SureCross™ *Flex*Power™ Solar Supply

Includes the solar panel, mounting kit, and rechargeable battery pack

Figure 1 - The assembled FlexPower Solar Supply.

Features

The *Flex*Power Solar Supply provides autonomous power for continuous wireless sensing and monitoring applications in a compact, plug-and-play power solution.

- *Flex*Power Solar Supply with rechargeable battery pack provides reliable power (nominal 5.0V dc) for applications with higher power demands than a standard DX81 or DX81P6 can supply
- Solar Supply includes the panel, charge controller, rechargeable battery pack, and mounting hardware
- Weather resistant environmental enclosure

For additional information and a complete list of SureCross accessories, refer to Banner Engineering's website, www.bannerengineering.com/surecross.

Models

Model	Nominal Output Voltage	Replacement Battery Pack
BWA-SOLAR-001	5.0V dc	BWA-BATT-003 Replacement battery and controller pack

⚠ WARNING . . . Not To Be Used for Personnel Protection

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

These devices do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A device failure or malfunction can cause either an energized or de-energized output condition. Consult your current Banner Safety Products catalog for safety products that meet OSHA, ANSI, and IEC standards for personnel protection.

Printed in USA Feb 2012 P/N 137304 rev. F

Overview

The *Flex*Power Solar Supply provides autonomous power for continuous wireless sensing and monitoring applications in a compact, plug-and-play power solution. The *Flex*Power Solar Supply includes the panel, charge controller, rechargeable battery pack, and mounting hardware. The ac wall charger is sold separately.

With a rechargeable battery pack, this assembly provides reliable power (nominal 5.0V dc) for applications with higher power demands than a standard DX81 (single battery) or DX81P6 (6-pack battery) can supply. The battery pack recharges in direct sunlight and supplies power to the SureCross devices autonomously without sunlight.

Battery Replacement

Solar Core (Battery) Replacement

When the rechargeable batteries need to be replaced, order model number BWA-BATT-003. This replacement part includes the batteries, controller, and wiring.

To replace the battery pack:

1. Remove the sign-post top cap.
2. Gently remove the battery and controller assembly by pulling the strap.
3. Unplug the core pack from the sign post top cap.
4. Plug the new core pack in and insert the core pack into the tube.
5. Mount the cap securely and tighten.
6. Charge the replacement solar core pack for 8 to 16 hours using the ac wall charger (sold separately as an accessory). Though this solar core pack ships from the factory with a partial charge, this recharge will ensure your battery pack has enough power to operate efficiently regardless of weather conditions and sun availability.

Properly dispose of your used battery according to local regulations by taking it to a hazardous waste collection site, an e-waste disposal center, or any other facility qualified to accept NiMH batteries.

As with all batteries, these are a fire, explosion, and severe burn hazard. Do not burn or expose them to high temperatures. Do not crush, disassemble, or expose the contents to water.

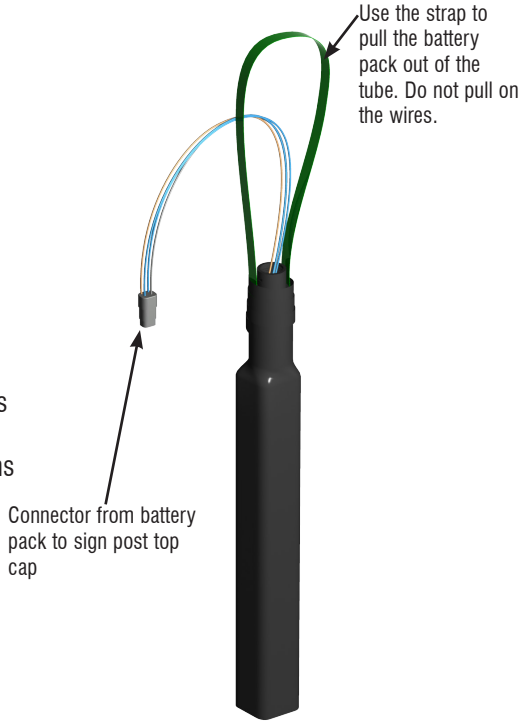
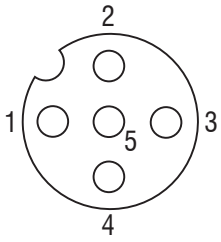


