THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

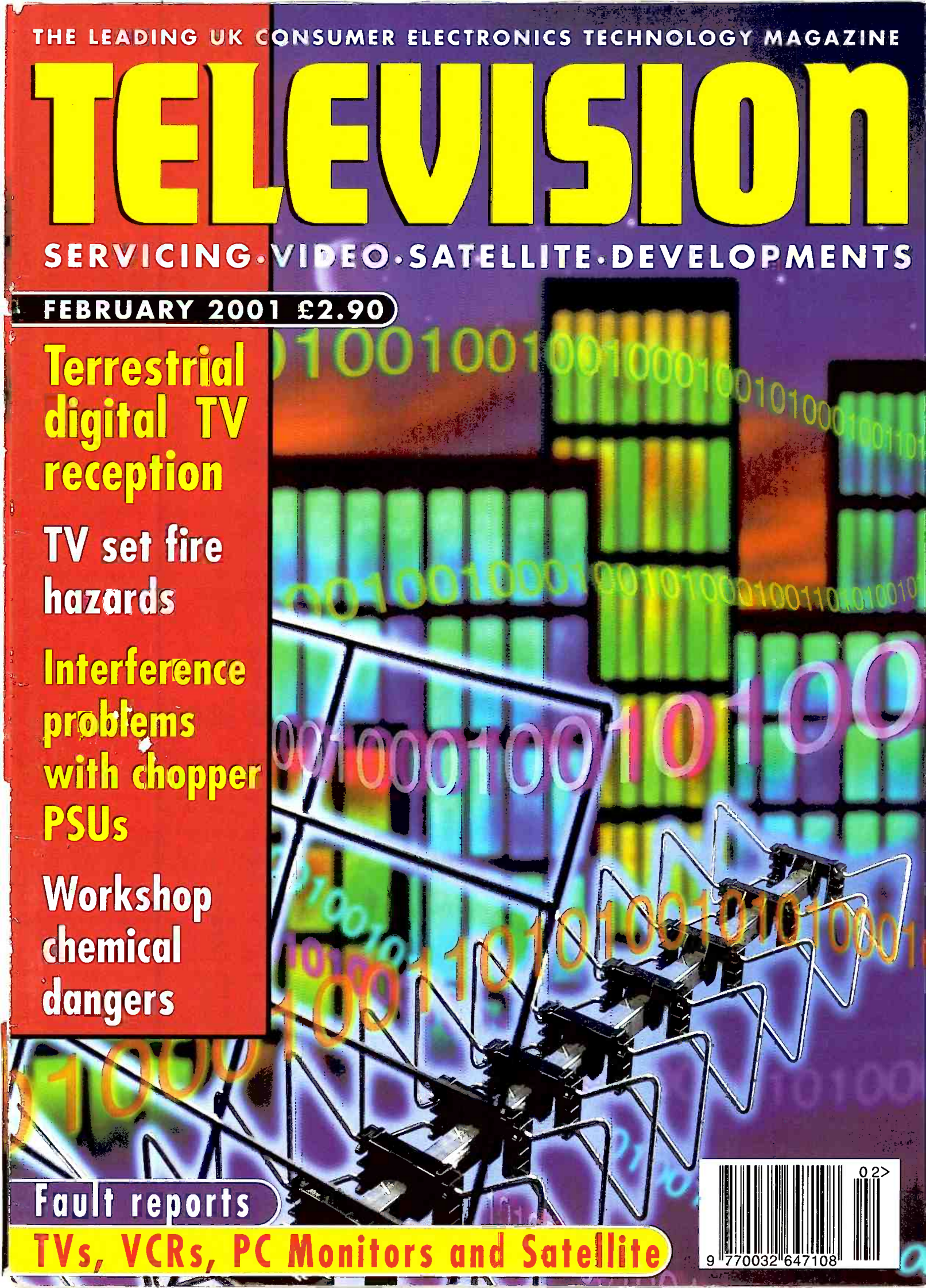
FEBRUARY 2001 £2.90

Terrestrial digital TV reception

TV set fire hazards

Interference problems with chopper PSUs

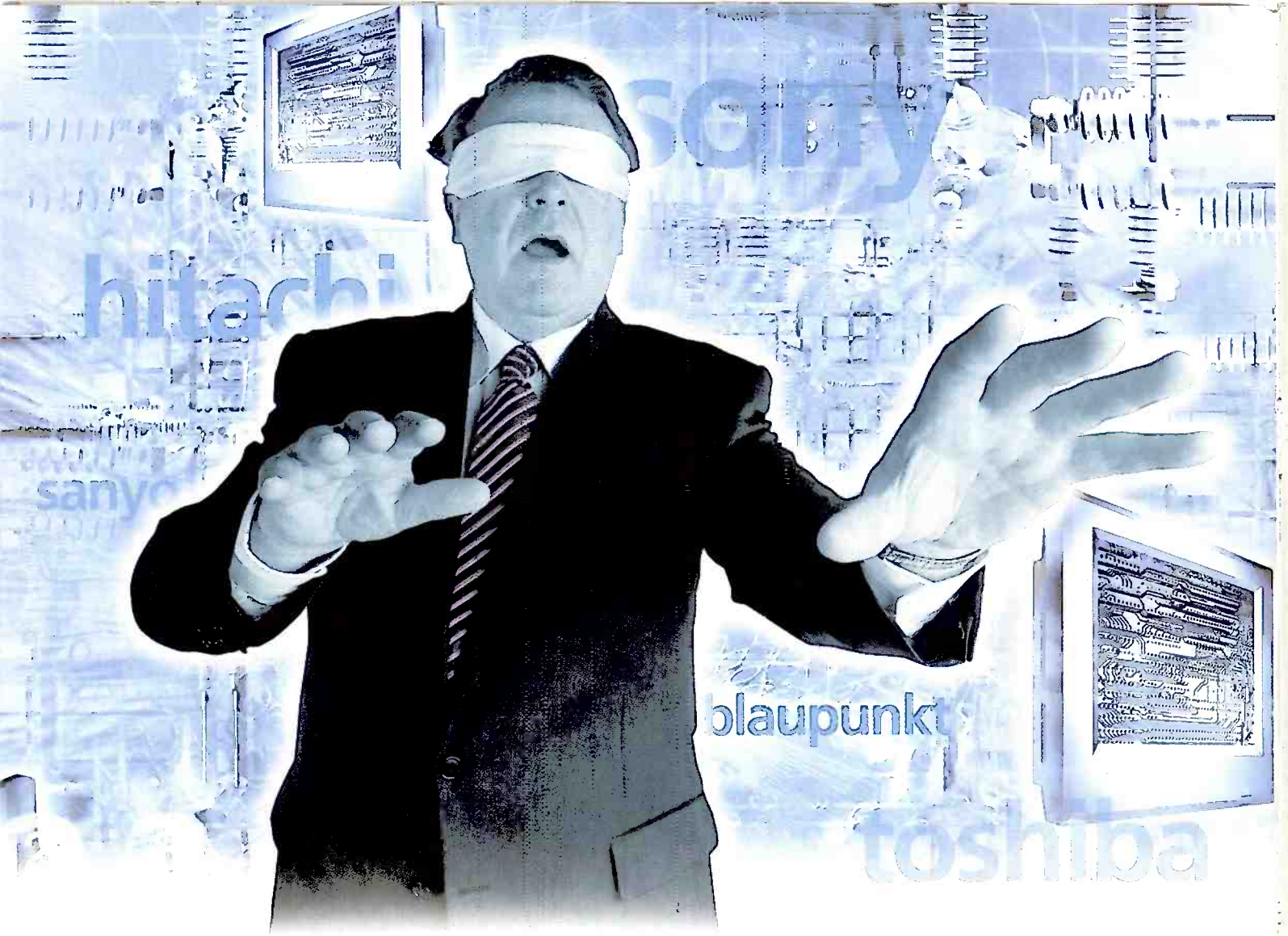
Workshop chemical dangers



Fault reports

TVs, VCRs, PC Monitors and Satellite

02>
9 770032 647108



Is this how you feel when you're looking for a replacement remote control?

Trying to source replacement remote controls can be like running around blindfolded. To help solve this age old problem, we've produced the definitive guide to König replacement remote controls. Over 11,000 in fact, covering UK TV, video and satellite receivers. All the latest models back through to the late eighties are listed, even LCD's!

It's pocket size, user friendly with alphabetical listings and, best of all, totally free! No catches, no tricks, we just thought it might come in handy.

For your free copy, visit our web site, www.konig.co.uk, call us direct on 01635 278678 or contact any of the König Club Founder members or approved stockists for your free copy.

CHS

EMC

Seme

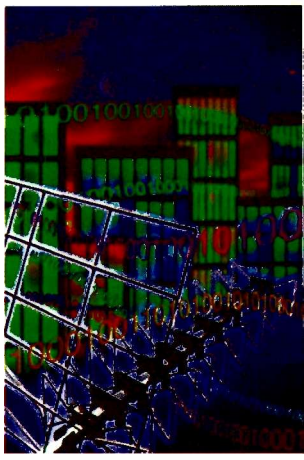
WILLOW VALE
ELECTRONICS LIMITED

A Ruwido Product

CONTENTS

February 2001 Vol. 51, No. 4

Next issue, dated March, on sale February 14th.



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.

THE WALLIS
REMOTALOG 2001

Wallis is pleased to announce the launch of their new "***Remotalog***".

The Remotalog, which has been prepared, solely as a result of demand by dealers, is the First of it's kind. *The Ultimate Remote Control Guide for* TV's, VCR's, Combi's, Satellites, STB's, Camcorders, DVD's and Hi-Fi.

- 30,000 Equipment references
- 6,000+ New models
- User-friendly layout
- Sourcing and Product information
- Dedicated Remotes
- Price reductions on virtually all models
- Universal Remotes
- "Point & Go" Compatibility information

Don't Delay – Register your interest today by contacting

WALLIS UNIVERSAL LTD

A109 RIVERSIDE BUSINESS CENTRE, LONDON, SW18 4UQ

TEL: 020 8870 3388 • FAX: 020 8870 9988

EMAIL: sales@wallis-universal.co.uk

Wallis Universal
REPLACEMENT REMOTE CONTROLS

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 @ 47P 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

GENUINE PHOENIX USE ONLY REPAIR AND REFURB ELECTRONIC KITS

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, IC's, 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 Communications White Paper

The government, noting the changes and developments that are occurring in the communications industry, seems to have considered it an appropriate time to be seen to be taking an interest and exercising some degree of overall control. Hence the recently published White Paper.

As far as regulation is concerned, things had got into a bit of a mess, with various bodies having been added over the years for various purposes (there are at present nine regulators of one sort or another, including the Broadcasting Standards Commission, the Independent Television Commission, the Radio Authority and Oftel). But the system has worked reasonably well. Is it desirable to make substantial changes at this time? To do so could hardly be regarded as a matter of vital national interest. The muted reception given to the White Paper seems to back this view. It would, perhaps, be better to let matters ride for a while, to see how things like entertainment via the internet develop. It is early days yet, and far from clear exactly how communications will evolve in the immediate future. Relatively small changes to the technology and the industry's economics could have unforeseen consequences.

The government's stated aim is to provide a "modern and intelligent" framework for regulating the communications industry. There is to be a three-tier structure, headed by a super-regulator called Ofcom, to ensure a "level playing field" for all broadcasters. It would subject all broadcasters, including the BBC, to a minimum content standards code, rules on advertising and sponsorship, and requirements for news coverage. Ofcom would provide a general focal point for all complaints. A second tier would oversee responsibilities for public-service broadcasting, including regional and independent production. It would involve the BBC, ITV and Channels 4 and 5. Channel 4 would retain its present status and not be privatised. Channel 5's remit would be reviewed. The third tier would provide broadcasters with a "more transparent, self-regulatory remit", with Ofcom acting as a "backstop". Although the BBC would form part of the new three-tier structure, there would be no changes to the BBC governors' power over editorial independence and impartiality.

Hardly exiting stuff. In fact it all sounds much like what we have at present with the addition of Ofcom. There is a certain vagueness about all this, as though it was concocted to give the impression of government action when little is actually intended.

Significant changes are proposed for ITV however. The 15 per cent limit on the total TV audience controlled by one company is to be abolished. In view of ITV company mergers it had become obsolete anyway, but this doesn't mean that some limit might not be desirable. The rule that prevents one company from holding the two ITV licences in the London area is also to be scrapped. Together, these changes could pave the way for the creation of a single ITV company.

That would be the end of any vestige of ITV as it was originally conceived. The arguments in favour of this are that there is nowadays adequate competition from cable and satellite broadcasters, and that anything less than an ITV monopoly would be a small operation by international standards and not able to compete as a world-status broadcaster. There is something specious about this view. Media moguls seem too anxious to want to run ITV as a single entity. The present virtual duopoly surely consists of companies that are well able to stand up for themselves and operate successfully. There does not seem to be any very good reason to hand ITV to a single operator as a monopoly, and end competition for audiences within the ITV field. Does anyone really feel that this is an appropriate way for ITV to end up? The suggestion that Ofcom could exercise effective control over such a monopoly is not very convincing.

An even more significant factor is the question of media cross-ownership – to what extent newspaper owners for example might be permitted to own radio and TV networks. The government has clearly decided to put this question to one side for the present. It is to "invite comments". It could have shown a bit more gumption about such an important issue, though it's admittedly difficult to get a purchase on the whole slippery issue of who owns what and what control over ownership should be exercised. In purely TV terms, what does stand out here is the continued need for a public-service broadcaster of the stature of the BBC.

The abolition of restrictions in the radio broadcasting sector is also to be "considered" but seems likely to be on the cards. There would have to be some restrictions however, for technical reasons.

The White Paper is hardly an inspiring document. It is tempting to write it off as a bit of an irrelevancy. But important issues are at stake, and should be given the most careful consideration. It's just that this does not seem to be quite the right time to do so. It would be better to leave things for a while and see how, in say two-three years, the technology is progressing and shaping the prospects for the future of broadcasting.

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 249.
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 DTT phase-in

The Digital Terrestrial Group reports that phase two of the introduction of terrestrial digital TV broadcasting in the UK has now started. During phase one 81 DTT transmitters were to be brought into operation: only one, the Channel Islands, remains to be deployed.

The second phase will involve transmitter upgrades, with equalisation of the six digital multiplexes as far as possible to improve reception, particularly of the ONdigital channels. During this second phase, coverage of the UK population should increase from 75 to 88 per cent – still short of the 99·4 per cent achieved by analogue TV. The DTG says that as a result of the upgrades many households will be able to receive DTT via their existing aerials without the need to install a wideband aerial instead.

The third phase will involve the analogue signal switch off. The government would like this to begin around 2006-2010, but some observers consider this to be an optimistic target.

ONdigital has become the first broadcaster to join the Internet Content Rating Association (ICRA), which labels and filters internet content. ONdigital launched its ONnet service last autumn, giving viewers access to the internet via their TV sets.

With the prospect of a stock market flotation later this year, the quality and number of ONdigital subscribers has been under scrutiny. ONdigital has been offering greatly reduced subscription renewals to minimise the churn rate, while figures released by BARB (the Broadcasters' Audience Rating Board) are some forty per cent less than those claimed by ONdigital. There has always of course been argument about the number of subscriptions being processed etc. Since ONdigital is unlikely to be profitable by the time of the flotation, valuation will be based on an assessment of revenue projections and subscriber levels.

A new ONdigital set-top box has been launched by Pace. The receiver is faster in operation and provides improved reception in marginal areas. Pace says the new receiver gives faster access to on-screen menus and programming. This enables users to change channels and access ONdigital's e-mail service (ONmail) virtually seamlessly.

Philips Semiconductors has launched the TDA10045 DTT receiver chip which provides 2K and 8K OFDM demodulation plus forward error correction. There is also a version, type TDA10021, that provides from 4- to 256-QAM demodulation plus FEC for cable digital STBs.

Back injury

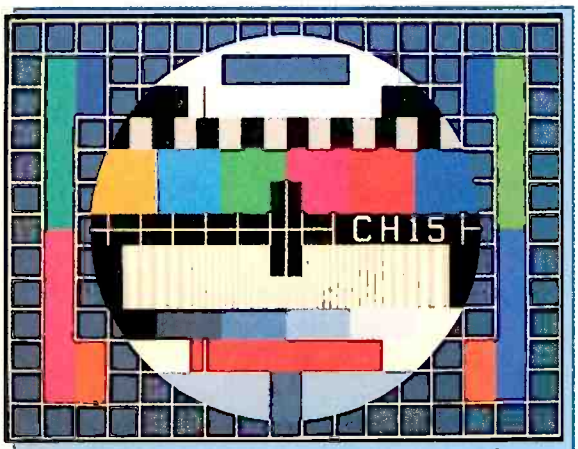
Back injury caused by carrying TV sets has been a problem for many years – there has been detailed medical investigation into the problem, which has become worse with the introduction of heavy large-screen models. Earlier last year RETRA asked setmakers what research was being carried out to minimise the health and safety risks associated with such products. It has now sent a list of proposals on product and packaging design to the brown-goods trade association BREMA. The proposals are as follows:

(1) There should be two hand-grips at each side of a carton. They should allow the fingers to pass right inside and have plastic reinforcement at the edges.

(2) Two hand-grips should be moulded into each side of a TV cabinet, so that more than one person can lift it at each end. These grips could be indented beneath the cabinet so as not to detract from the appearance of the set or reduce its appeal to prospective customers.

(3) TV cabinets should be designed so that there is room for fingers to be released when a set is placed on a stand or other support.

(4) There should be no sharp edges that might cut into fingers.



An exhibition of paintings by artist David McKeran is being held at the Radlett Centre, 1 Aldenham Avenue, Radlett, Hertfordshire from January 30th to February 24th. Nine paintings of TV test patterns, carried out between 1992 and the present day, are featured. Each of the paintings represents a conciliation between the original electronically-generated test pattern image and the paint medium used by the artist. Admission to the exhibition is free.

Satellite news

Eutelsat is to place an urgent order for the first satellite to be optimised for IP (Internet Protocol) access with satellite return link capabilities. The new satellite, to be called e-Bird, will be positioned at 25·5°E and have a total of 20 transponders, 16 with 36MHz bandwidth for the forward link and four with 108MHz bandwidth for the return link. Coverage of the European region will be provided by multiple spot beams that will be accessible using small transmit terminals.

There are also to be two more Hot Birds, 8 and 9, at 13°E, completing the replacement of existing Hot Bird capacity. With these two satellites, Eutelsat will have a combined capacity of close to a hundred transponders operating in both the Ku and Ka bands. Additional features will include multiple service areas and on-board processing.

Eutelsat is to be converted from an association that involves 48 states and national telecommunications companies into a private company, based in Paris, with stock market quotes. The time scale is some two and a half years. This will make it easier to raise money for further expansion. In the meantime Eutelsat has received permission from the European Commission to adopt a corporate structure. This will take place during the summer.

Astra 2D was successfully launched on December 19th. Once co-located with 2A and 2B at 28·2°E, Astra 1D will be redeployed. 2D has 16 transponders, each with a 26MHz bandwidth, operating in the frequency range 10·7-10·95GHz.

Thomson-Microsoft TVs

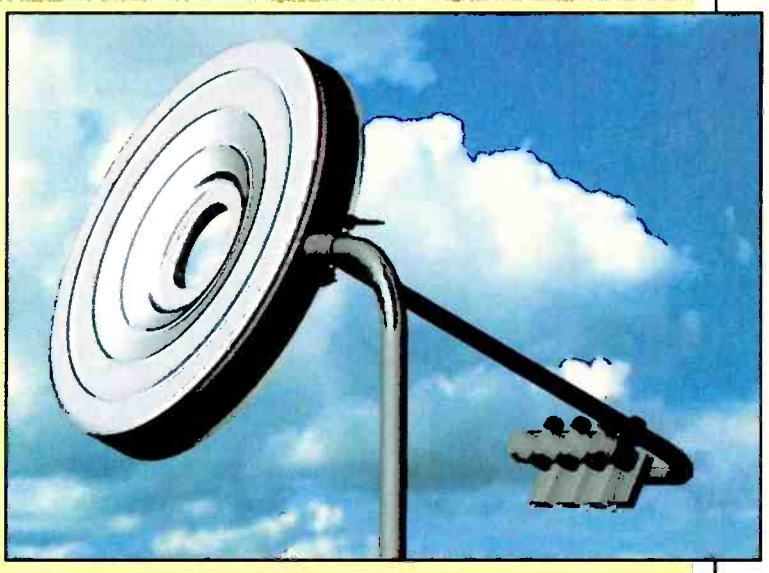
TAK, a joint venture between Thomson Multimedia and Microsoft, has launched a new range of TV sets in France. They have built-in e-mail, internet and interactive TV features as standard. The sets have an integrated 56k modem, 32Mbytes of RAM and Microsoft TV Advanced software. The first model, a 32in. set, will sell for the equivalent of about £550: Thomson says that TAK-enabled sets will cost about £100 more than an equivalent non-TAK set and adds that all its TV sets will, in time, include TAK technology as standard. TAK is working with local content providers to supply free interactive TV services such as information, advertisements and educational material. Viewers will have full internet access. All services will be free, and viewers will not have to subscribed to any provider.

The launch features twelve models, including 28 and 32in. widescreen sets and 28 and 32in. 16:9 super flat-screen sets. Some include 100Hz scanning and/or Virtual Dolby surround sound. There are also 4:3 models, some with Virtual Dolby surround sound. Thomson plans to launch TAK models in Germany this autumn but has, so far, no plans to market such sets in the UK.

Sharp's LCD TVs

Sharp is to launch LCD TV sets that will be up to 40 per cent cheaper than current models. The company had previously announced plans to stop producing conventional sets in 2005. Its range of LCD sets, initially to be sold in Japan, will have 13, 15 and 20in. screen sizes. Worldwide sales are expected to start in May.

The 13in. model is intended for sale at about Y88,000 ($785). This brings the price significantly below the Y10,000 per inch threshold, which market observers see as the crucial point for a surge in sales.



Here's something totally new in satellite receiving aerial design. The Cybertenna has been developed by Telewide AB for reception from several satellites which can be spaced over quite a wide arc. It's based on the lens rather than the reflector principle, with a diameter of 80cm and a concave front surface that tapers to a 20cm hole to reduce wind resistance. The LNBs (up to eight) are mounted behind the lens, which is coated with a specially-developed material.

The design is said to reduce substantially the signal loss that occurs when a traditional dish is used with with side reflection, and virtually eliminates interference. It has a single cross-polar lobe, which further reduces noise. Weight is 8kg (without LNBs).

The aerial is expected to be available throughout Europe by the middle of the year. For further details apply to Anette Petersson, Telewide AB, SE-931 04 Skellefteå, Sweden. Phone +46 910 173 40, fax +46 910 393 79 or e-mail anette@telewide.se
The internet address is www.cybertenna.com

STB technology

Samsung and OCTAL of Portugal have signed an agreement on the development and manufacture of advanced digital set-top boxes – OCTAL brings to the venture technology based on Microsoft TV middleware. The two companies will co-develop the hardware and software required, and jointly market products to satellite, terrestrial and cable TV companies around the world.

The first product, to be launched in March, will be the STB5005C digital cable STB. It will be capable of receiving and recording interactive digital video broadcasts and be able to provide broadband internet access, audio/video-on-demand, e-mail, networked games, home shopping and other digital media services. A DVD/CD player will be incorporated. The initial order is from TV Cabo, Portugal's leading cable TV operator.

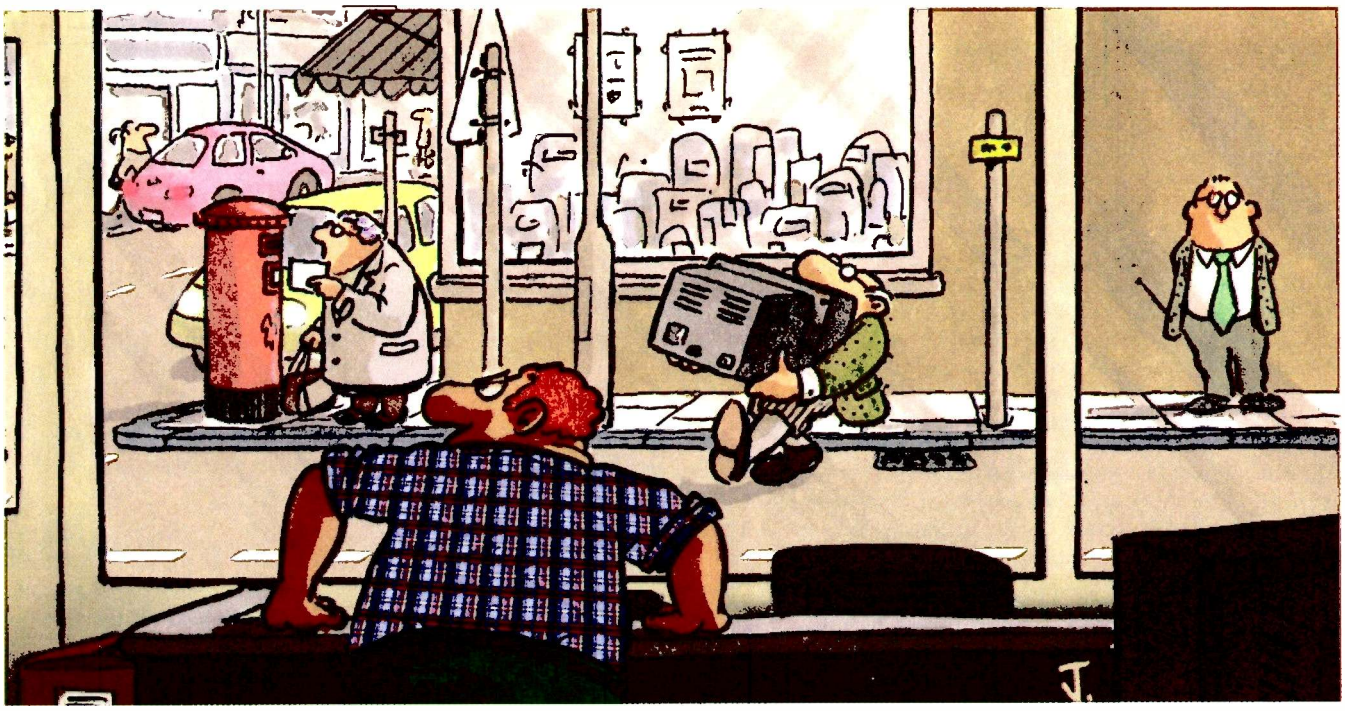
Convergence Integrated Media plc, the leading developer of Linux and open-source software for digital TV, and galaxis Technology plc, a market leader in digital STB technology for cable and satellite receivers, have formed an alliance to develop STBs that use the Linux operating system and work with the new MHP (Multimedia Home Platform) standard. The STBs will use the Texas Instruments TI72XX multiprocessor (with ARM-9 cores) and will provide digital TV reception, Java-based interactive multimedia services and internet access. Lübeck-based galaxis supplies digital STBs to pay-TV and cable network providers throughout the world.

Dolby news

An increasing number of digital set-top boxes sold in Europe have Dolby Digital decoders with a Dolby Digital bitstream output socket. Premiere World, the German digital satellite TV broadcaster owned by Kirch and BSkyB, has since last summer downloaded Dolby Digital bistream output software to set-top boxes supplied by Nokia, Philips and Sagem. The Dolby Digital bitstream licence is free to hardware manufacturers and allows them to include the logo on their products. In the UK, Systemax Europe has become the first European manufacturer to include an audio subsystem approved by Dolby – there's a Dolby logo on the CPU box.

Dolby Laboratories has released in the UK, at £1,450, the DM100 hand-held bitstream analyser, which is designed to monitor Dolby Digital, Dolby E and PCM bitstreams. It enables system integrators and service engineers to test the integrity and composition of such bitstreams in production facilities, broadcast facilities and home-cinema systems. In addition to decoding, it can provide test streams in these formats.

The DM100 identifies the input bitstream format and decodes it. Users can monitor individual channel pairs or a two-channel downmix of any multi-channel programme through headphones, while the sum of the two channels can be monitored via a small built-in loudspeaker. Test bitstreams are stored in non-volatile RAM, and can be changed in the field by using a software update. The pass-through mode enables the input signal's AES channel-status bits to be modified before being passed to the output connectors. A two-line by 16-character LCD shows Dolby Digital and Dolby E metadata information.



Anniversary problems. A Matsui that kept blowing up and some other TV faults. The importance of logical fault-finding. Donald Bullock's servicing commentary

WHAT A LIFE

"Do you think you can look after everything today?" asked Stephen. "Paul and I want to go out and do a bit of shopping. It's Mum's birthday, as you know."

"Oh Lord!" I blurted out as I heard the reminder. Then, as he spun round, I waved at the air with both hands. "Damned wasp or something" I said.

"What, in January?" he queried.

"Global warming", I explained.

So there I was, tied up in the shop, while Greeneyes was eyeing the calendar, watching the clock and brewing up a bit of trouble. She hasn't forgiven me for the fact that I forgot our hundredth wedding anniversary last June or July, or whenever it was.

A Matsui 21V1T

On top of all this I had a Matsui TV set, Model 21V1T, that kept blowing up. It's fitted with the Grundig CUC7303 chassis – how the trade has changed! – and had been brought in because there was brushing at the left-hand side of the screen. This had told me that there was a pulsing EHT discharge which coincided with the start of the efficiency-diode controlled part of the line scan. An easy one. The set's EHT lead is detachable and is held in the LOPT socket by a plastic grip nut. It was loose, and tightening was all that was required. I then put the set on soak test.

An hour later it blew up. I couldn't detect any short-circuits, so I resoldered a few joints here and there, checked the mains filter capacitor and the plug wiring, then put it back on soak test.

Now what about Greeneyes' birthday? I lifted the phone and rang Benitos, the new and highly-acclaimed Italian restaurant.

"Do you have a table for two tonight?" I asked.

"Yes sir. The price would be seventy pounds each."

I gasped and put the phone down. Then I rang the Restaurant Elite. It sounded a bit noisy. "What's the price of your menu?" I asked.

"Five pounds a head" I was told.

"Can you do a table for two tonight?" I asked.

A burst of hysterical laughter came from the phone. "Tonight? You must be joking. With Ireland playing a local team? The place is packed."

Electrical matters

Then, as the Matsui blew up again, I spied Mrs Edham bounding towards the shop with her enormous daughter in tow.

"Hello Mr Brewer" she shrilled as she came through the door. "You seem to be very highly thought of around here. I wish my Hazel could find a chap like you." Hazel grinned sheepishly. "Yes, you've been recommended by that tall, thin chap at Snoddies" she continued. She stretched herself as high as she could and grinned.

"Mr Bullock knows all about electric irons" he told me, "he's the chap to fit the spares I'm selling you."

She pulled a pink Happy Melody Economy iron from her bag and set it down on the counter, along with a length of thin mains lead, a set of papery washers and a strange thermostat.

"I've got the fitting destructions" she gushed as she handed me a bit of rice paper covered with squiggles.

I turned it over and found some English words. "Can this machine suffers will undo for shocking death with incompetent electric worker" they read, "only stop his water steams when they do not be on and squirt out. Made in China."

I looked up at Mrs Edham in time to see her pulling a jumble of wires and a thousand bits of toy railway track from her bag.

"The Snoddies man said you're good at mending these too" she smiled. "How proud you must feel, being so highly recommended. And by a competitor too."

Hazel smiled at me with a mouthful of brown and leaning tombstones. It took me ten minutes to get them and their rubbish out of the door.

Back to the Matsui

I returned to the Matsui set. This time I

saw that one tag of the mains switch was blackened. I'd found the cause of the trouble at last! I cleaned and resoldered the switch, boxed the set up again then put it back on test.

I looked about. Things seemed to be quiet, so I took the phone off the hook and popped across the road for a big box of Black Magic chocolates for Greeneyes.

"None left, Don" I was told, "had a run on 'em over Christmas. All we've got left is this little box of candied peel. Bit shop-soiled I'm afraid."

A Ferguson T14R

I ran back to the shop. As I put the phone back on the hook the Matsui failed again. Then Mr Sturton strode in with a 14in. Ferguson set. He banged it on the counter and turned to me.

"One more chance. That's all I'm giving this set. I'll get it mended this one time. If it fails again, out it goes. In the nearest skip."

"Er, right" I said. "What's up – er, what's the matter with it?"

"The matter with it?! Why, it doesn't go of course. D'you think I'd bring it here if it did?"

"Er, right" I said

Before settling down to it I had another look at the Matsui set and saw a neat dry-joint on the main smoothing block. Why hadn't I noticed it before? I resoldered it, boxed the set up and put it on soak test again.

Then I took a look at Sturton's set, which is fitted with the TX805 chassis. It was stuck in standby. Some checks in the power supply section showed that instead of 15V there was 0V across CP20. The associated 0·68Ω surge-limiter resistor RP68 was open-circuit. I checked for a short but couldn't detect one, so I fitted a new resistor and tried again. The resistor blew. Further checks showed that the 12V regulator transistor TP14 (BC337), which is fed from the 15V supply, was leaky collector-to-emitter. A replacement restored normal operation, with a good picture.

Well, perhaps things will now go all right I thought. There came a bang. The Matsui set had blown again. That did it. I flared up like a savage and paced the floor.

"Someone's got it in for me" I told the walls. "That's what it is. A fault has been put in that set, or it's being blown up by remote control, or something . . ." I went to the window and scanned the street for some furtive fellow with a mysterious box connected to an aerial.

A podgy chap in tweeds

I couldn't see anyone except a podgy chap in tweeds and plus fours. He was trudging a 25in. Mitsubishi set towards the shop. A minute later he struggled in and placed it on the counter.

"Hello Mr Bullock" he sang, "I'm John Rowland."

I glowered at him. "What do you want?" I said.

"Only this set repaired" he replied, "there's a picture all right, but it's got bowed sides and too much width."

"Rather like you" I muttered.

The man stopped. "Pardon, Mr Bullock?" he blinked.

"Oh, er – they sometimes do, er, ha ha" I replied.

The Matsui sussed out at last

Once he'd departed I scowled at the lifeless Matsui set. Was I being set up? Where had it come from? Who was the customer? I looked at the job card, where it said 'name'. S. Miles. Ah! I knew it! S. Miles, Smiles, the laugh on me of course. Some rotter had bugged the set, put a joke name on it and brought it in to get me going. He knew I'd be on my own here. They're probably filming me from one of those big Candid Camera vans with the hole in the side. I scanned the street outside for big vans with holes in the side, but didn't see any.

I'd seen sets sabotaged before. I remember Walter, an engineer at Hoggetts. He'd spent days tracing the cause of an intermittent fault on a set, only to have his reasonable quote turned down by the customer. "I'll take it to Crubbs" he had said.

That made Walter very angry. So he carefully peeled back the coverings of the mains transformer and choke and painted the windings with battery acid. But things then went wrong. The customer changed his mind and accepted Walter's quote. Although Walter tried to undo his sabotage, the set blew up and bounced back on him time and time again . . .

But hang on, I thought. I'm a rational chap. A logical thinker. A TV engineer, no less. Of course the Matsui hadn't been sabotaged. It had a perfectly normal fault. All intermittent faults turn out to be simple once they've been rumbled. A bugged set? Never!

I opened up the Matsui once again. Now, which circuits give the most trouble in TV sets? Those subject to the highest voltages and current flows of course. Particularly where high frequencies are involved. That means the chopper and line output stages. Let's start again – logically. At the chopper circuit.

One minute later I found that C669 had no solder at one end. When I pulled the lead out I saw a tiny burn mark. I cleaned it off and resoldered it. Then I switched the set on and checked the HT voltage. All was well. I boxed the set up and put it back on soak test. It didn't fail again.

The Mitsubishi CT25B3STX

Now for the 25in. Mitsubishi set, which was fitted with the Euro 12 chassis. I plugged it in and switched it on. Sure enough there was EW bowing and excessive width. EW correction is handled by a TEA2031A chip, IC551, in this chassis. I fitted a replacement and tried again. A perfectly-proportioned picture appeared – for two minutes, then it went.

What hadn't I done? I had failed to check the HT voltage. I did so and found that it was normal. Time for a bit of cunning. I switched the set off, with the meter still connected, then switched it on again. The HT voltage rose to an excessive value, then settled down to the correct level.

I checked the chopper circuit and saw that C906 (47µF, 50V) and C909 (2·2µF, 50V) were both leaking. The former couples the drive to the chopper transistor, while the latter is a smoothing capacitor for feedback to the TEA2261 slave regulator chip. Replacements cured the HT aberration and, when I'd fitted another TEA2013A chip, there was a perfect picture.

Birthday saved

But it was Greeneyes' birthday! I rang the Post Office. Perhaps it could supply a big box of chocolates, any make.

"Sorry, we've had a run on them."

The day was wearing on and I wasn't doing very well. I decided to phone my friend Fred and ask him to get me a box of chocolates.

"No can do, Don. I'm stuck here with the kids while the Missus is out shopping."

Well, I mused, I must get something settled. I'll have to grin and pay up at Benitos. So I phoned back.

"I'd like a table for two tonight, please."

"Sorry sir, we're now fully booked."

I slumped in the chair. What a terrible day! I reckoned that after phoning Mr Rowland about his Mitsubishi set I'd have to slip off to face Greeneyes for messing up yet another anniversary. I phoned the number Mr Rowland had given me.

"Rowland Court Hotel and Restaurant, John Rowland speaking" a voice said, against a background of melodious music. I told him his set was ready.

"Wonderful" he said, "and more than I'd hoped for. I could see that you were on your own and under pressure when I called."

"I still am" I said, "after forgetting our wedding anniversary I've now forgotten my wife's birthday chocolates and I've yet to book a table for two for this evening. You don't happen to have one?"

"I have just what you want, sir, a delightful one in the bay but not too close to our four-piece orchestra, and I can arrange for candle lighting if that would suit."

"It would" I said, "I'll book it."

"And by the way we have a chocolate stall here. Only the best makes, but only large boxes I'm afraid."

"Mr Rowland, you've saved my life" I replied. ■

Grandata Ltd

distributor of electronic components

Television Repair / Modification Kits

MODEL	KIT TYPE	ORDER CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
GOODMANS		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

MODEL	KIT TYPE	ORDER CODE
HINARI		
HIT14RC	PSU	ONWAKIT
JVC		
AV29SX1EK	FIELD O/P KIT	JVCKIT1
AV29SX1EN	FIELD O/P KIT	JVCKIT1
AV29SX1EN1	FIELD O/P KIT	JVCKIT1
AV29SX1PF	FIELD O/P KIT	JVCKIT1
AV29TSIE1	FIELD O/P KIT	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N		GRUNDIGKIT1
21V1T		GRUNDIGKIT1
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3

MODEL	KIT TYPE	ORDER CODE
MITSUBISHI continued		
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
NEI/NIKKAI		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERTICAL O/P IC	PANKIT2
TC28XD60	VERTICAL O/P IC	PANKIT2
TX28XD70	VERTICAL O/P IC	PANKIT2
TX29XD70	VERTICAL O/P IC	PANKIT2
TX-W26D3	VERTICAL O/P IC	PANKIT2
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1

MODEL	KIT TYPE	ORDER CODE
PHILIPS continued		
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME OUTPUT	SAMKIT2
CI6844	FRAME OUTPUT	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	POWER / LINE	SHARPKIT1
51CS05H	POWER / LINE	SHARPKIT1
59CS03H	POWER / LINE	SHARPKIT2
59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME KIT	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME KIT	THOMKIT3
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2

ORDER CODE	PRICE
GRUNDIGKIT1	£ 10.50
GOODKIT1	£ 11.00
JVCKIT1	£ 11.00
MITSKIT1	£ 3.00
MITSKIT2	£ 15.00
MITSKIT3	£ 6.00
NIKKAIKIT1	£ 12.00

ORDER CODE	PRICE
ONWAKIT	£ 12.00
PANKIT1	£ 7.00
PANKIT2	£ 9.00
PHILKIT1	£ 7.60
PHILKIT10	£ 8.50
PHILKIT2	£ 2.50
PHILKIT3	£ 4.00

ORDER CODE	PRICE
PHILKIT4	£ 4.25
PHILKIT5	£ 5.75
PHILKIT6	£ 5.50
PHILKIT7	£ 7.60
PHILKIT8	£ 4.25
PHILKIT9	£ 7.50
SAMKIT2	£ 8.00

ORDER CODE	PRICE
SAMSUNGKIT	£ 16.00
SHARPKIT1	£ 11.00
SHARPKIT2	£ 11.00
THOMKIT1	£ 7.00
THOMKIT2	£ 12.00
THOMKIT3	£ 9.00
THORNKIT1	£ 12.75

GENUINE PHOENIX KITS SUPPLIED

USE ONLY GENUINE PHOENIX REPAIR AND RETURN ELECTRONIC KITS

GENUINE PHOENIX KITS SUPPLIED

WE STOCK A FULL RANGE ON TELEVISION SPARES INCLUDING LINE OUTPUT TRANSFORMERS , ON / OFF SWITCHES .....etc

CD Pick Ups

Part No	Price
KSS 152 A	£13.00
KSS 210 A	£12.00
KSS 210 B	£15.00
KSS 240 A	£24.00

Part No	Price
KSS 213 B	£11.50
KSS 213 C	£11.50
OPTIMA 6 S	£11.50
OPTIMA 5	£11.50

Part No	Price
RCTRTH8151	£20.00
RCTRTH8112	£15.00
CDM12.1	£15.00
CDM12.1 MECH.	£20.00

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

Remote Controls

Universal Preprogrammed Remote Control

Preprogrammed to cover all major Brands of TV , Video , Satellites and CD Players .

Replaces upto 8 different remote controls

With teletext & fastext functions

Order Code : RC9
Price : £10 + vat

Bulk Prices

5 pieces £45 + vat
12 pieces £96 + vat
24 pieces £168 + vat

Magician Sky Digital Remote Control

Operates all SKY digital TV box functions
Operates combinations of TV , VCR & Cable/Satellite systems
Covers 1000's of brands
Teletext and fastext functions
Backlit device indicator keys
Order Code : MAGICIAN4
Price : £10 + vat

We also stock replacement remote controls for 5,000 different models at very competetive prices, contact us for all our remote control requirements . Many of our remote control prices have been reduced.....Please call us for our latest prices

Universal Brand Replacement Remote Controls

Brand for Brand Replacement
Codeless set-up
Teletext and Fastext
Pre-Programmed for the latest models
Replaces broken and lost remotes

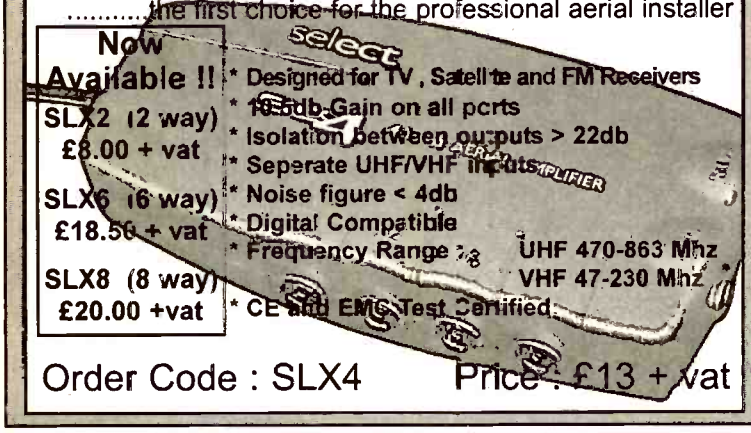
Brand	Order Code
Panasonic TV	RCUNI01M
Sony TV	RCUNI02M
Philips TV	RCUNI03M
Hitachi TV	RCUNI04
Mitsubishi TV	RCUNI05
Nokia TV	RCUNI06
Samsung TV	RCUNI07
Toshiba TV	RCUNI08
Ferguson TV	RCUNI09
Grundig TV	RCUNI10
Goodmans/Alba/Bush TV	RCUNI13M
Matsui/Hinaril/Orion TV	RCUNI14M
Satellite	RCUNI17

Price : £7.50 + vat

Accessories / Tools

SLx4.....4 Way Aerial Amplifier

.....the first choice for the professional aerial installer



Now Available !!

SLX2 (2 way) £8.00 + vat
SLX6 (6 way) £18.50 + vat
SLX8 (8 way) £20.00 +vat

* Designed for TV , Satellite and FM Receivers
* 10.5db Gain on all ports
* Isolation between outputs > 22db
* Seperate UHF/VHF inputs
* Noise figure < 4db
* Digital Compatible
* Frequency Range : UHF 470-863 Mhz, VHF 47-230 Mhz
* CE and EMC Test Certified

Order Code : SLX4 Price : £13 + vat

SOLDER SEAL KIT

DON'T CRIMP IT....SOLDER IT !!!

FOR QUICK AND SAFE CABLE CONNECTION SOLDERING , GLUE-ING AND SHRINKING WITH A HOT AIR GUN ALL IN ONE ACTION

HOT AIR GUN WITH PIEZO ELECTRONIC INGNITION

USES LIGHTER GAS

BLOWS HOT AIR UPTO 650C

ORDER CODE: TOOL53
PRICE : £13.00 + VAT

HOT AIR GUN

FLAMELESS...ONLY HOT AIR

IDEAL FOR THE FOLLOWING :

SHRINKING TUBES

SOLDER SEALS

HEATING AND DRYING

HOBBY & MODELLING

BENDING PLASTICS

SMD SOLDERING

BLOWS HOT AIR UPTO 650C

ORDER CODE : TOOL54
PRICE : £7.50 + VAT

We stock over 650 different video heads covering over 2500 different models for the following makes :

AIWA, AKAI, ALBA, AMSTRAD, BAIRD BLAUPUNKT, DAEWOO, DECCA, FERGUSON, FISHER, FUNAI, GEC, GOLDSTAR, GRANADA, GRUNDIG, HINAR , HITACHI , JVC , LUXOR , MATSUI ,MITSUBISHI , ORION PANASONIC , PHILIPS , SAISHO , SAMSUNG , SANYO , SHARP , SONY , TOSHIBA...AND MANY MANY MORE

This advert is just a smaall selection of our stock.

We also stock the following :

Full Range of Video Spares	Full Range of Satellite Spares	Multimeters
Full Range of TV Spares	Scart and Phono cables	Service Aids
Transistors	Linear IC's	Computer IC's

Japanese Transistors..2SA,2SB...etc & much much more !!!!!

All at very competitive prices !!

Please contact us if you cannot find the part you are looking for.

* 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

Chemical hazards

Pete Roberts explains the health hazards and regulations associated with chemicals commonly found in the TV repair workshop.

Warning
In compiling this work, Pete has carried out extensive research, in addition to sharing his own experience. However, this article should be treated as a guide only. If you are using any chemical regularly, or in large quantities, find out from the supplier exactly what the regulations relating to it are, and whether it poses a safety risk.

Many familiar materials are potentially harmful, and their use in the workshop is subject to COSHH – the Control of Substances Harmful to Health. They include domestic products carrying a CHIP (chemical information and packaging regulations) label, the familiar panel with pictograms and one or more 'risk-' and 'safety phrases'.

Materials like washing-up liquid that do not carry a CHIP panel do not come under the requirements of COSHH. But toilet bleach for example does.

Other candidates are cleaning solvents, paints and varnishes, adhesives and sealants, together with what is arguably the most significant hazard in the electronics industry: rosin (colophony) flux fumes. Materials like solder that contain lead come under separate regulations.

Does COSHH apply to you? Yes, if you employ others, or if members of the public – including your family – have access to your premises.

As far as the self-employed engineer is concerned I can't see the regulations applying, as no other person is exposed to involuntary risk. European human rights legislation would probably overrule any regulation intended to 'protect' one from the consequences of one's own activities.

However, it doesn't pay to play Russian roulette with your health, particularly as the harm inflicted by some materials may not show up for several decades.

The Montreal Protocol

The Montreal Protocol outlawed the manufacture of chlorofluorocarbons as well as other organochlorine compounds known to cause stratospheric ozone depletion. This has resulted in several well-known cleaning agents becoming discontinued.

As quantities of CFC solvents remain stockpiled and can still be legally sold off and used, I'll start by describing their properties, hazards and uses.

Chlorofluorocarbons – and their temporary replacements, hydrochlorofluorocarbons – are clear, volatile, highly mobile liquids that in normal use may be regarded as completely non-toxic. However, the toxicity profile by inhalation is unusual to say the least.

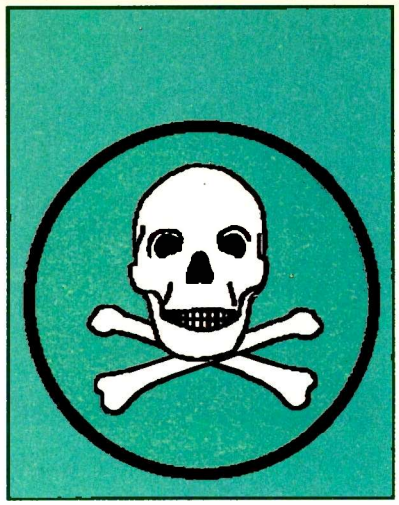
The vapour has no known harmful effect up to levels considerably higher than 1000ppm (parts per million). Very high concentrations can kill by excluding oxygen – in other words by simple asphyxiation. Above a certain threshold though, chlorofluorocarbons can also cause heart or respiratory failure.

It is difficult to estimate concentration as all CFCs possess a characteristic but very faint smell, but in a normally ventilated workshop taking into account the amounts of the material likely to be present, it is unlikely that a dangerous concentration could be reached.

There is no known hazard via skin absorption, but these chemicals are powerful degreasants. They will strip the protective layer of fatty acid from the skin's surface.

Exposure to the low molecular weight, low boiling point materials can result in frostbite due to the rapid cooling on evaporation: this is how freezer sprays work. Instantaneous temperatures as low as –50°C can be reached.

No single compound or mixture of the CFC or HCFC families is known to be carcinogenic, i.e. capable of causing



cancer. CFCs do not attack most plastics or finishes, but they may cause silicone rubber to soften and swell, although this will revert back to normal on evaporation of the solvent. They evaporate to leave no residue, although chilling can cause some condensation of moisture.

CFCs – and their HCFC replacements – are exceptionally safe when used on delicate items like video heads or CD pick-up lenses. While themselves non-flammable, should chlorofluorocarbons (and HCFCs) be exposed to extreme heat, they will break down to form extremely dangerous products including phosgene, hydrogen chloride and hydrogen fluoride gases.

Trichlor...

The sale of previously popular chlorinated solvents, including 1,1,1,trichloroethane, trichloroethylene and carbon tetrachloride for general purpose cleaning and degreasing is now forbidden under EU law. However there will no doubt be significant quantities in circulation so again a description of their properties is in order.

All chlorinated solvents are hazardous. They have pronounced narcotic and anaesthetic properties. One member of the family – chloroform – is well known for its use as an anaesthetic.

Acute exposure to high levels of chlorinated solvents, or long-term exposure at low levels, is known to result in kidney and liver damage. With the exception of 1,1,1,trichlorethane, they are also suspected carcinogens.

While non-flammable in their own right, chlorinated solvents will break down if exposed to fire, producing phosgene and hydrogen chloride. All chlorinated solvents can enter the body by skin absorption, leading to similar risks as exposure by inhalation. Again, they will also strip the protective fatty layer from your skin.

Replacement cleaning agents now fall into two main classes: aqueous (water based) typified by Electrolube's Safewash 2000, and non-aqueous, which tend to be alcohol based.

Alcohol isn't just the stuff you pour down your neck after a day's delightful intercourse with pleasant, generous, understanding customers. Ethyl alcohol (ethanol) is just one of a large group of what you could describe as 'organic bases'. They are easily recognised by the '-ol' suffix at the end of their name.

No one in their right mind would try cleaning tape heads with vodka or whisky, but ethyl alcohol can be used in the workshop in another familiar guise: good old meths. The Government makes a lot of money from duty levied on what is officially described as 'potable alcohol'. To avoid duties, ethyl alcohol sold for other purposes is rendered undrinkable by adding about ten percent methanol, hence the title methylated spirits.

Meths sold via retail outlets is dyed blue, but industrial methylated spirit sold in bulk – known as IMS – is usually clear. Methanol is highly toxic, and if drunk in any quantity causes blindness and eventual death through liver damage; it's metabolised in the body to eventually produce formaldehyde in the liver – the stuff used to pickle specimens in biology laboratories. Enough said!

Meths is an excellent general purpose cleaner, relatively cheap and readily available from any pharmacy. It's harmless to plastics, including polystyrene, natural and synthetic rubbers. Its main drawback is that it can contain significant amounts of water. This may cause problems in some applications and slows down evaporation.

When working in the trade years ago, meths and a cotton bud was standard kit for cleaning tape heads and pinch rollers. In the days of wooden cabinets, French polish could be retouched with a varnish made from

Material	Carcinogen	Harmful via skin absorption	Harmful via respiratory system	Flammability	Other hazard
Benzene	Yes, very	Yes	Yes	Very high	Irritant
Petrol	Yes	Yes	Yes	Very high	May cause dermatitis
Meths	No	Slightly	Slightly	High	May cause dermatitis
I.P.A	No	Slightly	Slightly	High	May cause dermatitis
1.1.1 trichloroethane	No	No	Yes	None, but phosgene may be formed if heated to decomposition temp.	Fumes cause narcosis, liver and kidney damage.
Chlorofluoro-carbons	No	No	No (in normal concentrations)	None, but hydrofluoric acid fumes formed if heated to decomposition temp.	Strips skin fat, leading to dermatitis risk
Carbon tetrachloride	Possibly	Yes	Yes	None, but phosgene may be formed if heated to decomposition temp.	Inhalation leads to narcosis, kidney and liver damage. Causes dermatitis.
Perchloroethylene (Perk, dry-cleaning fluid)	Not thought to be	Yes	Yes	Same risks as with 1.1.1.trichloroethane	Fumes strongly narcotic
Xylene, Toluene	Not thought to be	Yes	Yes	High	Fumes narcotic.
White spirit	Not thought to be	No	Yes	High	Fumes narcotic

Proprietary materials usually comprise mixtures of solvents. Refer to the maker's COSHH literature for information. Remember to treat ALL chemicals with respect.
All information in this article is based on my own experience in laboratory work as well as data researched via the Internet.

shellac dissolved in meths, then stained the appropriate colour.

Unfortunately, meths isn't very good at removing flux from PCBs. Despite the stern warnings on the CHIP label, meths is a relatively safe material to handle. While the ethanol content is harmless, methanol is harmful by skin absorption and inhalation of the vapour. However the amount you'll be exposed to by casual contact is unlikely to cause you harm, otherwise it wouldn't be sold for domestic use.

In the distant days of my childhood, I was the proud owner of a Mamod steam engine that ran on meths. I always reeked of meths, but it doesn't seem to have done me any mischief. Just don't ever drink the stuff – whatever the temptation – or wash your hands in it. The main hazard associated with meths is its extreme flammability.

Isopropyl alcohol

Becoming very popular for general cleaning is isopropyl alcohol (IPA), also known as iso-propanol or propan-2-ol.

Like many higher molecular weight alcohols, propyl alcohol exhibits the property of isomerism, meaning that it can exist in two or more distinct molecular forms. These forms are known as isomers, having differing properties despite having the same chemical formula.

Propyl alcohol has two isomers: 'normal' or n-propanol, and iso-propanol. N-propanol is classified as toxic, but the iso- form is relatively benign.

Although the CHIP panel advises against skin contact, isopropyl alcohol is a major constituent of liniments, and in fact is known in the States as 'rubbing alcohol'. However, like other solvents it does defat the skin.

IPA vapour is not particularly toxic by inhalation; its strong cat-pee odour would become intolerable long before dangerous concentrations could be reached. However, like it's cousin ethyl alcohol, IPA is very, very flammable.

As an all round service aid, IPA is almost as good as the CFC cleaners it is intended to replace. It's harmless to most plastics and finishes, it's safe on rubber belts and friction surfaces, and it's very good at removing flux residues from PC boards.

Some solvents, while not generally found in the workshop in their own right, are found in products like switch cleaners, paints and varnishes. These include xylene, toluene, turpentine and white spirits. Xylene and toluene are aromatic chemicals, meaning they include a benzene ring in their structure. These chemicals are not carcinogenic, but they are harmful in other ways.

Inhaling their fumes can lead to a state of euphoria, hence the abuse of materials incorporating these chemicals – glue sniffing. Continued exposure causes central nervous system depression, leading to respiratory failure and death. Chronic exposure can lead to liver damage.

Skin contact will result in defatting, and xylene and toluene are both harmful through skin absorption. Paint thinners are often based on xylene and toluene with perhaps one or two other ingredients. Turpentine, like rosin, is derived from pines, while white spirit is a petroleum derivative. These chemicals are relatively benign, but can cause dermatitis through continued skin contact. All are highly flammable.

Petrol

Before leaving the subject of solvents, *never* use petrol for any cleaning work whatsoever. It is very aggressive towards most thermoplastics, paints and finishes.

Petrol vapour forms an explosive mixture with air, turning the workshop into a potential bomb. Petrol contains many poisons, including significant quantities of benzene, arguably the most dangerous human carcinogen known. Cancers caused by exposure to benzene may take 20 or thirty years to develop.

It is a matter for concern how such a mixture of carcinogens and poisons that would be regarded as extremely dangerous in an industrial environment, is made available to the public with little more than a warning about its flammability.

Solder hazards

As I mentioned earlier, the major health hazard facing electronics engineers is posed by rosin, or colophony, flux fumes.

Rosin is a natural product derived from pine trees, but it does have irritant properties. It's extensively used on the bows of stringed instruments.

When used as a flux, rosin forms fumes that are a known cause of industrial asthma. I suffer from asthma myself and I still don't know to today whether my electronics activities since my teens are responsible.

From experience, it is difficult to make a good joint with so-called 'low-fume' solders – even using a temperature-controlled iron. It's also been found that the 'low-fume' fluxes can pose even more of a health risk than conventional rosin types.

COSHH now requires employers to take steps to minimise exposure to solder fumes. We can't avoid soldering, so the best way of dealing with the problem is to remove the fumes before they reach your lungs. Unfortunately, solder fumes become attracted to the face by convection currents caused by the air next to your skin becoming heated then rising.

By far the most effective means of reducing exposure is by extracting the fumes at source. Extractor kits comprising a tube mounted above the iron tip are available, the tube being connected by flexible hose to an extractor system exhausting to the outside.

Next best is the miniature version of a cooker hood that sits on the bench behind your job. These use a fan to draw the fumes through a charcoal filter before returning cleaned air. Their effectiveness depends on the filter, which slowly loses efficiency and needs periodical replacement.

Lead is not covered by the COSHH regulations; it comes under a separate set of its own. As far as electronic service is concerned, lead represents a low hazard. As lead is not absorbed via the skin, rubber gloves aren't needed when handling solder. Lead fumes are a different matter and are a recognised danger as lead can enter the body via the respiratory tract.

Again, fume extraction at source is the best way to deal with this hazard. Where high exposure to lead fumes is unavoidable, as in lead smelting, employers must provide regular medical examinations for employees. However, under normal conditions soldering does not constitute such a high risk.

Lead is a cumulative poison as it's not normally excreted and builds up in body tissue. Lead, cadmium and other toxic heavy metals have to be removed from the body using chemicals known as chelating agents.

Don't smoke!

While it's obvious that you must not smoke when handling flammable solvents or aerosols, smoking while using non-flammable materials also poses risks.

When heated above their decomposition temperatures, CFCs and chlorinated solvents break down to form amongst other things hydrogen chloride, hydrogen fluoride and phosgene. The first two are acid gases that

intensely irritate, and can destroy lung tissue.

Phosgene is highly poisonous and has been used as a chemical weapon. It causes pulmonary oedema; the lungs fill with fluid and the victim eventually dies literally by drowning. Drawing CFC or chlorinated solvent vapour through a lighted cigarette or pipe will produce these dangerous breakdown products. Likewise, if these materials are involved in a fire, evacuate staff immediately. Always let the fire brigade know what chemicals are on the premises.

Detailed first aid procedures are given on a product's safety data sheet, but basic first aid advice is common to all workshop chemicals. Excessive vapour inhalation can lead to drowsiness, mood changes and similar signs of intoxication. If these symptoms become apparent in a colleague he or she must be immediately removed to fresh air and medical help sought.

It is best to ensure that the workshop is adequately ventilated at all times. Skin splashes should be washed off with soap and water, preferably using superfatted toilet soap. Dearer soaps contain cold cream or skin oils. These repair the skin's protective layer of fatty acid, repeated loss of which can lead to dermatitis. For those of you with sensitive or damaged skin, a suitable barrier cream is strongly recommended.

Accident procedures

All chemical splashes to the eyes must be treated as *serious* accidents. The affected eye must be immediately irrigated with clean, cold tap water for at least fifteen minutes. The patient should then be taken to the nearest A&E department, even if no further symptoms are apparent.

To avoid inadvertently swallowing anything harmful, always wash your hands before eating. This is good practice anyway after handling certain customers' equipment! Never use cleaning agents on live equipment, and after cleaning a printed circuit board, allow it to dry thoroughly before applying power.

Under the COSHH regulations, a responsible person must be nominated to ensure that all materials are stored and used safely. This person should also be familiar with basic chemical first aid procedures.

All safety information furnished by suppliers should be retained, filed and made available to anyone who may need it. All flammable chemicals should be stored in a locker located in a cool, dry place well away from any sources of ignition, oxidising agents or direct sunlight.

You also need permission from the fire brigade to store most flammable materials in anything other than small quantities. Also, bear in mind that aerosols dispensing otherwise harmless materials may use flammable propellants. Don't store cleaning rags soaked with turps, lubricating oil or similar flammable liquids of low volatility. They may spontaneously combust. ■

More information

This short article no more than scratches the surface of a subject that occupies entire libraries. There's plenty of practical advice on product manufacturers' websites, as well as straight from the horse's mouth: the Health and Safety Executive, home page http://www.open.gov.uk/hse/hsehome.htm.

A lot of useful information is available from the US counterpart of our HSE, the Occupational Safety and Health Administration at http://www.osha.gov. Data sheets covering all Electrolube's products are downloadable from http://www.electrolube.com. Most documents are in PDF format and you'll need the free Adobe Acrobat Reader to view them. This is included on the RS CD-ROM catalogue; otherwise it's available from Adobe as a free download: http://www.adobe.com

In this second article, written to aid those of you wanting to expand your business into CCTV installation and repair, Joe Cieszynski looks at the importance of camera format and resolution.

Repair and install CCTV

In the CCTV world, a camera's format is expressed as the size of CCD image chip that the camera incorporates. Dimensions for each of the chips found in CCTV cameras are given in **Fig 1**.

Cameras with $^1/_3$in format are popular because they are less expensive than their larger counterparts yet they offer a high degree of performance.

The next size up is the $^1/_2$in format. This format is widely used, but more often on larger installations. In such cases, the modest extra cost of each camera is less significant, and is more than offset by the overall improvement in system performance.

Other camera formats are $^2/_3$in and 1in. cameras with $^2/_3$in chips are available for a price, but 1in format CCD cameras are simply too costly. However, cameras with 1in tubes were common in the past, so you might come across them while working on existing installations.

Adjusting for different light levels

Where auto iris, or AI, lenses are needed, the installer must decide which type of lens is best, then make sure that the camera can accommodate it.

There are two types of auto iris lens. Earlier AI lenses employed 'video drive'. Here a video signal is fed from the camera to the lens assembly.

A processing circuit in the lens assembly uses the brightness information in the video signal to ascertain the average incoming light level. A DC control voltage derived from this information operates a small motor.

The disadvantages of this arrangement are the large physical size of the lens assembly, and the relatively high current consumption of the iris motor. The principle is illustrated in **Fig. 2**.

The second, and more common AI lens type is referred to as direct drive. Here the processing and iris control circuits are located within the camera. A DC control voltage to operate the iris is made available at a socket on the side of the camera. Direct-drive lenses are far more popular with installers not only because of their smaller size, but also because the lens is far less expensive than a comparable video-drive arrangement.

During the past ten years the use of motorised iris lenses has reduced in the wake of galvanometric-driven lenses. These lens types offer the advantages of even smaller size and lower current consumption.

The aperture in a direct-drive type lens requires two galvanometer coils;

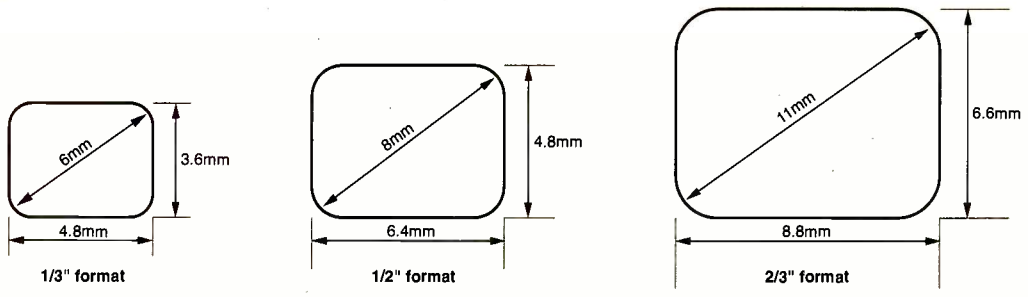


Fig. 1. When describing a CCTV, it is common to refer to it using the dimensions of its CCD's image area.

a drive coil and a damping coil. Because the system is in effect a servo control, the damping coil is necessary to prevent the iris from hunting.

Figure 3 shows the basic arrangement. The DC connection between the camera and the lens assembly is normally via a four-pin connector.

When selecting a camera/AI lens combination, it is important to ensure that the camera has an iris control output, and that the output is appropriate for the type of lens. Some cameras offer both video and DC drive outputs. In this case, make sure that the selector switch is set correctly.

Also, if the camera has its own electronic iris, make sure that this is switched off when an AI lens is fitted. If it isn't, the two iris controls will forever fight each other and hunting may occur – particularly when the light level suddenly alters.

An electronic iris is normally used with a fixed-iris lens. Here, the electronic-iris circuit controls the incoming light level by adjusting the exposure time of the CCD imager, like the shutter speed in a camcorder.

A standard plug connector – known as the P plug because it was developed by Panasonic – has been developed for connecting the camera and lens iris. Unfortunately there are many examples of equipment where this standard is not adhered to.

In practice you will come across a range of connection methods. The important thing is to check the wiring configurations rather than making assumptions. Also check that the lead coming from the lens is long enough to reach the socket on the camera. I was recently caught out by this and found myself having to re-wire the lens with a longer lead. This is not easy in a busy work environment.

The pin-out for the P connector is shown in **Fig. 4**, along with typical configurations for video and DC drive lenses.

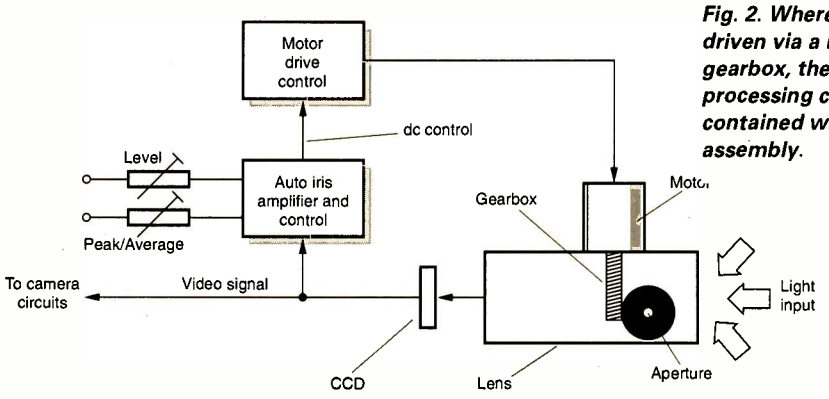


Fig. 2. Where the iris is driven via a DC motor and gearbox, the signal-processing circuits are contained within the lens assembly.

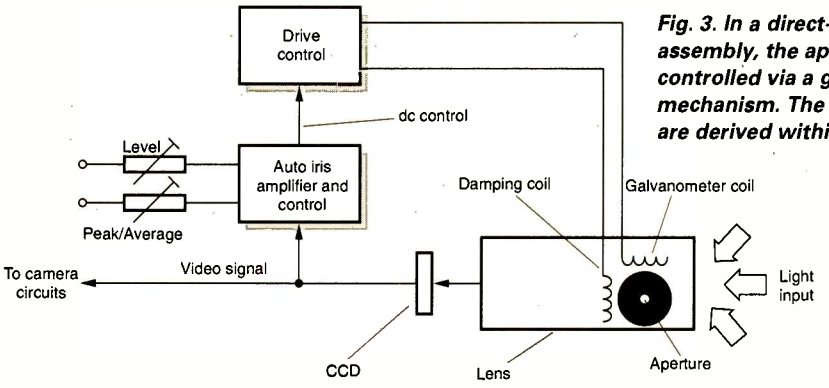


Fig. 3. In a direct-drive lens assembly, the aperture is controlled via a galvanometric mechanism. The DC drive voltages are derived within the camera.

Image quality issues

On TV crime-fighting programmes, you often see highly blurred images from CCTV footage that are not unlike the images produced by pre-war experimental TV transmissions. "Can you identify this person?" ask the police. Such images do nothing to promote the effectiveness of a modern CCTV system.

There's a number of possible reasons why images obtained from some CCTV systems are poor. Perhaps the area that the camera was required to cover was too great. Even with computer enhancement, there is a high degree of guesswork involved in identifying faces that only occupy a tiny proportion of the screen. You simply cannot reliably recreate small facial details that never existed on the original recorded image.

Another possibility could be that the system is a few years old. During the past five years camera performance has moved on in leaps and bounds. However, a customer that has spent a considerable sum of money on a system just a few years ago will be reluctant to throw most of his hardware away to improve performance.

Finally, it may just be that the system was never installed, or perhaps maintained, correctly.

Standards for CCTV performance

The police and other interested parties are well aware of these problems. For some years the Police Scientific Development Branch (PSDB) have been looking at ways of defining and measuring CCTV system performance. What they have come up with is quite interesting.

Anyone wanting to move into the serious end of CCTV installation should be aware of the PSDB

guidelines, which many in the industry believe will become industry standards in the future.

The PSDB has devised the following classifications for CCTV; Monitor, Detection, Recognition, and Identification.

An image intended for monitoring is defined as one that will allow the observer to see the location, speed, and direction of a person in the cover area. This will usually be a wide-angle view.

Detection should allow the observer to locate a person with a high degree of certainty, having been prompted to do so by something such as a guard or alarm system.

Recognition quality must be good enough to allow an observer to say with a high degree of certainty whether the person on the monitor is someone that they have seen before.

Identification requires the highest resolution image of a person. Such images must contain sufficient detail to enable the observer to see the person clearly enough to be able to describe them, or to identify them again. Such an image is only possible from a close-up or zoom shot. It has the disadvantage of not being able to record any activity other than that by the person being monitored.

Of course, there are factors other than image size that determine the effectiveness of a system. Camera and monitor resolution, angle of view, speed of target, lighting, and recording system all have an effect. For this reason, the image sizes shown in **Fig. 5** can only be taken as a guideline.

Nevertheless, when surveying a system you should attempt to determine from the customer which of the four classifications they expect for each area of cover. That way you have a better chance of installing a system that will meet the customer's expectations.

Image clarity

It is one thing to talk about definition and image size, but it is another thing to accurately measure and quantify them outside of a laboratory.

To make some sort of realistic measurement of a CCTV system performance, the PSDB developed a test target called the Rotakin, illustrated in **Fig. 6**. This image of a person wearing a somewhat unusual suit is designed to act as a target in the cover area.

Using Rotakin, a surveyor can assess the coverage, image height, contrast and overall quality of each camera view, while the familiar black and white resolution bars can be used to determine definition. The Rotakin is also effective for comparing the performance of different cameras, lenses, and monitors.

The stand that the Rotakin is mounted on has a 12V motor which can rotate the image at a rate of 25rev/min. This provides a representation of a person 'moving quickly but stealthily', to quote the Rotakin information sheet. Such dynamic simulation is important because it is unlikely that the image of interest will be standing still, staring into the security camera!

The Rotakin kit includes a camouflage cover that meets with MOD specifications. This may be used to test system performance when you are trying to pick out people other than black and white striped ones.

The Rotakin is an expensive piece of test equipment. It will be a long time before smaller companies can afford one. At a more practical level though, broadcast standard test cards are available. Using one of these as a target will give a good indication of resolution.

By now I trust that you have a better idea of the factors that govern the choice of CCTV cameras. However the performance of a CCTV system is also heavily reliant on the lens.

In my next article, I will be looking at the subject of lens theory and methods of selecting the right lens for a given application. This article will also help you appreciate the significance of the dimensions of the camera's image sensor. ■

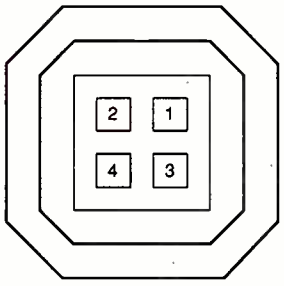


Fig. 4. Pin-out for a Panasonic 'P connector' socket. Typical pin assignments for direct-drive and video drive are given in the table.

Pin number	DD drive	Video drive
1	Damping –	+12V
2	Damping +	Not used
3	Drive +	Video
4	Drive –	Ground

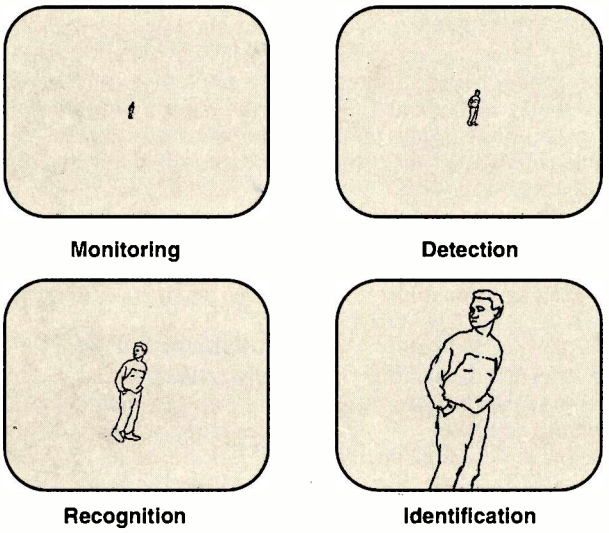


Fig. 5. PSDB classifications of CCTV systems, with suggested minimum image size for each classification. For monitoring purposes the image must not be less than 5% of the screen height. For detection it should be no less than 10%, for recognition no less than 50%, and for identification no less than 120%. These figures are based on the assumption that all parts of the system are adjusted and functioning correctly.

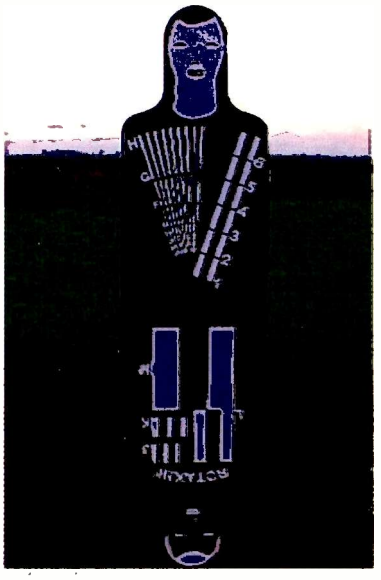
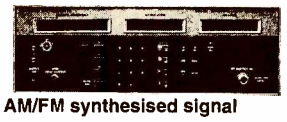


Fig. 6. The Rotakin test target, developed by the Police Scientific Development Branch for measuring CCTV system performance.

