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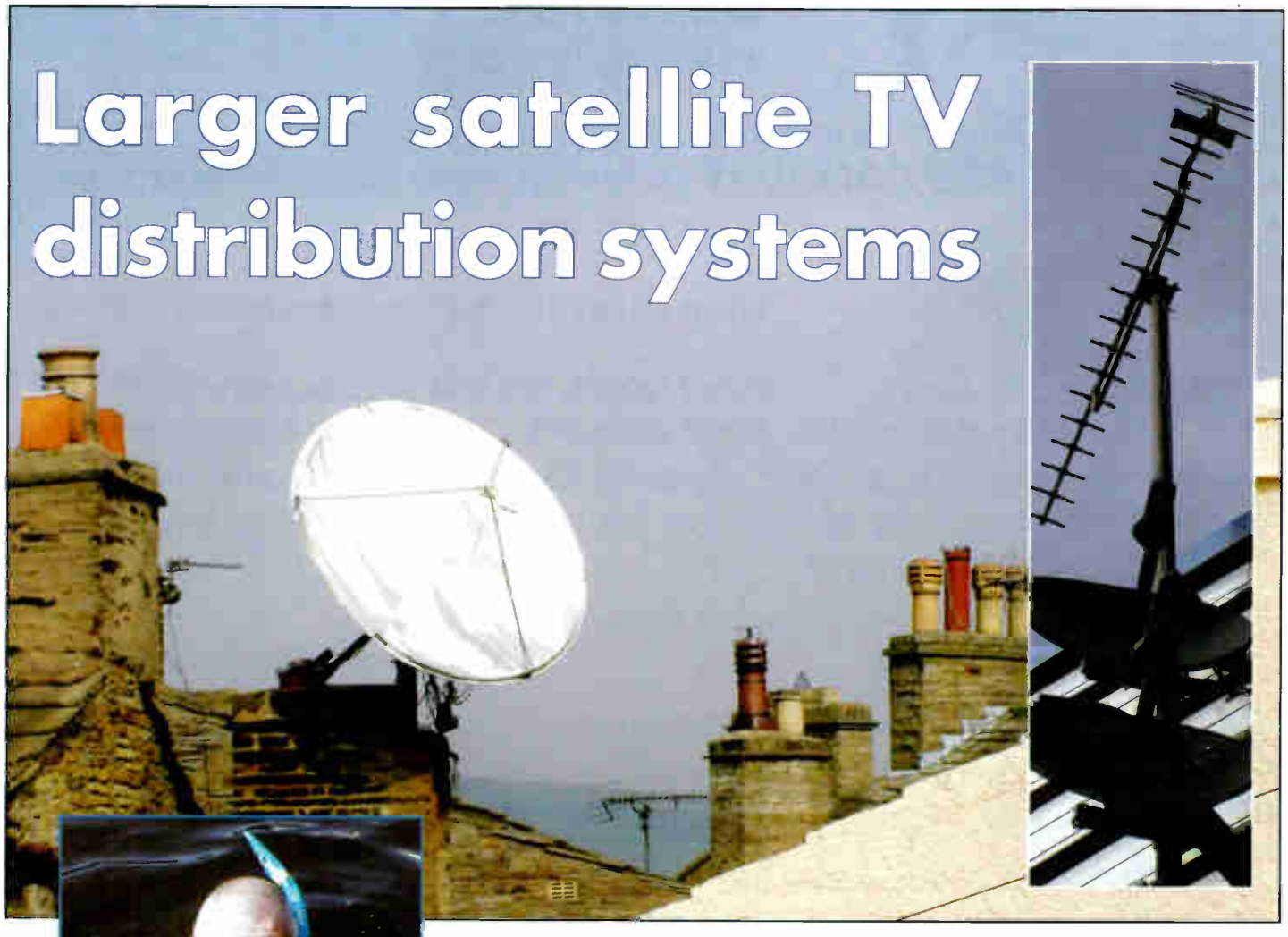

Larger satellite TV distribution systems

Test report:
The Aqua FM Swim-Man

Servicing the 11AK37 power supply

DTT reception problems

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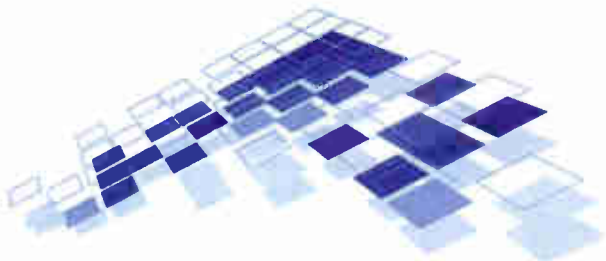

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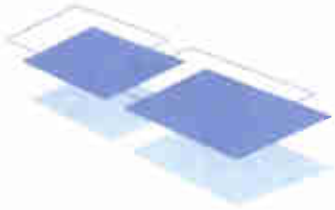

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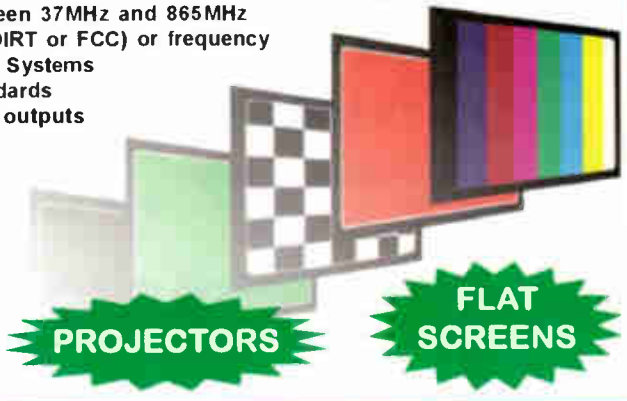

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HIGHBURY BUSINESS

The videotape era

Is the ubiquitous VCR about to be dumped in the great technological dustbin, along with so much other obsolete equipment that was once state-of-the-art? You might well think so from the stir caused by Dixons' announcement that it is to cease selling VCRs. There is still a demand for the machines however, because people have large libraries of tapes and new VCRs are so cheap. The problem for Dixons is that there is little profit in selling VCRs and thus not much point in allocating expensive retail space to them. Others will be happy to continue selling them, until disc technology finally takes over. This is fast happening.

The history of video recording is a fascinating one. Audio recording started to move from acoustic to electric in the mid Twenties. Acoustic audio recording didn't last long after that. Baird put video on 78 r.p.m. discs as early as 1928. But it was crude video, with negligible bandwidth. Magnetic recording had been suggested as early as 1881 (by Edison's assistant Sumner Tainter), and the first magnetic recorder/player was patented by Valdemar Poulsen in 1898. Poulsen decided to use steel wire as the recording medium, but was aware of tape as a possible alternative. All this was a long way before magnetic recording could be developed as a practical consumer possibility however. Magnetic recording for audio use by consumers started to become available in the late Forties.

The problem with video was the much greater bandwidth required. For experimental purposes in the early days the answer was to use wide tape and run it at great speed. But huge reels of tape would not be a practical consumer proposition: highly expensive, and difficult to handle. The answer that emerged, for professional and consumer applications, was to move the heads as well as the tape, thus increasing the effective tape speed. Fritz Schröter of AEG proposed the use of rotating heads that moved across the width of the tape in 1932. Patents for such a system were taken out by Luigi Marzocci in Italy in 1938. Subsequently practical development work was started by Bing Crosby Enterprises in 1948 (the reason for this is a story in itself!), and a successful demonstration was given in late 1951. The first high-resolution motion picture to be reproduced by means other than photography was recorded and played back by Bing Crosby Enterprises in October 1953.

At much the same time the Ampex Corporation and RCA were carrying out experimental work in the US and, in the UK, a BBC team started a project that led to the development of VERA (Video Electronic Recording Apparatus) in about 1958. Ampex launched a practical recorder at the NAB Convention in 1956. Both Ampex and the BBC were using FM to record the video signals. All this was of course a long way from consumer hardware.

It seems that Norikazu Sawazaki of Toshiba was the first to start experimenting with helical tape scanning, in 1954. He has written that "by 1956 we could somehow record and reproduce video signals". Other companies started to work on this, and by 1967 Philips and Sony had launched reel-to-reel helical-scan magnetic-tape video recorders in the UK. The move that was to make videotape recording a practical proposition for the domestic market was the development of cassette systems. Philips was first with this, launching the N1500 system in the UK in 1974. It had certain disadvantages however: a short recording time, an awkward reel-upon-reel cassette and, a small but very important point, the lack of a heater to avoid problems with dampness – the tape could stick. In 1978 the Japanese launched two competing cassette systems, VHS from JVC and Betamax from Sony, which both underwent rapid development. VHS became the standard, and has remained so ever since.

The first VCR to go on sale at Dixons, in 1978, was the JVC HR-3300EK, a piano-key operated top-loader with a red LED digital clock/timer. It weighed more than 13lb and cost £798.75 (over £3,000 in today's money), enough now to buy forty VCRs. A half-hour videotape cost the equivalent of £20. During the last 26 years Dixons has sold millions of VCRs, with the demand peaking in 1993. Between 1980 and 1990 the worldwide market for VCRs went from 10 to 200 million units, and by 2002 almost 90 per cent of UK households had one.

The first practical video disc system for the consumer market, VLP (Video Long Play), was announced by Philips in 1972 and was launched in the UK in 1974. It subsequently came to be known as LaserVision. Picture quality was superb, but the playback time was rather limited and there was no record facility. So it was not a serious contender to the VCR, and didn't last long in the market. It emerged from advances in disc and laser technology.

Research continued however, leading to the development of the DVD, first as a playback only system and subsequently with record/playback capability. DVD was introduced in 1996, and has the advantage of being a digital system. It's much simpler to use than tape, and is a great advantage for the providers of prerecorded material. Manufacturers have managed to reduce the price of DVD players and player/recorders dramatically. No wonder it has proved to be the most successful consumer electronic product ever. There is no chance of DVD and VHS coexisting indefinitely.

Dixons to drop VCRs

Dixons has announced that because of the growing popularity of DVD technology and reduced demand for VCRs it is to stop selling them.

The company says that demand for VCRs has fallen dramatically since the mid-Nineties, while sales of DVD players have grown sevenfold over the last five years. Sales of DVD players at Dixons have been outstripping VCRs by forty to one.

Dixons says that with newer innovations such as portable and recordable DVD and hard-disk drive recording catching the public's attention, it has decided to concentrate on the next generation of home entertainment products. John Mewett, marketing director at Dixons, commented "We are saying goodbye today to one of the most important products in the history of consumer technology. The video recorder has been with us for a generation – many of us have grown up with the joys, and occasional frustrations, of tape-based recording. We are now entering the digital age, and the new DVD technology represents a step-change in picture quality and convenience." He added that DVD technology is now very competitively priced – Dixons is selling DVD recorders for less that £150.

Associated company Currys is to continue selling VCRs however, while Comet says it will supply VCRs as long as there is a demand for them. The same no doubt applies with the supermarkets.

Philips ends LCOS production

Philips has ceased production of LCOS (Liquid Crystal on Silicon) chipsets and has ended development work on the technology. Philips had introduced three LCOS projection-TV models in the US. These will remain on sale for a few months then be discontinued. The company will not launch LCOS projection sets elsewhere. The main problem has been inability to increase production yield and compete with the lower-cost DLP (Digital Light Processor) technology developed by Texas Instruments. In the November news pages we reported that Intel, which had also been working on LCOS technology, had postponed the launch of chipsets. The company has now cancelled further development on LCOS

Conditions that were to be applied to the sale of extended warranties (see Teletopics February 2004) have been changed and postponed. They were due to come into force on December 1, but are now unlikely to be implemented until April at the earliest. Some major retail chains have already introduced many of the changes however. It looks as if the DTI is making a right mess of this matter.

LG Electronics has launched the world's largest plasma TV display panel, measuring 71in., in South Korea. The panel has 1,080-line HD capability. It's not likely to be a mass-market item however at a cost equivalent to about £40,500. Previously Samsung's 63in. PDP had been the world's largest.

Solent TV off air

Solent TV's ch. 54 transmitter installation at Rowridge, Isle of Wight, was struck by lightning on October 14, causing severe damage to the aerial, feeder and transmitter. Programming and news continue to be available via the station's website (www.solent.tv). The transmitter itself was destroyed and a replacement has had to be ordered. Aerial damage was also severe.

BSkyB latest

The latest results from BSkyB, for the quarter ending on September 30, show that DTH subscriber growth was greatly reduced in comparison with the same period in 2003. The increase was just 62,000, bringing the total to over 7·4m, compared to an increase of 170,000 during the same quarter in 2003. But BSkyB says it remains on track to achieve its target of eight million DTH subscribers by December 2005. The number of Sky+ subscribers increased by 77,000 to 474,000, while the number of multiroom subscriptions rose 64,000 to 357,000.

BSkyB has introduced a radical redesign of its interactive services portal Sky Active. This now makes greater use of video and original editorial content to create a magazine-style channel that offers on-demand entertainment and information as an alternative to conventional TV. Sky aims to encourage more frequent visits and greater use of Sky Active's range of services, which includes games, betting, what's-on guides and the National Lottery. There's a video-based 'front page' with a schedule of short programmes, and content is being updated daily and also during the day. The new 'contents' page consists of a 16-screen video mosaic that's designed to provide faster access to Sky Active's various services as well as links to new features pages.

The Sky Freesat service was launched on 21 October 2004.

New DVD recorders from JVC

JVC has introduced a number of new DVD recorders including Model DR-M10, a successor to the DR-M1. Its features include compatibility with DVD-RAM, DVD-RW and DVD-R discs and playback of DVD-Video, CD, CD-R/RW and Video CD discs. It can also play back WMA and MP3 audio files, and reproduce JPEG still photos stored on a CD-R or CD-RW disc. In addition there's a progressive scan output option. The Super MPEG Encode Preprocessor provides noise reduction prior to MPEG encoding of the input signal, for example from a VHS videotape, while a timebase corrector reduces jitter. The recorder can memorise data from up to 1,300 programmes, and uses a simplified timer-recording process called On-Disc Timer Programming. It writes the data for timer recording on the disc as well, enabling users to set the timer simply by loading a programmed disc. This also ensures that a particular programme is always recorded on the same disc. The Live Memory feature provides simultaneous recording and playback. Library Database DVD Navigation helps users manage recording and playback by storing the information on up to 1,300 programmes and displaying animated thumbnails.

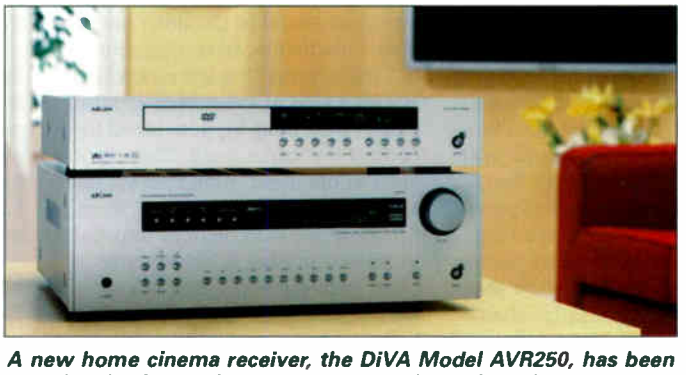
Models DR-MH20 and DR-MH30 incorporate a hard-disk drive, with 160GB capacity in the former case and 80GB capacity in the latter – these capacities correspond to 272 hours and 136 hours of video respectively. An Intelligent Dual-Pass Encode Dubbing system analyses the video content while recording it, in the first pass, on the hard disk: it then, on the second pass, dubs the content to DVD with the bit rate adjusted according to picture complexity. Transferring content from the hard disk to DVD can be done at 32x normal speed, enabling a one-hour programme to be dubbed in just under two minutes. The hard-disk system also includes a Play List Editing feature, which is designed to make it easier to edit images transferred from a digital camcorder prior to burning on to a DVD.

Model DR-MV1 is a combined DVD recorder and VHS VCR. Programmes can be dubbed from VHS to DVD or from DVD to VHS by pushing a single button. The DVD recorder skips any blank space on the tape in VHS-to-DVD dubbing, so that the disc is free of unwanted blank spaces between recorded programmes. The recorder also has two tuners, enabling two different programmes to be recorded on DVD and tape simultaneously.

Model DR-MX1 combines a 160GB hard-disk drive with a multi-format DVD recorder, a VHS Hi-Fi recorder and a twin TV tuner. This three-in-one recorder provides six-way dubbing without connection to external devices, i.e. HDD-DVD, DVD-VHS or HDD-VHS. The twin tuner enables two different programmes to be recorded simultaneously on the HDD, DVD or tape. This model is compatible with DVD-RAM, DVD-RW and DVD-R discs and playable formats include DVD-Video, WMA, MP3, JPEG and CDs. Video can be dubbed from the HDD to a DVD at a maximum speed of 32 times the normal rate with DVD-R 4x discs – a one-hour programme can be copied to DVD is just under two minutes.

Watch out CE manufacturers!

Microsoft and Intel, which dominate the PC industry, are to mount a joint advertising campaign in the US to promote the PC as an entertainment device. The idea is to ensure that consumers are aware of the technologies that the two companies have adopted to break into the mainstream consumer electronics field. The campaign will use the slogan 'Digital Joy'. Consumers will be able to visit a website or 38 mock-ups of digital living rooms that will be set up in shopping malls across the US. The Media Center version of Windows will be promoted – it works with chips that have been designed by Intel for digital entertainment. New Media Center extenders will also be promoted: these transmit video, music and pictures from a PC in one room to TV sets elsewhere in the home.



A new home cinema receiver, the DiVA Model AVR250, has been launched by Arcam. It has seven audio channels with an output of 75W per channel, or 100W per channel in the stereo mode. All current audio decoding requirements are met, including DTS 96/24, Dolby Digital EX and Doly Pro Logic II. A programmable master audio delay of up to 220msec avoids loss of lip sync with some digital display panels. Price is about £1,000.

Help with the digital switchover

The Ofcom consumer panel, an independent body set up to advise the media regulator, has recommended that the government should devote some £400m to help disadvantaged people, including the elderly, poor and disabled, cope with the switchover to digital TV. This is unlikely to involve the provision of any equipment, just "practical help and advice". And the responsibility for providing this would probably fall on "existing community networks". So don't expect any generosity.

Laser development

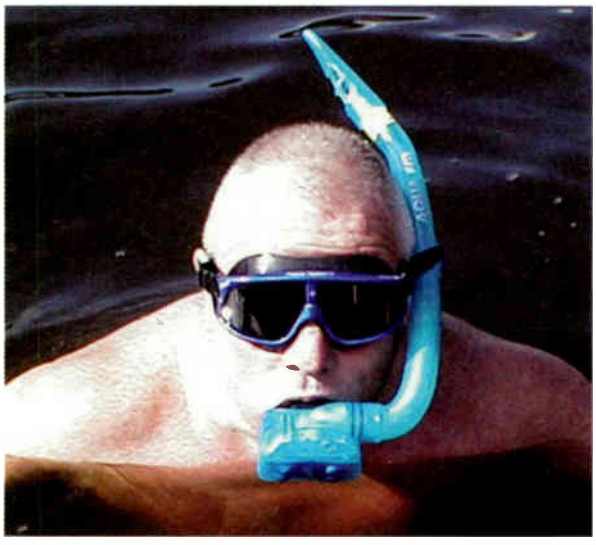
Sony and Nichia Corporation have developed an integrated dual-wavelength coupler that's compatible with the red lasers used for DVD playback and the blue-violet lasers which have been developed for use with the next generation of optical discs, e.g. Blu-ray.

Mass production of the couplers, which incorporate a laser of each type, will start by the end of the year. Until now the laser systems have been separate. By incorporating both lasers the new coupler will provide an optical system that's simpler, smaller and more reliable.

It will be used in the new generation of Blu-ray machines.

Test report:

The Aqua FM Swim-Man



And now for something completely different ... Pete Roberts, our aquatic electronics correspondent, reports on an FM radio designed for use by swimmers

No, you haven't picked up a diving magazine by mistake. That strange-looking device adorning my face isn't just a perfectly usable snorkel, it is also what must be the most unusual FM radio ever.

Swimming is considered to be the best possible exercise and, with eleven million swimmers in the UK alone, is by far the most popular participant sport. But even the most committed open-water swimmer, like myself, has to admit that it can be boring, especially when ploughing up and down a swimming pool. This is where the Aqua FM Swim-Man comes in, the ultimate companion.

Listening while swimming

What at first glance appears to be a conventional snorkel is actually fitted with a full-range (87·5-108MHz) scanning FM radio with a stainless-steel wire aerial concealed in the snorkel tube itself. Swimmers' radios are available with waterproof earphones, but have several disadvantages. Earphones are difficult to retain in wet ears, especially in rough water. The leads tend to stick to wet skin, and can tangle with a swimmer's arms. As the earphone leads also act as the aerial, and VHF radio waves don't penetrate water, the wires end up having to be draped about the head. And last but not least, even waterproof earphones eventually succumb to the chemicals used to sterilise swimming-pool water – chlorinated pool water is every bit as corrosive to copper wire as sea water! These comments are, believe me, based on personal experience.

The Aqua FM Swim-Man dispenses with earphones. Instead, it transmits sound to the inner ear via bone conduction, from piezoelectric transducers that are embedded at either side of the rubber mouthpiece (see Photo 1), positioned to contact the molar teeth. There's no need to bite hard: light contact with the teeth is all that's needed, even for someone with teeth as unusual as mine – putting it bluntly, my buck teeth put Bugs Bunny's to shame! Prospective users should however bear in mind that, if you are not used to using one, a snorkel is something that takes a bit of getting used to.

The works

I haven't opened up my unit, as to do so would compromise the hermetic sealing as well as invalidating the warranty. But the 'works' are visible through the translucent casing.

There are no obvious IF transformers or filters. This, coupled with the now commonplace 'reset then scan' method of tuning, suggests the use of one of those single-chip FM receivers with a low IF and a pulse-counter discriminator. Reception is mono only – stereo is pointless, as there is no way of effectively separating the left and right channels when the sound is transmitted via the teeth and skull.

Two AAA cells provide the power. As a 3V supply can provide a maximum drive of only about 1V RMS, the power output stage drives a fairly hefty transformer (see Photo 2) to step up the voltage sufficiently to drive the transducers. Unfortunately this takes a fair bit of power, so battery life can be limited if the receiver is used at high volume.

Operation is by means of five buttons that are mounted on the front of the radio's body: power on/off; scan; reset (restarts the scan at the LF end of the band); volume up; and volume down. A flashing LED warns that the unit is powered.

Performance

Reception outdoors is as good as you can get. It's remarkably good in the indoor pool I use. This is located in a red-brick building however: I've not had the opportunity to try the unit in one of those factory-style, metal-clad sheds that are used to house some modern recreational facilities. Nevertheless the Aqua FM should work satisfactorily wherever reasonable reception can be obtained using a standard pocket portable FM radio receiver.

Ultimately, reception depends on location. I live in the primary service area of the Holme Moss transmitter, at the edge of the Liverpool-Manchester conurbation, and have

several powerful local radio stations nearby.

The Aqua FM works as a normal snorkel but, as VHF radio signals don't penetrate water, reception is possible only while you swim on the surface, with the tube and its internal aerial above water. If you dive then, provided the power is left on, the radio remains tuned and reception is resumed on your return to the surface.

A purge valve is fitted to drain any water that may collect in the tube and, as with an ordinary snorkel, it needs to be clipped to swimming goggles or a mask. The construction of the unit, which is made in France, is somewhat more robust than most recreational snorkels I have come across. This gives me the impression that the Aqua FM has been designed for serious use in the open sea.

A specialised version is available, intended for use in coaching and synchronised swimming. It works in conjunction with a poolside transmitter to relay speech and music.

The Aqua FM is not a toy: it's a full-featured diver's snorkel with the radio's housing capable of withstanding a maximum depth of 10m (33ft). As mentioned above, wearing a snorkel is something that takes some getting used to: those unaccustomed to snorkelling may find the mouthpiece uncomfortable for a while. Like many open-water swimmers I'm a breaststroker and keep my head above water. I've not tried the Aqua FM using front crawl. Will it work with dentures? I can't comment from experience, but see no reason why not, though poor contact or cushioning between denture and gum would result in some loss of volume.

The clarity of reproduction is excellent outdoors. In an indoor pool the high level of ambient noise (splashing, ventilation, shrieking kids) may be intrusive if you are attempting to listen to classical music or to speech, but the use of standard swimmers' earplugs should overcome this problem.

You may also have to persuade the management of your local pool to allow the use of the Aqua FM as, thanks to the current obsession with so-called 'health and safety', some leisure centres go as far as banning swimming goggles. Just point out that it's a radio, and that the 3V battery doesn't turn you into the human equivalent of an electric eel! I'm fortunate in having the use of a private health club's pool, where there's no objection to the use of masks, snorkels and other big boys' toys.

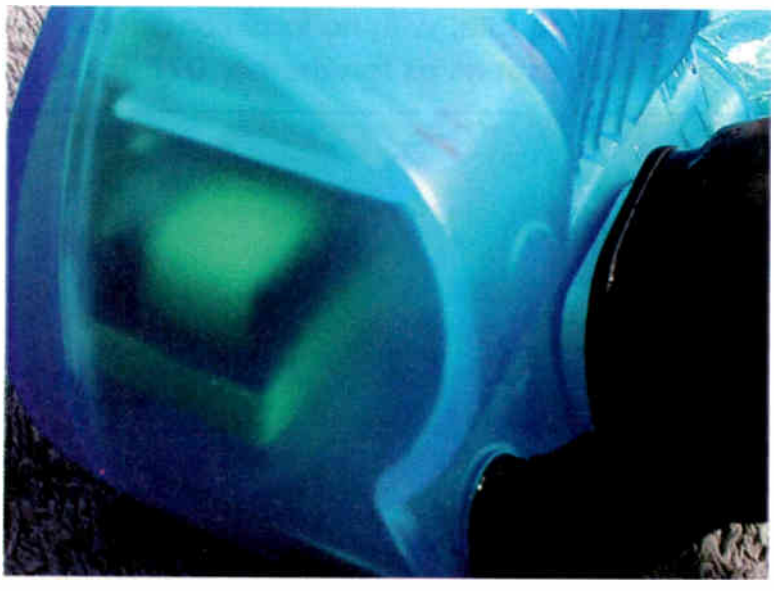


Photo 1 (top): Close-up view of the mouthpiece. The odd 'leg' on the right-hand side is the electrical connection to the radio circuitry.

Photo 2 (middle): Close-up view of the body of the radio, showing the transducer driver transformer.

Photo 3 (bottom): The Aqua FM with its heavy-duty carrying case. That clear plastic is thick and tough.

Availability

Interested in stocking the Aqua FM? The suggested retail price is £75: a trade discount is offered to bona-fide dealers. The unit comes complete with batteries, a multilingual instruction manual, and a strong plastic carrying case (see Photo 3) that has a separate pocket for swim mask or goggles.

Contact AquaSphere UK Ltd., Neptune Way, Blackburn, Lancashire, BB1 2BT. The telephone number is 01254 278 873.

Incidentally my rather posh mask is AquaSphere's Seal model, which has UV-400 certified mirror lenses.

DTT reception

Dr Les May describes problems with digital terrestrial television reception. Over a period of two years he has found that DTT is far from reliable, despite living in an area where the signal strength should be more than adequate, with no local conditions that could cause problems. This raises questions as to whether DTT has a long-term future

At Christmas 2002 I installed a digibox to receive Freeview, the digital terrestrial TV (DTT) service promoted by the BBC. The box was a generous present from my brother. I think that, like the rest of my family, he had come to the conclusion that it was time to shut me up about the coming wonders of the new age of digital terrestrial television and let me get on with watching it.

Some weeks ago I watched *America* on BBC4 without the programme once achieving synchronisation between what Alistair Cook was saying and what his lips seemed to be saying. The following week the programme achieved synchronisation, or at least near synchronisation, for much of the time. I find that switching the digibox off momentarily, then switching it back on again, usually gets the audio and video streams in sync – but not always.

This trick doesn't cure the problem of picture freezing every twenty seconds or so which, as my wife is keen to remind me, is annoying if you happen to be watching *Coronation Street* or the *Tour de France*.

Location

Now I don't live in a cave, a wood, a steep-sided valley or on the wrong side of an industrial estate full of metal-frame, metal-clad buildings. I live in a suburb that consists of low-density housing, about 21km from the Winter Hill transmitter. If it wasn't for the houses and trees in my neighbours' gardens, I would be able to see it from my back door!

So perhaps the aerial could be to blame? I doubt it, as we've about the biggest aerial, of the correct type, in the immediate area. In fact we have two aerials. The second one is a smaller, lower affair that feeds our 'second' TV receiver in the dining room. When the digibox is switched off and the two sets receive an analogue signal the pictures are equally good, which suggests that the analogue signal here is far from marginal.

Symptoms

There are no fringes with our analogue-signal reception to suggest multi-path reflections. There's no patterning and no snow. In scenes that are shot at night or in a darkened room the black content is just that – black. But when you watch the same material via DTT the black is anything but black. Green and red shapes drift across the black areas, and every so often you can make out letters or whole words. Where do they come from?

Though they are most noticeable in black areas, artefacts can be seen drifting across any area of solid colour when it happens to be stationary. This is so with every studio background, piece of turf or a clear blue sky. When a TV director wants the highest possible quality he uses film. As a viewer, I appreciate this: being able to say that something was "beautifully filmed" adds to the pleasure of the viewing experience.

It's not just picture content that suffers. Several radio channels are available via the digibox: but you are unlikely to get through a thirty-minute programme without half a dozen breaks in the audio.

