

DustTrak™ Aerosol Monitor Solar Power Kit



Model 854060

(Used for Powering Environmental Enclosure Models 8535/8537
and all DustTrak™ Environmental Monitors)

Operation and Maintenance Manual

P/N 6008416, Revision G
November 2022



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Part Number

6008416A / Revision G / November 2022

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Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call TSI's Customer Service department at (800) 680-1220 (USA) or (001 651) 490-2860 (International) or visit www.tsi.com.

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Safety Information



WARNINGS

- Use of components other than those specified by TSI® may impair the safety features provided by the equipment.
- The instrument has been design to be used with batteries supplied by TSI®. **DO NOT** use a substitute.

Old batteries must be properly recycled in accordance with the local environmental regulations.
- **DO NOT** use non-rechargeable batteries in this instrument. Fire, explosions, or other hazards may result.
- If the solar power kit is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- **DO NOT** connect the Solar Panels **directly** to the Environmental Enclosure as this may result in damage. The Solar Panels **MUST** be connected to the Solar Battery Enclosure Box so they can be regulated by the Solar Charge Controller.



CAUTION

The enclosure is designed to be water resistant to rain or spray. It has a NEMA rating of 3R. It is not designed to be waterproof when immersed. Setting it in a pool of water will result in flooding the inner compartment with water. This will severely damage the battery pack. **DO NOT** set the Battery Enclosure in **water**!

Description of Caution/Warning Symbols

Appropriate caution/warning statements are used throughout the manual and on the instrument that require you to take cautionary measures when working with the instrument.

Caution



CAUTION

Failure to follow the procedures prescribed in this manual might result in irreparable equipment damage. Important information about the operation and maintenance of this instrument is included in this manual.

Warning



WARNING

Warning means that unsafe use of the instrument could result in serious injury to you or cause damage to the instrument. Follow the procedures prescribed.

Caution and Warning Symbols



The following symbols may accompany cautions and warnings to indicate the nature and consequences of hazards:

	Warns that the instrument contains a laser and that important information about its safe operation and maintenance is included in the manual.
	Warns that the instrument is susceptible to electrostatic discharge (ESD) and ESD protection should be followed to avoid damage.
	Indicates the connector is connected to earth ground and cabinet ground.

Reusing and Recycling



As part of TSI® Incorporated's effort to have a minimal negative impact on the communities in which its products are manufactured and used:



-  **DO NOT** dispose of used batteries in the trash. Follow local environmental requirements for battery recycling.
-  If instrument becomes obsolete, return to TSI® for disassembly and recycling.




Product Overview

The solar power kit provides 12V DC power to allow for continuous operation of the DustTrak™ Environmental Monitor and Environmental Enclosures.

Unpacking / Replacement Parts

Compare all the components you received with those listed in the table below.

Item	Part Number	Qty	Description
	801812	2	90 W Solar Panels
	801814	1	Solar Battery 12 VDC 100-120 Amp-Hr

Item	Part Number	Qty	Description
	801816	1	Battery Enclosure w/Charge Controller and power cables
	801815	1	Panel Frame/ Ground Mount Kit
	801840	N/A	Power cable (item included in 801816 kit, use 801840 for replacement only)

Setting Up



WARNING

Refer to Solar charger manual for further installation and operation instructions.

The setup of the Environmental Enclosure is an important part in allowing reliable and accurate sampling of aerosols in a wide range of conditions. TSI® cannot ensure accurate measurements if any of the components are set up incorrectly. Failure to follow these procedures could result in damage to the enclosure or its components.

NOTICE

Prior to using the Battery Pack for the first time, a full recharge is recommended. **Recharging Battery Pack(s) immediately after use (within one hour maximum) is critical to obtaining optimal recharge time, battery health, and battery life.**

The full Solar Power System is shown in Figure 1. The following section details the setup of this system.

IMPORTANT

Make all Solar Panel Power System electrical connections in the order outlined below. Damage to the system can occur if connections are not made in this order.



Figure 1: Solar Panel Power System

1. Remove the Solar Battery from its packaging and place it in the Solar Battery Enclosure. Make sure that the battery positive (+) terminal is on the right (the positive terminal is noted on the battery with a RED marking).

2. Remove the battery terminal bolts using an adjustable wrench. Connect the wires that are terminated with ring terminals, to the battery terminals as shown (see Figure 2).

NOTICE

There are two wires coming from the charge controller: one is **BLACK** and is labeled **(-)**; the other is **RED** and is labeled **(+)**.

The **BLACK (-)** wire should be connected to the battery negative **(-)** terminal, which has a black marking on the top of the battery.

The **RED (+)** wire should be connected to the battery positive **(+)** terminal.

