

ZAMP  SOLAR®  
ACADEMY

# Zamp Academy

Zamp Academy is a program aimed to educate dealers and distributors about solar, how it works, Zamp Solar products and how to sell. Through this presentation we will cover:

1. Solar Basics
2. How 12-Volt Solar Works
3. Zamp Solar Kits
4. How to Size a Solar Kit
5. Installation Processes
6. Quick and Easy Troubleshooting
7. Frequently Asked Questions

# Introduction:

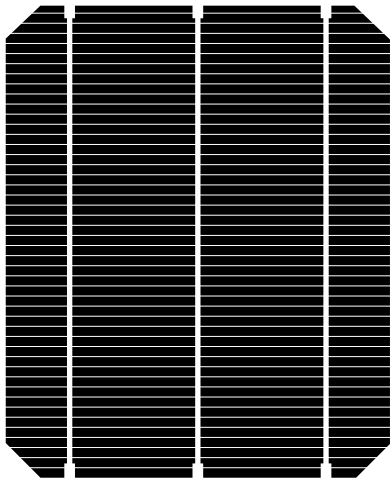
Solar allows users to rid themselves of noisy generators, while also allowing them to camp free of electrical connections. By recharging the batteries of an RV, solar not only allows users to go longer on their off-grid and boondocking adventures; it also protects and extends the life of the battery up to 300%, saving time and money on costly replacements.

# 12-Volt Solar Basics:

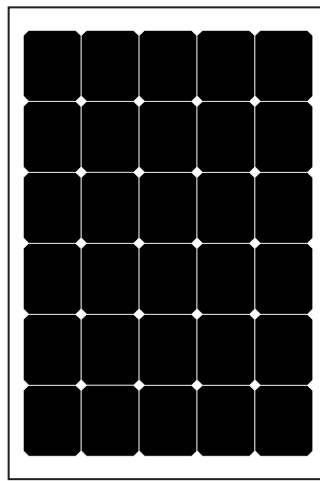
Solar Cells: A silicon based cell which directly converts sunlight into electricity

Solar Panel/Module: A panel comprised of solar cells designed to absorb the sun's rays.

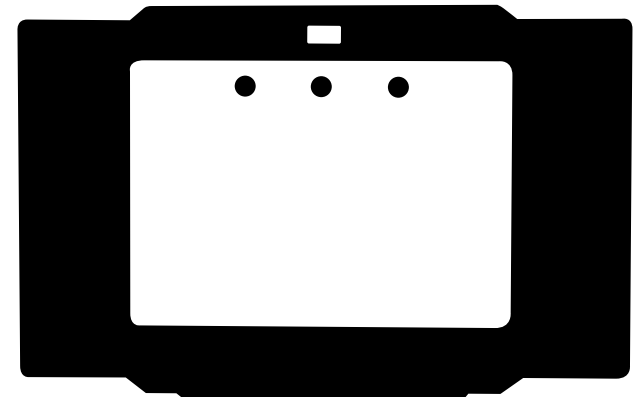
Charge Controller: A device that controls the amount of volts and amps needed to charge and maintain a 12-volt battery



Solar Cell



Solar Panel



Charge Controller

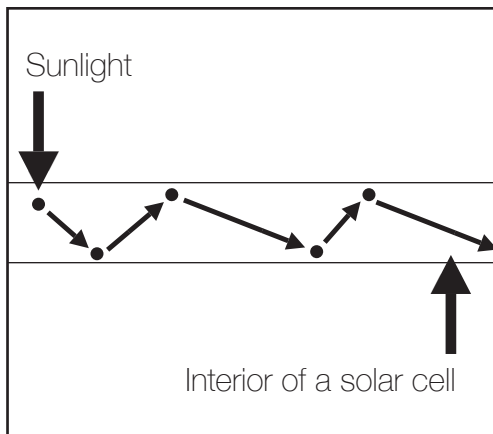
# 12-Volt Solar Basics:

1. Sunlight hits the solar cells and energy is generated
2. Generated energy travels to the charge controller
3. The charge controller monitors the battery's level of charge to keep it healthy and maintained.

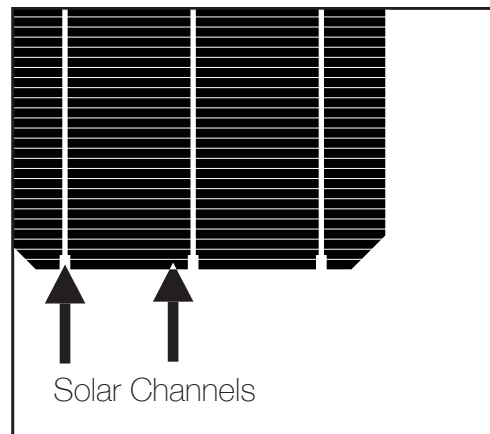
\*\*Solar does NOT power appliances like shore power does, rather it charges the battery which powers the appliances through an inverter.\*\*

# How 12-Volt Solar Works:

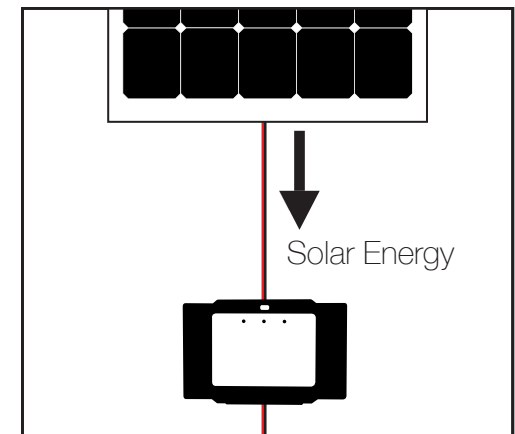
1. When sunlight hits the top silicon layer of the solar cell it begins bouncing energy between the top and bottom layers, generating power.
2. The generated energy then flows through solar channels found throughout the solar cell. The channels funnel the energy from each individual cell towards the UV coated wires
3. The energy then travels through the wire to the charge controller



1.