The problem is that while analogue reception degrades gracefully, digital reception doesn't. My wife happily watches Welsh soap operas, choral singing and documentaries that are received as a distant signal, arriving at the side of the aerial and in a different channel group. But she won't watch *Coronation Street* via the digibox because she wants to see it without interruptions.

Cause of annoyance

Television exploits some of the characteristics of human vision. We have, for example, an extraordinary ability to 'fill in' missing detail. At any instant our eyes may be capable of picking out detail and colour over only a tiny part of the visual field but, even at the periphery of our vision, detail and colour are both perceived. The brain carries out a sort of integration process.

Feed our eyes with a series of still pictures at a sufficiently fast rate and we see movement. Illuminate millions of red, green and blue microscopic dots in just the right way and we see a colour that, in itself, doesn't exist externally. These characteristics of human vision enable us to experience the real, three-dimensional world of objects. We experience this world as a continuous flow of visual information. It's transient, here for a moment then gone forever.

When a digital TV or video system falls down it does so in a way that breaks up the continuous flow of visual images. The expectation, unconscious, that our visual experience of the world will consist of a continuous flow from one moment to the next is not fulfilled. This is why an otherwise perfect but intermittently halting picture from a digital source is so annoying, while noisy pictures from an analogue source can be watched with enjoyment. Ask yourself what you would rather do: drive down an unfamiliar road in a mist, or drive down it with perfect visibility but with the scene before your eyes being halted for a couple of seconds every so often?

I don't want to suggest that digital is necessarily inferior to analogue TV. I've seen superb picture quality decoded from digital signals received via satellite transmissions. What I do suggest is that with digital terrestrial transmission there's the possibility of transforming what, with an analogue transmission, is a strong signal to one that's marginal.

That's what seems to be the problem in my area, because the quality of the pictures, or sometimes lack of it, varies from channel to channel, from day to day and even from minute to minute. Whether the cause is trees waving about in the wind, rain squalls, flocks of birds, refraction of the signal as the ground warms up or something else I can only guess. Basically the signal is not sufficiently robust.

The switchover to digital

Why am I grumbling when my neighbours aren't? Because I have a DTT digibox, whereas they have BSkyB or cable signals (or both), or are what the industry charmingly calls 'refuseniks': those who, it is felt, could afford to sign up for satellite or cable reception, or buy a DTT digibox, but won't, preferring to stay with the analogue TV services. Presumably it's assumed that when push comes to shove, and the switch-off of analogue transmissions is imminent, these refuseniks can be bullied, cajoled or bribed to go digital.

The suggested date for this has, over the past few years, varied between 2006 and 2010. At present the target seems to be 2012, one set for the BBC by the government. But politically it could be never, because 2012 is at least two parliaments away, and why should any party run the risk of handing a spectrum sell-off windfall to the opposition if it looses the crucial election?

BSkyB claims to have a penetration of 48 per cent of households and expects this to rise to 58 per cent after spending a further fortune on an advertising campaign. This would leave a lot of households to be reached by either cable or DTT. Aside from the question of subscription cost, there are many areas that are simply out of reach for cable.

The measure quoted for DTT uptake is the number of digiboxes sold. A more accurate measure would take into account those who use their digiboxes to receive BBC1 and 2, ITV, C4 and Five and choose to ignore the analogue transmissions. If, as I suspect, the number of those who do this is not many, the apparently small number of complaints about sometimes poor picture quality should not be taken as evidence that viewers are satisfied. It is quite amusing to watch the picture break up, pause and make a few false starts while the BBC is transmitting its advertising trailer for Freeview. Yes, this really does happen!

Prospects

If my experience with a DTT digibox is shared by other viewers, there are going to be a great many disgruntled people come the final switchover – because many viewers live in areas that are far less favourable for DTT reception than mine. It is one thing to tolerate poorer picture quality with an 'extra' service such as BBC4, quite another to put up with it for a basic service that people feel they have paid for through their licence fee.

We seem to be sleepwalking into a fiasco when the analogue signals are finally switched off. In my view the refuseniks have got it right. Unless they have an overwhelming urge to watch BBC4 or Sky News, they should keep their money in their pockets. At present, 'free-to-air' DTT is a bit of a con.

If you think that this is rather over-the-top, ask yourself how many consumer-priced digital video recorders you have seen on sale? Even at less than one pound per gigabyte, disc-based video recorders are not the answer. Or are we to forgo the 'improved' digital video picture quality and resort to our old analogue VCRs to archive favourite programmes?

At the time of writing this, in August 2004, BSkyB has announced a satellite service, FreeSat, that provides some 200 TV and radio channels. It's not entirely free however, as a one-off payment of £150 is required for equipment, installation and a viewing card – the latter is available separately for £20 if you already have a receiver and dish. But pay-TV packages will presumably be pushed, as FreeSat viewers will not contribute to BSkyB's future revenue stream, and the card could always be invalidated and a charge made for a replacement.

Free-to-view satellite reception of non-subscription TV channels is available. So what's the problem, you may ask? Well, it's not compatible with DTT, which could be rendered obsolete. A fiasco isn't, I consider, too strong a word to use for the planned switchover to all-digital transmissions. ■

Typical example of digital picture breakup (pixellation) under poor-signal conditions, when the digital decoder can't cope.

A Vestel power supply

Many modern sets are fitted with the Vestel 11AK37 chassis. Stephen Williams describes the operation of its power supply and lists the most common fault conditions

Vestel chassis are used in many modern colour TV sets, predominantly those aimed at the cheaper end of the market. The 11AK37 chassis has a power supply which is based on the 8-pin MC44608 chopper control/driver chip. The 11AK19 chassis has a similar power supply, but several different control/driver chips are used in the various versions of this chassis.

Fig. 1 shows the primary side of the power supply used in the 11AK37 chassis, and Fig. 2 the secondary side. The MC44608 chip IC800 provides a variable pulse-width drive at pin 5, at an operating frequency of 40-75kHz. The drive output is optimised for use with a power FET as the chopper transistor. The MC44608 chip also has a standby mode, which minimises the power consumption in this state.

Basic circuit operation

D809 and R801 provide a start-up feed for pin 8 of IC800. This pin is connected via a 9mA internal feed to the IC's power supply (VCC) pin 6. Once the voltage at pin 6 rises to 13V, as C810 charges, the power supply starts up, with the pulse-width modulated drive appearing at pin 5. The internal 9mA feed is then disconnected, as there should be sufficient voltage from the winding connected to pins 3 and 4 of the chopper transformer TR802 for D804 to maintain the charge across C810.

At this stage pin 6 also monitors the 13V supply, which must stay between 10V and 15·4V. Should the supply go outside this range, IC800 will operate in a pulsed mode and all the primary and secondary supplies will fall to very low levels. If the voltage at pin 6 falls below 6·5V, IC800 will switch off completely.

Feedback for voltage regulation is applied to pin 3 of IC800 via the opto-isolator IC801. On the secondary side of the circuit IC801 is driven by the TL431 variable shunt regulator IC818, which monitors the busy main HT supply (150V) via a resistive ladder network. The current through IC801 is proportional to the HT variations. Regulation is achieved by varying the width of the output pulses at pin 5 of IC800. The control loop maintains the HT voltage within 1V.

Pin 2 of IC800 monitors the current passed by the chopper FET Q801 by checking the voltage developed across its source resistors R834 and R807. If this voltage rises to about 1V the drive output at pin 5 ceases.

Pin 1 of IC800 monitors the amplitude of the pulses present in the chopper transformer TR802. It also checks that the pulses decay through zero volts on a pulse-by-pulse basis (known as zero-crossing or demagnetisation). If this doesn't happen the drive output at pin 5 is again shut down and the IC latches off, as there must be an abnormality in the chopper output stage. In addition pin 1 detects the change in pulse level as the power supply switches to standby, and alters its detection levels accordingly.

Passive components are used for power-factor correction.

The standby mode

In the standby mode transistor Q804 is switched on, connecting the 8·2V zener diode D801 across IC818. This causes a dramatic increase in the feedback to pin 3 of IC800 via IC801. IC800 interprets this as an overload, terminates normal pulse-width modulated drive and switches to the pulsed, low-power standby mode.

In standby, with the output voltages all reduced, the microcontroller chip still needs a constant supply so that the set can be brought out of standby. For this purpose a reconfiguration is carried out on the secondary side, operated by Q802. This transistor, which is normally on, is switched off, activating thyristor D889. This enables D802 to top up the supply, provided by D803, to the 5V regulator IC802. In this way the standby 5V supply is maintained. In some versions of the circuit the standby supply may be 3·3V – it depends on the type of microcontroller chip used.

Additional protection

An additional HT current monitoring circuit is sometimes included in the 11AK37 chassis, consisting of Q803 and the associated circuitry. Q803 monitors the voltage developed across R830. In the event of excessive HT current, the voltage across R830 will increase and Q803 will switch on. A voltage will then be developed across R823. This is applied via D510 to pin 52 of the microcontroller chip. After a few seconds this chip will activate the standby mode. Pin 47 goes high, Q804 switches on, Q503 switches on and Q802 switches off.

Pin 52 of the microcontroller chip also monitors the 8V and 5V lines and the beam current, via various resistors and diodes.

11AK37 chassis overview

The 11AK37 chassis generally has a microcontroller chip that includes teletext and OSD generation. There's a separate signals/deflec-

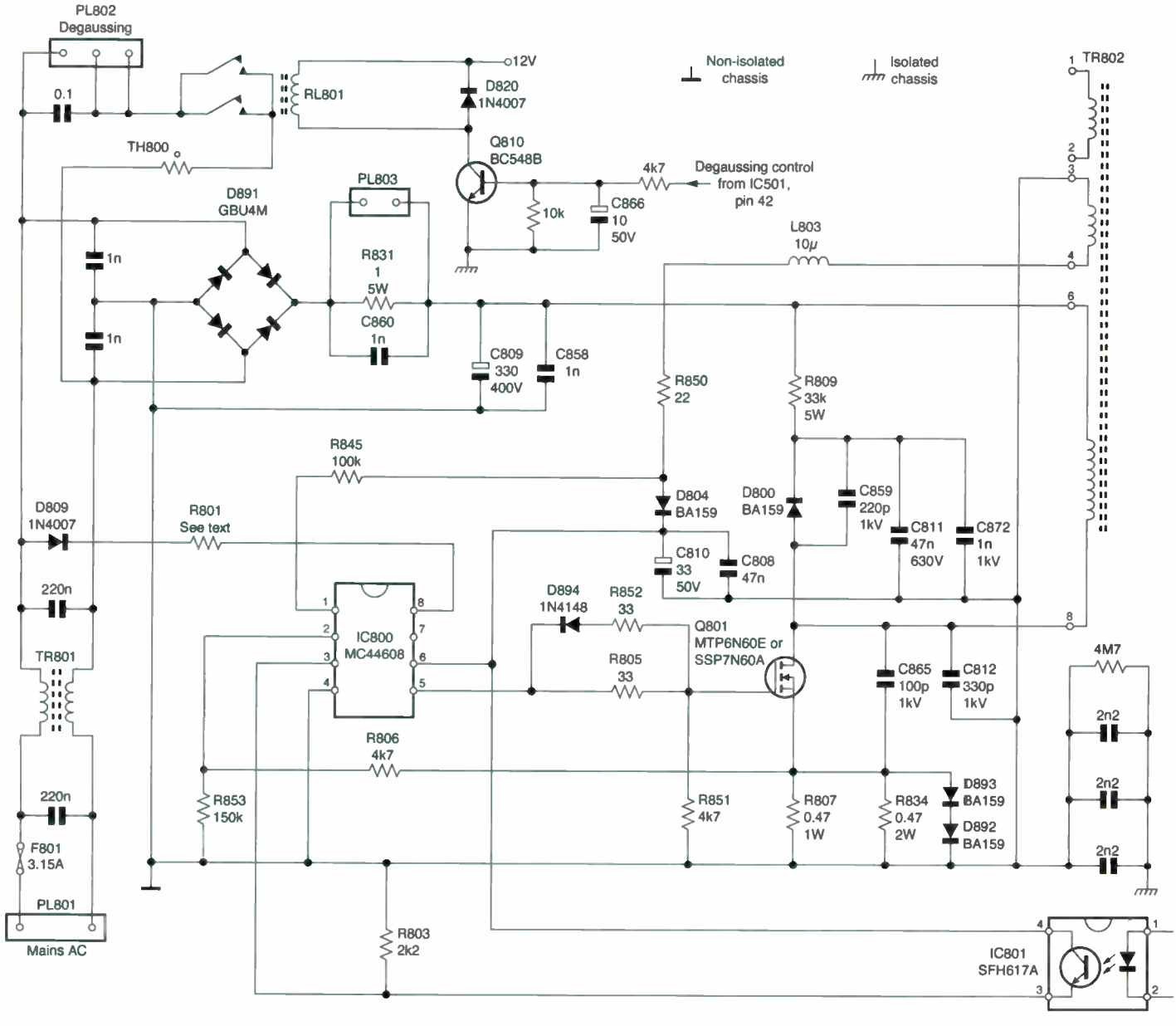


Fig. 1: Circuitry on the primary side of the chopper power supply in the Vestel 11AK37 chassis.

tion processor chip and a sound processor chip. Types may vary from model to model.

Default settings are stored in a non-volatile memory chip, along with tuning information and any other customer adjustments.

Fault finding

The main power-supply fault you get with this chassis is a general component wipe out, with IC800, Q801, D894, D893, D892, R852, R805, R834, R807, R831 and maybe IC801 defective. The usual cause is mains spikes arriving via R801 at start up. Because of this the value of R801 was increased from 1kΩ to 4·7kΩ. If you are dealing with one of these sets, for whatever reason, this upgrade should be carried out to ensure future power supply reliability.

Failure to start can be caused by C810 being open-circuit.

Creeping HT can be caused by the resistors in the monitoring network increasing in value, particularly R854 and R817. In some sets there's a single resistor here, R817, with a value of 120kΩ.

Causes of a set switching off for no apparent reason are R830

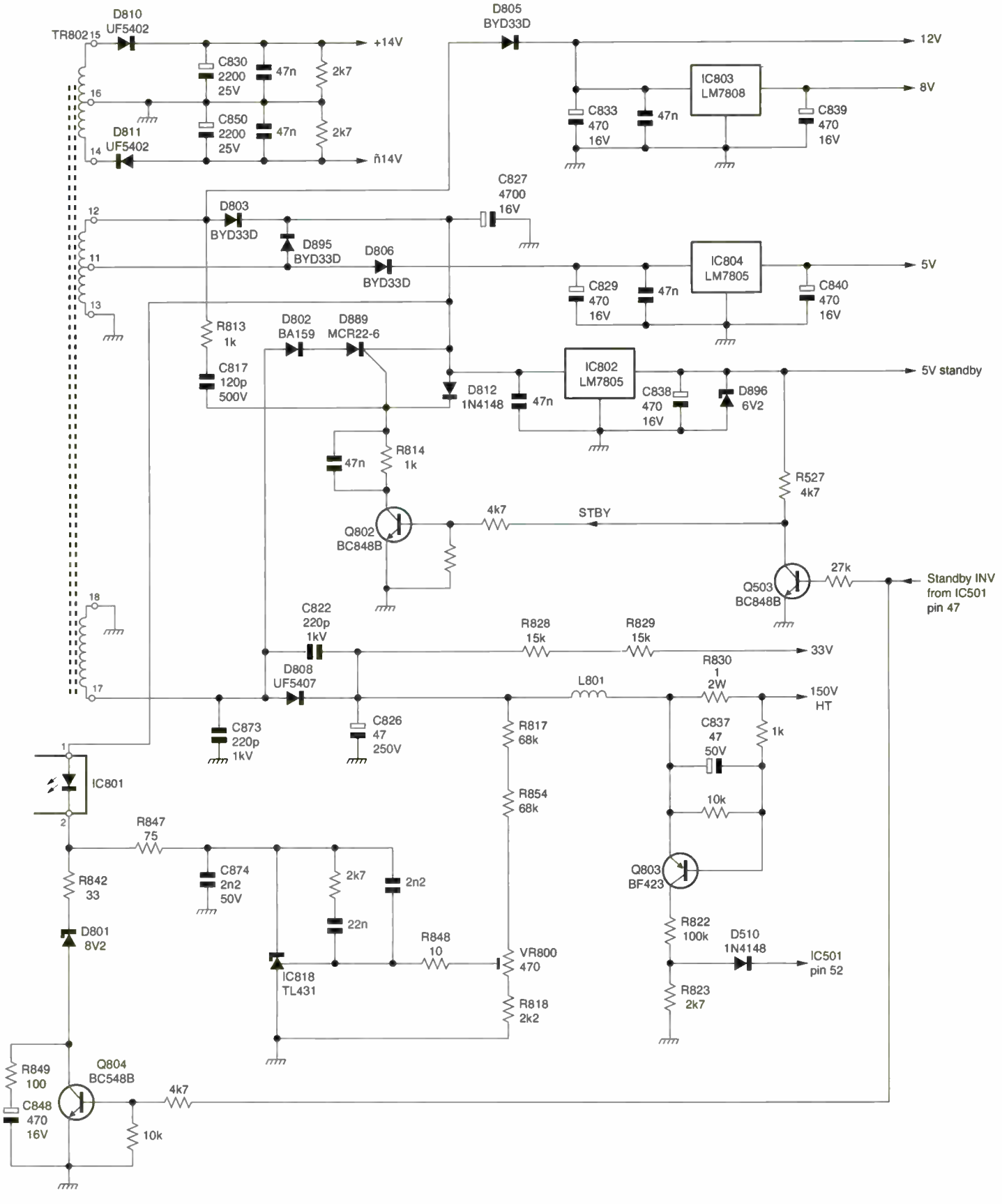
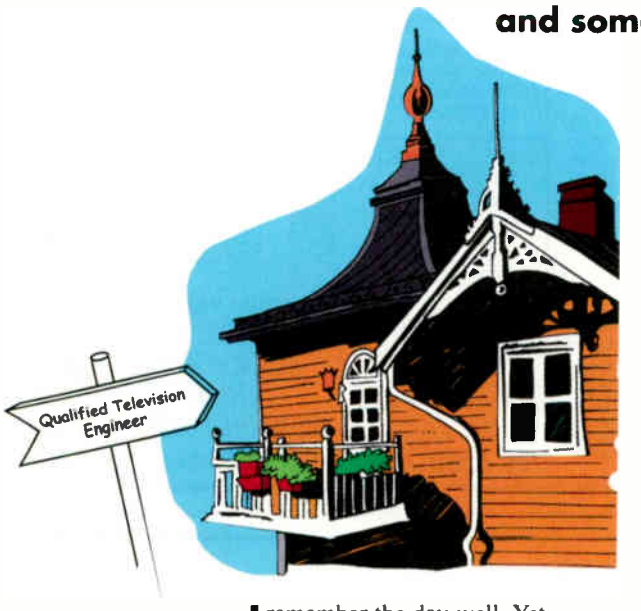


Fig. 2: Circuitry on the secondary side of the chopper power supply in the Vestel 11AK37 chassis.

Striking out on our own

Elaine Everest on the first steps to self-employment – and some subsequent developments



I remember the day well. Yet another TV rental workshop had closed, the one where my husband worked. With the mortgage on our large, rambling Victorian house to pay, a decision about the future had to be made.

"Why not use the spare bedroom as a workshop and go self-employed?" I suggested.

To this day I wish I'd kept my mouth shut. Most young men employed in a dying trade would have retrained. By now they would be heads of industry, presidents of banks or even prime ministers – well anyway they would be earning a load of dosh for sitting on their backsides all day!

Perhaps not. Back to the spare bedroom idea. We cleared out the one half of the bunk beds that came with us when we got married – my sister still sleeps on the other half at my parents' house. My collection of cuddly toys was stuffed into the loft and a workbench was installed. It consisted of two old utility chests of drawers with the door of the third bedroom resting on top. Even in those days himself, my polite word for hubby, had collected enough test equipment to be able to run the BBC single-handed. Spares could be purchased when needed.

Getting customers

So we were up and running. But we needed customers. We couldn't rely on parents and the odd aunt or two. Besides, they expected free repairs – their perks of our job so to speak!

This is where the Advertising Department came in. We had a neighbour who had a printing press in his mum's garden shed. He ran off a batch of business cards for us, orange with black writing. It was the Seventies, and orange was very fashionable. We left these cards with anyone and everyone. We even put a few in the telephone boxes. This was back in the days before phone boxes were filled with pictures of Exotic Rita and Desirable Doris flashing their wares.

We also ran a few lines in the classified ads section of the one local newspaper. "Qualified Television Engineer, Black and White and Colour" it said. This was a reference to his qualifications, not his nationality. As for the word 'qualified', the ink was barely dry on the certificates that had taken five years to obtain – with distinction, I still proudly boast to this day.

A problem at that time was the number of engineers who moonlighted from their day jobs, clearly using company vehicles and spare parts. We found out that these gentlemen usually boasted "free call out" in their advertisements. They could afford it, we couldn't!

We were now ready for business, waiting for our two-tone green trimphone to trill – remember that annoying sound? But trill it did, though slowly at first.

We had to tighten our belts to begin with. Live off the contents of the freezer, right down to the odd packets with no labels and pieces of fish with more ice than fish left on the fillets. Interesting days!

Amongst our first

Speaking of fish, one of our first customers was the local fishmonger, a larger-than-life character who loved his ale. Many a time we were woken in the early hours, the aforementioned trimphone's shrill call frightening us to death. Had there been an accident? Were the in-laws ill? No, it would be our friendly fishmonger waking from his beer-induced slumber to find that his TV set was completely dead. Nine out of ten times this was because it was well past two in the morning, long after all good TV stations had gone off-air. He usually received the sharp end of my tongue. But he paid well when it was a genuine call – with beautiful, plump smoked haddock.

Now I'm probably not the best TV engineer's wife, being known for putting customers straight when they attempt to invade our private life. Like our first Christmas. We were half way through the meal, the Queen had spoken, and the pudding was ready to be lit. There was a knock on the door, and a young man from down the road came in. Could himself fix the set, as his dad wanted to watch *Morecambe and Wise*?

We pointed out that we were eating. No problem, he would wait. And wait he did, standing there until we had finished. Very strange.

Transport

The same lad's dad sold a few vehicles from the front garden of his council house, and owed us a favour. Every TV repair business needs an estate car, and we were no exception. A deal was struck, and

we became the proud owners of a shabby company vehicle.

It very soon became apparent that the car would need a respray, to impress the customers. A neighbour who had most of the paint division of a well-known Dagenham motor company in his garage offered to do the job. We picked a rather nice chocolate brown colour, left the vehicle with him and went off camping for a week.

On our return we were eagerly looking forward to seeing the revamped vehicle. Yes, it was brown. But the finish resembled that of a rather old, dry orange. What could we do? This chap had 'mates', and was not the sort of person to cross in a hurry.

Several days later I caught one of his children setting fire to the fence between our garden and the local railway line. This turned out to be to our advantage. It seemed that the boy had a record of such crimes, and his dad wasn't too keen for him to be reported. A word in his ear and our vehicle was resprayed correctly. The boy kept clear of our fence thereafter, and lived to be prosecuted another day.

Customer care

Himself believes in looking after his customers. Most of them have remained with us for many years, and we now do repairs to their childrens' and grandchildrens' sets. But we've had the occasional rogue punter.

A big job and good earner in earlier days was to change the tube in a set. We did business with a local expert known as Deaf Harry, for obvious reasons. He made an excellent job of regunning tubes, but sometimes one would flash over and had to be returned. His answer was always that he never heard it!

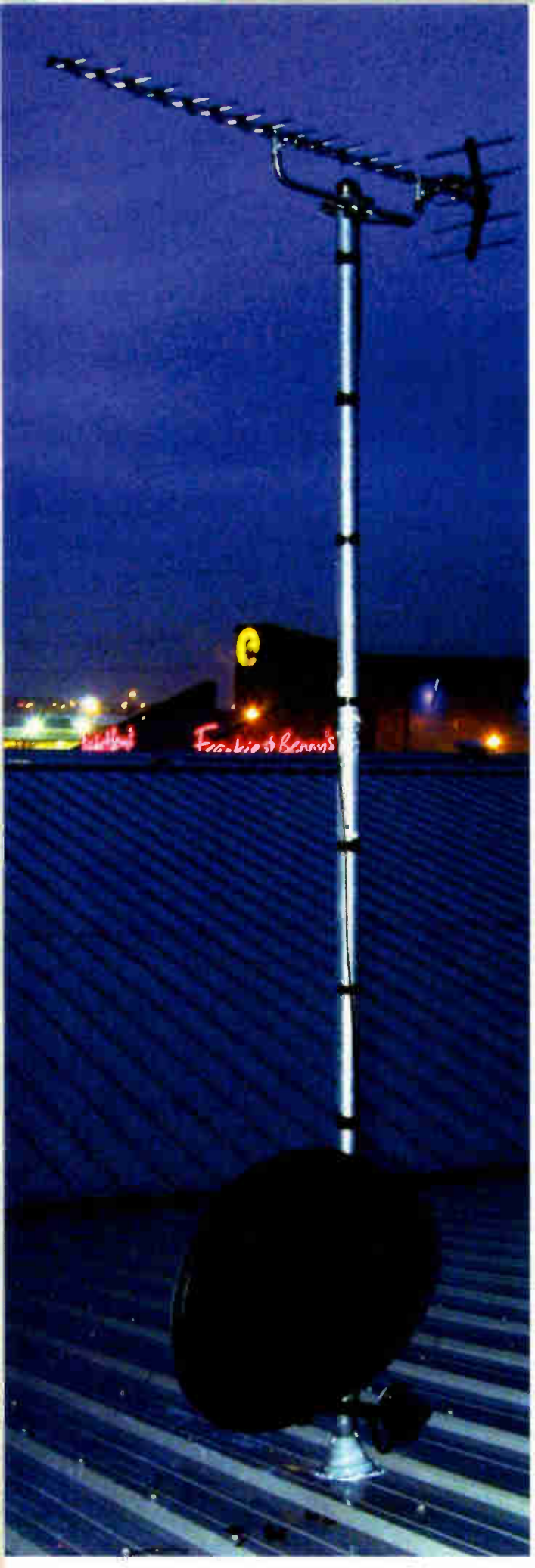
When it became apparent that a customer's TV set would need a tube change before long, himself wouldn't charge as much as usual for any other repairs required, the idea being to help with the high cost of the tube change when this became essential. One particular customer had received such a discount, and we waited for the call to do the tube change. It never came.

A year later, when himself was called out late one night to attend to a fault with this set, he noticed a sticker on the tube. It belonged to a 'while-you-wait' TV centre that had sprung up in a nearby town. It was not quite run by Butch Cassidy, but probably by his near relatives.

We'd been sorting out problems for customers of this establishment's cowboys since it had opened. This particular client of ours had availed himself of their services, being offered a discount on the tube change as there were several other problems that needed attention. He'd been ripped off for attention to these – sorry, had been charged alarmingly highly. I was incensed by this customer's action. It seemed that we were OK for the cheap work and late-night call outs, not for the bigger jobs. But in the end he paid for his betrayal of our good nature, having been overcharged by the cowboys.

What annoyed me even more was that a group of men could put our trade into such disrepute by cheating customers. Elephants and TV engineers' wives never forget. I danced for joy when, a few years later, these rogues ceased to trade after lengthy prosecutions by the trading standards people.

This had nothing to do with the time when himself was kidnapped by the local mob to repair their mother's TV set. But that's another story . . . ■



Satellite TV distribution systems

This concluding instalment in Bill Wright's present series takes a look at larger systems, including repeaters and equalisation

The systems we've looked at so far in this series have every downlead running back to one point. The maximum permissible downlead length sets the practical limit with such a system. With a 'new-build' project, where it's easier to implement a technically ideal solution than it is in an old, occupied building, I suggest that no downlead should be longer than 30m. This means that in buildings above a certain size there need to be two or more locations where groups of downleads come together. These locations could contain nothing more than passive tap-off units and multiswitches, or they might include repeater amplifiers.

Planning larger systems

Every large system presents its own challenges. Often several appropriate system designs will spring to mind, all radically different and each with its advantages and disadvantages. If you understand the principles of RF distribution and have the use of good test equipment, you can usually find an effective and economic customised solution. If you don't you might well find yourself asking a manufacturer or distributor for help.

This will get the system planned for you, possibly free of charge, but the drawback will be that the planner is restricted to the items he sells. This might be fine, but I've seen many systems that have been installed using inappropriate and over-elaborate methods. Equipment dealers make their living from selling equipment, and I've found that with a minority of them this leads to unnecessarily expensive solutions being recommended. The favourite is to use eleven channelised UHF amplifiers for the five analogue and six digital channels where one broadband amplifier would be perfectly adequate.

There is no need to fall for this sort of thing. If you understand the basic principles you can read the specifications of the various items available and plan your own system. Mix and match components, drawing on whichever brands fit the bill. This is one of the few modern industries where customised solutions are the norm.

Tap-off line systems

Terrestrial-only TV distribution systems were, and are, often designed around the use of tap-off lines. The basic layout consists of a long cable, usually CT167, with tap-off units along its length. Typically the CT167 cable might run through the lofts of a terraced row of houses, with a double tap-off serving every two dwellings. To compensate for the losses in the CT167 cable, the tap-off values decrease gradually along the line. Thus all outlets receive the correct signal levels.

A tap-off line system for satellite and terrestrial reception needs five parallel tap-off lines on each run, and each tap-off location needs five tap-off units and a multiswitch. To minimise the component count and the complexity of the system, it makes sense to have the maximum number of outlets per tap-off location, as long as the downlead lengths don't become excessive.

