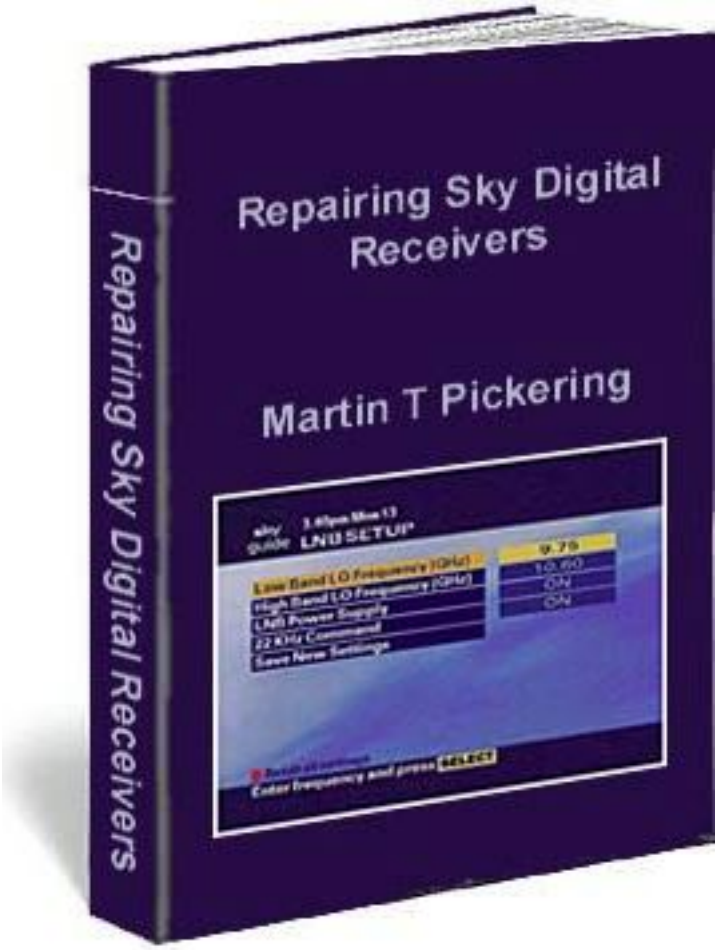
Repairing Sky Digital Receivers

Learn the trade secrets about satellite Receiver repair



http://www.satcure.co.uk (UK Sky Digibox and Apple Mac accessories) and
http://www.netcentral.co.uk/satcure (Analogue satellite and everything else)
http://www.satcure-focus.com (electronics, car and caravan accessories)
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Repairing Sky Digital Receivers

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Thanks to
The various manufacturers of satellite equipment, without whose help this book would not have been possible. Also to Michael Dranfield of Digifix.

As more faults and cures become known, this book is continually updated.

If you paid for this book then you are entitled to free updates.
Notification of updates will be given in the monthly satellite mailshot.

Copyright

It takes *years* to gather the information for a book like this and *weeks* to type it, check and recheck it.

Imagine how long it needed just to take the photographs, retouch them, resize and crop them, compress them and position them on the pages for your benefit.

It takes two minutes to steal a book like this.

A few sad people steal it for kicks
A few think they can sell it
Most people don't *mean* to steal it at all. They just can't be bothered to send the payment.

So, I'll make it easy. I'll accept *any* form of currency which has equivalent value here in England. English notes, Scottish notes, UK unused stamps, UK cheques, UK Postal Orders, US Dollar bills, Deutschemarks, Francs...

Heck, I'm even happy to barter for new information, Apple Mac software or what have you?

Thanks! *Martin Pickering*

http://www.satcure.co.uk

Getting your Sky Digital Receiver Repaired

Introduction

Most books about repairing electronic gizmos are aimed at those people who know what they are doing and have the right equipment and training. Such books are often full of technical explanations which even the time-served repairer neither uses nor understands.

This book is a MATHS-FREE ZONE. I promise you that there is less maths in this volume than you would need to count out your beer money!

You will find simple explanations of everything you need to know. In fact you will probably understand satellite receiver repair better than most repairers by the time you've read this!

Wherever possible I tell you how to fix it, unless it requires specialised knowledge or equipment.

In addition, you will find trade secrets exposed: Short cuts and best methods that time-served repairers know from experience.

Apart from all this, the book contains descriptions of faults which *may* develop in your receiver; how to *prevent* them; what to do about them *if* they occur. Satellite receivers are complex pieces of electronic equipment. Nowadays they all use "chips" called "microprocessors" – those gizmos that lurk inside every computer and translate your keyboard commands (or should I say "mouse commands") into what-you-see-on-the-screen.

With such complexity it is understandable that components will fail. You will learn how to minimise such failures; how to carry out simple repairs yourself and, if all else fails, how to get the repair done as cheaply as possible!

General Faults

Some “faults” are caused by lack of signal. You should also read “Installing Sky Satellite TV” which covers this problem.

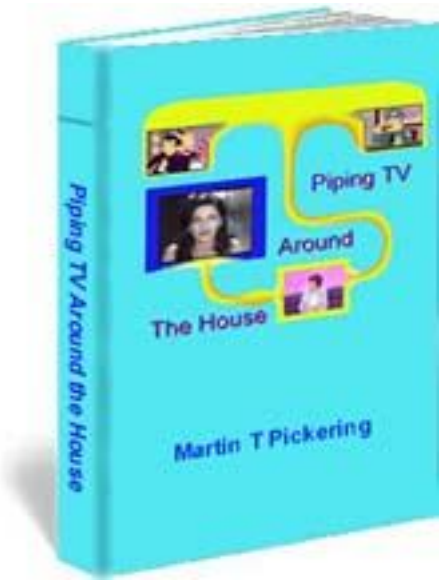
Why are my UHF output pictures so grainy?

Unlikely to be a receiver fault. You probably have the UHF output tuned on top of a Digital terrestrial channel. Try disconnecting the terrestrial aerial to see if this cures the fault. If it does, change the UHF output channel. Otherwise suspect a bad cable or connection, amplifier or splitter.

Why is there no audio from the RF Output?

You are probably trying to use it with a European "PAL-G" standard TV. Connect it with a Scart cable or use our RF Modulator (see catalogue).

Why do my terrestrial pictures have interference lines?



Your terrestrial signal is probably too weak or your channel tuning is incorrect. Read “Piping TV Around the House” for more information.

Also read the information about screened connections in the accessories catalogue.
http://www.satcure.co.uk

Why does the TV picture sometimes freeze or break up into blocks?

There is a number of possible causes for intermittent freezing and so-called "macro-blocking" (pixelisation) of the TV picture.

First of all, there may be a fault in the broadcast chain. Such faults are temporary and usually of brief duration, so no corrective action is called for. Secondly, reception of satellite-TV programmes can be affected by adverse weather conditions. The digibox is able to minimise such effects,

but will not be successful if the weather is really bad. In this case, the only thing to do is to wait until the weather improves. A larger dish and accurate alignment can minimise such problems.

Finally, if the problem occurs in good weather and is common to all channels, it is probable that the cause is poor installation (incorrect dish-alignment, faulty LNB or faulty cabling). Check the whole installation thoroughly. Very occasionally, the fault might lie inside the Digibox itself, in which case you'll have to scrap it or get it repaired. *But be sure to test it on a known good dish system before jumping to conclusions!*

Factors that affect the Quality reading

The signal strength reading has little meaning as out-of-band signals and also signals from other satellites can affect this reading. Apart from that, each receiver from the same batch will give a different reading due to component tolerances. I've found that replacing the tuner module has a large effect on this reading.

The Quality reading is related to the Bit Error Rate (it's the inverse) so the higher the reading, the better.

However, bear in mind that both readings are taken from the "bouquet" that is transmitted by the "default transponder". Each bouquet is a data stream that carries the information for, typically, ten programmes.

If the picture breaks up in bad weather then the signal quality is not good enough. The usual answer is to use a larger dish, assuming that the coaxial cable is already CT100 standard or better (CT125 for long runs). You can simulate bad weather by fitting, temporarily, a 6dB in-line attenuator. If the picture disappears then you do not have a 6dB "rain margin". Bear in mind that having too high a signal strength can cause problems (it "swamps" the tuner and, if the dish is too large, it could "swamp" the LNB as well).

Some channels Missing - UK installation

usually Sky One (or the BBC package before June 2003).

First of all, try re-installing the unit. If, after reinstallation, the channels are still not present, you should contact Sky, who will then re-initiate the card-pairing procedure. The smart card may be faulty. This is not com-

mon but I've had some reports of its occurrence including my own card. If lots of channels are missing, then you may be receiving only horizontal or only vertically polarised signals (instead of both) or your LNB may be faulty or your receiver may be sending the 22kHz signal to the LNB even when a low band transponder is selected or your cable may be faulty - water inside or kinked or old.

On-screen message "No satellite signal being received"

There is a number of possible causes for this 'No signal' message:-

Bad weather. By its very nature, this is a temporary phenomenon; once the weather conditions improve, the signal should return to normal.

The dish is loose or has shifted position, or the LNB is not correctly aligned. Check the alignment of both dish and LNB and check the dish for secure mounting.

The LNB cable may be damaged. Check for damage to the LNB cable and for water-ingress. If necessary, replace the cable.

The “F” connector on the rear panel of the digibox is loose. Fasten the cable “F” connector securely to its socket (with mains power off!)

Incorrect settings at the LNB Setup and / or Default Transponder screens. Check the settings of these screens, which can be accessed from the 'hidden' Installer Setup menu (see next page). You can also use the “Manual Tuning” option (see menu picture on next page) to check the signal strength of a specific frequency bouquet.

The programme listings disappear occasionally

For no apparent reason, the programme listings are unavailable when called for on the EPG or via the banner. It will only show the current programme.

Sky sometimes appear to have transmission problems that can cause the listings to drop out (I'm sure they would not admit to it, however).
Try unplugging the Digibox for a minute. You may have an installation fault (dish alignment, cable damage) or a faulty receiver. Often a software fault which can be fixed by forcing a software download.

Cable Fault

We had a complaint about an Amstrad digibox. Mrs Smythe had been using her DRX100 digibox for a number of years. Every so often the picture would break up into squares, though the signal strength / quality display was normal. Since the DRX 100 has a reputation for tuner trouble, I decided to take the box back to the workshop. It worked without trouble there, even when the ambient temperature was raised by covering the top, during a test period that lasted for several hours. This made me feel that a new tuner might not cure the problem, so I decided to install a temporary digibox at Mrs Smythe's house.

We have a number of old 'loan' digiboxes, so I phoned Sky and arranged for Mrs Smythe's card to be paired with a Grundig GDS200. I then delivered and installed this, and asked her to report any strange effects seen on the picture. Next morning she was on the phone to say that exactly the same thing was happening with the Grundig digibox.

A check with our spectrum analyser on what came out at the receiver end of the cable showed that the top of the high-band IF range (approximately 1,900MHz) was about 10dB down on the low end (1,100MHz). This was well below normal, particularly with the shortish cable run involved. The digibox signal-strength and quality displays remained OK because transponder 4 (11.778G11z) is used as the reference: it has a low-end IF of 1,178MHz.

When I headed up to the roof I found that the outer sheathing of the cable had several nicks in it near the dish. This had allowed ingress of water. Once the cable had been replaced the IF response at the digibox was much flatter across the band, and several dBs up even at the low end.

I left the Grundig digibox in place as I wanted to replace the tuner in the Amstrad box in any case. It was the original one, and might have failed at any time. There were no more problems with the Grundig digibox that evening, or indeed subsequently when the Amstrad box with its new tuner was back in place.

CH.

No Fault Found

Some Digiboxes returned for repair are, upon inspection, found to be fault-free. There is a number of common problems associated with such units. The problems, together with their causes and cures, are listed below.

Problem: Sky digibox dials out repeatedly

The most probable cause is that the digibox has been instructed via satellite signal to do a callback by Sky (using the freephone number). At any one time, there may be a large number of digiboxes calling back. As a result, the lines get busy and a callback may fail. The digibox will then wait - usually around 6 minutes - and then attempt another callback. The digibox will repeat this cycle of waiting and calling back until a call-back is successfully completed. In some instances, this can take a considerable time.

Cure: To stop the cycle, carry out the new installation procedure, including the manual callback.

Note: Sometimes the problem is caused by an incorrect dialling prefix which the user can set in the on-screen menu. Ensure that there is no prefix.

Problem: 'The Sky digibox remote control does not work, or the LED on the remote control remains lit.

Sometimes, a button on the remote control can become stuck down. The result of this will be that, for about 30 seconds, the LED on the remote control will remain lit, while the remote command LED on the set-top box will flash. After this time, the only function available on the remote control will be the one that is associated with the button which is stuck. For example, on the Sky digibox, if the [i] button becomes stuck, the only function available will be the programme information banner.

Cure: Free the button which is stuck.

Problem: Sky digibox user cannot display the Search-and-Scan banner. (Pressing the arrow key or information key produces no discernible effect.)

Cause: The Search & Scan Banner Timeout (at the Picture Settings screen) has been set to 0 seconds.

Cure: On the remote control, press the Services button. At the Services menu, highlight and select the System Setup option. At the System Setup menu, highlight and select the Picture Settings option. At the Picture Settings screen, set the Search & Scan Banner Timeout to a value greater than zero.

Problem: Only free-to-air channels are available.

Cause: If there is no viewing card inserted in a set-top box, or if the viewing card is not inserted correctly, the user will be able to display only free-to-air channels (which do not require a card).

Cure: Insert the viewing card correctly.

Problem: Sky digibox user cannot send or receive email.

Cause: The user has not registered for email services.

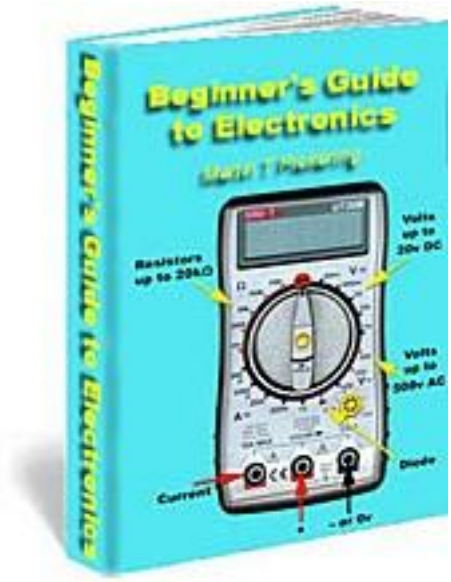
The user needs to register (via the Organiser) with Open.... for interactive services. This will create an Open profile, which can then be used to register with the Open email service.

Problem: When email arrives, the Message LED on the Sky digibox does not light up.

Cause: The message LED is not currently used by Sky. Emails are held on a server, rather than in the digibox itself. So, the only way to find out whether there are any email messages awaiting collection is to log on to the Open.... email server.

Cure: From time to time, the user should log on to the Open.... email server to see if there are any email messages awaiting collection.

These books will lead you into repairs gradually



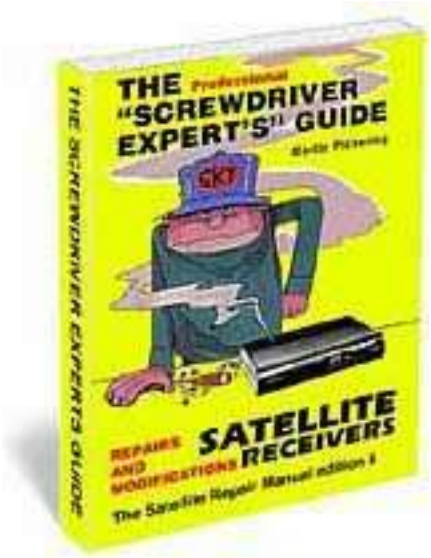
Beginners Guide to Electronics

Easier to understand than anything you've read previously!

Martin has a knack of explaining technical subjects in simple language. Components covered include resistors, diodes, transistors and capacitors.

As an example, it describes in detail how to build a flashing LED circuit on perforated stripboard (“Veroboard”) with a photo-graph of every stage.

This is NOT just another boring technical book full of mathematical equations. You'll like it! Ideal for everyone from the young student to the retired lady looking for a new hobby. You'll definitely want more!



Beginner's Guide to Receiver Repair

Based on the original “Screwdriver Expert’s Guide to Satellite Receivers” this practical book describes to you the basic components and a typical power supply with diagrams and explanations.
You'll learn how to solder and discover what to check and measure.
You will be capable of soldering in compo-nents supplied as a kit and you’ll under-stand why you are doing it and you’ll even be able to figure out other possible fault causes and cures. This book is an invaluable addition to any repair kit.

Faulty receiver

Before assuming that your Digibox itself is faulty, please check it as follows: (I've tried to avoid technical jargon while, at the same time, giving you enough information to carry out the tests and make your own deductions.)

Firstly, simply disconnect your receiver from the wall socket power for a minute then reconnect (use the wall socket switch if there is one and *don't* wiggle or pull out the little power plug at the rear of the receiver as this can cause dangerous arcing!). Wait a minute for the receiver to "search for listings". If it now works, you probably had a typical "computer lock-up" problem.

If the fault symptom remains, unplug it again but this time *hold* the "backup" button on the front panel while you reconnect power (use the wall socket switch if possible). Release the "backup" button when all the front panel lights come on (about 25 seconds). Now leave the receiver for 15 minutes while it downloads new software. If the fault symptom remains, or it continues to 'load software' after the 15 minutes, read on:-

WARNING
A Grundig that tries to download the software all the time is a common symptom that occurs when someone tries to download new software with either a power supply or tuner fault. The only cure now is to replace all four flash memory chips. This will get the box back to where it was originally, with either a dud tuner or dud PSU, which will then need to be repaired.

So it is MOST IMPORTANT that you do not try to download new software unless you are certain that the above does not apply!

This may also apply to other models so DO NOT download software unless you are sure that the power supply and tuner are functioning correctly.

Some faults are caused by YOU or your family!
Press [services] [4] [0] [1] [select] and then [select] again for “LNB setup”.

Make sure that the settings are 9.75, 10.60, ON, ON. These are the correct settings for a standard “universal” LNB.
If they are incorrect, put them right then save the settings.

Press [backup] to return to the Installers Setup menu.
Press [2] Default transponder

Check the settings again. They should look like this unless you are in a fringe reception area (outside the UK) in which case you should refer to the booklet “Installing Sky Digital TV”.

It is imperative that you determine whether you really have a faulty receiver. Take it to the house of a friend or relative and connect it, making sure that you disconnect 230 v power *before* disconnecting anything else, and that you reconnect the power plug LAST, *after* reconnecting everything else. Also check the screw-on "F" plug to make sure that none of the outer strands of "shield" braid can touch the centre wire as a short-circuit here can damage the receiver internal circuits.

IMPORTANT
Label all connections *after* you switch off mains power and *before* you forget them!
If your receiver works OK on a different dish installation then take it home and try again. If the fault symptoms are there at home, then the receiver is probably OK but you have an installation fault with your cable, dish or LNB. Get a professional to test it or read my book "Installing Sky Digital TV".

Note that, occasionally, the receiver will show a fault *only* after it has warmed up but this can be confused with a faulty LNB which may also exhibit a fault *only* after it has warmed up. The only way you can check an LNB is with a substitute good receiver. (Any digital receiver will do).

(Try http://www.APSIuk.com for your nearest professional installer).

Stuck in standby

This symptom almost always indicates a serious fault which can not be repaired except in the factory. A possible exception is the Grundig GDS range which occasionally show this symptom because of a simple power supply fault (kits available from SatCure). Also see Panasonic notes.

However, the cause of the problem is more often one of the following:

Voltage-surge damage (often caused by nearby thunderstorm)
Water damage (water ran down your terrestrial aerial cable)
Liquid spillage (from watering plants or baby's feeding cup)
Leaking Pets (cats like the warmest spot and often pee).
Heat-induced fault (Switch off 230v at wall socket to let it cool down).

Before sending your Digibox for repair, remove the cover and look inside for signs of damage. In the case of a voltage-surge you will sometimes see a black I.C. or transistor which has cracked or exploded - often leaving a tiny fragment of plastic rattling around inside - shake it!
In the case of liquid there is usually a white or green powdery deposit in at least one area, or the silver tinned boxes may have rust spots.

If liquid spillage is evident then few repair shops will accept the Digibox because, even if repair is possible, the reliability can not be guaranteed. I learned this lesson the hard way! After several such “repairs” resulted in my having to hand back hard-earned cash to a grumbling customer, I stopped accepting liquid-damaged units.

The next section in this eBook contains fault reports from engineers who make their living from repairing Sky Digital receivers (and other equipment). Grateful thanks to Michael Dranfield and to TELEVISION magazine for allowing us to publish these reports.

Sky Digibox repairs

From the repair point of view, the "Sky Digibox" is difficult for the one-man repair shop to offer a full repair service. Most of the parts are the surface mount type and several of them are large, expensive surface-mount chips with hundreds of connections.

