



The Brat Solar Charge Controller Instructions



Features

- 12/24 Volt PWM charge controller gives excellent value
- Works as a load controller / Charge controller
- Conformal coated circuit board for harsh environments
- 15 Lighting/Load control modes with High and Low Voltage Disconnect
- Load circuit can be paralleled with the PV input to Increase charging power
- Three stage charging
- Clear rainproof enclosure with included liquid tight strain reliefs
- Manual and Auto EQ
- Solar Clock Mode turns The Brat into a solar clock
- Dead battery charging
- Short Circuit and overthermal protection and de-rating



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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS - These instructions contain important safety and operating instructions for The BRAT Charge Controller MODEL NUMBER MNBRAT.

If you do not fully understand any of the concepts, terminology, or hazards outlined in these instructions, please refer installation to a qualified dealer, electrician or installer. These instructions are not meant to be a complete explanation of a renewable energy system. All installations must comply with national and local electrical codes. Professional installation is recommended.

GENERAL PRECAUTIONS:

WORKING WITH OR IN THE VICINITY OF A LEAD ACID BATTERY, SEALED OR VENTED IS DANGEROUS. VENTED BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION. FOR THIS REASON, IT IS VERY IMPORTANT THAT BEFORE SERVICING EQUIPMENT IN THE VICINITY OF LEAD-ACID BATTERIES YOU REVIEW AND FOLLOW THESE INSTRUCTIONS CAREFULLY.

If service or repair should become necessary, contact MidNite Solar Inc. Improper servicing may result in a risk of shock, fire or explosion. To reduce these risks, disconnect all wiring before attempting any maintenance or cleaning. Turning off the inverter will not reduce these risks. Solar modules produce power when exposed to light. When it is not possible to disconnect the power coming from the Photovoltaics by an external means such as a combiner, cover the modules with an opaque material before servicing any connected equipment.

Never attempt to charge a frozen battery. Do not smoke around batteries.

When it is necessary to remove a battery, make sure that the battery bank disconnect breaker is in the off position and that the PV breakers, grid breakers and any other sources of power to the inverter are in the off position. Then remove the negative terminal from the battery first.

To reduce risk of battery explosion follow these instructions and those published by the battery manufacturer as well as the manufacturer of any additional equipment used in the vicinity of the batteries.

Avoid producing sparks in the vicinity of the batteries when using vented batteries. Provide ventilation to clear the area of explosive gases. Sealed AGM and Gel batteries do not under normal conditions create explosive gases. Refer to the battery manufacturer's documentation. Be especially cautious when using metal tools. Dropping a metal tool onto batteries can short circuit them. The resulting spark can lead to personal injury or damage to the equipment. Provide ventilation to outdoors from the battery compartment when installing vented batteries such as golf cart T-105 batteries. The addition of a spill tray is also a good idea.

Clean all battery terminals. Very high currents are drawn from the batteries; even a small amount of electrical resistance can result in overheating, poor performance, premature failure or even fire.

Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes. Wear complete eye and clothing protection. Always avoid touching eyes while working near batteries. If battery acid or battery terminal corrosion contacts skin or clothing, wash immediately with soap and water. If acid enters the eyes, immediately flood with cool running water for at least 15 minutes and get medical attention immediately. Baking soda neutralizes battery acid electrolyte. Keep a supply near the batteries

Do not work alone. Someone should be in the range of your voice or close enough to come to your aid when you work with or near electrical equipment.

Remove rings, bracelets, necklaces, watches etc. when working with batteries, photovoltaic modules or other electrical equipment. Power from an illuminated photovoltaic array makes a very effective arc welder with dire consequences if one of the welded pieces is on your person.

To reduce the risk of injury, connect only deep cycle lead acid type rechargeable batteries. Other types of batteries may leak or burst, causing personal injury or damage.

Wiring methods used shall be in accordance with the Canadian Electrical Code, Part I.

Wiring must be done in accordance with the National Electrical Code Article 690 ANSI/NFPA 70. Use Class 1 wiring methods for field wiring connections to terminals of a Class 2 circuit. Use only 14-10 gauge AWM wire. Select the wire gauge used based on the protection provided by the circuit breakers/fuses. Overcurrent protection must be installed as part of the system installation. Refer to the wiring diagrams provided in this manual for breaker/fuse/GFDI sizes and model numbers.

WARNING: This unit is not provided with a GFDI device. This inverter or charge controller must be used with an external GFDI device as required by the Article 690 of the National Electrical Code for the installation location.

Use of attachments or accessories not approved by MidNite Solar could result in damage or injury.

Before making any connections verify that the circuit breakers are in the off position including the inverter breaker. Double check all wiring before applying power.



INSTRUCTIONS DE SÉCURITÉ IMPORTANTES

CONSERVER CES INSTRUCTIONS - CES INSTRUCTIONS CONTIENNENT DES INFORMATIONS IMPORTANTES POUR UTILISER LE MIDNITE SOLAR THE BRAT CHARGE CONTROLLER (RÉGULATEUR DE CHARGE) MODEL NUMBER MNBRAT, EN TOUTE SÉCURITÉ.

Avant l'utilisez cet appareil lis et comprends toutes les instructions et avertissements.

Si vous ne comprenez pas l'une des concepts ou des instructions contenu dans cette manuel consulter un agent spécialisé.

Si des réparations sont nécessaires contactez MidNite Solar pour plus des informations. Danger de choc électrique et de risque de brulure. Rien à dépanner à l'intérieure du cette appareil. Ne pas ouvrir le couver. Pour toute réparation ou service d'entretien, consulter un agent spécialisé. Il y'a peut-être plusieurs sources d'alimentation dans cette system. Débrancher toutes les interrupteurs avant toute d'entretien où nettoyage.

Ne travaillez pas seul. Quelqu'un devrait toujours être à proximité pour aider en cas d'une situation d'urgence.

Retirer bagues, bracelets, colliers, montres, et quelles choses comme ça. Il y'a risque des blessures graves s'il y'a un court-circuit. Cela pourrait ruiner votre journée entière.

Cette appareil n'avoir pas un détecteur des fautes de terre. C'est nécessaire de emploi la protection contre des fautes de terre a l'extérieure de cette appareil en conformité avec le National Electrical Code.

Les méthodes de câblage utilisés doivent être conformes au Code canadien de l'électricité, Partie I.

Le câblage doit être fait en conformité avec le National Electrical Code Article 690 ANSI / NFPA 70. Utiliser des méthodes de câblage de catégorie 1 pour les connexions de câblage sur .des terminaux d'un circuit de classe 2. Utilisez uniquement des fils de AWM de calibre 14-1/0. Sélectionnez le type de câble utilisé sur la base de la protection prévue par les disjoncteurs / fusibles.



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Symbols used in this manual



Ground Symbol
Indicates an earth ground connection.

Changes from the previous versions of this manual

3-14-15

REV A - Production Release. 3/17/2015

REV B - Clarify Auto-EQ description. 3/27/2015

REV C - Add Lighting Controller info and Low Voltage Disconnect/Reconnect levels. 3/30/15

REV D - Add temperature compensation error info. 5/12/15

REV E - Page 10 Switch (S2) positions D and E were reversed 6/22/16



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Mounting The Brat:

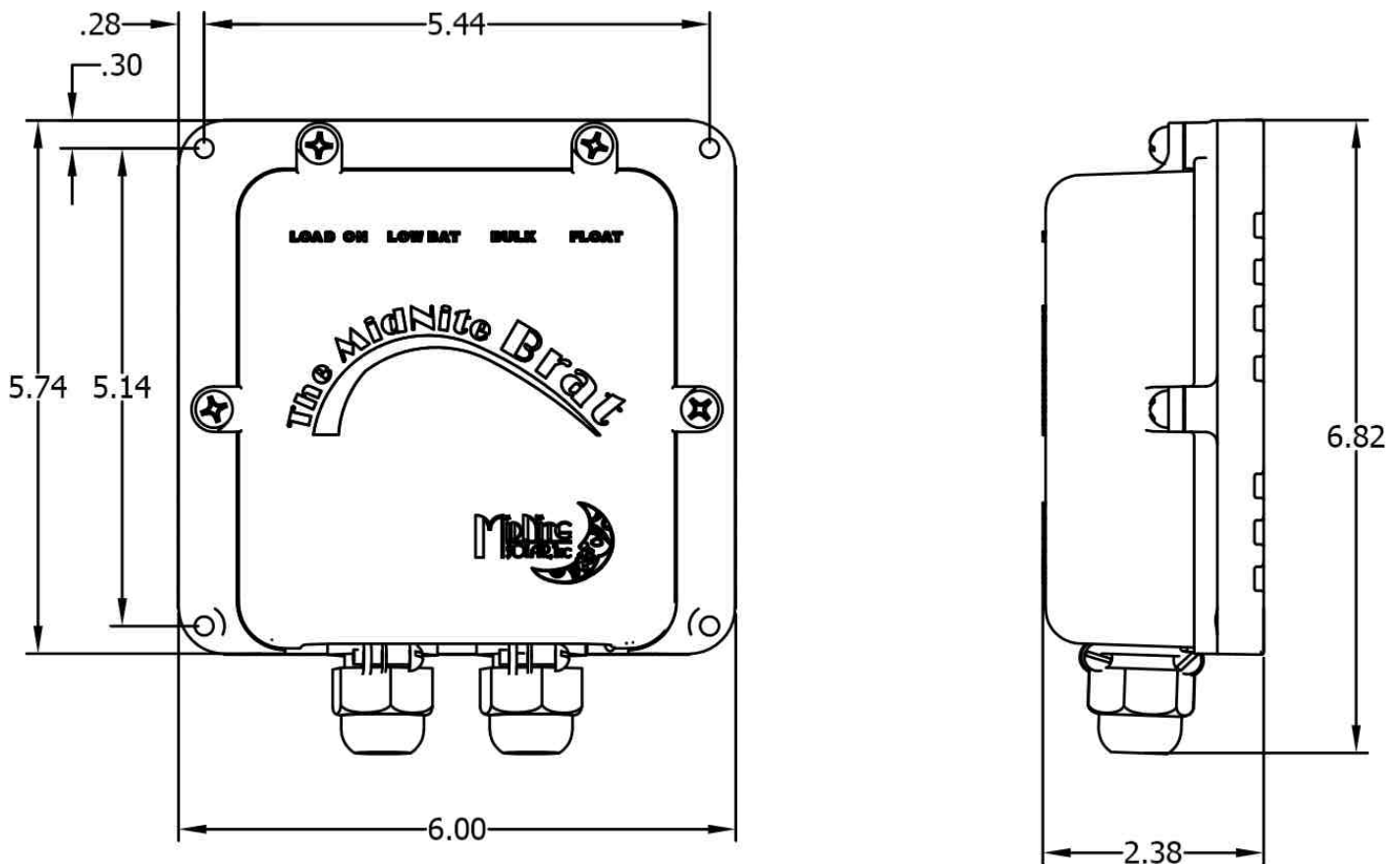
The Brat features rainproof construction allowing great flexibility in installation.

