

THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

# TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

APRIL 1996 £2.35

A REED BUSINESS PUBLICATION

## **FREE** TV/VIDEO SPARES GUIDE

**Servicing VCR  
audio systems**

**Widescreen  
TV operation**

**TEST REPORT:**  
**The Pace link system**  
**VCR chroma record  
arrangements**

**Fault Reports**

**TVs, VCRs,  
camcorders  
and satellite**

**Special offer**  
**10MHz function  
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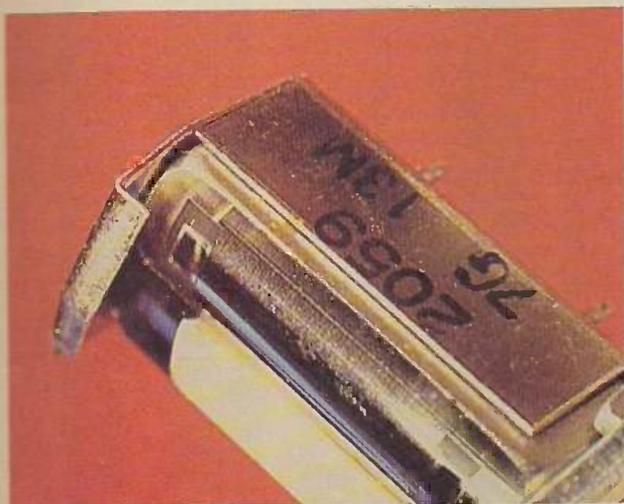
APRIL 1996

VOL. 46 NO. 6

## Video

### VCR Audio Servicing 404

The audio performance of VCRs gives rise to as many complaints as the video side. This new two-part series by Eugene Trundle covers all types of fault, mechanical and electronics, starting this month with linear record/playback systems.



### VCR Signal Processing 434

This concluding instalment in Joe Cieszynski's series deals with chroma signal processing in the playback mode, in particular the way in which phase and frequency jitter are cancelled during the up-conversion process.

## Servicing

### The B&O 37XX and 38XX Chassis 420

This survey of the fault history of these sophisticated sets, by Nick Beer, should enable you to sort out any problems that arise and keep them in good working order. Detailed information on line output transistor failure, a common problem, is included.

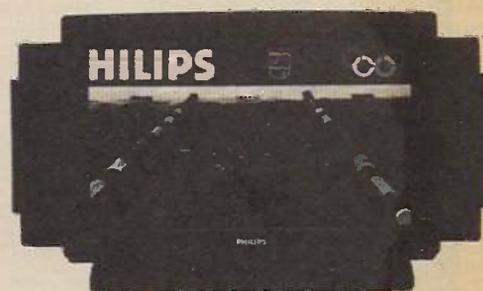
## NEXT MONTH

**Servicing the Sony BE3B chassis.** This chassis, introduced in 1994, was designed for use in economically priced sets with 21-29in. tubes. Unusual aspects of the chassis are described and servicing experience summarised. **Surface Mount Design Guidelines.** When tackling SM boards it's as well to know the design considerations and what these mean in terms of reworking. **A Chopper**

## Satellite

### The Pace Link 440

Hugh Cocks reviews the Pace Link system, which enables Pace satellite receivers from the PRD series on to be tuned, reconfigured etc. using a PC. This greatly simplifies an otherwise lengthy and tedious job.



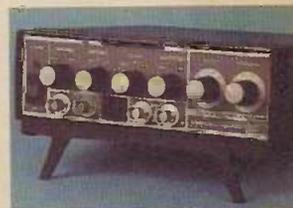
## Television

### A Guide to Widescreen TV 412

The various widescreen formats and what they can do cause a great deal of confusion and lead to many complaints to dealers and manufacturers. In dealing with these it helps to know exactly what is involved. Frank Harding explains.

## Reader Offer

A 10MHz function generator on offer at a special price of £149. See page 448.



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**Alternative for the Nikkai Baby 10.** Replacing the 12V regulator chip greatly improves reliability. **VCR Audio Servicing.** Eugene Trundle on problems with rotary-head systems. **Servicing - The New Approach.** John Coombes on self-diagnosis systems: what they can do and how to use them.

**Our May issue will be published on April 17th.**

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# Mature Markets

Mature markets, where purchases are limited to new first-time buyers and replacements, are poor for company profitability. During a growth phase firms can climb aboard the bandwagon, everyone does well and profitability is good. You soon know when saturation has been reached: the special offer stickers appear and firms start to report dismal results. The economic climate in the industrialised world during the Nineties has had a dampening effect on all markets. When consumers lack confidence they defer purchases. Then everyone suffers. New products can add zest to markets, but they have to be exceptionally desirable/useful to succeed. CDi is an example of an interesting product that failed to take off. It somehow lacked that "must have" feel.

Different products have different saturation levels. With TV sets the saturation level is almost 100 per cent: few people feel that they can 'do without one thank you very much'. The VCR comes pretty close, offering the user the ability to control his viewing schedule and an increase in programme material. The camcorder did surprising well for a time, until the market stalled a couple of years ago: its saturation level turned out to be rather lower than that for TV sets and VCRs, as one might expect from a device that calls for committed users with time to exploit its possibilities. The item of greatest interest at present to electronics market analysts is the PC, which has been in a rapid growth phase until it appeared to stall late last year. The saturation level for businesses was probably reached some time back, the question now being whether the saturation level has been reached in the domestic market. What seems to be happening is that growth continues, but at a much slower rate.

For many electronics retailers, the PC has offered a chance to increase business at a time when sales of other products have remained static or declined. In 1995 a record 65m PCs were sold worldwide, many to domestic users. Manufacturers as well as retailers saw this as a possible route to expansion and better profitability. Those who jumped aboard late however may find that their investment won't achieve the sort of return they expected. It's interesting that Philips has been contemplating a return to this market and that Sony has plans to enter it. Their timing seems suspect.

The US PC market was the first to stall. It was and is by a

wide margin the largest, with the US public keen to adapt to the PC as a way of doing things. In Europe, Germany has been the market leader, with sales per quarter comfortably exceeding a million. But the growth rate fell to seven per cent in the final quarter of 1995. By comparison, the growth rate in the UK was 31 per cent.

There has been a lot of business around in the PC market. Information released recently by the market research firm Dataquest showed overall growth in Europe during the final quarter of 1995 as 20.5 per cent, which means that around 4.8m PCs were sold. But has it been good business? As those of us in the traditional brown goods market know all too well, it's possible to move a lot of product while making little profit. Price cutting has now become endemic in PC markets and seems to be accelerating, both at manufacturer and retail levels. When a market approaches saturation point, which seems to be the case with the PC in some countries, the only course for manufacturers and retail chains is to go for increased market share. And that means price cutting.

It might seem surprising to some of us that anyone has been able to make much out of the consumer PC market. The sale of PCs calls for a far higher level of customer support than with most products (whether they get it or not is another matter). Despite the fact that PCs have been with us for many years now they remain troublesome devices, with their tendency to crash and not do quite what you expect. There seem to be two basic reasons for this: the use of insufficient memory, which is simple (though expensive) to correct, and software problems. Bill Gates in his recently published book *The Road Ahead* spills the beans on the latter subject. The requirement to write software that is compatible with different operating systems has presented horrendous problems. I've heard it said that despite its appearance of being forefront technology the PC is still in the Ford Model T era. Sometimes this feels all too true, though people seem to manage to find ways of coping.

Despite its problems the European PC market is a lot healthier than the TV one, which declined by five-ten per cent in 1995. Over capacity in the manufacturing side should be alleviated by Nokia's decision to pull out. It's difficult to see how anyone will ever again be able to make much money out of TVs. Even China has excess capacity!

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# Long-distance Television

**DX-TV conditions and reception, news from abroad and a look at the latest satellite activity. Roger Bunney reports**

**D**X reception conditions continued to be bleak during January 1996, with its cold and bitter weather. There were only two slight tropospheric lifts, on January 4th and 20th-22nd, giving Band III/UHF reception from the Benelux countries in eastern and south eastern areas of the country. There was at least some sporadic E (SpE) reception, as follows:

- |         |  |
|---------|--|
| 4/1/96  | RAI (Italy) ch. IA; ARD (Germany) chs. E2, 4; ORF (Austria) E4; SLO (Slovenia) E3; HRT (Croatia) E4. |
| 7/1/96  | PTC (Serbia) E3; HRT (Croatia) E4; unidentified signals on chs. E1, E3, E4, R1 and R2.               |
| 9/1/96  | PTC E3.  |
| 14/1/96 | PTC E3.  |

**Live coverage of the Dubai International Air Show via Eutelsat II F1 (13°E).**

The quadrantids meteor shower increased the number of morning period signal pings over the 3rd-



4th in comparison with the usual daily MS offerings. Let's hope that the Leonids shower in November will live up to the prediction of being an extremely intense shower.

My thanks to Peter Schubert (Rainham) and Garry Smith (Derby) for helping out with this frugal log.

## Band I

Following the publication in last month's column of information on new Band I frequency allocations, I have been keeping a casual check with my scanner on the ch. E3/4 spectrum. Weekday activity was noted at nominally 62.25MHz from the north east, suggesting an unknown business source. Various 'noises' are heard occasionally in ch. E3, and on bad days here in Romsey these interference sources render Band I unusable.

Fortunately SpE signals can be received during the summer using a low-elevation aerial, which reduces distant ground-wave interference. But there is little we can do until the full extent of the expected interference problem is known.

Meanwhile Robert Copeman, writing from Victoria, Australia, sends us news that is the reverse of the UK Band I reallocation. The authorities in New Zealand are considering the removal of amateur radio activity in Band I to increase the broadcast TV spectrum space: the TV3 network is seeking more Band I outlets.

Robert comments that the Australian SpE season has been "fairly quiet" in comparison with past years.

## Satellite Sightings

The snow across Europe has encouraged sporting activity – skiing in the French, Swiss and Austrian Alps has been featured daily for example. Snow boarding was seen at lunchtime on Sunday the 28th, during an ORF Eurovision feed via Eutelsat II F3 (16°E, 11.638GHz horizontal). This was of the FIS World Cup from Lienz.

At the same time the European Figure Skating Championships from Sofia, Bulgaria were to be seen via Orion at 37.5°W, the feed being to TF-1 France. This was of interest in being a lower horizon rather than the usual Eutelsat link. With surplus satellite capacity in Europe, there is competition to provide short-period transponder facilities. Despite Orion being promoted as a digital satellite, on one day I noted it carrying five analogue video feeds to Europe. Analogue is still alive and well!

Many signals are carried by Eutelsat II F3. I'm not sure what "Thaiwave Testing" signifies, seen at 1900 GMT on January 21st with captions using an unknown language. Any ideas?

The Balkans continue to be featured in news items. President Clinton arrived at the Tuzla air base on the 13th for an inspection/review of US peace keeping activity. CBS carried considerable footage of his arrival via its Eutelsat II F3 uplink.

Apna TV (London) seems to have disappeared from Gorizont at 11°W (11.525GHz). There are rumours that it is now downlinking via Eutelsat II F3 at 11.638GHz,

though I've seen nothing to date. The delayed Asian version of Apna is apparently using a C band transponder (3.825GHz) aboard the Express 2 satellite at 14°W.

Hugh Cocks tells me that the old Drake ESR324E satellite receiver, a black, manually tuned model dating from the late Eighties and built like a tank, is worth considering for 'DX' satellite reception. It's sensitive and the IF bandwidth can be considerably reduced via the rear-mounted IF drive control. Tuning is from below Sky Gold to way above the Astra Spanish channels. The IF output is at 70MHz, the five IF cans providing excellent selectivity. There is wide mono audio tuning, but Hugh says that changing the 10.7MHz ceramic filter really helps.

An Italian reader asks about the Morse code tones transmitted by various satellites including PAS-1 at 45°W. They identify the origination point. At 11.639GHz PAS-1 produces a string of numbers and letters, also 'HOMESTEAD; FLE. EDE'. If you feed the satellite receiver's unfiltered video output to the aerial input of a SW receiver and tune carefully over 1.5MHz you will find telephony. Check Intelsat 605 (24.5°W) at 11.137, 11.168 and 11.468GHz vertical. You will hear transatlantic communications from Italy through to Nigeria.

Nicholas Earley (Australia) tells us that he has been using a Pace MPEG digital receiver for his local Galaxy MMD service. The user manual, which he lent us, is relatively easy to follow but there seems to be little flexibility in the tuning, which is pretuned to specific channels. There is no scart or positioner connection. The receiver requires pin numbers (both user and service/installation) via a smart card that's inserted in a rear plug-in module. There's also a D socket for connecting an input from an external PC: maybe this is the answer to flexible operation? Twenty six pay-TV channels are available via MMDS or satellite in Melbourne.

Brian Williams, writing from Gardenview, South Africa, reports that fifteen MPEG channels are now available there via a spot beam from PAS-4 at 68.5°E, also forty customised audio channels via Digital Musical Express. There have, unfortunately, been delays in starting the four TV channel unscrambled analogue African Satellite Entertainment Service via

Intelsat 704 at 66°E. It will probably adopt VideoCrypt by 1997. Brian installs TV and satellite aerials and uses a 4m dish for his own C band reception.

Alan Smith in Thailand reports that he has at last received Ku band signals from Thaicom 2. There was an OB downlink during the SE Asian Games in December for Thai TV ch. 7. Excellent C band signals have been received from the new AsiaSat-2 satellite, which Alan feels is at 101.5°E instead of the allocated 100.5°E. If so, there may be interference from the Russian Gorizont satellite at 103°E. Star TV claims to have stereo or Dolby Surround sound but is apparently firmly locked to centre mono: the new Beverley Hills series that's billed as Dolby is also transmitted with mono sound.

### Terrestrial TV News

**Finland:** Applications for the new national commercial TV franchise are due to be received by the Finnish Ministry of Communications by March 31st. There are plans for the national radio and TV networks to go digital, also for more channel capacity to be offered to broadcasters later this year – YLE will construct and operate the transmitters.

**Norway:** Parliament has passed legislation to allow satellite TV channels to be relayed over local, terrestrial networks. The Media Administration Department has awarded about thirty seven-year regional TV franchises that will use mainly low-power UHF transmitters, with clear PAL. More details next month. NRK has started regional optout (news etc.) programming – so look out for regional identifications!

**Sweden:** Digital terrestrial TV transmissions, with up to twenty channels, are to be introduced from early 1998. Widescreen HDTV should follow in the year 2000.

**The Netherlands:** Plans to use the Nederland-2 transmitters for regional broadcasting are at an advanced stage. Each region will opt out of the network during the early evening to provide 40-45 minutes of local programming.

**South Africa:** The former CCV channel is now SABC-1, with English and Sotho programming; TV-1 is now SABC-2, with

San Diego  
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Afrikaans and English programming. Zulu and Xhosa programming will be slotted in elsewhere.

**Sri Lanka:** The newly established Broadcasting Authority is seeking applications for up to six new radio and ten TV stations to add to the existing four commercial and two

**A news feed for RTL, Germany from Las Vegas via the SBS-6 and Orion Atlantic satellites.**

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**John Locker was unable to identify this Intelsat K feed to Europe. The origin is presumably Brazil (Bahia state). Can anyone offer any further information?**

public services.

**Lithuania:** PAL colour is to replace Secam early next year.

**Slovak Republic:** The 68-73MHz OIRT FM radio band is to close shortly, with all stations moving to the 88-108MHz CCIR band. All TV transmitters that use chs. R4 and R5 will be closed down.

#### THE SATELLITE NEWSLINE (VOICE)

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#### Interference from CFLs

The February issue of the RSGB's excellent monthly magazine *Radcom* provided information on an intriguing source of yet more radio interference. In the EMC column Hilary Claytons-Smith wrote about tests on several low-energy lamps (CFLs - Compact Fluorescent Lamps). There are two basic types. The non-electronic (the Philips SL Comfort and Prismatic, and the Mazda 2D, are examples) uses a starter and an iron-cored choke. As a result it's heavy. The electronic type uses a chopper transistor that operates at approximately 30-60kHz with a ferrite-cored transformer. It has a higher efficiency.

