English

Installation, Operation and Maintenance Instructions

Solar Arrays

Mono®

MPA593/13

One Company, Unlimited Solutions

Contents

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE COMMENCING INSTALLATION

Warranty

Warranty Statement

1. Solar Arrays manufactured by Mono Pumps are covered by warranty for a period not exceeding twenty four months from purchase.
2. Mono Pumps will make good by repair, or at their option, the replacement of faulty parts under warranty, providing always that:
   (a) The equipment was correctly installed and properly used in accordance with Mono Pumps Installations and Operating instruction and accepted codes of good engineering practice.
   (b) The claim for goods under warranty arises solely from faulty design, material or workmanship.
   (c) The repair is carried out in the Mono factory or by an authorised agent or distributor appointed by Mono Pumps.
   (d) All freight costs to and from the factory or repair agent are to be paid by the purchaser.
3. In the case of equipment or components which are not of Mono manufacture, but supplied by them, the warranty is limited to that extended by the suppliers or manufacturers of such equipment.
4. Mono Pumps warranty does not cover any of the following:
   (a) Claims for third party liability of damage caused by failure of any of the company's products.
   (b) Damage caused by abnormal operating conditions, war, violence, storm cataclysm orany other force.
   (c) Damage caused by the equipment being used for an application for which it is not recommended.
   (d) Damage caused by sand or abrasive materials, corrosion due to salt water or electrolytic action.
5. The decision of Mono Pumps in relation to any claims or disputes over warranty is final.

6. The warranty is in lieu of all other warranties and conditions expressed or implied, written or oral, statutory or otherwise, which are hereby negated and excluded.
7. This express warranty does not exclude any conditions or warranty implied by the Trade Practices Act 1974 or separate State laws and in addition to any other right, that the original purchasers or any subsequent purchaser may have at law.

In case of claim please contact your Authorised Mono Dealer or contact Mono Pumps (Australia) Pty. Ltd.

Introduction

A solar array is a group of solar modules connected together on a common frame. The solar array forms a major part of your investment and as such must be correctly installed for efficient operation and long life. The array can be a post mounted stationary system or a post mounted tracking system.

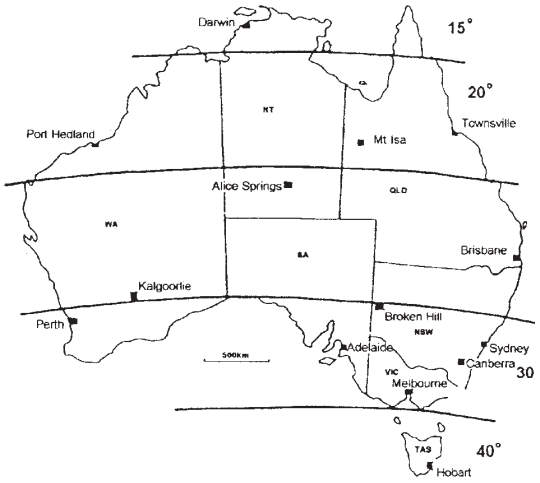
Orientation of the Array

The performance of the Mono solar water pumping system will be optimized with the array facing due north in the southern hemisphere (south in the northern hemisphere).
The array should face towards True North not magnetic North. The correction required for Australia is shown in the maps below.
Use a compass to determine the correct orientation and then proceed to layout foundations accordingly. Make sure that the array will be free from any shadowing effects, making allowance for long shadows in winter when the sun is lower in the sky.

MAGNETIC DECLINATION
TRUE NORTH = COMPASS READING
- MAP VALUE (DEGREES VARIATION)

Tilt Angle

The best performance of the solar modules is achieved when they are perpendicular to the sun's rays. A tracking array system produces more power output than a stationary system because the modules follow the sun as it travels across the sky. The Mono tracking array only follows the sun from east to west. It does not automatically track the sun as its position changes from season to season. Because the sun is higher in the sky (more overhead) in summer and lower in winter it is necessary to adjust the tilt angle of the array with each season in order to achieve the maximum year round performance of the system. Adjusting the tilt angle each season will also maximize the performance of stationary array systems.
The best summer performance is achieved with a low tilt angle, ie with the array almost parallel to the ground. The minimum recommended tilt angle is 10°. If the tilt angle is less than 10°, water will pool at the bottom of the solar modules resulting in dirt build up and reduced power output.
In winter the best performance is with a much steeper tilt angle. Most users tend to set the array for a compromise position that gives the best average performance throughout the year. This is achieved by setting the tilt angle to the same angle as the latitude of the system. This does not need to be done very accurately. Some array systems have pre-set tilt positions. On these arrays choose the position closest to your latitude. The map below shows suggested tilt angles for Australian sites.



Mono®

One Company, Unlimited Solutions

Introduction

Wind Ratings

The post mounted array structures have been designed in accordance with AS 1170. The maximum rated wind speeds are listed based on the number of modules on the array and the type of foundation used. The following assumptions were used when applying the standard.

- The calculations only apply to regions covered in AS1170.2
- The structures are not located where they may be subject to snow loading
- No shielding from other structures has been assumed
- The structures are located in predominantly flat terrain
- The structures present a low degree of hazard to life & other property in the case of failure
- The structures are supported at ground level and not on other structures
- Footings are founded in hard dense clay or soil with similar or better lateral soil pressure

Advice should be sought from a suitably qualified engineer if any of the assumptions do not apply.

It is recommended that the frame be removed from the post or footings when the wind speed is likely to exceed the wind rating of the system. This would also reduce the risk of damage from flying objects commonly associated with high winds. Note: The panels are rated to a maximum wind speed of 210 km/hr.

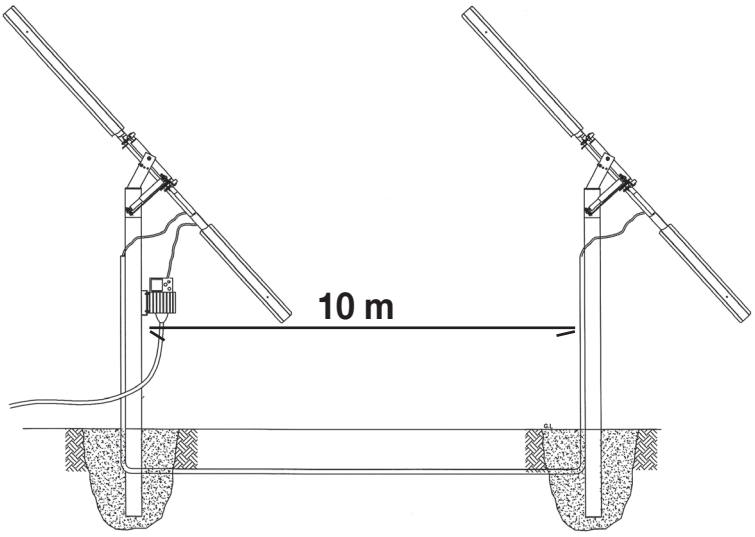
Multiple Arrays

Systems with more than 600 Watts use multiples of smaller arrays as follows:

750 Watt system	=	2 x 375 Watt arrays
900 Watt system	=	2 x 450 Watt arrays
1050 Watt system	=	2 x 525 Watt arrays
1200 Watt system	=	2 x 600 Watt arrays
1350 Watt system	=	3 x 450 Watt arrays
1575 Watt system	=	3 x 525 Watt arrays
1800 Watt systen	=	3 x 600 Watt arrays

When installing systems that use more than one array frame it is important that one frame does not cast shadows on the other. With stationary arrays this can be achieved by installing the arrays in a line side by side.

Tracking arrays need to be spaced further apart to prevent shadowing effects. A separation distance of 10 meters is recommended between each array frame with the frames mounted one behind the other. The interconnecting cables should be buried underground in electrical conduit in line with local electrical regulations.



