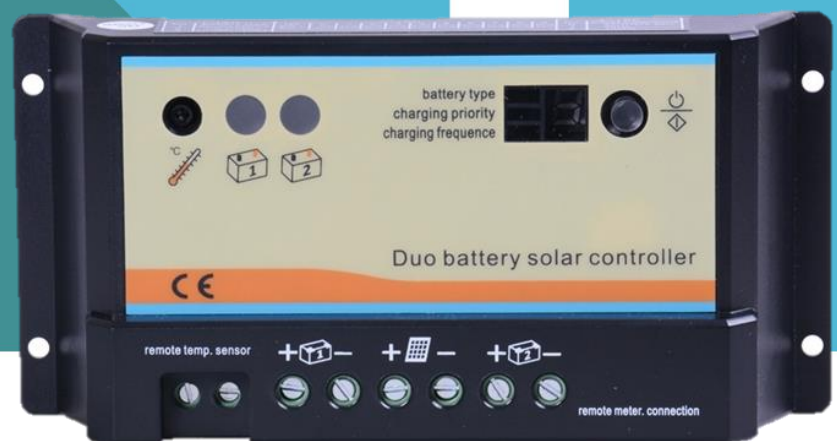


Duo Battery Charge Controller

RENOGY 10A | 20A
Pulse Width Modulation Solar Charge Controller Manual



2775 E. Philadelphia St., Ontario CA 91761
1-800-330-8678

Important Safety Instructions

Please save these instructions.

This manual contains important safety, installation, and operating instructions for the charge controller. The following symbols are used throughout the manual to indicate potentially dangerous conditions or important safety information.

 **WARNING:** Indicates a potentially dangerous condition. Use extreme caution when performing this task.

CAUTION: Indicates a critical procedure for safe and proper operation of the controller

NOTE: Indicates a procedure or function that is important to the safe and proper operation of the controller.

General Safety Information

- Read all of the instructions and cautions in the manual before beginning the installation.
- There are no serviceable parts for this controller. Do **NOT** disassemble or attempt to repair the controller.
- Disconnect the solar module and fuse/breakers near to battery before installing or adjusting the PWM1020CC-DB.
- Install external fuses/breakers as required.
- Do **NOT** allow water to enter the controller.
- Confirm that the power connections are tightened to avoid excessive heating from a loose connection.

Charge Controller Safety

- **NEVER** connect the solar panel array to the controller without a battery. Battery must be connected first.
- Ensure input voltage does not exceed 30 VDC (for 12V system) or 55VDC (for 24V system) to prevent permanent damage. Use the Open Circuit (V_{oc}) to make sure the voltage does not exceed this value when connecting panels together.
- Do not exceed 10A (PWM10DB) or 20A (PWM20DB). The Short Circuit (I_{sc}) of the solar array should be less than 10A (PWM10DB) or 20A (PWM20DB).

Battery Safety

- Use only sealed lead-acid, flooded, or gel batteries which must be deep cycle.
- Explosive battery gases may be present while charging. Be certain there is enough ventilation to release the gases.
- Be careful when working with large lead acid batteries. Wear eye protection and have fresh water available in case there is contact with the battery acid.
- Carefully read battery manuals before operation.
- Do **NOT** let the positive (+) and negative (-) terminals of the battery touch each other.
- Recycle battery when it is replaced.
- Over-charging and excessive gas precipitation may damage the battery plates and activate material shedding on them. Too high of an equalizing charge or too long of one may cause damage. Please carefully review the specific requirements of the battery used in the system.
- Equalization is carried out only for non-sealed / vented/ flooded / wet cell lead acid batteries.
- Do **NOT** equalize sealed / VRLA type AGM / Gel cell batteries **UNLESS** permitted by battery manufacturer.

WARNING: Connect battery terminals to the charge controller **BEFORE** connecting the solar panel(s) to the charge controller. **NEVER** connect solar panels to charge controller until the battery is connected.

WARNING: Do **NOT** connect any inverters or battery charger into the load terminal of the charge controller.

WARNING: Once equalization is active in the battery charging, it will not exit this stage unless there is adequate charging current from the solar panel. There should be **NO** load on the batteries when in equalization charging stage.

Table of Contents

| | |
|---------------------------------------|----|
| General Information | 5 |
| Optional Components | 6 |
| Identification of Parts | 7 |
| Installation | 8 |
| Operation | 13 |
| Troubleshooting | 15 |
| Maintenance | 15 |
| Fusing | 15 |
| Technical Specifications | 16 |
| Dimensions | 17 |
| Wiring Diagrams | 18 |

General Information

The Renogy **PWM1020CC-DB** features dual battery charging capability making it great for RVs, caravans, and boats. With its advanced PWM charging technology, your batteries will be protected from discharging and over-charging.

This controller is specifically designed for mobile off-grid applications supporting 12V deep cycle battery varieties such as sealed lead acid, gel, and flooded. The built-in RJ45 connector gives you the freedom of monitor the voltage, current and temperature of your system via MT-1 remote meter (sold separately).

Key Features

- 12V / 24V auto recognition
- Micro controller digital accuracy
- High efficient PWM charging, increase the battery lifetime and improve the solar system performance.
- Dual battery charging
- Sealed, Gel, and Flooded battery option.
- Remote temperature sensor (sold separated)
- Corrects the charging and discharging parameters automatically based on temperature compensation, improving battery lifetime.
- Short circuit protection
- Battery reverse polarity protection
- Overcharging or discharging protection
- Overload protection

PWM Technology

The PWM 10A/20ACC-Dual Battery utilizes Pulse Width Modulation (PWM) technology for battery charging. Battery charging is a current based process so controlling the current will control the battery voltage. For the most accurate return of capacity, and for the prevention of excessive gassing pressure, the battery is required to be controlled by specified voltage regulation set points for Absorption, Float, and Equalization charging stages. The charge controller uses automatic duty cycle conversion, creating pulses of current to charge the battery. The duty cycle is proportional to the difference between the sensed battery voltage and the specified voltage regulation set point. Once the battery reached the specified voltage range, pulse current charging mode allows the battery to react and allows for an acceptable rate of charge for the battery level.