Dave Lauder, a pioneer TV-DXer and EMC committee member, undertook tests on several CFLs. He found that the quietest from the RF interference point of view was the 25W Philips SL Prismatic. Most were quiet at VHF. Interference arose only when an aerial was used within a few metres of the CFL. The two-part Mazda 6L HEXA18 was the noisiest one at HF. Its noise output peaked at 70MHz then trailed off. At 50MHz the noise level with an aerial ten feet away rose by some 10dB. Overall however the interference produced by these devices is **minimal** - undetectable when used at a distance from the aerial.

Of more importance from the servicing point of view is the fact that these devices produce IR interference. They can thus **interfere with the settings of remote-controlled equipment**. The Mazda 6L in particular causes this problem. Dave discovered that the 6L "modulates its light around 35kHz, which is amplitude modulated by a spiky 50Hz waveform". It looks like bad news!

#### Digital TV

The North American Direct TV Ku band DBS service, which uses MPEG-2 compression and News Datacom International smart card authorisation, has apparently suffered from card hacking. Computer buffs have been able to transfer authorisation data from a legal card to a second one and so on. Cards are being sold at \$650, which gives access to the full 150-channel service. The normal charge is over \$500 a month. But Direct TV, with over 1.2m subscribers and 100,000 new subscriptions a month, seems to be happy to live

with a marginal number of pirate viewers.

#### Satellite TV News

BT Broadcast Services has installed several large dishes at its Martlesham, Suffolk base to link up with the PAS-4 Ku/C-band satellite at 68.5°E. Being low in the horizon, this satellite offers direct two-way links with SE Asia. NHK Tokyo is now using PAS-4 for feeds to and from Europe, having dropped the double-hop route via PAS-1. The new German music channel ONYX is now providing clear PAL transmissions via Eutelsat II F1 (13°E) at 11.146GHz horizontal. Worth a check for those interested in jazz, country, rock, blues etc. music.

Intelsat intends to launch nine new satellites during the next eighteen months. Here are some slots to check: Intelsat 707 at 1°W (March 1996); 708 at 50°W (current); 709 at 56°W (June 1996); 803 at 64°E (January 1997); 805 at 33°E (April 1998); 806 at 40.5°W (August 1997). Launch delays may occur.

The Greek ETI service is to change its name to ETI International and is likely to move to Eutelsat II F4 at 7°E. It will probably incorporate Mega, Antenna and RIK (Cyprus) programming. RIK's Eutelsat II F4 lease ended in February.

There is a move in North America from C to Ku band operation. Some companies are now in talks with the FCC on Ka band (28GHz) operation. The FCC asked interested parties to register claims for Ka band use by last autumn. So far over fourteen groups have published plans for Ka band operation, with both geostationary and non-geostationary satellites. Uses include mobile communications, multi-media, video, voice, data, etc. PanAmSat wants to use the Ka band for its PAS-10 and -11 satellites at 78°E. Teledesic Corporation has suggested using 840 low earth orbiting satellites for communications purposes.

The independent French company AB Productions started its AB-1 service via Eutelsat's Hot Bird (13°E) last December. The company has greater plans. It intends to launch up to ten compressed digital channels, then subsequently expand to twenty channels via a second leased transponder. France Telecom is also to launch a digital package via Eutelsat.



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BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
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
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
FERGUSON 00D3-508-002	1650p	LOT38
Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3		
PANASONIC TLF14567F	1850p	LOT39
Used On: TC2043, TC2243, TX300		
PANASONIC TLF14568F	1850p	LOT40
Used On: TX2231, TX2244		
PANASONIC TLF14584F	2350p	LOT41
Used On: TC2210, TC2160, TX1752, TX2112, TX2162, TXC22		
PANASONIC TLF14586F	2350p	LOT42
TC1651, TC2051, TC2061, TC2253, TC2263, TX5500		
HINARI	1600p	LOT43
Used On: CT15		
HITACHI 2434274	1250p	LOT44
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PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p

## Replacement Video Heads

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I.T.T.	VR3761	3100p
JVC & FERGUSSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NV8000	4600p
	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TL51000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV30E, CCDV95E, CCDSP5E	4800p

## Original Video Heads

MAKE	MODELS	PRICE
NATIONAL PANASONIC	NVG20, NVG21, NVG22, NVG25, NVG26, NVG28, NVG200, NVHD48	3000p
	PART NO: VEH 0343	
	NVG33, NVG45, NVG46, NVL23, NVL25, NVL28	2900p
	PART NO: VEH 0417	
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130	2700p
	PART NO: VEH 0416	

## Audio Control Head

**AMSTRAD ORIGINAL NO: 150751**  
 Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI V52, VCR4600, 4800, 5200, 5600, 6600, VIF3000, 5000  
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**AMSTRAD ORIGINAL NO: 153134**  
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 Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM **ORDER CODE: AH02 PRICE: 1450p**

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PART NUMBER	MODELS	PRICE
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VBR 0050	NV300, NV340 etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	625p
VBR 0125		625p

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	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2600p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3928, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 8467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49S86	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
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SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	220p
FREEZE IT	400ML	SP16	350p
FOAM CLEANER	400ML	SP05	170p
ANTISTATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	200p
AERO DUSTER	150ML	SP08	220p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	200p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
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TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
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9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	290p

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<b>SOLDER</b>		
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IRFBC40	400p	TEA 2019	200p	25K 1023	550p
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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	<b>SABA</b>		
TP661	RC 661	850p	T6772	RC 149	900p
<b>HITACHI</b>			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	<b>SALORA</b>		
A518612	RC903	900p	SERIES L	RC 190	875p
SCL002	RC904	850p	86173	RC 882	850p
C2096	RC 905	850p	<b>SANYO</b>		
A511940	RC 906	750p	RC218, RC222, RC228, RC238	RC 140M	700p
655602H	RC 907	800p	JXGE	RC 878	850p
<b>ITT</b>			JXD	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	<b>SHARP</b>		
RG306	RC 306	825p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
FS9/1-10/1	RC 307	850p	<b>SIEMENS</b>		
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
<b>KORTING</b>			<b>SONY</b>		
18279, 18396, 18460, 18521 SE	RC 108	850p	RM604, RM605, RM606	RC 140	700p
40540 VTS	RC 108	900p	32 CHANNEL	RC 140M	700p
<b>LOEWE</b>			RM613	RC 141	750p
DC11	RC 146	850p	RM632, RM636	RC 160	675p
<b>MATSUI</b>			<b>TATUNG</b>		
010270601	RC 889	850p	FXA	RC 877	850p
VX770	RC 892	850p	RC70	RC 883	750p
<b>METZ</b>			FX70 FASTTEXT	RC 894	850p
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COLOR (7156)	RC 183	850p	FB632	RC 632 ST	850p
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<b>NOKIA</b>			3V31-32	RC 344	800p
SATELLITE	RC 550	850p	3V57-58	RC 628	800p
<b>NORDMENDE</b>			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
<b>OCEANIC</b>			3V55, FV11	RC 783	800p
390C9500	RC 339	900p	TX100 FASTTEXT	RC 785	650p
<b>ORION</b>			TX100 STEREO FASTTEXT	RC 789	650p
RC53	RC 892	850p	PROFESSIONAL	RC 790	650p
<b>PANASONIC</b>			<b>TOSHIBA</b>		
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TC2200	RC 201	850p	CT9117	RC 951	800p
VSQ0357/NV730	RC 202	875p	201R4B	RC 952	800p
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- 1.60mm
- 2.00mm
- 2.40mm
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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
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5A	FUSE15	60P	FUSE31	50P
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5A	FUSE43	100P
6.3A	FUSE38	100P
8A	FUSE39	100P
10A	FUSE40	100P
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Also fits: Antitec, Boadstec, Casio, Crown, Fidelity, Goldhead, Granada, Hinari, Marguani, Omega, Protex, Schneider, SEG, Sentra, Shipton, Tashiko, Tatung, Towada, Universum

Order Code: AH02 Price: £14.50

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# VCR

## audio servicing

**Audio reproduction from VCRs gives rise to as many if not more complaints than the video reproduction. This two-part series by Eugene Trundle considers all aspects of VCR audio servicing, starting in this article with edge-track systems**



**T**he earliest method of recording sound on video tape with a domestic recorder is still the one most widely used: the longitudinal system, using a narrow track along the top edge of the tape. Subsequently several other, better techniques came along, most providing stereo sound. There have been hi-fi, AFM, stereo AFM and PCM (pulse-code modulation), the latter three being used by 8mm format VCRs. There was also, about twelve years ago, a longitudinal stereo VHS format, but this did not provide good performance. Except for a few Matsui and Saisho machines, it was abandoned in favour of the hi-fi system. This records the sound along helical tracks in tandem with the video signal.

In this two-part series we will be considering audio fault diagnosis with all types of VCR. We will also look at the practical aspects of head replacement and alignment, and the other mechanical and electronic factors that affect audio performance. We'll start with the simplest and cheapest system, then work our way up.

### Longitudinally-recorded sound

Even hi-fi capable VHS VCRs incorporate the longitudinal (mono) audio system, to provide a back-up and compatibility with non-hi-fi machines. This linear system is in principle the same as that used in audio only tape recorders. The main differences, in fact disadvantages, are the facts that the tape speed is slower in a VCR, the track is narrower, and there's no pressure pad to ensure good head-tape contact. As a result the VCR has a poorer performance in terms of frequency response, signal-to-noise ratio and the margin available for error and the effects of wear. Even so the sound from a monaural VCR that's in good condition is perfectly acceptable – but never brilliant, especially in the LP mode when the performance is further degraded.

### Recording bias

The basic magnetic tape transfer characteristic is decidedly non-linear, as Fig. 1 shows. It has

two reasonably linear sections along the flanks however, shown as A-A and B-B. To make efficient use of these, the signal to be recorded is superimposed on a relatively high-frequency (typically 65kHz) bias waveform. The amplitude of this waveform is closely controlled, so that the audio signal swings are centred on these two linear portions of the transfer characteristic. This optimises the signal-to-noise ratio of the reproduced sound and minimises waveform distortion. The signal itself has also to be well controlled: if too small it will be swamped by noise, while if it's amplitude is too great it will intrude upon the non-linear parts of the transfer characteristic and thus be distorted.

A preset potentiometer is usually provided so that the bias level can be set, with no audio signal present, for a specific RMS voltage across a low-value fixed resistor in series with the audio head. Manufacturers generally quote this level as an AC millivoltmeter reading. This is less convenient than the use of an oscilloscope, whose readings can be seen in peak-to-peak terms. To convert to a peak-to-peak figure, multiply the RMS voltage by 2.828. Thus a typical figure of 2.6mV RMS will translate as 7.35mV p-p. For a reading of this order you'll have to switch the scope's probe to X1 operation, which is no problem with the low-impedance signal source.

The result of excessive bias level is lack of HF audio response: at the other extreme, insufficient bias results in distortion of the reproduced sound. It's important to check the bias setting whenever a new audio head is fitted, because the required bias depends on the head's inductance. An audio head's inductance falls as it becomes worn, altering the bias level required. This is not as detrimental as the other effects of a worn head however, as we shall see.

### Head wear

The main effects of stationary audio head wear are a progressive reduction in the sound level, a deterioration in the signal-to-noise ratio and loss of the higher audio frequencies.

The result is hissy, muffled playback sound that's much worse with the machine's own recordings. Sound level variations are another characteristic of a worn head, though there are other causes, which we will explore later, of this. When assessing the performance in terms of frequency response, remember that the slow tape speed in the SP mode does not permit reproduction much above 11kHz while for LP operation the limit is about 7kHz.

While we are on the subject of performance specifications, the signal-to-noise ratio for longitudinally recorded audio is typically about 42dB. This is improved to about 50dB when Dolby noise reduction is incorporated. The wow and flutter variation with a machine in good condition can be as low as 0.2 per cent. In practice the average VCR does not do as well as this, and certain faults will introduce a tremendous increase.

Most manufacturers seem to be very shy about quoting this type of figure in their specifications – they are often left off the specification list altogether. There is no such reticence with hi-fi audio when this is incorporated.

### Audio problems

The fault symptoms that occur with longitudinal audio systems are many and various (this is apart from the electronics, which are usually quite reliable). Perhaps the most common fault condition is a dirty audio head. As with a worn head, the effect is low sound reproduction, which is hissy when the TV sound is turned up to compensate and is much worse when the recording has been made by the dirty head. The cause may be only a tiny speck of something on the head's surface. The cure is easy: thorough cleaning with an alcohol-moistened cotton bud, followed by a wipe with a clean one. Most head cleaning tapes seem to have little effect on audio heads.

A common problem is weak playback sound, often accompanied by cyclic or random level changes. Where this is not caused by a worn or dirty head, examine the tape closely in a bright light to see whether there is any scalloping or crinkling along the upper edge of the tape – the longitudinal audio track occupies a 1mm margin along the top edge. If the tape is damaged, it's likely that some mechanical fault in the VCR is responsible. This will have to be fixed. You cannot record good sound on a crinkled tape.

If there is no tape damage, check its

path across the face of the audio/control/erase (ACE) head assembly. This shouldn't vary, and should be as shown in Fig. 2. If the tape path across the head is incorrect or varies, the cause is probably either a worn pinch roller, an incorrectly adjusted tape guide or incorrect setting of the ACE head height.

Other causes of sound level variation are as follows: insufficient ACE head assembly tilt at the top – we'll consider this later when we come to head replacement; insufficient tape back-tension; excessive friction at the lower drum surface, so that the initial tape tension is 'mopped up'; and any other factor, for example a sticky tape exit (rotary) guide or an eccentric pinch roller, that causes cyclic variations in the tape tension across the head face.

Wow and flutter are generally caused by cyclic variations in the speed of the tape past the audio head. Perhaps the most common cause of this is a worn or faulty pinch roller. Other possible causes are a capstan servo fault, a duff capstan motor or a problem with its bearings, and excessive take-up torque (especially with certain Amstrad, Tatung and similar decks). The take-up torque shouldn't exceed about 90g/cm. A worn ACE head can also be responsible, because of surface friction.

An increasingly common cause of flutter, sometimes confined to LP operation, is rapid back-tension arm oscillation because of a problem with the tension band or the supply reel bearing. A useful clue to the cause of wow can be gained by comparing the wow frequency with the rate of rotation of suspect parts – the capstan, pinch roller, take-up reel and the video head exit guide.

Lack of treble response with a tape not recorded by the machine, its own recordings being OK, indicates that the head mounting requires adjustment because there's an azimuth error. More on this when we come to head replacement. Loss of lip sync between the sound and the picture during playback of a recording made by another, good machine is also a matter of ACE head alignment, again dealt with later.

If the playback sound is good but audio can't be recorded (blank tape) or the sound from the previous recording is heard, the cause is failure of the bias/erase oscillator. A clue, though this depends on the machine and is thus not infallible, is the presence of floating lines and blobs of colour – fragments of uneraser colour from the previous recording.

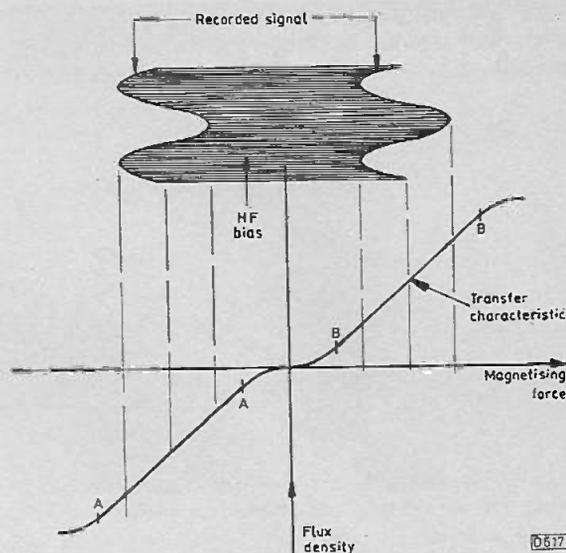


Fig. 1: Typical magnetic tape transfer characteristic. The HF bias ensures that the recorded signal is kept to the relatively linear portions A-A and B-B of the characteristic.

