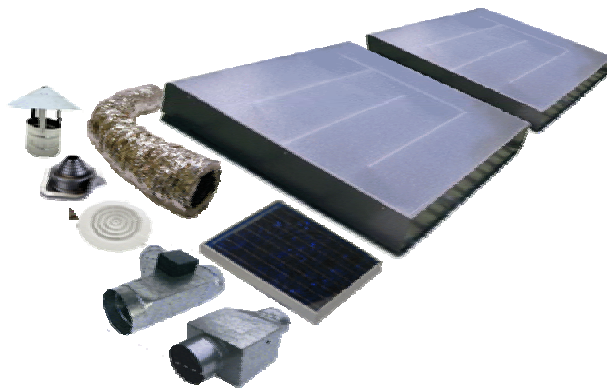
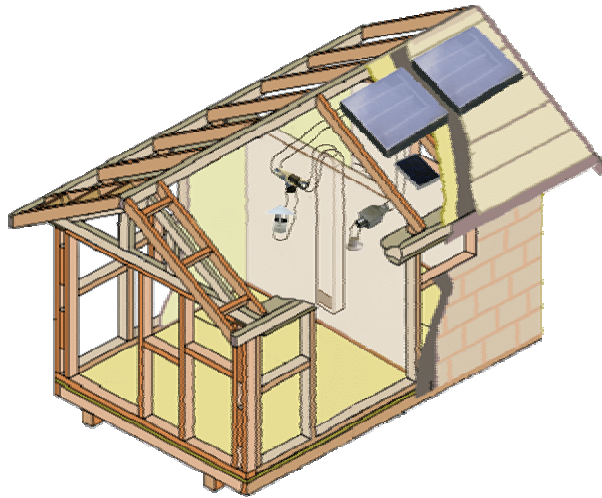


# Installation Guide



## Dual Collector System

Version 3

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Last updated 20<sup>th</sup> July 2007

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**Caution**

No Liability is assumed for any damage caused by improper installation.

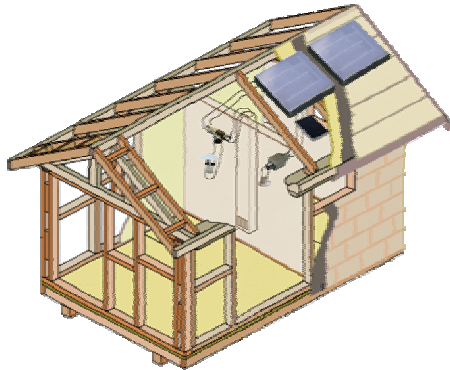
**Notice**

The information in this manual is subject to change without notification. Additional pages may be inserted in future editions. The user is asked to excuse any technical inaccuracies or typographical errors in the present edition.

No responsibility is assumed if accidents occur while the user is following the instructions in this manual.

This manual, any copyrightable subject matter sold or provided with or in connection with the sale of the Sun Lizard products are protected by copyright. All rights are reserved. Copying or other reproduction of all or part of this manual, any copyrightable subject matter without the prior written consent of Alternative Fuels & Energy Pty Ltd is prohibited. Any copies made of all or part of this manual, any copyrightable subject must contain the same copyright notice as the material from which the copying is done.

**1. Introduction** *Congratulations on your purchase of a Sun Lizard Solar Climate Control System and reducing your contribution to Australia's greenhouse gas emission.*



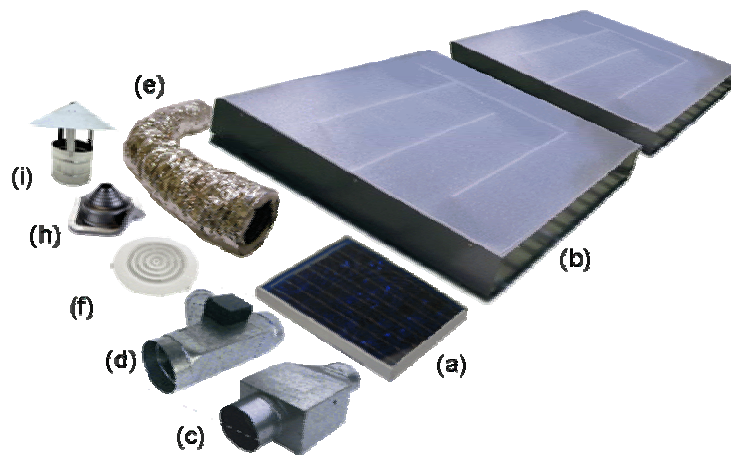
The Sun Lizard has been designed to install quickly and easily to most buildings. Prior to commencing the installation of the Sun Lizard, please read the following installation guide carefully and if in doubt, contact your local distributor or installer.

