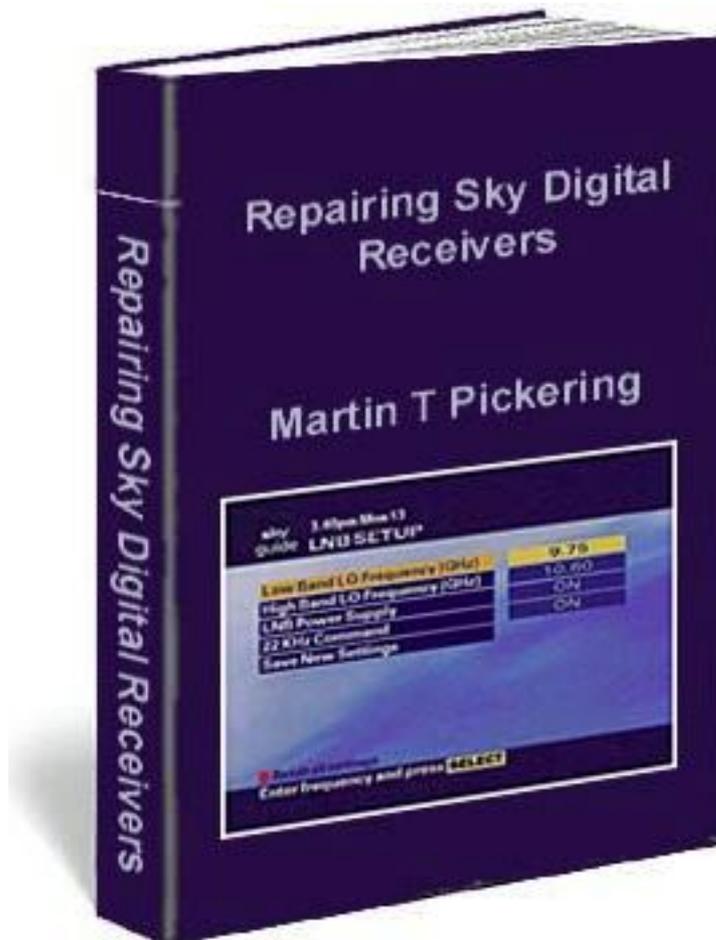


*Repairing Sky Digital Receivers*

# 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)  
<http://www.The-Cool-Book-Shop.com> (downloadable “virtual books” )

Get our monthly newsletter (free) at <http://www.satcure-focus.com>

*Repairing Sky Digital Receivers*

# Repairing Sky Digital Receivers

Written and compiled  
by  
Martin T. Pickering

Published by M.T. Pickering T/A SatCure

© Martin T. Pickering 2001

No part of this publication may be copied by any means, stored in a retrieval system or transmitted in any form without the prior consent of the copyright holder.

First edition (analogue) 1994.  
Rewritten for digital July 2001

**Last update November 29, 2003**

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.

## *Repairing Sky Digital Receivers*

### **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.

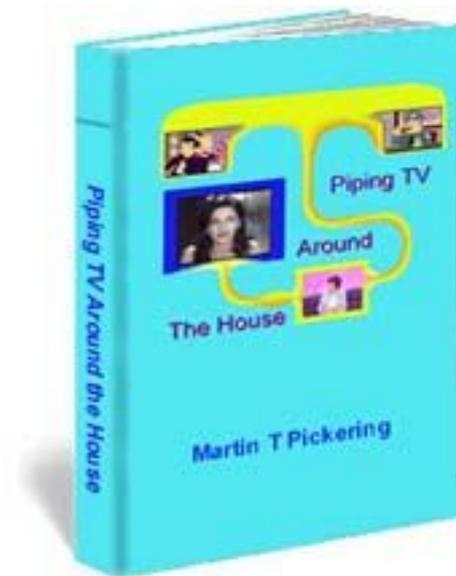
### **Why are my UHF output pictures so grainy?**

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,

## *Repairing Sky Digital Receivers*

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-

## *Repairing Sky Digital Receivers*

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 callback 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.

