FLUSH MOUNT SYSTEMS
INSTALLATION MANUAL

SCHLETTER
The Solar Mounting Group

FLUSH MOUNT FEATURES

Schletter Inc. offers a wide array of solutions for flush mount photovoltaic (PV) applications suitable for nearly any environmental condition. Every solar mounting system is designed for strength and ease-of-installation using high quality products to meet or exceed applicable IBC, ASCE, and UL standards.

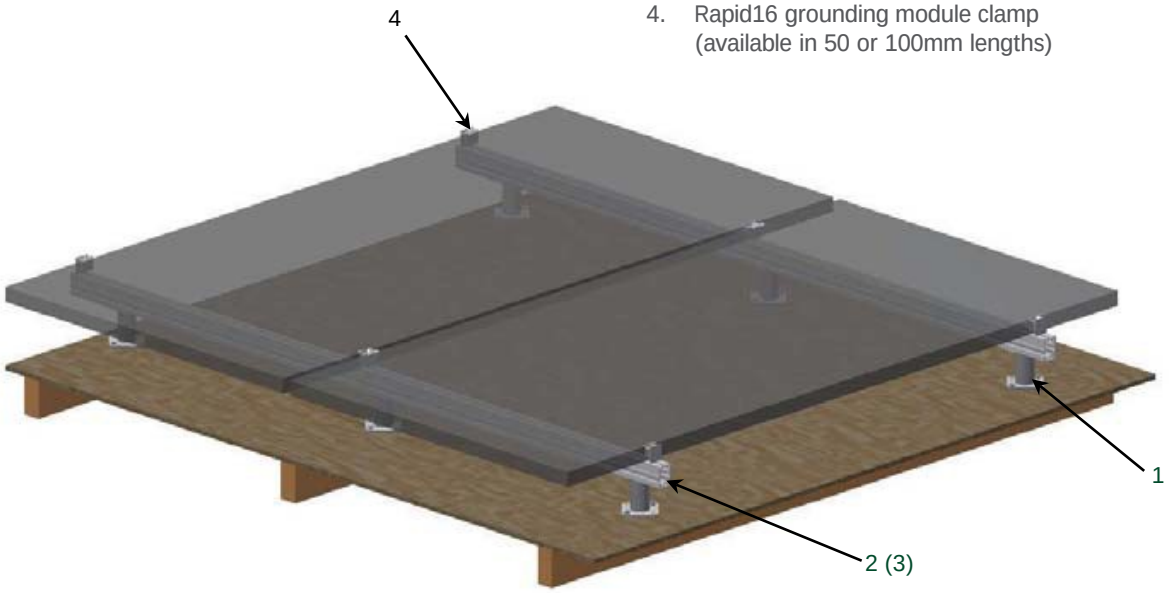
Flush Mount Features

- Conforms to UL 2703[1]
- Certified to LTR AE-001[2]
- Fire class resistance rating: Class A when used with Types I and Type III photovoltaic modules only[3]
- Flexible design
- Modular components
- Industry leading installation times
- Electrically bonded unit
- Included **Rapid16** grounding module clamp (available in 50 or 100mm lengths)
- Portrait and landscape module orientation[6]

Once the attachment mechanism is installed (i.e. roof hook, Fix2000, etc.), the process for installing the rails, modules, and clamps is essentially the same. The following will review proper installation methods for commonly used roof attachment components for Schletter Flush Mount Systems.[7]

Key Components[5]

1. Roof attachment (standoff shown)
2. Rail (purlin)
3. Internal splice
4. Rapid16 grounding module clamp (available in 50 or 100mm lengths)



[1]The Flush Mount System is evaluated for electrical bonding only. The Flush Mount System meets all IBC and ASCE requirements for structural loading; it was not evaluated for loading under UL 2703.

[2]Maximum load 5,400 Pa. Flush Mount Systems generally have a roof connector about every 2 modules.

[3]Special consideration needs to be taken during design phase if system requires protective fire barrier.

[4]Maximum number of modules shall not exceed maximum system voltage.

[5]Individual parts and components will vary from system-to-system. Please reference system specific drawings.

