THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

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Satellite is dead, long live the Internet?

It wasn't clear at the time, but in May an announcement was made that had very far reaching implications. Intel's Interactive Media Services Division and Excalibur Technologies Corporation were to form a new company called Convera that would "enable owners of branded high-value content, such as sports and entertainment, to produce and securely sell their audio and video content over the Internet". Following the announcement, an agreement was signed with the US National Basketball Association to develop interactive game broadcasts, plus highlights and classic moments. A similar agreement was struck to 'netcast' live and archive soccer over the web.

When subscription TV began, it was figured that sports coverage was the 'killer application'. People would pay quite high prices to watch live sport. And so it proved, particularly for satellite TV despite its huge initial investment. Interactive services followed using the customer's telephone line as the return path.

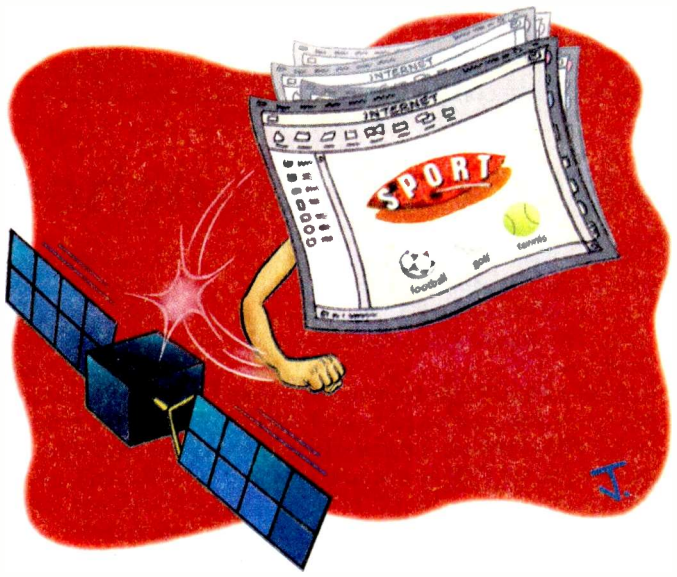
But then the Internet came along – out of nowhere. In the beginning, the narrow bandwidth of an analogue telephone line could not support moving pictures. Even the 64kb/s Home Highway couldn't deliver video of sufficient entertainment quality. But then came BTopenworld, an ASDL service which offered a 500Kb/s downstream connection and made Internet TV broadcasting a reality. Other countries have followed suit.

The beauty of ASDL technology is that it uses the copper already in the ground, so there's no more cable to lay. You are connected all the time, eliminating the time-consuming dial-up routine. Furthermore the copper can support speeds up to 16Mb/s if terminal equipment is moved out of the exchange and into the local street-side cabinet. This will happen over the next five years. "So what," you may say.

Satellites are very expensive and a number of launch failures have occurred recently – particularly galling as the satellites and rockets were too expensive to insure! They can cover only a restricted area because of power limitations and the need to have reasonable dish sizes on the ground. Satellites also have a limited lifetime of about ten to fifteen years.

The Internet is global and the mechanisms are in place to deliver video content securely to whoever is willing to pay for it. My prediction is that in ten years we will be watching television on a set which will be a cross between a TV and PC, which will plug into a phone line rather than an antenna. What will make this happen is wide choice, be it sport, archive material or video-on-demand. Wide choice is important because viewers want to improve the quality of their limited TV viewing hours – the average number of viewing hours per day has not increased for some time.

Cost will be the other driver. Internet delivery does not have the high costs associated with satellite and the intense competition should ensure that prices are reasonable. The process could be scuppered, however, if monopolies are allowed to develop.



Digital terrestrial broadcasting is actually quite a short-term phenomenon – it's technically superb, but there just isn't the bandwidth available for what people really want.

Satellite technology has not fared well recently, with the spectacular failure of the Iridium and ICO satellite phone companies (ICO has since been resurrected). The use of fibre-optic cables in international communications has pushed satellite communications into the margins. Use of different laser colours simultaneously has increased capacity massively. Moves to build 'broadband' satellite links to compete with fibre are probably doomed as they rely on the use of Ka band, at around 20GHz, which is unreliable in bad weather and not easy to use with Internet traffic. Of course, satellite will continue to be invaluable for maritime, aeronautical and military communication, and provide flexible links for outside broadcasts. The developing world will also use satellites while their communications infrastructures are being built.

Arthur C. Clarke originally proposed satellite communication in *Wireless World* in 1945. It became a reality in the early 1960s. I heard him recently propose the idea of satellites tethered to the earth or masts-in-space. Experimental work is currently underway to use High Altitude Platforms for broadband communication using pilotless solar-powered airships.

Perhaps, though, the age of the satellite has passed and the Internet is going to give us what we always wanted?

Peter Marlow

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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 758.
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REED BUSINESS INFORMATION

TELETOPICS

First PTR launched

TiVo has launched, in conjunction with BSkyB, the first Personal Television Recorder (PTR) in the UK. It's a separate set-top box which is manufactured by Thomson.

PTRs record TV programmes on a computer hard disk – we've previously called them PVRs (Personal Video Recorders) in these pages, but PTR now seems to be the preferred term. The BSkyB/TiVo PTR has a 40Gbyte disk that can store between 14-40 hours of programming depending on picture quality. It's designed for use with all digital TV broadcasting systems, also analogue cable and terrestrial TV, but does not cater for analogue satellite services.

A user enters his/her postcode, after which the PTR determines the channels that can be received at the location. The PTR also enables viewers to pause a live TV broadcast, record current and future programmes without programming a timer, automatically record every episode in a series, and use VCR-type functions such as rewind and fast forward. It uses an extended version of the SkyGuide EPG. Standard scart connections are used for the links to the TV set or set-top box. The PTR can also be connected to a VCR for archiving. A built-in Macrovision encoder maintains copy protection of programmes such as pay-per-view films. The PTR is selling for about £400, with a £10 subscription to the service.

BSkyB has also been working with Pace, NDS, OpenTV and NEC on an integrated PTR that consists of a SkyDigital decoder and a hard-disk recorder. This is expected to be launched early next year, and will be produced by Pace. The unit will be based on NEC's uP61032A integrated chip set and incorporates NEC's Enhanced Multimedia Architecture (Emma). It will have a 40Gbyte hard-disk drive and two digital satellite tuners, so that the user can view one programme while recording another one.

EW's 40th

Congratulations to our sister publication *Electronics Weekly*, which has just celebrated its 40th anniversary. Interesting to look back to issue number one, which was published on September 7th 1960. The front page included a report that Thorn Electrical Industries had achieved a record volume of radio and television business the previous year. Mr Jules Thorn (not Sir then) said that group profits before tax were £2,475,000. Another front-page story reported that Murphy Radio Ltd. had received an order of value approaching £200,000 from the Ministry of Aviation for leader cable equipment. Those are small sums today, but weren't then. And what has happened since to these once proud UK radio and TV companies, industry leaders in their day? Neither exists in its original form. Murphy continues as a brand, the name having passed from one company to another during the intervening years. The Thorn radio and TV business is now part of Thomson, with no manufacturing facilities in the UK.

There's been a resurgence of electronics activity in the UK in recent times, well reported by *Electronics Weekly*. But it's sad that so many once sound businesses fell by the wayside.

The Merlin II universal home entertainment control unit has been introduced by Philex. It combines remote control and programmable computer technology to enable a minimum of nine devices such as TV sets, VCRs, set-top boxes etc. to be controlled, giving up to 320 programmable functions. The new version incorporates DVD, Sky and ONdigital codes. For further details contact the Philex sales office on 020 8202 1919 or e-mail sales@philex.com

Video news

Sony is to launch a combined DVD-Video player and SACD audio player, Model DVP-S9000ES, that incorporates a new Field Noise Reduction system. It's claimed that this is more effective than conventional noise-reduction systems. Philips is also launching a DVD/SACD player, Model SACD1000. It differs in offering multi-channel (5.1) SACD audio rather than two-channel stereo.

A new DVD player from Toshiba, Model SD200E, features an integrated Dolby Digital decoder and a Super Anti-Alias filter.

Panasonic has introduced two S-VHS VCRs, Models NV-HS860B and NV-HS960B. Both include S-VHS-ET technology, EP recording, digital signal processing, a digital noise-reduction system, a tape-library system and set-top box control.

JVC has launched three VCRs that include an EP (Extended Play) mode – Models HR-S9700EK, HR-S8700EKMS and HR-J870EK.

Samsung's latest top-of-the-range TV Model WZ32W8VD, known as the Plano, has a 32in. Pureflat widescreen tube and Virtual Dolby Pro-Logic sound. Thomson and NEC co-developed the technology used in Thomson's newly announced Wysius 42in. 16:9 plasma display TV set.

The HTPC

UK company Sight and Sound Computers has launched what it calls the Home Theatre Personal Computer (HTPC). This equipment combines a fully-functional PC with a DVD player. It can record TV programmes on a 20Gbyte hard drive, and includes a 56k modem and an MP3 audio player. All for about £530.

Digital TV technology

Philips is to license Microsoft's TV software for use in a new generation of interactive and enhanced TV set-top boxes. The boxes will offer interactive TV, which includes programmes with extra interactive content; personal TV services such as hard-disk recording and customised EPGs; and internet access using the TV screen.

Pace demonstrated new home networking technologies at this year's International Broadcasting Convention, which was held in Amsterdam during September. The Gateway Expander acts like a wireless base station, providing a broadband link around the home (like cable or DSL) to equipment such as a PC or a TV set. Shopping Mate, a hand-held bar-code scanner, enables the user to scan goods to create a shopping list then send the information to the retailer via the Gateway.

Nokia Home Communications has launched Media Terminal, which offers digital TV, hard-disk video recording, networked games and internet access. It uses the Linux operating system.

NEC is to incorporate NDS's VideoGuard conditional-access system and XTV technology within its next generation of single-chip set-top box systems. VideoGuard has now been used in over 18·5 million set-top boxes worldwide, including BSkyB's boxes. XTV (Extended TV) is a hard-disk based technology that adds new functions to set-top boxes.

C-Cube Microsystems has developed the AviA9600 system-on-a-chip for digital set-top boxes. It includes a new graphics system, IEEE1394 and USB connectors for use with digital cameras and camcorders, an IDE controller for connection to a hard-disk drive, and an audio digital signal processor that's compatible with MP3, MPEG-2, Dolby Digital and DTS (Digital Theatre Sound).

NTL has launched a free EPG (Electronics Programme Guide) for UK digital terrestrial TV. It offers information and programme synopses up to two days in advance: the EPG has been developed in conjunction with interactive TV technology company Strategy and Technology. Viewers will be able to click on banner advertisements and be taken to 'microsites' that offer more information. NTL says that future developments include a 'TV Nanny' information guide using programme information from the broadcasters coupled with a unique rating system.

Telenor, which is Norway's leading telecommunications company, is to test VDSL (Very high-speed Digital Subscriber Line) technology to provide subscribers with up to thirty digital TV channels plus fast internet access. It will be the first company in Europe to use VDSL – others use ADSL. VDSL provides data transfer at speeds up to 25Mbits/sec over standard copper telephone lines. The trials are to take place in Stavanger and Sandnes this autumn.

Samsung recently launched two digital camcorders that provide "near-broadcast" picture quality using the MiniDV tape format. Compact Model VP-D55 at about £630 and flagship Model VP-D65 at about £800 have an 800,000 pixel CCD imager, manual 22x and digital 440x zooms, an LCD monitor, four auto exposure modes, six digital special-effects modes, and a FireWire (IEEE1394) output socket to enable digital video to be downloaded to most types of PC for on-line editing. Model VP-D65 also has a FireWire input for editing/storage. Other features include a still-image 'snapshot' mode for recording individual frames, and Samsung's XDR (Extended Dynamic Range) system.

For further information contact Samsung on 020 8391 0168 (fax 020 8397 9949).

Sterling

The high value of the pound is having an effect on TV manufacturing activities in the UK. Hitachi is to make 350 redundant at its Hirwaun plant. Fewer than 200 will remain, engaged in assembly and research. TV chassis will be bought "from the cheapest source, which could be anywhere in the world". Hitachi has no other TV plants in Europe. It's understood that Matsushita is no longer producing CRTs in the UK, and that its manufacturing has been reduced to assembly of top-of-the-range products. Design work in the UK continues.

ONnet launched

The ONdigital internet service ONnet is now in operation. Subscribers pay £5 a month, which includes a 'free' cordless keyboard and set-top box, picture-in-picture displays, e-mail and full internet access. A deal with BT enables subscribers to surf the web for 1p a minute at off-peak times and throughout weekends and 2p a minute at other times. The 'net-top box', developed by Pioneer GB, connects to the ONdigital STB. It reconfigures web pages so that they appear sharp and clear on a TV screen.

The ONnet portal provides 22 on-line services from organisations that include the BBC, ITN, Granada, Domino's Pizza and Ladbrokes. Sixteen more companies are set to join the portal.

Sandy Heath changes

There have been channel changes to two of the digital multiplexes transmitted from Sandy Heath. Multiplex 1 has moved from channel 29 to channel 42, while multiplex A has moved from channel 42 to channel 43. There are no power increases at present.

New services

VideoNet, which uses ADSL technology to offer its video-on-demand HomeChoice service to viewers, has extended its operation London wide. Until recently the service was available only in parts of north-west London.

European internet company PowerChannel is to offer TV viewers a free set-top box that provides full access to the internet. Users will be required to answer a monthly lifestyle survey. PowerChannel is working with Granada Media, which will provide the internet connection and distribution via its rental outlets.

Grundig's Status Vision Model MFW82 720/9, with 32in. Super Flat widescreen CRT, 100Hz scanning and an integrated DVD player, is one of a range of advanced TV models displayed by Grundig at the Live 2000 Show, held at Earls Court in late September. A report on the show will be included in our next issue.

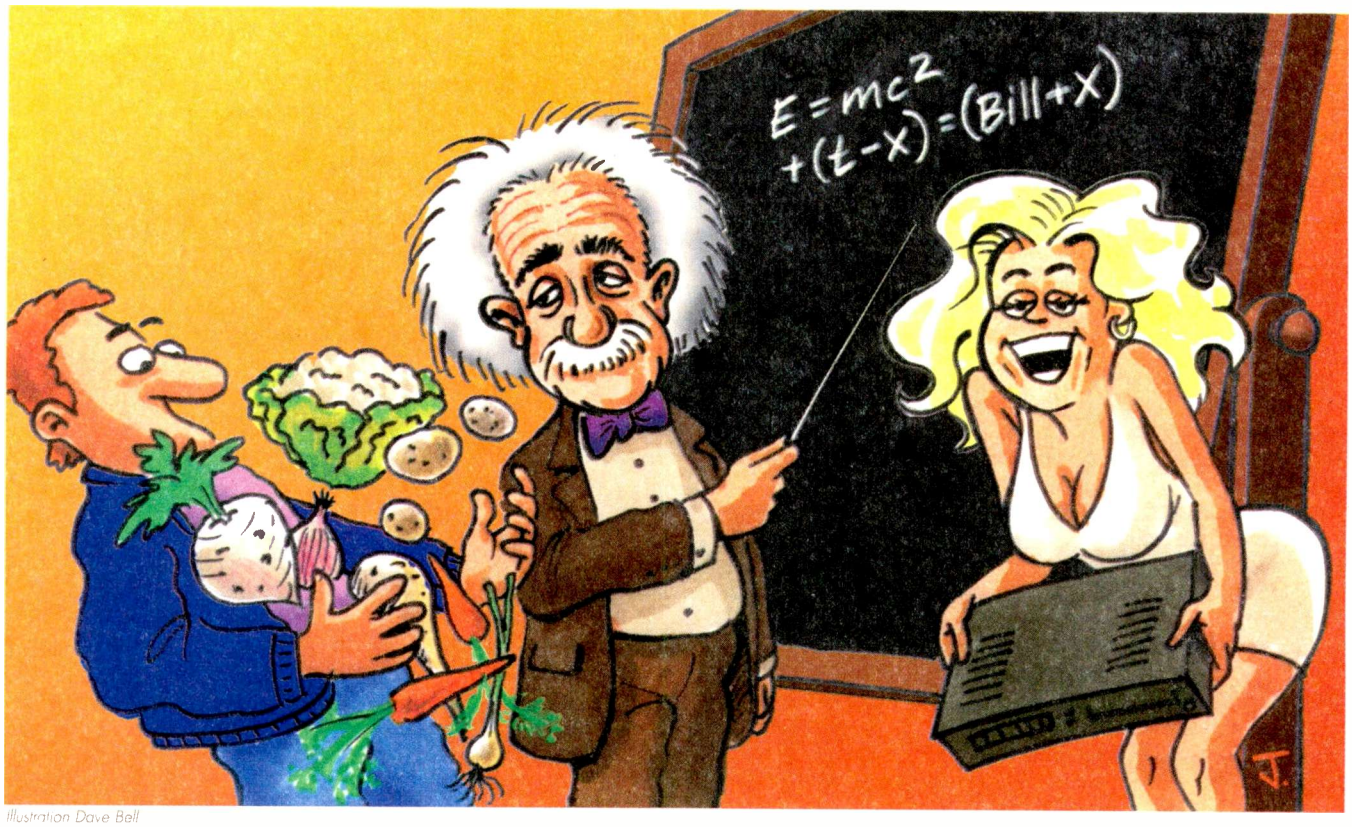

Illustration Dave Bell

WHAT A LIFE

Some video faults. A deficiency with servicing courses. Learning about customers, good and bad. Donald Bullock's servicing commentary

A scruffy cove came in the other day. He had half a dozen kids with him and an Amstrad recorder, which he handed to Steven.

"Haven't been here for nigh on four years" he commented. "We moved to Standford but now we're back. This recorder works when it feels like it. By the way, where's the old fellah? Is he still alive?" Then he caught sight of me. "Hey, didn't you used to be Mr Bullock?" he asked.

"Yes" I replied, "and didn't you used to be Mr Grazer?"

When he'd left I turned to Steven. "The Grazers' umpteen kids used to give their set a beating" I said, "his missus would prop them up in front of it as soon as they got up and leave them there till bedtime."

The VCR was an Amstrad UF40. "I don't like these cheap machines" Steven moaned, "for a start R1018 in the power supply will be dry-jointed."

He opened it up and found that R1018 was as he'd just said. There were more dry-joints all over the power supply section. The trouble is that the cabinet has only a single section of air vents, at one side. So there's insufficient air flow and the machine gets overheated.

Steven resoldered the dry-joints, then found that the mechanical functions were irregular. The machine produced tape loops and suffered from poor ejection and shutting down. This was caused by the mode selector assembly, which was dirty. Once it had been cleaned the machine worked normally. Mode switch problems are common with these machines.

Miss Monroe's Sanyo

The girl who wandered in was a Marilyn Monroe look-alike, only twice as soft voiced. "That boyfriend of mine is useless" she purred. "All mouth. Claims he can do anything – ride rodeo horses, fly aeroplanes, tame crocodiles and hypnotise chimpanzees to stop them smoking. Says he's a trapeze artist and can mend tellies and videos and cars. Yet when we're out he bumps into lamp posts. He can't get a job, and when he helped the paperboy he put the wrong papers through all the doors. Don't know what I see in him. Anyway, here's something else he said he could do but couldn't." She placed a Sanyo VCR on the counter. "It's dead. Can you mend it?"

It was a VHR776. When she'd gone, Paul looked at it. "I'll tell you exactly what's wrong with it" he said, "it'll be the 0·8A fusible resistor PR511 in the

power supply." He was dead right.

"You're almost as smart as that boyfriend" I said, "only not quite. Where's your Marylin look-alike?"

Dealers

Just then Eric came ambling towards our door. He has a few open-market stalls that sell cheap, imported electronic goods and had a couple of mini-TVs for us to fix. As he opened our door however Ackie Timberland appeared and touched his arm. Ackie is a likeable layabout who can't half spin a yarn. Harmless, but a time waster.

"A word with you" he said to Eric.

Eric looked him up and down, frowned and stepped back.

"I've got over fifty of them sets" Ackie said to him. "Very same name on 'em. All sealed in their boxes. Got 'em from a chap who went bust. Don't know what to with 'em."

Eric sensed a bargain. "What do you want for them?" he asked.

"Say fifty quid the lot?" suggested Ackie. "'ere let's go over to The George and talk about it."

"Eric – don't bother" I shouted. But it was no good. He was heading towards the pub with Ackie.

Eric was back next afternoon with his faulty sets.

"That fellow who waylaid me yesterday" he said "arranged a deal. He was supposed to deliver some tellies to me this morning but didn't turn up."

"I did try to warn you" I started off, but at that moment Ackie passed by and Eric rushed out.

"What about those fifty tellies you were supposed to bring?" he asked Ackie. "I waited all morning with your fifty quid."

"Waited for fifty tellies, for fifty quid!" Ackie exclaimed. "You 'ave to be jokin'. You couldn't get fifty tellies for fifty quid. Nowhere. Nor five hundred. Anyway I ain't got no tellies. I'm a gamekeeper. You've got me mixed up with someone else."

At that Eric came back in. "I dunno" he said, "I filled that fellow up with beer over The George, and did he move some. And a stack of crab sandwiches!"

"I tried to warn you" I said. "He's waste of time."

Eric stood thinking, then grinned ruefully. "My own fault" he said. "Thought I'd do all right out of it. Should have known better."

"Perhaps I could offer you a hundred of 'em for twenty five quid" I said. "We'll go over to The George to discuss it. I'm a bit thirsty, and peckish."

"Not likely!" Eric exclaimed. "Not twice in two days boy, not twice!"

Experience

More years ago than I care to recall I embarked on a television servicing course at the local technical college. The teachers were good and, eventually, I felt competent enough to step out into the servicing world to make my fortune.

I was wrong, even then. Those who taught me had forgotten to take into account the problems I'd get with customers. My course should have included a thorough grounding in psychology. I had to learn about this the hard way, by face-to-face dealings with the public. The practical psychology course has taken over fifty years so far, and I'm still learning.

My first lesson came on the first day of my first job. It was about repairing sets in the customer's house.

I accompanied an old hand on a series of outlying calls. About fifteen miles into the sticks we drew up at an enormous house, with its own drive, to look at a valve set. Its line output valve wasn't working because the 2·2kΩ screen grid feed resistor was open-circuit. When we'd fitted a replacement a picture appeared. The customer was so pleased that, after getting us a cup of tea, he patted us on our backs, walked us out to his garden and presented us with a huge haul of cabbages, new potatoes and an assortment of other vegetables.

A fortnight later, after receiving the bill, he arrived in the shop waving it and bawling about our incompetence and the firm being a bunch of rogues.

"Nearly two pounds for two minutes' work and a penny resistor" he yelled. "And another thing. Our ITV was all right before they came. Now it fades when it rains."

Our aerial riggers led tough lives too. They had to work in pairs, as the aerials were bulky. When there was a fault they might have to drive for umpteen miles, assemble their ladders, then run up and make good the fault. The more competent they were, the quicker they got things done. But that would rebound on them.

"Three pounds!" a customer might exclaim. "They were here for only a minute. That's £180 an hour, over twelve hundred quid a day! I'd like a job like that. Nearly eight thousand quid a week for doing hardly anything!"

"I don't watch it"

Another fact I quickly learnt was that no one in the family actually watched TV, though they couldn't manage without it when the set failed. I was told this week after week, year after year.

"I don't watch it myself" the husband would say. "It's the wife."

She would give me the same line. "I never watch it. It's my husband. He likes the sport."

If they were together they'd blame the children. "We never watch it. Have to have it for the kids."

It's gone again

And set after set wasn't really right after it had been repaired. I would learn about this when the next breakdown occurred. The bill hadn't been paid of course.

"It wasn't really right when you did it last time" they'd say, "but we thought we'd give it a chance to settle down."

I learnt about loftier things too, like the little-known addition to Einstein's theory of relativity: time shortens, in inverse proportion to the bill, once a set has been mended.

"Our set's gone again" I would be told, "you mended it only two months ago and it cost us fifteen quid." In fact it had been repaired ten months ago and I'd charged a fiver.

Mistakes

But mistakes were made, and some customers were very understanding. I recall the day when Phil, who ran a repair shop single-handed, telephoned me to say how distressed he was. At the time projection sets were new, and very expensive. He'd just started to work on one when his wife had dropped off their six-year old son Sydney for him to mind for half an hour.

So he decided to do something less taxing instead – put up a shelf in the workshop. Even so he was finding work hard because of his son's pestering.

"I just had to step into the office here to talk to someone" he said, "the boy's sending me mad. He's just made me drive a tack through my thumb. Into everything he is . . ." As he spoke a loud banging came from the workshop.

"Stop that banging, Sydney" Phil shouted. But the banging continued, and Phil had to shout again. That's how the conversation went.

We finished talking and I settled down to my own work. Before long Phil was on the phone again. He was almost hysterical.

"I don't know what to do" he exclaimed. "My wife's come and taken Sydney, but that banging he was doing . . . I just don't know what to do."

"It can't be that bad" I said, "tell me about it."

"The projection set" said Phil, "and that banging. It was Sydney. I'd left my tools and a large box of nails by the set. He's hammered a load of them into the set's polished top. It looks like an angry porcupine. What am I to do? I'm finished."

Fortunately Phil was a good handyman and his customer was the soul of reasonableness. Phil removed the nails, filled the holes, ironed on some matching veneer from the new do-it-yourself shop and then had it polished by Gilbert, one of my french-polisher customers. The set looked as good as new, and the customer was delighted. ■

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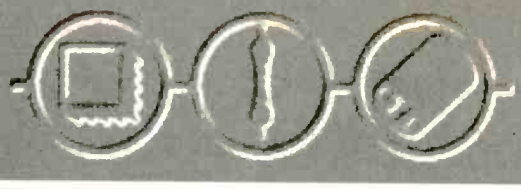
distributor of electronic components



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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
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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
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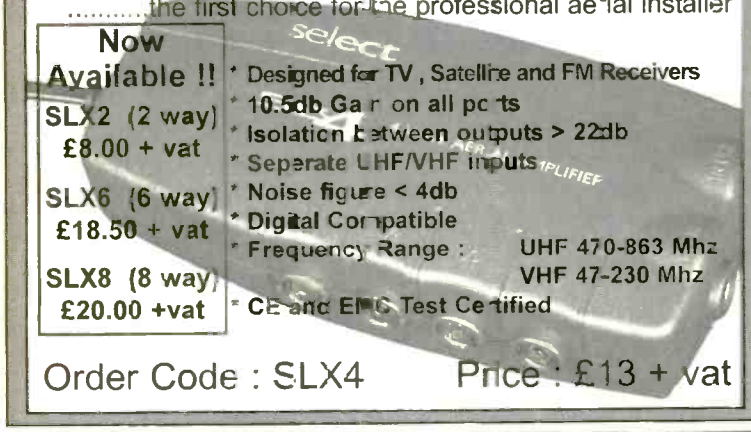

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Repair power tools

As with most electrical appliances, modern power tools can seem like complex pieces of equipment when you open them up for the first time. But most have a lot in common. Once you understand the basics, you will find that you can tackle all sorts of different types of power tool, from drills to jig saws. Colin Hughes explains.

In this introductory article, I will take you through the different stages of understanding the elements of a typical power tool. I will also dealing with fault finding and how to rectify any problems that might occur.

Figure 1 is an exploded diagram of a typical electric drill. There are five major parts to almost all power tools involving a rotating action:

- Switch
- Carbon Brushes
- Armature, or rotor
- Field coil, or stator
- Gearbox

When a machine stops working, the first thing that occurs to most people is that the carbon brushes have worn out. If that is the case, then the repair is relatively simple and cheap. If it isn't, then by following these easy steps, you could save yourself a lot of time, and money.

Where possible, use a process of elimination. What happened? Did the machine just stop? Has it been a problem that has been evident for a while? Think hard before taking any drastic measures.

Firstly, disconnect the appliance from the mains by unplugging it. All the following procedures assume that the appliance is disconnected, unless otherwise stated.

Check the fuse. This may seem overly obvious, but you would be amazed how many times I have seen customers bringing tools into the shop that are, 'broken', only to find that the fuse has blown.

Examine the cable for any cuts, breaks or, maybe, where it might have been trapped. A fast and reliable way to check this is to run the cable through your hands and feel for any nicks or breaks. If there are any problems, don't attempt any repairs to the cable. It is best to replace it.

Blow off any excess dust from the machine with compressed air, outside and in. Now things start to get a little technical. It is time to open up the machine.

I will use a typical drill as an example for the rest of the explanation, but the procedures will be similar for a wide range of power tools. Undo all of the screws holding the casing and give the housing a light tap with the wrong end of a

screwdriver to loosen it. Often, the housing is made so that one half lifts off while the other half holds all the internal components in place so remove it gently.

Use a multimeter to test for continuity along the cable from the plug's live contact all the way to the switch, then do the same with the neutral side.

If the fault was intermittent, then the cable could well be the problem. If you suspect the cable, but it appears as though the continuity is OK, try shaking the cable while the meter is connected to see if there is a break. A meter with a continuity buzzer is best for this job.

Every power tool switch is different, but all have one of two basic functions. The first is a standard on/off switch, the second is a variable-speed type, **Fig. 2**.

Checking a standard on/off switch is easy. You have a live and neutral coming in, and the same coming out. Simply turn the switch on – obviously with the machine unplugged – and check for continuity across the appropriate switch terminals.