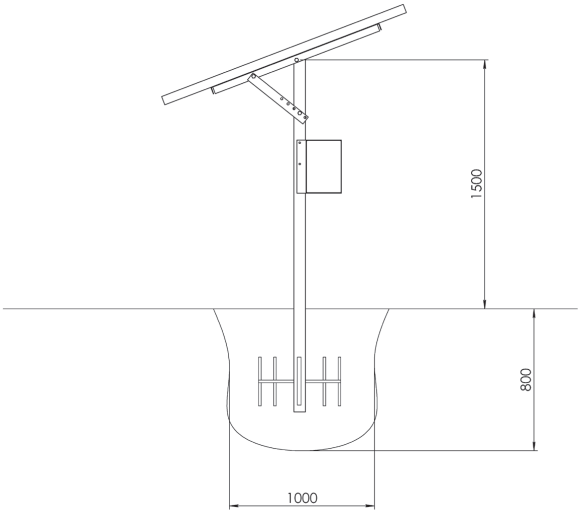
Single Panel Post Array

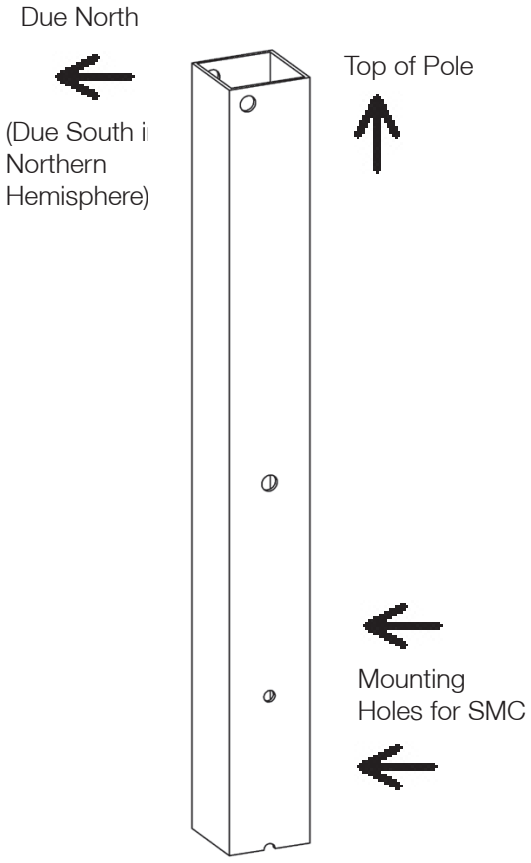
Single Panel Post Array (Stationary & Tracking)
The single panel post array is designed to simplify the installation of a array. This section has been broken up into two section, one for post installation and the other for the array head assembly. The array head assembly differs between a stationary head or tracking head set up
Installing the post

The single post stationary arrays are suitable for wind speeds up to 140 km/hr when installed with the following foundation dimensions:

To install the post first dig the appropriatly sized hole. To comply to AS1170, drill a hole in the base of the post and insert a reinforcing rod through the hole, and concrete the post into the ground.
Ensuring the post is vertical and facing due north (not magnetic north) in the southern hemisphere and due south in the northern hemisphere. Vertical reinforcing rods should be inserted into the concrete as shown in the diagram.
Leave this to set for at least two days before assembling the remainder of the array on to the post.

Modules	Hole size	Height of post above ground
1	1.2 m diameter x 0.8 m deep	1.45 m





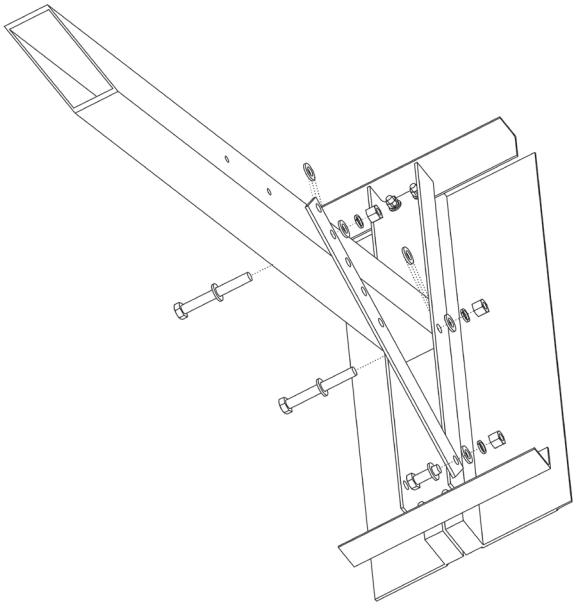
Single Panel Post Array

Array Head Assembly: Stationary

Unpack the array from the box in which it is supplied. Keep some of the cardboard and lay it on the ground. Lay the array down on the cardboard with the cells down. Ensure there are no rocks etc which could break the glass of the array when it is laid on the ground.

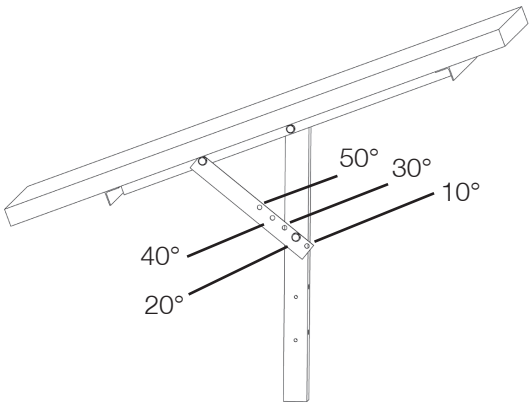
NOTE: The array is pre-wired and will start producing power as soon as sunlight hits the panels.

Fit the channel section of the array frame over the top of the post, and add the brace, as shown below. Note the use of packing washers between the post and the channel.

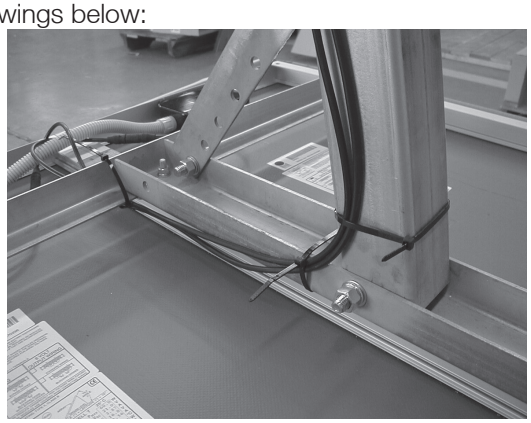


Note: The junction boxes will be at the bottom of the array when the tilt angle is set.

Choose the required tilt angle of the panel by the holes on the brace. Once the maximum angle is set, cut off any excess brace so there is no overhang.



Ensure cables are secured with cable ties as per drawings below:



Single Panel Post Array

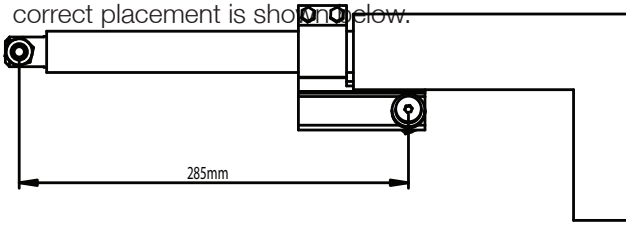
Array Head Assembly: Tracking

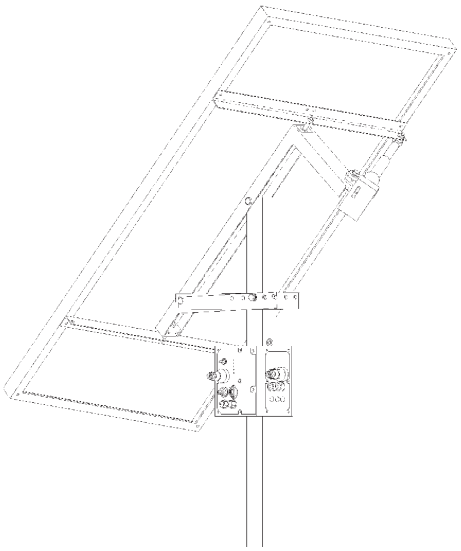
Unpack the array from the box in which it is supplied. Keep some of the cardboard and lay it on the ground. Lay the array down on the cardboard with the cells down. Ensure there are no rocks etc which could break the glass of the array when it is laid on the ground.

