



the **ecotube**™
Solar Installation Kit

Installation Guide



Installation Guide : For 1 - 2 panels

South Facing

Issue date: 1/1/2012
Issue version: 2.8

Installation Guide—Contents

	Page
Introduction	
Using this Installation Guide	3
Safety reminders and symbols	3
Transportation and handling	4
Installation Preparation	
Solar system overview	5
Before starting the installation	6
Panel location(s), panel size and roof space required	6
Practical considerations	6
Sizing the cylinder	6
Power supply	7
Safety considerations	7
Twelve Step Installation Guide	
1 Check the kit contents	8
1a Standard kit	8
1b Kit Variations	9
1c Extras	9
2 Prepare the panel	10
2a Fin angle adjustment	10
2b Panel preparation with fin angle adjustment	10
Connection Possibilities	11
3 Fix the panel mounting	12
3a On a pitched roof	14
3b On a flat roof	14
3c On a wall	14
4 Mount the Panel	16
4a On a pitched roof	16
4b On a flat roof	16
4c On a wall	16
5 Run the pipework & sensor cable	17
6 Join pipework to Panel	18
6a Connection through a pitched roof	18
6b Connection through a wall	19
7 Install Internal Components	19
7a Pump station & expansion vessel	19
7b Drain cock	20
7c Fit Sensors	20
7d Install SD3 Display Unit	21
7e Connecting sensors, solar controller & SD3 Unit	21
8 Fill, flush & test system	22
9 Install electrical protection	23
10 Set the solar controller	23
11 Configure for the customer	25
12 Commission and handover	25
Troubleshooting	26
Installation support	26
Appendix 1 — Commissioning checklist & sign off	27
Appendix 2 — Installers Notes	31
Appendix 3 — Kit contents specification	32

Introduction

Using this Installation Guide

This guide describes the Ecotube system and recommended methods for its installation and maintenance. It should be read and used in conjunction with the manuals supplied with, and relevant to, the individual components.

The guide is for 1 or 2 panel installations however for larger installations a similar approach can be applied. Components will then require selection to meet the specific requirements.

We recommend that all their products are installed by properly trained and qualified personnel. These assembly instructions are written for specialists who are authorized to carry out solar thermal installations. The installer should have the necessary basic skills and have the relevant accident prevention measures in place.

Installations have to be adapted to particular sites and responsibility for ensuring that the installation is safe and fit for purpose rests with the installer.

Safety reminders & symbols

Key to Safety symbols used in this manual



DANGER! Immediate danger to life & limb



DANGER! Electrical Hazard



DANGER! Risk of burns or scalding



DANGER! Potentially dangerous situation for the product and environment!

The installer must follow their own Health & Safety procedures, in particular:



The accident prevention regulations for work on roofs should be observed at all times.

Where appropriate use barriers to protect against drop hazard.

Use personal harnesses and/or protective scaffold as appropriate.



Care should be taken to avoid skin burns from contact with hot manifold piping when installing panels in bright sunlight.



Never fill the system with water or perform a pressure test on it if there is a risk of frost, even with air temperatures of 5°C frost damage could occur.

Transportation and handling

Please note the following:

- Transport the Ecotube panel horizontally to provide maximum protection of the tubes.
- The cardboard packaging for the panel has a reinforced top to prevent damage to the tubes.
- The panel should be transported onto the roof inside the cardboard packaging if possible.
- The panel should be carried by the mounting channels or boxed ends and not subjected to twisting.



Use the packaging or other suitable material to protect the panel if installing during sunny weather.



Panel weight of the DF100 (empty) is 40 kg.



When handling the panel suitable protective gloves should be worn to protect against sharp edges.



The panel ends are mechanically fixed to the mounting frame and as such can be hoisted to roof level with slings around either of the boxes.

Installation Preparation

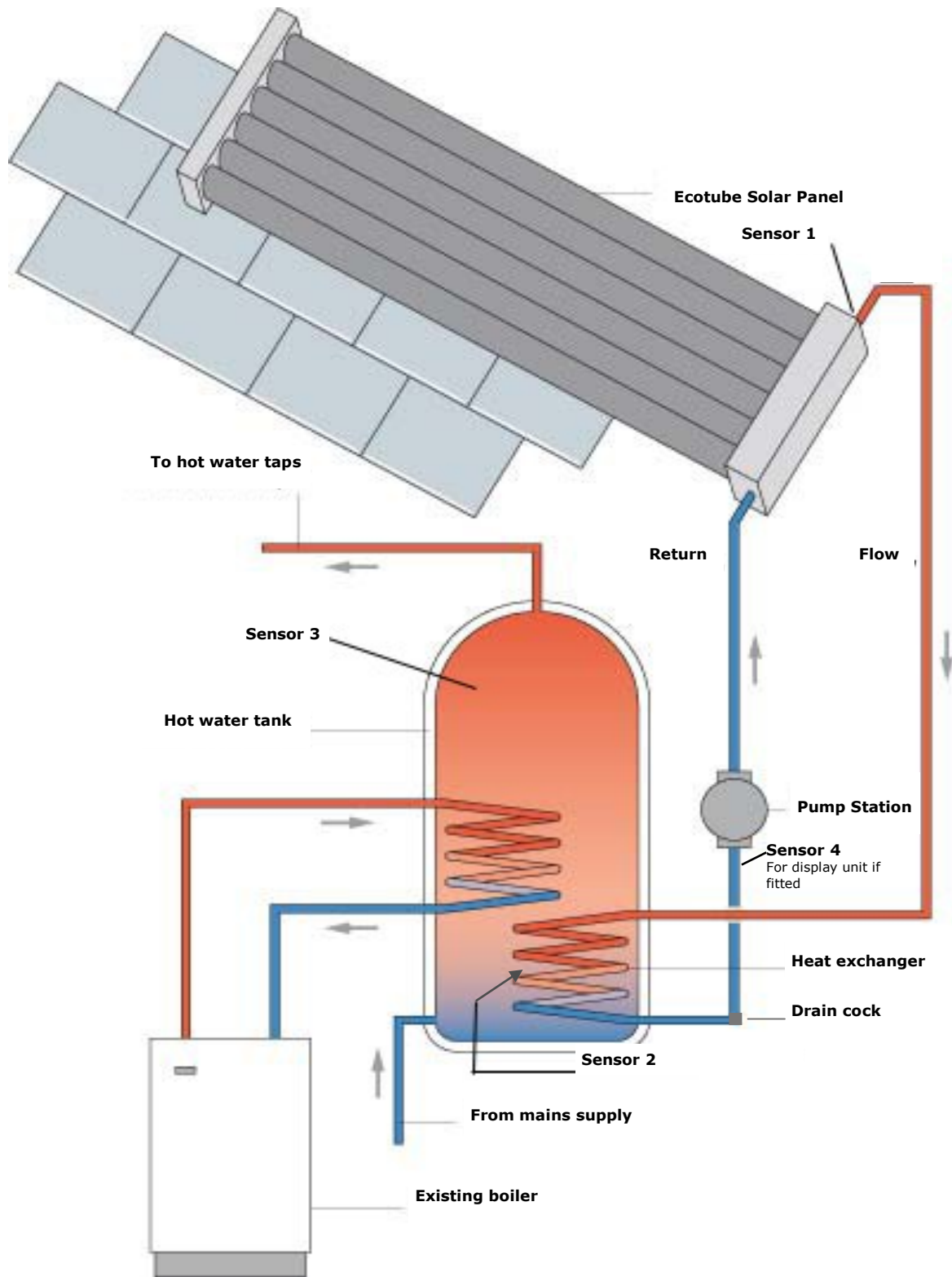
Solar System Overview

The Ecotube™ panel is made up of 6 evacuated glass tubes each containing a fin covered with a special coating of Titanium-Nitrite Oxide. A copper tube filled with system solution passes up the middle of a larger copper tube attached to the middle of each fin (see fig. 1). Solar radiation, direct and diffused, is absorbed by the fin coating and converted into heat. This heat is carried by the system solution and pumped to the hot water cylinder during operation of the circulation pump. The vacuum in the glass tubes eliminates convection and conduction heat losses as well as protecting the collector from adverse weathering influences.