## *Repairing Sky Digital Receivers*

**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.

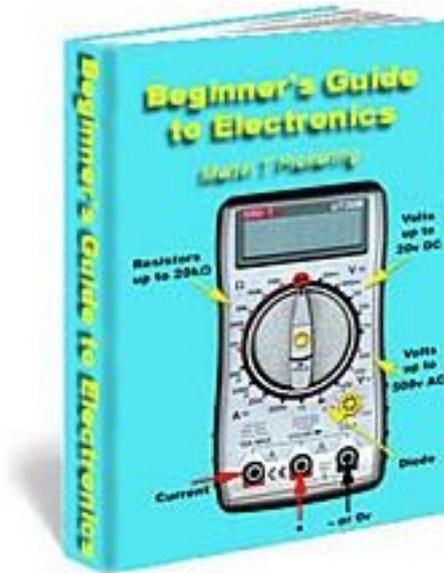
The user needs to register (via the Organiser) with Open... for interactive services. This will create an Open profile, which can then be used to register with the Open email service.

**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



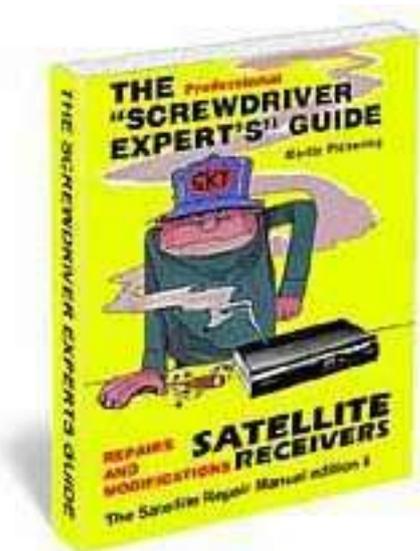
### Beginners Guide to Electronics

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 photograph 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 components supplied as a kit and you'll understand 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".

## Repairing Sky Digital Receivers

Make sure that the settings are 9.75, 10.60, ON, ON. These are the correct settings for a standard “universal” LNB.

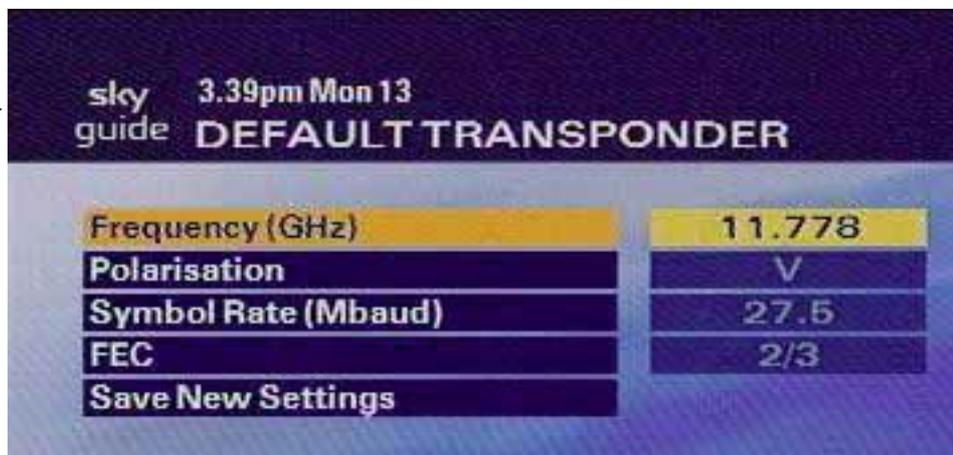
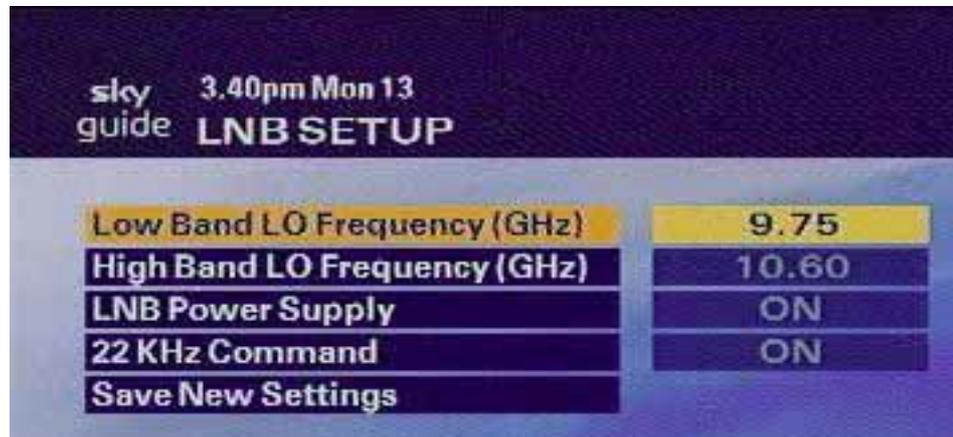
If they are incorrect, put them right then save the settings.