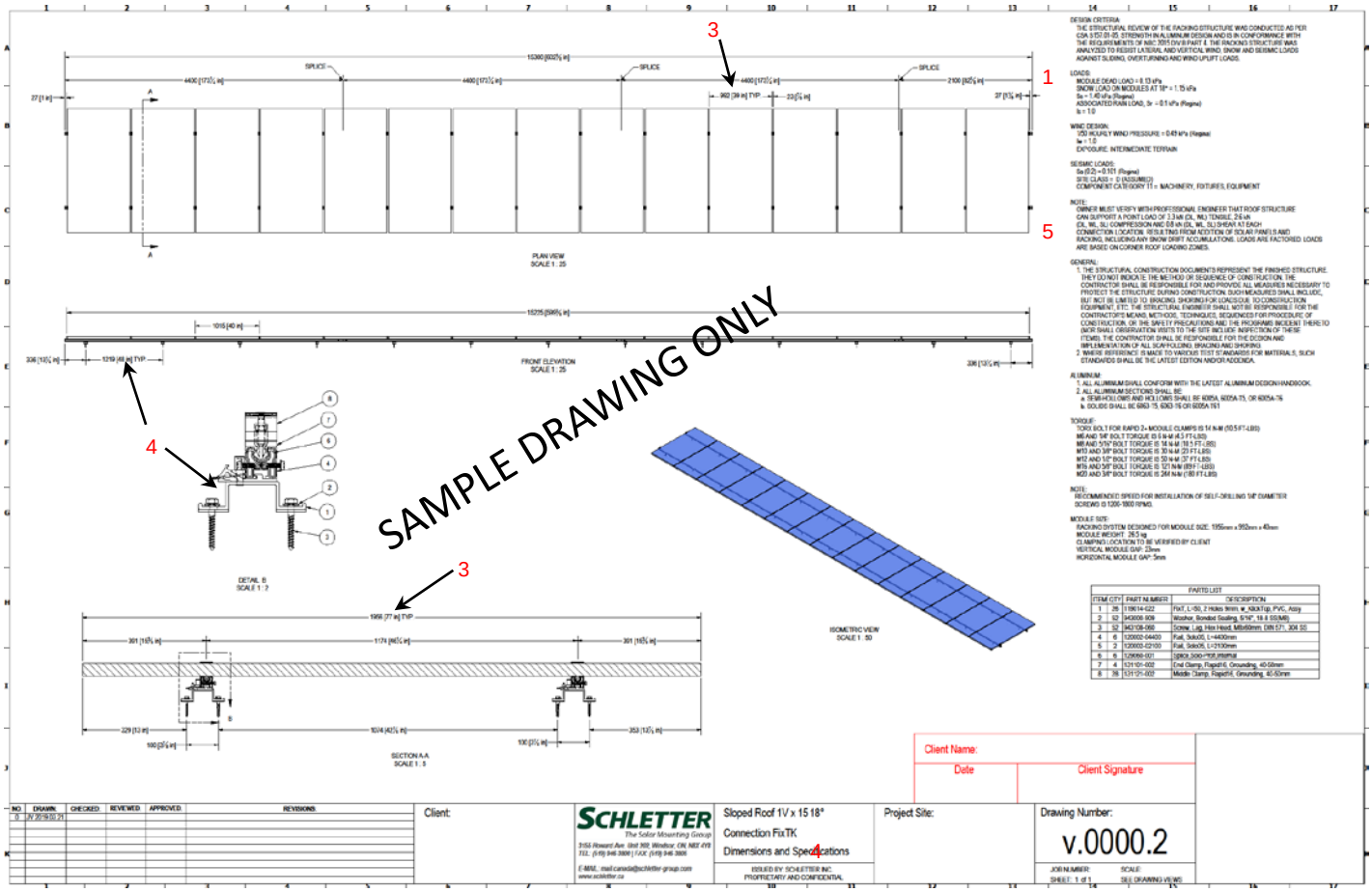
[6]This racking system may be used to ground and/or mount a PV module complying with UL1703 only when the specific module has been evaluated for grounding and/or mounting in compliance with the included manual.

[7]Installer is responsible for verifying that photovoltaic system meets applicable NEC standards.

SAMPLE DRAWINGS

Specific drawings are provided for each project. Key information included on these drawings is as follows:

1. Design Criteria
2. Notes Section
3. Module Dimensions
4. Connection Spacing and Type
5. Connection Forces



INSTALLATION TOOL LIST

- Tape measure
- Chalk line
- Indelible marker
- Inclinometer
- Carpenters square
- Pliers
- Torx® bit (TX40) for Rapid16™ module clamps
- 3/8” drive socket for self-drilling screws
- Drill bit — check hardware to determine drill bit size
- Torque wrench
- Wrench and/or socket for all bolted connections
- Rubber mallet for installation of end caps
- Ratchet and/or rechargeable power drill
- Chop saw







TX40


3/8”



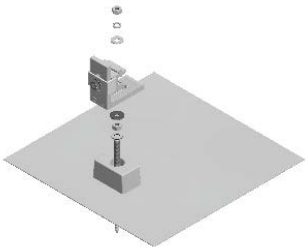



ASPHALT SHINGLE ROOF ATTACHMENTS

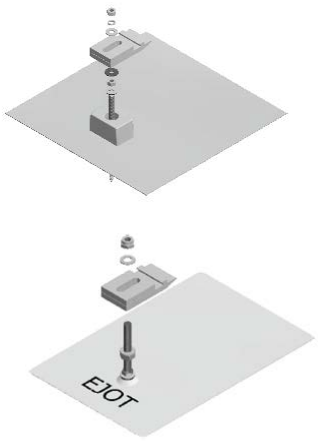
Schletter carries attachments from Quick Mount PV®, EcoFasten®, and Ejot® to offer robust solutions for asphalt shingle roofs which integrate with Schletter rails using our KlickTop HB or adjustable Rapid^{2+} Angle. Options fit standard 5" course.

