

Solar Power Shade
INSTRUCTION MANUAL

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Summary of Warnings and Cautions

WARNINGS

- All tent guy ropes must be staked down.
- Do not attempt to erect Power Shade under or near power lines. **Electrical shock or death may result from failure to acknowledge this warning.**
- Fabric package is heavy. Four to eight personnel are required to lift each main section. Always lift with your legs *not* with your back.
- Always begin raising the Power Shade from downwind, and lowering from upwind side. This will prevent wind from getting underneath and moving the partially raised / unsecured fabric.
- Two to three personnel are required to stand the fabric in the upright position. Always lift with your legs, *not* your back.
- Ensure all personnel and equipment have been removed from beneath Power Shade before striking / lowering.
- Stakes at Web/Ratchet Assemblies are required on the Power Shade. The stakes should be driven through stake plate completely at approximately 45 degrees to ground level. Failure to stake tent may result in personal injury or damage to equipment.
- Eliminate the possibility of tripping. Clear fabric and guy lines. Injury to personnel may result from falls.

CAUTIONS

- Allow slack in electrical cables. Strain on cable can damage equipment.
- Avoid damage to fabric and Solar Panels. Do not stand or walk on fabric or Solar Panels. Material may be damaged.

General Description

The Military Solar Power Shade field shelter provides 1, 2, and 3 Kilowatts of solar power to recharge a bank of batteries, and also provides shade from the sun to reduce solar heat load up to 80-90%. The Solar Power Shade is designed to fit over the MGPTS, TEMPER, ISO, and Airbeam storage shelters.

Table 1 contains the technical specifications for 1, 2, and 3 KW Power Shades.

Table 1 - Solar Power Shade Technical Specifications

Full Sun Power Output Rating @15.4V of Attached Solar Panels	1KW	2KW	3KW
Deployed Dimensions (LxW)	38 ft x 39ft 4in	58ft x 39ft 4in	78 ft x 39ft 4in
Deployed Max Height (Outside)	16ft 3.5 in	16ft 3.5 in	16ft 3.5 in
Deployed Clearspan Height (Inside)	13 ft	13 ft	13 ft
Packaged Dimensions (LxWxH)	96in x 40in x 47in	96in x 40in x 47in	96in x 40in x 47in
Number of Crates	2	2	3
Packaged Weight	1005 lbs.	1566 lbs.	2251 lbs.
Solar Panel Thickness with Laminate and Adhesive	0.014 in	0.014 in	0.014 in

Table 2 is a “clear-span” table for the Power Shade referencing MGPTS, TEMPER, ISO, and Airbeam shelters. Use this table as a guide for determining what size Power Shade should be used to fit over a given size shelter, or what size shelter will fit under a given size Power Shade.

Table 2 - Shelter Sizing Chart *FOR REFERENCE ONLY*

Powershade (LxW, Clearspan)	MGPTS (LxW)	TEMPER (LxW)	ISO (LxW)	Airbeam (LxW)
1 KW (20 ft x 22 ft)	Small (18ft x 18ft)	Type IV (32ft x 20ft 6in)	1 Sided Non-expandable (19ft 11in x 8ft)	This box intentionally left blank.
2 KW (40 ft x 22 ft)	Medium (36ft x 18ft)	Type IV (32ft x 20ft 6in)	1 Sided Expandable (19ft 11in x 8ft)	STAT-Model 32 (32 ft x 22 ft)
3 KW (60 ft x 22 ft)	Large (54ft x 18ft)	Type III (72ft x 20ft 6in)	2 Sided Expandable (19ft 11in x 21ft 6in)	STAT-Model 32 (32 ft x 22 ft)

1, 2, and 3 KW Power Shades Photographs

Figures 1, 2, and 3 show side view photographs of the 1, 2, and 3 KW Power Shades.



Figure 1 – 1KW, *Representation Only - Not Actual Image*



Figure 2 – 2KW, *Actual Image*



Figure 3 – 3KW, *Representation Only - Not Actual Image*

Set Up Instructions

Site Selection

Refer to Table 3 for approximate site sizes needed for erecting the Power Shade. Select a site that will be in full sun most of the day. The site should be relatively flat and free of surface rocks, trees and debris. The site should not be under or near power lines.

Table 3 - Solar Power Shade Site Size Selection Guide *APPROXIMATIONS ONLY*

Power Shade (LxW)	Approximate Site Size (LxW)
1 KW (38 ft x39 ft 4 in)	41ft x 41ft
2 KW (58 ft x39 ft 4 in)	61ft x 41ft
3 KW (78 ft x39 ft 4 in)	81ft x 41ft

WARNINGS

- Do not attempt to erect Power Shade under or near power lines. **Electrical shock or death may result from failure to acknowledge this warning**

Pole and Stake Locations (1KW and 2KW Power Shades)

Figures 4, 5, and 6 show the correct pole and stake locations for the 1, 2, and 3 KW Power Shades. The poles should be located as described in each figure. Plastic stakes should be used to mark the pole positions during measurement. The diagonal dimensions are shown and should be used for layout to ensure that the pole layout is square.

