

Wayne and Linda's Promaster Conversion

Conversion Goals and Objectives

When our children were younger, we traveled all over the US, tent-camping and "motelling" from the East to West coast and back. We live near Baltimore, MD and the firms we utilized to customize the van are local to the Baltimore-Washington region. In 1990 we traveled 12,000 miles in 6 weeks in a 1986 Dodge van with a 225 cubic inch straight six that huffed and puffed up the mountains. The most expensive part of the trip was food. In many cases, a campground was as expensive as a cheap motel. The Dodge was adequate but not ideal and certainly more suited to people in their 30's than 60's. You could not sleep in it, therefore we tent camped. You could sit in the captain chairs but not stretch. Food preparation inside was not possible. Thus was born the intention to travel more in retirement but to travel in a vehicle designed for travel and occasional sleeping. You need hard sided campers in parks like Yellowstone and Yosemite. For 10 years I have planned to acquire a Class B RV and now have the vehicle to do so. I dreamed of doing the work myself rather than pay \$40,000 to someone else. Most of this 'article' will be drawings and pictures.

Objectives

- Use as Wayne's main vehicle that behaves like a 'regular' car. We did not want a third vehicle.
- Ability to stand up (Wayne is 5'10" and Linda 5'4")
- Keep It Simple. The more water, gas, waste and electrical lines, pumps, etc, the greater the risk of something going wrong. Therefore, no running water, no blackwater system, no propane lines and limited electrical usage. The minimalist approach. Money saved on an RV buys a lot of hotel space.
- Ability to sleep inside on occasion without a lot of hassle
- Ability to have enough room to change more than your mind
- Have 'shore power' to run a microwave, induction burner, ceramic heater.
- Have a compressor type cooler that runs on 12v or 110v
- Have a porta potty for emergencies because sometimes facilities are not available
- Room to carry clothing and supplies in a tidy manner
- Ability to carry building material such as 4'x8' plywood or 10' poles since we are homeowners and don't have a pickup truck.



Linda's vision of what Wayne will build.

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The original chassis desired in 2006 was a Sprinter (25 years of dreaming and 10 years of planning!) but the introduction of the Dodge Promaster provided a cheaper alternative. It has the benefit of being a little wider and having a lower floor due to front wheel drive. The 136" wheelbase has excellent turning characteristics and overall the vehicle is only 10" longer than a Honda Odyssey.

We purchased the 2017 Promaster through Costco and worked with Ourisman Dodge to understand who could do what work for us. Fred Eldridge was knowledgeable and had many excellent contacts for fixing up the van. Wayne is a professional model maker and handy with tools but has limited electrical experience. In addition, there are certain purchases that are cheaper as ordered rather than as retrofitted. We ordered the van with the following:

- Swivel driver and passenger seats. Be advised that no one will replace the original seats so it is important you get the swivel seats.
- Full interior paneling
- Overhead LED lights.
- Rear windows and defroster
- Rear mounted camera and parking assist
- Towing package
- Auxiliary 12v outlet, and extra electrical switches
- Speed Control
- 220 amp alternator
- Auxiliary battery prep
- Upgraded radio but no GPS. Wayne hates them and they work on a phone just as well (or just as poorly!)
- List price was \$38k but with the Costco discount was less than MSRP, \$36,000 including taxes, tags and freight. Less than a minivan with a LOT more space!

The van took 6 months from ordering until delivery. The Dodge corporation was terrible to deal with. The van left the factory in Saltillo on August 17 and was 'lost' for a month. How can Amazon know where a \$10 package is but Dodge cannot tell us where a 36,000 vehicle is at all times? We ordered a 2106 model but received a 2017 due to the delay. Unfortunately the 2017 no longer comes with the auxiliary battery package.

WagonsByWayne

Note the running boards installed.