The water in the hot water cylinder is then heated by the system solution circulating from the solar system and through a heat exchange coil near the bottom of the hot water cylinder. Having dissipated its energy, the heat transfer liquid is pumped back to the solar panel for reheating. This process continues provided there is a temperature difference higher or equal to the pre-set value (usually 6°C). NOTE: If this condition is not maintained the pump will switch off and the control unit will wait for the temperature of the panel to increase before restarting the heat transfer process.

Solar System Overview

Fig1. System schematic



Before Starting the Installation

It is recommended that this system is installed by an MCS accredited installer.

In order to be eligible for any government incentives the installation has to be registered by an MCS installer.

Before starting an installation there is important preparation to do. Check the site and decide which Ecotube kit is needed – a one or two panel South facing or a two panel East/West system. This will depend on the size of the household and the hot water cylinder, and the orientation of the house.

Panel Location(s), Panel Size & Roof Space required

A key advantage of the Ecotube™ solar panel is that it can be installed at an angle on a pitched roof, horizontally on a flat roof, or vertically on a wall to gain maximum exposure to the sun's rays. It can also be placed flat on a specially constructed pergola in the garden.

Ideally it should be as close to south facing as possible but if that is not possible a two panel East/West system is also effective. Shading from buildings or trees should be avoided. Take into consideration roof orientation, dormer positions (if any), and internal and external pipe runs. Consult with the client as appropriate.

The dimensions of the Ecotube panel supplied with the Ecotube kit is 2230 x 720 x 135mm in size.

Practical considerations

Decide how the roof can be safely accessed and the height of scaffold required. The installation can be carried out using scaffolding to roof height and roof ladders or by working from an extended scaffolding platform. Examine ground conditions & hazards – i.e. ponds, brick walls, slopes, in the area the scaffold is to be erected in. Arrange for the scaffolding to be erected.

The roof should be checked before installation to ensure that it is in a sound condition and is capable of taking the weight of the panel(s). Check, as applicable, for loose tiles or slates, and soundness of roof timbers.

Plan the optimum route of the pipe runs.

If the panel is to be wall mounted decide if it can be fixed directly to the wall or if it is necessary to use additional battens

Sizing the Cylinder

The Ecotube system requires a hot water cylinder of a suitable size to prevent overheating of the system during normal usage. The cylinder must contain a heating coil able to be dedicated to the solar system.

- Single panel South facing systems require a cylinder capacity between 120L and 180L.
- Double panel South facing systems require a cylinder capacity of between 210L and 300L.
- Double panel East / West systems require a cylinder capacity of between 210L and 300L.

Power Supply



The solar controller will require a fused spur fitted with the appropriate size fuse. For a standard kit a 3amp fuse is recommended. If a fused spur is not already available it will need to be installed by a suitably qualified engineer.

Safety considerations



IMPORTANT:

DO A FULL HEALTH AND SAFETY ASSESSMENT BEFORE COMMENCING INSTALLATION

Each installation is different and the installer is responsible for ensuring that the installation is carried out in a manner fully compliant with all Health and Safety Regulations and best practices. The points listed below are watchpoints to be taken in to consideration but may not cover all eventualities.

Wear appropriate safety gear, high visibility jackets, hard hats, safety boots and gloves for handling the panel and for use when cutting the flexible pipe.

Safe working practices must be adopted when on roofs following all guidelines set out by the Health and Safety Executive. Care must be taken when erecting ladders on PVC guttering to avoid damage. Scaffolding or tower scaffold should always be used when called for by existing Regulations. Arrange for the scaffolding to be erected, only erect scaffolding yourself if you are qualified to do so.

Do not install on the roof, during adverse weather conditions, when the roof is wet or icy and slippery, or when it is excessively windy.

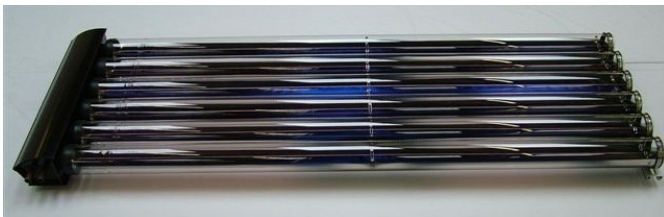
Assess if there may be any danger to passers by: use cones and/or warning notices as necessary. If the install impinges on public areas (e.g. pavements) notify the appropriate authority and arrange for the area to be cordoned off.

Consider how the panels can be hoisted safely. Make sure you have the correct equipment and enough assistance.

The 12 Step Installation Guide

Step 1: Example of Kit Contents

1a. Standard kits could contain:



- Ecotube™ Panel(s)

- Pump station with integral air separator



- RESOL Solar Controller



- Solar display unit, (SD3 smart display) Sensor, 10m bell wire, 20 cable ties. (Optional extra)



- Discharge container and connecting hose



- Fernox or Tyfocor Heat transfer fluid 2x10L



- Expansion Vessel



- Expansion vessel mounting kit



- 10m DN16 21N2 Pre-insulated, flexible, Solar Hose



- Fixing brackets for Solar Hose



- 15mm drain cock,



- 4m HT pipe insulation, 19mm thick



- DN16 nuts, clips & washers. 3/4" x 22mm compressions (4) 22mm compression stop ends (2)



- Installation Guide, User Manual, Warranty Registration Card. Laminated Important User Instructions



STEP 1. Installation Kit Contents cont.

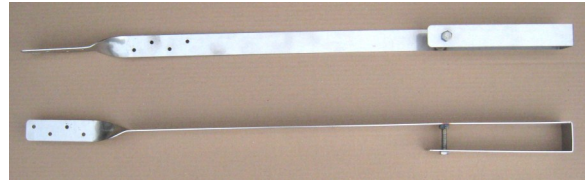
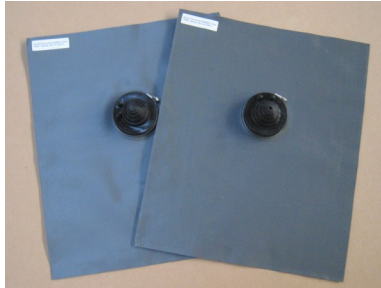
1.2 Additional items (optional)

Different roof fixing items will be required depending on the roof type you have, please specify:

Standard Pitched Roof Installation.

You will need:

- Solar roof flashings (2)
- Ecostraps and bolts (2 per panel) plus unistrut rails



Standard Flat roof Installation Kit

You will need:

- Rubber padstones (4 per panel)



1.3 Other Extras

Depending on the project you may also have purchased some of the following:

- It is a requirement that a Blending Valve, sized appropriately for the cylinder, is fitted to prevent scalding. Purchase a valve suitable for the system concerned.
- Additional Solar Hose

TIPS



If the panels are stored before the start of an installation, they must be kept in a dry location out of direct sunlight—use the packaging or a tarpaulin.



SAFETY REMINDER!

Exercise care when lifting heavy objects
Order and fit a blending valve to prevent scalding

Step 2: Prepare the Panel

2a Fin Angle Adjustment

NOTE: The fin angle may only be set when the system is un-pressurized.

As far as is possible panels should be positioned to face South. The fin angle will usually be at 0° when you receive the panel. Depending on the panel orientation and the roof type the fin angle should be adjusted to optimise solar collection. It is recommended that this procedure be carried out before the panel is fixed on the roof or wall.