Things to consider when selecting a location for the Brat:

- Length of wire runs/power losses - Longer wires mean heavier gauge wire and greater power loss.
- Environment - The brat's weatherproof construction gives great flexibility, but if it is installed in a very warm location power output may be reduced.
- Visibility of indicator LEDs - The Brat should be mounted where the status LEDs are readily visible.

When you have selected a suitable mounting location, simply attach to the selected area with appropriate screws (not included). #8 hardware should be enough to secure the Brat.

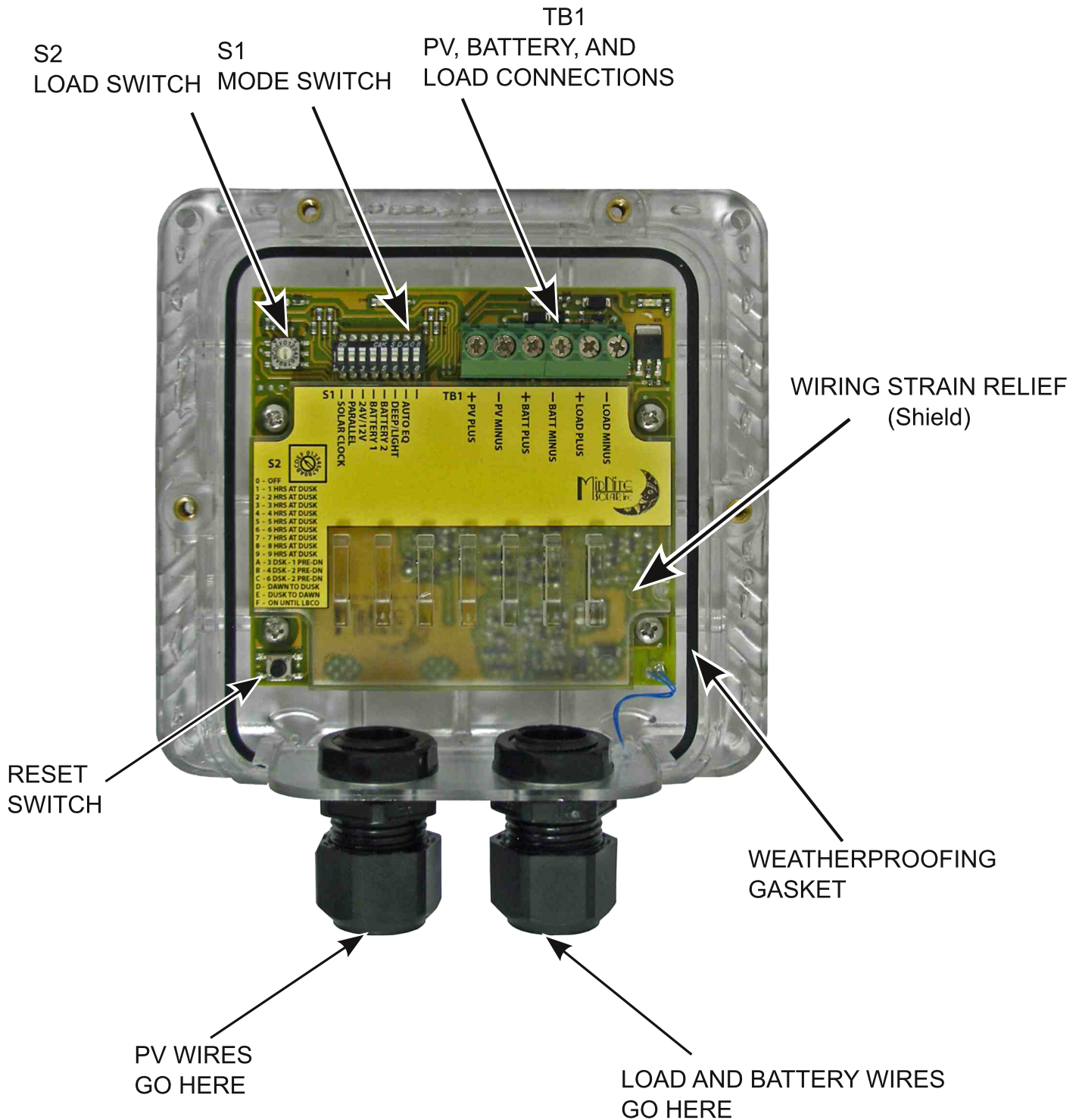
The Brat's weatherproof design even allows "nail it to a tree" installations.



Overall Mounting Dimensions



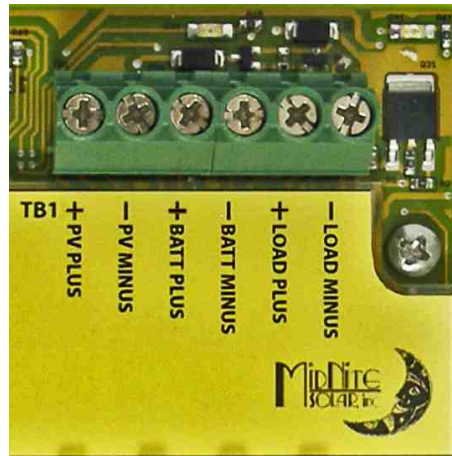
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Component Locator - No Scale



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Wiring the Brat:

All wiring for the Brat is done through the six position terminal block (TB1) at the top of the printed circuit board. Input and output circuit breakers sized to protect the wiring should be used on the input and output. Midnite Solar MNEPV Breakers are an excellent choice for this. Circuit breakers provide circuit protection as well as a convenient means of disconnecting for service or maintenance. Typical breaker sizes by wire gauge: 10 AWG - 30 Amp, 12 AWG - 20 Amp, 14 AWG 15 Amp.

Remove the front cover.

From left to right the connections are:

- | | |
|--------------------|--|
| PV PLUS* | This connection comes from the solar panels or combiner. |
| PV MINUS* | This connection comes from the solar panels or combiner. |
| BATT PLUS | This connection comes from the Positive connection on the battery. |
| BATT MINUS | This connection comes from the Negative connection on the battery. |
| LOAD PLUS* | This connection goes out to the Positive connection of the load/lighting to be controlled by the Brat. |
| LOAD MINUS* | This connection goes out to the Negative connection of the load/lighting to be controlled by the Brat. |

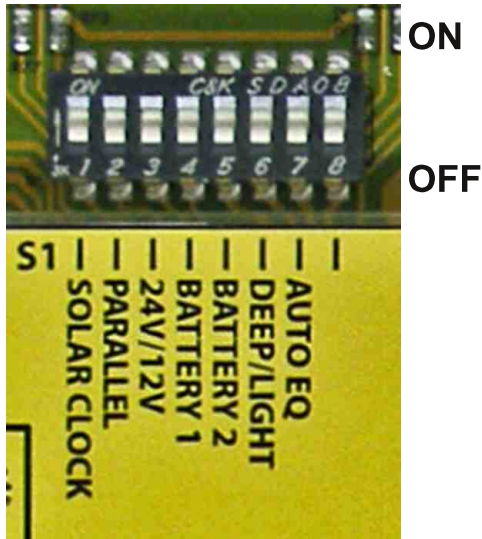
*For Parallel mode (30 Amp charging) the load section of the controller is *paralleled* to the PV inputs.

