

SolarLite® Pump

Solar Powered Chemical Injection Pump

INSTALLATION & OPERATIONS PROCEDURES MANUAL

Revision 1.1.3.2

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Introduction

The benefits of solar powered chemical injection pumping systems offered by Dresser will provide years of low maintenance, clean reliable service, zero noise pollution, without emissions to the surrounding environment. Our goal is to pass along a quality product, both a renewable resource and affordable investment to our customers.

To insure quality of product, functionality, operating procedures, warranty and service pertaining to equipment provided by Dresser to our customers, consult a qualified manufacturing representative.

Serialized Assemblies

It is strongly advised that all assemblies remain a complete or unbroken serialized set for proper functionality. These assemblies have been adequately sized based on the following variables: Daily Solutions Volume, Head Size, Well Pressures, Regional Solar Sun Hours, Temperature, Number of Days without Sun Light, and Quantities of Batteries and Solar Panels.

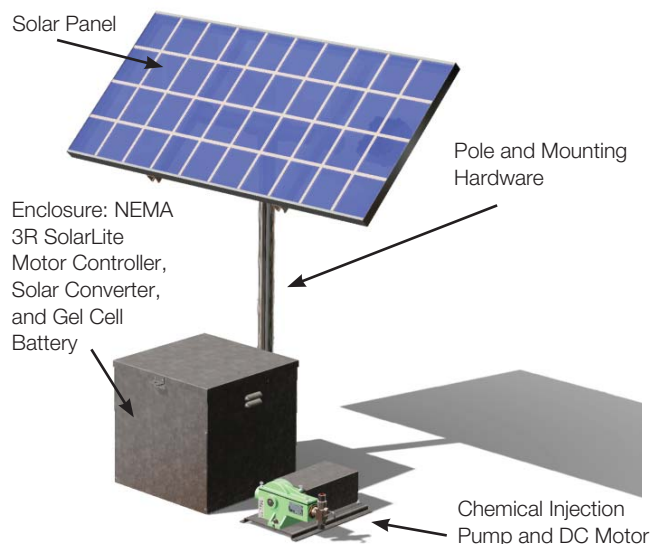


Figure 1 – SolarLite Pump General Configuration

Installation Instructions

The SolarLite pump assembly comes with connections which are provided to protect against accidental electrical shock. There are connectors inline provided for both the battery(s) and the solar panel(s). The connectors should not be connected while the SolarLite pump is being assembled or during any maintenance period.

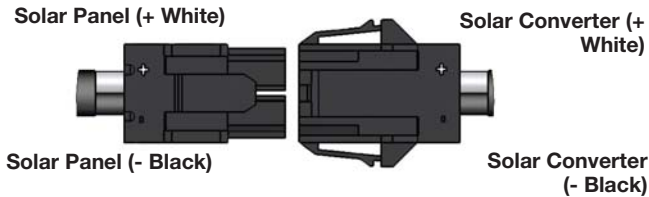


Figure 2– Solar Panel and Battery Connections

A 2.0 inch diameter schedule 40 galvanized coated 8 foot mounting pole has been provided for attaching the solar panels. The pole can be firmly attached to a leg of a solutions tank rack. An alternative method for securing the mounting pole would be to drive a T-post into the ground, slip the pole over the T-post and add a generous amount of Quick-Set concrete to the top opening of the pipe.

For Safety purposes, the battery and solar panels should not be connected until all other assembly steps have been completed.

Solar Panel Mounting

Mounting hardware to attach the solar panels to the pole has been pre-assembled to aid in field installation. Prior to placement of the 3-outlet 2.0 inch diameter Pipe Tee, loosen the Azimuth (direction the solar panels face) adjustment Set Screw. Reference Figure 3. Position the bottom inlet on top of the pole, making sure it is firmly centered and seated down. Make sure that there aren't any shadows that could contact any portion of the solar panel.

Solar Panel Alignment

During “sun hours” the solar panels are used to recharge the battery voltage used during the night or non sun hours. The solar mounting assembly should be adjusted to achieve Maximum Effective Irradiance or Maximum Peak Power (maximum sun hours). Configuring the azimuth (direction the solar panels face) and horizontal (tilt) placement of the solar panels is critical and should be adjusted or aligned at midday to achieve maximum “sun hours”.

To adjust both the direction the solar panels face and the tilt positions on the Solar Panel Mounting, there are (3) 5/8 in. - Set Screws on the 3-outlet 2.0 in. Diameter Pipe Tee component of the mounting assembly, which will require a 5/16 Allen Wrench. Reference figures 3 and 4.

