

THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

JULY 1996 £2.35

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**Servicing the
Mitsubishi
Euro 6 chassis**

**Aerial rigging
requirements**

Fault Reports TVs, VCRs, Camcorders and Satellite



WORLDS APART

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3 The 8 Way - the most popular of the preprogrammed types, replaces up to 8 remotes including TV, Video, Satellite and Cable TV with teletext and fasttext functions.

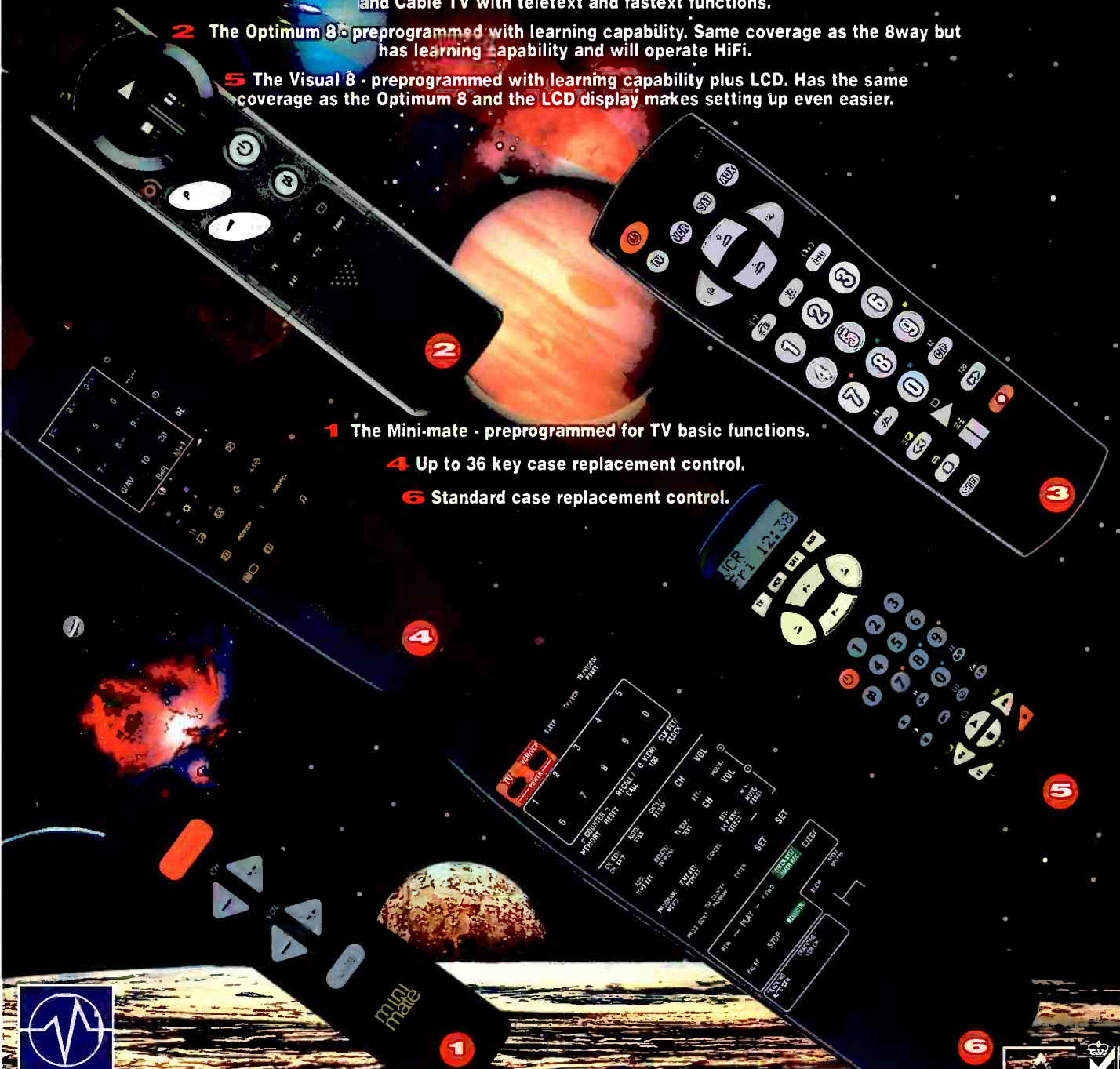
2 The Optimum 8 - preprogrammed with learning capability. Same coverage as the 8way but has learning capability and will operate HiFi.

5 The Visual 8 - preprogrammed with learning capability plus LCD. Has the same coverage as the Optimum 8 and the LCD display makes setting up even easier.

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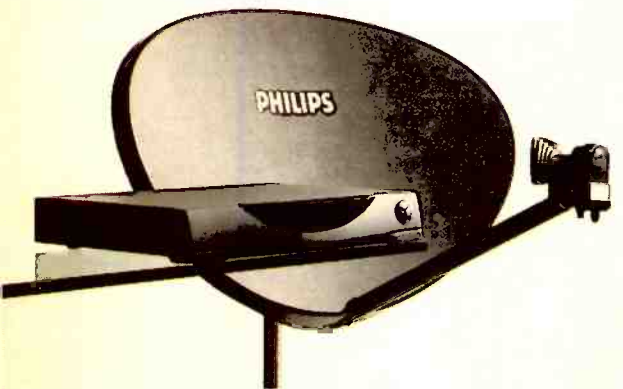


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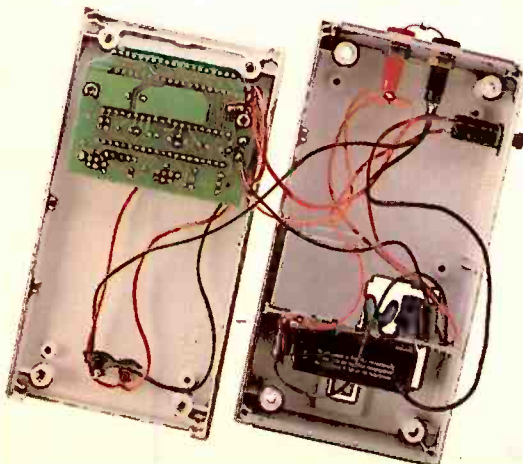
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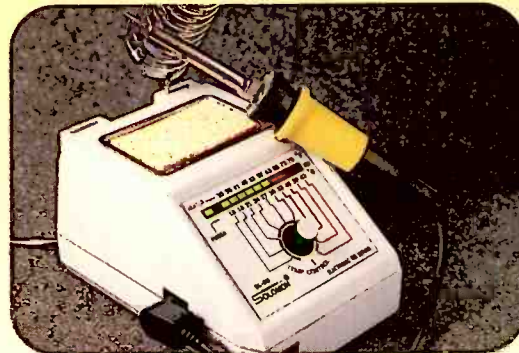


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SPECIAL OFFER

The Vann Draper SL-20, a temperature-controllable soldering station with bargraph temperature display and 150-420°C control range, is available to readers at the special offer price of £55 inclusive.



Cover
Photography by Trevor Bailey. Triax aerial kindly supplied by Aerial Techniques of Poole.

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

Grounds for Optimism?

The UK's economy is in one of those strange states where it is very difficult to predict how things will turn out in the immediate future. The statistics we see tell conflicting tales. For example, the latest figures from the Chartered Institute of Purchasing and Supply indicate that manufacturing activity in May fell for the fourth month running. The decline was the largest for more than three and a half years. Yet high street spending seems to be holding up well, and Bank of England figures for the same month show that M0, the narrow measure of money supply (notes and coins in circulation), grew by 6.3 per cent compared with 6.1 per cent the previous month. That doesn't sound like much, but can represent a big difference to people's spending.

It's easy to be misled by the statistics that pour out from government departments, banks, building societies and so on. Manufacturing activity has clearly been going through a bad patch, and businessmen talking together in such a situation tend to generate an atmosphere of pessimism. They sell to international markets however, so what is going on in the manufacturing field generally does not accurately reflect what is going on in the UK itself. What we do know is that manufacturers have been having difficulty clearing stock. When they see their shelves and warehouses filling up, they naturally cut back production. In this age of 'just in time' demand, with nobody wanting to hold more stock than is basically necessary, plants have to be able to match output to demand more precisely than in years gone by. Our sympathies to their managers.

But consumer goods don't seem to be so badly affected, and consumer demand

appears to be either holding up or increasing. This shouldn't surprise us either. Most people have reduced their borrowings, house prices have stopped falling and, as a result of tax and other changes, people are finding that they have a bit more money in their pocket. Interest rates are low and unlikely to rise in the next few months. Inflation is holding steady. These are the conditions that create consumer confidence.

This could well mean good times ahead for the consumer electronics trade. A recent report from the well-known retail consultancy Verdict predicts that a genuine economic recovery is likely later this year, with the best trading conditions since the Eighties. The electrical sector is singled out as a main beneficiary, with a strong demand for PCs in particular – sales are likely to rise by 200 per cent by the year 2000. One of the nice things about selling computers is the fact that the buyer will require other things. Software and a printer of course, a modem quite possibly nowadays, a scanner maybe. A fax link may help, and of course the consumer electronics firms are anxious to link this lot up the domestic TV set and home entertainment system. One feels that this will not happen just yet – people can't compute and watch TV at the same time. But there will be an increased demand for TVs that can double as monitors, and once the public latches on to the idea of upgrading its electronic equipment the sales prospects should open out.

Upgrading and spending more on high-specification products sounds good, doesn't it, yet Sir Stanley Kalms no less has been complaining about the poor quality of today's products. There are those who would point out that Sir Stanley and

the modern mass retailers must take some of the responsibility for this, because of their aggressive pricing policies. They have sought out ever cheaper product from markets around the world, with the result that all manufacturers end up adopting cost-reduction programmes. Graham Knight, writing in our sister magazine *Electrical and Radio Trading*, mentions that the rental TV sets his firm installed five years ago have proved to be far more reliable than those installed last year. The faults seem to be the traditional ones – faulty mains switches, defective line output transformer soldering, etc. – which, as he says, could easily be eliminated. Seems a long time since we were reading about the revolution introduced by Japanese manufacturing technology, with ever improving reliability. But the Japanese manufacturers have been badly affected by the recessionary conditions of the Nineties, and now do much of their manufacturing in satellite plants throughout SE Asia, where they obviously have to compete with the lost-cost (and, often, low-quality) locals. It's becoming increasingly clear that the current generation of VCRs, with their plastic mechanisms, have a lower build quality than those of a few years ago. One can't help but feel that PCs and monitors, which have so far proved more reliable than basic consumer electronics products, could go the same way. But there are grounds for optimism here – for those of us in the repair business. As long as the stuff isn't so grotty that it has to be thrown away when it fails, there will be a growing workload, which is just what we want! Time to invest, perhaps, in a nice new scope and soldering station, and bring back a smile to the faces of those poor old manufacturers.

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BACK NUMBERS

Some back issues are available at £2.75 each. For further details see box on page 655

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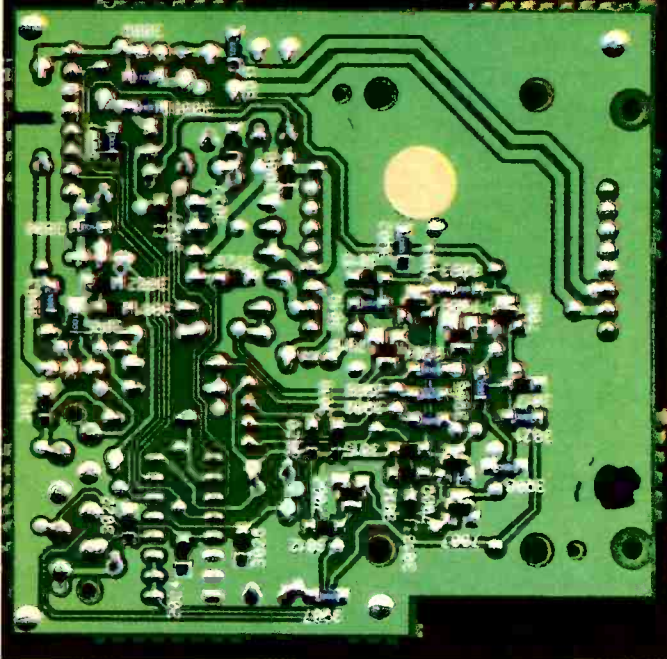
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Satellite

WORKSHOP



Jack Armstrong

It was Good Friday and the population had split into two groups. One counted red-and-white cones while sitting in stationary cars. The other half had donned gardening gloves.

Magic

When the phone rang I removed my gloves to answer it.

"My satellite's gone off" said an anonymous voice. "You advertise same-day repairs, so will you come and fix it? I was in the garden. When I went back it had gone off."

"Did you plug your lawnmower in next to it?"

Hesitation. She sensed the presence of a magician.

"How did you know?"

"Magic" I confirmed. "I'll come straight away."

The receiver was a Grundig GRD150. I took it back to the workshop and replaced the fuse, then tested the receiver which now worked perfectly. But I could hear a beep, beep from the TV set's loudspeaker when the smart card was inserted. This problem was solved by soldering the recommended 100nF capacitor

between links J72 and J80. When I returned the unit the entire family had assembled, waiting to watch a satellite TV programme.

"I fixed the power supply but I also noticed a bleeping sound with the card inserted. Did you know about that?"

"Yes" she said, "but the man at the shop – part of a well-known high-street chain – said it was normal."

"Ah" I replied, "well it's not normal any more. I've fixed that too."

The lady was delighted and paid my charge without argument. I've made a mental note to visit the shop to offer my services.

SRD500 Problems

I very occasionally receive calls from other dealers who get my number from goodness knows where! Clive was having problems with an Amstrad SRD500. It took about half an hour to warm up before producing a picture and, even then, several audio channels were missing.

Now I remembered having had this problem previously, and had tackled the picture problem first. C13 in the power supply had been the cause. Then, by the time that I'd replaced all the brown-looking capacitors in the power supply the audio problem had been cured.

So I suggested this approach to Clive, who had spent two hours probing around in the audio section to no avail.

"Power supply" he said incredulously, "I'll ring you back!"

True to his word, Clive did. Replacing C13 and C14 had fixed both problems. Thanks Clive. If you are reading this, you didn't leave me your phone number.

I've had several faults with this model. Picture problems are usually caused by electrolytic capacitors. Try replacing those near the tuner first. Last week I had an SRD500 with no audio at all. It took me an incredible two hours to trace the cause of the trouble to invisibly cracked tracks at the rear of the board. If the owner had said that she'd dropped the receiver her bill would have been much less.

Tripping SAT1700

This Nokia receiver is generally one of the most reliable models around. A local dealer had problems with this one however. He brought it to me after replacing most of the components in the power supply.

I checked his work, which seemed all right, and could find no components that measured incorrectly. But the power supply made a rapid ticking noise. This is usually caused by a short-circuit diode on the secondary side of the chopper transformer or, if the tripping is much slower, by a dead TL431 adjustable zener diode.

On a hunch, I removed the decoder board. The receiver then worked perfectly. I was now faced with the problem of discovering precisely which component on the board was drawing too much current. I considered rigging up a separate power supply, but this was too much like hard work.

I'd recently fixed a couple of Thomson VideoCrypt decoders in which the sync separator chip had gone short-circuit. It was easy to trace the cause of the trouble in these decoders because the transformer power supply had burnt out the series resistor that feeds the chip. Anyway, I removed the TEA2029C chip on the Nokia decoder board and the short-circuit disappeared. A new chip cured the fault.

The dealer was quite surprised to hear that the power supply had not been to blame.

e-mail etc

As you may have noticed, my e-mail address has changed. My technical advice service had become so popular that it was costing me a fortune to reply via CompuServe, whose local number is horribly unreliable. I asked them to sort it out, but all I received was promises.

A small, local company went out of its way to help me. I now have a lower-cost access point and, in return, have been recommending this company to friends. It's all about caring for customers. The big players find this very difficult.

You may not care for the Internet,

and I'm sorry if it bores you. I find it incredibly useful however. For example I can get information from repairers all over the world from the newsgroup called, cryptically, sci.electronics.repair. We all help each other to solve problems.

It works like a 'bulletin board'. You post a question and, sometimes within minutes, somebody posts a reply. One nice fellow who seems to be forever helping people with their problems is Nigel Cook. I've never met him, other than via the Internet, but he runs a shop called Diverse Devices that stocks obscure/obsolete components, second-hand test equipment, circuit diagrams and other stuff – I do manage to find them for you! Send Nigel two stamps for his catalogue. The address is Diverse Devices, 75 Priory Road, St Denys, Southampton SO17 2JQ.

There's a newsgroup for just about every type of hobby and business. Don't give up your subscription to *Television*, but you might find it useful to get connected.

Amstrad SRD510

Low level video is a common fault with this model. There are many

well-known causes. Here's another one that I've now had twice.

When I was carrying out scope checks on the first receiver with the fault I found that the video level was low quite soon after the tuner. I actually replaced the tuner, to no effect.

Further testing brought me to transistor TR42, which is at the back of the board. It clamps the incoming signal if a low LNB supply is detected. To add to my confusion the associated electrolytic C5 was also faulty. Replacing both items restored the video level to normal.

Another SRD510

This receiver was brought in because it was dead. After fitting the power supply kit and getting it up and running I found that there was no on-screen tuning menu – unless the LNB was disconnected to remove the signal.

I probed around with my oscilloscope for a time then resorted to the more basic process of measuring resistance values. This eventually brought me to R74, which was open-circuit. It seems that the resistors in this model are prone to this type of failure.

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

repairman@netcentral.co.uk

One model per message – state make/model and fault symptoms. If you have no e-mail facilities you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.

A Puzzling Pace

"No E-E" was the unusual complaint with a Pace PRD800 receiver. It transpired that there was poor terrestrial TV loop-through via the RF modulator: the satellite pictures were fine, but the terrestrial TV pictures were decidedly grainy.

A quick look beneath the board revealed a nasty rust patch. Fortunately the only damage was to a surface-mounted transistor (Q10) whose legs had corroded away. After fitting a replacement and cleaning the board around it everything was OK. I advised the customer to have the TV aerial coaxial cable replaced without delay.

Test Case 403

Life isn't easy for a trainee technician in 1996! He faces such a wide variety of equipment, produced by so many manufacturers. Most of it uses high-level technology, and the faults are often obscure and puzzling. Add to this the need for rapid and efficient diagnosis and repair and it's no wonder that Cathode Ray often feels confused, sometimes overwhelmed. It's all right for Sage and Television Ted: they've had two decades or more to master things gradually. It is fortunate that they are around to offer help and guidance.

Ray decided to put aside for the moment the Sony CD player that skipped tracks. He put it back with the Amstrad satellite box that wouldn't decode VideoCrypt. Instead, he turned to an easy-looking job – a ten-year-old Luxor 1101 TV set with no red in its display. Ray switched it on, and sure enough the red section of the colour-bar display was black.

Off with the rear cover and up to the tube's red cathode with an oscilloscope probe. There was no drive signal. Ray moved over to the R video output stage on the main chassis, where again there was no signal. He moved back one more step, to the TDA3562A colour decoder chip ICb1, which should produce an R output signal at pin 13. It didn't. For comparison he tried pins 15 and 17, where 2V peak-to-peak green and blue outputs were present.

So the cause of the fault appeared to be prior to pin 13 of ICb1, very probably within the chip. This was a reasonable conclusion, since the R signal is produced (from Y and R – Y) within the chip. The only relevant peripheral component that Ray could

discern was the 470nF R-channel clamp reservoir capacitor connected to pin 10. The voltage across this capacitor, about 5V, was way down on that across the corresponding G and B clamp capacitors connected to pins 21 and 20 (7.1V), but a replacement capacitor made no difference.

So the culprit had to be the decoder chip. Ray found that there was a TDA3562A in stock. He fitted it carefully, but to his amazement the picture still came up without any red. Once again a scope check showed that there was no red output at pin 13. Well, there has to be a reason for everything. Ray continued his investigation by interchanging the R and G outputs from pins 13 and 15 of the chip. This meant that the chip's R output was fed to the G video output stage while its G output went to the previously quiet R video output stage. There was still no red on the screen, and the chip's G output had now disappeared. The R output at pin 13 had perked up however, providing a drive for the G video output stage – there was a bright green bar where the red one should have been.

What was Ray to make of this strange state of affairs? What diabolical agency was at work? Is there nothing straightforward in the world of modern consumer electronics? Ray's friend Pete was earning better wages in the building trade . . .

Television Ted was on hand to come to the rescue. It transpired that if Ray had adopted a simpler approach at the outset he would have gone straight to the cause of the trouble. So where was the fault, and why was our man so cruelly misled? For the solution, turn to page 675. But think about it first!



**Reports from
David C. Woodnott
and Brian Storm**

Panasonic NVS7

This model is an S-VHSC palmcorder. The problem was that in the S-VHS mode a noise bar, about an inch from the top of the screen, would appear across the picture. It varied in intensity, almost cyclically, coming and going at will. The effect was more prominent with some tapes than with others. A JVC tape was worst, a Philips one best! The tape path alignment, tensions etc. were carefully checked, all to no avail. We eventually cured the fault by fitting a complete replacement drum assembly. Standard VHS pictures were at all times OK. **D.C.W.**

Siemens FA244G4/ Panasonic NVG1

"Cuts out in playback" was the reported fault. Record was OK. We checked the connectors around the main PCB and looked for dry-joints, all to no avail. Why playback

Camcorner

only? This wasn't so surprising when we'd realised how the cam/VTR switching works.

The slider on the VTR operation unit (top of camera) closes the cam/VTR switch contacts in the VTR mode. All that was wrong was a faulty switch. The contacts are open in the camera mode, thus no problem. In the VTR mode, intermittent contacts resulted in the unit defaulting to the camera mode. **D.C.W.**

Sanyo VMRZ1P

Playback and the VTR functions were OK, but there were no E-E pictures and no zoom/focus operation. The cause of the fault was the camera DC-DC converter, a replacement restoring normal operation. **D.C.W.**

Panasonic NVG3

As a result of a fall the cassette compartment wouldn't stay closed. We had been asked for an estimate for insurance, but this wasn't needed. All that had happened was that the cassette housing lock lever had become displaced. It was easily returned to its correct position. **D.C.W.**

Panasonic NVM10

This HiFi VHS camcorder was completely dead – the internal fuse R1701 had blown. A replacement (part no. VSF0059) was fitted, but the result was a brief puff of smoke and another blown fuse. The smoke had come from the HiFi audio PCB, where the 68µF capacitor C4524 had died of old age. A new fuse and

capacitor restored life to the camcorder. **B.S.**

JVC GR65

There was no sound at all, in either the record or the playback mode. After much checking we decided to replace the BA7757BK audio chip IC30. This cured the fault. **D.C.W.**

Sanyo VMD6P

The complaint, which is not common with this popular camcorder, was of tape chewing. It was obvious that the capstan motor was the cause of the problem. It turned very slowly, and in fact was almost seized. As cleaning and lubricating the bearing proved to be ineffective we had to fit a replacement. **D.C.W.**

Sony EVA300

Switching from LP to SP operation and back was the complaint with this camcorder. The cause was broken teeth on the supply and take-up reel assemblies. After fitting replacements we noticed that tape crinkling was evident in the rewind search mode. A new pinch roller put that right. **D.C.W.**

Canon E100E

There was no operation. We found that D409, which is part of the SS 5V supply to the syscon microcontroller chip, was short-circuit. In this condition the always 5V supply at regulator IC406 was low – the reading was approximately 3V. **D.C.W.** ■

Panasonic NVG2

The reported fault symptom sounded innocuous enough – "powers up then off". Nothing unusual there. A check in the power supply section of the main board showed that the 2SD2210 transistor Q1008 had overheated and was open-circuit. We fitted a replacement and checked for shorts on the supply rails. As nothing showed up we switched on. The camcorder powered up for about a minute, then our new transistor succumbed.

Q1008 supplies various circuits, including the camera head section. When the latter was disconnected and a second 2SD2210 transistor had been fitted the VTR section worked, with all functions available. So clearly the cause of the fault was in the camera head section.

Again no shorts could be measured. To try to isolate the faulty PCB we decided to disconnect the various sections of the camera

head in turn. A start was made by disconnecting the image sensor PCB. With the rest of the circuitry connected, we applied power. To our surprise power-up was achieved, with the camera unit producing CCD drive pulses and a sync pulse train with burst vectors. When the image sensor PCB was reconnected the original fault condition returned.

So the CCD image sensor was the cause of the fault, though cold checks failed to produce a measurable short-circuit reading. A replacement CCD unit from a scrap unit confirmed our diagnosis by providing E-E pictures. Unfortunately the customer declined, on cost grounds, to have the repair done. This would have been a disappointment in view of the time already spent on the camcorder, but by way of recompense the customer gave us the unit to avoid paying our estimate charge. **D.C.W.**

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TENSION BAND
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ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
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Used On: TC2043, TC2243, TX300		
PANASONIC TLF14568F	1850p	LOT40
Used On: TX2231, TX2244		
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Used On: TC2210, TC2160, TX1752, TX2112		
PANASONIC TLF14586F	2350p	LOT42
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TP400	RC 401	675p	RC5352	RC 5352	800p
TP590-600	RC 600	850p	RC5375	RC 5375	850p
TP390, TP610	RC 610	850p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	850p	RC5901	RC 5901	850p
TP630, TP650	RC 650	850p	RC5903	RC 5903	700p
TP660	RC 660	850p	SABA		
TP661	RC 661	850p	T6772	RC 149	900p
HITACHI			TC319-320	RC 328	875p
CLE800-CLE830	RC 140M	700p	TC356	RC 356	875p
A617402/655602	RC 192	875p	TC358	RC 358	850p
A512120/230	RC 900	800p	TC360	RC 360	800p
A514790	RC 901	800p	TC365	RC 365	800p
A5088470	RC 902	800p	SALORA		
A518612	RC903	900p	SERIES L	RC 190	875p
SCL002	RC904	850p	86173	RC 882	850p
C2096	RC 905	850p	SANYO		
A511940	RC 906	750p	RC218, RC222, RC228, RC238	RC 140M	700p
655602H	RC 907	800p	JXGE	RC 878	850p
ITT			JXDE	RC 884	850p
IFB13, 14, 15	RC 143	875p	VHR2300	RC 890	850p
FS4	RC 148	850p	RC628	RC 865	900p
RG305	RC 305	675p	SHARP		
RG306	RC 306	825p	G012ICESA, 123CESA, 204, 251	RC 140M	850p
FS9/1-10/1	RC 307	850p	SIEMENS		
VS5 RUK	RC 308	825p	FC616	RC 130	850p
VS4-1	RC 310	850p	FC631	RC 132	850p
MULTICONTROL (17C20)	RC 311	800p	FC742	RC 164	900p
KORTING			SONY		
18279, 18396, 18460, 18521 SE	RC 108	850p	RM604, RM605, RM606	RC 140	700p
40540 VTS	RC 108	900p	32 CHANNEL	RC 140M	700p
LOEWE			RM613	RC 141	750p
DC11	RC 146	850p	RM632, RM636	RC 160	675p
MATSUI			TATUNG		
010270601	RC 889	850p	FXA	RC 877	850p
VX770	RC 892	850p	RC70	RC 883	750p
METZ			FX70 FASTTEXT	RC 894	850p
JAVA COLOR (6890)	RC 166	850p	TELEFUNKEN		
COLOR (7156)	RC 183	850p	FB632	RC 632 ST	850p
JAVA (7180)	RC 184	850p	FB639	RC 639 ST	850p
MITSUBISHI			THORN/FERGUSON		
939P/03607, 939P/03609	RC 140M	850p	3V35-42	RC 342	650p
NOKIA			3V31-32	RC 344	800p
SATELLITE	RC 550	850p	3V57-58	RC 628	800p
NORDMENDE			TX10 TEXT	RC 732	575p
TC2336	RC 351N	850p	TX10 STEREO TEXT	RC 738	575p
CMC1, TC3519	RC 356	875p	TX9-90-100	RC 740	675p
OCEANIC			3V55, FV11	RC 783	800p
390C9500	RC 339	900p	TX100 FASTTEXT	RC 785	650p
ORION			TX100 STEREO FASTTEXT	RC 789	650p
RC53	RC 892	850p	PROFESSIONAL	RC 790	650p
PANASONIC			TOSHIBA		
EUR51200	RC 200	800p	CT937	RC 950	850p
TC2200	RC 201	850p	CT9117	RC 951	800p
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500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
1.25A	FUSE09	60P	FUSE25	60P
1.6A	FUSE10	60P	FUSE26	60P
2A	FUSE11	50P	FUSE27	60P
2.5A	FUSE12	50P	FUSE28	60P
3.15A	FUSE13	55P	FUSE29	50P
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Cable and Satellite Show

This year the emphasis was mainly on digital equipment.
George Cole reports

This year's Cable and Satellite Show was held at Earl's Court during April 15-17th. It's an interesting time for both these industries, not least because of the changeover in the broadcasting world from analogue to digital transmission.