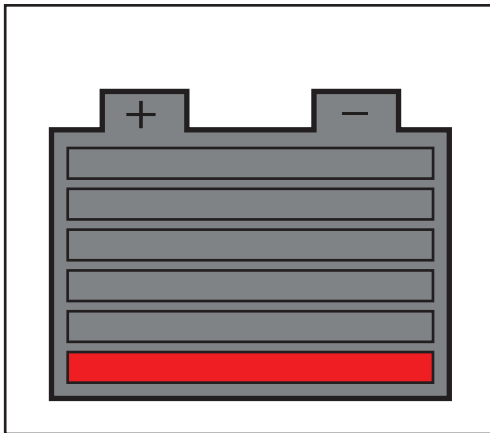
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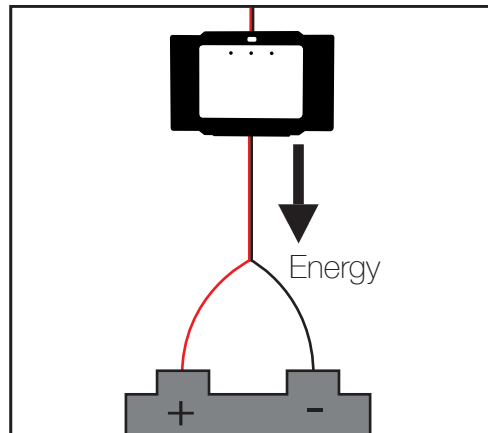
3.

# How 12-Volt Solar Works:

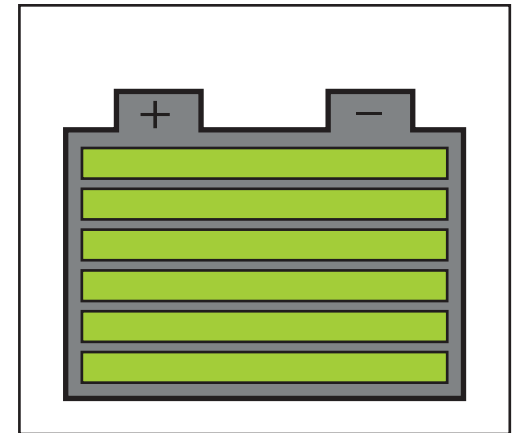
4. The charge controller monitors the battery to assess the amount of energy needed
5. The charge controller passes the needed energy from the panel to the battery through the UV rated wire
6. The battery is now being maintained and charged at a healthy level



4.



5.



6.

# How 12-Volt Solar Works:

Zamp Solar sells only 5-Stage charge controllers. The 5 different charging stages keep the battery as healthy as possible.

## The 5-Stages:

1. Soft Charge - When battery is dangerously low, (between 3 and 10V) the controller softly ramps battery voltage back up to 10V
2. Bulk Charge - Highest rate of charging within the cycle
3. Absorption Charge - When battery is almost full (85%) the charge controller slows down the rate of charge
4. Equalization Charge - Helps limit and prevent desalination in WET and Calcium batteries
5. Float Charge - Battery is fully charged and maintained at a safe level.



# Zamp Solar Kits:

Zamp Solar has a large variety of solar charging kits to fit the needs of each individual customer. The 2 basic kit types are:

Portable Charging Kits: Portable solar kits come in a convenient carrying case that allows the customer to bring solar wherever their adventure takes them.

Roof Mounted Charging Kits: Roof, or hard mounted kits, are installed to the roof of an RV, tiny home or shed.

# Zamp Solar Kits:

## Portable Solar Kits:



ZS-US-45S-P



ZS-US-90-P



ZS-US-140-P



Fused SAE Leads



Ergonomic Handle



ZS-US-180-P



ZS-US-230-P



Sturdy Leg

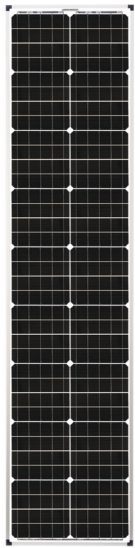
### Features

- Grade A monocrystalline solar cells
- Specialized AR coated glass (Anti-reflective)
- Dual battery digital 5-stage charge controller with LCD display, shows volts, amps and amp-hours for each battery bank
- Anodized aluminum Omni-Mount frame
- 15' Quick Connect SAE leads: Compatible with Zamp Solar Sidewall Ports
- Ergonomic handle
- Butterfly Clasps
- Easy to Use Tilt Leg

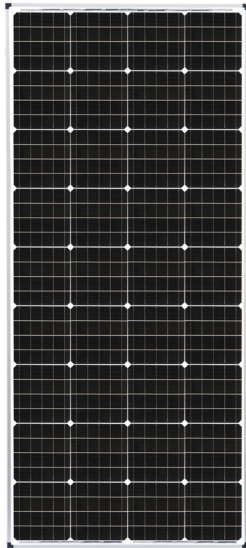
Name	MFG No.	Watts	Amps	Controller	Lbs
U.S. 45-Watt Portable Kit	USPI005	45	2.5	8AW	11.25
U.S. 90-Watt Portable Kit	USPI001	90	5	10AW	27
U.S. 140-Watt Portable Kit	USPI002	140	6.7	10AW	32.75
U.S. 180-Watt Portable Kit	USPI003	180	10	10AW	34
U.S. 230-Watt Portable Kit	USPI004	230	12.6	15AW	47
15' Extension Cable	ZS-HE-15FT-N	-	-	-	-

# Zamp Solar Kits:

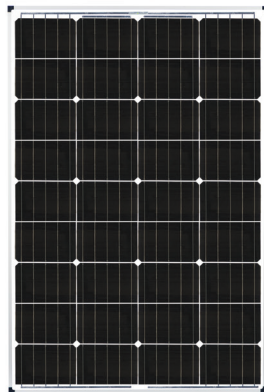
## Roof Mount DX and DX Expansion Solar Kits:



90-Watt Panel



170-Watt Panel



115-Watt Panel



100-Watt Flexi Panel



Digital 5-Stage Charge Controller



3-Port Roof Cap



Pre-Wired Battery Harness



Pre-Wired Roof Cap Harness

### Features

- New Pre-assembled flexible UV rated wiring harnesses
- Easiest Installation in the Industry- no crimpers or connectors needed
- Dual battery digital 5-stage charge controller with LCD display, shows volts, amps and amp-hours for each battery bank
- Grade A monocrystalline solar cells
- Omni-Mount feet - mount anywhere on the panel frame for easy installation
- Specialized AR coated glass
- Vibration resistant anodized aluminum frame
- 2 Self-resetting circuit breakers
- Stainless steel hardware

