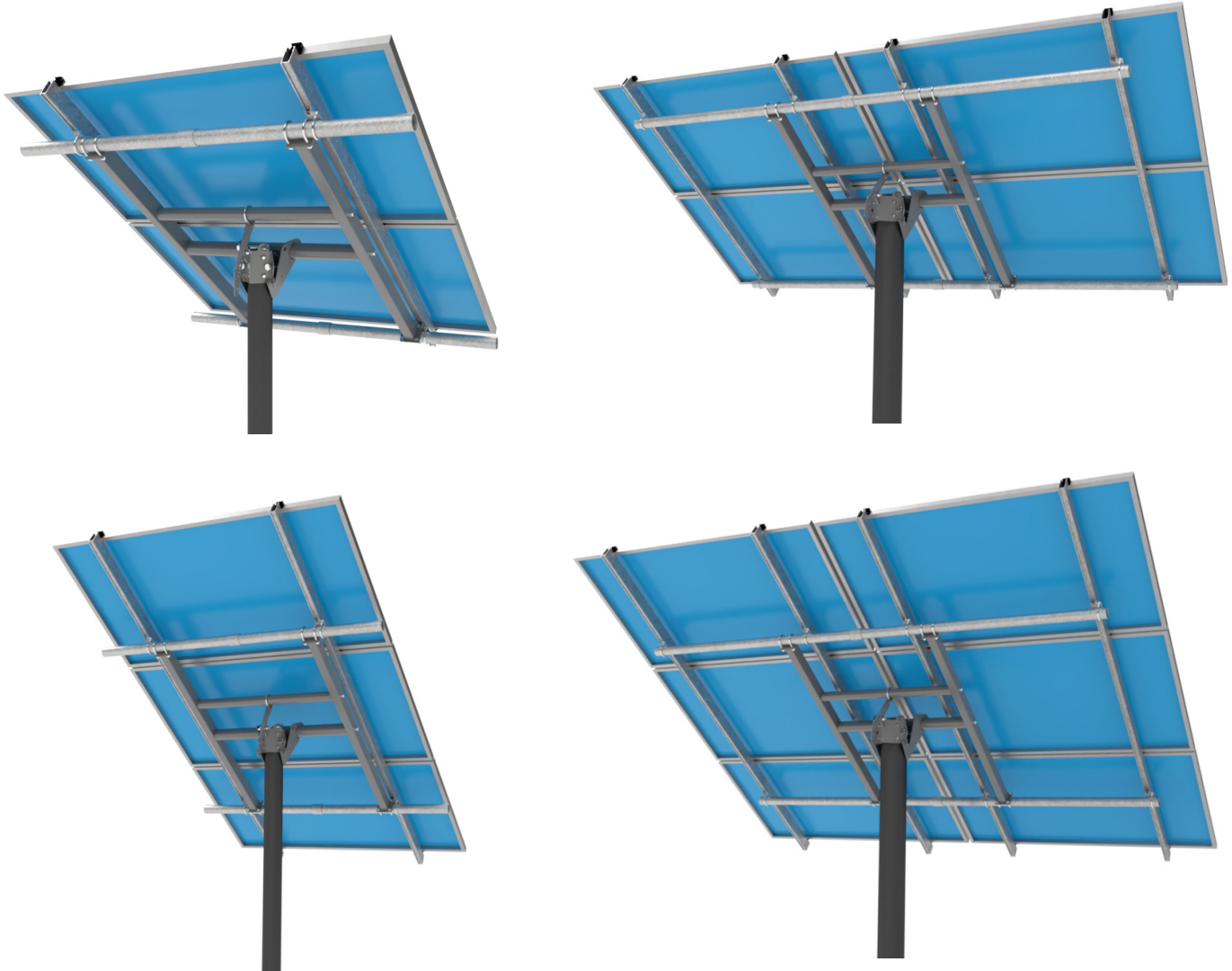


# Installation Manual

TTP-A-2 / TTP-A-2-93  
TTP-A-3  
TTP-A-4 / TTP-A-4-93  
TTP-A-4HW / TTP-A-4HW-93  
TTP-A-6  
TTP-A-6HW



Note: 2-inch horizontal steel pipes shown in the pictures above are not included. Purchase locally or from us.

**TTP-A-2, TTP-A-2-93**  
**TTP-A-3**  
**TTP-A-4, TTP-A-4-93**  
**TTP-A-4HW, TTP-A-4HW-93**  
**TTP-A-6**  
**TTP-A-6HW**

**2 Module Top of Pole Mount**  
**3 Module Top of Pole Mount**  
**4 Module Top of Pole Mount**  
**4 Module Top of Pole Mount, High Wind**  
**6 Module Top of Pole Mount**  
**6 Module Top of Pole Mount, High Wind**

Scan the QR Code below to see an animated video of the assembly of this mount.



Or go to: <https://instructions.online/?id=1424-cb%20no%20hoist>

Use these torque settings when assembling your TTP-A mount.  
If you are using anti-seize compound on bolts, reduce torque by 15%.

TTP-A Torque Settings			
Bolt Description	Bolt Size	Socket Size	Foot-Lbs
Cap Bolts	3/4-inch	1-1/8 inch	100
Cap Set Screws	1/2-inch	1/2-inch 8pt	30
U-Bolt on Adjuster	3/8-inch	9/16-inch	12
Hex Bolt on Adjuster	1/2-inch	3/4-inch	40
H-Frame Bolts	1/2-inch	3/4-inch	30
U-Bolts Pipe to H-Frame	3/8-inch	9/16-inch	15
U-Bolts on Pipe Mounts	5/16-inch	1/2-inch	6
Rail Splice Bolts	5/16-inch	1/2-inch	12
Pipe Mounts on rails	5/16-inch	1/2-inch	12
5050 Clamps placed as Mid Clamps	5/16-inch	1/2-inch	12
5050 Clamps placed as End Clamps	5/16-inch	1/2-inch	9

Technical Support: 707-234-8107 or 800-819-7236 Ext 556

## Disclaimer

This manual describes proper installation procedures and provides necessary standards required for product reliability. Warranty details are available on our website. [www.tamaracksolar.com](http://www.tamaracksolar.com)

All installers must thoroughly read this manual and have a clear understanding of the installation procedures prior to installation. Failure to follow these guidelines may result in property damage, bodily injury or even death.

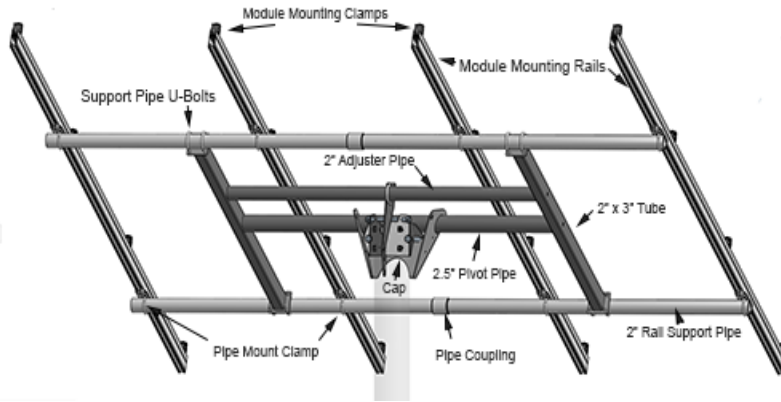
Some or all structural parts of this mount are made with painted steel which will show signs of rust in areas that get scratched during assembly. It is good practice to repaint scratched parts after assembly.

## Installer Responsibilities

- Follow all applicable local or national building and fire codes, including any that may supersede this manual.
- Electrical installation should be conducted by a licensed and bonded electrician or solar contractor.
- Module maintenance or removal must not break the bonding path of the system.
- Ensure all products used are appropriate for the installation and array under the site's loading conditions.
- Use only Tamarack parts or parts approved by Tamarack; substituting parts may void any applicable warranty.
- Comply with all applicable fire codes including, but not limited to, keeping walkways clear.
- Ensure bare copper grounding wire does not contact aluminum and zinc-plated steel components, to prevent risk of galvanic corrosion.
- If loose components or loose fasteners are found during periodic inspection, retighten immediately. If corrosion is found, replace affected components immediately.
- Provide an appropriate method of direct-to-earth grounding according to the latest edition of the National Electrical Code, including NEC 250: Grounding and Bonding, NEC 690: Solar Photovoltaic Systems, and CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1
- Disconnect AC power before servicing or removing microinverters and power optimizers.
- Review module manufacturer's documentation to ensure compatibility and compliance with warranty terms and conditions.
- Maximum Series Fuse Rating is 20 Amps.

