Our "Los Gatos Casita" Spring 2023 Trip

In 2021 we decided to purchase a **2023 Casita Travel Trailer** as backpack, canoe and kayak camping trips requiring us to sleep in a tent on the ground or in hammocks hung from trees was getting less fun. We selected the **Casita Liberty Deluxe** model which, like the Independence model, is specifically designed for couples with a king size sleeping area. A Casita travel trailer must be picked up in Rice Texas (i.e., Casita only does factory direct sales and has no dealerships) and they have a long lead order time before pickup as demand for them is very high as they are reasonably priced, last forever and can easily be resold for significantly more than their purchase price. In addition to Munich Germany, Austin Texas was also Gayle's home town. So an opportunity to visit Texas was not viewed as an inconvenience to us. Upon returning to our remote southern Oregon homestead, Gayle named our Casita travel trailer "Los Gatos Casita" as a tribute to our wonderful cats who traveled with us. We prefer "animals" over most humans…

Casita travel trailers, which are a direct descendant from the innovative and original 1968 **Canadian Boler Fiberglass Travel Trailer**, are constructed of marine grade fiberglass (a single layer shell design that doesn't trap moisture in a cavity which then shortens the lifetime of most other RVs), have a strong steel frame (unlike an aluminum frame having a cyclic fatigue failure limited life and subject to galvanic and salted road corrosion failure), are aerodynamic, lightweight (2,480 pound empty weight and 365 pound tongue weight that reduces to 270 pounds when our weight distribution hitch is used) and small (17 feet long) making them a dream to tow and do real camping in beautiful locations that many larger RVs cannot. And Casita travel trailers also have all the functionality that one desires for very comfortable camping: Air Conditioning; Bathroom with sink, shower and toilet; Ceiling Fan, Furnace (optional and recommended); Tank Hot Water Heater (6 gallons); Kitchen with large microwave oven (optional and NOT recommended), refrigerator (3 cubic feet), sink and stove; 30A 120VAC Shore Power (which we upgraded to 50A 120/240VAC) and Shore Potable Water Hookup; Sleeping Area (King, Full or Double Single Berth sleeping configurations as desired) and Holding Tanks for Potable (25 gallons), Gray (32 gallons) and Black (15 gallons) water. So Casita Travel Trailer has created the perfect travel trailer for loving couples who enjoy closeness and has been doing so since 1981.

To tow our Casita travel trailer, we purchased a **2023 Honda Ridgeline** truck. The Ridgeline's high reliability, high MPG and associated long distance towing range, and modern unibody-based design with fully independent suspension system (which then enables having a large payload volume capacity and provides an unsurpassed comfortable/smooth ride for both passengers and trailer) made the Ridgeline the clear 1/2 ton truck tow vehicle winner for our Casita travel trailer long duration, remote area towing missions. We also like that the Ridgeline has a clean and classy look free of any dodgy company sheep horn rebranding or other flashy decals/emblems and such that are all too often used to create market hype to target the increasingly gullible, low intelligence and low self-esteem population that need to frequent social media for some deranged sense of self-worth and are thereby easily manipulated. The only significant limitation of the Ridgeline over the other 1/2 ton truck tow vehicle competition is the Ridgeline's low 7.6 inches of ground clearance which limits its off-road capability. However, we find ATV/UTVs are far better suited for real off-road adventures than any available or modified off-road truck. And truly, going on foot is by far the best way if you are physically able to do so. Furthermore, the Ridgeline's 7.6 inches of ground clearance and auto floor lowering seats provides an advantage in that it enables one to easily enter or depart the cab without needing an additional step or a ladder…especially valued by those of us with worn out joints from having actually lived an adventurous, meaningful and memorable full life.

We selected and installed a **REDARC Tow-Pro Liberty Electric Brake Controller** in our Ridgeline. To further enhance our towing performance and safety, we selected and acquired an **Andersen Weight Distribution Hitch (WDH)** and had Casita install it upon our arrival in Rice Texas. The Andersen WDH helps ensure towing stability and enables shifting the weight from the tow vehicle rear axle to the tow vehicle front axle and to the Casita trailer axle while also reducing the Casita trailer tongue weight. Restoring a tow vehicle's front axle load becomes increasingly important when road/weather conditions degrade because of rain, snow or ice in order to retain good tow vehicle handling and retain a solid tow vehicle foundation to deal with a sway situation. The Andersen WDH also retains the comfortable/smooth ride provided by the Ridgeline while towing which significantly reduces wear and tear on both our Casita trailer and Ridgeline. In addition, the Andersen WDH provides self-adjusting anti-sway control negating the need for a separate anti-sway bar. And unlike other WDHs, the Andersen WHD does NOT need to be removed in order to back up the trailer.

Experts agree that WDHs work very well and work even better on modern unibody-based design tow vehicles because a unibody structure is extremely strong and rigid. There is no significant frame flex on unibody-based design tow vehicles as is the case with older frame-based design tow vehicles. Frame flex may use up a significant portion of the WDH effort before the WDH can even begin to restore the load on the tow vehicle front axle.

It is often argued that a WDH isn't needed to tow a Casita trailer if it is hooked to a 3/4 or 1 ton tow vehicle. And this is indeed true because the front axle load of these behemoth tow vehicles is already so large that the relatively light tongue weight of the Casita trailer has no significant effect on their large front axle load. But if you only need to tow a Casita trailer, you don't need anything larger than a 1/2 ton tow vehicle and you likely also don't want the higher acquisition and operational costs associated with having a behemoth 3/4 or 1 ton tow vehicle monstrosity that also struggles just to get out of its own way and find a place it can be parked.

Interestingly, a fully loaded 1/2 ton tow vehicle and trailer with a WDH hitch can be made more stable than any size fully loaded tow vehicle by itself. This is because any size fully loaded tow vehicle will experience understeer from the lighter front axle load that can't be corrected. This understeer can be easily corrected on the tow vehicle/trailer combination with a WDH.

We developed an Andersen WDH calculator and a Casita Weight & Balance calculator to enable accurate and easy determination of all the critical towing parameters to help facilitate a safe towing setup:

Andersen Weight Distribution Hitch Calculator

Casita Travel Trailer Weight & Balance Calculator

When we selected/ordered our **Casita Liberty Deluxe** and locked down our 1 March 2023 pickup date in Rice Texas, we decided to make a 3-4 month trip of it and visit some of the favorite places of our wild and wasted youth along with some new places that one or both of us had never been to before. Our trip began on 21 February and we safely returned to our remote southern Oregon homestead on 2 June 2023. We covered 12,630 miles total (we put about 10,000 miles on our Casita travel trailer), visited 24 States and had a truly wonderful time. Both our 2023 Casita and our 2023 Honda Ridgeline performed great with an average of 20.8 MPG for this 12,630 mile trip. Subsequent to this trip, we added rails and an aerodynamic device to the Ridgeline Leer canopy that increased our average towing performance to 21-22 MPG. It is aerodynamic drag that largely and continuously reduces MPG while towing. Trailer weight only reduces MPG when accelerating to your steady state towing speed or when going uphill.

Annotated photos of all the campgrounds and the places we visited on this Casita pickup trip follow. Following these Casita pickup trip photos, you will find a bookmarked bullet list summary of our many Casita refinements (those already completed and those being planned/provisioned for the future), refinement photos, refinement detailed descriptions, our rationale for doing these refinements and our rationale for the specific way we elected to accomplish these refinements. Please feel free to contact us at our engineering/construction company website should you be interested in anything herein or perhaps have additional questions, etc.:

Borst Engineering & Construction LLC - Contact Us

Enjoy and Happy Trails!
Gayle & Bob Borst

Live everyday like it is your first!

(And don't allow anything or anyone prevent you from doing otherwise...)

Departed Our Remote Southern Oregon Homestead on a Snowy 21 February 2023!


RZR
900

Waiting for SR58 to Open on Tehachapi Pass from Historic Blizzard Conditions, Tehachapi California

Finally Escaped the Blizzard Conditions, Kingsman & Winslow Arizona

The Blue Hole, Santa Rosa New Mexico
(Reliving Memories of Bob's College SCUBA & Sky Diving Years…)

Our Casita Travel Trailer Pickup on 1 March 2023, Rice Texas

Our First Night in our Casita, American RV Park, Corsicana Texas

Basin RV Resort, Bastrop Texas


SWIM AT YOUR
OWN RISK
No Life Guard
ON DUTY


SOUTHSIDE
MARKET
BARBECUE
SOUTHSIDE
MARKET
BARBECUE
HOT
SAUCE

McKinney Falls SP, Austin Texas

Matt's El Rancho Restaurant in Austin Texas
(Gayle's Favorite Tex Mex Place and Childhood Waiter Mo!)

South Padre Island KOA, South Padre Island Texas
(Our SpaceX Affiliate)


NO SMOKING
IN THIS AREA
Make a live
song request


D2
STOP


GROVE
Private Property

Rockport KOA, Rockport Texas
(Gayle's Dad's Final Resting Place at The Big Tree)


BIG TREE
GOOSE ISLAND STATE PARK


Keep It Growing
You can help Goose Island State Park staff keep the Big Tree healthy and growing.
The Big Tree
— by Mary Hockstra
I have gathered sun and rain to grow green leaves
Swaying softly in spring, rustling like applause in fall.
My limbs have shaded generations;
My roots have reached for centuries;
My children and their children's children surround me,
Here in this peaceful part of my land.
Golden sunlight diamonds have glinted on the ground around me
Cold fingers of ice have touched my hardwood.
Dust-dry days of sandstorms have scoured my skin
Torrents of rain, driven by gales have rushed at me,
And I have swayed, but stayed unbroken.
Silver moonlight has kept me company many a night.
Yet through all the seasons, sorrows, bitterness and beauty
All of the history I have withstood and witnessed,
There has been one thing I could not do.
I could not grow green dollars, or silver or gold.
Will you help me, standing here before me?
Then we may both grow old together,
As old friends should.
One of flesh, one of wood.
Respect the Fence
The Big Tree has survived for hundreds of years! You can help park staff keep it healthy by staying on this side of the fence. Walking near the Big Tree compacts the roots and makes it hard for the tree to get water, so please take your pictures with other trees nearby.
Help Us Help the Big Tree
Goose Island State Park staff and volunteers work very hard to keep the Big Tree healthy for you to enjoy. Park staff fertilize, trim branches, water, pull weeds and maintain the fence. If you'd like to help support these efforts, feel free to put a donation in an envelope into the "iron ranger" on the right of this sign.

Beyonder RV, Sulphur Louisiana


SEAFOOD

All About Relaxing RV Park, Theodore Alabama

Sun Outdoors, Orange Beach Alabama
(Reliving Memories of Bob's College Spring Break Years…)

Steinhatchee River Club, Steinhatchee Florida

Sun Retreats Homosassa River, Homosassa Springs Florida
(Swimming with the Mantees)

Long Key SP, Long Key Florida

Boyd's Campground, Key West Florida
(Reliving Memories of Bob's College Spring Break Years…)


Casita


AIRBORNE
POW-MIA
SPECIAL FORCES
SEABEES
SLOPPY JOE'S
KEY WEST


PAPA'S WALL
LIFE


BARRACUDA
World Famous
BOYD'S FISH CAMP
KEY WEST
EST. 1963


90 Miles to
CUBA
SOUTHERNMOST
POINT
CONTINENTAL
U.S.A.
KEY WEST, FL


KEY WEST

Larry & Penny Thompson SP, Miami Florida

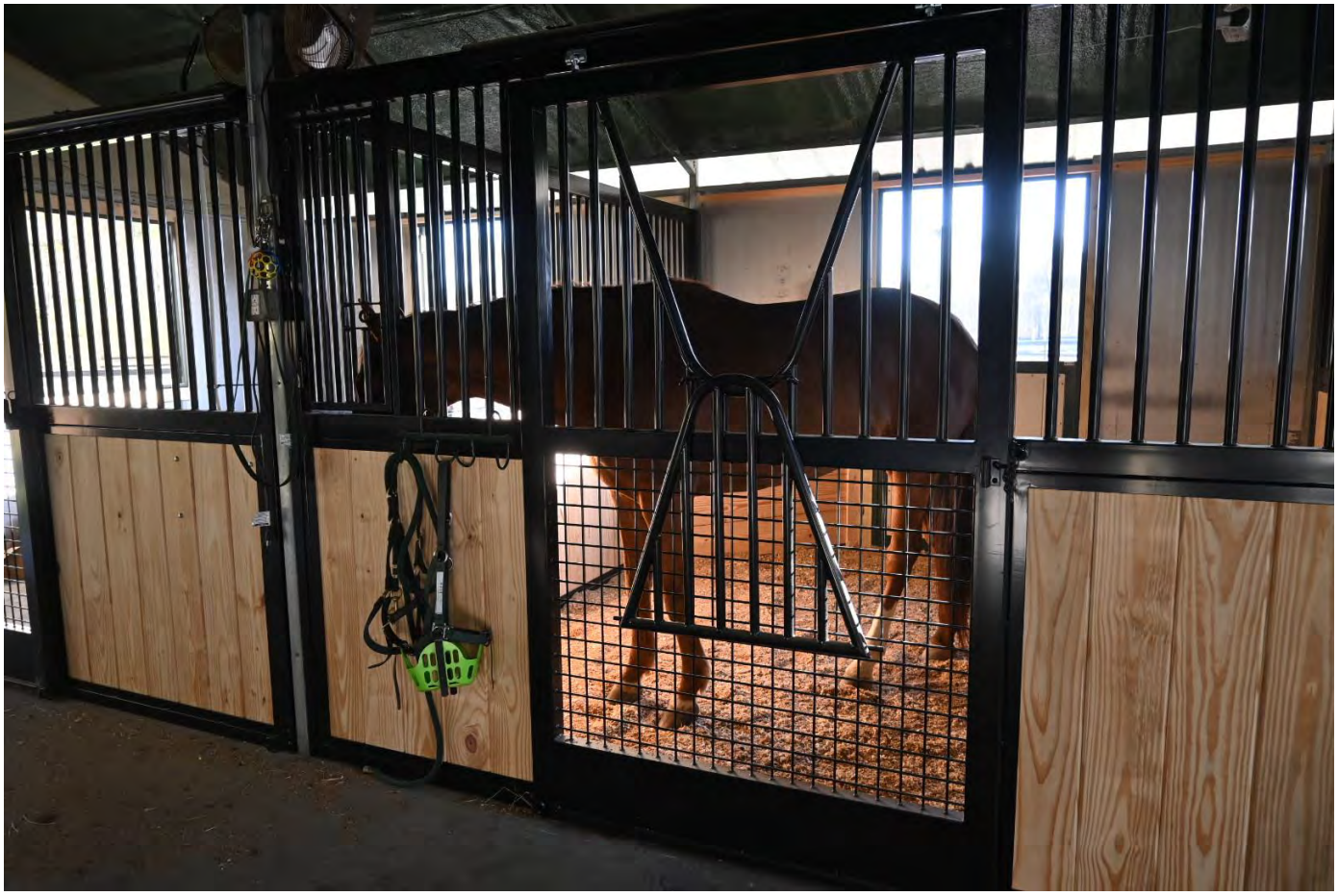

Pod 8

SpaceX Falcon 9 Launch from Cape Carnival Florida
(Our SpaceX Affiliate)

North Beach Camp Resort, Saint Augustine Florida

Myrtle Beach SP, Myrtle Beach South Carolina

Gayle's Childhood Friend Heidi's Home and Heidi's Mom, Gloucester Virginia




5472
WELCOME

Gayle's Brother's Home, Durham/Rayleigh North Carolina


Casita
07143

Mash Fork SP, Camp Creek West Virginia

Four Guys Campground near Red River Gorge, Slade Kentucky


TEXAS

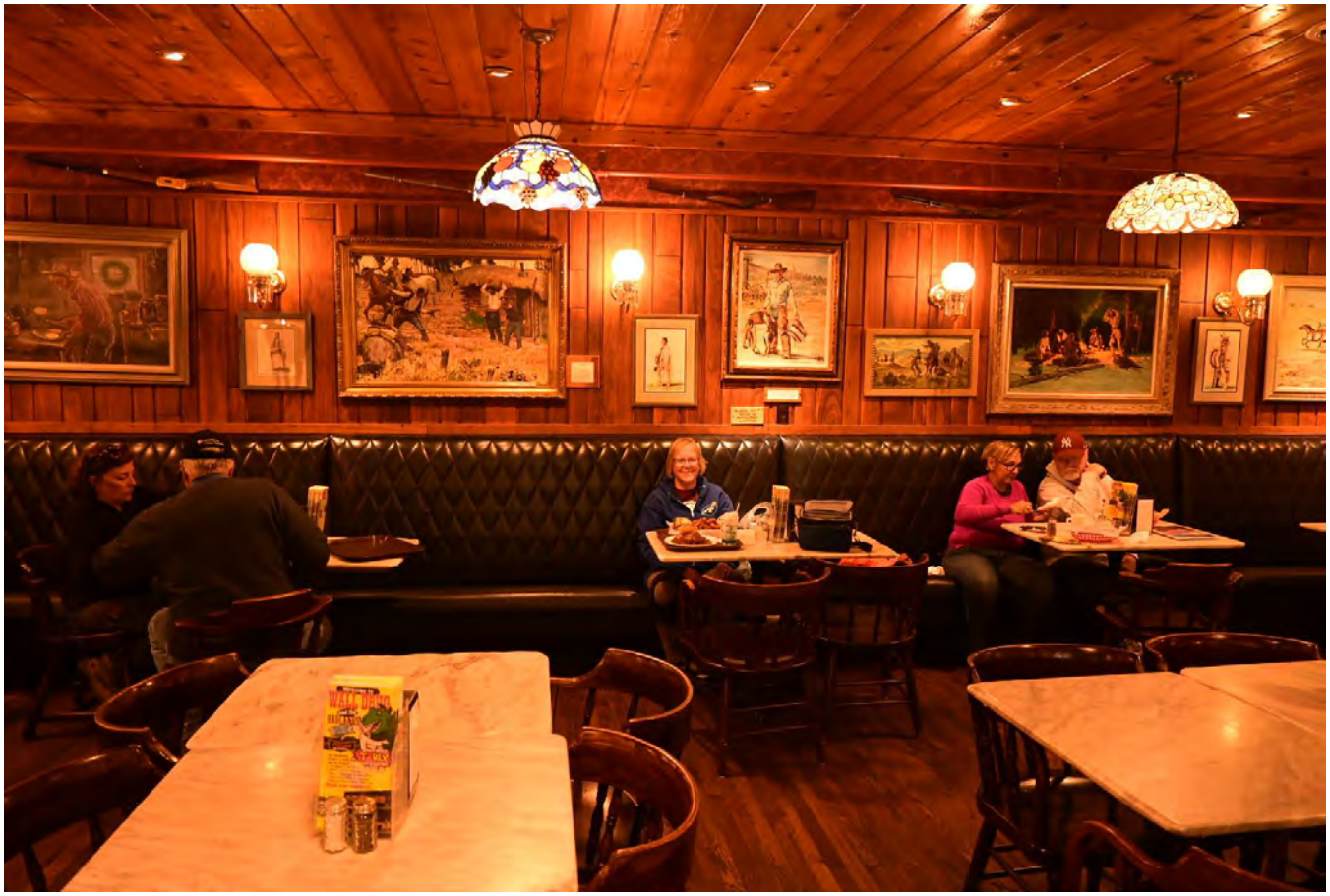
D & W Lake Campground, Champaign Illinois

Wilder City Campground, Allison Iowa

Big Sioux SP, Brandon South Dakota

Snake Creek SP located on Missouri River, Platte South Dakota

Wall Drug Store, Wall South Dakota



Cedar Pass Campground in Badlands NP, Interior South Dakota

Big Pine Campground, Custer South Dakota


TUNNEL CLEARANCES
AHEAD
Width: 8 ft - 0 in
Height: 9 ft - 9 in
SOUTH
87


Needles Eye
Tunnel


One Mile of Hell Bar
SOUTHERN COMFORT
Orinion
CAMP CREEK

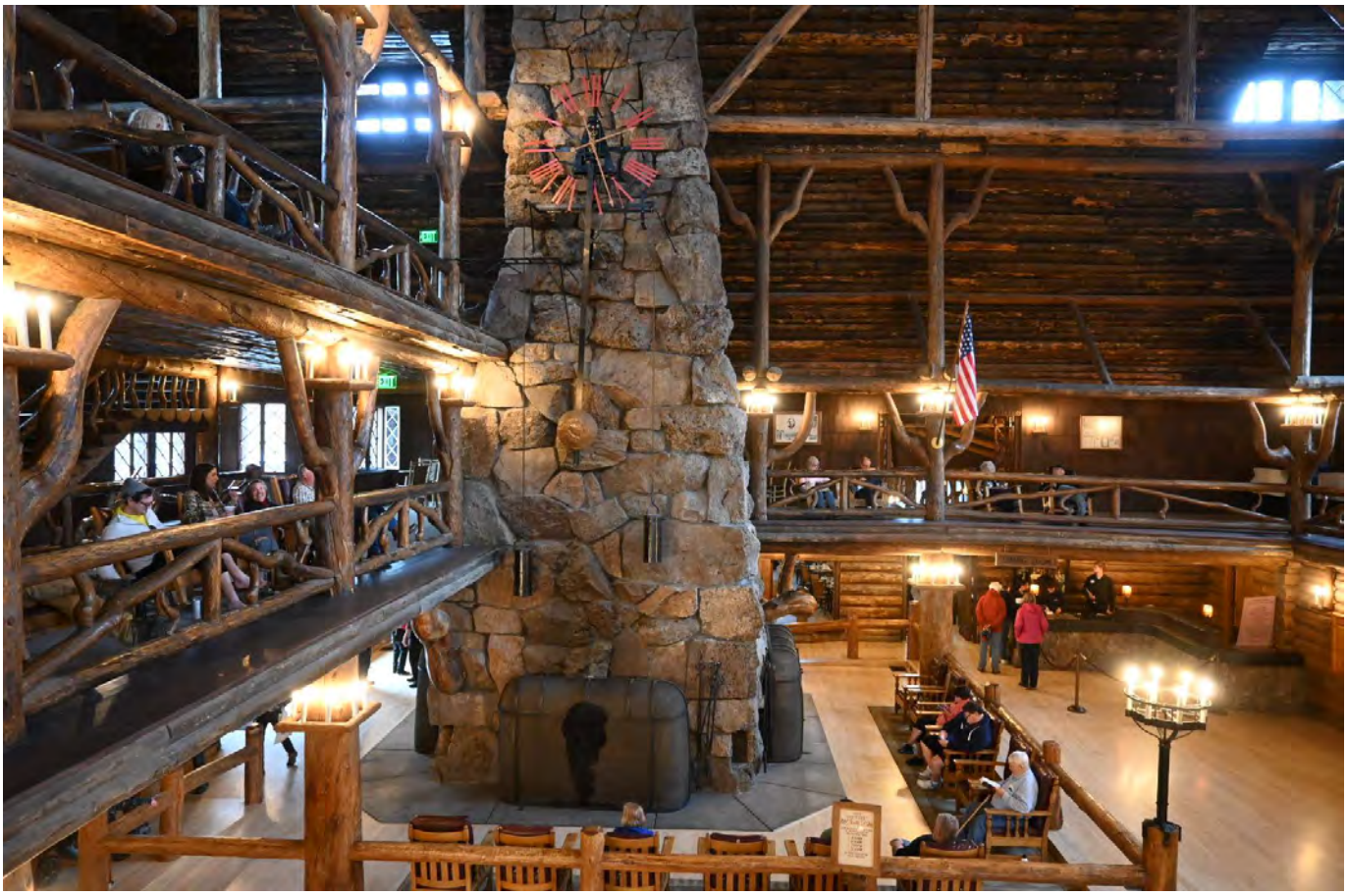
Big Horn National Forest, Cody Wyoming


Casita
1-800-442-9985

Madison Campground, Yellowstone & Grand Teton NPs, 5 – 22 May 2023


OLD FAITHFUL
GEYSER


OLD FAITHFUL INN




Casita

A hotel and fine dining night in Jackson Hole Wyoming!

A visit to see our friend Veterinarian Bryan Umstead and Bob's 2006 MX5 Miata in Dubois Wyoming.

