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 - - - There are known problems with all versions of Windows Explorer Browser
 - - - Chrome is lightning fast & a joy to use.

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1. Solar Power to a Parmak RM-1 Fencer Project

Fencer Specs

[This 100 mile fencer](#) with inverter draws ½ amp (6 Watts) with 1 ⅝ amp (19 Watt) pulses from the battery, as measured by the excellent [Watts Up Meter](#). (10 Watts Avg)

Solar Panel Specs

5- 12 Volt solar panels (245 Watts total) provide 17 volts max @ 14.21 Amps max MPPT. 300 AH of deep discharge batteries charge to 14.2 Volts in just 1 sunny day, and a 100% charge (12.8V) through multiple cloudy days. Load is a 10 watt fencer 24/7.

3-[15 watt panels](#) = total 3 Amps

1-[100 watt panel](#) = 5.41 Amps

1-[100 watt panel](#) = 5.8 Amps

Total 245 Watts, 14.21 Amps @ 17 Volts Vmp

This setup powers my fencer 24/7 through 6+ cloudy days and a full battery recharge on just 1 partly sunny day. Cloudy days can even recharge batteries to 100% @ 12.75 Volts

MPPT vs PWM Charge Controllers

MPPT [Current Boost Calculation Manual](#) Pg 5 explains Power boost to the battery.

MPPT Pwr Boost: Solar Imp(amps) * Vmp(volts) / Battery(Volts)=Boost (amps)

MyPanels =(14.21 amps times 17Volts) ÷ 12V = about 20.13 max amps max into the battery.

Notice amps to the battery exceed amps from the panels. MPPT boosts Amps to the battery because it includes a step down transformer to match Panel Peak Power to the 12 volt battery.

Transformer example: Input Volts * Amps = Output Volts * Amps

- then 100V @ 1 Amp = 10V @ 10 Amps, where both input & output = 100 Watts

This makes MPPT controllers a far better choice than other controllers on the market.

(I will be reporting on my own controller boost feature after I fix a **SERIOUS** wiring problem between the panels & controller, 120 feet #12 wire where I lose > HALF of the panel power)

Video proof of MPPT Power Boost for the skeptics

- [Why an MPPT Charge Controller?](#) (& what is **wrong** with PWM charge controllers)
- [Video](#) 1.95 Amps from Panel and 3.56 Amps into battery
- [Video](#) 7.6 Amps from the 24 volt panels & 12.8 Amps into batteries
- [Video](#) Controlled setup proves MPPT boost 2.4 amps @ 18.9 V in 3.3 Amps @13.3 V out to battery
- [Video](#) Direct Compare MPPT to PWM Panel = 40 Watt PWM from Panel 2.17A @ 12.0V - to Bat 2.11 A @12.54 V and MPPT from Panel @1.86A @15.52 V from panel and 3.62

A @ 12.76 V to bat



Photo: 12 Volt Panels, 21 A in, 24 A out using [Rogue MPPT Controller](#), [Video](#), [Manual](#)

Tools to help plan a solar system:

[Kill-A-Watt meter](#)

Used to measure the power consumed per day, week, month for any appliance.

[Watts-Up meter](#)

- In-line meter to the battery used to measure amps, volts, power

Video [TriMetric Battery Monitor](#) [Tech Details](#)

- Video includes my MPPT charge controller illustrating the Power Boost in action.

Formulas Required for Success

Ohm's Law:

- Amps = Volts / Ohms
- Volts = Amps * Ohms
- Ohms = Volts / Amps

Power Formulas:

- Watts = Volts * Amps
- **Amps = Watts/Volts**
- Volts = Watts/Amps
- Watts/Inverter Efficiency = Watts drawn from battery
- **MPPT Pwr Boost:** Solar Imp(amps) * Vmp(volts) / Battery(Volts)=Boost (amps) This is because MPPT includes a step down transformer where max watts in =max watts out
- **Inverter Amps Per Hr from battery:** Watts load on inverter divided by input volts (12) = the DC amp consumption per hour from a battery. (plus expected efficiency loss)

- **Inverter Run Time in Hours:** (Total Amps in Batteries/12) / total Amps Load on Inverter + ½ Amp (for inverter itself)
- [Wire Voltage Loss Calculator](#) Loss should be less than 3%

References

[Best prices for Solar](#)

[How to calculate solar energy loads](#)

[How to calculate losses through the inverter](#)

[Daily - Monthly Insolation Calculation](#) Power production per month for your site

[MPPT Power Boost](#) - Pg 5 [How does it work](#)

[Home Power Magazine](#)

