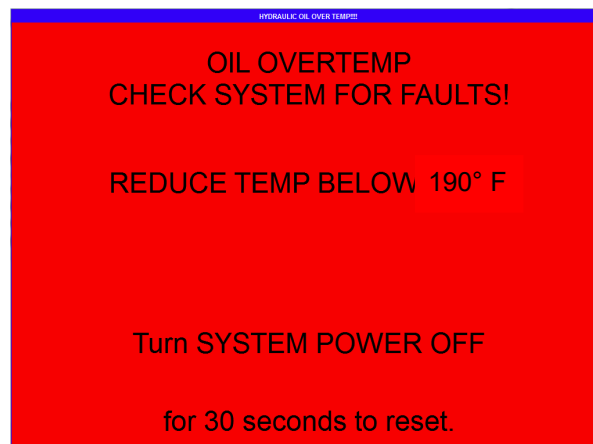
OVERTEMP PROTECTION ACTIVE

: Overtemp Switch is properly installed, and system is Protected from over heating.

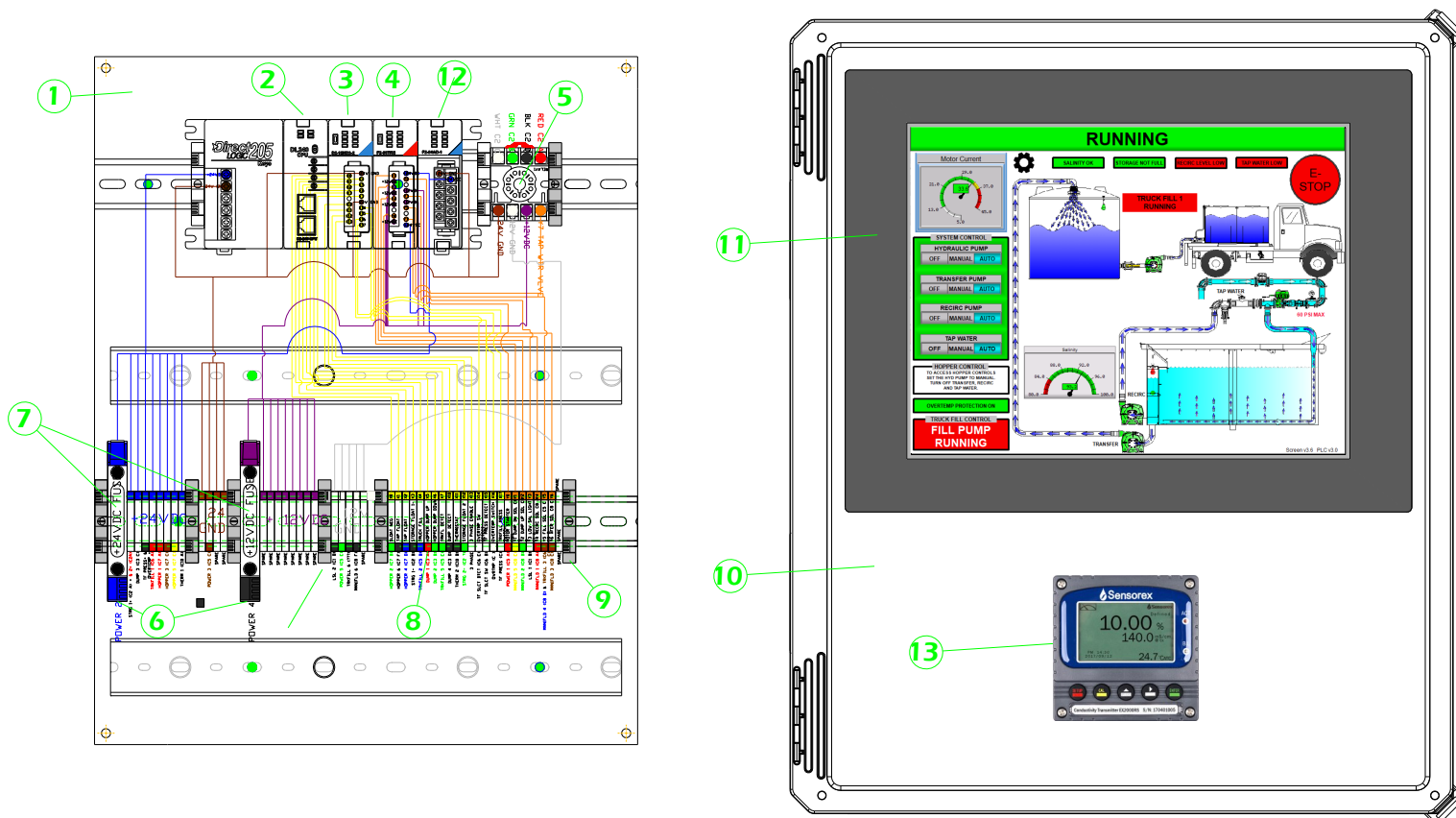
OVERTEMP PROTECTION NOT ACTIVE

: Overtemp switch is not properly installed, and brine maker is not protected from over heating. System can be run, but hydraulic oil temp will not be monitored.

Fault message screen:

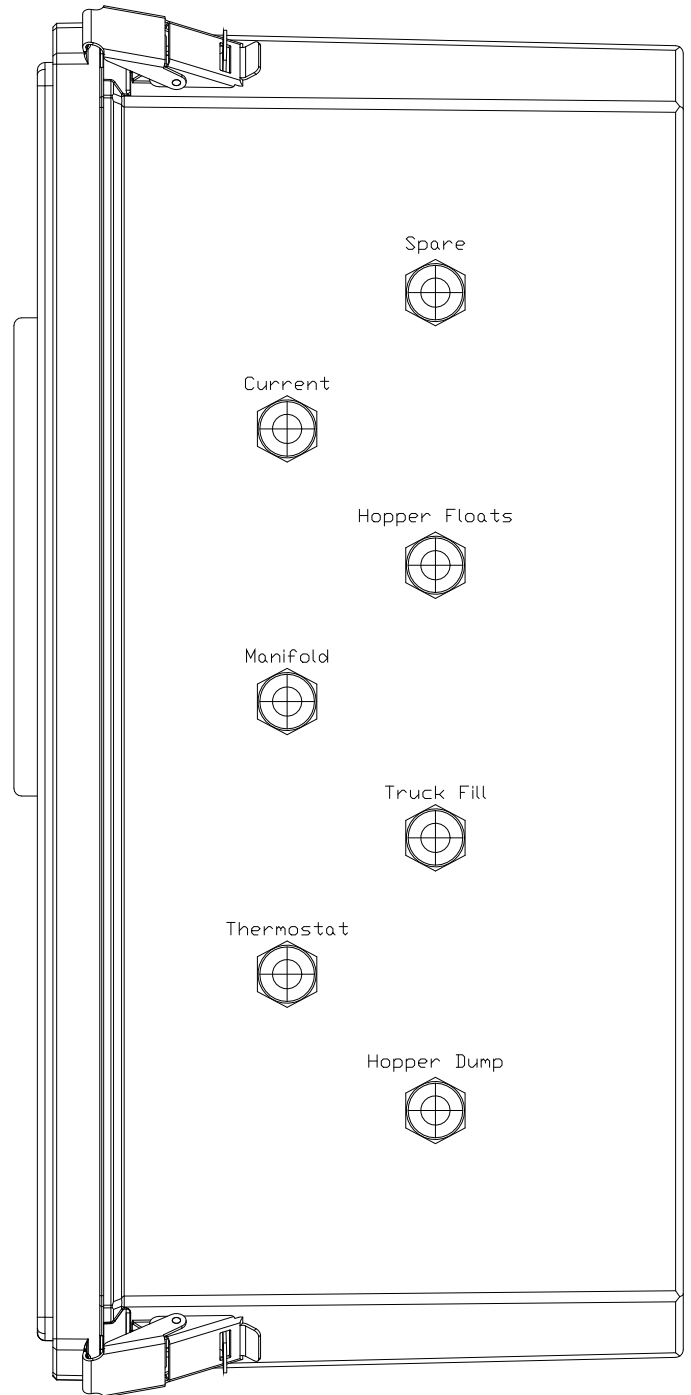
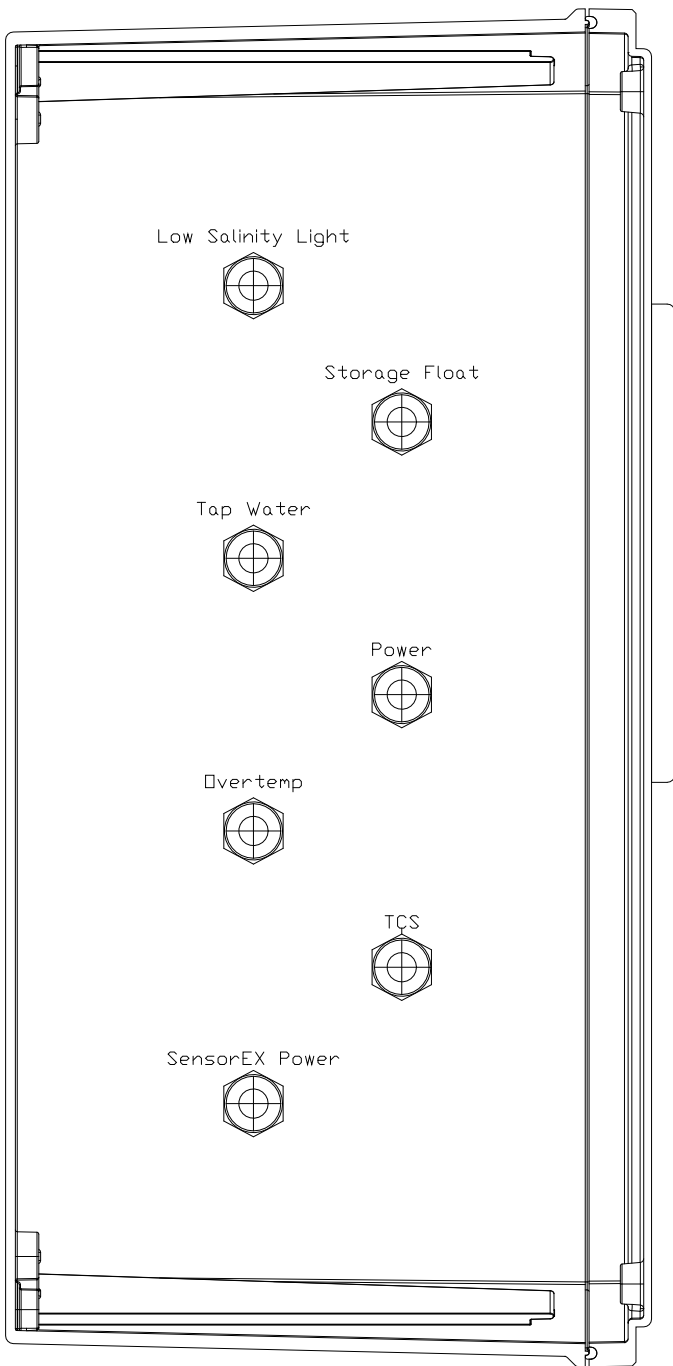