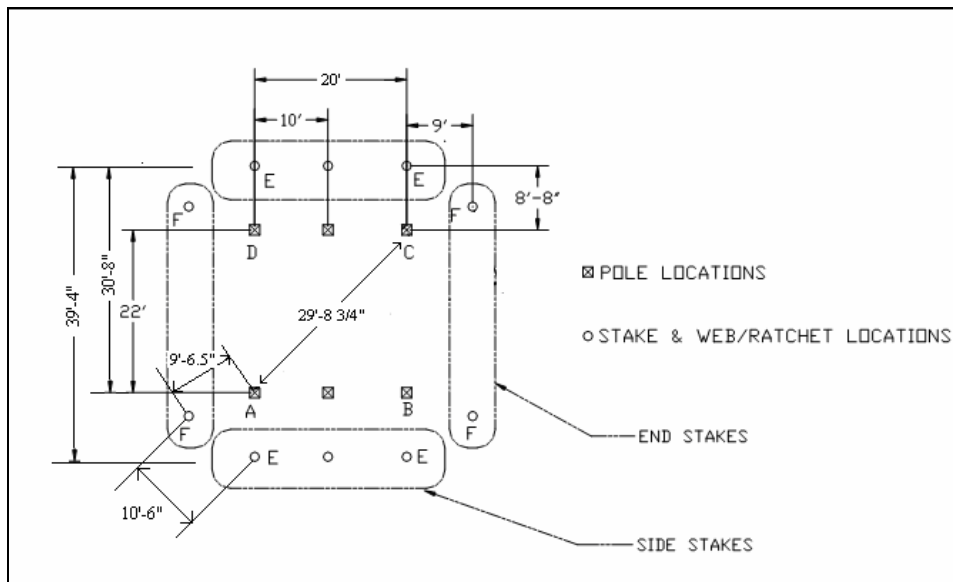


Figure 4 – 1KW Pole and Stake Layout

Pole and Stake Locations (2 & 3 KW Power Shade) – continued.

