



TSB03-01

TECHNICAL BULLETIN

TO: BP Solar Distributors, Dealers and Installers
FROM: [Gary Lienesch](#), Applications Engineer
SUBJECT: Alternative Grounding Methods for BP Solar Universal Framed Modules
DATE: August 15, 2003

BP Solar Universal module frames may be grounded using the hardware supplied with the module in accordance with the instruction sheet that is supplied with every module. While we recommend this method of grounding, we recognize that professional installers may prefer to use an alternative grounding method that makes installing a system easier. This technical bulletin details the optional methods that may be used to ground a BP Solar module that are in compliance with the National Electric Code (NEC) in the United States and retain the UL listing of the module. These methods apply to any module with a BP Solar Universal Frame.

Caution: Grounding a BP Solar photovoltaic module by one of the procedures described below does not invalidate the Limited Warranty. However, Warranty claims (power and workmanship) *that are a consequence* of any alterations will not be honored.

Four methods of alternate module frame grounding are presented below. These methods have been evaluated by UL as acceptable. Screw thread pitch is specified with English units in this technical bulletin; metric equivalent screw thread pitch may also be used. BP Solar does not endorse the use of any specific hardware for any alternate grounding method. Be sure to check with your local electrical inspector before the start of a PV installation to determine which grounding method is preferred.

- 1) **Drill Hole into Frame:** You may drill a hole in the side frame of the module. See Figure 1 for an illustration of the location of the side frame and bottom flange. To maintain the structural integrity of the module frame, you should confine any hole drilled to a specific area as shown in Figure 2. There are eight such areas on each module from which to choose. Three options are described below.

Caution: DO NOT drill a hole through the bottom flange; you risk damaging the backsheet lamination and cells. This will void the module's warranty if there is subsequent power loss due to a cracked cell, corrosion or other related damage.