Control Box Layout



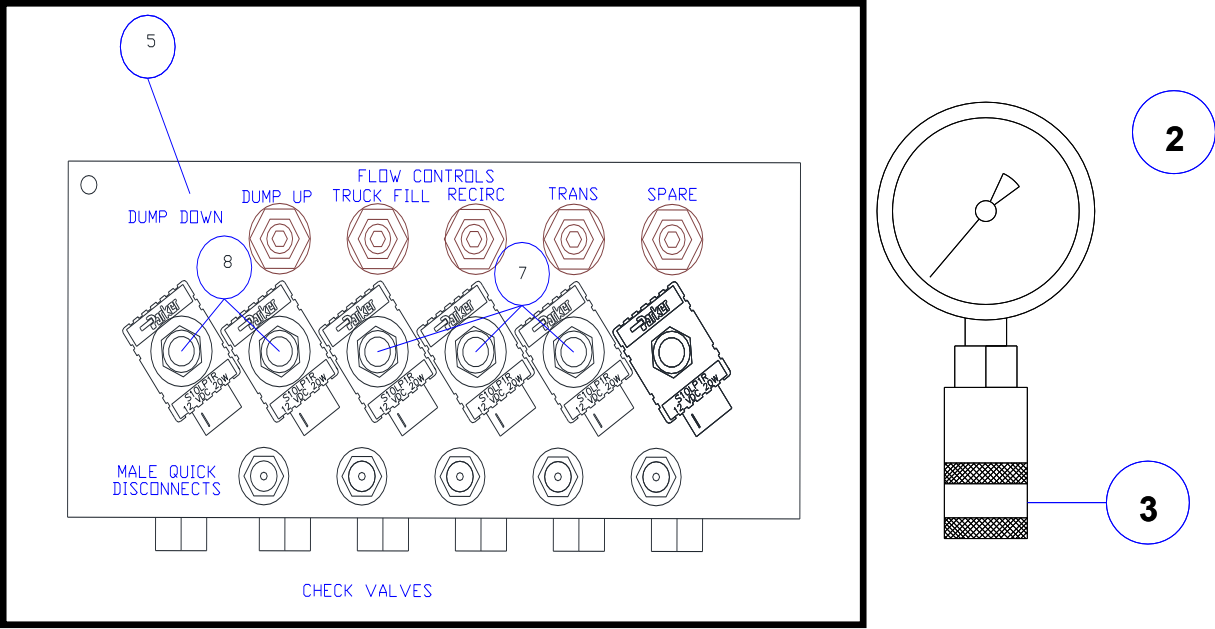
Control Panel Bill of Materials			
	Part #	Description	Qty.
1	HW-MP2016A	ENCLOSURE BACKPANEL	1
2	DL250-1	PLC CPU	1
3	D2-16ND3-2	16PT DC INPUT CARD	1
4	F2-08TRS	8PT RELAY OUTPUT CARD	2
5	KRPA-11DG-24	DPDT 24V RELAY	1
6	DN-F10	FUSE HOLDERS	2
7	AGC6	6A FUSE	2
8	DN-T12	TERMINAL BLOCKS	47
9	DN-EB35	END BRACKETS FOR TB	7
10	HW-201610CHQR	ENCLOSURE	1
11	EA9-T15CL-R	15" TOUCH SCREEN	1
12	F2-04AD-1	4 CHANNEL A/D INPUT CARD	
13	CX2000	Conductivity Transmitter/Controller	
x	OP-2CBL	PLC TO SCREEN CABLE	1

Control Box Side Views



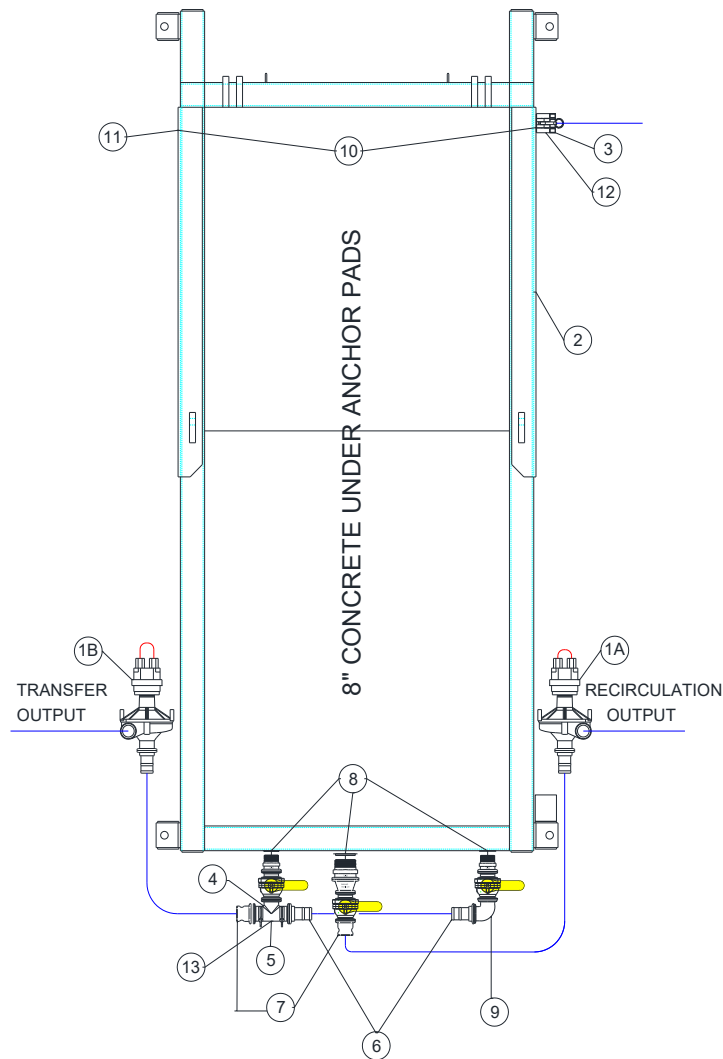
Hydraulic Manifold

Flow Control Valves turn counterclockwise to increase rates.



Hydraulic Manifold Bill of Materials			
	Part #	Description	Qty.
1	CVH-103P	CHECK VALVE	6
2	PG-4000	PENGWYN GAUGE 4000 PSI	1
3	FIR14VNPT	1/4 FEMALE QCD	1
4	MIR14VNPT	1/4 MALE QCD	4
5	ABM MANIFOLD	B/M MANIFOLD DRILLED 4X6X12	1
6	RC-S10L	COIL	6
7	DSL101C	2-WAY SIZE 10 NC	4
8	DS103A	3-WAY SIZE 10	2
9	NVH101S	SIZE 10 CARTRIDGE FLOW CONTROL	5

Hopper View

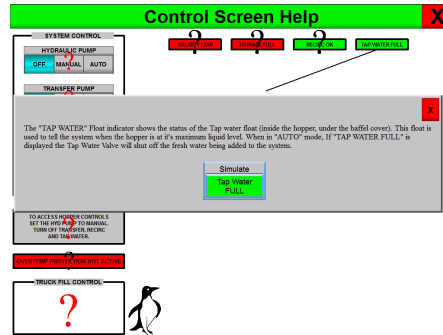


Item #	Pengwyn Part #	Description	Qty.
01	9303C-HM1C-BU	Recirculation Pump	1.00
02	HOPPER	Hopper/Frame Assembly	1.00
03	HB200-90	2" Male NPT to 90Degree 2" Hose Barb	1.00
04	M220SWP90	Sweep, 2" Port, Flanged	2.00
05	MV220BL	3-Way Valve, 2" Port, Flanged	1.00
06	M221GSA	Flange Fitting, 2" PVC Glue Socket	2.00
07	M220A	2" QDC Male Adaptor, Flanged	2.00
08	MBF220	Bolted Tank Fitting, 2" Port, Female Thread, Flanged	3.00
09	M220CPG90	Coupling, 90Degrees, 2" Port, Flanged	2.00
10	TF200	Bulkhead Fitting, 2" Port, Female Threaded	2.00
11	PLUG200	2" Plug	1.00
12	SW200	Swivel, 2" Male Thread, 2" Female Thread	1.00
13	SL200-90	Street Elbow, 90Degrees, 2" Threads	4.00

Settings/Calibration

HELP SCREEN

In the help screen any question icon can be selected and a description of that item's function will be displayed:



For some functions there are simulate buttons that will show what is displayed for a change in that state. All Brine Maker functions are disabled while in help mode.