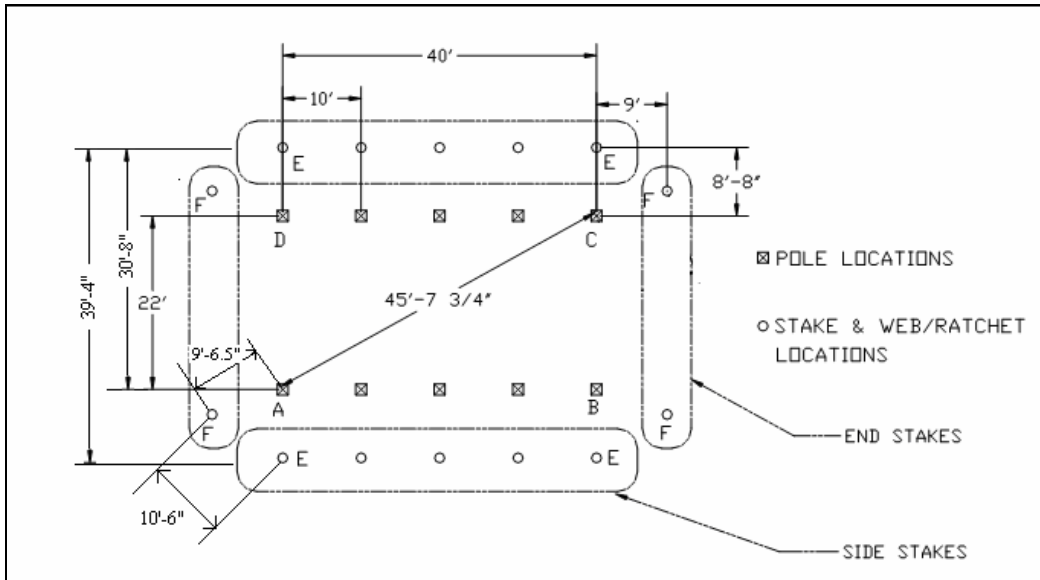


Figure 5 – 2KW Pole and Stake Layout

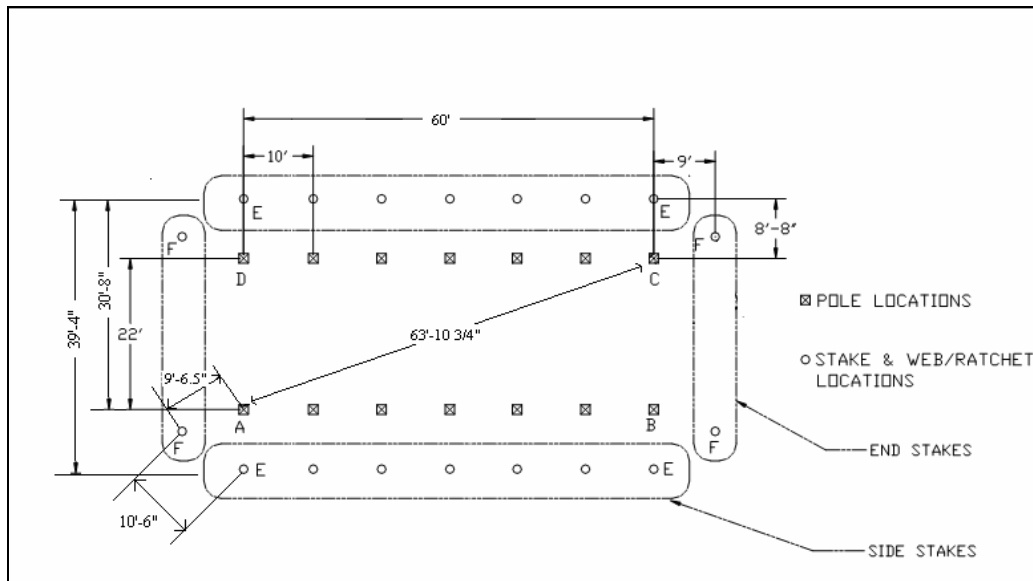


Figure 6 – 3KW Pole and Stake Layout

Pole Layout for Power Shade

Use the appropriate Figure 4, 5 or 6 as a reference to layout the locations for the poles.

1. Mark with a plastic stake starting at point A.
2. Locate and mark with a plastic stake, point B an appropriate distance from point A.
3. Locate and mark with plastic stakes, ALL remaining pole positions between point A and point B. These points are located at 10 foot spacings.
4. Locate and mark with a plastic stake point C. This is accomplished by using two tape measurers and marking the point where the diagonal measurement (point A to point C, see Table 4) intersects with the width measurement (point B to point C, 22 feet).
5. Locate and mark with a plastic stake point D. This is accomplished by using two tape measurers and marking the point where the diagonal measurement (point B to point D, see Table 4) intersects with the width measurement (point A to point D, 22 feet).
6. Locate and mark with plastic stakes, ALL remaining pole positions between point D and point C. These points are located at 10 foot spacings.

Table 4 - Power Shade Pole/Stake Layout Diagonal Distances

Power Shade Size	Diagonal Distance (A to C and B to D)
1 KW	29 ft 8 ³ / ₄ in
2 KW	45 ft 7 ³ / ₄ in
3 KW	63ft 10 ³ / ₄ in

Stake Layout for Power Shade

Use Figure 4, 5, or 6 as a reference to layout the locations for the stakes. A 36 inch steel stake and Web/Ratchet will be installed at each of the stake locations. The 36 inch steel stakes can be used to mark the locations for the stake and Web/Ratchet assembly.

1. Locate and mark with a steel stake the side stake locations. This is accomplished by visually aligning a straight measurement of 8 feet – 8 inches from each pole location.
2. Locate and mark with a steel stake the four end stake locations (two on each end of the layout).
 - a. Using two tape measurers, mark the intersection of a 10 feet 6 inch measurement from point E to point F stake locations and a 9 feet 6 1/2 inch measurement from point A pole location to point F stake location.
 - b. Repeat this procedure at each of the other three corner locations.

Install Stakes and Web/Ratchet Assemblies

Install Web/Ratchet Assemblies at all stake locations.

Each Web/Ratchet assembly should be individually staked, with all stakes driven down through the stake plate at approximately 45 degrees to ground level as shown in Figure 7.



Figure 7 – Stake Installation

WARNINGS

Stakes at web / ratchet assemblies are required on the Power Shade. The stakes should be driven through stake plate completely at approximately 45 degrees to ground level. Failure to stake tent may result in personal injury or damage to equipment.

Layout and Assembly of Fabric Sections

NOTE: Make sure the plastic stakes marking the pole locations are driven in far enough as to not interfere with the fabric while it is being assembled on the ground.

There are FOUR different fabric pieces:

- A ROPE END SECTION has lace ropes on one long edge.
 - A GROMMET END SECTION has grommets on one long edge.
 - A ROPE MIDSECTION has lace ropes on BOTH long edges
 - A GROMMET MIDSECTION has grommets on BOTH long edges
1. Arrange the fabric pieces with the solar cells on the top side of the fabric as shown in Figure 8 and matching the configurations depicted in Figures 9, 10, or 11 corresponding to the size of the Power Shade you are setting up. The aluminum plates should be positioned over the plastic stakes marking the pole locations.



Figure 8 – Solar Panel Positioned On Top Side

Figure 9 shows the 1KW configuration and is comprised of two end sections positioned such that match numbers “1” and “3” correspond.

