

THE WATTSUN™ AZIMUTH SOLAR TRACKER INSTALLATION GUIDE

Guide for All Azimuth Solar Trackers

Congratulations, you have purchased the finest solar tracker available. With proper installation, your tracker will provide years of trouble-free service while maximizing your solar power production.

Your tracker may include one of the following options (check your packing slip):

- **Stainless Steel Hardware** - recommended for high humidity and salt laden environments.
- **Dual Axis Tracking** - This option includes a dual axis tracker controller and a motorized linear actuator for automatic elevation adjustment.

The tracker comes complete with all the hardware necessary for assembly and installation of the PV array. The Wattsun™ Tracker requires a length of schedule 40 steel pipe for use as the pipe mast. Specifications for the pipe mast can be found on the data sheet for this particular tracker. All array wiring, electrical junction boxes, etc. must be provided by installer.

Dual axis versions only: **Do not** unscrew the inner tube of the elevation actuator, as this will destroy the factory pre-set mechanical upper and lower limit switch settings.

WARNING:

If the Wattsun™ Azimuth Solar Tracker is not installed to manufacturer's specifications, such failure to properly install unit may cause tracker malfunction and or serious bodily injury or death. This tracker moves, therefore the tracker should be situated away from anybody or anything that may come in contact with it as it moves.

KEEP CHILDREN AWAY FROM TRACKER AT ALL TIMES.

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ASSEMBLY INSTRUCTIONS

① *Installation of tracker pipe mast and foundation (in ground mounting):*

1) Choose an optimal solar location to install the PV array. Location should be as free from solar obstructions as reasonably possible. (Keep in mind that over a period of time, trees, etc. may grow enough to obscure the PV array from the sun.)

2) Dig an appropriate size hole for your tracker's foundation using a shovel, auger, or back-hoe.

WARNING: WINDY CONDITIONS CAN EXERT EXTREME FORCES ON THE ARRAY, FOUNDATION, AND PIPE MAST OF YOUR TRACKER.

The variables which affect the design of the foundation include tracker size, pipe mast height, soil conditions, geographical location, and local building codes. *Due to the many variables, the foundation is best designed by a qualified professional.* A general rule of thumb is to have an equal amount of pipe underground as above the ground with a three foot diameter reinforced concrete foundation. If you are unsure about the size and type of foundation required, seek professional design assistance.

3) Use the appropriate length of schedule 40 pipe in order to leave the recommended pipe mast height protruding from ground (see spec. sheet for pipe mast height).

Note: If the recommended pipe mast height is exceeded, it may be necessary to telescope a larger diameter pipe in the lower portion in order to withstand the increased forces exerted during windy conditions.

4) Cut at least two pieces of re-bar (more with 8 module or larger trackers), at lengths equal to the full diameter of the foundation. Weld re-bar onto (or drill holes and insert re-bar into) the underground portion of the pipe so that the pieces of re-bar loosely form an 'x' pattern that remains parallel to the ground. (When tracker pipe mast is completely installed, the re-bar will be perpendicular to the pipe and parallel to the ground and will protrude radially into the concrete foundation.)

5) Set the pipe into the hole and pour concrete around the pipe until it completely fills the hole. Also pour concrete into the pipe to secure the re-bar inserted in the bottom portion of pipe. Make certain the pipe is vertically level and allow concrete to set for at least 24 hours. If filling entire pipe mast with concrete, leave at least one foot of hollow pipe at top for azimuth drive assembly clearance.

② *Install the Azimuth gear drive assembly on top of pipe mast.*

For northern hemisphere installations, point the gusset located on the underside of the drive to 'true north' and tighten the three set bolts to secure tracker to pipe mast. These bolts should be tightened so that they securely dig into the pipe mast.

For southern hemisphere locations, point the gusset located on the underside of the drive to 'true south' and tighten the three set bolts to secure tracker to pipe mast. These bolts should be tightened so that they securely dig into the pipe mast.

**True north and south differs from magnetic indication depending on geographical location. Locate 'magnetic north' or 'magnetic south' using a compass and adjust your tracker setting accordingly.*

For Installations in the Tropics Only:

The azimuth tracker works by first rotating the PV array about the pipe mast then tilting the array to the proper elevation angle. Therefore, for installations **near the equator** (north 10° latitude to south 10° latitude) it will be necessary to rotate the azimuth tracker 180° bi-yearly. (Depending upon the time of year, trackers in this region will find the sun anywhere from north, south, or directly overhead of its location, making this manual rotation necessary.) Trackers for this region will also incorporate a return direction switch which will also need to be set during the bi-yearly rotation.

For example, **at the equator** rotation of the tracker will need to occur on the first day of spring and the first day of fall. The array should be rotated to point north on March 21st, and rotated 180° to point south on September 23rd. The direction return switch is located at the bottom of the tracker controller and should be switched to lean in the rotational direction in which the sun sets.

To rotate the tracker on the pipe mast, loosen the three set bolts on the masthead of the *azimuth drive*, rotate the tracker and re-tighten. Marking the pipe mast for the two yearly positions will aid in adjustment. You must also leave sufficient output wire lengths from the array for this purpose.

❶ **Single axis model elevation adjustment bar assembly and seasonal adjustment**

6-SA) Install the elevation adjustment bar into the forks located on the rear of the *drive assembly* (see Figure A1). The elevation adjustment bar incorporates holes for manual adjustment of seasonal tilt. Each hole equals 10° of tilt angle. The first hole is 0° or horizontal.

Summer: Set at closest setting to latitude. (i.e. if latitude is 50°, set elevation adjustment bar in 6th hole, or 50°.)

Spring/Fall: Set at closest to latitude plus 15°.

Winter: Set at closest to latitude plus 30°.

❷ **Dual axis model elevation actuator assembly**

6-DA) Install the elevation actuator as shown in Figure A2. There are spacer nuts to center the eyelet end of the *elevation actuator* inside the forks.

