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Editor
John A. Reddihough

Advertisement Sales
Reuben Gurunlian
0208 722 6028
Fax 0208 770 2016

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New Year reflections

It's that time of year (*Television* goes to press a month before its cover date) when it is appropriate to reflect on the general situation which, at present, does not look at all good – from either the geopolitical or the economic point of view. Will the UK's economy buck up a bit and make us all more prosperous over the next few months, or will it deteriorate and move into recession? It has seldom been a time when the answer to this sort of question has been more uncertain. As far as the radio and TV trade is concerned, there has never been a more tempting array of new products and possibilities to offer customers and thus increase business. Whether customers will be tempted, or decide that in uncertain times the money they have available should be put aside, is another matter.

This question was raised in an interesting way by Sir Samuel Brittan in the *Financial Times* recently. Should the citizen decide to spend or save? he asked, then went on to outline the 'conflicting messages' an individual in a position to sit back and reflect on what to do with his money will be getting right now. Save, save, save and everything will grind to a halt because of inadequate demand. Tax, tax, tax and the result will be much the same. But most spending is done with borrowed money, and there is a limit to the amount of borrowing the consumer can sustain – or banks can safely finance. It's probably getting near the limit for vast numbers of people – at precisely the wrong time in the economic cycle.

This presents incredible difficulties for those who have to decide on loans, interest rates and so on. About all that one can say is that those with cash to spare should indeed feel free to indulge themselves. For the rest of us it's a question of how to balance our various commitments, bearing in mind the present uncertain economic climate. All this assumes that we are rational beings who weigh up our prospects and come to carefully considered decisions. Real life is not like this of course, which is why the 'gloomy science' of economics is so uncertain. Those mythical characters 'the man in the street' and 'the man on the Clapham omnibus' are likely to go on getting themselves into debt regardless, if tempted to do so – or if some necessity makes it essential. And the equally mythical 'hidden hand' of Adam Smith won't be any help at all.

Samuel Brittan went on to raise the question of whether the 'consumer society' is unchallengeable or in need of some reform, citing writers such as Thorstein Veblen who satirised 'conspicuous consumption', Kenneth Galbraith who, in *The Affluent Society*, commented on excessive private consumption amidst public need, and John Stuart Mill who, a century and a half ago, considered the situation where profitable investment opportunities had all been exhausted and the economy reached a stable state – something we would now regard as highly unlikely. These philosophical viewpoints do however lead to a point that is of contemporary concern and is exercising the minds of many people, including that man in the street – or should it be the man in the out-of-town shopping mall? Can endless consumption be sustained without causing irreversible damage to the environment, and should we maybe try to make do to a greater extent with what we have rather than consigning things to the nearest landfill as soon as they start to be troublesome?

As far as the radio and TV trade is concerned, there has never been a more tempting array of new products and possibilities to offer customers.

For readers of this magazine the ideal situation would be for the public to decide that we should indeed exercise restraint, and that it would be best to care for products and have them serviced and repaired as necessary. There are two problems with this. First the low cost of new product and the whole way in which the modern, 'global' economy has evolved, with production carried out as cheaply as possible wherever it can be arranged. This all too often means by a Chinese OEM (original equipment manufacturer) who might well be running his operation in a way that would not be regarded as acceptable by the consumers who end up as the beneficiaries. The second problem is the rapid pace of technological change, which means that so many things become obsolete before their time.

In an ideal world some sort of balance could possibly be achieved. But we don't live in an ideal world – far from it. Food for thought then. Let's hope that things will be clearer and better for us all of in a year's time.

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, Television, Highbury Business Communications, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey, SM3 8BZ. Editorial correspondence should be addressed to Television, Editorial Department, Highbury Business Communications, Anne Boleyn House, 9-13 Ewell Road, Cheam, Surrey, SM3 8BZ.

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TELETOPICS

Hard disk developments

Toshiba has launched a combined hard-disc drive (HDD) and DVD-Video recorder, Model RD-X3, in Japan. Its features include progressive scan outputs and internet connectivity. The RD-X3 uses DVD-RAM technology and has a 160GB hard disk which Toshiba says is the largest drive with any HDD/DVD-Video recorder. The hard disk can store up to 208 hours of programming while the DVD-RAM/-R drive can record up to twelve hours of video on a 9·4GB double-sided DVD-RAM disc.

The recorder uses a range of picture enhancement technologies including a progressive-scan video circuit, a ghost-reduction tuner (GRT), digital noise reduction (DNR), a 12-bit, 108MHz video DAC and D1 digital terminal input. Internet connection is provided by an Ethernet terminal with broadband capacity. The connection can be used in conjunction with Toshiba's Net de Navi software, which includes the ability to select programmes to record through an internet electronic programme guide (iEPG) and email selection by a mobile phone. It also enables users to download titles and images that can be employed to personalise the menus of DVD-R discs during recording. The latter appear on the replay display during playback of a DVD-R.

Other models in the Toshiba range include the entry-level RD-XS30 which can store up to 78 hours of video on its 60GB HDD but does not have internet capability, and the RD-XS40 which can store up to 156 hours of video on its 120GB HDD and includes internet connectivity.

Sharp has launched Model DV-HRD1 in Japan. This is a Digital Hi-Vision machine for HDTV (Hi-Vision) recording and playing back. Its features include an 80GB hard disk and a built-in digital tuner. The HDD can store about seven hours of digital HDTV programming, about fourteen hours of standard-definition TV programming, and up to 110 hours (in the 3x extended play mode) of analogue programming. It has a D4 digital terminal for direct connection to an HDTV-compatible large-screen TV set. The DV-HRD1 can be combined with a TV set that has a built-in BS digital tuner to record HDTV programmes while the user watches another programme. According to Sharp programmes recorded on the hard disc can be dubbed to DVD-RW and DVD-R discs and played back using current DVD players. The DV-HRD1 can play DVD-Video, video CD, music CD, CD-RW, CD-R (music CD format, JPEG data), DVD-RW and DVD-R discs. Its price in Japan is the equivalent of about £970.

TTi (Thurlby Thandar Instruments) has, in partnership with Tektronix, introduced a new range of low-cost colour-display digital oscilloscopes. The Tektronix TDS2000 series offers, in addition to its colour display, a 200MHz bandwidth coupled with high sampling speed, a choice of two- or four-channel models and many new features. The colour display and intuitive user interface improve user productivity. The fact that each active trace is displayed in a different colour makes it easier to distinguish waveforms at a glance: associated screen readouts and front-panel controls are also colour-coded for easy use and accurate interpretation.

There are eleven automatic measurements as standard, including rise- and fall-time, frequency, RMS and peak-to-peak values. On-screen cursors can be used to make manual measurements. In both cases the measurements are linked to the channel colour to maximise clarity. Two- and four-channel models both have an external trigger input so that all input channel can be used to capture and compare waveforms while triggering the instrument from a known source. A 'trigger view' feature can be used to verify the characteristics of the trigger source. Whatever the source, a high-resolution digital frequency counter displays the trigger frequency on-screen.

Prices for the TDS2000 series start from £995. For further details phone Thurlby Thandar Instruments Ltd. on 01480 412 451, fax 01480 450 409, or email sales@tti-test.com

Service 2003 Exhibition

The Service Exhibition, which is intended for repairers of white and brown goods and was last held in the 1990s, is to held again this year for one day only, on Thursday May 1. The venue is the Vauxhall Recreation Club, Luton. Exhibitors promoting their services and products will include spares and test equipment suppliers; providers of training; and firms involved in agencies, warranties, technical information, support systems, vehicles, finance, quality and management. A free-to-attend seminar/workshop programme is being organised.

The venue has good road and rail links and there are hundreds of free parking spaces. For further information phone Service 2003 on 01462 623 333.

Corrections and satellite update

Our apologies for a couple of errors last month. As a result of a production problem Figs. 2 and 4 in the Bench Notes feature were transposed. And, in this column, we gaily reported the launch of Hot Bird 7 and how it was taking up its role at 13°E. In fact it never got there. The enhanced version of the Ariane 5 rocket used for the launch was on its inaugural flight. It veered off course and was blown up by remote control, with the loss of the two satellites (Stentor and Hot Bird 7) it was carrying. While this should not affect Eutelsat's current broadcasting capacity, it will curb the company's growth prospects. Strange that Astra 1K and Hot Bird 7 were lost in such quick succession.

Eutelsat's major shareholders, France Telecom, BT Group and Deutsche Telekom, are keen to sell their stakes and have sought offers from several bidders including the US firm Intelsat. A price of about £2bn has been suggested. As we go to press there has been no more news on this front.

The satellite business is not too healthy at present. There are some 250 satellites in geostationary orbit, with more capacity than is currently required. Orders for new satellites have fallen from 23 four years ago to six in 2002.

DVD news

The DVD Forum, which is responsible for setting DVD standards, has agreed in principle to back a system that adds an audio CD layer to DVD-Audio discs to give full compatibility with standard CD players. A similar system is used by SACD format hybrid discs, which contain an SACD and a CD layer. DVD-Audio discs can at present contain a two-channel Dolby Digital soundtrack, giving compatibility with DVD-Video players, and high-resolution 5.1-channel audio that can be played only by a dedicated DVD-Audio unit. CD players will not play DVD-Audio discs, though DVD-Audio players can read standard audio CD discs.

It seems that various issues have to be resolved before DVD-Audio/CD Audio hybrid discs appear on the market. These include thorough testing with existing DVD-Audio, DVD-Video and CD decks to ensure that there are no playability problems. One potential problem is that the DVD specifications allow manufacturers to use a variety of boot-up options. For example some players look for a DVD-Audio/Video disc first and, if there isn't one, assume that the disc is a CD, focusing the laser accordingly. Others look for a CD disc first and, if one is detected, this is played, ignoring the surround-sound audio in the DVD-Audio layer. DVD manufacturers may also need to adjust their equipment and processes to accommodate the new discs. Some patent issues may also have to be resolved. As a result of all this, it seems unlikely that DVD-Audio/Audio CD hybrid discs will appear before the end of 2003.

Pioneer has launched a player that can read both SACD and DVD-Audio discs.

The DVD6C Licensing agency, the industry body that represents the seven leading developers of DVD technology and formats (AOL Time Warner, Hitachi, IBM, JVC, Matsushita, Mitsubishi and Toshiba), has announced that it expects to start licensing the patents for DVD-Audio and recordable DVD products early this year. Licences will cover drives and media, including DVD-Audio, DVD-RAM, DVD-RW and DVD-R. The DVD6C joint licensing programme was launched in June 1999 to provide a one-stop shop for DVD-Video and DVD-ROM related patents owned by DVD6C members.

Warren Lieberfarb, who helped found the DVD format, has resigned as president of Warner Bros Home Video. In 1992 Lieberfarb and Toshiba executive Koji Hase started to promote the idea of a high-capacity optical disc that would store high-quality video: Warner Bros and Toshiba subsequently set the standard for the SD (Super Density) disc. They soon gained the support of the major Hollywood studios and a number of consumer electronics companies, including Matsushita, Hitachi, Pioneer and JVC. In 1996 the specifications for the SD and the Sony/Philips Multimedia CD (MMCD) were merged to form the DVD specification. DVD has been a great success: more than half US households now have at least one player and buy more than a dozen discs a year – colour TV took twenty years to reach this level of penetration. No reason has been given for Warren Lieberfarb's departure. He has recently been involved in establishing Movielink, a system of selling and renting video over the internet.

Return of Finlux

The Finlux TV brand has been relaunched in the UK, with a range of 24, 28 and 32in. widescreen models. There are plans to add plasma screens and DVD players to the range. The company's address is Finlux UK, 11 Caen View, Rushy Platt, Swindon, Wiltshire SN5 8WQ. Phone number is 01793 886 320. There's a website at www.finlux.com

New operating system for domestic electronic devices

Matsushita (Panasonic) and Sony have formed a partnership to develop an enhanced Linux operating system for domestic digital electronic equipment. The companies aim to use the technology in their future products and make the source code freely available to the public to encourage its wider use in the industry. Linux is well known as an operating system for PCs and servers and is also starting to be used in domestic digital equipment – for example Nokia has launched set-top boxes that use it. Other companies that support the idea of using Linux in their products include Hitachi, IBM, NEC, Philips, Samsung and Sharp.

Global Display Solutions (GDS) has announced that its new repair and maintenance facility at Keighley, West Yorkshire is now fully operational. The high-tech unit has been designed to provide a diagnostic, problem-solving and repair service for information displays and monitors. GDS's products are widely used in sectors such as banking, marine, industrial control and passenger terminals. Software specially written for GDS enables monitors to be plugged in for a 95 per cent automatic set-up, substantially reducing repair time. For further information call 01274 230 150 or visit the website at www.GDS.com

New standards

Canon, Fuji, Olympus, Epsom and Sony have proposed a new industry standard that will enable consumers to print photos easily by connecting their digital still cameras to a printer directly, with no PC required. A number of companies already offer digital camera direct printing systems, but these use proprietary technology. The new system, known as DPS (Digital Printing System), is designed to ensure compatibility with digital cameras and printers regardless of brand.

DPS specifies an application layer control protocol and is independent of the physical interconnection used: it's designed to be extendible for implementation with future physical interfaces. The DPS Version 1.0 document, to be published formally at a later date, is written for USB as physical interconnection and Picture Transfer Protocol as the data transfer protocol. Consumers will be able to connect a DPS-enabled still camera and printer, using the camera to perform operations.

Hitachi, Matsushita (Panasonic), Philips, Silicon Image, Sony, Thomson and Toshiba have released the 1.0 specification for the High Definition Multimedia Interface (HDMI), which is intended as the next-generation digital interface for consumer electronics products. HDMI makes possible the secure distribution of uncompressed high-definition video and multi-channel audio via a single cable. The release of the HDMI Version 1.0 specification means that manufacturers can now develop and launch HDMI-compliant products. The HDMI initiative has broad industry support from major motion-picture producers, US satellite and cable companies and consumer electronics manufacturers.

HDMI combines high-definition video and multi-channel audio in a single digital inteface with a bandwidth of up to 5Gbits/sec. Benefits include uncompressed video quality, fewer cables and a small, user-friendly connector that's suitable for use with a wide range of consumer electronics products. In addition HDMI supports many of the capabilities of the AV.link interoperability protocols that are popular in Europe, such as the ability to control a number of devices using a single remote-control handset. HDMI uses High-Bandwidth Digital Content Protection (HDCP) technology to protect content from unauthorised copying and distribution.

Test report:

Grundig GDT1500 DTT adapter

Digital terrestrial TV seems to have taken off with the advent of the Freeview services. Several adapters have been introduced to provide reception. Peter Marlow reviews a Grundig unit that's available through Currys and Dixons outlets

The relaunch of digital terrestrial TV in the UK under the Freeview banner seems to have been a success. So we can expect a surge in demand for DTT adapters and widescreen TV sets with integrated DTT decoders. I reviewed the Pace DTVA adapter in the August issue. Other manufacturers, including Nokia, Panasonic, Daewoo and Grundig, are now producing adpaters. This review covers the Grundig GDT1500, which is available exclusively from Currys and Dixons at £99.95. Note that last June Grundig's set-top box interests were taken over by Thomson Multimedia. In addition to Freeview reception, the GDT1500 provides an easy-to-use electronic programme guide (EPG) and the ability to make timed recordings with a VCR.

First impressions and setting up

The GDT1500 is not as compact as the Pace DVTA, measuring 270mm wide by 141mm deep by 76mm high, but is more what you might expect an STB to look like. A nice feature is the internal mains power supply, so there's no chunky mains-plug power unit. The curved-top front panel has two buttons, for channel up and down selection, and a red/green LED. The rear panel, see Fig. 1, has an RF input socket, an RF loop-through socket, two scart connectors for the associated TV set and VCR, a mains-input socket and a telephone-like socket for a remote-control extender.

The unit comes with a remote-control unit, batteries and a mains lead. Power consumption is approximately 10W in operation with a 230V 50/60Hz mains supply. My only grouse was that one or two scart leads weren't included in the package. To wire the system up I had to borrow one from the children's VCR. The video and audio specifications are as follows:

Video: Signal-to-noise ratio 73dB, with jitter 1nsec.

Audio: Signal-to-noise ratio 95dB, inter-channel isolation 90dB, THD 0·03 per cent.

Table 1 provides further details.

Setting up is straightforward, though the manual could have been a bit clearer for the non-technical user. The auto-tune facility works well: it found all the Freeview channels plus some from a neighbouring multiplex in Wales. The picture displayed by my widescreen Philips TV set, with the adapter set to the 16:9 mode, is excellent.

Features

The GDT1500's EPG with picture-in-picture is its best feature. You can scroll through the channels before deciding which one to watch. Reminders for programmes you want to watch later can also be set, and a favourites list can be set up.

A timer in the unit enables you to make video recordings, provided your VCR has an 'auto-record' function. A list of programmes to be recorded can be set up, just as with a

VCR – no need for VideoPlus. If your VCR doesn't have this capability you can still record demodulated/decoded digital transmissions by selecting the scart output from the unit as the source.

A PIN number can be used to implement parental-control viewing restrictions, with censorship levels at age 5, 10, 15 or 18 years or Total Block (I'm not sure that UK DTT broadcasts have this feature yet). Services can also be completely blocked.

While I've been using the GDT1500 there have been two software downloads. Both took about ten minutes, and there were no problems.

The digital teletext service is good, but almost as slow as with the old analogue system. In addition it's not easy to get back out once you are in. The interactive services are similarly bewildering – once you press the red button it's hard to get back to the original transmission. A software change is needed here.

The remote-control unit is a bit fiddly. The buttons at the top of the GDT1500 enable you to change channel however, so no more problems when the remote-control handset goes walkabout. An optional remote-control extender unit, available separately, enables the adapter to be located out of sight.

Verdict

I think this is an excellent product, with better software than the Pace DTVA. It's easy to set up, though the documentation could have been more helpful. I feel that at least one scart cable should have been included in the package.

Note that to use this Grundig DTT adapter you may need a connection to a high-gain wideband TV aerial system. To check the digital TV coverage in your area, consult www.freeview.co.uk

Table 1: Brief specification for the Grundig GDT1500 DTT adapter

Basic: DVB compatibility, full access to Freeview, MHEG gives access to digital text and interactive services.

EPG: The electronic programme guide shows what's on now and what's on next.

Multiple video format: Select 4:3, 16:9 or letter-box to suit the TV set.

Scart sockets: One for TV connection, one for VCR connection.

RF loopthrough: Enables analogue TV transmissions to be viewed and digital broadcasts to be recorded at the same time.

Timer-output function: For recording with a VCR (record digital and watch analogue or vice versa).

Auto-tune and set-up: Easy plug-and-play technology gets the unit up and running quickly.

Infra-red remote-control extender option: You can hide the adapter away and place an IR remote-control extender on top of the TV, enabling the TV set's handset to control all adapter functions.

Parental lock: Enables family viewing to be limited. Activated using your own four-digit PIN.

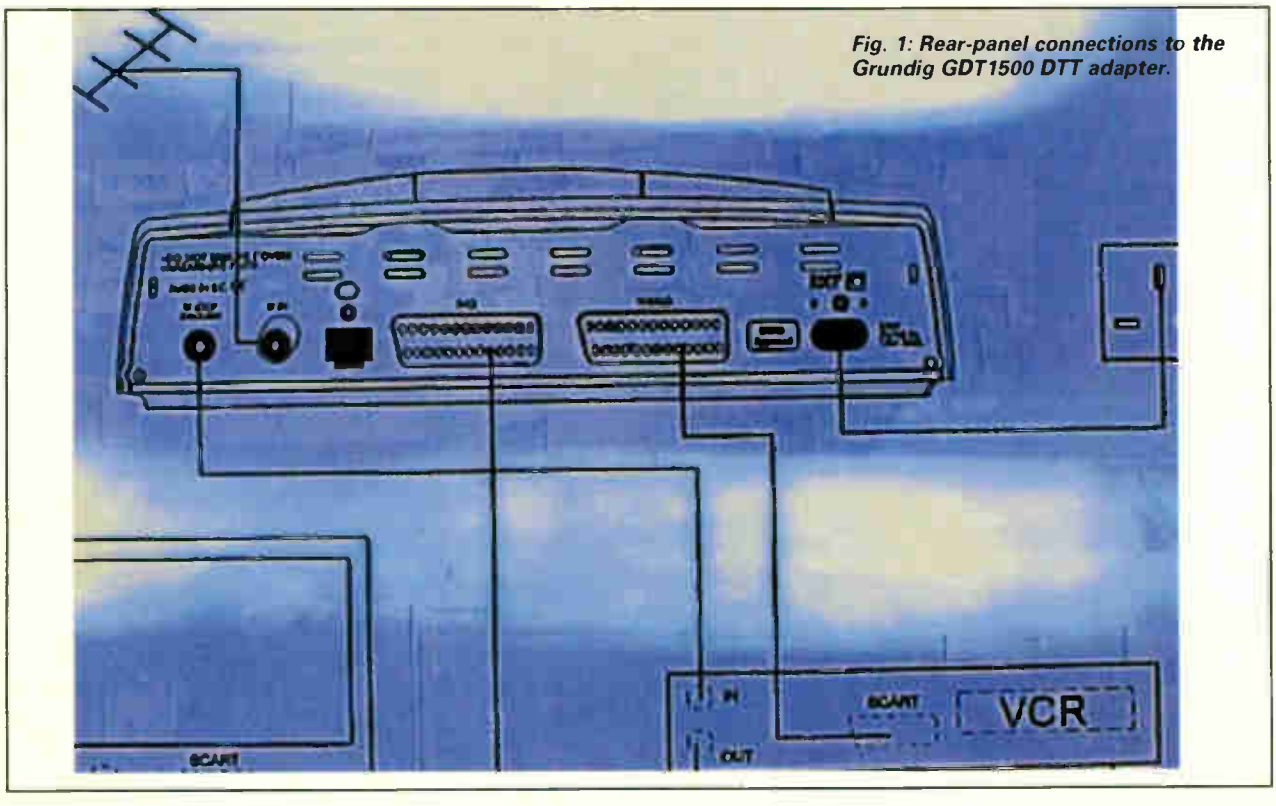


Fig. 1: Rear-panel connections to the Grundig GDT1500 DTT adapter.

EEPROM reprogramming jig

It has been common practice for some years to include an EEPROM in TV chassis to store service adjustment and customer preference settings. The data stored is vital to a set's working but it can be difficult, when a fault occurs, to determine whether the cause lies with the hardware or the software. Various approaches can be tried where data corruption is suspected. These are described, with particular reference to Sharp TV models, by the Sharp Technical Team.

For some time now Sharp and other manufacturers have been using an EEPROM (Electrically Erasable Programmable Read Only Memory) in their TV chassis to store service adjustments such as geometry, control data, CRT drive settings etc. and customer preferences, e.g. channel tuning, picture settings, audio control etc. The data is vital to the working of a set, but when a fault occurs it can be difficult to establish whether the cause lies with the hardware or the software, i.e. data corruption. Before we look at fault finding, the various terms used to describe the devices involved should be explained.

EPROMs and NVMs

Sharp and some other manufacturers use the term NVM (Non-Volatile Memory) instead of EEPROM, and NVM will be used in this article. Another term that means the same thing and is in common use is EAROM (Electrically Alterable Read Only Memory).

To enable the microcontroller chip to work it has to be provided with a program. This is normally, but not always, stored in an external device called an EPROM (Erasable Programmable Read Only Memory). There are alternative devices, namely OTPs and MTPs, and all are used in Sharp chassis. An EPROM has a small transparent window at the top to enable ultra-violet light to be used to erase the memory, after which it can be reprogrammed. OTPs and MTPs don't have this window. An OTP (One Time Program) device can be programmed only once. Such devices are cheaper than EPROMs but less flexible. MTPs are similar to OTPs but can be programmed many times: hence the name MTP (Multi Time Program). Note that all these devices are sensitive to static electricity, so anti-static precautions must be used when handling them.

What's stored where?

As mentioned above, an NVM is used to store various values that can be adjusted when the chassis is in the service mode, also any changes the user makes when setting up the receiver. NVMs are also used to store various transient data values required during operation of the microcontroller chip. Sharp TV sets use a combination of an NVM and an EPROM. The EPROM stores what could be called default or start-up data, while the NVM stores set-up data, set by the installation engineer, and end-user preference information, e.g. brightness etc.

When a blank NVM is fitted in a set default data from the EPROM is downloaded to it via the microcontroller chip during the boot-up procedure. This process takes about a minute to complete, and occurs only at the initial switch-on after replacing an NVM. It's important that the process is not interrupted, as this could cause corruption of the data. If a set switches on within ten seconds after fitting a new NVM the data writing procedure will not have been completed: there may be a problem elsewhere in the set.

When a set is switched on after replacing the NVM there may be poor geometry, incorrect audio and picture settings etc. This is because the EPROM default data downloaded to the NVM needs to be modified to take into account CRT and component tolerances and customer preferences.

Before blanking or replacing the NVM in a Sharp set it's advisable to check that the correct EPROM version is fitted. This information is on the Technical website for Sharp account holders. Those without an account can contact Alan Dyson at Techline Services. Phone 0906 861 5915. This is a chargeable service.

Fault conditions

The symptoms caused by faulty software in a TV set are many and varied. Some may appear to be caused by a hardware fault. NVM corruption can sometimes lead to premature failure of the line or field output stage. Most symptoms are more obvious however, such as no sound, a blank raster, a blanking fault (half a picture, parts of the picture missing, etc.), or an on-screen display or teletext problem. The list of possibilities can be quite extensive.

In such a case it's helpful to be able

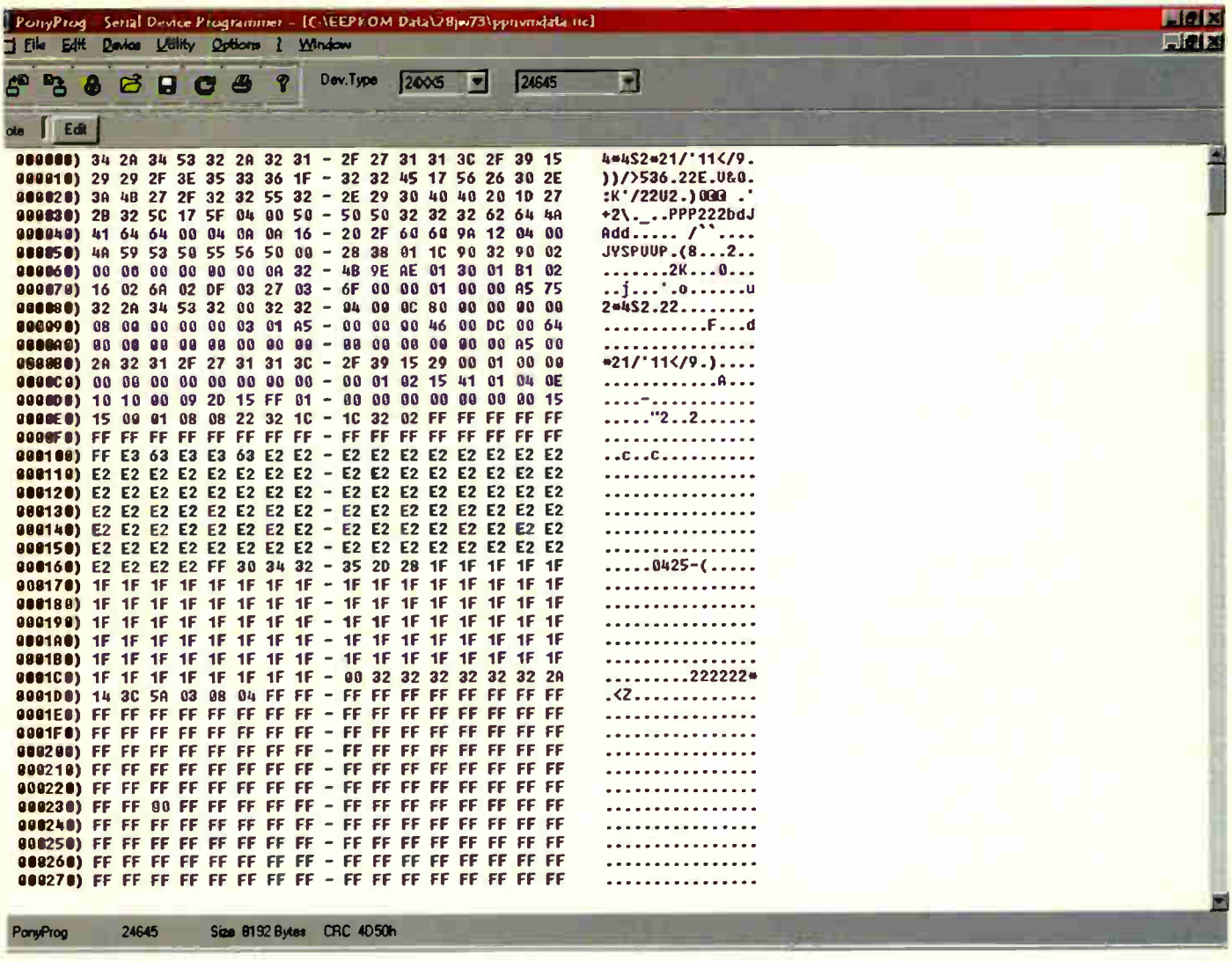


Fig. 1: Screen shot of the Ponyprog application.

determine whether the cause is software or hardware based. This can be achieved by ensuring that the NVM contains correct data. If the NVM has been loaded with a new, working set of default values, the receiver will either work (if data corruption had been the problem) or will remain faulty (if a hardware defect is present).

Fault-finding procedures

Without access to an NVM programmer there is little choice but to replace the NVM, turn on the set and wait. When a blank NVM has been fitted in a Sharp FW, GS, HW or JW range model it takes about a minute for default data to be downloaded from the EPROM. As mentioned above, if this process is interrupted corruption can occur. The whole process then has to be restarted.

To make fault finding much easier, Sharp has issued details of a handy little interfacing jig that enables an NVM to be programmed quickly and easily in situ from a PC. Default data is available for account holders at the Sharp Technical website. For non account holders a disc is available from Sharp Spares or parts distributor Willow Vale Electronics. The part number for the jig is NVM-PROG-JIG1, Sharp price code BC. The part number for the disc is NVM-DATADISK1, Sharp price code AL.

Once the jig has been made and the software installed on a PC, an NVM can be programmed and the data can be viewed. You can also take data from a good NVM. The basic requirements for these operations are as follows: a PC, minimum specification 486 or better; software to address the NVM and read the data; a hardware buffer which is connected between the PC's printer port and the NVM in the TV set; and a connector to provide a link to the NVM.

Software

To enable data to be programmed into an NVM, software to drive the interface hardware is required. Appropriate software is freely available on the internet, in several versions. One version can be found at

http://www.lancos.com/ppwin95.html

The software available from this site can be used with all the NVMs used in Sharp TV receivers, enabling a 'memory map' of the programmed locations to be viewed on a PC monitor.

An NVM can suffer from corruption when one of its storage locations becomes either stuck at a certain level or loses information. If this problem is encountered, it's possible to 'fill up' the NVM with ones or zeros then read the information back. This enables a comparison to be made between the two sets of data, correct and corrupted.

Note that the NVM software required for a particular model depends on circuit configuration and the type of CRT fitted. This is because the communication process within the chassis, and the characteristics of the scanning coils, differ. If incorrect software is programmed into an NVM, at best the set will work but have incorrect geometry while at worst it won't turn on.

The default data provided at the Sharp Technical website and on disc ensures that the geometry, audio levels, AFC offset and control data are correct, but minor adjustments may be required to an individual receiver to compensate for component tolerances. With certain models it's necessary to reprogram the scart input levels manually and reset the AFT, the AGC and the G2 (A1) control. All sets need to be retuned to suit the local

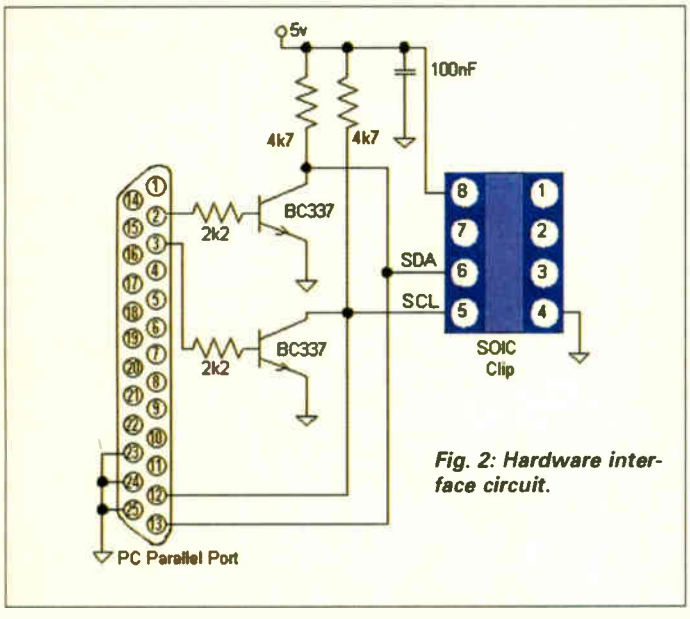


Fig. 2: Hardware interface circuit.

