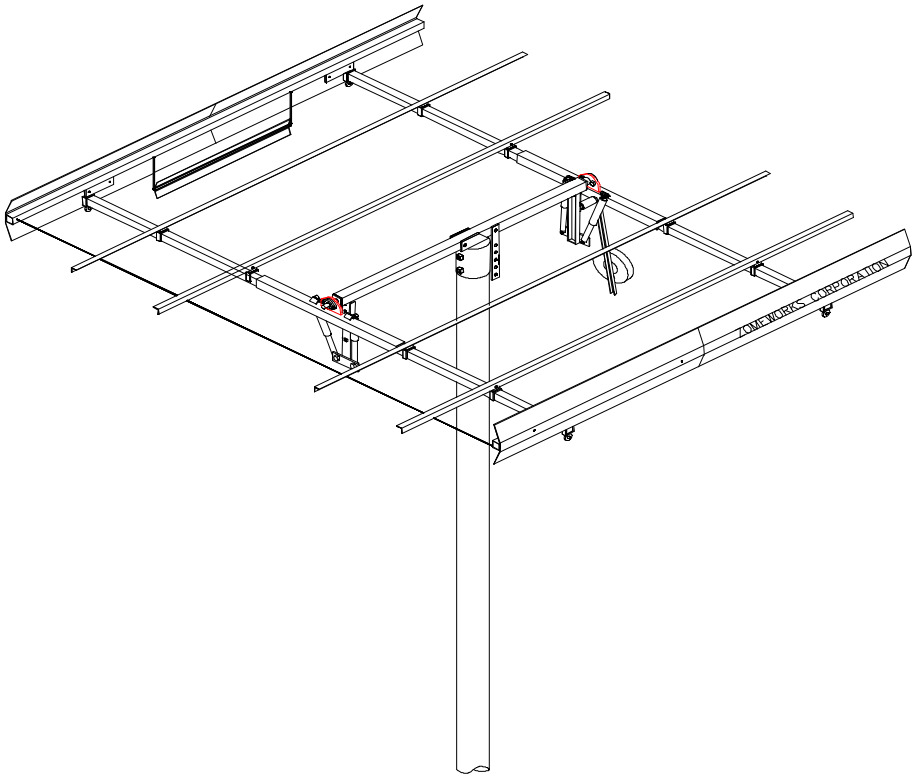
ZOMEWORKS
CORPORATION

F-SERIES TRACK RACK™

ASSEMBLY INSTRUCTIONS

SALES ORDER # _____ MODEL# _____



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Revised 4/1/10

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ABOUT TRACKERS

The F-Series Tracker is an ingenious and economical way to increase photovoltaic efficiency an average of 25%. Photovoltaic panels mounted on a Tracker will be much more efficient than the same panels mounted on a fixed rack when the Tracker follows the sun 6 hours a day. Because a Tracker relies on a differential of solar heat gain in the canisters, it will react more slowly when the sun is partially obscured.

CHOOSING A LOCATION

Choose a location where the tracker will receive the sun all day. Clear exposure throughout the day with an unobstructed and clear view of the sun is required. Locate the Track Rack™ where it will receive the earliest morning sun. The rack needs the early morning sun to "wake up", or return to the eastern position, so it is important to place your Track Rack™ where it won't be shaded in the morning by structures, poles, trees, bushes, etc. Remember that the sun rises and sets north of east /west in the summer and south in the winter. You will be able to adjust your Track Rack™ for the winter & summer solstice accordingly.

TRACKER OPERATION

The Track Rack™ is moved by the shifting weight of the liquid refrigerant from the east or west canisters through the copper transfer tube located at the south side of the assembly. The aluminum "shadow plates" shade the canister closest to the sun, the other canister grows warmer and shifts the weight to the cooler canister, tilting the Track Rack™ until it points exactly at the sun and shades the canisters equally.

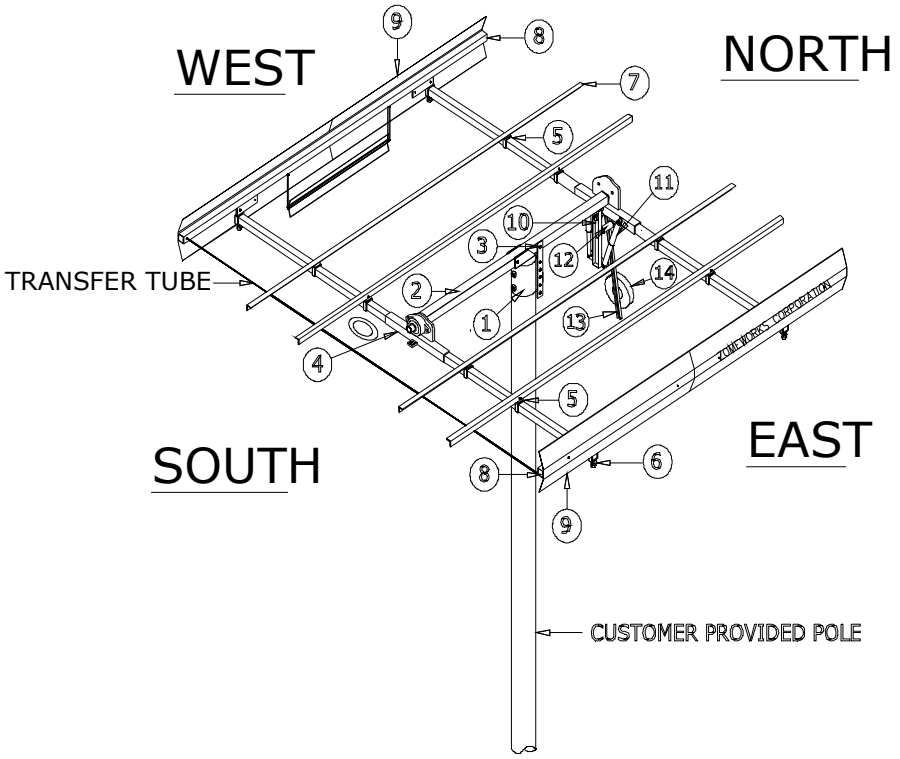
TOTAL TRAVEL

The rack is designed to travel through a 90° arc and is still very effective down to 60° rotation. A Track Rack™ is stable if the axle is above the center of gravity. If the axle is below, the Track Rack™ will be unstable. Even in calm, sunny weather it will be hunting for, but overshooting the sun. To make the tracker stable, lower the center of gravity by moving the counterweight down. A Track Rack™ with its center of gravity perfectly adjusted will reach its stop in the afternoon at about the same time all the Freon has moved to the west canister. It should not strain hard against the bumper stops. If the center of gravity is too low the tracker won't turn all the way to the bumper stops. If the center of gravity is too high the tracker will be unstable in the wind. There is a broad latitude of adjustment that works for most trackers.

SHOCKS AND THE BUMPER STOPS

The shock absorber is the first line of defense for the Track Rack™ against wind. It's meant to prevent sudden gusts from pushing the rack off course, as well as restricting any violent movement that may harm the rack and modules. The shocks yield to a constant force by design, thus promoting tracking and, as a result, will be affected in a constant wind-loading situation. The bumper stops are the second failsafe in the structure. They prevent any catastrophic failure from occurring by limiting the overall travel of the Track Rack™.

F-Series Recommended Tools and Parts List



RECOMMENDED TOOLS:

- (2) Adjustable 12" Crescent Wrenches.
- (2) 1-1/8", 15/16", ¾", 9/16 and 7/16" Wrenches.
- Rubber Mallet (Hammer will scratch the finish).
- Two Sawhorses (Not required, but helpful).
- (2) 6-ft Step ladders.
- 15' of medium weight Rope.
- Tape Measure.
- 1/8" Allen Wrench (Provided).

NOTE TO INSTALLER: The installer must provide the schedule 40 steel pipe. Your Track Rack™ may hold more modules than illustrated, but the concept is the same. Before assembling your Track Rack™, use the list below to assure that you have all of your components. In the event that you may have missing parts, contact **ZOMEWORKS Customer Service @ 1-800-279-6342**. **PLEASE** have your **SALES ORDER NUMBER, DATE OF PURCHASE,** along with your **DEALER NAME** when calling. Thank you.

F-SERIES PARTS LIST

Key	Quantity	Structural Component Description	Check
1	1 ea.	Gimbal	
2	1 ea.	Axle Tube	
3	1 ea.	Seasonal Adjustment Arm	
4	2 ea.	Truss Tube w/ pre-attached bearings	
5	8 ea.	Truss Tube slider	
6	4 ea.	Canister Slider with end rings	
7	4 ea	Module mounting rails (extra rail set versions will have 6)	
8	1 ea.	Pair of canisters w/ attached copper transfer tube	
9	4 ea.	Shadow plates (One with Zomeworks Decal)	
10	1 ea.	Bracket Shock Mount	
11	2 ea.	Shocks	
12	1 ea.	Bumper Bolt Assembly	

13	1 ea.	Counterweight mounting arm	
14	1 ea.	25 lb counterweight	
not pictured	1 ea.	Installation locking bar	
not pictured	1 ea.	Storm collar	

UTRF-064, 090, & 120 Hardware List		
Quantity	**Description**	**Check**
Gimbal, Axle & Seasonal Adjustment Arm Hardware		
2	3/4" x 2" Yellow Zinc Plated Bolt (pre-installed)	
1	3/4" x 4-1/2" Zinc Plated Bolt (pre-installed)	
2	3/4" Zinc Plated Flat Washer (pre-installed)	
1	3/4" Zinc Plated Lock Washer (pre-installed)	
1	3/4" Zinc Plated Hex Nut (pre-installed)	
1	5/8" x 4-1/2" Zinc Plated Bolt (pre-installed)	
1	5/8" x 2" Zinc Plated Bolt (pre-installed)	
2	5/8" Zinc Plated Lock Washer (pre-installed)	
4	5/8" Zinc Plated Flat Washer (pre-installed)	
2	5/8" Zinc Plated Hex Nut (pre-installed)	
1	1" Bronze Spacer (located in hardware bag in gimbal box)	
2	1/2" x 1-3/4" Zinc Plated Bolt (pre-installed)	
4	1/2" Zinc Plated Flat Washer (pre-installed)	
2	1/2" Zinc Plated Nylock Nut (pre-installed)	
Shock, Shock Mount Bracket, Storm Collar, Bumper Bolt, and Locking Bar Hardware		
3	¾" x 3-1/2" Zinc Plated Bolt (pre-installed)	
2	¾" x 2-3/4" Zinc Plated Bolt (pre-installed)	
1	¾" x 1 ½" Zinc Plated Bolt (pre-installed)	
1	1" x 2" Steel offset bushing (pre-installed)	
2	3/4" Zinc Plated Lock Washer (pre-installed)	
5	3/4" Zinc Plated Jamb Nut (pre-installed)	
3	3/4" Zinc Plated Hex Nut (pre-installed)	
1	Capsule of .5ml Loctite thread sealant (located in hardware bag in gimbal box)	
1	1" x 6" Zinc Plated Bolt (Bumper bolt) (located in hardware bag in gimbal box)	
1	1" Jamb Nut (Already on Bumper Bolt) (located in hardware bag in gimbal box)	
1	1" I.D. x 4 ¼" Rubber Hose (already on Bumper Bolt) (located in hardware bag in gimbal box)	
2	½" x 2 ½" Zinc Plated Carriage Bolts (located in hardware bag of gimbal box)	
2	½" Zinc Plated Lock Washers (located in hardware bag of gimbal box)	
2	½" Zinc Plated Hex Nuts (located in hardware bag of gimbal box)	
Module Rail, Sliders, Truss Tube, & Canister Hardware		
16	3/8" x 1-1/4" Zinc Plated Bolt (pre-installed)	
16	3/8" x 3/4" Yellow Zinc Plated Bolt (pre-installed)	
32	3/8" Zinc Plated Flat Washer (pre-installed)	
16	3/8" Zinc Plated Nylock Nut (pre-installed)	
16	3/8" Zinc Plated Jamb Nut (pre-installed)	
4	9/16" x 1-3/4" Zinc Plated Bolt (pre-installed)	
4	9/16" Zinc Plated Lock Washer (pre-installed)	