Astra and Eutelsat

SES was celebrating the successful launch of its Astra 1F satellite on April 9th. The company announced that Viacom, the entertainment and publishing giant, has leased two of Astra 1F's transponders, bringing the total number leased to 12. Thus over half the total capacity of 22 transponders has now been booked. Viacom's channels include MTV Europe, VH1 and Nickelodeon. MTV Europe and VH1 Germany are moving from Astra 1E (transponder 71). The third Astra digital satellite, 1G, is to be launched in the summer of 1997. SES is now seeking new orbital positions for further satellites, to extend its coverage. The company demonstrated digital transmissions from NetHold and Canal Plus, including a near video-on-demand system.

Astra's rival Eutelsat, with its 13°E slot, is to launch a series of Hot Bird satellites for both analogue and digital broadcasting. The company announced that it has authorised Matra Marconi to start manufacture of Hot Bird 5, which will have 22 transponders and be launched in the spring of 1998. It will carry a digital multiplexing system, specified by Eutelsat and the European Space Agency, called Skyplex. This will enable digital TV and audio channels to be uplinked from a number of different locations and then downlinked as a single multiplex for

reception with an IRD and a 45cm dish. Hot Birds 2, 3 and 4 are under construction and will be launched in August 1996, the first quarter of 1997 and the autumn 1997 respectively.

Digital Receivers

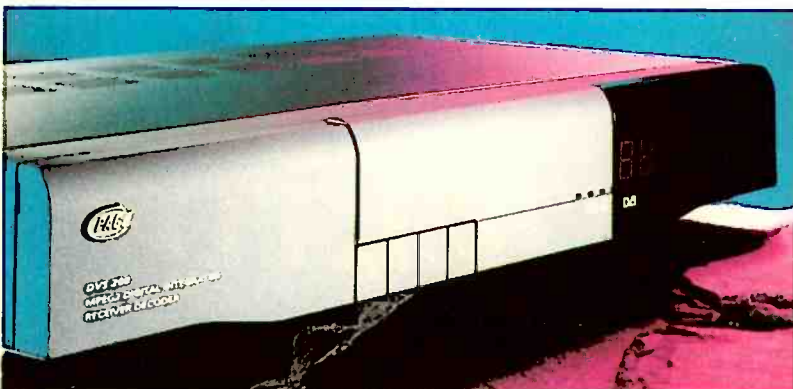
Pace showed an interesting design intended for digital cable, satellite and terrestrial reception – Model DVST600. It enables the user to tune in digital transmissions from any source, avoiding the need for several set-top boxes. But the issue of conditional access has to be decided before Pace can go into full production. The view taken by Pace is that terrestrial digital TV should use the same conditional access system as other types of transmission.

Pace also launched the DVC200, an MPEG-2 digital cable decoder that was being demonstrated by pay-TV company Irdeto. NetHold, Irdeto's parent company, provided a digital feed via Astra 1E. Model DVC200 can download software off-air, and has a modem return path for interactive services. It has a high-speed digital output that runs at up to 50Mbits/sec, and an RS232 serial interface for connection to a PC. The unit provides an electronic programme guide (EPG). Other features include four AV phono sockets, infra-red remote control and a video mosaic system that provides multiple screen images. This can be used for programme selection or displaying multiple camera angles. A second-generation version, Model DVC600, will be launched later this year. It will incorporate an internal modem to provide the return path for pay-per-view and interactive services.

Pace and Telvés have developed a digital SMATV distribution system that the companies say could be used to upgrade analogue systems in blocks of flats. It distributes QPSK (quadrature phase-shift keyed) signals rather than the QAM (quadrature amplitude modulated) signals generally used by cable networks. The system combines the use of Televés' IF/IF channel processor and Pace's DVS200 IRDs. Satellite digital QPSK IF modulation is downconverted to the 48-860MHz spectrum, enabling the signals to be distributed via conventional coaxial cables. At each access point the VHF/UHF modulation is block up-converted for decoding by a DVS200 IRD.

Philips also showed working MPEG-2 DVB decoders, including a system capable of receiving both analogue

The Pace DVS200 MPEG-2 digital integrated receiver-decoder.



and digital transmissions. The analogue signals are looped through the digital section to the analogue section then fed to the TV set. Philips points out that this enables users to view pictures from whatever source. One surprise was the disappointing MPEG-2 picture quality produced by some Philips equipment. It was not possible to ascertain whether the cause of this was poor encoding, transmission problems or a combination of these factors.

Echostar's DSB9600 MPEG-2 DVB receiver handles QPSK DVB-S digital satellite transmissions and QAM DVB-C cable signals. It also offers subtitling, teletext, an EPG, twin scart sockets, a high-speed data port and an RS232 interface.

As music services such as DMX and Astra's ADR increase, so more and more companies are launching equipment for their reception. TechniSat's Astrastar AX1 and AX2 receivers have 256 DMX and 256 ADR channel capability. Other features include an RS232 interface and an optical digital output.

Last year Nokia unveiled its Multimedia Terminal, which has been renamed the Mediamaster 9500S. It can receive signals with any bandwidth from 2-54MHz and decode video streams that are variable from 1.5-45Mbits/sec. The unit is DVB compliant and can handle MPEG-2, pan-and-scan, letterbox and non full-size picture formats.

The Mediamaster can be linked to a VCR, a hi-fi system, a CD audio, CD-ROM-XA, Photo CD or video CD player. It will also send and receive faxes and e-mail and gives access to the Internet. That's what I call versatile! The electronics include a Motorola 68340 16MHz processor, 1Mbyte of RAM with a 512Kbyte extension, and 1Mbyte of flash (non-volatile) memory. The unit can be used with PC cards (formerly PCMCIA) and smart cards.

Nokia has invested £25m in Mediamaster production facilities and has recruited an extra 300 staff. Manufacture began in April, and there are two production lines. A billion units have been ordered by the German company Kirch. An agreement has also been signed with Irdeto: this gives Nokia a licence to manufacture and market MPEG-2 DVB set-top boxes that comply with Irdeto's conditional access system.

Looking farther into the future, Pace showed Concept 2000. This is a multimedia system that can be used for FM radio, Astra Digital Radio (ADR) and satellite TV reception. It also has a CD output. According to Pace future developments could include a unit with a read-write CD-ROM or DVD, a high-speed cable modem capable of sending or receiving around 4-2Gbits of data a second, and a keyboard and mouse for controlling entertainment services or playing games.

Analogue Equipment

Everyone I spoke to at the show was convinced that analogue services would continue alongside digital transmissions for some time. Five to ten years was the general estimate. So it wasn't surprising to see a number of new analogue receivers.

Nokia launched its Sat 8000 series, which includes the Sat 8001 with 600 preset channels, three category lists, four scart sockets and VideoPlus. The Sat 8000 is a mid-range unit that offers 319 preset channels, favourite channel selection, parental lock and a VCR timer. Model Sat 800 Plus also has 319 channels, with selection of 36 favourite channels, Wegner Panda sound, 26 audio presets, three scart sockets and a VideoCrypt decoder with a single-card reader. Suggested price is £229, which includes a 60cm dish. Model Sat 1800 is an IRD with 600 preset channels (TV and radio), VideoPlus, a VideoCrypt



The Philips STU3510 satellite receiver, shown with the Philips SD8610 elliptical satellite dish.

decoder and three scart sockets. This one has a suggested price of £300 including a 60cm dish.

Although MAC has been abandoned in most of Europe, it is still popular in Scandinavia. Nokia's Sat 8003CS is a PAL/MAC stereo receiver which has two smart card readers, 500 preset channels and Wegner Panda stereo sound.

Pace's Prima model has a wideband receiver, VideoCrypt decoder and 28-day, 4-event timer.

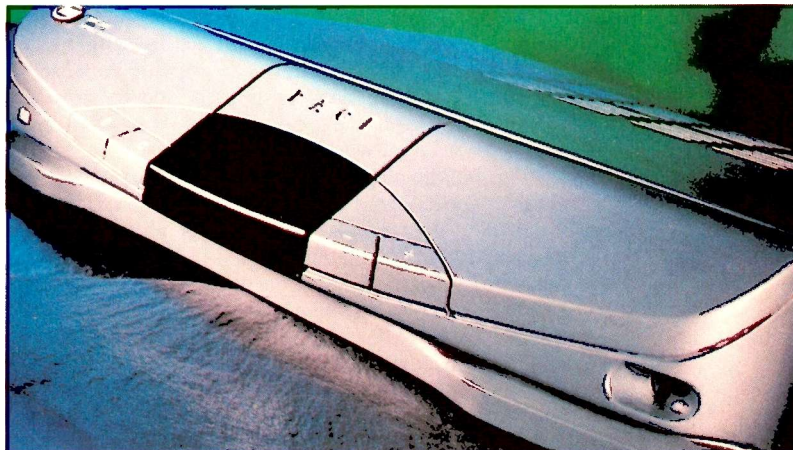
Philips had a new range of receivers on show, including the STU3510 which provides low- and high-band signal reception (up to 2,150MHz) and has automatic widescreen switching and dual LNB inputs. Model STU4310 has a twin tuner to enable the user to watch one satellite channel while recording a different one. Philips has introduced the Pye SB1191 for the budget end of the market. A range of Philips dish systems included an elliptical fibreglass model (SD8610).

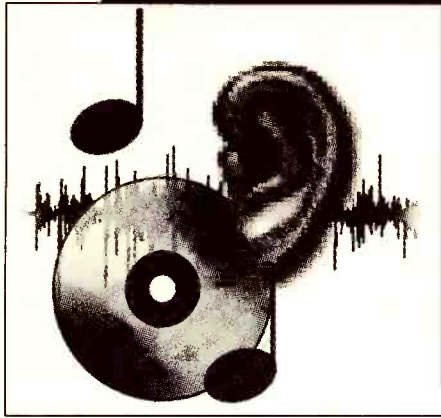
Multimedia

General Instrument had SURFboard on show. This is a cable modem that's designed to link high-speed multimedia services to the home. It offers speeds of up to 27Mbits/sec. To give you an idea of the speed, it would take a 28.8 telephone modem over four hours to download a 55Mbyte video file (enough for a six minute video clip), an ISDN connection over two hours, an Ethernet cable modem 44 seconds and SURFboard just 16 seconds.

We can expect to see even more digital equipment at next year's show now that BSkyB has announced plans to go digital. ■

The Pace DVC200 MPEG-2 digital set-top box, which is designed for use with cable TV systems. It can download software off-air and has a modem return path for interactive services.





CD/Mini Disc Player Casebook

Reports from
Philip Blundell,
AMIEEIE,
Nick Beer,
Graham
Thompson,
Robert Marshall,
Chris Watton and
John Edwards

Philips CDC586

Focusing occurred when a disc was inserted but the disc didn't spin. Checks showed that one of the spindle motor drive transistors, Tr6511 (BC328), was open-circuit. To be on the safe side I replaced the pair – Tr6510/6511. P.B.

Sony CDPM18

This unit was extraordinarily sensitive mechanically – it would skip if you went near it! The RF output from the laser was clean but well down. Cleaning the lens restored the amplitude to 1V peak-to-peak, just within specification. But the machine still skipped. Better results were obtained when a new laser unit was fitted. I used a pattern KSS210RP from CPC: it worked very well. N.B.

Sony MZR2

We've had problems with a couple of these Mini Disc players recently. The first one was dead when removed from the box. All outputs from the DC-DC converter power supply were found to be OK. We then discovered that the micro-controller chip's reset was permanently active. The cause of this was traced to the reset tact switch S805, which had been made with its knob stuck under its escutcheon and was therefore short-circuit.

The problem with the second one was that it would play mastered discs, also discs that had been recorded by another machine, but when it was used to make and play back a recording it went through the motions but the playback consisted of just snippets of the recording, as if there was mistracking. If the same disc was tried in another player it registered as a blank disc. This was because the faulty machine was erasing the TOC. As with a floppy disc, re-recording consists of erasing the TOC, leaving the data to be over-written. We traced the cause of the problem to the magneto record

head, which was in the wrong position because its support bracket was bent. Although this item is fixed to the chassis with a single screw, it's not available as a separate part: you have to replace the whole laser assembly (part no. A3300221A), which costs a fair bit. It transpired that the unit had been dropped.

I must say that these players are a delight to work on. N.B.

Goodmans S2750

We've had two of these in recently. The first was dead with no +10V supply. Q403 was found to be open-circuit: it had failed because the clip that should secure it to a heatsink was missing.

The second one was also dead, with no AC at the bridge rectifier on the CD PCB. Checking back, we found that there was no output from the mains transformer. The secondary winding is centre-tapped, with the outputs taken via a couple of safety resistors. These are in the leads from the transformer, behind heat-shrink sleeving. Suitable replacements can be obtained from Farnell Electronic Components, Leeds – part no. PR01 2R2. As they are safety components, the correct type must be used. G.T.

Bush MS351CD

This player was totally dead. Even the drawer wouldn't open. The only sign of life was the LC display's back light, which was lit. We found that the 1N4148 diode D305 on the power supply/audio amplifier PCB was short-circuit. G.T.

Bush MC101CD Hi-Fi

The CD section of this unit produced an output on only one channel. First a word of warning. Before you remove the miniature plugs from the CD PCB, glue the sockets to the board. Otherwise the socket can remain attached to the plug, leaving only the pins on the board. This happened to us with the supply connector – although the wires were

red and black, the red one was the earth line! Resoldering in the output circuitry solved the one-channel problem. R.M.

Samsung RCD1300 CD/cassette/radio

There was no CD operation with this portable equipment. The TOC wasn't being read, and when we opened the lid we found that the disc was rotating backwards. The laser lens somehow looked odd – shifted to one side. When the unit was dismantled, the thin plastic cover that encapsulates the focusing coils and the laser was found to be partly crunched up. Fortunately we were able to reform the plastic and refit the cover. After some lubrication the unit worked remarkably well. R.M.

Toshiba XR9318

The disc motor ran out of control, the disc being just a blur. When we opened the drawer the disc clattered as it tried to go into orbit. The cause of the trouble was in the disc motor drive amplifier, where transistors Tr6511 and Tr6512 (BC337 and BC338) were both leaky and resistor R3570 (4.7Ω, safety type) was open-circuit. Replacing these items restored normal operation. C.W.

Akura DX9

The sound was audible but masked by a high-frequency hiss, while the lower frequencies suffered from an effect similar to crossover distortion in a conventional power amplifier. The cause of all this was the LC7881 DA converter chip IC10. J.E.

GoldStar CD621L

This machine remained lifeless. The display in the LCD panel read "00" with or without a disc inserted, because the disc-inserted leaf switch was bent and not being activated by the lid as this was opened and closed. We were able to cure the problem by carefully straightening and aligning the switch so that the lid made accurate contact with it. J.E. ■

Aerial Rigging

Climbing up ladders and on rooves is not everyone's cup of tea. But it can make the difference between solvency and business failure. John Pitt-Francis on the pros and cons and the equipment required



Why do aerial rigging? Surely field and bench servicing constitute a trade in itself, and should give you enough to be getting on with. Perhaps, especially with a one-man business. But, particularly in a rural area like mine, some aerial work may make the difference between solvency and business failure – when you first start off at any rate. Remember that even when you've done a good repair you may not see the customer again with the same piece of equipment for a couple of years, if at all. And not all friends and relations will ask who did the work! The need for at least some new business is never ending.

I started off by doing the odd loft or bungalow weatherboard aerial installation, and of course a few satellite dishes, because customers would ask me to. I soon realised that this was as well paid as TV/video servicing, with no call backs! It was also an opportunity to make the business better known, and gain reputation by doing a good job. In addition I found the work a pleasant change from the grind of 'bench nasties'. In my part of the world half a day spent on a roof can be just the tonic you need. But it's no good if you can't stand heights.

What You Need

Surprisingly little investment is required to add this extra string to your bow. The most obvious thing you'll need is a good set of ladders. Get the longest you are happy with. This will depend on whether you work solo or with assistance. I find that I can quite easily handle a 22ft, three-section ladder on my own, and that the extra cost in comparison with the two-section equivalent is well worthwhile. A stand-off attachment and a roof-crawling ladder are also essential.

Your ladders will determine the limits of what you

can do. There will always be some work that you'll have to turn down. Never push your limits: the consequences could be deadly. Safety is number one priority at all times. If you have any doubts about your ability, spend a day or two with someone who is competent and qualified in the use of ladders. I also follow the rule that this is good weather activity – when it's dry and calm.

If you don't have a local aerial supplier, you'll need a stock of aerial equipment so that you can carry out an installation at short notice. The equipment listed in the accompanying table will enable you to deal with most requirements.

A professional rigger would be happier to have a signal strength meter and other items not included in the list. But what's shown will get you along.

Reception Check

Your customer will look at the picture you get for him and accept it if it comes up to his idea of what should be present on the screen. For your own peace of mind however, connect a 6dB attenuator in series with the aerial lead and examine closely the results obtained with the weakest local channel. There should be no noticeable graininess. But the best test is with teletext: if errors can't be removed, you should tell the customer. You should also let him know if Nicam reception is less than perfect.

In Conclusion

What the above notes and my previous article haven't mentioned is that elusive quality called enterprise, probably because I lack enough of it! The situation is tough out there, but despite all the aggro it's only on very bad days that I would really want to do anything else. ■

What to stock

Two 10-element economy aerials for each local group.
Two 18-element economy aerials for each local group.
One high-gain aerial for the most-needed local group.
One top-of-the-range aerial for the next most-needed local group.
One 'omni' FM aerial with two diplexers.
A small assortment of chimney brackets and lashings.
A small assortment of wall brackets and weatherboard fixings.
An assortment of straight and cranked poles.
A wideband mast-head amplifier (24dB gain) with power supply.

A self-powered indoor 'setback' amplifier (19dB gain).
An assortment of two-, three- and four-way splitters, plugs etc.
Reels (one each) of white, brown and black coaxial cable plus clips. At least one reel should be suitable for satellite dish use.
A box of 8 x 60mm coach screws and plugs.
Spanners, including a 13mm ratchet type.
A hammer drill with 10mm masonry bit and an 8mm long reach wood bit.
A headband torch.

Forward thinking from...

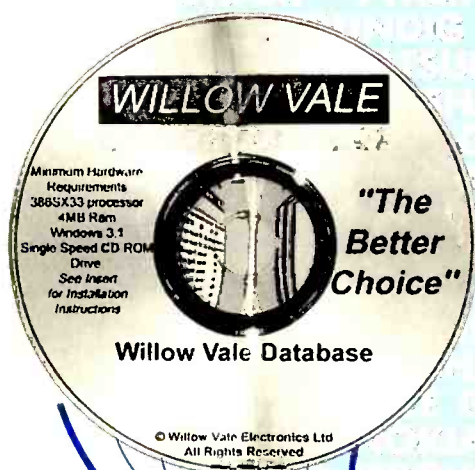
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A Zener Diode tester

Zener diodes are a common cause of faults in electronic equipment, so it's helpful to have a means of checking them. This simple meter, devised by **Michael Dranfield**, is a useful addition to your test armoury

Unlike most semiconductor devices, zener diodes cannot be checked with a multimeter. A zener diode may seem to be OK when forward biased, but may stabilise at the wrong voltage or not at all. We recently had a Samsung SI3240 VCR in with tuning problems, and found that the voltage across the 33V stabilising device was only 25V. In this case the cause of the problem was easy to diagnose, and there was no other damage. Things can be more tricky when the faulty zener diode is part of a switch-mode power supply: the whole power supply might blow up at switch on, especially where DC coupling is used throughout. We've had this happen with the Ferguson FV31 VCR and ICC5 chassis.

The tester described in this article applies a current-limited, high-voltage supply across the zener diode under test, showing the breakdown voltage on a liquid-crystal display with an accuracy of 0.1V.

Circuit Description

The circuit of the tester is shown in Fig. 1. It employs a single-transistor oscillator that runs at approximately 3kHz. Mains transformer T1 is used in reverse: its centre-tapped 4.5-0-4.5V winding is the oscillator transistor's load, the 0-240V winding stepping up the voltage to feed bridge rectifier BR1. When pushbutton switch PB1 is pressed, a voltage starts to build up across the rectifier's reservoir capacitor C4. This build up continues until the zener diode being tested starts to conduct. The conduction point is the diode's zener breakdown voltage, and is displayed directly by the LCD panel. R2 limits the current flowing through the diode to about 5mA.

The display device is a digital LCD voltmeter module that's available from Maplin. It has a maximum read out of 199.9V, which is not a problem since zener diodes with a higher breakdown voltage are rarely used. R3 and R4 calibrate the meter: the LCD module has a built-in preset for fine adjustment.



Approximately 350V is developed across C4. If the unit is run without a zener diode in circuit the display will over-range, displaying a one. No damage will be done to the display, but if you wish you can limit the test voltage at approximately 200V by connecting a 1.2M Ω resistor across C4.

Construction

Circuit layout is not critical. I etched my own board, but you could build the unit using tagstrip or Veroboard. The prototype unit is housed in a very professional-looking instrument case with a display window and a PP3 battery compartment. The case costs about £8 + VAT from Farnell while the Maplin GW01B display unit costs £11.95.

Setting Up

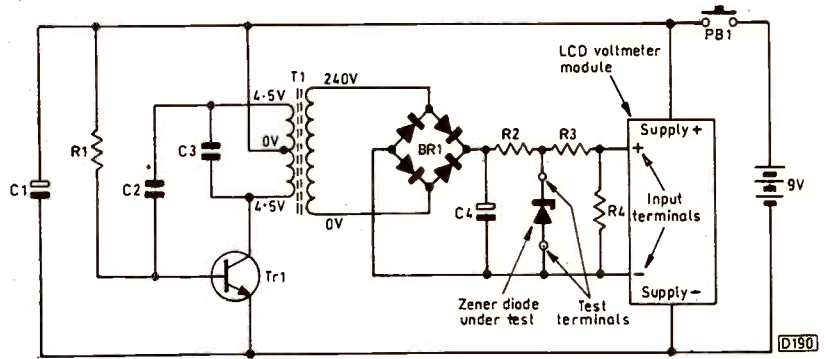
Initial setting up is easy. Insert a known good zener diode with a breakdown voltage of say 9.1V. Connect a digital multimeter across the zener diode. Switch on and adjust the preset on the LCD panel so that the reading is exactly the same as that displayed by the multimeter. Don't rely on the zener diode alone for calibration, as most zener diodes have a $\pm 5\%$ tolerance and the breakdown voltage can also vary with temperature.

In view of the high voltage present, in-circuit testing is not recommended. Although the input impedance is very high, touching the test terminals with your finger could still make you jump!

Use

Insert the suspect zener diode in the test socket. Push the button and hold it for a few seconds, until the reading stabilises. This is the diode's working voltage. If the meter reads 0.7V the zener diode is connected the wrong way round, with forward bias applied.

Happy testing!



Components required

- Tr1 2SC1815
- C1 100µF, 25V
- C2 0.047µF, 250V polyester
- C3 0.047µF, 250V polyester
- C4 2.2µF, 400V
- BR1 400V, 1A bridge rectifier
- R1 10kΩ
- R2 10kΩ
- R3 4.7MΩ
- R4 4.7kΩ
- T1 Farnell 432-684
- PB1 Farnell 140-690 miniature pushbutton switch
- LCD Maplin GW01B digital LCD voltmeter Case, Farnell 465-963
- Test sockets Farnell 145-299 (red), 145-300 (black), PP9 battery.

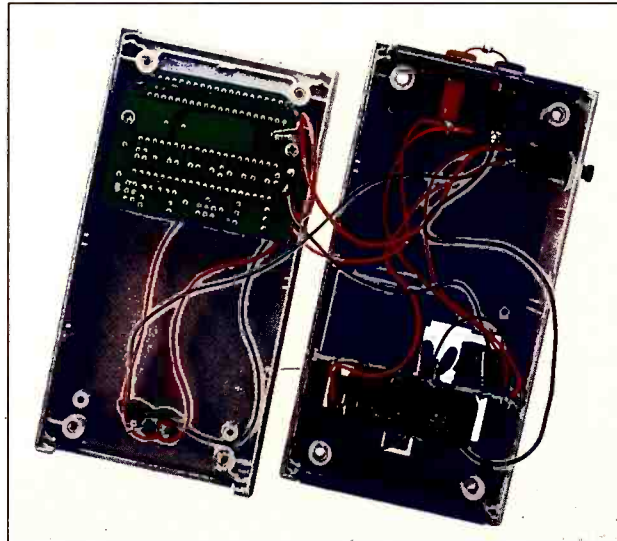


Fig. 1: Circuit diagram of the tester. Do not connect the negative side of C4 to the battery's negative terminal, as the LCD panel won't work in this condition.