Table 1: Parts list for the hardware interface

100nF, 50V capacitor
Two 2·2kΩ, 0·25Ω resistors
Two 4·7kΩ, 0·25Ω resistors
Two BC337 transistors
SOIC clamp connector
50cm cable for SOIC clamp
25-way D type connector and cable
8-pin DIL socket
DC input connector
DC power supply (5V, 800mA)
Circuit board, box

conditions.

NVM data is currently available for the following models: 59ESD7H, 66ESD7H, 56FW53H, 66FW53H, 66FW54H, 76FW53H, 76FW54H, 66GF63H, 76GF63H, 76GF64H, 66GS62H, 21HS50H, 21HT15H, 28HW63H, 32HW54H, 28JW73H and 32JW73H. New data is being added all the time however. You can add to your own portfolio of NVM data by extracting it from working sets as you come across them.

Software set-up and basic use

Although set-up of the software options differs for each user and interface, there are a few general points to note if you have not used the software before.

(1) Ensure that the calibration option (Options – Calibration) is carried out before using the application.

(2) Ensure that the correct port is enabled (Options – Set Up). Most units will be set up via a parallel port (LPT1) in Easy I^2C bus mode.

(3) Select the correct device type from the drop-down menus.

(4) Select read or write from the device menu. There are also a couple of icons for these functions: they are normally just under the file menu button.

One of the best ways to get to know the software is to use it. Be careful not to erase the NVM unless you want to. A check box comes up to prevent accidental writing.

Fig. 1 shows a screen shot of the Ponyprog application.

Hardware

Several circuits can be obtained from the website previously mentioned. Some are ready-built and can be purchased. The jig can be made either by sourcing the components individually or by purchasing the kit as detailed earlier. The most important thing to remember is that the circuit and software must be compatible, otherwise configuration problems may be encountered.

The circuit taken from this website (link http://www.lancos.com/prog.html#easyi2c) is shown in Fig. 2. It forms the basis of the jig used by Sharp. The components required for this circuit and the additional parts required to make a complete jig are listed in Table 1.

Power supply considerations

As mentioned previously, it's possible to read from and write to a NVM while it is connected in circuit. The receiver won't be operational, so a power supply is required. It must be able to provide enough current to ensure correct reading and writing. NVMs will generally read and write with a supply in the range 3-5V, but it's best to keep as close to 5V as possible (see note on 3·3V ICs in the next section however). As other devices are connected to the supply, it is recommended that the power supply is capable of providing 800mA to ensure no corruption of data.

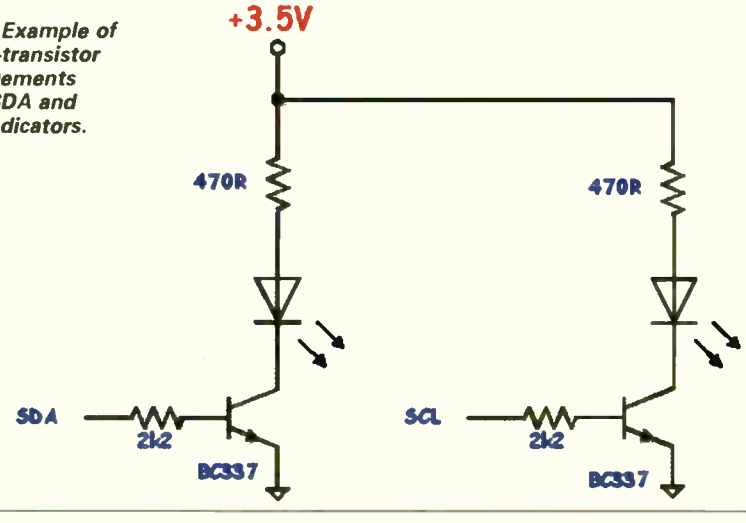
An external DC source can be used, plugged into the device when required. Such supplies are relatively inexpensive and can be used for other purposes. Most workshops are likely to have one that originally came with a product such as a MiniDisc recorder.

Additions to the jig

In addition to the SOIC connector, an 8-pin DIL socket connected in parallel with the SOIC clamp can be useful for reprogramming DIL NVMs out-of-circuit. A SOIC ZIF socket is available from RS Components under order code 766-980: it can be used to program gull-wing NVMs before they are fitted in a receiver. This device would also be handy for blanking NVMs that have been removed and stored before a reprogramming device became available. When programming an NVM out-of-circuit it will be necessary to ensure that pins 1, 2 and 7 are connected to ground.

Pin 3 controls the flow of data to the NVM, i.e. it enables the IC to receive data. The voltage level required depends on the device being programmed. Some ICs need a high for programming, others

Fig. 3: Example of buffer-transistor arrangements with SDA and SCL indicators.



a low. Note that when using the SOIC clamp to program an NVM in circuit the PCB wiring will ensure that pin 3 is at the correct level. A switch that selects the supply or chassis via suitable current-limiting resistors can be used to provide this function.

A 5V supply could have been used for this jig. Some models use ICs that work at 3·3V however. In this case the microcontroller chip, which is also connected to the supply, would be damaged. In some chassis there's a 3·3V regulator between the 5V supply and the Vcc pin, but later chassis don't have this. So the circuit uses a 3·5V supply, making it suitable for all receivers.

Extra items such as a power switch, operation and data LEDs etc. can be added if required. A data LED can be useful to see whether data is being transferred between devices. If this feature is to be added, a transistor buffer is recommended between the data line and the LED. See Fig. 3.

Remember that every addition will require more supply current and thus possibly a higher power-supply capacity.

Connector modification

You will have to obtain a SOIC NVM clamp, which is available from Farnell under order code 178 278 or CPC under order code SC01153 – note that Farnell supplies the clamps only in multiples of ten. The clamp enables you to read or write NVM data without need to remove the IC from the PCB. See Fig. 4.

We've found it best to reduce the spring tension of the clamp by cutting two turns off the spring and moving it closer to the pivotal point, see Figs. 5 and 6. The clamp can be difficult to fit if this modification is not carried out – in addition the plastic 'guides' that enable the IC legs to slot into the clamp will wear away quickly.

To ensure that a sound chassis connection is made to the PCB, pins 2, 4 and 7 of the clamp should be joined together.

To make the clamp more versatile, a small breakout connector could be made to enable small clips to be attached to the circuit, i.e. flying cables from the SOIC clamp input pins terminating in crocodile clips. Excessive or poor soldering with some NVMs can lead to the clamp not making good contact with the pins: the clips would be useful in such a situation, to make direct connection to the PCB.

Using the jig

Use of the jig is straightforward. Take the following steps.

(1) Plug the hardware interface into the PC's parallel port.

(2) Start up the Ponyprog software on the PC.

(3) Disconnect the receiver from the mains supply.

(4) Clip the SOIC clamp on to the NVM you wish to read from or write to.

(5) Supply power to the hardware interface.

(6) If a second NVM is fitted in parallel with the device you intend to program, it may be necessary to disconnect this device's data pin – see below.

(7) Choose the correct NVM type, using the Ponyprog software.

(8) Choose the operation to be carried out.

Notes

An extra NVM is fitted in some Sharp models (those with Dolby Pro-Logic). It's used as a teletext page store and is normally connected in parallel with the I^2C bus. There may be problems if it's left connected while programming is undertaken. To avoid this, lift pin 5 of the second NVM.

To ensure good contact between the clamp and the NVM it may be necessary to remove excess solder from the legs of the NVM.

When reprogramming a GA1E chassis set (Models 21HT15H and 21HS50H) it's necessary to remove the 100Ω surface-mounted resistors R1033 and R1035, which are mounted on the print side of the PCB. Remember to reconnect them after programming, as they are in series with the I^2C bus to the microcontroller chip.

The same applies when reprogramming a GA20 chassis set (Models 28JW73H and 32JW73H), but in this case the resistors are R1036 and R1038.

When the jig is used with Model 37JF25H or 37JF26H it's important to decrease the supply voltage to 3·3V, otherwise both the NVM and the microcontroller chip will be damaged.

Kits

As previously mentioned, this jig is available in kit form to Sharp account holders as a spare part, no. NVM-PROG-JIG1. It includes all the parts required to make the jig. Another spare part, no. NVM-DATADISK1, contains all the default data for the range of Sharp models shown earlier in this article. As each data file is only about 8KB in size, the software comes on a floppy disc. It also contains a copy of the Ponyprog software. If you don't have a Sharp account, these items can be obtained from Willow Vale Electronics, Wizard Distributors or CPC.

Construction of the jig should be easy for experienced engineers, so no detailed instructions are included here. They come with the kit. ■

Fig. 4: Using the SOIC clamp on a PCB.

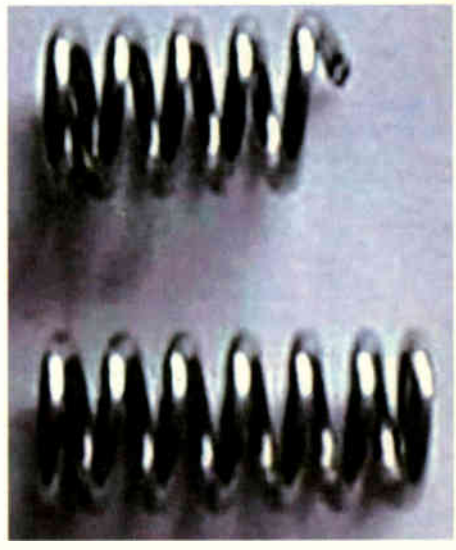


Fig. 5: Modified clamp spring, top, with unmodified spring below.

Fig. 6: Unmodified clamp left, modified clamp right.

In this final instalment in the series Mark Paul describes the teletext, audio and control sections of the chassis

Guide to the Thomson TX92 chassis

In Part 3 last month we covered the signal reception and processing sections of the chassis up to and including the tube drive arrangements. This leaves two signal systems to be described, teletext and the audio side. Once we've done that we will conclude with an outline of the microcontroller systems, which differ slightly between the two versions of the chassis (TX92 and TX92F).

Teletext

The chassis uses an SAA5281 single-chip teletext decoder IC, IT01, which can be used with all 625-line based World System teletext transmissions. No external memory is required as the chip can store up to eight pages, with an enhanced mode that allows seven Fastext pages to be stored. Few external components are required, and there are no critical or adjustable components.

Fig. 14 shows the teletext decoder chip in simplified block diagram form, along with the peripheral components except for the supply smoothing and decoupling components. 5V is fed via a filter to the VDD pins 11 and 52. Pins 4, 5, 15, 26 and 39 are connected to chassis. Typical power consumption is 75mA. A number of pins are not used and are left disconnected.

The 27MHz crystal QT01 forms part of a Colpitts oscillator, with connections to the chip at pins 1, 2 and 3. This is the master oscillator for all the timing. The amplitude of the oscillations is controlled to reduce radiated and conducted transmission of the 27MHz frequency. This also reduces the power level in the crystal.

A positive-going composite video signal at about 1·2V peak-to-peak amplitude is capacitively-coupled by CT10 to pin 9. The DC level at this pin is set by the sync separator, to optimise extraction of the sync pulses. This also ensures that the CVBS range lies within the capacity of the analogue-to-digital converter. In order to be able to separate the sync pulses correctly, despite a range of input signal amplitudes, a black-level sample has to be stored. This is the function of CT09, which is connected to pin 8. The capacitor at pin 6 generates a positive reference voltage for the AD converter.

Iref at pin 10, determined by RT02, provides a reference voltage for an internal analogue reference generator. Nearly all the analogue circuits in the chip use this reference.

The RGB outputs at pins 16, 17 and 18 are fed via the LL4148 isolation diodes DT01-3 to pins 14, 13 and 12 respectively of IV01. Pin 20 provides a fast-blanking output to enable the teletext display. The output level (high) at pins 16-18 is set by the voltage at pin 19. This is determined by the voltage-divider RT05/06 via the emitter-follower transistor QT01.

Pins 24 and 25 provide connections to the I²C bus. These pins are driven high during power down, setting the internal memories.

Stereo sound circuitry

Stereo models use either an MSP3400 or MSP3410 audio processor chip, IS40, for demodulation, decoding and scart switching. The MSP in the type number stands for Multi-standard Sound Processor. The difference between the two types is that the MSP3410 can handle Nicam sound while the MSP3400 can't. Both can demodulate FM mono and stereo signals and all satellite systems. Fig. 15 shows a basic block diagram for the audio arrangements in stereo models and Fig. 16

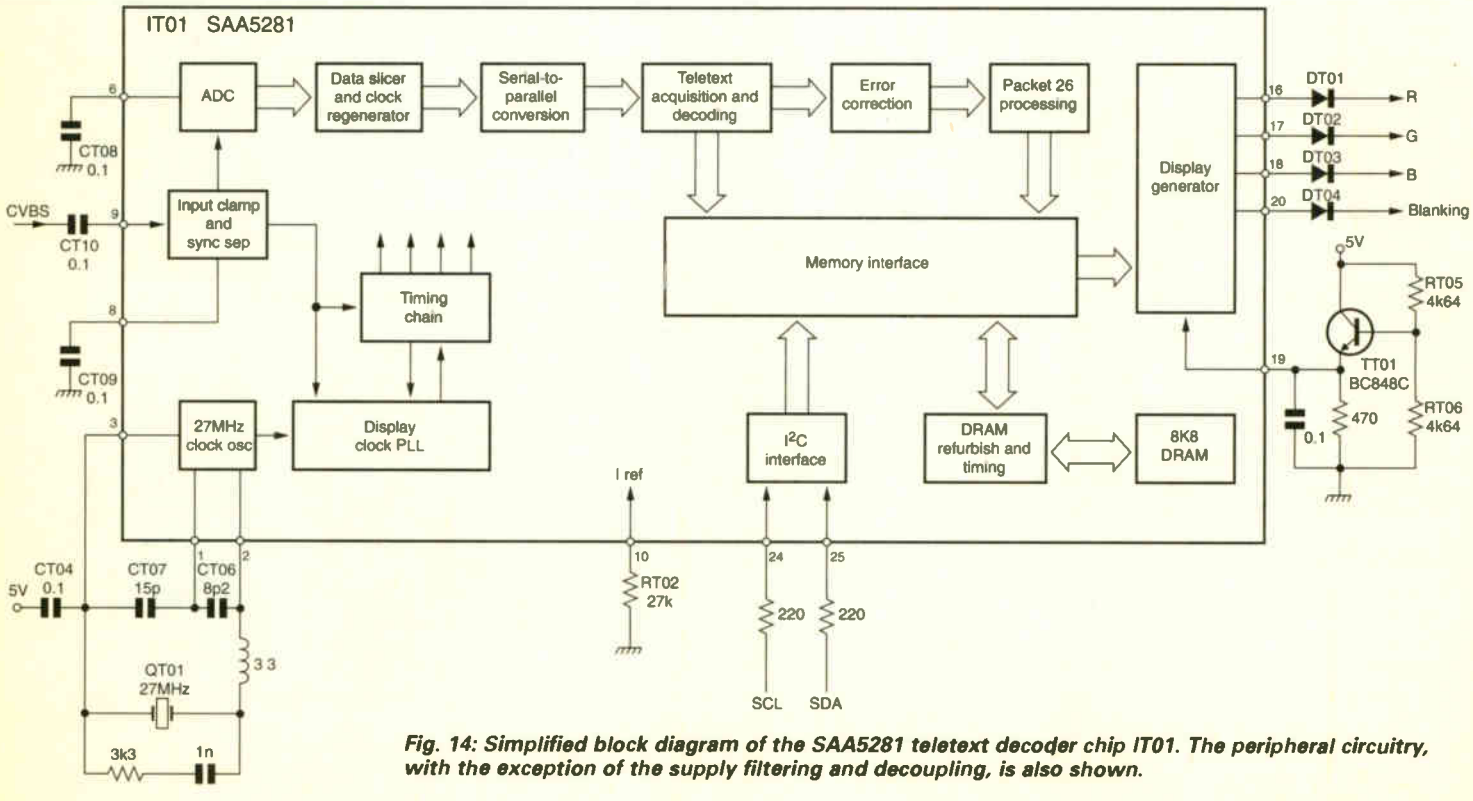


Fig. 14: Simplified block diagram of the SAA5281 teletext decoder chip IT01. The peripheral circuitry, with the exception of the supply filtering and decoupling, is also shown.

the demodulator system in the MSP3410 chip.

All functions in the MSP3410 chip are I²C-bus controlled. Operation of the chip relies on an 18·432MHz crystal, QS40. which is connected to pins 62 and 63. The power-on-reset at pin 24 comes from a BC848B transistor, TS20, whose base is connected to the power-fail output from the power supply (see Fig. 3, November).

The sound IF input is fed to pin 58 of IS40 with no pre-filtering. After AGC the signal is fed to an analogue-to-digital converter, which means that FM and Nicam demodulation are carried out digitally.

The mono input (AM sound system L at pin 60), two stereo scart inputs (AV1 and AV2) and the front-connector board input (AV3) as well as the FM and Nicam inputs (pin 58) contain pre-volume settings to compensate for level differences. In the switching section every input (FM, Nicam, scart, I²S, Sbus) can be selected and switched to every output.

The left and right stereo outputs at pins 29 and 28 respectively of IS40 are capacitively coupled to the TDA7263 audio amplifier/output chip IS80. Treble and bass adjustment within IS40 for these outputs is software-controlled across the range +12dB to –12dB in steps of 1dB. A loudness function from 0dB to +17dB is also available, and in addition there's stereo base width enlargement and pseudo-stereo if required. Overall volume can be set within a range of 106dB in steps of 1dB. The scart outputs at pins 33/4 and 36/7 are set to the standard 500mV.

The TDA7263 audio chip is an 11-pin SGS-Thomson device incorporating class AB stereo output stages. It includes a mute facility which is activated at pin 3. This is controlled by two BC848B transistors, TS81 and TS90. They receive inputs from the microcontroller chip and the power-fail line.

The audio output from the loudspeakers is 5W RMS per channel. There are headphone outputs at 1·8V, 200Ω. The headphone sockets are switched, so the loudspeakers are isolated when the headphones are plugged in.

Mono sound circuitry

Fig. 17 shows the audio arrangements used in mono-sound models. In some of these sets an LA7220 chip, IX01, is used for scart switching. Sound IF demodulation is carried out by the STV8224 chip II01, which receives a DC input (0·5-5V) for volume control at pin 13 from pin 10 of IV01. Scart audio in/out is at pins 16 and 15 respectively. II01's audio output at pin 14 is fed to the TDA7253 audio output chip IS85 via a tone-control circuit: CS08 (47nF) is switched in/out of circuit by a BC848B transistor, TS12. Control of TS12 is from the microcontroller chip IR01 pin 13 or 14 depending on type, see later. The output at this pin is low for 'music' and high for 'voice'.

The muting arrangement is the same as in stereo models. Control is at pin 3 of IS85. Muting occurs when the receiver is switched on/off, when no transmissions is received and in the standby mode. Pin 8 of IS85 provides 5W RMS and there is again a 1·8V/200Ω switched headphone output.

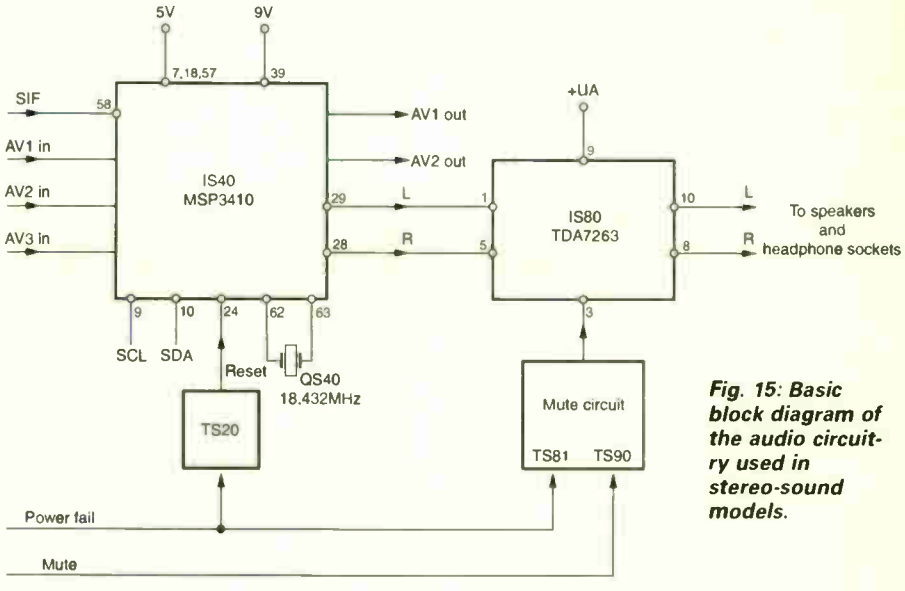


Fig. 15: Basic block diagram of the audio circuitry used in stereo-sound models.

Microcontroller systems

The microcontroller chip (IR01) used in the TX92 chassis is one of the ST9 series. The TX92 uses type ST9291J7B1, though there are variations with slightly different numbers and suffixes and part numbers. Check which one is fitted before ordering a replacement. The TX92F uses type ST9293J9B1. Again there are some variations. The main difference between these two basic types is in the pin connections – they both have 42 pins. Both operate in conjunction with an X24C04 EEPROM chip, IR02.

The pin connections to the microcontroller chip in the TX92 chassis are as follows:

Pin 1: Remote-control input. This is an interrupt-input pin, Schmitt triggered, for receiving and decoding IR control signals.
Pin 2: Reset. This is active low. To ensure proper reset of IR01 this pin must be held low for 53 cycles of the crystal oscillator in addition to the 10msec start-up period. The input comes from pin 6 of IP70 in the power supply
Pins 3 and 4: These provide the scart selection switching outputs AVE1 (pin 4) and AVE2 (pin 3). With AVE1 and AVE2 low the scart 1 input is selected; with AVE1 low and AVE2 high the scart 2 input is selected. With AVE1 high and AVE2 low the signal from the tuner is selected.
Pins 5 and 6: Keyboard row 0 and 1 scan outputs.
Pin 7: Keyboard column 1 input (channel up/down).
Pin 8: Not used.
Pin 9: Sound IF switching for mono receivers – low for systems I/D/K, high for systems B/G.
Pin 10: Keyboard column 0 input (volume up/down).
Pin 11: Used to control the standby LED and active high. With pin 11 high (standby) the red LED is on; with pin 11 pulsed (standby with child lock or standby with wake-up time set) the red LED is blinking; with pin 11 low (TV on) the brightness of the red LED is reduced.
Pin 12: CRT information – standard or flat.
Pin 13: Mono sound tone control. Low for 'music', high for 'voice'. With stereo models the sound 'ambience' conditions are selected by sending preset treble and bass values to the sound processor chip via the I²C bus.
Pin 14: Audio mute output. This provides 'anti-plop' during supply switching, i.e. on/off or into standby, also muting in the absence of a detectable transmission.
Pins 15-17: OSD outputs, blue pin 15, green pin 16, red pin 17.
Pin 18: OSD fast-blanking output. When any of the RGB outputs is active a logic 1 output pulse (5V) is generated. A voltage divider reduces the 5V to interface with the video processor chip IV01.
Pins 19 and 20: The I²C data and clock line connections respectively. The bus is connected to IV01, the EEPROM IR02 and IS40 (stereo models). There's a comprehensive range of service mode menus for setting picture, sound and operating conditions. Full details are provided in the relevant service manuals.
Pin 21: 5V supply.
Pin 22: Chassis connection
Pins 23 and 24: These pins are connected to the PLL filter and the reference current resistor respectively for the OSD oscillator circuit.
Pin 25: 5V supply for the analogue circuitry in IR01.
Pin 26: Line pulse input for OSD position control.
Pin 27: Field pulse input for OSD position control.
Pin 28: Format output. High for 4:3 and 16:9, low for centre with 4:3. This

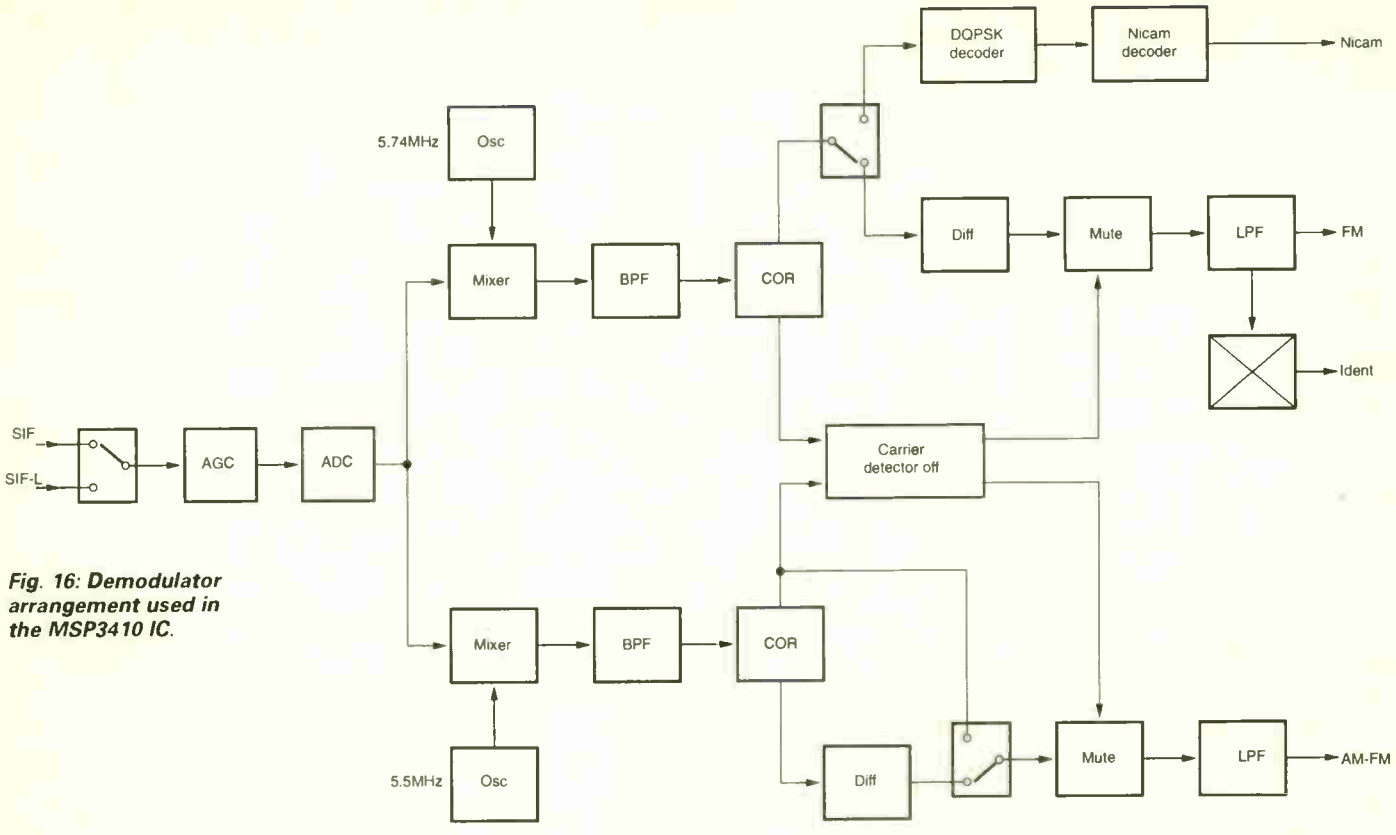


Fig. 16: Demodulator arrangement used in the MSP3410 IC.

command is used to switch a 16:9 set to a 4:3 'full information' display, i.e. blanked areas at the right- and left-hand sides of the screen.

Pin 29: Power control. High for standby, low for power on. This output is fed to pin 4 of IP70 in the power supply via an inverting transistor. TR02 (BC848C). So at IP70 its high for on and low for standby.

Pin 30: Safety input from TL60 in the line output stage. see Fig. 5 December issue. Various possible fault conditions are monitored, i.e. failure of the 26V field output stage supply, no field scanning, failure of the 13V supply, failure of the 200V supply and excessive CRT beam current.

If a fault condition is detected (high at pin 30) with the receiver in full operation, i.e. approximately two seconds after the on command. IR01 will switch off the receiver then switch it on again. This procedure will go through up to five trip cycles after which the receiver will remain off, indicating a permanent fault condition.

Pins 31 and 32: Trap switching control for various standards. For UK system I should be 01 for mono and 00 for stereo.

Pins 33-35: Band switching. For UHF pin 33 should be at 0, pins 34 and 35 at 1.

Pins 36 and 37: These are connected to the 8MHz crystal QR01. Since the internal clock frequency divider is not enabled in the TX92 chassis the internal clock runs at 8MHz.

Pin 38: Scart 2 pin 8 sensing input. See pin 41.

Pin 39: AC power-down detection input. Connected to the power-fail output from the power supply (see Fig. 3. November). This pin receives an early warning of power failure, enabling IR01 to back up current control data to the EEPROM IR02 before the supply to IR01 drops below the working level.

Pin 40: Tuning voltage PWM output.

Pin 41: Scart 1 pin 8 sensing input. Pins 38 and 41 monitor the voltage at pin 8 of the scart sockets via potential dividers. The receiver mode is TV with 0-0·9V at pin 38 or 41, AV 16:9 with 1·5-2·9V at pin 38 or 41 and AV 4:3 with 3·4-4·8V at pin 38 or 41.

Pin 42: AFC input. For station detection and fine tuning.

With the microcontroller used in the TX92F chassis the pin connections are as follows. See above for further details.

Pins 1 and 2: AVE2 and AVE1 control respectively.

Pins 3 and 4: I^2C bus SCL and SDA connections respectively.

Pins 5-12: As for the ST9291.

Pin 13: 5V supply.

Pin 14: Tone switching.

Pin 15: Mute command.

Pin 16: No connection.

Pin 17: OSD fast-blanking output.

Pins 18, 19, 20: OSD blue, green and red outputs.

Pin 21: Chassis connection.

Pins 22 and 23: OSD oscillator PLL filter and reference current resistor connections.

Pin 24: 5V supply for analogue circuitry.

Pin 25: Line pulse input.

Pin 26: Field pulse input.

Pin 27: Power control to IP70 via TR02.

Pin 28: AV2 pin 8 monitoring.

Pin 29: AV1 pin 8 monitoring.

Pin 30: Connection to 8MHz crystal.

Pin 31: Chassis connection.

Pin 32: Connection to 8MHz crystal.

Pin 33: Reset input from IP70.

Pin 34: Format output.

Pin 35: No connection.

Pin 36: Remote-control input.

Pin 37: AFC input.

Pin 38: Power-fail input.

Pins 39 and 40: Trap control.

Pin 41: No connection.

Pin 42: Safety input from TL60. High for switch off.

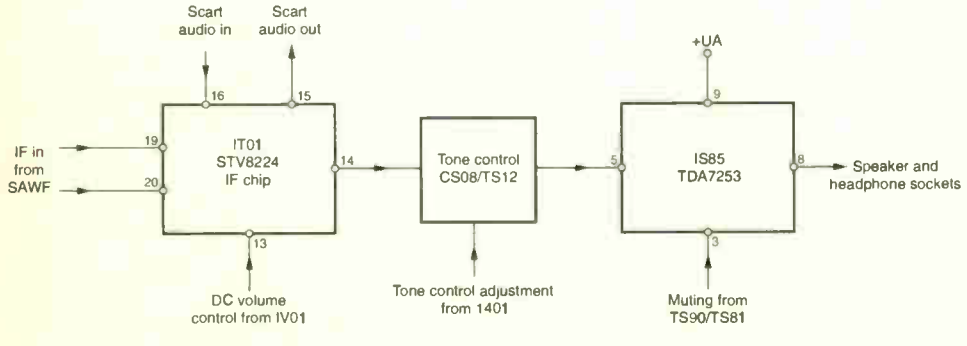


Fig. 17: Basic block diagram of the audio circuitry used in mono-sound models.

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The skills shortage

I was interested to read in Teletopics, December, that there's a lack of new blood entering the home electronics repair trade, and that the head of the Electronics Examination Board has drawn attention to this.

Let me illustrate the problems by telling you of two very good friends of mine, who we'll call Mr T and Mr V.

Mr T entered the trade in 1968, in the days of the BRC 2000 colour chassis. He saw dramatic changes in the industry during the following decades, and took on repair to component level of VCRs, CD and DVD players and microwave ovens, using his skills to cope with the changes from the DY86 to microcontroller-based TV systems, surround sound and other innovations. He had his own shop, which became steadily less profitable as the industry seemed bent on committing economic suicide. The hours became longer and the rewards fewer. Eventually he gave up and closed his shop. This highly-skilled engineer is now serving customers in the lighting department of a local B&Q DIY superstore. The shop is now a dry cleaners.

Meanwhile, 40 miles down the M62 in Liverpool, Mr V also does repairs. He too is a highly intelligent and skilled TV engineer who adapted to the many and dramatic changes in the consumer electronics repair trade and its economics. This is someone who is so skilled that the dreaded Thomson ICC5 chassis poses few problems for him! He too has his own shop. But to make a living he has been forced to open it for less than two days a week and take a job working at data entry in the Tax Office.

I am sure that these are typical of many such cases as the brain drain from our trade continues, with the trade losing its technical experts. They are not being replaced because the prospects and rewards are so poor.

