

Owner's Manual & Safety Instructions

Save This Manual Keep this manual for the safety warnings and precautions, assembly, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual near the assembly diagram (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

19f

THUNDERBOLT MAGNUM™ solar

68738

500 WATT charge controller



Visit our website at: <http://www.harborfreight.com>
Email our technical support at: productsupport@harborfreight.com

When unpacking, make sure that the product is intact and undamaged. If any parts are missing or broken, please call 1-888-866-5797 as soon as possible.

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No portion of this manual or any artwork contained herein may be reproduced in any shape or form without the express written consent of Harbor Freight Tools. Diagrams within this manual may not be drawn proportionally. Due to continuing improvements, actual product may differ slightly from the product described herein.
Tools required for assembly and service may not be included.

⚠ WARNING

Read this material before using this product.
Failure to do so can result in serious injury.
SAVE THIS MANUAL.

IMPORTANT SAFETY INFORMATION

In this manual, on the labeling, and all other information provided with this product:



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

CAUTION

CAUTION, without the safety alert symbol, is used to address practices not related to personal injury.



WARNING Read all safety warnings and instructions. *Failure to follow the warnings and instructions may result in electric shock, fire and/or serious injury.*

Save all warnings and instructions for future reference. The warnings, precautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

Installation Precautions

1. **Exercise special caution if working on roof or another high location.** Keep proper footing and balance at all times. Follow ladder supplier's precautions whenever working near or on a ladder.
2. **Install all sensitive electrical components (including wiring connections, regulator, and battery) inside a weatherproof enclosure to prevent electric shock.**
3. **Do not wire multiple panels in series.** If you need to connect two or more solar panels together, this work must be done by a qualified electrician unless they are connected through a regulator.
4. This solar panel kit is not designed for tie-in to a grid. Only a licensed electrician and a licensed building contractor can safely design and implement a grid tie-in system. Any grid tie-in system must meet all applicable building and electrical codes, and must meet standards established by the area power company. Improper grid tie-in can result in electrocution, fire, and other serious personal injury and property damage. An incorrectly installed grid tie-in system can cause feedback voltage, resulting in electrocution of electrical utility workers.
5. **Do not stand on or otherwise apply pressure to panel.**
6. **Handle solar panel with care, edges may be sharp.**
7. **Do not focus light on panel.**
8. **Install components with enough space to allow proper cooling.**
9. **This product may occasionally produce more current and/or voltage than its rated output. Increase output ratings by 25% when determining component required voltage and amperage ratings.** Refer to Section 690-8 of the National Electrical Code for an additional multiplying factor of 125 percent (80 percent derating) which may apply.

10. Panel must be connected using UL listed outdoor rated wire of the correct thickness (gauge) for the amperage rating and length (see warning number 9 also). Follow the guidelines in the chart below:

Current in Amps	Maximum Length				
	5'	10'	15'	20'	25'
0-5	18				
6-7	18				16
8	18			16	
10	18		16		
11-12			16		14
15			14		12
18	18	16	14		10
20			14	12	
22-24	12				
30	16	14	10		

Minimum Wire Gauge

11. Install an appropriate charge controller/regulator to regulate output and prevent damage. Do not attach panel to battery or power grid without proper regulator, inverter, and/or charge controller.
12. Install and use according to applicable National Electrical Code (NEC) standards.
13. This panel is not rated for use as fire-resistant roofing. If installing on a roof, install only over a fire resistant roof covering rated for the application.
14. Verify that installation surface has no hidden utility lines before drilling or driving screws.
15. Install only according to these instructions. Improper installation can create hazards.
16. Wear ANSI-approved safety goggles and heavy-duty work gloves during installation. Do not wear jewelry or metal watches when working near solar panels, wiring or batteries.
17. Handle panel with care. Glass may break or a sharp edge may be exposed during movement.
18. Keep installation area clean and well lit.
19. Install out of reach of children.
20. Keep bystanders out of the area during installation.
21. Do not install when tired or when under the influence of drugs or medication.
22. Use in 12 VDC systems only.