Back in Yellowstone…and our Casita was still there!

Indian Hot Springs, American Falls Idaho


INDIAN SPRINGS


5 FT
INDIAN SPRINGS


BOYD
CAMPGROUND

Crane Hot Springs, Burns Oregon


CCHS
Prowler

A lunch stop at Beckie's near Crater Lake NP about 70 minutes from home!
(Photos of this year's Crater Lake snowpack taken by our favorite house sitter.)

Returned Safely to Our Remote Southern Oregon Homestead on a Sunny 2 June 2023!

Casita Refinements (Completed & Planned/Provisioned for the Future)

While our Casita OEM trailer is certainly quite capable “as is”, although we did find a couple serious defects requiring remedy, it also provides a good starting point for people who have the knowledge and competence to create a customized trailer that meets ALL of their unique specific needs and personal desires. Our Casita travel trailer purchase and our refinements were specifically chosen to enable us to travel economically, far, fast and then comfortably and securely camp in very beautiful and very remote locations far away from people indefinitely.

Our Casita trailer refinements are presented more or less in the order that we actually accomplished them...from our easy refinements either accomplished while on this trip…to our more challenging refinements requiring a workshop or a larger time commitment to properly accomplish.

A bookmarked bullet list summary of our many Casita refinements, refinement photos, refinement detailed descriptions, our rationale for doing these refinements and our rationale for the specific way we elected to accomplish these refinements follow:

Applied knowledge & accomplishment over ignorance & incompetence!

Electronic Monitoring Devices

We use an affordable **DoHonest V35 True Wireless Backup Camera** system that we feel far outperforms the much more expensive Furrion or TadiBrothers systems often touted about on social media. We also added **RV Whisper** and **TRAK4** electronic monitoring systems.

The DoHonest V35 True Wireless Backup Camera system is totally wireless and this HD day/night vision camera has a solar panel making it fully mobile which enables it to be used for BOTH backing up our Casita trailer and for remote surveillance monitoring our camp area surroundings from within our Casita trailer during daytime and nighttime. We use our mirrors, our DoHonest V35 True Wireless Backup Camera system, and one of us outside to further confirm that all is well using Motorola FRS two-way radios to communicate so as to not have to shout at each other. The camera mostly helps with setting the initial starting point for the backup maneuver and then provides some additional assurance and guidance during the backup maneuver. We only use the standard mirrors on our 2023 Honda Ridgeline truck which perform adequately with our truck and our Casita travel trailer. However, we also carry extended mirrors with us that can be easily/quickly strapped on should an actual or legal need dictate using them.

The RV Whisper system enables real time Internet alerting/monitoring of our Casita 120VAC shore power status, 12VDC battery power status, Air Conditioning System status via **MicroAir EasyStart**, battery compartment access hatch status, entry door status, interior humidity status, interior temperature status, motion detection status, propane tank status via **Mopeka Pro** propane tank sensors and water leak detection status.

The TRAK4 system enables real time Internet GPS location tracking of our Casita via a month-by-month subscription plan. All these systems provide an additional level of comfort/security given that our cats are sometimes left in our Casita when we are out and about at places where we can't take them or can't leave them in our tow vehicle. This is the "Los Gatos Casita" after all!

Borst RV

Connected to: Borst Engineering

Oct 27, 2023 8:21am PDT

RV Indoor Temp

33°F

61% humidity

Updated: Oct 27, 2023 8:19am

Updated: Oct 27, 2023 8:17am

Driver Side LPG Tank

100%

11 Inches of LPG

99% Sensor Battery

Updated: Oct 27, 2023 8:19am

Passenger Side LPG Tank

37%

4.7 Inches of LPG

99% Sensor Battery

Updated: Oct 27, 2023 8:19am

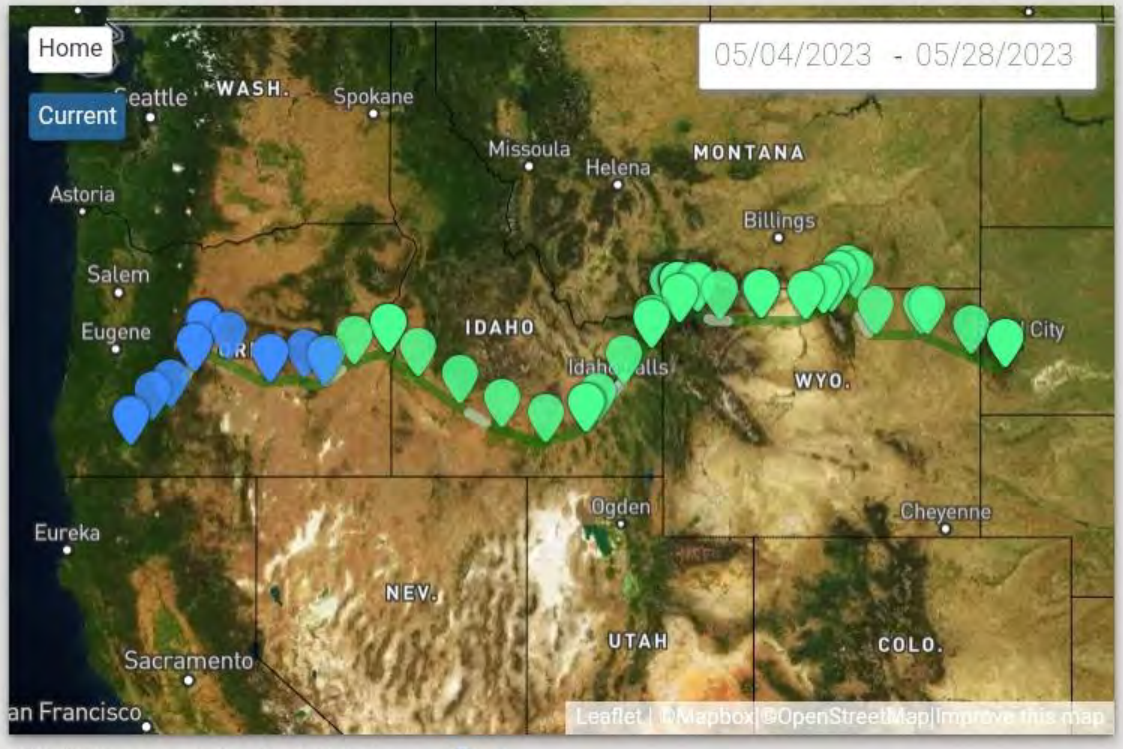
Version: 4.728, RV Name: Borst RV, Current time: Oct 27, 2023 8:21am PDT

SN: RVM3-0061

Model No.: RVM3

TRAK4

Devices > Borst RV



110 GPS reports loaded, 77 shown ? +

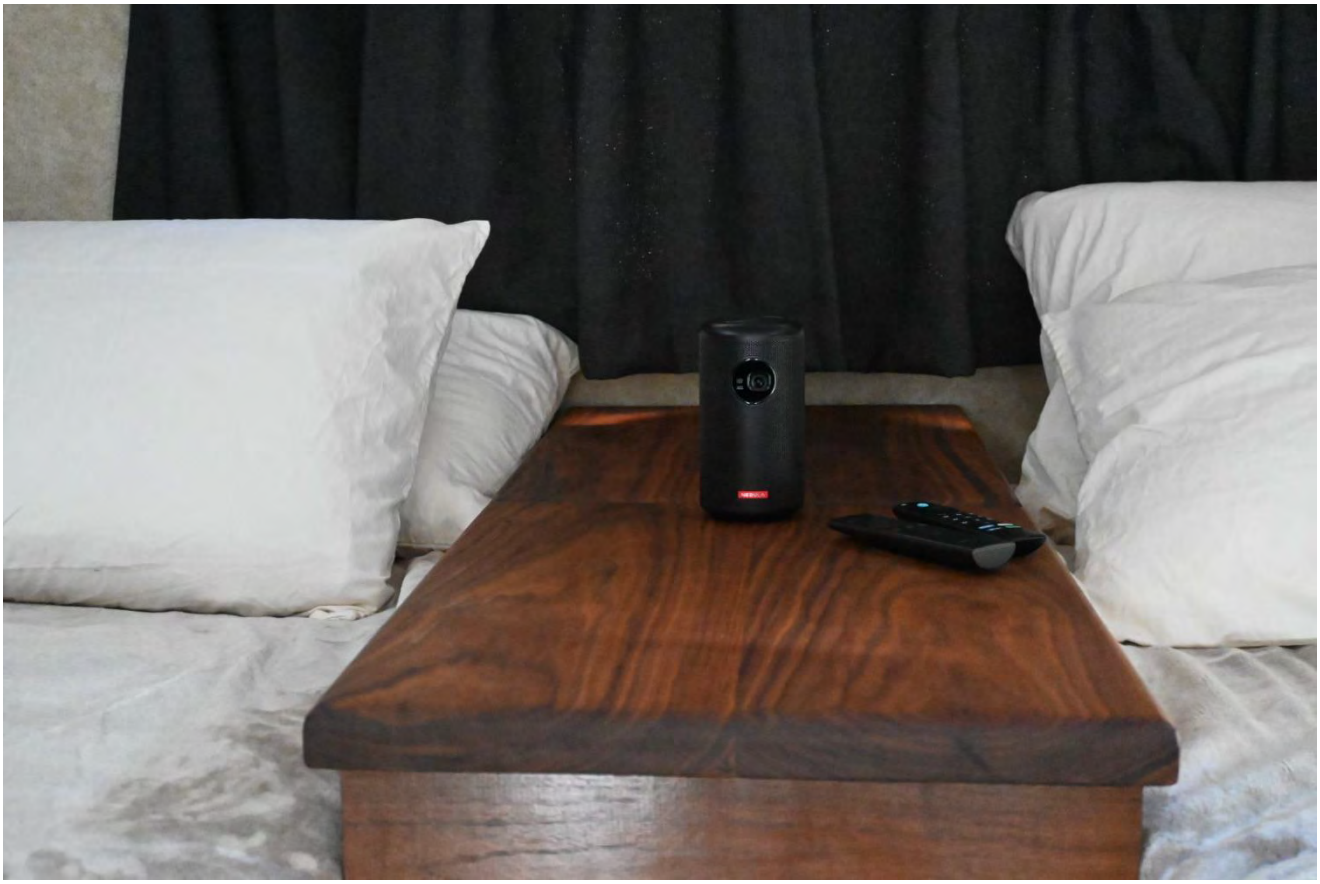
Last Report: 5/26/2023 2:23 PM PDT

Entertainment and Internet

We added a **Bolt-on Rear Bumper Hitch Receiver** which is lightweight, low cost, non-invasive (i.e., doesn't require bolting or welding a heavy rear hitch structure/receiver to the trailer frame) and is rated for 150 pounds of load. 150 pounds is also the maximum recommended weight to place on the rear of a Casita trailer to avoid creating a sway issue and potential accident.

We added a **Hitch Mount Flag Pole Holder** to enable using a 20 feet **Telescoping Flag Pole** and **Adapter Bushing** to create a satellite dish mast for our **Starlink Roam System** from our **SpaceX Affiliate**. This arrangement smartly places the entire weight of the satellite dish and the telescoping flag pole on the ground instead of some other weaker problematic arrangement that requires fastening it to the trailer structure. Starlink Roam provides High Speed Internet via a month-by-month subscription plan for making video phone calls, surfing the Internet, downloading our digital books onto our **Amazon Kindle Paperwhites** (which negates the need for any reading lights or storing paper books) and 4K streaming our desired HD programming that is then projected via a light-weight, portable, tiny soda-can sized HD **Nebula Capsule Projector** onto a light-weight and portable 40 inch **Tecdigbo Projector Screen** that can be easily hung when desired from two 6mm bolt/eye nuts installed in the existing roof upper cabinet fastener penetrations. With today's projector and Internet capability, there's absolutely no need to hang bulky TVs or use TV cable/satellite systems anymore...in RVs or in homes. This Bluetooth technology projector is also used as our Casita music sound system.

The Starlink Roam System Wi-Fi router and satellite dish power module were placed in our Casita driver side bench seat storage area and can be powered from either an added 120VAC 20A electrical receptacle outlet which can use shore power, an added Inverter or an added 12VDC 30A SAE power port (please see below for more details on these refinements). The Starlink Roam satellite dish cable is routed out our Casita OEM exterior access hatch in a similar fashion as the shore power cord. This access hatch is also conveniently used as an exhaust fan ventilation path for our custom "cat bathroom" which is located within a custom storage cabinet in our custom mattress sleeping area (please see below for more details on these refinements). So we will never replace this exterior access hatch with a solid panel for using a detachable shore power cord that we would then also have to find an as convenient place to store it.




Baltimore
9:38 PM ET
CORONAVIRUS PANDEMIC
LIVE
MILLIONS OF AMERICANS TRAVELING DESPITE CDC WARNINGS
CNN

Generator Purchase, Propane Conversion & Propane System Expansion

We purchased a **Honda EU2200i** generator and modified it to operate on propane using a **Hutch Mountain Conversion Kit**. These convenient, light-weight, quiet and reliable propane generators are very popular within the RV community. A couple of these generators could easily fit in our Ridgeline trunk space below the primary truck bed…so zero need for any additional ugly exterior Casita storage cabinets or shelves. Operating with propane eliminates any need or hassle of having to take along gasoline on camping trips or having the obnoxious smell of a gasoline powered generator in your camping area. Gasoline goes bad over time and can gum up the engine fuel system making it inoperable until repaired. Propane can be stored indefinitely and will never gum up the engine fuel system. And unless you also have a gasoline furnace, hot water heater, refrigerator and stove, you will still always need and use propane when camping anyhow.

We added two **MB Sturgis Sturgi-Stays** to our Casita OEM 20 pound propane tanks to provide maximum BTU/H capability using high pressure propane directly from the tanks. The advantage of using high pressure propane directly from the tanks instead of using low pressure propane from the downstream side of our Casita OEM propane regulator is that you are not limited to the relatively low BTU/H capability of the regulator. Using high pressure propane enables us to simultaneously operate all of our Casita OEM propane appliances (i.e., furnace, hot water heater, refrigerator and stove) and all of our current propane accessories which include this generator, **Camp Chief Explorer Stove** and **Camco Campfire** plus any additional propane devices that we may add in the future without being BTU/H capability limited. When shore power isn't available, operating our generator enables charging our Casita 12VDC battery and using our 120VAC appliances. When dry camping and before having our added **Renogy 3000 Watt Pure Sine Wave Inverter** and **Renogy Solar Foldable Solar Suitcase** (please see below for more details on these refinements), we would typically run our generator for a couple hours to fully charge our battery while having breakfast to enable using our breakfast 120VAC electric appliances such as our **Small Microwave Oven**, **Mini Toaster Oven**, **Nespresso Aeroccino** and **Gooseneck Electric Kettle** for V60 coffee pour overs or hot tea. Now that we have an Inverter and solar panels (please see below for more details on these refinements), we can operate all these appliances and our **Shark HV302 Rocket Pet Corded Stick Vacuum** without needing to use our generator when dry camping.

This **Honda EU2200i** generator has a floating neutral and ground like most portable generators. Since our Casita OEM Power Center is wired as a sub panel (i.e., per electrical code, a sub panel MUST NOT have the neutral and ground bonded together), our Casita OEM Power Center fully expects to receive power from a source that is wired as a main panel (i.e., per electrical code, a main panel MUST have the neutral and ground bonded together) as is the case when our Casita OEM Power Center receives shore power from a campground main panel hookup. As such, a **Generator Bonding Plug**, which bonds the neutral and ground together, should always be used with the **Honda EU2200i** generator so the Casita Ground Fault Circuit Interrupter (GFCI) system works properly to prevent electrical shock and your **Surge Protector** tests correctly and works properly. And NO, you should NEVER use a grounding rod on a generator that has a bonded neutral/ground that is supplying power to a single RV...and it is illegal to use ground rods in campgrounds too. "No Shock Zone RV Electrical Safety" by Michael Sokol is a great source of reliable information on this specific subject. Unfortunately, there is lots of bad advice on this subject on social media as is often the case as the brightest and best don't often frequent social media and such. And speaking of generators, you may also find our remote southern Oregon homestead self-constructed generator interesting too:

Lister Engine Generator

It should be noted that getting enough battery power to operate the Casita Air Conditioning System for an adequate amount of time isn't currently feasible or practical given the small size of the Casita (please see our Solar Panels refinement section for detailed explanation). So, shore power or a generator is required to operate the Casita Air Conditioning System.

Entry Closet Organization

We added a fully configurable, light-weight, low cost and strong **Closet Hanging Organizer** with five removable and light-weight 12 inches long x 9 inches wide x 6-1/2 inches deep **Plastic Bins** to the entry area closet which creates 3,510 cubic inches or about 2 cubic feet of storage which is more than adequate for our light-weight, small clothes items. We also have 10 strong stainless steel clothes hangers for our clothes items that need to be hung.

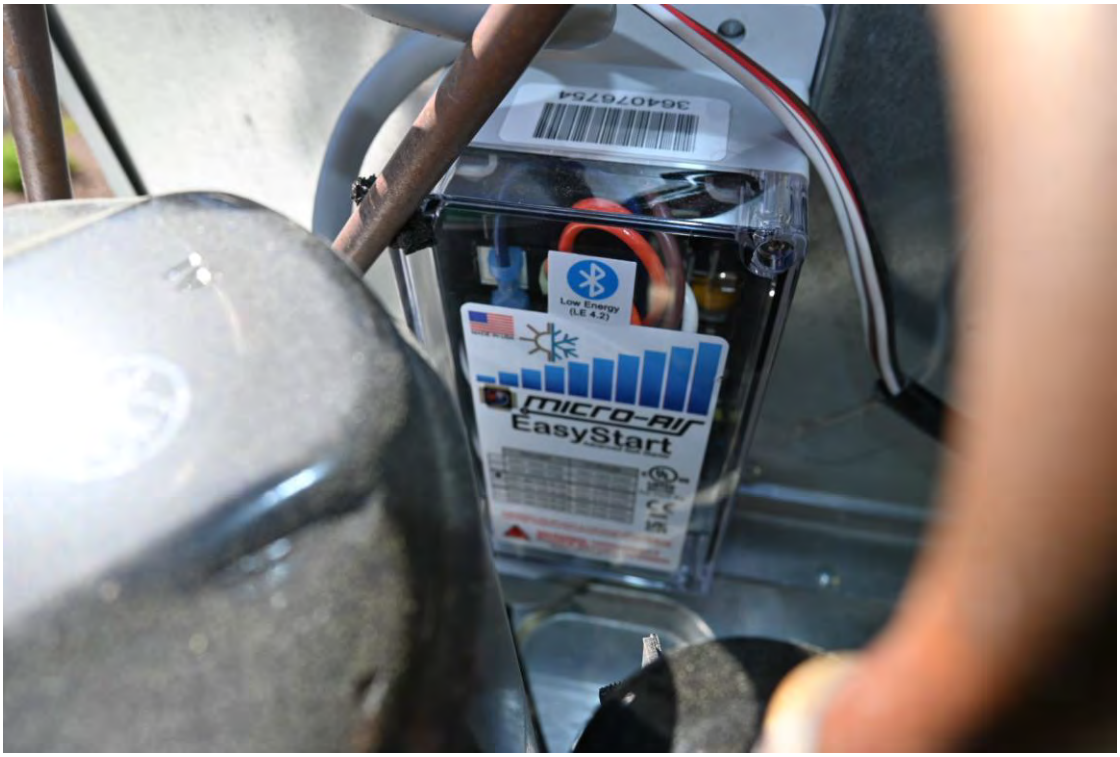
Given that the entry closet is the most forward storage area in the Casita, it is the worst storage area because any weight stored here quickly increases the trailer tongue weight (please see our **Casita Travel Trailer Weight & Balance Calculator** for understanding and accurately quantifying this). So as much as we would love to have fine handmade black walnut shelving, this entry closet is not a good location to add heavy wood shelving or store heavy items, so we only use this closet for storing our light-weight, small clothes items, broom and **Shark HV302 Rocket Pet Corded Stick Vacuum.**

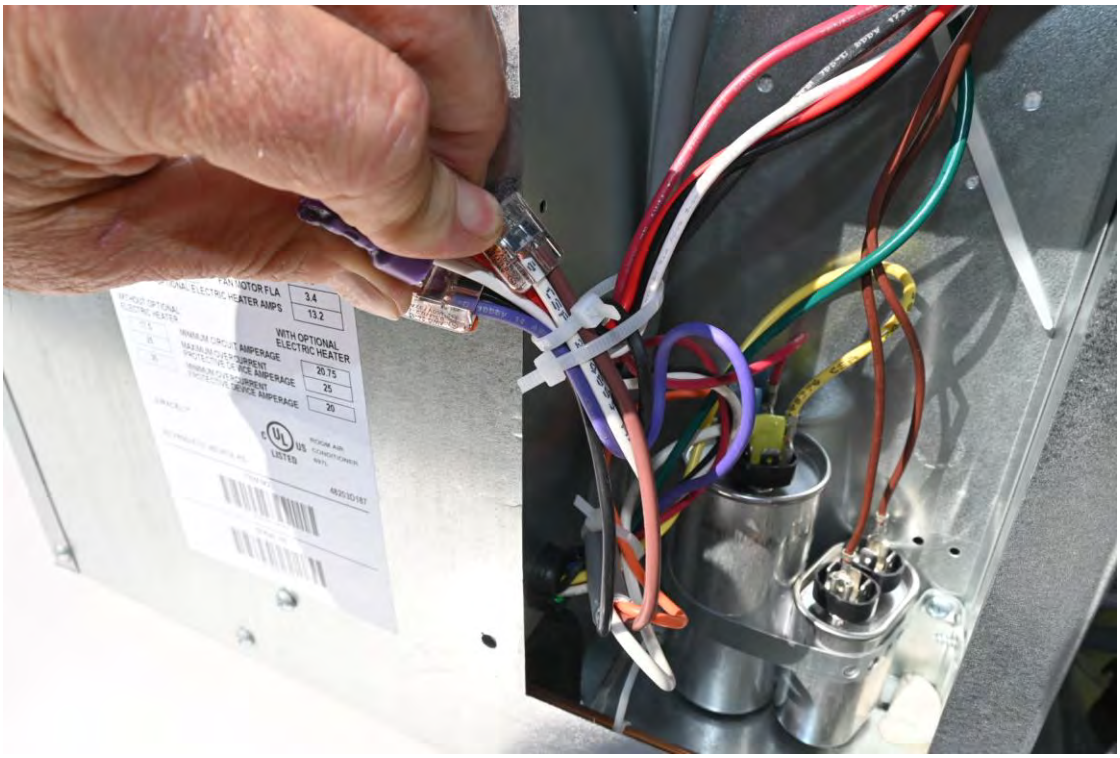
This 120VAC corded Shark vacuum only uses 500 Watts which enables it to be used when dry camping via our added **Renogy 100AH LiFePO4 Deep Cycle Self-Heating Battery** and our added **Renogy 3000 Watt Pure Sine Wave Inverter** (please see below for more details on these refinements). This 120VAC corded Shark vacuum also performs far better than the much more expensive cordless Dyson Stick vacuums and also eliminates needing a separate battery and battery charger.

The large 14.5 cubic feet of heavy storage space created by our custom storage cabinet in our custom mattress sleeping area (please see below for more details on this refinement) and the huge and easily accessible payload volume of our Honda Ridgeline tow vehicle negates any need to store items in our Casita trailer bench seat storage areas or any need to add additional ugly exterior storage cabinets or shelves.

Air Conditioning System Reduced Startup Power Modification

We added a **MicroAir EasyStart** to our Casita Air Conditioning System unit to enable operating our Casita Air Conditioning System using our small **Honda EU2200i** propane modified generator when shore power isn't available. EasyStart is a Bluetooth microprocessor device that minimizes and monitors the Casita Air Conditioning System starting amperage far better than a passive starting capacitor and which also interfaces with our **RV Whisper** system. It should be noted that getting enough battery power to operate the Casita Air Conditioning System for an adequate amount of time isn't currently feasible or practical given the small size of the Casita (please see our Solar Panels refinement section for detailed explanation). So, shore power or a generator is required to operate the Casita Air Conditioning System.