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The planned, but not necessarily executed (!), main conversion steps were:

1. Install a ½" High Density PolyEthylene (HDPE) floor
2. Install side and rear running boards for steps
3. Install CR Laurence window (FW395R T Vented) in the sliding door.
4. Investigate and install sound deadening and insulation
5. Make and install cabinets
6. Install wiring
7. Depending on what we found out, perhaps install additional windows.

Paper is cheap and we went through the same basic plans many others have shared. Beds up front, dinette in back that converts to a bed, raised flooring for storage, platform bed in back, lots of storage underneath, etc. Hopefully we have documented our build in sufficient detail to help others avoid mistakes with expensive materials or ruin a significant effort. The best part is, if you don't like it, take it out and start over. Wood is cheap, but repeat labor is draining.



Seats are swiveled around.



The button for the LEDs is right there in the middle, looking like a fastener.



As delivered, bare bones. Without sound deadening and insulation, Linda described the ride as 'punishing'.



Here is the vinyl cut for the back door along with the foam that is contact cemented to the vinyl and is installed next to the metal in the door cavity.

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1. Our first contractor (US Upfitters) installed the three part HDPE floor. A good investment only slightly more expensive than one that could have been purchased with the van and much more durable.
2. US Upfitters installed the running boards at the same time as the floor. We chose the Luverne Grip steps for each side and the rear. Very aggressive tread to prevent slipping.
3. The next thing was to mock up the interior. Cloroplast Campaign signs are perfect, being light, stiff and easy to cut, and in October/November, plentiful! The mock up provided us a way to get the curves to fit over the wheel wells and matching the curve above the 33" rib. We removed the panels that came with the vehicle to cut out the curves. We didn't re-use the lower rear panels but did re-use the other four. This is also your chance to get your dimensions exactly right and fit your cabinets around the contours and braces of the van.
4. We consulted a local RV Repair shop about electricity. They started out with van conversions so had a lot of experience. We were able to mark the 'cabinets' for outlet location. This allowed the rough wiring to be run prior to doing the insulation or cabinets. They also installed the 2000 watt inverter/charger and 2 6v batteries so we could see how big the cabinets needed to be.
5. Install the window. We chose a CR Laurence window (FW395R T Vented) for the sliding door; that is a full sized OEM window using the entire door bay. This was contracted to the same shop that did the electrical work.
6. Install a ventilation fan at the rear of the vehicle in the ceiling.
7. Insulation was done by consulting with Don Sombrooke from Sound Deadener Showdown, located in nearby Manchester, MD. This required:
 - ✓ Installing CLD tiles in 25% of the panel area to dampen vibrations in the van shell. Tap on various sections of the van to see which ones are 'tinny'. Some very tight areas in which a CLD tile could be placed are very solid spaces surrounded by ribs and don't need the tiles.
 - ✓ Removed the HDPE floor
 - ✓ Installed thinsulate (my idea, no reflection on Don!) on the floor, covered that with mass loaded vinyl (MLV) and then replaced the floor
 - ✓ Installed MLV around the wheel wells with closed cell foam between the MLV and wheel well



Note the staggered tiles in the forward bay ceiling. I started at the back and didn't get smart until the front. Every ridge and valley has to be touched by CLD tiles, perhaps no more than 4 feet apart. Otherwise a continuous length is still 'tinny' when you tap it. We had to add additional tiles to the rear bays.

Covering the wheel wells requires piecing together several straight MLV strips and then cutting them to overlap in a circle. I temporarily held them together with tape.



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Foam is placed inside the MVL wheel shell and cut out around the Velcro used to attach it to the wheel well.

