Tips, guides and reports for people repairing televisions and electronic equipment

TELEVISION

AND HOME ELECTRONICS REPAIR

MAY 2001 £3.00

Safe car wiring extensions

Mic preamp and mixer project

Servicing the Philips Anubis A chassis

Digibox/VCR/TV interconnections

Fault reports

Satellite, PC Monitors, TVs and VCRs

9 770032 647115 05>

We've seen the history of television unfold, now it's time we looked to the future...

As television comes of age, as the digital world embraces our industry, welcome to the future of replacement components, Classic Electronics. Whether you're looking for a new video head, transformers or remote control for the latest system, look to the Classic range of products for unrivalled reliability, quality and cost effectiveness.

Since we first started supplying components to the television and video industry back in the 70's, we've seen some historic changes, we've been part of those changes and we're looking forward to the future. Classic, the new name for components you've trusted and used for over 25 years. Available now from your distributor.

Visit us on Stand 10.66

National Exhibition Centre Birmingham UK

The ERShow

Sunday 22nd - Tuesday 24th April 2001

classic

Technical helpline 01635 278678

CONTENTS

May 2001 Vol. 51, No. 7

Cover photography
Mark Swallow

Editor
Martin Eccles

Consultant Editor
John A. Reddihough

Publisher
Mick Elliott

Advertisement Sales Manager
David Wilson
0208 652 3033

Group Advertisement Sales Executive
Pat Bunce
0208 652 8339
Fax 0208 652 3981

Editorial Office
01782 870684
Fax 01782 878233

Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

Next issue, dated June, on sale May 16th.

Economic Devices

32 Temple Street, Wolverhampton, WV2 4AN, UK Tele ++ 44 (0)1902 773122 Fax ++ 44 (0)1902 429052

We take your hassle

Some suppliers just won't help. We will work really hard to find those difficult parts - just ask and let our 'no holds barred' enquiry hound work for you.! ! !

...and look at the special offers..... (strictly while stocks last)

BUT11A @ 29P each BUT11AF @ 31P each
BU508A @ 60P each Fully wired scart lead 99P

a slight inconvenience....
....you must buy more than one.

BU208A	X 5	£3.75	TEA2018A	X 5	£3.70
BU508A	X 5	£3.00	UC3842	X 5	£2.95
BU508AF	X 5	£4.25	CNX62A	X 5	£1.45
BU508D	X 5	£4.45	S2000AF	X 5	£4.20
BUT11A	X 5	£1.45	TDA3653B	X 5	£2.75
BUT11AF	X 5	£2.35	TDA3654	X 5	£4.10
Philips type 1.2 volt Back up battery				X 5	£2.95
Philips type 2.4 volt Back up battery				X 5	£6.00
Scart - Scart lead 1.5m Fully wired				X 2	£1.98
Positor PT37,TH98009 (White)				X 5	£2.95
Thorn TX100 Chassis 110 DGR LOPTX				each	£11.24
Philips CP90 Chassis LOPTX				each	£11.63

....and now ask about our value for money full price list.

Remember £1.50 post & handling
All major credit cards accepted

MAJOR STOCKIST PHOENIX
PSU repair - refurb kits
Look for the PHOENIX stamp of approval
Over 200,000 kits sold

New Pace Digibox PSU refurb kit

Remote Controls from **£5.95** each
Stock held for over 5000 different models

SEMICONDUCTORS
Over **34,000** types of
transistors, ICs, diodes etc. or equivalents stocked

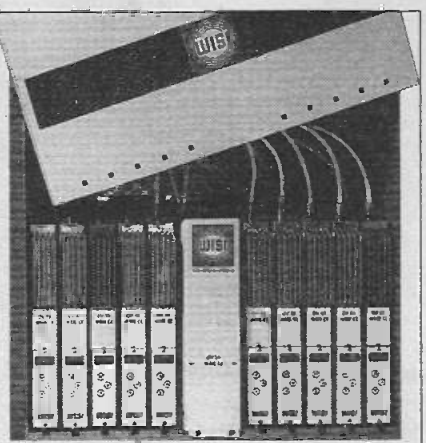
www.telepart.co.uk

The web page where you can look up the price and order all things TV, VCR and Satellite. Web search by model for video parts, remote controls, LOPT's etc,.
overseas enquiries particularly welcome

New CCTV catalogue out NOW
cameras, monitors, switches
quads, multiplexers, the lot.

The WISI headend that says YES to

- *Quality*
- *Ease of use*
- *Agility*
- *Each module an almost total entity*
- *Superb value*



WISI TOPLINE HEADEND

WISI's Topline headend system is very competitively priced yet is of superior design and build. It is easy-to-use with high quality channel processing that allows the user to retain quality of vision and sound for both analogue and digital signal sources. There are processors for satellite TV, terrestrial TV and radio.Each individual module incorporates its own control system enabling quick and easy set up. These chonnel processors come together in an 'all-in-one' base unit which contains all necessary accessories for eose of ordering - no additional items required.

CHECK THESE FEATURES

- Frequency agile freely selectable in the VHF or UHF range.
- Adjacent channel capable.
- TV standards 64 QAM B/G, D/K, I, L, M.
- Modular system for headend stations in SMATV and CATV systems.
- Modules for Analogue and Digital:
  Satellite TV & Radio: Analogue & Digital
  Terrestrial TV & Radio: Analogue & Digital
  Satellite I.F. Converters: Analogue & Digital compatible
  Terrestrial TV Converters: Analogue & Digital compatible
  TV Modulators: Analogue & Digital
- Individually programmable modules.
- High output level.
- Wall mounting or 19" rack mount with lockable cabinet door.

May we send you full details?

U.K. STOCKIST
J.W. Hardy Communications

WISI *A Breakthrough in Headend Design*

J.W. HARDY COMMUNICATIONS, 231 Station Road, Birmingham B33 8BB Telephone: 0121 784 8478 Fax: 0121 789 7931

M.C.E.S.

Specialists in the service and repair of all types of:

Digital Tuner Units

(Including Amstrad DRX 100)

Analogue Tuner Units
IF amplifier modules
RF Modulators & Booster amps
Video Heads
L.N.B.'s

FOR LATEST INFORMATION
and CURRENT PRICES
SEE OUR WEB SITE

HTTP://WWW.MCES.CO.UK

Telephone: 0161 746 8037
Fax: 0161 746 8136
Email: sales@mces.co.uk

15 Lostock Road, Davyhulme
Manchester M41 0ES

Dealing with the digital confusion

The public could be forgiven for thinking that digital TV is a con to get people to take on pay-TV. After all, the main sales effort has come from the pay-TV broadcasters, who have the finance and motivation to get people to go digital. It has in fact been vital for the contending providers of digital TV, satellite, terrestrial and cable, to collar as large a proportion of digital viewers in order to guarantee the future of their services. But however much pay-TV broadcasters may wish to sign up viewers, there is a substantial number of people who are either simply not interested in the additional services that digital can provide or who simply don't want to pay for what they feel should be free. It's not just that these people don't want digital TV however: they will affect the eventual analogue-digital transition, since no government is likely to switch off the analogue transmitters so long as a substantial proportion of viewers rely on them.

Since it is wasteful to have duplicated services in analogue and digital form, the question is how to appeal to those who are reluctant to switch over. The main effort has to go into putting across the idea of free-to-air (FTA) digital terrestrial TV. This shouldn't be too difficult, given adequate resources, since FTA digital offers a wider range of channels for no extra running cost and good-quality reception. But it does of course involve expense, on a receiver if you don't get an STB subsidised by a pay-TV service and, quite probably, on an expensive aerial upgrade – to ensure adequate signal input from the lower-power digital TV transmitters and to take into account the different UHF channel groupings that digital TV has brought about.

What can be done to encourage FTA digital viewing? Danny Churchill, deputy chairman of the Digital Television Group (DTG) and director of technology development at Dixons, writing in *ERT Weekly* identifies the problems as follows. He feels that the large number of broadcasters, setmakers and retailers involved are finding it difficult to get together to help promote digital TV. They have different agendas and different levels of commitment. There is a lack of overall leadership, and a push for change is not helped by the fact that the analogue TV market is still a very healthy one. Nevertheless everyone welcomes the existence of a new market, and an advertising campaign, starting at Easter, should help promote the multi-channel benefits of digital terrestrial TV.

But however good the promotion, it won't be successful if there is an inadequate supply of digital receiving equipment, either STB converters or integrated digital TV sets. The problem here has been uncertainty over basic receiver specification. From the public's point of view there has also been a lack of clear information on FTA DTT and the equipment available for its reception. The retailers have been found wanting in this respect – remember those now famed government ministers who tried and failed to get adequate answers to their questions? The blame tends, not unjustifiably, to be passed around. Why should retailers be expected to make much effort when little equipment is available and the public is being given little encouragement to take to FTA DTT? The FTA broadcasters also have their problems. For example if the BBC makes an effort at FTA promotion the pay-TV broadcasters are inclined to shout 'foul'.

According to Danny Churchill, dealer research has established that consumers find it difficult, at the point of sale, to distinguish between analogue and digital widescreen TV sets. The introduction of a DVB logo as a kitemark for IDTV sets, now backed by the government with the support of BREMA and the DTG, should help here. The research also revealed that while awareness of the BSkyB and ONdigital multi-channel pay-TV offerings is very high, awareness of the FTA option, and in particular its extra channels, is very low "if not zero". DTT broadcasters are combating this with an advertising campaign that promotes ten-channel widescreen digital as preferable to five-channel 4:3 analogue TV. This is linked to the kitemark with the campaign line "look for the DVB logo". ONdigital should benefit indirectly, since it will be easier to obtain subscribers once members of the public have taken the digital first step.

The problems of DTT coverage and aerial requirements are being looked at by a DTG working group which plans to make a lot more information available to manufacturers and dealers, including a series of service area maps that will show where adequate signal strength can be guaranteed. These will be issued to manufacturers so that they can provide dealer advice. On the aerial side, ONdigital and the DTG is providing manufacturers with an updated "area installation experience report". This indicates where reception has been troublesome and is improving. The aim is to provide advice to retailers so that they can sell with confidence. The Confederation of Aerial Industries (CAI) is collaborating with these moves, and a guideline of charges has been produced. Prices should range from £40 for aerial adjustment to £275 for a new system guaranteed to provide optimum performance in the prevailing reception conditions.

There's a long way to go to get everyone to move to digital TV. But at least some practical steps are being taken to encourage the move.

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Editorial correspondence should be addressed to "Television", Editorial Department, Reed Business Information, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

INDEXES AND BINDERS
Indexes for Vols. 38 to 50 are available at £3.50 each from SoftCopy Ltd., who can also supply an thirteen-year consolidated index on computer disc. For further details see page 440.
Binders that hold twelve issues of *Television* are available for £6.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

BACK NUMBERS
Some back issues are available at £3.50 each.

SUBSCRIPTION ENQUIRIES

Telephone:	01444 445 566
Fax:	01444 445 447
Credit card orders:	01622 778 000

Address: Television, Subscriptions Dept, PO Box 302, Haywards Heath, West Sussex RH16 3YY, UK.
Make cheques payable to: Television
Subscription rates:

UK	£32.00 per year
Airmail Eire	£36.00 per year
Airmail Europe	£46.00 per year
Airmail Rest of World	£59.00 per year

NEWSTRADE ENQUIRIES
Distributed by MarketForce
Telephone: 0207 261 7704

WEB SITE
For a full list of RBI magazines:
http//www.reedbusiness.com
ISSN **0032-647X**

REED BUSINESS INFORMATION

TELETOPICS

The analogue TV switch off

Two recently published reports suggest that the analogue TV switch-off may have to be postponed beyond the government's target of 2006-2010. A report by the media buying and research agency Optimedia says that by 2005 almost a third of homes could still be relying on analogue TV transmissions. The government's target for the start of the switch-off is conditional on at least 75 per cent of homes having access to digital TV, with full conversion to digital happening when at least 95 per cent of homes are equipped for digital TV and sets are available at prices affordable to those on low and fixed incomes.

Optimedia forecasts that almost 7·6 million (30 per cent) of households will still be receiving analogue TV in 2005, and that 3·2 million households will have opted for free-to-air (FTA) digital TV. It believes that ONdigital's pay-TV services will account for just 7·6 per cent of the market, with less than two million households having signed up.

The Consumers' Association, after carrying out a survey of 1,918 adults about their attitudes to and awareness of digital TV, concludes that the government's plans for the analogue switch off are "fatally flawed". Of those without digital TV, 32 per cent said they would never have it. 48 per cent of viewers said they would watch only FTA channels after the switch-off. So far, 66 per cent of those without digital TV said that they would not consider the switch. Fifty per cent of retired analogue TV viewers who knew about digital TV said that they would never switch to digital.

The Consumers' Association says that the government should end the forced march to the analogue switch-off and adopt a digital changeover policy that enables viewers "to switch to digital easily, affordably and because they want to". It's view is that the government should either postpone the shut down of analogue TV or subsidise the switch-over by making it either "inexpensive or free", so that viewers have "no or negligible financial outlay".

There seems to be no good reason to hasten the switch off, apart from the illogicality of continuing to run both services. But subsidies would be an expensive commitment, especially when the likely need for a good new aerial for terrestrial digital TV is considered. It is also going to be very expensive to achieve digital TV coverage that's comparable with that of the analogue services.

The government has decided to launch an information campaign on digital TV to combat confusion about the technology and the services available. It is also to introduce a kitemark to identify sets able to receive digital services. The intention is to avoid confusion with sets that have digital features but don't provide digital reception. Ministers who made enquiries found that they were given misleading information by some retailers.

NEC has developed a domestic personal-assistant robot called PaPeRo (Partner Personal Robot) that can recognise people's faces and 650 spoken phrases and can speak more than 3,000 phrases. On the basis of voice recognition it can carry out a number of tasks such as access to e-mail via the internet, the operation of TV, video and other equipment and appliances, provide reminders, play games and tell the time. The idea is to provide a user-friendly human-machine interface to make modern systems more readily usable by those who might experience difficulties, such as the elderly. It could also help with emergencies and with home security. Further development work on the system is being carried out.

Satellite ITV

In what appears to be a rather curious piece of wheeler-dealing ITV has reached agreement with SES to lease Astra 2D transponders for its services. The ten-year deal involves payment of some £100m. So ITV could, by the end of the year, be available to satellite viewers separately or via BSkyB. It seems that BSkyB had been asking £20m a year for ITV to join the SkyDigital package. Negotiations between ITV and BSkyB are expected to follow.

Kingston's VOD service

Kingston Communications plans to launch a video-on-demand service that will be based on the largest single streaming media server computer in the world. The server, nCube's n4 system, would enable Kingston to provide more than 6,600 audio-video streams simultaneously from a single item of multimedia content at a rate of 2-4Mbits/sec. Servers today typically provide about 500 streams per computer, so that broadcasters have to use several.

Kingston currently provides an ADSL-based service for several thousand subscribers in the Hull area, offering digital TV, high-speed internet access and local information on demand.

Satellite TV news

Eutelsat's Eurobird satellite was successfully launched into orbit at 28·5°E on March 8th, with a footprint that includes the UK. Its 24 transponders operate in the 11·2-11·7 and 12·5-12·75GHz bands. Eutelsat has signed a contract with Boeing Satellite Systems Inc. for fast delivery of the e-bird satellite, which will orbit at 25·5°E with twenty transponders covering Europe. Launch is expected to take place in the second quarter of 2002. The transponders will be optimised for IP access networks with return-link capabilities.

SES, the Astra satellite operator, has agreed to buy General Electric's satellite division GE Americom in a $5bn cash plus shares deal that will make it the largest company in the field. Assuming that it's approved by the US regulatory authorities, the merger should be completed by the end of the year. SES will then have a global network of regional satellite systems,

New from Sony

Sony has unveiled a range of new products, many of which will be released in the UK this year. They include Sony's first plasma-screen display (see photo above), Model PFM-42B1, which will sell for about £6,000. The screen has a diameter of 42in. with 3·15 million pixels and offers four aspect ratios, 16:9, wide zoom, letterbox zoom and 4:3, plus a zoom facility for close-ups.

A new range of projection TV sets, known as PS2 (nothing to do with the games console!), includes Sony's Digital Reality Creation (DRC) technology which uses digital processing to increase screen resolution. Screen sizes are up to 61in.

Sony says that DVD player sales in Europe will increase from four million in 2000 to about eight million this year. The company's new DVD models include the DVP-S9000ES, which incorporates a Super Audio (SACD) player; Model DVP-NS400D which provides DVD-Video, audio CD and CD-R/RW operation; and the combined DVD/SACD/CD player and receiver Model DAV-S800 with 5.1-speaker system. Sony has confirmed plans to launch a combined DVD-RW/DVD+RW home video recorder next year.

Model SLV-SE810 is a hi-fi VCR which includes satellite decoder control, a Smart Dial Timer, the Smart Search Plus tape management system, and Sony's Reality Regenerator and Super Trilogic technologies which are designed to improve picture quality.

Sony has ceased production of new Video-8 camcorders, its entry level now being Hi-8. Model DCR-TRV30 is a DV camcorder with a 1·55 megapixel CCD image sensor whose horizontal resolution is 530 lines and still image resolution 1,360 x 1,020 pixels. The camcorder uses 14-bit digital signal processing and features Super Steady Shot and NightShot technologies. Digital-8 Model DCR-TRV830E includes an MPEG movie feature and comes with a portable printer for still images. The CCD-TRV78E is a Hi-8 model with a 2·5in. LCD screen and a x560 digital zoom (x20 optical).

Last year Sony launched the MVC-1000, the first digital still camera to use CD-R discs as the recording medium. Models MVC-CD200 (with 2·1 megapixel CCD image sensor) and MVC-CD300 (with 3·1 megapixel image sensor) use 8cm CD-R/RW discs, each of which can store up to 81 fine-quality images or 13,000 VGA images.

In the audio sector Sony has launched the first multi-channel SACD player in Europe, Model SCD-XB770, and a PC-connection kit that makes it possible to download music files stored on a computer hard disc to a blank MiniDisc. The music files (such as MP3) are converted to PCM files before being stored on disc. The latest MiniDisc recorders offer high-speed dubbing and LP recording (x2 and x4). New MiniDisc portable players are compatible with LP recordings.

Sony has launched double-density CD-R/RW media and drives. The new discs can store twice as much data as a conventional CD (1·3Gbytes compared with 650Mbytes). The first double-density drive, Model CRX200E-RP, can write CD-Rs at x12 speed and CD/RW discs at x8 speed. It can read conventional CD-R/RW discs, but double-density discs cannot be read by standard CD-ROM or CD-R/RW drives.

The new double-density discs are the same size as ordinary CDs (120mm diameter, 1·2mm thick) but the track pitch is reduced from 1·6 microns to 1·1 microns, the maximum pit length is 0·623 microns instead of 0·833 microns, and the scanning velocity is 0·9m/sec compared with 1·2-1·4m/sec. The laser wavelength is the same (780nm), but the numerical aperture with the double-density laser optical system is 0·50 instead of 0·45 for reading data and 0·55 instead of 0·50 for reading/writing data.

Toshiba's China move

Toshiba has ceased to make CRT TV sets in Japan for the domestic market, transferring production to China. The aim is to reduce costs in a market that Toshiba sees as becoming increasingly competitive. Toshiba had been producing about half a million sets a year at its Fukaya plant in eastern Japan. The plant will now concentrate on liquid-crystal projectors and the development of digital TV.

Production capacity at Toshiba's Chinese plant at Dalian is being increased from the present million a year to one and a half million. Some 800,000 sets a year, including digital TV models, will be exported to Japan. Key components such as ICs for digital signal processing will be supplied to Dalian from Japan.

Next-generation processor

Sony Computer Entertainment, which makes the PlayStation 2 games console, has joined forces with Toshiba and IBM in a $400 million, five-year programme to develop a next-generation microprocessor chip with supercomputer processing power (teraflops) for consumer applications. The work will be carried out by a team of 300 at IBM's Austin, Texas base. Toshiba and SCE jointly developed the processor for the PlayStation 2.

The new sub-0·1µm processor, to be called Cell, will employ various technologies including copper interconnect, silicon-on-insulator transistors and the use of low-k dielectric material. It will enable 'intelligent' consumer products to communicate with one another and the internet via broadband networks. Possible future applications could include holographic or 3D TV.

This slimline video wall system has been added to Mitsubishi's range of video appliances. The display is based on Texas Instruments' digital light-processor chip, which provides XGA quality. Control is from a PC via an RS232C port. The light-source lamp has a life of 8,000 hours and provides a high-brightness display at 500cd/m².

WHAT A LIFE

A tale of ordinary folk? Donald Bullock on some of the characters he has encountered during his time in the TV servicing trade. All life is here!

We ran into Mike Wort the other day. Originally from the Isle of Wight, he now lives here in Spain and earns a living from the satellite dishes that sprout up everywhere hereabouts. Said he'd been a reader of this column for years, so I asked him in for a glass of wine. It wasn't long, being the sort of person he is, before he asked to check our TV picture. Then he asked for a short ladder, so that he could adjust the dish.

As I went to get it I realised I was a bit stiff. It's the cheap but all too palatable Spanish wine that does it. He noticed and ran out. "I'll carry it for you" he said, "I daresay it's a bit heavy."

What was I to say? Couldn't very well tell him I was OK, it was only the wine. He'd think me a wine-o. And I didn't want to pass a comment on getting older, Sometimes it's best to say nothing.

Another recent visitor was Philip Dowding, who has a TV business in Malmesbury, Wiltshire. He has a rich store of anecdotes about the unusual customers he's come across. One of them was the well-healed widow of an army officer. Her husband's former batman lives in an annex attached to her house. He helps with the cleaning and cooking, and generally looks after her. When she wants something she summons him by ringing a hand-bell!

You called, ma'am?

When Phil last called it was because her ancient dual-standard GEC set had broken down. Seeing its age and condition – and hers – he suggested that it might be time to invest in a new set.

"Why should I?" she asked.

"Well, for one thing it would have remote control" Phil said. "So you wouldn't have to get up to change channels."

"I don't now. Burrows sees to all that."

Just imagine it. Tinkle tinkle. "You called, ma'am?"

"BBC 2 Burrows, if you please."

"Certainly madam." Click!

Phil didn't make his sale!

Mr Bounty

This reminded me of a customer who'd once called in, a Mr Bounty. He was a scruffy fellow but seemed reasonable enough. He'd come with his wife, and was asking about a rental set. While we were talking he sent his wife out to their car to get us a couple of new-laid goose eggs. A kindly man, I thought.

"By the way I've just bought nearly half of Cranham Woods" he said. "I intend to build a woodland mansion there."

My jaw sagged. Cranham Woods indeed! It's a vast area where even a small house costs a fortune.

"It'll be heaven for the kiddies" he continued, "I'm looking for builders and carpenters right now. If you know anyone suitable, let me know. Only the best though. I pay top rates for first-class work and dedication."

He chose a set and told us his address. "Woodman's Cottage, end of Black Lane. I negotiated eight-ten months free stay with the town clerk, while the new place goes up. Amazing how they lick your boots when they know there's money about. Mind you it's a bit small and ramshackle, but it'll do temporarily. Can't really complain, can I?"

Our van man delivered the set. When he returned he mentioned that the place was a bit of a dump to say the least. He hadn't been able to find anywhere to put the set, and had had to leave it on the floor.

"Where's his deposit?" I asked.

"Said he'd bring it along later today."

He didn't. Nor did he call the next day. After a while I phoned old Mr Manderson, who ran our local Trade Protection Society.

"Oooh! Ha, ha! So he's had you too has he? Ha, ha. He doesn't have a bean you know. Nutty as they come, and a rogue with it. Lives in an imaginary world. You never phone us till it's too late, do you? You just don't learn. Hoo, hoo."

"We'll take the rental set back" I said.

"You'll be lucky. He usually sells any rental goods within ten minutes of getting 'em."

The Colonel

Then there was The Colonel, who was a horse expert. He arrived in a huge, newish Land Rover that was loaded with bales of straw. His Hitachi colour set was on top of them. He was dressed in tweeds and brogues, his speech was slow and quiet, and he oozed quality of a restrained kind. A horse clopped by as he brought his set in. It seemed to send him into a quiet ecstasy.

"I love horses" he said. "They're my business and my pleasure. I keep a horse farm. How fortunate I am to make a living from something I love."

I filled in a job card. Colonel Sir Aubrey French, The Cotswold Corals, Trepington. Trepington! A lovely Cotswold villiage, miles from anywhere and trapped in a fertile valley.

"We keep about a hundred horses" he said. "Breed 'em, train 'em, look after their health. Got our own vet of course. Supply several Arab sheikhs . . ." He went on to say that he was writing an authoritative book on horses and everything to do with them.

"Don't like to boast, but the book's been commissioned by the country's top publisher. Couldn't really spare the time, but then I couldn't refuse the £250,000 advance – just for doing what I'm happiest at . . ."

Colonel French's set was a Model C2514T. The symptoms were lack of height, and it kept shutting down. I decided to check the HT voltage first. It should have been 150V but was high at 190V. As a result the line output stage derived 27V supply, which powers the TA8427K field output chip IC601, had been driven up to 35V. So IC601 was being severely overrun.

The cause of the trouble was in the circuit that monitors the HT voltage for regulation purposes. R951 (82kΩ, 0·5W), which is in series with the HT preset, on the chassis side, had risen in value to 115kΩ. A replacement restored normal operation and, to be on the safe side, I replaced he TA8427K chip as well.

Colonel French collected his set a day or two later, took the bill and promised to drop his cheque in the post. "A pleasure, Colonel."

It didn't arrive, and after three months and a few reminders I telephoned his house.

His wife answered. I tactfully suggested that the bill might have slipped her husband's mind as he was engrossed in writing his book.

"How much is it?" she asked.

"Twenty pounds" I replied.

She promised to bring the money in the morning, and did. She was a colourless and sad soul, with a pale, worried face and baggy eyes. She arrived on an ancient scooter, and paid with

some well used notes and silver coins.

I felt sorry for her as she counted out the money. She looked all in, as pale, ill and shaky as her husband was bonny, solid and fit. As she turned to go she stumbled.

"Is something wrong, Lady French?" I asked.

She blinked and shook her head. "There's no Lady French" she said. "Please don't take any more work from him. He's an unemployable nobody. Name's Roy Small. Done no end of time for fraud. He's inside right now. We've got nothing but debts. I've had to borrow this bit of money. He spends everything he gets on his silly countryman's clothes, and spends his time wandering around looking at horses. We live with my people. Otherwise I'd starve."

"But the book" I said, "that huge advance."

"All fantasy" she replied flatly.

"And the Land Rover?"

"It belongs to my sister's husband. My husband nags and nags until he gets to borrow it. When it runs out of petrol he abandons it and cadges a lift back. We often have to collect it from miles away."

The bomb

Then there was Mrs Webster, the manager of a prestige hotel which she ran to her own strict standards. At the end of the day however she would enjoy a specially-prepared meal in the hotel's dining room then adjourn to the bar, where she would gently punish the gin bottle. Mrs Webster, originally from Wales, had a store of wartime reminiscences. They became more entertaining as the gin flowed.

Suddenly she heard a faint ticking and, as the line moved on, she stopped, parted a bush and found herself falling down a deep well. She landed on a pile of soft hay and there, beside her, was the landmine, ticking away.

One evening, while I was fixing their Philips projection set, she invited me to join her at the bar. "I'll tell you about the bomb" she said, in her melodic Welsh dialect."

By the time I got there the gin was flowing well. The bomb – it was thought to be a landmine – had dropped somewhere in the Rhondda valley. But nobody knew quite where, which is how she'd become involved.

"I knew the area well" she said, "all the pit-workings, the mineshafts, everything. So it wasn't surprising that when Mr Churchill came to our village next morning he sought me out."

"This bomb will be ticking gently, Mrs Webster" he said, "and I want you to organise a group to find it. I have to tell you that it's a dangerous job. The bomb could go off at any time. But there could be a medal or two in it."

"I don't care about the danger or the medals, I'll do it" she replied.

So, Mrs Webster told us, she lined up two hundred people, side by side, and advanced them slowly across the valley, with their ears to the ground. Suddenly she heard a faint ticking and, as the line moved on, she stopped, parted a bush and found herself falling down a deep well. She landed on a pile of soft hay and there, beside her, was the landmine, ticking away.

"I called out, and everyone came back and helped me out" she continued, "and of course they made the bomb safe."

"Was it a deep well?" I asked her

"Forty eight feet, eight inches" she replied.

I looked at her. "How do you know it was forty eight feet, eight inches?" I asked.

"I counted the courses of bricks as I fell" she replied. "Four to the foot."

Then she reached for her gin again. ■

Grandata Ltd

distributor of electronic components

Line Output Transformers

Part No	Code	Price
ALBA		
3714002	LOT02	£ 8.00
043714002J	LOT02	£ 8.00
43700000	LOT02	£ 8.00
AMSTRAD		
3714002	LOT02	£ 8.00
043714002J	LOT02	£ 8.00
43700000	LOT02	£ 8.00
FERGUSON		
06 D-3-084-001	LOT23	£12.00
06 D-3-087-001	LOT23	£12.00
HINARI		
3714002	LOT02	£ 8.00
043714002J	LOT02	£ 8.00
43700000	LOT02	£ 8.00
HITACHI		
2424593	LOT44	£ 9.00
2433751	LOT01	£13.00
2433752	LOT01	£13.00
2433891	LOT23	£12.00
2433893	LOT23	£12.00
2433952	LOT33	£10.00

Part No	Code	Price
HITACHI continued		
2434141	LOT33	£10.00
2434274	LOT44	£ 9.00
2434393	LOT405	£18.00
2434593	LOT44	£ 9.00
2435006	LOT401	£15.00
2436201	LOT90	£10.00
2433891H	LOT23	£12.00
MATSUI		
3714002	LOT02	£ 8.00
043714002J	LOT02	£ 8.00
43700000	LOT02	£ 8.00
7140021	LOT02	£ 8.00
MITSUBISHI		
731003	LOT51	£13.00
334 P 18506	LOT51	£13.00
ORION		
3714002	LOT02	£ 8.00
043714002J	LOT02	£ 8.00
43700000	LOT02	£ 8.00
PANASONIC		
TLF 14512 F	LOT39	£15.00

Part No	Code	Price
PANASONIC continued		
TLF 14520 F	LOT40	£15.00
TLF 14521 F	LOT39	£15.00
TLF 14567 F	LOT39	£15.00
TLF 14568 F	LOT40	£15.00
TLF 14584 F	LOT41	£15.50
TLF 14586 F	LOT42	£15.00
PHILIPS		
3119 108 31260	LOT90	£10.00
3119 198 62930	LOT57	£10.00
3122 138 36920	LOT57	£10.00
3122 138 36922	LOT57	£10.00
3122 138 36923	LOT57	£10.00
3122 138 37620	LOT90	£10.00
3139 128 30400	LOT90	£10.00
4812 140 10369	LOT90	£10.00
4812 140 10421	LOT90	£10.00
4822 140 10274	LOT123	£11.00
4822 140 10306	LOT57	£10.00
4822 140 10381	LOT128	£11.00
4822 140 10384	LOT127	£15.50
4822 140 10406	LOT73	£10.00
AT 2079 / 40	LOT73	£10.00
AT 2076 / 10	LOT57	£10.00

Part No	Code	Price
SAISHO		
3714002	LOT02	£ 8.00
043714002J	LOT02	£ 8.00
43700000	LOT02	£ 8.00
7140021	LOT02	£ 8.00
SHARP		
RTRNF 1220 CEZZ	LOT39	£15.00
SONY		
1-439-332-41	LOT100	£12.00
1-439-332-42	LOT101	£12.00
1-439-332-52	LOT100	£12.00
1-439-387-11 LOT311 £12.00		
1-439-387-21	LOT311	£12.00
TOSHIBA		
2433751	LOT01	£13.00
23236098	LOT288	£14.00
23236198	LOT288	£14.00
23236255	LOT289	£13.00
23236425	LOT288	£14.00

Many many more LOPT's in Stock... Please ring for ones not listed

105°c Radial Electrolytic Capacitors

VALUE	CODE	PRICE	PER PACK
10 volts			
470uF	CAP29	120p	10
16 volts			
330uF	CAP30	175p	10
470uF	CAP31	175p	10
680uF	CAP32	210p	5
1000uF	CAP33	210p	10
2200uF	CAP34	525p	10
3300uF	CAP35	500p	5
4700uF	CAP36	610p	10
25 volts			
10uF	CAP37	45p	10
22uF	CAP38	45p	10
47uF	CAP39	48p	5
100uF	CAP40	70p	10
150uF	CAP41	95p	5
220uF	CAP42	120p	10
330uF	CAP43	140p	5
470uF	CAP44	190p	10
680uF	CAP45	315p	5
1000uF	CAP46	365p	10
1500uF	CAP47	390p	5
2200uF	CAP48	200p	2
3300uF	CAP49	220p	2
4700uF	CAP50	365p	2
6800uF	CAP51	390p	2
35 volts			
10uF	CAP52	50p	10
22uF	CAP53	45p	10
33uF	CAP54	50p	5
47uF	CAP55	85p	10
100uF	CAP56	85p	10
150uF	CAP57	95p	5
220uF	CAP58	145p	5

VALUE	CODE	PRICE	PER PACK
35 volts continued.....			
680uF	CAP59	650p	10
1000uF	CAP60	435p	10
2200uF	CAP61	245p	2
3300uF	CAP62	1000p	5
50 volts			
10uF	CAP63	50p	10
22uF	CAP64	70p	10
47uF	CAP65	85p	10
100uF	CAP66	85p	10
220uF	CAP67	175p	10
330uF	CAP68	245p	10
470uF	CAP69	435p	10
680uF	CAP70	490p	5
1000uF	CAP71	525p	10
2200uF	CAP72	325p	2
63 volts			
0.47uF	CAP73	35p	10
1uF	CAP74	35p	10
2.2uF	CAP75	35p	10
3.3uF	CAP76	50p	10
4.7uF	CAP77	35p	10
10uF	CAP78	50p	10
15uF	CAP79	95p	5
22uF	CAP80	75p	10
33uF	CAP81	85p	10
47uF	CAP82	95p	10
68uF	CAP83	130p	5
100uF	CAP84	120p	10
150uF	CAP85	280p	5
220uF	CAP86	280p	10
330uF	CAP87	400p	10
470uF	CAP88	525p	10
680uF	CAP89	500p	10

VALUE	CODE	PRICE	PER PACK
63 volts continued.....			
1000uF	CAP90	540p	5
100 volts			
0.47uF	CAP91	50p	5
1uF	CAP92	85p	10
1.5uF	CAP93	70p	5
2.2uF	CAP94	50p	5
3.3uF	CAP95	50p	5
4.7uF	CAP96	50p	5
10uF	CAP97	95p	10
22uF	CAP98	105p	10
33uF	CAP99	155p	5
47uF	CAP100	175p	10
100uF	CAP101	210p	10
220uF	CAP102	600p	5
470uF	CAP103	600p	5
250 volts			
3M3	CAP104	175p	10
10uF	CAP105	260p	10
47uF	CAP106	435p	10
400 volts			
1uF	CAP107	215p	5
2.2uF	CAP108	225p	5
4.7uF	CAP109	315p	5
10uF	CAP110	400p	5
22uF	CAP111	250p	2
47uF	CAP112	350p	2
450 volts			
1uF	CAP113	280p	5
2.2uF	CAP114	320p	5
4.7uF	CAP115	495p	5
10uF	CAP116	550p	5
22uF	CAP117	415p	2

We have over 50 other values Please call for values not listed

CD Pick Ups

Part No	Price
KSS 210 A Original	. . .£14.00
KSS 210 A Replacement	. .£11.00
KSS 210 B	. . . . . .£15.00
NKS240A Replacement for KSS 240A	. . .£20.00
KSS 213 B	. . . . . .£11.50
KSS 213 C	. . . . . .£11.50
OPTIMA 6S	. . . . . .£11.50
OPTIMA 5	. . . . . .£11.50
RCTRH8147 Mechanism.	. . . . . .£10.00
CDM12.1 Mechanism.	. . . . . .£20.00
KSM2101ADM Mechanism	. .£18.00
KSM 213 CCM Mechanism	. .£15.00

Aerial Installation Accessories

Coax Plug Aluminium (Pack of 10)

Order Code : PLG51
Price : £1.25 + vat

Coax Plug Plastic (Pack of 10)
Order Code : PLG52

Coax Socket Plastic (Pack of 10)
Order Code : PLG53
Price :£1.50 + vat

Metal Screw Type Coax Plugs

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

Coax Couplers Pack of 10

Socket to Socket
Order Code : PLG54

Plug to Plug
Order Code : PLG55

Plug to Socket
Order Code : PLG56

Price : £1.50

Twist On F Connectors

Order Code : SATSOCKET13
Price : 16p + vat

Y Splitter Inductive 3 way

Order Code : YSPLITTER
Price : 40p + vat

7mm Coax Clips with 25mm nail Pack of 100

Order Code : CLIP1
Price : 80p + vat

Tel : (020) 8900 2329 Email : grandata.ltd@btinternet.com
Fax : (020) 8903 6126 Website : http://www.grandata.co.uk

Grandata Ltd

distributor of electronic components

Digital Satelitte Spares

Sky Digital Remote Control

Order Code : RCSKY
Price : £ 10.75 + vat

Sky Digital Remote & TV Link Eye Combination

Price : £ 18.50 + vat

Magician 4 Remote & TV Link Eye Combination

Price : £ 18.00 + vat

Sky Digital TV Link Eye

Order Code : TVLINKEYE
£ 9.99 + vat each
5 plus ....£ 7.99 + vat each

Sky Digital Amplifier By-Pass Kit

This is designed to allow operation of the TV link Remote Eye in situations where the existing amplifier cannot be replaced with one of the Global Communication UHF/VHF distribution amps.