NOTE: The array is pre-wired and will start producing power as soon as sunlight hits the panels.

Assemble the channel frame and the actuator to the array as shown below.

The actuator is supplied pre-assemblied, but for any reason the bracket position needs to be re set, the correct placement is shown below.



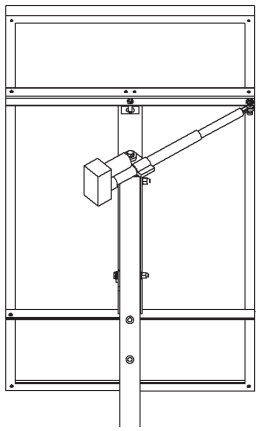


When tightening the shoulder screw pivots, ensure that joints are free to rotate, which will provide smooth tracking.

Lift the array frame onto the top of the post, and add the tilt adjust braces as shown below, with the actuator at the back of the array.

Note: The junction box will be at the bottom of the array when the tilt angle is set.

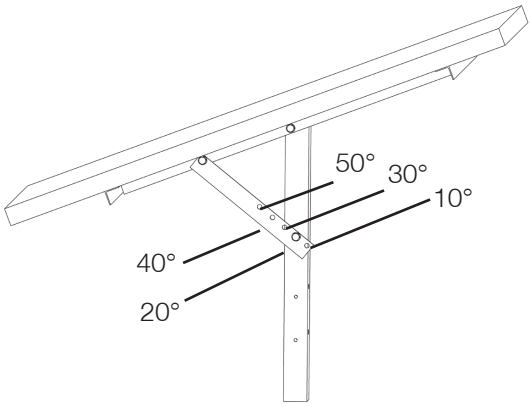
It is recommended that the rotationing joints on the actuator be annually lubricated using a suitable water proof lubricant to enable smooth operation, such as nickel anti seeze.



Correct Array Set up

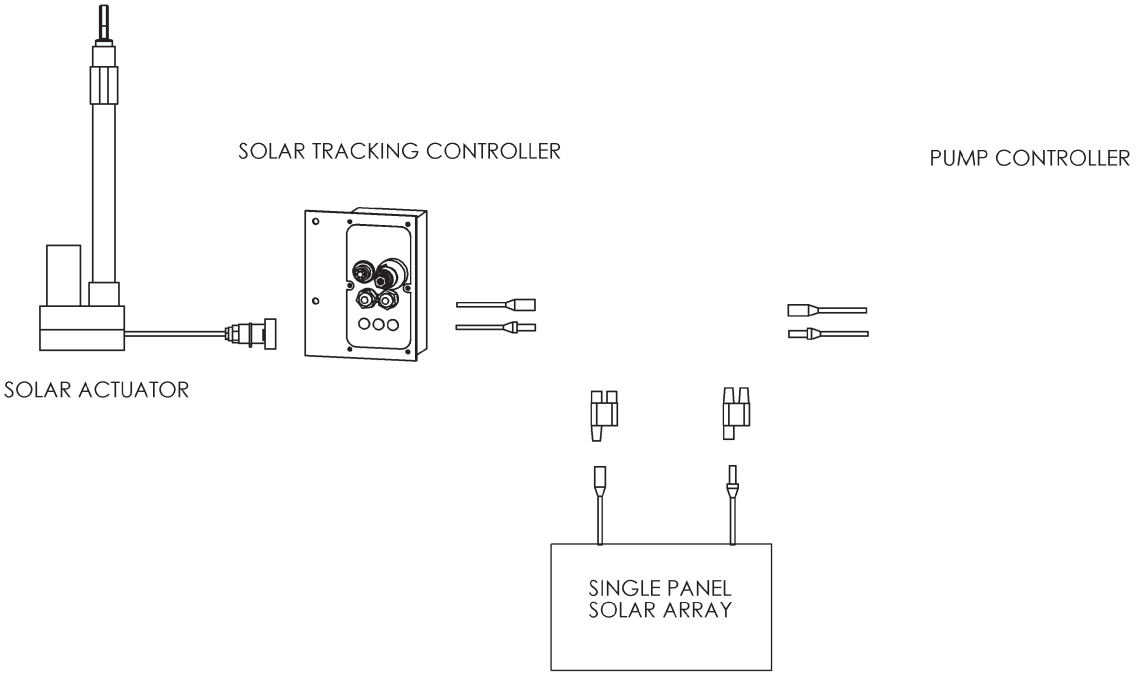
Single Panel Post Array

Choose the required tilt angle of the panel by the holes on the brace. Once the maximum angle is set, cut off any excess brace so there is no overhang.
Connect the Pump Controller and the Solar Tracking Controller side by side on the mounting post.
Connect the system as shown in the drawing below.
Follow the procedure 15-17 for the Solar Tracker Controller set-up
Once the system is fully constructed, set the Solar tracking controller to manual, and run the array through its full range of movement to ensure that there are no obstructions.



Connection of Tracking Controller
Single Panel Array

Connect the Solar Tracker as shown below.



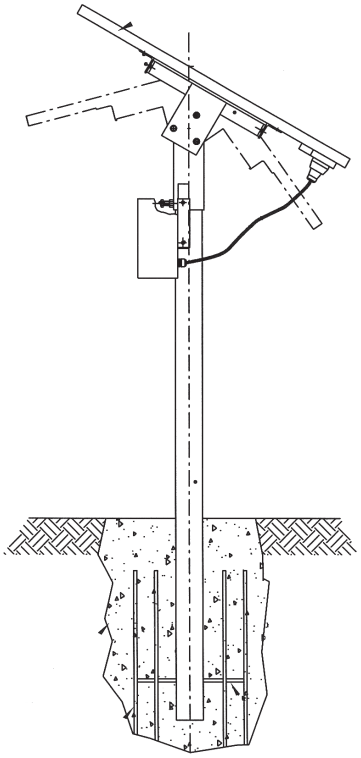
Post Mount Array

Post Mount Stationary Arrays
The single post stationary array is designed to simplify the installation of a stationary array. It is provided with a seasonal tilt angle adjustment and mounting bracket for the electronic pump controller.

Installing the post

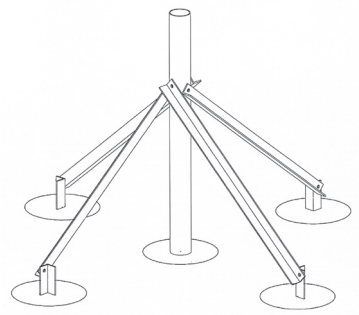
The single post stationary arrays are suitable for wind speeds up to 140 km/hr when installed with the following foundation dimensions:

Array	Hole size	Height of post above ground
150W	1.2 m diameter x 0.8 m deep	1.45 m
300W	1.25 m diameter x 0.95 m deep	1.45 m
450W	1.25 m diameter x 1.1 m deep	1.45 m
600W	1.25 diameter x 1.2 m deep	1.45 m



To install the post, first dig the appropriate size hole. Insert a reinforcing rod through the the hole in the bottom of the post and concrete the post into the ground. Ensure the post is vertical. Vertical reinforcing rods should be insterted into the concrete as shown in the diagram.
Leave this to set for at least two days before assembling the remainder of the array on to the post.
The arrays can achieve a wind speed rating up to 210 km/hr if the post is braced in four directions and the following foundations are used:

Array	Hole size	Height of post above ground
300W	5 holes - 0.6m diameter x 0.7m deep	1.6 m
450W	5 holes - 0.7m diameter x 0.7m deep	1.6 m
600W	5 holes - 0.8m diameter x 0.7m deep	1.6 m



The centres of the four outer holes should be 1.2 meters from the centre of the hole from the post. To install the post first dig the appropriatly sized holes. Insert a reinforcing rod through the hole in the bottom of the post and concrete the post into the ground. An additional 18mm diameter hole needs also to be drilled into the post to line up with one of the bolts in the column head. This must be positioned to ensure the array faces due North in the southern hemisphere or due south in the northern hemisphere.