Indeed never before have such high skill levels and dedication been rewarded so poorly. I too have suffered. The job I was forced to take pays £12k a year. I could earn the same money picking orders in a warehouse – or as a road sweeper in Derby.

Is it any surprise therefore that we are suffering from such a skills shortage?

I am of the opinion that British industry as a whole has got its priorities wrong. Put in a nutshell, the priorities these days are sales, sales, sales, sales, sales and, er, sales. A customer's TV set repaired out of warranty is seen not as a success for the engineer and for customer service but as a sales opportunity lost. The rewards all go to the sales staff, with service regarded as an unprofitable necessary evil there purely to sweep up as the sales department blunders on. Engineers are not valued: they are looked upon as a throwaway commodity along with the sets the trade sells.

I'd love to see some of those smiling salesmen cope in a flat on the local nightmare estate when faced with a faulty widescreen TV, a fuming customer, screaming kids and a huge pit bull terrier that sees him as lunch, something that TV engineers have to face all too often. They wouldn't stand a chance – just see them scurry about like headless chickens when such a customer turns up at their cosy shop!

Sales and service could and should work together. But salesmen often see the guys in the often ill-equipped room at the back as second-class citizens. I have often been called out of the workshop to sweep leaves from the front of the store as this was seen as something for the engineers to do.

The fact that spares are becoming harder and harder to obtain is another subject that's often discussed in this magazine. Could this be part of a policy to make repair less of a threat to sales targets? If components are not available, items cannot be repaired and become sales opportunities.

In closing, I have experience in repair to component level with all kinds of electronic equipment from 1930s valve

Live-test ESR checker

The live-test ESR checker I described last month (page 153) has played a part in most of my recent monitor repairs. As I've gained experience in using it, a problem has become apparent. The construction of some monitors makes it difficult to use the checker because there's no access to the print side of the main PCB unless it can be pulled into something that resembles a service position. With some IBM monitors this is virtually impossible. Despite this limitation, the checker has in its favour the fact that it is simple and can be built (mostly) from readily available salvaged components.

The original idea was that the checker would have a probe head which could be applied to the solder lands connected to each suspect electrolytic capacitor in turn. This was found to be difficult, because the awkward service position with many monitors makes it almost impossible to identify the correct solder lands "on the fly". I have found it much easier (and safer) to switch off and identify the electrolytic capacitor to be checked next, then solder the test probes to the track side.

In some cases the additional capacitance of the probe head has altered the fault symptom significantly, giving a double indication that the faulty electrolytic has been found.

Ian Field,
Letchworth, Herts.

radios to PCs. I have worked on broadcast transmitters, PMR, CCTV, broadband RF networks, cable TV, fibre optics, telephone exchanges (Marconi and Nokia). amateur radio equipment, data transmissions systems, cellular mobile equipment, domestic electronics, PA systems and access control. Surely this experience is of value to somebody? If it is, please feel free to contact me.

Steve Pendlebury,
Bush House, 218 Belmont Road,
Sharples, Bolton BL1 7AZ.

The Samsung SCT11D chassis

I was interested to read John Coombes' article on the Samsung SCT11D chassis in the December issue. One point that needs to be mentioned is the all-important change in the design of the SMR40200 chopper chip, the original often being responsible for power supply problems. The modified version contains a different chip mounted on a substrate with additional chip components. The overall shape and fitting are the same as the old 40200, so the modified version is a direct replacement – except that the original mounting insulator must be discarded. It's available from CHS and others at about £12.

Our standard procedure with a set fitted with this chassis is to replace the HIS0169C hybrid IC and fit a modified SMR40200C chip (unless the set has already been upgraded of course) and check the other power supply items mentioned by John. We do this regardless of the fault reported by the customer, because on several occasions when a non-supply fault has been repaired the customer has returned home, reconnected the set, then another switch-on surge has proved too much for the power supply, which went into the self-destruct mode, leaving an angry customer and some awkward explaining for us! It's a shame that this otherwise pretty good chassis was let down by an unreliable power supply design. But you experience many similar problems in this trade!

Chris Avis,
Exeter.

Model numbers

The Toshiba TV Model 21S04B has been mentioned on a couple of occasions recently. Though sold by Freemans (letters, December), it was not exclusive to this company. It appeared in a Toshiba brochure dated summer 2001, and was available through all the usual suppliers. The 21S04B was not made by Toshiba however, but by another company with two Ss in its name.

Graham Bond,
Bristol.

The JVC HRJ610EK

Here are some points to watch with these machines. The one I had recently was brought in because it sometimes left a loop of tape out when ejecting a cassette and occasionally snagged the tape, preventing removal of the cassette. When I dismantled the machine I found that it was spotlessly clean, but the mode switch (part no. PEME0757-03) was very discoloured. As the machine was about eight years old, it was a fairly safe bet that a new switch would cure the problem. So one was ordered and fitted, together with new loading and reel-drive belts. This proved to be the solution, but you can get into difficulties if you don't have a service manual.

When dismantling the machine take particular note of the flat cables WR4/WR5, which are connected to the AC head assembly, and WR8/WR9, which are connected to the top of the pre-rec board assembly. In both cases there are single sockets, CN1 and CN1001, with 7 and 6 pins respectively. But instead of single seven-way and six-way ribbon cables there are separate three-way, four-way, three-way and three-way cables, with no obvious indication of which way round each pair should be fitted. A quick dab of different colours of nail varnish on the cables and corresponding edge sockets will ensure correct positioning when they are refitted. Cables fitted the wrong way round will not cause any serious damage, but give peculiar results – guess how I found out! Of course Sod's Law states that at the end of a long day the pairs of cables will automatically lay themselves out in the wrong places.

Sockets CN1 and CN1001 and several on the main PCB are of the type that require the top edge of the socket to be lifted slightly to release the cables and pressed down again to secure the cables when these are reinserted. The 18-way flat printed connector from CN1 on the deck-terminal board to CN601 is different in that the sockets are fixed and a tight grip on the connector strip. The pressure of the socket on the printed tracks produces noticeable indentations on the printed contact wires, and sometimes you find that the end of the print has lifted away slightly from the plastic backing. If this is not noticed, the end can peel away from the backing as a result of pressure from the contacts on reinsertion. If this happens with contact 18 for example, rewind doesn't stop at the end of the tape because the link between the end-of-tape sensor and pin 80 of the microcontroller chip IC601 is now open-circuit. The cure is to trim, very carefully, 2mm from the end of the ribbon cable, using a good pair of sharp scissors. A faint smear of silicone grease or petroleum jelly before insertion is also desirable.

When carrying out the final assembly, note the jog/shuttle control on the front panel. It's connected to the main PCB by a seven-wire lead from seven-pin socket CN602 to a socket that's clipped to the side of the jog/shuttle control. Catch 22 is that this socket is longer than the seven-pin plug at the end of the connecting lead.

Faulty PC electrolytics

In the October 2002 issue, page 756, I wrote about faulty electrolytic capacitors on a PC motherboard (see Photo 1). Information on such failures has recently become available via the internet – go to the web page

http://www.niccomp.com/taiwanlowesr.htm

The source of the information is an article in the September/October issue of *Passive Component Industry Magazine*. It reported an unusually high failure rate with low-ESR aluminium electrolytic capacitors produced by a number of manufacturers in Taiwan. The cause is a problem with the aqueous electrolyte, which proved to be unstable when packaged in an aluminium can. Electrolysis occurs, with a build-up of hydrogen within the can. The result is rupture of the can or destruction of the rubber end-seal. In either case leakage of electrolyte can cause further damage. Lifetime tests on some of these capacitors have revealed failure after 2,000 hours with components rated for 4,000 hours' operation. Intel has stated that failure can occur after only 250 hours' operation.

Photo 1: A group of faulty PC motherboard electrolytic capacitors.

Jack Armstrong,
Sandbach, Cheshire.

So the plug can quite easily be fitted one pin to the left of the correct position, in which case you find that after final assembly everything works fine except for the jog/shuttle control, which just sulks and refuses to do anything.

After re-opening the machine and removing the front panel you peer into the depths of the socket on the control and discover that it has eight contacts but only seven terminate in pins. Shock horror, did one of them come away when you originally dismantled the machine? No, the eighth (first?) pin was never there. When you count the contact holes in the plug, seven, and the number of pins in the socket, seven, the penny drops. JVC has arranged for a seven-pin plug to fit into an eight-pin socket without a locating key to make sure that it goes into the right position. Nice one JVC!

Until a couple of years ago I used a Polaroid camera to photograph the innards of an unfamiliar piece of equipment before I delved into it – this is quicker and more accurate than making sketches, which also tend to attract coffee mugs. Nowadays I use a digital camera with an LCD viewfinder for this purpose. It's much cheaper, but sometimes I forget it!

John C. Priest,
Blackpool, Lancs.

Starting up

It was probably not the best time to chose, but back in 1995 we decided to start in business ourselves, after spending years working for others and a spell with various local authorities, who didn't like you to work! Here are some of the things we learnt when we started out.

Officials appeared wanting to know this and that and whether or not we were insured. Of course we were, very expensively, thank you. We now insure through Girobank, and do all our banking with them as well, as they are much cheaper.

The bin man appeared and told us we would have to pay £500 a month for rubbish collection. Not likely! We made our own arrangements with a private firm for the one bag a week.

An over-persuasive salesman sold us a lot of rubbish, which we still have! We now buy only what we want and insist that all representatives make an appointment, which we keep to half an hour. Most companies just phone once a week for orders, which we find most convenient – especially as they don't employ salesmen.

"I'm from the Health and Safety Executive" claimed another man, "you need a fire extinguisher". We have three thank you! My friend supplies and services them, and I do his tellys. Unfortunately he fooled the man in the Tee Shirt shop next door, who bought a powder one for £250. We were so disgusted we phoned the local fire station. The response was "Aah no! Powder's no use for clothing. You need water". My advice is to talk to the fire station first – they are very helpful – then buy from Viking Direct, whose prices are reasonable.

Then there was a surprise visit from TV Licensing, who check their returns now and again. Do be sure to send the returns back quickly, otherwise you risk prosecution. If, like us, you don't sell many TVs, videos etc., servicing them instead, make this clear. Otherwise they misunderstand the situation.

Finally a water official told us we had to have a water meter fitted, or else. Apparently this is not the case, though it's not what Offwat will tell you. As long as you don't go into the red with the water company you can politely refuse, which we did on the basis of security. Legally, you are entitled to do this.

Mike Adye,
A.D. Radio and TV,
West Norwood, London.

HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department or e-mail tessa2@btinternet.com

Wanted: Lower drum for the Sanyo VCR Model VHR291E, or a complete unit/scrap machine. Also a working Ferguson TX9 chassis with text interface and decoder PCB. Expenses paid. Ron Bruce, 11 New Zealand Way, Rainham, Essex RM13 8JP. 01708 558 792.

Wanted: Early (pre-1975) colour TV sets, equipment, picture monitors, spare parts, home-built equipment, catalogues etc. Please phone Keith Parker on 020 8422 5049.

Wanted: Help with a Proline TVC140 combi unit. When it's switched on a word (heat run) is permanently displayed at the top of the screen. I replaced the EEPROM but was left with lack of frame. Can someone tell me how to get rid of the heat run or get into the service setup. Vic Harris, Longfield Radio, 4 Ash Road, Dartford, Kent DA1 2RL. Phone 01322 226 835.

Wanted: A 30-line video recorded on a 12in. 78 r.p.m. disc by Baird of Plews; Philips 1in. video tape on an 8in. reel; also any obsolete and unusual radio and TV related items. All expenses paid. Please phone John Clappison on 01964 622 734 (Hull) evenings.

Wanted: Engineer code to access the set-up menus with the De Graaf TV Model D51HZ5. Someone in the trade must remember these sets, even if only because of the triangular remote-control unit! Am also looking for a DC-DC converter for the Sony C9 Beta VCR. Please phone Graham Denton on 01132 529 554 or email graham@kawasaki.org.uk

Wanted: Old half-inch ferrite rods, must be 6in. long or more. Willing to pay good money for them. Peter Tankard, 16A Birkendale Road, Sheffield S6 3NL. Please phone on mobile 079 31 463 823 between 9 a.m. and 10 p.m.

Wanted/for disposal: Require a Ferguson VCR Model 3V43 or the equivalent JVC Model HRD725EK for spares. Have for disposal several *Radio and Television Servicing* books dating from the Fifties and Sixties. Free to anyone who can collect or will pay the postage. Malcolm Priestley, 32 Bankpark Grove, Tranent, East Lothian EH33 1AU. Phone 01875 611 741.

Wanted: Quad 33 preamplifiers, FM3 tuners and 405 power amplifiers for spares. Phone Mike on 01758 613 790.

Wanted: Information on how to put the Philips Model 25PT4457 into the service mode. I need to alter the width. Also, does anyone know where I can obtain a line output transformer for the Philips G8 chassis? Steve Ball, 16 Scott Close, Stanground, Peterborough. Phone 01733 347 678 or email steve@ball7750.freeserve.co.uk

Wanted: Circuit diagrams for the following radio receivers: Grundig KS716 radiogram; Norleco LX38T/54 portable; Cossor 45. Also for the following test gear: Taylor 94A; Labgear E5780A pattern generator; Philips 9522 electronic test meter. Any information or scrap units appreciated. Costs met. Jim Littler, 363 Atherton Road, Hindley Green, Wigan, Lancs WN2 3XD. Phone 01942 726 379 or 07990 963 918.

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MJE15029	£2.00
MJE15030	£2.50
MJE15031	£4.00
MJE16002	£3.00
MJE18004	£1.25
MJE18006	£1.20
MJE18008	£1.50
MJE243	£0.60
MJE253	£0.85
MJE340	£0.25

Part No.	Price
MJE350	£0.80
MJF	
MJF16206	£4.50
MJF18004	£1.75
MJF18006	£2.00
MJF18008	£1.75
MJF18204	£2.50
STK0025	£4.20
STK0039	£6.00
STK086	£10.00
STK1039	£4.60
STK1040	£6.40
STK1049	£7.00
STK1050	£6.50
STK1060	£7.00
STK2025	£6.20
STK2028	£5.00
STK2029	£6.00
STK2030	£10.00
STK2038	£7.00
STK2048	£9.50
STK2058 IV	£16.00
STK2101	£10.50
STK2110	£5.50
STK2139	£6.75
STK2155	£9.00
STK2230	£4.70
STK3102 II	£5.30
STK3106	£25.00
STK3122 III	£7.25
STK3152 II	£9.00
STK3156	£5.00
STK350-030	£7.00
STK392-040	£12.00
STK401-050	£8.00
STK401-080	£9.00
STK401-120	£10.00
STK401-140	£12.00
STK4017	£4.00
STK4019	£4.80
STK402-040	£7.00
STK402-070	£7.00
STK402-070	£7.00
STK402-071	£7.00
STK402-090	£8.00
STK4021	£3.80
STK402-100	£9.00
STK402-100	£9.00
STK402-120	£9.00
STK4024 II	£5.50
STK4025	£5.30
STK4026	£4.80
STK4026II	£4.80
STK4026V	£5.00
STK4028	£5.50
STK4032 II	£5.10
STK4034 X	£9.25
STK4036	£4.70
STK4036V	£8.00
STK4038	£6.80
STK4040 II	£6.50
STK4042 II	£8.00
STK4046	£9.50
STK4050 II	£16.00
STK405-030	£7.00
STK405-050A	£12.00
STK405-070A	£8.00
STK4050V	£15.00
STK405-120	£11.00
STK4060	£5.10
STK4065	£6.50
STK407-040	£7.00
STK407-070	£8.50
STK407-090	£8.50
STK4101	£5.00
STK4111	£4.00
STK4112	£5.00
STK411-230	£12.00
STK411-240E	£14.00
STK4121	£4.80
STK412-150	£18.50
STK4122	£5.60
STK4130 II	£7.00
STK4130II	£7.00
STK4131	£4.80
STK4132 II	£6.00
STK4133 II	£7.50
STK4140 II	£8.00
STK4141 II	£4.20
STK4141 V	£6.00
STK4142	£5.30
STK4151	£6.80
STK4152	£6.50
STK4154V	£14.00
STK4161	£6.50
STK4161V	£8.50
STK4162	£5.50
STK4164 II	£11.75
STK4171	£9.00
STK417-130	£15.00
STK4172 II	£6.80
STK4181	£6.80
STK4182 II	£9.00

Part No.	Price
STK4191	£9.00
STK4191 X	£14.00
STK419-130	£15.00
STK419-140	£16.00
STK4192	£7.00
STK4197 II	£9.50
STK4199 II	£10.50
STK4199II	£10.50
STK420	£4.00
STK4204 II	£10.50
STK4204II	£10.50
STK4211 II	£10.00
STK4211 V	£8.00
STK4221 II	£12.00
STK4231 II	£10.50
STK4231 V	£14.00
STK4241	£10.50
STK4241 V	£12.50
STK4272	£5.00
STK4273	£5.50
STK4274	£5.00
STK4274	£5.00
STK430	£5.00
STK4301	£5.00
STK4311	£6.50
STK433	£4.00
STK4332	£3.65
STK435	£3.75
STK4352	£5.00
STK436	£4.30
STK4362	£4.50
STK437	£6.00
STK4372	£4.90
STK439	£5.00
STK4392	£5.00
STK441	£6.80
STK4412	£4.50
STK443	£7.00
STK4432	£6.00
STK457	£4.70
STK459	£5.60
STK460	£6.60
STK461	£6.00
STK463	£9.50
STK465	£9.00
STK4773	£8.20
STK4793	£8.00
STK4803	£10.00
STK4813	£8.00
STK4833	£8.50
STK4843	£7.20
STK4853	£17.00
STK4863	£7.00
STK4873	£11.00
STK488-010	£8.00
STK488-050	£8.00
STK4893	£10.00
STK4913	£9.00
STK501	£5.50
STK50322	£3.50
STK5314	£4.75
STK5315	£5.00
STK5323	£6.00
STK5324	£3.00
STK5325	£3.70
STK5326	£7.50
STK5330	£8.50
STK5331	£3.00
STK5332	£1.80
STK5333	£6.50
STK5335	£3.50
STK5336	£3.50
STK5337	£5.00
STK5338	£2.95
STK5339	£4.00
STK5340	£3.50
STK5342	£2.45
STK5343	£3.80
STK5352	£5.00
STK5352	£5.00
STK5353	£4.00
STK5361	£3.75
STK5362	£4.00
STK5364	£2.50
STK5364	£2.50
STK5371	£3.50
STK5371	£3.50
STK5372	£2.60
STK5373	£3.75
STK5383	£3.00
STK5391	£3.75
STK5392	£5.00
STK5421	£4.50
STK5422	£3.75
STK5431	£5.50
STK5434	£5.70
STK5436	£5.00
STK5441	£3.50
STK5443	£5.75
STK5446	£3.50
STK5451	£3.90
STK5461	£5.00
STK5462	£3.50

Part No.	Price
STK5464	£3.00
STK5466	£5.00
STK5467	£4.00
STK5468	£3.00
STK5471	£9.00
STK5472	£3.75
STK5473	£4.80
STK5474	£5.00
STK5476	£3.50
STK5477	£4.50
STK5478	£2.50
STK5479	£3.00
STK5481	£4.70
STK5482	£2.85
STK5483	£4.40
STK5486	£4.50
STK5487	£5.25
STK5488	£4.80
STK5490	£4.50
STK561	£4.00
STK563	£4.15
STK5632	£3.00
STK5720	£4.00
STK5725	£3.50
STK5730	£3.00
STK583	£4.00
STK6316	£3.00
STK6324B	£5.00
STK6327	£12.00
STK6328A	£4.00
STK6431	£6.00
STK6607	£4.00
STK6712BIV	£5.50
STK6722	£6.50
STK6732	£10.00
STK6822	£7.50
STK6875	£6.50
STK6922	£10.00
STK6932	£4.50
STK6962	£2.75
STK6972	£3.00
STK6981B	£5.00
STK6982	£6.00
STK6982H	£6.00
STK7216	£4.20
STK7217	£2.50
STK7225	£5.00
STK7226	£17.00
STK7233	£7.00
STK7251	£5.00
STK7253	£6.50
STK730-060	£6.50
STK730-080	£6.00
STK7308	£7.00
STK7309	£4.00
STK7310	£3.20
STK73405 II	£5.50
STK73410	£3.50
STK73410 II	£5.00
STK7348	£4.00
STK7356	£4.25
STK7358	£4.40
STK7359	£4.25
STK73605	£3.75
STK73907	£7.00
STK73908	£5.50
STK73908	£5.50
STK7402	£5.60
STK7404	£6.00
STK7406	£6.50
STK7406H	£7.50
STK7408	£6.75
STK7410	£15.00
STK7458	£12.50
STK746	£9.00
STK752	£3.00
STK7554	£4.80
STK7561	£6.50
STK7561A	£7.00
STK7562	£10.00
STK7563	£8.00
STK7563F	£6.50
STK7573	£3.00
STK7576	£15.00
STK760	£5.00
STK761	£3.00
STK770	£4.00
STK7707	£9.00
STK780	£4.80
STK78603	£7.50
STK78617	£24.00
STK795	£3.25
STK8050	£16.00
STK8250	£5.00
STK8260	£12.00
STK8280	£18.50
STR10006	£4.50
STR11006	£3.25
STR17006	£5.00
STR20005	£4.50
STR30115	£2.75
STR3315	£2.75
STR370	£3.00

Part No.	Price
STR371	£4.00
STR380	£3.50
STR381	£3.90
STR383	£4.10
STR384	£3.50
STR40090	£3.50
STR40115	£6.00
STR4090A	£6.50
STR41090	£3.30
STR4142	£4.50
STR4211	£3.15
STR43111	£9.50
STR440	£8.00
STR441	£9.50
STR44115	£4.75
STR442	£16.00
STR450A	£7.00
STR451	£8.00
STR45111	£5.50
STR4512	£4.00
STR452	£4.75
STR453	£5.00
STR454	£13.00
STR455	£5.50
STR456	£4.70
STR457	£6.00
STR470	£3.00
STR50020	£3.50
STR50092	£5.50
STR50103A	£2.60
STR50112A	£6.50
STR50113	£5.00
STR50115	£5.00
STR50213	£4.00
STR50330	£4.75
STR51041	£5.00
STR51213	£5.00
STR51424	£7.00
STR53041	£4.00
STR54041	£3.20
STR5412	£2.80
STR55041	£4.50
STR56041	£5.50
STR58041	£2.50
STR59041	£3.00
STR60001	£5.25
STR6008X	£5.75
STR6020	£2.70
STR61001	£4.75
STR7001	£6.00
STR80145	£4.75
STR81145	£3.75
STR81159	£4.00
STR8124	£10.00
STR83145	£5.00
STR83159	£7.00
TDA1420	£8.00
TDA1470	£12.00
TDA1514A	£3.25
TDA1540	£4.20
TDA1541	£5.00
TDA1541A	£4.00
TDA1546T	£10.50
TDA1547	£10.00
TDA1552Q	£3.50
TDA1553AQ	£3.25
TDA1553CQ	£3.00
TDA1554Q	£3.00
TDA1555Q	£3.75
TDA1556Q	£3.25
TDA1557Q	£3.00
TDA1558Q	£3.00
TDA1561Q	£5.00
TDA1562Q	£5.50
TDA1580	£4.25
TDA1599	£4.00
TDA1602A	£4.00
TDA16846	£2.00
TDA1670A	£2.00
TDA1675	£2.50
TDA1675A	£2.00
TDA16833	£2.00
TDA16846	£2.00
TDA1701	£14.00
TDA1770	£7.50
TDA1771	£2.00
TDA1870A	£2.00
TDA1872A	£2.75
TDA1908A	£2.50
TDA1940	£6.00
TDA1941	£3.00
TDA2003	£0.65
TDA2004	£1.50
TDA2005	£1.50
TDA2006	£0.70
TDA2009	£1.60
TDA2020	£1.20
TDA2030	£0.80
TDA2030H	£1.00
TDA2048	£6.00
TDA2050V	£2.00
TDA2051V	£4.50
TDA2052V	£5.25

Part No.	Price
TDA2450-3	£10.00
TDA2460-2	£0.70
TDA2501	£3.00
TDA2506T	£8.00
TDA2507	£4.50
TDA2510	£4.50
TDA2514A	£5.00
TDA2515	£4.50
TDA2520-1	£9.00
TDA2521	£8.00
TDA2522	£12.00
TDA2523	£8.50
TDA2525	£4.50
TDA2530	£3.00
TDA2548	£2.00
TDA2549	£3.00
TDA2558	£4.00
TDA2560Q	£7.00
TDA2560-3	£14.00
TDA2574V	£3.50
TDA2576A	£9.00
TDA2577A	£2.00
TDA2578A	£7.00
TDA2579A	£2.10
TDA2579B	£3.25
TDA2652	£48.00
TDA2653A	£4.50
TDA2710-1	£4.00
TDA2820M	£1.00
TDA2822M	£0.60
TDA3190	£2.00
TDA3301B	£16.00
TDA3303	£7.00
TDA3501	£3.00
TDA3502	£3.60
TDA3504	£3.00
TDA3507	£4.50
TDA3521	£7.50
TDA3560	£6.00
TDA3561	£3.00
TDA3561A	£3.00
TDA3562A	£2.60
TDA3563	£3.50
TDA3563A	£4.00
TDA3564	£3.25
TDA3565	£2.20
TDA3566	£2.80
TDA3566A	£3.00
TDA3567	£3.50
TDA3569	£3.00
TDA3570	£3.75
TDA3576B	£7.00
TDA3650	£6.75
TDA3651	£2.00
TDA3651A	£3.50
TDA3652	£5.00
TDA3652TX10	£8.00
TDA3653B	£0.80
TDA3653C	£0.85
TDA3654	£0.80
TDA3654Q	£0.85
TDA3724	£3.00
TDA3725	£3.00
TDA3730	£4.00
TDA3740	£4.00
TDA3750	£4.00
TDA3770	£7.75
TDA3771	£4.60
TDA3803A	£5.00
TDA4400	£1.75
TDA4420	£1.20
TDA4421	£3.00
TDA4422	£2.00
TDA4427	£3.00
TDA4429T	£20.00
TDA4431	£1.50
TDA4474	£4.00
TDA4480	£6.00
TDA4481	£2.15
TDA4482	£11.00
TDA4500	£3.00
TDA4501	£2.80
TDA4502	£4.00
TDA4503	£3.25
TDA4504B	£8.00
TDA4505A	£3.00
TDA4505E	£6.50
TDA4510	£2.00
TDA4556	£3.70
TDA4557	£4.00
TDA4560	£2.70
TDA4565	£1.50
TDA4566	£2.50
TDA4568	£2.25
TDA4580	£10.00
TDA4600	£2.00
TDA4600II	£1.60
TDA4601	£1.20
TDA4601D	£0.65
TDA4605	£1.90
TDA4610	£3.70
TDA4650	£3.00
TDA4651	£8.00

Part No.	Price
TDA4665	£2.50
TDA4670	£4.75
TDA4671	£5.00
TDA4680	£3.50
TDA4681	£4.50
TDA4685	£2.75
TDA4686	£5.00
TDA4687	£5.00
TDA4700A	£7.50
TDA4710H	£7.00
TDA4714C	£3.50
TDA4716C	£4.50
TDA4720	£6.60
TDA4725	£7.50
TDA4780	£6.00
TDA4800	£3.00
TDA4810	£5.00
TDA4850	£4.75
TDA4851	£3.25
TDA4852	£3.25
TDA4854	£5.00
TDA4855	£6.00
TDA4856	£5.00
TDA4858	£3.50
TDA4860	£2.00
TDA4861	£3.50
TDA4866	£2.75
TDA4880	£4.50
TDA4918A	£17.00
TDA4930	£5.00
TDA4935	£3.00
TDA4940	£2.00
TDA4941	£2.80
TDA4942	£2.00
TDA4950	£1.00
TDA4951	£4.50
TDA5010	£3.00
TDA5400	£6.00
TDA5500	£9.00
TDA5600	£4.50
TDA5610-2	£7.50
TDA5620	£4.50
TDA5702	£13.00
TDA5830-2	£11.00
TDA6100Q	£1.50
TDA6101Q	£1.20
TDA6103Q	£2.25
TDA6106Q	£1.25
TDA6107Q	£3.00
TDA6108JF	£3.00
TDA6111Q	£2.25
TDA6120Q	£5.50
TDA6160-2S	£4.75
TDA6160-2X	£2.50
TDA7052	£1.20
TDA7056	£2.00
TDA7262	£3.25
TDA7263	£3.50
TDA7263M	£4.00
TDA7264	£5.00
TDA7265	£5.00
TDA7266	£5.00
TDA7269	£5.00
TDA7269A	£2.75
TDA7293V	£5.50
TDA7294V	£5.50
TDA7295	£4.00
TDA7296	£5.00
TDA7297	£3.50
TDA7300	£5.50
TDA7302	£4.50
TDA7310	£8.00
TDA7312	£4.50
TDA7313	£6.50
TDA7318	£5.50
TDA7330A	£7.00
TDA7340	£8.00
TDA7350	£3.00
TDA7359	£3.00
TDA7360	£7.00
TDA7362	£4.50
TDA7365	£5.50
TDA7370V	£3.25
TDA7372A	£4.50
TDA7374V	£3.50
TDA7375V	£5.25
TDA7376B	£10.00
TDA7377	£4.50
TDA7381	£11.00
TDA7384A	£11.00
TDA7385	£10.00
TDA7386	£11.00
TDA7393	£10.00
TDA7394	£6.00
TDA7396	£4.50
TDA7431	£7.00
TDA7439	£6.50
TDA7495	£4.25
TDA7560	£18.00
TDA8000	£4.25
TDA8116	£3.50
TDA8120B	£4.00
TDA8137	£2.00

Part No.	Price
TDA8138	£2.00
TDA8138A	£1.30
TDA8138B	£2.00
TDA8139	£2.00
TDA8140	£2.00
TDA8143	£1.60
TDA8145	£1.20
TDA8146	£2.00
TDA8153	£10.00
TDA8170	£1.70
TDA8171	£2.30
TDA8172	£2.00
TDA8173	£1.75
TDA8174	£2.00
TDA8175	£7.00
TDA8177	£3.00
TDA8177F	£3.50
TDA8179S	£7.50
TDA8180	£12.50
TDA8205	£12.50
TDA8212	£3.50
TDA8214B	£10.50
TDA8215H	£3.00
TDA8217	£2.25
TDA8303	£2.50
TDA8304	£4.00
TDA8305	£5.00
TDA8305A	£5.00
TDA8310	£6.00
TDA8350Q	£2.75
TDA8351	£2.00
TDA8354Q	£2.75
TDA8356	£2.00
TDA8360N3	£8.00
TDA8361AN3	£8.00
TDA8361N3	£9.00
TDA8362AN	£12.00
TDA8362AN3	£7.50
TDA8362BN3	£8.50
TDA8362N3	£12.00
TDA8362N4	£9.00
TDA8362N5	£12.00
TDA8366N2	£15.00
TDA8366N3	£11.50
TDA8370	£11.50
TDA8372A	£16.50
TDA8374	£10.00
TDA8375A	£12.50
TDA8376	£15.00
TDA8380	£2.00
TDA8424	£4.00
TDA8425	£5.00
TDA8432	£5.50
TDA8433	£6.00
TDA8440	£3.00
TDA8443	£3.50
TDA8451	£3.25
TDA8453	£3.50
TDA8481	£9.50
TDA8501	£3.75
TDA8505	£11.00
TDA8560Q	£4.25
TDA8561Q	£5.25
TDA8562Q	£5.00
TDA8563Q	£4.75
TDA8565Q	£11.00
TDA8566Q	£5.50
TDA8567Q	£7.00
TDA8568Q	£6.00
TDA8569Q	£8.00
TDA8571J	£9.00
TDA8703	£5.00
TDA8708	£6.00
TDA8709	£7.00
TDA8741	£5.50
TDA8745	£8.50
TDA8840	£10.00
TDA8841	£10.00
TDA8842	£14.00
TDA8843	£15.00
TDA8844	£14.00
TDA9102C	£2.50
TDA9103	£4.75
TDA9105	£5.00
TDA9109	£10.00
TDA9141	£6.25
TDA9143	£4.00
TDA9144	£12.00
TDA9151	£11.00
TDA9160A	£9.50
TDA9162	£11.00
TDA9170	£7.00
TDA9176	£6.50
TDA9177	£8.00
TDA9210	£4.50
TDA9302H	£2.25
TDA9500	£7.50
TDA9503	£9.00
TDA9610H	£9.50
TDA9614H	£8.00

Please note that this a very small selection of the transistors and IC's that we stock.
We stock a full range of Japanese Transistors 2SA,2SB, 2SC,2SD,2SJ,2SK series , Diodes , CMOS , TTL Logic ICs , Computer ICs , Zenor Diodes...etc

K.P. House , Unit 15 , Pop In Commercial Centre , Southway , Wembley , Middlesex . HA9 0HB England