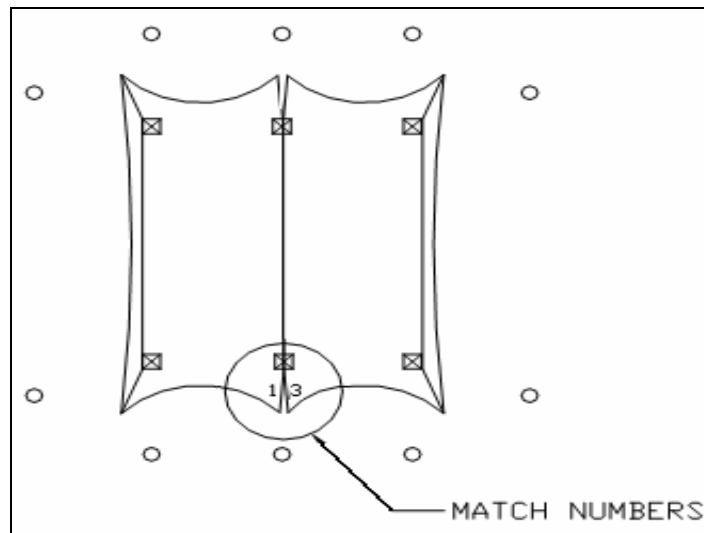


Figure 9 – 1KW Fabric Layout

Figure 10 shows the 2KW configuration which has a total of four sections such that the match numbers correspond to the figure.

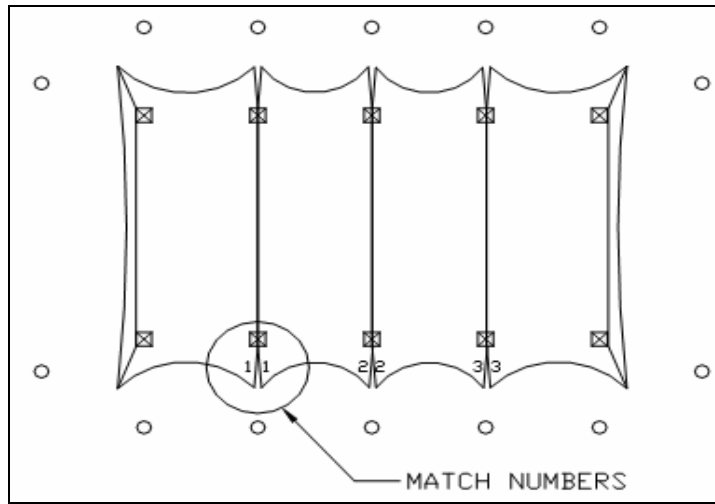


Figure 10 – 2KW Fabric Layout

Figure 11 shows the 3KW configuration which has a total of six sections such that the match numbers correspond to the figure.

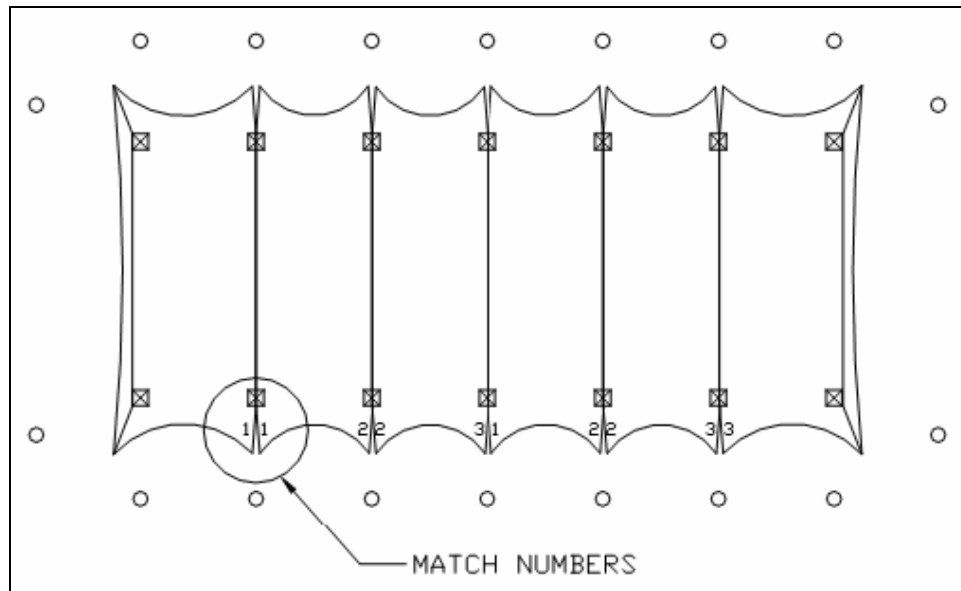


Figure 11 – 3KW Fabric Layout

2. With the fabric in the correct position, go to the pole positions which can be identified by the aluminum plates.
 - a. Identify the **grommet** side plate as the plate with the line of grommets along the edge of the fabric section.
 - b. Identify the **rope** side plate as the plate with the line of ropes along the edge of the fabric section.
 - c. At the pole positions, stack the **grommet** side plate on TOP of the **rope** side plate.
 - d. Install the flange and nipple assembly as per Figures 12 and 12a. These will hold the fabric together when installing the poles.
 - e. Repeat steps a through d at ALL remaining pole locations.