4	9/16” Zinc Plated Hex Nut (pre-installed)	
2	1” Flange Bearings (pre-installed)	
9	3/16” x 7-5/8” U.V. Pull-Tie (located in hardware bag in gimbal box)	
1	1/8” Allen Wrench (located in hardware bag in gimbal box)	
Counterweight Hardware		
1	3/4” X 1” Plastic Pipe Sleeve (pre-installed)	
1	1/2” x 2” Zinc Plated Bolt (pre-installed)	
2	1/2” Zinc Plated Flat Washer (pre-installed)	
1	1/2” Zinc Plated Lock Washer (pre-installed)	
1	1/2” Zinc Plated Hex Nut (pre-installed)	
1	1” Jamb Nut (pre-installed)	
Shadow Plate Hardware		
8	1/4” x 3/8” Zinc Plated Round Head Screw (located in hardware bag in gimbal box)	
8	1/4” Zinc Plated Fender Washer (located in hardware bag in gimbal box)	
8	1/4” Stainless Steel Lock Washer (located in hardware bag in gimbal box)	
PV Module Mounting Hardware (times number of modules)		
4	1/4” x 5/8” Stainless Steel Bolt (located in hardware bag in gimbal box)	
4	1/4” Stainless Steel Flat Washer (located in hardware bag in gimbal box)	
4	1/4” Stainless Steel Flange Lock Nut (located in hardware bag in gimbal box)	

F-SERIES POLE INSTALLATION

IMPORTANT NOTE: ZOMEWORKS CORP. ASSUMES NO LIABILITY FOR THE STRUCTURAL INTEGRITY OF THE POLE AND ITS INSTALLATION. SOIL AND WIND CONDITIONS VARY. IF THERE IS ANY DOUBT, CONSULT WITH A LOCAL STRUCTURAL ENGINEER. PLEASE TALK TO YOUR CERTIFYING ENGINEER BEFORE POLE IS MOUNTED.

LOCATION CONSIDERATIONS:

For installations in sandy or muddy areas, for tall mounting poles, or for any mounting different from the situations described in these instructions, you will need to consult a local structural engineer. Large TRACK RACKS™ can receive significant wind loads, so a strong mounting pole and foundation is very important. The site should receive the maximum possible sunlight from AM to PM, in the winter and summer. Avoid shade from buildings and trees, including shade that may occur in other seasons. The height of the pole should result in adequate ground clearance for the mounted modules.

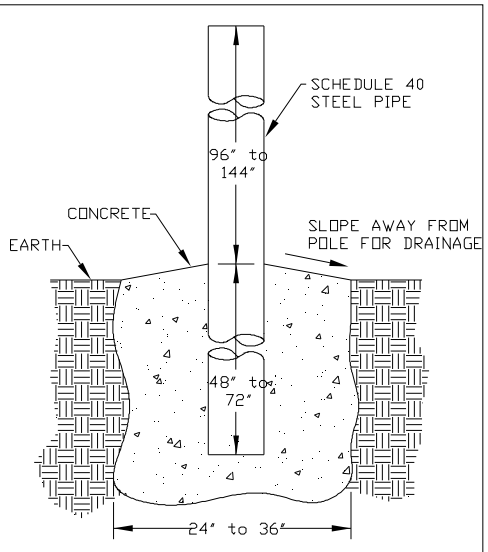
CAUTION – BE CAREFUL WORKING AROUND THE RACK AFTER INSTALLATION ON THE POLE. SOME OF THE STRUCTURAL MEMBERS MAY BE AT HEAD LEVEL.

- The customer provided pole is a 6” (nominal) schedule 40 steel pipe with a 6-5/8” OD (F-064, F-090 & F-120). Pole can be black or galvanized steel pipe.
- **Note:** Heavier schedule steel pipe, schedule 80 or schedule 160, can be used as long as OD is 6-5/8”or 8-5/8”.
- Using the chart below, find the **MINIMUM** acceptable pole height above your finished grade. Our largest tracker the UTRF-168 will be approximately 34” above grade when the rack is tilted to the maximum winter angle when rotated to the extreme east or west stop. It is strongly recommended that the pole height be to our minimum specifications.
- The minimum recommended hole depth is 1/3 the pole length, 1/3 in the ground, 2/3 above the ground. **Example:** 5’ below grade, 10’ above grade, total of a 15’ pole.
- Center the pipe in the hole, and using a level, make sure pole is vertical.
- Fill the hole with concrete (3000-psi minimum strength), and check level of the pole.

- The pole may be filled with concrete for added strength (only to approximate ground level).
- Allow concrete and pole to set for a **MINIMUM** of 36 hours **BEFORE** installing the Track Rack™.

MOUNTING POLE RECOMMENDATIONS:

Description	F-Series UTRF64	F-Series UTRF90	F-Series UTRF120	F-Series UTRF168
Minimum Schedule 40 Steel Pipe	6"	6"	6"	8"
Pole Height	96"	108"	120"	144"
Min. Pole Depth	48"	54"	60"	72"
Ground Clearance at 45° Tilt N/S & E/W	12"	20"	28"	34"
Minimum Recomended hole diameter	24" diameter Pipe set in concrete	24" diameter Pipe set in concrete	24" diameter Pipe set in concrete	32" diameter Pipe set in concrete
Rack Dimensions (up to but **NOT** to exceed Sq. Ft.)	124" EW 128" NS 64 Sq. Ft. of Module Area	148" EW 144" NS 90 Sq. Ft. of Module Area	148" EW 160" NS 120 Sq. Ft. of Module Area	169" EW 192" NS 168 Sq. Ft. of Module Area



POLE INSTALLATION DETAIL

REVISED: 06-01-06

Step 1: Attaching the Gimbal to the Mounting Pole: (Hardware needed: (2x) ¾" x 2" yellow ZP bolts)

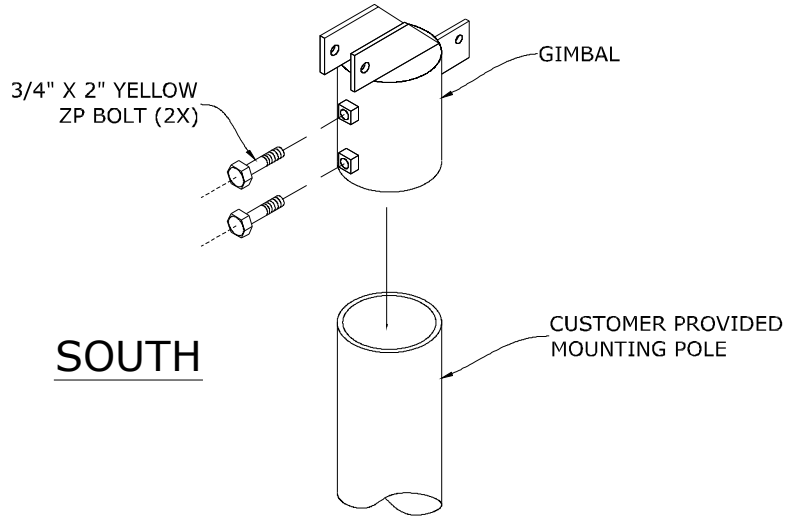


Diagram 1

- Place Gimbal on top of Pole.
- Set Gimbal with ¾"x 2" Yellow Zinc Bolts facing south. **See Diagram 1**.
- Tighten Bolts to secure Gimbal to the Pole. Recommended torque is 75 - 100 foot-pounds.

Step 2: Attaching the Shock Mounts to Axle Assembly: (Hardware needed: (2x) ½" x 1 ¾" ZP bolt, (4x) ½" flat washers, (2x) ½" Nylock nuts)

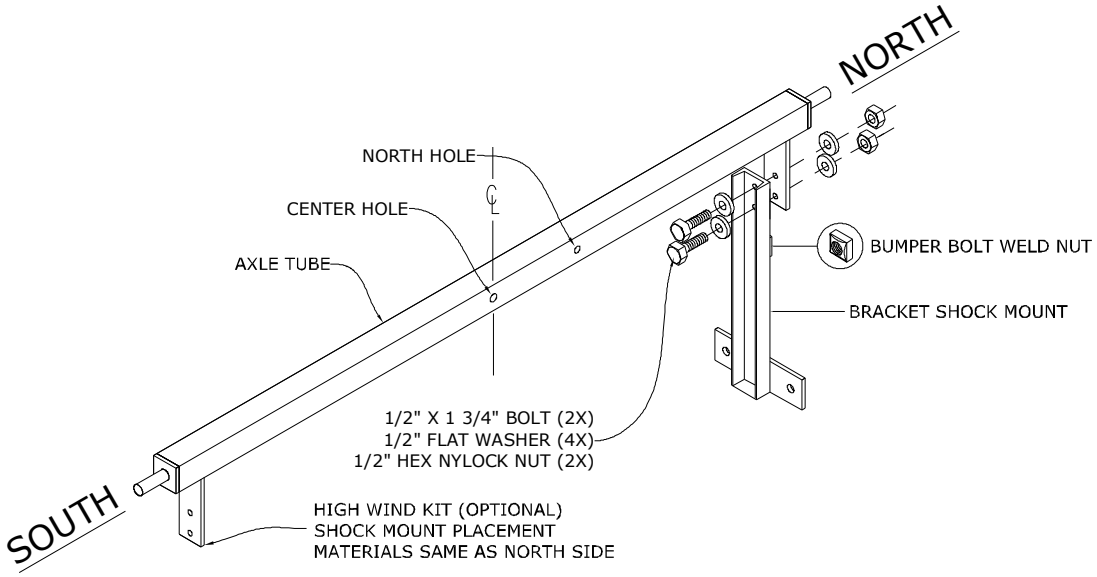


Diagram 2

- Bolt Axle Shock Mount to inside north end of Axle Tube using ½"x 1-3/4" Bolts, Flat Washers, and Nylock Nuts. Tighten the bolted assembly to 80 foot-pounds of torque. This connection is under considerable stress. **See Diagram 2**.
- Face Bumper Bolt Weld Nut toward outside, away from Pole.
- Check that the shock mount bracket bolts are kept tight. Check them at least twice a year.

