BR1100

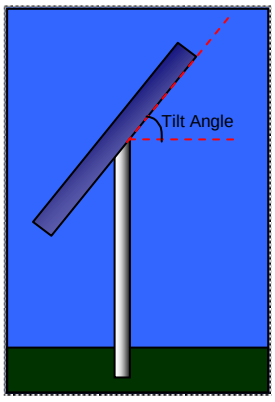
Solar Powered Chemical Injection Pump

The BR1100 Chemical Injection Pump is designed to operate utilizing the power supplied from 12 volt DC batteries which are charged using photovoltaic solar panels. The typical system uses one(1) or two(2) 12VDC, 100 amp-hour deep cycle batteries to store the electric energy produced by the panels for use throughout the day. Solar panels create an electric current when subjected to sunlight and the size and number of solar panels required depends on the daily power consumption of the system and the setup of the solar array.

Site Selection
To ensure optimum performance, a site where no shadows will fall on the solar panels is essential. The panels should be in a location where they can receive optimum exposure to sunlight. The panels should be in a position where they can be securely anchored so the wind does not blow them out of position or damage them.

Set-up
The panels should always be facing true South in the northern hemisphere to get the most contact with the sun.

The tilt of the panels depends on the latitude of the site. The angle is typically in the range of site-latitude-plus 15° (for winter months) to site-latitude-minus 15° (for summer months) which slightly maximizes the solar radiation in the winter or the summer respectively. Solar panels can be placed at an angle equal to the latitude which has no seasonal bias. Placing the solar panels in a vertical position (tilt angle of 90°) will aid in keeping the panel clean and clear from debris, especially snow, and is beneficial and recommended in northern latitudes (ie. Canada).



Solar panel tilt angle.

Maintenance
It is very important that the solar panels be handled with care as irreparable damage can be caused by impacting, bending, or twisting.

DO NOT short circuit the PV array or load while connected to the controller. This may DAMAGE the controller.

Solar panels are to be kept clean and clear of any form of covering, (e.g. dirt or snow) as the output from the solar panel will be reduced if the light transmission to the panel is decreased. Regular cleaning of the solar panel screen is necessary to optimize its performance by increasing light transmission. This can be done using mild soap and warm water with a clean, soft cloth. Use of sharp tools or greasy materials could damage the panels.

Follow these steps to determine the Solar Array Sizing for the pump system.

Step 1: Determine the Power System Requirements (Daily Amp Hours) required by the pump (multiply the pump amperage draw by the time on (seconds) per minute by 0.4).

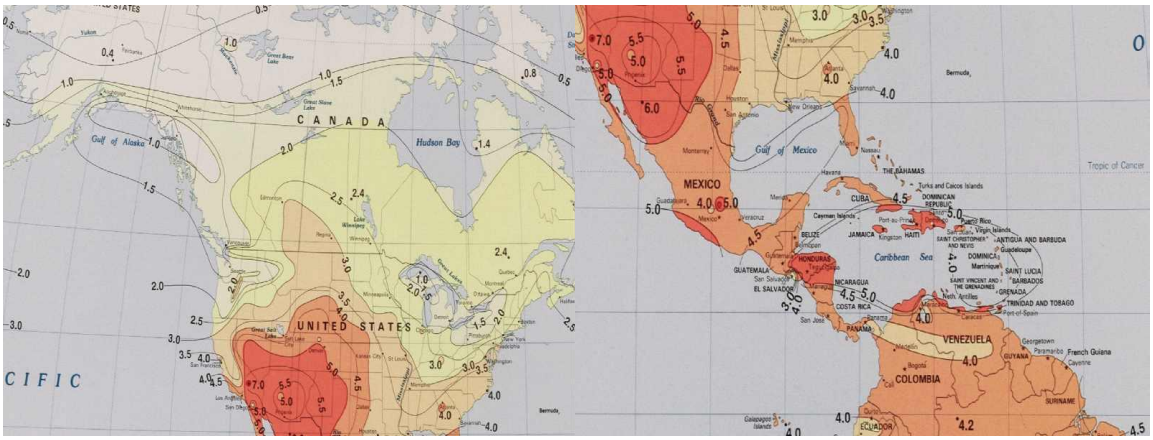
Daily Amp Hours = _____AHr

Step 2: Multiply the Power System Requirements (Daily Amp Hours) by 1.2 to account for battery charge / discharge efficiency.