- ✓ Installed hydrophobic melamine foam in the wall panels and ceiling for insulation, using 3M 90 Spray adhesive when necessary. Due to clearance on the roof ribs, there is only room for the 1.5" melamine foam panels on the roof and the upper bays. The lower bays are wide enough to place both the 1.5" and ¾" foam, staggered so the second layer covers the seam in the first layer.
- ✓ Installed mass loaded vinyl in the two rear bays above the wheel wells and the driver side lower bay. The sliding door and rear doors also received MLV. These were separated from the metal van walls by strips of closed cell foam (see picture of door cavity).
- ✓ The corners of each lower bay, whether it was plywood (3" bolts) or a replaced plastic panel (1"x¼"/20 bolts) by inserting the bolt through the metal van wall panel due to the weight of the MLV. The bolt had both a washer and lock washer inside the van wall to maintain tightness. Strings were tied to the bolts to pull them through the material and, more importantly, NOT to lose them behind the wall. All exposed bolts were finished with acorn nuts to reduce exposed sharp edges.
- ✓ Stuffed the ribs with thinsulate or foam, depending on the size of the cavity.
- ✓ We re-installed the 3 upper panels using the plastic studs that came with them.
- ✓ The two rear lower bay panels will be replaced by the plywood of the cabinets and will have the MLV attached to it with melamine foam in the cavity. Both the ¾" and 1.5" foam blocks are able to be used. Bolts are in the upper rib and around the wheel well in the spots originally used by the plastic studs.

Foam is installed across the ceiling and upper bay with thinsulate in the column and rib. The LED is still in its original transverse location.



Thinsulate on floor with MLV on top before the floor is remounted.



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Mockup of 32" wide cabinet with shelf at 30" off floor. This spans the center brace.



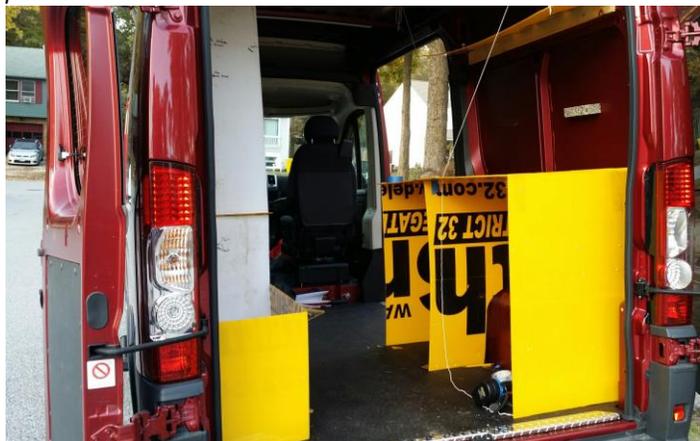
Looking at the 53" long countertop mockup. 12" shelf overhead is anchored to top 'rail'.



Cooler cabinet facing forward. It will be mounted to the backplate and has the batteries inside it.



Looking at the countertop from the rear. Note that we have 28" of floor space between the cabinet sections, enough to sleep one person



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8. We cut 12' 1x4's in half lengthwise to create our 1x2's. They were then screwed to the ceiling ribs using 1¼" (NOT any longer!) self-tapping screws and cut to a 117.5" continuous run.
9. We moved the LEDs that came with the van to run lengthwise rather than transverse across the van. We had to splice the wiring to reach across the ceiling.

Auxiliary battery, inverter and wiring, roughed in. Wheel MLV dismantled.



Panels remounted after insulating.



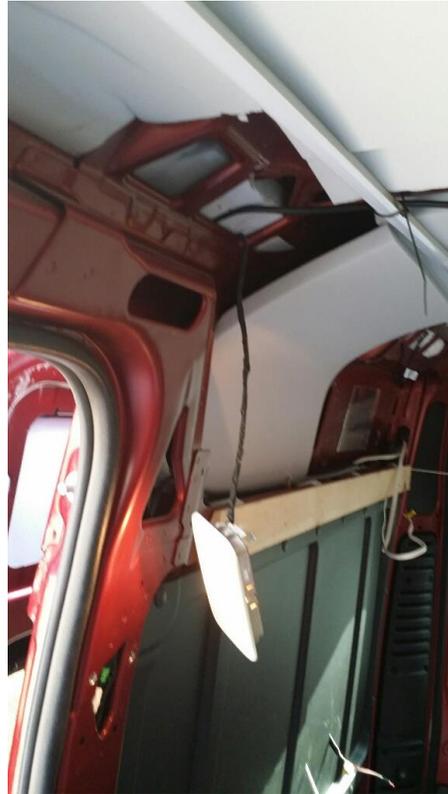
Overhead bin pulled down to expose rib and front insulation with 'furring' attachment points.