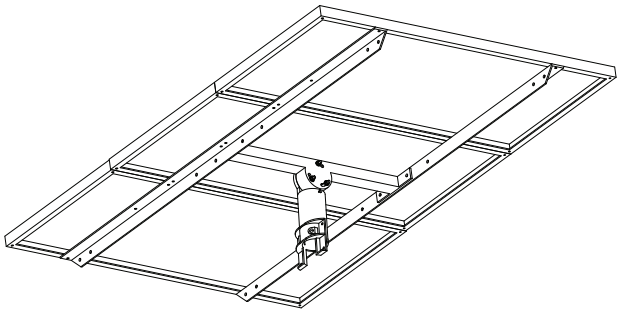
Post Mount Array

Leave to set for at least two days before fitting the wind braces. Drill an 18 mm hole through the post 530 mm from the top of the post. Drill a second 18 mm hole through the post 500 mm from the top of the post. The holes should be aligned with the four holes in the ground for the braces. Lay out the wind braces as shown. Bolt the braces to the post and the vertical anchor stakes. Fill the four remaining holes with concrete.

Head and Column Clamp Assembly

Unpack the array from the crate in which it is supplied. Keep some of the cardboard and lay it on the ground. Lay the array down on the cardboard with the cells down. Ensure there are no rocks etc which could break the glass of the array when it is laid on the ground.
NOTE: The array is pre-wired and will start producing power as soon as sunlight hits the panels.
Fit the panel mount between the rails as shown below using the supplied M12x40 bolts, nuts and washers.
Fit the column head to the panel mount using the M12 x110 bolts provided. This is the mechanisom the provides the seasonal tilt adjustment.

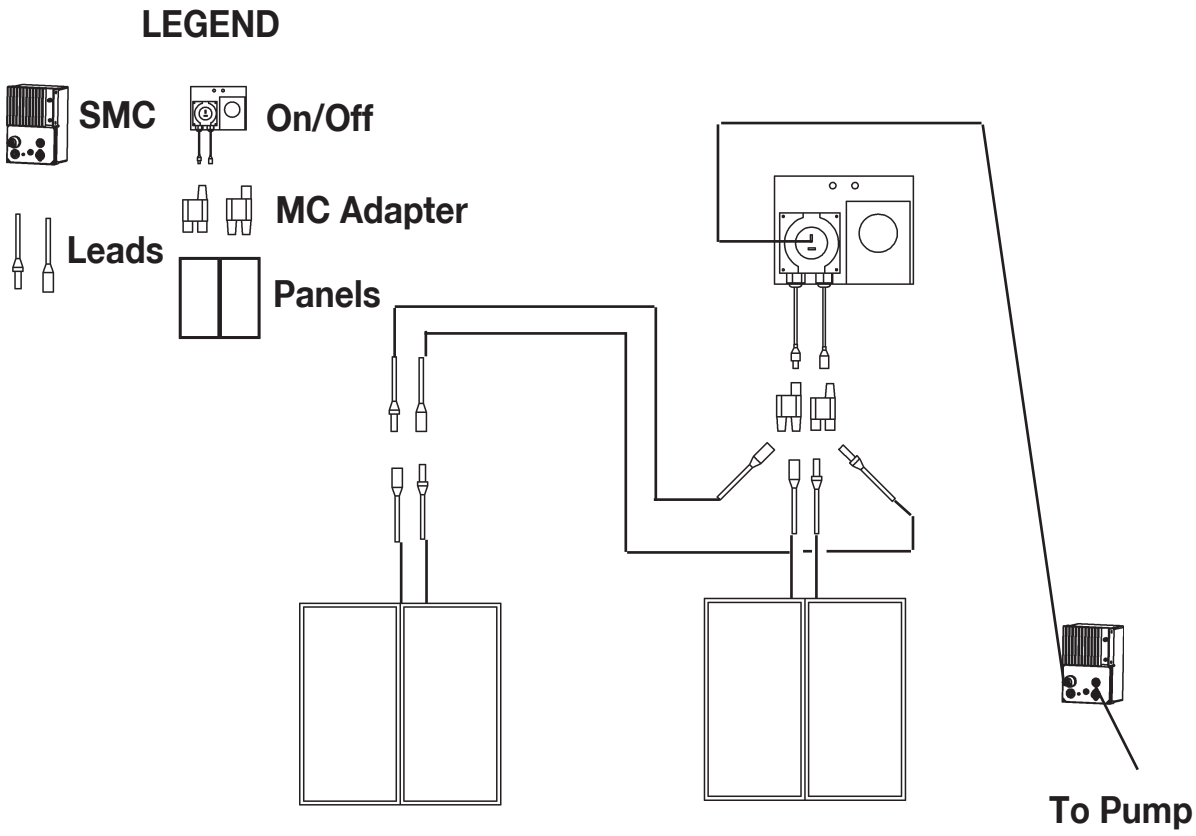
Tighten the bolts with the column mount 90° to the array for easier mounting on to the pole.
CAUTION: the array will tilt under its own weight when mounted on the pole if the three tilt angle bolts are not tight enough.
Mount the array on the pole. Align the frame so that the label on the head points due North. Insert and tighten an M16 bolt so that it passes through the hole in the post. Insert and tighten the second M16 bolt to clamp the array to the pole.
NOTE: The junction boxes will be at the bottom of the array when the tilt angle is set.
Loosen the three tilt angle bolts and set the tilt angle. Ensure that the three bolts are tight so that the array cannot slip in strong winds.



Post Mount Array

Wiring of Multi- Array Stationary Systems

The diagram below shows the correct arrangment for wiring multiple stationary arrays. The leads between the arrays need to be conduited and buried under the ground.



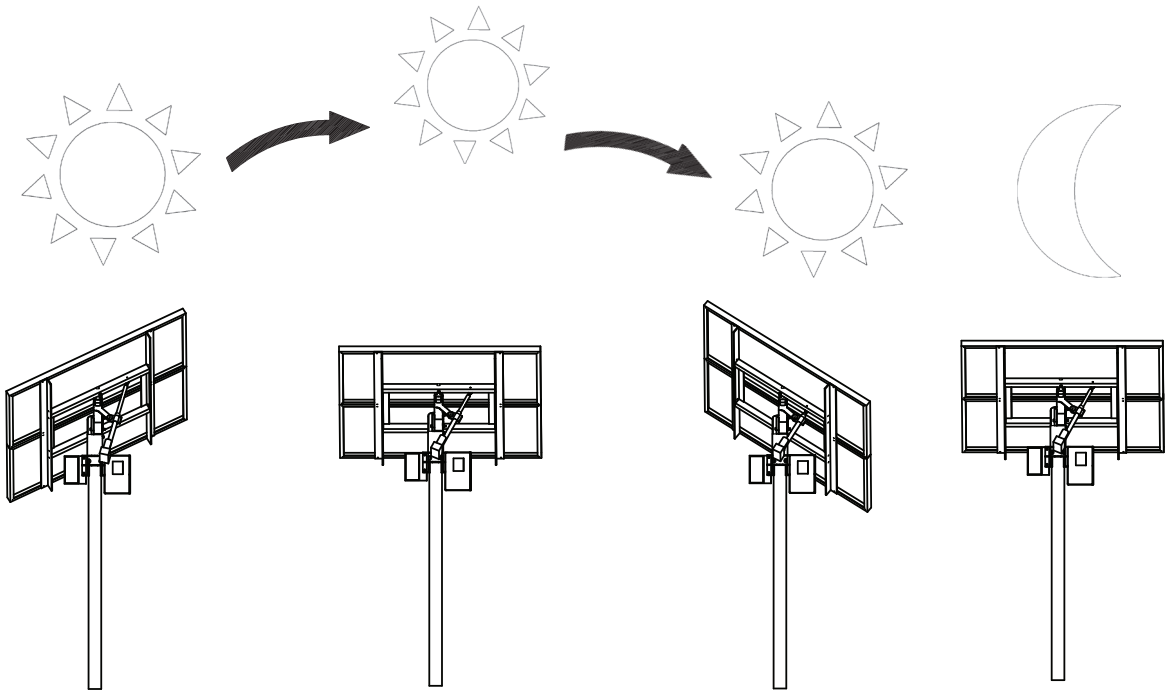
Tracking Array

Post Mount Tracking Arrays

The Electric Solar Tracker is designed to give greatly increased daily output from the solar modules and to continue to operate with virtually no maintenance for many years. The Mono electric tracker is a GPS controlled system, to ensure the optimum preformance at all times.