Figure 12 - Pole Plate Assembly

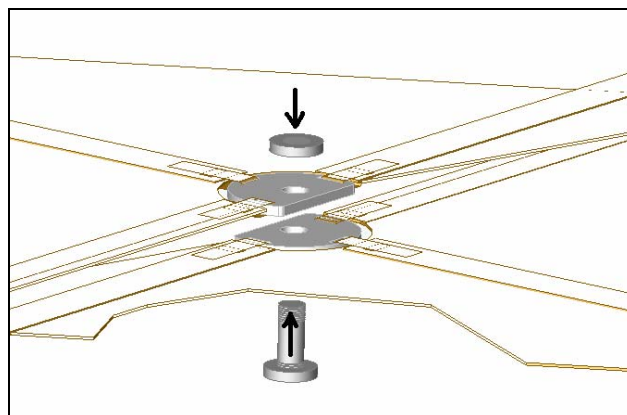


Figure 12a - Pole Plate Assembly closeup

3. Plugging the fabric together:
 - a. The fabric pieces have two-piece electrical connections which must be connected at this time. The electrical connectors are located at the laceline positions. (see Figure 13).
 - i. Starting at one edge, connect a plug on the ROPE side to the corresponding plug on the GROMMET side.
 - ii. Continue the procedure along the entire edge to the other side.
 - iii. Once this is done for ALL lacelines, the fabric is ready to be laced together.



Figure 13 – Electrical Plug Connections along Laceline

- 4. Locate & Secure Output Cables
 - a. Locate the output electrical cables at the side pole locations – such as those shown in Figure 14. Note that these are on the sides with the fabric section match numbers.

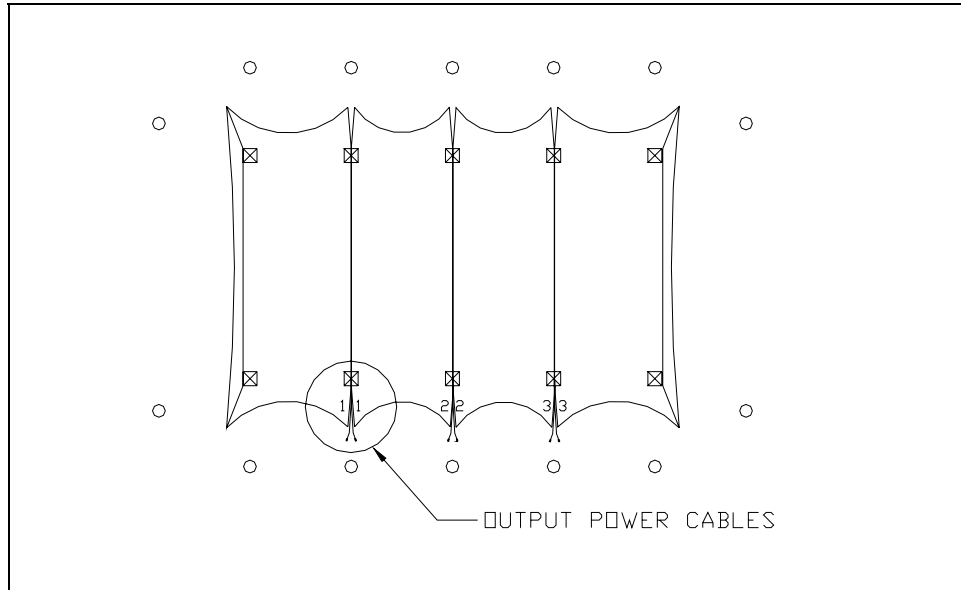


Figure 14 – Location of Output Power Cables

- b. Secure the output electrical cables in the loop/hook fastener pocket as shown in Figure 15.



Figure 15 – Secure Output Power Cables in Pocket

5. Lace Fabric
 - a. Start at a pole position and work across the width of the shade to the opposite pole position. The lacing from the pole to the outside edge will be accomplished at a later step.
 - b. Pull the first rope loop through the first grommet. Pull the next rope through the next grommet and connect through the first loop (see Figure 16).
 - c. Continue this procedure to the last rope/grommet and tie off with a half-hitch (see Figure 16.)
 - d. Repeat steps a through c for ALL remaining lace lines.