Casita Decal Removal & Custom “Los Gatos Casita” Artwork

We removed all our Casita advertising decals before the sun could permanently bake their images into the Casita fiberglass gelcoat and eventually result in them cracking and peeling off. We also think this is a much cleaner and classier look similar to our Honda Ridgeline tow vehicle. Furthermore, it is much easy to clean and protect the exterior fiberglass shell without having these decals. Since new Casita decals are always available from Casita, any future owner of our Casita could always put them back on if desired.

Being long time sailors, we use **Bow to Stern Protectant (BTS)** to protect the exterior of our Casita trailer. BTS goes on and comes off very easily. BTS can be applied to fiberglass gel-coat, metal, plastics, and metal. Designed for the harsh marine sailing environment, BTS has outstanding UV protection and can be applied in direct sunlight. BTS creates a durable finish that guards against stains including mildew and mold. BTS provides a water repellant shield that fights corrosion. Unlike wax, BTS continues to protect even after many repeated washings.

We also added black **Crebri Wall Shield** protectors to keep the spare tire from scratching our Casita gelcoat and we replaced our Casita OEM spare tire cover (Camco model 45345) with a high quality spare tire cover from **Custom Tire Covers** using “Los Gatos Casita” artwork created by our very talented daughter-in-law Sydney. Should you desire to have artwork created for some similar application, Sydney frequently takes on commissions and we would be very happy to put you in touch with her if requested. This is the “Los Gatos Casita” after all!


69W
Los Gatos Casita

Custom Mattress Sleeping Area

We eliminated all our Casita OEM uncomfortable cushions and added 8 inch thick mattresses from **Mattress Insider** that were custom designed and built to each of our preferred firmness levels. Our custom mattress sleeping area design provides the preferable Independence model 30 inches wide sleeping berths in the upper torso area where highly beneficial while also still retaining the preferable Liberty model 28 inches wide aisle in the dining area where it is absolutely needed to avoid having to play footsies while dining. These 8" thick mattresses also still allow us to use our Casita OEM folding kitchen counter shelf which provides desirable additional food preparation space. It should be noted that only the Liberty and Independence models enable two people to sleep in close proximity to each other and still easily go to the bathroom in the middle of night without having to crawl over each other or disturb each other.

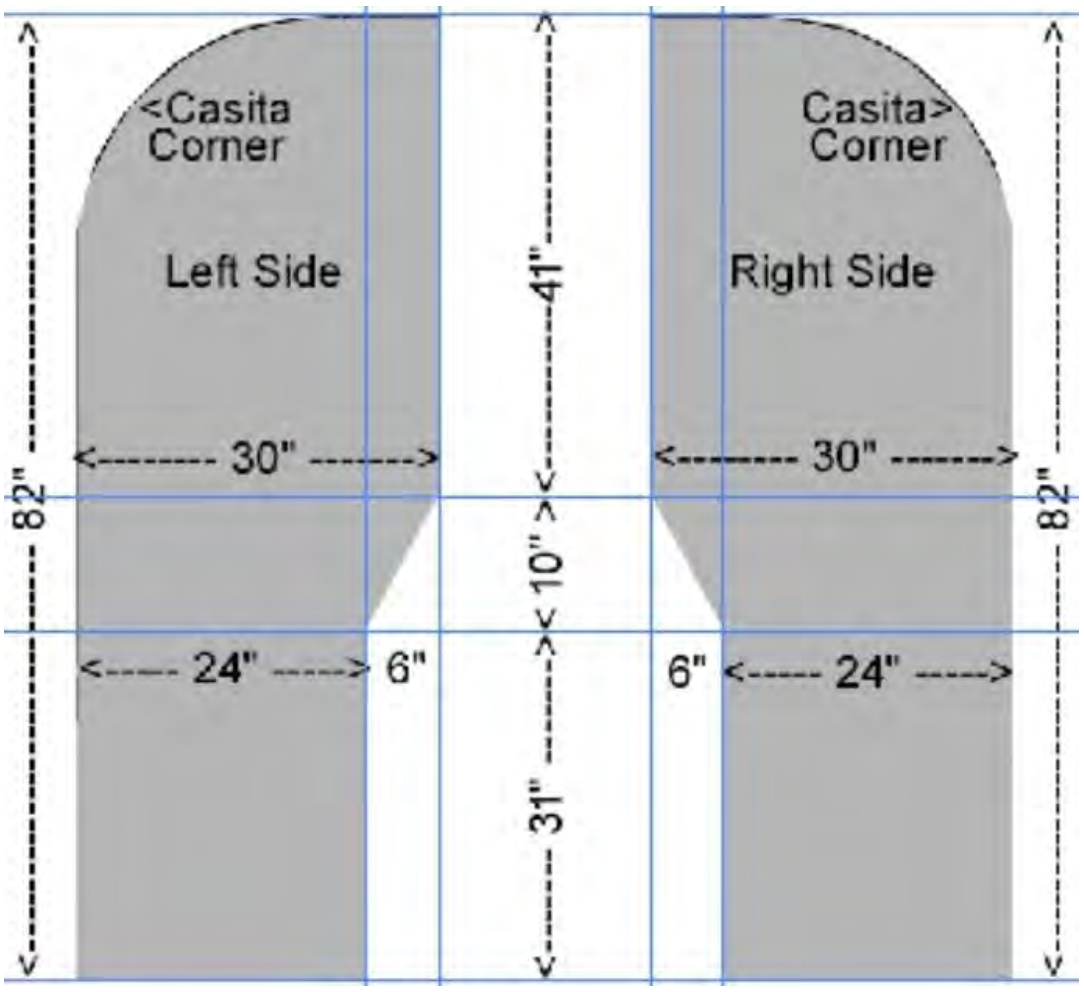
RV Love provides good general information about RV mattresses along with a 10% discount coupon code for **Mattress Insider**. Mattress Insider use a combination of high quality cooling gel foam and high quality memory foams of various densities to create your preferred firmness level and they use **Hypervent Aire-Flow Moisture Barrier** between the mattress bottom and where they are placed to avoid having any mildew issues. Working with Mattress Insider was a real pleasure and we were also able to get custom mattress zipper enclosures and custom matching 300 thread count fitted sheets, flat sheets and pillow cases from them at a reasonable cost.

Mattress Insider provides a 20 year warranty and a 365 day no risk trial period. Their mattresses are handcrafted in the USA and adhere to strict Volatile Organic Compounds (VOC) requirements unlike many other RV mattresses. So there's no obnoxious VOC smell and VOC off-gassing has been linked to lung cancer. Perhaps this is something to consider and ask about if you are shopping for an RV mattress.

Our custom sleeping area design retains the Liberty model's advantageous and easier access to our Casita lower bench seat and overhead storage areas, makes it far easier to sheet/blanket the mattresses and the mattresses can be kept fully made up and available at all times. Our custom sleeping area in concert with our dining area **Lagun Table System** (please see below for more details on this refinement) enables us to ALWAYS have BOTH sleeping and dining capability and WITHOUT needing to reconfigure anything.

The minimal 16 inches of gap between the 30 inches wide torso sections of our custom mattresses retains our desired sleeping closeness factor while also enabling the creation of a custom storage cabinet in this custom mattress sleeping area (please see below for more details on this refinement) created within the 28 inches wide x 41 inches long x 15 inches deep space below the mattresses and created within the 16 inches wide x 41 inches long x 12 inches deep space that goes through and 4 inches above the mattresses (which provides a total of 25,092 cubic inches or 14.5 cubic feet of storage volume for heavy items) and which supports the 30 inches wide torso sections of our custom mattresses without having to modify our Casita in any way.


3000W


<Casita
Corner
Left Side
Casita>
Corner
Right Side
82"
30"
41"
30"
82"
10"
24"
6"
6"
24"
31"

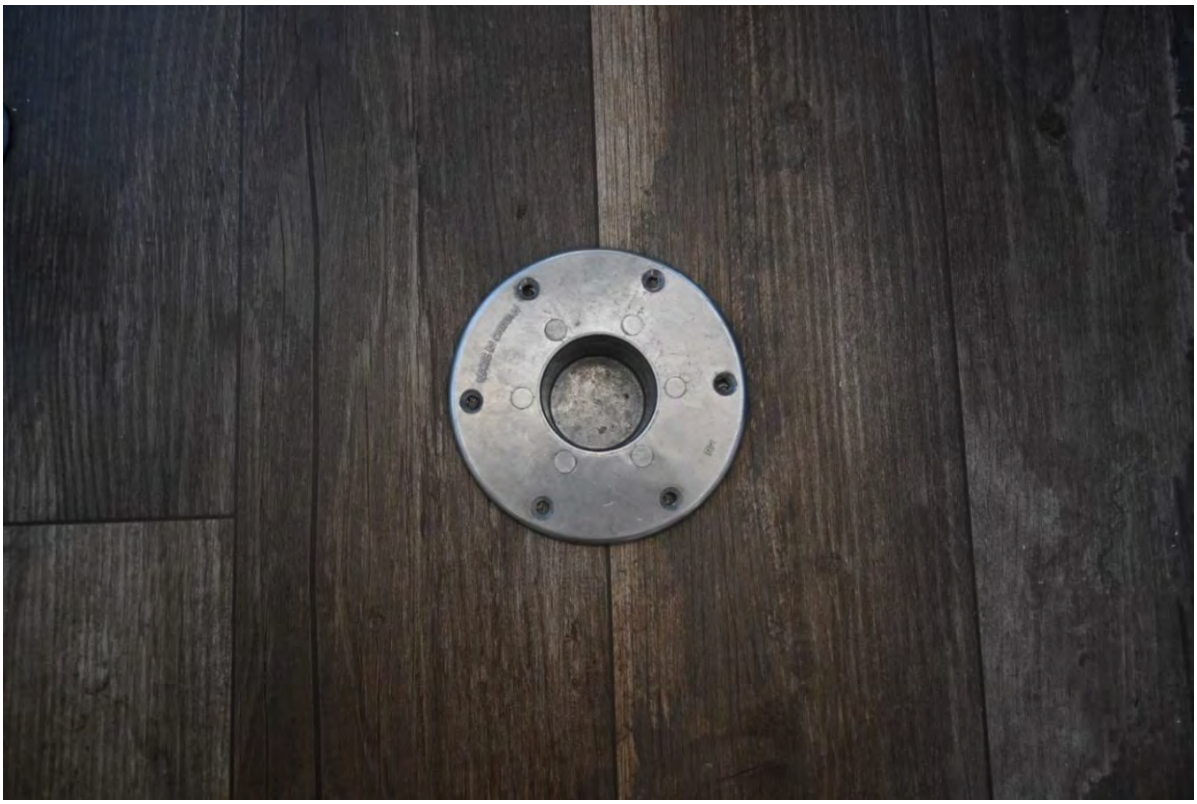
Custom Dining Table Area

We added a light-weight **Lagun Table System** to the dining area with a handmade 24 inches round black walnut table top finished with **Rubio Monocoat Oil Plus Pure** eliminating all of our Casita OEM heavy-weight bed and table configuration panels and steel support rods. Our Lagun Table System in concert with our custom sleeping area enables us to ALWAYS have BOTH dining and sleeping capability WITHOUT needing to reconfigure anything. The Lagun mounting plate was attached to the Casita passenger side bench seat with a marine plywood backing plate, 2x4s and a steel angle bracket rated for 250 pounds. We used the long Lagun leg option which provides the ideal table dining height when dropped to rest on our Casita floor and which also enables raising the table top to a sufficient height over the sleeping berth when stowed so as to not interfere with our feet or egress while sleeping at night.


Lagun

“Los Gatos Casita” Floor Plaque

We added a sand cast brass “Los Gatos Casita” tribute plaque handcrafted in the UK by **The Metal Foundry** to cover the hole in the floor created by the removal of the obnoxious Casita OEM table floor post support that would always collect dirt in its cavity that then would have to be vacuumed to remove it. The plaque holding screw holes were made identical to the floor post support screw holes. We also sealed the hole from underneath our Casita to keep water, etc. from entering the floor structure.



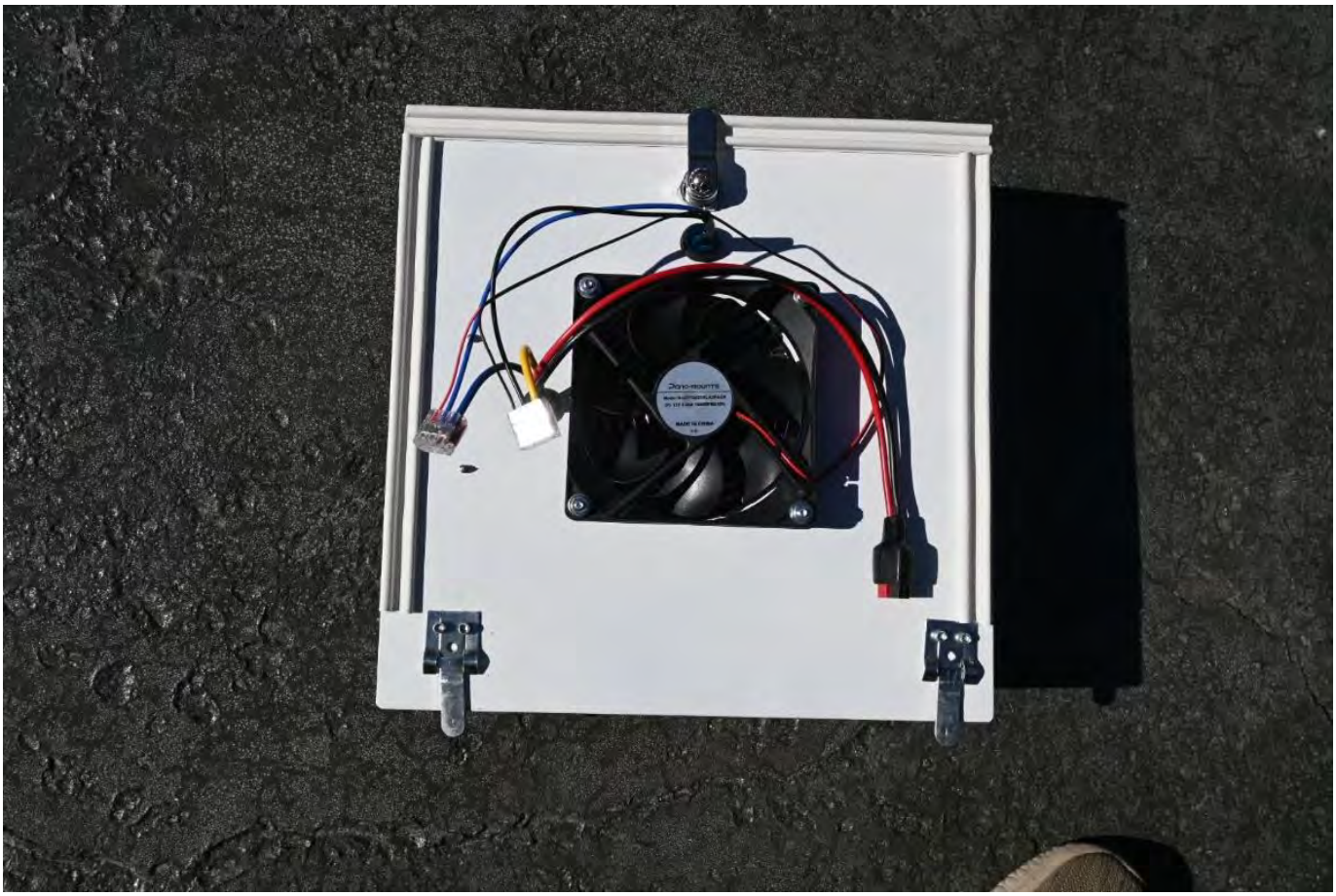

Los Gatos Casita
2023
Bob, Gayle, Butter Bean and Nigel

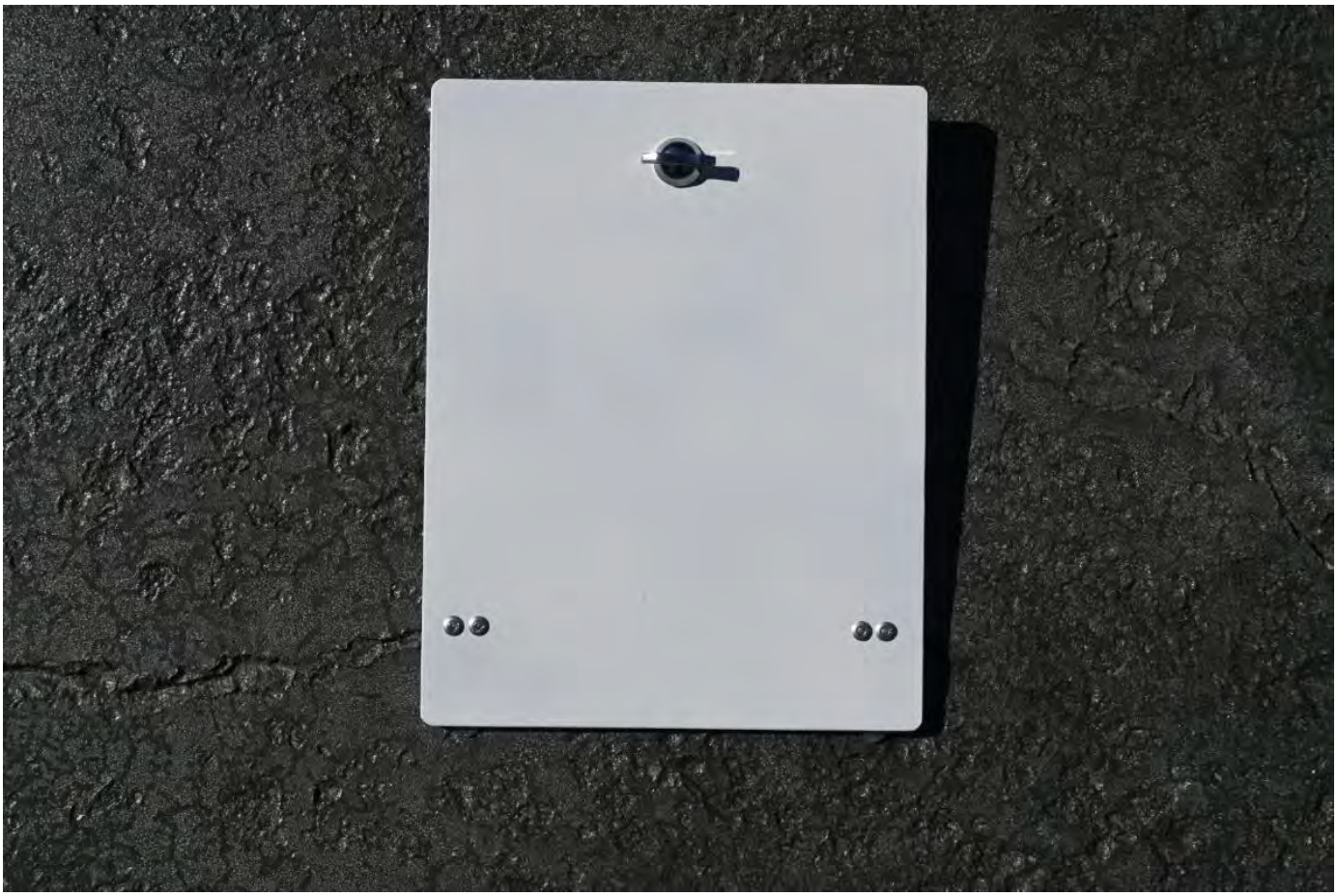
Custom Cat Bathroom & Storage Cabinet

We added a custom cat bathroom and custom storage cabinet in our custom sleeping area created within the 28 inches wide x 41 inches long x 15 inches deep space below the mattresses and created within the 16 inches wide x 41 inches long x 12 inches deep space that goes through and 4 inches above the mattresses (which provides a total of 25,092 cubic inches or 14.5 cubic feet of storage volume for heavy items). This cabinet supports the 30 inches wide sections of our custom mattresses without having to modify our Casita in any way. The cabinet structure was constructed to be as light-weight as possible using the minimum amount of oak veneer marine plywood and corner bracket structure with black walnut panels in the visible areas. The oak veneer marine plywood was finished with black walnut stain and Polyurethane. The black walnut cabinet front and mattress width extension rails were also finished with Polyurethane. Like the custom dining area table top, the black walnut cabinet access hatches were finished with **Rubio Monocoat Oil Plus Pure**. The black walnut cabinet top access hatches provide an additional flat, sturdy surface that can be used as a table for books, drinks, laptops, snacks, etc. And Portuguese red wine never looks finer or tastes better than being served on black walnut and triggers our **Madeira** sailing memories!

This cabinet provides two fully enclosed separate storage compartments at the most preferable furthest aft trailer loading location which reduces Casita trailer tongue weight (please see our **Casita Travel Trailer Weight & Balance Calculator** for understanding and accurately quantifying this). These two aft storage compartments can be easily accessed from the back top access hatch in the 16 inches x 41 inches section above the mattresses. The furthest aft storage compartment houses our added **Renogy 3000 Watt Pure Sine Wave Inverter** and is used for storage of all our entertainment items such as our **Nebula Capsule Projector**. The central storage compartment is used for general storage of heavy items.

More importantly, this cabinet also provides a fully enclosed and separate compartment for our large 19-1/2 inches wide x 27-1/2 inches long x 6 inches deep cat litter box. When this “cat bathroom” is “in use”, a motion detector timer switch is used to provide blue LED mood lighting and exhaust fan venting to the outside via the shore power cord access hatch using a quiet 12VDC 0.25A 1600 RPM muffin fan that operates for 10 minutes after each use. The electronics (motion sensor switch/timer, muffin fan and LED light) are mounted on a 1/8 inch thick aluminum access panel which is used to close off this cat bathroom from the driver side rear bench seat storage area using two lower spring snap cleats and an upper thumb lock. There is also an access panel used to close off the central storage compartment from the driver side rear bench seat storage area. Anderson connectors were used to enable easy removal of the electronics access panel from the cabinet whenever needed. The cat litter box can be easily slid out from the front via a magnetically fastened access hatch and or accessed from above via the front top access hatch in the 16 inches x 41 inches section above the mattresses. This is the “Los Gatos Casita” after all!





Bathroom Ceramic Toilet & Toilet Bidet Seat

We replaced our Casita OEMThetford tacky-looking, tacky-sounding, bacteria breeding, low quality plastic toilet with a high quality ceramic **Dometic 311 Low Profile Round Toilet** and added a 120VAC residential high quality **Brondell Swash 1400 Round Toilet Bidet Seat** which has a heated seat, blue night light and provides function rich control of endless toilet bidet seat warm water. Only clueless Americans wipe crap all over their butts with dry paper and think this is ok... Having a toilet bidet seat enables saving potable water when dry camping by reducing the need for as frequent showers. One also doesn't need to use and put any toilet paper into the black water tank so the contents are 100% biodegradable waste that is suitable to dump anyplace you would normally dig a latrine and then subsequently re-cover with earth when doing backcountry dry camping. The same can be said for the gray water tank's contents when biodegradable soaps are used as should always be the case anyhow.

Our Casita OEM Thetford plastic toilet was installed without any toilet flange whatsoever using only two screws through the thin-walled black water tank and lots of clear silicone adhesive. So a proper Dometic toilet flange was first added using epoxy bonded stainless steel 1/4-20 backing plate nuts and recessed Philip head screws to enable easy future replacement if needed. To fit the new toilet flange, a larger diameter hole had to be drilled using a plywood positioning template and hole saw. This Dometic toilet DOES NOT have the problematic ceramic hump at the back of the toilet like nearly all other RV toilets have that will interfere with a toilet bidet seat installation and therefore would first need to be carefully grinded away to eliminate this interference. This Dometic toilet DOES have a standard vacuum breaker at the back that will interfere with a toilet bidet seat installation, but since this vacuum breaker is just inserted into a rubber sleeve in the ceramic bowl, it can be easily removed, lengthened and then reinserted to eliminate this interference. We initially fabricated our own extension for the standard vacuum breaker that came with our Dometic toilet, but a **Vacuum Breaker Kit**, that has this required extension along with a hand sprayer to make cleaning the toilet bowl much easier and more pleasant, is now available from Dometic and may now just be purchased.