HOPPER CHARGE PROCEDURE

This button will walk the operator through the initial charge procedure (detailed later in this manual) step by step, insuring that Brine maker is correctly started at the beginning of the season, and after clean out operations.

CALIBRATE PUMP/MOTORS

This Password protected screen walks the technician through motor calibrations (detailed later in this manual) using an internal current meter.

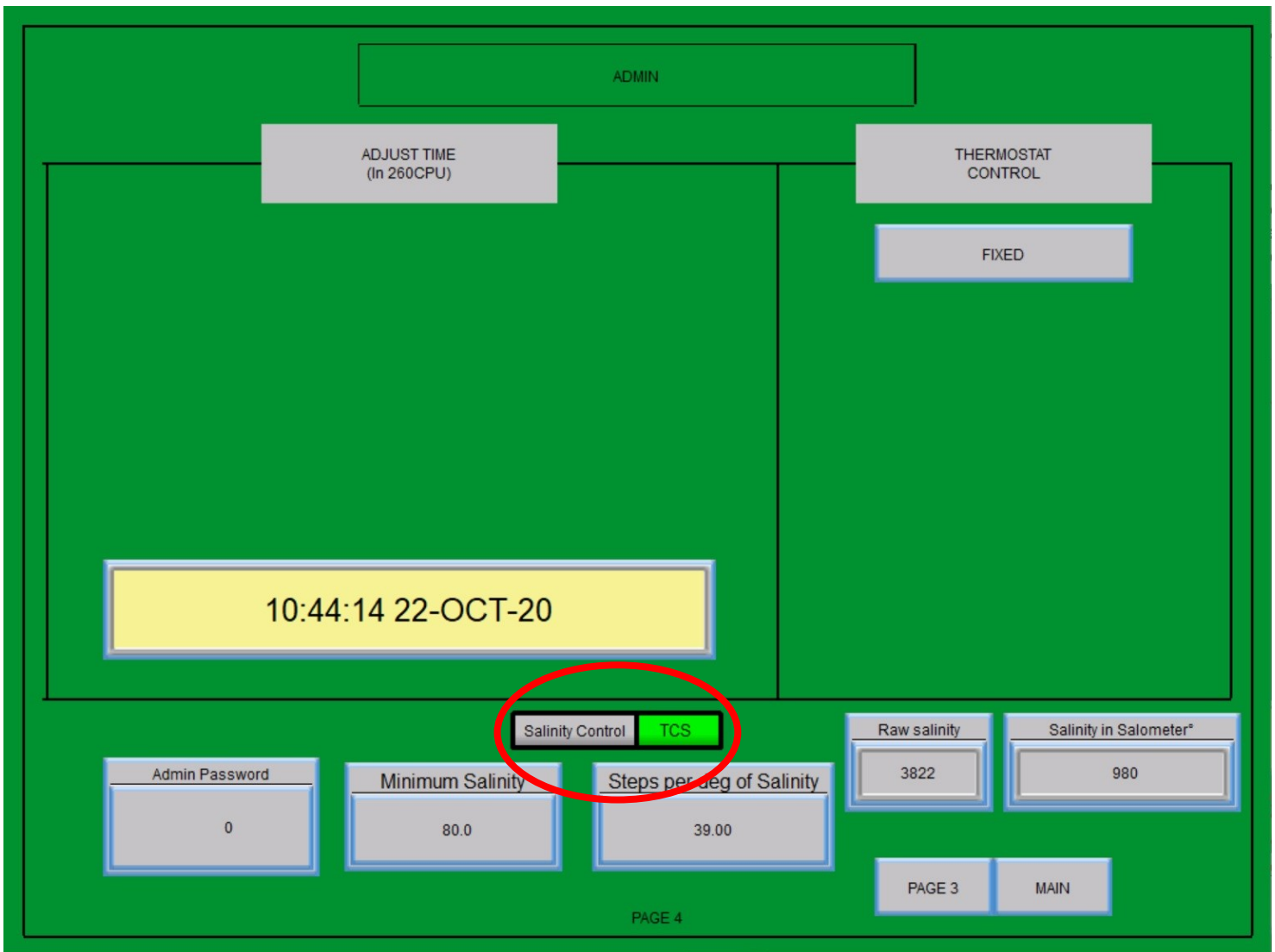
ADMIN

This Password protected screen provides access to minimum salinity setting, salinity calibration, Salinity measurement mode (TCS vs.Sloat), Time, and admin password.

Calibrating the Toroidal Conductivity Sensor (TCS)

NOTE: this Calibration is done at the factory and checked at startup by a qualified technician. It should only be adjusted if measured salinity is different from salinity shown on the screen.

- Touch the **ADMIN** Button and enter the password (password can be reset inside the admin screen if needed). In the Admin screen, make sure Salinity Control is set to "TCS". If it



is set to "SLOAT" touch the Salinity control button to toggle to "TCS".

- After Recirculating for several minutes write down the "Raw salinity". This number is the digital value provided to the PLC by the TCS sending unit.
- Take a sample of brine from the test port.

NOTE: the "Raw Salinity" and brine sample must be taken at roughly (within a minute or so) the same time to make sure the measurements being taken are of the same salinity.

- measure the brine salinity as accurately as possible with the salometer (include decimal places if they can be determined).
- Note that measurement.

Calibrating the Toroidal Conductivity Sensor (TSC) Continued

- To get the "Steps per deg of Salinity" (the calibration factor) Divide Raw Salinity by measures salometer degrees as:

$$\frac{\text{Raw Salinity}}{\text{Salometer reading}} = \text{"Steps per deg of Salinity"}$$

- Tap the Steps per deg of Salinity, and enter the result without the decimal point (for example: "39.45" should be entered as "3945")

The screenshot displays a green-themed control interface for a Toroidal Conductivity Sensor (TSC). At the top, there is an 'ADMIN' button. Below it, the interface is split into two main sections. The left section contains an 'ADJUST TIME (In 260CPU)' button and a large yellow box showing the current time and date: '10:44:14 22-OCT-20'. The right section contains a 'THERMOSTAT CONTROL' button and a 'FIXED' button. At the bottom, there is a row of buttons: 'Salinity Control' (highlighted in green), 'TCS' (highlighted in green), 'Raw salinity' (showing 3822), and 'Salinity in Salometer°' (showing 980). Below these, there are four input fields: 'Admin Password' (showing 0), 'Minimum Salinity' (showing 80.0), 'Steps per deg of Salinity' (showing 39.00 and circled in red), and 'PAGE 4'. To the right of the 'Steps per deg of Salinity' field are two buttons: 'PAGE 3' and 'MAIN'.

- Once this value is entered the Salinity in Salometer° should match your measured value (note that there are no decimals in their field either, so a measurement of 98° will show as "980")

Brine Maker On-Site Calibration

WARNING: While newer units with an integrated Amp Meter do not need to have the door opened, some units may require that the Motor Starter box door be open during these tests . Only properly trained technicians should operate the Brine maker for Initial startup or On-Site Calibration.

- Check all hoses and wires are connected using full line sizes and shortest routing
- Check motor nameplate for max amps; write on sheet
- Turn on the electrical service panel
- Check on screen amp meter for current readings

NOTE: Brine maker centrifugal pumps are NOT self priming. They must not be run dry or the shaft seals will be damaged. All suction ports must be flooded with liquid before starting. Make sure brine pumps are primed and operating before adjusting needle valves

- Check the hydraulic fluid level in the hydraulic reservoir. (Fill if necessary)
- Turn on the Motor Starter box
- Press manual button on motor starter to “Bump” hydraulic motor to ensure correct rotation, Contact a licensed Electrician to rewire if needed.
- Turn Hydraulic Motor to manual on PLC Screen, leave other three switches in off
- Check the load sense on gauge on hydraulic pump, setting should be ~150 psi
- Write down the initial amperage with no load on the motor; write on sheet
- Disconnect the transfer and recirc brine hoses from the Hopper
- Operate Hopper up and down, to bleed the cylinders of air
- Re-check the hydraulic fluid level in the hydraulic reservoir. (Fill if necessary)
- Hold hopper down to deadhead the system, verify that the max pressure is 1500PSI on the gauge on hydraulic pump
- Reconnect the hoses to the Hopper
- Turn the main water supply ON
- Check for tap water leaks
- Set Tap water switch to auto
- Verify electric ball valve opens, and visually look inside hopper to see water filling
- Let it fill until there are 2-3 feet of water in the hopper