Note: The shock mount can be installed on the south end of the tracker on all models. However, only for the UTRF-64 model at the maximum 45° winter tilt, the shock assembly will crash into the mounting pole. If a High Wind Kit is added, the maximum seasonal tilt angle would need to be less than 45 °.

Step 3: Attaching the Axle Assembly to the Gimbal: (Hardware needed: (1x) ¾" x 4 ½" bolt, (2x) ¾" flat washers, (1x) ¾" lock washer, (1x) ¾" hex nut

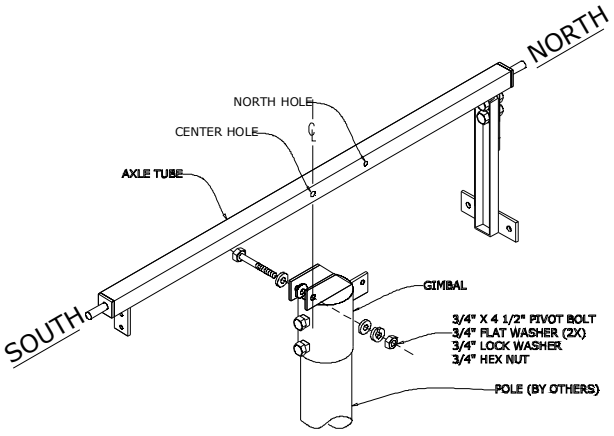


Diagram 3

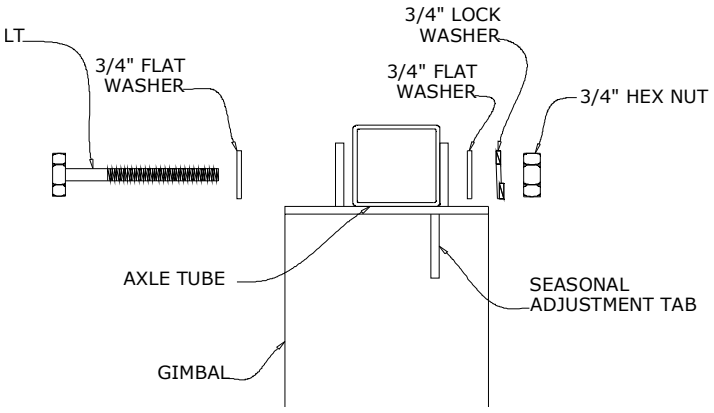


Diagram 3a

- Insert Axle Tube between the Gimbal tabs.
- Using ¾"x 4-1/2" Pivot Bolt, install into the center hole of Axle Tube and fasten using Flat Washers on both sides, a Lock Washer and a Hex Nut. **See Diagrams 3 & 3a**.
- Recommended final bolt torque is 100 - 150 foot-pounds.

Step 4: Installation of the Seasonal Adjustment Arm: (Hardware needed: (1x) 5/8" x 4 ½" bolt, (1x) 5/8" x 2" bolt, (4x) 5/8" flat washers, (2x) 5/8" lock washers, (2x) 5/8" hex nuts

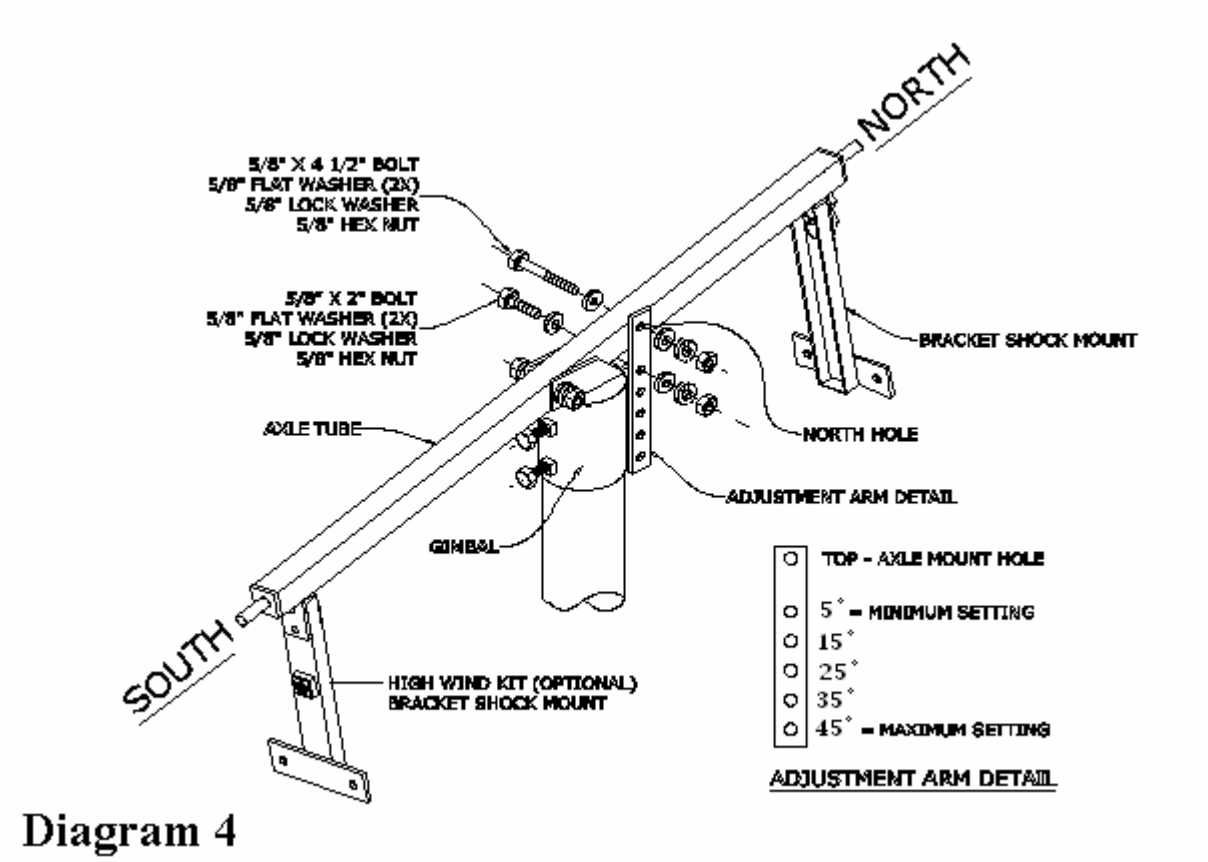


Diagram 4

- Level Axle Tube.
- Bolt Seasonal Adjustment Arm to Axle Tube through the north hole using a 5/8"x 4 ½" Bolt, Flat Washers on both sides, Lock Washer and Hex Nut.
- Bolt Seasonal Adjustment Arm to the tab on the Gimbal using 5/8"x 2" Bolt, Flat Washers on both sides, Lock Washer and Hex Nut. **See Diagram 4**.
- Final recommended bolt torque for both of these bolts is 150 foot-pounds. Maximum torque is 180 foot pounds.

Step 5: Connecting the Truss Tubes to the Axle: (Hardware needed: (1x) 1" Bronze spacer collar, Bearing hardware (pre-installed): (4x) 9/16" x 1 ¾" Zinc plated bolts, (4x) 9/16" Zinc plated lock washers, (4x) 9/16" Zinc plated hex nuts)

- Bearings and Bearing Blocks are factory mounted to Truss Tubes using 9/16" x 1 3/4" Bolts, Flat Washers, Lock Washers and Hex Nuts.
- Back out set screws on Truss Tube Bearings using Allen wrench provided.
- Install the 1" Bronze Spacer Collar over the North Axle Shaft and move up against axle tube.
- Slide one Truss Tube with Bearing on top and Shock Mount Weld Nuts facing inward onto north end of Axle Tube pressing against the 1" Spacer Collar. Tighten Bearing Set Screw using Allen wrench provided.

- Slide the second Truss Tube with Bearing on top and Shock Mount Weld Nuts facing inward onto south end of Axle Tube.
  Using a Tape Measure set the ***Center to Center Critical Dimension** between the Truss Tubes as follows:
  F-64 = 42-3/4" F-90 = 62-3/4" F-120/168 = 74-3/4"
- Tighten Bearing Set Screw using Allen wrench provided.

NOTE: Truss Tubes **MUST** hang below the axle.

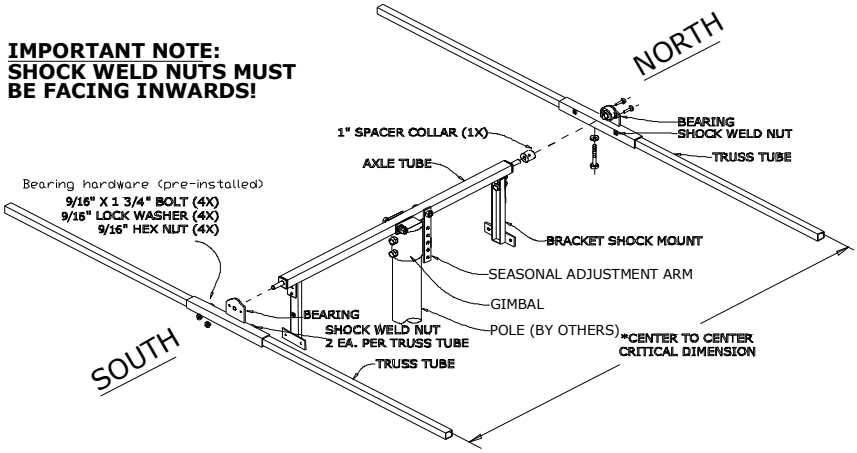


Diagram 5

Step 6: Attach Installation Locking Bar : (Hardware needed (all hardware pre-installed): (1x) ¾" x 3 ½" bolt, (1x) ¾" x 1 ½" bolt, (1x) 1" x 2" offset bushing, (1x) ¾" zinc plated hex nut, (1x) zinc plated jamb nut)

- The Installation Locking bar should be attached in place of one of the shock absorbers using the hardware provided, see **Diagram 6**. This bar will stabilize the rack during the rest of the installation.