Overhead bin closed around rail showing how we cut it to fit the overhead furring strip'.



Front light removed from upper rib and hanging to be installed in the front end of the overhead cabinet. Note the foam insulation.



Ceiling Grid to which wall cabinets are tied. They are installed over the 1.5" foam with 1.25" self tapping screws into the 'rib'.



10. We then finished the rest of the cabinetry as follows:

11. The cabinets were the most complex because we had to make them. They were constructed of ½" cabinet grade maple plywood, glued and screwed. This is prefinished, light and has a nice look. I preferred Baltic Birch plywood because it has more layers than other types and greater stability but came in 5'x5' panels. Installation required the ability to bolt to the frames and provide the usual flexibility demanded and expected in RVs. Outlet and light placement were chosen to plug in the cooler, microwave and grill as well as lights under the upper cabinet.

12. The passenger side base cabinets were designed to have 5 feet of counter space with drawers, a pantry, lower storage and a space large enough to put a couple totes or a 29" suitcase. We considered a slide out table at 30" to make an 'L' but came up with a better solution.

13. The driver side full height cabinets are a 32" wide x 22" deep closet for hanging clothes with a shelf at 30" above the floor and a drawer below that. The closed cabinet underneath is the storage spot for the 'port a potty'.

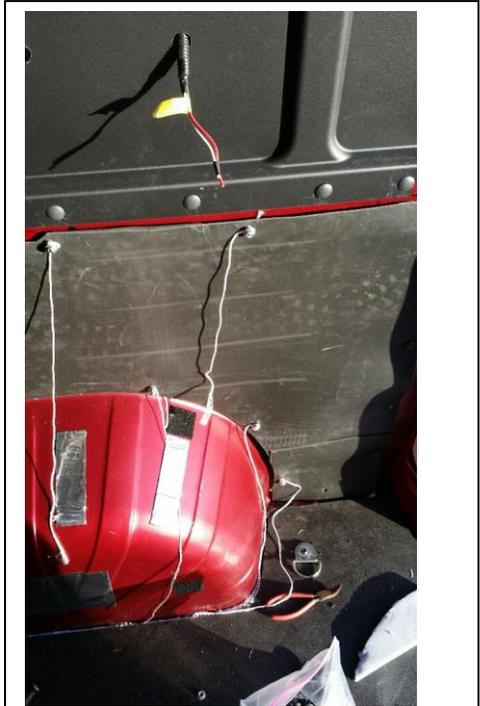
14. The driver side rear cabinet was designed to hold the cooler with the top at counter top level. This prevents us from having to drag it from somewhere and makes access easier. It has the auxiliary battery, inverter and wiring underneath. We considered a flip lid with a piano hinge and then bolted down with eye bolts through 'T' nuts but came up with a less invasive solution. The main issue was that we needed easy access to the on-off switch inside the cabinet. The pictures show our solution. We had to make the cabinets a little wider than originally planned due to the size of the batteries and, converter and wiring.

15. The narrow overhead shelf above the cooler were designed to hold sleeping bags and air mattresses without interfering with getting into the cooler..

16. We have space to add an overhead bin between the closet and driver's seat but are not doing this yet because we like the 'feel' of the open space behind the seats.

17. The overhead cabinets on the passenger side is built on a single piece of 3/4" plywood 13.5" wide as the base. See the pictures for how the base was routed to hold it in place in the existing rib. The microwave is mounted at the van rear and the front cabinet is used for storage.