Figure 2

Installation

5-pin M12 Euro Hookup



1	Brown	Not connected
2	White	Not connected
3	Blue	dc common (GND)
4	Black	Not connected
5	Gray	5V dc nominal

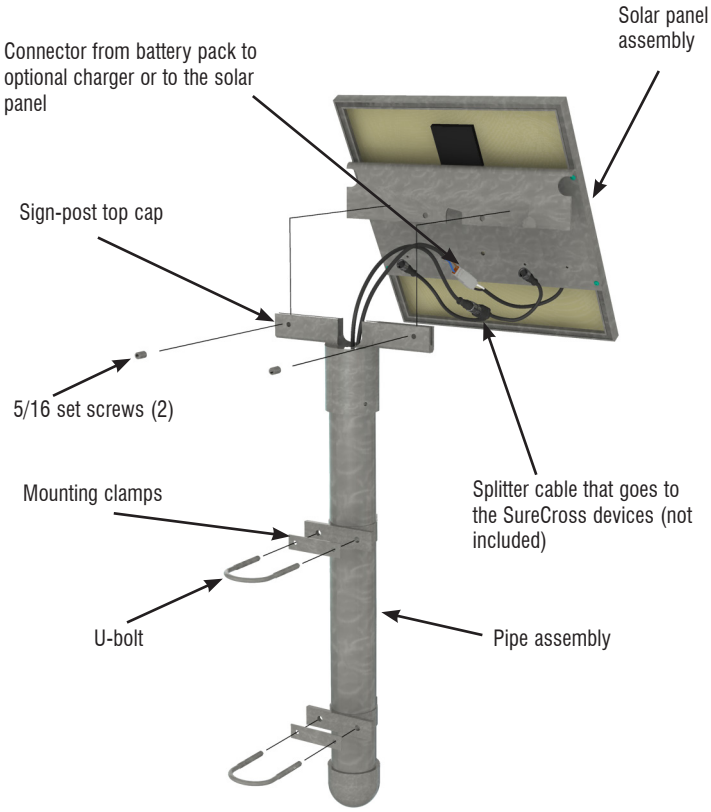


Figure 3 - Exploded view of the Solar Supply.

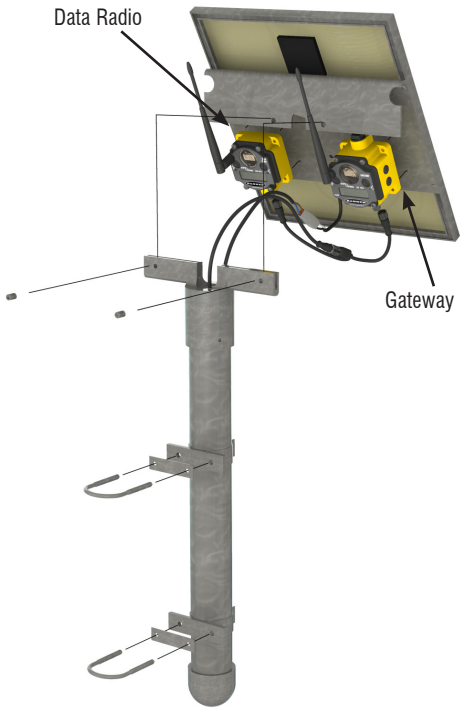


Figure 3b - Exploded view of the Solar Supply showing a Gateway and Data Radio connected to the splitter cable. (Gateway and Data Radio sold separately.)

Installation

The Solar Supply ships with an accessories pack, the pipe assembly, and the solar panel assembly.

Before installing the Solar Supply, the user should charge the solar core pack for 8 to 16 hours using the optional ac wall charger. Though this solar core pack ships from the factory with a partial charge, this recharge will ensure your battery pack has enough power to operate effectively after installation regardless of initial weather conditions and sun availability.