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”.



## Repairing Sky Digital Receivers

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).

## *Repairing Sky Digital Receivers*

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.

## 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.

## Repairing Sky Digital Receivers

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.

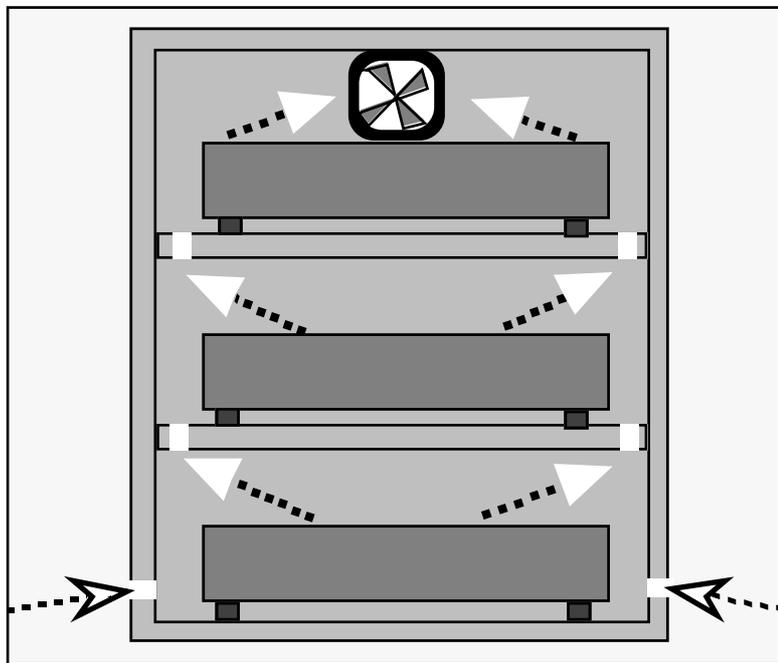
### Cabinet

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

## *Repairing Sky Digital Receivers*

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.