Optional Components

***The PWM10A/20A-Dual Battery charge controller is shipped by itself, without any additional components.**

Optional components that require a separate purchase:



Figure 1

Remote Temperature Sensor (TS-R): Measures the temperature at the battery and uses this data for very accurate temperature compensation. The sensor is supplied with a 6.6ft cable length that connects to the charge controller. **(Figure 1)**

LCD Display Tracer Meter (MT-1): Allows for real time monitoring of the charge controller. Perfect for circumstances where the user cannot easily access the controller or modify its parameters. It is supplied with a mounting frame and a cable that connects to the RJ45 port on the Dual Battery Charge Controller. **(Figure 2)**



Figure 2

Identification of Parts

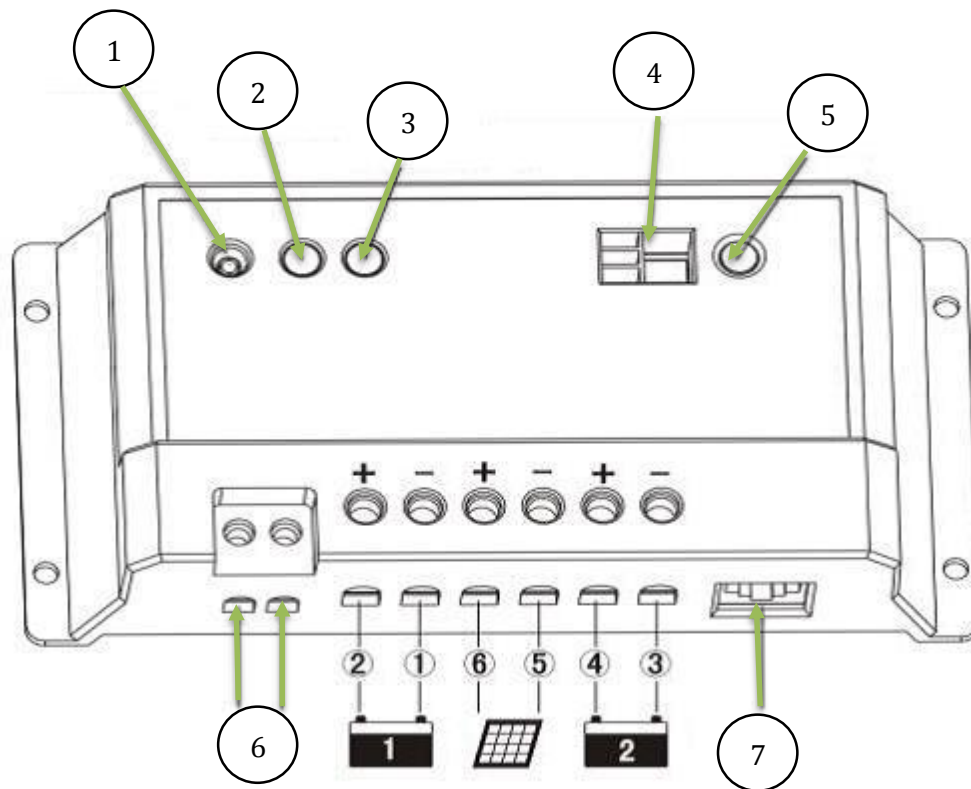


Figure 3

Key Parts

1. **Local Temp. Sensor**—Measures ambient temperature. Battery regulation is adjusted accordingly.
2. **Batt #1 status LED**—Provides charging & battery status and errors
3. **Batt #2 status LED**—Provides charging & battery status and errors
4. **Setting Indicator LEDs and Digital Display**
5. **SET Button**
6. **Remote Temp. Sensor (sold separately)** — a connection point for RTS (optional) to remotely monitor battery temperature.
7. **Remote Meter Connection (RJ45)** — a communication port for the remote meter MT-1 (sold separately).

Installation

General Installation Notes

- Read through the entire installation section first before beginning installation.
- Be very careful when working with batteries. Wear eye protection. Have fresh water available to wash and clean any contact with battery acid.
- Uses insulated tools and avoid placing metal objects near the batteries.
- Explosive battery gasses may be present during charging. Be certain there is sufficient ventilation to release the gasses.
- Avoid direct sunlight and do not install in locations where water can enter the controller.
- Loose power connections and/or corroded wires may result in resistive connections that melt wire insulation, burn surrounding materials, or even cause fire. Ensure tight connections and use cable clamps to secure cables and prevent them from swaying in mobile applications.
- Use with Gel, Sealed or Flooded batteries only.
- Battery connection may be wired to one battery or a bank of batteries. The following instructions refer to a single battery, but it is implied that the battery connection can be made to either one battery or a group of batteries.

Mounting

NOTE: When mounting the PWM1020CC-DB, ensure free airflow through the controller heat sink fins. There should be at least 100mm of clearance above and below the controller to allow for cooling. If mounted in an enclosure, ventilation is highly recommended.

WARNING: Risk of explosion! Never install the PWM1020CC-DB in a sealed enclosure with flooded batteries! Do not install in a confined area where battery gas can accumulate.

Step 1: Choose mounting location

Locate a vertical or horizontal surface protected from direct sunlight, high temperature, and water.

Step 2: Check for Clearance

Place the PWM1020CC-D in the location where it will be mounted. Verify that there is sufficient room to run wires and that there is sufficient room above and below the controller for airflow.

Step 3: Mark Holes

Use a pencil or pen to mark the four (4) mounting hole locations on the mounting surface.

Step 4: Drill Holes

Remove the controller and drill four sizeable holes in the marked locations.

Step 5: Secure Controller

Place the controller on the surface and align the mounting holes with the drilled holes in step 4. Secure the controller in place using mounting screws.

Wiring

Recommended tools to have before installation:



WARNING: Connect battery terminal wires to the charge controller **FIRST** then connect the solar panel(s) to the charge controller. **NEVER** connect solar panel to charge controller before the battery.

CAUTION: Do not over-torque or over tighten the screw terminals. This could potentially break the piece that holds the wire to the charge controller.

CAUTION: Refer to the technical specifications for max wire sizes on the controller and for the maximum amperage going through wires.

CAUTION: For mobile applications, be sure to secure all wiring. Use cable clamps to prevent cables from swaying when the vehicle is in motion. Unsecured cables create loose and resistive connections, which may lead to excessive heating and/or fire.

You are now ready to begin connecting your battery to your charge controller.