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 £150

MARCONI TF2015 AM/FM sig gen, 10-520MHz.....£175
RACAL 9008 Auto Mod Meter, 1.5MHz-2GHz.....£200
LEVELL TG2000MP 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 Autorangin 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 OLD 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 £300-£600
MARCONI 2400 Frequency Counter 20GHz.....£1000
H.P. 5350B Frequency Counter 20GHz.....£2000
H.P. 5342A 10Hz-18GHz Frequency Counter.....£800
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 H60/50 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. Oelay 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

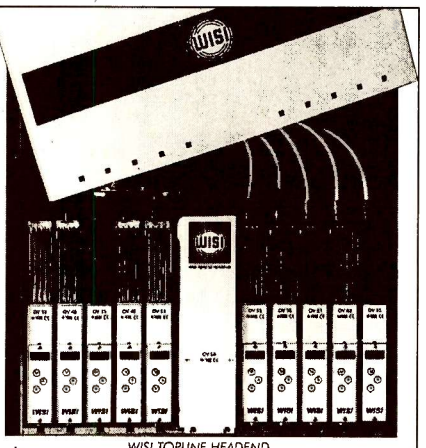
USED EQUIPMENT – GUARANTEED. Manuals supplied
This is VERY SMALL SAMPLE OF STOCK. SAE or telephone for lists. Please check availability before ordering. CARRIAGE all units £16. VAT to be added to total of goods and carriage.

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

The 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 channel processors come together in an 'all-in-one' base unit which contains all necessary accessories for ease of ordering - no additional items required.

CHECK THESE FEATURES

- Frequency agile freely selectable in the VHF of 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

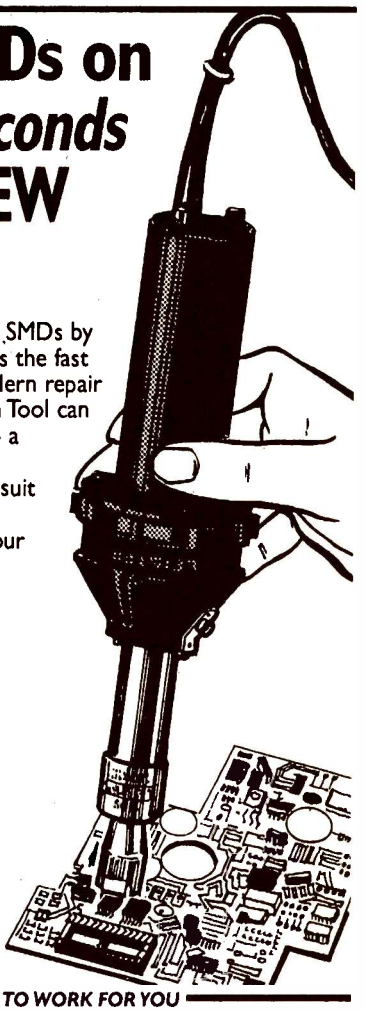
A Breakthrough in Headend Design

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

Repair SMDs on PCBs *in seconds* with the NEW Hot Jet 'S'

Desoldering and soldering of SMDs by hot air and without contact is the fast and efficient way for the modern repair workshop. And now, Welwyn Tool can offer the complete package - a range of hot air tools, SMD Rework Stations, nozzles to suit all SMD requirements, free demonstrations and free colour instructional brochure ... all available from Distributors nation-wide.

For further information, please ask for Reference No. TMS

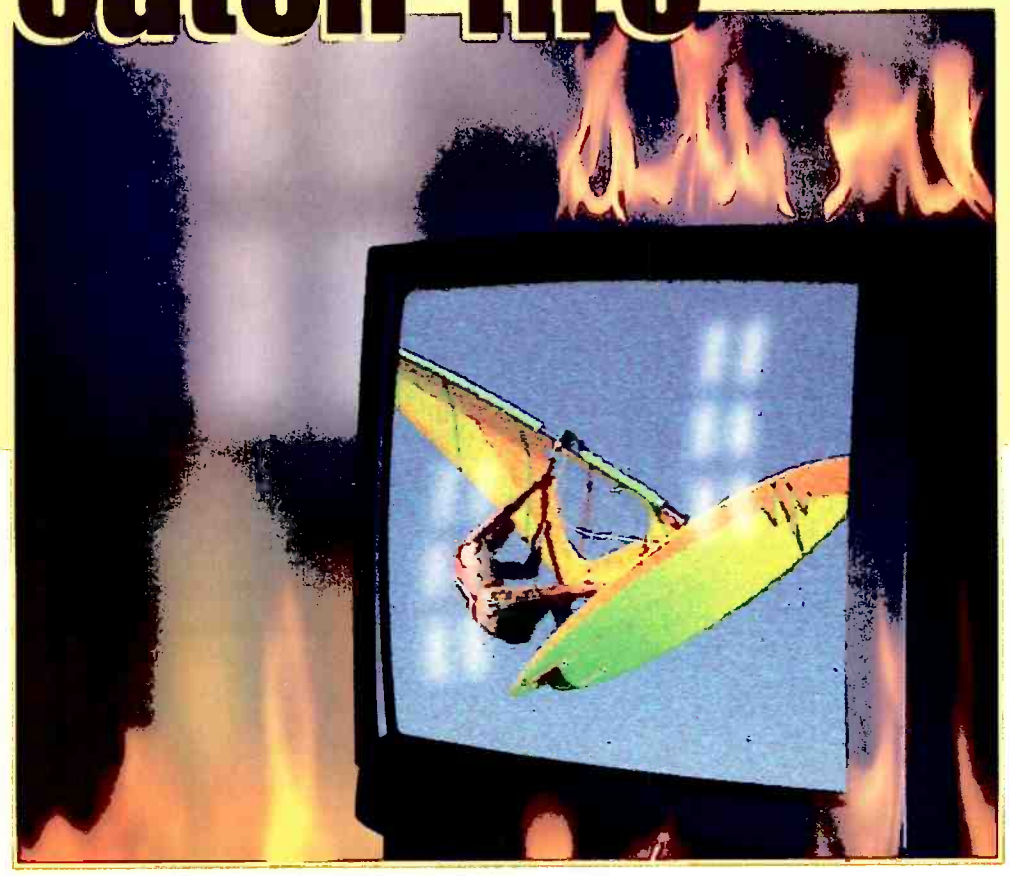


WELWYN TOOL CO.LTD.

4 SOUTH MUNDELLS,
WELWYN GARDEN CITY
HERTS AL7 1EH.
TEL: (01707) 331111.
FAX: (01707) 372175.

PUT HOT AIR TO WORK FOR YOU

TV sets that catch fire



Every year a number of TV sets catch fire, with potentially serious consequences. Michael Maurice investigates possible causes and comments on what can be done to improve matters

A report from an issue of *Forest Journal* (an edition of the *Salisbury Journal*) late last summer was sent to us recently. It was headed "Man killed by toxic fumes from TV set that caught fire". The set itself was a Matsui colour portable, Model 1455. It seems that there had been a power cut when the man returned home. He had gone straight to bed, then to sleep. Shortly afterwards power was restored. It was then that the set, which had been left on in standby, caught fire. The Home Office's forensic scientist stated that the set had melted down to its base. Before the accident it had apparently been working normally. The forensic scientist believed that the fire had probably started on the remote control board, but could not be sure.

A side panel which accompanied the report said that if you have a Matsui 1455 TV it should be taken to the local branch of Dixons or Currys for attention, also that "manufacturers advise that TV sets should not be left in the standby mode for long periods".

Giving evidence at the inquest Ian Cattermole, assistant company secretary of DSG Retail, said "the company has never heard of anything like this happening before". He was obviously not familiar with the Matsui 209R/209T.

The Matsui 1455

I have some experience of the Matsui Model 1455 and would like to make some suggestions as to what went wrong, causing the fatal accident. First, the set is fitted with the Preh mains on/off switch. It's known that this can catch fire. Sony found out several years ago – more on that later. Secondly, the set is fitted with an Onwa chassis. The power supply in this chassis is prone to producing excessive output voltages when the chopper transistor's base drive coupling capacitor, C607 in this version, fails.

Reading between the lines, I feel it far more likely that the power supply was the cause of the fault. When these sets are left in standby the power supply continues to run normally. The chopper transistor and its heatsink are hot, and this keeps C607, which is nearby, warm. When power is removed, the transistor cools down. So does its heatsink and C607. We know that towards the end of its life the characteristics and impedance of an

electrolytic capacitor change with temperature, and are worse when the capacitor is cold. When power was restored the chopper circuit's HT output, which is normally about 110V, could have risen to maybe double its correct level because of the condition of C607, a known weak link in the chassis. This very high HT would overload several other components that are not designed to operate at such a voltage. They could overheat to the point of ignition, and this could have started the fire. Speculation maybe, but quite a possibility.

Standby operation

This counters the "manufacturers' suggestion" that sets should not be left in standby for long periods. The fact that this Matsui set was continuously left switched on probably helped it to last as long as it did. Viewers will naturally assume that, when there is a standby facility operated by remote control, it should be used as the normal way of switching the set on and off. Putting a note to the contrary in the instruction book, should the set be designed for use in standby only for short periods, would be of little use: such a set should have a large warning label attached to it in a prominent position. But I don't for one moment believe that any sets are designed to operate in this way.

If a set is provided with a standby facility, the viewer will obviously expect to use it. He or she is likely to use it in particular in the bedroom: who would get out of bed unnecessarily to switch the set off? Some sets are in fact designed only to go into standby: Bang and Olufsen's LX2500/2800 series sets have their mains switch effectively hidden, while some later sets don't have an on/off switch at all. As far as I know, no Bang and Olufsen sets have caught fire for this or any other reason. But Bang and Olufsen sets now incorporate a separate on/off switch to comply with safety legislation.

The Matsui 209R/209T

In 1993 it became apparent that there was a serious problem with the Matsui Models 209R/209T. Two safety modifications were introduced. The first was because the copper tracks that carry the mains supply into the set, on the main PCB, were too close together. The modification for this consisted of cutting away the copper tracks to leave a safer gap between them. The second modification was to replace the surge-limiter resistor R601. The original 4Ω, 5W component could, under certain fault conditions, glow red hot and burn adjacent components instead of going open-circuit.

At first these two modifications were carried out only when a set received service attention. But one day, because of a house fire, they were deemed to be urgent. The service company organised as many engineers as possible to call and modify sets.

The 209R and 209T have the same type of power supply as the 1455 and later Onwa chassis, but in these C607 or its equivalent is the item to watch.

Problems with mains switches

It's not just Matsui sets that have been involved in fires of course. The mains switch in many chassis has been the cause of fire. Ferguson had a problem with Lorlin switches; Philips sets, some of which are only three years old or less, are prone to switch burning and charring; and Sony, which once used the same Preh switch as the 1455, discovered that it was potentially unsafe.

Once it had discovered the problem Sony immediately ordered an extensive recall and modification programme. Where the grey and black Alps switch could be fitted in place of the Preh type, it was; otherwise a new switch was designed for fitting. Large advertisements were placed in the national newspapers, and Sony contacted all its known customers and urged retailers to do the same. Switches were supplied free of charge to dealers, and labour charges were reimbursed through the labour claimback scheme. This was a commendable and hugely successful operation, and I'm sure that it prevented many accidents from happening. Replacement switches are still available from Sony through the company's dealers, free of charge, for sets that to this day still haven't been modified.

One day I received a phone call from an irate and worried customer. Some months earlier I had replaced the line output transistor in his Ferguson Model 59P7A. The night before his call he had noticed a burning smell while in bed, and sparks had come from the set. The mains switch was the cause. I showed the customer the charred remains without removing the switch, then returned the set to Ferguson so that the company would be aware of the situation.

The mains input circuit

So why do mains switches fail in this way? Fig. 1 shows a typical TV set mains input circuit. There are two points that are relevant to possible excessive heat generation. Prior to the application of mains power the bridge rectifier's reservoir capacitor C1 will be

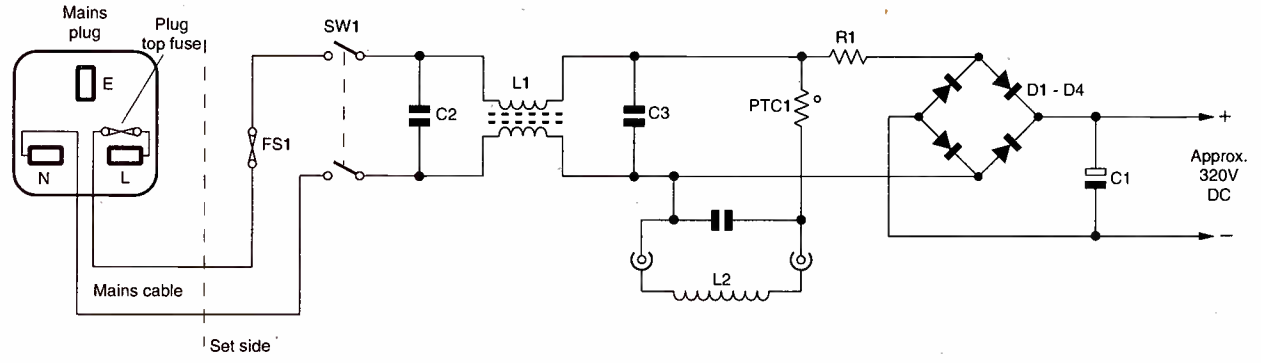


Fig. 1: Typical TV set mains input circuit. FS1 is the mains fuse, which is fitted either before or after the mains switch SW1. L1/C2/C3 provide interference suppression. PTC1 is the degaussing posistor and L2 the degaussing coil. R1 is the surge-limiter resistor, D1-4 the mains bridge rectifier and C1 the main smoothing block.

discharged (it's worth remembering however that in some chassis the charge can be retained for a considerable time). When switch SW1 is closed to apply mains power to the set, C1 will charge via the surge-limiter resistor R1 and the bridge rectifier. For a split second when it starts to charge, C1 presents a virtual short-circuit across the mains supply, R1 then being the only item that limits the current flow. As C1 charges, the current decays. The process is very fast – far too fast for any fuses to blow. The second point to note is that when the posistor (PTC1) in the degaussing circuit is cold it presents a very low resistance to the mains supply. Again this low impedance lasts for only a short time: as the posistor heats up its resistance increases and the current flow through it is reduced to a negligible level.

Thus at switch on there will, for a fraction of a second, be a huge current surge via the mains switch. Inevitably there will be a spark between the closing contacts of the switch (in earlier open switches you can see this spark). The switch contacts develop a tiny carbon patch that gets bigger with every spark. This increases the resistance of the switch, so the switch heats up. A good-quality switch might not prevent the contacts going open-circuit, but should prevent them from bursting into flames.

The position of fuse FS1 is important. In some chassis, notably those from Sony and Panasonic, the fuse is on the mains cable side of the switch, as shown. In most chassis however the fuse is between the mains switch and the interference suppression filter (L1, C2, C3). In two Philips sets I repaired recently (Models 25PT4523 and 25PT4521) with the fuse in this latter position, the switches and adjacent PCB were badly burnt. In both cases the fuse in the mains plug had blown.

It is a legal requirement that all electrical products sold nowadays have a 13A plug with the correct fuse fitted. These plugs are often moulded to the cable. There is also a label on the mains cable to tell the user the correct fuse rating. But many customers like to put their TV sets in an enclosed cabinet, taking the mains cable through a hole in the back. These holes are usually too small for the plug to go through, so the customer cuts it off and fits his own. This will usually be the nearest spare plug available, and will probably have a 13A fuse fitted. Fortunately in both the Philips sets just mentioned the original plugs and fuses were in place. Otherwise the consequences don't bear thinking about.

When the set fails some customers decide to try a DIY repair. They replace the fuse in the plug, usually with one from a working appliance, e.g. a kettle!

Other sources of combustion

There are other potential sources of combustion in a TV set, notably components in the chopper power supply circuit and the line output stage. Dry-joints are quite common here and, because of the voltage, current and high frequencies involved, arcing can occur.

I recently looked at a 33in. Goodmans set in which the line flyback tuning capacitor had become dry-jointed, arced and badly burnt several components in the vicinity. Fortunately the line output transistor had gone short-circuit as a result, and the set had shut down. I refused to repair the set as the only way of carrying out a safe repair would have been to replace the PCB.

Some manufacturers have tried to overcome the problem of dry-joints in power stages by fitting rivets to the board prior to component insertion. The rivets provide a greater area of contact between the print land and the component's legs. This has proved to be a largely successful technique, though I have seen a few problems in JVC sets around the connection between the line output transformer and the collector of the line output transistor. The same thing can happen with the Philips G110 chassis – this can sometimes arc and burn the board quite badly.

A problem with older Sony sets is that the two large, vertically-mounted resistors in the snubber network used to develop dry-joints and burn holes in the board. To combat this Sony devised modification kits that consisted of a new panel to be connected to the main PCB via cables. This board held the resistors, with the centre pin connected to the print via a rivet. Replacement main PCBs were made available to deal with extremely bad cases. Sony continued to manufacture these boards for some years after the original sets went out of production. The cost of a board would be reimbursed to a dealer after inspection by a TLO. This shows how far Sony takes its responsibilities to customers.

A problem with the Sharp Model DV5932H is that C619 either becomes dry-jointed or just goes into the self-destruct mode, burns itself up and takes adjacent components with it. The PCB is usually left with a large, charred hole. A check via the Sharp technical advice line brought the suggestion that I bridge the copper tracks and attach new components to them. I would decline to carry out such a repair however without written approval from the manufacturer. Main PCBs are not available from Sharp. So these still quite new sets can be assigned to the dustbin.

It is not uncommon to find that flyback-tuning and scan-coupling capacitors in line output stage circuits caused problems. The blue capacitors used in Philips sets appear to be particularly prone to internal arcing. They then go either open- or short-circuit, but not before doing quite a lot of damage to the board and the surrounding components.

Remedys

So what could be done to overcome such problems? In the case of the Matsui 1455 the addition of an avalanche diode such as the R2M across the 112V HT rail would have helped: it would go short-circuit in the event of excessive HT caused by a power supply fault, shutting the power supply down. JVC, which also used versions of the Onwa chassis in some of its 14 and 21in. models, devised modifications to overcome the power supply limitations and shut it down under excess-voltage conditions.

As engineers we should not consider carrying out any unofficial modifications to a set even if we think they would improve safety. If the set were to fail, resulting in a fire or other accident, the manufacturer would be likely to use your unofficial modification to direct blame away and point it firmly in your direction. Your public liability insurer (you have got public liability insurance, haven't you?) would not be happy.

I would like to see it become a legal requirement for the mains fuse to be fitted at the mains cable side of the mains switch and not after it. The reasons for this are as follows. This fuse is usually of much lower rating than the one in the plug top. It is also a different size, and not as accessible as the plug fuse. Customers may and often do replace the fuse in the plug: they rarely dismantle the set and attempt to

replace the internal fuse themselves.

The BEAB is setting new standards to further minimise the risk of fires caused by faulty TV sets. But the specifications apply only to a set when new, they don't take into account the ageing process that occurs with some components and can cause more serious problems, as with the Matsui/Onwa chassis.

It is my view that, with the public demand for cheaper and cheaper sets, cheap and possibly underrated components are probably being increasingly used. If a circuit is designed so that a particular resistor dissipates say 0·9W, it would be better to use a 2W component that runs cool than a 1W one that runs hot! This could be especially the case with cheap own-brand and other budget sets.

General comments

I have received from the Fire Brigade the following statistics for fires caused by faulty TV sets in the UK. Year 1996, 590; year 1997, 693; year 1998, 638. Figures for 1999 have not so far been released. I am told by the London Fire Brigade that in 1999 its specialist Fire Investigations Teams recorded thirty fires started by sets that were switched on and thirty by sets that were switched off. Of the sets that were switched off, six were switched off at the TV set and twenty four were in standby (these figures are for the Greater London are only). This might suggest that the mains switch is a likely cause of a TV set catching fire.

In the December issue of *Television* Colin J. Guy reported a potential cause of receiving an electric shock from a TV set's indoor loop aerial. The cause was breakdown of a rubber wedge, or more likely its glue, sandwiched under the mains input section of the PCB. This was another Matsui set. When the glue and rubber wedge start to conduct their resistance falls. As a result higher currents will flow. These will in turn heat the glue and rubber. There's potential for a fire here. It's quite possible that this could occur when the set is on, in standby or even switched off at the mains switch.

It would be interesting to find out how much information is fed back to the setmaker by the fire authorities when a fire caused by a faulty TV set is being investigated, and what action manufacturers are taking as a result to make their products safer.

It certainly seems that although TV sets are considered to be electrically safe and may pass the relevant safety standards and tests at the time of manufacture and sale, the same cannot be said of them all a few years later. Indeed the cases mentioned in his article show that some sets can become quite dangerous after only a few years' use.

I can't suggest a practical solution, but if the safety authorities were made aware of these problems perhaps legislation could be introduced to ensure that tests are carried out on sets after they have been put through some sort of ageing process. ■

Acknowledgement

My thanks are due to Alan Easton of the London Fire Brigade Headquarters for the invaluable help and information he provided.

The introduction of digital terrestrial TV transmissions has brought with it a host of challenges for the aerial installer. **Bill Wright** looks at some of the new problems and their solutions

Digital terrestrial TV reception

When Channel 5 arrived a few years ago the broadcasters had great difficulty in accommodating this one extra channel in the UHF band. Coverage is not and never will be complete, because there are not enough clear channels. At the time it seemed impossible for any further transmissions to be squeezed into the band. Nevertheless digital terrestrial television (DTT) eventually came along and was slotted in, though the coverage that has been achieved is a severe compromise. It's the cause of many of the reception problems we now face.

The digital transmitter network

The DTT transmissions in the UK consist of six multiplexes, each of which carries about eight TV services and occupies a standard 8MHz UHF channel bandwidth. The DTT transmitter network has been closely modelled on the analogue one, using the same main transmitter sites. The congestion in the UHF band, and the fact that the build up of the network is still in the early stages, mean that the transmissions fall short of the ideal in several ways. These are:

(1) Some multiplexes are transmitted at permanent low power.

(2) About a third of the transmitters have a restricted radiation pattern, which means that they radiate little or no signal in certain directions. This can apply to some or all of the multiplexes at a given site.

(3) In many cases the DTT channels are outside the analogue channel group.

(4) As yet very few low-power relay sites transmit DTT.

(5) Some multiplexes are transmitted on channels that are adjacent to those used for analogue signals at the same transmitter site. This precludes the use of simple filters to provide individual channel processing at the receiving site.

Characteristics of digital reception

When an analogue TV signal weakens, the quality of the picture declines gracefully. Even when the signal is 20dB below the recommended minimum, there will still be a picture of sorts. Digital TV is quite different, with a very narrow margin between a perfect picture and no reception at all. With a signal that's just at the margin, the picture will freeze and break up into blocks.

Since there will be an inevitable signal-strength variation over time, it's vital that a safety margin is built into the installation. The simple way to check this is to temporarily attenuate the signal by 6dB. This should have no effect whatsoever on reception. Fit the attenuator at the receiver's input. If however a masthead or distribution amplifier is in use, fit the attenuator at its input.

I think that all of us in this trade have at times been astonished by the terrible TV reception that some people will endure. But those who are prepared to stare at a horrible snowy analogue TV picture will not be so tolerant of the digital equivalent, which is a small red square on a black background. This means 'no signal'. Once the signal slips below the threshold by even a fraction of a dB there

is no picture or sound.

The modulation system used for DTT in the UK provides a lot of protection against multipath reception, the cause of ghosting with analogue signals. This seems to work very well – it's often possible to get perfect digital reception in places where the analogue pictures have clearly visible ghost images. It has proved to be a godsend on occasions. The need for a good aerial remains however, because digital TV needs good signal levels and won't tolerate really atrocious multipath conditions. But whereas slight ghosting may well mar reception with an analogue signal, digital reception will be perfect.

Signal levels

You get similar coverage with a digital transmission that's 20dB below an analogue one. This is because DTT works with a signal-to-noise ratio of about 24dB, whereas 44dB is required for a clean picture with an analogue signal. At first it's quite difficult to get used to this – it seems unnatural to regard a signal of –10dB/mV as 'good'!

An analogue signal-strength meter will not give an accurate reading, though installers may be able to learn from experience the reception quality that can be expected with a particular analogue-meter reading. There is however no real substitute for a proper digital signal-strength meter or a spectrum analyser.

DTT within an analogue channel group

As far as possible the six digital multiplexes have been incorporated within the channel group already used for analogue transmissions from the same site – see panel below.

When a customer has really good, noise-free analogue-signal reception, all full-power digital multiplexes should normally be received without difficulty. Since the signals are all in the same channel group, there shouldn't be large variations in propagation loss (path loss) so the analogue-signal field strength will usually give a good indication of expected digital-signal field strength. Don't make rash promises on the basis of this however. In an unfamiliar reception area, climb on to the roof and make proper checks with test equipment before you commit yourself. The reason for this caution is that, as previously mentioned, with some transmitters the digital radiation pattern may not correspond with the analogue one.

Transmitter radiation patterns

To prevent interference to another service, a transmitter's output may be restricted in one or more directions. A good example of this is Crosspool, which serves Sheffield and its surroundings. The Crosspool digital multiplexes are on channels 39, 42, 45, 53, 57 and 60. Unfortunately a low-powered relay at Totley Rise on the edge of the city provides analogue TV on channels 39, 42, 45 and 49 for a small residential district. If Crosspool transmitted digital signals in the direction of the Totley Rise service area, analogue-signal reception would be wiped out on channels 39, 42 and 45. Despite their low power, digital signals can play havoc with co-channel analogue-signal reception (the effect is to make the picture 'snowy', as if the analogue signal is weak). To avoid this, digital transmissions from the Crosspool transmitter are dramatically attenuated across an arc of about 15° centred in the direction of the Totley Rise service area. This leaves a large, wedge-shaped area of the city with little or no digital reception. The situation here is typical of the compromises that have had to be made with digital transmissions all over the country – and as long as digital and analogue transmissions have to share the UHF band it seems that there will be little improvement.

In a situation like this, digital-signal reception might not be possible even very close to the transmitter and with clear line-of-sight to it. Although the digital-signal levels might be adequate in absolute terms, the difference between them and the analogue ones, possibly as much as 50dB, could be enough to prevent digital-signal reception. If the digital signals are presented to the receiver at usable strength, the analogue ones will cause cross-modulation. The use of a masthead amplifier is, for the same reason, out of the question. When all signals are in the same group it's not possible to use filters to separate the digital and analogue channels.

Farther from the transmitter it will simply be impossible to obtain an adequate signal-to-noise ratio. If reception from an alternative transmitter is not possible, my only advice is to throw in the towel. Sell them SkyDigital instead!

Since the digital and analogue transmissions are, in a sense, competing with one another for bandwidth, perhaps transmitter powers and radiation patterns will be modified as more and more viewers change over to digital.

Basic aerial problems

Let's go back to the 'all signals in the same group' situation, but this time with no transmitter peculiarities. Suppose that analogue-signal reception appears to be all right but the digital-signal reception isn't. Some digital channels might be fine, but others might be 'blocking' or not present at all. Before you reach for the test equipment, look closely at the analogue pictures. The chances are that one or more channels will be just slightly snowy – probably not bad enough for the customer to notice, but nevertheless not perfect. A check with the meter will then show marginal analogue-signal strengths at the receiver.

This can be treated as a standard aerial-rigging problem: improve the signal-to-nose ratio of the analogue signals and the digital ones will surely follow. An inadequate aerial, damaged downlead, dodgy

Transmitters with all DTT within the analogue channel group

Aberdare
Angus
Beacon Hill
Brierley Hill
Bristol Ilchester Crescent
Broomsgrove
Brougher Mountain
Carmel
Chatton
Crystal Palace
Darvel
Dover
Eitshal
Emley Moor
Fenton
Guildford
Huntshaw Cross
Huntshaw Cross B
Keelyland Hill
Kilvey Hill
Lancaster
Limavady
Llanddona
Midhurst
Oliver's Mount
Pendle Forest
Pontop Pike
Presely
Redruth
Rosemarkie
Rosneath
Saddleworth
Salisbury
Selkirk
Stockland Hill
Sutton Coldfield
Torosay
Whitehawk Hill
Winter Hill (but not Winter Hill B)

Disregarding analogue Channel 5, Mendip and Tacolneston are group C/D and Storeton is group A for all analogue and digital transmissions.

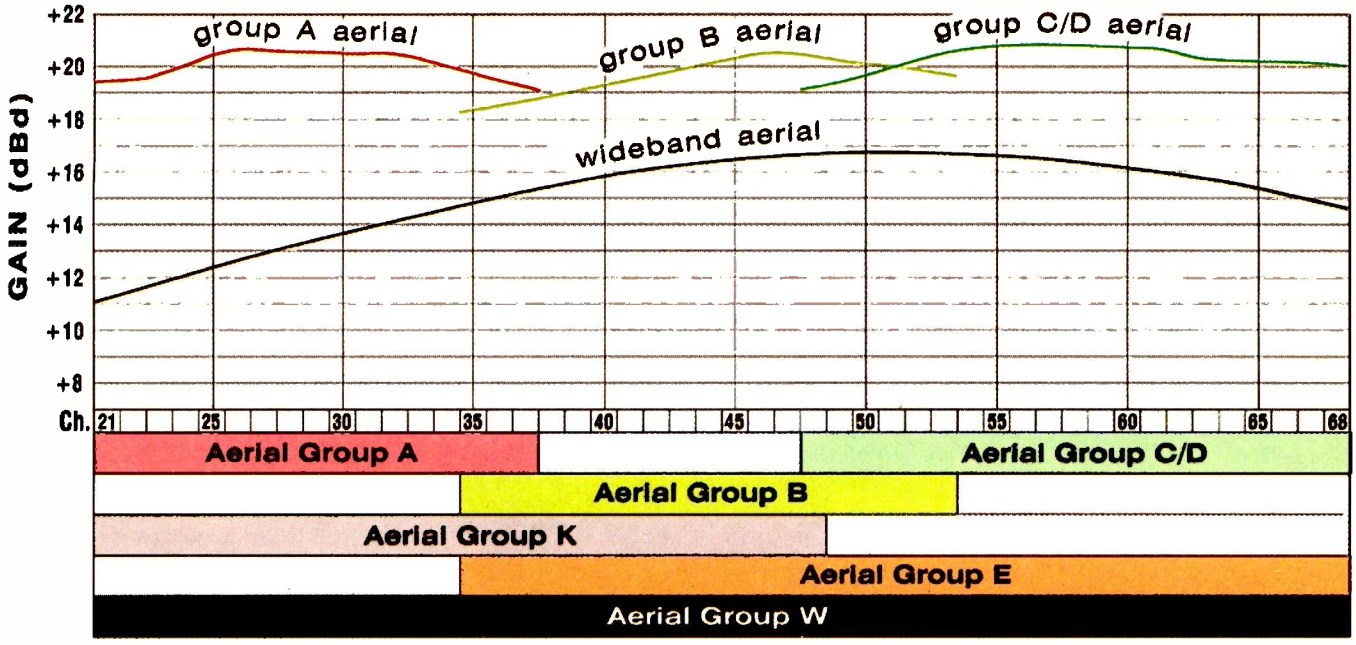


Fig. 1: The forward gain of wideband and grouped versions of a good-quality, high-gain aerial. The inferior performance provided by the wideband version is obvious, with the greatest deficiency being at the bottom of the band. The colours above correspond to the standard channel-group identification colours.

splitter in the loft etc. – look for all the usual possibilities.

If the analogue-signal reception is really snowy and there's no simple remedy, the challenge presented by digital-signal reception is roughly the same as that of obtaining noise-free analogue-signal reception. In areas of low field strength this can involve a high-gain aerial, masthead amplifier and careful aerial positioning. As a rule-of-thumb, look for no less than +3dB/mV (63dB/μV) from the aerial with the analogue channels to give reliable digital signals when these are the usual 20dB down.

DTT outside the analogue channel group

There is always, with aerial design, a trade-off between bandwidth (the frequency range) and gain (sensitivity). This is the reason why the UHF TV band is split into channel groups (see Fig. 1). In the good old days, all channels from a particular transmitter were within a channel group, so a 'grouped' aerial, with less bandwidth but more gain and directivity, could be used. Only a few transmitters did not comply with this arrangement. The situation ended with the arrival of Channel 5, which is often transmitted 'out of group'. It got much worse when DTT came on the scene, with many transmitter sites then using channels from the top to the bottom of the band.

A grouped aerial works very poorly on channels outside the intended group. For example a group A aerial used in the middle of the group B coverage can be expected to provide little or no gain and have virtually no useful directional characteristics. The likely result is that a new digital customer will ring to say "I can get only a few of the channels, but the ones I can get are perfect". This is because one or two of the multiplexes are in or near the analogue-channel group with the rest far away. The 'sudden death' nature of digital-signal reception means that during the auto-tuning process the multiplexes outside the channel group will yield nothing, and the channel list will in consequence be shorter than it should be. If the receiver has previously been installed elsewhere, the dreaded red square signifying no signal will appear in place of the missing channels. This will happen even in 'attenuator country', i.e. areas of extremely high field strength.

The higher channels

Where the analogue signals are all within group A and the digital ones are farther up the band, the field strength of the higher signals might be much lower than expected. In general, higher frequencies are affected much more by screening. So, if there is no direct line-of-sight to the transmitter, the field strength of multiplexes in the high fifties and above might be pretty dismal.

There are lots of group A analogue transmitters with group B and C/D multiplexes, so the problem is common. Relevant transmitters are: Belmont, Bilsdale, Bressay, Caldbeck, Caradon Hill, Chesterfield, Craigkelly, Divis, Durris, Fenham, Hastings, Idle, Knock More, Lark Stoke, Nottingham, Ridge Hill, Rowridge, Rumster Forest, Sandy Heath, Sheffield, The Wrekin East and West. Some of these transmitters also have 'out of group' Channel 5 signals.

Cable losses are greater at higher frequencies of course, so a downlead that has been fine for group A use will probably be unacceptably lossy with the top channels. Cables that have absorbed water will often have almost normal loss at the lower-channel frequencies but lose a massive amount of signal at the top of group C/D. Change the downlead as a matter of course when fitting a new aerial for digital reception, especially when some of the multiplexes are on high channels. Use a good-quality cable with copper braid over copper foil, e.g. Raydex CT100 or Ace QC100. For long runs use CT125 or QC125. Ensure that the cable ends are well sealed against moisture ingress, and avoid cable kinking, twisting or deformation during installation.

Wideband aerials

When the DTT signals are outside the local analogue-channel group a wideband aerial will have to be installed. But there are pitfalls for the unwary. In 'attenuator country' it's likely to be a doddle: fit a wideband aerial and take the cash! But in areas where the field strength is not too good the existing array is likely to be a good-quality, high-gain grouped aerial. The performance of a wideband aerial will not be as good as that of the grouped equivalent. Analogue-signal reception might be visibly degraded, and digital-signal reception could be disappointing.

UHF aerials derive most of their gain and directivity from the fact that they are resonant at the required frequencies. The lengths of the individual elements are adjusted for resonance. So are the distances between them. The driven element – the dipole in a Yagi array – is designed to transfer the collected energy to the feeder most efficiently. The wider the bandwidth, the more each factor becomes a compro-

mise. Fig. 1 shows the forward gain of the grouped and wideband versions of a good-quality, high-gain aerial. It is obvious from this graph that where the signal strength from a grouped aerial is only just adequate, replacing it with a wideband version is not an option.

Wideband reception is now unavoidable in many areas – the digital multiplexes couldn't otherwise be fitted in – but installers need to be aware of the performance deficit of the various wideband aerials available compared to the familiar grouped ones.

In the early stages of the changeover to digital TV, the VCR and all the TV sets except the main one will still need good analogue signals. Where a household has an existing distribution system for analogue-signal reception, fed by a large, grouped, high-gain aerial, there is no reason at all to alter the arrangement. The digital box can have its own aerial, with a separate cable from the roof.

At some locations the best digital and analogue signals will come from different transmitters. Even when all the required signals come from the same transmitter, separate aerials can in some cases be used to advantage. For example the ideal system for reception from the Malvern transmitter would be a group C/D aerial for the analogue signals and a group B aerial for the digital channels. In a difficult reception area the use of two grouped aerials rather than a single wideband aerial could make a real difference.

If the digital STB's RF output is not used there will be no complications with a separate aerial. If its RF output has to be distributed to all the TV sets at the premises, this can be done via a single channel-pass filter or a one-channel combiner such as the Taylor TCFL1-1CH (see Fig. 2). Incidentally, if anyone has an easy, reversible method of disabling the UHF loopthrough via an ONdigital box, please let me know.

Not all transmitters require receiving aerials that cover the entire UHF band. In some cases only groups A and B, or groups B and C/D, are used. In the former case use a group K aerial, in the latter a group E aerial (see Fig. 1 again). These aerials will perform better than the equivalent group W array that covers the entire band.

Table 1 shows the bandwidth of each channel group as a percentage of the centre frequency. It gives some indication of the likely relative performance of aerials designed for different channel groups.

There are, broadly speaking, three types of wideband aerial in common use: the Yagi, the log-periodic and the stacked dipole. We will consider each in turn.

The wideband Yagi

The wideband Yagi is similar to the conventional grouped Yagi, with its reflector, folded dipole and director chain, but the

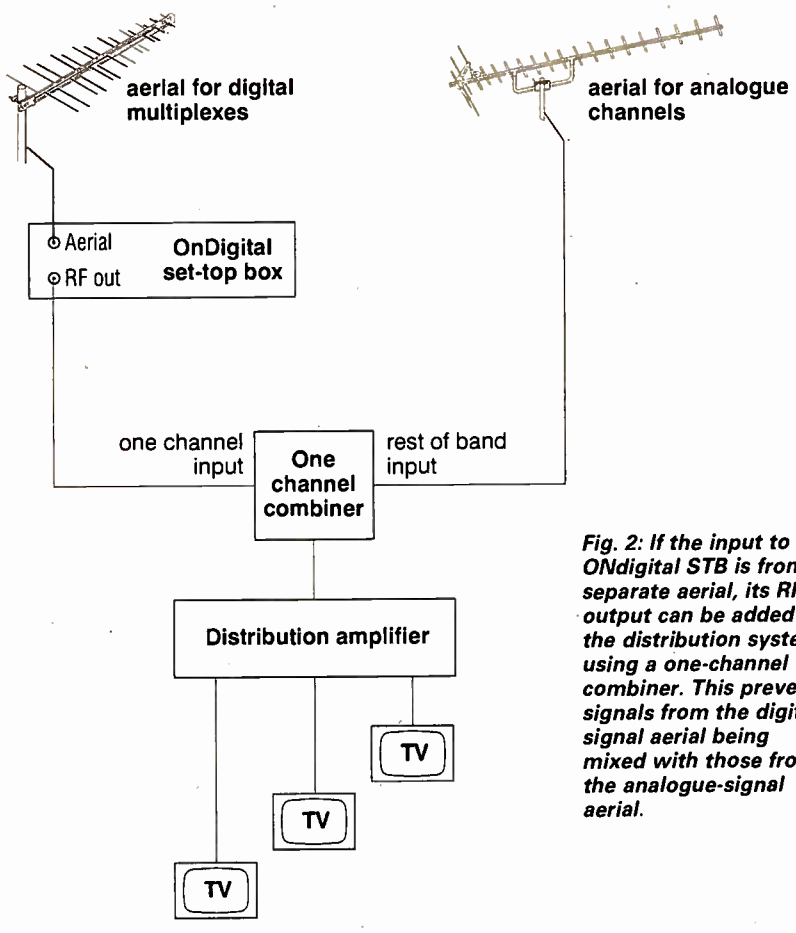


Fig. 2: If the input to an ONdigital STB is from a separate aerial, its RF output can be added to the distribution system using a one-channel combiner. This prevents signals from the digital-signal aerial being mixed with those from the analogue-signal aerial.

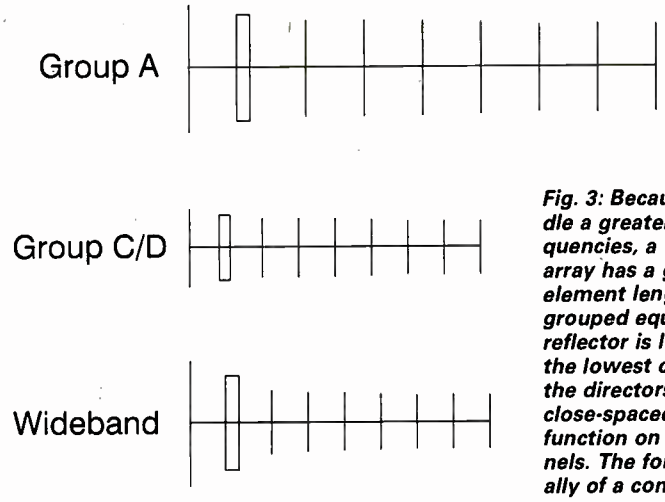


Fig. 3: Because it has to handle a greater range of frequencies, a wideband Yagi array has a greater spread of element lengths than the grouped equivalent. The reflector is long enough for the lowest channels, while the directors are short and close-spaced so that they can function on the higher channels. The folded dipole is usually of a compromise length.

Table 1: Bandwidth of different grouped aerials

Channel group covered	*Bandwidth*
A	24
B	19
C/D	20
E (B and C/D)	34
K (A and B)	43
W (A, B and C/D)	57

tuning of the array is much broader. The reflector is long enough to function with the lower channels; the director chain is scaled down so that it will function with the higher channels; while the dipole is, well, an uneasy compromise. See Fig. 3.

In general this type of aerial performs reasonably well in the middle portion of the band but is not so good at the ends, especially the bottom end (refer to Fig. 1). Reputable manufacturers go to a lot of trouble to optimise the impedance matching with their wideband Yagi arrays, but some of the 'contract' quality wideband efforts are an absolute joke, with no useful gain or directional characteristics on some channels.

The log-periodic

Virtually every other TV aerial ever made can trace its ancestry back to Professor Yagi's eponymous invention, but not the log-periodic. Unlike Yagi-based designs, every element in a log-periodic array is a driven dipole – that is, it's connected to the feeder, see Fig. 4.

I don't intend to go too far into the theoretical aspects of log-periodic aerial design. The basic idea is that the length and spacing of the dipoles in the array follows a regular geometrical progression. This ensures a smooth transfer of resonance from one dipole to the next as the frequency varies. The frequency coverage can be tailored exactly, because it's set by the resonant frequencies of the shortest and longest dipoles in the array. The boom also functions as a live transmission line, with the dipoles mounted along its length in alternating phase. The feeder is connected across the HF end of the boom.

The gain is more or less constant across the designed-for bandwidth, and the array is highly directional. Sounds too good to be true? Well, the drawback is the forward gain, which with practical designs that cover the UHF TV band is only about 9dBd (dBd = dB referred to a half-wave dipole). If you use a log-periodic to replace a grouped Yagi, expect to lose 3-6dB of gain. At this point you may reach for a wideband, low-gain masthead amplifier. We'll go into this later.

The stacked dipole

Widely known as the panel aerial, billboard, fireguard or grid, this array (see Fig. 5) consists of four dipoles (nominally full-wave) and a large reflector. The dipoles are stacked one above the other (when mounted for horizontal polarisation) and are linked to a central feed point by crossed transmission lines. The spacing of the dipoles and the crossed transmission lines means that the output, with an on-axis signal, is in phase at the feedpoint. This gives the aerial much of its gain and directivity. The double arms of the dipoles are of V shape and form the equivalent of a broad 'butterfly' dipole, so they have a much broader resonance than a straight dipole. The aerial is thus broadband.

This type of aerial is available from several manufacturers. Since the basic design allows considerable modification, the performance varies significantly from one manufacturer to another. In general however the gain can be as low as 8dBd on channel 21, peaking at about 13dBd somewhere around channel 55 or 60. The gain tends to decrease above this point, which is a pity because the response would otherwise be well suited to the familiar wideband situation where most gain is required with the highest channels. This type of aerial could be useful for group K reception (Bilsdale, Caradon Hill, Craigkelly and Storeton), where the channels are all in the range 21-49.

Some installers swear by the fireguard as an anti-ghosting aerial, which suggests that it could be useful for dealing with digital co-channel interference. I would dispute this for horizontal polarisation. When the aerial is used for vertical polarisation however the four dipoles are stacked horizontally, giving considerable rejection of off-beam signals because of the phasing of the array.

This is not a high-gain aerial, though it's often used with this in mind, and its quite high wind resistance means that secure mountings are required when the aerial is atop a high mast. I've never been a great fan of the fireguard, considering it to be rather unwieldy for the performance provided. But I have found it useful when it has been necessary to install an aerial half way up a wall. When the transmitter direction is roughly at right angles to the wall the installation is very neat, protruding only about 300mm.

Tree trouble

Strange things can happen when the signal has to pass through trees. With analogue-signal reception, familiar conditions include reduced signal strength across all channels, a severe reduction in the signal strength with one or more channels while others remain relatively unscathed, and deep signal fading for short or long periods. These symptoms can occur singly or in combination. Because foliage tends to affect the higher frequencies most – a wild generalisation, but let's stick with it – multiplexes on higher channels are likely to be a problem. Good reception of group A analogue signals tells you nothing about likely group C/D digital reception if there is even the slightest tree screening.

During initial installation the digital receiver might find fewer channels than expected. A spectrum analyser will show that some multiplexes are much weaker than the others. This can be dealt with in the same way as the equivalent analogue problem. Employ all the usual techniques, but in particular try to find a location for the aerial where there is less tree screening. This often requires a lot of effort, but will provide more reliable results than simply using a large aerial with an amplifier. Attempts to amplify very weak multiplexes will most likely result in cross-modulation, since they could be 50dB below the analogue channels. Before you consider amplification, get all the multiplexes as strong and even as possible at the aerial terminals.

The really annoying tree-screening fault is

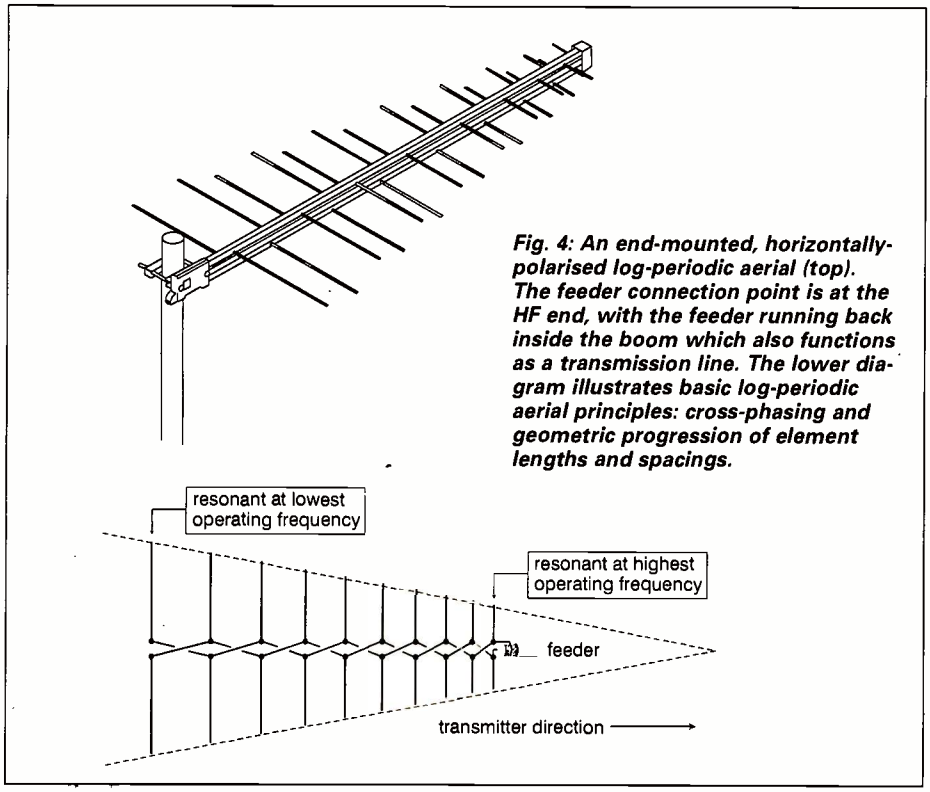


Fig. 4: An end-mounted, horizontally-polarised log-periodic aerial (top). The feeder connection point is at the HF end, with the feeder running back inside the boom which also functions as a transmission line. The lower diagram illustrates basic log-periodic aerial principles: cross-phasing and geometric progression of element lengths and spacings.

the 'occasional deep fade'. The signal level with one or more of the multiplexes suddenly takes a deep dive, dropping by 10-20dB. This lasts typically between 1-10 seconds and might happen once a week, once a night or once every few minutes. The customer might not be too concerned with analogue-signal reception, because often all that happens is that the picture becomes snowy for a short while. But with a digital signal the picture freezes or disappears, which is much worse subjectively. The customer will probably complain that it always happens "during the exiting bits". You may have to accept this, because the fault might well not show up while you are there. The chances are that the signal levels will not be too good even when they are at their best, so a better aerial location and a low-gain masthead amplifier might help. The customer should be made aware that this might not provide a complete cure, because at times the fluctuating signal might still fall below threshold.

Masthead amplifiers

The danger with a masthead amplifier is that the analogue channels will cause cross-modulation. The temptation to use an amplifier arises when one or more of the multiplexes is/are at or below the noise threshold.

Why are these multiplexes so weak? It might be that they are transmitted 30dB or more below the analogue channels, instead of the more common 20dB. Or it could be that there is a null in the transmitter's radiation pattern. It could also be because of frequency-selective screening along the signal path. When these factors combine, there can be very large differences in signal level between the weakest multiplexes and the strongest analogue-signal channels, making the use of a masthead amplifier problematic.

It's possible for digital signals weak enough to require a masthead amplifier to be accompanied by analogue signals strong enough to overload an amplifier. The digital signals will normally be about 20dB below the analogue ones of course, but even when this factor is discounted the dynamic range entering the amplifier can be rather alarming. The problem is exacerbated because cross-modulation that would have little visible effect across analogue channels of roughly the same strength can seriously affect accompanying weak digital signals.

To find the input signal level that drives an amplifier into cross-modulation, subtract the gain from the maximum output. So the vital message is "keep the gain down"! A masthead amplifier's gain should normally be enough to compensate for downlead losses plus no more than 10dB. High-gain masthead amplifiers should be used only when all the incoming signals are very low. They can make matters worse when used indiscriminately.

The choice of amplifier should take into account the noise figure and maximum output capabilities as well as the gain. I nearly always use a Labgear PUM110. This is a wideband amplifier built into a sturdy diecast housing, with a gain figure of 12dB and a noise figure of 2·5dB. It has a high maximum output figure, but even so might be in difficulty with digital signals that are 40dB or more below the analogue ones.

Where the conditions are less extreme, with all signals just slightly low, a masthead amplifier can often be very useful. When a grouped aerial is replaced with a wideband one the signal levels from the aerial will inevitably be lower. If a masthead amplifier wasn't in use previously, suggesting that the analogue signals from the grouped aerial were –3dB/mV or better, fitting one in conjunction with a wideband array can work well. This is especially true when the downlead is on the long side.

It's a different story when the analogue signals from the grouped aerial are in the range –20 to –10dB/mV. It's likely that a high-gain, grouped masthead amplifier is already in use. If so, tread very carefully. The signal-to-noise ratio is largely set at the input to the masthead amplifier. Thus if the output from the aerial is reduced, the signal-to-noise ratio will inevitably be worsened. If you do fit a wideband aerial, a high-gain wideband masthead amplifier would be appropriate. But the results could be disappointing.

Masthead amplifiers often amplify out-of-band signals that you would otherwise know nothing about. The classic case is the UHF communications base station of the 'BD to Z Victor One' variety operating in the 450-470MHz region. This frequency range is well within the passband of most masthead amplifiers, and a nearby transmitter can easily cause cross-modulation. Digital reception can be badly affected at the level where only faint patterning may show with an analogue picture.

A clue might be the intermittent nature of the fault, because the interfering carrier is present only when in use – though some carriers are on continuously. The cure is to fit a notch filter in-line before the masthead amplifier. A suitable one is the Taylor TBF4. As this is an indoor unit, some sort of housing will be required. A spectrum analyser will have to be used to identify the offending signal and tune the filter.

Distribution amplifiers

Some cheap domestic distribution amplifiers will be disturbed by strong signals at frequencies as low as 27MHz. Now that CB radio has been largely displaced by the internet as a means of broadcasting teenage angst, the main culprit seems to be taxi base stations and suchlike operating at about 175MHz and pirate VHF-FM stations. The solution is to fit a 300MHz high-pass filter such as the Antiference TVI/U. See also 'Interference from VHF Transmissions', *Television* November 2000.

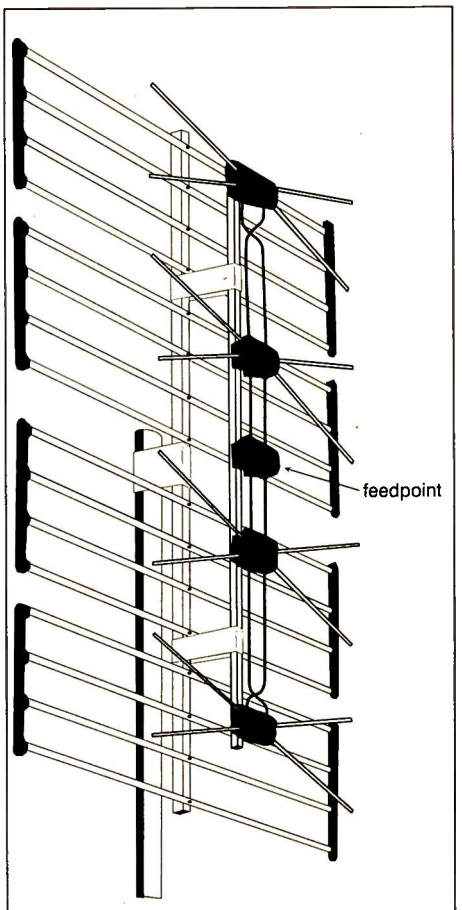


Fig. 5: The stacked dipole array has four full-wave dipoles and a large reflector.

There are some really bad distribution amplifiers on the market. One common deficiency is a severe gain fall-off above channel 60. Another is very limited maximum output, which can mean that the amplifier produces cross-modulation with even quite modest signal input levels. This sort of thing just won't do when the digital signals are 20dB below the analogue ones.

The distribution of digital and analogue signals together on a communal TV system is a large subject fraught with difficulty. It's beyond the scope of the present article, but I hope to cover it at a later date. ■

To follow

In a further instalment I'll consider separate processing of digital signals, co-channel and impulse interference, 'the finishing touches' – installing set-top boxes and IDTV receivers, scart and RF interconnections – and lastly the prospects of all this for those of us in the trade.

Servicing the Sharp CS chassis

This month's instalment (Part 2) deals with the unusual field (class D) and line output stages. Alex Towers describes basic circuit operation and fault-finding procedures

In Part 1 last month we covered the basic operation of the CS chassis, then fault-finding in the power supply section. This month we will outline procedures for tackling faults in the line and field timebases.

If there's a problem in the line output stage (a faulty line output transistor, shorting LOPT, damaged flyback tuning capacitors, dry-joints at the connections to the deflection coils, etc.) the set will not start up – the start-up procedure described last month will be aborted. As an aid to fault diagnosis the line output transistor can be removed, enabling the start-up process to be completed.

When this is done the line drive signal will be present at pin 56 of the multi-function chip IC201 until the set is turned off. The best place to monitor the line drive signal is at R611, which is mounted on the top of the PCB (see Fig. 9). It's important to note that the amplitude of the drive signal must be at least 6·5V peak-to-peak: the line output stage will not operate correctly with anything less.

Pin 56 of IC201 is an open-collector output. This means that a load resistor is required, which brings us back to R611 (820Ω). R611 is connected between pin 56 of IC201 and the 8V supply. It can go high in value or open-circuit. The result is low or no line drive. Within IC201 a couple of protection diodes are connected to pin 56. One is connected to the positive supply, the other to chassis (0V). These diodes can become leaky, the result being no or very low line drive. The normal resistance between pin 56 and chassis (0V) is approximately 1·2kΩ while the resistance between pin 56 and the 8V supply is 820Ω (R611). If the resistance to chassis is less than 500Ω, this almost certainly means that IC201 is faulty and must be replaced.

The field timebase

Problems occasionally arise in the field output stage. Most of them result in a dead set. Faults in the field output stage usually involve destruction of the output pair of transistors Q507 and Q508. If these transistors are removed and the PCB is cleaned there should be no permanent damage to the print.

The following items should also be replaced when the output transistors have failed: D501, D502, D507, D512, C506, C507, C512 and C517. D507 and D512 are radial components mounted on the component side of the PCB. Fig. 10 shows the position of certain of these components on the print side of the PCB.

The field output stage occasionally becomes intermittent, the result being erratic field scan problems such as cramping at the top or bottom of the picture or partial collapse. In this situation it is best to start by replacing the components listed above.

If there's of a bright line, which cannot be removed by adjustment, at the top of the picture (about one inch down) the normal cause is C512 and/or C517.

Fig. 11 shows the field timebase circuit. To minimise dissipation, the output stage operates in the class D mode (the transistors, Q507 and Q508, are operated as switches which are either saturated or

Fig. 9: Checking the line drive signal at pin 56 of IC201.

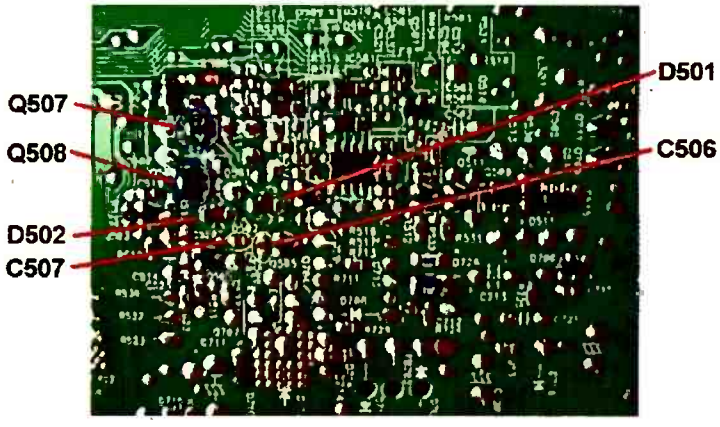


Fig. 10: Location of critical field timebase components on the print side of the PCB.

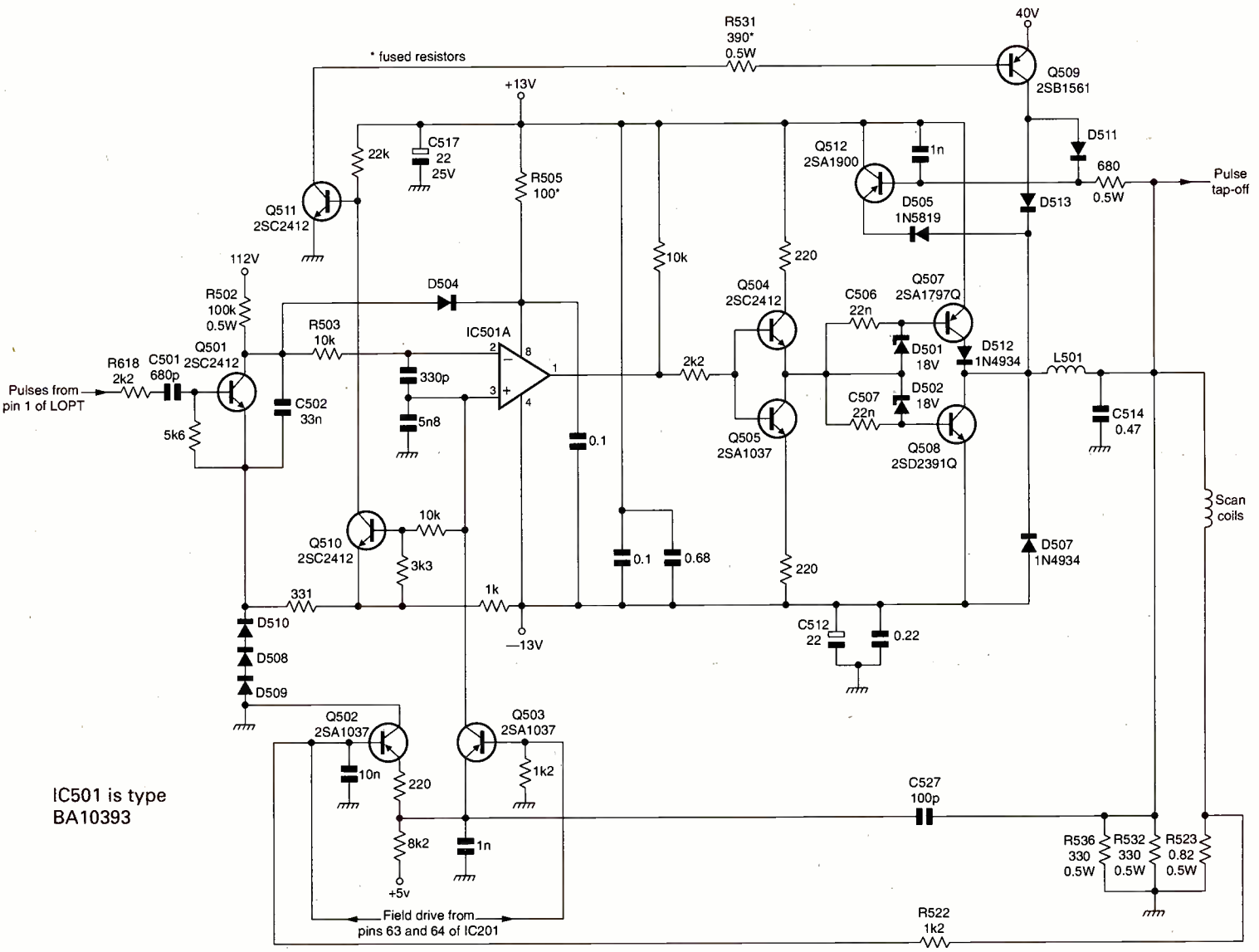


Fig. 11: The field timebase circuit used in the Sharp CS chassis. IC501A is the pulse-width modulator, Q504/5 comprise the driver stage and Q507/8 the output stage, with Q509 and Q512 providing the flyback action. The +13V, –13V and +40V supplies are derived from the line output transformer. The above circuit applies to 51cm models. There are several component variations with 59/66cm models.

off). A low-pass filter (L501 and C514) integrates the output to produce a sawtooth waveform to drive the field scan coils.

Class D operation means that a pulse-width modulated drive is required. This is created by mixing a line-frequency sawtooth and a field-frequency ramp: as the ramp progresses, the mark-space ratio of the pulse-width modulation increases.

IC501A is the pulse-width modulator. A vertical drive ramp from IC201 is applied to pin 3 via Q502/3. The other input, at pin 2, is a line-frequency sawtooth that's produced by Q501 and its associated components. Pulses from pin 1 of the line output transformer are fed via R618 and C501 to the base of Q501, which acts as a discharge device for the *RC* charging circuit R502 and C502. To ensure a linear sawtooth, R502 is connected to the HT supply (112V or 150V depending on tube size). In effect the output from IC501A is a 15·625kHz squarewave modulated by the field drive waveform.

C501 or Q501 can fail, producing a rainbow effect at the top of the screen.

Q509, which is connected to the 40V supply (45V in larger-screen models), provides the field flyback in conjunction with Q512. If the 40V supply is missing or low (typically 25-35V) there can be field cramping, severe linearity problems – and even sound muting. These symptoms are sometimes present together. Typically C619, D619 (59/66cm models) or problems with Q507 and Q508 cause these faults.

The line timebase

The line driver and output stages are unusual in that there is no impedance-matching driver transformer and they start up at twice the line frequency. The basic circuit is shown in Fig. 12.

When the line output stage starts up, energy is induced in the output transformer T601 and diodes D609 and D610 provide power to turn the output transistor Q601 on and off. At the start of the conduction cycle, Q601 is biased on via R602 from the +13·5V line. As the transformer is energised, D609 provides current to turn on Q601 harder. Likewise the –18V supply works in conjunction with current via D610 and Q603 to turn Q601 off. During the start-up process the line speed is doubled. This means that the output transformer is untuned and doesn't take too much current.

When IC201 receives a feedback pulse at pin 57 from the output stage the line speed is switched to the conventional 15·625kHz. At this point Q601 is turned on and off entirely by the supplies generated by D609

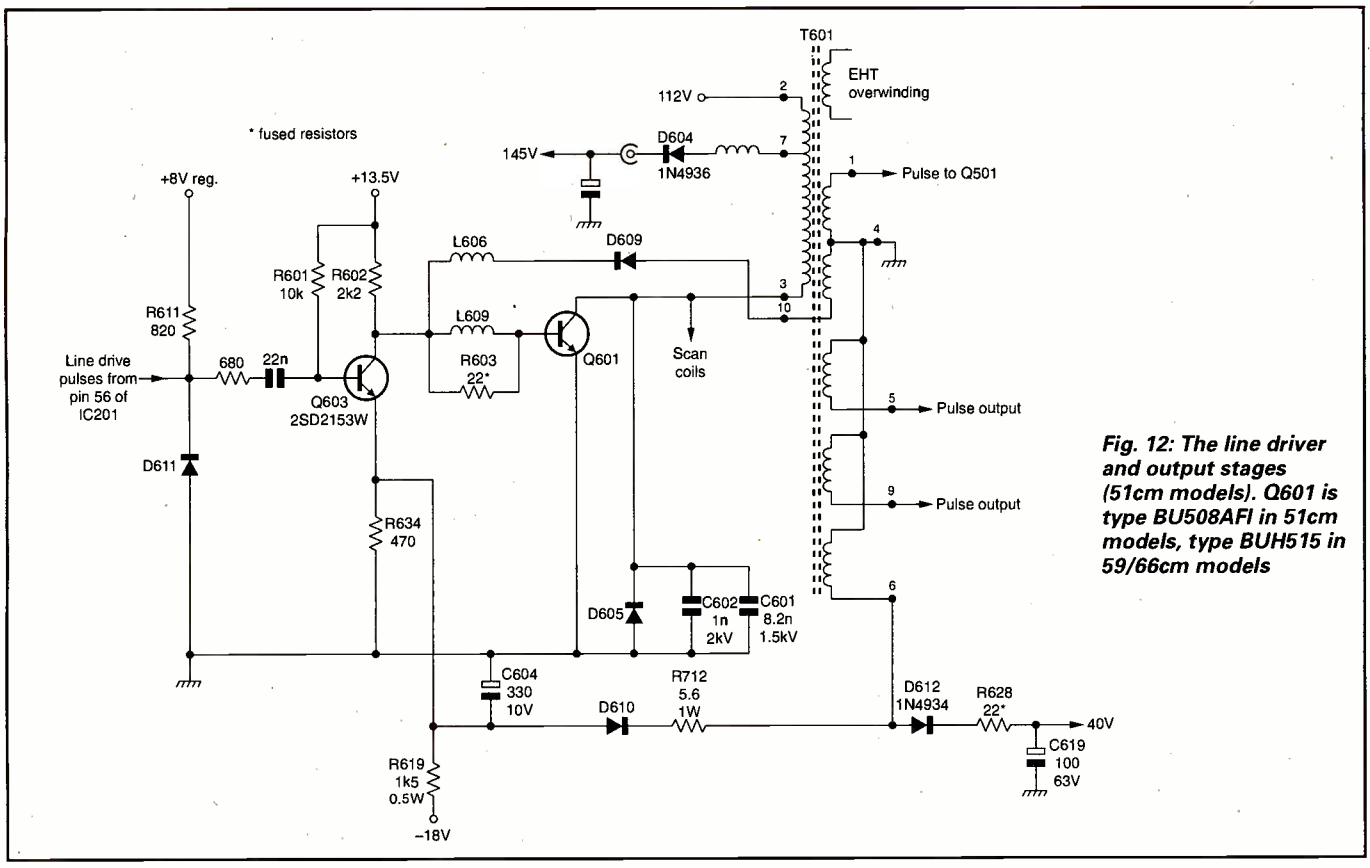


Fig. 12: The line driver and output stages (51cm models). Q601 is type BU508AFI in 51cm models, type BUH515 in 59/66cm models

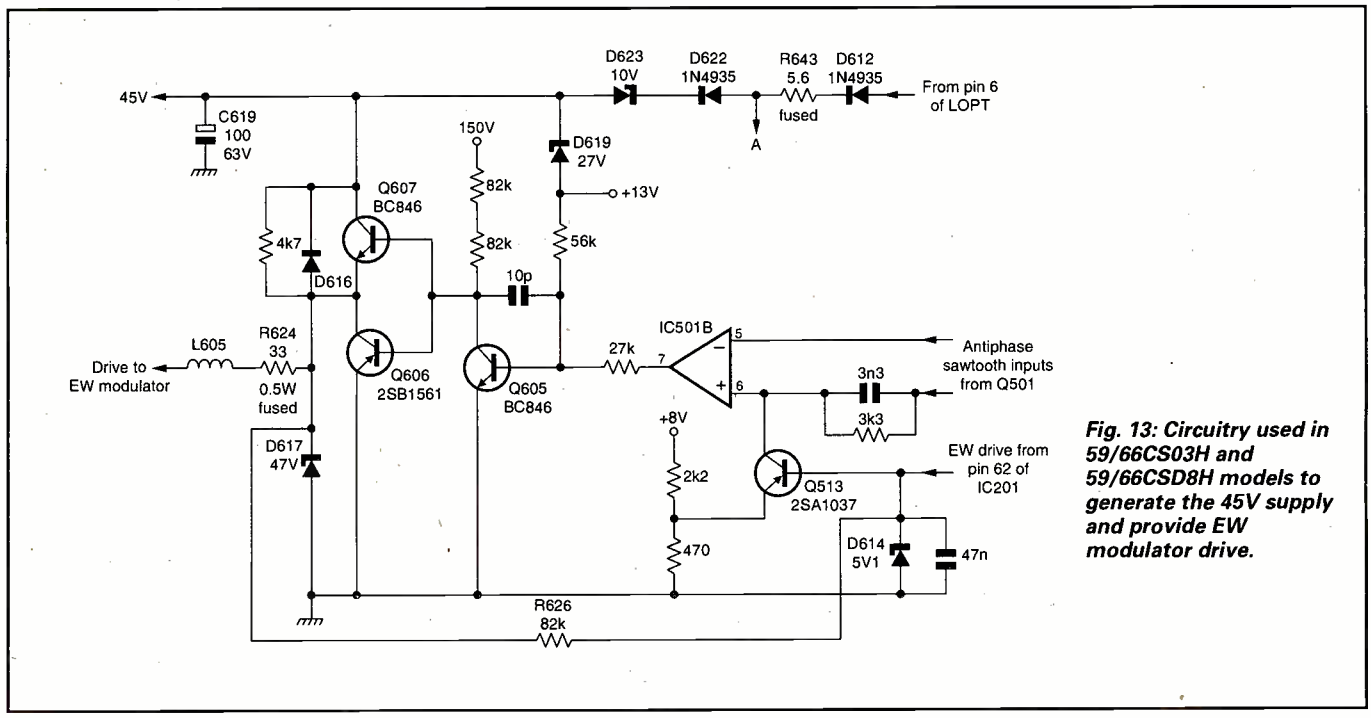


Fig. 13: Circuitry used in 59/66CS03H and 59/66CSD8H models to generate the 45V supply and provide EW modulator drive.

and D610, with Q603 synchronising the action.

A number of problems can occur with this unusual circuit, resulting in intermittent or premature failure of Q601. D609 and D610 can break down intermittently, causing loss of switching voltage. C604 can dry out because it's mounted near to R628: this leads to loss of energy in the negative supply, with Q601 overheating then failing. It is routine practice to bend resistor R628 away from C604 and replace the latter with a high-temperature (105°C) type. D609, D610 and C604 come as part of the CS Chassis Kit – see Part 3 next month. R601 can go high in value or open-circuit: the result is instant destruction of Q601 at switch on.

The circuit used in larger-screen (59 and 66cm) sets is basically the same, the main difference being the use of an EW diode modulator.

The 40/45V supply

A 40/45V (depending on tube size) supply is generated from pin 6 of the line output transformer for use in various other parts of the receiver. The circuitry depends on the chassis version. If the chassis is version 5 or above with **CS03H receivers, use

the **CS05H circuit diagram. If the chassis is version 7 with **CS03H or **CS05H receivers, use the **CSD8H circuit diagram.

It is important that this supply is correct as it's used for several critical purposes, as follows:

(1) To generate the flyback voltage in the field output stage (to return the spot to the start of the scan).

(2) To turn off a muting circuit which ensures that the audio output is suppressed when the set is turned on. This eliminates any popping or banging from the internal speakers during the start-up. Note that the Pro-Logic speakers that are driven from the Dolby Pro-Logic PCB are not muted in this way.

(3) For the EW correction circuit in 59/66cm models (to provide pincushion correction).

Pincushion correction is not necessary with 51cm sets, so there is no EW circuitry. In addition the supply generated from pin 6 of the line output stage is slightly lower at 40V. The rectifier circuit used is shown in Fig. 12. D612 is the rectifier and C619 the reservoir capacitor. The value of the surge-limiter resistor R628 is 22Ω.

With 59/66cm sets EW correction is required and the supply generated from pin 6 of the LOPT is slightly higher at 45V. Fig. 13 shows the circuitry used in 59/66CS03H and 59/66CSD8H models. D622 is the 45V rectifier with C619 its reservoir capacitor. The value of the surge-limiter resistor R643 is 5·6Ω. D619, which is connected to the LOPT-derived +13V supply, acts as a clamp. The EW output stage operates in the class D mode. IC501B is the pulse-width modulator, Q605 is a driver transistor while Q606/7 are the output transistors.

Fig. 14 shows the slightly different 45V rectifier circuit used in 59/66CS05H models fitted with chassis versions 5 and 6. D612 is the 45V rectifier, C619 is the reservoir capacitor and the value of the surge-limiter resistor R628 is 5·6Ω. D619 clamps the cathode of D621.

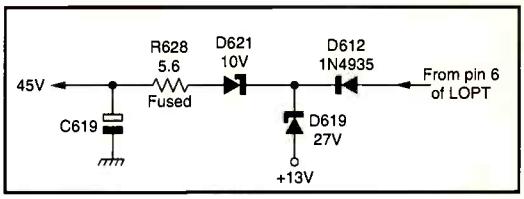


Fig. 14: Modified 45V supply circuit in 59/66CS05H models using chassis versions 5 and 6.

In all these circuits C619 is rated at 63V, 105°C.