A tee fitting must be added to the pressurized water line to enable feeding pressurized water to the toilet bidet seat. In addition to adding a toilet water shutoff valve, we also added a dedicated toilet bidet seat water shutoff valve and a water filter. These shutoff valves are useful for performing future maintenance or to independently deal with a toilet or a toilet bidet seat leak while camping. Both the vacuum break device and hand sprayer only see pressurized water when the toilet is flushed. Both the toilet and the toilet bidet seat always see pressurized water unless the shutoff valves are closed. We used PEX-A and ProPEX expansion fittings for this plumbing. Unlike the Casita OEM PEX-B and crimp fittings, PEX-A won't be damaged by freezing and ProPEX fittings will never fail and leak as is all too common with crimp fittings. As such, with the exception of the shower hot water line, we are slowly replacing all our Casita OEM 1/2 inch diameter PEX-B and crimp fittings with 1/2 inch diameter PEX-A and ProPEX expansion fittings when the opportunity or need arises. We replaced the shower hot water line with 1/4 inch diameter PEX-A to reduce the hot water delay time and further save potable water when using the shower when dry camping. Additional potable water savings are expected in the future by using a RV optimized tankless hot water heater (please see last page for more details on this).

A 120VAC 20A electrical receptacle outlet was added to our Casita bathroom to power this toilet bidet seat. This electrical receptacle outlet uses a dedicated **Inverter/Shore Power Selection Switch** to enable manually selecting between No Power, Shore Power or Inverter Power from our added **Renogy 3000 Watt Pure Sine Wave Inverter** (please see below for more details on this refinement). This added toilet bidet seat uses a maximum of 700 Watts when in actual use when heating the water to the maximum temperature. This added toilet bidet seat doesn't exceed 10 Watts at other times and typically uses much less when in standby Eco mode. This added bathroom electrical receptacle outlet uses a water proof in-use cover and is also protected with a Leviton dual function Ground Fault Circuit Interrupter (GFCI) and Arc Fault Circuit Interrupter (AFCI) 120VAC 20A electrical receptacle outlet like all of our other Casita 120VAC 20A electrical receptacle outlets. GFCIs prevent electrical shock and AFCIs prevent electrical fires. While using GFCI protection and a water proof in-use cover for this bathroom electrical receptacle outlet should provide adequate safety from any potential risk of electrical shock, also having the ability to use the aforementioned dedicated **Inverter/Shore Power Selection Switch** to completely turn OFF the power to this bathroom electrical receptacle outlet when taking a shower further eliminates all risk of electrical shock. We added a Warning Placard adjacent to our

Oxygenics Fury RV Shower Wand (which provides an amazing shower experience with very little water usage) as a reminder to take this extra safety precaution too.


RV


brondell

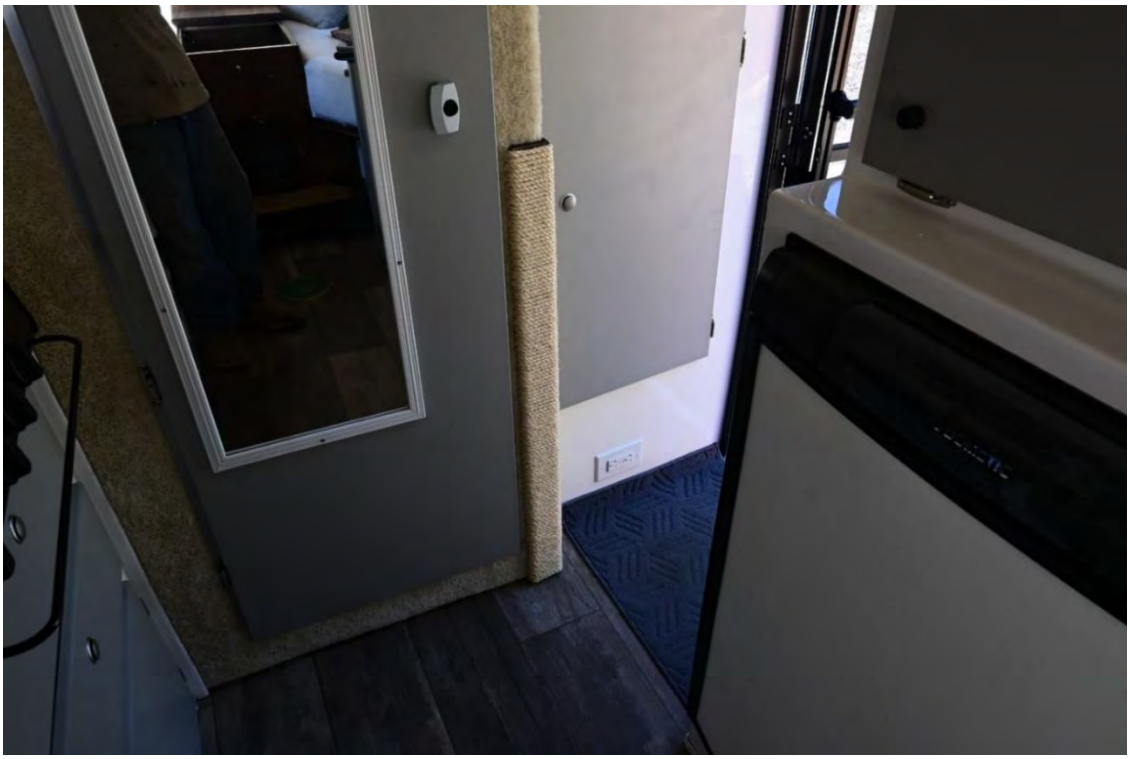

Turn OFF Power
Before
Showering

Bathroom Teak Shower Mat

The Casita bathroom is a “wet” bathroom similar to the “head” in a sailboat. We very much prefer a wet bathroom for camping and for sailing because a wet bathroom requires far less valuable space given the minimal time a bathroom is actually used and a wet bathroom is much easier to clean, sanitize and dry after our last shower than a larger “dry” bathroom. We added a handmade sailboat teak shower mat to our Casita wet bathroom. This teak shower mat eliminates having a cold or wet bathroom floor and, in concert with our heated toilet bidet seat and colorful fabric shower curtain, makes our Casita bathroom a much more comfortable and inviting space to use.

Cat Scratching Post

We added a handmade 36 inches tall cat scratching post made from marine plywood and sisal rope to the bathroom and entry closet wall corner which is 3-1/4 inches wide x 3-1/4 inches wide. Unfortunately, Casita didn't make this corner a normal 90 degree angle...it's more like a 70 degree angle. To remedy this issue, we used a 3/4 inch leg x 1/2 inch leg x 30 inches long aluminum angle to create a 3/4 inch standoff behind this cat scratching post on the side facing the entry door to properly install the cat scratching post at a true 90 degree angle. The carpet conceals the aluminum angle and this remedy hides this Casita construction sin. This is the “Los Gatos Casita” after all!



Improved Hot Water Heater Control Panel Location/Functionality

We removed the obnoxious Casita OEM hot water heater control panel having only a non-illuminated gas switch and incandescent illuminated gas ignition confirmation indicator from the low floor area where it was always getting inadvertently hit to the kitchen sink area. We then added a **Suburban Hot Water Heater Control Panel** having LED illuminated electric switch, gas switch and gas ignition confirmation indicator. A 12VDC activated **Suburban Hot Water Heater Relay** is also required for this modification to provide and switch 120VAC to the hot water heater heating element. We used epoxy bonded stainless steel 8-32 backing plate nuts and button screws in lieu of rivets to enable easy future replacement if needed. The inside electric switch avoids needing to go outside to use our Casita OEM electric switch located inside the hot water heater compartment or using the hot water heater circuit breaker as a switch. Circuit breakers should NOT be used as switches as this shortens their life potentially creating a situation where they won't function when needed to function.

Our Casita OEM electric switch inside the hot water heater compartment is now only used as a safety feature (turned OFF) when the tank is emptied for Winterization or other maintenance tasks are being performed to prevent having the electric heating element inadvertently operate while the tank is empty causing it to self-destruct. We also chose this location as a provision for a future electric & propane tankless hot water heater control panel which requires more space and has the ability to select a precise hot water temperature (please see last page for more details on this).

Improved Battery Disconnect Location/Functionality

We removed the obnoxious Casita OEM Battery Disconnect Switch from the low floor area where it was always getting inadvertently hit. We added robust **Anderson SB350 Connectors** rated for disconnecting/connecting the battery with a 450A active load and we used flexible, well-insulated 4/0 AWG **WindyNation Battery Cable** also rated for 450A to enable BOTH easy battery disconnect and easy battery removal. Furthermore, having the battery disconnect close to the battery reduces the electrical fire risk from having the Casita OEM Battery Disconnect Switch 13.8VDC bare terminals in close proximity of where kitchen pots are often stored, puts the battery disconnect outside the Casita which is considered a safer location if there is a fire, and disconnects BOTH the positive side (considered mandatory) and negative side (considered optional but desirable) of the battery. We added an **AMOMD 600A DC Bus Bar** on the interior side of the battery compartment which was used to connect our added Anderson SB350 connectors and our Casita OEM 12VDC 8 AWG wire which goes to our Casita OEM 12VDC 40A auto resetting circuit breaker and then to our Casita OEM Power Center. Our Casita OEM 12VDC 40A auto resetting circuit breaker was eventually replaced with a high quality **Del City 50A Auto Resetting Circuit Breaker with Ignition Protection** AND a **Eaton 60A Maxi Blade EasyID Fuse** for the reasons detailed and explained in the below Lithium Battery Upgrade refinement section.

And while on the subject of DC auto resetting circuit breakers, it should be noted that they are typically polarized meaning that the Source (normally the battery) MUST be connected to a specific terminal and the Load MUST be connected to a specific terminal. This is because an electromagnet needing a specific polarization is used to increase the electric arc distance when the auto resetting circuit breaker is initially tripped to extinguish this electric arc. If a DC auto resetting circuit breaker is installed such that its polarization requirement is NOT followed, when it is initially tripped this electric arc may never get extinguished and this may cause the circuit breaker to catch fire as shown **here**. High quality auto resetting circuit breakers have Ignition Protection to prevent this from occurring. ***However, this was NOT the case for our Casita OEM 12VDC 40A polarized auto resetting circuit breaker…but fortunately our Casita OEM auto resetting circuit was at least installed correctly.*** But the astute reader might then wonder what happens when the Charger/Converter is charging the battery which then reverses things by making the Charger/Converter the Source and the battery the Load which then violates the polarization requirements of the installed auto resetting circuit breaker. If the amperage rating of the auto resetting circuit breaker and the wire were properly sized to be greater than the maximum amperage that the Charger/Converter can physically generate, nothing bad happens as the auto resetting circuit breaker never gets tripped and the wire can handle the maximum current generated by the Charger/Converter. ***Unfortunately, Casita installed a Charger/Converter that can potentially generate 55A when charging lithium batteries and only installed a 40A auto resetting circuit breaker...which we consider a potential safety issue.***

To easily and conveniently eliminate all battery parasitic current drain (measured to be 0.15A) from our Casita OEM electrical devices (i.e., the MaxxFan, propane leak detector, thermostat, USB port LEDs, etc.) while inside our Casita, we disconnect our Casita OEM Power Center from the positive side of the battery using an added robust **Solid State Relay** (SSR) and an added robust **Aircraft Guarded Switch** now located in a non-intrusive location. When this switch is in its guarded ON position, the switch powers the normally open state SSR causing it to close and the battery is then connected. When this switch guard is opened and the switch is then toggled to its OFF position, power is removed from the SSR causing it to return to its normally open state and the battery is then disconnected. This SSR is rated for 60A at 100VDC, only uses 0.14 Watts (i.e., 10mA times 13.6VDC) when powered to its closed state, uses 0 Watts when unpowered in its open state and has a Mean Time Between Failures (MTBF) of 2,441 years.

Long lengths of negative 12VDC wire are not a problem (the entire Casita metal structure is grounded to negative 12VDC after all), but one should always avoid long lengths of unprotected positive 12VDC wire. Casita properly addresses this by locating our Casita OEM 40A auto resetting circuit breaker on our battery compartment using as short a length of positive 12VDC 8 AWG wire as possible. In a similar fashion, our positive 12VDC SSR battery disconnect is also located on our battery compartment and AFTER the auto resetting circuit breaker protection using 8 AWG wire.

Positive 12VDC for SSR control is also taken AFTER the auto resetting circuit breaker protection but BEFORE the SSR (the importance of this order being that you need to retain SSR control power to enable reconnecting the battery after the battery is disconnected by the SSR), then is further protected with an ATC 3A fuse and then is connected to the SSR positive control input terminal using as short a length of 14 AWG wire as possible.

Negative 12VDC for SSR control is taken close to the guarded switch, then connected to one switch terminal and the other switch terminal is then routed back to the battery compartment and connected to the SSR negative control input terminal using 14 AWG wire.

While working on the battery compartment, we took the opportunity to provision it for our added **Renogy 3000 Watt Pure Sine Wave Inverter**, which is also even capable of 6000 Watts for short durations, and our **Renogy 100AH LiFePO4 Deep Cycle Self-Heating Battery** (please see below for more details on these refinements). For lithium batteries, it is recommended to use a conservative 10VDC (i.e., the typical lithium Battery Management System low voltage cutoff) for battery discharging calculations. ***So, assuming a 90% Inverter efficiency, to obtain 120VAC at 20A or 2,400 Watts of power (i.e., 120VAC times 20A), our lithium battery would potentially need to supply the Inverter 267A (i.e., 2,400 Watts divided by 10VDC divided by 0.9* Inverter efficiency).** We used a total of 10 feet (5 feet for the positive wire side and 5 feet for the negative wire side) of flexible, well-insulated 4/0 AWG **WindyNation Battery Cable** (which results a 2.8% voltage drop at our conservative 12VDC and 267A design condition) to connect the aforementioned added **AMOMD 600A DC Bus Bar** to an added **Blue Sea Systems 400A Class T Fuse Block** which uses a **Blue Sea Systems Class T Fuse**, an added high quality **Del City Auto Resetting Circuit Breaker with Ignition Protection** and then to our added Inverter. Our current 125A Class T fuse (which can be easily replaced in the future with a 350A Class T fuse) is used to prevent our current 120A auto resetting circuit breaker (which can be easily replaced in the future with a 300A auto resetting circuit breaker) from resetting multiple times if there is some Casita trailer electrical system failure causing a very high current in excess of our design limits. ***There have been reports of auto resetting circuit breakers resetting multiple times until there is a circuit breaker or a wire insulation meltdown that then results in an electrical fire. And allowing this auto resetting circuit breaker to repeatedly trip and reset will cause premature failure of both the circuit breaker and the Inverter. We don't want to experience this while camping.***

However and unfortunately, lithium batteries currently only typically have a C1.0 maximum discharge current rating (i.e., 1A maximum discharge current per battery Amp Hour capacity or 100A for a 100AH battery). This current 100A limitation is much less than our 267A system design objective. And any lithium battery larger than 100AH will NOT currently fit in our Casita OEM Group 27 battery compartment and, as explained in great detail in the below Solar Panels and Lithium Battery Upgrade refinement sections, it makes little sense to have more than 100AH lithium battery capacity in a Casita trailer. But future Group 27 100AH lithium batteries with a C2.7 or higher maximum discharge current rating (i.e., 2.7A or higher maximum discharge current per battery Amp Hour capacity or 270A or higher for a 100AH battery) and also perhaps having higher AH capacities too are reportedly in development and this would indeed be the cat's meow in Los Gatos Casita speak!

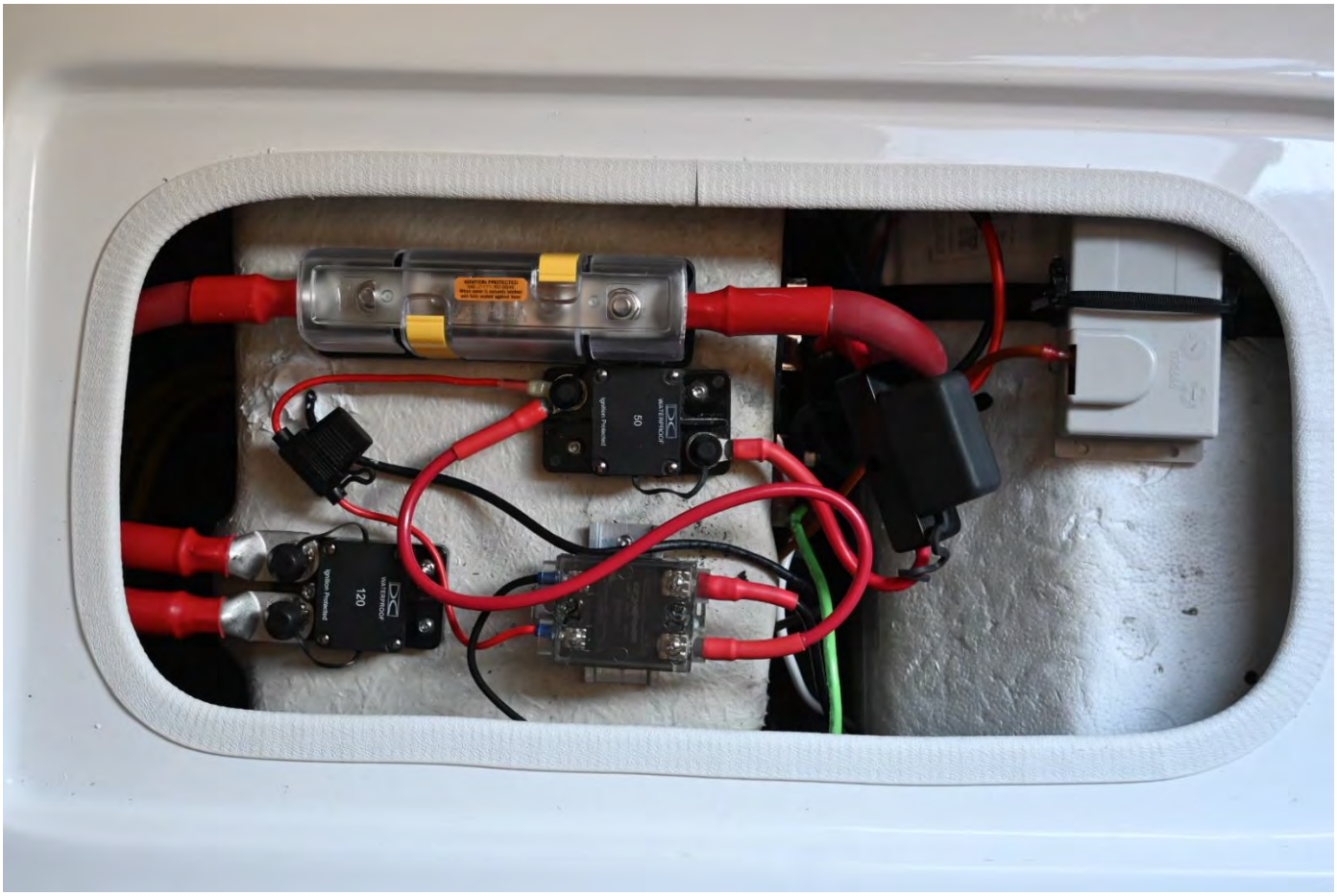
While our Inverter has BOTH AC and DC voltage protection should it experience a large AC load needing higher DC amperage than the battery can provide causing the battery voltage to sag or surge beyond specifications, we don't want to use or solely rely on this protection. So, we currently limit our 120VAC Inverter output amperage using an 8A dedicated Inverter AC circuit breaker so our maximum continuous AC Inverter power should never exceed 960 Watts (i.e., 8A times 120VAC). And therefore, our maximum continuous DC Inverter input amperage should never exceed about 107A (i.e., 960 Watts divided by 10VDC divided by 0.9 Inverter efficiency). While this DC amperage is greater than our current battery C1.0 or 100A maximum continuous discharge current limit, it is well less than our current battery C1.3 or 130A maximum short duration discharge current limit. 960 Watts easily satisfies all our current 120VAC short duration power needs (e.g., our hair dryer, microwave oven, toaster oven, toilet bidet seat, vacuum, etc.) without needing to operate our small **Honda EU2200i** propane modified generator when shore power isn't available. In the future, this 8A dedicated Inverter circuit breaker can be resized to as high as 20A to provide the full 2,400 Watts of AC power capability supported by our overall system design when expected lithium battery technology improvements will increase

our current C1.3 maximum discharge current rating to C2.7 or higher (i.e., 2.7A or higher maximum discharge current per battery Amp Hour capacity or 270A or higher for a 100AH battery).

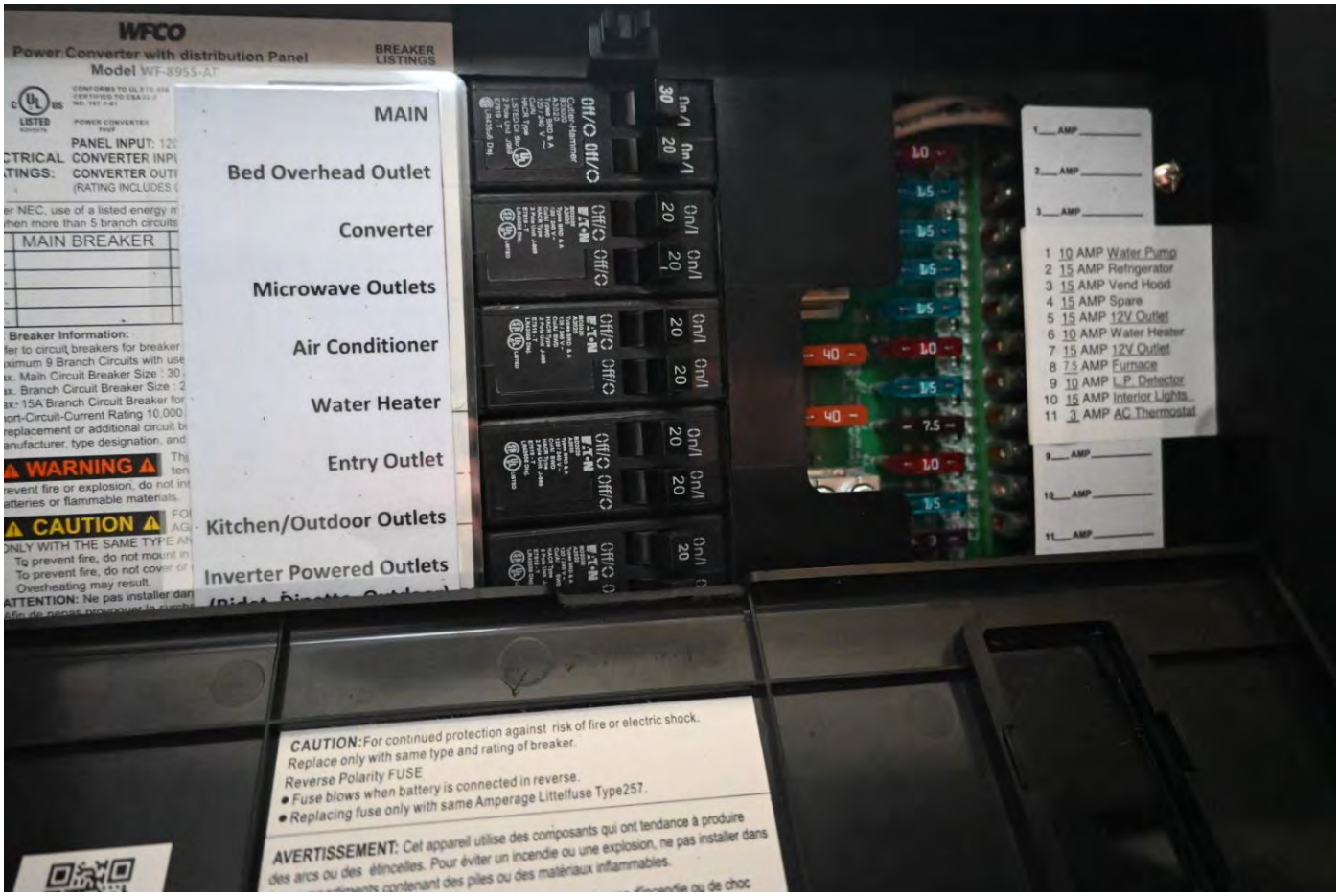
It is always wise to future-proof a system design when economical and practical, especially in a Casita travel trailer that will likely have an extremely long life (having a marine grade fiberglass single layer shell design that doesn't trap moisture in a cavity which then shortens the lifetime of most other RVs) and certainly has an actual demonstrated lifetime that is far longer than any other available RV at any price point. Hence our rationale for using a 3000 Watt Inverter that can supply 120VAC at 20A, 450A rated Anderson SB350 DC connectors, 450A rated DC battery cable, a 600A DC bus bar, a 400A DC Class T fuse block, a dedicated auto resetting circuit breaker (currently 120A) that can be easily resized to 300A in future, a dedicated DC Class T fuse (currently 125A) that can be easily resized to 350A in the future, 120VAC electrical receptacle outlets rated for 20A and a dedicated 120VAC Inverter circuit breaker (currently 8A) that can be easily resized to 20A in the future.