Almost all variable speed switches on the other hand are different, making it very difficult to show in this article how to test them. If you call into your local power-tool repair shop though, most of them should be able to either test the speed controller for you. Some may even let you have a wiring diagram.

Going in deeper

You will notice two wires from the switch leading to the field coil of the stator – the outer stationary part of the motor. Check these wires along their length for continuity.

Next check the carbon brushes. Leave the brushes in situ for the time being; that way you can do two checks in one. Place your meter across the brushes to see if you have a circuit across the rotor armature. Then turn the armature slowly and keep your eye on the dial for any changes in the readings.

If your readings are fairly constant you know that the brushes are ok. To be on the safe side, check the length of the carbon. If the brushes look worn, change them. For the sake of a few pounds it will save the customer a lot of hassle in the long run.

Another quick check while we are in this area is to see if there are any signs of burning around any of the windings at the commutator. The commutator is the section of the armature that the brushes run on. Any discolouration or melting in this area could mean that the machine is ready for that big power tool heaven in the sky – or perhaps a big repair bill.

Remove the carbon brushes. It is now time to check the outer field coils, **Fig. 3**. Most coils consist of two sets of copper windings, making four connections. With your meter, check across each pole individually and take a note of the readings. If both readings are similar, then the coil should be all right. If there is a large discrepancy, nine times out of ten, the coil is scrap. If you have a reading on one side, but not the other, again it's time for a new stator.

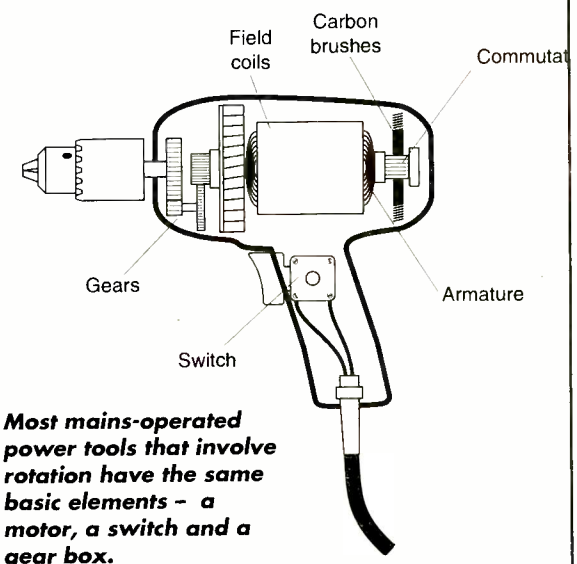
As a final electrical check, test the rotor armature for any faults, **Fig. 4**. Most of the time, an armature can be diagnosed as broken virtually straight away from the way your machine behaves. Your drill or saw, or whatever, starts to run slowly, or it starts to arc badly around the brushes. In such cases, you can virtually guarantee the armature has blown.

A faulty armature is often evident when you open the casing on the machine. If you see any signs of burning, or melting, around any part of the armature an armature fault is highly likely. There's a distinctive smell associated with a machine that is burnt out in this way. Another easy way to tell is if your tool starts to smoke and gets hot while in use.

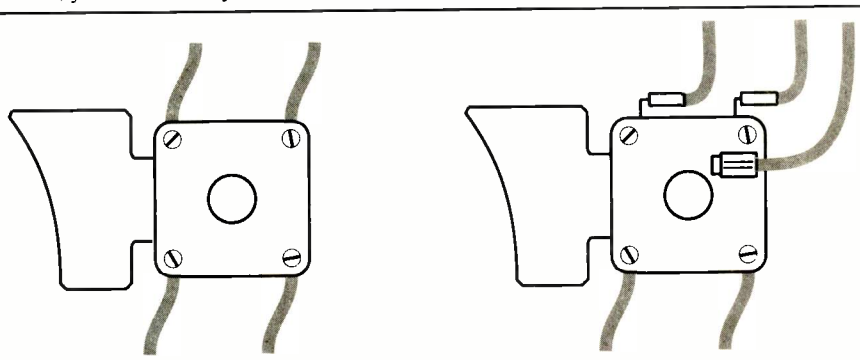
The problem is that an armature is one of the most expensive parts of the power tool. If the tool you are repairing is a DIY type, you might as well tell the customer to throw it away and buy a new one.

Black and Decker is one of the few manufacturers of do-it-yourself machines that sells the motor as a complete sub assembly. You cannot buy the component parts, just a complete motor. This makes the repair even more expensive.

If there are no signs of burning then remove the armature ready for the testing procedure. Unfortunately there is not a lot you can test on an armature without specialist



Most mains-operated power tools that involve rotation have the same basic elements – a motor, a switch and a gear box.



You'll encounter two main types of switch on power tools. One is a simple on/off type, the other a more sophisticated speed control switch.

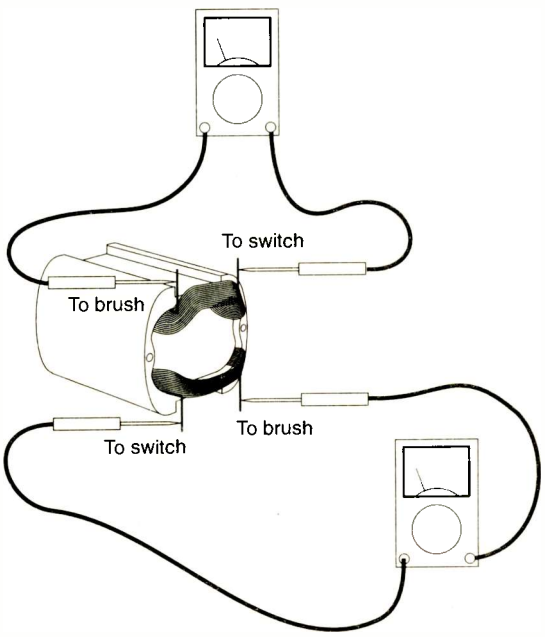
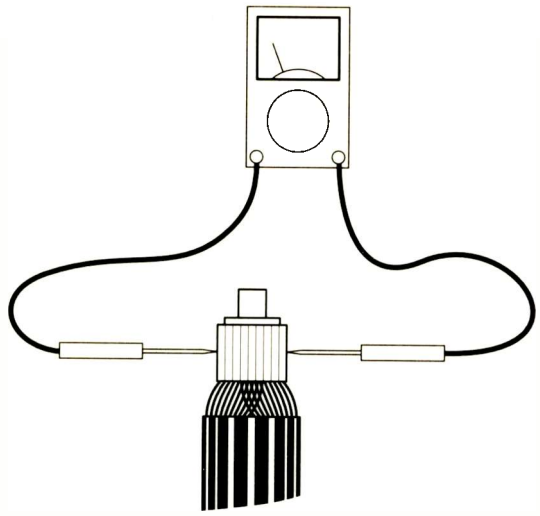


Fig. 3. Both field coils should have the same fairly low resistance, whose value depends on the power rating of the motor and its type.



Rotor coils are checked by probing each opposing pair of commutator contacts. Readings should be low resistance, but not a short, and the readings should be the same for each contact pair.

equipment, but make the usual visual checks for any broken wires on the windings.

Check for any signs of heat damage such as dark brown windings or melted insulation. Also check the commutator for any severe wear. And check the roller bearings to make sure they are in good condition. Again, if you are in doubt – change them.

Mechanical issues

The gearbox is next. A lot of the new power tools incorporate what is classed as a 'clamshell' construction. This means that the housing comprises of just two parts, so when all of the screws are removed; the two parts can be completely separated to aid repairs.

All that needs to be done with the gearbox is to make sure that all of the gears are in good order. Clean all of the grease out of the gearbox with a good quality de-greaser.

Be careful to note where all of the bits and pieces came from. There is nothing more annoying than finding a shim left when everything is back together. These parts are in there for a reason – so don't throw them away!

Replace the gears and fill the gearbox with high-quality grease. Rule of thumb is 50% grease, 50% air. "Too much of a good thing doesn't make it a better one," as my old manager used to say.

You should now be ready to put your machine back together again. Make sure that when you fit any new parts you don't force the parts into place. Even the toughest of power tools has fragile parts, and it wouldn't take kindly to being hammered back together again.

If the tool won't go together easily, there is something amiss somewhere. Just take your time to make sure that all bearings, wires and shims are located properly and you should find that the housing would slot together with the minimum of fuss.

Before you plug the tool in to test it, just try moving the chuck, or drive, with your hand to see if it moves freely. If it doesn't, you have fitted something wrong and will have to open the machine up again.

If everything seems fine, then plug the tool in. Hopefully, when you switch it on, everything will work as the maker intended.

Your machine may seem OK, but for safety's sake, take it to your local power-tool repair agent and ask him or her to flash test it for you. This will give you the piece of mind that your tool is electrically, as well as mechanically, safe. It will only cost a few pounds, but it will give you and your customer peace of mind.

I hope that this gives you an insight into the world of power tool repairs, and helps you keep your customers' machines in tip top condition. A little maintenance goes a long way. ■

Colin is head of PET Power Tools' service department, based in Crewe.

Fig. 1. VHF broadcast signals can affect analogue TV picture quality when a combined UHF/VHF amplifier is used for signal distribution.

Interference from VHF transmissions

The proliferation of VHF transmissions in the UK has brought with it an increase in TV interference problems. Bill Wright looks at the causes and suggests remedies

In recent years hundreds of VHF-FM radio transmitters have come into operation in the UK. The Radio Authority has brought the 105-108MHz section of the FM radio band into widespread use, and there are now about 400 VHF-FM transmission sites in full-time operation. Radio stations of a more transient nature also abound.

Each year about 350 RSLs (Restricted Service Licences) are issued, allowing small-scale broadcasting for periods of up to a month. Every large conurbation also seems to have a variety of pirate stations, some of which are quite high powered.

These new transmitters pop up in all sorts of unlikely places. Even when they are low-powered they often produce a much higher field strength in the nearby area than any other transmission, because they tend not to be co-sited with other transmitters. For this reason, the main impact of a new radio service for people living near the transmitter is often, sadly, that it interferes with their TV reception. It's quite common for these transmitters to be located within densely populated areas, so interference is a distinct possibility.

I'm not suggesting that the transmitters radiate significant power out of band. Any harmonic radiation is normally quite insignificant, at least as far as licensed stations are concerned. The problem starts at the receiving site, as the interference is usually caused by cross-modulation within a wideband masthead or distribution amplifier. The interfering signal normally enters the amplifier via a VHF-FM radio antenna: an amplifier with one or more input signals that are too strong will produce cross-modulation.

Diagnosis

When patterning suddenly appears on all analogue TV channels those unfamiliar with the problem will usually fit a replacement amplifier.

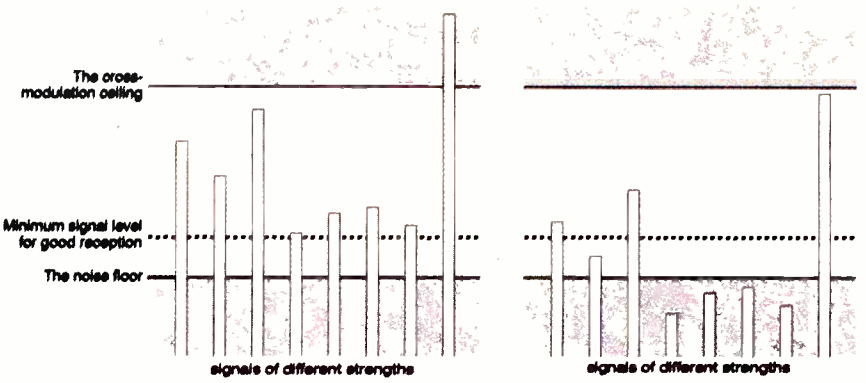


Fig. 2. In a), left, is a representation of signals of different strengths, including one that's strong enough to cause cross-modulation. In b) is the same scenario but with all the signals attenuated by the same amount. The s-to-n ratio of the medium-strength signals may now be too low for good reception. Weak signals, though, fall below the noise floor, which means that they will, in effect, disappear.

Consternation – the fault is still present! It can be hard to identify, let alone cure, this fault without a spectrum analyser, but look carefully at the appearance of the interference on the screen, see Fig. 1. The effect is quite unlike cross-modulation from a video carrier. The patterning may tremble slightly, in time with the sound being broadcast by the interfering station. Some of the pirates over-modulate – or over-deviate – badly. This shows up on the TV screen as more obvious fluctuations in the patterning.

The use of a UHF/VHF amplifier is universal when VHF-FM signal distribution is required in a domestic system. It's also common in small- and medium-sized commercial systems serving say fifty dwellings. These amplifiers have separate inputs for VHF and UHF but, because the signals are combined internally before being amplified, a strong radio signal can interfere with television and vice versa. Cross-modulation caused by a VHF-FM signal will affect other radio channels and also the TV reception. On radio, the effect tends to be a quiet 'burbling' noise in the background. The effect on an analogue TV picture is as shown in **Fig. 1**.

Terrestrial digital reception is badly affected by even slight cross-modulation, because the digital signals are about 20dB below the analogue ones. The effect is the familiar 'stop-start' and 'blocking' that appears when a digital signal is in any way deficient. In a severe case, the dreaded red dot and blank screen will appear.

The simple test is to unplug the VHF antenna from the amplifier, leaving the UHF one connected. If this clears the TV interference, you know that the fault is cross-modulation, and that the modulating signal is coming in via the VHF antenna. This suggests that it is a VHF or HF rather than a UHF signal.

Without a spectrum analyser to positively identify the troublemaker, this is probably the practical limit to diagnosis. It might be worth asking the customer if there are any new radio stations in the area, since legitimate station launches are always publicised. But the culprit could be a pirate or a non-broadcast transmission. Two-way radio base stations normally transmit and receive alternately so, if the interference comes in short bursts, look for a nearby radio amateur, taxi office, or CB radio enthusiast.

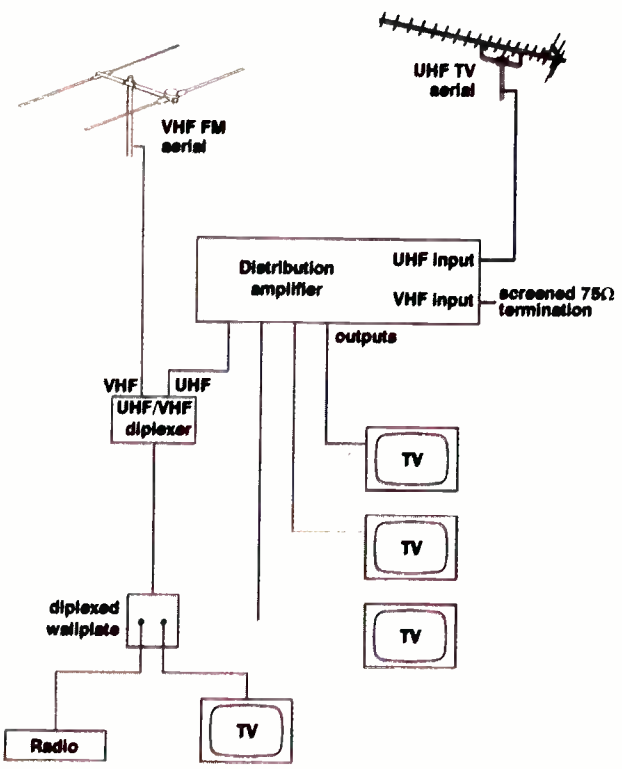
Masthead amplifiers

What if the interference continues when the VHF antenna is disconnected? The UHF antenna itself is unlikely to pick up dangerous levels of VHF or HF signal. Even if it does, the VHF/UHF diplexer built into the distribution amplifier should provide protection. But if a masthead amplifier is in use, things are different. The worst amplifiers in this respect are the cheap, high-gain, ultra-wideband ones. These often have no input filters and are not screened. It follows that the best amplifiers to use are good-quality, low-gain ones built into a diecast box. In an extreme case it might be necessary to fit a filter before the masthead amplifier. This should be a last resort however, because the small but inevitable through-loss introduced is very undesirable prior to amplification.

Electronic indigestion

Customers often find the idea of a signal being "too strong" rather difficult to grasp. "How can it be too strong?" is the usual response. I've successfully used the expression 'electronic indigestion' in my attempts to explain. Incidentally, I once encountered an old chap who was very concerned because he had lost his 'calmer downer'. It turned out that this was an attenuator which he kept in a drawer all through each summer until the leaves came off the trees. When the signal levels rose each autumn as a result of the reduced

Fig. 3. Where only one outlet needs VHF radio signals, the VHF antenna can be connected after the amplifier using a diplexer.



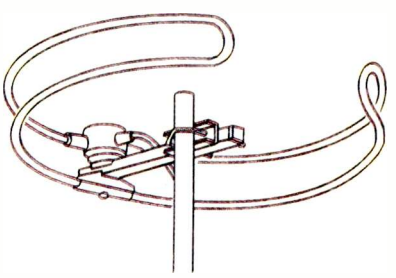


Fig. 4. The common 'halo' VHF-FM antenna is omni-directional and horizontally polarised but its gain is very poor.

screening, his distribution amplifier would be driven into cross-modulation. He would then clamber into the loft to fit the attenuator. It turned out that he had forgotten to remove the attenuator the previous spring, and had not noticed the snowy TV pictures all summer. But I digress

The noise floor and the cross-modulation ceiling

Assuming that the interfering signal is from a VHF-FM broadcast transmitter, we should think about the whole business of amplifying and distributing VHF-FM radio signals. The distribution of FM radio is unlike that of analogue UHF-TV: there is a large number of channels, that might be at widely different strengths, and they have to be amplified together. A range of 30dB is quite normal.

While this is accepted, there are limits to the dynamic range that an amplifier (or the front end of a receiver) can be expected to handle. Signals above a certain strength will cause cross-modulation, while signals below a certain strength will be affected by the background thermal noise of the amplifier and the receiver.

If a new local transmission produces a signal at the antenna terminals 30 or 40dB above what was previously the strongest, and it causes cross-modulation, a natural reaction would be to fit an attenuator at the amplifier input. Unfortunately, by the time the strong signal has been sufficiently reduced the weaker ones will probably have disappeared under the noise. This is a central problem with all forms of RF distribution, and is shown in schematic form in **Fig. 2**. The distance between the 'noise floor' and the 'cross-modulation ceiling' depends on many factors, but is never infinite.

Separate VHF and UHF systems

When this problem arises, the first point to consider is whether the VHF signals really need to pass through the amplifier. With a domestic system it's often the case that VHF radio reception is needed at only one or two outlets. The losses in a two-way (or even a four-way) splitter will not affect normal VHF radio reception and, if it's possible to fit additional downleads and outlets for VHF, the UHF and VHF systems can be completely separate. Where the installation of extra downleads would present a problem, the VHF signals can be diplexed into an existing downlead at the amplifier's output rather than its input, see **Fig. 3**. Suitable diplexers include the Labgear CM9006, the Taylor VHF/UHF-K and the Antiference UF23.

Commercial distribution systems should use separate amplifiers for VHF and UHF if there is even a suspicion that cross-modulation from a VHF source might affect UHF reception. The outputs of the two amplifiers should then be diplexed together for distribution. Whether or not separate amplifiers are used, it's worth remembering that the strongest VHF signals can – and should – leave the head-end 10dB or more below the UHF signals.

Antenna type and alignment

The time has come to climb on to the roof. VHF antennas – apart from large multi-element types – are not very directional, but whatever directional properties the antenna has should be used to reduce the strong local signal as much as possible.

Perhaps the most common type of VHF-FM antenna in use is the 'halo', see **Fig. 4**. As the name suggests, it's in the form of a horizontal circle. This design contrives to be both omni-directional (non-directional) and horizontally polarised. The drawback is that this combination of properties is obtained at the expense of gain (sensitivity), which is very poor. The design is pointless under normal circumstances, because virtually every permanent FM station in the UK transmits mixed polarisation. Thus a straightforward vertical half-wave dipole would be much better. The halo's lack of directivity doesn't help us, but since RSL stations and pirates usually transmit using a simple vertical dipole, a horizontally-polarised receiving antenna can help reject their signals. When the polarisation of an antenna is used to discriminate against an unwanted signal, you will find that the polarisation null is a very small angle of rotation. Accurate alignment and a firm antenna fixing are essential.

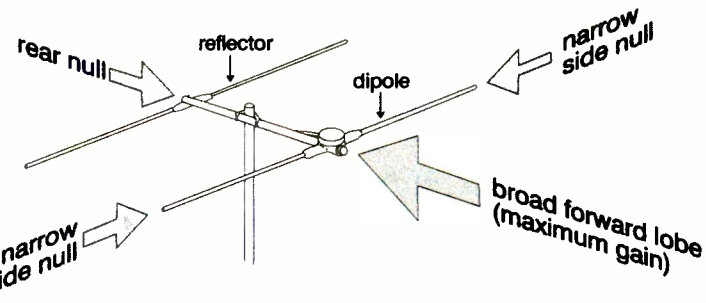


Fig.5. An array mounted horizontally has side nulls because a dipole is very insensitive to signals arriving 'end on'. The side nulls are deep, but very accurate alignment is required to make use of them.

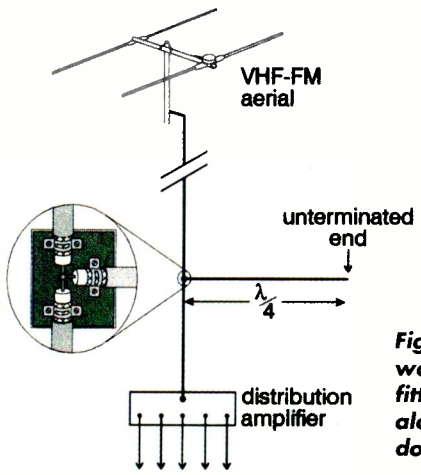


Fig.6. The quarter-wave stub can be fitted anywhere along the downlead.

Another common VHF-FM antenna is the two-element or 'H' type, which consists of a half-wave dipole and a reflector. Normally this type of antenna is aligned with the dipole nearest to the transmitter and broadside on to it. Instead, it may be possible to align the rear null (direction of reduced sensitivity) with the unwanted signal without affecting reception too much, since

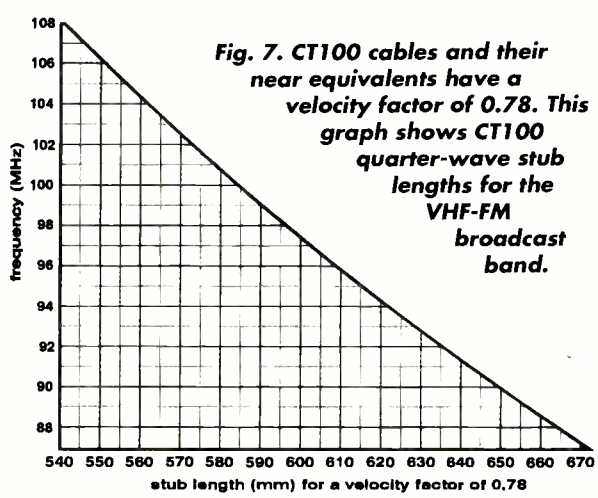


Fig. 7. CT100 cables and their near equivalents have a velocity factor of 0.78. This graph shows CT100 quarter-wave stub lengths for the VHF-FM broadcast band.

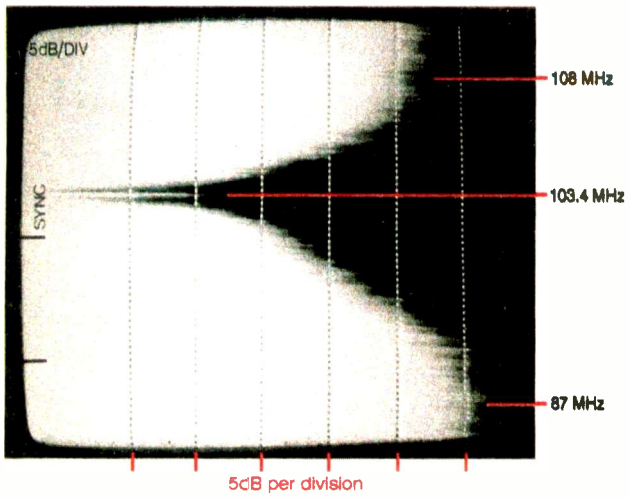


Fig. 8. Spectrum display showing response notch obtained with a $^1/_4$-wave stub, centred on 103.4MHz in a workshop half a mile from a medium-power transmitter on that frequency. A tiny signal can be seen at the bottom of the notch. This has entered between the notch filter and the analyser despite the use of good screening techniques.

the forward lobe (direction of maximum sensitivity) is very broad. If the array is mounted horizontally, side nulls will also be present, see **Fig. 5**, because a dipole is very insensitive to signals that arrive 'end on'. The side nulls are deep, but very accurate alignment is required to make use of them. This technique might even be extended to tilting the antenna a few degrees, so that the end of the dipole is pointing slightly upwards exactly towards the transmitting antenna – in the quite likely event that this is high up and nearby. Adjustments of this sort are well nigh impossible without a good meter or analyser.

None of these tricks can be used if the required transmissions are of very low field strength. In order to lift the signals out of the noise, it will be necessary to use a large multi-element array, aligned uncompromisingly for maximum signal. For the time being the strong unwanted transmission must be ignored.

Filters

The only remaining possibility is the use of an in-line filter in the VHF-FM antenna downlead. Ideally, this will stop the unwanted signal while allowing all the others through. The snag is that a passive notch filter is not as selective as we would like. The VHF-FM radio band has a channel spacing of 100kHz, which is about 0·1 per cent of frequency. Compare this with the UHF-TV band, where channel spacing is about one per cent of frequency. A UHF notch filter is not a perfect device: it will quite severely attenuate one channel above and one below the target. With FM radio things are, as you would expect, about ten times worse.

The TBBP2 from Taylor Bros is a typical VHF notch filter. It's a two-stage unit that will reduce the rogue signal by a very useful 28dB, but channels 300kHz at each side will drop by 10dB. So the notch filter is a rather crude device when used in the VHF radio band. If a wanted signal is very close to the unwanted one, forget it. But if the interfering transmission is near the top end of the band, where most of the pirates are, the effect of a notch filter on frequencies below 98MHz will be negligible.

Quarter-wave coaxial stub

If you don't want so spend £15 on a filter or, like me, you are caught out without one a long way from home, there's an alternative. This is an old trick, perhaps so old that many people have forgotten it. The quarter-wave stub, or tee section, consists of nothing more than a short length of coaxial cable connected to a point anywhere along the downlead, see **Fig. 6**. The junction has no splitter or impedance matching, but should be well made and compact. The other end of the tee-piece is open: it's not terminated by 75Ω or by a short-circuit. The length of the tee-piece needs to be exactly a quarter of a wavelength. That's a quarter-wave in cable, not in space. Radio waves travel at significantly less than the speed of light when they are passing through cable. The ratio is the 'velocity factor', and varies from about 0·60 to 0·50 in coaxial cable depending on the cable's construction. Practical experiment suggests that the velocity factor of CT100-type cable is around 0·78.

The signal travels along the tee-piece to its end. Since this is not terminated, the signal is then reflected back towards the junction point where it arrives 180° out of phase with itself,

Fig. 9. Spectrum analyser display of output from a VHF-FM antenna. The antenna has been aligned to minimise reception of a 103.4MHz transmitter about 1km away, but that signal is still about 20dB above the next strongest. If a 20dB attenuator was fitted to prevent cross-modulation many weak signals would be lost.