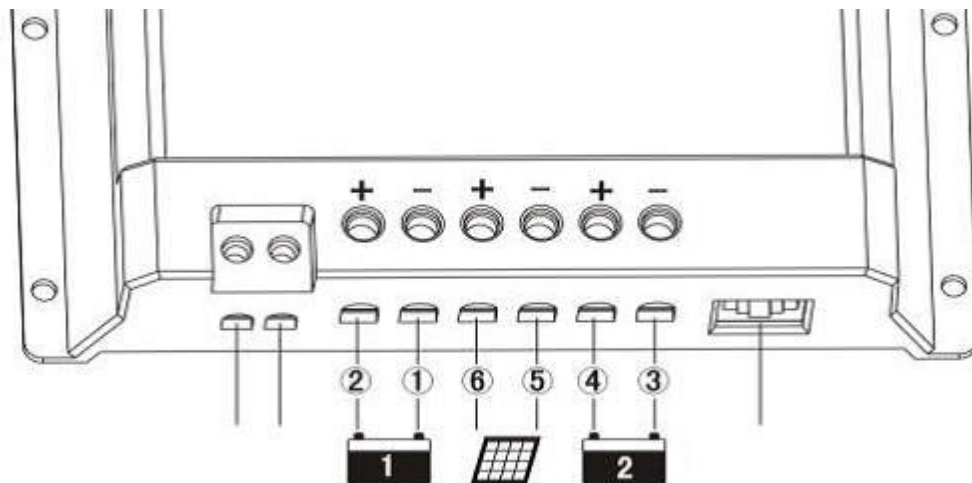
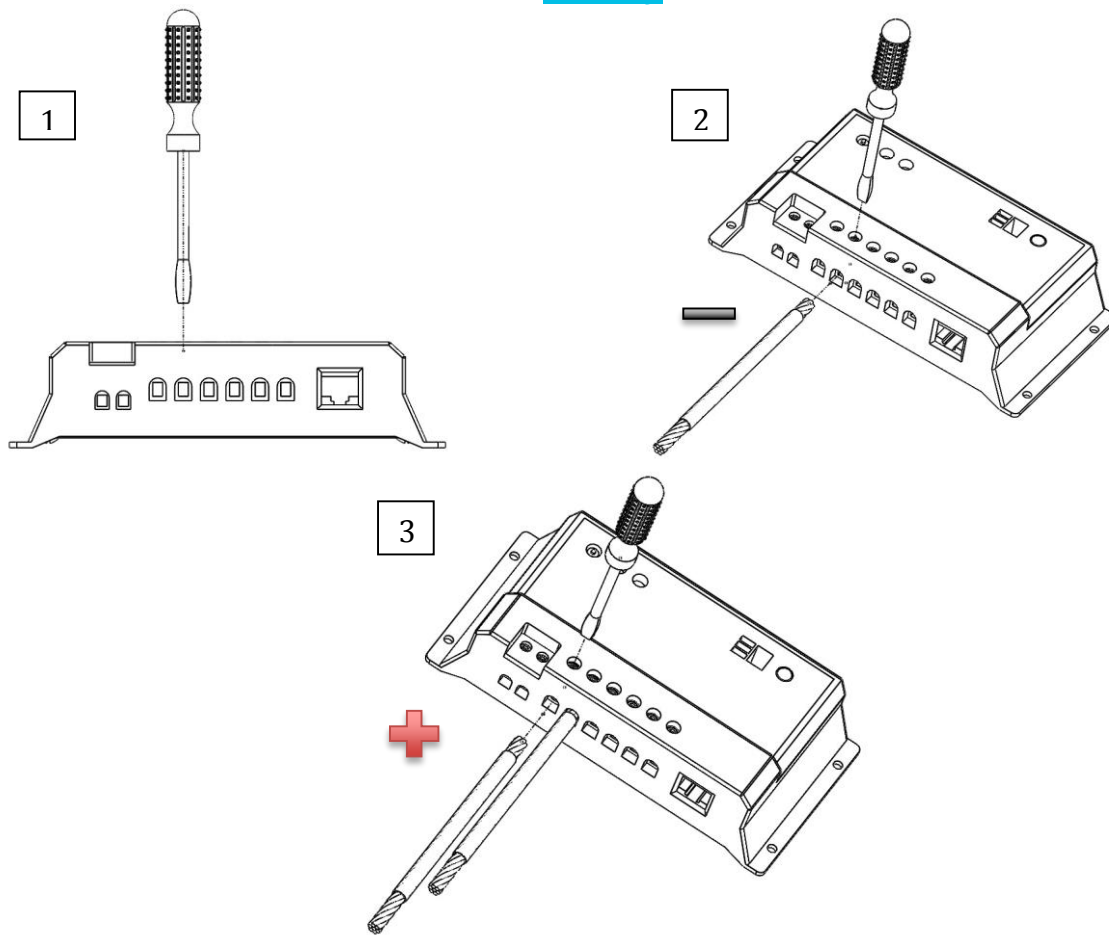