Casita had more than one wire under some of the circuit breakers so we initially added more circuit breakers to comply with electrical code and we relabeled the circuit breakers accordingly. However, we eventually decided to upgrade our Casita OEM Power Center marginal 30A (3,600 Watts) 120VAC only capability to 50A (12,000 Watts) 120/240VAC true split-phase capability. Please see below for more details on this refinement.


BATTERY HOOKUP
+ POSITIVE TO BLACK WIRE
- NEGATIVE TO WHITE WIRE


50
120


Shore Power
Inverter Power


WFCO
Power Converter with distribution Panel
Model WF-8955-AT
BREAKER LISTINGS
MAIN
Bed Overhead Outlet
Converter
Microwave Outlets
Air Conditioner
Water Heater
Entry Outlet
Kitchen/Outdoor Outlets
Inverter Powered Outlets
MAIN BREAKER
WARNING
CAUTION
1 10 AMP Water Pump
2 15 AMP Refrigerator
3 15 AMP Vend Hood
4 15 AMP Spare
5 15 AMP 12V Outlet
6 10 AMP Water Heater
7 15 AMP 12V Outlet
8 7.5 AMP Furnace
9 10 AMP L.P. Detector
10 15 AMP Interior Lights
11 3 AMP AC Thermostat
CAUTION: For continued protection against risk of fire or electric shock.
Replace only with same type and rating of breaker.
Reverse Polarity FUSE
• Fuse blows when battery is connected in reverse.
• Replacing fuse only with same Amperage Littelfuse Type257.
AVERTISSEMENT: Cet appareil utilise des composants qui ont tendance à produire

Improved Potable Water Pump Switch Functionality

We replaced the non-illuminated and unlabeled Casita OEM potable water pump switch with a blue LED illuminated and labeled marine **Water Pump Switch**. We used epoxy bonded stainless steel 8-32 backing plate nuts and button screws in lieu of rivets to enable easy future replacement if needed. We have literally sailed all over the world and adding marine themed accessories to our marine fiberglass Casita provides us a nice sense of nostalgia.

Improved Potable Water Tank Functionality

We added a PVC low profile, full port, **Hose Bib Valve** to the potable water tank to enable both easier 6 gallon jug filling via our spare backup Casita OEM water pump (FloJet model R3526144D) setup and easier city water connection filling via a potable water hose. We find that using a couple 6 gallon jugs and topping off our potable water tank every couple days works well when dry camping. Since PVC is highly susceptible to UV sunlight degradation, we also painted this plumbing with a white bonding primer expressly designed for plastic adhesion and a white semi-gloss acrylic paint expressly designed for UV protection.

We added a marine **Sea Dog Stainless Steel Vent** to the potable water tank fill cap so it doesn't need to be removed when filling from the hose bib valve. We also removed our Casita OEM vent tube and plugged where it entered the tank which then enables filling the tank to its full 25 gallon capacity and traveling without any potable water spillage…although we nearly always travel with ALL tanks empty. We have literally sailed all over the world and adding marine themed accessories to our marine fiberglass Casita provides us a nice sense of nostalgia.

Power Inverter and Additional Electrical Receptacle Outlets

We added a 120VAC 20A electrical receptacle outlet where the obnoxious Casita OEM Hot Water Heater Panel was previously located, which also motivated us to add three additional electrical receptacle outlets where also needed.

We added a 120VAC 20A outdoor electrical receptacle outlet on driver side in the identical location as our Casita OEM passenger side outdoor electrical receptacle outlet. We added a 120VAC 20A electrical receptacle outlet inside the driver side bench seat storage area to power our **SpaceX Affiliate** **Starlink Roam** system. We added a 120VAC 20A bathroom electrical receptacle outlet to power our bathroom toilet bidet seat. We added 12VDC powered USB ports inside the driver side bench seat storage area to power our RV Whisper and TRAK4 electronic monitoring systems. We also added a 12VDC 30A SAE power port inside the driver side bench seat storage area for additional future flexibility.

All four of these aforementioned electrical receptacle outlets use a dedicated **Inverter/Shore Power Selection Switch** to enable manually selecting between No Power, Shore Power or Inverter Power via our added **Renogy 3000 Watt Pure Sine Wave Inverter**, which is also even capable of 6000 Watts for short durations, and was placed inside our custom storage cabinet in our custom sleeping area. 12VDC power to the Inverter from our lithium battery is accomplished using 450A rated Anderson SB350 connectors, 450A rated battery cable, a **Blue Sea Systems 400A Class T Fuse Block**, a **Blue Sea Systems Class T Fuse** (currently 125A to align with our current lithium battery maximum discharge current limit that can be resized to 350A in the future) and a high quality **Del City Auto Resetting Circuit Breaker with Ignition Protection** (currently 120A to align with our current lithium battery maximum discharge current limit that can be easily resized to 300A in the future) for the reasons described in detail in the above Improved Battery Disconnect Location/Functionality section. This Inverter can currently provide us with 960 Watts of 120VAC power (currently limited by an 8A dedicated Inverter circuit breaker) which should hopefully increase to 2,400 Watts of 120VAC power in the future when Group 27 lithium battery technology is expected to improve. However, 960 Watts easily satisfies all our current 120VAC short duration power needs (e.g., our hair dryer, microwave oven, toaster oven, toilet bidet seat, vacuum, etc.) without needing to operate our small **Honda EU2200i** propane modified generator when shore power isn't available.

We elected to use the Inverter for ONLY powering the aforementioned four 120VAC 20A electrical receptacle outlets and NOT the entire Casita OEM Power Center to avoid creating a situation where the Inverter could be potentially turned ON when the air conditioner, hot water heater, etc. also happens to be ON thereby creating an immediate Inverter over-load situation requiring resetting Inverter circuit breakers. We also wanted to use a dedicated **Inverter/Shore Power Selection Switch** to enable manually selecting between No Power, Shore Power or Inverter Power. The Inverter must also be manually turned ON too. Circuit breakers should NOT be used as switches as this shortens their life potentially creating a situation where they won't function when needed to function.

This Inverter has a bonded neutral and ground like most Inverters. Since our Casita OEM Power Center is properly wired as a sub panel (i.e., per electrical code, a sub panel MUST NOT have the neutral and ground bonded together), our Casita OEM Power Center fully expects to receive power from a source that is wired as a main panel (i.e., per electrical code, a main panel MUST have the neutral and ground bonded together) as is the case when our Casita OEM Power Center receives shore power from a campground main panel hookup. As such, this Inverter does not need any further modification to be used either as a direct power source for some limited electrical receptacle outlets or as a power source to the entire Casita OEM Power Center. However, all Inverters MUST be grounded to the RV metal structure. "No Shock Zone RV Electrical Safety" by Michael Sokol is a great source of reliable information on this specific subject.

We added a **Renogy 100AH LiFePO4 Deep Cycle Self-Heating Battery** (please see below for more details on this refinement). ***When using LiFePO4 batteries and Inverters larger than about 1500 Watts AFTER the battery has been disconnected for an extended period of time or AFTER the Inverter has been turned off for an extended period of time, the Inverter capacitors MUST FIRST be PRE-CHARGED.*** Our 13.6VDC 100AH LiFePO4 battery using a short length of 4/0 AWG cable only has about 0.005 Ohm resistance which will result in a horrific 2,700A (i.e., 13.6VDC divided by 0.005 Ohm) short duration (i.e., less than

microsecond) Inverter capacitor inrush current. If the Inverter capacitors are NOT first pre-charged, this capacitor inrush current will exceed the LiFePO4 Battery Management System (BMS) maximum discharge current limit (130A for our 13.6VDC 100AH LiFePO4 battery) and the battery will (if it has NOT been previously damaged and is still properly functioning) be immediately shut down by the BMS. Circuit breakers and fuses will NOT react at all to this high amperage, short duration inrush current. However, this high inrush current from the battery into the Inverter capacitors (having a total capacitance value of 0.18 Farads for our 3000 Watt Inverter) can easily damage the sensitive MOSFET transistors used in the BMS and can also damage the Charger/Converter and Inverter too. We suspect that many people are totally unaware of this destructive situation and frequently damage their BMS, Charger/Converter and Inverter without ever having a clue or gaining the understanding why. Here is an excellent white paper on this specific subject:

Explanation of Inverter DC Capacitance and Inrush Current

For our 13.6VDC 100AH LiFiPO4 battery and our 3000 Watt Inverter, capacitor pre-charging is accomplished using a 1 Ohm 200 Watt **Power Resistor** and a **Blue Sea Systems 3-Way Switch** which is rated for 300A continuous and is rated for 900A intermediate (30 seconds). This 3-way switch, was placed in a non-obtrusive, hidden but easily accessible location on driver side of our customized sleeping area cabinet in the pillow area. This 3-way switch is FIRST selected to Position 1 to ONLY ALLOW 13.6A (i.e., 13.6VDC divided by 1 Ohm) of current or 185 Watts (i.e., 13.6A times 13.6VDC) of power to flow from the battery through the power resistor to fully pre-charge the Inverter capacitors in about 0.9 seconds (i.e., 5 capacitor time constants times 1 Ohm times 0.18 Farads). Then this 3-way switch is selected to Position 2 to enable the battery to provide its maximum discharge current to the Inverter hence forth. The pre-charge circuit is protected with a 15A ATC fuse and is physically connected between the 3-way switch Position 1 and Position 2 terminals. The battery positive 4/0 AWG cable from the auto resetting circuit breaker is connected to the 3-way switch Output terminal and the Inverter positive 4/0 AWG cable is connected to the 3-way switch Position 2 terminal. All of our Inverter 120VAC power loads are also FIRST removed BEFORE accomplishing this capacitor pre-charge procedure and BEFORE turning ON or turning OFF our Inverter by using our dedicated **Inverter/Shore Power Selection Switch** and setting it to the OFF Position.

We replaced all of our Casita OEM 120VAC **15A** electrical receptacle outlets that were fed from Casita OEM Cutler-Hammer BD2020 tandem 120VAC **20A** circuit breakers with 120VAC **20A** Leviton dual function Ground Fault Circuit Interrupter (GFCI) and Arc Fault Circuit Interrupter (AFCI) electrical receptacle outlets. GFCIs prevent electrical shock and AFCIs prevent electrical fires. While using GFCI protection and a water proof in-use cover for the bathroom electrical receptacle outlet used to power our toilet bidet seat should provide adequate safety from any potential risk of electrical shock, also having the ability to use the aforementioned dedicated **Inverter/Shore Power Selection Switch** to completely turn OFF the power to this bathroom electrical receptacle outlet when taking a shower further eliminates all risk of electrical shock…and a Warning Placard was added adjacent to the shower wand as a reminder to take this extra safety precaution.

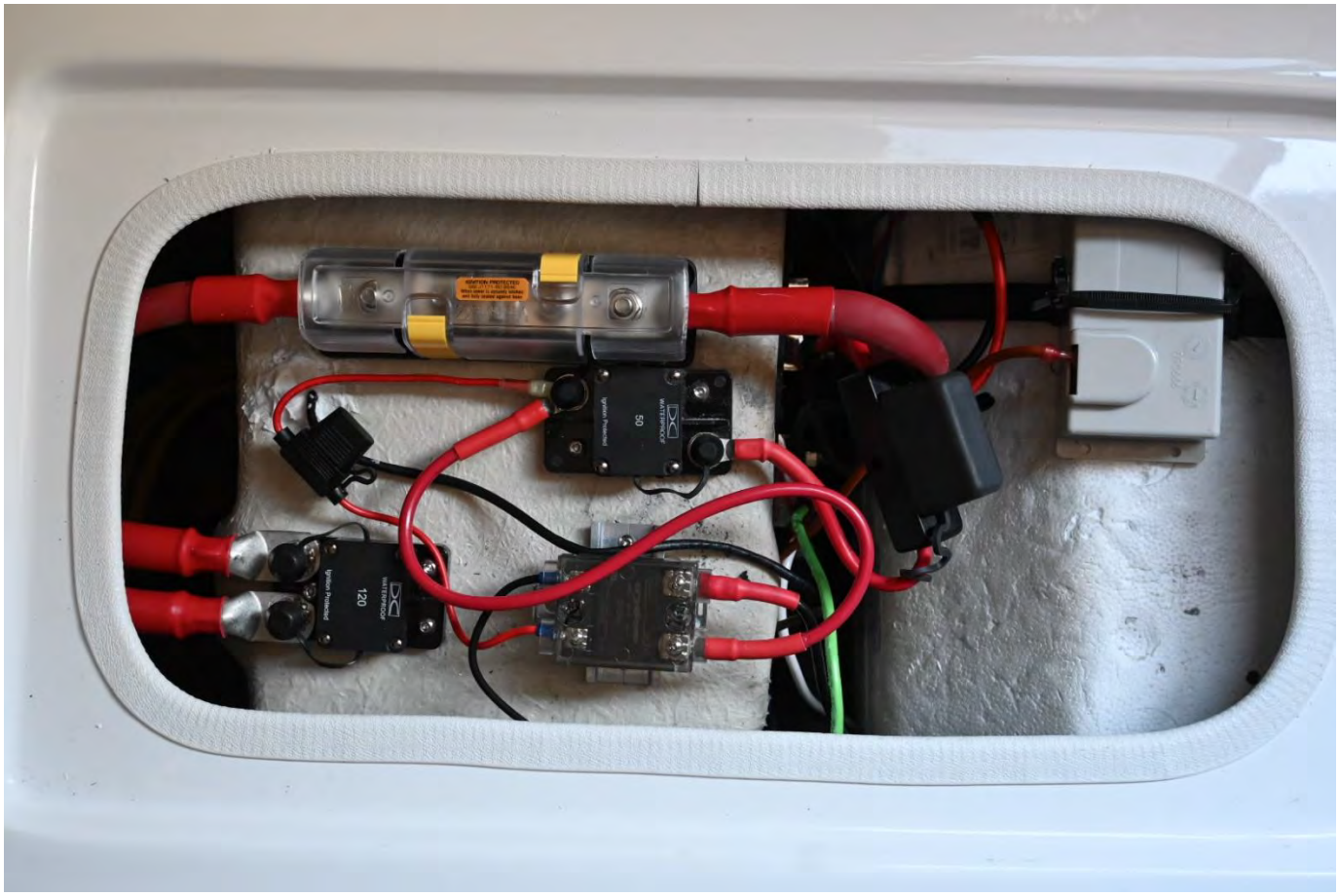
While replacing all of our Casita OEM electrical receptacle outlets, we discovered that the electrical receptacle outlet in the microwave cabinet was dangerously miss-wired. Apparently, the ground wire was cut too short so Casita didn't use it at all. Instead, Casita just connected the outlet neutral screw to the outlet ground screw. While this results in this electrical receptacle outlet still testing as if properly wired, this wiring approach dangerously places 120VAC on the ground path when an appliance is plugged into this electrical receptacle outlet which could then cause an electrical shock and potentially death. Fortunately, the Casita shell is fiberglass and is not metal which likely kept us from encountering this fate on our Casita trailer pickup trip. This type of miss-wired electrical receptacle outlet is very difficult to detect without actually looking at the electrical receptacle outlet wiring. Anyhow, we corrected this Casita quality control issue and we mention this for people's awareness. Again, "No Shock Zone RV Electrical Safety" by Michael Sokol is a great source of reliable information on this specific subject.


Shore Power
Inverter Power


AF/GF
3.0
TEST MONTHLY
TEST MENSUEL
TEST
RESET
LEVITON


RENOGY
3000W


OFF
1


50
Ignition Protected
WATERPROOF
120
Ignition Protected
WATERPROOF

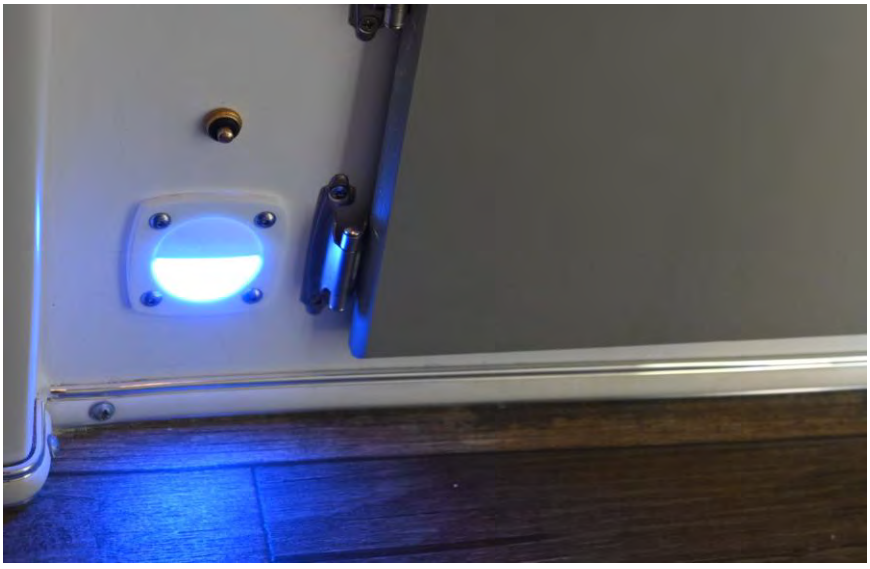

AIRXCEL
RENOGY
ON
OFF

Floor Passageway Lamp

We added a marine **Sea Dog Blue LED** floor passageway lamp where the obnoxious Casita OEM Battery Disconnect Switch was previously located. We used epoxy bonded stainless steel 8-32 backing plate nuts and button screws in lieu of rivets to enable easy future replacement if needed.

We have literally sailed all over the world and adding marine themed accessories to our marine fiberglass Casita provides us a nice sense of nostalgia. We find blue light to be very calming and relaxing while still retaining our full night vision. So the blue light from this floor passageway lamp, our “cat bathroom” mood light, our water pump switch and our toilet bidet seat provides the night time ambience we like very much without compromising our night vision which we may need. In fact, we like blue light at night so much that we even backlight our "backyard" stream waterfall features in blue light which looks especially amazing from our patio when our propane Tiki torches are also lit!

We also took the opportunity to remove the rivets from our Casita OEM Propane Leak Detector and used epoxy bonded stainless steel 8-32 backing plate nuts and button screws to enable easy future replacement if needed. We changed our Casita OEM Propane Leak Detector 12VDC wiring to use **WAGO Connectors** to enable easy disconnection of the detector should it fail during a camping trip. We often use these innovative connectors and highly recommend them.



Hepvo Sink Drain Valves

We replaced the P-traps in the bathroom and kitchen sinks with **Hepvo Valves** to reduce sink drain freezing risk. It has been reported that getting a Hepvo valve into a Casita Liberty Deluxe with our Casita OEM furnace wasn't possible because of inadequate space, however, we didn't have this issue at all and accomplished an easy vertical Hepvo valve installation. However, given the close proximity Casita put the bathroom sink drain connection to the PVC drain pipe that goes into the entry closet area, we had to get creative and used a marine hose barb **ForeSpar Sink Drain**, hose barb adapter on the PVC drain pipe, 1 inch black flexible silicone hose elbow and stainless steel screw clamps enabling us to accomplish an easy horizontal Hepvo valve installation in the entry closet area. Casita already used a Hepvo valve for the bathroom shower floor drain.

Corrected Casita Black Water Tank Plumbing Deficiency

This is more of a correction to a Casita OEM black water tank plumbing design/installation deficiency than an actual Casita refinement. Our Casita OEM 3" ABS female NPT x Sprocket elbow that Casita uses to connect the dump out plumbing to the black tank male NPT outlet was 90 degrees but Casita just forced it to bend down to where the Valterra black and gray dump valves are located. As such, this elbow is put under significant stress and is very prone to crack, fail and leak. This actually occurred to us about 5,000 miles into our 12,640 mile Casita trailer pickup trip. Fortunately, it was the female NPT elbow end that failed and NOT the black tank male NPT outlet which would have then required replacing the entire black tank. We ground up some ABS into powder and mixed it with ABS glue to accomplish an "on-the-road" temporary repair. Yes, we could have requested a Casita warranty repair, but given the high value of our time that would be lost coordinating this, the time and expense to get our Casita to some Casita authorized repair location and the high likelihood of just getting the same deficient plumbing design/installation back again, we elected to properly and permanently correct this deficiency ourselves after returning to our remote southern Oregon homestead.

To remedy this issue, we lowered the elbow height about 1-1/2 inches by adding an ABS 3" female NPT x Spigot adapter to the Sprocket end of the standard **Casita OEM Elbow** where it is then connected to the black tank 3" male NPT outlet. And we also added a second ABS 3" male NPT x Spigot adapter to the female NPT end of the standard Casita OEM elbow to then enable adding a 3" **Fernco Flexible Coupler** to relieve the elbow stress. Valterra also makes a 3" **Valterra Flexible Coupler** for just this purpose too that Casita should have likely used, but the Fernco adapter being double the length actually provides better overall flexibility and better support. It should be noted that that this second added ABS 3" male NPT x Spigot adapter MUST be installed AFTER first screwing the elbow onto the black tank outlet to allow turning it given the restricted space in this area. **Zialoc 2200 Clear Silicone Sealant** was used to seal the threaded fittings and ABS glue was used for the Sprocket/Spigot fittings. Since ABS is highly susceptible to UV sunlight degradation, we also painted this plumbing with a white bonding primer expressly designed for plastic adhesion and a white semi-gloss acrylic paint expressly designed for UV protection.

We also have a spare **Valterra Dump Valve Assembly** and we fabricated a spare set of dump out plumbing that can now be easily and quickly used to deal with any future dump out plumbing system failure should the need ever arise again.