Daily Amp Hours Required = _____AHr

Step 3: Determine the average sun hours per day in the area from the map below.

Average Sun Hours per day = _____Hr.



Step 4: Divide the Daily Amp Hours Required (Step 2) by the Average Sun Hours per day (Step 3) to determine the total solar array amps required.

Solar Array Amps Required = _____Amps

Step 5: Determine the Optimum or Peak amps of the solar module used. This can be found on the module specifications.

Solar Module Peak Amps = _____Amps

Step 6: Determine the total number of solar modules in parallel required by dividing the Solar Array Amps Required (Step 4) by the Solar Module Peak Amps (Step 5). Round up to the next highest number.

Number of Solar Modules in Parallel = _____

Step 7: Determine the number of solar modules in each string (wired in series) if your system is larger than 12 VDC.

DC Battery Voltage	# of Modules in Each Series String
12	1
24	2
48	4

Number of Solar Modules in each Series String =_____

Step 8: The total number of solar modules required is found by multiplying the number of solar modules in parallel (Step 6) by the number of solar modules in each series string (Step 7).

Total Number of Solar Modules = _____

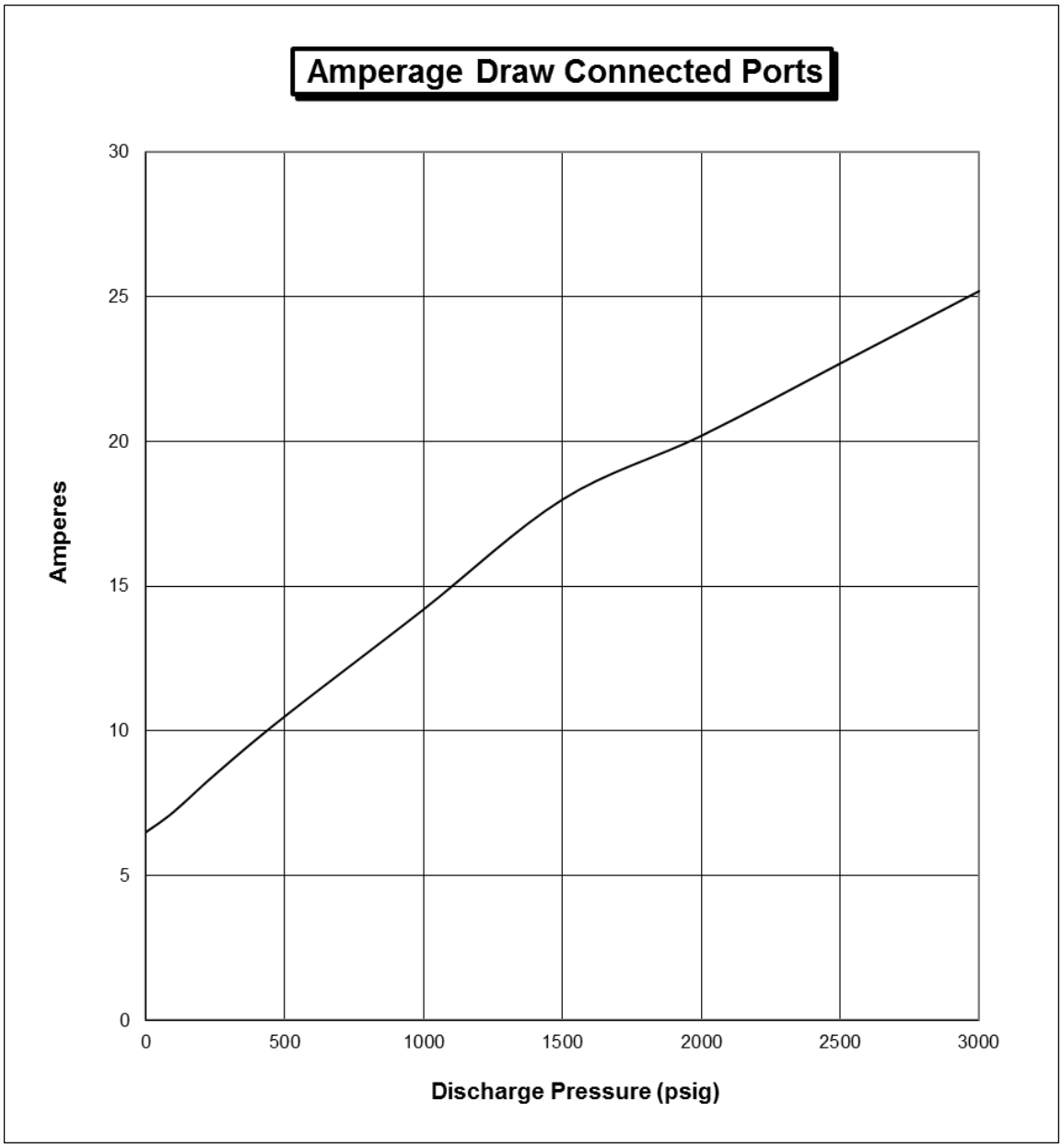


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Table 1 - Determine Required Duty Cycle from Required Pressure and Volume