\*Most features listed above NOT found on Flexi model\*

Name	MFG No.	Watts	Amps	Controller	Expands to
U.S. 115-Watt Roof Mounted Deluxe Kit	KIT1003	115	6.3	30A	345 Watts
U.S. 170-Watt Roof Mounted Deluxe Kit	KIT1005	170	9.4	30A	510 Watts
U.S. 680-Watt Roof Mounted Deluxe Kit	KIT2014	680	-	60A	1,020 Watts
U.S. 115-Watt Roof Mounted Expansion Kit	KIT1008	115	6.3	-	-
U.S. 170-Watt Roof Mounted Expansion Kit	KIT1009	170	9.4	-	-
U.S. 90-Watt Slimline Kit "L"	KIT1007	90	5	30A	270 Watts
U.S. 90-Watt Slimline Expansion Kit "L"	KIT1010	90	5	-	-
U.S. 170-Watt Dual Battery Charge Kit	ZS-US-160-30AD-DX	170	9.4	30AD	510 Watts
100-Watt Flexi Roof Mounted Kit	ZS-100F-30A-DX	100	5.6	30A	300
100-Watt Flexi Expansion Kit	ZS-EX-100F-DX	100	5.6	-	-

# Zamp Solar Kits:




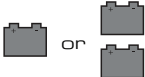



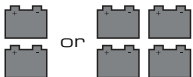

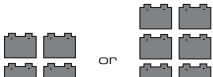
## How Do Roof Mount DX and DX Expansion Solar Kits Work?:

Our DX Kits are all designed to be expandable. By starting with a base kit and adding expansion panels, kits can range from 90 to 1,020-Watts. DX Kits come with a solar panel, 3-port roof cap (3BCAP), a Charge Controller\*, Pre-assembled wiring harness, mounting hardware and feet. Expansion kits come with a solar panel, mounting hardware, feet and the needed wire to connect the panel with the 3-port roof cap.

Panel sizes can be mixed and matched to make a kit that perfectly fits your customers needs.

# How to Size a Solar Kit:

It is important to remember that there will always be exceptions, however the chart shown below is a great place to start.

Size of RV		# of Batteries	Recommended Kits for Weekend Getaways		Recommended Kits for Longer Off-Grid Stays		
Small		10'-14'	 1 12-Volt	45-Watt Portable	90 or 115-Watt Roof Mounted Deluxe Kit	90-Watt Portable	115-Watt Roof Mounted Deluxe Kit
		15'-20'	 1-2 12-Volt or 2 6-Volt	90-Watt Portable	115-170-Watt Roof Mounted Deluxe Kit	140-Watt Portable	170-Watt Roof Mounted Deluxe Kit
Medium		21'-30'	 2 12-Volt or 2 6-Volt	140-Watt Portable	170-Watt Roof Mounted Deluxe Kit	180-Watt Portable	170-Watt Roof Mounted Deluxe Kit and 170-Watt Expansion <b>340 Total Watts</b>
		31'-40'	 2-4 12-Volt or 2-4 6-Volt	180-Watt Portable	170-Watt Roof Mounted Deluxe Kit and 170-Watt Expansion <b>340 Total Watts</b>	180 or 230-Watt Portable	160-Watt Roof Mounted Deluxe Kit and 2x 160-Watt Expansions <b>510 Total Watts</b>
Large		40'+	 4-8 6-Volt	2x 230-Watt Portable	170-Watt Roof Mounted Deluxe Kit and 2x 170-Watt Expansions <b>510 Total Watts</b>	2x 230-Watt Portable	640-Watt Roof Mounted Deluxe Kit and Optional Expansions <b>880-1,020 Total Watts</b>

# How to Size a Solar Kit:

## Detailed Sizing and Exceptions:

1. What type and how many batteries do you have?
2. How much space do you have on your roof?
3. How much power do you use?
4. Where are you? Ex: Alaska or Florida
5. What are your parasitic loads?
6. What is your camping/off-grid lifestyle?

# Installation Processes:

For different systems and charge controllers the installation process varies. We are going to go through the installation processes for:

1. Portable Charging Kits
2. Roof Mounted Panel Installation
3. Roof Mounted Kits with the 30A Charge Controller
4. Roof Mounted Kits with the 30AD Charge Controller
5. Roof Mounted Kits with the 60A Charge Controller
6. How to Wire for multiple battery banks

# Installation Processes:

## Portable Charging Kits:



### Portable Quick Start Guide

#### Alligator Clip Install

1. Remove Portable from the rigid nylon travel case
  2. Unlatch the butterfly clasps (40-Watt does not have clasps) and open panels flat
  3. Unfold tilt legs and place panels in direct sunlight
  4. Clip the red alligator clip to the positive battery terminal then clip the black alligator clip to the negative battery terminal
  5. You are now charging your batteries.
- \* First time you use the unit you may need to configure the charge controller for the appropriate battery type



Alligator Clips

#### Sidewall Solar Port Install

1. Remove Portable from the rigid nylon travel case
  2. Unlatch the butterfly clasps (40-Watt does not have clasps) and open panels flat
  3. Unfold tilt legs and place panels in direct sunlight
  4. Remove/unclip the alligator clips at the SAE connection
  5. Plug the SAE lead from the panel into the sidewall port on your RV
  6. You are now charging your batteries.
- \* First time you use the unit you may need to configure the charge controller for the appropriate battery type



SAE Portable Lead



# Installation Processes:

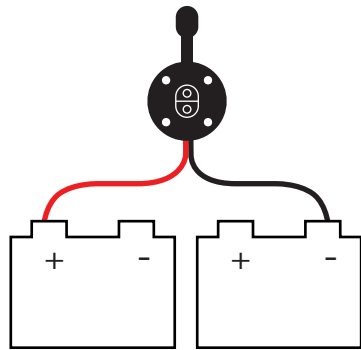
## Portable Charging Kits:



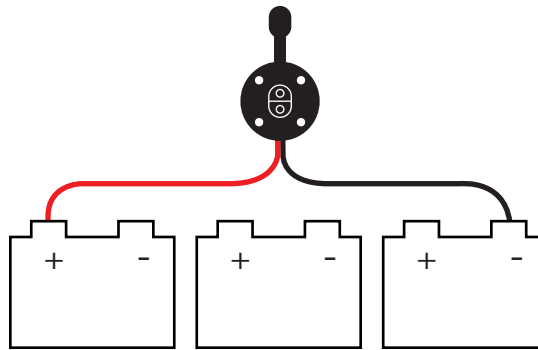
### Common solar wiring for multiple 12-Volt Batteries

