Xantrex Director of Engineer David Miller displays the company's Freedom EX 4000. The box houses a 48-volt, 4,000-watt inverter; an 80-amp, 48-volt battery charger; a 50-amp transfer relay and a 48-volt to 12-volt converter.

A 48-Volt Future

Although the market is growing slowly, suppliers believe 48-volt power systems are the RV industry's future.

By Kristen Fiore

As consumers look to stay unplugged from shore power for longer periods, 48-volt power systems are becoming a popular alternative in the RV market. Though they may initially cost more and pose higher-voltage safety risks, they are ultimately more efficient in various ways.

Representatives from three suppliers who offer 12- and 48-volt systems differ in their perspectives on present-day systems, but all believe 48-volt power is the industry's future.

What's the Difference?

The major difference between traditional 12- and 48-volt power systems is voltage. According to David Miller, directorofengineeringatXantrex, higher-voltage systems use lighter gauge wiring, saving cost and weight.

Volta Power Systems Advanced Engineering Vice President Kirk Chapman said, "A 48-volt system will really reduce the wire size. The big deal about bringing wire size down and being able to transfer more power more efficiently is how it brings the costs down."

Typically, 12-volt systems use 4-gauge wire, which is .2043 inches thick. A 48-volt system typically uses 8-gauge copper wire, which is 37.5% smaller at .1285 inches thick.

> *"To wrangle a 12-volt cable from the front of the RV to the back is not only expensive, the wiring is pretty heavy."*
>
> **– David Miller**

A standard system might use about 25 feet of copper wire throughout the RV. The 4-gauge wire will weigh about 31.5 pounds when 25 feet is used.

An 8-gauge wire, measured at 25 feet, will weigh 12.4 pounds, about 61% less weight than the 4-gauge wire.

Additionally, 12-volt systems may use positive and negative 4-gauge wire, contained in a plastic jacket. The systems would double the wire weight to 63 pounds. In these scenarios, the 48-volt system would use half the amount of copper wire and its wire would weigh 81.4% less.

If a manufacturer installed power systems in 150 RVs in a month, averaging 25 feet of copper wire in each, a 12-volt system would use wire weighing 9,450 pounds. A 48-volt system's wiring would weigh 1,860 pounds.

Smaller wire sizes also use less copper, which saves money. Copper prices have nearly doubled in the past three years.

For OEMs, Miller added that 48-volt systems can be more cost-efficient to install.

"To wrangle a 12-volt cable from the front of the RV to the back is not only expensive, the wiring is pretty heavy," he said, "so you save on the cost of the wiring but also potentially on the labor costs and weights."

Because total vehicle weight is important to OEMs, reducing materials' heft is attractive.

Installing a large 12-volt cable might also involve drilling larger holes through walls, Miller said, or positioning cables behind cabinetry—a tricky and labor-intensive endeavor.

Go Power's PowerBoard system contains all the components needed to power a 48-volt system in one place.

Go Power's PowerBoard System has three batteries to provide energy for the 48-volt system.

In recent months, Dometic and RecPro released 48-volt air conditioners. Although 48-volt rated ACs and other products are available to maximize 48-volt power systems' efficiency, 12-volt rated products, when paired with a converter, can be powered by 48-volt power systems.

Go Power recently worked with its parent company, Dometic, to launch its new 48-volt air conditioner. The AC unit is compatible with Go Power's PowerBoard system, which houses all the 48-volt power components together in one place.

> *"When you have a 48-volt power system, you can fit more energy and more power. You can use higher-voltage solar panels."*
>
> **– Kirk Chapman**

Mark Spilsbury, Go Power RV Division manager, said, "We are actually keeping the entire power system at 12-volt and then using a converter to up-convert from 12 to 48 to run the air conditioner. Then, everything else still runs the same way at 12 volts."

Full 48-volt power systems include batteries, inverters, solar power and charge controllers made specifically for 48 volts. These products are slowly hitting the RV market. RV manufacturers are carefully considering how 48-volt offerings could impact the RVs they build in the future.

48-Volt System Benefits

Chapman said, "Up front, it might cost more, but over time, the efficiency and longevity and the size of the weight savings for fuel is going to add up over the long run, and you are actually going to come out ahead with a 48-volt system."

The control for Volta's 48-volt power system in the 2024 Outside Van Approach motorhome displays the batteries' state of charge, temperature and charge time remaining.