Tel : (020) 8900 2329 Fax : (020) 8900 2329 Email : sales@grandata.co.uk

Grandata Ltd

distributor of electronic components

CD Pick Ups and Mechanisms

Part No	Price	Part No	Price	Part No	Price
CDM12.1 Mechanism	£14.00	KSS 213 B	£8.75	OPTIMA 6 S	£11.50
KHM220AAA DVD Mechanism	£ 40.00	KSS 213 C	£9.50	OPTIMA 5	£11.50
KSS 210A Original	£11.00	KSS 213 D	£16.00	RCTRTH8151	£20.00
KSS 210A Replacement	£9.50	KSS 213 F	£12.00	RCTRTH8112	£14.00
KSS 210 B	£15.00	KSS 240 A	£30.00	RCTRH8147 Mech	£ 10.00
		NKS 240 A Replacment for KSS240A	£20.00		

CD Spindle Motors

22.5 mm Shaft — Order Code : CDMOT1 — Price : £ 2.00 + vat

8mm Shaft — Order Code : CDMOT2 — Price : £ 2.00 + vat

105°c Radial Electrolytic Capacitors

VALUE	CODE	PRICE	PER PACK
10 Volts			
100uF	CAP118	£0.45	10
470uF	CAP29	£1.20	10
1000uF	CAP119	£1.50	10
2200uF	CAP120	£2.10	10
16 Volts			
22uF	CAP121	£0.35	10
33uF	CAP122	£0.35	10
47uF	CAP123	£0.35	10
100uF	CAP124	£0.60	10
220uF	CAP125	£0.80	10
330uF	CAP30	£1.75	10
470uF	CAP31	£1.75	10
680uF	CAP32	£2.10	5
1000uF	CAP33	£2.10	10
2200uF	CAP34	£5.25	10
3300uF	CAP35	£5.00	5
4700uF	CAP36	£6.10	10
25 Volts			
10uF	CAP37	£0.45	10
22uF	CAP38	£0.45	10
33uF	CAP126	£0.40	10
47uF	CAP39	£0.48	5
68uF	CAP127	£0.55	10
100uF	CAP40	£0.70	10
120uF	CAP128	£0.85	10
150uF	CAP41	£0.95	5
220uF	CAP42	£1.20	10
330uF	CAP43	£1.40	5

VALUE	CODE	PRICE	PER PACK
35 Volts...continued			
470uF	CAP44	£1.90	10
680uF	CAP45	£3.15	5
1000uF	CAP46	£3.65	101500uF
	CAP47	£3.90	5
2200uF	CAP48	£2.00	2
3300uF	CAP49	£2.20	2
4700uF	CAP50	£3.65	2
6800uF	CAP51	£3.90	2
35 Volts			
1uF	CAP130	£0.40	10
3.3uF	CAP131	£0.40	10
4.7uF	CAP132	£0.45	10
10uF	CAP52	£0.50	10
22uF	CAP53	£0.45	10
33uF	CAP54	£0.50	5
47uF	CAP55	£0.85	10
68uF	CAP133	£0.55	10
100uF	CAP56	£0.85	10
150uF	CAP57	£0.95	5
220uF	CAP58	£1.45	5
330uF	CAP134	£1.60	10
470uF	CAP135	£1.75	10
680uF	CAP59	£6.50	10
1000uF	CAP60	£4.35	10
2200uF	CAP61	£2.45	2
3300uF	CAP62	£10.00	5
4700uF	CAP136	£3.50	2
50 Volts			
1uF	CAP137	£0 35	10

VALUE	CODE	PRICE	PER PACK
50 Volts...continued			
2.2uF	CAP138	£0.35	10
3.3uF	CAP139	£0.35	10
4.7uF	CAP140	£0.35	10
10uF	CAP63	£0 50	10
22uF	CAP64	£0.70	10
33uF	CAP141	£0.85	10
47uF	CAP65	£0.85	10
68uF	CAP142	£0.90	10
100uF	CAP66	£0.85	10
220uF	CAP67	£1.75	10
330uF	CAP68	£2.45	10
470uF	CAP69	£4.35	10
680uF	CAP70	£4.90	5
1000uF	CAP71	£5.25	10
1500uF	CAP143	£4.50	5
2200uF	CAP72	£3.25	2
3300uF	CAP144	£3.25	2
63 Volts			
0.22uF	CAP145	£0.45	10
0.47uF	CAP73	£0.35	10
1uF	CAP74	£0.35	10
2.2uF	CAP75	£0.35	10
3.3uF	CAP76	£0.50	10
4.7uF	CAP77	£0.35	10
10uF	CAP78	£0.50	10
15uF	CAP79	£0.95	5
22uF	CAP80	£0.75	10
33uF	CAP81	£0.85	10
47uF	CAP82	£0.95	10

VALUE	CODE	PRICE	PER PACK
63 Volts...continued			
68uF	CAP83	£1.30	5
100uF	CAP84	£1.20	10
150uF	CAP85	£2.80	5
220uF	CAP86	£2.80	10
330uF	CAP87	£4.00	10
470uF	CAP88	£5.25	10
680uF	CAP89	£5.00	10
1000uF	CAP90	£5.40	5
100 Volts			
0.47uF	CAP91	£0.50	5
1uF	CAP92	£0.85	10
1.5uF	CAP93	£0.70	5
2.2uF	CAP94	£0.50	5
3.3uF	CAP95	£0.50	5
4.7uF	CAP96	£0.50	5
10uF	CAP97	£0.95	10
22uF	CAP98	£1.05	10
33uF	CAP99	£1.55	5
47uF	CAP100	£1.75	10
100uF	CAP101	£2.10	10
220uF	CAP102	£6.00	5
470uF	CAP103	£6.00	5
160 Volts			
2.2uF	CAP146	£0.45	10
10uF	CAP147	£1.40	10
22uF	CAP148	£1.80	10
33uF	CAP149	£2.30	10
100uF	CAP150	£3.25	5

VALUE	CODE	PRICE	PER PACK
200 Volts			
100uF	CAP151	£3.25	5
250 Volts			
1uF	CAP152	£0.60	10
3.3uF	CAP104	£1.75	10
10uF	CAP105	£2.60	10
22uF	CAP153	£2.30	10
47uF	CAP106	£4.35	10
100uF	CAP154	£4.50	5
220uF	CAP155	£2.00	2
350 Volts			
1uF	CAP156	£0.70	10
3.3uF	CAP157	£1.50	10
10uF	CAP158	£2.25	10
22uF	CAP159	£3.40	10
400 Volts			
1uF	CAP107	£2.15	5
2.2uF	CAP108	£2.25	5
4.7uF	CAP109	£3.15	5
10uF	CAP110	£4.00	5
22uF	CAP111	£2.50	2
47uF	CAP112	£3.50	2
100uF	CAP160	£4.00	2
220uF	CAP161	£7.00	2
450 Volts			
1uF	CAP113	£2.80	5
2.2uF	CAP114	£3.20	5
4.7uF	CAP115	£4.95	5
10uF	CAP116	£5.50	5
22uF	CAP117	£4.15	2

Fuses

20mm Glass

Time Lag

CURRENT RATING	ORDER CODE	PRICE
100mA	FUSE36	75p
160mA	FUSE01	75p
250mA	FUSE02	75p
315mA	FUSE03	75p
400mA	FUSE04	75p
500mA	FUSE05	75p
630mA	FUSE06	75p
800mA	FUSE07	60p
1A	FUSE08	60p
1.25A	FUSE09	60p
1.6A	FUSE10	60p
2A	FUSE11	50p
2.5A	FUSE12	50p
3.15A	FUSE13	55p
4A	FUSE14	55p
5A	FUSE15	60p
6.3A	FUSE16	60p

Quick Blow

CURRENT RATING	ORDER CODE	PRICE
100mA	FUSE37	60p
160mA	FUSE17	60p
250mA	FUSE18	60p
315mA	FUSE19	60p
400mA	FUSE20	60p
500mA	FUSE21	60p
630mA	FUSE22	60p
800mA	FUSE23	60p
1A	FUSE24	60p
1.25A	FUSE25	60p
1.6A	FUSE26	60p
2A	FUSE27	60p
2.5A	FUSE28	60p
3.15A	FUSE29	50p
4A	FUSE30	50p
5A	FUSE31	50p
6.3A	FUSE32	50p

All above Fuse prices are for a pack of 10

Wickman Fuses

Fast Blow

CURRENT RATING	ORDER CODE	PRICE
0.04A	FUSE53	60p
0.05A	FUSE54	35p
0.063A	FUSE55	35p
0.08A	FUSE56	35p
0.1A	FUSE57	30p
0.125A	FUSE58	30p
0.16A	FUSE59	30p
0.2A	FUSE60	30p
0.25A	FUSE61	30p
0.315A	FUSE62	30p
0.4A	FUSE63	30p
0.5A	FUSE64	30p
0.63A	FUSE65	30p
0.8A	FUSE66	30p
1A	FUSE67	30p
1.25A	FUSE68	30p
1.6A	FUSE69	30p
2A	FUSE70	30p
2.5A	FUSE71	30p
3.15A	FUSE72	30p
4A	FUSE73	30p

Slow Blow

CURRENT RATING	ORDER CODE	PRICE
0.05A	FUSE74	65p
0.063A	FUSE75	65p
0.08A	FUSE76	65p
0.1A	FUSE77	35p
0.125A	FUSE78	35p
0.16A	FUSE79	35p
0.2A	FUSE80	30p
0.25A	FUSE81	30p
0.315A	FUSE82	30p
0.4A	FUSE83	30p
0.5A	FUSE84	30p
0.63A	FUSE85	30p
0.8A	FUSE86	30p
1A	FUSE87	30p
1.25A	FUSE88	30p
1.6A	FUSE89	30p
2A	FUSE90	30p
2.5A	FUSE91	30p
3.15A	FUSE92	30p
4A	FUSE93	30p
5A	FUSE94	30p

All above Wickman Fuse prices are for single units

Axial Lead Fuse Protectors

CURRENT RATING	COLD RESISTANCE (Ohms)	ORDER CODE	PRICE
125mA	1.7	FUSE95	£3.00
250mA	0.665	FUSE96	£3.00
375mA	0.395	FUSE97	£1.20
500mA	0.28	FUSE98	£3.00
750mA	0.175	FUSE99	£3.00
1A	0.125	FUSE100	£1.20
1.5A	0.0823	FUSE101	£2.00
2A	0.0473	FUSE102	£1.20
2.5A	0.036	FUSE103	£2.00
3A	0.029	FUSE104	£2.00
3.5A	0.024	FUSE105	£2.00
4A	0.0204	FUSE106	£2.00
5A	0.0155	FUSE107	£1.20
7A	0.10105	FUSE108	£2.00
10A	0.00705	FUSE109	£2.00

SPECIFICATION

Voltage Rating : 125 V upto 5A , 50V 7A,10A

Operating Temperature : -55C TO +125C

All above Axial Lead Fuse Protetor prices are for a pack of 5

Grandata Ltd

distributor of electronic components

Television Repair / Mod Kits

MAKE & MODEL	KIT TYPE	CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
1499Y	STANDBY	MODKIT37
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
2099TX	STANDBY	MODKIT37
BTV17	STANDBY	MODKIT37
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
DECCA/TATUNG		
TVC563	STANDBY	MODKIT37
GOLDSTAR		
CF25A50F	FRAME	MODKIT36
CF25C22C	FRAME	MODKIT35
CF28A50F	FRAME	MODKIT36
CF28C22F	FRAME	MODKIT35
CF28C28F	FRAME	MODKIT36
CF29C42F	FRAME	MODKIT35
GOODMANS		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT

MAKE & MODEL	KIT TYPE	CODE
GOODMANS..Continued		
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1
CUC 7301/3 (BUZ90)	PSU	GRUNDIGKIT2
CUC 7301/3 (MJF18004)	PSU	GRUNDIGKIT3
HINARI		
HIT14RC	PSU	ONWAKIT
JVC		
AV29SX1EK	FIELD O/P	JVCKIT1
AV29SX1EN	FIELD O/P	JVCKIT1
AV29SX1EN1	FIELD O/P	JVCKIT1
AV29SX1PF	FIELD O/P	JVCKIT1
AV29TSIE1	FIELD O/P	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N (BUZ90)	PSU	GRUNDIGKIT2
21V1T(MJF18004)	PSU	GRUNDIGKIT3
TVR180R/T/2080	STANDBY	MODKIT37
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1

MAKE & MODEL	KIT TYPE	CODE
MITSUBISHI..Continued		
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
NEI/NIKKAI		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERT OUTPUT	PANKIT2
TC28XD60	VERT OUTPUT	PANKIT2
TX28XD70	VERT OUTPUT	PANKIT2
TX29XD70	VERT OUTPUT	PANKIT2
TX-W26D3	VERT OUTPUT	PANKIT2
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7

MAKE & MODEL	KIT TYPE	CODE
PHILIPS..Continued		
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME	SAMKIT2
CI6844	FRAME	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	PSU	SHARPKIT1
51CS05H	PSU	SHARPKIT1
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
66CS03H	PSU	SHARPKIT2
66CS05H	PSU	SHARPKIT2
66CSD8H	PSU	SHARPKIT2
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME	THOMKIT3
ICC9 CHASSIS	EAST/WEST	THOMKIT4
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2
TX92F CHASSIS	EAST/WEST	THOMKIT4

ORDER CODE	PRICE
GRUNDIGKIT1	£ 10.50
GRUNDIGKIT2	£ 10.50
GRUNDIGKIT3	£ 10.50
GOODKIT1	£ 11.00
JVCKIT1	£ 11.00
MITSKIT1	£ 3.00
MITSKIT2	£ 15.00

ORDER CODE	PRICE
MITSKIT3	£ 6.00
MODKIT35	£ 9.50
MODKIT36	£ 5.00
MODKIT37	£ 6.50
NIKKAIKIT1	£ 12.00
ONWAKIT	£ 12.00
PANKIT1	£ 11.00

ORDER CODE	PRICE
PANKIT2	£ 9.00
PHILKIT1	£ 7.60
PHILKIT10	£ 8.50
PHILKIT2	£ 2.50
PHILKIT3	£ 4.00
PHILKIT4	£ 4.25
PHILKIT5	£ 5.75

ORDER CODE	PRICE
PHILKIT6	£ 5.50
PHILKIT7	£ 7.60
PHILKIT8	£ 4.25
PHILKIT9	£ 7.50
SAMKIT2	£ 8.00
SAMSUNGKIT	£ 16.00
SHARPKIT1	£ 11.00

ORDER CODE	PRICE
SHARPKIT2	£ 11.00
SHARPKIT3	£ 9.00
THOMKIT1	£ 7.00
THOMKIT2	£ 12.00
THOMKIT3	£ 9.00
THOMKIT4	£ 4.00
THORNKIT1	£ 12.75

Satellite Repair / Mod Kits

Amstrad DRX100
Tuner Repair Kit

Order Code
SATKIT35

Price
£ 1.40 + vat

Amstrad DRX100
Power Supply
Reliabilty Kit

Order Code
SATKIT36

Price
£ 12.00 + vat

Amstrad DRX100
Power Supply
Repair Kit

Order Code
SATKIT37

Price
£ 13.50 + vat

Grundig GDS200
Digital Satellite Receiver
Repair Kit

Early psu
MODEL : DS0 - 0385 REV C

Order Code: SATKIT34A
Price : £ 10.00 + vat

Grundig GDS200/300
Digital Satellite Receiver
Repair Kit

LATER psu TYPE REV 03
DSO - 0375 REV A
DSO - 0385 REV 5

Order Code: SATKIT34B
Price : £ 10.00 + vat

Digital Satellite Receivers Fan Kit

Suitable for
Amstrad DRX100 , DRX200
Grundig GDR200 , GDS200
Pace Digibox
plus many more analogue makes and models

Order Code : FANKIT1
Price : £ 10.00 + vat

Panasonic Digital Satellie Receiver Fan Kit

Suitable for Panasonic TU-DSB20/30 , TU-DSB31/35

Order Code : FANKIT2
Price : £ 15.00 + vat

Grandata Ltd

distributor of electronic components

Aerial & Digital Satelitte Accessories

Sky™ Digital Remote & TV Link Eye Combination

Order Code : SKYPACK1

Price : £ 16.00 + vat each

5 +

£ 14.50 + vat each

Sky™ Digital Remote Controls

Order Code : RCSKY

1 +

£ 7.95 + vat each

5 +

£ 7.45 + vat each

10 +

£ 6.95 + vat each

Sky™ Digital Remote & SLx Link Eye Combination

Order Code : SKYPACK2

Price : £ 13.00 + vat each

5 +

£ 11.50 + vat each

SLx Aerial Amplifiers

Now with built in Digital ByPass Operates with Sky™ DigiEye

Class leading noise figure of 4dB or less

6dB signal amplification on all models

Description	Order Code	Price
2 Way - No Bypass	SLX2	£ 8.00 + vat
2 Way - With Bypass	SLX2B	£ 9.25 + vat
4 Way - No Bypass	SLX4	£ 13.00 + vat
4 Way - With Bypass	SLX4B	£ 14.00 + vat
6 Way - No Bypass	SLX6	£ 18.00 + vat
6 Way - With Bypass	SLX6B	£ 19.00 + vat
8 Way - No Bypass	SLX8	£ 18.50 + vat
8 Way - With Bypass	SLX8B	£ 20.00 + vat

Integrated Digital By Pass

SLx Masthead Amplifiers

UHF TV antenna pre amplifier designed for the professional aerial installer

15dB gain masthead amplifier ideal for majority of domestic installations

26dB gain masthead amplifier for longer cable runs (loss of more than 3dB) or if connected to passive splitters

Requires 12V DC power supply via downlead either via dedicated power supply unit or from a distribution amplifier with line powering

15dB Amp Order Code : 27830R
Price : £ 4.30 + vat

26dB Amp Order Code : 27831R
Price : £ 4.50 + vat

SLx Masthead Amp PSU
Order Code : 27832R
Price : £ 5.00 + vat

Postage for 2+ £ 5.00 + vat

Coax Plug Aluminium

Order Code : PLG51
Bag of 10
Price : £ 1.25 + vat
Bag of 100
Price : £ 9.00 + vat

Screw Type Coax Plugs

Order Code : PLG62
Bag of 10
Price : £ 1.60 + vat
Bag of 100
Price : £ 12.50 + vat

Twist On F Connectors

Order Code : PLG101
Bag of 10
Price : £ 1.00 + vat
Bag of 100
Price : £ 6.00 + vat

Coax Coupler Socket to Socket

Order Code
PLG54
Bag of 10
Price : £1.50 + vat

Coax Coupler Plug to Plug

Order Code
PLG55
Bag of 10
Price : £1.50 + vat

Y Splitter Inductive 3 way

Order Code
YSPLITTER
Price : 40p + vat
Bag of 10
Price : £ 3.00 + vat

SLx Link Eye

Allows control of Sky™ Digibox via the signal feed for second TV

Order Code : 27833R

1 - 9
£ 6.50 + vat each

10 - 24
£ 5.50 + vat each

Sky™ Digital TV Link Eye

Order Code : TVLINKEYE

Price
£ 10.75 + vat

5 +
£ 7.99 + vat each

10+
£ 6.99 + vat each

SLx Amp By Pass Kit

For use with aerial amplifiers and Sky™ Digibox

Allows for operation of Link Eye in conjunction with a distribution amplifier

Order Code : 27829R
Price : £ 5.00 + vat

Digital Satellite splitters 5 - 2400 MHz

Item	Code	1 +	10 +
2 way splitter (Power Pass 1 Port)	27900R	£ 2.40	£ 2.00
3 way splitter (Power Pass 1 Port)	27901R	£ 2.70	£ 2.25
4 way splitter (Power Pass 1 Port)	27902R	£ 2.80	£ 2.40
6 way splitter (Power Pass 1 Port)	27903R	£ 5.00	£ 4.00
8 way splitter (Power Pass 1 Port)	27904R	£ 5.60	£ 4.65

Grandata Ltd

distributor of electronic components

Konig Remote Controls

KONIG ELECTRONIC

KONIG ELECTRONIC

Part No.	Code
AKAI	
CT2582E	IR9700
CT2585	IR9700
CT2885	IR9700
CT2885E	IR9700
IR16	IR9700
RC556	IR9397
RC85	IR9700
AMSTRAD	
SRD550	IR9386
SRX510	IR9386
AE6001	IR9352
B & O	
Beolink 100	IR9843
BEKO	
RC51321	IR9398
RC51331	IR9398
RC61331	IR9398
BLAUPUNKT	
8669493	IR9188
1532	IR9503
1570-46	IR9516
8627 105 463	IR9188
8668813000	IR9516
I555-46	IR9516
I563-46	IR9516
IB16	IR9504
IC16	IR9504
ID32	IR9503
IL32	IR9503
IM32	IR9503
IM55-16	IR9516
IM63-16	IR9516
IM70-16	IR9516
IP32	IR9503
IQ16	IR9504
IR32	IR9504
TC106	IR9406
TC110 PIP	IR9248
TC143	IR9406
TC144	IR9406
TC190	IR9529
TC192	IR9529
TC194	IR9529
CROWN	
RC51331	IR9398
RC61331	IR9398
2190T	IR9397
DAEWOO	
DMQ1414	IR9397
DMQ14A 1	IR9840
DMQ20A 1	IR9840
DMQ2195	IR9840
DMQ2595	IR9840
DMQ2895	IR9840
FERGUSON	
20H3	IR9594
22B5	IR9584
22H3	IR9594
2415	IR9584
2422	IR9584
2423	IR9584
2433	IR9584
2445	IR9584
2452	IR9584
2453	IR9584
2463	IR9584
2475	IR9584
26H3	IR9594
29132	IR9584
36K2	IR9594
41H3	IR9594
4233	IR9584
4414	IR9584
4415	IR9584
4423	IR9584
4433	IR9584
51A0	IR9584
51A2	IR9584
51A3	IR9584
51A4	IR9584
51A5	IR9594
51G2	IR9594
51G3	IR9594
51H3	IR9594
51H4	IR9594
51J7	IR9594
51K3	IR9594
5980	IR9584
59B2	IR9584
59B3	IR9584
59B4	IR9584
59B5	IR9584
59D2	IR9584
59D3	IR9584
59G2	IR9594
59G3	IR9594
59H4	IR9594
59H5	IR9594
59J7	IR9594
59LS2	IR9639
6223	IR9584
6245	IR9584
66B2	IR9584
66B3	IR9584
66H3	IR9594
66H4	IR9594
66H5	IR9594

Part No.	Code
FERGUSON ..continued	
6RLS2	IR9639
A10R	IR9259
A14R	IR9259
A16R	IR9259
B51F	IR9639
B51NX	IR9639
B59F	IR9639
B59N	IR9639
B59NX	IR9639
B68F	IR9639
B68NX	IR9639
C59NX	IR9639
C68NX	IR9639
D51ND	IR9639
D59F	IR9639
D59N	IR9639
D68N	IR9639
D78N	IR9639
E51N	IR9639
E59R8	IR9639
RCU1734	IR9584
RCU1742	IR9584
RCU1785	IR9594
RCU1789	IR9594
RH880	IR9584
RH885	IR9325
RHT01	IR9259
RHT10	IR9639
RHT30	IR9259
T49F	IR9639
T49N	IR9639
T51F	IR9639
T51N	IR9639
T59F	IR9639
T59N	IR9639
T68N	IR9639
T742	IR9584
T752	IR9584
T758	IR9584
T789	IR9584
T78DPL	IR9639
GOLDSTAR	
105-068	IR9403
105209B	IR9862
105210A	IR9862
105-219J	IR9854
105-224V	IR9854
105-229H	IR9854
105230A	IR9862
105-230C	IR9854
38T1	IR9854
CB20E40X	IR9854
CBT2190E	IR9403
CBT4902	IR9403
CBT4902E	IR9403
CBT9905	IR9403
MS068K	IR9862
GRUNDIG	
CUC503	IR9614
CUC5200	IR9614
CUC5301	IR9529
CUC5302	IR9529
CUC5310	IR9614
RC212	IR9614
RC300	IR9614
TP500VT	IR9509
TP590VT	IR9509
TP600VT	IR9509
TP610	IR9504
TP621	IR9209
TP630	IR9509
TP650	IR9504
TP661	IR9562
TP661 TOP	IR9615
TP663	IR9614
TP710	IR9529
TP711	IR9529
TP712	IR9614
TP715	IR9749
TP720	IR9614
TP760HIFI	IR9614
TP770	IR9749
TP771	IR9749
TP800	IR9749
TP900	IR9749
TRC1	IR9715
TRC2	IR9715
HITACHI	
2970491	IR9479
A518780	IR9142
C1405	IR9476
C1414	IR9476
C2057H	IR9142
C2067	IR9142
C2067H	IR9142
C2114	IR9476
C2146TN	IR9677
C2147TN	IR9677
C2156TN	IR9983
C2166TN	IR9677
C2170TN	IR9983
C2186TN	IR9983
C2257H	IR9142
C2259H	IR9142
C2261	IR9142
C2267H	IR9142
C2268H	IR9142
C2273	IR9142
C2273H	IR9142
C24W1TN	IR9983
C24W511TN	IR9983

Part No.	Code
HITACHI ..continued	
C24WS511T	IR9983
C2514	IR9476
C2546	IR9677
C2546TN	IR9677
C2547TN	IR9677
C2556TN	IR9983
C2566TN	IR9677
C2567TN	IR9983
C2567TN2	IR9983
C2586TN	IR9983
C2659H	IR9142
C2660	IR9142
C2661	IR9142
C2846TN	IR9677
C2847TN	IR9677
C2856TN	IR9983
C2866TN	IR9677
C2886TN	IR9983
C28W410TN	IR9983
C28W510TN	IR9983
CBP1476R	IR9142
CBP1646R	IR9142
CBP2067	IR9142
CBP2216	IR9142
CBP222	IR9142
CBP226	IR9142
CBP260	IR9142
CL1256TAN	IR9983
CL24W1TAN	IR9983
CL2556TAN	IR9983
CL2586TAN	IR9983
CL2856TAN	IR9983
CL2886TAN	IR9983
CL28W1TAN	IR9983
CL28WD2TAN	IR9983
CL32WD2TAN	IR9983
CLE871A	IR9602
CLE871B	IR9602
CLE874A	IR9602
CLE874B	IR9602
CLE876	IR9476
CLE876C	IR9477
CLE876D	IR9477
CLE876G	IR9477
CLE902A	IR9677
CLE902B	IR9677
CLE903A	IR9677
CLE921A	IR9983
CLE921B	IR9983
CLE922A	IR9982
CLE922B	IR9982
CLR876E	IR9477
CP2146TA	IR9677
CP2546	IR9677
CP2546TA	IR9677
CP2556TAN	IR9983
CP2841TA	IR9677
CP2856TA	IR9983
CP2856TAN	IR9983
CP2886TAN	IR9983
CP28WD2TAN	IR9983
CP32WD2TAN	IR9983
CPT1556	IR9576
CPT1557	IR9576
CPT1560	IR9576
CPT1561	IR9576
CPT2155	IR9575
CPT2164	IR9575
CPT2558	IR9575
CPT2564	IR9575
CPT2566	IR9575
CPT2669	IR9575
CPT2785	IR9575
CPT2870	IR9575
CST1430	IR9576
CST1435	IR9576
CST1560	IR9576
CT2116	IR9476
CTRM200M	IR9542
JVC	
AV21TS1EN	IR9698
AV25TS1EN	IR9698
AV25VM1EN	IR9698
AV28VM1EN	IR9698
AV29SX1EN	IR9698
AV29TS1EN	IR9698
AV32WZ2EN	IR9698
RC8072	IR9698
RC8074	IR9698
RMC530	IR9698
RMC682	IR9698
RMC761	IR9698
RMC761E	IR9698
RMC770	IR9698
RMC771	IR9698
RMC7711E	IR9698
RMC793	IR9698
RMC7931E	IR9698
LOEWE	
FB300	IR9616
FB50	IR9514
FB52	IR9514
FB70	IR9514
FB72	IR9514
FB90	IR9514
FB91	IR9514
MATSUI	
076G047240	IR9490
076L067240	IR9490
2076R	IR9490
2092T	IR9490

Part No.	Code
NOKIA	
3126	IR9157
3126F	IR9157
C1	IR9161
C2	IR9161
C3	IR9161
C4	IR9161
CM 1	IR9569
D1	IR9161
D2	IR9161
E1	IR9161
E2	IR9161
EM2	IR9700
ES5	IR9701
FS10	IR9573
FS11	IR9506
FS4/1	IR9573
FS4/2	IR9573
FS5	IR9506
FS5/1	IR9573
FS9	IR9506
FS9	IR9573
IRC1	IR9157
IRC2	IR9157
IRM1	IR9535
IRS1	IR9535
IRS2	IR9535
IRS3	IR9535
RCN610	IR9752
RCN620	IR9751
RCN624	IR9757
SM1	IR9491
SM2	IR9491
PANASONIC	
02280227	IR9835
91005926	IR9835
EUR50100	IR9826
EUR51920	IR9835
EUR51921	IR9835
IR3592	IR9826
TC1485DR	IR9826
TC14S1R	IR9834
TC150E	IR9562
TC1656PFR	IR9826
TC1785DRS	IR9826
TC1785IR	IR9826
TC1785UR	IR9826
TC2185DRS	IR9826
TC2185IR	IR9826
TC21R1C	IR9826
TC21R1U	IR9826
TC21S1R	IR9834
TCC23PFR	IR9826
TNQ1410	IR9826
TNQ8E0421	IR9826
TNQ8E0422	IR9826
TNQ8E0428	IR9826
TNQ8E0430	IR9826
TNQ8E0432	IR9826
TNQ8E0435	IR9834
TNQ8E0436	IR9834
TNQ8E0441	IR9826
TNQ8E0461	IR9834
TX14S1T	IR9834
TX21S1RC	IR9834
TX21S1T	IR9834
TX21S1TC	IR9834
TX21T1C	IR9826
TX25A2C	IR9836
TX25A2CI	IR9836
TX25W2	IR9836
TX25W2C	IR9836
TX25W2CI	IR9836
TX28A1D	IR9826
TX28A2C	IR9836
TX28A2CI	IR9836
TX28W2	IR9836
TX28W2C	IR9836
TX28XDP1C	IR9835
TX29AD1D	IR9835
TX29W2CI	IR9836
TX33A2C	IR9836
TX33A2CI	IR9836
PHILIPS	
RC5002	IR9510
RC5140	IR9510
RC5154	IR9510
RC5240	IR9510
RC5250	IR9510
RC5260	IR9510
RC5300	IR9510
RC5350	IR9510
RC5410	IR9553
RC5420	IR9553
RC5540	IR9510
RC5701	IR9434
RC5801	IR9553
RC5801	IR9556
RC5901	IR9556
RC5903	IR9556
RC6008	IR9434
RC6404	IR9465
RC6416	IR9465
RC6512	IR9464
RC6804	IR9434
RC7118	IR9464
RC7141	IR9465
RC7500	IR9464
RC7507	IR9710
RC7512	IR9864
RC7535	IR9864
RC8201	IR9434
RC8205	IR9710
RC9010	IR9434

Part No.	Code
PHILIPS ..continued	
RC9020	IR9434
RC9030	IR9434
RC9050	IR9556
RC9057	IR9710
RC9060	IR9556
RC9070	IR9434
RC9133	IR9710
SAMSUNG	
CX5312W	IR9432
CX5325W	IR9432
CX532WT	IR9432
CX534WT	IR9432
RM104	IR9432
RM109	IR9546
SANYO	
4AA4U1TO092	IR9459
JXBA	IR9457
JXCL	IR9530
JXCR	IR9530
JXFF	IR9457
JXGA	IR9139
JXGE	IR9139
JXGT	IR9460
JXGW	IR9460
JXGY	IR9460
JXLB	IR9460
JXLG	IR9460
RC238	IR9974
RC254	IR9974
RC258	IR9530
RC305	IR9974
RC307	IR9457
RC308	IR9457
RC317	IR9457
RC318	IR9457
RC321	IR9457
RC612	IR9457
RC625	IR9457
RC628	IR9457
RC642	IR9530
RC645	IR9974
RC685	IR9457
RC700	IR9139
RC702	IR9139
RC710	IR9139
RC711	IR9460
RC901	IR9139
S02	IR9460
S03	IR9460
SHARP	
37AM12S	IR9788
51AM12S	IR9788
51AT15S	IR9788
54AM12S	IR9788
54AT15S	IR9788
54CS05SN	IR9711
CV2044	IR9487
CV2145	IR9487
70CS03S	IR9711
72CS03S	IR9711
72CS05SN	IR9711
C1421	IR9487
C2021	IR9487
CV2121	IR9487
CV3707	IR9487
CV3709	IR9487
CV3710	IR9487
CV3720	IR9487
DV1416SN	IR9487
DV1506SN	IR9487
DV1706SN	IR9487
DV2108IS	IR9711
DV2130EX	IR9487
DV25071S	IR9711
DV25073S	IR9711
DV25081S	IR9711
DV25083S	IR9711
DV28037S	IR9711
DV28071S	IR9711
DV28081S	IR9711
DV28083S	IR9711
DV3750S	IR9788
DV3760S	IR9788
DV5160S	IR9788
DV5403S	IR9711
DV5432S	IR9711
DV5465S	IR9711
DV5470S	IR9711
DV5935H	IR9711
DV6301S	IR9711
DV6303S	IR9711
DV6311S	IR9711
DV6313S	IR9711
DV6332S	IR9711
DV6336S	IR9711
DV7001S	IR9711
DV7002S	IR9711
DV7003S	IR9711
DV7011S	IR9711
DV7024S	IR9711
DV7032S	IR9711
DV7036S	IR9711
RRMCG0351CESA	IR9487
RRMCG0351CESB	IR9487
RRMCG0351CESD	IR9487
RRMCG0370CESA	IR9487
RRMCG0483PESA	IR9487
RRMCG0489CESB	IR9487
RRMCG0568PESA	IR9487
RRMCG0617PESA	IR9487
RRMCG0618PESA	IR9487