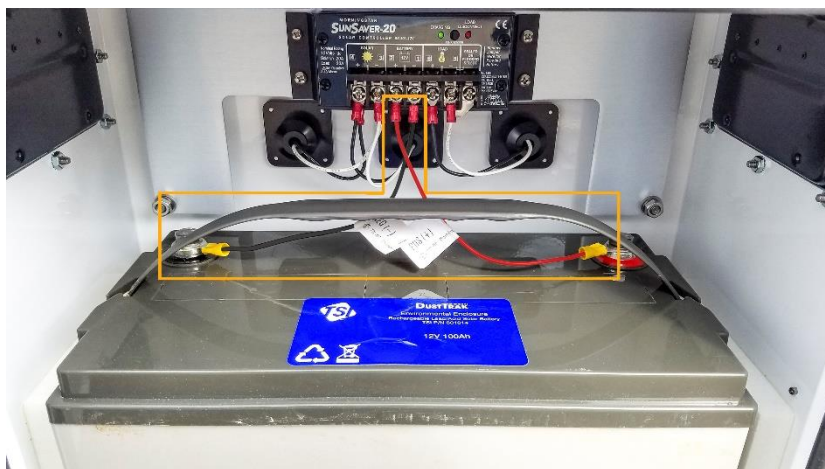


Figure 2: Install the Solar Battery and Connect to Controller

3. The next step is to attach the two power cables (see Figure 3) to each Solar Panel.



Figure 3: Attach Power Cables

4. Remove the Solar Panel from its packaging and access the junction box on the end of the panel.
5. Remove the screws, cover and sealing strip from the box and set aside (see Figure 5).
6. Remove one of the access holes that is labeled $\frac{1}{2}$ " (see Figure 4).

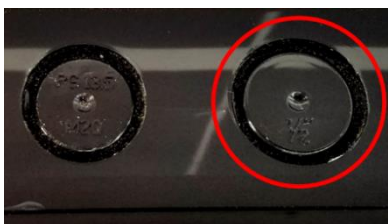


Figure 4: Prior to removing the center piece labeled $\frac{1}{2}$ "



Figure 5: Remove Screws, Cover, and Sealing Strip

7. Pass the power cable through the $\frac{1}{2}$ " diameter access hole while attaching the individual pieces of the cable strain relief to the junction box (see Figure 6 and Figure 7).

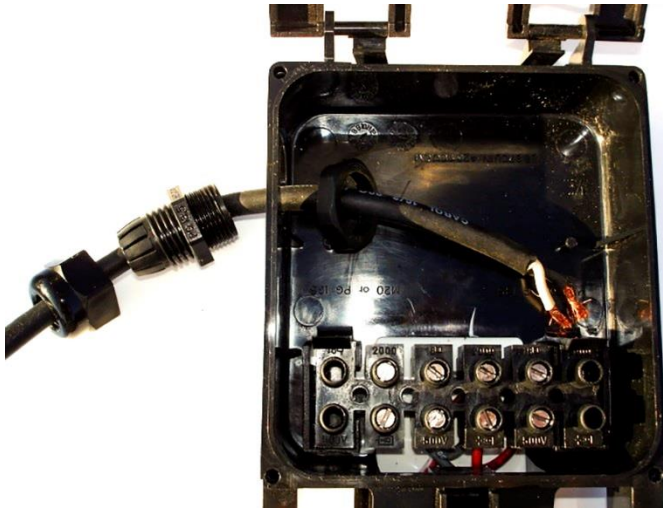


Figure 6: Strain Relief and Power Cable through Access Hole



Figure 7: Strain Relief and Power Cable through Access Hole

8. Tighten the nut to create the proper seal with the cable (see Figure 8). Be sure to not overtighten as this could cause damage to the cable.



Figure 8: Tighten Nut to Create Proper Seal with the Cable

9. Next, attach the power cable (polarity shown in Figure 9) to the Solar Panel screw terminals as shown in Figure 10.

NOTICE

Make sure the wires are connected as shown below. Connecting the wires incorrectly can cause severe damage to the Solar Power System. Refer to the Solar Cell manufacturer's specification sheet for additional details.

BLACK power cable wire connected to **RED** Solar Term. This is the **POSITIVE (+)** connection.

WHITE power cable wire connected to **GREY** Solar Term. This is the **NEGATIVE (-)** connection.

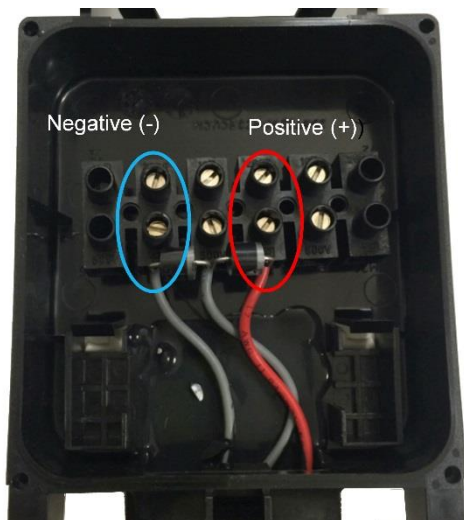


Figure 9: Solar Panel Terminal Polarity.
(Supplier part number 90J. See solar panel instructions for details).