**2. Handling & Unpacking** Carefully remove the items from the boxes. Please take note of these general precautions.

- Each collector weighs approximately 60kg. It is important that at least two strong persons are available to lift and handle the systems on site.
- When handling the collector, take extreme care, as the glass is fragile.
- Avoid placing the panels on any uneven surfaces
- Do not twist or bend the collector; always lay the collector on a flat surface.
- When moving the collector, ensure that it is lifted by its side and not by the corners.
- Do not place tools or other heavy objects on the glass even with the protective cover in place. Glass breakage during installation or through negligence will not be covered under warranty.
- **Throughout the installation of the Sun Lizard, the installer should ensure that the Product Specifications are not compromised.**

### 3. Inventory Checklist

Check that nothing is missing against the list of shipped components below:



#### Typical Installation of Sun Lizard Dual Collector System

- 1 x (a) PV Panel (30W BP Photovoltaic Panel)
- 2 x (b) Solar Heat Collectors
- 1 x (c) Fan Box
- 1 x (d) Air Flow Box
- 2 x (e) Insulated Flexible Duct
- 2 x (f) Ceiling Register
- 1 x Electronic Control System (incl. Wall Switch & Cable)
- 5 x (h) Dektites
- 1 x (i) Exhaust Flue
- 3 x Y Adaptor
- 4 x 90° Metal Bends
- 8 x 150mm dia 500mm Metal Pipe
- 4 x Square Tube (located under the each collector)
- 2 x L Section Roof Mounting Brackets
- 1 x PV Adjustable Mounting Frame

Additional components supplied with Sun Lizard if required and ordered for the following roof types:

#### South Facing Pitched Roof with Ceiling Cavity

- 2 x NS Roof Frames

#### East and West Facing Pitched Roof with Ceiling Cavity

- 2 x NS Roof frames

#### East or West Facing Pitched Roof with Ceiling Cavity

- 2 x EW Roof Frames
- 2 x NS Roof Frames

#### Flat or South Facing Roof with no Ceiling cavity

- 1 x Exhaust Adaptor (Exhaust Flue replaced)
- 2 x NS Roof frames

#### North Facing Pitched Roof with no Ceiling Cavity

- 1 x Exhaust Adaptor (1 x Exhaust Flue replaced)

2 x NS Roof frames

**East or West Facing Pitched roof with no Ceiling Cavity**

1 x Exhaust Adaptor (1 x Exhaust Flue replaced)

2 x EW Roof frames

2 x NS Roof frames

**East and West Facing Pitched Roof with no Ceiling Cavity**

1 x Exhaust Adaptor (1 x Exhaust Flue replaced)

2 x EW Roof frames

Custom Ducting not included in the package are:

Wall ducts

External insulated roof duct or pipe

Please turn to [page 19](#) for more information or consult your local builder or installer.

If there are any missing parts, please contact AFE on (03) 9722 9596.

Where possible, please recycle all packaging. If you have received a number of Sun Lizards, your local distributor may collect packaging for reuse. Unfortunately, the cost to ship empty packaging back exceeds the cost of new packaging unless it is done in bulk. We have tried to use recycled materials, offcuts and recyclable components to reduce waste.

#### **4. Important Notes Before Installing a Sun Lizard**

It is recommended that a qualified tradesman be used to install the Sun Lizard Climate Control System to:

- Ensure that the roof structure is capable of withstanding the additional weight of the Sun Lizard.
- Complete the installation and ensure that the Sun Lizard is correctly mounted to withstand any extreme local conditions.
- Complete all roof penetrations to meet any regulations.

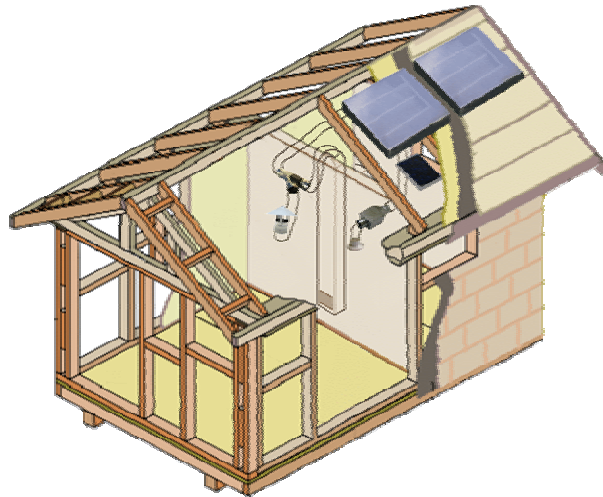
While it is possible for a home handyman to do the installation, local regulatory requirements may necessitate the use of a qualified tradesman. While no warranty will be void if a qualified tradesman is not used, no responsibility for roof leaks or other possible damage through incorrect installation will be entertained.

To avoid damaging any of the components, it is recommended to assemble the Sun Lizard on the roof as part of the installation procedure. Once the solar collector is mounted and fixed, the remaining components can be easily assembled. If assembly is impossible on the roof of the building, then assembly should occur prior to installation.

We recommend laying out all the components in a dummy assembly to ensure you are familiar with how they will all fit together. Do this on the ground first and then on and in the roof. This is also useful to ensure you keep ducting to a minimum and have all the components required prior to commencing installation.

Note that the Colorbond finish of the Sun Lizard may have a plastic film to prevent scratches during manufacture. In some cases there may still be a film attached to the outer panels. Once the Sun Lizard is securely in place, this film can be removed.

## 5. Selecting a Location for the Solar Heat Collectors



The Sun Lizard should be installed on the roof of your building as close as possible to the following conditions:

1. The most effective direction to install the Sun Lizard is between 5 degrees East and 10 West of due North. Installation outside of this orientation will degrade performance to some degree. Local conditions may require minor changes to this ideal.
2. If no roof surface faces North, then an Elevation Frame may need to be used to achieve the optimum performance. If you have not purchased additional frames for your specific roof type, please contact your local distributor or contact us direct to aid you in the selection of the appropriate accessories.
3. The Sun Lizard requires the sun to work. If trees shade your roof during the day, the Sun Lizard will not be as effective, or in extreme cases, it may not work at all. Ensure that minimal shading occurs on the roof (where the proposed location of the Sun Lizard is to be) during the day. The elevation of the sun and therefore any shading will vary throughout the year and is different in various parts of Australia. If you are unsure, please talk to your local distributor or contact us direct.
4. The Solar Heat Collectors will need to be mounted at an angle that is suited for your location to ensure the Solar Heat Collectors obtain the maximum solar gain. Please refer to the map and tables below to determine the optimum tilt angle (elevation from horizontal). If unsure, please talk to your local distributor or contact us direct.