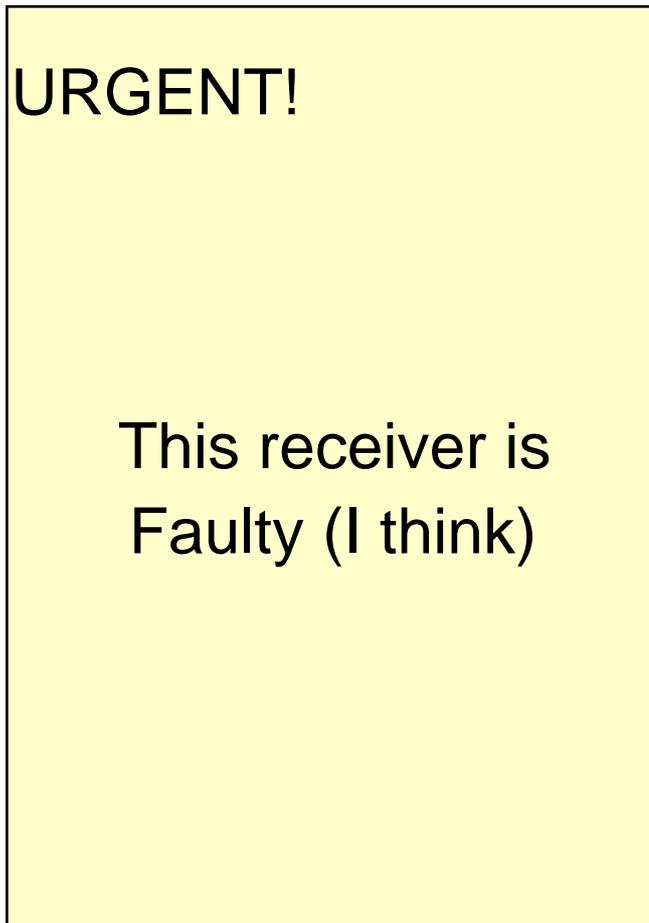
## *Repairing Sky Digital Receivers*

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

## *Repairing Sky Digital Receivers*

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.**

## *Repairing Sky Digital Receivers*

- **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:

## *Repairing Sky Digital Receivers*

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

## Repairing Sky Digital Receivers

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”.

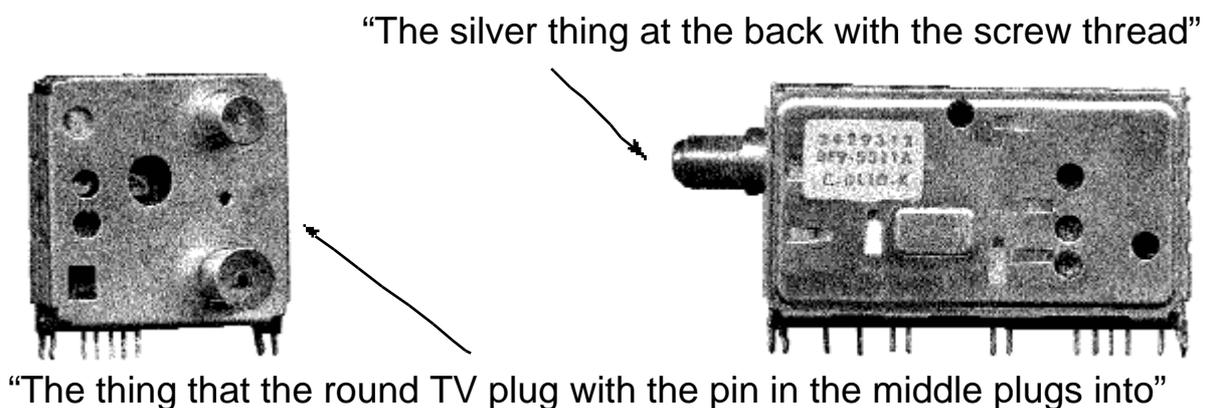
Ignorance of a technical term is not a crime and nothing to be ashamed of but if, for instance, you refer to a “tuner connection” when you mean a “modulator socket” then you might double your repair bill by confusing the repair man.