[HandyBobSolar Blog](#) - Avoid **SERIOUS** wiring problems thanks to [Rgearhead](#)

Supplies

[Inverter Sales Web Site](#) Huge selection of inverters

[Battery #4 Interconnect Wires](#)

[#2 wiring from controller to Panels](#)

[30 Amp Voltage Controlled relay switch](#), 10 to 60 volt DC input

[Automotive Style Fuse Box 6 circuits](#)

[Bus Bar kit bus bars](#) (1 bar per kit for the Solar Panels)

[Lug Bar](#) (for splicing 2 large cables)

[Panel Gounding Lugs](#)

Ground Mounts Home Made

[Home Power DIY PV](#)

[20 Kwh Solar Array](#)

[Small Solar Array](#)

Solar Ground Mount Photos



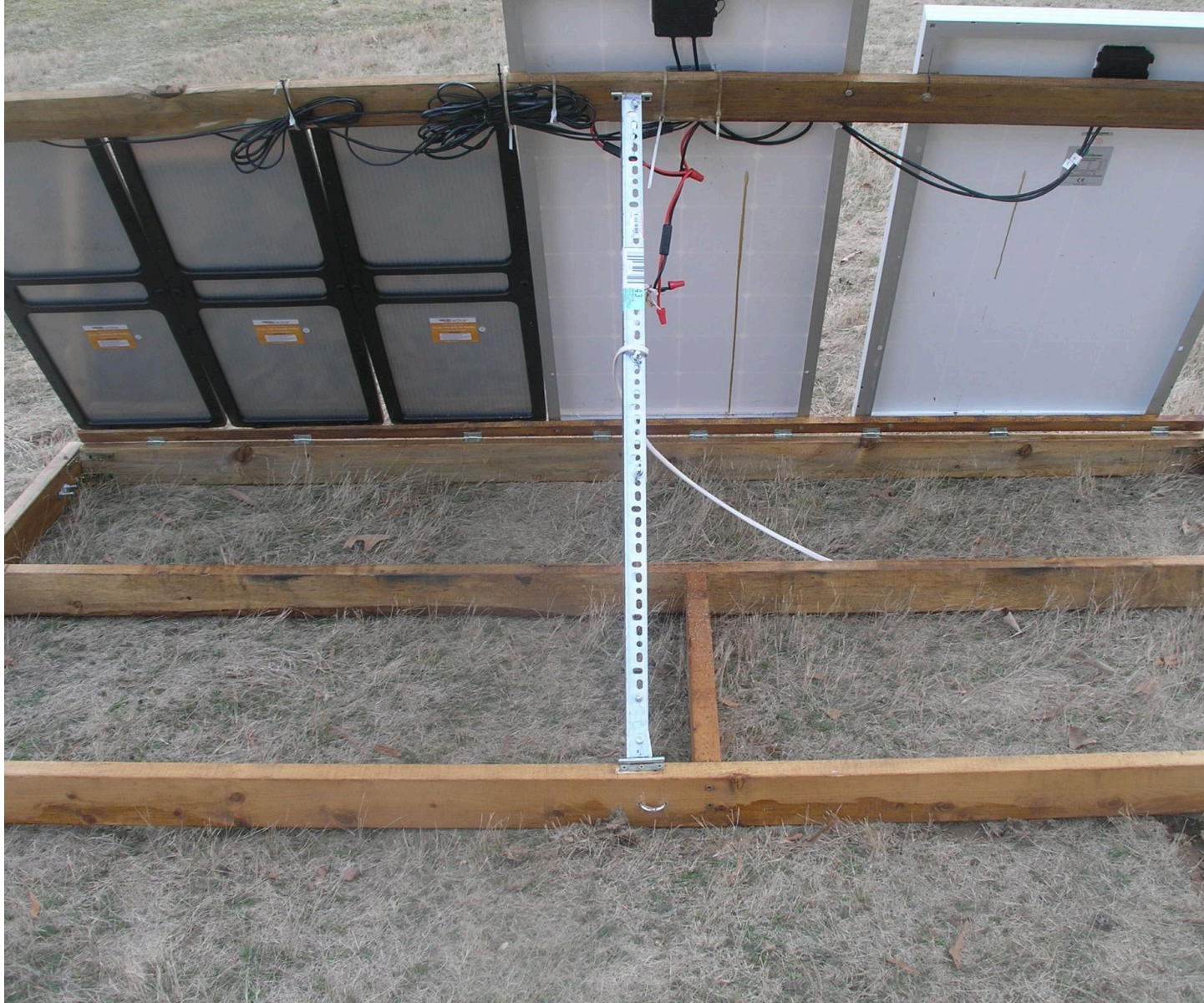
Left solar panels are 100 watts each from [SolarBlvd](#) right panels are 15 watts each from Harbor Freight. Round fence posts to be attached to the shackle bolt seen on the right.