Image 1: Map showing Latitude for Australian cities

Latitudinal Range	Solar Heat Collector		PV Panel		Examples of Major Centers
	Optimum Elevation	Elevation Range	Optimum Elevation	Elevation Range	
15°-20°	5°S-0°	15°S-10°N	15°N - 20°N	5°N-30°N	Cairns
20°-25°	0°- 5°N	10°S-15°N	20°N - 25°N	10°N-35°N	Mackay Rockhampton
25°-30°	5°N - 10°N	5°S-20°N	25°N-30°N	15°N-40°N	Brisbane, Gold Coast, Geraldton
30°-35°	10°N-15°N	0°-25°N	30°N-35°N	20°N-45°N	Port Macquarie, Newcastle, Gosford, Sydney, Adelaide, Perth
35°-40°	15°N-20°N	5°N-30°N	35°N-40°N	25°N-50°N	ACT, Melbourne, Ballarat, Bendigo, Geelong
40°-45 °	20°N-25°N	10°N-35°N	40°N-45 °N	30°N-55°N	Devonport, Launceston, Hobart

Chart 1:

- There are limitations on the length of inlet and outlet ducting that can be installed with the Sun Lizard. The selected position for the Sun Lizard and all components must be such that it does not exceed the maximum 12m length inclusive of both inlet and outlet duct lengths. The shorter the duct length, the more efficient the Sun Lizard will work.

- 6. Selecting a location for the Fan Box**

If you have a ceiling cavity, it is easier to locate the Fan Box inside the ceiling cavity approximately mid-way between the ceiling return vent and the roof outlet to the solar collectors.

If you do not have a roof cavity (flat roof or cathedral ceiling) then the Fan Box will need to be located on the roof immediately behind the solar thermal collectors. A weatherproof cover is included in this case.
- 7. Selecting a location for the Airflow Control Box**

If you have a ceiling cavity, it is easier to locate the Airflow Control Box inside the ceiling cavity approximately mid-way between the heat ducting going down the wall and the roof inlet from the solar collectors.

If you do not have a roof cavity (flat roof or cathedral ceiling) then the Airflow Control Box will need to be located on the roof immediately behind the solar thermal collectors. A weatherproof cover is included in this case.
- 8. Selecting a location for the Ceiling Inlet Return Vent**

The optimum location for the ceiling inlet return vent is at the highest point of the ceiling in the area to be heated or cooled. In a two story building it should be in the upper story. However, this may be impractical or aesthetically not possible or may make the ducting length too long. Any position high up in the ceiling or on a wall will draw out the warmer air near the ceiling.
- 9. Selecting a location for the Outlet Heating Vent**

The ideal location for the outlet heating vent is on a wall about 200mm off the ground. If you are using box ducting or ducting inside a cupboard, have the outlet heating vent come through the wall so that warm air is blown across the floor before rising back up to the ceiling. This gives a better distribution of heat in the room.

If it is not possible to run ducting down a wall, then air can be blown in through a ceiling “fanjet” diffuser. In this case make sure the inlet return vent and the outlet heat vent are diagonally opposite each other in the area to be heated.
- 10. Selecting a location for the PV Panel**

Like the Solar Heat Collectors, the PV Panel requires sunlight for as long as possible. It should ideally be located near the Solar Heat Collectors making sure no shadows from the collectors fall on the PV Panel. This is especially important to check if using frames to change the mounting angle of the Solar Heat Collectors.

The PV Panel needs to face due north and have an elevation that suits your area. See the map and chart on page 7 to get the correct angle for your location. The PV Mounting Bracket enclosed with the Sun Lizard allows you to adjust the elevation of the PV Panel once you have selected a location.

## **11. Selecting a location for the Exhaust Flue or Exhaust Adaptor**

The Exhaust Flue should be located as close to the Airflow Control Box as possible to minimise ducting length. Ensure that it will not cast a shadow on the PV Panel of Solar Heat Collectors.

If you have a flat roof or cathedral ceiling, the Airflow Control Box will be on the roof. In this case an Exhaust Adaptor is provided that takes the place of the Exhaust Flue. This is fitted to the Exhaust Port of the Airflow Control Box (see diagram Exhaust Flue and Adapter).

## 12. Installing the Frame

### EW Frame

Notes: the longest section of tube sits flat on the roof with the shortest section being the vertical/upright. On the Elevation Frame NS (the smaller frame kit), the longest section sits on top of the Elevation Frame EW.