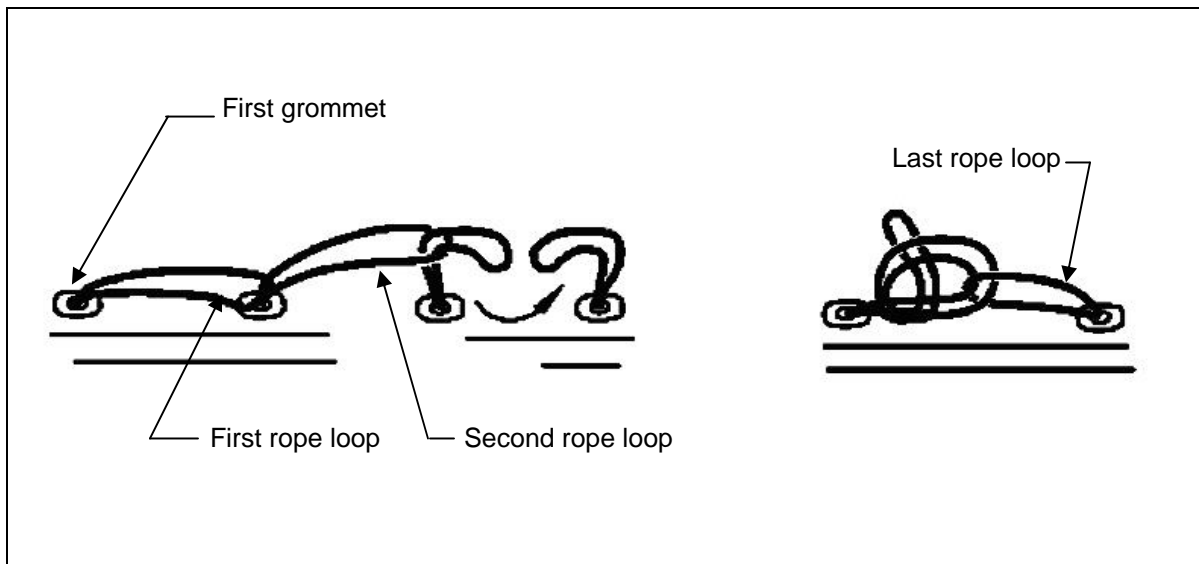


Figure 16 – Rope – Grommet Lacing (a.k.a. becket lacing)

- e. Starting at a pole location begin lacing the sections from the pole to the edge of the shade.
- f. Pull the first rope loop through the first grommet. Pull the next rope through the next grommet and connect through the first loop (see Figure 16).
- g. Continue this procedure to the last rope/grommet and tie off with a half-hitch (see Figure 16.)
- h. Repeat steps e through g for ALL remaining sections (from pole to outside edge of the shade).

CAUTIONS

Avoid damage to fabric and Solar Panels. Do not stand or walk on fabric or Solar Panels. Material may be damaged.

Erect Fabric Sections

Connect Web/Ratchet Assembly

1. Slide the web through the ratchet assembly such that a tail of 1 to 2 feet of webbing is extending from the ratchet assembly. See Figure 17.



Figure 17 – Webbing in Ratchet Assembly

2. Crank the ratchet at least one turn with the pointed end of the extra steel stake so that the web will not slip out.
3. Repeat steps 1 and 2 for ALL remaining stake locations.
4. Locate the web snap hook at an end stake location (Point F in Figures 4, 5, or 6). Attach the snap onto the steel ring on the end of the fabric.
5. Locate the web snap hook at the corner stake location (Point E in Figures 4, 5, or 6). Attach the snap onto the steel ring on the corner of the fabric.
6. Repeat steps 4 and 5 for ALL remaining end stake locations.
7. Locate the web snap hook at a side stake location.
8. Place the ring on the ROPE side of the fabric on TOP of the GROMMET side and snap the snap over BOTH rings. See Figure 18.
9. Repeat steps 7 and 8 at ALL side locations.



Figure 18 – Snap hook to Ring Attachment

Assemble Poles

Every Power Shade pole has a row of 3 plunger pin holes. The middle hole is for nominal situations and slight adjustments for variations in terrain are possible by using the other two lateral holes. The poles are in 3 sections. Each joint has 3 holes, 4 inches apart, for a total of 8 inches adjustability up or down. Figure 19 is a schematic drawing of the poles showing the 3 plunger pin hole configurations. Table 5 lists the lengths by which the Power Shade poles can be adjusted.