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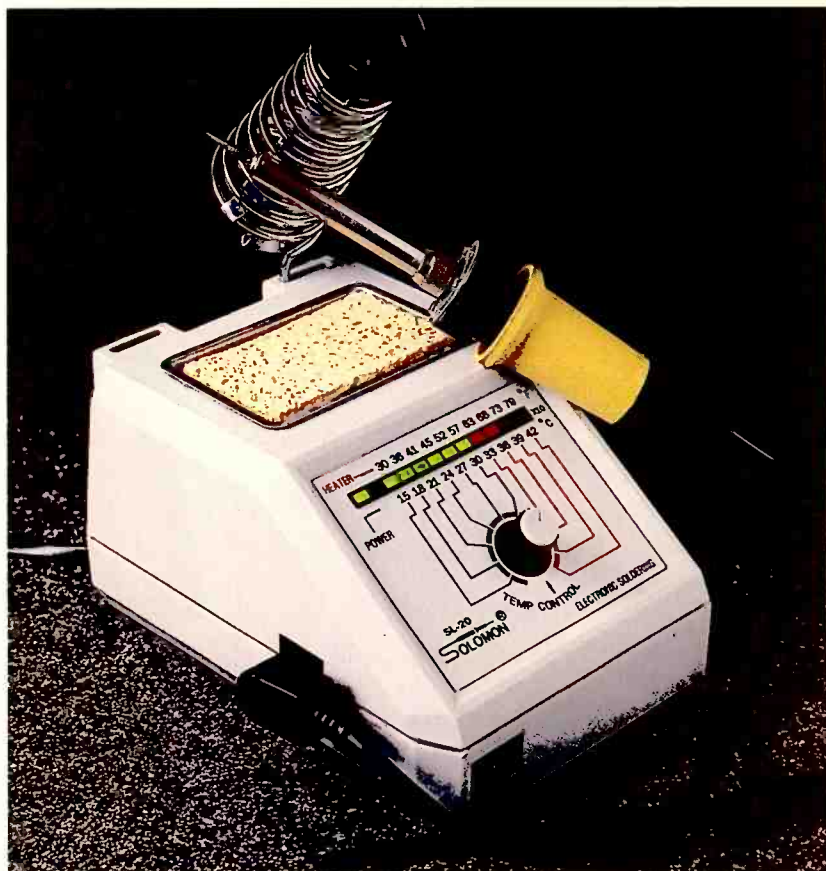
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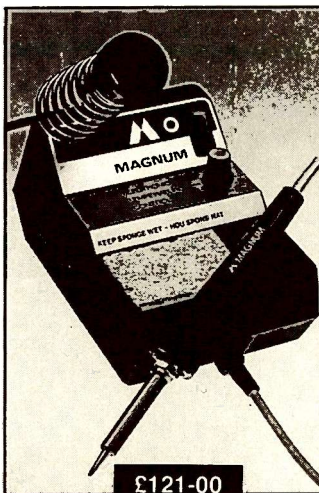
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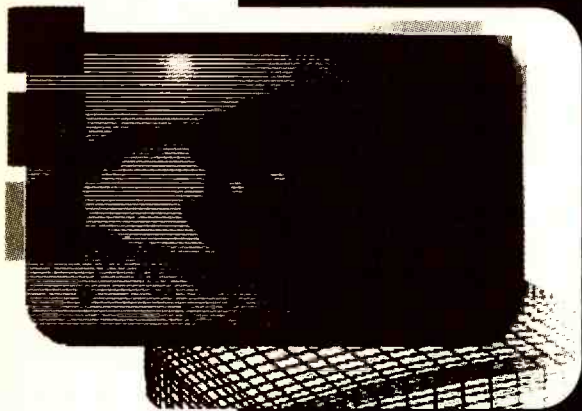
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Reports from Philip Blundell, AMIEIE, Richard Flowerday, Brian Storm, Graham Richards, Shane Humphrey, Keith Evans, Michael Maurice, John Edwards, Graham Thomson and Giles Pilbrow

Grundig CUC4410 Chassis

One of these sets came to us after visiting another dealer. He had fitted a new line output transformer and, when this had failed to cure the problem, had given up. The first thing we found was that the BU508A line output transistor was short-circuit. We removed it and connected a dummy load across the HT supply. The voltage was OK at 159V, but the line output transistor's base drive (normally 6.7V peak-to-peak) was low. A new TDA8140 chip restored the drive to the correct level, and a new BU508A brought back the picture. But the width was excessive, with bowed verticals. We found that D7102 (ZPD30) in the EW module was short-circuit, removing the EW modulator drive. **P.B.**

Philips CP90 Chassis

If there is no line oscillator operation – the 95V supply is present but there's no EHT etc. – check the 19V supply. You'll find it marked 19V by C2691. If the voltage is low, check C2691 (330µF) by replacement. **P.B.**

Hitachi C2118R

For intermittent or permanent loss of line output stage operation, check the HT supply (+B) at the line output transformer. If the voltage is

TV Fault Finding

above 112V, the 39kΩ resistor R909 (part no. R349319) has probably gone high in value. **P.B.**

Philips CP110 Chassis

"Teletext fault" it said on the job card. When we selected text we found that most of the page was correct but the letter at the far right-hand side of each row was wrong. After checking the supplies to ensure that the voltages were correct and free of ripple, we checked the RAM's data and address lines. No problems could be seen here, so we decided to try a new ROM chip (UPD4364). This cured the spelling errors. **P.B.**

Sharp D3000 Chassis

This set (Model DV5903H) had a colour fault: the luminance and colour were shifted with respect to each other, being two inches apart. Now the luminance/chroma delay can be adjusted in the service mode, but this moved them by only a small amount. A phone call to the nice man at Sharp Technical brought the suggestion that we replace the non-volatile memory chip IC1411 in the video unit. When we did this and switched on there was a loud bang – the field output chip had blown its top!

Another call to Sharp Technical confirmed that we had ordered and fitted the correct part. Maybe the new NVM was faulty? Another one and a replacement field output chip were obtained and fitted. This time the picture came back and the colour fault had gone. We spent a few minutes setting up the picture geometry then wrapped up the job.

The sigh of relief in Manchester could almost be heard. **P.B.**

Sony BE3B Chassis

As a Sony ASC we have had several of these sets in for repair. The following fault notes are intended to supplement your recent article on the chassis (May/June issues).

Dead set: The most common cause is failure of the start-up resistor R600 (39kΩ, 5W) in the power supply.

'Not completely dead' set: Check the four circuit protectors PS600-603 adjacent to the chopper transformer T601. They seem to fail for no apparent reason.

Lack of width, bowed picture: Check whether the 2SC4793 EW modulator driver transistor Q801 is open-circuit.

Excessive width: There are two common causes of this fault. Either of the following two items could be open-circuit. Check fuse link PS801 (0.4A) and R813 (1kΩ, 1W) which provides Q801 with base bias.

No teletext: This fault had apparently been intermittent to start with. It was now permanent. The 13.875MHz teletext clock crystal X1001 had failed.

Poor colour: This was an unusual fault. A check with a test pattern showed that the B – Y colour-difference signal was missing. Colour decoding is carried out by

the TDA8366 jungle chip IC301, in conjunction with the TDA4665T delay line chip IC302. Scope checks showed that the B - Y signal was present at pin 44 (output) of IC301 and at pins 14 and 12 of IC302. It did not return to pin 46 of IC301 however. The 0.1 μ F chip coupling capacitor C323 was open-circuit. Normal operation was restored when we touched it with a soldering iron, but we replaced it to be on the safe side.

No sound or picture: This was another unusual fault. The timebases were working, and a video signal was present at the scart-1 socket. We also discovered that when we tried to tune the set to the output from our pattern generator it wouldn't, in the search tuning mode, stop at any channel. This suggested a problem with the BA7046F coincidence detector chip IC202, whose internal oscillator wasn't working. A replacement chip restored normal search tuning. **R.F.**

Panasonic TX25W3 (Euro 1 Chassis)

There was a dark, blank raster with no sound. After much checking of the data lines around the digital chips I resorted to my usual method with these sets: guesswork. The Nicam chip IC1401 has been responsible for a different set of symptoms nearly every time I've had to replace it. So I removed it and, surprise, surprise, up came a good clear picture. Yet another MSP2410 chip was called for. **B.S.**

Panasonic TX29AD1 (Euro 2 Chassis)

Dark, diagonal black lines, from the top left of the picture to the bottom right, would sometimes appear on the picture. On occasions the set would cut out and go into the standby mode. The main advantage of the Euro 2 over the Euro 1 chassis is the fact that there are considerably fewer chips in the guesswork equation. As a result the second chip I replaced cured the fault! It was the TPU3040-18 teletext processor chip IC1701. **B.S.**

Panasonic TX25A3 (Euro 1 Chassis)

The picture and sound would come on for about thirty seconds. Then the line drive would cut out and the set would relapse into the standby mode. Intriguingly, if the aerial was disconnected the set would continue to operate indefinitely, though with a noisy raster. What have I said

before about the MSP2410 Nicam chip IC1401? Yes, it was again the culprit. **B.S.**

Panasonic TX25MD1 (Euro 2 Chassis)

The field scan would sometimes vary quite considerably, and occasionally the set would revert to the standby mode. After a lot of testing I found that the ST42C08CB1 EEPROM chip IC1203 was the cause of the trouble, a replacement restoring normal operation. **B.S.**

Matsui 2190

This digital TV chassis was dead. We found that the 115V HT supply was OK, measured at the cathode of D802. But a 5V supply was missing. It comes from the M78L05 regulator chip IC804, whose input voltage was OK. A new M78L05 put matters right. **G.R.**

Sharp C1491

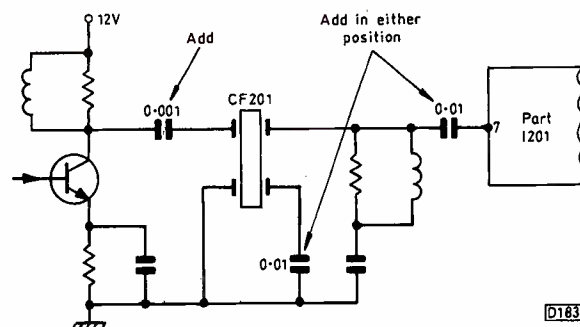
A blank raster with no sound was the complaint with this portable. Many of these sets were sold in the UK under the Rediffusion brand name, and it's a very common fault. The SAWF fails, and some suppliers used to provide a modification kit. It consisted of a replacement filter plus two capacitors to provide DC isolation, also a modification sheet. The 0.001 μ F capacitor is added to provide AC input coupling to the SAWF. The 0.01 μ F capacitor provides coupling/DC isolation at the output side of the SAWF and may be fitted in either of the two positions shown in Fig. 1. The idea is to improve the reliability of the SAWF. The Sharp kit part no. was VCK2PU1HB103K. We fitted the last one we had in stock, completely curing the fault. **G.R.**

Samsung CI5030AN

When this set was switched on from cold it produced the symptoms of being slightly off tune, i.e. a distorted monochrome picture with line pulling. In addition it was not possible to tune the set when it was first switched on because it wouldn't stop at a station. Once the set had warmed up (after fifteen-twenty minutes) it worked perfectly and tuning was possible. After a considerable amount of heating and freezing we found that the culprit was C401. A replacement restored normal operation from cold. **S.H.**

Panasonic Alpha 4 Chassis

The on-screen display consisted of



only 'black boxes', with no colour content: the picture and teletext displays were perfectly normal. We found that C3304 (0.01 μ F) was leaky. As a result R3309 (820 Ω) had gone high in value, upsetting Q3301's biasing. Replacing these two components restored the on-screen displays. **S.H.**

Proline NV2400/NV2700 (Tatung 180 Chassis)

The complaint with one of these sets was inability to tune in stations coupled with a delay in responding to channel change commands. We found that the 33V supply to the citac chip had disappeared because one of the two 10k Ω resistors (R005 and R006) that supply the 33V stabiliser had gone open-circuit. It's a good idea to replace them both - they are located next to the tuner. **K.E.**

Hitachi CPT1455

The problem with this portable was sporadic brightness variations. We found that the 200V HT supply was unstable because C761 (4.7 μ F, 250V) was defective. **K.E.**

Ferguson 59P7 (ICC5 Chassis)

The customer said that when the set was taken out of standby the red light at the front went out but the set remained dead. An almost dead short across the HT line was caused by failure of the pincushion correction transformer LG11, something that's becoming common. Its demise had destroyed the EW correction chip IG01 and the 120 Ω and 56 Ω safety resistors (both marked RL44) in the HT feed to the transformer. It's worth checking the 330nF S-correction capacitor CL44. In this set one end was dry-jointed and the casing was bubbling up and split.

Before you switch on after replacing the above items, check the resistor in position J134 - this is the 22V feed to IG01. If it's open-circuit, the chip will immediately fail. The result will be severe EW distortion. In our set the value of the resistor was 220 Ω (safety), not

Fig. 1: Modification to the Sharp C1491 and related models to improve the reliability of the SAWF CF201. The 0.01 μ F capacitor can be fitted in either of the positions shown.

120Ω as shown in the circuit diagram. K.E.

Murphy M22501 (Fidelity ZX4200 Chassis)

This set's picture was a real mess. The top third was stretched, the horizontals were ragged, and there was a static hum bar in the centre of the screen. It looked like, and proved to be, a power supply problem. Visual inspection showed that C87 (47μF, 200V) was in distress. Its replacement put matters right. K.E.

Hitachi CPT2174 (G6P Chassis)

This set was dead with a purr coming from the power supply. The cause of the trouble was eventually traced to the line driver transformer. Its body is used as an earth return, and one of the lugs was dry-jointed. Resoldering cured the fault. M.M.

Philips FL1.1 Chassis

When this set was switched on it went into standby. If you pressed the channel buttons on the remote control handset the EHT came up then died. After this the LEDs at the front started to flash. The cause was a dry-joint on L5521. Resoldering it put matters right. M.M.

Sony KVM2131

This set came from another dealer who had soldered all the joints in the IF can. When I got it there was no video input to the sync separator/timebase generator chip. Video went into the text board but didn't come out. The cause of the trouble was the N15 circuit protector L2 on the text board. Replacing it cured the fault. M.M.

Saisho CM250R

There was no sound or raster. If you turned up the first anode preset you could see that there was field collapse. This was a bit of a red herring however. The field drive comes from the TA7698 chip, which requires 12V at pin 2. This supply was missing. We found that R408 was open-circuit because D408 read approximately 300Ω both ways. Replacing these items cured the fault. M.M.

Panasonic TXC74 (Alpha 1W Chassis)

The reported fault was "colour goes funny, worse when cold". As the set had been running for several hours, it was not possible to make a diagnosis at the customer's house. I took the set back to the workshop

and, when it was nice and cold, the fault was certainly there. A whistling noise came from the set, and the picture was breaking up into horizontal lines.

Scope checks at the secondary side of the power supply failed to reveal anything amiss, so I treated the set to some freezer squirts on the primary side. When C808 (10μF, 63V) was cooled the set went berserk. A new capacitor restored normal operation. M.M.

Saisho 1480

This set was dead. Checks showed that the surge limiter resistor was intact and that the start-up resistors read 330kΩ, as they should. The set uses an STR50103 regulator chip. Unusually for this device, it was open-circuit. A replacement restored normal operation. M.M.

Philips CTX-E Chassis

The fault description was "no picture and sounds like a radio". There was EHT, and when the first anode control was turned up I found that there was field collapse. It was obvious that the sync/drive generator chip was running from its start-up supply. The cause of the trouble was loss of the 12V supply because the 2.2Ω fusible resistor R3585 was open-circuit. A replacement restored normal operation. M.M.

Beon CTV1412R

The complaint with this portable was that the sound went off after twenty minutes. As flexing the board made the sound come and go it appeared that a dry-joint was the cause of the trouble. C105 (4.7μF, 160V) was going open-circuit however. M.M.

Tatung 140 Chassis

The owner complained that when he switched this set on there would be lots of crackling, and after about half an hour the picture might appear. He also said that the problem had been present for some time, and that he thought the switch was faulty! The power supply in this chassis is based on a TDA4600 chip. When you get a fault like this, look no farther than the electrolytics associated with this device. In this set they are C807, C808 and C810, all 100μF, 25V. Replacing all three restored normal operation at switch on. M.M.

Ferguson B49F (TX90E Chassis)

This set was dead. A scope check at

the collector of the chopper transistor showed that the set would try to start up then die. We could find no shorts on the secondary side of the chopper power supply, nor any fault on the primary side. Luckily we had another of these sets in for repair. Swapping over the chopper transformers proved that this item was the cause of the trouble. M.M.

Mitsubishi CT2525TX

Replacing R901 (4.7Ω, 5W), the 2SD1887 chopper transistor Q901 and the TEA2164 chopper control chip IC901 brought this set back to life. But when we switched it off then on again Q901 went short-circuit. The cause of the trouble turned out to be the 3V zener diode D909, which was short-circuit. J.E.

Grundig CUC3800 Chassis

There was no audio output, just hiss. The cause of this was a faulty U2829B sound IF demodulator chip (IC2110). It lives on the plug-in IF stereo board, next to the tuner. J.E.

ITT-Nokia Core 2 Chassis (110°)

This set could be switched on but as soon as the EHT came up there was severe arcing between the line output transformer's screened lead, which protrudes from the base of the transformer, and the body of a nearby electrolytic. The set would then shut down. Redressing the lead, which had a crack in the sleeving where it emerged from the transformer, provided a cure. I also renewed the capacitor, just in case. When the set was switched on again there was a good picture, but it was of reduced size both vertically and horizontally. The pictures also ballooned in and out depending on the brightness of the scene. This provided a clue. R536 (33kΩ), which is part of the anti-breathing and beam limiting network connected to pin 5 of the line output transformer, was badly burnt and open-circuit. Replacing it restored a perfect raster. This resistor is situated on the opposite side of the transformer, well away from the original fireworks, so how it was destroyed remains a mystery. J.E.

Network NWC1401

The complaint with this 14in. portable was no colour. A scope check showed that there was no oscillation at the 8.8MHz crystal X1 on the vertical plug-in colour decoder board. A new crystal produced an 0.5V peak-to-peak

waveform and normal colour. **J.E.**

Grundig CUC2410

There was sound and text but no channel picture. When the brightness was turned up fully only a blank raster was displayed. We found that there was no video input at pin 8 of the TDA3566 colour decoder chip because the BC548C video buffer/amplifier transistor Tr2523 was short-circuit collector-to-emitter. A replacement restored the picture. **J.E.**

Alba VTV14

There was no tuning voltage at pin BT of the tuner in this combined TV set/VCR. The cause was Q101 which was short-circuit. It's situated between the rear of the tuner and the chassis support rail. **G.T.**

Soundwave CTV2003R

According to the job ticket this set was a heavy smoker. C590 was the culprit, damaged because the PCB around pin 4 of the line output transformer had cracked. **G.T.**

Bush 2114T

This set had no picture or sound and there was a high-pitched whistle. We found that the HT was at

172.5V instead of 112V. Replacing C801, C802, C817 and C818 in the power supply cured the problem. Unusually, there was no other damage. **G.T.**

Ferguson TX100 Chassis

Intermittent low gain was the problem with this set. The tuner and various components in the IF strip had been replaced, but the cause of the fault turned out to be the SL1432 IF preamplifier chip. **G.P.**

Philips 14TVCR240/05

The power supply in this combined TV/video unit was tripping. Checks on the 110V supply showed that it rose to about 170V each time the power supply pulsed. So attention was directed at the regulation circuit, which consists of a winding on the chopper transformer with feedback to pin 1 of IC7310. There was no voltage at pin 1 of the chip because R3343 (5.6Ω safety) was open-circuit and D6335 short-circuit. The resistor's part no. is 4822 052 10568, the diode's part no. 4822 130 8330. **G.P.**

Matsui 1436

For low or no line drive, check the value of R756 (0.5Ω). This resistor

is connected between the base of the line output transistor and the secondary winding on the line driver transformer. **G.P.**

Philips CP90 Chassis

There was a herringbone pattern on the picture when this set was switched on from cold. Scope checks showed that there was ripple on the 19V supply. Replacing C2691 (330μF, 25V) cured the fault. **G.P.**

Matsui 209R/209T

If the set is dead with a barely audible whine coming from the power supply, examine capacitor C613 (4.7nF, 1kV disc ceramic). If split or burnt in any way, replace it. Before it finally fails, this capacitor can be responsible for intermittent cutting out. **G.P.**

Ferguson TX100 Chassis

There was no sound until the volume was turned right up. We wasted a lot of time on the remote control PCB before tracing the cause of the fault to the TDA2578 sync/line generator chip IC4, where the 'valid signal' voltage at pin 13 was slightly low. As a result, the sound was partially muted. A new chip put matters right. **G.P.** ■

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What a Life!

A number of interesting TV faults came Donald Bullock's way between visits from Jeremy Hopsack, the opulent optician

A smart new Range Rover drew up outside. It was driven by Jeremy Hopsack, a local optician. He works one day a week, when he does his eye tests and orders his stock. For the rest of the week his girl sits there taking his bookings. I've never come across anyone who is so expensively dressed, so relaxed and oozing such opulence. His set was a 26in. Loewe model. It would be.

"Can you get it from the car old chap?" he breathed. "Got a bad back you know. It's the darned polo."

The Loewe M124

As Jeremy departed for his club we struggled to get his M124 on to the bench. It was dead. When we removed the back we found that the 1.6AT mains fuse had blown and the power supply had gone up. The TDA4601 chopper control chip was short-circuit. This had all been caused by the failure of the small, blue thermistor in the start-up circuit.

Steven sat down to fit the replacements, then started the set up gingerly via our variac. It came on in standby. When he used the

remote control unit to switch it to fully on the standby light went out but there was no raster.

Steven's next step was to disconnect all the outputs on the secondary side of the power supply, adding a 100W bulb as a dummy load across the HT reservoir capacitor C652. It lit brightly, removing any suspicions about the power supply circuitry. A check on the BU508D line output transistor T539 then showed that, to our surprise, it had gone very high resistance base-to-collector. A new one restored the raster, but the HT was at 160V instead of 142V.

When the HT preset was used to reduce the HT voltage to the correct level the set squealed. C652 (47 μ F, 250V) had dried up. So had the associated HT smoothing capacitor C653, which is also 47 μ F. After fitting a couple of new electrolytics and setting up the HT voltage the set worked satisfactorily, though the tube was flat.

The next day a colourfully dressed huntsman called in, complete with whip and bugle. It was Jeremy. He looked utterly miserable.

"Look at this ridiculous get-up" he moaned. "The things I have to get up to, just to fill in the time."

Tears almost welled up in our eyes. But not quite.

Snoddies Strikes Again

Wendy Whitstable brought in her Sanyo CBP2145 (E2 Chassis). "Gone to a line" she announced, "and the sound crackles and cuts out."

When we opened it up we saw that someone else had been there first. The field scan had collapsed all right. This part of the circuit was full of dry-joints, and two small capacitors in the power supply had each been replaced with a couple of huge ones for which there was

insufficient room – wire had been used to extend their legs!

We attended to the dry-joints first, then checked with the circuit to find out what the capacitors should have been. The circuit told us that the value was 10 μ F, 25V. They had been replaced with a pair of 3,300 μ F, 16V capacitors. When we'd put this right we had perfect field scanning.

We finally looked for the cause of the intermittent sound. In order to remove the chassis, someone had cut the speaker wires and afterwards simply twisted them together. Replacement leads were fitted.

We were curious to know who had previously 'looked' at the set, and asked Wendy when she returned.

"Snoddies" she said. "We got tired of waiting. They had it for six weeks. Said spares were difficult."

A Strange Display

Tricia Tripmeyer was clearly a lady in a hurry.

"Helloee . . . Got this set here. Akai I think. Yes. Can you fix it? Can't stop now . . ." Then she ran off across the green.

The set was an Akai CT2179N-UK. When we switched it on we found that the newsreader's face was severed from top to bottom. The right side was on the left-hand side of the screen while the left side was to the right.

"Line oscillator speed too fast" I said. Then I noticed that every set in the shop was displaying random interference. We opened the Akai up. The chassis is in two parts, the power supply and line timebase circuits sharing one panel. To the rear of this, behind the line output transformer, there's a blue, 222pF, 1kV capacitor – C416. One side is connected to chassis. This leg had been burning in its solder joint,

The things I have to get up to just to fill in the time.



melting the panel support peg. As a result R412 (10k Ω , 0.5W) had gone open-circuit.

Replacing these two items cured the set. Pity we can't do anything about its owner.

Delayed Start Up

A Philips 21GR9752/25B (G90B chassis) was awaiting attention. The ticket said "no picture for the first five minutes". I switched it on and found that there was no raster, though the tube's heaters were alight. After marking its position carefully, I advanced the setting of the first anode preset, expecting to see field collapse. In fact a bright raster with flyback lines appeared, and the remote control unit had no effect on the set. So I wound the first anode control back to its original position and waited for the five minutes to elapse.

The screen suddenly flickered a few times, then a very good picture came up. In addition the remote control unit now worked. I reckoned that the delay was probably caused by a low-value reservoir/smoothing capacitor and, with the set now warmed up, got busy with the freezer.

The fault condition returned when C2660 was cooled. It's a 680 μ F reservoir capacitor which, with D6660, produces about 9V to feed to the 5V regulator. We checked it and found that it read 400 μ F when hot, almost open-circuit when cold.

An Amstrad TV/video

Neither I nor Steven felt like tackling the Amstrad TVR3 combined TV/VCR that someone had brought in for attention. In the end I tried it. The unit was dead, with a cassette jammed in it. While I was checking around Mr Drripp, the unit's owner, shuffled in.

"Ah. Gollimup then. Good. It's all caused by the tape. When you gets it out, the set'll be all right."

I removed the recorder and started to work on the TV chassis.

"You won't find nothing wrong there" said Drripp.

I immediately saw that C310, a pretty, Smarty-sized blue capacitor (3,300pF, 1kV) had cooked and split. So I snipped it out and handed it to Mr Drripp. The 4AT fuse had also blackened, and the STK7348 regulator was faulty. As I worked on I noticed that Mr Drripp had crept out.

I replaced these items, reconnected the recorder (this is necessary) and switched on. The unit chirped a few times but refused to switch on – the

power supply wasn't oscillating. So I separated the two sections and got to work again. The value of the 1 μ F, 50V capacitor C307 in the feedback circuit had fallen to 0.002 μ F. I replaced it with a 105° type. Then I saw that C314 (470 μ F, 16V) had been leaking.

As I replaced these two capacitors Mr Drripp crept back in, holding a bank card and some blues. When I'd finished I reassembled the unit and switched on. Up came a picture with good sound. Mr. Drripp seemed to be pleased.

"There we are" I said, "that seems to be all right, doesn't it?"

"But what about the tape in the recorder?"

"Ah" I said, pressing the eject button. Out it came. I popped it back and pressed play. The recorder sprang to life, playing Drripp's tape in all its glory.

As I disconnected the unit Steven pulled out his pen and reached for the invoice pad. Mr Drripp started to say goodbye to his blues.

A Samsung Camcorder

I picked up the Samsung VPE808 camcorder that Steven had taken in. The playback was grainy. So I immediately pushed it to Steven's end of the bench.

He opened it and announced that the heads were worn. A check with CPC revealed that the part no. was SS69063-213-651, that it was available only to special order, and would take seven-ten days to arrive. It came rather sooner. While the invoice clearly referred to the upper drum assembly, a complete upper and lower assembly had been sent. This is, we supposed, the way it comes.

Steven fitted it by removing the camera's top casing then gently lifting out the deck/PCB assembly. The drum assembly is secured by a couple of flat plastic connectors and three screws. The trade price of the assembly is £57.14 inclusive of VAT, and I've never seen a head change done faster.

CPC

Mention of CPC reminds me that the company's new catalogue arrived the other day. It's quite the largest spares catalogue I've come across for our trade. CPC is to be congratulated on several counts: on the vast range of items stocked, on the prices, and on the speed and efficiency of the delivery service.

The catalogue's layout and presentation are wonderfully clear. Its indexing, which is the key factor,

couldn't be better. And the catalogue is free to those in the trade. I also find CPC's frequent, well-produced 'flyers' with special offers welcome.

Well done CPC!

Return of the Range Rover

An angler, complete with oilskins and waders, climbed out of the Range Rover that pulled up outside. He walked to the back and pulled out fishing rods, baskets, nets and giant umbrellas. Then he came into the shop. It was Jeremy Hopsack again.

"Hello folks" he said. "Can you bring in the telly in my car? It wants putting right."

When we went out to get it we saw that it was a Loewe. Our hearts sank.

"So it's gone again" I said.

"Not art all" he replied. "It's my brother's set. He was so impressed with the job you did on mine that when his failed he asked me to bring it along."

Phew! We put it on the bench and noticed that it was exactly the same model.

"It works when the weather's warm" Jeremy said. "When it's cold it doesn't. Give us a ring." Then he looked himself up and down. "Look at this lot. I've to go off fishing, but don't really want to have anything to do with the slippery things."

We plugged the set in. The workshop was warm and the set worked, but it chirped as well. We felt that the suspect was probably in the primary side of the chopper supply. So we switched off and brought the freezer into play, spraying the electrolytics one at a time and trying the set whilst the selected capacitor was cold.

When we got to C624 (100 μ F), which couples the drive to the base of the chopper transistor, we found that the set wouldn't come on until we warmed the capacitor with a soldering iron. We took it out and connected it to the capacitance meter. When it was hot the reading was 80 μ F. The reading dropped to about 5 μ F when the capacitor was cold. But fitting a replacement didn't clear the fault!

We persevered and found another electrolytic that behaved in much the same way, C638 (1 μ F). This is the reservoir capacitor for the feedback voltage to the control chip. It read 0.8 μ F when hot, open-circuit when cold.

When this one was replaced the set behaved perfectly. It ran well when both hot and cold, and didn't chirp any more. ■

Servicing the

Mitsubishi Euro 6

John Coombes on the main features of this 90° chassis and how to go about fault diagnosis

The Euro 6 chassis was used in a group of 90° Mitsubishi sets that were on sale during the period 1988-1990, including Models CT2145BM and CT2146TX, the latter with teletext. An M50439-563SP microcomputer chip, IC701, controls the operation of the chassis, working in conjunction with the M58630P EAROM chip IC702. The circuitry used in the chassis is straightforward, the main thing to bear in mind from the servicing point of view being the fact that there are two separate self-oscillating chopper power supplies. One provides 5V and -30V outputs to power the control system. The other provides a 122V HT supply, a 16V supply for the audio output chip and a 12V supply for the signals stages and the TDA2579 timebase generator chip IC501. The two chopper transformers T901 and T951 and the optocoupler PC951 provide mains isolation.