### PIC EW Frame

#### For a tiled roof

- (a) Position the Elevation Frame EW into the correction position.
- (b) Check that the orientation is correct, by adjusting the pitch of the frame to produce a level surface. To get the correct angle before cutting the tube, place the assembled frame on the roof overhanging the side and then using a spirit level, get the top of the frame horizontal, then mark the vertical tube where it needs to be cut. Cut the tube and bolt together using the hinge and bolts supplied.
- (c) Using the four frame-mounting brackets or other appropriate fixing components, fix the frame to the roof. Ensure that the structure is secure. The frame comes with two spacers to ensure that the two sides of the frame are correctly positioned in relation to each other. Use the spacers at the base of the frame first and once the frame is secured, screw the spacers to the top of the frame to brace and space the frame prior to locating the Elevation Frame NS on top. You can use the spacers to temporarily hold the frame together while you position it on the roof. Remove tiles and confirm that the brackets can be screwed/bolted to roof joists, mark the bracket position on the frame, and then drill bolt holes. Fix the brackets to the roof joists and then bolt the frame to the brackets.
- (d) Once secure, the frame should be checked again to ensure a level surface at the top of the frame. Check with a spirit level.
- (e) Now mount the Elevation Frame NS

Depending on the orientation and pitch of your roof, your Sun Lizard may come with an Elevation Frame. In the previous section, “selecting your location”, you would have chosen your installation location and also acquired the appropriate accessories to complete the installation.

Refer to the following notes to complete the preparation for the installation of the solar collector, if your installation requires the use of an elevation frame. If not, proceed to step 13.

Prior to fixing the Solar heat Collector or any frames, keep in mind that the ducting or pipe will bolt onto the rear of the Solar Heat Collector. If there is a ceiling cavity, this ducting will go into the ceiling cavity using duct flashing. If there is no ceiling cavity or if the preferred option is to have the Fan and Airflow Control Boxes on the roof, any ducting will connect to the Fan and Airflow Control Box and go through the roof into the building. You need to make sure when locating an appropriate position that the roof penetration and ducting will not be obstructed by roof battens or other structural beams. It may be easier to connect the Fan and Airflow Control Box, flashing and ductwork first and then align and attach the collector afterwards. If you require a frame, do the frame first.

onto the level top surface of the Elevation Frame EW. The longest section sits on top of the EW frame. The mounting holes at the end of each frame section should match and both frames should be secured to each other at each corner.

### Pic NS Frame on EW Frame

- (f) Adjust the Elevation Frame NS so that it creates a pitch appropriate to your location (see chart 1) and faces North (see selecting a location). Typically this angle will be between 15 and 20 degrees. The predrilled holes in the Elevation Frame NS vertical/upright section are at 5 degree intervals starting at 10 degrees. Select the correct hole and cut off just above the hole on both upright sections.
- (g) The installation is now ready for the mounting of the Solar heat Collector.

### For a metal roof.

- a) Position the Elevation Frame EW into the correction position.
- b) Check that the orientation is correct, by adjusting the pitch of the frame to produce a level surface. To get the correct angle before cutting the tube, place the assembled frame on the roof overhanging the side and then using a spirit level, get the top of the frame horizontal, then mark the vertical tube where it needs to be cut. Cut the tube and bolt together using the hinge and bolts supplied.
- c) Fix the frame to the roof with the appropriate bolts and/or brackets, in at least six locations. Ensure that the structure is secure. The frame comes with two spacers to ensure that the two sides of the frame are correctly positioned. Use the spacers at the base of the frame first and once the frame is secured, screw the spacers to the top of the frame to brace and space the frame

- prior to locating the Elevation Frame NS on top.
- d) Once secure, the frame should be checked to ensure a level surface at the top of the frame. Check with a spirit level.
  - e) Now mount the Elevation Frame NS onto the level top surface of the Elevation Frame EW. The longest section sits on top of the EW frame. The mounting holes at the end of each frame section should match and both frames should be secured to each other at each corner.
  - f) Adjust the Elevation Frame NS so that it creates a pitch appropriate to your location (**see chart 1**) and faces due North (see selecting a location). Typically this will be between 15 and 20 degrees. The predrilled holes in the Elevation Frame NS vertical/upright section are at 5 degree intervals starting at 10 degrees. Select the correct hole and cut off just above the hole on both upright sections.
  - g) The installation is now ready for the mounting of the Solar heat Collector.

### Using an Elevation Frame NS

Note: The Elevation Frame NS can be used to increase or decrease the angle of the solar heat collector. To increase the angle the vertical/upright section is placed to the south, to decrease the angle (a very steep northern roof) the vertical/upright is placed to the north.



**For a tiled roof.**

- a) Position the Elevation Frame NS into the correct position facing North (see selecting a location).
- b) Using the four frame-mounting brackets or other mounting brackets, fix the frame to the roof. Ensure that the structure is secure.
- c) Once secure, adjust the Elevation Frame NS so that it creates a pitch appropriate to your location (see [chart 1](#)) and faces due North (see selecting a location). Typically this will be between 15 and 20 degrees. The predrilled holes in the Elevation Frame NS vertical/upright section are at 5 degree intervals starting at 10 degrees. Select the correct hole and cut off just above the hole on both upright sections.
- d) The installation is now ready for the mounting of the Solar Heat Collector.

**For a metal roof.**

- a) Position the Elevation Frame NS into the correct position facing North (see selecting a location).
- b) Fix the frame to the roof with the appropriate bolts, in at least six locations. Ensure that the structure is secure.
- c) Once secure, adjust the Elevation Frame NS so that it creates a pitch appropriate to your location (see [chart 1](#)) and faces North (see selecting a location). Typically this will be between 15 and 20 degrees. The predrilled holes in the Elevation Frame NS vertical/upright section are at 5 degree intervals starting at 10 degrees. Select the correct hole and cut off just above the hole on both upright sections.
- d) The installation is now ready for the mounting of the Solar Heat Collector.