To do this, run a red wire from **LOAD PLUS** on the Brat's terminal block to the incoming PV positive connection. **PV PLUS** and **LOAD PLUS** should both be connected to the positive PV input. Next you may choose to run a black wire from **LOAD MINUS** on the Brat's terminal block to the incoming PV negative connection. Connecting this **LOAD MINUS** is optional since the negative connections are tied internally.



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Setting up the Brat:



S1 - DIPSWITCH

MODES:

The switch marked as **S1** is used for setting up the various modes of the Brat. Pushing the switch up turns it on and pushing it down turns it off.

Switches S1-2 (Parallel), S1-3 (12/24 Volt), and S1-4 and S1-5 (Battery Profile) are only read on power up of The Brat. These switches should be set before powering up The Brat. S1-1 and S1-6 through 8 may be set at any time.

For lighting / load settings see **S2** on page 10.

- | | |
|------------------------------|---|
| S1-1 Solar Clock - | When on, The Brat will adjust load control for seasonal solar changes (time). |
| S1-2 Parallel - | When on, the load circuit is used by the Brat to boost charging to 30 Amps. |
| S1-3 24V / 12V - | Push the switch up for 24V systems and down for 12V systems. |
| S1-4 Battery 1 - | Selects the type of system battery - See Below. |
| S1-5 Battery 2 - | Selects the type of system battery - See Below. |
| S1-6 Deep / Light - | Up allows load to discharge the batteries deeper. Down for normal / light. |
| S1-7 Auto EQ - | Slide the switch up to enable Auto EQ. |
| S1-8 PWM DISABLE - | Slide switch up for On/Off charging - Reduces EMI. Not recommended. |
| S1-4 OFF and S1-5 Off | Sealed Profile #1 Bulk and Absorb 14.1, Float 13.7, Equalize NA*. |
| S1-4 OFF and S1-5 On | Sealed Profile #2 Bulk and Absorb 14.4, Float 13.5, Equalize NA*. |
| S1-4 On and S1-5 Off | Flooded Profile #1 Bulk and Absorb 14.4, Float 13.2, Equalize 15.5. |
| S1-4 On and S1-5 On | Flooded Profile #2 Bulk and Absorb 14.4, Float 13.7, Equalize 14.9. |

* Equalization is disabled for sealed batteries.

Using The Brat:

Now that all solar panels, batteries, and loads (if any) are connected and all mode switches are set it is time to give the system one last look for wiring errors. When satisfied that all is correct it is time to power up the system for the first time.

First turn on the disconnect/breaker to the battery. Next turn on the breaker/disconnect to the solar panels and finally turn on the breaker/disconnect to the loads (if any).

What you should see:

What you should see when you turn The Brat on is the LEDs chasing from left to right and back two times. After initialization, If there is power from the panels and no errors The Brat would show that it is



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Bulk charging (Yellow LED) and depending on settings it would show if loads are on (Blue LED). If an Error is present the LEDs will indicate the error code (See Error Codes on page 10).

Three stage charging:

- Stage one, bulk charge - The Brat sends all available power to the batteries until the bulk voltage setting is reached.
- Stage two, Absorb charge - The Brat holds the batteries at the absorb voltage for two hours as long as adequate power is available from the panels.
- Stage Three, Float charge - The brat holds the batteries at the float voltage as long as adequate power is available from the panels.

EQ and Auto EQ Charge*

The Brat holds the batteries at the EQ voltages listed on page 8 for two hours as long as enough power is available from the panels. This is a form of controlled overcharge that allows the cells of the batteries to become more equally charged. Refer to your battery manufacturers recommendation for equalizing your batteries and expect to be adding water afterward.

Auto EQ* when enabled (Switch S1-7 in the up position).

After thirty days of operation The Brat will attempt an EQ cycle. The Auto EQ cycle starts after The Brat completes Absorb charging and is ready to go to Float.

If The Brat does not complete Absorb charging at this time it will wait until it does complete Absorb charging to start AUTO EQ. That may be later on the same day or in subsequent days.

If the full EQ cycle does not complete The Brat will try to complete the cycle the next day, but only the next day. If Auto EQ is not complete at this point the day counter will reset and try again in thirty days.

*EQ and Auto EQ charge are only available for flooded batteries.

Attempting to EQ or Auto EQ a sealed battery is disabled to prevent damage to the batteries.

Lighting/Load Controller

The Brat has an output for controlling lights or other loads up to 10 amps.

The loads run from the battery and will be at the same voltage as your system battery.

It can be used to turn lights on or off at dusk or dawn and run for various amounts of times.

See the **lighting modes**, **Solar Clock** and **wiring diagram** sections in this manual.

The lighting/Load controller also protects your battery from excessive discharge by disconnecting loads.

There are two setpoints to choose from for low voltage Disconnect (LVD).

Shallow discharge disconnects the loads earlier leaving a higher level of charge.

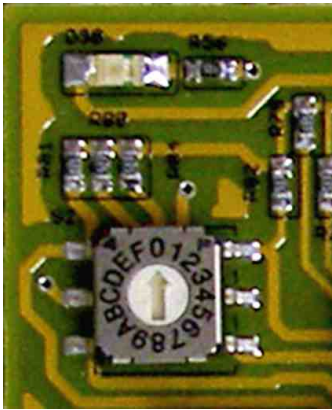
Deep discharge is meant to allow using all available power but still protecting your battery from damage. Loads will automatically restart when the voltage returns to the reconnect level.

Low Voltage Disconnect:.....	12V Setting.....	24VSetting
Light/Shallow discharge.....	11.7V.....	23.4
Deep Discharge.....	11.0V.....	22.0V
Reconnect	12.6V.....	25.2V



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Lighting Modes:



S2 Rotary Switch

The Brat includes a lighting controller that can be used to turn lights or other loads on at sunset and before dawn for a specified period of time or until the battery is depleted to the depth of discharge (LVD) setting.

The rotary switch marked as **S2** is used for setting the lighting controller.

The rotary switch (S2) settings are as follows:



- 0 - Turns lighting controller off.
- 1 - Turns lights on for one hour at dusk.
- 2 - Turns lights on for two hours at dusk.
- 3 - Turns lights on for three hours at dusk.
- 4 - Turns lights on for four hours at dusk.
- 5 - Turns lights on for five hours at dusk.
- 6 - Turns lights on for six hours at dusk.
- 7 - Turns lights on for seven hours at dusk.
- 8 - Turns lights on for eight hours at dusk.
- 9 - Turns lights on for nine hours at dusk.
- A - Turns lights on for three hours at dusk and one hour before dawn.
- B - Turns lights on for four hours at dusk and two hours before dawn.
- C - Turns lights on for six hours at dusk and two hours before dawn.
- D - Turns lights on from dawn to dusk.
- E - Turns lights on from dusk to dawn.
- F - Turns lights on until Low Battery Cut Off (LVD).

Test/Reset Manual EQ pushbutton

The pushbutton switch on the lower right corner of the board is used for:

1. Testing loads (Click).
2. Resetting displayed fault conditions (Hold).
3. Starting/Stopping manual EQ (Hold).

1. **To test loads** connected to the Brat's controlled load output give the pushbutton a momentary push. Power will be available at the output for ten seconds. This is useful for verifying function of the connected loads. Note: load functions are only available when the brat is not set to parallel. See S1-2 on the page 8.



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2. **Resetting fault conditions:** If a fault condition is present, pressing and holding the pushbutton will reset the fault condition. If the fault condition is still present the fault indication will return.

3. **Manual EQ:** If no fault condition is present, pressing and holding the pushbutton will tell The Brat to manually start an EQ cycle after it completes absorb. If The Brat is in Float the manual EQ Will start immediately.

One of three things will happen at this point.

1. All LEDs blink three times and the green LED remains on. This indicates an attempt to EQ a sealed battery.
2. The LEDs will blink once in succession from left to right to show that the EQ request is accepted and the green LED will blink when the EQ cycle begins and throughout the EQ cycle.
3. If an EQ cycle has already been initiated the LEDs will blink once in succession from right to left to show that the EQ request is Cancelled and the green LED will return to its previous condition. For example: on-showing that The Brat has returned to Float.

TO STOP AN EQ CYCLE - Auto or Manual, press and hold the reset button for two seconds

NOTE: EQ is only available for flooded batteries. Attempting to start an EQ cycle with switch S1 set to any sealed battery setting (see page 8) will result in an error being displayed on the LEDs and the EQ cycle will not start.

NOTE: If the battery is disconnected while the PV input is active The Brat may continue to function. If this should occur the load output may lose regulation resulting in possible damage to connected loads. Always disconnect the PV input before disconnecting the battery.

Error Codes

When an error occurs all LEDs will blink together three times and a code will be displayed.

These codes are shown on the LEDs as follows:

Attempt to EQ a Sealed Battery	Off	Off	Off	On
Reverse polarity Battery	Off	Off	On	Off
Reverse polarity PV	Off	Off	On	On
24 Volt Battery with Brat set to 12 V	Off	On	Off	Off
Parallel**	Off	On	Off	On
Switch set to an invalid setting while on*	Off	On	On	Off
Temperature sensor failure	Off	On	On	On

**Indicates that the load circuit was not correctly wired for Parallel (30 Amp) charging.

*An Invalid setting change includes setting sealed batteries to Auto-EQ, changing battery voltage while The Brat is powered, or changing the Parallel/Load setting.