Part No.	Code
SHARP ..continued	
RRMCG0662PESA	IR9487
RRMCG0739BM5A	IR9711
RRMCG0777PESA	IR9487
RRMCG0833PESA	IR9487
RRMCG0898CESA	IR9487
RRMCG1014BM5A	IR9711
RRMCG1023BM5A	IR9711
RRMCG1031BM5A	IR9788
RRMCG1036BM5A	IR9711
RRMCG1046BM5A	IR9788
RRMCG1048BM5A	IR9788
RRMCG1050BM5A	IR9788
RRMCG2799CESA	IR9487
SV2044G	IR9487
SV2044S	IR9487
SV2145G	IR9487
SV2145S	IR9487
SV2577S	IR9487
SV2777S1	IR9487
SV2877S	IR9487
SV2877S1	IR9487
SONY	
RM604	IR9974
RM607	IR9974
RM609	IR9974
RM615	IR9511
RM620	IR9511
RM625	IR9511
RM630	IR9511
RM631	IR9511
RM632	IR9511
RM633	IR9511
RM634	IR9511
RM635	IR9511
RM640	IR9321
RM641	IR9321
RM641A	IR9321
RM650	IR9336
RM651	IR9336
RM652	IR9336
RM654	IR9336
RM656	IR9448
RM657	IR9336
RM658	IR9321
RM661A	IR9321
RM670	IR9123
RM671	IR9123
RM672	IR9123
RM673	IR9123
RM677	IR9448
RM681	IR9442
RM682	IR9442
RM683	IR9442
RM684	IR9442
RM685	IR9442
RM686	IR9442
RM687B	IR9448
RM687C	IR9448
RM689	IR9441
RM694	IR9452
RM698	IR9442
RM717	IR9448
RM719	IR9448
RM816	IR9441
RM817	IR9441
RM820	IR9452
RM826	IR9441
RM828	IR9452
RM830	IR9443
RM831	IR9443
RM832	IR9443
RM833	IR9451
RM834	IR9452
RM836	IR9871
RM837	IR9451
RM839	IR9871
RM841	IR9452
RM842	IR9443
RM883	IR9871
RM886	IR9871
THOMSON	
14G21D570	IR9639
14GM53	IR9639
14GM56	IR9639
14M570	IR9639
21M576	IR9639
21MG51	IR9639
925TX1 049	IR9508
RCT2000	IR9259
RCT3000	IR9831
RCT5000	IR9259
RCT5020	IR9502
RCT5141S	IR9470
TOSHIBA	
1400	IR9962
1400R	IR9962
1400RB	IR9962
1400RBG	IR9962
1400RBN	IR9962
1400RBT	IR9962
1400RBW	IR9962
1400RDT	IR9962
1440RB	IR9852
1440RBT	IR9852
1440RD	IR9852
1440TB	IR9852
1440TBT	IR9852
1450RB	IR9852
1450RD	IR9852
1480RB	IR9953
1480RBT	IR9953

Part No.	Code
TOSHIBA ..continued	
1480RBW	IR9953
1480TB	IR9953
1480TBT	IR9953
1480TBW	IR9953
1480TBY	IR9953
1480TBZ	IR9953
1510RBT	IR9962
1510RDT	IR9962
1510RT	IR9962
155R9B	IR9962
155R9BT	IR9962
155R9BW	IR9962
155R9BZ	IR9962
156R9	IR9962
156R9B	IR9962
156R9BG	IR9962
156R9BW	IR9962
1720RB	IR9962
1722TB	IR9852
1732TD	IR9852
2100RB	IR9962
2100RBG	IR9962
2100RBT	IR9962
2101RBZ	IR9962
2102RBZ	IR9962
2121RD	IR9962
2132DB	IR9852
2140RB	IR9852
2140TB	IR9852
2141TB	IR9852
2145DB	IR9852
2145DD	IR9852
2150TD	IR9953
2152DB	IR9953
2152DD	IR9953
2155DB	IR9953
2163DB	IR9953
2163DB	IR9953
216R9B	IR9962
216R9B2	IR9962
2173DB	IR9953
2180TD	IR9953
2181TB	IR9852
2181TB	IR9953
219R	IR9962
219R9B	IR9962
219R9B2	IR9962
2522DB	IR9953
2522DD	IR9953
2527DB	IR9953
2535DB	IR9852
2535DD	IR9852
2537DD	IR9852
2545DB	IR9852
2545DD	IR9852
2550TB	IR9953
2552DB	IR9953
2552DD	IR9953
2555	IR9953
2555DB	IR9953
2555DD	IR9953
2557DB	IR9953
2563DB	IR9953
2563DD	IR9953
2573DB	IR9953
2577DB	IR9953
2579DB	IR9953
2636B	IR9953
2835DB	IR9852
2837DD	IR9852
2852DB	IR9953
2853DD	IR9953
2855DD	IR9953
2857DB	IR9953
2857DD	IR9953
2863DD	IR9953
2866DD	IR9953
2873DB	IR9953
2877DB	IR9953
2879DB	IR9953
3327DB	IR9953
3339DB	IR9953
3357DB	IR9953
3377DB	IR9953
3387DB	IR9953
3787DB	IR9953
40PW8DB	IR9953
48J6DB	IR9953
49PJ6DG	IR9953
55PJ6DB	IR9953
55PW8DB	IR9953
7037DD	IR9852
7053DD	IR9953
CT6869	IR9953
CT9369	IR9962
CT9383	IR9962
CT9387	IR9962
CT9396	IR9962
CT9399	IR9962
CT9414	IR9962
CT9432	IR9962
CT9455	IR9962
CT9475	IR9962
CT9476	IR9962
CT9480	IR9962
CT9552	IR9962
CT9826	IR9953
CT9784	IR9953
CT9785	IR9953
CT9859	IR9953
CT9867	IR9953
CT9868	IR9953
CT9900	IR9953
CT9949	IR9953

Price : £ 6.50 + vat each

This is just a selection of Konig Remote Controls that we stock.

Grandata Ltd

distributor of electronic components

Line Output Transformers

Part No	Code	Price
ALBA		
3714002	LOT02	£12.00
043714002J	LOT02	£12.00
43700000	LOT02	£12.00
AMSTRAD		
1810951	LOT55	£14.00
3714002	LOT02	£12.00
043714002J	LOT02	£12.00
43700000	LOT02	£12.00
AM152591	LOT55	£14.00
FERGUSON		
00 D-3-508-002	LOT381	£15.50
06 D-3-083-001	LOT82	£12.50
06 D-3-083-002	LOT82	£12.50
06 D-3-084-001	LOT23	£12.50
06 D-3-087-001	LOT23	£12.50
06 D-3-088-001	LOT84	£14.50
06 D-3-093-001	LOT204	£16.00
06 D-3-508-003	LOT276	£14.00
06 D-3-512-001	LOT204	£16.00
29201-022-01	LOT63	£17.00
473197	LOT304	£15.50
D 059 / 37	LOT200	£14.00
GOODMANS		
1352.5008	LOT1167	£15.00
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AT 2079/30102	LOT106	£12.50
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SERVICE CASEBOOK

Michael Maurice

Sony KV28FD1E (GE1 chassis)

This must be one of the most complex TV sets ever produced by Sony. The fault symptom was that strange menus and graphics would intermittently appear on the screen. Sony technical was able to suggest a cause: dry-joints at the microcontroller and Megatext chips. So I took out board A, removed the screening can and started to resolder these ICs. I went over every joint, taking good care and using lots of flux. Then I refitted the board and switched the set on. It worked, and a lengthy soak test suggested that everything was now OK. But you can never be too sure with a fault like this, so I decided to leave the set on test for another day.

When I checked next day the set was still playing up, but not as badly. So I checked my resoldering then decided to apply the iron to the flash memory chips, IC036 and IC037. After another long soak test everything seemed to be OK.

Philips 29PT632A (GR2.4 chassis)

This should have been a simple repair. The mains switch had failed and burnt up the PCB on which it sits. The PCB is not readily available from Philips and is expensive, but SEME supply an OEM version which is a direct equivalent. I keep it in stock and fitted one. The components, apart from the switch, were carefully removed from the old board and transferred to the new one, then a replacement switch was fitted.

When the set was switched on it remained in standby. It could be brought out of standby when the control panel at the side of the set was used, but not when the remote-control unit was used. In fact no remote-control functions worked. It took some time to establish that the cause was a short-circuit between the output from the remote-control receiver and chassis – the new PCB was defective, with a bridge between the chassis and output tracks. Once this bridge had been removed the set worked perfectly. But the job took a lot longer than I had estimated.

Sony KVA2942U (AE2A/B chassis)

The complaint was no sound. In addition there were pops and bangs when the set was switched on and off, and the sound muting was inoperative. The customer then told me that these problems had started when another engineer had tried to fix an intermittent sound fault. The cause of this had been dry-joints at the left-channel audio output chip IC251. He had resoldered this IC but, in the process, had bridged pins 1 and 3, connecting the mute line to the output.

As the mute line is shared by both audio output chips, IC251 and IC261, these were replaced, along with Q206 (2SA1037K) via which the muting is applied – it was short-circuit. The set then worked correctly but, after half an hour, the sound became unstable. R627 (4·7Ω) in the power supply had failed. It's connected in series with the earthy side of the +22V and –22V audio supply lines. There were no further sound problems once a replacement had been fitted.

Philips 25ST1724 (GR2.1 chassis)

There was no teletext with this set – selecting text would produce the fault code F7 on the screen. The cause was the microcontroller chip IC7800 on the teletext board. It's type PCF84C81/A89. Ensure that an exact replacement from Philips is fitted, otherwise some text functions won't work.

Toshiba 2500T/JVC HRD660

This customer had inherited the VCR and had decided to use it to replace his ageing Bush machine. He'd had the Toshiba set from new. His complaint with this set up was bands of lines on the TV picture, whatever the channel. Plugging the aerial into the back of the TV set made no difference. The customer also mentioned that a strange buzzing noise came from the VCR when it was switched on.

Disconnecting the mains supply to the VCR removed the interference. The VCR's power supply was the cause of the trouble: it was radiating interference. The customer also mentioned that the VCR's heads were worn. In view of this, repair was considered to be uneconomical. Pity, I would have liked to know exactly what was responsible for the interference.

Grundig XS63/8/FT (CUC5360 chassis)

The fault with this set was no video via the scart sockets. These are on the video PCB, along with the switching arrangements and the decoder. A quick look at the circuit diagram suggested that the scart and tuner signals go via the video switch to the IF chip, but this is not the case. Only the scart signals are routed through the CD4052 switch IC: switching between the scart and tuner signals is carried out in the tuner/IF IC. Fault-finding becomes easier once this is appreciated – just! Four DC-coupled transistors are involved, CT2512, CT2513, CT2514 and CT2517 (types BC848/858). Replacing all four cured the fault. ■

Television 2003 Accessories Guide

The number of AV accessories has multiplied as more and more can be done with basic equipment while installations have grown in complexity to include sophisticated home cinema arrangements. Eugene Trundle takes a look at this diverse field, and shows how the accessories currently available can add interest and profit to retail businesses and those of the service specialist

Modern AV equipment and twenty-first century lifestyles have produced a thriving market for add-ons and accessories. Where once there was a TV set, an aerial and maybe a VCR, there may now be up to half a dozen silver boxes hooked to the aerial, satellite dish and telephone socket. All are remote controlled, and most are interconnected by a cat's-cradle of wires, plugs and sockets. The camcorder introduces further possibilities, and may add links to a PC to the various options. The traditional goggle-box has metamorphosed to become a 'home-entertainment centre'.

Basics

Even the simplest domestic installation, consisting of a TV set and VCR in the living room, calls for some accessories. The mains connection seems straightforward, but there are seldom enough 13A power sockets available and the traditional cube-shaped block adaptors can be a source of much interference, spikes and splashes that are not at all to the liking of the microcontrollers in the gear they feed. It's better to use a four- or six-way strip power distributor, ideally with a built-in surge protector. The modest cost can save much frustration, and perhaps many hundreds of pounds when a lightning storm occurs.

Photo 1: High-quality scart lead from Supra.

Surge-busters may not combat the interference that troubles terrestrial digital TV reception, but CPC and others offer a range of filters and interference suppressors designed for connection in line with either the receiver or the appliance which is the source, to smooth out hash and glitches. Mains plugs can be difficult for the elderly or disabled to deal with, while children may poke something into a mains socket with horrific results. Solutions are easy-grip plugs, colour-coded ones, types with a neon indicator and safety 'dummies' to block off a live connector.

Mention of interference to DTT reception brings us to the aerial downlead and, particularly, the flylead that connects the TV set to the VCR. The most common type is very cheaply made, with sparse braiding that does little to screen interference and radiation either into or from the lead. The ideal is a cable which is solid- or double-screened. They can be made from CT100-type satellite cable for example, or bought from specialist cable suppliers – but they cost a bit more than fifty-five pence a go. The cost of a good lead is money well spent, and the same goes for wall-outlet plates as we saw in the July/August 1999 issues of this magazine (Multiple Outlet Wallplates by Bill Wright, pages 646 and 686).

Scart leads that come bubble-packet at very low prices also fall into the cheap-and-cheerful category. Their unscreened signal conductors and common earth paths cause interference and crosstalk – symptoms are background noise and hum on sound and picture disturbance. Better designs have individually-screened signal leads, more robust plugs and higher build quality. Suppliers of these, at prices that range from moderate to cor-blimey, include Customcable, Ixos, Keene Electronics, Lektropacks and QED. Photo 1 shows a high-quality scart lead from Supra.

Aerials

The advent of digital terrestrial TV, and particularly reception problems with it, has rekindled interest in UHF aerials. The partial adoption of 16-QAM modulation with the relaunched Freeview services has

improved the situation, likewise increases in transmitter power, but reception is still no cinch in many areas. The aerial manufacturers have all launched 'digital' products, mainly wideband arrays, and aerial upgrades will still be required by many viewers if they are to get full, reliable and consistent reception of the new programmes.

While a wide range of aerial types from Antiference, Maxview and Triax/Unix is available from suppliers such as CPC, specialist dealer Aerial Techniques is the source to try for unusual and exotic types: expert advice and a wide range of fixing, filtering and other accessories are available from this source, also multistandard receivers and recorders. Scantec is another wholesaler/distributor with a large selection of RF products. Photo 2 shows a digital-ready UHF array from the Triax range.

I believe that we have now reached the stage where it's worthwhile using double-screened cable with all new aerial installations. In areas where the signal is weak, the combination of a good high-gain aerial and a quality masthead amplifier (whose noise figure is more important than its gain) can work wonders. The Triax F-type amplifier, with a noise figure below 2dB, works well in my experience.

Bill Wright and others have shown in previous issues of *Television* the need, in some circumstances, for bandpass, notch and interference filters. The presence of Channel 5 transmitters in the gap between UHF bands IV and V still causes carrier-clashes with VCRs etc. CPC has available high-pass in-line coaxial filters, ferrite suppressor flyleads and masthead bandpass filters, while the Pace Ch. 5 shifter/booster device is also still available from CPC and others. Channel levellers and notch filters are stocked by Aerial Techniques.

RF distribution

RF distribution amplifiers are now becoming common in family homes, with children as young as three getting their own bedroom TV sets – witness the tale of Tom Trotter, see Test Case 480 (December 2002 issue, page 79)! Customers could of course go to the nearest DIY shop and buy a set-back amplifier, but they would do better to come to you for it and have it installed properly, with careful attention to routeing, signal levels and interference protection.

A distribution amplifier at the aerial itself or under the eaves enables external cabling to be used (see photo 6). This is often easier and more convenient than disturbing the interior décor. Antiference has weatherproof distribution amplifiers (Xtraset Outsider) with up to four outputs, while the Global LoftBox has been designed to handle just about any signal that may need to be networked – satellite, UHF analogue/digital, FM radio, DAB and modulated CCTV signals. It can also be used with the Global Eye system with Sky digiboxes, to which we'll return later. Global products are stocked by HiSat and J.W. Hardy. Televes has a wide range of aerials and distribution equipment.

Modulators

Some modern equipment, primarily DVD players and the first inexpensive DTT receivers, is not equipped with an internal UHF modulator. This can present problems where a house-wide RF distribution system is in use. It can very often be solved by a scart link to the VCR, whose modulator can pass on the signal when the deck is set to the stop position and the input selector to AUX, Line or AV. There will be no stereo sound at the remote receiver of course, but domestic Nicam modulators have not yet been introduced by even the keenest gadget makers. The solution to this one is a 'videosender', which we'll come shortly.

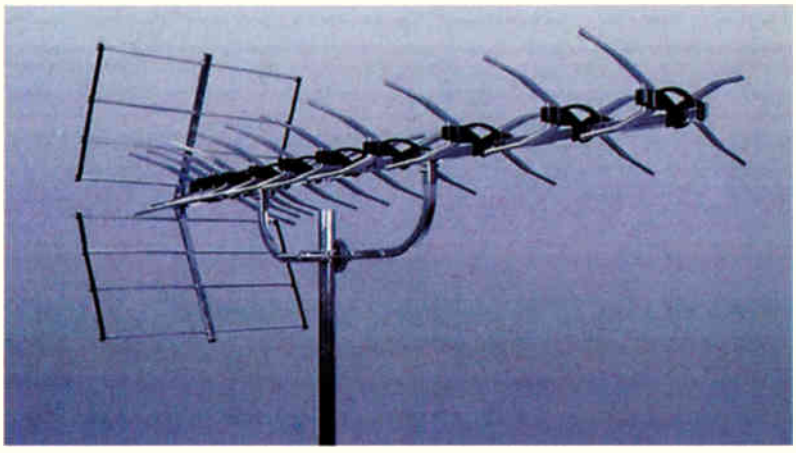

Photo 2: A digital-ready UHF array from Triax.

Where the VCR cannot be used as a modulator for any reason, standalone types are readily available. The more expensive ones can be set to provide an output on any channel in the UHF bands. This is important where other signals encroach upon the channel 30-40 output spectrum provided by ordinary modulators.

Videosenders

RF networks are fine for small TV sets in bedrooms, kitchens and elsewhere, but there are drawbacks – the need for cabling and tuning and, where bigger and posher TV sets are in use beyond the living room, their inability to distribute stereo sound. These problems can be overcome by the new generation of videosenders,

Photo 3: The CM808 universal remote-control handset from Wallis Universal. Note the LCD programme indicator.

Photo 4: The Philips Pronto control system.

which can 'narrowcast' on a tiny scale within a legal transmission slot at 2·4GHz. They connect via scart or phono sockets at each end and have a typical working range of up to 60 metres, which is at least house-wide.

The Digisender DG200/220 (AEI Security and Communications Ltd.) and Lektropacks' VS Plus can also carry remote-control commands back to source, whatever form this takes. Giga 30 takes the concept further, with a UHF output, while the mini-MVS type has ultra-compact modules – though little bigger than a pack of cigarettes, they convey good pictures and sound. These devices all have a preset choice of transmission channels, to avoid clashes with similar types nearby.

Remote-control extenders

There are many remote-control extenders that enable living-room based signal sources, players and receivers to be controlled from the bedroom or wherever. Sky digiboxes are designed for use with an infra-red plus cable system. This is connected to the RF2 output socket, which also provides power for the coupling device – the Global Remote Eye or Grandata's cheaper alternative SLx, order code 27833R. These inexpensive systems have a remote IR receiver which is connected to the RF aerial cable to pass commands back to the digibox. The system works well, but requires good DC continuity in the distribution system (bypass boxes are available from Global) and can control only the Sky receiver.

Many people want to drive a VCR and perhaps a DVD player as well as a Sky box from afar. There are several choices here. The most popular is perhaps the Marmitek Powermid device, which converts IR commands to RF form and transmits them, using an on-board telescopic aerial, up to 30 metres to the receiver module, where they are reconverted to IR pulses that can be used by the receiver, player or whatever. Powermid Plus adds a preprogrammed universal remote-control handset that can take the place of up to eight others and incorporates RF as well as IR transmitters.

Triax has a remote-control extender outfit that uses the RF distribution cable to pass commands to a little living-room sited IR relay module. Various accessories are available to enhance its compatibility and versatility. For cases where the IR beam, from an ordinary remote-control unit or one of these extender systems, cannot be easily seen by the intended recipient Keene Electronics can provide IR 'beam benders', power amplifiers and fascia-mounting side-emitter wands. Wow!

Universal handsets

We come next to universal remote-control handsets. There's a vast range of substitute devices that are designed to reduce the number of zappers on the chair arm or the coffee table. The simpler ones are inexpensive. A new range from Wallis Universal is particularly easy to use and can replace several OEM handsets. Model CM808 (see Photo 3), which sells at about £37, has a novel LCD screen that indicates which type of device (TV set, VCR, DVD player, Digibox, or audio, up to twelve in total) has been selected for control. I've tried these handsets and they work well. One For All is another well-known supplier of universal zappers. The company has recently introduced a barcode-scanning type, which works with a supplied booklet, and a six-in-one 'future-proof' model that can download new codes via the internet or a telephone line. It sells for about £38 and is available from CPC under order code HS0060945. Economic Devices is worth a call for single-model replacement zappers: the company has a list that runs to 50,000 models.

The most versatile, most profitable and ultimate user status-symbols in this field however are those exotic IR control centres that boast LCD backlighting, touch screens, processor control and every type of bell, whistle and if-I-ruled-the-world programming facility. Some of these can put more money in your till than many TV sets, VCRs and even DVD players: they certainly offer a better mark-up!

Starting with the more modest types, the E-Pilot and Merlin devices, which are available from CPC, sell at over £100 and are programmable to control eight or nine devices, with 'customisable' macro functions. From this level we move up to the Marantz learning-type RC2000 Mk 2 and RC500I, and the Philips Pronto range which costs up to £1,000 retail! That's for the Pronto RU970, with near photo-quality colour touch-screen display, 8·8MB of memory, RF output, docking station, PC serial link and editing software. See Photo 4. It's available from Keene Electronics.

Home cinema

As a more sophisticated set-up to the TV-plus-VCR arrangement we started off with, more and more people are kitting themselves up for what has become known

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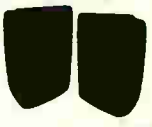

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DVD114	9.95
AMSTRAD	
DVD850	6.95
BUSH	
DVD2000	6.95
DVD2009	6.95
DAEWOO	
DVG6000D	9.95
DANSAI	
DVD1010	9.95
DVD852	9.95
DVD952	9.95
DVD955	9.95
FERGUSON	
488FE	5.75
GRANADA	
91230A	5.95
IRRADIO	
FTC1450X	5.95
FTC2023SX	5.95
LG	
3200E	6.95
ADVD320	6.95
DVD2200A	6.95
DVD2200N	6.95
DVD2280P	6.95
DVD2330P	6.95
DVD3000E	6.95
DVD3200E	6.95
DVD3200EC	6.95
DVD3200P	6.95
DVD3350E	6.95
DVD3351E	6.95
DVD3351P	6.95
DVD4710	6.95
DVD5063	6.95
DVD5083	6.95
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N1170	9.95
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14PT168601B	5.95
14PT168601P	5.95
14PT168601S	5.95
14PT168601V	5.95
14PT266501	5.95
14PT3685	5.95
14PV184	5.95
14PV284	5.95
17PT1564	5.95
17PT1565	5.95

MODEL	PRICE (£)
17PT1666	5.95
20PV184/05	5.95
20PV184	5.95
21PT1664	5.95
21PT166401S	5.95
21PT1664S	5.95
21PT1666	5.95
21PT2684	5.95
21PT2684	5.95
21PT4455	5.95
21PT4476	5.95
21PT447501	5.95
21PT5304	5.95
21PT5324	5.95
21PV288	5.95
21PV688	5.95
21PV688/05	5.95
24PW6005	5.95
24PW6304	5.95
24PW6324	5.95
25PT4455	5.95
25PT4475	5.95
25PT4655	5.95
25PT5005	5.95
25PT5105	5.95
25PT512501	5.95
25PT5304	5.95
25PT5324	5.95
28PT4455	5.95
28PT4475	5.95
28PT447501	5.95
28PT4655	5.95
28PT477501	5.95
28PT5005	5.95
28PT5105	5.95
28PT512501	5.95
28PW5304	5.95
28PW5324	5.95
28PW5406	5.95
28PW5407	5.95
28PW6005	5.95
28PW6006	5.95
28PW6304	5.95
28PW6305	5.95
28PW6324	5.95
28PW6515	5.95
28PW6816	5.95
28PW8807	5.95
29PT5304	5.95
29PT5324	5.95
29PT5515	5.95
29PT5578	5.95
32PW6005	5.95
32PW6006	5.95

MODEL	PRICE (£)
32PW6304	5.95
32PW6305	5.95
32PW6324	5.95
32PW6515	5.95
37TA1474	5.95
52TA4415	5.95
70TA4415	5.95
72TA5214	5.95
G3TA4415	5.95
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DBRT210	5.95
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C114Y4T6Y	5.95
C121S20	5.95
C121S20BT	5.95
C15344N	5.95
C15937AN	5.95
C15944N	5.95
C16237	5.95
C16271T	5.95
C16837AN	5.95
C16840	5.95
C16844N	5.95
C16847	5.95
C17073	5.95
C17271	5.95
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WS2820PF	5.95
WS2820PP	5.95
WS3220PF	5.95
WS3220PP	5.95
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14M1	5.95
14M2	5.95
14MT2	5.95
21B3	5.95
21BN1	5.95
21BN2	5.95
21D1	5.95
21DG1B	5.95
21DN1	5.95
21DN2	5.95
21DN3	5.95
21DN4	5.95
21MT2	5.95
21MT2G	5.95
21XP1	5.95
25B3	5.95
25BN1	5.95

MODEL	PRICE (£)
25DN1	5.95
25DN2	5.95
25DN3	5.95
25DN4	5.95
25M1MK3	5.95
25M2	5.95
25MT2	5.95
25MT2G	5.95
25XP1	5.95
25XP2	5.95
26WN3	5.95
28AN3	5.95
28B3	5.95
28DN1	5.95
28DN2	5.95
28DN3	5.95
28DN4	5.95
28L2	5.95
28M1MK3	5.95
28M2	5.95
28MT2	5.95
28S2	5.95
28WN3	5.95
28WP2	5.95
28WP3	5.95
28XP1	5.95
28XP2	5.95
32WP2	5.95
32WP3	5.95
C14EA90B	5.95
C14EA97B	5.95
C21EF45NB	5.95
C21EF45NBA	5.95
C21ES35B	5.95
C21ES35G	5.95
C21ES55NB	5.95
C21ES57NB	5.95
C25EG65NB	5.95
C25EG77NB	5.95
C25EG98B	5.95
C25EP55NB	5.95
C25EP57NB	5.95
C28EH25NB	5.95
C28EH27NB	5.95
C28EH65NB	5.95
C28EH75B	5.95
C28ER55NB	5.95
C28ER57NB	5.95
C28WN1B	5.95
C28WP1B	5.95
C28WP2	5.95
CB5957MK11	5.95
CB6649	5.95
CB6659	5.95

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Photo 5: Home cinema systems call for many accessories.

as home cinema. Picture sources for this are primarily Sky digiboxes and DVD players. Used with a large-screen TV set, maybe a plasma or projection type, and a digital surround-sound audio system, these can produce the feel and atmosphere of the cinema very effectively. Some enthusiasts go to huge lengths in pursuit of picture and sound fidelity, as a trawl through the pages of relevant specialist publications will show. There's money in this business, not only because of the cost of the hardware involved but also because of the vast range of accessories associated with it. Such a set-up may embrace virtually every category of electronic AV box and the control systems and connecting links required. Installation and commissioning of these outfits can also be a lucrative business. See Photo 5.

Interconnections

We have looked at cables for straightforward installations. Those used for home cinema and hi-fi take us into a different world of gold-plated contacts. oxygen-free copper and goodness knows what else, with associated hype and, for the supplier, much profit in percentage terms.

Where an analogue signal is generated locally it's best fed to the TV set in RGB or component video (YUV) form. High-quality cables for this purpose, in both scart and phono format, are available from the suppliers previously mentioned. Where the TV set doesn't have sufficient RGB-equipped sockets a switchbox can be used to connect digiboxes, DVD players and games. These come as simple manual and sophisticated auto-switching types. The latter, in the form of the Quattro unit, automatically switches and routes signals under the control of scart pin 8 control signals or its own remote zapper.

Switchboxes are also available for loudspeaker selection, optical audio routeing (Lektropacks BTZ-1C at £30) and routeing phono video/audio signals. It's even possible, with boxes such as Keene's KA series and STOC type respectively. to convert between RF (coaxial) and optical audio carriers and from composite to S video, though the latter is really only for connection convenience – it cannot provide true S-video picture quality. JS Technology is an innovative player in the video signal conversion business. with wonder boxes that turn RGB signals into S video and component form, and RGB into VGA format for plasma display panels.

Photo 6: A Triax UHF distribution amplifier for outdoor use.

Displays

This brings us to accessories designed specifically for plasma screens. Some screens have difficulty in getting a grip on the 0·3V amplitude sync pulses in a normal video signal. The SyncBlaster from Keene Electronics boosts sync-pulse amplitude without the need for an external power supply, drawing DC from the source scart plug. It works equally well with picture projectors and LCD screens. Some screens don't have a built-in tuner: an increasing range of neat receiver modules is becoming available for this purpose.

A range of Fresnel-lens optical magnifiers for those who want big-screen pictures from small-screen TV sets is marketed by Lektropacks. They can blow up a 14in. picture to 22in., or a 28in. widescreen image to 34in. size.

Optical picture enhancement is also the purpose of the special projection screens marketed by DRH screens Ltd. These provide much better pictures than a plain surface with a front-projection set, and come in manual- or electrically-operated form.

Large-screen pictures can also be enhanced by electronic means, for example with a tuner/line-doubler/progressive scan converter from Plasma Direct, or Lektropacks' CVP video scaler, which is suitable for TV display systems with PC/VGA input and scanning facilities.

Audio

The audio system is a vital part of a home cinema installation. In a multi-purpose living room good-quality headphones can enhance dad's enjoyment of

Queen of the Damned while Claire does her homework and mum reads *Hello* magazine. Cordless phones are perhaps better, and certainly have a higher mark-up!

Real home-cinema audio however involves a mighty six-channel audio amplifier with a Dolby 5.1 digital decoder, blasting out up to 1kW of audio power, much of it from a floor-mounted subwoofer. The sophisticated amplifier/decoders used for this purpose also contain an AV selection and routeing system, and on-screen caption/graphics generators for setting up and to indicate signal source and operating mode. Revealing their North American origins, they don't have scart sockets: phono and S-video ports are used exclusively. This calls for many 'sprouting' scart-adaptor leads, and high-quality ones at that. The audio from a DVD player is fed to the amplifier via 'lossless' optical data cords, all of which come (hopefully) from your shelves or via your order book.

Loudspeaker cables are also hyperbole items that you should recommend and supply. They range from bell wire (well not really!) to exotica at twenty quid or more a metre. For unobtrusive installations flat-ribbon speaker cable, down to 0·5mm thick, is available from Lektropacks and CPC.

Control centres and furniture

A control centre is the very thing for those customers who are deeply into home cinema, perhaps with a dedicated room or, sometimes, a converted garage. Amongst these the Ikon AVS and Audiofile system can control and co-ordinate hi-fi, home cinema, lighting, heating and security systems.

For larger dealers the sale of AV furniture, in the form of racks, stands, cabinets and consoles, is a worthwhile sideline, see Photo 8. Once again such 'accessories' carry a great deal more profit, percentage wise, than the gear which goes on them. Top makers and distributors in this field are Alphason, Soundstyle, Stands Unique and Triskom. Their phone numbers can be found in the contacts box included in Part 2 next month.

Satellite boxes and digiwidgets

The subscription-movie service provided by Sky is a primary driver of the home-cinema business – the set-top box is a dear friend of the movie fan. There's little profit or pleasure unfortunately for the dealer or trade engineer from selling Sky digiboxes or subscription packages, or in most cases from STB repair. Custom installation and the supply/fitting of accessories holds out a better promise of reasonable rewards.

Most Sky boxes are connected to a BT telephone line, for which extension leads, plugs and multiway adaptors are readily available. Many households now have the box and a PC connected to the phone line, and the damage that can be caused to a modem by a lightning strike has often been described in these pages. Surge arrestors to prevent this, and for use with mains and dish-feed lines, are available from CPC and others. They represent a low-premium insurance policy – perhaps! You take the broker's commission when you put your tools away.

A wide range of accessories is available from SatCure, including cooling fans (internal and external), on-screen red-spot removers and auto-on triggers to ensure digibox start up after a mains power cut.

