

## HandyBob's Blog

### Making off grid RV electrical systems work

- Home
- FAQ's PLEASE READ THIS FIRST
- About Our Boondocking Life
- The RV BATTERY CHARGING PUZZLE
- 2014 SOLAR IDEAS, BATTERIES & OTHER THINGS
- April 2012 – The Money Question
- RV SOLAR QUICK ANSWER ?
- The HISTORY, or how did I end up so angry?
- HandyBob news for FALL 2012
- HandyBob's 9 GOLDEN RULES for living on Solar and Battery Power
- INVERTER ISSUES – Spring 2013
- January 2013 PROPANE HEATING Off Grid
- Grid Tied Solar Power – My Opinion
- 2015 – FORUMS ARE STILL DANGEROUS
- 2015 MIDNITE CLASSIC PROBLEMS
- 2015 – The TRIMETRIC 2030... PERFECT



### INVERTER ISSUES – Spring 2013

I need some photos, but I rarely take pictures of other people's installations. The message will not wait.....

I am over it. People keep contacting me and either asking what inverter to buy or telling me about the problems they are having. I give up. As of now, I will recommend only two inverter companies, Magnum and Morningstar. I know, they do not make cheap things and they may not be the answer for the needs of low budget campers but I am sick and tired of what has happened. I explain the GFCI and high voltage shutdown problems in my RVBC Puzzle and do not want to repeat the whole thing here. Simply put, if an inverter has 120V receptacles on it, do not use an extension cord to connect it to an AC panel. You can only power an electrical panel from units that have hard wire terminals. Plus, temperature compensated charging that is set correctly for flooded batteries will regularly exceed 15V. Even a cheap little Morningstar charge controller that is set at 14.4V or a controller set for the now recommended 14.4V for AGM's will exceed 15V occasionally on cold days. An inverter with a 15V limit will not let you watch TV on cold days when the sun is shining and your solar power is working. I am convinced that this 15V limit is one of the reasons that many RV solar dealers refuse to set charge controllers correctly or to install temperature compensation. You can turn the voltage down if you want to ruin your batteries by undercharging but I will not do it. All of you folks out there who think your batteries are charged by the system you have that is set too low and does not have temperature compensation need to wake up and buy a hydrometer. You are in for a shock. You get by, but you are ruining your batteries. I have my list of companies whose products I refuse to touch and it grows. It is time to name them and I am very carefully stating facts here.

Let me explain.

In our first rig we had a Heart Interface Jazz 1000 modified wave unit. It worked great. It would even run the 1200 watt microwave to make popcorn and I used it to make coffee every day, back when nobody would believe that we could do this. We used that unit for many years and it is still working in a friend's rig. Heart was bought by Xantrex. Later I suggested to somebody that a Xantrex replacement for this might be good for them. Guess what, the newer Xantrex X-Power inverters (which are made in China) shut off at 15V. This changed at some point in time, earlier units worked at over 16V. I had a 400 watt unit of theirs with a 16.5V limit that we used for small loads for a while until it started to have run away output voltage problems. I documented that in an earlier post. Xantrex makes temperature compensated charge controllers that will exceed this and they have been making them for a long time, so somebody in the company knew. I tried to phone Xantrex & got nowhere. I wrote them a letter about these issues that was never answered. They blew me off because I am the voice in the wilderness, again. A respected solar dealer that probably does not want me to name them, because they still sell Xantrex, told me that they wrote the same letter and also were ignored. I suffered a Xantrex charge controller failure at about this time on a unit that was just out of the three year warranty. Remember, Morningstar has a five year warranty and my Tristar that is now over 6 years old is working perfectly, daily charging here in Montana to 15.1V. I know that Xantrex inverter chargers do not have the 15V shutdown problem, because they were designed to be run in solar systems and they have temperature compensated chargers. I don't care, you couldn't give me one for free. There is a principal at work here.

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When I asked my favorite suppliers why they still sell Xantrex, they said "because people ask for it".  
Xantrex is on my list.

Many years ago I researched power inverters without chargers and I bought a Vector modified wave unit that I have been very happy with. It has hard wire connections for feeding an AC panel, soft start, big surge capability, low price and 16.5V input capability so my temperature compensated solar system will not cause it to shut down. Something like 10 years later it is still working in our rig after powering woodworking tools, the toaster and the coffee maker every day. Wonderful. A few years later I tried to duplicate this in a friend's RV. Sorry, Black & Decker bought Vector and their bean counters "improved" the company, that model is no longer available. No hard wired AC output, GFI that shuts down if you connect it to a panel and a 15V limit. This is something that is aimed at the over the road truckers.  
Vector is on my list.

So, I went looking. I found Aims (The Inverter Store). Great, they had a 16.5V shut down and they did offer some big units with hard wire capability. I bought or recommended friends to buy a few in the next few months. I still have one, a 3000 watt 24V input unit that I bought for running tools in my building project. It refuses to reliably start the air compressor that I use to run nail guns, that my old 2200 watt Vector starts every time. I replaced it with a Magnum and I am afraid to give it to anybody for free. They had to ship two to me before I got one that worked at all. My friends suffered failures and the company fought them on getting warranty replacements. I documented a 40% failure rate in about six months on the ones I knew about, so I wrote them a letter, which they ignored. Later I heard quite the horror story about Aims from my favorite supplier, which mirrored my experience. They had a pallet of failed Aims inverters in their warehouse.  
Aims is on my list.

(Added Nov. 2014... I gave the above inverter to a neighbor for a temporary system so he could run power tools while building. It failed within ten seconds of firing it up. A little angle grinder fried it.....) Aims is REALLY on my list.