Correction

In Fig. 5 last month the outputs from D719 and D710 should have been shown as +18V and –18V respectively (for 51cm models). +16V and –16V is correct for 59/66cm models.

Next month

In the concluding instalment next month we will deal with the audio circuitry (class D again), adjustments, changing the NVM values, software reset and the multi-purpose kit introduced to deal with known faults in the CS chassis.

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: A remote-control unit for the Akura Model CX12 and help with how to adjust the grey scale with this digital chassis. Phone Mike Cotterill on 01481 727 434 or e-mail mpc@gtonline.net

Wanted: A faulty Toshiba Satellite Pro 430CDS laptop to use for spares to repair mine. I have a problem with the keyboard having a mind of its own. Phone/fax Kevin Davies on 01437 710 760 or e-mail Kdand JB@aol.com

Wanted: Circuit diagram for the Model C14R08 colour TV, sold by Boots and designed by Fidelity PLC. Phone/fax Denis Taylor on 01753 520 745.

Wanted: Can anyone supply pinout and voltage data for the ENV57D29F1 tuner module, believed to be of Panasonic origin? Garry Smith, 17 Collingham Gardens, Derby DE22 4FS. Phone 01332 381 699.

Wanted: Nicam board for the Finlux Model 3621 (3000 chassis); a remote-control unit for the JVC VCR Model HRD910EK (must be in good condition); and an instruction/service manual for the Ferguson VCR Model 3V53. Phone Richard Davey on 01162 813 681.

For disposal: Twelve complete years of *Television*, 1979-1990 (144 copies). Also seven hardback servicing volumes published by Newnes, as follows: two volumes *Radio Servicing* circa 1950s, and five volumes *Radio and Television Servicing* 1956-1960. Offers please. Buyer would need to arrange carriage from L.A. Monk, 151 Cordell Road, Long Melford, Sudbury, Suffolk CO10 9EP.

Wanted: A working direct-drive motor for the Maranz Model 6300 record deck. Brian Ambridge, 24 Brecon Road, Brooke, Nr Norwich NR15 1HS. Phone/fax 01508 550 648.

Wanted: A circuit diagram (photocopy OK) for the Roadstar Model HSP-02. It's a 6in. colour portable TV set with a Panasonic tube. Any pin identification information for the internal Mitsubishi 42-pin microcontroller chip type M34300-012SP would also be very welcome. David J. Bolt, Park Cottage, Berners Lane, Woolverstone, Suffolk IP9 1HR. Phone 01473 780 833 or e-mail David.Bolt@Breathemail.net

For sale: Service engineer giving up repairs has 27 TV and 25 video manuals, all original, Hitachi, Philips etc., for sale at £20 the lot plus £10 carriage if you want them sent. David Forfar, 65 Ormskirk Road, Old Skelmersdale, Lancs WN8 8TR. Phone 01695 735 132 or e-mail DAForfar@uclan.ac.uk

Wanted: Second-hand hot-air soldering station. Bogdan Tataeu, Gh. Doja Street no. 31, BL.34C, Ap. 12, Ploiesti, COD 2000, Romania.

Wanted: Does anyone have an Akai VT100 portable VTR in working order? It's a US-signal standard helical-scan machine that uses 1,200ft reels of 0·25in. tape running at 11·25in./sec with a horizontal resolution of 200 lines. A friend has some tapes and is willing to pay good money for transfer if anyone can help. Failing that does anyone have a new head block assembly, type PV-H001? If you can help, please e-mail Andrew Wylie (New Zealand) at wynot@xtra.co.nz

For sale: Mullard high-speed valve tester complete with instruction book, indexes, testing cards and adaptors. On original trolley stand. Not working (needs servicing). Offers please to Pinnicks TV on 0121 444 4002.

Wanted: Circuit diagram and/or service manual for the Fluke 8000A multimeter. Will photocopy and return immediately, and pay all expenses. R.J. Thomas, 17 Heol Newydd Caereithin, Swansea SA5 5AF. Phone 01792 583 406.

Reducing radiated interference

Chopper power supplies and microprocessor chip clock circuits can both cause HF interference. There are ways in which the circuits should be laid out to minimise this. Ray Porter, M.Sc., C.Eng., MIEE explains the principles

In a recent DX and Satellite Reception column (November) Roger Bunney mentioned interference caused by the chopper power supply in his digital satellite receiver. So it seemed to be a good idea to put together an article on the techniques used to reduce radiation from clock oscillators and chopper power supplies. The aim is to provide technicians with sufficient knowledge to be able to assess whether improvements to interference-generating equipment might be possible.

We weill look at the techniques used to minimise interference through correct PCB design practice. Reduction of interference at its source should always be more effective than the use of external filtering.

Sources of emissions

Any electrical loop that carries a rapidly changing current acts as an aerial, emitting an electromagnetic field. The efficiency of such a radiator, and thus the strength of the interference, depends on the area enclosed by the loop that carries the current.

Stray magnetic fields are produced by inductors and transformers. The amplitude of the interference induced in a conductor that cuts this leakage flux depends on the rate-of-change of the flux. This means that conductors close to high-frequency inductive components are those most likely to suffer from induced interference.

Other multi-turn magnetic receptors may pick up interference, even if they are not in close proximity to the source of stray magnetic fields.

The spectrum of emissions

The mathematical technique known as Fourier Analysis shows that all pulse waveform shapes are made up from the sum of a series of sine waves of different frequencies (called harmonics) with different phase relationships. A square wave with a mark-space ratio of exactly 1:1 for example is made up from the fundamental frequency and odd-numbered harmonics while an almost square wave with a mark-space ratio of nearly 1:1 is made up from the fundamental frequency plus odd- and even-numbered harmonics.

The higher-frequency harmonics are those that usually cause problems, as they fall within a receiver's IF or aerial-circuit bandwidth. It's possible to measure the presence of harmonics up to 160MHz with a poorly-designed microprocessor clock circuit that runs at 16MHz, or harmonics at 200MHz from a chopper power supply that runs at 100kHz and has not been designed to minimise such emissions.

Chopper power supplies that operate as fast power switches produce one set of harmonics from the switch-on action and a different set of harmonics from the switch-off action, because these events occur at different speeds. Emissions at the fundamental switching frequency will also be present.

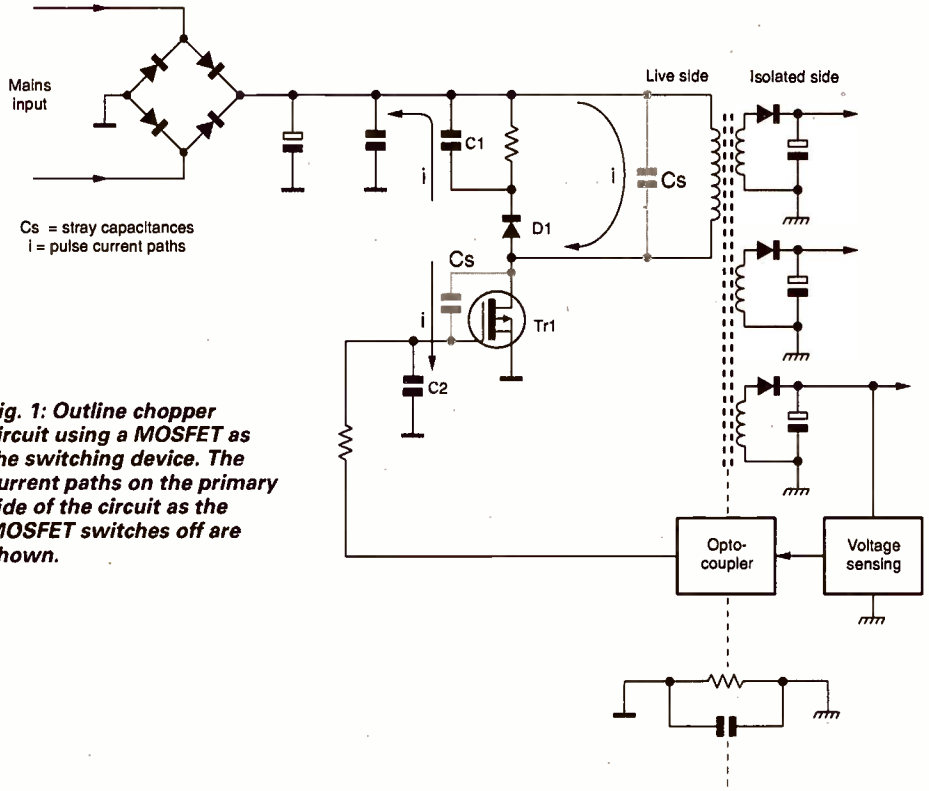


Fig. 1: Outline chopper circuit using a MOSFET as the switching device. The current paths on the primary side of the circuit as the MOSFET switches off are shown.

PCB and circuit design rules

(1) Think of the PCB layout as a large rack system that contains many separate functional circuit blocks which are connected together. This approach makes it obvious that shared current paths can cause problems, because of series-mode interference, and that long PCB tracks will result in large high-frequency voltage drops and act as aerials. Use of a solid-copper PCB ground plane, for example within a multi-layer PCB, is not a cure-all for EMC (electromagnetic compatibility) problems. Multiple cuts in a ground plane sheet are necessary to create star point, in order to avoid shared-current paths.

(2) Minimise the area of individual circuit loops that carry high-

frequency currents in order to reduce radiation efficiency as much as possible.

(3) Slow the switching *speed* of high-voltage devices as much as possible. This can be done by adding capacitance in the collector or drain circuit of a chopper device (e.g. C1 in Fig. 1) to slow the switch-off without increasing device dissipation, and adding capacitance in the base or gate circuit (e.g. C2 in Fig. 1) to slow the switch-on. The latter will increase device dissipation, and must be done taking into account the power limitations of the chopper device.

(4) Separate the current return paths and link them together at star points. This is the way to control the whereabouts of high-frequency currents, rather than have them pollute a large ground plane, and stop one current path putting its voltage drop in series with another path.

(5) Use very fast diodes with a 'soft' recovery in clamp (e.g. D1 in Fig. 1) and rectifier circuits. This prevents large current spikes that last for hundreds of nanoseconds, as normal diode charge storage (at the junction) makes a reverse-biased diode behave like a short-circuit until its stored charge is dissipated.

Schottky diodes have no stored charge, but are not available with reverse-voltage ratings of greater than about 60V. For this reason semiconductor manufacturers have developed ultra-fast soft-recovery diodes for use in higher-voltage circuits.

(6) Oscillator circuits associated with microprocessor-type chips usually have one or two capacitors that are connected between the crystal or resonator and microprocessor ground. These capacitors carry a current at the clock frequency, and must be close to the microprocessor chip to minimise the circuit-loop area. They must not be connected to the ground plane arbitrarily, but instead connected separately to the microprocessor clock ground pin – so that the capacitors' current doesn't energise the whole ground plane.

(7) Decouple power supply points at integrated circuits so as to minimise the track length and loop area of the circuit function that's being decoupled. Do this by considering the functions within the integrated circuit. This latter point is very important with integrated circuits that have several supply points. To join them all together and use a single capacitor to decouple them will not provide optimal results.

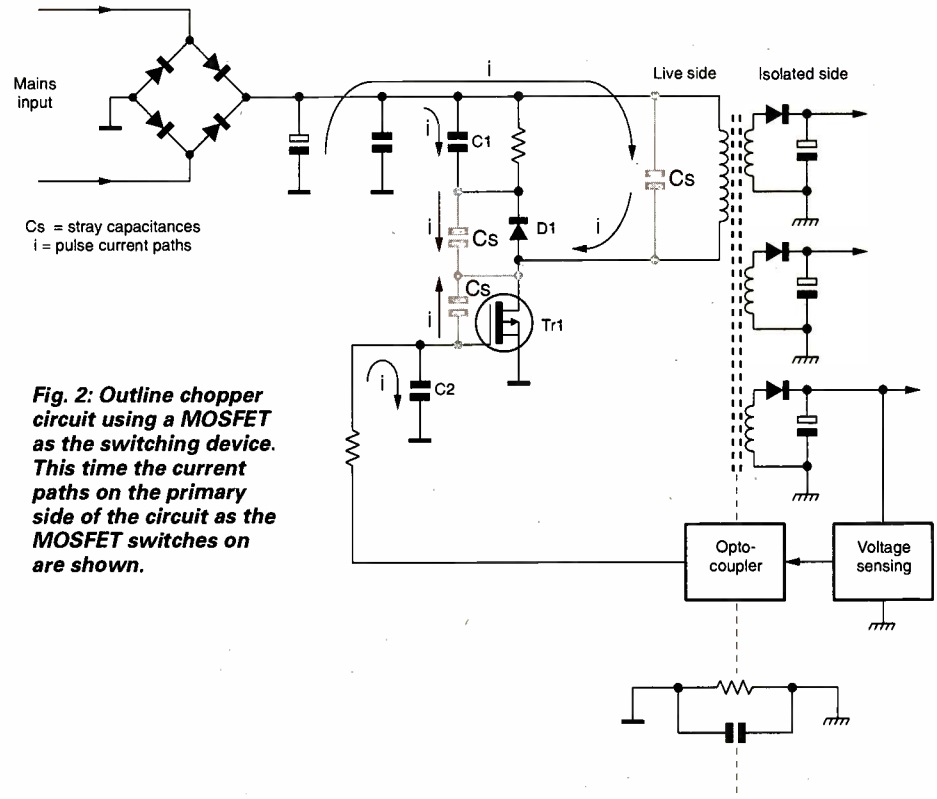


Fig. 2: Outline chopper circuit using a MOSFET as the switching device. This time the current paths on the primary side of the circuit as the MOSFET switches on are shown.

A practical example

Figs. 1 and 2 show a typical chopper circuit in outline form, using a discrete MOSFET to provide multiple DC outputs from a 230V mains supply. The loops that carry currents with high-frequency components on the primary side of the transformer are identified. Fig. 1 shows the current paths when the chopper device is switched off, Fig. 2 the current paths when the chopper device is switched on.

Taking these paths into account, Fig. 3 shows diagrammatically how the connections should be arranged in order to minimise loop areas and series-mode coupling between paths. The PCB should be laid out so that the tracks go to the star points and have minimum physical length. ■

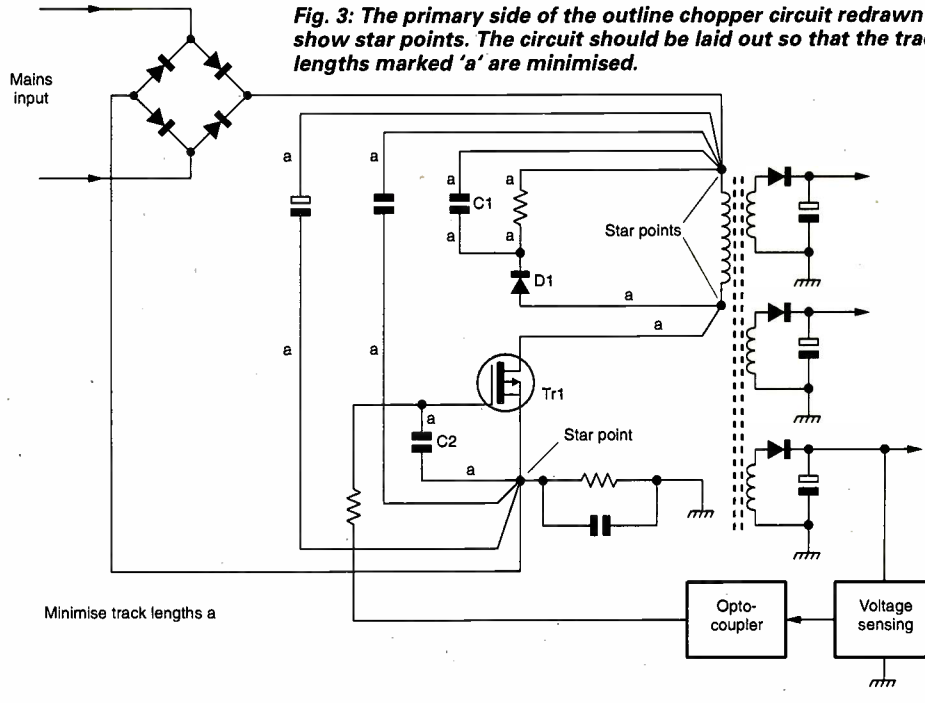
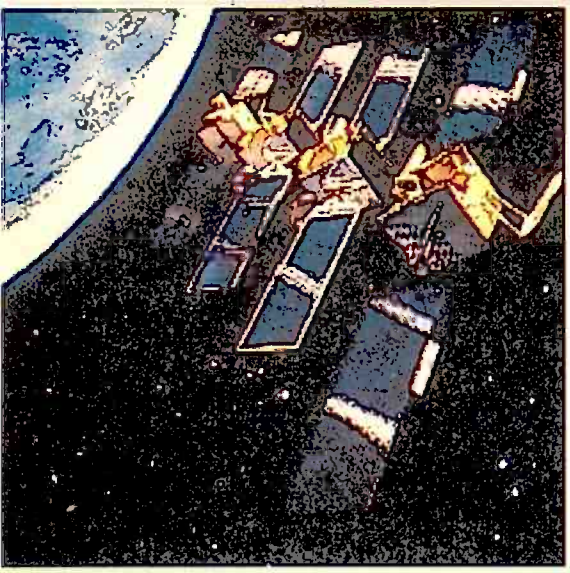


Fig. 3: The primary side of the outline chopper circuit redrawn to show star points. The circuit should be laid out so that the track lengths marked 'a' are minimised.



Terrestrial DX and satellite TV reception reports. News on terrestrial TV broadcast and satellite band changes. Meteor shower dates for 2001. Reviews of a web site for those interested in the history of TV and a book on the link between weather and VHF/UHF propagation conditions. Roger Bunney reports

DX and Satellite Reception

November was a good month for DX reception. The sunspot maximum is with us, F2-layer propagation was active on several days from late October onwards, and there was the bonus of the Leonids meteor shower.

Of all the meteor showers during the year, the Leonids is the most likely to produce enhanced signal reception. It peaked on 18th, with extensive 'pings' and longer-duration signals in Band I. When I checked ch. E2 with my scanner during the morning I found it alive with continuous pings. Cyril Willis (King's Lynn) also logged numerous pings and pictures in Band I during the 0730-0900 period on that Saturday.

But the star performer was the F2 layer. There have been reports of F2 reception in Australia, South Africa and here in Europe. An e-mail from Todd Emslie (Sydney, Australia) on October 31st alerted me to an opening. Between 0915-1055 GMT he received signals from the German TV transmitters at Beindenkopf and Gruenten, a distance of some 10,250 miles, also signals from an Italian radio amateur, IK5YJY, at 50·14MHz. The German transmitters were confirmed by scanner frequency measurements. China chs. C1 and C2 and Nakhon, Thailand ch. E2 were also received. This suggests that it should have been possible to receive the Australian Wagga Wagga ch. 0 (46·240035MHz) transmitter in Europe, though there have been no reports of such reception.

Ian Roberts (Johannesburg, South Africa) has been logging F2 reception and, more interestingly, regular evening TV reception from Europe via TE (transequatorial skip). His TE reception reached central European Band I transmitters, confirmed by using a high-quality scanner to measure the frequency.

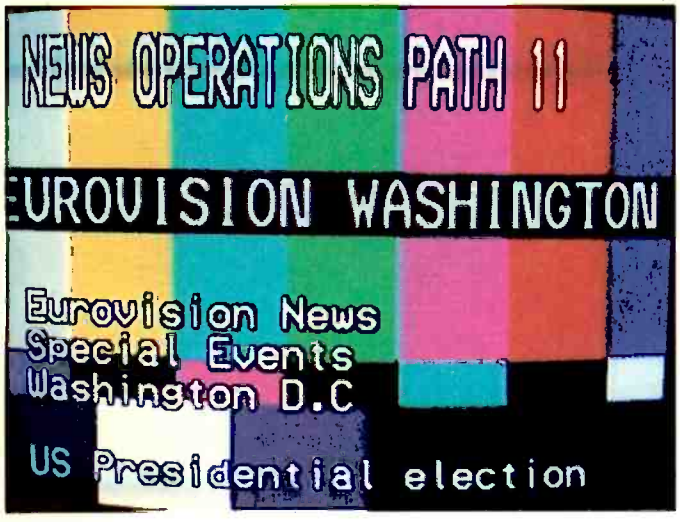
In the UK, Cyril Willis logged F2 signals on nine days to mid-November. Definite identifications included Syria ch. E2 on the 1st and IRIB TV2 (Iran) on the 2nd. On the 24th he checked six different E2 video carriers with his scanner: we hope for some identifications later.

Ryn Muntjewerff (The Netherlands) probably received China ch. C1 via early-morning F2.

For my part, I logged very strong F2 reception of ch. E2 signals on the 25th, with at least five different carriers present. I had relatively clear video with two ch. E2 carriers on the 30th, but unfortunately I had to leave for work at 0840 before I could identify them. I make a point of checking ch. 0 (Australia, 46·25MHz) and ch. 1 (NZ, 45·25MHz) but to date there has been not a buzz! While Cyril Willis at his rural location has no 49MHz interference to contend with, I'm swamped at my location in a modern housing estate – nothing is ever seen through the S9 +49dB sash on ch. R1.

The next few months could well be good for enhanced DX-TV. It will probably be the last opportunity ever for analogue VHF DX-TV via the F2 layer.

There was a minor Sporadic E opening on the evening of the 4th, with ch. E2 and E3 signals received from NRK (Norway). In all it was a very encouraging month. Hopefully there's more to come!



A US presidential election news feed via NSS K at 21·5°W.

Satellite sightings

If you are a student of American politics, November was an exciting month. The Atlantic airwaves were busy with elections, Florida recounts and White House press statements – not everyone's cup of tea. One bonus however was the larger than usual number of outside broadcasts from various US states. NSS K has been a main carrier of US political news and this meant that lesser used frequencies were fired up for other news items. On November 8th I found the 'Presidential Election – EBU Feed Path 11' at 11·533GHz H (SR 26,000, FEC 3/4). Just a little down the band, at 11·461GHz H (SR 6,116, FEC 3/4) there was, at 1820 GMT, an outside broadcast of horse racing from Dortmund, Germany. This was the first time I've seen floodlit horse racing. After a single race the transmission was cut.

The other significant US event was the visit of President Clinton to Hanoi from November 16th. Air

Force-1 duly arrived at Hanoi International Airport and the presidential motorcade made its way to Hanoi City. As with another recent Reuters transmission, the whole motorcade was covered from the tail vehicle using a hand-held camera – and included the casual internal car conversation of the FBI heavies! An historic moment, carried to the UK via the NSS K Reuters lease (11·533GHz H digital).

When I checked Arabsat 2A at 30·5°E on the 23rd there was, at Khartoum airport, another such event. An Arabic dignitary had arrived and was met with a guard of honour and massive, enthusiastic crowds. Unlike the manipulated Bill Clinton welcomes, with the crowds kept at a safe distance by the FBI, the Arabs tend to swamp a dignitary and his entourage with apparently no concern for safety. This reception was at 4·081GHz RHC, a favourite frequency for news feeds – this one for the JSC channel.

During a check on the 30th I found that the usually very strong Libyan TV channel at 4·167GHz RHC had disappeared. An exotic OB that night, at 4·077GHz RHC with background captions 'TIX-MAAL', turned out to be Radio Television Djibouti. Something must have been happening in the Arabic world, other than the Israeli/Palestinian conflict, as the evening of the 24th produced a live Arabic-language feed from Moscow via NSS K, on the RTV Moscow-1 circuit (11·556GHz H, SR 5,632, FEC 3/4).

More analogue signals have been seen via the rather elusive Eutelsat II F3 at 21·5°E. It's a difficult satellite to find because, depending on dish size, there can be signal interference from the adjacent high-powered Astra satellites at 19·2°E. At 11·578GHz V however I found, at 2230 GMT, a new TV channel, RTV-21. It went off air at about 2305 GMT. The audio was at 6·5MHz. It's a Balkan station based in Pristina: unfortunately the programme content is hardly inspiring, with scenes of despair and few happy faces.

SISLink is a regular user of II F3. Its coverage was prolific during the recent UK flooding. One morning Roy Carman noted SIS-35 (UKI 485) in the gales and wind at Selsey beach, SIS-12 (UKI 588) taking shots by a raging river, and SIS-14 (UKI 33) covering flood action. These were all digital Ku-band signals using the regular parameters SR 5,632 and FEC 3/4.

A few days earlier Roy had seen another news transfer from Moscow to the UK via II F3. The video package was from the HTB TV channel. It showed a very large oil platform called Regalia floating inshore near an Esso installation. Regalia was being prepared for towing to the Barents Sea to lift the wreck of the Russian Kursk submarine from the sea floor.

A reminder to you to check the analogue transmissions from Astra at 19·2°E, since both the Bayerischer Rundfunk channel and BR-Alpha carry their Space Night programming from about midnight UK time. On November 16th BR featured the launch, live, of PanAmSat PAS-1R into orbit, eventually to be positioned at 45°W to replace PAS-1, an old favourite that's now ageing fast.

Europe*Star-1 (45°E) has been seen on test at 11·447 and 11·489GHz H with a black level + syncs signal. Meanwhile Europe*Star-B has been parked alongside Eutelsat II F1 at 48°E: in late November analogue tests were being held at 12·220 and 12·765GHz V. I feel that the UK-based Europe*Star group will be marketing this slot aggressively now that it has so much satellite capacity above earth and fibre cabling below.

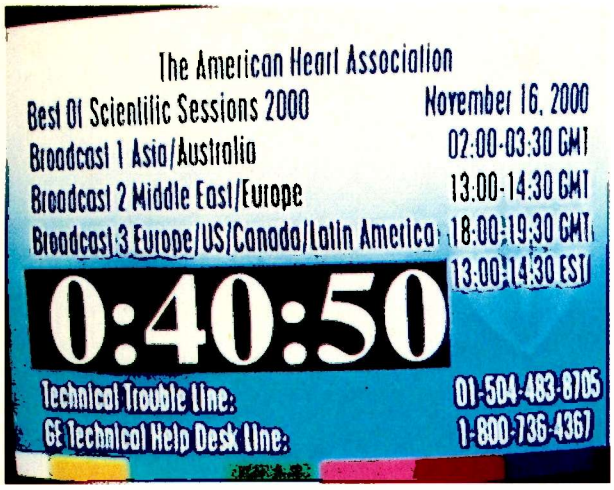
Broadcast news

Russia: On August 27th last the 320m high Ostankino TV tower in Moscow caught fire. As a result, most of the broadcasting and regional communications services were taken off air. The 26-hour fire started with a short-circuit in the silicone-insulated coaxial feeders for the NTV transmitters, then spread down to the 60m level. A three-hour delay in switching off the power didn't help. The fire was eventually put out by cutting the feeders above and below the hot spot. The transmitters at a lower level are OK, but repairs and rewiring will take a year.

Meanwhile services across the Moscow region have been maintained by using temporary masts and sites. The NTV service is using the TNT/Stolitsa Channel's site at Oktyabrskoye Pole, with a 150m mast and 100W ch. R5 transmitter. A 147m mast has been erected at the Ostankino site for the national service All Russia State TV and Radio Broadcasting Company (VGTRK), and a temporary transmitter is being installed at Balaskikha. ORT national broadcasts are also operating in Band III from the 147m mast at Ostankino.

USA: There is continued pressure from the industry to adopt the COFDM digital transmission system instead of 8-VSB. On-air tests to compare the two systems are at present being held in Washington.

The US and North Vietnamese flags flying together over Hanoi International Airport, an historical sighting via NSS K.



Count-down clock for medical enthusiasts.

By last September 148 TV stations were using 8-VSB, covering some 64 per cent of the country. Interesting that the number one commercial market New York had only two digital stations while the number two market Los Angeles had nine, the number three market Chicago three and the number four market Philadelphia seven.

Australia: Networks 7, 9 and 10 were due to go on air digitally on January 1st. Manufacturers seem to be slow to show interest in providing digital STBs because of Australia's unique DTV standard, COFDM with HDTV and SDTV and two additional digital audio transmissions, using the Band III and UHF spectrums. Networks want STBs quick and cheap, at about the Aus$500 level. There are unlikely to be many Australian digital TV viewers initially.

New Zealand: No decision on when to go digital, or the standard to adopt, has so far been taken.

Ku-band reception from the PAS-2 satellite in Auckland is being marred by high-level 900MHz transmissions from mobile phone service masts. These get picked up by down-feeder cables and overload the receiver's tuner. The problem has been experienced in the UK at distances of about 100m from a large Cellphone mast. Use of high-quality, double-screened coaxial cable helps, but the mast supplier should be approached when this problem is experienced.

Identifications: RAI (Italy) now has a corner identification, resembling a butterfly, that's present throughout programming other than news. The Latvian second channel LVT-2 is using colour bars with an inlaid identification LATVIJAS TV 2 in white letters on a black bar. SVT-1 Sweden is using the Philips PM5534 pattern with SVT-1 at the top and SVERIDGE lower down.

Radio: The Wireless Group has joined Delta 171. The two intend to set up an offshore radio station, on a sea platform, about twenty miles from the Dutch coast, transmitting programmes to the UK to rival the BBC's Radio 2. Radio station 171 The Lounge is expected to open in 2002, with analogue transmissions at 171kHz, and be licensed by the Dutch government.

Satellite news

Intelsat has initiated POR (Pacific Ocean Region) orbital changes to cater for increased demand. Satellite 702 has been moved to 176°E, and 602 is to operate in slightly inclined orbit at 178°E until the launch of 705 in 2003. 802 and 701 are to remain at 174°E and 180°E respectively. The four satellites will now operate with 2° instead of 3° spacing: this will require more accurate dish alignment, especially for C-band operation.

Privatisation of Intelsat is to be completed on July 18th, 2001. All assets will be transferred to a Bermuda-based holding company; C/Ku-band satellite licences will be transferred to Intelsat LLC in Delaware; and Ka/V/BSS band authorisations will be licensed to Intelsat Ltd. in the UK. The main service operation will remain at the current Intelsat HQ building in Washington.

AsiaSat-5 will be launched in 2002, taking up position alongside AsiaSat-3A at 105·5°E. It will have C- and Ku-band transponders. Interesting that the C-band coverage will be extended down to 3·4GHz at the low end, instead of 3·6GHz as at present. The high-end limit will remain at 4·2°.

Hot Bird 5 at 13°E now carries the World Radio Network multiplex, which consists of forty radio channels from across the world, with music, speech, news and business information in unencrypted digital form. The multiplex is uplinked via France Telecom's globecast facilities. For further information phone (+44) 171 896 9000.

Europe*Star is increasing capacity at 45-48°E (see satellite sightings earlier) and further action is planned at 5°W an old Telecom slot, with the launch of the STELLAT craft in April 2002. It will have ten C-band and 35 Ku-band transponders to provide video/data/internet capacity across Europe, North Africa, the Middle East, Africa and North America (east). Stellat is a partnership between France Telecom and Europe*Star.

SES and Deutsche Telekom have signed an agreement to launch Astra 3A in spring 2002. It will take up position at 23·5°E, the old Kopernikus slot, with twenty Ku-band transponders to provide digital cable TV links and internet capacity.

Eurogay plans to set up a satellite radio station to serve Europe's gay community from a studio in Hamburg, starting in July 2001. Negotiations are currently taking place for capacity via Astra at

Meteor showers – 2001

Our thanks to Neil Bone, director, meteor section, of the British Astronomical Association for providing the following information on the meteor shower periods for 2001.

Shower	*Overall dates*	*Peaking*
Quadrantids	January 1st-6th	January 3rd
Lyrids	April 19-25th	April 22nd
Eta Aquarids	April 24-May 20th	May 4-5th
Cetids	May 7-June 9th	May 14-25th
Delta Aquarids	July 15-August 20th	July 29th and August 6th
Perseids	July 23rd-August 20th	August 12th
Orionids	October 16-27th	October 20th-22nd
Taurids	October 20-November 30th	November 3rd-5th
Leonids	November 15-20th	November 17-18th
Geminids	December 7-17th	December 12-14th
Ursids	December 17-25th	December 22nd

The Giacobinids will be inactive this year. As in the past the most active shower will be the Leonids. In 2000 it produced good level signal pings on November 17th and 18th. Unfortunately the clouds and rain didn't allow successful visual sightings, but the low VHF channels were very active, with high ping levels that produced the usual picture flashes.

19·2°E. Eurogay radio also intends to provide an FM regional terrestrial radio service across all sixteen German states.

Internet site – TV memorabilia

A friend recently suggested that I check the internet site www.meldrum.co.uk, which is organised by Louis Meldrum. Those interested in the days of 405-line TV in particular could spend hours there. Many routes can be selected: test cards and tuning captions from the originals up to the present 16:9 ones; pictures of studios, equipment and OBs; and histories of the BBC and the various ITV companies over the years.

I'm familiar with airborne TV over Vietnam in the late Sixties. In addition the site describes, with pictures, a UHF educational airborne TV project in the USA in 1961-66. It provided TV over a 250-mile radius, circling over Montpelier, Indiana.

Having worked for thirty years for both Southern TV and TVS I found it fascinating to relive the pictures and sounds of these two companies. But if your interest is Rediffusion, ATV, Harlech, Border or any other company it's all there.

The content is mainly from 1990 back to the mid 1950s and includes images of early Emitrons and Ally Pally. Interesting to see some of the information concerning the 1992 ITV franchise farce, when financiers took over from programme makers and entertainers. The site continues to expand, with contributions from many folk involved in those days. If you have access to the internet and were involved with TV in any way over the last sixty years, this is a site you've really got to visit.

Book review

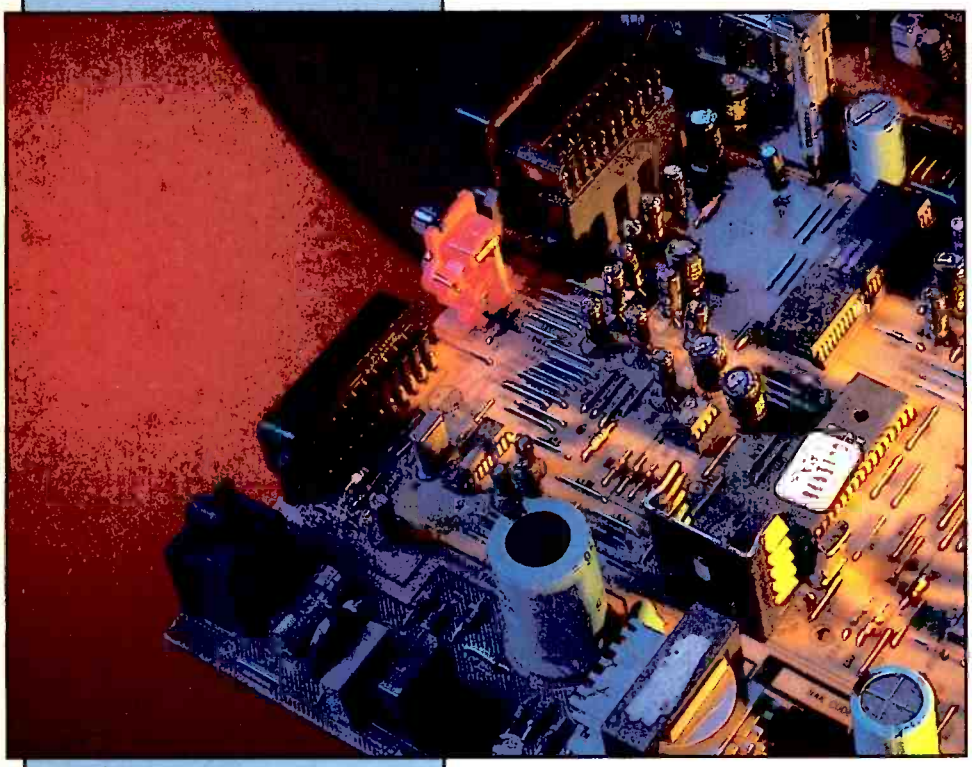
Austin Uden is well known to established DXers, having edited an FM band DX reception column, FM Diary, in *Hi-Fi News* magazine. His interest in VHF propagation, both tropospheric and ionospheric, has continued over the years. He has now published a slim booklet, *The Barometer and DX*. It discusses in depth the mechanisms that give rise to enhanced tropospheric propagation. This involves the study of prevailing weather systems, the general anticyclonic situation and the highly relevant isobar charts.

DXers are aware that, with an anticyclonic system, VHF and UHF reception is generally enhanced parallel to the isobars, particularly on warm, still days with clear skies. As evening draws in, a temperature inversion occurs. Conditions peak again after dawn, and tend to fade away as the sun rises. Autumn openings were regular events some years back during late September and into October, often enhanced when dense fog was present. Austin's study and conclusions are based on close monitoring of barometric pressure. He compares specific weather systems with actual tropospheric propagation conditions.

The booklet is a study of how rising or falling barometric pressure can affect tropospheric propagation, using overall prevailing weather maps to draw conclusions about reception possibilities – based on past experience.

Serious VHF and UHF DXers in Western Europe will find detailed insight into the subtle variations in tropospheric propagation, with guidance on short-term forecasting of improving conditions.

The Barometer and DX by Austin Uden is an 18-page, A4-size booklet, spiral bound, with card and clear plastic covers. It's available at £7.50 including postage (crossed cheque/postal order) from A. Uden, 12 Hampden Close, Aylesbury, Bucks HP21 8NS.



SATELLITE WORKSHOP

JACK ARMSTRONG

Pace MSS500

Hans Bauermann stared balefully at the rear wall of my house. I had called him because water was dripping from the kitchen ceiling, above the door. It seemed to be coming from the RSJ support beam and was leaving a rusty trail down the inside of the wall.

"Unverbesserlich!" he grunted to himself, "dummkopf!"

"Can you see what's wrong?" I asked.

"Ja, stimmt! Zum eedeeat haf drilled ze hole srough ze mortar, unt ze rainvasser goes in!"

He was pointing to my satellite dish mounting bracket. Sure enough, to fit the lower bolt some idiot had drilled into the mortar between the bricks. Hans went out to his van and returned with a large gun of sealant, which he squeezed into the hole before replacing the bolt.

"Zere, zat vill do it. You tell ze eedeeat he should not drill ze mortar." He leaned from his ladder and, to emphasise the point, tapped me on the head with his spanner.

I promised that I would tell the idiot, but wasn't about to tell him I did it myself. Especially as I'd written a book on satellite dish installation some years ago!

"How much do I owe you?"

"Ha! Chust vait here!" He stomped off to his van, carrying his ladders in one huge hand. Moments later he returned with a Pace MSS500 satellite receiver in his hand. "I haf just bought zis. He becomes no zatellite pictures" said Hans, waving his enormous hands in the air like an Italian policeman.

"Okay, I'll fix it."

"See zat you do" Hans said rather menacingly.

I'm sure he was just being friendly when he gave me another poke with his spanner.

When I tried the receiver out on the workbench I found that it didn't light up. I looked inside and found a very black fuse. This indicated the need for Satkit 10. I fitted the parts in the kit and also replaced C2, the large 100µF, 400V reservoir capacitor for the mains bridge rectifier. According to my Genie ESR meter it was open-circuit.

But the power supply remained stubbornly dead. Very unusual. Close inspection of the components and tracks failed to reveal any defect, so I resorted to measuring every component. As a result I found two open-circuit surface-mounted resistors, R803 (470Ω) and R10 (1kΩ). Replacements cured the fault, and the receiver then worked perfectly.

I've never known C2 to fail on any previous occasion. Maybe the demise of the two resistors had something to do with it.

When Hans returned to collect his receiver he was extremely pleased. I could tell by the affectionate way in which he tapped my head with his hammer and called me "Schweinhund!"

A Pace D150 D2MAC decoder

I don't normally see any of these nowadays, but Dieter sent me an e-mail from Austria. He had fitted Satkit 6 and the repair had been unsuccessful.

Unfortunately, being a perfectionist, Dieter had decided to replace R212, which looked rather brown.

"After I replaced R212 with a 100Ω, 2W resistor my power supply exploded!" he wrote.

I'm not surprised. R212 is a 100kΩ resistor rated at 350V. Definitely not 100Ω!

The Grundig GDS200 Digibox

I've mentioned capacitor failure in this model's power supply on several occasions now. SatCure has introduced Relkit 33a for the early version of the power supply, in which the large capacitor C1 has a label with "Model D50-0385" and a small label marked "271007 D1" or "Grundig P/No 271008".

It's very easy to make a mistake and fit a capacitor the wrong way round. So, if you are in any doubt about your ability, don't even attempt the repair. Contact the experts, Genserve, in Swindon (phone no. 01793 886 333), who will repair it for you. SatCure can be contacted for kits via its web site at http://www.satcure.co.uk

Please don't phone for a catalogue or information – all the information you need is at the web site.

The Panasonic TU-DSB30 BSkyB digibox

Panasonic digiboxes are much favoured by enthusiasts for two reasons. First, the processor is very fast, so the receiver changes channels very quickly in comparison with other BSkyB digiboxes. Secondly the tuner is very sensitive and can tolerate wide signal-strength variations, so it's suitable for use in parts of Europe where other digiboxes won't work. This applies to the DSB20 and DSB30 but, apparently, not to the later DSB31.

Because the processor runs so fast it has a heatsink, but no fan. I've heard of processors failing, so maybe a fan would be a good idea. Most failures seem to occur in the power supply however. They would be simple to fix if Panasonic would kindly

supply a circuit diagram and spare parts. Unfortunately I've been unable to get either, so I'm forced to guess. This situation is not ideal, because a wrong guess could affect the safety of equipment. I do advise customers to take their receivers to an authorised Panasonic agent but, since they know that I've repaired tens of thousands of satellite receivers and written books on the subject, some customers insist on paying me to 'have a go'.

Juan brought his receiver all the way from Spain for me to look at because it was 'dead'.

"A seemple fault, Senor Armstrong. You feex him in a minute!"

The power supply whistled, but there were no lights and almost no output voltages. The cause was fairly obvious once I'd made some DC measurements (with the power supply disconnected!). Zener diode D814 was short-circuit. It's clearly a protection zener diode for the 3·25V supply, but I was concerned that it might have failed when *all* the output voltages had gone high. So I removed it and disconnected the power supply from the motherboard.

My fears were unfounded: the power supply now produced the correct voltages, and the regulation was perfect. All the electrolytic capacitors produced very low ESR readings when checked. I have no idea as to the zener diode type. The marking appeared to be '1B25'. I would guess that a 3·25V supply would be protected by a 3·6V zener diode, but I don't stock these. So I fitted a 3·9V zener diode rated at 1W. Juan paid me for the repair and took the digibox back home, so I think it must still be working.

I've had e-mails from others who have diagnosed the cause of power supply failure but cannot obtain parts. One needs the optocoupler 'PC801' which is marked, on successive horizontal lines, 8F, P721F and 4 8.

Another fault report that came to me by e-mail relates to transistor Q203 on the power supply board. Curiously, all the transistors in the power supply I have are labelled Q8XX, so I'm puzzled about this.

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems by e-mail. You can reach him via the internet web site at:

http://www.ukstay.com/jack

If you have no internet access you can write to him c/o Television, Room L514, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps.

The transistor is a KTA1281 (pnp type in TO92 case) and is labelled 'A12 81 Y K013'. When it fails, the LNB voltage rises to 33V! The board appears to have been made by Samsung. The transistor itself is made by KEC semiconductors. A TIP32A might do the job.

Test Case 458

Pam, our girl Friday, listened impassively to a stream of invective over the phone. It appeared that Mr Dale's TV set was just out of guarantee and had no sound or colour. Convinced that the manufacturer had rigged the set to do just that, this irate customer demanded to know what we were going to do about it? And when? Pam promised to send Doc Colin that very day. Doc, Pam and the others in the Test Case workshop don't make television sets, don't break them and have no pleasure or profit from their problems! Even so, it seemed that all the sins of the world were ours, and Colin received a very frosty reception at Primrose Walk.

The set concerned was a large-screen Samsung Model WI28W6 (S51A chassis) and, yes, it had been bought just over a year ago. There was indeed no sound and no colour though the set seemed to be OK in every other respect except, perhaps, the beam landing – with bright colours there was slight staining at one corner of the screen. Colin turned up the sound: at high settings there was enough background noise to indicate that the audio amplifiers and loudspeakers were working. He then turned up the colour. There was no change in the back-and-white picture on the screen. He pulled out the mains plug and listened to Mr Dale grumbling and whining about his TV set for four minutes before restoring power to get a reset. As this brought no relief to the symptoms, Colin took the set out to the van and drove off to the workshop with it, glad to be away from Mr Dale.

It was hustled straight on to TechnoCrat's bench. Why do the nastiest people get the best service? Just to keep them off the phone, perhaps. With the back off the set, TC saw that the colour purity was OK now that it had been switched on from cold. But the colour and sound were still absent. He started by making some checks in the audio department and found that although power was present nothing emerged from the TDA7297 audio amplifier chip. Nor indeed was anything reaching it from the TDA9859 sound processor chip.

Drawing a blank here, and wondering whether there was some link between the two symptoms, TC phoned Mr Dale to enquire whether they had both appeared at the same time. After ten minutes he was fully acquainted with Mr Dale's opinion of the set, the manufacturer, the fact that the set had not yet been repaired, what it had cost, how the salesman had known it would go wrong because he tried to sell him an extended warranty, and more. Eventually, with an ear like a roast chop, TC learnt that both symptoms had indeed developed simultaneously. The set had been OK when it had been switched off one evening. It had come on without sound or colour the next evening.

What common element could there be here? TC looked at the colour decoder section, which is centred on the TDA8844 IC. This chip does everything, video-signal wise, from the IF bandpass-shaping SAW filter to the drives for the RGB output stages. Might it be faulty? If so what about the lack of sound? The TDA8844 chip is not involved with this.

In fact TechnoCrat was barking up the wrong trees. There was a common cause of the two symptoms. What was it, and where was the root of the trouble to be found? For the solution, turn to page 249.

VCR CLINIC

Reports from
Philip Blundell, AMIIE
Graham Richards
Michael Dranfield
Kevin Green, TMIIE
Geoff Butcher
John Poulton and
M. Della Verita

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 246 for where and how to send reports.

Panasonic NVL25
For a smeary picture with poor sync and intermittently muting sound check C7651 (10µF, 16V). It's a bipolar electrolytic. **P.B.**

Toshiba V109B
If there's no lift or deck operation though the clock is working, check the STK7253 chip in the power supply for missing outputs. **P.B.**

Panasonic NVFS100B
If there's no S-VHS playback, check for video at pin 7 of the hybrid chip IC303 on the luminance/chrominance pack. The IC is suspect if the video signal is present at pin 2 but not at pin 7. Its part number is VEFH05. But first replace the surface-mounted capacitors on the hybrid and check the tracks around them for corrosion. It worked for me! **P.B.**

Mitsubishi HS721-V-B (U deck)
We've had several of these machines in which the lift levers have broken. The part numbers are as follows: F/L arm L 515C001030 (WVE code 77641BA), F/L arm R 515C001040 (WVE code 77641AA). **P.B.**

Mitsubishi HSB29
The playback pictures lacked detail and the contrast was low. In addition picture mute would intermittently operate, going to a blue raster. Use of heat and freezer indicated that the cause of the fault was near the BA7255BS chip IC2A0 on the top PCB. In fact C204 and C284 (both 10µF, 50V) were leaking electrolyte. Replacements cured the faults. **G.R.**

Sanyo VHR276E
No picture playback and no E-E, just a blank screen, are the symptoms when the 12V supply is missing. The usual cause is that R5110, a 27Ω Sanyo safety component, is open-circuit.

Dry-joints at the chopper transformer can be the cause of its demise. **G.R.**

Hitachi VTF860
Intermittent appearance of the on-screen display during playback etc. was the complaint with this machine. The cause was found to be the M50458 OSD generator chip IC1401. **G.R.**

Daewoo V50
If the power supply is completely dead, check C53 (1µF, 100V) on the power supply sub-PCB. The replacement must be a 105°C type. **G.R.**

Goodmans VN6000
If the machine won't switch on and the clock flashes on or off, go straight for C822 (330µF, 10V). The voltage reading across this capacitor should be 5·8V. If the voltage is slightly low, the capacitor is faulty. **G.R.**

Akai VSA650
This top-of-the-range VCR had already been to two other dealers. The first one had made the problem worse while the second one said that a new power supply would be required, at a cost of £140.

These VCRs have a quite complicated chopper power supply. I found that the machine was dead and that the 2·2Ω thermistor TH1 had been replaced with a 3W wirewound resistor, which was smoking. In addition lots of electrolytic capacitors had been replaced and the print was damaged.

A check at the base of TR20 suggested that its on time was too long. The cause was C24 (22µF, 50V) in the error amplifier circuit. It had dried out, with the result that TR17 was on for too long.

This wasn't the end of the story however. The 40V supply was low at 20V because the 1·5mH storage inductor L6 had shorted turns. A replacement was required.

And finally the screening plate from behind the power supply was missing. This machine will not function correctly without it, as switching radiation from the inductors is picked up by the head amplifier. A plastic coated screening plate from an old satellite decoder was cut to size and pressed into service. **M.D.**

Hitachi VTF860
There was a disturbance on the screen when this machine loaded or unloaded a tape. The cause was traced to C12 (470µF, 16V) in the power supply. It was open-circuit. **M.D.**

Toshiba V213B
This machine's power supply had blown up. The cause was failure of the three electrolytic capacitors on the primary side of the chopper circuit. Once the power supply was up and running I found that the machine had difficulty loading a tape, either in or out. The tape would jerk violently. More capacitors I thought, as the motor supply voltage bounced up an down with the jerking. I was wrong however: the loading motor was faulty. It read only 10Ω. A new motor produced a reading of over 200Ω and rotated when connected to an ohmmeter. **M.D.**

Panasonic NVSD44
This machine was brought to us because of a power supply problem. The cause was quickly traced to D14 and D15, both of which were open-circuit. As a result there was no 12V supply. There was more to it than that however, as the tuner/RF booster was found to have an internal short. I was

lucky: the cause was simply a solder bridge in the tuner. **K.G.**

Panasonic NVFS88

We had many hours of fun with this machine before finding the cause of the problem. The VCR would run for some five-six seconds then stop, but this happened only in the record mode. The cause was failure of transistor Q4004. **K.G.**

Samsung SV421K

This machine would chew the tape very nicely when rewind was selected – it would emit a very loud crunch as it reached the start of the tape. After many checks the cause of the fault was found to be C240, which is a small surface-mounted capacitor. **K.G.**

Ferguson FV77HV

This VCR behaved very strangely. When a tape was inserted it would thread up, go into a fast play mode for a few seconds then stop. After that no functions worked. If the machine was switched off at the mains then switched on again, with a tape already inserted, it would fast wind in either direction and the channels could be changed normally. If play was selected however the tape would start to run much too fast for a few seconds, with a bit of a straining noise from the mechanism. It would then gradually slow down and stop, with all the functions locked up as before. If the machine was stood on its end it worked normally!

To cut a long story short, I found that the retaining circlip on the capstan spindle was missing. As a result the capstan rotor dropped down slightly. This presumably upset the capstan pulse generators. **G.B.**

Hitachi VTF770E

The customer complained about poor playback and recording. These turned out to be separate faults.

I decided to tackle the playback problem first. The machine would sometimes play back perfectly, but the picture was sometimes barely recognisable. On other occasions it was evident that the problem was to do with the head switching. When this was checked I found that the switching point varied each time a tape was loaded. The tacho pulse at pin 7 of IC601 was found to be low in amplitude at 1V p-p instead of 3·3V p-p. The cause was C1656, which read 2µF instead of 10µF (16V). A replacement capacitor plus head switching-point adjustment restored perfect playback.

The cause of the record problem was the AGC capacitor C5F (0·47µF) in the IF module. **J.P.**

Panasonic NVHD625B

The complaint with this machine was that it ejected the tapes. I had to replace the worm wheel, which had a few cracked teeth, the master main cam gear, the loading motor shaft and the mode switch.

The worm wheel had cracked teeth because the plastic loading motor PCB holder had snapped, so the PCB kept falling down. The worm wheel intermittently caught the main gear and snapped a few of its teeth. **M.D.V.**

JVC HRD960EK

This machine had apparently died while in use. Replacement of the following items brought it back to life: C28 (100µF, 63V, 105°C), C25 (47µF, 50V) and CP2 (N20). **M.D.V.**

Toshiba V813B

The complaint with this machine was tape chewing. I traced the cause to the capstan flywheel, which was cracked. This item is not available separately, so the capstan had to be replaced. Wiltsgrove seemed to offer the best price. I also replaced the usual belts and the pinch roller. **M.D.V.**

BCE 2000 on foot . .

John P. LeJeune reports on the 2000 Broadband Cable Show

London Olympia's Grand Hall was tightly packed with stands during the annual Broadband Cable Show, and the mezzanine floor accommodated a sizeable overflow. It was a particularly important show this time because, following the demise of the Cable Communications Association, there was no Cable & Satellite Mediacast and ECC. Mediacast should be back at a new venue, Dockland's ExCel, this May.

Broadband cable is increasingly important as the demand for more and more bandwidth for data services and the delivery of electronic entertainment to the home escalates. For most people cable TV is the most familiar application. It was a prominent feature of the exhibition. The start of digital cable TV in the UK has given the industry a leading position throughout the world: UK engineers are in demand internationally for their knowledge, experience and expertise. This was evident at the Society of Cable Telecommunication Engineers' stand – there was complete take-up of membership application forms during the first two days of the show. The Society's recent incursion into continental Europe is further evidence of the appeal of UK engineering excellence beyond our shores.

There were exhibitors from many countries, in particular Germany and the USA. Far Eastern countries are beginning to take an interest, and there was a smattering of stands from the rest of Europe. Although the show is in no way comparable to the International Broadcasting Convention held each year in Amsterdam – the scope is not nearly so wide for one thing – it does have the makings of a major event for cable telecommunications away from the giant US conventions.

In addition to TV, the uses of cable covered by the show included telephony and data transmission. The technology includes fibre optics, which is fast becoming the principal carrier of high-speed data around the globe.

Exhibitors

Large and small companies were present, and some of the smaller companies revealed gems of electronic engineering. Swires Research of Basildon, Essex, was amongst the smaller UK companies present, with a hand-held, battery-powered 64-QAM analyser. 64-QAM is the modulation system used for digital cable TV. The analyser produces a 'constellation' display of the 64 phase/amplitude states and is an aid to the diagnosis of noise, interference and modulation errors.

Tratec Telecom B.V. of Holland's eye-catching stand displayed a range of cable TV products. This company is concentrating on the 'home network' and the interference and noise problems that such networks can introduce. Its Multi-Service Box provides three broadband outputs for TV and FM, three connections for modems and a telephone connection. Excellent isolation between all connections ensures minimal interference, cross-coupling and noise injection back into a CATV network.

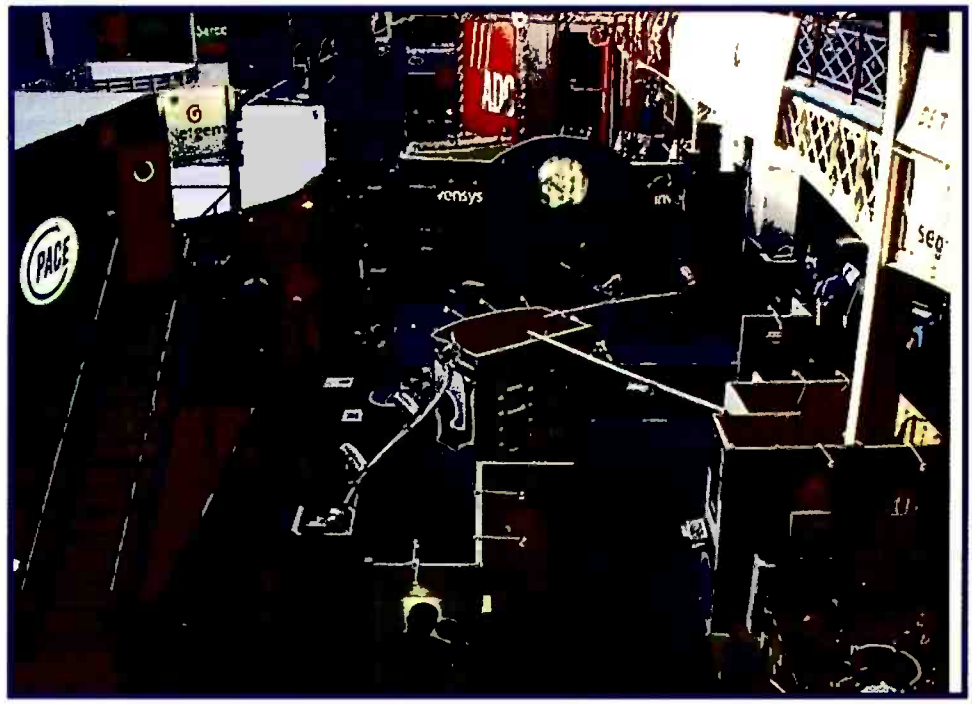
Philips, with its Magnavox brand, has been manufacturing cable communications equipment for many years. The Philips-branded Spectra-Hub network technique, using DWDM (Dense Wavelength Division Multiplexing), enables existing fibre-optic networks to be rapidly updated to provide vastly increased carrying capacity. DWDM is analogous to frequency-division multiplexing: infra-red light beams of different wavelengths are transmitted simultaneously along a fibre. Philips claims that this can increase transmission capacity a hundred-fold.

Wisi, known for its head-end equipment, showed a full range of analogue and digital head-end processing systems. The latest is the Topline Headend II.

Pace had the same stand as at the IBC. The company is a leader

in set-top box technology – design, manufacture and new concepts. It sees the internet as being a provider of streamed video entertainment, which raises the issue of performing rights and thus conditional access. Pace considers scrambled services via the internet, accessible only via a set-top box under the control of the service provider, to be a prospect for the near future. Global broadcasting via very high-speed data is another prospect as bandwidth availability increases exponentially. According to Pace the set-top box will evolve to become a 'residential gateway', the hub of a home network.

Scientific Atlanta describes its Explorer 6000 digital set-top box as a home gateway in that it can provide internet access, telephony and e-mail via a cordless phone and the Ericsson Screen Phone. It is compatible with a Bluetooth base station, and can connect with USB and FireWire.



Delivering the signals

New ways of delivering digital signals via cable have been developed over the past few years. For many telephone subscribers, xDSL systems – ASDL for high-speed data access to the internet and VDSL for even higher-speed applications such as VOD (video on demand) – will be the best way to link up.

The telephone system deregulation that commenced in January 1998 did not include the 'local loop', which connects subscribers to the exchange – this has remained totally under the control of BT. But this year will see the final deregulation steps, allowing competitors to provide the local loop. They should lead to some interesting prices and additional services. BT is at present rolling out its ADSL service and appears to be more than ready to meet the stiff competition that's likely to follow total deregulation.

In conclusion

The prospect of fibre-optic cables bringing signals right to the home was prominent at BCE 2000. It was predicted that several networks with this degree of fibre extension would come into operation during 2002. The only copper would be from the interface unit to the hardware indoors. An era of phenomenal data transfer speeds, possibly global, would thus begin.

It's not the end for copper though. Technologies like ADSL and VDSL are new and one can expect further development with them. Telephone and Cable TV companies throughout the world have invested heavily in copper networks and will welcome new technology to enhance them.

But the real advances will come in the fibre-optic field. The technology is relatively new and has tremendous potential for development. We live in exciting times! ■

Service notes on the Sharp BCTV-A chassis

We've had a fair number of these sets pass through our hands. They include Models DV5935, DV5937 and DV6635. Most faults are caused by problems in the line output stage. Our experiences have been as follows:

Dead set with smell of burning: It's quite common to get a big burn up around R619/R632 (both 39Ω, 0·5W, R632 fused) in the line-scan coupling circuit. The cause is C619 (560nF, 250V). C604 (470nF, 250V) is often damaged as well. With a little care, it's possible to repair the damage. The line output transistor Q600 (2SD1546) usually also dies: if you are lucky, it will have died before the board damage is excessive. If the resistors burn up after your repair, replace L603 (3·3mH) which is sometimes damaged by the heat.

Dead set, Q600 short-circuit, R619/R632 OK: The usual cause of failure of the 2SD1546 line output transistor is dry-joints at the scan coils. Unplug the lead from the coils, unclip the small PCB, turn it over and resolder any obvious dry-joints. In one set the plug/socket was intermittent – this was cured by cutting the wire and soldering it directly to the reverse side of the board.

Power supply pulsing from cold: In every case we've found that C743 (330µF, 25V) was open-circuit. It's the reservoir capacitor for the supply to the MC44602 chopper control chip (IC700) in the power supply.

Field collapse: This is commonly caused by D601 (part no. DX0127CE) going open-circuit. It's the rectifier diode for the LOPT-derived 16V and 12V (via regulator IC600) supplies.

Rolling on-screen display: The cause is failure of C600 (100µF, 63V), the reservoir capacitor for the LOPT-derived 42V supply. You will find the voltage across C600 low.

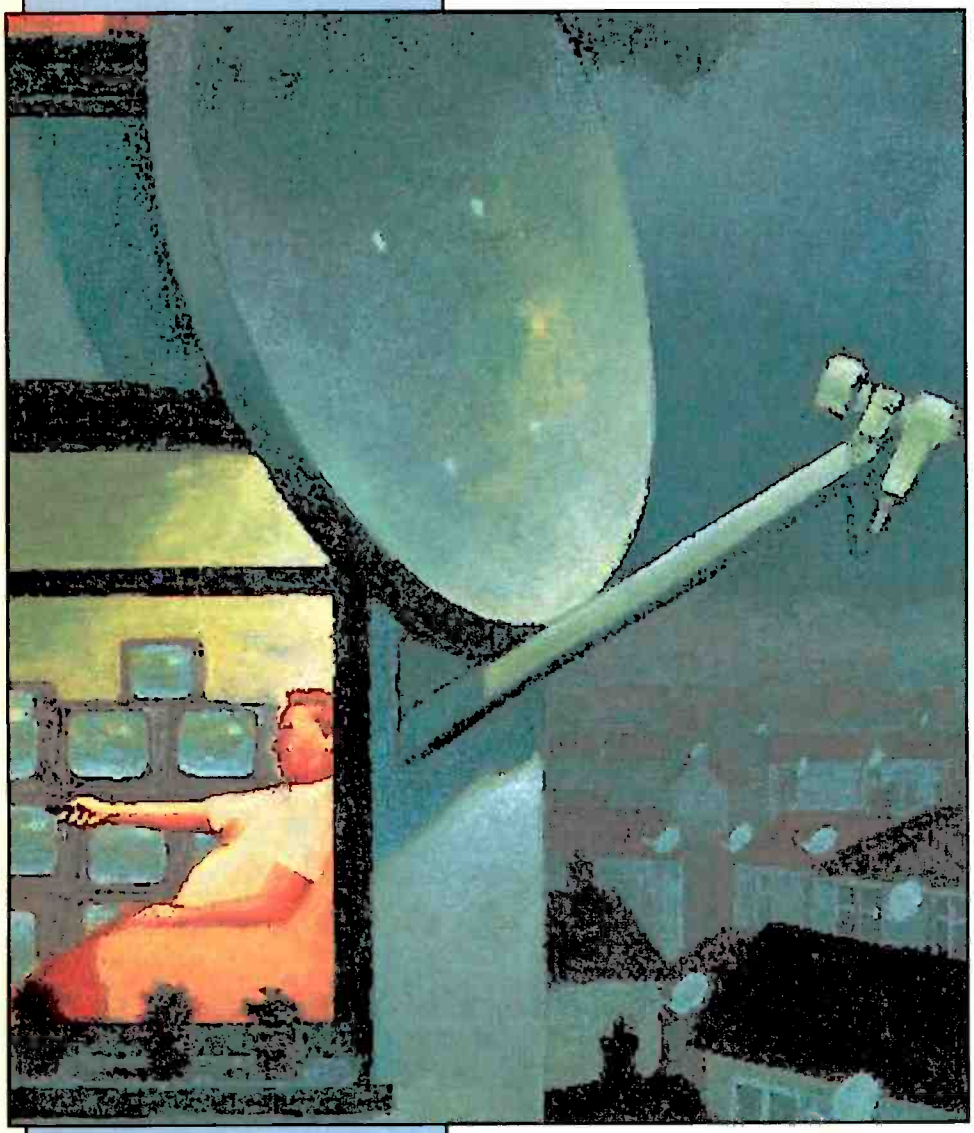
Bad pincushion distortion: Check C607 (560nF, 250V) in the line-scan coupling circuit and the EW diode modulator loading coil L604 (15mH).

Field 'unstable': Check C504 (0·47µF, 50V electrolytic) and the EW coil L604.

Field or pincushion problems: These can be caused by the TDA8350Q chip IC500 – it provides the field output and the drive to the EW diode modulator.

No picture: Can be IC500 again, supplying incorrect blanking pulses to the colour decoder circuit. The picture may be OK from cold then go off when the set has warmed up.

Report from Nigel Goodwin



SATELLITE NOTEBOOK

Reports from Pete Haylor and Christopher Holland

Connectors for digital TV

The need for interference-free connections has become very important with the advent of digital TV. I've looked in a number of catalogues but none have screened faceplates for satellite or terrestrial TV use. Several contributors to *Television* have in past issues provided their solutions to the problem. This is mine.

Anyone who has installed SkyDigital will have come across the TV link 'magic eye'. There are two connectors, one male and one female, in the pack. If they are not used when fitting the TV link they can be used as faceplate connectors to provide screened connections for either satellite or terrestrial digital TV feeds. They require modification before fitting however. The method I use is as follows: it calls for a pillar drill, a file, drill bits – and time!

Obtain a blanking faceplate and drill the hole/holes as required, using a suitable drill – I use a 3/8in. bit. Fit the thread end of the connector into the drill chuck and tighten carefully (to prevent damage to the thread). Hold the edge of the file against the knurled part of the connector: when the drill is running, the brass will start to come off at a steady rate. Stop from time to time and check whether the connector will now fit the hole drilled in the faceplate. The brass is not very thick, so proceed with care. To date I've had to scrap only one!

When you have 'machined' the connector so that it is the correct size, attach it with a locknut taken from an F coupler. You can buy these from several satellite/TV shops etc.

To date the best connector I've made is a triple one for a satellite digital TV feed from the dish, a terrestrial digital TV feed from the aerial and a Sky RF output to other TV sets. To give room for the cables, a twin blanking faceplate was used.

Use F plugs to connect the coaxial cables. If the box is deep enough, connect directly. If the box is too shallow, use right-angled adaptors (to prevent RF radiation, remember not to expose any of the inner cable). **P.H.**

SkyDigital Update

Where the signal from the dish has been checked and found to be OK, problems with SkyDigital reception are usually caused by coaxial cable deficiencies. Sometimes only certain frequencies are affected, with picture freezing/blocking on some channels.

The transponder listing in the table opposite shows channel allocations at the end of 2000 and will make it easier to check whether there is poor reception at certain frequencies. As before, the transponder number is in brackets after the frequency and the EPG number in brackets after the channel name.

Now that Astra 1D is active, the universal LNB has to switch to the low-band range (10·95-11·70GHz) when a low-band channel is selected from the EPG. I understand that some problems have been experienced with communal SMATV systems where a low-band output has not been connected to the magic switch which distributes the IF signal to individual receivers, the result being a 'no signal' message display when a low-band channel is selected.

Astra 2A and 2B have northern and southern footprints which overlap in the UK.

In Wales, S4C is on EPG no. 104 and Channel 4 on 184: in other parts of the UK the numbers are reversed. The correct regional BBC1 and BBC Choice for the subscriber's postcode is on 101 and 160 respectively. Out-of-area BBC Choice regions are on chs. 964/5/6 and can be viewed normally: out-of-area BBC1 reception is blocked.

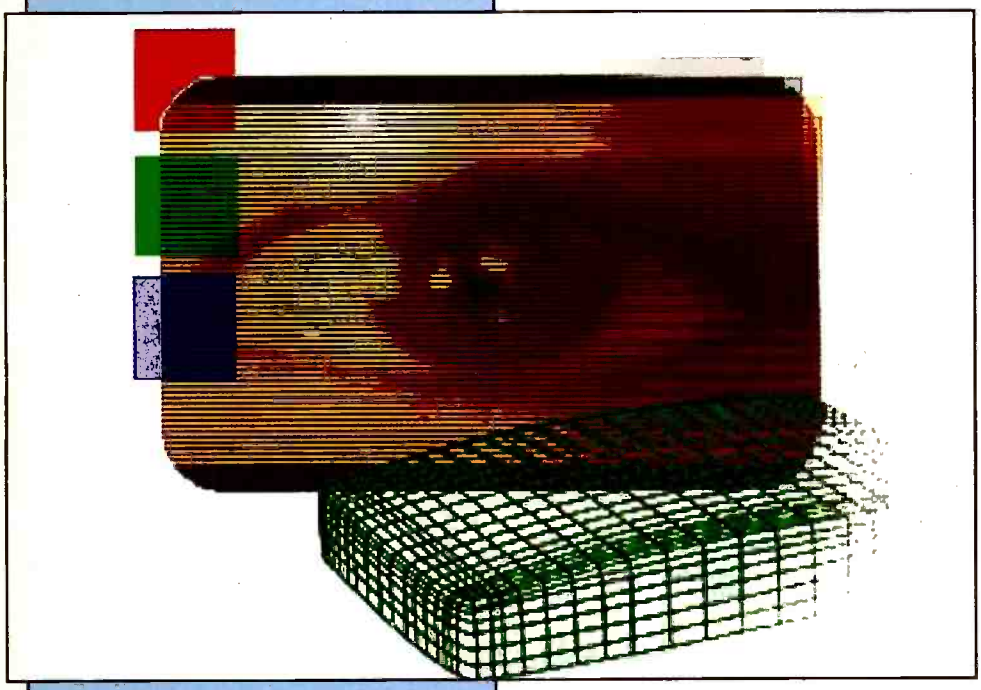
Astra 1D transmissions have a symbol rate of 22,000 with FEC 5/6. With Astra 2A and 2D the symbol rate is 27,500 and the FEC 2/3. Astra 2D was launched in late December to take over from 1D.

Eutelsat II F4 is now co-sited at the Astra 2 slot. If a digibox is tuned to 11,553GHz horizontal polarisation, with symbol rate 27,500 and FEC 3/4, various Czech signals will be found (a dish of at least 60cm will be needed). Most are encrypted, though two radio stations (Praha and Vitava) can be received by storing them in the digibox's extra-channels menu. **C.H.**

SkyDigital transponder listing

Frequency (GHz)	*Pol*	*Channels and EPG numbers*
10·862 (51) 1D	H	Disney (613), Disney Plus (614), Toon Disney (615), Playhouse Disney (616).
10·921 (55) 1D	H	Sky Travel (145), Tara (178), Hallmark (190), MUTV (410), Box Office channels (736-40), Playboy/Adult 974/981.
10·936 (56) 1D	V	Sky Sports Extra.
11·720 (1) 2A S	H	BBC1 England/N. Ireland (101), BBC2 (102), BBC Choice (160), News 24 (507), BBC Knowledge (573).
11·740 (2) 2A S	V	Living (112), Challenge (121), Bravo (124), Trouble (607), Travel Shop* (653), TVX Cable**, Test Card**.
11·758 (3) 2A N	H	Channel 4 (104), Channel 5 (105), Premier Widescreen (305), Film 4 (324), Sports 1 (401), Pheonix Chinese News* (673), Sports 1 Test**, Sports UEFA**.
11·778 (4) 2A N	V	ITV Background (103), Box Office 59 (759), Sky Box Office Widescreen 1 (760), Sky Box Office Widescreen 2 EPG Audio Track (761), Box Office 18 Plus (769).
11·798 (5) 2A S	H	BBC1 Wales/Scotland (101), BBC Choice Wales/Scotland/N. Ireland (160), all BBC radio stations. Radio 5 is encrypted, requiring a minimum free-to-air channel viewing card.
11·817 (6) 2A S	V	UK Gold (109), UK Gold 2 (110), UK Style (148), UK Arena (151), Play UK (452), UK Horizons (544).
11·836 (7) 2A N	H	Premier (301), MovieMax (308), Box Office 1-5 (701-5), Automotive channel**, Sky 1 Cable feed**.
11·856 (8) 2A N	V	Premier 2 (302), MovieMax 2 (309), Sports News (413), Nat Geographical (538), Box Office 6-9 (706-9).
11·876 (9) SA S	H	Discovery channels (133, 551-6 and 618), Animal Planet (570).
11·895 (10) 2A S	V	Paramount (127), Sci Fi (130), MTV and VH1 channels (440-6), Nick Junior (606), Service 9**.
11·914 (11) 2A N	H	Premier 3 (303), MovieMax 3 (310), Sports 3 (403), Box Office 11-15 (711-5), Sky Digital info UK (999), plus additional 'info' channels not in the EPG.
11·934 (12) 2A N	V	Premier 4 (304), MovieMax 4 (311), Sky Sports in pubs (401-3), Box Office 16-20 (716-20), Playboy/Adult (981), Retail Info (997).
11·954 (13) 2A S	H	Extreme Sports (422), Travel Shop 2 (634), Screenshop (645), Dating Channel (656), TVX (977), Testcard**.
11·973 (14) 2B S	V	Sony TV Asia (670), Zee Music (677), Zee Bangla (678), Bangla TV* (679), Pakistani TV* (680), Asia 1* (682), Channel East* (688), MBI* (698).
11·992 (15) 2B N	H	Open Shopping.
12·012 (16) 2B N	V	Open Shopping.
12·032 (17) 2B S	H	ITN News* (525), QVC* (630), Ideal World* (642), Bid up TV* (647), Travel Deals Direct* (648), TV Jobshop* (654), Lashkara* (691), ITN Radio* (943).
12·051 (18) 2A S	V	Travel* (181), TCM (327), Cartoon Network (601), Shop* (636), QVC UK* (650), CNN Radio * **.
12·070 (19) 2B N	H	Sky 1 Ireland*** (106), Cinema (315), Money Channel* (516), Cartoon Network + 1 hour (602), Box Office 21-5 (721-5).
12·090 (20) 2B N	V	Sky 1 UK (106), Rapture (187), Cinema 2 (316), Box Office 26-30 (726-30).
12·110 (21) 2B S	H	Channel Health* (193), Shop America* (646), U Direct Films (800-11), UCB Europe (940), UCB Cross Rhythm* (941), UCB Inspirational* (951), Red Hot Films (983), Red Hot Euro (984).
12·129 (22) 2A S	V	S4C (184), BBC Parliament* (508), S4C 2* (519), Simply Money* (522), Inspiration* (653), B4U (667), Zee TV (676).
12·148 (23) 2A N	H	Granada Plus (118), Bloomberg (504), Nick UK (604), Box Office 31-5 (731-5), Chanel Line up* (996), Info channel (999).
12·168 (24) 2A N	V	Channel 4 regional tests (Channel 4 is likely to vacate transponder 3 shortly).
12·188 (25) 2B S	H	Q* (455), Biography (563), Music Choice/2 Music Choice testcards** (851-86), Sky Digital Info Ireland** (999).
12·207 (26) 2B S	V	Sky News UK* (501), History Ch plus 1 (562).
12·226 (27) 2A N	H	Breeze (136), Men&Motors (139), Racing channel (416), History channel (541), Computer channel (547), Box Office 41-5 (741-5), Midnight Blue (980).
12·246 (28) 2B N	V	Open Shopping.
12·266 (29) 2B S	H	MovieMax 5 (312), Kiss TV (450), Fox Kids plus 1 (611), Box Ofice 49-53 (749-53), Retail info Ireland*** (997).
12·304 (31) 2B N	H	Open Shopping.
12·324 (32) 2B N	V	CNBC (510), Adventure 1 (560), Medical channel (902), Virgin Radio* (917), Talk Sport (918), Capital Gold* (923), XFM* (924), Youth FM* (935), Premier*/Sky News Radio** (938), Heart*/Costcutter * ** (939), Oneword* (942), Storm Live* (946), Primetime* (947), Sunrise* (948), Talk Gospel* (949).
12·363 (34) 2B S	V	Sky Business/Pub Channel (480), National Geo plus 1 (559), Nick Replay (605), Box Office channels (754-8 and 765-8).
12·382 (35) 2B N	H	Eurosport (419), The Box (449), Fox Kids (610), God Channel* (650), Box Office Preview (700), Box Office 46-8 (746-8).
12·402 (36) 2B N	V	Liberty TV* (202), Pin TV* (639), Gujari* (692), CEE(I) TV* (693), U Direct Preview (800), U Direct channels (812-6), Classic FM* (916), Classic Gold* (919), The Mix* (920), Planet Rock* (921), Core* (922), WRN Euromax (937), Solar Radio* (944), Panjab Radio* (945), Total Rock*/Family Radio* **/Family Radio International * ** (950).
12·422 (37) 2A S	H	Prime TV (685).
12·460 (39) 2B N	H	Sky Sports Extra (404).
12·480 (40) 2A N	V	Artsworld (199), MUTV (410), Sky News Ireland*** (501), Box Office preview (700).