To assemble your solar power device, follow these installation instructions:

1. Connect the two-piece mounting clamps together around the pipe as shown in figure 3. Use the supplied u-bolts to lock the clamps to the pipe, positioning the clamps about 10 inches apart.
2. Insert the solar panel assembly into the sign-post top cap and align the mounting holes.
3. Insert the supplied 5/16 set screws into the sign-post top cap and through the solar panel mounting plate. Tighten.
4. Connect the two cables protruding from the pipe assembly. One cable ends in a gray connector; connect this to the cable coming from the solar panel. The second cable is black with a Euro-style connector; this plugs into the SureCross device or devices that the solar assembly is powering.
5. To mount the assembly to another pipe, use the supplied u-bolts, otherwise mount to a flat surface as necessary.

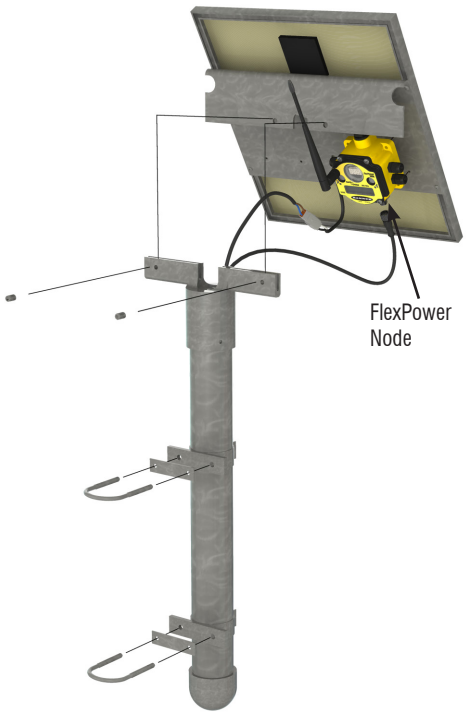


Figure 3c - Exploded view of the Solar Supply showing a FlexPower Node connected to the splitter cable. (FlexPower Node sold separately.)

Application Information

Insolation and Autonomy

In every solar/battery powered application there are two important parameters that help determine how much usable energy can be harnessed from the available sunlight:

- Insolation is the amount of solar radiation falling on an area per unit time. Insolation can be characterized as an equivalent number of hours of direct sunlight per day required to maintain a desired load.
- Autonomy is a measure of how long the assembly will supply power without sunlight. Autonomy depends on the load and battery capacity, but it is also affected by battery temperature. A fully charged battery in our assembly will supply 350 mW with 10 days of autonomy. Ten days of 100% autonomy means that the battery is able to carry the load through 10 days of darkness or 20 days with half the required sunlight.

The SureCross *Flex*Power Solar Supply supports many applications including wireless network range extension, remote sensing, and wireless 4–20 mA transmitter operation and monitoring. These typical 350 mW applications require an average winter insolation of 1 kW·hr/m^2 per day. This is equivalent to an average of 80 minutes of sunlight shining directly on the solar panel per day during the least sunny time of the year. Locations that will provide this amount of sunlight include most locations between the Arctic Circle and Antarctic Circle. For average daily sunlight estimates please refer to an insolation map of your installation location or consult with a Banner Sales Application Engineer.

Load Shedding

Without sunlight, the supply is powered exclusively from the battery. When the battery is mostly depleted, the controller disconnects the load, or sheds the load. This load shedding lasts until the solar panel recharges the battery to a sufficient operating level, which can require up to five minutes of full sunlight.

Solutions for Additional Power

Some applications require more power than one SureCross *Flex*Power Solar Supply can deliver. If load shedding is unacceptable and a standalone solar assembly does not meet your power requirements, consider adding a DX81P6 Battery Supply Module battery backup or consider using more than one solar assembly connected in parallel. See page six for example configurations.

- Battery Backup. The DX81P6 can supply backup power to a 350 mW load for up to 30 days of autonomy after solar autonomy is exhausted.
- Parallel Assemblies. SureCross *Flex*Power Solar Supplies are modular and can be connected in parallel.