## Tools Required

- 1 1/8-inch Socket
- 1-1/8-inch Wrench
- 3/4-inch Socket
- 9/16-inch Socket
- 1/2-inch Socket
- Ratchet to fit Sockets
- Crescent Wrench
- Torque Wrenches (settings range from 6 to 100 foot-pounds. This may require multiple wrenches)
- Tape Measure
- Angle Finder
- Compass
- Ladder

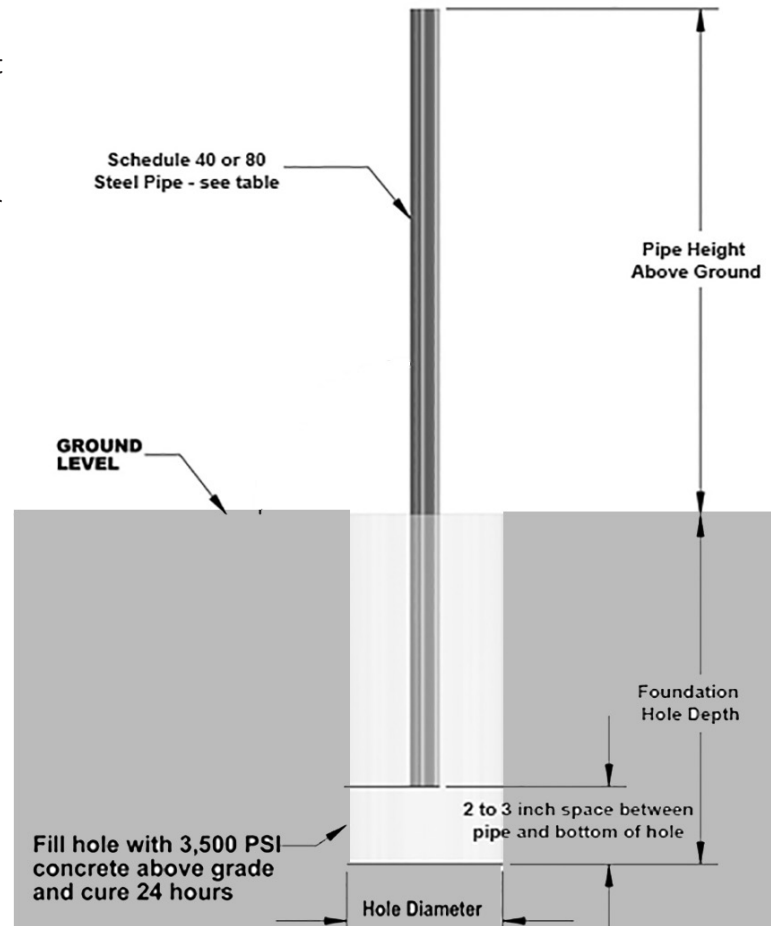


TTP-A Series Pole Mount - COMPONENTS

			Mount Model>>>					
Category & Item #	Part #	Part Description	TTP-A-2	TTP-A-3	TTP-A-4	TTP-A-4HW	TTP-A-6	TTP-A-6HW
4-inch Cap Assembly #CB-POLECAP-4	N/A	Vertical Mounting Pole Top Cover	1	1				
	N/A	Front Half of Pole Cap with 2.5-inch Holes	1	1				
	N/A	Rear Half of Pole Cap with Backplate	1	1				
	N/A	Tilt Adjuster Arm	1	1				
4-inch Cap Hardware #29-TP04-CAP	23-7510-600	Bolt, 3/4"-10 x 6" Grade 5 Zinc, Hex	1	1				
	24-7510-450	Flange Nut, 3/4"-10 Zinc Finish, Case Hardened Serrated	3	3				
	23-7510-700	Bolt, 3/4"-10 x 7" Grade 5 Zinc, Hex	2	2				
	23-5013-150	Set Screw - 1/2"-13 x 1.5" Cup Point, Plain, Square Head	6	6				
	23-5013-155	Bolt, 1/2"-13 x 1.5" Grade 5 Zinc, Hex	1	1				
	25-5013-000	Washer, Flat 1/2" x 1.375 OD Low Carbon Zinc Finish Steel	2	2				
	24-5013-155	Flange Nut, 1/2"-13 Zinc Finish Case Hardened Serrated	1	1				
	23-38UZ-02P	U-Bolt 3/8" for 2" Pipe, Zinc Plated with nuts	1	1				
6-inch Cap Assembly #CB-POLECAP-6	N/A	Vertical Pole Top Cover			1	1	1	1
	N/A	Front Half of Pole Cap with 2.5-inch Holes			1	1	1	1
	N/A	Rear Half of Pole Cap with Backplate			1	1	1	1
	N/A	Tilt Adjuster Arm			1	1	1	1
6-inch Cap Hardware #29-TP06-CAP	23-7510-800	Bolt, 3/4"-10 x 8" Grade 5 Zinc, Hex			1	1	1	1
	24-7510-450	Flange Nut, 3/4"-10 Zinc Finish, Case Hardened Serrated			3	3	3	3
	23-7510-900	Bolt, 3/4"-10 x 9" Grade 5 Zinc, Hex			2	2	2	2
	23-5013-150	Set Screw - 1/2"-13 x 1.5" Cup Point, Plain, Square Head			6	6	6	6
	23-5013-155	Bolt, 1/2"-13 x 1.5" Grade 5 Zinc, Hex			1	1	1	1
	25-5013-000	Washer, Flat 1/2" x 1.375 OD Low Carbon Zinc Finish Steel			2	2	2	2
	24-5013-155	Flange Nut, 1/2"-13 Zinc Finish Case Hardened Serrated			1	1	1	1
	23-38UZ-02P	U-Bolt 3/8" for 2" Pipe, Zinc Plated with nuts			1	1	1	1
H-Frame Assembly #CB-FRAME	N/A	Pivot Pipe 2.5-inch Sch 40	1	1	1		1	
	N/A	Pivot Pipe 2.5-inch Sch 80				1		1
	N/A	Rectangular Tube 3x2 x 0.12 wall	2	2	2		2	
	N/A	Rectangular Tube 3x2 x 0.188 wall				2		2
	N/A	Adjuster Pipe 2-inch Sch 40	1	1	1		1	
	N/A	Adjuster Pipe 2-inch Sch 80				1		1
H-Frame Hardware #29-TP46-HFR	23-5013-300	Bolt, 1/2"-13 x 3" Grade 5 Zinc, Hex	4	4	4	4	4	4
	25-5013-000	Washer, Flat 1/2" x 1.375 OD Low Carbon Zinc Finish Steel	4	4	4	4	4	4
	23-38UZ-02P	U-Bolt 3/8" for 2" Pipe, Zinc Plated with nuts	8	8	8	8	8	8
Module Mounting Rails #CB-RAIL-KIT	90545	3.1 Rail 93-inch (TTP-A-2-93, TTP-A-4-93, TTP-A-4HW-93)	2		4	4		
	89495	3.1 Rail 85-inch (TTP-A-2, TTP-A-4, TTP-A-4HW)	2		4	4		
	90453	3.1 Rail 66-inch		4			8	8
	89556-B	3.1 Rail Splice w/ 2 bolts and ch nuts		2			4	4
	88450	5050 Module Mounting Clamp	6	8	12	12	16	16
	88955	Pipe Mount with U-Bolt	4	4	8	8	8	8
	89846	3.1 Rail End Cap	4	4	8	8	8	8
	88504	Ground Lug	1	1	2	2	2	2
	88474	Module Lead Clip	6	8	12	12	16	16

## Foundation Hole and Pole Guidelines

- The suggestions below are recommendations only. It is the installer's responsibility to validate foundation parameters prior to installation; a local geotechnical report may be required to assess soil conditions. We recommend consulting with a local engineer familiar with local regulations and build site requirements, including soil conditions, terrain, and load criteria (wind, snow, seismic). All of these parameters may impact foundation requirements.
- If array angle will be seasonally adjusted, use the foundation and pole pipe sizing guidelines for the planned steepest angle. This insures the pole and foundation are strong enough to support the array, as well as maintaining the desired minimum ground clearance, at all projected angles.
- Highlighted lines in the tables on the next 2 pages require **schedule 80** pipe for the main support pipe.
- Dig hole according to recommended depth and diameter. Remove or properly compact any loose material at the bottom of the hole.
- The pole length listed in the following tables are based on having the pole installed 2-3 inches from the bottom of the dug holes. Use a brick, concrete block, tiles, or other non-organic solid material at the bottom of the hole to support the pole, raising it above the bottom of the hole and allowing concrete to fully encapsulate the pipe pole. If using a thicker material, be sure to allow for the added thickness when calculating the above-ground and total pole lengths.
- Set pole in hole and use a level to insure that it is straight and plumb in all directions.
- Brace pole to prevent movement while pouring concrete. Pour so concrete is in direct contact with the soil. If forming or using sonotube, properly compact backfill. Allow concrete to cure for recommended length of time.



## Soil Classifications

- If in doubt about the soil type and holding strength, consult a local engineer.
- Class 3 - Sandy Gravel and/or Gravel - Lateral Bearing Pressure - 200 lbs/sq ft below natural grade
- Class 4 - Sand; silty sand, clayey sand, silty gravel, and clayey gravel - Lateral Bearing Pressure - 150 lbs/sq ft below natural grade
- Class 5 - Clay, sandy clay, silty clay, silt and sandy silt - Lateral Bearing Pressure - 100 lbs/sq ft below natural grade

TTP-A-2 For Array Ground Clearance of 3 Feet														
Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for <b>Ground Clearance of 3 Feet</b> at Lowest Part of the Array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 4-inch Schedule 40. Highlighted sections in the table below require 4-inch Schedule 80 Pipe.														
Soil Type →			Class 3				Class 4				Class 5			
Foundation Diameter →			24"		36"		24"		36"		24"		36"	
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	4.1	2.5	6.4	2.1	6.0	2.8	6.7	2.4	6.3	3.3	7.2	2.8	6.7
	120		2.9	6.8	2.4	6.3	3.2	7.1	2.7	6.6	3.8	7.7	3.2	7.1
	140		3.2	7.1	2.8	6.7	3.6	7.5	3.1	7.0	4.3	8.2	3.6	7.5
30°	100	4.7	2.9	7.3	2.5	6.9	3.3	7.7	2.8	7.2	3.8	8.2	3.3	7.7
	120		3.4	7.8	2.9	7.3	3.8	8.2	3.2	7.6	4.4	8.8	3.8	8.2
	140		3.8	8.2	3.2	7.6	4.3	8.7	3.6	8.0	5.0	9.4	4.3	8.7
40°	100	5.1	3.3	8.2	2.8	7.7	3.7	8.6	3.2	8.1	4.3	9.2	3.7	8.6
	120		3.8	8.7	3.2	8.1	4.3	9.2	3.6	8.5	5.0	9.9	4.3	9.2
	140		4.3	9.2	3.7	8.6	4.8	9.7	4.1	9.0	5.7	10.6	4.8	9.7
50°	100	5.6	3.6	8.9	3.1	8.4	4.0	9.3	3.4	8.7	4.7	10.0	4.0	9.3
	120		4.1	9.4	3.5	8.8	4.6	9.9	4.0	9.3	5.5	10.8	4.6	9.9
	140		4.7	10.0	4.0	9.3	5.2	10.5	4.5	9.8	6.2	11.5	5.2	10.5
60°	100	5.9	3.8	9.4	3.3	8.9	4.3	9.9	3.7	9.3	5.0	10.6	4.3	9.9
	120		4.4	10.0	3.8	9.4	4.9	10.5	4.2	9.8	5.8	11.4	4.9	10.5
	140		5.0	10.6	4.2	9.8	5.6	11.2	4.7	10.3	6.6	12.2	5.6	11.2