1D = Astra 1D, 2A = Astra 2A, 2B = Astra 2B, N = North footprint, S = South footprint.
Transponder 4 is the receiver default transponder. The new Sky Text uses transponder 32. Transponders 30 (12·285GHz V), 33 (12·344GHz H) and 38 (12·441GHz V) are not at present used.
*Unencrypted. All other channels are encrypted.
**Channels not in EPG when a standard Sky Viewing Card is used.
***Digiboxes used in Ireland are blocked from receiving the UK terrestrial channels and instead receive alternate Sky News and Sky One feeds with local advertisements. Free-to-air BBC radio stations are also left off the EPG, with the exception of BBC World Service (926).



TV FAULT FINDING

Reports from
Michael Dranfield
Glyn Dickinson
Ian Bowden
Denis Foley
Graham Richards
Eugene Trundle
Geoff Butcher and
I. Levy, LCGI

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 246 for where and how to send reports.

Sony KV211XMU (AE1 chassis)

This set could be tuned in, but when the channel was changed after it had been on for an hour or so the stations would all be lost. If the set was left to cool down, they would all be back.

This suggested a problem around the M58655 memory chip IC003, and I found that its –30V supply fell to –15V when the fault occurred. A check with the circuit diagram showed that this supply is derived from the LOPT. I replaced the reservoir capacitor C826 and the smoothing capacitor C017 (both 10µF, 50V), but an hour later the problem was back. There's a small white coil (L807) with a parallel 10kΩ resistor (R830) in series with the rectifier diode. The coil had –30V at one end and –15V at the other: a puff of freezer on the coil cleared the fault.

It's not very often that you come across an intermittently open-circuit choke. One from a scrap board provided a lasting cure. **M.D.**

Bush 2850NTX-A (TV8 chassis)

These sets appear to be made by Schneider of Germany. The complaint with this one was no results. Some quick checks showed that the power supply lines were all in order – but note that they will be slightly low when the power supply is running unloaded.

I thought that the microcontroller chip IC702 was the cause of the trouble, because there was activity at the serial data and clock pins 40 and 41 for only about a second, after which activity ceased. There was 5V at pin 42, the voltage at the reset pin 33 was high, and the 8MHz clock was running (pins 31 and 32). So it appeared to be a fair bet that the IC was faulty. Wrong!

To cut a long story short (much time was wasted as the service manual contains no circuit description), the microcontroller chip must receive a sync pulse from the line timebase at pin 26 within one second of powering up, otherwise the serial data and clock lines will become inactive and the set will appear to be dead.

The problem was caused by transistor T301 (BC547B), which provides the input to the Darlington line driver transistor T309. It was leaky. Once a replacement had been fitted the set worked normally.

Loss of field sync at pin 27 of the microcontroller chip might also result in some sort of shutdown, but because of lack of time I've not been able to confirm this.

A word of warning about transistors T307, T304, T305 and T306 in the EW drive circuit. They all float on the voltage at the collector of the line output transistor: any voltage measurements here must be made with respect to the T307's source connection. In the interests of safety, a service manual should be obtained before one of these sets is serviced. **M.D.**

Ferguson C39F (Thomson TX90 chassis)

RL24 (2·2kΩ, 0·7W) in the line scan circuit was burnt to a crisp. Capacitor CP27, which is right behind RL24, had been melted by the heat. To be on the safe side I also decided to replace CL23 and CL24 (both 3·3µF, 160V). The cause of the damage had been a dry-joint at the line scan coupling capacitor CL26 (360nF, 250V). Because of this the scan current's earth path had been via RL24, CL23 and CL24. **M.D.**

Sharp 66DS03H

This set wouldn't respond to the remote or the on-board controls. A common cause of this complaint is failure of R704 and/or R705 (both 68kΩ) in the 5V supply to the slave microcontroller chip IC702. Not this time however. IC702 was processing the remote control data and feeding it to optocoupler IC704. A good 5V peak-to-peak serial data train was present at the LED section of IC704, but at the output side the pulses were at only 1V peak-to-peak. A replacement optocoupler made no difference, the 3·3kΩ pull-up resistor R102 was

OK and the 5V supply was spot on.

This left only the C161K main microcontroller chip IC101 as the suspect. When pin 74 (data input) was lifted, the amplitude of the serial data across R102 was restored to the correct level. Resistance checks at pin 74 produced readings of 200Ω both ways. Replacement of IC101 cured the fault. It's an 80-pin surface-mounted device. **M.D.**

Tatung 190 Series Chassis

This 14in. portable would come on OK, but the chopper transformer whistled very loudly. Then, after ten seconds or so, the set would revert to standby. A check on the 115V HT supply showed that the voltage rose to 150V in the standby mode.

The cause of the fault was the 47Ω, 4W wirewound resistor R827 on the primary side of the power supply. It's part of the FET chopper transistor's snubber network, and was open-circuit. Note that the snubber circuit differs in some versions of the chassis. **M.D.**

Philips 22GR9972

This set suffered from intermittent teletext. The cure was to reflow the connections to all the surface-mounted ceramic capacitors on the text PCB.

While the set was on test another problem occurred: the on-screen display flashed up "MONO F2" during reception of a Nicam signal. Close inspection of the Nicam PCB revealed hairline cracks around most of the surface-mounted ceramic capacitors. Resoldering them cured the F2 fault.

Could this sort of problem be the cause of intermittent power supply blow ups? **M.D.**

Fidelity CTV920

The chopper transformer was buzzing and the HT voltage was very low. The cause was traced to the blue disc ceramic capacitor C171 (3,300pF, 2kV), which was burnt and split. It's part of the snubber network associated with the STK7348 chopper chip (IC7).

The set was also sometimes reluctant to start from cold. This problem was cured by replacing C169 (1µF, 50V). It provides the feedback drive to the chopper transistor in IC7. **M.D.**

Sharp 66ES05

If the set won't respond to the remote control unit and the on-board volume and channel-change buttons don't work, replace the two 68kΩ resistors R704 and R705. Use 0·75W, 350V metal-film resistors. R704 and R705 are near the on/off switch. They supply power to the slave microcontroller chip on the primary side of the power supply.

The chopper power supply is switched off in standby, reducing the consumption to a couple of watts. **M.D.**

Ferguson B59F (ICC7 chassis)

For low, weak sound replace CS14 (1µF, 63V) in the IF module. **M.D.**

Thomson TX90 Chassis

There were three connected faults with this **Ferguson** set: no sound, the tuning didn't stop, and the set reverted to standby after five minutes. The common factor was the signal ident circuit – the ident input at pin 36 of the microcontroller chip IR01 didn't change. There are four transistors (TJ01-4) in the ident circuit. In view of previous experience of faults in this area I decided to replace all four (BC558A, BC548B and two BC558Bs). After that the set worked normally. **G.D.**

Philips 21GR2550 (G90AE chassis)

This set would work all right for several minutes. It would then start to go off and on violently. I couldn't find any dry-joints, but there was a smell of ozone. The CRT's focus pin was arcing, so a new base socket was required. **G.D.**

Hitachi C2546TN

If the problem with one of these sets is field collapse, before you condemn the field output chip it's worth checking for a dry-joint at the fusible resistor in its power supply. We've had several sets with this fault. Unfortunately two of them had suffered screen burn at the centre of the CRT. So do check for this whenever one of these sets comes in for repair. **G.D.**

Ferguson TX100 Chassis

This ageing set had developed an appetite for line output transistors. The bravest of them lasted for only about a week. I had checked all the usual dry-joints, and replaced the line hold control. Luckily at switch-on I heard a definite arcing and, having just repaired a 25in. Sharp set, took a look at the scan coil PCB. Sure enough the left-hand pin was dry-jointed. It would be a good idea to check any set fitted with this type of PCB. **G.D.**

Hitachi C2546TN

This set came out of standby, growled crossly for a second, then went back again. No shorts were evident, and resoldering didn't seem to help. A blinding flash of inspiration then suggested that I change the scan coils. I did and it worked! Now, how about five correct lottery numbers?! **G.D.**

Samsung CI3351A (P68SA chassis)

This set produced a very odd picture. When the first anode voltage was turned up I was able to see that the width was only about two-thirds normal and that there was a two-inch section which was brighter down the middle of the screen. A scope check at the collector of the line output transistor showed that two voltage spikes were present. As I couldn't find any faulty line output stage components, I took a look at the line drive waveform.

At the collector of the line driver transistor Q401 there should be a squarewave of 25V amplitude with overshoot on the positive-going leading edge. In this case the amplitude was low at 17V, and the leading edge was severely rounded. The reason for this was that D405 (1N4003) was open-circuit. It provides the supply for the line driver stage, taking over from the start-up feed via D404 once the output stage has come into operation. **I.B.**

Panasonic TC2195 (Z3T chassis)

The customer said there was no picture. In fact the field scanning was very distorted and would sometimes collapse completely when the chassis was moved. A look at the underside of the PCB showed that nearly every joint in the field output stage had been resoldered in the past.

By flexing the PCB very gently I discovered that the cause of the trouble was in fact in the area of the TDA4505M IF/timebase generator chip IC101. Most of the connections looked suspect, but when pin 2 (field ramp generator) was heated with an iron the solder shrank away from the PCB. The set worked perfectly once the chip's pins had all been resoldered. **I.B.**

Pye 37KN3030 (Philips NC3 chassis)

There was an odd fault with this old portable: a vertical green tuning indicator bar was permanently present on the screen. The cause was found to be C371 (100µF, 16V), which was short-circuit. It's in the circuitry that detects when sync lock has occurred and should then switch off the tuning line. **I.B.**

Panasonic TXS3T (Z7 chassis)

The symptom was no sound, picture normal. "Can't be much" the customer had said. After checking that the volume hadn't been turned down I connected another receiver via the scart socket. The result was perfect sound. I didn't have a service manu-

al, so I checked around IC601 (M52778SP-A) with a scope. FM sound was being fed in at pin 2, but I couldn't find any audio output. The ever-helpful people at Panasonic suggested C208 (10µF), which is connected to pin 33. Not this time however!

Once I had obtained a manual I saw that the audio should leave IC601 at pin 47 and pass to pin 10 of IC251. It didn't, so it seemed that IC601 was faulty. But the price is £15.95 plus VAT! As there was no alternative I had to order one. Fortunately the replacement restored normal sound. **D.F.**

Bush etc 11AK12 Chassis

If you get one of these sets with a blown up power supply (short-circuit power MOSFET chopper transistor etc.), you must replace the chopper transformer. It's available at a very reasonable price from Bush as part of an upgrade kit: you get an improved transformer, a resistor, a capacitor and instructions. The chassis is used in various **Bush**, **Goodmans**, **Crown** etc. sets. **G.R.**

Philips 21PT1532/05 (L6.1 chassis)

This set would intermittently lock up or loose the picture altogether. To cure this problem, carry out the following modification: remove Tr7505 (BC548B) and fit a BC337-40 transistor in its place, then change the value of R3500 from 330Ω to 470Ω (part no. 4822 0512 0471). These two components are in the 5V supply (+5S) that feeds the microcontroller chip and the EEPROM.

If any unusual faults persist, the EEPROM chip may be corrupted. Its part number is 4822 2096 2098. **G.R.**

Sharp 51AT15H/15AT151R (5BSA chassis)

This set was dead though the standby LED went out when a channel button was pressed. Checks showed that there was no line drive at pin 12 of the MC44007 colour decoder/timebase generator chip IC801 because its 5V supply at pin 35 was missing. The cause was traced to the BC338-40 standby switching transistor Q708, which was short-circuit. **G.R.**

Philips 21PT165/05 (AA5 AB chassis)

Loads of these sets have come in because of tripping, with burn ups or short-circuit RGB output transistors etc. on the tube base PCB. The tube base PCB with components is available for less than £5 plus VAT from Philips, but very often the TDA8362 multi-function chip IC7015 on the main PCB will have been damaged. This costs nearly £30. If, after fitting these items, there is a dull picture the 8·2Ω safety resistor R3470 in the RGB HT supply is open-circuit.

Having repaired the set you could well find that it bounces back after a week or so, again tripping but this time with the line output transformer reading short-circuit, usually at all pins. So we now include the price of a replacement LOPT in the estimate when one of these sets comes in with RGB faults. It seems that the transformer develops an intermittent fault that causes the tube base PCB trouble. **G.R.**

Samsung CI5344 (S51A chassis)

Wrong option set up can cause: (1) poor or no colour, (2) no sound, (3) white noise on sound, (4) no sync. To reset to the UK standard, proceed as follows:

(1) Switch on at the mains switch.

(2) Use the remote-control unit to go to standby.

(3) Then, in quick succession, key in 'display', 'menu', 'mute' and 'standby'. You should then be in the option set-up.

(4) Set 'option' for 'CI'.

(5) Go to reset.

(6) Press volume up (the display will change to "wait for 5 secs").

(7) Finally, go to 'standby'. **G.R.**

Mitsubishi CT37C2STX

If the set is stuck in standby, replace C959 (470µF, 16V) and C956 (2,200µF, 25V). Also check R956 and R986 for badly-soldered joints. **G.R.**

Sony KVE2522

The picture displayed by this old set was very distorted: cramped at the centre, stretched at the top and folded over at the bottom – painful! Normal field scanning was restored by replacing the 680µF, 25V scan coupling capacitor C532 and the 100µF, 50V flyback boost capacitor C531. **E.T.**

Toshiba 214R7B

The customer told me that he had inadvertently left the set in standby overnight rather than turning the mains power switch off. The next morning it was dead. His switch off procedure had not been the cause of the fault however – it would have happened anyway sooner or later. I found that the mains fuse had blown because of a faulty degaussing posistor. One of the discs inside had disintegrated.

As usual this was not the end of the story. While reassembling the set I found that when the main smoothing capacitor was pushed down slightly there would be an arcing noise and the set would then sometimes revert to standby. After a fair amount of resoldering in the main power supply area without success, I spotted a bad joint at the primary winding of the small transformer that powers the standby and control circuitry. It was nowhere near the apparently sensitive area of the PCB, but resoldering it cured the trouble. **G.B.**

Sony KVM14TU (BE1 chassis)

There was no sound or picture, just a high-pitched whistle from the power supply – as though there was a short-circuit across its output. Resistance tests failed to reveal any shorts however. The cause of the trouble was eventually traced to a breakdown in the line output transformer's plastic insulated case. The insulation was able to resist the low voltage from the ohmmeter but not the full HT from the power supply. **G.B.**

Ferguson T59F (TX92 chassis)

This set kept shutting down. I checked for shorts on the secondary side of the power supply (line output stage etc.) but couldn't find any. When the cathode of DS4 was disconnected the power supply started up all right. A check on the secondary voltages revealed that there was only 30V at DP51. There was also excessive ripple. The cause of all this was CP52 (100µF) which was open-circuit. **I.L.**

Ferguson RP46 rear projector

For no convergence, check the operation of the convergence power supply near the blue tube. Resistor RP09 (100kΩ) goes open-circuit. This is a very common fault that can be repaired on site.

Another fault is RP18 (220kΩ) going open-circuit. This stops the convergence power supply working.

I've had both these faults about eight times during the last year, at different sites. Use resistors rated at 340V. **I.L.**

Orion 2093S combi unit

When this TV/video combi unit was playing back a tape there was wow on sound with a swirling picture. The cause was traced to CS23 in the TV power supply. It was open-circuit. **I.L.**

Ferguson D51N (ICC9 chassis)

This set was dead with the line output transistor short-circuit. Once a replacement had been fitted the set started up, but with no picture. There was drive at the base of the line output transistor, but it was of low amplitude. A check on the voltages in the line driver circuitry showed that there was only 2·5V instead of 6·5V at the collectors of TL64 and TL65. The cause of the fault was that DL61 (1N4001) went open-circuit on load – it measured OK out of circuit. **I.L.**

LETTERS

Send letters to "Television", Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS or e-mail jackie.lowe@rbi.co.uk using subject heading 'Television Letters'

Contrasts

After leaving the consumer electronics repair trade I obtained a job with a company that installs and repairs industrial electronics – my new job is to repair factory process equipment. We are called out when the manufacturer of the machine cannot repair it (for example because of its age) or when the manufacturer's engineer cannot call for some weeks.

If the owner of the machine can isolate the cause of the fault to a PCB, we will repair it in the workshop. But often there is no documentation (circuit diagrams etc.). So someone (that's me!) is sent to the site to diagnose the fault. Sometimes there is more than one machine, so comparisons can be made between a working and a faulty machine. Otherwise you have to call on all your diagnostic abilities to locate the source of the trouble. You could well have to trace out the circuit of the faulty area, component by component, to be able to understand how the circuit block works. Where ICs are involved, the fact that a lot of circuit blocks follow IC manufacturers' data sheets obviously helps.

There's a great contrast with the TV trade. Cost is not a problem with a machine that could easily cost £60,000 or more. But the time taken to get the machine running again *is* important. If you have to replace every IC on the PCB (maybe twenty or thirty) you do it. If you need a part now and a supplier some miles away has it, you get a motorcycle courier to bring it to you (£100 to get a £1 part!).

So the rules of the game are quite different. But tracing the cause of a fault by using your own initiative, with the test equipment you had the foresight to take with you, is still the same. Your experience as a TV engineer can be used to good effect in other areas of electronics.

Philip Blundell, AMIIE(elec), Birmingham.

Repairing power tools

I tend to avoid repairing power tools (see article in the November issue) because they are invariably 'run into the ground' – even more so than other domestic electrical items – and, as many of them are outrageously expensive in relation to their quality, the customer may well not be a 'happy bunny' even before a repair that turns out to be unreasonably expensive.

I can however add some information on equipment for testing armatures. During one of my occasional excursions into automotive electrical work I came across a curious item of test equipment known as a 'growler'. The best way to describe it is to outline how a DIY approximation can be constructed.

The heart of the unit is a shaded-pole motor, typically a fan motor from a microwave oven. The modification required to it will dramatically reduce its winding inductance, so it will no longer be suitable for direct connection across a 230V mains supply. A ballast winding will therefore be required. This can consist of the primary winding of a mains transformer.

The basic growler consists of an inductor with open pole faces in the form of a V-block, a current-limiting ballast, and some way of indicating change of current. Once the armature has been checked for any windings that are shorting to the frame, the growler is used to check more thoroughly for windings that have shorted turns. The magnetic flux passes through two poles at a time of the armature being tested, when they are in contact with the V-block pole faces. If the flux passes through an armature pole with shorted turns, the current rises. The magnetic attraction at the V-block is just sufficient to hold the armature on while allowing it to be eased around by hand. When this is done the armature 'growls', hence the name.

The basic DIY approximation can be made from a shaded-pole fan motor by cutting away the core around the rotor aperture to form the V-block. File the surfaces so that they are slightly convex, to ensure that there is only one contact point per pole face. Remove the brazed-on copper shaded-pole shorting links.

The motor used can be almost any shaded-pole type of suitable size. A washing machine pump motor may also be suitable. As it is impossible to predict the winding characteristics of whatever motor you might decide to use, some trial and error is inevitable.

The best solution to providing the required ballast is to use the primary winding of a 12V mains transformer. 12V auto bulbs can be connected to the secondary side of the transformer to vary the loading. In addition they will vary in brightness to indicate a change in the loading when a pole with shorted turns is brought into contact with the V-block poles. A transformer with two 115V primary windings quadruples the options for varying the loading.

Most commercial growlers have an ammeter, usually a moving-iron or bi-metal strip/resistance-wire type. Such instruments are rare nowadays. The moving-iron ammeter from a cheap Halfords battery charger could be salvaged, but the 4-5A rating would be too high to provide a useful indication when in series with the growler winding. It might work better when connected in series with the lamps connected to the ballast transformer's secondary winding.

As it is impossible to know what suitable items a constructor may have to hand, I can't be more specific and the design of the case is left to the individual's ingenuity. I hope that, with a magazine like *Television*, I don't have to remind anyone of the importance of safe working practices with a mains-powered test jig.

Ian Field, Letchworth, Herts.

A last repair?

I think I've just attempted my last TV repair for the general public. The set suffers from intermittent remote-control operation. After spending hours checking this and that the cause of the fault seems to be the microcontroller chip. The cheapest quote I've had for a replacement is £86. Suppose I'm wrong? I don't suppose the set, a Comet special, cost more than £200 and the customer doesn't want to pay more than £25 including labour. What do I do?

I've a workshop full of VCRs I have spent hours on. Quote a customer £20 and you never see him again. I've never seen a trade die as quickly as this one. Years ago we were the elite – we even got petrol during a shortage.

Have you seen a college that offers a TV servicing course in recent years? No. All the years of studying have now gone to waste.

Name and address supplied.

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

All Tech Tips

http://www.skyeinteractive.net/techtips/

Another US technical tips site which deals with subjects related to repair of the whole range of consumer electronic items. The site is being updated and plans to include current repair articles, books on repair, schematics and links to manufacturers technical repair sites. There's also a chat room.

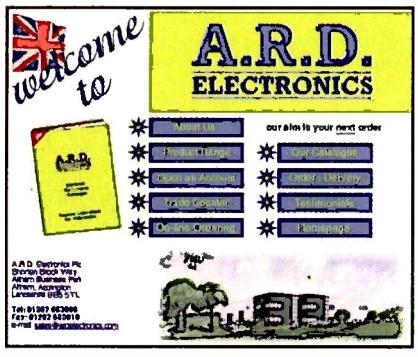
Anatekcorp

http://www.anatekcorp.com/

A US site selling computer databases of fault reports and schematics, but it has some interesting articles for free download - you can even submit your own. There's a technicians forum but you have pay $60/year to be a member.

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.

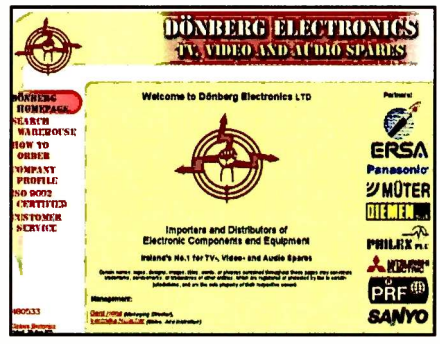
Doknet Service manuals

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

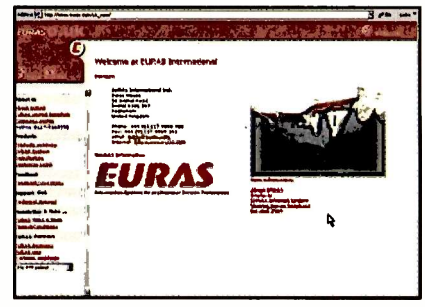


As the leading distributor for the TV, Video and Audio trade in Ireland, we supply over 2000 shops & service dept with Audio-Video and TV spares, Semiconductors, Test Equipment, Service Manuals, Remote Controls etc. At present we stock over 30,000 different lines

EURAS International Ltd

http://www.euras@euras.co.uk

"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

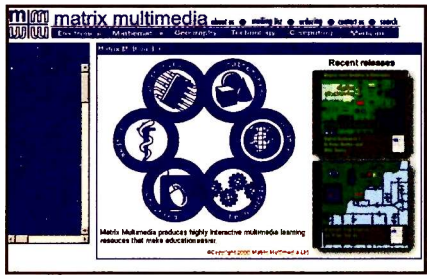
http://www.mb21.co.uk/index.html

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).

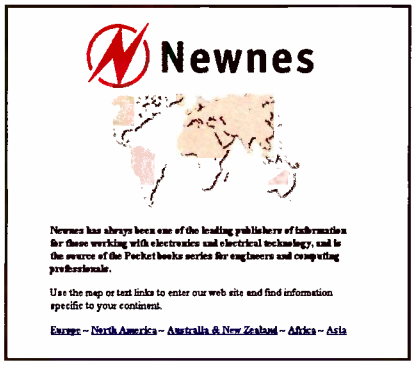
M.C.E.S.

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

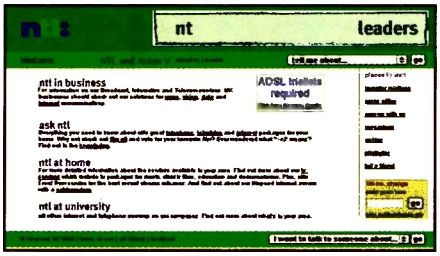


Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

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.

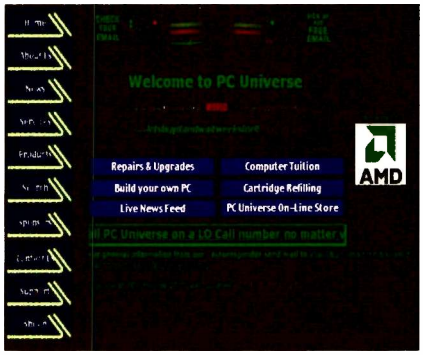
Mauritron Technical Services

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

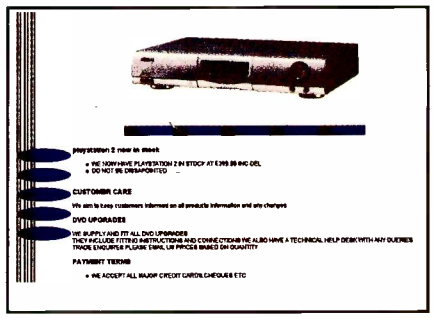
http://www.horizonsatellites.co.uk

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

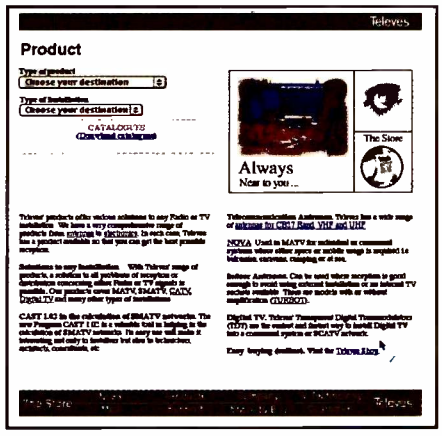
http://realguide.real.com/stations/

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".

Put your web address in front of 21 000 electronics enthusiasts and experts.
Television **acknowledges your company's need to promote its web site, which is why we are now dedicating pages in every issue to announce your WEB ADDRESS.**
This gives other readers the opportunity to look up your company's name, to find your web address and to browse the magazine page to find new sites.

We understand that cost is an important factor, as web sites are an added drain on budgets. But we are sure you will agree that the following rates make all the difference:

FOR 12 ISSUES:
Lineage only will cost £150 for a full year, just £12.50 per month.
This includes your company's name, web address and a 25-word description.
Lineage with colour screen shot costs £350 for a full year, which equates to just £29.17 per month.
This price includes the above mentioned information, plus a 3cm screen shot of your site, which we can produce if required.

To take up this offer or for more information ring:

Pat Bunce on 020 8652 8339
or fax on 020 8652 3981.
or e-mail: pat.bunce@rbi.co.uk

Company name		Web address		

AUDIO FAULTS

Reports from Russell J. Fletcher

We welcome fault reports from readers – payment for each fault is made shortly after publication. See page 246 for where and how to send reports.

Teac AX1030 amplifier

The reported fault was no audio output with the protection relay remaining open. Some quick resistance checks on the audio output transistors and voltage checks on the supply lines and mid-point indicated that the power amplifiers were OK. Attention was then turned to the protection circuit, where R367 (100kΩ) was found to be open-circuit.

Studiomaster Powerhouse 8:2 powered mixing desk

Intermittent output to the headphone monitor socket is a common fault with these desks. The usual cause is the headphone volume control, which cracks across the PC mounting pins. I've also had no output to the headphone monitor socket on several occasions because the bottom three inches or so of the monitor PCB has cracked across. I've no idea why this happens.

Revox B710 tape cassette deck

These superbly built recorders still hold a good price. A fault you sometimes get is that one capstan motor intermittently fails to run at power-up – the motor will work if you turn the capstan by hand. There are two capstan motors in the well-engineered mechanics, but unfortunately this start-up fault seems to develop with age. The manual says don't dismantle the motors, but you've nothing to loose against the cost of a replacement. Once you've got the motor out and in bits, use some very fine wet-and-dry paper (1200 grit) to lightly hone the shaft where it sits in the bearing. Finish the job with some polishing paper, then reassemble with a little machine oil. This should greatly improve matters.

You occasionally get a fault with the headphone monitoring. The LM301 op-amp chips in the headphone amplifier are the most likely cause – IC1 and IC2 on the mic/phones PCB.

Technics SL1200/1210 professional turntable

You sometimes get the complaint "erratic pitch" with these machines. The control systems usually have nothing to do with this fault, the cause being a noisy 21V regulated supply. The action required is as follows: replace the two 2SD637 transistors Q2 and Q3 and the MA1051M (5·1V, 400mW) zener diode D2.

Nakamichi BX2 cassette deck

The reported fault was intermittent winding and no take-up. It didn't take long to find the cause: there was a dry-joint at driver transistor Q602 on the main PCB.

Studiomaster Vision 8 powered mixing deck

A very common complaint with this deck is intermittent low output and distortion. The cause is on the power amplifier PCB, which is mounted at the bottom of the case and will have to be removed. Take a look at the joints of the driver transistors, particularly the left channel (centre of the PCB): you will see that they are cracked. This is normally because the transistors have not been inserted far enough through the board. Desolder and move them down the heatsink against which they are mounted – they will slide under their clips. Resolder with a decent amount of leg and you've cured the fault for life.

JBL MR series professional speakers

If the report with one of these units is "works but creaking sounds at high levels", check the HF diaphragm drives. They can be damaged when subjected to overloading. The problem is not always visible, so check by substitution if possible. Both units of a pair seldom seem to be damaged simultaneously. Diaphragms can be obtained as spare parts from the UK distributor, Arbiter. They are not cheap – about £90 retail – so don't let the customer think that the problem is something trivial! You can get the same problem with other models.

Quad 303 Hi-Fi power amplifier

These units are now quite old though they can still provide good results. But to maintain performance as specified and correct operation they require servicing. The main problem is the output coupling capacitors and the smoothing capacitors in the power supply (all 2,000μF). If these capacitors develop leakage and fluid gets on to the driver PCBs below, a major blow-up will occur.

Replace all the capacitors at the slightest sign of problems, i.e. cracking of the rubber end casing, crystalline growths or seepage. In fact it's best to replace them even if they look OK: explain the problem to the owner and persuade him to have the unit brought up-to-date. Otherwise next time you see the amplifier it may be too late.

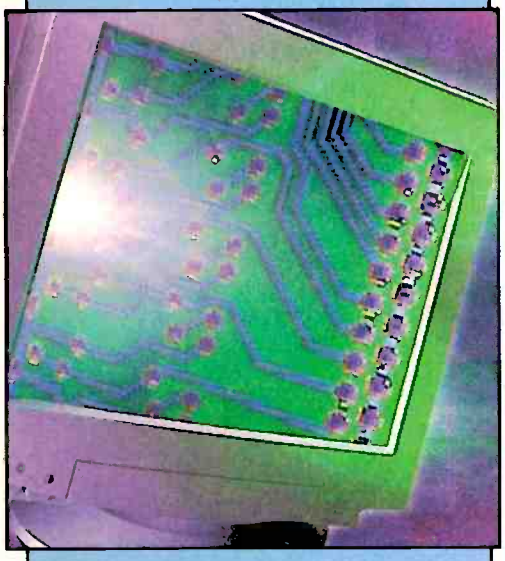
Denon DRM700 cassette deck

The reported fault, which was unusual with this unit, was failure of one channel to record. The cause was traced to one side of the input level control being open-circuit.

Studiomaster Vision 708 powered mixing deck

A complaint you sometimes get with this deck is intermittent loss of output to the speakers. The fault can drive you to distraction, but the cause is very simple: replace the 'insert' jack sockets at the rear of the unit. The break contacts become tarnished and thus resistive or open-circuit.

This trouble is very common with all amplifiers that have a send/return loop.



MONITORS

Fault reports from Geoff Butcher David Martin and Ian Field

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

faxed to: 020 8652 8111

or e-mailed to: tessa2@btinternet.com

IBM 07-593

There were no signs of life in the EHT section of this 17in. monitor though the power light was on and changed from orange to green when a signal was fed in. I traced the HT supply to the line output stage and found that R182 was open-circuit. Further checks revealed that the line output transistor Q602 and its supply regulator Q607 were both short-circuit.

Power transistor failure is almost always caused by a defect elsewhere, electrolytic capacitors being high on the list of suspects. In this case C182 (10µF, 250V) was a likely culprit and proved to be high impedance.

Normal operation was restored once these items had been replaced. The only problem I had was with Q602, type 2SC5244A, which I was unable to obtain through the usual channels. I fitted a BU2527AF, without the insulating washer as this device has an insulated case. Although on paper being somewhat lower rated, it appeared to run well within its limits in this monitor, even at the highest scan rates. **G.B.**

Dell D1028LR

When this 17in. monitor was switched on, with an input signal applied, the EHT rustled up but there was no raster. A vertical line – frame collapse – appeared when the A1/G2 control was turned up. The monitor is fitted with the **Philips CM6800 chassis**, so I contacted the always helpful Philips help desk and was told that a service manual, part no. 4822 727 21057, could be obtained from Dutchwest Distribution, Haltwhistle. It arrived in just a few days and cost a very reasonable £10.24 including post etc. The manual is clear and comprehensive.

The cause of the trouble turned out to be absence of the +8V supply, because the L7808CV regulator IC7153 had failed. There was no obvious cause for its demise, but C2160 (100µF, 16V) was replaced with a 105°C type just in case. **D.M.**

Elonex MN069/A9S

Initially there was no display, but the power supply was working and the tube's heaters were alight. When the A1/G2 preset was advanced a weak, tall and narrow display appeared. The vertical over-scanning indicated that the EHT and line scan current were low in about equal proportion.

This model has a B+ PWM regulator of the flyback type. If the MOSFET (Q317, type IRF630) is cut off, inductor L304 and diode D317 in series feed the unboosted supply (46V) to the line output transformer. To confirm that the line output stage works, all you normally have to do is remove Q317. But Q317 wasn't operating anyway and the line output stage was producing a narrow display – as it would with Q317 removed. So I tried a new IFR630, which blew instantly.

I suspected the drive waveform, but a check with an oscilloscope showed that there was a good, clean squarewave of 6V p-p amplitude. On a hunch, I decided to check L304. As I didn't have an exact replacement to hand, I borrowed from a Philips chassis an inductor that serves the same purpose and is of almost exactly the same size and shape. When it was patched in, the +B PWM controller worked normally. I found that it was possible, with care, to redrill the PCB holes to suit the slightly different pin centres. **I.F.**

Digital VRT17HA

These Sony manufactured monitors shut down to standby, with the green and amber LEDs alight, when one of several faults is present. They invariably do so before anything that might provide a clue appears on the screen. To make matters worse, the internal construction leaves a lot to be desired, though it's easier to dismantle them than it looks.

I had no clue as to where to start, so the power supply seemed to be a good idea. I monitored an assortment of voltages that either did or didn't switch off as the indicator changed from green to green and amber, but this exercise didn't provide any clues either. The next step I took was to check the ESR of all the electrolytics on the secondary side of the power supply. C613 (1,000µF, 25V) started off the scale then seemed to recover over a few seconds, ending up at about 4Ω (this phenomenon is probably because of the high test frequency, 200kHz, used in my home-made ESR bridge). C619 (47µF, 16V) had an ESR of about 2Ω. C614/5/6 (all 100µF, 25V) had ESR values of 1Ω, 4Ω and 0·5Ω respectively. C625 (100µF, 16V) produced an ESR reading of 1Ω. All the other electrolytics on the secondary side produced readings that I considered to be acceptable (less than 0·25Ω). A number of resistors were then checked, but no defects were found. So the faulty electrolytics were replaced and the power supplied was refitted. There was no change when the monitor was tried again.

I eventually had the idea of disconnecting the mains supply every time the monitor shut down, for just long enough so that it reset, then restoring the power. This produced sufficient cumulative heating of the CRT's heaters for some emission to start, so that I could see a symptom to diagnose.

It appeared in the form of a very faint horizontal line – there was frame collapse!

There were some doubtful solder joints on the main PCB (doubtful as to whether they would have had anything to do with the fault as well as being doubtful as to their condition). Once these had been attended to I replaced the TDA8172 frame output chip IC407. This restored the picture with no further shutting down.

The state of the power supply electrolytics in this example suggests that it would be wise to check these items as a matter of routine. **I.F.**

Dell Ultrascan 17XE (DM26-HS)

There was no fault ticket with this monitor and a lot of time was wasted on inspection and soak testing, to no avail. Since the chassis is of Mitsubishi manufacture, I suspect that someone had attempted to use the non-standard signal-connector lead intended for the Ultrascan 17FS-EN (VC7EN).

Use of a DMM is the quickest way to tell which type of lead is required. The normal VGA connector has 75-82Ω terminations at pins 1, 2 and 3. With the non-standard connector, the top row has 75-82Ω terminations only at pins 2 and 4, the blue input being at pin 10 (middle row). Pin 9 is a dead giveaway. It's normally not connected, or in rare cases earthed. With the non-standard interface it's the H-sync input with a resistance of several kΩ. The D1726-HS monitor requires a normal 15-to-15 VGA cable. **I.F.**

Digital PCXBV-PE

The fault was not quite as the customer described it – no picture. In fact the monitor displayed a grey-scale test pattern in cyan, but the colour content was very intermittent. When I examined the CRT panel I found plenty of old soldering. Some had begun to part company, some was just beginning to crystallise and some had been fairly recently reworked. Attention to the soldering cleared the problem.

This model is similar to the **Dell D1528LS** and the **IBM 2215-002**. **I.F.**

Gateway (2k) Crystalscan YE0711-01

The complaint was no green in the display. It didn't take long to find a crack on the CRT base panel when I traced back from the green cathode pin to the green output stage. It was very much localised to the class A output transistor and its heatsink solder spiggot, which suggested that some force or impact on the heatsink had overstressed the PCB. But the screening, which encloses the CRT base PCB completely, was without any sign of damage. So perhaps there had been a mishap during manufacture.

The track to the transistor's collector pin had torn with jagged edges, which probably made reliable contact. But one side pin had a track that led away in two directions: both were severed at the edge of the solder pad, which lifted away as soon as the iron was applied to the solder joint. This must have caused trouble for some time! The track to the transistor's other side pin had a crease in it but was not severed.

I used a scalpel to trim back the damaged tracks, then remade the connections with thin tinned-copper wire. There was no further problem with the display's green content. **I.F.**

Astvision 5U

Someone had replaced the IRF630 transistor with the more powerful IRF640 (18A instead of 9A), but the replacement had nevertheless cooked. For test purposes I fitted an IRFP40 (14A, 500V, 180W). Even though the component that was responsible for the overheating is common to all modes, i.e. is not switched in or out for different modes, the problem was present in only some modes. With all 800 x 600 and some 1,024 x 768 modes there was intermittent sideways pulling of the picture and the IRFP40 was getting hot – but not as hot as the IRF640 did.

The culprit was C434 (0·47µF, 250V), which had split its casing. There was no further trouble after replacing C434 and fitting the correct IRF630 transistor in position Q410. **I.F.**

Lynwood M14W

This mono VGA monitor had been converted for Atari use. There was an intermittent horizontal sync fault: the symptoms were line tearing and occasional complete loss of sync. It was almost impossible to instigate the fault, and once it appeared it would go when it chose – not when I made an attempt to affect it by poking components with a plastic trimming tool.

The internal horizontal hold preset appeared to be in good order – it turned smoothly, with no evidence of intermittent contact. But the fault could be controlled at will when light pressure was applied to the top of this preset. **I.F.**

Compaq 460

The customer asked for a replacement signal cable, but unfortunately I'd had a run on this particular type. There were several in the salvage box however, with split insulation though apparently repairable. When I contacted the customer he said that the monitor was used "in house", so appearance wasn't important.

I fitted a fresh blade to the scalpel and cut the plug moulding open. Unfortunately the cable seems to suffer from its manufacturer's efforts to do a good job. The moulding conceals a metal box that encloses the internal wiring and connections: it provides good screening and is of apparently sound construction. But the box reduces the amount of plastic moulding in contact with the cable's outer insulation which, along with the main screening braid, works loose from the plug assembly. Once the body of the cable is free to twist in the plug's cable entry, the signal connectors tend to pull out of their crimp terminations. This had happened, or was about to happen, with all the cables I had.

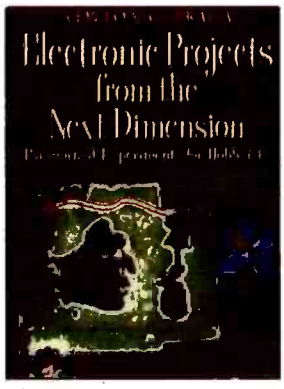
The complexity of the chassis mounting strain relief fittings meant that a compatible cable would have to be used, with whatever alterations necessary being made at the plug end. The original plug had every pin except 9 fitted, but not all were used. Pins 5, 11 and 12 were not connected. Pin 5 is usually 'power-on self-test', which is generally irrelevant with DPMS power management. Pin 11 is usually a chassis connection. The other odd thing was that pin 15 was linked to pins 4 and 10 (chassis). With a plug 'n' play video card it would short the SCL line to chassis. The replacement plug didn't have pin 15, so this anomaly didn't arise. I did however tape a note on the monitor to explain that the plug was not exactly as the original one.

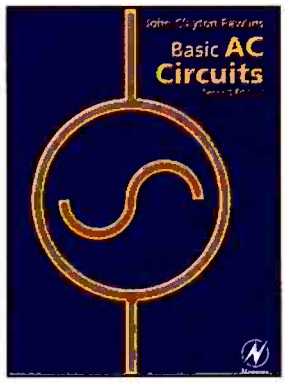
The monitor is used with a variety of machines, each of which is used with a variety of monitors, most of which have as standard a plug that's identical to the replacement I adopted. I have a suspicion that part of the original problem may have been the non-standard connection to pin 15, which the repair has hopefully corrected. If I'm right about this, the problem would have occurred with only some P'n'P-capable computers. The important thing is to advise the customer of any changes, so that appropriate action can be taken should there be a problem. **I.F.**

Dell VC10EN

This monitor was dead. I found that several resistors on the primary side of the power supply were charred beyond recognition. Fortunately a scrap chassis was available, so most of the values could be ascertained from this and the more difficult to obtain items could be taken from it. The following items had to be replaced: R118 (150Ω); R117 (0·22Ω, 2W); D106 (BZV85C24); R110 (120Ω); R111 (10kΩ); IC101 (SG3824M); Q101 (2SK1118); and F101 (3·15AT). **I.F.**

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

Pages: 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:_____

Answer to Test Case 458

– page 231 –

The approach adopted by TechnoCrat in his attempt to find the cause of the trouble with the Samsung set (S51A chassis) may have been appropriate with receivers produced some years ago. But sets are nowadays under the command of a microcontroller chip, which relies on its ROM for marching orders and an EEPROM memory for particular settings. The latter is programmed, at the factory or during installation and use, with 'site-specific' data such as tuning points, the TV transmission system, the colour/brightness/contrast settings and so on. At switch on this data is sent along an I^2C bus to the various chips in different parts of the circuitry to tell them what's required. It's in the control section of the set that multiple faults like the ones with Mr Dale's set (and ones that might be called 'weirdos') often have their root.

In this case the data in the EEPROM had become partially erased. The problem was cured by entering the service mode and resetting it.

With this particular chassis the manufacturer recommends some modifications in the microcontroller chip area to ensure that the system doesn't crash again at some future switch on or off. The modifications involve removing seven components, changing the value of a capacitor, adding a new capacitor and fitting a wire link. Full details are available to dealers from Samsung Electronics. Other manufacturers also have modifications for this sort of thing. It's always as well to check.

NEXT MONTH IN TELEVISION

A look at DVD
Edgar Beddow describes the basic DVD technology and provides some initial information on player servicing.

NiCad battery charging
A switch-mode PSU can be pressed into service as a NiCad battery charger, but some modifications are likely to be required on the output side. Ian Field describes the system he has devised.

The Comdex Fall 2000 Show
The Comdex Show in Las Vegas last November was dominated by record-capable DVD formats, solid-sate recording systems and wireless technology. George Cole reports on the developments presented at the Show.

Good to get wired
The home of the future will be technology-controlled. There are various ways of going about this: Mark Paul describes the system devised by the HomePlug Powerline Alliance.

Toshiba service briefs
Know-how from Toshiba Technical on various TV and VCR servicing topics.

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.

CAMPION WHOLESALE LTD.

UK's Largest Electrical Wholesaler

For Both the UK and Export

NEW

Ex-Rental and Graded
TV's, Videos, Satellite,
Hi-Fi Equipment and White Goods

FREE Delivery Service to most areas of the UK
World-Wide Export Service
Experts in UHF / VHF Conversion

TEL: 01299 879642 FAX: 01299 827984

CALL TODAY FOR A BROCHURE OR COME AND SEE OUR LARGE WAREHOUSE

Unit 75 Barracks Rd, Sandy Lane Ind. Est. Stourport, Worcestershire DY13 9QB

Just 10 minutes from M5 Junction 6 - Worcester North

TV's From £5.00

Video's From £5.00

Satellite's From £5.00

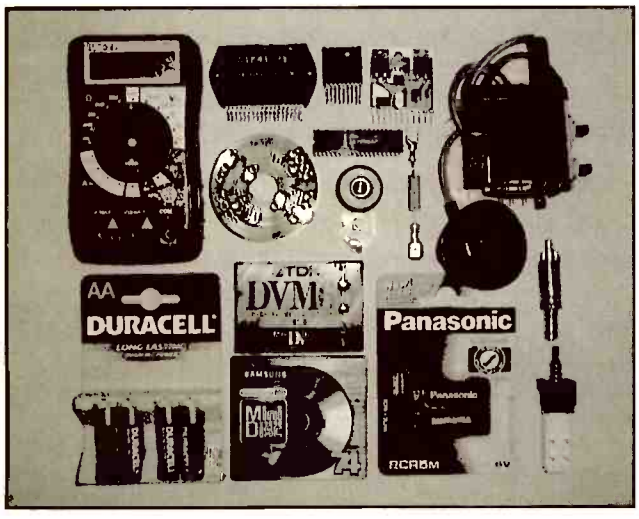
TV / Video Stands From £1.50

Major Credit Cards Accepted

ONLINE SHOPPING CHEAPER AND EASIER

www.elclondon.co.uk

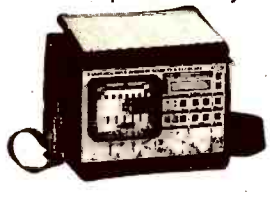
TV, VIDEO SPARES AND ELECTRICAL ITEMS



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.

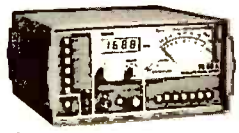
The panoramic field strength meter MC30A combines in one instrument all the functions necessary for installing and checking TV or satellite reception, both analogue and digital. The visualization of the spectrum and the picture allows the carrying out of all the necessary adjustments with this one instrument. 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

Unit X2, Rudford Industrial Estate, Ford, Arundel BN18 0BD
Telephone: 01903 723726 Fax: 01903 725322 Mobile: 0976 241505

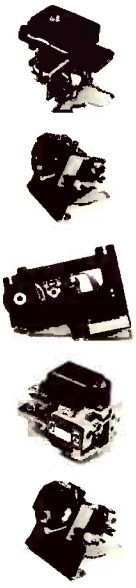
Sole Import Distributors

WILTSGROVE LTD

28/29 River Street, Digbeth, Birmingham B5 5SA
Tel : 0121 772 2733 Fax : 0121 766 6100
e-mail : sales@wiltsgrove.co.uk

CD LASER PICKUPS

PART NO.	ORDER CODE	PRICE
KSS330A	AP-1032	£35.15
KSS213E	AP-1078	£13.90
SOHDP1	AP-1092	£33.95
SOHAA	AP-1127	£22.50
OPTIMA-7B	AP-1129	£30.05
SFP101	AP-1131	£22.50
OPTIMA 720	AP-1134	£14.95
HOPM3	AP-1165	£14.95
RCTRH8173AFZZ	AP-1180	£19.85
KSS710A	AP-1185	£22.46
KSM620A	AP-1190	£22.30
KSS562A	AP-1195	£18.75
KSS560A	AP-1200	£17.44
KSS320B	AP-1205	£22.80
KSS313A	AP-1210	£23.20



DON'T FORGET We Stock 1,000's of Spare Parts for Many leading Brands of TV's & VCR's

SANYO 21" Colour Monitor

Ideal for CCTV/ Security Use

- Standby Mode
- Sound & Picture controls (Bass,Treble,Balance,Colour, Brightness,Contrast)
- Mute button
- Remote Control
- AV Terminals (1/2/3) & S-Video Socket
- RGB Mode
- Wall or Stand mountable

1+ £114.95
3+ £99.99
ORDER CODE AV-1054A

Technical Data	
Power Source	AC 220-240V 50Hz
Colour System	PAL
AV Terminals	
Audio Monitor Out	RCA type x 2 (R/L)
AV in	RCA type x 2 (AV1/AV2) (RCA to BNC Adaptor supplied)
21Pin SCART Socket	CENELEC standard (AV3)
Sound Output	5 Watts x 2
Picture Tube	51cm diagonal 90degrees
Dimensions	517(W) x 470(H) x 495(D)mm
Weight	22kg

8in1 Universal Preprogrammed Remote Control

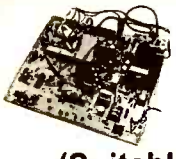
- 8-Way Universal pre-programmed Remote Control
- Can operate Text/ Fastext
- TV, VCR, SAT, Aux
- LED indicator Code Book (supplied)
- Supplied in Retail packaging

1+ £6.75
10+ £6.25
50+ £5.75
ORDER CODE URM-380

2in1 Universal Preprogrammed Remote Control

- 2-Way Universal TV, SAT Remote Control
- Can operate Text/ Fastext
- LED indicator Code Book (supplied)
- Supplied in Retail packaging

1+ £5.75
10+ £5.50
50+ £4.50
ORDER CODE URM-850



ONWA CHASSIS'S

(Suitable for Spares Only!)

£15.00 ORDER CODE SPT-2510E

Lopt no.	IC's	Transistors
FCK-14A028	AN560IK	D1545
Tuner	LA7910	D1554
UVE33-F31	KA2201	C1815
	AN5633	D467
	AN5521	C2001
	L7812CV	A1015
	MN1220	C2482
	TDA8192	
	MN15245KWC	

£15.00 ORDER CODE SPT-2510F

Lopt no.	IC's	Transistors
101-228002-06	ST6385BB1/BKY	CF70088
	AN5601K	SAA5231
	LM324N	SDA5234
	SE140	GM76C88-AL
	TDA2009A	LA7106
	TC4066BP	D2334
	KA2107	D804
	TEA5114	BD435
	LA7016	C1815
	STRS6309	A1015
	TDA8145	D400
	7812CV	C2482
	NE5532N	TDA1543
	HCT4052	
Tuner		
VTSR7BD23		

£15.00 ORDER CODE SPT-2510C

Lopt no.	IC's	Transistors
101-220005-03A	711A6215	D1402
	MN12C201D	D2499
	AN5633K	A1015
	TBA820M	C1815
	LA7910	C2482
	TDA8192	B774
	AN5521	

£15.00 ORDER CODE SPT-2510B

Lopt no.	IC's	Transistors
FCM21A004	742A3302	D2499
	CF70095ANN	A1015
	CF72306	D2498
	AN5265	C1815
	MN3868	B774
	AN5071	C1317
	AN5534	A1013
	LA7016	C144
	AN5195K-B	
	24C04-6	

£15.00 ORDER CODE SPT-2510D

Lopt no.	IC's	Transistors
154-378A	KWTEC68241Y	D2498
	CF70095ANN	D1555
	CF2306	C1815
	AN560IK	A1015
	TDA1904	D400
	TC4066BP	C2462
	LA7830	
Tuner		
VTSR7BD23		

£15.00 ORDER CODE SPT-2510H

Lopt no.	IC's	Transistors
FCM20A016	KWTCC68230Y	D1545
	AN5601K	BUH515D
Tuner	CF70095ANW	A1015
103-131310	CF72306	C1815
	HCF4066BE	C2482
	LA7830	D400
	LA7910	
	TDA1904	
	93C46CB1	

£15.00 ORDER CODE SPT-2510J

Lopt no.	IC's	Transistors
FCK-14A019A	KWTAC68224Y	D1554
	CF70095AN	D1545
Tuner	CF72306	D467
MITSUMI	93C46AB1	C1815
	KA2201	C2482
	TA8701AN	
	AN5601K	

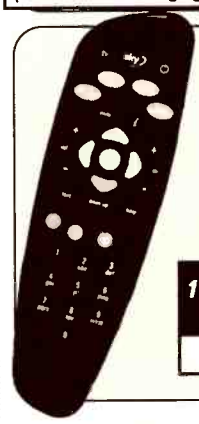
Sky Digibox Magic Eye

The Global link infra-red remote control extender allows full control of the SKY Digibox from any room in the house. The Remote Eye is the only true 100% compatible Sky Digibox control extender.

Available In Retail Blister Packaging or Loose Polythene bag

1+ £11.95
ORDER CODE SPS-3200 (Retail Blister Packaging)

1+ £9.95
ORDER CODE SPS-3200A (Loose Polythene Bag)



Sky Digibox Remote Control

- For use with the PACE model DIGIBOX and BSB2200.

1+ £10.75
ORDER CODE IR-1086G

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

Freefax Orderline : 0500 55 05 05

ADVERTISERS' INDEX

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.

SERVICE DATA

CLASSIFIED TEL:020 8652 8339

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

SERVICES

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

SERVICE COMPONENTS

TIME LAPSE VIDEO HEADS

Quality, low cost, replacement video heads specifically for time lapse applicants.

European supplier: *Vector*

Unit 3, 3 Campsie Road, Kirkintilloch
Glasgow G66 1SL Scotland
Tel: 0141 777 6667 Fax: 0141 776 8343

Call for prices and further info or visit:

www.video-head.com

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 772249
E-mail: sales@navspares.co.uk

ELECTRONIC SURPLUS CLEARANCE SALE

SCOOP PURCHASE
FLUKE HAND HELD DIGITAL MULTIMETER MODEL 8024B

Cancelled export order 750V AC/DC 2 amp AC/DC Resistance 20Megohm plus Siemens range. Also measures temperature –20ºC to +1265ºC. Temp. probe not included. Calibrated for K-type thermocouple. Peak hold facility. Supplied brand new and boxed but with original purchasing organisation's small identifying mark on case. Test leads and handbook included. Offered at a fraction of original price: **£47.50**, p&p £6.50.

(Dept. T) CHEVET SUPPLIES LTD
157 Dickson Road, BLACKPOOL FY1 2EU
Tel: (01253) 751858. Fax: (01253) 302979
E-mail: chevet@globalnet.co.uk
Telephone Orders Accepted
Callers welcome Tues, Thurs, Fri and Sat.

inStore ELECTRICS LIMITED

1043 Leeds Road
BRADFORD BD3 7DB
Tel: 01274 665670/660196
Fax: 01274 665246
E-Mail: tradesales@instorelec.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
OVO MULTI REGION	£120

Audio • DVD • CDR • Cameras • Fax • MWO
CREDIT CARDS WELCOME • 48 HR DELIVERY

RECRUITMENT

QUALIFIED SERVICE ENGINEER

Must have experience on TV/Video and Audio Equipment.
5 days a week.
Staff discounts.
Salary negotiable.

Contact Peter or Steve
020 7249 4814

To Advertise in Television Classified Telephone Pat Bunce on:

020 8652 8339

or Fax on

020 8652 3981

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

SERVICE DATA

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 628785
Visa/ Access accepted

APPOINTMENT

BENCH ENGINEERS

KEENS SERVICE

The company has been operating since 1991. We install and service, in the field as well as in our workshop, quality branded televisions, satellite, video and audio products on behalf of some significant trade customers, as well as to the public.

We are looking for City and Guilds qualified engineers, with a proven record of quality repairs, to be part of our long term expansion.

We offer very good basic salary, with overtime and bonus opportunities.

For your Information Pack and Application Form, please contact ***Kevin Evans on 01494 727731***

Keens Service Limited 56 - 58 Sycamore Road, Amersham, Bucks. HP6 5EE

LINEAGE

EX RENTAL TELEVISION slot meters in lots of ten, £140.00 vat post and packing. Tel: 01200 429056.

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

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:-
1IN/2KV, 2N2/2KV, 4N7/4KV EACH 15p
5N6/2KV, 6N2/2KV, 9N1/2KV EACH 15p
35V-22 UF, 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-IMV F/S £5 P&P £5.00
IMV-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-CVCR0-POWER £5.00
POSITOR 18 2 PIN 20p
POSITOR-2322 662 98012 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 FIT 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 – VPT – 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 4 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-TI228B 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 – 620E £12.00
MAINS SWITCH WITH STAND-BY £50p
MODULATOR No 5587881 £5.00
OSCILLOSCOPE 20MHZ DOUBLE BEAM – V212 £188.00
PANEL-TELETEXT G8P – 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 £1.00

1996/7 MATSUI

VIDEO CHASSIS WITH TUNER-IR £5.00 POST £4.00

MATSUI – ORION

DECKS WITH HEADS – D1096 VXA110 VP 9401 £16.00
HEAD-VSR1500 = 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 6000, 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
243066, 243063
3220029, 3714016, 47003481
AT2076/78, AT2076/88, AT2078/25
AT2077/81
DST81N243/472593-00
DST85B235/47328700 & /40153200
DST8N234/400086AD, &/47805200L
DST88N234/47320041, &/47317590
DST186N243/473058-00
TFB3035D, TFB3069D, TFB4023AD
TFB4039AD, TFB4066AD

ALL LOPTS £5.00

FERGUSON
TX9
TX10
TX85, TX86
TX89, TX98, TX99
Y260781
FSTY260482
LOPT RED SPOT
LOPT WHITE SPOT & YELLOW SPOT

PANASONIC
TC2203, TLF 1456B
TLF1457B, TLF701/6

TOSHIBA
TFB 3035D, TFB 4023AD, TFB 4032BD
TFB 4038AD, TFB 4110AD
TFB 3089D, TFB 4088AD

VIDEO DECKS

AIWA 1500
MATSUI VXA 1100
MATSUI 1500
ORION D1094
ORION D1096
ORION D2096 ETC } ES 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 T9535 240V
MAINS SMALL £5.00
PAL TV ADAPTOR – RGB IN UFH 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 1188 £3.00

PHILIPS
NEW TYPE UNIVERSAL £8.00 (3 in 1)
RC4001

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, CPTZ178 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 IKZ 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 TBJZA-00ZA-ALPS £3.00
SATELLITE SXT2302180968 £3.00
SATELLITE WITH BASE BAND MIN SXT2302234 £4.00
SMALL UNF/VHF £3.50
VHF/UHF – TEKE4-112A £4.00
4944
U321, U341, U342, U343 } £2 EACH
U344, U411, U412, U944 }
U743, 7744
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 TM UG3-103A £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
7806	20p	2SD1453	£1.00	BU205	75p	BUT12A	20p	BYW95	10p
7809	20p	2SD1576	£1.00	BU206	£1.00	BUT13	£1.00	BYW95C	10p
7812	20p	2SD1577	£2.00	BU207	£1.00	BUT18AF	£1.00	BYW562A 100V	8p
7812F	20p	2SD1807D3	15p	BU208	80p	BUT71/800	15p	BYX10	10p
2SC940	£1.00	2SD1878	£1.00	BU208A	£1.50	BUW11	40p	BYX38/300	25p
2SC3795	£1.00	2SK1460	£1.00	BU208D	90p	BUW84	60p	BYX55/350	10p
2SC3973B	£1.00	2SK1464	£1.00	BU222	£1.00	BUX39	£1.00	BYX55/600	10p
2SC4313	£5.00	2SC4891		BU326	£1.00	BUX84	50p	BYX71/60	20p
2SC4589		1500V/15A	£2.00	BU407	40p	BUX84AF	50p	BYZ106	10p
10A/1500V	£2.00	AN5521	£1.00	BU508A	90p	BUY49	20p	BZW-C110	5p
2SC7350	15p	AN5551	£1.00	BU508AF	£1.00	BY187	5p	BZW83-C20	3p
2SD200	£1.00	AN5831	£2.00	BU508D	80p	BY208-800	8p	CA3123Q	50p
2SD1401	40p	BC550C	20p	BU508DF	£1.00	BY228	15p	CD5555BE	20p
2SD716	£1.00	BDV648	50p	BU705	£1.00	BY229	6p	CLI571A	£5.00
2SD787	30p	BDV658	50p	BU801	50p	BY255	5p	FE3B	4p
2SD1789	30p	BF8695	20p	BU806A	£1.00	BY299-200	15p	HA1140	£1.00
2SD820	£1.00	BF870	20p	BU807	50p	BY299-800	30p	HA1185	£1.00
2SD868	75p	BPW41	15p	BU808DFI	£1.00	BYT71-800	15p	HA1196	50p
2SD880	30p	BT Phone Batterys	£1	BU824	50p	BYV19-30	15p	HA11485ANT	£1.50
2SD1264	50p	BU105/04	80p	BU826	£1.00	BYV28-200	15p	HA11804NT	£1.50
2SD1266	£1.00	BU108	£1.00	BUK444/800	£2.00	BYV95B	10p	HA13385PI	£2.00
2SD1398	£1.00	BU124	50p	BUK845/600	£2.00	BYV95C	12p	HA13388P3	£2.00
2SD1415	£1.00	BU126	80p	BUK454/600	£1.00	BYV96D	10p	HCF4520	50p
2SD1427	£1.00	BU180A	65p	BUT11	50p	BYW20-08-9	£1.00	HCF4520BE	50p

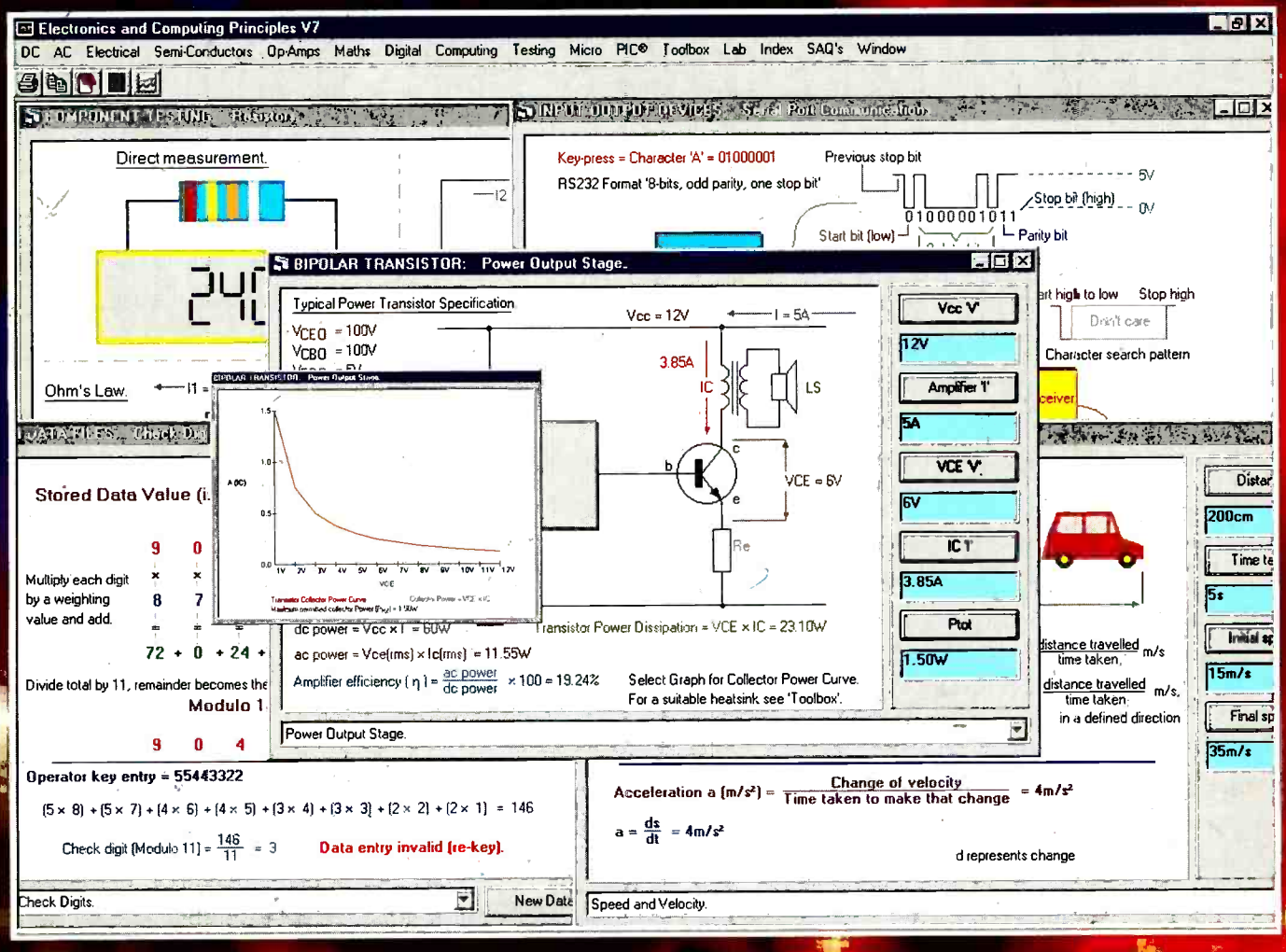
HD6140425J	50p	No accounts	No Credit Cards
HD6140815	£1.00		
HE4528BP	15p	**SENDZ COMPONENTS**	
HEF4029BP	20p	**63 BISHOPSTEIGNTON, SHOEBURYNESS, ESSEX SS3 8AF.**	
HEF4093	20p	**Tel: 01702 338894 Fax: 01702 338805**	
HGA1124A	50p		
HM6264 ALP-15	£3.50	**Specific P/P charges are PER ITEM • For UK addresses 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.**	
IK7ST 6931 B1	£3.00		
IN5401	3p		
IR106A	10p		
L298N	£4.00		
LA7830	£1.00		
LA7831	£1.00		
M708 ABI	£1.50		
M708 LBI	£1.50		
M37204ECSP	£1.00		
M58658P	£1.00		
MN650	£1.00		
SI3522V	£1.00		
SAA1061	£3.00		
SAA3018	£1.00		
SAA5010	£2.00		
SAA5231 (TEXT)	£2.00		

PLEASE ADD 17.5% VAT to BOTH THE GOODS TOTAL AND P/P CHARGE

‘Electronics and Computing Principles V7’

‘95, ’98, NT or 2000

Studying electronics or computing or just want to keep up-to-date in a easy and enjoyable way, then this fully interactive software is for you.



Visit **eptsoft.com** or telephone for full details of more than a thousand menu items.

Personal user £99.95 +VAT

Education £299.95 +VAT

(Includes unlimited multi-user site licence.)

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, RCL 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, Powers, Simplifying, Equations, Graphing, Slope and Translation, Angles, Complex Numbers, Statistics, Lottery Number Predictor, Physical Science.

Computer Science:-

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.

ELECTRONICS LAB (Optional add-on hardware).

eptsoft limited. Pump House, Lockram Lane, Witham, Essex. UK. CM8 2BJ.
Tel: +44 (0)1376 514008. Fax: +44 (0)870 0509660. Email: info@eptsoft.com.

Switch, Delta, Visa and MasterCard accepted.

No additional postage or airmail charges.

THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

JANUARY 2001 £2.90

Install and repair CCTV

Design your own WAP site

Servicing the Sharp CS chassis

Reader offer
A pair of two-way PMR radios

Fault reports
TVs, VCRs, PC Monitors and Satellite

01>
9 770032 647108

Is this how you feel when you're looking for a replacement remote control?

Trying to source replacement remote controls can be like running around blindfolded. To help solve this age old problem, we've produced the definitive guide to König replacement remote controls. Over 11,000 in fact, covering UK TV, video and satellite receivers. All the latest models back through to the late eighties are listed, even LCD's!

It's pocket size, user friendly with alphabetical listings and, best of all, totally free! No catches, no tricks, we just thought it might come in handy.

For your free copy, visit our web site, www.konig.co.uk, call us direct on 01635 278678 or contact any of the König Club Founder members or approved stockists for your free copy.

CHS

Seme

WILLOW VALE ELECTRONICS LIMITED

KÖNIG ELECTRONIC

A Ruwido Product

CONTENTS

January 2001 Vol. 51, No. 3

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 February, on sale January 17th.

THE WALLIS
REMOTALOG 2001

Wallis is pleased to announce the launch of their new "*Remotalog*".

The Remotalog, which has been prepared, solely as a result of demand by dealers, is the First of it's kind. *The Ultimate Remote Control Guide for* TV's, VCR's, Combi's, Satellites, STB's, Camcorders, DVD's and Hi-Fi.

- 30,000 Equipment references
- 6,000+ New models
- User-friendly layout
- Sourcing and Product information
- Dedicated Remotes
- Price reductions on virtually all models
- Universal Remotes
- "Point & Go" Compatibility information

Don't Delay – Register your interest today by contacting

WALLIS UNIVERSAL LTD

A109 RIVERSIDE BUSINESS CENTRE, LONDON, SW18 4UQ

TEL: 020 8870 3388 • FAX: 020 8870 9988

EMAIL: sales@wallis-univer al.co.uk

Wallis Universal
REPLACEMENT REMOTE CONTROLS

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 @ 47P 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

USE ONLY GENUINE PHOENIX REPAIR AND REFURB ELECTRONIC KITS

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, IC's, 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.

Service registration

A lot of people put a lot of effort into trying to get the Retra-sponsored scheme for registering consumer-electronics service providers, along similar lines to the CORGI scheme for gas fitters, off the ground. Sadly, it failed to do so. It may be relevant that our trade has always been highly fragmented, with numerous small firms and individuals providing service for the public. However that may be, it would be difficult to get everyone involved to agree to and implement a registration scheme, despite the advantages it would provide for both the public and the trade. There are at least two major problems: cost, and the time and effort required. Retra did its best. During last summer it ran a pilot scheme, but by the date the 91 participating dealers should have returned their self-assessment forms, in early September, only 21 had done so. As a result, the Retra Council decided to drop the idea. It had become clear that there was insufficient commitment.

All has not been lost however: the Association has used the work put into the scheme to update its code of practice. But this is not the same thing, and falls far short of what some feel strongly is required – that some form of regulation, possibly backed by legislation, should be introduced to protect the public against those notorious cowboys and establish high service standards that the public knows about and is prepared to pay for.

It would indeed be nice to have mandatory standards, compulsory registration and a licensing system that the public recognised, but isn't it all, especially with the current state of the trade, rather pie in the sky? We all know that basic servicing costs and the current low prices of most consumer electronics products make the repair trade a difficult, barely economic business. How can those scraping a bare living be expected to fork out the not negligible sums that would be required to make the system work? It would require adminitration, a way of setting standards, and inspection to ensure that they are being observed. Who has the time and the resources, even if they have the will? There are clearly some well-established and well-run companies that could cope with all this without too much difficulty. Equally there are far more that would find it an extra burden they are unable to take on. Whether you could or couldn't manage, i.e. your economic and trade situation, can vary greatly with local conditions. It is clear that over much of the UK it is, today, extremely difficult to provide the public with a brown goods servicing facility and at the same time make a decent living. Some evidently believe that, if sufficient effort was put into regulation, it would eventually pay for itself as a result of the public confidence and esteem created. But that could take a long time – and time is against us at present.

Do I sound unduly pessimistic? My feeling is that the cowboy problem has always tended to be over emphasised. Cowboys exist and are a nuisance, true. But cowboys can't continue to con the public indefinitely – unless they get some help from those who are technically proficient. The worst cowboys soon give up and try something else, especially in today's trading conditions. Apart from the economics involved, there is the fact that equipment is becoming far too sophisticated for the cowboy to be able to handle. The public also has some protection in the form of the local trading standards officers.

There are those who feel that the public should be free to get whoever they want to service their domestic electronic equipment, despite the fact that there are safety risks. It is not easy to establish a fair balance between freedom and regulation. Those who are competent and capable of providing a good service will soon become known locally and establish a good reputation, which is half the battle. Appalling things can be done by the incompetent, but you could never eliminate this entirely – and the most dangerous botching is perpetrated by the public itself.

In an ideal world you could legislate and drive up standards. The public would appreciate and happily pay for the high standards. But we don't live in an ideal world. What CORGI has achieved may not be practical in the consumer electronics field. People are, sensibly, scared of gas. TV sets may catch fire, but they don't explode and demolish your front room. For many years fail-safe design has been a feature of consumer electronics goods. There is not quite the degree of public concern that there is with gas.

Good engineers and service companies should be able to establish a reputation for fairness and competence, which will provide a firm foundation for their business, but the main problem today is to generate sufficient work. The Retra scheme failed to get off the ground, but there are two other organisations that are committed to good service standards, DASA and Descoe. DASA (the Domestic Appliance Service Association) never really caught on in the consumer electronics field, but Desco (the Domestic Electronic Service Centres of Excellence scheme), which is run by Retra Council membler Chris Keeble, is doing the right sorts of things in the present difficult conditions. They are both deserving of support. You can contact DASA at 71 The Maltings, Stanstead Abbotts, Herts SG12 8JG (phone 01920 872 464) and Descoe at Sound and Vision Electronics, 26 The Triangle Shopping Centre, Frinton-on-Sea, Essex CO13 0AU (phone 01255 673 766).

