INSTRUCTIONS FOR INSTALLATION OF MANUAL TRACKER FOR SOLAR PHOTOVOLTAIC PANELS APPROX AREA 6 SQ.METERS- FOR SOLAR WATER PUMPING SYSTEMS- INCLUDING DUAL PUMP SYSTEMS- MODEL MTS-06-01

INDEX

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1. INTRODUCTION

Solar PV energy depends on sunlight and the angle of incidence of the solar light on the panel surface on earth.

Sun path varies every day depending on season, day and time of the year and other variations in space of the earth's rotation around the axis of orbit around the sun.

If the solar panel surface is always aligned such that the angle of incidence of the sun light path is always perpendicular to the panel's surface.

The Photovoltaic energy capture on any average day thus depends on the season and the orientation of the panel surface.

The gains in energy by tracking of the array are much more for a solar direct system, such as solar water pumping or Photovoltaic Grid connection-where no battery is used.

There are 2 major types of solar tracking mechanism.

i) Dual Axis
ii) Single Axis

Dual Axis tracking, tries to achieve both north south tracking, as well as east west axis. Single axis tracking systems, The North south axis is fixed, whereas the tracking is achieved only in East West axis.

It is well known and established that for a fixed tilt Solar PV array-tilted at angle equal to latitude-gives maximum annual average energy yield. Keeping this principal in mind, the manual single axis tracker is configured accordingly.

The 5 step single axis manual can achieve as much as approx 20% more energy than a fixed tilt system. Such manual tilting operation 5 times a day can thus increase the water output for the system.

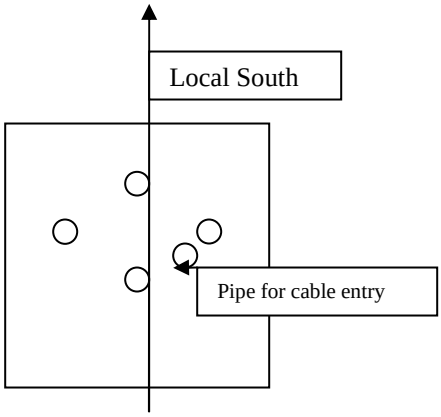
2. SPECIFICATIONS FOR MANUAL TRACKER:

s/n	Parameter	Specifications	Remarks
1	Array surface area	Max 06 sq.meters	Surface area-including 10 mm gaps between panels.
2	Static weight array	Max 90 kgs.	
3	Type	Fixed tilt single axis	Tracking East west axis
4	North South Tilt angle adjustment	15-27 deg to Horizontal-adjustable.	Other angles on request-max range 7 to 30 deg to Horizontal
5	East West Tracking range	-46 deg 0 + 46 deg-seen from front facing Handle	Wide range
6	Number of steps	5 positions Each step Approx 23 deg apart.	Morning-Mid-Morning-Afternoon, Mid afternoon, evening.
7	Locking of each step position.	Positive Locking bolt- & wing nut	
8	Design wind speed	50 m/s	Gust as per IS 800-assuming suitable foundation adequacy

3. INSTRUCTIONS FOR INSTALLATION:

3.1 FOUNDATION:

This consists of a RCC foundation as per GSDA Drawing. Size is approx 600x600x1000 mm
The foundation bolt system consists of 04 nos M 16 bolts- suitably tied to the Rebars of the foundation at the time of casting. The center to center distance shall be 500 mm



Mark the position of the foundation as shown to point one axis to the Geographical south-locate and mark the Local south Direction by locating the Pole star (Dhruva Tara)
Adjust the center to center distance 500 mm between bolt centers, while ensuring a cover of at least 50 mm is available to the bolts-tied to the re-bar. Embed a pipe approx 2 inch dia for taking cables below ground level to the controller.

3.2 ASSEMBLY MAIN MAST

After the Foundation is cast and curing, place the Foundation channels on the bolts and tighten nuts by hand. Install the 4 hole flange on the two channels and erect the 1.5 meter mast pipe. Make the mast pipe level vertically as well at the top Flange.
Install the bracing angles between the pipe and foundation channels- recheck the vertical alignment of mast and also horizontal flange level.

3.3 BOTTOM PLATE:

Fix the bottom plate on flange ensuring the 2 sockets welded on it for the hinge pins are towards south side. Align the center line of bottom plate to south.

3,4 TOP PLATE:

Now place the top plate such that the central socket for the hinge pin is between the 2 sockets on the bottom plate. Insert the hinge pin between the sockets of the bottom and top plate. If due to

galvanizing some cleaning is needed, use a round file to clean the socket holes of excess galvanizing material if any.