Order Code : AMPBYPASS
Price : £ 7.75 + vat

Magician Sky Digital Remote Control

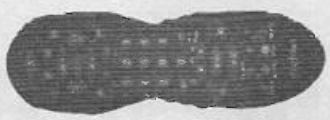
Operates all SKY digital TV box functions

Operates any combination of TV , VCR & Cable/Satellite systems

Full teletext and fatstext functions

Backlit device indicator keys

Ergonomic & tactile design



Order Code : MAGICIAN4
Price : £10.00 + vat

Global Communication Distribution Amplifier

Fully compatible with Sky Digital TV Link Eye
10dB gain to each Port
No Mains wiring required when using Sky Digibox

2 way	4 Way
Order Code	Order Code
GLOB2WAY	GLOB4WAY
Price : £ 13.75 + vat	Price : £17.25 + vat

THIS KIT IS DESIGNED TO REPAIR THE FOLLOWING POWER SUPPLY FAULTS ON THE PACE DIGIBOX 2200:
DEAD PSU TRIPPING PSU

IT COMES WITH CLEAR AND CONCISE INSTRUCTION ON HOW TO CARRY OUT THE WORK

Order Code :SATPSU32
Price : £15.00 + vat

THIS KIT IS DESIGNED TO REPAIR THE NO LNB VOLTAGE FAULT ON PACE DIGIBOX 2200

IIT COMES WITH CLEAR AND CONCISE INSTRUCTION ON HOW TO CARRY OUT THE WORK

Order Code : SATKIT33
Price : £4.00 + vat

PACE DIGIBOX 2200
SPARES SERVICE MANUAL
Contains :Circuit Diagrams
50 plus page Service Manual

Order Code : BOOK07
Price : £ 20.00 (No VAT)

Transistors / Linear IC's

BU208A	75p	BUT11A	35p	IRF820	90p	MJW16206	600p	TIPL791A	80p	LM723	40p	STR10006	450p	TA8207K	175p	TDA4605	190p
BU2508A	100p	BUT1AF	35p	IRF830	85p	MJW16212	350p	AN5151	200p	SAA1293	550p	STR20005	450p	TA8215	300p	TDA4950	100p
BU2508AF	110p	BUT12A	80p	IRF840	85p	S2000A3	175p	AN5601K	750p	SAB3035	275p	STR40090	350p	TA8221AH	600p	TDA8170	170p
BU2508D	130p	BUT12AF	90p	IRF9610	95p	S2000AF	90p	BA5406	180p	STK4131	480p	STR4211	315p	TA8227	250p	TDA8171	230p
BU2508DF	120p	BUT18A	80p	IRF9620	85p	S2000N	150p	BA6209	85p	STK4141 II	420p	STR440	800p	TA8251AH	700p	TDA8172	200p
BU2520AF	170p	BUT18AF	65p	IRFBC30	120p	S2055A	175p	HA13150A	1150p	STK4142	530p	STR441	950p	TA8427K	200p	TDA8350Q	275p
BU2520DF	225p	BUT56A	65p	IRFBC40	210p	S2055AF	175p	HA13151	875p	STK4151	680p	STR44115	475p	TA8718N	550p	TDA8362N3	1200p
BU2525A	325p	BUW13A	200p	IRFZ44	160p	S2055N	150p	HA13152	800p	STK4152	650p	STR451	800p	TDA1170N	85p	TEA1039	150p
BU2525AF	220p	BUZ80	135p	MJ11015	250p	TIP121	35p	HA13153A	900p	STK4171	900p	STR4512	400p	TDA1175	175p	TEA2018A	80p
BU2525D	240p	BUZ80AF	200p	MJ11016	300p	TIP122	30p	HA13155	920p	STK4172 II	680p	STR50103A	260p	TDA1180	120p	TEA2037	200p
BU2527AF	400p	BUZ90A	180p	MJ15003	250p	TIP125	30p	HA13157	950p	STK4191 II	900p	STR54041	320p	TDA1518BQ	240p	TEA2164	160p
BU426A	70p	BUZ90AF	280p	MJ15004	300p	TIP127	35p	LA4440	200p	STK4332	365p	STR58041	250p	TDA1557Q	300p	TEA2260	225p
BU508APH	60p	BUZ91A	260p	MJ15015	250p	TIP2955	50p	LA4445	200p	STK5331	300p	STR59041	300p	TDA1558Q	300p	TEA2261	185p
BU508D	75p	IRF510	70p	MJ15016	350p	TIP29A	22p	LA4460	120p	STK5332	180p	STR6020	270p	TDA2004	150p	TEA2262	275p
BU508DF	85p	IRF520	75p	MJ15022	400p	TIP3055	50p	LA4461	120p	STK5333	650p	STR61001	475p	TDA2005	150p	TEA5101A	300p
BU508V	110p	IRF530	75p	MJ15023	400p	TIP31A	22p	LA4705	400p	STK5337	500p	STR81145	375p	TDA2030	80p	TEA5101B	175p
BUF405A	200p	IRF540	100p	MJ15024	300p	TIP32A	21p	LA7830	90p	STK5481	470p	STRD1706	360p	TDA2030H	100p	TEA5170	200p
BUH1215	450p	IRF610	80p	MJ2501	100p	TIP33	50p	LA7851	200p	STK5482	285p	STRD1806	360p	TDA3562A	260p	UC3842N	60p
BUH315	200p	IRF620	100p	MJ2955	55p	TIP33C	60p	LM1207N	450p	STK73410	350p	STRD1816	350p	TDA3653B	80p	UC3842AN	80p
BUH315D	175p	IRF630	75p	MJE13007	100p	TIP34C	60p	LM2405T	625p	STK73410 II	500p	STRD4420	550p	TDA3653C	85p	UC3843	80p
BUH515	200p	IRF640	150p	MJE13009	100p	TIP35C	65p	LM2406T	400p	STK7348	400p	STRD6108	450p	TDA3654	80p	UC3843AN	80p
BUH515D	250p	IRF710	150p	MJE18004	125p	TIP36C	65p	LM2416T	650p	STK73605	375p	STRS6707	1000p	TDA4565	150p	UC3844	70p
BUH517	275p	IRF720	85p	MJF18004	175p	TIP41A	20p	LM324	30p	STK73907	700p	STRS6708	575p	TDA4600	200p	UC3844AN	80p
BUH517D	175p	IRF730	125p	MJF18006	200p	TIP41C	22p	LM339	35p	STK7406	650p	STRS6709	600p	TDA4600 II	160p	UC3845AN	80p
BUH715	425p	IRF740	90p	MJF18204	350p	TIP42C	22p	LM393	45p	STK7563F	650p	STV9379	400p	TDA4601	120p	UPC1488H	115p

* Please add £1 p+p and VAT to all orders
* All components are brand new
* We accept payment by Access , Switch , Visa , Cheque and Postal Order
* All prices quoted are subject to availabilty and may be changed without prior notice

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

Tel : (020) 8900 2329 Email : grandata.ltd@btinternet.com
Fax : (020) 8903 6126 Website : http://www.grandata.co.uk

Having discovered that modern tape recorders don't have provision for a microphone input, Keith Cummins designed the preamplifier/mixer circuit presented here to meet this need

Microphone preamplifier

When I set about finding a replacement for my thirty-year old Sony TC136 tape recorder I discovered that more recent models don't have provision for a microphone input. This is a drawback, as I sometimes need to produce voice recordings to send to distant family or friends. So, having bought a new recorder plus a MiniDisc machine, I decided to design and build a suitable microphone preamplifier. The result is presented in this article. The preamplifier includes a pan-pot for moving the voice position within the stereo field, and a mixer stage that provides voice over other programme material.

Design parameters

The design assumes that a good-quality dynamic microphone with an impedance of 600Ω will be used. Phase is maintained, i.e. with both the microphone and line inputs a positive-going input results in a positive-going output. A design aim is that the signal-to-noise ratio and frequency response won't compromise the performance of the recorder. Because of the unit's likely infrequent use and the possibility that a mains power supply could introduce both hum and earth-loop problems, I decided to use battery power – two PP3 batteries provide positive and negative 9V rails. The unit is housed in a neat, sloping panel box that's available from Maplin. The basic specification is set out in Table 1.

Circuit description

The full circuit of the unit is shown in Fig. 1. It uses two ICs. IC1, an OP27, is the microphone preamplifier stage. IC2, a TL074, contains four operational amplifiers which are used to provide the stereo panning and the mixing facilities.

The microphone preamplifier could hardly be simpler. The OP27 chip, which is a low-noise instrumentation op-amp, is used in the classic inverting mode. Since pin 2 is a virtual earth, R1 sets the input impedance. Its value, 620Ω, matches that of the microphone. C1 has two functions. It sets the low-frequency roll-off point, in this case 60Hz, for the microphone channel. It also blocks DC, ensuring that the op-amp offset is not amplified by the ratio R2:R1. This ratio does set the AC gain however. To be precise, this is –R2/R1, the minus sign indicating phase inversion.

The gain from the mic. input terminals, in dB, is

$20 \log_{10} (220{,}000/620)$, i.e. 51dB.

Since the microphone is terminated by its own impedance, its terminal voltage is reduced by 6dB. So the preamplifier's gain relative to the open-circuit output voltage of the microphone is 51 – 6 = 45dB.

The upper frequency limit is determined by the OP27 IC's gain-bandwidth product. Because of the high gain, the device starts to run out of steam just above audible frequencies. It's 3dB down at 25kHz. This is acceptable and helps reduce the possibility of RF breakthrough.

Because of the low DC offset and the use of positive and negative supply lines, there is no need to block DC to the mic. level control RV1, whose slider is taken to the non-inverting inputs of IC2a/b. This is where the circuit starts to get interesting.

The pan amplifier section

When the gains of IC2a and IC2b are equal, the same microphone signal level will appear at the left- and right-channel outputs and the sound will appear to come from mid-way between the stereo speakers. The purpose of the pan-pot RV2 is to move the apparent sound source left or right across the stereo sound stage.

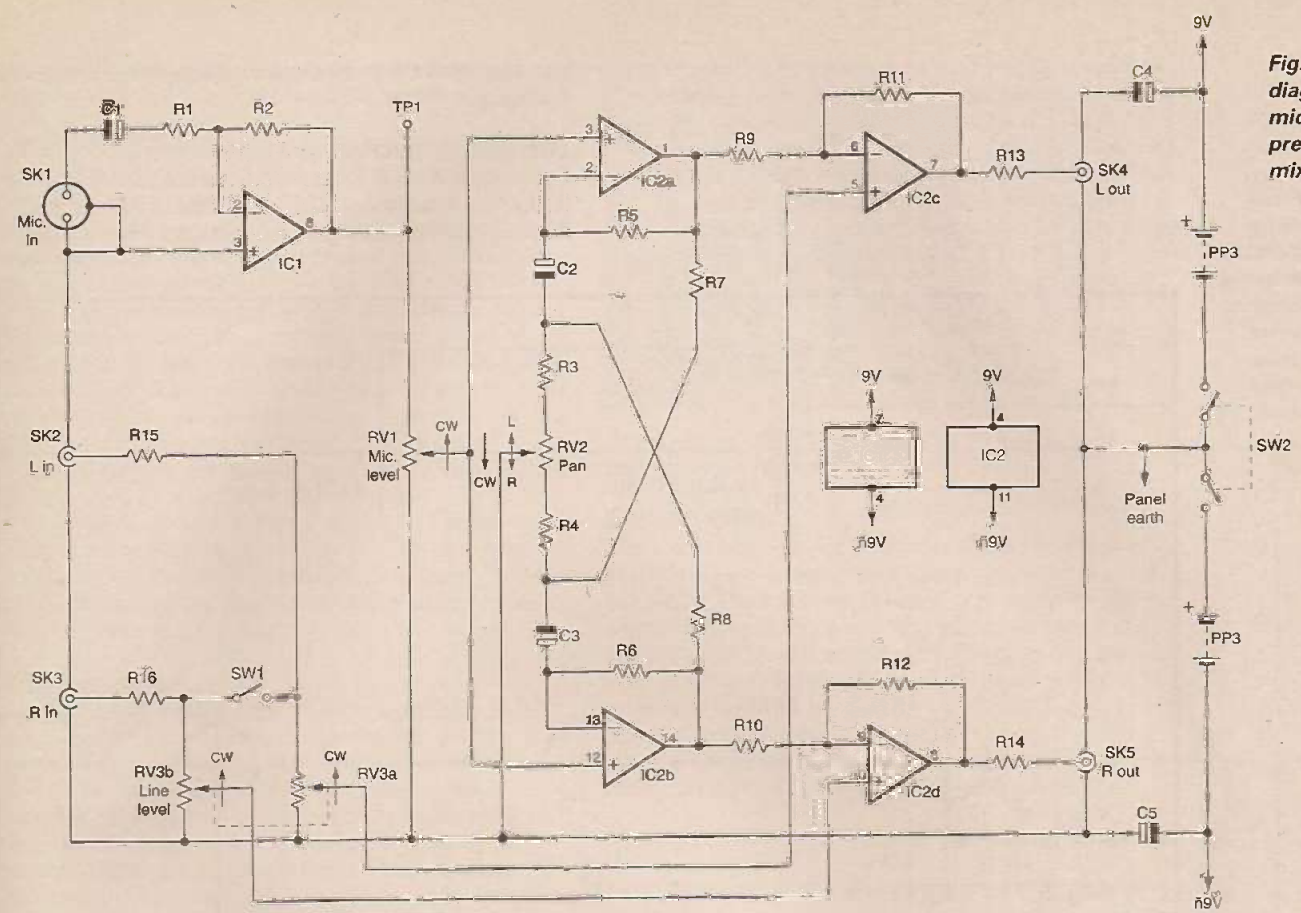


Fig. 1: Circuit diagram of the microphone preamplifier/ mixer unit.

To do this correctly, the gain in one direction has to be increased by the same amount as the gain in the other direction is reduced.

As I discovered when designing the circuit, this is not as easy as it sounds. First, I should mention that it is not a good idea to allow full power on one side and nothing on the other – this gives rise to a somewhat unnatural 'lop-sided' stereo effect. My listening experiments indicated that a maximum 12dB difference in levels is about right.

Having established this, the next task was to design a circuit that's symmetrically balanced, so that for every 1dB increase at one side there's a complementary 1dB decrease at the other. If, the for moment, you imagine that R7 and R8 are not fitted, then do the calculations to find out what happens to the gains of IC2a and IC2b as RV2 is adjusted, you will see that there is an increase of nearly 5dB at one side but the corresponding decrease at the other side is only about 2·5dB. This is unacceptable since, overall, the sum of the two output levels has increased. We want the apparent sound source to move but not become louder. The solution is to provide cross-coupled feedback via R7 and R8.

The scheme works as follows. With RV2 centred, the outputs from pins 1 and 14 of IC2 will be equal. Thus in this unique position the gains can be calculated by imagining R8 to be in parallel with R5 and R7 to be in parallel with R6. A simple calculation shows that this is equivalent to removing R7 and R8 and changing the values of R5 and R6 to 27kΩ. The gain in each channel is then 11·36dB.

Having established this, we have to consider what happens when RV2 is moved off centre. Let's say it's moved upwards, i.e. the gain of the left channel is increased. The gain of IC2a increases, and feedback via R7 to the inverting input of IC2b reduces this op-amp's output. This reduced output is applied via R8 to the inverting input of IC2a, further increasing its gain. Thus the compensating effect, in dB, is complementary in the two halves of the circuit.

The compensation has to be precise: too much will over compensate for the error we want to correct. The simple op-amp calculations I started off with were superseded by two sheets of A4 and involved some horrible numbers. What you have to do is to assign voltages and currents to the various parts of the feedback network, then apply Kirchhoff's Laws, derive six simultaneous equations, solve them, calculate the gains – and pour yourself a whisky!

The results of this toil are shown in Table 2, measured at 1kHz using a Levell RC oscillator type TG200DMP and a Levell broadband voltmeter type TM6B. The errors are so small that they are insignificant with listening tests.

Table 1: Microphone preamplifier specification.

Input impedance (mic.)	600Ω unbalanced
Gain from mic. input terminals to output*	62dB
Panning range	±6·5dB†
Mic. channel frequency response (–3dB points)	60Hz-25kHz
Signal-to-noise ratio	76dB‡
Output headroom (at 2V RMS output)	8dB
Power consumption at 18V	11mA

* With mic. gain control RV1 at maximum and panning control RV2 centred.
† Maximum difference between channels = 13dB.
‡ Relative to 0dBm, i.e. 775mV RMS. With output at 1kHz and mic. input terminated at 600Ω.

Capacitors C2 and C3 are included as DC blocks to prevent the op-amps' offset voltages being affected by RV2. As the TL074 is a FET input device, 100 per cent DC feedback can be applied via R5 and R6. This minimises the offset. Note that although C2 and C3 are electrolytics they work with such low voltages (millivolts) that their polarisation is insignificant. This also applies to C1 in the microphone preamplifier section.

The mixer section

The outputs from IC2a and IC2b are fed via R9 and R10 to the mixer stages IC2c and IC2d. As far as the inverted microphone signal is concerned these act as

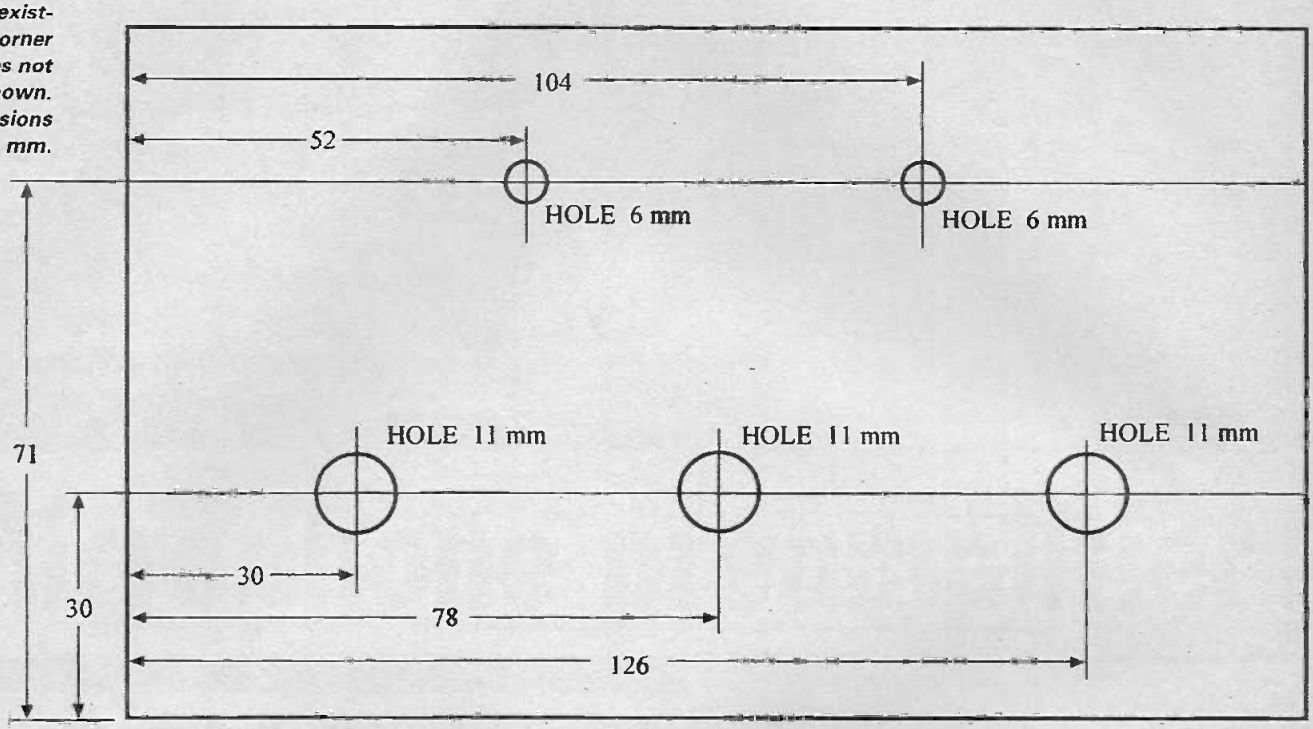
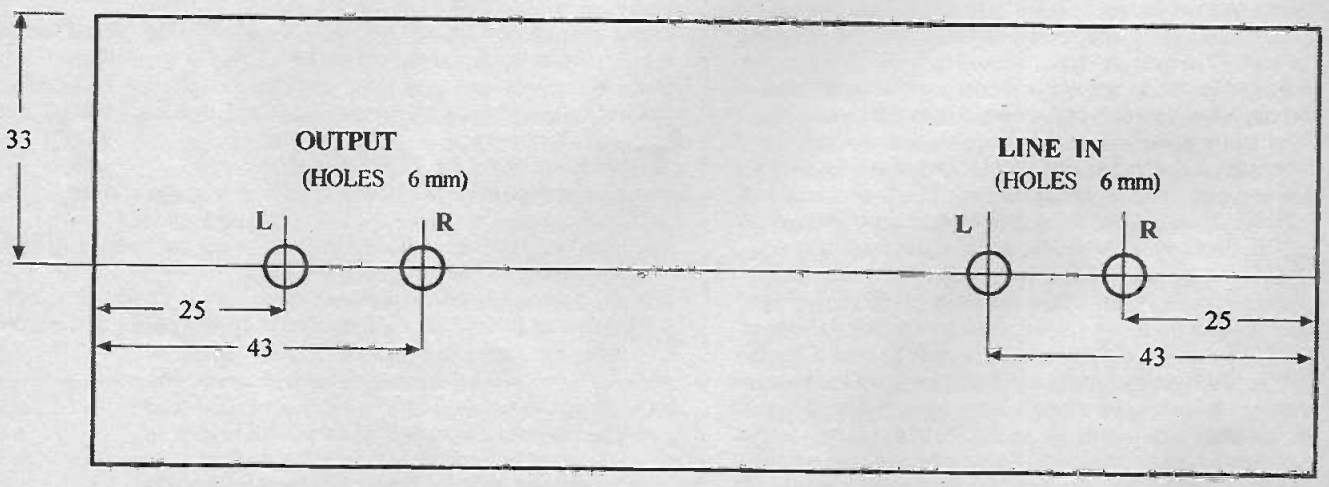


Fig. 2: Front panel drilling details. Already existing corner holes not shown. Dimensions in mm.



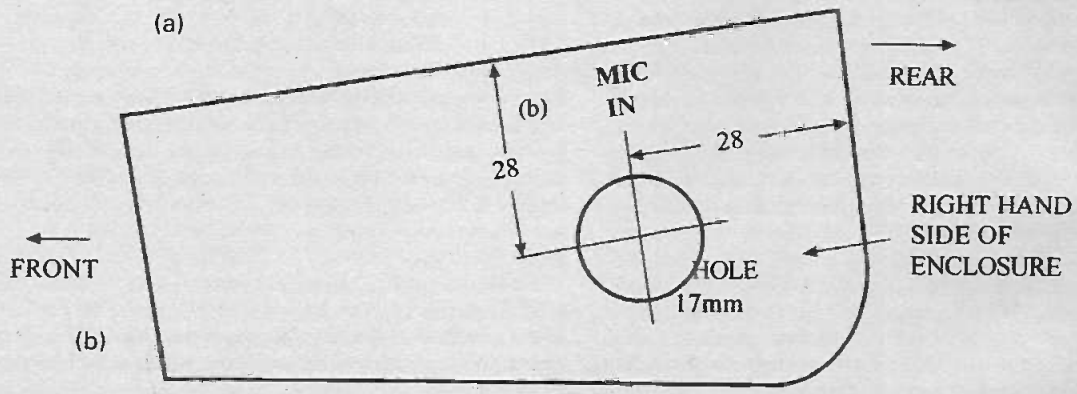


Fig. 3: Case drilling details, (a) rear sockets, (b) mic. input socket at the right-hand side. Dimensions in mm.

unity-gain inverting buffers, since the feedback resistors R11 and R12 have the same values as R9 and R10.

The L and R line signal inputs are fed via R15 and R16 to the ganged line level-control potentiometers RV3a/b, whose sliders are directly connected to the non-inverting inputs of IC2c and IC2d. Seen from these inputs the mixer stages have a gain of two (6dB), since the gain is determined by (R9 + R11)/R9 = 200/100 = 2. So R15 and R16 are included to attenuate the input, but only by 4·5dB. This provides a 'spare' 1·5dB of gain so that the line level control doesn't have to be rotated to fully clockwise to achieve unity gain through the unit. SW1 is included to connect these inputs to provide a mono signal if required. This can, for example, help reduce noise if an old mono vinyl disc is being played by a stereo pickup cartridge.

The outputs are buffered by R13 and R14 before passing out at SK4 and SK5. The very small offsets involved (less than 5mV) permit direct coupling to be used, eliminating the need for coupling capacitors at various points in the circuit.

The batteries

Lastly the two batteries that provide + and –9V supplies. The use of two rails enables the op-amps to be operated symmetrically about chassis potential. The 18V total also provides plenty of signal headroom, which is beneficial because it prevents overloading and enables the compression circuits in the recorder to receive a clean signal even when it's large. This is particularly helpful should the microphone be knocked accidentally, minimising the 'thump' effect that might otherwise be squared off, generating nasty, audible 'crunchy' harmonics.

The batteries are decoupled by C4 and C5, which ensure that the AC impedance remains low as the batteries age. SW2 is a simple on/off switch.

I was tempted to include an indicator LED, but it would have consumed about the same as the rest of the circuit. So to preserve battery life it was left out. I labelled the switch "battery on-off" in the hope of reminding myself to switch off! Battery life, using zinc-chloride batteries, is at least 38 hours. Note that alkaline batteries, though good for heavy loads, will provide only 50 hours at about twice the price. Another case of "horses for courses". Rechargeable PP3 batteries will provide about 13 hours per charge.

External view of the preamplifier/mixer unit.

Construction

The unit is built into an ABS desk control box type M1005, whose external dimensions are 161 x 96 x 61/39mm. The ABS part is black, with a grey finish aluminium panel that looks very smart, especially if a labelling unit is used to print grey identification labels. I use a Brother P-Touch 85, which produces a very professional result.

One of the problems with building the components into the box is the mounting arrangements. It's best to avoid having odd screw heads projecting from the

Table 2: Differential gain of the pan amplifier.

Left channel set to (dB)	*Right channel measured (dB)*	*Right channel set to (dB)*	*Left channel measured (dB)*
0	0	0	0
1	–1	1	–1
2	–2	2	–2
3	–3	3	–2·9
4	–4	4	–4
5	–5·1	5	–5·1
6	–6·2	6	–6·2
6·5	–6·7	6·5	–6·4
end of range		end of range	

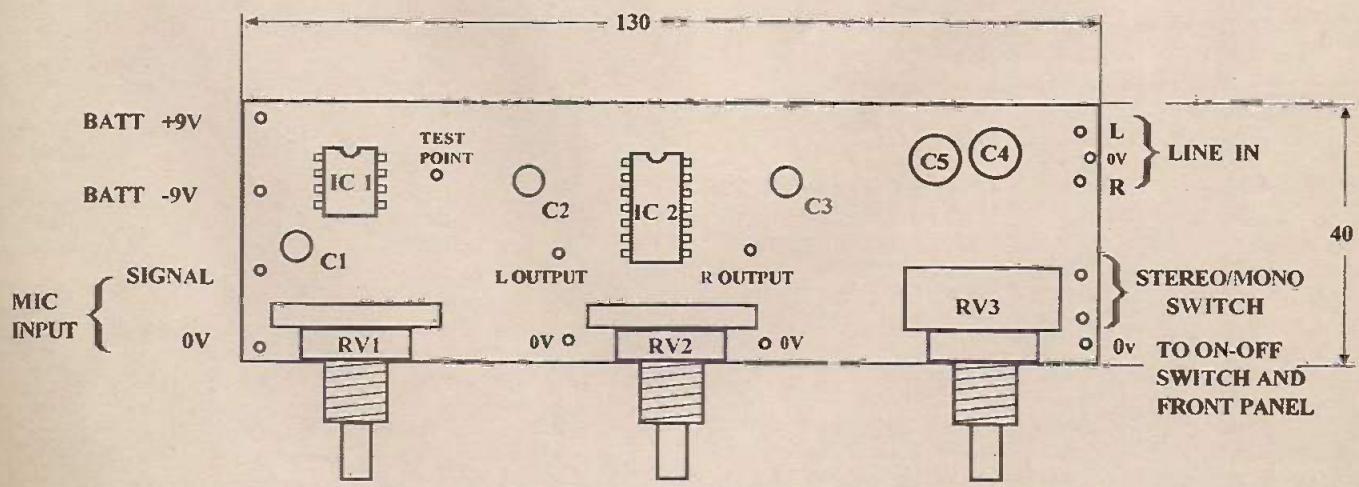
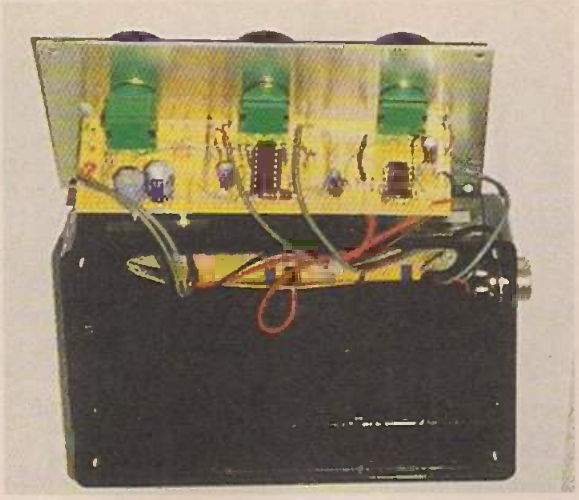


Fig. 4: Positions of the main components and connections on the stripboard. This is a suggested guide for the upper (component) side. Use the front panel as a template to position the potentiometers. Cut the potentiometer shafts to 9mm and enlarge the holes for the potentiometer legs to 1mm.



Internal view of the preamplifier/mixer unit.

case, especially from the front panel where they can look very untidy and amateurish. My solution is simple: the control potentiometers are fitted to the panel, and the stripboard is attached to the potentiometers' connections and supported by them. As there are no heavy components on the stripboard, it can easily be held in position by the twelve potentiometer connections. The positions of the six leads from the line-level ganged potentiometer ensure that the stripboard doesn't bend or twist.

Here's the easiest way to go about the task. First, drill the box and front panel as shown in Figs. 2 and 3. Then cut the shafts of the potentiometers down to a length of 9mm. Fit the potentiometers in their correct panel positions, loosely, with their connections in the direction of the horizontal centre line of the panel. Cut the stripboard to the dimensions shown in Fig. 4, with the strips running lengthwise. Offer the board to the potentiometers, with the edge of the board touching the back of the panel. You will find that the potentiometer leads are in line with the third row of holes from the edge (the third and sixth row for the stereo line-level potentiometer). Joggle the positions of the potentiometers so that their leads line up with holes in the board. The holes are too small, so mark them with a pencil, remove the board and drill out the marked holes to 1mm. Offer up the board again to ensure that the potentiometers now fit. Tighten the potentiometer securing nuts, but not fully. This ensures that the potentiometers remain in their correct positions for attaching the board later.

Assemble the components on the stripboard, using Fig. 4 as a guide. Make the track next to the panel the 0V rail. The battery + and – rails can be at the other edge, decoupled by C4 and C5 whose common 0V connection is linked across the board to the 0V track.

Fit pins to make the off-board connections to the batteries, switches and sockets. The potentiometer slider connections can be made by equipment wire links to the appropriate points in the circuit, so fit these links ready for connection when the board is finally assembled with the potentiometers.

Check all interconnections thoroughly, cut/disconnect any long bits of track that go nowhere, then offer up the board to the potentiometers and solder all the connections. You will find that the board is quite rigid. Tighten the potentiometers' securing nuts fully, taking care not to twist them and put strain on the board.

The connections can now be made between the board and the batteries, switches and sockets. Fit an earthing connection between the on-off switch and the panel: this then connects to the switch and the stripboard 0V line. Fit the mono/stereo switch. Wire the battery connectors, one lead from each to the appropriate + and – board connection, the others to the on-off switch. Wire the mono/stereo switch to its pins on the board. These leads do not need to be screened. Screened leads are necessary for the remaining connections, to the four phono sockets and the mic. socket.

Fit the phono and mic. sockets to the case. As with the on-off switch, instal an earth connection under the mic. socket securing nut, to ensure that the plug and socket shells are earthed. This earth can be connected to the socket's earth pin, which is in turn connected to the screen of the cable that connects the mic. input to the board. Leave the phono sockets' securing nuts and earth tags loose until the cable screens have been soldered, then tighten the nuts. This procedure will prevent excessive heat deforming the plastic case.

There are positions at the rear inside of the case where self-tapping screws can be fitted. Put a round-headed screw in each position, then find a heavy rubber band that will fit conveniently between the two screws. Lay the batteries in the bottom of the case and fit the rubber band – this is a simple means of securing the batteries.

Before you connect the batteries check that there are no supply rail short-circuits. If you have an eye glass, inspect the tracks for solder splashes or whiskers (no, I'm not perfect, and neither are you!). This can save time and effort later. If all looks OK, fit the batteries, switch on and check voltages.

Big voltages, except on the supply rails, will indicate that something is wrong. Pin 6 of IC1 and pins 1, 7, 8 and 14 of IC2 should all be very close to 0V. If all is well, try applying a signal to the mic. input while monitoring the test point with a scope. If this is OK, set RV1 to maximum, RV2 to centre position and check that you have outputs from the unit, equal in each channel. Check that the line input is mixed correctly with the mic. signal. If all is well, fit the control knobs and label the controls, switches and sockets.

Fit the four panel screws and the job is done. ■

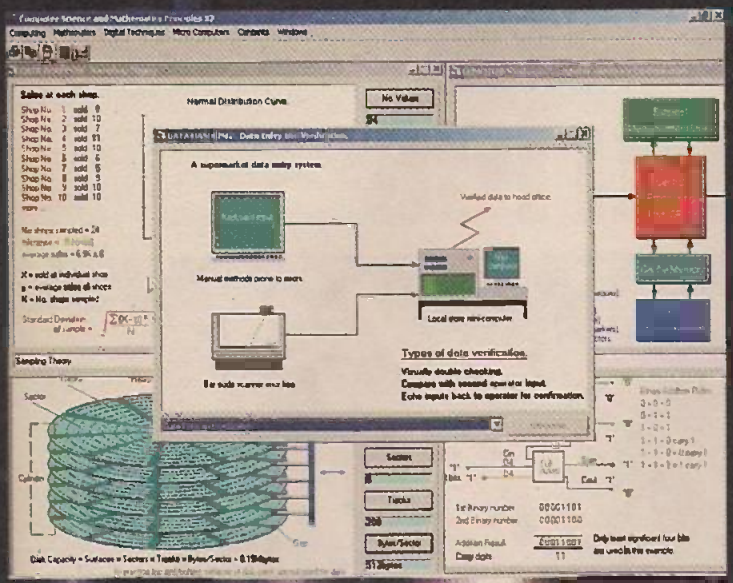
Component list

R1	620Ω	C1	2·2µF, 10V
R2	220kΩ	C2	10µF, 10V
R3	4·7kΩ*	C3	10µF, 10V
R4	4·7kΩ*	C4	220µF, 16V
R5	33kΩ*	C5	220µF, 16V
R6	33kΩ*		
R7	150kΩ*	IC1	OP27
R8	150kΩ*	IC2	TL074
R9	100kΩ		
R10	100kΩ	RV1	4·7kΩ log. (Maplin VQ01B)
R11	100kΩ	RV2	10kΩ lin. (Maplin VP95D)
R12	100kΩ	RV3	100kΩ +100kΩ log. (Maplin VQ36P)
R13	2·2kΩ		
R14	2·2kΩ	SW1	SPDT (Maplin FH00A)
R15	68kΩ	SW2	DPDT (Maplin FH04E)
R16	68kΩ		

*0·4W, 1%. All others 0·25W, 5%

Sockets: SK1 Maplin FK22 (requires Maplin mating plug FM50); SK2-5 Maplin YW06G.
Knobs: Two NK2 (Maplin RX01B), 1 PK2 (Maplin RX02C).
Miscellaneous: Two PP3 battery connectors (Maplin HF28); ABS console M1005 (Maplin LH63); stripboard, connecting wire, screened lead, rubber band etc.

'Computer Science & Mathematics Principles V7'



Computer Science:-
Hardware Devices, Data Structures, Data Files, Computer Systems, Data Handling, System Development, Computer Programming, Data Analysis, Binary Numbers, Binary Arithmetic.

Digital Techniques:-
Logic Gates, Flip Flops, Combinational Logic, Counters, Counting, Shift Registers, Boolean & DeMorgan's Theorems.

Microcomputers:-
Microprocessors, Basic Micro Computer, Busses, Memory Addressing, A.L.U, Clock and Reset, Instructions and Control, Memory R/W, Addressing, Instructions #1, Instructions #2, Instructions #3

Mathematics:-
Simple Numbers, Number Conversion, Number Types, Roots, Triangle Ratio's, Triangle Angles, Area, Surface Area & Symmetry, Volume, Percentages, Ratio's, Fractions, Vectors, Circles Angles, Laws, Algebra, Rules, Algebra, Rules, Powers, Simplifying, Equations, Graphing, Slope & Translation, Curves & Angle Conversion, Physical Science.

Personal user £59.95 +VAT
Education* £299.95 +VAT
(*Includes unlimited multi-user site licence.)

'Electronics and Computing Principles V7'

Electronics:-
Atomic Structures, DC Current flow, Basic Electronics, Simple DC Circuits, Types of Switching, Variable Voltages, Ohm's Law, DC Voltage, DC Current, Series/Parallel Resistors, AC Measurements, AC Voltage and Current, AC Theory, TCL Series/Parallel Circuits, Capacitance, Capacitors, Inductance, Inductors, Impedance, Communication System, Signals, Attenuators, Passive/Active Filters, Tuned Circuits, Coupling and Selectivity, Oscillators, Circuit Theorems, Diode Theory, Diode Applications, Transistor Theory, Bipolar Transistor, Transistor Configurations, Transistor Circuits, Field Effect Transistors, Operational Amplifier Theory and Applications, Sum and Difference Amplifiers.

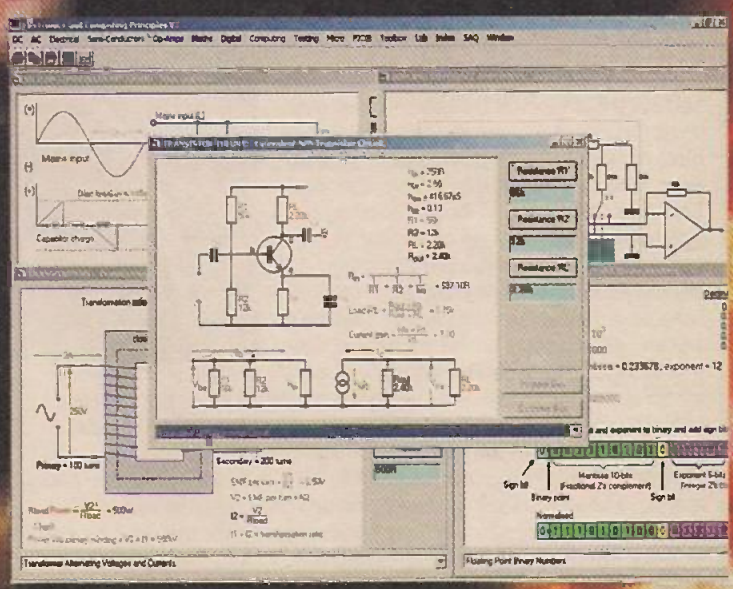
Electrical:-
DC and AC Power, SCR, Power Supplies, Voltage Regulators, Magnetism, Motors/Generators, Transformers, Three Phase Systems.

Digital Techniques:-
Logic Gates, Flip Flops, Combinational Logic, Counters, Counting, Shift Registers, Logic Interfacing, Timers, Boolean Algebra and DeMorgan's Theorems.

Microprocessors and PIC Microcontrollers:-
Basic Micro-Computer, Busses, A.L.U, Clock and Reset, Instructions and Control, Memory Cells, ROM and RAM, Memory Addressing, Instructions, PIC Introduction, PIC16F84 Architecture, PIC16C71 A/D, Byte, Bit, Literal and Control Instructions.

Measurement and Component Testing:-
Analogue multi-meter, Measurement, Component Testing.

Mathematics:-
Simple Numbers, Number Types, Roots, Triangle Ratio's, Triangle Angles, Area, Surface Area and Symmetry, Volume, Percentages, Ratio's, Fractions, Vectors, Circle Angles, Laws, Algebra Rules, Algebra, Powers, Simplifying, Equations, Graphing, Slope and Translation, Phase Angles, Complex Numbers, Statistics, Lottery Number Predictor, Physical Science.



Computing:-
Hardware Devices, Data Structures, Data Files, Binary Numbers, Binary Arithmetic.

Toolbox:-
DC Calculations, AC Calculations, Numbers, Applications.

Self-Assessment Questions:-
DC, AC, Power, Semi-Conductors, Op-Amps, Digital, Mathematics.

Components and Equipment Picture Dictionary:-
High quality digital camera images and explanatory text.

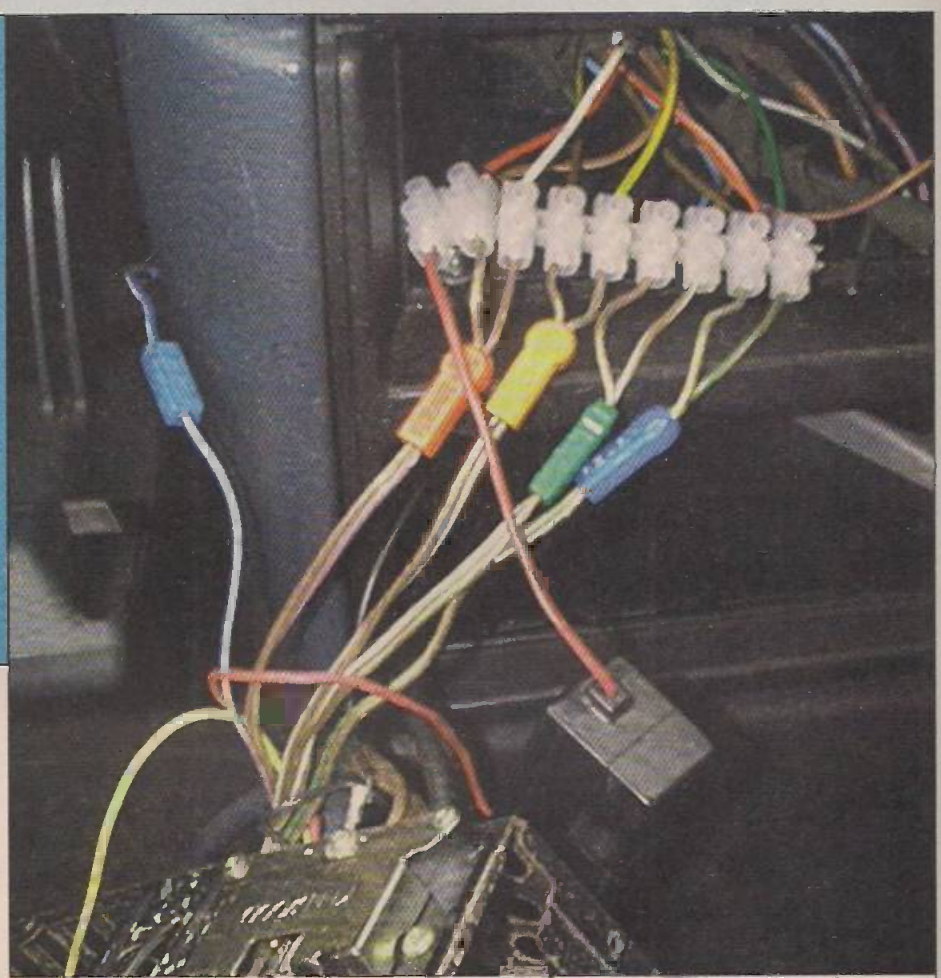
Personal user £99.95 +VAT
Education* £299.95 +VAT (*Includes unlimited multi-user site licence.)