Easy adjustment for panel tilt with wing nuts & metal bars attached to hinges. Wheel in corner makes it easy to move - Note many hinges under the panels for tilting toward the sun. Panels are mounted between a treated 1x4 (top) and a treated 1x2 (bottom). Frame is treated 2x4's.



Hinges mounted to treated 1x2 & to the treated 2x4 base.



Shackle bolt below the hinge will be attached to a fence post driven deeply into the ground to protect the ground mount from being blown away in a severe storm.

Solar charge controller

for the battery bank is a MPPT design with the Auto-Equalize feature.

MPPT Calculation: $I_{mp}(\text{amps}) \times V_{mp}(\text{volts}) \div 12V = \text{Current Boosted amps to battery}$
therefore $17v * 14.2A (241.4) / 12 = 20.11 \text{ Amps Max Potential Boost}$

http://www.solarblvd.com/Charge-Controllers-MPPT-Charge-Controllers-Blue-Sky-Solar/c6_46_91/p596/Blue-Sky-Solar-Boost-2512i-25A,-12V-3-Stage-Charge-Controller/product_info.html

This 12 Volt charge controller has ALL of the required features to maximize our expensive battery life, includes 4 charge modes to treat the batteries like a baby. A high quality charge

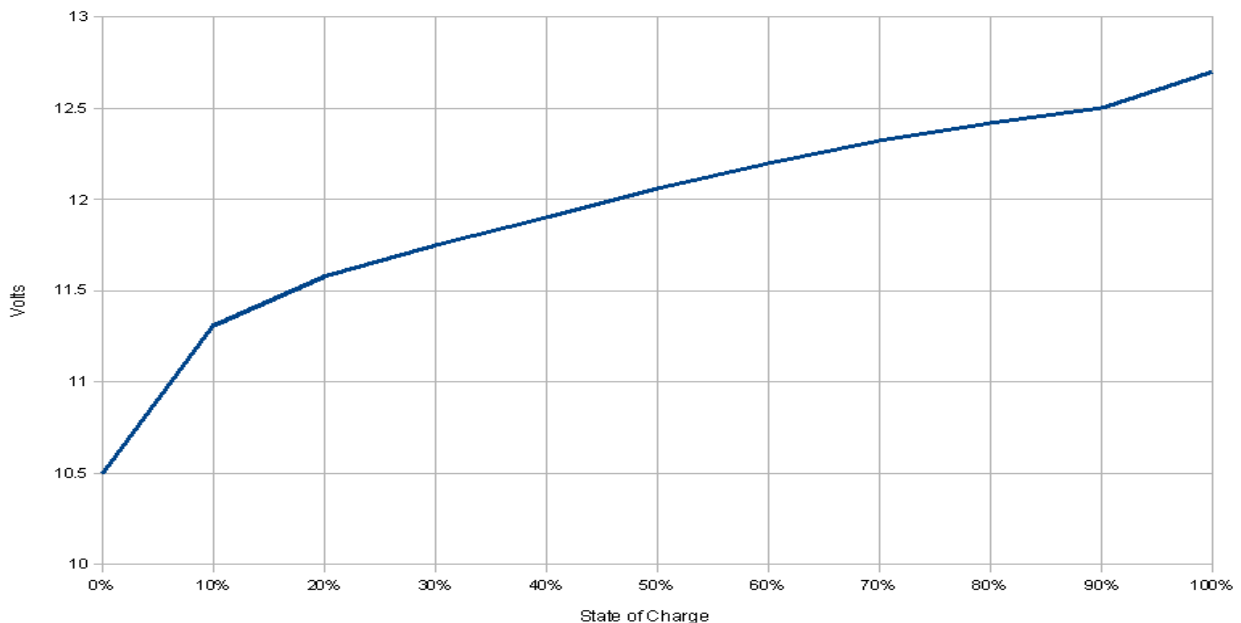
controller is ESSENTIAL to maximize battery life. [Manual](#)

- MPPT Design not the Cheapo PWM design that wastes solar watts.
- Bulk Mode at MAX amps (up to 17 Amps in our case) until 14.2 volts, No pulses.
- Full charge, slow pulse rate @ 14.2 Volts, for 2 hours
- Trickle charge Faster pulses @ 13.2 Volts @ 0.2 Amps per 100 AH battery capacity. In this case 0.6 amps for 300 AH deep discharge batteries. ()
- Auto-Equalize very rapid pulses @15.2 Volt for 2 hours every 30 days (3 amps per 100AH battery is needed for this mode. (Removes battery sulfation) This setup needs 9 Amps and we have 17.1 Amps available)

all indicated by panel lights. MPPT feature automatically adjusts to get maximum power from the solar panels all day. This works like a step-down transformer... High voltage low amps in and low voltage high amps out. This can potentially get 60% more power from a panel than other controllers. The higher the panel voltage, the more amps to the battery.