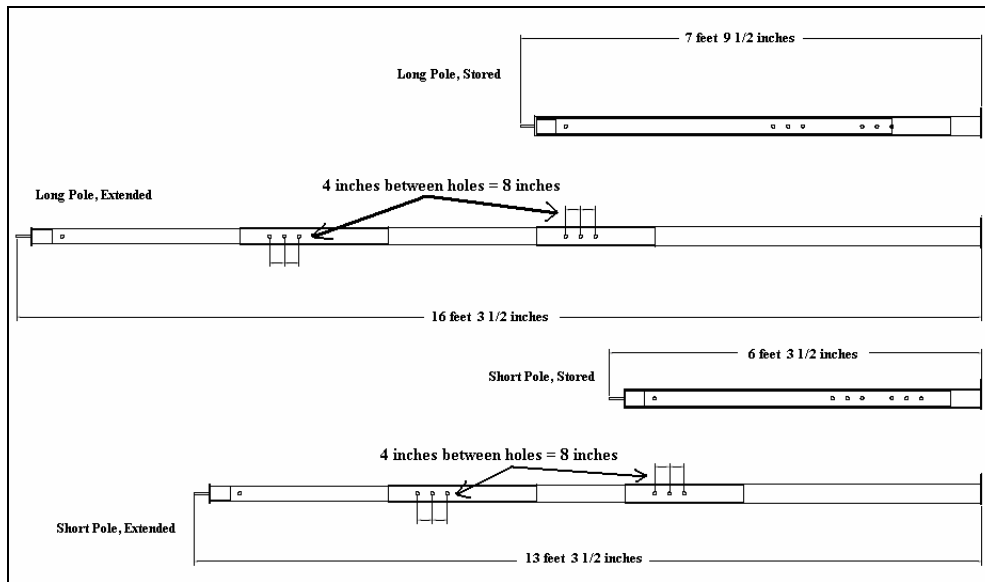


Figure 19 – Pole Schematic

Table 5 - Power Shade Pole Length Adjustabilities

Power Shade Pole Lengths	Center-Hole Lengths	Adjustable Lengths
Short Pole	13ft 3 ½ in	± 8 in
Long Pole	16ft 3 ½ in	± 8 in

1. Pull the plunger pin on the outer leg section.
2. Slide the inner section outward and align upper holes.
3. Push in plunger pin. See Figure 20.

Note: Do not separate pole sections

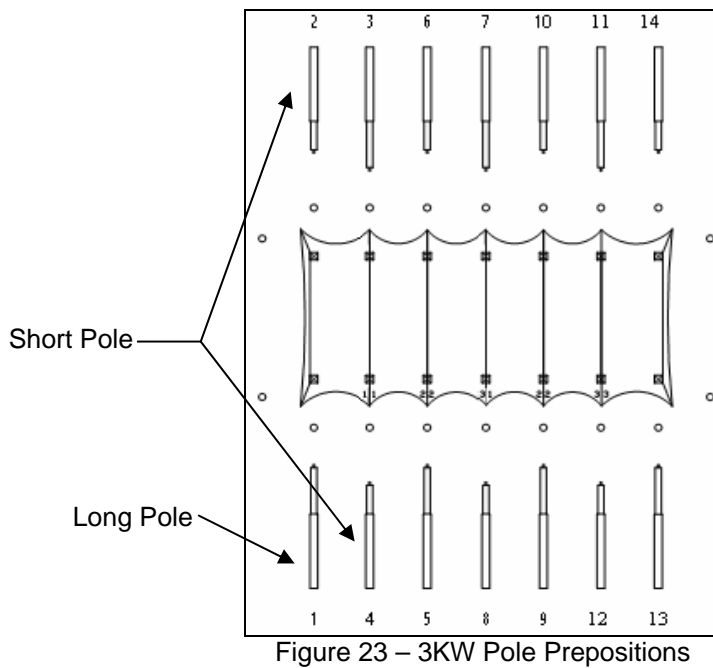
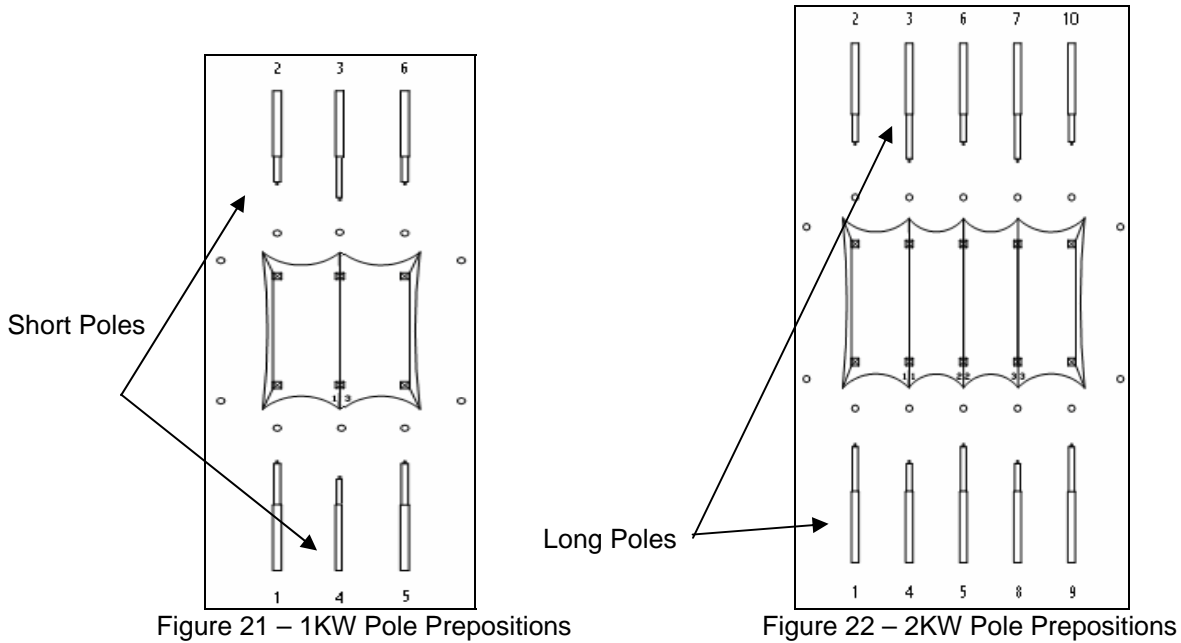