Many of the accessories previously mentioned, for example distribution systems, universal zappers, cables etc. are of interest to Sky digital viewers. For those who want to follow Roger Bunney around the Clarke Belt, or simply to watch the wide variety of programmes on offer from birds other than the Astra cluster at 28·2°E, there is a huge range of accessories, from LNBs to esoteric CAMs, dish positioners and DiSEqC gear to blue-movie subscription cards.

Selling, installing and commissioning satellite systems for ethnic minorities can be an interesting and rewarding business for the freelance technician who is as ready with his ladder and drill as he is with his meter and screwdriver, despite the fact that the number of foreign TV channels on offer from Sky via its 'specialist' menu is now considerable.

Transmissions intended for countries other than the UK often call for special dishes, receivers and programming. Companies such as J.W. Hardy, Holderness Solutions Ltd., HiSat and Pulsat can supply these needs. I know several one-man-band specialists in large cities who do very well catering for clients with overseas roots.

Part 2

We've covered a lot of ground this month, but there is still a great deal to consider. In Part 2 next month we'll be looking at videography (camcorder work), computer video, care products, TV-PC convergence and home security amongst other things. ■

Photo 7: The One For All Kemelion universal remote-control unit.

Photo 8: AV furniture is a good sideline for dealers. Photo courtesy Stands Unique.

Scattered musings of a well-worn serviceman. Chris Avis on over forty years in the trade

Under the bench

Forty-four years is a long time: forty-four years in this trade is a lifetime. I began my apprenticeship when ITA was in the cradle and global warming was caused by valves. There followed a heady mix of continuing fascination and frustration as my servicing career proceeded through set-top boxes (Band I/III converters in those days), VHF turret tuners and their dreadful Fireball cousins, early germanium transistors, 405/625 dual-standard monochrome receivers, then the similar early centrally-heated colour hybrid receivers. This led to the first solid-state colour chassis and subsequently the VCR format battle, precursor of the present recordable DVD format war –are lessons never learnt? More recently there have been satellite broadcasting, OnDigital, OffDigital and now the gobsmacking gigabytes of hi-tech wizardry that does anything from recording unwanted programmes on a personal video recorder to telling the fridge when to order more ice cream. Have we perhaps become a little to clever for our own good?

Today many TV sets and VCRs, not always the cheapies, have a brief life expectancy before dumping proves to be more economic than repair.

As some readers will know from previous articles, Anne and I have run our small service and sales business in Exeter for over twenty years. We still manage to make a living, though it certainly doesn't get any easier. Apart from the obvious challenges of playing constant catch-up with advancing technologies and retreating service support, there are other contemporary issues that concern us.

The WEEE directive and set life

The WEEE directive from the EU on waste disposal and recycling is having increasingly adverse effects on manufacturers and retailers. Although commercially painful, it is right that environmental concerns are at last forcing the realisation that we cannot throw pollutants into the ground and sky indefinitely and retain a world worth living in.

Some of our customers still own and use Japanese sets made over twenty years ago. Our own TV set is a vintage Sony with a service record of one fault (the on/off switch of course). Today many TV sets and VCRs, not always the cheapies, have a brief life expectancy before dumping proves to be more economic than repair. The set manufacturing industry still has the ability to produce sensibly-designed. well-made equipment using components and assembly procedures chosen to ensure long-term reliability. But this comes at a price, and the current preoccupation with sacrificing quality in the cause of cut-throat competition at all costs is something for which our service industry and the environment are paying dearly. There is, in addition, little point in producing a TV set with an environmentally-friendly low power consumption if the thing is so unreliable that it consumes hours of service-bench energy before a premature landfill burial.

Does the western world's insatiable pursuit of ever-increasing hi-tech innovation fulfil needs or create them? A philosophical point to deliberate on – answers please to the letters page!

We try to recycle as much as possible in our business. A local electrical wholesaler who does some mail-order business welcomes any smaller boxes, packing material and padded bags that we can pass on to them. The council recycles cardboard and office paper, and several charities such as the RNIB will accept empty printer cartridges for reprocessing. A

mutually beneficial arrangement with a local totter diverts potentially repairable TV sets en-route to the landfill. We recondition and sell them with a new remote-control handset and a twelve-month guarantee. Maybe the population around Exeter is a unique species, but we find that there is still a steady local demand for refurbished sets of all sizes. These provide a significant part of our income.

Advice

The best 'special offer' that an independent can provide is impartial, user-friendly advice. It's a commodity rarely stocked by the multiples. A few years ago I prepared an A4 sheet on digital TV, which is still a major cause of customer confusion. I update it regularly as the rules of play change and the goal posts move.

On the back there's advice on bringing in repairs and the vexing subject of charges. A copy is supplied with every collected repair and is always appreciated. One customer even asked if he could publish some of it in his next village newsletter!

For a copy to adapt and use as you wish, send an SAE to me at 37 Clifton Road, Exeter EX1 2BN or contact me at chris.avis@btopenworld.com

On the subject of advice, why don't blank video cassette manufacturers include a warning with the self-adhesive labels they provide recommending that the labels are stuck on the box, not the cassette? Peeling labels often come adrift and jam the deck mechanics, yet this simple preventive remedy has never been adopted by the tape makers.

Spares suppliers

All service businesses have their favourite spares suppliers, and those that have been relegated to the farthest end of the proverbial barge pole. Some that we have used over the past twenty years have seen changes of management, ownership and trading policies, not always for the better.

As a small service business we have to deal with suppliers that major on economical brown-goods spares. There are two current holders of the RadioVision RAVES (Rapid Audio and Video Economic Spares) award.

CHS has excellent stocks of a wide-ranging list of economical spares, and an efficient CD-ROM based ordering system. As I write this I have just seen another major supplier's special-offer flyer highlighting a VX1100 belt kit for £1.16 plus VAT. This compares with the current CHS price of 24p plus VAT. The competitor's offer price for the popular HR7503 line output transformer is £10.50 net. This compares with the CHS price of £6.25.

The other award has gone to Wiltsgrove, particularly for the company's very wide range of remote-control units. This includes many of the more obscure types – very useful to us for our older refurbished sets. Prices are generally very competitive. For example a replacement KSS240A laser unit is, at the time of writing, available for an unrivalled £16.75 plus VAT. Enquiries about some of the usually more costly ICs will often help your bank balance.

Hanging on

With less than five years to go to retirement we're hanging on in there. This trade is still the weird and wonderful business it always has been, and so are some of our customers, but we love it – usually. As Groucho Marx said, "Anyone can grow old. All you have to do is to live long enough." I'll let you know in five years if we have! ■

Test Case 482

The Test Case workshop can't be all that bad, despite the problems, cock-ups and mistakes described in this feature from time to time. As the shortage of technicians and repair shops becomes ever greater, we find that more and more work is coming our way. We have recently taken on the servicing side for two more dealers in this region, and some of the jobs we are getting come from customers who live forty or more miles away. These are brought to us, so Doc Colin doesn't have to make 80-mile round trips with his toolbox. There are a few downsides however. For one thing the customer can experience quite a delay, and for another the dealer's mark-up can push some estimates beyond a viable level.

Another drawback is that we are asked to deal with equipment with which we are not familiar – product experience counts for a lot at the service bench. Television Ted's trouble this month was with a Samsung TV set. It was nothing exotic, simply a Model CI14F1T5X (S15A chassis) that was about two and a half years old. Nor was the fault a very serious one: the complaint was about sibilance on sound. Who remembers the first lady newsreader, Angela Rippon? She provided a very good test for this sort of thing.

Ted first checked the tuning which, picture-wise, seemed fine. He next fed in an audio signal from a local source, in fact a VCR. With the set and the VCR tuned to the same broadcast, the 'thhhs' effect came and went as the two audio sources were selected in turn. There was no doubt then that the cause of the trouble was within the tuner/receiver section of the Samsung TV set.

A check with the service manual showed that the relevant part of the circuit is simple and easy to follow. The TDA8842 jungle chip produces a sound IF carrier that passes through a couple of electronic switches and ceramic filters (selected in accordance with the region of use), then an emitter-follower transistor, after which it returns to the chip at pin 1. Within the chip it's then subjected to the usual limiting followed by demodulation. By tracing the 6MHz signal through its entire path, Ted confirmed that the microcontroller chip was setting the switches correctly. The signal was present at seemingly sufficient amplitude throughout – there was after all no noise on the sound to suggest low amplitude, and no vision buzz was discernible. Even so, Ted replaced the two 6MHz ceramic filters, taking care that the new ones were of the correct type, SFE not CDA or T, for this application. There was no change to the symptom, so the originals were put back again.

While poking around, Ted noticed that there was a change in the sound when he touched the area where the carrier-coupling capacitors associated with the emitter-follower transistor Q202 are located. These capacitors are C601 and C604, which are both 270pF. Replacements were fitted, but again there was no change to the sibilance.

Maybe the jungle chip was in some way faulty. There didn't seem to be much else that could have been the cause. With a mere 56 pins, it was not as daunting as some similar devices. Would a replacement cure the fault? What's your opinion? The solution, and maybe a surprise, is to be found on page 251.

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Meteor shower dates for 2003. The current RSL-TV situation in the UK. Roger Bunney reports

Sporadic E reception of Pskov-TV ch. R1 by Ryn Muntjewerff in the Netherlands.

The emphasis with this month's column is changed somewhat from the usual one as I will be providing information on the current and projected RSL-TV situation across the UK: a growing number of lowish-powered UHF stations are springing up to provide varied local programming. This offers exacting DX opportunities – see later.

November 2002 was a disappointing though typical early-winter month for TV-DXing, with little excitement. Even the mid-month Leonids meteor shower produced minimal signal activity, at least during the periods monitored. A check for visual MS displays at 0230 on November 18 drew a blank. There has however been some F2 reception to lift the general autumn gloom, the log being as follows:

5/11/02	Unidentified Arabic ch. E2 transmission; RTQ-0 (Australia), scanner-level signal at 46·1718MHz.
6/11/02	Two Irib (Iran) ch. E2 signals received.
11/11/02	Very strong unidentified Arabic ch. E2 signal.
14/11/02	Three unidentified ch. E2 signals received.
18/11/02	TVQ-0 (Australia) ch. A0 received at scanner level; Irib ch. E2; four unidentified ch. E2 transmissions.

On the 24th an unidentified ch. E3 transmission was received at 1250 hours. And that's it for the month!

Satellite sightings

Atlantic Bird-1 is now fully operational and the GlobeCast multiplex at 11·014GHz V (SR 20,145, FEC 3/4) is humming with signals. There has always been plenty of sports via GlobeCast. This time there was dramatic ice-skating from Quebec on November 1, when the finals of the 2002 Mastercard Skate Canada International tournament were being broadcast. Even more dramatic, eight days later, were live pictures from the ISS (International Space Station) when a Russian Soyuz-5 rocket docked and unloaded materials. There were chummy pictures as the crews met, and detailed pictures of the inside of the ISS. The uplink crew left aboard a different Soyux-5 rocket that had been docked previously at the ISS. An external camera on the space station showed the departing rocket on its two-hour return trip to Russia.

Further space action was seen on the 23rd via the CNN Newsource lease with NSS-7 (21·5°W) when the space shuttle Endeavour was launched to dock with the ISS for an exchange of crews. This was at 11·563GHz H (6,117, 3/4). There were beautiful pictures as the sun set over the Cape, highlighting the about-to-be-launched Shuttle with its liquid nitrogen (?) steaming white against the lattice support structure, also pictures from within the Shuttle's cockpit as the crew were strapped in and various preparations prior to the launch were carried out.

GlobeCast via Atlantic Bird-1 provided a rich variety of North American sports action during the month, including the PGA Gold and the NESN ice-hockey championships. Check the GlobeCast leases for sport on any evening and you'll probably be in luck.

Each year Ramadan produces vivid pictures as the sun sets over Mecca, the sky going from blue to the golden sunset then blackness in just a few minutes. The floodlit minarets, ornate stonework and mass of circulating pilgrims and worshippers provide a dramatic backdrop to the event. Several Arabic TV services carry Islamic prayers from Mecca throughout the Ramadan period: the Saudi channel 2 takes Mecca during all the periods of worship while other channels broadcast only parts of the Islamic day. Saudi channel 2 can be found at 11·747GHz V (27,500, 3/4) via Arabsat (26°E), which is OK with a 90cm dish. The multiplex carrys numerous other Arabic channels.

For the past few months I've also been monitoring the Eutelsat Sesat bird at 36°E. In addition to many unusual signals, the Fox News Network from Jerusalem has carried breaking news. Check the Fox feed at 10·963GHz V (3,254, 3/4) which, during the 24-hour period, transmits either news feeds or colour

bars. For a couple of days in mid-November the Jerusalem feed was replaced with one from Amman, Jordan. Non-Cat Thailand appeared via Sesat on November 19 at 11·510GHz V (6,117, 3/4), but the picture cut just after the signal parameters had been confirmed! On the same day R.R. SNG-03 appeared via Sesat, at 11·069GHz V (5,632, 3/4) but was encrypted. Another miss.

Unusual signals are also to be found via NSS 703 (57°E), which is just visible at my location. On November 11 a scan revealed digital activity at 11·149GHz V (6,667, 7/8), but my RSD receiver produced an 'encrypted signal' caption with the service identification MTI-EBU-LBR. I also tried my Manhattan DigiPlaza receiver to see if this would produce more information. The signal locked, this time with a different identification – TES D-16 – but alas no pictures.

Alan Richards (near Nottingham) is lucky in being able to receive signals from PanAmSat 9 (58°W), which carries a rich variety of television entertainment. The 15th International Baseball Cup from Havana, Cuba was carried for several days during the middle of the month. Domestic Cuban TV is also available via this satellite, which is well received via Alan's 1·2m ex-SIS bookie dish. He also reports that the French Petrol Station TV, with a 'Chev C1' service identification, can be found via Eutelsat W3 (7°E) at 11·053GHz H (6,666, 7/8).

The EBU New York news feeds via Intelsat 605 (27·5°W) were a feature of my sat-zapping in the early days. The Stefan Hagedorn internet newsletter reports that the digital feeds, at 11·475GHz V, have now ceased. The same frequency was used in the simpler analogue days!

Roy Carman (Dorking) reports that live uplinks of the Mount Etna volcanic eruptions in Sicily were carried by both Eutelsat W2 (16°E) and the Russian Express 3A satellite (11°W). The former was at 12·517GHz H (5,632, 3/4) with the identification HOL 091. Pictures showed the red-hot lava flows burning through trees, blocking roads and destroying houses.

Meteor showers 2003

I'm grateful once again to Neil Bone, director of the meteor section, The British Astronomical Association, London W1J 0DU, for this year's meteor shower dates, see Table 1.

Random meteors and the more dramatic meteor showers can produce signal reflections throughout the year in Band I. When a shower is particularly active the usable frequencies can rise to Band II (FM) and, at times, reach Band III (175MHz upwards). Meteor burn-ups leave an ionised trail, typically at a height of about 100km. This is at a similar height to the E layer and, with a sufficiently intense burn-up, you get VHF signal reflection over similar distances. Random meteors are naturally unpredictable, but the major meteor showers occur at predictable dates and times.

For successful MS DX-TV reception you need a very accurately-tuned TV receiver with a reduced IF bandwidth. The latter helps lift the weak signals from the noise. Equally important is the receiver's sync lock-up capability. Since the signals often last for only a few seconds, accurate setting of the line and field hold controls is essential to ensure quick locking. A two-element wideband Band I aerial will suffice, providing signal pickup over a wide angle. Use a preamplifier to make up for the lack of aerial gain.

Though the number of Band I transmitters continues to decline, quite a number are still in operation, particularly in Scandinavia. The distance of the latter from the UK provides a suitable reflection path.

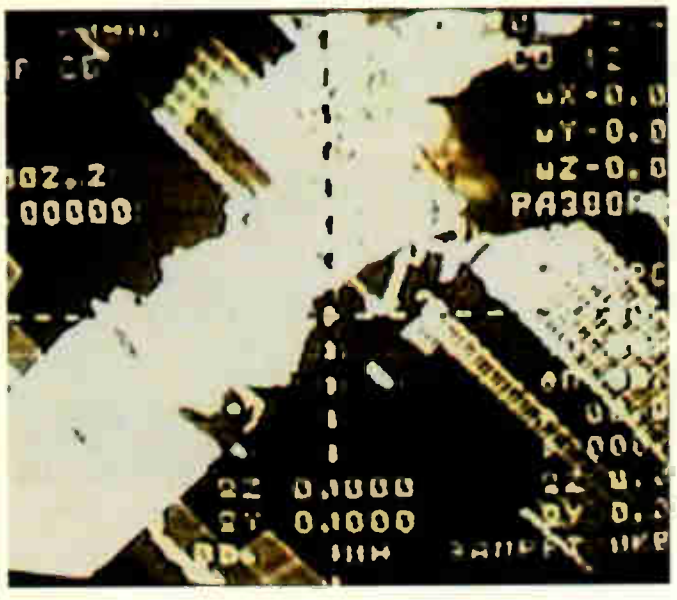
Note that Leonids activity is at present declining, and is likely to be less than in 1999-2002. The Perseids and Geminids should provide good potential in 2003. There will be no substantial Giacobinids activity this year.

Broadcast news

South Africa: The SABC intends to start moving to digital radio and TV transmission shortly. Detailed plans for dual analogue/digital operation are expected to be released by the SABC's Johannesburg HQ in early January. The aim is for full digital conversion of the transmission network by the end of 2007.

Report on the Soyuz- 5 undocking from the ISS begins, reception from Atlantic Bird-1.

France: A report in *Six News* reveals that 50MHz amateur radio operation is very active in France, but there are many restrictions as Canal + still uses the Band I channels L2, 3 and 4. In



An ISS camera view of the departing racket.

areas close to a ch. L2 Canal + transmitter, e.g. Corsica, no amateur operation is permitted. But full amateur power is allowed in areas away from potential TV interference, though each amateur must obtain an operating permit. The *Six News* feature includes a complex regional map of France showing where amateurs can operate, with aerial type, transmission mode and power limits.

Table 1: 2003 meteor shower dates

Meteor shower	*Overall period*	*Peaking*
Quadrantids	January 1-6	January 3 at 22 hours
Lyrids	April 19-25	April 22 at 20 hours
Aquarids	April 24-May 20	May 4
Cetids	May 7-June 9	May 14-25
Delta Aquarids	July 15-Aug 20	July 29 and Aug 6
Perseids	July 23-Aug 20	Aug 13 at 03 hours
Orionids	Oct 16-27	Oct 20-22
Taurids	Oct 20-Nov 30	Nov 3
Leonids	Nov 15-20	Nov 18 at 03 hours
Geminids	Dec 7-16	Dec 14 at 10 hours
Ursids	Dec 17-25	Dec 22

RSL-TV coverage

There has been a steady growth of RSL (Restricted Service

Table 2: RSL-TV station listing by regions

Anglia
Bedford: Herts TV ch. 52 H, 5kW. Transmitter site Sheerhatch Wood. Cleared to start.
Braintree: Herts TV ch. 64 H. Transmitter site Kentishes Farm. Planning.
Cambridge: Herts TV ch. 56 H, 1kW. Transmitter site Madingly. Planning.
Chelmsford: Herts TV ch. 57 H. Transmitter site Bakers Wood. Planning.
Dallington: Midlands Cable TV ch. 48 V, 0·065kW. Transmitter site Dallington Park. Licensed.
Huntingdon: Herts TV ch. 44 H. Transmitter site Wood Green Animal Shelter. Planning.
Ipswich: Herts TV ch. 66 H. Transmitter site Hill Farm. Planning.
Luton: Herts TV ch. 68 H, 0·8kW. Transmitter site Luton. Cleared.
Northampton: Midlands Cable TV ch. 33 H, 1kW. Transmitter site Cogenhoe United Football Club. On air.
Norwich: TV Norwich ch. 68 H, 10kW. Transmitter site Tacolneston. Licensed.
St. Neots: Herts TV ch. 55 H, 0·5kW. Transmitter site Little Barford Church. Cleared.
Stevenage: Herts TV ch. 51 H, 1kW. Transmitter site Bury Farm, Knebworth. Cleared.

Borders
Carlisle: Carlisle TV Ltd. ch. 48 H, 10kW. Transmitter site Caldbeck. Licensed.

Carlton Central
Aylesbury: Herts TV ch. 65 H. Transmitter site Stone. Planning.
Bicester: Herts TV ch. 65 H(?), 1kW. Transmitter site Oxford. Cleared to start.
Leicester: Middlesex Broadcasting Corporation ch. 68 H, 4kW. Transmitter site New York Farm. On air.
Oxford: Oxford Channel ch. 47 H, 10kW. Transmitter site Oxford (common with Bicester). On air.
Stratford upon Avon: Bard TV ch. 48 H. Transmitter site Gospel Oak. Planning.

Carlton/LWT
Henley on Thames: Herts TV ch. 61 V. Transmitter site Henley on Thames. Planning.
Welwyn Garden City: Herts TV ch. 53 H. Transmitter site West End. Planning.

Carlton Westcountry
Cornwall: James Driscoll Associates ch. 56 H. Transmitter site Redruth. Planning.

Grampian
Inverness: Caledonia Television ch. 52 H, 10kW. Transmitter site Rosemarkie. Licensed.

Granada
Manchester: Manchester Student Television ch. 39 H, 4kW. Transmitter site Bolton Water Tower. On air.

Licence) TV in the UK over the past four years. An RSL allows a TV service, usually commercial, to be established covering a defined local area. Licences are awarded to applicants considered by the ITC to be best able to provide a programme service within the application brief for their particular area, with the emphasis being on local content. This is similar to the method used when awarding ITV regional franchises up to 1992.

Each RSL-TV licence lasts for four years and is renewable after a tendering procedure. The Isle of Wight RSL-TV station TV 12, though successful, lost its franchise in mid 2002 and closed down within days, though the licence still had four months to run. If a franchise is awarded but the station fails to go on air, the ITC can revoke the licence. This has happened in Aberdeen.

In some areas of the UK there is considerable RSL-TV activity, while other areas have no such services. It depends on where channels can be fitted in without causing interference to main services. The writer lives in Romsey Hampshire, where it's possible to receive good-quality pictures from Southampton TV on ch. 29 (also poor-quality pictures from the station's ch. 55 relay) and the Isle of Wight Solent TV service on ch. 54. The Romsey area is to have its own RSL-TV service on ch. 48.

These RSL-TV signals can, under favourable conditions, be received outside their intended service areas, giving scope for the DX enthusiast.

A listing of the current RSL-TV situation is provided in Table 2. It has been compiled from ITC internet listings. For latest information, check at
http://www.itc.org.uk/uk_t.../rsl_transmitters

Fox News Amman received via Sesat at 36°E.

HTV
Cardiff: Capital TV ch. 49 H, 0·12kW. Transmitter site Merlin Cardiff. Cleared to start.

Meridian
Bournemouth: My TV Network ch. 29 H. Transmitter site Hengistbury Head. Planning.
Chichester/Bognor Regis: Radio Enterprises Ltd. ch. 46 H, 1kW. Transmitter site Nunnington Farm. Licensed.
Isle of Wight: Solent TV Ltd. ch. 54 H, 2kW. Transmitter site Rowridge. On air.
Lymington: Local Television Company ch. 48 H. Transmitter site council offices. Planning.
Portsmouth/Southsea: My TV Network ch. 29 H, 1kW. Transmitter site Gosport. On air.
Reading: Applicant unlisted, ch. 62 H, 1kW. Transmitter site Sulhamstead. Cleared to start.
Romsey/Totton: Local Television Company ch. 48 H, 1kW. Transmitter site Toothill. Cleared to start.
Southampton: My TV Network ch. 29 H, 4kW. Transmitter site Fawley. Also ch. 55 V relay transmitter at Millbrook, 0·2kW. Both on air.
Tunbridge Wells: Very Local Television ch. 68 V. Transmitter site Tunbridge Wells. Currently suspended.

STV
Glasgow: GOTV ch. 59 H, 10kW. Transmitter site Black Hill. Licensed.
Lanarkshire: Thistle Technology Group ch. 48 H and ch.67 H, 10kW. Transmitter site Black Hill. Transmissions currently off air.

Tyne-Tees
Teeside: City Broadcasting ch. 67 H, 10kW. Transmitter site Hemlington. Cleared. Covers Stockton, Redcar and Middlesbrough.

Ulster
Belfast: Northern Visions ch. 62 H, 1kW. Transmitter site Ballygomartin. Cleared.
Coleraine: North West Television Services ch. 48 H, 1kW. Transmitter site Coleraine. On air.
Derry: North West Television Services ch. 21 H, 5kW. Transmitter site Sherriff's Mountain. On air.
Limavady: North West Television Services ch. 48 H, 0·5kW. Transmitter site Stradreagh. On air.

Yorkshire
Grimsby/Cleethorpes: Lincolnshire Television ch. 63 H, 0·5kW. Transmitter site East Ravensdale. Cleared.
Hull: Lincolnshire Television ch. 62 H, 5kW. Transmitter site Caistor. Cleared.
Scarborough: Praxis Pictures ch. 68 V. Transmitter site Olivers Mount. Planning.
York: TV York ch. 54 H, 5kW. Transmitter site Askham Bryan. Licensed.

SATELLITE NOTEBOOK

Reports from
Christopher Holland
Hugh Cocks
and
Michael Dranfield

Missing EPG channels

I've come across two cases recently where one or two channels have been missing from a digibox's EPG. On the first occasion the customer rang to say that ch. 103 (ITV) was missing. When 103 was entered the red 'channel unavailable' message appeared. The second case was a new installation that wouldn't produce Channel 4 on 104 or Channel 5 on 105. All other channels were available with the two digiboxes.

In both cases removing mains power from the digibox and rebooting restored the channels to the EPG. It's strange that in four years I've never come across this problem before, then it happened with two digiboxes in quick succession. Maybe it's something to do with new software being downloaded into the boxes. **C.H.**

Digital channel update

The latest channel additions at 28·2°E are listed in Table 1. The EPG number is shown in brackets after the channel name.

BBC Radio 7 started transmissions in mid-December via transponder 5 (11·798GHz H). EPG no. is 922. The Welsh-language S4C (EPG no. 184) is no longer encrypted. Previously it was available automatically with a viewing card registered at a Welsh post code but had to be specially requested outside Wales.

Chartshow (transponder D7S) has moved from EPG no. 458 to 455 to make way for The Hits (458). Hollywood Classics TV has been allocated EPG no. 247.

The E Entertainment TV channel started testing in late November with various unencrypted live Sky Sports and Box Office feeds (see Photo 1). Regular transmissions started in Early December. Classic FM TV started tests around the same time with a caption, see Photo 2, and appeared in the EPG before starting full transmissions.

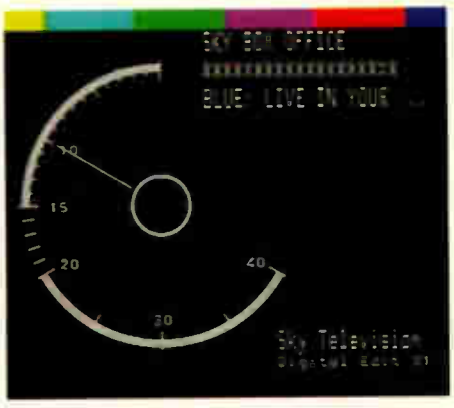


Photo 1: E Entertainment TV test transmission.

Photo 2: Classic FM TV test transmission.

Photo 3: GlobeCast test pattern via transponder D9S prior to the start of Asia TV Network.

Photo 4: Radio TV Guinea colour bars transmitted in the morning till 0900 via Intelsat 605.

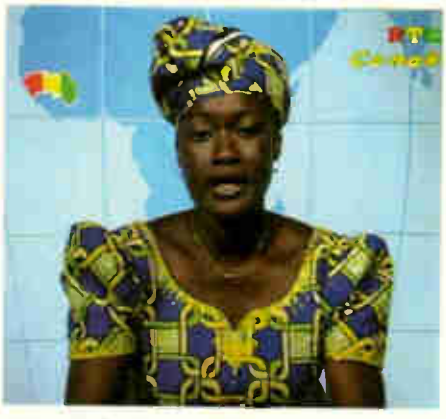


Photo 5: Radio TV Guinea programme transmission. Note logo at top right-hand side.

Photo 6: City TV Bogota via NSS 806. The very low symbol rate doesn't seem to diminish picture quality.

Photo 7: Argentine Channel 7 test pattern via NSS 806.

Table 1: Latest digital channel changes at 28·2°E

Channel and EPG	*Sat*	*TP*	*Frequency GHZ/pol*
Asia TV Network	EB	D9S	11·623/H
Classic FM TV (464)	EB	D2S	11·488/V
E Entertainment TV (250)	EB	D6S	11·565/V
Galaxy Radio (921)	2B	32	12·324/V
N. American Sports Network (420)	EB	D9S	11·623/H
P Rock (461)	2B	30	12·285/V
Simply Asian (826)	EB	D9S	11·623/H
Sky One Mix (107)	2A	27	12·226/H
The Hits (458)	2A	4	11·778/V
The Music Factory	2A	10	11·895/V

TP = transponder. 2A = Astra 2A. 2B = Astra 2B. EB = Eurobird.

A GlobeCast test pattern with an ATN programme identification banner was in use via transponder D9S at the beginning of December, see Photo 3. The vertical line in the bottom rectangle of the Philips pattern continuously moved from end to end. Asia TV Network then started up later in the month.

Paramount TV (EPG no. 127) moved from transponder 10 to transponder 25 (12·188GHz H). Shortly afterwards The Music Factory appeared with tests via transponder 10 (11·895GHz V). **C.H.**

Intelsat 605 update

Since my listing of the C-band channels available via Intelsat 605 (27·5°W), see the December issue, Radio TV Guinea has started transmissions at 3·934GHz, with RH circular polarisation, a symbol rate of 4,550 and 1/2 FEC. Colour bars are transmitted in the morning, prior to programmes, up to 0900 UK time – see Photo 4. During programme transmissions there's always a logo identification at the top right-hand side of the picture, see Photo 5.

Radio National Guinea is transmitted as a separate 192kbit/sec mono audio channel. **H.C.**

C-band reception

Last month I listed the signals available from NSS 806 (40·5°W) in the lower part of the 4GHz band. Table 2 lists the transmissions in the upper part of the band – those marked with an asterisk are encrypted.

A lot of the transmissions use very non-standard symbol rates, going as low as 1,900 with City TV, Columbia, though the picture quality doesn't appear to be diminished (see Photo 6). Apart from the Argentine analogue Channel 7 (see Photo 7) there are unfortunately no test patterns during the South American night.

Argentine Channel 7 (4·167GHz) is a 625-line PAL transmission with mono TV sound on a 6·6MHz wideband FM subcarrier and Radio Nacional Argentina in mono on a 7·5MHz narrowband FM subcarrier.

Photo 8 shows the Telecaribe and Photo 9 the TV Marti caption.

There are some other frequencies that

Photo 8: The Telecaribe caption via NSS 806

Photo 9: The TV Marti caption via NSS 806.

Table 2: Higher frequency allocations, NSS 806

Frequency GHZ/pol	*SR/FEC*	*Service*	*Country*	*Standard*
3·982/L*	6,665 7/8	National Geographic	Argentina/Brazil	–
4·016/R*	5,712 3/4	RCN TV	–	–
4·021/R	1,900 7/8	City TV, Bogota	Columbia	525
4·045/R*	14,000 7/8	Fox Sports	South America	–
4·068/R	7,400 7/8	Telefe and Horse Racing	Argentina	625
4·092/R	2,965 3/4	Telecaribe	–	525
4·100/R*	6,111 3/4	Televen	–	–
4·108/R	3,280 5/6	Rede Gospel**	Brazil	525
4·123/R	8,900 3/4	Worldnet	–	–
4·123/L	4,340 3/4	Colour bars***	–	525
4·143/R	4,800 3/4	Worldnet/TV Marti	Aimed at Cuba	–
4·150/L*	3,702 7/8	National Geographic	Paraguay	–
4·167L	Analogue	Channel 7	Argentina	625
4·181/R*	26,667 5/6	Pramer Cablevision	–	–

* Encrypted channel.
** Also Manchete Gospel FM in 256kb/sec stereo.
*** Also tone and an unidentified Brazilian radio station in 128kb/sec mono.

use MPEG-1 and the North American Digicipher system. An MPEG-2 receiver is not able to decode these. **H.C.**

Amstrad DRX100

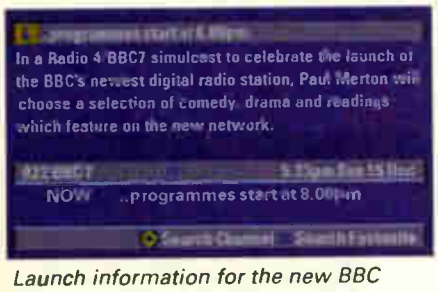
The RF audio output from this digibox was crackling and popping though the scart audio output was OK. The mono audio input to the RF modulator comes from pin 34 of the CXA2078Q chip U901. A scope check at this pin showed that a lot of hash was present. As U901 also switches the scart audio, I decided 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 C911, so the next step was to short its negative end to chassis. This is what I 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.**

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 STV0119B 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.**



Launch information for the new BBC Radio 7 which is available on EPG no. 922.