Various manufacturers produce kit for this sort of system. The five tap-offs are built into one unit, which plugs directly into the multiswitch. Some products are passive, but some amplify the signal to the tap-off line. Given the very high signal losses via cable at 2,050MHz, this is the only way a long tap-off line can be done.

There is obviously a limit to the amount of repeated amplification that can be used, though I've seen systems where the installers have not understood this. The result is adequate (or even high) signal levels but very poor carrier-to-noise ratio and BER. In one case cheap

satellite downlead cable had been used for the tap-off lines, each of which was 120m from end-to-end. The result was a complete lack of the higher-frequency signals at the last few dwellings connected to the system.

To keep the downleads at a reasonable length it's sometimes possible to feed only a few outlets per tap-off location. But, unless the system is very small, this can become messy. An extreme example would be a row of detached holiday chalets, with the tap-off line cables running underground between them.

Multiswitches are much more complicated than simple tap-off units, and are thus more likely to go wrong. So every unit needs to be in an accessible location.

Accurate planning of signal levels and equalisation can be difficult where there is a long series of tap-off locations. Each tap-off location has to be earth bonded, which can be quite an expense where each location feeds only a small number of dwellings.

The Vision V5 range of amplifiers, tap-off units and multiswitches goes some way towards solving installers' tap-off line problems. Fig. 25 shows a typical system layout using this equipment, but don't interpret the diagram too literally as it gives no details of cable losses. The whole system is powered from the amplifier at 18V DC, which is carried on the two horizontally-polarised satellite feeds. This has the great advantage that a mains supply is not needed at each tap-off location, but I hope that the sorts of problems we used to have years ago with DC line-powered UHF systems don't affect this equipment. DC line power via long tap-off lines and trunk cables always made the system susceptible to damage by electromagnetic pulses from nearby lightning strikes. I haven't heard of this happening with the Vision kit however. An advantage of the Vision V5 line-powering system is that the power can be injected at any point in the system – wherever a mains supply is available.

The Vision range uses quite high tap-off values to avoid problems caused by repeated amplification. This reduces the through-loss and minimises or eliminates the need for tap-off line amplification. It's an example of a basic principle of RF distribution, which is to get the signal as far down the system as possible without amplifying it. To compensate for the tap loss, each switch includes amplification. The switches have variable attenuators for terrestrial, high-band and low-band satellite signals, to provide accurate adjustment of the signal levels. Ability to adjust the terrestrial signal levels is particularly important, because the UHF signal levels will not match the satellite ones at each point in the system. With the larger switches in the Vision range the gain of each group of outputs can be varied in 2dB increments, to compensate for different downlead lengths. This is a good idea in principle, but it means that the electricians who first fix the cables must label them accurately. Unfortunately this often seems to be insurmountably difficult for them.

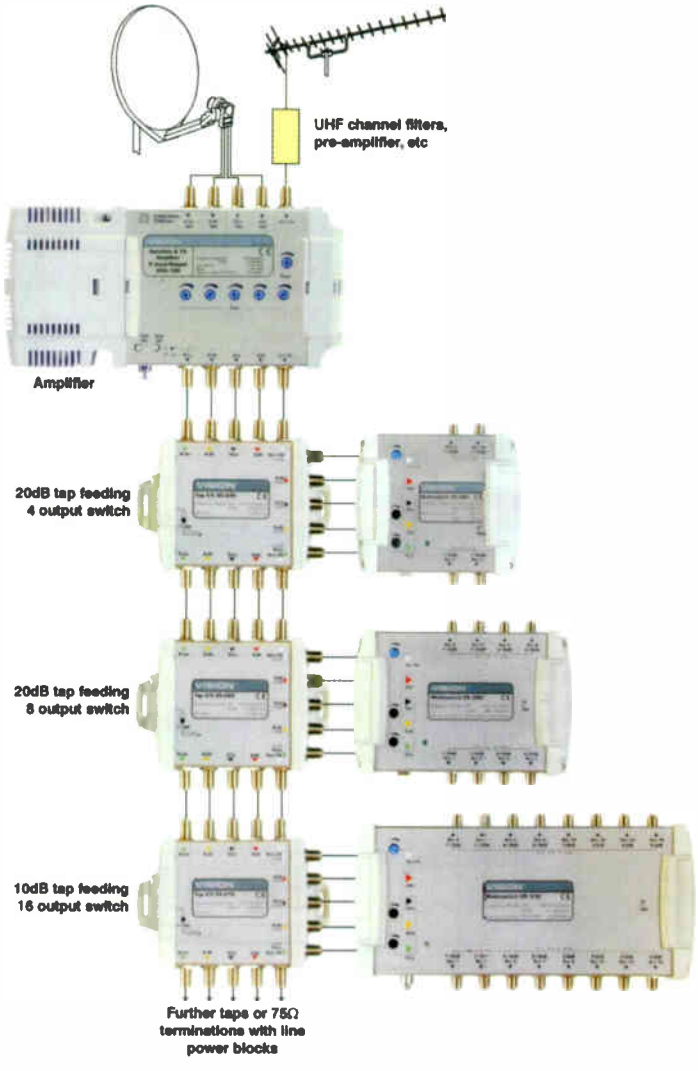


Fig. 25: A tap-off line system using the Vision V5 range of amplifiers, tap-off units and multiswitches.

A larger system

Fig. 26 shows the arrangement of part of a larger system that follows the same basic principles but uses discrete components. There are a head-end and a number of tap-off locations. Only part of the system is shown: the rest is much the same. We installed this system recently.

The system layout was to a large extent dictated by the design of the building, with the only feasible place for the tap-offs in the risers. This meant that the downlead lengths varied considerably, but it enabled the number of flats connected to each tap-off location to be relatively high. Because the flats are quite large, and the building isn't high-rise, the numbers ranged from six up to twenty. But a system to this design will often have forty downleads meeting at each riser. The more the merrier is the rule when considering ease of installation and maintenance.

As you can see, the schematic gives the addresses of the flats connected to each tap-off location – for the benefit of those who have to fault-find in later years. For the same reason the downleads should be labelled at the tap-off locations, even when no allowance is made for different lengths.

Where the tap-off locations have mains-powered amplification, this layout resembles more a UHF system, with a head-end feeding repeaters via trunk cables, than a simple tap-off line. There are five parallel trunk cables of course, four for the satellite IF and one for the terrestrial signals. On a system of this size the trunk cable should be CT167 or equivalent. The figures in red show the losses in each section of trunk.

The head-end

The head-end for this system is shown in Figs. 27 and 28. The photograph shows the satellite section of the head-end only, and was taken during installation. The numbers shown in red on the schematic are the approximate signal levels in dBmV for the strongest multiplexes

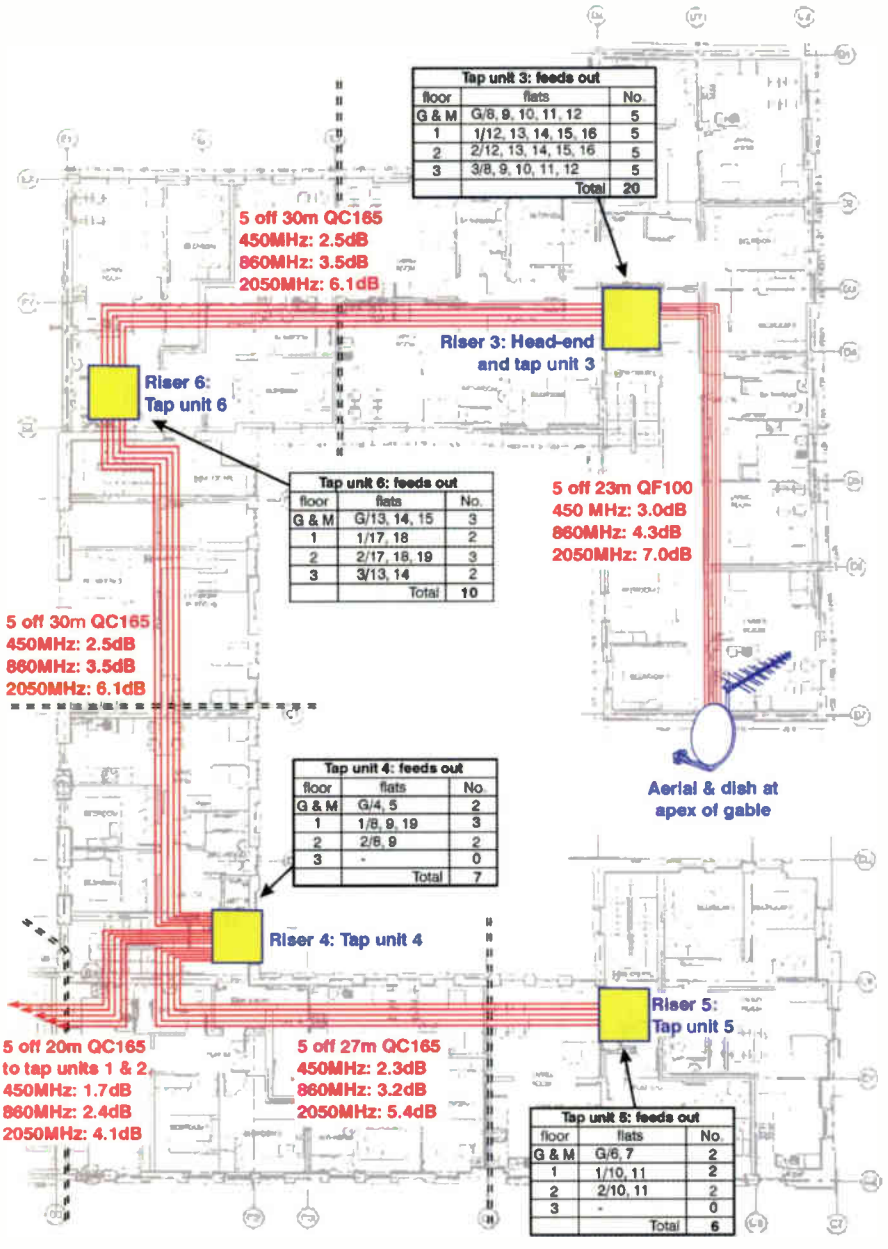


Fig. 26: Schematic of part of a system based on tap-off lines.

at the top end of the band. The four satellite IF amplifiers are mounted on a common backplate, with their power-supply unit. See Fig. 29 for a closer view of the amplifier.

These amplifiers, Taylor type TIS808, can provide a maximum output level of 57dBmV. So there's no danger of cross-modulation, given the output levels needed here. A practical test should always be carried out however to establish an amplifier's true maximum output – never mind what it says in the catalogue.

With the amplifier connected to the set of signals it will carry, turn up the gain in small increments while observing the BER of one of the weakest multiplexes. To ensure that the measuring instrument isn't swamped, fit a variable attenuator at its input and adjust this for the maximum BER reading at each amplifier gain setting. When an output level is reached where the BER starts to deteriorate, you are about 6dB above the maximum safe level. It might be necessary to use a line amplifier as a preamplifier for this test, to lift input levels sufficiently to the points where the BER starts to degrade.

In the example shown in Figs. 27 and 28 twenty dwellings are connected directly to the head-end, so it can be thought of as a combined head-end and tap-off location. As you can see, 25dB tap-off units are used to extract enough signal from the trunk to supply the local multiswitches. I've chosen to use discrete taps here for each trunk feed, but multiple units that handle all five feeds are available.

Incidentally the through loss of a single 25dB tap is less than that of a double 30dB tap, hence the splitters following the taps. It is important to minimise through loss at each tap-off location because, as I've said before, we are trying to get the signal as far as possible along the trunks without the need for further amplification, which adds noise – noise lowers the carrier-to-noise ratio and thus reduces the BER. The blue numbers show the approximate levels of the analogue terrestrial TV signals at various points.

Fig. 30 shows a selection of components that could be used for a head-end of this type.

Repeaters

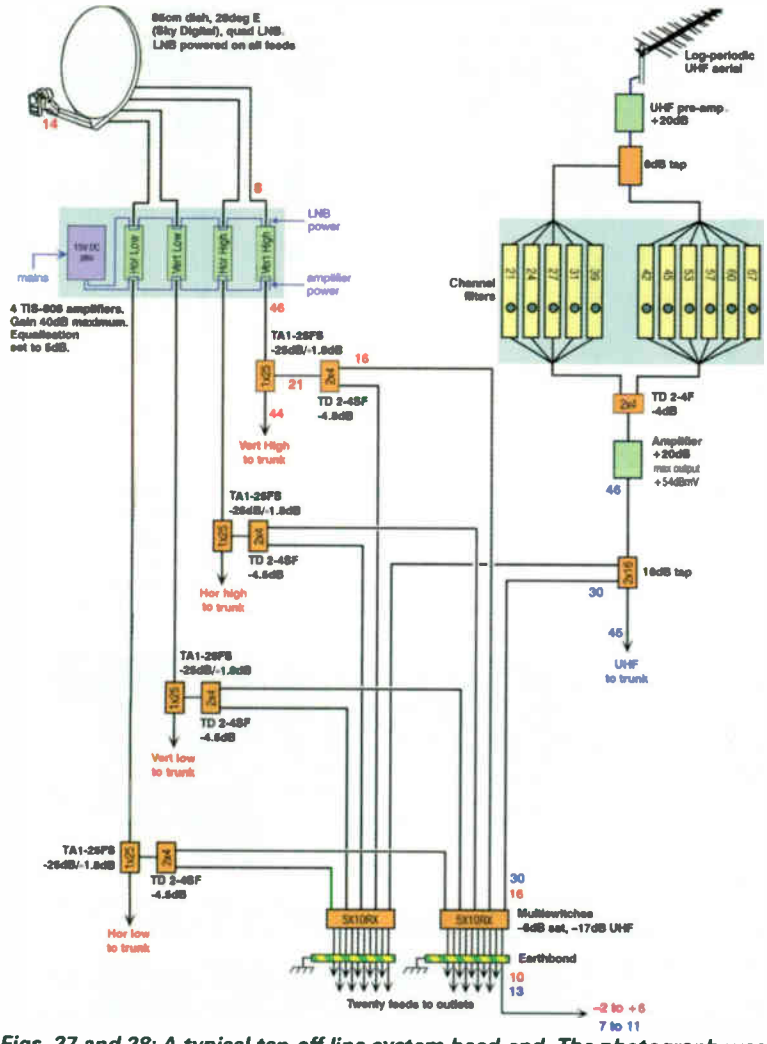
Fig. 31 shows repeater four in Fig. 26. This is a tap-off, multiswitch and amplifier combination but, for simplicity, I'll call it a repeater. As the system feeds two wings of the building from here on, this installation has splitters at all five feeds. Note that the loss of the satellite IF splitters is 4·5dB, about 1dB more than that of the VHF/UHF ones.

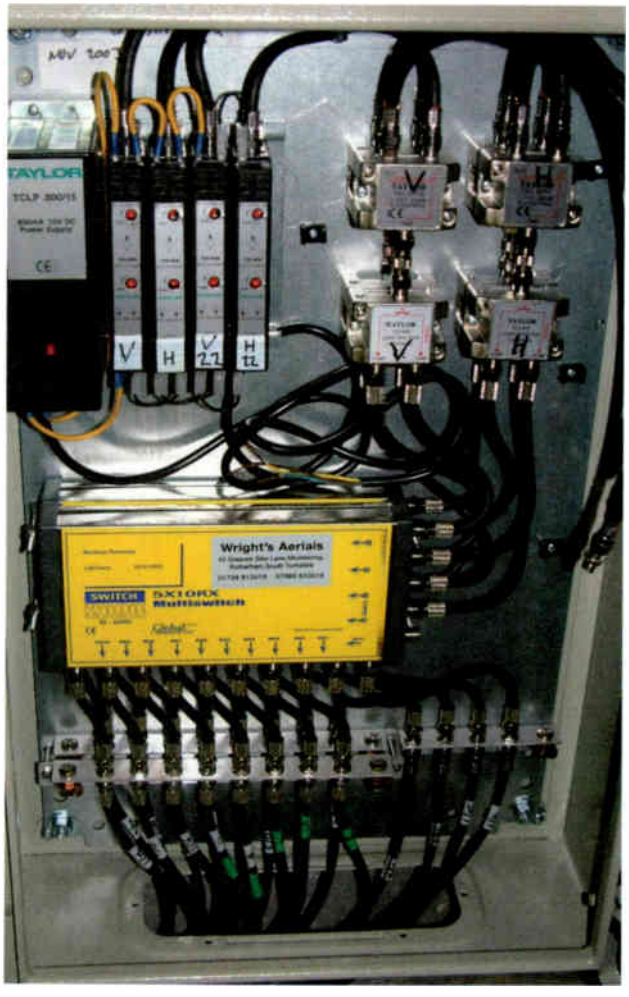
The signal levels needed for the two wings are slightly different, so the taps that feed R4's multiswitch are on one splitter output rather than being connected to the incoming feeds. This provides the necessary signal-level differential between the two outgoing feeds for each polarisation/band. The tap value for VHF/UHF differs from that for satellite IF – the use of discrete components gives complete flexibility in this respect.

This repeater has amplification for the UHF line but not the satellite IF bands. Again, building the repeater from discrete components provides design flexibility. This is the only repeater in the system for which a mains supply is needed. As a 'landlord's supply' was available nearby, it was thought better to take advantage of this rather than use line power.

Equalisation

As far as possible all the multiplexes should arrive at each receiver at more or less the same level. Unfortunately coaxial cable attenuates the higher frequencies more than the lower ones so, as the cable run becomes longer, there is more and more inequality between the higher and lower multiplexes. I've tried to show this in Fig. 32. When





Figs. 27 and 28: A typical tap-off line system head-end. The photograph was taken during installation, hence the unconnected outputs and lack of earth bonding. To save space, the multiswitches and tap-off units are stacked one above the other. The UHF section is not shown. The numbers shown in red on the schematic are the approximate signal levels in dBmV for the strongest multiplexes at the top end of the band. The blue numbers are approximate UHF analogue signal levels. High-value taps feed the co-located multiswitches from the main tap-off line output.

The equipment is housed in a steel cabinet. If the location is completely safe from being tampered with, an open wooden backboard is acceptable.

an analyser is connected to any of the outlets the response should be reasonably flat, as shown in Fig. 33.

Equalisers are available to compensate for the greater losses in cable at higher frequencies. They are also known as slope filters. Some have a fixed slope of 3, 6 or 9dB, and some are adjustable. Equalisers with a range of 40-2,050MHz are suitable for satellite IF use but, if the maximum equalisation figure quoted is, say, 20dB, only about 9dB of that will be across the satellite IF band. Some cheap equalisers intended for the domestic market have a non-linear response, attenuating the middle of the band hardly at all. These are of no use. Equalisers fitted between the LNB and the main amplifier need to have a DC pass.

As mentioned previously in the section on small systems, some preamplifiers have equalisation built in. There isn't really any point in buying ones without it, because whenever you use a line amplifier you will usually find a bit of equalisation useful.

Passive equalisers reduce the strength of the lower-frequency signals so they match that of the higher-frequency ones. When calculating the signal levels for the whole system, it's best to work out the higher-frequency levels first, using this to decide on amplifier gain, tap values etc., then decide how much equalisation is needed and where to put it. Once the signal levels for the higher frequencies have been calculated, working through the system again, with the loss figures for the lower frequencies, should produce the equalisation figures. Allow 1dB through loss at the higher frequencies for each equaliser. Table 5 gives the losses in 100m of each of several types of cable at various frequencies.

Here's a slightly different way of calculating equalisation. The only difference is that the sums are done before the amplification required is taken into account. If you take the 1,000MHz and the 2,050MHz figures as the bottom and top of the satellite IF band, you can easily work out the difference for each of your cable runs. Add up the equalisation needed for the whole tap-off line, from end to end. Add something for the dish feeds and the downleads, and bear in mind that splitters and taps usually lose a bit more signal at the higher frequencies than the lower ones (despite published figures, I always allow 0·5dB for this). The downlead figure has to be a rough average. This whole assessment, or educated guess, gives the total amount of equalisation needed.

Actually it gives the total

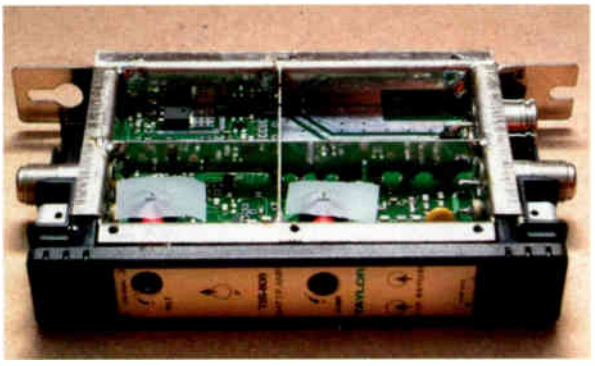


Fig. 29: A Taylor TIS808 satellite IF head-end amplifier.

Fig. 30: Some head-end components. Top row, left-to-right, a Teleste splitter, a Taylor VHF/UHF 20dB variable equaliser, a Taylor VHF/UHF/satellite IF 20dB equaliser, a Hama satellite IF equaliser, and a Global line-power injector and DC block. Middle row, left-to-right, an F-type attenuator, an F-type DC block, and an F-type attenuator with DC pass. Bottom row, left-to-right, a Global splitter with DC pass, a Taylor satellite IF four-way tap-off unit, and a Wolsey eight-way VHF/UHF/satellite IF splitter with power pass to all outputs.

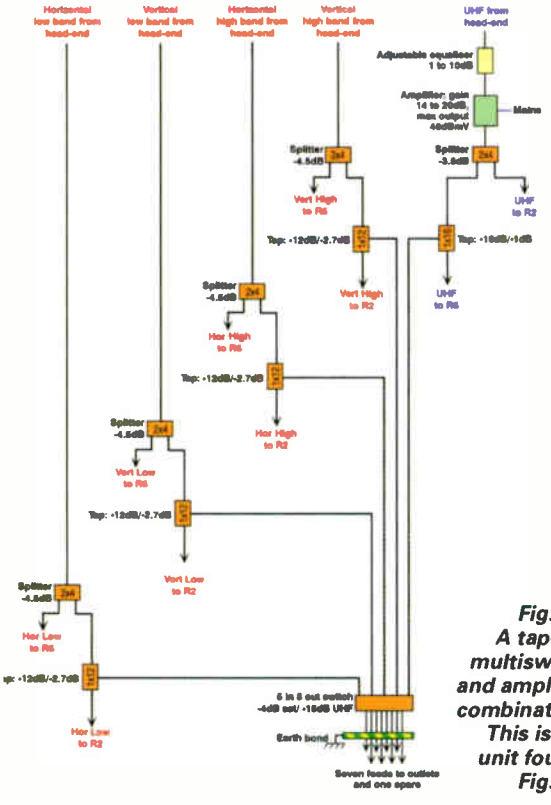


Fig. 31: A tap-off, multiswitch and amplifier combination. This is tap unit four in Fig. 26.

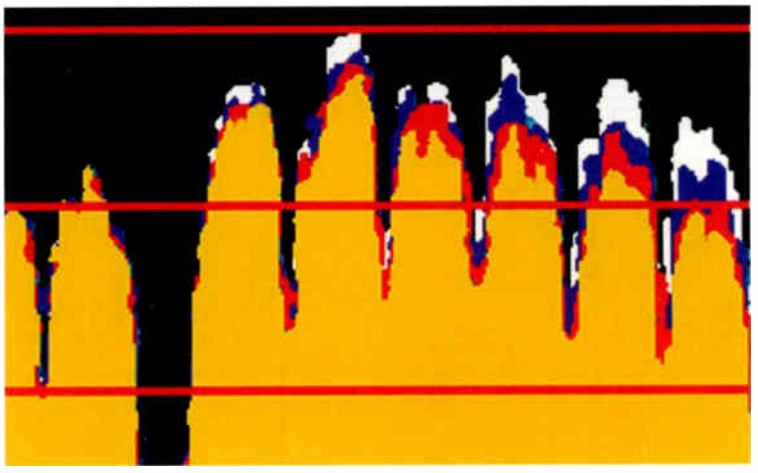


Fig. 32: An analyser display of one of the high-band polarisations. The whole satellite IF band is shown, with the low frequencies on the left. The horizontal red lines are 5dB divisions. The white, blue, red and yellow areas represent the response after 20, 40, 60 and 80m of CT100 cable respectively. The blue, red and yellow areas have been moved upwards, so that the response of the lowest multiplex is equalised. This highlights the extra signal loss at the higher frequencies.

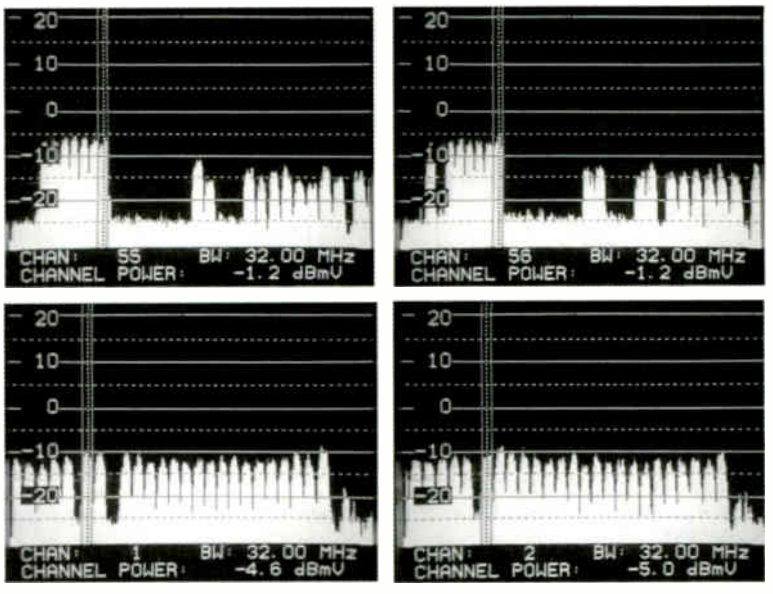


Fig. 33: Typical analyser displays of the four groups of signals, as measured at the outlets. If the signal levels decrease significantly from left to right, equalisation is needed.

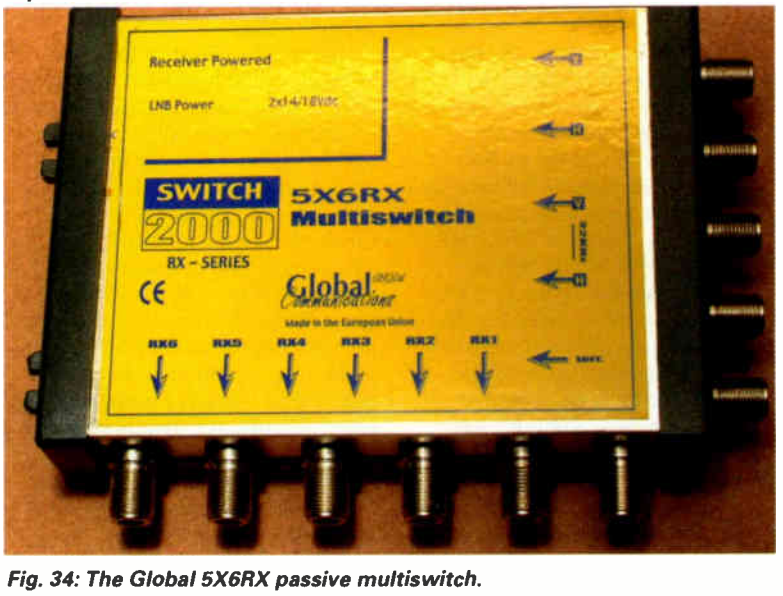


Fig. 34: The Global 5X6RX passive multiswitch.

amount needed at the outlet farthest from the head-end. The figure will be less for outlets that are nearer, so a compromise is needed. Suppose the gross figure is 6dB. As a rule-of-thumb, apply 4dB of equalisation. If the gross figure is 10dB or more, the equalisation should be applied in two stages, at the head end and half way down the trunks.

The head-end shown in Figs. 27 and 28 uses separate amplifiers for each of the four sets of satellite IF signals: these amplifiers have adjustable gain and equalisation. If you use amplifiers without built-in equalisation, it might be necessary to fit passive equalisers at the amplifier inputs.