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LED indications

Blue LED (Far left)	On Solid = Load is on. Slow Blink = OCP Fault, Can attempt reset by pressing reset button.
Red LED (2nd Left)	On Solid = Load disconnected by Low Voltage Disconnect (Low Batt). Slow Blink = Battery Voltage too low (LVD) or too high (OVD).
Org LED (2nd Rt)	On Solid = Bulk Charging. Slow Blink = Absorb Charging. Rapid Blink = Bulk or Absorb, Output derated due to overheating.
Grn LED (right)	On Solid = Float Charging. Slow Blink = EQ cycle in progress. Rapid Blink = Float or EQ, Output derated due to overheating.
GRN and RED	Slow Blink = OCP - an overcurrent event has occurred.

Solar Clock - The Solar Clock uses dusk and dawn to determine time of day.

When the slide switch S1-1 (furthest left) is turned on for the first time or after a reset The Brat begins a monitoring cycle and records sunrise and sunset for seven days. At the end of this seven day period The Brat has a pretty good idea of time of day. The Brat uses this information with the load function to turn loads on and off at dusk and dawn as set by the user. The Brat continues to monitor dusk and dawn to keep the solar clock updated.

For example, if in late spring you set The Brat to turn the load on at dusk for two hours and dusk is at 7:30 PM it would turn the load off at 9:30. As the sunset time gets later the turn off time will remain at 9:30. Should dusk come after 9:30 the load would not come on.

On that sad, sad day after the solstice when the daylight hours start getting shorter again the turn off time will remain at 9:30 while dusk could be at 5:13 or earlier. The on time adjusts automatically by length of day. The Solar Clock works with load modes 1-9.

The Solar Clock is reset when S1-1 is set to off for more than 30 seconds.

Temperature sensing and compensation.

The Brat has a temperature sensor near the bottom of the plastic enclosure. This sensor is used for temperature compensated battery charging. Charging is adjusted by $-30\text{mV}/^{\circ}\text{C}$ in 12V mode and $-60\text{mV}/^{\circ}\text{C}$ in 24V mode. Temperature compensation is most effective if The Brat is near the batteries.

If the sensor becomes damaged or disconnected The Brat will ignore this sensor and disable temperature compensation. Charging will continue as if at 25°C . An error code will be displayed, all LEDs blink three times then Low Batt, Bulk and Float LEDs light together for 2 - 3 seconds.

The LEDs will then return to normal, displaying load/charging status The temp sense error status will be displayed once a minute. To cancel the error status display - hold the button at the bottom of the board for three seconds. The error code will flash three times to acknowledge the request.

An error code will continue to show when the unit is powered up.

Repairing the sensor will clear the error.



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Glossary

- Absorb..... A charging state where the battery is held at the absorb volt setting for 2 hours.
- Amp..... A measurement of electrical current.
- Amp-Hour..... A measurement of electrical power. Amps x Hours.
- Auto-EQ..... An equalization charge that will attempt to start every thirty days.
- AWG..... American Wire Gauge.
- BATT..... Battery or Battery Bank.
- Bulk..... A charging state where all available power goes to the battery until it reaches the Absorb voltage setting.
- EMI..... Electro Magnetic Interference. Electrical noise.
- EQ..... Equalization charge. An extended charge to match charge level on battery cells.
- Float..... A charging state to maintain a fully charged battery.
- LED..... Light Emitting Diode.
- LVD..... Low Voltage Disconnect.
- OVD..... Over Voltage Disconnect.
- Minus..... Negative power connection
- Parallel..... A mode where the Load circuit is used to increase The Brat's charging capacity.
- Plus..... Positive power connection.
- PV..... PhotoVoltaic.
- PWM..... Pulse Width Modulation. How The Brat maintains regulation.
- Solar Clock..... The ability of The Brat to estimate time of day. Used with the load function.
- Temp Compensation Charging voltage adjustments made by The Brat based on Ambient temperature.
- Three Stage Charging..... A charging scheme for batteries with three levels of charging.
- Watt..... Instantaneous power. Amps x Volts = Watts.
- Watt-Hour..... A measurement of electrical power. Watts x Hours = Watt-Hours.

Ratings

- Max PV Voltage in 60 Volts DC
- Max Output 30 Amps DC Configurable as 20 Amps charge and 10 Amps load or as 30 Amps charge only.
- Thermal Shutdown 85°C restarting at 55°C

Low Voltage Disconnect:.....	12V Setting.....	24V Setting
Light/Shallow discharge.....	11.7V.....	23.4V
Deep Discharge.....	11.0V.....	22.0V
Reconnect 	12.6V.....	25.2V

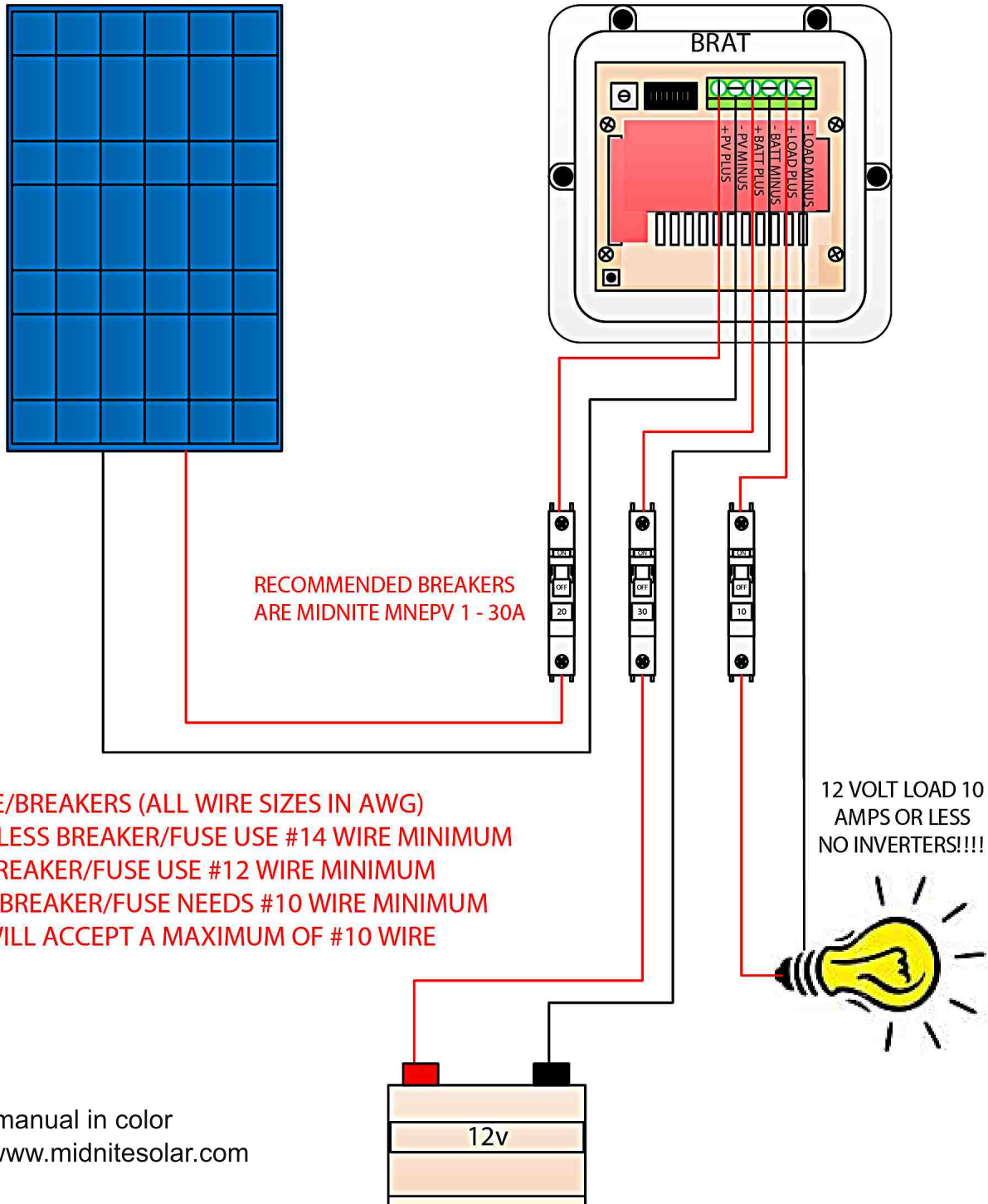
Troubleshooting

Problem	Possible Cause(s)	Solution
Batteries do not charge	Incorrect system Voltage selected Not enough sunlight reaching the panels wiring error	Set S1-3 to correct system voltage Reposition panels, check for shading Verify all connections



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BRAT WITH 1- 12V PANEL (USUALLY HAS A VMP OF 17 VOLTS OR MORE) AND A LIGHTING LOAD ON A 12V BATTERY REVA-2-16-15