It is provided with a seasonal tilt angle adjustment which allows you to obtain maximum output through-out the year. Alternatively the tilt angle can be set at the angle which gives the best performance at the time of the year when the highest output is needed. Remember that with a Solar Tracker, the power from the sun is optimised through-out the day. However there is little power available when the sun is less than 15 degrees above the horizon.

The movement of the array through out the day is indicated in the diagram below.



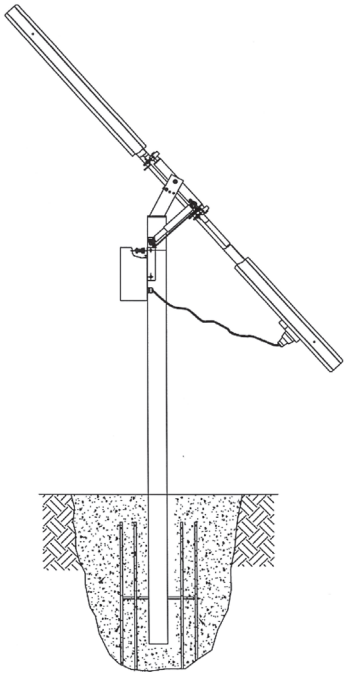
Tracking Array

Installing the post

The tracking arrays are suitable for wind speeds up to 140 km/hr when installed with the following foundation dimensions:

Array	Hole size	Height of post above ground
150W	1.2 m diameter x 0.8 m deep	1.45m
225W to 300W	1.4 m diameter x 1.6 m deep	1.6m
375W to 450W	1.4 m diameter x 1.7 m deep	1.6 m
525W to 600W	1.4 m diameter x 1.75 m deep	1.6 m

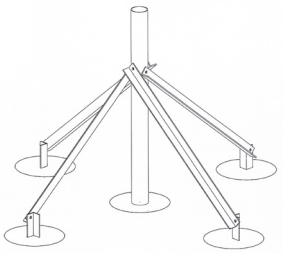
To install the post first dig the appropriate size hole. Insert the reinforcing rods through the two holes in the bottom of the post and concrete the post into the ground. Ensure the post is vertical. Vertical reinforcing rods should be insterted into the concrete as shown in the diagram.
Leave this to set for at least two days before assembling the remainder of the array on to the post.



The arrays can achieve a wind speed rating up to 210 km/hr if the post is braced in four directions and the following foundations are used:

Array	Hole size	Height of post above ground
150W to 300W	5 holes – 0.6m diameter x 0.7m deep	1.6
375 W to 450W	5 holes – 0.7m diameter x 0.7m deep	1.6 m
525W to 600W	5 holes – 0.8m diameter x 0.7m deep	1.6 m

The centres of the four outer holes should be 1.2 meters from the centre of the hole for the post. To install the post first dig the approptiate size holes. Insert a reinforcing rod through the the hole in the bottom of the post and concrete the post into the ground. Ensure the post is vertical and the single hole in the top of the post is pointing due south (not magnetic south).
Leave this to set for at least two days before fitting the wind braces. Drill an 18 mm hole through the post 530 mm from the top of the post. Drill a second 18 mm hole through the post 500 mm from the top of the post. The holes should be aligned with the four holes in the ground for the braces. Lay out the wind braces as shown. Bolt the braces to the post and the vertical ancher stakes. Fill the four remaining holes with concrete.



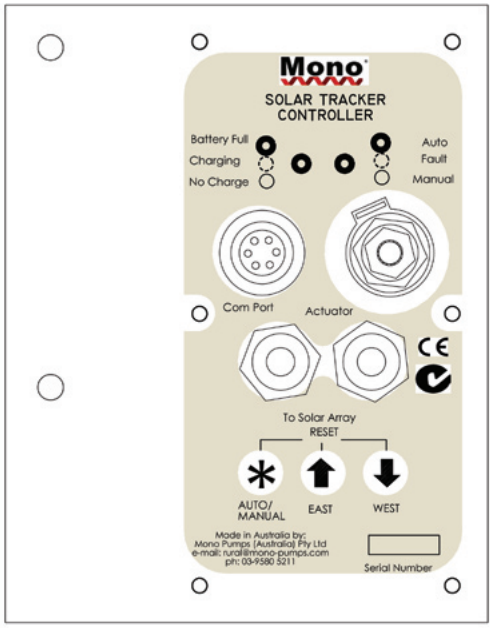
To achieve the wind load of 210 km/hr, an additional 18mm diameter hole needs also to be drilled into the post to line up with one of the bolts in the column head. This must be positioned to ensure the array faces due North in the southern hemisphere or due south in the northern hemisphere.

Tracking Array

Electronic Tracking Controller

Description

The Electronic controller / motor system is used to drive a solar module frame. The controller drives a 300mm stroke linear actuator to position the array frame perpendicular to the Sun's movement. The Tracking controller utilises a Global Positioning Sensor to extract satellite time and longitude, from this information the controller will then calculate the position of the sun relative to the controller's longitude. The controller will then drive the actuator to the calculated position which inturn moves the frame to the appropriate position.



Features

Simple installation.

Sensorless motor positioning.

GPS solar position calculation.

2 LED diagnostic indicators.

Automatic and Manual operation.

30-200V input Battery charging.

Com Port – Solar Display Unit connection.

Plug and Socket connections.

Motorised Linear Actuator.

Excellent Low Light Performance.

Accurate Solar Tracking.

75 Degree Total tracking angle.

Tracking Array

Operation
Setup

Install Tracker and connect wiring.
The controller is shipped in a low power sleep state, push any button for one second to commence normal operation. DO NOT push buttons until the unit has been installed.
Push “Auto/Manual” button, the “Auto” indicator will illuminate
If low battery LED starts flashing on installation refer to note 1.
The Solar Frame will immediately track to the east.
After **5-10 minutes**, the unit will track to position.
Note 1: If low battery LED is flashing, the unit will need to be left for between 30 minutes and 24 hours to charge, if the unit is placed in automatic mode it will resume normal operation once the battery is charged.

Modes of operation

Automatic Tracking -
Pushing the Auto/Manual button will toggle the unit between Automatic and Manual Mode. Auto mode will automatically position the solar array towards the Sun. The unit will start at the east at 5:00am solar time, it will start to track from 9:30am to 2:30 pm in 15 minute increments. At 7:00 pm solar time the unit will then “Park” at the Horizontal position.
Manual -
Allows the Solar Array to be positioned manually via the East and West Buttons
East - Moves the array towards the east direction.
West - Move the array towards the west direction.
Reset -
If all three buttons are pushed simultaneously the unit will perform a full reset and re-initialise the automatic tracking function. After reset the unit with be in manual mode. When the reset sequence has been activated the controller will give an audible sound for 2 seconds.

Fault Modes
Low Battery -
The low battery mode will stop the automatic tracking sequence and attempt to charge the battery. This mode will continue for an minimum of 30 minutes up to 24 hours. The unit will continue normal operation after this period.
Motor Jam -
If the motor is jammed while tracking to the west the unit will stop tracking and will reset the next morning.
Note:
If the Auto/Manual Button is pressed the Fault will be cleared and the unit will attempt normal operation.

LED Indicators

The Tracker Controller features two multifunction system status lights (LED’s). The functions of the LED’s are as follows:

<u>Mode LED</u>
Off – Manual Mode
Flashing (1 flash per 2 seconds) – Low Battery
On - Automatic Mode

<u>Charge LED</u>
Off - no charge
Flashing (1 flash per second) – Battery Charging
On – Battery Fully Charged

Battery
To maintain long battery life observe the following conditions:
Always keep the controller connected to the solar array.
Disconnect the battery if the controller is disconnected from a solar array for an extended period time, greater than 1 week.
DO NOT take the unit out of the low power sleep state until the unit has been installed (do not push the buttons until connected to array).