Given that we had to remove the Valterra dump valve assembly, we took the opportunity to properly lubricate it using **Molykote 111 Compound** which we highly recommend and use for all our water filter canister O-rings in our remote southern Oregon homestead self-constructed mountain stream and well water filtration system which you may find interesting:

Our Water Filtration System

And if you like construction stuff, you will find lots of photos of our remote southern Oregon homestead here that we constructed entirely ourselves except for help with the concrete pours:

Construction of Our Garage/Shop/Guest Quarters

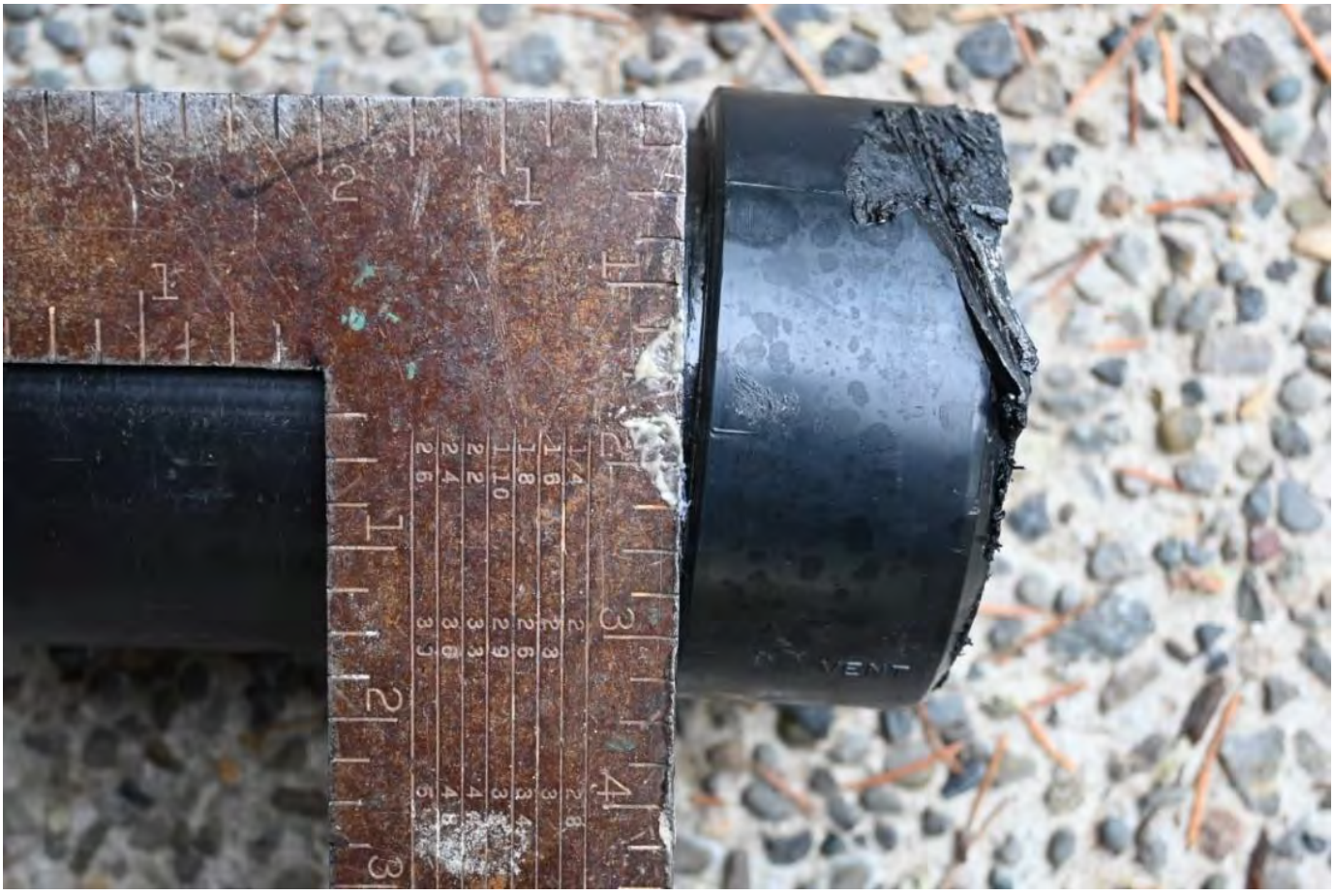
Construction of Our Residence

We have found doing things ourselves is far more personally satisfying, meaningful and memorable than just buying things and bragging about them for some deranged sense of self-worth from having lived an insignificant and superficial life. Same with being a dependable, faithful, unselfish life partner and doing things that benefit future generations like fostering healthy child development and conservation. At the end of your life journey you can't take anything with you and you only have the great memories you made along the way!

Scouting (Troop 455 Renton, WA)

Rogue River Watershed Council

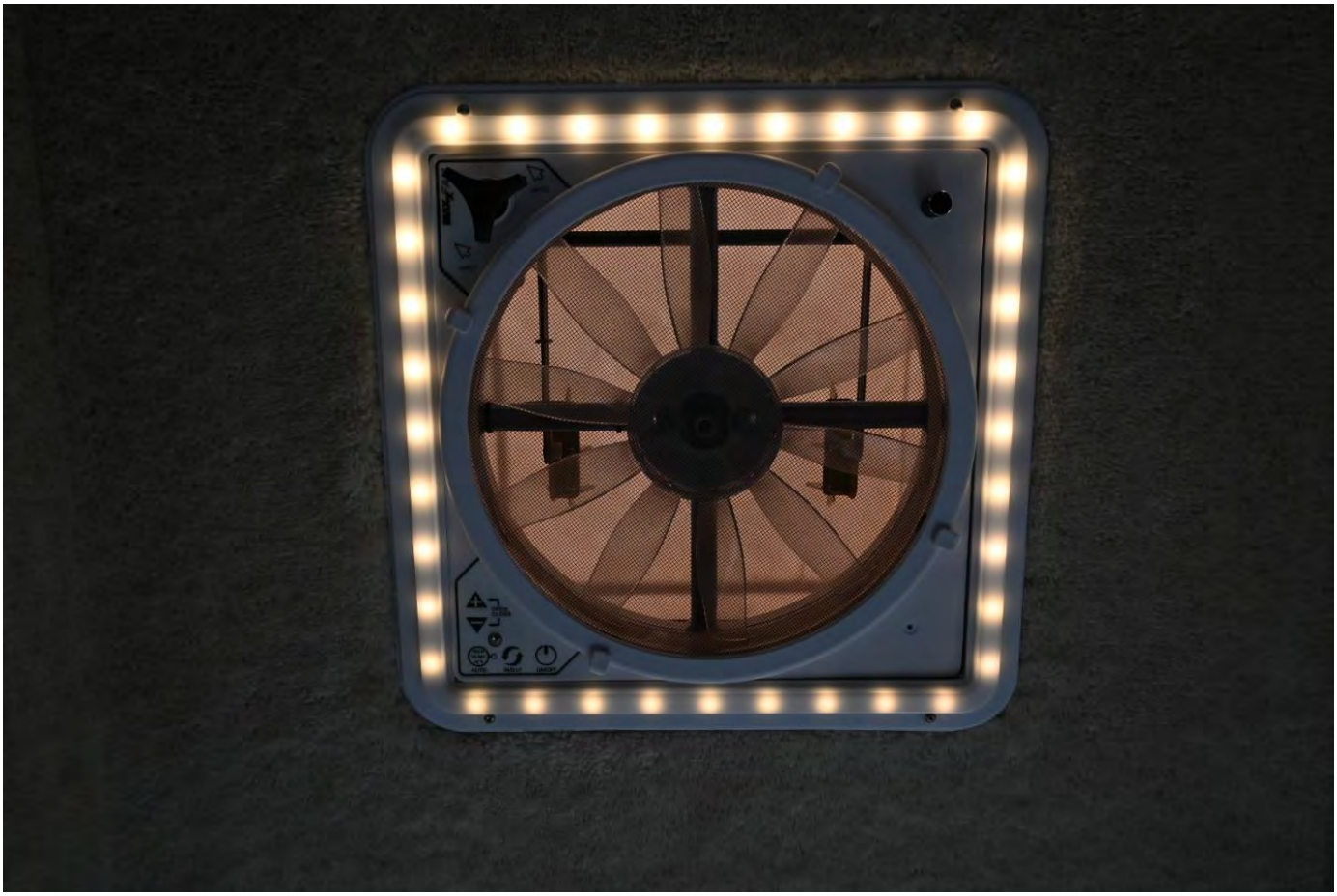
WaterWatch

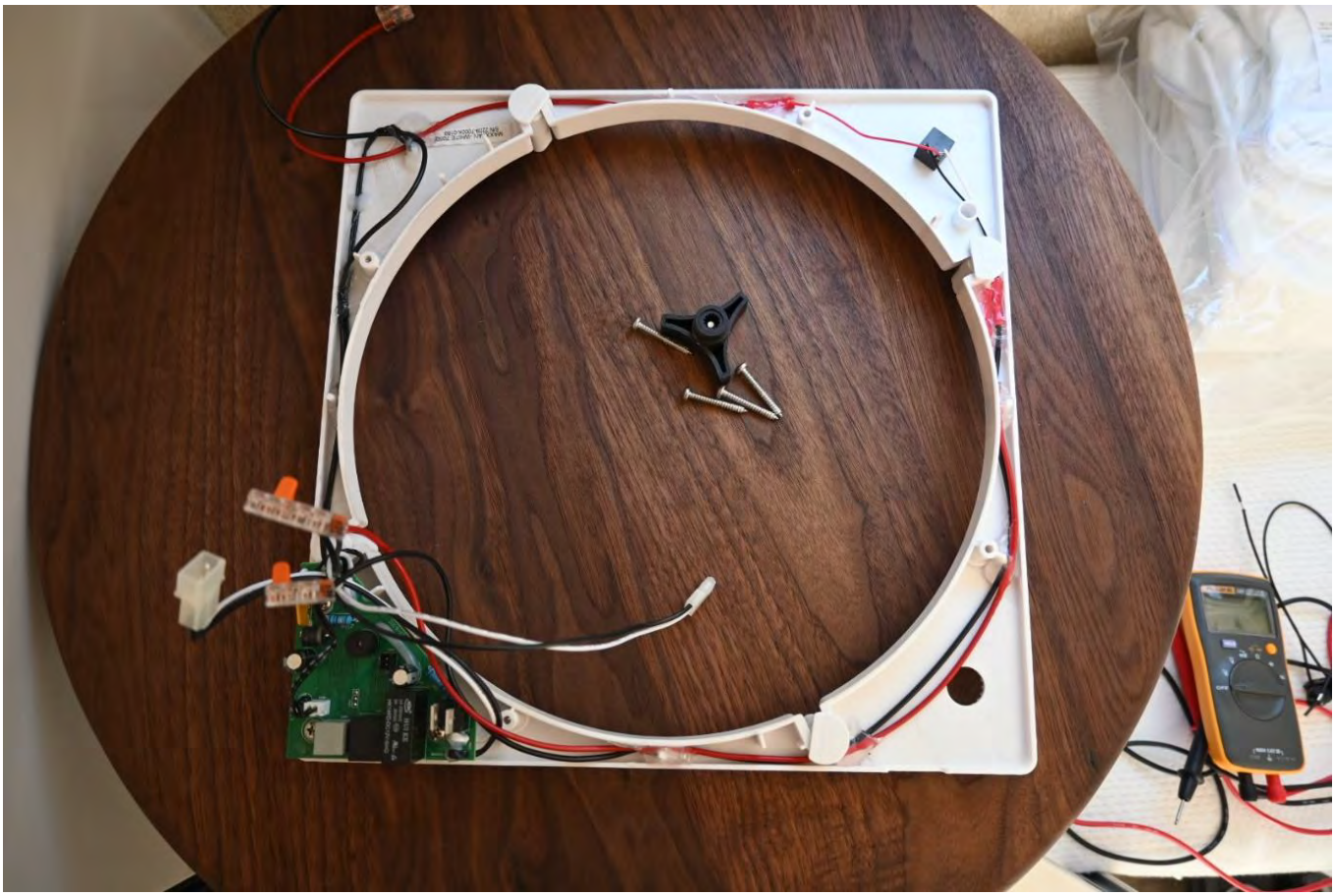

VENT


Becker's Lodge
BRITISH COLUMBIA
RECEPTION OFFICE
LIFEGUARD

Dimmable Chandelier Light

We added **Heng's LED Chandelier** with the warm white color option and added a **Manual LED Dimming Switch** to our Casita OEM Maxxair Fan. This dimmable chandelier in concert with our blue "cat bathroom" mood light, blue floor passageway lamp, blue toilet bidet seat light and blue potable water pump switch light create a nice night time ambience. The Heng's LED chandelier bezel was directly attached to the original Maxxair Fan bezel using epoxy bonded stainless steel 8-32 backing plate nuts and button screws in lieu of rivets to enable easy future replacement if needed. The Heng's LED chandelier bezel had to have the interior corners filed to fit Maxxair Fan electronics section. A remote control LED dimming unit could also be installed, but given the small size of the Casita and the desire to keep things simple and not having remote controls requiring batteries, we elected to use the simpler manual LED dimming switch approach.





Interior/Exterior LED Lights

We replaced all our Casita OEM exterior and interior lights with high quality, low power, modern-looking, simple electronics lights from **Leisure LED** that use replaceable T10 LED wedge panels in our desired brightness (Lumens) and our desired light color temperature (Kelvins) for each of our specific Casita lighting areas. **Zialoc 2200 White Silicone Sealant** was used to seal the exterior light fixtures.

Entry Door Double Step

We replaced our Casita OEM Entry Door Single Step with a **LHC Entry Door Double Step**. A great feature and improvement especially given Gayle's knee issues and required knee replacement surgeries in June and October shortly after our Casita trailer pickup trip.

Solar Panels

We added a portable 200 Watt, 12VDC Monocrystalline **Renogy Solar Foldable Solar Suitcase** that charges our battery via an added SAE Port mounted through the floor of the battery compartment which keeps it out of sight and out of the weather. This SAE Port is connected to an added terminal block on the interior side of the battery compartment that is connected directly to the battery using **Anderson SB350 Connectors** rated for disconnecting/connecting the battery with a 450A active load. This SAE Port is protected with an ATC 30A fuse. We use one 10 feet long and two 20 feet long 10AWG **Renogy Solar Panel Extension Cables** that enables us to place our solar suitcase at either a 10, 20, 30, 40 or 50 feet distance from the added SAE Port. We use a SAE to MC4 adapter to connect these extension cables to our added SAE Port while properly placing the IP67 waterproof and 20A charge current rated **Renogy Voyager Solar Charge Controller** in very close proximity to our battery as is required for good charging performance. We drilled and tapped small holes for stainless steel M4 x 0.7 machine screws into the bumper frame to enable securing the charge controller with stainless steel knurled thumb nuts when it is actually being used.

We also have a SAE to Anderson adapter to enable using this added SAE Port for other applications such as powering our 12VDC air compressor which we use for inflating tires and for blowing air out of our Casita plumbing when Winterizing it and powering our aforementioned spare backup Casita OEM water pump (FloJet model R3526144D) setup which we use to enable easier potable water tank filling from 6 gallon jugs.

The Casita Air Conditioning System operates on 120VAC and uses about 13A which equates to needing 1,560 Watts of power to operate it (i.e., 120VAC times 13A). So at least 1,560 Watt solar panels, which is about 98 square feet of panels which would weigh about 300 pounds, would be required to operate the Casita Air Conditioning System without depleting the battery bank during daylight hours. A 12VDC battery bank would also have to produce 144A (i.e., 1,560 Watts divided by 12VDC divided by 0.9 Inverter efficiency) to operate the Casita Air Conditioning System. To operate the Casita Air Conditioning System for 8 hours at night time would require a battery bank with at least 1152 Amp Hours (AHs) of usable capacity (i.e., 144A times 8 hours) which is at least twelve 100AH lithium batteries which would weigh about 312 pounds and about two times more than that or about 624 pounds if lead acid batteries are used. And you will then have a fully depleted battery bank come morning. It should hopefully and quickly become very obvious that the large battery footprint and the large solar panel footprint necessary to operate the Casita Air Conditioning System for an adequate amount of time isn't currently feasible or very practical given the small footprint of the Casita trailer. So, shore power or a generator is required to operate the Casita Air Conditioning System…and this is a much more economical, lighter weight, practical and safer solution too.

We replaced our Casita OEM 12VDC lead acid battery with a **Renogy 100AH LiFePO4 Deep Cycle Self-Heating Battery** (please see below for more details on this refinement). For LiFePO4 lithium batteries, it is recommended to use 13.6VDC (i.e., the lower Idle Stage charging voltage) for battery charging calculations. Our 200 Watt solar panels use a 75% efficient, low cost, simple and robust Pulse Width Modulation (PWM) solar charge controller which can generate a maximum charge current of 11.0A (i.e., 0.75 times 200 Watts divided by 13.6VDC). We could fully charge a 100% depleted 100AH lithium battery in 9.1 hours (i.e., 100AH divided by 11.0A) under perfect solar conditions…and perhaps twice that long (18.2 hours) under marginal solar conditions. However, in reality, we will at most only need to fully charge 50% of our battery capacity (i.e., our worst case battery depletion given our worst case 24 hour maximum power usage rate) which will take 4.5 hours (i.e., 50AH divided by 11A) under perfect solar conditions...and perhaps twice that long (9 hours) under marginal solar conditions. If one elects to use a 98% efficient but much more complicated and expensive Maximum Power Point Tracking (MPPT) solar charge controller which can generate a maximum charge current of 14.4A (i.e., 0.98 times 200 Watts divided by 13.6VDC), this time can be reduced to 3.5 hours (i.e., 50AH divided by 14.4A) under perfect solar conditions...and perhaps twice that long (i.e., 7 hours) under marginal solar conditions. Bottom line, we will always be able to adequately replenish our 100AH lithium battery with our 200 Watt solar panels with only 4.5 to 9 hours of solar exposure. So we think our 100AH lithium battery, our 200 Watt solar panels and our low cost, robust 20A rated PWM solar charge controller is about perfect for our Casita trailer.

Our portable solar suitcase in concert our added 100AH lithium battery and our added **Renogy 3000 Watt Pure Sine Wave Inverter** easily satisfies all our 12VDC long duration power needs (e.g., our electronic

monitoring, entertainment, internet, lighting, etc.) and easily satisfies all of our 120VAC short duration power needs (e.g., our hair dryer, microwave oven, toaster oven, toilet bidet seat, vacuum, etc.) without needing to operate our small **Honda EU2200i** propane modified generator when shore power isn't available. Our portable solar suitcase enables us to easily and quickly move and place it in sunny locations to address the reality that these sunny locations often change over the course of the day when camping in forested areas.

Solar panels mounted on the Casita roof require the Casita to be in a sunny location which is very undesirable in hot weather. Solar panels mounted on the Casita roof can be damaged by road debris and adverse weather conditions, e.g., dust storms, hail, wind, etc. Solar panels mounted on the Casita roof are more difficult to keep clean of dust and snow. Solar panels mounted on the Casita roof significantly increase the aerodynamic drag when towing which reduces MPG. And solar panels mounted on the Casita roof require making multiple penetrations into the Casita fiberglass structure for fastening and routing wire which can then become future water leak points.

Adding solar panels to the roof of a behemoth RV does have some merit, if you already made the mistake of owing a behemoth RV, since it has plenty of space and towing capacity for large solar panels, batteries and power Inverters and you will nearly always be staying in a sunny parking lot. However, the advantage and real benefit of owning a small RV like the Casita trailer is that you can easily do real camping in small tent sites in nicer places that have some scenery, trees and wildlife while avoiding being near the typically gluttonous and obnoxious people who own these obscene behemoth RVs that block the sun/view and run their smelly generators all night long. Nevertheless, we have found that remote backcountry camping where you only take the minimal stuff that you really need and can personally carry is far more enjoyable and fulfilling than even Casita trailer camping. If you are fortunate enough to live in the Pacific Northwest and are adventurous, physically-able and self-reliant, we highly recommend joining the **Mountaineers** and being around people who don't live a degenerate, gluttonous and greed-based life.


RENOGY
11.2 A
VOYAGER
SOLAR CHARGE CONTROLLER
12 VOLT
20 AMP


RENOGY
13.6 V
LiFePO4
Hold for 3 sec. for settings
100%
VOYAGER
SOLAR CHARGE CONTROLLER
12 VOLT
20 AMP


RENOGY

Access Hatch Thumb Locks

We removed all our Casita OEM keyed thumb locks on the four exterior access hatches to eliminate the needless frustration of having to fumble around with keys to open and close them. Casita uses the same CH751 keys that likely every RV OEM uses so there isn't any real security in using their keyed thumb locks. We replaced the thin, uninsulated water fill and shore power cord access hatch Casita OEM keyed thumb locks with **JR Products** non-keyed thumb locks (J4500115, 5/8 inch). We replaced the thick, insulated water tank access hatch Casita OEM keyed thumb lock with a non-keyed thumb lock (J4500135, 1-1/8 inch). We replaced the thick, insulated battery compartment access hatch Casita OEM keyed thumb lock with a unique keyed thumb lock (J4500185, 1-3/8 inch) and we also use a **RV Whisper** door sensor on this battery compartment hatch and battery holding angle bolt locks for additional security too.


WARNING
THIS CONNECTION IS FOR 110-125-VOLT AC, 60 HZ, 30 AMPERE SUPPLY.
DO NOT EXCEED CIRCUIT RATING.
EXCEEDING THE CIRCUIT RATING MAY CAUSE A FIRE AND RESULT IN DEATH OR SERIOUS INJURY.
AS-14B

Awning, Accessories & Security

We added a **Keder Rail Awning System** which is far more aerodynamic, far lighter weight, far less complex and thus far less prone to failure, and far less expensive than the Casita OEM Fiamma Awning Installation. And we think the aerodynamic streamlined Casita trailer just looks and performs much better without an afterthought, boxy looking and ugly Casita OEM Fiamma Awning Installation.

It is aerodynamic drag that largely and continuously reduces MPG while towing. And aerodynamic drag rapidly increases by the square of the speed so driving faster rapidly requires much more tow vehicle power and rapidly reduces MPG. Trailer weight only reduces MPG when accelerating to your steady state towing speed or when going uphill. Many people under-appreciate the cumulative effect and benefit that reducing aerodynamic drag and reducing tow vehicle power has on increasing MPG and thereby reducing overall fuel usage/expense. Taking advantage of several small reductions in aerodynamic drag (e.g., not having a Casita OEM Fiamma Awning, roof mounted solar panels, external storage containers/shelves and using a smaller, aerodynamic streamlined tow vehicle and trailer, etc.) and reducing parasitic tow vehicle power losses (e.g., not using tow vehicle alternator to charge the trailer battery or power the trailer refrigerator, etc.) whenever possible does all add up to increase MPG and thereby significantly reduce overall fuel usage/expense, especially when one considers the many years and long distance one may tow a trailer.

We used and installed **Keder 8.5mm Aluminum Awning Rail** on BOTH the driver side and the passenger side of our Casita trailer for maximum camping flexibility. These Keder rails accept 6mm, 7.5mm and 8.5mm awning welts. Our 90 inch long (driver side) and our 82 inch long (passenger side) Keder rails were installed using **3M VHB 5952 Tape** and four stainless steel 1/4-20 1-1/8 inch long screws and stainless steel acorn nuts on each side using the existing penetrations that Casita used to fasten our Casita upper cabinets. This approach avoids the need to create additional penetrations which can then become future water leak points and this approach also utilizes the upper cabinet structure as a backing plate which further increases the Keder rail pullout strength. When the Awning is installed at these Keder rail locations, the Awning is 79 inches in height above ground level with our Casita trailer high lift axle. **Zialoc 2200 White Silicone Sealant** was also used to further seal these penetration holes and the Keder rails. We currently use an 81 inch x 96 inch awning with a 7.5mm welt which was custom made by **Marti's Awnings** and we use **Green Elephant Telescoping Poles** and **Glow in the Dark Tent Stakes** to support the far end of the awning. Working with Kelly Franklin from Marti's Awnings on this project was a real pleasure.

Our Keder Rail Awning System is advantageous for short stops and enables keeping the sun off BOTH the driver side or the passenger side of our Casita trailer as desired. Our Keder Rail Awning System does NOT allow rain water to flow between it and the Casita trailer which is a common complaint for the Casita OEM Fiamma Awning Installation. One can also select whatever color and style of awning one desires and one can then easily replace it in the future if this is ever needed or desired.

Nevertheless and for longer stays, our best camping accessory by far has been our **Clam Pavilion Screen Tent**. It provides a large outdoor space free from bugs and weather that can be easily heated with our propane **Camco Campfire** while also providing a great enclosed and secure space for our cats to safely enjoy the outdoors. Our Clam Pavilion Screen Tent can be easily set-up or taken down in 60 seconds or less and it can be placed wherever desired as it is not limited by the Casita trailer location like Fiamma Awning Installation or our Keder Rail Awning System. The only real disadvantage of the Clam Pavilion Tent is that it somewhat bulky, heavy and long. However, the Clam Pavilion Tent easily fits within the canopy of our Honda Ridgeline truck and the two of us can easily set it up and take it down. We have played many backgammon games and enjoyed many happy hour drinks and meals in our Clam Pavilion Screen Tent in the fine company of our cats in all sorts of weather.