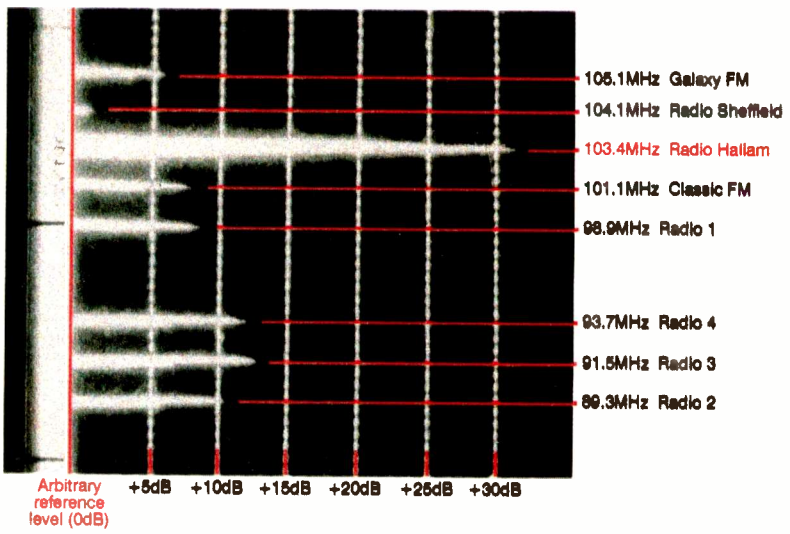
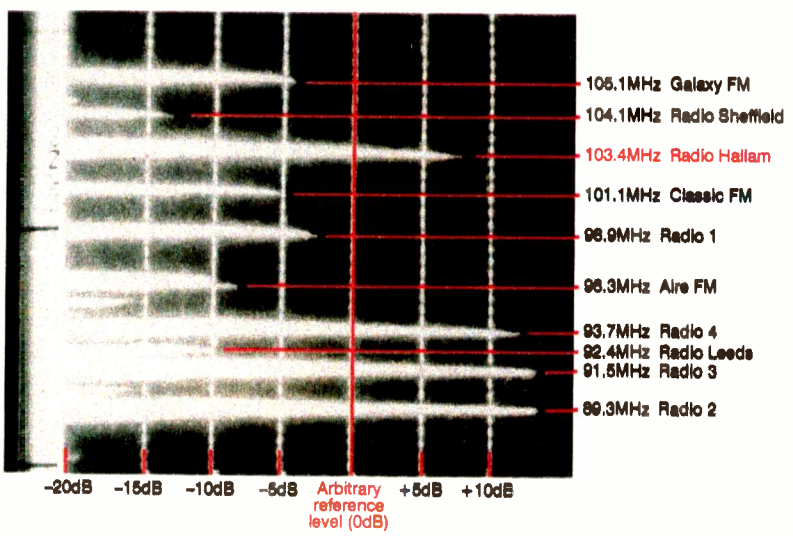


Fig. 10. Antenna feed as in Fig. 9, but with $^1/_4$-wave stub tuned to 103.4MHz. Signal at 103.4MHz has dropped 24dB. At 104.4MHz, 7 channels higher, it has lost 15dB. At 96.9MHz, 22 channels lower, it is −10dB. This sounds bad, but the notch means that antenna output enters the distribution amplifier 20dB up, which lifts signals 5dB, or so, further above the noise floor.



so to speak. The result is a deep notch in the response of the main transmission line. The quarter-wave stub is, in fact, a homemade notch filter. To find a quarter of a wavelength in cable:

[75/*f* (MHz)] x velocity factor = length in metres

Figure 7 shows the calculated lengths for quarter-wave stubs for the VHF-FM band. This gives a very good approximation of the stub length for CT100-type cable, but the stub should be cut slightly too long and trimmed repeatedly by about 2mm until the exact length is reached. This is done with one eye on the signal level, which should drop with each cut. It's almost inevitable that you will make one cut too many, then see the signal level start to rise again. But you've found the exact length, so you can fit another stub that should be exactly right. The end of the stub should be well sealed against moisture, and the cable secured. For cable with an unknown velocity factor – or for a good demonstration of the way the signal level drops as the stub length is altered – start with a tee piece about 50 per cent longer than shown in Fig. 7 and, initially, remove about 25mm each time. Ignore the signal level produced at the moment when the cutters short out the end of the cable, because the short-circuit itself produces a 180° phase change. After many bits of coax have hit the deck, the signal level should start to drop with each successive cut. The reduction in signal level is greater for each successive cut until the minimum is reached.

Clear demonstrations

If you have a VHF noise generator and a spectrum analyser, the whole thing becomes much easier and more certain, because the response notch can be seen clearly, see **Fig 8**. As bits are snipped from the stub you can watch the notch move up to the desired frequency. You can also watch the notch move up and down the band slightly as you squeeze and twist the quarter-wave stub. This is a good demonstration of the importance of not deforming coaxial cable when it's being installed. The mere demonstration that an open-ended coaxial cable will return virtually 100 per cent of the applied signal shows the importance of correct termination and impedance matching on any coaxial network. This point should be rammed home to those who don't bother to fit a 75Ω termination at the end of tap-off lines.

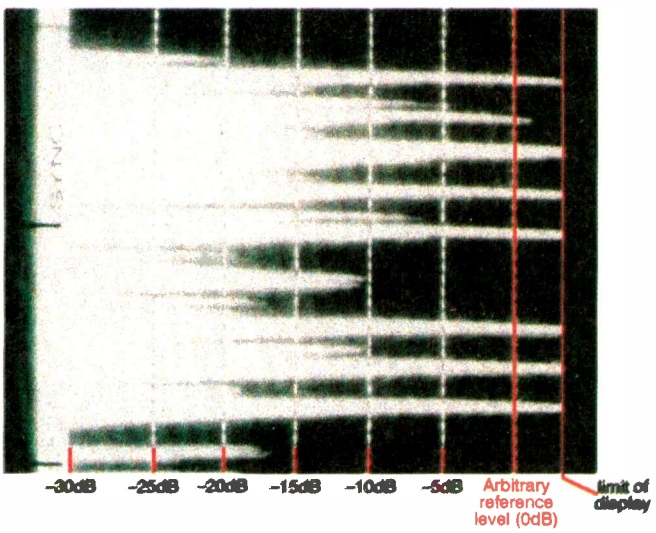


Fig. 11. Moving the reference point to the top of the display reveals a large number of weak signals. A good tuner will receive all the signals shown here, but if the distribution amplifier input is unduly attenuated to accommodate an overstrong signal, the weak ones will be lost under the noise.

Figures 9 and **10** show the before-and-after effects of a stub tuned to 103·4MHz. Note the changed reference-level position. In **Fig. 11** the reference level is moved down a further 20dB, revealing about fifty weak FM stations all of which might disappear below the noise floor of a distribution amplifier if the input was unduly attenuated.

If a tuned stub for a VHF frequency is used on a cable that also carries UHF TV, a series of response notches will be present across the UHF band. This precludes the use of the technique should a notch coincide with a wanted UHF channel.

Whether the unwanted signal is rejected at the antenna or by means of a filter, every cable and component that follows should be 100 per cent screened. If they aren't, the unwanted signal might sneak in. A plastic-cased amplifier installed in the loft is a likely culprit. Braid connections should be perfect.

Other sources of VHF interference

Although this article has focused on the problem of interference caused by strong VHF broadcast radio transmissions, the techniques outlined can be used to counter the effects of any VHF signal that causes interference. VHF-FM radio antennas pick up all sorts of out-of-band signals – the most likely culprits are shown in **Fig. 12**. If the cause of the problem is the kid next door and his CB radio, use an Antiference TVI/V filter. This stops CB but passes VHF-FM. If there is a general problem with strong out-of-band signals, use an 88-108MHz bandpass filter. This will attenuate everything except the VHF-FM radio band. A suitable filter is the Taylor TBP2. ■

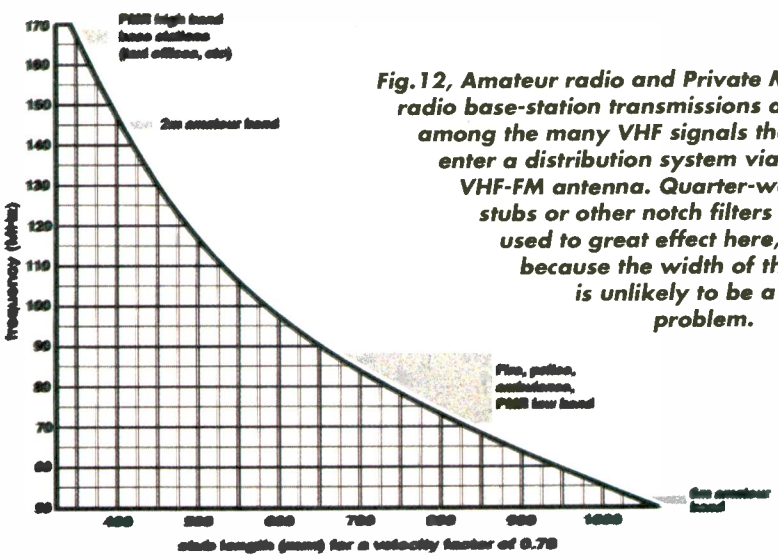
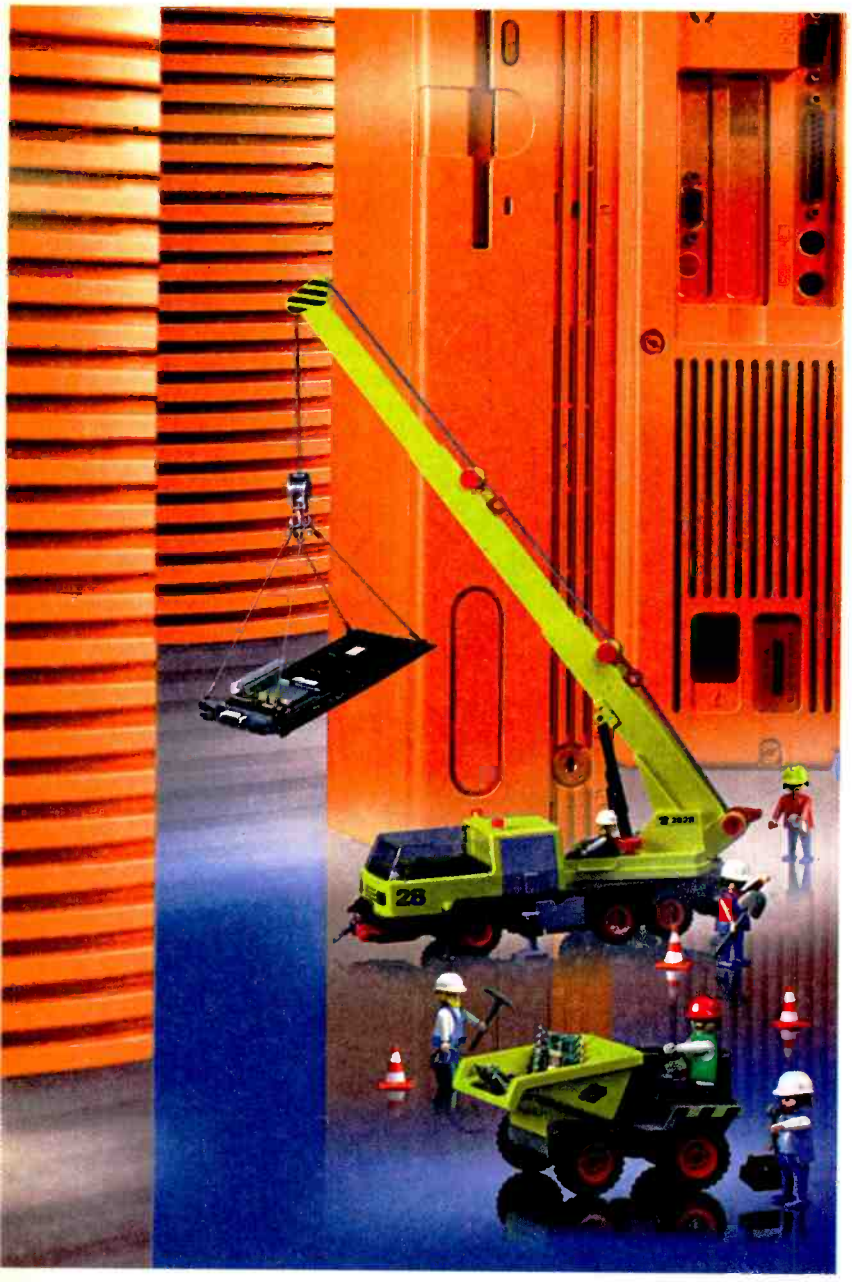


Fig. 12, Amateur radio and Private Mobile radio base-station transmissions are among the many VHF signals that can enter a distribution system via the VHF-FM antenna. Quarter-wave stubs or other notch filters can be used to great effect here, because the width of the notch is unlikely to be a problem.



Building and Upgrading PCs

In this concluding instalment Russ Phillips deals with monitors, disk drives, operating systems, modems, backup devices, audio, software and peripherals, with notes on installation and recommendations on what to get

Video card and monitor

Whereas an image displayed on a TV screen takes up a given proportion of the screen, an image displayed on a computer monitor has a fixed size in pixels. This is an important difference. It means that larger monitors can display more information, since they have a greater number of pixels. The number of pixels and colours that can be displayed also depends on the amount of video memory available, either on a video card or set aside in the memory modules on the motherboard. As a general rule of thumb, 2MB of video memory is plenty for a 14 or 15in. monitor, 4MB for a 17in. monitor, 8MB for a 19in. monitor and 16MB for a 21in. monitor. If you are using a motherboard with an on-board graphics chip, or if you want to keep the cost of the graphics card down, the amount of memory quoted above can be halved. Although this means lower resolution or fewer colours, it should still provide an acceptable display for most purposes. Video cards are sometimes referred to as graphics cards: the two terms are interchangeable.

If your motherboard has the appropriate slot, an AGP card is the best choice. If not, a PCI video card should be used. Some 386 and 486 motherboards do not have PCI slots, in which case an ISA card will have to be used – it will probably have to be bought second-hand. For workshop and office use a 2D card can be used. If the computer is to be used for modern games or 3D graphics, a 3D card should be used. If the computer is to be used extensively for both roles a 2D/3D card would be best, though a 3D card could be used.

The majority of monitors use a CRT for image display. Others use an LCD. The latter tend to be expensive but have lower power consumption and take up less space. LCD monitors are not generally considered to be suitable for video editing, playing modern games or any application that involves fast-moving graphics, but are suitable for office applications.

Fitting the video card is simply a matter of removing the appropriate blanking plate for the slot that's to be used, inserting the card into the slot then fixing it in place by means of the securing screw through the card's backplate.

Once the video card is in place, connect the monitor to its 15-pin sub-D connector then switch the system on. As several items are still missing, the system should beep several times and display an error message. Having assembled a number of PCs, I can testify from bitter experience that a lot of time and hassle can be avoided by checking that the system works (as well as can be expected!) as soon as possible, then testing again each time a new item is added.

Floppy-disk drive

Some type of floppy-disk drive is essential. For one thing, you may have to start the OS installation with a floppy disk. Until recently the 3·5in. high-density drive was universally fitted to PCs. It is still a popular choice, since the drives

and disks are both very cheap. Its main limitation is that a disk can store only about 1·4MB of data. Although this is more than enough for most of the tasks for which an office or workshop computer is likely to be used, it is often inadequate for storing images. To overcome this limitation, various companies have introduced new, higher-capacity drives. They use specialised disks that provide capacities of 100MB or more, but some can use 3·5in. floppy disks as well. If you decide on a high-capacity drive, either buy one that is compatible with 3·5in. disks or get a 3·5in. drive as well. Fitting instructions should be supplied with the high-capacity drive.

To fit a 3·5in. floppy drive, remove the blanking plate from the relevant drive bay in the fascia and, if one is fitted, from the metal framework inside the case. The drive can then be slid into place from the front and secured with screws at either side. To avoid damage to the drive, it's important to use the correct length screws. Once the drive is in place, attach one of the outputs from the power supply to the appropriate connector. The 34-pin ribbon cable connects the drive to the mother board. If the cable has two connectors at one end, this end should be connected to the drive, using the connector farthest from the motherboard. If the connectors aren't polarised, the marked edge of the cable should go to pin 1. Once the floppy drive has been fitted, turn on the computer and test again.

Hard drive

Modern hard drives come in two basic types, IDE and SCSI. These terms refer to the way the drives interface with the motherboard: they are mutually incompatible. For most uses IDE is recommended, as this type of drive is cheaper and often easier to install. If you are building a new computer, any available drive will probably provide more storage space than is likely to be needed for a workshop or office PC. If you are using second-hand parts, refer to the notes in the Operating Systems section. In either case if the computer is likely to be used extensively for playing modern games, video editing or graphical design work the hard drive will need to be as large as possible.

As long as the motherboard can differentiate between them, two IDE drives can be connected to a single connector on the board. In order to facilitate this, each drive is configured as a master or a slave, the master being the main drive on which the OS will be installed. If the motherboard has two IDE connectors, a secondary drive, which may be a hard drive or a CD-ROM, can be set as a slave or as a separate master on the same cable.

Configuring a drive is normally done by fitting a jumper in accordance with the instructions that come with it. Many drives have the master/slave positions indicated on the drive itself. Once the drive has been configured as a master or slave it is fitted in a similar way to a floppy drive, with some slight differences. The ribbon cable uses a 40-pin connector, the end connector being used for the master, the middle one for a slave.

Since external access to the hard drive is not required, there is no need to remove the blanking plate from the fascia. Most cases have at least one drive bay without a fascia: use it if available.

CD-ROM, CD-R or CD-RW drive

Some type of drive capable of reading a CD-ROM disc is not essential but is virtually so as most software comes on CD. An IDE CD-ROM drive is likely to be a good choice for an office or workshop computer.

CD-ROM drives are rated by speed, new ones being at least 48x, which means that the data is transferred up to 48 times faster than an audio CD player. Speed is unlikely to be important unless the computer is to be used for multimedia applications such as reference CDs and modern games. Any new CD-ROM drive should be fast enough for this purpose. If you are buying second-hand, 8x or better should be sufficient.

A CD-R or CD-RW drive may also be a good choice. A CD-ROM drive can only read data from a disc, while a CD-R or CD-RW drive can read data from a normal CD and write data on specially produced discs. CD-R and CD-RW drives can both use CD-R discs, which are very cheap but allow data to be written on to them only once. A CD-RW drive can also use CD-RW discs. These are more expensive but enable data to be written, erased and written again many times, in a similar manner to a floppy disk. CD-R discs can store about 650MB of data while CD-RW discs generally store about 600MB. These drives are usually relatively slow at reading discs, so it may be worthwhile having a CD-ROM drive as well. Although CD-R and CD-RW drives tend to be very slow at writing data on a disc they can provide a cost-effective way of storing large files and can be used to back up important data on the hard drive.

All three types of drive are fitted in the same way as a hard drive, except that the appropriate blanking plate will need to be removed from the fascia. If the motherboard has enough IDE connectors, a single drive should be fitted as a master via its own cable. If a CD-ROM drive is to be used with some form of writer, both drives should be on the same cable with the CD-ROM as the master.

Keyboard and mouse

When choosing a keyboard and mouse, it is important to make sure that their connectors are of the correct type for the motherboard. Most modern motherboards have PS/2 sockets for both items. A PS/2 socket is small (about half the diameter of a DIN socket) and round, with six pins. If these are not present, there should be a five-pin DIN socket for the keyboard and a nine-pin D plug (probably referred to as 'COM1' or 'serial port 1' in the motherboard manual) for the mouse. Both these devices simply plug in to their respective connectors.

If you have an unusual type of keyboard or mouse, or one with extra functions, you may need to install a driver once the OS has been installed. This will be covered in the next section.

OS and BIOS

If Windows is to be used as the OS (operating system), the settings in the BIOS (Basic Input/Output System) must be correctly set before it is installed. If Linux is to be used however this is not necessary. When the computer starts, a message such as "Press DEL to enter setup" or "<CTRL-ALT-S> to enter system configuration utility" will be displayed. Press the key or key combination indicated to enter the BIOS set-up utility. The motherboard's manual should give details of the BIOS settings, though many manuals leave a lot to be desired in this respect. Most of the default settings should be suitable. The main settings to be checked are that the hard and floppy drives are correctly listed. The appropriate settings for the hard drive will probably be listed on its case, but most modern BIOSs have an 'auto' setting that detects the type and size of hard drive fitted automatically. If any CD drives are fitted, they should be listed as "AUTO" or "NONE" under the hard disk type.

If you are concerned about other people using the computer without your knowledge, you can set a password that has to be entered before the computer will operate. If the motherboard has an on-board video chip, the amount of system RAM to be used as video memory is usually set in the BIOS.

The operating system can now be installed. This will usually involve starting the computer with a special 'boot disk' in the floppy-disk drive. Full instructions should be given with the OS and will probably be supplied on a CD-ROM, though older operating systems such as Windows 3.11 are often supplied on a series of floppy discs.

Once the OS has been installed, drivers for hardware that has already been fitted should be installed. Drivers are essentially small programs that enable the OS to communicate with the hardware. The video card will probably need a driver to be installed, and if a CD-ROM, CD-R or CD-RW driver is fitted this will also require a driver. If the keyboard or mouse

has extra functions, drivers will have to be installed before the extra functions can be used. Common drivers may be included with the OS but, if a suitable driver is supplied with the software, this should be used in preference to the driver supplied with the OS. Instructions for installing the relevant drivers should be included with the hardware.

Once the OS and drivers have been installed, the OS can be set up to the user's preferences. The first thing to set up is the display resolution and colour depth. The maximum resolution and colour depth depend on the amount of video memory available, and are largely a matter of personal taste. Older video cards may provide only sixteen colours, while more modern cards can display millions of colours at high resolution. In practice 256 colours is sufficient for many applications, and anything greater than 16 bits (65,535 colours) is likely to be warranted only for graphics-intensive applications or games. For these latter uses a colour depth of at least 24 bits (16·7 million colours) should be used if possible.

The other main settings that need to be adjusted at this point are the date, time and screen saver. The use of a screen saver is recommended to avoid phosphor burn-in, a symptom that most readers have probably seen with older TV sets suffering from field collapse.

Modem/ISDN terminal adaptor

Modems are nowadays used mainly for access to the internet and e-mail. Many modern modems have extra facilities to enable them to be used as fax machines, and you can get external modems that provide voice mail and answering machine facilities. The internet and e-mail are very useful tools, but access to the internet can be slow because of the limitations of the telephone system when it's used to transmit data. ISDN provides a much faster data connection at increased cost. The extra investment for ISDN is likely to be worthwhile only if you expect to spend a lot of time using the internet. It certainly isn't economically feasible if your main use of the internet is likely to be for e-mail. Even faster and more expensive than ISDN are SatModems, which use a satellite link to receive data and the phone line to send it. Modems and ISDN terminal adaptors (TAs) are available for fitting internally or externally.

When choosing a modem it's important to be aware of a type known as a WinModem. This has less hardware than others, and uses the computer's processor to compensate for the lack of dedicated hardware. The WinModem is cheap but has two main disadvantages: it works only with a computer that uses a supported version of the Windows OS; and it uses computer processing power, which means that less power is available to run the operating system and any other programs.

Fitting an internal modem or ISDN TA is similar to fitting any internal expansion card, such as a video card. Older modems used ISA cards: more modern ones use PCI cards. Although the PCI bus is faster than the ISA bus, there is no speed advantage in using a PCI modem. Make sure that you have a spare expansion slot of the appropriate type for your chosen modem.

An external modem or TA needs to be plugged into a power source, usually via an external power supply, and connected to the PC's serial port via a suitable lead. This port will have either a 9- or 25-pin male D connector, so it's important that the cable has the appropriate connector.

With either type, once the device has been fitted the driver has to be installed. There may be two drivers with a fax modem, one for the normal modem functions and a second for the fax functions. The modem also has to be connected to a phone socket: an ISDN TA requires a special socket that has to be fitted by the phone company.

Backup device

Some form of backup device is essential if the computer is to be used to store important data, such as company accounts. All the data in a computer is stored on the hard disk. Although modern hard drives are very reliable, all the data will be lost when one is faulty. Specialised backup devices are available, usually using digital tapes to store the data. Any device with enough capacity to store the data can be used however, e.g. a CD-R/CD-RW drive, high-capacity floppy drive or tape drive. If only small amounts of data are to be backed up, you could even use a normal high-density 3·5in. floppy-disk drive. It's not necessary to back up the applications, since these can be reinstalled from the original floppy disks or CD-ROMs if necessary.

The backup device should be fitted into one of the drive bays and will probably connect internally to an IDE channel, an SCSI card or an internal PCI or ISA card. If the device uses an SCSI connection, a PCI or ISA card with the appropriate connector should be included.

There are also external backup devices that connect to the computer via the parallel port, USB port or an SCSI connector.

Whether the device is fitted internally or externally, a driver will have to be installed.

Sound cards and speakers

These may not be required if the machine is to be used as an office or workshop computer. It should however be borne in mind that many programs use audible prompts, so some sort of sound system is desirable. Sound cards and speakers are available within a wide price range, the quality generally being reflected in the price. The more expensive cards and speakers are aimed primarily at games players. With an office or workshop PC there is probably no reason to spend more than is basically necessary for these items.

Most sound cards have a line output to enable a hi-fi amplifier and speakers to be used. Purpose-built speakers are considerably cheaper however and are normally shielded to prevent magnetic radiation, so they can be placed close to a CRT without causing purity errors.

The sound card is fitted in the same way as a video card or internal modem, the speakers being connected via a 3·5mm stereo socket on the backplate. Older sound cards fit into an ISA slot while newer ones tend to be of the PCI type, so it's important that you have an appropriate free expansion slot.

If a CD drive of any kind is fitted, use an audio cable (supplied with the CD drive) to connect it to the sound card.

A driver has to be installed, and there may be some extra software included with the card for installation if required. Microphones and joysticks, if used, are connected to the sound card.

Software

Even the most powerful computer is useless without software. What software you install in your new PC depends on how you intend to use it. If it is to be used to test monitors in the workshop, software to generate test patterns will obviously be useful. Nokia has two suitable programs, one for CRT displays (NTest) and one for LCDs (LCD-test), at its web site (http://www.nokia.com/monitors/download/index.html). Both can be downloaded free. They work only with Windows 95/98/Millennium, 2000 and NT however. If you want a program that will run on an older version of Windows, or you don't have access to the internet, send a 3·5in. floppy disk and SAE to me via the editorial dept. I will then send you a copy of a suitable program I've written myself. For an office PC a word processor and spreadsheet are essential. A database application may be useful, but modern spreadsheets have database facilities that are sufficient for most users. Office applications such as these are often sold together in integrated software suites such as Lotus SmartSuite, Microsoft Office and StarOffice.

A browser and e-mail client program, as well as an account with an internet service provider (ISP), are required to use the internet and e-mail. Many ISPs provide free browser and e-mail software. Anti-virus software is essential if

any version of Windows is used as the OS. Because of the way it works, viruses are much less likely to affect Linux. Though Linux viruses have been written, they have never been seen except in research laboratories. An alternative to buying anti-virus software is to use an internet-based virus check such as the one at McAfee's web site (www.mcafee.com).

Peripherals

By now you should have a fully working PC, with enough software installed for it to be a useful piece of equipment. Some well-chosen peripherals could make your new investment even more useful. Depending on whether the PC is to be used as an office or workshop machine, a printer or VGA output splitter is likely to be the first choice.

There are three basic types of printer, dot-matrix, ink-jet and laser. Dot-matrix printers are nowadays used only when it is desirable to make multiple copies of a document using carbon paper. Ink-jet printers are relatively cheap to buy, and modern ones can print in colour. Running costs are relatively high however. Laser printers cost more than ink-jet printers initially. Colour ones are available, but they are very expensive. On the positive side, laser printers provide very high-quality output, usually print faster than an ink-jet type, and the running costs are low. Fitting a printer is simply a matter of connecting it to the parallel port and installing the driver.

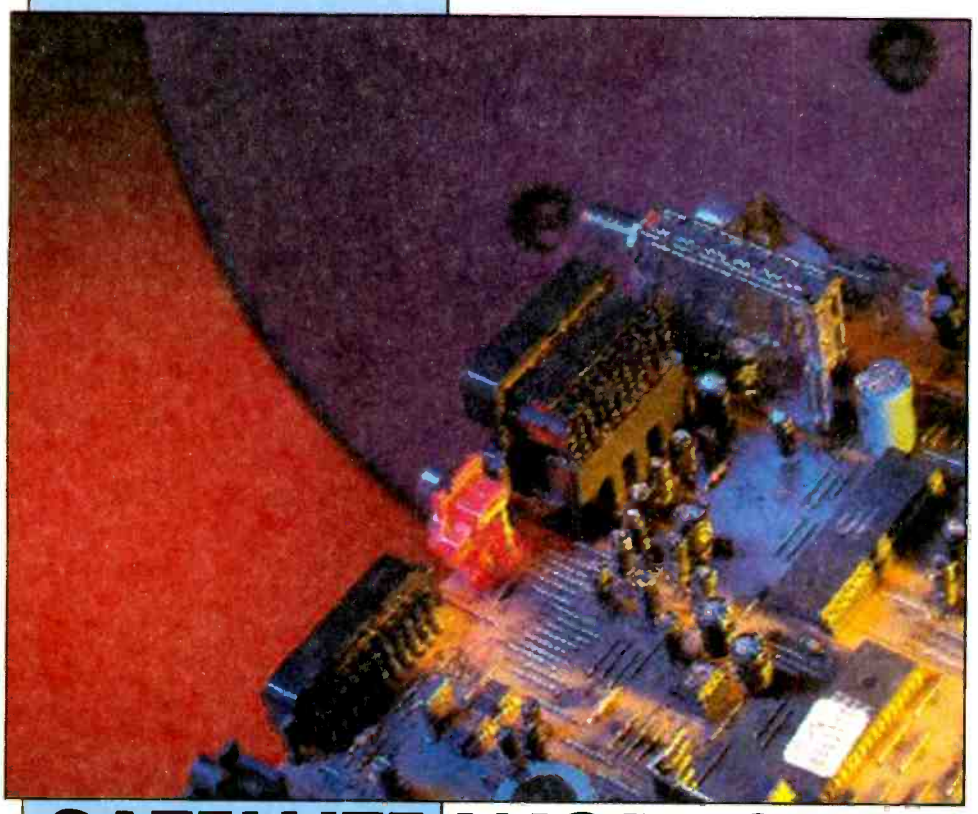
A VGA output splitter is basically the computer equivalent of a UHF splitter, enabling a number of monitors to be connected to a single PC. If your computer is to be used for testing monitors, one of these should be considered an essential purchase. The number of outputs varies with different models.