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 49 are available at £3.50 each from SoftCopy Ltd., who can also supply an eleven-year consolidated index on computer disc. For further details see page 184.
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

DVD developments

Warner Home Video has developed an extension to the DVD Regional Coding system. Called Regional Coding Enhancement (RCE), the extension is designed to stop so-called Region Zero players playing Region 1 discs from the USA. RCE works by asking a player whether it's a Region 1 player and then if it's a Region 2 (European) player. If the answer to both questions is yes, the player is assumed to be a Region Zero machine and the disc can't be played. Instead an on-screen message is displayed telling the viewer that there is no fault with the disc but that it may be necessary to consult the retailer from whom the machine was bought or the manufacturer.

The first DVD title to use RCE is Columbia's *The Patriot*. Initial reports suggest that RCE is effective with some Region Zero players but not with others.

Sony, Philips and Pioneer have developed a prototype high-density DVD system known as DVD-Blue. It uses a blue laser (wavelength 405nm) and can store up to 22·5Gbytes of data on the single side of a 12cm disc. This is sufficient for up to eight hours of standard-definition TV pictures or two hours of high-definition TV recording. The problem with blue lasers at present is their limited life span.

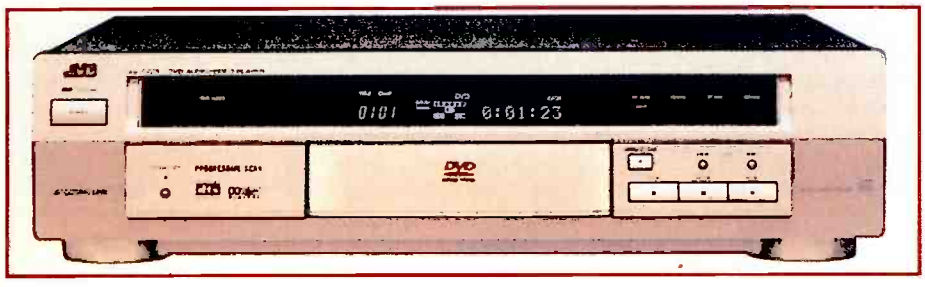
Toshiba has launched, in Japan, a combined DVD-RAM and hard-disk recorder. The machine, Model RD2000, went on sale in December. It has a 30Gbyte hard-disk drive and a 4·7Gbyte DVD-RAM drive, enabling up to 33·5 hours of video images to be stored on the hard disk and 4·5 hours on the DVD-RAM at a data transfer rate of 4·5Mbits/sec.

Editing between the hard-disk drive and the DVD-RAM is possible, and the viewer can select either of four recording modes. These are standard play (4·5Mbits/sec), long play (2·2Mbits/sec), manual (manually selectable between 2-9·8Mbits/sec in 0·2Mbits/sec steps) and 'just' (the transfer rate is determined by the capacity remaining on the DVD-RAM disk, regardless of the hard-disk drive capacity). Live TV programmes can be paused and recorded simultaneously, and the RD2000 has a number of library functions.

The combi recorder can also read DVD-Video, Video CD and audio CD discs. There are S-video and composite video input terminals, while the output terminals include DI1 (digital), component video, S-video and composite video. Weight is 8·9kg and the price in Japan the equivalent of about £1,765. There are at present no details of a UK launch.

Toshiba has launched two DVD-Audio players, Models SD500 E and SD900E, which can also play DVD-Video, audio CD, CD-R and CD/RW discs and incorporate Dolby Digital and DTS decoders, with six channel outputs at the rear. Model SD900E is equipped with 3D-DNR, which is designed to suppress noise that enters the software at the time of mastering and noise on the original film.

JVC's first DVD-Audio player for the European market, Model XV-D723GD, (see picture left) has built-in Dolby Digital, DTS and MPEG decoders which are compatible with MLP (Meridian Lossless Packing – see page 152 for more on this). On the video side there's an MPEG decoder, a graphics chip and a 10bit/54MHz DA converter. The graphics chip includes VFP, a JVC exclusive, which enables the user to set up the quality of the display according to personal preference. There are variable zoom ratios: 14 steps from x1/16 up to x1,024.



New TV/Video chips from Philips

The Nexperia chip set has been introduced by Philips Semiconductors for use in next-generation consumer set-top boxes. The aim is facilitate change in the way TV is used by combining digital video, audio, graphics and internet operation with interactive facilities. The pnx8320 chip integrates the functions assumed for low- to mid-range STBs, including video recording, internet browsing and digital audio. The higher-specification pnx8500 provides high-definition video and 3D graphics. The chips incorporate a 133MHz processor and unified memory architecture. They can be used with terrestrial, satellite or cable TV systems. Audio decoding includes MPEG-2, Dolby Digital, MP3 and G.729. There are seven versions of the pnx8320 to give STB designers optimum flexibility. Acer, the world's third largest PC manufacturer, is developing an advanced interactive STB with hard-disk recording based on the pnx8500. Software-based operation enables new features, applications and services to be added remotely without the need for hardware upgrades.

Philips Semiconductors has also launched a second-generation 'GreenChip', the TEA1507, for use in TV set, monitor and VCR chopper power supplies. It provides a further ten per cent power saving in the standby mode compared to the first-generation GreenChip, and is already being used by three leading international TV manufacturers in their 2001 designs.

The TEA1507 has a high level of integration, its very low peripheral component count providing a cost-effective power supply. The chip enables a product to operate with optimal efficiency at all power levels, including quasi-resonant operation at high power, fixed frequency at medium power, and reduced frequency in the low-power (standby) mode. Valley switching is enabled in all modes for maximum efficiency. With burst-mode operation, the standby power consumption can be reduced below 1W. By combining the chip with Philips' STARplug system, standby levels of 100mW can be achieved.

The chip has comprehensive protection features, such as safe-mode restart under fault conditions; continuous-mode protection by means of demagnetisation detection (zero switch-on current); accurate, adjustable overvoltage protection; short-circuit winding protection; under and over input voltage protection; and low, adjustable excess current protection. To improve overall system protection, a novel mains-independent 'over power protection' has been added.

While the first-generation GreenChip used a 14-pin DIP package, the TEA1507 is encapsulated in a simple 8-pin DIP package.

Philips/LG to merge CRT interests

Philips and LG Electronics are to form a 50:50 joint venture that will combine their CRT manufacturing interests. The new company will be the largest CRT manufacturer in the world. At present Philips is the leading supplier of TV CRTs worldwide while LG has the number three position in CRTs for monitors. Combined sales will run at some £3·75bn a year, and the company will have about 36,000 employees.

Last year the two companies formed a joint LCD venture called LG Philips. In addition to CRTs the new venture will, following valuations, include the plasma display activities of the two companies. The new company will be legally established in The Netherlands with its operational headquarters in Hong Kong. Arrangements for the venture should be completed in the first half of 2001. The aim is to establish a clear cost leadership in a fiercely competitive, mature world market. Philippe Combes, chief executive of Philips Display Components, will head the new company.

Digital TV

According to the *Pace Report 2001* the number of digital TV subscribers in the UK more than doubled between 1999 and 2000, from 13 per cent to 28 per cent. Pace is working with Philips Remote Control Systems and HighPoint Systems to develop Shopping Mate, a hand-held device designed for networked homes. Use of Shopping Mate will enable consumers to order goods by scanning them whilst shopping and sending the data to their digital set-top box at home. From there, the orders will be sent to the retailer.

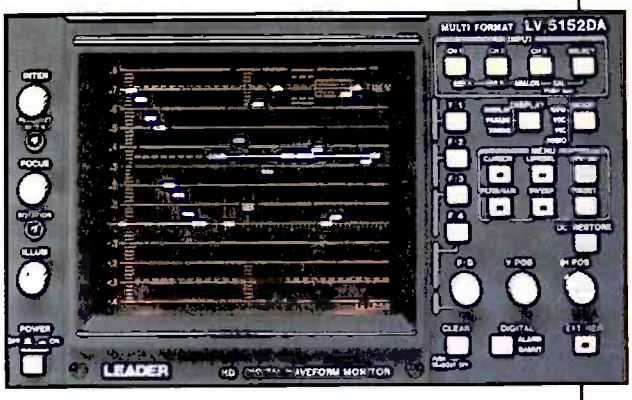
Microsoft and Two Way TV, the UK interactive TV company, have signed a letter of intent with the prospect of incorporating Two Way TV's technology in the Microsoft digital TV system in Europe and North America.

Satellite news

Astra 2B is now in operation at 28·2°E. It has up to thirty Ku-band transponders, with 109W travelling-wave tube output amplifiers, operating in the range 11·70-12·75GHz. Astra 2A and 2B enable SES to deploy up to forty transponders in the BSS frequency band (11·70-12·50GHz). With its steerable aerials 2B can also activate up to sixteen transponders for operation outside Europe in the band 12·50-12·75GHz. Astra 2D should by now be in orbit at the same position, with 2C due to follow in June. 1D is being kept in operation at 28·2°E until 2D is brought into full service.

SES has signed an agreement with Deutsche Telekom for a new satellite, Astra 3A, which will be positioned at 23·5°E to provide TV and data services for German-language markets.

Eutelsat has signed an agreement with the Russian Satellite Communications Company (RSCC) to purchase twelve of the eighteen Ku-band transponders aboard the Express AM1 satellite, which is due to be positioned in orbit at 40°E in early 2003. The transponders will increase Eutelsat's coverage of southern Europe, North Africa, the Arab peninsula and the Indian sub-continent.



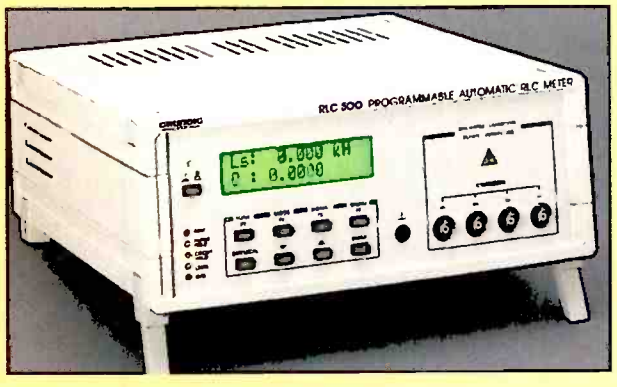
Leader Instruments Corporation has announced a new, upgraded HDTV digital/analogue waveform monitor, Model LV5152DA. Several important operating features have been added, including the ability to handle 14 HDTV formats including 30 (29·97) Hz progressive, 30Hz sF and others. Selection is automatic, and includes colourimetry to match the selected system. Detection and logging of colour gamut errors is provided, and a powerful addition is the separation of embedded AES/EBU digital from the signal being processed, with eight output channels in four pairs. In addition a readout in hex of all data points on a selected raster line is provided, with the choice of manual line selection or line capture as a result of a detected TRS error. There are extensive monitoring functions, including waveform, vector, picture and stereo.

The error detection system spots CRC errors in video (Y and C), audio and ANC data. The time of the first error is shown along with total error count and time elapsed to facilitate BER determinations.

The LV5152DA is available in the UK exclusively from Thurlby Thandar Instruments Ltd., 2 Glebe Road, Huntingdon, Cambs PE18 7DX. Phone 01480 412 451, fax 01480 450 409.

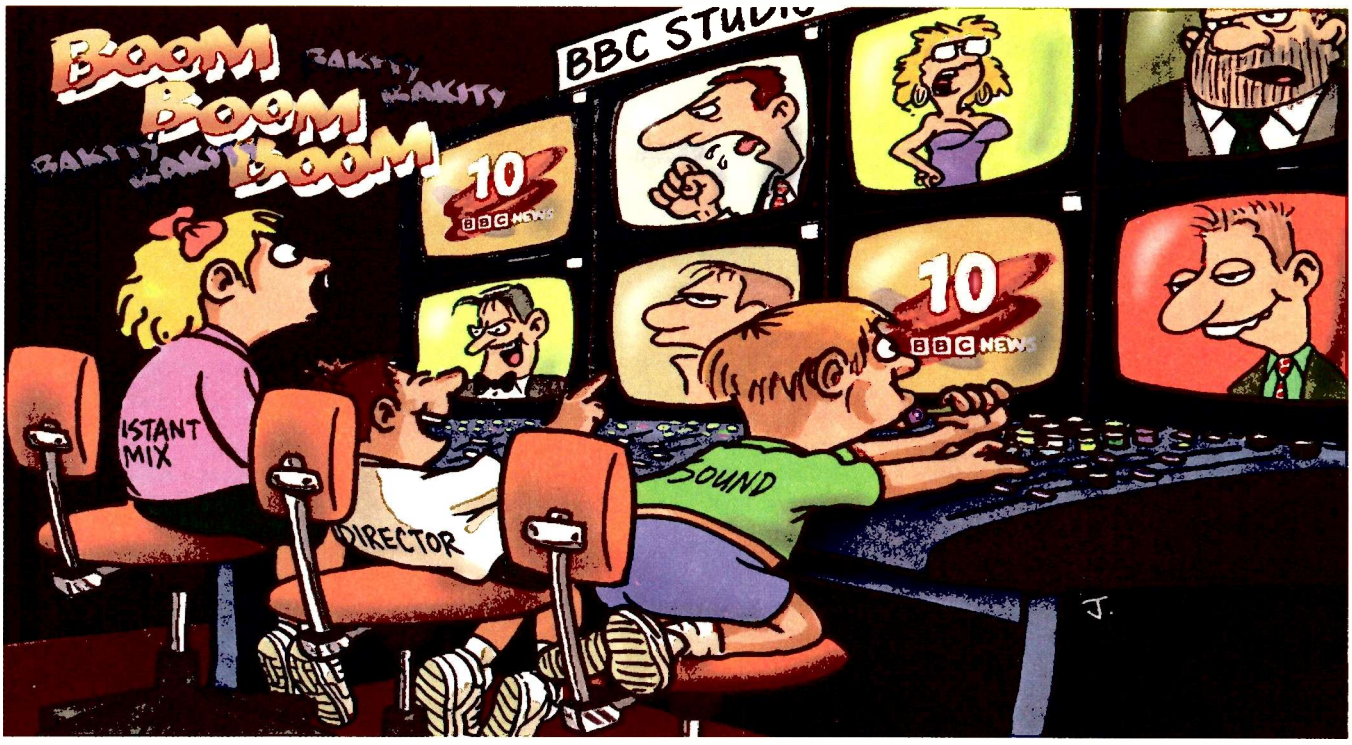
Labgear buyout

Labgear, a leading manufacturer of TV, radio and satellite reception equipment (aerials, amplifiers, distribution equipment etc.) with a history that goes back nearly seventy years, has been bought by its management. Previous owner Teleste Corporation of Finland announced its intention to sell the company at the beginning of 2000. Labgear employs about 100 staff at Cambridge and Ely. Its main work at present is the development of products for the digital TV market in the UK.



Vann Draper Electronics, world-wide distributor for Grundig Test Instruments, has introduced a range of three new automatic LCR meters. Model RLC300 is an automatic/manual instrument for professional applications, with eight measuring parameters, tolerance and relative results, level and phase, four test frequencies and two voltages for electrolytics and polarisation. Model RLC200 has a reduced specification and a basic resolution of 0·2%. With Model RLC100 the resolution is 0·5%.

For further details apply to Vann Draper Electronics Ltd., Stenson House, Stenson, Derby DE73 1HL. Phone 01283 704 706, fax 01283 704 707 or e-mail sales@vanndraper.co.uk



WHAT A LIFE

TV problems: strange customers and strange faults. Some moans, including modern audio equipment and current BBC programming. Donald Bullock's TV/video commentary

I was first to get to the workshop the other morning, except for three odd-looking fellows who were waiting at the door. Two had television sets with them. They trooped in after me.

Early birds

"By the way, I was recommended to come here by Snoddy's – that tall, thin chap it was" said the long and greasy-haired fellow, who was untidily dressed in a black leather outfit and carried a Pye portable set.

"Oh dear" I muttered, as I gave him a quick glance up and down. "Er, unusual outfit, that."

"Ah, I'm a biker, see" he replied.

I looked about but couldn't see a motorcycle. "Where's your bike then?" I asked.

"Haven't got one yet, by the way" he replied. "Oh, and by the way, I'd like you to repair this telly."

I pulled up a job card. "Name, please?" I asked.

"Carruthers-Smythe" he replied.

Obviously immature I thought, noting the name down. Then I waved him out and looked at the next fellow.

He grinned and pointed to a van across the street. "I've brought our Mitsubishi TV for repair, so to speak" he said. "It's a big 'un, so to speak. Can you help me with it?"

I breathed in ten pints of air and followed him to the van. The set was a monster Mitsubishi job, with 29in. tube. I contemplated running away, but decided to face up to it.

As we waltzed it across the road and into the shop there was a chorus of tooting motor horns while a blue-haired woman hollered that we were a pair of louts who deserved the birch.

Having put the set down and recovered my breath, I drew up another job card and glanced up at him.

"Mainwaring-Chapman" he said, "and incidentally the picture's a mass of patterns, so to speak."

I nodded grimly and waved him out too. Mr. Loony I wrote on the card and tucked it into the back of the set. Then I turned to the other chap, who was sitting on the set he'd brought in.

"Before we go any further" I said, "could you tell me your name?"

"Mr Harmsworth-Jukes" he replied, "does that seem a good idea?"

"It fits" I said, "what's wrong with the set? Nervous breakdown?"

The chap doubled up and broke into a peculiar laugh. "Cyuk, cyuk, cyuk, harrrr . . . cyuk, cyuk, cyuk, harrrr . . ." Eventually he stopped and pulled himself together.

"It's a Philips set" he said. "Went dead yesterday, so I thought I'd better get it repaired. Does that seem a good idea?"

"As good as any I've heard so far today" I said.

As he left I wondered whether I should consult one of those counselling people, as the Reverende Goode did when an overhead pigeon chose him. But I decided to soldier on.

A Philips GR1-AX

The Pye set was a 37KV1242/05B 14in. portable, which uses the Philips GR1-AX chassis. Steven took it on. The pre-tuned pictures were hazy with severe flickering at the top of the screen. He tried tuning other programmes and found that the tuning bar skipped through each channel and stopped just after it.

We'd had this problem before with the chassis and had found that slightly retuning the AFC tank coil L5045, which is just to the left of the TDA8305 IF/time-base generator chip IC7020, did the trick. Steven found that the same action cured this set.

The Monster Mitsubishi

When we switched on the monster Mitsubishi set, which was fitted with the Euro 4 chassis, it displayed severe hori-

zontal patterning. This improved a bit as the set warmed up.

It seemed to me that the cause of the trouble was radiation from the chopper power supply, so we decided to check the electrolytics on the secondary side. We found three that were virtually open-circuit, two in the 5V supply and one in the 12V supply. The latter was C920 (470µF, 25V), which is the reservoir capacitor at the input to the 12V regulator IC901. The two in the 5V supply were at either side of the 5V regulator IC903 – C922 (100µF, 25V) and C923 (100µF, 10V). We decided to upgrade them to 105°C types.

Once the replacements had been fitted the set produced an excellent picture.

A Philips AA5

The Philips set, which was fitted with the AA5 chassis, was dead and tripping. Paul was handling this one. He soon found that there was a short in the line output stage, and was relieved to find that the line output transistor had substantial base-to-collector leakage. A replacement made no difference however. After some further checking, he suspected the line output transformer. We had a new one in stock, so this was installed. Again there was no difference, and we found that the original one worked all right in a similar set. So it seemed a good idea to return it to Harmsworth-Jukes' set.

Paul continued with his checks and eventually alighted upon C2450 (680nF, 250V), which is the scan coupling/S-correction capacitor. When he took it out he noticed that there was a hairline crack around its case. It read dead short when checked.

A replacement cleared the fault, and we noticed that the set produced a particularly good picture. A number of similar Philips small-screen (14-20in.) chassis, such as the Anubis A, use a similar line scan circuit with a coupling capacitor of similar value – the value fitted depends on tube size and type.

Flashing lines

"Mr Bullock, I have been on a wild duck hunt trying to find you. I am all at sixes and sevens, for I am in agony with my wife."

I gave Mr Kostonoski my full attention. His cap was almost two feet across: I decided not to take him up on that but concentrate on his misery.

"Now look. Together we can crack this, I'm sure" I said, "please tell me more."

"All the time flashing lines" he continued, "any more I cannot stand and I am taking the cow by the horns."

He spun round, ran to his old car and returned with a 20in. Ferguson set, Model T51F. It's fitted with the TX91 chassis. We pulled it on to a bench and switched it on. Sure enough the picture it produced was covered with flashing, horizontal lines. Mr Kostonoski began to jump about. "It's agony" he cried.

We told him it would probably be OK if he called later and then concentrated on the set itself. Steven suggested that we try it out with a signal fed in via a scart lead. When he plugged one in there was a perfect picture.

"We'll have a look at the IF circuitry" he said, "the BC858C surface-mounted transistors there can cause this sort of trouble – TH02, TH03 and TH04." It didn't take him long to replace them. He then plugged the aerial in again and switched on. A normal picture then appeared.

When Mr Kostonoski returned later that day he was all smiles. "How pleased to see it I am" he declared, "I am delightful."

Moans and groans

My first moan this month is about a fairly expensive Aiwa audio system I took from England to Spain so that I could enjoy the high technical quality of the BBC's radio programmes via satellite and play my carefully remastered CD Bing and Bix records. The unit, which is full of irritating and superfluous gimmicks, is designated the "NSX999 System with CX-N999 Centre Unit and SX-N999 Speaker System". My main complaint is about the built-in reverberation circuit that distorts the sound. I can't adjust it out. The best results I have been able to manage are muzzy and lacking in HF response.

Son James tells me that in a recent television programme a similar modern Japanese product was compared and examined side by side with an older British sound system. The older system produced consistently high-quality sound and the programme's expert demonstrated that, while the modern system was capable of such quality, it took him a lengthy time, adjusting and manipulating the controls, to achieve it. Once the system was switched off, the high quality was lost – the lengthy adjustment procedure had to be repeated.

Since the remedy for the Aiwa's poor results completely eluded me, I put it aside and brought back into use the twelve-year old Sony system I'd previously decided to retire. Early in October I wrote to Aiwa asking for help. As yet there has been no reply.

BBC TV

My second moan is about the deterioration of BBC television. We older fellahs always knew it would happen once commercial television was let loose in Britain, but few of us imagined how low it would sink. Today's programmes don't compare with those of ten years ago, or even of five years ago. Anything regarded as being even faintly intellectual is pushed towards midnight or beyond. Normally when you switch on you are confronted with 'comedy' programmes that feature sub-standard bores, dirty-mouthed yobbos or both. Entertainment today just doesn't have the quality of Morcambe and Wise, Tommy Cooper and the Two Ronnies.

This is not the only trouble. The BBC's airwaves are now crammed with aggravating and time-consuming gimmicks and fake 'commercial' adverts, there presumably to lull some into thinking that they are actually watching ITV. More often than not previously straight programmes, such as the news, are accompanied by a curious and intrusively discordant pumping noise – something copied from Sky News. It's time that adults were once again put in the charge of BBC programming.

A while ago Greeneyes and I spent some hours at the Spanish home of Edmundo Ros and his wife. They are a charming couple. When we were told that a programme called the Edmundo Ros story was to be transmitted one evening we wanted to see it. An examination of the evening's programme list on digital television revealed no mention of Edmundo Ros however. So we switched about in the hope that the programme list was faulty and that we'd stumble across it. We did, though not until it was half over. And the reason we failed to find it in time was that it was entitled not the Edmundo Ros story but I sold my Cadillac to Diana Dors. It subsequently went out more than once on the BBC Knowledge channel – as The Edmundo Ros Story of course.

BBC Radio is now little better. The old Light Programme, now pushed as Radio Two, used to present each morning a programme of varied popular music aimed at housewives but enjoyed by all, with a new and well-known presenter each week. It's now a wearisome presentation with commentary that seems to go on for ever. The records played are excruciating. And if you should switch on in the afternoon, prepare to suffer the awful and continuous self-congratulatory nasal whining of an odd Australian.

I feel better now.

The with-it Bullocks

Incidentally we now have a web site: www.bullock-bros.com

We can also be reached by e-mail as follows.

General enquires: enquiries@bullock-bros.com

Steven: steven@bullock-bros.com

Paul: paulbullock@bullock-bros.com

And me: donald@bullock-bros.com

There now! ■

Grandata Ltd

distributor of electronic components

Television Repair / Modification Kits

MODEL	KIT TYPE	ORDER CODE
ALBA		
1452T	PSU	ONWAKIT
1427T	PSU	ONWAKIT
1402	PSU	ONWAKIT
1455T	PSU	ONWAKIT
1456T	PSU	ONWAKIT
1458T	PSU	ONWAKIT
1459T	PSU	ONWAKIT
2002	PSU	ONWAKIT
2009B	PSU	ONWAKIT
2052T	PSU	ONWAKIT
2152T	PSU	ONWAKIT
CTV501	PSU	ONWAKIT
CTV701	PSU	ONWAKIT
CTV840	PSU	ONWAKIT
CTV841	PSU	ONWAKIT
CTV485	PSU	ONWAKIT
AKAI		
CT1417	PSU	ONWAKIT
CT2159U	PSU	ONWAKIT
CT2162UNT	PSU	ONWAKIT
CT2863UNT	PSU	ONWAKIT
GOODMANS		
147TT	PSU	ONWAKIT
149T	PSU	ONWAKIT
1430RA	PSU	ONWAKIT
1430RS	PSU	ONWAKIT
1430RW	PSU	ONWAKIT
1450T	PSU	ONWAKIT
1455TS	PSU	ONWAKIT
2019R	PSU	ONWAKIT
2029T	PSU	ONWAKIT
2029TA	PSU	ONWAKIT
F16 CHASSIS	FRAME	GOODKIT1
F16 CHASSIS	LINE	GOODKIT1
F16	PSU	GOODKIT1
F16	VIDEO	GOODKIT1
GRUNDIG		
CUC 7350		GRUNDIGKIT1

MODEL	KIT TYPE	ORDER CODE
HINARI		
HIT14RC	PSU	ONWAKIT
JVC		
AV29SX1EK	FIELD O/P KIT	JVCKIT1
AV29SX1EN	FIELD O/P KIT	JVCKIT1
AV29SX1EN1	FIELD O/P KIT	JVCKIT1
AV29SX1PF	FIELD O/P KIT	JVCKIT1
AV29TSIE1	FIELD O/P KIT	JVCKIT1
C14E1EK	PSU	ONWAKIT
C14T1EK	PSU	ONWAKIT
C21ET1EK	PSU	ONWAKIT
CS21M3EK	PSU	ONWAKIT
MATSUI		
1455	PSU	ONWAKIT
1498	PSU	ONWAKIT
2086	PSU	ONWAKIT
2098	PSU	ONWAKIT
21V1N		GRUNDIGKIT1
21V1T		GRUNDIGKIT1
MITSUBISHI		
AV1 SERIES	PSU	MITSKIT3
CT1M5B	PSU	MITSKIT3
CT21M5BT	PSU	MITSKIT3
CT25M5BT	PSU	MITSKIT3
CT21A2STX	TDA 8178S	MITSKIT1
CT21AX1B	PSU	MITSKIT3
CT21A3STX	TDA 8178S	MITSKIT1
CT21AV1BS	PSU	MITSKIT3
CT25A2STX	TDA 8178S	MITSKIT1
CT25A3STX	TDA 8178S	MITSKIT1
CT25A4STX	TDA 8178S	MITSKIT1
CT25A6STX	TDA 8178S	MITSKIT1
CT25AV1B	PSU	MITSKIT3
CT25AV1BS	PSU	MITSKIT3
CT25AV1BD	PSU	MITSKIT3
CT25AV1BDS	PSU	MITSKIT3
CT28AV1B	PSU	MITSKIT3
CT28AX1BD	PSU	MITSKIT3
CT28AV1BDS	PSU	MITSKIT3

MODEL	KIT TYPE	ORDER CODE
MITSUBISHI continued		
CT29AS1	TDA 8178S	MITSKIT2
CT29A4	TDA 8178S	MITSKIT2
CT29A6	TDA 8178S	MITSKIT2
CT29B2	TDA 8178S	MITSKIT2
CT29B3	TDA 8178S	MITSKIT2
CT29B6	TDA 8178S	MITSKIT2
CT33B3	TDA 8178S	MITSKIT2
M5 SERIES	PSU	MITSKIT3
NEI/NIKKAI		
CE25 CHASSIS	PSU	NIKKAIKIT1
C289FTXN	PSU	NIKKAIKIT1
C28F41FXN	PSU	NIKKAIKIT1
PANASONIC		
IC561	TDA 8175	PANKIT1
TX25XD60	VERTICAL O/P IC	PANKIT2
TC28XD60	VERTICAL O/P IC	PANKIT2
TX28XD70	VERTICAL O/P IC	PANKIT2
TX29XD70	VERTICAL O/P IC	PANKIT2
TX-W26D3	VERTICAL O/P IC	PANKIT2
PHILIPS		
310.10708		PHILKIT3
310.20491		PHILKIT2
310.20496		PHILKIT10
310.31994		PHILKIT6
310.32252		PHILKIT5
310.32253		PHILKIT4
310.32254		PHILKIT9
310.32255		PHILKIT7
310.32262		PHILKIT8
310.62264		PHILKIT1
ANUBIS A	SOPS	PHILKIT2
CP110 CHASSIS	SOPS	PHILKIT8
G90A CHASSIS	SOPS	PHILKIT10
G90B CHASSIS	SOPS	PHILKIT10
G110 CHASSIS	SOPS	PHILKIT3
GR2.1 CHASSIS	SOPS	PHILKIT1

MODEL	KIT TYPE	ORDER CODE
PHILIPS continued		
GR2.2 CHASSIS	SOPS	PHILKIT1
D-16 CHASSIS	SOPS	PHILKIT6
HSM VIDEO	SOPS	PHILKIT5
JSM VIDEO	SOPS	PHILKIT4
KSM VIDEO	SOPS	PHILKIT9
LSM VIDEO	SOPS	PHILKIT7
SAMSUNG		
CI5944	FRAME OUTPUT	SAMKIT2
CI6844	FRAME OUTPUT	SAMKIT2
VIK310	PSU	SAMSUNGKIT
VIK320	PSU	SAMSUNGKIT
VIK350	PSU	SAMSUNGKIT
VI375	PSU	SAMSUNGKIT
VI395	PSU	SAMSUNGKIT
WINNER 1	PSU	SAMSUNGKIT
SHARP		
51CS03H	POWER / LINE	SHARPKIT1
51CS05H	POWER / LINE	SHARPKIT1
59CS03H	POWER / LINE	SHARPKIT2
59CS05H	POWER / LINE	SHARPKIT2
59CSD8H	POWER / LINE	SHARPKIT2
66CS03H	POWER / LINE	SHARPKIT2
66CS05H	POWER / LINE	SHARPKIT2
66CSD8H	POWER / LINE	SHARPKIT2
THOMSON		
35029400		THOMKIT2
35065920		THORNKIT1
FV70	PSU	THORNKIT1
ICC7 CHASSIS	TDA 8178FS	THOMKIT1
ICC7 CHASSIS	FRAME KIT	THOMKIT3
ICC8 CHASSIS	TDA 8178FS	THOMKIT1
ICC8 CHASSIS	FRAME KIT	THOMKIT3
R3000	PSU	THOMKIT2
R4000	PSU	THOMKIT2

ORDER CODE	PRICE
GRUNDIGKIT1	£ 10.50
GOODKIT1	£ 11.00
JVCKIT1	£ 11.00
MITSKIT1	£ 3.00
MITSKIT2	£ 15.00
MITSKIT3	£ 6.00
NIKKAIKIT1	£ 12.00

ORDER CODE	PRICE
ONWAKIT	£ 12.00
PANKIT1	£ 7.00
PANKIT2	£ 9.00
PHILKIT1	£ 7.60
PHILKIT10	£ 8.50
PHILKIT2	£ 2.50
PHILKIT3	£ 4.00

ORDER CODE	PRICE
PHILKIT4	£ 4.25
PHILKIT5	£ 5.75
PHILKIT6	£ 5.50
PHILKIT7	£ 7.60
PHILKIT8	£ 4.25
PHILKIT9	£ 7.50
SAMKIT2	£ 8.00

ORDER CODE	PRICE
SAMSUNGKIT	£ 16.00
SHARPKIT1	£ 11.00
SHARPKIT2	£ 11.00
THOMKIT1	£ 7.00
THOMKIT2	£ 12.00
THOMKIT3	£ 9.00
THORNKIT1	£ 12.75

GENUINE PHOENIX KITS SUPPLIED

GENUINE PHOENIX KITS SUPPLIED

WE STOCK A FULL RANGE ON TELEVISION SPARES INCLUDING LINE OUTPUT TRANSFORMERS , ON / OFF SWITCHES .....etc

CD Pick Ups

Part No	Price
KSS 152 A	£13.00
KSS 210 A	£12.00
KSS 210 B	£15.00
KSS 240 A	£24.00

Part No	Price
KSS 213 B	£11.50
KSS 213 C	£11.50
OPTIMA 6 S	£11.50
OPTIMA 5	£11.50

Part No	Price
RCTRTH8151	£20.00
RCTRTH8112	£15.00
CDM12.1	£15.00
CDM12.1 MECH.	£20.00

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

Remote Controls

Universal Preprogrammed Remote Control

Preprogrammed to cover all major Brands of TV , Video , Satellites and CD Players .

Replaces upto 8 different remote controls

With teletext & fastext functions

Order Code : RC9
Price : £10 + vat

Bulk Prices

5 pieces £45 + vat
12 pieces £96 + vat
24 pieces £168 + vat

Magician Sky Digital Remote Control

Operates all SKY digital TV box functions
Operates combinations of TV , VCR & Cable/Satellite systems
Covers 1000's of brands
Teletext and fastext functions
Backlit device indicator keys
Order Code : MAGICIAN4
Price : £10 + vat

We also stock replacement remote controls for 5,000 different models at very competetive prices, contact us for all our remote control requirements . Many of our remote control prices have been reduced.....Please call us for our latest prices

Universal Brand Replacement Remote Controls

Brand for Brand Replacement
Codeless set-up
Teletext and Fastext
Pre-Programmed for the latest models
Replaces broken and lost remotes

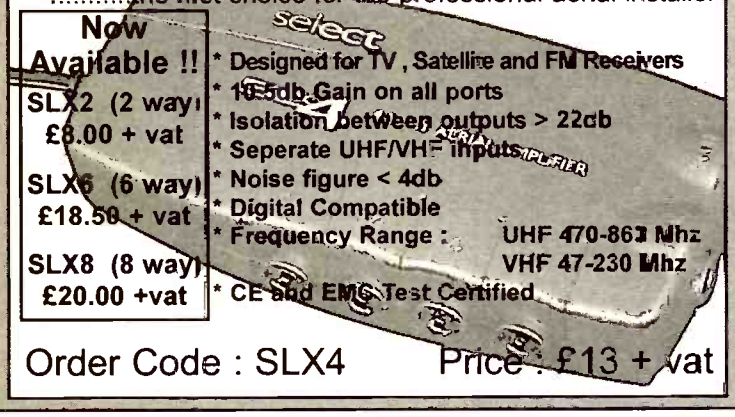
Brand	Order Code
Panasonic TV	RCUNI01M
Sony TV	RCUNI02M
Philips TV	RCUNI03M
Hitachi TV	RCUNI04
Mitsubishi TV	RCUNI05
Nokia TV	RCUNI06
Samsung TV	RCUNI07
Toshiba TV	RCUNI08
Ferguson TV	RCUNI09
Grundig TV	RCUNI10
Goodmans/Alba/Bush TV	RCUNI13M
Matsui/Hinaril/Orion TV	RCUNI14M
Satellite	RCUNI17

Price : £7.50 + vat

Accessories / Tools

SLx4.....4 Way Aerial Amplifier

.....the first choice for the professional aerial installer



Now Available !!

SLX2 (2 way) £8.00 + vat
SLX6 (6 way) £18.50 + vat
SLX8 (8 way) £20.00 +vat

* Designed for TV , Satellite and FM Receivers
* 10-5db Gain on all ports
* Isolation between outputs > 22db
* Seperate UHF/VHF inputs
* Noise figure < 4db
* Digital Compatible
* Frequency Range : UHF 470-862 Mhz, VHF 47-230 Mhz
* CE and EMC Test Certified

Order Code : SLX4 Price : £13 + vat

SOLDER SEAL KIT

DON'T CRIMP IT....SOLDER IT !!!

FOR QUICK AND SAFE CABLE CONNECTION SOLDERING , GLUE-ING AND SHRINKING WITH A HOT AIR GUN ALL IN ONE ACTION

HOT AIR GUN WITH PIEZO ELECTRONIC INGNITION

USES LIGHTER GAS

BLOWS HOT AIR UPTO 650C

ORDER CODE: TOOL53
PRICE : £13.00 + VAT

HOT AIR GUN

FLAMELESS...ONLY HOT AIR

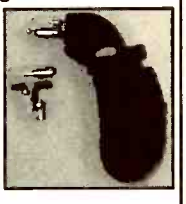
IDEAL FOR THE FOLLOWING :

SHRINKING TUBES

SOLDER SEALS

HEATING AND DRYING HOBBY & MODELLING

BENDING PLASTICS



SMD SOLDERING

BLOWS HOT AIR UPTO 650C

ORDER CODE : TOOL54
PRICE : £7.50 + VAT

We stock over 650 different video heads covering over 2500 different models for the following makes :

AIWA, AKAI, ALBA, AMSTRAD, BAIRD, BLAUPUNKT, DAEWOO, DECCA, FERGUSON, FISHER, FUNAI, GEC, GOLDSTAR, GRANADA, GRUNDIG, HINARI , HITACHI , JVC , LUXOR , MATSUI ,MITSUBISHI , ORION , PANASONIC , PHILIPS , SAISHO , SAMSUNG , SANYO , SHARP , SONY , TOSHIBA...AND MANY MANY MORE

This advert is just a smaall selection of our stock.

We also stock the following :

Full Range of Video Spares	Full Range of Satellite Spares	Multimeters
Full Range of TV Spares	Scart and Phono cables	Service Aids
Transistors	Linear IC's	Computer IC's

Japanese Transistors..2SA,2SB...etc & much much more !!!!!

All at very competitive prices !!

Please contact us if you cannot find the part you are looking for.

* 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

Might WAP

You've probably heard a lot about WAP recently. Firstly the hype and then the criticism. But is it really of any use? Can it benefit your business? Peter Marlow investigates, and explains how you can build your own WAP site.

WAP stands for 'wireless application protocol'. Mobile phones that are 'WAP-enabled' can access the internet. Not quite all the internet though because of small screen size, limited keyboard and narrow bandwidth. So special WAP sites have been built that are optimised for access by mobile phones. And there are lots of them around already.

Getting connected

A number of WAP-enabled mobile phone models are available. Among them are the Motorola Timeport, Nokia's 7110, Mitsubishi's Trium, Siemens' C35 and the Ericsson R320S. They are available by monthly subscription or pay-as-you-go.

To get on the internet, you select from a menu and wait while the connection is made to your WAP gateway. This is like dialling up an ISP as the number and password are pre-programmed.

Note that if you have problems making the connection then your phone may not be data-enabled. Cellphone providers don't seem to do this automatically. However, only a free phone call to the help line is needed to get you up and running.

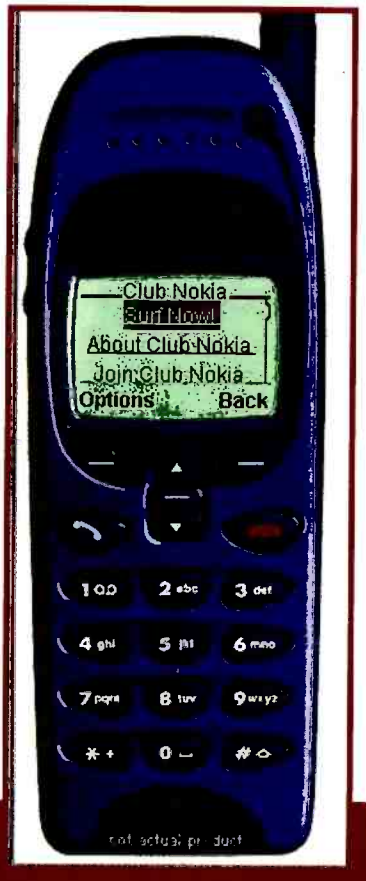
Once the connection is established you will see a menu provided by your WAP gateway with news, weather, stocks and shares, horoscopes, directories and a search engine on offer.

On most phones you can type in web addresses of WAP sites you wish to visit and bookmark these sites for later. It is expensive and impracticable to surf the web with a mobile phone, so the bookmark feature is invaluable.

Remember that you are connected at only 9600bits/second so it can be slow going. BT has introduced a much faster GPRS connection but it is expensive and geographically limited at present.

E-mail can also be set up by a phone call to your WAP gateway or through their internet site. You can receive e-mails, even with attachments in some cases, and you can also send e-mails. But the mobile phone keyboard is a big disincentive. A small fold-up portable keyboard will be the answer but we will have to wait for that.

You are not tied in to your WAP gateway. You can change it by entering new setup codes. Some phones allow up to four different gateways. A number of large companies have their own WAP gateway, where employees on the move can access corporate information such as sales figures and product information. There is a facility to nominate a fax number to have pages of information downloaded.



The main menu screen at Club Nokia.

Motorola Timeport showing a typical menu at the Phone.com WAP developer site.

WAP sites

The big players such as Amazon.com and Lastminute.com already have WAP sites for 'M-commerce' and many are following. But imitating the internet is not necessarily the best use of WAP's forte for time sensitive and location-dependent data.

Railtrack, for example, has just started a WAP site that will tell you when your next train home is. You register on the company's internet site http://www.railtrack.co.uk, where you click on 'Timetable' and then click the mobile phone logo on the left. You type in you details, your home station and work station,

benefit your business?

how far it is to your place of work and the time you are at work. When you dial up the WAP site it 'knows' where you are and can tell you the time of the next suitable train with the minimum of keying.

Other useful applications include take-away menus, cinema listing and booking service and a video library listing – there are many more. Plumbing was one of the first trades to take advantage of mobile phones when they were introduced. Now, Caradon Ideal Boilers, the UK gas boiler manufacturers, BT Cellnet and Improveline.com have teamed up and developed a mobile internet service for plumbers and heating engineers.

The service offers access to technical and diagnostic support. Once it goes live, up to 8000 installers of Caradon boilers will be provided with Siemens C35 WAP-enabled mobile phones connected to BT Cellnet's network. This initiative surely paves the way for other parts of the servicing industry.

Building a WAP site

WAP sites are not programmed in the familiar HTML but in Wireless Markup Language, or WML, which is similar. WML gets away from the 'point-and-click' interface and optimises the data for display and interactivity using the buttons on the phone. WAP pages are simply menus, text with simple graphical pictures, and data input areas.

There's a shareware package called WAP Wizard Lite on the cover CD-ROM that was supplied free with the November issue. You can also download it from www.wap-soft.com. This software enables you to build a basic WAP site without needing to know anything about WML.

The package runs on any PC with Windows 95 or higher. It allows you to write simple menus with links to text pages. A selection of graphics is included.

To install the software, run setup.exe in the folder /WAP on the CDROM. After installation, start up the program Start|Programs|WapWizLite|WapWiz. It opens with a blank home page configured as a menu. First type in a page title and type in a menu item on the left and the link, either a page or internet URL which you want the phone to go to if selected.

To create a new page click on the page icon on the far left of the toolbar. This will be configured as a text page, but you can make it into a menu by clicking the menu radio button at the top right. The text page has a title and one graphic, selectable from a library (courtesy of Phone.com). Remember that the phone screen is quite small.

You can view your page by clicking on the magnifying class icon on the toolbar. Note that mobile phones can display pages differently.

To move between pages click on the tab strip.

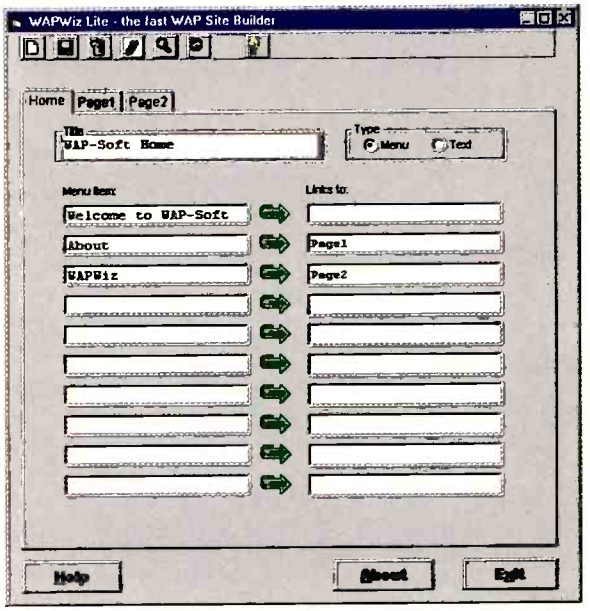
To compile your WAP site into WML click on the disk icon. This builds a file called index.wml in your 'Program Files\WAPWizLite\Web' folder.

Before you publish, you should add a WAP folder to your present web site as below: http://www.mycompany.co.uk/wap/index.wml

You should also check that your ISP can support WAP files of the WML and WBMP variety. Most will be able to.

Next, upload the contents of the folder 'Program Files\WAPWizLite\Web' to the WAP folder on your web site. This will consist of Index.wml and any graphical files. Click the Mobile Phone icon on the toolbar to launch Microsoft Web Publisher, or alternatively use your ISP's FTP standard software.

Now try your site out on a mobile phone. The best phones at present are the Nokia 7110 or the Mitsibushi Truim. These allow you to directly enter a URL. Motorola's Timeport inexplicably does not allow you to do this, but there are other ways of viewing URLs with it (talk to Genie).



Producing a WAP menu page is as easy as filling in the boxes. To produce text for a page, simply select 'Text' in the 'Type' panel.

For more details, print out the help file on the cover CD-ROM with Internet Explorer: d:\wap\WapWizLite Help.htm.

In summary

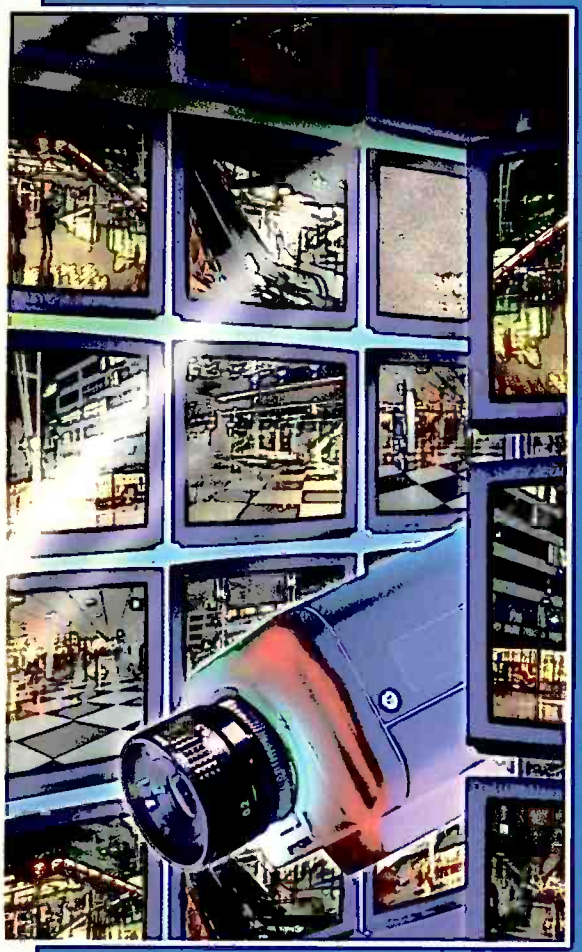
There is no doubt that WAP has a future. As phones get more like personal organisers, WAP will get easier to use. The thing that I like about WAP is that it gives information almost instantly. You don't have to wait for the PC to boot up and dial your ISP.

Accessing information on the move should improve people's working lives across a large variety of professions. ■

Need more information?

Peter Marlow BSc(Hons), ACGI, CEng MIEE is Technical Director of SoftCopy Limited, a multimedia publishing house, which has recently started a new division called WAP-soft to design WAP sites for customers and develop tools for the Wireless Internet. You can contact him at peter.marlow@softcopy.co.uk.

Repair and install CCTV



An obvious extension to a TV repair business is CCTV installation and maintenance. The growth in surveillance-camera systems is huge in both domestic and commercial markets. But where do you start? In this, the first of a set of articles, Joe Cieszynski explains.

The term 'closed circuit television' encompasses a wide range of technologies and levels of sophistication. On the one hand a system may comprise nothing more than a single 12V monochrome camera connected directly to a small monitor. At the other extreme, a system may have many dozens of cameras both indoors and outside, separated by a distance of many miles and controlled and monitored at a central control station.

Complex systems like this require telemetry to control the pan, tilt, zoom, wash/wipe, and heater facilities. They also need sophisticated multiplexers to allow all cameras to be switched quickly and without sync disturbance, and a considerable amount of civil engineering is involved to erect towers and lay underground cables.

Where do you start?

Anyone considering entering this rapidly expanding market must decide at what level they intend to start. It may be tempting to stay at the low-technology end of the market and install observation kits in homes and small retail units. But this is an area that is quickly becoming saturated because of the DIY kits now available. A growing number of 'installers' that are jumping on the bandwagon have no electrical or electronics knowledge whatsoever.

The next level of complexity is perhaps most suited for a qualified electronics engineer breaking into the market. Systems at this level comprise a number of cameras, both internal and external, a multiplexer, a time-lapse VCR, and of course at least one monitor.

The vast majority of installations are of this size. There is currently a demand for good engineers who can specify and install systems that deliver quality pictures.

The most complex installations are those installed at locations such as major city centres and along motorways. These are really out of reach of the small-time installer. Such contracts are usually secured by the major security equipment installers who have the manpower and range of expertise required.

Cameras

Selecting the right camera is important when surveying for a CCTV installation. There's a number of points to consider when choosing a camera. These include whether it is intended for indoor or outdoor use and whether it is monochrome or colour. The type of supply voltage has to be considered, as have resolution, physical size, overt or covert use, type of auto iris drive and format. There will be more on iris drives in a section on lenses that comes later.

If the camera is to be mounted outdoors, then it will need a housing. Even a fixed housing should have an integral heater, which will require a 230V supply. As it is necessary to run a mains supply to such housings, it is usual to employ a 230V camera. Most 230V cameras are suitable for both internal and external use.

For internal use, the choice camera is less restricted as there is a vast range of both low and high voltage colour and monochrome cameras available.

The decision to go for monochrome or colour is frequently governed by cost. However it is becoming increasingly common for a third

party, such as an insurance company or a local police authority, to insist on colour cameras.

Colour isn't always best

Although there are sound reasons for using colour cameras, I have encountered a few instances where this insistence has been based on the incorrect assumption that colour means greater resolution. I was able to save a customer a considerable amount of money by demonstrating to a third party that this is not the case.

CCTV cameras, both monochrome and colour, range in resolution typically between 330 and 570 TV lines or 'TVLs'. An expensive high-resolution monochrome camera may prove to be a better choice than an inexpensive low-resolution colour camera.

A coloured picture is more palatable for an operator to view over a long period of time. When located in premises such as a department store, a coloured image tends to give an improved depth of view.

Bear in mind though that colour cameras require a reasonably high lighting level in order to provide an acceptable picture. Also, they are not sensitive to infra-red (IR) light. This means that when considering their use internally, the lighting levels must be taken into account.

For external use, all but some very expensive cameras will require some form of artificial lighting at night. Careful consideration must be given to this factor when evaluating colour cameras for outside use. There is certainly no point in adding IR spotlights at a cost of over £300 each when the colour camera won't benefit from them.

The minimum operational light level of the camera is important. Measured in lux, this figure is generally quoted in suppliers' catalogues or manufacturers' technical information.

CCDs and light level

All but a few specialised CCTV cameras employ CCD image devices rather than vacuum tubes. This has brought the operational light level down considerably in recent years.

Beware that a simple comparison of figures in a catalogue will not always suffice. Lux figures are somewhat like power output figures for audio hi-fi equipment; they vary depending on how they are measured.

As a guide, if the room has average light levels then a camera with a lux value of around 1 will produce acceptable results. Once the area covered becomes dimly lit, then start to look for cameras with figures below 0.5 lux.

There is a vast range of relatively inexpensive monochrome cameras available that boast figures as low as 0.1 lux. These can provide remarkably clear, high-contrast pictures in very dark locations, albeit with some background grain caused by the AGC turning the gain up full, amplifying the front end noise.

Unless you are prepared to pay a lot of money, lux figures for colour cameras are rarely below 1. In many cases, they are in the order of 1.5-2 lux.

Lenses

Another factor attached to lighting levels is the type and format of lens fitted to the camera. I will be discussing lenses in detail in a later article, but it should be pointed out here that the lens has a direct bearing on the amount of light entering the camera.

A wide-angle lens allows far more light into the camera than a zoom lens. If the lens is a good quality one, this factor is usually of little consequence. But if the camera chosen for an application is already operating at its low light level limit, and a long range zoom lens is fitted, the resulting picture will be degraded.

Camera operating voltages

CCTV cameras are available for one of three supply voltages; 230V AC, 24V AC or 12V DC.

At first glance, the operating voltage may not appear to be too significant when surveying for a system. But the choice of camera supply will have a direct bearing on the material costs and labour involved. This is because some supply methods require more wiring than others.

In a 12V DC system, the supply is fed via a separate cable – usually four-core alarm cable. This means that every co-axial cable must be buddied with a dc cable. In some cases this is no problem for the installer. However, where there is a need for all cables to be hidden, losing that extra cable can sometimes prove difficult.

Another problem associated with 12V DC systems is that of voltage drop. A typical current consumption for a monochrome camera is 350 to 500mA. If the cable run exceeds 100m, then voltage drop can begin to impair camera operation.

Fig . 1. A phase meter offers a simpler approach to setting up the field sync phase adjustment between cameras. (Courtesy of NG Systems)

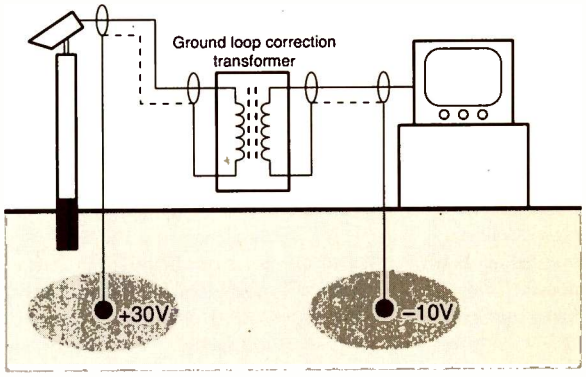


Fig. 2. Ground loops occur where there is a difference in the earth potential between two ends of the co-axial cable. They can be corrected by introducing an isolation transformer in the path of the video signal.

The problem is made far worse if the lens to be employed has a motorised zoom. This is because the motor is supplied via the same cable.

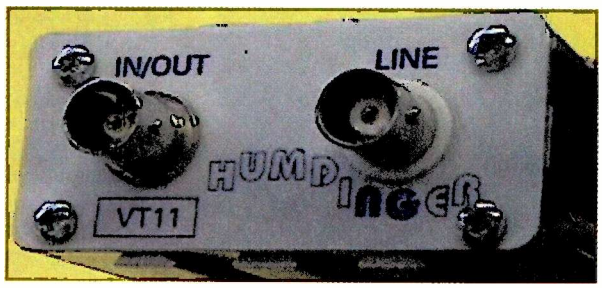
The 12V is derived from a power supply, the rating of which must be suited to the number of cameras being installed. Working on a rule of thumb of two cameras per 1A supply, it becomes obvious that for even a modest system, a fairly large power supply will be needed.

There are two schools of thought on this subject. On the one hand you can install a single large capacity 12V power supply rated high enough to power all cameras. On the other hand you can opt for a number of smaller units.

Having multiple supplies has the advantage that if one unit fails, the whole system is not put out of action. In practice this option is not much more expensive. Additionally, the problem of voltage drop can be reduced by dispersing the power supplies around the site.

A 230V AC system will usually work very well. Installation is more difficult though because every camera location needs a fused spur.

Under current regulations, mains electrical work must be carried out by a competent person. Final



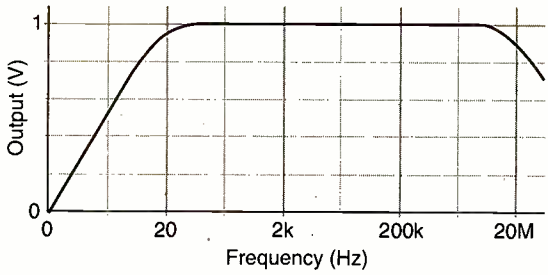


Fig . 3. A typical ground-loop corrector employing a transformer. Note the insulating bush around the 'Line' socket. This prevents the case of the unit from grounding the incoming cable. The second socket is labelled 'In/Out' because the unit may be installed either at the camera or in the control room.

inspection and testing of the circuit must be performed and a certificate of compliance issued to the customer by the inspector, in accordance with BS7671.

If you you carry out the work and you are not a qualified electrician, you will need to subcontract part of the work out. If you don't, you risk prosecution in the event of any mishap.

Having said that, where external cameras are being used, a 230V supply is by far the best. It is essential if a pan/tilt unit is employed as these require 230V to operate the motor.

Locking multiple cameras

Another advantage of having all cameras operating from a 230V supply is that many cameras have a switch to enable the internal sync generator to be locked to the 50Hz mains (line locked). This feature is not essential if an elaborate switcher or multiplexer is to be used, as the incoming signals will be aligned digitally, giving a form of genlocking.

If a simple budget switcher is to be used though, locking the cameras to the mains will overcome the problem of frame flip-over each time the switcher changes inputs. This assumes of course that all cameras are fed from the same 230V mains phase.

Many mains-fed cameras have a control marked 'PhaseAdj'. This has the effect of shifting the field sync pulse generated by the camera through a maximum of 120°. This angle is the difference between any two phases in a three-phase mains supply. Thus where the line lock facility is being used, correct vertical sync can be obtained by adjusting the control on each camera.

Phase adjustment is not always straightforward. Yes, you can simply turn each control until the frame bounce is eliminated at camera switch-over. However like many 'fly-by-wire' methods of this nature, be prepared for problems caused by mains fluctuations, changes in operating temperature, etc.

The correct way to adjust phase is to use an oscilloscope. One camera – usually camera 1 – is taken as a reference. Its video output is fed to the oscilloscope's channel 1. The scope is triggered to this field sync signal.

Output from each camera is then fed in turn to channel 2. The phase control for each camera is adjusted until the field-sync pulses are aligned.

This all sounds very simple until you come to realise that camera 1 is in the reception area while camera 2 is in the car park on a 15m tower. You sometimes need some very long co-axial leads running to your scope!

An alternative to using a scope on site for phase adjustment is to use a hand-held phase meter like that illustrated in **Fig 1**. This is a much better option to taking an oscilloscope up a tower, or trying to view it from a height of 10m in bright sunlight.

Ground loops

One problem sometimes encountered with mains-fed systems is ground loops causing hum bars and possible sync disturbance. This is more likely to occur in a premises that is fed via a three-phase mains supply.

Cameras located around the site may be fed from different phases. When the earths are connected together at the control desk, earth currents begin to flow, modulating the video signal.

The problem might be due to a fault in the electrical installation in the premises. This should be investigated by an electrician. Sometimes though, no fault can be found. In such cases ground-loop correctors may be employed to rectify the problem, **Fig 2**.

A ground-loop corrector is a 1:1 isolation transformer with an impedance of 75Ω. It is designed to pass the 0 to 5.5MHz bandwidth video signal.

The transformer breaks the earth connection between the camera and the switcher/monitor. The unit may be mounted at either end of the installation. However it is usually more convenient to locate it at the control room end. **Figure 3** illustrates a typical device.

As you might expect, the transformer will introduce a signal loss. In the case of a short cable run this should not pose a problem. However, where the signal has already travelled through a few hundred metres of co-axial cable, introducing a transformer may resolve the problem of a hum bar only to introduce a noisy picture. For situations such as this, ground-loop correctors with a built-in video amplifier circuit are available.

Also available are ground-loop correctors incorporating an opto-coupler to break the earth loop. However, because they need a power supply, such units tend to be more expensive.

For sites where ground loops are particularly troublesome, units containing a number of individual transformers or opto-couplers are available. The number of inputs can vary, typically from two to eight.

Vandalism issues

Where cameras are located in public places and there is a real possibility of the camera being pulled off the wall, for example in a pub or night club, mains-operated cameras may not be the best choice.

Once a camera has been torn down, its owner is left with the problem of live wires hanging out of the wall, and all of the potential legal implications attached.

For internal use, 24V AC cameras are very popular. Being defined as extra low voltage, 24V does not come under the same regulations as 230V. Alternating-current transmission largely overcomes the problems of voltage drop.

A separate ac supply is required for such cameras. However some switchers incorporate a limited ac supply, which is sufficient for a small system.

Some cameras are suitable for both 12V DC and 24V AC operation.

Camera ergonomics

The physical size of the camera is sometimes an important factor to consider when designing a system.

On the one hand, the customer might want the cameras to be obvious so that they act as a deterrent. On the other hand it may be more desirable for the cameras to be hidden, either for covert observation or perhaps for their own protection.

Covert cameras are currently available in numerous guises, and their performance is remarkable. A typical covert camera will operate from 12V DC, and comes with a

fixed lens and an electronic iris. It will probably use only four-core alarm cable to carry both the supply and video signals.

The idea of passing 1V pk-pk video signals along unscreened cables might appear rather crude to those of you who are familiar with video distribution. As long as the cable run is not too extensive though – most manufacturers quote 100m maximum – and the cables are kept away from sources of electrical noise, then these cameras perform very well. Co-axial cable is undesirable in such applications. Clearly, the camera will not be very covert with a large co-axial feed running to it.

Covert cameras come disguised as, for example, passive infra-red detectors, smoke detectors and clocks. New guises are appearing all the time. If you really want to enter the world of James Bond, then for around £60 you can buy a camera module and fit it into anything you wish.

Cameras for shops

Dome cameras are very popular in shops and department stores. There are two types.

The simpler type contains one real camera and four or five dummies. The idea is that potential criminals do no know which area is being monitored.

Additional operational cameras can be installed in the dome. However, as with any large multi-camera system, where a number of multiple camera domes are installed, the switching rate has to be quite rapid to cover all areas. A combination of automated patrols and manned monitoring is essential.

An alternative to the multiple camera dome is the speed dome. This has just one camera mounted on a turntable. The operator can control the rotation, tilt and zoom and is thus able to move the camera into any position.

The name 'speed dome' is not just cosmetic. The servo can move the camera into any position very quickly. Because all connections between camera and output cables are via slip rings on the turntable, the camera can rotate continuously in one direction.

A microprocessor controls the dome, enabling the operator to programme specific stopping points. It can then be left to follow a pre-programmed observation pattern – known as an automated camera patrol. The operator can interrupt this pattern if required.

Some speed-dome systems have the ability to train all the cameras onto one point at the command of the operator, or perhaps when a security tag detector triggers at an exit. The idea is that the potential culprit trying to steal from a department store is video recorded by numerous cameras.

When first implemented this worked well, until the criminal fraternity cottoned onto it. Then they devised a routine where one member of a gang would walk near to the exit holding a tagged garment causing the alarm to trip, and while he/she innocently apologised, the rest of the gang ransacked the store! It is now more common to program just one dome to zoom into the event.

In my next article, I will be looking at camera formats, irises and resolution. ■

Testing Digital TV Reception Systems

In this second, concluding instalment K.F. Ibrahim describes a typical ONdigital STB, the basic boot-up sequence and then provides fault-finding guidelines

Pace DTT STB

Fig. 2 is a block diagram of the Pace ONdigital terrestrial digital TV STB. The main difference between this and the satellite DTV STB described in Part 1 last month is the front-end, which includes a tuner, a down-converter (U100), an OFDM demodulator (U200) and an FEC processor (U300). Orthogonal frequency-division multiplexing is the modulation system used for DTT in Europe and other parts of the globe.

As with the satellite model, the output from the front-end is fed via a multiplexer system (U154-6) whose purpose is to enable data to be switched to the PCMCIA external input/output port. The

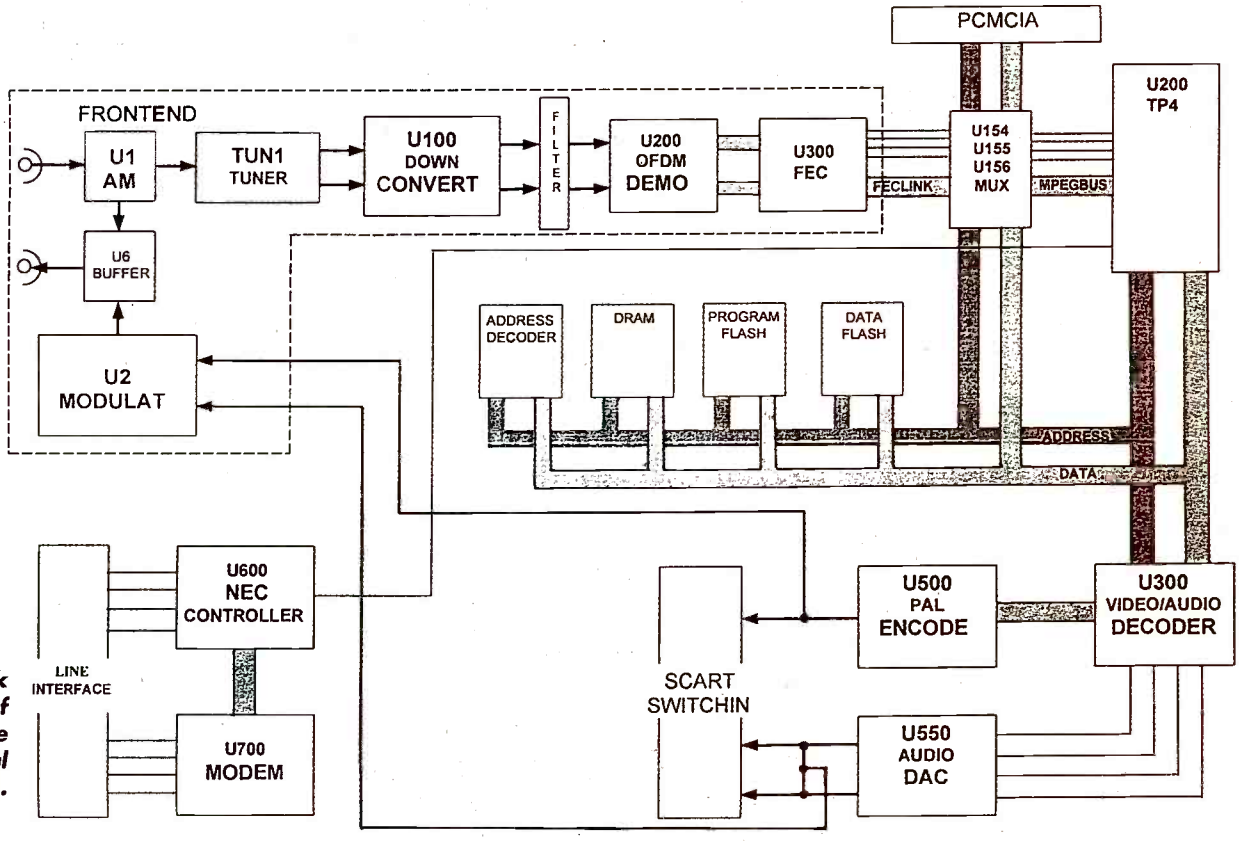
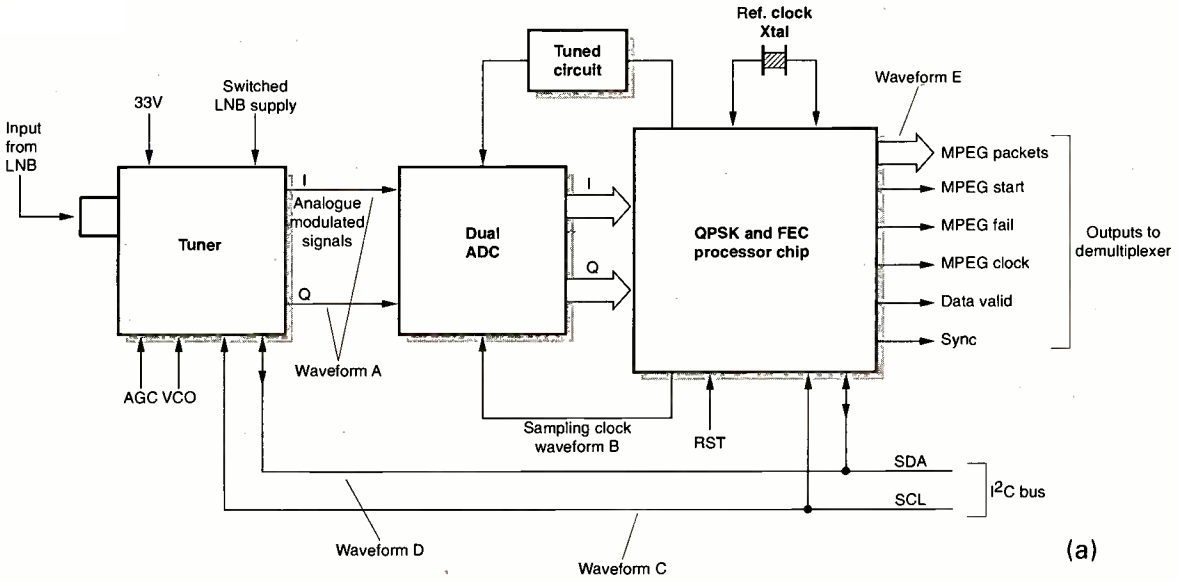
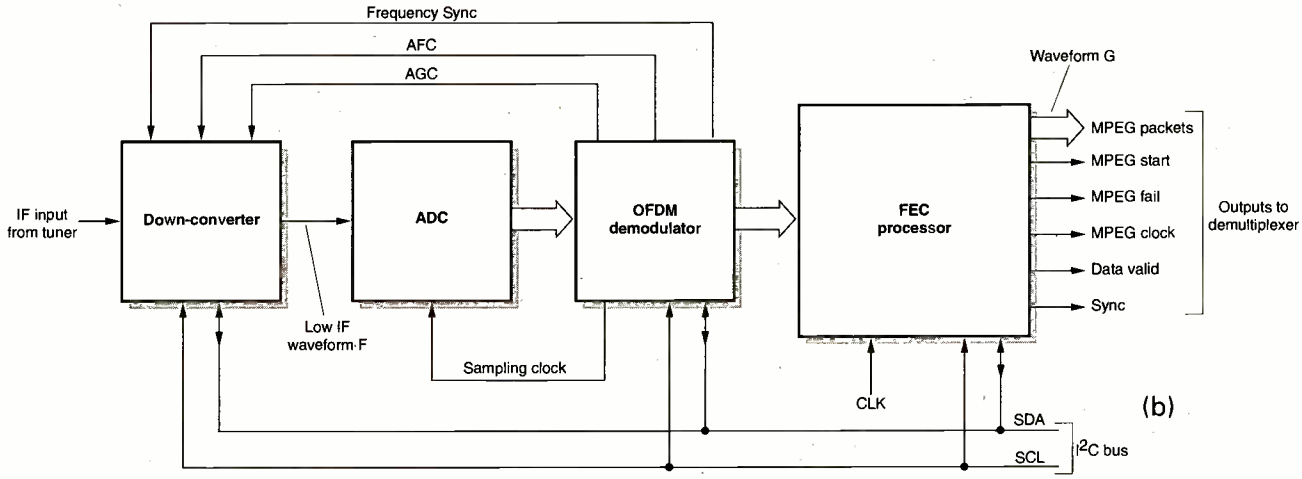


Fig. 2: Block diagram of the Pace ONdigital STB.





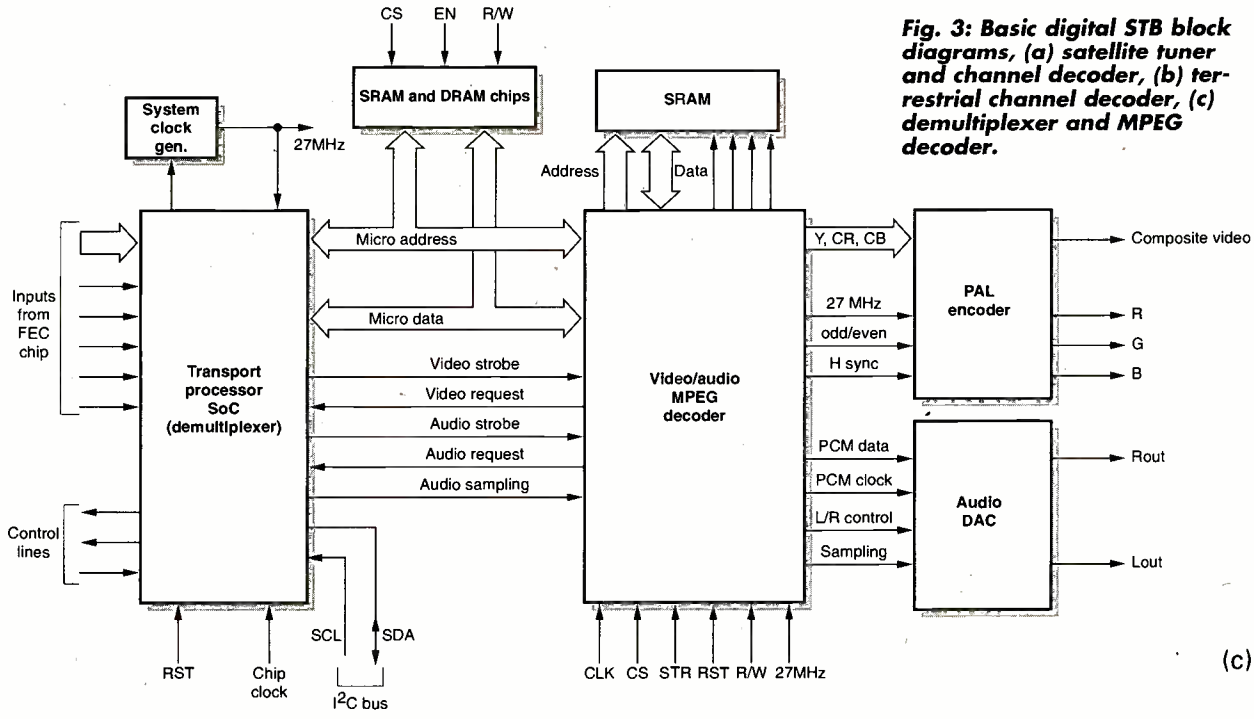


Fig. 3: Basic digital STB block diagrams, (a) satellite tuner and channel decoder, (b) terrestrial channel decoder, (c) demultiplexer and MPEG decoder.