Adjust fin angles as follows:

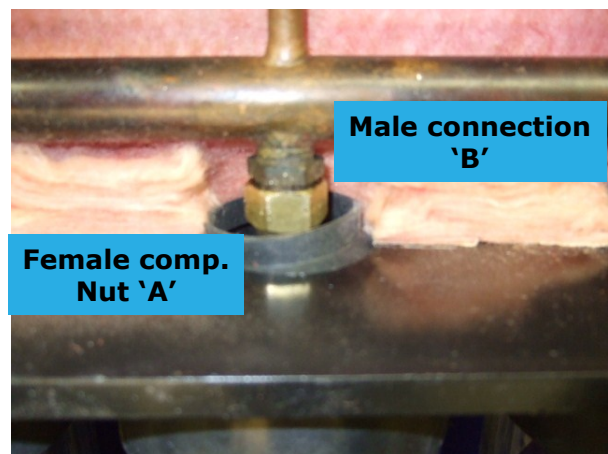
- A) Vertically mounted panel on a 40° pitch sloping roof that does not face exactly due south — rotate fins to face due south.
- B) Horizontally mounted panel on a pitched roof — alter fin angle to face 40° off the horizontal (allow for the pitch of the roof).
- C) Horizontally mounted panel on a vertical wall—alter fin angle to face 40° off the horizontal.
- D) Panels installed on a flat roof should be arranged on the roof to face south with the fins set at 30° off the horizontal

If you have a query about whether or not the fin angle needs adjustment please phone our helpline on 02087833050 ask for Technical

2b Panel preparation with Fin Angle Adjustment

1. Unscrew the 3 self tapping screws on the panel header box
2. Open the header box and carefully remove the top layer of heat insulation to reveal the header pipe work and tube connections.
3. Loosen the jubilee clip at the end of the tube
4. Carefully loosen the lower tube compression nut (female nut A fig. 2) from the upper manifold connection (male connection B fig. 2), until the tube rotates
5. Rotate the tube until required fin angle is reached
6. Carefully tighten the lower tube compression nut to the upper manifold connection until tube is unable to rotate, **DO NOT** over tighten
7. Retighten the jubilee clip
8. Repeat steps 3 to 7 for each tube

Fig. 2 – Evacuated Tube Connections



Male connection 'B'

Female comp. Nut 'A'

2b Panel preparation continued

9. Drill a hole in the rubber around or between the pipes and push the sensor inside the manifold. Use the sensor with the black cable as this is heat protected.
10. The sensor should be located on the flow pipe (pipe closest to the glass tubes) inside the manifold just before the exterior flow pipe connection. It should be secured in direct contact with the copper pipe using a jubilee clip. (See Fig. 3). This sensor will later be connected to the sensor wire on the insulated pipe, in the roof space using the connector box supplied.
11. Replace the heat insulation into the header box and replace the header box lid
12. Screw the 3 self tapping screws back into the panel header box
13. Air pressure test the panel to 1 bar to check for leaks.
14. Select the flow and return pipes and fix 22 mm compression joints to these, blank off the other 2 pipes with 22mm stop end compressions. Please consult Fig. 4.
15. Note the unique panel number and write it down on the warranty registration card.

Fig 3. Panel manifold end to show sensor position

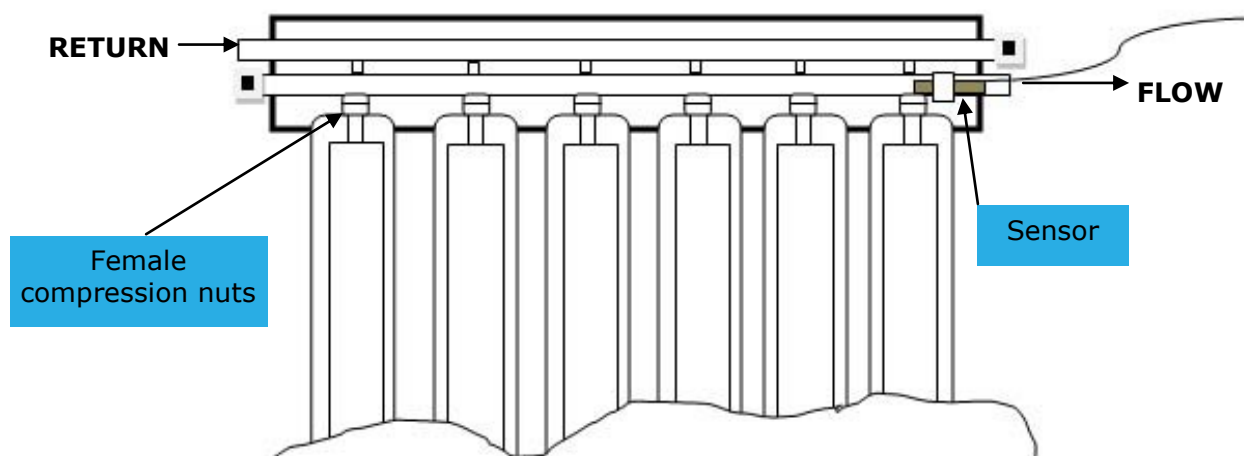


Table below shows install area and sensor requirements for different kit options.

Ecotube™ Kit	No. of Panels	No. of Panels with Sensors	Required installation area W x H (mm)
1 Panel Kit	1	1	720 x 2250
2 Panel Kit	2	1	1480 x 2250
East/West Kit	2	2	720 x 2250 (2-off)

TIPS



REMEMBER: The panel flow connection is the copper pipe closest to the glass tubes, the return pipe is the one furthest away.

WARNING: When changing the fin angle be extremely careful not to crack the compression nuts when loosening and tightening them.

Fig 4. Connection Possibilities

The panels can either be installed vertically or horizontally (see figs.1 & 2).

Fig 4a. Vertical Installation

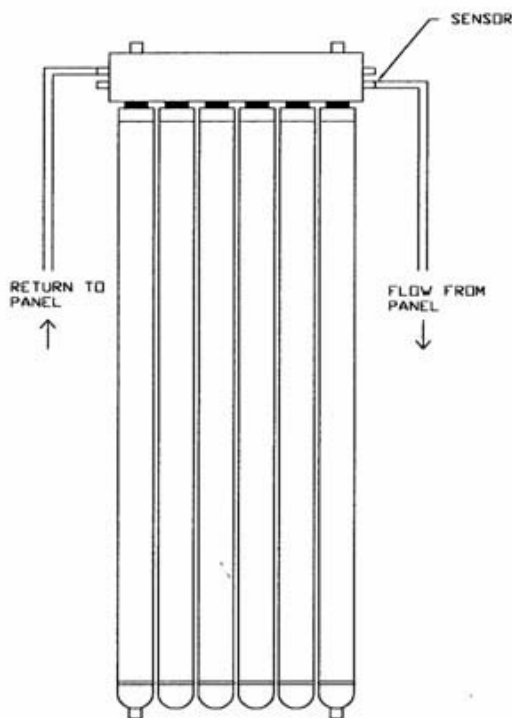
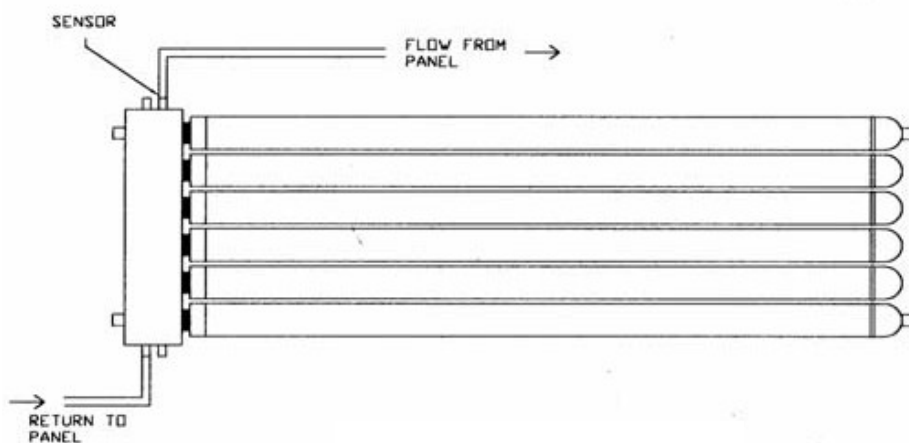