Battery Precautions

1. **Wear splash-resistant ANSI-approved safety goggles and electrically insulated gloves while working near batteries.**
2. **Use an appropriate charge controller whenever connected to battery.**

3. Charge, store, and maintain batteries according to supplier's instructions.

Service Precautions

1. **Before service, maintenance, or cleaning:**
 - a. **Dry solar panels and outdoor wiring thoroughly while wearing electrically insulated gloves.**
 - b. **Cover all solar panels with an opaque cover, such as a blanket.**
 - c. **Disconnect all solar panels.**
 - d. **Disconnect all batteries.**
2. **Do not service during rain, fog, or any other wet/humid weather.**
3. **Do not stand on or otherwise apply pressure to panel.**
4. Do not allow children to play with or near this or electrical components.
5. Inspect at least monthly; do not use if damaged, parts are loose, water is found inside the housing, electrical insulation is cracked or damaged, or connections are loose.
6. Maintain product labels and nameplates. These carry important safety information. If unreadable or missing, contact Harbor Freight Tools for a replacement.



Specifications

Max. Input Wattage	360 Watt (for 12V panel)
Max. Input Voltage	50V
Max. Input Amps	30A
Rated Output	12VDC
Overcharge Voltage	14.5V ± 0.4V

Note: Output will decrease as the panel gets hotter than room temperature (~70° F). Angle, solar intensity, cloud cover and other factors will effect output.

Installation



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product:

Note: For additional information regarding the parts listed in the following pages, refer to the Assembly Diagram near the end of this manual.

Identifying Port Connections

1. The battery should be connected to the ports that show the battery icon with a + and - symbol. Please note that “+” stands for positive pole and “-” stands for the negative pole.
2. The DC load should be connected to the ports that show the light bulb icon and the positive (+) and negative (-) symbols.
3. The Solar Panel should be connected to the ports marked with the solar panel symbol and the positive (+) and negative (-) symbols.

WARNING! Follow indicated polarity for all connections and verify all connections are secure before use.

Making Connections

WARNING! When disconnecting or connecting, always follow this sequence:

Disconnecting:

1. Disconnect the positive and then negative ports of the Solar Panel.
2. Turn off the Load Switch (designated by the bulb icon), then disconnect the load ports.
3. Disconnect the positive and then negative ports.

WARNING! Do not disconnect battery before disconnecting solar panel.

Connecting:

1. Connect the battery ports, first positive and then negative.
2. Connect the solar panel ports, first positive and then negative.
3. Connect the load ports, first positive and then negative.

Wiring

Note: Only a licensed electrician and a licensed building contractor can safely design and implement a grid tie-in system. Any grid tie-in system must meet all applicable building and electrical codes, and must meet standards established by the area power company.

1. Run wires from panels, through weatherproof grommets and into enclosure where charge controller/regulator is located. Use wires of the proper size and rating and use twist connectors (not included) to connect wires.
2. Secure all connections using terminals, or solder all wire splices to ensure good connections.
3. Weatherproof all connections and route the wire in a way that it will not be torn loose from the panel.
4. Allow system to charge according to the solar panel's instructions.

Operation

The Display Button (marked by the triangle symbol) works in a cycle pattern. See below.



By pressing the button, the LED will toggle through the three different modes:

- a. Battery Voltage (12V)
- b. Output Current to Load (18A)
- c. Solar Charge Current (18A)

1. Mode 1 / Battery Voltage:
The LCD will show the working voltage of the battery (12V, for example)
Pressing the Load Switch in this mode will NOT change the display on the LED.
2. Press the Display Button again (Mode 2) and the LED will show the output current from battery to load (18A).

If the Load Switch is ON, the display will not change.

If the Load Switch is OFF, the LED will show 00.0 A.

If the overload discharge is triggered in this mode, the load output will be cut off. Pressing the Load Switch will cause an alarm to sound.

Once system recovers from over discharge or overload, press the Load Switch to reset the load output function.

3. Press the Display Button a third time and the LED will show the charging current from the solar panel to the battery (18A).

Pressing the Switch Button in this mode will change the LED display.

WARNING! Connect Battery Clamps according to correct polarity (red for positive and black for negative.) Do not short circuit the Battery Clamp.

NOTICE: When installing Charge Controller to Solar System, always verify that battery voltage and solar panel voltage are matching. The input current from the Solar Panel should not exceed the max. solar input current limit of the Charge Controller.

NOTE: It is normal for the current on LED display to change. Since the battery is changing between charging and discharging status when in over-charger protection, the current variation is normal.

Overcharge Protection

When the battery voltage is too high, the Controller will stop charging to avoid overcharging. When battery voltage decreases, the Controller will start charging again.