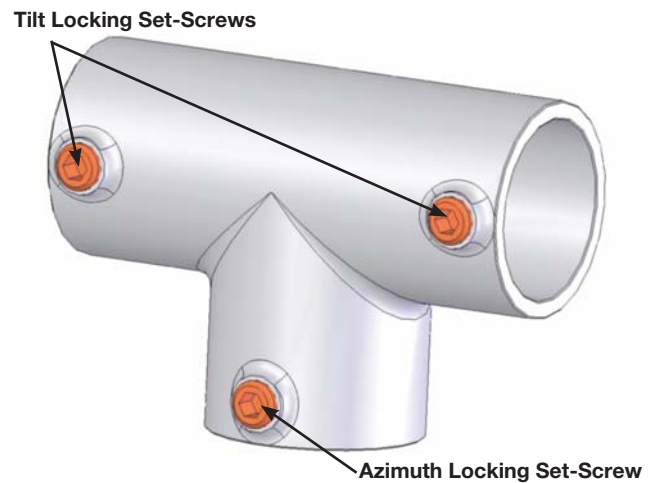


Figure 3

STEP 1: Direction: Adjust the Solar Panel Array Azimuth (direction the solar panels face) by facing the assembly towards true South, not magnetic south. True South (Solar Noon) is defined as the position halfway between Sunrise and Sunset. Determine the halfway point between sunrise and sunset for a given day, and face the solar panels in that direction.

STEP 2: Tilt: Dresser recommends the tilt angle be set for winter or the winter solstice (December 21). Use one of the following methods to set the tilt of the solar panels.

Method 1: Reference Figure 6 to obtain the desired Tilt angle with respect to the latitude of the end customer's well location on the right side of the graph. Follow the curve across the graph to the left side to “Photovoltaic Module Angle (Deg.)” with reference to the horizontal plane. Use a cheap protractor, and a foot long piece of string with a small weight attached to the end to set the tilt of the solar panels.

Method 2: First, determine the latitude of the install location. Then subtract the Sun Declination Angle (-23.5°) from the latitude. This method for finding this angle can be seen in the following example provided. Reference Figure 4.

Tilt Angle = Latitude Angle – (Declination Angle).

Example: Site: Houston TX, Latitude = 29°8'

Latitude (29.8°) – Declination Angle (-23.5°) = 53.3°

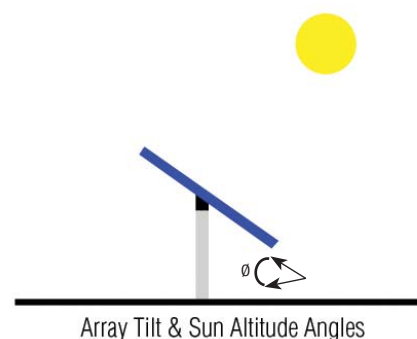


Figure 4

After adjusting the Azimuth and Tilt angle, tighten down the set screws that secure the 3-outlet Pipe Tee fitting to the 2.0 in. mounting pole.