Tracking Array

Electrical

Solar Array Input

Power: 3W Maximum.

Voltage: 30 to 200 VDC.

Solar Array: 150 Watts to 600 Watts.

Actuator Output

Voltage: 12 VDC.

Current: 0 to 6 A.

Battery Type

Mono Part Number: SUN E0380

Battery Type: 12V 1.2AH
Long Life Sealed Lead Acid

Com Connector

RS232

9600 baud

rts/cts

Dimensions & Weight Tracker Controller

Weight: 3.9 Kg

Dimensions: Refer Drawings

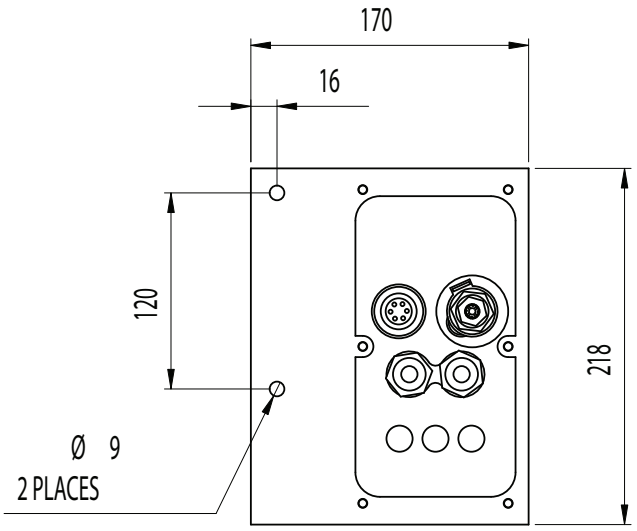
Environmental

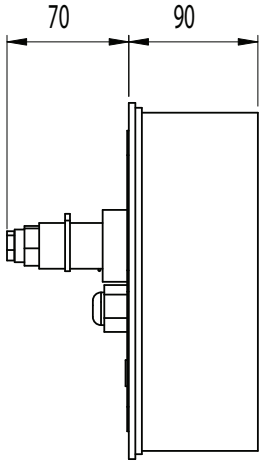
Storage
Temperature: -10 to 60C
Operating
Temperature : -10 to 50C

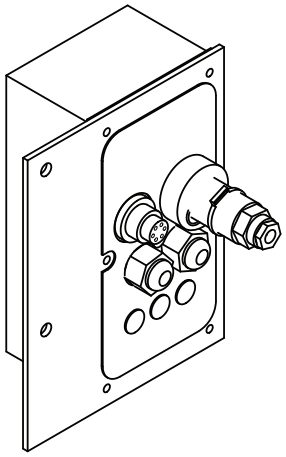
IP Rating: IP66

Humidity: 95% Max.

All dimensions in mm



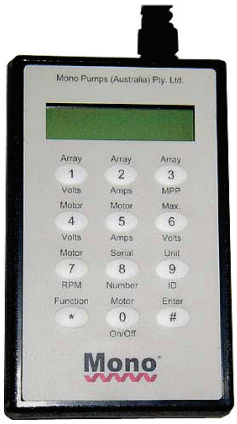




Tracking Array

Solar Display Unit

Mono Part Number : SUN DISP UNIT
The Solar Display Unit is an optional accessory that allows the operator to extract data from the Solar Tracker Controller and change software settings within the STC.
The unit has a two line display. The first line displays information on the current operating mode of the controller. Eg. Automatic Mode, Low Battery etc.
The second line of the display shows information depending on the currently selected function.
The functions are listed on this page and differ from the text on the keypad of the display of the unit. E.g. To see the array voltage press key 1 then the Enter key. The second line will now display the array voltage. The voltage will be updated continuously until a new function is selected.



The display unit can be powered directly from the STC or from its internal 9 volt battery. If the STC is powered, the Display unit takes power from the STC (i.e. it will operate even if the Display unit battery is flat.) If the STC is not connected to an array or the STC battery is flat, the display unit can power the STC via the Display unit's internal battery.

A list of the primary functions is shown next.

Primary Functions

1 Array Voltage

2 Charge Current

3 Actuator Set Position (mm)

4 Battery Voltage

5 Battery Current

6 Actuator current position (mm)

7 Solar Time (not local time)

8 Serial Number

9 Unit ID version

Second Functions

There are additional functions that can be accessed by pressing the * key followed by the number key and enter.

1 Time offset from GMT

2 Longitude

3 Latitude / Tilt Angle

4 Not used

5 Not used

6 Not used

7 GMT acquisition Time

8 Number of Satellites used

9 Solution Valid (Factory Diagnostics)

Overriding the Hemisphere

While the GPS is very accurate there will be situations in which the tracker is orientated for a different hemisphere to what the GPS indicates.

Note: GPS's and Local maps do not always agree. To allow for this it is possible to manually override the Hemisphere setting obtained from the GPS.

By pressing "*19#" on the hand held display unit, the Display will toggle to one of the following settings:

"Override Hemis N" -

Override to Northern Hemisphere

"Override Hemis S" -

Override to Southern Hemisphere

"Override Hemis A" -

No Override, Hemisphere from GPS

The Solar Tracker Controller is now set to the dis

played setting.

Repeat "*19#" to toggle to the next one.

The unit will then need to be reset in order for the

setting to take immediate effect.

Note: The Latitude displayed ("*3#") will not change

if the Solar Tacker Controller Hemisphere is Over

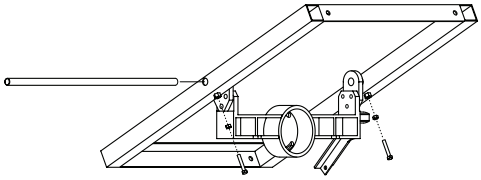
ridden as this is read directly from GPS.

Tracking Array

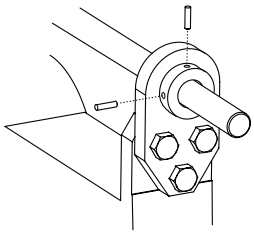
Tracker Assembly

Note: Ensure that Loctite 771 (nickel anti-seize) is used on all hardware connections. Failure to apply anti-seize could result in the stainless steel threads gauling.

1. Lean the frame on its side so that access to bottom of the array is possible.
2. Insert pivot shaft into frame piece and through the bearings in the tilt head. Secure in place using the two M10 bolts through the welded nuts.

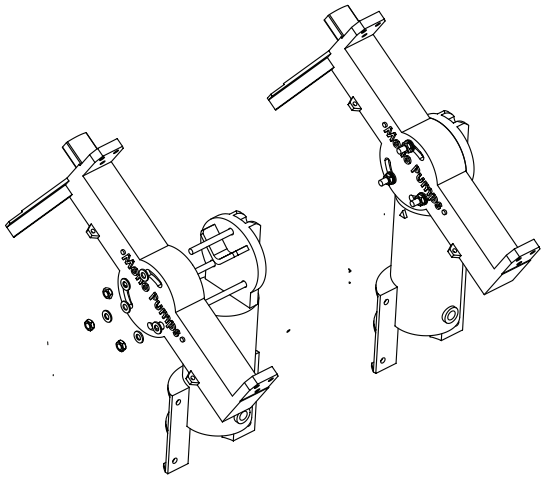


3. Align the tilt head centrally in the frame. Tighten the grub scews on both bearings. Note: It may be necessary to change the positions of the bearings on the shaft to align the bolt holes.

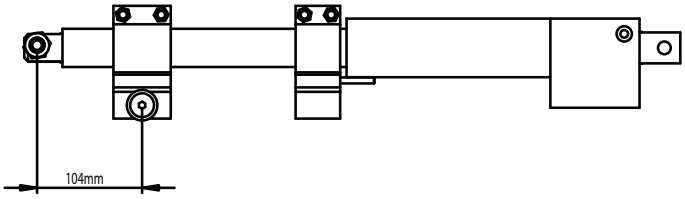


4. Add the pole head to the array post (con creted in the ground).
   Mount the array frame to the pole head as in the following diagram (array not shown for clarity).