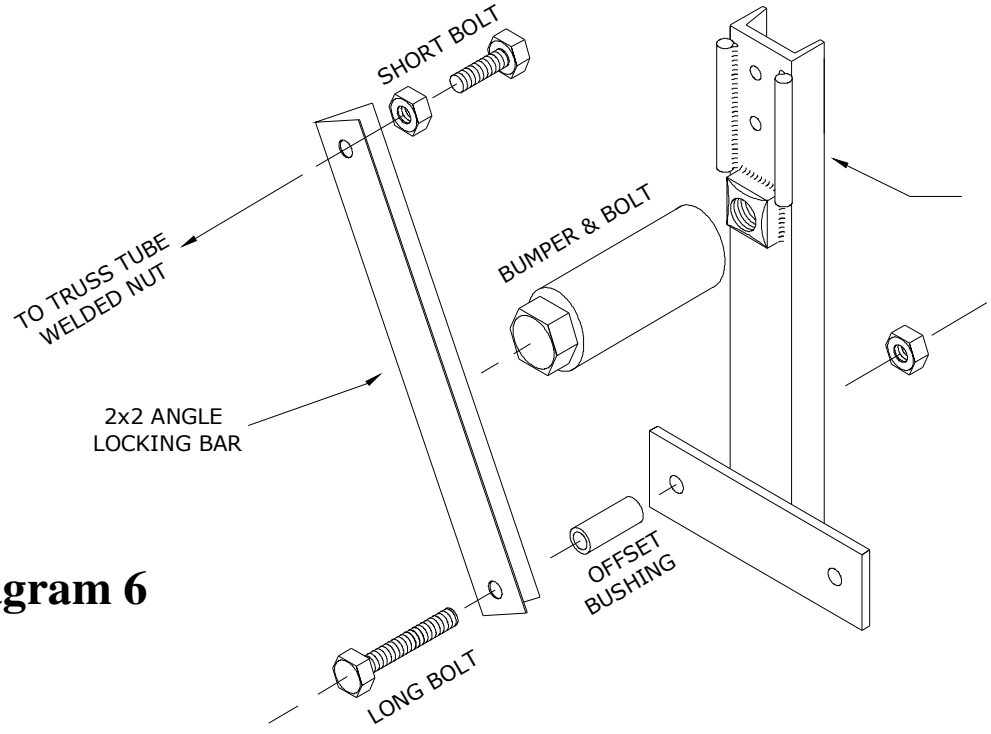


Diagram 6

INSTALLATION LOCKING BAR ASSEMBLY

Step 7: Slider and Module Rail Installation: (Hardware needed: Truss and canisters sliders: (16x) 3/8" x ¾" bolts, (16x) 3/8" hex jamb nuts; Module rails: (8x) 3/8" x 1 ¼" bolts, (16x) 3/8" flat washer, (8x) 3/8" nylock nuts)

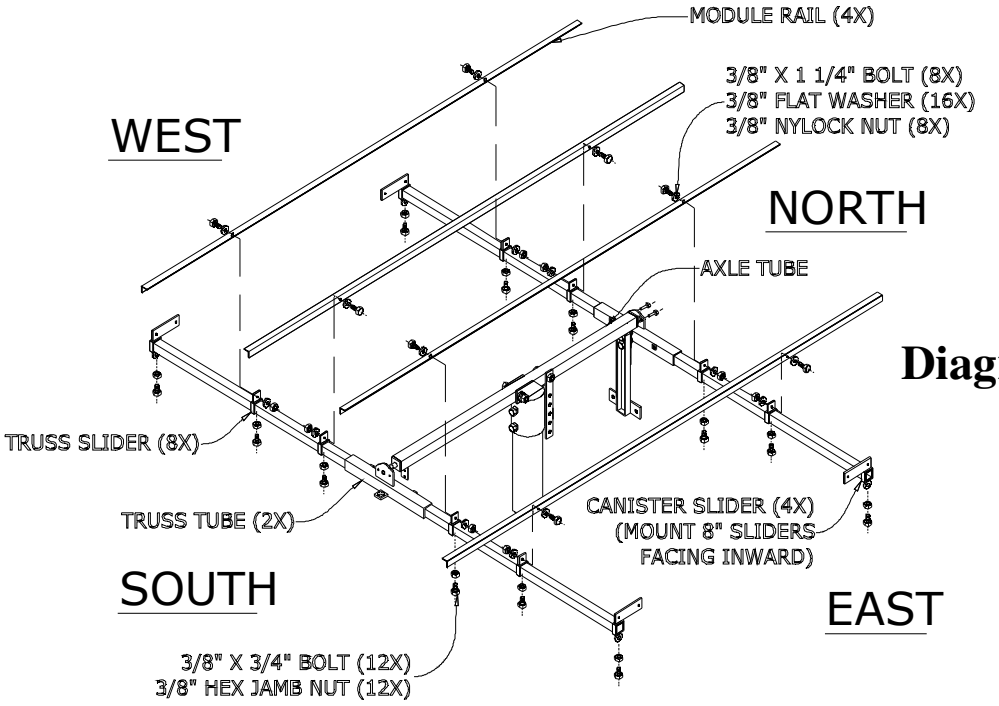
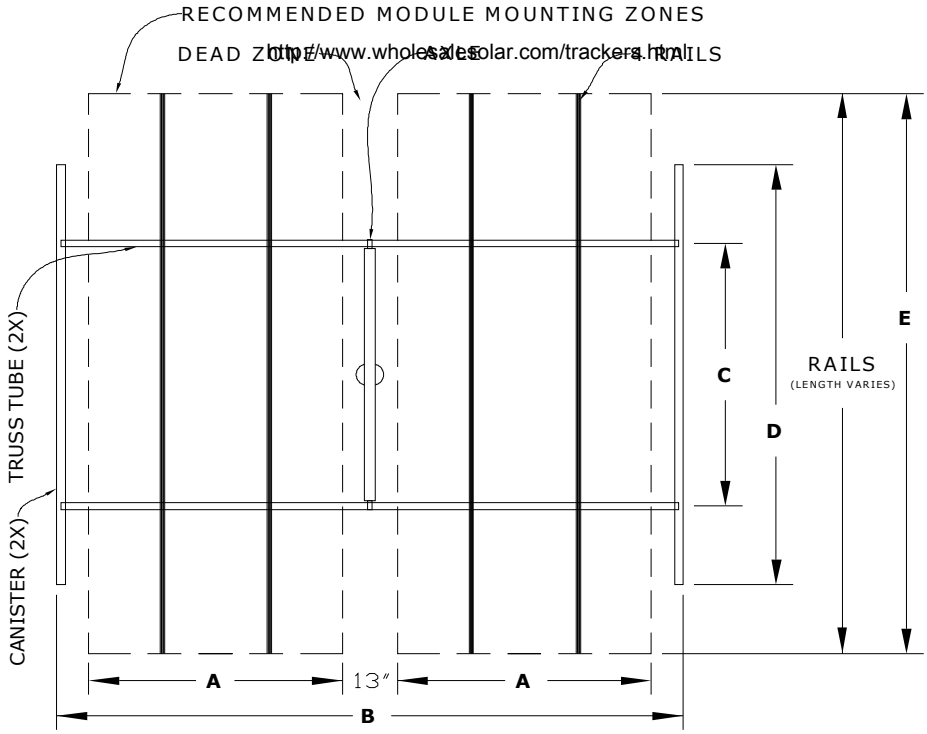


Diagram 7



MODEL	DIMENSION				
	A	B	C	D	E
F-64	51"	124"	42 3/4"	80"	120"
F-90	61"	148"	62 3/4"	120"	148"
F-120	61"	148"	74 3/4"	120"	160"
F-168	74"	169"	74 3/4"	120"	192"

NOTE:
THE TOTAL MODULE AREA MUST **NOT** EXCEED THE MAXIMUM RECOMMENDED SQUARE FOOTAGE OF YOUR ZOMEWORKS TRACK RACK.

Diagram 7A

- Slide Two (2) Truss Sliders, (3 with Offset Kit), and One (1) 8" Canister Slider (with ring welded to bottom) over each end of the Truss Tubes facing inward. The Mounting Tabs must be upwards.
- There is a 13" wide DEAD ZONE in the center axis of the Tracker. Modules **MUST NOT** invade this Zone unless an Offset Bracket Kit is included. Doing so may damage modules or impede function of the Tracker.
- Most modules mount at the intermediate hole location in a landscape orientation (long dimension, E/W).
- Determine the correct rail spacing for your chosen module and mounting holes. **See Diagram 6B**.
- For standard Four (4) Rail installation. **See Diagram 6A**.
- For Six (6) Rail Center Module installation using offset brackets, **see Diagram 7B**.
- The Photovoltaic Modules should be centered between the Axle and Canisters mounting evenly.

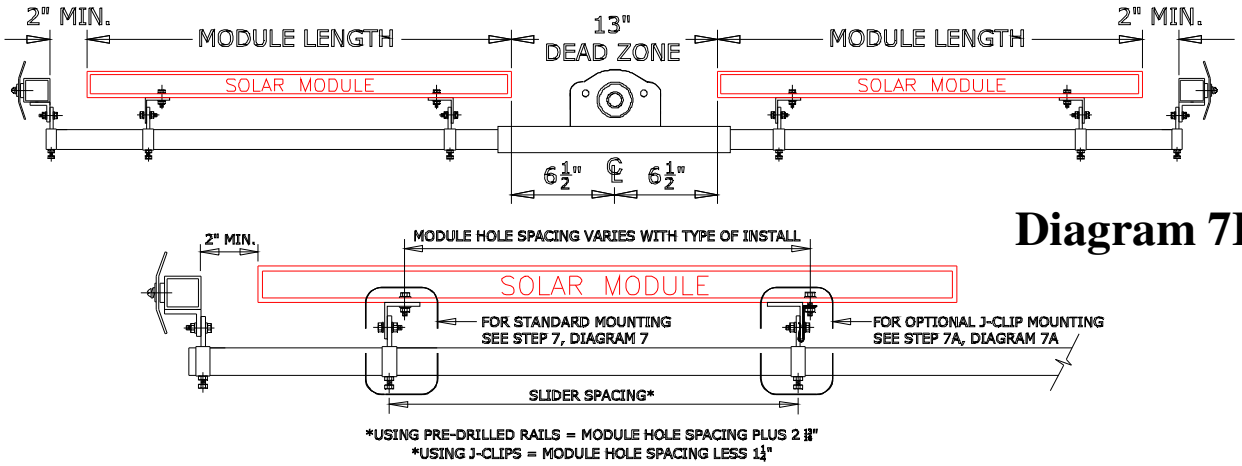


Diagram 7B

- Bolt the Module Rails to the Truss Sliders as shown in **Diagram 7** with a 3/8"x 1-1/4" Bolt, Flat Washers on both sides and then a Nylock Nut. For proper balance space the Sliders evenly on each side of the axle.
- Position the rail sets and center them between Axle and Canister. **See Diagram 7**. Tighten slider set Bolts and Jamb Nuts tight to the slider tube (Recommended torque is 36 foot-pounds).
- Set Canister Sliders at the end of Truss Tubes as shown in **Diagram 7B**. Tighten set Bolts and Jamb Nuts.
- The canisters on each side of the Track Rack™ should not be "shaded" by the Photovoltaic Modules. Maintain at least a 2" minimum clearance. **See Diagram 7B**.