Figure 5

Pipe Tee

Solar Panel Angles for Various Latitudes

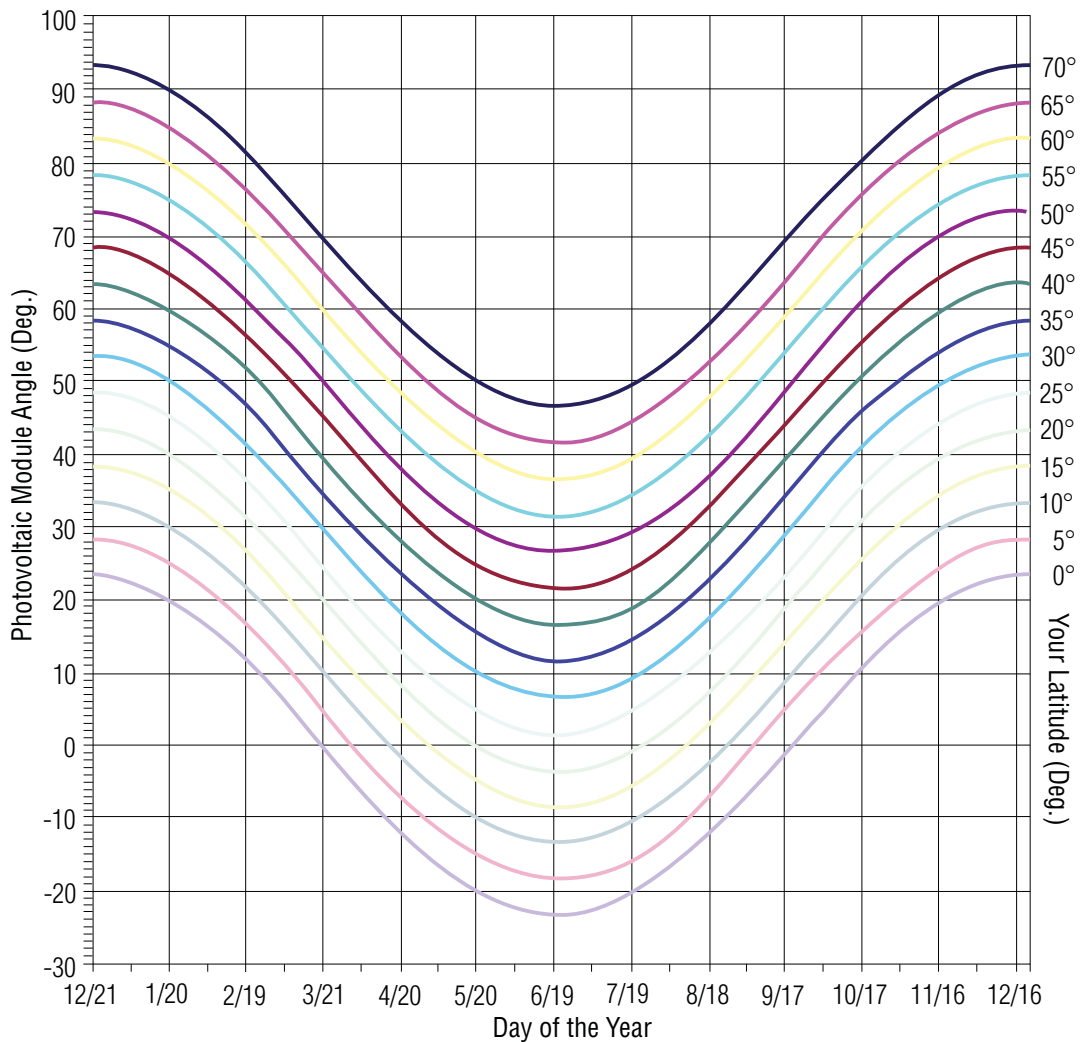


Figure 6 – Solar Panel Tilt vs. Well Latitude Location

Solar Panel Wiring

Panels Provided with Unit: Using a piece of cardboard, keep the Solar Panels covered while making any electrical connection to the Solar Panel Junction box. Follow the instructions and wiring diagram for proper polarity connectivity. Always use insulated tools to avoid high voltage and current produced by the solar panels. Install the cable glands as needed into the side of the Solar Panel Junction box. Position a screw driver on the diameter of the circular plastic plug to remove. Install the cable gland, avoiding over tightening. Slide power cable through the cable gland and hook up white wire to positive contact and the black wire to negative contact. Where multiple panels are used, unless only one solar panel cable is protruding from the battery enclosure, all Solar Panels are to be wired to a unique solar panel cable assembly. In some instances, two panels will be wired in parallel (connecting Positive to Positive and Negative to Negative). Close the junction box and secure the lid using the captive screws provided.

A simple plug/socket assembly has been provided to isolate or to disconnect the power from the Solar Panels to the electrical charging system for safety and general maintenance.

Do not plug in until all other connections and assembly have been completed. After all connections have been made, remove the cardboard cover.

Panels Provided by Customer: Using a piece of cardboard, keep the Solar Panels covered while making any electrical connection to the Solar Panel Junction box. Follow the instructions and wiring diagram (Reference Figures 18-20) for proper polarity connectivity. Always use insulated tools to avoid high voltage and current produced by the solar panels. Route the solar panel wiring through the enclosure opening (Figure 7). Install and tighten the cable gland connector into the side of the enclosure. Each solar panel wiring assembly should be routed through a unique opening. In some instances, two panels will be wired in parallel (connecting Positive to Positive and Negative to Negative).

A simple plug/socket assembly has been provided to isolate or to disconnect the power from the Solar Panels to the electrical charging system for safety and general maintenance.

Do not plug in until all other connections and assembly have been completed. After all connections have been made, remove the cardboard cover.

For safety purposes, the battery and solar panels should not be connected until all other assembly steps have been completed.

Route the motor cable thru enclosure opening.

Route the solar panel cable thru enclosure opening.

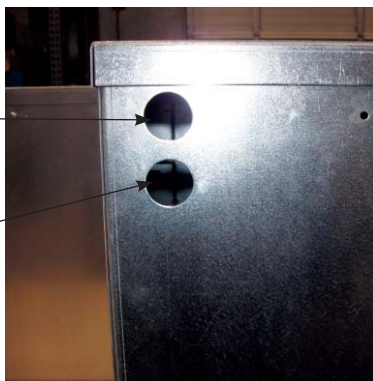


Figure 7

Volume vs RPM Chart

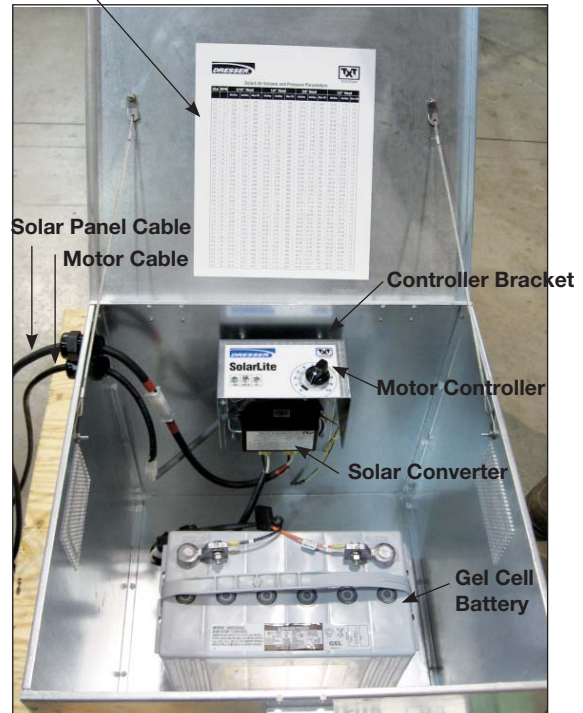


Figure 8 – Enclosure: Battery, Motor Controller, and Solar Converter

Battery Enclosure

The Battery Enclosure is constructed from a galvanized steel or aluminum exterior shell, security latch, and ventilation slots. The enclosures are designed to meet NEAM 3R standards and are available to accommodate 1, 2, 3, and 4 batteries. The battery enclosure is a top hinge type which will lay on the ground. The Motor Controller, Solar Converter and Terminal Strip come pre-assembled on the controller bracket from Dresser. This bracket is located on the upper back wall of the Battery Enclosure. It has been designed to be offset from the back mounting surface of the enclosure for additional circulation and cooling.