Main Power Supply Operation

Fig. 1 shows the circuit of the main power supply, which is based on the STR54041 chip IC901. Mains bridge rectifier D901-4 produces about 330V across its reservoir capacitor C907. This is fed to chopper transformer T901 and also to the subsidiary power supply (see Fig. 2). R906 and R972 provide base bias for the chopper transistor, which is incorporated in IC901. The circuit operates in the conventional blocking oscillator manner. C911 provides feedback to the base of the chopper transistor from a secondary winding on the transformer. When the chopper transistor saturates, C911 receives a negative charge and the transistor switches off. C911 then discharges via R906 and R972. When the chopper transistor's base is sufficiently positive, it switches on again.

The point at which the chopper transistor switches on is determined by the drive control system within the chip. This receives, at pin 1, a negative voltage which is produced by D909 and C908. Since this voltage is a measure of the output produced by the circuit, regulation is achieved. VR901 enables the output to be adjusted.

Q901 provides excess current protection by sensing the voltage developed across R903, which is connected in series with the chopper transistor's emitter. If the current is excessive Q901 will switch on, shorting out the chopper transistor's base.

The same technique is used for standby switching. When standby is requested, Q954 provides the base shorting action. The command comes from pin 10 of the microcontroller chip IC701, via Q953, optocoupler PC951 and the driver transistor Q955.

Subsidiary Power Supply Operation

The subsidiary power supply (Fig. 2) operates in a similar manner, but in this case discrete circuitry is used. Q951 is the

chopper transistor, which is biased via R973 and R952 from the 330V supply developed across C907. Feedback to its base is via C955 and R962, while D954 and C956 develop a negative bias voltage that varies with the circuit's output, thus providing regulation.

Power Supply Fault Finding

It's common to find that the 2AT mains fuse F991 has blown. Common causes of this are short-circuit bridge rectifier diodes (D901-4, type BYW56) or a faulty on/off switch (S991). If the fuse has blown, a replacement is fitted and the set then works, suspect the degaussing thermistor RP901 – it may however have blown itself apart so that the fuse will not blow. Shorted turns in the degaussing coils will also blow F991.

If the fuse is OK but there is no sound or raster, check whether there is about 330V at pin 3 of the chopper chip IC901. If this voltage is missing or low, check the bridge rectifier diodes D901-4 which could be open-circuit and their reservoir capacitor C907.

If IC901 is receiving its supply, check at the collector of the 2SC4004 chopper transistor Q951 in the subsidiary power supply. There should also be some 330V here. If this voltage is missing, check the continuity of winding 5-6 on transformer T951 and R975 (270Ω, 0.5W fusible) which could be open-circuit. If voltage is present but incorrect, replace Q951.

If these items are all OK, the next thing to check is the operation of the μPC78M05H 5V regulator IC951. There should be about 7.3V at its input pin 1. If this voltage is missing, check whether R957 or D956 is open-circuit. If the voltage is present, check at output pin 2 where a 5V reading should be obtained. No or a low voltage here means that several things might have to be checked: IC951 itself, C709 which might be open- or short-circuit and the EAROM or microcontroller chips IC702 and IC701 respectively. It may be necessary to replace these chips to prove the point.

The next step if everything is OK so far is to ensure that the ON3105V optocoupler PC951 is receiving its 5V supply. Check whether the LED within the optocoupler is open- or short-circuit. If the optocoupler is functional, check at pin 10 of the microcontroller chip IC701 to see whether it goes high/low when the standby switch is operated. If necessary, check through the standby on/off switching path – via Q953 then Q955 and Q954 which can go open-circuit. There should be 29V at the collector of Q955: check R971 and R966 if this voltage is missing. If Q955 has no base voltage (should be 0.3V), check R970 and R959.

We have so far checked through the the subsidiary power supply and the standby switching. This brings us to the chopper chip IC901 in the main power supply. The most

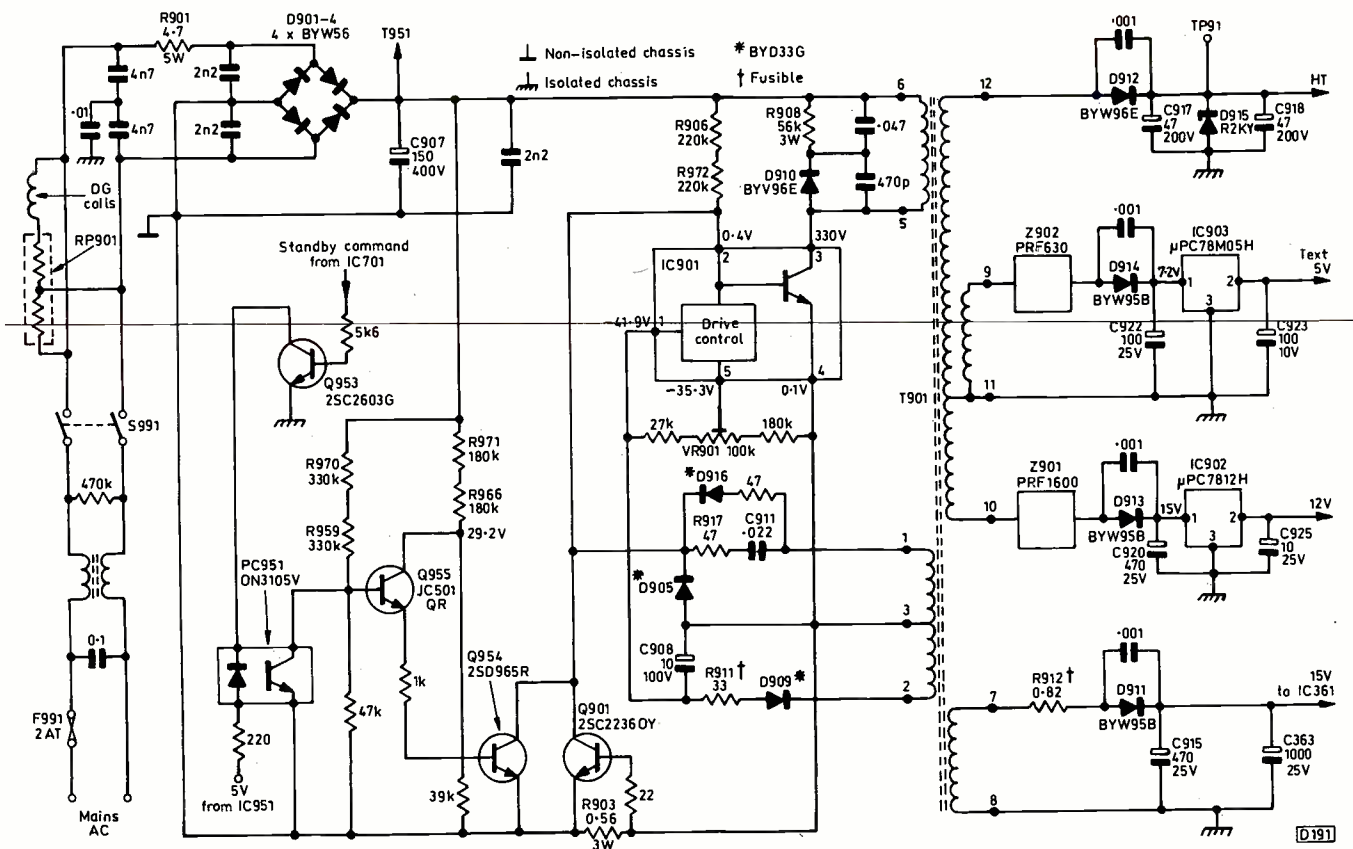


Fig. 1: The main power supply circuit. The 5V supply fed from pin 9 on the chopper transformer is present only in teletext Model CT2146TX.

common problem with this device is a shorted chopper transistor. Check at pins 2, 3 and 4. If the chopper transistor is short-circuit, check R903 which may have gone open-circuit. IC901 will not operate if either R906 or R972 has gone open-circuit, but in my experience these resistors seldom fail. R911 should also be checked if IC901 has to be replaced because of an internal short.

IC901 can also be responsible for intermittent loss of the sound and raster or intermittent HT voltage variations, which will alter the picture size.

I have never had to replace the main chopper transformer T901. But dry-jointed pins can cause many problems, from no sound or raster to no sound.

If the cause of loss of sound and raster is on the secondary side of the main chopper circuit there is very often a loud hum or noise. No HT voltage at TP91 could mean that the rectifier diode D912 (BYW96E) is open-circuit or, more likely, that its reservoir capacitor C917 is short-circuit. Another possibility is that the R2KY over-voltage protection diode D915 is short-circuit. IC901 is suspect if it has failed. D915 is not shown on the official circuit diagram – and is not in all sets. If the HT voltage is low, check whether C917 and/or C918 is open-circuit.

If the symptoms are a loud humming sound with no audio or picture, check whether the µPC7812H 12V regulator chip IC902 is open-circuit or dry-jointed. No output from IC902 can also be caused by C925 being short-circuit. If there's no 15V input at pin 1 of IC902, check the PRF1600 circuit protector Z901, D913 and C920.

Here's a tip that might save you expense. A PRF1600 circuit protector is rated at 1.6A, a PRF5000 at 5A etc. Fuses are much cheaper than circuit protectors. If a fault condition necessitates a lot of replacement, use a fuse of the same value instead of a circuit protector – solder leads to the metal caps at the ends of the fuse.

Line Timebase Faults

No sound or raster can of course be caused by a fault in the

line timebase. The first and most obvious thing to check is whether the 2SD1878 line output transistor Q552 is short-circuit. If it is, be sure to check for dry-joints at the driver transformer T551 before fitting a replacement and switching on.

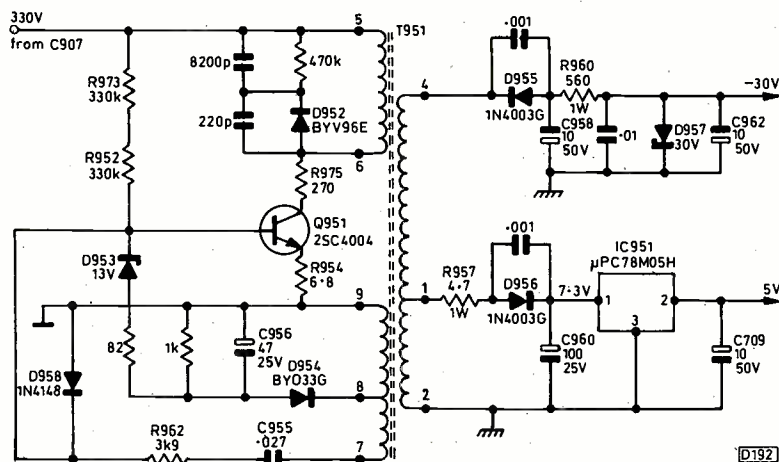
If the line output transistor is OK but is not working, check whether L553, which is in series with its emitter, is dry-jointed. Then check for about 120V at its collector. If this voltage is missing, check whether R556 (12Ω, 10W) is open-circuit. If everything is OK so far, check for dry-joints at the driver transformer T551.

Loss of line drive can also be caused by R551 (4.7kΩ, 5W) going open-circuit or a faulty BF419 line driver transistor (Q551).

The line output transformer T553 can also kill the line output stage when it has shorted turns. It can also be responsible for an intermittent bright raster and/or poor focusing.

I've had no sound and raster because the TDA2579

Fig. 2: The subsidiary power supply circuit, which is used to power the control system.



timebase generator chip IC501 didn't receive its start-up supply at pin 16. C509 (33 μ F, 16V) was short-circuit and R516 (390 Ω , 0.5W) open-circuit.

CRT Heaters Out

If there's no raster and the CRT's heaters are out, check for dry-joints at pins 9 and 10 of the tube's base socket. Alternatively R671 (0.82 Ω , 2W fusible) could be open-circuit or there could be dry-joints at pins 9 and 10 of the line output transformer T553.

Field Collapse

In the event of field collapse the first thing to check is that the μ PC1378H field output chip IC401 is receiving its 24.5V supply at pin 6. If not, check D553 (BYW95B) and R563 (0.82 Ω , 0.5W fusible) which could be open-circuit, and C567 (1,000 μ F, 35V) which could be short-circuit. IC401 could be faulty – check it by replacement.

The cause of field collapse has also been traced to open-circuit field scan coils and a faulty TDA2579 timebase generator chip (IC501). Check the latter by replacement if necessary.

Tuner Faults

The tuner unit TU101 can cause several problems, i.e. low gain, no gain, intermittent loss of signals (stopped oscillator), also loss of signals because of a broken aerial socket or dry-joints. Check that the 12V supply is present at pin UB of the tuner unit. If missing, check C155 (330 μ F, 16V) which could be short-circuit.

If there's no vision signal (a snowy raster) or sound (just

noise), check whether the μ PC574JK 33V regulator IC704 is short-circuit or its feed resistor R921 (15k Ω , 2W) is open-circuit.

If channels can be tuned in but not stored, check that the M58630P EAROM chip IC702 is receiving its 5V supply at pin 1 and its -31V supply at pin 2. If the latter is missing, zener diode D957 (EQA02-30AC) could be short-circuit and/or R960 (560 Ω , 1W) open-circuit, though the most likely cause is that winding 4-1 on transformer T951 is open-circuit. This latter fault can sometimes be repaired – if the lead is long enough to resolder. IC704 itself can of course be the cause of failure to store programmes.

Display/Picture Faults

Loss of the HT supply to the RGB output stages will produce a bright raster with normal sound. Check whether R559 (2.2 Ω , fusible resistor) is open-circuit and/or C565 (33 μ F, 250V) short-circuit. If these items are OK, check on the tube base for faults/problems.

A blank screen gave the impression that the receiver was in the AV mode, but there were other symptoms – intermittent lines on the picture and flickering to dark. The JC501QR video buffer transistor Q104 was faulty.

Contrast problems have on a couple of occasions been traced to R215 (100k Ω) being open-circuit. If the contrast is low but can still be varied, check the condition of the 100k Ω subcontrast control VR201's carbon track.

If there's a bright green picture, check Q702/3 (JC501QR) in the character output/blanking circuit. They are connected to pins 44 and 46 respectively of the microcontroller chip IC701, and can go short-circuit.

Patterning can be caused by dry-joints at the 12V regulator IC902. If this is OK, check the 15V supply reservoir capacitor C920 (470 μ F, 25V) by replacement. A 105 $^{\circ}$ capacitor should be used in this position.

Loss of one colour is very often caused by dry-joints on the tube base. Alternatively the relevant 2SC2688MN output transistor (Q651 red, Q652 blue, Q653 green) could be open-circuit or dry-jointed. Less likely is a faulty TDA3565 colour decoder chip (IC252) – in the CT2146TX this is IC251, type TDA3561A.

No Sound

For no sound, first check that the AN5265 audio amplifier chip IC361 is receiving its supplies at pins 1 and 9. It requires 12V at pin 1 and 15.8V at pin 9.

If the 15.8V supply is missing, C363 (1,000 μ F, 25V) or C915 (470 μ F, 25V) could be short-circuit, or R912 (0.82 Ω , 0.5W fusible) or D911 (BYW95B) open-circuit. Alternatively IC361 itself could be faulty.

The 12V supply is derived from the 15.8V supply via two 0.5W, 100 Ω resistors (R368 and R371) and the EQA02-11CD/RD12EB2.BS zener diode D362. If it's missing, D362 is probably short-circuit and the two resistors open-circuit.

Other possibilities for no sound are failure of Q302 (JC501QR) or the M51496P IF chip IC101.

No Teletext (Model CT2146TX)

No teletext is seldom caused by a fault on the teletext PCB. Much more likely is loss of the 5V teletext supply. First check whether the 630mA circuit protector Z902 (type PRF630) is open-circuit. Alternatively the μ PC78M05H 5V regulator IC903 could be faulty or dry-jointed.

Remote Control Faults

If there's no remote control operation, check the handset's battery connections. The batteries could be low or leaky, with corrosion. The LED could be dry-jointed, or the leads to the crystal dry-jointed or broken. If all these items are OK, check the M50462P chip by replacement. ■



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Satellite Notebook

Hugh Cocks on satellite TV Servicing problems

Pace SS9200 Problems

The owner of a Pace SS9200 complained that it "would sometimes go off". We ascertained that the red light stayed on when the receiver went "off", but during our visit the receiver behaved impeccably. So it was back to the workshop with the receiver and the MTI LNB, which might have been to blame.

It was two days before the problem was seen, when we switched on from cold. The UHF modulator was producing no RF output – the scart output was OK, but this was not used by the owner.

I removed the PCB from the chassis and found that the modulator's supply was intact. Once a few dubious looking joints in the modulator had been resoldered normal operation was restored and no amount of switching off and on from cold would bring the fault back. To ensure a quiet life however I decided to replace the modulator with one from a scrap set. It was the type of problem that would reappear as soon as the receiver had been returned!

The 'Hwa Lin' modulator used in the SS9000/9200 will not be sadly missed in years to come! Some Grundig TV sets hate it to the extent that they can't cope with the slight frequency drift. If a Grundig set is in use, I try to ensure that wherever possible the connection is via a scart lead. If this is not practical, the TV set is left with three channels tuned to the Pace receiver's output, one centre tuned, one tuned low and the other high. This saves call-outs when the set produces a blurred black-and-white picture!

There was another problem with the SS9200 receiver however. Vague diagonal lines were present on the picture whether the connection was at UHF or via a scart lead. They were not unlike

those caused by the infamous capacitor in the tuner (C416). I replaced this capacitor, also C29 which causes lines with VideoCrypt signals and, for good measure, the two 1 μ F capacitors in the power supply. As the PCB's colour was remarkably good for its age, I was confident that these measures would have cleared the problem. They hadn't of course – that would have been too easy for Monday morning!

Further investigation showed that the lines were present only with vertically polarised signals. When an external power supply was used, clear pictures were also obtained with the vertical channels. A scope check on the LNB supply at LK205, the PCB link adjacent to the tuner, showed that large spikes were present. They were larger with the vertical than the horizontal voltage supply. The culprit was C128, which is located next to the tuner's body. It decouples the LNB supply and had obviously been subjected to a lot of heat from the tuner over the years. Its near neighbour C133, which decouples the tuner's 5V supply, also looked vaguely discoloured. So this was replaced as well.

It is getting to the stage where most of the electrolytics in these receivers will have to be replaced as part of the standard repair procedure. Why the horizontal channels were not affected is strange: possibly the drying out 10 μ F, 25V electrolytic (C128) was a bit more effective at the higher voltage.

A Dead Pace MSS100

This receiver appeared to be totally dead – the owner said that it had gone off in the middle of a programme. A quick check showed that the mains fuse FS1 was intact, also the 5V supply fuse FS2 on the secondary side of the supply.

The power supply in this model is

based on chopper chip U1, which on the circuit diagram is shown as a TOP200 though all the devices I've seen have been labelled TOP202. Fig. 1 shows the simple circuitry used on the primary side of the chopper transformer. There was HT at pin 3 of U1, and a small, varying voltage at pin 1. This pin receives feedback from a winding on the transformer, via D8 and the 15V zener diode D7. When the voltage at its cathode rises to about 21V D7 conducts, adjusting the chopper turn-on time. The varying voltage remained at pin 1 of U1 when D7 was lifted. The only other thing connected to pin 1 is the RC series network consisting of R2 and C4, which determine the loop response and start-up delay. Tests showed that they were both OK (C2 by substitution).

As I had a spare TOP202 in stock I fitted it, hoping for the best. But the results were exactly the same. I began to suspect the transformer but before checking this I did what I should have done much sooner – check the rectifier diodes on the secondary side of the circuit. D9 (BYV96D) in the 30V supply was short-circuit.

VideoCrypt Decoders

The original stand-alone VideoCrypt decoders, many of which are still in use here, are now more than five years old. One problem we get is cards being killed by spikes on the local mains supply. Receivers that have a switch-mode power supply don't seem to cause problems directly. What seems to happen is that the high voltage that's present at regulator TP05 (the front lens regulator, fixed to the metal screening) suddenly sends a spike into the card.

The high voltage (card Vpp supply) is no longer used for any form of communication with the card. As a quick fix to prevent such

disasters I cut TP05's centre leg, thus preventing any high voltage from reaching the card. One possible problem is that the supply may at some stage in the future be needed again. Hopefully the decoders will by then have reached the end of their useful life. My customers are more than happy with this solution.

The problem also occurs with the Amstrad SRD400, though I've not had it recently and have thus been unable to investigate ways of cutting off the Vpp supply. Fortunately there aren't many of them left now. They had great difficulty coping with supplies of less than 230V, and often needed a step-up transformer. Their threshold sensitivity seemed poor in comparison with other receivers, and the AFC preset under the decoder PCB required winter/summer adjustment.

Plug-fitting surge protectors may well help. The problem here in the Algarve is that house earth wiring is so poor. More often than not there's only two-pin wiring to work with. I learnt my lesson early on. A few years ago a customer's fridge had a fault as a result of which the cabinet became semi-live. The house earth was very high resistance/open-circuit. The cabinet was connected to the earth wire or course, and the plug was connected to a three-pin socket. Somehow the house earth was connected to the water pipes. As a result, the kitchen taps were sitting at quite a high voltage in relation to the sink, which seemed to be earthed through the waste pipe. It's true - I got a shock, fortunately before I turned the tap on and got wet hands!

Pace MSS100

Whenever an LNB was connected this brand new receiver produced a pink screen with the message "LNB Short Circuit". This caused some confusion, because the receiver was being installed as part of an IF distribution system and the initial checks were made on line. Receiver substitution produced normal results however. With just a line amplifier connected as the load the message still appeared. With no load, the 13/17V supply was present at the LNB socket. The receiver worked correctly when fed with an independently powered IF signal.

The 20V and 17V supplies were present at L4 and L6. To prevent the short-circuit protection system working, I lifted the cathode end of the 8.2V zener diode D15 and

connected it to D11, where a constant 17V is present. D15 is connected to Q4 to form the LNB supply monitoring circuit. When D15 is connected to a constant 13V or 17V supply the shut-down system won't work. This enables you to test the LNB supply.

When I'd done this I found that under load the collector of Q2 was at around 5V but the voltage at the collector of the FXT749 transistor Q1 was much higher. These two points should be linked! The track and soldered connections looked intact, but linking these two transistors and reinstating the shut-down circuit restored normal operation.

Watery Problems

The Italian manufacturer IRTE is well-known for its motorised dishes. A problem can occur with the feed when one of these dishes has been in use for a few years. The feed usually consists of a Teflon bulb that contains a metallised ring. It all works very effectively. But what can happen after heavy rain is that water gets past the polariser's O ring, filling up the bulb. This produces efficient signal attenuation!

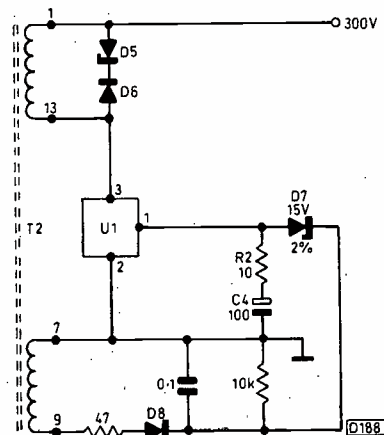
The first time I came across this I wasted a lot of time and effort changing the LNB and realigning the polar mount. Careful inspection of the Teflon bulb will reveal all - it's surprising how much water can get in. The solution is to make a couple of small drain holes at the bottom of the bulb to let the water out.

The signals may still be weak after doing this! The cause will be bad corrosion of the aluminium feed tube. Once the tube has been cleaned up everything should be OK.

Pace PSR800

This is the non-VideoCrypt version of the PRD800. A German gentleman appeared with one, complaining about "no pictures". It was an early version - Pace date codes are easy to read, the first number in the long row being the year and the next two the week. This one started 329, indicating 1993, week 29. So I replaced the electrolytics in the chopper control chip U1 (C5 22 μ F, C7 and C8 10 μ F) to ensure that the power supply was happy.

When I switched the receiver on only inverted video could be seen, with a C-band frequency display (3.6-4.2GHz), via a scart

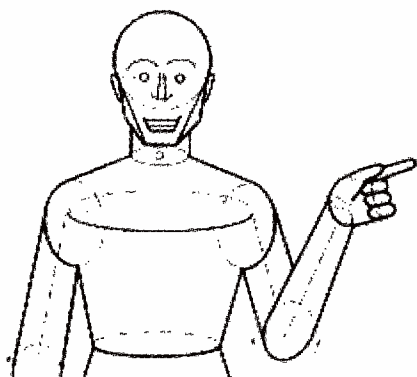


connection. This was soon put right by switching the LNB installation menu to FSS. I next pressed F then UHF on the remote control unit to see which channel was being used by the modulator. The receiver displayed 74. Something must be wrong, as it should go to only 69! When I entered a normal UHF channel number the modulator went to it and the receiver seemed to store the channel happily.

So far so good - however only the horizontal channels appeared, an attempt to change the polarisation mysteriously producing polarisation skew numbers next to H. This model doesn't cater for polarisers, and the option is not available in the menu! I eventually restored normal H/V polarisation selection by replacing the eight-pin EEPROM U6, and have subsequently found that reprogramming with a Pace Link cures the problem.

Another symptom can be incorrect menu background colours (not blue). Some of the software for other PRD/PSR models must be present, and the receiver somehow jumps to the wrong mode. I understand that there was an NTSC version called Model NSR800. The North American UHF channels extend to 83, so maybe this bit of software had jumped across. In retrospect, I should have checked whether the channels were moving in North American channel steps! Why the fault occurs is a bit of a mystery. The cause could be power supply spikes (not unlike the SS9000/9200 factory channel reset problem), in which case replacing the three electrolytics mentioned earlier will help. Replacing the 1 μ F electrolytic C9 in the SS9000/9200 stops the factory channel reset: leave it too long before this item is replaced and the symptom will be a dead receiver with a short-circuit BUT11A chopper transistor! ■

Fig. 1: Circuitry around the chopper chip U1 in the Pace MSS100 receiver. D5 and D6 prevent the pulse voltage at pin 3 of the chip rising above 200V.



The following notes are based on issues CDH58 and CDH59 of the Toshiba Service Bulletin

TOSHIBA

Service Briefs

TELEVISION

Model 261T4B

Vertical line, which varies with the brightness, down the right-hand side of the screen: Replace C449 (330 μ F, 16V).

Model 1720RB

Buzz on sound: Peaking coil L601 faulty. Replace with type TRF4120AJ, part no. 23238713.

Models 1720RB, 1721TB

Lack of contrast: CA16 PWM filter capacitor for contrast control leaky. Replace (0.01 μ F, 50V disc ceramic).

Models 2100RB, 2100TB, 2500TB

Tuning drift: CA23, CA24 or CA28 leaky. Replace as necessary (0.1 μ F, 63V).

Model 2141TB

Intermittent loss of tuned stations: Can be caused by the AFT buffer transistor Q106 being faulty. Replace (type 2PC1815Y, part no. 23314794).

Models 2512DB, 2812DB

Lack of width – won't adjust in the service mode although the graphics change: Coil L423 in the DPC circuit faulty, though its DC resistance measures OK. Replace coil (type AT4043/60T, part no. 23211896).

No sound: Can be caused by DV07 being leaky. This puts a high on the mute line. Replace (type 1N4148, part no. 23115599).

Models 2152DB, 2552DB, 2555DB, 2852DB, 2855DB, 2857DB, 3357DB (C5 Chassis)

No line or field sync or a blank screen, with the OSD OK. Usually intermittent: Crystal XT01 (27MHz) in the teletext unit faulty. Replace (part no. 23153012).

