Modifications I've done to my 2007 Great West Legend Sprinter Chassis RV

We purchased a 2007 Great West Legend RV and decided to add some missing features.

My Modifications

[Added LiFePO4 House Batteries](#) - I replaced the house batteries with four LiFePO4 batteries.

See this page for how I built the cables and junctions [Battery Wiring](#).

[Added Solar Panels and Charge Controller](#) - I added six solar panels and a solar charge controller.

See this page for additional details on the roof solar panels [Roof Solar Install](#).

[Added a WiFi Booster](#) - I added a high power WiFi Booster.

[Added Rear Storage](#) - I added a rear storage box for the fresh water and waste water hoses that could be accessed from the side of the RV.

[Added Rear Shelf For Bluray Player](#) - I added a shelf next to the TV in the rear for a Bluray player and some storage for Discs.

[Tables](#) - I made some tables.

[Diesel Can](#) - I added a carrier and Diesel Can for spare fuel.

[Ham Radio Antenna Mount](#) - I added a heavy duty mount for a Ham radio antenna.

Some of these modifications have undergone improvements. Older versions are described on this page [Old Modifications](#).

[Kitchen Upgrade](#) - I replaced the peeling countertops and failing fridge.

Details

[Added LiFePO4 House Batteries](#)

The coach had with Lead Acid House batteries, but I replaced them with four 100 Amp Hour LiFePO4 batteries (LiFeBlue LB12100PC). These can run everything for at least three days, including my Ham Radio Station, the Microwave, the Keurig and a toaster in the morning without running the generator. These batteries have built in monitoring, accessible via Bluetooth with an app on a phone or tablet.

I had used batteries that could be removed using Anderrson SB175 connectors, but those add to the voltage drop. Since these Lithium batteries are now permanently installed, they are wired up with 1/0 cable for each battery. That can take up to 250 Amps and I added a 250 Amp fuse for each battery. I used terminal fuse holders and put two of them in a marine plastic battery box and two in the original battery wells, as shown below:

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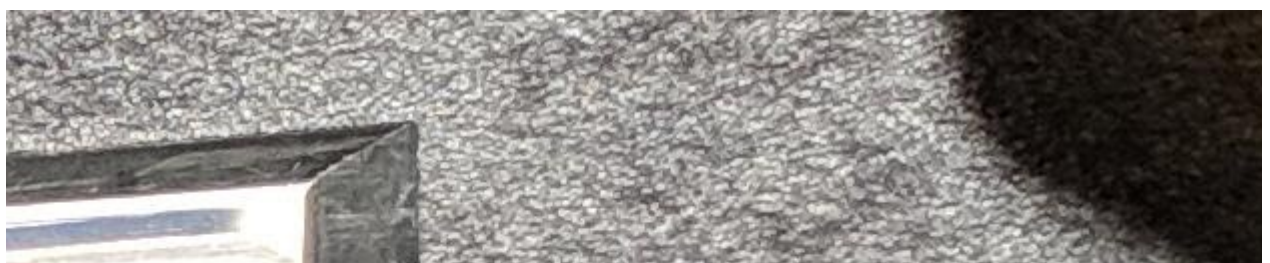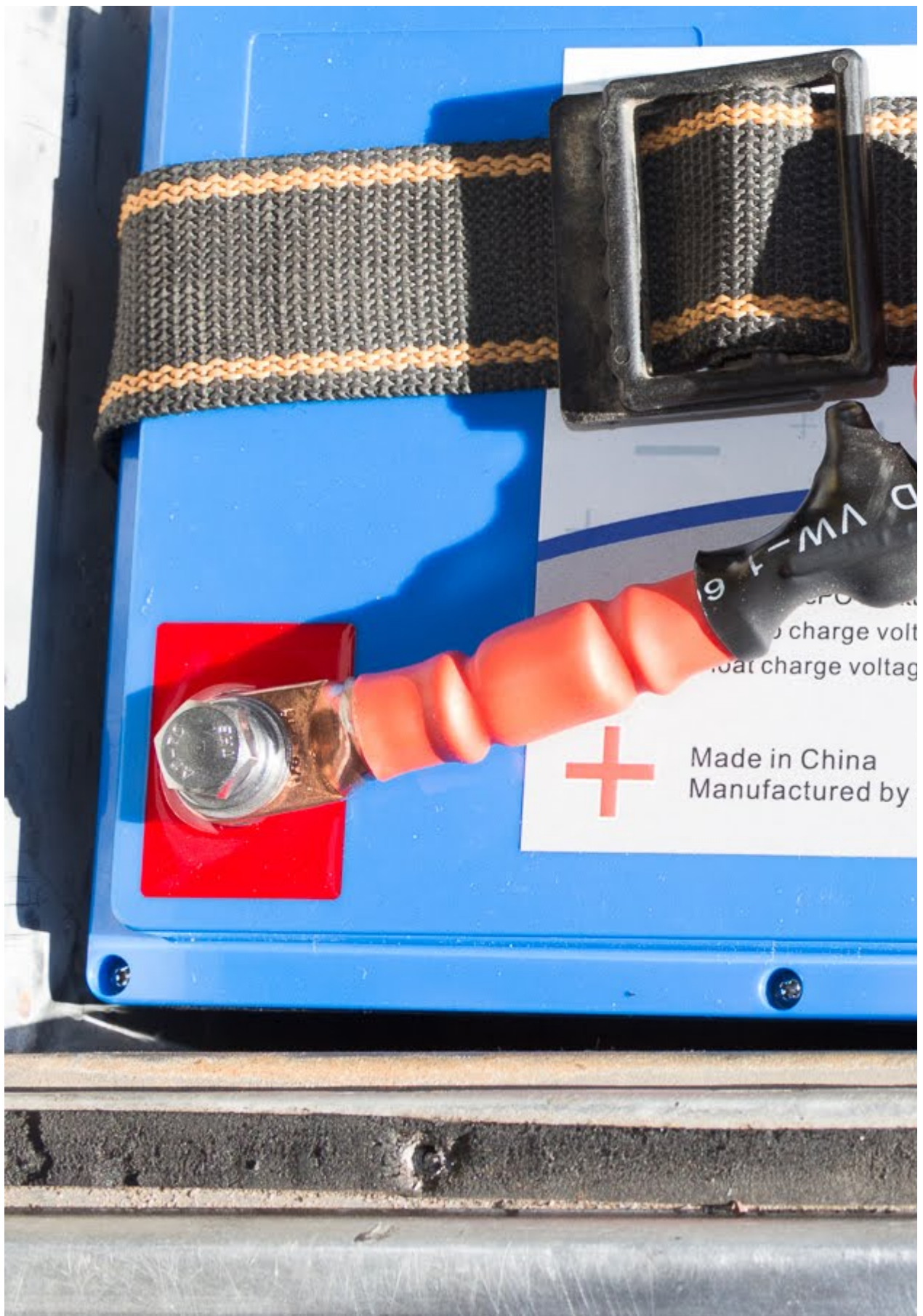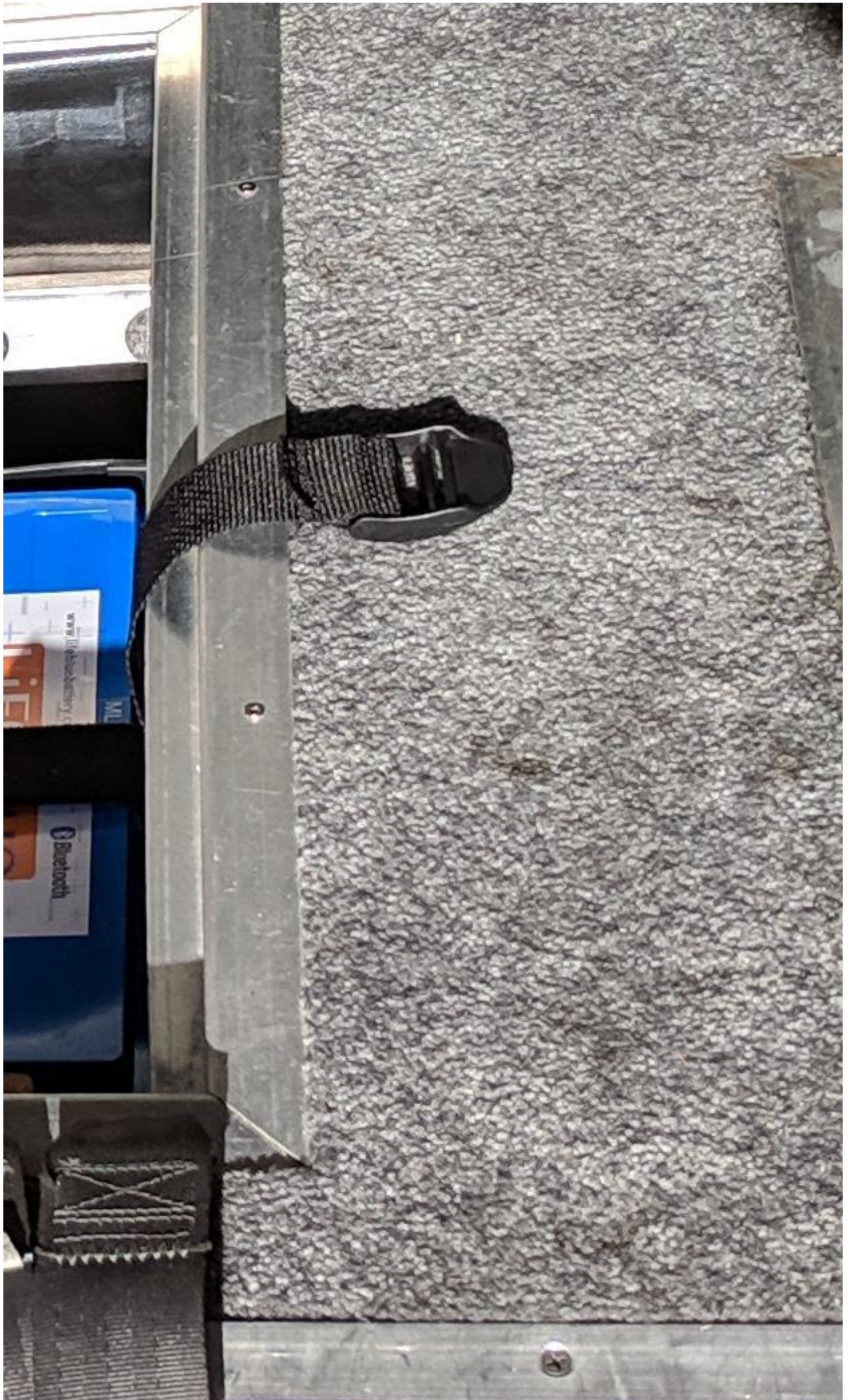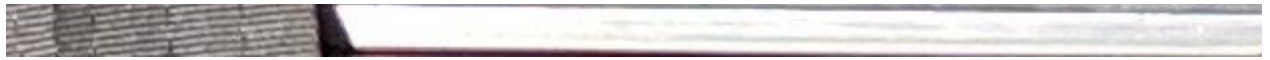
The two batteries in marine battery boxes were then put into the rear center storage well. A holder, made of plywood and angle aluminum, was built to hold the battery boxes, and the holder was attached to the large chassis bolts holding the generator.