Motor and Pump Install

Connect the DC motor cable end through the cable gland connector through the enclosure to the mating connector within the enclosure. Reference Figure 7. A standard 8 foot motor wire harness comes pre-assembled. This connection can easily be connected and disconnected for ease of installation or relocation and service. Reference Figure 9.

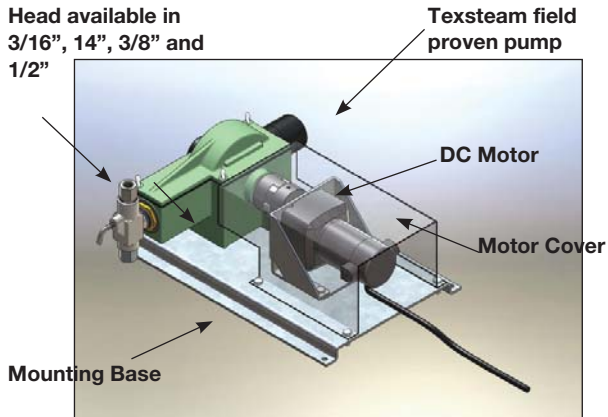


Figure 9

Battery Wiring Install

Once the enclosure has been mounted, the battery(s) can then be inserted into the battery enclosure. Reference figures 10 - 12 and schematics for wiring and installation steps.

On multiple battery installations, a ground wire has been provided. The wire should be connected from a negative battery post to the negative connection on the terminal block on the enclosure backplate.



Figure 10 - Single Battery

Connect Battery

Connect color coded cable(s) from battery to connector within enclosure that terminates to terminal block. The battery connectors are unique and will only connect to themselves.

Connect Solar Panel

Route solar panel cable through enclosure and connect to connector within enclosure that terminates to terminal block. The solar panel connectors are unique and will only connect to themselves.

The system should now be operational. The "Power On" LED on the control bracket should be illuminated.

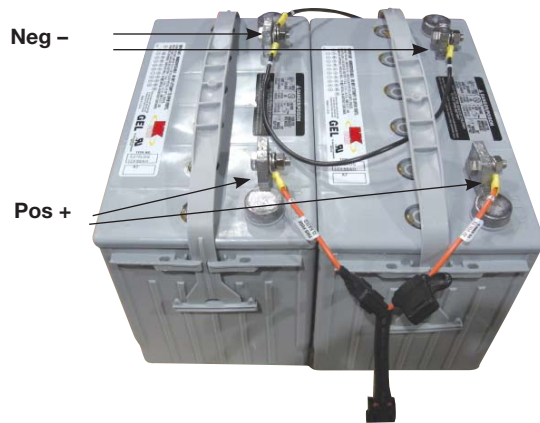


Figure 11 - Double Battery

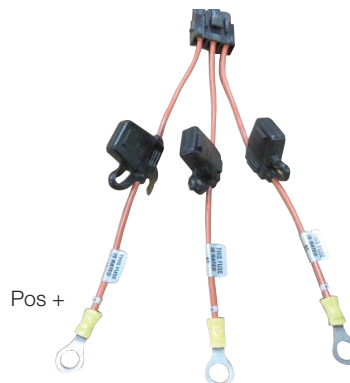


Figure 12 - Triple Battery Positive Cable End

Set Pump Starting Parameters

Review Table 1 for desired volume per head size and set the RPM dial on the motor control bracket to the appropriate speed as indicated on the table.

Note: The volume of chemical should always be verified utilizing a drum gauge or other appropriate method.