SIZING FUSE/BREAKERS (ALL WIRE SIZES IN AWG)
 15 AMP OR LESS BREAKER/FUSE USE #14 WIRE MINIMUM
 6-20 AMP BREAKER/FUSE USE #12 WIRE MINIMUM
 21-30 AMP: BREAKER/FUSE NEEDS #10 WIRE MINIMUM
 THE BRAT WILL ACCEPT A MAXIMUM OF #10 WIRE

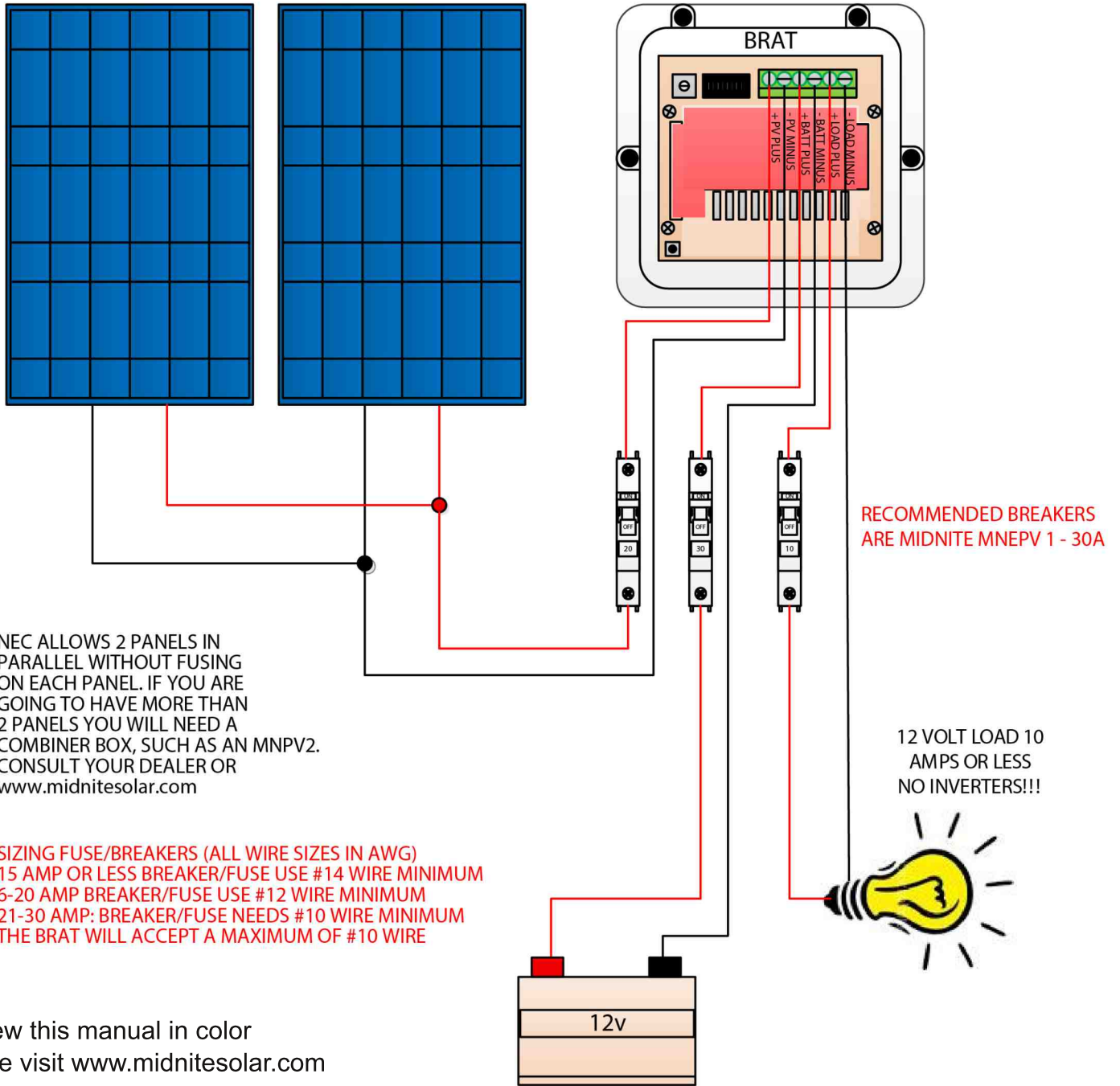
To view this manual in color
 please visit www.midnitesolar.com

MNEPV Breakers for use with The Brat are available in 1,2,3,4,5,6,7,8,9,10,11,12,15,20 and 30 Amp sizes. Larger sizes are available but not for use with The Brat.



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BRAT WITH 2- 12V PANEL (USUALLY HAS A VMP OF 17 VOLTS OR MORE) AND A LIGHTING LOAD ON A 12V BATTERY REVA-2-16-15

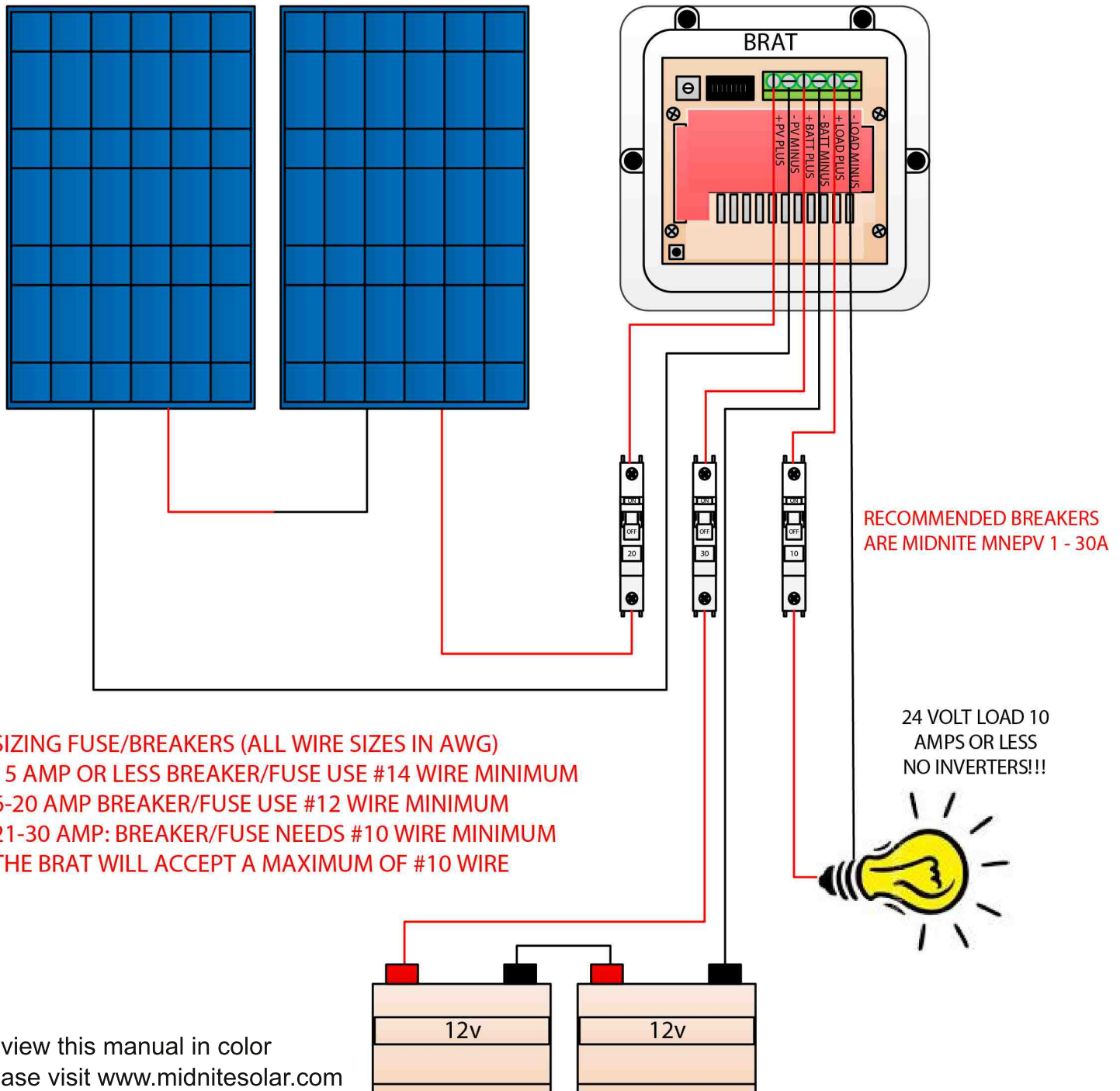


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The Brat Solar Charge Controller Instructions