Fig 4b. Horizontal Installation

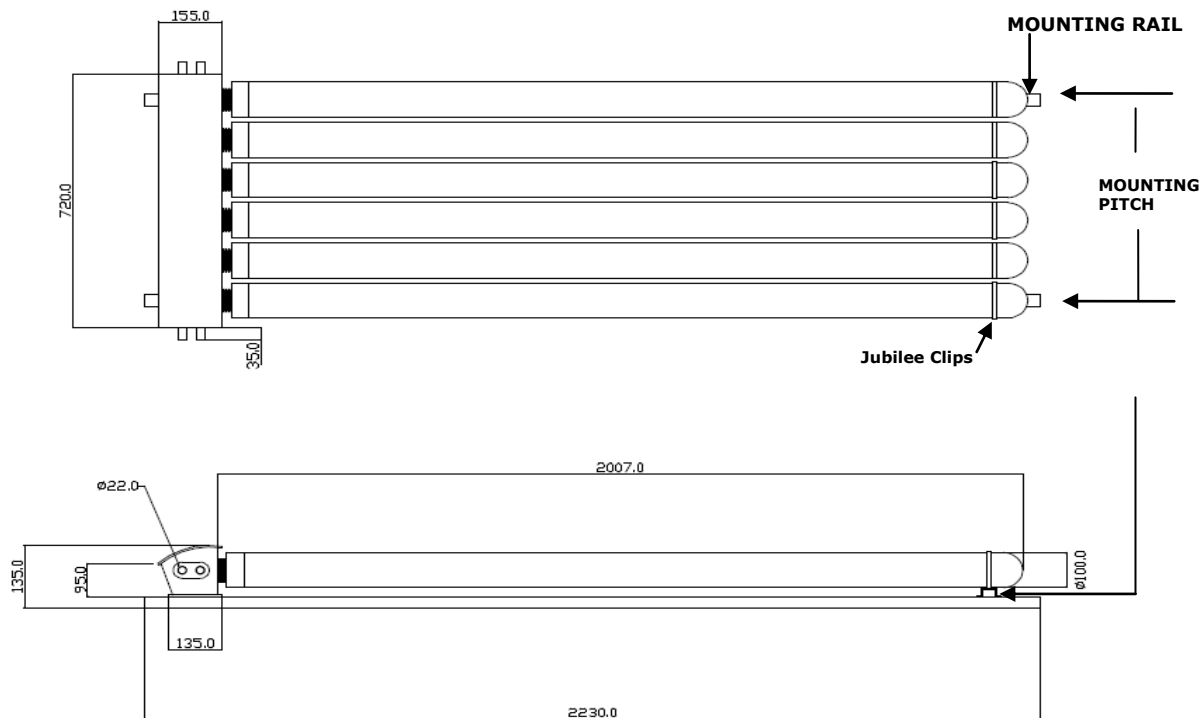


Important – When carrying out horizontal installation it must always be ensured that the direction of flow is from the bottom of the panel to the top to ensure venting.

Fig 5. Panel plan and elevation diagram showing mountings

The mounting rails can be adjusted if required by loosening the fixings and sliding the clamps to suit the preferred pitch. Ensure that the clamps are tightened well once moved.

The mounting rails are provided with several 8mm wide slots to allow for diversity of fixing centers.



- Stop ends for blanking off the unused panel connections are supplied.

Step 3: Fix the panel mountings

The third step is to fix the mountings for the panel
You may have purchased either a pitched or a flat roof kit.

3a. On a Pitched Roof refer to Figs 6 & 7

1. Access the roof to locate rafters for fixings. Remove roof tiles where fixings are to go.
2. Use the optional Ecostraps as they offer more flexibility.
3. Fix the straps to the rafters using suitable wood screws. Straps should be as wide apart as possible but the exact spacing will depend on the distance between the rafters and the configuration of the roof.

TIPS



- Although it is sometimes impossible to avoid standing on tiles/slates, keep this to a minimum and try not to put on your full body weight. Apart from the danger of slipping, a cracked tile or slate means unnecessary repair work.



- At least four tiles should be left clear from top connection to ridge, for ease of working on pipe connections inside the roof space.

3b. On a Flat Roof

If you are putting the panel on a flat roof:

1. Place the 4 padstones (optional, with flat roof kit) on the roof, spaced so that the mounting channels (see Fig. 5) will rest centrally on them.
2. There is no need to secure the panel to the roof.

3c. On a Wall

If the panels are to be wall mounted

1. Measure the centres of the panel mounting channel slots (see Fig. 5).
2. Drill two holes into the wall at this distance apart.
3. Install suitable shield anchors (not supplied)

STEP 3C TIPS

- If the wall substrate needs reinforcement we suggest the use of 41mm x 21mm unistrut (not supplied) fixed to the wall with appropriate fixings and then the panel can be fixed to the unistrut.
- A slight rise should be allowed for at the manifold end to assist in venting.
- **REMEMBER!** Fixing the panel is a two person job.