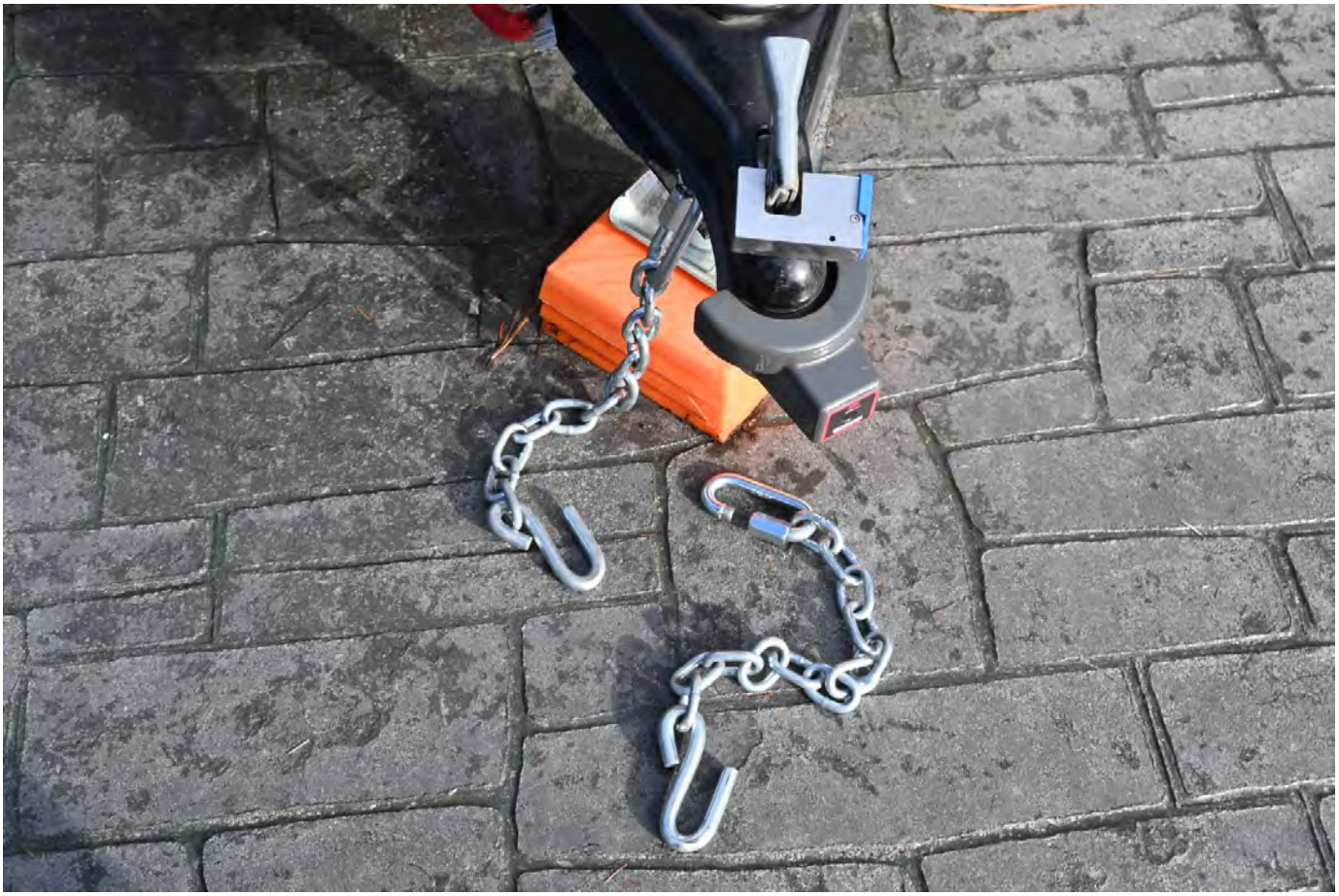
The COMBINED cost of BOTH our Keder Rail Awning System and our Clam Pavilion Screen Tent was far less than the cost of a Casita OEM Fiamma Awning Installation which also helped fund our other refinements.

And speaking of accessories, all of our locks (i.e., battery compartment access hatch lock, battery holding angle bolt locks, entry door lock, hitch ball lock, hitch coupler lock, propane tank clamp lock, tire lock lugs, wheel clamp locks and window clamp locks), removable safety chains, **RV Whisper** and **TRAK4** provides us some peace of mind. While there isn't a lock or security system that can't be easily defeated by a determined thief, defeating multiple locks and security systems does take some additional time which may enable one to employ other measures to defeat the thieves. Furthermore, thieves are more likely to strike softer targets than more difficult and riskier targets. And there are always RVs in campgrounds whose owners don't take any security measures at all which provides us even more peace of mind.

Pursuant to federal law **USC § 926A**, firearms can currently be transported with you while traveling across all States. And a good attorney will successfully defend you should you ever need to access and use them should you fear for your life while traveling or while staying in your temporary Casita home in an increasingly dangerous and life threatening Country. Peace Officers can currently also conceal carry in all States too. And to be perfectly clear, we fully support extensive and vigorous firearm background checks and prosecuting and confiscating firearms from those individuals who have them and can't pass a background check. Like driving, towing a RV and running for public office, we believe some things are only privileges that must first be earned by demonstrating that one is first a competent, law-abiding, trustworthy citizen in good standing.

Unfortunately, our Constitution has been proven to be ineffective and obsolete and is politically interpreted by deranged self-serving people who are not elected, who can be easily bribed and influenced, who are not required to represent the majority interests of the general population and who can't be held accountable for any of their actions. And when the majority interests of the general population are not represented, you don't have a **Democracy** where power is vested with the general population. You have an **Autocracy** where only a select group of powerful and wealthy deranged self-serving people have this vested power. And rest assured that these deranged self-serving people will ultimately always take away all general population personal freedoms that can threaten or weaken them including the privilege to have firearms, speak the truth and even make personal decisions that only affect the individual in order to further pursue their deranged self-serving agenda by further increasing their control, power and wealth. If you do NOT believe this, talk in private sometime with a person from China, Iran, North Korea, Philippines, Russia or Saudi Arabia. We have extensively traveled the world and have talked to many people living in Autocratic governments. These are not places that you will enjoy or feel safe living in, so you might want to seriously consider trading your mistaken anger/fear-induced faux news and social media brainwashing beliefs for actual critical thinking skills, reality and truth. It is truly amazing to us how effective these carefully orchestrated brainwashing and propaganda machines created by these deranged self-serving people can so easily con and convince seemingly normal and intelligent people to believe untruths and do things that go totally against their best interests and personal welfare.

A good RV insurance policy provides the ultimate peace of mind with regard to RV damage/loss.




CITY OF EDMONDS
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Curtains

We replaced our Casita OEM hard, heavy-weight, and noisy metal blinds with soft, light-weight and quiet curtains. For the curtain hanging hardware, we used **RECMAR 3208** PVC plastic curtain tracks, **RECMAR 3050** black ABS plastic eye slides, and **RECMAR 3030** black stainless steel end stops. The curtain tracks were fastened to the window frame in same location that Casita uses for the blinds using five ¾ inch sheet metal screws per window. Well-secured curtain tracks perform way better than curtain rods in moving vehicles. We initially used low cost ($30 total), thin fabric, standard/widely available, 24 inches length, light green Café curtains. After testing our curtain system and determining the perfect curtain sizes needed for each window, we purchased and are awaiting delivery of thicker insulated/blackout fabric, custom sized, dark gray Pinch Pleat curtains from **BelleCoseHome**, which while costing significantly more than our initial Café curtains, were significantly less cost than the other custom curtain options often suggested on social media (e.g., Dyers RV, Gary Manufacturing, etc.) and reportedly of better quality too. We shall see…and we should hopefully have them after returning from our 2024 Winter trip to the Arizona desert and **Puerto Penasco Mexico** on the Sea of Cortez where we sailed with our children in past years. Our Casita OEM metal blind elastic fabric locks were retained and repurposed for use as open curtain tie points.

Unlike metal blinds, curtains do NOT need to be locked into place before traveling and do NOT create condensation, corrode/rust and create the potential for mildew. There's nothing worse than hitting these noisy metal blinds in the middle of the night and then sometimes also have cold water fall onto your face! And speaking of condensation and humidity, we use several **DampRid Dehumidifiers** which are a desiccant type of dehumidifier to mitigate this issue when storing our Casita travel trailer. Unlike refrigerant or thermo-electric types of dehumidifiers, desiccant dehumidifiers work well at very low temperatures and don't use any electrical power at all. When actually camping in our Casita travel while in high humidity conditions, we use a **Pro Breeze Mini Dehumidifier**, which is a thermo-electric type of dehumidifier which are far lower cost, far quieter and use far less electric power (only 23 Watts) than a refrigerant type of dehumidifier. We can operate this Pro Breeze Mini Dehumidifier continuously for about 35 hours using only our 100AH lithium battery power without recharging it…and we typically recharge after only 12 hours of overnight usage via our solar panels. To learn more about dew point temperature and condensation formation, please see our **Psychrometrics Calculator** and our **Building Assembly Moisture Analysis Calculator**.


Sealy
DOWN ALTERNATIVE
EXIT
EXIT

Scissor Jacks

We replaced our Casita OEM two weak Scissor “Stabilizers” with four strong **BAL 24002D Scissor "Jacks"**, to provide better Casita stabilization when camping and to enable easy Casita jacking for replacing a failed tire on the road and easy accomplishment of any future Casita maintenance tasks underneath our Casita without having to rely on or trust someone else to properly jack our Casita without damaging it. Maximum Casita weight is limited to its maximum axle load of 3,500 pounds. These BAL Scissor Jacks are each rated for 7,500 pounds load capacity. So jacking up a maximum weight 3,500 pound Casita on four of these BAL Scissor Jacks only uses about 12% (i.e., 3,500 divided by 30,000 times 100) of their rated load capacity. Our fully loaded for travel Casita weighs in at 2890 pounds, so our jacks will at most only see about 9.6 percent of their rated load capacity. ***Nevertheless, it would still be dangerous and foolish to work under any vehicle ONLY supported on jacks and proper jack stands or blocks MUST also be properly placed and used whenever working underneath a vehicle or for keeping a vehicle jacked up for long durations.***

These Scissor Jacks need to be properly welded onto the proper sections of the Casita frame using proper welding plates that have the proper Scissor Jack bolt mounting hole spacing which may be obtained from **Little House Customs**. These welding plates come with grade 2 bolts (74,000 PSI tensile strength) that enable the Scissor Jacks to be easily replaced should they ever become damaged or fail. While the supplied bolts are entirely adequate for this application, we elected to use stronger grade 5 (120,000 PSI tensile strength) stainless steel 3/8-16 bolts, nuts and split lock washers installed with **Permatex Anti-Seize Lubricant** to prevent corrosion and galling. ***It should be noted that the BAL scissor jack handles are designed to intentionally fail at a very light load, likely as a company legal insurance policy, so we sent them to our scrap pile to be decarbonized and converted into wrought iron which is then used to make handmade fire tools and other useful items.*** We primarily use a **Camco Scissor Jack Socket** and our DeWalt cordless drill (NEVER use a cordless impact driver) for extending/retracting our Scissor Jacks and we use our **Craftsman Speeder Handle** as a secondary manual backup.

We used our portable Lincoln 140MP “Multi-Process” welder in MIG mode and Lincoln steel self-shielded 0.035 NR-211MP (DC-) wire to accomplish this relatively simple welding task. We use **BOESHIELD T9** to lubricate and protect our Scissor Jack Acme threads. BOESHIELD T9 performs far better than WD40 or any other dry lubricants we are aware of and one should definitely NEVER use greasy or wet lubricants which will collect road grit and then cause high friction, binding and eventual failure of the Acme threads. BOESHIELD T9 was developed by Boeing back when they were a great aerospace engineering company. Bob had a **distinguished 35 year career** with Boeing designing control systems for airplanes, missiles, rockets, rotorcraft and wind tunnels before leaving in 2015 to maintain his professional ethics, personal morality, physical well-being and mental sanity from disingenuousness and degenerate executives promoted on the basis of nepotism far above their competency level that took over control and misdirection of the company solely for selfish personal gain.

We retained our Casita OEM Scissor Stabilizer brackets that are welded onto the frame along with the mounting hardware to repurpose them to support a sewer hose carrier custom constructed from 72 inches long and 6 inches in diameter PVC pipe and end fittings (please see below for more details on this refinement).

It should be noted that holes should NEVER be drilled into the Casita structural frame because of how frame structure transmits and addresses the associated forces and moments it experiences. For example, the horizontal elements of an I-beam are called the flanges and the vertical element is called the web. The web resists shear forces and the flanges resist the bending moment experienced by the I-beam. Drilling holes into either the web or flanges will create stress concentration points that significantly weaken the frame structure causing it to be much more susceptible to failure which can even occur at other locations than where the holes were drilled.

Sewer Hose Carrier

We custom constructed a sewer hose carrier from 72 inches long and 6 inches in diameter PVC pipe and end fittings and supported it under our Casita trailer using the existing Casita OEM scissor stabilizer brackets that are welded onto the frame. Some people use the Casita OEM hollow rear bumper to store their sewer hose, but it makes little sense to us to put a wet hose into a steel container that will then rust. Furthermore, our Casita OEM rear bumper isn't nearly big enough to hold our sewer hose with their associated fittings. Our 6 inches in diameter PVC sewer hose carrier can easily hold our **Camco RhinoFlex 15 Feet Sewer Hose Kit**, our **Camco RhinoFlex 5 Feet Sewer Hose Extension**, our **Camco RhinoFlex 10 Feet Clean Out Hose Kit,** our **Camco Holding Tank Flexible Swivel Stik**, our sanitary gloves and our hand cleaner. We placed this sewer hose carrier such as to be the first place that will bottom out on uneven terrain to ensure not damaging our potable water tank hose bib valve, rear bumper, or scissor jacks. We also lined the inside of our Casita rear bumper with a square PVC fence tube and we use it to store our **SpaceX Affiliate** **Starlink Roam** satellite dish mast and our **Keder Rail Awning System** poles.

Lithium Battery Upgrade

A Group 27 LIFEPO4 battery has 2 times the usable Amp Hour (AH) capability of the Casita OEM Group 27 lead acid battery and at least 3 times the life expectancy. Some LIFEPO4 battery manufactures even claim as much as 10 times the life expectancy. So if a replacement Group 27 LIFEPO4battery can be obtained for less than 6 times the cost of a Group 27 lead acid battery (2 times AH capacity and 3 times life expectancy), it will most certainly have a positive Return on Investment…that is, if you happen to camp or live that long… A LIFEPO4 battery can also be charged 5 times faster than a lead acid battery which makes small solar panel charging very practical and extremely effective. A LIFEPO4 battery does NOT require any maintenance at all. A Group 27 LIFEPO4 battery is about half the weight of the Casita OEM Group 27 lead acid battery which weighs 52 pounds.

Our Casita OEM lead acid battery was showing signs of nearing the end of its dependable life from having undergone many charge cycles during our first year of very active dry camping ownership so we elected to upgrade to a **Renogy 100AH LiFePO4 Deep Cycle Self-Heating Battery** having a C1.0 maximum continuous discharge current rating (i.e., 1A maximum discharge current per battery Amp Hour capacity or 100A for a 100AH battery) and a C1.3 maximum short duration discharge current rating (i.e., 1.3A maximum discharge current per battery Amp Hour capacity or 130A), weighs 26 pounds, automatically self-heats using charge power to enable charging the battery in cold weather, and fits in our Casita OEM Group 27 battery compartment without needing any modification other than drilling and using 2-1/2 inch leg holding angles in lieu of our Casita OEM 2 inch leg holding angles.

Although this LIFEPO4 battery reduces our Casita trailer weight by 26 pounds and reduces our trailer axle load by 34.4 pounds, it does increase our trailer tongue weight by 8.4 pounds. However, with our fully loaded 2890 pound Casita trailer and our Andersen Weight Distribution Hitch, our trailer tongue weight is 295 pounds which is only 49.2% of our Honda Ridgeline tow vehicle's maximum tongue weight limit and results in a 10.2% trailer tongue weight to trailer weight ratio and 85.5% tow vehicle front axle load restoration which are within the recommended ranges for good all-weather tow vehicle handling and safe trailer towing. Please see our **Casita Travel Trailer Weight & Balance Calculator** and our **Andersen Weight Distribution Hitch Calculator** for understanding and accurately quantifying this.

For LiFePO4 lithium batteries, it is recommended to use 13.6VDC (i.e., the lower Idle Stage charging voltage) for battery charging calculations. Our replacement **Progressive Dynamics PD9145ALV Converter/Charger**, designed expressly for LIFEPO4 batteries and capable of providing a 45A maximum charge current (please see below for more details on this refinement), can fully charge our 100% depleted 100AH LIFEPO4 battery in 2.2 hours (i.e., 100AH divided by 45A) or our 50% depleted LIFEPO4 battery in 1.1 hours. Under perfect solar conditions our 200 Watt solar panels with a 75% efficient Pulse Width Modulation (PWM) solar charge controller can generate a 11A charge current (i.e., 0.75 times 200 divided by 13.6VDC) and can fully charge our 50% depleted LIFEPO4 battery (i.e., our absolute extreme worst case battery depletion given our worst case 24 hour maximum power usage rate) in 4.5 hours (i.e., 50AH divided by 11A)...and perhaps twice this long (i.e., 9.1 hours) under marginal solar conditions.

We do NOT allow our tow vehicle to charge our LIFEPO4 battery at all as this isn't required at all given our 100AH LIFEPO4 battery capacity, our 200 Watt solar panel charging capability and our 45A Charger/Converter charging capability which can be used with either shore power or our small **Honda EU2200i** propane modified generator. This thoughtful, integrated design approach and operational plan eliminates any need of having to use an additional and very expensive DC to DC battery charger (e.g., **Renogy DC to DC Battery Charger**) to accomplish this purpose, reduces stress on our tow vehicle alternator and slightly increases our tow vehicle MPG. ***However, please be forewarned to NEVER suggest anything like this on the Casita Forum, which is NOT affiliated in any way with Casita Travel Trailer, or you will be quickly fire-stormed by either weak-minded individuals lacking critical thinking skills or by degenerates who apparently benefit in some deranged way by hanging out in social media forums to spew and advocate nonsense over facts and truth to push their personal agenda.*** This is likely from having personally made many poor life decisions themselves, fools of a feather tend to flock together and misery always loves company. Or maybe they are members to the fossil fuel cartel who deny man-made global warming, force women to have their offspring without being financially responsible and who put themselves and their greed above all things. But as

Mark Twain so eloquently well stated…"Never argue with stupid evil people as they will only bring you down to their low level and beat you with experience!" And it has also been alleged that there are some people who hawk their products/services via this forum who have the ability initiate these fire-storms and thereby effectively censor anything that could adversely affect personal agenda. Furthermore, any contributions that you post on this forum will not be Internet searchable because all the information on this forum is excluded from Internet search engines. So participation on this forum is not the best use of one's precious time if one is truly interested in actually providing factual and useful information to those who are actually capable of appreciating and benefitting from the same. If you Google "Gayle & Bob Los Gatos Casita" you will find many contributions that we have made to other less disingenuous and Internet searchable RV forums that may be of possible interest to you. But again, social media is the worst place to obtain factual and truthful information. ***So be wise and do your own independent research and carefully consider all the pros/cons before making any decisions that you may later badly regret!***

LIFEPO4 battery voltage doesn't decrease in a predictable and reliable fashion like lead acid batteries, so one can't accurately determine the State of Charge (SOC) of LIFEPO4 batteries by only just using the battery voltage. A fully charged nominal 12VDC LIFEPO4 battery should read between 13.4VDC for an older battery and 13.6VDC for a newer battery when the battery is at rest (i.e., is NOT being charged or discharged). At a low 20% SOC level, which is the recommended lowest SOC level one should go to maximize LIFEPO4 battery life, this drops to about 12.8VDC and this is only a valid approximation when a constant 0.2C discharge rate (i.e., 20A for a 100AH battery) was used to reach this 20% SOC level. Fortunately, the Renogy LIFEPO4 Battery Management System (BMS), which is currently considered the most capable and safest BMS in the lithium battery RV industry, can very accurately determine SOC and many other useful parameters (e.g., voltage, current, remaining AH capacity, remaining hours of time, warning codes, battery self-heating status and number of active paralleled batteries in a battery bank) and can conveniently display all this information along with easily enabling one to put this LIFEPO4 battery into an optimal hibernation state for long term storage. So this Renogy BMS eliminates any need of having to use an additional and very expensive battery shunt device (e.g., **Victron Smartshunt**) to accomplish this purpose. Consequently, we used the **Renogy Battery Monitoring Screen** that came with their LIFEPO4 battery and mounted it adjacent to our Renogy Inverter Control Panel.

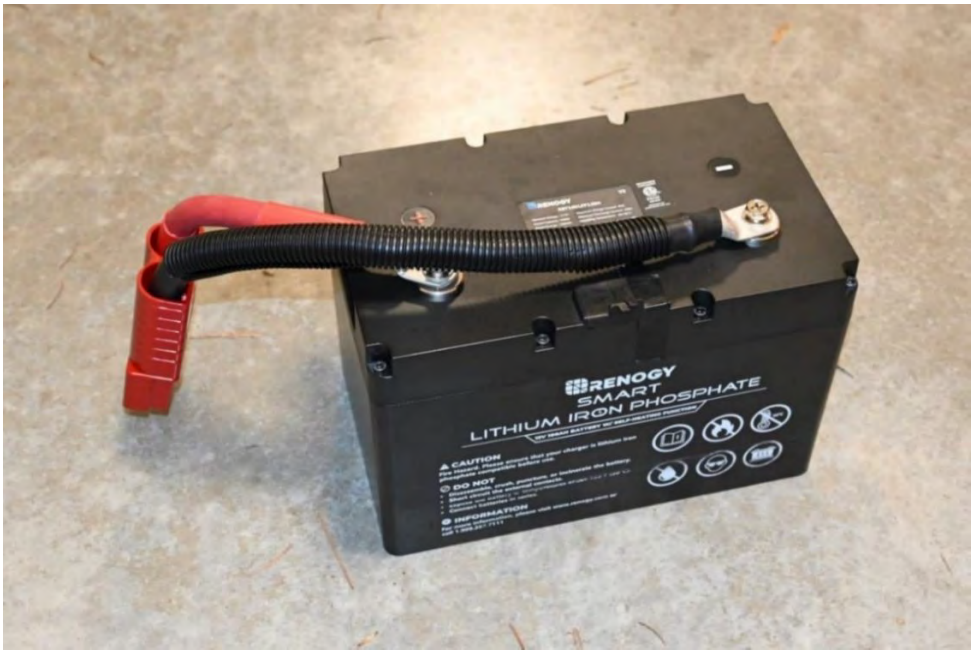
It should be noted that LIFEPO4 batteries charge much faster than lead acid batteries by using a much higher charge current. To handle our LIFEPO4 Charger/Converter 45A maximum charge current, our Casita OEM 40A auto resetting circuit breaker was replaced with a high quality 50A auto resetting circuit breaker with Ignition Protection AND a 60A Maxi Blade fuse was also placed in series with this auto resetting circuit breaker to prevent it from resetting multiple times if there is some Casita trailer electrical system failure causing a very high current in excess of our design limits. There have been reports of auto resetting circuit breakers resetting multiple times until there is a circuit breaker or a wire insulation meltdown that then results in an electrical fire. And allowing this auto resetting circuit breaker to repeatedly trip and reset will cause premature failure of both the circuit breaker and the Charger/Converter. We don't want to experience this while camping.

Hopefully, our LIFEPO4 battery will last until battery technology improves further and a C2.7 or higher maximum discharge current rating Group 27 battery becomes available (i.e., 2.7A or higher maximum discharge current per battery Amp Hour capacity or 270A or higher for a 100AH battery). Yes, one could also double or triple both the AH and maximum discharge current rating by creating a battery bank of multiple batteries all connected in parallel, i.e., connecting all the positive battery terminals together and connecting all the negative battery terminals together. For example, connecting two 100AH batteries in parallel together, each rated for a 100A maximum discharge current limit would create a battery bank having a 200AH and a 200A maximum discharge current limit. However, if you also have a convenient, light-weight, quiet and reliable propane generator, there is little benefit to creating a battery bank at all as your generator can supply all of your long duration 120VAC power needs and is far more cost effective and lighter weight than a large battery bank, large solar panels and large power Inverter too.

