

RV SOLAR SYSTEM DESIGN WORKSHEET

These calculations will give you a good idea how much energy you use and how much solar energy is required to give a 100% self-sustaining electrical system during ideal weather. Consider your batteries as a bank account -- **you cannot take out more than you put in** plus the amount with which you started.

Conservation in use (withdrawals) and adequate production (deposits) is the key to a *balanced electrical system*.

Questions:

- Do you already have a generator for backup?
- Do you park in cold places with extensive furnace use?
- How many people live in the RV?
- Do you fall asleep with the color TV on?
- Are you energy conscious or do you use power liberally?
- Do you frequently use campgrounds or park in other places where electricity is readily available?

Considerations:

If you already have a generator, it can provide a backup. If you do not, we suggest you compare cost with equal value of solar panels. An RV furnace can use lots of propane and an enormous amount of battery electricity over a cold week end.

- Have you considered a catalytic heater?
- Are you energy conscious?

Leaving an outside light on all night can use as much power as what one panel can produce in half a day. An 8 hour day's drive can usually refill a battery bank from the alternator, unless you are running the refrigerator on 12 volt. Tilting panels during winter time increases output up to 30% for those spending more than two weeks in one spot. Each RVer has an individual "lifestyle" and habits on using electricity differently.

MAKING YOUR CALCULATIONS:

There are two ways to measure electrical consumption (Watts, AH). It is essential that you not mix Amp Hours with Watts. We find that converting to Amp Hours (AH) is simple, convenient and allows measuring panels, batteries and appliances on a common base. The **APPLIANCE CONSUMPTION WORKSHEET (print it out)** lists the approximate amp draw of typical appliances. Read the label on the appliance or measure with an ammeter.

Calculations:

1.	Energy used per day from worksheet (Total AH)	= _____
2.	Add 10% line loss & battery inefficiency:	= _____
3.	Grand Total AH:	= _____
4.	Assuming a 4.5 amp (80 W) panel can produce 35AH in summer or 25 AH in winter under clear skies, determine how many panels you will need:	= _____

SIZING A SOLAR ELECTRIC SYSTEM

Solar panels generate a predictable amount of power each day. A typical 80 watt (4+ amp) panel on a good sunny day can produce over 30 Amp Hour (AH) of power daily-- that is about 1/3 of a full RV battery. To overcome battery resistance and line loss you should produce about 10% more power than you actually use. If you continually use more power than you produce, you can cut back on consumption or generate more power. Fortunately, these solar systems are modular and you can add on at any time without replacing existing equipment.

To determine how much of a system you need, you can use **the general rule of thumb** (what other RVers find acceptable) or try to determine what your daily consumption is:

1. Make a list of items normally used daily.
2. Multiply amp draw by hours (or fraction) of use to give total AH.

EXAMPLE: a one panel system

Item	Amps	x Hr/day =	AH/day
15 watt fluorescent light	1.0	6.0	6.0
Two 12v incandescent lamp	1.5	2.0	6.0
TV (9" color) 12 volt	3.0	4.0	12.0
Water pump (12 min/day)	8.0	0.2 (12/60=.2 hr)	1.6
12 volt stereo	0.8	2.0	1.6
Total AH used per day =			27.2

In this example, extra power generated can be stored in the battery or used for other purposes. We deliberately left out electric appliances that produce heat. They are extremely wasteful. Use propane to cook and heat in an RV. Compare fluorescent tubes with incandescent auto lamps. "Flours" use a bit less electricity but give far more illumination. One "flour" will equal 2-3 "incads." Shop carefully. Read labels for amp draw or calculate using the WATTS formula (Amps x Volts = Watts). Some 9" color sets only draw 2.5 amps, while other may use 6 amps.

Don't forget "hidden or phantom" power users not listed: Propane refrigerators use 12 volt for the igniter brain even when on 120VAC. Digital stereos and TV use 12v, even when turned off, to maintain memory circuits. Gas & CO detectors use 12v also.

SOLAR SIZING "RULE OF THUMB" for the average RVer:

Whether or not you choose to install a solar system, we encourage you to measure and calculate your energy requirements. It will show you how to better manage your situation. But, based on the thousands of systems we've been involved with, the average RVer, one without unusual needs, generally finds that **one 80 watt panel and one 105 AH battery (or equivalent) per person** provides an adequate system for long term outings. An extra panel and battery provides insurance during bad weather and enough power to handle the unexpected.

The AC appliances listed below require the use of an inverter. The AC amps have been multiplied by 10 to show the DC amp draw from the battery (for example, 5 amp AC = 50 amp at 12VDC).

<u>Appliance</u>	<u>Approx.Current (amps@12volts)</u>		<u>Hrs/day</u>	=	<u>Amp Hours Consumed</u>
Microwave oven	125	X	_____	=	_____
Blender	15	X	_____	=	_____
Computer	4	X	_____	=	_____
13-in color TV	7	X	_____	=	_____
B/I vacuum	100	X	_____	=	_____
Electric broom	60	X	_____	=	_____
Hair drier 1200w	95	X	_____	=	_____
Satellite receiver	3	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
_____	_____	X	_____	=	_____
Total amp hours used per day =					_____