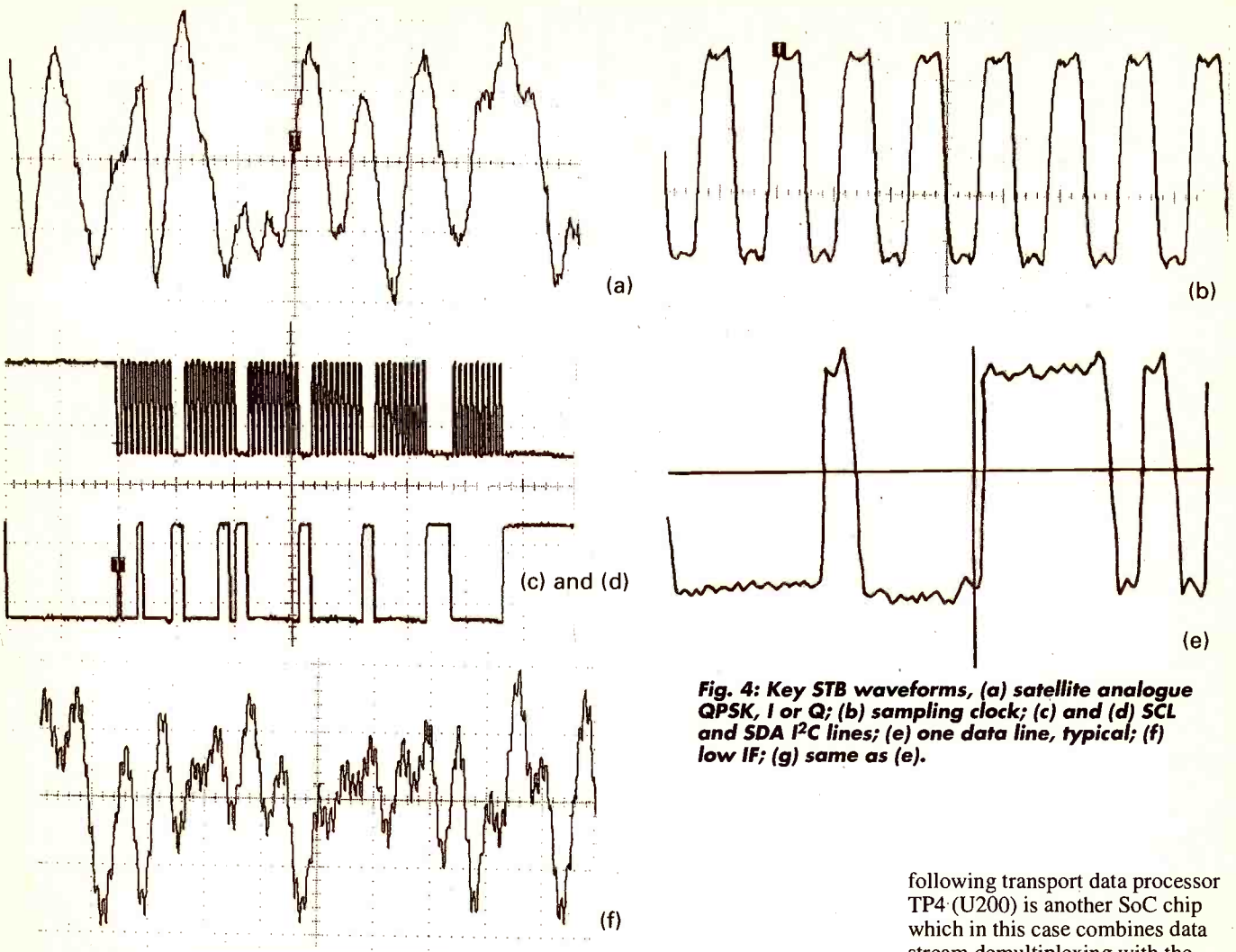


Fig. 4: Key STB waveforms, (a) satellite analogue QPSK, I or Q; (b) sampling clock; (c) and (d) SCL and SDA I²C lines; (e) one data line, typical; (f) low IF; (g) same as (e).

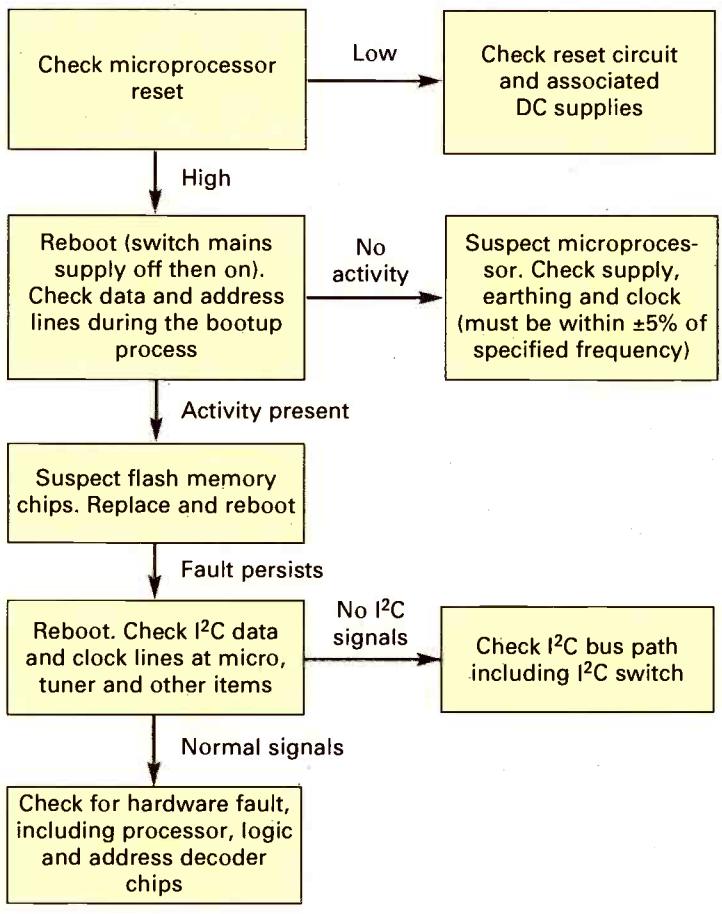


Fig. 5: Fault diagnosis chart for the stuck-in-standby symptom.

following transport data processor TP4 (U200) is another SoC chip which in this case combines data stream demultiplexing with the conditional access system.

The selected data packets from TP4 are fed to the MPEG video/audio decoder U300. Once decoded, the video data is passed to a PAL encoder (U500) while the audio data goes to the DAC U550. Video and audio outputs are available via the scart socket or UHF modulator. Teletext data packets are extracted and processed by U200.

U200 is actually a microprocessor chip that, with the NEC microcontroller U600, controls the operation of the STB. There is telephone connection via a modem (U700) and line interface, and RS232 communication via a UART chip and line driver (not shown).

The boot-up sequence

A set-top box is normally never switched off. It remains in standby when not in use, with its microprocessor, microcontroller and all the other processing chips set and ready to receive and process data.

When an STB is switched on from cold however it goes through a comparatively lengthy process of setting, initialising, configuring and

programming the processor and decoder chips. This involves the loading of the operating platform (also known as the start-up program) and other software routines from flash memory to the microprocessor's DRAM memory. The process is known as the start-up or boot-up sequence.

There are two parts to the boot-up sequence: boot-loader and initialisation. The boot-loader process involves reading and loading the start-up program and checking the applications. If the boot-loader finds any corrupt programs or applications, it will attempt to download new software off-air. This will succeed only if the box has been set up correctly so that connection to the provider can be made via satellite dish or terrestrial aerial.

An off-air software download is indicated by the LED display on the STB's front panel. The progress of the downloading process may also be observed on the screen of the associated TV set if the STB is connected to it via a scart cable.

If the boot-loader process is completed successfully, the on-board microprocessor carries out the next phase, STB initialisation. This involves the processor checking that it can communicate with all the other devices connected to it, including the memory chips, the video/audio decoders, the modem, the smart-card and conditional-access module, then initialising them by loading the appropriate data in their registers.

If the initialisation process fails, going no farther than the boot-loader, the STB will remain stuck in standby. This is the most common fault with a digital STB. The cause could be faulty or corrupt flash software or a hardware malfunction. In the first case, a forced upgrade should be attempted. As an alternative, flash memory chips can be reprogrammed by a PC via the RS232 port. If an upgrade fails, the flash memory that holds the boot-up software is suspect. Try fitting a new set of programmed flash memory chips. If a hardware malfunction is suspected, the faulty chip must be found and replaced. The procedure in this case depends on the chip. A first step however would be to check the I^2C bus for activity during the boot-up process, at all chips.

When the initialisation process has been completed successfully the channel decoder begins to search for the default channel, which is known as the home channel. If the signal is detected, the channel decoder locks to it and data is received, decoded and processed. The result is a picture and sound. If the home channel cannot be detected, the channel decoder looks for other channels. Failure to lock to any incoming signal produces the 'no signal' message on the screen.

Fault finding

Fig. 3 shows basic STB block diagrams and Fig. 4 key waveforms. Figs. 5-7 provide flow-

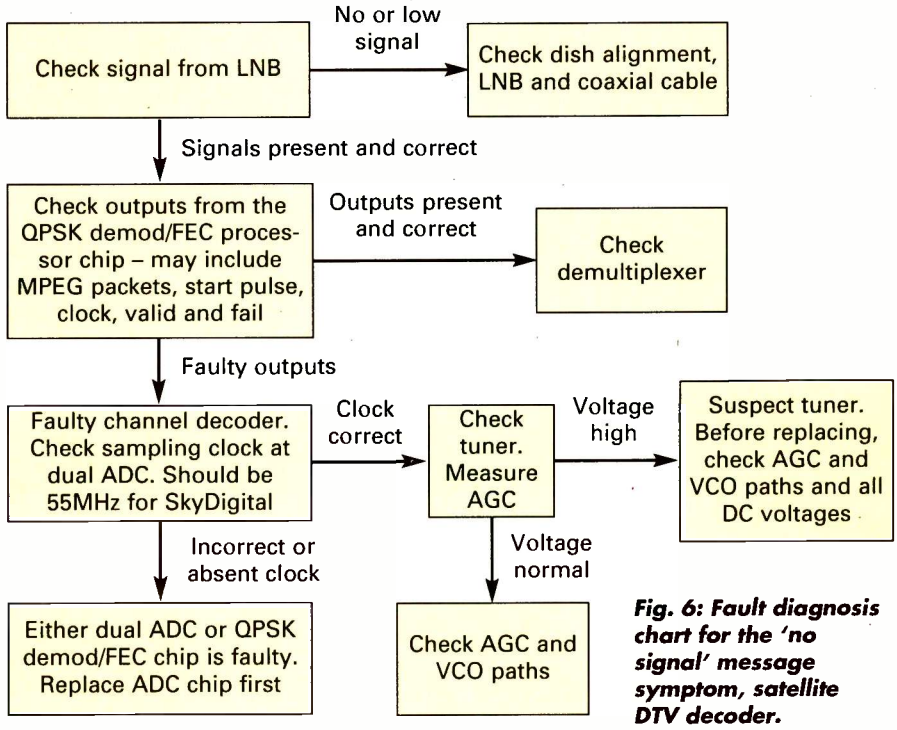


Fig. 6: Fault diagnosis chart for the 'no signal' message symptom, satellite DTV decoder.

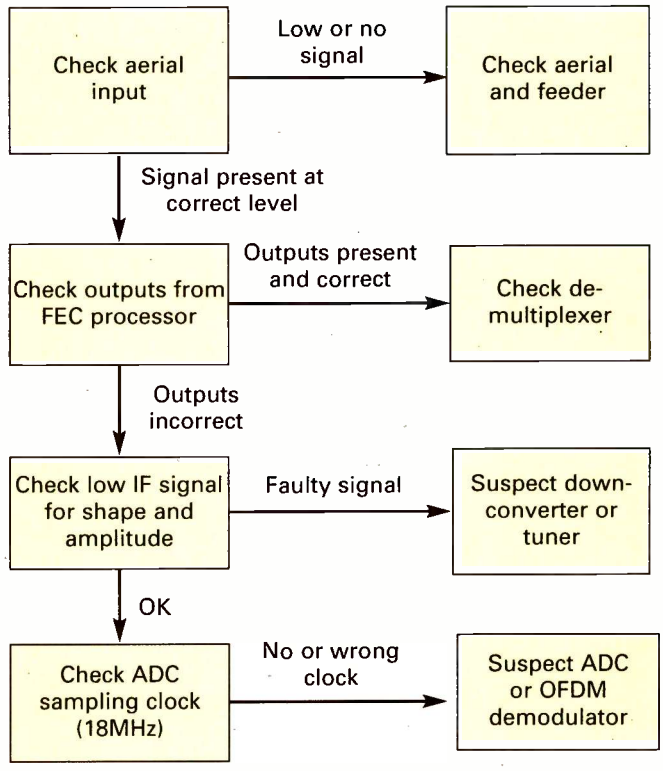


Fig. 7: Fault diagnosis chart for the 'no signal' message symptom, terrestrial DTV decoder. The outputs from the FEC processor may include MPEG packets, start pulse, clock valid and fail.

Fig. 8: Typical picture displays produced as a result of partial failure of the demultiplexing SRAM chip.

Fig. 9: Typical picture displays produced as a result of partial failure of the video SDRAM chip.

chart checks for the most common faults encountered, stuck in standby and the 'no signal' message.

Memories

The various types of memory in a digital STB are used for the following purposes:

DRAM: Microprocessor temporary store.

Flash: Microprocessor permanent store for boot-up and other routines.

SRAM (static RAM): Demultiplexing memory for storing packets of MPEG data.

SDRAM (synchronous DRAM): Video data store and audio delay.

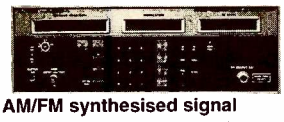
Memory chips can fail either totally or partially. Partial failure can be caused by: the corruption of one or more cells; an address, data or control pin stuck at low or high; or shorted pins. Symptoms observed as a result of memory faults are listed in Table 1. ■

K.F. Ibrahim is senior lecturer at the College of North West London, in charge of digital television short courses, and is author of the textbook *Television Receivers*.

Table 1: Memory faults and resulting symptoms.

Memory	*Partial failure*	*Total failure*	*Consequences*
DRAM	Stuck in standby	Stuck in standby	Boot-up and other routines will not be downloaded from flash memory
Flash	Stuck in standby	Stuck in standby	Absence of boot-up routine
SRAM	Constantly changing pattern of picture break up (see Fig. 8). Menu normal	No picture or sound. Menu normal	The picture breaks up in blocks rather than pixels, as wrong data packets are decoded
SDRAM	Constantly changing pattern of picture break-up (see Fig. 9) and sampled sound. Menu normal	No picture or sound. Menu normal	Picture break-up is in the form of pixelisation, as pixels are displayed in the wrong position on the screen

MARCONI 2019A

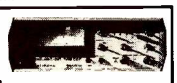


AM/FM synthesised signal generator 80KHz–1040KHz

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 £150

MARCONI TF2015 AM/FM sig gen, 10-520MHz.....£175
RACAL 9008 Auto Mod Meter, 1.5MHz-2GHz.....£200
LEVELL TG2000MP 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 Autorangin 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

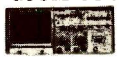
IT'S SO CHEAP YOU SHOULD HAVE IT AS A SPARE

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 OLD 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 £300-£600
MARCONI 2400 Frequency Counter 20GHz.....£1000
H.P. 5350B Frequency Counter 20GHz.....£2000
H.P. 5342A 10Hz-18GHz Frequency Counter.....£800
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 H60/50 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

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.

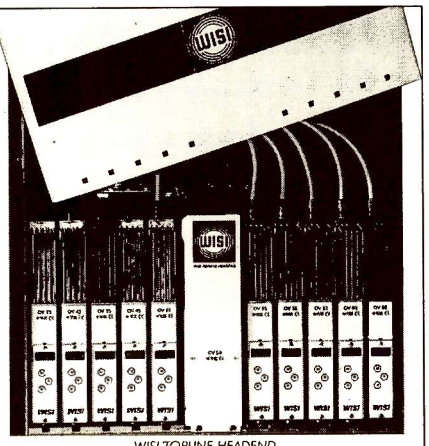
STEWART of READING

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)

Access VISA

The 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 channel processors come together in an 'all-in-one' base unit which contains all necessary accessories for ease of ordering - no additional items required.

CHECK THESE FEATURES

- Frequency agile freely selectable in the VHF of 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

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

A visit to Dolby Labs

George Cole provides an update on the latest audio technology, including Dolby Digital for TV and discs, the DVD-Audio format and the MLP and AAC systems

The name Dolby is synonymous with noise-reduction systems used by audio cassette decks, surround-sound technology, and the digital audio format used by DVD-Video players and some TV broadcasting systems. The company is also involved in DVD-Audio and the electronic delivery of music. I recently visited the company's headquarters in San Fransisco to see and be briefed on the latest developments in these fields.

Dolby Laboratories was formed in London in May 1965 by Ray Dolby, who had been involved in the development of the Ampex Corporation's Quadruplex videotape recording system in the Fifties. When Dolby Laboratories was formed there were four employees: today there are over 550. The company's headquarters, in a converted warehouse, include a magnificent presentation theatre along with administration, engineering, testing and licensing facilities. The company's European headquarters are at Wootton-Bassett, Wiltshire.

Dolby gets its income from manufacturing encoders, providing a variety of services, and from licensing its decoder technology for use in hardware such as DVD players, games consoles, AV amplifiers and TV sets. The number of licensed Dolby products is now more than 853 million. There are no licence fees from Dolby chip-set production, the use of Dolby encoders, or inclusion of the technology with such software as DVD discs, games titles or audio tapes.

Surround-sound technology

Dolby has developed a number of surround-sound technologies. The original Dolby Stereo system was designed for cinema use, then came two domestic versions, Dolby Surround and Dolby Pro-Logic. They use a matrix system that adds extra channels (centre and surround) to a two-channel stereo recording. A decoder extracts and processes the extra information, which is fed to additional loudspeakers.

Dolby Surround decoders were quick to appear on the market, and in 1990 Toshiba was the first company to launch a Dolby Surround TV set. The Pro-Logic system is basically an enhanced version of Dolby Surround, providing improved directional sound. Recently an improved version, Pro-Logic II, has appeared. Developed by audio pioneer Jim Fosgate, Pro-Logic II provides discrete-like performance from a matrix-based system. We were able to com-

pare the two and I noticed a definite improvement to the sound field.

Virtual Dolby Surround was originally developed for the PC market, so that computer users with games and multimedia software could experience surround sound effects from a pair of PC speakers. But Virtual Dolby Surround is also aimed at the TV market. It uses a sound-cancellation process to create "phantom speakers".

Dolby Digital

With the audio world moving to digital technology, it was inevitable that Dolby Laboratories would develop a digital surround-sound system. Thus Dolby Digital appeared. It uses an algorithm known as AC-3, with data rates between 32-640kbits/sec. This can provide mono sound, stereo sound and six discrete channels – left, right, centre, left surround, right surround and low-frequency effects (also known as LFE or a sub-woofer). The Dolby Digital surround-sound channels have a frequency range of 20Hz-20kHz, which compares with the limited 100Hz-7kHz of Dolby Surround's surround channels.

AC-3 is a lossy compression (or, to be more accurate, data-reduction) system, which means that data is lost during the encoding process. Other data-reduction systems include MPEG, ATRAC (used for MiniDiscs), DTS (Digital Theatre Sound) and PASC (used by the now-defunct DCC – digital compact cassette – system). Data reduction is required because a PCM (pulse-code modulation) audio system generates comparatively large amounts of data. The audio CD system, with a sampling rate of 44·1kHz and 16-bit encoding, generates a huge amount of data that can be difficult to store or transmit. So data reduction is required with multi-channel audio.

AC-3 is a perceptual-coding system. The difference between the coded data and the original data is called quantisation noise. Perceptual coding systems work by exploiting the limitations of human hearing (the ear is less sensitive at very low and very high audio frequencies, while sound below the threshold of hearing is inaudible) to shape the quantisation noise characteristic so that the noise is inaudible. As a result, compression ratios of between 8:1 and 12:1 become acceptable.

AC-3 makes use of a phenomenon known as frequency-domain masking – a louder sound makes a quieter sound inaudible. This masking works both ways: quieter higher frequencies are masked by loud lower ones and vice versa. Another hearing characteristic, known as critical-band frequency resolution, is based on the fact that the human ear has finite frequency resolution and certain frequency-bands sound alike. Thus some bands can be removed without affecting the overall sound.

The key to successful perceptual coding is to develop algorithms that come close to matching the characteristics of the human ear. Dolby's algorithms are designed so that they can be adapted as the technology improves. A Dolby Digital encoder samples the initial audio signal to produce a series of data samples. These samples, which naturally vary with time, are converted to equivalent cosine functions by using a Modified Discrete Cosine Transform (MDCT). This is a version of the Fast Fourier Transform (FFT), which uses complex mathematical calculations to convert waveforms into a series of simple harmonic functions. A bit-allocator determines how many bits are used for each frequency sample. The samples are then arranged as a bit stream.

The Dolby Digital decoder unpacks the bit stream, analyses how many bits were used for each frequency sample, and then reconstructs the signal. An inverse MDC transform converts the frequency samples back to time samples.

As a result of all this, Dolby Digital can provide a mono signal with a data rate of just 96kbits/sec (a compression ratio of 8:1), a two-channel stereo signal with a data rate of 160kbits/sec (10:1 compression), or a 5.1-channel (left, centre, right, left surround, right surround and sub-woofer) signal with a data rate of just 384kbits/sec (12:1 compression).

Dolby Digital also has a decoder down-mixing facility. Whenever a 5.1-channel signal is fed to a decoder that's connected to fewer than six speakers, the down-mixing process combines channels. If there are more speakers than there are coded channels, the unused speakers are muted. This arrangement can also be used with Dolby Surround.

Dolby Digital was introduced for cinema use in 1992. More than 25,000 screens worldwide are now equipped with the system. In 1998 Dolby Labs introduced Dolby EX, which provides an additional surround-sound channel.

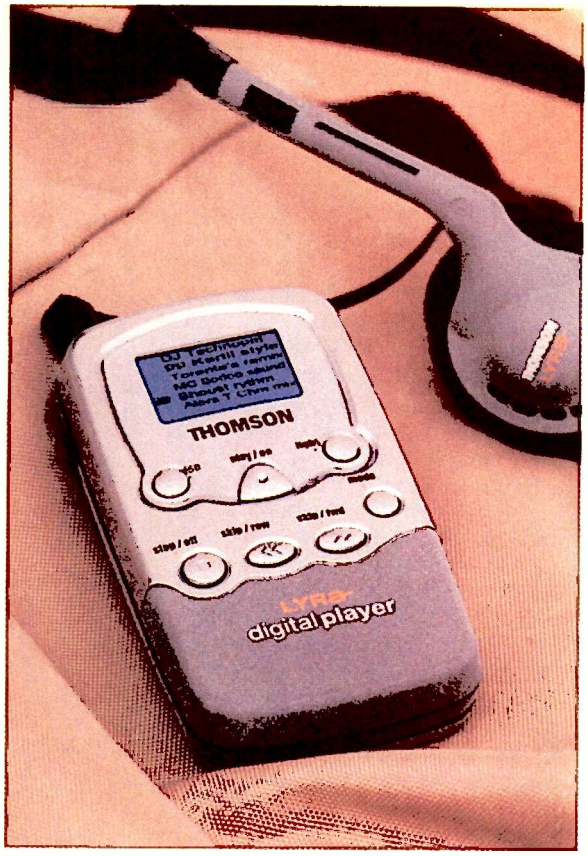
Dolby Digital and TV

Dolby Digital has also been adopted by many digital TV broadcasting systems around the world. In December 1996 the US Federal Communications Commission (FCC) announced that Dolby Digital would be used with US HDTV system proposed by the Advanced Television Systems Committee. ATSC broadcasting commenced in 1998, and there are now 153 stations on air.

In Europe the Digital Video Broadcasting (DVB) standard was adopted. This originally stipulated MPEG-2 video and MPEG audio. As a result of lobbying by Australia (which uses an HDTV version of DVB) and Singapore however the DVB standard was changed in July 1999 to allow Dolby Digital to be used for new and existing DVB transmissions. By July 2000 more than ten million digital set-top boxes incorporated Dolby Digital technology.

Dolby Digital is being used by some broadcasters in continental Europe,

Toshiba's twin-tray entry-level DVD-Audio player, Model SD500E, can also play DVD-Video, CD-R and CD audio discs.



The Lyra digital player from Thomson for use with music files downloaded from the internet.

notably ProSieben in Germany. STB manufacturers such as Nokia, Panasonic and Technsat have launched Dolby Digital products in Germany, and the specification for the new digital decoder from the German digital pay-TV company Premiere World will include Dolby Digital. The Scandinavian specification for DVB receivers is being modified to include Dolby Digital, and the French digital satellite broadcaster TPS has transmitted film trailers with 5.1-channel Dolby Digital via Hot Bird 4. Dolby Labs says that the BBC has expressed an interest in using digital surround sound.

Optical disc formats

Dolby Digital was used by the original LaserDisc format, but only the NTSC version which had room in the waveform to accommodate an AC-3 soundtrack. Early NTSC LaserDiscs carried analogue video, two FM sound channels and PCM audio – the latter for compatibility reasons. To add Dolby Digital, one of the FM channels was used to store the data. The result was a LaserDisc that had PCM audio, Dolby Digital and a mono FM channel. The first Dolby Digital LaserDiscs were launched in the USA in 1995. The LaserDisc has since been superseded by DVD-Video.

Dolby Digital is part of the DVD specification, though originally it was mandatory only for DVD discs intended for NTSC markets, being optional for PAL DVD discs (which must carry MPEG-2 audio). This PAL specification was called for by European manufacturers who wanted DVD to be backwards compatible with MPEG-1 audio (used by the Video CD and CDi formats). In December 1997 however Dolby Digital became mandatory for PAL/Secam DVD titles. Thus all DVD players and discs now have Dolby Digital audio – an increasing number also include DTS audio as an optional extra.

Incidentally the new Sony PlayStation 2 games consoles have built-in Dolby Digital decoders.

DVD-Audio

This year saw the launch of the first DVD-Audio players in the USA, Japan and Europe, produced by several companies including Panasonic, Technics, Pioneer, Toshiba, JVC and Onkyo. The players are designed for compatibility with a variety of discs, including audio CDs and DVD-Video discs.

DVD-Audio provides high-quality, multi-channel sound that far outstrips the audio CD – see Table 1 for a comparison. The discs can also store a range of multimedia content such as text, pictures, graphics and video clips. As with DVD-Video, DVD-Audio discs may be single- or dual-layered, but unlike DVD-Video there is no provision in the specification for dual-sided discs. Nor does DVD-Audio use the Regional Coding system. DVD-Audio discs can be bought anywhere in the world and used with any DVD-Audio player.

In November Warner Music Group launched the first seven DVD-Audio titles in the USA. They are playable by both DVD-Audio and DVD-Video machines and contain a six-channel (5.1) 96kHz/24-bit surround-sound mix, a stereo 96kHz/24-bit mix and a Dolby Digital surround mix, the latter being playable by all DVD-Video players as well.

A new term, 'advanced resolution', has been introduced to describe any DVD-Audio mix that uses at least twice the sampling rate of standard CDs (44·1kHz) and more than 16-bit quantisation (resolution).

The Smart (System Managed Audio Resource Technique) content function enables two-channel reproduction of a six-channel sound source to be controlled by the studio staff. This is done by placing mixdown coefficients as control information in a data channel on the DVD-Audio disc. As a result, when a multi-channel DVD-Audio recording is played back via a two-channel system the listener hears the sound in stereo form exactly as the producer or artist intended.

MLP technology

Although DVD-Audio has a greater data storage capacity than an audio CD (a single-layer DVD-Audio disc has a 4·7GB capacity while the capacity of an audio CD is 650MB) and a faster transfer rate than both CD and DVD-Video (9·6Mbits/sec compared with 1·4Mbits/sec and 6·1Mbits/sec respectively), the DVD-Audio format is hard pushed to store the data required to provide at least 74 minutes of high-quality, multi-channel audio (the standard DVD-Audio playback time). A five-channel PCM audio track with 20-bit quantisation and 96kHz sampling would provide a maximum playing time of a little over one hour. Furthermore the sampling and encoding process would require a transfer rate of 13·8Mbits/sec, which is well above DVD-Audio's maximum data rate of 9·6Mbits/sec (see Table 1).

The DVD-Audio working group (WG-4) considered a number of solutions. One was to use a perceptual-coding compression system such as ATRAC3, AAC (see later), MP3, Dolby Digital or DTS, but this would have been unacceptable for a high-end audio format. Another possibility was to encode the audio channels using a mixture of sampling rates and quantisations. This was considered to be too complex, though it's an option for DVD-Audio production.

The solution was to adopt a technology developed by the small UK audio

The Pioneer DV-828A DVD-Audio player can handle a recorded bandwidth greater than 20kHz.

company Meridian. Meridian Lossless Packing (MLP) is a lossless data compression system that's used for all six-channel mixes. It works like a PC ZIP file, which packs in the data in a more efficient manner.

MLP uses several techniques to achieve this, including lossless processing and lossless matrixing, which reduces the correlation between channels; lossless prediction to reduce inter-sample correlation (waveform prediction), using a large palette of filters; and Huffman coding. These processes provide a disc capacity saving of about 58 per cent, making it possible to put both a stereo and multi-channel, 96kHz mix on the same disc plus multimedia content (see Fig. 1).

MLP is a mandatory part of the DVD-Audio specification, but content developers have the option to use it or not. Dolby Laboratories is the exclusive worldwide licensee for MLP. Dolby Labs has not carried out any development work on MLP and doesn't sell the encoders (Meridian does this – the encoders cost about $7,500 each). Royalties are paid by MLP encoder users and by manufacturers that include MLP decoders in their products, such as DVD players. No royalties are payable by the software industry for use of the technology.

Disc zones

DVD-Audio discs all have two zones, audio and video – the latter can be used for video clips, text, graphics and other information. The video clips conform with the standard DVD-Video specification and can be played by any DVD-Video player (with Dolby Digital audio). Incidentally the text, pictures and graphics on DVD-Audio discs can be viewed on a TV screen while listening to advanced-resolution music.

The Warner Music Group (and BMG) also uses the video zone for the entire album encoded as a Dolby Digital audio mix. This makes DVD-Audio discs compatible with DVD-Video players and means that those who own a DVD-Video player can play DVD-Audio discs, though with lower sound quality.

Dual-layer technology

So far none of the music companies that support DVD-Audio have expressed interest in using the dual-layer technology for hybrid discs, as used by the Sony/Philips SACD (Super Audio CD) format. These hybrid discs have one layer devoted to high-quality audio and another for Red Book audio, which can be read by a standard CD player. There are no plans for DVD-Audio compatibility with audio CD players.

Table 1: Comparison of CD, DVD-Video (single-layer) and DVD-Audio (single-layer) discs.

Parameter	*CD*	*DVD-Video*	*DVD-Audio*
Capacity	650MB	4·7GB	4·7GB
Channels	2	8 max	6 max
Frequency response	5Hz-20kHz	DC-48kHz	DC-96kHz
Dynamic range	96dB	144dB	144dB
Recording time	74 mins	133 mins average	74 minutes or more*
Max data rate	1·4Mbits/sec	6·1Mbits/sec	9·6Mbits/sec
Audio signal	PCM	Dolby Digital, MPEG, PCM	PCM
Options	–	DTS, SDDS etc.	Dolby Digital, DTS. MPEG etc.
Sampling rate	44·1kHz	48 or 96kHz	**
Quantisation	16 bits	16, 20 or 24 bits	16, 20 or 24 bits

*In all modes including 96kHz/24-bits/6 channels and 192kHz/24-bits/2 channels.
** 44·1/88·2/176·4kHz or 48/96/192kHz for two-channel sound, 44·1/88·2kHz or 48/96kHz for multi-channel sound.

Electronic music delivery

The music and electronics industries have had to cope with the advent of music downloaded from the internet and stored on a PC or portable internet music player. The most popular music file is the MP3 (MPEG-1 Layer III) format, but a newer one, AAC (Advanced Audio Coding), offers better sound quality and greater security. AAC also has a thirty per cent lower data transfer rate than MP3 and can handle up to 48 audio channels. It was developed by Dolby Laboratories, AT&T, the Fraunhofer Research Laboratory in Germany and Sony, and is recognised by the International Standards Organisation (it is part of the MPEG-2 audio specification ISO 13818-7). The Japanese ISDB digital TV system uses the AAC format.

AAC has three data rates, 64kbits/sec, 96kbits/sec and 128kbits/sec. The 64kbits/sec rate provides "excellent" sound quality, the 96kbits/sec rate sound quality that's indistinguishable from a stereo source while the 128kbits/sec rate is claimed to be indistinguishable from a 5.1-channel source. The various settings were demonstrated, and I was very impressed with the sound quality at even the slowest.

The future

During a final question-and-answer session Ray Dolby was asked whether audio technology was suffering from the law of diminishing returns – in this case becoming harder to develop new audio formats that offer a demonstrable improvement compared with existing audio hardware or systems. He agreed, but added that the challenge now is to make the best sound more affordable.

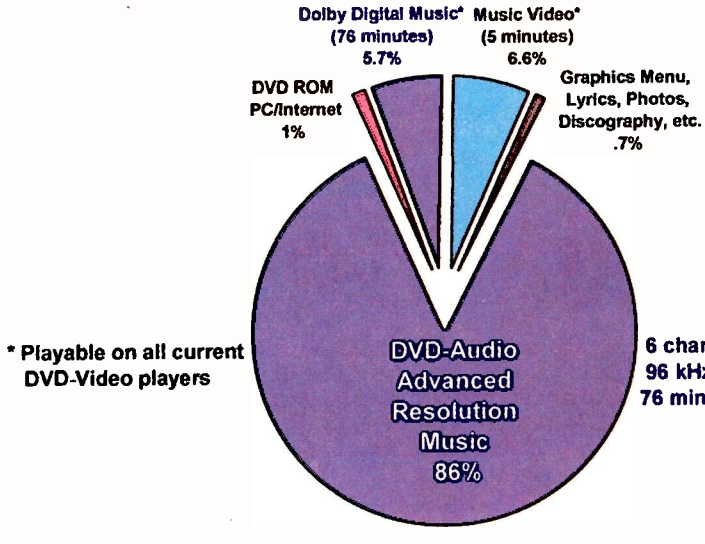


Fig. 1: Use proportions of a typical DVD-Audio disc (single-layer, one-sided with Smart content). Percentages are approximate. Smart content fold-down instructions use less than 0·1 per cent of disc capacity to deliver advanced resolution stereo.

Servicing the Sharp CS chassis

This is an unusual chassis that can easily confuse those not familiar with its operation. The following article (Part 1) by Alex Towers has been designed to make servicing easier by means of a step-by-step approach to fault finding

At first glance the CS chassis, with its densely-packed surface-mounted components on both sides of the PCB, looks as if it would be very difficult for fault-finding and repair. With a logical approach and some care and attention however the chassis, in its various versions, can be serviced at little cost to either your pocket or your sanity.

Several problems can be experienced with the chassis. They are not too difficult to fix. The main requirements are an understanding of the way in which the chassis works, and confidence in replacing surface-mounted components. The aim of this article is to assist with fault diagnosis and, hopefully, enable you to avoid unnecessary component replacement and time-consuming searches for the cause of faults.

Note that, unless otherwise stated, all the circuit diagrams and pictures are based on Model 51CS05H.

Fault finding

To save time and stress it's best to tackle faults logically rather than to jump in and follow hunches. Try to ensure that a component is actually faulty before replacing it.

One thing that can catch out the unsuspecting engineer is the operation of the receiver in the standby mode. A processor chip on the primary side of the chopper power supply circuit, IC1010, disables the power supply for standby. To turn the set on, either press one of the four buttons at the front or use the standby button on the remote control unit. It's not unusual for the receiver to take up to ten seconds to come out of standby as the start-up procedure is carried out.

The chassis does not get particularly hot, and the heatsinks and output transistors should be only warm to touch. It is rare for the major ICs to fail, though the video processor IC201 is probably the most common device to fail in a set.

There are several ways in which the large, flat-pack ICs can be replaced. We can't describe them all here. If you are happy with the method you usually employ, use it. Otherwise it's best to call upon someone who has experience of replacing such devices without damage to repair the set. The ICs are of two types, gull-wing and J-legged. Both are simple to replace when you know how.

As sets that use the CS series chassis are now some four-five years old, dry-joints are beginning to appear. You will find them mainly in the chopper and the line and field output stages, but they can be present anywhere in the chassis. They normally occur at standard radial-lead components, but it's worth reflowing the solder at surface-mounted output devices as well.

When looking for dry-joints, especially in the field output stage, don't be surprised to find that an intermittent fault is caused by component failure rather than a dry-joint. Refer to the field timebase section for an example of this.

It's important to check the connections to the line scan coils wherever a set comes in for repair. The scan coils all have a small PCB to which the drive cable is connected. Occasionally the socket becomes dry-jointed, the result being either erratic turn on or failure of the line output transistor (Q601). Resoldering the connections will usually remedy this but in some cases, where a dry-joint has arced, the scanning leads will have to be connected to the coil tags directly.

Receiver and chassis identification

The first two digits of the model number indicate the CRT screen size – 51, 59 or 66cm. The next two letters indicate chassis CS. The last three digits indicate features, as follows:

**CS03H Basic Fastext and Nicam receiver.
**CS05H Fastext, Nicam and SRS receiver.
**CSD8H Dolby Pro-Logic models (59 and 66cm only).

Although the sets may be fitted with different versions of the chassis, they are all basically the same. The major differences between 51 and 59/66cm models are in the power supply and the audio, field and line output stages.

Table 1 lists the main ICs used in the CS chassis. The type and part number remains the same with most screen sizes and chassis versions. Only the NVM and EPROM have different part numbers depending on model. NVM and EPROM part numbers are listed in Table 2.

Dolby Pro-Logic models incorporate another NVM (IC1011) that contains the extra data required for Dolby Pro-Logic processing. Its part number is RH-IX1603BMZZ.

These chassis were produced in

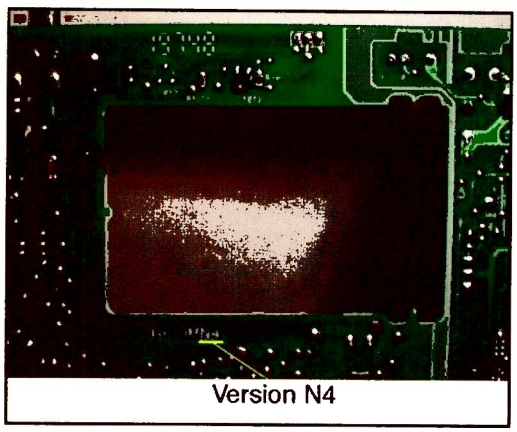


Fig. 1: Location of the chassis version number.

Table 1: Main ICs used in the CS chassis.

IC	*Function*	*Type*	*Part number*
IC1001	Microcontroller	SAB-C502	RH-IX1598BMZZ
IC1002	NV memory	24C16	Depends on model
IC1004	EPROM	–	Depends on model
IC1005	Port controller	SN74ALS573	RH-IX1485BMZZ
IC1006	Port expander (input to IC1001)	HEF4021BT	RH-IX1474BMZZ
IC1007	Port expander (output from IC1001)	HEF4094BT	RH-IX1475BMZZ
IC1008	Optocoupler (data to IC1010)	MOC8105SR2	RH-FX0103BMZZ
IC1009	Optocoupler (data from IC1010)	MOC8105SR2	RH-FX0103BMZZ
IC1010	Primary-side processor	ST6210BM	RH-IX1559BMZZ
IC1012	Reset pulse gen (secondary side)	PST529	VHIPST529C2-1
IC1013	Reset pulse gen (primary side)	PST529	VHIPST529C2-1
IC201	Video processor (51cm models)	TDA8374B	RH-IX1611BMZZ
	Video processor (59/66cm models)	TDA8375A	RH-IX1582BMZZ
IC301	Multiple sound processor	MSP3410B-TS-F7	RH-IX1592BMZZ
IC302	Headphone amplifier	M5218L	VHIM5218L//-1
IC303	Op amp, audio PWM	BA10393	RH-IX1556BMZZ
IC401	Mega Text	SDA5273C26	RH-IX1584BMZZ
IC501	Op amp, field PWM*	BA10393	RH-IX1556BMZZ
IC701	Optocoupler (power supply regulation)	MOC8105SR2	RH-FX0103BMZZ
IC802	Delay line	TDA4665T	RH-IX1583BMZZ

*Also EW amplifier in 59/66cm models.

various versions that differ in minor ways – normally small layout changes or alternative 40/45V generator circuits. The chassis version can be identified by examining the edge of the main PCB around the CRT base-panel cutout – see Fig. 1.

It's important to know the chassis version, as this will enable the correct circuit diagram to be used. All early chassis used in **CS03H receivers were either versions N2, N3 or N4: later models were fitted with the N5, N6 or N7 versions. These latter were the base chassis for **CS05H and **CSD8H models. So, when servicing an N5 or higher number chassis, it's advisable to use a **CS05H or **CSD8H service manual.

Table 2: NVM and EPROM details for different models.

Model	*NVM (IC1002)*	*EPROM (IC1004)*
51CS03H	CH-IX1588CJH3	CH-IX1507CJH8
51CS05H	CH-IX1588BMZZ	CH-IX1507CJHB
59CS03H	CH-IX1588BMZZ	CH-IX1507CJH7
59CS05H	CH-IX1588BMZZ	CH-IX1507CJHA
59CSD8H	CH-IX1588BMZZ	CH-IX1600CJH0
66CS03H	CH-IX1588BMZZ	CH-IX1507CJH7
66CS05H	CH-IX1588BMZZ	CH-IX1507CJH6
66CSD8H	CH-IX1588BMZZ	CH-IX1600CJH0

First steps

The first thing to note is that the chopper power supply is switched off in standby, so there will be no voltages on the secondary side of the supply. When you look at the front of the set all that's visible is a red light. This doesn't mean that the power supply is running: the neon is connected across the output from the mains switch, so it's a mains-on indicator only.

When a set comes into the workshop for repair, check that it's not in standby either by pressing any of the four buttons at the front for a couple of seconds or by using the standby button on the remote control unit. If the power supply then starts up, this normally means that it's all right – even if it shuts down again a few seconds later.

Before proceeding further, check the resistances across the various supply lines. They vary slightly (by a few hundred ohms) from set to set, but the following figures provide a guide:

+18V supply (cathode of D719) greater than 1kΩ.

–18V supply (anode of D710) greater than 500Ω.

HT supply (cathode of D708) greater than 1kΩ with the line output transistor disconnected. The HT is 112V for 51cm sets, 150V for 59/66cm sets.

+7·1V supply (cathode of D712) greater than 10kΩ.

The two +5V supplies are derived from the +7·1V supply via Q704 and Q707. We will consider these later.

Fig. 2 shows the circuitry on the primary side of the chopper power supply. For standby operation, Q702 is switched on thus connecting the gate of the chopper MOSFET Q701 to the earthy side of the supply produced by the mains bridge rectifier D701-4. Pin 10 of IC1010 controls Q702 – the voltage here is high for standby – via R734 and D721. IC1010 is powered by a separate full-wave rectifier circuit (D724-5 and C723) whenever the set is connected to the mains supply. Note that the voltage at its supply pin (1) can be anywhere between 3·5V and 5·1V – zener diode D1101 is included to set the maximum voltage. If the voltage is lower than 3·5V there's a fault in either the rectifier circuit or IC1010.

You can check whether the power supply is operational by disconnecting one end of D721. Be careful when doing this: if the set is shutting down because of a protection fault, further damage may occur. It is important to reconnect D721 after completing a repair. Otherwise, when the set

returns to standby the sound and picture will be muted by the microcontroller chip IC1001 but the chopper circuit will not be turned off. The result can be intermittent popping sounds from the loudspeakers or other erratic conditions while in standby.

Fig. 3 shows the location of IC1010 and associated components – D724 and D725 are behind the posistor. Fig. 4 shows the location of R734 and D721 on the print side of the PCB.

IC1010 generates a synchronisation signal so that communication with the main microcontroller chip IC1001 can be maintained via the optocouplers

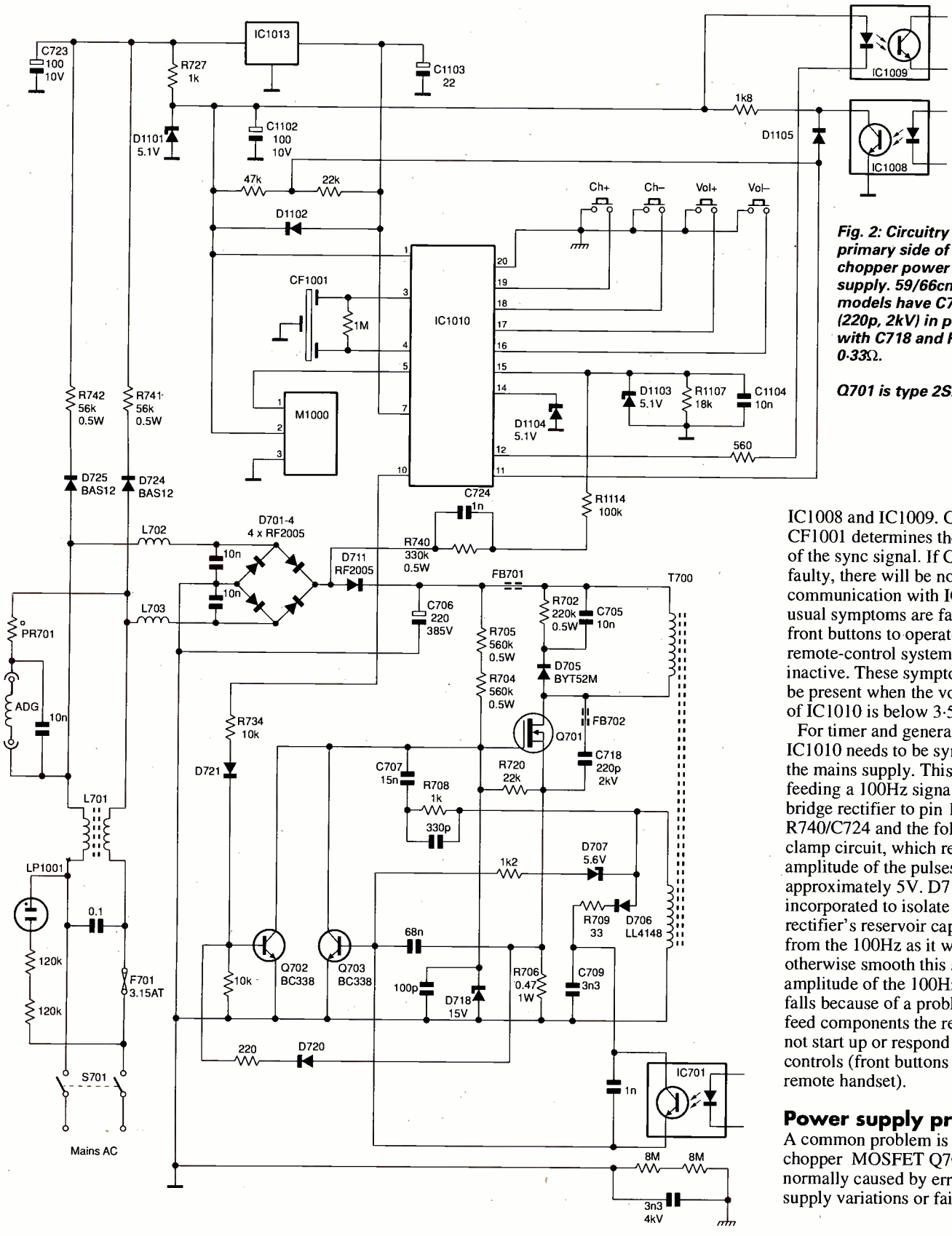


Fig. 2: Circuitry on the primary side of the chopper power supply. 59/66cm models have C733 (220p, 2kV) in parallel with C718 and R706 is 0·33Ω.

Q701 is type 2SK2605.

IC1008 and IC1009. Ceramic filter CF1001 determines the frequency of the sync signal. If CF1001 is faulty, there will be no communication with IC1001. The usual symptoms are failure of the front buttons to operate and the remote-control system being inactive. These symptoms will also be present when the voltage at pin 1 of IC1010 is below 3·5V.

For timer and general operations IC1010 needs to be synchronised to the mains supply. This is done by feeding a 100Hz signal from the bridge rectifier to pin 15 via R740/C724 and the following clamp circuit, which restricts the amplitude of the pulses to approximately 5V. D711 is incorporated to isolate the bridge rectifier's reservoir capacitor C706 from the 100Hz as it would otherwise smooth this signal. If the amplitude of the 100Hz, 5V signal falls because of a problem with the feed components the receiver may not start up or respond to the controls (front buttons and the remote handset).

Power supply problems

A common problem is failure of the chopper MOSFET Q701. This is normally caused by erratic mains supply variations or failure of C706

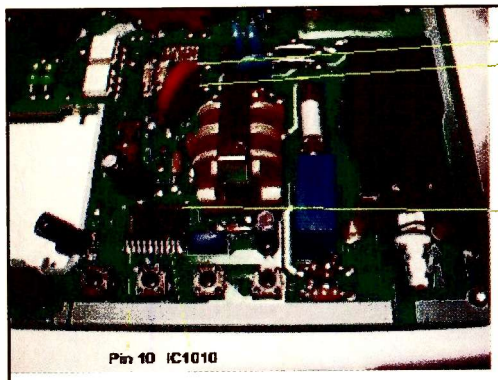


Fig. 3: Location of IC1010 and associated components (D724/5 are behind the posistor).

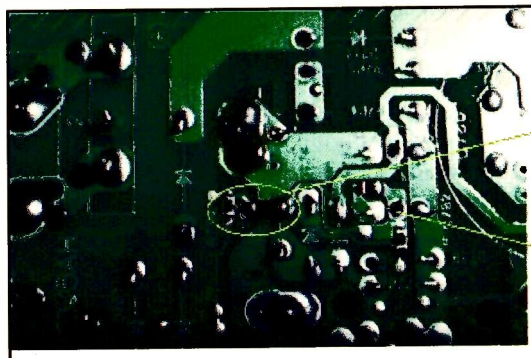
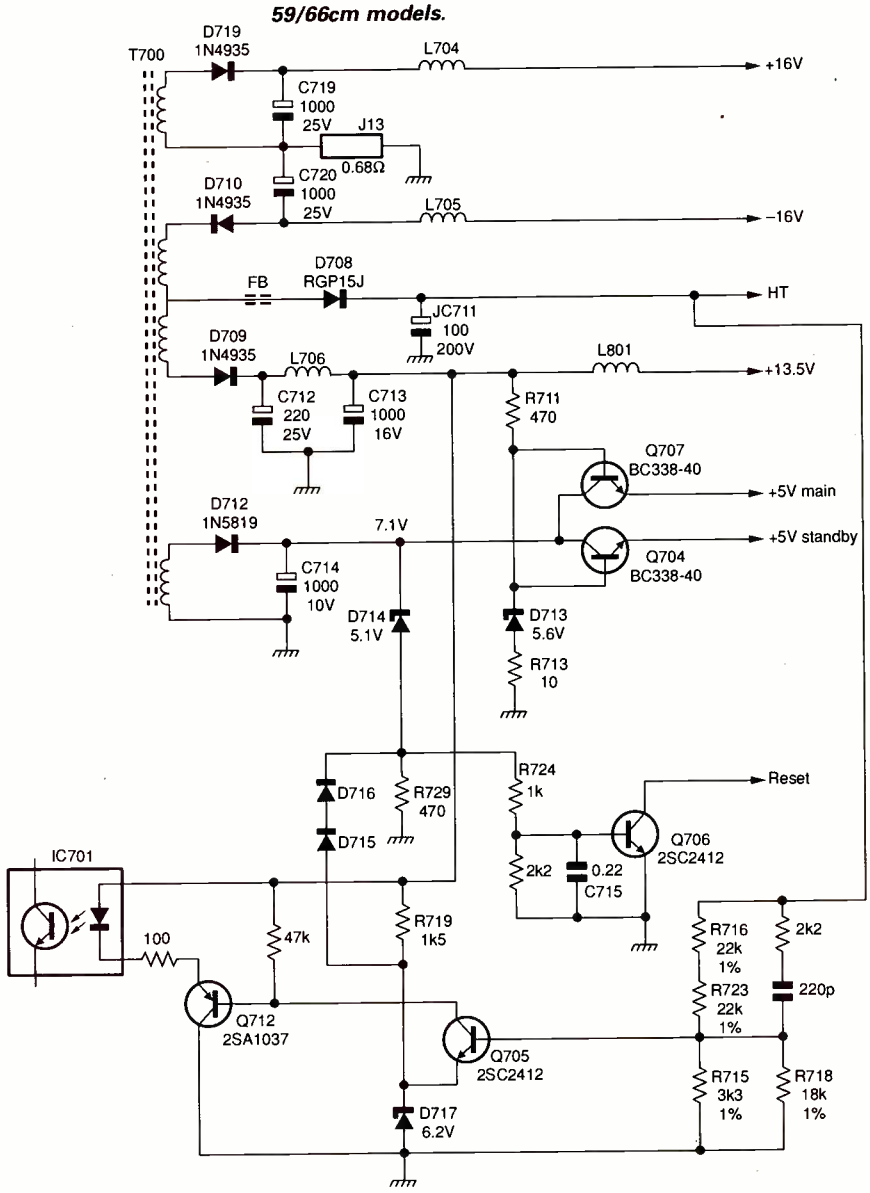


Fig. 4: Location of R734 and D721 on the print side of the PCB.

Fig. 5: Circuitry on the secondary side of the chopper power supply. In 59/66cm models R716 and R723 are 49·9kΩ 1%, R715 is 4·7kΩ 1% and R718 is 180kΩ The HT is 112V in 51cm models, 150V in 59/66cm models.



(rivets loose). In most cases you will also find that D718 and Q702 are faulty. Sometimes R720 (22kΩ) also fails. It is worth checking the value of R720: if it goes high there will be intermittent failure of Q701.

In normal operation the voltage at the gate of Q701 rises to 4·5V. Q701 then switches on. The voltage at its gate continues to rise until it reaches about 9V, when Q703 switches on, returning Q701's gate to 0V. Thus Q701 switches off. The charging circuit at Q701's gate consists of R704/5 and C707, which is returned to earth via R708 and the winding on T700. R704/5 can go high in value. In this event the power supply normally fails to start up. Alternatively its operation may be erratic.

IC701, Q703 or R709 can be the cause of poor regulation. If R709 goes high in value all the outputs from T700 will rise. As a result the reservoir capacitors may fail prematurely. In a few rare cases other parts of the circuitry may be damaged.

Fig. 5 shows the circuitry on the secondary side of the power supply. Q704 and Q707 provide 5V supplies for the various processing ICs. Note that although the output from Q704 is labelled +5Vstby it is not present in standby as the chopper circuit is switched off. These 5V supplies can sometimes be low (less than 4·9V is considered to be low). This will lead to erratic or no operation of the various processing ICs or even failure of the output stages. Normally either Q704 or Q707 will be the cause of a low 5V supply.

Q707 has been known to cause intermittent failure of the field output stage supply fuses (R631 and R632), a black band at the bottom of the screen, the 'rainbow effect' at the top of the screen, line tripping and slowness in coming out of standby. If Q707 is faulty it's a good idea to replace C714 as well, even if it has been replaced before.

Q706 provides the reset pulse at pin 10 of the microcontroller chip IC1001. It's controlled by the charging of C715 via R724 and D714 from the 7·1V supply. If C714 is leaky, the 7·1V supply will develop slowly and the reset pulse will not reset IC1001 or will do so after a delay of minutes to hours.

If C714 has to be replaced, be sure to fit a component rated at 105°C.

The start-up procedure

Once you have established that the power supply will operate independently of any control from IC1010 the next step is to see if the start-up procedure is being completed. It's important to understand the start-up procedure, as this is the key to finding the cause of the majority of faults in the CS chassis. The basic start-up procedure is as follows – the Nicam LED is red during steps 1-16 and green during steps 17-19:

(1) IC1010 and IC1013 are fed with power derived from the mains supply via the rectifier circuit D724/5 and C723.

(2) IC1013 resets IC1010 at pin 7, which goes low.

(3) The power supply starts up when pin 10 of IC1010 goes low.

(4) The +5V supply is established.

(5) The microcontroller chip IC1001 is reset at pin 10, which goes high to reset and then returns to 0V.

(6) The clock oscillator at pins 20 and 21 of IC1001 starts.

(7) Data is read from the EPROM IC1004 via the parallel data bus (ALE is active).

(8) The I²C bus reads data from the NVM (non-volatile memory) IC1002.

(9) IC1001 produces a secondary reset pulse via pin 14 of IC1007.

(10) The secondary reset pulse resets IC305 and IC401 (via Q1001).

(11) Data is sent to IC305 via the I²C bus to check that it has been reset.

(12) Data is sent to IC201 via the I²C bus to check that it is operational.

(13) The secondary reset pulse occurs again.

(14) Line drive, at 31·250kHz, starts at pin 56 of IC201.

(15) IC401 is interrogated via the M3 bus to check that it is operational.

(16) The line output stage becomes active. A flyback pulse is sent to pin 57 of IC201.

(17) IC201 switches the line drive at pin 56 to the normal rate, 15·625kHz.

(18) The field and audio output stages become active.

(19) Audio and video mute released: the picture appears.

Note that if the set was in standby when the mains supply was last switched off it will revert to standby at step (7) via the action of IC1010. Also that during the start-up data is transferred to IC1010 via optocoupler IC1008. This enables IC1010 to interpret the various remote-control and key-scan commands.

By monitoring the ALE signal at pin 11 of IC1005 (see Fig. 8) you can check whether data communication is taking place between the EPROM (IC1004) and the microcontroller chip IC1001. Effectively, the ALE signal changes state each time data (an instruction) is read from the EPROM. This must therefore mean that the reset pulse

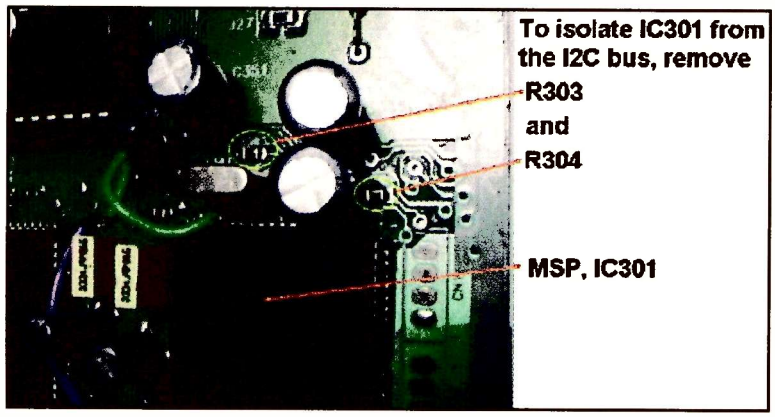


Fig. 6: Isolation of the MSP chip IC301 from the I²C bus.

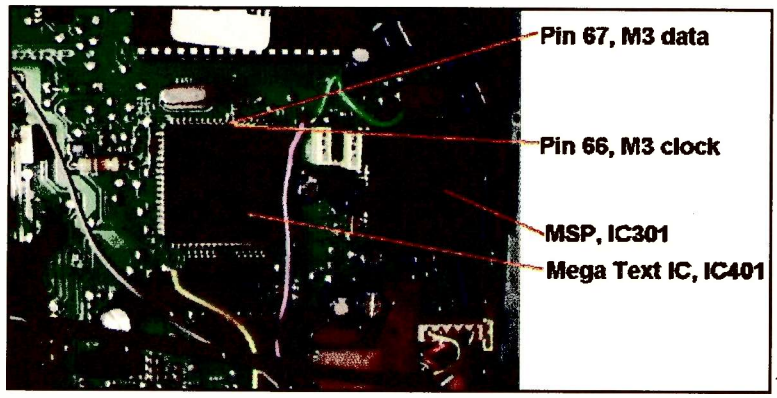


Fig. 7: Location of IC301 and IC401.

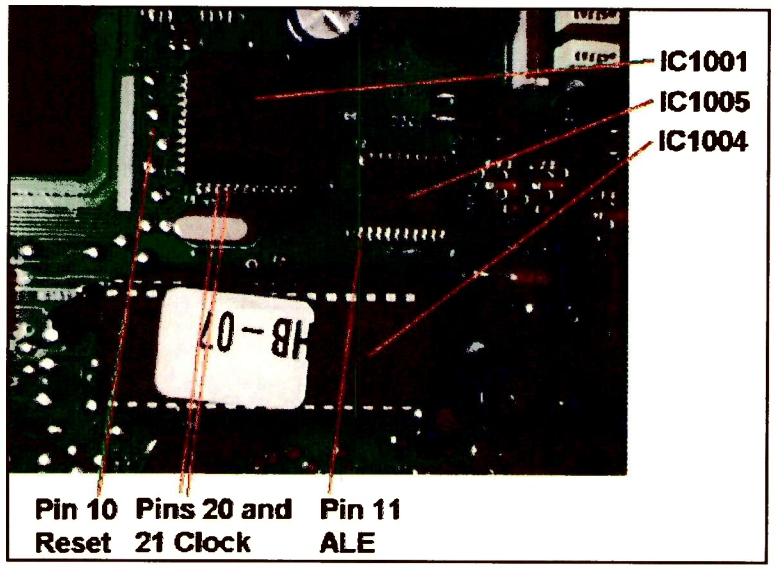


Fig. 8: Location of the microcontroller chip IC1001, the EPROM IC1004 and the port controller IC1005.

has been applied to IC1001 and that the system clock is working. The microcontroller chip reset is on the leading edge – when the reset has occurred the reset pin will be low at 0V. This does not, however, mean that the NVM is working correctly. If you suspect that the NVM is faulty it can be removed from the circuit. If it is faulty the set will then start up after about thirty seconds. However when this is done the line timebase will run at 31·250kHz and there will be no picture or sound. This technique will not work with the Dolby Pro-Logic Models 59CSD8H and 66CSD8H unless the Dolby Pro-Logic panel is disconnected and the software (NVM and EPROM) is replaced by **CS03H versions.

Once the microcontroller, EPROM and NVM chips have been ruled out as fault possibilities the next signals to check are those that control the processing ICs. The CS chassis has two system buses. The first is the I^2C bus that communicates with the signal processor chip IC201, the multiple-standards processor IC301, the NVM IC1002 and the tuner. The second bus is a dedicated M3, which is used for communication with the Mega Text chip IC401.

The CS chassis has a staged power start-up as follows: (1) The power supply starts. (2) The line output stage starts. (3) The field output stage starts. (4) The audio stage mute is released. This ensures that very little stress is placed on the power components in the chassis.

If you suspect that either IC301 or the tuner is faulty and is causing I^2C problems they can be disconnected. The result will be loss of sound with IC301 disconnected and no tuning with the tuner disconnected. To disconnect IC301 from the I^2C bus, remove R303 and R304. Fig. 6 shows the location of these items. This technique will not work if, within IC301, there's a short-circuit that affects the operation of other parts of the circuit (the likelihood of this is remote).

If the Mega Text chip IC401 doesn't respond to the secondary reset pulse, the line output stage will start up then shut down repeatedly in a two-second cycle. The Mega Text IC may not be faulty: it is more likely that the 20·48MHz crystal X451 is short-circuit or off-frequency. Note that if the Mega Text crystal is disconnected the receiver will start up but there will be no OSD or teletext. Fig. 7 shows the locations of IC301 and IC401.

If IC201 is disconnected from the I^2C bus the set will not come on and the Nicam LED will flash at two-second intervals as the secondary reset pulse is repeatedly applied. This applies with Dolby Pro-Logic and later software versions only – when the earlier EPROM is fitted the LED remains steady (on).

Fig. 8 shows the physical arrangement of IC1001, IC1004 and IC1005. The NVM can just be seen at the top of the picture. Note that there are several different types of EPROM, depending on the receiver and chassis type. It is important that the correct EPROM is fitted, otherwise the overall operation of the set may be adversely affected. If you are in any doubt as to which EPROM should be fitted, refer to the parts listing in the relevant service manual. Experience has shown that failure of the EPROM is very unlikely.

The NVM is also available in a number of different versions. Once again the correct type must be ordered, using the part number listed in the service manual.

To follow

In Part 2 next month we will deal with fault-finding in the various power output stages. ■

Test Case 457

Having been bombarded by letters and phone calls from Sky Television, Harry Smith had finally, though grudgingly, decided to go for the new digital satellite TV service. But he wanted to hang on to his old Pace analogue receiver for the channels, mainly German, that a digibox can't provide – never mind MTV and the Cartoon Network! He checked up and found that for £90 he could have a dual-feed installation, including a new 60cm dish, a shiny new digibox and a connection to the phone, provided by Test-Case Repairs and BSkyB between them. The offer was heavily subsidised of course.

It was the first dual-feed job to come the way of our young dish-devil Cathode Ray. Sage explained to him what was involved: he would need a special bracket to hold the additional LNB in position, and he would first have to align the dish with Astra 1 to get the best possible analogue signals, then align the second LNB for maximum signal strength and the best signal quality from Astra 2 to feed to the digibox. He had used both digital and analogue signal-strength meters before with other jobs, so he set off with confidence, armed with a new 60cm dish, a digital-ready LNB, a roll of cable, a two-way telephone adaptor, etc.

The old dish and its fixing bolts were rusty. With a mini-hacksaw and new clamps, Ray fixed and aligned the new dish and the old LNB, then got a good analogue signal – at the expense of a thumb dripping with blood. He bolted on the bracket and the new LNB, which was offset to catch the digital signals from Astra 2 reflected by the dish. The reading he obtained from the meter was not as high as he had come to expect from recent digital-only installations, but he assumed this was because of the LNB's offset position. Anyway, a new length of CT100 cable was run down to the lounge, alongside the existing one, and the phone cable was tacked along the wall and round to the socket. The strength and quality indications provided by the Panasonic digibox were somewhat lower than normal, a bit under fifty per cent each, but the picture and sound were fine. Sky took but a few minutes to activate the new viewing card.

Ray made out the invoice, and had begun to pack his gear back in the van when the rain started. It brought with it bad news from Mr Smith: the digital pictures were now intermittently freezing and breaking up! When he called up the installation menu, Ray saw that the on-screen signal strength and quality bar-graphs had dropped back some more – to the point at which the Panasonic digibox's error-correction system could no longer cope. The analogue signals from the original LNB continued to provide excellent sparkly-free pictures however.

A new digital LNB was tried: no joy. Ray fitted the digital LNB at the focal point of the dish, which he then realigned with Astra 2. This produced excellent digital signals, pictures and sound. The system was then reassembled in the initial manner, but once again the digital signal strength and quality were borderline. Was the equipment faulty, or was it down to Cathode Ray, or maybe something before he arrived on site? For the answer, turn to page 184.

LETTERS

Send letters to "Television", Room L514, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS or e-mail jackie.lowe@rbi.co.uk using subject heading 'Television Letters'.

European broadcasting

A previous correspondent (Letters, October) brought up the subject of broadcasting control imposed by digital technology. Sky Television might be quite correct, legally, in not allowing its TV transmissions to be received and decoded abroad because of copyright conditions. But there may be legitimate reasons for reversing this situation.

Like it or not, we are now part of the European Community. This means that border controls have been abandoned and there is free movement of goods and people within the Community. Why can't the same apply to broadcasting? For obvious technical reasons terrestrial transmission cannot be used for the purpose, but direct transmission via satellite provides the ideal way of doing it. This would make possible a whole new world of broadcasting which Sky, perhaps after negotiations with copyright owners as necessary, could use to everyone's advantage – including Sky itself.

People migrate from one country to another within the EC for a variety of reasons, which include work and retirement. They should be able to watch TV networks of their choice in their own language. SkyDigital could make this possible. Indeed the European Parliament might at some stage decide to make it mandatory. The Parliament might even rule that being barred from watching Sky's or any other broadcaster's programmes in another country is a breach of human rights!

I gather that many foreigners living in the UK can watch their mother country's satellite broadcasts by arranging to obtain a viewing card from their embassy. So why can't Sky arrange for UK viewers to receive its broadcasts when resident abroad by obtaining a viewing card through the local British Consul? Sky would suffer no loss of control over the system, and would be able to pass on collected revenues to the relevant copyright holders.

The future for Sky could be as a European broadcaster, with multi-sound channels. It's possible to use different subcarriers for extra sound channels with analogue transmissions. Provided too many channels are not expected of a digital multiplex, the same should be possible with digital transmissions. The decoder could be configured to select the appropriate sound track automatically.

At present digital TV can prevent those outside the UK watching British TV. But with some planning and initiative, Sky could achieve its potential to become a true European broadcaster. Why not?
Michael Maurice,
Wembley, Middx.

DVD Players

DVD players seem to have hit the ground running in this country. Lower-range models can be obtained for £230 (W.H. Smith) and, with higher-range models available at about £400, there's something for everyone. My estimate is that about one household in forty in the UK now has a DVD player of some sort.

One strange thing is that the cheapest models seem to be multi-region while some of the more expensive models are capable of playing only British discs. Service and repair of the cheaper imported players at a reasonable cost could be a problem. With some computer-based DVD players costing as little as £60 and labour charges levied by some of the larger companies costing as much as £46 plus VAT an hour, many customers will buy a replacement rather than pay for an out-of-guarantee repair.

One point that surprises me is that as far as I know no DVD player has an RF output. The reason for this could well be that as the picture quality is probably the best we have ever seen, why impair it by using an RF modulator? Well, the picture quality certainly is very good, but how do we feed the output from one DVD player through an amplifier to every TV set in the house? The more cynical observer might come to the conclusion that this costs the manufacturer less while the user may buy extra players. If I've got this all wrong, maybe a manufacturer will put me right.
John Hopkins,
Felixstowe, Suffolk.

RETRA membership

In his letter in your November issue Alan Tooke said he understood that you cannot become a member of Retra unless you trade from a shop. I would like to make it clear that for many years Retra has had a considerable number of service-only members, i.e. businesses that do not normally sell new products. While it is true that full-retail members of Retra must, at present, have a shop or showroom, there is no such requirement for service-only members.

The only relevant stipulation we have for such members is that they must operate from premises that are rated for business purposes. So anyone operating from a business-rated workshop could be eligible. We would be delighted to hear from service businesses that think they might benefit from membership of the Association.
Fred Round, Chief Executive,
Radio, Electrical and Television Retailer's Association (RETRA) Ltd.,
St John's Terrace, 1 Ampthill Street,
Bedford MK42 9EY.

Monitor test software

Having recently started a new business repairing computer monitors, based on many years' experience of domestic TV and computer repair, I found the two articles (October and November issues) on upgrading PCs interesting and useful. Unfortunately it appears that Nokia has sold its monitor business, so the monitor test software mentioned seems to be no longer available from the web site specified.

While searching the internet however I found an alternative site that makes monitor test software available free of charge. It's

www.csf.org.uk/home.html

To download the software, all you need to do is to complete a short questionnaire.
Andy Hood,
South West Monitor Repair Specialists.

Signal interference

Test Case 454 (October) dealt with a VCR that produced snowy pictures via its modulator. The cause was a strong DTTV signal from the roof-top aerial on the same

Digital Terrestrial TV

There are six digital terrestrial TV multiplexes. Each occupies a conventional 8MHz TV channel but, as a result of the digital signal compression used, several different broadcast services are present within the channel. For example the BBC multiplex consists of BBC1, BBC2, BBC News 24, BBC Choice and BBC Learning (the latter is to start in 1999).

The six multiplexes are as follows: BBC; ITV/C4; Multiplex A which is operated by SDN Ltd. for S4C, C5 and other services; and Multiplexes B, C and D which are operated by ONdigital.

The multiplexes have had to be fitted into the existing UHF TV bands. A joint project team consisting of frequency-planning engineers from the BBC, the ITC and NTL devised the multiplex frequency allocation plan on which the following channel allocation table is based. At some transmitter sites it is not possible for all the multiplexes to operate at the same power. In addition it is not possible, at some transmitter sites, for all six digital multiplexes to be within the existing analogue-channel aerial group.

The listing is up-to-date at the time of publication but is subject to revision. The ITC mentions that changes may be required as a result of international co-ordination requests and because of engineering practicability, coverage and error-correction considerations. Not all transmitters will come into use at the start of the new services.