When wiring a solar port to multiple batteries, it is important to remember that your batteries are wired together. To gain the most from your solar, be sure to place the positive wire on the first battery in the sequence and the negative wire on the last battery in the sequence. This is true regardless of the number of batteries in the bank. If you are using the alligator clips

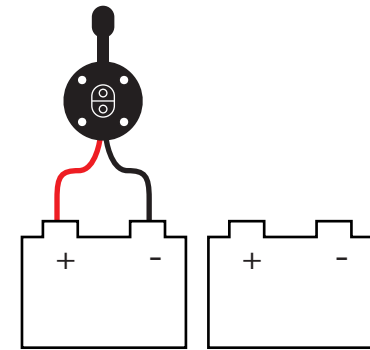
How **TO** wire a solar port for 2 batteries



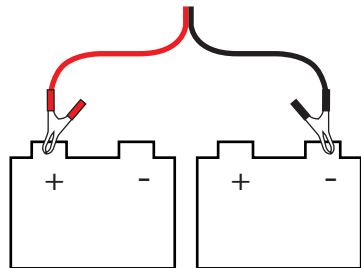
How **TO** wire a solar port for 3 batteries



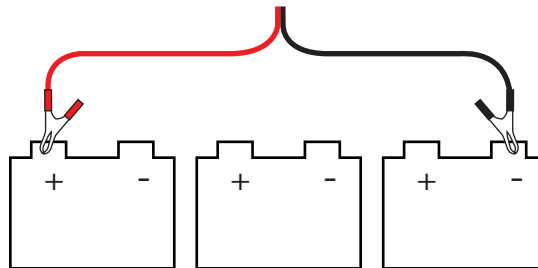
How **NOT** to wire a solar port for 2 batteries



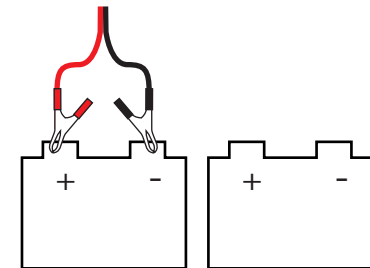
How **TO** wire alligator clips for 2 batteries



How **TO** wire alligator clips for 3 batteries




How **NOT** to wire alligator clips for 2 batteries



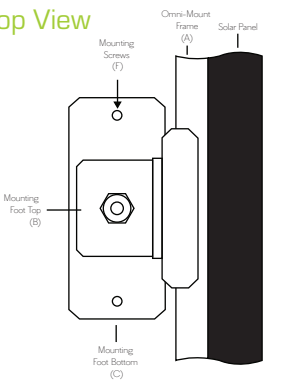
# Installation Processes:

## Roof Mounted Panel Installation Instructions:



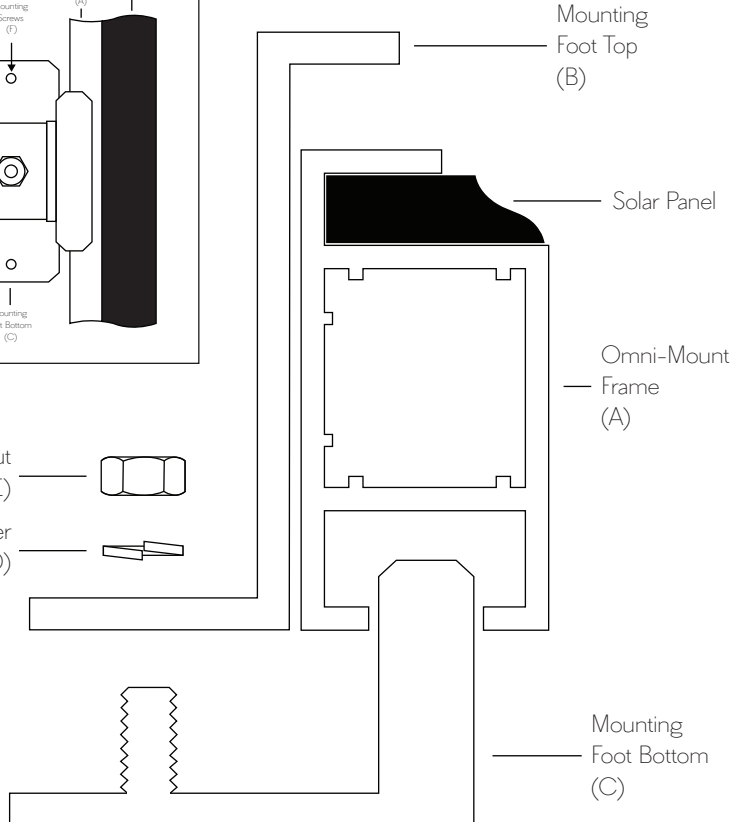
### US Removable Mounting Feet Quick Start Guide

#### Top View



Labels in Top View diagram:

- Mounting Screws (F)
- Mounting Foot Top (B)
- Mounting Foot Bottom (C)
- Omni-Mount Frame (A)
- Solar Panel



Labels in Exploded View diagram:

- Mounting Foot Top (B)
- Solar Panel
- Omni-Mount Frame (A)
- Mounting Foot Bottom (C)
- 1/4-20-Nut (E)
- Lock Washer (D)

#### Included Mounting Foot Components

- B (4) Mounting Foot Top
- C (4) Mounting Foot Bottom
- D (4) Lock Washer
- E (4) 1/4-20 Nuts

#### Not Included Components

- Tube of UV Rated Adhesive Sealant
- Drill
- F (8) Mounting Screws (size #8)

#### Install Instructions:

1. Find placement for your panel(s) on roof.
2. Install mounting feet to panel by following the diagram.
3. Tighten 1/4-20 nuts to approximately 20 foot lbs of torque.
4. Mark the location of the mounting foot (C) holes on the roof of your RV.
5. Drill holes as indicated by the marks from previous step.
6. Apply a generous amount of sealant to the RV roof where mounting feet and screws will be placed.
7. Place panels and mounting feet over the drilled and sealed areas.
8. Install the mounting screws (C) and let sealant set.
9. Retighten as needed.