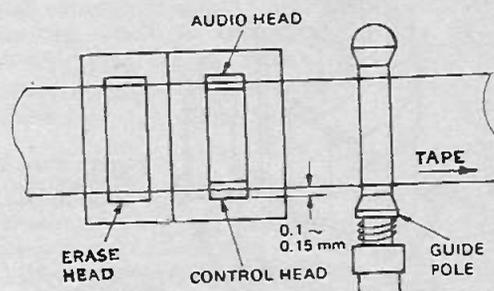


Fig. 2: Vertical alignment of the ACE head assembly.

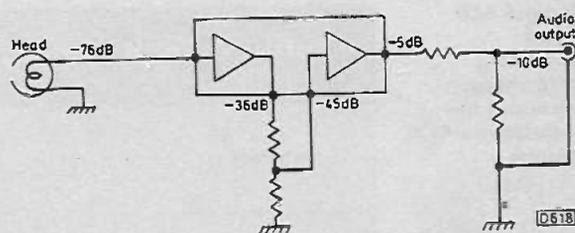


Fig. 3: Audio levels in a VCR's sound playback channel.

A faulty, possibly burnt, oscillator transistor or module may be responsible, or the stationary full-erase head connections may be poor. The best cure in the latter case is to remove any plug-and-socket arrangement used and solder the wires directly to the head leadouts.

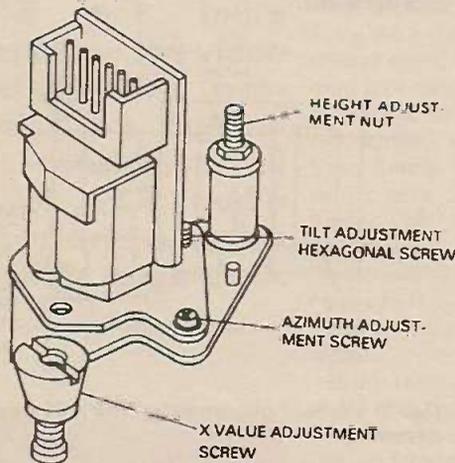
### Audio electronics

Faults in the audio section of a VCR's electronics are rare indeed –

**Table 1: Conversion chart for dB/RMS/peak-to-peak VCR audio levels**

dB	p-p	RMS
+20	22V	7.8V
+10	7V	2.4V
0	2.2V	780mV
-10	700mV	240mV
-20	220mV	78mV
-30	70mV	24mV
-40	22mV	7.8mV
-50	7mV	2.4mV
-60	2.2mV	780µV
-70	700µV	240µV

The TV/video line in/out level is between -10dB and 0dB. The microphone and off-head tape level is -70dB.



**Fig. 5: A typical ACE head mounting arrangement, showing the adjustment points.**

now that relays are no longer used! Where such a fault is present, fault tracing with an oscilloscope and a multimeter will quickly establish the cause, be it a noisy transistor, a leaky electrolytic capacitor or a dodgy potentiometer. In a modern VCR the audio electronics will use a single chip.

The important thing is to check with standard-level signals, provided by a signal- or pattern-generator in the record mode and an alignment or reference tape in the playback mode. You can if you wish make the latter yourself: see *Television* February 1995, page 245. Fig. 3 shows typical audio signal levels at various stages in a VCR's playback path: the lowest and most vulnerable level is at the head's output. The standard output level for a scart or line output socket is around 850mV peak-to-peak with a 75Ω termination impedance. Without this, the level rises to between 1.3V and 1.5V peak-to-peak, which is what you should see if you connect the audio output line to an oscilloscope directly.

In setting up the levels, the first step is generally to adjust the audio playback level for correct output signal amplitude during playback of an alignment or standard tape, then to adjust the recording level to achieve the same output during playback of a tape recorded by the machine. This assumes that the recording bias has been checked. A record signal level adjustment is seldom provided these days however, because the level is set by the broadcast FM deviation and the

carefully fixed gain between the sound demodulator and the recording head. Follow the manufacturer's alignment instructions carefully for such presets as may be provided.

**ACE head replacement**

Many of the fault symptoms described above are caused by a worn or faulty audio head. Replacement is a relatively common task. Some audio heads wear out more quickly than others. In this respect I find that middle-aged Sanyo and Hitachi VCRs are common offenders.

You can get a good idea of the state of wear of an audio/control head face by examining a strong light reflected from it. A worn head assembly will have a noticeable step on one or both of the audio and/or control head inserts, as shown in Fig. 4: the appearance is reminiscent of a water-worn pebble, and the groove or step can be felt with a fingernail. Control head wear causes intermittent or permanent loss of the control track pulses of course: the effects are loss of servo phase control, with mistracking and sound wobble as a result; a 'frozen' tape counter readout; picture and/or sound muting in many machines; and, with some dual-speed machines, hopping between SP and LP playback.

Replacement and alignment are easiest when the replacement head comes ready-mounted on a complete bracket assembly (see Fig. 5), because the height control nut moves the whole assembly vertically

**Table 2: Fault symptoms and their causes with longitudinal VCR sound**

Symptom	Likely causes
Weak, noisy sound	Dirty or worn head, poor tape path alignment, incorrect electrical levels.
Sound fluctuates	Worn head, insufficient tape tension, crinkled tape, worn pinch roller.
Wow/flutter	Worn pinch roller, faulty capstan motor, worn bearings, capstan servo fault, excessive take-up tension, worn audio head (flutter).
No sound or sound fades away	Wrong tape path (pinch roller could be worn), electrical fault, erase/bias oscillator not working (record only).
Sound distortion	Insufficient recording bias, excessive recording level, an electrical fault.
Poor HF response	Worn head, incorrect azimuth setting, excessive recording bias, electrical fault.
Playback too loud	Incorrect signal levels - check settings and feedback loop.
Hum on sound	ACE head shield/case not earthed, an electrical fault.

and there's little interdependence between the height and other settings. The sort of head that's simply mounted on a baseplate takes longer to align because all three mounting screws affect the height in addition to the azimuth and tilt settings.

In either case the first thing to do is to get the height correct, so that the tape passes, in the playback mode, centrally between the outermost edges of the audio and control head inserts as shown in Fig. 2. Use of a lamp and a dental mirror will facilitate this adjustment. When the height setting is correct, the audio and control track outputs will both be at their maximum level. Some manufacturers can supply a jig for ACE head height adjustment.

Start with the head face vertical (the mounting plate parallel to the baseplate or deck). Then give the top of the head assembly a small degree of tilt out, corresponding to no more than one turn of the tilt adjustment screw shown in Fig. 5. This will ensure steady contact between the tape and the audio head, minimising audio signal fluctuation in both the record and playback modes. If this tilt is overdone, pick up of the control track pulses may be impaired.

### Azimuth setting

For good treble reproduction, it is vital that the audio head gap is at precisely 90° to the tape ribbon. Adjustment is carried out with the azimuth set screw shown in Fig. 5: it works against a spring on the other side of the head. Play an alignment or standard tape with a 6kHz or 7kHz test tone. Adjust the azimuth setting for maximum audio output — the peak is quite sharp. Ensure that the tilt and azimuth settings have not altered the head height (Fig. 2 again), then seal all three screws with paint, varnish or locking compound.

At this point the VCR should be capable of recording and playing back good, clear audio with no level fluctuation, a good high-frequency response and little noise. We can now go on to X adjustment. This is the lateral (along the tape path) positioning of the head assembly.

### X positioning adjustment

This final procedure is necessary for correct tracking of prerecorded tapes and to establish correct lip sync between the sound and vision during playback. Lateral adjustment of the head assembly's position is carried out by some form of internally-

threaded cone (Fig. 5) or by moving the slotted head baseplate sideways then clamping it with a screw.

Adjust the ACE head assembly's position, while playing an alignment or standard tape and with the tracking control at its centre position, for maximum off-tape video FM envelope amplitude. This corresponds with optimum tracking, and ensures that the machine's recordings can be played back by other machines without trouble.

You may find that the amplitude of the video FM envelope peaks more than once over the range of movement of the ACE head assembly: be guided by the instructions in the service manual, which will typically specify the first peak from an extreme (forward/backward) setting or whatever. If the wrong peak is selected, there will be poor lip sync on playback of tapes recorded by other machines.

It's not always simple to set the user tracking control to the centre of its range. In machines with plus and minus pushbutton tracking controls, pressing both keys simultaneously generally does it and removes any auto-tracking action. With a VCR that has a single auto-tracking button, start from the eject mode and don't press the auto-track key.

Where no manual tracking adjustment is provided and auto-tracking is permanently engaged, the tracking control loop will nullify the effect of ACE head X adjustment during playback. In this case the manufacturer's service manual will specify another method of achieving the correct X position. With the Hitachi VTF350 for example, the correct setting is for a 12msec time lag between the falling edge of the head flip-flop pulse and the off-tape control (CTL) pulse, see Fig. 6.

### Alignment summary and sequence

Fig. 7 summarises the four ACE head assembly adjustments pictorially. Since mechanical adjustment is done during playback of a known-good tape, it is carried out before electronic alignment.

On the electronic side the first step is to set up the recording bias level. Then, where provision for it is incorporated, set the playback level for the specified audio output from an alignment or test tape. Finally, if a potentiometer for this is provided (rare with modern VCRs), set up the record level. Follow the manufacturer's instructions closely when carrying out these



Fig. 4: A worn head. The step or groove is visible near the top edge of the audio head insert.

adjustments.

Again, RMS values can be converted to peak-to-peak ones by the x 2.828 factor quoted earlier. 0dB corresponds with 0.776V RMS, so that -6dB is approximately 400mV and -8dB 300mV. A conversion chart is provided in Table 1.

### Fault chart

Table 2 summarises the fault symptoms likely to occur with a longitudinal audio system in a VHS VCR, with possible causes and cures. Use it in conjunction with the main text.

### Next Month

Part 2 will be concerned mainly with trouble shooting in the hi-fi audio sections of VCRs, where a whole new set of symptoms and fault patterns present themselves. ■

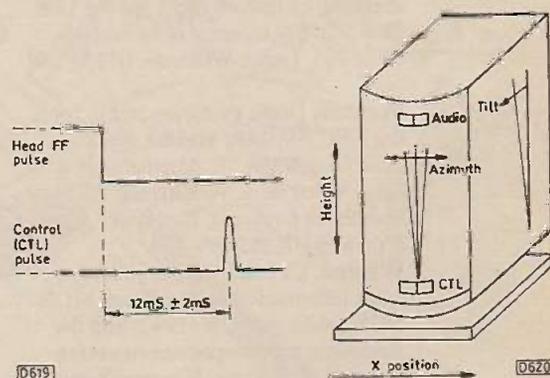


Fig. 6 (left): Correct X position adjustment condition for one VHS VCR with full auto-tracking.

Fig. 7 (right): The four directions of movement involved in the mechanical alignment of an ACE head assembly.

# 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:** Any information on the Akai GX650D open-reel tape deck. Robert Morris, 54 Beaufort Road, Ashton-under-Lyne, Lancs OL6 6NU. 01613 396 485.

**Wanted:** Circuit diagrams for the Grundig Model 4245GB (GSC200 chassis?) and an Elonex computer monitor believed to be Model 243/91. Also a high-voltage control module for the Sony Model KV2705. Eric Jacques, 530 Wakefield Road, Dalton, Huddersfield, W. Yorkshire. 01484 511 666.

**Wanted:** Circuit diagram and any fault notes for the Ford 2006 RDS keycode car stereo. Two of these units in for repair have no display and thus no operation. They are thought to be of Blaupunkt manufacture. F.P. Reeves, 5 Arnold Road, Clacton-on-Sea, Essex CO15 1DD.

**Wanted:** Photocopy of leaflet 75000K on fitting a TDA8180 chip in the Fidelity ZX3000 chassis, or any relevant information. R.E. Norgan, 24 Hankinson Road, Winton BH9 1HJ. 01202 778 069.

**Wanted:** Teletext board for the Sony Model KV21XMTU. Justin Johns, 28 Woodland Road, Neath, West Glamorgan SA11 3AL. 01639 638 629.

**Wanted:** Service manual or circuit diagram, or loan or copy, for the 17in. Dell VC7EN monitor or Mitsubishi TFS6705. Lance Williams, 01254 249 668.

**Wanted:** Drum motor assembly for the NEC N9014K. Has no. DCX-6N2NA 7095NC-1. Alternatively a scrap video deck. A. Clifford, 23F Troutbeck Crescent, Blackpool, Lancs FY4 4SX. 01253 697 460.

**Wanted:** Circuit diagram and any other information on the Wang MON 1428 colour monitor (1992) and the Audioline 890 telephone/answering machine. R. Morris, Wootton Security Systems, 24 Wootton Green Lane, Balsall Common CV7 7EZ. 01676 533 060.

**Wanted:** User manual and circuit diagram (particularly the former) for the JVC GX78E video camera. P.M. Rae, 79 Coleshill Street, Birmingham B72 1SH. 01213 545 444.

**Wanted:** Original service manual (must be legible) for the National NV780EM VCR. William Coughlan, 65 Lower Beechwood Avenue, Ranelagh, Dublin 6. 00 353 1 4978 453.

**Wanted:** Manual or circuit diagram (photocopy o.k.) for the MC661-C r.f. field strength meter. W.A. Sinclair, Ark, Haroldswick, Shetland Islands ZE2 9ED. 01957 711 516.

**Wanted:** User manual, service manual and spare parts for the Grundig TS1000 hi-fi reel-to-reel tape recorder. Ron Dark, 14 Northdene, Bideford, Devon EX39 3NZ. 01237 471 042 (afternoon or evenings).

**Wanted:** Function switch for the Fidelity FD1316 CD, radio, cassette player. No. S101 is printed on the switch. D.J. Sutcliffe, 111A Nab Lane, Mirfield, West Yorks WF14 9QJ. 01924 499 694.

**Wanted:** VF display for the Ferguson 3V43 VCR, also a 2SK1340 for the Orion FAX500 fax machine. M. Shaw, 19/21 Elland Lane, Elland, Halifax, W. Yorks HX5 9DU. 01973 768 894.

**Wanted:** Full data sheets for the SGS-Thomson M104B1 remote control receiver/decoder chip and the M709L remote control encoder/transmitter chip. Ray Halls, 6 Liskeard Drive, Bramhall, Stockport, Cheshire SK7 2JA.

**Wanted:** Circuit diagram and any other information on the Baxall CCTV camera Model 6698. John H. Carter, 147 Maidenway Road, Paignton, Devon TQ3 2PT.

**Wanted:** Take-up reel sensor for the Ferguson 3V39. Also a Granada VHS AH3 with new idler, clutch and belts fitted plays for ten-twenty minutes after which it slows down then stops. Any ideas? D. Bagley, 6 Beech Hill Avenue, Mansfield, Notts NG19 7EN. 01623 649 550.

**Wanted:** A51EAF00X01 tube for a Nokia/ITT Fastext TV set. Urgently required, will collect. Edward Conway, 31 Warren Road, Filton, Bristol BS12 7EN. 01179 693 982.

**Wanted:** Philips ON4418 chopper transistor for the Apple Two page monitor. Apple will supply only a complete power supply. According to Philips the device was produced for a special contract and no information on

its specification or possible alternatives can be supplied. A circuit diagram would be welcome. This too seems to be a state secret. Dave Lawrence, 21 Brill Place, Bradwell Common, Milton Keynes, Bucks MK13 8LT. 01908 235 474.

**Wanted:** Circuit diagram/service manual for the Audioline 910 telephone answering system. D. Jannece, CS Services, 54 Wyatts Green Lane, Wyatts Green, Brentwood, Essex CM15 0PX. 01277 822 380.

**Wanted:** A LOPT for the Hinari Model CT6; a lower drum for the Panasonic NV730 VCR; and a complete LCD display for the Sanyo VHR7200E VCR. Anthony Oboh, 13 Nazareth Gardens, London SE15 2AB. 0802 876 334.

**Wanted:** Service manual for the Ferguson 3C01 camcorder, to buy or borrow for photocopying. Also a VA301 battery charger which I gather is the one to use with this camcorder. M.W. Humphrey, 45 Broadmead, Tunbridge Wells, Kent TN2 5NE. 01892 541 614.