The holder before the batteries were installed looks like this:

After the batteries were installed, cables connected them to a junction which then was attached using 4/0 cable to the inverter / charger that already was in the coach. The two batteries in the center storage well look like this:

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A hole was cut in the carpeted storage cover for the cable and it looks like this with the cover on:

The battery wiring is 1/0 Gauge welding wire. The house electrical systems are shown on the left side. The inverter / charger is the large grey and yellow unit. The white unit in front of it is a solar charge controller, and the standard house electrical panels are the brown boxes to the far left. Two house batteries are under the dark rectangular covers. The junctions are in the clear boxes. A Sterling BB1260 battery to battery charger is used to charge the batteries from the engine alternator, as the LiFePO4 batteries use different charging voltages.

You can see how I did the crimping and wiring here Battery Wiring.

The original wiring was not well done. Romex was run under the van and it eventually rubbed through to the wire and shorted 120V to chassis ground. Only AWG 4 wire was used for some of the DC battery connections and it was not all color coded. Only the inverter's fault detection likely saved me from a disaster. I put all the exposed AC wiring inside flexible metal conduit inside the RV. All DC wiring is in split loom for some extra protection.

Added Solar Panels and Charge Controller

I want to be able to charge these four batteries in the boonies without running the generator. The whole idea about dry camping in the woods is peace and quiet. So, a solar system was the obvious solution.

I installed one 135W nominal panel on the roof of the RV, as shown here:

Since there was an empty spot at the front of the roof, I installed one more smaller 100W nominal panel on the roof that fit the spot:

The panel install details can be seen on this page: Roof Solar Install.