Along with the benefit of additional power, parallel assemblies also offer redundancy and flexibility.

When used in parallel, multiple SureCross *Flex*Power Solar Supplies recharge independently for added system flexibility when direct sunlight is unavailable. Multiple panels can be positioned in different directions to maximize recharging at different times of available sunlight. Partial shade from trees or buildings is a common problem in solar applications because partial shade prevents individual solar panels from generating power to recharge the battery. When multiple assemblies are used, partial shade results in a partial system recharge instead of a zero system recharge.

Temperature and Location Considerations

The SureCross *Flex*Power Solar Supply can be expected to drive a 350 mW load with 10 days of autonomy at battery temperatures between -10C to +45C (14F to +113F). Because lower temperatures decrease battery capacity, applications in very cold climates require extra consideration. The SureCross *Flex*Power Solar Supply will stop recharging the battery at temperatures greater than +45C because of battery limitations. All these factors contribute to decreasing system autonomy and may require additional power regardless of insolation.

Be aware that because much of the earth has typical insolation values that are 2 to 6 times higher than 1kW·hr/m^2 per day, it may be possible to get more power from your SureCross *Flex*Power Solar Supply. In some high insolation locations, it is possible for two SureCross *Flex*Power Solar Supply Assemblies to supply up to 2 W continuously with four days of autonomy.

If you have any questions or need help determining the best solution for your solar application, please contact a Banner Applications Engineer to help you find the right solution.

Sample System Configurations

Autonomous Process Monitoring with Continuous Sensor Operation

A single *Flex*Power Solar Supply can supply any continuously powered 4–20 mA, two-wire transmitter at 13V and power the DX80 *Flex*Power Node for continuous sensor operation.

This application requires at least 80 minutes of sun per day and the battery provides about 10 days of autonomy with a full transmitter signal of 20 mA. Marginal solar situations can be supplemented with a DX81P6 Battery Supply Module acting as a battery backup unit to add an additional month of autonomous operation.