Volume L/day	Pressure PSI																	
	0		100		250		500		1000		1500		2000		2500		3000	
	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle	On time (s/min)	Duty cycle
1	0.035	0.06	0.042	0.07	0.045	0.08	0.058	0.10	0.085	0.14	0.1	0.17	0.145	0.24	0.175	0.29	0.22	0.37
2	0.052	0.09	0.066	0.11	0.075	0.13	0.097	0.16	0.15	0.25	0.2	0.33	0.27	0.45	0.33	0.55	0.42	0.70
3	0.073	0.12	0.09	0.15	0.102	0.17	0.14	0.23	0.23	0.38	0.31	0.52	0.4	0.67	0.5	0.83	0.62	1.03
4	0.094	0.16	0.115	0.19	0.138	0.23	0.19	0.32	0.32	0.53	0.425	0.71	0.54	0.90	0.67	1.12	0.8	1.33
5	0.12	0.20	0.14	0.23	0.177	0.30	0.25	0.42	0.4	0.67	0.53	0.88	0.68	1.13	0.84	1.40	1.02	1.70
6	0.15	0.25	0.175	0.29	0.23	0.38	0.315	0.53	0.49	0.82	0.64	1.07	0.8	1.33	0.98	1.63	1.3	2.17
7	0.18	0.30	0.21	0.35	0.28	0.47	0.38	0.63	0.58	0.97	0.75	1.25	0.95	1.58	1.17	1.95	1.4	2.33
8	0.217	0.36	0.25	0.42	0.33	0.55	0.44	0.73	0.66	1.10	0.85	1.42	1.08	1.80	1.33	2.22	1.6	2.67
9	0.265	0.44	0.31	0.52	0.38	0.63	0.52	0.87	0.75	1.25	0.96	1.60	1.19	1.98	1.48	2.47	1.77	2.95
10	0.306	0.51	0.36	0.60	0.44	0.73	0.57	0.95	0.83	1.38	1.06	1.77	1.32	2.20	1.7	2.83	1.95	3.25
15	0.543	0.91	0.63	1.05	0.75	1.25	0.9	1.50	1.28	2.13	1.65	2.75	2	3.33	2.5	4.17	2.95	4.92
20	0.82	1.37	0.9	1.50	1.03	1.72	1.26	2.10	1.7	2.83	2.12	3.53	2.69	4.48	3.37	5.62	3.96	6.60
25	1.07	1.78	1.19	1.98	1.3	2.17	1.6	2.67	2.15	3.58	2.67	4.45	3.38	5.63	4.22	7.03	4.92	8.20
30	1.37	2.28	1.45	2.42	1.63	2.72	1.9	3.17	2.58	4.30	3.21	5.35	4.07	6.78	5.06	8.43	5.95	9.92
35	1.615	2.69	1.7	2.83	1.9	3.17	2.3	3.83	3.02	5.03	3.77	6.28	4.76	7.93	5.9	9.83	6.94	11.57
40	1.875	3.13	1.97	3.28	2.2	3.67	2.6	4.33	3.45	5.75	4.32	7.20	5.45	9.08	6.81	11.35	8.05	13.42
