

Low-EMF camping trailers

Camping trailers (RVs/caravans) are sometimes a refuge for people with environmental sensitivities. Reducing the electromagnetic radiation can help make the trailer safer. This article is a catalog of measures to consider, such as wiring methods and equipment selection

Keywords: Low EMF, trailer, camper, RV, caravan, porcelain trailer, motor home, wiring, grounding, dirty electricity, radiation, electrical sensitivity



*The EMF levels can be reduced by carefully selecting the equipment.
This very-low-EMF trailer in Arizona uses solar panels, a
no-EMF solar charger and no inverter.*

Introduction

Camping trailers can contain many electrical appliances which radiate EMF and generate dirty electricity on the wires. The small spaces inside a trailer make it difficult for sensitive people to keep a safe distance.

Radiating appliances often found in a travel trailer include:

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- battery charger
- inverter
- electric refrigerator
- propane refrigerator with electronic controls
- electric water heater
- propane hot water heater with electronic controls
- electric stove
- air conditioner
- electric space heater
- DC motors (fans, etc.)
- low-energy light bulbs
- computer, television, etc.

Trailers that are not wired properly can have unbalanced wiring circuits, which can radiate substantially. Improper wiring or grounding of a metal trailer can cause electricity to run in metal walls themselves, which is called stray currents.

With the small spaces in a trailer, the appliances are tucked in where they can fit. It is not unusual for some to be placed under the bunks, radiating the sleeper all night.

The amount of modification needed depends on the individual. Some people just need a low-EMF place to sleep, while they can use electronics during the daytime. Others need a very-low-EMF environment at all times, which is difficult to do, and may not be realistic.

Using a travel trailer is a trade-off. A trailer offers low-cost living, and it can be parked in low-EMF areas, but it is much more difficult to have a good air quality and low EMF environment inside.

Checking a trailer

Experience is needed to fully check a trailer for EMF problems, but much can be done with most cheap AM radios and a low-cost gaussmeter.

Walk around inside with an AM radio set to the lowest frequency on the dial (around 730 kHz). This will not work with an FM radio. Hold the radio with the speaker facing you, and move the radio around the space. Hold it up against the breaker box, exposed wires, any electronics and even on the bunk bed. Increased static indicates unwanted EMF.

Do the same with a gaussmeter, which will measure low-frequency EMF in either milligauss (USA) or microtesla (Europe). If the gaussmeter has multiple sensitivity ranges, make sure to test with the most sensitive setting.

Experiment by turning circuits on and off on the breaker panel and see how the environment changes. In trailers with wiring errors, you may get a reading around outlets with nothing plugged in, perhaps even if all the breakers are turned off.

The charger and the inverter

If the trailer has batteries, it will have a battery charger and probably also an inverter. They are often built together and placed next to the breakers.

The battery charger charges the batteries whenever the trailer is plugged into an outside source of electricity (shorepower, solar power, generator, or motor home engine).

The inverter takes electricity from the battery and steps it up to regular AC electricity (120 volt AC in North America, 230 volt AC most other places).

Both the charger and the inverter produce EMF and dirty electricity, often a lot of it. Try to hold an AM radio and a gaussmeter near them.

If the camper will be parked where there is grid electricity available, consider disconnecting both the charger and the inverter, and remove the batteries.

An alternative is to install solar panels and a no-EMF charge controller, disconnect the inverter, and occasionally charge the batteries with a generator. See later in this article.

Another alternative is to have a trailer that must always be connected to shorepower (grid power). Then the battery charger and inverter can be totally removed.

Camper vans and motor homes

In RVs that can drive on their own, i.e. motor homes and camper vans, there are usually two sets of batteries. One is to start the engine, while the other is for lights at night. These batteries are electrically separate. However, there is usually a device that makes it possible for the engine to charge both batteries while the engine is running. This device can send out a lot of EMF and dirty electricity. It may be possible to disconnect this special charger and then just rely on other means to charge the RV batteries.

Grounding a trailer

It can sometimes help to connect the trailer to a ground rod, but it can also make things worse. An ungrounded trailer may build up a charge relative to the ground, such as from thunderstorms or the electricity used inside. This can be alleviated with grounding.

If AC electricity is used in the trailer, it may be beneficial to ground the trailer, but it must be done correctly. Otherwise stray currents can be generated.

The basic rule is that there is just one grounding point on the trailer. Connecting to multiple points can create stray currents. The best point to use is typically the negative/neutral in the electrical panel. For trailers with batteries, the negative battery terminal is usually a good choice.

From the grounding point, a thick copper wire can go to a ground rod (grounding electrode). In places with sandy soil, multiple ground rods can be used, but they must all be connected to the same grounding point.