Truly Interactive PC based courses on CD-ROM for Windows '95, '98, NT and 2000
Visit www.eptsoft.com or telephone for full details.

eptsoft limited, Pump House, Lockram Lane, Witham, Essex. UK. CM8 2BJ.
Tel: +44 (0)1376 514000. Fax: +44 (0)870 0509660. Email: info@eptsoft.com. Switch, Delta, Visa and MasterCard accepted. No additional postage or airmail charges.

Safe wiring practice for car electrics

Vehicle wiring may need to be altered for many reasons – basically because the owner wants something to be added. It can be done safely or botched. In the following article Tom Baker outlines the best way to go about this sort of job. It's an ideal field for TV engineers looking for a lucrative way of supplementing their income



"If I'd a pound for every time I did such and such I'd be rich by now." You must have heard that said many times, and have probably said it yourself. I'm no exception. If I had a pound for every time I've had to tidy up someone else's poor attempt at car wiring, or repair badly-wired and indeed dangerous joints in wiring harnesses, I would have retired long ago. I don't pretend to be a leading authority in such matters, but if you follow the guidelines in this article you will have fewer sleepless nights worrying about whether your beloved vehicle, or your customer's beloved vehicle, will work reliably and not burst into flames.

I have been fitting car radios/CD players, immobilisers and alarms, and items such as electric windows, reversing aids and so on for many years. To say that nothing surprises me now would be only too true. I'm not a registered auto electrical engineer, but I am a fully-qualified TV engineer – one who is always on the lookout for ways to expand my business. I have learnt the hard way, with help from good friends in the auto electrical trade, and consider that I am now fully competent in this field. Some of the jobs that have come to me after work done by main-stream garages confirm this view.

First, a word of encouragement. Don't be afraid to tackle this type of work. It can be very lucrative. You will probably have to get your hands dirty for a while, but such jobs will more than pay for the extra hand cleanser and towels you'll use.

Joining wires

There are several different ways of joining wires together. Let's start with the 'chocolate block', or screw-terminal connection block to give it the proper name. For various reasons, I don't like to see these blocks used for car wiring. First, they are bulky, and you can never be sure that you haven't tightened the screws to the extent that most of the wires have been severed and the joint is made by a single strand. Or you can trap the insulation beneath the screw, and thus don't make an electrical connection at all. The screw head can break while you are tightening it or, worst of all, the screw was cross-threaded from new and, when you tighten it fully, it doesn't touch the wire at all, leaving you to wonder why the new unit you've just installed won't work. You may spend several hours checking your work before you discover the cause.

Then there are the auto-electrician's friends, the crimp connectors. There are butt, spade, bullet, piggy-back, pin, fork, snap-lock, flag and closed-end versions, and some come with male and female variants. I do use these, but not as much as I used to. If used correctly, they are very safe, but you must have the proper tool for the job. Simply using cutters and pliers isn't good enough as, in my experience, there is no guarantee that the crimps will be the same, i.e. some are easy to crimp and some need a vice to

crimp them. The thing to use is a double-crimp ratchet-type tool. This is not cheap, but is the only way to do the job properly.

There are some rules for the correct use of crimp connectors. First, don't leave any uncovered wire outside the crimp. Make sure that you have only enough wire to make the connection safe. If the crimp hole is too large for the wire, double up the wire to fill the hole. And finally use only the correct-colour crimp for the job: red for 0·5-1·5mm^2, blue for 1·5-2·5mm^2 and yellow for 4-6mm^2.

Then there's the cowboy's way of connecting wires: twist them together and cover with either sticky tape, plasters or, a bit better, insulation tape – but not wrapped neatly either.

Preferred method

I prefer to join wires together with solder then cover with heat-shrink sleeving. There's a knack to doing this, and I will try to explain it clearly. First, you must unwrap the wiring harness back far enough to get to your wire properly. This isn't always easy, as you may be on your back underneath the dashboard, but it has to be done. Then cut off the required length of shrink-wrap sleeving to cover the joint – remember that it has to go over two wires and of course the solder, once the joint has been soldered. The clever bit is to fit the shrink-wrap on to the wire and keep it away from the heat of your iron, otherwise it will start to shrink before you can get it over the joint. Remember also that there must be no solder spikes on the joint: a spike could break through the heat-wrap after it has shrunk, then short out to the next wire when you recover with new insulation tape the loom you undid.

If you have to join more than one wire into an existing loom the only safe way to do so is to cut the wire in the loom and join the new one with one of the two ends, get your shrink-wrap over the biggest soldered end, then resolder the other end to the joined wires, recover with the shrink-wrap and introduce back into the loom.

I have seen cases where the insulation has been stripped back a little bit on the wire, the new wire just wrapped around the open joint, then taped. This must not be done. It's very dangerous, because it is impossible to achieve a sufficiently tight joint for electrical safety. The joint can go high-resistance and start a fire, especially where you are trying to introduce another live wire, say for a radio memory or an amplifier.

Why things go wrong

The most common cause of fuse blowing is wires that are badly fitted through holes in the metalwork of the car, chafing the insulation and thereby causing a short-circuit. If you must go through metalwork, fit a grommet so that the wire cannot chafe. Bad earths are another reason why thing's don't work.

It's very useful to have a tool for fault tracing. I use a device called a Power Probe, which you connect to battery live and earth and has a switch for either +12V or –12V. It has a continuity check and tells you whether a wire is live, dead or earth.

Hints and tips

When dealing with modern cars fitted with airbags it's important to ascertain whether a wire you are about to cut or join is part of an airbag circuit. There is nothing worse than having an airbag go off in your face, because it's expensive to get it put back.

If possible, always connect extra live wires to the appropriate points in the fuse box – there are very often spares to join to. If there aren't any spares, you can always connect to the battery terminals. A number of slave fuse boxes are nowadays available. All you have to do is to find somewhere safe to fit one. Connect a large live cable from the battery plus terminal, then use the outputs you require with appropriately-rated fuses. You must always fit the correct fuse when installing a new circuit.

In addition, when fitting a car audio amplifier you must use the correct wire size for the electrical side and also the speaker side.

If you have to go under carpets or through sills the same basic rules apply: make sure the leads don't go over sharp bits of metal or through holes without grommets.

Insulation tape

Insulation tape is worth its weight in gold in certain areas but is a right pain when used in the wrong areas. The use of insulation tape to reinsulate a wiring loom after work on it, and to cover new wires inside the car loom, is good. But beware of using tape in the engine compartment. This is a hot spot for plastic wrapping, which can harden, shrink and subsequently come off. There's also the problem of dampness in the engine area: this can lead to tape becoming unstuck and thus falling off.

Where heat and water are a problem you can use either self-amalgamating tape or split corrugated tubing which enables you to open it down the split so that the wires can be inserted for protection, after which you should put a bit of self-amalgamating tape over each end and use tie wraps to attach the tubing somewhere safe, away from excessive heat and vibration from pulleys, belts, fans etc.

Tie wraps

To my mind tie wraps are the best thing to hit car wiring for a long time. They are neat, you can put them through holes and suspend cables where it wouldn't be possible before, and you can use them to bunch groups of cables neatly and carefully. I'm sure you will all have your favourite uses for tie wraps, but they really do come into their own when carrying out work on cars.

Caravan sockets

As I've seen so many poor attempts at wiring a socket for either a trailer or a caravan this subject merits special attention. It isn't hard to install a socket and, if you follow the instructions on the pack (you can even get them pre-wired) and use the correct cable, connected to the correct wires in the rear light loom, with reinsulation afterwards, you can't go wrong.

The previously mentioned Power Probe is a help here. You can insert the pointed probe into the cable insulation and gently touch the wire inside to ascertain which state it's in, i.e. live, dead or earth, without causing any damage other than a tiny pin-prick. This isn't quite as easy as it sounds however, as countless pin-pricks to my hand testify. I've by now learnt to carry a box of plasters with me – blood stains car upholstery and is difficult to remove.

To say that I've seen more cock-ups with this type of wiring than any other would be to understate the situation. Here are a few things to avoid. First, don't connect your new wiring directly to the rear of the bulb unit. This looks messy and in some cases makes it difficult to change bulbs when they blow. Don't trap the wires under the spare wheel or jack. I've very often come across this. And don't leave the new wiring where it can get caught by items placed in the boot, or in a tray of water. The latter can be present when the lid doesn't close properly, which is often the case. As you've probably guessed by now, this is another situation where I find tie wraps ideal. There always seem to be suitable holes for the purpose in the rear of boot.

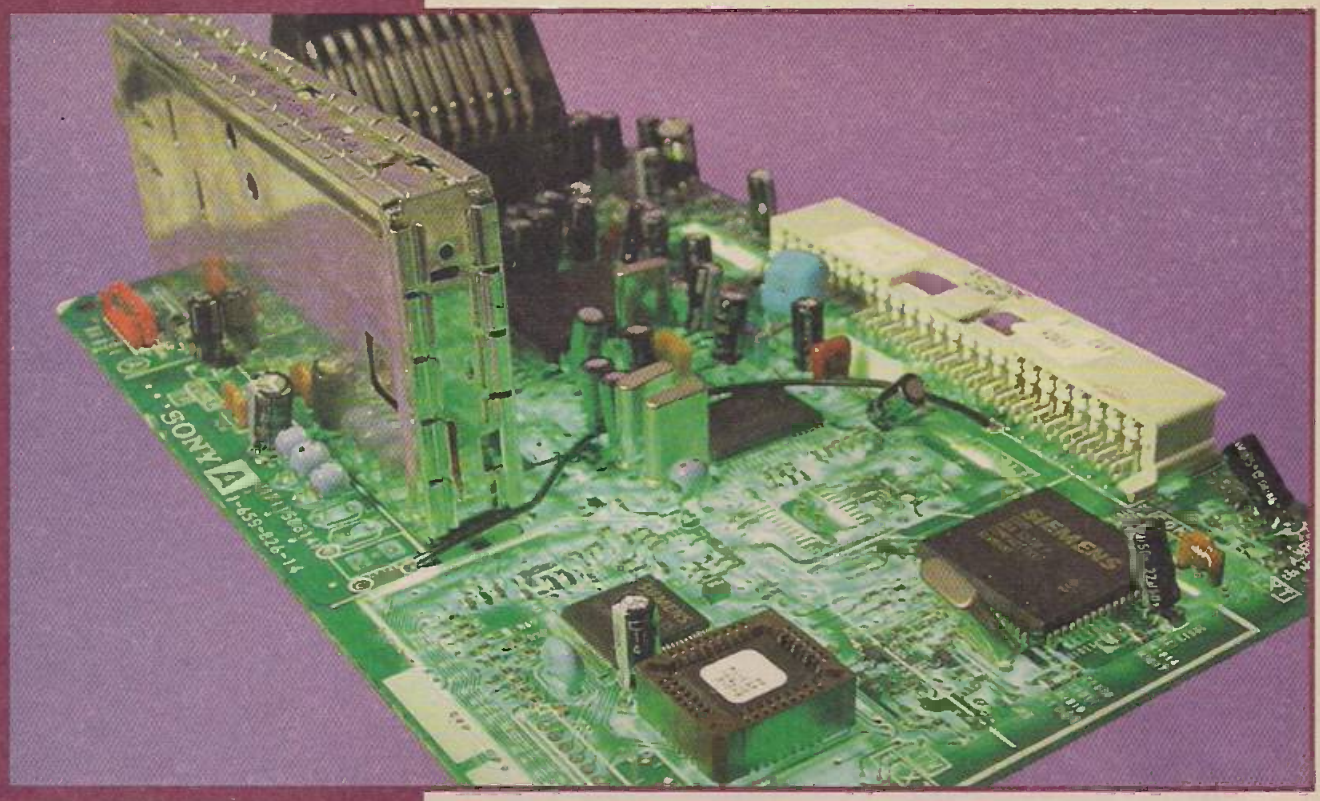
Good luck!

I hope this introductory article will encourage you to venture at least into the cleaner side of auto electrics. It's a way of boosting your income with some welcome, easily-earned money.

In future articles I'll deal with radio/CD installation, alarms/immobilisers, aerials, reversing aids and rear-view cameras, and car radio decoding after removing the radio or having a flat battery.

Incidentally, terminals and connectors can be ordered from Cable Ties Direct, 72-76 Clun Street, Sheffield S4 7JS, phone no. 0114 249 9259, fax order line 0800 073 2023.

Heading photo: An example of how *not* to do it. Don't use screw-terminal blocks like this! ■



Servicing the Sony BE3D chassis

In this concluding instalment Giles Pilbrow deals with system control, the service mode, the I²C bus, teletext and signal processing, then rounds off with a list of some common fault conditions

The microcontroller chip and the video, sound and teletext signal processing chips are all on board A. This board looks a bit daunting at first sight, with its high proportion of surface-mounted components and integrated circuits. The following notes outline circuit operation and provide practical advice on fault finding.

System control

The heart of any modern TV chassis is its microcontroller chip. This one uses a Siemens SDA5250M 8-bit device, which operates with an 11·5MHz clock. For flexibility the operating software is stored in a separate 128K-byte ROM chip, IC3 – the software version is usually printed on the chip's label, or can be read from the 'IC status' screen in the service mode. User and production data are held in a non-volatile memory, IC2. This 32K-bit serial EPROM is linked to the I²C bus. To reduce the possibility of the NVM data becoming corrupted, IC2 has an additional control line (pin 7) to inhibit writing unless the microcontroller chip has specifically requested it. For data to be written, pin 7 must be low.

To ensure reliable start-up a reset pulse is generated by IC4. This is applied to the microcontroller and some of the other ICs once the standby 5V supply has been established.

Software updating

There were several software revisions during the life of the BE3D chassis. Problems ranged from intermittent switching to standby (early F1 and F2 models) and loss of picture/sound (all sets made before March 1997) to intermittent problems with the set not coming out of standby (all models fitted with IC1001). Sony issued various bulletins that detailed the software changes. The most recent was TV04899, which includes some circuit changes on board A. If IC3 is replaced without modifying the circuit the result will be field collapse – the set will not shut down.

The service mode

Access to the service mode is by putting the set into standby then pressing the sequence of keys shown in Fig. 2 on the remote-control handset.

Once the set is in the service mode TT_ _ is displayed on the screen – this is known by Sony as test mode 2. When a two-digit code from the handset is entered at this point some functions are activated. There are many so-called TT codes. The more useful ones are listed in Table 1.

Other adjustments can be accessed via the service menu.

The I²C bus

With the exception of the teletext chip all the ICs on board A are controlled by the I²C bus. Each chip contains a number of memory locations known as registers, which need to be loaded with data before the IC can perform its tasks. Fig. 3 shows the I²C bus and microcontroller arrangement.

It's not possible to see what data is transferred via the I²C bus. The only checks that can be made are for activity on the clock (SCL) and data (SDA) lines, and that the amplitude of these signals is similar. For fault-finding there's a diagnostic system that indicates errors either

with the bus generally or when a specific IC fails to respond. The error codes are listed in Table 2. There are three categories as follows:

(1) General, where a number of devices fail to respond. This is usually because a supply is missing.

(2) Bus problems. Either the SCL or the SDA line is held low, usually because of failure of an IC. Short-circuits can be identified by resistance checks. If no short-circuit can be detected, each chip can be isolated in turn from the bus lines. This is easier than it sounds, as 100Ω resistors are fitted in series with the clock and data inputs to each chip. Lifting each of these in turn along the affected bus line will reveal the culprit

Obviously the set won't work when one of the chips is disconnected, so the thing to do is to look for a *change* in the error code when a chip has just been disconnected.

(3) Device failure. Each chip has error codes of its own. Most have several to indicate different internal problems. Exactly what these mean is of little relevance for servicing.

There are cases where no error code is displayed. This can happen if the micro-

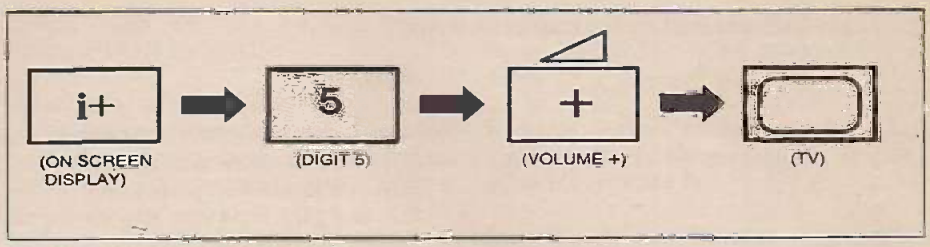


Fig. 2: Entering the service mode.

Table 1: Useful TT codes.

TT00	Exit service mode.
TT07	Enable/disable ageing mode.
TT08	Reset customer setting to factory default.
TT13	Scart auto 16:9 switching (pin 8) enable/disable.
TT14	Display software version and TV status.
TT16	Sets for 32in. wide CRT.
TT21	Sub-contrast adjustment (use red/yellow keys to adjust).
TT22	Sub-colour adjustment (use red/yellow keys to adjust).
TT23	Sub-brightness adjustment (use red/yellow keys to adjust).
TT24	Set up for UK operation (PAL I, UHF chs. 21-68).
TT37	Sets for 25in. (24in. wide) CRT.
TT38	Sets for 29in. (28in. wide) CRT.
TT49	Erase and reprogram the NVM (programme position 59 only).
TT74	Teletext/OSD horizontal shift (use red/yellow keys to adjust).

Fig. 3: Block diagram of the system control arrangement. R617 is on the main board.

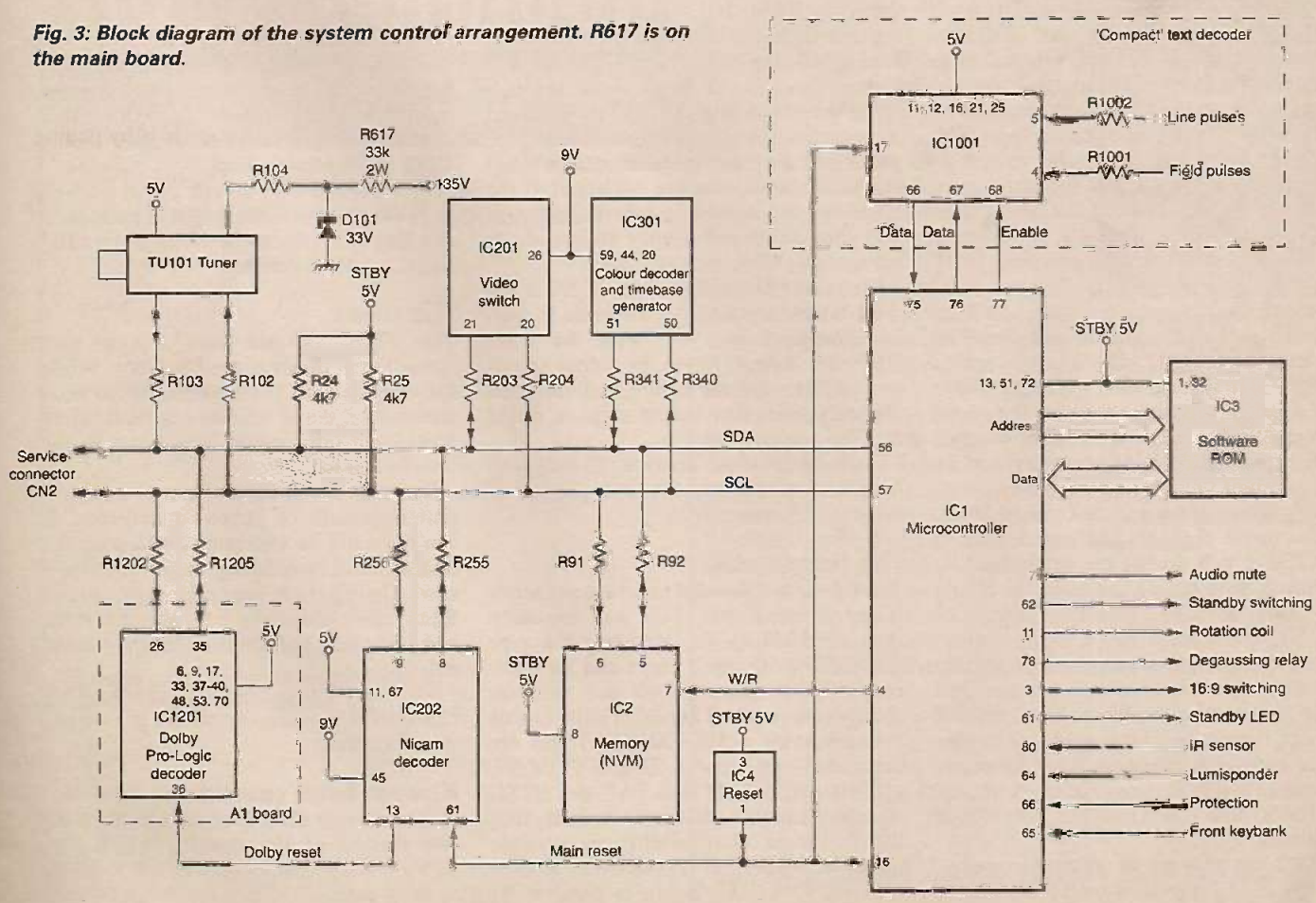


Table 2: Error codes for bus problems.

Number of LED flashes	*Problem*
2	Main board protection in operation. Field output failure or excessive current.
3	SCL line low. Short across line.
4	SDA line low. Short across line.
5	SCL and SDA lines low. Any device could be faulty.
10, 18	Failure of the NVM IC2.
19	More than one device hasn't responded.
7, 16, 21	Failure of the video switch IC201.
6, 17, 22	Failure of the jungle chip IC301.
11, 12, 13, 14, 15, 20, 23, 25, 26, 27	Failure of the teletext chip IC1001.
28	Problem with the Dolby Pro-Logic decoder chip IC1201
8	Problem with the tuner.
9, 24	Problem with the Nicam decoder chip IC202.

controller chip isn't running, or has an internal fault.

Teletext

All BE3D chassis sets have teletext, but there are two different types of decoder. The simplest version uses the teletext capabilities of the microcontroller chip IC1. This involves the minimum of external circuitry for the purpose. The main difference is that the frequency of crystal X1 is 18MHz.

Although IC1's teletext capabilities are perfectly adequate, it does not have the ability to produce the detailed graphics needed for the menus in some models. With these, IC1001 is added. It's an SDA5273 chip from the Siemens Megatext family of devices, referred to as Compact Text in Sony chassis. Instead of making use of the I^2C bus, a proprietary three-wire bus is used to link IC1001 directly to the microcontroller chip IC1. IC1001 requires line- and field-frequency pulses to operate. Loss of the field pulses will result in text/OSD rolling. With loss of the line pulses there will be no output at all.

Sound

Sound signal demodulation and decoding is handled by IC202, which in UK sets is an MSP3410 that can deal with both 6MHz mono and Nicam stereo signals. The sound IF signal is fed in at pin 25, after which it is digitised and decoded internally. Unlike older designs there are no frequency-determining components, such as ceramic filters, in the sound channel. The sound systems that IC202 will decode are determined by the destination setting stored in the NVM, and can be changed by the TT codes: TT24 sets UK operation.

Should a foreign receiver be brought into the workshop, conversion is simple. Just enter the service mode and, at the TT prompt, type in 24. This should at least give mono audio. Sets made for the Russian and German markets are fitted with an MSP3400 chip which does not have Nicam capability.

IC202 has two pairs of stereo outputs. Pins 56 and 57 provide signals for the audio output chip on the main board. Pins 59 and 60 provide outputs for the headphones and the line-out phono connectors. It's possible to establish from the sound menu the type of signal here (mono/Nicam) and the volume level. This additional output from IC202 is useful when you are trying to establish the cause of a no-sound fault, as checking for sound at the headphone socket will reveal whether IC202 is working.

Surround sound

Sets equipped with Dolby Pro-Logic are fitted with a small daughter board known as the A1 board. This has a Motorola digital signal processor chip, IC1201, and a 256K-bit RAM, IC1202. Digital audio is fed directly to the DSP chip from IC202 on board A, using what's known as the I^2S bus.

The A1 board is piggy-backed on board A, being held in place by its two 8-pin connectors. Take care when inserting board A1, as the connectors are not keyed. If the board is fitted the wrong way round the set will shut down and display error code 4, because the SDA line is earthed.

The main audio output from IC202 is not used in these models. All the audio is routed through board A1, with the front left/right channels fed to the output amplifier IC1200 and the centre and surround channels fed to an output chip on board K1.

Faults on board A1 are rare. To help with fault-finding an extension lead, part no. 9-948-000-27, is available.

The jungle chip

The colour decoder and timebase generator stages are in IC301. This was originally type CXA2000Q. In later sets it's type CXA2076Q. The two chips can be interchanged, but some circuit and software changes are required to enable older boards to work with a CXA2076Q. These are detailed in Sony service bulletin TV08397.

IC301 will decode both PAL and NTSC signals, and all models have both crystals fitted. Secam compatibility is possible using an additional TDA8395T decoder chip (IC303). PAL delay is handled by IC302, which is either a Sony CXL5520M or a Philips TDA4665T. There are some circuit differences with these two ICs, so take care when ordering. The Philips type gives more trouble, the symptoms being no colour or incorrect hue with some phase shift between the chrominance and luminance signals.

Video switching

IC201 selects either S- or composite-video signals from the tuner or any of the AV inputs. The switching voltage from pin 8 of the scart sockets is fed to pins 4 and 6 of IC201. The voltage level at these pins indicates the signal-source state, as follows: 0-2V no signal; 4·75-7·25V a 16:9 signal; 9·5-12V a standard 4:3 signal.

Some external equipment provides insufficient voltage to switch the set to the correct mode. To overcome this, the auto 16:9 switching can be disabled by entering TT13 in the service mode.

Pin 23 is fed with a sync signal derived from the tuner's video output. This is used as a flag to the microcontroller that a valid signal has been detected.

The tuner

The BE3D chassis uses a combined tuner/IF unit manufactured by Sony. While the tuner section is considered to be non-serviceable, the IF section can be repaired and circuit information is included in the service manual.

The most common problem is an intermittent picture or picture disturbance. It can normally be instigated by tapping the unit. Careful resoldering should provide a cure. The places to concentrate on are the 8-pin interconnection between the tuner and IF boards and the 6-pin output terminal.

For no video output check Q01 (2SA1037K), which sometimes goes short-circuit or leaky.

Known fault conditions

Set comes on then goes to standby with two flashes of the standby LED: The STV9379 field output chip IC500 is faulty or dry-jointed.

Set comes on then goes to standby with two flashes of the standby LED. Set works all right once D505 is disconnected: Zener diode D505 (MTZJ-T-77-3.6A) in the protection circuit is leaky.

Set comes on then goes to standby with two flashes of the standby LED, which still flashes when D505 has been removed: Replace the NVM memory chip IC2.

Set does not go into standby fully – picture disappears but the line is still running: Check/replace Q602, Q603 and Q604 in the standby switching circuit, also reservoir capacitor C615. Then ensure that the HT is 135V. If not, replace the error detector chip IC602 (SE135N).

Set operates normally until standby is selected. It then pulses in and out of standby, with RY600 clicking each time: Check/replace Q601 (2SC3852A), D603 (6·8V zener diode) and R634 (22Ω) on the primary side of the power supply. R634 was not identified as such in Fig. 1 last month (page 350): it's the 22Ω resistor between D604 and Q601.

Brief burst of EHT followed by no operation, with no error code: The excess-current protection system is in operation because the line output transformer T803 is faulty.

Set intermittently shuts down at switch on. Some arcing interference is visible on screen when the set does work: Replace the line output transformer T803.

Line tearing when hot (32in. models only): Replace the line driver transformer T804 with new type, part no. 1-437-195-14.

Incomplete degaussing: Replace relay RY600 with improved type, part no. 1-755-018-11.

Picture is partially blanked horizontally: Zener diode D817 (RD5.6ESB2) in the blanking circuit is leaky.

Over bright almost negative picture but without flyback lines: Set is in the ageing mode. Enter TT07 in the service mode to clear.

Random channel change or volume bar appearing: Replace tactile switches S900/1/2 on board D.

No sound (headphones OK) with PS600/1 open-circuit: Replace the TDA7264 audio output chip IC1200.

Very distorted audio or loud crackling sound: The audio demodulator/processor chip IC202 (MSP3410) is faulty.

Set locks up or shuts down when hot: IC202 (MSP3410) is faulty. This fault can always be confirmed by heating IC202.

Complete loss of sync in the teletext mode: IC1001 faulty (models that incorporate IC1001).

Incomplete or scrambled OSD and menus, teletext OK: IC1001 faulty (models that incorporate IC1001). ■

Digibox/TV/VCR interconnection

Keith Cummins describes an alternative way of linking a digibox, a VCR and TV set(s) as required. It provides advantages where two or more TV sets are in use

This article describes a rearrangement of the usual digibox, VCR and TV set interconnections. The advantage is that it enables the UHF outputs from both the digibox and VCR to be distributed simultaneously to another TV set (or sets if a distribution amplifier is used) in parallel with the analogue terrestrial TV signals.

Conventional approach

The usual arrangement is shown in Fig. 1, with the incoming terrestrial analogue TV signals daisy-chained through the digibox and VCR to the TV set in that order. The VCR is fed with the terrestrial channels plus the digibox's RF output, and in turn feeds the main TV set with the terrestrial channels plus both tape playback and digibox RF output signals. Scart connections may or may not be included, depending on the use of baseband PAL, digibox RGB, stereo sound etc.

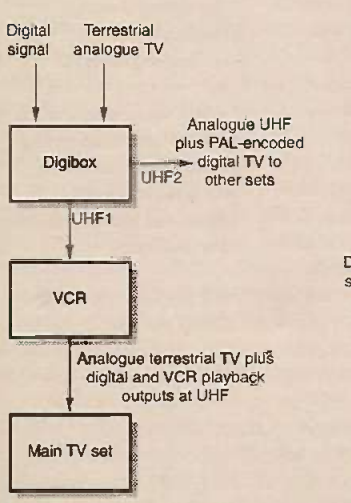


Fig. 1: The usual way of connecting a digibox, a VCR and a TV receiver.

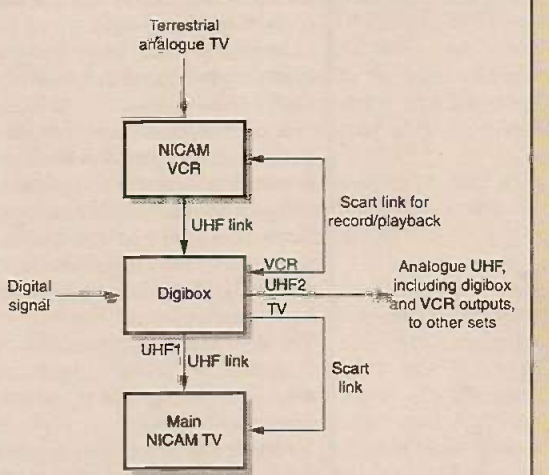


Fig. 2: Reversing the positions of the digibox and VCR, together with the use of scart connections, enables the digibox and VCR output signals to be played back via other TV sets in the system.

The alternative

The rearrangement I have adopted is shown in Fig. 2. A Nicam VCR precedes the digibox in the UHF daisy-chain, and separate scart leads connect the digibox to the VCR and main Nicam TV set.

The scart connection between the VCR and the digibox makes recording of baseband PAL from the digibox possible despite the fact that the VCR and digibox are 'the wrong way round' as far as UHF linking is concerned. The UHF output from the VCR is included with the other signals fed to the digibox, and as a result is present in parallel with them and the digibox's own UHF output for distribution to other receivers via the digibox's UHF2 socket. Note that additional receivers, even if Nicam capable, will be unable to produce stereo sound from the VCR or digibox as their UHF outputs carry only FM sound.

In my case the digibox's factory UHF output setting was ch. 68. The VCR's UHF playback output is on ch. 37. There's no Channel 5 terrestrial signal in my area – I receive it, courtesy of Sky, via the digibox. The main terrestrial channels are in group A (21, 24, 27 and 31). There's a local RSL station on ch. 54. So I was in luck and didn't have to retune either the VCR or digibox output.

To summarise, the scart link between the digibox and the VCR enables baseband PAL and stereo sound from the digibox via the aux facility to be recorded: for playback, baseband PAL and stereo sound from the VCR are fed to the digibox. The digibox's UHF2 output provides analogue UHF TV, including terrestrial UHF and UHF from the digibox and VCR (sound is mono FM only), for distribution to other TV set(s). The scart link between the digibox and main TV set feeds RGB video and stereo sound from the digibox, and baseband PAL plus stereo sound from the VCR, to the TV set. The analogue terrestrial TV signals are fed to the main receiver via the UHF link. ■

Unique reader offer:

x1, x10 switchable oscilloscope probes, only £21.74 a pair, fully inclusive*

*Additional pairs as part of the same order, only £19.24 each pair.

Please supply the following:

Probes

Total_____

Name_____

Address_____

_____

_____

Postcode_____ Telephone_____

Method of payment *(please circle)*

Cheques should be made payable to Reed Business Information

Access/Mastercard/Visa/Cheque/PO

Credit card no._____

Card expiry date Signed

Please allow up to 28 days for delivery

Seen on sale for £20 *each*, these high-quality oscilloscope probe sets comprise:

- two x1, x10 switchable probe bodies
- two insulating tips
- two IC tips and two sprung hooks
- trimming tools

There's also two BNC adaptors for using the cables as 1.5m-long BNC-to-BNC links. Each probe has its own storage wallet.

To order your pair of probes, send the coupon together with £21.74 UK/Europe to Probe Offer, Electronics World Editorial, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Readers outside Europe, please add £2.50 to your order.

Specifications

Switch position 1	
Bandwidth	DC to 10MHz
Input resistance	1MΩ – i.e. oscilloscope i/p
Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC
Switch position 2	
Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

Switch position 'Ref'
Probe tip grounded via 9MΩ, scope i/p grounded

Servicing the Philips Anubis A chassis

Large numbers of these nice little sets, which first appeared in 1991, were sold. They are very reliable and are worth reconditioning for sale when brought back in part exchange. Pete Murchison describes the few problems you could expect to get with them

Philips introduced the Anubis series of colour TV sets in 1991. The chassis had been designed to drive tubes of size up to 21in., and was the successor to the G90AE and G90B chassis. A considerable number of these sets were sold, and they have proved to be extremely reliable. However they are now coming back in part exchange as customers upgrade to more modern widescreen sets. We have found that they are well worth reconditioning to sell as a second set or to those who just want a basic, cheap TV receiver. The tubes are almost always good and bright, the PCBs are hardly ever burnt or discoloured, and once a set has been renovated it can be installed and forgotten about. As with all Philips products, spares are readily available and the prices of major items such as the line output transformer are very reasonable. Philips Service is to be commended!

The circuitry is contained on a single PCB which is modular, i.e. the board is divided into specific areas each of which is dedicated to a particular circuit function. The microcontroller chip provides a menu system for automatic tuning and the brightness, contrast and colour settings. Menus can be called up from the front panel or via the remote-control unit. The microcontroller chip also switches the set in and out of standby.

Power supply

The power supply forms the heart of the chassis and, along with the line output stage, is where most faults occur. So it's a good idea to take a look at the operation of the power supply before considering the faults that can occur.

Fig. 1 shows the basic power supply circuit (much simplified), which is of the now familiar Philips SOPS (self-oscillating power supply) variety. It provides a 95V HT supply for the line output stage, a 9V supply for the audio output stage, and a 5V supply for the microcontroller chip when the set is in standby (when the set is fully on the microcontroller chip is powered by the line output stage derived +5B line). All other circuits are fed with a low-level voltage in standby so that they cannot operate.

The mains input is fed to bridge rectifier D6502-5 which charges its reservoir capacitor C2505 to about 290V. Chopper transformer T5525 and transistor Tr7525 are connected as a blocking oscillator, with feedback to the base of Tr7525 via winding 15-10 of the transformer. Block B controls the on/off switching of Tr7525. There's regulation feedback from the secondary side of the circuit via optocoupler IC7514. Resistors R3514/18/20 provide pulses to start the circuit operation. Incidentally there's nothing new about blocking oscillators: I remember valve versions in the timebases of TV sets in the Fifties and early Sixties!

When Tr7252 conducts, energy is stored in the transformer. This is released when Tr7252 is switched off. The rectifiers on the secondary side of the circuit then conduct.

The 95V HT supply is monitored by Tr7537, with zener diode D6537 providing a reference voltage at its emitter. Tr7537 drives the optocoupler via Tr7552/4.

Protection

Overvoltage protection is provided by the crowbar trip consisting of transistors Tr7556 and Tr7555. Zener diode D6555 monitors the line output stage derived +5B supply, while D6557/8/9 monitor the 95V supply. When Tr7555/6 latch on, the SOPS is switched off via IC7514.

Standby operation

Pin 19 of the microcontroller chip IC7600 controls the on/standby action by switching transistor Tr7571 on or off (for standby). When Tr7571 is switched off, thyristor Thy6570 is able to conduct. It charges C2560 to some 13V, which is fed to the regulation circuit via zener diode D6568. This reduces the on time of the chopper transistor, with the result that the output voltages are greatly reduced.

The 5V regulator transistor Tr7561 provides the supply to the

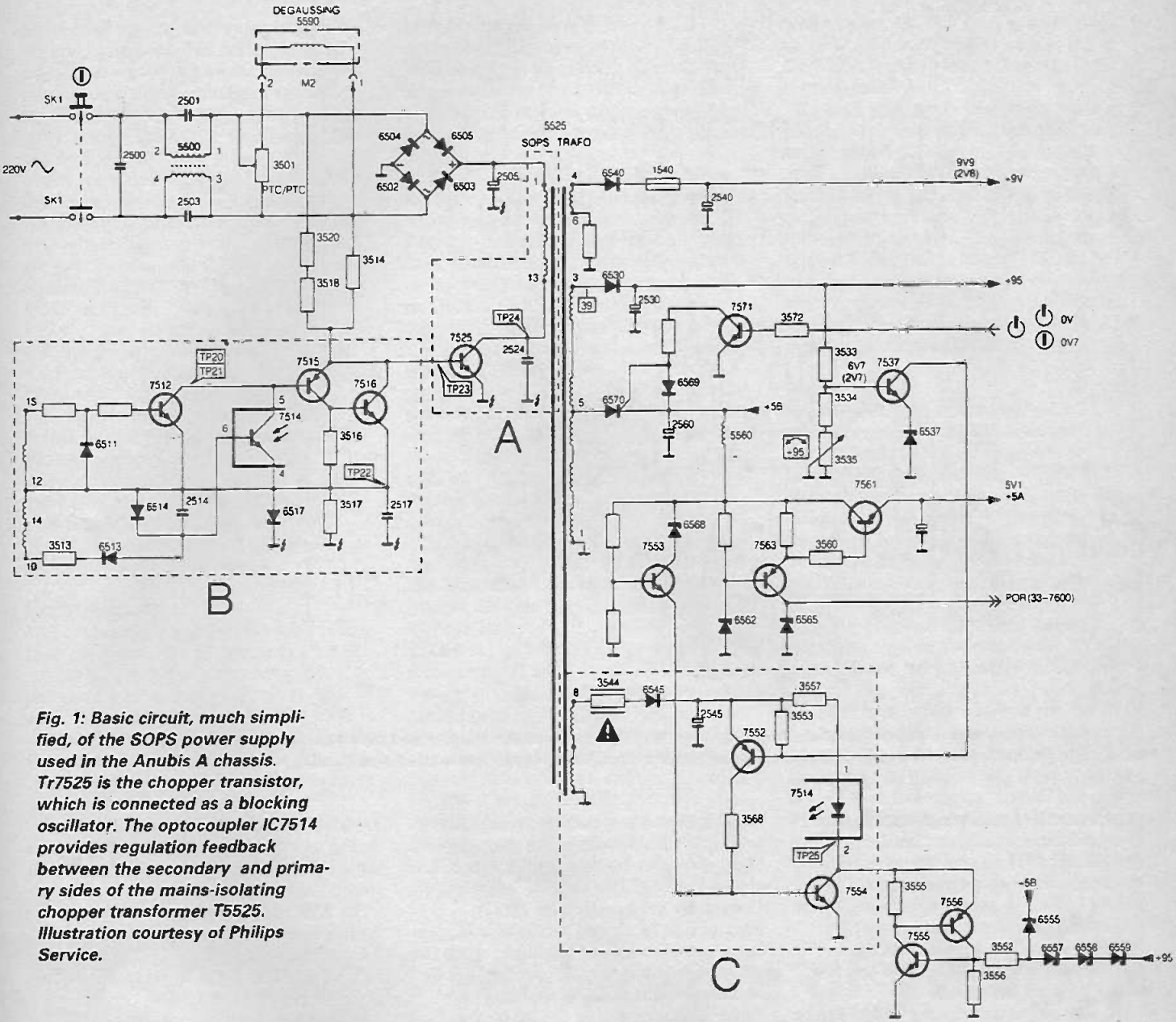


Fig. 1: Basic circuit, much simplified, of the SOPS power supply used in the Anubis A chassis. Tr7525 is the chopper transistor, which is connected as a blocking oscillator. The optocoupler IC7514 provides regulation feedback between the secondary and primary sides of the mains-isolating chopper transformer T5525. Illustration courtesy of Philips Service.

microcontroller chip IC7600. When the set is switched on, IC7600's reset pin 33 has to be kept low for at least 1msec. Zener diodes D6562/65 and transistor Tr7563 provide the reset action.