This creates a cushion to keep the salt from damaging the spray bars

- Add 1-2 buckets of salt to hopper, filling so that the peak of salt is roughly even with the top of the hopper

- Open recirculation ball valve
- Turn Hydraulic motor on and record current (should be approx. 13A for a 3 phase motor)
- Verify transfer ball valve is in “Production” setting, not “Pump Down” setting
- Turn recirculation pump to auto setting
- Check amperage draw with just the recirculation motor (Recirc Only); write on sheet

-- Difference between “No Load” and “Recirc Only” should be approx. 5-7 amps --

- Recirculate Hopper until Salinity Float (Sloat) is indicating at least a minimum of eutectic brine mixture
- Turn transfer switch to auto
- Check amperage draw with just the recirculation and transfer motors; write on sheet

-- Difference of “Recirc Only” to Recirc and Transfer should be approx. 7-8 amps --

- Produce enough brine that bottom of storage tank is filled above suction port of Truck Fill Pump

-- Usually 2,000 to 4,000 gallons --

- Attach Truck fill output hose to a storage tank (on truck, or back into the hopper or storage tank)
- Open ball valve at the cam-lock fitting and on the storage tank.
Turn on truck fill pump
Check amperage draw with all three motors; write on sheet

-- Difference of Recirc and Transfer to all 3 motors should be approx. 7-8 amps --

Adjusting the Needle Valves

- Use 11/16” Wrench, loosen lock nut at base
- Using 3/16” Allen wrench, turn top of valve clockwise to decrease flow and amperage; turn counter clockwise to increase flow and amperage
- To finish calibrating needle valves, use 11/16” wrench and Allen wrench simultaneously. Hold needle valve in place with the Allen wrench, and tighten lock nut with 11/16” wrench

- Open recirculation ball valve
- Turn Hydraulic motor on and record current (should be approx. 13A for a 3 phase motor)
- Verify transfer ball valve is in "Production" setting, not "Pump Down" setting
- Turn recirculation pump to auto setting
- Check amperage draw with just the recirculation motor (Recirc Only); write on sheet

-- Difference between "No Load" and "Recirc Only" should be approx. 5-7 amps --

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- Check amperage draw with just the recirculation and transfer motors; write on sheet

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Turn on truck fill pump
Check amperage draw with all three motors; write on sheet

-- Difference of Recirc and Transfer to all 3 motors should be approx. 7-8 amps --

Adjusting the Needle Valves

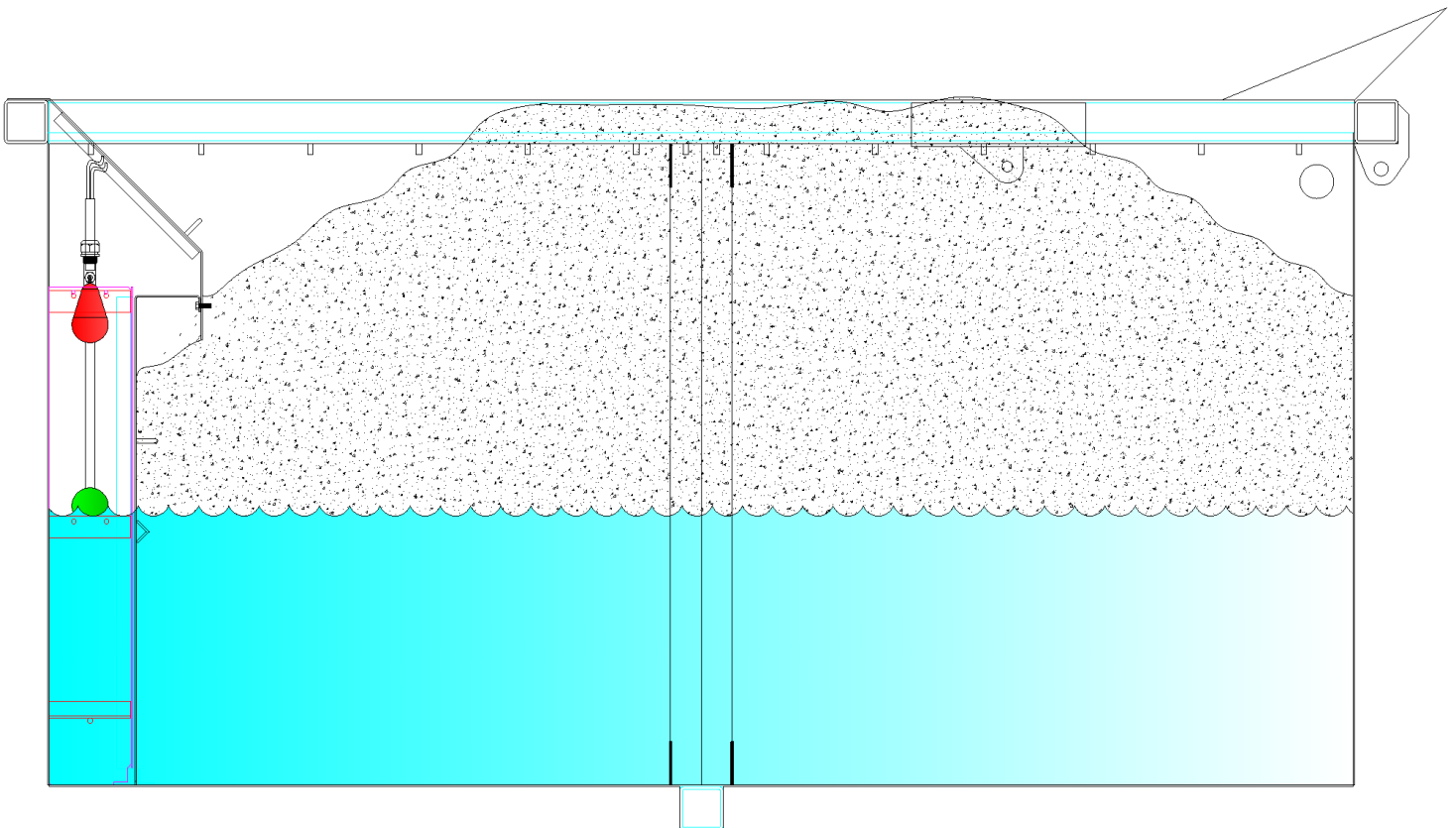
- Use 11/16" Wrench, loosen lock nut at base
- Using 3/16" Allen wrench, turn top of valve clockwise to decrease flow and amperage; turn counter clockwise to increase flow and amperage
- To finish calibrating needle valves, use 11/16" wrench and Allen wrench simultaneously. Hold needle valve in place with the Allen wrench, and tighten lock nut with 11/16" wrench

Clean-out and Maintenance Instructions

Initial Hopper Charge Procedure:

- Make sure that Hopper is all the way down on the frame
- Make sure hopper hoses are connected (Recirc, and Transfer)
- Make sure the Recirc valve is open
- Set the transfer valve to **PRODUCTION** position
- Make sure water shutoff valve is open
- Set brine maker controls (hydraulic motor, transfer, recirc, and tap water) to auto
- Once the water level is above 24" in the hopper add salt
Enough salt should be added so it mounds 2-3" above the tap water fill level (approximately at the wing nuts)
- Once tap water reaches the fill level, tap water valve will turn off
- When salinity light turns off check salinity at the test port (on the water tap valve assembly) to ensure proper salinity levels.

The hopper must be cleaned regularly to remove undissolved debris (approx. 100-200yds of salt used) during brine making operations.



Making Brine

Running in Automatic Mode:

- Once the “Initial Charge Procedure” has been completed, the PENGWYN Brine Maker is ready to make brine.
- During brine making operation, make sure the following remain true:
 - ⇒ Salt is loaded
 - ⇒ Recirc valve is open
 - ⇒ Transfer Valve is in PRODUCTION position
 - ⇒ Fresh Water Valve is Open
 - ⇒ All Screen options are set to Auto
- The Brine maker will offload brine of the proper salinity, and refill the fresh water making brine continually
- Be sure to periodically check brine for proper salinity, especially after initial season startup. If brine salinity is low contact PENGWYN at (614) 488-2861 or 1-888-PENGWYN
- When salt is used up, the “Add Salt” light will turn on.
 - ⇒ Load as much salt as possible without overflowing the hopper, or piling it on top of the clean well cover
 - ⇒ Brine Maker will continue to produce brine automatically

Extending time between adding salt and increasing overall salinity:

- The more salt you load into the hopper, the longer you will produce high salinity brine before salt is used up and salinity begins to decrease toward minimum.
- Adding more salt with each recharge is a good idea, but can cause a mess if the hopper overflows
- There are a couple of ways this can be avoided
 1. Additions of salt when Add Salt light is off
 - Adding salt when not “required” by the add salt light is perfectly acceptable
 - Add salt until it is visible above the brine at most.
 - Some operators prefer to add salt on a regular schedule maintaining maximum salinity throughout production (i.e. adding a 3 yard bucket of salt every hour keeps brine at maximum salinity and means that the add salt light will seldom light)