TTP-A-2 For Array Ground Clearance of 6 Feet														
Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for <b>Ground Clearance of 6 Feet</b> at Lowest Part of the Array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 4-inch Schedule 40. Highlighted sections in the table below require 4-inch Schedule 80 Pipe.														
Soil Type →			Class 3				Class 4				Class 5			
Foundation Diameter →			24"		36"		24"		36"		24"		36"	
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	7.1	2.9	9.8	2.5	9.4	3.3	10.2	2.8	9.7	3.8	10.7	3.3	10.2
	120		3.3	10.2	2.9	9.8	3.7	10.6	3.2	10.1	4.4	11.3	3.7	10.6
	140		3.8	10.7	3.2	10.1	4.2	11.1	3.6	10.5	4.9	11.8	4.2	11.1
30°	100	7.7	3.4	10.8	2.9	10.3	3.8	11.2	3.2	10.6	4.4	11.8	3.8	11.2
	120		3.9	11.3	3.3	10.7	4.3	11.7	3.7	11.1	5.1	12.5	4.3	11.7
	140		4.4	11.8	3.8	11.2	4.9	12.3	4.2	11.6	5.7	13.1	4.9	12.3
40°	100	8.1	3.8	11.7	3.3	11.2	4.2	12.1	3.6	11.5	4.9	12.8	4.2	12.1
	120		4.4	12.3	3.7	11.6	4.9	12.8	4.2	12.1	5.7	13.6	4.9	12.8
	140		4.9	12.8	4.2	12.1	5.5	13.4	4.7	12.5	6.4	14.3	5.5	13.4
50°	100	8.6	4.1	12.3	3.5	11.8	4.6	12.9	3.9	12.2	5.3	13.6	4.6	12.9
	120		4.7	13.0	4.0	12.3	5.3	13.6	4.5	12.8	6.1	14.4	5.3	13.6
	140		5.3	13.6	4.5	12.8	5.9	14.2	5.1	13.4	6.9	15.2	5.9	14.2
60°	100	8.9	4.3	12.9	3.7	12.3	4.8	13.4	4.1	12.7	5.6	14.2	4.8	13.4
	120		5.0	13.6	4.3	12.9	5.6	14.2	4.8	13.4	6.5	15.1	5.6	14.2
	140		5.6	14.2	4.8	13.4	6.3	14.9	5.4	14.0	7.3	15.9	6.3	14.9

TTP-A-3 For Array Ground Clearance of 3 Feet														
Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for <b>Ground Clearance of 3 Feet</b> at Lowest Part of the Array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 4-inch Schedule 40. Highlighted sections in the table below require 4-inch Schedule 80 Pipe.														
Soil Type →			Class 3				Class 4				Class 5			
Foundation Diameter →			24"		36"		24"		36"		24"		36"	
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	4.7	3.0	7.5	2.5	7.0	3.3	7.8	2.8	7.3	3.9	8.4	3.3	7.8
	120		3.5	7.9	2.9	7.4	3.8	8.3	3.3	7.8	4.5	9.0	3.8	8.3
	140		4.0	8.4	3.3	7.8	4.3	8.8	3.7	8.2	5.1	9.6	4.3	8.8
30°	100	5.5	3.6	8.9	3.1	8.4	4.0	9.3	3.4	8.7	4.7	10.0	4.0	9.3
	120		4.2	9.5	3.6	8.9	4.6	9.9	3.9	9.2	5.4	10.7	4.6	9.9
	140		4.7	10.0	4.0	9.3	5.2	10.5	4.4	9.7	6.1	11.4	5.2	10.5
40°	100	6.2	4.1	10.1	3.5	9.5	4.5	10.5	3.9	9.9	5.3	11.3	4.5	10.5
	120		4.7	10.7	4.0	10.0	5.3	11.2	4.5	10.5	6.2	12.2	5.2	11.2
	140		5.3	11.3	4.5	10.5	5.9	11.9	5.0	11.0	7.0	13.0	5.9	11.9
50°	100	6.8	4.4	11.0	3.8	10.4	4.9	11.5	4.2	10.8	5.8	12.4	4.9	11.5
	120		5.1	11.7	4.4	11.0	5.7	12.3	4.8	11.4	6.6	13.3	5.6	12.1
	140		5.7	12.3	4.9	11.5	6.4	13.0	5.4	12.0	7.5	14.1	6.2	13.0
60°	100	7.3	4.7	11.8	4.0	11.1	5.2	12.3	4.5	11.6	6.1	13.2	5.2	12.3
	120		5.4	12.4	4.6	11.7	6.0	13.1	5.2	12.3	7.1	14.3	6.0	13.1
	140		6.1	13.0	5.2	12.3	6.8	13.9	5.8	12.9	8.0	15.1	6.8	13.9

TTP-A-3 For Array Ground Clearance of 6 Feet														
Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for <b>Ground Clearance of 4 Feet</b> at Lowest Part of the Array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 4-inch Schedule 40. Highlighted sections in the table below require 4-inch Schedule 80 Pipe.														
Soil Type →			Class 3				Class 4				Class 5			
Foundation Diameter →			24"		36"		24"		36"		24"		36"	
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	7.7	3.4	10.9	3.0	10.5	3.8	11.3	3.3	10.8	4.5	12.0	3.8	11.3
	120		3.9	11.4	3.4	10.9	4.4	11.9	3.8	11.3	5.2	12.7	4.4	11.9
	140		4.4	11.9	3.8	11.3	5.0	12.5	4.3	11.8	5.8	13.3	5.0	12.5
30°	100	8.5	4.1	12.4	3.5	11.8	4.5	12.8	3.9	12.2	5.3	13.6	4.5	12.8
	120		4.7	13.0	4.0	12.3	5.2	13.5	4.5	12.8	6.1	14.4	5.2	13.5
	140		5.3	13.6	4.5	12.8	5.9	14.2	5.0	13.3	6.9	15.2	5.9	14.2
40°	100	9.2	4.5	13.5	3.8	12.8	5.0	14.0	4.3	13.3	5.8	14.8	5.0	14.0
	120		5.2	14.2	4.4	13.4	5.8	14.8	4.9	13.9	6.7	15.7	5.8	14.8
	140		5.8	14.8	5.0	14.0	6.5	15.5	5.5	14.5	7.6	16.6	6.5	15.5
50°	100	9.8	4.9	14.5	4.2	13.8	5.5	15.1	4.7	14.3	6.4	16.0	5.5	15.1
	120		5.7	15.3	4.8	14.4	6.3	15.9	5.4	15.0	7.4	17.0	6.3	15.9
	140		6.4	16.0	5.4	15.0	7.1	16.7	6.1	15.7	8.3	17.9	7.1	16.7
60°	100	10.3	5.2	15.3	4.5	14.6	5.8	15.9	5.0	15.1	6.8	16.9	5.8	15.9
	120		6.0	16.1	5.2	15.3	6.7	16.8	5.7	15.8	7.8	17.9	6.7	16.8
	140		6.7	16.8	5.8	15.9	7.5	17.6	6.4	16.5	8.8	18.9	7.5	17.6



TTP-A-4 and TTP-A-4HW for Array Ground Clearance of 3 Feet

Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for **Ground Clearance of 3 Feet** at Lowest Part of the Array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 6-inch Schedule 40  
(Highlighted sections require 6-inch Schedule 80 Pipe)

Soil Type →		Class 3				Class 4				Class 5				
Foundation Diameter →		24"		36"		24"		36"		24"		36"		
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	4.1	3.3	7.2	2.8	6.7	3.6	7.5	3.1	7.0	4.3	8.2	3.6	7.5
	120		3.8	7.7	3.2	7.1	4.2	8.1	3.6	7.5	5.0	8.9	4.2	8.1
	140		4.3	8.2	3.6	7.5	4.8	8.7	4.1	8.0	5.6	9.5	4.8	8.7
30°	100	4.7	3.8	8.2	3.2	7.6	4.2	8.6	3.6	8.0	5.0	9.4	4.2	8.6
	120		4.4	8.8	3.7	8.1	4.9	9.3	4.2	8.6	5.8	10.2	4.9	9.3
	140		5.0	9.4	4.2	8.6	5.6	10.0	4.7	9.1	6.6	11.0	5.6	10.0
40°	100	5.1	4.3	9.2	3.6	8.5	4.8	9.7	4.1	9.0	5.6	10.5	4.8	9.7
	120		4.9	9.8	4.2	9.1	5.5	10.4	4.7	9.6	6.5	11.4	5.5	10.4
	140		5.6	10.5	4.8	9.7	6.3	11.2	5.3	10.2	7.4	12.3	6.3	11.2
50°	100	5.5	4.7	10.0	4.0	9.3	5.2	10.5	4.4	9.7	6.1	11.4	5.2	10.5
	120		5.4	10.7	4.6	9.9	6.0	11.3	5.1	10.4	7.1	12.4	6.0	11.3
	140		6.1	11.4	5.2	10.5	6.9	12.2	5.8	11.1	8.1	13.4	6.9	12.2
60°	100	5.9	5.0	10.6	4.2	9.8	5.6	11.2	4.7	10.3	6.5	12.1	5.6	11.2
	120		5.7	11.3	4.9	10.5	6.4	12.0	5.5	11.1	7.6	13.2	6.4	12.0
	140		6.5	12.1	5.5	11.1	7.3	12.9	6.2	11.8	8.6	14.2	7.3	12.9