Figure 4 Connection order

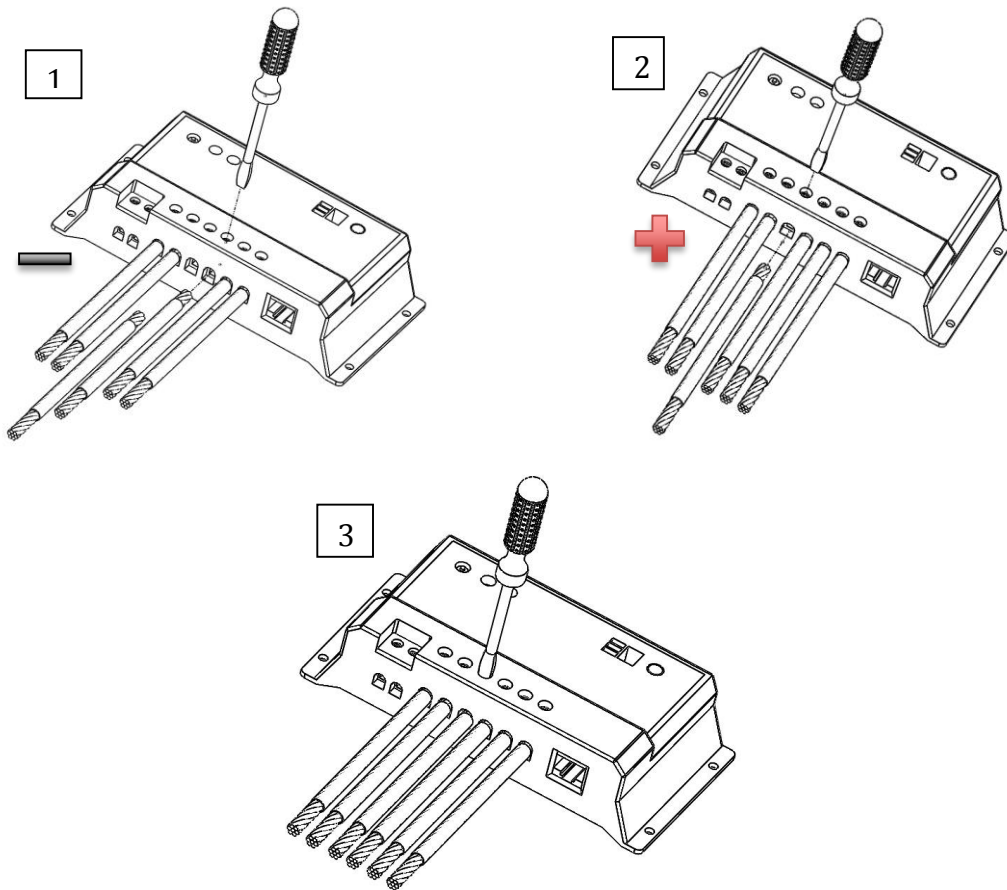
Battery



Connect Battery 1: Refer to **Figure 4**, Connect the negative terminal of Battery 1 to the negative terminal of the charge controller under the Battery 1 logo. Then connect the positive terminal of Battery 1 to the positive terminal of the charge controller under the Battery 1 logo.

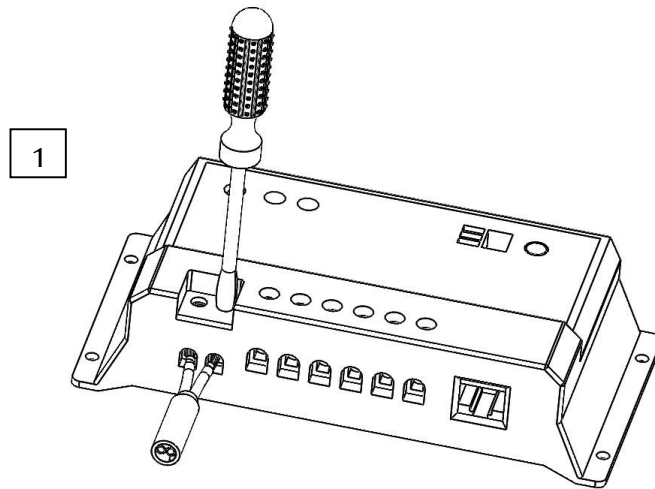
Connect Battery 2: Repeat the process described in **last step** for Battery 2. **Figure 4** shows the connections. If you are not planning on installing a second battery you can skip this step.

Solar Panels



Connect the solar panel(s): Connect the negative PV lead of the solar panel to the negative terminal of the charge controller under the solar array logo. Then connect the positive lead of solar to the positive terminal of the charge controller under the solar array logo. Make sure the solar module(s) voltage and current do not exceed the ratings of the charge controller.

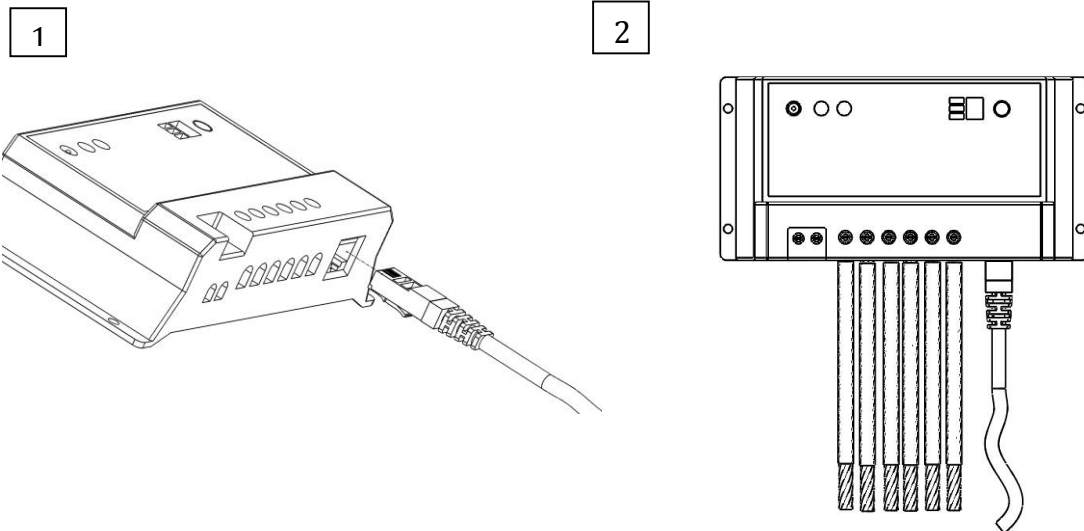
Temperature Sensor (if applicable)



Connect the Remote Temperature Sensor (Optional): If you purchased the remote temperature for your batteries, you can connect it in the remote temperature terminals depicted in **Figure 4**. If you are not planning on using this sensor, you can skip this step.

Note: When the RTS is not present, the controller will calculate the data from the local temperature sensor. The controller will obtain data from RTS automatically when present.

MT-1 Tracer (If applicable)



Connect Remote Meter MT-1 (Optional): The remote meter MT-1 is sold separately and can be connected in the RJ45 communication port. Again, if you are not planning on using this meter, you can skip this step.

Operation

Battery Type

To select the battery type press the SET button on the controller a few times until the “Battery Type” LED lights up. Press the setting button again and hold it for 5 seconds until the digits start flashing. Press the setting button again to choose the battery type as described in **Table 1**. Leave it in this position, and it will stop flashing after a few seconds. The controller has recorded the battery setting.

| Battery Type | Digital Display |
|--------------------------|-----------------|
| Sealed lead acid battery | 1 |
| Gel battery | 2 |
| Flooded battery | 3 |

Table 1 Battery type setting

Charging Priority

To adjust the charging priority of the batteries press the setting button on the controller a few times until the “Charging priority” LED lights up. Press the setting button again and hold it for 5 seconds until the digits start flashing. Press the setting button again to choose the percentage level listed on **Table 2**. Leave it in this position, and it will stop flashing after a few seconds. The controller has recorded the Charging priority setting.

| Number | Battery #1 | Battery #2 |
|--------|---------------|------------|
| 0 | 0% | 100% |
| 1 | 10% | 90% |
| 2 | 20% | 80% |
| 3 | 30% | 70% |
| 4 | 40% | 60% |
| 5 | 50% | 50% |
| 6 | 60% | 40% |
| 7 | 70% | 30% |
| 8 | 80% | 20% |
| 9 | 90% (pre-set) | 10% |

Table 2 Charging priority settings

Note: In the normal charging conditions, the controller will distribute the charge for the selected setting. When Battery 1 is fully charged, charge will be diverted to Battery 2, and return to the no. 4 charging priority setting automatically when Battery 1 is low on voltage. When the controller detects that Battery 1 is the only battery connected, all the charge will go to the Battery 1 automatically.