The price of scanners has fallen rapidly in recent years. Whether or not one will be useful is more debatable. Basically a scanner takes a picture of a document, photograph etc. and enables the image to be seen on the monitor and altered by the computer. Scanners normally have OCR (Optical Character Recognition) software included. It enables a typed document to be converted into a text document that can be edited as required. Scanners are usually connected via the parallel port or an SCSI card. A through socket is provided on a parallel-port scanner to allow the printer to use the same port. SCSI scanners are often faster but require an extra expansion card to be fitted inside the PC. Some scanners use the USB for connection to the computer. USB provides a relatively simple way of connecting peripherals to a PC, but it's important to ensure that your OS supports it and that your motherboard has USB sockets.

Peripherals often come with some software that makes them more useful. A good example is the OCR software supplied with most scanners. Note however that software supplied in this way is normally not as capable as software that's offered for sale. It might offer fewer facilities than the full commercial product or be an older version. So you might find that you need to replace the software supplied with your peripherals.

Conclusion

The modular nature of modern PCs makes them relatively easy to build, and building one from scratch gives you a good insight into how they work. This could in turn enable you to carry out PC repairs, thus increasing the variety of servicing work you can undertake. Upgrading a second-hand PC is a cost-effective means of acquiring a PC for office or workshop use.



SATELLITE WORKSHOP

JACK ARMSTRONG

A Nokia Mediamaster

Joe the baker must be one of the few people who actually bought a receiver for the ONdigital transmissions before the rental system was introduced. I had never seen inside one previously, so I was intrigued when he brought along his Nokia Mediamaster after it had been "struck by lightning".

My first problem was to remove the security screws. They're similar to the Torx type, but with five lobes and a pip in the centre. My Torx drivers all have six lobes and wouldn't fit.

"I've already had the screws out to check the fuse" Joe said, "but there isn't one. Here, let me take them out again."

He pulled out one of those enormous penknife things. You know, the ones that have ten blades, a pair of pliers, scissors, three screwdrivers, a thing for removing stones from horses' hoofs and a folding lawnmower. The 'security' screws were out in a jiffy. I now know who to call next time I lock myself out!

The fuse turned out to be a Wickman encapsulated type, FS01. It was marked T1.25A and was open-circuit. As nothing else seemed to be faulty, I decided to replace the TOP224 chopper chip. But that's easier said than done! The only way I could remove it, having desoldered the wires, was to use a butane multipurpose soldering iron in the "flame-thrower mode" to melt the solder on the lugs of its copper heatsink. With several cries of "ouch", and unrepeatable phrases expressing annoyance, I managed to prise the metalwork out, then plunged my burnt fingers into a cup of cold tea with a sign of relief.

Joe watched impassively. He was accustomed to handling large, hot ovens.

"Should've let me do that" he commented, "hands of asbestos – that's me."

After fitting the replacement chip and a new fuse I connected the receiver to my TV aerial and switched on the power. Four zeroes appeared in the display, then a number 6, then a picture and sound. Hurray!

Pace MSS500

One of these receivers arrived by mail with a comprehensive fault report that explained the situation. Its owner apparently fancied himself with the soldering iron and had fitted the parts from Relkit 10 to cure a dead power supply. He had then found that the receiver lit up but there was no picture. The screen was blank except for the channel names that rolled across it. There was audio, and the on-screen menus worked fine. This limited the fault area to the video amplification and decoder section, prior to the graphics insertion IC (U7).

My first move was to replace the PTV111 sync separator chip, the 503kHz ceramic resonator and the 1µF capacitor (C208) next to it. As this made no difference I had to call upon the oscilloscope for help. The signal was present at pin 15 of the switching chip U17, but didn't reach the graphics chip (U7). There are three surface-mounted transistors in this signal path, Q101, Q63 and Q105. It's awkward to carry out tests with the board upside down and connected, so I replaced the three transistors and reassembled the unit. A bad piece of guesswork: the unit still didn't work!

I was forced to live dangerously by turning the board upside down and connecting power and the LNB. This time I found the seat of the fault within seconds. The signal didn't pass via the 1µF multilayer ceramic capacitor C200. The capacitor itself was OK however: somebody had knocked it and fractured a pad from the copper track.

A good repair was achieved using a tiny length of PTFE-covered wire. I now had a picture, but there were no decoder messages and the on-screen channel names still floated across the screen. This time I guessed correctly: the PTV110 chip was faulty. A good used one cured the fault and left me with a fully operational receiver.

A Pace 2200 Digibox

A nice man called John asked me to order a service manual for the Pace BSkyB digibox Model 2200. I normally send these receivers to Pace for repair, and suggested that he should do the same. But he was keen to "have a go". Fearing the worst, I sent him the manual. A few days later he kindly sent me the following report.

"The chap I bought the digibox from said it was stuck in standby because of a power supply fault. I started to check the power supply outputs, which seemed to be OK – but I didn't know what voltages to expect. I then checked the crystals. Some were working, but the 27MHz one looked dead.

At this point I felt that a manual might indicate whether the crystal should be oscillating in standby. The manual confirmed that the voltages were correct, and the description in it suggested that the main processor U300 talks to the housekeeping processor U600 via lines nec-st20, stneccIk and st-20nec. I used a scope to check these lines, and found that they were static. So I guessed that the main processor chip was waiting for some other input – if it was in fact OK.

I still wasn't sure whether the 27MHz crystal should be alive, so I removed it from the board and swapped it with a 24MHz crystal on a computer I/O PCB. Sure enough the crystal was dead. I then put the 24MHz crystal in the digibox, hoping that it would start up and produce an error message. No such luck.

I remembered that my ONdigital box looks very similar inside. My luck was in: it has a 27MHz crystal. I put it in the

BSkyB digibox and powered it up. After less than a minute, up came the blue Sky screen."

I feel that this tale is worth relaying because most of us are afraid to tackle digital receivers, expecting to find that the cause of a fault is a 500-pin IC. Crystals are prone to failure however – those manufactured by IQD and used in the early Pace MSS100 and Grundig GRD150, to name just two models, prove the point. I've had to replace many a crystal over the last few years. So remember to do as John did, and look for the obvious.

Pace MSS 1008ip

"Hello Lady Dipdale!" I had immediately recognised the plummy accent on the telephone and greeted her accordingly.

"Oh yes. I wander if you wad be sow kind as to take a look at Lord Dipdale's satellite? It's the racing, don't you know? He does so miss it."

"I'll come and collect it at once, ma'am."

"Er, that won't be necessary. I'll send Featherstone along with it. That way we won't need to clean the carpet again, will we?"

Hmmm. She remembered the muddy boots episode from four years previously. Amazingly good memory for such an ancient person. Featherstone is the gardener, handyman, butler and, as it happens, carpet cleaner. He also remembered . . . He rolled up in a LandRover Discovery. The oldest in the fleet, I suspect, but still pristine. When he handed the receiver over he stared pointedly at my boots.

"I'll be back to collect it at five, sharp!"

"OK. It will be ready and I shall await you with open wallet" I smiled.

"Hmmph. You should be payin' 'er ladyship."

He drove of, leaving a cloud of diesel fumes behind.

A quick look inside the receiver convinced me that there was no point in testing it. The electrolytics in the power supply were black. They begin life as light blue, so this was an obvious sign of "pizzafication" as I like to call it (place in a medium oven, gas mark 5, and leave for three years or until the cheese goes brown).

I replaced all the power supply electrolytics, using yet another Relkit 10 from SatCure (phone 01270 753 311). Everything else looked fine, so I reassembled it with its dish positioner board and audio board. At switch on the front panel lit up and I had a brief flash of scrambled picture before the screen went blank, apart from a distorted white bar that floated across it.

It appeared to say "Please insert card", but there wasn't much point! By switching the 230V mains supply off and on I occasionally got a good picture, so there seemed to be an intermittent problem with the sync pulses to the decoder. Curiously, the foreign channels were also affected.

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.

I dismantled the receiver again and removed the main board. As I didn't want to have to do this many more times I decided to take every precaution. I replaced the surface-mounted BC856B transistor Q58, which had left a burn mark on the top surface of the board, using the slightly higher-rated BC857C. I also replaced all the electrolytics around the PTV111 sync-separator IC, and the 503kHz ceramic resonator which can become microphonic and intermittent. On reassembly the receiver worked flawlessly. So one, or a combination, of the devices I had replaced must have been the culprit.

Featherstone arrived bang on time and made a large donation to the Armstrong beer fund. I doffed my cap and thanked him profusely. He looked unimpressed and, as he left, stared pointedly at my boots. I must remember to buy some polish.

Test Case 455

During the RETRA 2000 Service Conference (see report on page 668 of the September issue) Colin Guy described how he runs his business. To generate sufficient income, he applies his servicing skills to a wide variety of hardware. Now, how versatile are you? This month we leave Sage, Television Ted and the others far behind while we follow their ex-colleague Techno-Supersleuth (TS), who is now self-employed.

His first call was to Colonel Kingsley's immaculate back garden. This retired warrior uses a vintage cylinder lawnmower to keep his grass trim. It's petrol-driven, and has a red frame and a green tank. But it had developed a problem! It would start all right, with one pull of the rope, and then happily tick over for a while. After that it would suddenly cut out and wouldn't start again for perhaps five minutes, no matter how red-faced the Colonel became pulling the rope. If, following a successful start, the engine was revved up and then used to perform some work, it would splutter to a halt in a very short time. Once again it wouldn't restart for several minutes but, given enough time, it would burst into life at the first pull.

An electrical fault perhaps? A Voltstick showed TS that ignition pulses (and presumably sparks) continued until the little engine stopped completely. So attention was turned to its diddy little carburettor. The cause of the trouble was soon found. What was it? Not a difficult one but, as TS tested the engine, he was summoned to the fence by a large woman in the next garden. In the very tones of Margot Leadbetter, she commanded him to look at her Flymo Sprintmaster XE30, an electric rotary jobba. It had become very heavy to push, she said, even with an empty grassbox. Fifteen minutes later, a tenner had changed hands and the lady was actually *running* to and fro with her bright-orange Flymo. What had TS done to it?

An urgent repair awaited our friend when he returned to his workshop. It was a CB radio, the centre of Hard Man's (Walter Hankers') world, and it had got into trouble. Only in the transmit mode, mind, when its signal was, according to Joan Ranger and Pack-Man, weak and distorted. The receive mode was OK. The same symptoms were present when the transceiver was hooked up to GoldenHands' aerial.

TS gave this one some thought, then removed the cover and went straight to the fault. It took just minutes to fix. No components, a small bill, and the cure was guaranteed! How did TS deal with this one? And on what Sherlock-Holmes type reasoning did he know almost exactly where the fault lay?

The last patient of the morning, before TS went to the pub to spend a little of the Flymo-lady's money, was a Panasonic microwave oven. It was labelled "dead", and its mains fuse had blown. The note with it said this happened every week or two, in spite of the fact that Ace Appliances had already replaced the lamp and a "rectifier". Tehno-Supersleuth dismantled the rather dirty cooker and checked it out. He had encountered this sort of thing before, with Panasonic and other makes of microwave oven, and very soon had a diagnosis. Two relatively small and cheap components went into that oven and provided a lasting cure. What were they?

You'll find the answers on page 56. But do try to suss them out yourself first: one day you may have to!

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'

Whose expertise?

Several readers have written about manufacturers that don't provide service information to repairers other than those who have their technical and commercial approval. Manufacturers also claim the high ground when it comes to decisions such as the acceptability of a PCB repair. The assumption is that the manufacturer knows best and has the highest level of expertise, the implication being that 'outsiders' are incapable of carrying out satisfactory repairs on their products. The restriction of service information is one way of making this a self-fulfilling prospect.

But just how good is manufacturers' expertise, and are they entitled to consider themselves the arbiters of good engineering standards? If that expertise is so overwhelming, how come the masses of modifications and upgrades that have been introduced over the years?

Here's one example. The Sony Model SLV715 VCR has a power supply that I would describe as a disgraceful cost-cutting design for an expensive VCR. Apparently it was bought in, but that's no excuse. According to the circuit diagram, it has a voltage booster sub-circuit whose purpose is to raise the input to the motor supply regulator IC203 from about 14V to 17·8V, an afterthought if ever I saw one. The smoothing capacitor C203 is rated at 25V. Since the measured voltage across it is 26V, this capacitor eventually spills its inside all over a densely packed PCB. The power regulator, in struggling to keep the output voltage down to 12V, generates a great deal of heat – there's a primitive heatsink – and usually also dies. In Sony's official repair kit of capacitors the 25V one is replaced with one rated at 35V. That really is expertise!

This made me wonder whether the switch-mode power supply was actually running at the correct frequency, perhaps making the booster circuit a bit too efficient. Parts suppliers do not know of any problem, and Sony will not talk to me.

However you look at this sort of problem, it is hardly high-technology stuff. Commercial arrogance may be, expensive parts certainly.

Len Knott,
Ringwood, Hants.

FTV viewing

Your note on the free-to-view digital satellite card service (Teletopics September, page 644) was incorrect in suggesting that customers can no longer use a digibox's modem to authorise their viewing cards. Those who connect their phone line to the back of their set-top box receiver can use its modem to authorise the service. Those who do not have a phone line connected to their receiver should contact the free-to-view card service on 0870 243 8000 to request authorisation. Further advice can be found on the BBC's web site at www.bbc.co.uk/reception

Ian Adams, BBC Customer Services,
BBC Television Centre, London.

Audio output capacitors

Joe Cieszynski's letter in the September issue presented an interesting theory leading to a very plausible hypothesis – if the noise boys can plug it up wrong, they probably will plug it up wrong. I must confess that in my original fault report (June) I hadn't considered the phantom power possibility, though the converse is often the case, in that phantom power feed resistors suddenly go open-circuit for no apparent reason. Do I wonder why? My original reasoning might well have run along the following lines:

(1) Anyone using a DAT recorder would almost certainly have a half-decent desk.

(2) Said desk would almost certainly have phantom power switchable at each channel input. This is not to say that the switch would be correctly set of course.

(3) Microphone inputs would be on XLRs, with jacks for line send and returns.

(4) Microphone XLR feeds would probably come in on a multicore cable from a stage box, separate from line-level signals.

(5) Line-level signals fed into microphone XLR inputs would sound awful and would not be persisted with for long enough to trash coupling capacitors.

It might have done, but it didn't. What I actually thought was "they've plugged it up wrongly, no need to look for an external cause".

Now I dare say there are desks with switchable XLR inputs that will accept a DAT feed into the 'mic' socket without complaining, but I went for the amplifier theory simply because the DAT recorder was in a road case with other outboard effects and had a jack field patch panel at the rear. So did the amplifier stack. It just seemed an easier mistake to make.

On another front, Cyril Bateman's capacitor tester looks like the bee's knees. I greatly admire his technical skills in designing it. We here at Micomicon Electronics have a capacitor meter – different league though, it's only a simple one. Ours is protected by using hands-free, hook-style probes on the leads and a two-pole (detonator type) push-button switch that shorts them out via a low-value resistor. Connect capacitor and push to test.

Adrian Spriddell,
Micomicon Electronic Services,
Diss, Norfolk.

Still some good business

In the September issue you suggested that the TV repair industry is dead. I hope you don't think this is true for all dealers. My TV/video repair work is increasing, and I intend to increase it further. I have a 2,000 square ft warehouse full of work. If we have to turn to the Americans to be told how to run our businesses, we deserve to fail!

Personally I don't understand the word failure, only how to win. I've been at it for forty years and intend to carry on till I drop. I still get a buzz from a good day's business. How about printing a non-moaning article for a change? Best of luck to you all.

E.R. Webb, KTV Electronics,
Camborne, Cornwall.

TV repairs

The television repair business is dead (September page 643)? Not yet, fortunately. Long gone are the days when one might fit a new tube, and today a new LOPT or, in many cases, an expensive IC might well make repair uneconomic. But most failures continue to be fairly simple and not expensive to repair. Should a set be written off because of a blown fuse and a shorted bridge rectifier, chopper transistor or degaussing thermistor? Or because of a couple of dry-joints? Of course not, and it does no good to spread the idea that repairs are a waste of money.

There's also the fact that not all sets are cheap 14in. colour portables. A growing number of widescreen sets, sets with 100Hz scanning and sets with complex audio systems, not to mention projection sets, are being sold. Their owners will probably be reluctant to trash them. More work in prospect.

Some technology, such as that just mentioned and the prospect of flat screens, is making sets *more* expensive not less. If someone spends a couple of thousand pounds on a set they will probably not be averse to a fair-sized repair bill when something goes wrong.

The trade has suffered from a severe shake out, and business probably hasn't hit the bottom yet. But there is and will continue to be repair work for us to do, and we should encourage this, not write it off.

Jeremy Crabshaw,
Croydon, Surrey.

Registration and the future

After reading the RETRA Service 2000 report (September) I am surprised that consideration is being given to setting up a registration system for engineers. There already is an internationally-recognised registration organisation in operation. I became a registered engineer with the Engineering Council on 26th November 1983. To register, you have to have qualifications and undertake to continue to update yourself. This can be done by attending lectures, going on courses, etc. I would hope that one day all practising engineers will have to be registered to carry on trading legally.

I understand that you cannot become a member of RETRA unless you trade from a shop. However a lot of good engineers trade from workshops or even from home. Many have more test equipment than the average shop, often because shop managers have little knowledge of engineering and don't want to buy expensive equipment. A self-employed engineer on the other hand knows that time wasted because of wrong diagnosis means loss of income.

I was surprised to see, in the same issue, an advertisement for engineers placed by a national company (which has lots of shop fronts, and might be RETRA registered) stating that technical qualifications are not essential. Doesn't the firm realise that if it employs unqualified personnel and something goes wrong it's leaving itself wide open to litigation?

I am sure that leading manufacturers will not be pleased that this company is apparently employing non-qualified staff to do an engineer's job. Possibly a monkey could do the work for them if it could read an idiot guide supplied direct from a manufacturer that will talk only to account holders.

It's good that the Engineering Council is pushing for the term 'engineer' to become protected, so that no one without qualifications and registration can call himself or herself an engineer.

Quite a few large shops in my area do not have an engineer on their staff. They rely on freelancers like myself, or use unqualified people. The latter approach can on occasion work reasonably well, for example with mechanical faults on VCRs.

Alan Tooke, I.Eng., MIIE (elec),
St Leonards-on-Sea, East Sussex.

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: The control panel, part no. 29501-066-22, or just the microcontroller chip (Motorola ZC86602P) from it, for the Grundig Model M70-395-CTI-GB (CUC3800 chassis, but others similar). An alternative is panel 29304-072-51 which uses a Siemens SDA2080-A003 microcontroller chip. Either of these chips, which were used in other Grundig models including TV/video combinations, would do since I have faulty panels of each type. Phone Les Austin on 01624 878 686 or e-mail manxduke@binternet.com

Wanted: Main PCB (MA-181) for the Sony VCR Model SLV-E80, or a non-working recorder. Phone J. Brida on 01509 212 101 or 0705 003 0437, or e-mail j.brida@ntlworld.com

Wanted: A working digital colour panel, part no. QPWF7009BM, from a scrap Sharp Model DV1400SN. Alternatively ICs to fix a no-colour fault, or panel part no. QPWBF7024BMN for the Euro DS1 chassis. R. Peters, Bloque Bravo No. 6, Casa 3, Pueblo Bravo, 03170 Rojales, Alicante, Spain. Phone/fax 00 34 96 671 9902.

Wanted: Transformer for the Akai hi-fi mini component system Model AC500. John Porter, 4 Cromore Gardens, Creggan Estate, Londonderry, N. Ireland BT48 9TF. Phone/fax 02871 280 722.

For sale: Very heavy-duty Pivotelli wall-mounting swivel arm for a TV set or monitor, black finish, with fixings, £30. Julian Bohan, 30 Stanley Street, Lincoln LN5 8NG. Phone 07021 100 499 10 a.m. to 10 p.m. or fax 08707 414 692.

Wanted: Instruction manual for the Matsui VX1000 VCR, original or photocopy, also a service manual. Costs paid. D. Lee, 16 Devonshire Place, Claughton, Birkenhead, Wirral, Cheshire CH43 1TU.

Wanted: Tuner unit for the Sony VCR Model SLV-353UB or a complete panel. Also require a Quad FM3 tuner for spares or repair. Phone Mike on 01758 613 790.

Wanted: Service manual for the Amstrad CTV3021N or information on the store/memorise circuit. Ron White, 29 Nunnery Street, Castle Hedingham, Essex CO9 3DN.

For sale: Seventeen volumes of Newnes' *Radio and Television Servicing*, from 1953-1962. £5 each plus postage or offer for the lot. Phone N.N. Hunter on 0116 287 2397 or e-mail nnh@dmu.ac.uk

Wanted: Hitachi 598EM VCR for spares, or a complete drum assembly and chroma colour PCB. A Philips 723-05 VCR for spares. Original remote control unit for the Finlandia/Granada CTV Model C59HZ6, or does anyone know how to access the service program with a copy remote? Complete working mother board for the Sanyo CTV Model CBP2872 (ED1 chassis). Steve Thomson, 51 Churchill Way, Manor Estate, Stafford ST17 9PB. 01785 223 219.

Wanted: LOPT for the Hitachi Model C2118T, serial no. U11823595, also a LOPT for the Memorex 1400R. Steve Rose, Flat 9, Limerick House, Heathfield Park Road, Woking, Surrey. Phone 01483 762 780.

Wanted: Could someone advise on safe replacement equivalents for the following devices in the Thorn 9000 chassis: VT412 TE527 line driver transistor; VT701 R2540 Syclops transistor; W704 F249. Mr Roy, 22 Grebe Close, Waterlooville, Hants PO8 9UT. Phone 023 92 783 811.

Wanted: Video camera lead to connect a Canon VC200 to a Ferguson Videostar SVHS machine. Lead supplies power to the camera. Please phone Eddie Richardson on 01328 829 078 or mobile 07787 596 164.

Wanted/for disposal: Require circuit diagram for the Sanyo VHR1100E VCR. Photocopy OK. Have for disposal a 1950s Murphy stereo radiogram Model A632SR. Cabinet in mint condition, radio needs a little attention. C. Brooks, 10 Fords Close, Bledlow Ridge, High Wycombe, Bucks HP14 4AP.

Wanted: Modulator for the Ferguson Videostar Model 3V45 VCR. G. Thomas, 31 The Parade, Merthyr Tudful, Glamorgan CF47 0ET. Phone 01685 722 575.

For disposal: Available for spare parts, one Sony SLC7UB Betamax VCR in good condition, complete machine; and two Philips V2020 VCRs, quite poor condition generally and externally but with complete PCBs. Suit enthusiast/collector. Phone George Frewin on 01264 354 949.

For disposal: Twenty computer monitors, various makes, Mitsubishi, Dell, IBM, Mitac, Siemens, Hewlett-Packard, Tandom, 14, 15, 16, 17in., all complete. Spares or repairs. £150 the lot. Phone 01342 423 447.

Wanted/for disposal: Require circuit diagram for the control circuits, Philips VCR Model VR2030 (or complete manual); also manual/circuits for Armstrong 600 series hi-fi tuners/amplifiers (mid 1970s). Have for disposal a Ferguson SRB1 BSB receiver, unused, boxed, complete with remote control unit and Squarial. Steve Sheppard, 12 Bedford Road, Harrow, Middx HA1 4LZ. Phone 0208 863 5150.

Satellite Band Scanner

Denis Mott describes a way of modifying a portable monochrome TV set to provide a panoramic band display or normal reception with a signal-strength indication at the top of the screen

Many developments in components and hardware have taken place since my first satellite band scanner design was published in the November 1990 issue of *Television*. This has made it possible to devise an improved and simpler version. The most noteworthy development has been single receiver tuner/IF blocks, as used in Pace receivers. The one I decided to adopt, from the Pace MSS300 satellite receiver, was developed by Pace and built in the Far East. It enables the whole project to be shrunk to fit into a portable TV set, though it's a bit of a tight fit.

One problem is that developments have to some extent overtaken the design. The unit will display only analogue satellite signals. It remains perfectly OK as a spectrum analyser however. Unfortunately the power requirements are still much the same as before, with the LNB needing 120mA at 13/17V. This made it necessary to use a separate power supply, which is mounted on the base of the TV set in its own box. Again the Pace MSS300 came in handy: I was able to use its chopper power supply circuit with minimal alteration.

I used a Roadstar TV415 7in. monochrome portable TV/radio receiver as the basis of the scanner. It was severely chopped to enable the scanner PCB to be incorporated. Various components, such as the receiver block and the power supply components, were taken from a redundant Pace MSS300 receiver.

There are two modes of operation, 'normal TV' which displays analogue pictures with a signal-strength line at the top, and 'sweep' which scans the band and produces a panoramic display of the signals present.

This project is not intended for the inexperienced constructor and should not be undertaken lightly. The information presented here shows the circuitry I used to implement the signal-strength indicator and the scanner.

Fig. 1 is a block diagram of the scanner. In the earlier design I kept the TV tuner and audio sections. Many years of use have proved that they are unnecessary, so they have been omitted from the present version. This has made it possible to use much simpler switching, mostly solid-state.

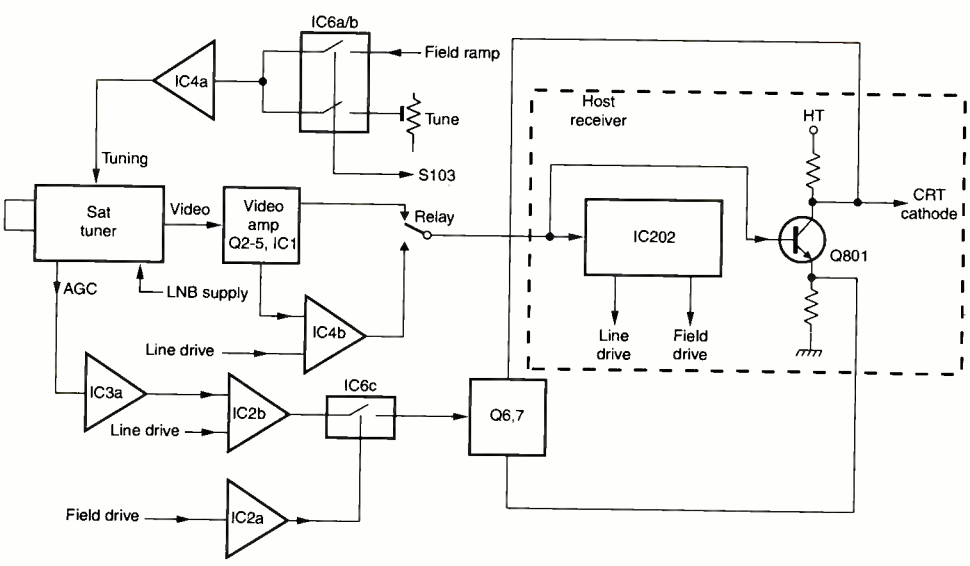


Fig. 1: Block diagram of the satellite band scanner.

Circuit description

Fig. 2 shows the circuit diagram, with the exception of the circuitry in the host receiver and the power supply. Switches S101-3 are mounted on the power supply panel.

The receiver block produces video and AGC outputs. The latter is buffered by Q1 then fed to the signal-level monitor section. In the 'normal TV' mode IC3a and IC2b produce at the top of the screen, when IC6c is closed, a white line whose length is proportional to signal strength. This line starts at the left-

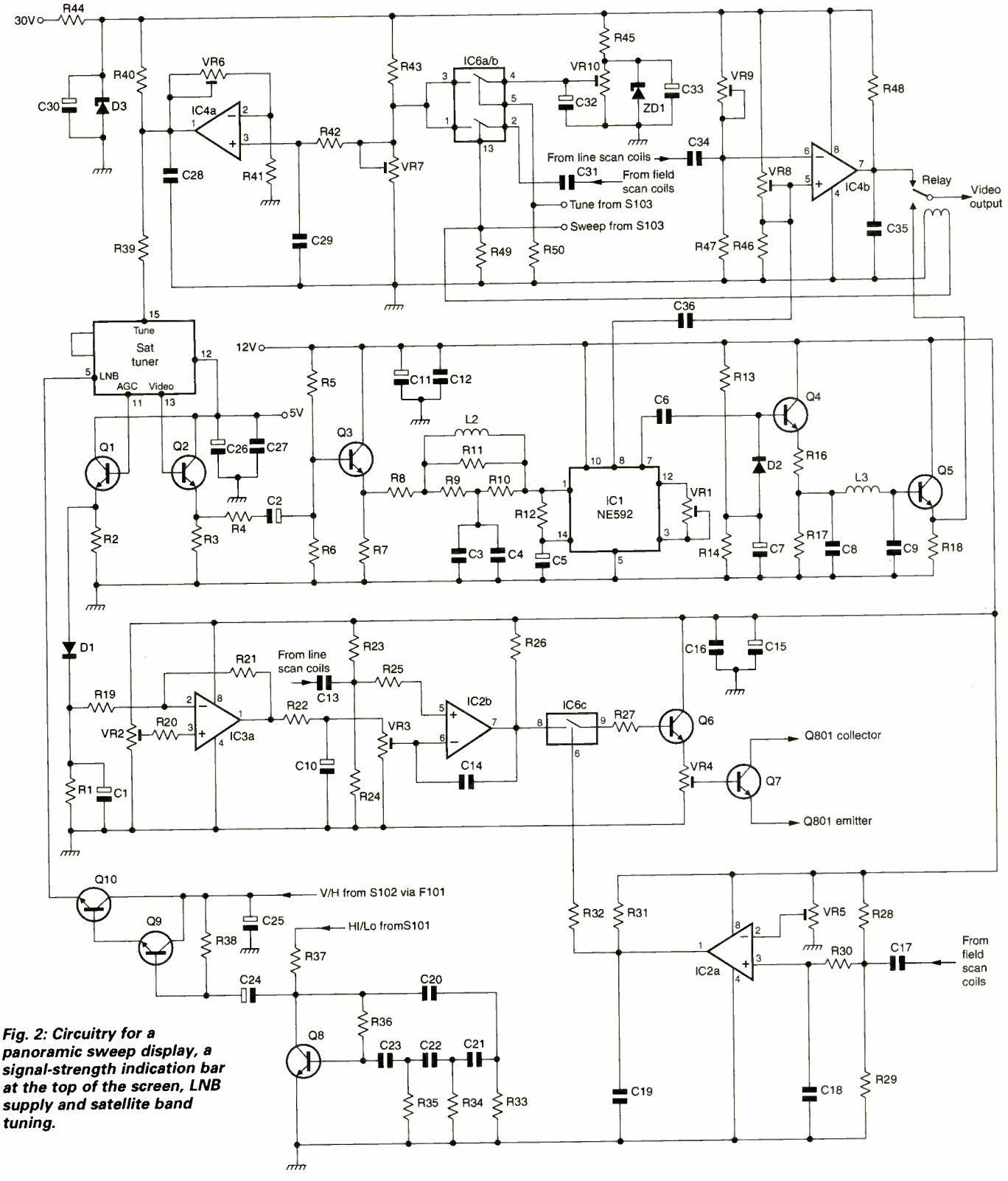


Fig. 2: Circuitry for a panoramic sweep display, a signal-strength indication bar at the top of the screen, LNB supply and satellite band tuning.

hand side of the screen, its extent to the right indicating the signal strength. IC2a, in conjunction with VR5, determines the position and thickness of the line. VR2 and VR3 set the sensitivity and the full-signal length of the line which, though not calibrated, serves as a good guide. Output transistor Q7 is connected in parallel with the video output transistor in the host receiver (Q801 in the TV415).