Random display of the Channel number and the Nicam stereo symbol, often with noises on the sound: Cause is Nicam dropout. The problem occurs mainly with cable networks that remodulate the stereo sound signals on to their own Nicam carriers. The cure is to replace IF/Nicam unit H002, type MVGS43A.

with the improved version type MVGS43B (part no. 23148249). Take great care when removing the original unit as the print is very fine and is easily damaged: do not use a plunger-type solder sucker.

The fault can also occur with terrestrial off-air signals where there is multipath reception, but this is rare.

Models 2535DB, 2835DB

Stuck in standby: Can occur when the TA8854AP EW correction chip IC302 is faulty – incorrect drive output at pin 2 turns the DPC amplifier QD03 hard on, also activating D471 (overvoltage/excess current protection) in the power supply. If this is the case replace IC302 (part no. B0384680).

Stuck in standby or tripping: Can be caused by circuit protector ZP31 going open-circuit. This unloads the 27V supply, with the result that D471 (overvoltage/excess current protection) in the power supply operates. Replace ZP31 (part no. 23144452).

Note that there is a teletext circuit change in later versions of this chassis. A type SAA5281 chip is used in position ICF02 instead of type SAA5246. As the SAA5281 has an internal RAM, ICF03 (BR6265) is no longer needed.

Model 2857DB

With the receiver left in the Surround mode, the centre and Surround speakers are not muted when headphones are in use: The muting circuit is disabling only the woofer – it expects Surround off to be selected when using headphones, otherwise dialogue will be affected. A circuit change is required to deal with this. Details can be obtained from Toshiba Technical on 01276 694 555. Later receivers have been modified in production.

VCRs

Models V204B, V254B, V404B, V454B

Power shuts off when the machine is hot: The power supply overheats and the thermal protection operates. This occurs mainly when the weather is really hot. The cure is to remove and discard the cover on the component side of the PSU. This change has been implemented in production.

Starts to load a tape but stops half way – fault is

intermittent: Solder missed from connection to the 1N4001 diode DT102 in the capstan Vcc supply.

No display: Replace the 39Ω fusible resistor RP051 if it's open-circuit. Part no. 70041116.

Models V212B, V312B, V412B

Goes to standby intermittently – the power supply buzzes and the display goes out: Replace the BCP53-16 regulator transistor TP91 (part no. 70010941) and the 1.5Ω resistor RP91 (part no. 70041078).

Won't load a tape. Capstan 7V supply (BP03, pin 3) drops when a tape is inserted: Replace the 1N4001 diode DP31 (part no. 70010453) even though it might measure OK out of circuit.

Model V254B

Trips out intermittently in play: DT102 faulty.

No colour: ICV100 faulty.

No E-E audio: Reset the micro.

Poor picture, no colour: CV021 faulty. It's connected to pin 21 of IV001.

Model V513B

Blank E-E and playback screen: If a check on the 5V supply shows that it has fallen to 1.2V fuse FP02 (630mA) is open-circuit. Replace fuse.

Model V611B

Dead, no display: Cause can be no low reset at pin 16 of the M50957-226SP timer microcontroller chip ICX01 because of failure of transistor QX03. If so replace QX03, which is type 2SC2458Y – part no. A6332430).

Model V703B

Dead machine: Will occur if CP Z822 in the Ever 6V supply is open-circuit. Replace Z822 (part no. 23144480).

Model V705B

No E-E or playback sound: Can be caused by the 2.7V zener diode DW011 being leaky. As a result the MPX audio 9V supply on the audio PCB can be low at around 2V. Replace DW011, part no. 70010160.

E-E video overloaded with smearing, no playback colour: CV016 (1μF, 50V), which is connected to pin 16 of the main YC signal processor chip IV001 (LA7447M), was faulty.

White flashing picture: Cause was traced to RV011 (100Ω) being short-circuit. It's connected to pin 11 of the luminance processor chip.

Models V804B, V825B, V854B, V855B

Playback marred by a 2cm band of white noise across the screen, more noticeable with prerecorded tapes: Cause is a contact problem with slip-ring assembly G050 on the drum. Replace the slip ring assembly, part no. 70031451.

Model V855B

No playback colour: Cause was traced to C436 (1μF) which was short-circuit. It's connected to pin 8 of the TL8843P chip IC431. The short produced a 0V reading at pin 8 of IC431.

AUTO SET-UP VCRs – CNI CODES

In order to provide a fully regional PDC service, the BBC is to change the CNI (Country, Network Identification) codes transmitted with the teletext signal. This change will not affect PDC operation. It will however prevent auto set-up models **V255B, V425B, V825B and V855B** identifying between BBC-1 and BBC-2 during auto set-up and auto clock set – Toshiba and other manufacturers use the CNI codes for broadcaster identification during search tuning. As a result, an auto set-up will not put BBC-1 in position 1 or BBC-2 in position 2, storing them in positions 7 and 8 or higher instead. It will be necessary to tune BBC-1 and BBC-2 to positions 1 and 2 manually.

In addition, Toshiba uses BBC-1 (in position 1) to set and recheck the time and date (daily, at 0800 hours). Ensure that position 1 is tuned to BBC-1.

Models produced during 1996 have the new codes added to the microcontroller's software.

Stop press: The BBC has announced that the CNI code changes will not be implemented until 1998.

VCR SERVICE KITS

A mechanism service kit (part no. 70031719) has been produced for Models **V212B, V213B, V312B, V412B, V423B and V513B (R2000 chassis)**. It contains a drive belt, head cleaner assembly, brake band subassembly, idler arm assembly, reel belt and pinch lever assembly. This is available to dealers at £11.18, which is a considerable reduction on purchasing the items separately.

A washer kit (part no. 70031720) for the same models is available at £3.73. It contains six different types of washer used in this mechanism, with five washers of each type. Again there's an appreciable saving.

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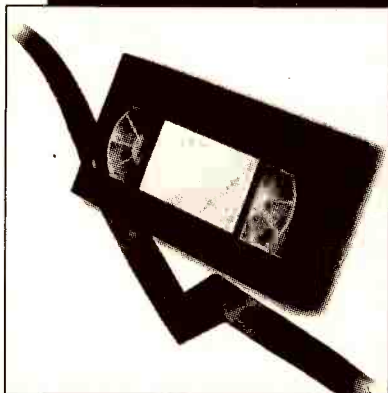
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Reports from Philip Blundell, AMIEE, Michael Dranfield, Eugene Trundle, Paul Hardy, Keith Evans, Chris Watton, Simon Bodgett, Robert C. Meade, Graham Thompson and Michael Maurice

Philips VR6761 etc

If the symptoms displayed by one of these machines look as if a video head has failed, check for the presence of the head switching pulses (HP) at pin 7 of plug L6 on the head amplifier module before ordering new heads. The HP pulses can go missing because of a broken wire from plug B15 on the lower logic/servo board P606 to plug S2 on the top signals board P303. The solid-cored wire takes exception to being flexed too often. P.B.

Toshiba V404

If the machine plays all right but there's no front display, check whether RP051 (39Ω, safety) in the power supply is open-circuit. A possible cause of its failure is that the ribbon cable to connector PK02 on the front panel is incorrectly routed, with the ribbon chafing on the cabinet top. The resistor's part no. is 70041116. P.B.

Samsung VIK310, 320, 350, 375 Series

These VCRs suffer from a serious problem in the fully-enclosed chopper power supply. C110

VCR Clinic

(100μF, 25), which provides negative bias for the error amplifier within the STR11006 chip IC101 to control the regulation, dries up. When it loses capacitance, the negative feedback at pin 1 of IC101 falls. As a result the chip thinks that the output voltages have fallen and attempts to increase them, causing a lot of damage.

When a customer brings in one of these machines never, whatever the complaint, plug it in without first replacing C110. If a machine goes off during say a power cut and is left off for any length of time the power supply can blow up (if you are lucky!) when power is restored. If you are unlucky, you can find yourself replacing endless components. In some cases the burnt up components can damage the main PCB.

In addition to replacing C110 it's advisable to replace C122 (2.2μF, 250V) and C109 (47μF, 100V).

M.Dr.

Sharp VCA615 etc

In this range of VCRs the tape should shuffle backwards and forwards after loading. If this doesn't happen, the capstan motor is usually faulty. The small 10μF, 25V capacitor leaks electrolyte that eats the print away. Don't despair: the damage can easily be mended with some fine wire. M.Dr.

Ferguson FV71

This machine had failed to come back on after a power cut. There were no dried up capacitors this time: TP91 (2SA1020) was short-circuit collector-to-emitter. A replacement restored normal operation. M.Dr.

Memorex VR2150

Apart from fast forward/rewind this

machine worked normally. In the fast wind modes the torque was very low – the same as the play torque in fact. We suspected the mode switch, and managed to match it up with a Sanyo one stocked by Chas Hyde and Son Ltd. (part no. 11600CF). The only problems were that a fair amount of dismantling was required and to reassemble/align the mechanism we had to obtain a service manual from Tandy at £21. The new switch cured the trouble however. M.Dr.

JVC HRD750

These excellent machines are six or seven years old now. Thus some are suffering from dried up electrolytics in the power supply. If the problem is total loss of action, check C14 (1μF, 50V) and C13 (180μF, 16V) in the chopper circuit. E.T.

Panasonic NVG21

The fault with this machine was very intermittent and it took us a long time to track down the culprit. When the fault was present there was complete loss of action: even the clock display went out, leaving only the green cassette-in indicator (near the standby switch) alight to indicate that power was reaching the machine. The culprit turned out to be the STK5338 regulator chip IC1001 in the power supply can. E.T.

Toshiba V611B

This machine's fault would put in an appearance about once every three months. When it did appear the symptoms were no eject, no deck functions and a seemingly jammed tape-loading mechanism, culminating in shut down. Loading motor M003 was the culprit. In the fault condition it drew 600mA from the 5V supply with no mechanical load. So we also replaced its driver chip IC603. There

was a clue, had we realised it: picture interference when the faulty motor was running. **E.T.**

Hitachi VTM112E

This machine wouldn't accept a cassette – the half-load lever would not retract. I partially stripped the mode gear assembly, half expecting to find the gear damaged. What I actually found was a split washer jammed in one of the cam-gear grooves. As no split washer seemed to be missing from the mechanism, I assume that it had fallen in during manufacture. I managed to get it out without having to dismantle the mechanism completely. **P.H.**

Hitachi VT5890E

I had no information on this machine and the customer was extremely vague about what the problem was. After some testing I found that a still picture would sometimes be displayed although the still command hadn't been used. This usually happened after a reverse search then going back to play. A tight capstan motor was the cause of the trouble. I took it to bits, cleaned and greased the bearings then reassembled it. This fixed the fault. **P.H.**

Sharp VCH81H

A cassette was jammed in the mechanism. After extracting it manually and confirming that there was no mechanical damage I inserted another cassette, but it wouldn't play and there was no capstan rotation. The supply voltages and control signals on the motor board were correct. A new motor assembly got the machine working again. Fortunately the assembly is not expensive and is easy to change. **P.H.**

Philips Charlie Deck

There was usually no forward motion (play, record or fast forward) once a cassette had been fully rewound. No apparent error showed up when the on-board diagnostic program was tried. A phone call to Philips technical produced the solution. As the brakes were inefficient, the entire length of the clear leader was drawn towards the supply spool. The slight forward tape movement after rewind was insufficient to wind the leader on to the take-up spool fully. As a result the leader was exposed during loading.

The solution is to replace the reel discs and brake parts as follows: counter force brake, item 209, part

no. 4822 403 52488; brake arm assembly, item 213, part no. 4822 403 10257; reel discs (two), item 207, part no. 4822 528 10523; brake rollers (two), item 232, part no. 4822 528 70638. The item numbers refer to the numbers shown on the exploded view of the mechanism in the manual. Replacing the reel discs is a fiddly job: the special removal tool part no. 4822 395 30243 helps. **P.H.**

Panasonic NVD48

This machine was dead. Checks in the power supply showed that Q3 and D12 were short-circuit. After replacing them D12 failed at power up. Another replacement was fitted, then the machine was powered up via the variac. This revealed that the power supply outputs were not being regulated properly. The cause was C12, which had fallen in value. In addition C19 was open-circuit. Once these two capacitors had been replaced the machine worked normally. **P.H.**

GoldStar RQ5041

After fitting a new drum we found that there was poor colour with prerecorded tapes. So we set the machine up as per the book, but the results were the same – the colour in the playback picture was still out-of-phase. Advice was sought from GoldStar technical, who are very helpful. "Try another drum" was their recommendation, but again the results were the same.

Time for some head scratching. We had already checked the chroma signal path and had found no faults. The only thing that didn't match up with the measurements given in the manual was the FM envelope, which was smaller than specified though beautifully formed. Fortunately a similar machine came in for repair, so we were able to carry out comparison checks. With the good machine the FM was not appreciably larger and wasn't as well formed as with the faulty machine. So we decided to change all the subassemblies, again without any improvement.

When a third new drum was fitted the machine worked perfectly. So was this two faulty new drum assemblies? Well, not actually faulty but incorrectly assembled. The upper drums were on the wrong way round. Correcting this produced perfect results. Should you get this sort of problem, note that the upper drum is coloured green on one side and white on the other. The upper face of the lower

drum is coloured green. White goes to green, not green to green as with the faulty drums. **C.W.**

Goodmans GVR3000

If you have trouble tuning in one of these machines, or you get a number of the same channels grouped together, remove the front panel then look beneath the clock where you should find four holes in the board, marked TP4 and 5 and TP6 and 7. Short out 4 and 5 to empty the memory then short 6 and 7 to start full auto-tuning. **C.W.**

Grundig VS500

This machine was dead with no outputs from the power supply unit. The mains side was OK, but the primary side wasn't oscillating. A check at pin 6 of the chip produced a reading of 10V, which should have started the drive but didn't. So we replaced the chip. This was the wrong thing to do, as it made no difference. The cause of the problem turned out to be C1326 (47µF, 25V), which was low in value. It's the reservoir capacitor for the chip's DC supply. **C.W.**

Matsui VX755/Saisho VR3600

This machine would run all right for a couple of hours. It would then appear to go into the pause mode for about a quarter of a second, run normally for a few seconds then pause again. When we looked in at the top we saw that the capstan motor was pausing, with the tape not stopping long enough to switch off the machine. Checks at the motor drive and supply pins showed no reason for the pauses, so we assumed that the motor was duff. In fact all that was required was a spot of oil in the motor's upper bush. **C.W.**

Akai VSF10

This machine was doing some nasty things to our customer's tapes. On examination we found that the cassette tray didn't go down fully because the left-hand coupling cam and operating rack had slipped by one tooth. Willow Vale supply a modification kit, part no. 57550E, to cure the possibility of slippage. **K.E.**

NEC N9053K

Coloured noise on the picture and failure to erase previously recorded audio were the complaints with this machine. When you get this it's a safe bet that the cause of the problem is around the full erase head. On this machine a plug and

socket arrangement is used here. When the plug was removed we found a fractured wire. It's best to remove the plug and hard wire the connections directly on to the head pins. **K.E.**

Samsung SI7220

The causes of intermittent servo faults can be frustrating and time-consuming to trace. This machine was no exception. It came in with the complaint that the sound suffered from wow and flutter while tracking noise bars moved up the picture. After resoldering numerous suspect joints on the motor control/servo subpanel to no effect we decided to check back to the audio/control head. The screen on the connector plug from the head to the main PCB proved to be loose. **K.E.**

JVC HRS4700

There were no functions at all. No power up, no nothing. Voltage checks showed that the display chip's reset port was at 2V, which is not a good thing. The fault persisted when this chip had been replaced. Doesn't it make you mad! Replacing the timer chip and, for good measure, the CAT chip got the machine going. **S.B.**

JVC HRS880

There was no front-control operation because the tuner/timer chip was faulty. A replacement restored normal control. **S.B.**

Amstrad VS1000

Fuse F01 in this combined satellite/VCR unit had ruptured violently and we found that IC7001, which is type STRD6008, was short-circuit. Amstrad Technical recommended that we also replace the main smoothing block C7510 to prevent further problems. **G.T.**

Samsung VI520T

This machine provided a choice of symptoms. Sometimes it worked. At other times it either locked up with an odd segment of the display lit, or various segments flashed along with random flashing of the function LEDs and the mechanism shuffling.

The power supply in this VCR consists of an STR type chip that provides a 13V output and a discrete-component chopper circuit that provides a 5V output. The normal cause of the sort of fault described above is that C3, which smooths the 13V supply, dries up – being covered with a screening can, the power supply runs warm.

Access is also a test of patience.

After replacing C3 we carried out some checks around the microcontroller chip on the front PCB. When its 5V supply was scoped we found that a 1V peak-to-peak squarewave was sitting on it. Back to the power supply, where C13 and C14 had dried out. A check on the rest of the capacitors in the power supply revealed that many of them were showing signs of stress. A blanket replacement of the capacitors in the power supply and the removal of carbonised glue from the PCB completed the repair. **G.T.**

Sanyo VHR3300E

This machine was dead. Replacing R1, which was open-circuit, in the power supply restored normal operation. **G.T.**

Philips VR6185/DMP decks

The symptom was very intermittent jamming when laced up in the play/record modes. After much investigation I found that a pivot lever (Philips ref. 260) hidden under the threading ring at the rear of the deck was worn/broken.

Replacement with one from a scrap machine provided a cure. **R.C.M.**

Panasonic NV430

If the tape loops after going from play to stop then eject, i.e. not after fast forward or rewind, the mode switch requires cleaning or replacement. **R.C.M.**

Ferguson FV62

The job card said "no E-E sound", but on test there seemed to be plenty. After a while the sound disappeared. The repair shop engineer had replaced the tuner, and was surprised that this hadn't cured the fault.

I traced the sound path from the main board to the little PCB that has the audio record/playback amplifiers on it. There was sound at the input to this board, but not at the input to the chip. C017 had never been soldered at one end. Resoldering it restored permanent sound. **M.M.**

Roadstar VCR7200PV

When a cassette was inserted the machine whirred a bit then ejected it. The customer had already had two quotes: one repairer told her that the lower drum had failed, the other that a new carriage was required. Now I had the machine

and there was another fault: a loop of tape was left when the cassette was ejected.

I checked the machine in front of the customer. The capstan wouldn't rotate because the wrong screw had been fitted to the carriage, distorting the motor plate; wires to the carriage had been cut and twisted together; and it was clear that the machine had been thrown back together when the estimate had been refused. A replacement screw in the carriage got the capstan motor going again, and a new piece of wire replaced the lead that had been cut.

Now to the original fault. When a cassette was inserted the machine went into the rewind mode for a couple of seconds, laced up, went into rewind again, unlaced and ejected the tape. The culprit was the end-of-tape sensor, a replacement restoring normal operation. **M.M.**

Toshiba V110B

We were called to clean the heads but found that we couldn't tune the machine in to the TV set. It appeared that the cable installers had been a bit rough. The centre pin of the RF modulator/converter had been pushed in, and the preset for the RF tuning range was loose – the print around it had been cracked. When all this had been put right we were able to tune in the VCR and cable system. What should have been a twenty minute job (head cleaning) ended up taking an hour and a half! **M.M.**

Panasonic NVJ40

The customer's original complaint was about interference. She also complained that occasionally, during playback, the machine would stop and come back on again. As it looked as if the cause of trouble was ripple from the power supply, I took the machine back to the workshop – where it performed faultlessly. When it was returned to the customer both faults showed up almost immediately.

The switching on and off was a power supply fault: IC1102 was dry-jointed. The interference seemed to be caused by some form of interaction between the TV set and the VCR. Disconnecting the aerial from the VCR failed to cure it. Adding an attenuator made it worse. Slight adjustment of the RF converter frequency plus retuning the TV set eliminated the problem. **M.M.**

Inside the Pace MSS1000 Satellite Receiver

In this second instalment J. LeJeune describes the signal switching arrangements, the microcontroller system and the front panel circuitry

In Part 1 last month we provided a general block diagram of the receiver then went on to describe the power supply circuitry and the video signal path, starting at the LNB input to the tuner. This brought us to buffer transistor Q107, which was a convenient point at which to break off. Q107 provides feeds to the video source selection chip U21 and the modulator video source selection chip U30 (see Fig. 6 last month). We will now explore these paths.

AV Switching

Fig. 8 shows in block diagram form the signal paths and control arrangement associated with the 4052 chip U21, which directs feeds to/from the TV and VCR scart sockets. Before going any further, a correction is required: in Fig. 6 last month the switch pole was incorrectly shown as being connected to pin 5 instead of pin 3. Fig. 8 shows this correctly.

There are two switches within U21. One is used for video source selection while the other is the SVHS chroma switch. The satellite TV video (plus on-screen graphics as required) appears at pin 4. The other inputs to this switch arrive at pin 2 from pin 20 of the TV scart socket and at pins 1 and 5 (which are connected together) from pin 20 of the VCR scart socket. The selected output at pin 3 is passed via amplifier Q40/41 to pin 19 of the

TV scart socket.

Pins 9 and 10 are the control lines: the switch connections made depend on whether these are high or low – the following table shows the various conditions.

Selection table for U21

Pin 9	Pin 10	Routing
H	H	Pin 4 to 3, also 11 to 13
H	L	Pin 2 to 3, also 15 to 13
L	H	Pin 5 to 3, also 14 to 13
L	L	Pin 1 to 3, also 12 to 13

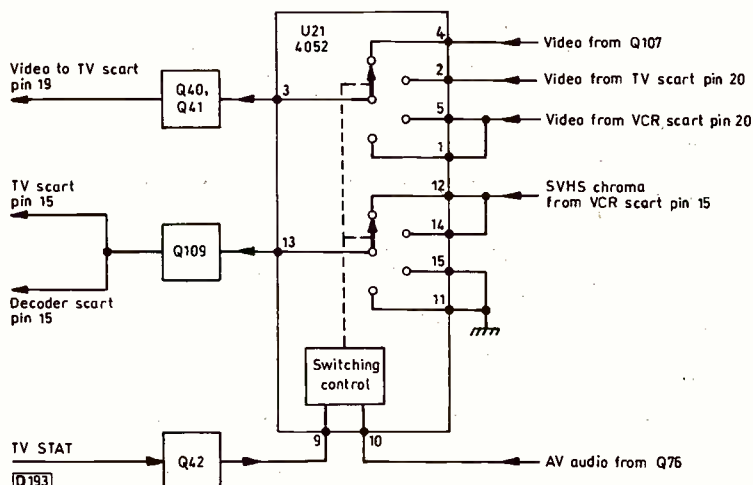
If pins 9 and 10 are both high, pin 4 (satellite TV) is connected to output pin 3: the satellite TV video plus any on-screen messages then pass via Q40/41 to pin 19 of the TV scart socket. At the same time pin 11 is connected to pin 13. This switches off Q109, removing 12V from pin 15 of the TV scart and decoder scart (AV1) sockets.

In passing, both the AV1 and AV2 (auxiliary) scart sockets have baseband video at pin 19 (see Fig. 6 last month). This is not suitable for feeding to a VCR. These sockets are intended for the connection of additional external decoders if required – for alternative transmission standards or scrambling systems.

Pin 9 is controlled by the TV STAT line via inverter transistor Q42. The TV STAT line comes from pin 23 of the microcontroller chip U22. Whenever this line is high, pin 9 of U21 is low. In this condition, video from pin 20 of the VCR scart socket is passed to pin 19 of the TV scart socket. In addition, SVHS chroma from pin 15 of the VCR scart socket is passed to pin 13 and then via Q109 to pin 15 of the TV and pin 15 of the decoder (AV2) scart sockets.

When pin 9 is high, the inputs from the VCR scart socket are open-circuit. The status of pin 10, which is controlled by the AV AUDIO line (via inverter Q76), then determines whether the satellite TV input from Q107 is selected or the video from pin 20 of the TV scart socket is looped through. The AV AUDIO line originates at pin 13 of the shift register chip U25, which is used as an expander for U22.

Fig. 8: Block diagram showing the video signal source selection arrangement.



Note that the satellite TV video feed may consist of video from the AV1 or AV2 (auxiliary and decoder) scart sockets, selected by U26 (see Fig. 6 last month). Also that it's not possible to view satellite TV via the TV scart socket and send audio and video from the VCR scart socket to the modulator for an RF link to another room simultaneously.

When pin 10 of U21 is low, pins 19 and 20 of the TV scart socket are connected. With pin 8 (source switching) held high, this provides a simple loop through. If pin 10 of U21 is high, video from the tuner or from the decoder or auxiliary scart socket is fed to pin 19 of the TV scart socket.

In the TV loop-through condition (the AV AUDIO line low), audio signals are fed to the audio processor chip U18 and back to the TV scart socket. This enables Home Cinema effects to be applied to them. To achieve this the AV AUDIO line also controls the audio input preselector chip U20 (see Fig. 10).

Switching of the TV audio and video signals through the MSS1000 is controlled by the remote control unit's TV→SAT key. In the TV loop-through mode, TV→AV appears in the front panel display.

VCR and RGB

The VCR STAT line is a bi-directional one that runs between pin 32 of the microcontroller chip U22 and, via D71 and R222 (see Fig. 9), pin 8 (status switching) of the VCR scart socket. With a modern VCR set to play connected to this socket the line will go high, telling U22 that a VCR input is present.

Pin 32 of U22 controls pin 8 of the TV scart socket via Q37 and Q36. D71 prevents pin 8 of the VCR scart socket going high when pin 8 of the TV scart socket is high and the VCR is not in the play mode. It also prevents the VCR holding the VCR SAT line low.

RGB loop through is normally enabled when pin 16 (fast blanking) of the selected AV scart socket is high. Selection is achieved by pressing the remote control unit's 0 key until the appropriate source is indicated in the display. A low at pin 16 of the decoder scart (AV2) or pin 8 of the AV1 scart disables the RGB mode.

One section (pins 12, 13 and 14, with pin 11 for control) of the 4053 switching chip U20 is used as the RGB disable switch - see Fig. 10. When pin 16 of the decoder scart AV2 goes high, Q38 is switched on and pin 11 of U20 goes low. If Q112 is off, pin 12 of U20 will be high and 5V will appear at the base of Q113 via pin 14. Since Q113 is an emitter-follower, this voltage will be fed to pin 16 of the TV scart socket. Q112 is switched on by the presence of a high at pin 8 of the auxiliary scart socket AV1. Input selection is then automatically switched to the AV1 socket via the AUX STAT line, which goes to pin 13 of U22. Pin 12 of U20 is now low, and RGB is disabled by taking pin 16 of the TV scart socket low.

Modulator Source Selection

Another 4053 chip, U30, controls modulator video source selection, see Fig. 11. It's also used for speaker configuration selection and muting. Pins 1, 2 and 15, controlled by pin 10, pass either the satellite TV video or VCR video via Q61 to the modulator. The control signal applied to pin 10 is the MOD VID SRC (modulator video source) line from pin 25 of the microcontroller chip U22. Under normal conditions this line is high and satellite video is selected. When it goes low the video from pin 20 of the VCR scart socket is selected. This can happen only when VCR PLAY or VCR→AV is displayed on the front panel and the receiver is using speaker configuration 2 or 4. These configurations allow a UHF TV connection for

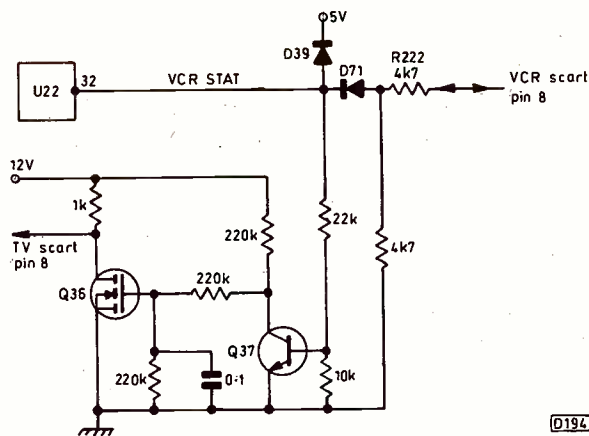


Fig. 9: VCR STAT switching.