TTP-A-4 and TTP-A-4HW for Array Ground Clearance of 6 Feet

Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for **Ground Clearance of 6 Feet** at Lowest Part of the Array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 6-inch Schedule 40  
(Highlighted sections require 6-inch Schedule 80 Pipe)

Soil Type →		Class 3				Class 4				Class 5				
Foundation Diameter →		24"		36"		24"		36"		24"		36"		
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	7.13	3.80	10.68	3.30	10.18	4.20	11.08	3.60	10.48	4.90	11.78	4.20	11.08
	120		4.40	11.28	3.70	10.58	4.90	11.78	4.20	11.08	5.70	12.58	4.90	11.78
	140		4.90	11.78	4.30	11.08	5.50	12.38	4.70	11.58	6.40	13.28	5.50	12.38
30°	100	7.65	4.40	11.80	3.70	11.10	4.90	12.30	4.20	11.60	5.70	13.10	4.90	12.30
	120		5.00	12.40	4.30	11.70	5.60	13.00	5.80	12.20	6.60	14.00	5.60	13.00
	140		5.70	13.10	4.80	12.20	6.30	13.70	5.40	12.80	7.40	14.80	6.30	13.70
40°	100	8.12	4.90	12.77	4.20	12.07	5.40	13.27	4.70	12.57	6.40	14.27	5.40	13.27
	120		5.60	13.47	4.80	12.67	6.30	14.17	5.40	13.27	7.40	15.27	6.30	14.17
	140		6.30	14.17	5.40	13.27	7.10	14.97	6.00	13.87	8.30	16.17	7.10	14.97
50°	100	8.53	5.30	13.58	4.50	12.78	5.90	14.18	5.00	13.28	6.90	15.18	5.90	14.18
	120		6.10	14.38	5.20	13.48	6.80	15.08	5.80	14.08	8.00	16.28	6.80	15.08
	140		6.80	15.08	5.80	14.08	7.70	15.98	6.50	14.78	9.00	17.28	7.70	15.98
60°	100	8.86	5.60	14.21	4.80	13.41	6.20	14.81	5.30	13.91	7.30	15.91	6.20	14.81
	120		6.40	15.01	5.50	14.11	7.20	15.81	6.10	14.71	8.40	17.01	7.20	15.81
	140		7.20	15.81	6.20	14.81	8.10	16.71	6.90	15.51	9.50	18.11	8.10	16.71



TTP-A-6 and TTP-A-6HW for Array Ground Clearance of 3 Feet

Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for **Ground Clearance of 3 Feet** at lowest part of the array & Exposure Category B For Various Soil Class and Foundation Hole Diameter. Vertical Pipe is 6-inch Schedule 40 (Highlighted sections require 6-inch Schedule 80 Pipe)

Soil Type →			Class 3				Class 4				Class 5			
Foundation Diameter →			24"		36"		24"		36"		24"		36"	
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	4.71	3.9	8.4	3.3	7.8	4.3	8.8	3.7	8.2	5.1	9.6	4.3	8.8
	120		4.5	9.0	3.8	8.3	5.0	9.5	4.2	8.7	5.9	10.4	5.0	9.5
	140		5.0	9.5	4.3	8.8	5.7	10.2	4.8	9.3	6.7	11.2	5.7	10.2
30°	100	5.50	4.6	9.9	4.0	9.3	5.2	10.5	4.4	9.7	6.1	11.4	5.2	10.5
	120		5.4	10.7	4.6	9.9	6.0	11.3	5.1	10.4	7.1	12.4	6.0	11.3
	140		6.1	11.4	5.2	10.5	6.8	12.1	5.8	11.1	8.1	13.4	6.8	12.1
40°	100	6.21	5.3	11.3	4.5	10.5	5.9	11.9	5.0	11.0	6.9	12.9	5.9	11.9
	120		6.2	12.1	5.2	11.2	6.8	12.8	5.8	11.8	8.0	14.0	6.8	12.8
	140		6.9	12.9	5.8	11.8	7.7	13.7	6.6	12.6	9.1	15.1	7.7	13.7
50°	100	6.83	5.7	12.3	4.8	11.4	6.4	13.0	5.4	12.0	7.5	14.1	6.4	13.0
	120		6.6	13.2	5.6	12.2	7.4	14.0	6.3	12.9	8.7	15.3	7.4	14.0
	140		7.4	14.0	6.3	12.9	8.3	14.9	7.1	13.7	9.9	16.5	8.3	14.9
60°	100	7.33	6.1	13.2	5.2	12.3	6.8	13.9	5.8	12.9	8.0	15.1	6.8	13.9
	120		7.0	14.1	6.0	13.1	7.8	14.9	6.7	13.8	9.2	16.3	7.8	14.9
	140		7.9	15.0	6.7	13.8	8.9	16.0	7.5	14.6	10.5	17.6	8.9	16.0

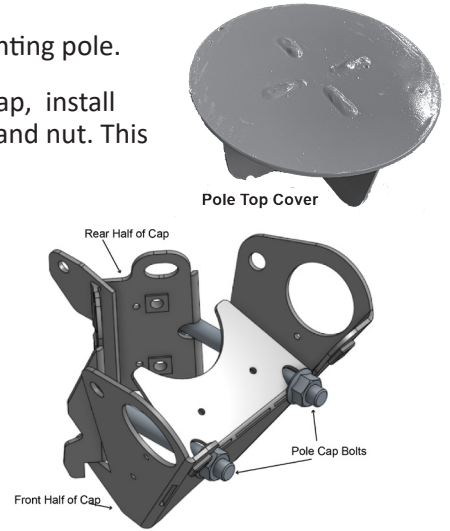
TTP-A-6 and TTP-A-6HW for Array Ground Clearance of 6 Feet

Foundation Hole Depth, Height of Pole Above Ground and Total Pole Length for **Ground Clearance of 6 Feet** at lowest part of the array & Exposure Category B For Various Soil Class and Foundation Hole Diameters. Vertical Pipe is 6-inch Schedule 40 (Highlighted sections require 6-inch Schedule 80 Pipe)

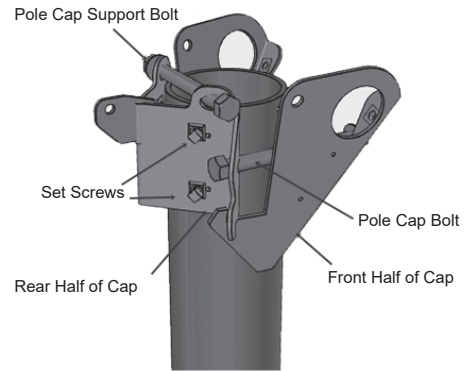
Soil Type →			Class 3				Class 4				Class 5			
Foundation Diameter →			24"		36"		24"		36"		24"		36"	
Array Tilt Angle ↓	Wind Speed (mph) ↓	Pipe Above Ground (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)	Hole Depth (ft)	Total Pipe Length (ft)
20°	100	7.71	4.4	11.9	3.8	11.3	4.9	12.4	4.2	11.7	5.8	13.3	4.9	12.4
	120		5.1	12.6	4.4	11.9	5.7	13.2	4.9	12.4	6.7	14.2	5.7	13.2
	140		5.7	13.2	4.9	12.4	6.4	13.9	5.5	13.0	7.5	15.0	6.4	13.9
30°	100	8.5	5.3	13.6	4.5	12.8	5.9	14.2	5.0	13.3	6.9	15.2	5.9	14.2
	120		6.0	14.3	5.2	13.5	6.8	15.1	5.8	14.1	7.9	16.2	6.8	15.1
	140		6.8	15.1	5.8	14.1	7.6	15.9	6.5	14.8	9.0	17.3	7.6	15.9
40°	100	9.21	5.8	14.8	4.9	13.9	6.4	15.4	5.5	14.5	7.5	16.5	6.4	15.4
	120		6.6	15.6	5.7	14.7	7.4	16.4	6.3	15.3	8.7	17.7	7.4	16.4
	140		7.5	16.5	6.4	15.4	8.4	17.4	7.1	16.1	9.8	18.8	8.4	17.4
50°	100	9.83	6.3	15.9	5.4	15.0	7.1	16.7	6.1	15.7	8.3	17.9	7.1	16.7
	120		7.3	16.9	6.2	15.8	8.2	17.8	7.0	16.6	9.6	19.2	8.2	17.8
	140		8.2	17.8	7.0	16.6	9.2	18.8	7.8	17.4	10.8	20.4	9.2	18.8
60°	100	10.33	6.7	16.8	5.8	15.9	7.5	17.6	6.4	16.5	8.8	18.9	7.5	17.6
	120		7.7	17.8	6.6	16.7	8.7	18.8	7.4	17.5	10.2	20.3	8.7	18.8
	140		8.7	18.8	7.4	17.5	9.8	19.9	8.3	18.4	11.5	21.6	9.8	19.9

### Step One - Pole Cap Assembly

- Place Vertical Mounting Pole Top Cover/Cap on top of 4 or 6 inch vertical mounting pole.
- Put **Pole Cap Support Bolt** through the two top holes in rear half of the Pole Cap, install **Pole Cap Flange Nut** and tighten firmly. It is not necessary to torque this bolt and nut. This bolt keeps the Pole Cap from sliding down the post.
- Put the two **Pole Cap Bolts** into rear half of Pole Cap, then through front (larger) half, put **Pole Cap Flange Nut** *loosely* on the bolt. These large nuts and bolts may be difficult to thread together by hand. Start nuts on bolts by hand and use wrenches as needed. Bottoms of cap will hook together as bolts tighten.
- Slide assembled Pole Cap over 4-inch or 6-inch vertical mounting pole. Front and back of cap assembly should be aligned so the two **Pole Cap Bolts** are approximately horizontal and top edge of the front (larger) part of cap is against the vertical pole. Rotate Pole Cap on post so front (larger) half of Pole Cap is on side of pole that array will be facing.
- Loosely install four of the 1/2-inch **Set Screws** in threaded holes on rear half of Pole Cap. Do not tighten at this time.