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.*



## 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

## *Repairing Sky Digital Receivers*

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.*

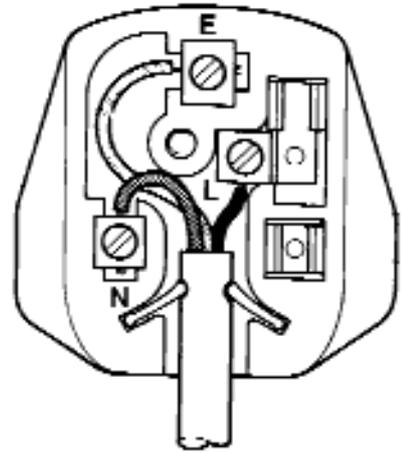
## **Mains Plugs in the U.K.**

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:

## *Repairing Sky Digital Receivers*

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!

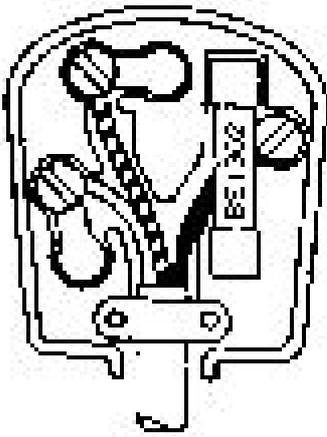
Once the end portion of sheath is removed, fit the cable into the plug, securing the remaining sheath with the clamp. Allow 10mm extra for connection and cut the brown and blue wires to reach the Live and Neutral terminals, respectively.

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.

## Repairing Sky Digital Receivers



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!*

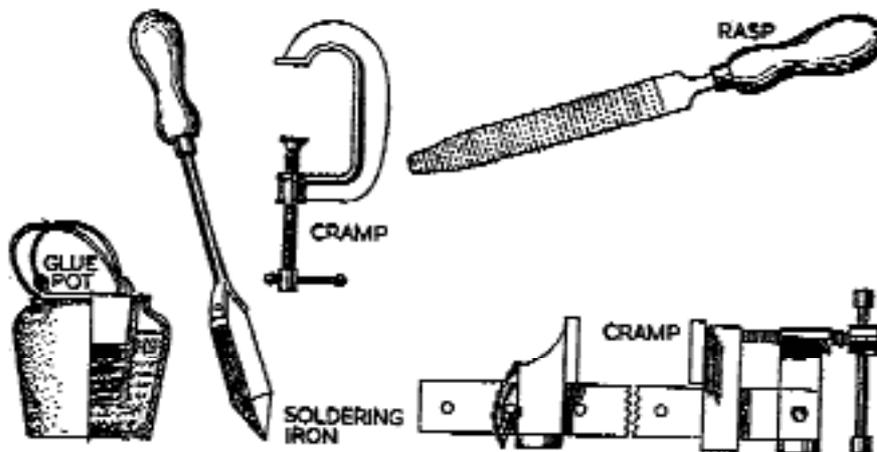
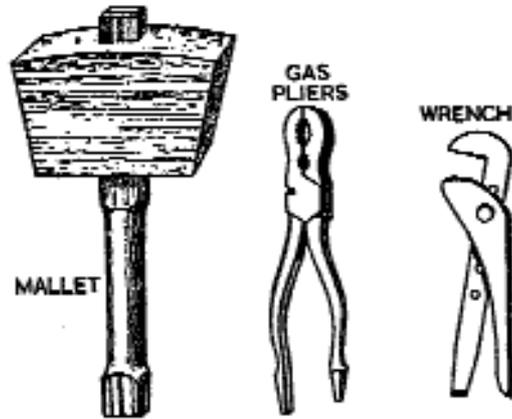
## Basic Tools

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

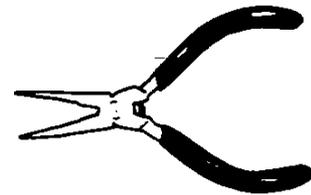
The most common screwdriver is the flat-blade one used for slot-head screws. People don't seem to realise, however, that this comes in different sizes. Use the one which fits the slot exactly. The blade should be square-ended – NOT sharpened to a chisel point or rounded off because you tried to use it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