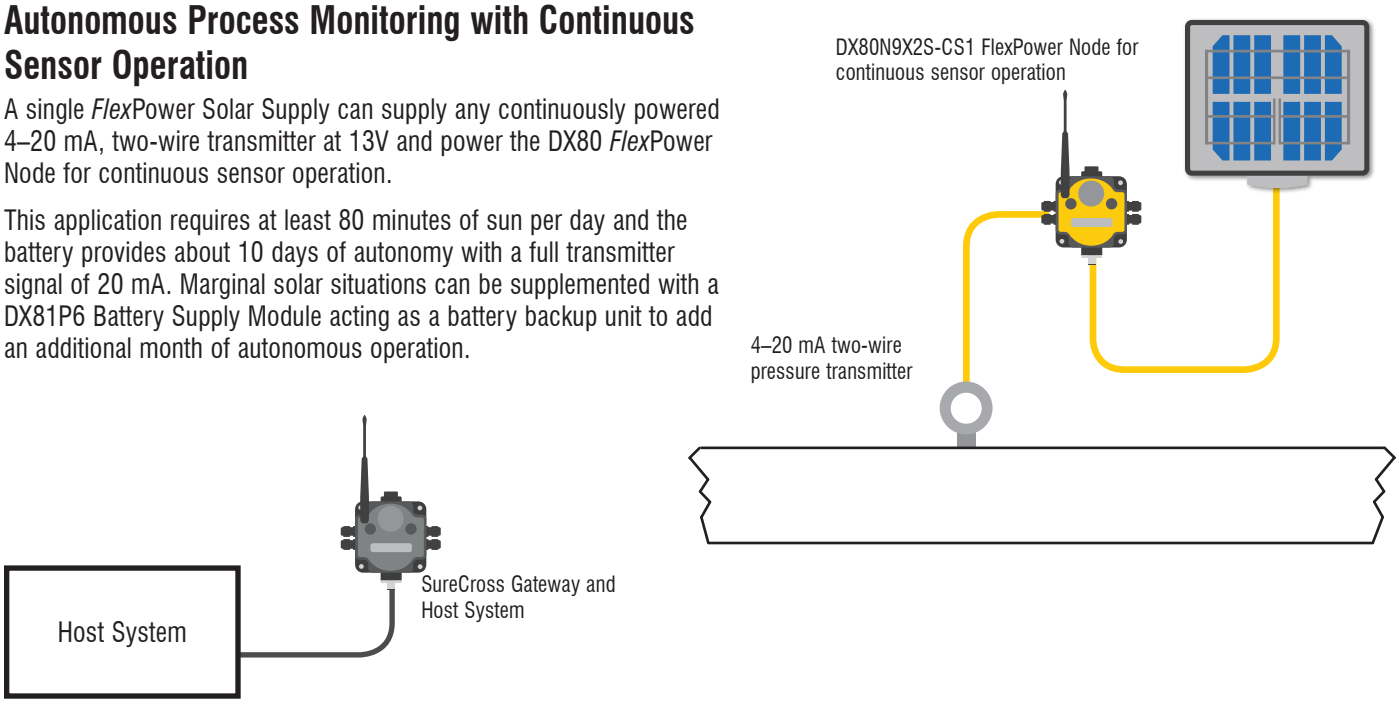


Figure 4

Wireless Network Range Extension

For extending the range of the wireless network, the solar panel and rechargeable battery pack powers data radios and special *Flex*Power Gateways.

In the system shown, the solar panel system powers a remotely located data radio and Gateway. *Flex*Power Nodes make up the remainder of the wireless network. To extend this wireless network even farther from the host system, a solar panel powered data radio repeater can be used.

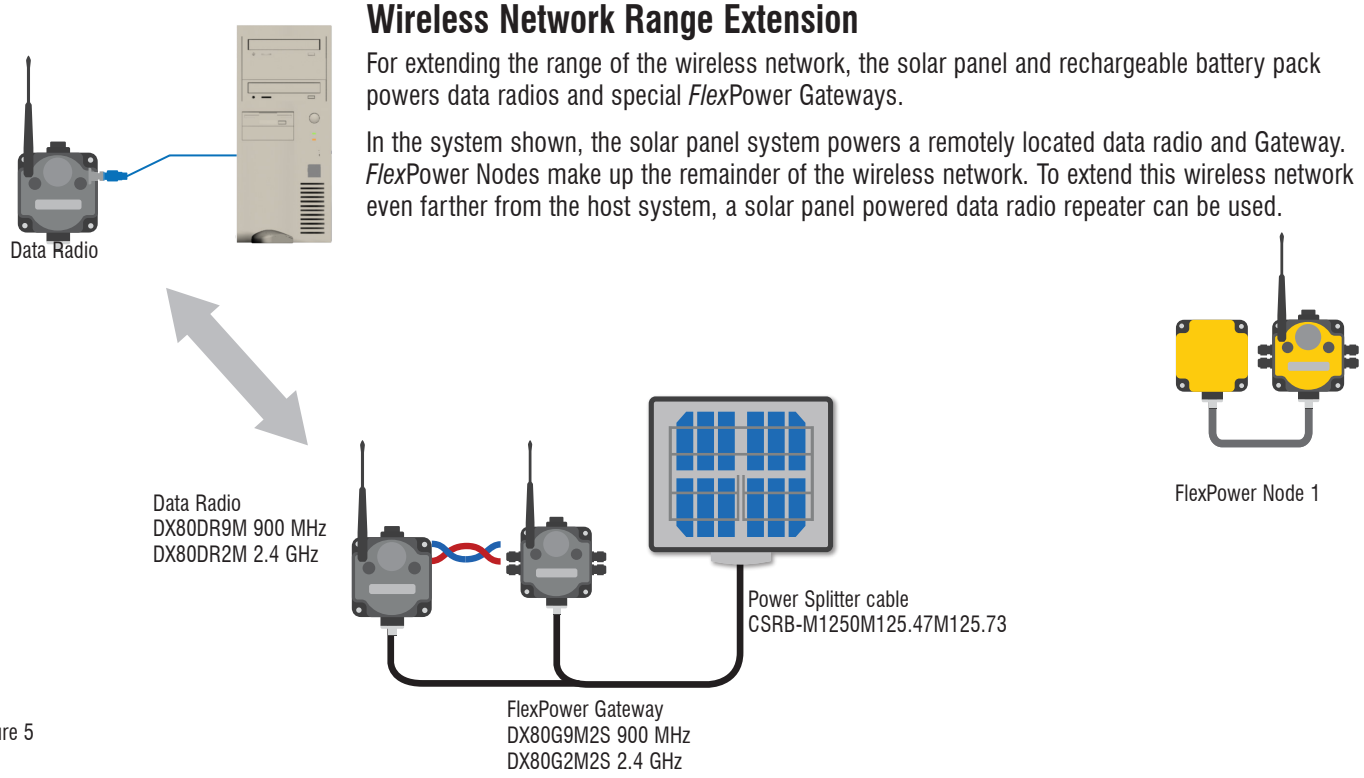
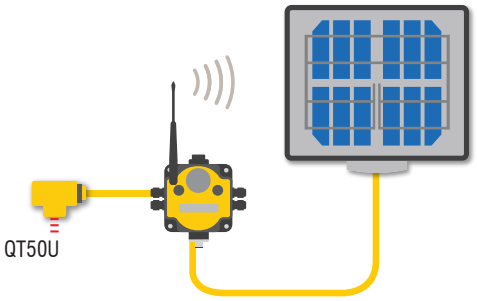