Next, Samlex was suggested by a trusted supplier. Things went great for a while with very few problems and then one day a couple of years ago I installed one of their inverters that up until that day had worked fine. Surprise, the customer called me the next day to tell me that their inverter was beeping and shutting down when the voltage went over 14.9. Samlex had changed their specs with no warning. I researched and found that some (but not all) of the Samlex units still have a 16.5V shut down. By picking & choosing carefully I have been able to use some of their units and I was able to fix this problem, but it cost me. Now (spring 2013) I have a guy who just arrived with a fouled up installation done in Canada and the 3000 watt inverter some clueless RV dealer up there sold him and under wired so that it does not work at all has a 15V limit and it will not work when his charging is working correctly on cold days (after I fix it). The inverter was installed a long ways away from the batteries and fed with #2 (not #4/0), so that it cannot run more than the TV. There is a 400 amp fuse in the line, for wire rated at 115 amps and an inverter that can pull over 300 amps. While I was at it, I looked at the instructions for his Samlex flush mount charge controller that has temperature compensation, that right in the instructions explains how it can exceed 15V. Here we go again. I wrote to Samlex. Guess what? Well, I actually did get my first reply and they say they are aware of the problem and are working on change, but no offer was made to help this guy. They just said that this specific inverter is one they outsource from Cotek (it says Samlex on the front). "Not my fault." They sent a chart showing which of their units work at over 15V. (None of them are 3000 watt.) I expect this chart will change over time and I have no way to keep up with it. The instructions for the charge controller go on & on for pages of over technical PV and battery theory, but say nothing about the voltage drop issues that I have been harping on for years, so it is very unlikely that any of them installed by RV guys who know nothing about DC voltage drop will ever work, even if they do accidentally get set it correctly. This one was installed in accordance with the instructions (and not set correctly), but at quite a distance from the batteries it will not work to fully charge the batteries due to a big voltage drop problem. The #10 cables on the three panels are connected to one pair of #12's that go down from the roof to a controller. This will not work at all. He is here now after traveling for three days to get here and his batteries are nowhere near charged. I wrote to them again, bringing these last issues up. Guess what? If you are careful you may find a Samlex product that will work for you but do not ask me to make a recommendation because.....  
Samlex is on my list.

There will be a new Magnum and a Morningstar Tristar MPPT controller in this rig when it heads north in a couple of days. His microwave will finally work on battery power and he will be able to use his rig as a mobile home & office as he told the idiot in Canada who fouled the installation up was his intention. What I do not understand more than anything else is how a person can pay the bill & drive away without first insisting that the system be demonstrated to him and making sure that it works. I do not let customers leave until they understand how everything works and can show me this. There is no excuse for this kind of thing to still be happening in the RV industry. Why people cannot understand why I am still so angry is beyond me. I have had a few conversations with some of those guys and they always end up with me losing my temper and yelling at them. One guy called and wanted to know why his customer had filed a complaint with the Better Business Bureau. This guy had fouled up everything he had touched in a poor lady's rig, even the mini blinds. Nothing was right, from electrical to plumbing. I yelled at him "If this is the kind of work you do, then do the world a favor and just stop!"

Another name that keeps coming up is Go Power, a company that aggressively markets to the RV industry and is very popular in Canada. Their inverters shut down at 15V. Their charge controller is a flush mount unit set at only 14.4V and in the typical installation it will not work to fully charge batteries. Up until very recently they were still selling on-off 15 year old technology controllers and I have tossed many of them into the trash. Now they finally joined the 20th century and switched to PWM, but set it so that it will not work unless you buy it for a camper that sits in the yard between camping trips. I have my pet name for these guys: "No Power".  
Go Power is on my list.

Recently a company that sells solar kits and batteries contacted me and offered to pay me to help them produce a video on proper installation for the RV market. I looked at their web site and responded to them that I would not be associated with anything that shows Xantrex or Go Power products, which is what they sell. I really could use the money, but I never heard from them again. They are not really interested in doing this video to help people like they claimed. They are doing it to make more money.

Now, you are going to bring up any number of other names. I am not going to try to list all of them, but virtually every inverter offered in our world now comes out of the bowels of China and has all of the same issues. Many are virtual clones with the color & the names different but you can tell they are the  
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same. I have seen Cobra and Xantrex units side by side that looked identical, with the same watt meter. I wonder how many factories there are producing boxes that are different colors on the outside, but exactly the same on the inside. Even the US company that was suggested to me has this voltage issue, but at higher prices. I really would not care about the price if they worked. I wish I could find the guy who had the brainstorm resulting in the acceptable voltage being lowered to 15V. Well maybe not, because nothing good would ever come out of it. I'd probably end up being locked up.

If you want an inverter that will work on a properly set up solar system, you need to do some research. I am not doing any more looking. Magnum or Morningstar. Period. Magnum is made in Washington, USA. I have seen ONE problem with a Magnum and they jumped through hoops to fix it. Magnum has the best technical assistance on the planet and they call you back if they happen to be busy, which is not often. I personally think that either Magnum is not charging enough, or Xantrex is over priced, pocketing the excess profits, because their manufacturing costs must be lower. Morningstar now makes their inverters in Taiwan and I have seen no difference at all from when they used to be made in the USA. I have seen ONE failure with a Morningstar, which happened within 5 minutes of start up, and they could not stop apologizing, sent out a replacement and paid freight both ways. I have not yet had a single problem with a Morningstar charge controller and have only heard from one person who had. These are both good companies.

Any manufacturer that would like to contact me and try to convince me otherwise is welcome to try. I am not holding my breath and I am through experimenting. People keep telling me that I need to quit being so negative. I am not negative. I am positive that the world is full of idiots who care only about making a profit.

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