# Installation Processes:

## Roof Mounted 30A Installation:



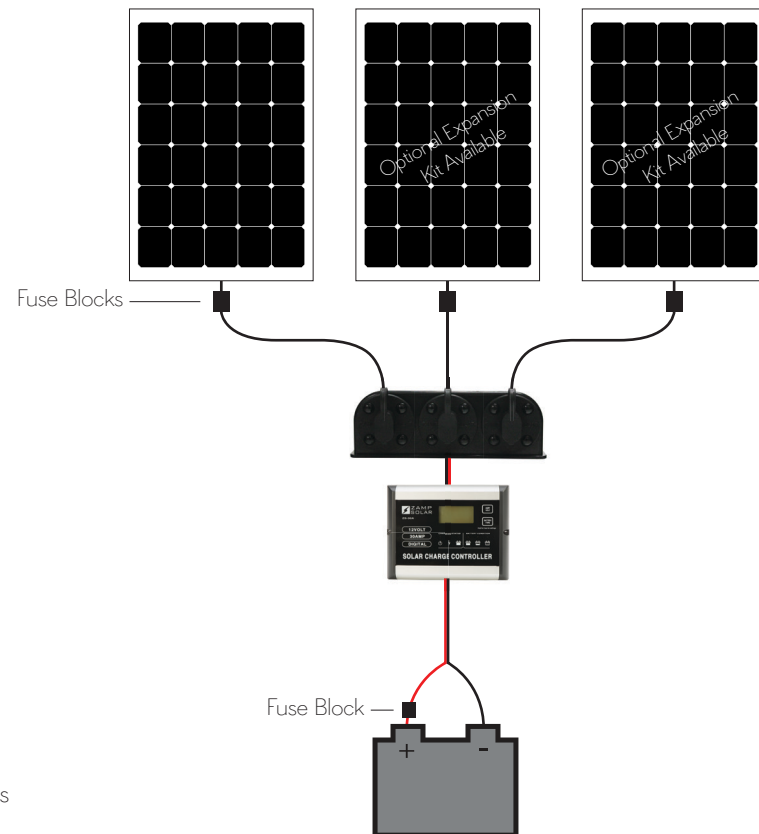
### 30A Deluxe Roof Mounted Quick Start Guide

#### Install Safety:

- Inspect the installation area for safety hazards
- Be sure to remove all metal, such as rings and other jewelry
- Disconnect all power sources and ensure solar panels are completely covered - by a box or blanket until installation is complete

#### Install Instructions:

1. Arrange the layout of your panels and wire, ensuring that:
  - 3-port roof cap is no more than 15' from charge controller
  - panel leads can reach 3-port roof cap
  - charge controller is no more than 9' from battery
  - panels are not shaded by vents, AC units, or other obstructions
2. Connect 15' Solar wire(s) to the 3-port roof cap(s).
  - Strip the ends of both positive and negative wires 1/2 inch
  - Screw the red (+) wire into corresponding positive terminal, black (-) wire into corresponding negative terminal.
3. Feed wires through roof and mount 3-port roof cap. Complete routing the 15' cable from roof to charge controller location
  - \*Do not make connections at this time
4. Proceed to route the 10' cable from the charge controller to the battery
  - \*Do not make connections at this time
5. Connect the positive solar wire to the charge controller, then connect the positive battery wire to the controller. Repeat with negative wires.
6. Mount your charge controller
7. Attach mounting feet to panels. Proceed with panel installation.
8. Connect positive wire to battery and repeat with negative wire
9. You may now plug the SAE leads into the 3-port cap and uncover your panels
10. You are now charging your battery.
11. Configure your charge controller to the proper battery type



# Installation Processes:



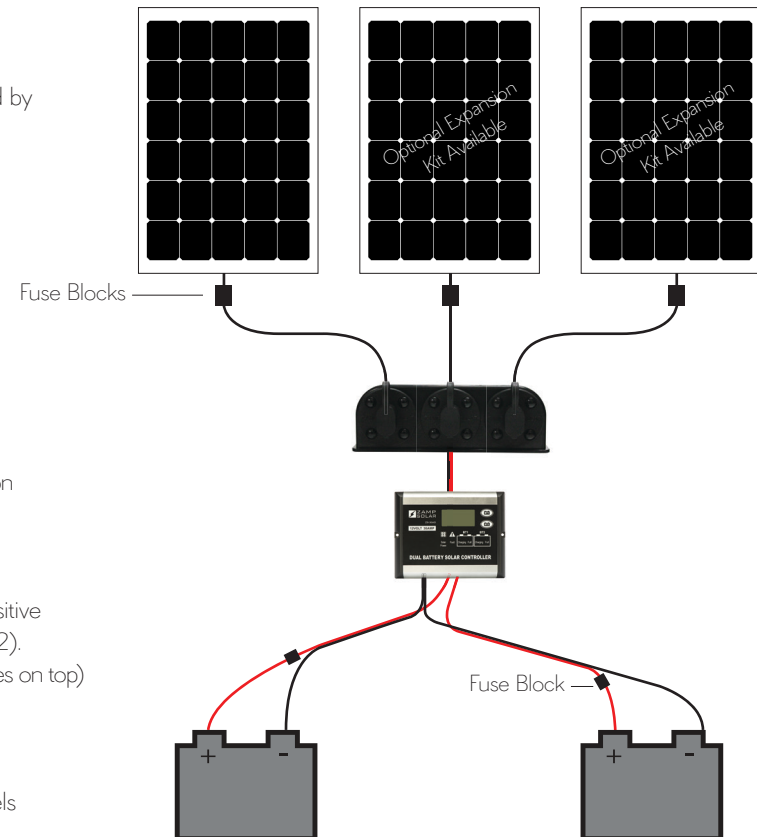
## 30AD Deluxe Roof Mounted Quick Start Guide

### Install Safety:

- Inspect the installation area for safety hazards
- Be sure to remove all metal, such as rings and other jewelry
- Disconnect all power sources and ensure solar panels are completely covered by a box or blanket until installation is complete