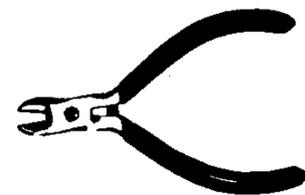
### Pliers

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



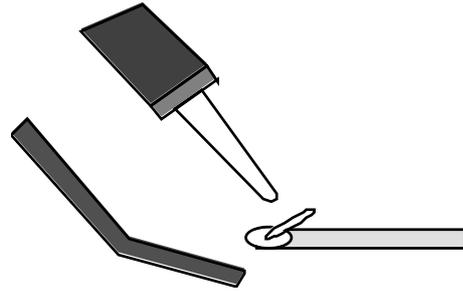
You need fine solder of 0.7mm diameter *or less* for soldering modern electronic components. The solder should contain cores of flux. The percentage of flux will be marked on the solder bobbin. You will see that the solder is a mix of tin and lead in 60/40 proportion and the flux percentage should be 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.

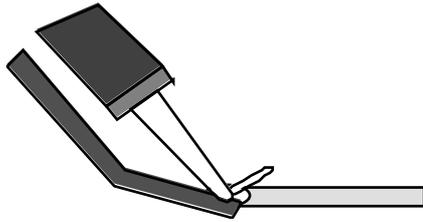
The most common flux is a resin called “rosin” which comes from trees. However, a number of synthetically manufactured fluxes (such as X32 made by Multicore) are also used. These fluxes leave either less residue or a clear residue, which makes inspection of the solder joint easier and may result in a 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



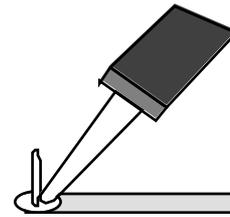
solder-suckers. These are like miniature bicycle pumps with an internal spring. You prime the sucker by pushing the plunger down until it locks. Pressing a button releases the spring-loaded plunger and it sucks up anything close to its nozzle. Great for zits! Not so great for printed circuits.

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.

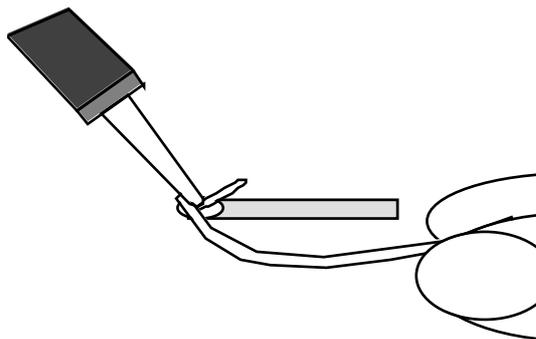
By far the best method is to use a product which goes under various names such as “Solder wick” or “Desoldering braid”.

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

## Repairing Sky Digital Receivers

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)

## *Repairing Sky Digital Receivers*

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.

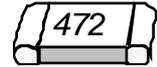
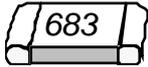
When you bend a component wire underneath the board it should always lie along the attached copper track.

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

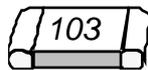
Always press the iron tip against the component lead and the copper pad then apply the solder to the opposite side of the pad.

## 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.

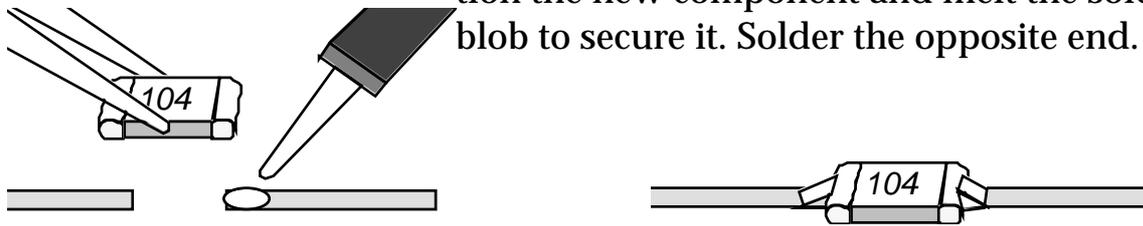
The device is too small to accommodate the part number so the manufacturer prints his own code on the top surface — usually a single letter and a number only.