Amstrad, for example, don't provide any spares or service information at all (although I have found a Samsung Service Manual for it in PDF file format!).

The **DRX100** was made for Amstrad by the Samsung factory in Portugal. BskyB may offer a replacement Digibox to customers whose DRX100 has failed outside warranty. If you have one of these you might consider insuring it right now. The tuner module is prone to failure, giving "no signal" message with signal and / or quality indication bars bouncing randomly on-screen.

Tuner modules are available (expensive) for the DRX100 but you can get them exchanged, provided you don't damage them yourself! (see later).

In theory it is possible that you can replace the DRX100 tuner yourself but there is a risk that you might damage your receiver. If that happens then no reputable repairer would be interested in repairing it. The new refurbished tuner will be at least as reliable as it was the first time. Unfortunately, nobody can fully eliminate the overheating fault that, in my opinion, is probably a tuner design fault. However, a fan can be fitted to improve reliability.

As with all Digiboxes, the DRX100 is somewhat prone to damage by power surges on both the mains 230v supply and the telephone connection (if you use it). SatCure sells surge-protection adapters to minimise this problem (see catalogue at http://www.satcure.co.uk/accs).

Although surge damage can sometimes be repaired if it's not too severe, the protection adapter provides very cheap "insurance"!

DRX100 Picture problems

In early models labelled 4F0101 the 3v3 surface-mount regulator in position U104 can fail, causing “blocking” and “ freezing” of the picture. Measure its output voltage. If incorrect, replace it. (Ask SatCure).

Removing the DRX100 tuner module

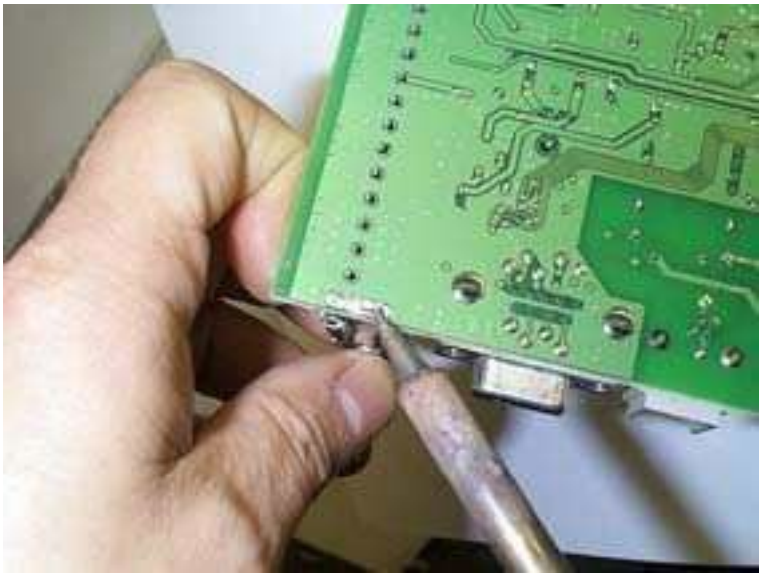
WARNING
Do not attempt this operation with inadequate equipment or knowledge. Do not attempt this operation unless you are reasonably certain that the tuner is faulty. Disconnect the receiver completely.

To gain access to the tuner you must remove 5 cover screws and lift the cover off. Lift the power cord grommet out of the rear panel slot. Remove the tuner nut and washer, 3 rear panel screws and the tiny screw that holds the interface module inside to the rear panel. Unclip the rear panel at top corners and use a thin blade to release the three clips underneath. Pull the panel off. Now look at the main board:-

When you handle the main board, remember it is susceptible to damage from static electricity. Put your hand on the metal chassis before touching the board. Take care not to knock any components!

Early models had one screw hidden beneath the plug-in module at the rear. Simply pull the module upwards to remove it. Remove the 5 or 6 screws that secure the main board and lift the board just enough to let you get the desoldering iron under it to desolder the tuner pins so that gravity assists.
Sometimes it will be necessary to add fresh solder to each pin before desoldering is possible.

Note: Although it may be possible to remove all traces of solder with desolder wick or a pump-action solder remover, I have personally never managed to do so.



I use a DS-801 desoldering station, made by Weller, which cost about £500 in 1992. Other suitable stations may be available at slightly lower prices.

Turn the main board upside down. The pins are in plated-through holes with several tracks joining them on the top surface of the PCB (out of sight beneath the tuner). Put the soldering iron tip on each tuner pin and push it from side to side to ensure that it is free to move in the hole, with no solder connecting it to the track. Remove some solder from both tuner fixing lugs so that you can untwist them. They must align perfectly with their slots. The success of the next operation depends on the way in which you hold the tuner and iron. You need a VERY hot iron. I use a 45 Watt Weller iron with a number "8" tip (430'C). Most "D.I.Y." irons do not produce enough heat so you may need an assistant to hold a second iron on the lug.
Place your left thumb on the threaded 'F' connector and press down while, at the same time, pushing up against the board with your first finger, as shown in the photograph. Hold the iron in your right hand. Press the soldering iron tip against the tuner lug and apply fresh solder between them to improve heat transfer. As the solder around the lug melts, maintain the gentle pressure with finger and thumb.

When you feel the solder release its grip, ease the tuner lug out of the slot until it is just clear. Now repeat the operation for the other tuner lug. Make sure that the tracks which connect to the tuner pin holes on top of the board are undamaged. If any are damaged, repair with very fine wire and measure the continuity.

Fit the replacement tuner carefully and solder the lugs first. If you solder a pin first, any movement can break the delicate tracks on top of the board. Replace the mother board.

Check all plug-in connections - especially the white connector near the front panel. Make sure these plugs are pushed fully into their sockets, otherwise you may find the receiver is "stuck in standby".
Now reassemble the receiver, ensuring that all screws are fitted into the correct holes and tightened. Reconnect all cables and apply mains power.

If the receiver still gives "No Signal" indication after one minute warm-up then you damaged a connection or the initial diagnosis was incorrect. Here's a photo of a tuner that has the copper "via holes" still attached to its pins. This means that the mother board has been destroyed. It may be possible to repair the board by passing a fine wire through each hole and soldering top and bottom. (The "No Signal" message can have other causes such as the 15MHz crystal - available from SatCure - or the I.C. "U100" with the heatsink).

If you don't want to do the tuner replacement yourself read this page:
http://www.satcure.co.uk/repairs.htm
At the time of writing, the cost is £40 for tuner replacement (plus £5 if you want a fan fitted) plus £10 for insured return carriage, plus VAT at 17.5%. This applies to UK mainland.

Tuner failure is caused by excessive drive to the resonator (circular metal device) which results in gain degradation. This is generally not a problem until the power is turned off then on, at which point the gain is too low to set the resonator circuit oscillating, so the tuner doesn't work.

The gain can be increased by replacing three tiny capacitors with ones of different value. This requires extremely good eyesight, a steady hand, a needle-tip soldering iron, 0.3mm solder and the skill to do the job properly. Frankly, I tried it once and gave up! I don't recommend it to anyone.

DRX100 Safety

Although the DRX100 bears the "BEAB approved" mark, there's a couple of features relating to safety which, in my opinion, have crept into the design after approval was granted. The first is obvious in that, in later DRX models, the mains cable insulation has been removed so that a ferrite ring could be fitted. This modification has not been carried out on all versions – I've seen receivers without it – but, where it has been done, it leaves the brown and blue mains wires free to touch the cover. I recommend that you put insulation over these wires before reassembling the receiver. The second point compounds the first in that the mains protective earth is connected to chassis by means of a single screw (see red arrow) that holds a printed circuit board soldered copper pad in contact with the metal base. The last time I read a safety standard from BSI it stated that the fixing method for the protective earth wire should not be dual-purpose. This requirement stemmed from the days when a mains transformer was bolted to a chassis and one of the bolts also held the earth tag.

If someone swapped the transformer they could accidentally leave the screw loose. In fact the screw might work loose simply through the vibration of the transformer, leaving the equipment without a secure earth connection. So the protective earth connection should always be fixed separately, using a method that can not accidentally work loose.

In the case of the DRX100, the same screw is used to hold the power supply board AND to hold the copper pad in contact with the chassis. If someone removes the power supply and fails to replace and retighten the screw, that leaves no reliable earth connection. In addition, the solder on the copper pad is quite thick and may "creep", leaving the connection loose. Finally, there is no locking washer or nut. A switch-mode transformer (as used here) vibrates at high frequency so the same problem could arise.

A capacitor kit is available for the DRX100 power supply.
Order RELKIT34 from SatCure.

Other parts may also be available separately.
The Amstrad **DRX200** has replaced the DRX100. It uses a slightly different power supply, mounted at the right hand side of the box.

See fault reports later in the book.

The DRX100 and 200 were made by Samsung in Portugal.
The DRX 300 was made by Technisat in Germany.
The DRX 400 is made by a company (?) in the Far East.

Specialised parts ordering

Because of the expensive equipment and skill required to remove and fit surface mount components, SatCure does not stock or list most of the specialised parts that you'll find mentioned in this eBook. However, if you'd like us to order parts, please contact Sales. Please be sure to give the exact PART NUMBER of the device, its CIRCUIT POSITION (eg. U300) and the MAKE and exact MODEL NUMBER of the equipment (eg. Pace BSKYB2500S3).

Once you have received the order code and price from Sales, you can use our secure Shopping Cart to place your order.

More Amstrad fault reports

Amstrad DRX100
When faced with the "no satellite signal" message on the screen, cheek capacitors C105, Cl 10, Cl 12, Cl 13, Cl 15, C122, C 124 and C352 before you try a new tuner. They are all 47µF, 35V, 105' electrolytics, and are near the tuner. With the unit 1 had on the bench all these capacitors had ESRs that were well out of tolerance. It worked normally once replacements had been fitted. D.J.

Amstrad DRX100
Power supply faults are beginning to show up in the very early versions of this digibox - the one with the dark-brown SRBP power supply PCB. This one was stuck in standby. The cause was not the modem voice processor chip this time. C15 (330RF, 25V) on the power supply PCB had fallen in value. To date I've not had any failures with the later power supply PCB, which is made of fibreglass. M.D.

Amstrad DRX100
If one of these digiboxes is slow to come out of standby, replace C9 and C10 (both 1,000µF, 10V) on the power supply PCB. They may be low in value, causing ripple on the 5V rail. So far this fault has affected only early models with the dark-brown SRBP power supply PCB. SatCure does a good range of upgrade capacitor kits that are well worth fitting.

Amstrad DRX100
This digibox was the early version with the ST20TP2 micro chip. It wouldn't move from the searching for listings page, and no clock time appeared in the corner. In addition the red LED inside, which seems to light up when a signal is being received, was not lit.

Scope cheeks on the in-quadrature and in-phase outputs from the tuner confirmed that it was working correctly. But there were no digital inputs at the multiplexer chips U 13, U 14 and U 15. 1 then discovered that by pressing the internal reset button S 1 the box would reboot up and work correctly - until it was unplugged from the mains supply.

This led me to suspect that the BCM4200KEF channel decoder / DAC chip U100 was faulty, but a replacement made no difference. Still convinced that the cause of the fault lay in this area, 1 spent some time

scoping waveforms and comparing the results with those from a working box - until 1 spotted a missing component, R133. This is a zero-ohms link, and was present in the working box. Fitting the link restored the faulty box to full working order. How it had ever worked is a mystery. But it must have been OK until it was disconnected from the mains supply one day. M.D.

Amstrad DRX100
This Digibox was stuck in standby. There was no oscillation when I checked the 56.4480MHz cloak signal at pin 20 of the R6715-13 modem chip U305. A new crystal didn't fix it but replacing the chip did.

Amstrad DRX100
No sat signal received, or intermittent picture freezing, usually when the box has been on for a while. So far this has affected only early models with the ST20TP2 micro chip and SRBP power supply board.
Cause: oscillation on 3.3 volt rails to the BMC4200 channel decoder chip U100. This oscillation comes from the MC33269 3.3V regulator U 104. A scope check on regulator chips U104 AND U105 will confirm this.
Cure: replace C112, 47 µF and C113 47 µF. This is the cause of the oscillation, not the regualtors, although replacing them with type LM 1117DT-3.3 will also cure the fault but not the cause.

Amstrad DRX 100 The RF audio output from this digibox was crackling and popping though the scart audio output was OK. The mono audio input to the RF modulator comes from pin 34 of the CXA2078Q chip U901. A scope check at this pin showed that a lot of hash was present. As U901 also switches the scart audio, 1 decided that it was faulty and fitted a replacement. Needless to say the fault was still present.

The coupling between U901 and the modulator is via C91 1, so the next step was to short its negative end to chassis. This is what 1 should have done in the first place, because the crackling was still present on the RF output. The noise was being generated by the modulator itself, a replacement clearing the trouble. M.D.

Amstrad DRX 100
This digibox was stuck in standby with no LNB voltage present. Its owner said he had fitted a power-supply capacitor kit some eighteen months previously. Checks showed that the cause of the problem was

with the 3.3V supply, where the voltage was low at 2.2V. The value of the 1,000pF, 16V reservoir capacitor Cl 2 had fallen to 12µF, with an ESR of l2Ω. All the capacitors were green in colour and made by 'Nover'. The quality of the kit capacitors that had been fitted was in fact probably worse than that of the originals.

Replacement capacitor kits were originally produced by SatCure, but have been copied by other firms that have undercut prices by using poor-quality components. I recommend purchasing capacitor kits from SatCure, which supplies low-ESR capacitors rated for high ripple current. M.D.

Amstrad DRX 100

This digibox had a familiar symptom - it produced the 'no satellite signal received' message - but this time the tuner's local oscillator was running and it was producing Q and I outputs. The OSD said a signal was being received, but with no quality.

The cure was to replace the BMC4200KEF QPSK channel decoder chip U100. M.D.

Amstrad DRX 100

When you get the 'no-signal' condition, the first thing to do is to check capacitors C105, Cl 10, Cl 12, Cl 13, Cl 15, C122, C124 and C352. They are all 47µF, 35V, 105°C. If they prove to be OK, cheek whether Q101 (TIP42Q is open-circuit base-to-collector before, if necessary, replacing the tuner. J.C.

Amstrad DRX 100

This digibox was stuck in standby with 18V at the LNB socket, indicating that it was not going to come on. I noticed that the 56.448MHz clock signal at pin 24 of the decoder G729 was missing, but this turned out to be a red herring as it reappeared at power up then died again.

To force a reset 1 shorted pin 2 of IC U3 (DS 123 3) to chassis a few times with the digibox still connected to the mains supply. This produced a result: the digibox came out of standby with use of the remote-control unit. The banner at the bottom of the screen was OK but the picture was broken up, a bit like a Grundig digibox with a dud power supply.

Now that 1 could see the fault 1 replaced the two AV SRAM chips U601 and U602 (type KM416S 1 120DT-G 10). This cured the fault: the digibox would now boot up correctly when first powered. M.D.

Amstrad DRX 100

This digibox produced the "no satellite signal received" message. I plugged in my satellite polarisation checker and found that the red LED came on, indicating that the LNB voltage was in excess of 22V.

The culprit was the vertical / horizontal polarisation switching regulator U 10 1 (type KA317), which was short-circuit. A replacement cured the fault but, while checking the operation of the digibox, 1 found that the LNB voltage couldn't be turned off using the installation menu. The LNB switch-off transistor Q 10 1 (2SA928) was also short-circuit. All was well once this transistor had been replaced. M.D.

Amstrad DRX 100

If one of these digiboxes is stuck in standby with no LNB voltage, check for a 27MHz clock signal at pin 2 of the buffer chip U2. Although the IC could be faulty, the more likely culprit is the 27MHz crystal X l. M.D.

Amstrad DRX 100

This digibox produced the "no satellite signal received" message. The tun er wasn't the cause this time as I had repaired it only three months previously. Another common problem with this model is failure of the QPSK chip U100 (type BCM4200). As it's easy to replace I fitted a new one. But the fault remained.

The LNB was being powered. The 28V tuning supply was present at pin 10 of the tuner, and there was 5V at pin 6. The next step was to check the serial data to the tuner, at pin 2 of IC U103A. 1 compared the data here with that in a working digibox and found it to be the same.

The Q and 1 signals at pin 55 of U100 and TP l 13 were correct (20OmV peak-to-peak) without an LNB connected, but when the LNB was connected they rose to over 4V p-p instead of the expected 40OmV p-p, and the AGC output at pin 41 of U100 was up and down all over the place.

The problem was clearly signal-related, so I decided to swap the tuner. This made no difference. More careful checks in the Q+, Q- and I+, l-

input circuit showed that there were low-amplitude signals at pins 49 and 54 of U100. These come from a divider that consists of R 126, R 127 and Cl 19, which is where the problem lay. When Cl 19 was removed from the board and checked 1 found that it was leaky - the reading was approximately 400Ω. Replacing this a pin-head size surfacemounted l µF ceramic capacitor cured the fault which, as far as the customer was concerned, was the same as before. M.D.

Amstrad DRX100

This digibox worked intermittently. When the fault occurred the picture would freeze and remain on the screen but live sound continued. The STP20 micro chip would also lock up, and the box wouldn't respond to remote-control commands or operation of the buttons on the front panel. The only way to get the box going again was to disconnect it from the mains supply. The cause of the fault was traced to IC U16 (74LVTH16244), the tri-state bus converter. A replacement restored normal operation.

Amstrad DRX100

This digibox had what looked like a straightforward fault, 'no satellite signal'. The tuner was not the cause, howeve; nor did a new QPSK chip cure the fault. The circuitry around the channel decoder chip U100 is very simple, but extensive checks on the peripheral components failed to reveal the cause of the problem.

Eventually, after much time had been spent on it, the cause of the fault was found to be on the power-supply PCB. The 8V supply was about 0.5V low, but contained no HF ripple. I decided to replace the three 330µF, 25V electrolytic capacitors on the power-supply PCB, and this cured the fault. 470µF replacements were used as the original capacitors still read 280µF at IkHz and their ESR was below 1Ω, indicating that something better was required.

Amstrad DRX100

This digibox took at least ten minutes to come on: it would just sit there in standby. When it did eventually decide to come on, the picture would be pixellated and the into banner would be flashing, with broken sound. The fault could be made to come and go by scoping around the AV RAM chips U601/2. Inspection with a microscope then revealed that the solder around some pins had not melted fully from new. A reflow of all pins cured the fault.

Amstrad DRX 100

A problem I've come across a few times with this digibox is that L106 has burnt up. It's a 10µH surface-mounted inductor that feeds the 28V tuning supply to the tuner. I am not sure of the cause of this fault, as a new inductor provides a cure and I've never found a measurable short-circuit. But to be on the safe side I replace the surface-mounted decoupling capacitor C 103 (0. 1µF) and the tuner.

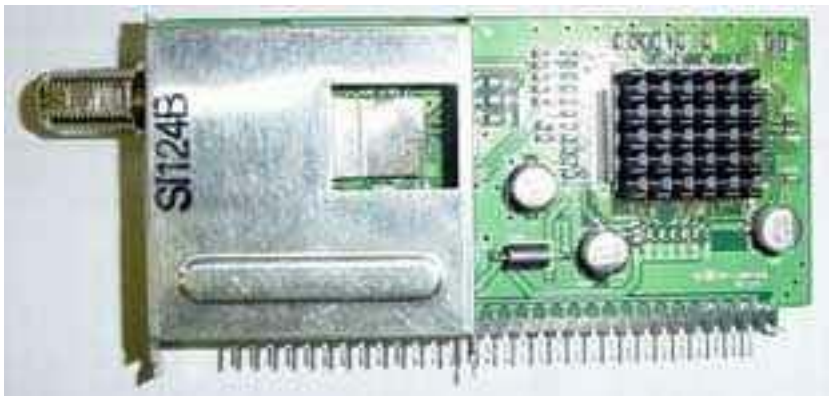
Specialised parts ordering

Because of the expensive equipment and skill required to remove and fit surface mount components, SatCure does not stock or list most of the specialised parts that you'll find mentioned in this eBook. However, if you'd like us to order parts, please contact Sales. Please be sure to give the exact PART NUMBER of the device, its CIRCUIT POSITION (eg. U300) and the MAKE and exact MODEL NUMBER of the equipment (eg. Pace BSKYB2500S3).

Once you have received the order code and price from Sales, you can use our secure Shopping Cart to place your order.