Fix the Pin for the eye bolts (2 Nos M-12 x 140 for tilt angle adjustment to local south) and insert nuts and washers between the bottom plate. The angle of tilt now can be adjusted by changing the nut position along the length of the eye bolt. See table for gap between two plate for the tilt angle..

3.5 PLUMMER BLOCK & FIXING SQUARE TUBE:

On the top plate fix the 02 nos Plummer Blocks (SN 507 for 30 mm dia shaft) by fixing bolts- make the alignment and hand tighten the bolts.

Place square tube between the two shaft ends by aligning the shaft holes to the 4 flange fixing bolt holes on the square tube. tighten the shaft fixing bolts to square tube.
Now once the tube is fixed between the shaft bearing blocks-, tilt the tube to any one side and measure center of shaft to edge of the tube to check the alignment is at right angles to the shaft axis. Adjust bolt in holes of Plummer block mounting and then fix the bolts of plummer block firmly,
Check the movement in the bearings with shaft is smooth. Use Grease or Lubricating oil if needed. Mark the center of the square tube for alignment and fixing U struts.

3.6 HANDLE EXTENSION ASSEMBLY:

The handle extension assembly is fixed by means of 2 hex rods, fixed to the square tube.
On the hex bar an angle is fixed. On this angle two angle cleats 50 mm long are fixed. IN the angle cleat a Bolt 16 x 125 is fixed with 3 nuts to make in between spacing for the 2 Nos 35x35 angles. which act as a handle. The Lock bolt is a separate part with handle.

3.7 HANDLE ASSEMBLY:

On the 16x25 mm bolt fix the two angles approx 250/400 long so that the flat face of the angles is facing you. Keep a gap of approx 13 mm to pass the Lock bolt pin through this space. Fox the Handle bar to the two angles by means of a bolt.

3.8 INSTALLATION OF " U " STRUTS:

The struts are fixed by means of 2 Nos 8 or 10 mm 125 long bolt and nuts. through the holes in the U strut- and flat clamp piece that shall grip the square tube.
The center to center distance of the U strut must be equal to the pitch of the panel mounting holes on the longer side. (Approx 936 mm center to center or similar)
The cleats welded to the U strut are used later to tie the 25x5 angles as bracings for support.

3.9 INSTALALTION OF SOLAR PANELS:

The solar panels can be installed on the U struts before the struts are fixed to the square tube or after the U struts are fixed center to center on square tube.

Install spring nuts at the appropriate module holes.They can easily slide in the U strut to suit location of hole.
If the solar panels are to be installed after the U strut is installed on square tube; then lock the square tube at noon position. so that it is fixed. lower the tilt angle so that the square tube is flat. (One can always lift the plate to fix the tilt angle as required and fix with the eye bolt nuts.)

3.10 INSTALLATION OF CONTROLLER AND DC MCB:

The Installation of bracket for controller and DC MCB can be fixed on the angle supports and flats. Use 115 dia U bolt to grip the two horizontal angles. Fix the flats

4.0 ALIGNMENT CHECKS:

1) Foundation- Verticality of Pipe mast & level of Bottom plate-check by water level or level tube.
2) Square tube alignment and plummer block adjustment: Check distance between center of shaft to each end of square tube-adjust to correct the distance to be equal.
3) Check shafts easily rotate in bearings.Use grease or Lubricating oil if required.
4) Handle assembly: check that the handle rotation is smooth, and no part is obstructed in the east west movement in whole of the 5 step tracking movement.

5.0 ROUTINE MAINTENANCE AND TROUBLE SHOOTING:

1. Periodically check the east west movement is smooth. Use lubricating oil in small quantity only if needed.
2. In case of strong wind-Lock the array in noon position. At this position the array works like a fixed tilt array.

6.0 DO'S AND DONTS:

6.1 DO's:

1. Do align the array to face due south.
2. Do do the tracking at least 3 times a day; 5 times a day is preferred and can give more water output.
3. Do ensure to make alignment checks once 6 months.
4. Do lock the array frame at noon in case of high wind/storm, as a safety precaution.