Figure 10: Attach Power Cable to Screw Terminals

10. With the wires tightened, secure the terminal block in its retaining clips as shown in Figure 11.



Figure 11: Secure Terminal Block and Tighten Strain Relief

11. Next, install the sealing strip to the inside of the junction box cover, as shown in Figure 12.



Figure 12: Apply Sealing Strip to Junction Box Cover

12. Attach the cover to the junction box using the supplied screws, as shown in Figure 13.

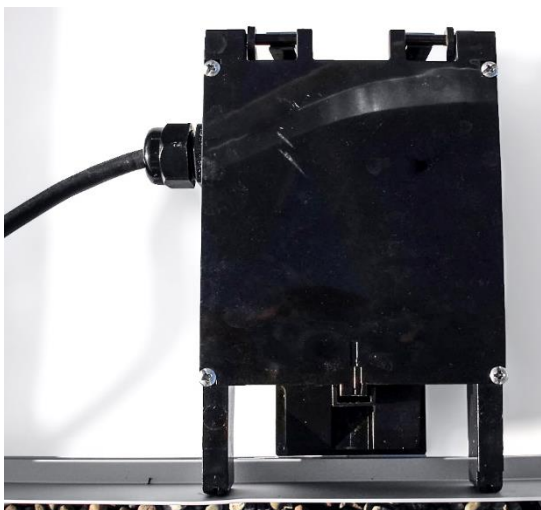


Figure 13: Attach Junction Box Cover

13. Attach the **two** structural angle pieces to the solar panels using the supplied hardware. Fasten each angle piece in 4 locations as indicated by the red circles (see Figure 14).



Figure 14: Assemble the Solar Panels on the Mounting Frame

14. Attach the two shorter structural angles to the angle pieces installed in the previous step (see Figure 15).



Figure 15: Attach Shorter Structural Angles

15. Complete the frame, by fastening the two flat bar pieces and mounting feet to the structural angles (see Figure 16 and Figure 17).

NOTICE

Additional fastening locations are present in the flat bar and angle pieces, which can be used to adjust the solar panel angle.



Figure 16: Fasten Two Flat Bar Pieces



Figure 17: Fasten Mounting Feet

NOTICE

For best results, mount the solar panels at an angle directly pointed at the path of the sun, allowing for maximum energy to be collected by the solar panels. **Reference the solar panel manufacturer's instructions for angle recommendations.**



WARNING

It is highly recommended that you secure the frame to a flat surface. The secured structure should be heavy enough to prevent large gusts of wind from moving the panel assembly. The mounting feet can be used to fasten the assembly to a heavy structure.

16. Connect the other end of solar panel cables to the Solar Battery Enclosure as shown in Figure 18. The Green LED on the Solar Charge Controller will illuminate when solar energy is available, and the Solar Battery is charging.



WARNING

DO NOT connect the Solar Panels **directly** to the Environmental Enclosure as this may result in damage. The Solar Panels **MUST** be connected to the Solar Battery Enclosure Box so they can be regulated by the Solar Charge Controller.



Figure 18: Connect Solar Panels to Battery Enclosure Box

17. Connect the third power cable (Figure 19) to the Solar Battery Enclosure, as shown in Figure 20.



Figure 19: Power Cable



Figure 20: Connect Power Cable to the Environmental Enclosure

18. Next, plug the enclosure power cable (used for solar power) into the DIN rail. This wire harness comes pre-installed at the factory; however, the AC main power supply is plugged into the DIN rail in its place. Unplug the AC mains power supply, from the “**24 VDC In**” location and replace it with the enclosure power cable (Figure 21). Alternatively, you can plug the wire harness into the “**Battery Backup DC In**,” if you would like to use the system as a back up to AC mains power (Figure 22).