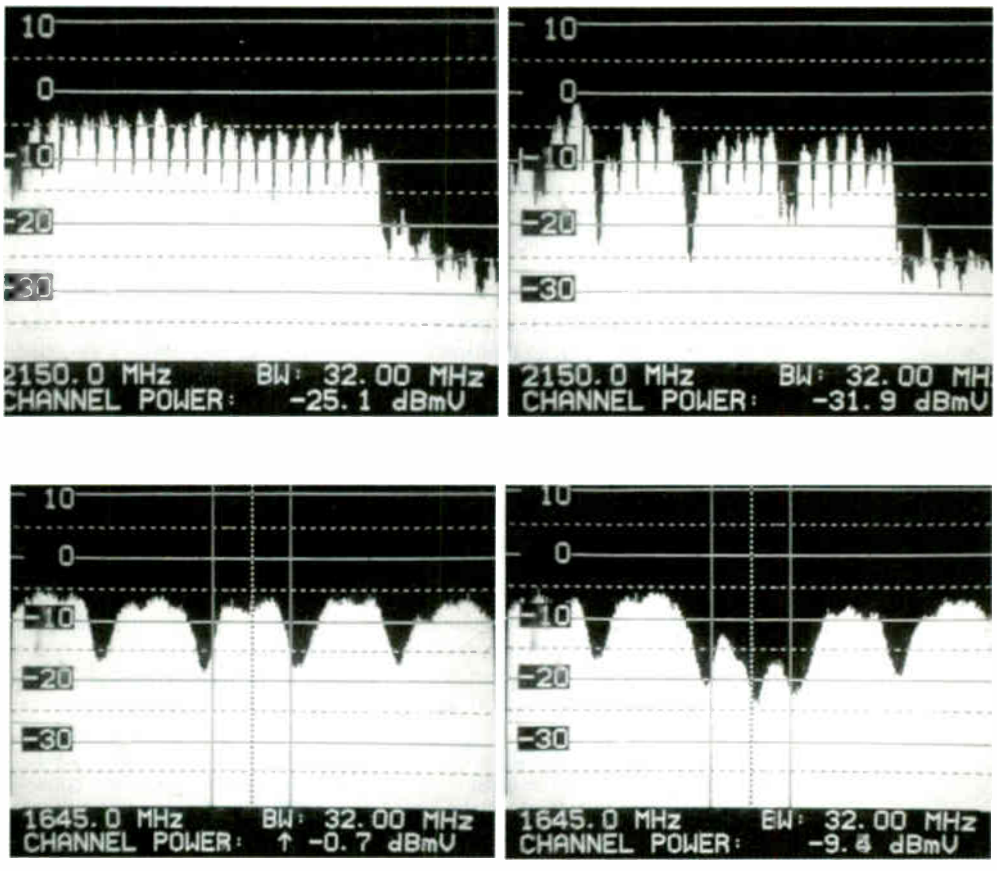
Receiver-powered multiswitches

The type of multiswitch described when dealing with small systems is not ideal for use in a larger system where high-powered UHF/VHF amplifiers are used. There's no need for the added complexity of UHF/VHF amplification within the multiswitch. It's better simply to take the through loss of a passive switch into account at the planning stage and provide appropriate signal levels. These passive switches, see Fig. 34, are sometimes called 'receiver-powered switches', because the polarisation and band switching is powered by the receiver line power. They don't need a mains supply, which can be a great advantage, saving £100 per tap-off location in some cases. Line powering via the trunk cables is a complication you can do without in a large system.

Passive switches are sometimes used as 'stand-alone switches' where no terrestrial signals are involved. To make this possible, the receiver line power is passed through the switch to the four IF inputs, to power the LNB. Don't use this configuration for a Sky system, because the current drawn by a quattro LNB can cause problems for Sky receivers. If you use these switches as part of a larger system, check that the splitters or taps that feed them have a DC open-circuit on the output ports, to protect the receivers. Alternatively, fit line-power blockers at the switch inputs.

Line terminations

As I near the end of this series, I must mention line termination. It really is important that every coax-



Figs. 35 (left) and 36 (right): These four signal-analyser screenshots show the effects of an unterminated tap-off line. The analyser was connected to an outlet fed from a multiswitch that was in turn fed from the penultimate tap-off unit along the line. The final tap-off unit was not very far away and, for the shots shown in fig. 36, had no line terminator fitted. As a result the reflected signals suffered little cable attenuation, the complaints being about unreliable reception of just a few satellite channels.

Fig. 35 (top) shows the full satellite IF band after a terminator had been fitted. Fig. 36 (top) shows the response notches caused by the unterminated line. Ignore the channel-power readings on these shots – the cursor had been moved out of band.

The lower shots are 'close-ups' of one of the affected multiplexes, with the termination fitted for the left-hand shot and missing for the right-hand shot. The channel-power reading gives the average attenuation caused by the unterminated line, but the distinct notch across the multiplex will degrade the BER more than the average channel power would suggest.

Table 5: Signal loss per 100m of cable

Frequency (MHz)	CT100	CT125	CT167
5	1·3	1·1	0·8
50	4·3	3·4	2·6
100	6·1	4·9	3·7
200	8·6	7·1	5·4
450	13·2	11	8·6
600	15·4	12·7	9·9
860	18·7	15·5	12
1,000	20	16·8	13·3
1,200	22	18·5	14·8
1,500	24·7	20·8	16·9
1,750	26·9	22·6	18·6
2,050	29·4	24·9	20·4
3,000	36·2	31	25·8

ial line ends with an impedance-matched load, otherwise signal will be reflected back from the end of the line, causing all sorts of trouble. Specifically, a pattern of standing waves will be set up along the line, which means that at points on the line where the reflection is 180° out-of-phase with the incoming signal there will be a null, see Figs. 35 and 36. Near the end of the line the null can be deep enough to prevent reception of the satellite multiplexes affected. Farther back from the end of the line analogue reception can suffer from close-spaced ghosting and degraded teletext.

It's really easy to avoid this problem. Pretty well everything uses F connectors these days, so screw an F line terminator on to anything that doesn't have anything else screwed on to it. This includes unused multiswitch outputs, unused tap-off outputs and, of course, the trunk-out from the last tap-off unit along the line.

The terminators contain a 75Ω resistor that matches the cable impedance and efficiently soaks up any energy in the cable. They cost about 18p so, if you use a couple of hundred before one prevents a call-back it will have been worth your while. If the cable carries line power, use a line-power blocker before the terminator.

Concluding sermon

That mention of call-backs brings me neatly to my conclusion. Never mind about call-backs: we are here to do an excellent job, even beyond the point where the customer or resident has any direct realisation of the good things we've done. Isn't that what being a professional is all about?

Mounting my soapbox, I have to say that standards in the RF system installation trade are often abysmally low. That's a strong claim, but I spend a lot of time looking at truly horrible installations and can tell you, with great regret, that it is justified. If you need proof, look at the Rogues' Gallery at http://www.wrightsaerials.tv

The attempts of the CAI (Confederation of Aerial Industries) to improve matters are hampered by low membership and the consequent difficulty in imposing standards across the trade. Until membership of a recognised trade body with efficient policing of standards becomes effectively compulsory for installers of medium and large systems, there seems little hope that installation quality will improve.

In the meantime the market is a jungle, with builders and management agencies crossing their fingers and sticking a pin in the Yellow Pages. You and I can't do much about this sad state of affairs, but at least we can make sure that our own work is up to scratch. To be cynical, when standards are generally low it's necessary to do only a reasonable job to be outstanding and, once you have a reputation for doing a really good job, the world will beat a path to your door.

The installation of TV and radio distribution systems is a growth industry at present, because of the buoyancy of the housing market and the changeover to digital television. There's a lot of money to be made, and repeat business is the key to success. If you are interested, buy some good test gear, learn all you can about the job (this includes learning from your mistakes) and, with a bit of luck, you'll prosper. ■

Test Case 505

It's thirty-five years since the BBC and ITV went over to colour broadcasting. In those far-off days in 1969 a common TV display problem was 'misconvergence' – a colour-fringing effect caused by poor registration of the red, green and blue rasters. Old hands will recall those tube-neck mounted magnets and the array of adjustment twiddlers provided, so that you could overlay the three rasters correctly. There were static and dynamic adjustments. Thanks to the design of modern CRTs, colour fringing is nowadays almost unknown.

An elderly customer of ours, Pete Harrison, was suffering from the effect however – or rather his set was! He called out our Todd to investigate, but omitted to tell us what sort of set it was. So our young man was surprised when he was confronted with a fairly-ancient rear-projection model – the sort that uses three small CRTs and a concave viewing screen. There were also some speakers around, part of an 'all-in-one' home-cinema outfit in which Pete had just invested. These have a DVD player that incorporates a surround-sound decoder, and amplifiers to feed the speakers supplied. Sure enough the on-screen pictures had a 'tartan' effect, caused by colour misregistration. Todd solved this one almost by accident, while trying to get access to the set. What do you think that was all about?

Todd wasn't to get away with it as easily as this however. He was next shown the satellite pictures, which had sparklies on them. Now digital TV systems cannot give rise to these comet-tailed interference effects – but this was no digital outfit. It consisted of a 60cm dish and an old Pace analogue receiver, with the dish still pointing at the Astra 1 orbital position long after the Sky programmes, the original reason for the installation, had migrated elsewhere and gone digital. All that was left to watch from this slot was Eurosport, CNN and a handful of German channels, a few of which broadcast some saucy adult content late at night – RTL, DSF and VOX for example. This suited Peter better than having to pay Sky lots of subscription money! But the pictures on all channels had gradually deteriorated of late, every one of them now being suffused with sparklies. Wow!

Todd had no experience of this! He went back to the van and consulted his good friend Sage.

What would Todd and the others do without Sage, who explained that if the sparklies were predominantly white or predominantly black the receiver-box's tuning had probably drifted off, while if there was an equal mix of sparklies and 'darklies' the likelihood was that the signal strength had deteriorated? This is how FM vision reception is affected. Todd was also given a quick run-through of the remote-control unit's set-up functions with this old Pace Model 9200IRD.

Back indoors Todd examined the picture carefully and found that the sparklies were all white ones: local-oscillator drift maybe? Todd laboriously selected each of the channels used by Pete in turn, retuned them for zero interference, and stored the settings. That did the trick, and Todd finally went on his way. Could he have done this better or more easily? And what was the cause of the colour fringing produced by the old rear-projection TV set? It was obviously nothing highly technical. For the answers, see page 187.

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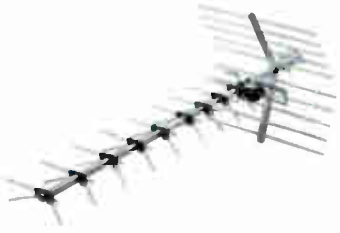

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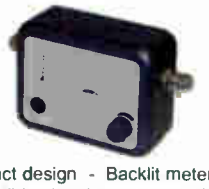

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1799Y	STANDBY	MODKIT37
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2029TA	PSU	ONWAKIT
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F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1

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CUC 2051	PSU	MODKIT48
CUC 2058	PSU	MODKIT48
CUC 2059	PSU	MODKIT48
CUC 2080	PSU	MODKIT48
CUC 7350		GRUNDIGKIT1
CUC 7301/3 (BUZ90)	PSU	GRUNDIGKIT2
CUC 7301/3 (MJF18004)	PSU	GRUNDIGKIT3
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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
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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

MAKE & MODEL	KIT TYPE	CODE
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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		
28PT4457/05	PSU	MODKIT50
28PW5407/05	PSU	MODKIT50
28PW6006/05	PSU	MODKIT50
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
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
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SAMSUNG		
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CI6844	FRAME	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT

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VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	PSU	SHARPKIT1
51CS05H	PSU	SHARPKIT1
56FW53H	PSU & DOLBY	MODKIT45
59CS03H	PSU	SHARPKIT2
59CS05H	PSU	SHARPKIT2
59CSD8H	PSU	SHARPKIT2
59DS03H	PSU	SHARPKIT3
59FW53H	PSU & EW	MODKIT49
28HW53H	PSU + EW	MODKIT52
56FW53H	PSU + EW	MODKIT52
66CS03H	PSU	SHARPKIT2
66CS05H	PSU	SHARPKIT2
66CSD8H	PSU	SHARPKIT2
66EW53H	PSU + EW	MODKIT52
66FW53H	PSU + EW	MODKIT52
66FW53H	PSU & DOLBY	MODKIT45
66FW53H	PSU & EW	MODKIT49
66FW54H	PSU & DOLBY	MODKIT45
66FW54H	PSU & EW	MODKIT49
66FW63H	PSU + EW	MODKIT52
76FW53H	PSU & DOLBY	MODKIT45
76FW53H	PSU & EW	MODKIT49
76FW54H	PSU & DOLBY	MODKIT45
76FW54H	PSU & EW	MODKIT49
76FW53H	PSU + EW	MODKIT52
76FG64H	PSU + EW	MODKIT52
DA-100 CHASSIS	PSU & EW	MODKIT49
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SLV777UB	VCR - PSU	MODKIT40
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35065920		THORNKIT1
FV70	PSU	THORNKIT1
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ICC7 CHASSIS	FRAME	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME	THOMKIT3
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Christmas Specials !! Line Output Transfomers

Service Casebook

Michael Maurice

One of the problems with modern TV chassis is that when a fault occurs the protection circuit normally operates before the set has had a chance to come on fully. The CRT, being basically a valve, won't have had time to warm up and produce a display before the shutdown takes place.

A method I use to get round this problem is to disconnect the CRT's heaters from the line output stage and power them from an external 6·3V supply. This supply must not be earthed. Power should be applied for at least thirty seconds before the set is switched on.

As the CRT's heaters are active when you switch the set on, you should be able to observe any symptoms briefly before the protection circuitry comes into operation and the set shuts down.

This method is infinitely preferable to disconnecting the protection circuit and waiting to see where the smoke comes from!

Hitachi C2576TN (A5 chassis)

The above method was used when repairing this set. At switch on the EHT rustled up briefly then the protection circuit came on. The usual cause of this is dry-joints at the EW loading coil, as a result of which the TDA8350Q field/EW output chip IC601 fails. The remedy is to resolder the dry-joints and replace the IC.

Not this time however. Preheating the CRT revealed that field scanning occurred in only the lower half of the screen. The cause was the TDA9160N3 processor/driver chip IC501. The correct Hitachi chip must be used in his position, though it's very expensive. A replacement, along with a new TDA8350Q IC, cured the fault.

JVC AV29SX1EK (JA chassis)

This was another example of the TDA8350Q field/EW output chip destroying the preceding processor/driver chip, which in this case is a TDA8366N3. After replacing the TDA8350Q chip I found that there was field scanning in only the bottom half of the screen. Unlike the Hitachi A5 chassis set, this one didn't go into the protection mode. The TDA8366 chip is available from SEME – at a far more reasonable price than the TDA9160 used in the Hitachi set.

Mitsubishi/Black Diamond BD3251WD

There was a time when Mitsubishi and quality went together. Having stopped making TV sets and VCRs in the late Nineties, the company has re-entered the TV market by buying chassis from Vestel and marketing them under the Black Diamond brand. This set was one such example. It was dead apart from a chirping noise that came from the power supply. Fortunately all that was wrong was that the line output transistor was short-circuit, because an associated tuning capacitor was dry-jointed. All was well once a replacement transistor had been fitted and a number of joints in the line output stage had been resoldered.

Ferguson 51P7 (TX98 chassis)

This set led me a merry dance. I'd repaired it a few weeks earlier when the degaussing posistor had failed. It now needed a new line output transformer, which I obtained and fitted in the customer's home. He phoned a few days later however to say that the set was changing channels of its own accord, cutting out, and doing other weird and wonderful things. So I took it to the workshop and resoldered a number of suspect dry-joints on the main board. Unfortunately this didn't cure the problem, and I was beginning to suspect the new LOPT.

As luck would have it a friend had a scrap set which provided me with another LOPT to try. Once this had been fitted the set behaved itself and was returned to the customer. The one I originally fitted came from Classic, with a few capacitors, resistors and an instruction sheet. The instructions were followed carefully, and it seems that this LOPT is a replacement for three versions that were originally fitted by the manufacturer. What had gone wrong I will never know!

JVC AV32WFP1EK

I've had a few of these sets that were dead because the line output transistor (Q521) was short-circuit. The cause of its demise is dry-joints at the EW loading coil. The transistor is type 2SC5552RL.

Philips 21PT5322/05 (GR2.4 chassis)

The customer complained about a firework smell and crackling sound. On investigation I found that the casing of the line output transformer (Eldor) was breaking down. A replacement restored normal operation.

Toshiba 32ZP18Q

A fault that's becoming common with this set and the others in the range is intermittent freezing of both on-board and remote control. As the situation gets worse, the set may or may not come on. The cure is to remove the teletext module and resolder all the pins of the surface-mounted flash

memory chip QT09. I suggest that you use plenty of flux when carrying out this operation, followed by a good clean up with a solvent cleaner or flux remover. Inspect your work carefully before refitting the module.

Mitsubishi HS750V

The complaint with this VCR was lines on the screen. They were present in both the playback and EE modes, but were worse with rewind/fast forward, eject and loading. The cause was noise from the power supply. Replacing all the reservoir capacitors on the secondary side of the power supply cured the fault.

Thomson 24WK25U

Isn't it nice when everything goes right! I had a phone call about this set while I was on my way to a supplier. It sounded like the usual line output transformer trouble, so I took down the model number and discussed the price with the customer. As he agreed, I was able to pick up a transformer with the rest of my order and, on the way back, called to fit it. This cured the fault and left me with a very happy customer.

Philips 29PT632A (GR2.4 chassis)

This one didn't go quite as smoothly! The set was dead apart from the usual power supply ticking. As so often, fuse F1534 had blown because the line-scan coupling capacitor C2550 was playing up. Replacement of these two components, which I carry in the van as standard stock, normally provides a complete cure. Not this time however. The 68V zener diode D6561 in the EW protection circuit had also succumbed. But it took a visit to the workshop to sort that out.

Hitachi C2976TN (A5 chassis)

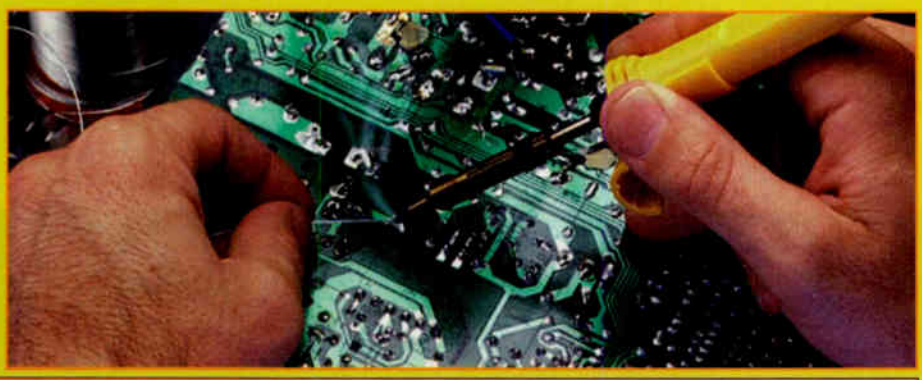
I'm not a fan of this complex chassis, though they are not too bad once you get to know them. This one was dead with the power supply pumping. The line output transistor was short-circuit because of a dry-joint at the associated tuning capacitor. These items were replaced along with the TDA8350Q field/EW output chip IC601 – because the EW coil L751 was dry-jointed.

Ferguson T78N

The complaint with this set was that the picture would disappear, leaving the sound. The obvious thing to suspect was dry-joints at the CRT socket. Not this time however. The cause was the line output transformer – its heater winding was going open-circuit intermittently.

Bush DVD140TV

This 14in. TV/DVD combi unit was dead with its power supply buzzing. The cause was failure of the line output transistor. As I couldn't find any reason for this, I replaced the transistor and the transformer. This cured the fault, but three weeks later the unit was back: the picture had a line through it, and was far too small. A check on the HT voltage showed that this was much too low at 73V. One of those nasty, cheap, yellow high-voltage disc capacitors had split in two! A replacement cured the fault, but it was hard to convince the owner that the two faults were totally unrelated and that an additional charge had to be made.



Bench Notes

Adrian Gardiner returns to those little 5·5in. monochrome sets and describes an epic problem experienced with some 11AK19 chassis

Small mono portables

In the July 2004 issue I mentioned some problems I had come across with a batch of 5·5in. monochrome portable TV sets (see page 532). I had bought a crate of faulty receivers and had then set about refurbishing them for resale. A list of what seemed to be common faults was included. Since then I've had a letter from a Mr Lee, who asks how many sets there were in the crate and where I had obtained it.

I bought the crate on eBay, as part of a larger pallet of defective catalogue returns. There were 55 sets in total, all faulty. I repaired 49 of them successfully, raiding the other six for parts. This made the repairs economical and provided replacement CRTs for some of the sets!

Mr Lee says that there are a lot of these sets around – you find them at various 'tacky' shops, markets and car-boot sales, where they sell for anything from £3 to £25! They come from China, with various brand names on them and in three main versions. The first is a basic TV set, the second has AV inputs for use as a monitor, and the third includes a radio. Mr Lee asks whether I have the complete circuit diagram and could write a full servicing article, also for information on adding AV sockets to the more basic model.

Unfortunately I don't have a circuit diagram, and I have no plans for writing an in-depth servicing article. My only knowledge of these sets is what I gained from servicing the ones I bought. I doubt whether much information is available on them: being so cheap, they are probably considered to be throwaway items. Nevertheless can anyone help – with circuit information and any other faults?

Finally Mr Lee asks about the odd transistors used in these sets, and mentions 'vision buzz' from the loudspeaker. The design is so simple that almost any old transistors will work, depending on function. TIP41/42 series transistors are ideal in the power circuits. In the various other sections, regular BC337/557/558 transistors are ideal substitutes. As for the buzz, you can usually improve the situation or eliminate the problem by careful adjustment of the IF discriminator coil.

My thanks to Mr Lee for his letter. I would welcome further correspondence, which I will endeavour to answer through this column.

A troublesome 11AK19

A lovely, bog-standard widescreen Bush set recently came in for attention. Even better, the complaint was a standard one: EW failure, followed by complete breakdown with a 'ticking' sound. A faulty BU2508AF line output transistor, open-circuit 27Ω fusible resistor in the EW drive circuit, dry-joints and possibly a defective EW drive FET I thought. How wrong could I have been!

The replacements listed above were quickly fitted. I then powered the set, expecting good results. But there was instant failure of the line output transistor. The scan-correction capacitor is the usual culprit, so a replacement was fitted along with a new BU2508AF. Instant death of the new transistor once again followed. I removed it and connected a dummy load, to check the HT voltage. This should be 150V: it was correct and stable.

Although they are not usually the cause of instant line-output transistor failure, the various other capacitors in the circuit were each removed in turn and tested. The EW modulator circuit was also examined carefully, especially the two diodes. Nothing amiss was found, so the circuit was reassembled and further soldering was carried out to eliminate any possible dry-joints. Another BU2508AF was fitted, and again bit the dust. As there was no other apparent fault, I concluded that the line output transformer was short-circuit. There wasn't one is stock, so one had to be ordered.

And another one!

I put the set aside, then found that the next set was another 11AK19 with the same complaint. Unfortunately it wasn't just the symptoms that were identical. After carrying out the routine repair, the same fate befell the new line output transistor. Although tempted to order another line output transformer, I went through the same procedure of testing various components in the line scan and EW correction circuitry. In the end I came to the same conclusion. I decided to defer ordering a second transformer until the first one had arrived and been tried, but my stock of BU2508AFs was now running low.

The LOPT arrived a couple of days later, so 11AK19 number one was taken back to the bench. The transformer and a new transistor were soon fitted, and I was ready to test the set. By now you will probably have guessed what the result was. Another dead line output transistor!

I've never come across a line-drive problem with this chassis, but felt that this was probably the cause of the trouble. So the dead line output transistor was removed and oscilloscope checks were carried out in the drive circuit. These also failed to reveal anything unusual. The waveforms were clean and correct.

At a total loss as to the cause of the problem, I decided literally to rebuild the line output stage. All the capacitors were replaced, along with the EW modulator diodes, the injection choke and other coils and resistors. Confident that everything was now OK, I fitted yet another BU2508AF. But I just had to have missed something, hadn't I? When power was applied, the transistor met its death.

A third

Enough time had by now been wasted, so the set was shelved. Later that day a third 11AK19 arrived on the bench and also required line output transistor replacement. It was privileged to have the last remaining one in stock fitted. Pop! Instant failure again. I was becoming depressed.

The cause

Then the penny finally dropped. It couldn't be surely? But I had just read something in the magazine (Letters, October) about 'fake' audio output transistors. Could I have had an inferior batch of BF2508AFs? I ordered another batch, which arrived next day, and quickly fitted one in 11AK19 number three. This time all was well. The set powered up and produced an excellent picture. Shortly afterwards the first nightmare 11AK19 was also running perfectly.

I don't know whether I was unlucky to have had a duff batch of these devices, or whether they can also come in inferior 'fake' form. The transistors that failed were all badged 'PHL'. Have any other readers had similar problems? ■

Measuring ESR

This second, concluding instalment completes the description of Alan Willcox's latest ESR meter, with a suggested stripboard layout and component specifications

In Part 1 last month I dealt with ESR and its measurement, and described the significant features of my latest ESR meter design. I'll start this month with a description of the basic circuitry used.

Circuit description

Fig. 4 (see page 78 last month) shows the basic ESR meter circuit. The important features of the oscillator and test interface sections were covered last month. There is no need for a regulated power supply. Just to remind you, the amplitude of the HF output waveform obtained from the oscillator (IC1a) is set by the characteristics, which are virtually temperature-stable, of the two diodes D1 and D2 in the negative-feedback path between pins 1 and 2. The amplification and detection levels provided by the other stages are set by the ratio of the source and feedback resistor values used. This is standard operational-amplifier practice. The way in which operational amplifiers work was covered in some detail in my articles in the March/April 1999 issues, so only a brief description is given here.

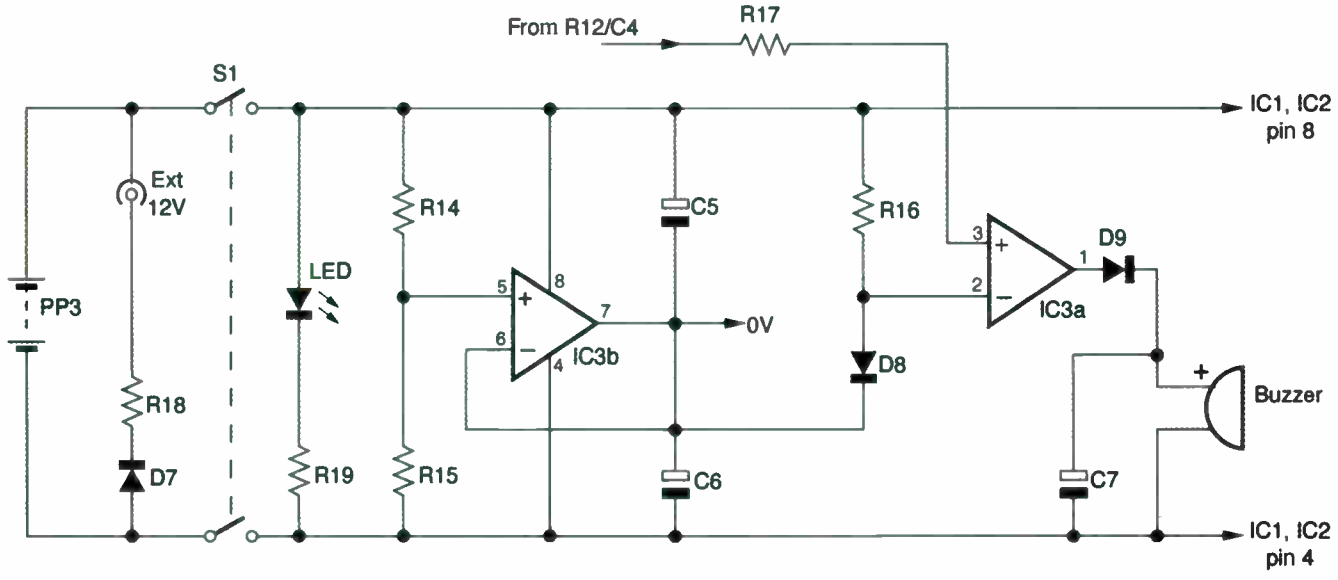
The frequency of the Wien-bridge oscillator is approximately equal to $1/(2\pi RC)$ when resistors R1 and R2 and capacitors C1 and C2 have equal values. At this frequency there is no phase shift across the bridge and thus maximum positive feedback. At resonance, the upper section of the network (R1, C1) has twice the impedance of the lower section (R2, C2), so there's a transmission loss of 1/3. To sustain oscillation, the overall gain (ALC) must be greater than unity. The transmission loss through the network is offset by the gain determined by the ratio 1 + (R3/R4). In this circuit the ALC would be more than the three times required were it not for diodes D1 and D2, which override the effect of R3 as mentioned above.

The following two stages of amplification (IC2a and IC1b) are straightforward, with no need for correction circuitry. Capacitor C3 in the feed to the detector stage (IC2b) is included to remove any DC component and also to reduce sensitivity to low frequencies (mains hum or whatever). R12 sets the gain in the detector stage. Because of the high intrinsic gain of an operational amplifier, the forward voltage drop across detector diodes D3 and D4 is overcome and detection at even mV level is not a problem.

Split-rail generator and buzzer

That is all there is to the basic circuit. But the operational amplifiers require positive and negative supplies. This requirement is provided by IC3b, see Fig. 6, which is configured as a voltage-follower. There is 100 per cent negative feedback (pins 7-6), so the output voltage must settle at half the supply voltage, set by the equal ratio of R14 and R15. I was pleased to find that the circuit remains stable with outputs as low as ±3·1V. This lower supply voltage range is quite consistent.

IC3a is configured as a voltage comparator. When the ESR reading is less than 0·5Ω, the output from the detector goes higher than the forward voltage drop across D8. The output at pin 1 of IC3 therefore



goes high, activating the buzzer. The ESR level at which the buzzer operates is set by the overall gain. This point can easily be changed by altering the value of R12. If its value is increased, the overall gain rises and the buzzer will operate at a higher ESR level.

The value of 100Ω for R18 is chosen to limit the current from an external 12V source to a rechargeable battery to the trickle level. The overall consumption is so low that, if you are one of those who remember to switch off battery-powered equipment when it's not in use, an ordinary battery is OK and will last for quite a long time.