7) Install the main east/west support tube (Figure B). First, insert and center (using a tape measure) the tube onto the lower half of the *azimuth drive channel*. Next, place the upper half of the azimuth drive channel on top of the tube, which 'sandwiches' the tube between the upper and lower parts of the azimuth drive channel. Finally, secure the azimuth drive channels and support tube together with the eight 3/8" bolts provided (which will now be labeled the *support tube assembly*). Be sure to use the washers and lock washers and tighten the bolts securely so that the tube is firmly bound between the upper and lower azimuth drive channels.

Note the azimuth drive channels will slightly overlap each other when fully secure.

8) Install the module mounting struts and angle support brackets onto the e/w support tube assembly (Figure C) using the U-bolts, washers and self locking nuts provided.

Note: If desired, the PV modules may be mounted to the struts at this time (prior to installation onto the support tube assembly), which will remove the difficulty of mounting each individual module to the struts while working above your head (see step #9). However, mounting the modules to the struts first will require more assistance in lifting and placing the heavier, assembled module unit onto the support tube assembly. For either application, the *web* of the module mounting struts must be oriented toward the outer ends of the

modules for strength.

First, place each module mounting strut onto the top of the support tube assembly (making sure each *web* is oriented toward the outer end of the modules - see Figure C). At the same time, the rectangular cut-out area of the angle support bracket should be placed onto the underside of the support tube assembly. Insert and loosely secure U-bolts: it may be helpful for module adjustment to tighten the U-bolts later. Next, bend each end of the angle support bracket upward to meet the *web* of the module mounting struts (see diagram). You will find that the holes on both the angle support bracket and the module mounting channel will line up. Insert bolts and loosely secure nuts. Once all mounting struts are loosely secured to the support tube assembly, place the *end cap channels* over the ends of the module mounting struts, tapping them into place (see general tracker configuration). Insert bolts and loosely tighten nuts. This whole assembly should be centered onto the elevation support tube.

9) Mount the modules onto the struts using the hardware provided (if not already done during step #8). The modules will mount by the four intermediate holes on the long sides of the module. Use the washers and lock washers provided.

10) Making sure the array is centered (mounted modules) **on the support tube assembly, securely tighten the U-bolts** so that they dig into the corners of the *e/w/* support tube. **Tighten all nuts and bolts thoroughly** which were intentionally left loose during assembly.

● **Tracker controller wiring and drive motor wiring:**

24 VOLT ARRAY DIRECT TRACKER CONTROLLER SPECIFICATIONS

Controller input power specifications:

24 Volt Mode: Input voltage range is 23 to 60 volts DC.

12 Volt Mode: Input voltage range is 11 to 60 volts DC.

(See below for switch position settings to select input voltage mode)

Do not connect the output wire harness to a power source. The output wires are the four wire cable on the right side of the controller box. Connecting any of these output wires to the PV array or a power source will cause permanent damage to the controller and void the warranty.

Power supply connection options:

The input power leads are the Red (pos) and Black (neg) wires in the two wire cable on the left hand side of the controller chassis.

Option # 1) Connecting the tracker controller directly to a 24 volt PV array:

The input power leads should be connected to a nominal 24 volt PV array. Typically, this will be the output of two 12 volt PV modules in series. The input voltage should never exceed 60 volts DC and will only operate when the input voltage is above 23 volts. The controller is shipped to operate in this mode from the factory.

The tracker controller will automatically adapt to whatever current is available from the PV array. If the PV array is only capable of producing small amounts of current (20 to 500 ma) the tracker controller will move the tracker in small increments. If the array is providing over .5 amps of current, the array will move in a smooth fashion.

The tracker will return to the east at first morning light when powered directly from the PV array:

The tracker will return east at first morning light. At sunrise, the tracker will begin to move east in small increments depending upon how much current flow is available from the PV array. As the current flow from the array increases the frequency of the movement will increase until the tracker moves in a continuous motion. Typical full east return should occur 15 minutes after sunrise.

Option #2) Connecting the tracker controller directly to the systems 12 or 24 volt battery bank:

The input power leads for the controller may be connected directly to the main 12 or 24 volt battery bank. **If the installation is a 12 volt system, connection to the main battery bank is required.** If the controller is wired directly to a main battery bank, the positive lead running from the battery bank must be fused at the battery bank with a 5 amp fuse.

Failure to fuse the input power wire at the battery bank may create a potential fire hazard.

When connecting the controller to a 12 volt battery bank, the voltage selector toggle switch inside the controller chassis must be set to the middle (12 volt) position. The controller is shipped from the factory with the switch set in the 24 volt position. The switch is a three position toggle with the following selections:

- 1) 24 volt power connection, array direct or main 24 volt battery connection: **All the way up towards the shade pole.**
- 2) 12 volt main battery bank connection (Fuse at battery bank): **Middle position.**
- 3) Freeze tracker position: **All the way down.**

East return will occur at sunset when powered directly from a main battery bank. Although the tracker will be facing east at sunrise there will be little energy gained from this approach over the array direct method of powering the controller since it takes so little time to return east in the morning.

● **General Operating Functions of Tracker Controller:**

The controller will mount on the east side of the PV array with the clamp provided. The optimal location for the tracker controller is the NE corner of the array (see diagram). The controller will clamp to the edge of the PV modules with the aluminum channel clamp attached to the controller.

The controller is equipped with a 5 amp automotive spade type fuse (ATO) inside the controller chassis.

The controller outputs are short circuit protected and will limit the output current to 3 amps.

Also incorporated inside controller chassis is a sensitivity adjustment potentiometer. This is a single-turn pot, clock-wise rotation equals greater sensitivity. This adjustment is factory pre-set and should only be adjusted by qualified personnel.

On Dual axis versions: The controller prioritizes the azimuth (eastwest) axis. If the azimuth axis is not on track, the elevation axis will not function. Only when the azimuth axis has locked onto the sun will the elevation axis adjust.

See controller wiring diagram and mounting location on last page.