1. Connect Roof Attachment

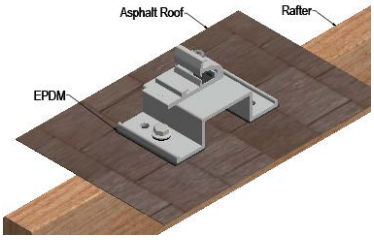
- FixTK for asphalt roof
- Rapid 2+ SML for asphalt roof
- See Quick Mount PV, EcoFasten, or Ejot installation specifications.[8]
  www.quickmountpv.com
  www.ecofastensolar.com
  www.ejot-usa.com



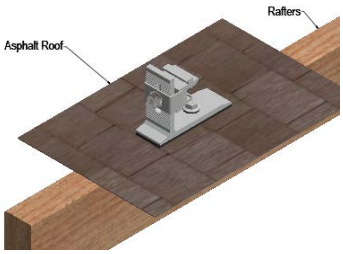
Connect Rapid2+ Angle as shown using provided hardware



Connect KlickTop HB as shown using provided hardware



Connect FixTK to rafters using the 2 middle holes only.



Connect Rapid2+ SML to rafters using lag bolt

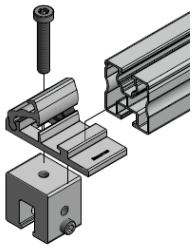
[8]©Quick Mount PV is owned exclusively by Quick Mount; ©EcoFasten is a registered tradename of EcoFasten Solar; ©EJOT is a registered tradename of EJOT; neither tradename is owned by Schletter

STANDING SEAM CLAMP

Schletter Flush Mount Systems are compatible with most S-5!® standing seam clamps.

1. Connect Standing Seam Clamp

- See S-5!® website for proper installation (www.s-5.com).[7]
- Locate position of clamp on roof; arrange the clamps according to the required rail positions; attach clamps loosely to roof profile, set final torque once rail is positioned.



Connect RapFix to S-5! Mini clamps using M8 bolt

2. Standing Seam Clamp to Rail Connection Options

- Use KlickTop for S-5! Mini clamps and KlickTop HB or Rapid2+ Angle for the S-5! U.

Connect KlickTop HB to S-5! U using M10 bolt and washer

3. Schletter Folding Clamp 503 Rapid

- Rapid16 module clamps connects directly to standing seam clamp.

Schletter Folding clamp 503 Rapid for standing seam roof

[7]S-5!® is a registered tradename of S-5! Corporation; tradename is not owned by Schletter

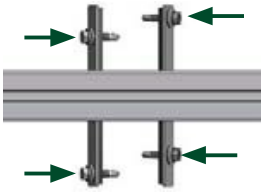
SINGLE FIX-V / CLAMPFIT

1. Single Fix-V to Rail Connection

- Connect SingleFix-V to rails before attaching to the roof.

side view

Slide hook into bottom channel of rail



Tighten self-drilling screws until there is slight pressure on the gasket

2. Connect Single Fix-V to Roof

- Measure and mark distances between attachments before installing (screws should not be uninstalled and reinstalled in same location).

- Connect SingleFix-V to Roof with **EcoLight**
- **450 mm module support profile**

3. ClampFit fastener

Can be combined with the universal Rapid16 module clamps.

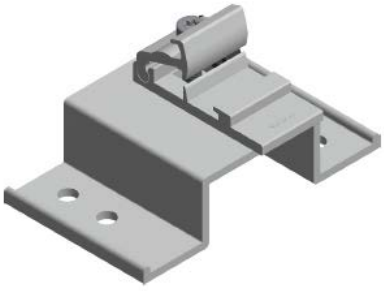
- For all common trapezoidal sheets
- Used only for landscape applications
- Clamping location must be verified with module manufacturer

FIXTK™

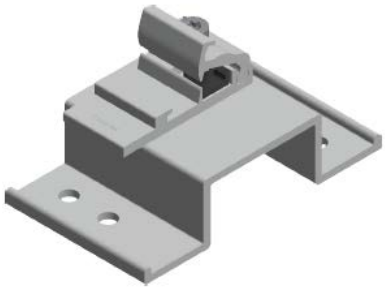
Aluminum roof attachments for corrugated sheet metal roofs 26 gauge or thinner and where roof deck cannot support installation.

1. Connect FixT to Roof

- Locate strapping and mark attachment points (see design drawings and/or span table).
- Drill pilot holes on designated attachment points.
- Can be installed perpendicular or parallel to strapping.