Charging frequency

To change the charging frequency press the setting button on the controller a few times until the “Charging frequency” LED lights up. Press the setting button again and hold it for 5 seconds until the digits start flashing. Press the setting button again to choose a charging frequency listed on **Table 3**. Leave it in this position, and it will stop flashing after a few seconds. The controller has recorded the Charging priority setting.

| Number | PWM Charging Frequency |
|--------|------------------------|
| 0 | 25 Hz (pre-set) |
| 1 | 50 HZ |
| 2 | 100 HZ |

Table 3 Charging frequency settings

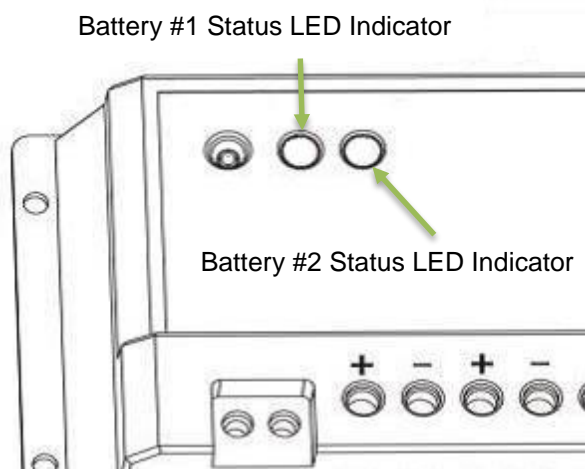


Figure 5 Charge controller LED indicators

Battery Indicators

The LED indicator shown in Figure 5-2 will turn on whenever sunlight is available for battery charging. Under normal charging conditions, the charging LED will lit red at all times.

| Color | Indication | Operating State |
|-------|-------------------|--------------------------------------|
| Red | Solid | Charging |
| Red | Slowly Flashing | Full |
| Red | Frequent Flashing | Not Charging* |
| Red | Quickly Flashing | Short-circuit* |
| Red | Off | Battery not Connected / Overvoltage* |

Table 4 Battery LED indicators

*Please refer to the following section for trouble shooting

Troubleshooting

- Check all connections to ensure they are secure and clean
- Check polarity of the battery connection and make sure the battery generates at least 6V
- Ensure the solar panels are exposed to sufficient light – ideally position them to face the sun directly
- If charge controller states that there is short-circuit, please ensure that the panels are connected correctly, and that the wires at the terminals are not touching each other.
- If one of the status LED is off and a battery is connected, check that the battery terminals have good connection and that the polarity is correct. Check that the voltage doesn't exceed the rated input voltage shown in **Table 7-1** on Section 7.
- If the charge controller is not charging, ensure that the panel's polarity, and check for loose connections.

Maintenance

For best controller performance, it is recommended that these tasks be performed from time to time.

1. Check that controller is mounted in a clean, dry, and ventilated area.
2. Check wiring going into the charge controller and make sure there is no wire damage or wear.
3. Tighten all terminals and inspect any loose, broken, or burnt up connections
4. Make sure readings in the LEDs are consistent.

Fusing

Fusing is recommended in PV systems to provide a safety measure for connections going from panel to controller and controller to battery. Remember to always use the recommended wire gauge size based on the PV system and the controller.

| NEC Maximum Current for different Copper Wire Sizes | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|------|------|
| AWG | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 | 0 |
| Max. Current | 10A | 15A | 20A | 30A | 55A | 75A | 95A | 130A | 170A |

Table 5

| Fuse from Controller to Battery |
|---|
| Controller to Battery Fuse = Current Rating of Charge Controller Ex. 20A Dual Battery CC = 20A fuse from Controller to Battery |

Fuse from Solar Panel(s) to Controller

Ex. 200W; 2 X 100 W panels

Series:

$$\text{Total Amperage} = I_{sc1} = I_{sc2} = 5.75A * 1.56$$

$$\text{Fuse} = \text{minimum of } 5.75A * 1.56 = 8.97A = \underline{\underline{9A \text{ fuse}}}$$

Parallel

$$\text{Total Amperage} = I_{sc1} + I_{sc2} = (5.75A + 5.75A) * 1.56$$

$$\text{Fuse} = \text{minimum of } 11.5 * 1.56 = 17.94 = \underline{\underline{18A \text{ fuse}}}$$

Technical Specifications

Charge Controller

| Description | Parameter |
|---------------------------------|------------------------------|
| Nominal System Voltage | 12VDC/24VDC Auto recognition |
| Rated Charge Current | 10A |
| Rated Discharge Current | 10A |
| Maximum Battery Voltage | 30V |
| Max. Solar Input Voltage | 30V (12V), 55V (24V) |
| Max. PV Input Power (10A Model) | 120W (12V), 240W (24V) |
| Max. PV Input Power (20A Model) | 240W (12V), 480W (24V) |
| Operating Temperature | -31°F to +131°F |
| Self-consumption | 4mA (idle), 10mA (charging) |
| Terminals | 4mm ² |