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.

## Repairing Sky Digital Receivers

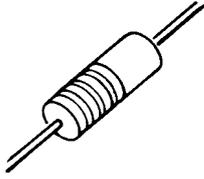
The end terminations of resistors and capacitors are very delicate. Most manufacturers recommend a maximum cumulative soldering time of 5 seconds. When you come to remove one from a PCB, remember that 3 seconds were used up to put it there in the first place! Don't expect to remove one of these devices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

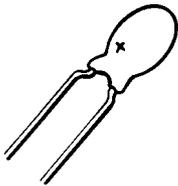
## Recognising Components



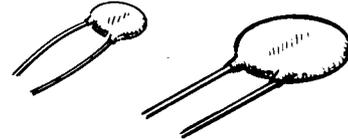
**Resistors** come in various sizes but usually look like the illustrations, with three or more coloured bands to indicate the resistance value and tolerance (accuracy %).



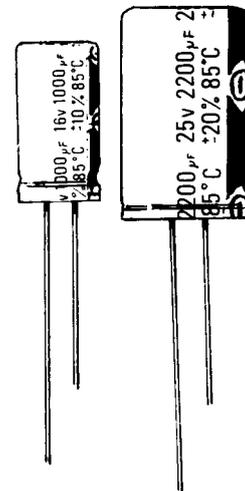
**Capacitors** come in all shapes and sizes. One of the most common is the ceramic disc.



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

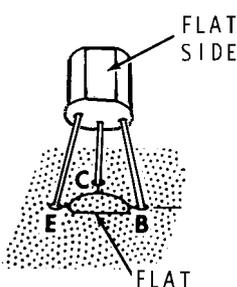
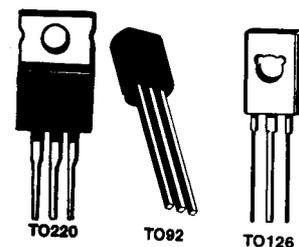


**Electrolytic capacitors** usually have the negative lead marked. The ones on the right are called “Radial lead” electrolytics. The one below is an “Axial lead” electrolytic. The negative end is designated by a stripe.



**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

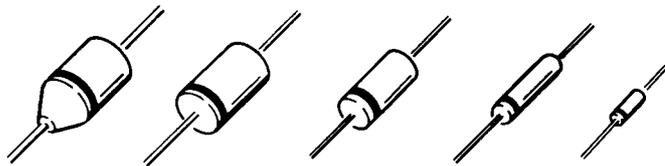
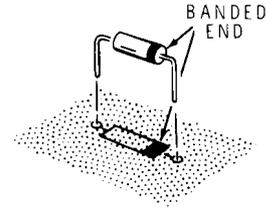
## Repairing Sky Digital Receivers



*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.

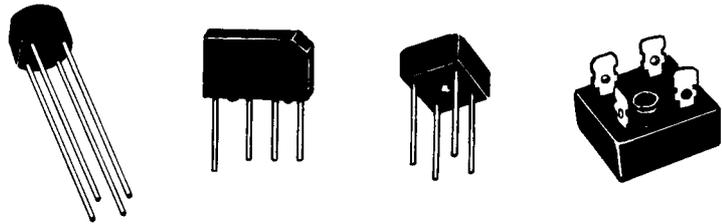
**Diodes** almost always have one end marked with a band. This end is called the “cathode”. The diode will pass current only when this end is more



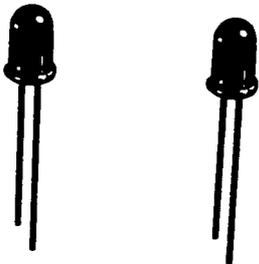
negative than the “anode” end, so it is important to fit diodes the correct way round.