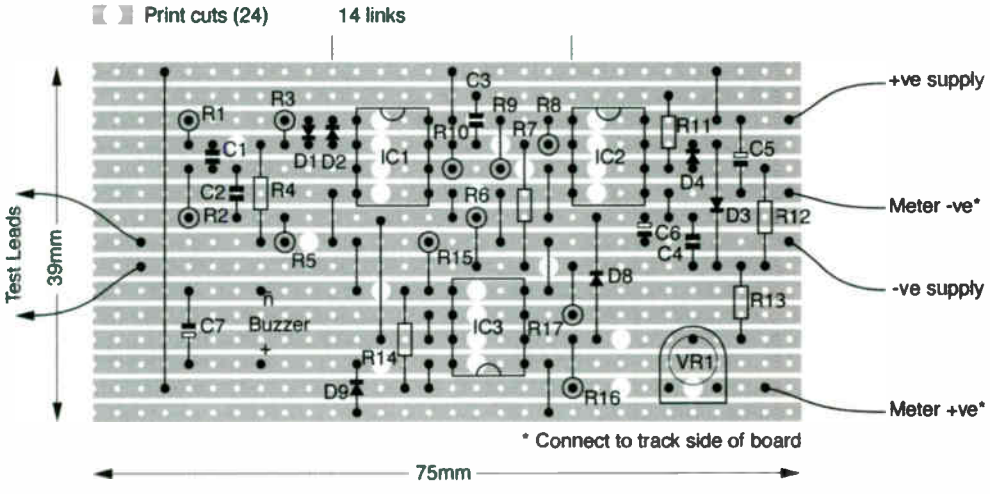
Although the basic meter circuit is happy with a supply between 6-30V, the buzzer and LED won't be. The value of 2·7kΩ for R19, which is in series with the power-on indicator LED, gives good brightness over a supply range of 6-9V, with only a few mA drawn.

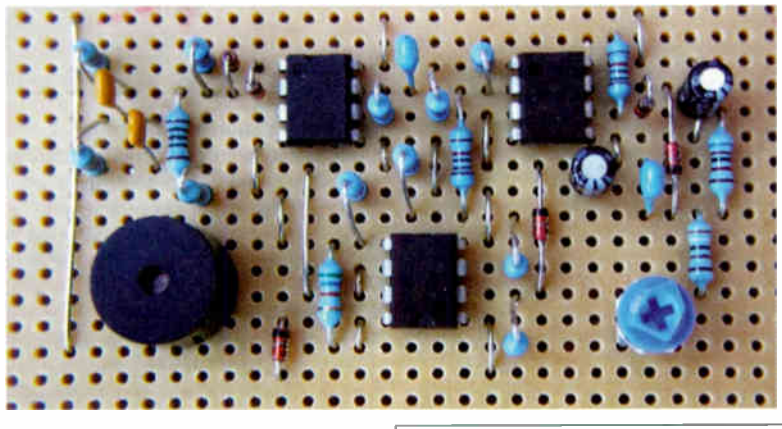
Practical points

As the meter operates at 100kHz, any inductance in a circuit being checked will produce a high-impedance reading. If an EW coil produces a reading, it has shorted turns. Another use of the meter is where the line output transistor appears to be short-circuit. A quick check with the meter will isolate it – if the short is elsewhere, in most cases the impedance of the line output transformer will be in the way and will result in a high reading. If there's a low reading, the transistor is most often the culprit.

ESR meter users have come up with new applications. The non-polarised, high-voltage capacitors used in the line output stage (tuning etc.) can be tested. I've not taken the trouble to design a new meter scale for this application, as I have no practical experience of such checks. It seems to me that if such a capacitor gives any reading at all other than short-circuit it will be OK. This type of capacitor does not change value.

I would like to think that the present article just about sums everything up with respect to the



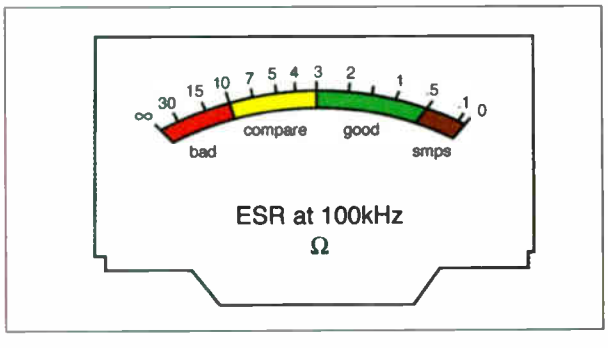


Top – Fig. 6: The split-rail generator and buzzer comparator circuits.

Centre – Fig. 7: Suggested layout on stripboard.

Left – Layout of the prototype meter on stripboard

Bottom – Fig. 8: The ESR meter scale, shown full size (58mm).



Parts list

Item	Value/type	CPC order code	
R1, 2	3kΩ	REMFR4 followed by the value	
R3	220Ω		
R4	100Ω		
R5	1Ω		
R6	2·7Ω		
R7, 9, 11, 16, 17	10kΩ		
R8, 10	100kΩ		
R12	*68kΩ		
R13	3·9kΩ		
R14, 15	56kΩ		
R18	*100Ω		
R19	*2·7kΩ		
All 0·5W, 1% metal film			
VR1	10kΩ cermet preset	RE01881	
C1, 2	470pF low-loss high-stability**	CA02068	
C3, 4	0·1µF ceramic multilayer	CA02098	
C5, 6, 7	22µF, 16V	CA01613	
D1, 2, 3, 4, 8, 9	1N4148	SC1N4148	
D5, 6	1N4004	SC1N4004	
D7	1N4002	SC1N4002	
IC1, 2, 3	TL082CN	SCTL802	
LED	3mm Superbright	SC00023	
M1	100µA moving-coil	PM11119	
S1	Miniature toggle switch	SW-Z201/Z	
Buzzer	5V DC	LS00654	
Case	ABS box	EN55030.	See text
Test leads	2mm plug to probes	IN00772.	See text
Veroboard		PC00046	
Spot face cutter for Veroboard		PC00066	
PP3 battery clip lead		BT02187	
High-current protection choke		PW00037.	See text

*The value of R12 sets the turn-on point for the buzzer, see text. R18 sets the charge current, see text. R19 is chosen for good brightness with the LED specified.

**For correct oscillator operation C1 and C2 must be of the type specified.

quick in-circuit location of faulty electrolytic capacitors. If anyone contemplates the design of a PCB for the project, it is important that separate operational-amplifier chips are used for the oscillator and the first amplifier stage – to avoid interference between the oscillator and the sensitive first amplifier stage. Fig. 7 shows a stripboard layout for the meter's circuitry. Fig. 8 shows the meter scale.

Don't be tempted to use plugs and sockets for the test leads – you would in time get problems in the low-ohms range. Soldered connections should be used throughout. I use 2mm test leads with the plugs cut off. Make sure that you file the probes to give sharp points. The coating that's on them has a significant resistance.

The case specified in the parts list is a bit on the deep side. To achieve a slimmer appearance, I bought another case, type EN55029 (too slim), and combined the halves. This might sound extravagant, but you still end up with two cases and they cost only about £2.

Protection methods

In a letter in the August issue this year Jim Littler suggested wiring an inductor across the test lead terminals to protect the meter should it be connected to a charged capacitor. I can see no problem with this, and followed up with a letter in the September issue. If a value somewhat lower than the 150μH recommended there is used, producing a reading of say 30Ω, this reading will be present each time the meter is switched on and you will know that it is working correctly. It will not affect the use of the meter. We are only interested in values that are much lower.

If this method of protection is used with a digital meter, the display will settle at a fixed reading. This will show that all is well with the meter and will also eliminate superfluous readings. In the case of a moving-coil display, it will double-up as a power-on indicator.

The use of a circuit protector in series with the test leads has been suggested. The problem is that it would tend to blow too easily and require frequent replacement.

To reiterate, diode protection (D5, D6) should always be included.

Any comments about high-current choke protection, which seems to be a unique idea, and on ESR measurement in general would be welcome.

You can reach me by email at alanesr@hotmail.com

I think that covers everything. ■

DVD

Fault reports from Geoff Darby Chris Bowers and John Coombes

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

Reports can be sent by post to:

Television Magazine Fault Reports, Highbury Business, Media House, Azalea Drive, Swanley, Kent BR8 8HU

or e-mailed to: t.winford@highburybiz.com

Toshiba SD22VB

This DVD/VCR combi unit was basically dead. If you listened to the power supply very carefully you could hear a faint squeal. I suspected C519 (2,200µF, 6·3V), as there was a bulge at the top, but its ESR and capacitance value were both found to be in order. I nevertheless fitted a replacement, using a similar capacitor rated at 10V, then went in search of the real cause of the trouble.

This proved to be one of the rectifiers on the secondary side of the power supply, D507, which was short-circuit. Once a replacement had been fitted the unit was up and running again. **G.D.**

Aiwa CX-LDV701EZ

This unit wouldn't play discs. The cause was simply a defective optical unit. Take care when you fit a replacement. There are two separate laser diode shorting points which are some distance apart instead of the more usual single three-track shorting point. **G.D.**

Panasonic DVD-LA95

The fault report that came with this unit said "sound but no picture, flashing blue LED on controls". When I tried it out the symptoms seemed to be exactly as described. Close inspection of the display however revealed that it was in fact producing a normal picture: you just couldn't see it easily because the fluorescent backlight wasn't working.

The inverter that generates the high-voltage supply for this light is mounted on a pencil-thin PCB inside the hinge-up LCD screen assembly. This PCB is also used to couple together two flexiprints that run between the display and the drive PCB in the main unit. A surface-mounted fuse on the inverter board had blown, and a dead short could be measured at its back side. But no obviously defective component could be found, so the cause was probably one or other of the surface-mounted ICs on the board.

There's no circuit diagram or parts list for the inverter in the service manual. It's available as a complete board however, and the owner decided to go ahead with having a replacement fitted. Once it had been obtained and installed the unit once more produced good pictures, while the blue LED no longer flashed. **G.D.**

Panasonic DVD-RV32

This unit showed fault code F498 in the display. Internal inspection revealed the cause – dry-joints at the flash ROM chip IC3080. Resoldering this item restored normal operation. **C.B.**

Sony DVP-S335

When the power button was pushed for 'on', this player would power itself off. A check inside revealed the cause of the problem: the optical block wouldn't go to the initial position because the sled motor was faulty, so the unit switched itself to standby. Unfortunately the sled motor is part of the optical block and is not available separately. A replacement optical block, type KHM220AAA/JIRP, part no. A6062397A, and an auto set-up restored normal operation. **C.B.**

Sony HCD-S880

This unit wouldn't load discs. Investigation revealed that the rubber loading roller didn't rotate. When you get this problem the two pulley assemblies 501 and 505 should be replaced, using improved ones – part numbers X-4954-711-3 and X-4954-712-3. **C.B.**

Sony DVP-S336

This unit was completely blocked when the background picture appeared on the screen. In addition there were horizontal, digitalised lines on the background picture. Checks inside with a multimeter and oscilloscope revealed the cause of the fault: RAM chip IC504, which is part of the AV/DEC circuitry on board MB86, was faulty. A replacement, part no. 875957319, restored normal operation. **C.B.**

JVC XV522SL

The fault with this unit was no clock display. Checks inside revealed that fusible resistor R954 (4·7Ω, 0·25W) was open-circuit. **J.C.**

Pioneer DV717

This unit played DVD discs all right but wouldn't play CDs, which would just be ejected. The cause of the problem was a faulty optical block. A replacement from the manufacturer comes mechanically pre-aligned. **J.C.**

LETTERS

Send letters to "Television", Highbury Business Communications, Nexus House, Azalea Drive, Swanley, Kent, BR8 8HU or e-mail t.winford@highburybiz.com using subject heading 'Television Letters'.

Please send plain text messages. Do NOT send attachments. Be sure to type your full name, address, postcode, telephone and e-mail address (if any).
Your address and telephone number will not be published but your e-mail address will unless you state otherwise.

Unrepairable sets

One of my customers bought a 32in. set from an eBay trader. It was made by a well-known manufacturer, and came with a year's 'back-to-base' warranty. But my customer lives in London while the seller is in Wales. So it came to me.

The set was dead, apart from a slight rustle of EHT at switch on followed by a flashing standby light. On inspection I found that the set had been repaired previously. The field output IC had been replaced, but it was not the cause of the failure this time. A phone call to the manufacturer's technical help line provided little assistance. The two suggestions I was given, including replacement of the line output transformer, didn't cure the fault.

My next step was to disconnect the CRT's heaters and run them from a separate 6·3V supply, so that the CRT was warm when the set was switched on. At switch on a raster that filled the screen vertically but only two-thirds of it horizontally appeared. This pulsed on and off a few times, then the set tripped out. I phoned the manufacturer again, but they hadn't come across this fault and didn't know what to suggest.

I took the set into the workshop, disconnected the supply to the line output stage, and ran the set with a bulb as a dummy load. The HT came up but wasn't stable. So I replaced the optocouplers, the feedback monitoring IC, the chopper control IC and the chopper FET. The power supply was now stable but, when the feed to the line output stage was reconnected, the set behaved as before.

My next step was to take the set to a friend who runs an Authorised Service Centre. He did his checks, but couldn't find what was wrong with the set. A colleague he called was just as baffled.

Fortunately the manufacturer has its own specialised repair centre. So I refitted the original LOPT, reconnected the heaters and sent it to them. An engineer looked at the set and ordered a LOPT, a field output chip and a line output transistor. When these failed to provide a cure he was baffled and replaced the entire PCB! Fortunately this was done under warranty.

This saga raises several questions. What would the repair have cost had the set not been under guarantee? Why are manufacturers making their sets so complex, and with so many protection circuits, that even their own trained engineers can't fix them? And if the manufacturer's own trained engineers can't fix their sets, what hope is there for the rest of us? After all any fool can replace a main PCB – provided this is available and provides a cost-effective solution. Most of the time this is not the case.

Michael Maurice,
Wembley, Middx.

Line output transistor problems

In the August issue James Grant reported a problem (extended fault reports, page 626) he had experienced with a Daewoo TV set that bounced because of line output transistor failure. He found that his stock of 2SD1880 transistors had come from two different manufacturers, which explained the cause of the problem.

I wasted hours recently on a comeback set then, seeing the above fault report, came to a similar conclusion. It was originally fitted with a 2SD1880 line output transistor. I decided to fit a 2SC3893A transistor (sometimes marked ST1803A), as used in some Philips TV sets, and found that it ran very cool. But the base-emitter resistance was about 80Ω, which is higher than either of the 2SD1880 variants checked by James Grant. So it would appear that the problem is caused by the design of the device: the resistance alone may be misleading. The 2SD1880 I used initially as a replacement was obtained from the Daewoo spares distributor.

R. Langley, Hertsmedia Servicing,
Hatfield, Herts.

A Renegade V8 1500

I'm sure that many of you oldsters out there know how it is with the youth of today. You never quite get to hear the whole story. Whereas in the past it was usually fiddling with the RF or messing with the video, now it's usually the computer. "I didn't do anything, honest, it just died", "it just locked up", "why can't I download", and so on. Talk about the technological revolution.

It was like this earlier in the week when a distant relative's son brought in one of those enormous car amplifiers.

"What's the problem?" I asked.

"It's just dead" he replied.

"What were you doing at the time?" Fair question, I thought.

"Nothing, honest!"

The amplifier turned out to be a Renegade V8 1500 (1,500W in a car, I ask you?!). I took the top off and powered it up. He was right. No LEDs, everything dead. I had a prod around with the scope, and it looks like a breakdown in the power processing: the 12V supply suddenly disappears, to be replaced by a very poor 2V. The 12V supply is distributed everywhere, so it's not easy to isolate components.

I've tried contacting Renegade for some assistance, but had no joy. So I'm just hoping that somebody out there will eiher have a circuit diagram or be able to point me to a relevant website for assistance. I can't let this callow youth's amplifier beat me, not yet!

Colin Squires.
colin.squires@lafarge.com

Unusual incidents

I am renowned for aerial antics, but other unusual incidents have occurred over the years. Here are a couple.

My engineer friend Jim was working on an upturned chassis one day when the nosy owner came in and asked about progress. Jim asked him to leave the workshop, but he decided to peer at the chassis instead. There was a sudden explosion – the main reservoir electrolytic had blown up. Its inside was embedded in the workshop ceiling, leaving an empty can. The customer left the shop in great haste!

My cat liked to sniff under the dressing table in my bedroom. I never knew why. One day he put his paw on a frayed wire that led to a reading light. He leapt in the air, banging his head on the underside of the dressing table. He never went into the bedroom again after that!

Philip Bearman,
New Barnet, Herts.

TV History

I thought the leader (The Hayes Story) in the October issue was excellent. What a pity that the BBC didn't carry out more research on the development of TV on this side of the Atlantic before awarding most of the credit to the USA (Jeremy Clarkson's *Inventions* series).

I well remember the development work that led to the world's first HD system and the achievements of the EMI team at Hayes. The system they developed was the basis of all subsequent systems. Its launch as a fully operational electronic system in 1936 was a world first. It was followed by the French. TV did not start in the US until 1942! The Americans did however come up with FM intercarrier sound, which helped with tuner drift when the VHF bands were opened up. Let's give more credit to the likes of Blumlein, McGhee and Tedham and their associates – before the Yanks lay claim to radar, the first computer and the Battle of Britain!

Ron Bravery.
By email

Editorial comment: There was much progress with TV development on both sides of the Atlantic in the early Thirties. RCA demonstrated the first successful all-electronic TV system during the first few months of 1933. Broadcasts were made from an experimental RCA transmitter, W2XBS, atop the Empire State Building. The system used 240-line scanning and the vision carrier was at approximately 45MHz. But this was in the depths of the depression. During the winter of 1932-3 it is estimated that as many as 15m people were unemployed in the US, a third of the workforce. Industrial production had halved since 1929. It was hardly a time to launch TV. Subsequently the Americans were held back by their inability to agree to a TV standard. This was eventually overcome when the NTSC was set up. Hence the long delay in the US.

The claim to be 'first' with TV could perhaps be claimed by the Russians. Boris Rosing of the St Petersburg Technical Institute appears to have developed a sophisticated system, with mirror-drum scanning and a CRT for the display, as early as 1907. There was even a British Patent for the system, no. 27,570. And it was a student of his, Vladimir Zworykin, who filed the first patent (he had emigrated to the US) for the Iconoscope electronic camera tube in 1923!

Articles welcome

Ever thought of writing an article for *Television*? If so, we'd be interested to hear from you. Maybe you've a project to describe, servicing information or know-how on a chassis or product we've not previously featured, or could write on some aspect of the technology we've not previously gone into. We cover audio as well as TV/video, and are interested in IT topics. If you have any ideas or want guidance, please email t.winford@highburybiz.com or write to The Editor, Television, Highbury Business, Media House, Azalea Drive, Swanley, Kent, BR8 8HU.
Payment for articles is made shortly after publication.

• HELP WANTED • HELP WANTED • HELP WANTED • HELP WANTED •

Wanted: Playback head for the Truvox R104 reel-to-reel recorder, which dates from about 1966, or does anyone know where I could obtain one? Derek Farler, 107 Chandag Road, Keynsham, Bristol, BS31 1QE. Phone 01179 863 130.

Wanted: Chopper transformer for the Akai Model TV2141T, which is fitted with the Nokia Stereo Plus chassis. It's an Eldor 8473 transformer, circuit reference T040. I am told that the Nokia Model 5156 is the same. Has anyone got a scrap chassis to rob? Sensible price paid. Roger Burchett, Haytor, Stone Street, Lympne, Hythe, Kent, CT21 4JY. Phone 01303 267 969.

Wanted: User manual for the Trio/Kenwood oscilloscope Model CS-1040, 40MHz. A photo copy or any information would be welcome. Please phone Eric Brown on 01253 857 544.

For disposal: The following are free to a good home – they must be collected: a Decca 100 console TV, working; a Philips G11 TV plus spares; a Philips 2000 type VCR plus spares; a Grundig TV with CUC220 chassis; an Ultra Model 6604 (valve TV set). G. Maillardet, 149 Downs Road, Gravesend, Kent, DA13 9HF. Phone 01474 832 059.

Wanted: Does anyone know the cause of a flashing picture with the Sony Model KVX2562 (AE2 chassis)? The repetition rate is once a second and only the picture is affected, the sound and on-screen graphics being OK. Please contact Brian Battams on 020 8845 5123 (South Ruislip, Middx) or email brianbattams@aol.com

For sale: *Television* magazines from 1987 to 1992, total 62 copies (a few 1992 copies missing). Contact Mike on 01758 613 790.

Wanted: Service manual or circuit diagram for the Canon bubble-jet fax machine Model B200S. Also, does anyone know how to repair/obtain service information for the BT Contour 50 payphone? Please phone Steve Roberts on 01687 462 189 (Mallaig, Scotland).

Wanted: Does anyone have spindly legs? This is not a reference to physiology but a plea for help to get four legs as used by Thorn in the late Sixties and early Seventies with the company's last-generation monochrome sets, e.g. those fitted with the 850, 950 etc. chassis. The ones I need are die-cast hollow metal that push on to ferrules, but the wooden ones with angled plates to splay them out would do. I need a set for an Alba radiogram. Also does anyone have a circuit diagram for the Taylor 94A 405-line pattern generator or the Telequipment 405-line pattern generator – or a scrap machine. I can pick up within fifty miles of Wigan. Jim Littler, 363 Atherton Road, Hindley Green, Wigan, Lancs, WN2 3XD. Phone 07990 963 918.

Wanted: A Philips CD100 CD player for spares. I need a mechanical part from the lid, and two ICs. Please email Mike Bennett at mike@tvmuseum.co.uk

For disposal: Free to a good home. A working Sony Model KV2022UB TV set. One owner since new (1981). In excellent condition with mint remote-control unit and original instruction manual. I need the space! Please phone Steve Cunio on 07740 098 616 or email steve.cunio@bt.com

Wanted: Spare parts for the following camcorders: JVC Models GR-S707 and GR-DVL40, and Sony Models CCD-V5000 and TRV-35. Also the Sony DAV-S300 amplifier PCB. Would consider complete non-working machines, any condition. Please phone Dave on 01843 231 512 or email hedgehog@turbo48.fsnet.co.uk

For disposal: Because of retirement, I have a considerable number of service manuals etc. to dispose of. K.V. Cunliffe, 4 Glebe Drive, Stottesdon, Kidderminster, DY14 8UF. Phone/fax 01746 718 406 or 07970 764 154.

Wanted: Old half-inch diameter ferrite rods. Must be six inches or more long. Will pay very good money for them. Peter Tankard, 16A Birkendale Road, Sheffield, S6 3NL. Phone 0114 231 6321.

For sale: Canon (Panasonic) VC20 colour video camera (not camcorder), still boxed with silver carry case. Silver case for VR30 (Panasonic NV180) tape deck plus Canon tuner-timer unit Model VT30 and remote-control unit, all as new, but no tape deck. BSR McDonald 8-track stereo tape deck (mains), as new plus two tapes. Also various other bits and pieces. Offers please. Phone or fax Jack Richman on 020 8590 4947 or email jack@richman8.wanadoo.co.uk

Wanted: I am having trouble with a Ferguson-Thomson Model B59F (ICC8 chassis). The remote-control unit won't bring the set out of standby. If the on/off switch is used it is possible, after several attempts, to get the indicator to change to green, but it immediately goes back to standby. The set has been in use for about ten years. Any ideas, please email Jack Detsios at tacksdex@hotmail.com

DX and Satellite Reception

Terrestrial DX and satellite TV reception reports. Broadcast, DTT and satellite TV news. Aerials for cellular communications. Roger Bunney reports

*The Tellytrack horse racing channel received via Europe*Star 1 at 45°E.*

At the time of writing we are well into autumn in the UK. DX conditions have been very poor. Sporadic E reception has all but died, and the very wet and windy weather removed any prospect of a late tropospheric opening. The only SpE activity reported does however contain some good news, see below:

2/10/04	Unidentified ch. E3 programmes.
4/10/04	TVE (Spain) ch. E3.
5/10/04	RAI (Italy) ch. IA; Tele-A (Italy) ch. E2–; unidentified ch. E3 programme.
9/10/04	SVT (Sweden) ch. E2; unidentified ch. E3 programme.
23/10/04	Unidentified ch. E3 programme.

The good news is that TVE Madrid ch. E2 is still on air! Hugh Cocks (Algarve) has confirmed this at mid-October.

Teleradio News no. 133 from HS Publications reports that a new African ch. E2 transmitter is on air, the vision carrier frequency being 48·2486MHz. It's been received in southern Europe, with a stronger/clearer carrier than the Equatorial Guinea ch. E2 transmitter at Malibo. The signal direction suggests that the source is Liberia, Sierra Leone or Guinea. In response to an email, Hugh Cocks confirms that the signal has been received in Portugal. He comments that it's strange, in that when it is present a fine 'hash-like interference' is received over 48-48·5MHz. When this is tuned across there's a sound (AM) like a fine crosshatch vision buzz, peaking every few kHz. He wonders whether this could indicate a transmitter problem. A coarse, crawling diagonal dot pattern is seen on the picture. The only content has shown African participants, but no audio is heard at 53·75MHz. Reception is more frequent than from Equatorial Guinea – when the latter is received the audio is often of better quality than the picture! Ghana and Nigeria have both used ch. E2 in past years. Here in Romsey, Hants I've often noticed, at both my old and present addresses, a crawling-dot pattern on Band I pictures. I suspect that the cause is some form of computer/data EMC radiation.

A tropospheric success can however be recorded this month – not at VHF or UHF, but at 10GHz! The November 2004 issue of *CQ-TV*, which is published by the British Amateur Television Club (BATC), reports a world record of 1,564km for terrestrial transmission/reception. This was over a sea path between amateur TV teams EA7/F4CXQ in southern Spain and I8/HE51BC in southern Italy, the signals passing just south of Sardinia. The previous world record of 1,031km was established back in 1999. EA7's equipment consisted of a 1·5m dish running at 15W with SSB and ATV. Two 1·2m dishes were used by I8/HE, running at 25W SSB and 23W ATV. Our congratulations to those involved on this outstanding achievement. The two-way picture quality achieved (see photos) was remarkable considering the distance, the frequency and the low powers used.

Satellite sightings

While the press was full of comment about relaxation of the gambling laws and the prospect of super casinos opening around the country, Alan Richards (Skegness) came across a strange programme link via Intelsat 10-02 (1°W). He found a programme caption on test card declaring "Casino Season 3 prog # 308". A large audience of mainly youngsters awaited the start. There was background lettering 'Casino' in brass studs on red velvet, also a spot-lit green baize roulette table. It appeared to be a junior gambling game. The service identification, 'Norkring Occ', suggests a Scandinavian origin. This was seen at 11·481GHz V (SR 6,111, FEC 3/4). Alan hopes to obtain a new 1m+ dish shortly – it's at present on the back wall of commercial premises. At his previous location he was able to obtain an ex-SIS dish from the rear of a bookie's shop!

The news from Iraq continues to be grim. As the al-Jazeera

channel often features breaking news I've run another TV channel download from ArabSat at 26°E, the first for more than a year. There are several new channels: al-Iraqia at 11·748GHz V; al-Arabiya at 11·787GHz V; al-Emarat, AD-Test 1, 2 and 3, Abu Dhabi-E (English, encrypted), AD Sports, AD Feed-2 and –3 and Private all at 11·863GHz V; Almustakilla at 11·940GHz V; and Allekhbaria at 12·012GHz V. All ArabSat channels have an SR of 27,500 and 3/4 FEC. Al-Jazeera is at 11·940GHz V and is FTA. With most Arabic news broadcasts the content tends to be more graphic than would be shown in the UK. In addition a new Tunisian-based general-entertainment channel has announced that it will open shortly: Hannibal TV will be available via ArabSat (26°E) at 11·746GHz V and the Hot Bird 13°E slot at 12·051GHz V, 27,500 and 3/4 in both cases.

The old Orion (now Telstar 11) slot at 37·5°W is but a shell of its former self, but Roy Carmen (Dorking) reports life here. A couple of Russian TV channels, with service identifications WMNB and RTN, can be found at 12·513GHz and 12·522GHz H (5,425, 1/2), transmitting NTSC (525 lines). These channels could be feeding North American cable networks.

On October 8 the Hilton Hotel at Elat was seriously damaged by a terrorist car bomb, with many deaths. It's a few hundred yards across the border in Egypt, but the Israeli satellite facility company SHEN was on the scene during the day and into the evening, uplinking live reports from the border crossing itself. Transmission was initially via Eutelsat W2 (16°E) at 12·643GHz H but subsequently moved to 12·563GHz (5,632, 3/4) – the service identification was NAYEDET Ch2.

During the same period atrocities occurred farther north. RAMATTAM SNG4 was found via Eutelsat W1 (10°E) at 11·023GHz V (3,390, 3/4): content revealed a missile attack in Gaza. News updating was via Ramattan News Agency Gaza.

Eutelsat W1 has carried several breaking news stories. One that wasn't featured in European news reports was a dramatic rail crash in the St Benadine area of Los Angeles, California. A very long freight train loaded with containers hit a lorry that had skidded off the adjacent freeway. The result was a vast pile-up of container trucks, some swinging off the track and smashing into adjacent housing. The KABC-TV news helicopter was scrambled and fed live pictures of the chaos to the ABC-News One programme, at 10·971GHz V (4,167, 5/6).

It is a long time since NASA-TV has been seen, mainly because the CNN Newsource feed via NSS 7 (21·5°W) is now encrypted. But on the evening of October 23 it was seen via Eutelsat W1, with live pictures and audio from the Russian control room involved with the return to Earth of the American crew from the International Space Station (ISS). The crew had been aboard the ISS for 188 days. Since the destruction of the Columbia shuttle in early 2003 all crew (American and Russian) and supply transportation to ISS has been provided by Russia with Soyuz craft. This particular broadcast, on the return of the ISS-Soyuz 8 expedition, involved both the Russian and NASA control rooms and culminated with live pictures from the ISS itself. At one point there appeared to be confusion between the control rooms, with Russia using Moscow time and America Central time!

All in all an interesting satellite monitoring period.