**Wanted:** TDA2170 chip for the IIT DigiVision TV receiver. Phone 01736 763 259.

**Wanted:** Circuit diagram (photocopy would do) for the Philips 22RB382/15 four-valve mains radio. Also for the power section of the Toshiba V83DC VCR. B.A. Milne, 22 Aldwych Place, Blackburn, Lancs BB1 9QP. 01254 246 127.

**Wanted:** Working Mitsubishi HSB20 remote control unit and a tuner/IF panel for the Sony Model KV1440. D. Jordan, Central Electronics, 6 Queen Street, Stirling FK8 1HN. 01786 451 230.

**Wanted:** Service manual (or photocopy) for the Philips 22AV1160/48S D2-MAC decoder. Roger Munt, Tyn-y-Coed, Kilnwood Lane, South Chailey, E. Sussex BN8 4AU. 01273 400 347.

**For disposal:** Philips NV1700/43 VCR. Not assembled and may not be complete. Free - but as the chassis is heavy the recipient must pay for postage. S. Shaw, PO Box 1404, Randfontein, 1760, South Africa. e-mail: stephen.shaw@digitec.co.za

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# Satellite WORKSHOP

**A**part from occasional collections and deliveries, house calls are not something I do as a rule. However an installation company, based fifty miles away, had fitted a motorised system that was giving problems. Would I check it out before they sent an installer on what might be an expensive wild goose chase?

## A Poor Choice

When I arrived I found that the receiver was an Echostar LT8700 – the very low-threshold version. The dish was a 1.5m job with, according to the customer, an 0.6dB LNB. Despite all this the pictures, especially the Sky channels from the Astra satellites, were very sparkly. These are very strong signals and would not normally give rise to problems like this.

The dish was twenty metres from the house, so no great losses here. When I thought about the problem however it was fairly obvious what was causing the sparklies. I proved the point by connecting a 250m reel of cable between the existing feeder from the dish and the receiver. Magic! The Astra sparklies had disappeared.

Jack Armstrong

The problem was being caused by excessive, not insufficient, signal strength. The LT8700 is an enthusiast's receiver, with a very low input threshold. It was designed for seeking very weak signals, not to be belted by the power from the five Astra satellites. The large dish, low-noise/high-gain LNB and the short cable run only made matters worse, providing an input that would have given even an old SRX100 problems.

I asked the customer which weak stations interested him? The reply was "none – I just want the best pictures from Astra and Eutelsat".

It seems to me that someone had made a very bad choice of system. This one would have been fine for TV Mauritania, which gives a very weak C-band signal in the UK. For Astra it was definitely overkill. I said nothing about this to the customer however, and he was happy for me to leave the reel of cable in place until I could get an attenuator.

The installer was none too happy with my call-out charge. He was even less happy when I told him what I thought about a company that could sell a customer a totally inappropriate system.

## Auto-eject

A customer brought me a Pace MSS500 which, he said, would record clear channels but would record only *scrambled* Sky channels. I asked the usual questions – was it connected via a scart lead, and was he pushing the Sky card into the slot fully?

His answer left me rather puzzled. He reckoned that his cat kept pulling the card out of the slot whenever he went out of the house with the VCR left to make a timed recording. I suggested that he should lock his cat out of the room, but he said this made no difference – somehow the cat always got it.

The unit was left with me for testing. Everything worked perfectly, but I noticed that the slightest tap would open the card flap. I phoned and suggested that I would drop the receiver off on my way home, since it decoded perfectly. That would give me a chance to check his VCR and the connections.

When I arrived he insisted that the receiver should be installed on top of the VCR, inside his hi-fi cabinet. Regular readers will know my feelings about this. I told him that it was at his own risk, and plonked it inside the cabinet.

I then tried recording a Sky channel, pushing the card firmly home as the VCR began to record. Playback showed that all was well. Next I set the MSS500 and the VCR to time-on after five minutes. With two minutes to go, we sat back and stared. The cat was nowhere to be seen. But my customer kept glancing at the door, as if he expected the beast to pounce at any instant.

Finally, there was an almighty clunk as the old VCR cranked into life. The MSS500 responded by releasing its flap and ejecting the card!

The correct answer was to replace the MSS500's catch mechanism. I would do that later. Meanwhile I used the fault as an excuse to persuade the customer to install the unit outside the hi-fi cabinet, where it would stay cooler. It had certainly been running very hot inside the cabinet. As a precaution I ordered replacement capacitors for C11 and C12 in addition to the catch. Pace recommends this upgrade, since extremely low ESR capacitors are required in these positions.

## Cambridge Receivers

I wonder how many people repair Cambridge receivers? The old RD480 is fairly difficult. After removing the cover my first action is always to run hot-melt glue along the ribbons on the main board. If I don't do that, the wires snap off as I put the receiver back together.

The tuner is awkward to remove and worse to replace. I can do some tuner repairs (you can call my e-mail number) but tell most of my customers that Cambridge receivers use "throw-away calculator technology", which in my opinion is not too far from the truth.

The ARD200 in its various OEM guises is if anything worse in this respect. I could, albeit with considerable difficulty, use my Weller desoldering station to remove the tuner. Since the iron broke however (the second one

whose end snapped off in a year) I've reverted to my trusty old station made by a US manufacturer called Pace (a coincidence!). Armed with this beast, I can get the tuner out without any track damage at all.

### Another One!

The owner of a Grundig GRD280 was very irate – the card flap wouldn't remain closed. This almost new receiver is similar in design to the GRD150/250. Grundig has however taken to heart previous complaints about the poor clip and weak hinges on the early model's card flap. An improvement has been achieved by using the same catch mechanism that Pace uses in Models MSS500/1000.

Unfortunately this customer had wrenched the flap open instead of giving it a gentle push to release it. The result was a broken catch. You just can't win! The Pace order code for the latch unit is 249-1003100.

### A Blown up SRD600

This receiver had come all the way from Scotland. Apparently the owner had taken it to a local repair shop which had removed all the power supply components because

they were faulty and had then returned it – minus components and all screws and brackets. That's how it arrived, but the owner had done an excellent job of packing it (not many do). As a result it was in perfect condition.

One component in the power supply caused problems, a 22nF capacitor rated at 630V. Amstrad don't stock it, but helpfully suggested trying the "usual distributors". Farnell don't stock it: RS list it but no longer stock it. One of my friends suggested that I try Tardis Electronics, 30 Station Road, Sandbach, Cheshire (01270 763 029). This is ostensibly an ordinary TV and video repair shop, but a vast labyrinth of rooms stretches far back into the building. Terry Boyd, the owner, seems to have just about everything under the sun – how about a 15,000µF capacitor rated at 150V, or two unused Quad II amplifiers?! Terry says that he does "mail order on request", which apparently means that if you know what you want he'll look for it. I noticed computer boards stuffed with EPROMS; boxes of resistors, capacitors, valves, video heads and TV spares: even a butter churn! But I digress.

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 his CompuServe address:

INTERNET:100613.2105@compuserve.com

No letters or phone calls please: he can cope with e-mail requests only.

We found a box of 20nF capacitors rated at 1.5kV and I bought the lot. The capacitors are large, but I persuaded one to fit by glueing it neatly (well, if Amstrad can use glue. . .) at the rear of the power supply and using short, insulated wires to connect it to the board. When the parts had been fitted the unit fired up immediately and everything worked – except that the D2MAC board produced audio and messages on a *blank* screen. I spent a long time with my oscilloscope trying to find why no video was coming out before I checked and found that the colour, brightness and contrast were set to zero in the menu!

## Test Case 400

With number 400, we pass a milestone in our cock-ups and conundrums saga, which has now been going for a third of a century! The central theme this month is video recording and editing, concepts undreamt of in the early Sixties when the Test Case series started.

Sage was quietly battling with a satellite receiver when he was summoned to help out at the service reception counter. There he found a cheerful gentleman with a VHS cassette in one hand and a Panasonic VHS-C palmcorder in the other. It transpired that the camcorder had been a Christmas and retirement present from his wife, and that our customer had made good progress in the techniques of shooting and editing during the weeks since he'd had it.

Initially he would shoot the raw footage on location, often in the LP mode to conserve tape. It might consist of a visit to the local beach, wild birds feeding in the garden, or the latest grandchild crawling across the hall floor. The material would then be edited by using a dual-speed domestic VCR to play it back, hooked via a scart lead to a second domestic VCR whose record-pause key was the means of editing. At the end of each required shot or sequence the record process was held up while the next item was sought using the playback machine's forward or reverse keys. A master tape copy was in this way assembled, with the assistance of a simple sound mixer and a caption/title generator. The edited master tape then became the means of running off as many VHS copies as were required, by using one of the VCRs to play it back while the second VCR made the recording on a blank tape.

The VHS tape was played so that Sage could see and hear the

effect of all this. As expected, the image was somewhat blurry and lacking in definition. Vertical lines in the picture had a watery appearance and a tendency to wave to the left and right, especially at the top of the screen. There was some misregistration between the luminance and chrominance components of the picture. And the colours were of woolly outline and doubtful hue, again especially towards the top of the picture, where a blue sky would sometimes be replaced by one that was a sickly pink or purple haze.

Neither did the sound emerge from all this unscathed. There was a noticeable hiss, and the sound had a muffled and constrained air about it, though the dubbed-over music and commentary sounded a bit better than the original location audio track. Yuk!

It was explained to Sage that the results were quite good when the original footage was played back by the camcorder, using the TV set as the monitor; and that playback of the edited master tape could provide just acceptable sound and vision reproduction. But the third-generation copies made from the master tape were not really usable. Sage was then asked what the cause of the trouble was, and what he could do about it.

Plainly, there was no magic-wand solution. But Sage was able to suggest a couple of things that could be done to help matters without the need to buy extra equipment, and outlined a series of increasingly expensive steps that could be taken to minimise the problems if not entirely eliminate them. What are the fundamental causes of this sort of picture/sound deterioration, and what can be done about it? For the solution, turn to page 437.

# A Guide to Widescreen TV



**A great deal of confusion has been created, amongst both dealers and the public, by the various widescreen TV formats and what they can do. Frank Harding provides a guide to the technology with a view to eliminating user complaints**

**S**ome brief notes on the latest ideas from Philips, giving an insight into various modes of TV operation, particularly with widescreen sets, appeared in the September 1995 issue of *Television*. Since then it has become clear to me, being involved as I am with customer queries and complaints, that there is at present a lot of confusion over the whole concept of widescreen TV.

Many of the enquiries and problems that I have to deal with are a direct result of customers being given incorrect information. Some dealers are unable to explain, effectively, what a customer will actually see on the screen of his brand new £1,500+ purchase. As a result the customer may go back to the dealer, or contact the manufacturer, threatening legal action because the set is not performing in the way he thinks it should. The basic point to remember is that a widescreen TV set is, except for the shape of the screen, the same as a standard one, and will receive and display only what is actually being transmitted.

The following notes have been prepared to help dealers avoid these sorts of problems, and should also be useful to engineers just entering the trade.

The present 625-line TV format has served us well for over thirty years –

from the first BBC-2 monochrome transmissions in 1964 to the introduction of colour in 1967, then teletext in the mid-Seventies and much later Nicam digital stereo at the end of the Eighties. The various additions were designed so that they fitted within the existing channel bandwidth, so as not to cause undue interference with older sets. We have now reached the situation where there's no room left for extras. The present system has run its course and cannot be further extended.

## Widescreen TV

Or can it? The introduction of widescreen TV sets a few years ago has meant that more people are now taking an interest in Home Cinema. It follows that they want to see their favourite programmes in the new 16:9 format. The existing TV system will not however allow direct transmission of widescreen pictures. Once again the broadcasters are faced with a conundrum: over ninety per cent of the public watches on standard 4:3 aspect ratio TV sets, but there is now a requirement for 16:9 widescreen transmissions while retaining the present system that allows for only 4:3 broadcasting. Moreover any further changes will also have to be compatible with the existing 4:3 sets.

The answer is to transmit pictures with a letterbox format, which enables 16:9 pictures to be displayed within a 4:3 frame. With a standard TV set the result will be full width but a black band at the top and bottom, as the picture is made up of only some 469 active lines (the black bars are produced by the additional inactive lines).

What does a viewer with a 16:9 aspect ratio set see? The same thing, except that the letterbox picture sits neatly in the centre of the screen with black borders all round. This, after all, is what is being transmitted. He can use the Movie Expand feature so that the picture fills his screen. But the problem here is that the letterbox picture is made up of only about 469 lines: when these are expanded to fill the screen the line structure can look quite coarse, with loss of vertical resolution.

## PALplus

With PALplus a full resolution, widescreen picture can be produced – provided the widescreen receiver incorporates a PALplus decoder. Because of the limitation imposed by the existing TV system, a letterbox picture is again transmitted. With the aid of digital technology however, the 'missing' lines of the expanded picture are encoded and included on

the inactive lines that form the black bars at the top and bottom. A set without a PALplus decoder ignores this digital information. A set fitted with a decoder is able to decode the digital information and use it to fill the 'missing lines', producing an expanded picture with full resolution. The PALplus decoder will also switch the set automatically to the widescreen mode.

The original broadcast is still being transmitted in 4:3 letterbox format, but with additional digital information inserted into the black-bar part of the picture. Thus the transmitted information still occupies the same bandwidth as that of a standard 4:3 programme. The disadvantage with a normal 4:3 set is the loss of picture information at the top and bottom of the screen. Widescreen sets without a PALplus decoder also display a letterbox picture and need to be switched to the Movie Expand mode to display a full picture – with a coarser line structure.

### Widescreen Plus

Some of the latest Philips widescreen sets incorporate Widescreen Plus to overcome the coarse line structure without the need for a PALplus decoder. As explained in the September article, interpolation between pairs of transmitted lines is used to create extra lines which are then added to restore the vertical resolution. This is done by storing the picture in a memory and using a chip to decide what information should be selected for the extra lines. Back in September the system was still on the drawing board: it has now been adopted by Philips.

I've actually had one irate customer ask why we are still using the old 405-line system when the rest of Europe is using 625 lines! He'd apparently asked his dealer about the coarse line structure and been told that "we still use the old 405-line system on widescreen". Once I had explained the situation as best I could he was in a rather better frame of mind.

### Widescreen Operation with VCRs

Another common complaint I get is when a customer has bought a widescreen TV set and VCR and goes out and hires (or buys) a prerecorded widescreen tape. He returns, the family sit down to watch and find that they have a letterbox picture in the middle of the screen. Why? Because the tape has been recorded in the 4:3 letterbox format to make it compatible with standard TV sets. As far as I know there is at

present no true widescreen prerecorded material available. When a tape is labelled widescreen it is, in fact, in letterbox format. So Movie Expand has to be used to make the picture fill the screen, with a consequently coarse line structure.

It's worth noting that any VCR will record or play back genuine widescreen material. A VCR that's 'widescreen compatible' incorporates 16:9 switching. This simply means that when a genuine 16:9 tape is recorded and then played back, an extra signal recorded on the tape enables the machine to identify it as widescreen and, via the scart lead, automatically switch the TV set to widescreen operation. Older VCRs that do not have 16:9 switching will still record and play back 16:9 material, but the TV set will have to be switched to the widescreen mode manually.

It's quite difficult to try and explain all this to a customer who "just wants his new telly to work in widescreen" or asks "why should I have to use Movie Expand when the tape says widescreen?". To convince a customer that his TV set and VCR are working correctly and that he hasn't been conned is the hardest thing in the world. Life can sometimes be easier when you know the reasons.

Another problem you will come across is that several different widescreen ratios have been used. So there may still be boarders around some films even when Movie Expand has been selected.

### Movie Compress

Another common complaint arises from misunderstanding of the use of Movie Compress or Vertical Squeeze. A number of modern 4:3 home cinema sets have this feature. Many customers come on the phone to complain that this function makes the picture even narrower when they use it during the transmission of a widescreen (letterbox) film. This is not surprising: they are simply compressing a 4:3 letterbox picture! Movie Compress will serve a purpose only when true widescreen broadcasts and tapes become available.

If we could watch true widescreen pictures on a 4:3 aspect ratio TV

set the characters would all be tall and thin, i.e. the picture would be squashed in the EW direction. To avoid this Movie Compress (Vertical Squeeze) is used to change the picture to letterbox form. You end up with black bars at the top and bottom, but everything looks correct.