Note: After I fix the serious panel wiring problems, I will be testing Power Boost. We should see 14 Amps @17 Volts from the panel boosted upwards toward 18+ Amps going into the batteries to recharge every morning.

Battery Specs



[State of Charge vs Voltage Chart](#)

Battery State of Charge vs Voltage

For a FULL CHARGE, battery must be held at 14.4+ volts for at least 2 hours before going into trickle charge.

100% = 12.73

90% = 12.62
80% = 12.50
70% = 12.37
60% = 12.24
50% = 12.10 <<<<<< **Never discharge below 50% or battery will be damaged**
40% = 11.96
30% = 11.81
20% = 11.66
10% = 11.51

System Testing

2/8/13 Severely cloudy day. This is the WORST it can get for solar!

The sun is not even visible for the entire day. Battery voltage & Charging amps measured:

8:00 AM - 12.59 V @ 0.02 Amps
9:00 AM - 12.61 V @ 0.33 Amps
10:00 AM - 12.65 V @ 0.63 Amps - I'm surprised anything at all is sent to the batteries
11:00 AM - 12.66 V @ 0.69 Amps - 90% charged
02:00 PM - 13.03 V @ 1.95 Amps - **amazing** - 100% charge on such a BAD day
03:00 PM - 13.02 V @ 1.75 Amps
04:00 PM - 12.95 V @ 0.95 Amps - 100% charged
05:00 PM - 12.66 V @ 0.14 Amps - 90% at sundown

This is far better than I expected for such a horrible day !

2/9/13 Partly cloudy day to mostly sunny

8:00 AM - 12.72 V @ 1.63 Amps - 98%
9:00 AM - 13.08 V @ 3.03 Amps
10:00 AM - 13.92 V @ 7.43 Amps
11:00 AM - 14.18 V @ 7.86 Amps (**Charge Complete** with 4 hours of sun to go - YAY)
12:00 PM - 14.18 V @ 6.56 Amps (after 2 hours it should drop down to Trickle Charge)
01:00 PM - 13.22 V @ 1.58 Amps (**YAY - Made it to Trickle Charge - Major Success**)
02:00 PM - 13.22 V @ 1.60 Amps - trickle charge
03:00 PM - 13.22 V @ 1.71 Amps (Trickle charge @ 0.6A PLUS 1.1A to the Fencer)
04:00 PM - 13.05 V @ 0.92 Amps (dropped into Bulk Charge mode)
05:00 PM - 12.90 V @ 0.12 Amps (sun is setting, still getting some AMPS!)

2/10/13 HORRIBLE Cloudy, Rainy day

12:00 it was so cloudy that ZERO amps !
03:00 **12.94 V (100% charge level reached in spite of a terrible day)**

2/11/13

09:00 AM 12.53 V @ 0.78 Amps - 80% - Heavy overcast
10:00 PM 12.81 V @ 1.91 Amps - Light overcast (100%)

12:00 PM 13.38 V @ 4.23 Amps - Bright overcast

01:00 PM 14.02 V @ 8.80 Amps - Sunny

02:00 PM 13.84 V @ 6.70 Amps - Cloudy

03:00 PM 13.60 V @ 4.31 Amps - Sunny

2/12/13

08:00 AM 12.74 V @ 1.62 Amps - Clear - 100% already

09:00 AM 13.24 V @ 3.88 Amps - Clear

10:00 AM 13.28 V @ 2.91 Amps - Hazy cloud cover

12:00 PM 12.96 V @ 1.12 Amps - Heavy overcast

03:00 PM 13.16 V @ 1.62 Amps - Heavy overcast

2/13/13 Heavy overcast all day

12:00 PM 12.40 V @ 0.25 Amps - 75%

03:00 PM 13.02 V @ 3.17 Amps 100% still overcast but a bit brighter.