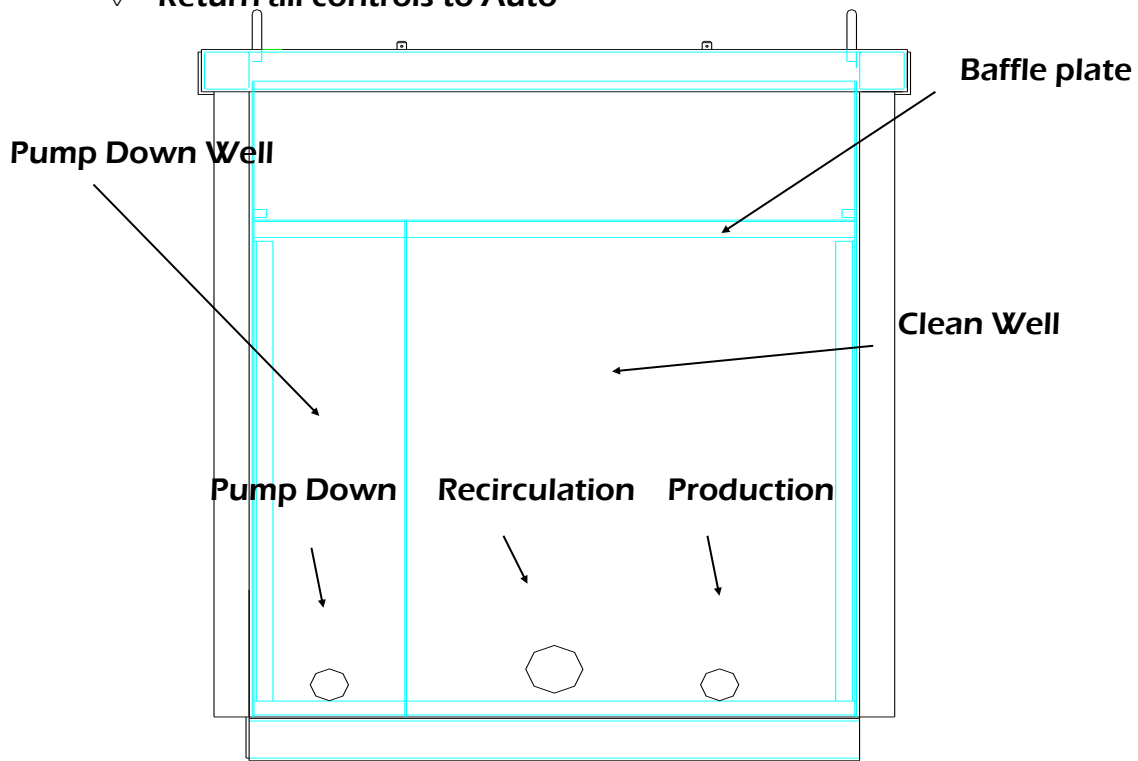
2. While not required for operation, when the “Add SALT” light is on, some of the remaining brine can be transferred to storage manually if necessary to allow room for more salt

NOTE: Brine transferred when the “ADD SALT” light is lit will be at or below the minimum salinity setting.

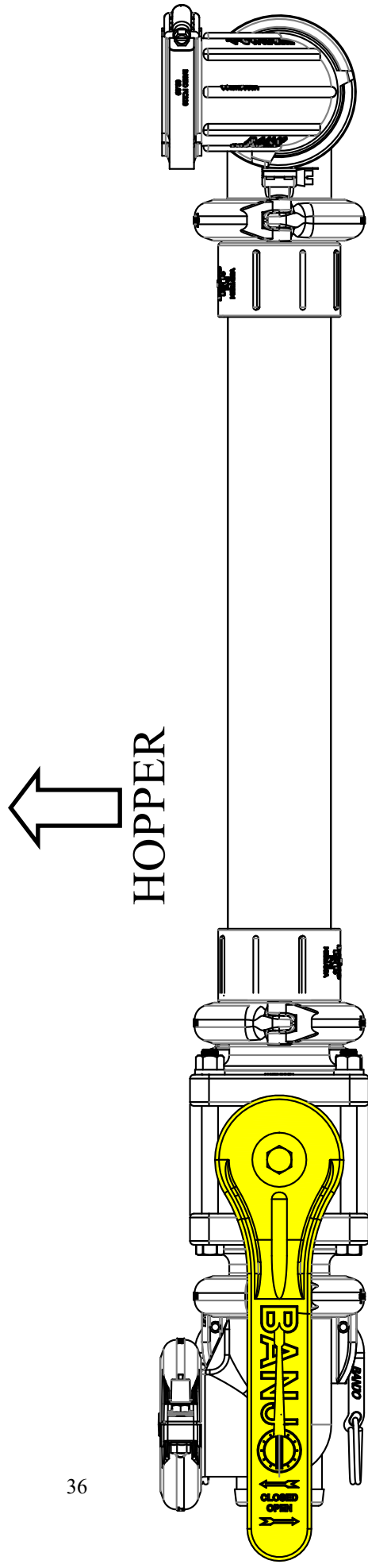
NOTE: If lower salinity brine is desired, waiting for the “ADD SALT” light and adding smaller amounts at a time will reduce the time spent producing High salinity brine before minimum is reached reducing the over all salinity in the storage tank.

WARNING: Running in MANUAL defeats all overflow protections

- To manually transfer brine:
 - ◇ Turn “Tap Water” and “Recirc Pump” to OFF
 - ◇ Turn “Hydraulic Pump” to MANUAL
 - ◇ Turn “Transfer Pump” to MANUAL
 - ◇ Monitor Brine level in hopper and in the storage tanks to avoid running the transfer pump dry or overflowing the storage tanks
 - ◇ Transfer until hopper is about half full
 - ◇ Add salt until mounded just below the top of the hopper, being sure to avoid piling it on top of the clean well cover
 - ◇ Return all controls to Auto



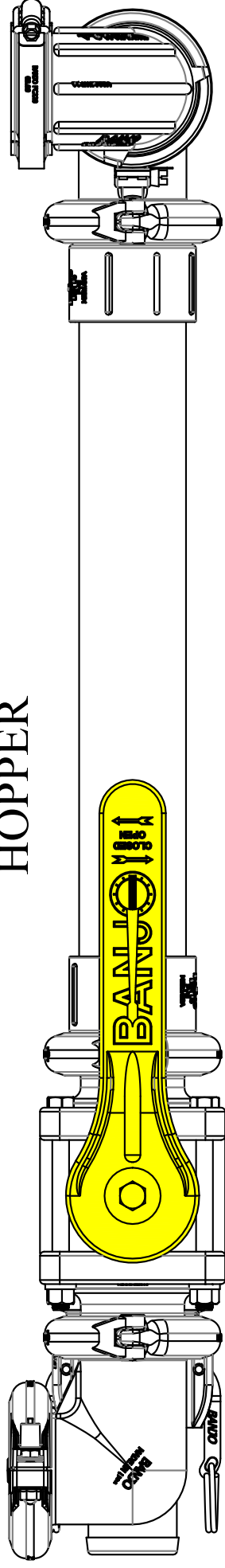
The Transfer Valve must be set to “**PRODUCTION**” as shown here (Valve handle to the Left when facing the hopper) for brine making operations. This allows the transfer pump to pull clean brine from the large side of the well. This side contains the Tap water and Recirc floats that ensure the pump suction ports remain flooded



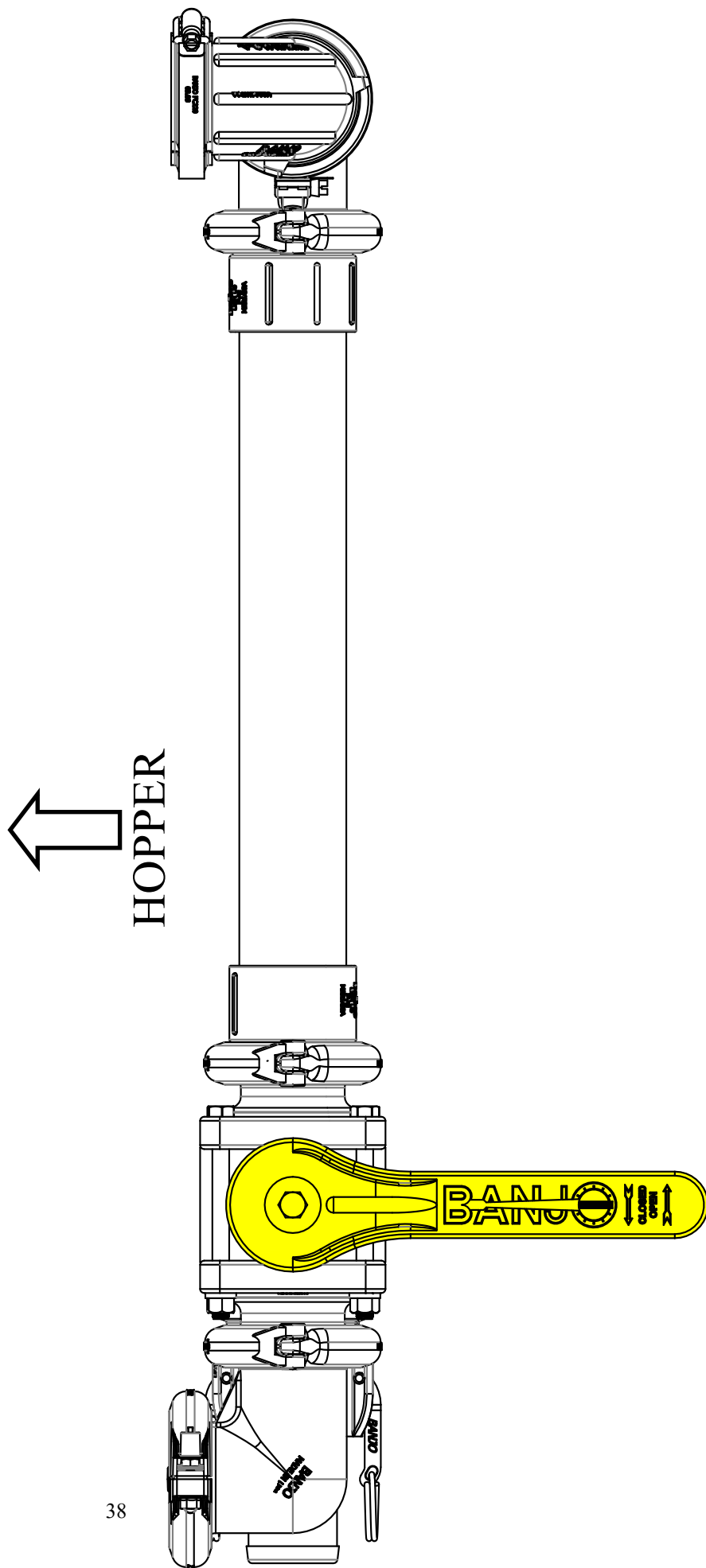
The Transfer Valve can be moved to “**PUMP DOWN**” as shown below (Valve handle to the right when facing the hopper) in order to transfer as much brine as possible prior to Hopper cleanup.