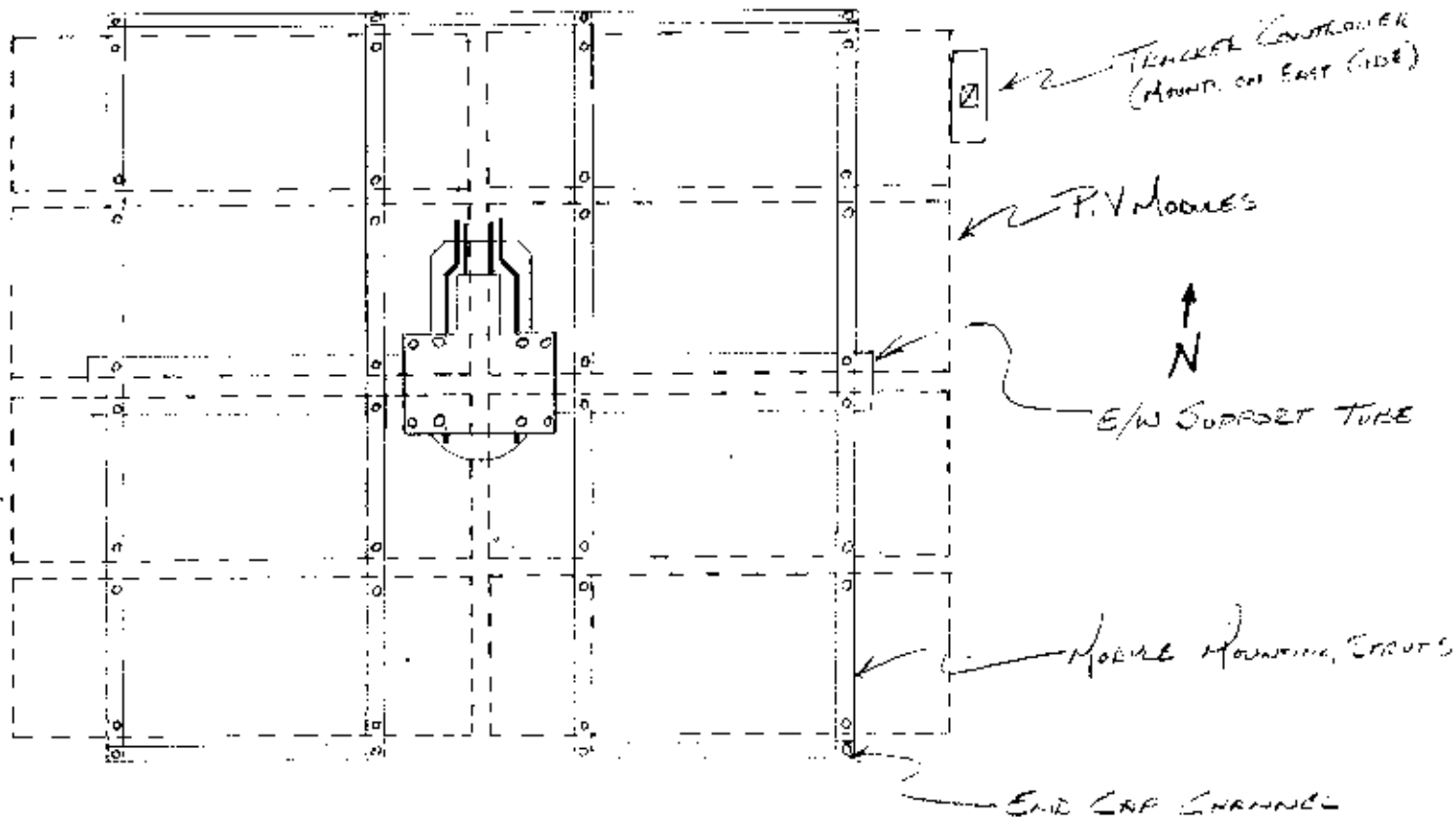
Once power is connected, the tracker should begin to move and track the sun. Manipulate the tracker to its extreme range of motion by covering each sun sensor independently with black electrical tape to make sure that all wire service loops are long enough and that the wires are free from all pivot points. Failure to move the tracker to all its extreme positions may mean that the tracker will bind and cause a fuse to blow at a later time. Please take the time now to check for free movement in all tracker positions.