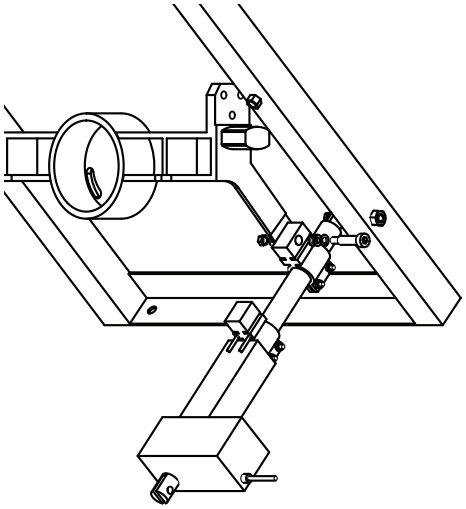
   Whilst lifting, ensure the array frame is well supported, as the panels are free to rotate.
   Tighten the M10 bolts on the head to eliminate movement whilst further assembly. For assembly it is ideal to set the array horizontal.



5. The actuator bracket is factory set, but for any reason this has moved, the correct position of the bracket is shown below (when the actuator is fully home).

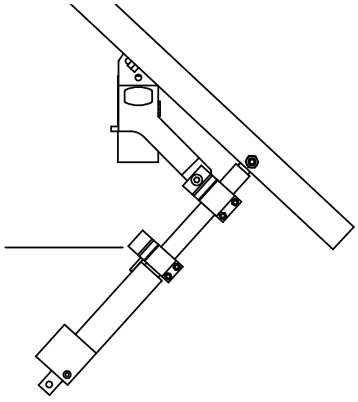


6. Add the linear actuator to the frame as in the drawing below. The force on the actuator rotating joints from the wave washers should only be light, so not to add load to system.
   This rotating assembly should be lubricated with a water proof lubricated, such as nickel anti-seeze. This needs to be repeated annually for long life.



7. In east position (array rear view) the actuator orientation must be as shown. No need to remove or adjust bracket

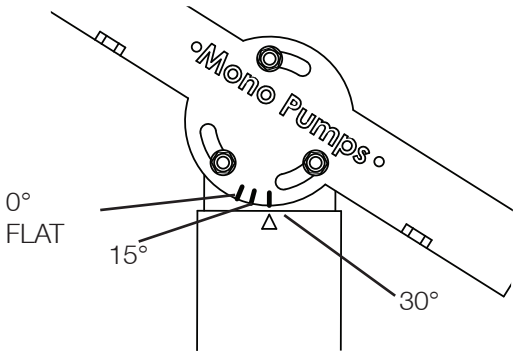
Bracket should face up



Tracking Array

8. Check the north-south orientation of the array. When correctly in position, tighten the two clamp bolts through the holes in the side of the pipe support to lock it in position on the post. (1 off M16 x 45 screw for 2 and 3 panel systems, 2 off M20 x 50 screws for 3 and 8 panel systems).

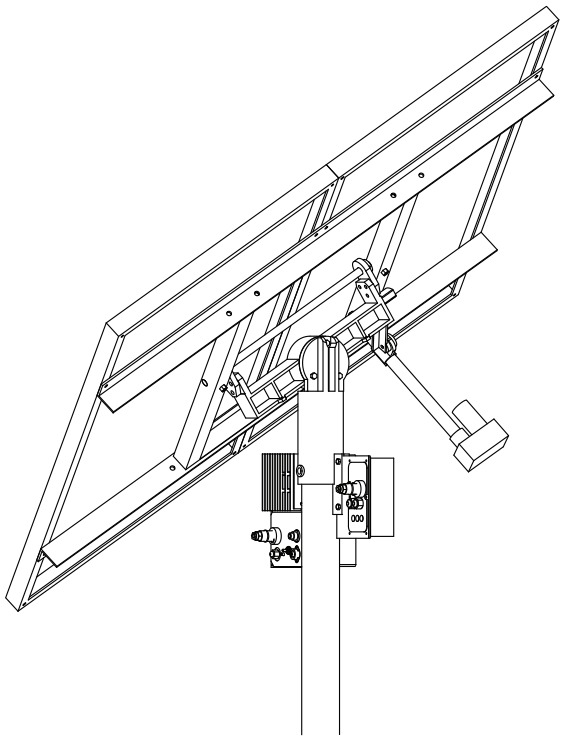
9. Adjust the array to the optimum tilt angle (refer to the diagram below). To determine the optimum seasonal tilt angle, refer to the selection information or via the hand held display reading the tracker controller.



Ensure that the three clamp bolts are tightened securily. Always support the array when ajusting the angles, as frame will drop under its own weight.

8.

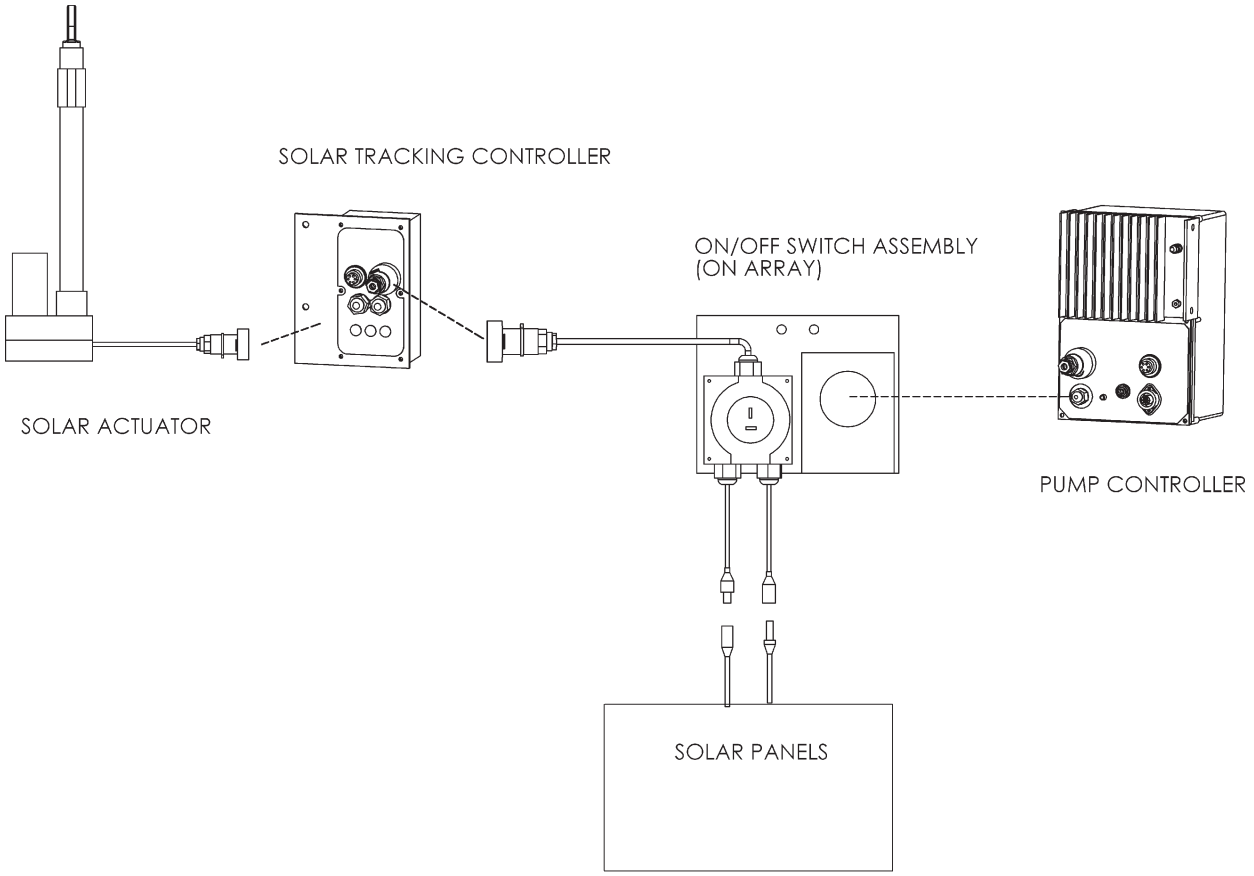
Add the controllers to the post head. The pump controller is mounted on the east side of the pole and the tracker controller on the west. Both controllers face north, as shown below.