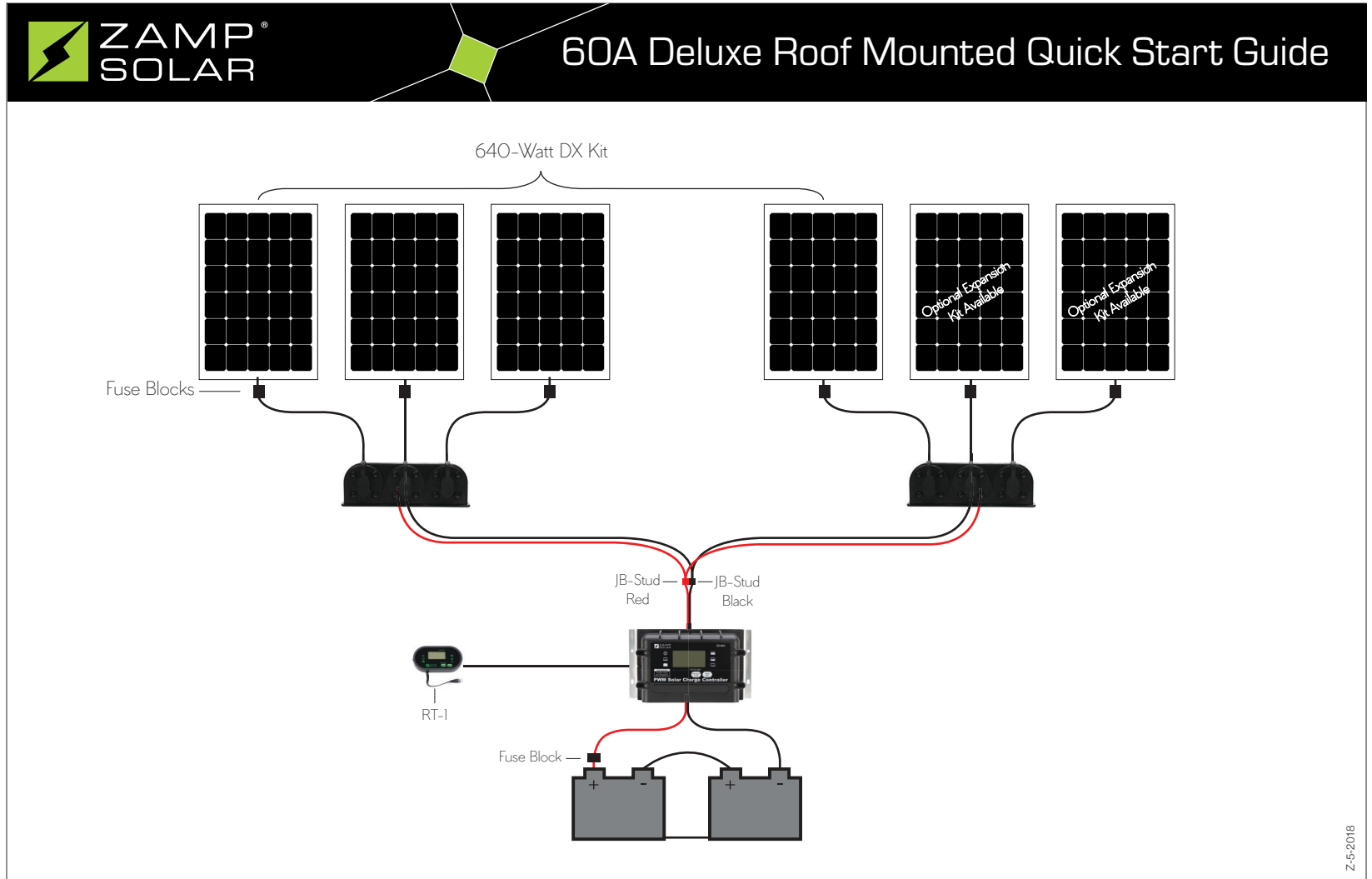
### Install Instructions:

1. Arrange the layout of your panels and wires, ensuring that:
  - 3-port roof cap is no more than 15' from charge controller
  - panel leads can reach 3-port roof cap
  - charge controller is no more than 9' from battery
  - panels are not shaded by vents, AC units, or other obstructions
2. Connect 15' Solar wire(s) to the 3-port roof cap(s).
  - Strip the ends of both positive and negative wires 1/2 inch
  - Screw the red (+) wire into corresponding positive terminal, black (-) wire into corresponding negative terminal.
3. Mount 3-port roof cap and route the 15' cable from roof to charge controller location
  - \*Do not make connections at this time
4. Proceed to route the 10' cable from the charge controller to the battery
  - \*Do not make connections at this time
5. Connect the positive solar wire to the charge controller, then connect the positive battery wires to the controller (1 red terminal on BAT 1, 1 red terminal on BAT 2).
6. Stack the negative wires on the charge controller (solar wire on bottom, battery wires on top)
7. Mount your charge controller
8. Attach mounting feet to panels and proceed with panel installation.
9. Connect positive wire to battery and repeat with negative wire
10. You may now plug the SAE leads into the 3-port cap and uncover your panels
11. You are now charging your battery.
12. Configure your charge controller to the proper battery type(s)





# Installation Processes:

## Roof Mounted 60A Installation Diagram:



# Installation Processes:

## Roof Mounted 60A Installation Instructions:

  60A Deluxe Roof Mounted Quick Start Guide	
<b>Install Safety:</b> <ul style="list-style-type: none"><li>- Inspect the installation area for safety hazards</li><li>- Be sure to remove all metal such as rings and other jewelry</li><li>- Dissconnect all power sources and ensure solar panels are completely covered by a box or blanket until installation is done</li></ul>	<b>Install Instructions:</b> <ol style="list-style-type: none"><li>1. Arrange the layout of your panels and wire, ensuring that:<ul style="list-style-type: none"><li>- 3-port roof cap is no more than 15' from charge controller</li><li>- panel leads can reach 3-port roof cap</li><li>- charge controller is no more than 9' from battery</li><li>- panels are not shaded by vents, AC units, or other obstructions</li></ul></li><li>2. Connect 15' Solar wire(s) to the 3-port roof cap(s).<ul style="list-style-type: none"><li>- Strip the ends of both positive and negative wires 1/2 inch</li><li>- Screw the red (+) wire into corresponding positive terminal, black (-) wire into corresponding negative terminal.</li></ul></li><li>3. Mount 3-port roof cap(s) and route the 15' cable(s) from roof to charge controller location<ul style="list-style-type: none"><li>*Do not make connections at this time</li></ul></li><li>4. Proceed to install the ring terminals from both roof caps to the corresponding Junction Box Terminal (red on red, black on black)</li><li>5. Install the Y adapter on top of the Junction Box Connections (red on red, black on black)</li><li>6. Install bare copper ends into the charge controller, ensuring connection is tight. Repeat with battery harness<ul style="list-style-type: none"><li>* Connect RT-1 wires to charge controller and proceed with RT-1 install as per the manual instructions.</li></ul></li><li>7. Mount your charge controller</li><li>8. Install the fuse block onto the positive battery terminal.</li><li>9. Connect the positive wire to the fuse block</li><li>10. Connect the black wire to the negative battery terminal</li><li>11. You may now plug the SAE leads into the 3-port cap(s) and uncover your panels</li><li>12. You are now charging your battery.</li><li>13. Configure your charge controller to the proper battery type</li></ol>
<b>Install Tools:</b> <ul style="list-style-type: none"><li>- Flat head screwdriver</li><li>- Philips head screwdriver</li><li>- Wire stripper</li><li>- Dicor</li></ul>	