Periodic Maintenance

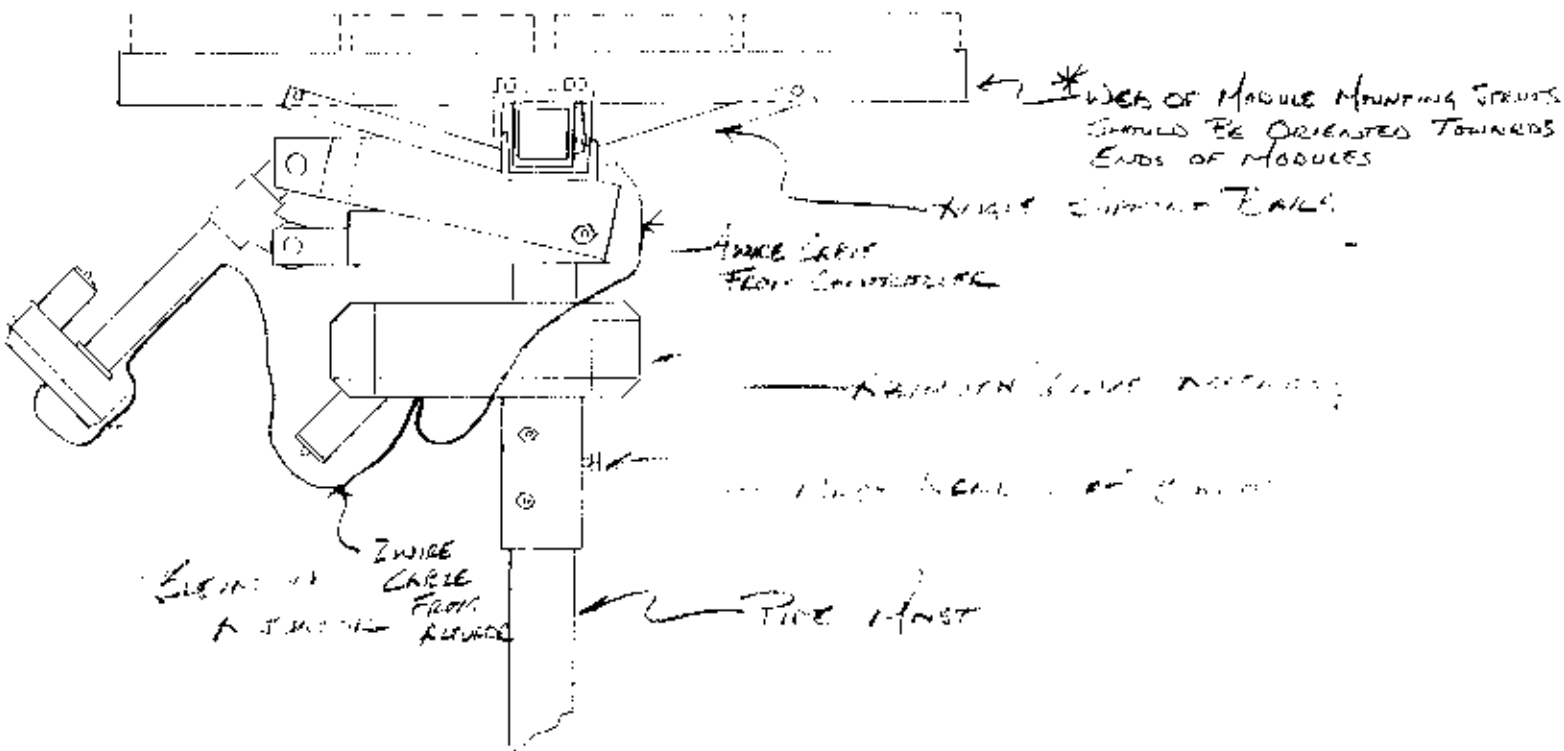
Grease main gear teeth of the azimuth drive annually with automotive wheel bearing grease. The grease zerk on the main gear shaft bearing should receive 4-6 pumps of lithium-base general purpose chassis grease from a grease gun on a yearly basis as well. Inspect all bolts for tightness annually.