Dial	RPM	3/16" Head			1/4" Head			3/8" Head			1/2" Head		
		Qts/Day	Gal/Day	Max psi	Qts/Day	Gal/Day	Max psi	Qts/Day	Gal/Day	Max psi	Qts/Day	Gal/Day	Max psi
2.0	5	2.92	0.73	5000	5.12	1.28	3000	11.52	2.88	1000	20.48	5.12	500
2.2	6	3.50	0.88	5000	6.14	1.54	3000	13.82	3.46	1000	24.58	6.14	500
2.4	7	4.09	1.02	5000	7.17	1.79	3000	16.13	4.03	1000	28.67	7.17	500
2.6	8	4.67	1.17	5000	8.19	2.05	3000	18.43	4.61	1000	32.77	8.19	500
2.8	9	5.26	1.31	5000	9.22	2.30	3000	20.74	5.18	1000	36.86	9.22	500
3.0	10	5.84	1.46	5000	10.24	2.56	3000	23.04	5.76	1000	40.96	10.24	500
3.2	11	6.42	1.61	5000	11.26	2.82	3000	25.24	6.34	1000	45.06	11.26	500
3.4	12	7.01	1.75	5000	12.29	3.07	3000	27.65	6.91	1000	49.15	12.29	500
3.6	13	7.59	1.90	5000	13.31	3.33	3000	29.95	7.49	1000	53.25	13.31	500
3.8	14	8.18	2.04	5000	14.34	3.58	3000	32.36	8.06	1000	57.34	14.34	500
4.0	15	8.76	2.19	5000	15.36	3.84	3000	34.56	8.64	1000	61.44	15.36	500
4.2	16	9.34	2.34	5000	16.38	4.10	3000	36.86	9.22	1000	65.54	16.38	500
4.4	17	9.93	2.48	5000	17.41	4.35	3000	39.17	9.79	1000	69.63	17.41	500
4.6	18	10.51	2.63	5000	18.43	4.61	3000	41.47	10.37	1000	73.73	18.43	500
4.8	19	11.10	2.77	5000	19.46	4.86	3000	43.78	10.94	1000	77.82	19.46	500
5.0	20	11.68	2.92	5000	20.48	5.12	3000	46.08	11.52	1000	81.92	20.48	500
5.2	21	12.26	3.07	5000	21.50	5.38	3000	48.38	12.10	1000	86.02	21.50	500
5.4	22	12.85	3.21	5000	22.53	5.63	3000	50.69	12.67	1000	90.11	22.53	500
5.6	23	13.43	3.36	5000	23.55	5.89	3000	52.99	13.25	1000	94.21	23.55	500
5.8	24	14.02	3.50	5000	24.58	6.14	3000	55.30	13.82	1000	98.30	24.58	500
6.0	25	14.60	3.65	5000	25.60	6.40	3000	57.60	14.40	1000	102.40	25.60	500
6.2	26	15.18	3.80	5000	26.62	6.66	3000	59.90	14.98	1000	106.50	26.62	500
6.4	27	15.77	3.94	5000	27.65	6.91	3000	62.21	15.55	1000	110.59	27.65	500
6.6	28	16.35	4.09	5000	28.67	7.17	3000	64.51	16.13	1000	114.69	28.67	500
6.8	29	16.94	4.23	5000	29.70	7.42	3000	66.82	16.70	1000	118.78	29.70	500
7.0	30	17.52	4.38	5000	30.72	7.68	3000	69.12	17.28	1000	122.88	30.72	500
7.2	31	18.10	4.53	5000	31.74	7.94	3000	71.42	17.86	1000	126.88	31.74	500
7.4	32	18.69	4.67	5000	32.77	8.19	3000	73.73	18.43	1000	131.07	32.77	500
7.6	33	19.27	4.82	5000	33.79	8.45	3000	76.03	19.01	1000	135.17	33.79	500
7.8	34	19.86	4.96	5000	34.82	8.70	3000	78.34	19.58	1000	139.26	34.82	500
8.0	35	20.44	5.11	5000	35.84	8.96	3000	80.64	20.16	1000	143.36	35.84	500
8.2	36	21.02	5.26	5000	36.86	9.22	3000	82.94	20.74	1000	147.46	36.86	500
8.4	37	21.61	5.40	5000	37.89	9.47	3000	85.25	21.31	1000	151.55	37.89	500
8.6	38	22.19	5.55	5000	38.91	9.73	3000	87.55	21.89	1000	155.65	38.91	500
8.8	39	22.78	5.69	5000	39.84	9.98	3000	89.86	22.46	1000	159.74	39.93	500
9.0	40	23.36	5.84	5000	40.96	10.24	3000	92.16	23.04	1000	163.84	40.96	500
9.2	41	23.94	5.99	5000	41.98	10.50	3000	94.46	23.62	1000	167.94	41.98	500
9.4	42	24.53	6.13	5000	43.01	10.75	3000	96.77	24.19	1000	172.03	43.01	500
9.6	43	25.11	6.28	5000	44.03	11.01	3000	99.07	24.77	1000	172.03	43.01	500
9.8	44	25.70	6.42	5000	45.06	11.26	3000	101.38	25.34	1000	180.22	45.06	500
10.0	45	26.28	6.57	5000	46.08	11.52	3000	103.68	25.92	1000	184.32	46.08	500

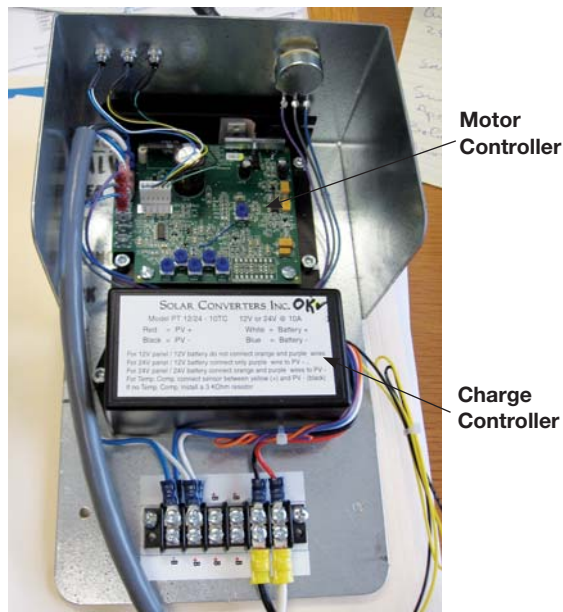
Head Size	# of Heads	RPM Range		Volume Range		Units of Measure	Pressure Range (psi)
		Low	High	Low	High		
3/16"	Single	5	45	2.92 (2.76)	26.31	Quarts (Liters)/Day	0-5000
	Duplex	5	45	2.92 (2.76)	52.62 (49.79)	Quarts (Liters)/Day	0-5000
1/4"	Single	5	45	5.12 (4.84)	46.07 (43.61)	Quarts (Liters)/Day	0-3000
	Duplex	5	45	5.12 (4.84)	92.14 (87,190)	Quarts (Liters)/Day	0-3000
3/8"	Single	5	45	11.52 (10.9)	103.68 (98.12)	Quarts (Liters)/Day	0-1000
	Duplex	5	45	11.52 (10.9)	207.36 (196.23)	Quarts (Liters)/Day	0-1000
1/2"	Single	5	45	20.48 (19.38)	184.29 (174.43)	Quarts (Liters)/Day	0- 500
	Duplex	5	45	20.48 (19.38)	368.58 (348.80)	Quarts (Liters)/Day	0-500