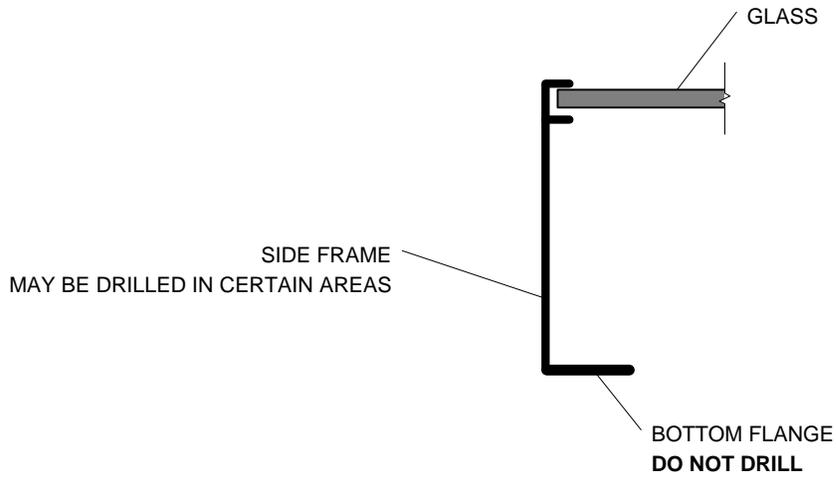


Figure 1 - Cross-section of module frame showing where a hole may be drilled

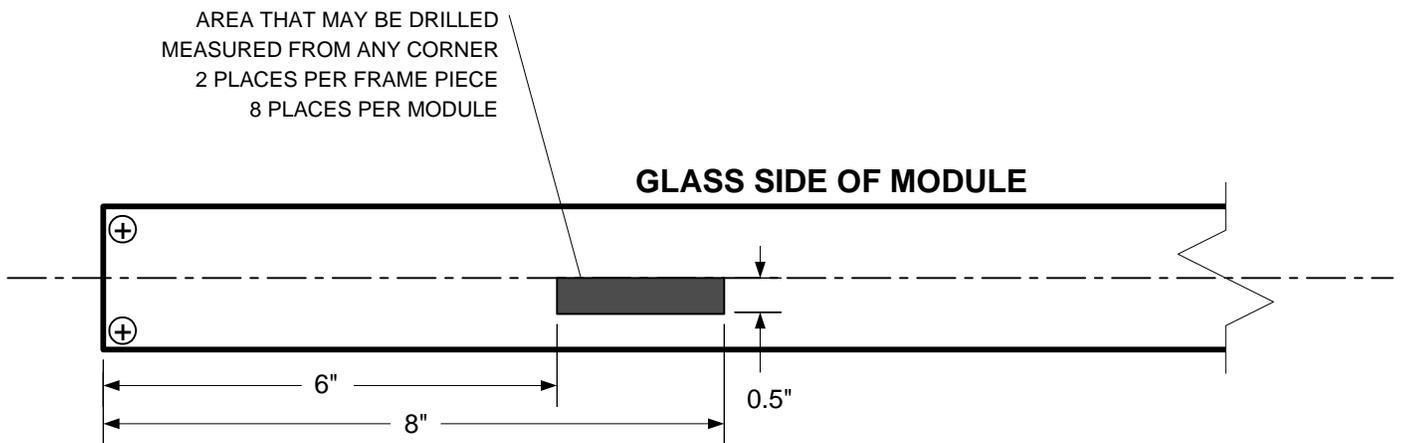


Figure 2 - Area on any side of module frame that may be drilled

a. You may drill a hole through the side frame to accommodate a stainless steel (SS) self-tapping screw. Such a screw must have a thread pitch of at least 32 turns-per-inch (TPI). You may not use the 10-24 screw supplied with the module in this case because the thread pitch, 24 TPI, which is suitable for the provided ground holes on the bottom flange, will not provide adequate thread contact with the side of the frame, which is thinner.

1) A SS self-tapping screw can be used with a SS washer to compress a solid copper wire wrapped around the screw against the frame. The copper wire may either terminate at the screw or continue to the next module.

2) A SS self-tapping screw can be used without a washer to secure a ring or spade terminal.

b. You may drill a hole through the side frame to accommodate a Service Post Connector such as the one shown in the illustration. Be sure to use a Service Post Connector that is rated for direct burial. Many such connectors are rated for indoor use only. You will also need SS hardware – a star washer and nut – to complete the assembly. See Figure 3 for an illustration of this assembly.



c. You may drill a hole through the side frame to accommodate a Lay-In Ground Bushing Lug such as the one shown in the illustration. Be sure to use a Lay-In Ground Bushing Lug that is rated for direct burial. Many such connectors are rated for indoor use only. You will need SS hardware – a bolt, flat washer, star washer and nut – to complete the assembly. See Figure 4 for an illustration of this assembly.