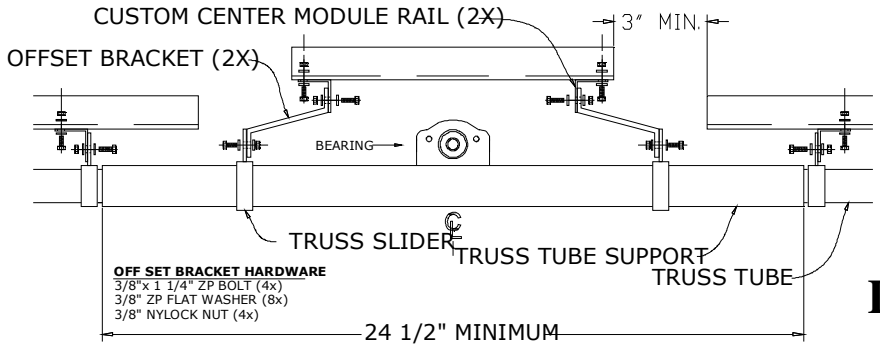


Diagram 7C

Step 8: Modules using Pre-Drilled Rails Installation: (Hardware needed: (4x # of modules) ¼" x 5/8" SS bolts, ¼" SS flat washer, and ¼" SS hex flange lock nut)

PRE-DRILLED RAIL DETAIL

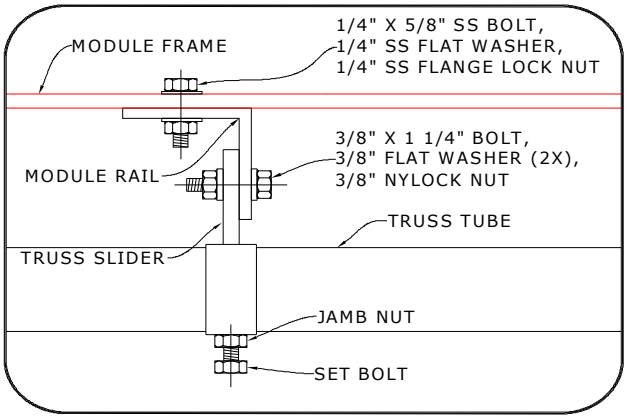


Diagram 8

- Install modules on rails using four (4) sets of ¼"x 5/8" SS bolt, SS flat washer, and SS hex flange lock nut. **See Diagram 8**.

- Most modules mount in a landscape orientation (long dimension E-W). Check your Module Mounting Zone Drawing.
- Adjust the module rail spacing as required to fit your modules. **See Diagram 7B or 7C**.

NOTE: Before mounting your modules, check to see if the Junction Box is going to be located on top of a rail. If so, you may have to pre-wire the module before mounting the unit to the rails.

Step 8A: Modules using J-Clip Installation: (Hardware needed: Module mounting hardware (see Step 8 above), J-clips)

- Most modules mount in a landscape orientation (long dimension E-W).
- Place the J-Clips on the rails as shown. **See Diagram 8A**.
- Space the J-Clips to match the holes in the module frame.
- Provide spacing between the modules as per the manufactures recommendations (minimum 3/8").
- Bolt the modules to the J-Clips using ¼"x 5/8" SS bolt, SS flat washer, and SS hex flange lock nut. **See Diagram 8A**.
- Adjust the module rail spacing as required to fit the modules. See **Diagram 7B or 7C**.

NOTE: Before mounting your modules, check to see if the Junction Box is going to be located on top of a rail. If so, you may have to pre-wire the module before mounting the unit to the rails.

J-CLIP RAIL DETAIL

- Four (4) J-Clips are used to install each module.
- Check your Module Mounting Zone Drawing.

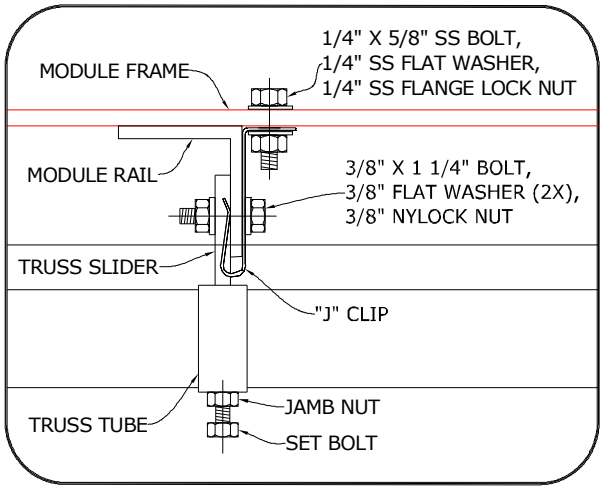


Diagram 8A

Step 8B: Center Module Offset Brackets Installation: Offset brackets are used for racks with extra rails

- Most modules mount in a landscape orientation (long dim. E-W). Some center mounted modules are mounted in a portrait position (long dim. N-S).
- Install your offset brackets as shown. **See Diagram 7C & 8B.**
- Install modules on rails as shown using (4) sets of ¼" x 5/8" SS bolt, SS flat washer, and SS hex flange lock nut. **See Diagram 7C & 8B.**
- Adjust the module rail spacing as required to fit your modules. **See Diagram 7C & 8B.**

OFFSET BRACKET DETAIL

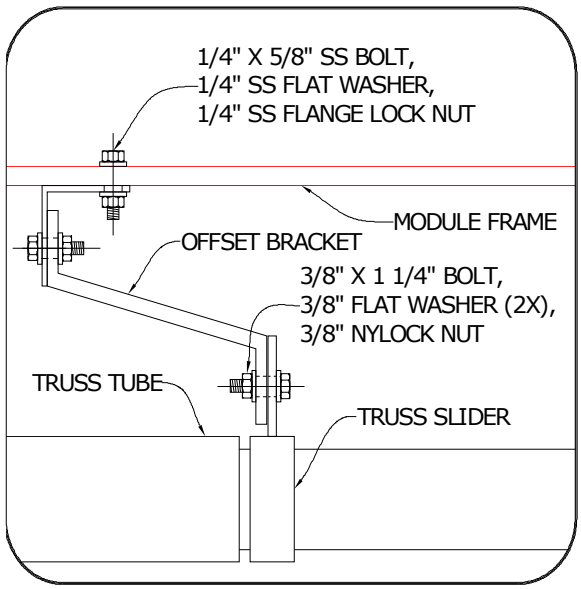


Diagram 8B

NOTE: Before mounting your modules, check to see if the Junction Box is going to be located on top of a rail. If so, you may have to pre-wire the module before mounting the unit to the rail.

Step 9: Balancing the Track Rack™

- The Tracker must be balanced above its pivot axis.
- Adjust the Axle to the minimum 7 1/2° horizontal position using the Seasonal Adjustment Arm, **see Diagram 4**.
- Remove the locking bar and rotate the Rack to a horizontal East-West position.
- The Tracker should balance and maintain this position. If it flops to one side, adjust the balance by moving the opposite Module Rail set away from the Axle. Loosen the slider set screws, and with a hammer tap the sliders away from the Axle. Without the Counterweight, the Tracker is likely to be top heavy in which case, it will never maintain a horizontal position, but it should show no bias for one side over the other.
- When balanced, tighten all Slider Set Bolts and Jamb Nuts on rail sliders.

Step 10: Shock Absorber, Bumper Bolt, and Locking bar Installation: (Hardware necessary: Shock absorbers: (2x) ¾" x 3 1/2" bolt, (2x) ¾" x 2 ¾" bolt, (2x) ¾" lock washers, (2x) ¾" hex nuts, (4x) ¾" jamb nuts; Bumper bolt: (1x) 1" x 6" bolt, (1x) 1" jamb nut, (1x) 1" rubber bumper; Locking bar: (1x) ¾" x 3 ½" bolt, (1x) ¾" x 1 ½" bolt, (1x) 1" x 2" offset bushing, (1x) ¾" zinc plated hex nut, (1x) zinc plated jamb nut)