Fig 6. Pitched Roof solar panel mounting schematic - Side View

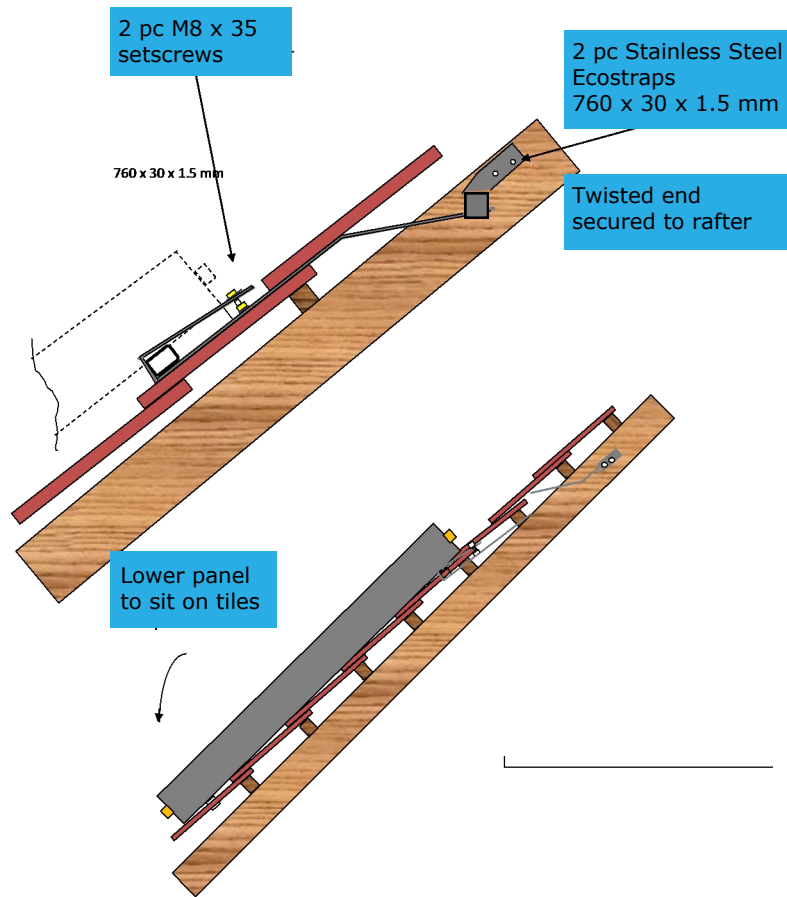
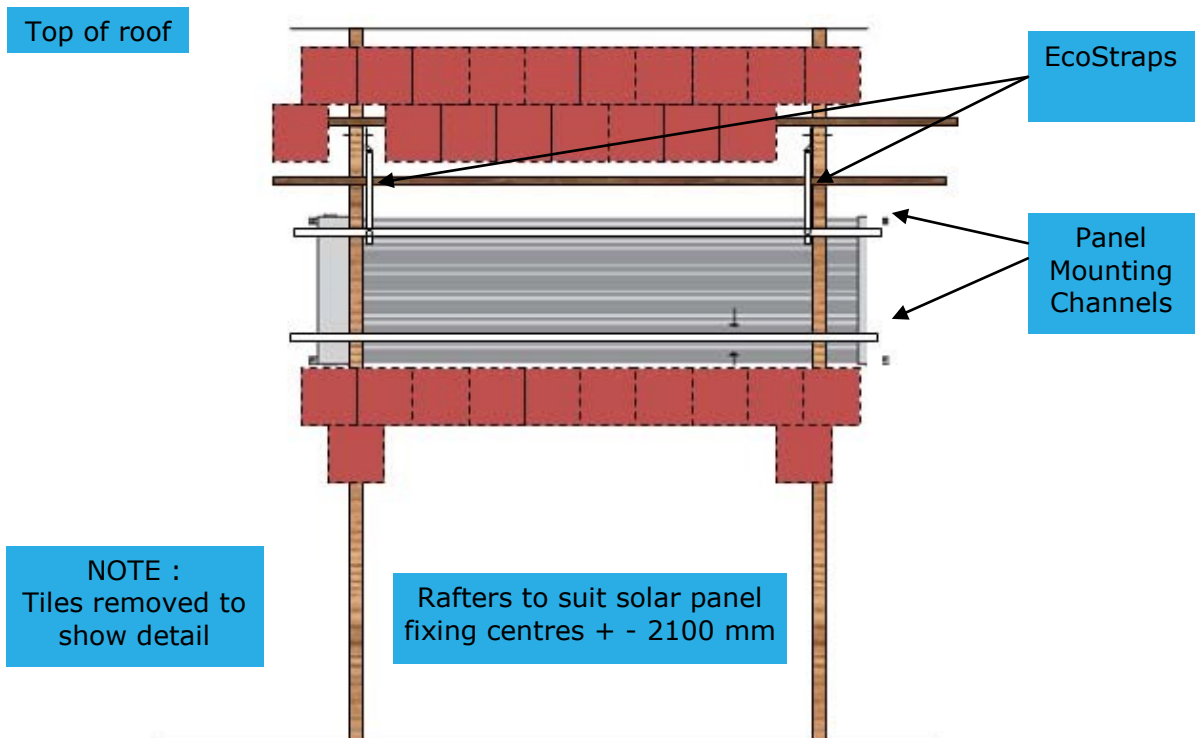


Fig 7. Pitched Roof solar panel mounting schematic—Plan view of a landscape fixing



Step 4: Mount the Panel

The fourth step is to attach the panel to the mountings

Step 4a. On a Pitched Roof

If the roof is sloping:

1. Attach the two unistrut rails provided to the back of the mounting rails
2. Hoist panel to roof level and slide the panel up the roof over the fixings.
2. Ensure the fins are facing the correct way.
3. Lift the panel into position on the mounting straps.
4. Fix the panel in position using securing bolts.

Step 4b. On a Flat Roof

If you are putting the panel on a flat roof:

1. Hoist the panel up to the roof and place on the rubber padstones
2. Ensure the fins are facing the correct way.
3. No securing to the padstones is necessary.

Step 4c. Wall Mounted

If the panel is to be wall mounted

1. Hoist the panel up and position on the wall mountings or shield anchors.
2. Ensure the fins are facing the correct way.
3. Secure the panel in place by fixing to the shield anchors.



TIPS

- When hoisting the panel, it is quite useful to take the weight by a rope slung over the ridge tiles and finally tied to a ground fixing or chimney stack. This allows fine adjustment and marking of fixing points with no danger of the panel slipping.
- The Ecotube panels can be hoisted by the manifold end using suitable slings / rope with care. NOTE: **Do not** allow panel to twist during hoisting as this can damage the connections within the manifold.
- Avoid exposing the vacuum tubes of the panel to strong sunlight during installation, keep covered with a suitable cover until the system is filled. Prolonged exposure, without fluid, may damage the panel.



SAFETY WARNING!

Mounting the panel on the panel mountings is a job requiring at least two able persons. Carry out a risk assessment prior to hoisting up the panel.

Step 5: Run Pipework and Sensor Cable

The fifth step is to run the pipework & cable through the property.

1. Stainless Steel DN16 2 in 2 is supplied in a standard kit and can be installed directly to the panel with the fittings supplied. The heat insulation materials must be able to withstand temperatures of up to 160°C, the supplied hose includes 14mm thick Armaflex HT insulation as standard. 10m of hose is supplied with the Ecotube kit, if more is needed it can be ordered from the supplier who provided the kit. The use of this hose is recommended in order to reduce the number of joints (and therefore risk of leaks) and also to enhance the finished appearance of the installation.
2. If the tubing of the flow and return lines is carried out using copper tubes they must be DIN 1786 or approved systems.
3. You will already have decided on the shortest and least disruptive route from the panel to the cylinder through the property for the pipework and sensor cable.
4. Make sure the pipework is neatly fixed to the property where necessary
5. When considering connection possibilities for a panel on a sloping roof consult Figs. 4a and 4b.

TIP

For a neater job come off the panel and penetrate the roof in 22mm copper pipe using compression fittings and then connect to DN16 2 in 2 flexible solar hose.