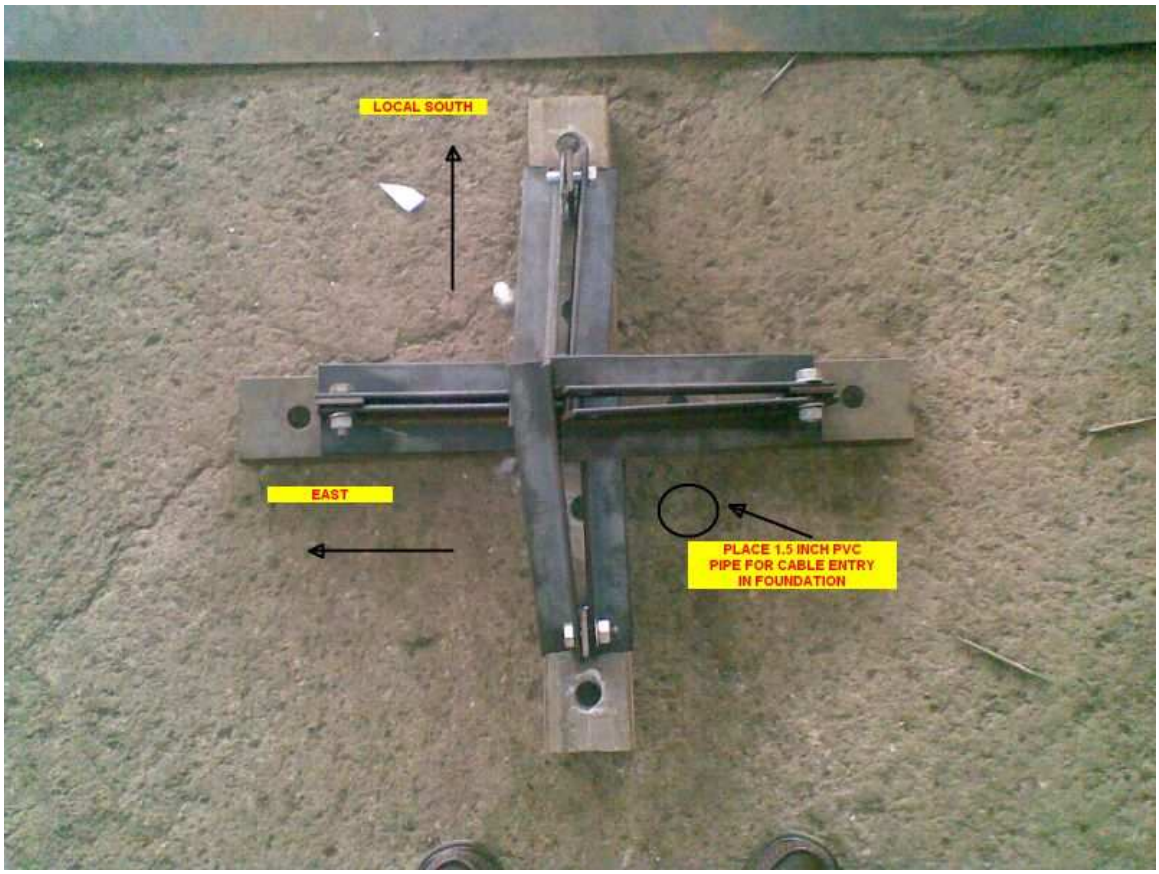
6.2 DON'T's:

1. Don't track the array wrong side. For example facing west in mornings or facing east in afternoons.
2. Don't move or track the array in case of strong winds.

To: Report Problems:please e mail to vistarelectronics@gmail.com- giving the details of installation location, sl no., Model name,

END OF MANUAL

Foundation arrangement



Notes:

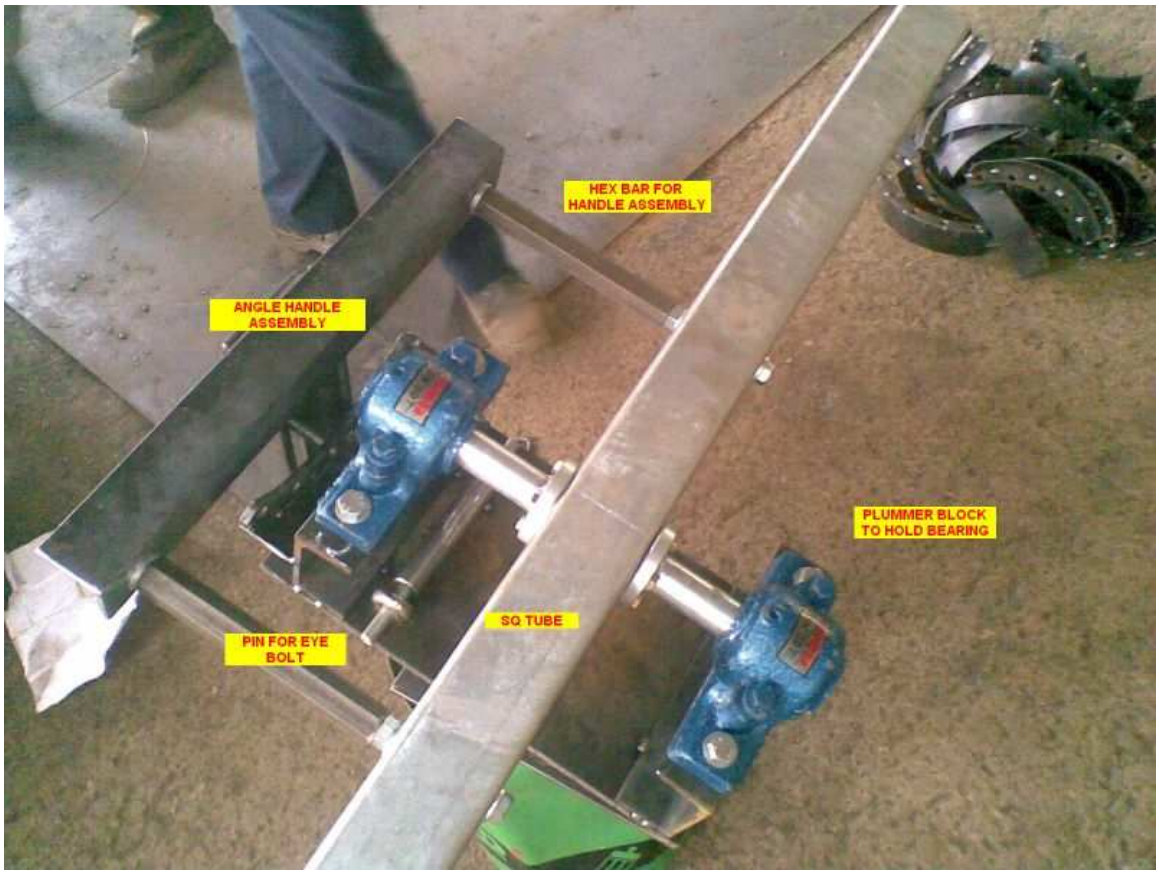
1. Locate local south Direction
2. Place a PVC Pipe with long bend in the shuttering before concreting as shown for cable entry.
3. Foundation Bolt c-c 500 mm Bolt is 16 dia x 220 Long-Bolt to be tied with Steel bars of foundation.-and align for center to center distance.

Top & Bottom Plate arrangement

Notes:

1. The tilt angle to face due local south can be adjusted by the length of the eye bolt between the top & bottom plates Hinged
2. After fixing the Bottom plate on flange of the main mast; first check levels : vertical for the mast pipe and horizontal for the bottom plate.
3. Then install the top plate with Plummer blocks and square tube fixed to the shafts coming out of the plummer blocks. Connect it with the 10 mm Pin to completely insert in the sockets of the Top and Bottom plates.
3. Check the hinge action OK by manual adjustment of angle between top & bottom plates.
4. Adjust length of Eye bolt by Nuts provided. Ensure the length of Both eye bolt between the top and bottom plate is equal.

Square tube and Plummer block arrangement



Notes:

1. After installing Plummer blocks, and bolting the square tube; adjust the blocks to align square tube such that:
   - i) Distance from end of mid of square tube to center of shaft in the blocks are equal.
   - ii) When handle assembly is rotated freely, check that the gap between angles of the handle to sector plate welded to Channel of Plummer block are equal and at least approx 3mm to 8 mm-to have unobstructed movement.
   - iii) Adjust if required by use of washers in the connecting bolt of hex Rod to the angle fixing bolt provided.

Handle Assembly

Notes:

1. Gap between edge of sector plate to angles of the handle is between 3-8 mm.
2. Adjustment by loosening angle fixing bolt to square tube.

Assembly of solar panels on U struts:

Notes:

1. Lay panels face down or resting on edge of a wall .
2. Insert spring Nuts to align to the mounting holes of panel.
3. Use 40 long 3 mm plate and flat, spring washer for M-6 bolt and insert to fix to the spring Nut placed in the U Strut
4. Align the panels and check gas are equal.
5. Tighten till spring washer is closed.

Mounting U strut with or without solar panels on the square tube.

Notes.

1. Mark center to center pitch of solar panel Mounting holes on Square tube-from the center of the square tube.
2. Lock square tube in Noon position.-
3. Insert 2 Nos M8 or M-10 Bolts 130 long through the two holes 87 mm apart at the center of the U strut. Tighten by nuts so bolts remain fixed to U strut.
4. Use a Piece 50x 6 mm with cleats welded to fix the angle bracing downwards and insert in the bolts of the U struts and place washer and Nuts to secure the U strut to the square Tube.
5. Check alignment to ensure the solar panels are placed centrally on the square tube.and tighten.

Tilted View of solar panels

Notes:

1. Photo shows tilt angle approx 20 deg –Due south.