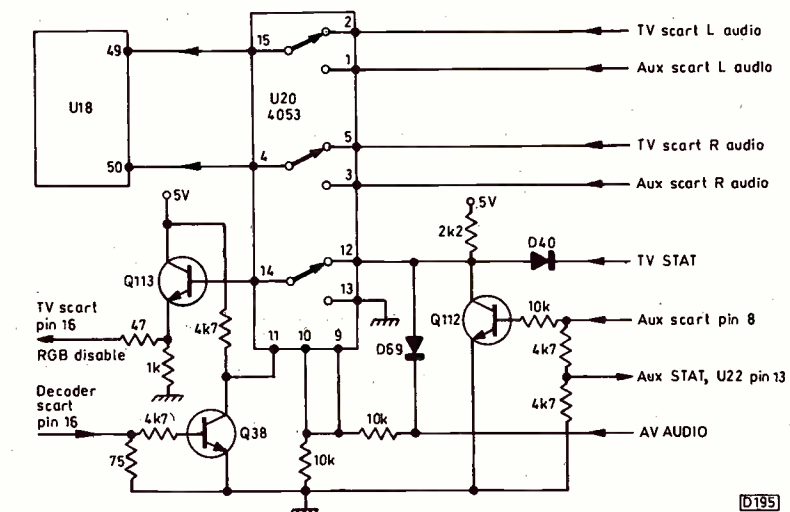


Fig. 10: The audio preselector and RGB disabling switch U20.

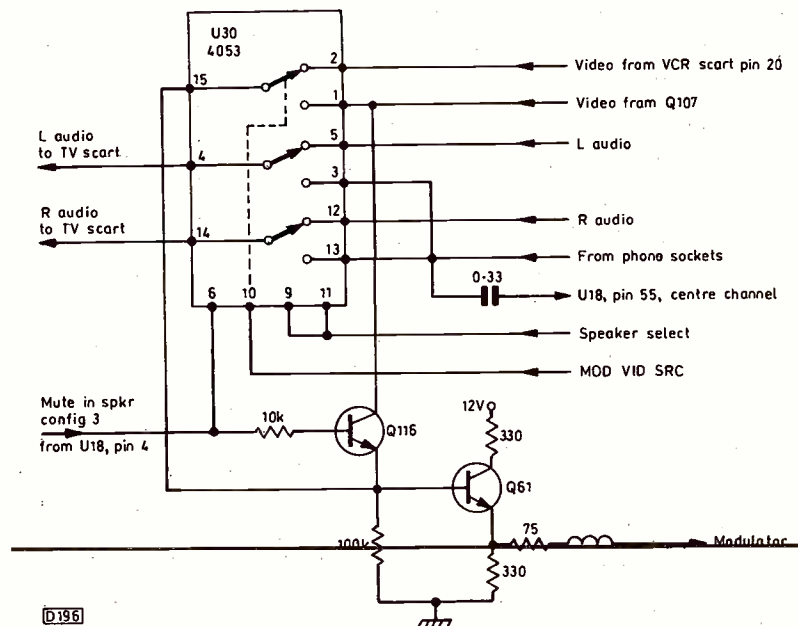


Fig. 11: The modulator video selector and speaker configuration selection and muting switch U30.

video and audio from selected sources.

Speaker configuration 3 disables the outputs from U30 to mute the sound to the TV scart socket. It makes use of one of the Surround (rear) speakers for the centre channel. The TV speaker should obviously be inoperative in this condition, because of its uncertain phasing with respect to the centre channel speaker. With U30 disabled however there's no video output to the modulator. An alternative route is therefore provided, via Q116 which is controlled

by the mute speaker configuration line from pin 4 of U18 – the same line that controls the U30 disabling at pin 6.

The Modulator

Fig. 12 shows a block diagram of the modulator, which follows the usual pattern for the Pace family of satellite receivers. It's based on an SL5066 chip (U15). A smaller IC, U16 (SP4633), acts as a pre-scaler, sampling the local oscillator frequency and providing feedback to the phase-locked loop controller within the Nicky chip U26. The screened compartment for the modulator also contains a UHF loop-through amplifier and signal combiner.

Q61's video output is AC-coupled to pin 4 of the modulator chip U15. Audio from pin 14 of U19C is fed to the cathode of varicap diode D37, which is part of a 6MHz tank circuit connected to pins 15 and 16 of U15. The 6MHz carrier is thus frequency modulated.

UHF output channel tuning is carried out by D36, which is part of another tank circuit connected to pins 9, 10, 11 and 12 of U15. Pins 7 and 8 of U15 feed a balanced signal to pins 2 and 3 of the pre-scaler U16. This divides the frequency by 64, delivering an HF signal in the range 7.2-13.4MHz to pin 13 of U26. The signal is divided further in U26, then compared to a reference 7.8kHz signal produced by division from the 4MHz clock signal fed to pin 12 of U26 – this is in turn derived by division by four from U22's 16MHz clock oscillator. The tuning output at pin 14 of U26 is taken via integrators Q32/33 to D36.

The UHF loop-through amplifier is a wideband circuit using two BFR193 transistors. Its gain is a nominal 6dB, enough to compensate for the loss in the following combiner circuit. This uses a balun transformer to prevent the modulator's output appearing at the wideband amplifier's output, with the possibility of reaching the UHF aerial input. It's basically a splitter used backwards, and introduces a nominal loss of 4dB.

The Microcontroller Chip

The microcontroller chip U22 is a Z8 device. In early models a ROM-less version was used, fitted on a small daughter board. This was subsequently replaced with a full-mask version when minor software bugs had been eliminated. U22 operates in conjunction with the shift register U25 (CD4094BCN), which is used as a port expander, and the 24C32 EEPROM U27 which stores information entered from the on-screen menus.

U22's clock oscillator, connected to pins 2 and 3, runs

at 16MHz. Another chip in this area, the 74LS74 U31, forms a divide-by-four circuit to provide a 4MHz clock for the Nicky chip U26.

U22 also communicates with U1, which drives the front panel display and decodes the IR remote control signals and front panel commands.

The control line arrangements are shown in Fig. 13. U26, U7 and U18 share a common bus with U22, U25 and U27: data on the bus is also supplied to U4, U6 and U9 on the Dolby Sound PCB.

The pin connections for U22 and U25 are shown in the following table.

Microcontroller and port expander pin connections

Microcontroller U22	
1	5V
2	16MHz clock
3	16MHz clock
6	Reset
10	Serial clock
11	Chassis
12	VCR scart pin 12 via Q103
13	AUX STAT
14	LNB short
15	AFC
16	VideoCrypt sense
17	U25 enable
18	VideoCrypt chip U8 enable
19	Serial clock 2 sound
20	Serial clock 1 sound
21	Nicky chip (U26) enable
22	22kHz tone on/off
23	TV STAT
24	Speaker selection
25	MOD VID SRC
26	Card 1
27	Card 2
28	OSD chip (U7) enable
29	Common clock
31	DEC STAT
32	VCR STAT
33	Station ID input
34	Dish pos data
35	VideoCrypt authorise
36	Surround clock
37	Data line
38	Front panel data
39	Front panel interrupt
40	Front panel clock

There are no connections to pins 4, 5, 7, 8, 9 and 30.

Expander U25	
1	Latch
2	Data
3	Common clock
4	LNB on/off
5	Standby
6	LNB select
7	Bandwidth
8	Chassis
9	No connection
11	U17, pin 10
12	C Band
13	AV AUDIO via Q76
14	H/V polarisation
15	5V
16	5V

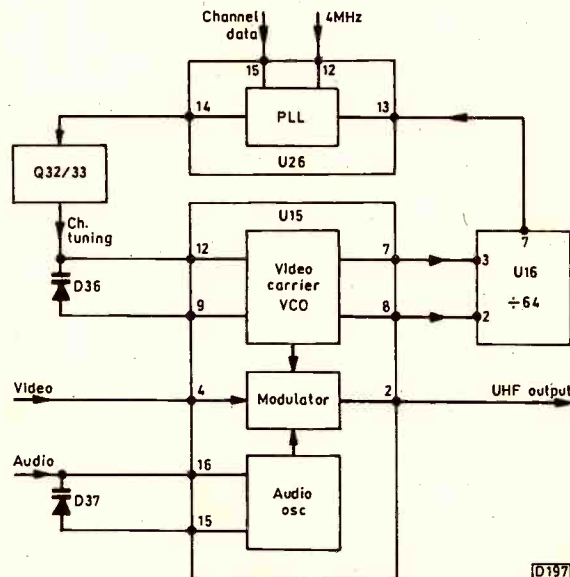


Fig. 12: Block diagram of the modulator.

Front Panel

A feature of the MSS1000 is its comprehensive display panel. Fig. 14 shows the general arrangement. There are ten 7 x 5 segment alphanumeric character grids plus indicators for the LNB input selected, parental lock, 16:9, VCR, AV1, AV2, timer, C Band, Ku Band, AFC, VideoCrypt, six audio effects, stereo, simulated mode, Dolby PLSS and, finally, which card slot has been selected.

The fluorescent display tube is a vacuum device that uses positive ion emission from a heated filament - this can be seen as thin, horizontal wires that traverse the display. When a negative voltage, typically -21V, is applied to a segment positive ions from the filament are attracted to it and it lights up. Normally the segments are held 'off' by the application of 5V from the microcontroller chip U1. The filament is coated with barium salts, and is heated by applying to it an 8V peak-to-peak squarewave. This squarewave is obtained from the 22kHz tone oscillator circuit (see Fig. 4 last month). The display microcontroller chip U1 is a 64-pin device that runs at 4MHz. It also decodes the IR remote commands, the rotary knob and pushbutton commands, and drives the channel and volume LEDs that indicate the mode of the rotary control knob.

U1 constantly monitors the state of switches SW1-4. SW1 sets the rotary knob's control mode to volume. SW2 selects the standby/operate mode. SW3 sets the rotary knob to the channel selection mode. SW4 is for home cinema effects selection.

A ribbon cable connects the front panel to the main board, carrying the supplies and communications between the microcontroller chips. Transistors Q1-4 and 7 are buffer/inverters for ports P0-3 and 13.

General

The receiver has given little trouble in service apart from the occasional failure of C2 on the display panel - this blanks the display. Use of a multilayer ceramic instead of an electrolytic capacitor in this position has solved the problem.

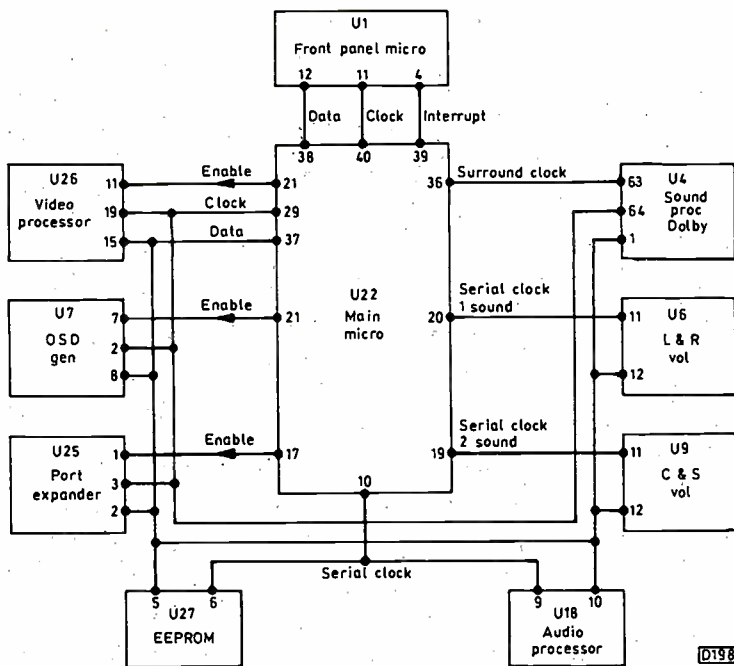


Fig. 13: The bus control lines.

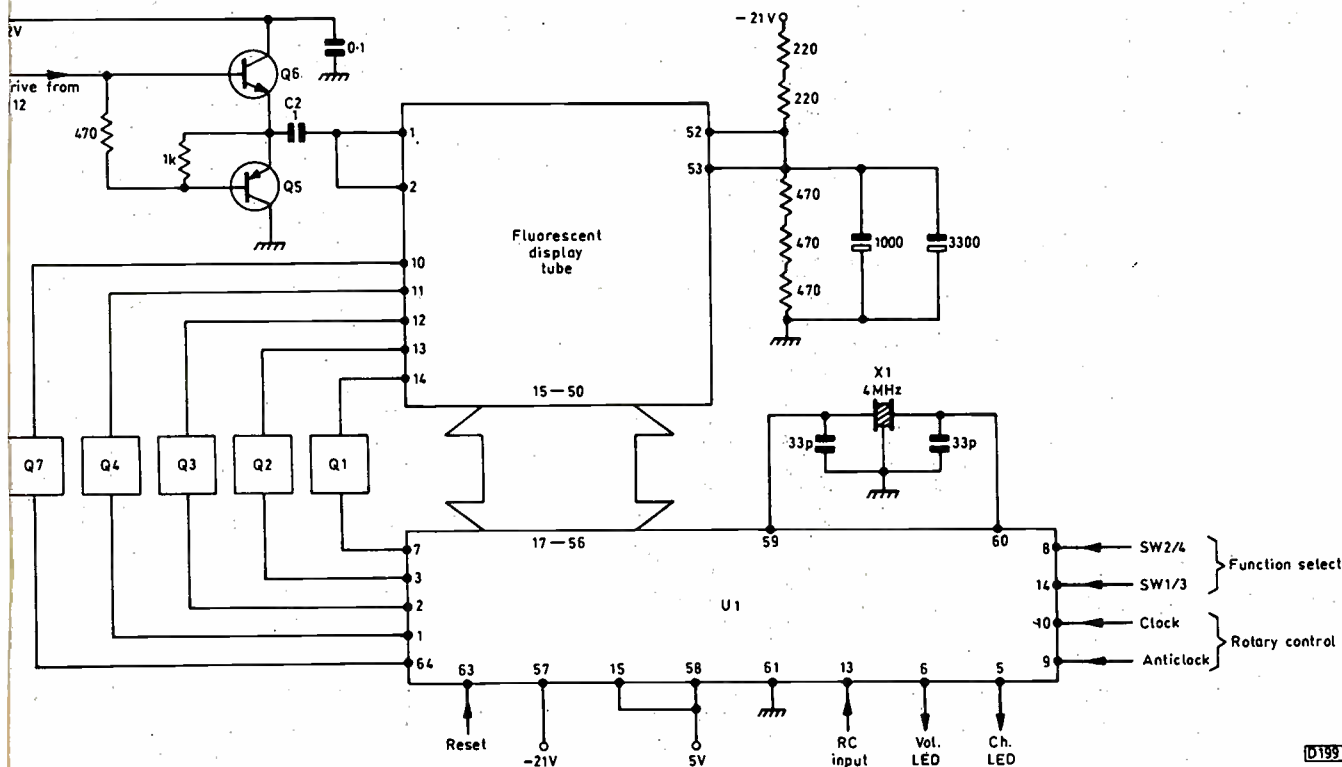
The receiver emits a fair amount of radio hash interference in certain situations. Remedies have been applied to calm this. With all the processing that goes on within the receiver, it's little wonder that some radiation occurs.

The performance with encrypted signals could cause problems with some early models. This situation seems to have been much improved, possibly because of the improved energy-dispersal clamp circuit now used.

As my own mains supply is overhead, there are more than the usual number of interruptions during the winter months. These do not seem to worry the MSS1000 in any way.

In the concluding instalment next month we'll deal with the audio side of the receiver.

Fig. 14: The front panel arrangement.



D199

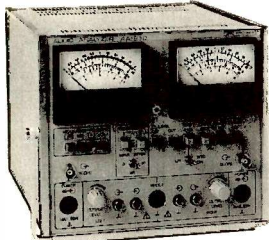


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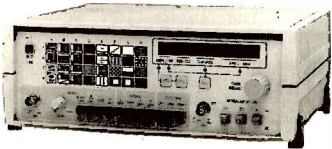
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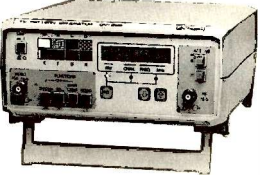
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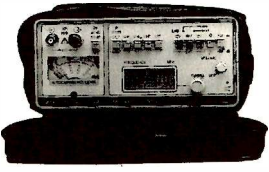
32 patterns, 32 internal memories. PAL/NTSC/SECAM standards, with I, B, G, H, M, M, N, D & K, NICAM, teletext all in one instrument. Optional on screen logotype. (Other pattern generators available from £ 210). £ 1428

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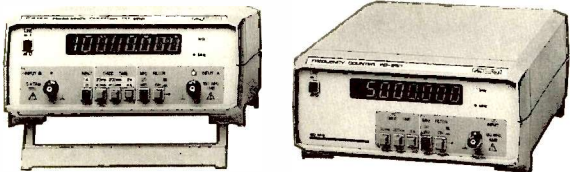
Compact high performance generator, RF and video outputs. Frequency range same as GV-698/11, 37 to 865 MHz. Circle pattern included. £ 433

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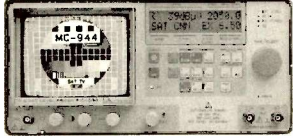
Ideal instrument for the professional installer of FM/TV aerials and satellite TV dishes. Covers 48 to 856 MHz and 950 to 2050 MHz. Lightweight, compact and rechargeable battery operated. £ 599

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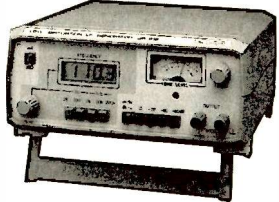
FD-250 covers 20 Hz to 160 MHz and FD-252 covers same plus, 100 MHz to 2.4 GHz. Large L.E.D. display. Wide performance at low cost. £ 153 & £ 206

TV & Satellite Level Meter
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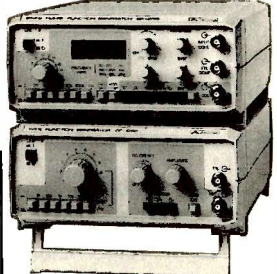
This meter has everything for the top flight installer of aerials, dishes, CCTV, MATV, SMATV and other systems. Features include TV monitor, spectrum analyser, sync pulse, teletext, printer output, 99 memories, tuneable audio subcarriers, etc. Full autocorrection for superb, unequalled accuracy! RS-232 as standard. £ 1949

Low Distortion Low Frequency Generator
Model GB-212



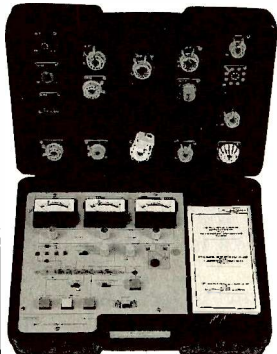
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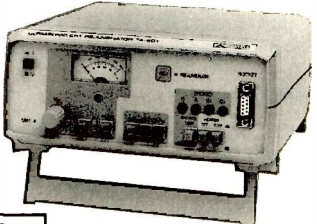
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TELETOPICS

Digital TV Plans

The BBC has announced plans for the start of digital TV services. Its DTV services will be made available via all distribution systems – digital terrestrial, digital satellite, cable and, later, telecommunications networks. BBC channels will be available in the widescreen format, with CD quality sound, and many new services will be launched – for example a 24-hour news channel. An optional 'video stream' will offer complementary or alternative programmes. There are plans for a series of thematic channels, based partly on archive material, to be provided on a subscription basis. Director-general John Birt feels that all this can be achieved, while saving up to twenty per cent of its annual budget, through the use of digital technology to enhance efficiency and partnerships with the private sector.

The ITV companies have agreed in principle to launch joint digital terrestrial TV services. A new corporation, which has been dubbed 'ITV-2', may be set up to achieve greater efficiency than that offered by the present network system.

BSkyB plans to launch a digital satellite TV service in the autumn of 1997, offering between 200 and 500 channels – between 60 and 100 will be used to provide near instant-demand film broadcasting. BSkyB intends to work in partnership with as many broadcasters as possible to provide a diverse package. An eight-channel venture with Granada Television is to be launched later this year, and talks have been held with the BBC with a view to providing up to twelve channels. A substantial subsidy – how this might work has not been made clear – is proposed to

keep the cost of the decoders required to around £200. In return for reduced rental fees, BSkyB proposes to meet half the cost of the launch of a new Astra digital TV satellite. BSkyB and British Telecommunications have also held discussions aimed at forming a joint venture to promote digital TV and interactive services in the UK.

The UK Digital TV Group has endorsed the DVB common interface for use in digital terrestrial equipment. This is a standard for connecting proprietary conditional access systems, allowing different CA systems to be used by different operators and for their replacement in time. The decision is being notified to the government and the broadcast regulators concerned, including the DTI, the ITC, OFTEL and the European Commission.

TV/Video Equipment

Hitachi has launched several models that include the company's new 3D spatial sound system. Like JVC's 3D Phonic, this promises Surround-sound without the need for external speakers. The Hitachi 3DS system uses a digital signal

processor chip to provide signals for four front-facing speakers. The sets also have a Dolby Pro-Logic processor and four 10W amplifiers, which can be used with either optional IR- or wire-linked speakers.

JVC has launched its DV (digital video) camcorder in the UK, as

Model GRDV1. Despite its tiny size (43 x 148 x 88mm) the camcorder offers a range of functions including editing and multimedia possibilities – some of these are off-loaded on to a docking station that forms part of the package. Price is about £1,800 including the docking station.



This in-built car TV will keep the kids amused while you are driving. The 6in. colour set can be used for video games as well as normal reception. So far the Clarion Car Multimedia System, which can also be used to obtain directions, is available only in the USA. A European launch is expected "soon".

Business Developments

The world's largest PC manufacturer Compaq Computer has formed an alliance with Thomson Consumer Electronics to develop a range of domestic entertainment products. The two companies plan to involve other consumer electronics and PC manufacturers, entertainment content creators and broadcasters in developing products that combine computer technology with the latest developments in the consumer electronics field.

The first product, expected within twelve months, will be a PC-TV that combines the features of a multimedia PC with a large-screen TV. Compaq and Thomson will be aiming such products at the upper end of the consumer electronics

market. Internet access will be a feature.

ComStream Corporation of San Diego, California, a leader in satellite-based technology, has announced an agreement with Matsushita Electric (UK) Ltd. to develop and manufacture TV set-top products for use with digital TV services. ComStream is also to work with Matsushita's R&D centre in Frankfurt on developing enhanced digital TV products incorporating multimedia technology. Manufacture of set-top boxes at Matsushita's Cardiff plant is to start later this year. ComStream has supplied over 1.5m demodulator subsystems used in Thomson Consumer Electronics' digital satellite set-top boxes marketed under the RCA brand name.

Interactive TV

Two Way TV, which has been running interactive TV trials in the Central TV area, plans to develop its services beyond games to betting, interactive advertising, home shopping, banking and market research. Over fifty hours of interactive programming a week is currently available to subscribers, ranging from Telly Addicts to Question Time, using terrestrial broadcast technology.

The UK's largest cable operator Telewest has announced a new service called Cable Internet. It will be a high-speed cable modem service available to cable and non-cable TV subscribers, both domestic and business. The operation will be run by a subsidiary company that will be open to other cable operators to join. Several leading cable companies have already expressed support for the service.

MPEG-4

The latest MPEG audio-vision compression system, no. 4, is designed for Internet use. It's described as "a universal mechanism for communicating audio and visual data". The specification is due to be completed by November 1998. The vision side will code information on the items that comprise the scene individually rather than working on a field by field basis, using a "virtual reality modelling language" (VRML). Instead of a fixed compression algorithm for encoding and decoding, an extendible set of tools that are combined as required for the particular application will be used. The VRML approach will enable

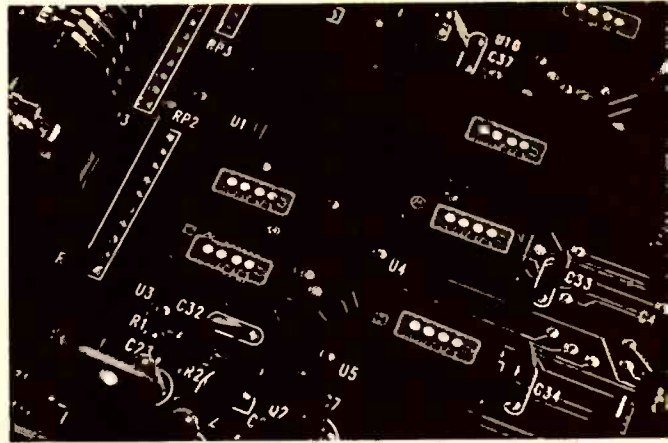
the perspective to alter: as objects are approached, newer versions can be downloaded. The MPEG-4 Syntactic Description Language (MSDL) enables the coded objects to be linked and built up. MSDL handles the set-up between terminals, and checks whether the decoder has the set of tools required to manipulate the encoded audio-visual data - if not, it downloads the missing techniques.

What you seem to get at the receiving end is a multiplex of audio-visual data that can be manipulated, rather than having fixed fields. It's a new technique that provides a truly interactive approach.

The Next Generation

Texas Instruments has announced a major advance in IC technology. The company's Timeline technology uses 0.18 micron connections within the chip, enabling 125m transistors to be fabricated on an IC the size of a thumbnail. This can give such a chip the processing power of 20

PCs! Complex consumer equipment, including videophones and voice-recognition systems, are possible applications. The reduced size makes the chips faster and quieter and reduces power consumption. Different types of device can be fabricated on a chip to increase design flexibility.



TEMPERATURE CHECK

The new MicroCelsi self-adhesive labels enable the temperature reached by electronic components to be permanently shown. The labels measure 5 x 12mm and are particularly suitable for attaching to ICs. They have four spots which change permanently from white to black when the temperature rises to 60, 71, 82 and 93°C respectively. By sticking the labels on components in equipment being soaked, you can from time to time check for any excess temperature hot spots that have occurred, enabling suspect components to be identified. The temperature level needs to be exceeded for only a fraction of a second for a spot to change from white to black.

More information and free samples are available from Dipl.-Ing. Ernest Spirig, PO Box 1140, Hohlweg 1, CH-8640 Rapperswil, Switzerland [fax (+41) 55 222 6969].

Special Edition Teletest

A special limited edition of the Teletest is available from Ozan, for the same price as the standard version. The special edition has been introduced to celebrate two years of Ozan's pattern generators, which are being used by thousands of satisfied customers. The Teletest-2 has six test patterns and S video outputs as well as composite video, RF video and a 1kHz audio tone. For a free information pack call Freecall Ozan on 0500 009070.

D-VHS Standard Finalised

JVC has finalised the technical specification for its Data VHS format. The system, announced in April 1995, offers both analogue and digital bit-stream recording. The latter is a process of recording compressed or encrypted digital signals on the tape directly, with readout in the same way. In other words the D-VHS deck does not contain a DAC or digital decompression or decoding circuitry: these would be handled by a set-top decoder or other external device.

D-VHS uses a new grade of S-VHS tape

and a special cassette with an ID hole. The cassette is based on conventional VHS technology and offers a standard capacity of 31.7-44.5Gbytes, giving a recording time of five to seven hours. Tape speed is 1.67cm/sec, the drum rotating at 1,800 RPM. Video head azimuth is $\pm 30^\circ$, track width 29 microns and track length 10.6mm.

The recording specification is as follows: main input data rate 14.1Mbits/sec, sub-data input rate 0.146Mbits/sec, recording rate 19.14Mbits/sec. Each track represents one sector, the length of the sync block

being 112 bytes. Reed-Solomon error correction coding is used, the modulation system being NRZ (non return to zero).

The format also uses an IEEE1394 digital interface. This is a high-speed serial interface with a maximum speed of 400Mbits/sec. It is designed for data communication amongst multimedia equipment such as electronic cameras, computers and digital AV equipment. The first D-VHS decks will be launched in the USA later this year, with a European launch in 1998.