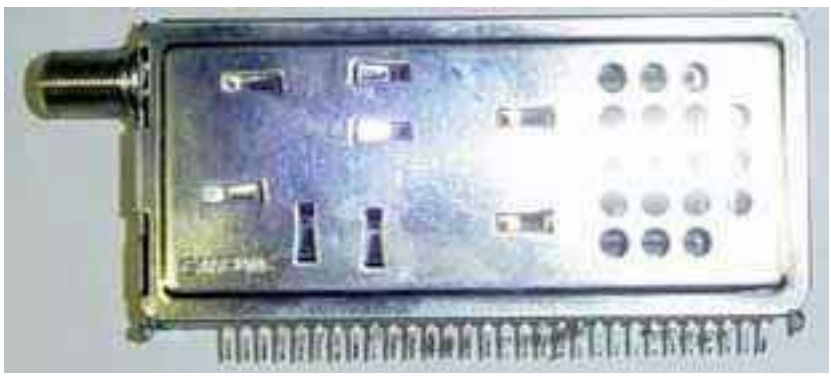
Amstrad DRX200 Although this digibox could be switched out of stand-by it didn't produce video or sound via either the RF or the scart output. The cure was to replace the AUPR05002B video switching chip, for which the board reference number appears to be U2. Note that it runs mega hot! A small heatsink might have improved its life span. (Heatsink available from SatCure).

Amstrad DRX200
Box switches on, i.e. green light on front lit but no RF output, no output from scart sockets and no TV-video loop through switching.
Cure: replace the 64 pin chip behind the RF modulator. The board has no reference number but the chip is a TDK APRO 5002B.



Amstrad DRX200
No sat signal received (models that use the open ZIF tuner unit). Replace the Connexant 24108-20ES chip under the metal can.

Chips available from SatCure but D.I.Y. replacement is NOT feasible.



Amstrad DRX200
The other variant uses a metal box tuner which is more reliable.

Amstrad DRX300

No sat signal received intermitentley, or intermittent freezing and hiccoughing of the picture and sound. Cure: replace Connexant chip 24108-20ES inside metal can where LNB cable goes in. Note: this board has no screen print lettering at all.

Amstrad DRX400

No sat signal received intermittently, or intermittent freezing and hiccoughing of the picture and sound. Cure: replace Connexant chip 24108-20ES inside metal can where LNB cable goes in.

Chips available from SatCure but D.I.Y. replacement is NOT feasible.

Amstrad DRX300

This digibox produced the 'no satellite signal received' message, the problem being no LNB supply. A quick look at the installer menu showed that the LNB power was set to on. I then found that the LNB enable switching transistor T104 (BC848Q) was turned off. Its base voltage comes from pin 89 of the QPSK chip IC 103 (M4110). When I shorted the collector and emitter of T104 the LNB supply came up, but all was not well. The supply was at 18V (horizontal polarisation): a correctly booted box should provide 13V (vertical polarisation) so that it can start searching for the channel listings.

LNB polarisation control comes from pin 86 of IC103, so it seemed that this chip was faulty. But 1C103 is linked to the front-end ZIF chip (CX24108-20ES) via a three-wire bus. The ZIF chip is notorious in this model, often being the cause of intermittent picture freezing. In view of its notoriety I decided to replace it first. This cured the fault.

It highlights a problem you increasingly meet in electronic servicing: the device that produces the wrong output signal is not necessarily the one that's faulty.

Amstrad DRX300

There had been a minor spill on the primary side of the power supply, which had blown up. Repair was quite straightforward however.
I replaced the TDA16846 chopper control chip IC701, the SPP02N60S5 chopper MOSFET T701, the l5Ω, 3W surge-limiter resistor R740, and C712 (22pF, 50V). For good measure I also replaced the 22kΩ 3W snubber resistor R714 as it gets hot and can change value. After that all was well.

Amstrad DRX300

This digibox was stuck in standby. It didn't take long to discover that the CX24110-11ES QPSK demodulator chip IC103 was getting hot, in fact very hot - it was running at over 100'C. 1 fitted a replacement, but this also became hot very quickly and I switched the box off. A quick check at pin 9 revealed that the 3.3V supply was spot on.

The cause of the fault was eventually traced to a short within the CX24108-20ES front-end ZIF chip IC101. Fortunately the new CX24110-11ES chip hadn't been damaged.

Take care when replacing components in this model. As the PCB has no screen printing, it's easy to remove an IC and then not know which way round to fit the replacement!

Amstrad DRX400

This digibox was dead with a blow up in the power supply. The fuse was black and the top had blown off the TOP243P 7-pin chopper chip. As I didn't have this device in stock I decided to order ten, which was just as well because the replacement blew up at switch on. The cause was found to be the mains bridge rectifier's reservoir capacitor C5 (33µF, 400V). I also decided to replace the four bridge rectifier diodes D2, D3, D6, D7, using type 1N4007, and the optocoupler IS01 (type PC123).

Amstrad DRX400

This digibox produced the "no satellite signal" message. The cause of the problem was a faulty front-end ZIF chip, U102 (CX24108-20). It's the same chip that's used in the earlier DRX300 model, so it looks as if this may become a common fault.

The DRX400 is better built than the DRX300, with all the component numbers screen printed on the PCB. The 300 has no screen print at all. Note, however, that the top cover on the DRX400 is very difficult to remove. Because it's such a tight fit, a dealer phoned me the other day to ask how to remove the lid on one he had in for repair!

Pace

Pace was the first manufacturer to supply Digiboxes. Their Service Department has, in my opinion, been second to none. Spare parts and service manuals are available for the Pace **BskyB2200** Digibox and later versions. Dealers could initially get free training at the Pace factory and the Technical Help line is almost free, with calls being charged at standard national rates. You can also get help by e-mail and the Pace web site has a password-controlled technical section for dealers. Few other companies provide such comprehensive support. In addition, SatCure can supply Pace Digibox spares.

Pace have a fixed charge of around £65 which includes repair and return and VAT. If you want them to collect it the price is £73 approx. They will collect only from an address where someone is guaranteed to be there during "working hours" (eg. office).
Alternatively, an exchange replacement box costs about £200.
If the receiver is definitely at fault then you should contact Pace on 01274 532000. Ask for "Satellite Returns Department".

They will want to know:
The model number from underneath the receiver "BskyB2x00".
The complete serial number
Your credit card details (or enclose a cheque when you send the receiver).
They will give you a Returns Authorisation number which you must write on a label on:
The underside of the receiver
The inner packing box
The outer packing box

Note: only dealers can return equipment to Pace so speak nicely to your local electrical shop unless you are in the trade.

Pace Micro Technology
Victoria Road
Saltaire
Shipley
West Yorks
BD18 3LF
01274 532000
returns@pace.co.uk

ZIF Tuner faults

The most common Pace Digibox fault at present is caused by the "Zero I.F." tuner module (see photograph) which creates a variety of symptoms from "some channels missing".. "no satellite signal.." to "stuck in standby". It's impossible to be sure that the tuner module is the cause but it often is. The removal and replacement procedure is similar to that

which was shown earlier for the DRX100 tuner. It's not an *easy* D.I.Y. job but it's *possible*, with care. You can get an exchange tuner from SatCure.

Now for the technically competent....

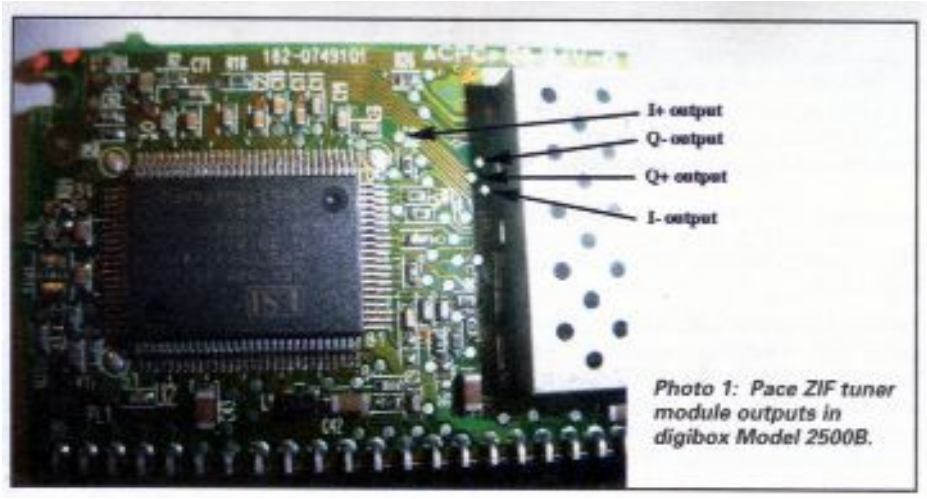


Photo 1: Pace ZIF tuner module outputs in digibox Model 2500B.

I+ output
Q- output
Q+output
I- output

An oscilloscope check when the Digibox is running will confirm whether the tuner is faulty. When the test points identified in the phot are checked you should see an analogue signal of 400 mV or more. If the tuner is faulty you will usually find that the Q (quadrature) output is missing. The signal frequency at the four test points should also be checked, using a digital frequency counter connected via a x10 probe. With the Sky Home Page channel 998 selected, the frequency should be 8.5 to 8.9 MHz. (Faulty tuners are often at 2 MHz or 14 MHz). If the frequency of the down-converted analogue signal is outside this range, the tuner is faulty and there will be no digital output at pins 18 - 25 of the ZIF tuner unit.

Replacing the faulty I.C. requires fairly specialised equipment because it has an internal heat plate which must be soldered via pads to the copper on the board. The equipment heats the I.C. on its top surface and the board underneath, causing the solder to melt.

Here's a photograph of the underside. You can see the area to be soldered and it's quite impossible without the correct equipment. (Well, you could try an electric paint-stripper gun but don't be surprised if you destroy the entire unit!)

The reason for failure of this I.C. in the first place is thought to be inadequate soldering of the heat dissipation plate - implying that even the manufacturers can't get it right!

Of course you can order tuners from SatCure but don't expect to get a "new for old" discount if you've destroyed the old unit.

Specialised parts ordering

Because of the expensive equipment and skill required to remove and fit surface mount components, SatCure does not stock or list most of the specialised parts that you'll find mentioned in this eBook. However, if you'd like us to order parts, please contact Sales. Please be sure to give the exact PART NUMBER of the device, its CIRCUIT POSITION (eg. U300) and the MAKE and exact MODEL NUMBER of the equipment (eg. Pace BSKYB2500S3).

Once you have received the order code and price from Sales, you can use our secure Shopping Cart to place your order.

Some other faults that we've seen

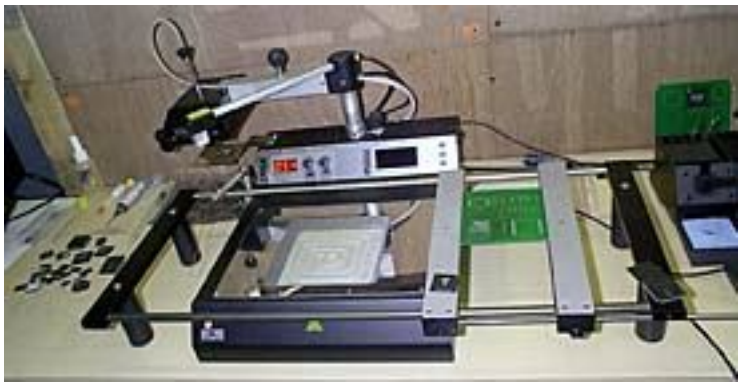
BskyB 2200 - telephones not working with the Pace box connected.
Replace D852 39v Zener and U852 Optocoupler.
Note that, in the case of a "modem fault" like this, Pace recommend replacing five components which are available as a kit 265-230A2B1.
In addition. it is recommended that the modem I.C. U700 be replaced (but this is definitely beyond the scope of D.I.Y. repair.)

A fault in the modem section can cause the Digibox to "stick in stand-by". However, this symptom can be caused by numerous other faults so don't automatically assume it's the DSP1675 modem chip at fault! It could be the 29.4912 MHz crystal X700 or the 27 MHz crystal X370 or a faulty microcontroller chip. This is a BGA (Ball Gate Array) device in later models (2500S3 onwards) and special equipment (and skill) is needed to replace it. The chip itself costs around £40. The equipment costs around £4000.

You can improve reliability of the microcontroller on Pace Digiboxes by fitting our fan kit. http://www.satcure.co.uk/tech/fan.htm

A complete Pace Digibox power supply repair kit is available from:
SatCure

Note: Pace BskyB models from 2500S3 onwards have a power supply board which is *separate* from the mother board.



Pace 2200
This digibox worked OK when scart outputs were used but there was no output via the RF sockets. The usual cause of the problem is water getting down the aerial lead and entering the modulator, but not on this occasion. This time the cause was failure of the RF carrier oscillator because the 8.2µH coil L640 had never been soldered properly from new.

Other items to check for this problem are the 4MHz crystal X640 and the varicap diode D640. And don't overlook possible loss of the 33V tuning supply. Cheek these items before condemning the TDA8822T chip. M.D.

Pace 2200
This digibox displayed the "no satellite signal received" message. The dealer who sent it to me had already replaced the tuner to no avail. Pins 12 (in phase) and 14 (in quadrature) of the dual ADC chip U404 were receiving the correct signals from the tuner, and the chip was producing digital outputs. The fault was cured by replacing the following L64704 channel decoder chip U403. M.D.

Pace have kindly listed a number of fault symptoms and possible causes. Most of these need workshop diagnostic equipment to confirm but they are reproduced here for guidance.

Please be sure to check ALL the general causes of faults (previous pages) before deciding that one of the following is the answer!

Stuck in Standby causes

Intermittent
PCB revision A2-B1
Check for water ingress around the modulator can. If corrosion is present, clean it away.

Intermittent
PCB revision A2-A3
U386 may be faulty

Permanently stuck in standby
PCB revision A2-A7
X401 crystal may be faulty - measure 10MHz.

More Stuck in Standby causes

Permanently stuck in standby
PCB revision A2-B1
U700 may be faulty - measure 29MHz reference.

Permanent but remote command LED flashes when key is pressed.
PCB revision A2-B1
U7002 and U7006 may be faulty.

Permanent but remote command LED flashes when key is pressed.
PCB revision B1.
ZIF tuner may be faulty.

Permanent + low voltage readings on various PSU rails.
PCB revision A2-B1
Check U4 for short-circuit.

Permanent + SDRAM clock OK. I2C held at 3v3 with occasional data burst.
PCB revision A2-B1
Suspect U900 and U901

Permanent + I2C data present but not correct (too much activity).
PCB revision 5512 [A1]
Suspect ZIF tuner.

Other Pace faults

No teletext operation - control line ttxtrequest is OK but ttxtdata is held high.
PCB revision A2-B1
Suspect U300

No UHF channel 69 - voltage on D640 higher than normal over UHF range of channels.
PCB revision A2-B1
Suspect D640

No IR operation via RF2 - Remote IR signal is OK going into Q605.
IR works Ok via front panel.
Check 5.0 output of Reg1 which must be accurate.

No IR operation via RF2 - 8v signal output from RF2 but no operation.
PCB revision A2-B1
Suspect Q603 and Q604.

No IR operation via RF2 - no 8v supply or supply is incorrect.
PCB revision A2-B1
Suspect R70 or D53.

Crackling on audio via Scart.
PCB revision A2-B1
Check for dry joints on R955, R997 and around U903, U907 and U908.

No audio or crackling audio - no PCMDATA on pin 41 of U320.
PCB revision A2-B1
Suspect U320.

Crackling audio - U550 very hot. U551 pulling down 5v output.
PCB revision A2-A4
Suspect U551.

No audio via Scart - OK via RF
PCB revision A2-B1
Check for short-circuit across C3012.

No audio - no signal at inputs of U551.
PCB revision A2-B1
Suspect U320.

No audio - video OK.
PCB revision A2-B1
Check for dry joints around U551.

No audio from RF modulator - OK from Scarts.
PCB revision A2-B1
Suspect U905.

Distorted audio - sounds like a “Dalek”.
PCB revision 5512 [A1]
Suspect BGA chip U300.

Audio disappears or distorts when box warm - fault in G729 operation.
PCB revision A2-B1
Suspect U3002.

Tone superimposed on audio - tone generated by G729 chip.
PCB revision A2-B1
Suspect U3002.

High pitch whistle on audio.
PCB revision A2-B1
Suspect U320.

LNB supply incorrect - both H and V measure low.
PCB revision A2-B1
Suspect D105.

No horizontal channels - vertical OK.
PCB revision A2-B1
Suspect U103 and Q103.

No satellite signal
PCB revision A2-A7
Suspect C433 and C434.

No satellite signal - U451 pin 3 voltage high, pin 50 is 0v.
PCB revision A2-A7
Suspect tuner module.

No satellite signal - signal strength indication is low; quality fluctuates.
PCB revision A2-A7
Suspect tuner module.

No satellite signal on some channels - low and high frequency transponders are missing; middle ones are OK.
PCB revision A2-A7
Check D405 30 volt zener.

No TV listings
PCB revision A2-B1
Suspect U320.

No TV listings but Digibox working OK
PCB revision A2-B1
Suspect U7002 and U7006.

No TV listings - no video or audio
PCB revision A2-B1
Check signals from front end multiplex outputs (U151, U153 and U155). If signals are OK, change U300. If not OK, the fault lies in the front-end circuit.

Fine, coloured lines on picture
PCB revision A2-B1
Suspect U500.

Small green squares or small block of lines on screen - some channels worse than others.
PCB revision A2-B1
Suspect U321 and U322.

Blocks on menu - Remote function may lock up. Picture OK.
PCB revision A2-B1
Suspect U321 and U322

No RF output
PCB revision A2-B1
Check for 4MHz (X640) on crystal side of C653.

Black-and-white rolling picture on channels 68 and 69.
PCB revision A2-B1
Suspect C650 and C651.

Picture and audio freezing intermittently.
PCB revision A2-A7
Suspect U404.

Poor picture from Scart and RF - pink, snowy picture. Sound OK.
PCB revision A2-B1
Suspect U321 and U322.

Picture is black and white
PCB revision A2-B1
X320 27MHz reference running at wrong frequency.
Suspect C370.

Blank screen - Audio OK. Scart leads plugged in OK.
PCB revision A2-B1
Check for dry joints around U900 and U901.

Blue screen, no audio.
PCB revision A2-B1
No audio output from U901.
Suspect U900 and U901.

Intermittent picture break-up - menus showing blocks and bars.
PCB revision A2-B1
Suspect U321 and U322

Intermittent picture break-up - Searching for TV listings on weak signal.
PCB revision A2-B1
Suspect R116, R117, C107 and D109.

Intermittent picture freezing.
PCB revision A2-A7
Errors on “notfecfail”.
Suspect U403.

Intermittent picture freezing.
PCB revision A2-A7
Check pin 22 of U404 for 55MHz and pin 1 of U402 for stable 5v.
Suspect U404.

At system test screen “Telephone line not connected”.
PCB revision A2-B1
STB can not see phoneline voltage.
Suspect U853, U854 and D854.

No RGB operation - No switching on Scart pin 16.
PCB revision A2-B1
Suspect Q902 and Q903.

No widescreen switching - No switching voltage on Scart pin 8.
PCB revision A2-B1
Suspect Q904.

Not reading card - only Free To Air channels available.
PCB revision A2-A3
Suspect R391

Channels missing - no 22kHz tone on Horizontal polarised channels.
Vertical polarised channels OK.
PCB revision A2-B1
Suspect Q103.

On-screen message indicates problem with viewing card.
PCB revision A2-B1
Check 4.5MHz 5V p-p waveform on pin 15 of U1100. If not present, check that input on pin 24 is 4.5MHz 4.5V p-p. If OK, change U1100.

Will not dial out - System test indicates OK.
PCB revision A2-B1
Suspect Q850.

Displays purple screen.
PCB revision A2-B1
No SDRAM clock at pin 35 on U321 and U322.
Suspect U7200.

Modem fails to go “off-hook”.
PCB revision A2-B1
Suspect D854.

Sky menus displayed in wrong colour. Video and audio OK.
PCB revision A2-B1
Suspect U320.

Slow to boot up - modem IC not running.
PCB revision A2-B1
Suspect U700.

Access to Open... interactive services is suddenly lost.
On-screen display reverts to the main Sky Guide Interactive menu.
PCB revision 5512 [A1]
Suspect U300.

“ERR” on front panel display.
Suspect X102 on front panel.

“ERR” on front panel display.
Intermittently OK. I2C incorrect.
Suspect C305.

No channels viewable. Scans OK. If powered down then up, Welcome screen is displayed.
Check U254 for dry joints.

Will not tune.
Suspect U300.

Will not switch on.
Check U300 for dry joints.

Red and green blocks on picture - menu OK
BskyB2500S
Suspect STi5512 BGA chip U300.

Dead BskyB2200
This digibox had suffered lightning-induced surge damage, confirmed when I found that the 39V zener D852 at the line side of the modem was short-circuit. Fitting a modem repair kit, including U700 the DSP1675 modem chip, didn’t bring the box to life. Measurements found that D2 (RS2K) in the PSU was short-circuit. Replacing the TOP224Y chopper chip U2 brought the digibox to life but the 3v3 supply rose to 4v4 so I switched off quickly! Replacing the optocoupler fixed this but the flash memory had to be force-upgraded before the Digibox would change channels.