Discharge Protection

When battery voltage drops too low, the Controller will cut off the power to the load to prevent battery damage.

Servicing



Procedures not specifically explained in this manual must be performed by a qualified technician.

⚠️ WARNING

TO PREVENT SERIOUS INJURY FROM ELECTRIC SHOCK:

Before service, maintenance or cleaning:

- a. **Dry Charge Controller and outdoor wiring thoroughly while wearing electrically insulated gloves.**
- b. **Cover solar panel with an opaque cover, such as a blanket.**
- c. **Disconnect solar panel after use.**
- d. **Disconnect all batteries after use.**



TO PREVENT SERIOUS INJURY FROM ELECTRIC SHOCK OR CUTS:

Do not use damaged Charge Controller. If wiring insulation is damaged or weathered, solar panel glass is cracked, or housing is opened, have the problem corrected before further use.

Note: It is normal to see up to 20% degradation in amorphous silicon solar panel performance within the first 6 months before the amorphous coating stabilizes.

Cleaning

Clean and inspect all parts of the Solar Power System **MONTHLY**, or more frequently to maintain peak efficiency.

1. **Wear electrically insulated gloves and ANSI-approved safety goggles.** Dry solar panel and outdoor wiring thoroughly.
2. **Cover solar panels with an opaque cover, such as a blanket.**
3. **Disconnect solar panel and batteries.**
4. Clean solar panel with mild, non-abrasive cleanser and soft cloth and paper towels. Do not clean with brushes or abrasive cleaners.
5. Inspect the general condition of the Solar Power System, including panel, batteries, controllers, and mounting connections. Check for loose hardware, wiring insulation damage or weathering, cracked glass, open housing, cracked or broken parts, loose or corroded contacts, and any other condition that may affect its safe operation.
6. Inspect and maintain batteries according to supplier's instructions.

Adjustment

To increase efficiency:

1. **In the Winter**, increase the panel's angle by 10°.
2. **In the Summer**, decrease the angle by up to 10°.
3. **In the Spring and Fall**, keep the panel at the angle recommended by solar panel's instruction manual.

PLEASE READ THE FOLLOWING CAREFULLY

THE MANUFACTURER AND/OR DISTRIBUTOR HAS PROVIDED THE PARTS LIST AND ASSEMBLY DIAGRAM IN THIS MANUAL AS A REFERENCE TOOL ONLY. NEITHER THE MANUFACTURER OR DISTRIBUTOR MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND TO THE BUYER THAT HE OR SHE IS QUALIFIED TO MAKE ANY REPAIRS TO THE PRODUCT, OR THAT HE OR SHE IS QUALIFIED TO REPLACE ANY PARTS OF THE PRODUCT. IN FACT, THE MANUFACTURER AND/OR DISTRIBUTOR EXPRESSLY STATES THAT ALL REPAIRS AND PARTS REPLACEMENTS SHOULD BE UNDERTAKEN BY CERTIFIED AND LICENSED TECHNICIANS, AND NOT BY THE BUYER. THE BUYER ASSUMES ALL RISK AND LIABILITY ARISING OUT OF HIS OR HER REPAIRS TO THE ORIGINAL PRODUCT OR REPLACEMENT PARTS THERETO, OR ARISING OUT OF HIS OR HER INSTALLATION OF REPLACEMENT PARTS THERETO.

Parts List

Part	Description	Qty.
1	Cover	1
2	Switch	2
3	Board Screws	4
4	PCB Board	1
5	Output Screws	2