Wiring for balanced circuits

The wiring should follow these three basic rules:

1. There must be only one single point where there is a connection between the neutral wires of the AC circuits. This point is at the AC breaker panel.
2. There must be only one single point where there is a connection between the minus wires of the DC circuits. This point is at the DC breaker/fuse panel.
3. There must be only one single point where the chassis is connected to the AC neutral and DC minus.

In other words, it is not acceptable to connect the neutral (or negative) from two circuits anywhere else, such as in an outlet box. It is also not acceptable to connect the neutral and the ground wires anywhere but at the breaker box.

Factory-wired trailers usually follow these rules, but it is common for do-it-yourselfers to violate them. Even some professional electricians make mistakes.

For a detailed explanation, see the book *Tracing EMFs in Building Wiring and Grounding*, by Karl Riley.

An experienced electrician can check if the trailer is wired correctly.

Trailers with metallic inner walls

Some trailers have metal walls on the inside, such as some models from Airstream and CampLite, as well as some custom-built MCS trailers.

The problem with metal walls is that they can become energized by stray currents, such as through electrical outlets. If an electrical device is plugged into an outlet, and it leaks current onto the grounding wire (which many electronic devices do), a current may travel through the screws and wall box, across the wall panel and to another outlet. A similar scenario can happen if the neutral wire is connected to the ground near the outlet (which is a common wiring error).

Rewire the trailer

Some sensitive people completely refurbish a trailer by removing the inner walls and insulation. During this work, it may be useful to modify the wiring as well. Consider these options:

- install twisted wires
- re-route wires
- run wires in steel conduit
- move appliances

The magnetic field is typically reduced by 90% around twisted wires, compared to straight wires. The wires can easily be twisted using a variable-speed power drill. One turn per 4 inches (10 cm) is good. Be careful not to twist the wires too tightly, then the wires become thicker, which can be a fire hazard as the wires cannot cool so well if carrying a high current, such as from a space heater.

In some cases it is possible to buy cables with pre-twisted wires inside the sleeve. Some ROMEX 12/3 cables happen to be that way, just cut off the extra red wire in each end.

Route the wires so they do not come as close to the sleeping area, and where you spend much of the day.

The wires can be run inside steel conduit, which is the best shielding available, but it costs a lot more to install and it also adds weight to the trailer.

Move the location of appliances away from the sleeping area. It is best to place the appliances as close to the electrical panel as possible, so the radiating wires are as short as possible.

The zero-EMF trailer

It is possible to create a zero-EMF trailer, with the following setup:

- 12 volt DC system
- solar panels
- no-EMF charge controller
- propane refrigerator (without electronic controls)
- propane stove (outside)
- propane water heater (without electronic controls)
- no AC
- no heat
- no inverter or converter
- no shorepower (grid power)

With no heating and cooling, this is only possible to do by moving the trailer seasonally, so it is always in a somewhat comfortable climate. Some people spend their winters in southern Arizona and move to a cooler climate for the summer. This is not a comfortable way to live.

Some people who are only electrically sensitive have installed a wood stove inside their trailer.

Factory-installed 12 volt systems will need some modifications to become zero-EMF. The typical changes are to replace the charge controller and unhook any inverter and converter. The propane refrigerator may also need to be replaced, though most models are low-EMF.

For details, see www.eiwellspring.org/offgrid.html.

Gas appliances

Many people with MCS are suspicious of gas appliances, and for good reason. A propane stove should never be used inside a trailer, but some sensitive people cook outside every day using a propane camp stove and have no problems.

RVs all have propane forced-air heaters, which are not tolerated by people with MCS. Some have tried to retrofit a direct-vent heater, but with limited success. Most MCS trailers use electric heaters; a few have no heat.

A propane water heater and propane refrigerator are standard in RVs. These are vented to the outside, but some fumes can still get into the trailer. Most MCS-retrofits put in electric versions, which may not be realistic for people with severe EHS.

One strategy is to turn on the water heater just when it is needed and stay outside while it heats up. This works for both electric and propane heaters.

A propane refrigerator has a much smaller flame than a heater, so it pollutes a lot less. It may be acceptable as-is for people who are not highly chemically sensitive. It may be possible to install an exhaust pipe from the back of the fridge and out through the opening behind it. Make sure the pipe slopes upward, is of a suitable material and there is a back-draft damper on it.

Modern propane water heaters and refrigerators for RVs now all have electronic controls, which may be a problem. Some people have been able to find used models through RV shops.

Air filtering

Travel trailers are not as airtight as a house, so they must be parked in an area with good outdoor air. Do not rely on air filters, though they may occasionally be needed temporarily.

There are 12 volt DC and regular AC air filters available. Be aware that DC motors send out more EMF than AC motors do.

For more information

For more information on low-EMF technologies, low-EMF solar systems and environmental housing methods, see www.eiwellspring.org.

The local building supply store should have books about basic wiring techniques.