45	2.13	3.55	2.25	3.75	2.5	4.17	2.95	4.92	3.88	6.47	4.86	8.10	6.14	10.23	7.58	12.63	9	15.00
50	2.4	4.00	2.53	4.22	2.8	4.67	3.28	5.47	4.32	7.20	5.29	8.82	6.83	11.38	8.47	14.12	10.17	16.95
60	2.94	4.90	3.1	5.17	3.4	5.67	3.95	6.58	5.2	8.67	6.42	10.70	8.16	13.60	10.17	16.95	12.05	20.08
70	3.5	5.83	3.65	6.08	3.97	6.62	4.65	7.75	6.1	10.17	7.47	12.45	9.53	15.88	11.93	19.88	14.14	23.57
80	4	6.67	4.2	7.00	4.57	7.62	5.3	8.83	6.94	11.57	8.54	14.23	11	18.33	13.62	22.70	16.14	26.90
90	4.55	7.58	4.75	7.92	5.17	8.62	5.96	9.93	7.82	13.03	9.59	15.98	12.26	20.43	15.21	25.35	18.24	30.40
100	5.1	8.50	5.3	8.83	5.76	9.60	6.65	11.08	8.69	14.48	10.69	17.82	13.69	22.82	17.16	28.60	20.36	33.93
120	6.2	10.33	6.4	10.67	6.96	11.60	7.98	13.30	10.5	17.50	12.63	21.05	16.29	27.15	20.36	33.93	24.43	40.72
140	7.2	12.00	7.5	12.50	8.16	13.60	9.35	15.58	12.2	20.33	14.83	24.72	19.17	31.95	23.86	39.77	28.73	47.88
160	8.3	13.83	8.6	14.33	9.35	15.58	10.95	18.25	13.95	23.25	17.16	28.60	21.93	36.55	27.42	45.70	32.47	54.12
180	9.35	15.58	9.7	16.17	10.9	18.17	12.55	20.92	15.75	26.25	19.27	32.12	24.69	41.15	30.43	50.72	36.55	60.92
200	10.4	17.33	11.25	18.75	11.75	19.58	13.9	23.17	17.5	29.17	21.55	35.92	27.55	45.92	34.09	56.82	41.06	68.43
300	15.7	26.17	16.27	27.12	17.7	29.50	20.25	33.75	26.3	43.83	32.12	53.53	41.23	68.72	51.37	85.62		
400	21	35.00	21.8	36.33	23.3	38.83	26.6	44.33	35.05	58.42	43.17	71.95	55.35	92.25				
500	26.3	43.83	27.3	45.50	29.5	49.17	33.9	56.50	43.9	73.17	53.91	89.85						
600	31.6	52.67	32.7	54.50	35.6	59.33	40.7	67.83	51.4	85.67								
800	42.2	70.33	43.65	72.75	47.55	79.25	54.36	90.60										
1000	52.8	88.00	54.6	91.00	58.75	97.92												