Table 2 – Head Size vs. Volume Range

Motor Controller

The Motor Controller has been designed to provide continuous motor operation. Features include:

- A variable speed motor that will match pump output requirements.
- Three LEDs (Light Emitting Diode) located on front panel mount display that represent:
 - Power On (Power has been supplied to the controller)
 - Motor Run/Stop (Green light illuminated indicates motor running)
 - Fault condition (Motor fault condition)
- Manual field input capabilities using RPM adjustment knob. Reference figure 12.



Motor Controller Enclosure

A covered bracket has been provided to provide a degree of protection to personnel from accidental exposure to electrical components and also provide a degree of protection to the electronics from the environment. Avoid static discharge into the circuitry when servicing or connecting electrical connections.

Solar Converter

The Solar Converter uses the latest in technology to further boost the performance current produced by the solar panels with the aid of micro processor solar power management tool. The result is a highly efficient solar power converter. When solar energy is being produced using solar panels, a micro-processor measures and determines the optimum operating charging point to charge the battery. A low voltage disconnect is included in the design to protect the battery from excessive discharge. Two LED's provide a visual indication as to the status of the solar converter. A temperature sensor is also provided to monitor battery temperature; this sensor provides feedback to the solar converter and will adjust battery charge conditions accordingly as the temperature changes.

Gel Cell Battery

All batteries conform to BCI specifications. Batteries are maintenance free. Sealed construction eliminates: periodic watering, corrosive spills and fumes. Electrolyte will not stratify, no equalization charging required. Allows for faster recharging intervals. Battery operating temperatures range from -76°F (-60°C) to 140°F (60°C). All batteries in multi-battery configurations are to be wired in parallel (connecting Positive to Positive and Negative to Negative). All batteries cables are equipped with a current limiting device to protect against an over current condition.

Simplex/Duplex Pump

All pump heads as a standard incorporate a 316 stainless steel body and the Texsteam® proven plunger and packing design technology. Pump outputs are a basic setup input feature. Daily Volumes can be selected in Quarts/Day. Output volumes remain constant as pressure requirements change. Min/Max daily volumes based on continuous duty range from 2.92 to 368.58 quarts/day.

Adjustable Stroke Length

An adjustable stroke length plunger is offered and as an option. Consult factory for part number and pricing information.

Electric Motor

The DC brushed motor used in the SolarLite pump has gone through rigorous testing prior to distribution to market. The motor are designed for: high efficiency, low power consumption, long life, and continuous duty cycle. The brushes of the motor will need to be replaced every 10,000 hours (approximately 14 months) of motor operation. Contact the factory for replacement brushes.