### 13. Installing the Solar Heat Collectors

#### Connecting to a frame

- a) Undo the bolts at each end of the Top Hat section underneath the solar heat collector. Inside is square tube which is predrilled. Slide all four pieces of tube out to the second hole and refit bolts.
- b) Making sure the collector is facing the correct direction (the inlet/outlet cover plates with 6 nuts are on the south side) slide the collector and the square tube into the frame hinges on the northern side and fit bolts.
- c) Standing at the rear of the solar heat collector, lift the collector until the rear is high enough to bring up the vertical/uprights of the frame and then connect the hinge to the square tube.
- d) Tighten and check all bolts
- e) Remove 6 nuts at rear of solar heat collector and take off cover plates.
- f) Fit inlet/outlet adapter and replace nuts and washer.



Use extreme care to lift the 60Kg Solar Collectors onto the roof. Use an elevator or lift if available or at least 4 men and enough ropes and ladders to ensure safety at all times. Mount the Solar Collector to the roof of your building (or if using an elevation frame, to the frame itself - see below).

With a tile roof, use the mounting brackets (if supplied) or metal strapping tape to slide under the roof tile, and fit to a roof batten.

With a metal roof, mount the Solar Heat Collector directly to the roof, ensuring that the mounting bolts are also bolted to the roof battens or strapping tape is secured to the roof and collector.

**Once the Solar Collector is mounted, ensure that it is secure enough to withstand any extreme local weather conditions. It is the responsibility of the installer to ensure that the Sun Lizard is correctly installed and secured to the roof of the building so that it will withstand all weather conditions.**



## 14. Penetrating & Flashing the Roof

### Roof with Ceiling Cavity

- a) Select location for roof penetrations and remove tiles or cut 160mm holes in metal.
- b) Cut rubber of Dektite or Aquaseal to suit 150mm pipe and fit pipe into rubber.
- c) Place into hole in roof but do not seal at this stage.
- d) Fit 90 degree bends to pipe and tape temporarily
- e) Cut and fit pipe to 90 degree bends and fit to inlet and outlet pipe of solar heat collector and tape temporarily

*Pic 2. A Sun Lizard correctly installed showing how it should look when flashing and ducting is complete*

### Roof with no Ceiling Cavity

- a) Select location for ceiling return vent by checking inside the building where any timber structures are located and marking and cutting plaster first. Mark and cut the holes for the ceiling register using the template on the register box.
- b) Cut hole in metal roof matching hole in plaster.
- c) Cut rubber of Dektite or Aquaseal to suit 150mm pipe and fit pipe into rubber.
- d) Place into hole in roof but do not seal at this stage
- e) Select location for heating outlet pipe by checking inside the building where any timber structures are located and marking and cutting plaster first.
- f) Cut hole in metal roof matching hole in plaster.
- g) Cut rubber of Dektite or Aquaseal to suit 150mm pipe and fit pipe into rubber.
- h) Place into hole in roof but do not seal at this stage
- i) Fit 90 degree bends to pipe and tape temporarily
- j) Cut and fit pipe to 90 degree bends and fit to inlet and outlet pipe of

### Roof with Ceiling Cavity

The Sun Lizard Dual Collector requires five openings in the roof to allow 150mm pipe ducting to be connected to the inlet, outlet and exhaust vents inside the building. Typically this is done using Dektites or Aquaseals. Pipe coming from the Solar Heat Collector joins a 90 degree bend and then passes through the Dektites or Aquaseals so it goes into the ceiling cavity. Option A - The two inlet and two outlet pipes from the Solar Collectors are joined using a Y Branch and 45 degree bends ([see diagram below](#)). The inlet and outlet through the roof then need to be vertically arranged. This only requires 3 roof penetrations. Option B - Each Solar heat Collector can be connected independently and the Y Junction connection can be done inside the ceiling cavity. This requires 5 roof penetrations.

If the solar heat collectors are mounted on frames then the holes should be immediately behind the collector to minimise pipe length.

### Roof with no Ceiling Cavity

If there is no ceiling cavity, the ceiling return vent and the heating outlet vent will connect directly to the roof.

It is critical that the length of ducting is kept short as all ducting on the roof needs to be weatherproof and insulated to minimise heat loss.

If the solar heat collectors are mounted on frames then the holes should be immediately behind the collector to minimise pipe length.

solar heat collector and tape temporarily

## 15. Ducting

### Roof with Ceiling Cavity

- a) Select location for ceiling return vent by checking inside the building where any timber structures are located and marking and cutting plaster first. Mark and cut the holes for the ceiling register using the template on the register box. This vent will draw warm air from the ceiling into the Sun Lizard, heat it up and pump it back into the building. Choose a location at the highest practical point in the building.
- b) Connect pipe or flexible ducting and make sure it is well taped and sealed.
- c)

### Roof with no Ceiling Cavity

The ceiling return vent should already be installed – see section 14.

You should plan out the installation of the ducting to maximise efficiency and produce the most effective airflow system for the building. **Diagram 1** in this installation guide provides a simple explanation of airflow and the duct installation for any building.

One thing to consider is that many buildings are quite warm on the northern side and cold on the southern side. If your building is like this, consider placing the ceiling vent close to the north side to take this warmer air out to the Sun Lizard for heating and pump it back to the southern side of the building. This effectively makes it a smart, active heat shifter. In summer, the northern side of the building is also the side most likely to be the hottest, so this inlet installation is the most effective for summer as well as winter.