Faults

Perhaps the most common fault is a dead set with the mains fuse blown. The first thing to check is the degaussing posistor PTC3501 which often arcs over inside. If the posistor is OK, check whether the chopper transistor Tr7525 is short-circuit. If it is, the optocoupler IC7514, transistors Tr7512/7515/ 7516/7555 and diodes D6515/6545/ 6549 (some of these are not shown in the simplified circuit) should also be checked.

After a failure of this type it's advisable to fit the replacement components in the SOPS repair kit ES7021. Philips recommend this for continued reliability. The kit contains an optocoupler, four bridge rectifier diodes, a 2A mains fuse, transistors Tr7525, Tr7516, Tr7512 (BC848) and Tr7515 (BC858), and diodes D6522, D6523 and D6517 (BZV85-5V1).

All very well, but what do you do if the set still fails to power up? The answer is to check the thyristor Thy6570 (SFOR5D43) and the associated LL4148 diode D6569. These could be defective, holding the set in permanent standby. In this event the red standby LED should be illuminated, telling you that the primary side of the circuit is working with the +5A supply present.

Sometimes however the +5A supply goes haywire when the set is switched to standby. The symptoms are that the set doesn't switch off properly, with the picture flickering on and off. The cause is the 6·2V zener diode D6568. A kind of motor-boating sound from the loudspeaker, with the LED flickering, occurs when transistor Tr7553 (BC858A) is leaky. This transistor can also be responsible for a power supply 'hiccup' every so often, with the picture flickering each time the hiccup occurs.

A dead set does not necessarily mean a power supply fault of course. A fault in the line output stage will trip the power supply, with the set shutting down.

The line timebase

Fig. 2 shows a simplified circuit of the line timebase, which is straightforward. IC7015 (TDA4504) is a multi-function chip that contains the IF section, the timebase generators and the sandcastle pulse

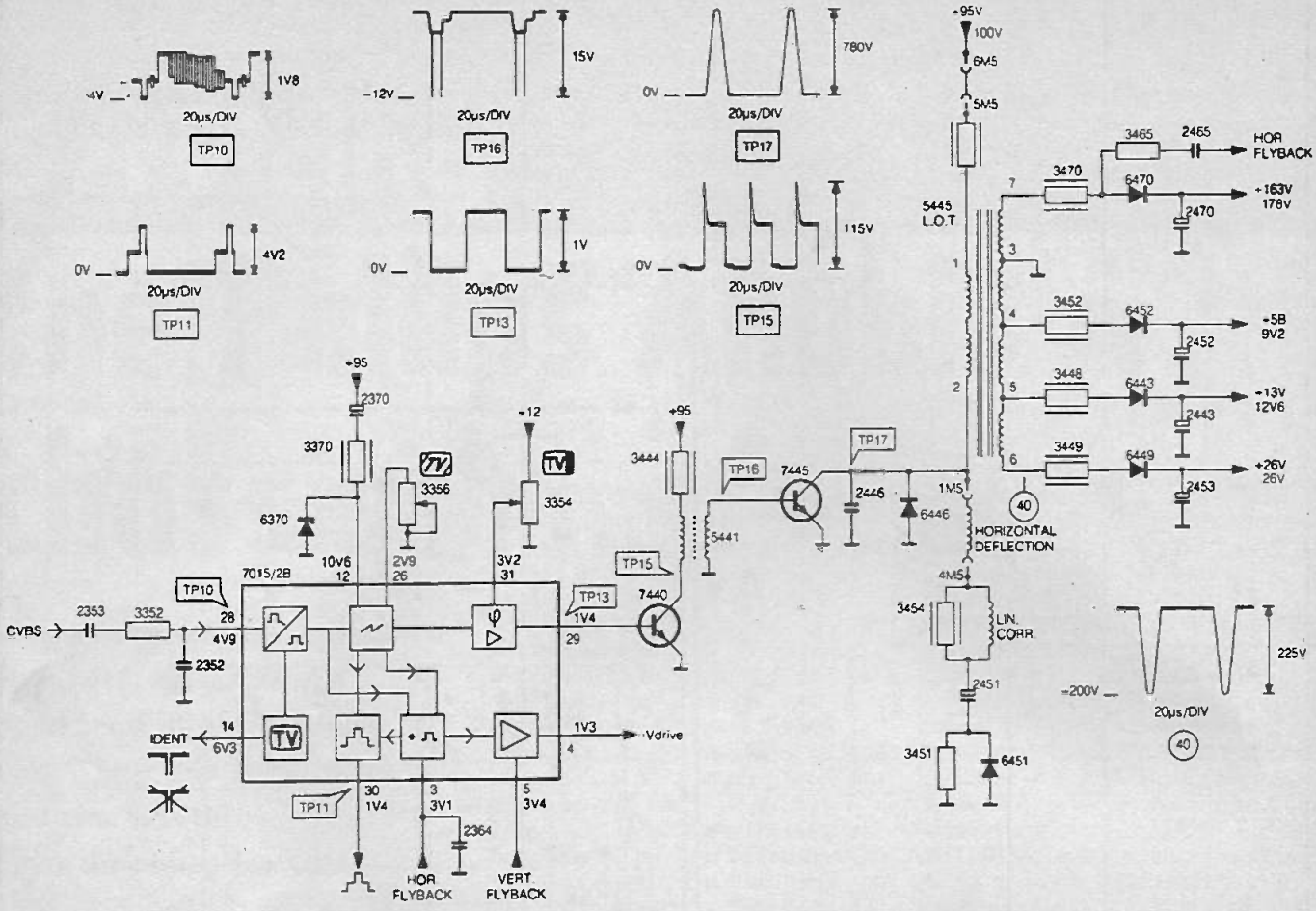


Fig. 2: Basic circuit, much simplified, of the line timebase. IC7015 contains both the line and field generators, with line drive output at pin 29 and field drive output at pin 4. It also contains the IF strip. Illustration courtesy of Philips Service.

generator. The squarewave output at pin 29 is passed to the line driver transistor Tr7440 (BF422) which is transformer-coupled to the output transistor Tr7445 (BUT11AF). The output stage provides the line deflection current, various supplies from the secondary windings on the transformer, and the EHT, focus and first anode voltages.

The line output transformer T5445 can be a source of trouble in more ways than one. The internal insulation can break down with a short-circuit between the primary winding and chassis. This closes down the power supply. The same thing happens when shorted turns within the transformer cause excessive current flow and, as a result, line output transistor overheating. The transistor then fails with emitter-collector punch-through. Sometimes however the transistor holds its own: the defective transformer then makes the set go into the protection mode, with the red standby light blinking rapidly.

When scan coil plug M5 is disconnected there is no 95V feed to the line output stage. If the power supply is OK, the HT voltage will then rise to 95V, confirming that the cause of the fault is in the line output stage.

A defective line output transformer can also produce a brilliant white screen with flyback lines when, for some reason, the tube's first anode voltage has gone sky high – probably because of a defective chassis connection within the transformer. Conversely the transformer, with its integral first anode and focus controls, can cause complete loss of brightness when the set has been on for some time, because the first anode voltage has dropped to a low value. This seems to be caused by the controls changing value with temperature.

Another strange line output stage fault leads to complete loss of colour. A scope check at TP11 (pin 30 of IC7015) will show that the sandcastle pulses are of reduced amplitude and distorted. The cause is R3456 (330kΩ or 430kΩ depending on tube size) cooking and going high in value.

Apart from these faults I've found that the line output stage is very reliable. This goes for much of the rest of the circuitry as well. There are however a few general faults that are worth mentioning.

Tuning troubles

The UHF tuner, type U743, is controlled by IC7600. A voltage-synthesis tuning system is employed. Pin 1 of IC7600 produces an output of 0·2-5V depending on the frequency selected. This is fed to the base of transistor Tr7605, whose collector sets the correct tuning voltage (0-33V). AFC is added: it's switched off during search tuning, and on again when a station is received. It's the AFC that sometimes causes trouble.

The AFC can be slightly too slow to operate when search tuning is in progress. As a result, stations are passed without locking on. The cure is slight readjustment of the IF detector coil L5040.

At other times the picture starts to go haywire because the AFC suddenly drifts off (erratic tuning). In this case check the status diode D6052 (LL4148) and zener diode D6370 (LLZ-F12). The tuner can also drift, with complete loss of picture and sound.

Another peculiar fault can occur when tuning a VCR's UHF output: the set won't lock to it – most frustrating! There's a small modification that can be implemented to cure this. It ensures proper pull-in of the VCR channel. Connect a BZY79C-6V2 zener diode and a 1N4148 diode in series, anode to anode, between pins 14 and 21 of the TDA4504 chip IC7015, with the cathode of the zener diode to pin 21 and the cathode of the 1N4148 diode to pin 14.

Copy-protected tapes

While on the subject of connecting a VCR to these sets it's worth mentioning the

problem of playing Disney tapes, which are copy protected. The results jump all over the place, because these sets don't like reproduction from copy-protected tapes. I discovered this when I sold a set to a friend for his daughter's bedroom: she was hooked on Disney videos! Extra pulses are added to the field sync with these tapes, the result being instability.

A number of modifications are required to cure this, because both the chroma and the sync circuits are affected. In the sync section, change C2350 to 47nF, C2351 to 4·7µF, R3350 to 75kΩ and R3351 to 1·5kΩ. There are several changes to the chroma circuit to prevent flicker. Add a 47nF capacitor between pin 12 of IC7250 (TDA4650) and chassis; change C2267 to 1nF; replace jumper wire 9268 with a 5·1kΩ resistor (Philips part no. 4822 116 52286); replace C2310 with a 10kΩ resistor; remove R3306 and fit a jumper wire in its place. This should, hopefully, resolve the problems. I say hopefully because in practice I could still detect a slight flickering of the picture.

Colour faults

I've occasionally had the following colour-fault symptoms: the picture has a kind of greeny bias to it, faces look very sickly, and there's a Hanover blind effect. The cause is a faulty delay line or TDA4660 delay-line chip (IC7221). This IC can be the cause of a very curious fault, when a blue line is superimposed on the middle of a colour picture.

Apart from these few faults the colour decoding circuitry seldom gives any trouble.

Hotel mode

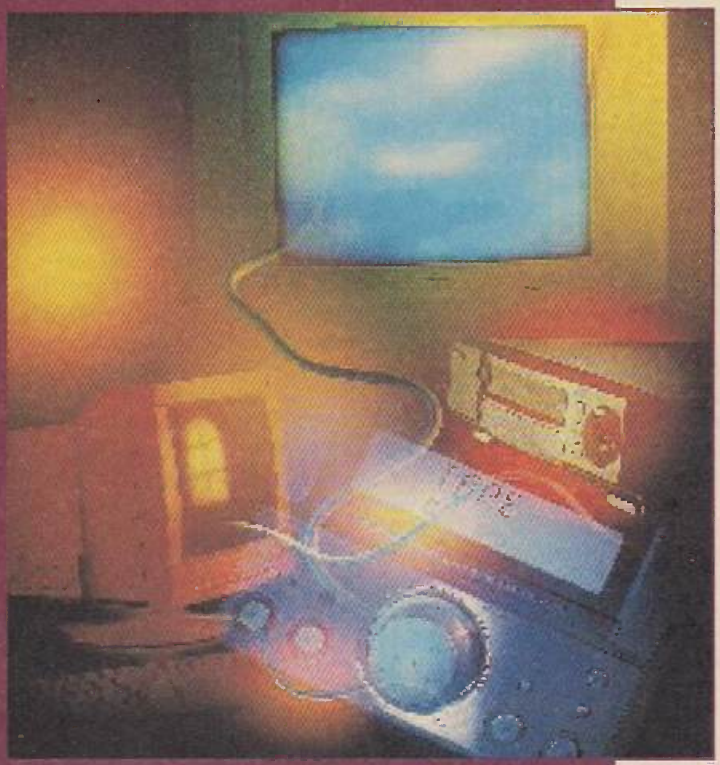
An acquaintance of mine works for the local council at the rubbish disposal skips where members of the public go to dispose of household rubbish, and is surprised by the number of really good TV sets that are dumped after a few years' service with often only a very simple fault. He brings me these sets for repair and resale, after which we split the profits between us. Recently he came through the door with a 21in. Anubis A set in his arms, plonked it on my bench and announced that it came on OK but with just a snowy screen, suggesting that perhaps the tuning system was at fault as it was impossible to call up the tuning menu. He was amazed when I pushed a few buttons, got the set to retune and told him that there was nothing wrong with the set: it had been locked in the hotel mode, a setting that prevents the user from fiddling with the tuning or adjusting the volume level – handy for hotel bedroom sets!

To deactivate this mode, select ch. 38 then press both 'select' on the front panel and 'sleeptimer' on the remote-control handset for four seconds, after which an H will be displayed at the front of the set. Switch the set off then back on again. This removes the H and cancels the hotel-mode setting, so that normal tuning and volume control once again operate. Note that the set can be returned to the hotel mode by repeating this procedure. Also note that non remote-control sets employ an earlier version of the microcontroller chip: with this the hotel mode can be set/reset at the front-control panel – press 'select' while holding the search button in. Should you replace the microcontroller chip with a later version and find that the set is stuck in the hotel mode you will need to replace the ST24C02P EEPROM then retune all the programmes.

To tune, press the select button the front panel. This brings up the horizontal green tuning bar on the screen. Next press the search button. The tuning process then starts, with the bar gradually lengthening as the microcontroller chip searches up through the channels. The search stops when a TV station is found. This can be assigned a programme number by using the programme +/– buttons, after which it must be memorised by pressing store. All quite straightforward.

Nursery set

So, going back to where I started, a perfectly good TV set had been thrown out because someone couldn't unlock the hotel mode! There's a further tale to be told about this particular set which, after being cleaned up, was put on display in the shop for sale. A few days later her ladyship from a nearby stately home rushed in declaring that she urgently needed a television for the children's nursery – something second-hand would do. Her eyes fell on a nice little set that stood in the corner. It was the previously-mentioned Anubis. "Perfect" she declared then, once a deal had been struck, she said she would send the butler round to collect it. Later that day Jeeves drew up in a very stylish limousine and took the set. There we have it then, a perfect "rags to riches" tale, with a set from the local council skips now residing in a rather posh nursery! Anubis is the ancient Egyptian god of death, but here was one Anubis that refused to die! ■



The home of the future is likely to be controlled and linked to the outside world by digital technology. There are various ways of going about this. Mark Paul describes the system being promoted by the HomePlug Powerline Alliance

Get wired

Regular readers will probably be aware of 'smart-home technology', or 'home networking', an idea that the high-tech community has been advocating for many years. Technical developments to date have been quite basic, with most progress in the area of 'assistive technology'. The prospect of e-mail access to a refrigerator, sending a movie direct from a PC to a TV set some distance away, or engagement in multi-player video games using computers three floors apart has yet to be realised.

A major consideration is the transmission system. Hard-wired data cabling (RF technology) or the use of existing mains wiring both have their backers. Another approach is a composite system, which would enable installations to be customised. One such system is being promoted by the HomePlug Powerline Alliance.

The HomePlug Powerline Alliance

The Alliance's founder members – AMD, 3Com, Cisco Systems, Compaq, Conexant, Enikia, Intel, Panasonic, Texas Instruments, Motorola, S3's Diamond Multimedia and Tandy/Radio Shack – have recently been joined by Cogency Semiconductor Inc. The initiative has received public approval from Microsoft which, not surprisingly, supports industry efforts to bring about the digital home.

HomePlug Powerline Alliance Inc. is a non-profit corporation. It was established to provide a forum to help create global standards and technical specifications for home powerline working, also to propagate the demand for relevant products and services through sponsorship of market and user education programmes. Founded in March 2000, it has since grown rapidly. There are now over fifty member firms whose interests span hardware, software, semiconductors, consumer electronics, utility and retail operations.

Field trials on the technology were carried out last June in more than 500 homes world wide. This led to the HomePlug 1.0 specification, which will enable products to be brought to the market during 2001.

Cogency's chip sets

Cogency Technology Inc., founded in 1997, specialises in chip sets for residential powerline networking. It subsequently merged with Power Trunk to form Cogency Semiconductor Inc. Cogency's design team came from the computer division of LSI Logic Corporation, which has a worldwide mandate for several core technologies including PCI, 1394 (FireWire), USB (the universal series bus) and Pentium multi-processing chip sets. Power Trunk's main activities were in power networking: the company had developed a range of high-speed transmission products for its 'channel-adaptive technology'.

The new company has adopted a wide design brief, and is to use its skills in OFDM (orthogonal frequency-division multiplexing) to enter other developing markets including broadband wireless. Its overall experience has given it the ability to provide building blocks for use in semiconductor devices for in-home networking, home gateway and audio/video streaming via power lines, also future wireless products.

Cogency engineers were the first in

the world to demonstrate high-density, multicarrier transmission via power lines and make clear the benefits. The company claims that the use of channel-adaptive technology as an effective, high-quality transmission system enables fast powerline networking to be achieved in even the worst transmission conditions.

Cogency Semiconductor, based in Ottawa, aims to make the electronic home a reality.

Its products should enable people to create a network throughout their homes with no need for any extra infrastructure. Ron Glibery, Cogency's Chief Executive, comments that "domestic users aren't likely to want to pull professional cable through their walls at home, as in an office: the challenge is to find solutions that use the existing infrastructure, in particular by distributing digital signals via power lines".

HMT technology

Cogency manufactures a channel-adaptive technology chip that enables digital data to be transmitted and received, at the high speeds required, via ordinary electrical sockets. Applications of the technology include shared broadband internet access between PCs and internet appliances and multidevice gaming – in addition to audio/video distribution within the home.

Video transmission is of course impossible at a 2,400 baud rate. Cogency's claim is to have taken the transmission rate to megabyte speeds. Its harmonic multi-tone (HMT) technology uses a wider frequency band of multicarrier signals, which are processed dynamically at lower cost than any other similar technology. The system self-monitors the multicarrier transmission for real-time impairments, then adapts the signal dynamically without performance degradation.

The networked home

Much of the infrastructure to enable people to take full advantage of what the internet has to offer is already in place. Although fun gadgets – networkable TV sets, refrigerators, wheely bins etc. – are still on their way, the PCs are there. An increasing number of homes will soon have more than two PCs that can be networked together. It seems reasonable that the first step in the networked home will be to link PCs, printers, modems, DVD players, a home network server etc.

The primary use of the home network will perhaps be to link several PCs to a single high-speed internet connection.

What will the home network market involve? Some believe that consumers will take advantage of a world-wide network of interactive media and TV programming. The driving force is likely to be entertainment content. It's a fact of life that consumers will pay a premium for this.

Consumer electronics companies such as Sony, Panasonic, Samsung and Thomson Multimedia are working overtime on the connection of their equipment to the internet. Many internet appliances are still only on the drawing board, but LG Electronics at any rate has come up with the internet refrigerator, which gives the user access to the internet through a flat-screen monitor built into its door. There is more to come!

LETTERS

Send letters to "Television", Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS

or e-mail tessa2@btinternet.com using the subject heading 'Television Letters'.

Please send plain text messages. Do NOT send attachments. Type your full name, address, postcode, telephone number and e-mail address (if any).

Your address and telephone number will not be published unless requested, but your e-mail address will unless you state otherwise.

Please send ONLY text intended for the letters page. Correspondence relating to subscriptions and other matters must be sent to the office address given above.

Digital terrestrial TV

In his article on digital terrestrial TV reception in the April issue Bill Wright describes channel storage by a DTTV receiver when signals are available from two or more transmitters as "haphazard". What seems to happen is this:

The receiver scans each UHF channel in turn, from ch. E21 to ch. E68, looking for digital multiplexes (muxes). When it finds a mux it looks for the digital channels within, notes the programme number assigned to each one, and stores it appropriately. If there is no specific programme number for a channel it's stored at the next available position from 800 upwards.

The first time a given mux is encountered its channels are stored as described above. Channels from a different mux, previously stored in positions required by the new mux, are moved to the next available position. The new channels are stored correctly.

The second time a given mux (numbered 1, 2, A, B, C and D) is found, the receiver checks to see if the service is identical to the first or contains regional variations. In either case the new channels are stored in their correct positions. If the new mux is identical to the first one, the old channels are discarded: otherwise, they are moved to the next available positions.

If you know which UHF channels are occupied by the muxes from various transmitters, and which channels are present in which mux, it's possible to work out how the channels will be stored. The problems occur when a weak signal contains an identical mux on a higher channel than a strong one, because the strong transmitter's channels will be overwritten.

Bill also mentions cutting the wire to pin 8 of the scart to disable auto-switching with an STB. This is rarely necessary, as the TV/DTV button on the digital remote-control unit sets pin 8 (input switching), pin 16 (RGB switching) and the RGB video pins 15, 11 and 7 to 0V, which should make most TV sets revert to the previously selected analogue channel and then operate normally. An STB with up-to-date software comes on in the DTV mode when started manually and in the TV mode when started by the timer.

In his DX-TV column Roger Bunney mentions a thirty-pound 'iMac'-style VHF/UHF portable monochrome receiver. I bought one at the end of last year with a view to dabbling once more in VHF DX-TVing. The set certainly looks promising, as it comes complete with a circuit diagram. In the UK version the three-position I/III/UHF switch has the left and centre positions wired together and the dial has only two scales, showing channels 21-69 UHF and 4-13 VHF.

Having rewired the switch in accordance with the circuit diagram I have yet to find any Band I signals, though utility stations are evident in Band III. The receiver is not as usable as I had hoped for UHF reception, as the drive cord system suffers from very bad 'stiction' that makes tuning rather hit-and-miss. I'm sure that the keen experimenter will find a solution to this problem.

Alan Pemberton,
Sheffield.

Ni-Cad battery charging

I read Ian Field's article on Ni-Cad battery charging (March issue) with interest – it's a subject that we here at Micomicon know more than a little about – and may be able to shed some light on the question of NiMH versus Ni-Cad batteries and the 'memory effect' referred to.

Two effects associated with Ni-Cad batteries have become confused in people's minds. Only one of them is anything to do with memory. It was first noticed by NASA. An orbital satellite's batteries were being charged when it was in sunlight, and drained when they were used to power the satellite while in darkness. This happened at precisely the same time each day, the charge lasting for exactly the same number of minutes and the discharge occurring at precisely the same current and lasting, again, for exactly the same number of minutes. After many days of this partial charge/discharge cycle, NASA noted that the batteries wouldn't deliver power beyond the point at which they had been previously discharged – in other words the batteries had 'memorised' the point of partial discharge, and refused to operate after this point had been reached.

This is the true 'memory effect', and is the source of the myth that Ni-Cad batteries should always be completely discharged before being recharged. It almost never occurs. You would need to use your laptop for say one hour, 16 minutes and 30 seconds every day and charge overnight repeatedly for a couple of weeks before the effect would appear. This is obviously not going to happen in normal use.

The effect usually referred to as 'memory' is in fact a voltage drop. It has nothing to do with reduced capacity and does not occur as a result of partial charge/recharge cycles. The cause of the problem is a secondary alloy of nickel that's created when a fully-charged battery stays on a trickle charger for some length of time. A normal Ni-Cad cell has a nominal voltage of 1·2V, while the secondary alloy has a lower nominal voltage of about 1·08V. Thus a ten-cell battery (nominal 12V) that suffers from this problem could be thought of as a dual battery, with one part providing 12V and the other 10·8V.

In use, power will always be drawn from the higher-voltage section first. Your laptop will operate normally until the 12V section of the battery is exhausted and power starts to be drawn from the lower, 10·8V section. Most laptops won't function at this lower voltage. The battery will be considered to be suffering from loss of capacity and returned to the charger.

The question is, what is actually being charged? Not the secondary-alloy 10·8V section of the battery, as this part has not been used and is still fully charged. Only the normal-alloy 12V section of the battery receives a charge. Next day you fit the battery in your laptop and it behaves exactly as before: everything works normally at first, then the battery fails at the same point as it did during the previous day (in fact the effect may worsen with time, as subsequent charging may produce even more of the secondary alloy).

Once this false 'memory effect' is understood, the discharger myth can be explained. Because your laptop will never use and therefore discharge the 10·8V section of the battery, the secondary alloy will stay there for ever. But if the battery is connected to a discharger that properly discharges both the normal section *and* the secondary-alloy section of the battery, when the battery is subsequently recharged it becomes 100 per cent normal alloy and the 'missing capacity' mysteriously returns.

The sensible way to avoid the voltage-drop problem is to use a 13·2V or 14·4V battery for 12V-nominal applications, as any reduced output won't result in the equipment ceasing to function prematurely. The battery will be fully discharged every so often and any secondary alloy will be eliminated. Never using a trickle charger would also seem to be a good move.

Dischargers should if possible be avoided. Discharging before recharging is unnecessary and seriously reduces the life expectancy of a battery. A lamp bulb or resistor should **never** be used to discharge a Ni-Cad battery. Discharging beyond the point of full discharge (9·5V for a 12V battery) may damage the battery permanently, release hydrogen gas and risk starting a fire or explosion.

Adrian Spriddell,
Micomicon Electronics,
Diss, Norfolk.

Capstan motor pulley

In the February VCR Clinic M. Della Verita mentioned a problem with the plastic capstan motor pulley in the Toshiba Model V813B. Although it's not available as a separate part from Toshiba, there was a similar problem with various Mitsubishi models, e.g. the M37, and a more reliable metal pulley is available for these. It just so happens to be a perfect fit, with a little glue, for the troublesome Toshiba/Ferguson range. I've been fitting these pulleys for several years now without any problems. The pulley is available from CPC at approximately £5 under code no. VS00472.

D. Mcintyre,
via e-mail.

Monitor scan rates

Geoff Butcher's fault report on an IBM 07-593 monitor (February, page 246) had me thinking when he commented that his substitute line output transistor worked "well within its limits, even at the highest scan rates". The notion that a line output transistor is under the greatest stress in the highest-resolution modes is worth consideration.

First, one has to remember how the scan-current waveform is produced. When the output transistor switches on it produces a linearly rising ramp current in the inductive load. This occurs during the second half of the scan, when the beam is deflected from the centre to the right-hand side of the screen. But in addition the energy stored in the transformer must be sufficient for the efficiency diode to be able to provide scan current during the first half of the following line.

Lower scanning rates keep the transistor on for longer, with the possibility that the peak collector current might rise to a higher level than with the faster scan rates. In most circumstances the B+ regulator will be set to provide, automatically, a safe supply rail voltage for the mode in use. But modes are often grouped to economise on settings/EEPROM size. This involves a compromise in how closely the B+ control matches the line output transistor's forward conduction time.

Ian Field,
Letchworth, Herts.

Qualifications and registration

Having read all the letters published so far on the registration of engineers I would like to mention the registration certificate issued to me in 1952 for TV (see photo above right). I had previously received sections A and B. This certificate ensured that my wages would be at least the current rate for a qualified engineer with television experience, and was issued by the RTRA (now RETRA).

I continue to work (see Monitor fault reports March) and would be interested to know if anyone else still has one of these Radio Service Trade certificates?

E.T. Evans,
Fleet, Hants.


JOINT STANDING COMMITTEE
for
THE RADIO SERVICE TRADE
26 FITZROY SQUARE, LONDON, W.1

REGISTRATION CERTIFICATE for 1952

Issued to [illegible]
124, Boundary Road, [illegible], Berks.

Section ~~A~~, ~~B~~, TV.

No. 552

This Certificate is the property of the Joint Committee and must be surrendered to the Joint Secretaries on demand.

Further to Jason Boylin's letter on qualifications and registration (March), I have worked in the TV trade for over 45 years with no formal qualifications other than the amateur radio exam, and as far as I know have not electrocuted anyone or burnt their house down. If this makes me a cowboy, so be it. Because of the rapid progress of technology, qualifications mean very little after a year or two. I could probably draw you the circuit diagram of an early Fifties TV set from memory, but this doesn't help much when you are battling with one of today's microcomputer-controlled monstrosities.

I wonder whether having qualifications actally makes you a better engineer? The days when hubby would put the family set on the kitchen table to look for the valve that didn't light up are long gone. Anyone who repairs modern TV sets has to have a fairly good knowledge of basic electronics and certain skills, especially when you consider the fragile nature of today's equipment. I have read criticism in these pages of those who cream off the easy jobs. Which easy jobs? Even the replacement of a line output or chopper transistor calls for a degree of skill, and unless the underlying cause of the fault has been found the set will soon be back again. How long would someone who refused to carry out a further repair last in the business?

Repairs required because of signal processing or microcontroller faults are often uneconomic because of the time needed or the cost of ICs. In this neck of the woods most people are not prepared to spend more that £30-£40 on a repair, unless it involves a large-screen set – and I'm getting to the age when I have difficulty carrying these.

Strangely, work has improved dramatically this year. At present I have about fifteen sets in the workshop. This time last year I was looking for a job. I think the upturn is largely because of the number of local firms that have ceased to trade over the past year. This is born out by the fact that since I changed my long-standing advertisement in the local paper from "second-hand sets for sale" to "TV repairs" quite a few people have told me that they can't find anyone to do repairs. I think the way forward, for me anyway, is the course that Bruce Adams has taken, i.e. vintage radio repairs. I already get a few, but have not been able to command the price he does. At least I understand them however!

Peter Nutkins,
Charmouth, Dorset.

Cost of digital TV

I have no real objection to digital TV, though I think analogue transmissions

provide better definition. But the haste to dump analogue by 2006 is irresponsible. I have customers who are frightened that their screens will suddenly go blank. Some cannot afford to buy a new TV set, let alone pay for programmes. For a fair and smooth transfer, like 405-625, analogue TV should not be shut down before 2015, if at all.

Half the people do not want or cannot afford pay-TV, myself included. They need to be able to buy a digital TV set, take it home and use it. None of this conditional access and control by broadcasters nonsense. I was amused when I read that the government minister involved went shopping for a free-to-air digital TV and couldn't find one. No surprises there. The latest crazy idea is to give everyone a free STB. What, only one?! As most households will need at least four, this is not a very good idea.

As for widescreen TV, you can keep it. Everyone's picture has to be stretched, squashed and have gaps, including widescreen, to accommodate it. The 4:3 aspect ratio has better geometry and viewing comfort. Widescreen TV is like watching a tennis match through a letterbox.

John Langley,
Burton Latimer, Northants.

Audio faults

The fault report on a Peavey UMA150T amplifier with a failed negative supply reservoir capacitor (March, page 309) reminded me of a similar problem I had with an A&R Cambridge SA200 hi-fi power amplifier that dated from the early Eighties. The reservoir capacitors in this particular unit have two extra 'dummy' tags to provide additional mechanical support on the PCB. But because of a misunderstanding these tags were commoned to chassis instead of being connected to 'floating' pads as they should have been. The remedy was to cut off the dummy tags. I'm not familiar with the Peavey amplifier, but it may be worth checking whether this is the case. These extra tags are presumably in contact with the electrolyte inside.

On the subject of the Quad 303 power amplifier (February, page 245), in later production the reservoir and output capacitors were mounted with their connection tags uppermost to help alleviate the leakage problem. Quad used to supply a small extension loom to enable older 303s to be modified when these capacitors had to be replaced, but it would be easy to make your own.

The Quad 303 used some very obscure transistors in the driver and output stages. Quad have supplied alternatives for the pre-driver and output transistors as they became obsolete, but the 38495/38496 driver transistors remain a mystery. If anyone knows of alternatives for these transistors, which have proved to be reliable, I'm sure this information would be of interest – not just to myself.

On a different subject, TV sets that catch fire (February), note that the mains rectifier's reservoir capacitor is usually connected across the rectified mains input when the set is in standby. This increases the likelihood that the capacitor will leak electrolyte, forming stray conductive paths on the PCB. It's clearly another possible fire hazard. Another point to note is that the PCB (always SRBP rather than fibreglass, for cheapness) in the power supply area often looks badly charred after a few years' use. One wonders how badly charred the PCB has to be before it starts to become conductive.

The degaussing thermistor also usually remains connected to the mains supply. It can blow up without warning. Incidentally, plug-in air fresheners are normally heated with a PTC thermistor that's connected across the mains supply. I once pulled one apart and was surprised to find that it wasn't fused! Are there any known cases of the posistor in these units shorting?

No mention has been made of VCRs and satellite receivers. Nowadays these nearly all have a switch-mode power supply and remain in standby to keep the clock running etc. They are often housed in badly-ventilated TV/video cabinets, which adds to the problem. Modern 'mid-engine' VCRs are usually assembled on a single PCB, with the deck mechanism screwed down on top and no access to the tracks underneath. Dry-joints in the power supply would go unnoticed, unless they were actually producing on-screen symptoms.

I hope that these points provide food for thought, and don't prove too alarming!

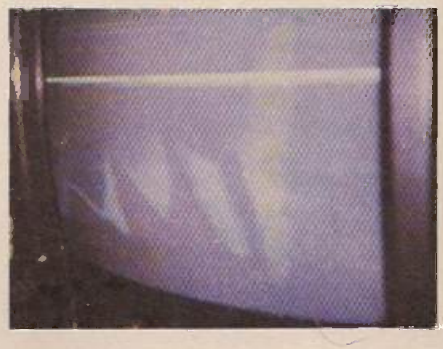
Simon Pearson,
Chipping Norton, Oxon.

In the December issue audio faults page Russell Fletcher mentioned Peavey Black Widow drivers and their replacement baskets. I've come across several of these and other pro. speakers where the driver has stopped working and a quick meter check at the speaker terminals suggests that the coil is open-circuit. But a double check with the meter at the coil end of the flexible connecting wires proves otherwise. In this event replace the connecting wires with some desoldering or other very flexible braid and the speaker will have a new lease of life. Don't condemn the speaker until you have checked this out.

John Beer, J.B.Electronics,
Tiverton, Devon.

How to survive

I've been in and around the TV trade since leaving school way back in 1958 – you know, valves and all that! I don't want to be a security guard or work in a hotel (current local job options), so I've got to



squeeze a few more years out of the TV trade until I can retire (yippee!). With this in mind I've had a look at some of the problems that have caused the downfall of local shops with repair facilities (apart from unrealistic borrowing based on excessive optimism, and trying to compete with the nationals on selling new goods) and have come up with the following.

The firms I'm thinking of have all taken on too much work. I know that sounds daft, but the most common complaints I hear from customers are: so and so had my set for weeks, kept fobbing me off with excuses, waiting for parts, promised to phone me back and didn't, never called when he said he wound, rude, etc. Sounds familiar? A customer will then go on to complain about all and sundry.

So, if you are a one man and his dog outfit like me, I suggest the following policy. I work on a free estimate and a no cure, no fee basis. I find that if I haven't sussed out cause of a fault within half an hour I probably never will, so I return the set to the customer promptly with sincere apologies that on this occasion I've been unable to help. I'm still the good guy, for telling them the way it is. Most customers are happy that you've tried, and will normally buy a second-hand set from you or trot off to Asda for a new one. Same applies to parts. If an item is ridiculously expensive or on back order, forget it – it will only lead to grief. You don't want your workshop piled high with sets you'll never repair or waiting for parts you'll never get. Far better to lose half an hour now than spend hours that you can't charge for, and your reputation won't be wrecked. As for videos, I don't have the leads and jigs needed to work on the newer stuff, so forget 'em. The cost of repairs is likely to exceed the cost of a new machine.

All right, you won't make a fortune in this way, but you'll definitely avoid an awful lot of aggravation, and it isn't the end of the world to turn away work you don't want.

The photo above was provided by a customer to show me what the intermittent fault on his Matsui portable looked like when it was present. Now that's what I call helpful!

Mike Hayward,
Falmouth, Cornwall.

AUDIO FAULTS

Reports from
Mike Leach
Pete Roberts
Paul Sargent, LCGI and
Andre Nel

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 426 for details of where and how to send reports.

Sony HCD-H650M midi system

This model uses a standard KSS-240A laser assembly which, as we all know, is prone to failure. Recently I've had several cases where a new laser assembly failed to cure the skipping and jumping symptom – usually the machine wouldn't read discs at all. The problem can be caused by an intermittent laser ribbon cable. If a new cable fails to cure the fault, try replacing the three 47µF, 4V surface-mounted electrolytic capacitors C105/6/7 on the CD board. The smell when you desolder them will usually indicate whether they are the cause of the trouble. **M.L.**

Arcam Alpha 6 CD player

A loud humming noise came from within the metal cabinet – the audio relay was vibrating very fast. If you get this symptom, try replacing C416 (470µF, 25V). It's mounted close to the mains input plug. The chances are that this capacitor will be the sole cause of the problem. **M.L.**

Sony HCD-MD5

The MiniDisc unit wouldn't eject a disc. Once the machine had been stripped down it was easy to eject the disc by manually winding the belt on the MiniDisc assembly. The mechanism would then load another disc, but wouldn't eject it.

The cause of the trouble was the BA6287F loading drive chip IC431. It's an eight-leg surface-mounted device which is on the digital board. The Sony part no. is 8-759-040-83.

I've had one case where there was an irrepairable burn-up on the board when this IC had failed. So it's worth checking the condition of this area of the PCB whenever one of these machines comes in, whatever the fault. **M.L.**

Roberts R700 transistor radio

This old-timer was an original from 1968, not the current replica. It's an unusual design, with completely separate tuners and IF strips for AM and FM reception, with only the audio stages common. Germanium transistors are used throughout. The faults were first no FM reception then loss of AM reception. The cause of the AM fault was traced to a shorted decoupling capacitor that removed the power to the Mullard mixer/oscillator/IF module.

The cause of the FM problem took rather longer to sort out. These sets use Mullard AF11x series diffused-alloy transistors, which are known to suffer from two failure modes: a collector-to-case short and a shorted base-emitter junction. Someone had been melting solder on top of the IF amplifier transistors – remember, these are germanium devices! As a result two of them had failed, also the mixer/oscillator transistor in the tuner head. Fortunately the tuner's special RF amplifier transistor had survived, as an AF115 won't work in that position.

After fitting three new transistors from my small stock of these vintage devices all that was necessary was to repair a print break that prevented the bass control working. **P.R.**

Sony TA-VE150 integrated AV amplifier

Several of these amplifiers have come into the workshop. They all seem to suffer from similar problems. The usual reported symptom is one channel intermittent. It could be the rear or front speakers or even both. The customer may complain that one channel is permanently off, the other intermittent. I've found that the cause is nearly always dry-joints at the output ICs and regulators.

The main PCB comes out very easily. Check for dry-joints at IC751, IC701, IC651, IC601 and IC501. Also check plugs CNS800 and CNS801, and regulators IC801 and IC802.