Pace BskyB2200

The complaint with this digibox was that it would intermittently freeze and display the 'No satellite signal' message. This happened with the horizontally-polarised channels only. I didn't suspect the tuner as it was an early box fitted with the non-ZIF type. When I checked the box it worked faultlessly on the horizontal channels. I decided to leave it on test in the corner of the workshop, with my home-made polarisation tester connected to the aerial socket. Changing between H and V brought the fault up straight away: the H LED went out.

The problem seemed to be in the LNB current-sensing circuit, around the comparator chip U103 and the 0.3 Ohm sensing resistor, R 114, but tests in this circuit failed to reveal anything amiss. I next checked around the house-keeping microcontroller chip U600, which was turning off the LNB via Q 138, but replacing U600 made no difference. The only input to this chip from the LNB circuit is via a potential divider that consists of R 116 (22k) and R 117 (2.7k). As this input is clamped by a 3.3V zener diode, D109, I mistakenly assumed that it was for over-voltage monitoring. If so, shorting D109 to chassis should enable the 18V supply and restore the horizontal channels. Not so.

At this point I decided to compare voltages with those in a correctly-working box. In the working box the voltage at the centre of the potential divider (TP745) was 1.424V for vertical and 1.848V for horizontal channels. The faulty box produced readings of 1.330V for vertical and 1.740V for horizontal channels. Clearly if the voltage at TP745 is below a preset limit U600 will switch off the LNB. D109 is presumably there for protection of some sort.

I could now see what the problem was: the LNB voltage was slightly out of tolerance. Rather than play around with the LNB supply I worked out that, if I shunted R 116 with a 220k resistor, the threshold voltage at TP745 would rise by 0. 1 V, matching the voltages in the working box. Doing this provided a complete cure. M.D.

Pace BskyB2200

This was a later version of the 2200 fitted with the ZIF tuner. It produced the 'no satellite signal received message'. The dealer who sent it to me said he had fitted a new tuner, but it looked more like a used than a new

one. My first step was to check the installation menu, to confirm that the settings were all correct. I then removed the tuner and plugged it into my test rig. This confirmed that it was OK, so I refitted it and checked the tuning, 3.3V and 5V supplies, the serial clock and data lines, and the LNB supply. Everything seemed to be in order, but the digibox still didn't work.

I then realised that the 22kHz tone was missing from the LNB supply, though it was set to 'on' in the menu. The tone is generated by a pulse-width modulator within the ST20 housekeeping microcontroller chip U600, the tone output being at pin 142. It was present here. I continued scope cheeks through to C 102 (470pF) and found that it was missing at the output side of this capacitor. But a replacement capacitor made no difference.

The 22kHz tone is generated by a pulse-width modulator in the main microcontroller chip, which is U300 (ST20); it's switched on and off by toggling pin 1 of the housekeeping microcontroller U600. Time was wasted here. The tone is on when this pin is high (1.53V) and off when it's low (0V). But the change is not instantaneous: it takes place three seconds after you press 'select' with the remote-control unit. Very naughty!

Anyway U600 was OK, so it was back to the output side of C102. This is connected to the collector of the LNB switch-off transistor Q 138 and the LM358M 22kHz tone amplifier chip U103. Clearly one or other of these items was deleting the tone. Replacing Q138 made no difference: replacing U103 made D 101 (BAS 16) go up in smoke. I also found that D107 (15V zener diode) and the 2SK2414 FET Q103 were leaky. Replacing all these items (U 103, D 101, D 107 and Q 103) finally restored normal operation. M.D.

Pace BSKYB2200

This digibox wouldn't read the viewing card. Only programmes 181 onwards were available. Card reader problems are common with this model, caused by bent contacts in the card reader. But the problem was still present when I fitted a new reader.

A scope check at pin 15 of the TDA8004T chip U1100 confirmed that the card had been detected. This is the reference clock signal to the viewing card, and is present only when a card has been inserted. Pin 26 provides

output data from the card but was dead. Pin 16 provides a reset output for the viewing card: it should rise to 5V to reset the card, but rose to only 1.25V when the card was inserted.

A new TDA8004T chip cured the fault. The upper mondex PCB has to be removed to gain access to this chip.

Pace BSKYB2200

Stuck in standby with the LNB voltage pulsing to 13V every three seconds is a common problem with this model, but can be very intermittent. The first time I came across it the box came on while I was scoping waveforms and the fault didn't reappear until three weeks later. The cause of the trouble is an intermittent 29.49120MHz modem clock crystal. You can check it at pins 66-67 of the DSP1675 modem chip U700.

Pace 2500S

This digibox would sometimes work normally but at other times would be stuck in standby with no LNB supply and the STI5512 IC stone cold. The cause of the problem wasn't the STI5512 chip however - I had replaced it some weeks earlier to cure another problem. I traced the cause to crystal X1300 (8.3886080MHz) which was intermittent. It clocks the house-keeping micro. M.D.

Pace 2500S3

This digibox was stuck in standby. When I removed the top I spotted the cause of the problem straight away: the top had blown off the CSP1043C chip U2102 in the modem interface. This is a sure sign of lightning damage via the phone line. It's not necessarily terminal, however. In this case replacing U2102, the 3.3V surface-mounted zener diodes D 1600 and D1610, the PC452 optocoupler U1604, the 39V, 1W zener diode D1605 and U1600 (M605) brought the box back to life. M.D.

Pace 2500S3

This digibox was stuck in standby. In a situation like this, one of the quickest ways of narrowing down the cause of the fault is to plug a polarisation checker into the LNB socket. As the digibox boots up and goes through the start-up routine you will see a flashingLED sequence that's particular to the model concerned. In this case the green (vertical) polarisation LED lit for about three seconds, went out for three seconds and then kept on repeating this. In a Pace box this usually indicates fail-

ure of the modem to initialise.

The cause of the trouble was traced to the modem flash memory chip U 1505. It's preprogrammed and has to be ordered from Pace. The replacement restored normal operation.

Pace 2500S3

The customer complained that some channels were missing. On test I found that the digibox was stuck on vertical polarisation. When I selected a channel with horizontal polarisation, EPG no. 235, the LNB -polarisation change FET Q100 didn't apply 20V to the cathode of D100.

Q100 was not the cause of the fault however. There was only 15V at its input instead of 20V. In fact the 20V output from the power supply was missing - the 15V was coming via the FET's internal protection diode.

When I examined the power supply panel I found a burnt-up, surface-mounted decoupling capacitor, C2532, on the underside. The track beneath it had also been damaged. No value for this capacitor is given in the manual, so I removed one from a scrap PCB and found that it's 47nF. A replacement capacitor and some track repair cured the fault.

Pace 2500S5

Unlike the 2500S3, this model has the ZIF front-end on the main board. The MAX2115 ZIF chip is unfortunately prone to failure. This particular digibox produced the 'no satellite signal received' message, and the cause was traced to the ZIF chip. Replacement is far from easy. You have to use a soldering station to remove the screening can after removing the LNB socket. The replacement chip measures only 6min square and has 48 solder pads underneath. Unlike BGA chips, which come with pre-attached solder balls, the MAX2115 has bare pads. An exact amount of solder has to be applied to the PCB, then the chip is sat on top and taken up to reflow. This requires great skill and care to get it right. It's not my favourite job.

Pace 2500S3

This digibox produced no sound output but was OK in every other respect. L and R analogue signals were present at pins 11 and 10 of the DA converter chip and at pins 12 and 2 of the TL084CD buffer chip U1006, but the outputs were missing at pins 14 and 1 of this chip. This

IC has split supplies, +8V and -8V, and it turned out that the negative supply at pin 11 was missing.

I traced the source right back to the power supply and found that there was no voltage at the anode of rectifier diode D2503. Further checks showed that the chopper transformer had an open-circuit winding, between pins 14 and 13. When I removed the transformer the cause of the fault was found to be a poor soldered connection where the copper wire is wrapped round the leg. Resoldering cured the fault, so a new transformer was not needed.

Pace BSKYB2600

Lightning via the telephone line had struck this digibox, which was now stuck in
standby. Data was being sent via C802 andC804 to the CX22496 line-side interface
chip U8200, but the chip wasn't responding. As this IC is on the line side, it gets its DC supply by rectifying the 4MHz square-wave clock signal fed to transformer T8200. The result should be a 4MHz reference clock signal at pin 28 and a 3.5V DC voltage at pin 7. I found that the voltage at pin 7 was low (2.9V), which confirmed my suspicion that the IC was dud.

Replacement of this CX22496 IC is not for the faint-hearted. It's housed in a 28-pin QFN package: all the pins are underneath, and the ground plane of the PCB has to be soldered to the underside of the chip. Furthermore the IC is only 5mm square! Once the replacement had been installed the digibox came on and all was well.

Sky Plus BSKYB3000

For 'no satellite signal received' via the second tuner, go to the installer menu and do a full system reset. You may save yourself an unnecessary repair bill.

Specialised parts ordering

Because of the expensive equipment and skill required to remove and fit surface mount components, SatCure does not stock or list most of the specialised parts that you'll find mentioned in this eBook. However, if you'd like us to order parts, please contact Sales. Please be sure to give the exact PART NUMBER of the device, its CIRCUIT POSITION (eg.

U300) and the MAKE and exact MODEL NUMBER of the equipment (eg. Pace BSKYB2500S3).
Once you have received the order code and price from Sales, you can use our secure Shopping Cart to place your order.

Panasonic

Panasonic offer a repair service but no spares or service information. Some dealers may agree to look at a Panasonic Digibox which has a power supply fault but it's often difficult to tell if the symptoms indicate a faulty power supply or a motherboard fault.

Otherwise, a faulty Panasonic Digibox must be taken to the nearest Panasonic agent who will arrange to return it to the factory for repair. It will speed up the arrangements if you have the original packing but leave all accessories (remote control etc.) at home as these are not required and could get lost. The charge is likely to be from £82, with additional handling charges. Any units that are still under 12 months old should be returned to the dealer (with proof of purchase date) for free repair.

UK Panasonic help line is 0800-1693012
Phone this number and ask for your nearest Panasonic Digibox repair agent. In some circumstances Panasonic may agree to collect your receiver - for example, if you have a daytime office address which looks like an electrical "trade" address. This is not cheating - it's cheaper and easier for Panasonic to deal with a company and to know that someone will be there when the carrier arrives to collect or deliver.

Panasonic Southern Ireland have a different system. Their phone number for southern Ireland customers and dealers is 353-12959966. Their address is Panasonic Ireland Ltd, Burton Hall Road, Sandyford Industrial Estate. Dublin 18.

Note: SatCure *can* obtain some Panasonic spares. Please ask.
Michael at DIGIFIX does repair Panasonic Digiboxes (and all others).
http://www.satcure.co.uk/repairs.htm

A common fault is breakage of the “RF Output 2” connector. This is part of a short cable asse,bly which is plugged into the modulator inside the Digibox and is held by one screw to the rear panel. SatCure stocks this RF connector and it’s very simple to replace.

Now, for the technically competent....

Some faults we've seen

TU-DSB30 front panel LEDs flash on and off, faintly or don't light at all.
Zener D814 marked "1B25" in the power supply connected across the 3.25 volt supply. It has no function other than "protection" and can be disconnected for testing purposes. SatCure can supply a replacement part.

TU-DSB30 gives out 33v on the LNB F connector (kills the LNB)
Replace Q203 on the Power Supply board. It's a KTA1281, PNP transistor (TO92 case) but a TIP32A seems to work OK as a replacement.

Power supply completely dead (measure output voltages)
K2718 Switching transistor in power supply faulty.
(It's a MOSFET with internal diode - available from SatCure).

Another possible fault which I have not had time to investigate:

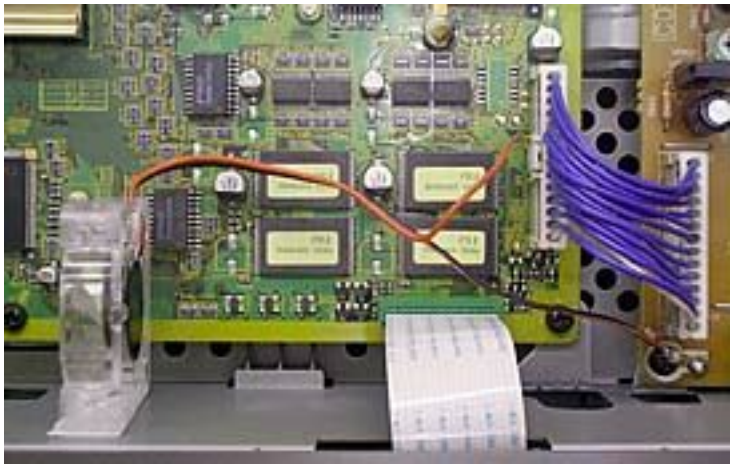
Digibox goes to standby by itself or while changing channels:

As you will realise, any momentary break in mains power will have the effect of causing a Digibox to go to standby so the first thing to check is the mains power cord (try flexing it), plug at receiver end (tight?), mains plug (tightness of wire-securing screws and fuse), wall socket (use an extension lead to bring power from a different socket) and, finally, the mains supply itself. Watch for flickering lights or get the electricity board to put a monitoring unit on it for a day or two. I *think* they'll do this for free – especially if you raise a question about safety!

However, the Panasonic Digibox currently has quite a reputation for doing strange things, of which "dropping to standby" is one. So don't get up your hopes.

Other checks that should be made are internal so mains must be disconnected. The power supply is connected to the mother board by a multi-wire connector, having a long white plug at each end. In theory, tarnishing of the contacts can cause problems. I use a tiny drop of WD-40 to "wash" the contacts, pushing each plug up and down a dozen times to clean the contacts. Use only a tiny drop of WD-40, don't let it touch any components and wipe it off with a tissue afterwards. (Some

"experts" might frown at the use of a proprietary water repellent but I've been using it for years - done over 25,000 satellite receiver repairs - so I know it's safe to use as described). The photo-graph shows the two white connectors and a fan fitted.



The microprocessor is a large square chip device which runs very hot. It's a prime suspect and obviously beyond the scope of DIY replacement (and beyond the capabilities of many workshops). You could experi-ment by running the receiver on an open shelf with its cover removed but do so *only* if you can make sure that no animals or children can get near to it! If it runs faultlessly like this, then a miniature internal cooling fan (stocked by SatCure) might help to prolong its life.

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 CPU 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.

Panasonic TU-DSB20

I had suspected for some time that the symptoms I'd seen with Panasonic Digiboxes might be due to the very high CPU temperature. Unfortunately, Panasonic don't appear to supply spare parts or service information to independent repair shops so we are left to guess. When one particular Digibox arrived for repair, I decided to try a CPU cooling kit. If switched to standby after 20 minutes or more the Digibox would not come back on. It seemed an ideal candidate.

In fact the Fan + heatsink cured the fault altogether. The receiver was left on and tested periodically over two days of very hot weather and it worked perfectly. The customer was extremely happy since I'd originally quoted £100 for the repair.

Another example:

Panasonic TU-DSB30

After 1 hour this Digibox went to standby all by itself and would not come back on.
The heatsink alone cured the problem but I was concerned that the customer might still manage to make it overheat in an enclosed cabinet (as they do!) so I fitted the fan as well.

More Panasonic faults

A TU-DSB20 that was permanently "searching for listings" appeared to have a tuner fault - but didn't. The services menu indicated a good signal and quality and lock were OK. But there was no network ID and no transport stream. Checks at the 208 pin ST20TP3BX50S chip IC421 showed that MPEG data was entering at pins 69-76 so a tuner or AD converter fault was ruled out. However, there was no digital activity at the memory address pins 1 - 28 or memory data pins 30 - 67. They were all stuck high at 3.3V, so the data bus had stopped. A replacement chip cured this fault.

Panasonic TU-DSB20
There was an intermittent fault with this digibox - the picture would go blank with the sound still present. Checks around the STV0119 PAL video encoder chip IC304 revealed that the line sync pulses at pin 1 disappeared when the fault occurred. They come from pin 96 of the AV decoder chip IC301, but replacing this chip failed to cure the fault. The cause was eventually traced to the 74LCX 16245 bus multiplexer chip IC610, which buffers the data from the expansion slot at the back of the unit. M.D.

Yet another cause for the "stuck in standby" symptom has been related to me by Michael Old. He says that the front panel ribbon connector should be cleaned and reinserted into its socket in the mother board.

A cause of TU-DSB31 power supply "tripping" is a short-circuit zener diode D815 6.8v. If this has failed DON'T replace it without checking carefully. The usual cause is a cracked PSU board. Look carefully for cracks around the optocoupler. A crack here can cause the secondary voltages to rise and burn out the zener across the 5 volt rail.

Another cause of TU-DSB31 power supply "tripping" is a short circuit diode D811 which is a UF5404 ultra-fast reverse recovery diode for the 16.5 volt rail.

This model also suffers from card contact problems. We've had one receiver which would show only channels 181 onwards. When a FTV card was inserted, the card serial number was not displayed in the menu screen. The fault cause was that the front four gold contacts in the slot were not touching the card. A temporary cure is to slide a thin piece of card on top of the smartcard. Replace the card contact assembly for a complete cure.

Panasonic TU-DSB30

This digibox displayed the "no satellite signal is being received" message. The customer said it had gone off after a lightning storm. The cause of the problem was loss of the LNB supply. Checks in the LNB circuit revealed a short-circuit diode, D001, which is marked N610. As it's connected to a large inductor, I assume it's part of a chopper circuit used to generate the LNB supply. Panasonic won't supply spare parts or circuit diagrams, so one has to guess. I decided to fit a fast-switching BA157 diode, which cured the problem. No other damage had been done. M.D.

Panasonic TU-DSB30

This digibox would return to standby when it was switched on. 1 found that it would stay on when the viewing card was removed. This problem is usually caused by out-of-date software rather than a card problem, and sure enough the operating system was about a year out of date.

When I tried to update the software nothing happened: the system software update message just stayed on the screen. 1 left the unit on overnight, but the message was still on the screen next day. The problem was cured by replacing the M29F800AB-70N1 flash-memory chips IC356/7/8/9. Make sure you fit the correct version, as different types are used. The suffix AB seems to relate to where the boot block is held in the memory. Fit the wrong chips and the unit will be stuck in standby. M.D.

Panasonic TU-DSB30

Intermittently won't come out of standby. When it does it works fine, sometimes until a button on the remote control is pressed. It will then go back to standby and won't come back on. Leave box unplugged for a few days and it will sometimes come back on. Intermittent problem gets worse untill finally it won't come out of standby at all.
Cure replace IC 602. 74LCX16245.

You can also check the following:
Look for IC351 near the four flash memory ICs. Just above IC351 is a tiny device labelled "R494". If it's there, remove it. It shouldn't be there. I think it's a surface-mount fuse that is supposed to be blown open-circuit or removed after factory programming. Anyway, it has no function.

Panasonic TU-DSB30

The picture produced by this digibox was covered in red and green blocks, which indicates a failed SDRAM chip. There are two to choose from: IC302 and IC303. I decided to check their temperatures using a laser-sighted digital thermometer. This showed that IC302 was running 2°C hotter than the other chip. A replacement (KM416S 1 120DT-G8) SDRAM in the IC302 position cured the problem.
I first used this trick about ten years ago, to locate a faulty RAM chip in an Atari computer that had eight of them in parallel. M.D.

Panasonic TU-DSB30

If the unit is stuck in standby, check near the flash memory for a component that's designated R494. It appears to be some sort of surface-mounted fuse and is not fitted in later production units. If present, remove it. This may well cure the fault. My guess is that the component was something to do with the factory programming of the flash chips, and should he blown open when this has been completed. If it's not fully open-circuit, the digibox can stick in standby.

It would be nice to be able to obtain service manuals for Panasonic digiboxes, especially as Panasonic has now ceased to produce Sky digiboxes.

Panasonic TU-DSB31

There's a built-in software problem with this model: the flash memory chips cannot complete a large operating software jump in one go. Because of this, if you have any old unused receiver more than about a

year old the box, when you come to update its software, will go through the download routine but will not rewrite any software. Unless you have 3.0 or above software, there will be problems with reading the card

The only way to cure the fault is to replace the flash memory chips IC357 and IC359 and trtansfer the old serial number and version number into the new chips. Make sure that the box is updated every time Sky sends out a new version of the software. This is of course done automatically when the box is in regular use.

Panasonic TU-DSB31

The customer complained about picture break up. When I ran his digibox in the workshop for a couple of days it was OK, but the picture break up started again as soon as it was returned. In view of this I advised him to get the LNB checked. He did so, and in fact had the LNB and cable run replaced. But the fault remained. So the digibox came back to the workshop, where again it worked correctly. I suggested sending the digibox back to Panasonic, which runs an exchange scheme - you never get the same box back, which is handy if there's a nasty intermittent fault. I eventually managed to get a replacement and tested it in the shop for a day. It was fine. But ten minutes after the customer collected it he phoned to say that the picture was still breaking up. So the aerial installer was asked back to recheck the dish and LNB, which he said were fine. After more messing about I obtained another digibox from Panasonic, but the fault was still present. Yet another digibox was obtained from Panasonic. Each one worked all right at the shop, but not at the customer's house.