### True Widescreen

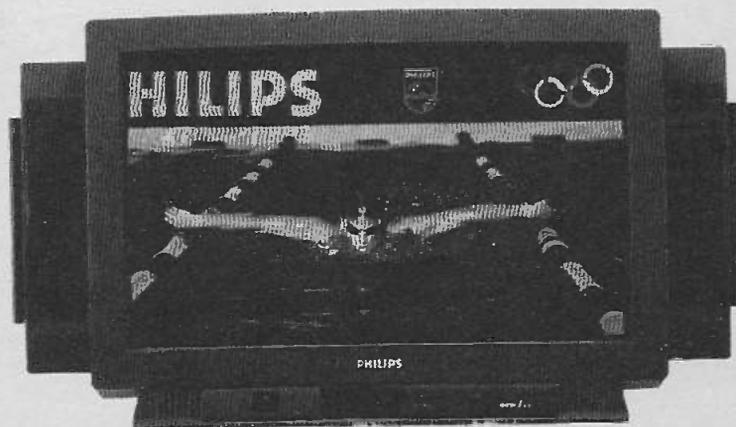
True widescreen pictures are not likely to be available until digital transmissions get under way. The BBC hopes to start a pilot service some time next year. A decoder will be required to enable existing sets to receive them. Those with 16:9 widescreen sets should have little trouble. But if widescreen transmissions become the norm, only modern 4:3 sets with Movie Compress will be able to display correct pictures.

### In Conclusion

I hope that the above notes will help to answer, in a non-technical way, some of the questions you are likely to be asked by customers. The information was originally prepared for training sessions I was asked to give for the customer help desk section in a major company. Many dealers may find the information useful, as it appears from questions received by the help desk that they are often the result of sales staff providing incorrect or ambiguous answers.

The latest figures from the European Association of Consumer Electronics Manufacturers (EACEM) suggest that sales of widescreen sets in Europe this year will total about 510,000, which is somewhat more than the number of widescreen sets sold during the five years since the format was introduced.

Sales in the UK are expected to rise from 15,000 in 1995 to some 40,000. The price of widescreen sets is falling as production has increased. A basic PALplus widescreen set should now be obtainable at under £1,000. ■



# What a Life!

**Donald Bullock on how it might have been if he repaired cars. Instead, he has devilish difficulties with CDs, electrolytics and other things**

**M**ore years ago than I care to recall I attended our local technical college, where the rudiments of this trade were driven into my head. Although I didn't realise it at the time, I emerged a socially deprived person – in at least two respects.

Had I studied something else, say motor engineering, then got myself a job in a garage, I'd have been able to hold a conversation about it with anyone in the local. Might even have profited from it. Let's see how the conversation would have gone.

"Had a terrible car in yesterday. Everything wrong with it. Kept cutting out – only when warm. Back bumper kept falling off. Petrol gauge read half full all the time. And there was this squeak. Took me hours to find the source. He was back with it today. Both front wheels punctured – wanted 'em fixed under guarantee!"

Laughter all round.

"Have a drink on me, Don!"

"No, let me get him one!"

A television engineer on the other hand tends to be isolated, even distrusted. Suppose I was to have a go. Might be something like this.

"Had this terrible set in yesterday. Sync waveform kept varying. Field oscillator ran too fast. There were line striations, but only on monochrome. And intermittent Hanover bars."

Shuffling and cringing all round, plus dark looks. A general edging away – and no free drinks.

The other deprivation? Well the

motor engineer can charge hundreds of pounds for his work, because cars have risen in price umpteen times. My work has to be done for peanuts.

## Unlearning

Then there's my brain, which is so crammed with useless information that I can't seem to get current things into it. I sometimes wish I could attend an untechnical college, to become an untelevision engineer. First I could be untaught the resistor colour code. Then pFs and  $\mu$ Fs and the nature of electricity.

I could be untaught all I know about Collaro record changers, and that company's dreaded two-way tape transcriber. And the Philips' changers, for which the only remedy was a suitably sized box addressed to Croydon. And oh to be untaught the misery of restringing wireless dial drives. ("What? Twelve and six for a bit of string!") Then there are all those valve types, pin connections and equivalents that keep running around in my mind.

These thoughts started off when I noticed that valves and valve equipment seem to be making something of a comeback. There are advertisements in *Television* for old valves, and some of the prices offered are surprising. I still recall the day we finally decided, after postponing it for ages, to throw away our stock of hundreds of the things.

I gather from BBC radio that valve amplifiers and equipment are

now commonly used by entertainers and recording studios. Apparently they stand up better to overloading, and produce a 'rounder' sound. Well, yes. But they produce a great deal of heat, consume much too much current, and amplifiers with good chokes and transformers are heavy. Now they are very costly. Some cost thousands of pounds!

## Contrasts

Our Spanish place sits in a large plot, with the front gates a tidy step from the house. Some while ago I decided to fit a bell push at the gates, in parallel with the one at the front door. When I looked into this I found that our electric doorbell was designed to work directly from the mains supply. There was no transformer, and the bell push and its wiring were at full mains potential. I soon did something about that. Then someone suggested a radio operated bell, the bell push being a transmitter.

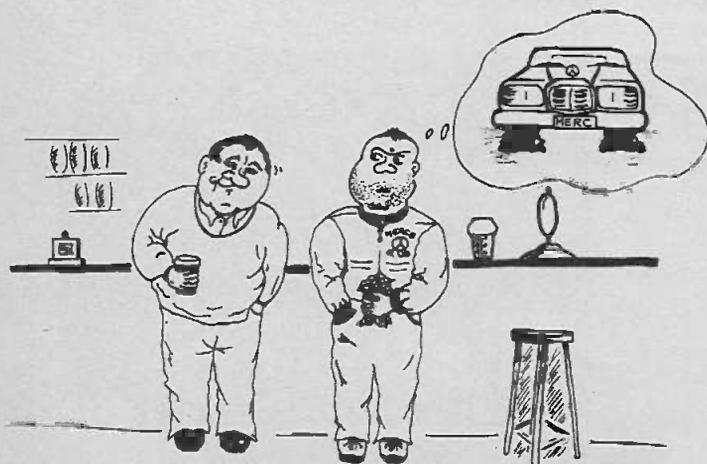
We were given one as a present. It was manufactured by a Middlesex firm called Busybody Products (24 Windmill Road, Brentford). It's neat, robust, digitally designed and produces loud, harmonious chimes that can be heard even beyond the claimed range of fifty feet. Well it did, but after a few months it gave up the ghost, perhaps because of the hot Spanish sun.

As it was a present we had no guarantee. So I wrote to Busybody Products to ask whether they could help. When they received my letter they telephoned me in Spain, offering to post me a replacement free of charge.

I find this commendable indeed. It's very unlike some of my recent experiences in our own trade. We needed a number of satellite receiver/decoders for example, and sent off faxes to several firms back in the UK. There were no replies.

## A Disc Problem

My Sony stacking system required attention recently. As Steven was trying to sort out a Fisher colour set that made him nasty, I decided to



*I've been listening to this bloke now for nearly two hours and he hasn't mentioned a big end or an exhaust pipe yet – wouldn't be surprised if he wasn't quite the full shilling. . .*

have a go at it myself.

The tuner, Model ST-V50L, uses a 6V orange pilot lamp to illuminate the display panel. It had gone out. This had happened before, a year or two ago, and Sony had charged me over £6 for a replacement. Since the manufacturing cost could be little more than coppers, I was thinking about a possible alternative solution as I dismantled the cabinet. I needn't have worried. The trouble was caused by a dry-joint in the supply line.

There was also a problem with playing CDs. The player, Model CDP-M30, was skipping. But only with some discs. And one of my most valued discs, a wonderfully cleaned-up compilation of Bix Beiderbecke 78s, wouldn't play at all.

The discs that were skipping didn't skip at the same place each time. This seemed to rule out the discs, and I couldn't see any obvious blemishes on them. A closer examination of the Bix disc showed that there were some very faint blemishes, so I cleaned it carefully. But it still wouldn't play.

I opened up the machine and gave the player the once over. When I came to the laser I noticed that its lens looked grey. A cotton bud moistened with alcohol removed a noticeable amount of dust from it. When I reassembled the unit and tried it out I found that all the discs played perfectly.

A more careful examination of the discs, with a magnifier, revealed that they all had blemishes, some very slight indeed. The moral is that a dirty laser lens and a slightly blemished disc add up to failure of the unit to get the message. Don't forget that the discs contain a great deal of information in addition to the recorded sound.

### Electrolytic Problems

Having dealt with the stacking system, I decided to help Steven with the Fisher set – a Model CFB2144. It had a snowy raster with no picture.

"Tuner" I said.

"It isn't" he said.

"Tuner supply voltages" I said.

"They're all correct" he said.

Then, before our eyes, BBC-2 appeared, followed by BBC-1, Channel 4, ITV then back to BBC-2. After a few more minutes the snowy, blank raster returned.

"The set behaves all right when it's been on for a couple of hours" he said.

I shambled off towards the kettle.

Making tea is easier than thinking.

Meanwhile the set started to search tune again. Once we'd got all the channels in turn it came right. The picture was stable and we could change them with the selector.

We pooled our immense brain power and studied the panel. There's a hot spot around the 5V and 12V regulators in this chassis. So we connected a pair of voltmeters across both lines and watched. The voltages fell in sympathy with the symptoms. Time to replace the two regulators, but this made no difference. Then we spotted a pair of 100µF, 25V electrolytics. We took one out and checked it with the capacitance meter. It measured spot on. We did the same with the other one, with the same result. We put them back. I was beginning to feel nasty too.

Some time later we'd made no further progress. The pictures were perfect. So we tried spraying the regulator area with freezer. Back came the search tuning, followed by the snowy raster.

We then used our bit of card with the small hole in it, so that we could freeze components individually – not the electrolytics, as they'd checked OK with the meter. As this had no effect, we sprayed the whole area. The fault symptoms were back.

We again gave those electrolytics dark looks. For want of something to do, Steven took one out and checked it with the capacitance meter. It seemed to be perfect. Steven left it connected across the meter.

"Can't understand it" he said, wearily. "Jo wants me to get a job in insurance." Then, as we watched, the meter reading began to fall – and continued until it was 70µF. When we touched the electrolytic's leads with the iron the reading rose to 100µF.

We fitted a replacement. This stopped the search tuning.

When we took out the other electrolytic (in the 12V supply) and checked it the results were much the same. It measured full capacitance at first, fell to 80µF, then returned to full value when its leads were touched with the iron. A replacement cleared the snowy raster, restoring a high-quality picture.

What had obviously happened was that in removing them for test we'd warmed them, restoring their full value. Thus our original readings had not indicated their value when cool.

### Yet Another

We boxed up the Fisher set and, flushed with our success, pulled a Matsui VX1000Y VCR on to the bench. Drifts off tune it said on the card!

The machine worked all right for a few minutes, then began drifting. I studied the picture on the monitor while it was stable (Steven had made his exit) and noticed that a very faint hum bar moved up the screen. A quick look at the power supply revealed a 47µF, 100V electrolytic capacitor (C504) that had a white, cheese-like crust on its top. When I took it out and checked it I found that its value had fallen to 25µF. I examined it and noticed that there were pinch marks on both sides, as if the machine that had popped it into the board had been too heavy-handed. A replacement cured the trouble.

Steven returned as I was boxing it up.

"That took you only five minutes" he said. "How did you manage it?"

I ran my nails across my teeth. "Cleverness" I said. ■

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# VCR CLINIC

Reports from Philip Blundell, AMIEEIE,  
Simon Bodgett, Eugene Trundle, Brian Storm,  
Richard Flowerday, Ray Porter, Chris Avis,  
R.J. Longhurst, Christopher Nunn,  
Michael Maurice and Gerald Smith

## JVC HR-D540 etc

The cause of tracking problems with this range of machines can usually be traced to defects with the pole bases. You may find that the rotary guides are loose, the result being that they adjust themselves as the tape passes. The brass insert can become dislodged, so that the pole base does not go fully into the V block. Finally, the inclined guide can become loose, so that its alignment changes – or it can even fall out! P.B.

## Philips VR2547

This machine would not operate for more than a few seconds in the play, wind or rewind modes. Scope checks at connector CN1 showed that while supply reel pulses were present at pin 17 there were no take-up reel pulses at pin 5. The cause of the fault was photointerrupter PS1 (part no. 4822 130 82705). P.B.

## JVC Heads

During the period just before Christmas Darron had fitted new video heads in a JVC HR-J420. When he tested the machine he had difficulty with LP recording and playback – standard play operation was fine. We went through the usual checks, including another set of heads and a replacement lower drum. A comparison was then made between the new heads and the ones that had been removed. Our conclusion was that two of the rotary transformer windings between the LP heads were swapped over.

JVC has now confirmed that any of three different and non-interchangeable drum units may be fitted to this range of VCRs, depending on geographical production batches. The models involved are the HR-J220, HR-J225, HR-J420, HR-J425, HR-J620, HR-J625, HR-J725 and HR-J825.

Before any major part of a drum unit is changed – the upper or lower section or static components – JVC bulletin DKC322, dated February 1996, should be referred to. Non JVC account holders can obtain the information from the Willow Vale technical line (0891 615 915). Calls cost 49p/min. To save costs, write down the model and serial number before making the call. S.B.

## JVC HR-J200

Failure of the under-deck mode switch is quite common with JVC machines. This is the first time we've had the fault with a 'mid-mount' model however. The symptoms – both very shy and spasmodic – were failure to rewind and tape looping at eject. E.T.

## Panasonic NVG25

You sometimes find that the head drum motor in one of these machines won't start up – it twitches instead. The cause of the trouble may well lie in the power supply, where the electrolytic capacitors C18/22/23 are suspect. If replacing them doesn't cure the fault, try replacing all nine miniature electrolytic capacitors on the drum drive CBA under the drum motor – ensure that the types used in positions C1, C2 and C3 are non-polarised.

This note probably applies to many models that use the Panasonic G deck. E.T.

## Tatung TVR6151/Decca DVR6151

We've encountered intermittent ghosting – and multiple ghosting – in the record and E-E modes with three of these machines. The cause is dry-joints at the legs of the SAW filter in the IF module. Retin and solder them all, whether or not the tell-tale 'rings' are visible. E.T.

## Panasonic NVJ47

This machine's E-E picture was covered with wide, dark flashing bars that seemed to vary with the sound signal. After a quick check on the power supply lines to confirm that they were all up to specification we moved to the luminance/chrominance subpanel. The main item here is IC302, which processes the luminance and chroma playback, record and E-E signals – and is expensive! Fortunately C318, a small 22µF capacitor connected to pin 9 of the chip, turned out to be the culprit. When this had been replaced we had clear E-E pictures. B.S.

## Panasonic NVSD200

This machine played back tapes at cue forward speed. The cause of the trouble was the BA6871S capstan motor drive chip IC2501. B.S.

## Panasonic NVG21

This machine worked all right for a ten-year old VCR, but there was no illumination from the multi-function display on the timer board. The cause of most faults with these machines can usually be traced to world-

wear capacitors in the power supply, but in this case the chopper transformer T1001 was defective – windings S7 and S8, which should supply the filament voltage, didn't. B.S.

### Panasonic NVHS800

This S-VHS machine would try to load the cassette carriage then power down and sulk. The mechanism is activated by blocking the take-up spool tape end sensor when a cassette is inserted. In this case the transmitter diode D1501 was open-circuit. A replacement LN59P infra-red transmitter diode restored normal operation. B.S.

### Sanyo VHR775E

The customer complained that one of these normally reliable machines "kept switching off". On test we discovered that when the machine powered up the drum and capstan motors would run at top speed for a few seconds, the machine then shutting down. The cause of the fault turned out to be the BU2896K servo chip IC351, whose capstan and drum servo outputs were continuously high at 5V. A replacement cured the problem. R.F.

### Akai VS22

This machine was to all intents and purposes dead, with all five outputs from the power supply either missing or very low. The obvious split present in TR12 suggested that there was worse to come, and that a replacement power supply board would be the ideal solution. But that would have written off the machine.