The video output from the receiver block is buffered by Q2 and fed to the video amplifier/demodulator section, which consists of Q3, IC1, Q4 and emitter-follower Q5, whose output is fed via the relay to Q801 and, for sync purposes, pin 6 of the KA2915 IF amplifier/demodulator/timebase generator chip IC202 in the host receiver. The actual connection is to the junction of R215/6.

The tuning voltage amplifier IC4a can be fed with a variable DC supply, from VR10, for normal reception or switched to sweep the band under the control of a sawtooth waveform obtained from the field timebase in the host receiver. VR6

and VR7 determine the sweep linearity and offset respectively. The sweep waveform is tapped from the input to the field scan coils. S103 selects between potentiometer and sweep tuning and also operates the changeover relay.

Q8, Q9 and Q10 form a band-switching tone generator. Q8 is connected as a sinewave oscillator, with Q9 and Q10 used as a modulated series-pass circuit for the supply to the LNB. S101 provides high/low-band switching while S102 selects vertical or horizontal polarisation.

The spectrum display is novel and an easy approach. The field sweep starts at zero (the top of the picture) after the flyback. The sweep-tune voltage also starts at zero and increases. Thus lower-frequency signals are displayed in the upper section of the screen, the signal frequency increasing as the display moves down the screen.

IC4b is used as the display modulator in the sweep mode. It acts as a voltage comparator, with one input from a video source and the other obtained from the line timebase. I added an 0·5Ω, 1W resistor in series with the line scan coils, at the earthy side, to provide the feed, which is taken from the junction of this added resistor and the line scan coils. VR8 and VR9, set amplitude and offset respectively, produce the correct conditions for a nice, noisy base line at the right-hand side of the screen with no signal, and a nice display of spikes that progress leftwards when signals are present.

The field hold control has to be adjusted in this mode to provide a good display, as the sync signal is disturbed by the swept signals that upset the timing of the field oscillator.

With a little practice setting up the presets is not difficult, as long as the constructor is aware of which part of the circuit is being set up. The functions of the various presets are as follows:

VR1 IC1 tuning; VR2 signal level; VR3 line length; VR4 line brightness; VR5 line position; VR6 sweep linearity; VR7 sweep offset; VR8 sweep display amplitude; VR9 sweep display offset; VR10 tuning.

The power supply

The complete power supply circuit is not shown as the primary side is the same as that in the Pace MSS300. Fig. 3 shows the circuitry on the secondary side as this differs in one or two respects. All I did was to relay the components on a new PCB to fit my requirements. The circuit references are the same as for the Pace MSS300. Note that resistors R106, R107 and R108 are close-tolerance 1 per cent types and are surface-mounted. They can easily be removed and fitted on the new PCB, which will also accommodate leaded resistors.

The layout of my panel must and does observe safety rules, i.e. the live side is isolated from the secondary side by a minimum 6mm of free space. If you choose to redesign the layout, this requirement is a must. For added safety outdoors, an ELCB or isolation transformer should be used.

There is no 5V regulator. This is not required as the transformer is well designed and provides exactly 5V at the required load.

I added a resistor and LED in series across the LNB supply fuse. Should the LNB supply be shorted and the fuse blow, the LED will light to indicate the situation.

Construction

The Roadstar TV415 was selected as the host receiver because it has a radio section at the right-hand side of the cabinet. When this is removed the site is ideal for the added circuitry. It's advisable to have a circuit diagram of the host receiver before you start. Other sets may be just as suitable or better.

Component values/types

Capacitors

C1	1µF
C2	10µF
C3	680pF
C4	4·7nF
C5	100µF
C6	100nF
C7	100µF
C8	330pF
C9	330pF
C10	10µF
C11	10µF
C12	4·7nF
C13	4·7nF
C14	330pF
C15	100µF
C16	100nF
C17	470nF
C18	47nF
C19	1nF
C20	10nF
C21	10nF
C22	10nF
C23	10nF
C24	10µF
C25	100µF
C26	10µF
C27	100nF
C28	22nF
C29	15nF
C30	220µF
C31	470nF
C32	10µF
C33	22µF
C34	47nF
C35	10nF

Diodes

D1	1N4148
D2	1N4148
D3	33V
ZD1	6·2V

Coils

L2	33µH
L3	5·6µH

ICs

IC1	NE592
IC2	LM393
IC3	LM358
IC4	LM393
IC6	4066

Resistors

R1	3·3kΩ
R2	470Ω
R3	470Ω
R4	75Ω
R5	56kΩ
R6	68kΩ
R7	470Ω
R8-10	75Ω
R11	330Ω
R12	75Ω
R13	6·8kΩ
R14	5·6kΩ
R15	100kΩ
R16	75Ω
R17	470Ω
R18	470Ω
R19	10kΩ
R20	10kΩ
R21	100kΩ
R22	2·7kΩ
R23-26	10kΩ
R27	4·7kΩ
R28	100kΩ
R29-31	10kΩ
R32	1kΩ
R33	680Ω
R34	680Ω
R35	820Ω
R36	8·2kΩ
R37	1kΩ
R38	3·3kΩ
R39	33kΩ
R40	2·7kΩ
R41	10kΩ
R42	10kΩ
R43	3·9MΩ
R44	1·2kΩ, 2W
R45	1·5kΩ
R46	2·2kΩ
R47	3·3kΩ
R48	4·7kΩ
R49	10kΩ
R50	10kΩ

Transistors

Q1-Q6	2N4401
Q7	2SC2228
Q8	BC109
Q9	JC501
Q10	TIP31A

Variable resistors

VR1	10kΩ
VR2	10kΩ
VR3	10kΩ
VR4	4·7kΩ
VR5	4·7kΩ
VR6	100kΩ
VR7	1MΩ
VR8	22kΩ
VR9	100kΩ
VR10	10kΩ

Relay

12V with changeover contacts

If a TV415 is used, remove its radio PCB, TV tuner, power supply heatsink and components. The mains transformer from the cabinet back is surplus, also the slide switches at the front, the volume control, audio output stage and other components to do with the sound. With the TV/radio switch removed a link must be fitted between the two points marked D on the PCB. The 12V supply from the separate (MSS300) power supply can be fed in at this point.

I reused the plastic frame that holds the radio PCB. On the first prototype I tried incorporating the tuning control potentiometer and gearing, but there was too much backlash for the fine tuning required in the final version. So a single-turn potentiometer was fitted where the control shaft came through. It took a bit of cutting and shutting to get this in. A large-diameter knob is used to give the tuning a bit of feel.

The power supply and scanner circuit PCBs I designed are available, with the relay, from Denmo Electronics, 91 Sheepridge Road, Sheepridge, Huddersfield, West Yorkshire HD2 1PF. If my PCB is used it will fit in the TV415's cabinet, just, but a little judicious use of a craft knife will be required to modify the cabinet back.

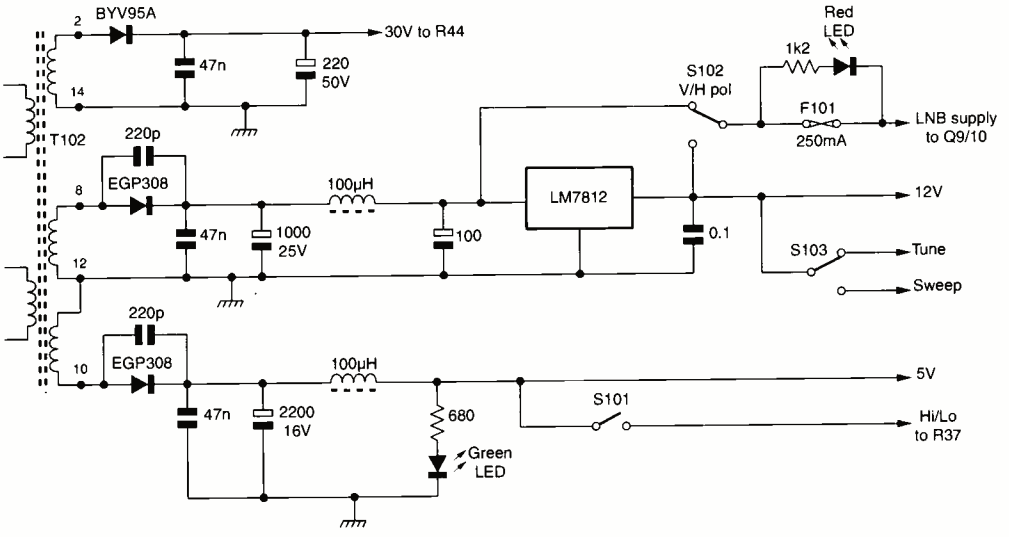
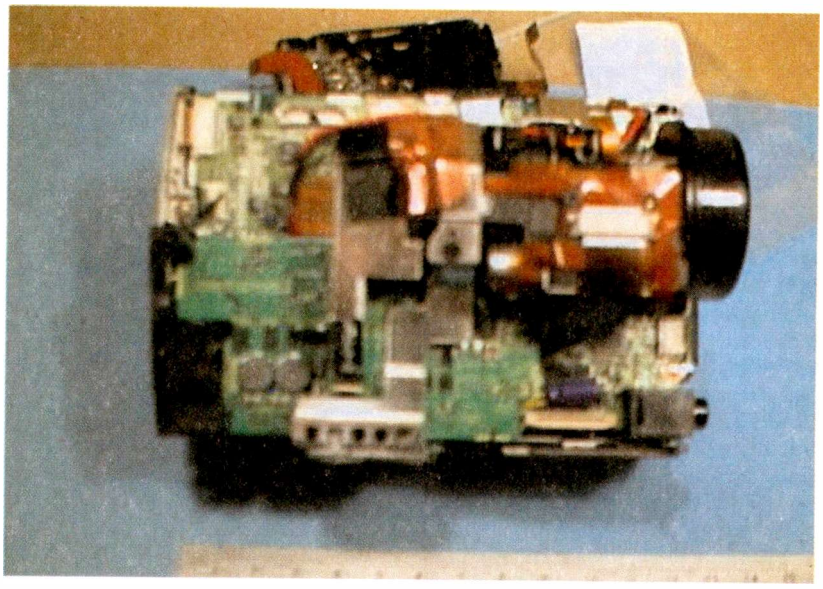


Fig. 3: Circuitry on the secondary side of the power supply.

In conclusion

Although I've provided circuit details for a satellite scanner before, I felt it appropriate to publish this updated version with its benefits of size reduction and weight saving. No doubt further modifications will be possible in the future – maybe a digital section, who knows? My thanks to R. Flemming of Pace Micro Technology and P. Morley of PM Satellite Systems for their help.

This latest instalment in the series by Steve Beeching, I.Eng., covers the audio side of the digital video cassette format



What is DVC?

The DVC format records the audio signal as PCM (Pulse Code Modulation). There's an option for two-channel (stereo) or four-channel (two stereo channels) sound tracks, the specifications being as follows:

Two channels, 16 bits with 48kHz sampling
Four channels, 12 bits with 32kHz sampling.

There's a further option for playback only: two channels, 16 bits with 44·1kHz sampling. This is similar to the CD format and is possibly for replay of music tapes.

Tape layout

The tape layout for the two record/playback options differs. It's designed to keep the data volume the same on each audio section of the digital track whatever the option. For two-channel, 16-bit digital audio the first six tracks of a frame are used for the left-hand channel and the following six tracks for the right-hand channel. This is shown in Fig. 1. There is no option for dubbing additional sound with this option.

In the four-channel mode, see Fig. 2, the first six tracks of a frame are allocated to the normal left and right stereo sound channels from the microphone while recording pictures. The next six tracks are allocated to dubbed L′ and R′ audio. Thus when dubbing is undertaken in the four-channel mode the original audio tracks remain intact and the dub sections are replaced without affecting the ITI or video data at either side. During playback the menu options are: sound track 1, sound track 2 and mixed playback of both.

Customers are often confused by this. We get complaints about audio playback failure when the customer has set the recording-menu option to 12 bits and the playback menu to ST2, which is blank unless dubbed.

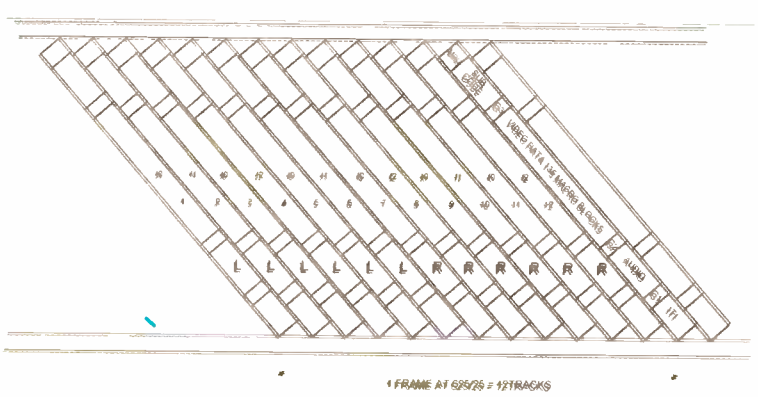


Fig. 1: Tape layout with two-channel, 16-bit/48kHz audio.

Data volume

The data volume for two-channel, 16-bit 48kHz sampling is

2 x 48kHz x 16 = 1,536kbits/sec (768kbits/sec per channel).

The data volume for two channels of the four-channel, 12-bit 32kHz sampling is

2 x 32kHz x 12 = 768kbits/sec for both channels.

This shows that 12-bit/32kHz audio data fits two sound channels in the same space as one channel of 16-bit/48kHz audio data.

768kbits/sec ÷ 25 frames ÷ 6 tracks = 5,120bits/track. The audio data allocation for one head scan track of the tape is just over 5kbits.

Audio error correction

The audio data is segmented and scattered in a fixed way

on the recorded tape in a similar fashion to CD. Thus if there is data loss it doesn't affect a contiguous audio data stream. Cross Interleave Reed Solomon Code (CIRC) is used for audio error correction: interpolation corrects burst errors, then Reed Solomon error correction deals with single bits.

Fig. 3 shows the idea. The audio data in the top row is contiguous and is stored in memory area. It is then read out in an interleaved format, with the data bits scattered across the data stream, as shown in the second row. Say bits 37, 2, 6, 10 and 14 are lost during playback, see third row, because of a dropout or damaged tape. After de-interleaving, the data is restored to contiguous form and the lost data now appears as random bits, see fourth row, that can be corrected by the Reed Solomon error correction process.

Parity error correction

A simple example of parity error correction is shown in Fig. 4. The original data (4, 2, 6, 8) is multiplied by a series of prime numbers (3, 5, 7, 11). The sum of this multiplication, 152, is added to the data stream as a parity checksum, then recorded. During playback the data is again multiplied by the same series of prime numbers (3, 5, 7, 11). Because one bit is in error (7 instead of 8), the checksum is this time different (141). The playback calculation is next checked against the recorded parity checksum (152).

The difference between the two sums (152 – 141 = 11) indicates which data bit is incorrect, in the example the one with 11 as the multiple. As the difference is positive, the error is negative so 1 is added to the data (7) to equate the two sums. Had the calculation indicated a positive error, say 9, the correction would be by subtraction.

Audio track arrangement

The audio data is recorded on the tape in a similar manner to the video data, being read like a page, across and down. It's arranged as sync blocks that start with sync data, then ID data, audio auxiliary data, the audio data itself and finally parity data. See Fig. 5. The auxiliary audio data contains information on the sampling frequency and number of bits per audio sample. There are fourteen audio sync blocks in total: nine audio data sync blocks and five outer parity code blocks.

The fourteen audio sync blocks each consist of 90 8-bit bytes. 14 sync blocks x 90 bytes x 8 bits x 25/24 (ATF data 24/25 modulation) = 10,500 bits. These fourteen blocks include the inner parity and outer parity checksum data. Inner parity corrects a single sync block row data error while outer parity corrects for larger errors over a number of sync block rows. This is carried out prior to the Cross Interleave correction.

Nine sync blocks are allocated to the audio data: 9 blocks x 72 bytes x 8 bits = 5,184 bits per track. This is sufficient for the calculated 5kb of audio recording data, which is not compressed.

Correction

There was an editing error in the September issue instalment in this series, on page 661. The final paragraph on this page (running over to page 662) should have read:

To summarise, a TV frame consists of twelve *horizontal* sections, each of which occupies a track on the tape. Each of the twelve *horizontal* sections contains five super blocks and, in turn, 27 macro blocks. Five by 27 gives 135 macro blocks per track.

This should be clear by reference to Fig. 5, page 661.

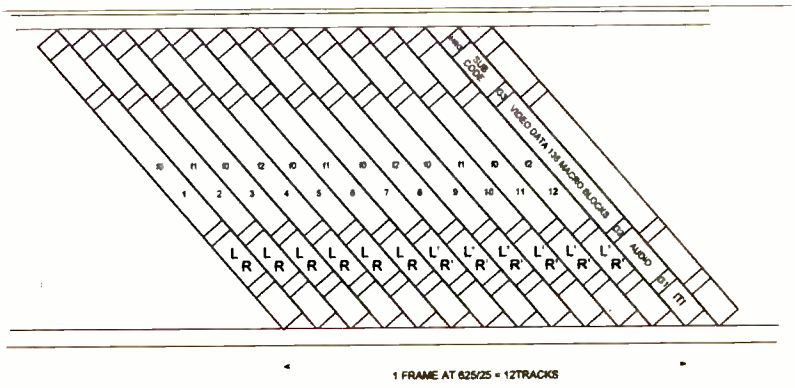


Fig. 2: Tape layout with four-channel, 12-bit/32kHz audio.

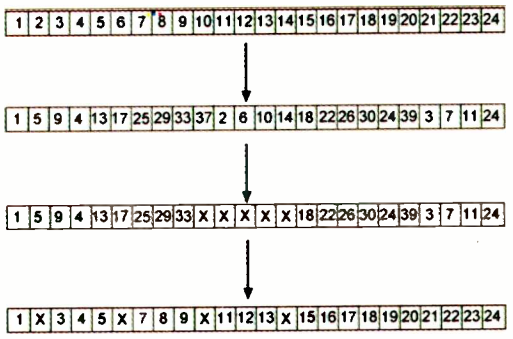


Fig. 3: An example of CIRC error correction.

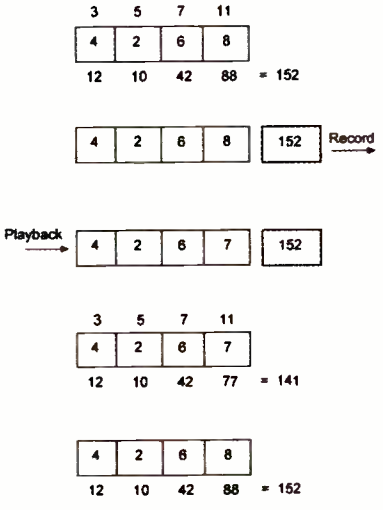


Fig. 4: An example of parity error correction.

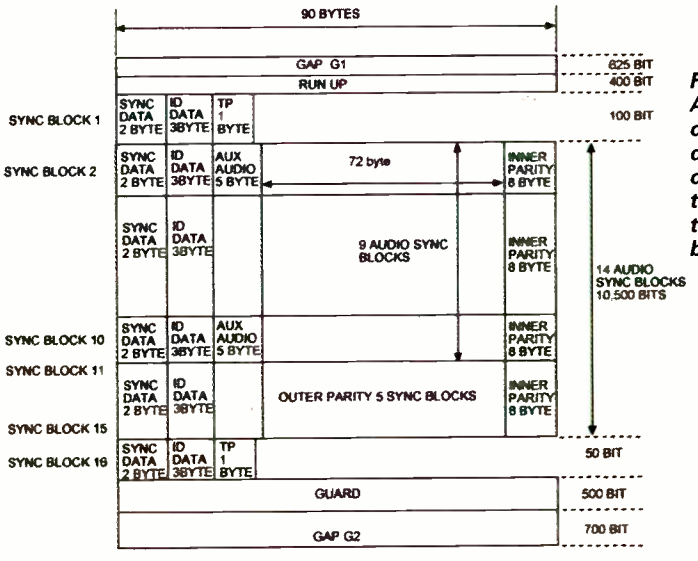


Fig. 5: Arrangement of the audio data section of the tape track as fourteen sync blocks.

Fault Guide: The Philips FL1.10 Chassis

These complex sets incorporate protection and self-diagnosis systems but can still present difficulties when fault finding. John Coombes presents a step-by-step guide

Models that use the FL series chassis are sophisticated sets that date from 1991-6. They have Nicam stereo sound, teletext, picture-in-picture (some models) and an I^2C bus control system. There are widescreen versions (these have two line output transistors) and versions with 100Hz field scanning. Some models incorporate a satellite receiver. This article is based on the basic FL1.10 chassis however.

No sound or picture is the most common fault symptom. The sets incorporate a lot of protection circuitry that will produce this condition. Note first that there are two chopper power supplies, the main (SOPS) and the standby (μSOPS) one. The latter produces the +V start (17·5V) and +5V standby supplies.

If there's no LED illumination, check mains fuse F1200 (2·5AT) and the four mains bridge rectifier diodes D6210-13 (type GP15J-16). When the fuse has blown it is more likely that the degaussing thermistor is faulty (note that the thermistor fitted depends on the type of tube).

If the power supplies are both dead with no LEDs lit, check R3252 (220kΩ) in the bias supply for the BUX85F μSOPS chopper transistor Tr7250. It tends to go open-circuit. It's helpful to remember that with the red LED alight the μSOPS power supply must be working.

The +5V standby supply powers the microcontroller chip IC7115, which therefore continues to work when the main SOPS is faulty or shut down because of a fault condition. The SOPS protection (shut down) circuitry operates when there's a fault in the field driver/output stage, the EW driver circuit or the audio output circuitry; excessive beam current; excessive EHT (the waveform at pin 13 of the line output transformer T5555 is monitored); or excessive output from the SOPS circuit (protection occurs when the voltage across C2236, the reservoir capacitor for the 13V supply, rises above 19V).

Service kits are available to repair the SOPS circuit. They include the plug-in drive/control board and all the parts that should be replaced to provide a sure, long-lasting repair. It's important to replace all the items included in the repair kit. There are four different kits for the various versions of the FL series chassis. For the FL1.10 chassis the kit is part no. 4822 310 31921.

μSOPS faults

If the supply to the microcontroller chip IC7115 is missing and the mains input circuit is OK, i.e. there's 285V across the bridge rectifier's reservoir capacitor C2214, there is a fault in the mSOPS circuitry. This is fed from the mains bridge rectifier via R3235 (1W, 5% safety type). Check whether R3235, R3252 or the transformer T5255 is open-circuit. R3250 (62W), which is in series with the chopper transistor, could be high in value or open-circuit. There are three transistors on the primary side of the circuit, Tr7201 (BC857C), Tr7250 (BUX85F) and Tr7251 (BC848). Check these for shorts, also if necessary diodes D6201 (LL4148) and D6251 (LLZC5V6) by replacement. Tr7201 and Tr7251 can be responsible for low output from the mSOPS power supply when faulty. If the on LED flickers, check the BD825 5V regulator transistor Tr7270 on the secondary side of the circuit by replacement.

If the 5V output is low, check the zener diodes D6266 (BZX79-F6V8) and D6272 (BZX79-B5V6) by replacement. The symptoms are stuck in standby with the spatial /11 symbol displayed and failure to respond to commands.

The protection arrangements

There are two forms of protection, software and hardware. Software protection operates when the microcontroller chip gets an incorrect or no response from a chip/device linked to it via the I^2C bus. Hardware protection operates when the monitoring circuitry detects one of the fault conditions listed above (see paragraph five), e.g. a faulty field driver/output chip. Fault indications are given by on-screen error code numbers, flashing LEDs, or both at the same time if the set is in the service default mode and able to produce a raster.

If the set is giving a fault indication, switch off then on again then momentarily link test points S24 and S25 on the small signals panel to enter the service default mode.

Always do this first, to establish whether software or hardware protection is in operation. Note that the service default mode can be switched off only by switching the set to standby – if the set is switched off at the mains then on again it will came back on in the service default mode. When software protection is in operation the set will run and produce an error code. Refer to the service manual for details. This feature is very helpful when dealing with intermittent faults. When hardware protection is in operation the set will not start up while the default mode is activated. The microcontroller chip will still be in operation however, producing LED indications for about five minutes – probably because it establishes that a supply is missing.

To implement the software protection mode, the microcontroller chip produces a standby output. The voltage at TP56, the standby/protection input to the SOPS control panel, then falls below 0·5V. When hardware protection is in operation the voltage at this point falls to 0·5-1V – with the set operating normally the voltage is approximately 17V. To determine whether hardware protection is active, measure the voltage at TP56 with the set in the service default mode or before error message 99 appears in the LED display.

If a line output stage short-circuit is suspected, check the harmonic tuning capacitor C2504 first. To isolate the SOPS power supply from the line output stage, disconnect L5511 at the supply side. Do not run the power supply off load: connect a 100W bulb between the supply side of L5511 and chassis. Note that the lamp will come on for only about two seconds then go out, because software protection is being activated. Use the service default mode to get the lamp to light continuously.

If the lamp does not light, check that diode D6260 (LL4148) in the µSOPS circuit is producing the +V start supply. This is nominally 17·5V but may be as high as 22V, as the µSOPS circuit is non-regulated. This is normal.

If the main power supply still doesn't start up, there could be a fault in the audio output section, which receives +16V and –16V supplies. Unsolder them both – if they are disconnected separately protection will operate.

If the main power supply is still shut down, proceed as follows. The line output stage must be disconnected and a variac used to produce a slowly increasing AC input. Remove diode D6375 (LL4148). This disables the SOPS over-voltage protection. Power the set via the variac, starting at about 60V AC. Monitor the 141V HT supply (TP57) while slowly increasing the AC input. The power supply should start up when the AC input reaches about 170V, producing the 141V HT output.

If the HT supply doesn't regulate correctly, fit a power supply repair kit.

If the power supply now runs and works correctly, replace D6375 (LL4148), Tr7380 (BC858C) and Tr7381 (BC848C). Fit replacements, don't rely on cold checks.

If the power supply didn't start up with D6375 removed, proceed as follows – with the line output stage still disconnected and the AC input not exceeding 175V. Fit a new LL4148 diode in position D6375, don't refit the old one. Then remove coil L5381. This disconnects all hardware protection except SOPS overvoltage via D6375. If the supply now operates correctly, a fault is activating one of the hardware protection lines. After refitting L5381 you can check by disconnecting individual lines. Do not operate the set with coil L5381 removed and the line output stage connected.

To check whether the field timebase is the cause of hardware protection operation, connect one probe of a dual-beam scope to TP62 and the other to the 28V supply, with both inputs DC coupled. If there's a field deflection fault, the 28V voltage will start to fall while, at the same time, the voltage at TP62 rises. If there is a slight delay between these two events, the field timebase is not causing the protection to operate.

To check the E/W circuit, connect a DC-coupled scope to the collector of Tr7540. If the voltage rises to 14V then falls to 0·7V before dropping to 0V, the E/W circuit is the cause. If the voltage rises to 14V and remains steady before falling to 0V the E/W circuit is not the cause.

The line output stage can be checked by using a scope to check the amplitude of the pulses at pin 13 of the line output transformer. If they exceed 16·5V the protection will operate. This could indicate a faulty or poorly-connected component.

Excessive beam current is given away by the appearance of a very bight screen before the protection operates.