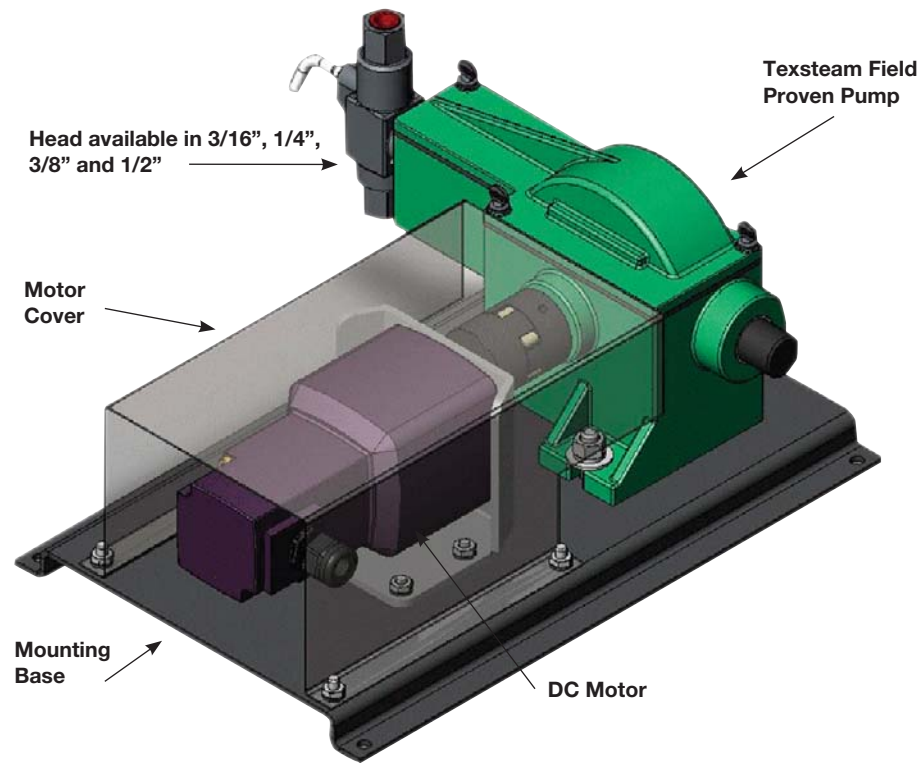


Figure 14 – Pump and Electric DC Motor Assembly

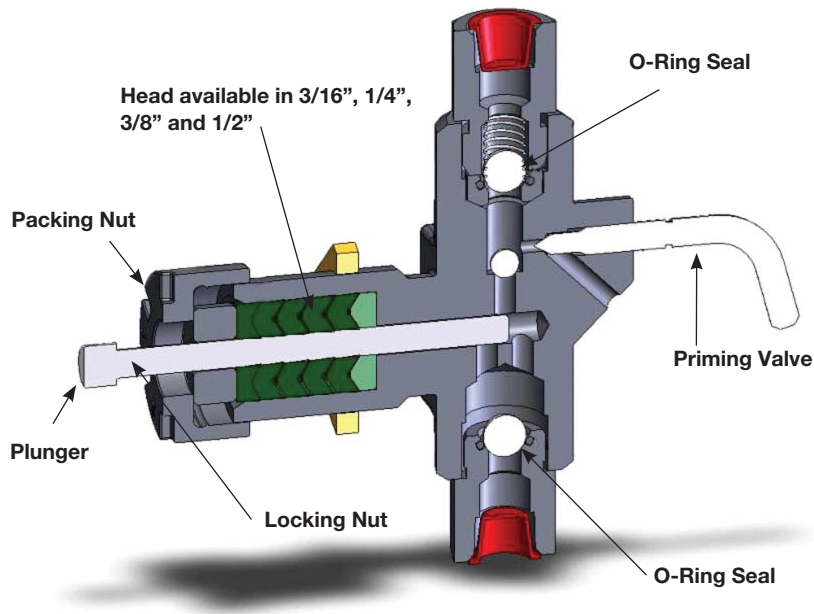


Figure 15 – Chemical Injection Pump Head

Elimination of Pump Drag and Friction

Packing Tightness

Particular attention should be given to Packing Nut tightness. Over tightening of Packing Nut can result in excessive losses of electrical power, which effects battery life, and pre-mature seal packing degrading. The method for tightening all Texsteam pumps is the same. **NEVER ADJUST PACKING WITH THE PUMP RUNNING.** Loosen the Packing Nut until you can feel that it is free, then retighten until you feel a snug fit, then one more little tightening, the size of one (only) notch in the Packing Nut. If this does not work, stop the pump and tighten only one more notch.

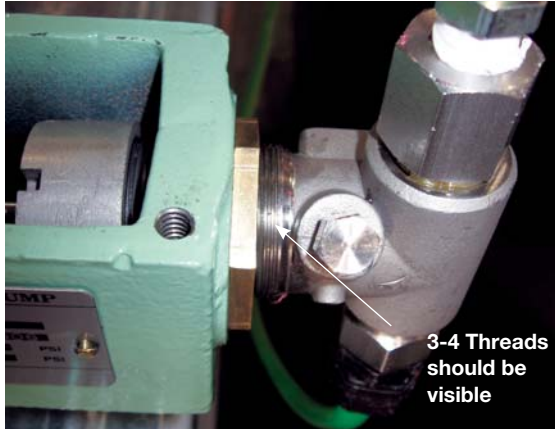


Figure 16

Head Adjustment

Between 3 and 4 screw threads should be present once the locking nut to secure the head to the pump base has been tightened. Reference Figure 16.

An adjustment should be performed to minimize friction between the coupling and pump housing. Reference Figure 17.

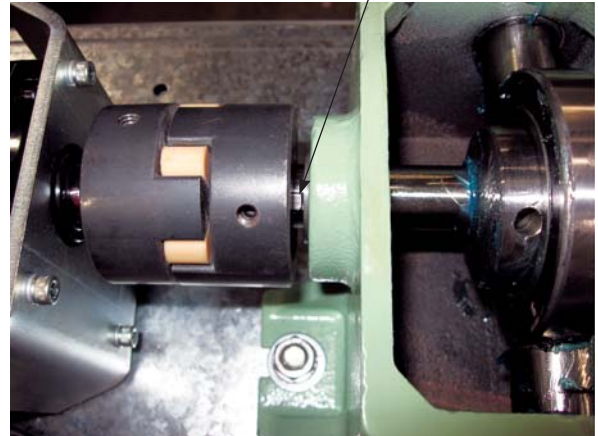


Figure 17

Wiring Diagrams

Wiring diagrams provided with units when shipped. Consult Dresser if an additional or specific wiring diagram is needed.