Amstrad DRX200

Although this digibox could be switched out of standby 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. **M.D.**

Pace 2200

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 0·3Ω sensing resistor R114, 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 Q138, but replacing U600 made no difference. The only input to this chip from the LNB circuit is via a potential divider that consists of R116 (22kΩ) and R117 (2·7kΩ). 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 R116 with a 220kΩ resistor the threshold voltage at TP745 would rise by 0·1V, matching the voltages in the working box. Doing this provided a complete cure. **M.D.** ■

VCR CLINIC

Reports from
Eugene Trundle
Bob Flynn
Martyn S. Davis
David I. Scott
and
Dave Husband

We welcome fault reports from readers – payment for each fault is made after publication. See page 236 for details of where and how to send reports.

Toshiba V725K

This machine would accept a cassette, but with one exception none of the front-panel keys had any effect. The eject key had an effect – it brought up 'test' on the front-panel display. Play mode could be entered by using the remote-control unit, but the picture was snowy and had bad tracking. Nor was there any sound from the tape or the tuner! All these symptoms stemmed from corrupt data in the EEPROM chip. We had to reset all the option bytes. A table listing them is available from Toshiba's technical department. **E.T.**

JVC HRJ665

This was a strange one! The machine wouldn't accept a cassette but if one was wound in manually the deck worked correctly in every respect. There would be a problem only during eject, when the cassette stopped while it was still well inside the machine. The cause was that the record tab switch, which also acts momentarily as a cassette in/out sensor, wasn't being triggered. Its little plastic operating lever had somehow become 'unclicked' at the left-hand side. All that was needed was to press it back into place. **E.T.**

Philips VR6547

The customer complained that after a minute the picture would break up with no sound, and the counter would stop. But when I plugged the machine in to test it nothing came to life. This VCR is identical to the **JVC HRJ200** range and, as with these machines, C12 (2·2µF, 50V) was the cause.

Then, before I had a chance to insert a tape, I noticed that the E-E picture and sound were constantly blanking out and returning. The situation improved as the machine warmed up. The cure was to replace C206 (0·1µF, 50V) in the IF module, which is the smaller of the three cans.

At last to the original fault, whose cause turned out to be a worn pressure roller. As a result of the wear the tape rode up off the control head.

When I ejected the cassette a big loop of tape was left inside the machine. A new mode switch, part no. PU60622, sorted out this final problem.

What a life indeed! **B.F.**

GoldStar GHV1240I

This old-timer wouldn't accept tapes. As usual, the arm assembly gear R on the side of the housing had parted company with its spring because of a broken lug. Tapes were accepted when a new gear (435-148R) was fitted, but as I wired up the machine to test it I found that the TV channels via the VCR were wandering in and out of tune.

I replaced C715 in the IF module as it often causes similar problems, but this made no difference. I then spotted some old brown glue under a coil connected to the tuner unit's TU pin. Removing this glue cured the fault. **B.F.**

Sanyo VHR790

This machine was dead following a power cut. It has two 150kΩ start-up resistors which, curiously, are fed from the mains bridge rectifier's reservoir capacitor via two 1·5MΩ resistors. One of these was open-circuit. I decided to replace them both, after which everything was fine. **M.S.D.**

Samsung SV630B

This machine came in dead with a tape stuck inside it. Some quick checks revealed a power-supply meltdown: D1SR11, Q1SR02, Q1SR01, R1SR11 and R1SS10 had all failed. A quick call to Samsung Technical produced the suggestion that the cause could have been the 43V zener diode ZD1SS1 associated with the 33V line, on the secondary side of the power supply. Not this time!

After a full rebuild and reassembly I sat and watched as R1SR11 went up like a firecracker while everything else went short-circuit.

Second time round I replaced the failed components, removed and checked every capacitor, measured every resistor, checked every diode then powered the main board via a variac. With an input of about 50V AC the VCR's display bars lit up, and stayed lit as I increased the input to the full mains voltage. I refitted the deck and repeated the variac power-up procedure. This time the power supply failed to come to life. The fault had to be on the deck!

In fact the cause of the fault was to do with the capstan-motor assembly: its on-board IC had blown a hole and was leaking fine sand! It seems that with this power supply design the 15V rail will, when a short is present, continue to supply current until the chopper transistor has had enough and breaks down. **M.S.D.**

Panasonic NVSD40B

There were two complaints with this immaculately kept machine, intermittent sound drop-out and picture instability. They sometimes occurred together, but often happened independently. Fortunately for me the fault put in an appearance straight away. The cause was fairly quickly traced to poor soldered joints at the audio/sync head.

Playback of prerecorded tapes was satisfactory once these dry-joints had been attended to, but playback of the machine's own recordings wasn't. I was fairly

confident that a general mechanism overhaul would improve matters, and this turned out to be the case. The guilty items were a very loose pinch roller and a back-tension band with virtually no friction material left. After replacing them and carrying out adjustments perfect results were obtained. **D.I.S.**

Goodmans TX3650

This well-used machine was given to its new owner who simply wanted to be able to play prerecorded tapes. Unfortunately when he tried to use it he was unable to find the test signal so that he could tune his TV set to the VCR's output. On top of this, when he tried to play a tape it tangled within a few seconds. The test-signal problem was caused by a faulty modulator, which it would not have been economic to replace. I suggested to the owner that he should use the scart connector for playback, which he was prepared to do.

The other problem was cured by replacing the pinch roller and back-tension band and cleaning and adjusting the mechanism. An acceptable though compromise repair was thus achieved. **D.I.S.**

Panasonic NVFJ610B-K

This fairly new machine wouldn't respond to the remote-control unit. The limited number of functions that could be controlled at the machine itself worked correctly, while the remote-control unit worked the owner's matching Panasonic TV set.

Correct operation could be restored by applying slight pressure to the IR receiver, so I suspected poor joints on the main PCB. This was not the case however. The cause of the problem was that one of the IR receiver's three leads had fractured where it enters the body. The leads are bent by 90°, so it's possible that the damage could have happened during the lead-forming process or when the component was attached to the PCB.

As with most modern machines, access to the solder side of either PCB is not good, and requires deck removal. After removing the deck I was able to loosen both PCBs from their fixings. This provided sufficient room to be able to solder the new component without having to strip everything out of the case. **D.I.S.**

Ferguson FV10

Another repairer had fitted a new head drum and had overhauled the mechanics. Shortly afterwards a sound problem arose, but my now he had had enough and wouldn't look at the machine!

The symptoms, low and distorted sound in the E-E and playback modes, suggested trouble in the modulator. I would have preferred to fit a replacement, but was pretty sure that the owner wouldn't agree to this after his recent expenditure on the machine. So repair at component level was called for. When I removed and examined the modulator I found two capacitors that appeared to have dried out, C2 and C3. Replace-ments provided a cost-effective repair – to everyone's relief! **D.I.S.**

Hitachi VTMX110E

This Hitachi-badged VCR with the Philips Turbo deck was dead. I found that the LT fuse MP160 was open-circuit. A total strip down was required to replace it, but after doing this and inserting a tape the fuse blew a few seconds later. Before its demise I noticed that the heads rotated but the capstan motor hadn't even twitched. A new motor cured the fault – or rather one from a scrap machine, to make the repair economical! **D.H.** ■

MONITORS

Fault reports from Ian Field and Richard Barsby

We welcome fault reports from readers – payment for each fault is made after publication.

Reports can be sent by post to:

**Television, Fault Reports,
Anne Boleyn House,
9-13 Ewell Road,
Cheam,
Surrey SM3 8BZ**

**or e-mailed to:
tessa2@btinternet.com**

CTX 1565D

This monitor produced a single short flash from the green LED after which there was nothing. As luck would have it the first item I checked, the 2SC4924 line output transistor Q701, was short-circuit. I didn't have one in stock, so I decided to try the standard 2SC3886A. It's impossible to tell, using a DMM diode-check, whether a short-circuit transistor has an integral damper diode. I knew that the 2SC3886A doesn't, but it didn't matter as this chassis has a discrete damper diode next to the transistor on the heatsink.

Before soldering the transistor I decided to check all the components in the B+ feed, starting with the 35V supply rectifier D109 then the B+ PWM flyback rectifier D407 and the associated MOSFET. These items were all OK, but the two diodes were both dry-jointed. Overall the soldering was reasonably good, and the dry-joints at the diodes didn't look as if arcing had started, so I decided to give the chassis a more thorough inspection than usual in search of possible causes of the line output transistor failure.

There were very slight signs of liquid stain on the PCB around the transistor. Inspection of the dust inside the top ventilation grilles was inconclusive, so I soldered up and gave the monitor a long soak test with plenty of switching on and off to try to provoke any weakness. As the monitor worked happily enough I declared it fit. **I.F.**

Essex PV772IM

This monitor was dead with the power supply tripping. A note attached to it read "customer says it's the power transistor". Sure enough the line output transistor was short-circuit. It had been resoldered recently, leaving doubt as to whether it was the original transistor or a replacement that hadn't lasted long.

When I disconnected the line output transistor there was still something that stopped the power supply working, so I decided to check the IRF640 MOSFET in the B+ PWM regulator circuit. The regulator circuit is of the flyback type in this chassis. While this is less troublesome than a Buck-type regulator with a p-channel MOSFET, when it fails it usually stops the power supply.

A quick way of checking a MOSFET is to use a continuity tester to check for drain-source leakage. This is usually a sufficient test. But a residual charge at the gate will often make the MOSFET conduct. A further MOSFET test is to use the voltage at the continuity checker's probes to forward and reverse bias its gate and confirm that the device conducts and cuts off. This MOSFET seemed to lose conductivity when positive gate bias was applied. I've come across this symptom before, associated with mysterious faults in B+ PWM regulators. The MOSFET tested normally when it was removed however. So I tried cleaning the PCB with strong solvent before refitting the MOSFET. I repeated the test before resoldering its pins and obtained normal results. The monitor worked normally once the pins had been resoldered. I then gave it a long soak test, with repeated switching on and off. There was no further trouble.

One of the detachable PCB guides had been broken, and someone had attempted to repair it with petroleum-based adhesive. Since the plastic is ABS, similar to polycarbonate, the hydrocarbons in the adhesive had made the plastic around the original break disintegrate. I used superglue to reassemble as many of the larger fragments as I could figure out where they should fit. This left a lot of gaps and very little mechanical strength, and I had trouble building up any substance – the brand of superglue I was using seemed to be extra runny. Then I remembered an old "trick of the trade". Cigarette ash makes a good, absorbant filler, and reacts with superglue to produce very rapid hardening. It sets like granite!

Part of the locating lug was missing, so the repair would be subject to greater stress than the original part. But it should have held provided it was not handled in a rough manner. **I.F.**

CTX 1565GM

The problem with this monitor was that the focus drifted as it warmed up. It was no surprise then when I found a Panasonic M36KPC000X01/47 tube inside. The prognosis would have been much better had the other common culprit for this sort of thing, a Chunghwa tube, been fitted. Panasonic CRTs are the most difficult to 'flash-clean', and frequently suffer a relapse.

Previous attempts at flashing the focus electrode to dislodge debris have involved fitting a flylead to the focus cavity and flicking between maximum focus output and chassis or, in extreme cases, feeding it with a raw collector pulse. This method has been about 80 per cent successful with all CRT makes except Panasonic.

In an attempt to achieve greater success I decided to wire up a scrap CRT base with the three cathode pins connected to an earthing braid which was in turn connected to the Aquadag earthing braid. The lead from the focus cavity was then eased under the anode cap. Very often the flashing and sparking inside the CRT's neck is not vigorous enough to indicate that the electrodes are being cleaned. On such occasions I use

a NiCad battery consisting of five D-cells to apply 6V to the heater. This usually produces enough activity to clean the electrodes.

There was a considerable improvement after carrying out this procedure, but the focus still drifted by more than an acceptable amount. A second attempt was made, during which the frame scanning failed. So it was impossible to tell at this stage whether there had been a further improvement to the focusing.

Although voltages were present at the LA7838 frame IC and touching the checker on certain pins made the horizontal line bounce, I decided to try a replacement. This made no difference of course. Scope checks proved that the PC's video card was still supplying frame pulses, which were present all the way to and beyond the 74LS86 pulse inverter/buffer chip. A look at the chassis revealed a small cluster of chips directly beneath the CRT's rimband, with associated electrolytics that stood up with little more than 2cm clearance. Because of the slight curvature of the rimband the two chips in the middle looked the most likely suspects. These were an HA11324, which is a standard '324 quad op-amp, and an LA7851 sync jungle chip. In view of its function the latter seemed the most likely suspect, but as this chassis is a real pig to remove and work on, I decided to replace both ICs. To my great relief the frame scanning had been restored. Ironically, although the chassis is very difficult to dismantle it unclips easily from the front part. It would have been simple to put the monitor on its side during this flash-clean procedure, with the chassis tray unclipped and positioned a safer distance from the rimband.

This wasn't the end of the story however. Despite the reputation that Panasonic CRTs have for causing focus problems, the cause of the trouble turned out to be a faulty line output transformer. The monitor performed well once this had been replaced. **I.F.**

Advance OS2000R oscilloscope

The problem was no trace. Despite being of solid-state design, this oscilloscope contributes to taking the chill off the workshop in colder weather – so it often gets left on for long periods even when it's not in use. One afternoon I noticed a nasty smell which puzzled me until I went to use the scope. Repair was obviously necessary, but the insides of these instruments make me nervous!

Some designs run the CRT with the final anode at or near chassis potential and the EHT at the 'pins end'. Others split the EHT potential between the final anode and the pins end so that the deflection plates are at approximately 200-300V above chassis potential. In addition the EHT is usually lethal, being mains-derived. In this case a 750V winding on the mains transformer feeds a three-diode multiplier: the PCB markings indicate that the final EHT is 3kV.

The EHT section was obviously working. A spark could be drawn from it for well over a centimetre! While searching for some less-hazardous voltages to investigate I noticed three electrolytics that are mounted on the mid-chassis bulkhead, behind the main chassis front-panel controls. There were two 2,000µF, 25V types and a mains-input style two-in-one can smoothing block.

Only one of the 2,000µF electrolytics had a voltage across it, so I followed the wire leading away from it into the loom. It emerged only a short distance away and went to a small PCB on the mid-chassis bulkhead, next to one of the deflection plate amplifiers fitted to the side of the CRT shielding. When I traced along the PCB print I discovered that the two electrolytics are part of a symmetrical power supply which is fed with 18V AC and uses a W02 bridge rectifier (MR101). For regulation there are zener diodes with dropper resistors, each with an emitter-follower: the two TO126-encapsulated transistors are bolted to the mid-chassis bulkhead.

The positive side of the supply was working, but no voltages were present in the negative regulator section. One of the four diodes in MR101 had ruptured open-circuit. There are no fuses or other protective devices in this circuit, so the fault current had continued until it had destroyed the short-circuit diode. Apart from attending to the heat-damaged print around the bridge rectifier there was nothing else to do but replace MR101, switch on and watch for signs of trouble. As nothing untoward occurred, I added first the X plug-in then the Y plug-in. Once the instrument was powered with both modules in place I was very relieved to see both traces appear on the screen.

Although the EHT generator was in good condition, I was not happy because it uses stacked selenium-pellet type rectifiers. As my workshop gets rather damp at this time of the year I decided that silicon rectifiers would be safer. The EHT winding is marked 750V AC. It doesn't specify RMS, but I assume that this is what it is and that the peak voltage is higher, say about 1·06kV. The rectifiers must withstand the full peak voltage plus the peak value stored by each capacitor. I couldn't find any 2kV rectifiers, so I used two BY359F1500s in series to replace each selenium rectifier.

Note that because of the greater efficiency of silicon rectifiers the final EHT will be increased, with a corresponding increase in beam current. It's important to realise that the stronger beam will require more deflection, which obviously affects both axes.

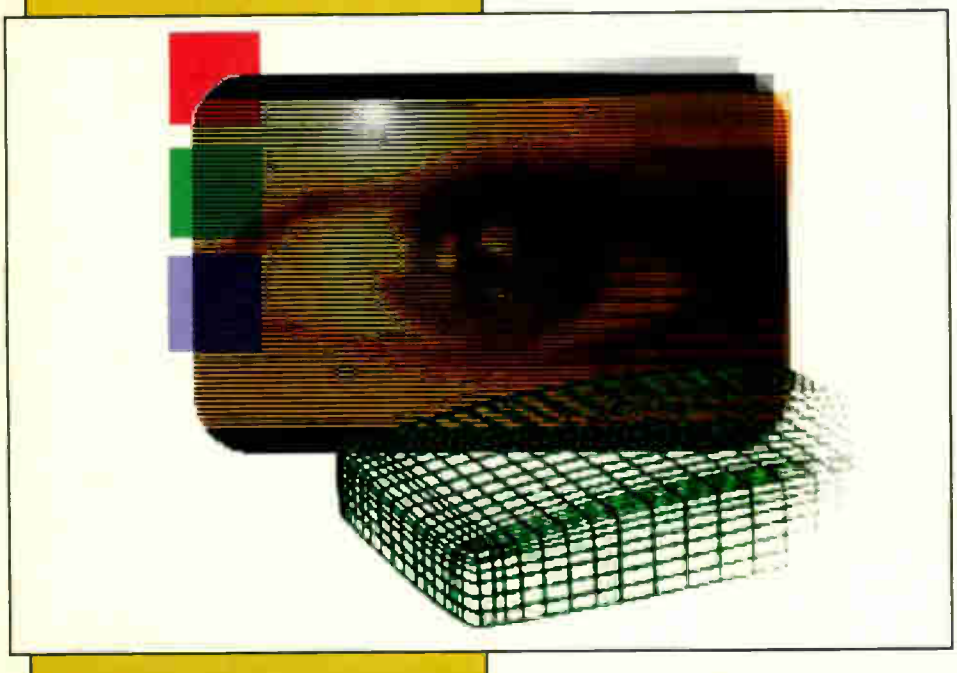
A more important issue arises when upgrading from selenium to silicon diodes in an EHT multiplier – safety. In the event of diode failure a selenium rectifier would burn up, whereas the silicon rectifiers I used would become a stubborn short-circuit. It occurs to me that the weakest point would be the wiring in the loom. The fumes produced when a selenium rectifier fails are highly toxic, but they do provide ample warning that something is amiss. Although the oscilloscope had been designed to cope with incandescent disintegration of a selenium rectifier stick, I would not like to risk the possibility of an insulation fire in the harness.

Various types of fuse were considered. Plain glass and ceramic (20 x 5mm) types were rejected because the voltage multiplier would be capable of flashing across the deposits of vaporised fuse wire on the inside of the fuse body. The "arc-quenching" sand-filled type was also rejected, mainly because none of the types I found in the lists I referred to guaranteed reliable quenching at the applied voltage. The solution was to use a 1·5in. link made of 22 SWG solder. It's required in series with only the first diode in the multiplier. The cross-sectional area of the solder is equal to or greater than the wire in the loom, but its resistance/cm is higher and its melting temperature is very much lower. A fault causing excess current in the circuit will quickly melt a break in the link, and the ensuing arc will widen the gap even more rapidly. **I.F.**

Dell 1600HS

There was no green in either the foreground or the background of this monitor's display. When I opened it up I found that it was fitted with a Sony chassis of the N3 family. A scope check at the green cathode showed that the voltage was high at 190V – the other two cathodes were at approximately 120V.

DC levels in the video channels are set by the LM324 quad amplifier chip IC409, the pins for the green channel being 5 +ve input, 6 –ve input and 7 output. The voltage at pin 7 was high at 10·5V, raising the green cut-off voltage. The voltage at pin 5 was 1·9V, approximately the same as for the other channels, so I assumed that this was OK. At pin 6 the voltage was 0·6V and obviously incorrect. The cause of the trouble was an open-circuit DC feedback resistor, R229 (1MΩ). **R.B.** ■



TV FAULT FINDING

Reports from
Michael Dranfield
Eugene Trundle
Philip Salkeld
Robin Beaumont
Les Mainstone
Ian R. Turnbull
Philip Laws
Gary Laidler
James Grant
and
Arthur Jackson

We welcome fault reports from readers – payment for each fault is made after publiation. See page 236 for details of where and how to send reports.

Samsung CI5337AN (US60A chassis)

This set was dead because there was no line drive from the TDA4504B if/timebase generator chip IC101. The problem was not caused by the chip however. Its 12V supply was low at only 8V. The cause was D801 (1N4007) in the feed to the 12V regulator chip. It had a high forward resistance of 50Ω. **M.D.**

Goodmans 286NS/05 (Philips L6.3 chassis)

For EW distortion replace C2913 (390nF, 250V) on the scan panel. It looks as if it is brand new but you will find that it's open-circuit. **M.D.**

Goodmans GTV66W1 (11AK19 chassis)

There was EW distortion because of a dry-joint at C613 (12nF) in the diode modulator circuit. In addition R629 (27Ω safety), which is in series with the modulator drive, was open-circuit. I replaced these two items but R629 blew again at switch on. There were no more dry-joints but I found that C630 (390nF, 250V) in the bridge circuit was low in value at only 100nF.

I have subsequently had other sets fitted with this chassis where C630 has fallen in value. It runs hot. **M.D.**

Toshiba 2505DB

There was partial field collapse when this set was switched on from cold. After about ten minutes the scan had opened up to full size. The problem is caused by C372 (2·2µF. 50V), which is mounted under IC371 on the print side of the PCB. On this occasion however a replacement failed to cure the fault and much time was wasted chasing red herrings. What had happened was that C372 had also leaked slightly, producing a conductive path on the PCB. A good clean up cured the problem.

If you accidentally fit the replacement capacitor the wrong way round the set will work but there will be intermittent field jitter. Guess how I found out! **M.D.**

Tatung VU2CEO (C chassis)

An audible noise from the chopper transformer when the set is left in standby can be cured by replacing CE803 (220µF, 25V). It's on the primary side of the chopper circuit, being the reservoir capacitor for the supply to the TDA4605 chip. **M.D.**

Matsui 20TN (Tatung chassis)

If the problem is field flyback lines at the top of the picture, replace R424 (22Ω). **M.D.**

Philips GR2.2AA chassis

This set was dead because the mains bridge rectifier's reservoir capacitor C2603 (150µF, 385V) had fallen off its rivets and was rattling around inside. Once a replacement had been fitted the set came on, but there was excessive width. This problem was caused by C2559 (100µF, 25V), which had leaked electrolyte on to the width coil damping resistors R3551 and R3552 and caused a burn-up on the PCB. New components, a clean up and track bridge cured the EW problem.

When the fault occurs with 25in. models the preset width control burns up, taking out a safety resistor between the line output transformer and the width potentiometer. **M.D.**

Hitachi IDTVs

With the advent of Freeview, users who previously disregarded the terrestrial digital TV transmissions are taking an interest in them but find that, typically, they can get only two or three channels. This is because of outdated software. An upgrade is available from Hitachi in the form of a plug-in and charge-up card. After its use retuning will bring in all the programmes, in both the 16- and 64-QAM modes. **E.T.**

Thomson 24WK25UG

These and similar sets can in some environments suffer from excessive picture tilt. A kit, which consists of a rotation coil and associated drive electronics, is available from Thomson's service department. After

fitting it adjustment is by means of a preset potentiometer, not via the set-up software, even though it's offered in the service menu. **E.T.**

Hitachi C2546TN

This set was as dead as a dodo, for the very good reason that the ON4584 chopper transistor Q903 was open-circuit between all three leadouts. A replacement failed to bring it to life because ZD901 (4·7V BZX79 series zener diode) and D905 (1N4531) in the start-up voltage supply were both short-circuit. **E.T.**

Bush 3472NTX

The standby light blinking is a common symptom with these sets. If you find that the S2000A line output transistor is short-circuit, almost certainly the line output transformer has suffered from insulation breakdown. It can be obtained from CHS under part no. FBT40564. **P.S.**

JVC AV28WFT1EKS

The complaint with this in-warranty set was "goes to standby". When it was switched on a picture would appear momentarily, with lack of width, then the set would shut down to standby. JVC Technical was able to provide a quick diagnosis: the 2nF, 1·5kV line output stage tuning capacitor C521 breaks down. Nice to get help. A replacement, part no. QFZ0196-202, cured the fault. **P.S.**

Wharfedale 550S

These sets were sold by Tesco and are now starting to give trouble. I hear from other engineers that there are problems obtaining spare parts. With this one the line output transformer was burning. Straightforward: CHS can supply it under part no. ALB924. **P.S.**

Toshiba 2927DB

This strange fault was cured by block replacement of several components in the deflection distortion correction circuit, which is based on the TA8859P chip IC302. The symptoms were lack of height but momentary full height when you changed channels. Items replaced were C322 (2·2µF), C317 (220µF) and R329 (22kΩ, 0·5W). You need to go into the service menu to readjust the height. Instructions are given in the service manual. **P.S.**

Philips 21PV330/07 (Delta 2000 chassis)

This TV-VCR combi set came in with a short-circuit line output transistor. I could find no obvious cause for this, but a replacement failed without warning an hour or so later. I replaced the line output transformer and various other items without clearing the fault. Several output transistors later the problem was cured by fitting a new line drive transformer. I can only assume that the original one developed an internal short when hot. **R.B.**

Philips 32PW6305/05 (A10 chassis)

This set seemed to tune normally but only snow appeared on the screen. The cause was traced to the small signal panel, by substitution, but no component fault could be found here. The A10 chassis may be fitted with either a Philips or an ALPS tuner. They are not identical. The tuner type has to be set in the option codes and stored in the EEPROM. If the tuner fitted differs from the stored option code it will receive incorrect I²C bus information and be unable to tune in the signal. I checked the option codes against the label attached to the tube and found that one number was incorrect. After adjusting this the set worked normally. **R.B.**

Amstrad CTV3128

The customer told us that the picture was bowed in at the sides, adding that they had been watching the set in this state for nearly a week before calling us. Why do they leave things until the set smokes? Anyway, a quick check on the print around the line output stage revealed a mass of dry-joints. After attending to that I carried out some further checks. C592 (0·68µF) had changed value, and the TDA8145 EW correction chip, I600, had failed. For good measure I also replaced the S2055N line output transistor. **L.M.**

Panasonic TX28W3 (Euro-1 chassis)

Apparently this set had "just died". When I stripped it down I found that the power supply was inactive, with 330V across the mains bridge rectifier's reservoir capacitor C618 but no activity elsewhere. R628 (470kΩ), R626 and R627 (both 560kΩ) all appeared to be distressed though they read within tolerance. So replacements were fitted.

My old Hameg oscilloscope has a component checker which I find invaluable. I pressed it into service to check all the electrolytics on the primary side of the power supply. There was a very crooked lean on the scope's display when C622 (100µF, 25V) was checked, though the capacitor meter said its value was correct. It seemed a sensible policy to replace all the electrolytic capacitors in this area, and after doing so I confidently switched on. Once I'd checked and reset the HT voltage (P633) the set seemed to be happy enough. The back went on, I printed out the invoice, then put the set on the soak-test bench while other jobs were attended to.

Two hours later the set shut down. A large black cloud appeared over the workshop: there's nothing more dispiriting than a dead Euro-1 after you have proclaimed it well. I took off the back and went over the same ground as before until I realised my fatal error: I hadn't replaced the TDA4601 chopper control chip IC611. Once a replacement had been fitted the set livened up and continued to run satisfactorily. **L.M.**

Goodmans W322NS (F19 chassis)

A regular ticking sound came from this set's power supply. Some quick checks revealed the usual dry-joints at C68, C69 and C70, while D24 (BY228) was short-circuit. C69 (22nF) produced a completely incorrect reading. I replaced these items, switched on – and was rewarded with the same ticking as before. Out came the BU508D line output transistor, which the tester said was OK. But I've been caught out by that before. Once a replacement had been fitted the set produced a good picture and sound. **L.M.**

Panasonic TX29AD1DP (Euro-2 chassis)

The complaint was dead with the power supply tripping, mainly from cold. The items to replace are C622 (47µF, 50V) and C634 (1µF, 50V) which are associated with the TDA4605-3 chopper control chip I611. **I.R.T.**

Hitachi C32WF810

Intermittently switching to standby is a complaint you sometimes get with these sets. Before getting involved in the complex protection circuit, check the 'oscillator PCB' for dry-joints. It's a small sub-PCB which is mounted horizontally near the scart sockets. **I.R.T.**

JVC AV32WFP1EK

This set was dead with the standby LED on. When the 12V and 5V rails were checked C966 (0·01µF) was found to be short-circuit. **I.R.T.**

Hitachi C24W410

If there's a very intermittent crackle on sound replace the 47Ω resistors R4005 and R4009 in the audio output circuit. **I.R.T.**

Philips 21PV288

This TV-VCR combi unit certainly swelled the coffers of the swearbox! It was stuck in standby: there was no response to either the front or the remote

controls. To cut a very long story short, the SAA5254 text processor chip IC7881 proved to be the cause of the problem. **I.R.T.**

Philips 25MN1550 (GR2.2AA chassis)

It took some time to find the cause of the fault with this set. Initially the line output transistor was replaced and dry-joints were attended to. Three weeks later the line output transistor failed again. Various capacitors and the line output transformer were replaced, but the set still continued to eat BU508s every now and again.

While it was on soak test I noticed that there appeared to be variation in the horizontal phasing. So I replaced the TDA2579B timebase generator chip. After a lengthy soak test the set then seemed to be all right. **P.L.**

Goodmans W322NS

This widescreen set's power supply was pumping. It didn't take long to discover that the line output transistor was short-circuit. As I didn't have a service manual I removed the transistor, connected a 60W bulb across the HT rail and monitored the line drive. All was well. A new line output transistor failed immediately however. The next thing to check seemed to be the 15nF, 2kV flyback tuning capacitor. The cause of the trouble was now obvious: one of its legs had no solder. How the set had worked as long as it had is a mystery. **P.L.**

Panasonic TX14JT1

This under-guarantee set lost BBC1 at position 1, but would retain it at a spare position. The cure was to replace the EEPROM IC1205, part no. X24S11-1MAZ. **P.L.**

Bush 2152T (Onwa chassis)

The symptoms with this set were no sound and a blank raster, with a slight swirling pattern present on the screen. Scope checks showed that a good video signal was present at pin 19 of the IF chip IC101. I followed this to the teletext chip IC801, where it was lost because the 5V supply was missing. It was being muted by Q805, which was switched on because there was 3V at the collector of the standby relay driver transistor Q605. Scope checks showed that pulses were present at the base and collector of this transistor. In a flash of inspiration I replaced the electrolytic capacitors on the secondary side of the chopper transformer. Bingo! I wish I had taken more notice of that swirling pattern. **P.L.**

Hitachi C2874TNY

If one of these sets reverts to standby there are two things to check. First the TDA7253M audio chip IC4451, which could well be short-circuit. If not replace R952 (68kΩ) in the HT preset network – its value is critical. **P.L.**

JMB JMBN028WSS

This 28in. widescreen set wasn't very welcome in my small workshop, so I decided to try to get it out of the way as soon as possible. The fault symptom was severe EW bowing, and the customer complained of a smell of burning. Checks in the line output stage showed that RV38 (8·2Ω) was open-circuit, because of similar problems to those you get with chassis such as the 11AK19. I started to check capacitors and soon came across CD21 (680nF, 250V) which looked perfect but read open-circuit when checked with a capacitance meter. Fortunately a replacement restored normal operation, because trying to get circuit diagrams for these supermarket TVs is a joke. **G.L.**

Samsung CI20S2OBT

This set was dead with the 3·15AT mains fuse shattered. Visual inspection revealed that C805 (2·2nF, 800V) was black and had lost some of its outer case. But it still read 1·7nF when checked with a capacitance meter. I fitted a replacement rated at 1kV and, to my surprise, the set then came on. In view of past troubles with certain Samsung models I gave the set a long soak test. There was no further trouble. **G.L.**

Matsui 1436XA

We've had two of these older portables in recently. The first was completely dead. By luck we've had this fault before: the primary winding of the standby transformer, which is in front of the relay, was open-circuit.