## 16. Connecting the Fan Box

- a) Connect the ducting or pipe from ceiling return vent to Fan Box inlet and securely screw and/or tape.
- b) Connect the ducting or pipe from the roof outlet to the Fan Box outlet and securely screw and/or tape

Diagram showing duct connections to Fan Box

The Fan Box is connected to the ducting coming from the ceiling return register and going to the inlet connection of the Solar heat Collector. This may be done inside the ceiling cavity or on the roof. Labels on the Fan Box indicate the air direction. The fan box should not be connected too close to the ceiling register to avoid fan noise coming into the room via the ducting. It should be located at the furthest point from the ceiling register, just before it goes through the roof. Ducting should be secure and airtight.

If mounted on the roof, an optional weather resistant cover is provided. The base of the cover is fixed to the roof, the Fan Box mounted inside and the top cover screwed down over the Fan Box.

## 17. Connecting the Air Flow Control Box

- a) Connect the ducting or pipe from the Solar Heat Collector outlet to the Air Flow Control box inlet and securely screw and/or tape.
- b) Connect the ducting or pipe from the heating duct or pipe to the Air Flow Control box heating outlet and securely screw and/or tape.
- c) Connect the ducting or pipe from the Exhaust Flue to the Air Flow Control box exhaust outlet and securely screw and/or tape. If roof mounted fit the Exhaust Adapter instead.

Diagram showing duct connections to Airflow Control Box

Attach the Airflow Control Box to the ducting or pipe coming from the Solar Heat Collector. Labels on the box indicate the air direction. The "straight through" pipe is for heating and connects to the heating ducting inside the house. The 45 degree branch is for exhaust air and connects to the Exhaust Flue if used. If roof mounted the Airflow Control Box has a weatherproof cover which should be fitted after installation. In roof mounting there is no need to use the exhaust flue. If mounted inside the ceiling cavity, then the exhaust flue and additional Dektites or Aquaseals are used to remove hot air in summer.

If mounted on the roof, an optional weather resistant cover is provided. The base of the cover is fixed to the roof, the Airflow Control Box mounted inside and the top cover screwed down over the Airflow Control Box.

## 18. Connecting to Your Outlet Duct

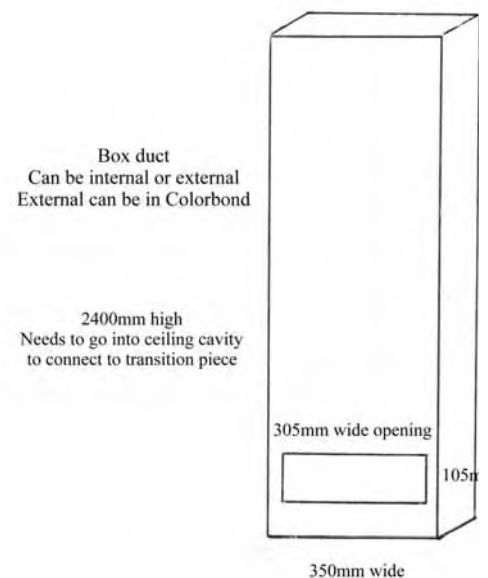
Connect and secure ducting or pipe to the top of the wall ducting.

Using 150mm (6") insulated pipe or flexible ducting, the outlet from the Airflow Control Box needs to be connected to pump the warm air into your building and its outlet should ideally be located near floor level. If the Sun Lizard is being installed into a new building then the ducting can be installed into the walls at the construction stage and fit off can occur once the building has been completed. However, if the Sun Lizard is being retro-fitted, the following may be applicable:

- Run the insulated ducting down a cupboard or wardrobe beside the room(s) to be heated and then run the vent through the wall into the room to be heated. A good option is to run it through a drying cupboard in a laundry, as some heat will escape from the ducting so you can dry clothes and heat your house at the same time. A round to rectangle transition piece will need to be fitted to the top plate and made secure and airtight unless using round pipe or insulated ducting and connecting to a round register.
- Build a cupboard (or drying cabinet - see above) or column into a corner of the room to be heated. A round to rectangle transition piece will need to be fitted to the top plate and made secure and airtight unless using round pipe or insulated ducting and connecting to a round register.
- Cut the top plate out of a cavity wall and then knock out the noggin that will be located half way down the wall. Take care not to damage the plaster wall. Cut an opening (or openings on both sides if required) for the vent registers. A round to rectangle transition piece will need to be fitted to the top plate and made secure and airtight.
- Purchase or manufacture a

rectangular box duct measuring at least 85mm x 350mm and either place it into the wall by removing the plaster and noggins between 2 studs. Alternatively fit the duct in front of the wall like an exhaust flue for a gas heater and either have it made of Colorbond to match the wall or paint it the same colour as the wall. Make the Box Duct 100mm x 350mm. (see Diagram 6 Box Ducting)

This is an easy option, especially where there are no cupboards as the box duct simply screws to the wall, goes into the ceiling cavity and connects to a transition piece which converts the rectangular box duct to the circular flexible ducting.



*Diagram 6. Guidelines for designing and making box ducting*

*Note that your ducting may need to be customised to suit you own home so talk to your tradesman before ordering ducting*

If no other options are available, air can be pumped back into the building through a ceiling register.

Note that for all connections you need to ensure that all the ducting is air tight and there are no restrictions, unnecessary bends or other problems that will restrict

airflow and performance. When selecting registers to fit in the wall or box ducting, ensure the register does not block the airflow unnecessarily. Increase the depth of the box duct if this may be a problem or select registers that are not too deep.