18. The ceiling was constructed of 1/8" poplar because it could bend across the ceiling.



MLV is bolted to the van wall and wheel where the original panels were bolted. Strings are tied to the bolts to prevent them from being dropped and lost.



Closed cell foam is cut to fit inside the MVL shell for the wheel well.

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A second furring strip on the front of the cabinet face will support the ceiling on the outside of the cabinet.



The shelf was routed $\frac{3}{4}$ " so it would fit over the 'ledge' to give it a solid support structure. Note the 'lip' in the back used to mount the ceiling.



The cabinet face is screwed into the overhead furring strip. The strip will also act as the support for the ceiling.



This is the base cabinet underneath the shelf. It too has been prepped for wiring. I had to replace all the bolts with 3" bolts to maneuver the cabinets in place. We drilled $\frac{1}{2}$ " holes in the cabinet backs and used fender washers to fasten them



This is the inside of the upper cabinet and the wiring to the electrical outlet used by the microwave and under cabinet lights.



The other adjustment you have to be ready for are the beveled ribs on the floor. Here you see the bottom of the cabinet base cut back at an angle to sit square on the floor.

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The electrical cabinet has been built around the batteries and inverter.



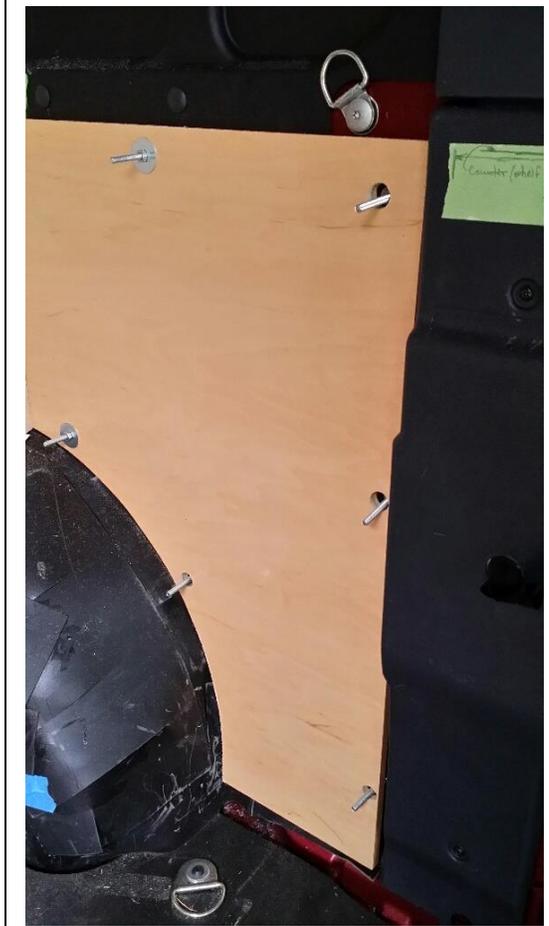
This is the finished electrical cabinet and the batteries are vented to the outside.



This is the electrical panel at the rear just inside the driver's side back door.



The bottom side of the top of the electrical cabinet is cleated so that it does not move and it is easy to remove when needed. The cooler sits on top of it.



The lower back panels are bolted on using 3" bolts through 1/2" holes protruding through the ribs in the wall and through the holes around the wheel wells. This is sufficient to hold everything in place.



All bolts have a lock washer and regular washer inside the van rib. Use a fender washer to span the 1/2" hole. Put a second nut after the first one. Cut off the bolt and when you unscrew the second nut, the threads are re-established. We finished with an acorn nut that is gentle to hands, clothing and soft items.