A simpler method of checking whether the SOPS supply is the cause of hardware protection being initiated is to connect a DC-coupled scope between TP59 and chassis. If the voltage exceeds 19V the SOPS is faulty. There will be spurious shut down if zener diode D6376 (LLZC18V), which monitors the SOPS circuit, is leaky. Check it by replacement. D6376 can cause very intermittent shut down.

Protection is held on by a latching circuit that consists of Tr7380 (BC858C) and Tr7381 (BC848C). Check these transistors by replacement if the set is stuck in standby. With some sets you can get a ticking noise from the power supply and a line on the screen when Tr7381 is faulty: this occurs when the receiver gets hot.

Line timebase faults

If the receiver is dead with the red LED lit, check for dry-joints at the line driver transformer T5503 (which could also be open-circuit) and the line output transformer T5555. With a dry-joint condition the set may run for long periods of time until hot, then cut out. If the line output transistor Tr7506 is short-circuit, ensure that T5503 is not dry-jointed. If T5503 is OK, check the tuning capacitor C2504 which may be leaky or dry-jointed. C2504 is a 2kV safety component whose value varies with the model/tube – from 330pF to 2·2nF. In later production the voltage rating was increased to 3kV. Various selected line output transistors have been fitted. I generally use a 2SC4288A which seems to work well.

A dead set with the standby LED on can be caused by an EW circuit fault. Check the driver transistor Tr7610 (2SA1359) and diode D6525 (BYW95C). Tr7542 (BC857C) in the protection circuit will cause this fault when leaky. If there's no EW correction, L5526 may have shorted turns.

If the receiver goes into the protection mode when warm and the display on the front panel starts to flicker, check for dry-joints at T5503. Dry-joints at L5526 can be the cause of the set going into the protection mode intermittently.

Some receivers can go into the protection mode for no apparent reason because the line output stage protection is too sensitive. For monitoring purposes the waveform at pin 13 of the LOPT is connected to D6546 via an *RC* coupling network that consists of C2547 and R3547. The sensitivity of the circuit can be reduced by lowering the value of C2547 and increasing the value of R3547. It would be as well to consult Philips Technical if you think this should be done, quoting the model and serial number.

Field timebase faults

The field driver and output stages are in the TDA3654Q chip IC7450 which is monitored at pin 7 by the protection

circuitry. Thus failure of this chip will switch off the SOPS circuit.

For field collapse without switch-off, check whether IC7450's 29V supply (pin 9) is present. It is derived from the line output transformer. If it's missing, check D6534 (BYD34G) and the associated components, especially C2535 (1,000µF, 35V), R3534 and R3535 (both 2·7Ω safety type). The field drive input is at pin 1 of IC7450 (test point TP64). If this is missing or incorrect, check the TDA2579B/N8S1 timebase generator chip IC7400 by replacement. Open-circuit field scan coils could be the cause of loss of field scanning.

If there is very intermittent field collapse, check for dry-joints at IC7450 and if necessary the scan coil plug/socket. Before resoldering the plug/socket, clean the pins so that the resoldered joints are good.

The TDA3654Q chip can be the cause of reduced scan at the bottom of the picture when warm. If this problem is experienced, check the chip by replacement.

If there are flyback lines on the picture check whether zener diode D6451 (BZX79-C8V2) is open-circuit.

Loss of sync

This occurs when R3509 (100kΩ) goes open-circuit, removing the line flyback pulse feed to pin 12 of the TDA2579B/N8S1 sync/timebase generator chip IC7400.

Tuner/IF faults

Low gain, with a snowy picture and noisy sound, is the most common fault. It may be intermittent, or there may be picture flickering or blanking out to give no picture or sound. Other possible symptoms are failure to tune in some channels, tuning drift, the colour disappearing or even interference on a particular channel. The cause of these faults is a poor earth connection at the tuner unit's screening plate. The solution is to resolder the plate.

If the receiver goes into channel search and continually runs through the search mode, check/replace the tuner/IF unit.

For failure to tune, check R3240 (100kΩ, 5%, 0·5W) in the power supply. When this resistor is open-circuit there will be no tuning voltage feed.

Audio faults

No sound usually means failure of the TDA1521Q/N4 audio output chip IC7000, which should be checked by replacement. With this fault the set will switch to standby via the protection system, showing error code 99.

If the sound keeps crackling on all channels and the receiver sometimes goes into standby with no error code, check the Nicam module by replacement.

If there is a noise in one channel but the other one is OK, suspect the TDA8425/V7 audio control chip IC7680. Check it by replacement.

Remote control faults

The remote control units are very reliable but the battery connections can cause problems – intermittent operation or no results. The buttons can stick or go short-circuit. As a result the batteries will fail. If the remote control unit is inoperative or the functions are incorrect, check whether there has been liquid spillage into it.

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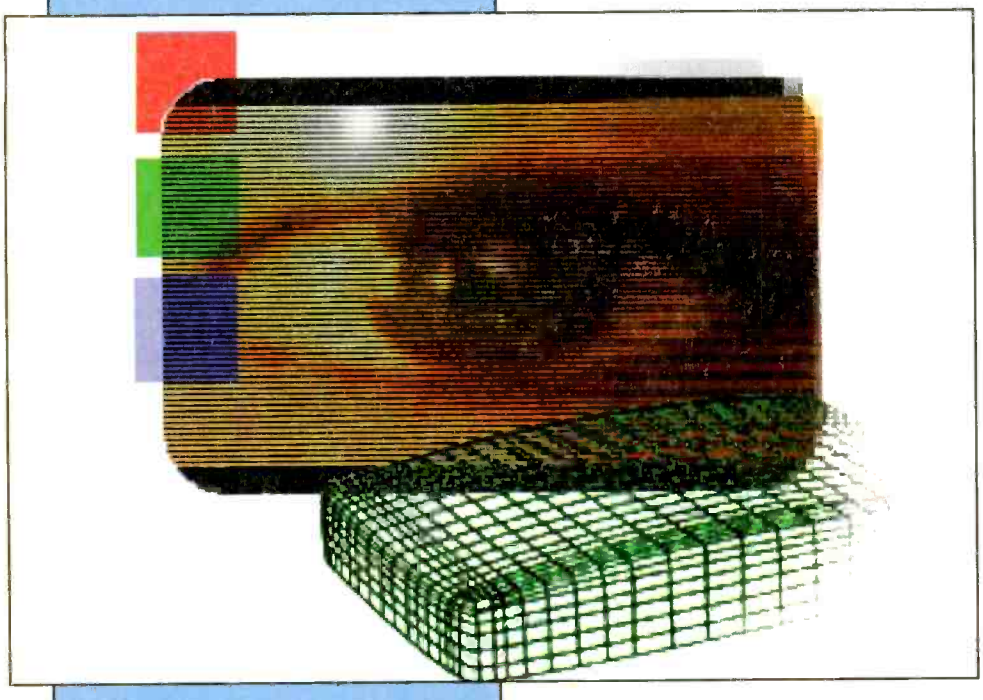
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

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



TV FAULT FINDING

Reports from
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Giles Pilbrow
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Colin J. Guy
Mike Leach and
Denis Foley

Sharp 66DS05

Failure to come out of standby is becoming a common problem with these sets. The cause is the BUH515 line output transistor going short-circuit. It usually fails because of a dry-joint at the line scan coupling capacitor C613 (0·68µF, 250V). **M.D.**

Sony KV2766

This is a big set and, to make matters worse, it was used upstairs in a bedroom and the fault was intermittent. When a satellite TV signal was fed in at the scart socket, the terrestrial signal remained on the screen. As the set gradually warmed up, the satellite TV picture and sound started to break through. The cause of the fault was eventually traced to a capacitor on the power supply PCB. The 6V output was slightly low, the culprit being C655 (220µF, 25). It had an ESR of 4Ω and its capacitance value had fallen to 80µF. **M.D.**

JVC C14E1EK (Onwa chassis)

The customer complained that this set wouldn't come out of standby, but I never saw the fault while the set was on test. What I did notice was a slight field bounce when the channel was changed. The fault was in the line output stage derived 12V supply, which was slightly low at 11·5V. Safety resistor R434 (0·68Ω) was the culprit. It read high at 1·2Ω.

I've since had R434 go open-circuit intermittently in other sets. This ties in with the customer's original complaint. **M.D.**

Bush 2550NTX

These not very old sets can suffer from a very serious burn up at the line scan plug connector. If you get one in for repair before this happens, resolder the pins at the deflection coils socket. If the burn up has already occurred, the set will almost certainly be a write-off. **M.D.**

Sharp DV6632H

For ragged verticals and EW distortion in the corners, replace C623 (4·7µF, 63V) in the EW diode modulator drive circuit. It's right in front of the hot-running EW driver transistor Q603. **M.D.**

Mitsubishi CT25M1TX

There was sound but no picture. The cause was loss of the 5V supply to the teletext ICs. I found that circuit protector Z95 (630mA) on the power supply PCB was open-circuit. **M.D.**

Bush 2914

This set produced a good picture and sound, but the chopper transformer was squealing very loudly. When I removed the back I immediately saw that a new line output transformer had been fitted. This is where the trouble lay. The sync winding for the power supply had been fitted the wrong way round. It consists of three turns of insulated red wire wrapped around the core of the LOPT. The correct phasing is vital. In Panasonic sets a black stripe indicates the polarity, but this transformer didn't have any indication. All that was required was to reverse the connections to the winding. **M.D.**

Ferguson B14R (TX80 chassis)

If one of these sets refuses to come out of standby, check whether DP12 or DP36 is short-circuit. They are both type BA157. Beware however: the mains reservoir capacitor CP31 remains fully charged in this condition. **M.D.**

Hitachi C2133TN (Nokia Stereo chassis)

The customer said "there was a crack like breaking glass, then nothing". I took the back off, expecting to see a shattered fuse and associated power supply damage, but everything seemed to be OK. When I connected the mains supply and switched the set on there was the welcome rustle of

EHT followed by the appearance of a snowy raster. There were no on-screen graphics, and the channel-change buttons on the set and the remote control unit did nothing apart from produce a red-LED flicker.

I've had only one of these sets before, some two years ago. What seemed like acres of surface-mounted silicon had to be replaced, which cost a lot of time and money, and the customer never came back. Since then the set had been in use in my son's bedroom. It now proved useful, enabling me to carry out voltage and waveform comparisons between the faulty and the working set.

The service manual is very sparse on information, and quite misleading in places. For example the supply labelled "stby 5volts" is present only when the set is not in standby. Comparison checks showed that all the voltages were the same, and there was no discernible difference with the clock and data lines. I replaced the EEPROM, because it's easy to do, but this didn't help.

Once you get to this stage the only logical approach is to replace the cheapest chip first. But inspiration then struck – unfortunately about three hours later than it should have done! I disconnected the clock and data lines to the Nicam processor chip, a 64-pin monster that costs about £35. When I switched on again there was an excellent picture and all functions were restored – apart from the sound of course. **S.H.**

Ferguson ICC9 Chassis

There was no vision when this set was first switched on, just a blank raster with intermittent flashing that, in time, became more frequent until the picture appeared. A check through the video path when the set was in the fault condition revealed that transistor TC02 (BC848) was reverse biased, with its base at 4V and its emitter at 4·5V. The cause was the next surface-mounted transistor in the stage, TC03 (BC858), which was leaky from emitter to collector – there is DC feedback to the previous stage. TC03's collector voltage should be 3·8V, not 9V as it was in this set. **I.B.**

Beko 11.1 Chassis

This large set had no life and no model identification label, which had probably been removed sometime during a dubious part of its history. Thanks to the Harvey service manual library, I was able to discover the chassis type and then found that the 4·7Ω safety resistor R101 in the feed to the line driver stage had expired. After carrying out the usual checks for shorts, the condition of the driver transistor TR101 and the presence of line drive from the jungle chip, I tried fitting a new resistor. This didn't bring success.

The next logical suspect seemed to be the line driver transformer T101. It's not listed in SEME's catalogue but proved to be a modestly-priced stock item, no. BE051709. When the replacement arrived I decided, before fitting it, to compare the DC resistance of the primary winding in the new and the old transformer. The readings were 4·2Ω and 1·8Ω respectively. This confirmed that the original transformer was defective. **C.A.**

Sharp DV5103H

This set seemed to be dead. There was HT however, but it was low at 35V. The cause was Q509 (BC635) and Q510 (BC338) in the field timebase: they were both leaky. C236 and C502 were also replaced.

There appear to be different versions of this chassis. Our circuit diagram showed an IC field output stage. **G.P.**

Bush 2863NTX

There was field collapse, with no ramp signal at pin 42 of the TDA8362 multi-purpose chip. The ramp generator is fed from the 33V tuning supply. Because R818 (22kΩ, 1W) was open-circuit, this feed was missing. **G.P.**

Sony KVM2101U (BE2A chassis)

This set suffered from very intermittent and sporadic interference that seemed to respond to tapping or flexing the PCB. The cause of the problem was found to be a bad earth connection at the STR54041 chopper chip's heatsink (IC601). The joints looked all right but the tags were badly tarnished. Cleaning and resoldering cured the fault. **G.P.**

Bush 2052T

There was no sync (line or field) though the on-screen display was OK. IC301 (AN5601K) is the main video/chroma/timebase/sync processor, video being fed in at pins 15 and 16. The only problem I could find was that there appeared to be a very low-frequency signal superimposed on the video waveform. When pin 16 was disconnected the waveform was normal, though with a blank raster of course. So I decided to replace the IC, which unfortunately made no difference.

I checked everything around IC301, all to no avail, and began to realise that this was not the usual component type of fault. Then an idea occurred to me. Under and above the main PCB there's black gunge (adhesive) that's used to secure various wire links. I'd once had trouble with this type of glue in an Amstrad SRD510 satellite receiver – it had caused intermittent and weak video. I decided to remove all this black glue from the underside of the PCB. When I switched the set on again after doing this the fault had been cured. **G.R.**

Ferguson D59N (ICC9 chassis)

This set had field flicker (as if the frame hold control was incorrectly set – them were the days!). Scope checks revealed the presence of a 25Hz squarewave at pin 20 (breathing correction) of the STV2160 multi-function chip IV01. There should, according to the manual, be no waveform at this point. Pin 20 is decoupled by a 1nF surface-mounted capacitor, CV11. In fact the manual was wrong: the capacitor was 100nF, and it was open-circuit. I tried a 1nF capacitor, but this had no effect. A new 100nF capacitor cured the fault. **G.R.**

Onwa K9228

This set was stuck in standby. Checks around the microcontroller chip proved that there was no clock oscillator operation. A new 8MHz crystal was all that was required to restore normal operation. **G.R.**

Samsung CI5373T

If the complaint is sound sibilance (hissing etc.), add a 330pF capacitor across C223. We've done this with half a dozen of these sets now. C223 is mounted at the front right corner, just outside the screening can. **G.R.**

Bang & Olufsen 3201 (MX4500/5000)

The problem was the tuner going dead when tapped. To clear this fault, remove the VHF module. There are two modules: the one to remove is that closest to the chassis edge, just behind the aerial input. If the customer requires VHF operation, try a blanket resoldering of the VHF module. The other one, which provides UHF operation, doesn't appear to give any problems. **G.R.**

Hitachi C2576TN

The complaint was stuck in standby. In fact the protection circuit was in operation. You can prove the point by measuring the voltage at the gate of thyristor Q958, which is near the line driver transformer. If the reading is 0·7V, the protection circuit in operation. A wire link across C932 will disable it, but I

wouldn't recommend doing this.

Fortunately a careful inspection revealed that one of the audio output chips (IC4500) had a hairline split in its case. Disconnecting it brought the set back to life. A replacement was then ordered. **G.R.**

Nokia 6364UK SFN

This set was dead with no sound or picture. I soon found that the S2000AF line output transistor was short-circuit. After fitting a replacement I looked for a cause of its failure and found that the two tuning capacitors next to it were dry-jointed and sparking. After cleaning up the PCB and resoldering the connections I ran the set on test for two days to prove that it was OK. **G.S.**

Nokia 5156 Stereo Plus

If there is no sound or faint noise, try disconnecting pins 7 and 9 at the Nicam module. The mute transistors VA60 (BC857) and VA61 (BC847) are suspect if the sound then comes up. **G.S.**

Goodmans 1404

The customer said that the fine tuning didn't work. I found that channels could be tuned in correctly in the tuning preset mode but, on reverting to the normal mode, every channel would be slightly off tune. As a result, the pictures were patterned and distorted.

There seems to be little information available on this model. Despite this I was able to cure the problem by slight adjustment of the AFC tank coil T103. **G.B.**

GoldStar CF25A64DF (PC73A chassis)

There were flyback lines at the top of the picture. The cause was FR359 (10Ω fusible), which was open-circuit. It's in the flyback supply for the field output chip. **C.J.G.**

Toshiba 2500TBT

The top of the picture was badly stretched. I found that C303 (2·2µF) was open-circuit. Though part of the field timebase circuit, it's well away from the output chip. **C.J.G.**

Grundig P37-070 (CUC7301 chassis)

The line output transistor was short-circuit. A replacement ran hot, and the picture was displaced to the right. The cause turned out to be transistor CT169 (BC858B), which is a buffer between the TDA8362A chip and the line driver stage. It was, as so often with these surface-mounted devices, leaky. **C.J.G.**

Ferguson T5173GF (TX91 chassis)

At switch on there was a burst of EHT then the set reverted to standby, with the standby LED flashing. I found that the set would power up and produce a blank raster when the microcontroller chip's reset input was held low. So the power, line and field stages were all OK. I then noticed that IR03 is a 24C04 EEPROM. Being highly suspicious of this device, I fitted an empty one. The set then powered up with the set-up menu showing. A complete set up and retune completed the repair. **C.J.G.**

Panasonic TX21S3T (Z7 chassis)

A loud whistle came from the power supply because there was no line drive. D861, which supplies the start-up supply for IC601, was open-circuit. **C.J.G.**

Thorn P1480R (Daewoo C901 chassis)

There was no sound at all from this set. The cause was traced to the sound detector coil L128. One from a scrap set restored normal operation. **C.J.G.**

Sharp DV5165H (4BSB chassis)

The line output transformer was short-circuit between its primary winding and chassis. When a replacement was fitted a loud screaming noise came from it. Voltage checks showed that the 5V supply was low at 4V. A new 7805 regulator (IC751) restored normal operation. **C.J.G.**

Philips 25ST2761 (GR2.2AA chassis)

This set would pulse on and off for a couple of minutes when it was first switched on from cold. Replacing C2559 (100µF, 25V), which smooths the supply to the line driver stage, improved things but the set was still reluctant to start. A replacement CNR50 optocoupler completed the cure. **C.J.G.**

Sony KV25K5U (FE1 chassis)

This new, boxed set had peculiar symptoms. There was a snowy, low-gain picture and a noise that sounded a little like a 1kHz tone came from both speakers. This tone was also audible in the AV mode, but the picture was then OK. I wondered whether the tuner was faulty, but ruled that out because the AV switching would isolate it in the AV mode.

I decided to concentrate on the audible tone and tried fitting the known good stereo decoder board from a stock set. This made no difference. As the 5V output from regulator IC604 in the power supply was slightly low at 4·96V I tried disconnecting it and fed in an external 5V from the bench power supply. This produced good results in all sound and picture modes. But replacing several components in the set's 5V supply failed to cure the fault: the set still produced the same symptoms when its own 5V supply was used.

After spending some time carrying out checks the set started to work all right by itself, but the fault was back next day. This prompted me to try the use of heat and freezer. It still took some time, but I eventually discovered that the set worked correctly when the main microcontroller chip IC001 was heated intensively. When I carried out a substitution check with the stock set, swapping over the microcontroller chips, the fault appeared in the stock set.

It seems that from cold the clock and data lines from the main microcontroller chip were upsetting the tuner and stereo decoder, thus producing the two fault symptoms. A new microcontroller chip restored correct operation. **M.L.**

Nokia 5524UK FX (Mono Plus chassis)

This usually reliable chassis is beginning to suffer from a common problem, slow start up from cold. A quick rustle of EHT can be heard at switch on, then the set goes dead with no standby light display. The cause is normally CO33 (10µF, 160V) which is the reservoir capacitor for the HT supply. **M.L.**

Sharp 66CS-03H

A common fault seems to be emerging with these sets: slow start up from cold. The front green and orange LEDs will usually flash, and there will be no response when the remote control unit is used. Apart from dry-joints, try replacing C714 (1,000µF, 25V), the reservoir capacitor associated with D712. You will quite often find it bulging or even split. **M.L.**

Philips/Dynatron G110 Nicam Chassis

Field bounce and rolling were caused by failure of C2465 (220µF, 16V). It smooths the 12V supply (+12d) which is used by the TDA2579 timebase generator chip IC7470. **D.F.**

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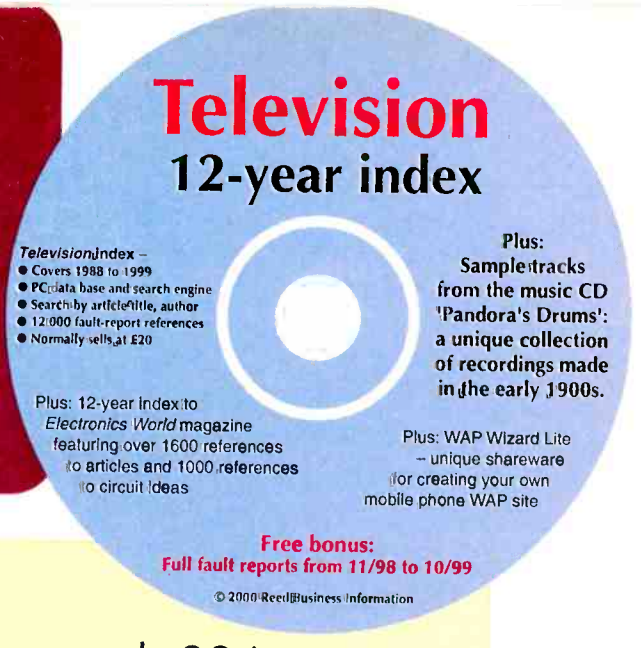

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Each piece of software is in a folder.

The folders 'TvIndex' and 'EwIndex' are the *Television* and *Electronics World* indexes for Windows 3.1, 95, 98 and NT. In each folder, there's a '.TXT' text file containing a description of the software and installation details.

To load the WAP Wizard Lite shareware for 95, 98 or NT4-SP4, run the 'Setup.exe' program within WAP the folder. There's an HTML file in the folder containing instructions on how to use the program.

You can use your audio CD player as normal to play the audio CD. Your player should ignore the data, but as a precaution, at first playing, start with the volume turned low. Note that if you are using an audio CD player or CD player on the PC, these tracks appear as audio tracks 2 and 3. Track 1 is blank. On the Mac, they're tracks 1 & 2.

The folder called 'Wordgen' contains software relating to Colin Attenborough's article describing a word generator for digital testing that appeared on page 880 of *Electronics World*, November 2000. This folder includes the PC controlling program and PLD software.

An 8-input video selector was described in the October issue of Electronics World. Object code and Protel PCB files this article are in the folder entitled, 'VidMPX'. The PC-based control software is included. Copy the two folders to two floppies then run 'setup.exe' on the first floppy.

The folder 'Lights' contains the software for the Christmas lights 'Circuit Idea' in the December 1999 issue of *Electronics World*.

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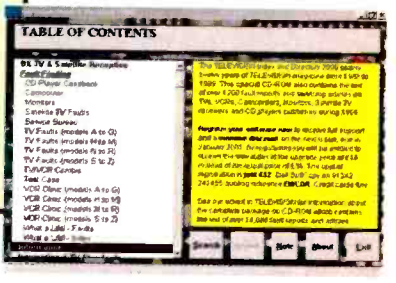

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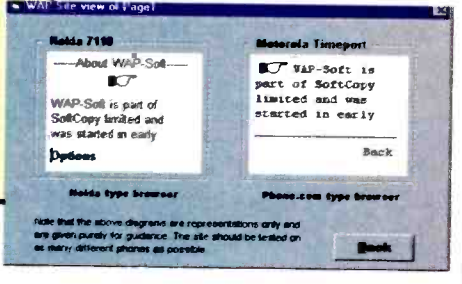

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For more details, see page 53.

Terrestrial DX and satellite TV reception. News about terrestrial channel and satellite belt changes. Interference caused by switch-mode power supplies, and the need for a combined C and Ku band LNB to enable a single dish to be used. Roger Bunney reports

DX and Satellite Reception

Signal reception via the E layer continued well into August this year. In fact it has been one of the best seasons for SpE reception for some years. Here's the SpE reception log for the month:

2/8/00 TVE (Spain) chs. E2, 4; RTP (Portugal) ch. E3.

4/8/00 RAI (Italy) ch. IA; TVE E2-4; RTP E3; YT-1 (Ukraine) R2. I noted a smudgy Loony Tunes cartoon at 0810 BST on ch. E3, possibly JTV.

5/8/00 RAI IA, B; RTP E3; TVA (Italy) E3; TVE E2, 3; NRK (Norway) E4; RTL Klub (Hungary) R2.

6/8/00 YT-1 R2; ORT (Russia) R2; TVE E2-4; RTP E2, 3; TVA E3.

C-band satellite reception. An RTD (Radio Television Djibouti) presenter via Arabsat 2B (30·5°E).

7/8/00 TVE E4; YLE (Finland) E4; SVT (Sweden) E2; the old Russian 0249 mono scope test pattern was seen on ch. R2 at 1239 BST, origin unknown.

8/8/00 RAI IA; TVA E3; RTL Klub R1.

12/8/00 RAI IA; RTP E3.

13/8/00 RAI IA; TVA E3; TVE E2-4; RTP E3.

16/8/00 RAI IA; TVA E3; YT-1 R1; Belarus R1.

20/8/00 RAI IA; TVA E3; TVE E2-4; RTP E2; NRK E3, 4; RTL Klub R2; LTV (Lithuania) R2.

31/8/00 RAI IA, B; TVA E3.

The very hot weather during August 23rd-25th provided excellent Band III and UHF tropospheric signals, with good reception of RTL (Luxembourg) ch. E7 as far as the Midlands. French signals swamped the south coast, while Benelux and German signals were present in Eastern counties. Unfortunately the Perseids meteor shower didn't produce any worthwhile signals in early August.

The August issue of *Six News* and the September issue of the RSGB publication *RadCom* both report extensively on quite remarkable SpE reception from May through to July. With amateur radio we are talking about SSB signals with a bandwidth of perhaps 2·5kHz: a TV-DX signal has a bandwidth of at least 2-3MHz, while the lowest channel, A2, is some 3·5MHz higher. Harrogate listener David Whitaker heard ten North American stations on July 10th. On the same day Howard (WB4WXE) in Alabama made contact with many UK and Dutch amateurs. On May 29th Pat (W5OZI) in Texas heard G3WZT (UK) at the early hour of 1420 GMT.

Canadian/East coast US stations were present until nearly 0100 hours on July 10-11th. May 25th was another good day, with perhaps the season's first transatlantic contacts. On June 20th there was two-way contact between Barbados and the UK at 2058 GMT: the best distance that day was Barbados-Sweden. A DXpedition to the Virgin Islands reported five European openings over June 25th-July 9th, with reception from mid-evening onwards, typically 1920-2230. Peak days were July 9th-11th, with FAI propagation also noted – FAI (Field Aligned Irregularities) produces a fluttery type of signal reception (for more on FAI see page 17 of the *TV-DXers Handbook*). The best UK to North American contact during this period was between Chris (G4IFX) and K5AM (in New Mexico) at a late 2324-0051 GMT, a distance of 8,258km.

Satellite reception

The main news during the period was from Russia, and unfortunately it wasn't good. On August 27th there was the dramatic fire at the top of the Moscow Ostankino TV tower. This massive concrete tower, the World's second highest man-made structure, rises to 1,772ft. It is of great interest to TV-DXers, being the transmitting base for Moscow's TV and radio (except

MW) services, also mobile radio, out-of-town microwave links and other communications. There's also a restaurant.

The fire originated towards the top of the structure and spread downwards to about 300ft AGL. The fire brigade's hoses reached only to 270ft, but stopped the fire spreading any farther down. By the 28th the fire had burnt itself out. I monitored the 3·675GHz (C band) RHC-polarised analogue downlink via Gorizont 31 (40·5°E). This carries the PTP channel, which I assume had lost its Moscow terrestrial coverage as it's transmitted from the tower – some eleven TV and twelve radio channels were put out of action. There was extensive footage of the fire and those attempting to deal with it, with remarkable close-ups of the transmitting aerials surrounded by smoke and flames.

The Reuters 'RTV Moscow 1' carried live reports of the fire during the early morning of the 28th. This was via NSS K (21·5°W) at 11·550GHz H (SR 5,632, FEC 3/4). The usual Moscow-London 11·600GHz H digital feed via Eutelsat II F3 (now at 21·5°E) appeared to be quiet – at least whenever I checked. ORT-1 provides a very strong C-band signal at 3·675GHz via Express 3 (11°W). While checking this slot I thought it worth doing a Ku-band scan in case something was active. The RDS receiver stopped at 11·518GHz V, the Serb 'RTS-Sat' programme channel (service identification 'RTS Sat', SR 16,000, FEC 3/4, VPID 1281, APID 1282). The same package includes colour bars with the identification 'Feed'!