I then lent the customer two stock Panasonic digiboxes, a TU-DSB30 and a TU-DSB35. The former worked perfectly at the customer's house but the DSB35, which looks the same as the DSB31, produced break up.

The customer decided to phone Sky for advice, and was told to switch the output from RGB to PAL. Much to my and his amazement, this cured the break-up problem. But he had just bought an expensive 32in. set, and wanted the better picture quality that RGB output provides.

By now I could see that this was a factory problem, and that no matter how many new DSB31 or DSB35 digiboxes were tried the problem would remain. I managed to speak to the Panasonic service manager in

the workshop. He confirmed that there was a design fault, and said that there was nothing Panasonic or I could do. He suggested replacing the DSB31 with the later DSB50 model, to which I agreed, but later came back to say that his boss had vetoed this and all he could do was to refund the money I had paid for the exchange.

By now the customer was getting reallyangry. So I gave him the Panasonic service manager's phone number to see if he could sort the problem out. When the customer reported back to me the bottom line was that Panasonic knew about the problem but was not prepared to provide a newer replacement model. At least the customer knew that it wasn't my fault!

I then spoke to John Glenton at MCES about the problem. He said they had come up with a modification to cure it, and that if I sent him the tuner he would carry out the modification. I couldn't for the life of me see how a modification to the tuner would cure picture break up in the RGB mode but, clutching at any straw, I decided to give it a go. When the tuner came back I fitted it and let the customer try the box. A couple of days later, to my amazement, he said that the fault had been cured.

According to John Glenton the current drawn by the RGB output can affect the tuner, causing intermittent picture break up. I can only assume that the video output chip and the tuner are fed from the same supply line, and that this is how the faults are related. Anyway the customer went away happy, more so because I had repaired his digibox when Panasonic had told him that nothing could be done. But the credit has to go to John Glenton at MCES, without whose help repair would not have been possible. You can contact MCES on 0161 746 8037, or alternatively email sales@ mces.co.uk

Panasonic tuner modules

The TU-DSB31 tuner (left) has the part no ENA67A10C3 and is slightly different from the one used in the older TU-DSB30. Reports suggest that the latter has better selectivity, which enables it to work better in poor reception areas where some signals are much weaker than others.

I would be interested to hear from anyone with details of the tuners used in other Panasonic models. MP

Tuner failure is very rare.

Specialised parts ordering

Because of the expensive equipment and skill required to remove and fit surface mount components, SatCure does not stock or list most of the specialised parts that you'll find mentioned in this eBook. However, if you'd like us to order parts, please contact Sales. Please be sure to give the exact PART NUMBER of the device, its CIRCUIT POSITION (eg. U300) and the MAKE and exact MODEL NUMBER of the equipment (eg. Pace BSKYB2500S3).

Once you have received the order code and price from Sales, you can use our secure Shopping Cart to place your order.

Grundig

Grundig have appointed repair agents to do Digibox repairs. Again, no spares or service information are available and faulty units should be delivered to Grundig authorised dealers for shipping to the repair agent.

Genserve, 11 Caen View, Rushey Platt, Swindon, Wilts. SN5 8WQ
(01793) 886333
Grundig models tend to be only "fair" for fringe reception areas outside the UK, although the GDS310/2 , GDS2000 and GDS3000 are almost as good as the Panasonic TU-DSB30.

Many problems with the Grundig Digibox are caused by the demise of the power supply. The symptoms usually include loss of some programmes and occasionally "lines on the picture", sound faults or other strange things.
There are five versions of the power supply unit as shown in the photographs. You can order a Repair and reliability upgrade kit and solder in the parts yourself or you can remove the Power Supply Unit (5 screws), pack it carefully in a cardboard box, and post it for repair:
http://www.satcure.co.uk/repairs.htm

DSO-0385 REV.C
Order RELKIT 33a

REV.03 (GDS200 +300)
Order RELKIT 33c

DSO-0375 REV.A
Order RELKIT 33b

DSO-0385 REV.F
Order RELKIT 33b

GDS310/2, GDS2000, GDS3000

use a totally different power supply. So far, the only failures have been of the regulator I.C. No kit is available at present but some individual parts are available from SatCure.

GDS310 power supply

How can you be certain if the PSU is faulty?

Four methods:-

1. Visual inspection. The Electrolytic capacitors should have perfectly flat tops with no bulging (and no bulging of the rubber plug underneath each one). By the time any bulging occurs, the capacitor is well gone. If there's no visible sign, this does NOT mean that the capacitors are OK.

2. Borrow another Grundig and swap its PSU over into yours. If it now works, that proves that your PSU is not OK.

GDS3000 power supply

3. Use an oscilloscope to monitor the individual output voltages. If you can see high frequency ripply of more than 100 millivolts, the capacitors need to be replaced.

4. Measure each electrolytic capacitor with an ESR meter (not a capacitance meter - this will not usually show a faulty capacitor).
In our experience ALL Grundig Sky Digibox PSUs start to fail after 12 months. The RELIABILITY kit *ought* to be fitted *before* this happens.

Most GDS power supplies are interchangeable but **GDS3000 power supplies** can NOT be changed with earlier models!

Grundig Digibox - Fault Symptoms we have seen

The picture gradually fades into noise and the unit eventually shuts itself off. This happens even when the menu is on screen. Also the digibox might affect the phone line by answering any calls!

Replace 27MHz crystal oscillator.

Several times each day, the picture produced by the receiver loses all colour output and everything, (picture, EPG banners, menus etc.) goes black and white. Usually within a minute or two colour returns.

TV incompatibility. Try changing PAL / RGB in the on-screen menu. If that doesn't help, try a different TV set.

Some channels give a "NO SAT. SIGNAL RECEIVED" banner after about 10 seconds of blue screen.

This can be a power supply problem - assuming that your dish and LNB are OK.

Another possible fault which I have not had time to investigate:-

Digibox goes to standby by itself or while changing channels or won't stay on (red front panel LED and green mother board LED flash on/off every few seconds.)

This symptom may be caused by a bad power supply connection. Lift the white (some versions are red / brown) multi-pin plug from left edge of the mother board. Spray the pins with WD-40 and then push the plug on and off the pin connector several times to clean the contacts. Bending the pins slightly (!) may also improve the connection. It may be necessary to solder a wire from the zero-volt track on the PSU board (below the black wires) to the nearest corner of the tuner module.

Also see notes about Panasonic going into standby.

Grundig GDS200/1

The picture produced by this digibox was pixelating and breaking up into blocks.

You often get these symptoms as a result of a power supply capacitor fault but this time a replacement PSU did not effect a cure. The cause of the problem was the STi-3520 MPEG audio / video decoder chip U40. If a fan doesn't cure the fault then replacement is the answer.

Grundig GDS200

This digibox would produce a colour picture only when it was in the RGB mode. When the output was switched to PAL the picture obtained, with either the RF or the scart output, was in monochrome. The menu was also displayed in black and white.

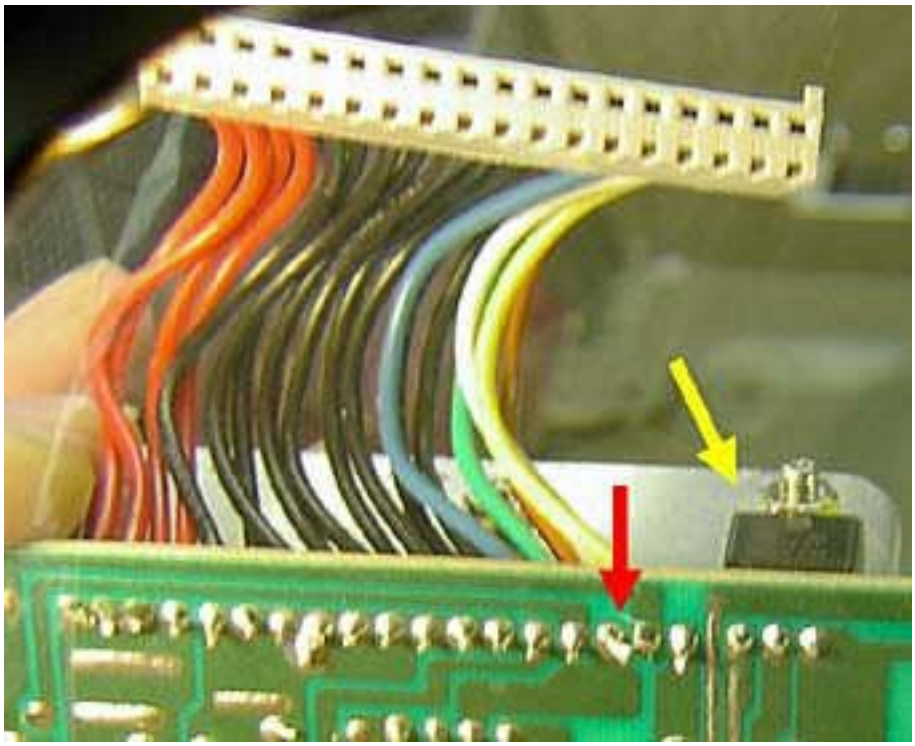
Checks around the STV0 1 19B colour encoder chip U35 revealed that the clock frequency at pin 24 was incorrect. The reference clock signal at this pin must be correct to four zeros, i.e. 27.0000MHz. It was actually running at 27.0950MHz. The fault was cured by replacing the crystal oscillator block U27. M.D.

Receiver wants to update its software the whole time with the four leds lit just as if you did a forced update!

The Grundig that tries to download the software all the time is a common problem that occurs when someone tries to download new software with either a power supply or tuner fault. The only cure now is to replace all 4 flash memory chips. This will get the box back to where it was originally, with either a dud tuner or PSU.

After fitting a refurbished DSO-0375 PSU, the receiver would give, via Scart connection, a picture with weak contrast or no picture at all. Curiously, touching the TV aerial fly-lead to RF Output 2 would bring the picture back but cause the sound to disappear for several seconds. The receiver worked fine with a different PSU.

Voltage measurements showed the the 12 volt supply (yellow wire - furthest connection from the front panel) was varying between 6v and 11.6v. The I.C. "U5" (yellow arrow) was intermittent and replacement



cured the fault. However I was initially sidetracked by an apparent short (red arrow). I snipped the wire as a precaution.

Grundig Modem faults

A faulty modem will often cause the front panel red LED and on-board green LED to come on and go off continually every few seconds. You can produce this symptom artificially simply by removing the modem board from its mother board connector.

The usual failure item is the modem chip type DSP1670TV7 which has 144 pins and is NOT for D.I.Y. removal. This chip is very expensive (over £35 at the last check). Ask SatCure about ordering.
Basic operation can be restored by replacing the DSP1670TV7. Even if all the components on the line side of the modem are wiped out, the box will then function but with no interactive services.

The box will not function if the modem board is removed.

GDS310 won't come on , no LEDs lit and no pictures.

If the modem is not fault,y the chances are the AT87F52 front panel micro or its crystal are dud.

Grundig GDS series modem board

When the modem in one of these digiboxes has been affected by a lightning strike the box will be stuck in standby with the red LED flashing. As the microcontroller chip has to communicate with the modem before the box will come out of standby, leaving the modem board out won't help. In my experience so much damage is caused to the line side that the modem board cannot be repaired economically.

All may not be lost however. Many customers don't use the interactive services and, if these are not required, it's possible to get the modem board up and running so that the box will work though the modem side is dead. First replace the DSP1670TV7 modem microcontroller chip U7 (expensive!). Then check the 100µH surface-mounted inductor L5. If it's open-circuit, the CSP1034AH-J line interface driver chip U1 is faulty. As this will no longer be required, remove it from the PCB. Replace L5 with virtually any RF choke that has a DC resistance of about U2 or less. The photo shows the work required.

In 99 per cent of cases this action will restore communication between the modem board and the main microcontroller chip, and the result will be a working digibox without interactive services.

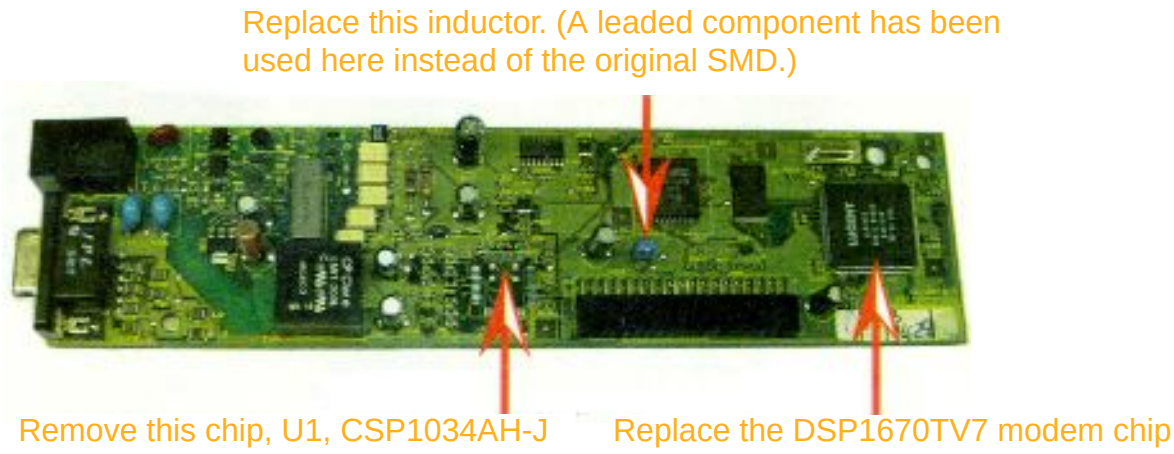


Fig. 1: Work required on a lightning-damaged Grundig GDS series modem PCB to restore digibox operation without the interactive facility.

WARNING

A Grundig that tries to download the software all the time is a common symptom that occurs when someone tries to download new software with either a power supply or tuner fault. The only cure now is to replace all four flash memory chips. This will get the box back to where it was originally, with either a dud tuner or dud PSU, which will then need to be repaired.

So it is MOST IMPORTANT that you do not try to download new software unless you are certain that the above does not apply!

More Grundig faults

Grundig GDS200

This digibox was dead with no standby LED illumination. Checks showed that the 5V supply was low at only 3V. The cause was U4 (PQ30RV21) in the power supply. D.I.

Grundig GDS200

This digibox produced the 'no satellite signal' message. Voltage checks showed that the 30V supply was missing. Zener diode M1 (30V, IW) was short-circuit and S 11 open-circuit. D.I.

Grundig GDS200

This digibox sometimes worked all right. On other occasions it would be dead with no red or green LEDs on the front panel lit. The cause was traced to pin 52 of the ST20 microcontroller chip. It's a part of the memory data bus to the flash memory ICs, and had not been soldered from new. A drop of flux and a touch with the iron cured the fault for good.

Grundig GDS200

If the LEDs are all flashing, the cause may be capacitor C3 (47µF, 25V). Check its capacitance and / or ESR reading.

Grundig GDS200 / 1

This digibox had the usual power-supply capacitor problem. After attending to this I found that the software was out-of-date. A forced download was carried out but wasn't written into the flash memory. The fault was cured by replacing the four M29W800AT90N1 flash-memory chips U6-9 with good ones from a different Digibox. Don't forget that

these chips hold the serial number of the digibox. Thus after replacing them it will no longer recognise the viewing card as being the correct one. You'll have to get the new serial number from the on-screen menu then phone Sky with the card details and customer's details to get the viewing card reactivated.

Grundig GDS200/1

This digibox didn't produce any sound. I decided to check the signals at the AK4317VF analogue-to-digital converter chip U31. Pin 5 had the 12.35MHz clock signal; pin 7 was at 3.07MHz, approximately 64 times the audio sampling rate; pin 9, the right-left clock, was running at 48kHz; and the 18-bit PCM data input from the STi3520 AV decoder chip was present at pin 8. But there were no analogue audio outputs at pins 17 and 18. There should be 100 - 200mV peak-to-peak signals here. The analogue and digital power supplies were both present, so it seemed that the chip was faulty. Wrong!

I had forgotten to check the mute input at pin 12. This comes from pin 168 of the ST20TP3 microprocessor chip. A replacement ST20TP3 chip cured the fault.

Grundig GDS200/1

Should the power supply in this digibox be dead, check for voltage across C3. If there is no voltage here, either R40 or R5 is open-circuit. Their value varies in different versions of the power supply. In this one, type DSO-0375 revision A, both should be 220kΩ, 0.75W, 350v.

Grundig GDS310/02

Lockout/freeze frame was the problem with this digibox. The cause was traced to C12 (1,000pF, 16V) which had gone open-circuit. J.C.

Grundig GDS310/2

This digibox said 'no satellite signal received'. I found that, after boot up, the LNB voltage was 18V (horizontal polarisation). Vertical polarisation (13V) is required for the listings. So I shorted the green wire at the power supply to switch the LNB supply to 13V. After a short delay the time came up at the corner of the TV screen. The box was now locked to the incoming signal, and soon began to work correctly with the vertical channels. The horizontal channels were OK when the short had been removed.

V / H switching comes from pin 71 of the 100-pin GDS-SIDD1.0 chip U7. This pin should go low for the verticallypolarised channels but was stuck high. A replacement IC cured the fault. M.D.

Grundig GDS310/2

This digibox produced the 'no satellite signal received' message because its LNB power output was missing, though it was set to on in the installation menu. I found that the LNB enable transistor Q22 was switched off with its base voltage low - this should be high for on. When I shorted the collector of Q22 to chassis to make the LNB voltage appear it did, but at 18V (H). It should be at 13V (V) after a correct boot up.

The next test was to short the green wire on the power supply unit to chassis. This switches the LNB supply to 13V, but the no-signal message remained. LNB polarisation selection is controlled by pin 71 of the GDS-SIDDI.0 chip U7. I decided that this chip had to be faulty and fitted a replacement, which cleared the problem.

Grundig GDS2000

Although this digibox had 13V at the LNB socket, none of the front-panel LEDs lit up. The problem is sometimes caused by the Amtel chip that controls the LEDs and buttons at the front. Not this time however. The fault was cured by replacing the STiSS 12SWE BGA-type chip U 16.

Grundig GDS2000

This digibox worked all right but an audible noise came from the chopper transformer. The cause was found to be C1 (220µF, 400V), the mains bridge rectifier's reservoir capacitor. It was virtually open-circuit.

Grundig GDS2000

After ten minutes' operation the sound would cease and the picture would freeze and remain on the screen. A check in the services menu showed that the transport stream had gone to 0962, so the fault was clearly tuner-related. I found that the fault occurred when the slightest amount of heat was applied to the TDA8060 downconverter chip, but a brand-new replacement made no difference. So I decided that it would be best to replace the whole tuner. After doing this the digibox worked normally.

Grundig GDS3000

The problem with this new digibox model was no picture via either the RF or scart output, though the sound was OK. Scart/RF video routeing is carried out by IC U15 (type ML6429CS). Checks here showed that there was a video input at pin 2 but no output at pin 3. A new ML6429CS chip cured the fault.

Grundig GDS3000

This digibox produced a pixellated picture with no sound, but the information banner at the bottom of the screen was OK. While this can be caused by a faulty AV SRAM chip, I have found that the usual cause is a defective STi5512SWE 13GAtype chip (U12), especially when the chip is running a bit cooler than its normal working temperature of 68'C. Note that this digibox has no ventilation holes at the top, which could possibly contribute to the early failure of U12.

Grundig GDS3000

There was no colour on the PAL setting and no RF output. The cause was the 27MHz crystal Xl.

Specialised parts ordering

Because of the expensive equipment and skill required to remove and fit surface mount components, SatCure does not stock or list most of the specialised parts that you'll find mentioned in this eBook. However, if you'd like us to order parts, please contact Sales. Please be sure to give the exact PART NUMBER of the device, its CIRCUIT POSITION (eg. U300) and the MAKE and exact MODEL NUMBER of the equipment (eg. Pace BSKYB2500S3).

Once you have received the order code and price from Sales, you can use our secure Shopping Cart to place your order.

Sony Digiboxes VTXS750U and VTXS760U

Many Sony VTXS750U boxes have a problem with 12.285 V, which is where Game Network, P Rock & Performance are broadcast from. The cause is not known but it has been suggested that a larger dish might cure the fault.

Power supply problems also occur. These are usually cheap to repair IF you know which part has failed and IF you have the desoldering equipment required! The chip (red arrow) is a common cause of problems but also check the surface-mount diodes for short-circuit.