Connect KlickTop to FixT using M8 bolt



M10 hexagon-head bolts and M10 flange nuts

RAIL INSTALLATION

1. Rail Options for Flush Mount Application

- EcoLight, Eco05, Solo, SoloPlus, SoloXL
- Top channel: M8
- Bottom channel: M10

EcoLight

Eco05

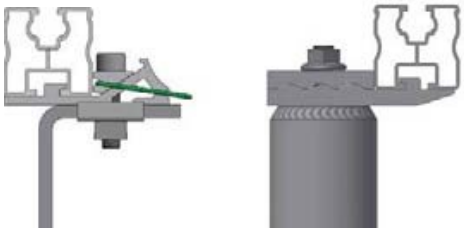
Solo

SoloPlus

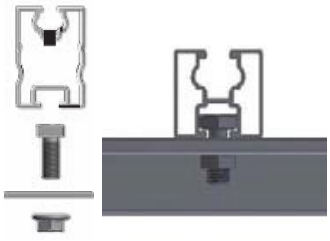
SoloXL

1. Install Rail

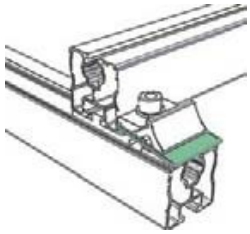
- Installation method varies depending on the type of roof attachment-to-rail connector being used; follow appropriate instructions shown to the right.



KlickTop and KlickTop HB: press rail channel into 'hook', secure by tightening bolt/nut



Slide M10 hexagon-head screw into rail channel, secure with M10 flange nut from underside of roof attachment

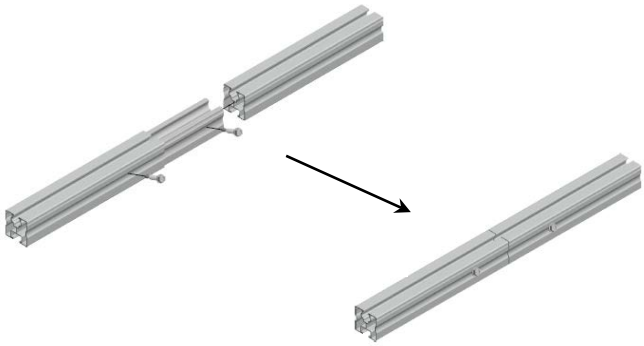


Rail-to-rail connection

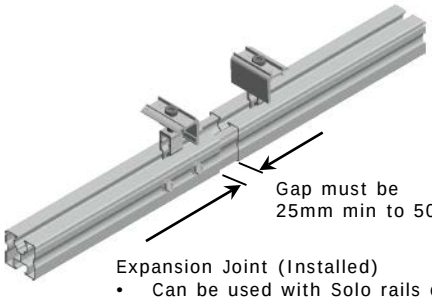
RAIL INSTALLATION

3. Add Rail Splice

- Insert half of internal splice into first rail, secure with provided self-drilling screw; insert exposed end of splice into second rail, secure with self-drilling screw



Splice (Installed)

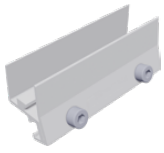


Gap must be
25mm min to 50mm max

Expansion Joint (Installed)
- Can be used with Solo rails only
- Screw located on one rail only to allow movement

Eco internal connector set Internal

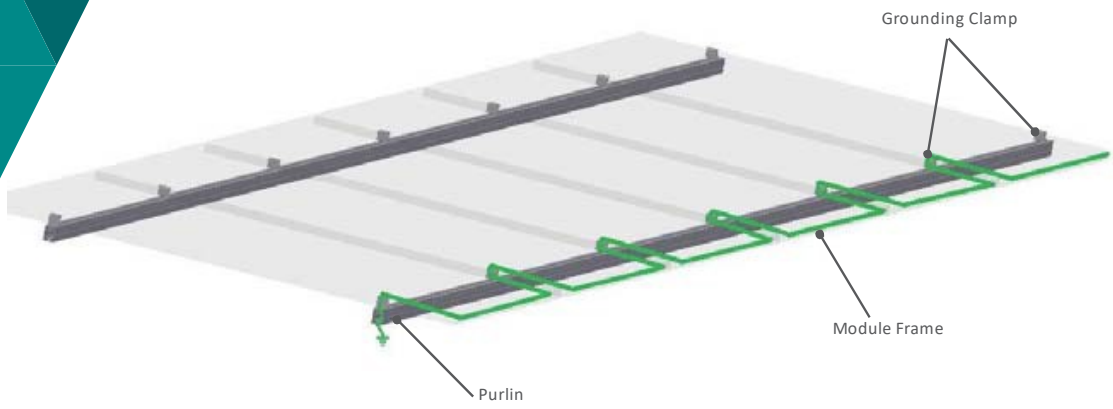
Solo slide-in connector set, Internal



Eco05 connector, External

Solo, SoloPlus & Solo XL connector, External

GROUNDING PATH DIAGRAM



The following purlin rails can be used for this grounding path.