We were able to restore the machine to working order by replacing TR1, TR7, TR12, L8 and C6 however. A mains surge could have led to TR7 and TR1 going short-circuit. This would have split TR12 and burnt out L8, but why should C6 have gone open-circuit at the same time? R.P.

### Panasonic NVSD44

This machine would take in a tape but would then immediately eject it. The usual cause of this symptom is a stalled capstan motor: the drive chip may be faulty, or the capstan stator unit. In this case however the cause of the fault was the MN67434VRSG main microcontroller chip IC6001. B.S.

### Panasonic NVHS1000

This top-of-the-range machine was inoperative, with no illumination of any kind from the front display panel. Fortunately the cause of the trouble was a minor one. Transistor Q1102 in the power supply was open-circuit, with the result that there was no unswitched 5V supply. A new 2SD1996STTA transistor restored life to the beast. B.S.

### Samsung SV821K

These elegant, neatly-designed machines have proved to be a popular choice with our customers. The dozen or so we've sold recently have produced no serious problems, though there has been one irritating niggle: some won't produce a paused picture in the SP mode without a noise bar at the top. This is more apparent on some machines than on others. A check on the FM envelope produced by our Philips test signal tape showed a slight dip at each end. This was easily corrected by slight anticlockwise adjustment of the input and exit guides. Then, with a fresh recording, we obtained a near-perfect still frame – as you would expect with a four-head machine.

One machine we tested also had no lip sync with our prerecorded Dudley Moore tape – the notes on his piano were in the wrong place! The Philips test tape has a useful 'flash/click' section for checking the phase alignment of the audio/control head. This revealed that the head's lateral adjustment was one FM envelope peak too far from the head drum.

Samsung seem to be unaware of these problems, but if this is the worst trouble we get I for one will excuse the company for the odd off day on the assembly line! C.A.

### Ferguson 3V29/JVC HR7200

After fitting a service kit to this venerable machine we found that we had no playback picture. Scope checks along the luminance signal path brought us to the playback Y level preset R201, which was open-circuit at the top end. C.A.

### Akai VSF33EK

If the machine is dead with no display though the power supply is o.k., go to the 120Ω fusible resistor FR221 which is situated near the i.f. module under a left-to-right cross plate. When it goes open-circuit the 'power-down' voltage at pin 5 of the syscon chip IC1 remains high at 5V. The result is complete shut-down of the machine. R.J.L.

### Ferguson 3V35/6/8/JVC HRD120 etc

There was intermittent flashing/pulling in the E-E mode and the playback picture consisted of horizontal bars. Checks in the power supply revealed that the 9.3V supply was fluctuating quite wildly. The fault came and went when the set-up preset R8 was tapped. Everything was o.k. when a replacement had been fitted and set up. R.J.L.

### GoldStar GSE1296I

A hum bar in the E-E mode also affected playback etc. Checks in the power supply showed that all the outputs seemed to be affected, but scope checks were inconclusive. After further investigation got us nowhere we resorted to careful electrolytic bridging. Healthy conditions were obtained when C118, a 100μF, 16V electrolytic, was bridged. Replacing it restored correct operation. R.J.L.

### Akai VSF55EK

Lines flashed across the E-E picture and the machine wouldn't play tapes properly. These symptoms usually mean that C15 is open-circuit. This time it wasn't! The power supply was quietly ticking, and checks at connector WF1 showed that the unregulated 10/13V supply (pin 9) was the cause of the trouble. This led us to C6, whose replacement cured the fault. It's a 100μF electrolytic. R.J.L.

### JVC HRD530/Ferguson FV14T

There was a hum bar in the E-E mode. It's not the easiest power supply to work on, but scope and meter tests revealed that the 40V supply was low at 30V, with a lovely ripple. Even better, the offending capacitor C5, a 47μF, 63V electrolytic, was sitting above the mains transformer winding, next to C6 which was also suffering from heat stress. This is a 100μF, 63V electrolytic. Two new electrolytics solved this one. R.J.L.

### Roadstar VCR7200

This VCR kept blowing its 1.25A fuse (F803). Current checks at the fuseholder revealed wild fluctuations

depending on which function was selected. The cause of the fault was traced to C807 (4.7 $\mu$ F, 100V). Once this had been replaced the current measurements returned to an acceptable level. C.N.

### GoldStar GSE1290IQ

There were a couple of intermittent problems with this machine: it would sometimes refuse to accept a cassette, and it would sometimes switch from SP to LP. I suspected the mode switch but decided to replace the whole loading block, which includes the mode switch and loading motor. A speed fault was cured by replacing the pinch roller. M.M.

### Toshiba V513B

The customer complained of a snowy picture on his other TV sets when he was using this machine. This wasn't a fault condition: the aerial amplifier within the VCR is turned off during playback. As you can't switch it back on in these Thomson machines, if the customer has his aerial system wired so that he can watch tapes throughout the house he can't watch normal off-air TV. Fortunately the shop where the machine was purchased took a sympathetic attitude and exchanged it for another machine. M.M.

### Sanyo VHR390E

The customer's complaint was of snowy TV and VCR E-E pictures. We found that liquid spillage had corroded the supply track to the signal booster section of the RF converter module. Cleaning the PCB and adding a link restored the signals. M.M.

### GoldStar RC703I

This machine would intermittently loop the tape and would also switch from SP to LP. Originally, when eject was selected the half-load arm would spring back to a position next to the capstan motor, sometimes catching the tape. There's a modification kit to overcome this problem: you replace the cam and gear so that during eject the guide arm stays under the carriage. In addition, check whether the felt that forms the take-up spool's soft brake has come away from the lever: if so, glue it back. This can also be a cause of tape looping on eject. The speed change was cured by replacing the pinch roller.

Part numbers are: modified cam and gear lever 435-450A; mode switch if required 556-133A; pinch roller 333-209C. M.M.

### Ferguson FV68TX

This machine was dead with the chopper transistor short-circuit and the mains fuse open-circuit. The cause of the failure was attributed to diodes DP91 and DP92, which are wired in parallel. When they'd been replaced the chopper control chip IP01 still didn't work

however. To cut a long story short, we had to replace FP01, TP34, TP35, DP16, DP11, RP27 and, again, IP01. To my relief the machine then worked. M.M.

### Akai VSF15

Intermittent shutting down and ejecting was the complaint with this machine. When it came to me it would only eject: the loading motor ran in reverse and stalled when it got to the fully eject position. The cause of the trouble was a tiny sliver of solder across two pins of the loading chip – removing this cleared the fault. M.M.

### Akai VS66EK

The original fault with this machine was that the mechanism was mistimed. After resetting it we found that there was a lot of interference on the playback and E-E pictures. This was caused by noise from the power supply. It was cured by replacing C15 (100 $\mu$ F, 25V). M.M.

### Toshiba V804B

The mechanism was jammed, and the carriage drive lever gear had broken. After replacing this item and retiming the machine I found that the entry guide wasn't going fully home. The guides are made of plastic, and the lugs that keep this one on track had broken. A new guide cured the fault. M.M.

### Finlux VR3724

The complaint with this machine was that it wouldn't play and/or damaged tapes. On inspection I found that the capstan motor was not turning. The cause was Q5102 which was open-circuit. G.S.

### Sanyo VHR190

Intermittent failure to work with the remote control unit was the complaint with this VCR. I stripped the machine down and removed the remote control receiver, but there were no dry-joints here. On investigating further I found a collection of dry-joints at CN712, which connects the two front panels. Resoldering these dry-joints cured the problem. G.S.

### Nokia VR3784

No functions was the complaint with this one – it wouldn't come out of standby. All the outputs from the power supply were present, but the secondary switched supplies were missing. This was because the power-up output from IC301 remained low. Replacing IC301 cured the problem. G.S.

### Finlux VR3724

The playback picture had lots of heavy, black horizontal lines across it. When we carried out scope checks around IC101 we found that the waveform at pin 41 was OK but the waveform that returned to the chip at pin 42 was noticeably faulty. The cause of the fault was traced to the 1k $\Omega$  resistor R1007, which biases buffer transistor Q1003, having gone high in value. A new resistor cured the fault. G.S.

### Sanyo VHR150

This machine played and searched correctly but there was no or very slow rewind and fast forward operation. Tests showed that the rewind/FF torque was very low.

The clutch seemed to be operating in the wrong mode, supplying play-level torque in the rewind and FF modes. The cause of this was a missing plastic end stop, against which the clutch mode select arm should rest. I inserted a screw in the plastic hole behind the clutch arm to act as an end stop. This restored normal rewind/FF torque. G.S.



### Matsui VP9401

This machine wouldn't rewind tapes and would stop when rewind search was selected. The beginning of tape sensor Q1002 was found to be dry-jointed. M.M.

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# Servicing the

# B&O 37XX and 38XX Chassis

**These sophisticated sets can be kept in good working order, providing excellent results. Nick Beer on fault-finding and precautions to take**

**T**hese two chassis are very similar. The sets that use them sold in quite large numbers, the range first appearing in 1986. Though pleasant to work on, the chassis can cause some puzzles for those not familiar with them. This article should help you sort out any problems.

The models covered are the L2500, LX2500, L2502, LX2502, L2800, LX2800, L2802 and LX2802. A word to start with on B&O model/type/chassis numbering, since this seems to confuse many people.

The model number is the one that appears after the word Beovision – with these sets it's on the right-hand edge of the strip of brushed aluminium that runs across the top of the set. The type number, which supplements the model number and appears on the back of the set, denotes the exact version of the model. This refers to things like the band coverage, TV system and colour system. With TV sets, the first digit(s) of the type number also give us the chassis type. The type numbers for L/LX2500/2800 models begin with 37, hence 37XX chassis: those for models L/LX2502/2802 begin with 38, hence 38XX. Simple, really!

The operation of these sets and of some of the circuitry was covered in a previous article of mine, in the April 1989 issue of *Television*, to which reference should be made. In this article I will be summarising our fault experiences since then. One small point is that the retrofit Nicam decoder is no longer available.

## Layout

The circuitry is arranged on a number of panels, see Fig. 1. Each panel has a number, which is included in the circuit component reference numbers. Thus 4TR11 is transistor TR11 on panel 4: there may be several TR11s in the set.

The power supply and deflection circuitry is on panel 4, which is at the right-hand side when viewed from the rear. The microcontroller and its associated circuitry, along with the tuner, are on panel 1 or 51 which is on the floor of the set. The line and field generator circuitry is on panel 26/27/53, with the scart sockets amongst other things. Panels 10/11/57 are hinged over the back of panel 26/27/53. Panel 10 or 57 is the teletext decoder panel, which is present in the LX models. L models have panel 11, which generates on-screen displays. Apart from panel

1/51 which is clipped to the floor of the set, all the boards can be hinged in or out easily.

## Remote control unit faults

All 00 models came with a black and silver 'video terminal' remote control unit for which spares are no longer available. 02 models came with a Beolink Mk 1 or 2 unit. Specific spares for these are also no longer available. All is not bad news however.

The Beolink 1000 is still a current handset for all relevant TV sets and hi-fi units, in Mk 4 form. Many of the spares for this, such as the case and battery cover, are compatible with earlier versions, though they are not always identical. The button mats are not compatible.

The Beolink Mk 4 can be used as a replacement for the earlier RC units, though some of the original buttons have disappeared – to be replaced with other commands – as the system has evolved. Most of the original commands can still be carried out however by using 'shift' commands – a sheet comes with the new handset. For example the '1-2' button on the video terminal unit provided a spatial sound effect with 00 sets: to achieve this with the Beolink 1000 Mk 4 you have to use 'sound shift sound'.

If you have a Beolink handset fault for which you can't obtain spares, B&O provides an exchange service, at a very reasonable cost, for a new Mk 4 unit. The current retail price for a Mk 4 unit is £99.95

Remote control unit failures usually involve liquid spillage. If the unit is badly affected, it doesn't qualify for the above exchange system. No go can be caused by tarnished battery contacts (replace the holder) or broken wires (they are solid cored) between the board and the holder. The button contacts can cause random command transmission, especially volume up or down. In earlier units the switches consisted of copper/brass springs on sticky film over the PCB. Later units have a plastic film with poppers in it, coated with carbon that makes with carbon contacts on the open PCB. The carbon on the film flakes off, landing across the PCB contacts.

## Set faults

So much for the remote control units, now to the sets themselves. We'll start with the power supply/deflection

panel PCB4 where, naturally, most of the faults occur.

A common fault is failure of the line output transistor 4TR11 (a BU508A or S2000A). If you simply replace it, the cure will not be long lasting. The following is the latest recommended procedure to prevent a recurrence: there have from time to time been additions as B&O has identified further potential causes. Modification kits with the parts required are available, part no. 3390454 for panel 26/27/53 and 3390487 for panel 4. You need both if the set has not received any previous attention. The prices are again very reasonable.

(1) Replace 4C28 (220 $\mu$ F), 4C29 (100 $\mu$ F), 4TR15 (with modified type in the kit), 4C34 (6.8nF), 4C32 (see below), 26R63 (2.2k $\Omega$  line frequency preset) and 26R65 (10k $\Omega$  horizontal phase preset).

Note that the new 4TR15 has a different pin configuration to the original. Follow the diagram on the sheet that comes with the kit. Take care: on some boards the pin connections are printed, differently, on both sides of the board! 4C32 is 1.5nF when the line output transformer is a Philips AT2077/81. 1.8nF when it's an Hitachi type – both values are supplied in the kit.

(2) Run a wire between pin 5 of connector P9 on panel 26/27/53 and the chassis connection to 26R65. Run another wire between the same pin of P9 and pin 8 of connector P22 on panel 4.

(3) Short the emitter of the line output transistor 4TR11 to chassis by adding a link to pin 2 of connector P26, which is very close to it.

(4) Add the two diodes supplied in the kit for panel 4 across 4D32. Connect them in series, with the cathode of one to the junction of 4D32 and 4R45 and the anode of the other one to the junction of 4D32 and 4R43. see Fig. 2.

It is as well to carry out all these modifications if they have not previously been done whenever one of these sets comes into the workshop. Because the sequence of modifications has evolved over a period of time you may find that some of them have been carried out but others, for example the wire links and extra diodes, have not been attended to. Check carefully.

Here are some other possible causes (some speculative) of repeated line output transistor failure (but do make sure that all the modifications listed above have been carried out): intermittent flashover in the CRT; intermittent arcing in the Philips type line output transformer; and the 10M $\Omega$  isolation resistor 4R5 going open-circuit.

Intermittent arcing noises that often don't destroy 4TR11 are sometimes experienced in addition to the problems mentioned so far – the focus spark gap, which is integral with the CRT base socket, causes problems. Don't be misled by this: a faulty line output transformer that produces excessive voltages will of course also result in spark gap firing.

It is important that any dry-joints on PCB4 are attended to. Dry-joints around the line output transformer 4T5, especially at the coils (4L5 for example), can result in failure of 4TR11. Have a good, careful solder around. The board print is fairly delicate, legs are bent over and with age the board and its print become fragile. You have nothing to worry about if you are careful however.

The whole board should be scanned for dry-joints. Pay particular attention to the high-density area, where many of the small transistors are mounted.

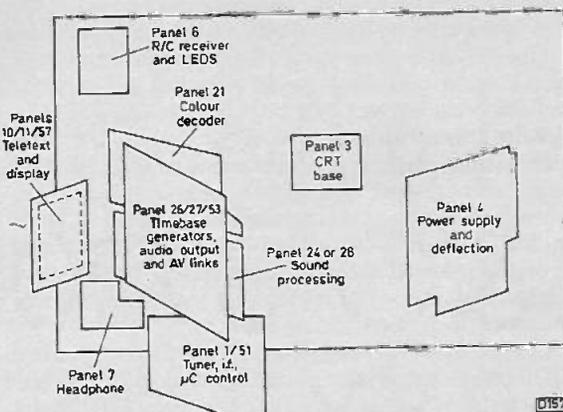


Fig. 1: Layout of the PCBs.