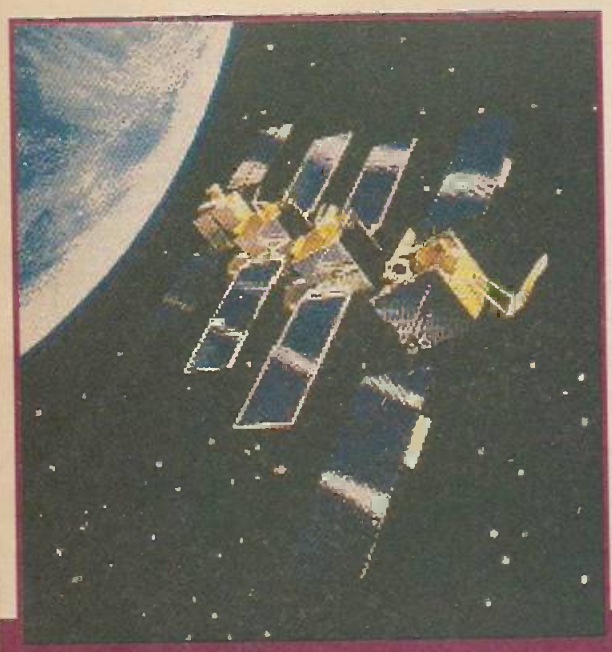
I've had to replace an output IC and a switching relay only once. **M.L.**

Sony HCD-RX80

There was a background hum on one channel, and 'notchy' operation of the volume control, with this 3-CD, twin-cassette midi system. IC201, which is labelled "EQ/VOLUME", seemed a likely candidate. As It's a large flat-pack surface-mounted IC all other possibilities were checked before I ordered and fitted a replacement. I breathed a sigh of relief when it cured the problem. It's also expensive! **P.S.**

Sanyo DC-F380KR

The complaint with this midi hi-fi unit was no record or playback via the right-hand tape deck. All other functions worked normally. I noticed that each deck had two solenoids, and that the left-hand solenoid on the faulty deck didn't seem to move at all. When I followed the wiring back I came to Q3132 (2SA952) on the front PCB – next to the fluorescent display unit. Although it measured good both in and out of circuit, a replacement restored normal record and playback operation. Strangely, the new and the old transistors both produced a gain reading of 372 when checked with my Peak component analyser **A.N.**



Terrestrial DX and satellite TV reception reports. Prospects for digital terrestrial DX-TV reception. News about broadcasting and satellite band changes. A new version of the D100 DX-TV tuner. Roger Bunney reports

DX and Satellite Reception

There was no F2-layer reception at all during February, with the maximum usable frequency rising to only 41·5MHz (on the 22nd). Conditions had been excellent during the previous two months. Tropospheric conditions were more interesting however, with a couple of periods that produced enhanced reception. The settled weather conditions around the 14/15th produced signals from the east and south east. Dave Philpot in Looe, Cornwall noted UHV TV and FM radio from the Benelux countries, including RTL (Luxembourg), and NE France. There was excellent UHF TV from France here in south Hampshire. Cyril Willis (King's Lynn) received signals from Germany, the Benelux countries and Norway (NRK chs. E5, 9 and 10), also the old favourite RTL ch. E7. In the Netherlands Ryn Muntjewerff received twenty five SVT-2 (Sweden) UHF stations including regional programming from Pajala ch. E34. There was a further spell of tropospheric enhancement on the 18th, with signals from the south and SE, but conditions were not as intense as a few days earlier.

Round the world yachtsgirl Ellen MacArthur beats up channel, approaching the end of the Vendée Globe Race. Reception via Intelsat 801 at 31·5°E.

Some Sporadic E reception was logged during the period, but very little. Peter Schubert (Rainham, Essex) noted unidentified programming in ch. E3 on the 10th and 11th. He mentions that Lopik ch. E4 (the Netherlands) carries Arabic programming which includes Arabic script. So beware: that exotic ch. E4 signal might come from a lot closer than the Middle East!

Back-tracking to January, Cyril Willis noted good meteor shower activity on the 3rd and 15th, from the Quadrantids shower. Cyril has just come out of hospital after an operation: he has our best wishes for a speedy recovery.

Very occasionally Equatorial Guinea ch. E2 is received in Europe. For a closer look at typical pictures from this TV service check the web site of radio amateur 3C51, at www.qsl.net/kb2wf

Satellite sightings

I had a change of dish during the month. My 1·2m prime-focus dish was removed from its concreted-in post on the 14th (incidentally we were Sky digitised that day!) and on the 15th a new Channel Master offset dish was installed. Greg Wood (Winchester) aligned the tracking from 43°W through 1°W to 42°E. A spectrum analyser makes the job easy: with the lack of analogue signals nowadays any other approach would be almost impossible. Locating the orbital slots with the new actuator arm that has reed-pulse operation (the previous dish had an H-to-H mount with optical-pulse operation) has taken ages. At the time of writing I've found most of the satellites. The new Gardiner LNB had low gain, so I refitted the old 10GHz unit.

Regular readers may recall the problems I had when I first moved to the present house and erected my two dishes. A neighbour complained, and the local planning enforcement officer appeared. I subsequently gained retrospective permission for the 1·2m dish. It seems that the same neighbour, looking at the new dish from a bedroom window, has once again complained. As a result the planning enforcement officer has reappeared, quoting chapter, text and verse regarding the nearby 1·5m dish, the number of dishes about the premises, DTI/DOE regulations and so on. The moral is, either pick your neighbours or don't live within the Test Valley council area!

During the period that I was off-air, UK/US planes bombed targets in Iraq. Nick (Sutton) checked the APTN feed via Hot Bird (12·581GHz H, SR 5632, FEC 3/4)

and found that Iraqi TV was being relayed in both PAL and NTSC. President Sadam was of course featured, with military footage of tanks, marching troops, jets, missiles and so on.

An event that touched many around the world was the return of the lone yachtsgirl Ellen MacArthur, who had sailed around the world in the Vendee Globe Race. There was extensive coverage via several Intelsat 801 (31·5°W) dowlinks on February 10/11th. I found at least three downlinks on the 11th as Ellen arrived in France. SNG-26 TES-26 UKI 358 was at 10·974GHz V; the same ident with a completely different camera shot was present at 10·988GHz V; while a French feed with the ident CANAL240F2 was present at 11·024GHz V. These links all used SR 5632 and FEC 3/4.

There was action in space on the 10th as another Shuttle flight ferried more sections to bolt on to the International Space Station. The video downlink was carried by the Reuters NSS K (21·5°W) lease at 11·462GHz V. There were truly excellent pictures plus output from the "Korolen Space Centre, Houston". At one point the Reuters transmission cut to a Russian control room that was apparently also involved with the mission.

The same lease carried crisp pictures from Camp David, Maryland on February 24th when Tony Blair met President Bush – the signals arrived from "WH Pool Camp David", i.e. White House pooled video news feed.

Programming from Djiboufi is now available via Arabsat 2A/3A (26°E) at 11·075GHz H (SR 27500, FEC 3/4). It's in a Lebanese digital multiplex that also carries ZEN-TV, Al Manar, NOS-TV and about seven test channels with colour bars.

Dave Gilroy (St. Albans) reports reception from a couple of rare birds. The Italian cable channels Hit Channel, Telegenova, Euro Medit and Magic TV were seen during the mid-afternoon period from Eutelsat II F1, which is in inclined orbit at 48°E. By 2130 the signals had disappeared as the satellite had moved within its inclined arc. These channels were at 11,183, 11,179, 11,590 and 11,598GHz H respectively with the unusual symbol rates 1628, 3254, 2500 and 2359. In the far west Dave found a "big fat BT carrier at 11·477GHz H (SR 26463, FEC 3/4) with five-six channels including DD World, Test card, BT promo etc." This was from PAS-9 at 58°W. For up-to-date information on satellites worldwide Dave recommends the website www.lyngsat.com

Scanner enthusiasts should check 269·74MHz narrow FM via the US Fleetsatcom bird at 15°W where Hugh Cocks (Portugal) has found Colombian Spanish radio programming. It can be received in the Algarve using an indoor aerial, but in the damp and freezing UK I have to use a high discone aerial with CT100 coax feeder. The signal is stronger in the evening.

Roy Carman (Dorking) watched an unusual sports event recently relayed to TV channel CT2 in the Czech Republic via Eutelsat II F4 (28·5°E) at 11·554GHz H (27500, 3/4). Scramble bikes fitted with spiked tyres raced on snow while towing a skier.

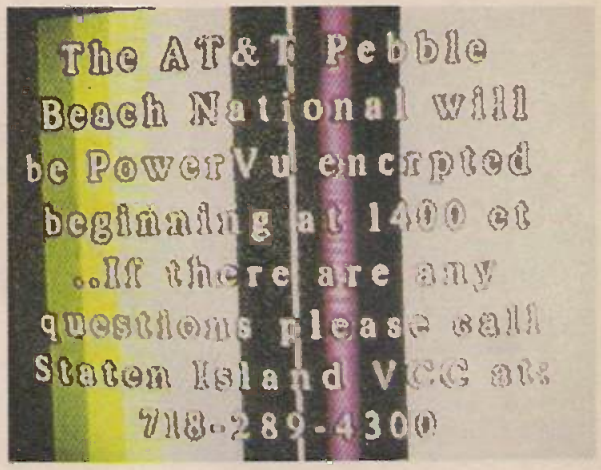
The crew that will fly to and spend a year at the International Space Station were presented at a press conference held at the Johnson Space Centre at 1830 GMT on February 27th. This was broadcast live via NSS K at 11·590GHz V (5632, 3/4).

Finally, a quick round-up of some snippets. The Racing Channel has been testing via Hot Bird (13°E) at 11·623GHz V (27500, 3/4) as an FTA signal. News feed signals have been seen via West Express 3A (11°W) at 12·669GHz H (6111, 3/4). Spanish-language enthusiasts might like to tune to the FTA Canal 47 Sevilla via Hispasat (30°W) at 11·731GHz V (28120, 5/6). Although Arabsat at 26°E is the recognised hot spot for Arabic programming, there are also many downlinks via Nilesat 101 and 102 at 7°W – Syrian programming has now arrived here at 11·823GHz V (27500, 3/4).

Digital DX prospects

Radio and TV transmissions are both steadily becoming digital – the ITU has just given the OK for the Medium Wave radio band to be used for digital sound broadcasting! What are the prospects for DX reception of digital signals?

Experience with digital satellite reception has been successful but frustrating. The lack of any digital signal presence via an analogue TV receiver doesn't help, as it means



Globecast announcement that PGA golf is to be PowerVu encrypted from early February – most PGA transmissions since have produced blankness!

either an analogue scan to check for likely frequency stops during a digital auto-search or the use of a digital receiver to scan and memorise all the signals found. This is time consuming and hardly what I'd call DXing! But the experience gained is helpful when it comes to terrestrial digital reception.

Analogue TV transmission allows weak-signal capture: the

Start of a news feed from Honolulu via NSS K after a US sub sank a Japanese fishing boat.

screen displays noise plus the weak signal, which can be enhanced by bandwidth reduction (or threshold extension with a satellite transmission). With a digital transmission there's an excellent, noise-free picture – or nothing! We therefore require a strong digital signal input level. This is the limiting factor with weak or fading tropospheric signals. If we ever get DTT (digital terrestrial TV) in Band I in Europe, how will Sporadic E treat a digital signal?

During the past few weeks there have been the first reports on digital terrestrial DX reception. An article by Henry Ruh, entitled "Digital DX, it can be done", appeared in *CQ-TV* (the British Amateur Television Club bulletin) no. 192. Henry works at a ch. A45 station in Chicago, and has been compiling a report on UHF-TV reception in that area, both analogue and digital. He has achieved some remarkable results using a Wineguard combined UHF/VHF aerial with rotor at 25ft above ground level.

Henry lives 45 miles from the Sears Tower, Chicago, and is able to receive DTT signals from Milwaukee, Indianapolis, Lafayette, Fort Wayne and Madison amongst other sources. He mentions the "lake inversion effect" that helps with reception from Milwaukee. WMTV-10 Milwaukee (analogue) transmits DTT on ch. A8 (DTV-8), a low-powered station. The signal suffers from co-channel interference and fading, the latter because of water-path inversion and rain. Fading causes picture blocking and audio click dropouts. WRTV-6 Indianapolis transmits parallel DTT on ch. A25, which is well received at about 150 miles. It's interesting that during flat conditions analogue reception from Indianapolis is only P1-2 while the digital reception is excellent (NTSC unwatchable, DTT OK). The DTT pictures are either perfect or missing: there's about a 1dB signal range that leads to picture break-up, blocking and broken sound.

Digital TV transmitters in the UK run at relatively low ERPs, say 10kW, compared to their co-located analogue brothers which can run at up to 500kW ERP. Henry's company has a 500kW ERP UHF DTT transmitter atop the Sears building. It's the most powerful DTT station in Chicago. Other DTT transmitters atop the Sears building include WFLD ch. A31 at 200kW, WCPX ch. A43 at 100kW and WSNS ch. A45 at 467kW. They are due to be joined by NBC ch. A29, ABC ch. A52 and WGN ch. A19, which at the time when Henry's article was being prepared were on test. He gives thumbs up to DTT DX potential at distances of say 200 miles, with UHF probably providing better results than Band III.

The top end of Band III, which includes DAB, is covered by *Sky News*. In the February/March issue there's a report from Danish Dxer Stig Hartvig Neilson. Using a three-element aerial, he regularly listens to the output from the DR ch. 12C (227·36MHz) DAB transmitter at Holsterbro, Western Jutland at a distance of about 80km, and the Oslo Region Osterlandet DAB transmitter, which also uses ch. 12C and runs at 1·2kW, at a distance of some 400km. Swedish DAB from Gothenburg on ch. 12A, a distance of 200km, is audible. Signal fading sounds like "a gargling effect, as if the audio is being chopped into very small pieces yet fully readable". Stig concludes that digital DX is possible.

While I was compiling this summary I received a suggestion to check out the following internet site:
http://pages.cthome.net/fmdx/hdtv2.html

It includes several pages of clear pictures of US DTT DX taken by Jeff Kadet (MaComb, Illinois). Reception is from several UHF stations, the farthest being WCYB-DT ch. A28 Bristol TN at 538 miles and WDIV-DT ch. A45 Detroit at 416 miles. Jeff uses a 7ft diameter Channel Master UHF dish at 85ft above ground level with head amplifier and very low-loss coaxial cable: the receiver is a PC fitted with a Beta version Hauppauge Win2k NTSC-DTV card. He's a member of the DX group WTFDA – the Worldwide TV and FM DX Association – which was founded in the late Fifties.

All this suggests that DTT-DX is possible, certainly during a tropospheric lift. The signal level needs to be much higher than with an analogue transmission, the threshold margin between lock (good quality) and nothing being very small. Perhaps, in time, fringe DTT equipment will be developed.

My thanks to Ian Pawson of the BATC, *Skywaves* and the Jeff Kadett web site for permission to quote the details above.

Broadcast news

UK: The ITC has confirmed that more of the UHF spectrum is to be released for digital transmissions. The extra bandwidth is equivalent to some fifty per cent of ONdigital's current allocation. The DTI has yet to decide whether it will be sold off to the highest bidder or allocated to an existing DTT operator.

The Isle of Wight RSL TV station TV 12 (ch. 54 H, Rowridge), which is to open a new channel in Chichester this summer, has acquired majority ownership of the RSL licences for the Swansea and Cardiff areas. It hopes to take on other RSL franchises. There is an extensive website that's worth a look.

Russia: DTT transmission tests are expected to start this summer, using the DVB-T standard. They will be conducted in Moscow, Nizhny Novgorod and St Petersburg initially.

Digital radio: The ITU (International Telecommunications Union) has adopted the digital broadcasting standard DRM, used for several years by Digital Radio Mondiale, for the Medium Wave AM band. Digi-AM will provide improved reception quality but will not include the data provided with Band III DAB. A finalised standard will be issued at the end of the year, with test transmissions starting in 2002 and an official launch during 2003.

The D100 DX-TV converter

The HS Publications D100 tuner unit has for some years been a popular means of achieving DX-TV reception in conjunction with a standard TV set. Previous models have featured switched IF selectivi-

ty (wide, medium and narrow), full VHF/UHF coverage, a remote voltage for variable notch filtering in Band I, variable independent sound carrier tuning with a TV audio output in Band II (FM), and separate RF and IF gain controls.

The company is to produce a new batch of D100s that will tune between 45MHz and 230MHz at VHF, including bandspread, but with the UHF coverage extending only to the middle of group B. As the D100 is mainly used for VHF DXing, HS Publications has opted to restrict the UHF coverage – though this tunes down to the 435MHz amateur TV band. The new version of the D100 costs about £150. For further details apply to HS Publications, 7 Epping Close, Derby DE22 4HR (please include an SAE) or phone 01332 381 699.

Satellite news

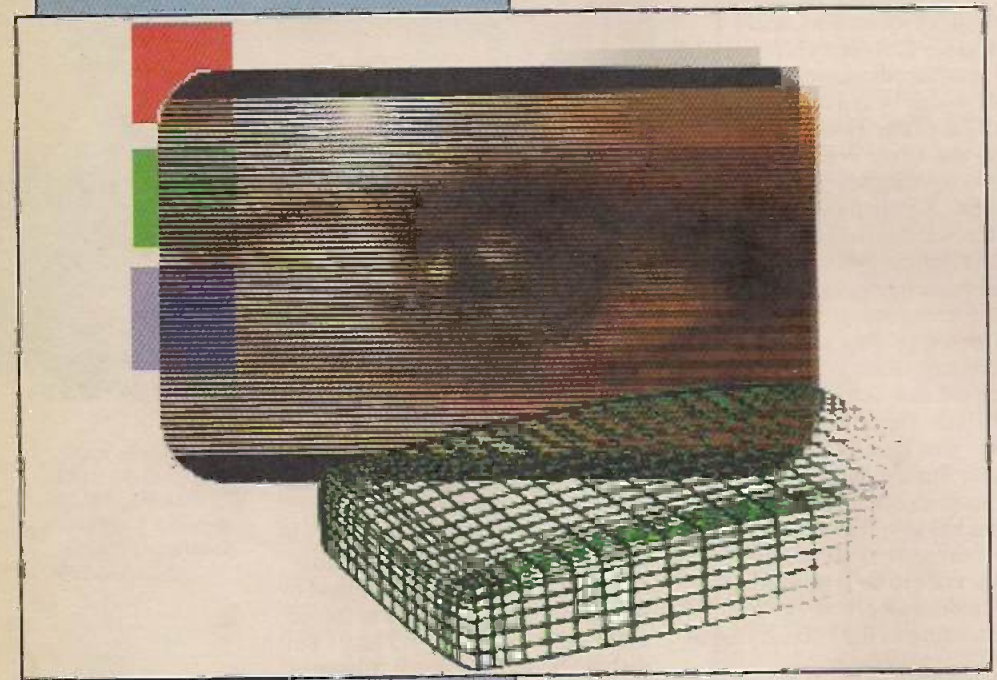
By the time that this is read Europe*star should be downlinking Sri Lankan TV to Europe via the Electroteks telecoms uplink station at Colombo. Check the Europe*star-1 slot at 45°E.

The Dutch digital multiplex Canal Digitaal is to include a pay per view service starting this summer. It will offer first-run movies prior to their release for the subscription TV channels Canal+ 1 and Canal+ 2. Receivers fitted with Mediasat decoding and Canal+ software will be required.

APT Satellite Holdings (Hong Kong) and Great Wall Industry (China) have signed an agreement to launch Apstar-5 in early 2003. It will replace Apstar-1 at 138°E. The satellite will carry 38 C-band and 16 Ku-band transponders – fifteen C-band transponders have already been leased by Singapore Telecomms. Great Wall is also to launch the new Intelsat APR-3 in early 2002. This all Ku-band satellite will slot in at 85°E. Chinese operator Sinosat has taken a lifetime lease on six transponders. Sinosat has also leased several C-band transponders aboard an Intelsat craft to be launched in 2003 to orbit at 178°E.

According to the February issue of the NZ trade magazine *SatFACTS* there's a major problem with the supply of intermediate-size dishes in Europe. Factories are making dishes in sizes up to 1m, larger ones not being required with the signal levels provided by most satellites. Professional users tend to use dishes with diameters of 2m or more. As a result 1·2, 1·5 and 1·8m dishes are becoming rare. Channel Master (UK) still sells a 1·2m offset dish however. ■

A Djibouti TV quiz show received via Arabsat 3A (30·5°E). Transmission in C band.



TV FAULT FINDING

Reports from
Michael Dranfield
P. Salkeld
Gerald Smith
Gerry Mumford
Graham Richards
Glyn Dickinson
Chris Watton
Michael Maurice and
Jason Boylin

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 426 for details of where and how to send reports.

Tatung T20TD50 (D chassis)

When teletext was selected the picture remained in the background. The set was not in the mix mode however. as the background colours changed when mix was selected. Pin 19 of the SAA5244P text chip should be low in the picture mode, high for text. This was OK, but the change wasn't being passed on to pin 5 of IC302 because Schottky diode D304 (BAT85) was open-circuit. **M.D.**

Grundig CUC7350 chassis

The dealer who brought this set along described the fault as a "twitching picture". On test I noticed that the width varied with picture content. When I checked HT supply the voltage varied between 119V at high-brightness white and 129V at black level. The cause was eventually traced to R60027 (0·56Ω), which is part of the current-sensing network in series with the chopper FET's source connection. R60028, in parallel with R60027, could also cause the problem. In 14in versions of the chassis these resistors are 0·68Ω. Note also that the correct HT setting depends on the type of tube, varying between 124-130V. **M.D.**

Alba CTV4855

This set produced very little sound output even though the on-screen display indicated that the sound should have been at maximum. The cause of the trouble was the 220µF, 16V sound coupling capacitor C202. **M.D.**

JVC CS2181EKT

All stations had reverted to ch. 21, which is BBC1 in our area. Other stations could be tuned in but not stored. The basic cause of the fault was two surface-mounted capacitors on the station-select module. They had both leaked electrolyte and damaged the print. The MN1226S memory IC also had to be removed, as there are through the board links that had gone open-circuit beneath it. I used a single strand from a length of 24-strand bell wire to repair these links. **M.D.**

Hitachi C2164TN

This set would trip out at switch on. As I didn't have a service manual I spent a lot of time getting nowhere. Then I recalled the customer mentioning that he had connected extension speakers to the set's rear speaker terminals a couple of weeks before the set had gone off. When I removed the TDA7263M audio output chip the set came back to life. Note that the correct M version must be fitted, as the TDA7263 has a different heatsink fitting. **M.D.**

Tatung T25NE61 (E1 chassis)

The picture had shifted right up to the top of the screen – only an inch of the bottom was visible at the top. Pins 1 and 2 of the TDA8350Q field output/EW driver chip IC401 should have differential field drive inputs from the TDA8366 IF/colour decoder/timebase generator chip IC501. One of these inputs, which are directly coupled, was missing. A new TDA8366 IC cured the fault.

You get a similar effect when the field scan coupling capacitor in the Ferguson 14in. portable Model 3787 (NordMende chassis) goes short-circuit. **M.D.**

Panasonic TX14B3T (Z375 chassis)

There seemed to be no picture, but when the setting of the first anode control was advanced the field collapse symptom appeared. IC301 (TDA8356) was faulty. The part number is the same as the IC type. To prevent failure of this IC at a later date, three modifications should be carried out: change the value of C309 to 22µF, 100V (part no. ECEA2A220); add an 0·01µF capacitor (part no. ECQM2A104J) across R310; and fit a 2·2Ω, 1W resistor in place of jumper wire R420. **P.S.**

Sharp DV5131H (S3B chassis)

There was continuous tripping because the line output transistor Q603 was short-cir-

cuit. The set's past record showed that two previous replacements had been fitted in a short period of time, so I contacted Sharp Technical Service. The advice provided was as follows: fit a 2SD1556 transistor, part no. TX0138BMZZ; fit a coil, part no. VP-CF1ROK0000, in place of FB601; and add a 1·8kΩ, 1W resistor in series with R600. **P.S.**

Sony KV28WS2U (BE3D chassis)

A couple of months ago (March issue page 296) I mentioned that failure of the EPROM in these widescreen sets is becoming a common problem. Two repairs bounced. I have now discovered that the EPROM corruption was caused by the red gun flashing over. Fortunately the EPROM could be reprogrammed, and the two tubes were under warranty. Never a dull moment! **P.S.**

Bush 2867NTX (11AK19 chassis)

If the picture sometimes takes a long time to appear but comes up quicker when the first anode control on the line output transformer has been adjusted, the item to check is capacitor C608 (10µF, 250V). It's the reservoir capacitor for the supply to the RGB output stages. You'll find it at the edge of the chassis, next to the LOPT. **P.S.**

Hitachi C2848TN

If C***48TN-311 appears on the screen the set is in the factory set-up mode. The cure is as follows. Remove the flap at the bottom of the remote-control unit and press the tuning button. Then press the menu button. Finally, go to standby. When you exit the standby mode the set prompt will be removed. **P.S.**

Sony KV32WF1U (BE3D chassis)

I dreaded having to tackle this fault: the symptoms were two serrated lines, one near the top of the screen and the other near the bottom. I phoned Sony Technical and was overjoyed to learn that it was a known fault. The cure is to fit an improved line driver transformer, part no. 1-437-090-31. It works. **P.S.**

Samsung CI5079T

I was told that this set "had sparked and the picture was all lines". When I checked I found that the set was dead. The two 100µF, 200V HT reservoir/smoothing capacitors were puffed up, and the R2K over-voltage protection diode had blown apart. It seemed that excessive HT had been the cause of the trouble, so in addition to the above items I replaced the 22µF, 50V electrolytic on the primary side of the power supply, the SMR40200C chopper IC and the HIS0169B hybrid chip HC801. It's also worth checking the audio output IC as this can go short-circuit. **G.S.**

JVC AV28WT4

This set was stuck in standby with the ECO light flashing. I found that the B1 secondary rail read virtually short-circuit. The cause was a short in the EW circuit. Normal operation was restored once D521, C470 and Q466 had been replaced. **G.S.**

Sharp CS05 chassis

The sound from one channel was distorted. It was worse at high volume. Normal sound was restored by replacing the relevant audio output transistors Q311 and Q312, their parallel diodes D307 and D308 and the 27V zener diodes D303 and D304 in the drive circuitry. **G.S.**

JVC C14E1EK (Onwa chassis)

The complaint with this set was that sometimes, at switch on, there was just a snowy screen and no sound. When this happened there were also no on-screen displays and no response to the remote-control unit. This led me to the TMS73C47 microcontroller chip IC602. As it was always possible to clear the fault by manually resetting this chip (connect pin 32 to chassis momentarily) much time was wasted probing around in the reset circuit.

The cause of the trouble was eventually found and was far more strange. There was a slight nick in the front edge of the PCB. This had severed the print that links pin 2 of IC602 to chassis. Pin 2 is used for factory testing of the IC, and is normally left earthed. Presumably with the pin floating there was a 50:50 chance as to whether the set was in the run or test mode. Much time would have been saved if the offending print had not been made invisible by a thick covering of black ink on the underside of the PCB. A small wire link cured the fault. **G.M.**

Hitachi CPT2158 (NP85CQ Mk II chassis)

This old set had been brought in with the complaint "poor picture". The screen was dark and streaky, and the overall picture brightness seemed to fluctuate. The cause of the trouble turned out to be zener diode ZD801 (3·3V, 500mW) on the tube base panel – it was leaky. ZD801 is part of the black-level restoration network, and affects all three drives (RGB). **G.M.**

Sharp DV3760H/3770H (4BSA chassis)

The set was allegedly dead. Checks in the power supply revealed that this was working. All the secondary voltages were OK except for the 13V output that should have been present at the cathode of D602. There is no fusible resistor in the rectifier circuit, and D602 read OK on a diode test. Nevertheless a replacement restored the missing supply. I fitted a GP15 type. **G.R.**

Grundig GT2103 (G1000 chassis)

I've had this fault several times now. The set seems to be dead, and after various checks you find that the ST6365 microcontroller chip IC500 isn't being reset (pin 33). If there's no reset voltage pulse here nothing happens. There are two surface-mounted transistors, TR450 (BC847) and TR451 (BCX19), in the reset circuit. What usually seems to happen is that TR451 goes short-circuit. I replace them both.

One set would work only with TR451 removed. I'd already replaced both transistors and the 3·9V zener diode D540. **G.R.**

NEI E28G1TFXN

This set had a dark picture and dark graphics. In addition remote control didn't work. The feed to the 5V regulator near the rectifier diodes on the secondary side of the power supply was only 4V, but rose to 7V in standby. The value of its feed resistor R686 had risen from 2·2Ω to 95Ω. I fitted an 0·25W safety type. **G.R.**

Philips L6.2 and L6.3 chassis

For channel lock-up etc. replace the BC337-40 transistor Tr7505. **G.R.**

Nokia 3724 (Mono Plus chassis)

This set was tripping because of a short-circuit across the U2 (12V) supply. The cause was on the CRT base panel, where pin 2 of the TEA5101N/B RGB output IC was dead short to chassis. The chip is available from CHS. **G.R.**

Sony KVM2101U (BE2 chassis)

There was excessive HT – it measured 180V instead of 135V across the reservoir capacitor C609. A replacement STR54041 chopper chip put that right, but the power supply was now squealing. The culprit turned out to be the 21V supply reservoir capacitor C610 (22µF, 63V). **G.R.**

Tatung F series chassis

These sets come in many guises, including **Hitachi** and **Goodmans**. They have a half-live chassis, with mains isolation provided by the LOPT and the scan coils. So care is needed when servicing. Care is also needed with the larger-screen models as there is a tendency for an unsupported CRT to crack the cabinet front when the back is removed.

This particular set would occasionally remain in standby, with a slight squealing noise. Close inspection with a magnifier revealed that two surface-mounted components at the edge of the chassis, R812 and C807, had never been soldered. **G.D.**

Philips 25PT4103 (L6.2 chassis)

Smoke then dead was the complaint with this set. As usual, C2912 (2·2nF, 2kV) had split. But once a replacement had been fitted I was rewarded with buzzing and no pictures. The HT was correct, but the secondary LT voltages were low. An external 9V feed got the set going, but with severe line cogging. Things were fine with a 200V mains input!

Despite the correct HT voltage, I decided that the cause of the trouble lay on the primary side (the chassis uses a non-isolated series chopper circuit to supply the HT for the line output stage), and eventually discovered that the two parallel current-sensing resistors R3514/5 (1Ω, 0·5W fusible) had risen slightly in value. **G.D.**

Sharp 51AT15 (5BSA chassis)

Now that these sets are a few years old it has been proved that most problems, such as slow starting, line cogging, line output transistor failure or intermittent tripping, respond to the following treatment.

Replace all six electrolytics on the secondary side of the power supply, using good-quality components. Also replace the two BC338-40 5V regulator transistors Q704 and Q708, and the BU508DFI line output transistor Q601, using Sharp-supplied spares. Don't worry: for once they aren't expensive! **G.D.**

Fidelity 3121

This supermarket set uses a version of the Turkish-manufactured **PT-11 chassis**, which can also be found in **Alba/Bush** and **Amstrad** sets. I've had a couple that were stuck in standby, with the voltage at pin 2 of the LM317 regulator chip I3 at only 2V, although the other supplies were present. This is the switched 12V line, which is turned on by the microcontroller chip I301 at pin 41. Unfortunately this device is designed to fail just after the guarantee period! The numbers on it make no sense, but it's available at quite a reasonable price under Amstrad part nos. 045101070221 (for the mono Model CTV322) and 045101070201 (for the stereo Model CTV352). They are versions of the Philips PCA84C8x1 microcontroller chip.

The excellent manual is already no longer available. **G.D.**

Mitsubishi CT25A4STX (Euro 12 chassis)

The complaint with this set was poor purity. The degaussing circuit includes a relay that can be activated from the handset. It didn't click in when operated. As this is a Mitsubishi set, the usual rule of heating the capacitors until you smell fish applies!

As expected, C960 (1,000µF, 35V) was leaking. So was C975 (47µF, 50V). When these had been replaced the relay still didn't operate, as the leakage had damaged the JC501 switching transistor Q903 which is mounted between the two capacitors. **G.D.**

Goodmans 3375 (F11 chassis)

This huge-screen set is fitted with the same chassis as Models 2575 and 2875. This one was dead, but a faint ticking came from the TDA4601-type power supply after a few seconds. Checks showed that the HT rose then fell to a very low value.

Since there were no shorts on the secondary side of the power supply I concentrated on the primary side and, as a start, replaced all the electrolytics. This didn't help, and waveforms showed that the set was trying to start but failing to latch on. With no manual, the only thing I could do was to check each component in turn. Fortunately it wasn't long before I discovered that R164 (100Ω, 5W) was open-circuit. It's in series with the feedback from pin 7 of the chopper transformer T1. **G.D.**

Amstrad WSTV3032

The BU2525 line output transistor had blown. When a replacement had been fitted the set ran for a minute with a narrow, folded picture, the output transistor getting hot and diode D01 smoking. The capacitors and all the silicon in the line output stage were checked and a new LOPT was tried, but the diodes kept overheating. The culprit turned out to be the STV2145 EW driver chip, which had no output. It's worth getting quotes for this device. One supplier quoted £16.40 plus VAT, another £3 plus VAT. **C.W.**

Salora M chassis

If one of the colours is missing or varying in level, check the 82kΩ resistors on the CRT base panel – R12 (red), R22 (green) and R32 (blue). It's quite common for them to fail. I replace all three **C.W.**

Hitachi C1415T

There was sound but no CRT display. Some quick checks revealed loss of line drive because the BF459 driver transistor Q701 was open-circuit. This type of transistor is used in the RGB output stages in some earlier Hitachi models, in which it also has a tendency to go open-circuit. **M.M.**

Sony KVDX271TU (AE1 chassis)

This set had difficulty in coming on from cold. The cause turned out to be C615 (1,000µF, 25V) which was leaky. It's the reservoir capacitor for the 14V supply via Q603 on the secondary side of the chopper power supply. Once a replacement had been fitted the set would come on from cold without any trouble. **M.M.**

Mitsubishi CT29B2STX

Failure of C906 (47µF, 63V) is a well-known cause of tripping with these sets. Similar symptoms are now beginning to appear because of failure of C909 (2·2µF, 63V). I now replace them both whenever a set comes in for repair. **M.M.**

GoldStar CI20C22F (PC42B chassis)

At switch on this set would come on for a fraction of a second then revert to standby. Checks showed that the GL7812 12V regulator IC831 was open-circuit. **M.M.**

Goodmans GD2880

This set's picture was very poor, with ghosting. It looked like an aerial problem, but a check with my pattern generator proved that the cause of the trouble was within the set. Resoldering a number of dry-joints in the IF section restored a normal picture. **M.M.**

Philips 21GR2550 (G90AE chassis)

There was intermittent loss of colour, loss of sound, random channel changing and a random display of F4 on the screen. This suggested a problem with the microcontroller system. Replacement microcontroller and EEPROM chips, IC7600 and IC7601, restored correct operation. **M.M.**

Goodmans 2875 (F11 chassis)

If the picture displayed by one of these sets gives the impression that the CRT is flat, with one or more colours missing, go straight for the three 68kΩ feedback resistors R26, R28 and R29 on the CRT base panel. You will almost certainly find that one or more has gone high in value or open-circuit. In the interests of reliability, replace all three. **M.M.**

Bush WST66 (4400 chassis)

"No results" it said in the report that came with this 28in. widescreen set. The LEDs on the front panel worked correctly, and at switch on an HT rustle could be heard. Scope checks showed that the 5V supply was missing at pins 39 and 44 of ICR1. Checks at test points then showed that the 5V supply was missing at TP6. The BD441 transistor was faulty. The heatsink clip retainer hadn't been fitted correctly and it had probably overheated as a result. This was confirmed when I tried to replace the transistor and noticed that the print on the underside of the PCB had come away.

Some repairs/links were needed to get this set back into service in a safe condition. Note that with this fault the handset's standby button no longer operates. **J.B.**

HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Full Motion Video cartridge for the Philips CDI210. Can anyone supply or provide information on a source for this item, which is required for a renovation project? Please phone Bob Mitchell on 01670 861 197 (evenings) or e-mail r.a.mitchell@lineone.net

Wanted: Volume and colour control knobs for the 20in. Pye Model 51KT3260/051. Geoff Holden, 5 Craigour Avenue, Torphins, Banchory AB31 4JA. Phone 01339 882 979.

Wanted: Circuit diagram for the Dansette record player/changer, photocopy OK. Any other information on this item would be appreciated. Donal Wyer, Ballykilmurry, Tullamore, Co. Offaly, Ireland. Phone 087 991 8961.

Wanted: Remote control unit and operating instructions (how to tune) for the Bush Model 1493NTX, and advice on an equivalent EEPROM (XL24C02P). Also a remote receiver panel (front of set) for the Thomson/Ferguson ICK2 chassis. Are there any particular causes of line striations with later Ferguson TX9 series sets with text? E. Roy, 22 Grebe Close, Waterlooville, Hants PO8 9UT. Phone 023 92 783 811.

Wanted: PB20013 relay PWB assembly for the JVC HR-S5000 SVHS VCR. It lives under the mechanism and has a sensor on it. Alternatively a complete scrap mechanism. Phone James Burch on 020 8402 2488 or e-mail jamesb@timelight.freeserve.co.uk

Wanted: Sound board, FM/AM 9101 with ITT MSP3410 chip, for the Ferguson ICC9 chassis. Reasonable price paid for working board. Phone B. Davies on 01702 523 872 (Essex).

Wanted: Used National E1AJ video cartridges. These were mainly used in schools and colleges in the Seventies to record TV programmes. It's a single tape spool housed in a body approximately 5in. square. R. Bell, 91 Kings Road, Melton Mowbray, Leics LE13 1QQ.

Wanted: If you have any issues of *Television* for disposal, or U-View books, perhaps we could negotiate a gift or exchange of CD-ROM Mauritron TV diagrams TV1, 3, 6, 11, 13 and 14. Joseph Anie, PO Box 383 Tema, Ghana. e-mail zodanie@netscape.net or kuu@africaonline.com.gh

For disposal free: About ten Tektronix colour VDUs (terminals) with keyboards. These run at VG rates so could possibly be converted to monitors. Carriage from Clacton to be mutually agreed. All believed working. Phone Graham Vine on 01255 821 655 or e-mail graham.vine@btinternet.com

Wanted: Can anyone supply or suggest a source for the Hall-effect device (original marked 3F) used in conjucntion with a Sony CX879 on drum stator assembly X2621-204-3 (Betamax VCR)? Sony cannot supply. Alan Stubbings, 7 Church Road, Saxilby, Lincoln LN1 2HH. Phone 01522 702 601 evenings, 01522 586 790 weekdays.

Wanted: Winding data for the output transformers used in the Leak Stereo 60 valve amplifier (EL84s), i.e. laminations, number of turns etc. Please phone Gary Riley on 01484 328 296 or write to me at 2 Winton Street, Lockwood, Huddersfield HD1 3SW.

Wanted: By engineer retired on medical grounds, anything to do with pre-1970 TV and radio sets, e.g. parts, valves, service manuals, books etc. Anything considered. Will travel to collect. Phone Steve Taylor on 01530 832 695 or 07761 793 859 (past callers please try again – there's been a phone fault). Alternatively e-mail steve.tailor@btinternet.com

Wanted: Circuit diagram for the Rediffusion/Doric Mark 1 colour TV chassis. Also a mains lead with flat-pin socket for the STC/ITT VC11 monochrome portable. Any pre-1970 colour TV sets and spares welcome. Phone Keith Parker on 020 8361 8896 (Barnet, Herts).

Wanted: Circuit diagram (photocopy OK) for the Siemens Bildmeister FF3077 TV receiver and any fault information on repeated failure of the BU208D line output transistor after a short time. Michael E. Gibson, 63 Bolton Road, Windsor, Berks SL4 3JX. Phone 01753 862 128.

Wanted: Service manual or circuit diagram for the Philips Model PM3232 oscilloscope. Alan Pearce, PO Box 1048, Nailsea, North Somerset BS48 4GH. Phone 01275 856 005 or email alan.pearce@btclick.com

Wanted: Small battery-operated signal generator for radio IF alignment. Phone C.B. Ives on 01670 517 000 (Hepscott, Northumberland) or mobile 07785 278 422.

Wanted: Circuit diagram for the Sony Model KX27PS1. This monster, chassis type SCC-404B-A) dates from about 1980. Can anyone suggest a source of spares at reasonable cost? The line output stage has fried! Ian Johnson, 6 Heathfield Crescent, Kidderminster, Worcestershire DY11 6PF. Phone 01562 750 971.