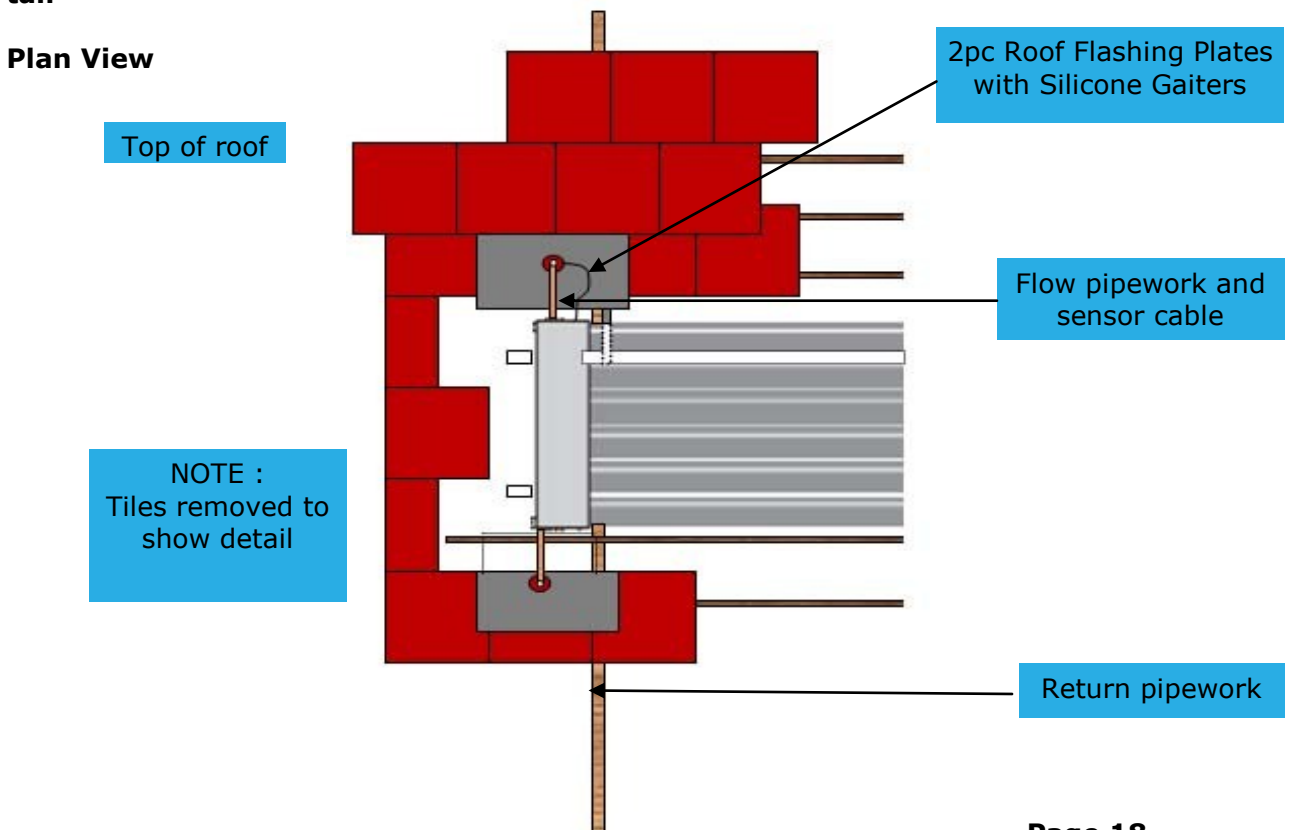
Step 6: Join Pipework to Panel

The pipework now needs to be connected to the panel through the roof or wall, depending on the location of the panel

STEP 6a Connection Through a Pitched Roof

1. The penetration through a sloping, tiled roof should be made using lead flashing plates or similar to prevent water ingress available as an option to your Ecotube Kit.
2. Locate where to drill your holes from inside the roof so as to miss the roof joists.
3. Drill the holes through the tiles (we advise drilling pilot holes first to minimise the chances of breaking tiles).
4. Lay the lead flashing over the tile with the hole.
5. Cut a small hole in the top of the cone of the flashing plate for the pipework (smaller than the pipe diameter) and push the pipe through.
7. Ensure the roof is water proof and the flashing is flush around the edges of the tile.
8. Repeat this process for the other pipe.
9. Cut a very small hole in the cone of one of the flashing plates to allow the sensor wire from the panel to enter the roof. Inside the roof space connect the sensor wire in the centre of the DN16 solar hose to the wire from the sensor on the panel using the connection box supplied.

Fig 9. Pitched roof solar panel mounting schematic with pipe work penetration detail



STEP 6b Connection through a wall

1. For a flat roof installation if possible run the pipework over the edge of the roof and penetrate the wall as for a wall installation.
2. If the pipework must penetrate a flat roof, consult a roofing contractor to ensure a waterproof finish.
3. To penetrate an exterior wall drill suitable size holes for sleeves to accept the flow and return pipework and another, smaller, hole and sleeve for the sensor cable.
4. All pipes should be sleeved through the full thickness of the wall.
5. Waterproof the installation using a suitable silicone sealant
6. Inside the roof space connect the sensor wire in the centre of the DN16 solar hose to the wire from the sensor on the panel using the connection box

WARNING!

Do not penetrate a flat roof. If it is not possible to run the pipework over the edge and through a wall consult with a roofing contractor to ensure a water-tight finish

Step 7: Install Internal Components

7a Pump Station, controller, expansion vessel & discharge container

The pump station and controller need to be mounted close together so that they can be connected with the lead supplied. They should be ideally be installed adjacent to the hot water cylinder so information on system status can be observed in relation to system pressure, system temperature and system flow. They should be located where the customer can clearly see and access both the solar controller and the system pressure gauge.

The expansion vessel is normally installed directly off the pump station using the expansion vessel connection set supplied with the kit. The discharge container is mounted below the pump.

Fix the Pump Station and ancillaries

1. Securely fix the pumpstation, controller, discharge container and expansion vessel mounting bracket to the wall.
2. Connect the hose supplied to the pressure relief valve and into the container
3. The controller will require a fused spur. If not already available this will need to be installed by a suitably qualified engineer
4. Before being secured the expansion vessel precharge pressure must be set to 1.3 bar (or 19psi) at 20°C. Do this by removing the valve cover, measuring the existing pressure in the vessel and bleeding the air with a tyre pressure gauge to the recommended pressure.



Connect the Panel, Pump Station & Cylinder see Fig. 1

5. Run the flexible, insulated stainless steel flexi pipes directly from the panel connections in the roof down to the solar cylinder, using the pipe brackets supplied. The flow pipe from the panel is connected to the left side of the pump station and the return pipe is connected to the cool right side.

For neatness, copper pipework is recommended to connect to the cylinder.

6. Join the flexi pipe to copper pipework with the connectors supplied as follows:

- A. Wearing a pair of safety gloves cut the flexi to the required length
- B. Slide on the nut and fix the circlip round the last groove on the pipe.
- C. Tighten the flexi-copper flat edge up to the nut.
- D. Release the nut to reveal the flanged end on the flexi pipe.
- E. Insert the washer and tighten back up.

7b Install Drain Cock

1. Attach the return solar connection on the cylinder with 22mm compression connections to the drain cock
2. The drain off cock should be located on this return pipe at the lowest point of the system (usually next to the return solar cylinder connection).
3. The copper return connection from the cylinder is connected to the bottom of the pump station.
4. The return flexi pipe to the panel should run from the top of the pump station.

5. The black S1 sensor should already have been installed and connected inside the manifold box on the flow pipe.
6. Install the grey S2 sensor on the cylinder – this is normally positioned in the pocket provided on most cylinders located in the middle of the solar coil. If a pocket is not provided carefully remove a section of the foam insulation, place the sensor against the cylinder ensuring good contact and re-cover with the insulation that you removed.
7. Install the grey S3 sensor on the top of the cylinder. If no pocket exists it can be strapped to the hot draw-off pipework as close to the cylinder as possible. This sensor is normally used to give an indication of the temperature at the top of the cylinder i.e. Temperature potentially going to the taps (prior to the blending valve)
8. Install grey S4 sensor for display unit to return pipe work beneath pump station using a cable tie or jubilee clip. N.B. This sensor is only required when fitting a SD3 display unit

7d Install SD3 Display Unit

The Display Unit should be mounted where it is easily visible. Consult with the client as to the exact location. It will be connected to the solar controller with the bell wire (supplied) so consider where this can be run unobtrusively.

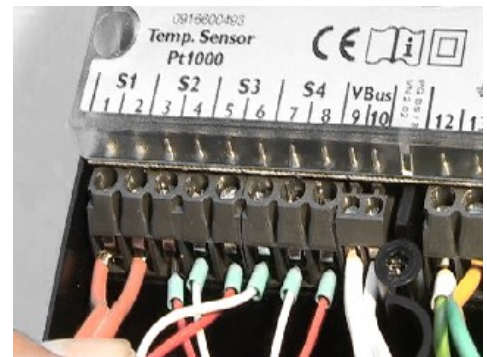
1. Mount the SD3 display unit following the mounting instructions in the SD3 box.
2. Take the supplied 10 metre length of 2 core bell wire and connect one end to the V-bus output in the solar controller.
3. Run the bell wire to the SD3 display.
4. Connect the remaining end of the bell wire to the V-Bus connection in the back of the SD3 display unit.



7e Connecting Sensors, Solar Controller and SD3 Display Unit

Connect the wires from the sensors to the correspondingly numbered points on the Solar Controller. For example when using a Resol BS4 the following apply.