## 19. Connecting the Electronic Control System (ECS), Switch and Cable

### Pic of ECS Roof with Ceiling Cavity

- a) The Electronic Control System Box is located with the fan box to make cable connections simple.
- b) Locate the wall mounted switch in an appropriate, accessible location and connect to the cable coming from the Electronic Control System (ECS) box.
- c) Connect the Fan Box to the ECS using the cable supplied.
- d) Connect the power cable for the PV Panel (labelled PV Power) to the ECS and pass through the Dektite or Aquaseal onto the roof to connect to the PV Panel.
- e) Connect the 240/12 volt plug pack to a 240 volt power source if available to allow for night time functionality.

### Roof with no Ceiling Cavity

- a) Locate the wall mounted switch in an appropriate, accessible location and connect to the cable coming from the Electronic Control System (ECS) box.
- b) Connect the Fan Box to the ECS using the cable supplied.
- c) Connect the power cable for the PV Panel (labelled PV Power) to the ECS and pass through the Dektite or Aquaseal onto the roof to connect to the PV Panel.
- d) Connect the 240/12 volt plug pack to a 240 volt power source if available to allow for night time functionality. This may not be possible with most roof installations.

All the electronics and switching is managed through the Electronic Control System.

This box will have a number of labelled connections and cables to attach to the various modules.

It may be necessary to drill a hole in the Top Plate of a wall and drop the cable through this hole and then make a small hole in the plaster wall to locate the cable and connect to the switch.

The cable may be run behind box ducting, inside a cupboard or other location and then the switch located and connected.

It may also be necessary to use electrical conduit if no other convenient way is found to get the cable from the roof to the switch.

**Make sure the cable and switch are installed before connecting the PV panel on the roof.**

Once the PV Panel is connected, swap modes from heating to cooling and swap from low to high speed to ensure all functions are operational.

### Roof with no Ceiling Cavity

The Electronic Control System Box is supplied with a weatherproof cover when located on the roof. If it can be located in an accessible position elsewhere that still enables cable connections then this is preferred

## 20. Connecting the Photovoltaic Panel

- a) Place the face down on the roof inside the packing box it came in.
- b) Use a sharp knife to carefully puncture a small hole in the rubber grommet at the end of the terminal box.
- c) Slide the power cable through the rubber grommet
- d) Connect the two wires to the appropriate positive and negative terminals (red - positive and white - negative).
- e) Replace the cover and screw shut.
- f) Turn the PV panel is turned over and the fans should immediately start operating if there is any sunshine.
- g) Attach PV Panel to adjustable mounting frame if required
- h) Securely attach PV Panel and/or mounting frame to roof

Show step by step pics

The photovoltaic panel should be the last device connected to complete the Sun Lizard assembly on the roof.

**We strongly advise placing a cover (the box it came in or a towel) over the face of the panel until after it has been connected to the power cable to stop it from generating electricity and causing any shorts or electrical faults.**

Fix the Photovoltaic Panel to the roof using the mounting frame, strapping and fixing bolts supplied.

If the roof doesn't face north or the angle is not at least 10 degrees towards north, use a small frame or bracket to raise and correct the angle so it is similar to the Solar Heat Collector. This will ensure optimal performance.

## 21. Finishing the Job

Once all the components are connected and tested, the ducting, roof penetrations and weatherproof covers (if used) need to be sealed and checked. If any external pipe or ducting is used it needs to be insulated and/covered with another layer to prevent heat loss.

It is extremely important to ensure that water cannot enter any of the electronic components so they should be mounted so that in the event of severe storms that no backing up of water due to leaves or debris on the roof will allow water to enter any of the boxes. If in any doubt, raise the boxes off the roof or place some form of diverter around the boxes.

Check that all the functions are working by changing modes on the Control Switch and then make sure it is left in the correct mode for the weather conditions.



## 22. Important notes on Installation

- The 150mm round flexible duct has an area of 17663 mm square ( $\text{Pi} \times \text{Radius} \times \text{Radius} = 3.14 \times 75 \times 75$ )
- But a circular duct has a smaller surface area than any rectangular duct, so allowance needs to be made for this as there is more resistance in rectangular duct.
- If you want to fit in a 90mm stud wall, then you need to allow for variation in timber thickness.
- So a duct with a thickness of 85mm would be fine.
- To calculate the width then is  $\text{area}/\text{depth} = 17663/80 = 220$ .
- 220 is therefore the minimum width of the duct, but you need to compensate for resistance, so at least a minimum width of 300mm.
- The other factor to consider is the vent registers.
- Most of these are 300mm wide where they connect to the duct and 330mm wide on the face, so in order to fit these to a duct you need to make the duct at least 330mm wide.
- It is possible to get square vent registers that measure 150x150mm which are obviously large enough.
- This then means the duct can be 250 wide and 85mm deep.
- Finally, if you are going from circular duct to rectangular duct, then the adapter needs to also not restrict the airflow.
- If the duct is outside the wall (not in the cavity), then make the depth at least 100mm to allow some depth for the register to fit.

You can pump the air into the room via a ceiling vent (not located near the inlet air vent) - this should be done as a last resort, as it is not as effective as heating at floor level, especially if the ceilings are over 2.4 metres (8').

In all cases the insulated ducting is connected to a metal or plastic vent in the wall, floor or ceiling and finished with a duct register. These can all be purchased from heating and cooling businesses or contact your local distributor.