Our 100AH LIFEPO4 battery in concert with our added **Renogy Solar Foldable Solar Suitcase** and our added **Renogy 3000 Watt Pure Sine Wave Inverter** easily satisfies all our 12VDC long duration power needs (e.g., our electronic monitoring, entertainment, internet, lighting, etc.) and easily satisfies all of our 120VAC

short duration power needs (e.g., our hair dryer, microwave oven, toaster oven, toilet bidet seat, vacuum, etc.) which enables us to conveniently dry camp indefinitely without needing to operate our small **Honda EU2200i** propane modified generator in places that don't require air conditioning. But having and operating our generator also enables us to conveniently dry camp indefinitely in places that do require air conditioning as long as we can obtain propane...which we will always need anyhow for our hot water heater, refrigerator and stove when dry camping in hot weather...and which we will also always need anyhow for our furnace, hot water heater, refrigerator and stove when dry camping in cold weather.

Now if you always camp in places with shore power, you don't even need a battery or a generator at all as 120VAC shore power will enable you to use your 120VAC air conditioner, hot water heater and refrigerator and will also power your Charger/Converter which will enable you to satisfy all your 12VDC power needs. And you will NOT need a propane furnace or a propane stove either as you can use an **Electric Space Heater** and an **Electric Induction Stove**, which is what we use when we have shore power to avoid using any propane at all. And if you are adventurous, physically-able and self-reliant, you don't even need a RV at all as you can go on foot and camp in the best places in the country and in the world with few needs and few people to ruin your experience and create great lasting memories which is all you will have at the end of your life journey.

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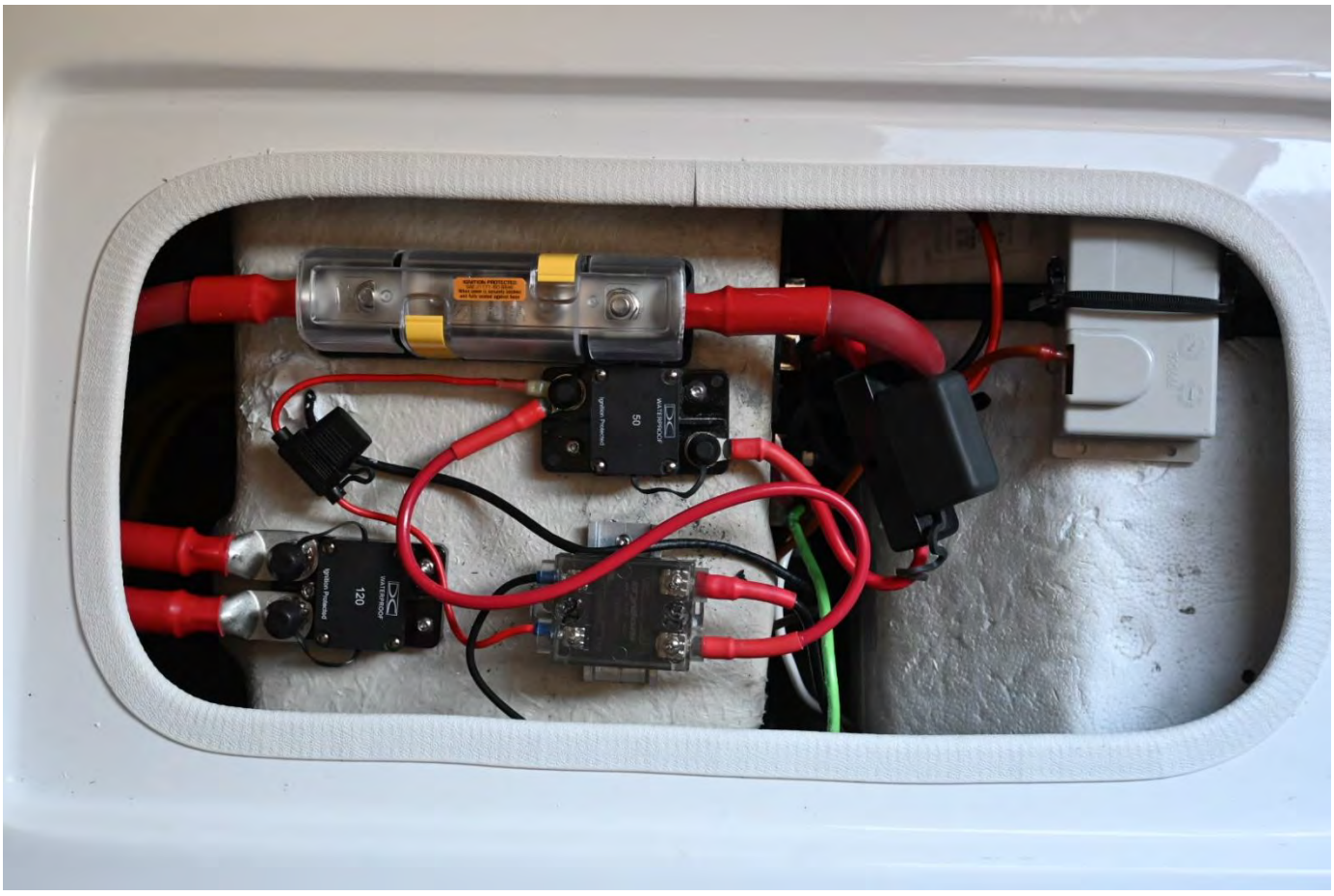
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RENOGY
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50A 120/240VAC True Split-Phase Service Capability

The 30A (3,600 Watts) 120VAC only capability Casita OEM **WFCO WF-8955-AD Power Center** is used to convert 120VAC to 12VDC, charge RV batteries, protect all 120VAC circuits using circuit breakers, protect all 12VDC circuits using ATC fuses and provide the central distribution wiring point for all Casita trailer 120VAC and 12VDC circuits. Here is a reliable and simple to understand **RV 30A versus 50A Service Electrical Tutorial** if your knowledge of this specific subject is lacking. And here is both a very interesting and very detailed **Electricity Tutorial** if you truly want to greatly expand your overall knowledge on this subject.

After giving this some deep thought and doing much research, we decided to upgrade our marginal 30A (3,600 Watts) 120VAC only capability Casita OEM Power Center to 50A (12,000 Watts) 120/240VAC true split-phase capability for any future Casita trailer refinements that could benefit from having this increased power and additional 240VAC circuit capability. We selected the **Progressive Dynamics PD55K000 AC Distribution Panel** which has a 50A rated staggered split-phase bus bar option that supports using standard residential, low cost single-pole 120VAC circuit breakers, single-pole tandem 120VAC circuit breakers and dual-pole 240AC circuit breakers. Every other power center or AC distribution panel we researched only had bus bars that could support single-pole 120VAC circuit breakers and single-pole tandem 120VAC circuit breakers and typically could only use non-standard and expensive circuit breakers.

We selected a **Progressive Dynamics PD60A DC Distribution Panel** which can hold eighteen 20A ATC fuses (three of which can even be 30A ATC fuses) with LED indicators to alert/identify blown fuses and uses our favorite WAGO connectors. It should be noted that the safest policy is to only use ATC fuses for boats and RVs that could experience a propane leak which could then result in an explosion if ATO fuses are used. The "C" in ATC means these fuses are closed and sealed from the environment. The "O" in ATO means these fuses are open and NOT sealed from the environment.

The hole in the seat bench for our Casita OEM Power Center was 12 inches wide x 11-1/2 inches high. This hole was made 4 inches wider to 16 inches wide total and oak hardwood was used to construct a strong doweled 19 inches wide x 12-1/4 inches high frame for mounting the electrical flush mount AC and DC distribution panels. The oak frame was finished with black walnut stain and Polyurethane. A 2x6 header was placed above the hole to strengthen the bench seat in this area. This header is supported by 2x4s on the sides and a 2x4 was placed at the bottom of the AC and DC distribution panels to provide additional support and strength. This 2x6 and 2x4 structure also acts as a backing plate for the AC and DC distribution panels allowing them to be fastened with 8 wood screws.

For some bizarre reason, our Casita OEM **WFCO WF-8955-AD-MBA Converter/Charger** uses a microprocessor and firmware to “Auto Detect” (AD) the type of the battery in order to then select the proper battery charge profile (e.g., lead acid battery, lithium battery, etc.). There have been many reports of this WFCO-8955-AD-MBA Converter/Charger reverting from the lithium battery charge profile to the lead acid battery charge profile (even AFTER getting it updated with the latest firmware…v1.19 as of this writing). We decided we just didn’t want to risk and experience this while camping. Frankly, it makes little sense to us why a company would complicate what should be a very simple and robust battery charging device with a microprocessor and firmware when a simple jumper pin or switch would certainly be more reliable? Perhaps to help address the situation of having to deal with an increasing clueless and ignorant population working on RVs who might not be capable of toggling the jumper pin or switch correctly given the type of battery being used? In any event and sad to say, this WFCO design approach didn’t instill us with very much confidence in their products in general.

Furthermore, our Casita OEM Converter/Charger when in the lithium battery Bulk charge profile charged at 14.6VDC and 55A and our **Renogy 100AH LiFePO4 Deep Cycle Self-Heating Battery** calls for a 14.4VDC maximum charge voltage and is only rated for a maximum charge current of 50A. There have been reports that exceeding the maximum charge voltage or maximum charge current rating of lithium batteries that use a Battery Management System (BMS) by even a small amount can cause the BMS to disconnect the battery which can then require having to accomplish a complicated BMS reset procedure. And then there is also the remote but potential situation of the lithium battery BMS completely failing and allowing the lithium battery to

charge above its maximum charge current rating which could then cause the lithium battery to fail and self-ignite. So, we didn't feel the need to push these limits or personally test this out while camping.

Therefore, after giving this some deep thought and doing much research, we also decided to replace our Casita OEM WFCO WF-8955-AD-MBA Converter/Charger with a **Progressive Dynamics PD9145ALV Converter/Charger** which automatically only uses proper LiFePO4 charge profiles (14.4VDC Bulk Stage and 13.6VDC Idle Stage) given the charge state and actual real-time usage of the LiFePO4 battery and can only physically provide a maximum charge current of 45A. And we also have a **Progressive Dynamics PD92201 Converter/Charger Remote Pendant** which provides remote annunciation of the current LiFePO4 charge profile being used and also enables manual selection if desired.

In summary, a reliable Charger/Converter which automatically uses proper LiFePO4 Bulk Stage and Idle Stage voltage profiles, provides remote annunciation of the actual voltage stage profile being used while also enabling manual selection of the desired voltage profile stage charge to use, and charges at a lower maximum charge current (i.e., 45A) than the maximum charge current rating of our LiFePO4 battery (i.e., 50A), our replacement auto resetting circuit breaker (i.e., 50A) and our added Maxi Blade fuse (i.e., 60A) seemed like a much better approach and also remedied our safety concern with the original Casita OEM arrangement (please see our Improved Battery Disconnect Location/Functionality section for additional details on this). Our Charger/Converter was mounted on a shelf created above the back of the AC and DC distribution panels and simply plugs into a 120VAC electrical receptacle outlet on the back of our AC distribution panel and easily connects to our DC distribution panel. This location also makes our Charger/Converter very convenient/easy to access and keeps it out of harm's way should our Casita plumbing ever fail resulting in a water leak.

To bring shore power into our Casita trailer, we selected a **Mighty Cord 50A & 25 Feet Long Shore Power Cord** which works well with our Casita OEM shore power cord compartment access hatch and easily fits in the compartment. This 50A rated shore power cord can be connected directly to 50A service, indirectly connected to 30A service (using a proper 30/50A adapter) or indirectly connected to 20/15A service (i.e., using a proper 15/50A adapter OR using a proper 15/30A AND a proper 30/50A adapter).

Despite the ignorance you may encounter on social media, properly connecting a RV 50A shore power cord to 30A service, 20/15A service or even to electrical code non-complaint "cheater" 50A service (a single-pole 50A circuit breaker providing only 120VAC instead of a dual-pole 50A circuit breaker providing 240VAC) when using PROPER code-compliant adapters (i.e., an adapter that properly shares the one hot 120VAC leg from the service with BOTH hot legs of the 50A shore power cord) will have no adverse consequences to your RV, your shore power cord, the campground electrical wiring or anything else whatsoever other than that any dual-pole 240AC circuit breakers in your AC distribution panel will no longer provide 240VAC (i.e., they will present zero VAC across their two hot legs). And again, you will first need an AC distribution panel with a 50A rated staggered true split-phase bus bar that supports having BOTH 120VAC and 240VAC circuits…and all RV 50A Power Centers and nearly all RV 50A AC distribution panels do NOT have a staggered true split-phase bus bar and therefore can NOT support 240VAC circuits!

When connected to 50A, 30A or 20/15A service, all of our Casita OEM 120VAC circuits receive 120VAC exactly like they originally received with our 30A (3,600 Watts) 120VAC only capability Casita OEM Power Center and there was no need to rewire any of our Casita OEM 120VAC circuits beyond just connecting them to the new AC distribution panel 120VAC circuit breakers. And when connected to 50A service, we now have 12,000 Watt power 240VAC circuit capability for any future Casita trailer refinements we may make that require this increased power and 240VAC circuit capability. We use low cost, portable and small **Progressive Industries 30A and 50A Kits** which provide protection against power surges that could damage electronics and which also have testers to confirm correct shore power wiring and adequate power quality BEFORE actual hookup. We feel this is a better approach than using an expensive, hard-wired Electrical Management System (EMS) that would consume limited and valuable Casita interior space where it would need to be installed or using an expensive, portable EMS that could be easily stolen. This was a relatively low cost and simple refinement and we now have a much more capable AC/DC power system than even many multi-million dollar Class A motor homes.

It should be noted that Casita and likely the entire RV industry's wiring color code doesn't follow normal convention and this can create serious issues for the uninformed and uninitiated. Casita uses Black wire for positive 12VDC and White wire for negative 12VDC. And Casita uses Black wire for Hot 120VAC, White wire for Neutral 120VAC and Green or bare copper wire for Ground 120VAC. Every other electrical industry uses Red wire for positive 12VDC and Black wire for negative 12VDC. And uses either Black or Red wire for Hot 120/240VAC, White wire for Neutral 120/240VAC and Green or bare copper wire for Ground 120/240VAC. So one has to wonder why the RV industry and Casita didn't follow this normal convention and use Red wire for positive 12VDC and Black wire for negative 12VDC. And use Red wire for Hot 120VAC, White wire for Neutral 120VAC and Green or bare copper wire for Ground 120VAC? In any event, please be aware of this and please be very careful when working with the Casita wiring, especially with 12VDC circuits where you might be mistakenly tempted to think the Black wire is NEGATIVE 12VDC when it is in fact POSITIVE 12VDC. This likely explains why RV Chargers/Converters need and typically have reverse battery polarity fuse protection…

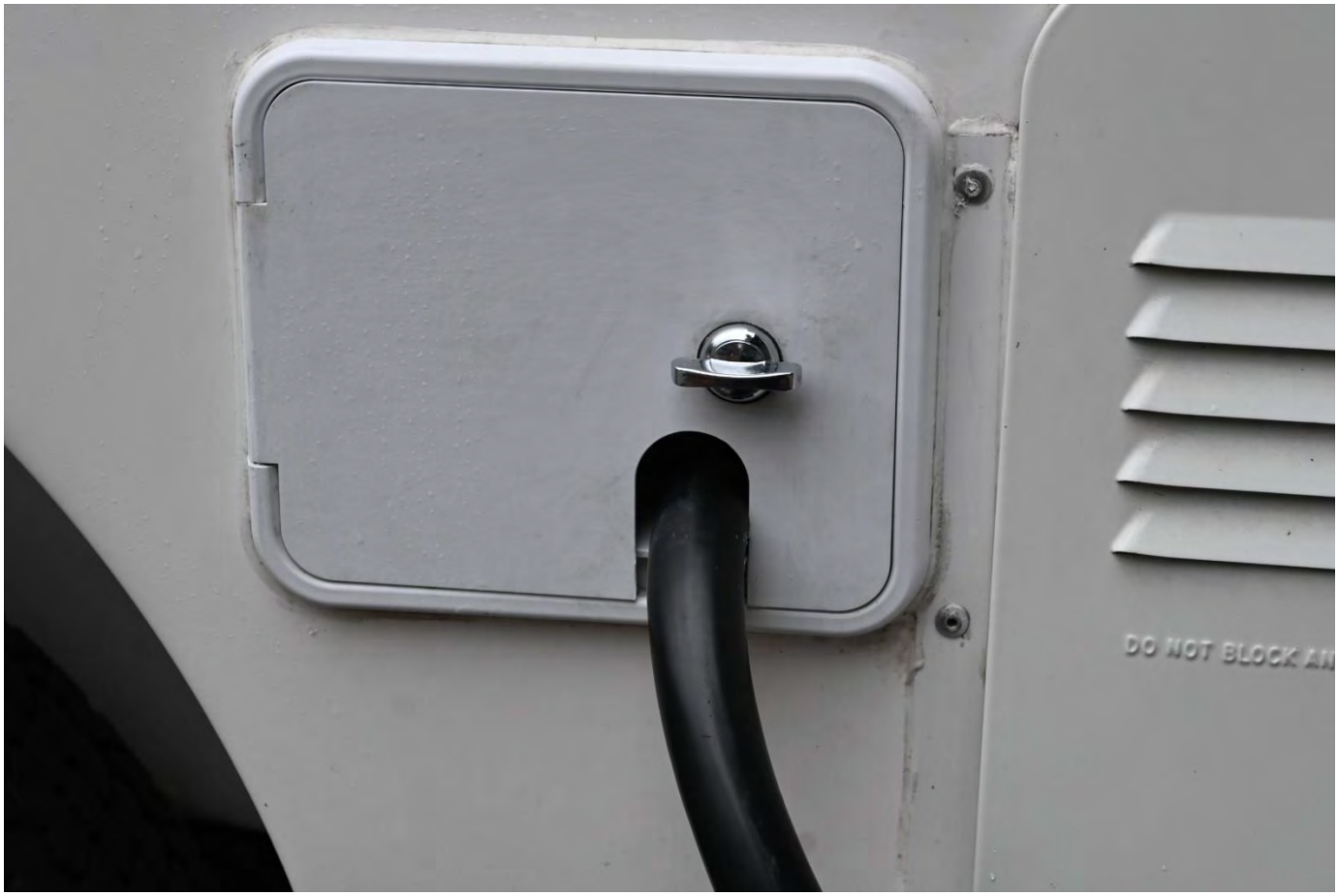

Model PD9145AL
3 STAGE LITHIUM CHARGING


JORGENSEN
JORGENSEN


MAIN
Power Control Center


INTELI-POWER 9100


Shore Power
Inverter Power


DO NOT BLOCK


Progressive Industries
50A
Progressive Industries
30A

Casita Cover

And of course, to complete these first year 2023 refinements, we purchased a Casita cover from **CalMark**. The CalMark website indicated that they were using **Sunbrella** material, but we were thrilled to discover that CalMark is now actually using **WeatherMax** material. We have decades of experience using both Sunbrella and WeatherMax for various sailboat covers and we have found WeatherMax to be preferable as WeatherMax is both lighter weight (which makes putting covers on and off much easier) and more durable long-term in windy and high UV maritime environments than Sunbrella material. There was about a 2 month CalMark production/delivery time, but we still received it just before Christmas…completing our first year of refinements just in time for our 2024 Winter trip to the Arizona desert and **Puerto Penasco Mexico** on the Sea of Cortez where we sailed with our children in past years.

Electric/Propane Tankless Hot Water Heater

If and when our Casita OEM Electric/Propane 6 gallon tank hot water heater fails, we hope to take advantage of our added 50A (12,000 Watts) 120/240VAC true split-phase service capability and hopefully replace this obsolete tank hot water heater with an Electric/Propane tankless hot water heater to provide endless hot water capability when using propane or when connected to 50A 120/240VAC shore power when we also have a readily-available supply of potable water and a convenient means to easily empty the gray water tank…which is now always the case for us when we are in campgrounds with hookups or when we are dry camping.

Well-designed, modern tankless hot water heaters don't have any significant delay and don't waste a significant amount of water. Tankless hot water heaters are ALWAYS more energy efficient than tank hot water heaters because they only heat water to the temperature you select and only for the short amount of time that you actually use this hot water as opposed to heating a tank of water to some high temperature and then having to keep heating it because of the continuous heat loss of the tank into the surroundings. This means that tankless hot water heaters use significantly less propane when dry camping than tank hot water heaters. Tankless hot water heaters require less space and weigh less than tank hot water heaters. Tankless hot water heaters don't need or use anodes that have to be frequently replaced and they don't have tanks that will collect grime, create Legionaries disease, corrode and eventually fail. Tankless hot water heaters do require periodic descaling using bypass valves in the system to allow pumping a descaling solution through just the tankless hot water heater.

RV propane tankless hot water heaters are already readily available that can generate 40 to 60 kBTU/H. However and unfortunately, RV Electric/Propane tankless hot water heaters are NOT available yet. We do NOT want to be forced to use propane to heat our hot water when we are paying for 50A service, water and sewer hookup and we want to take a long hot shower!

How much electric power a tankless hot water heater requires is solely a function of the hot water flow rate and the water temperature rise that is required (i.e., required power in BTU/H equals flow rate in GPM times delta temperature rise in degrees F times 500). Ideal shower temperature is 105 degrees F. A 0.8 GPM shower head is fairly common for dry camping when water isn't as readily available. If you set the tankless hot water heater to produce a maximum of 105 degrees F at the shower head, you don't need to also mix in and waste cold water to reduce the temperature to 105 degrees F. The objective here being to only create the minimum flow rate of hot water needed at only the highest water temperature needed to reduce the tankless hot water heater flow rate and water temperature rise requirements and hence also reduce the associated electric and propane requirements. The end result being a much more energy efficient, far longer life, RV hot water heater optimized for RV flow rates when dry camping using propane or when in campgrounds with 50A service without using propane.

A 240VAC circuit using a double-pole 30A circuit breaker (and actually only using a maximum of 27A) will generate 6.5 kW (i.e., 240VAC times 27A) or 22,000 BTU/H (i.e., 6,500 Watts times 3.41 BTU/H per Watt) which at a flow rate of 0.8 GPM could raise the input water temperature 55 degrees F (i.e., 22,000 BTU/H divided by 0.8 GPM divided by 500) which could then handle an input water temperature as cold as 50 degrees F (105 degrees F minus 55 degrees F) and achieve our 105 degrees F ideal shower temperature.

When using only propane, it could heat this 50 degrees F water to 105 degrees F at a 1.6 GPM flow rate (e.g., 44,000 BTU/H divided by 55 degrees F divided by 500). Or at a 0.8 GPM flow rate, it could raise the input water temperature 110 degrees F (i.e., 44,000 BTU/H divided by 0.8 GPM divided by 500) which would then allow handling even freezing 32 degrees F water and provide 142 degrees F water (i.e., 32 degrees F plus 110 degrees F).

When using both electric and propane at the same time like a standard RV tank hot water heater, it could heat this 50 degrees F water to 105 degrees F at a 2.4 GPM flow rate (e.g., 66,000 BTU/H divided by 55 degrees F divided by 500). Or at a 1.6 GPM flow rate, it could raise the input water temperature 83 degrees F (i.e., 66,000 BTU/H divided by 1.6 GPM divided by 500) which would then allow handling even freezing 32 degrees F water and provide 115 degrees F water (i.e., 32 degrees F plus 83 degrees F).

And when the input water temperature is warmer, which would nearly always be the case if you don't do Winter camping, it could provide even higher flow rates and/or provide even higher water temperatures.

So we are patiently waiting for some smart and innovative company to create an energy efficient, light-weight, dual fuel electric (240VAC 30A circuit) and propane (40 to 60 kBTU/H) tankless hot water heater to enable easy replacement of the dry camping unfriendly and obsolete Electric/Propane 6 gallon tank hot water heaters that we are currently forced to use in our RVs given the increasing number of RVs that now have 50A (12,000 Watts) 120/240VAC true split-phase service capability. A dedicated and optimized RV Electric/Propane tankless hot water heater design is much needed and would certainly become a very popular product. ***Updated March 2024: We are now actively working with a well-established German company to design, test and bring this RV optimized Electric/Propane tankless hot water heater to the marketplace. Goodbye obsolete RV tank hot water heaters!***

*** Provisional Awaiting Electric/Propane Tankless Hot Water Heater Test Unit ***