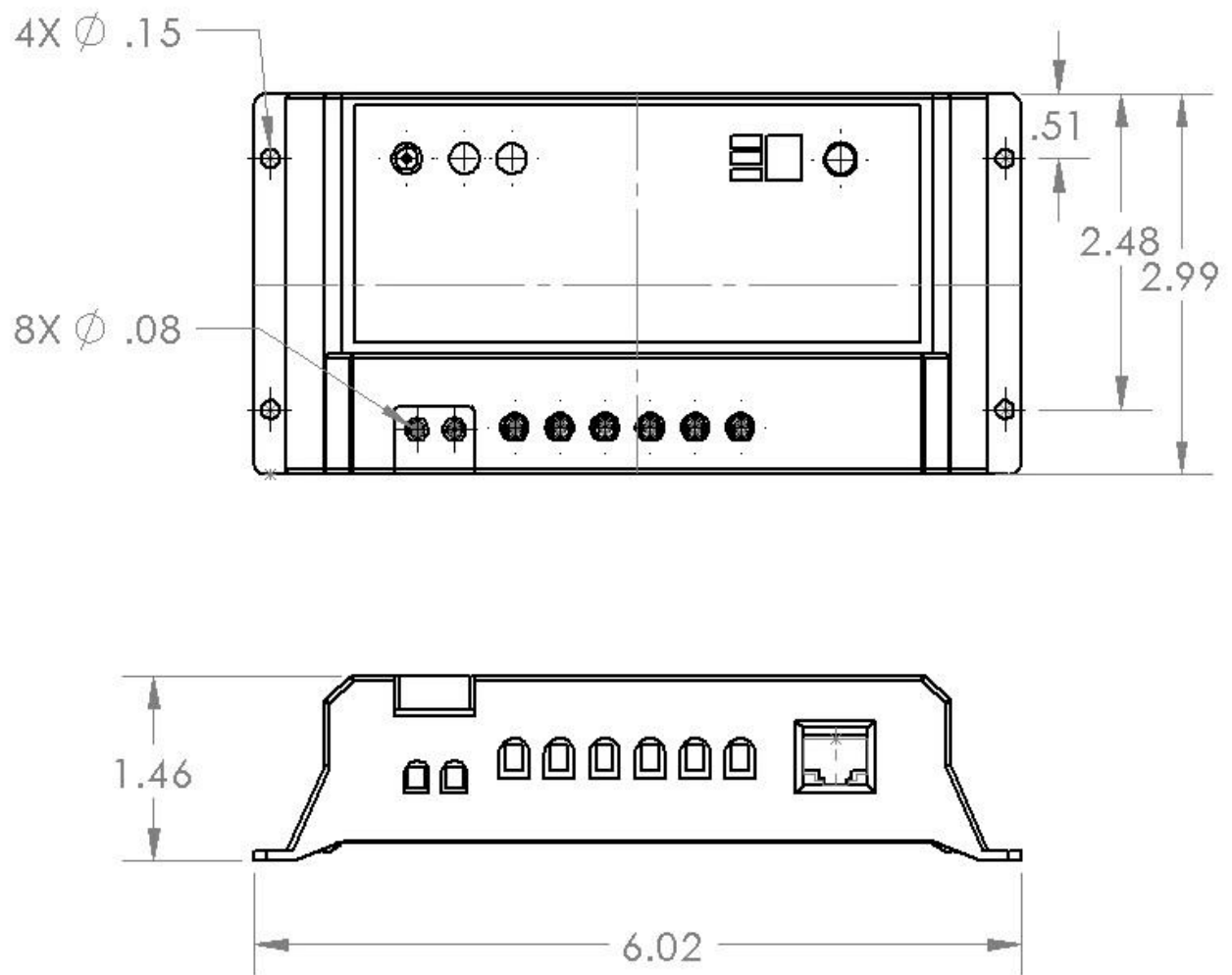
Table 6

Battery Parameters (Temp: 25°C)

| Control Parameter | | | |
|--------------------------|--------|--------|---------|
| Battery Charging setting | Gel | Sealed | Flooded |
| Equalization Voltage | 14.8V | 14.4V | 14.6V |
| Boost Voltage | 14.6V | 14.2V | 14.4V |
| Float Voltage | 13.7V | 13.7V | 13.7V |
| Boost Duration | 30 min | 30 min | 30 min |