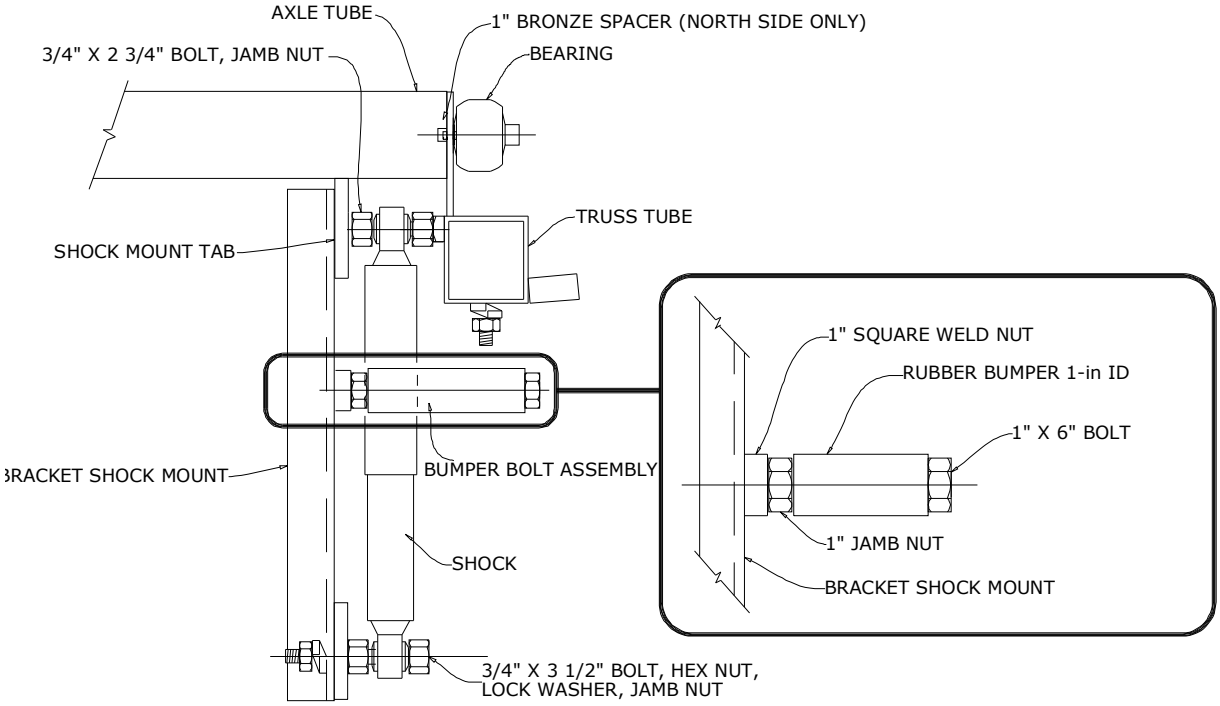
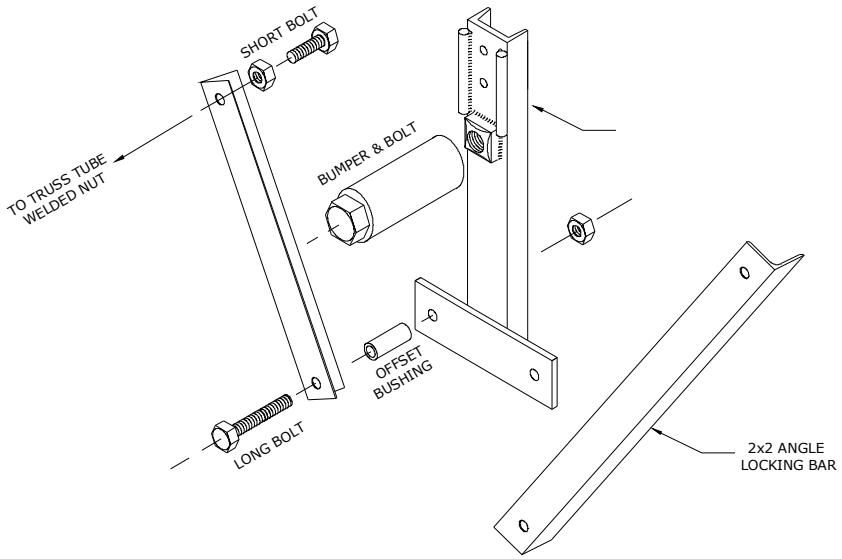


Diagram 10 **Diagram 10A**

SHOCK MOUNTING DETAIL **BUMPER BOLT DETAIL**

- The UTRF-064, 090 & 120 Tracker includes one pair of Shock Absorbers which mount on the north end of tracker.
- The UTRF-064, 090, & 120 High Wind Kit (optional) includes an additional pair of Shock Absorbers, Bumper Bolt and Shock Mount Bar which mount on the south end of the tracker. **See Diagram 2 and note on page 7**.
- Bolt lower cylinder end of Shock Absorbers to the Bracket Shock Mount using the ¾" x 3 ½" bolts. **See Diagram 10**.
- Bolt top end of Shocks to Weld Nuts on the top of Truss Tube using the ¾" x 2 ¾" bolts. Tighten the Jamb Nut to 165 foot-pounds. Use Loctite thread sealant. **See Diagram 10**.

- Adjust Shocks, Bolts and Jamb Nuts for adequate clearance between parts. The rubber bushing of the shock absorbers should not be crimped by the nuts. If the nuts are too tight, they will impede the action of the shocks. Loosen slightly if necessary.
- Thread Bumper Bolt into Axle Shock Mount's 1" Square Weld Nut. **See Diagram 10A**.
- Rotate tracker through its arc and check for any interference. Adjust if necessary.
- Lock Bumper Bolt in place by tightening Jamb Nut into the frame – maximum torque 400 foot-pounds.
- The locking bar should be used during periods of high winds, or to replace a missing or damaged shock. Install the Locking bar in place of one of the shock absorbers using the hardware provided, see **Diagram 10B**.



LOCKING BAR ASSEMBLY

Diagram 10B

Important Shock Absorber Notes:

The ZW-2003 heavy-duty shock absorber is quite stiff. To extend the shock for mounting, it may be necessary to bolt the lower end of the shock to the axle shock bracket and insert a long screw or bar through the other end of the shock, and hang on the shock with body weight until it extends. Typically 100 lbs. of force will extend the shock absorber 1" in 1 minute.

The Ø 3/4" shock bolts must be tight or they could work loose in windy situations. The recommended torque on the jamb nut that backs up against the weld nut on the truss tube is 165 foot-pounds. A medium size crescent wrench or pliers is not sufficient. A capsule of Loctite thread compound is included with the tracker. It should be used on the shock bolt threads.

Step 11: Installation and Adjustment of Counterweight: (Hardware needed: (1x) 1" jamb nut, (1x) ½" x 2" bolt, (2x) ½" flat washers, (1x) 1" plastic sleeve, (1x) ½" lock washer, (1x) ½" hex nut)

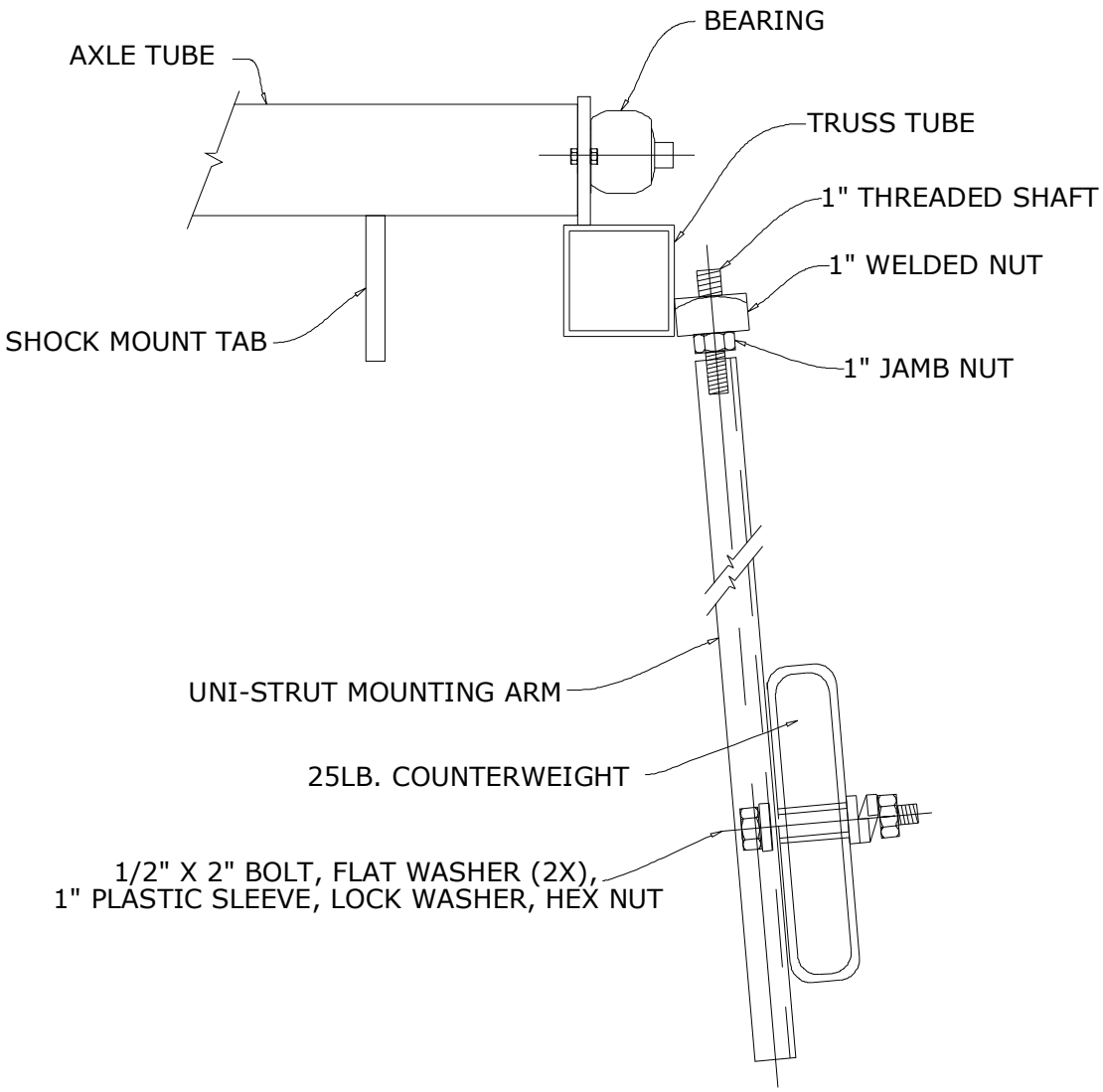


Diagram 11

- Mount Counterweight Arm to north end of Truss Tube. **See Diagram 11**. You must get full thread penetration into weld nut.
- Position Arm with the open face of the channel pointing towards Pole.
- Tighten the Jamb Nut (400 foot-pounds maximum).
- Mount Counterweight to the outside of Uni-strut Mounting Arm using ½"x 2" Bolt, Flat Washers, 1" Pipe Sleeve, Lock Washer and Hex Nut.
- Without the counterweight, the Track Rack™ is likely to be top heavy and tip to one side or the other. It should always be a pendulum and hang and return to horizontal. The Counterweight moves the center of gravity below the Bearing point. The lower the Counterweight, the more stable your Tracker will be.

NOTE: If the Counterweight is too low. The Tracker will be slow to wake up in the morning and may not track to the east and west limits. At optimum adjustment, the Tracker should just touch the Bumper Bolt at the beginning and end of the day.