WARNING: Running Brine operations in “**PUMP DOWN**” can cause the transfer pump suction port to draw air and lose it’s prime.
USE ONLY for monitored **PUMP DOWN** prior to Hopper Cleanup.

37



The Transfer Valve is a “bottom load” valve. This means that when the valve handle is set to the center position as below, both potential inputs are shut off, and the suction port of the transfer pump is **COMPLETELY BLOCKED**. This is useful for maintenance and repair activities, but will not transfer any brine and can damage the transfer pump if brine making operation is attempted in this position.



Measuring un-dissolved debris in the hopper:

- When the Brine maker calls for salt (the red light is on)
- Probe the bottom of the hopper with a broomstick or similar item
- If there is more than 18 inches of debris in the bottom of the hopper a clean out is needed

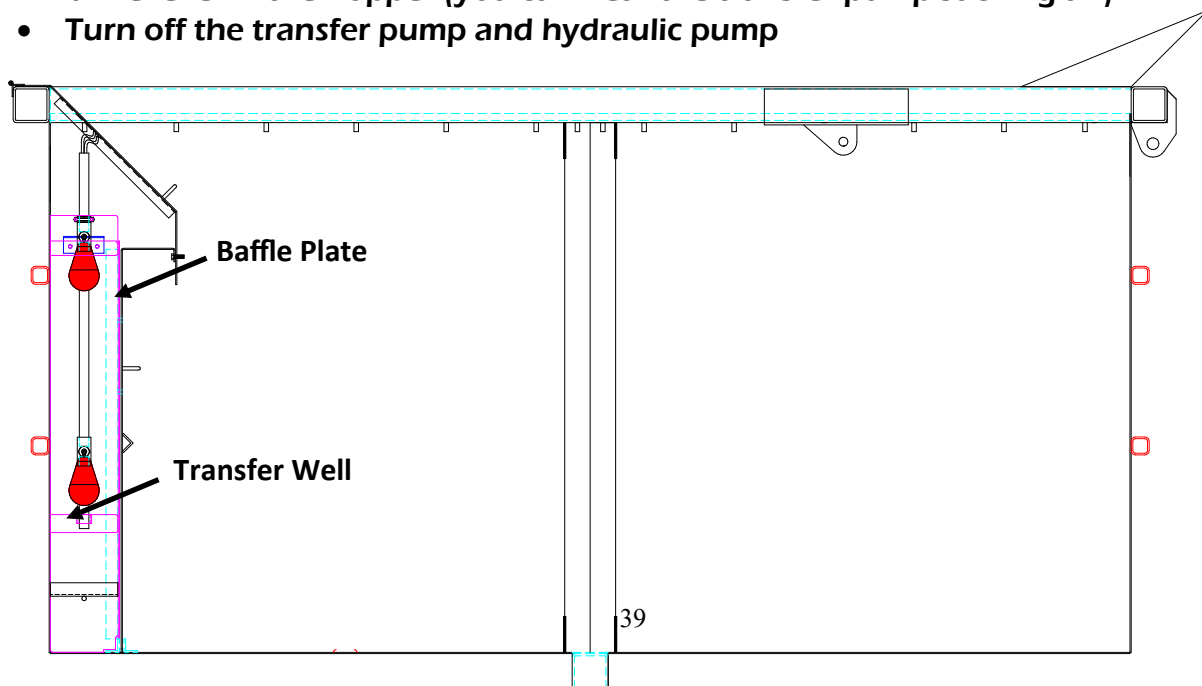
Production Cleanout Procedure:

- Move transfer valve from production to the pump down position
- Turn on hydraulic pump (manual)
- Turn on Transfer pump (manual)
- Pump as much brine out of the hopper as possible
- The Brine will still be relatively saturated since the brine being produced for much of the production cycle is at 90%+ concentration, and the “Low Salinity” limit is set to roughly 86% concentration. This means that brine in the storage tanks should not drop below desired levels at any point due to pump down operations.

NOTE: It is a good idea to check salinity often during operations, and just prior to pump down to make sure that proper concentration is maintained.

NOTE: If there is a large amount of debris in the bottom of the hopper the baffle plate slots may be covered. If this happens the transfer pump may offload brine faster than the pump down well can refill. If this happens the transfer pump may need to be cycled off and on several times to get all the brine out of the hopper.

- Pump down is complete when the transfer pump suction port is above the brine level in the hopper (you can hear the transfer pump sucking air).
- Turn off the transfer pump and hydraulic pump



- Open baffle cover and rinse floats and baffle area
- Secure baffle cover back into place
- Once the hopper is pumped down:
 - ♦Close the recirculation valve
 - ♦Move the transfer valve to the Production position
 - ♦Disconnect the hoses from the recirc. And transfer ports
 - ♦The hopper can now be dumped
- Hopper should be cleaned immediately as the debris can form a solid cake that is very difficult to remove if left to dry

CAUTION! Check that all personnel are clear of the hopper, and that the hoses are disconnected before operating the hopper dump!

- Position front loader bucket in front of and below hopper spout
- Run hopper up to dump debris
- Once hopper is in the fully up position, and the bulk of the debris is removed, open the water tap valve (manual) to rinse the remaining debris
- Check that the spray bars are undamaged, and flowing tap water properly
- Spray out remaining debris with a hose
- Once the hopper is clean, lower it back into place

CAUTION! Check that all personnel are clear of the hopper before operating hopper down!

- Reconnect hoses
- Open the Recirc. Valve
- Make sure the transfer valve is in the production position
- Charge hopper according to the “Initial Hopper Charge Procedure” above

Spring Cleanout:

NOTE: Failure to clean pumps will allow salt to harden around pump impeller and make disassembly necessary.

- Follow **Production Cleanout Procedure** above
- Once the hopper is clean and back in position
- Fill hopper until Recirc level is reached (approximately half way to the tap water fill level)
- Run the Recirc pump for several minutes to clear out brine and debris from Recirc/Tap Water assembly & hoses
- Disconnect transfer hose
- Turn on transfer to empty wash water through transfer pump
- Reconnect transfer hose
- Remove hoses from Truck Fill Pump
- Rinse thoroughly with a hose or similar (several minutes) to ensure that all salt brine/debris is removed from pump

Note: pumps can be treated with an anticorrosive such as RV or 50/50 Antifreeze once the brine has been thoroughly rinsed out

DATE: _____ SITE: _____
SERIAL# _____

FILL TANK AND CASE DRAIN

MOTOR ROTATION

STORAGE, SALINITY, RECIRC, TAP WATER
FLOATS:

☐

LOAD SENSE PRESSURE PSI _____
PUMP PRESSURE PSI _____

HOPPER UP
HOPPER DN ☐
BOX ☐
TRANSFER ☐
RECIRCULATION ☐
TRUCK FILL ☐
BOX ☐
LOW SAL. LIGHT ☐

MAX AMPS (Marked ☐ on Motor Plaque): _____ A

AMPS:

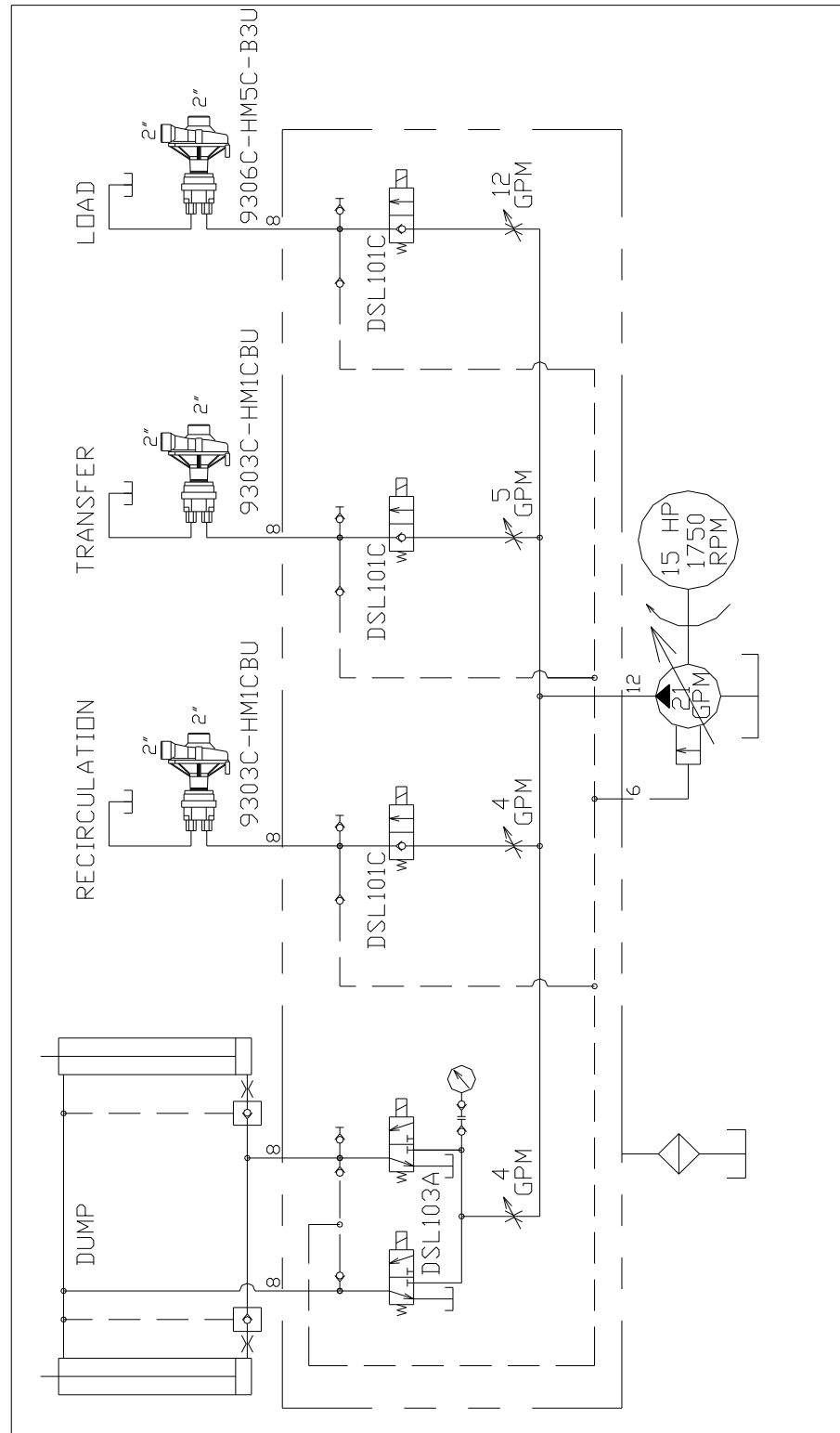
No Load: _____ A

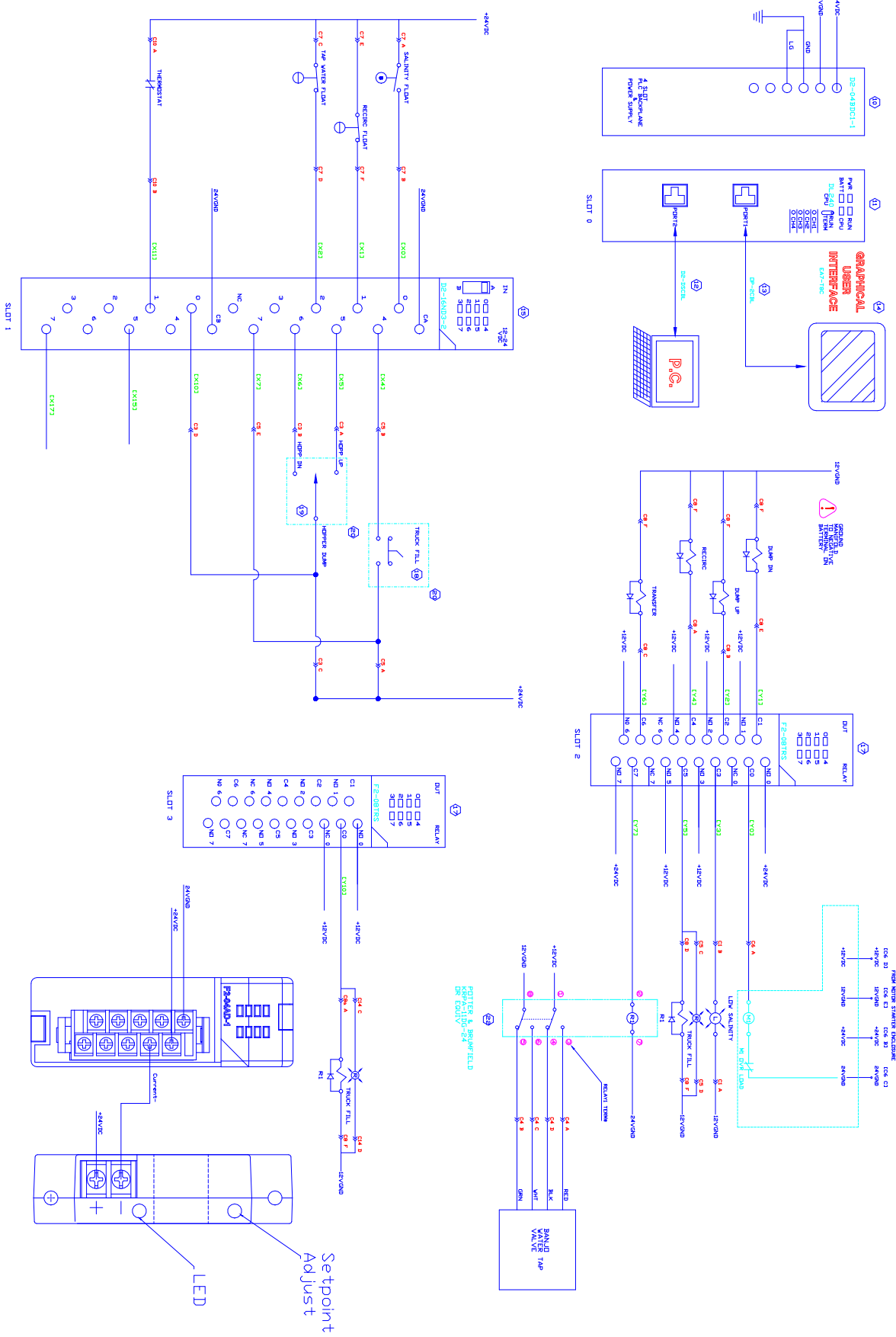
Recirc Only: _____ A

Recirc and Transfer: _____ A

Recirc, Transfer, and Truck Fill: _____ A

Hydraulic Circuit Diagram





PENGWYN
 2550 W. FIFTH AVENUE
 COLUMBUS, OH 43204

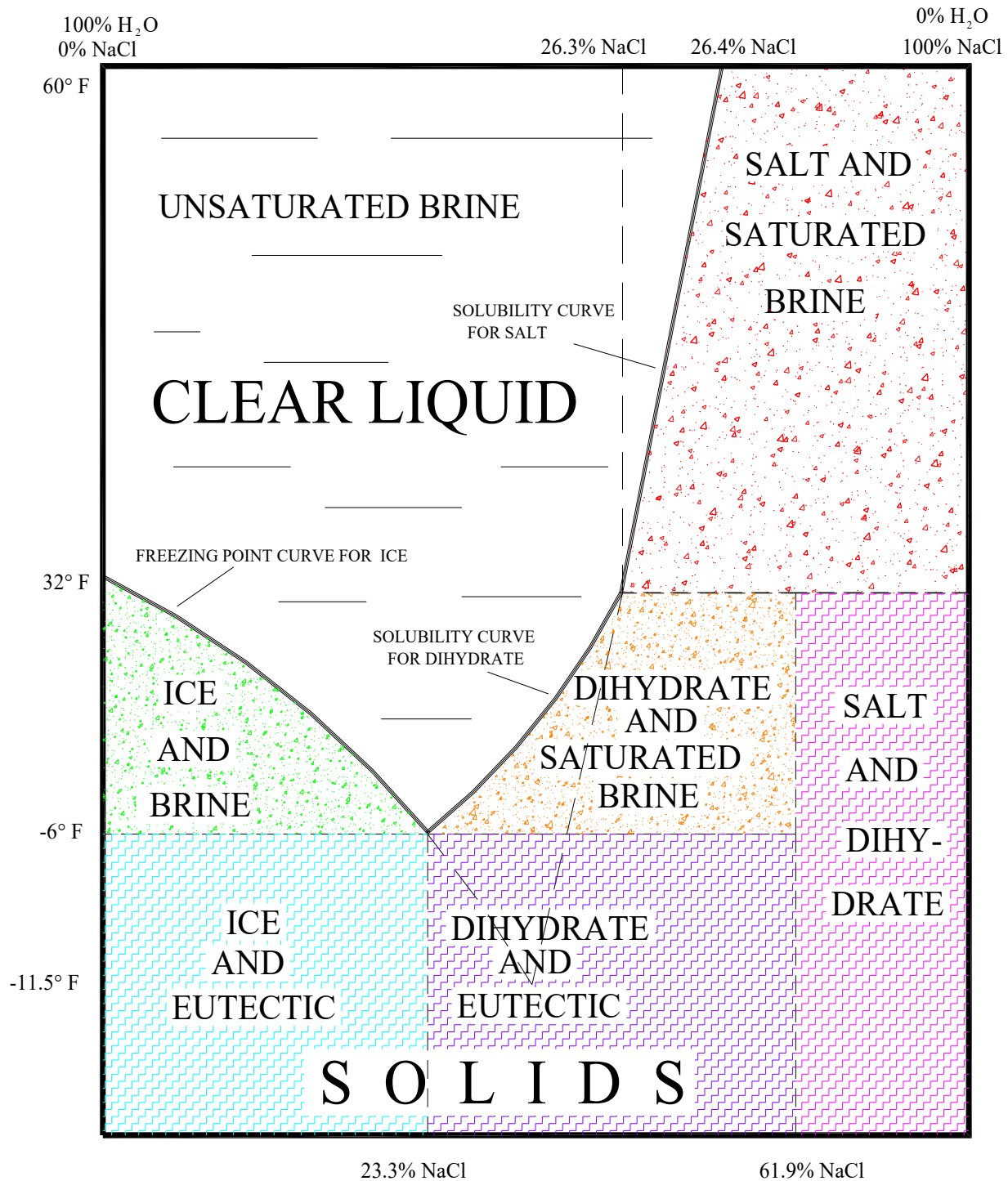
DRAWING NO.: 1

CONTROL PANEL SCHEMATIC

DRAWN BY: Charles Hoskins
 ORIG. DATE: 8-20-10
 REV. DATE: 2-10-2020

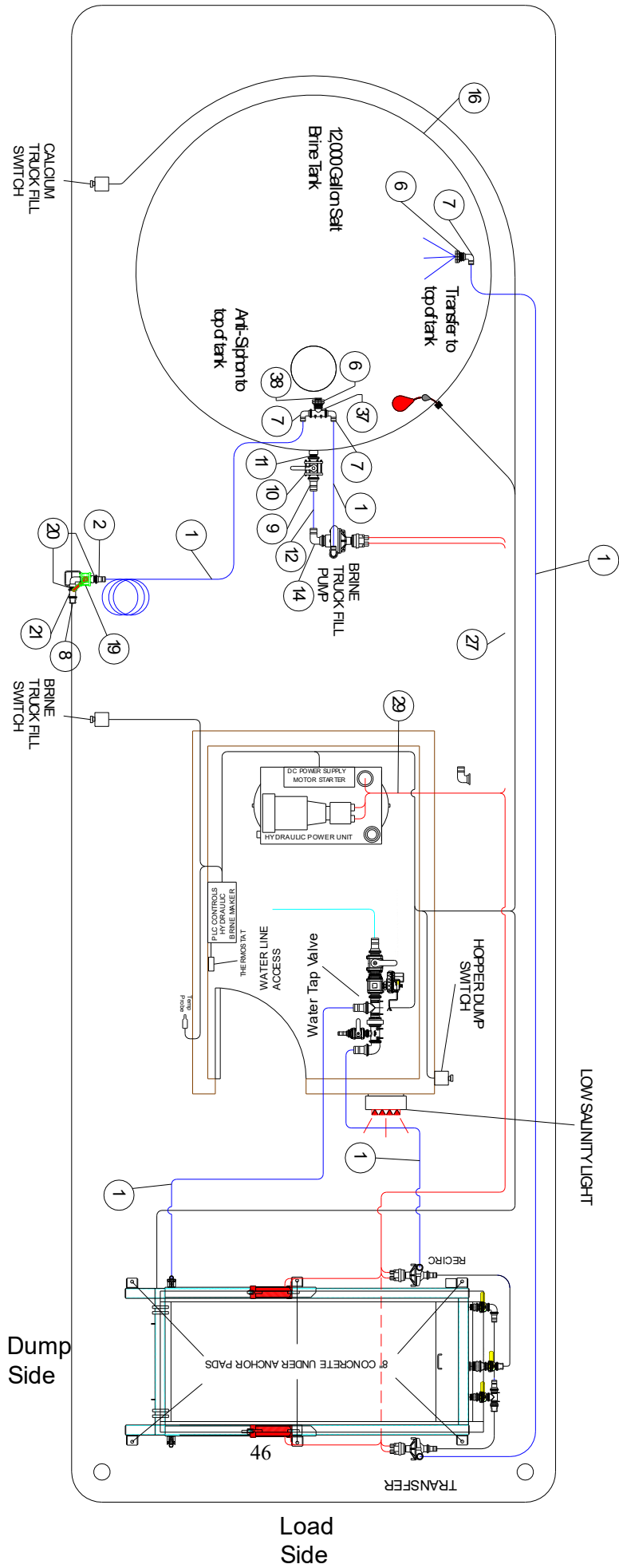


NaCl/H₂O PHASE CHART



SALOMETER DEGREES	SPECIFIC GRAVITY	BAUME DE- GREES	PERCENT SO- DIUM CHLO- RIDE BY WEIGHT	POUNDS PER GALLON OF BRINE (NaCl)	POUNDS PER GALLON OF BRINE (WATER)	FREEZING POINT DEGREES FAHR- ENHEIT
0	1.000	0.0	0.000	0.000	8.328	+32.0
2	1.004	0.6	0.528	0.044	8.318	+31.5
4	1.007	1.1	1.056	0.089	8.297	+31.1
6	1.011	1.6	1.584	0.133	8.287	+30.5
8	1.015	2.1	2.112	0.178	8.275	+30.0
10	1.019	2.7	2.640	0.224	8.262	+29.3
12	1.023	3.3	3.167	0.270	8.250	+28.8
14	1.026	3.7	3.695	0.316	8.229	+28.2
16	1.030	4.2	4.223	0.362	8.216	+27.6
18	1.034	4.8	4.751	0.409	8.202	+27.0
20	1.038	5.3	5.279	0.456	8.188	+26.4
22	1.042	5.8	5.807	0.503	8.175	+25.7
24	1.046	6.4	6.335	0.552	8.159	+25.1
26	1.050	7.9	6.863	0.600	8.144	+24.4
28	1.054	8.5	7.391	0.649	8.129	+23.7
30	1.058	9.0	7.919	0.698	8.113	+23.0
32	1.062	9.5	8.446	0.747	8.097	+22.3
34	1.066	10.0	8.974	0.797	8.081	+21.6
36	1.070	10.5	9.502	0.847	8.064	+20.9
38	1.074	11.0	10.030	0.897	8.047	+20.2
40	1.078	11.5	10.558	0.948	8.030	+19.4
42	1.082	12.0	11.086	0.999	8.012	+18.7
44	1.086	12.5	11.614	1.050	7.994	+17.9