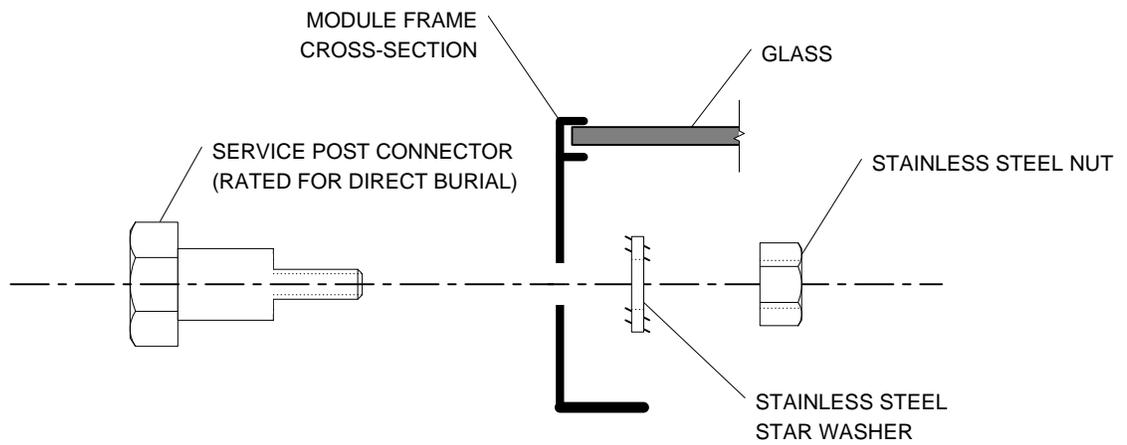


Figure 3 - Connecting a Service Post Connector

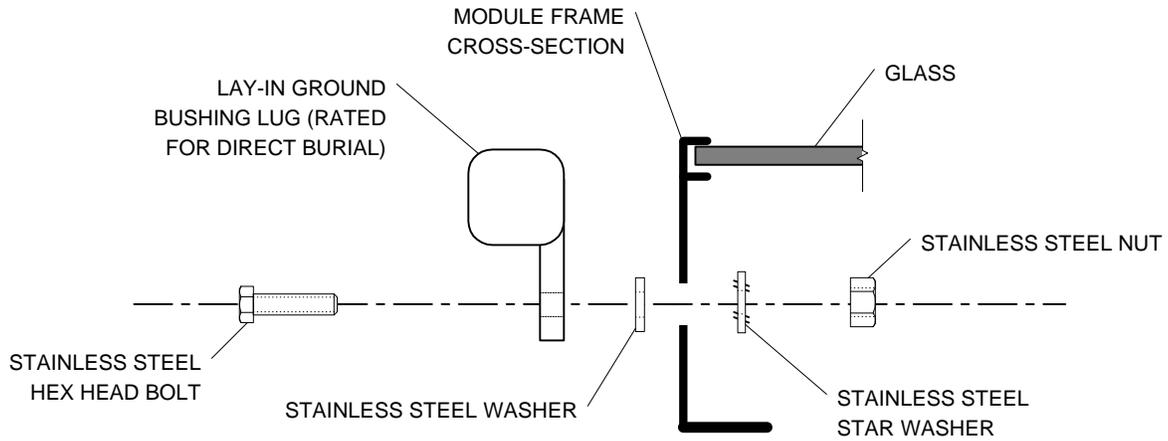
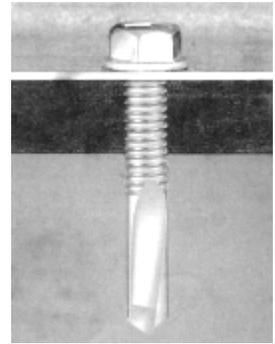


Figure 4 - Connecting a Lay-in Ground Bushing Lug

- 2) You may drill self-tapping fasteners into the frame such as the one shown in the illustration. This method is permissible *provided that two self-tapping fasteners are used for each module.* A single self-tapping fastener does not provide adequate grounding as there are too few thread turns in contact with the aluminum on the side of the frame. A single fastener could be used on the side of the frame provided it has a thread pitch of 32 TPI. However, a self-tapping fastener with 32 TPI has not been identified so two fasteners must be used per module.



Each of the two self-tapping fasteners must be drilled in the area defined in Figure 2. Keep in mind that there are two such areas on each section of frame. Each area is located by measuring in from each corner of the frame.

- a. A self-tapping fastener can be used to compress solid copper wire that is wrapped around the screw then terminated or the wire can continue to the next module.
- b. A self-tapping fastener can be used to secure a ring or spade terminal.

In both cases above, the ground path is not from the solid copper wire, ring or spade terminal through the anodization layer to the aluminum frame. Rather, it is from the wire or terminal through the fastener head, to the fastener threads and finally to the aluminum frame. Be mindful of the effects of galvanic corrosion with any metal pressed against the module frame.

- 3) **Use Lower Frame Screw:** Another method of attaching a ground conductor to a module frame is to secure a spade terminal lug to the module frame by using one of the module's screws. Each corner of the module frame has two screws. You may back out one of the screws used to attach the frame pieces at any corner of the module. *Select the screw opposite the front glass and next to the bottom flange of the module frame.* See Figure 5 for an illustration of which screw may be used. Back this screw out just enough to insert a spade terminal. Avoid removing the screw completely to ensure integrity of the connection by using the same tapped threads. This method can be used to insert spade-type terminals up to 5/16" [8 mm] thick. Be mindful of the effects of galvanic corrosion with any metal pressed against the module frame.
- 4) **Use Existing Mounting Hole:** Grounding a module frame can also be accomplished by using an existing hole on the bottom flange as long as the hole is not being used for mounting the module. Hardware should be SS. This method requires the use of a star washer large enough to ensure contact is made through the anodization layer around the hole. See Figure 6 for an illustration.

NOTES:

When selecting grounding hardware, be mindful of the effects of galvanic corrosion between dissimilar metals. In most cases, it is preferable to use stainless steel hardware in contact with the module frame.

When installing BP Solar photovoltaic modules, be sure to read and follow the installation instructions found in "Instruction Sheet Crystalline Silicon Photovoltaic Modules" which is packaged with each module.