GENERAL TRACKER CONFIGURATION

ARRAY TOP VIEW 2 ROW TRACKERS

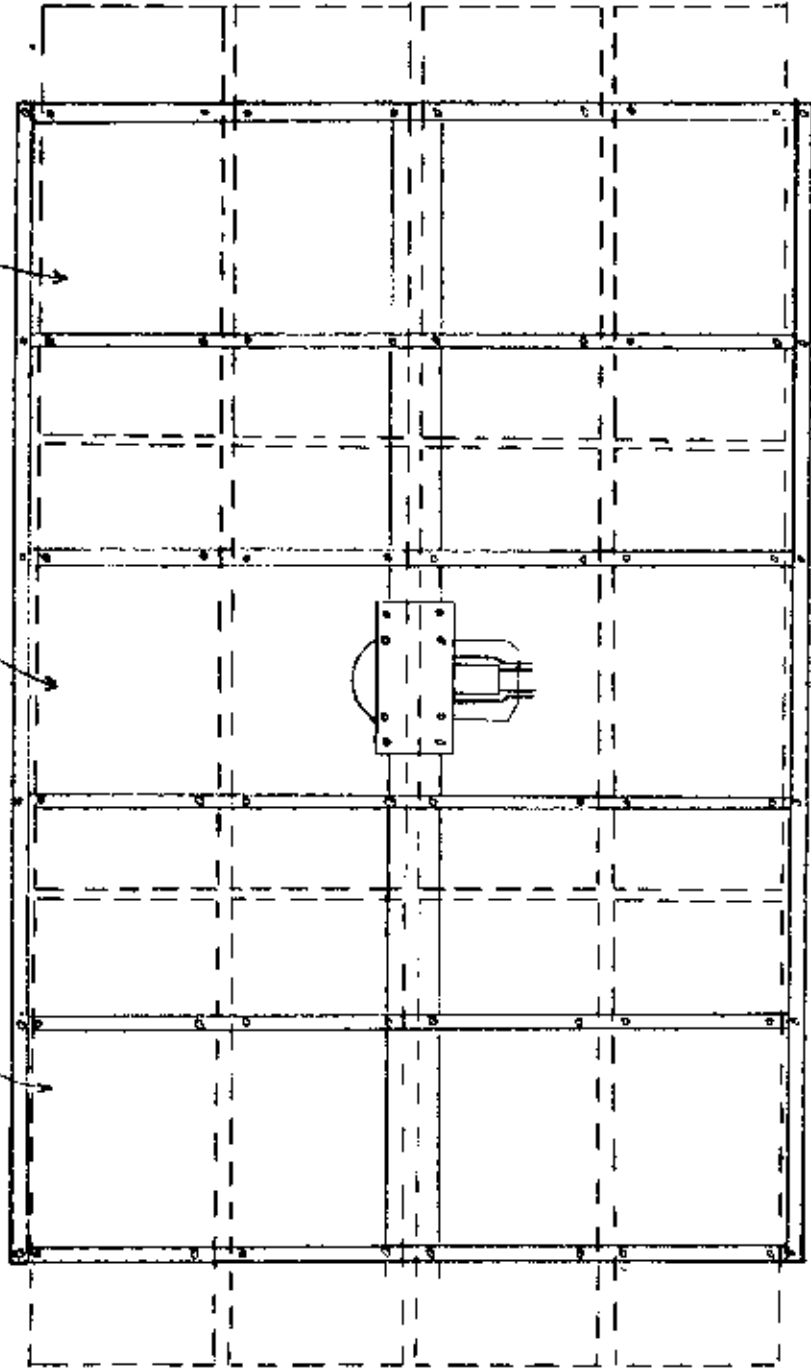


ARRAY - WEST VIEW



3 Row Tracker
CONFIGURATION

P.V. MODULES

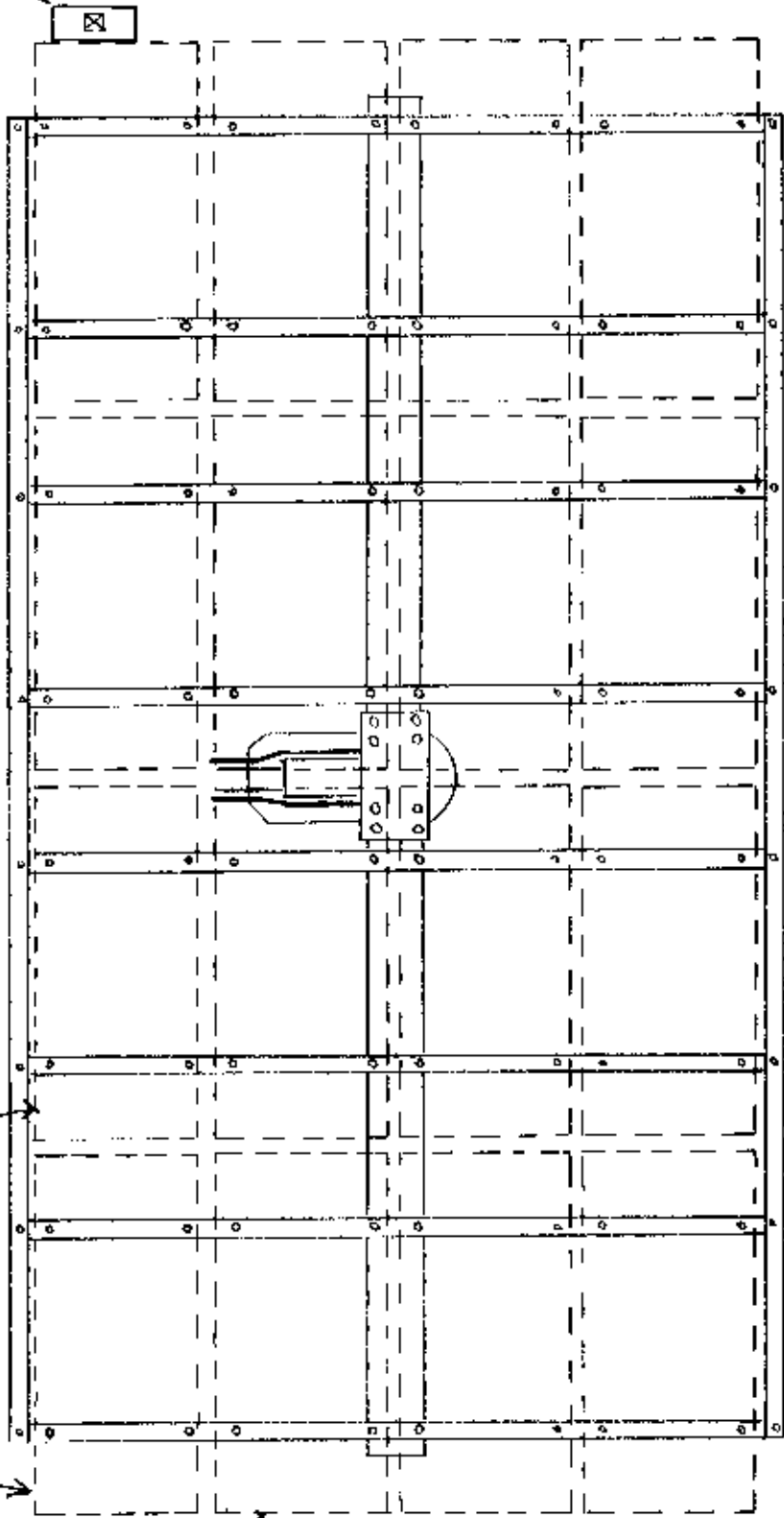


4 Row TRACKER CONFIGURATION

P.V. MODULES

CONTROLLER
MOUNTS ON
EAST EDGE

← N