2/14/13 Sunny Clear day

08:00 AM 12.61 V @ 1.59 Amps - 85%

09:00 AM 13.23 V @ 4.70 Amps - 100%

10:00 AM 13.80 V @ 7.96 Amps - 100%

11:00 AM 13.93 V @ 8.40 Amps - 100%

12:00 PM 14.04 V @ 8.32 Amps - 100%

01:00 PM 14.14 V @ 8.02 Amps - **Charge Complete**

02:00 PM 14.19 V @ 7.88 Amps - **Charge Complete**

03:00 PM 13.60 V @ 4.06 Amps - skipped trickle charge went into Bulk Mode

04:00 PM 12.99 V @ 0.62 Amps - Ends at 100% charge

2/15/13 Partly Sunny

10:00 AM 13.80 V @ 5.86 Amps

11:00 AM 13.90 V @ 8.90 Amps

12:00 PM 13.42 V @ 3.48 Amps

01:00 PM 14.18 V @ 7.00 Amps - **Charge Complete**

02:00 PM 14.18 V @ 6.90 Amps - **Charge Complete**

03:00 PM 13.53 V @ 4.95 Amps

2/16/13 Clear, Sunny - a great day for solar

10:00 AM 14.18 V @ 7.33 Amps - **Charge Complete**

02:00 PM 14.18 V @ 4.86 Amps

03:00 PM 14.18 V @ 4.55 Amps

02/17/13 Clear, Sunny

03:00 PM 13.23 V @ 1.53 Amps - **Trickle Charge**

02/19/13 Clear, Sunny

10:00 AM 14.18 V @ 6.70 Amps - **Charge Complete**

12:00 PM 13.23 V @ 1.48 Amps - **Trickle Charge**

04:00 PM 13.00 V @ 0.62 Amps - In the Shade, sun setting

02/20/13 Cloudy Overcast all day

01:00 PM 13.10 V @ 1.49 Amps - 100%

04:00 PM 12.80 V @ 0.22 Amps - 100%

02/21/13 Dark Overcast all day

10:00 AM 12.48 V @ 0.75 Amps - 80%

12:00 PM 12.66 V @ 0.95 Amps - 95%

02:00 PM 12.38 V @ 0.26 Amps - 70%

02/22/13

03:00 AM 12.31 V @ 0.00 Amps - 65%

04:00 AM 12.30 V @ 0.00 Amps

08:00 AM 12.49 V @ 0.95 Amps - 80% Heavy Overcast

10:00 AM 13.53 V @ 5.56 Amps - Partly Cloudy

12:00 PM 13.94 V @ 8.38 Amps - Overcast, bright

02:00 PM 14.18 V @ 7.65 Amps - Overcast, bright

04:00 PM 13.10 V @ 1.35 Amps - Overcast, bright

02/23/13 Sunny & thin clouds

11:00 AM 14.23 V @ 6.65 Amps - **Charge Complete**

01:00 PM 14.22 V @ 5.58 Amps

02:00 PM 13.23 V @ 1.55 Amps - **Trickle Charge**

03:00 PM 13.23 V @ 1.72 Amps - **Trickle Charge**

02/24/13 Bright & Sunny all day

02/25/13 Partly Cloudy

02/26/13 Dark, Cloudy, rainy

05:00 PM 12.50 V @ 0.00 Amps - 80% at sunset

02/27/13 Very Dark, Cloudy all day it doesn't get any worse for solar

06:00 AM 12.33 V @ 0.00 Amps - 68% before sunrise

11:00 AM 12.42 V @ 0.71 Amps - 73%

12:00 PM 12.38 V @ 0.50 Amps - 70%

02:00 PM 12.68 V @ 1.19 Amps - 95%

03:00 PM 12.52 V @ 0.54 Amps - 82%

05:00 PM 12.32 V @ 0.00 Amps - 68%

TESTING ENDED UNTIL THE PANEL WIRING IS FIXED

3/12/13 New Wiring from panels to controller 88ft #2 replaces 120 ft #12 wire

Max Voltage drop for #12 wire was **5.24V, loss=30.8%, EndVolts=11.76V**

4/05/13 Sunny NOW RUNNING ON NEW WIRING

Now full charge by noon even on cloudy days

01:19 PM 20.12 V @ 01.01 A 14.23 V @ 1.22 A

4/15/13 Sunny

11:00 AM 13.62 V @ 10.53 Amps 100%

4/16/13 Very Cloudy

11:00 AM 13.01 V @ 01.74 Amps 100%

System testing is a success in spite of a big problem I had with solar panel wiring.

The batteries charge up to 100% (12.73V) on the WORST of days, and reach MAX charge (14.18 V) by 10 AM on a good sunny day with plenty of time & power left to Auto-Equalize the batteries. The fencer should run indefinitely on this balance of solar panels, charge controller & deep discharge batteries. I think this setup would be perfect if I scrapped the small 15 watt panels & replaced them with a 140 watt panel. **Those Harbor Freight 15 Watt panels are just cheap toys, wasting my ground mount space.**

Discussion Board for Solar Fencer

Please leave any questions or comments here:

<http://www.americanpreppersnetwork.net/viewtopic.php?f=595&t=36051>

Final comments - Woulda Coulda Shoulda:

Those 15 watt 12 volt panels are a waste of ground mount space, and a waste of money.