Long-distance Television

DX-TV conditions and reception; satellite TV news and sightings; HDTV and long-distance reception in the Thirties. Roger Bunney reports

April produced the hoped-for increase in Sporadic E reception, which suggests that the coming season will be a good one. Certainly during the Sixties a mid-April opening always seemed to be followed by E-layer propagation from mid-May to early August, across Band I.

In those days the openings would be dramatic. As most TV stations transmitted test cards during the day time, identification of both familiar and rare signals was easy. Now that all-day TV is the norm, transmitter identification can be difficult. Dramatic reception is still possible – transatlantic signals from Canada, double-hop propagation from Nigeria and Ghana, exotic signals from Syria and Iran and so on.

Reception reports for April relate mainly to the weekends. Day-time checks showed that sustained low-level SpE signals were often present from the middle of the

month, but always it seemed RAI (Italy) ch. IB! Other reports I've received are as follows:

- 14/4/96 Unidentified ch. E4 signals from 1200 onwards.
- 21/4/96 Slovenia ch. E4; ARD (Germany) E2; TVE (Spain) E2, 3; RAI (Italy) IA, IB.
- 27/4/96 UT (Ukraine) R1, 2; Moldova R2; TVE E2, 3; RAI IA.
- 28/4/96 Slovenia E4; ARD E2.
- 30/4/96 ARD E2; Italy E2 (not RAI).

The 1996 edition of the *World Radio and TV Handbook* lists ch. E4 and E23 transmitters being operated in Jericho by the Palestinian Broadcasting Corporation. If the ch. E4 station is in operation and you receive it, let us know – the power isn't listed. Can anyone in the middle east provide further information? This could be the DX-TV challenge for 1996!

Satellite Sightings

The Israeli action in Southern Lebanon produced much news activity, with various SNG uplinks brought into operation. Eutelsat II F3 (16°E) was an extremely active bird, in both the Telecom band (12.5-12.75GHz) and, when capacity limitations made it necessary, the FSS band (10.95-11.7GHz). The UK 'Uplynx' facility was in operation on April 27th at Tyre, its UK144 truck providing a feed for CNNI at 1400 hours. Unfortunately the Eutelsat news feeds from 13°E now use compressed digital video.

The Jason VII project was in operation throughout April. This is

an educational exercise, with live broadcasts from the Caribbean sent to Europe via the PAS-3R satellite at 43°W (tune to 12.733GHz). For many enthusiasts it provided the first reception from this new and rather introvert satellite.

I've also seen very weak NTSC signals via Orion (37.5°W), at 11.657GHz (vertical). Even with threshold extension I was unable to identify the source. Perhaps it was a spot beam directed at Africa? Orion is often used for BBC regional OB hook-ups. Check at 1830-1900, when analogue programme inserts are often present at various frequencies within the Telecom band. BBC-Wales is a frequent user. Unusually, at the end of an insert the carrier is cut rather than displaying an identification, the general practice with other uplink operators.

An ART-Europe OB on the 28th featured a religious event. I'm told it was the Hajj, which marks the annual pilgrimage to Mecca. This was via Eutelsat II F3. At around the same period ART-5 appeared via this satellite. It's a general entertainment channel, with heavy emphasis on music. Some days later it disappeared.

MTA (Muslim TV Ahmadiyya), which used the 11.575GHz transponder aboard Eutelsat II F3, has moved to Intelsat at 34.5°W (11.009GHz vertical). The orbit is not inclined, which suggests that Intelsat has replaced the aged 603 bird at this position.

Ian Waller (Lincoln) reports that PAS-3R, though quiet in the Ku band, is active in C band (4GHz). He's logged a Chinese TV feed (CCTV-4) from Beijing to Africa at

**Muslim
Television
Ahmadiyya via
Intelsat 603 (?)
at 34.5°W.
Photo from
John Locker.**

Muslim Television Ahmadiyya
Assalamo Alaikum, welcome to
INTELSAT 603
31st March 1996
Test Transmission to 11-30
Schedule Programme 11-30 to 17-00
Test Transmission 17-00 to 23-50

4-18GHz. This is part of a Chinese World TV Service.

Checking eastwards, PAS-4 is very lively with the Arabic ART3/5 services at 11-649GHz and another ART programme at 11-585GHz, along with Paramount and VH1. This orbital slot (68-5°E) represents a very low elevation angle in the UK. The signals are therefore susceptible to the weather, with rain fade.

Alan Smith in Thailand has been angered by loss of BBC World Service TV via AsiaSat 1 – it's been transferred to PAS-4, at 4-155GHz. He points out that no BBC signals can be resolved in SE Asia across the 90° arc from 53° to 143°E. CNNI, ESPN, ABN etc. all provide excellent signals. Most viewers in the region have a fixed dish directed at AsiaSat 1.

Terrestrial News

Ireland: The main transmitters for the new RTE network are to be as follows: Cairn Hill E50 (H), Kippure E59 (H), Mt. Leinster E23 (H), Three Rocks E55 (H), Clermont Carn E68 (V), Maghera E68 (H), Mullaghanish E31 (H), Truskmore E63 (H).

Digital TV: On April 9th the BBC successfully transmitted and received DVB-T (digital video broadcasting – terrestrial) signals using the recently finalised terrestrial DVB specifications. The MPEG-2 coded BBC-1 transmission was transmitted from Crystal Palace and received at the BBC-TV centre in West London, using 18-1Mbits/sec.

In the USA Westinghouse Electronic has tested a newly-designed solid-state TV transmitter that, in comparison with conventional silicon solid-state hardware, will increase transmit power by up to three times and halve construction costs. The new transmitter uses silicon carbide devices. It was installed at the KLAS-TV studio, Las Vegas and transmitted pictures across the city to the NAB exhibition hall. This was the first public demonstration of the new technology.

UK: In its May bulletin the BDXC mention that the club's 1,602kHz RSL station at the Silverstone racing circuit operates with an 87-7MHz outlet in parallel. A TV service is transmitted on special racing days, using chs. E47/49. RSL is a restricted service transmission licence, usually low-

power (FM radio typically 25W fed to the aerial), issued for a specific period, i.e. special days or a continuous 28-day run. Did any DXer see any of this?

Norway: The NRK-2 service is to open on August 31st. It will use PAL for terrestrial transmission, with network distribution via Intelsat 702 (1°W). NRK-1 and -2 will then use encrypted DMAC for their downlinks. Eighty per cent of the population is expected to be able to receive NRK-2 from day one, 34 per cent via cable, 27 per cent off air and 18 per cent by DTH dish.

Regional programming in the early evening (1645-1700 GMT, 1630-1700 Wednesdays) has now started in seven different areas. The regions listed are Ostnytt, Ostlands-Times, Sorvestnytt, Midnytt, Vestlandsrevyen, Nordnytt and a rather odd-sounding 'NRK-4' (the Oslo region perhaps?).

Gibraltar: For several months a ch. E46 transmitter in the nearby Spanish town of La Linea has been radiating a PM5544 test pattern with the identifications 'CAMPO' at the top and 'GIBRALTAR' at the bottom. There are no programmes. It's thought that this is a political move related to the proposed GBC-2 service.

Africa: The first TV channel has opened in Malwi, operated by Central African Television. The Gambian government is financing an English-language TV service that's due to start in the late autumn – test transmissions are now on air for nearly 18 hours daily.

Moldavia: The ORT TV service from Moscow has been reduced to between 0300-0910GMT. RTR is now 1400-2100GMT and at other times the Ukrainian UT-1 channel is broadcast.

Portugal: Television Independiente (TVI) is to relaunch a terrestrial pay-TV service offering mainly films. It's run by the Portuguese Catholic Church.

Requests

Andrew Emmerson is interested in preserving old broadcasting equipment from the 405-line, valve era. In particular he wishes to restore a Marconi valve sync-pulse generator and an image orthicon camera. If you can help, ring Andy on 1604 844 130 or fax 01604 821



647 to discuss collection/delivery and financial details.

The latest newsletter from the Eddystone Users Group, of which I am a member, asks for information on an Eddystone TV receiver apparently made in the 405-line era. Can anyone confirm whether such a receiver was in fact produced and, if so, provide any technical details?

Thirties Style HDTV

This year marks the sixtieth anniversary of electronic TV

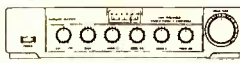
A rare shot of a PanAm PAS-2 feed to the UK via Intelsat K at 21.5°W, during the Taiwan elections. The PAS-2 position at 169°, over the Pacific, suggests that three links were required to bring the signal to Europe. Photo from John Locker.

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transmissions in the UK. The first regular high-definition (405-line) service started on November 2nd 1936 from Alexandra Palace and ran until it was abruptly closed down in September 1939, recommencing in 1946. Military use was made of the transmitter during the war years.

I have in my possession a number of copies of *Practical and Amateur Wireless – incorporating Practical Television* dating from the 1936-38 period, also a copy of *Television* from 1928. The latter includes a 30-line spinning disc TV receiver project! It's interesting that experimental 30-line mechanical TV transmissions continued in Russia up to the mid-Thirties: a "Birmingham youth" received a Moscow medium-wave broadcast of "a dancer performing", a distance of over 1,200 miles. The article went on to say that Russia was expected to have developed a form of electronic HD-TV by the end of 1937. It also mentions that the BBC's 30-line transmissions were received across Europe between

1932-35. Was this the start of DX-TV? The report dates from July 1937.

A few weeks earlier *Practical Television* was reporting on preparations for the May 1937 coronation of George VI. OB TV was then in its infancy, and much technical detail was included. Maximum camera cable distance was 300m, which had restricted outside broadcasts to the parkland around Alexandra Palace. For the coronation a new OB unit was brought into operation. It included a vehicle with a 1kW VHF transmitter to provide a link to Alexandra Palace.

The same issue of the magazine contained a report mentioning complaints about US TV receivers. The pictures were generally under ten inches wide and the tube phosphors tended towards a green hue. There were seldom less than thirty valves, though the latest 1937 designs were down to twenty four.

There was more on DX-TV in the January 13th 1938 issue of *Wireless World*, where daytime reception of Alexandra Palace TV sound (41.5MHz) was reported by India Radio in Delhi. This was early F2-layer propagation, the result of high solar activity.

Sixty years on we have MPEG video compression, satellite TV offering dozens of channels via a 60cm dish and talk of Ka band broadcasting at 28GHz. We've come a long way from the 30-line mechanical televisor. I wonder what the next sixty years will bring?

Satellite TV News

The digital Astra 1F satellite is now in orbit at 19.2°E. Transponder capacity has already been extensively booked. SES Astra has filed for twelve further orbital slots, which would enable the company's distribution services to be extended across Europe and into Russia. Discovery Europe plans to downlink five digital channels from Astra 1F. BSKyB's plans for digital TV via 1F have been put on hold awaiting confirmation of the technical standards and second generation equipment design, also passage of the new Broadcasting Bill now before Parliament.

Galavision is to move from Astra 1C to PAS-1 at 45°W (11.515GHz horizontal).

Star TV has launched its Mandarin language TV service to SE Asia from AsiaSat 1 and 2, with three channels. Future Star TV transmissions will be digital instead

of analogue, starting with Chinese Channel Taiwan.

The M Group in Thailand plans to launch two satellites, L Star-1 and L Star-2, in late 1997 and mid 1998 respectively, broadcasting 500 digital channels across SE Asia.

The Spanish broadcaster Antena 3 Television plans to introduce a twenty-channel pay-TV package by the end of the year.

PanAmSat plans to use C/Ku slots at 79 and 103°W and Ku-only slots at 58 and 79°W for worldwide expansion up to the year 2000.

Intelsat's Indian Ocean satellites are to be moved to new positions, with the traditional 3° spacing reduced to 2°. This could cause co-channel interference problems when smaller dishes are in use. The line-up will eventually be 704 at 66°E, 803 at 64°E (to be launched this Christmas), 602 at 62°E and 604 at 60°E.

Egyptian Radio and TV (ERTV) has ordered Nilesat, which is expected to be in operation by December 1997. Based on the Orion Atlantic design, it will be positioned at 7°W with twelve transponders offering up to sixty compressed channels in the DBS band (11.7-12.5GHz). Coverage will be Middle East/North Africa. Nile TV International, a weak signal in the UK via Eutelsat II F3 (16°E), will continue from its present slot.

Orbit International is to move from C band operation via Arabsat 1D at 20°E to Ku band operation via Intelsat 704 at 66°E. It will also be increasing its North African coverage by leasing Ku band transponders aboard Intelsat 601 at 27.5°W. Orbit claims to have 55,000 subscribers.

Arabsat 2A is due up this summer, with 22 C band and twelve Ku band transponders. 2B is to follow a year later. Coverage will extend across the Middle East and southern Europe. Ku band EIRPs are quoted at around 43-47dBW, which implies the use of 1-1.2m dishes.

The Israeli AMOS-1 satellite should be in orbit at 4°W by the time that this is read, with 54dBW spot beams focused on Israel and the surrounding countries and additional spot beams for eastern and central Europe. The latter beam is centred on France, with coverage extending to southern Ireland and the UK south of the Scottish boarder. At 54dBW EIRP, reception should be possible using 65-80cm dishes. Transmissions will use 10.95-11.2GHz and 11.45-11.7GHz, with linear polarisation. ■

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Answer to Test Case 403

– see page 625 –

The TDA3562A is a funny chip that's been fooling technicians for well over a decade. An auto grey-scale tracking circuit within the chip pulses the tube's R, G and B cathodes in sequence during the field blanking period to check each gun's 'black current'. Pin 18 of the chip then receives, in turn, feedback on each gun's black-current emission. The chip uses this feedback to set the clamping level for each gun individually.

In this particular set the TDA3562A chip was getting no reply from the red gun. Now you might, under these conditions, expect the chip to increase its R output in an attempt to get some red gun emission in the tube. But this would be to underestimate the TDA3562A! What it does instead, for reasons unknown to any of the workshop worthies, is to shut down its red channel.

The cause of the trouble turned out to be the tube's red gun heater, which was open-circuit. This wasn't easy to discern by looking at the tube neck, even in darkness. Nothing short of a new tube would get an R output at pin 13 of the chip.

If Ray had tested the tube's emission at the start, he would have seen why there was no red in the picture. But he would have been none the wiser about the strange habits of the TDA3562A chip! Right, now back to the Sony CD player and the Amstrad IRD...

NEXT MONTH

A Look at the Panasonic Z5 Chassis

The Panasonic Z5 small-screen chassis was introduced in 1993 as a lower-cost replacement for the Z4. It was largely designed at Panasonic's Cardiff plant, and introduced a new feature for non-Japanese chassis – a 'hot' line output stage. This means that the yoke and the chopper and line output transformers all have to provide mains isolation, a significant point when servicing is undertaken. Other features include a linear, transformerless remote control standby circuit, contrast auto tracking and an interesting teletext option. Ray Meadows describes the design.

Servicing the Amstrad TVR2/3

These were probably the first combined TV/VCR units to appear in the UK and sold well. Chris Watton describes repair procedures and the faults you are likely to encounter.

Cleaning with Water

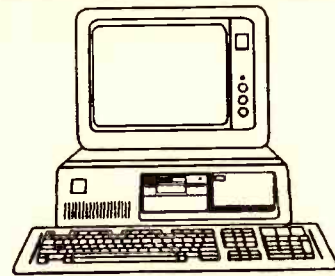
Contamination, corrosion and general messiness are common problems with electronic equipment. Cleaning procedures are changing, with water-based products now finding favour for use with PCBs and mechanical bits and pieces. The Electrolube Safewash 2000 range enables the technique to be used for general servicing. It pays to know what is involved and what can and can't be done. Pete Roberts reports.

Centre-mounted Madness

During the past couple of years all VCR manufacturers seem to have adopted centre-mounted cassette mechanisms. This has made servicing much more difficult. The increasing use of plastic mechanical parts has added to the problems. Jeff Herbert on the disadvantages of the present approach to VCR design.

Monitor Fault Finding

More servicing know-how on computer monitors.



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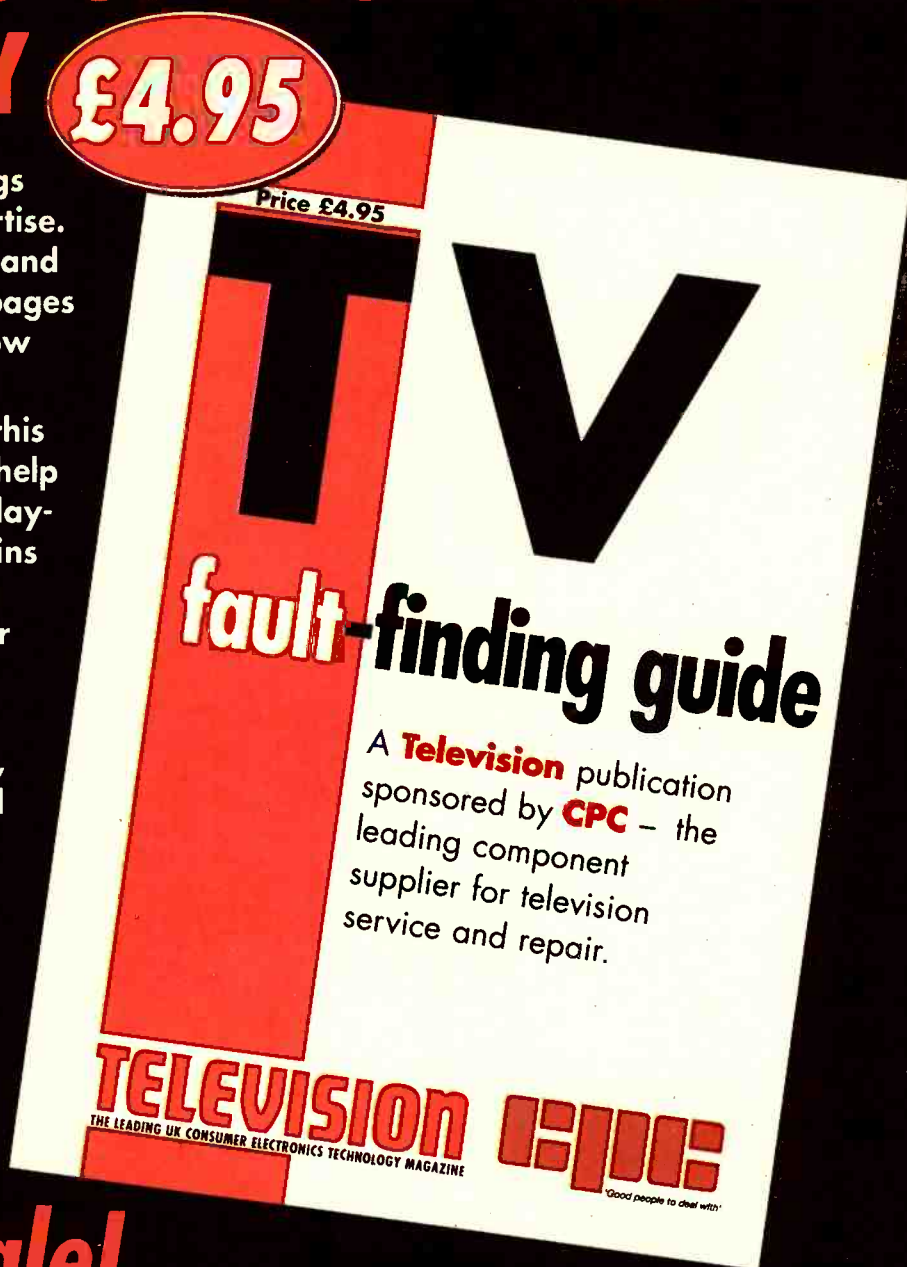
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Letters

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VCR Audio Servicing

In his article on VCR audio servicing (April '96, page 404) Eugene Trundle omitted to mention that as recently as 1990 Akai introduced a Nicam twin audio linear track stereo VCR that incorporated Dolby noise reduction (Model VS485EK).

The picture quality produced by this VCR is very good, with a resolution of around 270 lines, and to my ears the sound quality, despite the 0.3mm track width, is perfectly acceptable with respect to frequency response, noise and distortion.

The audio channel separation is excellent and remains good throughout a three-hour tape.

*Eric H.E. Barron,
Retired electronics engineer,
Dorset.*

Going it Alone

Having just read the excellent article Going it Alone by John Pitt-Francis in the June edition I feel that I may have some further advice to offer regarding customers and pricing. I hope that the following notes will be of help to those just about to jump in at the deep end.

First you have to build up a base of regular 'good' customers. Most of them will come from word of mouth recommendations from customers who have had a good deal from you! There is an army of what we call "wasters" in our neck of the wood: people who pick up electrical goods from boot sales and the like and descend on you with countless items that have already been written off several times by local repair shops. If you are a newcomer to the area and advertise, as you will have to do, they will seek you out in the

hope of getting these items repaired – "for a few quid" as they put it. The travelling population will also come to you with items they get for a song from local auctions. After a while you will get to know their faces and write off the items before you waste time stripping them down. The best way to get rid of both of these types is to charge an 'Inspection Fee', ranging from say £5, £10, or more depending on the type of unit brought in for repair. You will lose most of them when you mention this fee, as they don't like paying for estimates and will seldom come and collect something that you cannot repair. With these types you need to get your inspection fee up front – as the chance of getting it later is minimal! Despite your need for new customers, this type is of no use to you, as if you do manage to get one of their units working they will not want to pay a reasonable price for the work. Those companies that advertise "free estimates" – there are very few these days – simply load the cost of the estimate on to the customer's bill or the next customer's bill, as the running costs of a van and petrol have to be paid for by someone. You can explain this to your customers when they ask you for a free estimate: most of the genuine ones will understand.

Secondly you must have a minimum trade price, as we call it. (We do a lot of trade work: around 80 per cent of our throughput, and trade customers are among the best types you will get.) Apart from sending you work on a regular basis, they are less likely to haggle over prices, so you can give them a reasonable trade discount. Having a minimum trade price is essential if you are going to make a profit at the end of the year. It is also a help when dealing with retail customers at your door. Those who want jobs done for "a few quid" can be respectfully reminded that you are a professional, not some cowboy who works from his kitchen table, and that you do a good job for a fair price. Those who wince at your minimum price are likely to want

something for nothing and are of little use to you as a customer. Sounds hard and callous, doesn't it, but when you've been in this business for eighteen years you will be thinking exactly the same.

Pricing is difficult. The amount you can charge will depend on your competitors and the type of turnaround and service they give. Large outlets with high overheads are likely to have to charge a lot more than you. This gives you one advantage. If you work from home or run a small shop you are unlikely to be inundated with work these days. With time on your hands you can do a faster turnaround than your competitors, earn a reasonable living and charge less.

Our advertisement in the local rag states that most jobs can be done within 24 hours, and in many cases can be collected on the same day. This has won us many a customer.

Keep paperwork to a minimum (you don't need everything in quadruplicate, with copies for head office, despatch department, etc.) Keep it simple. All we use is a stick on 'post-it' label attached to the unit. This records the customer's name, address and telephone number, and the fault symptoms. It can be kept with the job until you come to write out the invoice.

Another advantage of the minimum price approach is that you make a reasonable profit when the fault is a simple one. This will make up for those 'horror jobs' we all get from time to time. If these were charged at the normal rate, the cost would exceed the original price of the equipment. We all have to grin and bare these jobs: it's part of your life as a repair man. If you can't take it, don't start in the first place! It may seem unfair to charge your customer a minimum price to replace a blown fuse or attend to a loose wire, but at the end of the day you are there to make a living. If you get into the habit of charging only "a few quid" for this type of job, and your minimum charge for the difficult ones, you will soon go under. Incidentally you won't find

many blown fuses or loose wires: the chances are that your customer will have already had a peek inside and attended to any fault of this nature. The way to look at it is that if your customer is not prepared to pay say £40 to repair a unit that cost around £300 new, he doesn't really want it done.

We now specialise in in-car audio equipment, and often have to remind the customer of how much the unit cost in the first place and its replacement value. Many are astounded to learn that the radio-cassette units in cars a few years old cost £200 upwards to replace. £40 for a repair doesn't seem so bad then!

Thirdly, estimates. We try and explain to customers that if we have to strip a unit down, write out an estimate, contact them and wait for confirmation before getting on with the job, this all takes time and at the end of the day they will be paying more than if they just let us get on with it. Another important rule is to estimate only if a unit is likely to cost over a certain amount to repair. With our digital car radio-cassette units we have a rule that we contact the customer only if the repair is likely to cost over £40, otherwise we go ahead and repair it (TV and video repairs could be priced higher, at say £50 or more). This will enable you to avoid those awkward individuals who take their units to every repair shop in the area and waste countless engineers' time in the hope of getting a "bargain" repair. Your inspection fee will also deter these individuals. At the end of the day the best way to succeed is to be fair and be seen to be fair. The cowboy rip-off merchants who operate in the plumbing and roofing trades in some areas don't last long and have to keep moving on. If you get known as a rip-off merchant you will soon run out of customers to fleece, as word travels fast – especially in a rural area.

And finally, warranty. You will have to decide what length of warranty you want to give, and can afford to give, on your repairs. We give 30 days on our in-car unit repairs, and price them that bit cheaper, which is what the majority of our trade and retail customers prefer. If you go for three months, as some TV and video repairers do, you need to charge a little more to cover the few that you are likely to get back during the warranty period. It's fine to make the odd allowance for your regular trade customers if one of their jobs has come back just

out of warranty, but if you do this with your retail customers the word will soon get around and they will expect their units to be warranted for life once you have had them on your bench. With units that are just out of warranty you can compromise by charging for any new parts and fitting them free – and can still make a few bob by pricing the spares at retail over what you paid for them trade.

I hope that the above will be of help to any of you starting out in the land of the self-employed, and the best of luck.

*Radio Electronics Engineer,
Cambridgeshire.
Name and address supplied.*

Head Cleaning Tapes

As Edward Branch said (letters February), customers seem to think that head cleaning tapes can cure all VCR ills, which we know is not true. When customers are told this, and that these tapes can cause damage to a VCR, they invariably ask me the same question – "why are they sold if they cause damage?" My answer is always short and sweet. "Why do they sell cigarettes?" The look on their faces says it all.

Incidentally I am now employed at Ford's engine plant at Bridgend, where I stick bits on engines. This is rather a waste of twenty odd years' experience. But with the shape the trade is in, I consider myself very lucky.

*Kevin Jones, Ex technician,
West Glamorgan.*

The TDA2170 IC

I first became aware of the problem of non-availability of this IC last year, when I used my last one and was unable to obtain further supplies. I tried the Help Wanted column of this magazine, and my thanks to all who took the trouble to contact me – most of whom had the same problem.

The answer came from Charles Hyde who suggested fitting a TDA8170, instead with some modifications. I have successfully carried out this modification to a 59cm ITT Model TX3546 (Digi 3 chassis). The procedure is as follows.

Remove the DIGI panel and HF unit to give more room, then take out the TDA2170. ITT had kindly numbered the holes on the top of the PC panel. Before inserting the TDA8170, bend pin 1 back in line with pin 2 and slightly open out the pins. Put pin 7 into hole 9, pin 6 into

hole 8, pin 5 into hole 7, pin 4 into hole 6, pin 3 into hole 5, pin 2 into hole 4, pin 1 into hole 2. Then link hole 3 to hole 9. Replace C402 with a 100µF 105° capacitor and check or replace D402. Refit the DIGI panel and HF unit.

When I switched on I was rewarded with a normal picture, though it was displaced downwards giving a two inch gap at the top. Adjusting the vertical shift still left a quarter inch gap. I looked at the circuit diagram and decided to play around with the value of the 6.8V zener diode D411: fitting a 7.5V zener diode allowed me to shift the picture up with a little to spare. Height and linearity adjusted normally.

The set has now been running for about 100 hours with no problems and with the TDA8170 getting no warmer than the original. As for long time reliability, only time will tell.