Sony VTXS750U

This digibox was dead with the top blown off the VIPER50 chopper chip. Normally a new IC and fuse will bring the box back to life, but not this time. I found that the surface-mounted 3.6kΩ resistor R800 was o/c.

The box came on when a replacement resistor had been fitted, but the picture was pixellating - though the info banner was OK. I then found that the 3.3V supply was high at 4.4V. A new PC 123 optocoupler (PH800) cured this problem and, thankfully, no damage had been done by the over voltage.

Sony VTXS750U

This digibox was dead except for a whistling noise that came from the chopper transformer. These symptoms are usually caused by a leaky diode in the snubber network or a short-circuit, surface-mounted diode associated with the 12V supply. Not this time, however. The cause was C807 (47µF, 50V) on the primary side of the power supply.

Sony VTXS760

Symptom: Apparently dead. No red LED lit on front panel; power supply is running but all output voltages very low. Chopper control chip VIPER50 gets very hot very quickly. D800 (RJ16) may be leaky in the snubber network; check this first but the problem can sometimes be caused by the chopper control chip. Also check for any shorted diodes on the secondary rail. Any of the above faults all cause the same symptom.

Sony VTXS760

This digibox was dead. On investigation I found that the power supply was running but its outputs were very low and the VIPER50 chopper control chip IC800 was getting very hot. The cause of the problem was the RJ16 snubber diode D800, which was leaky both ways.

Sony VTXS760

This digibox would intermittently return to standby. When it was powered up again I saw that it had rebooted, as it came back on with the Sky home page channel 998. I next found that if the LNB was disconnected the box would stay on. Checks then showed that the LNB voltage fell when the LNB feed was plugged in. In fact all the voltages on the secondary side of the power supply fell, by as much as ten per cent, as soon

as the LNB was connected. The 12V output measured 11. 89V and fell to 10.99V under load.

Cold checks failed to reveal any problem, but I noticed that the box stayed on longer with the lid off. By now it was clear that the fault was a thermal one, and use of freezer soon revealed the cause. A quick puff on the St VIPER50 chopper chip IC800 restored all the voltages to their correct levels. A new IC cured the fault.

Repairing your Remote Control Handset

Remotes do have a limited life, and I personally don't know of many remote controls older than about 8-10 years that are still working perfectly.

You can repair some types of remote control, but once you start taking them apart, you should really be thinking about replacing the remote control before it stops completely. It's a good idea to buy a low-cost limited-function remote to use every day and keep the original safe for those occasions when you need to use the special functions. The buttons which wear out are usually off/on, 1, 2, 3, up, down, forward, backward and volume. A low cost remote with just the basic functions will save wear and tear on your original expensive remote.

If the internal printed circuit board is cracked you can sometimes repair it. If the copper tracks are cracked you can usually solder fine bridging wires across. If the black conductive epoxy tracks are cracked then you can't repair them.

In addition, if somebody has already "had a go" , the remote is probably damaged beyond repair.

Can I repair it myself?

You may be able to. I'll tell you some "trade secrets" and you can decide for yourself. The type that uses a flexible silicone rubber moulded contact keypad is often repairable. This is how you do it ...

You will need the following:
A hair dryer
A small bottle of nail polish remover
Car windscreen de-icer containing Isopropyl Alcohol (Propan-2ol)
A toothbrush
A penknife

Remove batteries and any screws which hold the remote control moulded shells together. If it doesn't come apart easily, there may be moulded clips holding the two shells and/or screws hidden under labels.

Use the hairdryer to get the plastic case as warm as possible. This makes it more flexible. Now twist it in your hands and see where the split line is. You should be able to insert a small penknife blade and gently lift the plastic shell away from the clips. Work carefully around the perimeter with the blade. The battery compartment is often the weakest point if the moulding is very narrow at the corners. Take extra care here or you will break it!

Once the two shells are apart you can see the printed circuit board which contains the components. There are copper tracks insulated with green epoxy resin and, either conductive black resin contacts, or gold-plated contacts. Against the contact side of the board is the silicone rubber keypad moulding. The tips of the buttons contain conductive powder which is designed to connect the board contact pairs together electrically when pressed into contact.

There are four main failure modes:
Cracked copper tracks or cracked conductive resin
Contaminated contacts (coffee etc.)
Worn out button tips (no conductive powder left)
Button stuck down. If the red light at the top of the remote fails to come on when a button is pressed, after replacing the batteries, then check whether one of the buttons is stuck - in particular, the large “backup” button below the green button. If it is, the command will be “on” all the time and the remote control will stop working.

If the copper tracks are cracked it is sometimes possible to scrape the green epoxy coating away and to solder very fine wire to the shiny copper beneath. This is a skilled job. You use a single hair-thick strand from multi-strand flexible wire. A 1mm tip is needed for the soldering iron and 0.4mm solder. If the crack is extensive (more than 2 tracks affected) then the repair is unlikely to be reliable in use.

If the conductive resin is cracked it is usually impossible to carry out a reliable repair, although sometimes a temporary repair can be made with silver-loaded paint. If you get the remote to work like this, immediately use it to program a “learning remote” then store the repaired one away for emergencies only. This is worthwhile only if the original remote is unobtainable or substantially more expensive than the “learning remote”.

Contamination should be washed from the printed circuit board and from the silicone rubber keypad by scrubbing with a toothbrush and a little nail polish remover. This is a mixture of acetone and water. It often contains oil as well. Keep it away from plastic and protect your eyes and clothing. It can also be harmful to the skin so read the warnings on the bottle. Wash it off with de-icer. Dry the parts with the hair dryer to remove all moisture. Do NOT touch the cleaned contacts with your fingers! If the plastic case is contaminated, wash it with warm water and detergent (use an old toothbrush) then dry it thoroughly.

Finally, check the printed circuit board for damaged solder joints and loose connections. A favourite problem is that the little 455kHz resonator breaks. Another is that the invisible-infra-red LED stops working. (We supply both these parts).
If the button tips are worn out (you'll find the most-used buttons still don't work reliably after cleaning) then repair may not be possible. One method that we find successful is to take a strip of aluminium cooking foil. Now, handle it only with tweezers and cut it into tiny pieces. Glue a piece to each button tip with an impact adhesive. Put just a tiny smear of glue on the button tip.

This type of repair can last a year but sometimes it won’t last a day. There’s no way of predicting but it’s worth trying if the alternative is to throw the remote control away!

Finally, although a Sky Digibox is so cheap that it’s not worth bothering to repair it, you may be in a situation where you need it in a hurry and a temporary repair is the only answer.

Reducing Faults

Even if you get no other benefit from the book, this one page is going to save you more than the cover price! Based on personal experience of over three thousand repairs, I am going to tell you the single most important cause of failure of satellite receivers:-

Overheating

That's it! Eliminate overheating and your satellite receiver will last two, three maybe four times as long. In fact you will probably replace it because it is obsolete, rather than any other reason.

Why do satellite receivers suffer from overheating more than other electronic equipment? Well, that's a tricky one to answer but it may be caused by the tuner module inside (the thing you connect the satellite cable to) which gets very hot. In addition, the power supply has to reduce the mains voltage down as low as 5 volts and, in doing so, generates a great deal of heat. Apart from that, satellite receivers tend to be quite small and compact and all that heat, if it can't spread out, just burns up the electronic components inside.

What can you do to safeguard against failure?

- Keep your receiver on a smooth surface so that cool air can go underneath.
- Increase the gap underneath if possible.
- Leave *at least* 75mm air gap above so that warm air can get out.
- Do not put the receiver on or near anything which becomes warm: that includes TVs, Videos, Hi-Fi stacks, fire, sunlight, radiator etc.
- Do not put *anything* on top of the receiver.
- Put the receiver in standby when not in use.
- Do not shut it in a cabinet or on a shelf which is not open front *and back.*

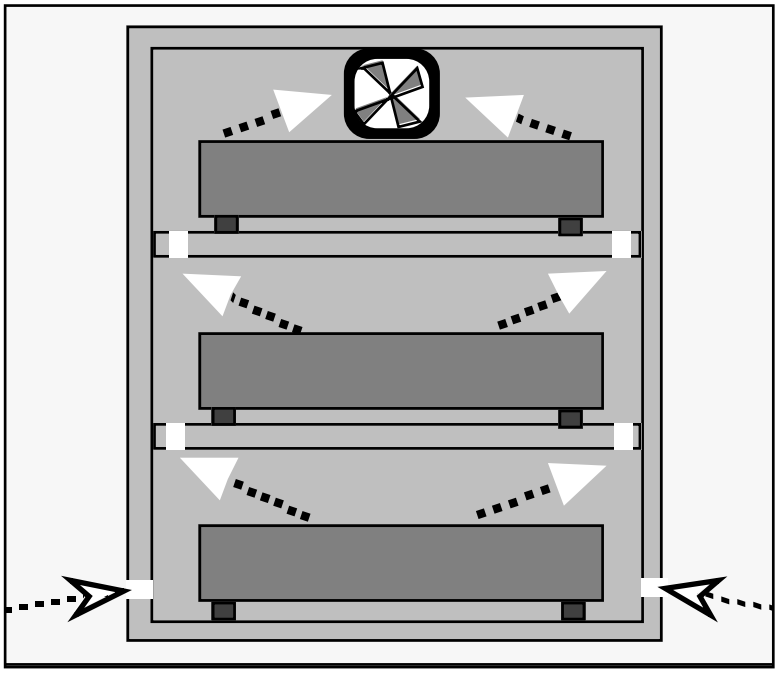
The only exception to the last point is if the cabinet is ventilated by a fan which keeps the internal temperature low. Most so-called Hi-Fi cabinets are killers but you can easily fit a small, quiet fan yourself.

The fan should be fitted near the top to draw air out and all of the internal shelves must have holes which allow the air to flow upwards.

Another cause of failure is: connecting or disconnecting leads from the rear of the satellite receiver while it is still plugged into the mains power supply. *Don't do it!* Switch the mains power off at the wall and remove the plug from the wall socket. Now label all connections and remove them.

Cabinet

Example of a suitable cabinet. The fan drags cold air from floor level.



The warm air inside each unit is pulled away through holes in the shelves. Very little warm air from a lower unit can go through a higher one so each stays cool.

Each unit stands on spacers so that cool air can flow beneath.
(You could screw or glue spacers to each shelf for convenience).

With this arrangement, the cabinet may be enclosed front and rear.

Only one or two tiny fans are needed to produce sufficient air flow. A 40mm diameter fan would be adequate. If the fan makes a noise because the rear of the cabinet resonates then fit it to one of the sides instead.

The bottom holes should be large slots covered with foam to filter out dust and carpet fluff.

Taking Care of equipment

Spillage of liquids into the receiver seems to happen more in pubs than in the home. When it does happen, the result is usually an unrepairable unit. It will *never* work reliably again. Most repair shops will take one look inside and say “sorry!”

Don’t even carry it in rain to your car without first putting it in a plastic bag. Just *one* drop of water inside is enough to destroy it!

If the worst does happen, unplug the receiver from the mains immediately. Put your hair dryer on its warm setting and dry off the moisture as quickly as possible. Most components will tolerate temperatures up to 100°C for a few minutes so the hair dryer should do no damage.

Take the cover off the receiver if possible and continue to dry it for at least twenty minutes to make sure that no moisture remains trapped beneath the components. Leave it for *at least a day* before plugging it into the mains again. With this treatment and a lot of luck it may survive.

Some people like their equipment to look nice. They treat it like the rest of the furniture, spraying it with polish and giving it a good rub. Unfortunately, furniture polish may contain nasty things like water and ammonia.

Not surprisingly, the delicate electronic circuit objects to even tiny droplets of moisture and eventually refuses to work. Besides that, most polish contains a cutting compound; you can see the traces of white powder on the receiver, so the polishing doesn’t even have the desired effect - it makes your nice equipment look dirty!

Well, I’ll give you a tip. In the workshop we polish the equipment with a very cheap polish which every car enthusiast keeps in his garage.
It’s called “WD-40™”.

Normally it is used to loosen screws or chase moisture off car ignition systems. In fact it has exactly the opposite effect to household polish. It even leaves a beautiful shine! One word of caution: it is *not* a good idea

to spray the equipment directly (especially if it is a video player, or any kind of music player with moving parts).

Spray the polishing cloth sparingly and use that to wipe the equipment.

Beware, also, that rubbing generates static electricity which will kill electronic components. Wipe slowly and gently with a *cotton* cloth. Synthetic cloths generate more electricity.

If Your Receiver Goes for service

How to put TV and Video back on line without satellite.

1. Unplug the satellite receiver from the mains.
2. Label each end of every cable!
3. Carefully unscrew the “F” connector at the tuner input socket.
4. Unplug the TV aerial from the “In” socket at the rear of the receiver.
5. Unplug the RF lead from the “Out” socket at the rear of the receiver.
6. Carefully plug together the last two cables (yes, they will fit together).
7. Remove the satellite receiver for repair. Everything will now work normally, minus satellite.

Reverse the process on return of repaired satellite receiver

Remember to re-set the clock / timer if one is incorporated.

There’s no need to re-tune any channels on the TV or Video. Leave well alone!

Your repairman will not normally need the mains lead (if separate), remote control or Sky Card so keep them safely at home *unless* you suspect a fault on the actual item, in which case make sure these extra items are listed on your sheet and labelled with your name.

Do *not* remove the mains plug from the cable unless it is impossible to fit the unit into its original packing with the plug fitted. Make sure that the plug can not damage the receiver no matter how hard the carrier might drop the box. (Although most workshops have quick-connect mains power units, removal of the plug could delay initial test.)

Always make a note of your Sky Card number to prevent accidental swapping of cards.

Put a photocopy of your Invoice with a copy of your fault report.

Now go into the loft and find the original packing for your satellite receiver.

Reducing Repair Cost

There are many ways in which you can reduce the cost of repairs but you may be surprised by the one that I put at the top of the list!

Writing down the Symptoms

It never ceases to amaze me that almost *nobody* is capable of writing down the fault symptoms. People seem frightened to commit the information to paper in case it is used against them as evidence! You will understand that if the description of the fault symptoms is incorrect then the repairman will have little chance of repairing the receiver quickly.

For example, would you drive your car to a garage and complain that "it won't go"? No? I'm not surprised – you'd obviously be lying. Yet hundreds of people send their receivers for repair with the explanation "DEAD". Would you expect that a dead receiver would show lights on the front panel or give a picture? Well, at least half of them do!

In fact many of them work for days without showing any sign of a fault. Maybe a wire came loose at the back and the customer didn't check. Maybe something connected to the receiver (the LNB, for instance) is faulty but the customer didn't check. It is imperative to test the receiver on another known-good dish system to ensure that it really is faulty - otherwise you could waste a lot of your time and money in sending a perfectly good receiver for repair! And the repair shop will almost certainly *charge* you for the workshop time - time needed to unpack, set up, test and repack your receiver.

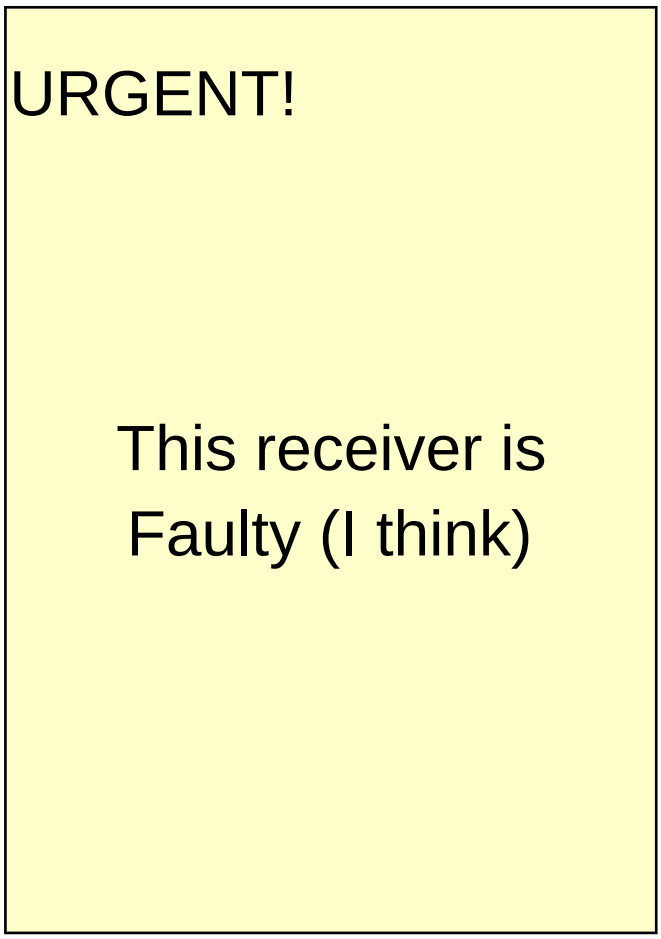
Then there is the truly faulty receiver which has the wrong symptom written down: "No pictures". The repairman leaves this on the test bench for three hours with a perfect picture on every channel. He keeps the TV volume down because he is concentrating on other repairs. Only later does he notice that there is no sound. Maybe the customer was confused. Maybe the shop got the fault report mixed up with one from another receiver. Whatever the reason, the repair is delayed and the customer gets a larger bill.

Most symptom reports are very brief and cryptic: “Goes on / off” is a typical one. What goes on / off? The picture, the sound, the front panel lights? How often does it happen? Can you imagine how frustrated the repairman becomes as he tests the receiver for the various possibilities? And supposing that the fault occurs only after three hours; do you suppose that the receiver will still be on the repair bench? No! It will be on the collection shelf with “NO FAULT FOUND” and an invoice for workshop test time.

YOU can do better than that!

Just *imagine* that you are the poor underpaid repairman:

It’s Friday. You’ve had a hard day and you are looking at the last receiver of the day. You want to get home for a meal and you are determined that this repair will be done in ten minutes or left till next week. The helpful information on the sheet says:



(Now, do you feel like testing this or leaving it till next week?)

How to Write Your Fault Report

Many faults occur because of mains borne interference. Unplugging the receiver allows the microprocessor chip to reset itself and might cure the fault forever. Alternatively, unplugging for a while may cure a problem caused by heat, although not permanently.

Before writing the fault report, you must carry out a few tests.

Can you still switch on the menu from the receiver and when it is on the screen can you hear audio? Do you get picture / audio from SCART and RF outputs? Write down the answers.

Unplug the receiver from the mains. Wait five minutes. Plug it back in. Now does it work properly? If so, for how long does it work before the fault occurs again? Try unplugging it for an *hour* then try again. Make a written note of your tests and results.

If it shows no sign of receiving mains power then check the fuse in the plug (replace it with the same type if you can't measure it). Check the fuse in the back of the receiver, if fitted. A fuse may melt because of a mains surge. However - *seek advice* before replacing an internal fuse!

There may be one or more internal fuses. You may replace these with the *exact same types* (read the markings on the metal end caps) but a melted internal fuse usually occurs because of a serious fault. *Replacing it could cause further damage when mains is applied.* Write down your findings.

If the fault is more subtle then carry out more tests:

A common problem is a loose plug on the LNB cable which short circuits the tuner input. The tuner feeds 13 volts or 17 volts to the LNB in order to supply it with power and to tell it whether Horizontal channels (17v) or Vertical channels (13v) are required.

So a short circuit in the "F" connector, cable or LNB will result in either a burned protection resistor in the receiver, or some other component burnt out (you might be able to smell it) or else the receiver has a clever design which detects the short circuit and simply shuts down that part

of the power supply or, perhaps, switches itself repeatedly off and on, waiting for the fault to disappear.

If this is the case, simply unplugging the LNB cable will remove the fault symptom (although you will now get no picture, of course).

To summarise, you should write all the information on a sheet and attach the sheet to the receiver so that it is difficult to remove. Make a copy to give to the dealer, separately, and keep a third copy for your own reference.

Your report should include, as a minimum:

• Your name, address and day time telephone number.

• A description of your receiver (Make, Model and Serial Number).

• A list of any accessories which you have included.

• Description (make and model) of equipment normally connected to your unit and type of connection (RF lead or SCART).

• Time of day, date, weather, temperature etc. when you first noticed a fault. Did it start gradually or did it happen suddenly?

• Description of *what you saw and what you heard* – on the TV screen and on the receiver front panel. Use plain English, not technical terms or words that only a doctor / architect / would use. Avoid ambiguity (and don't use words which have more than one meaning, either!)

• Say if the fault is intermittent or happens only when the unit is hot or cold. (If you don't know, try it! The repair man may charge £35 per hour for doing these tests).

• List which channels are affected and which are not. Have you actually tried *every* channel? Perhaps it is only Horizontally polarised channels which are affected. Perhaps only "low band" channels?

• Description of any tests you carried out and the results.

• Have you tried a friend's receiver in place of yours, or connected your receiver to his LNB cable? *Why not?* If you can borrow identical equipment, carry out some swap tests (but make sure there is no short-circuit on your cable before connecting a friend's receiver to it!)