EcoLight


Eco05


Solo

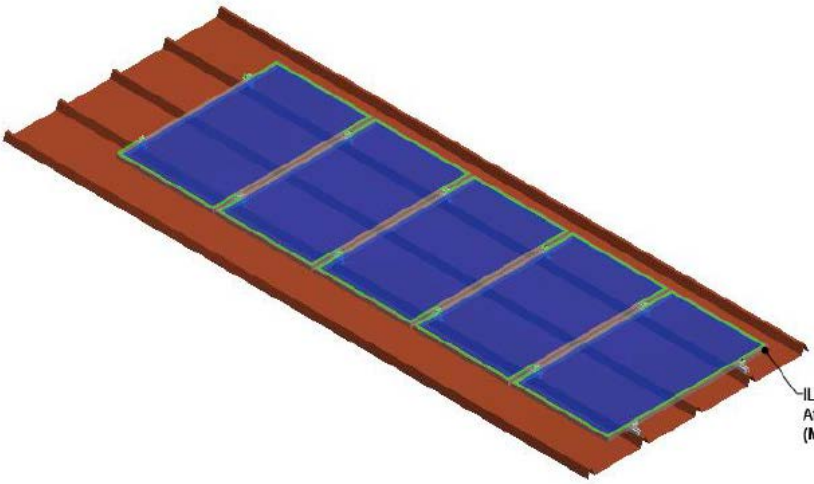

SoloPlus


SoloXL

GROUNDING PATH DIAGRAM
RAIL-LESS ATTACHMENTS

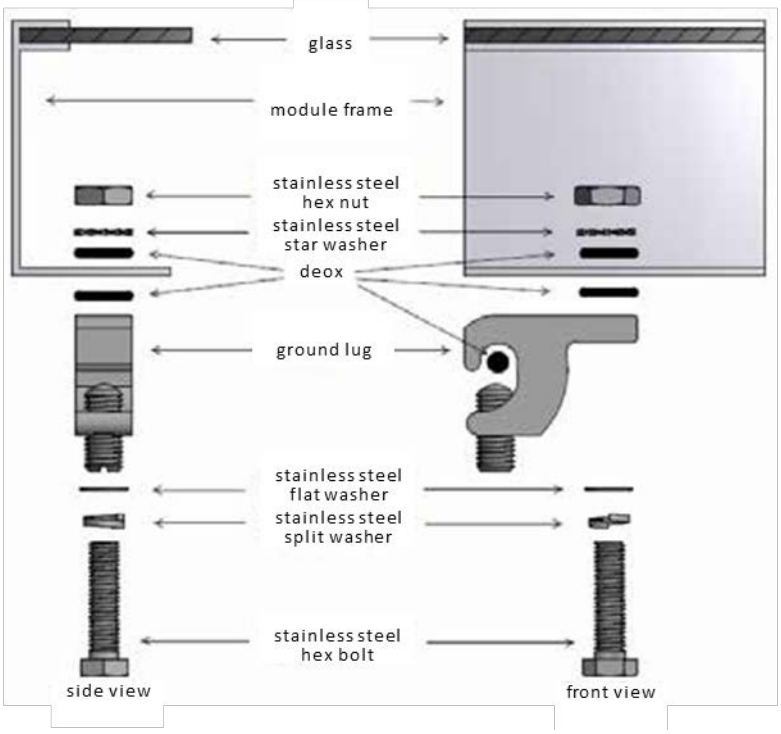
130004-100
ClampFit fastener, for Trapezoidal roofs

112001-005
Folding clamp 503 Rapid for standing seam roof



ILSCO GROUNDING PATH INSTALLATION INSTRUCTION

GBL-4SS, Ground Lug Installation Instructions for Photo Voltaic Applications



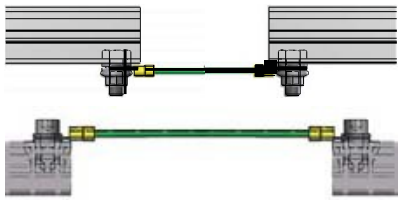
GBL-4SS

OPTIONAL ACCESSORIES

1. Bonding Jumper

- Electrically bonds adjacent systems, forming a continuous ground path.
- Available in 6-inch to 48-inch lengths
- Required at expansion joints/ physical breaks.

Bonding jumper



Bonding jumper connects directly to the top channel of rail using M8 or M10 hardware or bottom channel using M10 hardware

2. Overcurrent Protection Device (grounding)

- Accommodates strandard or solid copper wire (2 gauge to 14 gauge).
- Must use bare copper wire to make connection. Remove at least 2 inches of insulation to expose copper wire
- Connects to bottom M10 rail channel.

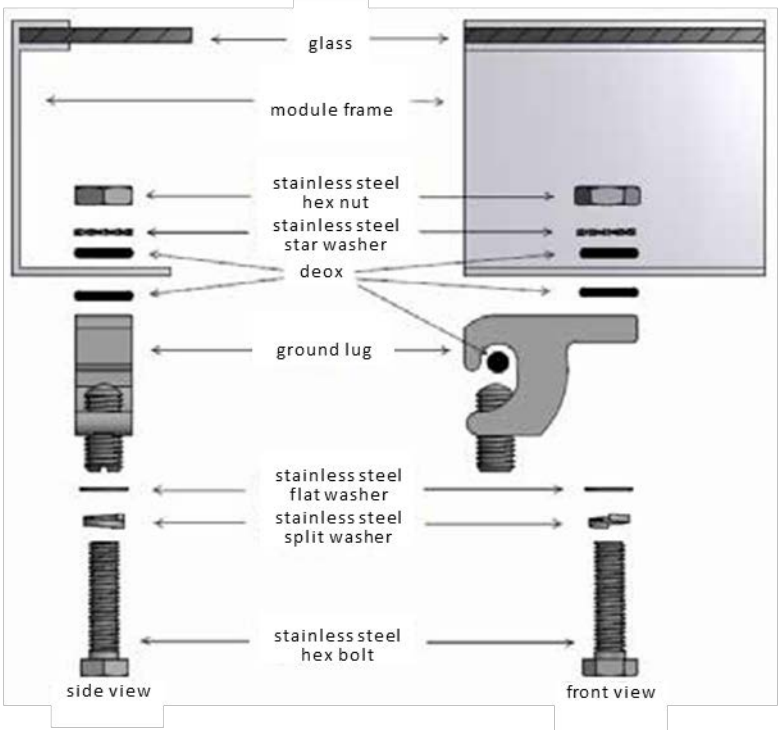
Loosen or remove top portion of grounding lug and insert grounding wire into appropriate groove