Step 12: Drive Canisters and Shadow Plate Installation: (Hardware needed: Canisters: (8x) 3/8" x 1 ¼" bolts, (16x) 3/8" flat washers, (8x) 3/8" nylock nuts; Shadow plates: (8x) ¼"-20 x 3/8" round screws, (8x) ¼" fender washers, (8x) ¼" lock washers, (9x) UV zip ties)

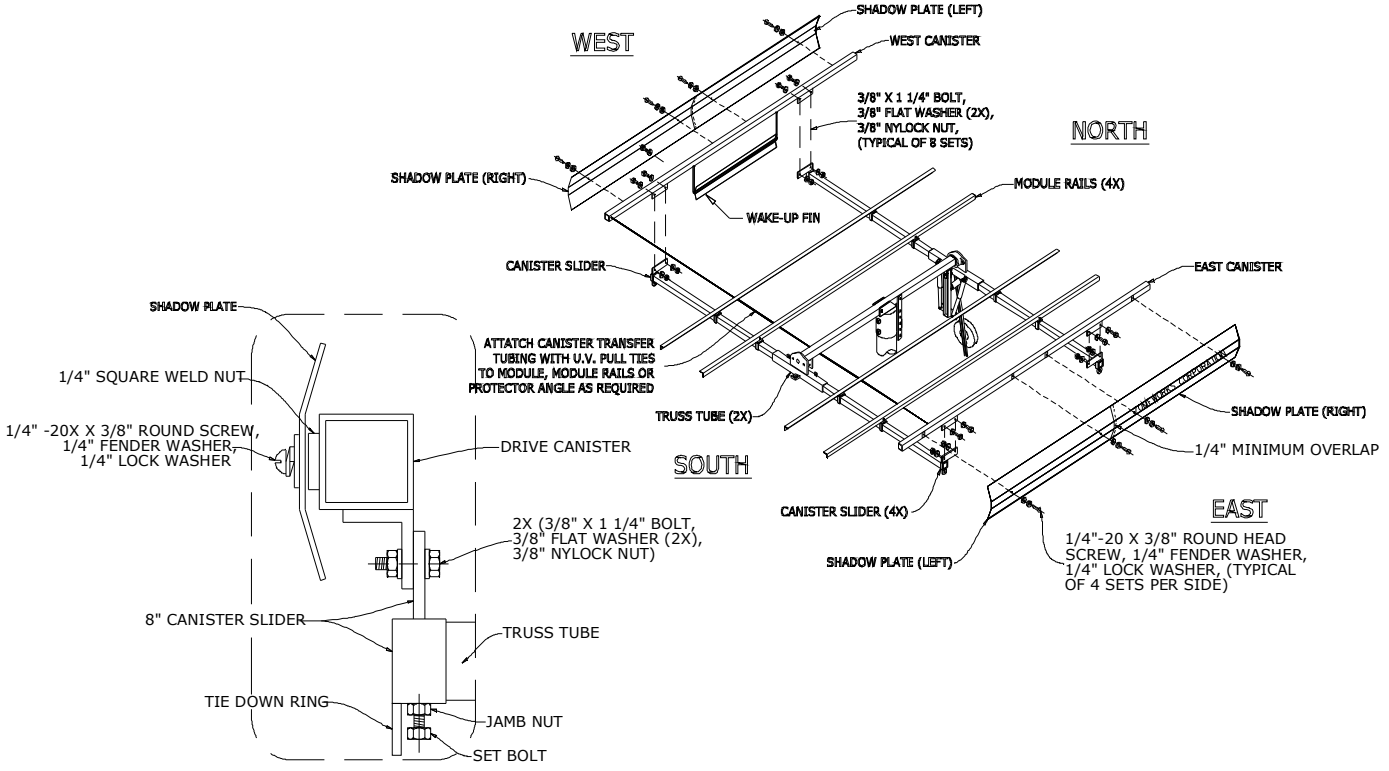


Diagram 12A **Diagram 12B**

- **IMPORTANT – Do not pinch Copper Transfer Tube while unpacking.**
- Carefully unpack Canister set and separate Canisters. The Copper Transfer Tube always installs on the lower, south end of the Tracker, on the north end only when the tracker installation is below the equator.
- **BE CAREFUL NOT TO DAMAGE THE COPPER TUBE.**
- Rotate Track Rack™ to the horizontal position.
- The Western Canister has a morning Wake-up Fin, which hangs below the main canister. This Fin **"Sees"** the early morning sun, heats quickly, and drives the Freon to the East Canister, tipping the Rack to the east. For best wake up performance, this Fin must not be shaded from early morning sun.
- Bolt the Western Canister to Canister Sliders as shown in **Diagram 12A** using the 3/8" bolts, flat washers, and nylock nuts.
- Install one pair of Shadow Plates to West Canister as shown in **Diagram 12A** using the ¼" screws, fender washers, and lock washers. As you face the Canister install Shadow Plate with Zomeworks Decal on right side, over lapping a minimum of ¼" at center.
  NOTE: The tracker will **NOT** function **WITHOUT** the Shadow Plates.
- Rotate Track Rack™ to the horizontal position.
- Bolt the Eastern Canister to Canister Sliders as shown in **Diagram 12A**.
- Install protector angle (Provided only if required).
- Attach Copper Transfer Tube to Modules, Module Rails and/or Protector Angle using the U.V. zip ties.

YOU MUST PLACE THE COPPER TRANSFER TUBE UNDERNEATH MODULES AND RAILS, AND AVOID CRIMPING OR ANY OTHER MECHANICAL DAMAGE. ONCE THE COPPER TRANSFER TUBE HAS BEEN FASTENED IN PLACE WITH THE ZIP TIES REMOVE THE LOCKING BAR AND MOVE THE RACK THROUGH ITS RANGE OF MOTION, CHECKING TO

MAKE SURE THAT THE COPPER TRANSFER TUBE IS NEVER CRIMPED OR IMPACTED BY ANY OTHER PARTS OF THE RACK.

- Install second pair of Shadow Plates. **Remember:** Zomeworks decal on the right!

Step 13: Seasonal Adjustments and Final Instructions:

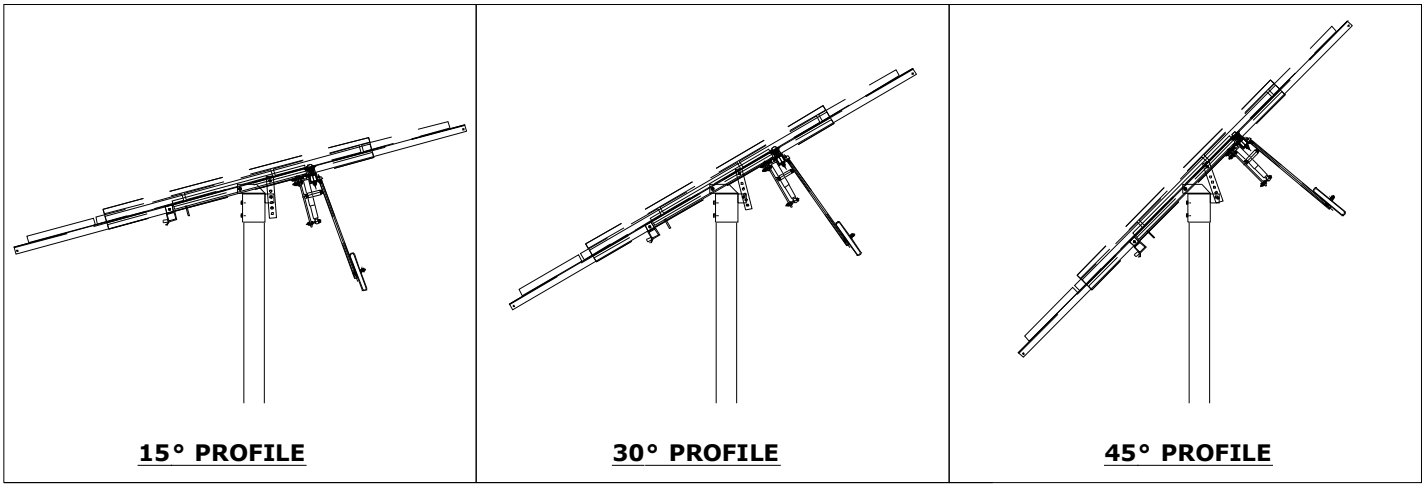


Diagram 13
Center: setting for site located at 30° latitude
Left: Summer setting for site located at 30° latitude
Right: Winter setting for site located at 30° latitude

- For maximum solar gain, adjust the angle of your Track Rack™ at least twice a year in spring and fall. Setting the Seasonal Adjustment Arm so the Track Rack™ faces the mid-morning sun. Your settings will vary according to your latitude. Your array should be more inclined in the winter and more flat in the summer.
- If you don't want to adjust the rack's position seasonally, the best setting for year-round output is an angle roughly equal to the latitude of the site, measured from the horizontal position (see **Diagram 13**).
- To optimize output year-round, adjust the rack's inclination twice per year, in spring and fall for example. In spring, set the array to an angle equal to the site's latitude-15°; in the fall, set the array to an angle equal to the site's latitude+15° (see **Diagram 13**).

- **GO BACK AND MAKE SURE ALL BOLTS AND SCREWS ARE TIGHTENED.**
- **THIS INCLUDES TIGHTENING THE SET SCREWS ON THE BEARINGS WITH THE ALLEN WRENCH PROVIDED.**
- **BE CAREFUL NOT TO STRIP THE SET SCREW.**

Step 14:

Install Storm collar: (Hardware needed (located in hardware bag in gimbal box): (2x) ½" x 2 ½" hex bolts, (2x) ½" lock washers, (2x) ½" hex nuts), also needed: Ratchet straps or strong ropes (not provided)

- Bolt the Storm collar low around the pole, using the two ½" x 2 1/2" hex bolts, lock washers, and hex nuts. Tighten the bolts to stabilize the collar around the pole. The eyelets on the collar should face East and West (**See Diagram 14**).
- Tie ropes, ratchet straps, or tie-downs between the eyelets underneath the four canister sliders and the eyelets on the Storm Collar. This will help to stabilize the rack during periods of high winds.

NOTE: The rack should be placed in a horizontal position and tied down to the Storm Collar during extreme weather events.