Figure 20 – Extend Poles

Raise Fabric

The Power Shade shape consists of alternating LONG and SHORT poles. It is VERY IMPORTANT that all poles be in the correct position. Figures 21, 22, and 23 identify how the poles should be prepositioned for the 1, 2, and 3 KW Power Shades. Note the position relative to the fabric match numbers on the side.

Important: These figures also indicate the order in which the poles should be installed.



Note that the aluminum peak plates are different color.

- The BLACK plates are the HIGH positions (i.e. use long poles)..
 - The WHITE plates are the LOW positions (i.e. use short poles).
1. Preposition the poles for the appropriate 1, 2, or 3 KW Power Shades as shown in Figures 21, 22, or 23.
 2. Locate the long pole identified with the installation order number 1.
 3. One person should lift the fabric at installation location 1.
 4. Two additional people, positioned with one person at each end of the pole, walk the pole (tip first) under the fabric being held by the person in step #2 into the BLACK peak plate at the first installation location.
 5. Insert the tip of the pole into the BLACK peak plate.
 6. Two personnel should then hold the base of the pole at the corresponding plastic stake in Position A shown in Figures 4, 5, or 6, while one person ratchets it to raise it to an upright position. (see Figure 24)



Figure 24 – Install First Pole

7. Two persons hold this pole in position while the third person adjusts the web/ratchet assemblies to keep the pole from falling.

Note:

 - **Corner poles require adjusting two web/ratchet assemblies.**
 - **Side poles require adjustment to only one web/ratchet assembly.**
8. Repeat steps 3 through 7 for ALL remaining poles in the order identified in Figure 21, 22, or 23.

Remember:

 - **BLACK** peak plates use long poles.
 - **WHITE** peak plates use short poles.

Tension Fabric Sections

1. Begin at the first pole.
2. Make sure that the base (bottom) of the each pole is in the correct position. It should be at the plastic stake marking the proper pole position.
3. Using the tip of the steel stake, ratchet the poles into a vertical position.
4. Visually inspect to see that the pole is vertical in both directions.
5. Repeat steps 2 through 4 for ALL remaining poles.
6. When all of the poles are installed, the poles should be all in a line and the webs should be tight.

Strike

Prepare Power Shade for Strike

1. Prior to striking the power shade, make sure all equipment has been removed from below the power shade.
2. Make sure that the output cables have been disconnected.

Remove and Package Poles

1. Using the pointed end of a steel stake, loosen the tension a small amount on each of the web/ratchets. The poles will lean but the overall shade will still remain standing.
2. With two personnel, lift a corner pole and then walk the base end out from under the shade. The third person should support the pole as it is lowered to ground level.
3. Repeat step 2 for ALL remaining poles.
4. Once the poles have been removed each pole needs to be collapsed for packaging. This is accomplished by pulling out the plunger pin, sliding the inner tube all the way into the outer tube, then pushing the plunger pin back in to lock the pole in the packaged configuration.

Disassemble and Package Fabric

Properly folding and packaging the fabric is important. Take care not to step on the fabric or solar panels. Inspect the fabric, solar panels, cables, grommets, rope loops and web/ratchet assemblies for damage so that it can be repaired prior to the next use.

CAUTIONS

Avoid damage to fabric and Solar Panels. Do not stand or walk on fabric or Solar Panels. Material may be damaged.

1. Disconnect the web snap hooks from the fabric at each of the web/ratchet assemblies.
2. Remove steel stakes and web/ratchet assemblies.
3. Unlace all sections.
4. Unplug electrical connections between fabric sections.
5. Open the loop hook pocket and free the output power cables.
6. Fold fabric sections.

- a. With two personnel, fold the fabric sections lengthwise with the solar panels to the inside. See Figure 25.
- b. Beginning at the first group of solar panels on the end, two personnel “accordion” fold the panel area of the fabric, folding it every 2 panels. See Figure 26.
- c. Continue step b until all the solar panels are folded on to a single section.
- d. Fold the end fabric from one end on top of the folded section, and then wrap the entire package with the fabric from the remaining end. See Figure 27.
- e. Repeat steps a through d for all fabric sections.



Figure 25 – Fold fabric section lengthwise



Figure 26 – “Accordion” fold the solar panel area of the fabric



Figure 27 – Fold Fabric Ends onto the Package and Wrap with the Opposite End Fabric

Package in Shipping Container

Place all components in the shipping container and secure.

Repair and Replacement Parts

Contact Powerfilm, Inc. for repair and replacement parts.

Powerfilm, Inc.
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