* Mount WEBS
OF MODULE STRIPS
TOWARDS OUTER
EDGE OF
MODULES AS
SHOWN

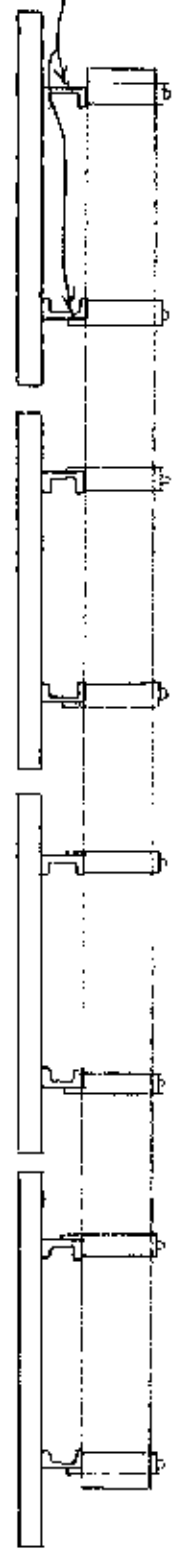


Figure A.2

Dual Axis Versions

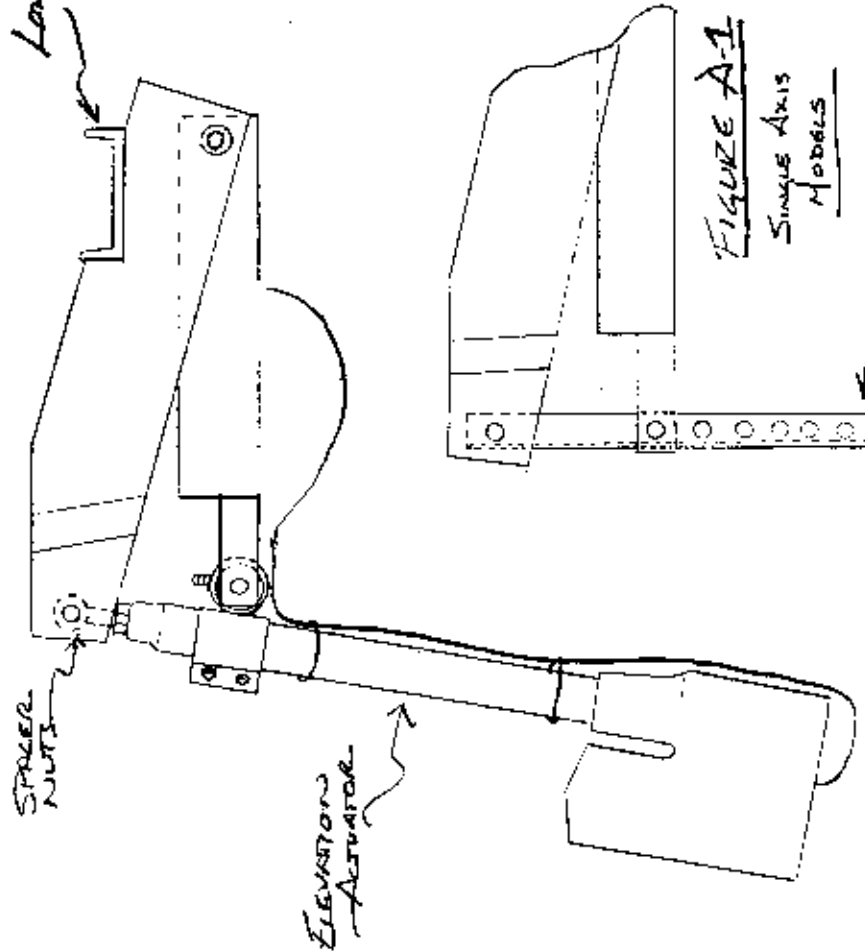


FIGURE A-1

Single Axis Models

ELEVATION ADJUSTMENT BAR

FIGURE B

EAST/WEST SUPPORT TUBE CLAMP ASSEMBLY