CC: Regional Sales Directors, Sales Managers, Customer Service, Marketing, Product Development, Projects, Regional Quality Managers, Quality Assurance, Technical Services, SESI

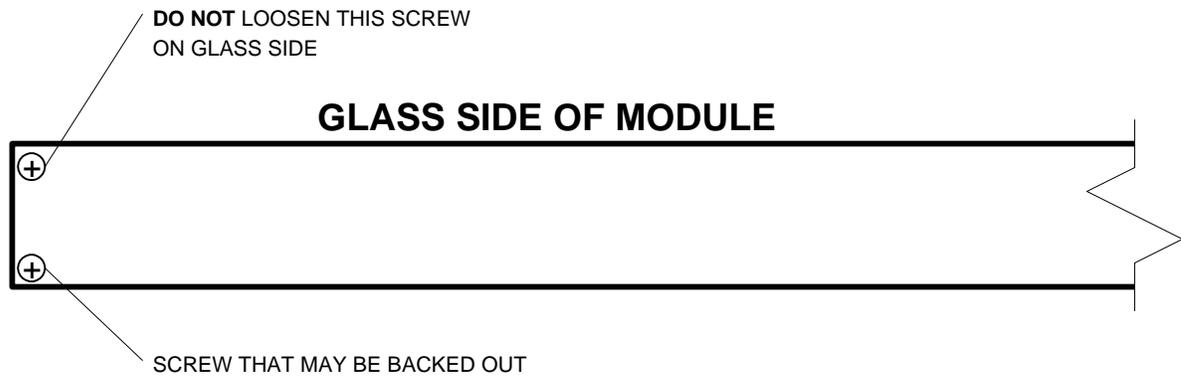


Figure 5 - Location of screw that may be used as a point of grounding

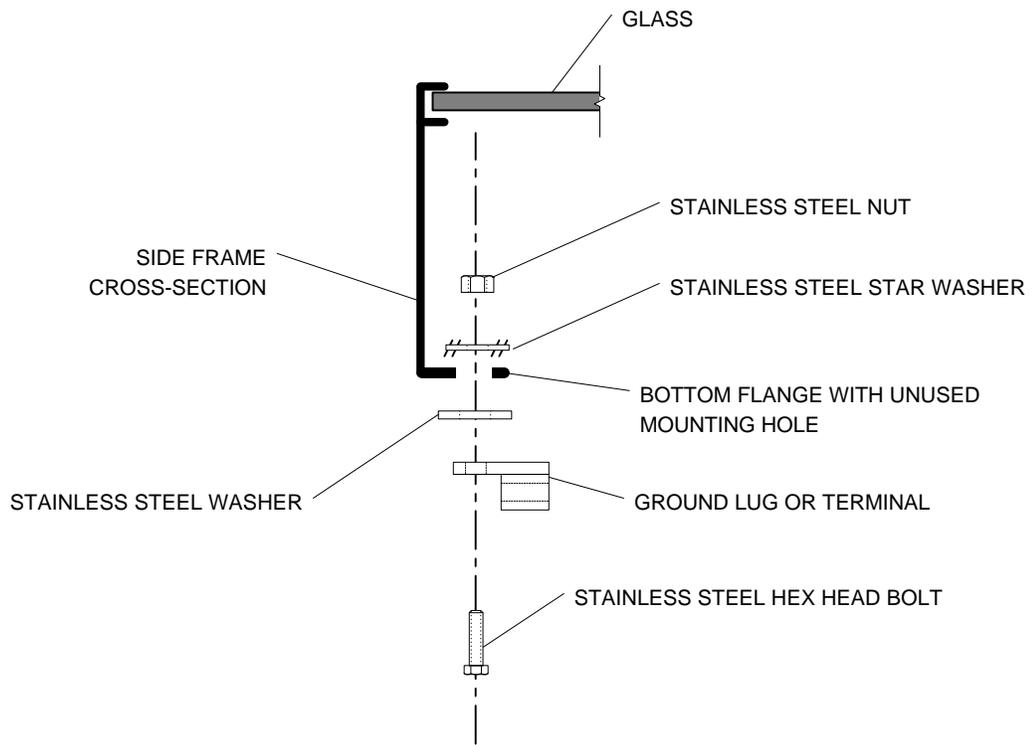


Figure 6 - Grounding a module frame using an unused mounting hole