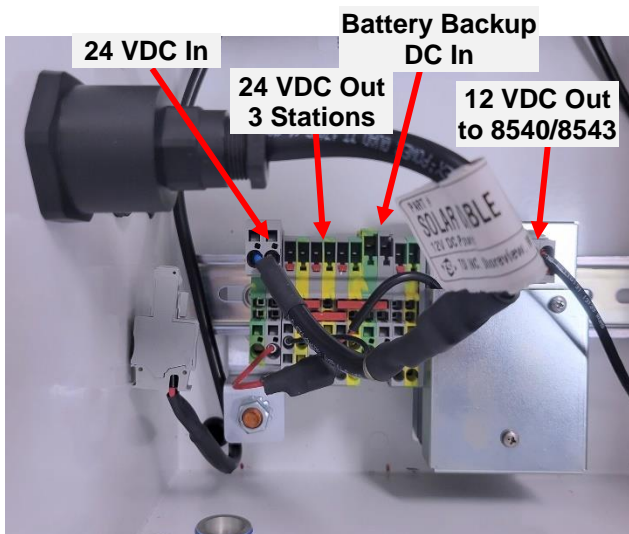


Figure 21: Enclosure Power Connections—24 VDC In

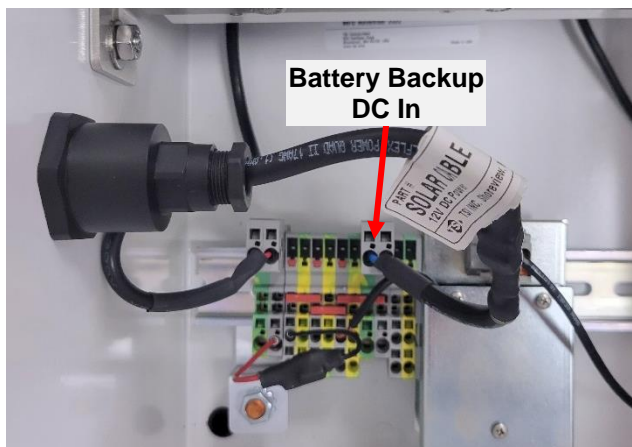


Figure 22: Enclosure Power Connections—Battery Backup DC In

19. Connect the power cord to the environmental enclosure as shown in Figure 23.

NOTICE

Optional Heated Inlet Temp Sensor also shown in Figure 23.



Figure 23: Power Cord from Solar Battery to Environmental Enclosure

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Operation

Overview

Prior to using the Solar Power System for the first time, a full recharge of the Solar Battery is recommended. Simply allow the battery to charge for a day with sunlight energy from the connected Solar Panels.

The Solar Charge Controller has built-in low voltage cutout protection for the Solar Battery. If extended non-sunlight conditions occur, causing the Solar Battery to become deeply discharged, the Solar Charge Controller temporarily cuts off output power. The Red LED on the Solar Charge Controller will illuminate when this condition occurs. Once sunlight returns, and the Solar Battery has been recharged to an appropriate level, the Red LED will turn off and the Solar Charge Controller will re-enable the power output.

The Green LED on the Solar Charge Controller will illuminate when sunlight power is available, and the Solar Battery is charging.



Figure 24: Solar Power System

See manufacturer manual in link below:

<https://www.morningstarcorp.com/products/sunsaver/>

TSI® utilizes the SS-20L-12V version of the controller.

See controller manual for definitions and additional controller troubleshooting.

Battery SOC LEDs

Three (3) battery “state-of-charge” (SOC) LEDs indicate the level of charge on the battery. The SOC indication is based only on battery voltage setpoints, which provides an approximation of the actual state-of-charge of the battery. The table below lists the SOC LED indications.

Battery SOC LED Definitions

SOC LED	Indication	Battery Status	Load Status
Green	Fast flashing (2 flash/sec)	Full battery: Equalize charge	Load on
Green	Med. flashing (1 flash/sec)	Full battery: Absorption charge	Load on
Green	Slow flashing (1 flash/2 sec)	Full battery: Float charge	Load on
Green	On solid	Battery nearly full	Load on
Yellow	On solid	Battery half full	Load on
Red	Flashing (1 flash/sec)	Battery low	LVD warning (Load on)
Red	On solid	Battery empty	LVD (Load off)
None	No LEDS on	Battery missing	Load off

Specifications

Specifications are subject to change without notice.

Power Requirements	
Solar System Run-time	Continuous (with adequate sunlight)
Rated Maximum Cell Power	90 watts (per panel)
Power Tolerance	±5%
Nominal Voltage	12 Volts
Solar System Battery	12 VDC, 100 or 120 Ah
Battery Run-time	90 to 120 hours (typical, full-charge to power cutoff, when no sunlight for charging)
Battery Charge Time	<10 hours at 72°F (22°C) (New battery, deep discharge to 95% charge, with adequate sunlight)
Operating Temperature	32 to 120°F (0 to 50°C)
Storage Temperature	-4 °F to 140°F (-20 to 60°C)

Physical (Solar Panels)	
Dimensions (HWD)	2 x 21 x 48 in. (5 x 53 x 122 cm) each
Weight	17 lbs (7.7 kg) each

Physical (Battery and Case)	
Dimensions (HWD)	8.5 x 15.3 x 17 in. (22 x 39 x 43 cm)
Weight	85 lbs (38.3 kg)



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P/N 6008416 Rev. G

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