

Grundig S-Video Sky Digibox Reliability Improvement

Why is additional cooling needed? <http://www.satcure.co.uk/tech/fan.htm>

Please download the full colour copy of this file from the above web page

All Central Processing Units (CPUs or “microcontrollers”) give off heat and the faster they run, the more heat they give off. The silicon chip at the centre must not exceed a temperature of about 200°C. At this temperature, the outside casing will certainly be hot enough to hurt you if you touch it!

Provided that the Digibox is kept in a cool room with plenty of ventilation and air movement around it, the CPU will probably be safe. Unfortunately, many Digiboxes are installed in rooms with central heating where the ambient temperature can be as high as 24°C in winter or 30°C in summer. To make it worse, the Digibox may be mounted in a tight space, perhaps even an enclosed cabinet. A gap of a few centimetres above is simply inadequate. Hot air doesn't move sideways without help. It needs to have a minimum of 100mm gap to move upwards before it can spread outwards and escape. In addition, there must be plenty of room beneath and at the sides to allow cool air to go in. Hot air can't come out unless cool air goes in — otherwise there'd be a vacuum!

So, to overcome this reliability problem, SatCure provides a solution in the form of a cooling fan kit with heatsink. Let's look at how it works.

The silicon chip is in a large square moulding but it is actually quite tiny — just a few millimetres in diameter. Any heat it gives off has to pass through a layer of plastic then be taken away by direct radiation (not very effective as the cover is in the way) or by air convection (not very effective in a closed box).

It can get rid of heat more quickly if we place a metal heatsink on it and fill the air gap between the CPU moulded plastic surface and the heatsink with a thermally conductive cream. The air gap is extremely small but it still provides good thermal insulation, consequently the thermal cream is important. But we need only a tiny amount.

The heat is now spreading out quickly into a metal heatsink which has lots of fins to give it a large surface area. This allows it to dissipate heat by radiation and by air convection more efficiently than the very small surface area presented by the chip alone.

By itself, the heatsink helps a lot but we can improve matters further by adding a fan.

Why don't the manufacturers do this?

1. Noise.
2. Cost
3. It can draw in dust which may cause problems.
4. Most Digiboxes will run for years with the CPU just below the critical temperature.

So SatCure supplies a fan kit that you can fit yourself.

Review

The following refers to our Panasonic kit but the Grundig version is very similar.

"I have just received the cooling kit for the Panasonic DSB-30 which comprises a heatsink, 40mm fan, superglue, thermal grease & of course comprehensive instructions with detail pictures. The heatsink & fan is of really good quality & really looks the biz. I used to think along the lines of 'leave it well alone, Panasonic must have designed the boxes to run with this sort of heat in mind & must have been tested'— but don't be fooled!! I was tempted to have a look inside my digibox & after removing just 3 screws & taking the lid off I found the culprit of all the heat that was coming from the digibox—the main CPU (the largest chip inside) comes with no heatsink or fan & this thing gets REALLY HOT!! At one point it was like touching a soldering iron & almost took my skin off. I wasn't aware that this chip was running that hot & so I'm really glad I had a look inside. I think it would have been a matter of a few months before this thing were to fail & at £300+ it's something that I want to look after & keep running for a long time.

This is where the "Panasonic Cooling Kit" from Satcure comes in. I followed the instructions & within an hour I had installed the heatsink & fan onto the CPU in my digibox & I was amazed at how much cooler it now runs. After taking a few rough measurements I found before it was running at around 65-70C & after fitting the heatsink & fan its now a staggering 25-30C max; what a difference! I don't want to speak too soon but, since installing the heatsink & fan, I haven't had any problems with the digibox locking up & also I haven't had that problem whereby when changing channels quickly it goes into "Searching For Listings". It's early days yet but so far so good, maybe these problems were caused by an overheating CPU? who knows.. time will tell.

So why I'm saying all of this is to make everyone who owns a Panasonic digibox (or any other model) aware of the heat problems these boxes have. I am now much happier knowing that my box is running so cool &, even though it may still go wrong someday, I know I have done my best to prevent any problems. Don't be afraid to remove the case & install one of these cooling kits. It's so simple & does the job perfectly. It looks damn cool, too. It's a shame you can't see it when the case is on :-p

I would give this product a big 'thumbs up'; it works great & doesn't make a huge racket like some fans. It's great value for money, is of really high quality & looks cool, too. A good 9.5/10. I'm more than happy.