Figure 5



FlexPower Node with switch power
DX80N9X2S2N2M2 900 MHz, external antenna
DX80N2X2S2N2M2 2.4 GHz, external antenna
DX80N9X2W2N2M2 900 MHz, internal antenna
DX80N2X2W2N2M2 2.4 GHz, internal antenna

Figure 6

Remote Sensing Applications

For remote sensing applications, the solar panel recharges a rechargeable battery pack, which in turn powers a Node and sensor. Solar panels are recommended for sensors that require power but do not have access to another power source.

In the configuration shown, the sensor is a QT50U with a ten second sample and report rate. The *Flex*Power Node's voltage boost supplies 12V to the sensor.

Parallel Solar Systems

Two or more solar systems can be directly ORed together using a splitter cable. Using the Solar Supply in parallel provides a modular approach to incrementally increase the capacity in some challenging applications or locations.

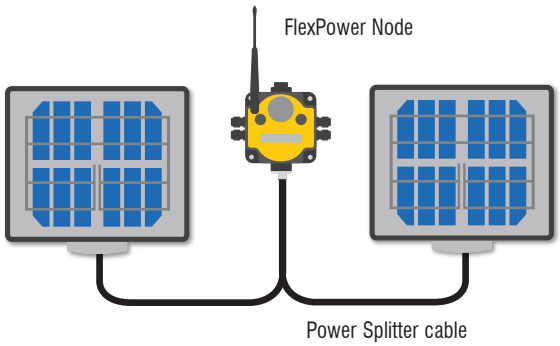


Figure 7

Battery Backup Feature

The *Flex*Power Solar Supply can be ORed with the DX81P6 Battery Supply Module using the CSRB-M1253.28M1253.28M1253.28 splitter cable. When the solar panel temporarily disconnects the load because of a lack of sunlight, the DX81P6 Battery Supply Module supports the system and powers the load. This battery backup can support a sensor system consisting of a 2-wire transmitter powered continuously with 15V at 20 mA and a DX80 Node transmitting once per second for up to 30 days.

For the DX80N*X2*-CS1 models, optional mapping allows a battery backup function to be mapped to a wireless error output to determine if the devices are powered by the solar panel assembly or the battery supply module.