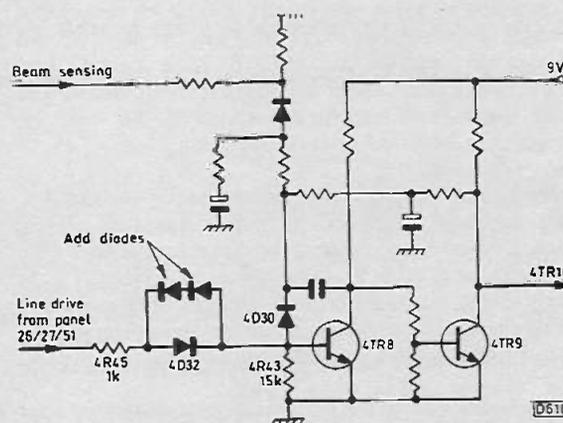


Fig. 2: The additional diodes required in parallel with 4D32.

### Other PCB4 faults

**Dead set, stuck in standby.** When the set is asked to come on the LED goes out, the set squeals and returns to standby: The usual cause is that the line output transistor 4TR11 is short-circuit. See previous notes. Another known cause is failure of the line output transformer 4T5, especially if it is the Philips type (grey).

As mentioned in my previous article on these sets (April 1989), there's an ideal way of fault localisation before you even take the back off. The sets incorporate an audio only mode, in which the power supply but not the line output stage is operational. If you go into this mode and the set comes out of standby and works, you can be reasonably sure that there's a line output stage fault. If it still doesn't come out of standby, carry out checks in the power supply or possibly the system control sections of the receiver. With the original video terminal RC unit the audio only mode is selected by pressing the AUX-1 button: with the Beolink 1000, use Shift-TV-1.

**Dead set with no LED light:** First make sure that the mains supply is reaching connector P27 on PCB4. If it isn't, the mains switch or a burn up on its PCB is the likely cause. The mains switch fitted to these sets is rarely used, which is just as well since it's pretty unreliable. Unlike many mains switches, this one fails safe – the latching usually goes.

To replace the mains switch, turn the set upside down,

remove the trap door under the switch and hook out the PCB. If the set is on its stand and you are making a house call the job can be done by crawling under the set, without need to remove the back cover. Note that the switch is available complete with PCB if the print is damaged. This includes a new mains lead.

If the mains supply is present at connector P27, the 3-3 $\Omega$  surge limiter resistor 4R3 could have gone open-circuit. When these sets were new this resistor used to bum up. If the 2AT mains fuse 4F1 is open-circuit, check the bridge rectifier diodes 4D2-5 and if necessary the BU508A chopper transistor 4TR1 (this item is remarkably reliable however).

Another cause of fuse failure is a defective posistor (4R103) in the degaussing circuit. As usual with B&O sets the degaussing is triac controlled. The triac (4SBT1) and the posistor (4R103) develop dry-joints.

**No standby mode:** If there is no obvious destruction the cause is likely to be loss of the standby 11V supply. This is produced by a separate, fused (4F2) power supply that consists of transformer 4T2, bridge rectifier 4D10-13 and its reservoir capacitor 4C14 (470 $\mu$ F). If the 250mA fuse 4F2 is open-circuit, check the bridge rectifier diodes. The most common failure here however is the reservoir capacitor 4C14 which goes open-circuit.

**Intermittent cutting out, not necessarily to standby:** This can be caused by loss of chopper transistor (4TR1) drive. Dry-joints can occur at the driver transformer 4T3, but the cause is often the driver transistor 4TR6 (BC338-25) breaking down under load – it goes open-circuit. A scope check at its emitter will confirm this if you happen to be watching when the fault occurs.

The primary side of the power supply is otherwise very reliable. It employs mostly discrete-component circuitry. Thus if the set has been subjected to a power surge or lightning many components can suffer. Nothing unusual here however. Fig. 3 shows the supply circuit.

### Safety testing

The insulation resistance should be around 11M $\Omega$ . If the reading is high, 4R5 (10M $\Omega$ ) is likely to be open-circuit. If the reading is low, suspect interwinding leakage in 4T1, 4T2 or 4T3. It is unlikely that the series-connected 0.01 $\mu$ F isolation capacitors 4C6 and 4C7 would both be leaky.

Flash testing is not recommended.

### Field timebase faults

Most field faults result in no vision. It's quite common, when you turn up the tube's first anode (G2) preset, to be greeted by a distorted field scan with virtually full height, flyback lines and no vision content. You'll find that 4D21 (1N4002) in the flyback boost voltage circuit is open-circuit, though it usually reads fine when cold. The result is no 12V supply at pin 8 of the TDA2170 field output chip 4IC2. Replacing 4D21 will restore the field linearity, but without vision. For the latter, replace the TDA2170 chip as well (part no. 8340717) as it's not producing the field-frequency section of the sandcastle pulses.

The TDA2170 chip requires +12V and -12V supplies. There could be a problem with these in the event of lack of correct field linearity. Check, by substitution, the 100 $\mu$ F capacitors 4C44, 4C45 and 4C47, also the 0.1 $\Omega$  safety resistors 4R74 and 4R75.

### The Tube

The tubes used in these sets are generally fault free, though we have had flashovers that have resulted in

failure of the line output transistor 4TR11 and its protection capacitor 4C32, whose value varies with the type of LOPT (see earlier). The life of the tubes fitted in the 37XX chassis has sometimes been disappointing. It is common to see very poor results.

The tubes fitted in the 38XX chassis seem to be much less likely to go low-emission.

If you have a very sick-looking picture, don't overlook the possibility that the tube's heater supply voltage might be low. Check for dry-joints on PCB4.

### The Microcontroller and the Bus

There are a fair number of differences between the two chassis in this area, but the good news is that reliability is excellent. Most of the circuitry is on the small panel that sits on the floor of the set, with the tuner on it. There's an extensive I<sup>2</sup>C bus system.

When there's a bus fault the set is likely to remain in standby. Bus pin connections to the chips are generally 2 for the data and 3 for the clock pulses. Check here for activity and DC pull-up. The lines are zener diode protected, so a short on the line should lead to a check on the relevant 5.1V zener diode. There are also series resistors in the connections to the individual chips. This helps with fault tracing, as the resistors can be lifted to clear or otherwise particular chips. Checking for the cause of a short-circuit on either line tends to be a rather long-winded process.

There are no software enhancements as such for the 37XX chassis. A datalink module is required to implement certain functions such as inclusion in an MCL2 link system, but the module is no longer available. If fitted, you'll find it above the left-hand collection of PCBs. Various system parameters are set by the series of DIP switches.

In similar situations the 38XX chassis is upgraded by replacing IC1 and IC3 on panel 51 to provide the required extra software.

Dry-joints are quite common on panel 51. These cause all manner of odd, often very intermittent faults such as going to standby. A tuner with a short-circuit is another cause of a set being stuck in standby.

### PCB26/27/53 faults

These alternative panels contain the audio output chips, the sync and timebase generator circuitry and the AV arrangements.

The audio output stages are generally very reliable and the faults simple – they are usually caused by one of the chips, a standard TDA2040 being used in each channel. The usual complaint is of noise or grumbling in one output.

Sync is handled by the TDA1940 chip IC5 and its associated components. It can cause several problems, usually thermal. The symptoms are drift or loss of sync. Be very careful here, as the width, linearity and frequency potentiometers all give trouble, changing value and becoming noisy. As mentioned earlier, the line frequency and horizontal phase potentiometers should be replaced to prevent line output transistor failure.

A transistor to note is TR3 (BC548B). When this is switched fully on, the line drive output from pin 2 of IC5 is shorted to chassis. This is done to implement the audio-only mode. Thus TR3 and its associated resistors could cause some puzzlement should a fault occur here.

### Cleaning

Do remove and clean the contrast screen following a repair. Removal is easy. Pull the speaker frets off gently,

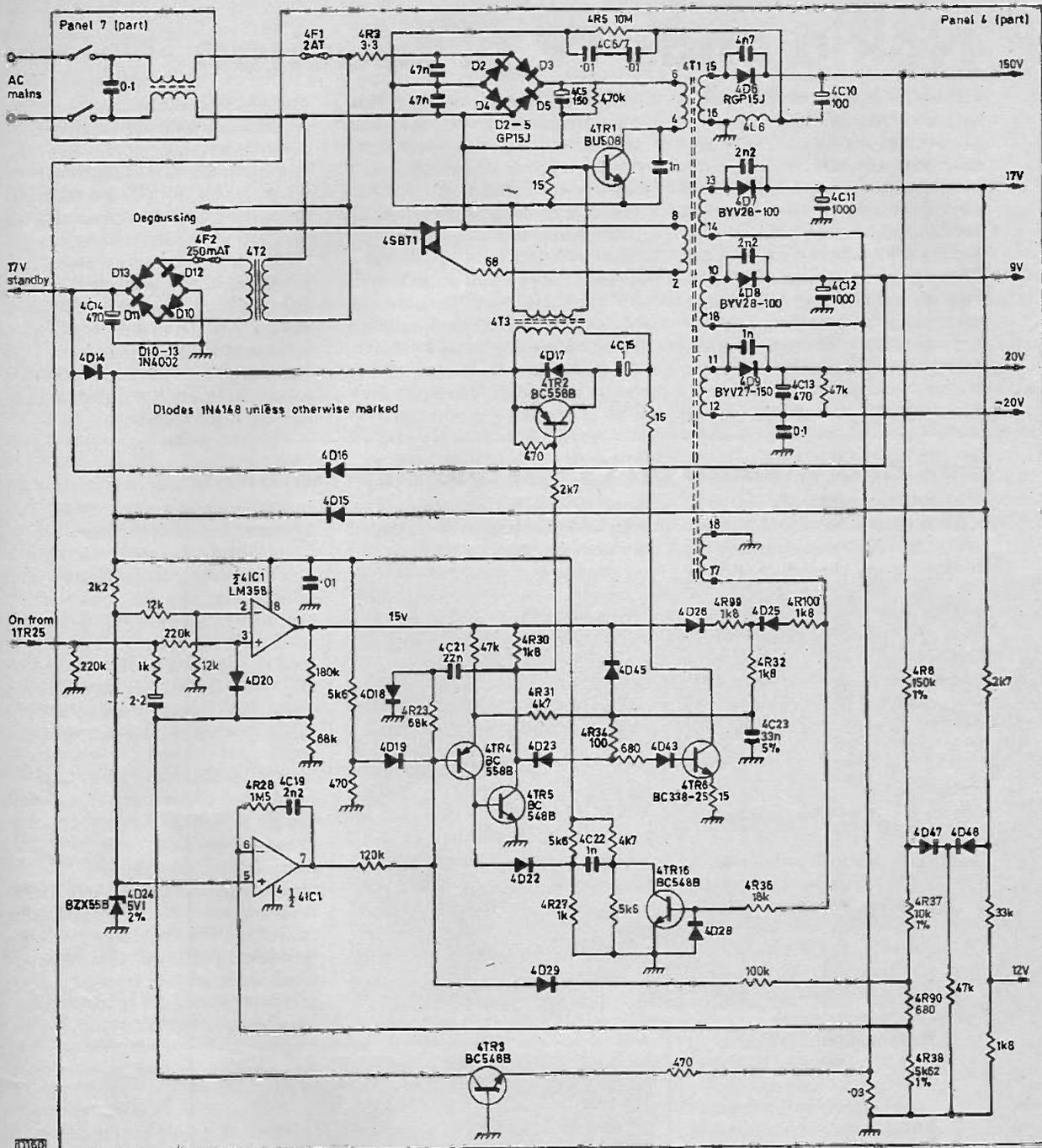


Fig. 3: The power supply circuitry. Note that there were several minor modifications during the production run. All components are prefixed 4. 4TR1 is type BU508A.

remove the plastic clips (under the frets) at each corner of the screen, then undo the Phillips screws under the clips. Also polish the aluminium strips around the cabinet and use teak oil or similar on wood veneer cabinets.

**In Conclusion**

These sets are a delight to work on, using a chassis arrangement that's well thought out. Work on the unclipped back-to-back PCBs on the left-hand side can be a bit fiddly however, as they flop around if left without support.

Since some of the circuitry is advanced – the bus control system for example – inexperienced engineers should take great care and never work without the service manual. There are some apparently pointless bits of circuitry, but the sets contain features that allow Link integration – they are more than just TV sets!

Treat the print with care, especially where PCBs have been getting hot. Hamfistedness or the use of a solder sucker (always use braid) will lead to disaster.

For B&O spares details, refer to the spares guide supplied with this issue.

# Nokia ends TV production

Excess TV receiver manufacturing capacity in Europe has been a problem for some time. The result has been losses and lack of profitability within the industry.

One of the worst affected firms has been Finland-based Nokia, which has made losses of over £245m on TV set production since 1988. Last year the loss was over £43m. Since there seems to be no prospect of turning Nokia's TV production side round, the company has decided to withdraw from this activity and concentrate on its

telecommunications business. This now accounts for 85-90 per cent of its revenues – up from 60 per cent two years ago and a mere 14 per cent twelve years ago.

In addition to its Scandinavian TV plants, Nokia has been a major producer in W. Germany, having acquired the Bochum plant from ITT some years ago. The company has set aside over £280m to cover the cost of closing down its Home Vision Products Division. It may remain in the consumer electronics field, using TV sets and VCRs

obtained from elsewhere: negotiations are being held on possible partnerships. Nokia's Display Products, Multimedia (Satellite) Network Terminals and Industrial Electronics Divisions will continue to operate as before.

Overall the company remains profitable, with a substantial increase in group sales for 1995. But competition in the telecommunications field is increasing, and Nokia has issued two profit shortfall warnings during the past two months.

## Sex and violence on TV – a one-chip solution

Under a law signed by President Clinton in early February TV sets sold in the USA must in future incorporate a V chip which will enable parents to prevent their children seeing violent or sexually explicit programmes. From next January, transmissions are to include codes that indicate the ratings of programmes. The V chip will act on these codes to prevent viewing at

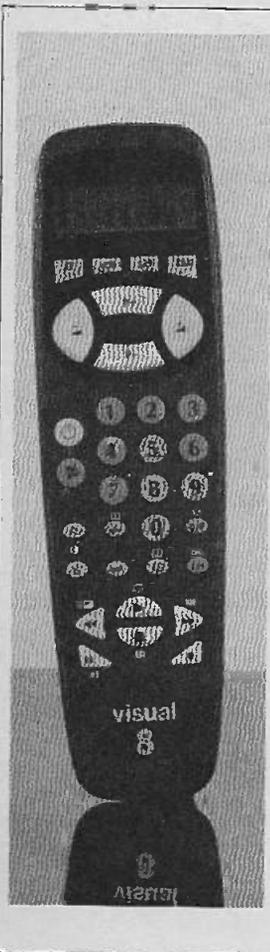
whatever level of unsuitability is selected by the parents concerned. Representatives of the US entertainment industry have agreed to develop a rating system for their programmes. At a meeting on February 14th, the European parliament voted to make mandatory the installation of V chips in all sets sold in Europe. The proposals will return to parliament after

consideration by the Council of Ministers and the European Commission.

Such a rating system could be difficult to implement – the chief executive of a leading European satellite broadcaster, NetHold, recently predicted that by the year 2000 some 4,500 channels will be available as a result of advances in digital compression technology.

## Philex remotes

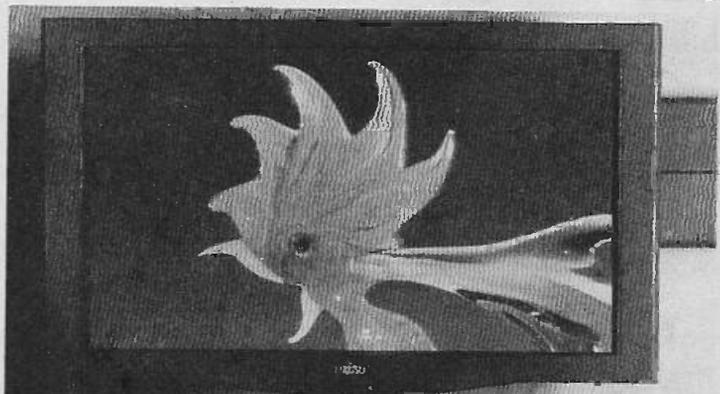
The Visual 8 is the latest and most advanced remote control unit in the Philex range of preprogrammable models. Its features include an LC display that shows the day, time, key and programming information. The Philex range, which also includes the Optim 8 and the original 8 Way, is claimed to have the most extensive libraries of codes of any remote control unit on the market. As a result the units will operate thousands of TV sets, VCRs, satellite receivers and cable TV systems. The Visual 8 will also operate hi-fi and CD units, and has teletext and Fastext functions. For further details contact Philex PLC, Philex House, 110-124 The Broadway, West Hendon, London NW9 7PP (0181 202 1717, fax 0181 202 0014).