The panels on the roof are really only to keep up the battery charge when driving or away from the vehicle. For when we are stopped and at the vehicle, I chose four 100W nominal Flexible Solar Panels (Windy Nation SOL-100F-01). These panels cost

more than standard panels, but they are extremely thin and light, and use high efficiency Sunpower cells. One panel is shown below:
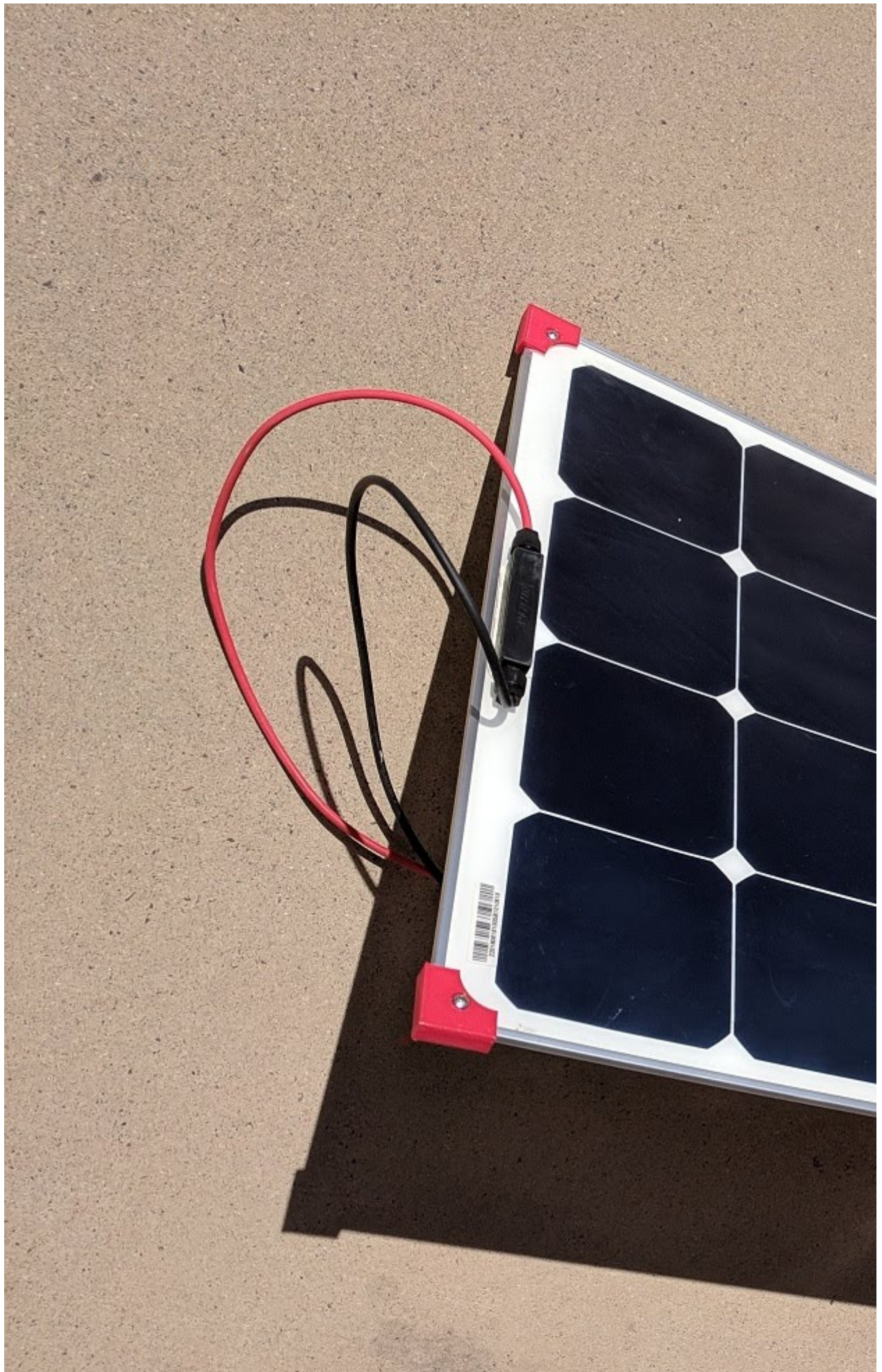
Notice that these panels are not on the roof. This is for a few reasons. There is some concern about how well these panels will survive on the roof. The RV does not have a big enough roof to fit all of them. The biggest reason is that generally, you will want to park the RV in the shade and have the panels in the sun. So, I built thin Aluminum frames with red 3D printed corner protectors and have PVC risers that are used to adjust the tilt, just use longer or shorter risers. The panels may be placed on the ground in the sun. The extension allows them to be up to about 50 ft away.