- I should've started with 24 volt panels that are available for less than \$1 per watt. The 12 volt panels are VERY expensive - at \$2 to \$3 per watt.
- My next ground mount will use a 1x4 under the panels instead of a 1x2 for added strength in case of a bad storm.
- I'm also going to add 2 more metal braces in the rear when they are restocked at the hardware store.
- My next ground mount will be 12 feet wide instead of 8 feet for powering my well pump & other future projects from solar.
- **Wire size was inadequate between the panel & controller.** [Read this](#), chapter wiring. I was using 110ft of #12 wire. I should get much better results using the proper sized wire to provide less than 3% loss at 17 amps. Proper wire sizing is a BIG DEAL in solar. The [Wire calculator](#) says Voltage drop for #12 wire = **5.24 V, loss=30.8%**, EndVolts=**11.76** The proper size wire is #2 for a loss less than 3%. Using #12 wire, we can see that the MPPT controller will never get enough input voltage to run at maximum power. I'm surprised it is even working at all !! I've ordered new #2 copper wire and cut the length down to 88 ft. More to come when I get the new wiring installed. New wiring done, charge amps up substantially.
-

2) Solar Power to a Well Pump Project

Project Steps

This project is suspended indefinitely until multiple issues are resolved.

After I cut down some trees. Wiring losses with 200 ft between the panels & controller would have been devastating. I want 50 ft or less between the panels & charge controller.

Discussion Board for Solar Well Pump

Please leave any questions or comments here:

<http://www.americanpreppersnetwork.net/viewtopic.php?f=595&t=36817>

A) Using the Existing ½ HP well pump

With **enough water storage** in pressure tanks, it looks possible to power this pump from a 200 AH battery & 1 or 2 solar 224 watt panels, each panel delivering 15 amps via MPPT.

Inverter Specs

Inverters are 90% efficient

110 Volt - 12VDC Inverters, [at Lowes](#)

- 2,300 Watt, 19.2 Amps \$248,
- 6,000 Watt \$599

110 Volt - 12VDC Inverters, at [Amazon](#)

- 2,300 Watt, \$250,
- 3,500 Watt, \$370

Old well water pump Specs

Well pump power consumption

½ HP 115 volts, 1 phase, 60 Hz, 15.3 amps, 1,700 Watts,
10GPM, = 600 gal per AmpHour

When running pump from inverter (inverter loses some power):

- $1,700/.90 = 1,888$ Watts, ([90% efficient inverter](#))
- Amps hours from battery: $1888/12 = 157$ AH
- $157/60 = 2.6$ Amps per minute, 10 Gal per minute

Water Usage Estimate 20 Gal per day (there are only 2 of us)

Usage per month @ 20 gal per day * 30 days = 600 gal per month,

therefore pump runs 1 hour per month drawing 157 AmpHours from Battery per month

These numbers are looking very good. (I will verify this when my new 119 pressure tank is installed)

Water Tank Calculations

Battery load calculations storing water in multiple pressure tanks [Tank=119/320](#) with [41 Gal drawdown](#) @ 20/40 psi pressure setting.

Pump draws 0.28 AH per minute from battery (17AH/60min)

Tank Drawdown = 41 Gal @ 20psi, 41 gal to refill to 40psi = 4.1 Min per refill

- 1- Tank, 41 gal run pump 4.1 min = 1.15 AH lasts 2 days (I will start with one tank)
- 2 tanks, 82 gal run pump 8.2 min = 2.30 AH lasts 4 days
- 3 tanks, 123 gal run pump 12.3 min = 3.45 AH lasts 5 days

Solar Panel Calculations

Use inexpensive 24 volt solar panels [now priced at less than \\$1 per watt](#)

Question: How many solar panels needed assuming 2 sunny days per week?

1 tank needs to be refilled every 2 days, 3 refills per week for 3.45 amps per wk.