Grounding lug
(Part #135003-003)

Grounding wire must extend through grounding lug by at least 1/4 inch

ILSCO GROUNDING PATH INSTALLATION INSTRUCTION

GBL-4SS, Ground Lug Installation Instructions for Photo Voltaic Applications



GBL-4SS

OPTIONAL ACCESSORIES

3. Cable Management

- If cable management was ordered with the system, install before modules are in place.
- Keep in mind: ProKlips will be positioned in the space between rail and back of module, which is created by module frame.

ProKlip-Multi 8 (129065-008): gently press clip into top channel of front or rear rail, use caution as clip may break.

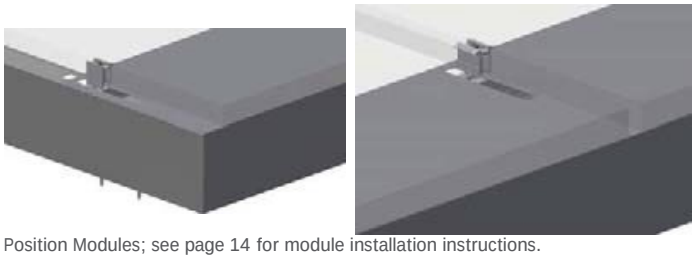
ProKlip-C (129005-000): connect clip to side of rail inserting hooks in top and bottom channels

FIRE BARRIER

- Required in systems installed on roofs with slopes less than 9.5 degrees (not for use on roofs with slopes greater than 9.5 degrees)
- Fire barrier should be installed after modules are properly installed.
- Start at one corner of the system and place the horizontal and vertical fire barrier pieces between the module frame and rail.
- Ensure correct dimension of the side alignment of module and rail.
- Maximum opening between fire barrier and roof deck is one inch.
- Provides for a Class A fire rating when used with Type I modules.
- For Type III modules, a minimum of 8” clearance between module and roof deck must be maintained, but no fire barrier is required for a Class A rating.
- Only required on perimeter of array.

Position side fire flashings

Position front and back fire flashings

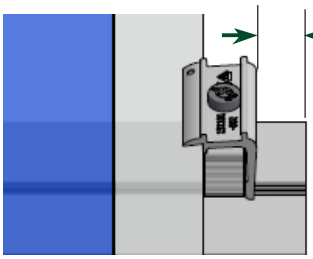


Position Modules; see page 14 for module installation instructions.
Secure all connections using module clamps

MODULE MOUNTING

1. Position Modules

- Position end clamps on rail approximately 20 mm from end of rail, do not tighten.
- Position first module and secure using pre-positioned end clamps, do not tighten.
- Attach middle clamps to rail on the exposed side of first module.
- Place second module next to first module and secure using middle clamp, do not tighten.
- Repeat until end of row.
- Modules installed in landscape require Module Support Plate (Part #139004-005) installed between module and rail.



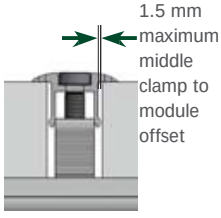
Position end clamps approximately 20 mm from end of purlin

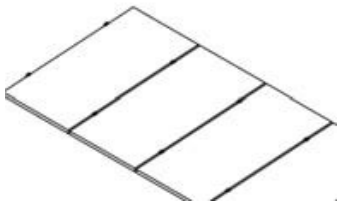
Portrait

Landscape

2. Secure Modules

- Verify that the module clamp is fully engaged on the rail and 1.5 mm maximum middle clamp to module offset is aligned with the module frame.
- Secure all clamps to specified torque values.
- When mounting modules, please observe the clamping points specified by the module manufacturer.



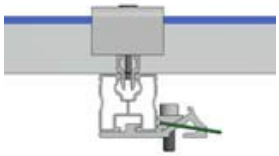


Allowable gaps between modules

Completed installation with module (Roof Hook)

Completed installation with module (Standoff)

Completed installation with module (Fix2000)



Rapid16 clamp connected to purlin (side view)

EQUIPMENT GROUNDING

- Many PV installations contain more than one mounting system. Such cases call for electrically bonding each of the different mounting systems. Since individual racks are fully bonded units it is only necessary to connect individual racks together from one single point to another single point.6 Only use stainless steel hardware when connecting harnesses or jumpers to the mounting system. Take care to prevent copper wires from directly contacting aluminum surfaces as this will cause corrosion. For this purpose, Schletter supplies a bonding jumper (see page 6).