46	1.090	12.9	12.142	1.102	7.976	+17.1
48	1.094	13.4	12.670	1.154	7.957	+16.2
50	1.098	13.9	13.198	1.207	7.937	+15.4
52	1.102	14.4	13.725	1.260	7.918	+14.5
54	1.106	14.8	14.253	1.313	7.898	+13.7
56	1.110	15.3	14.781	1.366	7.878	+12.8
58	1.114	15.8	15.309	1.420	7.858	+11.8
60	1.118	16.2	15.837	1.475	7.836	+10.9
62	1.122	16.7	16.365	1.529	7.815	+9.9
64	1.126	17.2	16.893	1.584	7.794	+8.9
66	1.130	17.7	17.421	1.639	7.772	+7.9
68	1.135	18.1	17.949	1.697	7.755	+6.8
70	1.139	18.6	18.477	1.753	7.733	+5.7
72	1.143	19.1	19.004	1.809	7.710	+4.6
74	1.147	19.6	19.532	1.866	7.686	+3.4
76	1.152	20.0	20.060	1.925	7.669	+2.2
78	1.156	20.4	20.588	1.982	7.645	+1.0
80	1.160	21.0	21.116	2.040	7.620	-0.4
82	1.164	20.4	21.644	2.098	7.596	-1.6
84	1.169	21.0	22.172	2.158	7.577	-3.0
86	1.173	21.4	22.700	2.218	7.551	-4.4
88	1.178	21.9	23.228	2.279	7.531	-5.8
88.3*	1.179	22.0	23.310	2.288	7.528	-6.0*
90	1.182	22.3	23.755	2.338	7.506	-6.0*
92	1.186	22.7	24.283	2.398	7.479	-6.0*
94	1.191	23.3	24.811	2.459	7.460	-6.0*
95	1.193	23.5	25.075	2.491	7.444	-6.0*
96	1.195	23.7	25.339	2.522	7.430	-6.0*
97	1.197	23.9	25.603	2.552	7.417	-6.0*
98	1.200	24.2	25.867	2.585	7.409	-6.0*
99	1.202	24.4	26.131	2.616	7.394	-6.0*
99.6	1.203	24.5	26.285	2.634	7.386	-6.0*
100	1.204	24.6	26.395	2.647	7.380	-6.0*

Sample Layouts



FIELD CONTROL WIRING 12V-DC
FIELD PLUMBING HYDRAULIC
FIELD PLUMBING BRINE
FIELD PLUMBING CALCIUM

Sample Layouts

PENGWYN

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614-488-0019

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