BRAT WITH 2- 12V PANEL (USUALLY HAS A VMP OF 17 VOLTS OR MORE) AND A LIGHTING LOAD ON A 24V BATTERY REVA-2-16-15

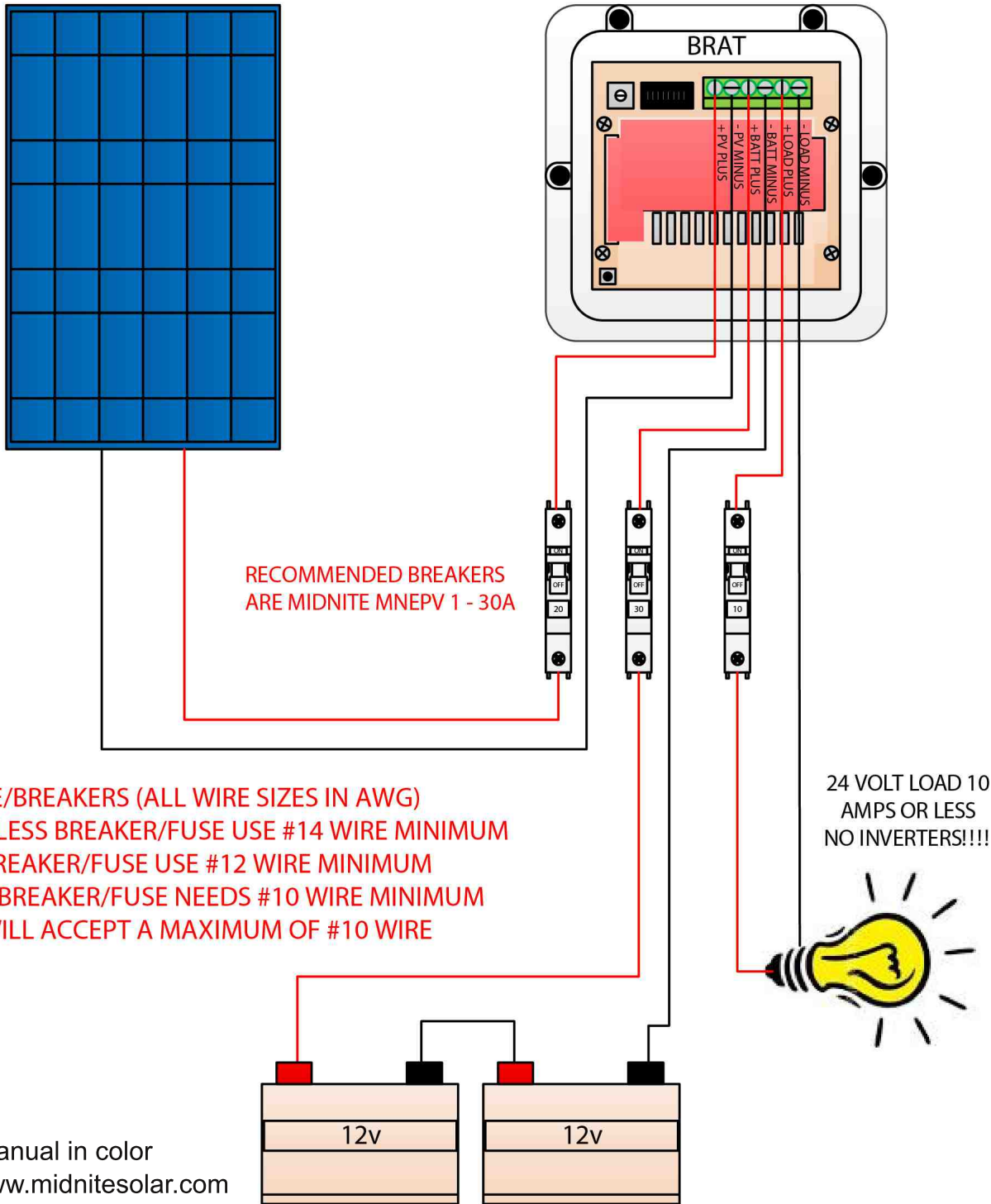


MNEPV Breakers for use with The Brat are available in 1,2,3,4,5,6,7,8,9,10,11,12,15,20 and 30 Amp sizes. Larger sizes are available but not for use with The Brat.



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BRAT WITH 1- 24V PANEL (USUALLY HAS A VMP OF 34 VOLTS OR MORE) AND A LIGHTING LOAD ON A 24V BATTERY REVA-2-16-15



SIZING FUSE/BREAKERS (ALL WIRE SIZES IN AWG)
 15 AMP OR LESS BREAKER/FUSE USE #14 WIRE MINIMUM
 6-20 AMP BREAKER/FUSE USE #12 WIRE MINIMUM
 21-30 AMP: BREAKER/FUSE NEEDS #10 WIRE MINIMUM
 THE BRAT WILL ACCEPT A MAXIMUM OF #10 WIRE

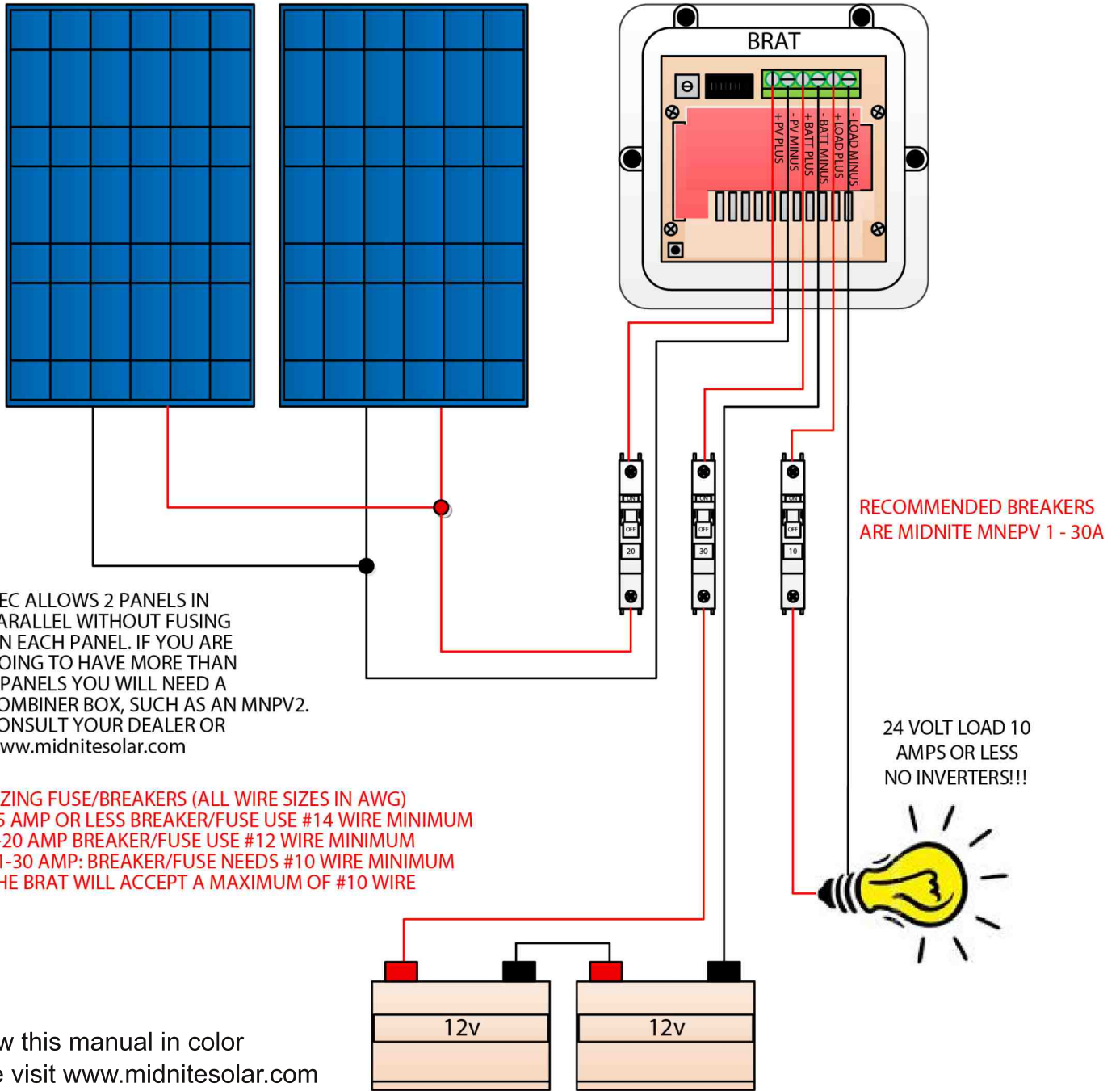
To view this manual in color please visit www.midnitesolar.com

MNEPV Breakers for use with The Brat are available in 1,2,3,4,5,6,7,8,9,10,11,12,15,20 and 30 Amp sizes. Larger sizes are available but not for use with The Brat.