Wanted: A 37in. Mitsubishi TV set, any model considered. Please phone Leslie Hine on 01229 582 557 or 01229 582 962.

Wanted: Service manual or circuit diagram for the Atari 1040ST PC. Also a tuning potentiometer drawer for the Philips KT3/K30 chassis. Please phone P.J. Axbey on 01792 523 577 (Swansea).

Wanted: Six 6V valves, i.e. 6AC56, 84, 6Z4, 75, 76 etc., for the Traveller car radio, made in the USA. Also a circuit diagram and any information on the date of manufacture and name of the manufacturer. The only number I can find is 1-9F70. The valves were made by National Union (USA). Any help with information on this set would be appreciated. R. Bocarro, 149 Little Chequers, Wye, Kent TN25 5DU. Phone 01233 811 683.

Wanted/for sale: Require a service manual or circuit diagram for the Fidelity F14 and Ferguson TX90 chassis, the MC01 monitor version of the TX90, and the Satellite Solutions FMTV-97A TV + FM aerial test meter. Photocopies OK. Also require an instruction sheet for the BT Call Display 50 (early model). Will pay costs. Have for sale to a good home a Russian Rigonda Symphony radio-stereo-phonogram plus two large column speakers. A circuit diagram is included and the set is all-valve with a large wooden cabinet. A clearout of Seventies equipment must continue. D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Wirral, Cheshire CH43 1TU.

Wanted: Front display PCB for the Hitachi VTF770 VCR and a tuning/memory/control PCB with ZC84203P IC for the Grundig CUC52 chassis. David Jordan, Central Electronics, 6 Queen Street, Stirling FK8 1HN. Phone 01786 451 230 or e-mail david.jordan3@virgin.net

Wanted: Circuit diagram (photocopy OK) for the GoldStar Studioworks Model 78i monitor. Phone Ian Livingston on 01482 887 946.

For disposal: Approximately twenty years' issues of *Television* magazine (240 copies) up to 1990. Phone B. Hopkins on 01327 350 706 (Towcester, Northants).

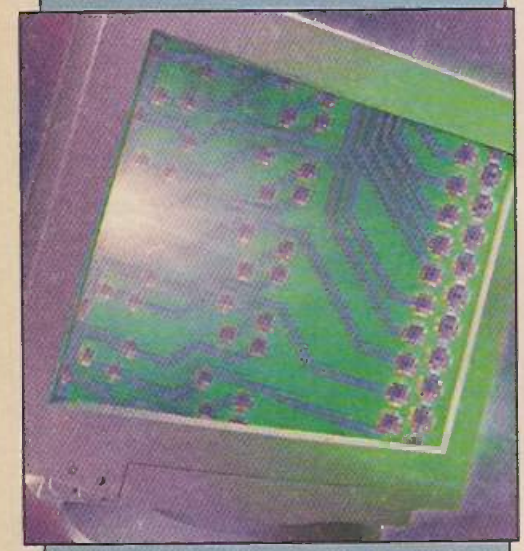
Wanted: Handbook and/or service manual for the Silver (Shin-Shirasuna Electric Corporation) cassette recorder Model ST33V 00L. Phone Norman Grant on 01772 463 444 (Preston).

Wanted: Circuit diagram for the output stage of the Philips AS405 midi system (photocopy OK). Phone Wilf Milton on 01823 667 575.

Wanted: Good working PCB for the Hewlett-Packard Deskjet HP420C colour printer. Also in-depth advice on an overheating power supply problem with the Sony SLV715HQ VCR. Will call back. Phone Len Knott on 01425 474 584.

Wanted: Tuner/IF/etc. panel and rear AV in/out panel for the Toshiba TV Model 3387DB. Faulty panels acceptable provided they are not damaged physically. Phone Doug Carson on 01229 774 749 or e-maildougcarson@fsbdial.co.uk

Wanted: DBL324 chip (IC801) or equivalent for the Texet Model DVT9254P. Also a copy of the user's handbook for the Sony Model KVA2532U. T. Steel, 185 Charter Road, Chippenham, Wilts SN15 2RF. Phone 07930 218 355.



MONITORS

Fault reports from Geoff Butcher Michael Dranfield Ian Field and Gerry Mumford

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

Reports can be sent by post to:

Television, Fault Reports,
Reed Business Information,
Room L514, Quadrant House,
The Quadrant, Sutton,
Surrey SM2 5AS

or e-mailed to:
tessa2@btinternet.com

JVC TM14EK

This standard composite-video monitor had lost frame sync – the picture was jumping badly. Checks revealed that the frame generator was operating at only about 35Hz. There is no hold adjustment, and the frame generator and sync circuits are all within the M52016SP chip IC201. This is not a cheap or common item. Fortunately the replacement I ordered cured the fault. **G.B.**

IBM 6321-R13

There was a breakdown in the insulation, with arcing, at the top of the focus unit. I found a bad joint at the earthy end, on the line output transformer – it had presumably caused excessive voltage at the other end. When I powered the monitor after reinsulating the affected area there was just a blank grey screen that could be varied by adjusting the brightness control. The TDA4881 video processor chip Z701 had also failed. **G.B.**

Sony CPD1000GST

This monitor powered up all right but there was no display, just a blank screen. The clue to the cause of the fault was the lack of any visible glow from the tube's heaters. I found that the heater supply smoothing capacitor C632 (470µF, 16V) was virtually open-circuit. **G.B.**

Tatung C5D1RDK-E01

This monitor wouldn't store user settings. The obvious thing to do was to replace the 8-pin EEPROM IC502, but to my amazement this made no difference. I won't tell you how much time was wasted looking for the cause of the problem, or for how many weeks I had the monitor. Then an identical one came in for repair. This proved that I had fitted the wrong EEPROM, a 24C02 instead of a 24C04. You need a blank one – it's quite possible that my supplier had sent the wrong type. **M.D.**

IBM 6312-002

The customer said that this monitor had been running for a while then the display collapsed to a vertical line which, he added, was green! It's one of those awkward designs in which the plastic tray has to be separated from the front/CRT assembly before the PCB can be lifted out for access to the print side. So I decided to start by removing the PCB, without powering up and waiting for the fault to show.

The only bad solder joint I could find was at C519 (1·5µF, 200V) in the line scan section. It didn't appear to have separated, but had obviously been getting hot in operation. The body of the capacitor was securely glued to a couple of nearby inductors with an excessively large blob of silicon rubber. This undoubtedly contributed to the failure, as the capacitor was not free to move with thermal expansion and pushed down on its leads as it warmed up. Several components had to be removed to cut away the excess sealant safely (come back 'brown glue', all is forgiven!). The rest of the soldering was OK, but to minimise the possibility of a bounce I went over the PCB looking for any soldering that could be improved.

As usual with this monitor the horizontal scanning was inadequate. There was a gap of at least 0·75in. at either side of the screen at the maximum width setting, even though the height could be adjusted 'way over'. The addition of a little extra to the flyback tuning capacitance usually does the trick. It doesn't seem to matter whether the extra capacitance is added across the line output transistor's collector/emitter or directly across the transformer's primary winding. In this case it was easier to add the extra capacitor across the transistor. 270pF is generally enough, but with this monitor 680pF was needed to get the display to within 0·5cm at each side.

If the capacitance increase is large the line output transistor may overheat. In extreme cases the line scan will become cramped at some point after mid screen. The cure for this is to upgrade the line output transistor. This model has a 2SC3886A transistor with a collector current rating of 8A. A suitable upgrade would be to fit a 2SC3688, which is rated at 10A. A BU2508 could, as another example, be upgraded to a BU2520 with the same effect.

In this case the transistor didn't overheat, and there was no evidence of any horizontal-linearity distortion. So I left the original transistor to get on with it! **I.F.**

Elonex MN024

This version of the MN024, labelled 'Advanced Colour Monitor', uses the Philips chassis that has an auxiliary chopper power supply which sticks up on a small steel bracket that's screwed to the cabinet floor. It's similar to one of the Digital monitors, which may in turn be the Philips CM1800 chassis or one that's very similar. Anyway, this particular monitor was reported to be dead with the LED glowing yellow.

The use of a fairly complex safety shutdown system and an unusual arrangement of dual B+ PWM regulators that serve the EHT generation and line scanning separately (despite a single

transistor to drive both!) makes it difficult to know where to begin. When the monitor was switched on it produced a brief indistinct noise, similar to 'rustling up', then shut down. The CRT's heaters remained alight, but checks soon showed that the main power supply had shut down. So the heater feed must come from the auxiliary power supply subpanel.

The line output transistor and efficiency/EW diodes were all OK, and cold checks showed that there was nothing amiss on the primary side of the power supply. Testing with power applied revealed that the supply at pin 7 of the UC3842 chopper control chip started up normally but was then shorted down by transistor 7104. Suspecting that an overload across one of the output lines was the most likely cause of the shutdown, I started by unsoldering pin 2 of the LOPT. The power supply then got going, but MOSFET 7623 was destroyed and resistor 3638 (1kΩ, 2W) overheated. It would obviously have been better to unsolder both MOSFETs, 7623 and 7618 (both type IRF730). With this done the power supply produced normal outputs and continued to run without shutting down.

When I unsoldered the rest of the LOPT's pins to enable resistance checks to be made I discovered that there was a short between the collector winding (pins 1-2) and the winding with the earthed centre-tap (pins 4, 5 and 6). Take care when looking up the number on the HR CD-ROM. On all previous occasions when ordering LOPTs for Philips chassis the 5-digit part number of the transformer (30391 in this case) has been sufficient. Fortunately I noticed before placing the order that different HR numbers are listed against the full part no. and the 5-digit number. **I.F.**

Elonex TE1438A

The complaint was "streaky horizontal line interference". Flexing the main panel seemed to affect the fault but didn't give any clue as to its whereabouts. A common fault with this chassis is the odd solder joint that fails to alloy with the copper pad correctly. Such joints are fairly obvious, because here is a well-rounded blob of excess solder. But after attending to these the fault was still present. During subsequent resoldering passes I noticed that some of the larger resistors had partially oxide coated leads within their solder fillets. Correcting this also made no difference.

A problem that produces similar-looking symptoms is caused by R632 (43Ω, 2W, 1%), which drops the input to IC602 (78CU12). It takes its supply from the 21V rectifier and should deliver about 15V to the 12V regulator. R632 can go high under load, though it measures OK when checked out of circuit. If the input to IC602, which feeds the CRT base panel, hovers just above its dropout voltage the result can be odd flickering and streaky lines on the screen. When I'd gone over this part of the circuit, but not found any faulty components to replace, the problem seemed to have subsided. But I was certain that it hadn't been cured!

I sat down and used the monitor with a PC to do some file organising while I wondered what to try next. After a couple of hours there was a loud crack, and I caught just a glimpse of a spark or flash around the back. With my inspection lamp ready, I turned the monitor around hoping to find a visibly damaged component such as one of the disc ceramic capacitors in the power supply's snubber network. No such luck. So I returned to the display to see if there were any visible symptoms. There were! The purity had deteriorated, indicating that the 270N degaussing posistor had failed. Once a replacement had been fitted there was no further sign of the fault.

During subsequent bench testing I noticed that the display was shimmering. The cause was traced to R602 (10Ω, 2W), which is in series with the heating section of the positor, to keep the latter hot enough to cut off the current through the degaussing coils. With R602 open-circuit, the only posistor heating current was via the degaussing coils. **I.F.**

Commodore KTC08/WY15E

As the model number suggests, this 15in. PC-compatible monitor is made by Wyse Technologies. This one was dead. The chassis is not easy to remove, let alone work on when powered for testing. Fortunately all the PCB securing screws are accessible without separating the front moulding and CRT assembly. As I was easing the PCB out, crystal Y601 fell out!

I disconnected the supply to the line output stage then powered the monitor. Its power supply worked, and further checks revealed that the BU2520AF line output transistor was short-circuit. There were numerous dry-joints in the line output stage, the B+ regulator and the power supply. Whether these caused the failure or the front-panel micro with its loose crystal confused the TDA9103 chip is something we'll never know!

There are two connectors between the front panel and the front edge of the main PCB. They are difficult to refit but must obviously not be overlooked during reassembly. Nor must the nylon insulating washer on the PCB screw next to the chopper MOSFET's heatsink. **I.F.**

Dell Vi1428E

This monitor had previously been in because of an intermittent horizontal shift fault. The cause had been poor soldering around T402, Q406 and Q407. It had also seemed advisable to replace all the small electrolytics on the primary side of the power supply. In addition I'd cleaned the PCB with solvent and inspected the soldering. Several areas had been reworked.

The monitor had then been returned, but shortly afterwards the customer complained that it sometimes wouldn't come on – it just sat there whining. On its return to the workshop I carried out a more thorough resoldering operation, concentrating mainly on the timebase area. The soldering to the UC3842 chopper control chip also looked a bit duff. But the prime suspects were the three-terminal regulator IC602, whose solder joints looked even duller, and the earth track that runs between the pins of T401 and the solder lug slot for the print side LOPT screening plate. The track beside the slot had cracked and partially lifted, and may have been intermittently shorting to one end of R425. It depends on the version: with some the track has a gap at the other side of the slot, so the break just mentioned leaves this track unearthed.

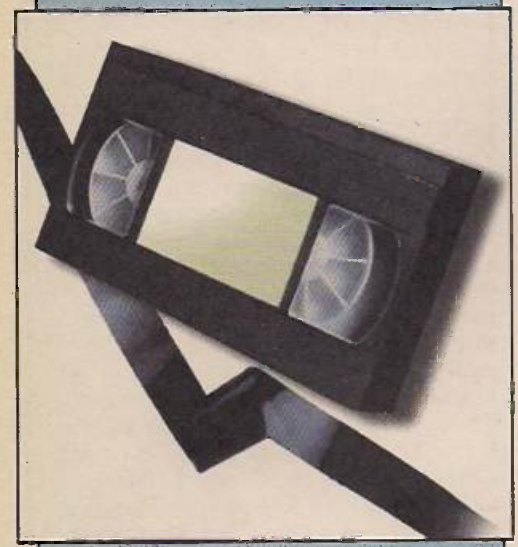
When the screening plate is refitted and soldered to the relevant lands it's difficult to see if both ends of the broken track are securely soldered to the plate's lug. To overcome the problem I fit a length of 20 SWG wire that must extend at least 15mm either side of the screen's lug slot, to avoid the risk that it might move while the solder is being melted to secure the lug. **I.F.**

Mitac L1450

This monitor was stuck in standby with just an amber LED lit and no display. The BU2508DX line output transistor Q501 was short-circuit because its base drive capacitors C508 (100µF, 16V) and C534 (1µF, 50V) had fallen in value by about fifty per cent. **G.M.**

CTX 1765D

The monitor powered up with a green LED but no display. This suggested trouble in the line output stage. I found that the 2SC4769 EHT transistor Q335 was short-circuit along with the 2SK1377 pre-regulator FET Q338 and the neighbouring BYV26C diode D327. Fusible resistors R460 (1Ω, 0·5W) and R470 (0·68Ω, 0·5W) were both open-circuit. Replacement of these items restored the display. **G.M.**



VCR CLINIC

Reports from Eugene Trundle Mike Leach D.M. Thomas Michael Maurice Ronnie Boag and Paul Sargent, LCGI

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 426 for details of where and how to send reports.

Sony SLVE295UX etc

This machine sometimes refused to eject a cassette and would go to sleep a few seconds later. The clue to the cause of the trouble was a whirring sound. It came from the loading motor, whose worm was cracked. As a result, when loaded the motor shaft rotated inside the worm. Shades of the Panasonic K deck, but in this case the little plastic bit is available separately.

I guess this fault could occur with any Sony model that uses the S tape deck. **E.T.**

Hitachi VTF660E

Playback via the RF modulator was fine but the picture that came via the scart socket was marred by lines of interference – similar to the effect of co-channel interference with analogue terrestrial TV reception. The culprit turned out to be the BH7633AS signal-routeing chip IC4501 on the rear jack PCB. It contains amplifiers and clamps as well as switches. **E.T.**

Sony SLVE730

This machine was to all intents and purposes dead, but when listening closely in the power supply area I heard a single squawk shortly after switch on. There was normal operation once C153 (47µF, 50V) and C154 (1µF, 50V) on the primary side of the power supply had been replaced.

A similar power supply module is used in **Models SLVSE35/50/60/70/80** and **SLVSX60/70/80**. **E.T.**

Philips 14VP200/07

This TV/video combi unit was still under guarantee. The fault symptom was a tinny buzz during tape playback only. It came and went when the ribbon cable from the audio/control/erase head was flexed at the PCB end. Because of access problems and difficulty getting the unit to work when it was dismantled, I decided to replace the ribbon cable and resolder the socket to the main (VCR) PCB. This cured the fault. **E.T.**

Aiwa HVGX350K

The fluorescent display panel was very dimly lit – in fact the display was only just discernible. Checks showed that its heater voltage was low. The cause was failure of CP25 (100µF, 10V) in the power supply section. **E.T.**

JVC HRJ225

Because of a broken gear on the upper side of the deck there was no eject. This is becoming quite a common fault, which is easy to cure by removing the carriage and unclipping the sliding-brake assembly. There's just enough room to replace the gear without the need for a major strip-down.

Once this had been done however there was a strange problem. When the machine was connected to the mains supply the mechanism would shuffle and the capstan motor would spin quickly, trying to eject a tape that wasn't there. The machine would then shut down. I initially suspected the mode switch, which is difficult and very fiddly to change, but the switch turned out to be OK. A faulty start sensor eventually proved to be the cause – a replacement cured the problem. It's worth noting that when a tape was wound into the machine manually in the fault condition everything worked fine, including fast forward, rewind etc. The fault symptom showed only when the machine was first powered up from the mains. **M.L.**

Sony SLV825UB

E-E operation was very poor and there were bent verticals. The cause of the trouble was traced to C13 (1µF, 63V) in the IF assembly. **M.L.**

Goodmans PD1700

There was playback but no record. The cause was the BC848B transistor 7605. **D.M.T.**

Panasonic NVHD620

This machine was dead. Checks showed that the problem was caused by QR1101 (UN6114) and Q1102 (2SD1991A) in the voltage-control section. **D.M.T.**

Samsung/Goodmans TVP5050IST

This unit was stuck in the pause mode. I found that the slider supply gear (item G520) was cracked – a replacement restored normal operation. The part no. is SAMSAC6680142A. **D.M.T.**

Goodmans/Daewoo VP2500

In the E-E mode there was just a blue screen. With playback there was no picture but the sound was OK. The menu was OK. The cause was traced to R350 in the video processor circuit. It's a 270Ω surface-mounted resistor. **D.M.T.**

Sanyo VHR276

This machine caused me a lot of grief. The customer complained that it would switch off when going into record. Easy I thought, replace PR512. So I fitted an N25 circuit protector, printed out an invoice and left. A couple of days later the customer com-

plained that the fault was still present, and added that it usually occurred after a rewind. So I replaced the mode switch. After that the machine acted strangely. I took it back to the workshop and found that the machine would accept a tape but when any function was selected it would lace up, unlace then switch to standby. I started off by carrying out checks in the power supply, but there was nothing wrong there. Then I checked and double checked the alignment, which was correct. In desperation I fitted another mode switch. After that the machine worked correctly. **M.M.**

Hitachi VTF360

This machine would intermittently fail to record or play the control track and creased the edge of a couple of tapes. The cause was found to be the back-tension band: the felt had parted company with the plastic band. A replacement restored normal operation. **M.M.**

Sony SLVE280

The customer complained about very poor recorded sound and intermittent failure to record. The circuit protector looked in a bit of a sorry state, so I replaced it with a CP N25. After that the record and playback sound were both good, and I was able to assure the customer that his machine wouldn't cut out again. **M.M.**

JVC HRJ425

This machine wouldn't go into play because the pinch roller failed to contact the capstan shaft. The cause was lever assembly item 50, which was cracked. **M.M.**

Sharp VCMH60

To start with there was motor pulsing and no display, but after a few minutes the VCR worked normally. When the outputs from the power supply were checked the 5V rail was found to be low. The fault was cured by replacing C925 (470µF, 10V) and C929 (330µF, 10V). **R.B.**

Daewoo V200

There was no display, so some voltage checks were carried out. I found that the –24V supply was missing. All that was required was to replace R62 (18Ω, 0·25W). **R.B.**

Samsung SV222B

This machine was dead. To restore normal operation several items in the power supply had to be replaced: transistors Q1SR01 and Q1SR12, diode D1SR11, zener diode ZD1SS1, capacitor C1SR12 and resistor R1SR11. **R.B.**

Akai VSG295

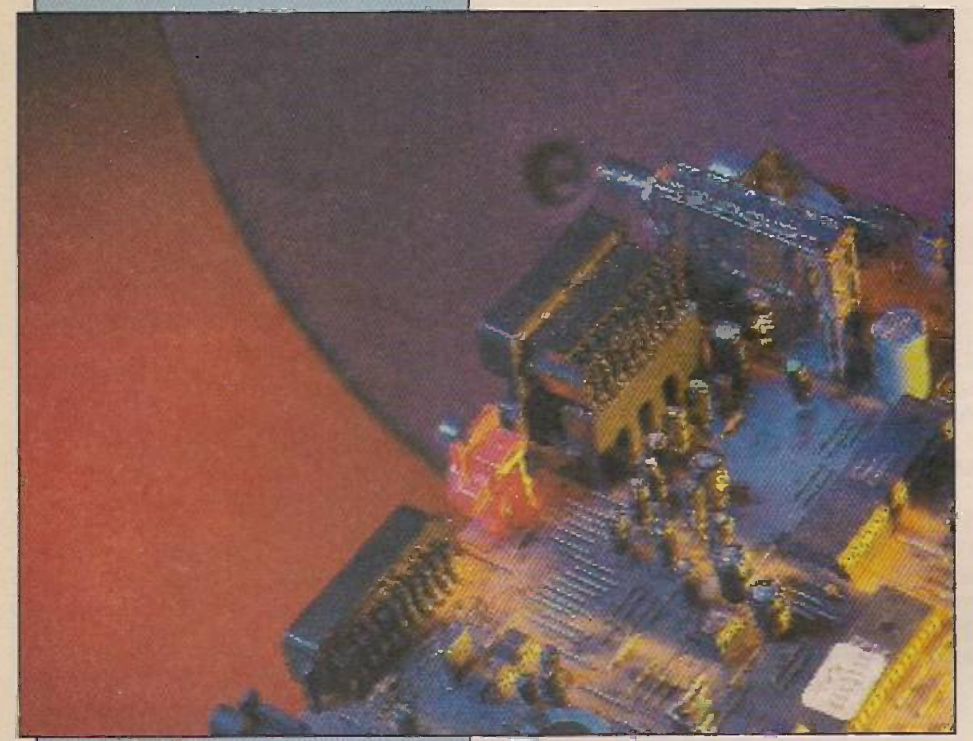
This machine's recorded pictures were intermittently snowy. The cause was dry-joints at capacitor C609 (10µF, 50V), which is part of the TU +B supply. **R.B.**

LG T163I

There was very low E-E and playback sound. The cause was a dry-joint at L402, which is in the supply to pin 11 of the BA7797 chip IC401. **R.B.**

Hitachi VT530E

"Poor tracking" it said on the job card. I nearly missed this one! When the machine had been playing for about an hour the picture paused every second or so. The culprit was a faulty and very hot capstan motor. Within a week I had another identical failure. **P.S.**



JACK'S WORKSHOP

JACK ARMSTRONG

Last month's column ended with a promise of more on servicing Apple Macs. So here goes.

Worn drives

The hard drive will eventually wear out, which will provide you with an opportunity to talk the machine's owner into fitting a larger capacity drive. In fact there probably won't be any choice, since 20-500Mbyte drives are now rather scarce. All older Macs used SCSI drives, both internal and external. Later Power Macs use standard IDE drives.

If you don't buy an Apple drive (you probably won't) you will need a piece of software to be able to carry out low-level formatting. The usual choice is either HDT by FWB Software or SilverLining by LaCie. In addition you will need a set of operating system installer discs or CDs – unless the owner can provide them.

Power supplies

Power supplies occasionally fail. Apple spares such as these are 'authorised dealer only', which means that you can't buy them. If you are familiar with switch-mode power supplies however repair shouldn't be difficult. Circuit diagrams are generally "unavailable".

Getting a new power supply fitted by an authorised dealer can be expensive. So the Mac owner is likely to be happy to pay if you can fix the supply at a PC price!

Software problems

Software problems are very common. Macs use dozens of little helper applications called extensions. Incompatibilities can occur should an owner carelessly install software without checking. Usually however an extension causes problems because it becomes corrupted. You can check for this by starting the Mac with the shift key held down. Hold the key until you see "extensions off". If the computer now runs all right, there's probably an extension problem.

The quickest solution is to drag the extensions folder from inside the system folder to the desktop, then immediately reinstall the operating system. This will create a new extensions folder. If the Mac now boots up and runs all right, you can drag any non-standard extensions from the folder on the desktop to the systems folder, a few at a time, and restart the computer. If the problem returns, you've narrowed the cause down to just a few extensions.

Fonts can cause similar problems, so treat them in the same way if necessary.

This method of fault-finding is time consuming, but the Mac owner will pay. Problems with files or the hard drive can often be fixed by running Norton Utilities (the Mac version) or TechTool Pro.

Sometimes an application refuses to work properly. The cause is often a corrupted preference file. You'll find it in the preferences folder inside the systems folder. Simply drag the offending file to the wastebasket then re-launch the application. This will create a new preference file. If this fails to cure the problem, put the old preference file back and reinstall the application.

No registry

You will be pleased to know that the Mac has no registry. It keeps track of all the files in a 'desktop file' which is invisible. It doesn't rely on this totally however, and in any case you can easily rebuild the file by holding down the option/alt and command/Apple buttons while restarting the computer. Hold the two keys down until the 'rebuild desktop' dialog window appears.

Corruption of the desktop file can make icons revert to their generic form or produce the "application not found" error message. This is not usually a serious problem, unless it's a symptom of disk corruption in general.

The desktop file should be rebuilt once a month as a routine precaution, though most Mac users don't bother.

No software

The complaint that "there's no software for the Mac" is simply not true. I'll admit that software is well hidden, but look at any standard package such as Microsoft Office and you'll find that a Mac installer is included.

The only software that's missing is Microsoft Access. This is probably because Access is so bad compared with the Mac standard Filemaker Pro that Microsoft don't want anyone to make a direct comparison!

Making a start

You'll need a basic toolkit before you can tackle Mac repairs. First get a mouse, in case the customer doesn't bring his along. The most recent Macs use a USB connection for the mouse – earlier ones use an

ADB connection, which is peculiar to Macs but is nowadays used for camcorder connections. The same connector is used for the keyboard – USB for later ones, camcorder type for the earlier types. One exception is the very early Mac Plus, but you can worry about this if you ever see one!

You start a Mac by pressing the on/off key on the keyboard: it usually has a left-pointing triangle. Early Macs make a ping sound as they start. Later ones make a boing sound, while the very latest produce an orchestral chord.

Memory faults are usually indicated by several pings at start up. A hardware fault such as a loose PCI card produces a sound like breaking glass with a Power Mac. Shut a Mac down by pressing the off key then the return key.

Monitors

Apple monitors normally use a 15-pin D plug, with some of the pins linked together in such a way that the computer can deduce the monitor screen size, scan rate, etc. To use a standard SVGA monitor you will need a 15-pin to 9-pin adaptor with ten DIP switches included. These switches must be set in order to simulate the links that the Apple Mac looks for. It's a tedious job unless you know the actual switch settings for every possible combination (I haven't found a list, but I'm working on it).

Since a 14in. Apple monitor can often be bought for a few pounds, you would be well advised to obtain one. It will work with most Macs.

A few Macs were made with a special 'hdi45' connector instead. The 'hdi45' adaptors are rather expensive new, so see if you can find someone who is throwing them away. It happens all the time – people don't realise their value!

Getting inside

A wide variety of case styles have been used, and the method of opening them is not always obvious. The MacSE/30 shown in the accompanying picture has four fixing screws in the rear cover. The top ones are recessed into the carrying handle aperture and a very long screwdriver is needed to remove them. The tool I use is a hardened-steel hex rod (2·5mm AF) 23cm in length with a handle in addition. This is needed for all the early 'portable' Apple Macs, from the Mac Plus onwards. They all have a built-in 9in. monitor tube by the way, and use 30-pin SIMMs. I'll cover this and other details in a later instalment.

Meanwhile don't throw those Mac bits away! The portable Apple Macs are now regarded as collectors' items and, since the USB was adopted by Apple as the new standard serial connection method, supplies of 8-pin mini-DIN serial connection peripherals are in demand. Printers in particular are hard to find, and I predict that keyboards and mice will follow.

An Amstrad SRD545

Back to satellite receivers! I was surprised when this one arrived since analogue repairs are minimal nowadays. The dealer who sent it had "fitted two Satkits without success". Apparently the power supply "keeps going bang".

When I dismantled the unit I noticed that the power supply DC connection plug had been cut off and each wire soldered individually to the tracks beneath the board. I intended to replace the power supply in any case, so this was no problem. When I removed the recessed screw inside the decoder screening box the cause of the original 'power-supply fault' became obvious: a brown wire was firmly trapped beneath the screw head, shorting the 12V supply to chassis!

With this fault corrected and another power supply fitted the receiver worked perfectly. As I didn't have the correct power supply I modified one from an SRD510, by replacing the LLF004 transformer with the LLF007 from the SRD545 then replacing the 330µF reservoir capacitor C620 in the 23V tuning supply with a 470µF, 35V capacitor to cope with the now higher 30V supply.

A Grundig GDS200 BSkyB digibox

Wossname up Church Street phoned me this morning. The conversation went like this:

"You fix these dodgyboxes. I've got a Grundig one here. Customer says her baby dropped his feeding cup and orange juice splashed inside. I've had a look and there's only a couple of drops. It's really sticky but I've wiped off most of it with a cotton bud . . ."

"No thanks."

" . . . and now the little green LED comes on, but it's dead."

"No thanks."

"It should be easy to fix. You'll have a look at it for me, won't you?"

"No thanks."

"Probably just needs a squirt of alcohol . . ."

"I could do with one myself. Look, I don't want it. If you want to try cleaning it that's fine. Slosh plenty of warm soapy water on to it, drain it, then finish with isopropyl alcohol and dry it with a hairdryer. Leave it in a warm place for a couple of days then test it. That's the routine."

"But why won't you . . ."

"Because I guarantee my repairs, and I can't guarantec something that's been treated to a dose of citric acid with added sugar, colouring and preservatives! Even if it works after cleaning it will probably fail a week or two later, because of corrosion or conductive salts trapped beneath the ICs."

"What shall I tell my customer?"

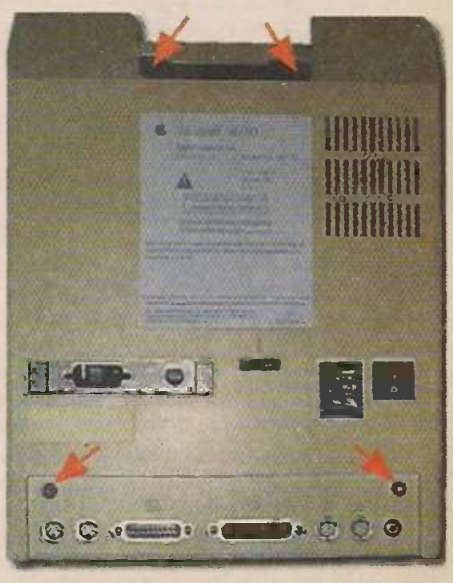
"Tell her to claim on her house insurance. You can buy her a nice new Panasonic digibox for about £300 inclusive. Or you can send the Grundig to Genserve in Swindon who will replace the mother board for you. The telephone number is 01793 886 333 (strictly trade only)."

If you have any questions about Apple Macs you can e-mail Jack from the internet web site at http://www.ukstay.com/jack

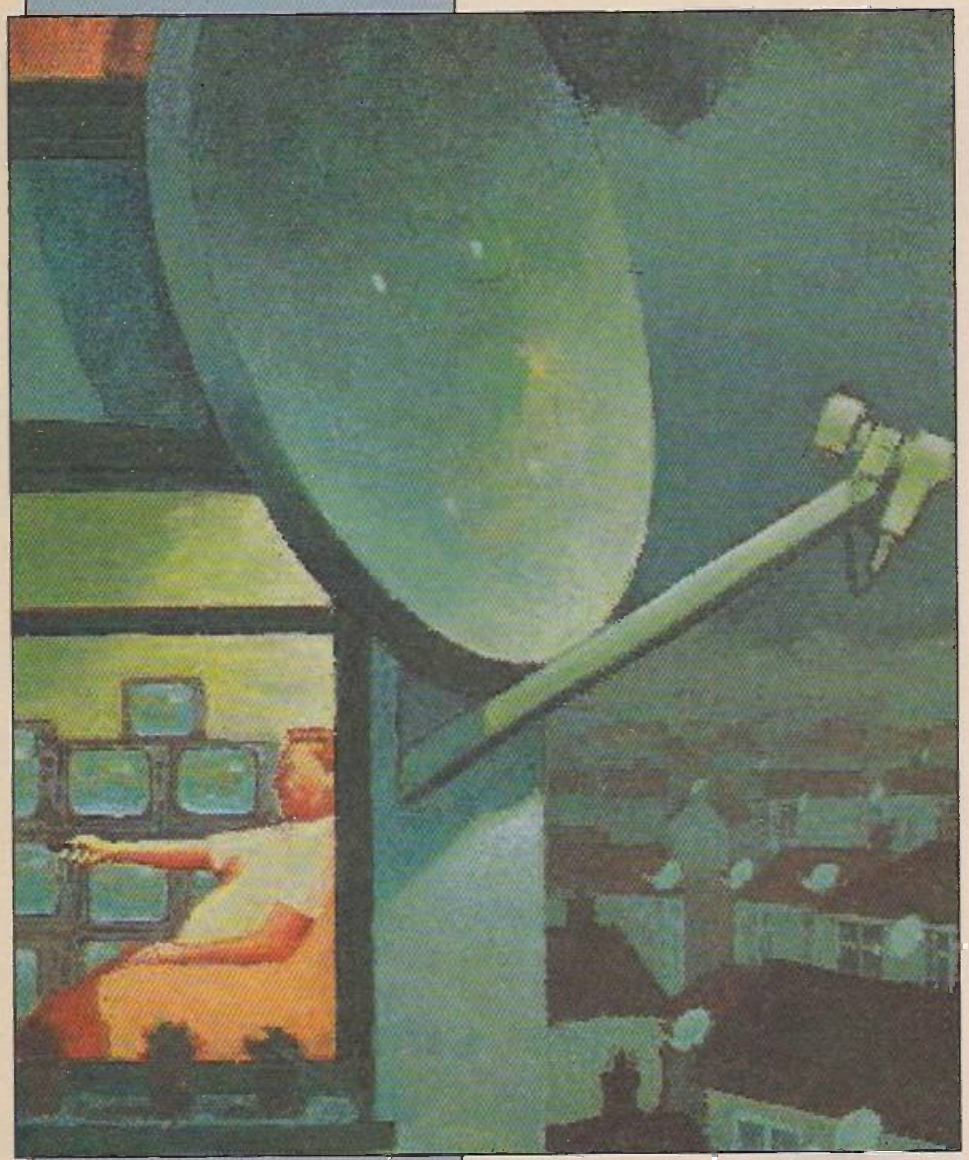
You can also contact Mac Users and ask questions at the Yorkshire Mac User Group web site (YMUG) http://www.ymug.york.co.uk

Information about Sky Digital satellite receivers can be found at http://www.satcure.co.uk

You can order Apple Mac cables, connectors, batteries and other accessories from the SatCure web site at http://www.satcure.com



MacSE/30 fixing screw positions.



SATELLITE NOTEBOOK

Reports from Christopher Holland and Michael Dranfield

In the December 2000 issue I mentioned a device that makes a Sky digibox come back on a predetermined channel after a mains supply failure. Normally a digibox reverts to standby following a mains interruption. A multi-receiver set-up, for example at a hotel, could cause problems unless there is some sort of UPS (uninterruptable mains power supply) to provide the receivers with constant mains power. Kesh Electrics, which manufactures the previously mentioned unit, has now come up with the Digimemo. It can be connected to up to six digiboxes, thus simplifying the arrangements with a multi-receiver installation.

The unit is housed in a small case, see Photo 1. Six coaxial leads, each terminated with a standard Belling Lee aerial socket, emerge from it. At first sight you could be forgiven for thinking that it's some sort of exotic RF signal amplifier or splitter!

The Digimemo works by simulating a remote-control signal from the 'mouse' infra-red pickup device that can be connected to a digibox's second RF output connector to provide channel changing at a different location via a coaxial cable and a second remote-control unit. The digibox assumes that someone is sending it a remote-control signal from another location to switch it back on after a power interruption.

Use

Each lead from the Digimemo is connected to the second RF output at the rear of a digibox. Power to the second RF socket must be switched on via the digibox's installation menu, as if a 'mouse' is to be connected (see Photo 2). This provides power for the Digimemo. It doesn't matter if you have fewer than six receivers. Just leave the unused connectors unterminated. They can be connected at any time in the future should the installation be upgraded with more receivers.

Photo 1: The Digimemo.

It is most important that all the digiboxes in the installation are connected to a common mains supply source, so that they all suffer a failure together and thus all start the reboot process at the same time when power is restored.

How do you determine the channel a digibox boots up with? Go to the favourite menu and place a tick (see Photo 3) beside the channel you want the digibox to go to at power-up. Scroll through the menu to ensure that no other channels have been ticked. The need to do this is because the Digimemo repeats the on command several times during the first minute or so, to allow for the fact that different makes of Digibox have different boot-up speeds. If you have more than one favourite channel in the list, the digibox may change channels to the next favourite within a few seconds of starting up with the first one. This could cause some confusion!

Kesh has tested the Digimemo by connecting it to every possible permutation and combination of types of digibox. So you can mix say some two-year old Pace digiboxes with a Grundig from a year or so ago and the latest Panasonic or Sony models: they will all work together happily with the same Digimemo unit.

Availability

At the time of writing the Digimemo-6 is available at about £99. Kesh Electrics plans to make available units with fewer outlets – these will cost less. For the latest information on price and availability, phone Kesh on 0286 863 1449. Or go to the website at www.pacelink.co.uk

The address is Kesh Electrics, Main Street, Kesh, Co. Fermanagh, N. Ireland BT93 1TF. **C.H.**

Pace 2500B digibox

This newish digibox came to me from another dealer. He had sent it to Pace for repair and a while later had received a call from Pace to say that half a dozen ICs had been replaced but the box still wouldn't come out of standby: it had probably been subjected to a high-voltage spike down the modem line, and was therefore not economical to repair. This was a serious challenge. I've repaired plenty of digiboxes, but not one returned by the manufacturer!

Once the lid had been removed it was evident that the flash memory U7200, U7202, U7204 and U7206 had been replaced, along with the DSP1675 modem chip, the ST20TP3 micro chip and a handful of components in the modem section. I eventually found that pin 41 of the µPD78011 housekeeping microcontroller chip U600 was running at 30MHz instead of 10MHz. I traced back via the buffer chip U203 to the source of this clock signal, pin 50 of the of the QPSK demodulator chip U403. It's derived from a quartz crystal which is connected to pin 49. This was the source of the problem: a new 10MHz crystal (X401) brought the box out of standby and it then worked all right.

The biggest problem with digiboxes is that they usually stick in standby when faulty. At least when a box switches on you can see the fault symptoms on the screen. **M.D.**

Photo 2: Installation menu.

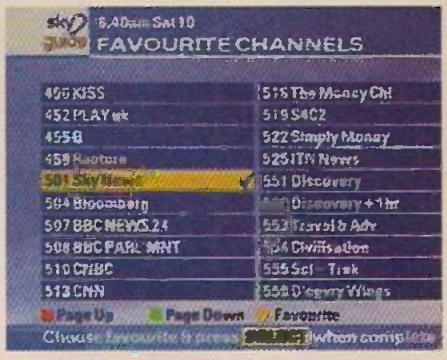


Photo 3: Favourite menu.

Pace VC200 VideoCrypt decoder

The 1A mains input fuse had blown and the MJE18004 chopper transistor was short-circuit. The cause was a short-circuit UF5402 diode, D30, on the secondary side of the power supply. **M.D.**

Pace 2200 digibox

This digibox worked fine via the scart socket but there was no output from the UHF modulator. In addition there was no RF loop-through. The problem was caused by water seeping down the aerial cable.