Specifications

Solar Supply

Nominal output voltage. 5.0V dc

Maximum output current. 1000 mA

Continuous output current. 70 mA per hour of sunlight/day

Total weight. 4.70 kg (10.35 lbs)

Solar Panel

Power Rating. 13.5 W at 9V

Non-load voltage. 9V

Short-circuit current. 1.5 A

Solar cells. Polycrystalline

Dimensions. 348mm x 386mm x 19mm (13 11/16" x 15 3/16" x 3/4")

Battery System

Type. NiMH

Nominal voltage. 6V dc

Capacity. 17.5 amp hours

Mechanical

Housing. Aluminum

Support bracket. Aluminum

Hardware. Zinc plated steel

Mounting angle. 60°

Effective projected area. 117 in^2

Environmental

Recommended operating temperature. −10 to +45° C (14 to 113° F)

Max Operating Temperature Range. −30 to +50° C (−22 to 122° F)

Operating humidity. 95% max. relative (non-condensing)

Outdoor rated. Direct sunlight required

* Battery capacity is reduced and recharging is less efficient outside this temperature range. The controller inhibits charging when the temperature is greater than 45° C (113° F). Protecting the battery from temperature extremes prolongs battery life.

Accessories

BWA-BATT-003	Replacement battery core pack, including the rechargeable batteries and controller (included with kit)
BWA-HW-009	Replacement accessories pack (bolts, set screws, pipe clamps, u-bolts) (included with kit)
BWA-SPANEL-001	Replacement solar panel (included with kit)
CSRB-M1250M125.47M125.73	Splitter cable, 5-pin, Euro-style male trunk to 2 female branches, black
CSRB-M1253.28M1253.28M1253.28	Splitter cable for dual power sources, 5-pin Euro-style female truck to two 5-pin Euro-style male branches. The truck and each branch are 1 meter long.
BWA-SOLAR-CHARGER	Battery pack recharger, ac wall plug

Dimensions

As assembled at the factory, the top of the solar panel is flush with the pipe for mounting against a wall. The panel mounting screws can be loosened and the panel slipped higher or lower as needed.

The mounting brackets are shown here positioned 10" apart, but can be adjusted as needed.

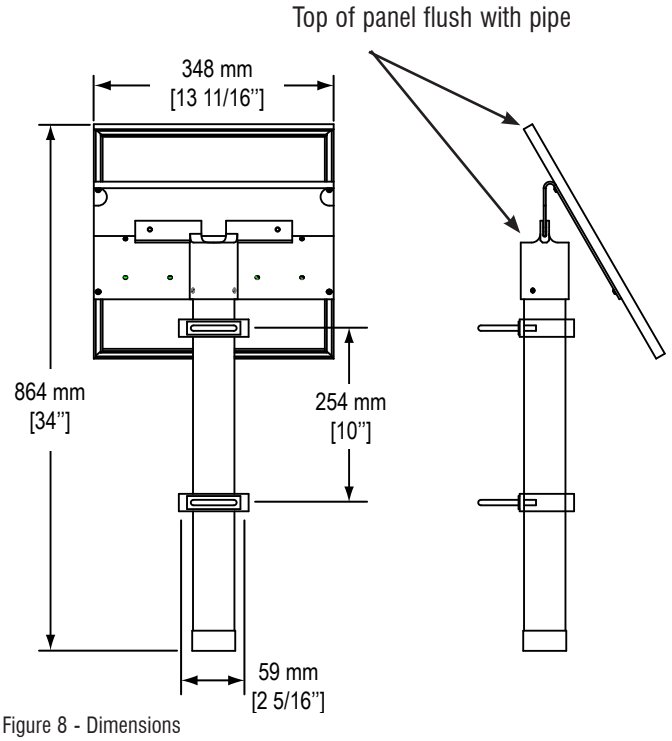


Figure 8 - Dimensions

more sensors, more solutions

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application of the Banner product.

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Lightning Arrestors/Surge Protection. Always use lightning arrestors/surge protection with all remote antenna systems to avoid invalidating the Banner Engineering Corp. warranty. No surge protector can absorb all lightning strikes. Do not touch the SureCross device or any equipment connected to the SureCross device during a thunderstorm.

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P/N 137304 rev. G