10. Plug in the Control boxes as shown on page 21 and 22. Follow the setup procedure as shown on page 16 prior to continuing.
11. Once the array is fully set-up, put the Tracker Controller in manual mode, and using the east and west buttons, run the tracker through the full range of movement to ensure unimpeded movement. Press the auto button once this is complete.

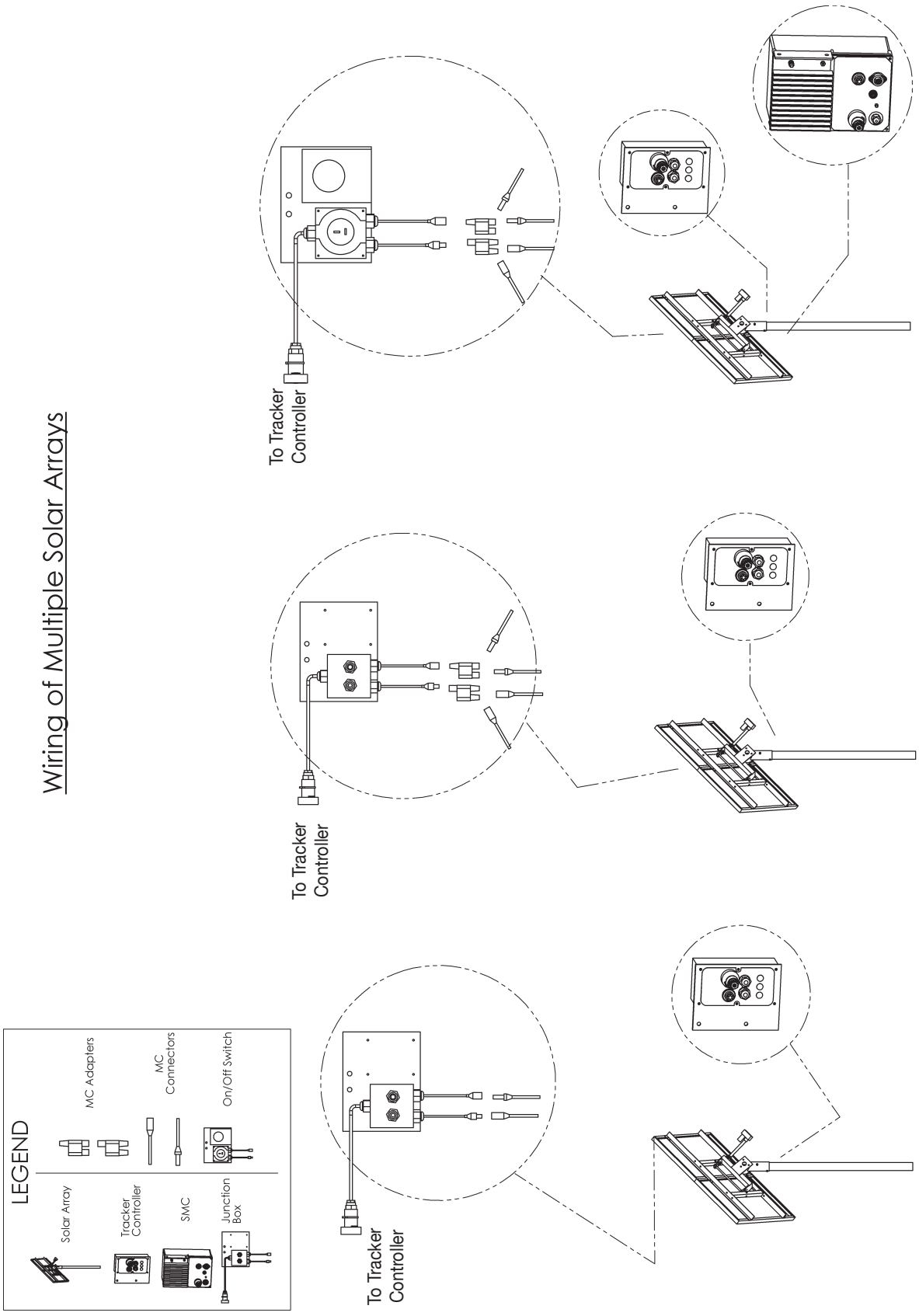
Tracking Array

Connection of Solar Tracking Controller



Warning: Ensure that the solar actuator is only plugged into the Solar Tracking Controller. Never plug the actuator directly to the on/off switch as this will cause the actuator motor to burn out.

Tracking Array



Maintenance

The solar arrays require minimal maintenance. To maintain maximum power output the modules should be cleaned every six months or whenever dust or bird droppings have built up on the modules.
Every 12 months the following checks should be made:

1. Check all bolted joins to make sure that they are tight.
2. The moving joints of the tracking arrays should be lubricated to insure that the frames continue to track freely.
3. Inspect the condition of all electrical conduits, switches and sockets and replace if any damage is visible.

Wiring of Arrays:
All solar arrays are pre-wired and tested prior to shipment. It should not be necessary for any direct wiring work to take place during installation of the system.

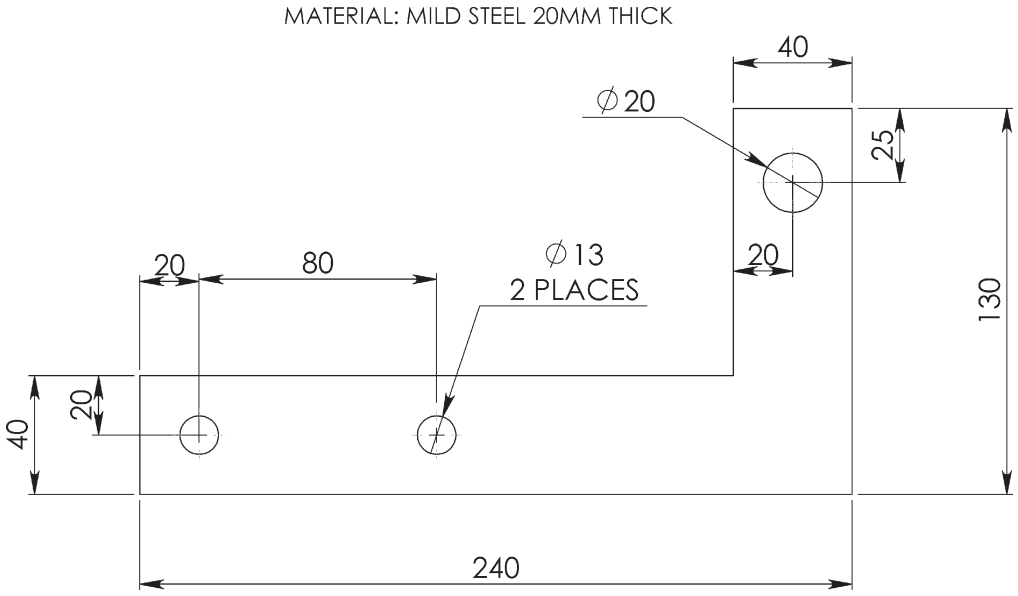
WARNING: Solar arrays can deliver voltage levels up to 170V DC at high light levels. Great care should be taken not to touch wires together, or act as a conductor yourself. Always unplug the electronic pump controller before working on the array In the event that alterations are required to the array itself, it is essential to cover the front of the array with a blanket or other suitable material to completely stop electrical generation.

The solar panels are fastenered to the array frame using factory fitted aluminium rivets. These are used as an anti-theft feature. To remove the panels, these rivets can be drilled out, although care must be taken not to damage the solar panels.

Lifting Apparatus

Lifting The Solar Array

If lifting apparatus is being used to install the array, remove one of the middle panels from the array, and connect a suitable sling to the galvanised frame at the centre of mass. Once lifted onto pole, bolt on the panel and re-connect.
Alternatively, the bracket below can be made up, which can be bolted to the holes at the end of the Duragal angle (four places), giving four lifting lugs.



All Dimensions in mm.

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