- The PV INSTALLER of Schletter's electrically bonded PvMax system must provide the components necessary for the final connections to the grounding electrode system. Typically the installation will incorporate a grounding electrode (ground rod), appropriately sized copper wire, rated wire connectors, and grounding lugs which are rated for this purpose. The PV INSTALLER must follow all manufacturers' installation literature. Installation must comply with all applicable NEC/CSA sections including but not limited to; NEC 250 (Grounding and Bonding), NEC 690 (Solar Photovoltaic Systems), CSA 22.1 (Safety Standard for Electrical Installations), and all other applicable state and local electrical code requirements.

- PV INSTALLER shall be fully responsible for all connections between Schletter's bonded PvMax system and PV grounding electrode system.

- Equipment grounding conductors shall be no less than 14AWG (copper) or 12AWG (aluminum).

- Equipment grounding conductors can be connected to any exposed metallic portion of rack system provided that:

  a. connection area is sufficiently sized
  b. dissimilar metals are not in direct contact
  c. connection does not interfere with other components
  d. connection is protected from damage

TORQUE SPECIFICATIONS AND TOLERANCES

Systems are specifically designed for each project. Please reference the specific project drawing for allowable tolerances and recommended torque for each size of bolt used in the system.

In the event of deviation from approved drawings, contact Schletter immediately.

Torx Bolt for Rapid16 Module Clamps	15 N-M	10.5 FT-LBS
M6 and 1/4" Bolt	6 N-M	4.5 FT-LBS
M8 and 5/16" Bolt	14 N-M	10.5 FT-LBS
M10 and 3/8" Bolt	30 N-M	23 FT-LBS
M12 and 1/2" Bolt	50 N-M	37 FT-LBS
M16 and 5/8" Bolt	121 N-M	89 FT-LBS
M20 and 3/4" Bolt	244 N-M	180 FT-LBS
Note: Recommended speed for installation of self-drilling 1/4" diameter is 1200-1800 RPMS.		

[6]Schletter recommends two bonding jumpers to connect separate systems for redundancy.

MAINTENANCE

- Yearly inspection of system should be conducted to maintain optimal performance.
- Visually inspect for signs of damage, wear, corrosion, or movement. Replace any affected components immediately.
- Check for loose wiring.
- Maintenance should only be performed by qualified personnel.
- Check mechanical details of structure:
    - At least 2% of bolted connections must be checked using a calibrated torque wrench. The torque wrench must have a display or be a click type torque wrench.
    - Torque wrench should be set at 50% of intended tightening torque. Check is successful if bolt cannot be loosened.
    - If >10% of checked bolted connections are loose, check has to be increased to 10% of all bolted connections.
    - If more than 10% of connections are still loose, all bolted connections much be checked.
    - Tighten all non-conforming bolts to specified torques
    - Requirements per ASME B107 and AISC

WARNING: Risk of death by electric shock.
AVERTISSEMENT: Danger de mort par secousse electrique.

SAFETY PRECATIONS

Follow proper installation and safety procedures at all times. Edges of parts may be sharp. Follow proper lifting procedures.

FOR MORE INFORMATION

For United States, visit www.schletter.us or call 888-608-0234 or for Canada, visit www.schletter.ca or call 519-946-3800 to speak to a Schletter representative for more information.

APPROVED MODULE LIST

MANUFACTURER	MODEL NUMBERS
Boviet Solar	BVM6612
Canadian Solar	CS1K-MS CS3K CS3K-MB-AG CS3K-MS CS3K-P CS3L CS3U CS3U-MB-AG CS3U-MS CS3U-P CS3W CS5A-xxxM CS6K CS6K-M CS6K-M AB CS6K-P CS6K-P-FG CS6K-xxxMS CS6P-M CS6P-P CS6P-P-SD CS6U CS6U-M CS6U-P CS6V-M CS6X-310|315|320P CS6X-P-FG
ET Solar	ET-M660 285|280|275|270|265 BB ET-M660 290|285|280|275|270 WW|WB ET-M672 340|335|330|325|320 BB ET-M672 345|340|335|330|325 WW|WB ET-P660 265|260|255|250 BB ET-P660 270|265|260|255 WW|WB ET-P672 315|310|305|300 BB ET-P672 320|315|310|305 WW|WB
Hanwha Q Cells	L-G3 L-G2 L-G4 Q.PEAK DUO BLK-G5-xxx Q.Peak DUO BLK-G6 xxx Q.Peak DUO G6 xxx Q.Peak DUO LG6 xxx Q.PEAK DUO-G5.X-xxx Q.PEAK DUO-G5-xxx Q.PEAK DUO L-G5.2 Q.PEAK DUO L-G5.3 (380-395) Q.Peak DUO L-G6.2 xxx Q.Peak DUO L-G6.3 xxx