- i.e S1 from the panel sensor
- S2 lower cylinder sensor
- S3 top of cylinder sensor
- S4 return flow sensor (before pump station)
- S4 is only used in conjunction with the SD3 display



STEP 7 TIPS

If the pressure vessel is set up incorrectly, the system will over pressurise and vent off.

Only insulate the connection between the pump station and the expansion vessel if there is a risk of burns to the customer.

The lower sensor S2 needs to be installed on the cylinder at the mid point of the Solar coil. Depending on the type of cylinder or heat exchanger it is critical to place this sensor in the correct position to ensure efficient operation of the system.

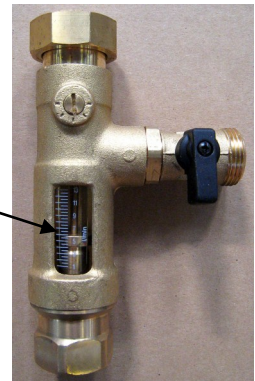
WARNING!



Once cut the flexi pipe is razor sharp. Wear gloves when handling.

Step 8: Fill, Flush and Test the System

1. If there is a possibility of contamination in the system, eg due to brazing, drain the system and flush through with mains water to remove any loose scale or contaminants
2. Use a fill and flush pump to fill the system with the glycol provided via the fill/flush points on the pump station.
2. Pressurise the system to 3 bar for 20 minutes to test for leaks
3. Check all joints for leaks, drain and repair if necessary, and retest
4. When draining disconnect the electrical supply to the pump station to isolate it. Use the drain points on the pump station or the drain cock on the return pipework adjacent to the cylinder to drain the system. If the system is already filled with glycol drain into original container for re-use.
6. Refill the system. Open the Automatic Air Vent (AAV). Reconnect electrical supply.
7. Pressurise the system to 1.5bar – this is the operational pressure
8. Run the pump on manual operation (MAN1). Check all the joints again. (see page 24, step 10)
9. Top up as necessary to maintain pressure at 1.5 bar as air is expelled through the AAV
10. Set the flowrate at 1.5 litre/minute/panel using the manual flowsetter on the pump station. E.g. Two panels would be 3L/minute
Take the reading from the top of the internal float
11. When satisfied that all air has been expelled close the AAV.
12. Set the controller to AUTO operation(MAN2). See page 24, Step 10



The System should now be operational the green light should be **ON**

STEP 8 TIPS

Use the drain points on the pump station or the drain cock on the return pipework adjacent to the cylinder to drain the system.

WARNING!



When draining disconnect the electrical supply to the controller and pump station to isolate them.

Step 9: Install Electrical Protection

For general electric shock protection:

1. Link the panels together so that they are electrically equal.
2. Connect the solar tubing (flow and return) within the buildings earthed equipotential bonding zone, using a short line. (this would normally be done via the equipotential bonding in customers cylinder cupboard)
3. If there is lightning protection in place in the building, large metal parts (e.g. the collector housing) must be connected to it. It is recommended that a RESOL surge protector is installed to extra protection.
4. Please observe the assembly instructions issued by the control system manufacturer.
5. Work must always be carried out by an authorised specialist.

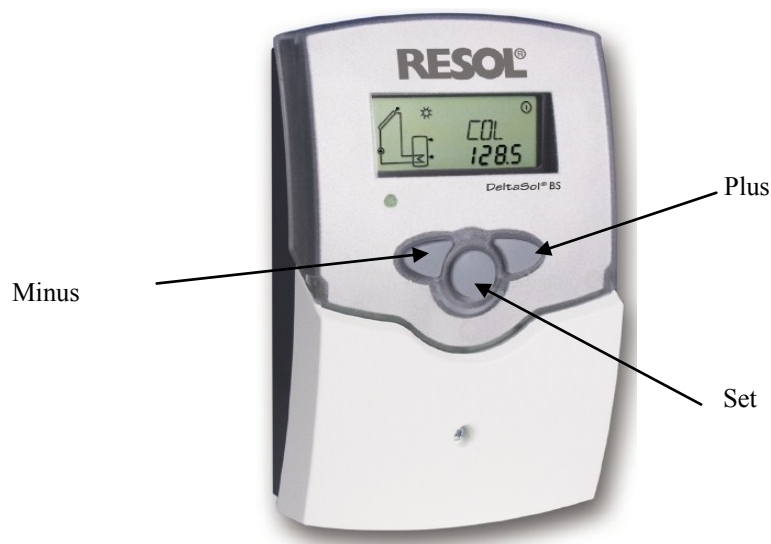
Step 10: Set the Solar Controller

Settings for the BS4 Controller only

Use the plus and minus buttons to scroll through the menu. Using the plus button go straight to "current time" setting and set the time by holding down the centre "set" button until the set sign flashes and then, using the plus and minus buttons, set the correct time. Once correct, hold down the set button until the "set" sign stops flashing in order to save the time selected. Next **hold down** the plus button until AAR 1 shows then follow the procedure on page 24

Definitions:

- COL = collector temperature
- TST = lower tank temp
- S3 = upper tank temp
- S4 = return temp
- HP = total operating hours of solar pump



Common BS4 controller settings should be as below:

(see controller manual for more detailed information and settings)

ARR1 = standard solar system (use this setting)

DTO = switch on temp difference (set to 6)

DTF = switch off temp difference (set to 4)

SMX = maximum store temp (set to 60)

EM = panel max temp shut down (set to 130)

OCX = collector cooling (set to off)

OCN = minimum limitation collector (set to off)

OCF = antifreeze collector (set to off)

OREC = option re-cooling (set to off)

OTC = option tube collector (set to off)

OHQM = heat quantity measurement (this is used for the remote display, set to on).

(If not using the display switch to off)

FMAX = flow rate (set to 1.5 ltr./min/panel i.e. 3L/min for twin panels etc)

MED% = heat medium (set to 3)

MAN1 = manual/auto operation (set to manual for testing and auto once commissioned)

MAN2 = set to Auto

LANG = language (EN=English)

BS4 = version number

The SD3 display (if fitted) will now show panel temperature, top store temperature and total kW hr output for the solar thermal system.



Step 11: Configure for the Customer

Configure the system to meet the Customer's needs

1. To customize the system for the client you need to understand when the customer normally uses hot water and how much is typically used. Consider baths, showers, washing up, washing machine (if hot fill) etc
2. Suggest a time programme for the boiler that meets the hot water needs of the customer. This will typically involve the solar gain through the day topped up by the boiler to ensure evening and morning hot water needs are fulfilled. e.g. depending on the time of year, set the timer to run the boiler until the cylinder is at the required temperature during the night to 'top up' the solar gain in advance of showers the following morning.
3. Set the thermostat on the cylinder to 65°C
4. To be sure the system is fully operational go through, and fill in, the commissioning checklist in Appendix 1.



WARNING!


Ensure the system reaches a minimum of 60°C for 1hr each week to guard against Legionella risk.

Step 12: Commission and Handover

1. Complete and sign the commissioning checklist
2. Make sure the customer understands the system.
2. Explain the readings on the display (or solar controller if no display is installed) with particular emphasis on S3, the cylinder temperature
3. Fix the laminated 'Important User Notes' near to the controller.
4. Make sure the warranty registration card is filled in and the customer has the user manual.

Job Done!