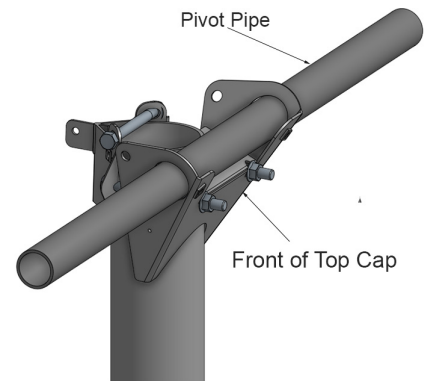


Hardware List for Step One	Vertical Mounting Pole Size	
	4-inch	6-inch
Pole Cap Support Bolt	Bolt, 3/4"-10 x 6"	Bolt, 3/4"-10 x 8"
Pole Cap Bolts	Bolt, 3/4"-10 x 7"	Bolt, 3/4"-10 x 9"
Pole Cap Flange Nut	Flange Nut, 3/4"-10	
Pole Cap Set Screws	Set Screw, 1/2"-13 x 1.5"	



### Step Two - Assemble H-Frame

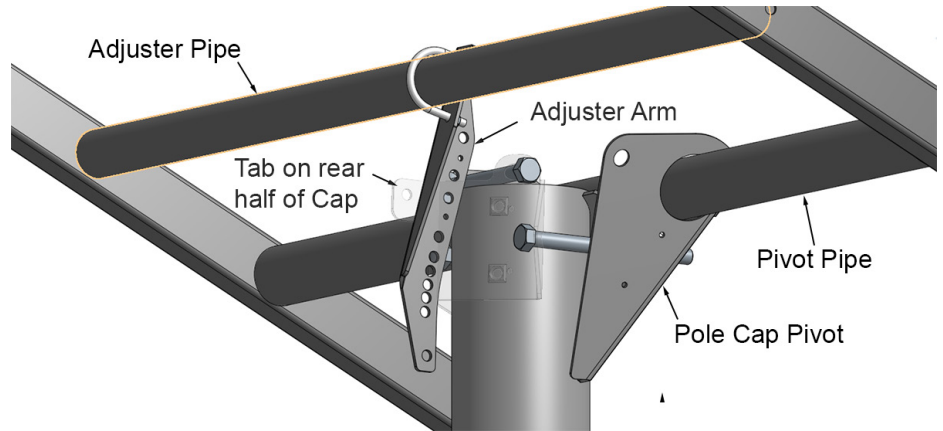
- Slide 2-1/2-inch **Pivot Pipe** through holes on front half of Top Cap and center.
- Securely tighten the **Pole Cap Bolts**, keeping them horizontal. Tighten enough that front of cap will not slide down pole. Do not fully torque to specification until final assembly.
- Place remaining two **Set Screws** - 1/2"-13 x 1.5" in threaded holes in front half of Pole Cap. Do not tighten at this time, tightening will occur in the final assembly.
- Bolt a 2 x 3-inch **Rectangular Tube** to each side of **Pivot Pipe** with one **H-Frame Bolt** and **H-Frame Washer**. Use hole in the center of 2" x 3" **Rectangular Tube** to attach **Pivot Pipe** with one **H-Frame Bolt** and **H-Frame Washer**. Repeat on other side
- Bolt **2-inch Adjuster Pipe** between two 2 x 3-inch **Rectangular Tubes** with one **H-Frame Bolt** and **H-Frame Washer** on each side. H-Frame assembly should look like picture to the right. Tighten the 4 bolts to 45 ft-lbs.



Hardware List for Step Two	Model	
	TTP-A-2 / TTP-A-3 TTP-A-4 / TTP-A-6	TTP-A-4HW TTP-A-6HW
2.5-inch Pivot Pipe	2.5-inch Sch 40	2.5-inch Sch 80
Rectangular Tube	2x3-inch x 0.12 wall	2x3-inch x 0.188 wall
H-Frame Bolts	Bolt, 1/2"-13 x 3"	
H-Frame Washers	Washer, Flat 1/2" x 1.375	
2.0-inch Adjuster Pipe	2.0-inch Sch 40	2.0-inch Sch 80

### Step Three - Assemble Adjuster Arm

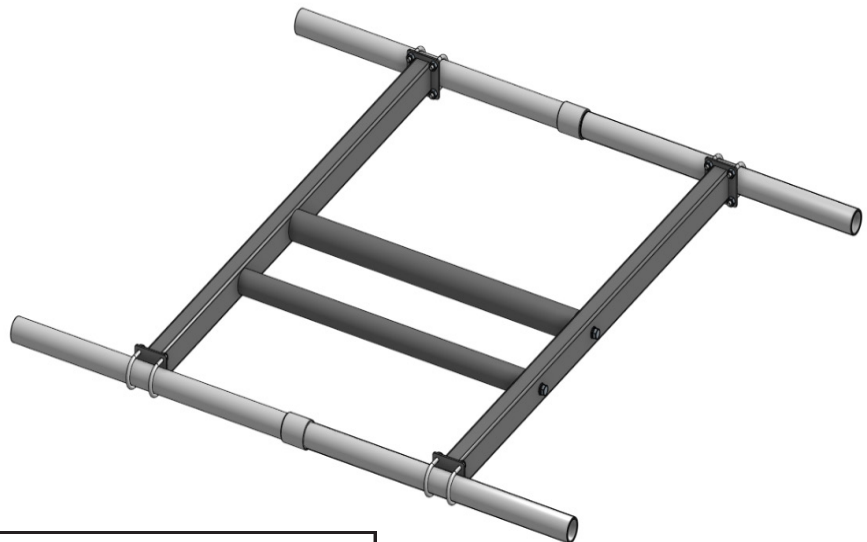
- Attach **Adjuster Arm** to **Adjuster Pipe** with **U-Bolt** and the **two flange nuts**. Hand tighten, for now.
- Using **Adjuster Arm** move H-Frame assembly to approximately horizontal position. Set this position by placing an **Adjuster Arm Washer** on the **Adjuster Arm Bolt** and insert thru hole in **Adjuster Arm** then thru hole in tab on rear of Pole Cap. Place second **Adjuster Arm Washer** on the **Adjuster Arm Bolt** and then place the **Adjuster Arm Nut** on the bolt and finger-tighten. Final array angle will be readjusted in a future step.



Hardware List for Step Three	Model	
	TTP-A-2 / TTP-A-3 TTP-A-4 / TTP-A-6	TTP-A-4HW TTP-A-6HW
Adjuster Arm U-Bolt with nuts	3/8" for 2" Pipe w/ two flange nuts	
Rectangular Tube	2x3-inch x 0.12 wall	2x3-inch x 0.188 wall
Adjuster Arm Bolt	Bolt, 1/2"-13 x 1.5"	
Adjuster Arm Washers	Washer, Flat 1/2" x 1.375	
Adjuster Arm Nut	Flange Nut 1/2"-13	

### Step Four - Rail Support Pipes

- 4-module and 6-module mounts will require either two 10-foot 2-inch pipes, if module length is less than 78-inches, or two 12-foot pipes, if modules are longer than 78-inches. Use schedule 40 pipe for TTP-A-4 and TTP-A-6 mounts. Use schedule 80 pipe for TTP-A-6HW or TTP-A-4HW mounts.
- 2-module and 3-module mounts (TTP-A-2 and TTP-A-3) require two 4-foot, 2-inch, schedule 40 pipes.
- If using one of our 10-foot or 12-foot **Pipe Kits**, pipe ships in two sections. Connect two of the 2-inch, Schedule 40 or 80 x 5-foot long or 6-foot long **Rail Support Pipes** together using a **2-inch pipe coupling**, tighten with two pipe wrenches. Repeat with remaining two 2-inch, Schedule 40 or 80 x 5-foot long **Rail Support Pipes** and **coupling**. Pipe, when purchased locally, can be purchased in required length to eliminate need for couplings.
- Attach assembled **Rail Support Pipes** to flat ends of H-Frame assembly, using two **U-Bolts with nuts** at the end of each 2 x 3-inch **Rectangular Tube**. Center pipes on assembly.
- Tighten nuts on U-bolts to 15 ft-lbs.



Hardware List for Step Four	All Models
Rail Support U-Bolts with nuts	3/8" for 2" Pipe w/ two flange nuts

### Step Five - Module Mounting Rail Assembly

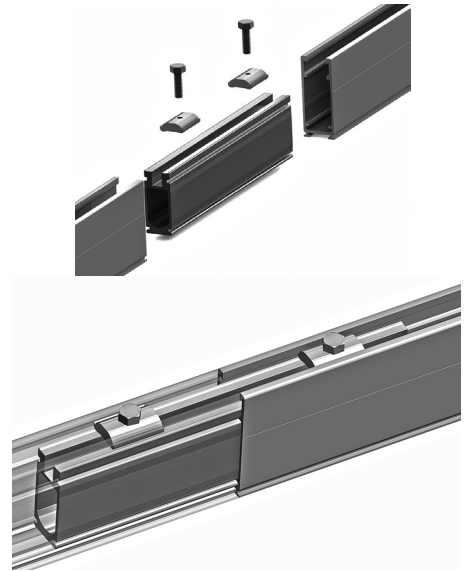
- Two and four module mounts: use either 85-inch or 93-inch Module Mounting 3.1 Rails provided, depending on model. **Go to Step 6.**
- Three and six module mounts: ship with 132-inch rails made of two 66-inch Module Mounting 3.1 Rails.