APPROVED MODULE LIST

Hanwha Q Cells (continued)	B.LINE PRO L G4.1 - 35mm B.LINE PLUS L G4.2 - 35mm B.LINE PRO L G4.2 - 35mm B.LINE PLUS BFR G4.1 xxx B.LINE PRO BFR G4.1 xxx Q.PEAK BLK G4.1/TAA xxx Q.PEAK L G4.2 / 4.5 Q.PEAK-G4.1|G4.1/MAX Q.PLUS BFR G4.1/TAA xxx or MAX xxx Q.PLUS G4 Q.PLUS L G4.1|G4.2 Q.PRO BFR G4|G4.1|G4.3|G4.4 Q.PRO G4 Q.PRO L G4.1 Q.PRO L G4.2 Q PRO L G4.5
Heliene	Heliene 36|60|72|96M Heliene 36|60|72|96P
Hyundai Solar	HiS-M250|255|260|265RG HiS-M310|315|320|325TI HiS-S265|270|275RG HiS-S330|335|340|345|350TI
Jinko Solar	Eagle 60|72 Eagle Black 60|72 Eagle MX JK07A|JK07B Eagle PERC JKM265PP-60 JKM270P-60-V JKM275P-60 JKM275PP-60-V JKM320P-72-V JKM330P-72 JKM330PP-72-V JKM390/395/400/405/410M-72HL-V
Kyocera	KD260|265GX-LFB2 KU260|265|270-6MCA KU260-6MCA KU315|320-7ZPA
LG	LGxxxN1C-A5 LGxxxN1C-G4 LGxxxN1K-G4 LGxxxN1W-G4 LGxxxN2C-B3 LGxxxN2W-A5 LGxxxN2W-B3 LGxxxS1C-A5 LGxxxS1C-G4 LGxxxS1W-G4 LGxxxS2W-A5

APPROVED MODULE LIST

LG (continued)	LG390N2T-A5 LGxxxQ1C-V5 LGxxxQ1K-V5 LGxxxA1C-V5 LGxxxN2T-J5 LGxxxN1C-V5 LGxxxN1K-V5
Longi	LR4-72HBD 415-435M LR4-72HBH 420-440M LR4-60HPB LR6-60PE300-320M LR6-60HPH300-320M LR6-72BP355-375M LR6-72HPH370-390M LR6-72PH350-370M LR6-72PH360-380M
Phono Solar	PS270P-20/U PS275P-20/U PS280P-20/U PS270PH-20/U PS275PH-20/U PS280PH-20/U PS305M-20/UH PS310M-20/UH PS315M-20/UH PS320M-20/UH PS305MH-20/UH PS310MH-20/UH PS315MH-20/UH PS320MH-20/UH
REC Solar	PEAK Energy Series REC245|250|255|260|265|270PE PEAK Energy BLK2 Series REC245|250|255|260PE BLK2 TWINPEAK SERIES REC265|270|275|280|285TP PEAK Energy 72 Series REC300|295 - 315PE TWINPEAK REC330|335|340TP72 TWINPEAK 2 BLK2 SERIES RECxxxTP2 BLK2 TWINPEAK 2 SERIES TWINPEAK 2S 72 Series RECxxxTP2S 72
Risen	RSM60-6-270M-290M/5BB
SolarWorld	Sunmodule Plus SW 275-290 MONO BLACK Sunmodule Plus SW 280-290 MONO BLACK (5-busbar) Sunmodule Plus SW 280-295 MONO Sunmodule Plus SW 285-300 MONO (5-busbar) Sunmodule Pro-Series SW 260 POLY WOB Sunmodule Protect SW 275-280 MONO BLACK Sunmodule SW 100 POLY RGP Sunmodule SW 150 MONO R6A Sunmodule SW 150 POLY R6A Sunmodule SW 320-325|340-350 XL MONO Sunmodule SW 80 MONO RHA

APPROVED MODULE LIST

Talesun	FEATHER 2.0 TP660P Hipro M295+ TP660M Hipro M350+ TP672M PID ZERO TP672M TD660M TD660P TP660|672M TP660|672P TP660|672P(H)
Trina	TSM-xxx PA05.08 TSM-DE14A TSM-DD14A TSM-PD05 TSM-PD05.05 TSM-PD05.08 TSM-xxx DD05A.05(II) TSM-xxx PD05.08 TSM-xxx PD05.10 TSM-PD14 TSM-PE14 TSM-PEG14 TSM-PEG40.07 TSM-PEG5 TSM-PEG5.07
WattPower	Glacier Series G3 WP-xxxM/G3-60H-V (325|330|335|340PC)
Yingli Green Energy	YL260P|255P|250P|245P|240P-29b YL275P|270P|265P|260P|255P|250P-29b YL290D|285D|280D|275D|270D-30b YL300C|295C|290C|285C|280C|275C-30b YL325P|320P|315P|310P|305P|300P-35b YL340D|335D|330D|325D|320D|315D-36b

For competent and comprehensive advice in planning your system, and for questions about logistics and order processing, our employees are gladly available to you.

For more information, please visit our website:
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