The Brat Solar Charge Controller Instructions

BRAT WITH 2- 24V PANEL (USUALLY HAS A VMP OF 34 VOLTS OR MORE) AND A LIGHTING LOAD ON A 24V BATTERY REVA-2-16-15

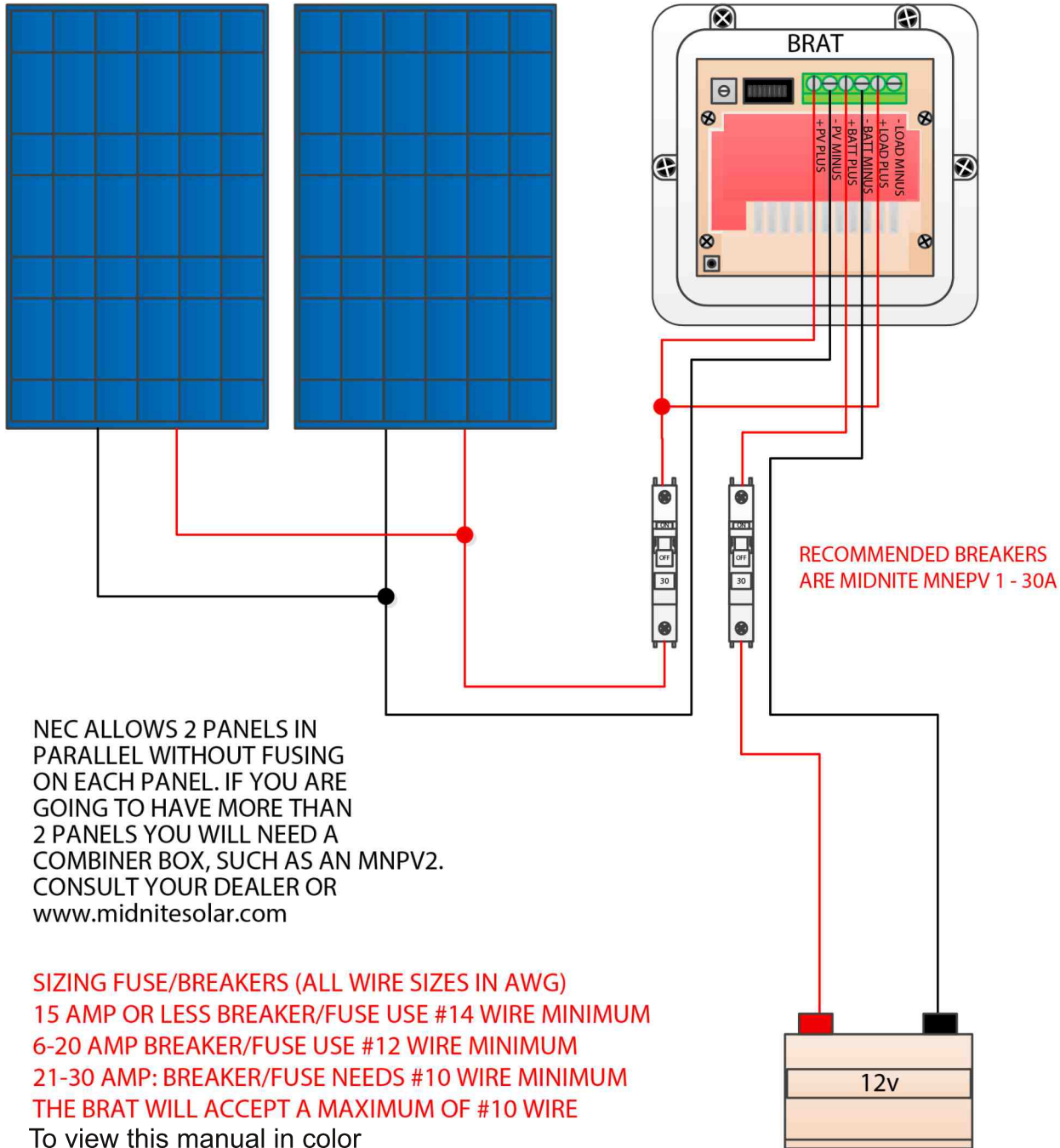


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The Brat Solar Charge Controller Instructions

BRAT WITH 2- 12V PANEL (USUALLY HAS A VMP OF 17 VOLTS OR MORE)
PARRALLELED LOAD CIRCUIT 12V BATTERY REVA-2-16-15



NEC ALLOWS 2 PANELS IN PARALLEL WITHOUT FUSING ON EACH PANEL. IF YOU ARE GOING TO HAVE MORE THAN 2 PANELS YOU WILL NEED A COMBINER BOX, SUCH AS AN MNPV2. CONSULT YOUR DEALER OR www.midnitesolar.com

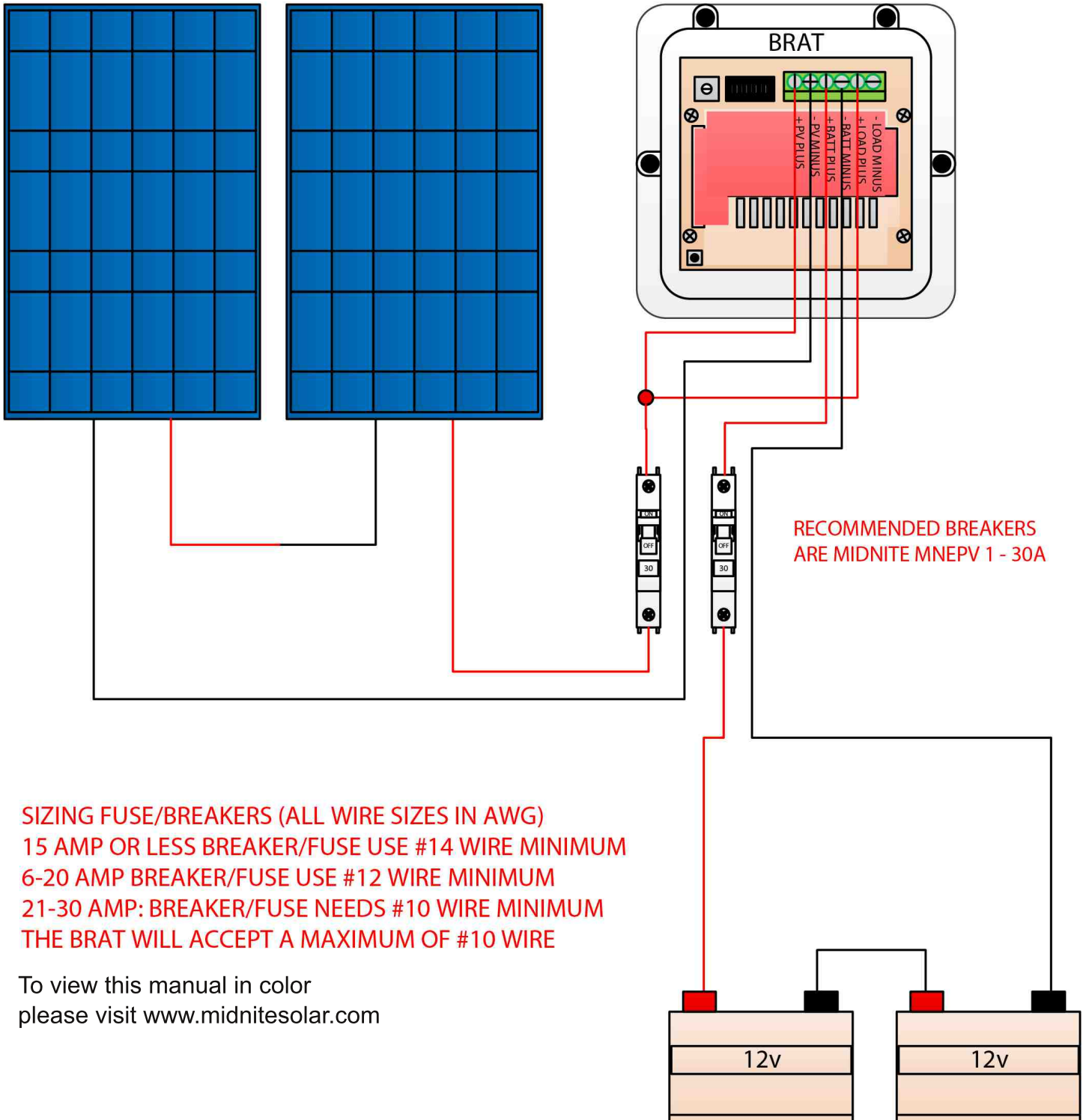
SIZING FUSE/BREAKERS (ALL WIRE SIZES IN AWG)
15 AMP OR LESS BREAKER/FUSE USE #14 WIRE MINIMUM
6-20 AMP BREAKER/FUSE USE #12 WIRE MINIMUM
21-30 AMP: BREAKER/FUSE NEEDS #10 WIRE MINIMUM
THE BRAT WILL ACCEPT A MAXIMUM OF #10 WIRE
 To view this manual in color please visit www.midnitesolar.com

MNEPV Breakers for use with The Brat are available in 1,2,3,4,5,6,7,8,9,10,11,12,15,20 and 30 Amp sizes. Larger sizes are available but not for use with The Brat.