Table 7

Dimensions

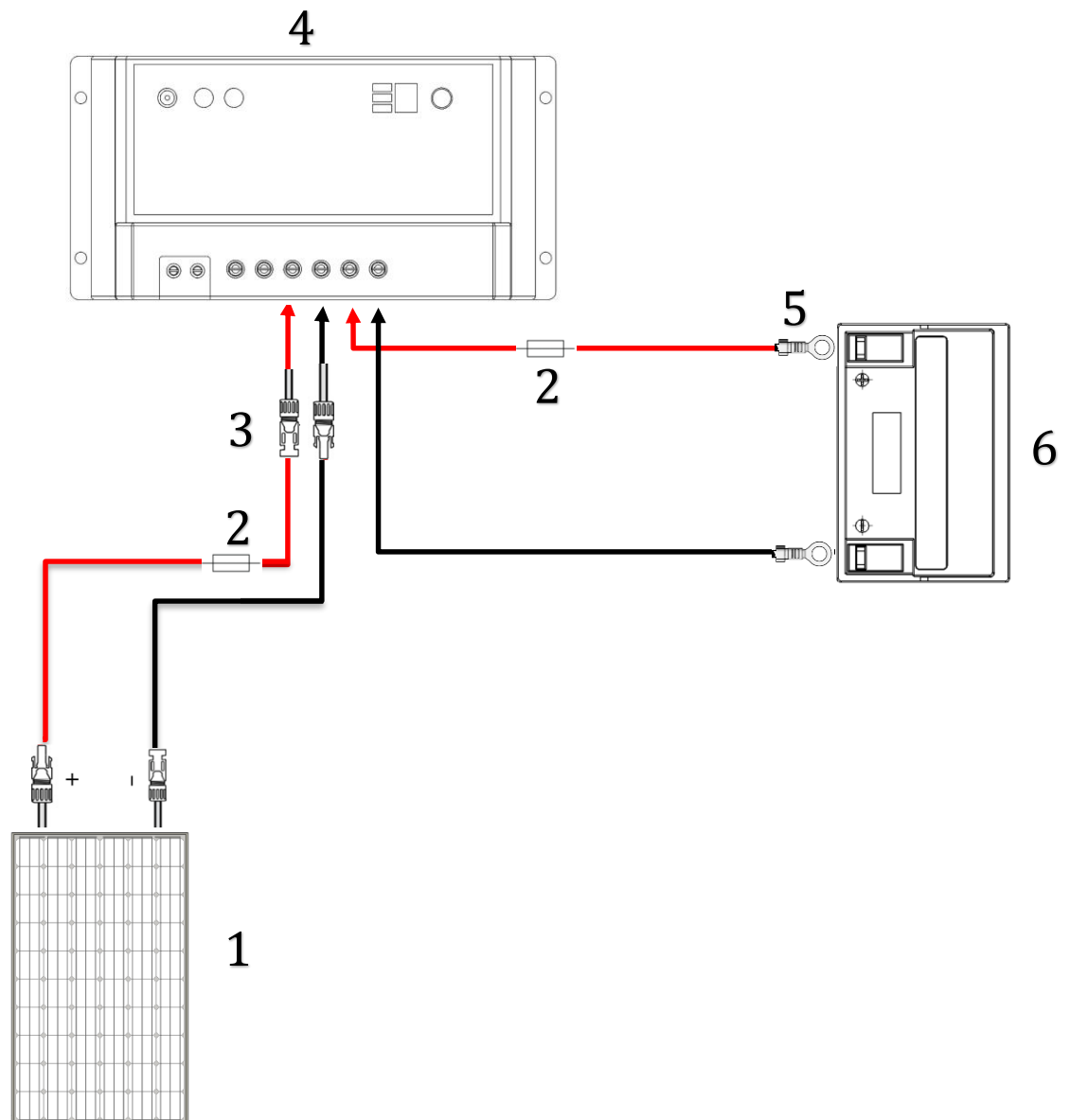


Note: All dimensions are in inches

Wiring Diagrams



100W Wiring Diagram



1. Solar Panel

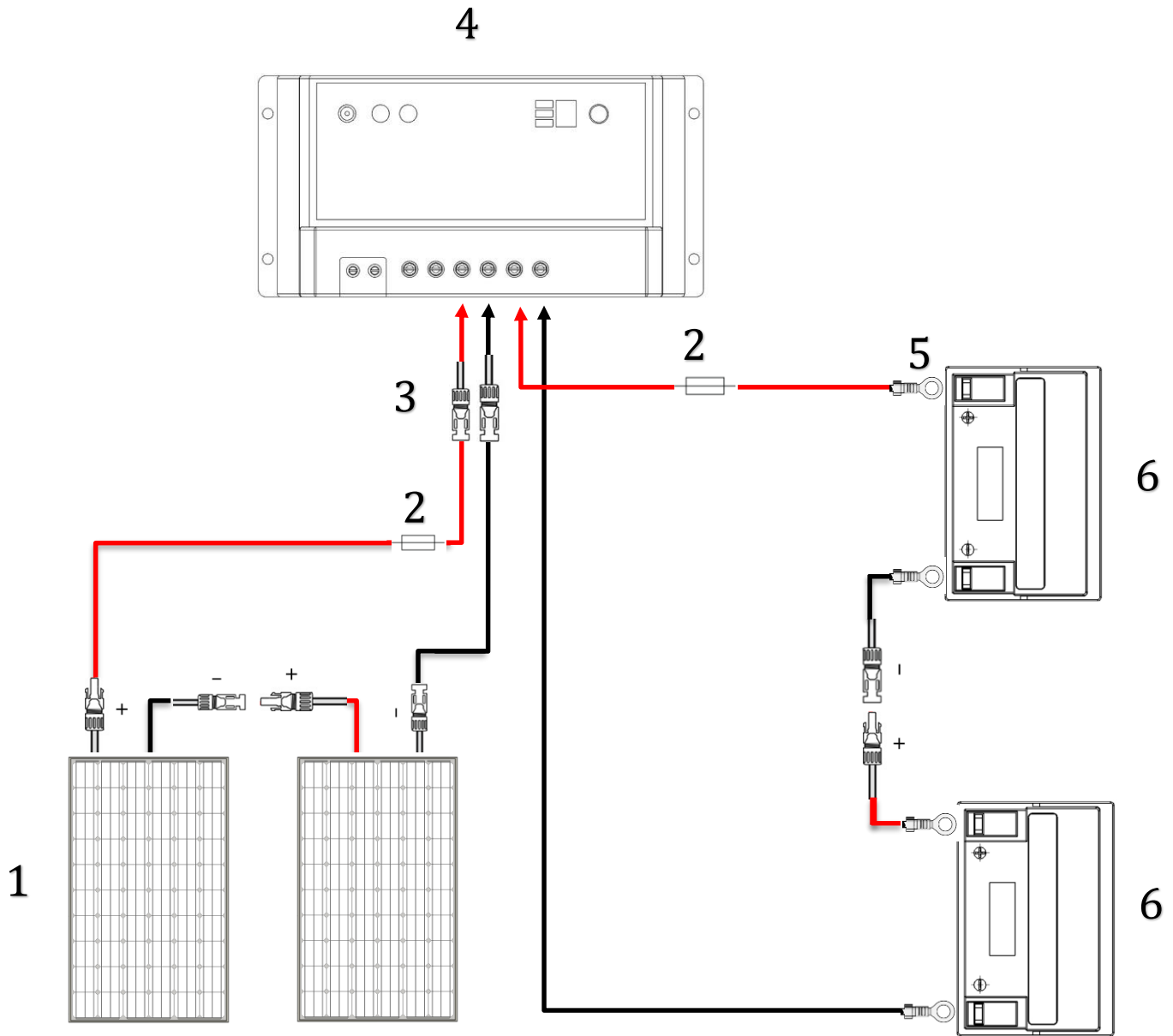
2. Fuse

3. Adapter Kit

4. Charge Controller (10A/20A),

5. Tray Cable

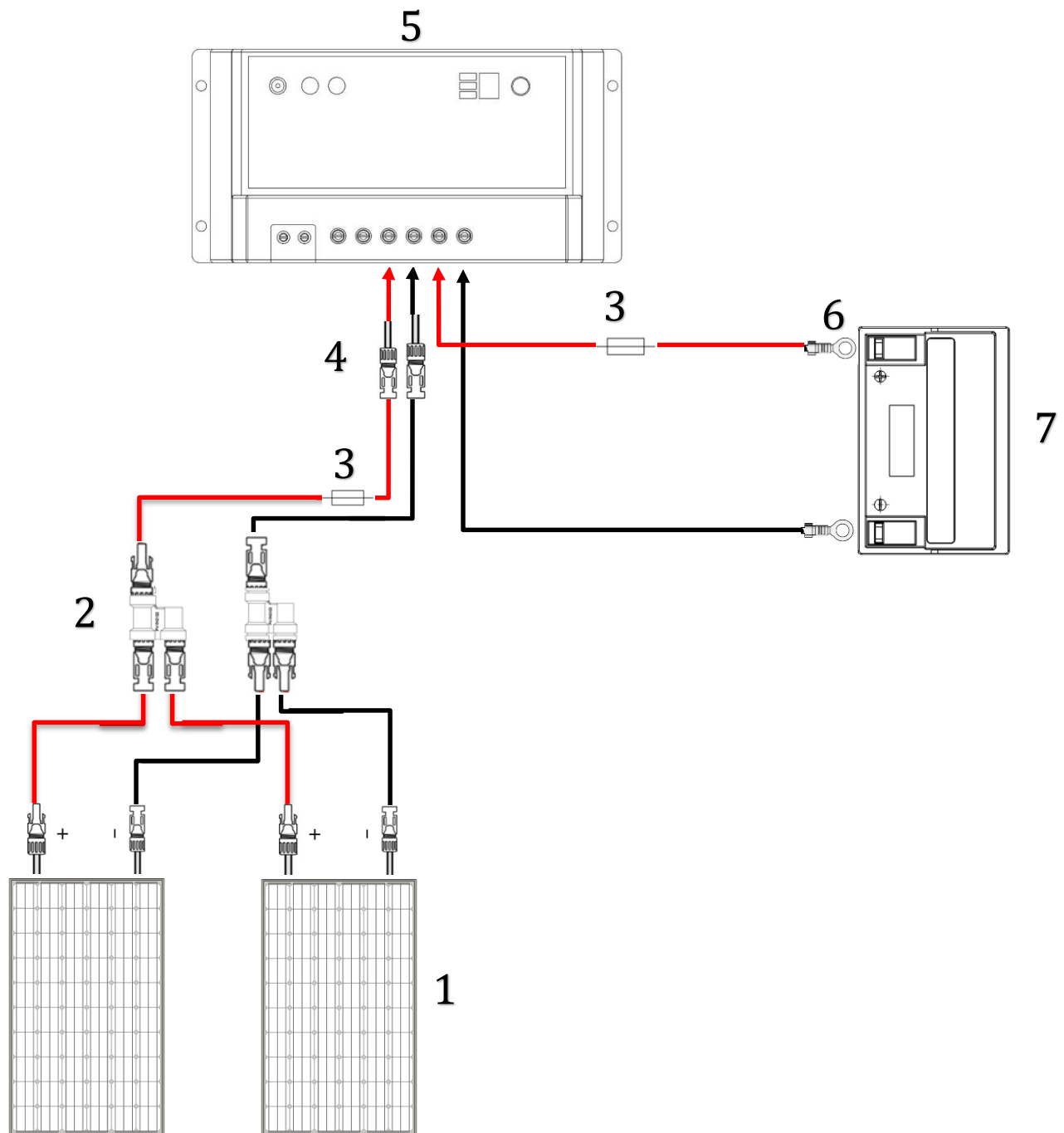
6. Battery Bank (12V)