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19. We then took the van back to JimDonnies to finish the wiring.
20. We continued to embrace KISS when we chose the cooler. We could have simply chosen a regular cooler with ice but felt that a better solution was available. The Norcold NRF60 (26" long x 16" wide x 21" high; 5.5 amps, 55 watts) runs on 12v only connected to the auxiliary battery. If you used the inverter to boost it to 110v, it would actually take more power from the engine. We used 110v when we first got it in the house. When stopped, you can use shore power to charge the auxiliary battery. I leave the cooler on 24x7 in the van and it doesn't drain the batteries.
21. Where are the beds? Well, that was a compromise. The vehicle is wide enough to sleep across it. We discussed a bunk bed arrangement but Linda felt she would be claustrophobic with only 28" between beds ($74"-17"=57"/2 = 28"$ above and below the proposed bunk). We finally concluded that with our final layout, we would have approximately 30" of space, Linda across the floor behind the seats and Wayne on the floor between the cabinets.
22. Cooking is done on a portable propane stove or inductive burner. We like to cook outside, particularly breakfast. Lunch is probably best eaten out and is relatively cheap compared to dinner. Dinner can be cooked inside or out, particularly on the inductive burner or crock pot plugged in on the counter. The small 700w microwave is multi-functional and a requirement in this century. It was sized to fit those single meals you can buy at the grocery store.
23. <http://www.pro-touring.com/threads/107719-Best-peel-and-stick-sound-deadener-Boom-mat-Dynamat-How-far-do-I-go-with-it>



The wardrobe sides are held in place at the roof by notching the lathing strips used to mount the ceiling.



The furring strips are secured at the rear with 'L' brackets.



This is the wardrobe side. Note the complex contours to help make it flush against the side. Insulation is fitted around protrusions.

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The microwave was taken apart and had the front feet replaced by a bolt to run through the shelf and be secured by nuts and lock washers.



The ceiling is done in sections and cut to fit. Place tape across the expanse to be covered, remove the tape and that is your length needed. Note repurposed entry light placed in overhead cabinet bulkhead.



The ceiling piece opposite the sliding door is the only piece 48" wide. This is made of 1/8" poplar which bends well but can also crack. Another option is that Sams and Costco have very nice 10'x7' rugs (not shag!) that would look very nice and would be easier to fit.



The driver and passenger wheel wells also received MLV treatment. One surprise was that Dodge had already put some sound deadening strips in the well.



Linda would have liked more of the front compartment sound proofed but I didn't feel comfortable taking apart more of the vehicle!



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This is a view of the pantry with the wardrobe and large drawer in the background. The bottom is open to show the port-a-potty storage area.



View of the driver's side cabinets from the rear door. Ledge is to tie down sleeping bags.



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This is how much clear space (46") we have to plan for a small bench seat. However, we require a flush mount to not interfere with sleeping space and have not found anyone who can do it. We may not be able to do this.



We needed to put in a rail to attach the door catches and the drawer catch in the space underneath the wardrobe. This rail is just underneath the 8" drawer. The drawer catch is mounted to the bottom of the drawer faceplate.



This is the view of the battery vent and shore power connection.



At the rear is a fold down table designed to cook on. Note the folding leg. It is kept in place with a carpentry clamp.



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If we had thought about it, the drawers would have been perfectly aligned to put in the table. The original design had a leg similar to the rear table.



This is a folding 5' bench seat that we use to sit under the table. It is conveniently 'bungied' to the back door and fits snugly against the breaker box.



Sleeping bags are roped into place. Spices are kept in handy magnetic cans. The table is velcro'd upright under the spices and against the wardrobe wall.



This is the bench underneath the table.

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What would we have done differently?