Broadcast news

UK: The BBC is supplying its reporters with 3G mobile phones to provide instant picture reporting in both the UK and overseas. A recent test enabled live pictures and audio to be sent from Israel to the BBC newsroom, and a live one-to-one 3G interview about P&O job losses was transmitted on September 29. With improved compression, bandwidth and handset hardware, the BBC proposes to make 3G phones standard issue for news reporting by the spring of 2006. Broadcasters will also be encouraging 3G reports of breaking news from the public.

The gates of the Meridian TV riverside studio centre in Southampton are to be finally locked on December 31, when the company moves to a smaller, news-only operation at Whitely near Fareham. The studio centre, built in the late Sixties for Southern TV on reclaimed land, replaced the former converted Plaza cinema, which opened for TV in August 1958. TVS, which took over from Southern TV, expanded programme production. But when Meridian won the franchise in 1992 programme making fell to a very low level. The studio complex will be demolished in early 2005 to make room for residential development.

Picture quality achieved with 10GHz amateur TV transmission/reception between Spain and Italy, a world record.

The RSL station Solent TV went off-air on October 14 and was still down at the time of writing. Its website says that a transmitter problem is being "assessed". Apparently the aerial, on the Rowridge mast, was struck by lightning in the early morning, resulting in severe damage to the transmitter and aerials. Much of the transmitter system was built as a one-off, which will mean delay before repair and the restoration of transmissions. The station is a non-profit, charitable operation, and as a result has inadequate backing in comparison with a commercial broadcaster. So the broadcast downtime may be lengthy.

Russia: The commercial broadcaster CTC is expanding, with a second network programme planned for Perm, Kazan, St Petersburg and Moscow, using recently-purchased transmitters. The new entertainment network should be on air by Easter.

New TV channels: The Malaysian newspaper *Malayala Manorama* is to start a 24-hour TV channel by early summer, with entertainment, news and bought-in content from other TV stations.

The German army's bullet-riddled communications centre near Kabul. Reception via Eutelsat W2 (16°E).

Chaos following a derailment near Los Angeles. Reception via Eutelsat W1 (10°E).

An educational TV channel operated by Nahdlatul Ulama, a Muslim group, is to open in Indonesia later in the year.

Over the next twelve months a further twelve TV channels are to start in Pakistan. The mixture is actually ten satellite and two terrestrial educational channels.

DTT news

NHK has expanded DTT to the outer areas of Tokyo, Nagoya and Osaka. Kobe and Honshu will be added by the end of 2005. DTT should cover the Japanese mainland islands by the end of 2006.

In the US the FCC has delayed the requirement to convert from analogue to digital TV transmissions to either late 2008 or early 2009. The senate has backed an enforced analogue close-down by 2008, expecting that at least 85 per cent of viewers will be able to receive digital transmissions by the end of 2006. Certain high-UHF channels are to be reallocated for use by the emergency services. For more information on the TV situation in the US, check at the FCC website (www.dtv.gov).

Five DTT channels are to be made available in Moscow by the end of 2006, transmitted from the Ostankino tower. They will supplement the present experimental ch. R32 transmissions.

TV Singapore and Radio Television Brunei (RTB) have formed a technical group to establish specifications for the start of DTT in the region.

After many delays, France intends to start DTT services on 1 March 2005.

Scientific-Atlanta is providing the engineering technology for the satellite operation that links the DTT transmitters for the two national RAI-TV (Italy) multiplexes. The system came into operation in early 2004, bringing DTT to the larger cities across the country.

Satellite news

A problem in Australia, likely to spread to New Zealand shortly, is being caused by the introduction of UNwired, a broadband wireless communication system that links users to a local base station for connection to terrestrial networking. Only a few systems are in operation at present, but hundreds more are expected to open. UNwired operates in an allocated terrestrial band, 3·4-3·5GHz, with transmission up to 10W, but this overlaps the extended C-band satellite spectrum of 3·4-4·2GHz – the original C-band spectrum was 3·7-4·2GHz. A suburban area where the UNwired system is in use will be swamped with relatively high-level transmissions that could overload C-band satellite dish electronics.

The problem can be reduced or eliminated by the use of high-performance, sharp cut-off bandpass filters, but these are not commonly available and are expensive. A bandpass or stop filter will attenuate the C-band signals however, and the UNwired signal levels are at +60dB to +70dB with respect to the satellite signals. An alternative is to use a 3·7-4·2GHz LNB instead of a 3·4-4·2GHz one, assuming that your wanted signals are not in the extended part of C band. Thanks to the NZ publication *SatFACTS* for this information (September 2004 issue).

The Indian Doordarshan DTH service should by now be in operation, providing forty channels (25 commercial, 14 multi-language Doordarshan plus BBC).

Afghan TV is now available via satellite, using a single Insat channel. India provided engineering help in the construction of an uplink station near Kabul, with regional insert capability from ten towns across the country.

Germany is transmitting a Farsi-language FTA TV channel via Hot Bird 6 (13°E), seeking an Islamic audience in Europe and the Middle East. The channel is at present partially funded from Iran, but it's hoped that the finance will eventually be provided by commercials.

An African news plus information channel is being planned by ZTV (Zimbabwe) and NBC (Namibia). ZTV is currently suffering from severe financial difficulties with its terrestrial TV channel – this could cause problems with funding the new venture.

A large industrial complex is being built by South Koreans at Kaesong, across the border in North Korea. Skylife, a satellite broadcasting company, is to deliver South Korean TV for terrestrial transmission across the complex, and has offered to provide additional transmitters at Mt. Kumgang (a N. Korean coastal resort) and Sinpo-Kumho.

Aerials for cellular communications

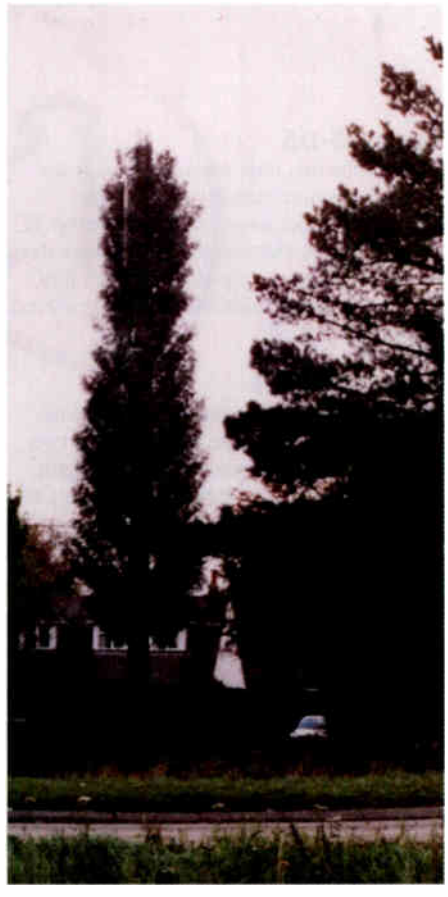
There's been much publicity in recent months over the increasing use of TETRA, a digital communications system for the emergency services. The government intends that it will become the definitive communications system across the UK. Controversy continues about the possible side-effects of the transmissions, which are in the 380-400MHz band, on the human body. Those in favour of TETRA claim that there's no problem as the radiation levels are very low. TETRA has been used successfully in Jersey for a couple of years, one advantage being that services attending an emergency can easily operate on common frequencies, thus speeding local communications.

Elsewhere in the UK the fire brigade still uses low-band VHF (AM or FM); the highway police use 150-155MHz (mainly FM but some AM); the local police use 450-454MHz FM; the ambulence services use low-band, high-band or UHF; while lifeboats use the 156-162MHz FM marine band (I'm not sure about what the coastguard uses). So there's a confusion of frequencies, with each service trying to liaise via various control rooms – or simply shouting at each other at the incident site. TETRA could clearly be a considerable benefit in this sort of situation.

Controversy also arises when a mobile phone company applies for local cellphone masts. This is not helped by the cavalier attitude of some companies that apply for permission at short notice – no council objection, and another mast is stuck up almost overnight.

Treepoles

One of our old friends, Andrew Emmerson (Northampton), wrote an article in a recent European Communications publication (see www.eurocomms.co.uk) on the activities of the Alan Dick Company of Cheltenham. This prompted me to do a bit of research. There's a line of five bare metal masts, not a single mast with aerial sharing but individual masts for each company, in a field adjacent to the M27 a mile and a half east of the M27/A31 junction (Copythorne). It's not a pretty sight at the


Left: A row of cellular phone masts adjacent to the M27 at Copythorne, the entrance to the New Forest. Centre: An Alan Dick Company Treepole mast near Fawley, Hants (A326). Right: A Lightning Treepole mast near Dorking, Surrey.

entrance to the New Forest National Park (see photo). At Fawley, Hants (junction of the A326/B3054, Dibden Purlieu) there are two cellphone masts, about 400 yards apart, that merge well with the adjacent fir trees: an experienced eye will notice the disguised masts, but the casual motorist will drive past unaware of them (see photo). Full marks for effort and environmental concern – but the fields on the opposite side of the road feature a long chain of 440kV super-grid pylons, perhaps 85m high, that carry electricity from the Fawley power station!

Access to the Alan Dick website (alan.dick.co.uk) revealed a veritable treasury of 'hidden' aerial expertise. I recommend that you take a look for further information. The Treepole range from the Alan Dick aerial-mast nursery includes full-grown specimens of Scots Pine, conifers, palm trees (rarely used in the UK!) and a dead tree apparently modelled on one struck during a thunderstorm – it's known as the Lightning tree.

The trees are manufactured in heights of 15, 19, 20 and 25m, depending on type of tree. The standard conifer for example is 15m nominal but can be extended to 19·5m. It can carry three vertical column aerials (120° sector) and a couple of 0·6m dishes at the top. The Scots Pine can carry three dishes, also starts at 15m and can be extended to 20 or 25m provided the recommended foundation is used. There are vertical column aerials for fitting at a specified position on the upper structure: they include the usual 1·8-2·4m aerial systems. Fixed (welded) mountings are provided for signal coverage of 0, 120 and 240° sectors but, once the holding-down bolts of the tree sections are 'cast', a crane will be required to rotate the mast on its holding-down bolts to modify the aerial's polar response should a variation of greater than 25° be needed. The top dish-mounting section of the Treepole can be swivelled on its own ring mount for dish orientation.

The Treepoles can be climbed. Provision is made for this with removable/permanent step rungs, though the Scots Pine has an internal fixed ladder within the trunk to the first branch level for access to the head electronics.

Full metallic and electrical continuity is provided for protection against lightning strikes, with 'sacrificial' lugs at the base of the mast.

For students of structure design, the foundation should have a concrete density of 24kN/m^2. The Scots Pine requires a concrete square with 5·75m sides and a depth of 1·2m. For comparison, when I dug my dish-pole foundation it was an 0·9m sided hole 1m deep. I used 3/4in. all-in ballast plus cement and water and a few broken bricks to help fill it up. Stir it round to make a wet splodge and tip the pole in!

Roy Carmen kindly provided the picture of a 'Lightning Treepole' next to woodland in the countryside near Dorking. The base equipment housing is painted dark green, and a rustic fence surrounds the site. It looks OK, much better than the alternative of a galvanised steel mast.

TETRA installations seem to use three vertical dipole stacks with 120°-sector mounting, usually bracketed away from the support mast at a distance of perhaps 2m. The TETRA version Scots Pine follows this pattern, with the dipole stacks suspended between branches. The Scots Pine has received a Millennium Products Design Award.

This could well be the answer for radio and TV DX enthusiasts who want a tall aerial mast but face an unhelpful local planning department. Except that it would be a Lottery-win mast. Daren Ayres, the Alan Dick Company's sales manager for cellular trees, says that the Lightning and Scots Pine trees at 15m height cost about £30,000 plus VAT ex works. Developing a site, from planning, groundwork and erection, including the tree, comes to some £150,000. And if you've won the Lottery, you'll be moving anyway! My thanks to Jeannine Burley of the Alan Dick Company for information provided. ■

AUDIO FAULTS

Reports from Chris Bowers Roy Blaber and Geoff Darby

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

Reports can be sent by post to:

**Television Magazine Fault Reports,
Highbury Business,
Media House,
Azalea Drive, Swanley,
Kent BR8 8HU**

**or e-mailed to:
t.winford@highburybiz.com**

Sony ZS-D5

Sometimes this unit wouldn't power up when the power/standby button was pressed. Checks inside the unit, on the TC section board, showed that there were dry-joints at the reset chip IC803. Once this item had been resoldered the unit powered up correctly. **C.B.**

Sony ICF-SW1

Distorted sound was the complaint with this unit. A look inside revealed that two surface-mounted capacitors on the main board had started to leak. These were C601 (100μF, 4V) and C608 (33μF, 4V). Replacements restored normal radio sound. **C.B.**

Technics SA-EH770

This tuner/amplifier wouldn't come out of standby. On this occasion replacement of the sound output chip IC601 cured the fault. It is an RSN311W64B device that's available from SEME. **R.B.**

Sony HCD-H801

The complaint was of intermittent distorted sound. The cause was dry-joints at the 5V, 8V and 12V regulators. **R.B.**

Kenwood RD-HD5MD

I've had a number of these units that have suffered from poor CD playability because of a defective laser. At first it looks as if the laser will be difficult to get at. But I've now developed an approach that makes the job of replacement quite straightforward.

Remove the main cover then the front panel. The latter is held by a black countersunk screw at each side and two gold screws underneath. One flexiprint, one normal connector and a screwed-down tag have to be disconnected. Next, remove one black screw at the lower left corner of the rear panel, one gold screw underneath the front edge of the large white flexiprint at the top right, four gold screws along the lower left edge of the chassis and one gold screw underneath, towards the back of the right-hand side – it's in a recess.

The upper part of the chassis can now be lifted slightly, to disengage it from the rear panel, and slid back, allowing the lower part of the chassis to come partly free, enough to be able to insert a hand to release the large white flexiprint from its connector on the top of the CD changer. The whole lower chassis, complete with the changer, can now be lifted away. Remove the last four gold screws from underneath to allow the changer to be lifted out completely.

To remove the deck from the changer, turn the whole mechanism upside down, disconnect the laser flexiprint from the small sub-board at the rear of the changer, then remove the two screws that secure this board. Allow it to hang away on the other piece of flexiprint that's connected to it. Next undo the two screws at the rear suspension points of the deck. Finally undo the front screws, each of which has a deceptive spring underneath. Although these look like typical weak deck suspension springs, they are actually about 5cm long when released and are capable of firing themselves, and the fixing screws, to the other end of the workshop – you've been warned!

If you now try to lift the deck clear you will find that you can't release the front, because it's located between two pins in the lift mechanism, and that the back won't come far either, because of two plastic projections that get in the way. Before trying to figure out how the changer comes apart, reach for a medium-sized, flat-bladed screwdriver. Insert this in the gap between the back of the deck and the changer and gently lever each side while lifting the back of the deck. It will come past the obstructing projections easily and, once lifted clear at the back, the front can be manoeuvred out from between the lift pins.

To remove the laser, undo the two small screws in the sled-motor cover and lift this off the deck – it's clipped as well as screwed. The motor is stuck in place, so a small screwdriver is required to lever it gently, taking care not to force its shaft, until it comes free at the front. The worm shaft can then be lifted clear, complete with the laser. The worm-gear pawl has to be swapped over from the old laser to the new one.

Reassembly is a blow-for-blow reversal of the dismantling procedure. Don't, however, forget to remove the solder blob that shorts the laser diode. And don't, as I did the first time, get a greasy fingerprint on the lens. It was enough to stop the laser working completely.

The unit can be run partially reassembled for initial testing. But be careful of the front-panel earthing lead which, at this point, will be hanging free. **G.D.**

Denon AVC-A10SE

This boat anchor of an AV amplifier came to me from another dealer, who is also a personal friend. When he first received it, there had been a catastrophic front-right channel output stage failure. It's an absolute beast to work on. The only way to gain access to the underside of the power amplifier board is to remove the complete heatsink assembly from the unit then either unscrew, or disconnect, all the power transistors – all down one side of the heatsink. When the PCB screws have been removed,

the board can be swung away from the heatsink enough to get access to it. The other transistors remain screwed to the heatsink, connected to their sub-board. For testing, it all has to be reassembled and refitted.

My friend's engineer had done a thorough job of locating faulty components in the stage, and had replaced TR804, TR806, R806, R810, D804 and ZD804. When it had all been put back together the stage worked – sort of. It had an output that was low and distorted. Some further time had been spent trying to get to the bottom of this new problem, without success. Some days later, guess who walked through the front entrance of the shop, to pick up some parts for a computer he was rebuilding for his daughter . . .? So I ended up lumbered with it.

When I got it on the bench I could see why they had become disillusioned with it. It really did involve a considerable amount of work to get down to the PCB. So I decided to adopt a slightly different approach. My first move was to switch on and wait for a few minutes. After a few seconds the output protection relay cut in correctly, and two minutes later the output stage was still cold. This is usually a good sign and often means, following an output stage blow up, that any remaining problems are caused by lack of drive, often because an open-circuit resistor has been missed.

Such a problem is normally easy to trace by carrying out comparative resistance checks between channels, using an analogue meter such as an AVO 8. I recommend the use of an analogue meter because there will be lots of readings that bounce between two values, because of the presence of electrolytics in the supplies. This effect can be misleading when a digital meter is used. In this case however little was revealed. So my next move was to apply a signal and warm up my oscilloscope.

Checks at R735 and R736, in the base drive circuitry for the output transistors and close to where the diodes had been replaced, revealed a very low and distorted waveform. Tracing back from here I came to TR712 in the complementary-symmetry driver stage. There was good audio at its base, but only the low, distorted waveform at its collector. Oddly there was no output from TR710, which drives the upper transistor (TR708) in the driver stage and whose emitter resistor is shared with TR712 in a sort of 'long-tailed pair' configuration. Cold checks in the stage revealed that TR710 was short-circuit and that the 68Ω emitter resistor, R730, was open-circuit. Rather than dismantle the whole heatsink assembly to get to the back of the board, I carefully snipped the legs of both devices to remove them and touch-soldered replacements to the remaining stumps.

At switch on there was an immediate improvement in the performance, but the output was still distorted. A further check on the drive waveforms showed that these were now present and correct, all the way to the resistors in series with the bases of the output transistors, but appeared at the base of only one of these transistors. The cause of this final problem was that R735, 4·7Ω, was open-circuit. Once this item had been replaced there was good, distortion-free output.

I let the amplifier run for a couple of days in this 'cobbled-together' state, to ensure that there were no further problems, then stripped it apart and fitted the replacement components properly. A final check on the quiescent current in the output stage, with reference to the procedure laid down in the service manual, completed the repair. **G.D.**

Sony HCD-CP101

The owner's complaint with this mini hi-fi was that "the volume won't turn up". According to the display it did, but the output from both channels was very low – just audible at the loudest setting. The cause of the trouble was transistor Q330 in the power-up muting circuitry.

There's a Sony bulletin, number 03PA003, that deals with the problem and suggests that wire link JW370, near the transistor, is removed and a 470Ω resistor is fitted in its place. Once this had been done the system worked perfectly. **G.D.**

Bush MD27RM

This unit caused me some headaches – in no small part because of my failure to notice a small but significant detail during disassembly. The basic problem was a faulty KSS213C laser unit. The deck in which it is located is a three-disc carousel type that's mounted in the bottom of the cabinet. To gain access to the deck and hence the laser many screws in the back, sides and bottom of the case have to be removed. With a budget item such as this, it's not the sort of dismantling job you want to do more than once.

Once you've got the changer out, the sub-deck has to be removed from the bottom. To do this you have to remove two plastic retainer brackets, one at each side of the sub-deck. These are secured by two screws that pass through a metal bracket under the sub-deck and one additional screw. Here's the detail I missed.

It's not possible to get at one of the screws without first removing a small PCB that has several switches mounted on it, for open/close detect etc. The PCB is secured by two silver screws that appear, at first glance, to be identical. When the laser had been replaced and everything, including this board and its screws, had been refitted, an initial trial indicated that all was now OK. Until, that is, I came to open the tray. It moved a couple of millimetres, then stopped. If it was pulled open manually it would close OK with its motor drive. I thought I must have remounted the switch PCB wrongly somehow. So out it all came again. And then again, and again.

It finally dawned on me what had gone wrong. One of the mounting pillars for the PCB is also the shaft for a spring-loaded lever that operates the 'open' switch on the underside of the board. When the board was screwed down fully, the lever stuck just enough to prevent it releasing the switch. Thus when open was requested the system-control micro read the switch, decided that the tray was already open, and immediately stopped the motor.

So what had caused this? Well the two identical-looking screws aren't exactly the same. The one that goes in the pillar on which the lever is mounted is ever so slightly thinner than the other one. Needless to say I'd got them the wrong way round. When the thicker one was screwed right home, it expanded the pillar just enough to prevent the lever rotating freely on it. Fitting the screws the right way round restored correct operation – and my sanity. **G.D.**

Sony HCD-RG60

This unit was to all intents and purposes dead, with no display of any kind and no response from any of the front-panel buttons, though the red standby light was illuminated. When mains power was first applied however the tape decks cycled and a relay clicked.

I was quickly able to establish that the Ever 5·6V supply was present and that the main power relay, which controls the supply to the transformer on the primary side, was energised. A few further checks proved that the unregulated 12V supply was missing. It's produced on the main board and is derived from the AC3 supply that comes from the transformer board.

The AC3 supply was missing because the 0·33Ω safety resistor R919 was open-circuit. As I was unable to find any shorts etc. across the 12V supply, I simply replaced the resistor. The result was a fully working unit. **G.D.**

VCR CLINIC

Reports from
Eugene Trundle
Michael Dranfield
Amrith Ramjewan
J.S. Ogilvie
Alan Stubbings
Brian Battams
L.B. Gare
and
Dave Packham

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Highbury Business,
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Azalea Drive, Swanley, Kent BR8 8HU

or e-mailed to:
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Sony SLV-SE230G

There was an intermittent fault in the record mode: no CTL pulses would be recorded on the tape. The effect during playback was of course waves of mistracking noise at intervals of a few seconds.The culprit turned out to be the servo/control chip IC601, which is a surface-mounted device. **E.T.**

Philips 14PV111/07

This combi unit would either stick in standby or revert to standby immediately after the picture appeared. The cause of the problem was in the VCR, not the TV, section. I found that the front-loading mechanism was jammed. The tray has a thin, toothed metal bar that meshes with the loading cog. This bar was bent: it's so thin and of such poor quality that it didn't seem worthwhile ordering a replacement – the bar would only bend again in time. So I bent it back into shape, after which it worked well enough. The quality of Philips VCR decks has certainly dropped over the last couple of years. **M.D.**

Philips VR597

This machine would pulse on when power was applied, then go off. A new LA5613 voltage-regulator chip solved the problem. **A.R.**

Thorn VR202LV

This machine was dead. When I removed the deck and the PCB the cause of the problem could be seen straight away: there was corrosion on the print side of the board because C5105 (470μF, 16V) and C5101 (1,000μF, 16V) had both leaked. Replacement of these two capacitors and a good clean up restored normal operation. **J.S.O.**

Black Diamond BD125N/S

This machine would shut down when a tape was inserted. So I removed the deck and cleaned the mode switch. A nice easy one for a change. **J.S.O.**

Sony SLC9 and others

I'm pleased to find that there seems to have been a revival of interest in Betamax machines: several have been brought in for repair recently after being retrieved from storage in the attic. This C9 suffered from the standard storage fault, drum failure. The cause is usually the Hall-effect feedback sensor. Replacement is straightforward after removing the drum assembly. But to prevent movement and possible leadout shorts the device should be secured in the housing with epoxy resin.

I used a Toshiba replacement, type THS103A, part no. A6090130, which is available from SEME. It's also used with the capstan and reel motors, where it gives no trouble. In the very rare instances where the CX879 drive chip is faulty a replacement can be obtained from Sony, part no. 875980879.

This repair is applicable to all Sony Betamax VCRs from the C9 to the HF950. **A.S.**

Thomson VTH6300U

The fault symptom with this eighteen-month old machine was intermittent play, reverting to rewind then standby. The fault was cured by removing the deck and cleaning the mode switch. Dismantling and reassembling the machine is extremely easy. After reassembling it I found that the picture quality was better than expected. **B.B.**

Philips VR850

This machine had no display. The cause was capacitors C2324 and C2326, which are both 220μF, 25V. They had gone low in value. There was a normal display once replacements had been fitted. **B.B.**

Aiwa HV-FX2800

Playback was OK but there was just noise on recordings. The TA1232 YC amplifier IC was faulty. **L.B.G.**

Toshiba V212B

There was no servo lock, as if there were no CTL pulses. The place to check for CTL pulses is at pin 11 of IC1740 (the pulses enter from the head at pins 4 and 8). In this case however all that was required was to clean the fan-type optical assembly under the video drum – it tends to get very dusty. **L.B.G.**

Aiwa G55

If the machine won't accept a cassette or, when one is wound in by hand, there are no functions, check R266 (3·3Ω) in the feed to the loading chip IC206. **L.B.G.**

JVC HRJ795EK

The cause of a power supply blow up was found to be the 15V zener diode D5301 on the secondary side. It was short-circuit.

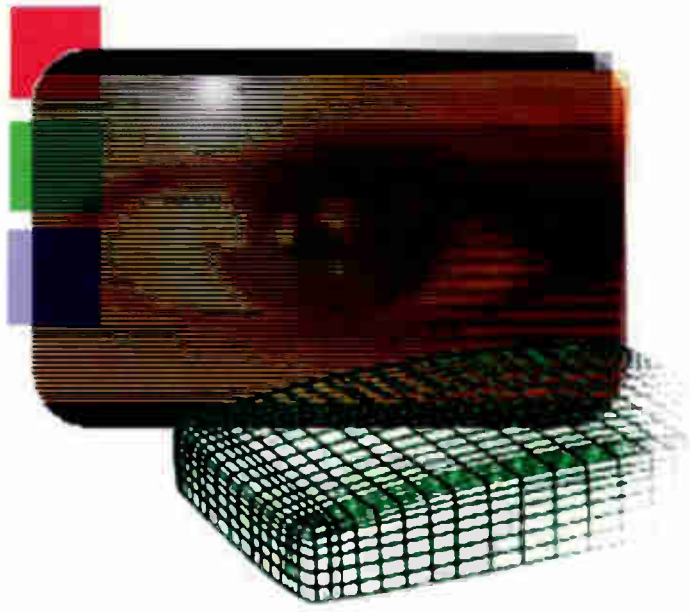
On rebuilding the primary side there was a repeat performance. The cause was the chopper transformer T5001. **L.B.G.**

Toshiba V513

This machine was dead though there was a slight squeal. I found that transistor TP91 (2SA1020) was shirt-circuit. Also check the 1·5Ω feed resistor. **L.B.G.**

Reoc TR4

There was no playback from the VCR section of this combi unit. The TV section was OK. All that was needed was a good head clean and a new pinch roller. **D.P.**



TV FAULT FINDING

Reports from
Michael Dranfield
Philip Salkeld
G. Patrick
Roger Burchett
Gary Laidler
Arthur Jackson
Mike Leach
Jerry Fedorak
Brian Battams
Martin McCluskey and
Charles Ritchie

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Hitachi C32W02TN

This set would revert to standby after a while. The cause was not, as might have been expected, dry-joints at the three-terminal regulators. Another fault symptom, which the customer hadn't noticed, was that on changing channels the OSD information was shaky and in addition a red and green line would appear at the top of the screen. All these faults were cured by replacement of C601 (220μF, 35), the flyback boost capacitor that's connected to pin 8 of the TDA8350 field output IC. It had dried out. **M.D.**

Bush 1470T

This set's picture would disappear intermittently, leaving a blank, unmodulated raster with sound. I also found that if text was selected the picture would remain on and no text was produced. Scope checks around the 27MHz clock crystal suggested that it was oscillating, but there was no 27MHz signal at pin 2 (clock input) of the SAA5254 text chip. It transpired that the 27MHz crystal was faulty – the 27MHz signal picked up was the free-running output from the text chip. **M.D.**

JVC C21M3EK

The complaint with this set was field collapse, but it worked fine on test. A few suspect joints were resoldered, after which the set was returned. Three weeks later it came back with the same complaint, and this time the fault was present at switch on. A scope check at pin 33 (field ramp) of the jungle chip showed that the waveform was missing. In fact a dead short was measured from this pin to chassis. The 1μF electrolytic charging capacitor was OK, the culprit being the parallel 0·02μF disc ceramic capacitor. **M.D.**

JVC AV28WFT1EKS

This set had been reverting to standby intermittently about twice a day. All the usual things had been tried without success. In desperation I consulted JVC technical and was advised to replace the following items in the field output stage: D493 and D494, type MA162; D492, type MTZJ22B-T2; Q402, type 2SC1740S/QR/-T; and C492 (10μF, 50V). Since doing this the set has worked perfectly. **P.S.**

Sanyo CE28WN5

I've recently had three of these sets in the workshop. They were all dead, and in each case the 2SD2580 line output transistor Q432 was short-circuit. Once a replacement had been fitted and some soldering had been attended to the sets all worked well, with no apparent reason for the transistor's failure. But don't think that there isn't a cause: tap the tube's neck with the back of a screwdriver and you will notice blue streaks across the screen. The tube is a Philips type. **P.S.**

Tatung T28NE51 (E series chassis)

This set had been in the workshop a couple of months previously because of a field-scan problem, which had been cured by replacing the TDA8350Q field-output IC. This time the complaint was that red/green lines were present at the top of the screen. The first option was to replace the IC again, but this made no difference. After checking a number of components I came to R437 (22Ω, 0·5W), which is in the LT feed to the IC. It had risen in value to about 150Ω. A replacement cleared the fault. **P.S.**

Bush 2874NTX (11AK19 chassis)

The customer's complaint was that the sound went off after an hour. I was expecting no sound at all, but there was crackling and hissing when the fault appeared. A job for the freezer then. When the Nicam processor chip IC301 was squirted the sound corrected itself. It's on the Nicam board. As these panels vary in different models, I thought the best approach would be to use one from a scrap chassis. This cured the trouble. **P.S.**

Naiko N3280W (PT90 chassis)

This set's geometry wasn't right: there was

excessive height and the EW correction was wrong. I assumed that to get into the service menu would be the same as with the PT92 chassis, but several attempts failed. After a few phone calls I found out how to do it: select menu; select features; then highlight language selection and key in 1923. This gets you into the service menu. Adjust as with the PT92 chassis, including press the TV button on the remote-control unit to store. **P.S.**

Panasonic TX32PL10

The complaint with this widescreen set was that the sound disappeared after twenty minutes. As no amount of freezing helped, I started to check voltages and found that the 5V supply to the audio processor chip IC2101 was missing. It comes from regulator Q850, whose collector lead hadn't been fully inserted in production – it was merely pressing against the upper side of the solder island. A solder up with lead-free restored normal operation. Strange that the fault had been present for a full year before the symptoms showed up. **G.P.**

Goodmans 2195T (Daewoo CP330 chassis)

This set was dead. There were no signs of distress, and the mains fuse was OK. The culprit turned out to be C817 (330μF, 35V), which is in the start-up supply. I decided to replace C811 (100μF, 16V) as well, as a precaution – it's the copper transistor's base-drive coupling capacitor. **R.B.**

Lenco TCV9905

I'd never come across this brand name before. The set is a 10in. TV/VCR combi unit, which was stuck in standby. Checks on the BU407 line output transistor QH02 showed that it was leaky all round. I fitted the higher-specification BU406, as the former device is not listed by my usual supplier. No reason could be found for the transistor's failure.