• Description of what you want the repair man to do, for instance:

(1) repair under warranty. You must enclose a copy of the Invoice.
Do not send the original – you may need it again, later. If the unit is exchanged for a different one, be sure to ask for the *new* serial number to be put on the Invoice as this maintains proof of purchase.

(2) estimate cost of repair (not always possible. If the receiver is completely dead, it could be a 10p fuse or expensive damage may have occurred – there is no way to tell) or

(3) go ahead and repair regardless of cost.
Stipulating a ceiling price is sometimes useful but, if the cost of repair can not be estimated in the first place, a low ceiling price can result in an "unrepairable" decision on a unit which might actually be repairable at a reasonable price.

(4) What to do with the unit when the repair is complete (keep it for collection, despatch it to your home or whatever?) If you don't mention this, your receiver could stay on the collection shelf for months. Don't rely on anyone to telephone you. Most repair shops will try once but give up if the number is engaged or they get no answer at the first attempt. They often don't have the time. Some use *only* e-mail.

Don't be afraid to write an essay.

You simply can not write too much information!
Regarding the description of the symptoms (I know I keep coming back to this but the object is to save your time and money):

Suppose your complaint is slight interference on the picture on certain channels. You have written a list of affected channels, when, how often etc. but you can't describe what you see on the screen. Try to answer the following questions:

Is the interference faint or quite strong or does it obliterate the picture completely? Does it consist of lines or dots? How many and how far apart? What colour? Do the lines go down the screen, across or diagonally? Do they appear to move or are they fixed?

Draw a sketch of what you see. Make a video recording, if you can, and put that with the unit (labelled with your name and address if you want it back!)

You would be amazed how many times I have seen lines across the picture described as “decoder fault” or “won’t unscramble”. This description is useless since the interference probably has nothing to do with the internal decoder.

Restrict your description to what you observe with your eyes and ears. Don’t try to guess the cause.

Please *don’t* use the word “faulty” in any description. This word is entirely superfluous; if the unit is *not* faulty, why would you have sent it for repair? Always describe the symptoms. If you take Johnny to the doctor and say “Johnny’s got Chicken Pox” and the doctor replies “No, it’s Heat Rash” you feel a fool. If you say “Johnny’s got red spots on his tummy” you can’t be wrong. *Leave the diagnosis to the expert!*

Most people seemingly can’t be bothered to write a sensible description of the symptoms so they write silly comments like “faulty tuner” or “faulty handset” instead of describing what they experience.

In most cases they have not bothered to try another handset and they certainly have no way of knowing that the tuner module is at fault.
If the fault is intermittent and the receiver works perfectly on the test bench (very common) then this sort of description gives the repair man absolutely no clue as to the nature of the fault.

If you describe what you actually *saw or heard* (or even smelt!) then he will have a much better clue on which to work.

Finally, if you are not absolutely certain of the technical description of an item, *don’t use a technical term*. There is nothing wrong with calling

something “the silver thing at the back with the screw thread” or “the thing that the round TV plug with the pin in the middle plugs into”.

Ignorance of a technical term is not a crime and nothing to be ashamed of but if, for instance, you refer to a “tuner connection” when you mean a “modulator socket” then you might double your repair bill by confusing the repair man.

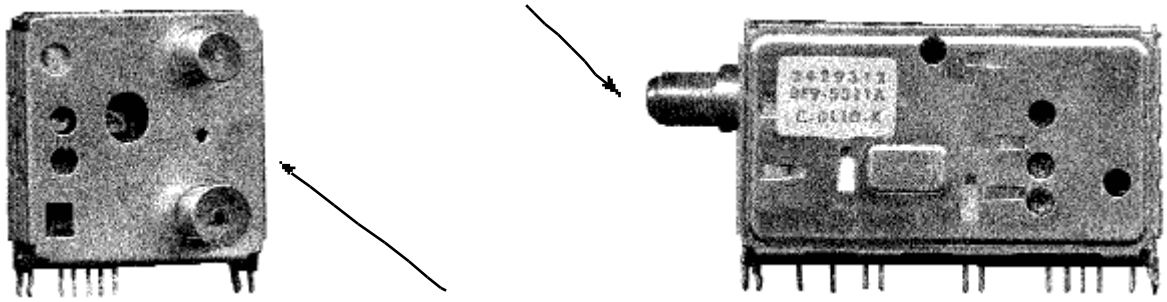
> Ignorance of technical terms is not a crime!
> Don't use them unless you understand what they mean.

Don't use technical terms unless you are absolutely sure that you know what they mean (and *don't* diagnose the fault!)

One unfortunate customer paid into the bargain when he reported his fault symptom as “tuner fault”. The apprentice technician in the workshop took his word as gospel and replaced the tuner. Then he fitted a new fuse (the actual problem). The customer received rather a large bill, and it wasn’t for the 10p fuse!

Simply describe what you observe. In this case, the customer probably observed that the picture disappeared leaving a blue screen. *A pity that wasn’t what he wrote.*

“The silver thing at the back with the screw thread”



“The thing that the round TV plug with the pin in the middle plugs into”

Packing and insuring

Electronic equipment should be protected in transit by putting it in the original manufacturer's packing box then wrapping that with two layers of corrugated cardboard and taping it. That is the *minimum* for safe handling. As a general rule, the unit should sit in polystyrene foam packing which has a thickness of 10mm for every kilogram of weight.

So a 3kg receiver will sit in the centre of a cardboard box with 30mm of polystyrene around each corner. This box will be protected by more cardboard around it. The polystyrene I refer to is called "expanded polystyrene" and comprises small, white spheres of soft polystyrene compressed together. If you use any other packing material then double the thickness given above. Rolled-up newspaper is no substitute for the correct packing.

I know a repair shop which received a satellite receiver that was wrapped in a plastic carrier bag with postage stamps taped to it! The receiver was wrecked; it was a kit of parts. The customer was upset. The repair man was embarrassed.

Even if you are taking the unit to your local shop for repair, I would advise packing it or at least putting it in the original box. It is likely that the shop will have to send it away for repair and they will definitely not stock packing for every make of receiver on the market! Consequently, they might pack it badly and, even if it is insured, you will suffer delays and inconvenience.

If you have to send the unit away for repair you can use either a national carrier or the post office. Make absolutely certain that the unit is insured against loss or damage. If you can easily drive to the place of repair then do that instead.

You should check with your repair shop but, in general, do not include the remote control handset, instructions or accessories unless they are faulty. Any repair shop which does a reasonable number of repairs will have the appropriate equipment for common models.

If your model is a few years old or if you know that it is not a common model then *do* provide any accessories that might be needed. If you take

it rather than send it, carry the handset and instructions with you but don't leave them unless required. Such items are easily lost and it can take a long time to re-order them. In addition, such losses invariably cause bad feeling and increase the cost. Label them with your name!

Do *not* remove the mains plug from the cable unless it is impossible to fit the unit into its original packing with the plug fitted. Make sure that the plug can not damage the receiver no matter how hard the carrier might drop the box. Push the pins through several layers of cardboard.

Always put your address label on every item.

Note: Many repair shops require you to telephone them to obtain a "Returns Authorisation Number" before you return any goods. The number helps them to keep track of equipment and is usually entered in a computer system, linked with your name (or the name of the shop where you bought it) and the serial number.

Equipment without an R.A. Number might be shipped straight back to you, unopened, with a bill for carriage so do check on the procedure before shipping any item for repair.

Take advantage of the telephone call to ask if the repairers can arrange for collection. They can frequently arrange for a carrier to pick up the goods for less than you would pay the Post Office! Ask what accessories must be sent with the equipment.

If the equipment is under guarantee then you just *might* be able to get a free collection. Don't be afraid to ask.

Remember that both collection and delivery require somebody to be at home to sign the forms when the carrier arrives. If nobody will be at home, make sure that a neighbour is available to accept delivery and that the carrier company knows the alternative address.

Where to take it for repair

If the unit is still under warranty then you *must* take or send it to the place where you bought it. If the unit was supplied by an independent installer then you *might* persuade him to collect it (but you have no right to demand such a service unless you have a written contract which states so as part of your guarantee). If you need to go direct to his supplier you must ask him for the reference number and date of *his* invoice from that supplier.

If the unit is no longer in warranty then you are likely to get the best repair service from the manufacturers (although not necessarily the cheapest). If they do not carry out repairs they will probably be able to recommend a company which can. Bear in mind that satellite receivers use some special parts which will not be stocked by the average TV and Video repair shop. If you go to a satellite repairer he is more likely to have the parts, thus reducing the repair time substantially.

Repair it yourself

If the fault is not too serious, you may be able to repair it yourself. However, I do not want to encourage you to attempt such a repair if you have no experience of electronic equipment. The best advice I can give you is to ask your local electronics expert to carry out the repair.

Even then, you must ensure that your friend understands what he is doing. A “cowboy” repairer could bodge the repair so badly that nobody would be able to repair it. If you are at all unsure, please have it repaired professionally and pay the price, safe in the knowledge that the unit will come back in working order.

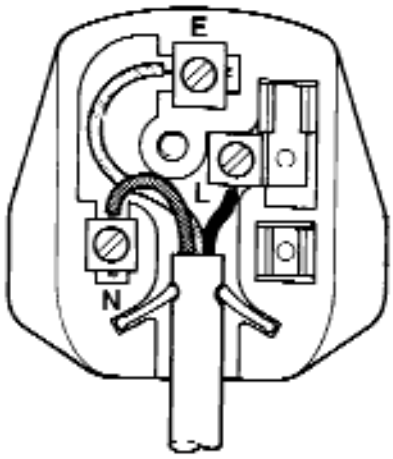
Provided that you have *some* electronics knowledge you might like to investigate further. In some cases you will recognise the description of the symptom. It may be so simple that you can cure it without removing the screws! *Some faults can be cured by pressing handset buttons.*

Mains Plugs in the U.K.

No book about satellite receivers could be complete without a mention of mains plugs and I make no apology for including this section.

Mains plugs have been responsible for many, many receiver faults and have also contributed to death and injury.

Some years ago, a friend was drilling a hole in his kitchen wall when the metal casing of his old power drill became “live”. The shock he received caused his muscles to contract and he fell from the metal step ladder, still clutching the whirring drill.



The continuing shock made him dance like a puppet, leaving a trail of gouges around the kitchen, until finally he managed to kick the switch on the plug socket. It transpired that the earth wire inside the plug had come loose and touched the live pin, thus passing the live mains through the “earth” wire to the drill body.

You may laugh at this little anecdote because my friend survived, but the story serves to illustrate the importance of correct and secure mains plug wiring. So, even if you *think* you know how to wire a plug, please read on. There's certain to be *something* here that you didn't know!

Your choice of plug is very important from the point of view of safety and ease of fitting. There are several cheap plugs on the market which are at best fiddly to assemble and, at worst, downright dangerous. The plugs which have been approved as safely designed and manufactured now carry the designation BS1363 (or BS1363A for the type which will withstand knocks), so avoid those which do not.

Don’t be ashamed to take a plug apart in the shop to inspect it. Ask to borrow a screwdriver, if necessary, and tell the shopkeeper where to put his plug if he is unhelpful. (However, if he is serving someone who is buying a £500 electrical gizmo, be patient and wait a couple of minutes). The features to look for in a plug are as follows:

1. Fuse clips which are rivetted or welded securely to the other metal parts. Beware flimsy rivets and screws which can work loose and cause serious overheating. Fuse clips which are silver plated will be more reliable than those which are not.

2. Cable sheath clamp which will hold the cable firmly. The best ones use a springy plastic flap which bites into the cable sheath and prevents it from pulling out. The worst are those with a thin fibre bridge held with two screws. Bridges moulded from plastic with tubular ends for the screws are good but fiddly; they are often reversible – to cater for thick or thin cable. Be sure to fit them correctly.

3 A captive cover screw. While this feature is not essential, it saves much scrabbling on the floor!

4 Correct value fuse. Sometimes the shop will swap the fuse for a more suitable value. (Sometimes they will offer to sell you a pack of ten).

Fitting the Plug

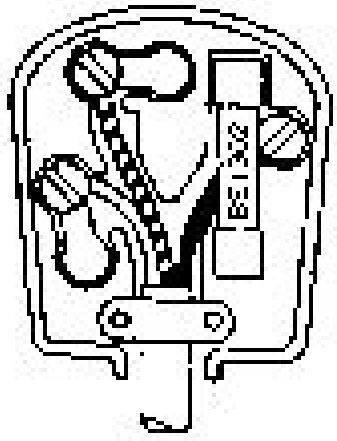
Tip: Do not remove the mains plug when sending for repair or you could delay the repair.

Use a knife to remove about 40mm of sheath from the end of the cable. Do not saw with the blade but bend the cable over your finger so that when you touch it with the blade the stretched sheath splits. Continue the split around the circumference by turning and bending the sheath while touching it with the blade. Avoid nicking the individual coloured wires, or your own pinkies!

Once the end portion of sheath is removed, fit the cable into the plug, securing the remaining sheath with the clamp. Allow 10mm extra for connection and cut the brown and blue wires to reach the Live and Neutral terminals, respectively.

Any green-yellow wire should be cut with at least 25mm to spare.

Use pliers or wire strippers to remove 10mm of insulation from the end of each wire. (You may need to remove the cable from the plug while you do this).
The strands of each wire should be twisted tightly and doubled over to fit into those brass pins with a hole and clamp screw or else hooked clockwise around terminals which use a screw and clamping washer.



The green-yellow earth wire (if present) is deliberately left long so that, if someone should trip on the cable or tug at it in such a way as to pull the sheath out of the clamp, the safety earth will always be the *last* wire to be disconnected, thus ensuring that the appliance is earthed while there is a possibility of its becoming “live”.

Ensure that no loose strands of wire are left, fit the fuse and replace the cover.

Since many appliances are “double insulated” you will find that only two core cable is used, with no green-yellow. Wiring the plug is simpler but do still make sure that the brown wire goes to the live pin via the fuse and the blue wire goes to the neutral pin. Since the cable will be thinner than three-wire cable, be sure to check that the clamp is tight and holds the sheath firmly.

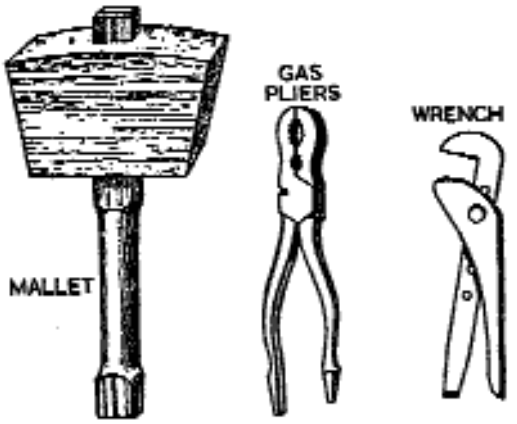
Britain (and parts of Ireland) is the only country in the world which uses mains plugs fitted with a fuse. Other countries rely on the fuses at the main fuse-box or, sometimes, on a fuse in the socket. The fuse in the mains plug, therefore, while not being absolutely essential, does give an added degree of protection from the risk of fire. If the appliance itself has a fuse then the fuse in the plug will prevent the mains lead from catching fire in the event of a short circuit in the lead. It is also a useful backup in case the appliance fuse does not melt quickly when a fault occurs. Fuses for use in mains plugs are manufactured to a British Standard BS1362 which should *always* be printed on the fuse cartridge.

Some appliances are now fitted with moulded plugs. The fuse is accessible for replacement but the wires are not. You should not remove this plug unless it is essential to do so. If you do need to remove the plug, take it out of the mains socket and cut the cable as close to the plug as possible. Remove the fuseholder and fuse. Destroy the fuseholder clip and dispose of the plug so that no child might plug it into a mains socket and receive an electric shock.

Tip: Don't send your receiver for repair with a "foreign" mains plug. It could delay the repair and you could be charged for the fitting of the correct plug for the country of repair!

Basic Tools

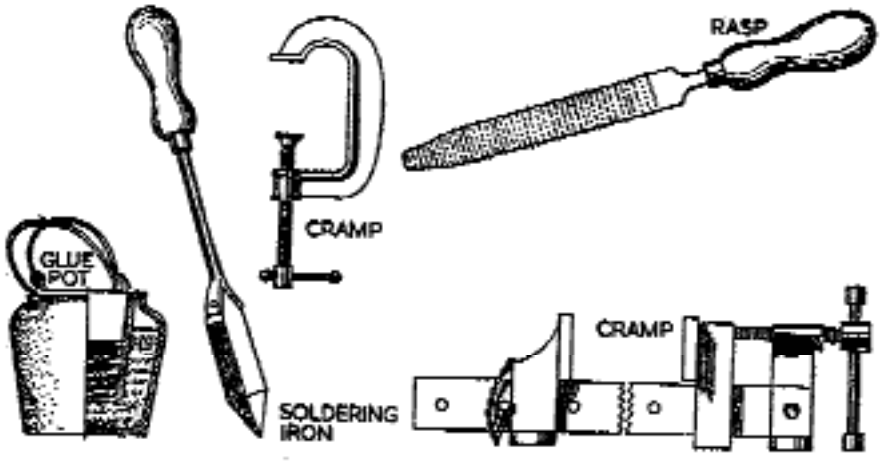
Here are some of the tools which are commonly used for satellite receiver repair.



The heavy mallet is ideal for bending the wires of components after insertion in the holes.

Gas pliers can be used to remove components without the need to de-solder.

Use a wrench to undo stubborn tuner nuts, when a spanner is unavailable, and a rasp to smooth the threads.



A heavy duty soldering iron is ideal for use with surface mount components.

(Get it nice and hot over a gas burner).

A variety of cramps will be needed to secure the board during hammering and soldering operations.

Finally, no tool kit would be complete without a glue pot. Absolutely indispensable for fixing those lifted copper pads and tracks after somebody else messed it up!

No, I'm not serious, but some people do actually appear to use these tools when attempting repairs!

The Proper Tools

Before you embark upon any repair or modification work you should have an understanding of the basic use of tools used in electronics.

You really can not do better than to take an electronics course at college, if only to get accustomed to using the tools and terminology used in electronics.

DANGER!

Once you remove the cover screws on a satellite receiver you expose yourself to a real danger of electric shock or burns. The intention of this section is to make you aware of some of the methods by which receivers can be repaired and modified and, while you might be encouraged to "have a go" yourself, please consider the risks involved – not only to yourself but to others if you are doing a "favour" for a friend.

Inside the receiver is a section which carries mains voltages. That is the good news. In a receiver which uses a "switch mode power supply" there are even higher voltages present. This power supply is extremely dangerous. Keep your fingers and tools away from it! You will find that it is almost always marked with a warning notice or symbol.

You are recommended to take the receiver to a time-served repair engineer if you are in any doubt at all.

First, you need a set of basic tools. You are definitely *not* going to be successful if you use hedge cutters for cutting wires and a poker for soldering!

SatCure can supply some tools such as soldering iron and cutters, multimeters and soldering kit. Please ask if you need other tools

Screwdrivers

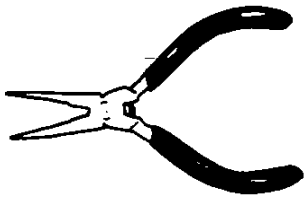
The most common screwdriver is the flat-blade one used for slot-head screws. People don't seem to realise, however, that this comes in different sizes. Use the one which fits the slot exactly. The blade should be square-ended – NOT sharpened to a chisel point or rounded off because you tried to use it on a cross-head screw!

Cross-head screwdrivers come in two different types and several sizes. One type is called "Phillips" and the other is called "Pozidriv™". If you use the wrong one it will slip and damage the slots. The two most useful sizes are #1 and #2, although you might also need #0 for very small screws.

An unusual type of screwdriver is needed for receivers manufactured by Nokia. It is called a "Torx" driver and has a star shaped end. It is almost impossible to remove Torx head screws with anything other than the correct size Torx driver. The most useful size is a number 10 but some receivers used a number 8 or 9.

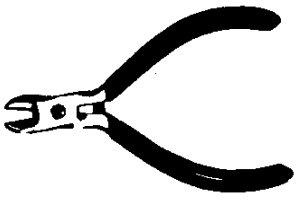
Pliers

Pliers come in all shapes and sizes. For handling electronic components you will need a very small pair of needle-nosed pliers. A larger pair of snub-nosed pliers will be useful for holding a nut while you tighten the screw.



Cutters

One of the tools most people think they can do without – until complaints arise from your spouse regarding misuse of the kitchen scissors! For cutting leads on components you need very small cutters. However, DO NOT use these for cutting thick cable or fence wire.



Soldering Iron

You can buy a very low-cost soldering iron which will be satisfactory if you seldom use it. Such irons usually take a long time to reach the usable temperature and lose their heat rapidly when used to heat up anything other than the smallest solder joint.