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.

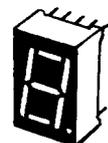


You will often see “bridge rectifiers” in power supply circuits. The “**bridge rectifier**” is simply a convenient way to house four rectifier diodes all connected together.



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.

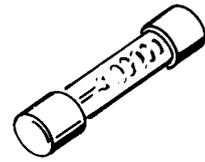
The seven-segment displays used to indicate the channel number often contain LEDs.



## Repairing Sky Digital Receivers

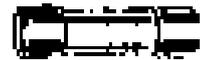
Hopefully, you can recognise a fuse!

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.

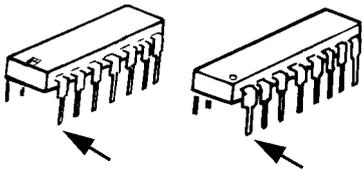


A fuse marked "T1A" is a one amp fuse with a Time-delay action.  
A fuse marked "F1A" is a one amp fuse with a Fast action.

*You must not substitute one for the other!*



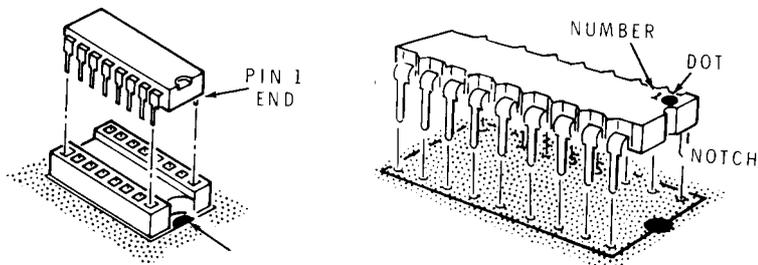
Always replace a fuse with one of an identical rating and type. The rating should be marked next to the fuse holder (this is a safety requirement which most manufacturers observe) so there should never be a problem in determining what fuse to buy.



**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!

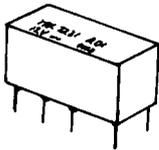
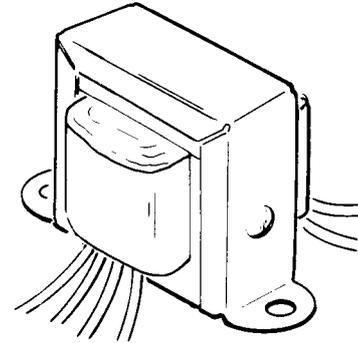
Sockets can be unreliable, however, so beware of intermittent faults caused by them. Always ensure that every I.C. pin is inserted correctly and pushed fully home. It is worth paying a little extra for a high quality socket.

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

## Repairing Sky Digital Receivers

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

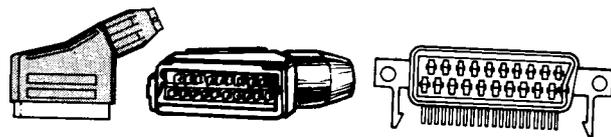
A mains **transformer** converts high voltage mains to safer low voltage which is required by the satellite receiver. It has one or more “primary” windings (hundreds of turns of fine insulated copper wire) connected to the mains and one or more secondary windings (thicker wire) which are isolated from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

<http://www.The-Cool-Book-Shop.com>

See our web sites at:

<http://www.satcure.co.uk>

<http://www.satcure.com>

(UK Sky Digibox and Apple Mac accessories) and

<http://www.netcentral.co.uk/satcure> (Analogue satellite etc.)

<http://www.satcure-focus.com> (electronics, car and caravan accessories and Audio)

<http://www.The-Cool-Book-Shop.com> (Downloadable books)

Get our monthly newsletter (free) at:

<http://www.satcure-focus.com/mailshot.htm>