The circuit is similar to the Goodmans Compact 110, though the component reference numbers differ. So look out for burnt glue! **R.B.**

Fidelity CTV3128/3228

If the line driver transistor Q580 has failed, feed resistor R508 should be changed to 2kΩ, 5W.

The original value was 1kΩ. This is an official modification. The resistor can go open-circuit and/or it may be impossible to read the value. **R.B.**

Wharfedale 550S

The customer said that the set went off while he was watching it. I couldn't see any signs of distress when I took the back off. There were no dry-joints, blown fuses or shorts. One thing that was drummed into me when I was younger was that high-value resistors in chopper circuits tend to go higher in value. In this case RP06 (3·9MΩ) was open-circuit. To be on the safe side I replaced RP05 (1MΩ) as well. **G.L.**

Grundig ST70-700 (CUC2030 chassis)

The customer complained that this set reverted to standby intermittently. It ran all right in the workshop of course, so all we could do was to return it. Next day the customer phoned to say that it was now dead. I quickly found that the S2000N line output transistor T53001 was short-circuit, but was not convinced that this was the only fault. In fact the real cause of the trouble was staring at me: there was a great big dry-joint on the small PCB above the scan coils. Dealing with these points wasn't the end of the matter however. When I switched on there was EW distortion. Fortunately a new TDA8350Q chip (IC50020) put that right. **G.L.**

Ferguson A59F (ICC7 chassis)

This set was dead and cold checks soon showed that the S2000AF line output transistor TL19 was short-circuit. The nearby s-correction capacitor CL24 (330nF, 250V) didn't look too happy and when I removed it I found that it was split on the underside. All was well once replacements had been fitted. **G.L.**

Grundig 28WV2N (CUC2059 chassis)

The problem with this set was excessive width and EW distortion. As I didn't have a circuit diagram I decided to carry out some cold checks in the line output stage. I soon found that D53072 (BYW76) was short-circuit. **G.L.**

Toshiba 28W23B (11AK33 chassis)

This set produced a very dark, unfocused picture. I suspected the line output transformer, and a colleague said he had come across faulty LOPTs in this set. So a new transformer was fitted, along with the usual power-supply kit. It was headache time when I switched on, because the symptoms were the same. Then I noticed a small bit of green on the tube base. A replacement base cured the fault. I won't be so keen to blame the transformer in future, even though every other job I do seems to involve one. **G.L.**

Schneider STV5501 (11AK19E3 chassis)

The set showed no signs of life. With this chassis I find it best to check all safety components before getting down to real fault finding, as these items often fail for no reason. In this case I found that the 27kΩ start-up resistor R806 was open-circuit. **G.L.**

Mitsubishi CT2125TX (Euro 10 chassis)

Severe patterning was the complaint with this set. The state of C952 and C956 gave them away – they were leaking electrolyte. Replacements cleared the trouble. **G.L.**

Alba CTV841 (Onwa chassis)

The customer complained about a smell of burning. Normally with this chassis the symptom suggests major destruction. But I had reconditioned the set not all that long back, so I was a bit more hopeful. When I removed the back I spotted a sad-looking blue disc capacitor, C435 (1nF, 2kV), with a tell-tale burn mark on it. It's one of the line output stage tuning capacitors. All was well once it had been replaced – the set still produced a very good picture. **G.L.**

Sanyo CE21MT4H (EC8-A21 chassis)

There were two intermittent faults with this set. First, when it was switched on it sometimes wouldn't come out of standby. Secondly, if the set did come on it would work normally for varying lengths of time but would then lock up, with no remote or on-board control possible. The cause of both faults was very dry soldered joints at crystal X801, which is associated with the microcontroller chip IC801. **A.J.**

Thomson 21MG17UG (TX807CS chassis)

This neat little 21in. set was dead. Checks on the primary side of the power supply showed that HT was present at the drain of the chopper FET TP020, but there was no switching activity. There were low and incorrect voltages everywhere in the start-up and drive stages. As I find that voltage checks in DC-coupled circuits are very misleading, I decided to switch off, discharge the mains rectifier's reservoir capacitor, and carry out cold checks.

Surface-mounted transistor TP026 turned out to be very leaky all ways round, a replacement restoring normal operation. I find that faulty surface-mounted transistors tend to become leaky rather than short-circuit and that for reliable checks they need to be isolated. **A.J.**

Toshiba 32ZD08B (C00S chassis)

This set appeared to start normally, as degaussing and an EHT rustle could be

heard, but reverted to standby after about one second. The HT supply reached 120V then fell to about 55V. The symptoms persisted when the feed to the line output stage was disconnected and a dummy load was connected in its place. A lot of fruitless checks were carried out on the primary side of the power supply and in the feedback circuitry. The fault was eventually cured by replacing the optocoupler Q826, part no. A8643108. **A.J.**

Thomson 32WF45UG (ICC20 chassis)

There are two main boards in this flat-screen 32in. model, a power/deflection board and a small-signals board. Apart from the tuner the latter is densely packed with surface-mounted components – and this is where the fault lay. The trouble was no B – Y, the grey scale and teletext colours being OK.

The U, V and Y signals pass from IC001 to IU308 then IV100 and finally IV200, where colour matrixing takes place. The cause of the trouble was in the final stage. The U signal from pin 17 of IV100 is fed to pin 27 of IV200 via the surface-mounted capacitor CV221. It had not been soldered at one end. **A.J.**

Grundig P37-730 (CUC7301 chassis)

This 14in. teletext set was dead. Cold checks failed to reveal any obvious shorts or open-circuit components, but on test only a low, pulsing chopper drive waveform was present. The supply at pin 7 of the control chip IC630 was also low and pulsing, because the associated decoupling capacitor C667 (100μF, 25V) was faulty. When checked with an ESR meter it produced a reading of 30Ω. **A.J.**

Toshiba 2857DB (C5SS chassis)

This set's picture was badly out of phase, i.e. it started about 3in. in from the left-hand side of the screen, the first 3in. containing a folded image that should have been at the right-hand side. The line flyback pulse required for AFC is obtained from pin 10 of the line output transformer, and is fed via shaping components to pin 25 of IC Q501. Scope checks showed that the problem was at the solder link connected to pin 10 of the transformer. A corroded joint here left it open-circuit. **A.J.**

Hitachi C32WD2TN (A7 chassis)

This set would shut itself down, but the cause wasn't the usual Hitachi dry-joint troubles. If you powered it several times on the trot so that the tube's heaters warmed up, you could see a very distorted line tearing effect down the centre of the screen just before the shut-down. It looked as if the set was trying to go to a complete line collapse without actually managing it.

I'd had this one before, some time ago. The culprit is C717, which is mounted near the scan plug. It is one of those small, blue pulse capacitors, the value in this case being 102nF, 2kV – it's in the line flyback pulse feedback network. The component was not distorted or blackened in any way, so watch out for this one. **M.L.**

Sony KD28DX50U (FE2D chassis)

There were two fault symptoms with this set, both caused by failure of the same component. The symptoms were no sound, plus the on-screen volume graphics wouldn't increase or decrease by more than five 'notches' at a time. If you managed to get the graphics up to maximum there was still no sound. Because of the graphics problem I ruled out the audio output stage and headed for the MSP3411 multi-sound processor chip IC201. Checks here showed that its reset pin was cycling up and down all the time (pin 24). A replacement chip cured both problems, restoring normal sound. **M.L.**

Hitachi C2514TE

Off-air TV reception was fine. The problem was with the scart input. Whatever the signal source, the picture was low-gain and grainy and there was no scart sound, with off-air TV sound in the background until the aerial was disconnected. The set responded to pin 8 switching via the scart connector, it just didn't seem to be doing it properly.

When I checked with the circuit diagram I saw that the scart sound should be present at pin 6 of the TDA8361 jungle chip IC201. A scope check confirmed that it was present here. But it wasn't being processed. A new jungle chip restored normal operation, including a good, clear picture via the scart input as well as the sound. **M.L.**

JVC AV25S1EK

The complaint with this set was that the raster came in at the sides along with a whistle noise – sometimes it would be OK. So it was off with the back to carry out some cold checks in the line output stage. I found that, under the plastic chassis support, pin 7 of the line output transformer was dry-jointed. I managed to catch it with solder – sometimes you have to unscrew to gain access. There were no other dry-joints, so I switched the set on and gave it a soak test. It produced a good picture considering its age. **J.F.**

Philips 29PT828C/25 (S4GFL2.20 EAA chassis)

The complaint with this huge set was reduced height, though it sometimes produced a full picture. Checks around the field output chip IC7260 revealed that pin 6 was dry-jointed. To be on the safe side I resoldered all the pins then gave the set a lengthy soak test. **J.F.**

Toshiba 2103TB

This set's power supply was pulsing. Cold checks revealed that a new line output transformer was required. I obtained an equivalent to the Toshiba original as this was more economical. **J.F.**

Wharfedale 350 PAL I

This supermarket/food outlet TV set was brought in because there was no picture. You could smell burning. Cold checks showed that the line output transformer, part no. PET-22-11/VDE-REG-NR4956, was faulty. Replacements can be obtained from Wiltsgrove. **J.F.**

Toshiba 2500TBT

Chirping from the chopper transformer in standby was the complaint here. The cause was found to be C830 (100μF, 50V) which was low in value. **B.B.**

Sony KVM2140U (BE2A chassis)

The symptoms produced by this set were intermittent contrast fading and a partial blanking of the top half of the picture, with hum on the sound. Two leaking capacitors were the cause, C012 and C823 (both 22μF, 50V). I cleaned the board, using solvent on a cotton bud, before fitting replacements.

A word of warning. When removing the stand, place the set on its front then remove the screws that secure the stand to the set. Don't try to remove the stand with the set in the normal position. There is no tie bar with this stand and, if the lower screws are loose, the upright supports splay outwards and the set will land up on the floor. Fortunately I caught it in time. **B.B.**

Hitachi CPT2508 (G7P Mk 2 chassis)

This set wouldn't come out of standby despite a blanket replacement of R919, R920, R931, R932, C916, C910, C929 and C914. When 12V from an external power supply was connected across C924

it sprang to life. The cause of the trouble was eventually traced to C737 (100μF, 10V) which is connected to the gate of the protection circuit thyristor Q706. **B.B.**

Hinari 14T (Grundig G1000 chassis)

There were no results from this portable set though the power supply was in operation, providing 100V for the line output stage. There was no line drive however, because R314 (6·8kΩ, 2W) was open-circuit. **M.McC.**

Sanyo CB5949 (EB2A chassis)

The fault symptom with this set was no results: the red LED was alight though not as brightly as usual. A check on the HT voltage showed that it was present but low. There were no signs of any distress anywhere. It seemed that the power supply was running in the standby mode.

Attention was turned to the 52-pin microcontroller chip IC701. Pin 48 should be high (5V) for power on but was at zero. The 5V supply at pin 27 was less than 3V: it rose to the correct value when pin 27 was unsoldered. When an external 5V supply was connected there was still no life from the set and IC701 ran very hot. A replacement, obtained from a scrap chassis, cleared the fault. **M.McC.**

JVC AV29SX1EK (JA chassis)

The usual cause of field collapse is failure of the TDA8350Q output IC. Not this time however. In these large-screen models the field scan current is fed to a raster-correction panel from a small plug on the main chassis. This plug was dry-jointed. The clue was that the line across the screen was slightly wavy instead of being straight. **M.McC.**

Mitsubishi BDS3251WS (11AK19 chassis)

This widescreen silver set is fitted with a version of the Vestel 11AK19 chassis. Its power supply showed no signs of life. I noticed a small component that was burnt to a crisp down near the chopper transformer. It turned out to be D807 (BA159), which is in the snubber network. All was well once this and the 22kΩ, 3W series resistor R822 had been replaced. **M.McC.**

Matsui 25M1 (Sanyo chassis)

This set was 'dead' with the red LED illuminated. When a channel button was pressed the power supply started up then, after a few seconds, reverted to standby. A check on the power supply's outputs while it was running showed that the 15V output was missing. The rectifier for this supply is D354. It read OK with a meter, but a replacement restored the picture and sound. **M.McC.**

Hitachi C2118T

After five minutes the height decreased with severe linearity distortion at the bottom of the picture. The soldering around the LA7835 field output chip looked to be in a very poor state, but after resoldering all the pins there was field collapse. A new LA7835 IC restored normal scanning.

The connections to the 9V regulator IC703 in this chassis should be checked. It's near the line output transformer. Replace C715 (330μF, 16V), which smoothes the supply to IC703. If there's excessive ripple on this supply the IC runs hot and melts the solder. This can be the cause of intermittent field-scan problems. **M.McC.**

Mitsubishi BDS295 (11AK19 chassis)

Sound and the EHT were present but there was no raster. As the tube's heaters were alight I advanced the setting of the first anode voltage control. There was still no screen illumination even when the setting was at maximum. The cause was a faulty line output transformer. A first-class picture was produced when a replacement had been obtained and fitted. **M.McC.**

Philips 14PV200/07

This combi unit was dead apart from a tripping noise that came from the power supply and clicking from the loudspeaker. Failure of the line output transformer is a common complaint with this chassis – the primary winding goes short-circuit to chassis. Fortunately however the cause was rectifier diode D6391 (BYW98-200), which was short-circuit.

Take care to refit the plug connectors in the correct positions when refitting the main PCB. **M.McC.**

Toshiba 2112DB

To cure flyback lines at the top of the picture replace C333 (100μF, 35V). If the field cramp is at the bottom, replace C336 (1μF, 50V). **M.McC.**

Mitsubishi CT25M3TX

Dead was the complaint with this set. The power supply was running, but there was no line drive. The cause of the fault was dry-joints at regulator IC954. Resoldering restored normal operation. **M.McC.**

BPL 9009KDR

This Sanyo-designed set was dead though the front LED gave a brief flicker at switch on. Replacement of the start-up resistors, R320 and R321 (both 120kΩ), got the set going – but only by pressing the standby button on the remote-control unit. These sets should come on fully when the on/off switch is pressed. I found that its momentary-make contacts were faulty. A replacement switch cured that.

In some Grundig sets faulty momentary-make contacts can cause intermittent audio muting, while the same defect in some Beko sets can cause intermittent operation of the front controls. **C.R.**

Amstrad CTV3121N (PT11 chassis)

Bad colour was the complaint with this set. In fact the CRT was producing no red output. A check on the voltage at the red cathode gave a high reading. Replacement of the TDA6103Q chip I201 on the base panel made no difference, the cause of the trouble being the feedback resistor in the red channel, R210 (82kΩ, 0·5W). The corresponding resistors in the blue and green channels, R208 and R209, were also replaced as they looked a bit tired. **C.R.**

Grundig P37-070GB (CUC7301 chassis)

When this set was switched on it produced a blank white raster then tripped. Sometimes there was no display, at others the raster would pulse between bright and dark. I found that the SW pin of the RGB connector on the tube PCB varied in unison with the fault symptom. The cause of the fault was found to be transistors CT181 (BC858B) and CT186 (BC848B) on the main PCB. I was saved a lot of time by a previous report from John Coombes on a similar problem. **C.R.**

Sanyo CBP1768B (EC1-B17 chassis)

The cause of this set's problems was loss of line drive. I found that there was no supply to the line driver transformer and then discovered that there was no continuity between D354 and C356 in the 24V supply. The reason was that C353 (1,000μF, 25V) had leaked and had corroded the track. I replaced C353, cleaned up the mess it had made and fitted an insulated wire link between D354 and C356. The set then worked perfectly. **C.R.**

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John Crisp

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S W Amos; R S Amos

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Mar 2000 ▲ 447 pages ▲ Illustrations ▲ PB
Published in UK
Code 0-7506-4624-9 **£20.99**

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J Edwards

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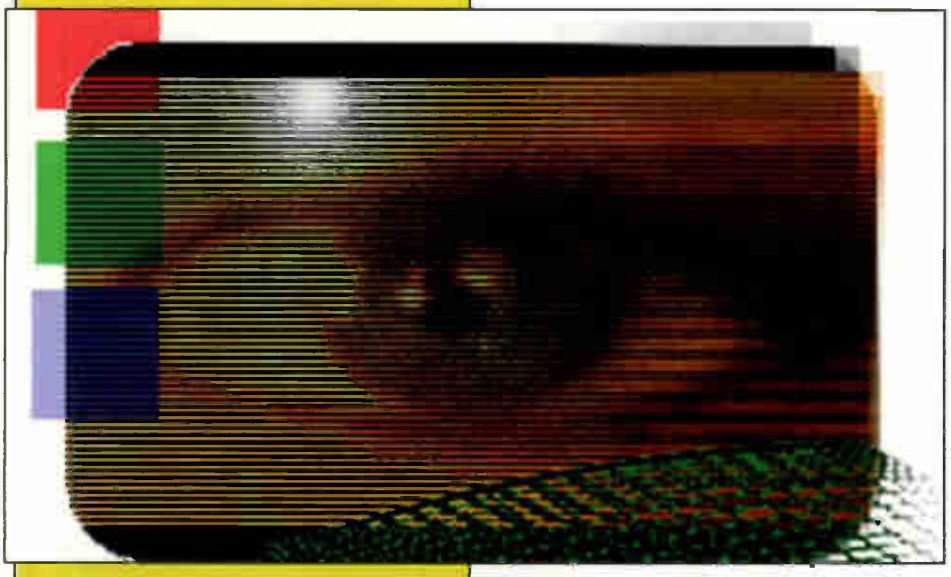

Extended Fault Reports

Reports on complex or tricky TV fault conditions are sometimes too long for inclusion in our basic fault-finding section. We've put a few of them together in this extended fault report feature

Reports from

Michael Dranfield

Arthur Jackson

Alun Rawson-Williams

Martin Cole

Martin McCluskey

and

Charles Ritchie

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

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Tatung T28NG80 (G series chassis)

This set would come on but after a few seconds the picture would start to become milky and dim. The fault was not thermal, as switching the set off then back on produced the same effect. I suspected a beam-limiter fault and, as a check, shorted to chassis the BCL line on the CRT base panel. This restored a good picture.

The CRT's cathode current is monitored by resistors R901, R902 and R903, with feedback to pin 28 of the VDP3116 video chip. I checked the components in the monitoring circuit, but none of them was faulty. I then figured that if the beam-current limiting was being applied too soon the cause must be incorrect cut-off data in the EEPROM. A look at the manual revealed five different locations that relate to BCL measurement, at addresses 50-58. I played about with these but didn't have any success. So I decided to do a full factory reset to reprogram the EEPROM with factory-default data.

The service manual tells you to set address 00 to FF and switch on. After five seconds the set came on and the picture fault had been cured. The trouble was that all the geometry and RGB drive settings etc. would now have to be set up correctly, taking up more time. What the service manual doesn't say however is that if you change address 00 to FE the EEPROM is factory reset without altering the geometry and colour-drive data.

Before you make any changes to an EEPROM, always read it first and store the file in your PC. Then, if anything goes wrong, you can reprogram it as it was before and start again. I had done this, so I was able to load the original data back into the EEPROM, change address 00 from 70 to FE, put the chip back in the set and switch on again. This time the picture was restored with the geometry settings preserved, as they were before, no further setting up being required. **M.D.**

Philips 32PW5407 (L01.1E chassis)

Two of these sets have come my way recently with the same complaint: dead. They were both about two years old. When tested they were found to be not totally dead – they were softly tripping.

Cold checks in the first one revealed a short-circuit BU4508DX line output transistor, Tr7460, but no obvious reason for its failure could be found. A replacement was fitted, and the set was then tried again. At switch on I heard the EHT rustle and everything appeared to be normal. But when the picture appeared it had reduced width and was slowly bowing in from one side. There was little time for checks, as the replacement transistor was overheating badly. So I switched off and started to think about it for a few minutes.

Line output transformers rarely produce such symptoms when they fail, and secondary-side loading was unlikely as all stages were operating and the tube's heaters were bright. So the likely cause was poor line drive. I connected a scope to the base of Tr7460 and switched on briefly. This revealed a slightly low-level, misshapen drive waveform. A check with the circuit diagram showed that the line-drive waveform is coupled to the driver transformer by an electrolytic capacitor, C2455 (47μF, 50V). Nowadays, electrolytic capacitors in any stage are suspect. A check on this one showed that it had an only slightly high ESR, but a replacement cured the fault.

The second set was identical in every way, and was repaired in minutes. Three friends in this trade have since phoned me for my view on this fault. In each case C2455 turned out to be the cause. **A.J.**

Sanyo CE32WN5-B (EB6-A32 chassis)

The customer told us that the problem with this 32in. set had been intermittent. It had occurred three or four times over the past few months, but was now permanent. The symptoms were that the set appeared to come out of standby, as the red light went from bright to dull, but almost immediately started to flash bright red then yellow alternately. Otherwise the set remained dead.

Checks showed that all the outputs from the power supply rose briefly to their correct levels, and that EHT was produced for a short time. Clearly some form of protection was coming into operation. Pin 19 of the microcontroller chip IC801 is the protect line. In normal use the voltage here should be 5V. In this case it reached only 1·1V. Several supply lines are connected to

the protect line via diodes that are arranged to conduct when the relevant supply goes low or disappears.

In this case diode D445 was switching on because of the absence of the tube's heater supply. As a result the protect line went low and the set shut down. The cause of the trouble was dry-joints at the series resistor R451, which is connected to pin 6 of the line output transformer. To make a reliable connection, this component had to be removed, scraped and tinned. Its condition explained the intermittent trouble prior to the total failure. **A.J.**

Philips 28PW6816 (A10E chassis)

This is a super-flat 28in. widescreen set with a built-in DVD player. The complaint was switching to standby after a few hours, with the red LED pulsing slowly. After a couple of hours on test the fault appeared as described. When the set was switched off and on again at the mains it started up again, which gave us a chance to check the error code in the service menu. Error 2 was shown: the service manual says that this means "vertical circuit defective", but experience has taught us not to regard this as being accurate. So we decided to run the set with a spare small-signals board (SSB) we had salvaged from a scrap A10E chassis. The set then ran perfectly all day, which proved that the fault was on the original SSB.

Most unusual faults with the A10E chassis are caused by a defective 'painter' chip, IC7064. Heating and cooling this item proved that it was the cause of the problem. In this case it's the less common type, known as the ED version (part no. 996500010426). Unlike the EP and ET versions no setting up or adjustments are required after fitting it. **A.J.**

Sanyo C25EG35-025 (EB2-A25 chassis)

I must have repaired dozens of these sets over the years and have required no more than a few different replacement parts. The main problem is that the chassis is plagued by dry-joints, virtually everywhere. The result is all sorts of faults including intermittently dead, picture collapse to a vertical line, no or intermittent field scanning, intermittent crackling on sound, and video-buzz breakthrough on sound depending on the volume-control setting.

The most effective cure – it's never failed up to now – is first to clean the whole board with PCB cleaner, then examine it carefully under a bench lamp, looking for dull soldered joints. A small problem will then very likely be encountered: when attempting to resolder these joints the original solder comes off completely, in little round globules. The solution is to clean and remove the original solder from the affected joint, then resolder using only new solder.

The components usually affected are the larger ones, i.e. transformers, ICs, capacitors, power diodes and the degaussing thermistor. **A.R-W.**

Naiko N2850W (PT92-110 chassis)

This 28in. widescreen supermarket TV set was just tripping. On investigation I found that the ceramic-disc tuning capacitor CD27 (2·2nF, 2kV) in the line output stage was burnt and leaky. A replacement cured the fault, but there was slight lack of width and the height was reduced as well. When I spoke to the customer he said it had been like this from new – he had thought this normal.

After numerous phone calls and web searches I eventually found out how to enter the service mode. You press and hold the volume-down button on the set and then press the teletext time button on the remote-control unit. Use the up/down cursor keys to navigate the menus and the left/right cursor keys to adjust – it's best to take a note of the original settings first in case you have to start all over again! New settings are stored automatically. Press the TV button to exit the service mode. **M.C.**

Schneider Cinema 2816.1

We had fitted a new line output transformer in this set because of arcing. The next day it was back in the workshop, dead with a short-circuit line output transistor (S2055N). A replacement was fitted but, on test, there was only a faint, narrow raster and after about a minute the transistor became very hot. Could the new transformer have failed? Another one was obtained and fitted, but the results were the same.

After that a more scientific approach was adopted! With the line output transistor removed, a scope check at its base connection revealed a very messy and distorted line-drive waveform. To cut a long story short, C304 (0·15μF, 63V) was found to be open-circuit. It's a small red capacitor that appears to be part of a damping network across the line driver transformer's primary winding.

A new capacitor restored the correct drive waveform and, after refitting the line output transistor, we were rewarded with an excellent picture – for about two minutes! This time there had been no overheating of the output transistor, but there was no drive at all at its base connection. When further checks were carried out in the line driver stage we found that there was a normal waveform at the base of the driver transistor but only a weak, distorted one at its collector. The transistor is a Darlington device, type BC618. A replacement restored normal operation, and a long soak test proved that no further faults were present.

Did the customer ask how much he owed us for the extra repair work? What do you think! **M.McC.**

Sony KV32DX30U (BE3E chassis)

Poor digital reception was the complaint with this widescreen, integrated digital TV set. Pictures broke up into mosaics and froze, with clicks and pops on the sound. Some channels were unobtainable. The customer had called out engineers when the set had been under guarantee, and was told that the aerial system was to blame. He had paid for a new 'digital' aerial, but the results were not much better.

The set displayed the same digital-reception problems in the workshop, so the cause of the trouble was obviously in the set itself. We decided to start by checking the set's UHF analogue reception – the customer had never used the set for this. Entering the tuning menu, we tuned in UHF channels 1 to 5. The result was grainy pictures on all channels. What could affect both digital and analogue reception in a set like this?

There's a small RF amplifier/splitter unit inside, mounted on the digital TV panel. One output feeds the built-in digital tuner, the other going to the UHF analogue tuner. The amplifier's 9V supply was present and correct. A replacement unit, part no. 8-598-515-00, restored normal reception on both systems. **M.McC.**

Black Diamond BDS29S (11AK19PRO chassis)

This set was dead with the surge-limiting resistor R817 (2·2Ω, 5W) open-circuit. Checks in the power supply showed no reason for its failure, and a replacement brought the power supply back to life. But there was no line output stage operation, and a scope check at the base of the line output transistor (Q605) showed that the line drive was missing.

The usual culprits in this situation are R866 (0·33Ω fusible) in the feed to the 8V regulator IC805 (7808) or R628 (2·2Ω fusible) in the feed to the line driver stage. Both were OK this time however. Further checks showed that there was no continuity between the base of the line output transistor and pin 4 of the driver transformer (TR601).

Once a blob of glue between scart socket 2 and the EW driver transistor Q603 had been removed, breaks in the tracks were visible. Fitting insulated wire links restored operation of the line timebase and a working set. **C.R.**

WHAT a LIFE!

Reports from the workshop and advice on PC printers and cartridges.

Donald Bullock's monthly commentary

I've heard it said that my hearing is not what it was, but beg to differ. It's just that people mumble more. Being of reasonable intelligence I don't watch much television nowadays, but I do listen to the BBC Home Service (which the whiz-kids call Radio Four) and I notice that many of the tape inserts in the *Today* programme are muffled, with barely any top response. Oh well, that's Progress I suppose.

A Grundig CUC2059

Anyway I was puzzled when I got a phone call the other day from Mrs Ruff, who told me that her belly had suddenly gone off – and a bit annoyed that she was wasting my time telling me about it.

"When you mean it's gone off, do you mean it has disappeared, or gone rotten?" I asked.

"I mean exactly what I say – it's gone off" she replied. Her voice reminded me of someone trying to saw a sheet of tin. "And you had it only the other day. My husband says he's got a good mind to come and sort you out."

"You'd better bring it in" I said. "I mean your belly, not your husband!"