NOTE: CLAMP CHANNELS WILL OVERLAP WHEN SECURED

LOWER ARMOUNT DRIVE CHANNEL

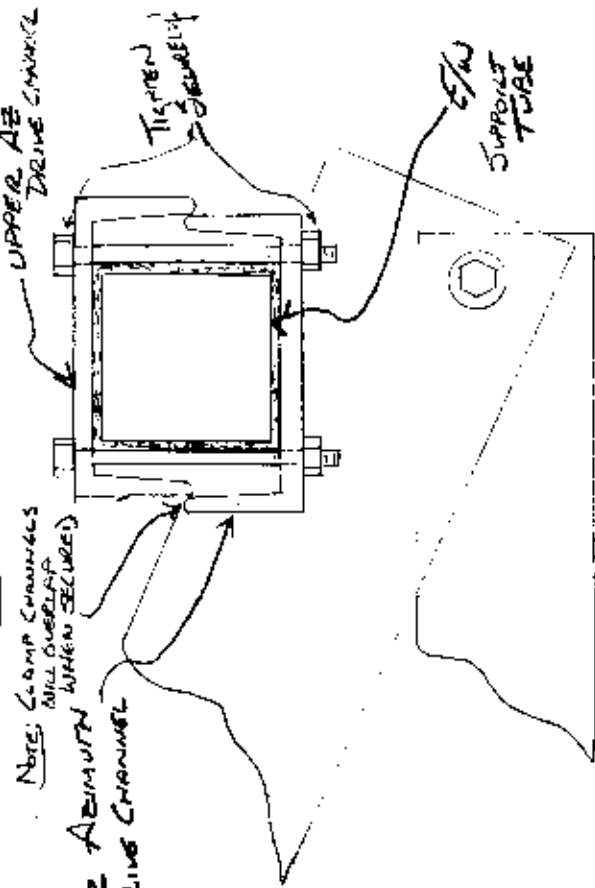
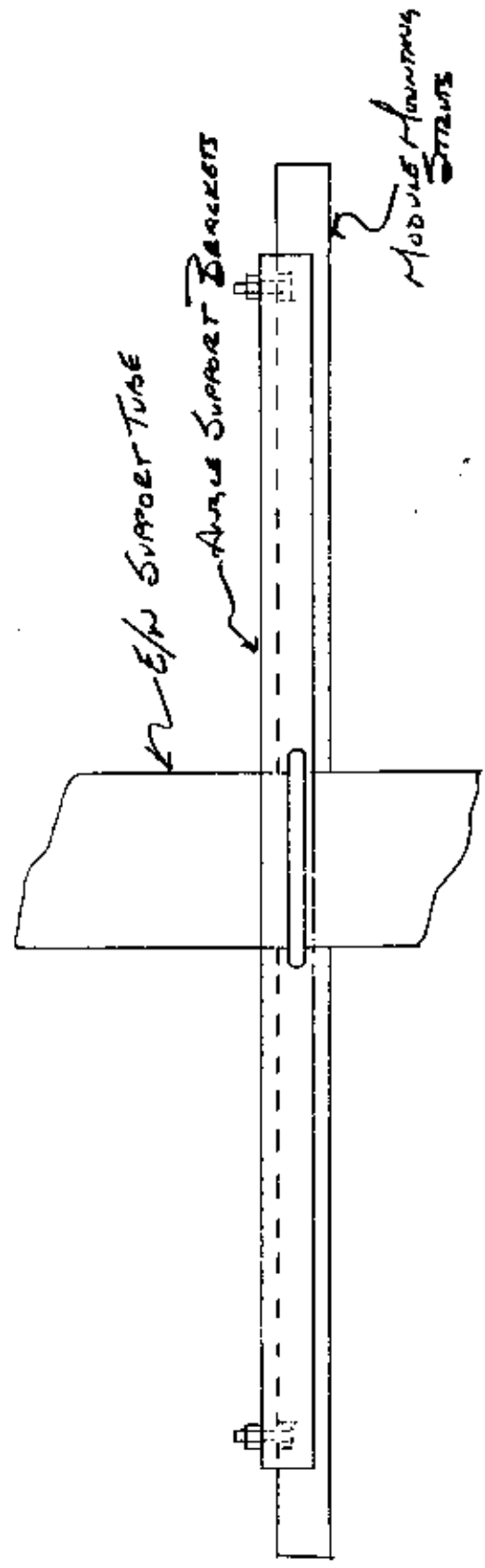
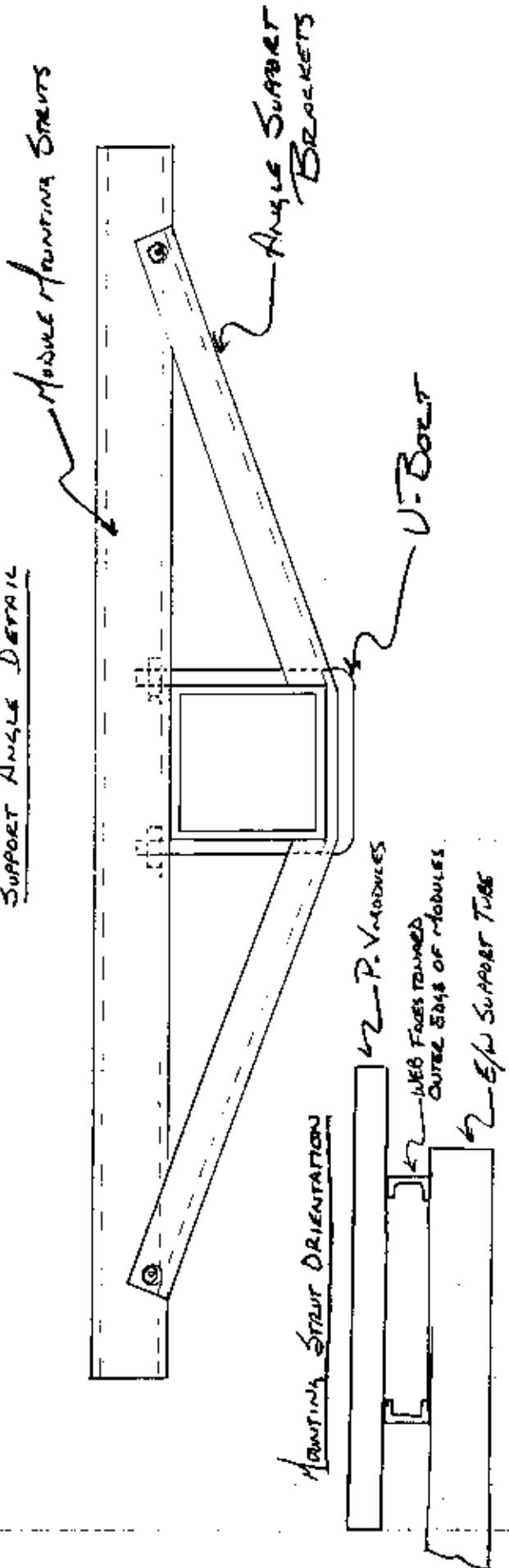
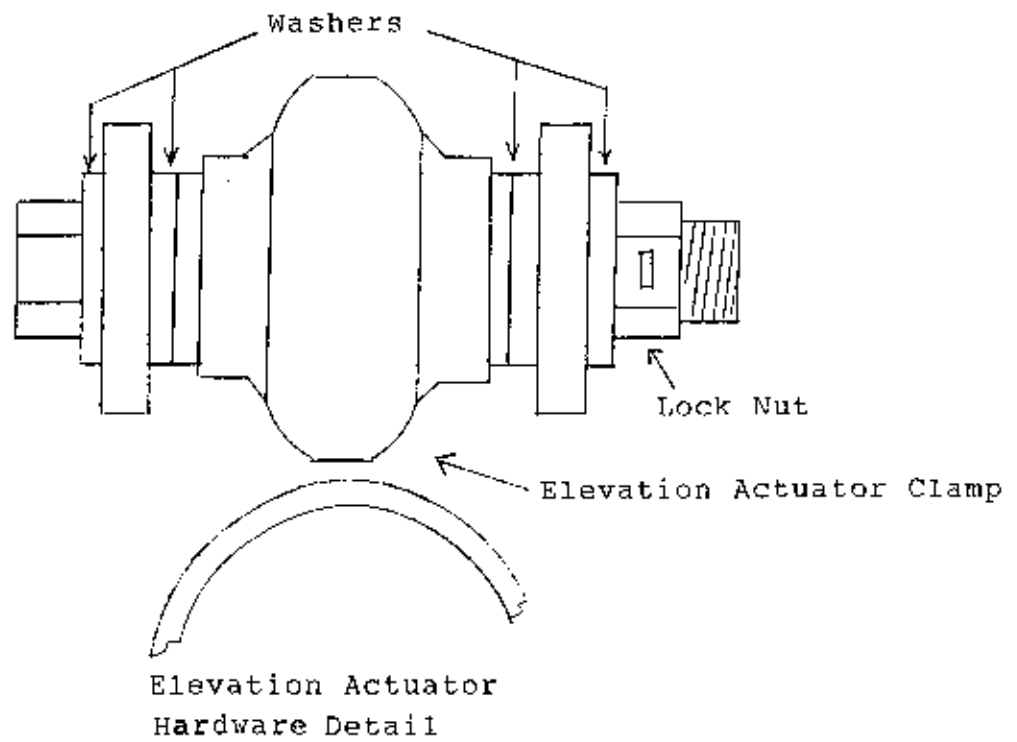
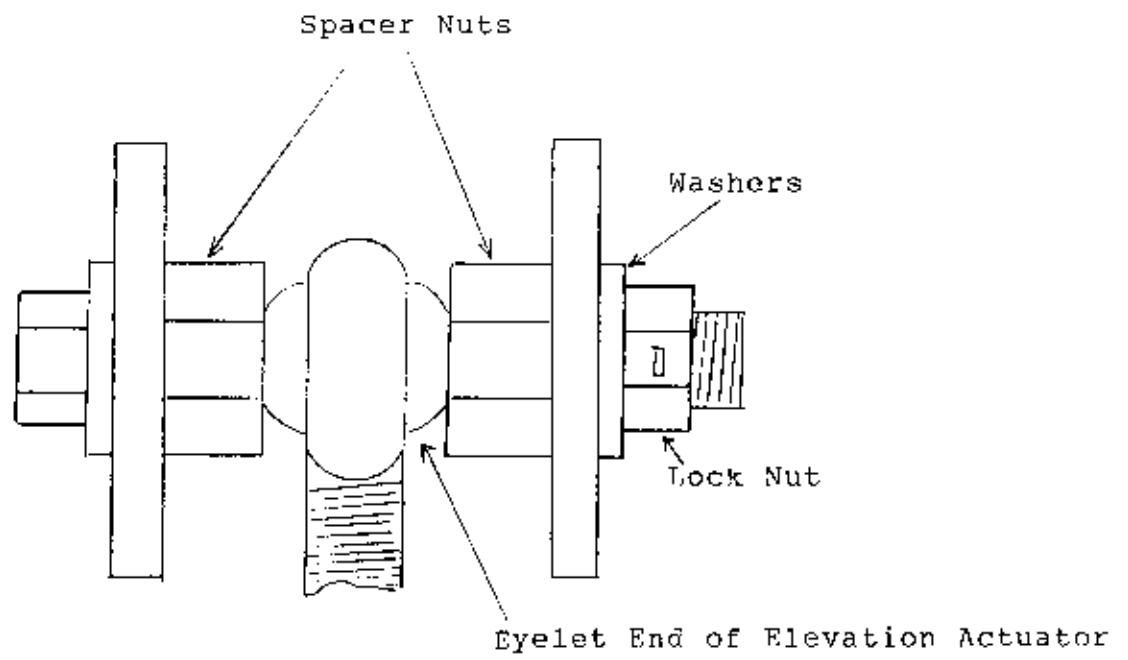