DTT Channel Allocations Chart

Transmitter	BBC		ITV/C4		Multiplex A		Multiplex B		Multiplex C		Multiplex D		Aerial Group
	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	
Aberdare	28	0·025	32	0·025	23	0·05	26	0·05	29	0·05	33	0·05	A
Angus	68	2	66	2	59	2	62	2	56	2	65	2	C/D
Beacon Hill	52	1	61	1	58	1	54	1	56	1	64	1	C/D
Belmont	30	5	48	10	68	10	66	10	60	4	57	4	W
Bilsdale	34	2·4	21	3	31	3	24	3	27	3	42	0·8	W*
Black Hill	41	10	47	10	44	10	51	10	55	10	65	10	W*
Bleanplwyf	28	2	22	2	25	2	32	2	29	1	33	1	W
Bluebell Hill	59	3	24	2	27	2	45	3	42	3	39	3	W*
Bressay	21	1	24	1	27	1	31	1	66	1	68	1	W*
Brierley Hill	68	0·05	65	0·1	56	0·05	59	0·1	66	0·05	62	0·04	C/D
Bristol KW	22	0·01	25	0·01	28	0·01	32	0·01	30	0·05	34	0·05	W*
Bromsgrove	34	0·025	29	0·0125	33	0·0125	23	0·0125	26	0·0125	30	0·025	A
Brougher Mtn	30	0·5	34	0·5	23	0·5	26	0·5	29	0·5	33	0·5	A
Caldbeck	25	5	23	7·5	26	7·5	39	1·6	45	1·6	42	1·6	W
Caradon Hill	34	4	31	2	48	2	21	2	24	2	27	2	W*

Transmitter	BBC		ITV/C4		Multiplex A		Multiplex B		Multiplex C		Multiplex D		Aerial Group
	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	
Carmel	55	2·5	65	2·5	59	2·5	62	2·5	68	1	66	1	C/D
Chatton	40	3	50	3	43	3	46	3	47	1	51	1	B
Chesterfield	34	0·02	40	0·02	43	0·02	46	0·02	50	0·02	52	0·02	W*
Craigkelly	33	1	29	1	23	1	26	1	42	2	39	2	W*
Crystal Palace	25	10	22	10	32	10	28	10	34	1·6	29	1·6	A
Darvell	22	2	25	2	32	2	28	2	30	2	34	2	A
Divis	29	2·3	33	2·3	23	2·3	26	2·3	48	1	34	0·8	K/W*
Dover+	68	1	61	1	55	1	58	1	57	1	60	0·5	C/D
Durris	30	10	34	10	52	10	51	5	41	5	44	5	W*
Eitshal	34	0·8	30	0·8	22	0·8	25	0·8	28	0·8	32	0·8	A
Emley Moor	52	5	40	5	43	5	46	5	50	5	49	2	B
Fenham	30	0·02	22	0·02	25	0·02	28	0·02	32	0·02	57	0·02	W
Fenton	34	0·05	30	0·05	22	0·05	25	0·05	28	0·05	32	0·05	A
Fremont Point+	38	0·2	43	0·2	49	0·2	32	0·2	66	0·2	68	0·2	W*
Guildford	49	0·1	44	0·1	41	0·1	51	0·1	47	0·1	54	0·1	B
Hannington	50	10	43	5	40	5	46	5	29	1·3	48	0·85	W*
Hastings	31	0·1	27	0·2	21	0·2	24	0·2	63	0·2	60	0·2	W*
Heathfield+	34	1·6	29	1·6	48	2·5	47	1	54	1	51	1	W*

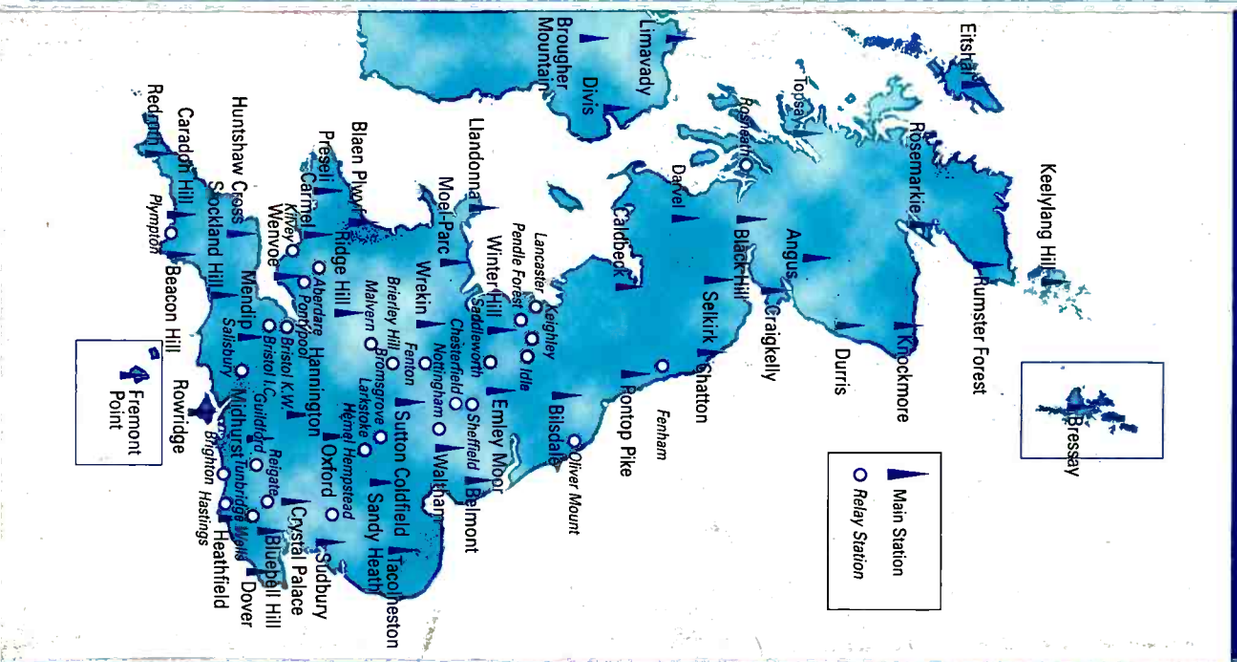
Transmitter	BBC		ITV/C4		Multiplex A		Multiplex B		Multiplex C		Multiplex D		Aerial Group
	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	
Hemel Hempstead	48	0·1	55	0·1	60	0·1	66	0·1	50	0·1	43	0·1	E/W*
Huntshaw Cross	54	2	58	2	61	2	64	2	53	2	57	2	C/D
Huntshaw Cross B	–	–	–	–	–	–	–	–	51	0·04	47	0·04	C/D
Idle	45	0·003	53	0·003	34	0·003	56	0·003	30	0·003	42	0·003	W*
Keelylang Hill	48	1	52	1	41	0·63	44	0·63	47	0·63	51	0·63	B
Keighley	53	0·05	48	0·05	30	0·05	34	0·05	–	–	–	–	W*
Kilvey Hill	25	0·3	22	0·3	28	0·3	32	0·3	21	0·05	31	0·05	A
Knock Moor	34	1	30	1	53	1	57	1	60	1	56	1	B
Lancaster	28	0·1	22	0·1	25	0·1	32	0·1	34	0·1	30	0·1	A
Lark Stoke	21	0·025	31	0·025	24	0·025	27	0·025	57	0·025	60	0·025	W*
Limavady	67	0·8	58	0·8	53	0·8	57	0·8	60	0·8	63	0·8	C/D
Llanddona	67	1	54	1	58	1	61	1	64	1	46	0·5	C/D
Malvern	67	0·1	59	0·1	65	0·1	55	0·1	23	0·05	26	0·05	W*
Mendip	59	3	55	3	62	3	65	3	52	0·25	48	0·25	E/W
Midhurst+	56	10	65	10	62	2·5	59	1	64	2·5	60	1	C/D
Moel-y-Parc	54	0·5	58	0·5	61	0·5	64	0·5	30	0·25	34	0·25	W*
Nottingham	39	0·02	67	0·02	53	0·02	63	0·02	29	0·02	59	0·02	W*
Oliver's Mount	49	0·05	67	0·05	54	0·05	58	0·05	61	0·05	64	0·05	B

Transmitter	BBC		ITV/C4		Multiplex A		Multiplex B		Multiplex C		Multiplex D		Aerial Group
	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	
Oxford	34	10	68	2·8	56	3	52	3	48	1	67	1	W*
Pendle Forest	21	0·05	24	0·05	27	0·05	31	0·05	30	0·05	34	0·05	A
Plympton	52	0·1	67	0·1	66	0·1	60	0·1	63	0·1	56	0·1	
WPontop Pike C/D		48	10	55	10	59	10	62	10	65	10	53	2
Pontypool	52	0·01	48	0·01	42	0·01	45	0·01	66	0·01	68	0·01	W*
Presely	47	0·5	51	0·5	39	1	42	1	45	1	49	1	B
Redruth	39	1	42	1	45	1	49	1·6	43	1	50	1	B
Reigate	31	0·1	21	0·1	24	0·1	27	0·1	–	–	–	–	W*
Ridge Hill	34	5	30	5	52	1	39	1	42	1	45	1	W*
Rosemarkie	47	10	51	10	41	10	44	10	46	4	50	4	B
Rosneath	67	0·1	53	0·1	57	0·1	60	0·1	63	0·1	48	0·05	C/D
Rowridge	67	10	52	10	30	10	32	3	25	3	28	3	W*
Rumster Forest	28	1	22	1	25	1	32	1	62	2	59	2	W*
Saddleworth	47	0·02	41	0·02	44	0·02	51	0·02	39	0·02	54	0·02	B
Salisbury	55	0·5	56	0·16	59	0·5	62	0·5	65	0·5	52	0·16	B
Sandy Heath	29	10	45	10	42	10	67	10	40	2·5	46	2·5	W*
Selkirk	53	3	57	3	60	3	63	3	66	0·5	56	0·5	C/D

Transmitter	BBC		ITV/C4		Multiplex A		Multiplex B		Multiplex C		Multiplex D		Aerial Group
	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	Ch	ERP	
Sheffield	39	0·05	53	0·05	57	0·05	60	0·05	45	0·05	42	0·05	W
Stockland Hill	22	2·5	28	2·5	25	2·5	32	2·5	30	2·5	34	2·5	A
Storeton	30	0·028	34	0·028	23	0·028	26	0·028	29	0·028	33	0·028	W
Sudbury	49	7	68	8·1	48	5	39	7·5	54	1·5	50	1·1	W*
Sudbury B	–	–	56	1·1	–	–	–	–	–	–	–	–	
Sutton Coldfield	41	4	44	4	47	4	51	4	52	2	55	4	E/W*
Tacolneston	63	10	60	10	53	10	58	5	43	10	46	5	E/W*
The Wrekin	21	1	31	1	24	1	27	1	53	1	57	1	W*
The Wrekin B	39	1	49	1	42	1	45	1	–	–	–	–	W*
Torosay	23	0·125	26	0·125	29	0·125	33	0·125	21	0·125	31	0·125	A
Tunbridge Wells	55	0·1	61	0·1	42	0·1	45	0·1	39	0·1	59	0·1	E/W*
Waltham	49	5	23	4	26	4	33	4	45	5	42	5	W*
Wenvoe	30	10	34	4	56	6	67	10	–	–	–	–	W*
Whitehawk Hill	66	0·1	50	0·2	55	0·1	48	1	58	0·4	61	0·4	C/D
Winter Hill	56	5	66	5	68	5	50	2	60	2	63	2	C/D
Winter Hill B	67	0·1	46	0·2	–	–	–	–	43	0·2	40	0·2	E/W*

*ERP in kW. *Aerial group change. In some cases not asterisked the group shown takes into account any change for C5 reception, i.e. viewers may be using a narrower-band aerial. +Under review or subject to confirmation.*

Location of Main Stations and Relays



DTT Channel Allocations chart

Pocket size reference

FREE with TELEVISION

channel as the VCR's output. The solution was to retune the VCR to a quiet spot in the band.

I recently had the same problem with a satellite receiver. With the advent of DTTV, finding a quiet spot in the band is not easy without a UHF spectrum analyser – especially if you are within range of two transmitters each of which transmits five analogue and six digital channels! Once the channels were established however, by using the excellent BBC Engineering Information website, it was relatively easy to find a free one that didn't produce patterning.

Ian Penfold,
Cambridge.

Digital rip-off

For thirteen years I was an audio engineer for a one-shop outfit which, as a result of building problems (the front of the building collapsed) and the loss of an under-guarantee repair contract with a major manufacturer, closed in January 1998. I was thus out of work and, because of a lack of suitable jobs, I ended up as a fabric cutter in a local mill. The mill job paid a lot more than any electronics job I've been for in the past, but the hours were long, the work tedious and hard on the fingers, and holidays were poor. More recently redundancy again loomed. I decided to take it and am now studying CAD. But I feel that it's a waste not being able to make use of all the training and experience I have.

But enough of personal matters. The main point I wish to raise is whether viewers are going to be completely ripped off in the digital era? When I first heard about digital TV I thought we might at last get a system that can provide what we want when we want it. But the way in which digital providers organise channels into groups is just not satisfactory. I and my family watch a lot of discovery home and leisure and a lot of discovery channel, as well as quite a few of the others. To replicate out current viewing, we would have to pay for several packages in each of which we would want only one of the four-five channels it contains. On top of that the Sky Sports channels are extra, and as for films we couldn't replicate what we currently have at all. Another problem is that a lot of the channels we watch are viewed on only an occasional basis, but if we didn't have them there would be huge holes in our viewing.

The right way to give viewer satisfaction would be to give every channel a separate price, so that we could pick exactly what we want, or to have real pay per view, i.e. no total charge but just pay for what you watch when you watch it. But this will never happen, because digital TV as organised at present is about provider and advertiser profitability rather than viewer satisfaction.

The advent of chip/hard-drive videos could also misfire. When I first read about the TiVo and other systems in the States, I thought they would be really good if the packaging was right. It seems that this wasn't satisfactory in the States, where sales have been poor. European broadcasters should have learnt from this, but I am disappointed to find that the TiVo boxes will be sold through Sky. As a result, I feel that we are not going to get a device that offers us all the things of which it is capable.

Edward Dicker,
Bolton, Lancs.

Registration

Having just read Alan Tooke's letter (November, page 25), I would like to point out that there is a trade association which registers companies (and their engineers and technicians) involved in electrical and electronic servicing.

DASA (the Domestic Appliance Service Association) is the closest to a trade association I know of in his field. If you are interested, contact the association – the phone number is 01920 872 464. It may well benefit you, and you may be able to share your experiences with other like-minded individuals.

Michael R. Brett, I.Eng., FIIE(elec),
Watford, Herts.

Parking tickets

If you are called to a customer who lives in a restricted parking area, i.e. with residents-only parking, yellow lines, etc., ask whether he/she can provide you with off-street parking or a visitor's parking permit. If not, you might like to consider refusing to do the job. No one can ask you to break the law. This is particularly important if you are an employee and your boss refuses to pay parking fines. If you are unfortunate enough to be subjected to disciplinary action over refusal to park illegally, take the matter straight to a tribunal.

If you get a parking ticket which you think is unfair, try to contest it. I was given a parking ticket while delivering a TV set. I wrote to the Local Parking Control Authority explaining the circumstances and pointing out that the nearest legal parking space was a quarter of a mile away, and that surely one couldn't be expected to carry a large TV set that distance. I also suggested that to attempt to do so might infringe health and safety laws. I enclosed a copy of the job card and a letter from the customer. Result: the ticket was cancelled and I got an apology.

Do not risk your health by carrying a large TV set any farther than is absolutely necessary. If you can't park safely near a customer's premises, decline the job. In our business, a parking ticket turns a profitable job into one that makes a loss. None of us can afford that. So don't take a chance: the risk is not worth it.

David Belmont,
Wembley, Middx.

Qualified engineers

As a qualified engineer, also registered with the Engineering Council (again 1983) and a member of RETRA, I would like to support Alan Tooke, I.Eng. (letters November). All too frequently I find myself wincing when I hear dealers who campaign for quality service and a registration scheme refer to their service staff as "service engineers", knowing that they have no right to do so.

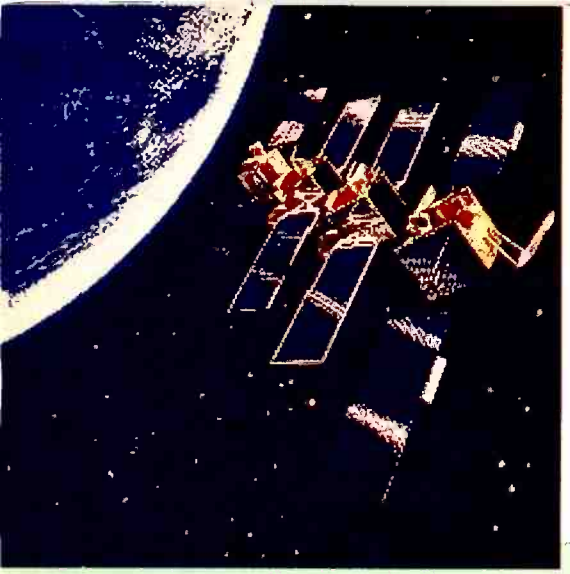
If it was made a requirement that there must be at least one qualified engineer at trading premises very few firms – independent shops, large retailers or national service companies – would be able to comply.

I supported the RETRA registration scheme up to the level of £300 a year for assessment. But there is very little evidence that the public will pay more for quality service. The proposed RETRA scheme is now defunct, through lack of support – no one seems to believe that the investment required to provide the quality of service to meet registration stipulations is financially viable.

A luxury metal and glass reception area and a stack of high-tech test equipment gathering dust, as required by at least one manufacturer, is only part of the equation. Another part is qualified engineers (this doesn't mean Not Very Qualified, i.e. NVQs). Quality of service should not be judged by location and a luxury reception area but by the state of the workshop; the level of equipment investment and expertise; record keeping and communications; willingness to train and keep up to date; and the technical ability to provide customer satisfaction.

The nature of new products coming on to the market, with their complex digital processing and interactions, will make it even more difficult for those engaged in servicing to meet consumer needs. This emphasises the need for properly qualified engineers.

Steve Beeching, I.Eng., AMIEE,
Newark, Notts.



Terrestrial DX and satellite TV reception. News about broadcasting and satellite belt changes. Does the future lie with cable transmission? An introduction to fibre-optic basics. Roger Bunney reports

DX and Satellite Reception

The peak of the present sunspot cycle is now close and the MUFs (maximum usable frequencies) are rising fast. In mid-October Cyril Willis (King's Lynn) noticed that the MUF had risen above 40MHz. By the morning of the 12th it had reached 41·15MHz, and by the 20th 44·6MHz was being reached. On the 24th, with the MUF to the south east at about 44·6MHz, the first video was seen on ch. E2 (48·25MHz) at 1050 hours BST. During the mid-late afternoon periods in late October US police and utilities were being regularly heard at above 37MHz – but it's difficult to establish a town or area when all you get is a query for "the sheriff" or something like that. On the 28th, a mobile checking the next call from base was told "tree across lines between poles 60 and 61".

Cyril also had some Sporadic E reception during October, as follows:

15/10/00 RAI (Italy) ch. IA; Video (Italy) ch. E2; TVA (Italy) ch. E3; TVE (Spain) chs. E2, 3 and 4; C+ (France) ch. L2.
21/10/00 TVE E2-4; RTP (Portugal) E3.

Cyril mentions an interesting method of identifying signals. A scanner and a sound blaster card in a PC are used to measure TV carriers, shown by a spectral display. It's called the "Digipan". If your scanner can tune in 1Hz steps, it's possible to check down to 0·1Hz. Internet users can find information at http://stoli.one.net.au/~vk4cp/digipan.htm

During an early September 2m contest amateur station G8TIC (Lizard Point, Cornwall) noted that, despite the use of a directional aerial system (two 10-element Yagi arrays), received signals spread over 80° with no apparent fall in strength (RSGB report). This phenomenon was experienced with UK and French stations. There is uncertainty as to what have been the cause – two suggestions are FAI (field aligned irregularities) and multipath scatter.

For the first time, after erecting my own DX aerials over a period of 37 years, an installation has suffered severe damage. The cause was the +80mph gales across the south on October 29/30th. Morning light revealed that the Triax Unix 100, previously on the roof peak mast, was pointing skywards: the 10ft x 1·5in. mast had been modified to a banana profile before folding over on the upper TK wall brackets.

Satellite sightings

The overthrow of President Milosevic took place just after I'd finished last month's column. When I arrived home on October 5th Sky News was reporting the riots in Belgrade. Sky and CNN both seemed to be carrying recent footage of the riots, though live reporting was via mobile phones within the crowds and city centre. I quickly checked a few satellites, but there was not a glimpse of raw footage – Stateside outbound news video via NSS K at 21·5°W consisted of mainly rehashed pictures previously seen from Reuters.

I then recalled that Serbian TV (RTS) is carried as a three-channel package via the Russian Express 3A satellite at 11°W: the RTS-SAT channel is a general programme service while another channel is used for the feed to the RTS transmitters. I tried 11·518GHz (SR 16,000+, FEC 3/4) at 1700 hours and up came – nothing! A strong carrier was present, but there were no pictures. One channel produced a 'picture' that looked like a broken digital video freeze. Some minutes later the carrier cut out completely: the uplink was dead. Later that evening Sky News reported that the TV Centre had been torched.

When the new President, Vojislav Kostunica, took up residence on the 6th RTS was back via Express 3A. There was a prolonged phone-in programme that evening, with Vojislav answering questions. After a break with music, a newly-appointed government official continued the phone-in session.

The other major news during the month was the escalating conflict between the Palestinians and Israelis. On the 14th President Clinton was seen flying from Andrews airforce base for peace

President Kostunica answers questions during a live phone-in programme on October 6th. Digital reception via the Express 3A satellite at 11°W.

talks by the Red Sea (see below). The Middle East summit was carried extensively via NSS K as news feeds for the main US networks: Reuters (11·462GHz V, SR 6,111, FEC 3/4) provided many live two-way reports. There were also many pan-Arabic reports via Arabsat 2B (30·5°E) at 4·08GHz RHC (C band).

At such times it's interesting to see how the Arabic TV networks report the situation. Most provide extended news. Al-Manar TV, which is part of the East Lebanese digital multiplex via Arabsat 3A at 26°E (11·785GHz V, SR 27,500, FEC 3/4), is perhaps the most anti-Israel. The technical quality is truly excellent, with the latest digital fx and video imaging. I've no idea who finances the operation – there are no commercials and few feature programmes. Syrian TV in the same digital multiplex is also very anti-Israel, with prolonged political footage between programmes. Stefan Hagendorn reports having seen Al-Manar TV via the NileSat 101/102 slot (7°W) – check at 11·823GHz V (SR 27,500, FEC 3/4).

I welcomed Roy Carman as a visitor on the 14th. While we were checking the Clarke Belt that afternoon we came across the Bill Clinton trip from the White House to Andrews airforce base carried in its entirety via NSS K. This was on-the-spot coverage, with the motorcade passing through the gardens and streets of Washington, carried out from the motorcade's end FBI car. Interesting to see the technique at traffic lights: when Bill's car stopped, an FBI blocking jeep would draw up alongside to provide protection. The video was obviously not intended for news purposes. I suspect that it was fed into a circuit at Andrews base for the security service to check/record and was inadvertently fed to the Reuters Atlantic lease!

Some of you may recall the video coverage of live medical operations fed to Europe from the Mayo Clinic in the USA, usually with a commentary from one of the surgeons. The Clinic was back on the 5th with a heart bypass operation – the full action in close up. This was an analogue transmission (PAL) via NSS K at 11·729GHz H, audio 6·6MHz, from 1800 onwards.

Intelsat 810 (31·5°W) continues to be used in the late afternoons for regional UK news feeds. Meridian and Anglia both make prolific use of the services. Anglia had live coverage from the Hatfield rail crash site on the 19th from 1750 hours. The transmission was at 10·983GHz V (SR 5,632, FEC 3/4), using the BT-TES 42 truck for the uplink. Regularly used digital slots via this satellite are at 10·963, 10·974 and 10·988GHz, all V.

Roy Carman continues to receive SNG and OB links via Eutelsat II F3 in its new position at 21·5°E. Because of the closeness of the Astra 1 slot at 19·2°E, precise dish positioning is required to minimise adjacent satellite interference. There is also the need to be able to compensate for II F3's inclined orbit. Most users followed II F3 when it moved from 36°E, but many of us have experienced difficulty in locking the signals from the new position.

Broadcast News

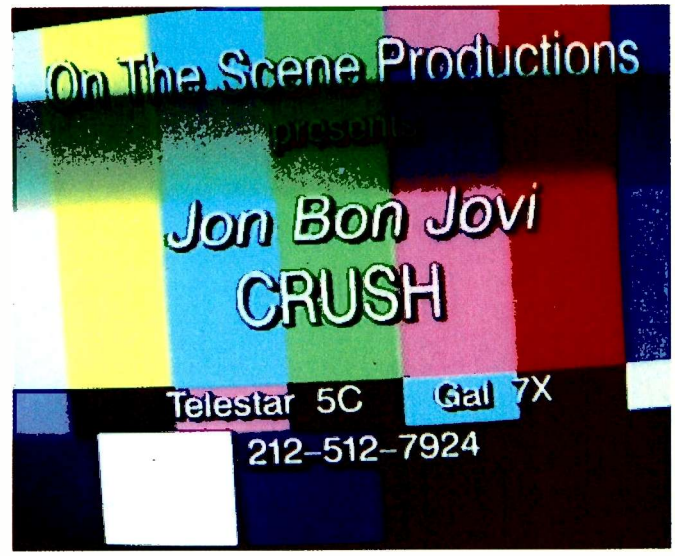
UK – RSL-TV: 'Channel 5', transmitted from the Craigkelly TV mast on ch. E52, has been on test since mid August. The content consists mainly of text, cartoons and local information plus live Sky News between 0800-0900 and 2200-2230. TV 12 (Isle of Wight – ch. E54) was off-air during the weekend October 21/22nd because of a "technical fault". Herts TV (Hertford) is advertising for a "head of station" to organise the start of the service during "the first half of 2001". The advertisement emphasis the need for experience of modern TV news, suggesting a difference from the other current RSL-TV stations that rarely include local news.

Graham Benson, chairman of TV 12, plans to form a consortium of RSL-TV stations to sell advertising space and promote their unique local services. Takeovers are likely to lead to RSL networks, strengthening the financial base of these operations – The Oxford Channel ran into debt last summer.

Greece: The Athenian channel TV Magic has been bought by Socratis Kokkalis, which will introduce new information and entertainment programming. Socratis plans to create a network alliance with other Greek local TV channels – forty have already been signed up – and has been granted a digital satellite TV transmission licence.

Denmark: A new Christian TV channel, Hosianna, is broadcasting from Slagelse on ch. E60.

Monte Carlo: The RTL-TV group is expanding, with more studio space and channels. More shares have been bought in Spanish broadcaster Antena 3, and media interests are being sought in Eastern Europe. RTL now has TV interests in eleven countries. In the UK it has an interest in United Media and Channel 5.



Start of a live pop interview networked from the States to Europe via NSS K at 21·5°W. The hum bar was caused by incorrect camera setting – 1/30th frame speed.

Satellite TV news

SES/Astra is developing a broadband interactive multimedia

service via small, two-way terminals, operating in Ka band with small dishes – typically under 1m. Apparently some 10,000 packages have started to arrive in Europe from Norsat International in Canada. Despite the high frequency, rain fade is said not to be a problem.

Check the BR or Sky-vacated analogue channels at 19·2°E on December 21st, late night, for coverage of the launch of Astra 2D. Recent launches have been carried on these channels in the clear with full control-room 'chat' – some of it suggested that the Kourou TV crew were unaware of being broadcast Europe wide!

Telenor has taken almost a quarter of the transponder capacity aboard Intelsat 10-02, which is due to be launched in 2003 to orbit at 1°W, for broadcasting to Scandinavia. The capacity will provide about 100 digital TV and radio channels.

PanAmSat-4 at 68·5°E, which is just above the SE horizon in the UK, will shortly be replaced by PAS-10. This will extend the footprint to cover S and SE Australia, providing single-hop Europe-Australia operation.

Two Hughes satellites will soon be providing digital L-band radio services in the USA. XM Rock is due for launch on Christmas Eve into orbit at 85°W, to be followed by XM Roll next February 12th. The services will be subscription financed and are intended for use by car and portable radios across the USA and parts of Canada. AsiaSat-4, another Hughes bird, is to be launched into orbit at 122°E in spring 2002, providing Ku- and C-band DTH TV/radio capacity across SE Asia.

Kanal E, a Turkish-language channel, has been started by CNBC-Europe to provide international and local financial news. It will be produced and edited at the E studios in Istanbul.

The CNN London Bureau is to expand programme output, providing an extra two and a half hours of live programming daily at 1100, 1400 and 2130 GMT. The Bureau will then provide eight hours of programming a day for CNN plus two hours for the CNNI channel. Twenty staff are being taken on.

Piracy of satellite programming is common in SE Asia, with illegal local cable systems distributing the pirated channels. Because of this HBO Asia has pulled the plug on its movie channel, replacing it with an advertising-supported service that will provide films from four major libraries. If this is successful, a service to Taiwan will be started.

Fibre-optic communication

You may have seen trenching teams installing green trunking underground for future fibre cables – hereabouts a trunk from Southampton is passing through Romsey en-route to Salisbury via the A27. It will presumably then go farther for future activity all over the country. This is not just for regional but also international communications. Fibre-optic communication is cheap, signal transmission delays are minimal, operation is totally secure, there's immunity to interference both inductive and electromagnetic, the bandwidth is wide and is suitable for data, voice and video, digital and analogue. Transmission loss is very low, an in-line repeater being required at about 50km.

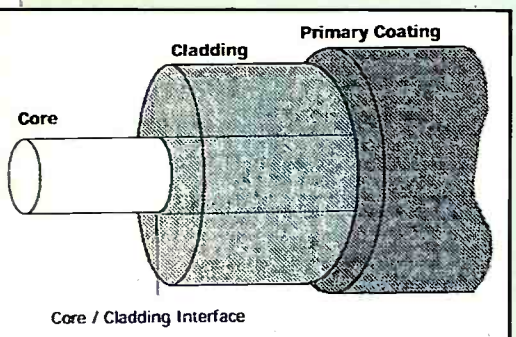


Fig. 1: Basic optical fibre construction.

Most fibre-optic cable is made of silica quartz glass. Fig. 1 shows the basic 'fibre' arrangement. It consists of a core, which is the actual glass transmission path; cladding, which is also glass but has different properties and acts as a waveguide to keep the light within the core; and a primary coating that acts as a protective barrier to prevent external light (especially UV) causing interference. The fibre may be attached to an outer plastic sheath or may be loose within the sheath, with optional gel between the fibre and sheath to prevent water ingress. Fig. 2 shows various forms of practical fibre-optic cable construction, from a single fibre with loose sheath (tube) to a six-fibre bundle with two quads of copper cable – copper may be used to carry power feeds etc.

There are three different types of optical fibre in common use, multi-mode/step index, multi-mode/graded index and single-mode/step index, see Fig. 3. With a step-index fibre there is an abrupt step at the interface between the core and the cladding. This means, with a multi-mode fibre, that light is reflected from the cladding to form a complex propagation pattern. With a single-mode fibre the cladding simply keeps the light within the core – this arrangement provides the best output pulse shape. With a graded-index fibre the core glass index is lower towards the outside. As a result, light is propagated as a series of envelopes, combining at regular intervals, instead of being reflected. Multi-mode/step-index fibres are for short-range (1km) use. Multi-mode/graded-index fibre can be used to provide a range of say 4km: an inexpensive LED can be used as the launch (transmit) device. Single-mode/step-index fibre provides a range of 50km before a repeater is required: a higher-quality, laser diode has to be used

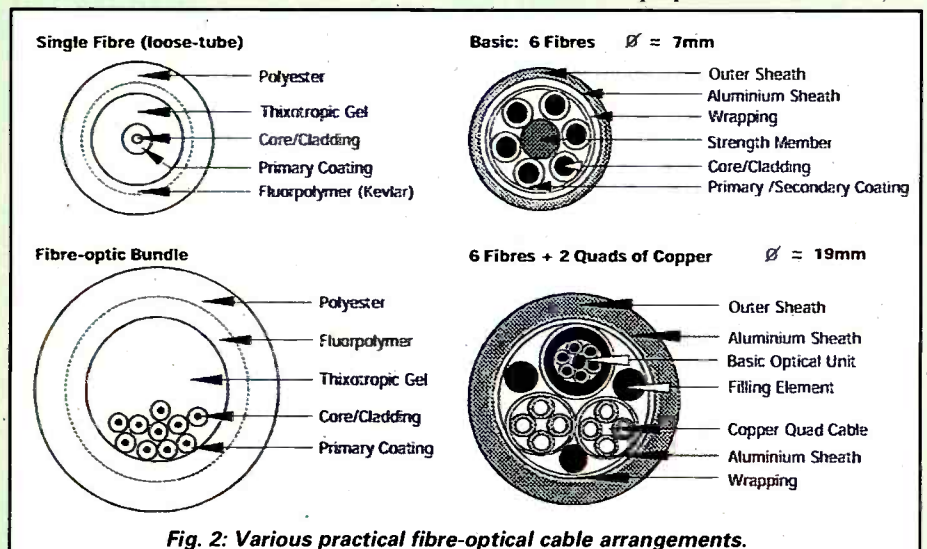


Fig. 2: Various practical fibre-optical cable arrangements.

Finally, porn channel Adult X has gone dark – apparently the bills weren't being paid, so it's now off-air. The channel used to be present as part of the Dutch Canal+ package Canal Digitaal via Astra at 19·2°E and the Scandinavian Telenor/Canal+ package Canal Digital via Intelsat 707 at 1°W. Canal+ has introduced its own erotic channel, X Zone, to maintain an adult service for Dutch viewers.

For disposal

Graeme Wilson, Technical Manager at UCB Studios, Stoke-on-Trent, has for disposal a number of professional 19in. rack-mounting Drake ESR1255 analogue satellite receivers. They are only four years old and cost £800 when new. Features of Model ESR1255 include four IF bandwidths, threshold extension, lots of communications features, 950-1,750MHz input, C/Ku-band operation and tuning in 250kHz steps with a front-panel readout. Reason for the sale is that UCB is now using Astra digital at 28·5°E instead of analogue at 19·2°E. Offers for any/all receivers should be made to Graeme on 01782 642 000, ext. 260, between 0800-1600 or e-mail ucb@ucb.co.uk

Satellite dead?

November's leader (page 3) suggested that fibre-optic has "pushed satellite communications into the margins" for international operations. Eutelsat and SES at any rate probably wouldn't agree: they are both investing in additional Clarke Belt capacity, with more satellites on order for both DTH TV and two-way communications and operations being extended into Ka band. There will be a growth of international satellite communications capacity over the next two years, with more launches planned than in previous years.

Fibre does offer many advantages however, including security, reduced carriage cost, wide bandwidth and local distribution networks underground to your home instead of an exposed dish as part of a DTH/VSAT system. Communications are changing rapidly. Medium wave may go digital for example, we have L-band digital radio via satellite, and analogue TV in the UK may be closed within five years. Things are moving fast.

Perhaps, with the prospect of fibre, the internet and ADSL taking over, it's time for some explanatory notes.

as the launch device.

The loss at a fibre-optic join is typically upwards of 0·2dB depending on the way in which the mating glass strands connect. A small air gap in the transmission path is destructive, particularly with an analogue signal. Mating contact faces are usually polished and shaped. Several contact variations are in use, the most efficient being the 'angle physical contact' (APC) which has an 8° angled-contact surface. This minimises return loss (reflection).

To minimise signal loss and reflection very high-quality plugs and connective components are required throughout a system. Fibre ends are cemented to the central pin of a connecting plug, and the pin must match exactly the mating bore for correct fibre alignment and signal transference. This involves fibre glass welding and related thermal techniques. Cable routeing follows satellite feeder practice, i.e. no sharp bends or pinching.

The basic LED launch device can be used to transmit a modulated signal, analogue or digital, over distances of say 10km, providing power of 0·5mW with operation at up to 50Mbits/sec. The LED is slow and non-linear, but cheap. A laser diode launcher emits a coherent light beam with a spectral width of <10nm. It requires a stable, temperature-controlled launch environment but provides up to 4mW transmit power over 50km of cabling. At the receiver end of the cable a pin diode or avalanche photodiode converts the incoming infra-red light to electrical signals for processing.

The technology provides mega bandwidths. Marconi has produced a fibre-optic strand that can carry 500,000 voice circuits, a bandwidth capacity of about 10Gbits/sec, and is carrying out research on a 40Gbits/sec system.

Optical multiplexers can now combine 32 light wavelengths for fibre transmission via a single launch laser diode.

My thanks to Krone (UK) for providing information on fibre-optic cables. For more on the technology, consult Krone's website – www.krone.co.uk

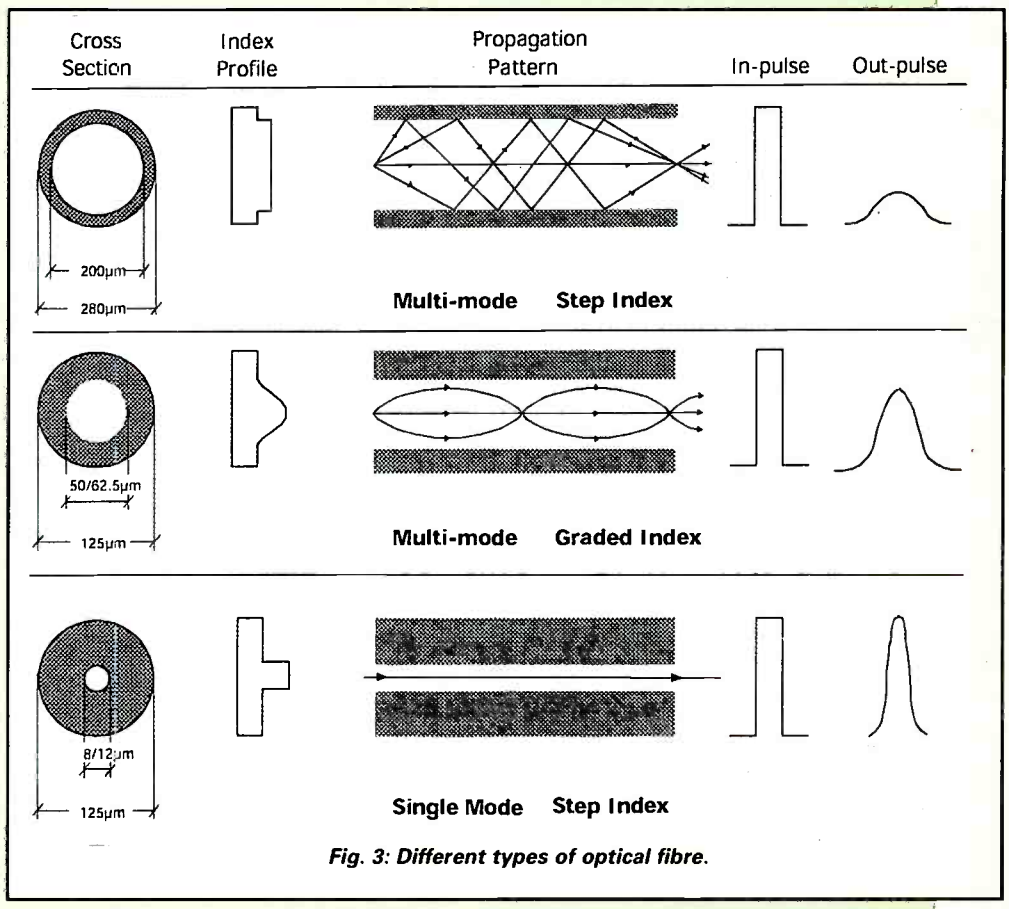


Fig. 3: Different types of optical fibre.

MONITORS

Fault reports from Ian Field and Michael Dranfield

We welcome fault reports from readers – payment for each report is made on publication. Reports can be sent by post to:

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

faxed to: 020 8652 8111

or e-mailed to: tessa2@btinternet.com

JD144K

I don't know what to call this monitor: there was no maker's badge on the front nor any sign that there had ever been one. The label on the back says: Model name 29J44L, Model no. JD144L and FCCID: AMPJD144K.

The 2·5AT mains fuse had blown, the mains switch had a fracture ring around one of its pins, and the soldering to the degaussing posistor looked dull. I removed the posistor for examination. It didn't rattle, but I broke it open to look inside. The plastic insert had vaporised metal deposits on it and the centre contact had a 'nibbled' appearance around the edges. A new 140M271 posistor and a quick go over the soldering, which wasn't too bad, completed the repair. I was expecting to find that the shadowmask was magnetised, but the purity was good when the unit was powered. **I.F.**

AST Vision 7L

"Smokes big time" was the concise job report that accompanied this monitor, which came from a trade customer. On inspection I found that the insides of C343 (1µF, 50V) had been splattered over the adjacent heatsink. Without service information the best I could do was to trace outwards from the most conspicuous damage. The first transistor I checked was Q346 (R1001), which was short-circuit base-to-collector and open-circuit base-to-emitter. This failure mode is often associated with a transistor that's driven to saturation and has an inductive load. There were in fact inductive loads nearby, but they were isolated by power MOSFET driver stages.

Working outwards from the 'epicentre', I checked numerous diodes, transistors and MOSFETs, one or two of which had heat-fatigued soldering but were otherwise OK. As the search widened, Q350 (R1001) came into view. It was burnt away and the adjacent PCB was slightly charred.

This presented me with a bit of a problem, as I hadn't come across the device before and no one had it in stock. Some searching through reference books and catalogues revealed that it's a Samsung device, in the KSR1XXX series, and that there's a '2SC' equivalent, type 2SC4363. It turned out to be a digital transistor with two built-in resistors, both 4·7kΩ, one in series with the base and the other between the base and emitter. When I looked at the basic ratings I decided to try the readily available 2SC1815 and add external resistors. It's a simple matter to cut the base lead short and insert a 4·7kΩ resistor, and the subminiature type fits nicely across the base-emitter leads.

Once the damaged components had been replaced the monitor was OK. When I told the customer that repair was viable and gave him an order number for the correct type of transistor he commented "never mind that, how soon can I collect?" **I.F.**

CTX 1565D

This monitor had an odd fault and I was unable to decide with any certainty whether the cause was the CRT or the LOPT/HV block. When I told the customer this he produced a second one, explaining that it had come to him with the mains fuse wired across. He suggested that I scrap it and use whatever parts were needed to repair the first one, in the hope that its CRT was OK.

When I removed the chassis which had been tampered with I expected to find that various tracks had been blown away. But it was OK in this respect, and the on/off switch was also OK. Further checks revealed that the fuse, the primary side of the power supply and the line output transistor were all OK. The culprit turned out to be Q401 (2SK890), which was short-circuit.

As the B+ PWM in this model is of the flyback type, the short-circuit MOSFET was shunting the power supply and activating the overload shut down. A handy feature of the flyback type B+ PWM controller is that it provides a step-up – in this case the pre-PWM supply is only 89V. Simply removing the MOSFET leaves the inductor and rectifier in series, feeding the pre-B+ PWM supply to the LOPT. When I tried this the monitor produced a display that was about two-thirds normal width.

Since the first chassis had a MOSFET ready assembled on its heatsink, I decided to fit this in the second one. While removing it I noticed that it was an IRF630. Both types are rated at 200V, 75W, but the IRF630 has a 9A rating while the 2SK890 is rated at 10A. A check on the serial numbers indicated that the chassis with the 9A MOSFET was of later production, so I was happy to install the IRF630.

Now that I had a working chassis it was possible to test my theory that the CRT in the other monitor was faulty – by swapping over the LOPTs. Both LOPTs worked faultlessly, confirming that the CRT was indeed defective. **I.F.**

Elonex MN024/F3T+ (Acer chassis)

The basic symptoms were power light on but no picture. I found that the power supply was pulsing because the BU2522 line output transistor Q302 was short-circuit – the capacitor on the rail that feeds the power LED obviously held sufficient charge to keep the LED alight.

While looking for possible causes of the line output transistor's failure I noticed that

there were numerous dry-joints, particularly at the pins of the chopper transformer – one was almost detached. The frame output IC needed resoldering, as did most of the power MOSFETs in the line output stage. I attended to the soldering and then noticed that the line flyback tuning capacitor C307 (4·7nF, 1·6kV) looked a bit bulged. Once this item and Q302 had been replaced the monitor worked perfectly.

C307 is in parallel with the 'damper'/upper EW diode, and both ends are connected via wire links. So it's difficult to find! To add to the difficulty, a large blob of opaque silicone-rubber had been placed over the upper capacitor/wire-link connection. **I.F.**

Elonex MN024/F6Y

This monitor was on its third visit and everyone was getting fed up with it – the end user, the trader and myself. On its first visit I found that there were plenty of dry-joints, but there was little by way of a fault description. The monitor had apparently been losing its width setting, though I had not noticed this while using it for two or three days when setting up new hard drives and carrying out general maintenance on the bench-test PC.

After this first session the monitor didn't even make it back to the end user – the focus was out. The trader had also discussed the fault with the user, since there is a knack to storing new settings on the front panel. The end user had said that he knew perfectly well how to operate the buttons correctly.

When the monitor arrived on my bench for the third time the focus was indeed appalling. The fault cleared as I inserted the trimming tool into the adjuster. After adjusting the focus I decided to press the reset button then centre all the presets. When the width preset (VR301) was moved the monitor went berserk! All that aggravation because of one noisy preset! **I.F.**

Taxan MV789LR

The original fault was that R820 (150kΩ, 0·5W, 1%) in the HT monitoring circuit had gone high in value. Instead of the usual PWM/line output stage blow up there had been severe arcing in the flyback tuning switch circuitry, which uses BDT62C Darlington transistors instead of the power MOSFETs used in more recent designs. In addition there was the usual collection of damaged HT electrolytics. After dealing with the original cause of the problem, then cutting away the charred PCB and linking the damaged tracks, the monitor worked. But it had a heat-sensitive side-pincushion fault that virtually cleared once the running temperature was reached.

These monitors are rare nowadays, but still turn up from time to time. Over the years I've noticed that a couple of 1µF, 35V tantalum bead capacitors (C109 and C121) close to the front edge of the PCB are sometimes fitted the wrong way round. And, yes, they cause side-pincushion faults! Having traced out this part of the circuit I came to the conclusion that the use of a polarised capacitor in one of the two positions was dubious. I decided to replace them both with non-polarised, non-electrolytic capacitors (Mylar or polycarbonate will do). When I did so the display appeared with extreme side pincushion distortion from cold. Adjustment of the S-pin gain and amplitude presets on the UPC1406C sub-panel brought the sides of the display neatly into line with no thermal effects. **I.F.**

Delta Electronics DB1765BA

The green LED was on but there was no rustle-up of EHT. Some quick checks showed that the line drive was missing, so I traced the source back to IC201, a 42-pin sync/jungle chip with an earthed screening strip glued to the top so that the type cannot be read! While tracing back along the track a flylead and 150kΩ resistor, secured about half way with a blob of white glue, had to be moved. When this was being done the resistor end pulled from the PCB, and on investigation I found that its lead had never alloyed to the solder. Fortunately the PCB was very clean, and as this item had been fitted after flux washing its connections to the PCB were the only ones with flux residues on them.

When I returned to IC201, I had no idea which pin was used for its supply. So I decided to check every pin with an oscilloscope. I found that there was no signal other than low-level noise at any of the pins, which confirmed my suspicion that the chip had no supply voltage. Use of the digital multimeter confirmed this.

Checks on the various three-terminal regulators on the secondary side of the power supply brought me to IC201 (78X12), which had no output or input voltage. The input comes via D213 (1N4001), which lost the supply despite checking OK out of circuit.

Incidentally one end of the 150kΩ resistor plus flylead is connected to the junction of R491/Q408 (base), the other to the junction of C526/R529. I have no idea whether the faulty connection made any contribution to the fault. **I.F.**

AOC 5VLr

The complaint was excessive width. There's a conventional EW driver transistor in this chassis, but unfortunately it wasn't the cause. Q411 (IRF630) had run hot and scorched the board: it was now short-circuit. Q410 (IRF630) was also short-circuit. The cause seems to have been a dry-joint at one end of C425 – there was evidence of arcing.

Once the two MOSFETs had been replaced and C425 had been resoldered there was width control, but the grey-scale was appalling. Several attempts at balancing it still left a slightly magenta black level. Any attempt at removing this left a predominance of green in the lightest bars.

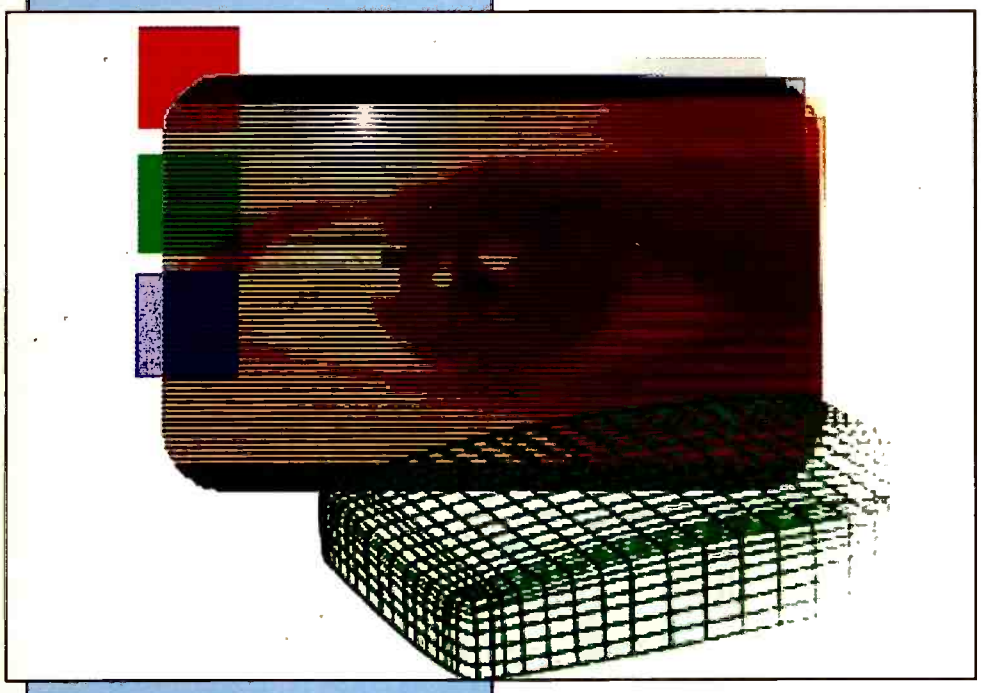
Pins 12, 14 and 17 are the gain control inputs at IC801 (TLS1233N). Only the inputs at pins 12 and 17 (blue and red) are adjustable. Pin 14 is fed from a fixed potential divider (R817 5·6kΩ and R823 1kΩ) between the 12V supply and chassis. The two adjustable potential dividers consist of a 5·6kΩ resistor and a 2·2kΩ preset. All three inputs are fed via series 220Ω resistors, and there are 0·1µF decoupling capacitors at the sliders of the presets and at the fixed tap. It was a simple matter to remove R823 and fit a 2·2kΩ preset in the vacated holes. The track to the 220Ω resistor was then cut, and a flylead was used for connection to the preset's wiper. The track cut isolated the decoupling capacitor, so one had to be fitted on the print side of the board.

It still took two passes to balance the grey-scale. The first was with all three cut-off controls at minimum, all three gain controls at maximum, the A1/G2 control backed off until only the four brightest bars were visible, then backing off the gain controls for the two most prominent colours. When the A1/G2 control was advanced to see which colour flooded the black level first, it became apparent that the cathodes had fairly varied cut-off points. Once these had been equalised by advancing the cut-off presets, only as far as needed, the gains had to be rebalanced.

With an aged tube it's best to start the second-pass gain balance with all three presets at maximum, then back off the two strongest drives to match the weakest. Once this had been done, advancing the A1/G2 control again showed that the black-level balance was only slightly off. A final tweak of the cut-off presets produced an acceptable grey-scale. **I.F.**

Mag DJ530

The power supply worked but this monitor wouldn't switch on. I traced the cause to a TO92-cased voltage regulator that had 16V at its input but only 2V at its output. The circuit reference number, Q309, might have led one to think it was a transistor, though it was marked LM78L05ACZ. It probably provides the 5V supply for the microcontroller chip. **M.D.**



TV FAULT FINDING

Reports from
Michael Dranfield
Kevin Green, TMIIE
Eugene Trundle
Gerald Smith
David Evans
Michael Maurice
Colin J. Guy
David Smith
John Poulton and
Steven Leatherbarrow

We welcome fault reports from readers – payment for each fault is made on publication. See page 166 for where and how to send reports.

Minoka MK1491A

This was an interesting fault condition. The set was tripping and the 112V HT supply was low, but removing its load by disconnecting the collector of the line output transistor made no difference. After many fruitless cold checks I decided to disconnect pin 4 of the optocoupler in the power supply. The HT voltage then rose to 150V – as the line output transistor was still disconnected, no harm was done. What I did find however was that R606 began to smoke. It's in the TDA1013B audio output chip's 20V supply, which is also used to bias the optocoupler. It turned out that the audio output IC was short-circuit. As a result the 20V supply was low and the optocoupler reduced the HT voltage. **M.D.**

Ferguson T51N (TX91 chassis)

This set had all sorts of intermittent faults. It would switch itself to standby, come back on of its own accord, the height would decrease and the sound system data in the EEPROM would change on its own. Presumably the height and sound system values were reverting to their default ones. Reprogramming the EEPROM would cure the problems for a few hours or so, but the EEPROM would then again become corrupt.

I noticed that the set would switch to standby when pin 2 (reset) of the microcontroller chip was touched, so I decided to decouple this pin with a 10nF disc ceramic capacitor. After that, touching pin 2 with a meter probe no longer switched the set to standby, but the other faults were still present.

Ferguson Technical suggested replacing the microcontroller and EEPROM chips as a pair, but this failed to cure the fault. I eventually traced the cause to the surface-mounted BC848B transistor TR01, which is connected to pin 39 (interrupt request) of the microcontroller chip. A replacement transistor restored normal operation.

Note that there are two versions of the TX91 chassis: the other is the TX91G. The microcontroller chips are not interchageable as they have different pinouts. **M.D.**

Tatung 190 series chassis

This set could be tuned in and the stations could be stored, but when the channels were changed the volume fell to zero. The fault was cured by replacing the HD401220RA06S microcontroller chip. Note that there is no separate EEPROM in this chassis – it's in the microcontroller chip. **M.D.**

Matsui 14V1R (Grundig CUC7303 chassis)

The customer complained that a faint picture was still present when this set was switched to standby. I couldn't see any picture when I tested the set, but the CRT heaters remained alight in standby and buzzing came from the field scan coils. Absence of the correct manual caused a bit of a problem, but I managed to find that pin 1 of IC676 should go to 1·2V in standby: in this set it remained at 10·7V. When I traced back from this pin I came to a BC848 surface-mounted transistor whose base would switch between 0·7V and zero though its collector remained high. It tested OK, but a replacement cured the fault. **M.D.**

Matsui 2086

For lack of contrast replace R316 (100kΩ). It's part of the beam-limiter circuit and can be found between the field output IC and the power switching relay. **M.D.**

Philips Anubis A AC chassis

One of these sets had a very narrow picture: just a strip about four inches wide some three inches from the left-hand side of the screen. The rest of the screen was blanked out. After some checking and head scratching I eventually found that the cause was the TDA3504 video controller chip IC7280.

Another of these sets had a nice little bread-and-butter problem: it would intermittently blow its BUT11A line output

transistor. The cause was found to be one we've had several times before, dry-joints at the connector plug that feeds the scan coils. **K.G.**

Toshiba 32MW7DB

There was no colour at all, just a very faint pattern over the screen. Checks showed that the relevant supply voltages were OK and that the reference oscillator was working correctly. I then found that the colour could be restored by attenuating the aerial input by about 12-18dB. The cause of the fault was the TA1259N chip Q501. **K.G.**

Sanyo CBP2565 (E3-A25 chassis)

There was complete absence of picture and sound though the front panel LED display was alight. It took a long time to discover that Q724 (2SA608) in the chopper power supply was short-circuit emitter-to-collector. It takes the error bias input from the regulation feedback optocoupler and applies this to the chopper control circuit. **E.T.**

Sharp 66AS05

This set had no sound or picture and it did not take long to discover that the 2SD1546 line output transistor Q600 had failed. I disconnected the HT feed to the line output stage then checked the waveform at C607, which couples the line drive to the pre-driver transistor Q606 (2SC2412). The drive should be 3V peak-to-peak but was cramped. When one end of C607 was lifted it came up full and uncramped. Q606, a surface-mounted device, turned out to be leaky. A replacement produced a clean line drive waveform and, once the line output stage had been repaired, normal sound and pictures were restored. **G.S.**

Nokia 6364UKSFN

The picture had what looked like an EW fault, though the EW correction circuit was OK. When I checked the network D515, R515, C515 I found that C515 (2·2µF) was faulty. A replacement restored correct scanning. **G.S.**

Mitsubishi CT2154TX (Euro 4 chassis)

This set was dead with no sound or picture. There was no activity on the primary side of the chopper power supply because the transformer was open-circuit between pins 5 and 6. A replacement restored the set to normal working order. **G.S.**

Sanyo CBP2180

This set had a snowy picture and wouldn't tune in. Checks at the tuner showed that there was no voltage at the TU pin. It comes from the front area of the PCB, where the cause was traced to dry-joints at link J159 – at the front right of the main PCB. **G.S.**

Decca D14RFG6 (Tatung F series chassis)

This set would switch on normally. After less than half a minute however it would, without any warning, shut down in the standby mode with the standby light flashing – there was a repeated pattern of four flashes. The cause was R909, R913 and R922 (all 180kΩ) which had gone high in value. They are on the CRT base panel. Diodes D901 and D910 in the beam limiter circuit, which is also on the CRT panel, can also cause this fault.

My thanks to Wizard Distributors who obtained this information from Tatung. **D.E.**

Sanyo CBP2876 (ED0 chassis)

This set wouldn't come on: it kept reverting to standby with a squealing noise. It's very difficult to fault-find with this chassis as almost any fault will make it go to standby! There was a tell-tale sign of burning from the TDA8170 field output chip however, and I noticed that it was cracked. I replaced it, along with the 100µF flyback boost capacitor C703, which had certainly seen better days, and the fuselink R715. When I switched on again I was rewarded with a picture that was flashing. There were also hissing and arcing noises from the line output transformer. A new LOPT and setting up restored good results. **M.M.**

Proline NV3200

The complaint with this 33in. monster was lines in the centre of the screen. Because of its size, I had to carry out the repair at the premises. Fortunately the problem turned out to be field flyback lines, caused by the demise of C432 (100µF, 63V). **M.M.**

Finlandia C51JZE (Nokia N chassis)

This set was dead though a clicking noise came from the power supply. Checks soon revealed that the S2000AF line output transistor was short-circuit. When a replacement was fitted there was an EW fault with the EW driver transistor TH03 (BD241D) running very hot. The culprit was CH09 (150nF) in the line output stage tuning network – it was open-circuit. The replacement should be rated at 400V. **M.M.**

Ferguson 59K7 (ICC5 chassis)

Intermittent operation was cured by attending to dry-joints in the line output stage. There was also lack of width, which required replacement of the TDA4950 EW correction chip IG01. **M.M.**

Philips 17PT166A (Anubis A AC chassis)

This set came in dead from another dealer who was convinced that the line output transformer was short-circuit. It wasn't: the cause of the short was the scan coupling capacitor C2450. The value varies with tube size. With 15 and 17in. tubes the value is 330nF. **M.M.**

Philips G110 Chassis

When the channel was changed this set would usually flick to a blank screen with unlocked text lines on it. This also happened when text was selected. The cause was found to be on the text board. I replaced the SAA5231 video processing chip, which then got very hot before blowing the safety resistor R3917 in the 12V supply. I next suspected the 13·875MHz crystal X1801, but it was blameless. The culprit turned out to be the 6MHz tuning coil L5803. Once a replacement had been fitted the SAA5231 chip ran cool and the set worked correctly. **M.M.**

Toshiba 3339DB

The picture was bright with flyback lines. My first check was on the 200V supply to the RGB output stages. As this was correct, attention was turned to the line output transformer. Adjustment of the first anode control got rid of the lines, but so did adjustment of the focus control! When I consulted Toshiba I was told that the CRT had failed. The customer didn't feel inclined to pay for a new tube, so I set up the focus and first anode controls as best I could. The customer was happy with that. **M.M.**

Philips Anubis A Chassis

This dead set required the usual power supply rebuild. When I reconnected it to the mains supply the fuse blew. So I did what I should have done in the first place: I started the set up via the variac, having replaced the fuse and the chopper transistor and connected a light bulb across the 95V supply as a dummy load. As everything was now OK, I refitted the chassis in the set. It worked until I tried to connect the aerial, then spluttered and died. This time a careful inspection of the PCB revealed a hairline crack between pin 12 of the chopper transformer and the optocoupler. Once this had been repaired and a new fuse and BUT11A transistor had been fitted the set worked and continued to work. **M.M.**

Toshiba 2512DBT

There was reduced height and bowing at

the sides of the picture. Both could be set up almost correctly in the service mode, but not quite. The cause was two dried up electrolytic capacitors in the screened DPC module, C372 (2·2µF) and C374 (220µF, 16V). **C.J.G.**

Philips 25PT4103 (L6.2 chassis)

This chassis uses a strange arrangement with the line and field output stages on the non-isolated side, the drives being fed via optocouplers. The problem was that the line output transistor, Tr7906 on the deflection module, ran hot and failed after a few minutes, though there was a perfectly good picture while it lasted. The cause was L5420 which was open-circuit. It's in the line drive circuit.

The parentage of the designers of several modern chassis has been under discussion recently in this workshop! **C.J.G.**

Mitsubishi CT21A2STX (Euro 12 chassis)

The picture was rolling and was generally unstable. Voltage checks revealed that the 12V supply was high at 15V. The cause of the fault was the 1N4148 diode D958, which is connected between pins 4 and 5 of the 12V regulator IC951. **C.J.G.**

Philips 21GR2350 (G90AE chassis)

The power supply was in a right mess following someone's attempt at fitting a repair kit. I had to remove most of the surface-mounted components then install a new kit. After that the outputs from the power supply were all low. The cause was Tr7654 (BC847C) which was leaky. **C.J.G.**

Sony KVE2912U (AE1A chassis)

There was no remote control operation and no sound. In addition the picture size varied with the brightness level, though this would improve as the set warmed up. The cause of all these symptoms was C615 (1,000µF, 25V), which is the reservoir capacitor for the +14V rectifier. **C.J.G.**

GoldStar CF28C28F (PC58A chassis)

Field collapse was cured by replacing IC351 (TDA8350CQ) which had virtually melted. The tatty soldering revealed that it had been replaced before, and when I looked more closely I realised that the puny, badly-designed clip didn't hold the IC tightly to the heatsink. So I adapted a stronger clip from another chassis, and ensured that adequate heatsink compound was applied. **C.J.G.**

Philips 14PV163 tele-video

This set would fire up very briefly when it was switched on from standby or when a tape was inserted. The tape would be immediately ejected, then the set would revert to standby. The cause of the trouble was the switching transistor Tr7352, which is in the middle of the PCB. It was open-circuit. A replacement cured both faults. **D.S.**

Sharp 66CS03H

This set was dead with a short-circuit BUH515 line output transistor. The cause of its demise was dry-joints in the line output stage. Note that the neon lamp is connected in the mains input circuit and indicates power on only. **D.S.**

JVC AV21F1EK (JX chassis)

There was no tuning or on-screen display with this set. The cause was simply dry-joints at the transistors on the long heatsink panel near the power supply and the line output stage. **D.S.**

Philips G90AE Chassis

When this set was switched on there was rapid tripping. The cause was traced to the BC557C transistor Tr7652, which is part of the pulse-width modulator circuit in the power supply. A replacement restored normal operation. **D.S.**

Sony KVE2922U (AE1C chassis)

The BUZ91A FET chopper transistor in this set had failed. The cause was R604 (150kΩ) and R610 (180kΩ) which had gone high in value. A new chopper transistor will fail immediately if these resistors are faulty. **D.S.**

LG GoldStar CF28C22F

If you get one of these sets with field collapse, it's best to fit the modification kit (KITPC33J). This involves replacing about seven components to improve reliability. The kit comes with instructions, and also covers Models **CF25C22F** and **CF29C42F**. **D.S.**

Ferguson C51F (ICC6 chassis)

Now and again this set would scroll through the channels, even though they were tuned in. If you get this problem look no farther than the touch membrane. We've also had the problem with similar models. Note that these sets scroll through the channels when no carrier signals are being received. **D.S.**

Goodmans GD2880 (Ferguson TX92 chassis)

This set was stuck in standby. When it was switched on the EHT came up then died instantly. The only clue I could find in the power supply was that pin 4 of the TDA8139 regulator chip IP70 was at 5V instead of 0V. This pin is connected to the set's safety system, which centres of transistor TL60 (BC548B) in the line output stage. When I overrode the protection by linking the collector and emitter of this transistor there was a normal picture and sound, which indicated that the cause of the fault was in the protection circuit. I eventually found that DF30 (BAV103) in the field output stage was open-circuit. Its function is to rectify the field output pulses to produce a bias voltage to hold TL60 on. **J.P.**

Amstrad CTV1410

This set wouldn't store stations. On investigation I found that the EEPROM's –30V supply was missing. Although the 2·2kΩ feed resistor R603 looked very distressed it read correctly when checked. The cause of the trouble was the 10nF decoupling capacitor C602. **J.P.**

Panasonic TX24MD1 (Euro 2 chassis)

This set was stuck in standby. When it was switched on the EHT would rustle up then die. The EAROM IC1203 was faulty. **J.P.**

Bush 2850NTX-A (TV8 chassis)

There was only a single dot in the centre of the screen. I found that the line scan connection was burnt at the plug to PCB joint. After repairing this there was field collapse. The TDA8170 field output chip was short-circuit and its supply components were damaged. These are rectifier D402 (BA157) and fusible resistor R408. The reservoir capacitor was OK. **S.L.**

Mitsubishi CT28AV1B (EE3 chassis)

This set produced a picture with severely crushed highlights (reminiscent of a faulty Sony IF unit – you know the one!). There was also very loud sound hum. I found discoloration and solder deterioration around Q952 (2SC2236) which proved to be leaky. There's a modification for this problem, available from CHS as "8V regulator kit", code 44052, at a very reasonable price. **S.L.**

Hitachi C2846TN

If the TV model number is displayed and cannot be removed, the set is in the 'factory mode'. Press both record buttons on the VCR section of the handset, switch to standby then switch off at the mains. Wait for thirty seconds. After that the set should be all right. **S.L.**

Daewoo TVC14VP tele-video

This unit was dead with the LED at the front moving from red to green. The cause of the trouble was R817, which was virtually open-circuit. Note that if there is a VCR fault that results in no deck operation the LED also, for some reason, produces this indication. **S.L.**

Goodmans 2019R (Onwa chassis)

If, after replacing the usual electrolytics in the power supply and the 12V zener diode D402, you are left with poor, no or excessive contrast, the culprit will be the AN5601K colour decoder chip IC301. **S.L.**

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.

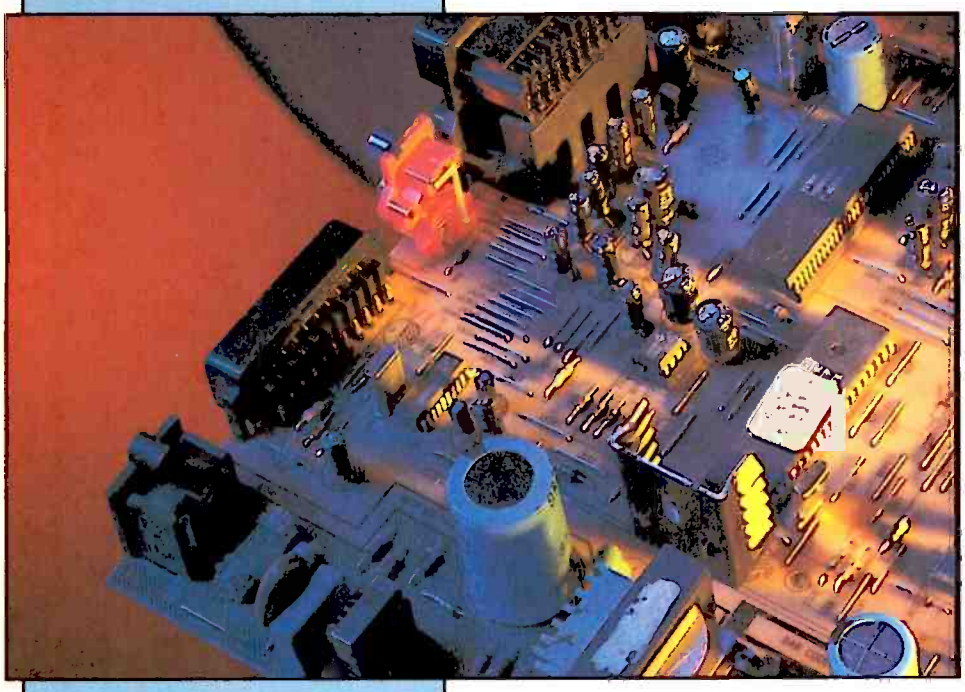
To order your pair of probes, send the coupon together with £21.74 UK/Europe to Probe Offer, Electronics World Editorial, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

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



SATELLITE WORKSHOP

JACK ARMSTRONG

Grundig GDS200

As mentioned last month, C18 in the GDS200's power supply can be the cause of failure to receive the horizontally-polarised channels. A local installer has just walked in with another GDS200 that has exactly the same "some programmes missing" symptom. C18, which is at the edge of the power supply board, was marked 47µF, 16V (it was impossible to read the value last time because of the glue). It produced a low ESR reading, but I replaced it anyway. As this made no difference I extracted a bulging 1,000µF, 16V electrolytic from the mess of glue and replaced it. An ESR check revealed that it was well past its best, but again the new one made no difference.

I then decided to do the job properly and used my Genie ESR meter to check every capacitor in the power supply. C12 produced too high a reading for a 470µF, 16V electrolytic, so I replaced it with one rated at 35V. I have 16V capacitors of this value in stock but, as they are much smaller than the original component physically, I used the higher-rated one which had a lower ESR. This restored the missing channels.

As with the Amstrad DRX100, you find more than one power supply design in the Grundig digibox. If you can't carry out a repair by checking the ESR of the electrolytic capacitors and replacing any that are suspect, you should arrange to have the receiver fixed by Genserve (01793 886 333). Note that Genserve is unable to provide any technical advice unless you subscribe to its advice service: this costs £50 a year.

Amstrad DRX100

The fact that the tuner module in the DRX100 digibox is prone to failure has been emphasised recently in the *Watchdog* TV programme – though I can't agree with their expert who attributed the cause to flexing of the rear panel! In fact it seems that hundreds of tuners may now be failing each week, so a design problem is the likely cause. MCES Ltd. in Manchester has apparently sorted out the problem and can repair and upgrade the tuner for about £25.

Provided you have workshop facilities and a desoldering station, you can remove the tuner without too much difficulty. The procedure is as follows.

Disconnect the receiver completely. Then remove five screws and lift off the cover. Raise the power cord grommet above the rear panel slot. Remove the tuner nut and washer, the three rear panel screws, and the tiny screw that holds the module inside to the rear panel. Unclip the rear panel at the top corners, then use a thin blade to release the three clips underneath. Pull the panel off and look at the main board.

When you handle the main board, remember that it's susceptible to damage from static electricity. So put your hand on the metal chassis before you touch the board. Take care not to knock any components!

Early models have a screw that's hidden beneath the plug-in module at the rear. Simply pull the module upwards to remove it. Take out the five or six screws that secure the main board, then lift the board just enough to let you get your desoldering iron under it to desolder the tuner's pins, so that gravity assists – see Photo 1. It's sometimes necessary to add fresh solder to each pin before desoldering is possible. It may be possible to remove all traces of solder with desoldering wick or a pump-action solder remover, but I've never managed to do so. I use a Weller DS801 desoldering station that cost about £500 in 1992. Other suitable stations are no doubt available.

Turn the main board upside down. The pins are in plated-through holes – see Photo 2 – with several tracks joined to them on the top surface of the PCB, out of sight beneath the tuner. Place the tip of the soldering iron on each pin in turn and push it from side to side to ensure that it's free to move in the hole, with no solder connecting it to the track. If a pin isn't free, feed fresh solder into its hole then suck it out and try again.

Next, remove some solder from both tuner fixing lugs so that you can untwist them: they must be aligned perfectly with their slots.

The success of the next operation depends on the way in which you hold the tuner and iron. You need a *very* hot iron. I use a 45W Weller iron with a number 8 tip (430°C). Most DIY type irons don't produce enough heat, so you may need an assistant to hold a second iron.

Place your thumb on the threaded F connector – see Photo 2 again – and press down while at the same time pushing up against the board with your first finger. Hold the iron in your right hand. Press the soldering iron's tip against the tuner's lug and apply fresh solder between them to improve the heat transfer. As the solder around the lug melts, maintain the gentle pressure with finger and thumb. When you feel the solder release its grip, ease the tuner's lug out of its slot until it is just clear. Repeat the operation for the other lug.

Ensure that the tracks which are connected to the tuner pin holes on top of the board are undamaged. If any of them are damaged, repair them with very fine wire and check the continuity.

Fit the replacement tuner carefully, soldering the lugs first. If you solder a pin first, any movement of the tuner may break the delicate tracks on top of the board.

Check all plug-in connections – especially the white connector near the front panel. Make sure that the plugs are pushed into their sockets fully, otherwise you might find that the receiver is stuck in standby. Reassemble the receiver, ensuring

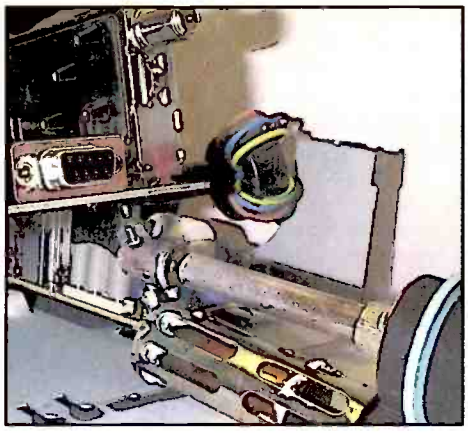


Photo 1: Tuner module removal in the Amstrad DRX100 digibox: access to the tuner module's pins.

that all screws are fitted into the correct holes and tightened. Reconnect all cables and apply mains power.

If the receiver still gives the no-signal indication after a one-minute warm up you've probably damaged a connection or the initial diagnosis was incorrect – the no-signal message can however be due to other causes.

Finally, a couple of general points. The stuck-in-standby symptom means that for some reason the microcontroller chip is unable to start up. Usually this doesn't mean a power supply fault, though it could do. More commonly the cause is at best a loose connector or faulty crystal or, at worst, serious damage to ICs because of a voltage surge on the telephone line.

Reliability can be increased by fitting inside the receiver an almost-silent miniature cooling fan that's available from SatCure (phone 01270 753 311). SatCure can also supply a voltage-spike suppressor adaptor that plugs into the 13A mains socket. This adaptor has, in addition, a pair of telephone sockets for in /out connection, minimising damage from phone-line surges during electrical storms. You can contact SatCure via its latest e-mail address at web site http://www.satcure.co.uk

The DRX100 bears the 'BEAB approved' mark, but a couple of features relating to safety seem to me to have crept into the design after approval was granted. The first is obvious – the mains cable insulation has been removed to enable a ferrite ring to be fitted, see Photo 3. This modification is not present in all versions of the receiver. Where it has been carried out it leaves the brown and blue mains wires free to touch the cover. I recommend that you add insulation over these wires before reassembling the receiver.

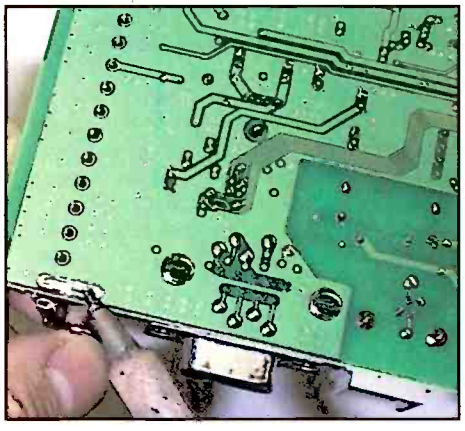


Photo 2: Unsoldering the tuner module's lugs in the Amstrad DRX100 digibox.

The second point compounds the first: the mains-protective earth is connected to chassis by means of a single screw that holds a PCB soldered copper pad in contact with the metal base. The last time I read a safety standard from BSI it said that the fixing method for the earth wire should not be dual-purpose. This requirement stemmed from the days when a mains transformer was bolted to a chassis and one of the bolts was also used to hold the earth tag: if someone changed the transformer the screw could accidentally be left loose. In fact the screw could work loose as a result of transformer vibration, leaving the equipment without a secure earth connection.

In the DRX100 the screw, arrowed in Photo 3, is used to hold the power supply board and the copper pad in contact with the chassis. If someone removes the power supply and fails to replace and retighten the screw, there is no reliable earth connection. In addition the solder on the copper pad is quite thick and could 'creep', leaving the connection loose. Finally there's no locking washer or nut.

A bad earth connection will show up, as any workshop technician knows, when an earth continuity check is made. But how many of us carry out this test with every unit we repair? I recommend, as a minimum, that you fit a locking washer under the screw head.