*John R. Langley,
Burton Lattimer, Northants.*

Ultrasonic Cleaning

David Woodnott (*Television May '96*) referred to possible use of a jewellers' type ultrasonic cleaner for camcorder PCBs with electrolyte leakage on them. A few points to note are that ultrasonics clean very well – so well that the component markings may come off the components and the PCB – while not all components are rated for ultrasonic cleaning. GEC Hirst Research Centre has published (*Electronic Production* March 1990) the results of a Government sponsored investigation into reintroducing ultrasonic cleaning of military electronics. It was found that old fears of damage are largely unfounded when current technology products are cleaned. The weakest components are quartz crystals. At a power density of 11W/litre of cleaning solution, cleanliness is obtained in less than two minutes, i.e. flux residues are removed, even beneath surface-mounted microprocessors, and no damage is caused. When the power is multiplied by three, the time for damage to occur is reduced by a factor of one thousand. So it's very important to know the power density of your cleaner – always fill it up fully.

The results were found using CFC (now banned) cleaners and aqueous solutions, so the method should be applicable to the service engineer as equipment becomes even smaller.

*Ray Porter, M.Sc., C.Eng., MIEE,
Stourbridge, W. Midlands.*

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: CX519-004P chip for the Sony Model KV2216UB2. D. Field, 18 Brighton Road, London N16 8EG. 0171 249 7820.

Wanted: Manual for the Tektronix 453 oscilloscope or a photocopy of the power supply circuit. David Hughes, 39 Whitehouse Lane, North Shields, Tyne and Wear NE29 8PB. 01912 911 492.

For disposal: Ferrograph RTS2 recorder test, as new £150. Philips VR323 in excellent condition £150. Free for collection, a Panasonic NV333 with a mechanical fault. John Pearce, 29 Shalgrove Field, Fulwood, Preston PR2 3SX. 01772 863 595.

Wanted: Manual or circuit diagram for the Scopex 4D 10A oscilloscope. Photocopy would do or does anyone know where I can get one? Have several years' *Television* and *Wirless World* issues for disposal. S. Jacovides, 20 Cheverton Road, London N19 3AY. 0171 272 7139.

Wanted: Panels for the Hitachi Model CNP192, also a circuit diagram. Donald Bills, 69 Greenfields Road, Kingswinford DY6 8EG.

Wanted: Manual or circuit diagram (photocopy OK) for the JVC Model VR5521L stereo receiver. G. Jones, 2A Mountain Road, Brynamman, Dyfed SA18 1AA.

Wanted: Remote control unit for the Osaki Model P1404T with Fastext. Several universal units have been tried but none work correctly. Andy Nicholas, 3 Chalkdell Fields, St. Albans, Herts AL4 9LZ. 01727 845 577.

For disposal: A Sobell Model T176C dating from approximately 1955-7. Any offers? Mrs Martyn, 01915 848 518.

Wanted: Circuit diagram for the Minbea Electronics (UK) IBM-compatible switch-mode power supply (made in Malaysia). Also the two foil-side surface-mounted chips, which are unmarked. One is an 8-pin flat pack the other a 16-pin flat pack. And a circuit diagram for the Amiga 500 power supply. D.J. Bolt, Park Cottages, Berners Lane, Woolverstone, Ipswich, Suffolk IP9 1HR.

Wanted: High-voltage focus

control unit for the Sony KV2212UB. Spares for the Rediffusion Mk 3/4 chassis or information on a supplier. Line output transformer (KF2825G) for the IBM 8503002. *Television* Sept. 1984, May 1986, May and Sept. 1988, Jan 1990 and Jan 1991. C.J. Davies, 52 The Close, Johnston, Haverfordwest, Pems SA62 3QQ. 01437 890 561.

Wanted: Service manual for the Sony Model KV6000BE or information on a tuning fault (won't stop and won't store). Geoff Dawson, Calder Valley TV, Old Tuch Lane, Sowerby Bridge, Halifax HX6 2EL. 01422 834 717.

Wanted: Service information or advice on a Triumph VR9501 (accepts a cassette but won't lace up or run). J. Cronk, 2 Mostyn Avenue, Prestatyn LL19 9NF. 01745 888 355.

Wanted: DMA2285 chipset, version 31, for the Ferguson SRB1 BSB satellite receiver. D. Robinson, 1 Sycamore Farm Cottage, Lower Bassingthorpe, Grantham NG33 4ED. 01476 585 760.

Wanted: PCD8571 memory chip or front control panel for the Luxor model 18056449 (SX9 chassis). Also a remote control handset for the Sony KV2092UB and a circuit diagram for the Amstrad CTV1401. H.S. Downing, 16 Mayfield Crescent, Lower Stondon, Henlow, Beds SG16 6LF. 01462 850 144.

Wanted: Circuit diagram for the Hitachi Model CPT2226 or details of the 7-pin chip M601 which is missing. R.C. Peirson, 61 Seaton Close, Staithes, Saltburn, Cleveland TS13 5AU. 01947 841 077.

Wanted: Circuit diagram and user manual for the Video Circuits V33 tube tester/reactivator, or one to buy. Also same for the Korting 82515 colour-bar generator. And Macdonald TV servicing books for 1982-3, 1983-4 and 1984-5. B.R. McLeod, 8 Cunningham Road, Hordean, Portsmouth, Hants PO8 9LT. 01705 597 941.

Wanted: MN1512VTJ chip IC7503 for the Panasonic NV730 or better still timer board VEP07213C. L. Gerken, Hertsmedia Servicing, Goldings North Road, Hertford SG14 2PY. 01992 555 873.

Wanted: Remote control unit for the Goodmans C141/Osume 1484R and a 1N5304 diode. Peter Ward, Petgra, Forest Corner, Ringwood, Hants BH24 3JW. 0142 475 445.

Wanted: Spares for Grundig TS1000 reel-to-reel tape recorder, especially two-track head carrier module, feet, NAB spool adaptors, accessories. Can supply part nos. Also service manual for the Mitsubishi Model HS710B. Have Salora SVE2000 video editor plus various sundries for exchange/disposal. Neil Black, 12 Clovullin, Ardour, by Fort William, Invernesshire PH33 7AB. 01855 841 256 (evenings).

Wanted: Circuit diagram (photocopy OK) for the Mitsubishi EUM128IM monitor and the Dell P1428E monitor. Tony Jackson, 31 Newcourt Road, Bray, Co. Wicklow, Ireland. 286 7142.

Wanted: An A51EBV13X01 tube (21in.) for the Ferguson TX98 chassis and an A66EAK51X01 tube or a 28in. Hitachi set. Must be in good condition and at cheap price. Stuart Fletcher, 131 Walsh Avenue, Hengrove, Bristol BS14 9SQ. 01275 891 893.

Wanted: Service manual for the Roneo 208 photocopier, user's guide for the Philips NMS6302 Viewdata terminal, text panel for the Sony XE4, a Sony RM641A remote control unit and a Philips VR6560. David Lacey, 7 Green Leach Avenue, St. Helens WA11 9LS. 01744 753 072.

Wanted: Mains transformer for the Hinari VXL6 VCR. Please contact Pat on 0171 474 4750 (53 King Street, Plaistow, London E13 8DB).

Wanted: Instruction manual for the Panasonic UF140 fax machine. Ken Howe, 13 Howardian Close, Lambton, Washington NE38 0PX. 01914 178 101.

Wanted: Power on/off switch knob for the Alba Model CTV744, and a control door for the Hitachi CPT2240 colour receiver. Dave Mackrill, 13 Tower Road, St. Leonards-on-Sea, East Sussex TN37 6JE. 01424 427 996.

Wanted: RF converter module for the Sanyo VHR3300 VCR. A salvaged working one will do. Also, does anyone know of any book(s)

that deal with DAT recorder servicing? Eddie Cox, 86 St. John's Road, Hedge End, Southampton SO30 4DF. 01489 782 885.

Wanted: WYC panel (in particular the HT4507A chip IC202) for the GEC V4005/Hitachi VT63 VCR. Pressure anywhere on the panel causes loss of signals, but blanket resoldering has had no effect. Nicholas Arnold, 19 Bond Street, Bournville, Birmingham B30 2LB. 01214 581 187.

Wanted: FMC-1245DL LOPT for the Samsung SM-12SFA7 monochrome monitor. The monitor was probably OEM and is badged ARC?. Ken Sims, 37 Glaisdale, Thatcham, Berks RG19 3XJ. 01635 873 128.

Wanted: LOPT for the Huanyu Model 37C-3, and an electronic viewing unit for the JVC GRA30. J.B. Thornton, John's TV Video and Hi-Fi, 27 Browning Road, The Straits, Lower Gornal, Dudley, West Midlands DY3 3BE. 01902 681 020 or 885 226.

Wanted: One or two Philips 20in. G11 sets, any condition. Also, can anyone explain the operating symbols on the front of Philips 20in. CTX-E sets? They are not shown in the manual. M.J. Levy, 19 Totternhoe Close, Kenton, Harrow, Middx HA3 0HS. 0181 907 3620.

Wanted: Circuit diagram and user manual (photocopies will do) for the Solartron/Solarscope Model CD711S-2, serial no. 41868 - an ex-MOD scope. C. Findlay, 56 Turlin Road, Mamworthy, Poole, Dorset BH16 5AF. 01202 679 246.

Wanted: Control unit and remote control for a Finlux 5620bc. Alan Hillman, 414 Canterbury Road, Densole, Folkstone, Kent CT18 7BH. 01303 89 281.

Wanted: LM1800N or μ A758C stereo decoder chip for the 3938 tuner unit in the Ferguson Hi-Fi System 25. Edward Christie, 251 The Avenue, Deneside, Seaham, Co. Durham SR7 8BE. 01915 812 265.

Wanted: Circuit diagram/manual (photocopies OK) for the Advance OS2200 scope with OS2007Y and OS2005AX inputs. S.E. Fung, 4

Ford Lane, Crewe, Cheshire CW1 3EQ.

Wanted: Service manual or circuit diagram (loan or for copying) for the Hinari VXL8 VCR. George Carruthers, 68 Osborne Road, Wisbech, Cambs PE13 3JW. 0836 693 809.

Wanted: Remote control handset for the Samsung SI1260 VCR. Les Swain, 53 Park Road, Huntingdon PE18 9SL. 01480 811 058.

Wanted: Nizam board or SN74LS08NS chip (IC4113) for the Hitachi Model C25-P819. D. Hall, 63 Wakefield Road, Aspley, Huddersfield, W. Yorkshire HD5 9AB. 01484 420 313.

Wanted: Circuit (photocopy OK) of an audio output stage using the STK086 module. Richard Dennis, 56 Holcombe Vale, Bathampton, Bath BA1 6UX. 01225 460 857.

Wanted: AVO CT160 valve tester, panel meter or complete assembly. P. Shepherd, 25 Tomkins Close, Stanford Le Hope, Essex SS17 8QU. 01375 640 618.

Wanted: Instruction manual for the Tektronix 543B scope - especially the timebase and X amplifier circuits. Also an owner's handbook for the Salora 5902 satellite receiver. Photocopies would do. W.G. Larman, Derimr, Horton Road, Stanwell Moor, Staines, Middx TW19 6BD. 01753 682 933.

Wanted: Reel assembly for the ITT 5035 music centre. R.L. Stroud, 16 Linden Road, Gloucester GL1 5HD. 01452 416 078.

Wanted: Circuit diagram for the Leak Stereo 20 valve amplifier; circuit diagram for the Saisho CT14RA; laser pickup assembly for the Crown Model CD110N. Neil Bilton, EBME Dept., Bronglais General Hospital, Aberystwyth, Dyfed SY23 1ER. 01970 635 926. Fax 01970 635 923.

Wanted: Where do Sinclair calculators go to die?! Information on the Sinclair Scientific calculator construction kit (photocopy would do) wanted, and a working calculator if possible. Also a service manual for the original ZX81 computer printer. D. Lee, 16 Devonshire Place, Cloughton,

Birkenhead, Merseyside L43 1TU.

Wanted: Any information on the CED 4A CRT tester; a Philips MAB8441P-T090 chip; and a LOPT for the Tensai TCT1025P 10in. mains/battery colour portable. D. Gough, 39 Bideford Road, Llanrumney, Cardiff CF3 9EF.

Wanted: Circuit diagram and any other service information on the Lasertech CD100 CD player. M.F. Blair, 65 Jackson Avenue, Rochester, Kent ME1 2SX. 01634 403 211.

Wanted: Sixties TVs. BRC 850/950 and any KB, GEC, Pye, Bush, Philips etc. sets. Those with flat dust screen preferred. Also complete chassis for the GEC C2236H and any Bush/Murphy CV2212 receivers. Philip Gay, 80A Milton Brow, Weston-super-Mare, Avon BS22 8DE. 01934 642 701.

Wanted: Remote control unit for the Tatung FX70 TV set. Have over 200 copies of *Television* from '59 on for disposal. Stan Jesney, 56 Barnacle Lane, Bulkington, Nuneaton CV12 9RQ. 01203 315 788.

Wanted: Line scan and power supply panels for the Philips G11 chassis. J. Abram, 11 Derwent Gardens, Ilford, Essex IG4 5NA. 0181 550 8546.

Wanted: Circuit diagram and any other information on the Silver CA2158 TV set, which was purchased in Cyprus. A. Jewitt, 1 Oakleigh Way, Durranshill, Carlisle CA1 2TE. 0122 832 481.

Wanted: Philips UV616S/6456 tuner. G. James, 58 Cromwell Court, Rushden, Northants NN10 0DS. 0193 357 374.

Wanted: Power supply circuit for the Echostar 6500 satellite receiver/positioner. H.S. Jeetley, 75 Hamstead Hall Road, Handsworth Wood, Birmingham B20 1HU. 01215 238 992.

Wanted: Type M48JLJ32X79 CRT and circuit diagram for the Tystar 2015 monitor. Also a charger for the Canon RC251 ion still video camera. J. Howells, 4 Kingsway Road, Fallings Park, Wolverhampton WV10 0SD. 01902 728 242.

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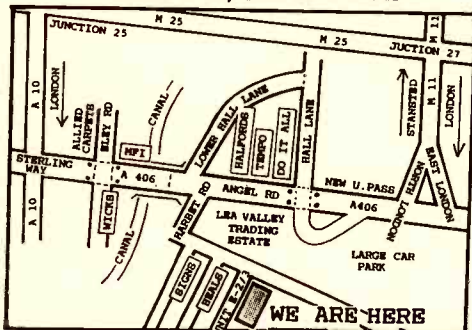
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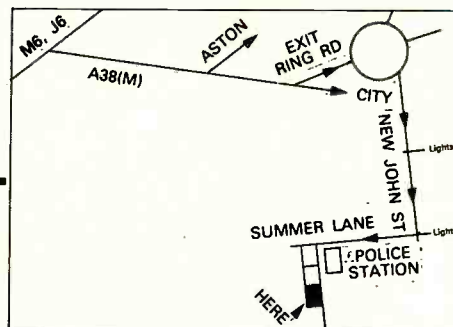
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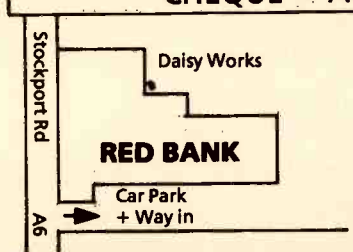
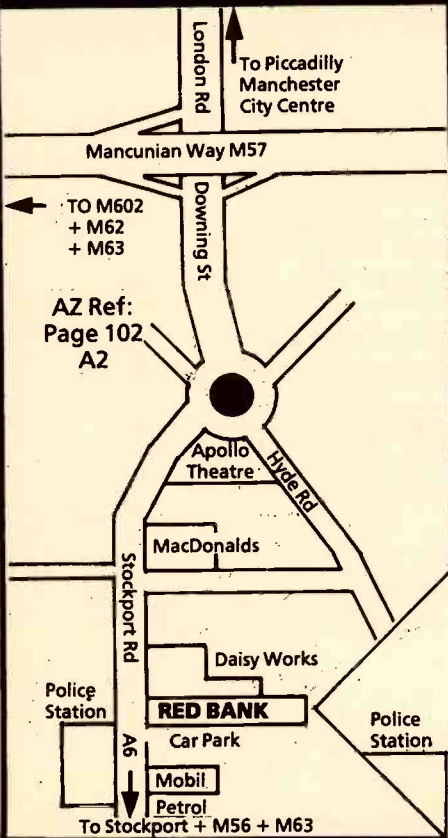
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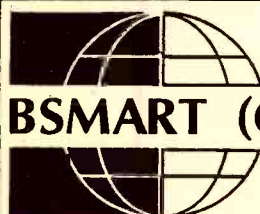
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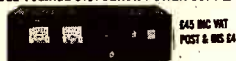
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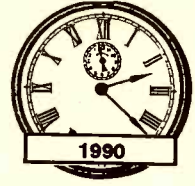
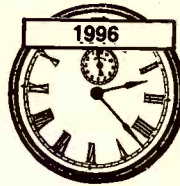
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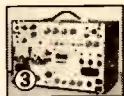


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In high street position,
East Sussex
Personal reasons for sale
£5,000 S.A.V.
BOX NO. A9218

**BUSINESS
FOR SALE
(BERKSHIRE)**

Well established TV/
Video Service Centre

Purpose Designed
Workshop, Reception Area,
Free Parking, Long Lease:-
rent fixed at £6,500 p.a.
until Dec 1998

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CLASSIFIED TEL: 0181 652 8339

TA8691N	£3.00	BUX84AF	£0.50	HGA1124A	£0.50
TDA1510	£2.00	BY187	£0.05	HA11440	£1.00
TDA1521A	£2.00	BY228	£0.10	HA11485	£1.00
TDA1543	£1.00	BY229	£0.06	HA11485ANT	£1.50
TDA2460	£2.00	BY255	£0.05	HA118041NT	£1.50
TDA2582	£1.00	BY299/200	£0.15	HA1196	£0.50
TDA2541	£1.00	BY299/800	£0.30	HA51338SP-1	£2.00
TDA2600	£2.00	BYT71/800	£0.15	HA51338SP-3	£2.00
TDA2611A	£1.00	BYV19-30	£0.15	HCF4520	£0.50
TDA2613	£1.00	BYV28-200	£0.15	HCF4520BE	£0.50
TDA3048	£1.00	BYV95	£0.03	HD6140425 J11	£0.50
TDA3564	£3.00	BYV95B	£0.04	HEF4029BP	£0.20
TDA3565	£3.00	BZW - C110	£0.05	HEF4093	£0.20
TDA4650	£3.00	BZW83 - C20	£0.03	HE4528BP	£0.15
TDA8417-3	£3.00	CA3123Q	£0.50	HM6264ALP-15	£3.50
BU801	£0.50	CD4555BE	£0.20	IN5401	£0.03
BUK454/600	£0.40	FE3B - General Inst		IR106A.	£0.10
BW11	£0.40	Diode	£0.04		

AN5551	£1.00	T/V FERGUSON	
ST6385BB 1/BFY	£2.00	Car Adaptor TA183 12v In 7.5v Out	
SN96551 NL	£3.00	500M/A	
SAA1061	£3.00	£5	
SAA3018	£1.00	STK5481	
STR58041	£4.00	£4	
BF870	£0.20		
BF869s	£0.20	STR4211	£5
UPD6376CS	£3.00	STK4793	£5
BC550C	£0.20	LA7830	£1
M58658P	£1.00	LA7831	£1
M708 ABI	£1.50		
M708 LBI	£1.50	ST6391BI/BC	£2
BY208-800	£0.10	FERGUSON ICC7	
BYV28/200	£0.10	T/V Amplifier	
2435121	£10.00	2 way Gain 7DB	£8
2436792	£10.00	ICC7 NICAM	
2436797	£10.00	IK2 PANEL	£7

Small panel meter 500, °A, 500 Centre	£1.50	
Phono Plugs	£0.10	
Tower 7mm Plastic clips 100 off box	£0.50	
Infra-red TX100 Receiver ICSL486	£0.50	
Hitachi 68P Issue 6 Teletext PWB F.S.T.	£15.00	
Hitachi PC315-11 Issue 7 Teletext Panel	£15.00	
Hitachi PC232AS Issue 4 Teletext Decoder	£15.00	
2435063	Focus Pots	
2435085	L.O.P.T. £10	K40 £2

Etri 240v fan 6in	£8.00	
DL701 Delay	50p	TMP47C634N/2685
DL711 Line	50p	£1
Matsui VX3000 Hand Set	£3.00	TMP47C634N
VCR Head VX3000	£10.00	£1
Matsui VSRI500 Head	£10.00	
Hand Set	£5.00	
Power Supply	£6.00	
Main Panel	£5.00	
Capstan Motor IC No M56730 ASP	£10.00	
Hitachi Capstan Motor ACE G4-B to ACE G40-B	£10.00	
Hitachi Video Hand Set RM933E	£30.00	
VT530 Pre-Amp	£10.00	
Amstrad VS1000-VS1100 Power Supply	£6.00	

4MHz XTALS		Text Panel No. T1228B
6MHz XTALS	30p	for Ferguson
4.4 T/V XTALS	Each	TX89-TX98-TX100
8.8MHz T/V XTALS		

Amstrad - Perdeo	
Fidelity - Decker - Tatung	
Plastic - Front Panels for all 1992 Models	each £4.00
Mitsubishi RMM36 Hand Set Video	£5.00
Nokia RC202 Hand Set	£4.00
Sanyo A09801 Hand Set Video L.C.D.	£7.00
Siemens Hand Set 1994 Model T/V Video	£5.00
Tuner Env-57459GI UHF-VHF	£3.00
UF754B UHF Tuner	£3.00

FV31R FERGUSON
64 pin Main IC HD6140815 £1

FERGUSON TX9 - TX10
IF PANEL £4
TX85 8 Push Button Unit
TX86 8 Push Button Unit £5
TX85 Switch MOD
TX86
TX89

J. V. C., Ferguson and Philips Cassette Adapter
VHSC/VHS, also for S-VHS £10

TX89 Tubase Panel	£5.00	Orion Motor
TX98 Tubase Panel	£5.00	50p each
TX99 Tubase Panel	£5.00	Canon Motor 12v 50p
2NZ/2KV		Capstan Motor £4
4N7/4KV	PULS	Mitsubishi HSE41 IC on Motor M51782ASP
5N6/2KV	15p	Burglar Alarm Kit - Professional unit, open and closed circuits, entry/exit delay, adjustable, audible, arming, panic, anti-tamper siren driven direct, 12V DC, fire quality glass rollertined PCB £12.00
6N2/2KV	EACH	
9N1/2KV		
11N/2KV		
35V/3300 Can	25p	
U412 Tuner	£5.00	8 Way Tuning Pots 50p
UHF Small Tuner UE30 and UE33		£3.00

Power Supply 12V - 3amp
for Ferguson Video Star Camera £4.00

24V Sub Min Relays		£0.25
Positor 2322 662 98009	50p	3 Pin POS. PTH451
Positor 2322 662 98012	50p	Black Type 50p
PERISWITCH		£6.00

CLE 874B HATACHI HAND SET	£8.00
T770 FERGUSON HAND SET	£7.00
NEW LNB LOW NOISE BULLET TYPE	£8.00
FERGUSON CHASSIS TX80 14"	£20.00
IC TX100 - TX98 M494B1	£5.00
TX80 TUNER MTP 2021	£18.00
BATTERY PACK VA310 9.6V 1,800 M/A	£4.00
LOPT - 3216001	£5.00
LOPT - 3714016	£5.00
LOPT - AT2071/25 - TOSHIBA	£10.00
LOPT - AT2077/81	£12.00
LOPT - DST186N243 473-058	£10.00
LOPT - DST85B243 401-532-00	£10.00
LOPT - DST85B243 401-532-00	£10.00
LOPT - DST85B243 401-532-00NC - FERGUSON	£10.00
LOPT - DST85B243 472-359-01NC - ICCS	£10.00
LOPT - DST85B243 473-197-00NC - FERGUSON	£15.00
LOPT - DST88B243 400-086-AONC - FERGUSON	£10.00
LOPT - DST88B243 400-086-AONC - IK2	£10.00
LOPT - DST88B243 400-086-AONC - TOSHIBA	£10.00
LOPT - DST88N243 478-052-OOC - TOSHIBA	£12.00
LOPT - DST88N243 478-052-OOC - IK2 FERGUSON	£10.00
LOPT - DST88N243 478-052-OOC - TOSHIBA	£10.00
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LOPT - FCC2015DE	£12.00
LOPT - FERGUSON - GREEN SPOT	£12.00
LOPT - FERGUSON - WHITE SPOT	£12.00
LOPT - T6045L - FERGUSON	£10.00
LOPT - TC2203 - NATIONAL PANASONIC	£15.00
LOPT - TFB3035D	£10.00
LOPT - TFB3089D - TOSHIBA	£8.00
LOPT - TFB4023AD - TOSHIBA	£10.00
LOPT - TFB4032BD - TOSHIBA	£10.00
LOPT - TFB4038AD	£10.00
LOPT - TFB4088AD - TOSHIBA	£8.00
LOPT - TFB4110AD - TOSHIBA	£10.00
LOPT - TLF1456B - NATIONAL PANASONIC	£15.00
LOPT - TLF1457B - NATIONAL PANASONIC	£15.00
LOPT - TLF701/6 - NATIONAL PANASONIC	£15.00
LOPT - TX89	£12.00
LOPT - TX98	£12.00
LOPT - TX99	£12.00
LOPT - Y260781 - FERGUSON	£8.00
MOTOR - CASSETTE TYPE - 12V WITH SPEED CONTROL	£0.50
PANEL - CMC115 - TTT FRONT PANEL - ITT	£6.00
PANEL - CVC80 POWER PANEL	£5.00
PANEL - ICCS CHROME BOARD - IC No. ON BOARD U4647 TKF OR HA11498	£6.00
PANEL - ICCS - TUBE BASE PANEL	£5.00
PANEL - IK2 - FM2211 STEREO	£5.00
PANEL - SEL 69112407 - TTT FRONT PANEL - SAME AS CMC303	£6.00
PANEL - SEL IFB 194P - TTT FRONT PANEL - ITT	£6.00
PANEL - SEL IFB150 U/K - TTT FRONT PANEL - ITT	£10.00
PANEL - SEL IFB300 - TTT FRONT PANEL - ITT	£10.00
PANEL - TX9, TX10 - TUNING PANEL 1509G	£5.00
PANEL - TX10 - REMOTE PANEL 540/01	£5.00
PANEL - TX89	£10.00
PANEL - TX90 - THORN FRONT PANEL - 8 PUSH BUTTONS 01M4-515-002	£10.00
PANEL - TX98 - T1353E FRONT PANEL W/INFRA-RED RECEIVER	£5.00
PANEL - TX98 - TUBE BASE PANEL	£5.00
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PANEL - TX98, TX99, TX100 - REMOTE - M494B1 - 01V6/682/003	£10.00
PANEL - TX99	£5.00
CMC 200 DIGITAL CAPACITANCE METER 200 PF TO 20 MF	£28.00
R2000 SERIES FERGUSON VIDEO STAR DECK MECHANISM	£30.00
Tripod shoulder pod for camcorder	£5
Ferguson VA super 218 cardioid camera microphone telescopic boom and stand	£12.50
Ferguson camcorder battery VA366 6v-1400 M/A	£5
Mitsubishi video hand set r.m.m. 45	£7
Ferguson lens for camcorder 2 off tele conversion lens x 1.4 and x 0.7	£6
Ferguson TX98, TX99 Text Panel T1228B	£15
RC Matsui hand set £5. Equivelant models Pace 900, hand set Ferguson, Sony, Grundig	£8

6 VA RS Encapsulated main transformer 0-120v-0-120v Pri 0-9v-0-9v Sec	
Burglar alarm kit main control panel. Send for data	£12.50
Ferguson tripods large type	£15 £1.50 post each
Bullet Type L.N.B.S. (Not Tested 10.7 to 11.7 GHz)	New £3
P.S.U. AC 12v 500MA	£1.00
P.S.U. AC 9v 1A	£1.50
ITT CMC201 Panel	£10

SENDZ COMPONENTS
01702 338894
(To order see back page)