In mid-August NSS K carried numerous reports from Moscow on the loss of the nuclear submarine Kursk, operating out of Murmansk. These reports were for many of the World's broadcasters: the Middle East in particular took many live reports. John Locker (Wirral) reported live feeds from Murmansk via Eutelsat II F3 at 12·520GHz H digital.

More tragedy, some days after the Air France Concorde crash, when a GulfAir plane on a Cairo-Bahrain flight hit the sea on landing. This was on the 23rd. A check on the Bahrain programme downlink via Arabsat 3A (26°E) at 11·767GHz H (SR 27,000, FEC 3/4) showed that there were numerous programme breaks for news flashes on the crash.

There were happier events during August. From the 26th onwards NSS K carried live downlinks from Nigeria of Bill Clinton's visit. An evening transmission from 2100 hours onwards at 11·462GHz V (SR 5,632, FEC 3/4, VPID 512, APID 640) for the US networks featured speeches and dancing, both traditional and Western.

The on-going Somalia Peace Conference was carried via Arabsat 2B (30·5°) at 4·078GHz RHC, an analogue transmission. This is a relatively strong downlink from RTD (Radio Television Djibouti).

Meridian TV transmitted live yachting reports via Intelsat 801 (31·5°W) at 10·922GHz V in clear MPEG for the *Meridian Tonight* magazine programme in early August. As usual BT carried the uplink, which was identified as 'BT TES 52', closing down rapidly once the insert had been transmitted.

The German Bayerischer Rundfunk service's *Space Night* showed the successful launch of Brazilsat 84 and Nilesat 102 from Kourou just after midnight (our time) on the 18th. It's worth checking this programme on weekday nights from about midnight. Transmission is via Astra (19·2°E) in analogue form at 11·141GHz H, with the audio at 7·02/7·20MHz. Nilesat slots in at 7°W, alongside 101, with outputs in the 12·110-12·480GHz spectrum directed at North Africa and the Middle East.

Cyril Willis watched parts of the Czech motorcycle Grand Prix over the weekend of August 19/20th, with OB coverage via Eutelsat II F4 (10°E). Two feeds were available for the event: the main live action was at 11·081GHz H, with action re-runs of highlights at 10·946GHz V, both with SR 10,847 and FEC 3/4. It's likely that two OB vans were in use at Brno – a single van would have diplexed both feeds on to a single frequency.

The Chechnyan problem seems to have taken a back seat recently. Roy Carmen noted a news feed via Eutelsat W2 (16°E) in early August however. It featured life with the Soviet army there. The transmission was at 12·540GHz H (SR 5,632, FEC 3/4).

Bandula Gunasekera (Colombo, Sri Lanka) reports reception of IBA (Israel) via the LMI-1 satellite at 75°E (south beam), his second Ku-band signal (C band is mainly used in Asia). IBA-3 appears as an analogue signal at 12·670GHz H with audio at 6·60MHz (Hebrew) and 7·02MHz (Arabic). There are radio channels at 7·38, 7·74, 7·92 and 8·10MHz. Bandula is looking forward to reception from the newly-launched Europe*Star at 45°.

Live shot of the July riots in Lima, Peru, seen from the Reuters office window. Fed via the Reuters uplink to NSS K.

My thanks to Alexander Gorski, a freelance cameraman from Paris, who has cleared up the mystery 'CIP PARIS' identification seen on colour bars. It originates from a studio/video facility known as CIP-Video (CIP = International Press Centre) in Paris (Palais des

Bahrain TV news carried many pictures of the downed passenger plane on August 23rd. Reception via Arabsat 3A (26°E) at 11·767GHz H.

Congres). The facility is connected to France Telecom Serte via fibre/microwave links.

Broadcast news

UK: BT Broadcast Services has commissioned a fibre-optical cable that links Paris and London, offering competitive overall circuit costs. It will enable French media groups and broadcasters to bypass the France Telecom satellite teleports, feeding output to the BT London teleport for onwards linking to the USA by satellite or further cable.

With plans for major TV changes at the BBC, funds for DAB have been frozen and two planned digital radio channels have been put on indefinite hold. Several contracts involving digital radio have not been renewed.

France: The French national network TF-1 has formed TF-1 Digital in a move towards subscription TV. The TF-1 Digital package will include Eurosport, LCI, LCI-Finance, TFX (an entertainment channel), Shopping Avenue and Odysee, also the Brittany regional TV channel TV Breizh. Recently introduced French media laws are designed to encourage a move to DTT: new operators are to be offered frequency allocations and existing broadcasters will get two-five channels each. The plan is for some thirty channels to be on air by the end of 2001.

Germany: Various satellite/terrestrial channels have changed hands. The news channel N24, SAT1, Pro Sieben and Kabel 1 have joined the Kirch Media group. Kirch has also bought TM3, which is aimed at female viewers, from News Corporation. This will give Kirch 30 per cent of the German TV market. TM3 is to be renamed Sun TV.

Monaco: The broadcast authority has reluctantly allowed the first 50MHz amateur radio transmission tests. Although Band I hasn't been used for years, the TV channel F2 allocation (819-line system E) has been retained.

India: The BBC is to provide a planning consultancy for the future conversion of Doordarshan TV's terrestrial services to digital form. DTT will first be provided in the major cities: Madras, Bombay, Calcutta and New Delhi.

Orbital news

Though BSkyB's analogue channels via Astra at 19·2°E are being switched off in favour of the digital slot at 28·2°E, German broadcasters are queueing up for channels at 19·2°E: the latest are music channels Viva and Viva Zwei. DFS Kopernikus 1FM3 has replaced 2FM2 at 28·5°E because of problems with the latter's steering.

Arianspace has signed a contract to launch nine Ariane-5 rockets to carry cargo and supplies to the International Space Station, which is at present under construction. Missions will start in the autumn of 2003 and run to at least 2014.

Two new Indian channels are being carried by Thor (0·8°W): B4U Movies, which screens a minimum of five movies a day plus music and general entertainment; and B4U Music, which offers film-related and other musical material. Bollywood Eros Network, an Indian company, signed with Telenor Broadband Services to carry the channels on Telenor capacity – at 12·226GHz V, SR 28,000, FEC 7/8.

The new Lockheed Martin satellite LMI-1 is now in operation at 75°E, offering broadcast, corporate, internet and other data service hookups via northern and southern beams. The Ku beam coverage extends from central Europe to the Pacific coast, north into the Arctic and south to Malaysia. A C-band footprint covers the Indian Ocean. The satellite is over the eastern horizon in the UK.

SMPS interference

I've recently been trying to reduce RF interference caused by the chopper power supply in my RSD OFM300 digital receiver. It extends across the MF/HF bands and manifests itself as a harsh buzzing noise every 100kHz, reaching about S8 signal strength on a Yaesu FRG100 SW receiver fed from a 60ft wire connected indoors via earthed (at each end) coaxial cable. The noise disappears when the aerial is disconnected, so the interference is obviously radiated rather than mains-borne.

The subject is discussed in some depth in the August 2000 issues of the RSGB publication *RadCom* and the NZ trade magazine *SatFACTS*. Not all chopper power supplies produce this interference, so it must be possible to take precautions at the design stage to avoid it. Where minimum cost versus performance is the criterion, interference suppression is probably well down the manufacturer's list of requirements.

Dave Lauder (G0SNO), who prepares the EMC report for the RSGB's EMC Committee, reports in *RadCom* on difficulties experienced with chopper power supplies and the response from TV receiver manufacturers when approached about the problem. Amongst several manufacturers mentioned, Toshiba and Hitachi both reacted positively, investigating their designs for possible modifications to reduce radiation. Panasonic entered into a discussion on the subject. Grundig Technical maintained that the company's sets conformed with EN55013 EMC requirements. Various Bush and Schneider models were found to produce wideband hash, or "chuff-chuffing" noise, across the HF band. The receivers may all conform with the European EN55013 EMC standard, but they are clearly not sufficiently silent. A check with a scanner will show that radiated hash reaches across the standard IFs and into Band I. Although the problem is usually restricted to the user's own home or that of his neighbour, there are cases where the interference hash has been radiated as far as 30m.

SatFACTS lists 29 possible ways of improving satellite receiver design, such as a detachable mains power lead, an on/off switch in the mains supply lead, and an auto channel-tracking notch filter (so that a notch in the feed-through input tracks the modulator's output channel, thus eliminating TV picture patterning). Item three on the list is a more reliable power supply.

On this latter point, there's discussion about a move from chopper to linear power supplies, i.e. use of a mains transformer. This would remove VHF hash interference and increase reliability. Because the mains supply in Australia can vary by ±6 per cent, chopper power supplies can operate "just within design limits" and be very uncomfortable, eventually going bang. A lower chopper frequency reduces

radiation, but means larger and thus more expensive components, in particular the transformer.

Back to my problem with the RSD receiver. The manufacturer was very sympathetic when approached and sent me a circuit, with suppression modifications, to experiment with and a bag of components. The simplest approach seemed to be to fit ferrite toroids, but this didn't help much. Short lead lengths made it difficult. The receiver has a metal case, which is ideal for earthing. But there's a two-wire mains input cable, so a mains earth isn't available. The case, and the mains, RF output, scart and aerial input cables are all free to radiate. Back to basic design problems.

The RSGB Guide to EMC (2nd edition) covers the problem of interference caused by chopper power supplies and suggests ways of reducing it. The ideas are equally applicable to amateur radio, SWLs and TV-DXers. It can be obtained from the RSGB for £19.99 plus £1.50 UK postage and packing. The RSGB can be contacted on 01707 659 015 (fax 01707 645 105). Alternatively check the RSGB book, EMC filter etc. listings at the RSGB shop on the internet (www.rsgb.org/books).

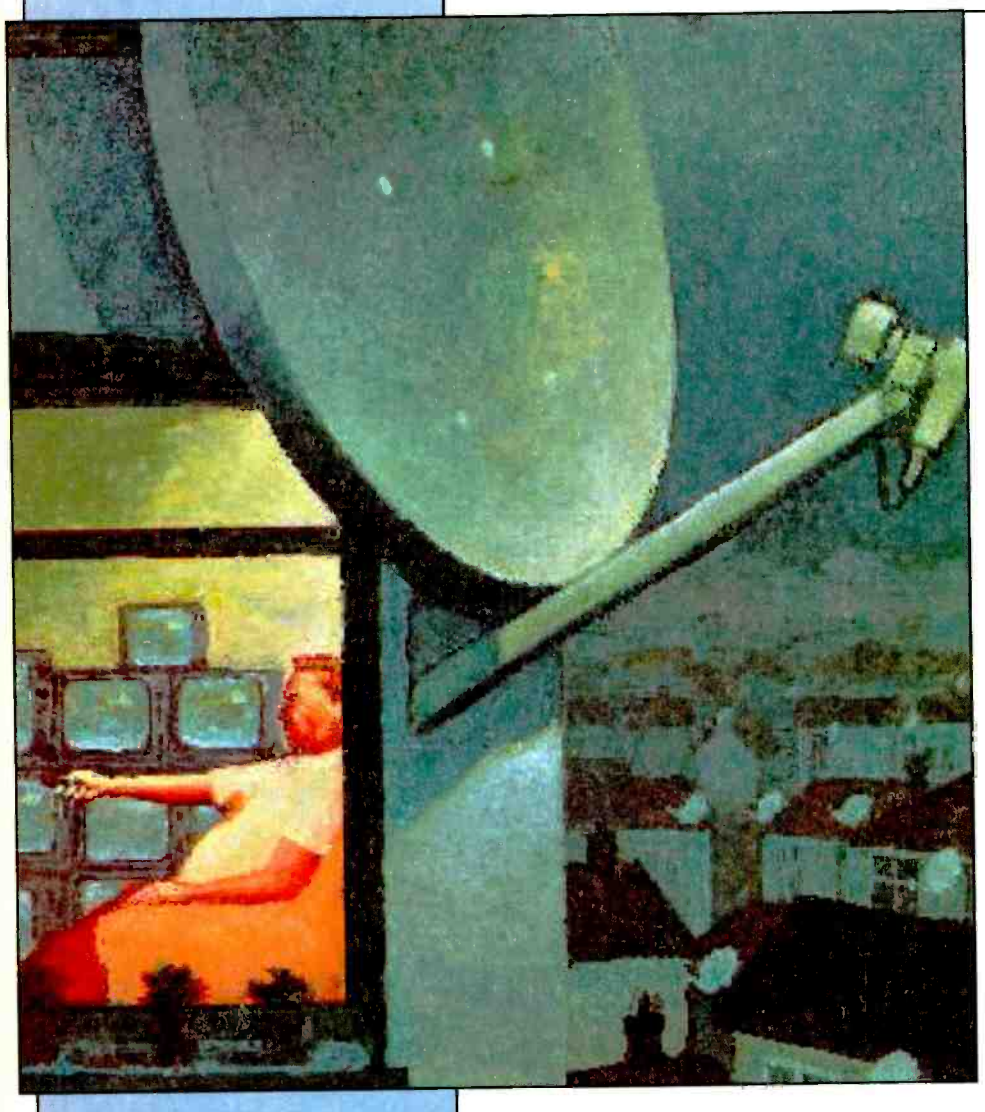
An unfulfilled need

At present I use two prime-focus satellite dishes, 1·5m for C band and 1·2m for Ku band reception. In the past I've considered using the 1·5m dish for both bands, with a Chaparral combined C/Ku feed system. But the shadowing loss at the focal point of the dish, caused by the mass of metalwork (feedhorn plus polarisers plus LNBs), has put me off the idea.

Very recently there's been a development that might have overcome this problem. A low-profile combined C/Ku-band feed with integrated LNBs was mentioned in a recent issue of *SatFACTS*. After several e-mails, and contact with satellite enthusiast Morris in Thailand, I was pointed towards a website for satellite supply company Smallear. Its 'stores and product pages' included the V4000 C/KuLNBF. The higher-specification V4000 Gold version was on offer at $149. The whole package is contained within C-band waveguide dimensions: an extremely slim package with just F sockets for C and Ku bands.

Unfortunately the V4000 is intended for use in SE Asia, covering 3·7-4·2GHz (noise 25-30°K) and 11·7-12·2GHz (noise 0·7-0·8dB). The C-band noise figure is perhaps too high for a 1·5m dish used with extremely low-level signals. The Ku-band performance looks to be (on paper) acceptable, given the use of a larger (1·5m), higher-gain dish, but the coverage is only a fraction of that required. Power requirements are 10-13·5V for vertical polarisation and 14·5-25V for horizontal polarisation, at 240mA. There's no provision for polarisation skew, just vertical/horizontal switching.

Cross-polar isolation of 20dB upwards isn't wonderful but, had the other specifications matched a UK zapper's needs, it would have been worth accepting Smallear's offer of a sample for review. The rather poor JPEG image via the internet clearly shows the larger C-band feed tube with the much smaller Ku-band feed tube 'up the middle'. The search continues.



SATELLITE NOTEBOOK

Reports from Christopher Holland

Distributing SkyDigital

I was recently asked to connect several Sky digiboxes to a single dish. The installation was to be at a block of flats that had an existing analogue IF distribution system which dated back a few years.

Connection of one or two receivers to a twin-output LNB is straightforward enough, being made directly to the LNB. Things become a bit more complicated when several digiboxes are in use. In addition to independent selection of signal polarisation, each digibox has to be able to select either the currently used Astra 2 (28·2°E) high band or the low band which will be used at some stage in future.

I decided to install a 90cm prime-focus dish. This gives lots of margin to cater for signal deterioration with heavy rain and helps to overcome signal loss in the distribution process. When a prime-focus arrangement is used, ensure that the LNB feedhorn has a cover over its front to prevent spiders getting inside. If they do, and make a home there, signals trying to get through will be effectively wiped out.

The LNB is a four-output type, providing horizontal and vertical high-band and low-band outputs. These are fed to a magic switch that distributes signals to the four digiboxes involved, see Fig. 1.

The high-band (11·7-12·75GHz) IF outputs from the switch do not require a 22kHz tone signal via the coaxial cable for band selection as the band and polarisation of the LNB's outputs are fixed. Low band (10·7-11·7GHz) is not at present used by Astra 2A. But it will be used at some stage in the future, so provision has to be made for the frequencies to be available.

The magic switch

As shown in Fig. 1 the four inputs from the LNB (high-band vertical, high-band horizontal, low-band vertical and low-band horizontal) are connected to the magic switch. Make sure that each line is connected to the correct input socket on the switch, otherwise you will get confusing symptoms. The inputs should be clearly marked – the LNB's outputs as well.

The magic switch I used has a built-in mains power supply that provides all four connections to the LNB with constant power. If the switch doesn't include a power supply, DC power will have to be fed into the cables prior to the magic switch, using standard power-injector modules. Powering the LNB in this way avoids the possibility that one of the receivers might supply excessive current to try to run the whole system. That could reduce the voltage presented to the magic switch below 17/18V, which would mean that the horizontal polarisation wouldn't be selected. The voltage and 2kHz tone from the individual digiboxes are used as magic switch commands, to connect each digibox to the required band and polarisation from the LNB.

Testing

The system should be checked using proper satellite IF test gear. Once this has been done, each connection should if possible be checked with its own digibox in place. As an aid to the polarisation switching check,

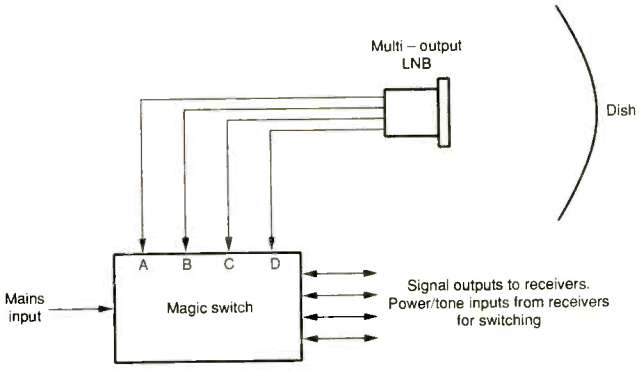


Fig.1: SMATV IF distribution system for use with Astra 2. The magic switch inputs are A high-band vertical, B high-band horizontal, C low-band vertical, D low-band horizontal. The LNB is continuously powered by the magic switch. The digibox power/tone outputs select the required band and polarsiation at the magic switch.

remember that CNN (channel 513) has vertical polarsiation while all the BBC channels are horizontally polarised. So flicking between channel 101 and channel 513 will show whether all is well. If not a message that says "for your information no satellite signal is being received" will be seen.

Channel 404, Sky Sports Active, currently uses the highest-frequency transponder (12·480GHz) aboard Astra 2A and thus has the highest IF coming down the cable. Any excessive signal loss because of a long cable run or an individual receiver will show up as a "no signal" message when Channel 404 is selected. In future the band up to 12·75GHz may be used, giving an even higher IF output from the LNB. So make sure that the signal strength coming down the line is adequate.

As a quick check, BBC 1 and 2 have the lowest IF at about 1,130MHz, CNN is at about 1,460MHz, Eurosport (Channel 419, with horizontal polarisation) is at 1,780MHz and Sky Sports Extra (Channel 404, horizontal polarisation) at 1,880MHz.

As there is little by way of low-band signals at present it's difficult to check that everything is working correctly. At the time of writing however tests are being carried out using transponder 64 (10·936GHz, vertical polarisation) of Astra 1D. The German Kopernikus satellite is co-sited at 28·5°E. It gives some usable signals in south and east England between 11·45-11·7GHz with a 90cm dish. For latest listings check the satellite guide on the internet at www.lyngsat.com

C.H.

SkyDigital update

The channels listed in Table 1 have been added since last month. The transponder number is shown in brackets after the frequency and the EPG number in brackets after the channel name.

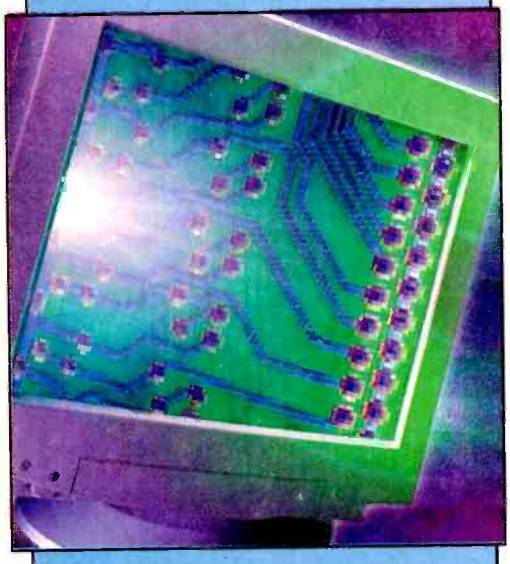
At the time of writing the BBC was running Olympics tests via transponders 1 (11·720GHz horizontal) and 5 (11·798GHz horizontal). Sky News Eire and Sky One Eire have started transmissions via transponder 19. Classic FM, Core, Classic Gold, the Mix, Planet Rock and WRN Radio stations have moved from transponder 21 to transponder 36.

Tests are being carried out via transponder 64 (10·936GHz vertical) aboard Astra 1D (currently co-located at 28·2°E) relaying Sky Sports Extra with a symbol rate of 22,000 and 5/6 FEC (SkyDigital transmissions normally have an SR of 27,500 and 3/4 FEC). **C.H.**

Table 1: New SkyDigital channels.

Frequency (GHz)	*Pol.*	*Channel*
12·110 (21)	H	Shop America (646), Gurjari TV (692), Punjab Radio (945)*
12·168 (24)	V	Channel Line up (996)*
12·324 (32)	V	Discovery Wings (556) and Discovery Kids (618)**
12· 402 (36)	V	Solar Radio* (EPG no. to be allocated)

*Radio stations.
**Original test transmissions were via transponder 9.



MONITORS

Fault reports from Geoff Butcher and Ian Field

Jean JD156H

There was excessive width – the width control had no effect – and no pincushion correction. A visual inspection showed that the line output transformer's scan drive pin was badly dry-jointed. It had obviously been running hot for some time, as the solder was discoloured. This had apparently been the cause of diode D406 going short-circuit.

Resoldering the LOPT and replacing the diode cured the fault. The latter was type 31DF6, which is a 30nsec switching type rated at 3A, 600V. **G.B.**

ICPI 72G9148

This monitor was dead except for a flashing power light. My first suspicion was that there was a short or overload somewhere. The cause however was that several chopper transformer connections had hairline cracks at the pads. **G.B.**

KDS 1440G

The width and horizontal position were both twitching and jumping, sometimes just a block of a few lines, sometimes the whole picture. The width and shift controls appeared to operate normally and smoothly. Logical thought suggested that the symptoms must have a common cause, and much time was spent searching for it. But logical thought proved to be in error. I eventually discovered that the width and shift potentiometers were both varying in value in a random manner. Replacing them (both 10kΩ) cured he trouble. **G.B.**

Compaq Pressario V410, Model 304

You sometimes find that the line output transistor has gone short-circuit for no apparent reason. The symptom is a flashing amber power light with no other signs of life. Various types are fitted in this position: I've found that the 2SC3892A is a suitable replacement. I always resolder the LOPT and any other suspect joints just in case. **G.B.**

Apricot XJ52178 (Tatung Y2 chassis)

There's a useful article on servicing this chassis on page 126 of the December 1997 issue of *Television*. A recent fault I came across wasn't covered however. The symptoms were as follows: the monitor would power up normally when switched on, but wouldn't restart after going into the power-save mode.

I found that the 110V HT had been set too low. But when it was adjusted for the correct voltage the EHT was much too high. The culprit turned out to be R504 in the EHT regulator circuit. It had gone o/c. Presumably the Phantom Fiddler had been at it again. **G.B.**

Gateway X19001/EV900

The customer said this monitor had gone "bang". I found that the mains fuse had blown because the IRFPE40 chopper transistor was short-circuit – a pinhole had blown in the top of the transistor. Before replacing it I made some checks on associated components. This revealed that D316 and D317 (both type 1N4002) and zener diode ZD301 were all short-circuit.

The zener diode had protected the chopper control IC from damage. It was poorly marked, but after a bit of guesstimation I decided that it was a 15V type. A replacement of this value and a 2SK2038 in the chopper position restored normal operation. **G.B.**

Packard-Bell 1015

The power light came on but there was no hint of EHT. I could hear the frame timebase running and there was 95V at the collector of the line output transistor. The cause of the fault was traced to R431 in the HT feed to the line driver stage – it was virtually open-circuit.

From its appearance the value seemed to be 3·3kΩ, but I couldn't be sure about this because heat had discoloured the marking bands. I confirmed the value by scrapping off the surface coating and measuring the resistance of part of the spiral. The halfway point produced a reading of 1·6kΩ in one direction and about 18MΩ in the other. A new 3·3kΩ, 2W resistor restored normal operation. **G.B.**

Compaq 460

This monitor was dead with the 2·5AT mains fuse F901 open-circuit. When the usual cleaning of the main PCB and inspection for damaged solder joints and micro-fractures had been completed I checked the 2SK1045 chopper MOSFET Q901. It was OK, and the bridge rectifier also passed muster. The 180N degaussing posistor PTC901 didn't rattle so, with this item removed and Q901 disconnected, I bypassed F901 with a 60W bulb and switched on. There was a short burst of life as the mains bridge rectifier's reservoir capacitor C907 (330µF, 400V) charged, proving that the mains input filter components were OK. I then dismantled the posistor for inspection and found that the pellets were intact with no visible sign of arcing.

The only way to get to the bottom of the matter was to reconnect Q901 and replace the fuse! When power was applied the

monitor worked, but the purity errors were extreme to say the least. With a new posistor fitted the purity became good at first switch on. **I.F.**

No Colour

Several monitors that have been brought in with the complaint "no colour" have turned out to be perfectly OK. Some manufacturers now include an EEPROM (type 24LC21 or similar) in the input circuitry, using pin 15 of the VGA plug for SCL and pin 12 for SDA. Since pin 12 is the mono-detect ID pin, this affects some older video cards which boot up in the mono mode. As yet I've not come across any explanation for adding an EEPROM. Any comments? **I.F.**

AOC 4N1r

The customer's complaint was "twitching width". I found that the on-off switch, with the monitor on the bench and its back removed, was a pain to operate unless the PCB was held firmly in its guide runners. This presented a potential hazard while working on the chassis, so the switch-button assembly was dismantled and checked before fault diagnosis began. The moulded button guides were poorly made and the spring was incorrectly fitted, limiting the button's movement. A small spot of hot-melt glue made sure that the spring stayed in the correct position while the button was refitted, and a thin smear of Teflon grease greatly improved the button's action.

Once the switch had been made operable without accidentally getting hold of the mains input circuitry while trying to hold the PCB in place I was able to investigate the main fault. The cause was very simple, though not so simple to find. Eventually, tugging the leads to the scan coils produced a disturbance. The four-pin scan plug was OK, but the two-pin plug nearby, P401, had an overheated pin. I cut the plug off and soldered the wires directly to the PCB. That put an end to the twitching width. **I.F.**

Elonex XV17

This is the version with the compact, rounded cabinet. There's no FCC ID number and it doesn't resemble the Digital VRC16. The complaint was "no lights, just a plaintive screech". It sounded as if something was shunting the power supply, so I made a beeline for the line output transistor (it could just as well have been the frame output chip, but that has more pins!). There are two line output transistors: one drives the LOPT to generate the EHT, while the other provides the line scan current. The latter (Q410 – type 2SC3688, but a BU2525 will do) was short-circuit. I followed the track that looked most likely to be the B+ feed to the line-scan inductor and came to Q416 (2SD1138) which was also short-circuit.

Because of the compact design, access to the component side of the main PCB is severely restricted. I found that the best way to gain access without disturbing too many connectors is to remove the video input side panel. As this is part of what stops the chassis collapsing in on itself, the monitor has to be put on its side. I then found that the easiest way to get at Q410's fixing screw, unless you remove the whole heatsink assembly with all that this entails, is to remove the EHT transformer and C410 (10µF, 25V non-polarised electrolytic). I replaced Q410 and Q416 then powered the monitor. C609 (47µF, 250V) exploded violently, then proceeded to imitate a Roman candle, accompanied by 'machine-gun' sound effects. Fortunately the main power supply went into the shutdown mode, the damage being limited to the line and EHT control and output stages.

Something was obviously amiss in the chopper power supply module, which takes some dismantling because of the piggy-back control PCB. Once I was able to examine it the first thing I noticed was the charring around D895, which had been replaced with a pair of BYM26Es in series. Its reservoir capacitor C821 was missing. The output produced by this rectifier circuit (230V) is sampled by I803 (TL431) via R807 (240kΩ). R807 checked OK but looked tired, so I replaced it with a ±1 per cent instrument-grade component. Without a circuit diagram, I had no means of checking C821's specification. So I used the same voltage rating (250V) as the capacitors farther along the supply and fitted the largest value that would fit, 220µF. It needed only an extra hole to be drilled to take the wider-spaced pins. I then set about making my own circuit diagram. While doing this I noticed that one leg of L804 had been snipped by the previous repairer, removing the +17V supply. As a result there was no feed to the LED section of TL431-controlled optocoupler I802 (4N35). This was the cause of the explosion on the main PCB. I can't imagine why L804 had been cut, since doing so would serve no diagnostic purpose.

At this point I was preparing to scrap the monitor and use it for spares, but I wanted to know whether the EHT transformer was serviceable. All four power devices were now damaged: Q416, which provides linear power control for the line scan output stage; the line scan output transistor Q410; the IRF740 EHT stage B+ PWM transistor Q607; and the 2SC4123 EHT output transistor Q404.