1-[Solar Panel](#), 24 Volt, MPPT 28.9V @ 7.58 Amps, Voc 36.6 V, delivers 15 amps w/mppt ctrl

Loss of Power in Summer

- [Power Loss Chart -vs- Temp Chart](#)
- [Centigrade vs Fahrenheit Table](#)

Charge Controller Calculations

[Morningstar MPPT Charge Controller](#)

- Volts In (Vmp) x Amps(Imp) In/Volts Out (14 or 28) = Amps Out,
- 12 Volt panel calc: $219 = 219/14 = 15.64$ Amps to battery exceeds 15A spec
- 24 Volt panel calc: $219 = 219/28 = 7.82$ Amps to battery
- Max. battery charge Current 15 amps,
- 4 Stage Charging: Bulk, absorption, float, equalize (optional)
- [Datasheet](#)
- [Manual](#) (Manual pg 23 for current boost details)
- [Why MPPT Doubles Amps to the battery](#)

Problem: Distance between solar panel & charge controller is limited to amps & wire size: See [Manual](#) pg 41

At 200 feet, 24 Volts, 7.8 amps, #8 wire is required - expensive

At 200 feet, 12 volts, 15 amps, BIG PROBLEM

Possible Solutions - New panel location on the roof or else this rube goldberg.

I will fix this problem by just adding another solar panel to correct for the loss

Desulfating Battery Chargers

[Battery Minder 2/4/8 Amp](#)

[Noco 26 Amp](#) at [Amazon](#)

B) The Simple Well Pump alternative

I am no longer looking at these options.

2 GPM, 24 Volts, up to 200 ft deep, piston pump,

This pumps water into a large 500+ Gallon storage tank (no pressure) for use later and can be operated alongside the old existing well pump & is driven by a 1/5 HP, 12-volt motor, or by a 1/4 HP, 24-volt motor. Each comes with two types of drives -- The Scotch Yoke drive pumps more quickly. The Linear Bearing Link Drive can pump from further down. Extremely Efficient - The motor's use of power is frugal, yet it does mighty things.

The [motor draws 120 watts](#) (10 amps at 12 volts, 5 amps @ 24 Volts) for the complete cycle. Voltage cannot be less than 11.75 volts or 22.4 VDC or the expensive motor could be damaged.

The inverter we use must have an output no less than 20 amps 12VDC, 10 Amps at 24VDC (Linear current booster). *(THIS IS A PROBLEM ! I either need a storage battery or another solar panel)*

The Motorized Extension Kit produces up to 180 gallons per hour! ... for Just Pennies a Day!

<http://www.simplepump.com/OUR-PUMPS/Motorized.html>

http://www.eventhorizonsolar.com/Simple_Pump/water-pump-sp.html

[Video of installation & demonstration of electric pumping.](#) This looks GREAT

Sun SDS Submersible Well Pump (alternative to Simple Pump)

Old existing pump must be removed.

\$550, 12 to 30 Volts & low flow 2 to 5 gpm

<http://www.solar-electric.com/susdssusopua.html>

[Controller PCA-30 for SunPump SDS Pump](#)- \$245

Required to connect solar panel directly to pump.

15 to 30 VDC input, MPPT, Float Switch ctl, 12v or 24v output, 6 Amp Max,

[Shurflow Controller](#) \$124, 150 Watts out

Inexpensive MPPT controllers:

3 Amp \$72, 7/15 Amp \$89, 10/15 Amp \$125, 15 Amp \$190

http://www.solarseller.com/dc_photoswitch_dc_timer_voltage_controlled_switch_dc_relay.htm

Disadvantage, we must remove the existing pump. Advantage it cost less than the TINY pump and is not likely to be damaged by 24 volt panel voltage dropping too low, so we can delete the batteries.

BOOSTER PUMP

See Improvement by Everyman here:

<http://www.americanpreppersnetwork.net/viewtopic.php?f=595&t=36817&p=323937#p324156>

Forget the Shurflo Pump - He says it won't last. We need to find a heavy duty pump such as the Wilcox-Crittenden.

This is needed to pump water into the pressure tanks. Multiple pressure tanks in parallel to boost capacity. We pay a \$\$HUGE premium for speedy booster pumps. All the more reason to have an extra large pressure tank capacity with multiple tanks. I found this Shurflo booster

pump for \$74

* 3 Gal/Min, 45 PSI, 24 volt @ 1.0 to 4.0 Amps depending on water pressure.

<http://www.shurflo.com/rv-products/rv-pumps/classic-series-water-pumps/revolution-4008-pumps/default.html>

The booster pump can be powered from [235 Watt 24 volt solar panels](#) that provides 7.8 Amps & are only \$0.85 per watt \$199.

[Controller for Shurflo Booster Pump](#) - Required to connect solar panel directly to pump.

Inexpensive controllers:

http://www.solarseller.com/dc_photoswitch_dc_timer_voltage_controlled_switch_dc_relay.htm

http://www.solarseller.com/dc_photoswitch_dc_timer_voltage_controlled_switch_dc_relay.htm

LINEAR CURRENT BOOSTERS = LCB (Motor Controllers)

I might go with 1 solar panel & 2-12 volt storage batteries in series instead of LCB's.