I traced the cause of the loss of RF loop-through to an open-circnit surface-mounted resistor, R663 (2·2kΩ), which provides Q610 with base bias.

No output from the modulator was caused by loss of the 33V supply at the surface-mounted resistor R644 (22kΩ). This supply was present at the RF bead L694 on the outside of the screening can however. Now these units use multi-layer PCBs, and it was evident that a through-hole was open-circuit. But the link was to the middle-sandwiched PCB. The box thus appeared to be beyond repair.

I decided to connect L694 to the junction of R644/C652 via a short length of insulated wire. There are small holes at each corner of the modulator's screening can. They enable the wire to be passed through and allow the lid to be refitted. The result: 100 per cent success! **M.D.**

Test Case 461

Can any manufacturer of home entertainment equipment have produced, over the years, a more diverse range than Sony? As time has gone by we've praised the company's products, cussed them, taken them on holiday (the Walkman) and to bed (clock radios), enthusiastically sold and rented them, wondered at the variety of switch-mode power supplies they employ and now, of necessity, have had to invest in a new PC system to keep up with the service manuals and circuit diagrams.

No manufacturer's products are immune to failure however. And when the fault with a piece of Sony equipment is intermittent, the cause can be as difficult to locate as with the products from any other manufacturer. Television Ted was struggling with an older Sony TV set, Model KVM2140U (BE2A chassis), that had worked perfectly on soak test for four days before the fault had put in an appearance. The sound, vision and raster had then disappeared, though the set was not dead: the indicator LED remained on, and EHT was still present – signified by a 'bristling' at the back of a hand held near the screen.

The set was left running with the back on and meters connected to the tube's blue cathode and the 120V HT line. It took a further two days of testing for the fault to reappear: the meters then showed that the HT remained constant at 120V but the tube's blue cathode voltage had risen. What, in a set without serial-bus control, could lead to this along with failure of the sound? Over a coffee Ted and Sage hatched a theory between them, that a line output transformer earthing pin was poorly connected, removing a supply voltage to both the sound and vision processing stages.

So much for guesswork! The relevant LOPT pin, no. 11, was perfectly well soldered to the PCB land. And anyway if the cause of the trouble had been here the LED indicator would have gone out – it's fed from the LOPT-derived 12V line. Sage then went back to his bench and Ted got out his mighty magnifying glass, an object of much derision and hilarity in the workshop but very useful for finding poorly soldered joints. The connections to the line output and chopper transformers were examined but proved to be OK. Likewise the print in the signal-processing sections and around the microcontroller chip IC001, though it was hard to see how the problem could arise in this area with the separate control lines for volume, brightness etc.

Ted followed up with a series of physical attacks on the PCB. He tapped it, flexed it, heated it to nearly boiling point with blasts of hot air and got it looking like a glacial ice-cap with freezer spray. But the set was impervious to these assaults, with its screen alight and its speaker speaking!

The set was put back on soak test and, after some hours, the picture and sound once more disappeared. But this time the sound and vision 'faded out' over a couple of seconds, which suggested an electrical rather than a physical fault. Further study of the circuit diagram, and a voltage check in the signal section, finally revealed the culprit. What was it? For the solution, turn to page 440.

WEB SERVICE

AcquiVision
http://www.acquivision.com

Acquivision solutions, including XY-Plotting, Oscilloscope (with FFT), Data Logging and Custom Software, have been getting the most from computers since 1994, Download software. Telephone (01903) 830502

Alltrade
http://www.alltrade.co.uk

ALLTRADE
AERIAL & SATELLITE LIMITED

Phone 01273 413798 Fax 01273 425700

Full e-commerce site with over 1500 products with in-stock quantities!! We supply everything associated with Digital/Analogue Terrestrial & DTH/Motorised Satellite reception. All Antennas. All Brackets. All Cables. All Connectors. All Amplifiers. We provide a free MATV/SMATV planning service as well.

A.R.D. Electronics Plc
http:/www.ardelectronics.com

A.R.D.'s Website details all the information you need to know about this new and exciting electronic

component distributor. It shows how to: open an account (credit or cash), obtain a trade catalogue and place orders (both online and direct)

Baird 30 Line Recordings
http://www.dfm.dircon.co.uk

For history buffs and the curious here's a fascinating site containing early TV recordings and their background.

BBC
http://www.bbc.co.uk/info/reception

http://www.bbc.co.uk/enginfo

If you need any help with your reception go to this site – both of the addresses point here. There's special advice for people with loft installations, and caravaners and boating enthusiasts.

Doknet Service manuals
http://www.doknet.com

This Dutch site says it has 350,000 service manuals and 1 million service parts.
You interogate the data base by filling out an order form, with the "request" box ticked, and then wait for an email to arrive back on your computer. However,
an on-line index would be useful and maybe on-line downloading of the manuals.

Dönberg Electronics
http://www.donberg.ie

As the leading distributor for the TV, Video and Audio trade in Ireland, we supply over 2000 shops & service dept with Audio-Video and TV spares, Semiconductors, Test Equipment, Service Manuals, Remote Controls etc. At present we stock over 30,000 different lines

EURAS International Ltd
http://www.euras.com/english

"The definitive fault index... based on feedback from manufacturers, technicians and workshops throughout Europe" IER Magazine. Available on CD-ROM including ECA vrt-disk 2000.

Subscription includes free Internet access for update downloading, access to pin board, discussion forums and classified ad section. Monitor database also available.

Goot Products
http://www.kieagoot.co.uk

Kiea Trading Company is the sole agent of Goot products, We specialise in supplying the soldering and desoldering product range manfactured by Goot Japan for the UK market. Goot uses advanced production technology to manufacture high quality soldering iron products for industrial, prfessional and general purpose use.

MB21
http://www.mb21.co.uk/index.html

Another enjoyable site with a "telenostalgia" section about the technical aspects of television. There's also a section on transmitter sites, teletext "then and now", and a "rough guide" to widescreen television

Matrix Multimedia Ltd
http://www.matrixmultimedia.co.uk

Matrix Multimedia publishes a number of highly interactive CD ROMs for learning electronics including: Complete electronics course, Analogue

filter design, and PICmicro(R) microcontroller programming (C and assembly).

M.C.E.S.

http://www.mces.co.uk

The MCES site gives details of our range of service including Tuners, Video Heads, RF & IF Modules plus latest prices and special offers.

Newnes

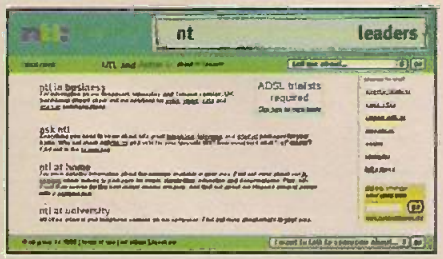
http://www.newnespress.com

Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

NTL

http://www.ntl.co.uk

Go to this site for information on NTL's Broadcast, Interactive and Telecom services, including packages for home



area by area. There's also a useful transmitter site map and database, giving locations and information. The site also contains useful documents, which describe digital TV, interactive TV and digital Radio. There's also a useful contacts list.

Mauritron Technical Services

http://www.mauritron.co.uk

The UK's leading independent supplier of Service Manuals and Operating Guides from valve to video. Also available on CD Rom or download direct from the internet.

PC Universe

http://www.pc-universe.net

PC Universe supplies core computer components at "WORLD-beating" prices. Our range of reliable brand name products is available to order online 24-7.
Nationwide delivery. Free Tech support at all levels. Call LO Call 0845 4585817

Sky digital repairs

http://www.horizonsatellites.co.uk

The Horizon site gives details of our range of products and services including Sky Digital Receiver Repairs.

Servicing Advice

http://www.repairfaq.org/REPAIR/F_Repair.html

Here are some frequently asked questions about servicing consumer electronic equipment, with a US bias. But there's some good material on monitors and CD players and CD-ROM drives. (thanks to David Edwards for this information)

Switch-it-on

http://www.switch-it-on.co.uk

We sell multiregion dvd players to trade and public, also tv, videos, hifi and playstation 2. We design our own upgrades on dvd and we sell all spare parts. All makes and most models stocked.

Timecast

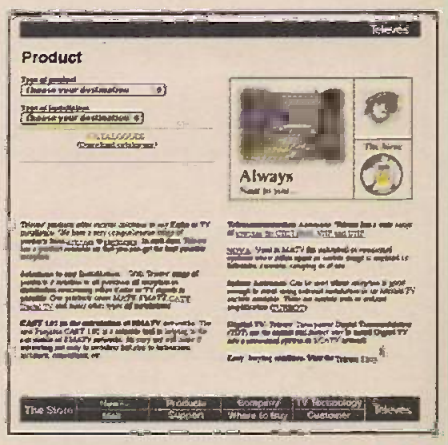
http://realguide.real.com/stations/

This site contains listings of TV and Radio stations available on the Internet. There are also some fixed cameras positioning in locations ranging from game park, high streets and people's houses - not exactly captive viewing! But an interesting thought - are PCs and TVs going to eventually "get married"?

Televes

http://www.televes.com/ingles/ingles.htm

Televes website was launched as an easier way to keep in contact with our World-wide Network of Subsidiaries and Clients. This site is constantly updated with useful information/news plus you can download info on our range: TV Aerials & accessories, Domestic and Distribution amplifiers, Systems Equipment for DTT and Analogue TV, Meters and much more.



The Service Engineers Forum

http://www.E-repair.co uk.

A brand new site dedicated to the needs of service engineers containing detailed servicing articles, circuits & repair tips. The site also includes for sale, wanted & special offer sections, industry news & much more. An impressive site well worth visiting.

For customers without net access, servicing product details are also available by ringing Mike on 0151 522 0053

UK Electrical Direct

http://www.uked.com

For a comprehensive on-line directory, buyers guide and resource locator for the UK Electrical Industry look at this site. Many of the companies listed have links to their own web sites, making this a one-stop shop for a huge amount of information.

UK Mailing List Group

http://www.egroups.com/list/uktvrepair

Following on from the newsgroup discussion last month there is a UK Email group for TV technicians where you can send an Email to everyone in the group. There's just over 30 people in the group at present. For more details and how to register look at the egroup home page. Just a general comment though - you do have to be careful who you give your Email address to so that you can avoid "spamming" - that is getting lots of unwanted Email about dubious Russian site (amongst others).

PSA

http://www.psaparts.com

This web site gives details of various specialist parts for repairers, from rare semiconductors to compute batteries and printer parts. The vast majority of items are in stock, and can be purchased on-line via this site's shopping facility.

Reed Connect

http://www.reedconnect.net/

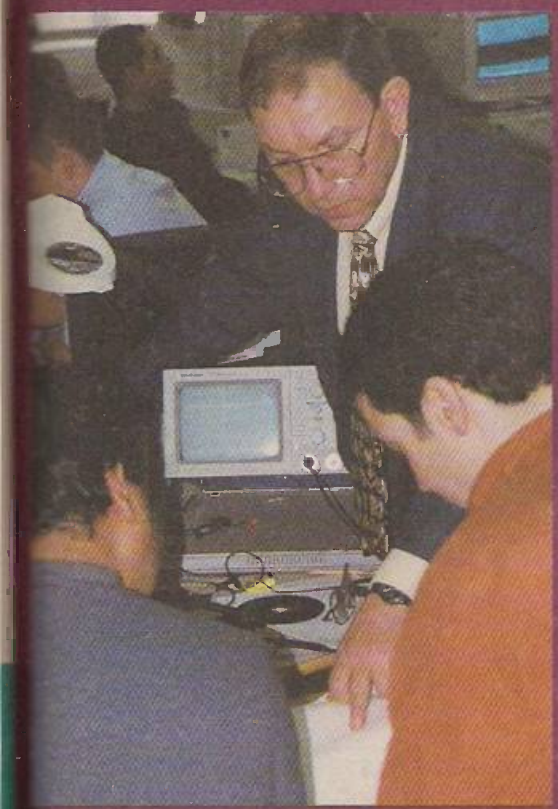
Another free internet access site, this time from Reed Business Information. However the site possesses a useful UK People and Business Finder, with an e-mail search. There's also business news and local information, and some good links to directory sites.

Repairworld

http://www.repairworld.com

Repairworld is a US based fault report database which is updated bi-weekly. It operates on a subscription basis and describes itself as an "affordable solution for all technicians". There is apparently no minimum number of months for which you have to subscribe. You can see some samples of the material for free, monitors, VCR, DVD and Camcorders being of particular relevance to UK users. The site provides a "chat room" where you can talk via your keyboard to others "in the room".

College of NW London's Digital Village



Later this year the College of North West London will open its new Digital Village, which will be a centre for training in digital applications and servicing, covering both consumer and commercial electronics. The Village involves a £150,000 refit of the college's entire second floor at its main centre in Dudden Hill Lane, Willesden. Complete redesign and refurbishment will be followed by the installation of £60,000 worth of the most up-to-date equipment and latest state-of-the-art facilities. The Digital Village, which is scheduled to open this September, will include a lecture room, remodelled and newly fitted classrooms, demonstration facilities, a foyer display, air-conditioning and sound-proofing.

The college went digital over two years ago when it began running City & Guilds accredited courses on the operation and servicing of DTV set-top boxes, to cater for the introduction of digital TV in the UK. It is now moving into other digital applications. This involves devising and writing a large number of new courses that will make the college the only Further Education institution in the UK offering such a wide range of subjects under one roof. The new courses include college-devised City & Guilds modules in digital television, DVD, PC monitors, network cabling including fibre-optics, digital signal reception (acrial installation), digital audio broadcasting (DAB), video conferencing, integrated digital TV (IDTV), e-commerce, microcontrollers and medical electronics.

The School of Electrical and Electronic Engineering is part of the college's Faculty of Technology, along with Built Environment and Construction and Automobile studies. The faculty is one of the largest providers of technology studies nationally, and was awarded top-ranking Grade 1 in last November's inspection by the Further Education Funding Council. In due course the college expects it to become one of the government-designated Centres of Excellence.

Recently the college has been pioneering courses on DVD players, to complement its unique courses on servicing digital TV equipment. The DVD courses are initially being offered as two-day short courses for practising engineers. They will become full mainstream courses in September 2001.

Senior lecturer Fawzi Ibrahim considers the reduced demand for electronics servicing to have been greatly exaggerated. He believes that while there will be fewer electronics servicing engineers in future than in the past, the vital cadre remaining will be of higher calibre in terms of the width and depth of their knowledge and skills.

Servicing digital TV and DVD players are just two of the subjects in a range of courses that the college's Digital Village will provide in all aspects of digital technology. Fawzi points out that developments in processing and control have changed the nature of electronics servicing. In order to cope with today's equipment, service engineers frequently have to update their knowledge and skills. The college has set itself the task of meeting these new needs. But it is not dropping any of its existing courses.

In addition to drawing students from around the UK, the CNWL receives many inquires about DTV courses from abroad and is now offering them to other colleges to run. The college also provides very popular general electronic servicing and PC repair and networking courses.

For further details of the college's courses and services, contact Sylvia Garvin on 020 8208 5440 or e-mail sylvia.garvin@cnwl.ac.uk

5-in-1 digital multi-tester

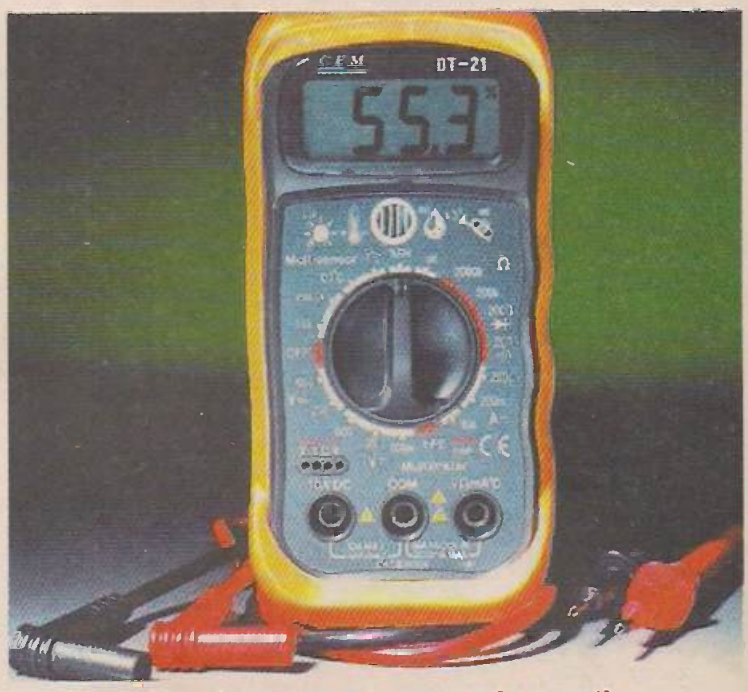
Reader offer price £49.99 – fully inclusive

Complete with batteries, holster, test leads and temperature probe

Now you can record measurements together with readings of environmental conditions – temperature, humidity, light level and even sound pressure – using just one meter, the DT21. This 3.5-digit multi-tester even checks transistors.

Sound level readings in decibels are taken via the meter's inbuilt microphone. The **light** function relies on a very stable long-life diode – also built in – and is fully cosine corrected for the angular incidence of light. Relative **humidity** sensing – with direct reading in percentage – is taken using an inbuilt sensor, as is ambient temperature in °C. A probe is also supplied for making localised **temperature** readings. Alternatively, you can use any K-type thermocouple.

The digital multimeter performs AC/DC voltage, DC current, resistance measurement and audible continuity, diode, transistor h_{FE} test.



For a PDF file of the meter's manual, e-mail eworld.orders@rbi.co.uk with the subject heading 'Meter manual'.

Features

- 11 functions: measures sound level, light, humidity, temperature, DC voltage, AC voltage, DC current, resistance, transistor, diode and continuity test.
- 3½ large LCD with indications for lux, °C, %RH and dB.
- Sound level: from 35dB to 100dB with C weighting, 0.1dB resolution.
- Light: levels ranging from 0.1lux to 20000lux.
- Humidity: from 25%RH to 95%RH with 0.1%RH resolution and fast time response.
- Temperature: –20 to 200°C and –20 to 1200°C ranges
- Transistor hFE, 0-1000 with 10µA base current
- Diode test current 1.4mA
- Separate jack for 10A current measurement
- 1MΩ input impedance
- 220V DC or RMS AC maximum overload for 200mV DC range, 600V RMS AC on other DC ranges

Voltage and current and resistance

Range	Resolution	Accuracy
DC volts		
200.0mV	0.1mV	
20.00V	10mV	±0.5% of rdg, ±2dig.
600V	1V	±1% of rdg, ±2dig.
AC volts		
200.0V	100mV	±1.2% of rdg, ±10dig.
600V	1V	±1.2% of rdg, ±10dig.
DC current		
200.0µA	0.1µA	±1% of rdg, ±2dig.
200.0mA	100µA	±1.2% of rdg, ±2dig.
10A	10mA	±2% of rdg, ±5dig.
Resistance		
200.0Ω	0.1Ω	±0.8% of rdg, ±4dig.
2.000kΩ	1Ω	
200.0kΩ	100Ω	±0.8% of rdg, ±2dig.
2.000MΩ	1kΩ	±1% of rdg, ±2dig.

Use this coupon to order your DT21 multimeter

Please send me ..... DT21(s) at the special offer price of £49.99 each. Note that the price includes VAT and recorded UK delivery. Please add £5 for overseas orders.

Name

Company (if any)

Address

Phone number/fax

Total amount £.....

Make cheques payable to Reed Business Information Group.
Or, please debit my credit card.

Card type (Switch/Master/Visa etc:)
Card No
Expiry date
Issue no

Please mail this coupon to *Television* together with payment. Alternatively fax credit card details with order on 020 8652 8111.
Address orders and all correspondence relating to this order to DT21Offer, Television, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Interference problems

Interference is a perennial bane for those interested in radio, TV and now data signal reception. Modern equipment, with clock pulses and switch-mode power supplies, has made matters worse. David Benyon describes some steps that can be taken to deal with the problem

In the March issue Roger Bunney mentioned some problems he'd had with interference caused by his digital satellite receiver. The most likely source of the interference is the microprocessor clock edge. I've had similar problems with an expensive Echostar SR-5500 receiver-positioner. Considering the price at which these units were sold, the interference problems are not acceptable. Previous satellite receivers I've had have included a Ferguson SM02 (which can still outclass some of the newfangled stuff in the picture-quality department) and Maspro Models SRE80 and SRE90: none of these receivers gave any trouble.

The Echostar receiver caused considerable annoyance because it obliterated Radio 1 FM, transmitted at approximately 88MHz. But when the TLO in Holland was contacted his advice was to put the FM receiver in the opposite corner of the room!

Investigation

A good spectrum analyser was employed to carry out an investigation, with a scope probe used as a 'sniffer'. The radiation was found to be coming from the CPU board. It originated from the clock output pin of a 100-pin custom IC. This is the master IC, one of its duties being to drive a crystal to generate a 4MHz clock signal for the Z80 CPU. The clock-signal spectrum was seen to be a comb-like series of spikes, 4MHz apart, extending to over 180MHz (and 4 x 22 is of course 88!). The turnover frequency was about 150MHz. But these measurements were rather approximate, as the probe was not properly matched.

With the probe connected to a scope, a superb squarewave was displayed. It had negligible rise and fall times and razor-sharp corners. While such a waveform might delight the chip designer, it's not really what the user requires – and anyway the Z80 will perform perfectly well with slower clock edges.

It might at this point be worth mentioning that RF radiation from most ICs is minimal, as the chip dimensions are too small to make an effective aerial. It's a different matter once a chip is connected to a copper track: the chip can then radiate easily.

Modification

There was insufficient room on the CPU board to add filtering, so an attempt was made to slow the edges of the clock pulses resistively. With some trepidation I cut the 'clock-out' track as closely as possible to the custom IC's clock output pin, while leaving enough land to solder to. A physically small one-eighth Watt resistor was then soldered across the break. The value tried initially was 75Ω, but the most acceptable results were obtained with a 1·5kΩ resistor. The waveform to aim for is one that's slightly trapezoidal, with smoothly-rounded corners.

Some internal shielding was also fitted, as CPU boards tend to be electrically noisy. In addition the 'sardine can' that encloses the chopper power supply was soldered to the case with copper braid.

These modifications enabled my clock-radio alarm to operate successfully while sitting on top of the Echostar receiver.

With so many Astra analogue dishes being scrapped at present, there is a handy supply of perforated metal that's suitable for screening and allows some ventilation. The perforations are ideal for gluing to plastic with hot-melt glue. But for proper screening a complete box, all electrically bonded and without large apertures, is required.

Chopper interference

The switch-mode power supply is another possible source of interference. It will use 'fast-recovery' diodes, whose 'snap-action' switching can be a fruitful source of interference. Even standard-recovery diodes produce harmonics. For example I once heard of a yachtie who sold his new and expensive wind generator for a song because it caused interference on his radio!

When the supply frequency is a few tens of Hz, power diodes can be shunted with small capacitors: 0·1µF usually works. But at switch-mode frequencies different techniques, using RF chokes, are more appropriate. The Farnell Electronic Components catalogue includes a good selection of small, three-terminal capacitors, and three-terminal capacitors with ferrite beads – the Murata devices in the EMC, filters and suppression section are worth a look.

Research

Outrageously noisy equipment can be readily tackled, but for serious research into EMC problems a screened room or 'cage' (an abbreviation for Faraday Cage) is needed in addition to a noise-free, filtered mains supply. It might at first sight be thought that this requirement calls for a budget of military proportions. This is not so. For the real enthusiast, a metal-bodied van will suffice. But do be careful and use an ELCB. And beware of static-zap.

Answer to Test Case 461

– page 433 –

The fault with this Sony set was an intermittent and obscure one. Though the sound and picture occasionally disappeared, the on-indicator light and the power supply remained on as normal. It was almost as if the brightness and sound levels were being turned down simultaneously – and so it proved to be! A study of the circuit diagram showed that various DC control lines converge, via separate blocking diodes, at the collector of Q005 which, as far as we could see, performs some sort of muting or 'soft-on' function. What's for sure is that if its collector goes to chassis potential all the control lines fall to zero, taking the sound and picture with them.

A soak test with a meter connected to the collector of Q005 showed that this was indeed what was happening – because the transistor went open-circuit at random intervals. Once a replacement transistor had been fitted the set ran trouble-free for many days.

But it wasn't released from the workshop until the diagnosis had been proved. The transistor, still unaffected by heating, cooling and violent shock, was hooked up to a small light bulb, a base bias resistor and a 12V supply. On day four the bulb faded out over a period of about one second. Thorough, huh!

Incidentally there seems to be some variation in the circuitry in this area with different models that use the BE2A chassis.

NEXT MONTH IN TELEVISION

Installing car radios
Though modern cars have car radios fitted as standard, many owners prefer to fit something of their own choice. They either call on you to start with or try to do it themselves and get into trouble, making it worse for us. Tom Baker on how to go about it.

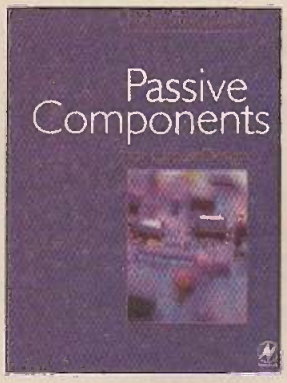
VHS runaround
Though the price of many VHS machines has dropped to the point where repair may not be economically viable, many of the problems that occur are relatively simple mechanical ones that are easy to deal with when you know how. Eugene Trundle provides a diagnosis and repair guide, based on many years' practical experience.

CeBIT report
George Cole reports on the CeBIT show, which covers everything from telephones to TV. Highlights of the 2001 show included recordable DVDs, the SD memory card and Dataplay recordable disc.

Measuring the CRT heater voltage
The CRT heater voltage is one of the most important in a TV set or monitor, since it affects CRT life. It is also one of the most difficult to check. Denis Mott presents a meter design that caters for this requirement.

Published on the third Wednesday of each month by Reed Business Information Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. **Filmsetting** by JJ Typographics Limited, Unit 4, Baron Court, Chandlers Way, Temple Farm Industrial Estate, Southend-on-Sea, Essex SS2 5SE. **Printed** in England by Polestar (Colchester) Ltd., Newcomen Way, Severalls Industrial Park, Colchester, Essex CO4 4TG. **Distributed** by MarketForce (UK) Ltd., 247 Tottenham Court Road, London W1P 0AU (0171 261 7704). **Sole Agents** for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.; South Africa, Central News Agency Ltd. ***Television*** is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.

BOOKS TO BUY



PASSIVE COMPONENTS FOR CIRCUIT DESIGN

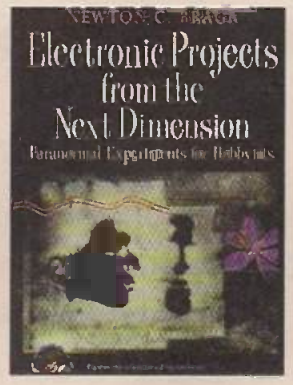
Passive Components for Circuit Design is a unique introduction to this key area of analog electronics designed for technician engineers and anyone involved in circuit design. The coverage encompasses all component types capable of power amplification: resistors, capacitors, transformers, solenoids, motors and transducers. The behaviour of the components is explored along with the different types available and the principles of circuit design. Tolerances, stability, variation with temperature, reliability and manufacturing standards are all covered. Reading this book will improve your skills in component selection and analog circuit design. These are essential skills not only for the analog designer, but for all circuit designers, professional or amateur.

Contents: Preface; Fundamentals; Fixed resistors; Variable resistors, potentiometers and diodes; Capacitors; Inductors and inductive components; Inductive devices; Transducing components; SMT; Hardware; Index

Readership: Technician engineers, circuit designers, advanced hobbyists

Pages: 304pp

Price: UK £22.00
Europe £24.00
ROW £26.00



ELECTRONIC PROJECTS FROM THE NEXT DIMENSION

For years paranormal scientists have explored the detection and documentation of spirits, auras, ESP, hypnosis, and many more phenomena through electronics. Electronic Projects from the Next Dimension provides useful information on building practical circuits and projects, and applying the knowledge to unique experiments in the paranormal field. The author writes about dozens of inexpensive projects to help electronics hobbyists search for and document their own answers about instrumental transcommunication (ITC), the electronic voice phenomenon (EVP), and paranormal experiments involving ESP, auras, and Kirlian photography.

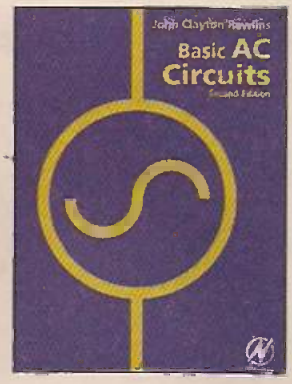
Although paranormal studies are considered esoteric, Electronic Projects from the Next Dimension teaches the technical skills needed to make devices that can be used in many different kinds of experiments. Each section indicates how the circuit can be used in paranormal experiments with suggestions about procedures and how to analyze the results.

Contents: White noise generators for use in instrumental transcommunication (ITC) and electronic voice phenomenon (EVP) experiments; Practical circuits for image experimentation, such as a wireless sparkling image generator, horizontal bar generator, brontophic sound, magnetic field generator, high-voltage generators (Kirlian Machine's I & II); Paranormal skills experiments with temperature change, polygraph, electro-shock, random number generation, UFO detection, and ghost-finding.

Readership: Hobbyists, Electronics Enthusiasts

Pages: 256pp

Price: UK £22.00
Europe £24.00
ROW £26.00



BASIC AC CIRCUITS

This is the step-by-step approach for beginners. This self-paced individualized learning tool covers concepts, terms, and the mathematics required to understand AC circuit problems. It has been designed to improve analysis techniques for prediction and control development.

Readership: Beginners meeting AC circuits for the first time: students; technicians

Poges: 921pp

Price: UK £27.00
Europe £29.00
ROW £31.00

Post your completed order form to:-
Jackie Lowe, Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS

Fax your order form to 020 8652 8111

How to order

Book Title_____

❑ I enclose a cheque/bank draft for £_____
(payable to Reed Business Information)

Please charge my credit/charge card
❑ Mastercard ❑ American Express ❑ Visa ❑ Diners Club

Credit Card No: Expiry Date

_____

Signature of Cardholder_____

Cardholder's statement address: (please use capitals)

Name_____

Address_____

_____

_____

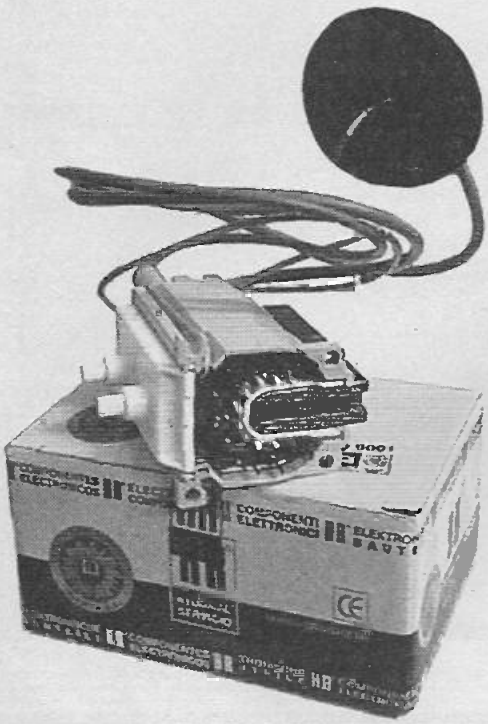
Post Code_____ Tel_____

WILTSGROVE LTD

28/29 River Street, Digbeth, Birmingham B5 5SA

TV•VIDEO•COMPONENTS DISTRIBUTORS

Tel : 0121 772 2733
Fax : 0121 766 6100
e-mail : sales@wiltsgrove.co.uk
web : www.wiltsgrove.co.uk



HR® DIEMEN s.a. Official Distributors

AMSTRAD CDTV50

5" Black and white tv
Top loading cd player
Repeat play functions
Mw/fm stereo

Only £24.99 each

Graded stock

Call Now on the TV Sales Direct line: 0121 772 2332

SONY MZ- R70 RECORDABLE MINIDISC

Jacket size portable MD
40 second shock resistant
1xAA battery
Easy pop up Mechanism
Dual headphone jack
Recordable

Graded stock

Only £99.99 each

SAMSUNG SP-R5150 DECT cordless phone

With Built in Digital Recording Feature

Only £32.99 each

User friendly MMI,Intercomhandset,Memory dialing,Tone dial switch over, Register recall, baby call,Hand set lock.

PANASONIC SURROUND SOUND SPEAKERS

New!!

2x FRONT SPEAKERS
2x REAR SPEAKERS
POWER 15watts 80hm

Only £29.99 each

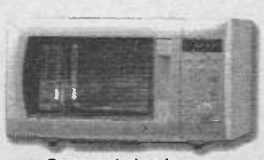
VETRELLA MULTI VAC 3in1Graded stock

Dry vacuum cleaner
Wet vacuum cleaner
Shampoo extraction cleaner
Full set of tools

Only £44.99 each

Graded stock

KOR-6105 Manual Microwave oven



800 Watts microwave power
5 power levels
Cyclic defrost
Acrylic interior
Dial set time
Dooor release button
Glass cooking tray

Graded stock

Only £24.99 each

Untested £17.50 each

TRADE ONLY. Offers subject to change without prior notice. Items Subject to Availability, Carriage and V.A.T.

Freefax Orderline : 0500 55 05 05

MARCONI 2019A

AM/FM synthesised signal generator 80KHz–1040KHz

NOW ONLY £400

H.P. 3312A Fun Gen 0.1Hz–13MHz.....£300
AM/FM Sweep/Tri/Gate/Burst etc. H.P. 3310A Fun Gen 0.005Hz–5MHz.....£125
Sine/Sq/Tri/Ramp/Pulse FARNELL LFM4 Sine/Sq Oscillator 10Hz–1MHz.....£125
Low distortion. TTLOutput. Amplitude Meter H.P. 545A Logic Probe with 546A Logic Pulser.....£90
and 547A Current Tracer
FLUKE 77 Multimeter 3½ digit Handheld.....£60
FLUKE 77 Series 11.....£70
HEME 1000 LCD Clamp Meter 0–1000A. In Carrying Case.....£60

RACAL 9008 AUTOMATIC MODULATION METER AM/FM 1.5MHz–2GHz

ONLY £95

H.P. 8494A Attenuator DC–4GHz 0–11dB N/SMA £250
H.P. 8492A Attenuator DC–18GHz 0–6dB APC7 £95
MANY OTHER ATTENUATORS, LOADS, COUPLERS etc AVAILABLE

DATRON 1061 HIGH QUALITY 5½ DIGIT BENCH MULTIMETER True RMS/4 wire Res/Current Convertor/IEEE £50

MARCONI TF2015 AM/FM sig gen. 10-520MHz.....£175
RACAL 9008 Auto Mod Meter, 1.5MHz-2GHz.....£200
LEVELL TG200DMP RC Oscillator, 1Hz-1MHz.....£50
Sine/Sq. Meter, battery operated (batts. not supplied)
FARNELL LF1 Sine Sq. Oscillator, 10Hz-1MHz.....£75
RACAL/AIM 9343M LCR Databridge, Digital Auto.....£200

STILL AVAILABLE • PREVIOUSLY ADVERTISED WITH PHOTOS

MARCONI 893C AF Power Meter. Sinad Measurement
Unused.....£100
Used.....£60
MARCONI 893B – No Sinad.....£30
MARCONI 2610 True RMS Voltmeter Autoranging 5Hz–25MHz.....£195
GOULD J3B Sine/Sq Osc. 10Hz–100KHz. Low distortion.....£75-£125
AVO 8Mk6 in Ever Ready Case, with leads etc.....£80
Others Avos from £50
GOODWILL GFC8010G Freq. Counter 1Hz–120MHz
Unused.....£75
GOODWILL GVT427 Dual Ch AC Millivoltmeter..£100-£125
10mV–300V in 12 Ranges Freq 10Hz–1MHz
SOLARTRON 7150 DMM 6½ digit True RMS → IEEE.....£95-£150
SOLARTRON 7150 Plus.....£200
RACAL TRUE RMS VOLTMETERS
9300 5Hz–20MHz usable to 60MHz, 10V-316V.....£95
9300B Version.....£150
9301/9302 RF Version to 1.5GHz from.....£200-£300
HIGH QUALITY RACAL COUNTERS
9904 Universal Timer Counter, 50MHz.....£50
9916 Counter, 10Hz–520MHz.....£75
9918 Counter, 10Hz–560MHz, 9-digit.....£50
FARNELL AMM255 Automatic Mod Meter 1.5MHz–2GHz
Unused.....£400

CLASSIC AVOMETER DA 116 DIGITAL 3.5 DIGIT COMPLETE WITH BATTERIES AND LEADS ONLY £30

SOLARTRON 7045 BENCH MULTIMETER

4½ digit BRIGHT LED WITH LEADS

ONLY £30

IT'S SO CHEAP YOU SHOULD HAVE IT AS A SPARE

HUNTRON TRACKER Model 1000.....£125
H.P. 5315A Universal Counter, 1GHz, 2-ch.....£80
FLUKE 8050A DMM 4½ digit 2A True RMS.....£75
FLUKE 8010A DMM 3½ digit 10A.....£50

TIME 1051 Low Ohm Res Box 0.01ohm to 1M Ohm in 0.01ohm steps. Unused £100

SCOPE FOR IMPROVEMENT

GOULD OS 300 OSCILLOSCOPE

DUAL TRACE 20MHz TESTED WITH MANUAL

FOR THE FIRST TIME EVER ONLY IT'S SO CHEAP YOU SHOULD REPLACE THAT DLD SCOPE **£95**

MARCONI 2022E Synthesised AM/FM Sig Gen.....£525-£750
10KHz-1.01GHz LCD Display etc
H.P. 8657A Synthesised 2-18GHz Sig Gen.....£4000
H.P. 8657A Synthesised 100kHz-1040MHz Sig Gen.....£2000
H.P. 8656B Synthesised 100kHz-990MHz Sig Gen.....£1350
H.P. 8656A Synthesised 100kHz-990MHz Sig Gen.....£995
H.P. 8640A AM/FM 500kHz-1024MHz Sig Gen.....£400
H.P. 8640A AM/FM 500kHz-512MHz Sig Gen.....£250
PHILIPS PM5328 100kHz-180MHz with 200MHz Sig Gen Freq Counter IEEE.....£550
RACAL 9081 Synth AM/FM Sig Gen 5-520MHz.....£250
H.P. 3325A Synth Function Gen 21MHz.....£600
MARCONI 6500 Amplitude Analyser.....£1500
H.P. 4275A LCR Meter 10kHz-10MHz.....£2750
H.P. 8903A Distortion Analyser.....£1000
WAYNE KERR 3245 Inductance Analyser.....£2000
H.P. 8112A Pulse Generator 50MHz.....£1250
DATRON AutoCal Multimeter 5½-7½ digit 1065/1061A/ 1071.....from £900-£600
MARCONI 2400 Frequency Counter 20GHz.....£1000
H.P. 5350B Frequency Counter 20GHz.....£2000
H.P. 5342A 10Hz-18GHz Frequency Counter.....£600
B&K Accelerometer type 4366.....£300
H.P. 11692D Dual Directional Coupler 2MHz-18GHz.....£1600
H.P. 11691D Dual Directional Coupler 2MHz-18GHz.....£1250
TEKTRONIX P6109B Probe 100MHz Readout. Unused.....£60
TEKTRONIX P6106A Probe 250MHz Readout. Unused.....£85
FARNELL AMM2000 Auto Mod Meter, 10Hz-2.4GHz. Unused.£950
MARCONI 2305 Mod meter. 500kHz-2GHz.....from £750

ROHDE & SCHWARZ APN 62 SYNTHESISED 1Hz-260kHz SIGNAL GENERATOR. BALANCED/ UN-BALANCED OUTPUT. LCD DISPLAY £425

H.P. 6012B DC PSU 0–60V; 0–50A 1000W.....£1000
FARNELL AP60/50 1kW Autoranging.....£1000
FARNELL H50/50 0–60V; 0–50A.....£750
FARNELL H60/25 0–60V; 0–25A.....£400
Power Supply HPS3010 0–30V; 0–10A.....£140
FARNELL L30-2 0–30V; 0–2A.....£80
FARNELL L30–1 0–30V; 0–1A.....£60
Many other Power Supplies available
Isolating Transformer 240V In/Out 500VA.....£40

PORTABLE APPLIANCE TESTER MEGGER PAT2 Only £180

SPECTRUM ANALYSERS

ADVANTEST R3261A 9kHz-2.6GHz Synthesised.....£4000
EATON/AILTECH 757 0.001-22GHz.....£2500
TEKTRONIX 492 50KHz-18GHz.....£3500
H.P. 8558B with Main frame 100kHz-1500MHz..£1250
H.P. 853A (Dig Frame) with 8559A 100kHz-21GHz.....£2750
H.P. 3580A Audio Analyser 5Hz-50kHz. As new.....£1000
MARCONI 2382 100Hz-400MHz High Resolution.£2000
B & K 2033R Signal Analyser.....£1500
H.P. 182 with 8557 10kHz-350MHz.....£500
MARCONI 2370 30Hz-110MHz.....from £500
HP141 Systems 8553 1kHz-110MHz from..... £500
8554 500kHz-1250MHz from £750; 8555 10MHz-18GHz.....from £1000

UNUSED OSCILLOSCOPES

TEKTRONIX TDS640A 4 Ch 500MHz 2G/S.....£4000
TEKTRONIX TDS380 Dual Trace 400MHz 2G/S.....£2000
TEKTRONIX TDS350 Dual Trace 200MHz 1G/S.....£1250
TEKTRONIX TAS485 4 Ch 200MHz etc.....£900
H.P. 54600B Dual Trace 100MHz 20M/S.....£900

OSCILLOSCOPES

PHILIPS PM3092 2+2 Ch 200MHz.. Delay etc £800. As new.....£950
PHILIPS PM3082 2+2 Ch 100MHz. Delay etc £700. As new.....£800
TEK TAS465 Dual Trace 100MHz. Delay.....£800
TEK 2465B 4 Ch 400MHz. Delay Curs.....£1250
TEK 2465 4 Ch 300MHz. Delay Curs.....£900
TEK 2445/A/B 4Ch 150MHz. Delay etc £500-£900
TEK 468 Dig Storage. Dual 100MHz Delay..£450
TEK 466 Analogue Storage. Dual 100MHz..£250
TEK 485 Dual Trace 350MHz. Delay.....£600
TEK 475 Dual Trace 200 MHz. Delay.....£400
TEK 465B Dual Trace 100MHz. Delay.....£325
PHILIPS PM3217 Dual Trace 50MHz.Delay.....£250-£300
GOULD OS1100 Dual Trace 30MHz. Delay..£200

JUST IN

HAMEG HM303.4 Dual Trace 30MHz Component Tester.....£325
HAMEG HM303 Dual Trace 30MHz Component Tester.....£300
HAMEG HM203.7 Dual Trace 20MHz Component Tester.....£250
FARNELL DTV20 Dual Trace 20MHz Component Tester.....£180
MANY OTHER OSCILLOSCOPES AVAILABLE

STEWART of READING
110 WYKEHAM ROAD, READING, BERKS RG6 1PL
Telephone: (0118) 9268041 Fax: (0118) 9351696
Callers welcome 9am-5.30pm Monday to Friday (other times by arrangement)

VISA

USED EQUIPMENT – GUARANTEED. Manuals supplied
This is VERY SMALL SAMPLE OF STOCK. SAE or telephone for lists. Please check availability before ordering. CARRIAGE all units £16. VAT to be added to total of goods and carriage.