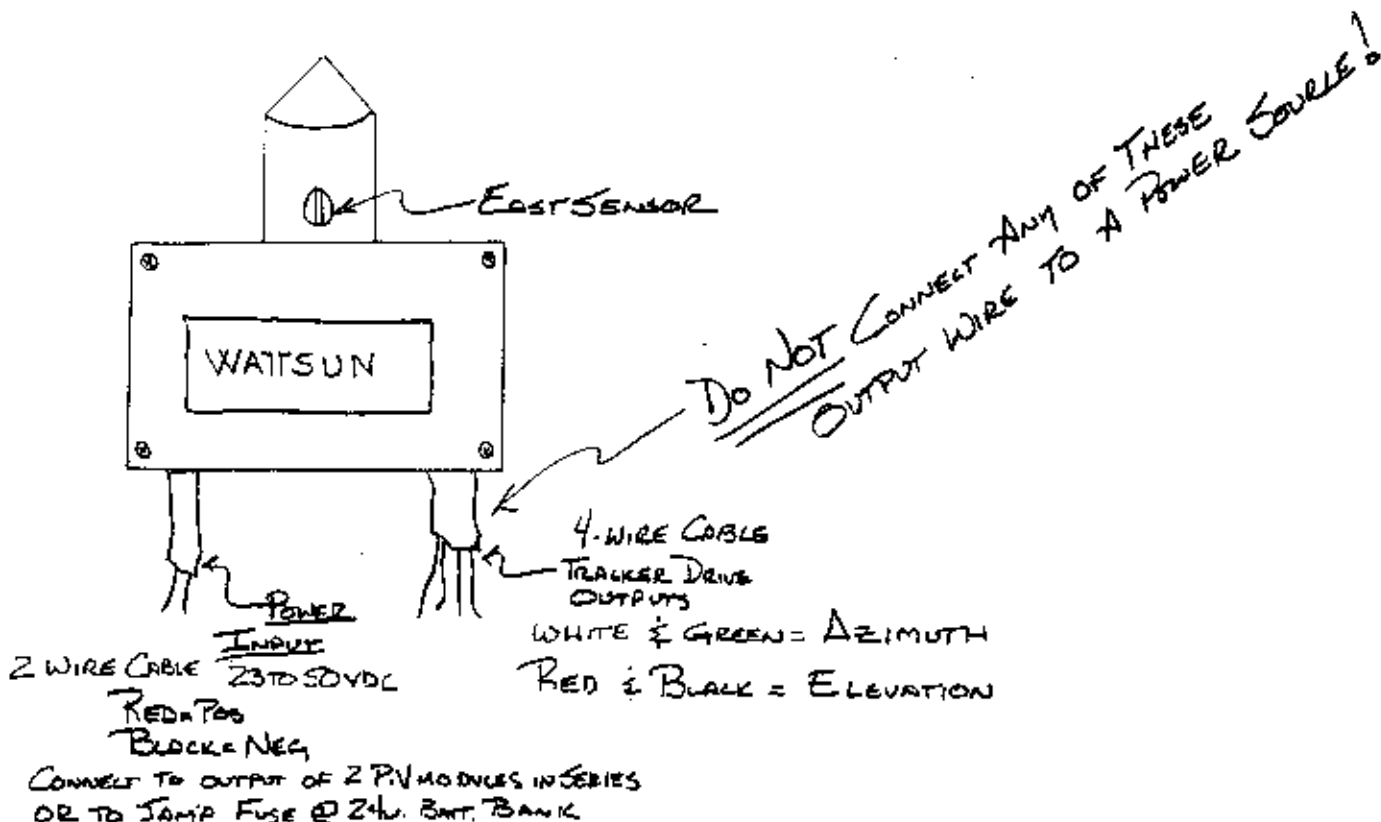
FIGURE C

SUPPORT ANGLE DETAIL





Tracker Controller Wiring Diagram



AZIMUTH DRIVE TERMINAL STRIP WIRING DIAGRAM