The pumps will need linear current boosters if we power them directly from the solar panels. Linear current boosters [LCB] are less expensive than banks of batteries. The LCB is the SAME THING as a "Controller" for a submersible solar well pump. Both LCB & "Controller" are very similar to MPPT charge controllers used for battery charging that I explained in my Fencer thread. All of these devices take in high volts @ low amps & convert to low volts @ high amps using a DC to DC inverter. Instead of charging a battery, they connect directly to the motor. They also include a few other bells & whistles for water shutoff switches & motor turn on & shut off control.

http://www.solarseller.com/solar_converters_inc_linear_current_boosters_faq.htm

PRESSURE TANKS

If we do this plan right, we can do this with just 1 - 24 Volt solar panel. We can get a MUCH larger pressure water tank that can supply enough water for many days of cloudy weather. So storage is once again into water tanks, & not into huge expensive battery banks.

Examples with photos:

- [Parallel pressure tanks](#)
- Simple Pump with [huge "Standard" water tank](#) used as a pressure tank:

[320 Gal Pressure tank](#) = 320 Gal 24x68, 140 lbs \$990

[Lowes pressure tanks](#): 36 Gal \$219, 44 Gal \$338, 62 Gal \$438, 86 Gal \$517, 119 Gal \$674

[Home Depot tanks](#)

- 35 Gal \$219, 42 Gal \$189,
- 220/85 Gal \$359, 53 x 24, 129 lbs, 1 ¼ NPT
- [320/119 Gal \\$553](#), 69 x 24, 153 lbs, 1 ¼ NPT **** I ordered this FP7135

DRAWDOWN WITH 20/40 SWITCH: 41.3 gal

DRAWDOWN WITH 30/50 SWITCH: 35.4 gal

DRAWDOWN WITH 40/60 SWITCH: 31 gal

[Manual PDF](#)

STORAGE TANKS

Big problems with storage tank in the winter here, reported by DuckNCover

<http://www.americanpreppersnetwork.net/viewtopic.php?f=595&t=36817&p=323937#p324179>

He says we need a Well House and need to filter the water with a UV filter.

How do we stop the storage pipes from freezing???

Use hoses for the storage tank instead of pipes, or heat the tank with robust solar water heater during the winter. Heated tank will warm up the pump house.

Cold weather piping here: <http://www.solartubs.com/solar-insulated-piping.html>

Solar Heater for storage tank: <http://www.solartubs.com/solar-Evacuated-Tube.html>

Heat exchanger - <http://www.solartubs.com/solar-plate-heat-exchanger.html>

Tractor Supply

- [Tractor Supply Water Tanks](#)
- [1,500 Gal 65h x87dia \\$800](#)
- [1,100 Gal 44h x87dia \\$600](#)
- [560 Gal \\$430 42h x67dia](#)

Stores water from the well, delivers it to the booster pump & pressure tanks.

Solar Panels

The [Sharp 235 Watt 24 Volt Panel](#) (\$0.85/watt \$199) provides MPPT @7.81 Amps, 39.1" x 64.6" x 1.8" Open Circuit 37.2 V, Max Pwr 30.1 V

Solar LOADS

The booster pump (3.6 Amps) turned on by the the water pressure switch - 3 Gal/Min

- 180 Gal per hour to supply 119 gal tank = 3 AH to fill tanks 1 x per week

Tiny Pump (5 Amps) turned on by water tank float switch relay.

- 180 gallons per hour = 5 hours per month supplies 1,100 gal tank

1 Solar panel + 2 - 100 AH deep cycle storage batteries (24 V) will be more than adequate to supply estimated load of 3.6 AH per wk for booster pump & 2 hours per month @ 5 AH for the Tiny pump

[Morning Star MPPT Charge Controller for battery](#) \$217

Discussion Group for Well Pump:

<http://www.americanpreppersnetwork.net/viewtopic.php?f=595&t=36817#p321488>

3) Additional Research Reports

Vitamin D3 Report

Vitamin D3 is a required hormone for the immune system & prevents/treats many diseases.

<http://tinyurl.com/Vitamin-D-Report>

Iodine Supplements prevents & treats many common disease

such as fibrocystic breast disease, cysts, hypothyroid, much more. Iodine is also required by the immune system to fight off cancer, disease & virus.

[Our new Website](#) Iodine References

Rejuvenate Your Septic Field, Save \$30,000

Also aerate your septic tank to prevent future clogged up septic field

<http://tinyurl.com/Septic-Solutions>

Grizz