1. Solar Panels
4. Charge Controller (10A/20A),

2. Fuse
5. Tray Cable

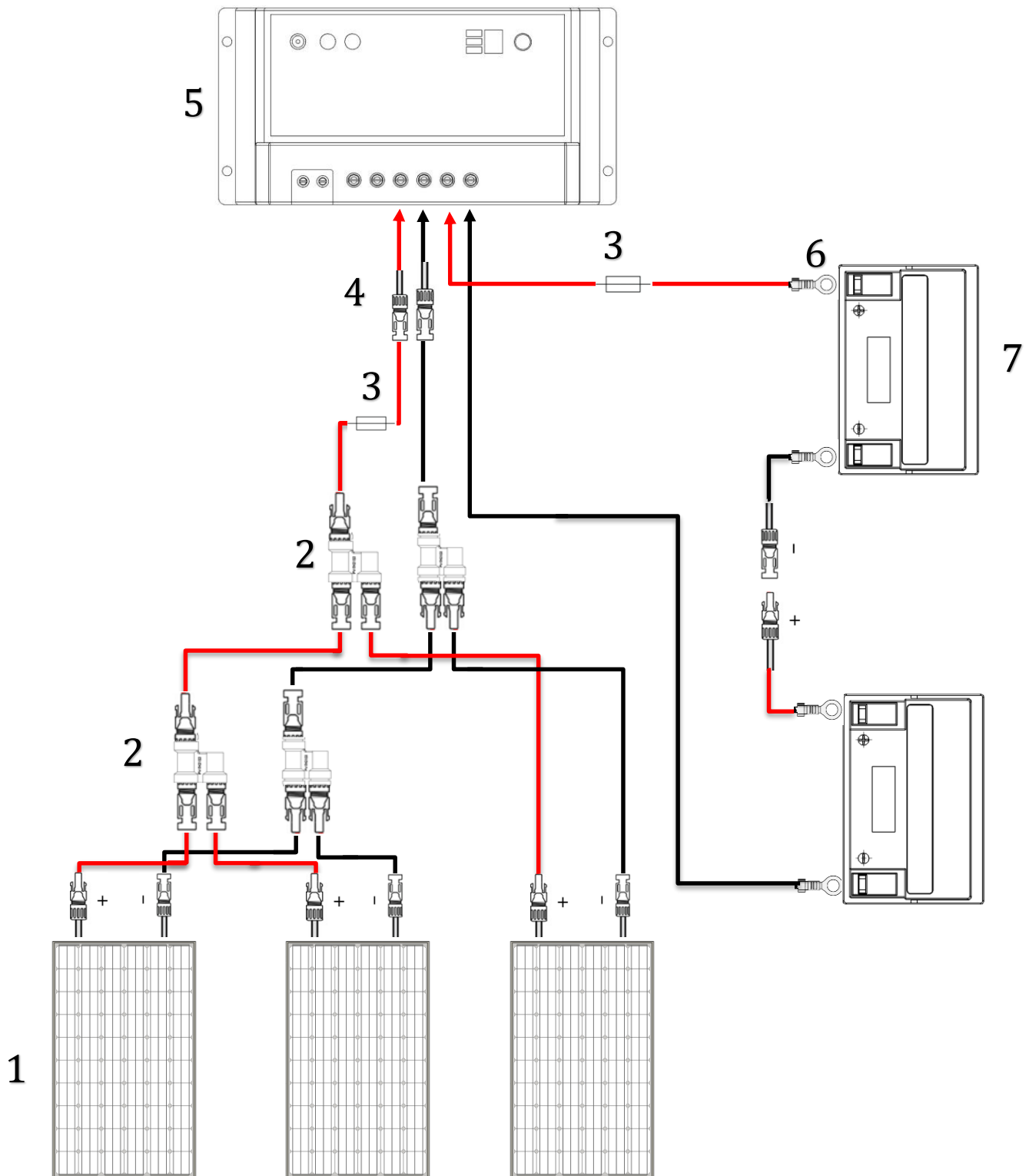
3. Adapter Kit
6. Battery Bank (24V)



1. Solar Panels 2. MC4 Branch Connectors
5. Charge Controller (20A)

3. Fuse 4. Adapter Kit
6. Tray Cable 7. Battery Bank (12V)

300W Wiring Diagram—Parallel 24V Battery Bank



- | | | | |
|----------------------------|--------------------------|-----------------------|----------------|
| 1. Solar Panels | 2. MC4 Branch Connectors | 3. Fuse | 4. Adapter Kit |
| 5. Charge Controller (20A) | 6. Tray Cable | 7. Battery Bank (24V) | |