As the power supply was now working correctly, these short-circuit devices were tripping it. There was a quiet ticking noise instead of a screech! Removing all four devices proved that there were no other shorts, and as a frame buzz could be heard the frame output chip was obviously working. I replaced Q404 and bypassed Q607 with a 60W bulb. This produced a brief EHT rustle, but it immediately shut down. I took this as a promising sign, but it didn't prove that the EHT transformer was OK. So I went ahead and replaced the other devices, after which the monitor rustled up and produced a picture!

During the struggle this unit ate my last 2SC3688, and I didn't have any spare 2SC4123s to start with. These transistors are rated at 1·5kV, 10A and 8A respectively. Q410 doesn't need an integral efficiency diode as one is fitted externally, nearby on the same heatsink. Q404 has an integral efficiency diode, but holes are provided in the PCB for fitting a separate diode, in which case a 2SC3886A, BU2508 or S2000 will do. A BU2522 or BU2525 could be considered for the higher-current (10A) device (Q410). There are few common alternatives for the IRF740, which is rated at 10A, 450V. The 2SD1138 is a common enough device. **I.F.**

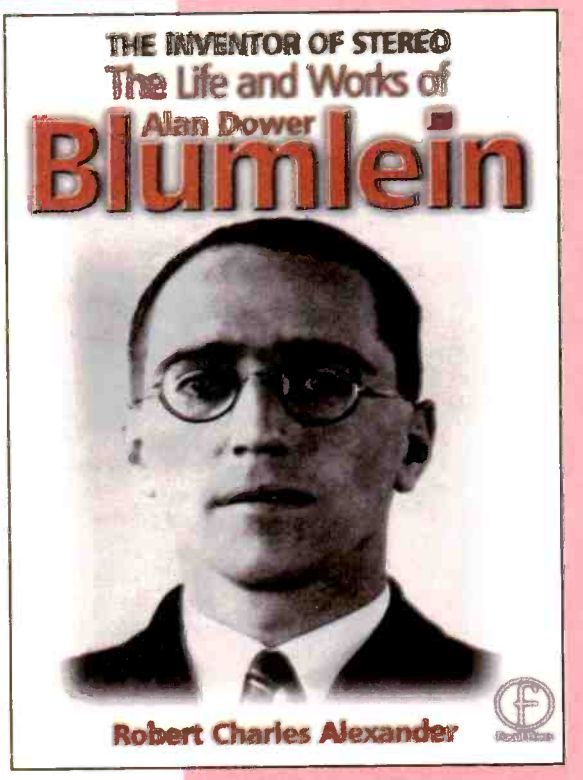
Data General 6628

This monitor is a **Compaq 420T** in disguise. The complaint was no picture, and the low-emission tube was no surprise with such an old monitor. Brown glue played its part, particularly around the A1/G2 components on the CRT base panel. All the brown glue should be chipped away, especially in the chopper power supply (it eats the snubber diode's wires!).

This version of the chassis has an inductor, L354, in series with the heater supply. It's on the main panel. If driving the cathodes to produce a peak white raster for several hours fails to improve the emission, L354 can be temporarily shorted out. This will encourage the deposits to leave the cathode surfaces. In severe cases one or two turns of the coil can be left shorted to increase the heater drive on a permanent basis.

Although glazed cathodes are not unusual with old monitors, the problem has been increased with the use of screen savers. Most of these replace one form of damage with another, by under-running the CRT. The best type of screen saver reduces the contrast without affecting the total brightness. **I.F.**

BOOK TO BUY



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This book is the definitive study of the life and works of one of Britain's most important inventors who, due to a cruel set of circumstances, has all but been overlooked by history.

Alan Dower Blumlein led an extraordinary life in which his inventive output rate easily surpassed that of Edison, but whose early death during the darkest days of World War Two led to a shroud of secrecy which has covered his life and achievements ever since.

His 1931 Patent for a Binaural Recording System was so revolutionary that most of his contemporaries regarded it as more than 20 years ahead of its time. Even years after his death, the full magnitude of its detail had not been fully utilized. Among his 128 patents are the principal electronic circuits critical to the development of the world's first electronic television system. During his short working life, Blumlein produced patent after patent breaking entirely new ground in electronic and audio engineering.

During the Second World War, Alan Blumlein was deeply engaged in the very secret work of radar development and contributed enormously to the system eventually to become 'H2S' – blind-bombing radar. Tragically, during an experimental H2S flight in June 1942, the Halifax bomber in which Blumlein and several colleagues were flying crashed and all aboard were killed. He was just days short of his thirty-ninth birthday.

For many years there have been rumours about a biography of Alan Blumlein, yet none has been forthcoming. This is the world's first study of a man whose achievements should rank among those of the greatest Britain has produced. This book provides detailed knowledge of every one of his patents and the process behind them, while giving an in-depth study of the life and times of this quite extraordinary man.

Contents

AUDIO FAULTS

Reports from Russell J. Fletcher and P.J. Roberts

Kurzweil PC88 keyboard

This sort of equipment is an unusual but welcome visitor to our workshop. It usually means that the customer doesn't know where to turn for help next, so the problem is a going to be a good source of income! It's worth reporting on this particular fault, because it appears to be caused by a design error. The reported symptom was an annoying hum on the audio output. It was at a low level but nevertheless frustrating, particularly when operating with 1·5kW at front of house. It was also said that the fault had been present from new, which was very unusual with a piece of kit of such high build quality.

I first checked the power supply, replacing the 10,000µF, 16V main smoothing block and two suspicious-looking 1,000µF, 10V capacitors. I distrust the latter, and replace them on sight with the 16V variety – many a fault has been cured in this way without even lifting the meter! It then became apparent that there seemed to be a design fault. I spent some time tacking in extra capacitors here and there and trying some series inductance, all to no avail. Next, for some reason, I picked up the discarded 10,000µF capacitor and stuck it across the output from the bridge rectifier, which was drawing attention to itself, leaning over and fixed to the subchassis as a heatsink, bare-legged and available! The hum decreased by about a half. But when the capacitor was moved across to the board-mounted one, less than an inch away, there was no change to the hum problem.

Something to do with the PCB current path layout I decided. Diving into the bin, I found some 42-strand speaker cable (about 1·5mm^2 for those not familiar with it), cut off two short lengths and soldered them the shortest distance between the bridge rectifier and its reservoir capacitor. This provided a complete cure.

As the unit was now so quiet, I wondered whether the value of the reservoir capacitor might be a little excessive. **R.J.F.**

Denon DCD425

We've had a couple of these CD players in recently. Loss of one audio channel was the complaint with the first of them. The cause was traced to a leaky mute transistor, Q301, in the final stages.

The other one suffered from intermittent skipping. An assembly person had forgotten to grease the sled! **R.J.F.**

Studiomaster Horizon 12 powered mixing desk

The audio from one channel was low and distorted. It took a time to locate the cause, which was very basic. The problem was quickly proved to be on one of the power amplifier boards. The amplifiers are fairly complex, and after extensive tests and checking I decided to remove a few semiconductor devices to double-check them out of circuit. I started with the drivers, as I had eliminated the output transistors earlier by substitution. The very first solder pad I touched with the iron fell off the board! Obviously the print was cracked at this point. A decent board repair cured the fault. **R.J.F.**

Denon DRM555 cassette deck

Here are a couple of problems we've had with these decks. First the eject mechanism not releasing. The mechanism concerned is on the left-hand side. It had slipped upwards because the assembly person forgot to apply the blob of glue. Release the single fixing screw, reposition and tighten. Finally apply some glue.

Secondly failure to eject some cassettes (door not opening without aid). Some cassettes are slightly oversized and stick against the silver, springy retainer inside the cassette tray, at the top. Push it up with your finger to release some of the tension. **R.J.F.**

Revox PR99 tape deck

There was an odd fault with this open-reel tape deck: it would sometimes go into the record mode when either selecting play or coming out of pause. The operation modes are selected by a logic control board which is situated at left of centre from the rear. Mode control on this board is carried out by a special IC which is now very difficult to obtain. In view of this I looked at the board with a certain amount of distrust. Then I noticed that there are five metallic pale blue Philips electrolytic capacitors on the board. I don't like these, so I replaced them with some good-quality modern capacitors. That cured the fault. **R.J.F.**

Denon DC1

The complaint with this mini system was distortion during playback of CDs only. I don't really know why, but replacement of the laser unit cured the fault. It must be type KSS210B. **R.J.F.**

Sony HCD-MD1EX

A whining sound was reported to come from within when MDs were being played. As I couldn't hear anything abnormal when the unit was checked I left it on soak test. Later I heard a very faint, high-pitched whining sound from within the unit during MD operation, even in pause. This gave me the clue I needed, as in this model the disc stops spinning when pause is selected. Thus all items in the MD mechanism were instantly eliminated. The cause of the noise was finally traced to the fluorescent display. A replacement cured the trouble. The display part number is 1-517-687-11. **P.J.R.**

Sony MDS-JE510

A grinding noise came from within. It was caused by failure of the mech 'in' sense switch. As a result gears LA, LB and LC had been damaged. Once new gears have been fitted you have to replace switches S681, S685, S686, S688 and all four rubber deck insulators. Part numbers are: gear LA 4-979-897-01; gear LB 4-979-898-01; gear LC 4-979-899-01; S681 and S685 1-572-467-61; S686 and S688 1-762-621-21; insulator 4-987-327-01. **P.J.R.**

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

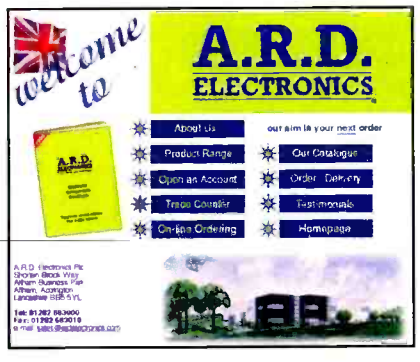
All Tech Tips
http://www.skyeinteractive.net/techtips/

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

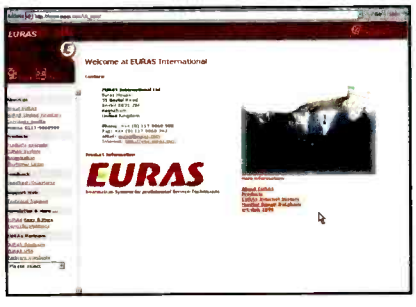
http://www.bbc.co.uk/enginfo

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.

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

Newsgroups
uk.tech.broadcast

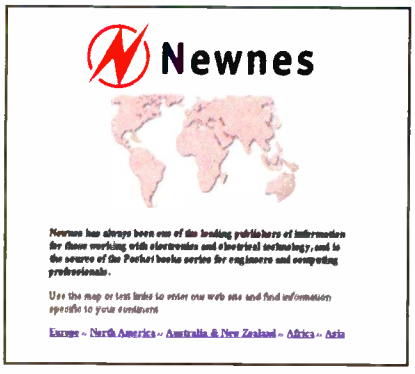
uk.tech.digital-tv

uk.tech.tv.sky

If you have never got into newsgroups then these are worth a look.
You"subscribe" (free of charge) to a newsgroup through your e-mail software (eg. Outlook Express). If it's not obvious how to do it then check out the help section on your Internet Service Provider's front page. Newsgroups are like notice boards where subscribers can send an Email to be viewed by everyone else.They are generally a source of help and advice, with plenty of humour too! Maybe there should be a TV engineer specific newsgroup called "uk.tv.engineers". Any thoughts? (thanks to Iain Dobie for this information)

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

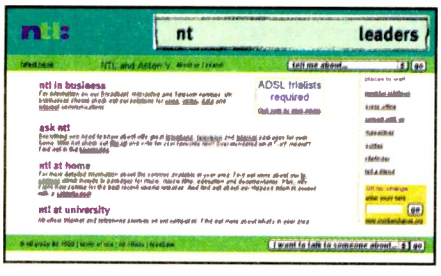


you when relevant new titles are published.

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.

M.C.E.S.

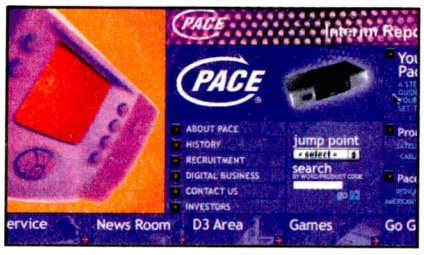
http://www.mces.co,uk

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

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.htm

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.

Philips

http://www.philips.com

http://www.semiconductors.com/products/

Take a look at the impressive Philips home page which leads to a product listing and detailed information. Perhaps more useful to the technician is the semiconductor data "tree" where data sheets can be downloaded on all Philips integrated circuits.

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)

Satcure

http://www.netcentral.co.uk

Packed with frequently asked questions (FAQ) about common faults and cures for faulty satellite receivers and decoders. Repair kits, upgrade kits, spare parts, surplus components plus links to other satellite information sites. Also audiophile components, electronic hobby kits, dolls house and model railway electrical stuff, a beginners' electronics course and lots of other information that will keep you occupied for days! The entire web site is also available on CD for just a £5 note.

Texas Instruments

http://www.ti.com

Quality Electrical Direct http://www.qed-uk.com Here's a new retail site with a very interesting feature - not only can you purchase from a huge range of consumer goods but you can also request price information on your mobile phone. For example, you could be looking around your local branch of Dixons and see something you want. You can then send a message to QED via the Short Message Service (SMS) on your mobile phone to request a price and delivery from QED. The information is send back to your phone.

Timecast

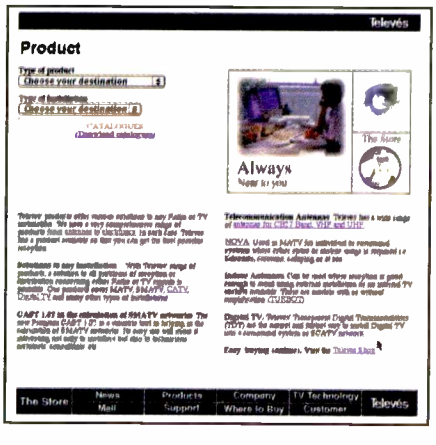
http://realguide.real.com/stations/

Television of the future? 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".

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Track

1 Washington Post March, Band, 1909
2 Good Old Summertime, The American Quartet 1904
3 Marriage Bells, Bells & xylophone duet, Burckhardt & Daab with orchestra, 1913
4. The Volunteer Organist, Peter Dawson, 1913
5. Dialogue For Three, Flute, Oboe and Clarinet, 1913
6. The Toymaker's Dream, Foxtrot, vocal, B.A. Rolfe and his orchestra, 1929
7 As I Sat Upon My Dear Old Mother's Knee, Will Oakland, 1913
8 Light As A Feather, Bells solo, Charles Daab with orchestra, 1912
9 On Her Pic-Pic-Piccolo, Billy Williams, 1913
10 Polka Des English's, Artist unknown, 1900
11 Somebody's Coming To My House, Walter Van Brunt, 1913
12 Bonny Scotland Medley, Xylophone solo, Charles Daab with orchestra, 1914
13 Doin' the Raccoon, Billy Murray, 1929
14 Luce Mia! Francesco Daddi, 1913
15 The Olio Minstrel, 2nd part, 1913
16 Peg O' My Heart, Walter Van Brunt, 1913
17 Auf Dem Mississippi, Johann Strauss orchestra, 1913
18 I'm Looking For A Sweetheart And I Think You'll Do, Ada Jones & Billy Murray, 1913
19 Intermezzo, Violin solo, Stroud Haxton, 1910
20 A Juanita, Abrego and Picazo, 1913
21 All Alone, Ada Jones, 1911

Total playing time 72.09

21 tracks – 72 minutes of music.
Published by *Electronics World*. All recordings reproduced by Joe Pengelly.

VCR CLINIC

Reports from
Eugene Trundle
Ian Bowden
Pete Gurney, LCGI
Michael Maurice
Steven Leatherbarrow
Paul Smith and
Giles Pilbrow

Philips VR241 etc (Turbo deck)

This machine, badged **Bang & Olufsen**, was fitted with the Philips Turbo deck. It wouldn't eject the tape. Nor, when the cassette had been wound out by hand, would it accept one. If the tape was wound in by hand all the way however the machine would play and record. The plastic lens/prism above the central cassette LED had broken off. It's available only as part of Kit G, which is part no. 4822 310 31961. **E.T.**

Sony SLVE250

This machine was accused of damaging tapes because it left a loop out during eject. It behaved itself for two days, then caught a loop of tape as described. I found that the supply reel was intermittently sticking to the back-tension regulator band, whose felt strip had come unstuck from its plastic backing. **E.T.**

Thorn VR426NVA

We've had two of these VCRs in recently, both with the same fault: a fully-laced tape was stuck inside and the machine went back to standby a few seconds after being switched on. In both cases the always +13V supply was missing because one end of D5110, in the power supply section, had not been soldered properly in production. You could well get this fault on an intermittent basis.

The machines are made by **Sanyo** and are similar to the VHR275E, also the **Sony** SLVE200/250. **E.T.**

Sony SLVE200UX

The reported symptom was no picture or menus. When playback was tried with a scart connection there was sound but no picture. The machine produced an RF output, but my sweep-tune monitor TV would not stop at it. All the mechanical functions worked, but the tuner channel couldn't be changed from preset 1. Checks in the power supply area revealed that there was no +36V supply for the tuner section. Rectifier diode D5103 was found to be leaky, and as a result fusible resistor R5110 was open-circuit. Once these two components had been replaced, the reason why you couldn't change channel numbers was seen: the machine was waiting for the user to press execute on the handset to start the auto-tuning procedure. **I.B.**

Goodmans VCP650

The customer said that this machine would not accept tapes. It worked all right for me until I removed the top cover. After that it failed to recognise that a tape was being inserted. This turned out to be a red herring however. Too much light was reaching the rear of the take-up side tape sensor which, as in many machines, is used – in conjunction with a shutter – to signal tape insertion.

With the sensor covered, the machine worked perfectly for many days until it was heard to shuffle the cassette carrier in and out of its own accord. I then discovered that the output from the supply-side sensor was going high. The voltage at its 0V pin had risen because of a high-resistance connection at the crimp connector between the main and the mech-connection PCB. This is PJ601, pin 1 – the blue wire. It's also the 0V connection to the mode switch. **I.B.**

Akai VSA650EK

The complaint was that any recordings made by this machine produced noise, mainly from the right-hand channel, when played back by another hi-fi VCR. I checked the hi-fi FM envelope with an alignment tape and found that it was perfectly flat. The two carrier frequencies were also correct. When I compared the amplitude of the hi-fi FM envelope during playback of a prerecorded tape with that produced during playback of one of the machine's own recordings I found that it was twice as high.

I tried increasing the hi-fi record current but this made no difference. The cause of the problem was that the luminance record current was too high. I assume that it was partially erasing the hi-fi signal, which is recorded beneath it on the tape. Once the luminance record current had been reduced, the amplitude of the hi-fi playback signal was the same with prerecorded tapes and the machine's own recordings. **I.B.**

Sony SLVE520

The problem with this machine occurred in the record mode only, when it would shut down after a while. Playback was OK. At first the fault took a considerable time to show up. It later became much more frequent. The cause was an old favourite with these machines: the fuse link PR512 had gone high-resistance.

It seems that while the supply rail voltage is adequate for playback the additional current required for the bias oscillator in the record mode increases the voltage drop across PR512 sufficiently to shut the machine down. **P.G.**

Panasonic NV850

The lights flashed and buzzing noises came from the mechanics of this old but well-made machine. There are two 3,300µF

capacitors in the power supply: both were in need of replacement. After that the machine worked and a service completed the repair. **M.M.**

Sony SLVE280

The N25 circuit protector PR512 is a common cause of trouble with these VCRs. In this case the machine would go to standby if either record or timer operation was selected. The customer also complained about poor sound. A new CP cured both faults. **M.M.**

JVC HRD910 etc

If there's poor tracking, usually varying in degree each time a tape is inserted, replace the 3·3µF aluminium electrolytic capacitor on the lower drum PCB assembly. A common fault is that the take-up and supply guides part company with the deck.

These points apply with many HRD series machines. **S.L.**

Hitachi VTF150

The capstan motor operated intermittently and was noisy. This sometimes meant shut down of the VCR. I've had to strip, clean or replace many bearings in Hitachi and other VCRs, and was a little surprised to find that in this case they were perfect, particularly as the noises suggested otherwise. The cause of the problem was C12 (470µF, 16V) in the power supply. **S.L.**

Mitsubishi HS740

Shut down, caused by failure of the capstan motor to operate (sometimes intermittently), can be caused by dry-joints at the capstan motor connector. **S.L.**

Sanyo VHR874E

If the machine seems to be dead, check the IC protector PR541 which is rated at 1A. I've also had normal playback but failure to record, with the machine shutting down, when this CP's resistance has increased slightly. **S.L.**

Goodmans TX1100

Playback was slow – similar to a standard-play tape moving at the LP speed. A scope check at pin 1 of P501 showed that there was ripple on the 5V supply. The cause was C509 (220µF, 10V), which was low at approximately half its correct value. **P.S.**

Matsui VP9405

This machine was brought in with a tape stuck inside. I had to remove it manually. The machine then accepted a cassette, but played it back at the fast-forward speed for a few seconds then shut down. The tape once again had to be ejected manually. The cause of the trouble was a faulty capstan motor. **P.S.**

GoldStar/LG RQ121

There was no display and the machine wouldn't accept a cassette. Voltage checks around the microcontroller chip IC505 showed that the 5V supply was missing. I traced the source back to D508, which was open-circuit. It's at the centre front of the top PCB. A new 1N4148 diode restored the voltage and normal operation. **P.S.**

Sony SLVE920UX

This machine had no display. All other functions worked normally. The cause of the fault was traced to transistor Q612 in the power supply. It forms part of a power-saving circuit that switches the display off in the standby mode, and was dry-jointed. **G.P.**

Answer to Test Case 455

– see page 23–

Two lawnmowers, one CB radio and a microwave oven. What next?! But £67 so far, and it's still the middle of the day. Most of the money was earned on the Colonel's lawnmower and the big microwave oven – and there was no VAT on any of it.

Col. Douglas Kingsley's mower has a proper little carburettor, with float chamber, vertical needle, die-cast barrel and all. It also has an in-line mesh filter to ensure that the incoming petrol is clean. This filter had become blocked with dirt and rust particles, allowing insufficient fuel through to sustain engine operation for long. A clean-up solved that one.

Margot's Flymo was also suffering from a blockage problem. To hover properly, it needs a good airflow down through its central column then out through the skirt. The air filters, particularly the one that contains a strip of honeycomb plastic film, under the top plate, were bunged up with grass. Another clean-up required!

In its way Hard Man's CB radio also had an impeded flow, this time of current to its transmitting department. A couple of joints in the power supply/wiring connections were dry and corroded. As a result volts were being 'dropped' in the higher-consumption transmit mode.

Finally, the Panasonic microwave oven. Its door switch and safety-monitor switch both showed signs of arcing and burning. Replacements provided a long-term cure.

It helps to be adaptable in these difficult times!

NEXT MONTH IN TELEVISION

WORKSHOP EQUIPMENT SUPPLEMENT

Our annual review of the latest servicing aids and equipment for use in the field and the workshop.

DIGITAL TV FAULT FINDING

In the first of a two-part series K.F. Ibrahim considers digital TV reception overall and the problems that can arise, then takes a look at the basic Pace digital satellite TV receiver. The aim is to be able to assess symptoms as a guide to successful fault diagnosis.

ALL ABOUT HEATSINKS

Power semiconductor device failure is generally temperature related, so the heatsinks used to dissipate heat play a vital role in ensuring reliability. Ray Porter covers the principles and design parameters relevant to consumer electronics products.

THE LIVE 2000 SHOW

A great deal of interesting new audio and TV/video equipment was to be seen at the Live 2000 show at Earls Court in late September. George Cole was there to report for us.

PLUS ALL THE REGULAR FEATURES

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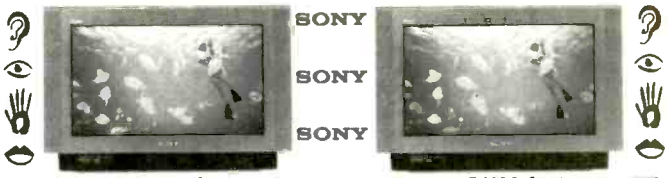

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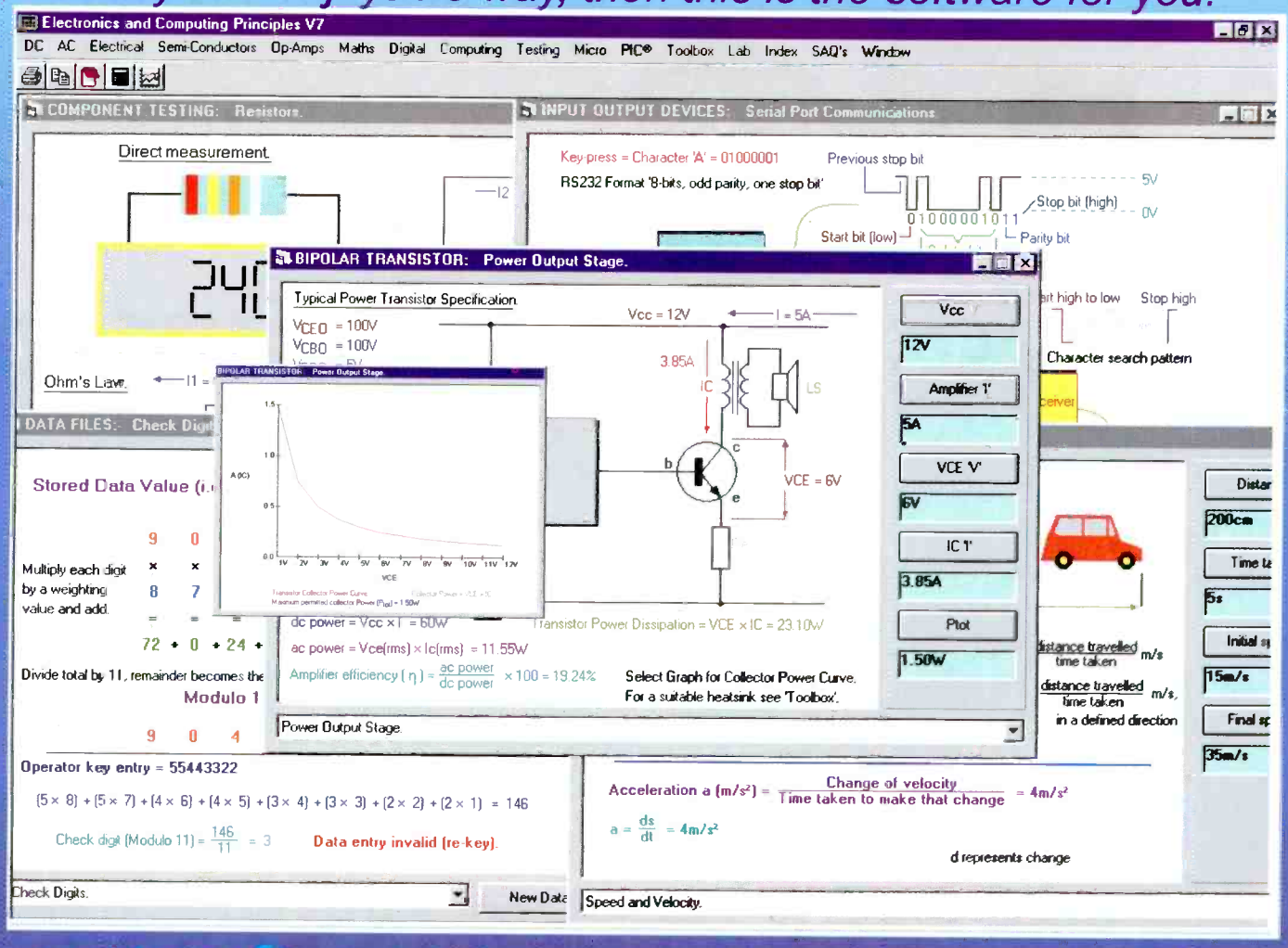

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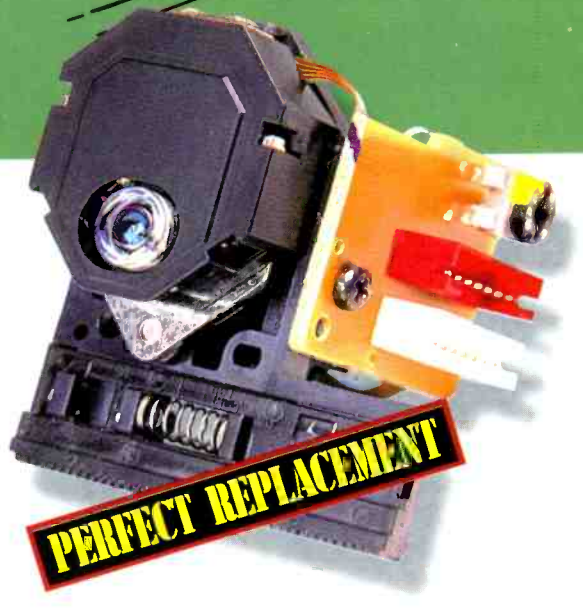

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