ONLINE SHOPPING CHEAPER AND EASIER

www.elclondon.co.uk

TV, VIDEO SPARES AND ELECTRICAL ITEMS

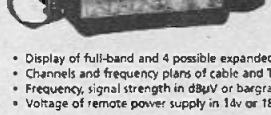
ELC EAST LONDON COMPONENTS
59/63 PLASHET GROVE, LONDON E6 1AD.

TWO MINUTES WALK FROM UPTON PARK TUBE STATION

TEL: 020 8472 4871 OR 020 8472 8899
FAX: 020 8503 5926
E-mail: sales@elclondon.co.uk

PERIFELEC

MC 30 A Spectrum Analyser

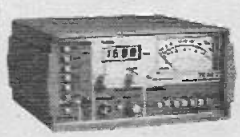


- Synthesized satellite cable and TV field strength meter with panoramic reception on 14 cm (5,5") screen and digital carriers measurement.
- Complete microprocessor and ispLSI logic control.
- Continuous frequencies from 46 to 860 MHz and from 920 to 2150 MHz on 4 bands.
- Selectable 4, 1 and 0,2 MHz spectrum band-width, picture measurement 1 MHz.
- Display of picture of selected synthesized channel.
- FM (Radio) L/L', B/G, I, D/K/K', M/N TV standards and Ku and C satellite standards.
- Possibility of 32 programs memorized per frequency band.
- Display (2 Lines of 16 characters).
- Range of measurement of signal strength from 20 to 120 dBµV, manual or automatic attenuator.
- Battery life about 1 hour 20 minutes, weight 5,8 Kg.

- Display of full-band and 4 possible expanded spectrums.
- Channels and frequency plans of cable and TV standards memorized.
- Frequency, signal strength in dBµV or bargraph, displayed on a digital display (2 lines of 16 characters).
- Voltage of remote power supply in 14v or 18v and 22 KHz in satellite + DiSEq C™ v1.2 switching.

The panoramic field strength meter MC30A combines in one instrument all the functions necessary for installing and checking TV or satellite reception, both analogue and digital. The visualization of the spectrum and the picture allows the carrying out of all the necessary adjustments with this one instrument. The high technology used in the MC30A allows a range of possibilities unheard of in a instrument in this price category.

SADELTA



Due to its weight and size, the TC-402 A/D is the ideal instrument for the installation of FM and terrestrial TV aerials as well as CATV systems.

- Peak detection.
- Built in loudspeaker for AM and FM reception.
- Frequency indication with 4 digit LCD display.
- Analogue and digital measurement.
- Multi-turn potentiometer to enable tuning.
- Weight including batteries: 1,9 Kg.

TC 402 A/D

TC 80 A/D

The TC 80 A/D has been designed for the reception of TV Satellite systems.

- Analogue and digital measurement.
- Full Band Frequency Sweep.
- Switchable 14 v or 18 v LNB power supply + 22 KHz tone switching
- Rechargeable 12 v / 2,6 Ah Battery.
- Weight including batteries: 3,3 Kg.

The TC80 A/D has been designed to aid the installation of analogue and digital satellite systems. This high quality meter has video and audio output via scart socket on rear and video only via BNC socket on front panel. The built in speaker delivers demodulated audio from any analogue satellite signals.

Full catalogue of meters available, please phone for details.

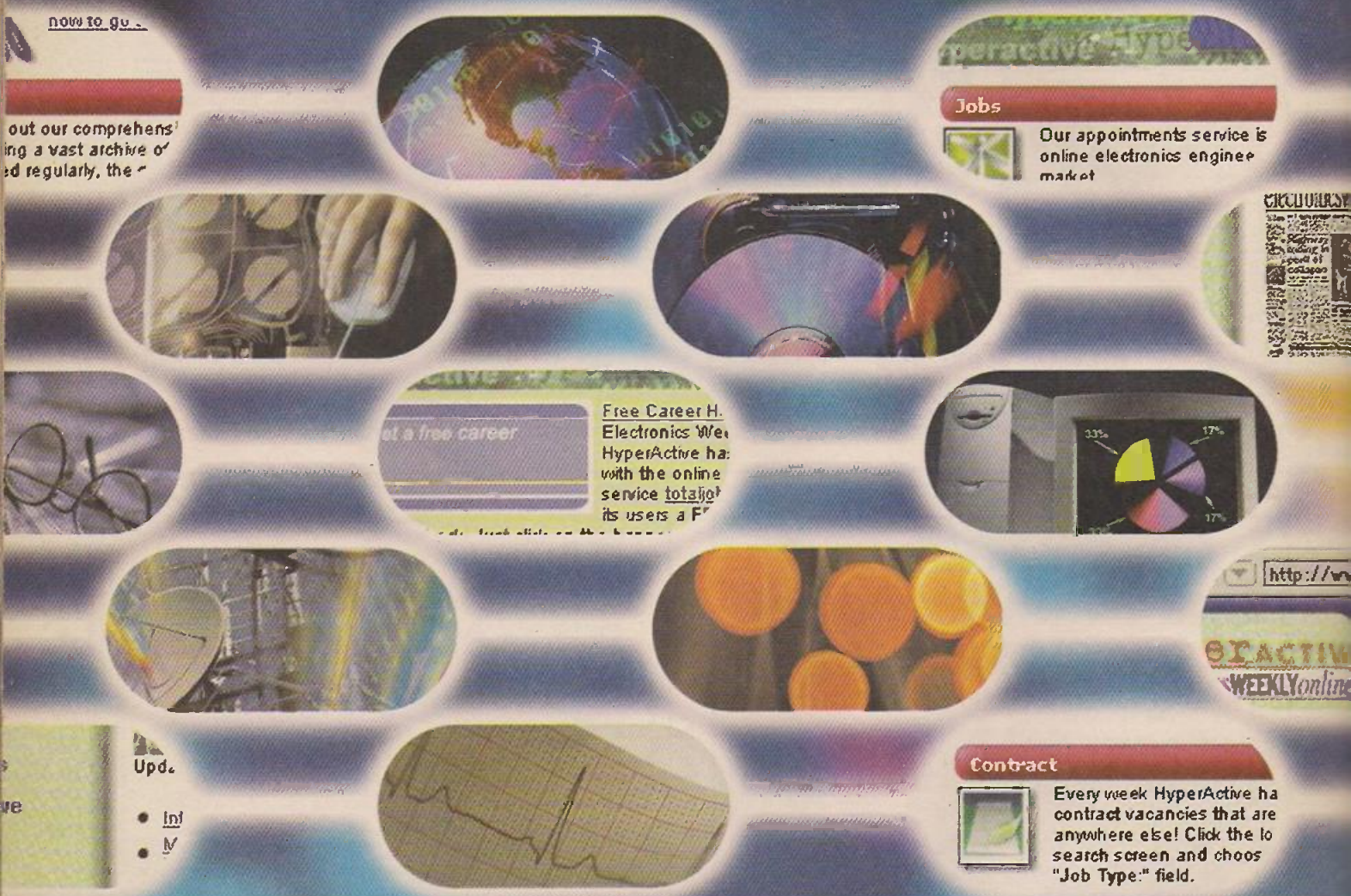
COASTAL AERIAL SUPPLIES

Sole Import Distributors

Unit X2, Rudford Industrial Estate, Ford, Arundel BN18 0BD
Telephone: 01903 723726 Fax: 01903 725322 Mobile: 0976 241505

Accurate recruitment information when you need it.

Simple Really.



Jones resourcing

Technical Recruitment

STS RECRUITMENT

Executive Recruitment Services plc

ElectronicsWEEKLY

HyperACTIVE

www.electronicsweekly.co.uk

Service Link

No other consumer magazine in the country can reach so effectively those readers who are wholly engaged in the television and affiliated electronics industries. They have a need to know of your products and services.

PHONE 020-8652 8339 **FAX 020-8652 3981**

The prepaid rate for semi-display setting is £15.00 per single column centimetre (minimum 4 cm). Classified advertisements £2.00 per word (minimum 20 words), box number £22.00 extra. All prices plus 171/2% VAT. All cheques, postal orders etc., to be made payable to Reed Business Information. Advertisements, together with remittance, should be sent to Television Classified, 12th Floor, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

SERVICES

TIMELAPSE VIDEO SUPPLIES

Video Heads and repair parts for security video recorders

Hitachi VTL 1000 heads only £34.50
Toshiba K V6200 heads only £27.00
Sony 2N4P-SQ heads only £49.00
JVC SRS970 heads only £49.00

Tel: 01642 895488 Fax: 01642 351634

NEED HELP NOW?

Then ring the
★ ELECTRON TECHNICAL HELPLINE ★
Genuine help available to all repairers of
T.V. - V.C.R. - SAT - AUDIO (Inc Valves) - MICROWAVE - MONITOR AND MOST ELECTRONIC EQUIP
Over 30 years experience and vast data base
0906 470 1706
Calls cost 60p per minute

Hours of Business Mon to Fri
9.00 am-12.30 pm : 2.15 pm-5.30 pm
Sat Morn 9 am-12 noon
ELECTRON G.T.
9 CHAPEL ST, DONISTHORPE, SWADLINCOTE. DERBYSHIRE DE12 7PS

SPARES & COMPONENTS

REPLACEMENT VIDEO HEADS
At very low prices
Over 3,000 models covered
FREE Catalogue on request
No VAT
Pay by Cheque or Credit Card
Accounts Welcome
N.A.V. SPARES
237 Thornton Road
Bradford, West Yorks BD1 2JS
Tel: 01274 772249 Fax: 01274 772247
E-mail: sales@navspares.co.uk

WANTED

BEST CASH PRICES PAID FOR VALVES

KT88 PX4 EL34 KT66
Complete collections usually welcome
Ask for our free wanted list
Visitors by appointments please

Sales@bel-tubes.co.uk
Billington Export Ltd
Billingshurst RH14 9EZ
Tel 01403 784961 Fax 01403 783519

REPAIRS

accént

TECHNIC

CAMCORDER REPAIRS

Collection and delivery anywhere in the UK.
All makes, fast service.
Phone free for details.

Fax: 01905 796385
(0800) 281009

PROPERTY

FOR SALE

Brown Goods Repair Business in Cambridgeshire.
Freehold property with 20 years of trading.
Good profit margins.
Approved repair agents for most major manufacturers.
Tel: 01487 842842

FOR SALE

inStore ELECTRICS LIMITED
1043 Leeds Road
BRADFORD BD3 7DB
Tel: 01274 665670/660196
Fax: 01274 665246
E-Mail: tradesales@instoreelec.fsnet.co.uk

MANUFACTURERS NEW GRADED STOCK
MINT IN ORIGINAL PACKING
EVERYTHING FULLY GUARANTEED

COMBI TVCR from	£99
14" PORTABLES SCART	£59
WIDESCREEN TV from	£185
ON DIGITAL WIDESCREEN	£375
SVHS VCR	£195
MICROWAVE OVENS	£34
DVD MULTI REGION	£120

Audio • DVD • CDE • Cameras • Fax • MWO
CREDIT CARDS WELCOME • 48 HR DELIVERY

Second Hand non-working Televisions, VCR's and Spares.
To sell (limited period) only.
Quebec Electronics
20 New Quebec Street, Marble Arch, London W1H 7DE.
Tel & Fax: 020 7723 6499

LINEAGE

PRIVATE RETAILER has excellent part exchange colour televisions and videos to clear. Tel: 01494 814317.

X-TALS 3.57955MHz £3.95; 4.43362MHz £1.00; 8.86724MHz £3.95; 11.2896MHz £3.95; 16.9344MHz £3.50; 22.5792MHz £3.95. IQED, Tel: 020 8391 0545. e-mail: japj69@netscapeonline.co.uk

MICROPROCESSOR/MINO COMPUTER Technical City & Guilds 756 trained, seeks part-time evening work. Please contact 020 8586 0765 (after 6pm).

SERVICE COMPONENTS

OPEN 6 DAYS **FAX BACK SERVICE NOW AVAILABLE**
TEL/FAX A.T.V. on 0114 285 4254

SAT/CTV Circuits	£5.00
VCR Circuits	£7.00
CTV Manuals	£10.50
VCR Manuals	£14.50

(P/P add £2.50 to each order)
419 LANGSETT ROAD, SHEFFIELD S6 2LL

VISA VISA

Fryerns
Service Information **FES** Circuit Diagrams
TV's, VCR's SATELLITE AUDIO & HI-FI
Most Models Covered
Prices are from £4.00 + £2.50 P/P
1 item – total £6.50 inc
2 items – total £10.50 inc
3 items – total £14.50 inc
4 items – total £18.50 inc
Payment by credit card or Postal Order for next day delivery.
Cheques to clear.
Tel/Fax 01206 211570
VISA
2 The Lodge
Easthorpe Green
Marks Tey. Colchester
CO6 1HA

SERVICE MANUALS
Have you ever turned away work for want of a Service Manual?
Have you ever bought a Service Manual and never used it more than once?
Then why not join ...
THE MANUALS LIBRARY
For details and membership application form write, phone or fax:
HARVEY ELECTRONICS
43 Loop Road, Beachley, Chepstow, Mons, NP16 7HE
Tel: 01291 623086 Fax: 01291 628786
Visa/ Access accepted

CLASSIFIED TEL:020 8652 8339

SERVICE DATA

SERVICE MANUALS

Thousands of models available
For most UK European, Far East and USA makes

Service manual prices

B/W TV	– £6	CTV/VCP	– £10
VCR	– £15	Camcord	– POA

Service sheets/circuits also available for some models
+data for satellite, audio and camera

❄ 50+ CTV PSU Circs Compilation (A4) – £10 ❄
❄ 50+ VCR PSU Circs Compilation (A4) – £10 ❄

Payment by Cheque/PO only please
Add £2 P/P etc, to order total. Do not add any VAT.

D-TEC

PO BOX 1171, FERNDOWN, DORSET BH22 9YG
Tel: 01202 870656

MISCELLANEOUS

THE JOULE A400 RADIO DECODING SYSTEM

The highly acclaimed A-400 car radio decoding system has just got even better – and so has the price!

Latest version 9.4 software now covers an even broader range of radios including:- ***Philips, Ford, Grundig, Blaupunkt, Kenwood, Becker, Clarion, Pioneer, Panasonic, J.V.C. Volvo and Hitachi.***

There is also a new *Misc.* section covering a variety of 'odd ball' radios.

The latest addition to our decoding system is the X3000 – a stand alone device for decoding the new Ford Traffic 3000 and 4000 models – even if they are displaying 'Lock 13'

Contact us now for further information and prices on **01325 310278** or visit our web site at www.elecsys.com where you can download a brochure and demo software or purchase a decoding system on-line.

Joule Electronics, Hilton Road, Aycliffe Industrial Park, Newton Aycliffe, Co. Durham DL5 6EN

RECRUITMENT

Brighton Pier require an Arcade Engineer Channel your skills in a new direction!

Offering the chance to work on the latest and most varied arcade equipment. The ideal candidate will be skilled in fault diagnosis and refurbishment skills. Smart appearance, good customer skills and a flexible attitude are essential. Excellent rates of pay.

Please ring 01273 609361 for an application form, or send your CV to Mrs J. Gallagher, Brighton Pier, Madeira Drive, Brighton BN2 1TW.

Are you urgently looking for:

TECHNICIANS
BENCH ENGINEERS
FIELD SERVICE ENGINEERS, etc.

Then why not let Television Magazine help you find the right person that you are looking for.

Call Pat Bunce on
020 8652 8339
020 8652 3981 (Fax)
E-mail PatBunce@rbi.co.uk

RECRUITMENT

TV and Video Sales and Rentals
Specialists in Hi-Fi Repairs
30a Corringham Road, Stanford-le-Hope
Essex SS17 0AH
Tel: 01375 640800

TV-VIDEO BENCH ENGINEER/SUPERVISOR
required by established family business for 20 years

We are looking for an experienced engineer who is prepared to take on responsibility, must have a City and Guilds 224 Electronic and proven track records in this field. Salary etc. negotiable. *Apply in writing to*

CLEARVISION
30a Corringham Road, Essex SS17 0AH
Tel: 01375 640800

Experienced
TV Bench Engineer
required
All leading brands.
Accommodation available.
Hertford Television Service
Tel: 01992 552955
Unit 1b
Foleholes Avenue
Hertford SG13 7JG

SERVICES

SWITCH - IT - ON

TV, Video, DVD
Technical
Sales/Repairs
DVD Upgrades
DVD Multi-region
Players
Trade and Public
Tel: 020 8764 6638
Fax: 020 8764 6166

To Advertise in Television Classified Telephone Pat Bunce on:
020 8652 8339
or Fax on
020 8652 3981

ADVERTISERS' INDEX

CLASSIFIED TEL:020 8652 8339

Special Offer Sale – 20 Remote Controls £20.00 (mixed all well known brands)

FERGUSON ICC 7 HAND SET £3.00

FERGUSON VIDEO

FV90 LV HAND SET £3.00
FV80 LV HAND SET £3.00
FERGUSON
BATTERY CONVERTER TA606 £15.00
24V DC/240V AC £15.00
BENCH POWER SUPPLY VARIABLE
0-30V 3A-TWIN METERS P/P £5.00 ea £50.00
BRIDGE RECTIFIERS 10 FOR £1.00
BURGLAR ALARM KIT full description £7.00
CAMCORDER-UNIVERSAL BATTERY 9.6V
1400MA FOR JVC-PANASONIC-PHILIPS £5.00
CAMCORDER RIPOD SHOULDER POD £3.00
CAPACITORS:-
HN/2KV, 2N2/2KV, 4N7/4KV EACH 15p
5N6/2KV, 6N2/2KV, 9N1/2KV EACH 15p
35V 22UF, 50V-4.7UF, 50V-100UF EACH 25p
AA BATTERIES 1.5 VOLT
STC ALKALINE 10p
DESOLDER PUMP £2.00
DIGITAL CAPACITANCE METER CMC200
200PF 20MF £28.00
FILTERS – 455 & 480 EACH 10p
GAS SOLDER IRON-PORTASOL HOBBY £10.00
INFRA RED DETECTOR
WIDE/SHORT ANGLE WITH RELAY £5.00
INFRA RED RECEIVER-MATSUMI MINIATURE £1.00
MILLI VOLTMETER-ELECTRONIC-LEADER
LMV-181A 40V A/C IN-1MV F/S £5 P&P £5.00
1MV-300V CALIBRATED – COST £225.00 £5 P&P
COLOUR TV BATTERY
CONVERTER IN 24VDC TO 240V OUT £15.00
MODULATOR-TUNABLE SATELLITE-TV £1.00
PANEL-IK2-FM2211 STEREO £5.00
PANEL-CVC80-POWER £8.00
POSITOR 18 2 PIN 20p
POSITOR 2322 662 78012 50p
POWER SUPPLY –
12V DC & 24V DC REGULATED £2.00
POWER SUPPLY-REGULATED 3-12V 500MA £5.00
PSU AC 12V 500MA £1.50
PSU AC 9V 1A £1.50
QUARTZ HALOGEN –
500W 200V FOR OUTDOOR LAMPS £1.00
R.S. SAFE BLOC £5.00
RELAYS-SUB MINIATURE 25p
SATELLITE TUNER UNIT – 2427611
. . . . BASE BAND/VIDEO OUT £3.00
SCART TO 4 PHONO LEADS 1.5M £3.00
SCART TO 6 PHONO LEADS £3.00
SCART TO "D" PLUG £1.00
SCART TO SCART LEADS
ALL PINS CONNECTED – 1.5 METRES £2.00
SOUND 5.5MHZ MPM 1000T £1.00
SOUND 6.0MHZ MPM 1040 £1.00
TRANSFORMER-RS ENCAPSULATED MAINS
0-120V-0-120V PRI 0-9V 0-9V SEC £1.00
TRIPLER KT3/K30 £4.00
TRIPLER UNIVERSAL £5.00

AMSTRAD

HEAD AND DRUM – 6000 £12.00
HEAD AND DRUM – NICAM £12.00
PANEL-CLOCK DISPLAY – 8.900 £5.00
PLASTIC FRONT WITH FLAP – 8.900 £3.00
POWER SUPPLY-VS1000-VS1100 £5.00
POWER SUPPLY, LONG OR SHORT CHASSIS
1991/1992 MODELS £3.00
POWER SUPPLY – SWITCH MODE
– DOUBLE DECKER £5.00
20 OFF MIXED NOKIA ITT
SALORA FINLEX SERVICE MANUAL £10.00
POST 4.00
MAINS ADAPTOR 12V AT 500 M/A
NEGATIVE CENTRE £1.00
NEGATIVE CENTRE £1.00
POSITOR EQV 98009 – SALE PRICE 25p

FERGUSON

ADAPTOR – VFT – TEXT – VA354 £2.00
AC MAINS & BATTERY-VA365 P/P £3.00 ea
CAMCORDER BATTERY, HIGH CAPACITY
9.6V 1800MA-VA310 £3.00
CAMCORDER BATTERY CHARGER
9.6 VOLTS VAZ65 EACH £6.00
CAMCORDER CAR ADAPTOR CHARGER –
AND BATTERY-VA308 £5.00
CAMCORDER LENS 2 OFF –
TELE-CONVERSION LENS x1.4 & x0.7 £1.00

CARDIOID CAMERA MICROPHONE-VA SUPER
218 TELESCOPIC BOOM & STAND £5.00
CHASSIS TX80-NEW-NO TUNER P/P £5.00ea £15.00
CHOKE MAINS INPUT-TX9-TX10 £4.00
CHROME BOARD-ICCS
I/Cs U4647TKF OR HA11498 £6.00
DECK AND CAPSTAN MOTOR:-
FV61LV, FV62LV, FV67LV, FV68LV EACH £30.00
FV70B, FV71LV, FV72LV, FV74LVX EACH £30.00
FV77HV £30.00
FV31R £12.00
HEAD AND DRUM
MODULATOR-SATELLITE-T1040-SRD3/4 £2.00
PANEL-10 MIXED FROM TX9 TO ICC5 £20.00
PANEL DECODER-ICC5 £5.00
PANEL-FRONT-TX100 £4.00
PANEL-IF-TX9, TX10 £4.00
PANEL-REMOTE AND POWER SUPPLY
FV31R DISPLAY P/P £2.00ea £5.00
PANEL-REMOTE-TX9, TX10 EACH £5.00
PANEL-REMOTE-TX10-540/01 £5.00
PANEL-REMOTE-TX10, WITH BATTERY
AND I/Cs 1544-033C £7.00
PANEL-REMOTE TX90 –
139 001 I/Cs M293B1 AND MS1000 £10.00
PANEL-REMOTE TX100
I/C M293B1-SAA5012 £5.00
PANEL REMOTE TX100
WITH STAND-BY BATTERY AND I/Cs £5.00
PANEL-T1228B TEXT
FOR TX89, TX98, TX99, TX100 £6.00
PANEL-TX90 THORN FRONT
– 8 BUTTONS 01M4-515-002 £5.00
PANEL-TUBE BASE-ICC5 £5.00
PANEL-TUBE-BASE-TX89, TX98, TX99 £5.00
PANEL-TUNING 1509G-TX9, TX10 £5.00
POWER SUPPLY 12V-3A
FOR VIDEOSTAR CAMERA PP3 £4.00
PUSH BUTTON UNIT-TX85, TX86 – 8 BUTTONS £5.00
RECEIVER – INFRA-RED ICSL486 TX100 50p
TRANSFORMERS-SWITCH MODE:-
TX85, TX86, TX89 EACH £4.00
TX100 £5.00
473190-00, 40153000 EACH £5.00
ICC5 3112-338 326842 £4.00

HITACHI

DECODER-TELETEXT PC232A5 – ISSUE 4 £15.00
HEAD AND DRUM – 6206 £12.00
MAINS SWITCH WITH STAND-BY £50p
MODULATOR No 5587881 £5.00
OSCILLOSCOPE 20MHZ DOUBLE BEAM –
V212 £188.00
PANEL-TELETEXT GSP – ISSUE 6 £10.00
PANEL-TELETEXT PC315-11 – ISSUE 7 £15.00
PANEL-TEXT-VT753E £20.00
POWER SUPPLY TV SWITCH MODE
STR 4211 ISSUE 10 £8.00
POWER SUPPLY VIDEO SWITCH MODE
VTM312ELM £10.00
THICK FILM-HM9204A £3.50

HOSIDEN

TUBE BASE – MIXED 10 for £1.00
AA Batteries made by STC Group of Companies 10p each

ITT

IF MODULES:
5827-01-51, 5827-03-51 EACH £3.00
5828-04-10, 5829-02-58 EACH £3.00
5929-03-41 EACH £3.00
TELETEXT CONVERSION KIT £3.00
CORE 2.90" ITT TEXT PANEL £3.00

1996/7 MATSUI

VIDEO CHASSIS WITH TUNER-IR £5.00 POST £4.00

MATSUI – ORION

DECKS WITH HEADS
D1096 VXA1100 VP 9401 £16.00
HEAD-VSR 1500 = ORION D2096 £5.00
PANEL-MAIN-VSR 1500 P/P £5.00ea £3.00
POWER SUPPLY-VSR 1500 £5.00
POWER SUPPLY & REG
TYPE STK 5343-VP9501 £8.00
POWER SUPPLY-SWITCH MODE-1500 £3.50

PHILIPS

DECODER-TEXT-K40-KT3 £6.00
IF PANEL FOR CP90-CP110 £5.00

TEXAS

NICAM BOARDS MK II £3.00

SAMSUNG TECU5983 VA24A
VHF-Tuner with Aerial Socket
Fit most new TV's £5

35-VICK DESOLDERING BRAID 1.5 meter
Size AA (2), Size AB (3), Size BB (4) £1

5 VIDEO HEADS FOR £20
Amstrad 6D00, Amstrad 8900. Heads & Drum

FERGUSON NICAM MODULE III
Art No 989 591-E00 £5

L.O.P.T.

36061, 36162, 36362, 36383, 36481
36482, 36761, 36831, 36832
36943, 36962
2432211, 2432351, 2432491, 2432851
2432871, 2432981, 2432984
2433952, 2434141, 2434393
2434451, 2434492
2435016, 2435062
2435064, 2435085, 2435121
2435372, 2435701, 2436773
2436792, 2436795, 2436797, 3216001
2436066, 243063
3220029, 3714016, 47003481
AT2076/78, AT2076/88, AT2078/25
AT2077/81
DST81N243/472593-00
DST85B235/47328700 & /40153200
DST88N234/400086AD, &/47805200L
DST88N234/47320041, &/47317590
DST186N243/473058-00
TFB3035D, TFB3069D, TFB4023AD
TFB4039AD, TFB4066AD

FERGUSON
TX9
TX10
TX85, TX86
TX89, TX98, TX99
Y2607R1
FSTY260482
LOPT RED SPOT
LOPT WHITE SPOT & YELLOW SPOT

PANASONIC
TC2203, TLF1456B
TLF1457B, TLF701/6

TOSHIBA
TFB 3035D, TFB 4023AD, TFB 4032BD
TFB 4038AD, TFB 4110AD
TFB 3089D, TFB 4088AD

ALL LOPTS £5.00

VIDEO DECKS

AIWA 1500
MATSUI VXA 1100
MATSUI 1500
ORION D1094
ORION D1096
ORION D2096 RTC
} £5 POST WITH HEADS EACH £20.00

CAPSTAIN MOTOR FOR ABOVE DECKS £15.00
AND HAND SETS £3.00
4 HEAD DECK FOR 1500 £20.00
20 HIGH VOLTAGE CAPS 1500V – 2000V MIXED £1.00
VIDEO PATTERN GENERATOR MODEL 19555 240V
MAINS SMALL £5.00
PAL TV ADAPTOR – RGB IN UHF OUT £5.00
MOTOR 12V 10p

HANDSETS

AMSTRAD
4600 £3.0
4700 £5.00
6000 £15.00
6800 £4.00
UNIVERSAL £3.00

DECCA
NICAM LCD £4.00

FERGUSON
BSB £1.50
FV41R/3V59
FV41R/FV42 FV51-52 } £10.00
ICC5 £7.00
IK2000, IK7000 EACH £4.00
SRD2, SRD3, SRD4 EACH £1.00
T780 £2.00
TV/SATELLITE WITH FST £3.00

HITACHI
CPT2158 (NO REPLACEMENT) £5.00
VIDEO RM933E VIDEO PLUS £30.00

MATSUI
1500 £5.00
VSR 1500 £4.00
VX3000 £3.00
3000/ORION – TV AND VIDEO £2.00
RC = PACE 900, FERGUSON, SONY, GRUNDIG £5.00

MITSUBISHI
RM35 – VIDEO £5.00

NOKIA
RC202 £4.00
VP9401
D1096
VXA1100
AND VIDEO PLUS

ORION
TV AND VIDEO £2.00
VIDEO WITH LCD 1992/93 MODELS £5.00

PANASONIC
EUR51142 £10.00
TC1632, TC1642, TC2232 EACH £8.00
TX2034, TX2044, TX2200, TX2234 EACH £8.00
TX2244, TX2300, TX2636, TX3300 EACH £8.00
RC201 TV REPLACES TNZ1411/2

PERDIO
PV 1185 £3.00

PHILIPS
NEW TYPE UNIVERSAL £8.00 (3 in 1)
RC4901

SAMSUNG
HANDSETS, TV & VIDEO – 12 TYPES EACH £3.00

SANYO
UNIVERSAL VIDEO £3.00

SIEMENS
TV/VIDEO 1994 MODEL £5.00

THORN
9000, 9600, TX9, TX10, TX1000
TEXT AND NON-TEXT EACH £10.00
CPT1408T, CPT2176, CPT2178 EACH £5.00
CPT2476, CPT2478 EACH £5.00
TEXT, REPLACES PHILIPS
KT3, K30, K4 ETC U/V £8.00
PHILIPS 3 IN 1 HAND SET £8.00
FERGUSON WITH TEXT IK2
CHASSIS P/P £5.00 £10.00
TX86 CHASSIS P/P £4.00 £10.00
ORION AND MATSUI CARRIAGE
1500 TYPE D1096 ETC £6.00
SANYO LOPT P/P £2.00 4 FOR £5.00
240V ADAPTOR 9V AC 1A £1.00

COMPLETE REPAIR KIT, CLUTCH AND
PINCH ROLLER, IDLER D2906 £7.00

TUNERS

IF TERC8-022A TBIZA-002A-ALPS £3.00
SATELLITE SXT2302180968 £3.00
SATELLITE
WITH BASE BAND MIN SXT2302234 £4.00
SMALL UHF/VHF £3.50
VHF/UHF TEK84-112A £4.00
4944
U321, U341, U342, U343
U344, U411, U412, U944 } £2 EACH
U743, 7748
AMSTRAD
UE33-BO1 £3.00
MRF7-7E33
MATSUI ORION VIDEO TUNER IF £5.00
FERGUSON
IF2105-RE £5.00
MTP2011-AP00 £5.00
UHF – ICC5 £5.00
VHF – ICC5 £5.00
TX85, TX86, TX89, TX90 EACH £4.00
TX98, T99, TX100 EACH £4.00
ORION
1500 – UE33 BO9 £4.00
PANASONIC
SMALL UHF/VHF £3.00
FERGUSON
DOUBLE SIDE NICAM £10
ICC5 NICAM SINGLE BOARD ICC5 £10
SHARP
TUNER AND IF 1810587 PA1 UK £3.00
TATUNG
UNIVERSAL 205 OR EQUIVALENT
WITH AERIAL SOCKET £3.00

MOTORS

HITACHI
CAPSTAN 150E £3.00
MATSUI
CAPSTAN I/C NO. M56730 ASP £15.00
2 TYPES 1995 TO 1997 MODELS MATSUI VIDEO
DECKS WITH CAPSTAN MOTOR
AND HEAD P/P £5.00 £20.00
MITSUMI
MOD MRF7-UF32 £5.00
MOD TMUG8-103A £5.00
MITSUBISHI
CAPSTAN-HSE41-I/C M51782ASP £2.00

Treble A Batteries12 for £1

7805	20p	2SD1432	£1.00	BU204	60p	BUT11AF	50p	BYW29/50	15p	HD61404251	50p
7806	20p	2SD1453	£1.00	BU205	75p	BUT12A	20p	BYW95	10p	HD61408U3	£1.00
7809	20p	2SD1576	£1.00	BU206	£1.00	BUT13	£1.00	BYW95C	10p	HE4528BP	15p
7812	20p	2SD1577	£2.00	BU207	£1.00	BUT18AF	£1.00	BYW562A 100V	8p	HEF4029UP	20p
7812F	20p	2SD180T03	15p	BU208	80p	BUT71/800	15p	BYX10	10p	HEF4093	20p
2SC940	£1.00	2SD1878	£1.00	BU208A	£1.50	BUW13	40p	BYX38/300	25p	HGA1124A	50p
2SC1573	£1.00	2SK1460	£1.00	BU208D	90p	BUW84	60p	BYX55/350	10p	HM6264	
2SC1973B	£1.00	2SK1464	£1.00	BU222	£1.00	BUX39	£1.00	BYX55/600	10p	ALP 15	£3.50
2SC4313	£5.00	2SC4891		BU326	£1.00	BUX84	50p	BYX71/60	20p	IK7ST 6931 B1	£3.00
2SC4589		1500V/15A	£2.00	BU407	40p	BUX84AF	50p	BYZ106	10p	IN5401	3p
10A/1500V	£2.00	AN5521	£1.00	BU508A	90p	BUY49	20p	BZW-C110	5p	IR106A	10p
2SC7359	15p	AN5551	£1.00	BU508AF	£1.00	BY187	5p	BZW83-C20	3p	L298N	£4.00
2SD200	£1.00	AN5831	£2.00	BU508D	80p	BY206-800	8p	CA3123Q	50p	LA7830	£1.00
2SD401	40p	BC550C	20p	BU508DF	£1.00	BY228	15p	CD4555BE	20p	LA7831	£1.00
2SD716	£1.00	BDV64B	50p	BU705	£1.00	BY229	6p	CLE871A	£5.00	M768 ABI	£1.50
2SD787	30p	BDV65B	50p	BU801	50p	BY255	5p	HE3B	4p	M768 LBI	£1.50
2SD7869	30p	BF869S	20p	BU806A	£1.00	BY299-200	15p	HA1140	£1.00	M37204ECSP	£1.00
2SD820	£1.00	BF870	20p	BU807	50p	BY299-800	30p	HA1185	£1.00	M38658P	£1.00
2SD868	75p	BPW41	15p	BU808DFI	£1.00	BYT71-800	15p	HA1196	50p	MN650	£1.00
2SD880	30p	BT Phone Batterys	£1	BU824	50p	BY V19-30	15p	HA1140SANT	£1.50	S13522V	£1.00
2SD1264	50p	BU105/04	80p	BU826	£1.00	BYV28-200	15p	HA11804NT	£1.50	SAA1061	£3.00
2SD1266	£1.00	BU108	£1.00	BUK444/800	£2.00	BYV95B	10p	HA51338SP1	£2.00	SAA3018	£1.00
2SD1398	£1.00	BU124	50p	BUK445/600	£2.00	BYV95C	12p	HA51338SP3	£2.00	SAA5010	£2.00
2SD1415	£1.00	BU126	80p	BUK454/800	£1.00	BYV96D	10p	HCF4520	50p	SAA5231	
2SD1427	£1.00	BU180A	65p	BUT11	50p	BYW20-08-9	£1.00	HCF4520BE	50p	(TEXT)	£2.00

No accounts — No Credit Cards

SENDZ COMPONENTS

63 BISHOPSTEIGNTON, SHOEBURYNESS,
ESSEX SS3 8AF.

Tel: 01702 338894 Fax: 01702 338805

Specific P/P charges are PER ITEM • For UK addresses add P/P to order then 17.5% VAT to total. This applies to EC unless VAT No. is given • Exports – P/P at cost • Postal Order/Cheque with order. Unless otherwise specified add £1.70 P/P to SMALL ORDERS + Additional P/P for HEAVIER GOODS. Technical Information by telephone only • Government/School Orders on official headings. Callers to shop – 212 London Road, Southend-on-Sea. Open Saturday Only 10-12noon – 2-5pm.

PLEASE ADD 17.5% VAT TO BOTH THE GOODS TOTAL AND P/P CHARGE

RICHARD

New to the Market !

Compatible BSkyB® Digital Remote

featuring Universal TV and VCR functions.

Ready to operate ALL Sky® Digibox® functions

Vast up-to-date Library for virtually all Brands

Pre-programmed for Universal TV Operation

Ergonomic User-Friendly Design & Layout

Pre-programmed for Universal VCR Operation

Supplied in Superb Brand-Free Retail Blister Packaging

Simple set-up by Device Code or Library Search

CE Approved

Only £8.75
Order Code: 324-00001

UK Delivery - All orders over £25.00 FREE
Pay by Mastercard, Visa, Switch and BAC's

Price subject to V.A.T.
(Offer ends 1st June 2001)

A.R.D. ELECTRONICS
'Our aim is your next order'

A.R.D. Electronics Plc, Shorten Brook Way,
Altham Business Park, Altham, Accrington, Lancashire. BB5 5YL.

Telephone: 01282 683000 Fax: 01282 683010

E.mail: sales@ardelectronics.com Trade Website: www.ardelectronics.com