1) Splice two **66-inch Module Mounting 3.1 Rails** together using provided **Rail Splice**, **Channel Nuts** and two **Channel Nut Bolts**. Slip **Rail Splice** 5-inches into end of one rail section, place a **Channel Nut** and **Channel Nut Bolt** approximately 2.5-inches from the rail end and tighten.

2) Slide second section of rail over **splice**, butting two rail ends together, and repeat Channel Nut installation process.

3) Repeat steps #1 and #2 with the other **66-inch Module Mounting Rails** and **Rail Splices**.

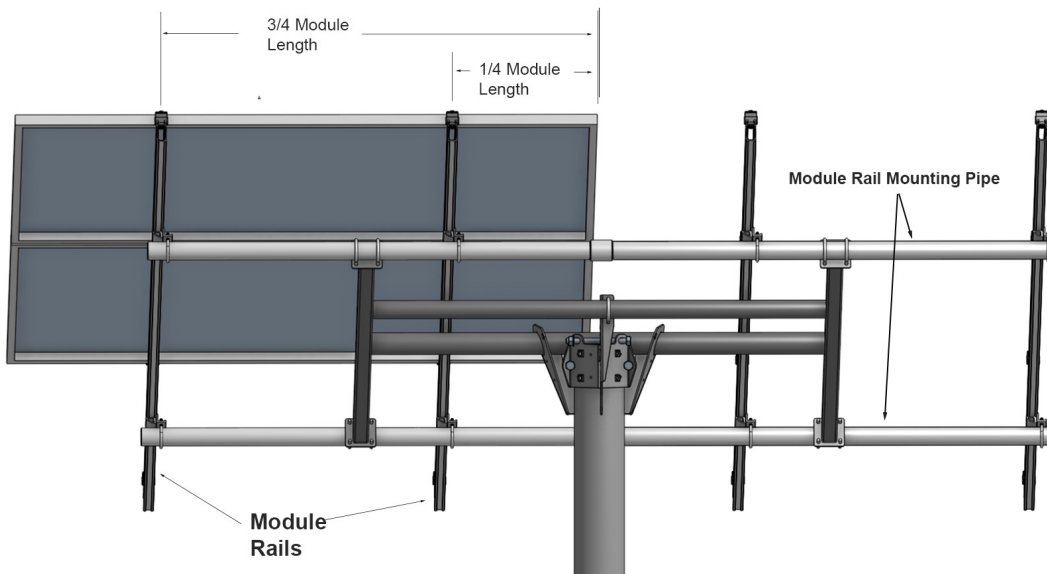
4) Tighten all **Channel Nut Bolts** in the completed 132-inch assemblies to 12 ft-lbs.



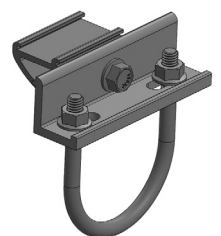
Hardware List for Step Five	Model	
	TTP-A-2 / TTP-A-4 TTP-A-4HW	TTP-A-3 / TTP-A-6 & TTP-A-6HW
Module Mounting Rails	85- or 93-inch x 3.1-inch	66-inch x 3.1-inch
Rail Splices	N/A	3.1-inch
Channel Nut	N/A	5/16-inch
Channel Nut Bolts	N/A	5/16 x 1.125-inch

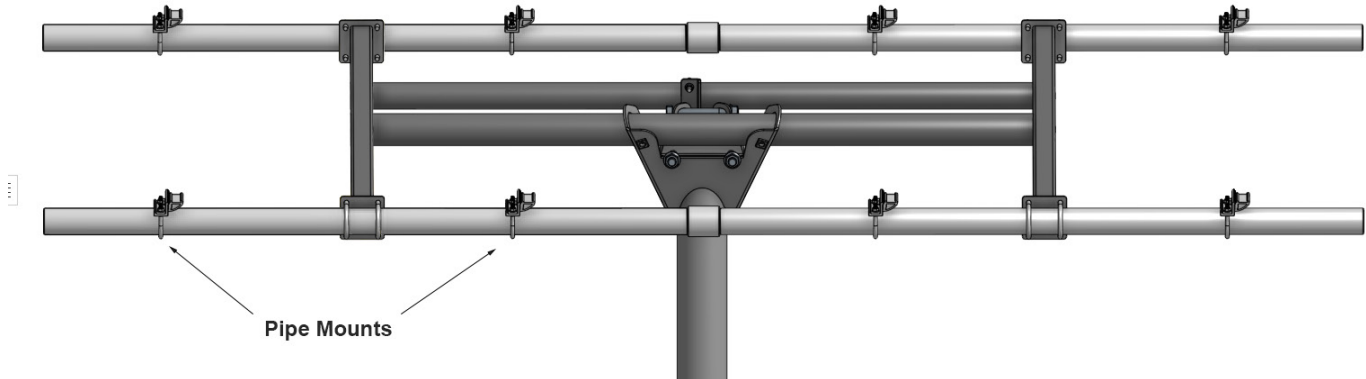
### Step Six - Attach Module Mounting Rails

- **Module Mounting 3.1 Rails** location on **Rail Support Pipes** should be approximately lined up with PV module frame mounting holes, or at a position 1/4 of the length of PV module from each end of the module.

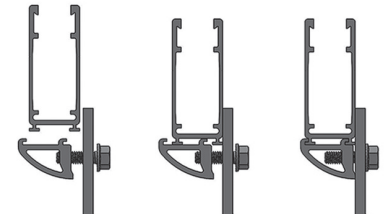


- Locate Rail positions on **Rail Support Pipes** and place one **Pipe Mount with U-Bolt** on pipe in each location. Two and three module mounts have two **Module Mounting 3.1 Rails** and four **Pipe Mounts with U-Bolt**. Four and six module mounts have four **Module Mounting 3.1 Rails** and eight **Pipe Mounts with U-Bolt**.



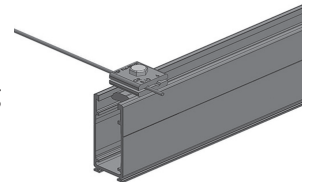


- Place one **Module Mounting 3.1 Rail** on two of the **Pipe Mounts with U-Bolt** installed on the **Rail Support Pipes**. Center rail in north/south direction so it extends past both **Support Pipes** the same distance. Make sure **Pipe Mount with U-Bolt** slips into both the mounting features on the bottom of the rails (see drawing at right). Tighten the 5/16-inch bolts on **Pipe Mount with U-Bolt** with a 1/2-inch socket to 12 ft-lbs.
- Repeat with remaining **Module Mounting Rails**.



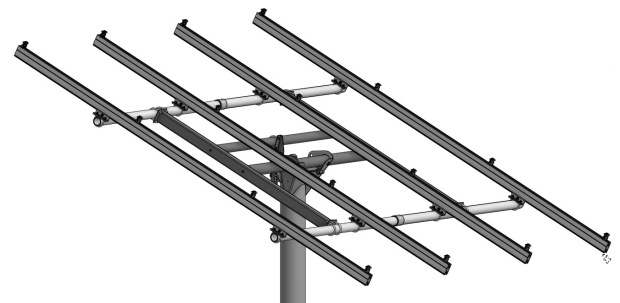
### Step Seven - System Grounding

- **Module Mounting 3.1 Rails** and the PV module frames are electrically bonded together by **5050 Module Mounting Clamps**. This creates a single electrically bonded unit for grounding purposes per UL 2703 requirements. One **Ground Lug** is required to provide equipment grounding for each column of PV modules.
- A **Ground Lug** can be attached at any location desired on one of the **Module Mounting 3.1 Rails**.
- Connect both ground lugs to the ground wire in the system according to local code.



### Step Eight - Mount PV Modules on Rails

- Before mounting the PV modules to the pole mount, map out desired location of the wiring junction boxes and module output cables.
- To center modules on rails, calculate the amount of excess **Module Mounting Rail** length you will have based on width of PV modules being used.



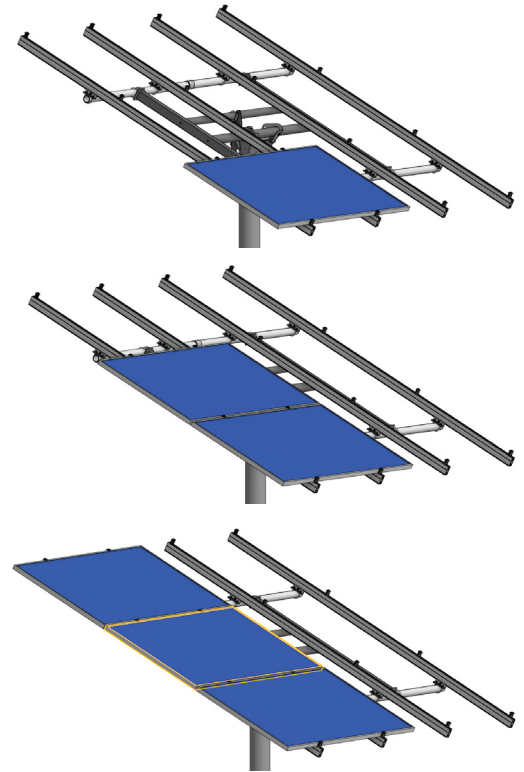
1) Add together widths of modules in a column plus 1/2-inch for each space between modules in the column.