# Installation Processes:

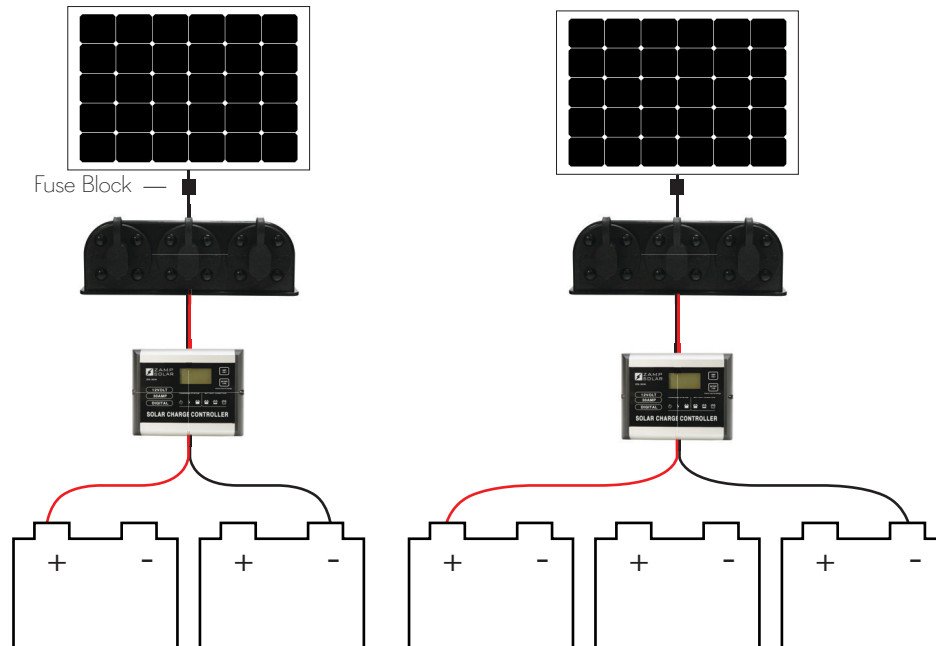
## Simple Wire Installation for Multiple 12-Volt Battery Banks:



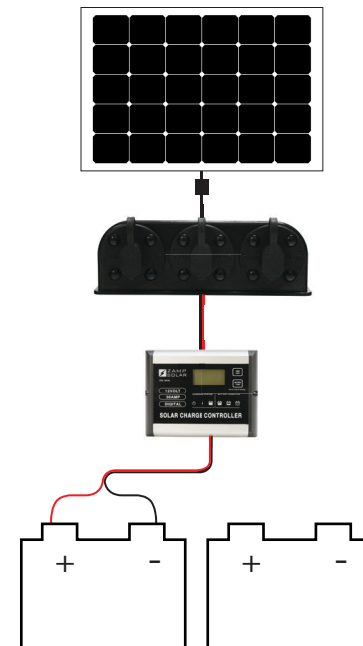
### Common solar wiring for multiple 12-Volt Batteries

When wiring a solar kit to multiple batteries, it is important to remember that your batteries are wired together. To gain the most from your solar kit, be sure to place the positive wire on the first battery in the sequence and the negative wire on the last battery in the sequence. This is true regardless of the number of batteries in the bank.

How **TO** wire a solar controller for 2 batteries    How **TO** wire a solar controller for 3 batteries