The resulting power produced from these four panels with a standard charge controller is just under 300 Watts:

The panels come with MC4 connectors, which are hard to work with. I made up some adapters to put the four panels in parallel and convert to Anderson Powerpole connectors:

I also used Powerpoles to connect to the charge controller and for extension cables:

If I will be located on place for some time, the four extra panels may also be placed on the awning, with the awning providing a slight tilt. Here is a picture of five panels in this configuration. The sixth was added later. There are security cables through grommets on the panels to make them harder to "walk away" and I installed some MC4 connectors on the roof near the awning to easily connect to and have no wiring on the ground:

With this configuration I saw up to 356 W / 25.8 A peak and got between 90 and 130 Ah each day, sitting in a forest campground with some tree cover:

Under ideal conditions, with two roof panels and four clean portable panels tilted toward the sun, up to 450W is possible.

I chose a Morningstar PS-30 solar charge controller. This is a standard PWM charge controller, NOT an MPPT controller. While MPPT controllers are more efficient, they also create lots of RF interference, and I use this with my Amateur Radio equipment.

This has not caused noticeable interference, but if it does, it can be switched to a very RF quiet mode. The charge controller is shown below:

I also got an optional remote panel that I mounted inside, just above the control panel for the inverter / charger. So, everything may be monitored from inside the RV. The two panels are shown below:

Added A WiFi Booster

I have a Ubiquity Bullet, which is a high power WiFi to Ethernet adapter. It is designed to provide a long range WiFi interface with a suitable antenna and connect to an

Ethernet network. I installed a high gain Yagi antenna on the TV antenna mount, so it can be rotated with the TV antenna. That is connected to the Ubiquity mounted on the roof, and then an outdoor rated ethernet cable is connected to a router inside the RV. The Ubiquity has a web based interface that you can choose a remote access point to connect to and then that will be relayed to all devices in the RV by the internal router.

The Ubiquity, combined with this high gain directional antenna has a range of thousands of feet, so you can park somewhere and pick up the WiFi from some place across the parking lot.

The antenna and Ubiquity are shown here:

The Ubiquity is connected to a WiFi router inside the RV. All the devices connect to the WiFi router in the RV and you only have to go to the Ubiquity setup and change what access point it connects to. The whole combination does take some networking knowledge to set up. It's not plug and play, but once set up, it works well.