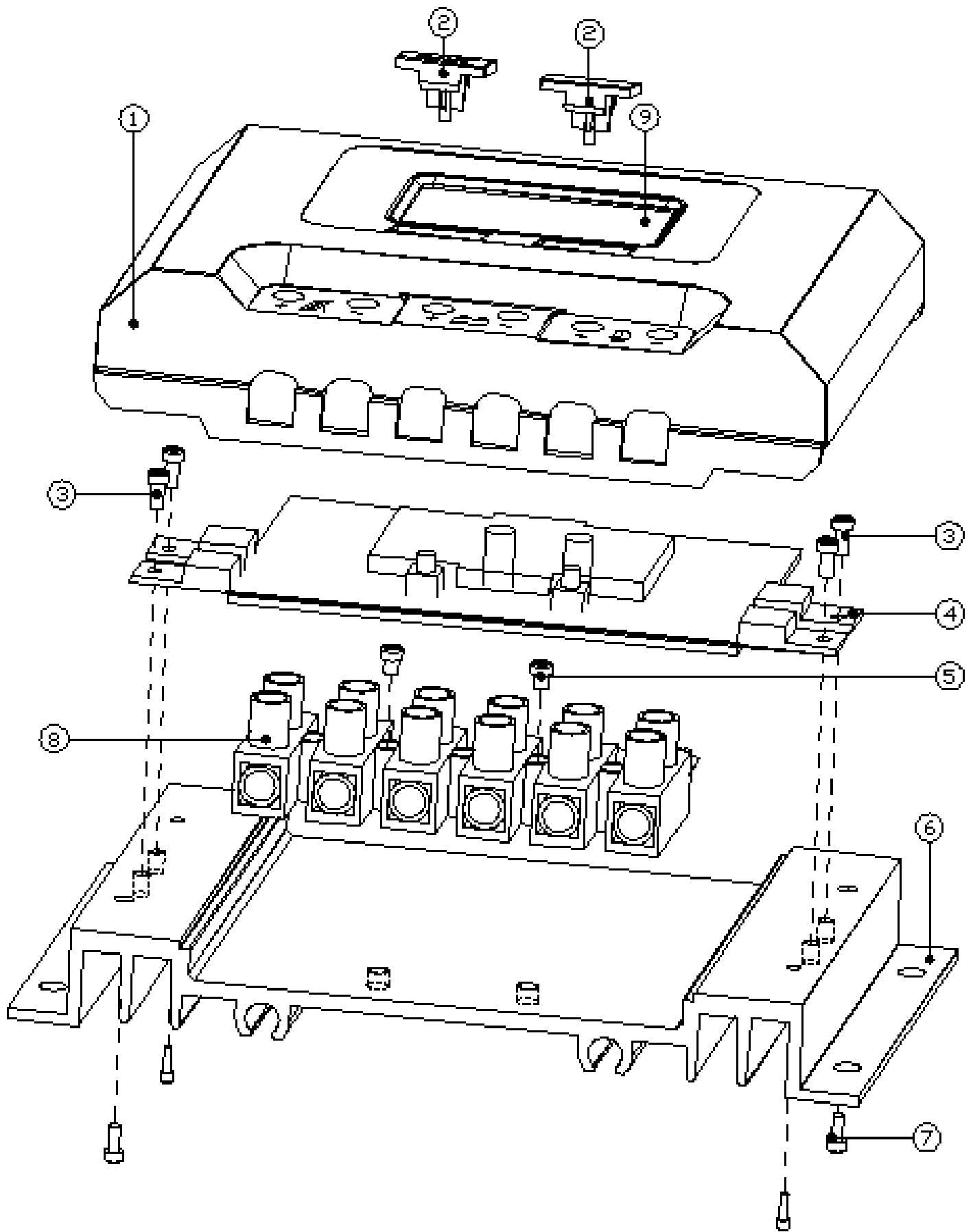
Part	Description	Qty.
6	Base	1
7	Base Screws	4
8	Output Jack	1
9	Display Board	1

Record Product's Serial Number Here: _____

Note: If product has no serial number, record month and year of purchase instead.

Note: Some parts are listed and shown for illustration purposes only, and are not available individually as replacement parts.

Assembly Diagram



90 Day Warranty

Harbor Freight Tools Co. makes every effort to assure that its products meet high quality and durability standards, and warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of 90 days from the date of purchase. This warranty does not apply to damage due directly or indirectly, to misuse, abuse, negligence or accidents, repairs or alterations outside our facilities, criminal activity, improper installation, normal wear and tear, or to lack of maintenance. We shall in no event be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of exclusion may not apply to you. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

To take advantage of this warranty, the product or part must be returned to us with transportation charges prepaid. Proof of purchase date and an explanation of the complaint must accompany the merchandise. If our inspection verifies the defect, we will either repair or replace the product at our election or we may elect to refund the purchase price if we cannot readily and quickly provide you with a replacement. We will return repaired products at our expense, but if we determine there is no defect, or that the defect resulted from causes not within the scope of our warranty, then you must bear the cost of returning the product.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

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MAGNUM™ **solar**