Ps, one tip is— if like me you don't like the idea of soldering the fan wires to the main board, then buy the adjustable voltage external PSU as well & simply solder to its wires or use a plug & socket instead. That way on a hot day you can turn up the speed of the fan & in the winter you can go for a dead silent system by lowering the volts. It couldn't be any easier ;-)"

Nick

Fitting a heatsink/fan to the Grundig Sky Digibox CPU

Disconnect the mains power connection and then all other connections, taking care to label them so you know where they belong.

It's recommended that you wear cotton clothing to minimise the risk of static electricity. Before touching anything inside your receiver, touch a cold water tap or a radiator. Then touch the metal chassis of the receiver. This ensures that you are at the same potential as the receiver.

Remove any labels which are on the CPU chip. Be very careful not to damage the chip or surrounding copper conductors. The surface of the chip must be free from all glue residue. Wipe it carefully with Isopropyl alcohol, surgical spirits or methylated spirits, taking care not to let any run beneath the chip.

Now you have a choice of what to fit. You can do any of the following:



For GDS2000/3000 see end page

1. Discard the heatsink. Fit the plastic pegs to the fan and simply glue it in position over the CPU chip U16. Make sure the airflow arrow points down towards the chip. This way you don't have to touch the CPU and, if it does ever fail, it's easy to remove the fan. Take care in your choice of glue. The "hot melt" type of adhesive applied with a heated gun is preferred because this adhesive does not cause short-circuits and is easy to remove. Clear adhesive with an organic solvent should be OK. DO NOT use any water-based adhesive or petroleum-based adhesive such as "Evo-Stick". These can cause serious corrosion.

2. Fit the fan with self-adhesive strip in a vertical position on the PC board.

3. Fit the heatsink directly to the CPU chip. The fan can then be fitted to the heatsink, if desired. The heatsink allows the CPU to get rid of heat very quickly.



Warning! Once the heatsink is glued to the CPU it may not be possible to remove it again. This will mean that the CPU itself can not be removed and replaced in the event of failure.

Fitting the heatsink

Cut one end off the thermal cream tube and squeeze a tiny blob at the exact centre of the CPU chip. It doesn't need much. We supply about 50 times more than you will need! The actual chip is only a few millimetres wide in the centre of the black moulded CPU package.



Now open the superglue tube. Eye protection and surgical rubber gloves are strongly recommended. Superglue bonds skin in 2 seconds. Place a small blob of superglue near each of the four corners of the CPU chip. You don't need much!



Place the heatsink in *exactly* the correct position and hold it firmly in place for a few seconds until the superglue hardens.

4. If you wish to fit the fan to the heatsink, don't glue it yet! Take the four plastic pegs and cut off the hook section as shown here.



Slide each of the pegs into the heatsink slots provided then gently push the fan down onto the pegs. Then glue the heatsink assembly to the CPU.

Make sure that the heatsink can not touch any surface mount components beneath it!



You will now need to connect the fan wires as follows.

Note: The fan will run even in standby.

Connect the red fan wire to the yellow wire in the power supply multi-wire connector. This can be achieved by pushing the bared end into the connector and securing it with tape or glue.

(A resistor can be soldered in the red wire to reduce the fan speed, if desired).

Connect the black wire to a zero-volt point (tuner module) or black wire from the power supply.



Make sure that no wires can go near the high voltage power supply or touch heatsinks or sharp edges. If you need to transport the Digibox, make sure that the fan and heatsink are still in position before reinstalling or connecting power.

The GDS3000 and possibly GDS2000 have a different board layout from that of earlier models and the CPU looks like this.

There is insufficient room to fit the 40mm heatsink.

One option is to cut the heatsink (remove burrs and sharp edges afterwards!) so that it is only 30mm wide then glue it to the CPU as described earlier. The fan can be mounted on double-sided foam adhesive pads so that its airflow is directed across the heatsink.