Added Rear Storage

There was a panel in the side of the RV that opened into the rear storage area under the seat. This panel was not that useful, as it opened into the area some distance above the floor. It was blocked off with some foam insulation and not used. We had to store the fresh water and waste water hoses in some plastic totes under the rear seat and it was a real pain to access them. With bikes on the bike rack, it was very hard to access and involved one person tilting the bike rack down manually and the other person struggling to get the totes in and out. I decided that a storage box that opened up to the panel on the side of the RV would make our lives much easier. So, I built a box out of 1/2" plywood and some pine for support that was just the right size for the two totes containing the hoses. The box is shown below:
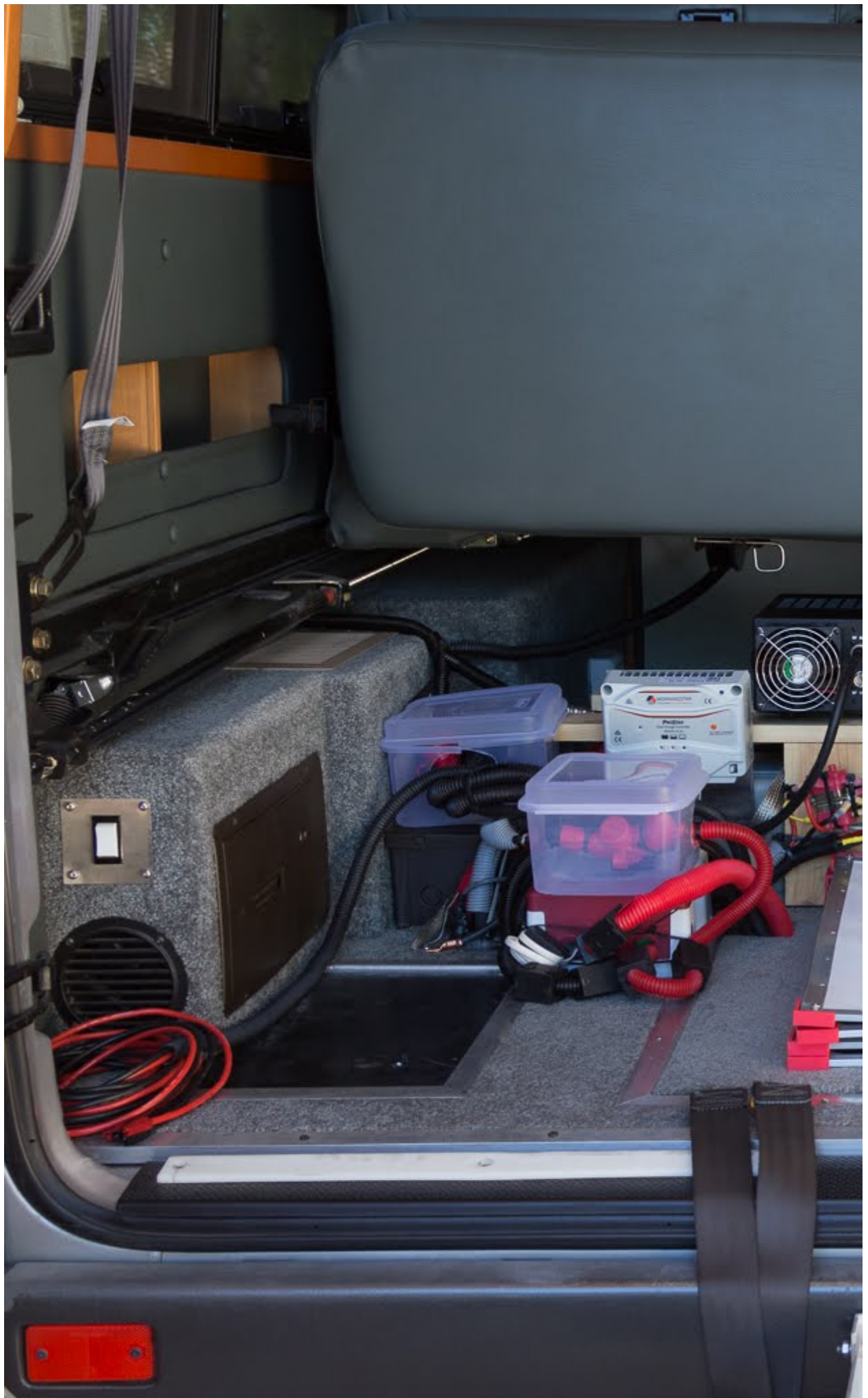
The storage box looks like this from the panel on the outside of the RV:

So putting it all together, with the storage box in the back, Solar panels stacked under the storage box, the solar controller and rest of the electrical panels in the back, the rear of the RV looks like this:

There is even some room left for other items. I added a foldable ladder, some camp chairs and a storage box for solar panel wiring:

Here is proof the movable seat just misses the box:

Added Shelf For Bluray Player

The RV came with an ancient DVD player with only a composite video output (yellow cable) but had a full HD TV. The DVDs looked awful. I found the Sony BDP-S3700 Bluray Player actually runs off 12V and includes a wall wart to make the 12V. I got an extra wall wart on eBay and cut off the cable and connected it directly to 12V, and an HDMI cable to the TV. This Bluray player includes streaming apps, so you can connect to wifi at a campground and watch Amazon or Netflix. I wanted a place to put it and there really was not anywhere it fit.

I created a custom shelf that matched the woodwork in the RV. I used laminated shelf board that was very similar to what was there, and stained Maple trim, and a few coats of Poly. There are three cubbyholes to store discs. The disc boxes fit fine, but my hands are a little small to reach all the way back into the cubbies. I made the lips in the front of the cubbies as small as I could (1/4") so they keep stuff from flying out. A battery powered CO detector is there also, because you can't have too many CO detectors. The shelf with the Bluray player looks like this:

Tables

The RV came with only one table and that one had some peeling laminate. I decided that I wanted wood tables and they had to be 18" X 24" to fit in the three locations for

tables in the RV, two in the back, an done in the front. There normally are only two tables and table legs. I found 18-Inch X 24-Inch Carving and Pastry Boards at Bed, Bath and Beyond for about $40 each. I finished them with many coats of Arm-R-Seal Oil and Urethane Topcoat and attached cast Aluminum cone style table leg bases. They fit on the table legs and look pretty good. The Arm-R-Seal is hard to get perfectly smooth. I don't have the ability to spray, but that probably would be best. They still came out looking pretty nice. They are shown below:
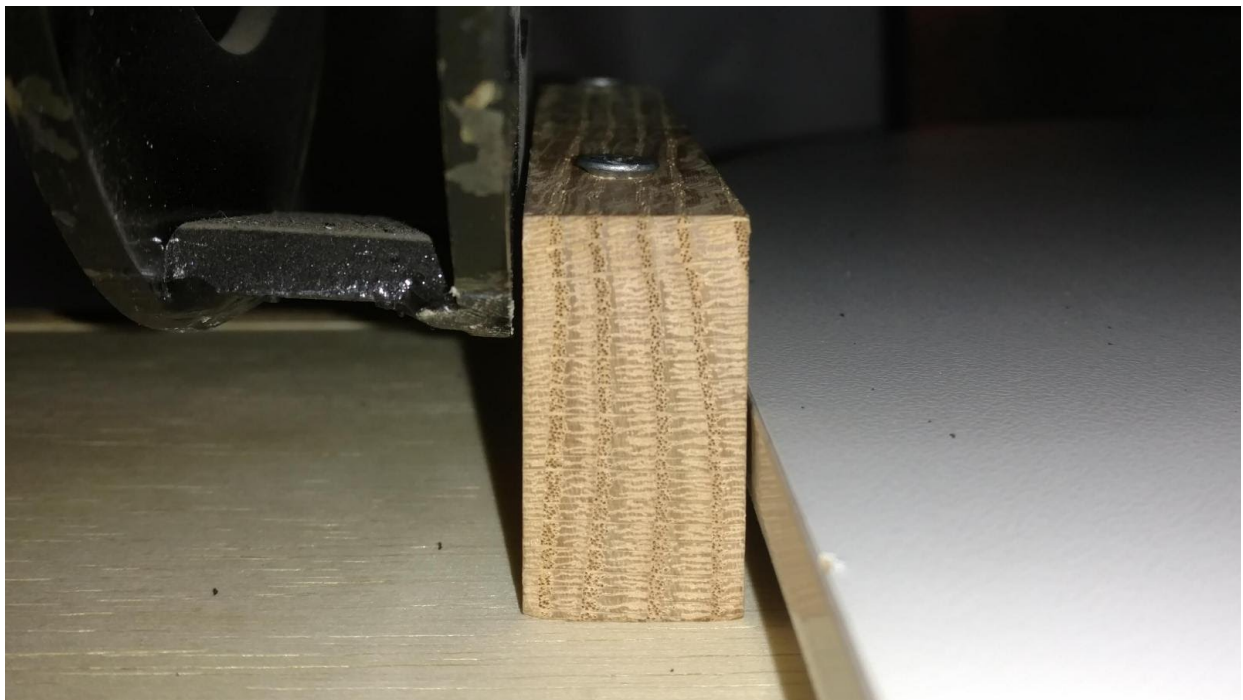
The two wooden tables fit in the table storage locations in the van, one in the closet and one in the rear door. It turns out that the third table is able to just fit above the added storage box, so it can be stored in the van also. Table legs are inexpensive, so we now have three tables! In the following images, you can see the third table and the retaining block I added just fit:

Diesel Can

I wanted to have a place for a 5 gallon container of Diesel. It is usually not full, but may be used when needed. I made a carrier out of aluminum and bolted it to the bumper in front of the bike carrier over the hitch. This is probably the safest place to put it. It is also secured with a tie strap and cable lock:

Antenna Mount

I designed an antenna mount for a large Ham Radio antenna to fit on the two hinge bolts that hold the spare tire carrier. The mount is installed just to the left of the spare tire carrier:

The mount is made from stainless steel by a friend who has access to a water jet cutter and the ability to weld stainless steel:

Here is a picture of the antenna, a Scorpion SA-680 installed on the mount.

To see more detail of my RV ham station go to this site: [Mark's Mobile Ham Station](#)

Kitchen Upgrade

The countertops were covered with thin Melamine. Here in the AZ heat, the Melamine was peeling and cracking. The fridge was a Dometic absorption model that did not work well in the heat. Temperatures in the refrigerator section got up to 50F on a hot day, risking spoilage. The sink was plastic. The stove did not have an igniter.