Miller said consumers need not worry about blowing a breaker while using the AC and other appliances simultaneously because 48-volt systems can supply larger power loads with fewer batteries.

According to Chapman, larger power systems are scalable because they easily integrate with renewable sources such as solar and wind power.

As RVers move away from using generators to more environmentally friendly offerings, 48-volt systems will provide OEMs opportunities to brand their companies as "green."

Chapman said, "48-volt systems can work across a broader range of solar inputs. They give more adaptability to environmentally conscious people."

Xantrex's Freedom eGen power system combines lithium batteries, an inverter, solar power and a charge controller. The system will power RVs, boats, trucks and more. Freedom eGen is available both as a standard 12-volt or 48-volt system.

Miller said, "The main thing is, you can operate all these loads without really ever having to use gasoline or a diesel generator. You will not upset your neighbors at the RV park. You do not have to turn on the gas. You do not have to maintain a generator."

In addition, 48-volt power systems enable RVers to go off-grid or unplug from shore power for longer periods.

Suppliers said the growing off-grid market is driving 48-volt systems' increasing popularity. As campgrounds swell with RVs, OEMs have been adding more full-package adventure options.

Chapman said: "When you have a 48-volt power system, you can fit more energy and more power. You can use higher-voltage solar panels. It allows that flexibility."

Downsides of 48-Volt Systems

Because 48-volt technology is still relatively new, 12-volt systems dominate the market. Products made for 12-volt systems are easier to find and cost less.

According to Spilsbury, OEMs are used to working with 12-volt systems.

"Going full 48-volt is more expensive and takes a higher level of expertise to make sure it is all hooked up correctly," he said.

Higher-voltage systems have more safety concerns than 12-volt systems do. As Spilsbury noted, "12 volts are a tickle, whereas 48 volts is a bit scarier."

Despite this, Miller said Xantrex is supporting the 48-volt push and concedes that RV OEMs need time to get on board and transition.

"They are used to doing things the 12-volt way," he said. "When you get into the 50-volt range, people start getting more worried about shock hazards."

In addition, 12-volt systems today are more accessible to DIYers.

"A full 48-volt system is still new," Spilsbury said. "There are so many people and unknown players in it, so getting the right stuff, putting it together and having the DIY side or a dealer to do that properly is a little trickier."

Aftermarket

Volta Power Systems created a power system driven by a dedicated vehicle engine alternator to run RVs' equipment requiring power. The system can be installed as OE equipment or as an aftermarket replacement.

"We offer complete turnkey systems to have unlimited energy storage based on your needs," Chapman said.

"We design systems to be modular and scalable. ...We sell complete systems, not just parts and pieces."

He said that Volta's power distribution line of products is prewired and

Kirk Chapman is Volta Power Systems' Advanced Engineering vice president. He has been with the company since 2018.

Go Power RV Division Manager Mark Spilsbury (right) talks with an attendee about Dometic's 48-volt air conditioner, powered by Go Power's PowerBoard system, during the RV Hall of Fame Suppliers Show.

Volta's 48-volt power system powers all Outside Van Approach's appliances and electronics.

prefused. Having pre-wired/pre-fused products eases upfitting. Upfitters simply find a place to mount and run the wiring.

Because of safety concerns, Chapman said 48-volt systems are not available to DIYers. However, he said OE installations are not the only affordable installation option.

"We make them available at a very competitive price," Chapman said. "They can be tailored to very specific needs. You would not always be able to do that in an OEM. Forty-eight-volt components are starting to be more on the market, so upfitters can do a lot more than OEMs can do."

> *"A full 48-volt system is still new. There are so many people and unknown players in it."*
>
> **– Mark Spilsbury**

However, Miller said if a consumer must retrofit an entire RV, including pulling wires and replacing electronics, the 48-volt system is likely not feasible unless they want to perform a full retrofit upgrade.

The Future

Spilsbury said more 48-volt electronics will start coming to market in 2026 and beyond.

Still, he cautions manufacturers or upfitters considering changing to 48-volt systems to be prepared.

"Make sure it is done by a proper, licensed technician," Spilsbury said. "Because it is so new, there will not be a lot of people out there yet."

Chapman agreed, saying he sees more competitors changing their systems to 48 volts because they realize the advantages.

"I think it is the future." he said, "Everything is going to be pushing toward 48 volts." **RVN**