She arrived at the shop shortly after. "He's in the car" she grated, leading me outside where she pointed to a Grundig TV set in the back of her car.

I brought it in and once I'd got her to depart Paul took a look at it. The set was one of those fitted with the CUC2059 chassis. It was dead all right, with the 1·6A mains fuse transformed into a tube of soot.

"Aye-aye, another of these" he commented as he went for the IRFPC50 chopper transistor in the power-supply section. "They've both winged it to heaven" he continued as he reached for a new transistor and fuse.

When he had fitted the replacements I watched anxiously to see what would happen when he switched the set on. But he didn't. He busied himself with a pair of nearby resistors, RP60001 (220kΩ) and PR60007 (120kΩ). These are the basic cause of the trouble, when they go high in value or open-circuit – it may be one or both of them that have done this. With the present set both were high, RP60001 measuring close to half a megohm.

Can you hear me?

Just as Paul had boxed up the Grundig set and placed it by the doorway Greeneyes clopped in with some mugs of tea. As she handed me mine she stubbed her toe on the set – and I got the tea in my lap. It was at this point that the well-dressed man with the briefcase called in.

"Mr Donald Bullock?" he asked Steven in a powerful, round voice.

Steven smiled and pointed towards Paul and me.

The chap smiled at Paul. "Mr Donald Bullock?" he repeated.

When Paul shook his head the man turned to me. "Mr Donald Bull..." he began.

I nodded and he came across to me, adjusting his height to mine. He spoke to me loudly, clearly and slowly.

"Can you hear me?" he continued, "my name is Friend, and I have good news for you."

"Are you sure you've got the right chap?" I said.

Mr Friend doubled up and laughed from his belly. Just for a few seconds. Then he undid his case and took out a little box. There was a tiny hearing aid inside it, as big as a pea.

"This will transform your life!" he boomed, "allow me to demonstrate it."

He popped it into my ear and a thousand invisible racing cars roared round the shop to the sound of a huge and fiercely quarrelling football crowd. I snatched the device from my ear at once and gave it back to him. "Not for me" I said, "but how much is it, anyway?"

"Only seven thousand pounds" he boomed.

I waived him out then eyed the boys. "Which one of you . . .?" I began. But I was speaking to an empty shop.

An Akai video

I had just got back after changing my trousers when Mr Ng, who always smiles, glided in with an Akai VCR.

"It is being absolutely dead, Donald" he said softly, "it's doing no work. It is showing me no numbers in the window, and always the little light is winking. It is being annoying to me, that little light."

"Worry not, Mr Ng!" I said brightly, "I am knowing what the trouble is. And I am having it mended for you by tea time."

Off he went, then Steven came in. "Any idea what's up with Mr Ng's Akai?" I asked. "It's a VSJ7 19EK-N and he says there's no display. It's dead with the standby light flashing."

"That usually means the 1,000μF, 16V capacitor in the power supply" Steven replied. "C116 I think it is."

And C116 it was. A replacement cured all Mr Ng's complaints.

Welsh magic

Our next callers were a Welsh couple, Dylan and Olwen Leekie. They had with them a Sony radio set. He was limping slightly.

"Been on my knees a lot, making a rockery, Mr Bullock" Dylan sang. Then he pointed to the set.

"Makes a silly noise, look you Mr Bullock" he sang, "like a motor-boat, can't they?"

"And we don't live anywhere near any water or anything" trilled Olwen. "I couldn't believe Dylan at first. After all he drinks quite a lot. I expect you know..."

Dylan straightened up and glowed at her. "Mr Bullock doesn't want to hear your silly stories about me, Olwen dear" he declared. "I don't hardly drink anything, Mr Bullock."

"Yes you do drink, Dylan. That's why your knees have swollen up. Show Mr Bullock."

I declined to take interest in this and tried the set. It was an ICF-SW1 and was motorboating.

"I'm worried that Dylan might get sea sick, what with his drinking..." trilled Olwen.

Paul decided to take a look at the set quickly while the couple went off to one or two other shops. It wasn't a difficult fault, electrolytic capacitor trouble again. The offenders were C601 (100μF) and C608 (33μF), both 4V types. There was no motorboating once replacements had been fitted.

When the couple returned for it the shop seemed to be so dull that I decided to set them arguing again.

"I knew a chap who drank a lot, and his knees swelled up like pumpkins" I said.

"That's what Dylan's knees have done Mr Bullock" she hooted.

"But they're nothing like pumpkins, dear " He rejoined, "and I hardly drink anything." Then he turned to me.

"Mr Bullock, please..." he pleaded.

A mean streak

Before our latest visit to the UK from back home in Spain a Mrs Tightwad-Glutton came to stay at a house close by, while its owner was taking a holiday. He'd asked me to loan and install a colour set for her while she was there. I had to obtain and rig up a temporary aerial, and spent quite a lot of time at it. He also asked us to take her back to the airport when her week was up.

"She'll pay you" he assured us. Only she didn't.

But she did buy herself a huge piece of steak the day before she was due to leave, only to find that she couldn't eat it all. Now that we were on our way to the airport she had this steak stowed in her hand luggage. As we neared the airport she began to have doubts as to whether she would be allowed to board the plane with it.

"Would you like to buy this steak?" she asked Greeneyes, "I paid good money for it."

"We don't eat red meat" Greeneyes replied.

"Couldn't you resell it to someone?" Mrs Tightwad-Glutton persisted.

It takes all sorts I suppose.

Printers

I've received a clear and detailed letter from reader Brian Gilbert following my moan about an Epson printer. He suggests that we play the printer manufacturers at their own game.

"Treat the printer as expendable" he advises. "After all it costs less than two full cartridges of ink. If it gives trouble by the time you have used them up, simply throw the printer away and buy another one complete with two more starter cartridges. You can buy a Lexmark Z615 printer (catalogue no. 670/0270) for £40 at Argos. I assume your PC has a USB connection. You will also need a USB lead. If you haven't got one, Argos can supply a lead at £10 (catalogue no. 676/0791). Also buy a Black Inkjet Refill Kit from Argos (catalogue no. 062/1063). It costs £7.99 and contains three bottles of ink and a syringe.

This printer comes with a black cartridge, 10N0017, and a colour cartridge, 10N0027. Being starter cartridges, they are half empty. Refilling the colour cartridge is difficult, as the colours get mixed up easily. So leave that one and stick to black. Insert the colour cartridge only when you really need it. The printer knows when only the black cartridge is present, and does its best with any colour content.

Then off you go! The ink will run out after less than a hundred pages. Distrust the 'ink out' warning noise. It often sounds when there is a significant amount of ink left. Just wait until the printing suffers. Then remove the cartridge and drill a small hole in the top, midway along the long side and a quarter of the way in on the narrow side, just big enough to insert the syringe. The kit may include a tiny hand-drill and plastic stoppers for the hole. If not, you will have to improvise. Don't allow the stopper to be too proud of the surface, as it might interfere when clamped in place.

Half fill the syringe and insert it through the hole. Probe around to find a hole in the cover over the sponge, and push the syringe to the bottom. Fill slowly. If you think you have over filled, withdraw the syringe until it is above the sponge and suck out surplus ink. Shake any surplus on to old newspaper. Avoid touching the printed circuit on the cartridge and if necessary wipe it clean with a tissue. Insert the stopper and refit the cartridge. Tell the printer, when asked, that it has a new black cartridge.

If the black cartridge gives up the ghost, don't pay £22.99 for a Lexmark 10N0016 full-size cartridge – go to a large Tesco store and get the Tesco own-brand one, which is clearly marked as being a replacement for the Lexmark 16."

"Worth a try?" Brian ends.

It certainly is. My thanks for your concise instructions on, as you put it, playing the printer boys at their own game. I will certainly follow your advice.

Letters and emails are always welcome – letters via the magazine office or emails to

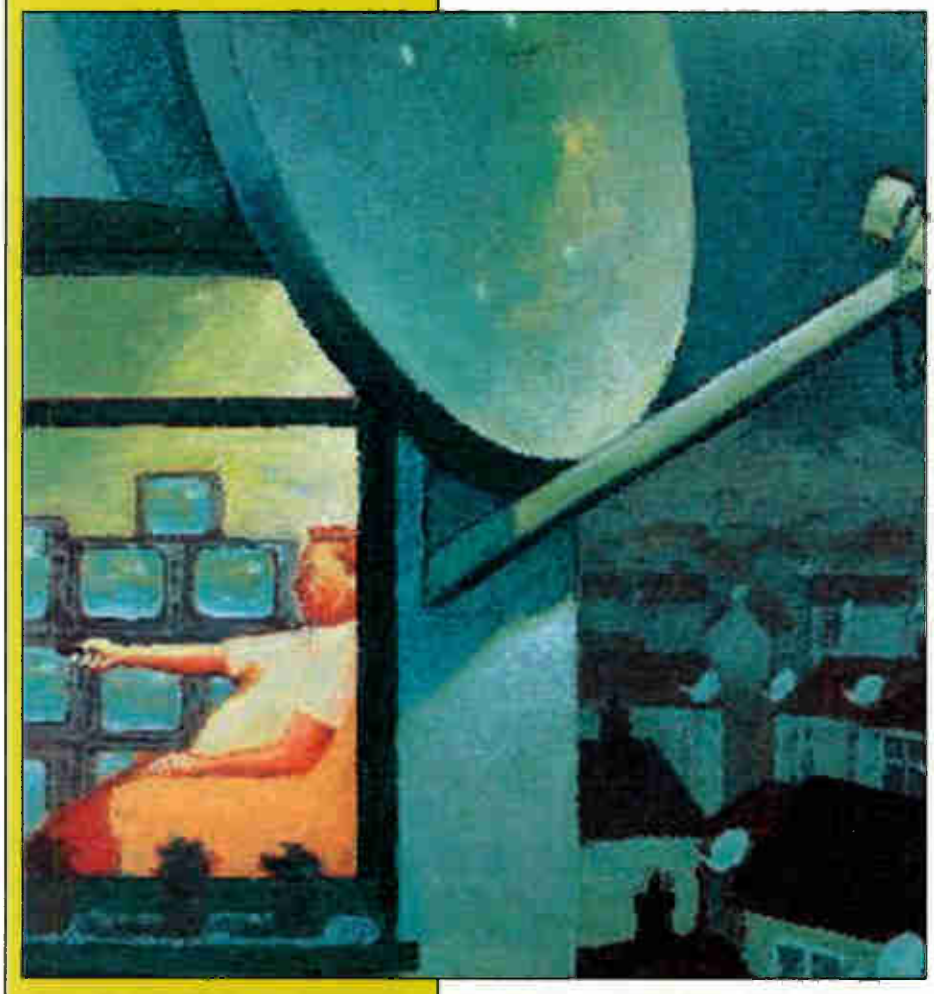
donald@wheatleypress.com

The VCR in retrospect

I see that Dixons has decided to phase out the sale of VCRs, after a quarter of a century, to concentrate on DVD players and recorders. Sales of DVD players have increased sevenfold over the past five years: they now outsell VCRs by forty to one. This is not surprising, since DVD players are now on offer for as little as £25, while a recorder can be bought for as little as £130 – likely to fall below £100 in the post-Christmas sales.

Dixons first sold VCRs in 1978, for £798.75, the equivalent of some £3,000 today. The machines were made by JVC, which had developed the VHS system. A similar model, with piano-style keys, was marketed as the Ferguson Videostar.

I was amongst those who bought one of the earliest Ferguson Videostar machines, a Model 3V16. We could have wished for nothing better, and made a practice of recording every worthwhile film that ever appeared on TV. Today we have a vast library and often dip into it to enjoy such classics as *Twelve Angry Men*, not to mention the early Busby Berkeley choreographed musicals. ■



SATELLITE NOTEBOOK

Reports from Christopher Holland and Michael Dranfield

Early transatlantic TV

The usual way in which North American news film was shown on TV in the UK prior to the launch of the Telstar satellite in 1962 was to send it across the Atlantic by air then scan it in. This naturally involved a considerable time delay. Recently I came across a copy of the *BBC Handbook* for 1960, in which a transmission system that speeded things up is described. The system was developed by the BBC and was first used in 1959. Basically, the film was scanned then transmitted via a standard transatlantic telephone line. As the phone line's bandwidth was far too small for video the film speed was slowed down, a black-and-white frame taking eight seconds to transmit. To reduce the transmission time, only alternate film frames were sent. No doubt the receiving film would have had to be synchronised in some way with the transmitted film, but there was no mention of this. The system enabled half a minute's TV transmission to be sent across the Atlantic in about fifty minutes. Presumably sound commentary would have been sent before or after the vision. And the receiving film would have had to be developed. How things have changed!

The first use of the system was to show newsfilm in the UK of the Queen's visit to Canada in June 1959. Pictures of her departure from the UK were also sent, in the opposite direction, to Canadian TV.

The article says that film of the Queen's arrival in Canada was seen on UK TV screens just over two hours after being shot, which would have been several hours ahead of the time taken to air-freight the film. The Canadian film was also seen in France, sent via the Eurovision network which started up in 1954. The system was presumably in regular use after that for a few years until satellites took over. **C.H.**

Digital channel update

The latest channel additions at 28·2°E are listed in Table 1. Where allocated, the

Photo 1: Start of ITV3 via Astra 2D.

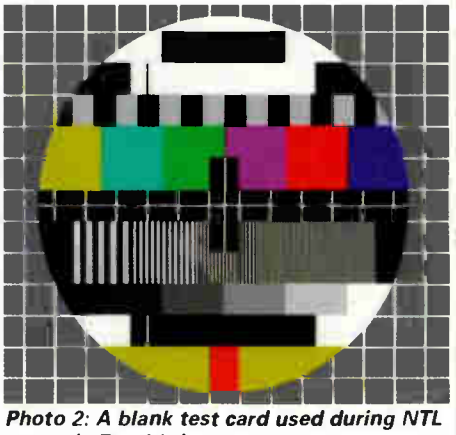


Photo 2: A blank test card used during NTL tests via Eurobird.

Photo 3: A Nilesat feed at about 12·202GHz.

Photo 4: Promo channel from Nilesat at 11·938GHz.

Photo 5: Showtime promo channel via Nilesat at 11·977GHz.

Photo 6: Saudi Arabia TV2 via Nilesat at 12·054GHz.

Photo 7: Video Cairo Sat feed via Nilesat at 12·149GHz.

Photo 8: Sawatel feed via Nilesat at 12·149GHz.

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

Channel and EPG no.	*Sat*	*TP*	*Frequency/pol*
ITV3* (119)	2D	54	10·906GHz/V See Photo 1
ITV tests	2D	44	10·758GHz/V
Move channel*	2A	13	11·953GHz/H
NTL tests	EB	C3	11·307GHz/H See Photo 2
On Air Radio* (938)	EB	C6	11·390GHz/V
Open Access 2* (262)	EB	D10S	11·642GHz/V
Sky Travel + 1 (140)	2D	52	10·877GHz/V
TWC Reloaded* (428)	EB	D9S	11·623GHz/H
UKTV G2 + 1 (256)	2A	6	11·818GHz/V
Unlimited TV* (259)	EB	D10S	11·642GHz/V
Wine TV* (253)	EB	C6	11·390GHz/V

*Free-to-air channels

TP = Transponder 2A = Astra 2A 2D = Astra 2D EB = Eurobird

EPG number is shown in brackets after the channel name.

ITV3 (119) appeared as a free-to-air channel on 1 November (see Photo 1), after two weeks of an encrypted promotional video that followed the colour-bar tests mentioned here last month. At the same time ITV2's EPG number changed from 175 to 118, replacing Granada Plus which suddenly ceased transmissions during the afternoon of 1 November. At the time of writing, ITV1 and ITV2 are still encrypted. One can't help but wonder for how much longer. Watch this space! In the middle of November ITV started tests via transponder 44 (Astra 2D), but there have been no programmes so far.

The Estate Agents Channel mentioned last month as testing via Eurobird transponder D7S has been allocated number 250 in the Sky EPG, with the name Real Estate TV.

Radio Caroline has announced that it is to move, along with several other channels, from Eurobird transponder D7S to the recently-activated transponder C6 (11·390GHz V), which apparently gives better signal strength in some parts of Europe. As Radio Caroline isn't yet in the Sky EPG, it has to be added in via a digibox's extra channels menu. The new frequency won't be updated automatically when in the extra channels menu – it would be if there was an EPG number.

To update the Radio Caroline entry in the extra channels menu, use the remote-control unit's yellow button to delete the old entry then do a search, entering the new frequency, the normal symbol rate of 27,500 and the forward error correction value 2/3 in the add channels menu. **C.H.**

Nilesat at 7°W

This month we'll take a look at what's available via the Egyptian Nilesat satellite at 7°W. The satellite's footprint is directed at North Africa and the Middle East, the signal strength in the UK being such that a dish of 1m diameter or more is required. The satellite transmits a considerable number of free-to-air Arabic-language and other channels however, some of which are available only via subscription or not at all via other satellites.

There are actually two co-located satellites, Nilesat 101 and 102. The former covers 11·7-11·9GHz while the latter covers 11·9-12·3GHz: there is probably some backup capacity on each, so this coverage could alter. Table 2 lists the various services currently available.

Newsfeeds are uplinked between 12·19-12·3GHz, with vertical polarisation, 3/4 FEC and a symbol rate of 2,894, 5,788 or 6,111. Photo 3 shows a feed received at about 12·202GHz with a symbol rate of 5,788. The Palestinian channel at 12·192GHz is used to uplink signals to the multiplex at 11·804GHz.

The news channels transmitted at 12·303GHz are aimed at the Indian subcontinent. They are interesting, as they are not seen elsewhere in Europe. **C.H.**

Pace 2600C1

This model seems to use the same chipset as the Amstrad DRX300. So it came as no surprise when loads of them started to come in with the display "no satellite signal being received", or working for a while then losing the signal. The usual solution is to replace the CX24108-20 front-end ZIF downconverter chip U200.

With the first one I repaired I removed the screening can, which is not easy, only to find that you don't have to as the top comes off! **M.D.**

Amstrad DRX100

This digibox was stuck in standby, with the red standby LED glowing very dimly. It's a common fault, which is usually caused by C9 (1,000μF, 10V) in the power supply. When a replacement had been fit-

Photo 9: ARY One TV via Nilesat at 12·303GHz.

ted however the digibox was still stuck in standby, but this time with a bright red LED. It transpired that the flash memory had been corrupted by the ripple on the supply line. A forced download cured the problem. **M.D.**

Pace 2600C1

This digibox said "no satellite signal being received". But not, this time, because the CX24108-20 chip was faulty. After boot-up the LNB voltage was at 18V instead of 13V. A quick check on the installer menu showed that the default channel was correctly set to vertical (13V).

In this model LNB supply switching is carried out via the I^2C bus, so a corrupt EEPROM chip was high on the list of possibilities. A replacement failed to provide a cure however. Data and clock signals were present at pins 12 and 13 of the LNBP21-20P bus-controlled LNB switching regulator chip U2700, which appeared to be working but was actually faulty. A replacement restored the correct voltage at the LNB socket and normal operation. **M.D.**

Table 2: Transmissions available from Nilesat at 7°W

Frequency/pol	*SR*	*FEC*	*Services*
11·747GHz/V	27,500	3/4	Various Arabic educational channels.
11·766GHz/H	27,500	3/4	BBC World India, Nile TV, various Egyptian TV feeds and radio stations too numerous to list.
11·785GHz/V	27,500	3/4	Dubai ch. 33*, Dubai Sports, CNBC Arabiya and various other TV and radio stations.
11·804GHz/H	27,500	3/4	Palestinian TV, Alhurra.
11·823GHz/V	27,500	3/4	Morocco, Sudan, Oman, Bahrain, Syria, Kuwait plus various radio stations.
11·843GHz/H	27,500	3/4	Nile Variety, Drama, Sports**, Sports Super**, ART (Arabic Radio and TV) feeds plus various radio stations.
11·862GHz/V	27,500	3/4	Showtime Network**.
11·881GHz/H	27,500	3/4	ADD**, Al Diyar, Smarts Way Channel.
11·900GHz/V	27,500	3/4	TV5 Middle East, DWTV Arabic, MBC2*, Dream 1, 2 and various other TV and radio stations.
11·919GHz/H	27,500	5/6	Show Net.
11·938GHz/V	27,500	3/4	Orbit Network** plus Promo Channel (see Photo 4).
11·958GHz/H	27,500	3/4	ADD**.
11·977GHz/V	27,500	3/4	Showtime Network** and unencrypted Showtime promo channel (see Photo 5).
11·996GHz/H	27,500	3/4	Showtime Network**.
12·015GHz/V	27,500	3/4	Al Jazerra Sports, 2M Morocco, CCTV9, Euronews and various radio stations.
12·034GHz/H	27,500	3/4	Jordan, Blue Nile, MBC, Al Jazerra, Al Arabiya.
12·054GHz/V	27,500	3/4	Saudi Arabia TV1, TV2* (see Photo 6) and various other TV and radio stations.
12·130GHz/V	27,500	3/4	Various Lebanese TV and radio stations.
12·149GHz/H	27,500	3/4	Sahar 1, Video Cairo Sat feeds (see Photo 7), Al Jazerra feeds, Sawatel feeds (see Photo 8).
12·192GHz/V	2,894	3/4	Palestinian Satellite channel.
12·226GHz/H	27,500	3/4	Arabian Travel TV, Samacom, Al Fayaa, Edeera.
12·303GHz/H	27,500	3/4	NTV Bangladash, ATN Bangla, ARY One TV (see Photo 9), NDTV India and various ART feeds.

*English-language programmes. **Encrypted channels.

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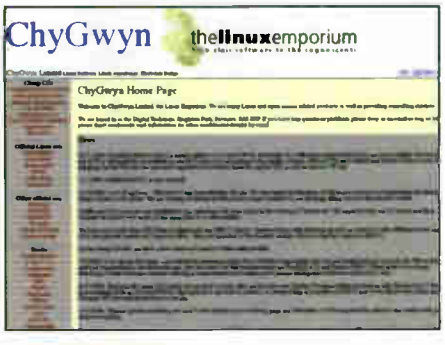

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Belinea 103015

This 17in. monitor's power supply had blown up. An unusual feature is that the on/off switch, though it looks like a regular mains type, actually controls the feedback from the regulation optocoupler. Thus the mains supply is present whenever the monitor is plugged in, regardless of the position of the on/off switch.

The IRFBC40G insulated-gate bipolar chopper transistor Q101 had failed violently, rupturing its emitter current sensing resistor R127 (0·22Ω, 5W). The track to R128 (1kΩ, 0·125W) had blown along its entire length, while a square slab had been blown out of the UC3842 control chip. Every zener diode on the primary side of the supply was faulty, and Q136 (2SA733) had failed. Several 1N4148 diodes needed replacement, and many resistors were suspect. R124 had been destroyed beyond recognition. In most designs the value of the resistor in this position is between 22-47Ω. I opted for 39Ω, 0·25W. The position for a diode in parallel with R124 was unoccupied. It provides faster discharge for the IGBT's gate capacitance and, when fitted, results in a slightly cooler-running chopper transistor. A fast rectifier like the FR102 works well in this position.

With a blow up like this all diodes, including zeners, and transistors in the power supply should be checked. The regulation optocoupler in this design is fed via a 470kΩ resistor, R140, which had protected it from the current surge.

When mains voltage was applied to the rebuilt power supply it worked. But the monitor didn't! The cause was failure of a resistor in the supply to the timebase generator chip. Once this item had been replaced the monitor worked perfectly. **I.F.**

Sony Multiscan 210ES

This monitor was dead with the 4A mains input fuse F601 blown. To get at the print side of the PCB the monitor has to be dismantled completely.

Remove the four case screws, next the two self-tapping screws that hold the plastic chassis to the front escutcheon, then the two threaded screws between the chassis and the CRT metal support. There are now twelve different plugs, including the EHT lead, to be disconnected. After doing this the chassis and PCB can be removed from the front escutcheon and CRT assembly.

To remove the PCB from the plastic chassis, take out the two self-tapping screws that appear to hold the mains input plug, then remove the data cable securing and the earthing tab to reveal two more self-tapping screws. Finally there are two more screws, one at the left and one at the right side of the PCB, about half way across. The PCB can then be levered out from its retaining clips.

The cause of the trouble was obvious once all this had been done. What appeared to be pin 9 of the line output transformer (T501), the pin spaced apart from the others, had arced through to the screening plate underneath it. A general clean up of the area was all that was required. But I glued a piece of mica to the screening plate to isolate it from transformer's pin, just in case another flashover should occur. **A.R-W.**

Apple Power PC M3046/Macintosh Performa 5200

Although it was eight years old, my customer wanted this combi computer/monitor repaired – she was used to it. The monitor part is of LG Electronics manufacture (CA34 chassis) and was completely dead. When I dismantled the monitor the cause was immediately apparent, as the line output transformer had a large bubble on its case. A replacement, part no. 154-128B, plus a new line output transistor (Q721, type 2SC5120) revived the monitor, which produced a superb display.

Once the monitor had been correctly set up and seen by my delighted customer, I was asked to upgrade the hard disk to 20GB. **A.R-W.**

Acer 7133

The fault report that came with this monitor said "when switched on the front LED lights for half a second then goes off". I removed the only two visible screws that hold the monitor's cover to the front escutcheon at the bottom and found that the top was stuck solid. To unfasten it, the trick is to insert a blunt screwdriver into the crack between the cover and top escutcheon, about 3cm from the left and right edges in turn, and press down hard, at the same time pushing the cover back and releasing the plastic clips that hold it to the front.

I was then able to get at the innards. The cause of the trouble was simple: the mains on/off switch at the front of the monitor was making only momentary contact. The switch is a single-pole one, of exactly the same type that's often fitted to the back of AT or ATX computer power supplies, except that the original was coloured cream. **A.R-W.**

Sony PVM-20L1

When the power supply was switched on this monitor made a tripping noise. Checks inside the unit, on the main board, using a multimeter soon revealed the cause. There was a dry-joint on the white mains input wire to the main board, just behind the power switch. All that was required to restore normal operation was to resolder this wire. **C.B.**

Answer to Test Case 505

– see page 150 –

Todd found that the picture fault disappeared completely when he moved the surround-sound loudspeakers away from the console rear-projection TV set. So re-siting the speakers a bit farther away from the set was all that was required to clear this 'fault'. Normally, nearby magnetic fields cause colour stains (impurity) in a colour set's display. But this was a projection model with three small CRTs that don't have shadowmasks. Thus differential deflection of the three electron beams, each one in its own CRT, has no effect on colour purity. Instead, it moves the primary-colour images with respect to each other on the screen. Hence the colour fringing – or "tartan" effect as Pete called it.

The sparklies on the pictures from the old analogue set-top box were caused by mistuning – oscillator frequency drift in either the receiver's tuner or the LNB after all these years. Conventional retuning cured the fault but, had Todd been more familiar with this model and its operation, he could have made life easier for himself by keying 'set up' then '2' to get into the LNB offset mode. This winds the preset frequency of the tuner's oscillator up and down. It affects all channels and thus saves the labour of doing each channel separately.

Digital TV sets and control chips make the chore of tuning unnecessary, and have obviated faults like this one.

NEXT MONTH IN TELEVISION

Repair of liquid-crystal displays

Increasing numbers of monitors and, now, TV sets use a liquid-crystal display. This means a completely different approach to repair. Much work on LCDs can be done only under Class 100 clean-room conditions. Peter Doxat of Teleplan Warranty Services describes the various fault conditions that arise and the repair possibilities.

Cult of the AVO 8

The AVO 8 is possibly the most famous multimeter of all time, putting in its first appearance way back in 1923. You can now buy the Mk 7 version. Why would you want to? Well, there are many applications where an analogue meter has decided advantages, and you can't do better than an AVO 8. Eugene Trundle takes a close look at the current model, its features and uses.

Vintage repair: the Körting MT157/158 tape recorder

Remember the era of reel-to-reel audio tape recorders? Michael Maurice has had one of these machines in the family since the early Sixties. He describes its construction and operation, and a restoration project.

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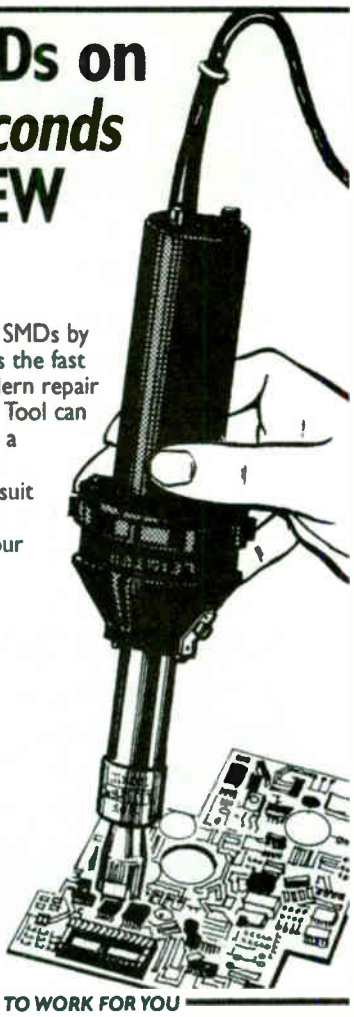

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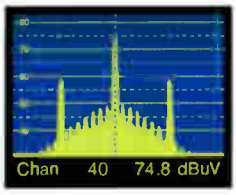

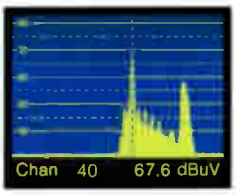

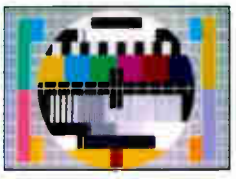

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