Troubleshooting

Problem	Cause	Action
No power to the controller	<ol style="list-style-type: none"> 1. Faulty/blown fuse in mains supply. 2. Faulty/blown fuse in control unit. 3. Circuit breakers/fuses tripped in house. 4. Power cut. 	<ol style="list-style-type: none"> 1. Check wiring and replace fuse if required with 3amp in plug. 2. Check and replace fuse if required with 4amp circular fuse in controller fixings kit. 3. Check wiring and reset. 4. Wait until power is restored.
Sensor fault indicated by: <ol style="list-style-type: none"> 1. !  symbols 2. 888.8 displayed for sensor 3. -88.8 	<ol style="list-style-type: none"> 1. Faulty sensor. 2. Loose connection on sensor leads. 3. Short circuit. 	<ol style="list-style-type: none"> 1. Check/Change sensor. 2. Check sensor wires for connection. 3. Check the line.
Pump will not run	<ol style="list-style-type: none"> 1. Mains/pump wiring faulty. 2. Pump rotor jammed. 3. System parameters EM exceeded. 	<ol style="list-style-type: none"> 1. Check wiring at mains/pump. 2. See pump manufacturers instructions. 3. Cover solar panels and allow to cool.
No circulation in system	<ol style="list-style-type: none"> 1. Pump isolating valves closed. 2. Air lock at pressure relief valve. 3. Air lock in the system. 4. Pump is not running. 	<ol style="list-style-type: none"> 1. Open valves. 2. Twist cap at pressure relief valve and vent air (if accessible). 3. Check all pipe work rises on return side and falls on flow side. Clear manual air vents. 4. See above.
Pressure drops in system	<ol style="list-style-type: none"> 1. Leak in system. 2. Drain down valve not closed. 3. Pressure relief valve not fully closed. 	<ol style="list-style-type: none"> 1. Check all joints. 2. Close fully. 3. Clean and replace if necessary.

Installation Support

Call the Installation helpline: 02087833050 and ask for technical

Appendix 1—Commissioning Checklist



Commissioning Checklist & Sign Off

Client Name & Address:	Site Address (if different):

Commissioning Checklist cont.

Panel and Roof

	Yes	No	N/A
1. Panels secured			
2. Roof tiles replaced and secure			
3. Sensor securely fixed			
4. Water-proofing checked			
5. Insulation OK			

Solar

	Yes	No	N/A
1. All joints checked for leaks			
2. Anti-freeze added, frost protection on controller switched to off			
3. All pipe work securely supported			
4. AAV valve closed			
5. Manual air vents cleared and closed			
6. Drain cocks closed and tightened			
7. Check valve bleed screw closed			
8. Pump correctly fitted			
9. Pump isolating valves fully open			
10. Pump setting correct/flow meter set – 1.5 litres/min per panel.			
11. System pressurised to 1.5 bar			
12. Filling loop closed			
13. Filling loop disconnected			
14. Pressure relief valve cleared			
15. No isolating valve between panels and safety valve			

Commissioning Checklist cont.

Primary – Auxiliary (if appropriate)

	Yes	No	N/A
1. All joints checked for leaks			
2. AAV Open			
3. Manual air vents cleared			
4. Drain cocks closed and tightened			
5. Radiators cleared of air			
6. Header tank ball valve operating			
7. Header tank insulation replaced			
8. Boiler operation checked			
9. Radiators checked			
10. Hot water checked			

Secondary

	Yes	No	N/A
1. All joints checked			
2. Cold tank filled			
3. Cold tank ball valve operating			
4. Gate valves open			
5. Cold tank lid and insulation replaced			
6. Water at all taps			
7. 3-way diverter valve correctly fitted (if applicable)			
8. Thermal mixing valve fitted			

Commissioning Checklist cont.

Electrics

	Yes	No	N/A
1. CH/HW controller reset			
2. Immersion heater connected and tested			
3. 13A socket to solar controller tested for correct polarity.			
4. Tank and reference sensors tested securely positioned			
5. Electric wires clipped and tidy			
6. Sensors tested on controller			
7. Controller temperature settings correct			
8. Pump setting on AUT			

Mains Water Supply

	Yes	No	N/A
1. House stop cock open			
2. Primary header tank stop cock open			
3. Cold tank stop cock open			

Insulation

	Yes	No	N/A
1. All pipe work insulated			
2. All insulation securely taped			

Tidy Up

	Yes	No	N/A
1. All dust sheets removed			
2. All packaging in vehicle			
3. Indoor work areas cleaned			
4. Outdoor work areas swept			

Appendix 2—Installers Notes

Comments:

Installing Engineer:

..... Sign
..... Print
..... Date

Site Specific Additional Details:

Electrical Supply Isolation

Specialist Information

Collector Manufacturer & Model: Ecotube DF100
Controller Manufacturer & Model: Resol
Cylinder Manufacturer & Model:

Appendix 3—Kit Contents Specification

Contents may vary

A3.1 Ecotube™ DF100 Panel(s)

- Dimensions - 2230 x 720 x 142
- Weight - Empty - 40kg - Full - 42kg
- Net aperture area - 1.114m²
- Net absorber area - 1.069m²
- Performance (Swiss testing station)
 - 949 kWh / panel / year
 - 852 kWh / m² / year
- Performance (UK)
 - 810 kWh / panel / year
 - 727 kWh / m² / year
- Gas displacement - CO₂ / year 153.9kg
- Electricity displacement - CO₂ / year 348.3kg
- Number of tubes - 6
- Diameter of tube - 100mm
- Solar Keymark collector details — Eurosun Vacuum Solar Systems GmbH 011-7S1803R
- Conformance - DIN EN12975

A3.2 Pump station & Solar controller for 1 or 2 panel installations.

Single & Double panel systems: PAW Pumpstation c/w BS4 Solar controller.

- Twin line pump station, dial pressure gauge, 6 bar pressure relief valve, air separator, flowmeter, fitted with manual air vent, filling and flushing unit, wall mounting kit, insulated casing.
- Resol DeltaSol BS4 Controller - easy to read multi-display screen with backlighting that allows the user to view the operating status of the system.

East/West System: Flowcon D2F Pumpstation, BS plus Solar Controller.

- Three line pump station, flow and return thermometers, dial pressure gauge, 3 or 6 bar pressure relief valves, flowmeter, filling and flushing unit, wall mounting kit, insulated casing.
- Resol Delta Sol BS plus Controller - easy to read multi-display screen with backlighting that allows the user to view the operating status of the system.

A3.3 10m DN16 2in2 pre-insulated, flexible, Solar Hose.

- Flexible hose with integral insulation enables protected pipework to be run with minimum joints reducing risk of leaks as well as enhancing finish and improving installation time.
- Technical Data:
 - Insulation: 150°C resistant closed cell EPDM, thickness 14mm, thermal conductivity $\lambda=0.038\text{W}/(\text{mK})$.
 - Sensor Cable: 2 core, 0.75mm², silicone rubber 175°C.
 - End fitting BSP thread 3/4", Max working pressure @20°C 16 bar, Dimensions W x H 90 x 50 mm.
- Set of 4 Solar Hose fixing brackets (set of 8 for East/West system), pack of fittings for stainless flexihose (2 of for E/W system).

A3.4 Expansion Vessel c/w mounting bracket with quick release coupling.

- Protects the system under stagnation conditions.
- Quick release coupling means EV can be serviced without system draindown.

A3.5 10L Fernox or Tyfocor Transfer Fluid

- Ready mixed Heat Transfer fluid and antifreeze affording protection to solar panels and pipework.

A3.6 Smart display SD3 - optional

SD3 smart display with 3 7 segment displays for indication of the system temperatures and heat quantity of the solar system.

A3.7 Panel Mounting Kit - optional

- Pitched Roof: LS2 Solar Roof Flashings set of 2 (set of 4 for E/W system), HT Insulation, Eco straps and fixings (2/panel).
- Flat Roof: Rubber padstone 1 pc 500mm x 500mm x 30mm thick to be cut into 4 equal squares.
- Wall Mounted: Wall hanging brackets and fixings (Not supplied)

A3.8 Documentation

- Installation Guide
- Users Manual
- Important User Notes (for fixing by Solar Controller)
- Warranty Registration Card