Here is the original setup, before the countertop started peeling.

Name: Original.jpg Views: 189 Size: 58.0 KB

I decided to first remove everything and see how they were attached. The countertops were attached to brackets with screws from the bottom. With the countertops off, you can see the fridge and plumbing.

Name: Counter_Off.jpg Views: 161 Size: 81.0 KB

I used the original countertop as a template.

Name: Template.jpg Views: 165 Size: 64.6 KB

You can see the peeling and cracking.

I removed the old fridge and some of the wood sealing it up in the back so the new one would fit.

Name: No_Fridge.jpg Views: 162 Size: 84.6 KB

I added Polyiso insulation where it would fit on the sides. I put more Polyiso on the top and back of the new fridge and slid it into the space, securing it at the back with some screws into the wood. I had to make a couple of 3/4 in high wooden slats to go below the feet at the front of the fridge. The feet at the back sit on an existing piece of wood. The new fridge is not as tall so I made trim pieces for the top and bottom and stained them to match the original woodwork .

Name: New_Fridge.jpg Views: 171 Size: 108.3 KB

The original countertop is 3/4" thick and the new one needs to be the same thickness to fit under the trim at the window in the back and to allow the distances to the plumbing fixtures to be the same as before. Everything is shoehorned in. There literally was 1/2 an inch to spare between things like the sink and the cabinet walls.

I cut the new countertop out of one piece of 1/4" Baltic Birch and one piece of 1/2" Baltic Birch. That is so I could sandwich elevator bolts between them for a more secure mounting.

Name: Cut_Wood.jpg Views: 159 Size: 83.8 KB

Notice that I cut things several times. My crappy jigsaw just would not cut straight. I finally cut approximately by hand and finished with a Router and trim bit, using the old countertop as template.

I then drilled holes in the brackets to fit the 1/4"-20 elevator bolts.

Name: Bolt_Holes.jpg Views: 153 Size: 57.0 KB

Name: Elevator_Bolt.jpg Views: 150 Size: 79.9 KB

Elevator bolts are basically have a wide, flat head with square shoulders so they don't rotate.

I cut holes in the 1/4" plywood, and using a Forstner bit, made space for the bolts to fit flush.

Name: Bolt_Hole.jpg Views: 149 Size: 93.0 KB

Here are views of the bolts pushed through the 1/4" plywood.

Name: Bolt_Top.jpg Views: 148 Size: 54.5 KB

Name: Bolt_Bottom.jpg Views: 145 Size: 82.4 KB

The head is flush with one side and the bolt sticks out the bottom.

I then attached the 1/2" piece of plywood on top, sandwiching in the elevator bolts. I smoothed things out, routed the edges for a nice look, stained and finished it.

A new stainless steel sink was mounted underneath with custom bent clips. I could not find one of the right shape.

Name: Ready_to_Install.jpg Views: 155 Size: 50.4 KB

You can see the sink, the clip and one elevator bolt ready to be attached to the bracket.

I used flange bolts with serrations and Loctite 243 to attach the bolts.

Name: Flange_Bolt.jpg Views: 143 Size: 57.5 KB

After everything is installed, this is what it looks like.

Name: Installed.jpg Views: 170 Size: 86.8 KB

Here are some of my other sites:

My RV ham station:
https://sites.google.com/site/marksmobilehamstation/
My Controleo2 based SMT Reflow Oven:
https://sites.google.com/site/markscontroleo2build/
My TS-590S MODs including a buffer board install for a panadapter:
https://sites.google.com/site/marksts590smods/
My TCXO Boards to replace the SO-3 in Kenwood TS-590 radios:
https://sites.google.com/site/markstcxo/
An explanation of various TCXO Characteristics in Kenwood TS-590 Radios:
https://sites.google.com/site/markstcxomeasurements/
Modifications to allow use of an external clock in a Perseus SDR:
https://sites.google.com/site/perseusmods/
How I use Spectrum Lab Software to do frequency measurements:
https://sites.google.com/site/spectrumlabtesting/

Pictures I took of the 2017 Total Solar Eclipse from Menan Butte, Idaho:
https://sites.google.com/site/marks2017eclipsephotos/

Revised April 18, 2020

Subpages (3):   Battery Wiring   Old Modifications - This is an archive of the old modification web page   Roof Solar Install