2) For TTP-A-4 and TTP-A-4HW: subtract above calculated number from 85.  
 For TTP-A-4-93 and TTP-A-4HW-93: subtract above calculated number from 93.  
 For TTP-A-6 and TTP-A-6HW: subtract above calculated number from 132.

3) The above calculation provides Module Mounting 3.1 Rails excess length, in inches, based on width of the particular PV modules being mounted.



- Start module installation at bottom of first column. Measure up the rail by 1/2 the distance calculated in #2 above. Place one **5050 Module Mounting Clamp** on each **Module Mounting 3.1 Rails** at this distance. Ensure side of **5050 Module Mounting Clamp** with two bonding pins faces module frame.
- Center first module east-to-west over rails and hold in place. To allow for at least 1/2-inch of space between the two columns of modules, make sure inside edge of module's frame is at least 1/4" outward from the center of the **Rail Support Pipes**. You can use **2-inch pipe couplings** in assembled **Rail Support Pipes** to determine the center. Make sure Module is straight and level on rails and tighten both **5050 Module Mounting Clamps** to 108 inch-pounds (9 foot-pounds).
- Install one **5050 Module Mounting Clamp** in each rail on other side of first module, slide it down so inside of clamp contacts frame of first module. Springs will hold the **5050 Module Mounting Clamps** in place prior to tightening. Place second module on rails, align with the first module, and slide down fully into the two **5050 Module Mounting Clamps**. Tighten clamp bolts to 144 inch-pounds (12 foot-pounds) to fully secure module.
- Install third module in the column on TTP-A-6 or TTP-A-6HW following previous steps.
- On top edge of last module of first column, install two **5050 Module Mounting Clamps** ensuring sides with two stainless-steel pins are facing in toward module frame, and clamp is tight up against the module frame. Tighten two **5050 Module Mounting Clamp bolts** to 108 inch-pounds (9 foot-pounds).
- Install next column of modules in same manner. Leave at least 1/2-inch of spacing between columns.
- Do final check to be sure all bolts and installation hardware on the array are properly tightened to the specified torque values.



## Final Assembly

- To set array tilt, remove previously installed **1/2 x 1.5"-inch bolt, nut and washers** from **Adjuster Arm**. Tilt array to desired angle, line up hole in **Adjuster Arm** that is closest to correct angle with hole in the tab on the Pole Cap assembly. Place one **washer** on **1/2 x 1.5" bolt** and insert through the hole in the **Adjuster Arm** and then through the hole in the tab on the rear of the Pole Cap. Place second **washer** on the **bolt** and replace the **flange nut**. Tighten to 40 foot-pounds.
- Tighten **U-bolt** on the **Adjuster Arm** to 12 ft-lbs.
- Rotate entire array around pole to point in desired direction. Tighten 3/4-inch nuts on the Pole Cap to 100 ft-lbs.
- Tighten all six **1/2-inch Set Screws** on Pole Cap to 30 ft-lbs with a 1/2-inch socket.

**Technical Support: 707-234-8107 or 800-819-7236 Ext 556**

Certified Module List for UL2703 Listing Program

Manufacturer	Model
Aleo	P18/P19/S18/S19/S59/S79.
AU Optronics	PM Series
Astronergy	modules with 30, 35, 40, and 45 mm frames aaSMbbyyC/zz-xxx Where "aa" can be CH or A; "bb" can be 60, 66, or 72; "yy" can be blank, 10 or 12; "C" can M, P, M(BL), M-HC, M(BL)-HC, P-HC, M(DG), or M(DGT); and "zz" can be blank, HV, F-B, or F-BH
Auxin	modules with 40 mm frames AXN6y6zAxxx Where "y" can be M or P; "z" can be 08, 09, 10, 11, or 12; and "A" can be F or T
Axitec	Modules with 35 and 40 mm frames AC-xxxY/aaZZb Where "Y" can be M, P or MH; "aa" can be blank, 125- or 156-; "ZZ" can be 54, 60, 72, 120, or 144; "b" can be S
Boviet	Boviet modules with 35 and 40mm frames - BVMZZaaYY-xxxBcc Where "ZZ" can be 66 or 76; "aa" can be 9, 10 or 12; "YY" is M or P; and "B" can be blank, L or S; and "cc" can be blank, H, H-BF, H-BF-DG, H-HC, H-HC-BF, H-HC-BF-DG, HC-BF or HC-BF-DG]
BYD	BYD modules with 35 mm frames BYDxxxAY-ZZ Where "A" can be M6, P6, MH or PH; "Y" can be C or K; and "ZZ" can be 30 or 36
Canadian Solar	Canadian Solar modules with 30, 32, 35, and 40 mm frames - CSbY-xxxZ Where "b" can be 1, 3 or 6; "Y" can be H, K, L, N, P, U, V, W, X or Y; and "Z" can be M, P, MS, PX, M-SD, P-AG, P-SD, MB-AG, PB-AG, MS-AG, or MS-SD
CentrosoSolar	C and E series.
CertainTeed	CertainTeed modules with 35 and 40 frames CTxxxYZZ-AA Where "Y" can be M, P, or HC; "ZZ" can be 00,01, 10, or 11; and "AA" can be 01, 02, 03, or 04
CSUN	Csun modules with 35 and 40 mm frames - YYxxx-zzAbb Where "YY" is CSUN or SST; "zz" is blank, 60, or 72; and "A" is blank, P, M or MM; "bb" is blank, BB, 5BB, BW, or ROOF
Dehui	Dehui modules with 30, 35 and 40mm frames - DH-MYYYY-xxx Where "YYY" can be 760, 772, 860, 872; and "Z" can be B, F or W
Eco Solargy	ORION 1000 ECOXXH156P-60, APOLLO 1000 ECOXXT156M-60, and APOLLO 1000 ECOXXA156M-60.
ET Solar	30, 35, 40, and 50 mm frames ET-Y6ZZxxxAA Where "Y" can be P, L, or M; "ZZ" can be 60, 72 or 72BH; and "AA" can be GL, WB, WW, BB, WBG, WWG, WBAC, WBCO, WWCO, WWBCO or BBAC
GCL	40mm frame: GCL-P6/72, 35mm frame: GCL-P6/72, GCL-P6/72H, GCL-M6/72, GCL-M6/72H, 35mm frame (Black frame): GCL-P6/60, GCL-M6/60
GigaWatt Solar:	Gigawatt modules with 40 mm frames - GWxxxYY Where "YY" can be either PB or MB
Hanwha Q-Cells	Modules with 32, 35, 40, and 42mm frames aaYY-ZZ-xxx where "aa" can be Q. or B.; "YY" can be PLUS, PRO, PEAK, LINE PRO, LINE PLUS, PLUS DUO or PEAK DUO; and "ZZ" can be G3, G3.1, G4, G4.1, L-G2, L-G2.3, L-G3, L-G3.1, L-G3y, L-G4, L-G4.2, L-G4y, LG4.2/TAA, BFR-G3, BLK-G3, BFR-G3.1, BLK-G3.1, BFR-G4, BFR-G4.1, BFR G4.3, BLK-G4.1, G4/SC, G4.1/SC, G4.1/TAA, G4.1/MAX, BFR G4.1/TAA, BFR G4.1/MAX, BLK G4.1/TAA, BLK G4.1/SC, EC-G4.4, G5, G5/SC, G5/TS, BLK-G5, BLK-G5/SC, BLK-G5/TS, L-G5, L-G5.1, L-G5.2, L-G5.2/H, L-G5.3, G6, G6/SC, G6/TS, G6+/TS, G6+, BLK-G6, L-G6, L-G6.1, L-G6.2, L-G6.3, G7, BLK-G6+, BLK-G6+/AC, BLK-G6+/HL, BLK-G6+/SC, BLK-G6/TS, BLK-G6+/TS, BLK-G7, G7.2, G8, BLK-G8, G8+, BLK-G8+ L-G7, L-G7.1, L-G7.2, L-G7.3, L-G8, L-G8.1, L-G8.2, L-G8.3, L-G8.3/BFF, L-G8.3/BFG, L-G8.3/BGT, ML-G9, BLK ML-G9, ML-G9+, BLK ML-G9+, ML-G10, BLK ML-G10, ML-G10+, BLK ML-G10+, ML-G10.a, BLK ML-G10.a, ML-G10.a+, BLK ML-G10.a+, XL-G9, XL-G9.2, XL-G9.3, XL-G9.3/BFG, XL-G10.2, XL-G10.3, XL-G10.c, XL-G10.d, XL-G10.d/BFG or XL-G10.3/BFG
Hansol	Hansol modules with 35 and 40 frames HSxxxYY-zz Where "YY" can be PB, PD, PE, TB, TD, UB, UD, or UE; and "zz" can be AH2, AN1, AN3, AN4, HH2, HV1, or JH2]
Heliene	Heliene modules with 40 mm frames - YZZxxxA Where "YY" can be 36, 60, 72, 96, 120 or 144; "ZZ" can be HC, M, P, or MBLK; and "A" can be blank, HomePV, or Bifacial]
HT Solar	HT60-156(M) (NDV) (-F), HT 72-156(M/P)
Hyundai	Hyundai modules with 33, 35, 40 and 50 mm frames - HiY-SxxxZZ Where "Y" can be A, D or S; "S" can be M or S; and "ZZ" can be GI, HG, HI, KI, MI, MF, MG, PI, RI, RG, RG(BF), RG(BK), SG, TI or TG
ITEK	40 and 50 mm frames IT-xxx-YY Where "YY" can be blank, HE, or SE, or SE72
JA Solar	30, 35, 40 and 45 mm frames JAyzz-bbww-xxx/aa Where "yy" can be M, P, M6 or P6; "zz" can be blank, (K), (L), (R), (V), (BK), (FA), (TG), (FA)(R), (L)(BK), (L) (TG), (R)(BK), (R)(TG), (V)(BK), (BK)(TG), or (L)(BK)(TG); "bb" can be 48, 60, or 72; "ww" can be D09, S01, S02, S03, S06, S09, S10, or S12; and "aa" can be BP, MR, SI, SC, PR, 3BB, 4BB, 4BB/RE, 5BB
Japan Solar	JPS-xxxP-60 (35mm), JPS-xxxM-60 (35mm), JPS-xxx-P-72 (40mm), JPS-xxxM-60-BB (35mm), JPS-xxx-P-72-BB (40mm)
Jinko	35 and 40 mm frames JKMYxxxZZ-aa Where "Y" can either be blank or S; "ZZ" can be M, P, or PP; and "aa" can be blank, 60, 60B, 60H, 60L, 60BL, 60HL, 60HB, 60HBL, 6HBL-EP, 60-J4, 60B-J4, 60B-EP, 60(Plus), 60-V, 60-MX, 7RL3-V, 7RL3-TV, 72, 72B, 72-J4, 72B-J4, 72(Plus), 72-V, 72H-V, 72L-V, 72HL-V, 72-MX, 72H-BDVP, 72HL-TV, or 72HL-V-MX3
Kyocera	KU26x-6MCA where x is 0 or 5.
LG	[LG modules with 35, 40, and 46 mm frames - LGxxxYaZ-bb Where "Y" can be A, E, M, N, Q, S; "a" can be A, 1, 2 or 3 "Z" can be C, K, T, or W; and "bb" can be A3, A5, A6, B3, B6, E6, G3, G4, J5, K4, L5, N5, V5 or V6]
LONGi	[Longi modules with 30, 35 and 40 mm frames - LRa-YYZZ-xxxM Where "a" can be 4, 5 or 6; "YY" can be blank, 60 or 72; and "ZZ" can be blank, BK, BP, HV, PB, PE, PH, HBD, HIB, HIH, HPB, HPH, or HIBD]
Mission Solar	33 and 40 mm frames MSEbbxxxZZaa Where "bb" can be blank or 60A; "ZZ" can be blank, MM, SE, SO, SQ, SR, or TS; and "aa" can be blank, 1J, 4J, 4S, 5K, 5T, 60, 6J, 6S, 6W, 8K, 8T, or 9S
Mitsubishi	Mitsubishi modules with 46 mm frames - PV-MYYxxxZZ Where "YY" can be LE or JE; and "ZZ" can be either HD, HD2, or FB