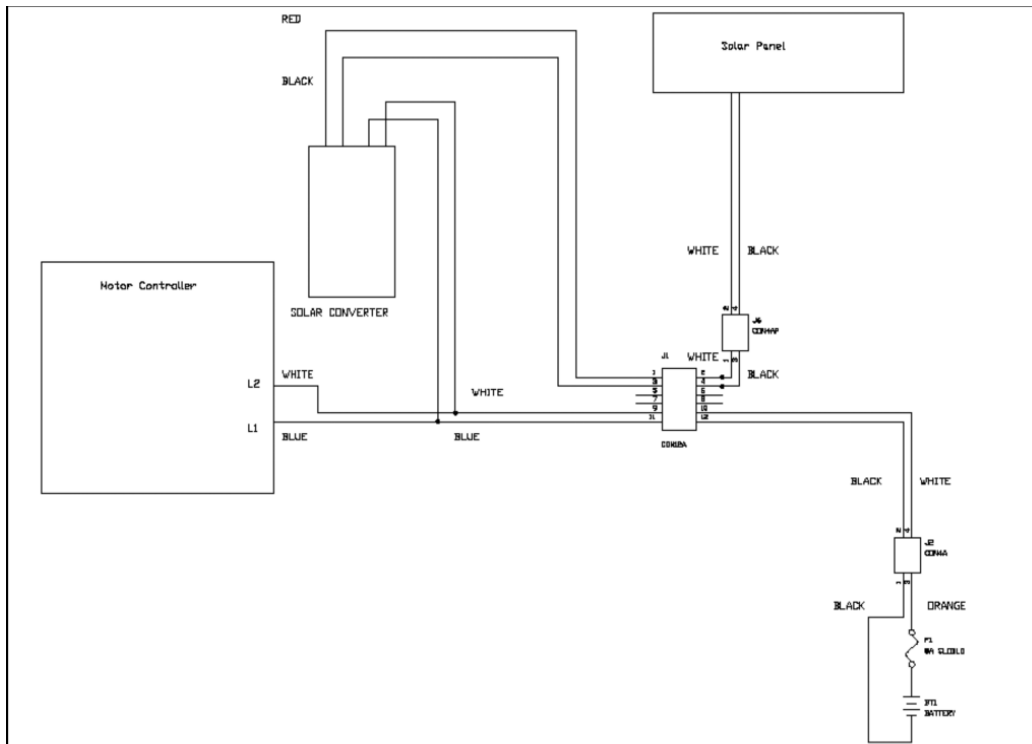


Figure 18- One Panel, One Battery Wiring Diagram

Solar Panel Maintenance

Very little maintenance is necessary other than the periodic cleaning of the solar panel screen. This will optimize the charging capabilities, by enhancing the light transmission. Use a mild soap solution, warm water and a clean soft towel to remove dust, bird dropping, etc. Use of any greasy substances or sharp tools might scratch the protective covering.

Handle the solar panels with care. The cells can easily be damaged do the fragile nature of the multicrystalline silicon cell structure. Irreparable damage can be caused by any impacting, twisting, or bending action of the panel assemblies. Do not drill or weld the frame if possible.

Motor Brush Maintenance

The brushes of the motor will need to be replaced every 10,000 hours (approximately every 14 months) of motor operation. Contact the factory for replacement brushes. Failure to replace motor brushes within recommended time may cause motor damage. Reference Figure 19.



Figure 19

Servicing

Emergency field repairs by authorized service technicians are strongly advisable. Repairs made by unauthorized technicians will void any warranty. To assure safety of equipment and personnel, only Dresser recommended replacement parts shall be installed. And above all, disconnect power from the SolarLite before servicing.

Damage to wiring and operating equipment may be avoided with careful reviewing the operating and installation procedures document by qualified personnel. At all times, operating safety of electrical equipment is imperative to avoid injury to personnel.

IMPORTANT

Read this instruction document with special attention to warnings, cautions and safety concerns. **FAILURE TO ADHERE TO THESE INSTRUCTIONS COULD RESULT IN SAFETY HAZARDS WHICH MAY RESULT INJURY TO PERSONNEL, MOTOR/CONTROLLER DAMAGE OR OTHER ELECTRICAL EQUIPMENT.** Doubts or reservations with regards to installations or maintenance with reference to connecting your "Solar Powered" Chemical Injection Pump system should refer to the detailed sections supplied in this manual. For additional instruction, classification or assistance, contact an authorized Service Center.

WARNING

Avoid personnel injury involving equipment that is in motion. Always remove or disconnect power prior to service to the motor, motor controller, batteries, charge controller, solar panels.

About Dresser, Inc.

Dresser, Inc. is a leader in providing highly engineered infrastructure products for the global energy industry. The company has leading positions in a broad portfolio of products, including valves, actuators, meters, switches, regulators, piping products, natural gas-fueled engines, retail fuel dispensers and associated retail point-of-sale systems, and air and gas handling equipment. Leading brand names within the Dresser portfolio include Dresser Wayne® retail fueling systems, Waukesha® natural gas-fired engines, Masoneilan® control valves, Consolidated® pressure relief valves, and Roots® blowers. It has manufacturing and customer service facilities located strategically worldwide and a sales presence in more than 100 countries.

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SolarLite® Solar Powered Chemical Injection Pump IOM
6.10