## 23. Handy Tips

- The overall ducting (inlet and outlet) can be up to 12 metres in length, however the unit will operate more efficiently the shorter the total ducting is. Ideally restricting ducting to less than 6 to 8 metres will give the best performance. Therefore location of the Sun Lizard in relation to the room(s) to be heated is critical in overall performance.
- The flexible ducting if used, should be stretched tight. If left loose this creates more resistance and reduces air flow.
- The ducting should not be compressed to fit through gaps or taped to anything which may cause the ducting to be compressed.
- Try to avoid 90 degree or sharper bends - ideally have 2 x 45 degree bends.
- If possible, use metal or polypropylene pipe made to measure. Although more expensive, it won't deteriorate and will allow optimum airflow. Use short lengths of flexible ducting to connect longer metal pipe or where it is too difficult to get metal fittings installed.
- We recommend using at least R1.0 (preferably R1.5) insulation around the outlet ducting to prevent any heat loss.
- The inlet ducting should be located at the highest point of the ceiling and as close to the Sun Lizard as possible. This facilitates removal of hot air in summer and also takes warmer air in winter that can be reheated and circulated back into the building.
- If the ductwork is installed within a cavity wall, the installer must ensure the same volume of air as the 150mm diameter ducting is provided and that the cavity **MUST BE** airtight. (See box ducting information on previous page), but 90mm x 250mm approximates the same volume of air and airflow and should be the minimum size.
- The outlet vent should be located in the wall at approximately 200-250mm above the floor height.
- The Sun Lizard is supplied with a control switch. This is connected via a cable to the electronic control box. The cable should feed down with the ducting and then mounted, with the control switch, on a wall near the vent register. 15 metres of cable is supplied, so it can be placed in other locations, but ideally in the same room.

## 24. Warranty

Solar Collector - 20 years  
Photovoltaic Panel - 10 years  
Fans – 2 years  
Electronics – 2 years

Accidental or deliberate damage is not covered.  
Incorrect installation may void the warranty.

## **25. Technical Help**

The Sun Lizard is designed to give years of maintenance free service. If there are any problems please check the web site for technical help. The latest troubleshooting information is available or you can contact a technical expert to give advice.

## 26. User Guide

### Pic of Switch

#### Switching On/Off

Press the button labelled On/Off until the LED flashes. This will turn the fans on or off. Once flash will indicate On and 2 flashes Off.

#### Swapping from high to low speed fans

Press the button labelled Fan Speed until the LED flashes. This will change the fans to High or Low. Once flash will indicate low speed and 2 flashes high speed.

#### Night Time Heat Extraction

If you have the optional 240/12 volt plug pack plugger into the Fan Box connected to a mains power socket and switched on, then if the Air Shifter is set to on the mains power will take over when there is not enough sunlight to power the fans including at night.

The Sun Lizard is designed to provide a solar solution to heating and cooling your home.

To optimise your benefits from the Sun Lizard please note the following will help you get the most from your investment.

Make your home energy efficient

- Insulation ceiling, walls and floor
- Seal doors and windows
- Use curtains and pelmets on windows
- Allow passive solar gain if possible
- Provide external shading in summer

Zone your home when practical

- Close doors to rooms not being used when you are home
- During the day when the Sun Lizard is working leave doors open to spaces you want heated to allow warm air to penetrate effectively, but close doors in the evening to retain heat in the living spaces

Work with the natural environment

- Wear appropriate clothing for the weather conditions
- Check the weather forecast so you set the Sun Lizard to the correct setting for the time of year or type of day
- Use external shading or allow passive solar gain at the relevant times of year
- Allow cross ventilation in summer when cool breezes replace the hot air

While no regular maintenance is generally required, from time to time you should check that the fans and batteries are still functional. The fans can easily be checked because if they fail there will be less air coming out of the Sun Lizard. Switch from high to low speed to confirm there is a change in air volume (note the noise on low will be a higher pitch than on high). If you believe there may be a fan problem contact us for more details. The batteries are likely to last 8-10 years and may continue to function after this. If however you find that you cannot change from heating to cooling the batteries may need to be changed. They are attached to the Electronic Control System and can be replaced easily.

<b>Image</b>	<b>Description</b>	<b>Document and page no</b>	<b>Page</b>	<b>Quality</b>
Sun Lizard Logo	Sun Lizard Logo	CCS Installation Guide	1	High
CCS Picture	Picture of CCS	CCS Installation Guide	1	High
CCS Pic on Roof	Picture on roof	CCS Installation Guide	4	High
CCS Inventory Pic	Picture of all components laid out	CCS Installation Guide	5	High
CCS installed layout	Show typical layout including ducting	CCS Installation Guide	7	High
Australia Map	Map showing latitude	CCS Installation Guide	7	High
Exhaust Flue and Adapter	Pic showing both to show different installation	CCS Installation Guide	9	High
EW Frame	EW Frame	CCS Installation Guide	10	High
NS Frame on EW Frame	Show how they fit together	CCS Installation Guide	11	High
NS Frame	Assembled	CCS Installation Guide	12	High
Pics of various connections	Show step by step connections	CCS Installation Guide	14	High
Pic of installed CCS	Show flashing and pipes	CCS Installation Guide	15	High
Dual Collector connections	Show inlet outlet connections and Y Branch	CCS Installation Guide	15	High
Fan Box	Showing close up of connections with labels	CCS Installation Guide	17	High
Airflow Box	Showing close up of connections with labels	CCS Installation Guide	17	High
Box Ducting	Box ducting	CCS Installation Guide	19	High
Pic of ECS	ECS showing connections	CCS Installation Guide	21	High
Pics of PV connection	Step by step PV connection	CCS Installation Guide	22	High
Pic of Switch		CCS Installation Guide	26	