**Certified Module List for UL2703 Listing Program**

Manufacturer	Model
NSP	D6M and D6P
Panasonic	30 mm frames EVPVxxxA, Where "A" can be blank or KPanasonic modules with 35 and 40 mm frames VBHNxxxYYzzA Where "YY" can be either KA, RA, SA or ZA; "zz" can be either 01, 02, 03, 04, 06, 06B, 11, 11B, 15, 15B, 16, 16B, 17, or 18; and "A" can be blank, E, G, or N
Peimar	40 mm frames SbxxxYzz Where "b" can be G, M or P; "Y" can be M or P; and "zz" can be blank, (BF) or (FB)
Phono Solar	Phono Solar modules with 35, 40, and 45 mm frames - PSxxxY-ZZ/A Where "Y" can be M, M1, MH, M1H, M4, M4H or P; "ZZ" can be 20 or 24; and "A" can be F, T, U, UH, or TH]
Risen	RSM72-6 (MDG) (M), RSM60-6
REC Solar	REC modules with 30, 38 and 45 mm frames - RECxxxYYZZ Where "YY" can be AA, M, NP, NP2, PE, PE72, TP, TP2, TP2M, TP2SM, TP2S, TP3M or TP4; and "ZZ" can be blank, Black, BLK, BLK2, SLV, 72, or Pure
Renesola	Virtus II with module ratings of 250-260 in increments of 5. 156 series with module ratings of 270-275.
S-Energy	S-Energy modules with 35 and 40mm frames - SABB-CCYYY-xxxZ Where "A" can be C, D, L or N; "BB" can be blank, 20, 25, 40 or 45; "CC" can be blank, 60 or 72; "YYY" can be blank, BDE, MAE, MAI, MBE, MBI, MCE or MCI; and "Z" can be V, M-10, P-10 or P-15
Seraphim Energy Group	Seraphim modules with 30, 35, and 40 mm frames - SEG-aYY-xxxZZ Where "a" can be blank, 6 or B; "YY" can be blank, MA, MB, PA, or PB; and "ZZ" can be blank, BB, BG, BW, HV, WB, WW, BMB, BMA-HV, BMA-BG, BMB-HV
Seraphim USA	Seraphim modules with 30, 35, 40 and 50 mm frames - SRP-xxx-YYY-ZZ Where "xxx" is the module power rating; and "YYY" can be BMA, BMD, 6MA, 6MB, 6PA, 6PB, 6QA-XX-XX, and 6QB-XX-XX; ZZ is blank, BB, BG or HV
Sharp	60 and 72 NUSA-xxx/NUSC-xxx
Silfab	Silfab Modules with 35 and 38 mm frames - SYY-Z-xxxAb Where "YY" can be IL, SA, LA, SG or LG; "Z" can be blank, M, P, or X; "A" can be blank, B, H, M, N; and "b" can be A, C, L, G, K, T, U or X
SolarWorld	Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 31, 33 or 46 mm frames SW-xxx, SolarWorld Sunmodule Plus, Protect, Bisun, XL, Bisun XL, may be followed by mono, poly, duo, black, bk, or clear; modules with 33 mm frames SWA-xxx
Solaria	40 mm frames PowerXT xxxY-ZZ Where "Y" can be R or C; and "ZZ" can be AC, BD, BX, BY, PD, PM, PM-AC, PX, PZ, WX or WZ
Sonali	SS 230 - 265
SunEdison	SunEdison Modules with 35, 40 & 50 mm frames - SE-YxxxZABCDE Where "Y" can be B, F, H, P, R, or Z; "Z" can be 0 or 4; "A" can be B,C,D,E,H,I,J,K,L,M, or N ; "B" can be B or W; "C" can be A or C; "D" can be 3, 7, 8, or 9; and "E" can be 0, 1 or 2
Suniva	Suniva modules with 35, 38, 40, 46, and 50 mm frames - OPTxxx-AA-B-YYY-Z and MVXxxx-AA-B-YYY-Z Where "AA" is either 60 or 72; "B" is either 4 or 5; "YYY" is either 100,101,700,1B0, or 1B1; and "Z" is blank or B
Sunpower	Sunpower standard (G3 or G4) or InvisiMount (G5) 40 and 46 mm frames - SPR-Zb-xxx-YY Where "Z" is either A, E, P or X; "b" can be blank, 17, 18, 19, 20, 21, or 22; and "YY" can be blank, BLK, COM, C-AC, D-AC, E-AC, BLK-E-AC, G-AC, BLK-C-AC, or BLK-D-AC
SunSpark	40 mm frames SYY-xxxZ-A Where "YY" can be MX or ST; and "Z" can be M, MB, M3, M3B, P or W; and "A" can be 60 or 72
Suntech	35, 40 and 50mm frames STPxxxy-zz/aa Where "y" is blank or S; and "zz" can be 20, 24, A60 or A72U; and "aa" can be Vd, Vem, Vfw, Vfh, Wdb, Wde, Wd, or Wfhb
Talesun	Talesun modules with 30, 35 and 40mm frames - TA6yZZaaxxx-b Where "A" can be D or P, "y" can be blank, F, G, H, I, or L; "ZZ" can be 60 or 72; "aa" can be M, M(H), or P; and "b" can be blank, B, T, or (H)
Tesla	Tesla modules with 40 mm frames - TxxxY Where "Y" can be H or S
Trina Solar	Trina Modules with 30, 35, 40 and 46mm frames - TSM-xxxYYZZ Where "YY" can be DD05, DD06, DD14, DE14, DE15, DE15V, DEG15, DEG15VC, DE19, DEG19C.20, DE06X, PA05, PC05, PD05, PD06, PA14, PC14, PD14, PE14, or PE15 ; and "ZZ" can be blank, .05, .05(II), .08, .10, .18, .08D, .18D, 0.82, .002, .00S, 05S, 08S, .20(II), A, A.05, A.08, A.10, A.18, (II), A(II), A.05(II), A.08(II), A.082(II), A.10(II), A.18(II), H, H(II), H.05(II), H.08(II), HC.20(II), HC.20(II), M, M(II), M.05(II), MC.20(II)
Upsolar	UP-MxxxP, UP-MxxxP-B, UP-MxxxM, UP-MxxxM-B
Vikram	40 mm frames VSyy.ZZ.AAA.bb Where "yy" can be M, P, MBB, MH, MS, MHBB, or PBB; "ZZ" can be 60 or 72; "AAA" is the module power rating; and "bb" can be 03.04 or 05
Yingli	YL xxx P-29b, YLM 60, YLM 72, YGE, YGE-VG, YLM, YL xxx P-35b, YL xxx D-30b, YL xxx D-36b
Waaree	AC, Adiya 60/72 Mono/Poly Black, Adiya 60/72 Multi
Winaico	35 and 40 mm frames Wsy-xxxZa Where "y" can be either P or T; "Z" can be either M, P, or MX; and "a" can be blank or 6

**Certified Power Optimizer List for UL2703 Listing Program**

Manufacturer	Model
Enphase	M250-72, 250-60, M215-60, C250-72, S230, S280, IQ 6, IQ 6+, IQ 7, IQ 7+, IQ 7X, Q Aggregator
Solar Edge	P300, P320, P340, P370, P400, P405, P505, P600, P700, P730, P800p, P800s, P850, P860