1. Don't order the extra wiring, rear air conditioning or the rear grab bars with the Promaster.
2. Install an aftermarket camera rather than ordering the backup camera. You need a camera that is always on because even with the windows in the rear doors, the pillar obstructs the vehicle directly behind you. No one will convert the backup camera to always being on for legal reasons. After we used the van for a while, we purchased a wireless camera that replaces the top stop light on the van. It displays in a 4"x6" replacement rear-view mirror so that by glancing in the mirror, it is like looking out the back of the van.
3. Consider automatic electrical steps instead of the side running boards although they are very expensive. The rear running board is a must!
4. We found out the floor we installed does expand and with the weight of the cabinets on it, it buckles in the center. Direct sunlight in particular expands it greatly. Solution? We routed a 1/8" groove down the middle as an expansion joint. If that doesn't work, I will cut it from around the cabinets and install laminate. We would recommend against this type floor.
5. Build the cabinet sides out of 5/8" plywood for greater strength and so the screws don't go through them. The measurements on the exploded view do not account for dado cuts for shelves. We used biscuit joints because 1/2" is really only 7/16" and not deep enough for dados.
6. We built frameless cabinets in an attempt to reduce wasted space. However, hanging the doors in a vehicle that you cannot level (like a house) is challenging. While the 'reveals' turned out pretty well, it is much easier to put doors on frames.
7. Anything aft of the wheel well is more likely to bounce. We don't know yet but perhaps the microwave should have been within the wheelbase to limit 'jittering', even though it is bolted down.
8. After using the van, we purchased an awning for the top of the vehicle; manual of course!

The van is finished! Perhaps one day we can replace this picture with a scenic one from our vacations!



Leaving the area by the sliding door also allows for the installation of a lift system, if needed.

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Costs	Estimated	Final	Notes
Van	36,000	36,000	Good deal through Costco
floor	\$750	\$750	Includes installation
Running boards	\$1,100	\$1,100	Includes installation
Insulation	\$500	\$1,700!	Noise suppression is more expensive than you think
Cabinet materials	\$500	\$700	Plus I paid a cabinet maker friend because I knew it would look good
Electrical	\$1,500	\$2,600	Plus \$3,000 labor which was more expensive than I thought. The inverter alone was \$1100.
Windows	\$1,800	\$900	We only installed one window in the sliding door
Rear View Camera	unplanned	\$1,100	We added this after the van was finished
Freedom 9'10" Awning	unplanned	\$1,325	We added this after the van was finished
Unplanned labor		3,000	Whoops!
Total	\$42,150	\$49,150	The awning and camera were more than compensated for by selling the 2006 RAV4 that the van replaced.