The Brat Solar Charge Controller Instructions

BRAT WITH 2- 12V PANEL (USUALLY HAS A VMP OF 17 VOLTS OR MORE)
PARRALLELED LOAD CIRCUIT 24V BATTERY REVA-2-16-15



SIZING FUSE/BREAKERS (ALL WIRE SIZES IN AWG)
 15 AMP OR LESS BREAKER/FUSE USE #14 WIRE MINIMUM
 6-20 AMP BREAKER/FUSE USE #12 WIRE MINIMUM
 21-30 AMP: BREAKER/FUSE NEEDS #10 WIRE MINIMUM
 THE BRAT WILL ACCEPT A MAXIMUM OF #10 WIRE

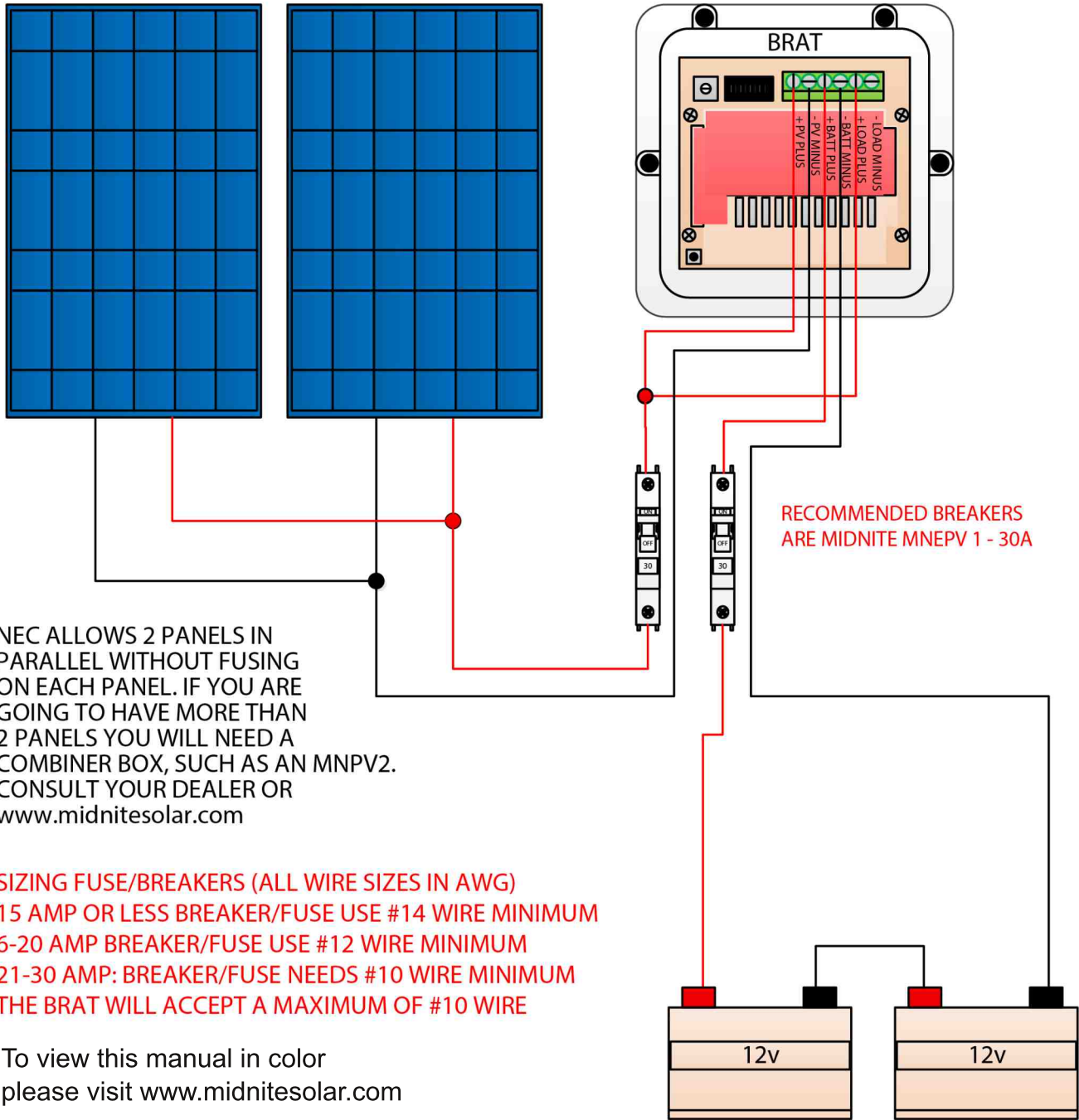
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MNEPV Breakers for use with The Brat are available in 1,2,3,4,5,6,7,8,9,10,11,12,15,20 and 30 Amp sizes. Larger sizes are available but not for use with The Brat.



The Brat Solar Charge Controller Instructions

BRAT WITH 2- 24V PANEL (USUALLY HAS A VMP OF 34 VOLTS OR MORE)
PARRALLELED LOAD CIRCUIT 24V BATTERY REVA-2-16-15



MNEPV Breakers for use with The Brat are available in 1,2,3,4,5,6,7,8,9,10,11,12,15,20 and 30 Amp sizes. Larger sizes are available but not for use with The Brat.



Optional Accessories



MNPV Series Combiners

When combining more than two strings code requires fuses or breakers on each string. This is because if a fault occurred in one string the output current of the other strings would gang up on the faulted panel with predictable results. Midnite MNPV combiners prevent this situation while making installation a breeze. Models with MC4 connectors offer Plug N Play connection to the solar panels and convenient wiring to the rest of the system. A combiner with circuit breakers also provides a convenient disconnect for the solar panels.

Type 3R Rainproof construction allows outdoor installation



MNEPV Breakers and MNTS Touch Safe fuses and Fuseholders

MidNite Solar MNEPV breakers and MNTS Touch safe fuseholders are agency approved Dinrail mount circuit protection. Available in a wide range of sizes. All MidNite circuit breakers can be used at 100% rated current when mounted in a MidNite enclosure.

Breaker / Fuseholder Torque Value: 20 In-Lbs (2.3NM)



MNEPV BREAKER

MNTS FUSEHOLDER



The Brat Solar Charge Controller Instructions

Optional Accessories



Baby Box



Big Baby

Baby Box and Big Baby Breaker Boxes

An economical and convenient way of providing overcurrent protection. For indoor use only

The Baby

General use powder coated aluminum enclosure for retrofits, small inverter disconnect, PV disconnect, AC or DC distribution. Used all around the world. 3/4 & 1" knockouts each end.

The Big Baby

The original Baby box has been a huge success in filling an industry need. We have created an enclosure called the Big Baby to overcome the Baby Box smallness allowing for a ETL listed 4 position din rail box. This box is about twice as wide as the baby box giving you more wiring room. It also includes a ground box lug and mounting provisions for our short insulated bus bar as well as a ground bus bar.



MNEDCQUAD Box

General use powder coated aluminum enclosure for 4 panel mount type breakers from 5 - 100 Amp.
For Indoor Use Only.



MNSPD Surge Protection Device

The MidNite Solar Surge Protector Device (MNSPD) is a Type 2 device per UL1449 rev3. It is designed for both AC and DC systems and provides protection to service panels, load centers or where the SPD is directly connected to the electronic device requiring protection.



The Brat Solar Charge Controller Instructions

MIDNITE SOLAR INC. LIMITED WARRANTY

MidNite Solar Power electronics, sheet metal enclosures and accessories

MidNite Solar Inc. warrants to the original customer that its products shall be free from defects in materials and workmanship. This warranty will be valid for a period of two (2) years for MNBRAT Charge Controllers.

At its option, MidNite Solar will repair or replace at no charge any MidNite product that proves to be defective within such warranty period. This warranty shall not apply if the MidNite Solar product has been damaged by unreasonable use, accident, negligence, service or modification by anyone other than MidNite Solar, or by any other causes unrelated to materials and workmanship. The original consumer purchaser must retain original purchase receipt for proof of purchase as a condition precedent to warranty coverage. To receive in-warranty service, the defective product must be received no later than two (2) weeks after the end of the warranty period. The product must be accompanied by proof of purchase and Return Authorization (RA) number issued by MidNite Solar. For an RMA number contact MidNite Solar Inc., 17722 67th Ave NE, Arlington, WA 98223 (360) 403-7207.

Purchasers must prepay all delivery costs or shipping charges to return any defective MidNite Solar product under this warranty policy. Except for the warranty that the products are made in accordance with, the specifications therefore supplied or agreed to by customer:

MIDNITE SOLAR MAKES NO WARRANTY EXPRESSED OR IMPLIED, AND ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEEDS THE FOREGOING WARRANTY IS HEREBY DISCLAIMED BY MIDNITE SOLAR AND EXCLUDED FROM ANY AGREEMENT MADE BY ACCEPTANCE OF ANY ORDER PURSUANT TO THIS QUOTATION. MIDNITE SOLAR WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES, LOSS OR EXPENSE ARISING IN CONNECTION WITH THE USE OF OR THE INABILITY TO USE ITS GOODS FOR ANY PURPOSE WHATSOEVER. MIDNITE SOLAR'S MAXIMUM LIABILITY SHALL NOT IN ANY CASE EXCEED THE CONTRACT PRICE FOR THE GOODS CLAIMED TO BE DEFECTIVE OR UNSUITABLE.

Products will be considered accepted by customer unless written notice to the contrary is given to MidNite Solar within ten (10) days of such delivery to customer. MIDNITE SOLAR is not responsible for loss or damage to products owned by customer and located on MIDNITE SOLAR'S premises caused by fire or other casualties beyond MIDNITE SOLAR'S control. This warranty is in lieu of all other warranties expressed or implied.



Midnite the Cat