A better choice is a high wattage, thermostatically-controlled iron. The one which I have used for twenty years is rated at 45 Watts and I use a number 8 tip which keeps the temperature above 400°C. The tip is iron-coated and lasts a long time. (Iron-coated tips must not be cleaned with anything other than a damp sponge or the iron will peel off and the tip will be useless). The tip size you choose should be tiny – about 1mm.

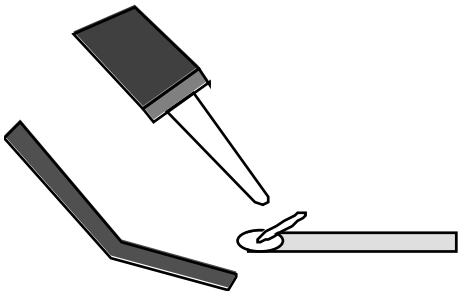
Solder

You need fine solder of 0.7mm diameter *or less* for soldering modern electronic components. The solder should contain cores of flux.
The percentage of flux will be marked on the solder bobbin. You will see that the solder is a mix of tin and lead in 60/40 proportion and the flux percentage should be about 5%. A higher percentage might make soldering a little easier but leaves a residue on the printed circuit board which looks messy and makes it difficult to inspect your work. A lower percentage may be acceptable and leaves virtually no visible residue but is not recommended for a beginner. (I use 2.2% rosin cored flux class 5A, grade KP, 0.7mm diameter 60/40 tin/lead solder from Maplin).

The reason for having flux is that it melts and flows over the metal which you are soldering. In doing so it excludes air and prevents the metal from oxidising (which would make it impossible for the solder to stick to the metal). Flux also has a slightly acidic action and dissolves any oxidation which is already present.

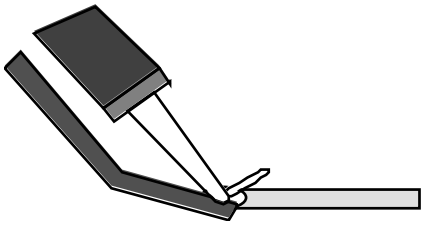
The most common flux is a resin called “rosin” which comes from trees. However, a number of synthetically manufactured fluxes (such as X32 made by Multicore) are also used. These fluxes leave either less residue or a clear residue, which makes inspection of the solder joint easier and may result in a more reliable circuit, since flux is known to cause problems if left on the board. However, your eventual choice may be influenced by the *smell* of the flux and its action on your nose and eyes!

Soldering



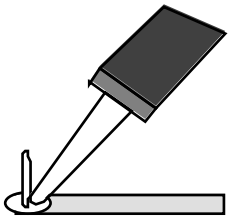
To remove a suspect or faulty component from a printed circuit board is easy – once you know how!

Many people swear by pump-action solder-suckers. These are like miniature bicycle pumps with an internal spring. You prime the sucker by pushing the plunger down until it locks. Pressing a button releases the spring-loaded plunger and it sucks up anything close to its nozzle. Great for zits! Not so great for printed circuits.



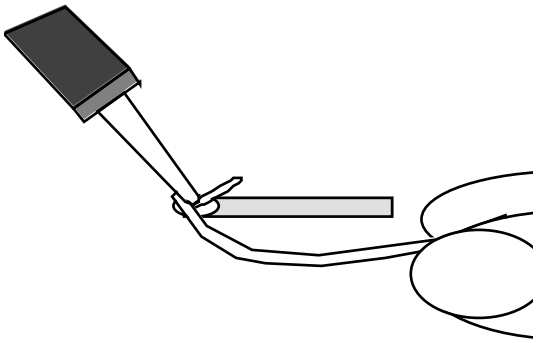
The usual effect is that it sucks the copper pad right off the board, leaving you with nothing to solder the new component lead to.

By far the best method is to use a product which goes under various names such as “Solder wick” or “Desoldering braid”.



This is very fine braid – like the screening braid found inside coaxial cable. The difference is that it is impregnated with flux.
Simply place the braid on top of the solder joint and press the tip of the iron onto it. When the braid is hot it will melt the solder which will be drawn up the braid by capillary action, aided by the flux.

Sometimes you will need to “prime” the braid by melting a spot of solder into it – called “tinning” – just to get it started.



When the solder is gone, use the tip of the iron to heat the component lead and push it upright so that it can be removed easily from the hole.

In the case of “plated through holes”, where the copper goes all the way

through the circuit board, you must make sure that ALL of the solder has come out of the hole.
If it hasn't, resolder the joint with fresh solder then use the desoldering braid again.

Repeat this process for every lead or leg of the component then lift it out of the holes.

To solder a new component in, bend the leads (if necessary) to match the hole centres. Push the leads through the board, taking care not to lift the copper pads off the board. Bend each lead in the direction of the copper track, making sure that the component is flat on the board (unless the original was spaced higher to dissipate heat). Hold the end of the solder on the copper pad and press the tip of the iron onto the solder. Rotate the tip left and right while pressing and feed more solder in as it melts.

Amateurs tend to put too much solder on the joint (and everywhere else, too!) and leave nasty big stains of flux so they can't see the track breaks which they have left.

A common mistake of the amateur is to melt the solder on to the tip of the iron then carry it to the joint.

Common Soldering Problems

It is easy for an expert to tell when an amateur has attempted a repair!

Broken copper pads and tracks are common. Amateurs tend to put too much solder on the joint (and everywhere else, too!) and leave nasty big stains of flux so they can't see the track breaks which they have left.

The solder joint should have a bright, shiny appearance and the component lead should stick out of it and not be submerged. The solder meniscus around the lead should be concave (curved inward) like a volcano. It should *not* look like a ball. If it does, then the solder has probably not made a good connection to the component lead.

Components should sit flat against the board, or be pushed down as far as they will go. Otherwise, when you touch them, the copper pads to which they are soldered will snap away from their copper tracks to leave an open circuit or an intermittent (on / off)

connection. Even if you do not touch the badly mounted component, there is every possibility that vibration or a knock will cause it to move and damage the copper track. The only exception is that a component which may run hot, either normally or under fault conditions, may be required to be spaced away from the board. In such a case, the component legs should be kinked to hold it in place or heat-resistant sleeves or beads should be fitted to the leads. Always copy the mounting method of the original component.

When you bend a component wire underneath the board it should always lie along the attached copper track, if possible – never away from the track. This position ensures that, if you need to desolder it, the copper pad will not be damaged.

A common mistake of the amateur is to melt the solder on to the tip of the iron then carry it to the joint. The problem is that the flux has evaporated by the time the solder gets there so a bad joint is inevitable.

Always put the iron tip onto the component lead and copper pad then apply the solder to the opposite side of the pad, forcing the solder on to the component wire and around the copper pad.

Feed in just enough additional solder to encircle the joint then take the tip away immediately. Hold the component still for a few seconds until the solder has solidified.

Movement of the component lead while the solder is still molten will cause a “dry” joint. The solder will be greyish rather than shiny silver and the connection may be no good. If this should happen, remove the solder with braid and re-solder the joint, carefully.

The problem is that, by the time the solder carried on the tip is applied to the joint, the flux has evaporated and a bad joint will result.

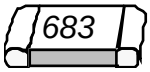
When you bend a component wire underneath the board it should always lie along the attached copper track.

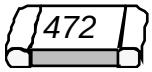
Movement of the component lead while the solder is still molten will cause a “dry” joint.

Always press the iron tip against the component lead and the copper pad then apply the solder to the opposite side of the pad.

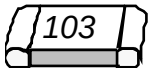
Surface Mount Components

Here is a brief summary of the components you will see. The most common component is the resistor. Made by depositing a film of conductive material on a little chip of ceramic, the resistor has tinned ends and the value printed on one surface in ordinary numerals. The first two digits represent the numerical resistance value and the third digit gives the number of noughts to be added.

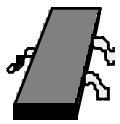




The left hand example, above, is 68000 Ohms or 68k while the right hand one is 4700 or 4k7. There is no way to determine the tolerance or the Wattage. The uncoated part of the ceramic body is usually white.



The resistor shown on the left is 10k. On the right is a capacitor. These have no markings so the only way to determine the value is to measure. Capacitors are usually uniformly coloured brown, grey or green. Unlike the resistor, the capacitor has no coating on the surface. If you break one in half and examine it under a magnifying glass you will see that it is constructed like a multi-layer sandwich. Layers of metal (silver or lead) are separated by layers of insulating ceramic. Odd layers of metal are connected to one end and even layers to the other.



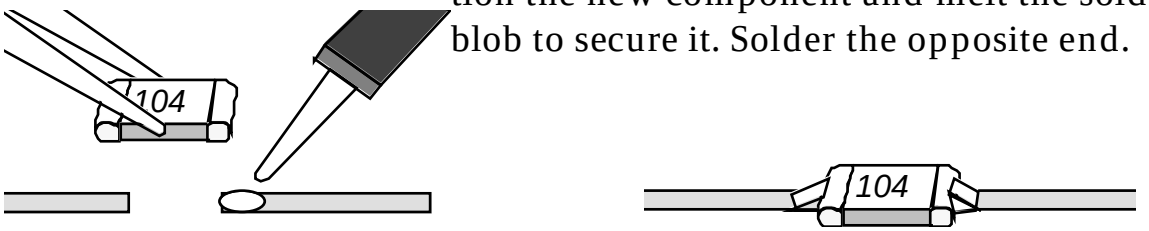
Transistors and diodes are usually found in the SOT23 type package which is small and fiddly to handle, even with tweezers. To add to the difficulty, the legs are usually made of tinned iron which is attracted to metal tweezers if these become magnetised.

The device is too small to accommodate the part number so the manufacturer prints his own code on the top surface — usually a single letter and a number only.

In the case of a diode, the middle leg is usually the cathode (striped on conventional diodes) and the other two legs are both connected to the anode. In the case of a transistor the middle leg is the collector, top right (in the picture) is the emitter and bottom right is the base.

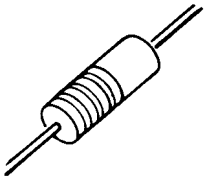
The end terminations of resistors and capacitors are very delicate. Most manufacturers recommend a maximum cumulative soldering time of 5 seconds. When you come to remove one from a PCB, remember that 3 seconds were used up to put it there in the first place! Don't expect to remove one of these devices and to re-use it. Always fit a new one.

Remove the existing component by applying the soldering iron tip to each end alternately, several times in quick succession, and flicking the component away. This is not always easy because the component is often glued to the board. Get rid of the solder from the copper pads by using desoldering braid. Blob a tiny amount of new solder on the right hand pad (or left if you are left handed). With a pair of tweezers, position the new component and melt the solder blob to secure it. Solder the opposite end.

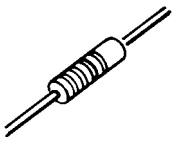


Use a 1.6mm tip (or smaller) and 26 gauge solder (0.5mm). Thicker solder or tips give enormous problems. Do the soldering as quickly as possible to avoid separating the end contact from the component. Don't worry about what the solder joint looks like. The strength of joint is unimportant.

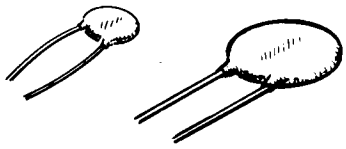
Recognising Components

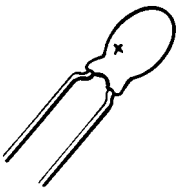


Resistors come in various sizes but usually look like the illustrations, with three or more coloured bands to indicate the resistance value and tolerance (accuracy %).

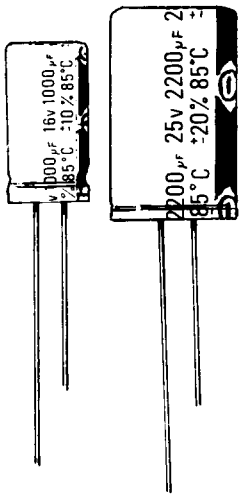


Capacitors come in all shapes and sizes. One of the most common is the ceramic disc.



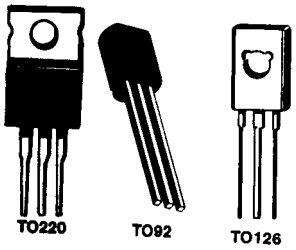


Some capacitors may be fitted only one way round. This Tantalum Bead capacitor has its positive lead marked.

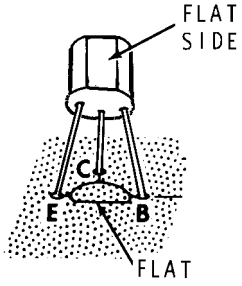


Electrolytic capacitors usually have the negative lead marked. The ones on the right are called “Radial lead” electrolytics. The one below is an “Axial lead” electrolytic. The negative end is designated by a stripe.

Transistors may be recognised by their black bodies and three legs – a bit like my mother-in-law!



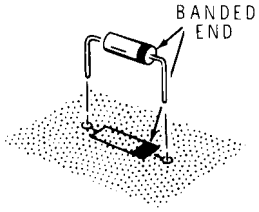
The sketch shows three common types: The TO92 type is a low-power device and you will see lots of these everywhere. The TO220 is designed to cope with fairly high power and is often bolted to a piece of metal which helps to keep it cool (a “heat sink”).



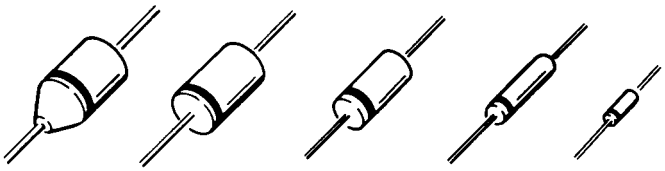
It is important to fit transistors the right way round. the three legs have names – Emitter, Base and Collector. The Collector is usually the middle leg on Japanese transistors but, with European made ones, the centre leg is often the Base. Amstrad receivers use some transistors where the middle leg is the Emitter so you

must replace a transistor with an identical type.
This trimming potentiometer is a variable resistor. Its slider can be rotated to alter its resistance. NEVER adjust a trimmer without:-

1. marking its original position and
2. understanding its function.

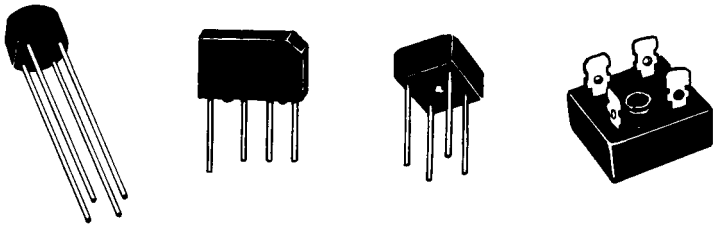


Diodes almost always have one end marked with a band. This end is called the “cathode”. The diode will pass current only when this end is more negative than the “anode” end, so it is important to fit diodes the correct way round.

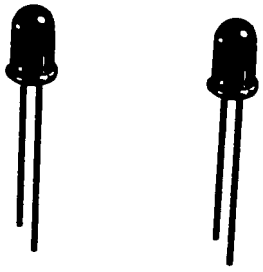


Higher power diodes are called “rectifier diodes” and are usually found in power supplies where they convert alternating current from the mains into direct current (D.C.) which the circuitry needs.

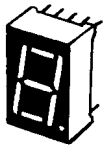
Another type of diode which looks identical is the Zener diode. This is used to prevent a voltage in the circuit from rising higher than a particular value. The value is often marked on the diode. For instance a BYX88C5V6 is a zener diode which works at 5.6 volts.



You will often see “bridge rectifiers” in power supply circuits. The “**bridge rectifier**” is simply a convenient way to house four rectifier diodes all connected together.

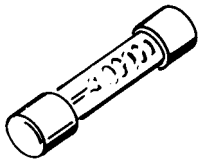


Although they do not look much like ordinary diodes, these **Light Emitting Diodes (LEDs)** work in much the same way and must be connected the right way round. In this case, the “cathode” can be seen inside the LED as an anvil shaped wire.



The seven-segment displays used to indicate the channel number often contain LEDs.

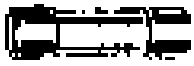
Hopefully, you can recognise a fuse!



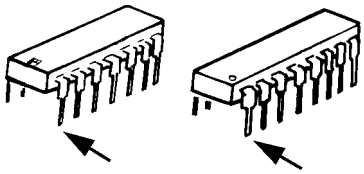
What you may not recognise is that there are several different **types of fuse**. The fuse rating is marked on the end cap or, in the form of coloured bands, around the body.

A fuse marked “T1A” is a one amp fuse with a Time-delay action.
A fuse marked “F1A” is a one amp fuse with a Fast action.

You must not substitute one for the other!



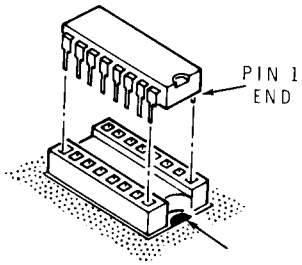
Always replace a fuse with one of an identical rating and type.
The rating should be marked next to the fuse holder (this is a safety requirement which most manufacturers observe) so there should never be a problem in determining what fuse to buy.

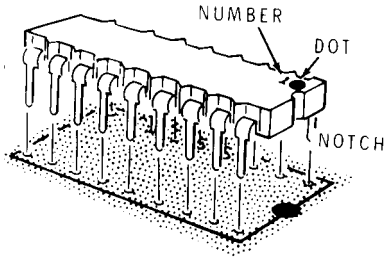


An Integrated Circuit (I.C.) can have any number of pins. Pin 1 is indicated by various methods – usually by a dot or notch near it.

The pins are counted anti-clockwise from pin 1.

The printed circuit board is marked to indicate the position of either pin 1 or of the notch near pin 1.





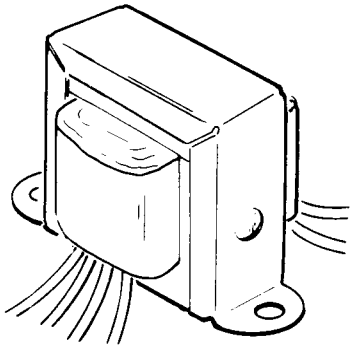
If you ever need to replace an I.C. it is a good idea to fit a socket, just in case you need to put the old I.C. back in; much easier than desoldering all over again!

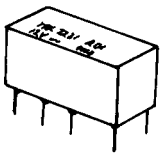
Sockets can be unreliable, however, so beware of intermittent faults caused by them. Always ensure that every I.C. pin is inserted correctly and pushed fully home. It is worth paying a little extra for a high quality socket.

I.C.s are prone to damage by static electricity. You should make sure that the receiver is disconnected from the mains. Touch the receiver

metalwork, to ensure that you are at the same voltage potential, before removing an I.C.

A mains **transformer** converts high voltage mains to safer low voltage which is required by the satellite receiver. It has one or more “primary” windings (hundreds of turns of fine insulated copper wire) connected to the mains and one or more secondary windings (thicker wire) which are isolated from the mains and should (in theory!) be safe to touch.

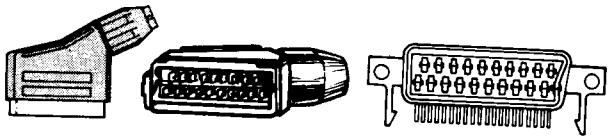




Some receivers use a switching relay to switch current from one point to another. A small coil of wire forms an electromagnet and pulls the switch contacts together when the coil is energised by an applied voltage.

Because **relays** have moving parts, it is not uncommon for them to fail in old age. Sometimes the contacts stick open and sometimes closed.
A click from the relay indicates that the coil is working but does *not* guarantee that the contacts are all right.

SCART connectors (also called PERITEL) are used to make connections between the receiver and external equipment. Amongst other connections, the SCART carries video-in and video-out signals. It also carries left- and right-audio channels in and out.



A final word of caution

The dangers of working on satellite receivers must be emphasised:
There is a risk of electric shock and a risk of burns from hot components.
There is also some risk of cuts from sharp edges.

There is a very real risk that you will nullify your warranty if you poke about inside your receiver.
There is a risk that, in attempting to repair it by yourself, you will eliminate all hope of repair by a qualified engineer.

IF IN DOUBT, DON'T ATTEMPT TO REPAIR IT.
Simply use the information to learn about the possible cause and cure, in order to estimate the likely cost of repair, *then take it to a shop*

Some of the booklets in this series include

"**Understanding Sky Satellite TV**"
"**Installing Sky satellite TV**" (in the UK and Europe)
"**Sky Digital in Spain** and southern Europe"
"**The Freeview Bible**" (UK Terrestrial digital TV)
"**Piping TV Around the House**" (connecting other equipment)
"**Repairing your Sky Digibox**" (and looking after it)
"**Installing a Motorised Dish**" (a real "Dummies Guide")
"**Receiver Repairs**" (for beginners - Screwdriver Experts Guide)
"**Satellite Secrets"** (Analogue system installation)
"**DVD Secrets**" (play discs from any region)

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