Working blind

Two magicians were born in my home town of Middlesbrough. One was the famous Paul Daniels. Not so famous, but well known locally, was "Blind Des". I first saw him in action when my granny's Decca DM4-CA had developed a rolling-picture fault (OK, I know this is supposed to be about satellite TV, but you'll like it!).

"Run and get Blind Des" my mum told my uncle, "he'll fix it."

Ten minutes later my uncle returned with an elderly lady who had a white-haired gentleman and a suitcase in tow. I knew he was blind because he tapped things with a white stick.

At the impressionable age of seven I quite expected him to wave his white stick and mutter some magic words that would instantly cure the jittery picture. Instead, he sat down in the armchair and told his wife to kneel down by the TV. She was used to this and described the symptoms in detail.

Blind Des listened then sat back and clasped his hands to his chest. This was better than the cinema!

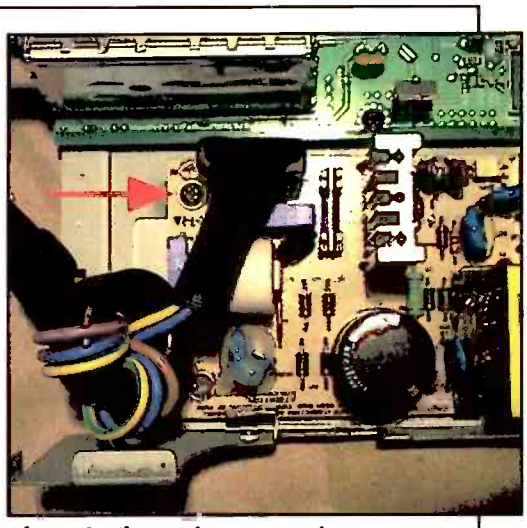


Photo 3: The mains-connection arrangement in the Amstrad DRX100 digibox.

"Swap th' ECC82s" he pronounced. "If that dun't fix it, replace grid bias resistuh under th' flywheel sync valve."

The little woman followed his instructions. It must have been the resistor, because she produced a large soldering iron from the suitcase and plugged it into a wall socket. With amazing dexterity, and much smoke, she replaced the offending resistor in seconds. After that there was a perfect picture.

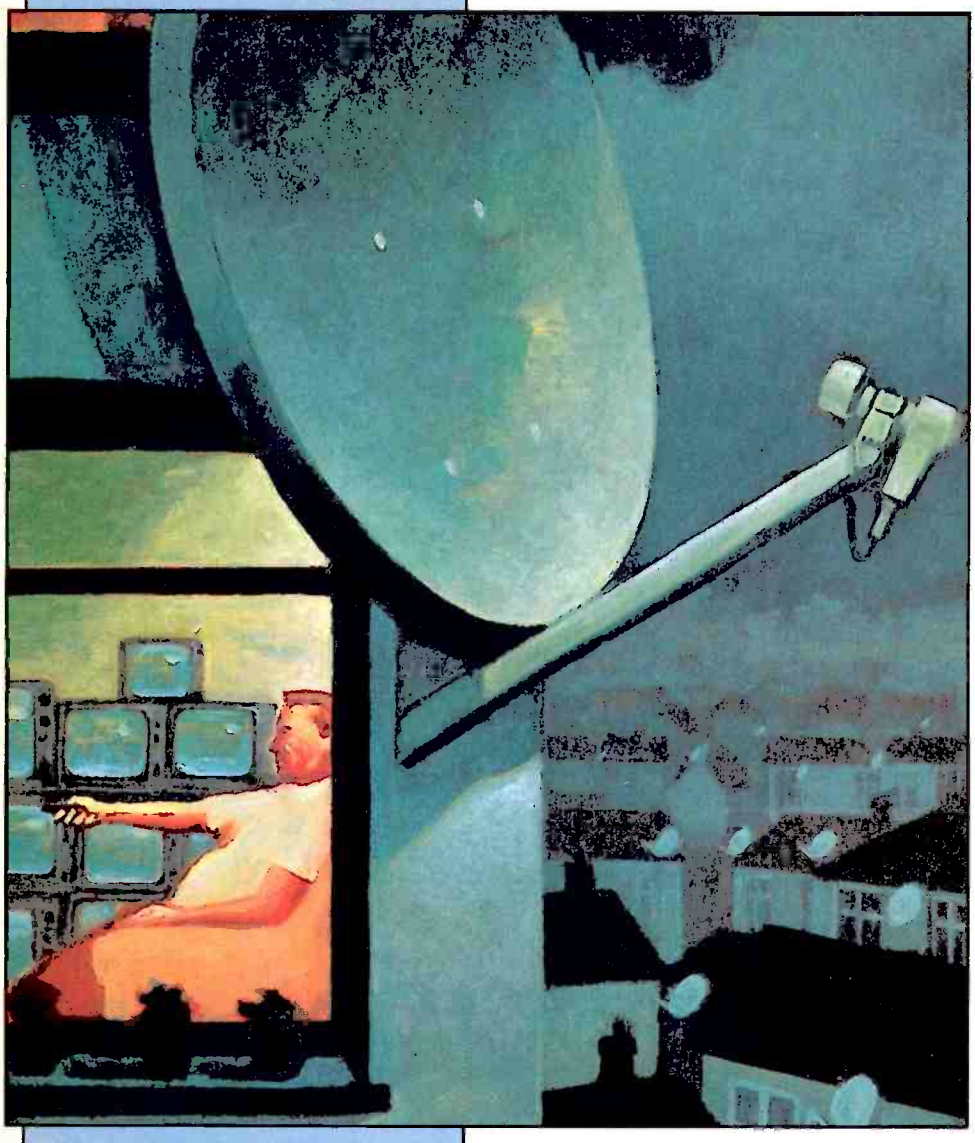
I remember being seriously impressed, and decided at that early age to be a TV repair man. I would learn all about sync valves before I became blind. I'm still not blind, despite the evil invention of surface-mounted devices!

The moral of this story is that you can fix things even when you can't see them, provided someone can 'paint a picture' in words. Most of my headaches arise from telephone calls and e-mails where the other person doesn't describe accurately what he sees and hears. We have to put up with this sort of thing from the public, but it becomes frustrating when engineers make the same mistake. So next time you mention "interference lines" to me, for example, shut your eyes and paint a verbal picture. How many lines? How far apart? What orientation? What colour? Solid, dotted or dashed? ■

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems by e-mail. You can reach him via the internet web site at:

http://www.ukstay.com/jack

If you have no internet access you can write to him c/o Television, Room L514, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps.



SATELLITE NOTEBOOK

Reports from Christopher Holland Hugh Cocks and Pete Haylor

BSkyB digibox/card matching

The first BSkyB digiboxes are now two years old. For a number of reasons it's becoming common for a subscriber to change his/her digibox. This is not as easy as in the analogue days, when any valid viewing card could be used in a VideoCrypt decoder. With the digital system the card and box are matched together. When an existing authorised card is slotted into a new digibox none of the sports, film or BBC channels can be seen. There's just a message to say that this is the wrong STB for the card and please phone 08702 404 040 for advice. At the time of writing basic channels (UK Gold, Discovery, etc.) plus channels 4 and 5 can however be viewed. Note that connection of a new box to the telephone line then going through the 'new installation' procedure in the installer set-up menu doesn't resolve this particular problem.

The procedure for matching a card with a new box is quite straightforward. Call 08702 404 040. Once you get through to an operator, give the customer's name and viewing card details, say that a new digibox is to be used and that you want the box and card "re-paired". The operator will then ask you to press the remote control unit's 'services' button, followed by '4', 'system setup', and then 'five'. Table 1 shows the system details menu, with the card number and receiver number represented by Xs.

Normally the receiver version and serial numbers have to be read out over the phone.

Table 1: Typical on-screen system-details menu for an early Pace 2200 digibox.

Manufacturer:	Pace
Model number:	1.2.3r
Version number:	9F0103
Serial number:	XXXXXXXXXX
Viewing card number:	XXX XXX XXX
Operating system version:	1.2S3Bu
EPG software version:	2.7a.2

You are then asked to exit the menu by pressing the 'Sky' button on the remote control unit and go to a premium channel, normally Sky Premier 1 (EPG 301). A picture should appear on all channels within a few seconds. If premium channels don't form part of the subscription package for the card concerned, a message on how to upgrade the subscription appears when one of them is selected. **C.H.**

Amstrad tuner repairs

We've had several Amstrad DRX100 digital STBs recently that were out of the twelve-month guarantee period and displayed the "no signal being received" message. The receiver has also been featured in the BBC TV consumer programme *Watchdog*. In all cases the tuner was the cause of the trouble. The basic problem is that the 479MHz local oscillator, which forms part of an IF double-conversion process within the tuner, stops oscillating. Not surprisingly, there is then no output from the tuner.

Repair is relatively straightforward if you are familiar with RF techniques. Alternatively Kesh Electrics offers a rapid tuner turnaround repair service for £12 plus carriage and VAT. Kesh can be reached on 02868 631 449, or you can visit the company's website at www.pacelink.co.uk where details of the service can be found. **C.H.**

The Panasonic TU-DSB30 digibox

A lot of these Silver Panasonic digiboxes have passed through our hands during the past year or so. To date we've had very few problems with them. This brand new one, straight out of the carton, displayed the "no signal" message despite producing sufficient voltage and current and a 22kHz tone to operate the LNB.

Before putting it back in the box to return it I removed the main PCB to check that the tuner's pins were making contact with the board. Fortunately the cause of the problem was immediately evident. There are five pins in a group nearest the F-socket end of the body: none of them had a good soldered joint. I resoldered these pins, then did the same with the rest, which are separated from the group of

five by a small gap. The digibox then worked normally. **C.H.**

NRK frequency change

NRK International, the Norwegian TV service aimed at expatriates living in other parts of Europe, caused some confusion recently when the frequency was changed. The signal is transmitted via Intelsat 707 at 1°W in MPEG-2 form, using the Conax encryption system. It had previously been available at 11·174GHz with horizontal polarisation. The change was to 11·677GHz, with the symbol rate 26,000 and FEC 3/4. 11·677GHz had been used by the BBC Prime MAC-D2 service before this was transferred to solely digital distribution via Hot Bird at 13°E.

Unlike the SkyDigital system, which automatically updates the EPG for any new signal characteristics, Norwegian receivers had to be reprogrammed manually for the new frequency and symbol rate. Fortunately the old and new frequencies were used in parallel for a period of about two weeks, with an on-screen message at times to tell viewers about the changeover. Nevertheless some had a blank screen for a short time.

Most NRK International viewers use a Nokia 9600 or 9800 STB to receive the service. I found it best to erase all previously stored information and do a 'new installation', using the new parameters to start the receiver searching, other free-to-air services being found during the process. Encrypted services that were found and put in the EPG list were easily deleted using the receiver's channel editing procedure. **H.C.**

SkyDigital update

Table 2 shows the channels added during the last month. The transponder number is shown in brackets after the frequency, the EPG number being shown in brackets after the channel name.

Sunrise Radio (transponder 32), mentioned last month as being on test, has been assigned channel number 948. MBI TV from Nigeria, which has been available for a while, has been allocated channel number 698 in the EPG.

Astra 2B is now co-located with 2A at 28·2°E. Some transponder tests are being carried out on Astra 1D, particularly with transponder 63 (10·921GHz H). **C.H.**

Table 2: SkyDigital channel update.

Frequency (GHz)	*Pol*	*Channel*
11·954 (13)	H	Dating channel (656)
12·324 (32)	H	Prime Time Radio (947)
12·402 (36)	V	CEE(I) TV (693), Liberty TV (202)

The Amstrad digibox

The Amstrad digibox has been showing its true colours recently, the usual problem being a defective tuner. The boxes tend to fail when they are between 13-15 months old. A customer who contacts his supplier is told that the box is not repairable and that a new one will cost about £400.

We get a few for repair each week. With 95 per cent of them the problem is the tuner, which MCES can repair at a sensible price. I keep some digiboxes in stock so that, whenever possible, I can turn the repair round the same day. The end price to the customer is now affordable.

Another fairly common problem is the "no signal" message because the dish/LNB is faulty. On a number of occasions I've found that the signal provided by the LNB is of low amplitude and cannot be improved no matter how the dish is moved. So I always carry with me a spare new dish/LNB – they have always cured the problem.

When you get this complaint, always check whether the dish is looking into a tree that was smaller when the dish was installed. It's a very common problem now. I suspect that the fitter didn't have a method of checking the line-of-sight alignment before fixing the dish in the first place. **P.H.**

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: Working control panel for the Philips VCR Model 31DV3/05, or the TMP47P1670VN chip IC101 that's located under the display. Phone Roy Wainwright on 01932 784 912 or e-mail roy.wainwright@tesco.net

Wanted: Two STK8050 chips for a Technics SU-V4 stereo amplifier. Phone David Paines on 01302 710 797 (most evenings).

Wanted: Circuit diagram for the Bush CTV Model 2059NTX. Roy Hylands, 25 Greyfriars, Kington Gardens, Solihull B37 5HY. Phone 0121 770 5330 or e-mail old@fathertime.fsnet.co.uk

Wanted: Service sheet for the Matsui Model 20V1T (CUC7303. XCE94). Expenses paid. Allan Watson, 2 Masefield Avenue, Padiham, Burnley, Lancs BB12 8SY. Phone 01282 774 114.

For disposal: Three old VCRs, collectors items, as follows: JVC HR3330TR (8928) PAL/Secam/NTSC; JVC HR7700E (3V23); JVC HR7200 (8930). All working with workshop manuals. Also a Dynamco dual-channel, delayed-sweep scope, needs slight attention. And many early service manuals, some Beta. Offers please to Dave Plummer (Hastings) on 01424 214 088.

Wanted: The following Mullard germanium transistors (or equivalents) for repair of an HMV 2128 transistor radio dating from the Sixties: AF115, AF117, AC155, AC113, AC154 and AC157. Frank Bailey, 53 Peile Drive, Taunton, Somerset TA2 7SZ.

Help/for disposal: Can anyone suggest an equivalent for the HA1141 chip in a JVC CTV Model 3020UK? Have for disposal a Sony CTV Model KV1330UB (working) £10; Decca CTV set (working) fitted with the 30 series chassis £10; and an ITT set fitted with the CVC5 chassis £10. D. Sniggs, 5 Collingwood Avenue, Muswell Hill, London N10 3EH. Phone 020 8374 9070.

Wanted/for disposal: Require an HM9205 stabiliser module (circuit reference CP901) for the Hitachi Model 2476 (G6P chassis) – or does anyone know the component values? Have for disposal, free to caller, *Television* magazines from 1975-79 and 1982-86. G.D. Stocks, 62 Ridge Park Avenue, Plymouth, Devon PL4 6QA. Phone 01752 668 015.

Wanted: Fault diagnosis pocket book covering the Ferguson TX85/86/89/98/99 chassis – photocopy OK. Also an RS203 bridge rectifier (D506) for the Hinari VCR Model VXL9. J. Alder, 37 Palm Avenue, Fenham, Newcastle-upon-Tyne NE4 9QT. Phone 0191 241 0167.

Wanted: Circuit diagram for the Telefunken TR1200 Hi-fi tuner-amplifier, to buy or borrow. B.J. Brandon, 8 Moor Park Avenue, Castleton, Rochdale, Lancs OL11 3JG.

Wanted/for sale: Require the following. A circuit diagram for the Sanyo/Fisher 170 tuner-amplifier; a working memory board for the Nokia SFN3578UK (Core 2 chassis 5861 78 33 on my diagrams) or a working SAA1289C chip; a 1MΩ log tapped (at 20%?) volume plus 5MΩ tone dual-concentric potentiometer with DPSW; circuit diagram (not *Radio and Television Servicing* equivalent) for the HMV radio Model 1381; a set of green Tripletone amplifier concentric control knobs; data for the Heathkit Oxford UXR-2; and a circuit for the Braun Model UKW66. Have for sale a 405-line Pam Model C600 in fair condition, a Tandon 286 and an Apple 11e PC complete with disks and monitors. Any offers? W. Milne, 20 Graham Road, Wimbledon, London SW19 3SR. Phone 020 8543 9542.

Wanted: Two working ECH42 valves or information on where they could be obtained. Also information on the CD player service modes for Philips mini systems, in particular Model FW630. Owen O Reilly, Belfield, Gaybrook, Mullingar, Co. Westmeath, Ireland. E-mail Owen_O'Reilly@eur.3com.com

For sale: U-View circuit diagram books as follows: TV volumes 1 (1989-90) and 2 (1991-92) and Video 1989-90 (two volumes). £20 each plus carriage. All four volumes together, carriage free. Phone Roger Dowling (Sidcup, Kent) on 07785 371 600 or e-mail rogerd@beeb.net

Wanted: For spares or repair, a Quad FM3 tuner. Also a tuner unit for the Sony VCR Model SLV353 (the tuner/RF unit is mounted on a removable panel). Phone Mike on 01758 613 790.

Wanted: A Loewe TV chassis, Model ART95 68447 9001. Good price paid or will swap for brand new Hitachi Model CPT2508/2808 less tube. Phone Peter Ward on 01425 475 445 (Ringwood, Hants).

Wanted: Help/advice on obtaining the manufacturer of and model number for a CRT overhead projection unit. The only identification information I have is the numbers on the PCBs. These are PWBF0597TA, PWBF0600TA, PWBF0590TA and PWBF0598TA. Phone Alun Payne on 0802 848 891 or e-mail paynea@globalnet.co.uk

Wanted: Remote-control handsets for the following Sharp VCRs: VCA105HM (four required), VCA113HM and VCA215HM. Phone Peter on 01282 864 415.

Wanted: Circuit diagram or service manual (photocopy OK) for the CTX VL700 17in. monitor. Q415 and R474 from pin 6 of the LOPT are burnt and cannot be identified. Kenneth G. Cargill, 1 Stradowen Drive, Strathfoyle, Londonderry BT47 6XN. Phone 02871 861 268 or e-mail kcargill@lineone.net

Wanted: Circuit diagram for the Philips CTV Model 24CE4570 (2B chassis). Photocopy OK or if original will photocopy, return immediately and pay all expenses. Khalid Khawaja, 4 Metric Walk, Smethwick, West Midlands B67 7DX.

Wanted: Retired (on medical grounds) engineer requires anything to do with pre-1970s TV and radio sets – parts, valves, books, circuit diagrams, old test gear, anything considered. Will travel to collect. Steve Taylor, 11 Charnborough Road, Coalville LE67 4SF. Phone 01530 832 695 or 07977 805 308 or e-mail steve.tailor@btinternet.com

Wanted: V2000 and Beta VCRs, spares, test tapes and manuals. Particularly looking for later V2000 (Philips, Grundig and B&O) and later Sony Beta machines. Also require heads for Philips N1500 and N1700 VCRs. Phone Steve Rowley on 01889 578 416 or e-mail steve@srowley.fsbusiness.co.uk

Wanted: CRT type 150AYB22 for the Hitachi Model CKP100, or a scrap set with good tube. Steve Partin, 4 Hendon Close, Highbridge, Somerset TA9 3LB. Phone 01278 788 429.

Wanted: White spherical 'ball' TV cabinet/enclosure as used by the Kerracolour 22in. set in the 1970s, with or without the TV chassis (Decca Bradford). Phone Carl Toomer on 07867 903 747 or e-mail tonyx@supanet.com

Personal voice communications without a licence over a two mile radius for £75, exclusive.

Reader offer

A *pair* of two-way PMR radios for just £75*

RS446 key features...

- Up to 2 mile coverage radius
- Scans main and subchannels
- Eight channels, each with 38 sub channels
- Backlit display for night time use
- Unique call function
- Headphone and mic sockets allow discrete use
- Battery status indicator
- Auto battery save feature
- Keypad lock-out

What is CTCSS

CTCSS – or 'continuous-tone controlled squelch system' – allows sub channels of the main channels to be used. There are 38 sub channels to each main channel. Using subchannels decreases the likelihood that someone else will be using the same frequency.

RS 446 personal mobile radio...

To celebrate its launch, new test and instrumentation company Tecstar is offering *Television* readers *two* RS446 personal mobile radios for just £75 excluding VAT and carriage.

Capable of transmitting and receiving voice over a distance of up to two miles, depending on terrain, the PMR 446 needs no licence. It offers eight channels, scanning – and with CTCSS up to 304 channel combinations.

A backlit liquid-crystal display shows volume level, channel number, sub-channel number, battery level and transmit/receive or channel busy. A unique call feature enables the user to alert the person they wish to contact.

Transmission distance is up to 2 miles. The radio has an accessory socket for an external headphone, earpiece or vox-microphone/headphone combination. A keypad lock and battery save feature are also standard.

The unit measures only 120 by 50 by 20mm and weighs less than 150 grams – including batteries. It is supplied complete with instructions and belt/mounting clip.

Compact, lightweight and low cost, the RS446 wireless personal-communications hand set has a wide range of applications. These include fetes, events and rallies. Builders on building sites could benefit from these radios, as could exhibitors at exhibitions and staff at warehouses, winter activities, sports events, maintenance departments, schools and care homes. Of course you can also use the RS446 just to keep contact with someone locally. The uses are almost limitless.

Send a cheques or postal orders to Tecstar Electronics Limited, 1 Nuffield Road, St Ives, Huntingdon Cambridgeshire PE27 3LX.
Tel 01480 399499, fax 01480 399503, e mail sales@tecstar.co.uk

Order coupon

Please send me RS446 personal mobile radios, for which I enclose:

For ___ **pairs** of RS446 radios at £75 per pair _____

Plus VAT at 17.5%, or £13.13 per pair _____

Plus £6 UK postage per order, or £14 overseas _____

Total _____

Fill in your name and address and post this coupon together with a cheque for the total amount above payable to Tecstar to the address below.

Name _____

Address _____

_____

Post code _____

Signature _____

Send cheques, postal orders etc to Tecstar Electronics Limited, 1 Nuffield Road, St Ives, Huntingdon Cambridgeshire PE27 3LX. Tel 01480 399499, fax 01480 399503, e mail sales@tecstar.co.uk

*excludes carriage and VAT

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

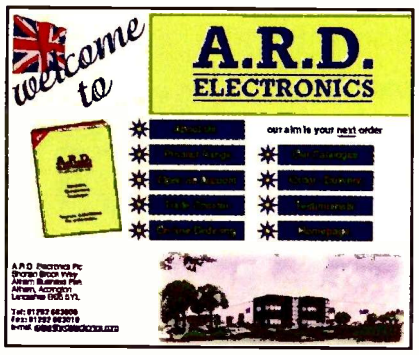
All Tech Tips
http://www.skyeinteractive.net/techtips/

Another US technical tips site which deals with subjects related to repair of the whole range of consumer electronic items. The site is being updated and plans to include current repair articles, books on repair, schematics and links to manufacturers technical repair sites. There's also a chat room.

Anatekcorp
http://www.anatekcorp.com/

A US site selling computer databases of fault reports and schematics, but it has some interesting articles for free download - you can even submit your own. There's a technicians forum but you have pay $60/year to be a member.

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

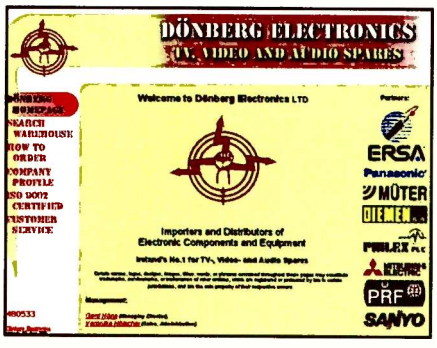
http://www.bbc.co.uk/enginfo

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@euras.co.uk

"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).

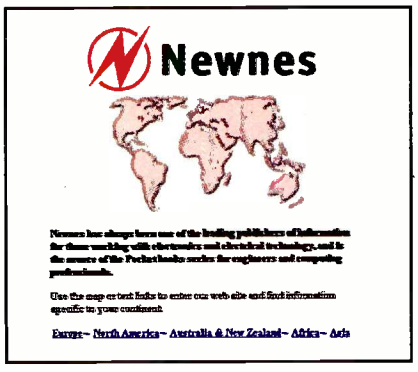
M.C.E.S.

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

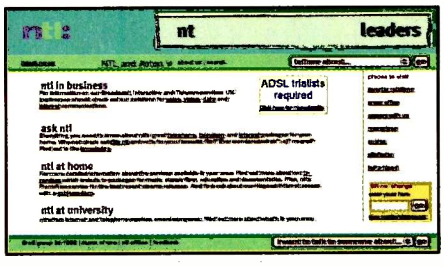


Check out this site for the latest book titles on TV & Video Servicing and Technology and their famous Pocket Book series. You can shop on-line and also register for an Email service to tell you when relevant new titles are published.

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.

Pace

http://www.pace.co.uk/trade/index.ht

The Pace site has a product finder. On servicing, there is a restricted access area for Pace retailers and service partners. If you are a member of the trade and you deal with Pace products you can apply for access by following the instructions. The free access area contains some useful Frequently Asked Questions and links to other useful sites such as the Lyngemark Satellite Chart at http://www.lyngsat.com.

Sky digital repairs

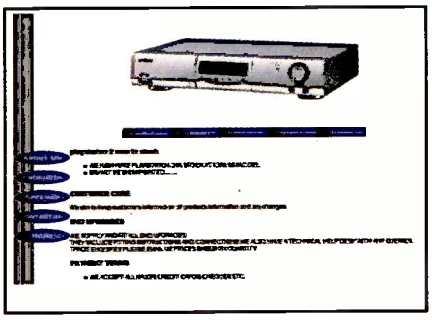
http://www.horizonsatellites.co.uk

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

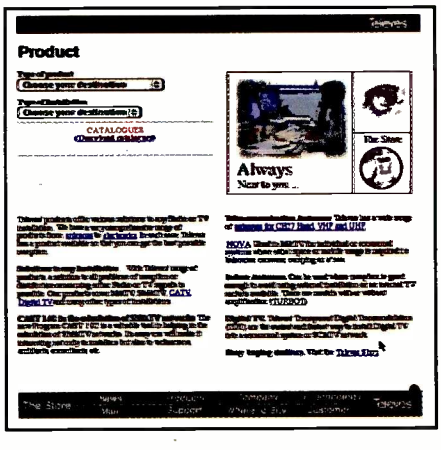
http://realguide.real.com/stations/

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

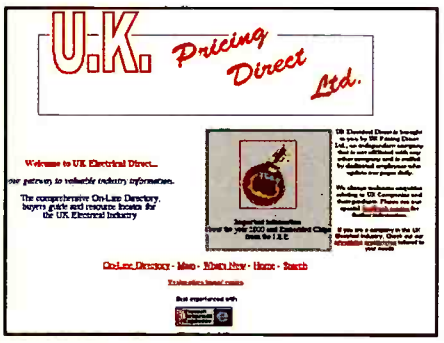
http://www.uked.com

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

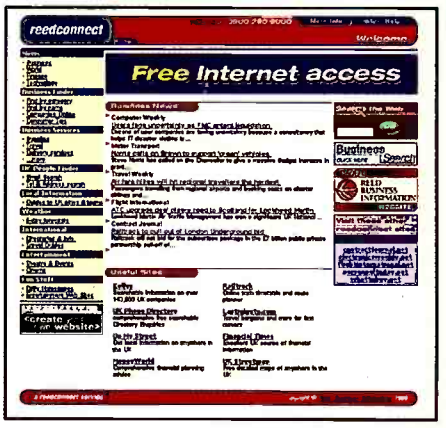
http://www.psaparts.com

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".

Put your web address in front of 21 000 electronics enthusiasts and experts.

Television **acknowledges your company's need to promote its web site, which is why we are now dedicating pages in every issue to announce your WEB ADDRESS.**

This gives other readers the opportunity to look up your company's name, to find your web address and to browse the magazine page to find new sites.

We understand that cost is an important factor, as web sites are an added drain on budgets. But we are sure you will agree that the following rates make all the difference:

FOR 12 ISSUES:

Lineage only will cost £150 for a full year, just £12.50 per month.

This includes your company's name, web address and a 25-word description.

Lineage with colour screen shot costs £350 for a full year, which equates to just £29.17 per month.

This price includes the above mentioned information, plus a 3cm screen shot of your site, which we can produce if required.

To take up this offer or for more information ring:

Pat Bunce on 020 8652 8339
or fax on 020 8652 3981.
or e-mail: pat.bunce@rbi.co.uk

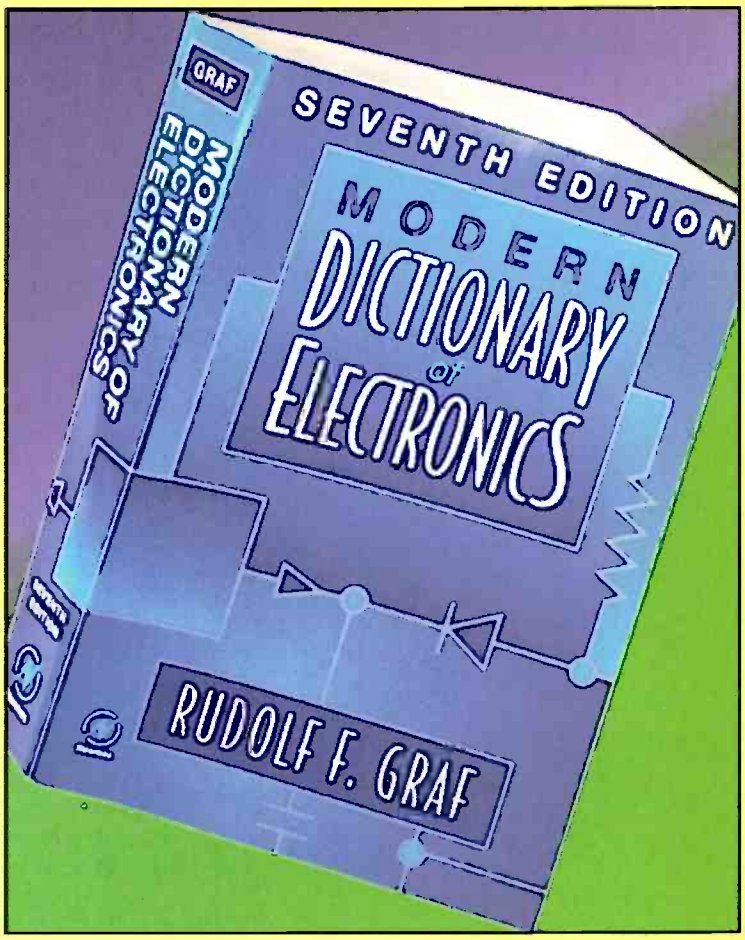
Company name		Web address		

BOOK TO BUY

Completely updated, this comprehensive dictionary contains over 28,000 electronic terms, phrases, acronyms, and abbreviations from the ever-expanding worlds of consumer electronics, optics, microelectronics, computers, communications, and medical electronics. This dictionary is a valuable resource for professionals in the field, hobbyists, students, or anyone interested in electronics.' - Poptronics

Included in this fully revised classic are well over 28,000 terms, phrases, acronyms, and abbreviations from the ever-expanding worlds of consumer electronics, optics, microelectronics, computers, communications, and medical electronics. From the basic elements of theory to the most cutting-edge circuit technology, this book explains it all in both words and pictures. For easy reference, the author has provided definitions for standard abbreviations and equations as well as tables of SI (International System of Units) units, measurements, and schematic symbols.

Modern Dictionary of Electronics is the bible of technology reference for readers around the world. Now fully updated by the original author, this essential, comprehensive reference book should be in the library of every engineer, technician, technical writer, hobbyist, and student.



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

Fax your completed order form to 020 8652 8111
UK Price: £42.50 Europe £45.00 ROW £47.50
Price includes delivery

How to pay

Modern Dictionary of Electronics

❑ 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:_____

VCR CLINIC

Reports from
Eugene Trundle
Ronnie Boag
David Smith
Paul J. Roberts
Roger Burchett
John Coombes
R.A.F. (Ace TV and Video)
Dave Dulson and
Ian White

Daewoo DVR7372P

The fault symptom, which was very intermittent, was that of dirty heads during playback, with slow and 'slurred' sound reproduction, even though the front panel proclaimed that the machine was operating in the SP mode. In fact the pinch roller was barely in contact with the tape, because of a faulty mode switch. **E.T.**

Panasonic NVSD40

No-go was the symptom with this machine: the only sign of life was a faint ticking that came from the power supply, at a rate of about one tick per second. Checks showed that there were no shorts or excessive loading. We also found that the power supply was of the FET chopper type, which is not covered in the main manual. R1120 had risen in value from 560kΩ to 900kΩ and R1121 from 820kΩ to 1MΩ. To ensure reliability we also replaced C1111 and C1136. **E.T.**

Tatung TVR933V etc

The deck and the electronics used in this and many contemporary Tatung VCRs are made by **Orion**. There is a tendency to erratic mechanical action, one aspect of which is refusal to eject the tape or respond to deck commands. The culprit is the tape-centre LED, which is mounted on the main PCB. I always replace the mode switch at the same time as it can be the cause of similar problems. **E.T.**

JVC HRJ220

This machine refused to accept tapes. The usual cure for this problem is to replace the mode state switch. In this case however the change-arm assembly (part no. PQ46353A-1) also had to be replaced. **R.B.**

Finlux VR163NX

This machine was dead. A new mains bridge-rectifier reservoir capacitor (100µF, 385V) got it going again with no further problems. **R.B.**

Sony SLVE280UK

This machine had been taken two dealers who had said "sorry, can't repair". It played perfectly, but when record was selected it would go into this mode for about fifteen seconds then shut down completely with the display going out. After a second or two it would try to reset and would then behave impeccably until record was again selected.

The cause was that infamous fuse PR512 (1A) in the 5V supply. A resistance check on it produced a reading of about 0·5Ω. As a telltale sign the fuse had a slightly discoloured band around the centre. Should PR512 fail completely there will be no operation or display. **D.S.**

Grundig GV496M

This VCR was dead after being unplugged by the customer. With the machine opened up it was just a matter of replacing C136 (1µF, 400V, 105°C) in the power supply and a general resoldering of dry-joints. **P.J.R.**

Sharp VCM20

This machine damaged the top of the tape. The pinch roller was well worn, but a replacement failed to cure the trouble – the tape continued to ride up the fixed guide. Sharp has issued a technical bulletin on setting up the audio/control head on the VCM23 etc. After going through the procedure I found that the problem was no longer present in the play mode but remained in forward search. Further checks revealed that the take-up torque was excessive. A new pulley reel cured that. **R.Bu.**

Hitachi VTM740E

This machine would accept a tape and the playback, record, rewind and fast-forward functions were OK. When eject was pressed however the machine would try to eject then reload. The cause of the problem was traced to the clutch base assembly. The top of the front-loading gear was damaged and there was a loose spring, which prevented movement of the cogs to the correct position for tape ejection. **J.C.**

Ferguson FV71LV (R3000 chassis)

No results with no display usually means faulty capacitors in the power supply. The first items to check are CP007 (100µF, 25V) and CP008 (10µF, 50V). Further possibilities are CP81 (1,200µF, 16V) and CP82 (1,000µF, 16V). Check them all by replacement.

If the capstan doesn't rotate, check whether the plastic pulley on the capstan spindle has fallen off. **J.C.**

Hitachi VTF450E

For an intermittently snowy picture, as if there are low-amplitude or missing CTL pulses, check the condition of the tension band. With this machine the felt had become unstuck, so that only the plastic rested on the supply spool. A replacement restored reliable operation. **J.C.**

Toshiba V254B

You can get very intermittent no results and a dim display with these machines. The item to check is CP041 (220µF), which tends to fall in value. The last time I had the fault CP041 measured 70µF. **J.C.**

Panasonic NVSD200

We've had several complaints about noisy rewind with these machines. First, ensure that the take-up and supply spools rotate freely and are well lubricated. Then, if necessary, check for a broken loading motor bracket and worm wheel gear. Replace as necessary. **J.C.**

Akai VSF510

If there is no playback picture but the sound appears to be OK, check the 5V reference supply at IC201. When D204 is leaky or short-circuit the supply can drop to 4·8V. There is a modification in this

area: a revised diode type and added 750Ω (1/6W) resistor. **J.C.**

Daewoo V60

For failure to start up, check capacitor C53 (1µF) which goes open-circuit. Then if necessary check resistors R51 and R52 (both 390kΩ) which tend to go high in value. **J.C.**

Thomson V321

If there is a loop of tape when a cassette is ejected, check diode D229 (1N4148) by replacement. **J.C.**

Goodmans TX4000

This machine was dead, so I replaced the usual capacitors in the Sony-made power supply. As this failed to cure the problem I had to take the machine apart again. There are two 390kΩ resistors in the power supply, R21 and R22. One of them was open-circuit, but it seemed wise to replace them both. In fact I suggest that this is done whenever one of these machines comes in – I have since had a two more failures. Use resistors rated at 0·5Ω. **R.A.F.**

Alba VCR7200

This machine would switch off because the drum speed was excessive. Checks showed that the drum servo was very unstable. A couple of freezer cans later I found that C6031 (10µF) near the reel sensor was heat-sensitive and in fact open-circuit. **R.A.F.**

JVC HRD610

The problem was lines across the picture, like mistracking. They were sometimes present when a tape was loaded but not on other occasions. I found that the left guide sometimes failed to reach the V block, because the brass bush beneath was loose. Remove and repair or replace it. **D.D.**

Philips Turbo deck

A fault you can get with these machines (Model VR285 etc.) is intermittent cutting out in play or record, showing error 2. Check the clutch unit underneath the deck. The spring inside cuts a groove in the inner bush and then, instead of gripping, just rotates. So the clutch has no grip. Replace item 115 (manual identification). **D.D.**

Sony SLVE220UB

The chassis used in this machine is used in a number of other models, including some **Sanyo** ones. Circuit protector PR512 is the root of many evils and is worth checking whenever you see any of these machines. If there is any sign of discoloration, replace it.

The faults it causes depend on the extent to which its resistance value has increased. Common ones I have come across are:

(1) Cuts out in record only.

(2) Cuts out in timer record only.

(3) The recorded audio is microphonic and echoey, playback being OK.

(4) Slow to change modes, especially from play to rewind.

(5) Intermittent capstan motor start-up.

So beware and watch this item carefully. **I.W.**

Answer to Test Case 457

– see page 159–

This type of dual-feed installation normally works well. The 60cm dish, aligned with Astra 1, maintains the previous analogue signal strength – in fact the clean new dish may well improve the signal. Astra 2 provides more powerful signals: this, together with the 'oversize' dish (40cm is normal), should compensate for the signal loss associated with the off-centre position of the second LNB. In normal circumstances the result is a more than adequate signal for the new digibox.

In this case however the signal wasn't adequate. The dish and the new LNB had been proved to be OK, but the LNB has to be correctly aligned with the reflected beam from Astra 2 at 28·2°E. This is where the trouble lay. The two Astra positions are nine degrees apart. Somehow Ray had ordered a six-degree bracket, the sort generally used for reception from Astra 1 at 19·2°E and the Eutelsat Hot Bird slot at 13°E. Thus the new LNB was off-beam with respect to its signal, and no amount of adjustment could get this right. Indeed it's surprising that the digital signal had been good enough to get the receiver going at all!

Once the correct bracket had been ordered, fitted and aligned the digital signal was excellent. But any profit from the job had long since disappeared. We had to put it down to experience.

NEXT MONTH IN TELEVISION

TVs that catch fire

In this age of consumer protection and BEAB testing you might think that a TV set being the cause of a fire is a very rare occurrence. It's not common of course, but it does happen from time to time – and standby operation has compounded the situation. In 1998, the last year for which figures are available, 638 fires in the UK were attributed to faulty TV sets. So it's as well to be aware of the possibilities. Michael Maurice has been looking into the subject and presents his findings.

Digital terrestrial TV reception

Digital terrestrial TV transmissions have brought with them a host of challenges for aerial installers. Bill Wright looks at the new problems and possible solutions. Aerials, signal amplifiers, distribution equipment and interconnections can all give rise to problems of one sort or another.

Interference caused by switch-mode PSUs

The chopper power supply has great potential as a cause of interference. What can be done to minimise this? Ray Porter describes the various sources of emissions, their spectrum and the PCB and circuit design rules that should be followed to reduce electromagnetic radiation.

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.

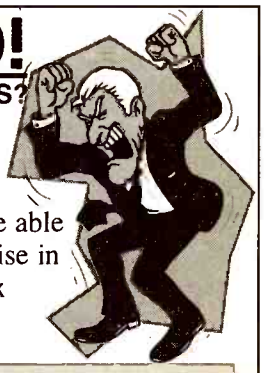
ONLINE SHOPPING CHEAPER AND EASIER

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

FRUSTRATED!



Looking for ICs TRANSISTORS?

A phone call to us could get a result. We offer an extensive range and with a World-wide database at our fingertips, we are able to source even more. We specialise in devices with the following prefix (to name but a few).

2N 2SA 2SB 2SC 2SD 2P 2SJ 2SK 3N 3SK 4N 6N 17 40 AD ADC AN AM AY BA BC BD BDT BDV BDW BDX BF BFR BFS BFT BFW BFX BFY BLY BLX BS BR BRX BRY BS BSS BSV BSW BSX BT BTA BTB BRW BU BUK BUT BUV BUW BUX BUY BUZ CA CD DX CXA DAC DG DM DS DTA DTC GL GM HA HCF HD HEF ICL ICM IRF J KA KIA L LA LB LC LD LF LM M M5M MA MAB MAX MB MC MDA J MJE MJF MM MN MPS MPSA MPSH MPSU MRF NJM NE OM OP PA PAL PIC PN RC S SAA SAB SAD SAJ SAS SDA SG SI SL SN SO STA STK STR STRD STRM STRS SV1 T TA TAA TAG TBA TC TCA TDA TDB TEA TIC TIP TIPL TEA TL TLC TMP TMS TPU U UA UAA UC UDN ULN UM UPA UPC UPD VN X XR Z ZN ZTX + many others

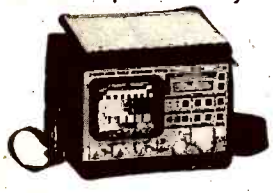
We can also offer equivalents (at customers' risk).
We also stock a full range of other electronic components.
Mail, phone, Fax, Credit Card orders & callers welcome.

VISA Connect

Cricklewood Electronics Ltd
40-42 Cricklewood Broadway, London NW2 3ET
Tel:020 8452 0161 Fax: 020 8208 1441

PERIFELEC

MC 30 A Spectrum Analyser

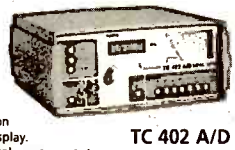


- Synthesized satellite cable and TV field strength meter with panoramic reception on 14 cm (5,5") screen and digital carriers measurement.
- Complete microprocessor and IspLSI logic control.
- Continuous frequencies from 46 to 860 MHz and from 920 to 2150 MHz on 4 bands.
- Selectable 4, 1 and 0,2 MHz 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

Setbacks

Technical Specification		
Reference	5371	5372
Inputs(2)	UHF/FM	UHF/FM
Outputs	6 (+1)	7 (+1)
Gain UHF	10 (+24)	10 (+24)
Noise Figure	2.5dB	
Line Power	12Vdc	
Output	89dBµV	

Features
- Ideal for digital installations
- Low noise figure
- F connectors
- Fully shielded

Technical Specification				
Reference		8130	8131	8132
Gain (dB)	out 1	23	17	7.5
	out 2	-	15	7.5
	out 3	-	-	12
	out 4	-	-	16
Outputs		1	2	4
Input		1		
Noise Figure		< 3.5dB		

Features
- Design for individual installations
- Proven reliability and performance
- IEC connectors
- CE conforms with EN55013, EN55082-1, EN60065

Technical Specification			
Reference	4381	4382	4383
Ampl.band(MHz)	5-380/470-860		
VHF Gain (dB)	26	13	13 05
UHF Gain (dB)	30	20	23 9 15
Var. gain VHF (dB)	>20	>20	>20
Var. gain UHF(dB)	>15	>15	>15
Max.output level (dBµV)	99	88	90 76 82
Noise Figure (dB)	<2.8dB	<2.8db	<2.8db

Features
- High output level/Low noise figure
- UHF and VHF variable attenuator (0-20 dB)
- IEC connectors
- Fully shielded

All these products are available from UK's main distributors and wholesalers

Televés

Televés UK Ltd Tel. 01633 875821 Fax 01633 866311
televes.uk@televes.com www.televes.com

WILTSGROVE LTD

28/29 River Street, Digbeth, Birmingham B5 5SA
Tel : 0121 772 2733 Fax : 0121 766 6100
e-mail : sales@wiltsgrove.co.uk

Merry Xmas & a Happy New Year

KÖNIG ELECTRONIC
Official Distributors

Don't Forget We Stock 1,000's of Spare Parts for Many leading Brands of TV's & VCR's

• LOPTS • REPLACEMENT & GENUINE REMOTE CONTROLS • MODE SELECT SWITCHES
• GEARS • BELT KITS • MEMBRANES • PINCH ROLLERS • CLUTCHES
• GEAR ASSEMBLYS • AUDIO CONTROL HEADS • MOTORS • TENSION BANDS
• POWER SUPPLY REPAIR KITS • LAMPS • SPRINGS • RIBBON CABLES
• CASSETTE HOUSINGS • IDLERS • ERASE HEADS • GUIDE TAKEUPS
• CAPSTAN MOTORS • LOADING ARMS • COUPLINGS • TAPE GUIDES
• MICRO SWITCHES • REPAIR KITS • MAINS SWITCHES & MUCH MUCH MORE.....

IF YOU CAN'T FIND IT THEN GIVE US A CALL.....

WE HAVE ONE OF THE LARGEST RANGE OF REPLACEMENTS REMOTE CONTROLS IN STOCK!!!!

WE COVER VIRTUALLY EVERY MAKE & MODEL AVAILABLE (UK & EUROPEAN)

HITACHI GRADED STOCK

TELEVISION	14", Remote control	£57.50
	14", Remote, Fastext	£67.50
	21" NICAM	£129.99
	25" NICAM	£169.99
	28" NICAM,	£199.99
	28" Widescreen	£259.99
	32" Widescreen with Cabinet	£399.99
VCR	LP/SP	£44.99
	LP/SP, Videoplus	£49.99
	LP/SP, Videoplus, NICAM	£79.99

CDTV50 Amstrad

- 5" Black & White TV
- Top loading CD Player
- Repeat Play function
- MW/FM stereo radio
- 20 track programmable CD
- Skip mode

£29.99

Toshiba 28W93DB
- Widescreen Nicam
- Super scene control
- Picture Size Adjustment
- Auto set up
- Cabinet stand

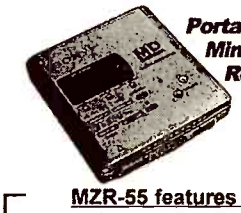
Price..... £299.00 each

Toshiba 28W8DB
- Widescreen Nicam
- Super scene control
- Picture Size Adjustment
- Auto set up
- 3 Shelf Cabinet stand

Price..... £315.00 each

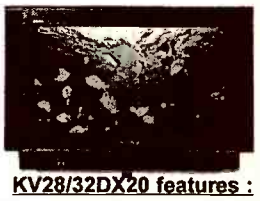
Toshiba 32ZD98B
- Widescreen FST
- 100Hz digital scan
- Dolby Digital
- Digital Pic. Process.
- On-Screen Display

Price..... £749.00 each



Portable MiniDisc Recorder

MZR-55 features :
- Error Correction • Sampling rate converter • 20 to 20,000Hz frequency response • Microphone input : stereo mini-jack • Line In : stereo mini-jack • Optical Digital Input • Headphone output : stereo mini jack • Comes with Carry case, Headphones with a remote control, AC Power adaptor, Rechargeable battery, Dry battery case.



KV28/32DX20 features :
- FD Trinitron WEGA tube • Integrated Digital Terrestrial Tuner • 50Hz digital picture • Digital Stereo Sound • NICAM • New 3D Sound system • Auto tunning • PCMCIA input for pay channels module • Multi Zoom modes • PCMCIA Input for pay channels module • Digital Text compatible • Auto labelling and Sorting

GRADED STOCK with 12 Months Guarantee

MZR-55 ... £84.99
KV28DX20 ... £449.00
KV32DX20 ... £625.00

• DVD PLAYERS • DVD PLAYERS • DVD PLAYERS •

HITACHI DVP-250E
- Region2 Player (can be modified for multi-region playback).
- Trick Play
- S-Video Output
- Digital Outputs
- Analog Audio Out
- Scart Output
- Shuttle Navigation
- On Screen Menu

£149.99
GRADED STOCK with No Guarantee

TOSHIBA SD100
- Region2 Player (can be modified for multi-region playback).
- Trick Play
- On Screen Menu
- DTS Stream out
- Dolby Digital Stream

£169.99
BRAND NEW with 12 Mnths G'tee

*Picture for illustration only
REC-200
- Multi-region
- Trick Play
- On Screen Menu
- Dolby Digital Decoder
- Available in Black

£109.99
BRAND NEW with 12 Mnths G'tee

PANASONIC
Surround sound speaker package consists of 4 high quality speakers.
Power : 15W, 8ohm.
Contents :
- 2 x Front Speakers
- 2 x Rear Speakers
- 2 x Front connector wire
- 2 x Rear connector wire

£29.99

SAMSUNG SP-R5100 DECT Cordless Phone

£29.99

SONY MDR-RF830RK CORDLESS HEADPHONES
- Vertical transmitter with built in charger
- Select from 2 channels for optimum signal reception.
- Auto ON/OFF
- Transmission up to 100m.

£13.99
GRADED STOCK

Brand New with 12 months G'tee

only Model : LCX137KS £54.99 each

*Picture for illustration

only Model : NSXS22K £94.99 each

NSX-S22
- Power Output : 70W
- Remote Control
- Radio
- 3CD Changer
- Twin cassette Deck

£69.99 Graded Stock

NSX-S16
- Remote Control
- Radio
- 3CD Changer
- Twin cassette Deck

£59.99 Graded Stock

14" GRADED PORTABLES FROM £39.99
20" R/C TEXT TV'S FROM £49.99
28" NICAM TV'S FROM £99.99

LP/SP VIDEO'S FROM £39.99
LP/SP VIDEOPLUS VCRS FROM £44.99
AND MUCH MUCH MORE IN STOCK!!!

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

Freefax Orderline : 0500 55 05 05

COLOUR TRADE

Wholesale Distributors & Export Agents of Domestic Electronics & Appliances

Possibly the Largest and Oldest Establishment in the UK

THOMSON, FERGUSON, SANYO, MITSUBISHI, BUSH, ALBA, GOODMANS

FACTORY GRADED (MINT)

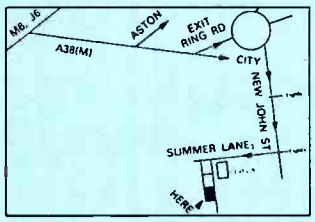
14" R/c TV	from £45
20"/21" Text Nicam	£59
28" Nicam	£135
28" Wide	£225
32" Wide	£300
VCR	from £45
CD Radio Cassette	from £15
CD Micro Hi-Fi	from £25
CD Multi Disc	from £39
CD Walkman	from £12.50
BT Phones	from £15
BT Dect Phones	from £35
BT Dect Answerphones	from £45

SANYO/SHARP

Microwaves	from £35
Microwave Grill	from £45
Microwave Combi	from £69
Hoover Vac	from £29.50

One Year Warranty

Ferguson 25" OP ..... complete £200



NEW HIGH STREET RETURNS

164 LINES

Irons, Kettles, Toasters ..... from only £3.82

Lava Lamps, Table Lamps, Floor/Wall Lamps, Touch Lamps, etc ..... from £6

R/C Toy Cars ..... from £7.50

Trimmers, Foot Spa, Phones, Car Battery Chargers, Audio Karaoki, Massager, Facial Saunas, etc.

Send for List Now

MANY MORE OFFERS AVAILABLE

Quantity based on stock availability and all prices are plus VAT

NATION-WIDE NEXT DAY DELIVERY SERVICE – VISITORS BY APPOINTMENT

Phone 0121-359 7020

Fax 0121-359 6344

PHOENIX HOUSE, 190 BRIDGE ST. WEST, BIRMINGHAM B19 2YT

AMERICAN EXPRESS · VISA · MasterCard · DINERS CLUB INTERNATIONAL

CAMPION WHOLESALE LTD.

UK's Largest Electrical Wholesaler

For Both the UK and Export

NEW

Ex-Rental and Graded
TV's, Videos, Satellite,
Hi-Fi Equipment and White Goods

FREE Delivery Service to most areas of the UK

World-Wide Export Service

Experts in UHF / VHF Conversion

TEL: 01299 879642 FAX: 01299 827984

CALL TODAY FOR A BROCHURE OR COME AND SEE OUR LARGE WAREHOUSE

Unit 75 Barracks Rd, Sandy Lane Ind. Est. Stourport, Worcestershire DY13 9QB

Just 10 minutes from M5 Junction 6 - Worcester North

TV's From £5.00

Video's From £5.00

Satellite's From £5.00

TV / Video Stands From £1.50

Major Credit Cards Accepted

D'LEC COMPONENTS LTD

Would like to thank all our customers, old and new for their support throughout this year, and may we wish you all a very Merry Christmas and Prosperous New Year!

Don't forget, if you need

Colour Picture Tubes

over the Christmas period, our last day for despatching goods will be 18th December 2000. We will then close from 20th to the 2nd January 2001.

We have also moved to new premises and have new numbers!

D'Lec Components Ltd,
3 Manor Court, Manor Drive, Sole Street, Cobham, Kent DA13 9BU
Tel: 01474 816717
Fax: 01474 816767
Mobile: 0850 301260
E-mail: david@dlecsales.freeserve.co.uk.

"Happy Christmas"

LA ELECTRONICS

WHOLESALE DISTRIBUTORS OF DOMESTIC ELECTRONIC APPLIANCES

Unit 15 Marks Hall Margaret Roding Dunmow Essex CM6 1QT
Telephone: 01245 231684 Facsimile: 01245 231862

NEW B GRADE STOCK AT BELOW TRADE PRICE

Large **WIDE SCREEN** 16 x 9 Format Televisions *from* **£450**

Large **REAR PROJECTION** Televisions 52" *from* **£1,500**

We also carry a Large selection of televisions and videos all at below trade price.

36cm portables	*from* **£60.00**
51cm televisions nicam	*from* **£150.00**
59cm televisions nicam	*from* **£180.00**
68cm televisions nicam	*from* **£200.00**
78cm televisions nicam	*from* **£450.00**
95cm televisions nicam	*from* **£800.00**
Videos 2 head mono	*from* **£65.00**
Videos 4 head nicam	*from* **£70.00**
Videos 6 head hi-fi nicam	*from* **£110.00**
36cm combined TV and video	*from* **£150.00**
dvd players	*from* **£150.00**

LARGE QUANTITY DISCOUNTS AVAILABLE

25cm televisions with DC 12/24 volt suitable for caravans – mobile homes – cars – kitchen use *from* **£120**

– ALL PRODUCTS ARE FULLY GUARANTEED –

YOU WILL NOT GET A BETTER DEAL ANYWHERE

We stock a great many other items in the TV and Video range so if you don't see what you are looking for, give us a call, ***we will save you pounds.***

Visitors by appointment only

NEW

TRADE WAREHOUSE NOW OPEN

Working stock graded, all makes and models, complete boxes, ready to go

Lowest trade prices on TV, VCR, Hi-Fi, DVD, microwaves, camcorders, w/machines, fridges, cookers, dryers, kettles, toasters, Walkmans.

TELEVISIONS

5in, 10in, 14in portables, 21in text, 20in text, 28in wide screen, 32in wide screen

DVD – 14IN COMBI – VIDEO

Opening Times:
Mon-Sat **9am - 7pm**
Sunday **11am - 3pm**

Trade repair service now available

EURO. V. MIDLAND

124 Milton Street, Walsall WS1 4LN

Tel: 01922 725294 Mobile: 077202 45607 Fax: 01922 723199

Rapid delivery nationwide on all orders big or small

All major credit cards accepted

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.

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

NEW **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 MasterCard

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 MasterCard
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

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

To advertise in Television Classified Telephone Pat Bunce on 020 8652 8339 or Fax on 020 8652 3981

LINEAGE

EX RENTAL TELEVISION slot meters in lots of ten, £140.00 vat post and packing. Tel: 01200 429056.

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

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

FOR SALE

inStore ELECTRICS LIMITED
1043 Leeds Road
BRADFORD BD3 7DB
Tel: 01274 665670/660196
Fax: 01274 665246
E-Mail: tradesales@instorelec.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 • CDR • Cameras • Fax • MWO
CREDIT CARDS WELCOME • 48 HR DELIVERY

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 772249
E-mail: sales@navspares.co.uk

WANTED

TOP CASH PRICES PAID FOR VALVES
e.g. KT88, PX25, EL37, DA100 and Valve Tester VCM163
Ask for our free Wanted List
WIDE RANGE OF OBSOLETE VALVES AND SOME CRT STOCKED
Visitors please phone for an appointment
billingtonexportltd@btinternet.com
Billington Export Ltd,
Billingshurst, Sussex RH14 9EZ
Tel: 01403 784961 Fax: 01403 783519

CLASSIFIED TEL: 020 8652 8339

With your input, we'll

TECHNICAL SERVICE MANAGERS

TECHNICAL TEAM MANAGERS

WORKSHOP TEAM MANAGERS

London, South East and Midlands

£Competitive + Benefits

CLASSIFIED TEL: 020 8652 8339

ASSISTANT SERVICE MANAGER/BENCH TECHNICIAN

£16 -£17,000

Apollo 2000, the UK's leading independent domestic Gas and Electrical Superstore retailer require an Assistant Service Manager/Bench Technician to join their Service Centre Department at Middlemore Road in Birmingham.

The successful candidate will be required to repair leading branded brown goods to component level and assist the Service Centre Manager with the day to day running of the department. The products serviced are up to date state of the art equipment and ongoing manufacturer training will be given.

Qualified to City and Guilds you need to be fully conversant with the Brown Goods repair industry and the administration associated with it.

Working hours will be 8.30am to 5.30pm Monday to Friday with 4 weeks paid holiday per year.

Apollo 2000 GAS + ELECTRICAL SUPERSTORES

Applications should be made in writing giving detailed career history to date to Mr. B Charlton, Service Centre Manager, Apollo 2000 Limited, 311 Middlemore Road, Birmingham B21 0AL

TW ELECTRONICS

KÖNIG ELECTRONIC

Infrared Project Engineer.
Electromechanical Project Engineer.

TW Electronics are a leading supplier of remote control handsets and electromechanical components to both Original Equipment Manufacturers and to the consumer service industry, where our products are marketed under the well known Konig Electronic brand.

We require 2 engineers to be based at our headquarters in Newbury, Berkshire to control new projects from conception to delivery and to give customer support on our existing product range.

The ideal candidates will have a TV/VCR/Electronics engineering background preferably supported by a formal qualification in this field. You will be dealing directly with our customers, and suppliers so good communication and organisational skills are essential. In return we offer a competitive salary, medical insurance, company pension scheme, bonus scheme and other benefits including assistance with relocation expenses.

Please send your application together with a current CV to: John Round, Technical Director, TW Electronics (Newbury) Limited, Beacon House, Harts Lane, Burghclere, Newbury, Berkshire. RG20 9JZ Tel 01635 278678 jround@twelectronics.co.uk

increase our output.

There's only one way to describe our approach to service - passionate! We provide the best, recruit the best and support to a similar standard. That's why - only the best will do.

Our Technical Service Managers are responsible for ensuring the engineering teams (field and workshop) provide excellent customer service through leading and developing Technical Team Managers and Workshop Team Managers. The successful candidate will possess strong supervisory management, technical and interpersonal skills.

Our Technical Team Managers are expert in their field, (Brown or White goods) - there to provide strong technical support for the field. These roles are Centre based with opportunities to accompany engineers in the field for training and development. Briefing and debriefing engineers is key to the role. This is a superb opportunity for someone to couple strong technical ability with 'proven' supervisory skills.

Our Workshop Team Managers will own workload, schedule work and assume responsibility for quality control. Training is a prime focus for the role, you will need technical and communication skills to get the best out of your workshop team. This is a hands on role for someone with strong technical expertise in either TV/Video or Audio/Video.

We offer a competitive package including benefits, each role having a Company car with the exception of the Workshop Team Manager role. In an organisation as service focused as ours - the prospects are equally tempting.

So if you have the qualities and experience, write enclosing a full CV and current remuneration details to:

Jennie Stewart, HR Administrator, Comet After-Sales Service, Unit 5, City Park Industrial Estate, Gelderd Road, Leeds LS12 6DR

COMET

JVC

SERVICE ENGINEER

Required by this leading brand consumer electronics company based in North London to service TV, Audio Video and Digital products.

We require a qualified Bench Engineer with a minimum of three years good practical experience. Candidates need to be capable of providing telephone assistance to our dealers as these duties will be required after the initial training period.

Good working conditions, Basic Salary + Company and Productivity Bonuses + Benefits.

Please send cv stating current salary to Personnel Department, JVC (UK) Ltd, 12 Priestley Way, London NW2 7BA

aiwa

SENIOR ENGINEER

Competitive Salary + Excellent Benefits

Heathrow

Aiwa (UK) Ltd is a leading manufacturer and distributor of audio/visual products.

The Position

Senior Engineer reporting to the Senior Manager Technical & Quality Assurance. Responsible for technical investigations, training and repairs. Providing reports and liaising on technical enquiries. Actioning calls on the technical helpline.

The Person

A very high degree of technical competence with **Audio/Visual** products is essential. You should have a good telephone manner and be able to communicate professionally and diplomatically (written and verbal). You should be PC literate (MS applications) and be flexible within your work patterns. You should be able to work well with others as a key member of a small team.

Please send your CV with a covering letter detailing experience and current salary to: Mrs Janine Tuck, Aiwa UK Ltd, Unit 5 Heathrow Summit Centre, Skyport Drive, West Drayton, Middx UB7 0LY. Alternatively you can e-mail to tuckj@london.aiwa.co.uk

CLASSIFIED TEL: 020 8652 8339

APPOINTMENTS

BENCH ENGINEERS

KEENS SERVICE

The company has been operating since 1991. We install and service, in the field as well as in our workshop, quality branded televisions, satellite, video and audio products on behalf of some significant trade customers, as well as to the public.

We are looking for City and Guilds qualified engineers, with a proven record of quality repairs, to be part of our long term expansion.

We offer very good basic salary, with overtime and bonus opportunities.

For your Information Pack and Application Form, please contact ***Kevin Evans on 01494 727731***

Keens Service Limited 56 - 58 Sycamore Road, Amersham, Bucks. HP6 5EE

VACANCY

QUALIFIED SERVICE ENGINEER

for workshop and field work.

Salary negotiable.

Applicants should have a clean driving licence and be physically fit.

Send CV to:

Bewarm TV, Clock House High Street, Cuckfield Sussex RH17 5JX

Experienced Bench and Field Technicians and Domestic Appliance Engineers required by

SERVICESPEED (SLOUGH)

TEL: 01753 524848

SERVICES

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

EXPERIENCED ENGINEERS

Bench or Field

for either TV, VCR, Audio or Camcorder.

Excellent Salary.

Modern workshop.

Staff discounts.

Please send CV to:
'A' One Digital Domain
Unit 2B,
Aberconway Road,
Morden, Surrey
SM4 5LN

Telephone
0208 543 8888

Due to further expansion

Visual FX

requires

FIELD/BENCH ENGINEERS

To repair TV/Video/Audio products

Top rates of pay

For further information
Contact Gary Hall
Tel No: 01708 381896

FOR SALE

SWITCH - IT - ON

TV, Video, DVD

Technical Sales/Repairs

DVD Upgrades

DVD Multi-region Players

Trade and Public

Tel: 0208 764 6638
Fax: 0208 764 6166

Wide range of working video recorders from **£20**
i.e. *Ferguson FV31, 32, etc.*
Sony SLV-ER7UY video plus video recorders from **£40**
Untested direct loads **£10**
Minimum quantity 5

GAMMA UK LTD
0121 458 4093

CLASSIFIED TEL:020 8652 8339

ADVERTISERS' INDEX

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, 2NZ/2KV, 4NZ/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
IMV-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 £5.00
POSITOR 18 2 PIN 20p
POSITOR-2322 662 98012 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 – VPT – 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 4 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 IC232A5 – ISSUE 4 £15.00
HEAD AND DRUM – 620E £12.00
MAINS SWITCH WITH STAND-BY £50p
MODULATOR No 5587881 £5.00
OSCILLOSCOPE 20MHZ DOUBLE BEAM –
V212 £188.00
PANEL-TELETEXT G8P – 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 £1.00

1996/7 MATSUI

VIDEO CHASSIS WITH TUNER-IR £5.00 POST £4.00

MATSUI – ORION

DECKS WITH HEADS –
D1096 VXA110 VP 9401 £16.00
HEAD-VSR1500 = 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 6000, 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
243066, 243063
3220029, 3714016, 47003481
AT2076/78, AT2076/88, AT2078/25
AT2077/81
DST81N243/472593-00
DST85B235/47328700 & /40153200
DST88N234/40006AD, &/4780520OL
DST88N234/47320041, &/47317590
DST186N243/473058-00
TFB3035D, TFB3069D, TFB4023AD
TFB4039AD, TFB4066AD

ALL LOPTS £5.00

FERGUSON
TX9
TX10
TX85, TX86
TX89, TX98, TX99
V260781
FSTY260482
LOPT RED SPOT
LOPT WHITE SPOT & YELLOW SPOT

PANASONIC
TC2203, TLF 1456B
TLF1457B, TLF701/6

TOSHIBA
TFB 3035D, TFB 4023AD, TFB 4032BD
TFB 4038AD, TFB 4110AD
TFB 3089D, TFB 4088AD

VIDEO DECKS

AIWA 1500
MATSUI VXA 1100
MATSUI 1500
ORION D1094
ORION D1096
ORION D2096 ETC } ES 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 T9535 240V
MAINS SMALL £5.00
PAL TV ADAPTOR – RGB IN UFH 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 1188 £3.00

PHILIPS
NEW TYPE UNIVERSAL £8.00 (3 in 1)
RC4001

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, CPTZ178 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 IKZ
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 TBJZA-00ZA-ALPS £3.00
SATELLITE SXT2302180968 £3.00
SATELLITE
WITH BASE BAND MIN SXT2302234 £4.00
SMALL UNF/VHF £3.50
VHF/UHF – TEKE4-112A £4.00
4944
U321, U341, U342, U343
U344, U411, U412, U944 } £2 EACH
U743, 7744
AMSTRAD
UE33-B01 £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 B09 £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 TMUG3-103A £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
7806	20p	2SD1453	£1.00	BU205	75p	BUT12A	20p	BYW95	10p
7809	20p	2SD1576	£1.00	BU206	£1.00	BUT13	£1.00	BYW95C	10p
7812	20p	2SD1577	£2.00	BU207	£1.00	BUT18AF	£1.00	BYW562A 100V	8p
7812F	20p	2SD180T03	15p	BU208	80p	BUT71/800	15p	BYX10	10p
2SC940	£1.00	2SD1878	£1.00	BU208A	£1.50	BUW11	40p	BYX38/300	25p
2SC3795	£1.00	2SK1460	£1.00	BU208D	90p	BUW84	60p	BYX55/350	10p
2SC3973B	£1.00	2SK1464	£1.00	BU222	£1.00	BUX39	£1.00	BYX55/600	10p
2SC4313	£5.00	2SC4891		BU326	£1.00	BUX84	50p	BYX71/60	20p
2SC4589		1500V/15A	£2.00	BU407	40p	BUX84AF	50p	BYZ106	10p
10A/1500V	£2.00	AN5521	£1.00	BU508A	90p	BUY49	20p	BZW-C110	5p
2SC7350	15p	AN5551	£1.00	BU508AF	£1.00	BY187	5p	BZW83-C20	3p
2SD200	£1.00	AN5831	£2.00	BU508D	80p	BY208-800	8p	CA3123Q	50p
2SD401	40p	BC550C	20p	BU508DF	£1.00	BY228	15p	CD4555BE	20p
2SD716	£1.00	BDV648	50p	BU705	£1.00	BY229	6p	CLE871A	£5.00
2SD787	30p	BDV658	50p	BU801	50p	BY255	5p	FE3B	4p
2SD789	30p	BF8695	20p	BU806A	£1.00	BY299-200	15p	HA1140	£1.00
2SD820	£1.00	BF870	20p	BU807	50p	BY299-800	30p	HA1185	£1.00
2SD868	75p	BPW41	15p	BU808DFI	£1.00	BYT71-800	15p	HA1196	50p
2SD880	30p	BT Phone Batterys	£1	BU824	50p	BYV19-30	15p	HA11485ANT	£1.50
2SD1264	50p	BU105/04	80p	BU826	£1.00	BYV28-200	15p	HA11804NT	£1.50
2SD1266	£1.00	BU108	£1.00	BUK444/800	£2.00	BYV95B	10p	HA513385P1	£2.00
2SD1398	£1.00	BU124	50p	BUK445/600	£2.00	BYW95C	12p	HA513385P3	£2.00
2SD1415	£1.00	BU126	80p	BUK454/600	£1.00	BYW96D	10p	HCF2520	50p
2SD1427	£1.00	BU180A	65p	BUT11	50p	BYW20-08-9	£1.00	HCF4520BE	50p

HD61404251	50p
HD6140815	£1.00
HE4528BP	15p
HEF4029BP	20p
HEF4093	20p
HGA1124A	50p
HM6264	
ALP-15	£3.50
IK5T6931 B1	£3.00
IN5401	3p
IR106A	10p
L298N	£4.00
LA7830	£1.00
LA7831	£1.00
M708 AIB1	£1.50
M708 LB1	£1.50
M37204ECSP	£1.00
M58658P	£1.00
MN650	£1.00
S13522V	£1.00
SAA1061	£3.00
SAA3018	£1.00
SAA5010	£2.00
SAA5231	
(TEXT)	£2.00

No accounts — No Credit Cards

SENDZ COMPONENTS

63 BISHOPSTEIGNTON, SHOEBURYNESS, ESSEX SS3 8AF.

Tel: 01702 338894 Fax: 01702 338805

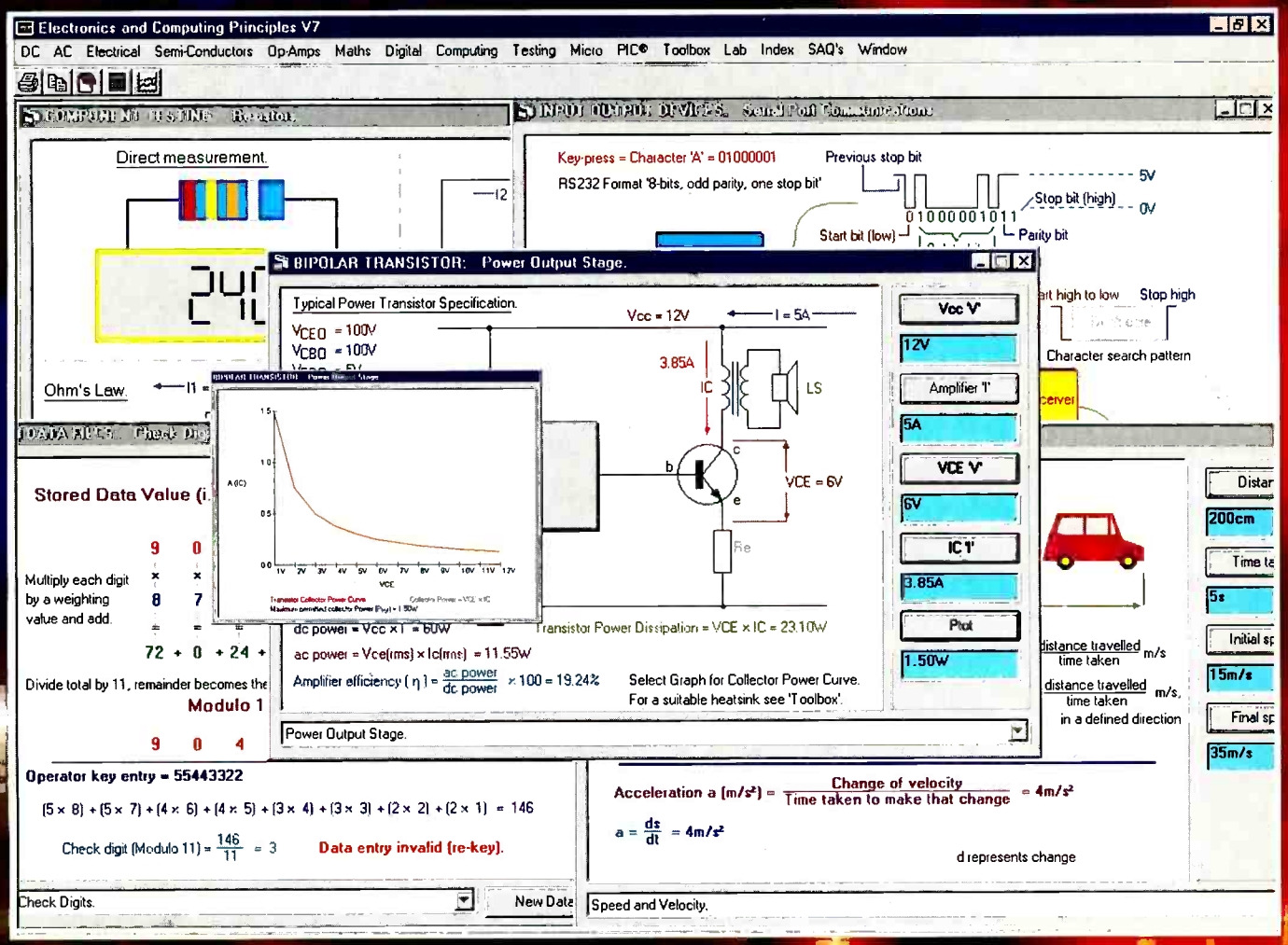
Specific P/P charges are PER ITEM • For UK addresses add P/P to order then 17.5% VAT to total. This applies to EC unless VAT No. is given • Exports – P/P at cost • Postal Order/Cheque with order. Unless otherwise specified add £1.70 P/P to SMALL ORDERS + Additional P/P for HEAVIER GOODS. Technical Information 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

‘Electronics and Computing Principles V7’

‘95, ’98, NT or 2000

Studying electronics or computing or just want to keep up-to-date in a easy and enjoyable way, then this fully interactive software is for you.



Visit **eptsoft.com** or telephone for full details of more than a thousand menu items.

Personal user £99.95 +VAT

Education £299.95 +VAT

(Includes unlimited multi-user site licence.)

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, RCL 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 Transl[illegible], Angles, Complex Numbers, Statistics, Lottery Number Pre[illegible], Physical Science.

Computer Science:-

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.

ELECTRONICS LAB (Optional add-on hardware).

eptsoft limited. Pump House, Lockram Lane, Witham, Essex. UK. CM8 2BJ.
Tel: +44 (0)1376 514008. Fax: +44 (0)870 0509660. Email: info@eptsoft.com.

Switch, Delta, Visa and MasterCard accepted.

No additional postage or airmail charges.