The second set would power up but remained in standby. The culprit was R652 (390kΩ, 0·5W), which is connected to pin 5 of the STK7348 chopper chip. **G.L.**

Schneider STV5501 (11AK19 chassis)

This set had a bright screen with flyback lines. Obviously the 200V supply to the RGB output stages was missing. The rectifier is D609, which in this set was a BA159. It was OK, but the resistor in series with it was open-circuit. To be on the safe side I replaced both these items. A long soak test proved that all was now well. **G.L.**

Philips 28PT4523/25 (MD1.2E AA chassis)

This set was tripping. Luckily cause of the trouble was obvious when a visual check was carried out: C2433 (1·5nF, 2kV) had burnt up. It's one of the flyback tuning capacitors in the line output stage. **G.L.**

JVC AV29SX1 (JA chassis)

There was a 6kHz buzz on the sound with this set. Much time was spent scoping around, looking for the cause, but I was uncertain as to whether it was on the Dolby or the AV selector board. Fortunately another of these sets came in a couple of days later. This enabled me to prove that the cause was on the AV selector board. The culprit was the MSP3410-SDIL multisound processor chip IC601. **J.G.**

Ferguson M3615UT (TX807 chassis)

This set came on and tried to start up – the LED went green for about six seconds – then reverted to standby. A few quick checks in the line output stage revealed that the flyback pulse at the collector of TL02 was at only about 300V peak before the set shut down. Cold checks then showed that DL04 (BY228) in the EW modulator circuit had a 1kΩ leak. A replacement brought the set back to life with an excellent picture. **J.G.**

Nikkai 3743 (11AK08 chassis)

Most of these sets we see are dead with R809 in the feed to the chopper transformer's primary winding open-circuit, often because the transformer is short-circuit between pins 2 and 10. If the transformer (TR802) is OK, the chopper MOSFET Q801 is probably short-circuit. In this case you will find that either R804 (820kΩ) or R805 (330kΩ) is high in value or open-circuit, causing the damage. Well made HR chopper transformers are available from SEME under order code PTX6074. **A.J.**

Thomson 28WF25U (ICC17 chassis)

The customer complained that this set was dead, but checks showed that voltages appeared on the secondary side of the chopper circuit for a few seconds, at about half the correct voltage. The cause of the trouble was traced to the standby power supply, where the 39V input to the series chopper transistor TP21 was low at 11V. Zener diode DP21 (39V) was leaky. Once this item had been replaced the set worked normally. **A.J.**

Sharp CV2133H (8P-SR chassis)

These excellent sets are now showing age-related problems. Very often the customer blames the on/off switch when the red LED flashes briefly at switch-on then fades out, leaving the set dead. The usual cause however is capacitors C714 (10µF, 100V), C716 (47µF, 63V) and C723 (3·3µF, 50V non-polarised) on the primary side of the power supply. When faulty they produce very high ESR readings. Replacements will restore normal power supply operation.

You will then usually find that there are visible teletext lines, because the field flyback boost capacitor C502 (220µF, 25V) has a high ESR. It's worth checking this capacitor when any repair is carried out. **A.J.**

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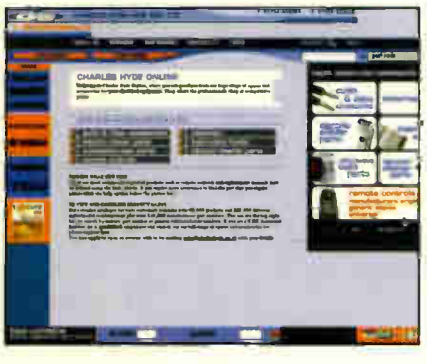

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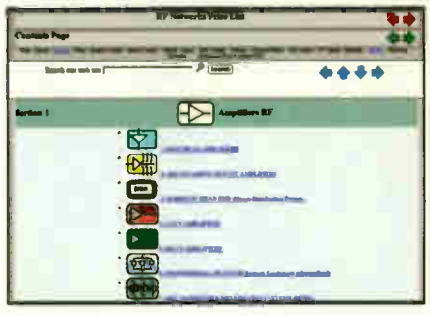

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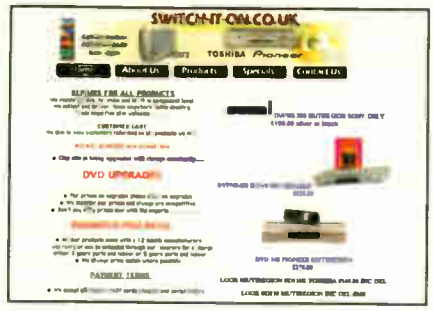

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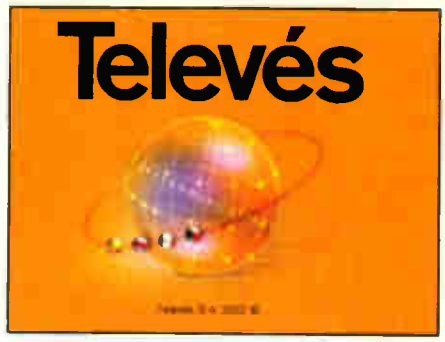

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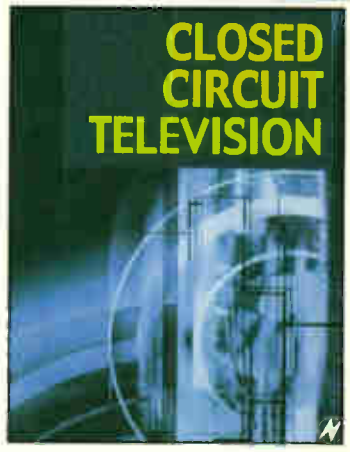

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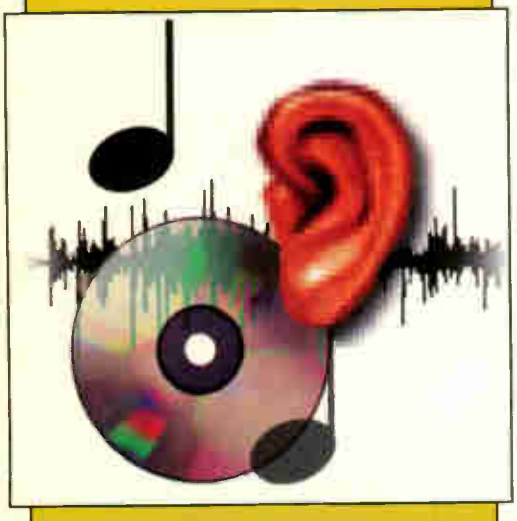

AUDIO FAULTS

Reports from
Eugene Trundle
Nick Beer
Matthew Biddlecombe
Pete Roberts
and
Geoff Darby

We welcome fault reports from readers – payment for each fault is made after publication. See page 236 for details of where and how to send reports.

Sony TA-VE150

When this mini surround amplifier was switched on its response, after a few seconds' silence, was to show "protect" in the display panel. There are five type 18752 audio power amplifiers, with 25 legs between them. Virtually all were dry-jointed. **E.T.**

JVC XLE3

Some hi-fi customers consider that units are worth repair because they form part of a larger assembly. This 14-year old CD player was an example. The complaints were about intermittent jumping and skipping during play and erratic operation of the loading tray. I replaced the 'Optima' laser unit and the tray- and sled-drive belts. After that it was ready for another fourteen years! **E.T.**

Sharp CD-BA1200H

Regardless of signal source the sound from both channels cut out after about five minutes. When I flexed the PCB the symptom came and went. Several pins of the big audio power-amplifier chip were dry-jointed. **E.T.**

Denon DC30

This mini system with multi-disc CD changer had been to us a few months previously with the same fault symptoms: intermittent failure to select the correct disc – by over-shooting the requested position or going to the very top of the selector's travel range, beyond the top disc. On that occasion we had found the circuit diagram very small and unclear in the area that seemed to be the cause of the problem – the mechanism-detection switches, which are on a small PCB at the rear edge of the mechanism. Some time had been spent working out which switch does what (no reference numbers) and annotating the circuit diagram. We concluded that one of the switches was faulty and, after replacing the PCB, everything seemed to be OK.

But here we were a few months later with the identical symptoms. A lot of time was spent observing the operation of the mechanism and scoping the mecha-state signals at the microcontroller chip. As everything here seemed to be fine we spoke to Denon Technical at Haydon. They had not encountered the fault, but suggested misalignment. This had already been checked.

We eventually discovered that the reason why the mechanism didn't stop where it should was failure of the solenoid that holds an intermediate gear in the drive chain to disengage this gear at the right time. So drive continued to be applied to the elevator. A scope check across the solenoid showed that the voltage disappeared when it should, relative to the positional information from the mechanism switches, yet the solenoid remained in the energised position. The mechanism worked correctly when the solenoid's slug was flicked at the right time. The cause of the problem was that the solenoid had become magnetised. Demagnetising the solenoid and the surrounding area restored correct operation. **N.B.**

Sony HCD-RX99

There was no CD drawer operation with this unit. As I didn't have a service manual I decided to take out the PCB that holds the drawer motor and IC to check for the presence of voltages. When I withdrew the board the motor fell into the inside of the unit! Judging from the appearance of the tags, it had never been properly soldered in the first place. Once I'd resoldered the motor to the PCB, refitted it and cleaned the lens everything worked perfectly. **M.B.**

B&O Beolit 700

The complaint with this thirty-year old but stylish LW/MW/FM radio was no FM reception. I connected it to my bench power supply, set to 7·5V, and checked the current consumption. In the MW and LW positions this was normal, about 20mA, but when FM was selected it rose to 100mA. So maybe there was a short in the FM tuner, which is the only section not common with the AM circuitry.

There was no change when I disconnected the supply to the tuner, so the problem wasn't in there. The decoupling capacitors came out next, but there was still no change. The cause of the problem turned out to be a small, self-supporting choke, made of fine enamelled wire, that was touching an adjacent resistor. This fault was cured by pushing the choke to one side and securing it with a few drops of melted candle wax. After refitting the decoupling capacitors and reconnecting the supply to the tuner the consumption, on FM, was about 25mA with no signal – a bit more than one would expect. In addition, while FM was now live, there was very weak reception of Radio 2 at 104MHz on the dial instead of its actual frequency from Holme Moss, 88·9MHz.

Closer inspection showed that all the cores in the tuner had been twiddled. The one in the RF input coil was shattered. First step was to adjust the oscillator coil and the associated trimmer to restore correct coverage, which with this model is 88-104MHz. The IF output coils were then peaked for maximum signal, as laid down

in the service sheet. In fact all the FM IF transformers, with the exception of the discriminator, are peaked rather than being stagger-tuned. The RF coil had to be removed in order to extract the smashed core. After finding a suitable core and refitting the coil I was able to align the RF amplifier correctly.

Reception was now fair, but not quite as it should have been. When I replaced the BF115 RF amplifier transistor the FM band was solid with local and national stations, even with the aerial retracted. Fortunately the phantom core twiddler had left the IF cans alone! **P.R.**

Sony HCD-ED1

I felt I'd not been told the whole story with this job. The customer's complaint was no sound, which is unusual with this equipment. Usually the only thing that happens is failure of the LCD backlamp, which is special and must be replaced with the correct type, Sony part no. 1-517-743-11.

Initial investigation into the no-sound problem revealed a hairline crack in the print run to the collector of the –7·5V regulator transistor Q510. Bridging this break restored the –7·5V supply, but the unit still didn't work. Further checks showed that there were no outputs from the +7V and +10V regulator transistors Q507 and Q509. In both cases the associated zener diode, D506 and D508 respectively, was short-circuit. Replacements restored the two supplies, and some life to the unit. Audio was now present all the way to the multipole back-panel connectors.

The speakers with this system are of the active type: each contains a full output stage and power supply, which is fed with low-voltage AC from the main unit via two of the back-panel connector pins. As there was still no audio output from either speaker, and the protection relays weren't closing, I was beginning to suspect the output ICs. I then spotted another rail, called B–, that comes across from the main unit and feeds the relays. It was missing. The cause was R524 (1Ω), which was open-circuit. It feeds Q512. A new resistor solved the problem. **G.D.**

Philips FW670P

This was a nasty problem, and I admit that I didn't get to the bottom of it without some help from Philips Technical. Basically, the CD player was completely inoperative. The associated controls, such as open/close, were recognised however, as the unit could be brought out of standby by using them. But the microcontroller chip didn't go on to produce the CD stby signal, though I could see nothing wrong with any of its inputs.

The man at Philips first suggested that the cause was the microcontroller chip itself, but I'd already tried that. He next had me check whether the deck performed a slight shuffle – and it is slight – at power up. It didn't, and this was the root cause of the problem. This little shuffle enables the microcontroller chip to test the mode switches and check that the deck is at rest. If it doesn't happen, the chip does not simply produce an error indication in the display, it takes the CD unit off line.

Once the plastic and metal covers over the deck have been removed, the disc magazine at the rear of the deck can be lifted out. You have to 'spring' the sides to disengage the pins from the ramp slots in the up/down shift plates. It was then obvious that the cam-drive motor was stuck. I released it by winding the worm gear round, then relubricated the gears and cleaned the switches. This restored the power-up shuffle. The magazine and covers were then refitted, and a long soak test proved that everything was now OK. **G.D.** ■

Bench Notes

Some awkward faults this time, particularly problems with microprocessor-type chips and a fuse that behaved oddly. Adrian Gardiner reports from the front line

This month I'll describe some of the more complex faults I've had to deal with recently. But before going further, readers may well have spotted an error in last month's column where Fig. 2 and Fig. 4 were transposed. This was caused by a mix up at the editorial office. Our apologies.

Microcontroller trouble

I don't know why, but I seem to have to replace an awful lot of microcontroller ICs, particularly those used in modern TV receivers. From conversations with others in the trade, this appears to be very unusual. Anyone wish to comment on this matter?

Toshiba 32ZD09G (C00S chassis)

Toshiba sets seem to be the worst sufferers from microcontroller trouble. Generally, Toshiba sets are very reliable, so I don't see a lot of them. With the slightest sign of a power surge however, pop and in they come. This particular set had been one such victim, because of a lightning strike close by.

The set was dead, but the power supply was actually in the protection mode (see below). Some quick checks revealed that the phototransistor section of the TLP621 optocoupler Q826 was short-circuit. When a replacement had been fitted the power supply was tripping. Working on a hunch, I next replaced the SE116 HT monitoring chip Q827. These SE series devices often suffer when there's been a power surge, and in the interests of reliability should be replaced as a matter of course in such a situation.

The power supply was now running, but the set was stuck in standby. Toshiba's software checks all the devices connected to the I^2C bus. If the set cannot start, the microcontroller chip reports on the condition by flashing the power LED. A one second cycle means that the set is in the protection mode, while half-second flashes indicate a fault related to the I^2C bus.

With this set the LED remained out, which led me to suspect the microcontroller chip. As this is a relatively expensive device, I first replaced the EEPROM QA02. There was no change, so off went the order for the microcontroller chip. Once it had been fitted I was rewarded with the sound of the line output stage starting up, then up came a picture. All that remained to be done was to enter the service mode and set up the various parameters. Do this by pressing the mute key, then press it again and, while holding it, press the menu button on the set.

REOC madness!

A REOC 21TN (Beko chassis) gave me the runaround recently. These sets are made exclusively for Safeway and, being of Beko manufacture, are fairly straightforward. This set was dead.

Initial checks showed that the fuse and the surge limiter resistor were OK. After finding that the chopper FET was in order I dived into the start-up circuit, but could find nothing amiss here. So in went a replacement chopper controller chip. There was still no change.

At this point I did what I should have done in the first place – check the voltage across the mains bridge rectifier's reservoir capacitor. It was low at only 70V. The on/off switch tested OK so, assuming that it was going high-resistance under load, I replaced the surge limiter resistor. After further tests I discovered that it was the fuse that was going high-resistance under load! It read OK on my meter, but a replacement brought the set back to life.

I have had this same fault on two subsequent occasions. So, if you find yourself in this position – replace the fuse first!

JVC AV29SK1EK (JA chassis)

This 29in. set, fitted with the JA chassis, was another troublesome one. Now apart from the usual field scan problems, these sets are supposed to be reliable and straightforward. I have repaired several of them however and have yet to have a simple fault.

This one looked promising: the mains fuse had failed because of a short in the bridge rectifier. But the set was just as dead when these items had been replaced. As the main chopper FET Q901 was innocent, I turned my attention to the start-up resistors. Everything seemed to be OK here, so a new MC44603P chopper control chip (IC901) was tried. At last progress had been made, but the power supply was now tripping.

No obvious shorts could be found on the secondary side of the power supply, so it seemed to be a regulation failure. In went a new TLP621 optocoupler (IC902) and SE135 monitoring chip (IC953). Success: the set was now stuck in standby!

Further checks proved fruitless. As a precaution I replaced the EEPROM (IC703). There are actually two EEPROMs in this chassis, the main one (IC703) for the microcontroller and IC805 for the teletext circuit. Progress had been made: the set now came on in standby and, after a three-second delay, the green power LED came on. The set remained lifeless however.

Checks around the microcontroller chip ruled it out, as the power-on line (pin 18) was going high after the three-second delay. This indicated that the IC was trying to get the set started. Moving to the TDA8366 jungle chip IC101, I found that there was no line drive output. The IC's power supply was OK, so I decided to eliminate it by substitution. Again the symptoms remained the same.

At this point I checked the I^2C bus and found that the SDA line was being held low. This meant disconnecting the various ICs from the bus one by one. The culprit turned out to be the P83C654FBP/541 teletext microcprocessor, which had an internal short. Once a replacement had been obtained and fitted I had, thankfully, another healthy patient.

Next month

Next month I'll be starting a series of articles on PCs. My involvement with computers extends over fifteen years. I intend to cover the basics of hardware and software fault diagnosis and repair. In addition to being useful for anyone thinking of entering this field, the series should help the ordinary user in keeping his machine running efficiently. ■

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WHAT A LIFE!

A power-supply problem with the Tatung D chassis. Difficulties with today's larger sets. The television trade in the days of single-channel receivers. Donald Bullock's servicing commentary

Mr Turnbull looked sour as he trudged through the door carrying his 20in. Decca D20TDE6 (Tatung D series chassis). "Slow to come on and squealing all the time" he complained. "Used to be wonderful, but no more. D'you think you could have a look at it for me?"

I took his details and he departed. Steven decided to take the set on. He plugged it in, switched it on and, sure enough, it gave an imitation of an angry pig. There was no raster for ten minutes.

"Let's have a good look at the chassis" Steven said, "it's always an idea when you don't feel like switching your brain on."

Always the optimist, he started off by giving the chassis a thorough check for dry-joints. After a couple of minutes he tired of this and decided that he would work things out for himself this time. But he continued with some basic tests – on the electrolytic capacitors and high-value resistors in the power supply.

Once he got going with the capacitance bridge it didn't take him long to find that CE802 (220µF, 16V) was at about half the correct value. It's the reservoir capacitor for the TDA4605 chopper control chip's LT supply (pin 6). He fitted a replacement and, with high expectations, switched the set on. It immediately began to squeal again.

He next found that CE806 (2·2µF, 50V) was low at 1µF. This is the smoothing capacitor in the regulation feedback loop. But replacing it made no difference either. Then Steven noticed that one of the leadout wires of C809 (1·5nF, 1·5kV) in the chopper FET's snubber network had been slyly arcing for some time at a hidden dry-joint, which had melted. This time the replacement restored correct operation. We thought the picture was particularly good. A DC-coupled cascode circuit is a nice design for RGB output stages.

Big sets

"If sets go on increasing in size we'll need a bigger workshop" Paul complained as he struggled in with a 28in. Bush Model 2872NTX – "and I'll have to take a body-building course."

I looked at him, then at the set, eyed myself in the mirror and pushed at my front teeth with my finger.

"There's this 28in. Bush set" Paul continued, "that 66cm Sharp set over there, the Bush widescreen set we took in yesterday, and now Steven's unloading a 28in. widescreen Panasonic set."

The Bush 2872NTX (11AK19E3 chassis), now on Paul's bench, was dead. We'd had the problem before with these sets. C833 (220pF, 600V), which is connected across the chopper FET Q802, had gone short-circuit. As a result one of the 1N4007 mains bridge rectifiers, this time D801, had gone short-circuit and the surge-limiter resistor R817 (2·2Ω, 5W) had gone open-circuit.

Once replacements had been fitted the set sprang to life, leaving Paul with two problems: that of finding some floor space for it (Steven had just filled its previous space with the Panasonic set) and getting it off the bench safely.

He decided to tackle the Sharp set next. This was a Model 66ES03H (CA10 chassis). When it was switched on there was sound and the comforting rustle of EHT as the tube became live, but no screen brightness. This appeared when the setting of the tube's first anode supply preset was turned up, revealing field collapse.

The cause of the trouble was in the line output stage however. The field timebase is of the switch-mode type, and depends on pulses from the line output stage to provide pulse-width modulation. These were missing because of a fault in the line scan circuit. R613 (2·2kΩ, 2W) had developed enough heat to melt and crack the casing of C613 (680nF, 250V), which had gone open-circuit. A replacement resistor and capacitor restored normal operation. There was then just the little matter of finding somewhere to put it.

As we were

In a recent column I made a passing reference to that bygone age when television engineers were universally respected and held in high esteem. A number of readers have asked for some more recollections of that happier age – for those in the TV trade at any rate. So we'll take a trip through time to the early post-war period, when there was only one TV channel – run by the BBC of course.

To own a TV set in those days was regarded as quite something. Because of this the huge Band I aerials that adorned the chimneys of the few who could afford a set were tremendous status symbols – to the extent that it was not unknown for a family to have an aerial but no TV set!

The early sets were mainly large

and heavy, many of them being housed in console cabinets. These were prized pieces of furniture. But however large the cabinet, the CRT screen was small, rounded and bulbous, not at all like the square-cornered, flat screens we are familiar with today. In fact many of the tubes were actually round-faced, a white-painted rubber mask being used to produce a "squared-off" picture. The 9in. round tube was widely used, with a deflection angle of about 65°. Later 17in. square-screen tubes with a 90° deflection angle were only slightly larger. And as there was no Rimband with the early tubes, a safety screen had to be fitted in front. Increase in scanning angle from 65° to 70° then 90° and subsequently 110° called for very considerable increases in scanning power. The early circuit designs and components could never have managed it.

There was a phenomenal number of brands in the early post-war period, all of them British. Most are just distant memories today – when did you last see an Ambassador, Beethoven, Cossor, Ekco, English Electric, Ferranti, GEC, Invicta, Kolster-Brandes, McCarthy, Masteradio, Peto Scott, Pilot, Raymond, Regentone, RGD, Ultra or Vidor TV? None of the sets had tuners as such: instead, those that were superhets rather than the troublesome TRF types were pretuned to receive a single channel, each batch (for different transmitters) being fitted with different aerial, RF and oscillator coils. They thus responded to one channel only, the local BBC one in Band I. London came first of course, followed by Birmingham (Sutton Coldfield) and, in time, most of the country.

A dealer's life

The life of a TV dealer was hard in those days. A new television set and an aerial array was a very expensive purchase for the customer. Most were bought on three-year hire-purchase agreements. So customers were fussy and particular.

Because of reception uncertainties, many customers would demand a home demonstration of several sets as of right. And as transmissions didn't start till 7 p.m., the dealer would have an hour or more to kill after closing the shop before he could begin his first demonstration. He'd be lucky to get home before bedtime.

The prospective buyer's locality had to be considered first. If it had a good signal, the dealer would lug sets of two or three different makes to his van, drive them to the customer, then lug them all out and demonstrate each one. If he got a good picture on one of them he would leave it on trial for two or three days before returning to install and set up the others. This could go on and on, first one set then another being given a trial.

Another complication was that a large proportion of the country's viewers lived outside the main transmitter service areas, many in the so-called 'fringe' areas. As the number of transmitters grew, a lot of customers might be outside the service area of any of them but within the fringe area of two or more transmitters. This could mean protracted delivery and demonstration of different-region sets, plus aerial turning or changing. Profit margins on TV sets were large by today's standards, but they had to be earned.

Aerial rigging

The aerial riggers led hard lives too. Not only did the signal strength vary from parish to parish, even in a good-signal area, it might also vary at a particular house, from one chimney to another. Curiously, the richer customers often lived in the most difficult signal areas. One of my customers, a leading and well-off stamp dealer, ruefully put this down to poetic justice!

I recall selling a large and expensive prestige TV set to a rich mill owner, subject of course to being able to get a good picture at his mansion, which was perched in the folds of a valley in the rolling Cotswold countryside.

But the signal proved to be terrible and, after spending several days erecting and dismantling various aerial arrays on its many chimney-stacks, the riggers conceded defeat. They brought the final array down and leant it across the man's front door while reaching for the knocker to report their failure. But before they could touch it the owner rushed out in a state of great excitement.

"Brilliant!" he cried, "you've cracked it at last. I've got a wonderful picture – come in and see!" Ducking under the aerial, they trooped in to see an exceptionally bright, clean and steady picture.

Out came the wine, the Player's cigarettes and the cheese and biscuits, and the day ended in a delightfully convivial manner.

The aerial, straddling the door, was in a highly unsatisfactory position. But there was no alternative to leaving it there. The mill owner happily took to using his back door to come and go by, and smartly planted a honeysuckle vine to cover the huge and leaning array. It remained in place for years. Even today when I pass the house, which now sports just a tiny UHF aerial, I glance down at its honeysuckle-covered front porch and slip into my memories of that signal saga.

It wasn't long before ITV came, provided by a mysterious something called Band III. This was to bring us a whole new box of problems, and most of us were scared to death by the prospect.

The Legend that was Clapham

Some readers have assumed that the Clapham in the title of my book, see heading above, refers to the London Clapham or the famous railway junction of that name. It doesn't. It refers to the Gloucester parish of Clapham, the poverty-stricken community where I first saw the light of day, and is largely about the astonishingly varied and larger-than-life characters who lived there in the Thirties. They survived from day to day by exploiting what they had in them – their skills, street wisdom, willingness to try a hand at anything and, in some cases, their charm, roguery or cunning.

Folk featured in the book include the canny Miss Fanny Thesp, Old Harry of the dewdrop nose, Mr Bint the cross-eyed barber, the 'bad woman' Sambo Lane, the singing burglar Lucky-bag Williams, Archie Workman the work-shy bent on lifelong toil, and many more. All highly individual characters who together, and unwittingly, formed a treasure chest of pathos and rich humour.

Fortunately for me the book has turned out to be very successful. For further details, including reviews, you can go to the website at

www.wheatleypress.com

DVD

Fault reports from C. Bowers and Geoff Darby

We welcome fault reports from readers – payment for each fault is made after publication. See page 236 for details of where and how to send reports.

Sony DVP-S300

The problem with this DVD unit was a noticeable sound level difference with CD and tuner operation. I removed the top and carried out some voltage checks in the power supply and audio output sections. There seemed to be a fault with the audio system CPU, IC903. A quick call to Sony Technical confirmed this.

A software bug has been known to affect some of these units, with serial numbers up to 5820036. The action required is to replace IC903 with the new improved type M30622MA-1E5PF, part no. 8-759-688-94. This restores more equal sound levels. **C.B.**

Sony DVP-S336

There was intermittent failure of CD, DVD or Video-CD playback with this unit, with the LCD message "no disc" or "C: 13:00" error. A quick look inside showed that F402 (0·8A) "conductor chip 2012" on the main board (side B) was open-circuit.

A modification is required when you get this fault. Remove F402/conductor chip 2012 and fit a "zero-ohm resistor" in its place. Erase the printing "F402 0·8A" from the board. Replace the 150kΩ resistors R416 and R418 with 82kΩ chip resistors, part no. 1-216-844-11. Then measure the resistance between pins 21 and 22 of the optical pickup's flexible cable connector. If the value is less than 6Ω, replace the optical unit. It's type KSS220AAA, part no. A-606-239-7A.

As the resistance value was low I fitted a replacement then carried out the servo adjustment. This restored normal operation. **C.B.**

Philips LX3000D/22S

This home cinema unit wouldn't power up though the red standby LED went out. The reason for this was that the main power supply's on/off relay failed to operate when asked to do so by the control system.

There was a simple cause: the relay driver transistor Q981 was faulty with base-emitter leakage and its base-collector junction almost open-circuit. I checked the reverse-protection diode across the relay's coil in case this had been the cause of the transistor's failure, but it was OK. A new transistor restored normal operation. **G.D.**

Sony HCD-S300 home cinema

Like a lot of engineers, I'm a terrible hoarder. I have a large box that keeps filling up with scrap items, like tape decks, which I am sure will be useful one day to provide the odd pulley I need in a hurry. But of coarse they never are useful. My latest box is used to save DVD lasers. Most of these come as decks, and I can't bring myself to throw away all those beautiful little motors and gears. I've given a number of them to a local model engineering club, where the motors and gears find a good home, turning gun turrets, raising ramps and so on.

Anyway, the problem with this particular DVD system was that it refused to read discs. The sled sometimes appeared to be doing odd things, but at other times the basic operation seemed to be normal. I installed another KHM220AAA RP deck assembly, which worked all right. But I had this gut feeling that the problem with the first deck was not the optical block itself. So I put the old deck back in, then ran the auto set-up – hold in the front-panel stop and mute buttons together, rotate the volume encoder clockwise, then follow the on-screen instructions.

When, as instructed, I inserted a single-layer disc and pressed remote 'enter' to start the set-up, everything worked normally. The disc was identified, and the focus, spindle and tracking servos were spun up. This further led me to believe that the laser was OK. When the sled servo was enabled however the procedure immediately failed and set-up was terminated. The sled motor therefore seemed to be suspect. It's a tiny four-connection stepper, whose shaft is the actual sled drive worm.

A rummage in my scrap box produced a KHM240AAA deck that had been replaced because of a bad laser. The sled motor is the same, so I swapped it over. This made no difference at all to the fault. The only thing this left as suspect was the sled 'home' sensor, which is a tiny three-pin slotted opto. It was again easy to swap over the one from the scrap deck. This time, when the auto set-up was run, everything proceeded normally for single-layer, CD and dual-layer discs. A long soak test, with a variety of titles, proved that there were no further problems.

It had been a satisfying fault to sort out, something that's increasingly rare with modern equipment. And, better still, it had proved the worth of the scrap box!

Strangely, later that day I had an S300 with an open-circuit spindle motor. The donor deck was again successfully pressed into service. **G.D.** ■

Solution to Test Case 482

– page 225 –

Sibilance is a fairly rare fault nowadays. Many years ago, when there were IF transformers and preset potentiometers to tweak, it was quite common. The fault seemed to be built-in with some models. We recall a certain Pye set . . .

Back to the Samsung CI14F1T5X however. There are no 6MHz coils or transformers here and their successors, in the form of ceramic filters, had been replaced by Ted. He had also replaced a couple of capacitors that seemed to be suspect. However this turned out to be another of those misleading control-section faults that often seem to defy logical fault-finding techniques. While leafing through the set-up pages in the service manual Ted noticed a software option called VCO, which could be set to 1 or 0. It was set at 1: the cure was to reset it to 0. Wow! Watch out for this one.

It's worth mentioning that Samsung TV sets fitted with the KS3A chassis – there are plenty of them, including 32in. widescreen versions – can suffer from complete loss of sound reception when, perhaps because of an interruption to the auto-tuning process, the sound section is incorrectly set to system B/G (5·5MHz). The solution is to reset it to system I, using the sound-system option in the user set-up menu, then store this setting. You will find the details in the instruction book.

NEXT MONTH IN TELEVISION

PC and camcorder problems

As the cost of digital camcorders has fallen more consumers are buying them and then exploring the facility to carry out editing with a PC. This is done via a FireWire link (IEEE 1394), but many users find that plug-and-play doesn't work. Steve Beeching describes the technology and the problems that can arise.

Test report: The Pure Evoke-1 DAB radio

Digital audio broadcasting transmissions have been available since 1995 but, because of the high cost of receivers, the service has been slow to take off. This situation has been overcome with the advent of the Evoke-1 receiver from Pure, the first to sell at under £100. Peter Marlow reports on its operation and performance.

Servicing PCs

Adrian Gardiner's Bench Notes column turns to PCs. Over the next few issues the basics of hardware and software fault diagnosis and repair will be described.

The coherer revisited

The coherer was one of the earliest forms of radio detector. Ian Rees outlines its history and describes a modern version he was able to devise.

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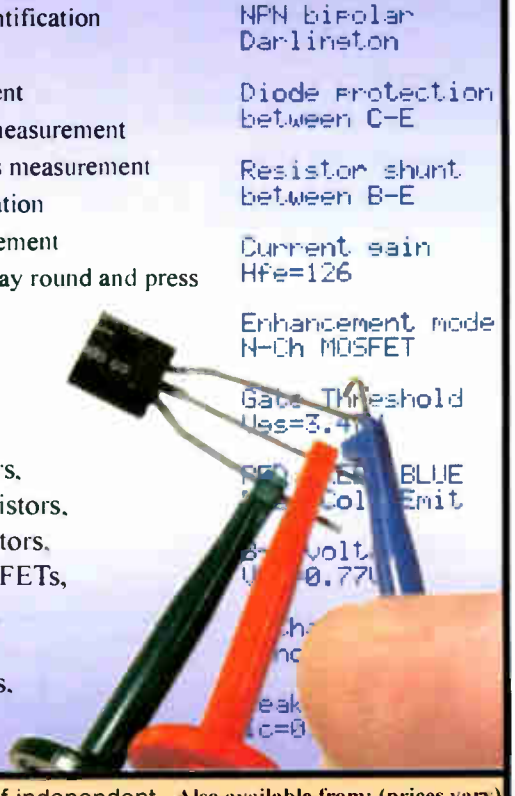

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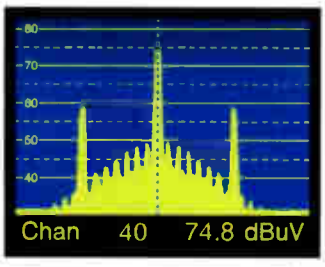

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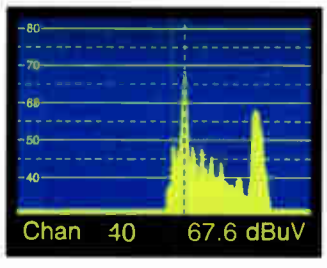

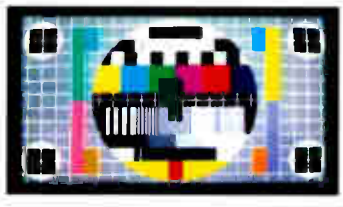

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