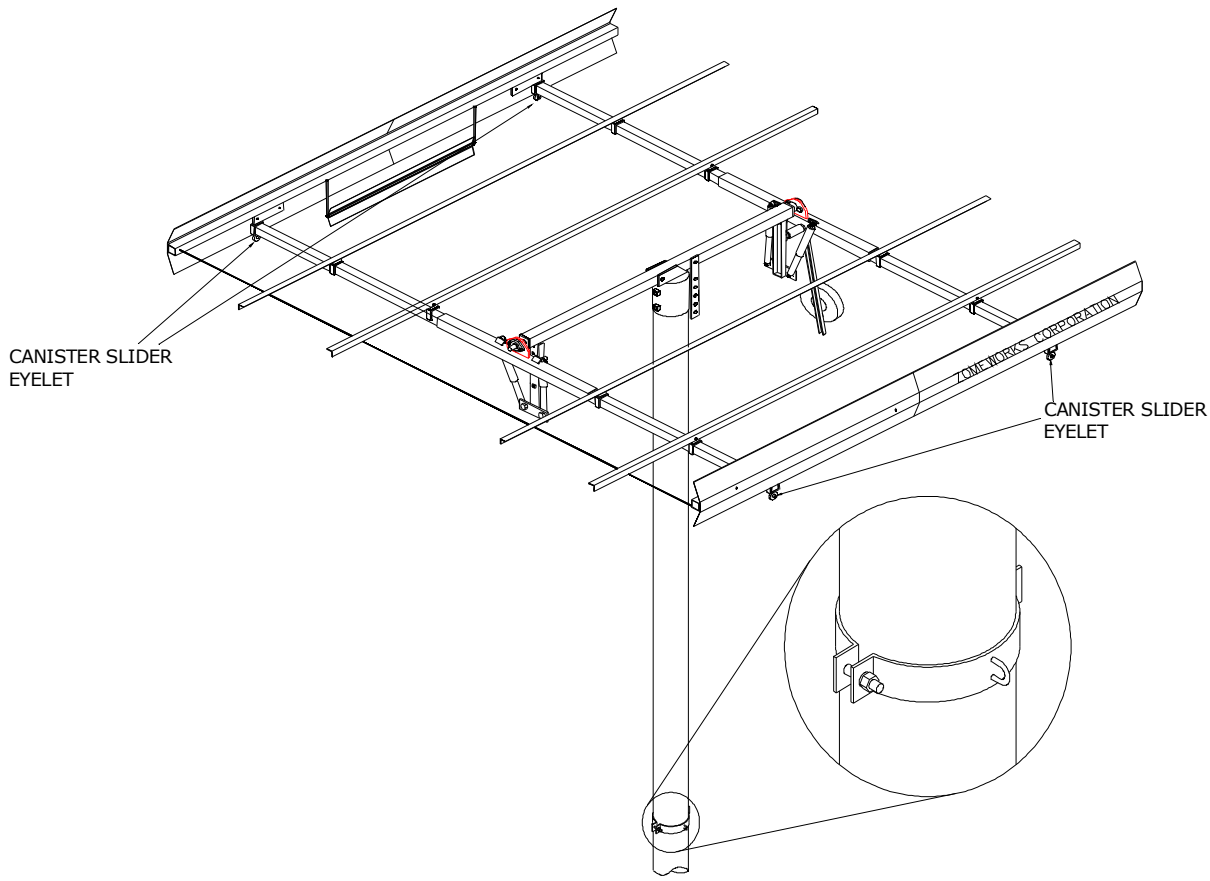


Diagram 14

F-SERIES TRACKER TROUBLESHOOTING

TRACKER SITS LEVEL, LEANS TO ONE SIDE, OR DOES NOT MOVE:

1. Manually move tracker through its entire range of motion. Check for any mechanical interference and correct if necessary. You must grease the bearings regularly, at least twice a year (See warranty).
2. Check shadow plates for proper installation. The tracker will not work without them.
3. Be sure the Track Rack™ is pointing south (in the Northern Hemisphere) and the copper transfer tube is mounted on the south end of the frame, and is not crimped in any way.
4. Check for any wiring which may stop the Track Rack™ from turning freely. Check wiring and junction boxes for equal balancing on the east and west sides.
5. A shock absorber may be sticking. On a calm sunny day remove shocks at the Truss Tubes. If it tracks without the shocks, call **ZOMEWORKS.** The shock absorbers may be defective. (Shocks are warranted for 2 years).
6. The Track Rack™ moves when sunlight warms one canister which then forces liquid into the other canister. You may simulate the sunlight's effect by warming the lower canister with a hair dryer or carefully with a hand torch (Alternately, you may also cool the upper canister with wet towels or a cold water spray). Within 10 minutes, the Tracker should begin to rotate towards the cooler canister. If the Track Rack™ does not move, and you have checked the assembly for movement, the Tracker may have lost its charge. Call your dealer or your **ZOMEWORKS** representative.

TRACKER IS SLOW TO WAKE UP:

1. Check that Track Rack™ is getting full early morning sun shining underneath the tracker. The wake up fin must see the sun.
2. Check modules and electrical junction boxes for equal balancing on the east and west sides.
3. Check bearings for lubrication so the tracker moves freely.
   NOTE: If the Track Rack™ is installed in a corrosive climate, check the axle and bearings frequently for rust or corrosion; you will need to grease your Track Rack™ bearings 2 - 3 times per year. Coating the axle and bearings with grease will help prevent corrosion.
4. The shock absorbers may be sticking when collapsed or extended. Remove the shock bolt at the truss tube and check the shock motion for "stick". If the tracker "wakes up" without the shocks, the shocks are likely defective. Contact your dealer or **ZOMEWORKS** for replacement. Do not leave the tracker defenseless with out shocks; a strong wind could damage it. Install the Locking Bar, and tie it down using the rings attached to the underside of the canister sliders.

TRACKER DOES NOT HIT THE BUMPER STOPS:

1. The tracker is very effective even if it doesn't track to the bumper limits. The bumper stops are set for approximately 90° of rotation.
2. To increase the rotation, raise the counterweight. But remember; raising the counterweight will make the tracker less stable in the wind. For optimum performance you must balance rotation against stability. If the tracker rotates further to one side than the other, the tracker may be out of balance, refer to **Step 8**, **Page 13** of the instructions and rebalance the rack.

IMPORTANT NOTES TO REMEMBER:

1. The Track Rack™ must be assembled according to the instructions.
2. The Track Rack™ should move smoothly through the entire range of motion, with the only drag supplied by the shock absorbers. If friction or interference is noted, check assembly against the instructions and make required corrections.
3. The photovoltaic modules should be centered and mounted evenly as per the instructions. The canisters on each side of a Track Rack™ should not be "shaded" by the photovoltaic modules. **YOU MUST MAINTAIN AT LEAST A 2" MINIMUM CLEARANCE**, check assembly instructions and see **Diagram 6B**.
4. Counterweight must be properly adjusted per instructions.
5. The Track Rack™ must be in a location that maintains a clear line-of-site to the sun throughout the day, and during different seasons. Remember that the sun's position in the sky changes from season to season.
6. To maintain optimum sun exposure you may want to adjust your Track Rack™ for the winter & summer seasons. Use the seasonal adjustment arm. This will vary with your location's latitude.
7. A shadow from structures, trees or other objects that may miss the Tracker in the summer may fall across it in the winter, preventing its operation.

MAINTENANCE:

1. Lubricate the greaseable bearings **TWICE A YEAR**.

2. Paint touch up will be necessary to prevent rusting. Sand off all rust prior to painting. Use a high-quality enamel or Rustoleum™.

3. If the Track Rack™ is installed in a corrosive climate, check the axle and bearings frequently for rust or corrosion; you may need to grease the bearings more frequently than twice yearly.

4. Check and tighten the shock bolts and shock arm bracket bolts are **AT LEAST TWICE A YEAR**. A tracker is defenseless against the wind without functioning shock absorbers. Check the bearings and mounting bolts. A bad bearing mount can cause further damage to the tracker. Check and tighten the main axle and seasonal adjustment bolts. Loose bolts will increase wear and the potential for failure.

5. A non-petroleum based lubricant may be used on the shock bolts that go through the shock absorber. A polymer or silicone based lubricant would suffice. You may call Zomeworks Technical Support for questions regarding this lubricant.

6. Visually inspect the Pivot bolt, which holds the axle assembly on top of the gimbal, for wear of either the bolt or the hole through the axle at least once per year. Tighten the nut if necessary.

PROPER MAINTENANCE IS THE RESPONSIBILITY OF THE CUSTOMER.
FAILURE TO FOLLOW THESE INSTRUCTIONS IS A LIABILITY.

WIND:

Trackers should be tied down to a fixed position during extreme wind conditions (50mph or above). The canister sliders (4 ea.) are fitted with rings for attaching ropes. The ropes can be tied to the storm collar or to another fixed object.

COLD:

In cold weather the hydraulic fluid in the shock absorber becomes stiff. The shocks won't move easily and the unit will not track effectively. In these conditions it is best to tie the tracker in a noon day position.

IMPORTANT FINAL NOTE:

YOUR ZOMEWORKS TRACK RACK™ WILL MOVE IN THE WIND, MUCH AS TREES DO. THIS MOTION IS EXPECTED AND DOES NOT HARM THE TRACKER OR ITS PERFORMANCE. UNLESS THE TRACKER IS BLOWN FAR OFF THE SUN AND STAYS THERE, THE ENERGY GAIN IS HARDLY AFFECTED. OVERALL, TRACK RACKS™ FAR EXCEED THE PERFORMANCE OF A FIXED ARRAY.

IF HIGH WINDS ARE EXPECTED AS IN A HURRICANE, SECURE THE TRACKER AS HORIZONTAL AS POSSIBLE AND TIE DOWN.

ZOMEWORKS TRACK RACK™

Limited Warranty

Zomeworks Corporation guarantees, to the original owner, its Track Rack™ passive solar tracker and fixed racks against defects in materials and workmanship for TEN YEARS from date of purchase. Shock absorbers and Bearings are warranted against defects in materials and workmanship for TWO YEARS from date of purchase. This warranty is limited to the repair or replacement of the rack in compliance with the instructions provided by Zomeworks.

Some problems can be solved with a simple on site adjustment. Please contact Zomeworks Corporation at the address and phone number below before returning your product. You must have an RMA number to return the product for warranty repair. If possible, return only the parts that are defective or damaged. Reuse your original packing material, if it's available, or call the factory for further instructions.

IT IS THE OWNER'S RESPONSIBILITY TO CHECK FOR DAMAGED OR MISSING PARTS IMMEDIATELY UPON RECEIPT OF THE TRACK RACK™. Freight claims are time sensitive and require immediate notice. If the packaging is damaged, write this on the receipt (freight bill) and have the driver initial this. Use this information to contact your freight carrier when damage is noticed.

Upon receipt of a defective part(s), freight pre-paid, Zomeworks will determine whether the defect was caused in manufacturing. If so, the part(s) will be repaired or replaced at no charge to the customer, and will be returned freight pre-paid. If the damage is not a manufacturing defect, the factory will contact the customer before any repairs are made. Original owners should contact their dealer if immediate replacement part(s) are needed. Individuals contacting Zomeworks Corporation desiring immediate replacement part will be required to provide Zomeworks Corporation with a valid credit card number to be charged for the replacement part(s). Zomeworks Corporation will credit the valid credit card upon receipt of the warranted returned part(s) from the individual.

This warranty does not cover rusting of the steel due to a corrosive environment (such as salt air). Standard Track Racks™ are painted mild steel and will require maintenance. It is the owner's responsibility to maintain the paint on the Track Rack™ in order to protect the steel against corrosion. For corrosive environments, Zomeworks Corporation can manufacture the Track Racks™ with an epoxy primer.

Limitations on Warranty

The above ten-year and two-year warranties are the only warranties and remedies provided by Zomeworks to user. Zomeworks disclaims all implied warranties of merchantability and fitness. In no event shall Zomeworks be liable for consequential or incidental losses or damages under any theory of liability, except to the extent that this limitation is found to be unenforceable under applicable state law. Some states do not allow the exclusion or limitation of incidental or consequential damages, so this exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

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