How **NOT** to wire a solar controller for 2 batteries

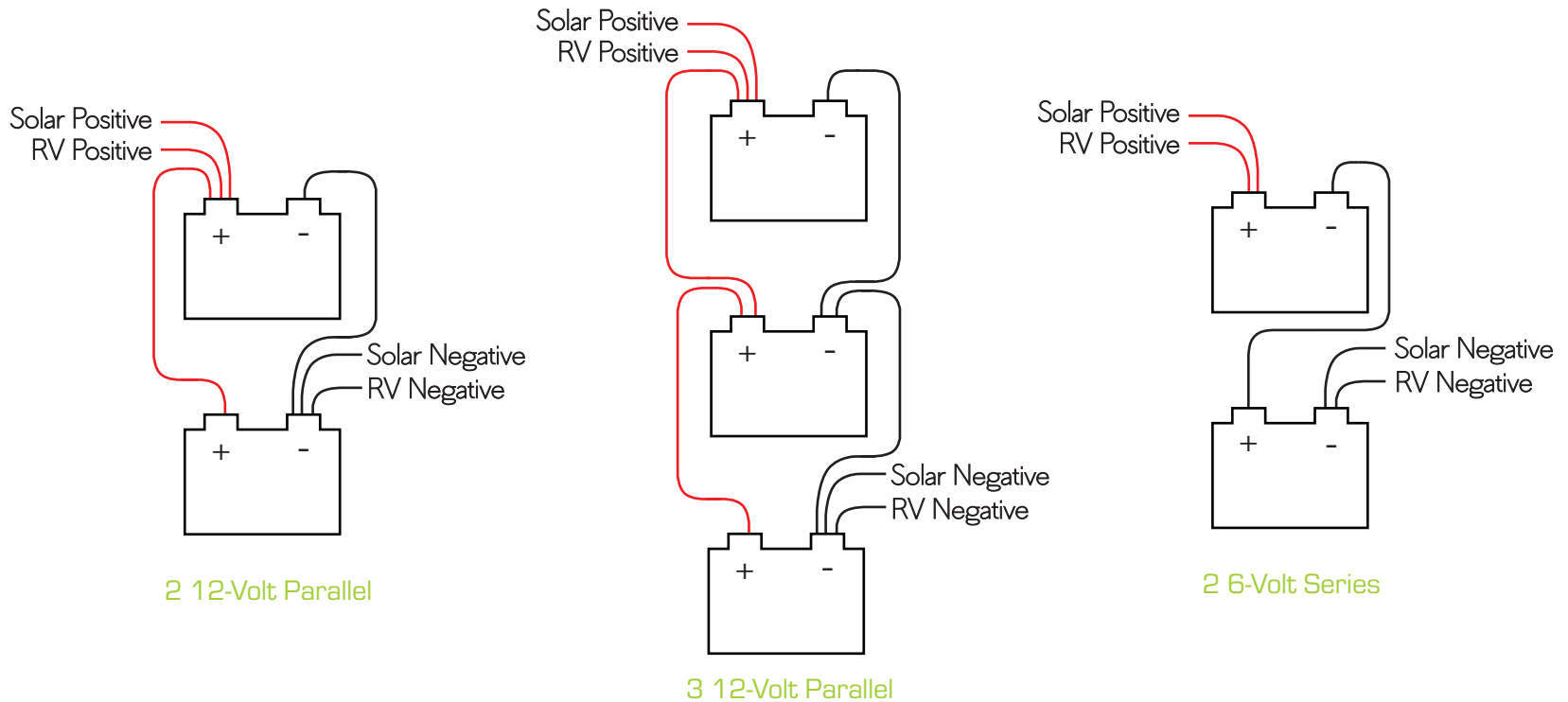


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\*Turn page to see detailed wiring for specific battery bank configurations

# Installation Processes:

## Detailed Wire Installations for Multiple Battery Banks:





# Installation Processes:

## What Does Solar Ready Mean:

1. If an RV is “Solar Ready” this indicates that the RV has been pre-wired with a 3-port roof cap, single port roof cap or a side-wall port during the manufacturing process.\*
2. If the RV has a sidewall port your customer simply choses a portable based on their needs and plug it in for use.
3. If the RV is equipped with a 3-port or single port roof cap but lacks a charge controller the customer will choose between our list of EX-DX Kits AND a charge controller based on their useage needs. Mount panels, wire charge controller and plug in.
4. If the RV has a roof cap and a charge controller, the customer will choose from our list of EX-DX Kits, mount the panel(s) and plug them into the cap.

\*Some manufacturers chose to only wire from the roof to the batteries.

# Installation Processes:

## Types of Solar Ports:

3-Port Cap



Roof/Sidewall Port  
(12AWG)



Bracketed Solar Port  
(For Airstreams)









\* If you find an RV is pre-wired for both portable and roof mounted solar please keep in mind that charge controllers work independantly of each other. They DO NOT show combined voltage and wattage.

# Troubleshooting:






## Examples of Common Error Codes:













### OPERATION - L.E.D. INDICATION


The 6 LED's indicate the charging status and the battery condition						
	Red	Blue	Green	Green	Yellow	Red
Solar Power Present-No battery connected	ON	OFF	OFF	OFF	OFF	Flash
Soft charging	ON	Flash	OFF	OFF	OFF	ON
Bulk charging	ON	ON	OFF	Subject to battery voltage		
Absorption charging	ON	ON	OFF	ON	OFF	OFF
Equalization charging	ON	ON	OFF	ON	OFF	OFF
Float charging	ON	OFF	ON	OFF	OFF	OFF
Solar panel weak	Flash	OFF	OFF	Subject to battery voltage		
At night no charge	OFF	OFF	OFF	Subject to battery voltage		
Battery Voltage below 11.5V (+/-0.2V)	ON	ON	OFF	OFF	OFF	ON
Battery Voltage between 11.5V - 12.5V(+/-0.2V)	ON	ON	OFF	OFF	ON	OFF
Battery Voltage above 12.5V (+/-0.2V)	ON	ON	OFF	ON	OFF	OFF

# Troubleshooting:

## Examples of Common Error Codes:

Solar panel abnormal mode	LCD display	LED indication	LCD backlight
Solar panel weak		 Flash	ON
Solar panel reverse connection		 Flash	Flash
Solar panel over voltage (> 26.5V)		 Flash	Flash

Battery abnormal mode	LCD display	LED indication			LCD backlight
Battery disconnected or less than 3.0V		 Flash	 Flash	 Flash	Flash
Battery reverse connection		 Flash			Flash
Battery over voltage than > 17.5V		 Flash			Flash
Battery temperature over 65C		 Flash	 Flash	 Flash	Flash

The solar controller abnormal mode	LCD display	LED indication	LCD backlight
The controller over temperature protection			Flash

# Frequently Asked Questions:

Q: Does my solar kit power my appliances?

A: Not Directly, 12-volt solar kits charge and maintain 12-V or 6-V batteries. The battery(s) then power your electronics through a 120-V inverter.

Q: How much solar do I need to run my AC?

A: Solar is not able to run the AC unit in RVs. AC units draw too much power, at a rate that is too quick for solar to safely and efficiently maintain the batteries health.

Q: Can I have too much solar?

A: No. We will always recommend more solar to ensure the best performance possible on the worst days. The charge controller will protect the battery from over-charging. The more solar the quicker the battery will recharge.

# Frequently Asked Questions:

Q: What is the correlation between amps, watts and volts?

A: Ohms Law states:  $\text{Watts} \div \text{Volts} = \text{Amps}$

Q: What is the difference between AC and DC power?

A: DC (Direct Current) is power drawn from a battery.

AC (Alternating Current) is power drawn from shore power, a generator or a wall plug in a home.

Q: Will my solar kit overcharge my batteries?

A: Solar can overcharge you batteries if you do NOT have a charge controller. The job of the charge controller is to monitor how full the battery is and provide the needed charge to keep it at a healthy level without overcharging.

# Frequently Asked Questions:

Q: What side of the cord is positive?

A: Ribbed or red is positive

Smooth or black is negative

Q: Can I use two systems at the same time? (a portable and a roof mount kit or 2 portables)

A: Yes. Just remember you can only connect 1 panel to a port, and if there are 2 charge controllers they work independantly from one another. They will not show combined Amps or Volts. They are separate systems

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