Parts List

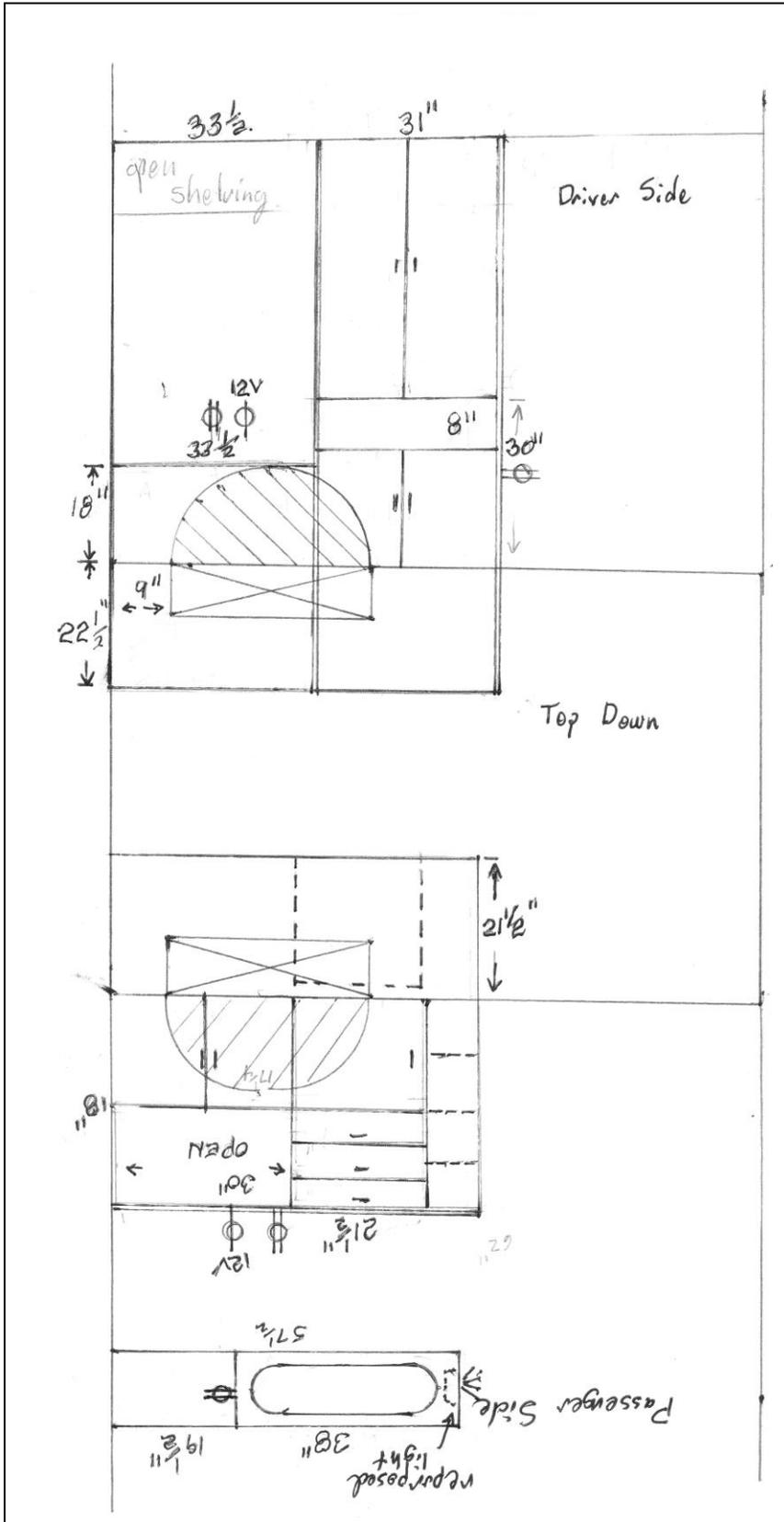
- One 3/4 " 4x8 sheet of birch plywood for the laminated surfaces
- One 3/4" 4x8 sheet of prefinished cabinet grade plywood
- Five sheets 1/2" 4x8 sheets of prefinished cabinet grade plywood
- Three sheets 1/8" 4x8 sheets of poplar for the ceiling
- Four 12' 1"x4" pine ripped to 1"x2"
- 80 CLD Tiles
- 30 1.5" 2'x2' Melamine Closed Foam Insulation
- 30 3/4" 2'x2' Melamine Closed Foam Insulation
- 110 Square Feet of Mass Loaded Vinyl (MLV)
- 5'x30' roll of Thinsulate
- Two cans 3M 90 Spray adhesive
- 100 sets of 1" and 1.5" bolts, washers, lock washers, nuts, acorn nuts
- Four sets of 75lb drawer slides
- Fourteen sets of cabinet hinges
- Twelve drawer/cabinet pulls
- Seven sets of door fasteners to hold the cabinet doors closed

Linda cooks on the induction burner.



This is a picture of the image picked up by the rear view camera as projected in the rear view mirror.

We made a screen door by purchasing a 60" wide door with magnets in the opening. It is fastened to the outside of the van with magnets sewn into the screen with seam binding. \$35 for the screen.



This is the first step I followed laying out the van. Center section is top down and then I drew the side elevations, similar to home design. All dimensions take into account that there are $\frac{1}{2}$ " walls and $\frac{3}{4}$ " shelves. If you use different thickness wood and want to dado the shelves, you need to remember to add $\frac{1}{4}$ " to the edge of the shelf in the dado.

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Here is the 3D view. The small shelf above the electrical cabinet is not shown nor the dimensions of the drawers. This is a view of the main cabinet components along with the dimensions. We decided to anchor the shelf through the faceplate thus making the screws the shearing point rather than have the screws potentially pull out from the bottom as illustrated.