## New CRT technology

NEC of Japan has developed a new colour CRT technology which it claims gives superior performance to the traditional phosphor dot trio and stripe systems. The Cromaclear system has the phosphors grouped in three elliptical depositions with vertical alignment. Horizontal dot pitch is 0.255mm while the mask

pitch is 0.25mm. According to NEC the system provides superior horizontal and vertical definition, and better edge-to-edge colour and focus uniformity. The technology will be used initially in 15 and 17in. monitor tubes which are to be released this year at the same price as comparable tubes using current technology.



*Fujitsu is to start producing 42in. plasma panels for TV receiver use next October, at an initial price of \$5,000 per panel. The company is at present supplying sample panels to leading setmakers, including Philips, Thomson and Bang and Olufsen in Europe. Initial production of the 75mm thick panels will be at a rate of 5,000 a month, rising to 10,000. If all goes well, Fujitsu plans to increase production to 100,000 a month by building a second, larger factory. The price of the panels should then fall substantially.*

## JVC's DVC Camcorder

JVC's Cybercam digital camcorder, which is known as the Pocket Movie in Japan, caused a great deal of interest at recent consumer electronics exhibitions (see reports in our November and January issues) because of its small size, about the same as that of a 35mm camera. It weighs just over 500g and measures 150 x 80 x 45mm. So how do they do it?

The small size has been achieved by using laser drill technology to increase PCB component density. JVC claims to be the first company to launch a commercial product that uses this technology, which has enabled 1,005 components to be packed on to two PCBs. According to a JVC source, up to six PCBs would have been required using conventional mechanical board drilling.

## Digital TV

The UK Digital TV Group, an industry-wide forum whose aim is to facilitate the introduction of digital terrestrial TV in the UK, has increased its membership from eight to twenty four. Most leading broadcast organisations and TV research and manufacturing firms are now members. The aim is to develop an open and competitive market in service provision, receivers and conditional access to ensure the rapid introduction of services, hopefully by the end of 1997.

The name of the joint venture between Pace and NTL's Advanced Products Division, which has been renamed Digi-Media Vision (DMV) after its acquisition by News Corporation, was changed from Pace-NTL to Pace Digital Systems. The joint venture provides a framework for co-operation in the development of set-top boxes for satellite and terrestrial applications. Prior to this change, DMV announced a partnership with Mitsubishi to develop semiconductor technology for use in digital TV receivers.

Steps are being taken to create a new European trade association to tackle the problem of smart card and decoder piracy. The Association Europeenne de la Protection des Oeuvres Embouillees (AEPOE) will be concerned with both digital and analogue systems.

## Satellite TV

The compact mesh dish which, with a diameter of 48cm, has an area 35 per cent less than a conventional 60cm dish is now available from leading satellite distributors including Longreach, Eurosat and Michael Black. It is intended for reception within an arc from Hull to Southampton, including Birmingham and all SE England.

Eurosat is distributing the IRTE Omnisat as an alternative to the conventional polar mount and actuator. This £250 device consists of a compact motorised mount that's located at the mast head to provide horizontal and vertical dish movement. It uses a positioning system (patents pending) that can memorise up to twenty positions anywhere in the satellite arc. Control is via an IR handset and an interface with a four-digit display. The existing coaxial feeder is used to carry power and data between the interface and the actuator. For further details contact Eurosat Distribution Ltd., 1 Oxgate Centre, Oxgate Lane, Edgware

Road, London NW2 7JA (0181 452 6699, fax 0181 452 6777).

The Grundig GRD150 satellite receiver has been replaced by the GRD200, with a specification upgraded to 200 channels.

Pace has launched the MSS290 (see photo below), an innovative mid-range satellite receiver that incorporates a new 3D matrixing chip to give broader sound quality. The unit maximises the performance of stereo TV sets by producing an enhanced stereo sound effect without the need for external speakers and amplifiers. Pace says that this is a "stereo plus option" rather than surround sound simulation. It also provides enhanced sound with mono transmissions and stereo effect playback when a VCR's output is routed through the satellite receiver. There are three sound effect options, simulated, cinema and music, each with eight level adjustments. The suggested retail price of the 250-channel receiver is £230.



## Two-source Surround sound

Dolby Surround and Surround Pro-Logic sound is all very fine, but many people don't want to have their living space cluttered with leads and speakers. To overcome this problem, several companies have devised systems that provide the surround sound effect while using just the conventional two left- and right-speaker systems. In all cases this is done by using digital signal processing to add extra components, including frequency-dependent phase shifts, to the sound signals to provide two outputs that nevertheless create a 3D listening effect.

JVC's system, which uses a Texas Instruments DSP chip, is known as 3D-Phonic. It converts a

Dolby Pro-Logic signal to a modified two-channel output. Sharp's Virtual Sound system uses a DSP chip to provide surround sound from conventional L and R stereo signals. It has two modes. Virtual One for music and Virtual Two for cinematic programme material: there are also three DSP settings, hall, live and dome.

These systems work reasonably well while not being as realistic as a five-channel system. The future could be with five-speaker systems that use infra-red links between the receiver/amplifier and the speakers. These have proved difficult to implement however, and have the disadvantage that each speaker system requires its own power supply.

# Satellite Notebook

Reports from  
Hugh Cocks  
Nick Beer  
Chris Watton  
Pete Haylor

## Strange Symbols

A Pace PRD900 wouldn't change channels and the front display showed strange symbols. The customer who phoned up about it seemed to be too confused to disconnect the receiver from the mains supply, so we had to call round and do it. This restored normal results. Before unplugging, I checked that it was a fairly late model and hadn't been running too hot – we didn't want a dead power supply. **H.C.**

## Pace PRD900

A "blue screen only" was the complaint with this receiver, actually a badged Grundig STR1. Pressing F then Store on the remote control unit removed the blue screen and revealed a healthy amount of snow. This increased when the IF feed from the dish was connected, but no signal could be seen on any channel. The voltage at pin 15 (tuning voltage) of the tuner was stuck at a few volts and wouldn't budge when the remote control unit was used to change channel.

To avoid wasting time, I faxed my long-term friend Sputnik who seems to enjoy fixing the nastiest faults possible with Pace receivers. His reply was: "Check if the modulator tunes (it did), if not change the Nicky chip. If this is OK, check that the tuner prescaler output (pin 18) is reaching pin 18 of the Nicky chip via C97 (10nF)."

A scope check showed that there was nothing at this pin of the Nicky chip. When I checked back to the tuner I found that the pin had never been properly fixed. Resoldering it produced good results. How it worked for so long in that condition is strange – the receiver was at least two years old.

Sputnik went on to suggest feeding an external tuning voltage to the tuner if all was o.k. up to this point, disconnecting the internal

fed via R128. If pictures are not seen, the tuner is suspect (but double check that the LNB is being powered); if they are seen, monitor the voltage at R128. The receiver's AFC should vary this. If not, Q15 or the feed from pin 16 of the Nicky chip is suspect.

Sputnik's final comments were: "Strange technical problems are very often caused by PCB cracks (and other non-technical causes). It can pay to throw the circuit diagram to one side and stare at the board for five minutes." Thanks Sputnik. **H.C.**

## Nokia 1700

The problem with this receiver was intermittent reception of encrypted channels, the screen occasionally going blank. Reception of unscrambled channels was all right. The cause of the trouble turned out to be poor contact between the decoder PCB and the pins on the main PCB. There are sixteen pins on the main PCB, arranged in two rows of eight – not unlike the Pace SS9000/9200, but with more connections.

Improving the pin contact was difficult. In the end I soldered a wire to each pin and made a direct contact to the decoder board. It was a lengthy and fiddly job, but completely successful.

The owner also asked if one of the IF input sockets could be repaired. The receiver has two Belling-Lee type sockets that are soldered to the tuner. One of them had started to come adrift. As the same problem would undoubtedly occur again, I soldered a 10cm (approximately) length of coaxial flying lead directly to the tuner input. At the other end I fitted an F plug and back-to-back connector, forming an F socket. F connectors seem to be much better for satellite IF links. **H.C.**

## Pace MRD960

This is the MAC D/D2 version of

the PRD series receiver. The owner complained that the MAC sound took a long time to come on, though the picture was OK. Reception of unscrambled PAL channels from Astra, and the scrambled ones via an external VideoCrypt decoder, was also fine. The principal MAC D2 channel received was BBC Prime, from Intelsat 601 at 27.5°W via a 1.8m dish.

The picture looked OK for MAC. I've never been a big enthusiast for MAC colour – it always looks a bit smeary with strange flesh tones. A direct comparison is possible in the evenings, when BBC World news is transmitted live on both channels: PAL wins hands down. . . Anyway, back to the point!

The displayed Bit Error Rate (BER) was very high, varying between 8 and 14. "No audio information" was the message when the remote control unit's audio button was pressed. This suggested a weak signal from the dish, but the other channels from Intelsat 601 appeared as they should. Time to retreat to the workshop. MAC faults have a habit of being nasty, and usually involve a "return to Pace" job.

When I opened up the receiver I saw that the colour of the main board around the power supply was very dark and that most of the electrolytics looked the worse for wear. I replaced all the discoloured power supply electrolytics, including the three infamous ones (C5/7/8) beside the TEA2018A chopper control chip, also two 22µF electrolytics on the MAC PCB (it sits above the main PCB, again not unlike the Pace SS9000/9200 with VideoCrypt), as they looked discoloured and sit very near one of the large, heat-producing MAC chips.

When I switched on again everything was back to normal: the BBC bit error rate was down to 0, and the sound came on.

immediately. The receiver had been sitting on a shelf, with not much air space above it. It has since been moved to improve the ventilation – the MAC models produce far more heat than the VideoCrypt ones. Where possible I try to fit heatsinks to the MAC chips to remove some of the heat: this does seem to improve reliability. I can't help wondering how digital receivers will fare in this respect. **H.C.**

### Pace PRD800

Here's one for the book. The customer had been away for three weeks and had, sensibly, unplugged this three-year old and previously trouble-free Pace PRD800 receiver during his absence. When he returned, on Saturday evening, he plugged the receiver in and found that it was dead, though there were no ominous noises.

During Sunday the household became restless because of the lack of TV. What to do? Simple answer: heat the receiver with a hairdryer until it was very hot, then connect up and switch on. Lo and behold, it worked! What must have happened was that the three notorious electrolytics C7, C8 and C5 (10, 10 and 22 $\mu$ F) beside the TEA2018A chip (U1) had been sufficiently revived by the heat and were then sustained by the receiver's self-generated warmth.

The customer rang in triumph on Monday morning to tell me the tale. As I was to pass nearby later that day, I called in to fit three new electrolytics. Always replace these power supply capacitors before carrying out any other work on a PRD receiver. The receiver may have come in because of an unrelated fault, but it will have been unplugged for a while. If you connect the set to the mains supply without replacing these electrolytics there's a strong risk that a power supply breakdown will be added to the original fault. **H.C.**

### Amstrad SRD400

There was no picture, just a blank raster. The sound was OK – though not at the customer's house, where the TV set muted the sound in the absence of video. This didn't happen with the old monitor we use in the workshop. When we traced the signal path from the tuner we soon came to a TC4053 switching chip (IC309). This was faulty, a replacement restoring the picture. **C.W.**

### Finlux SR5100

Any channel with VideoCrypt

## Pace MSS500/1000 Series Mod

For improved long-term receiver reliability the reservoir capacitors for the 14V (C12) and 5V (C11) supplies have been changed to long life/high ripple current types. It is recommended that these two capacitors are replaced whenever one of these receivers comes into the workshop. The new specifications are as follows: C11 1,500 $\mu$ F, 35V, 105°C long life/high ripple electrolytic, Pace part no. 856-1583750; C12 1,000 $\mu$ F, 35V, 105°C long life/high ripple electrolytic, Pace part no. 856-1082750. The sizes are slightly different from the originals, the new C11 being 12.5 x 40mm, the new C12 12.5 x 25mm.

encryption would, after a short time, gradually fade out and then become scrambled. We traced the cause to ripple on the supply. Replacing C172 (4,700 $\mu$ F, 25V) cured the fault. **C.W.**

### Cambridge RD480

Two huge hum bars and a loud buzz were all we got with this receiver. When we looked in the top we saw a bulging 4,700 $\mu$ F, 25V capacitor (C172). A replacement brought the receiver back to life. Mind the print – it's very thin. **C.W.**

### Pace MSS300

This satellite receiver worked fine apart from a loud whistle from the power supply – the chopper transformer to be precise. On investigation I found that one leg of R61 in the snubber network had never been inserted. It was simply sticking up in the air. I've known the isolation capacitor C62 to suffer the same fate.

A point to note is that the isolation resistor R68 is left out in later production units. The result is a floating chassis. Pace say that this is correct. A check on the insulation resistance should produce a near infinity reading instead of some 10M $\Omega$  with R68 fitted. **N.B.**

### Pace SS9200

This satellite receiver had an interesting fault. When the video signal was fed via the VideoCrypt circuit the picture was slightly distorted – it was dark and humy. The on-screen graphics were much worse: they were completely negative.

The video output buffer circuitry is a known cause of problems. One of the three transistors can fail, and indeed the PCB around one of them had a cooked appearance. Checks on the transistors suggested that they were OK however, and after replacing the one that seemed to have been overheating the fault symptoms remained as before. A check on D20, which sets the biasing for the stage, then showed that it had a curious characteristic for a 5-1V zener diode – it zenered

at around 6.5V! A replacement restored correct circuit operation. Out of interest we checked the diode with a curve tracer, which suggested that it was open-circuit! **N.B.**

### Ferguson SRV1

There was no vision with any signal that was passed to the VideoCrypt decoder PCB. Scope checks soon led us to the BC638 buffer transistor Q6 on the decoder board. It was open-circuit base-to-emitter. **N.B.**

### Ladder Work

The recent cold weather was just right for a bit of outside ladder work! Every job we had seemed to call for a stint on the ladders. My first job one cold and frosty morning was to use the hammer to free the ladder clamps on the roof of the van, so that the ladders could be used. . . This done, I ventured up to a roof to replace an LNB installed by someone else who, when the system failed, had disappeared. So muggins was called in.

There was no signal at the receiver, which was providing the correct LNB supply. So the LNB was suspected. After replacing it and thawing out I was greeted with the same symptoms as before! Back to the roof, to carry out a check on the feeder over its whole length. This brought to light a coupling in the gutter. It had been covered with moss to hide it. When I removed it I found that the water had rotted the centre core. Cause of fault found! After fitting a new length of cable I replaced the original LNB. Tests showed that everything was now OK.

Another outside fault. This time water was getting into the taped-up LNB connector because it was fitted with the feeder pointing upwards, taped to the pole on the T and K brackets. . .

But the best job of the week was a call because of an "intermittent and rolling picture". A check on the F connector showed that it was loose. Every time someone crossed the room the picture went! A quick F connector tighten up and I was on my way. **P.H.**

15.80H	3.83	ZSC2073	0.77	ZSD639	0.60	BC2528	0.07	BF470	0.33	BY399	0.11	HA13119	2.05	MJE18004	1.80	STK7358	5.81	TA1519A	2.74	TD48178FS	3.81
1N4001	0.04	ZSC2078	0.86	ZSD667	0.38	BC258	0.09	BF493	0.36	BY014	0.26	HA13403	3.59	MJE2955	0.88	STR4090	6.28	TA1520B	2.48	TD48180	4.87
1N4002	0.07	ZSC2120	0.23	ZSD669A	0.64	BC300	0.48	BF494	0.43	BY03D	0.43	HA1377	7.52	MJE2955T	0.88	STR4211	12.63	TA1521	3.36	TD48190	2.81
1N4003	0.05	ZSC2166	1.29	ZSD716	1.46	BC301	0.28	BF757	0.12	BY03J1	0.27	HA51338SP3	2.69	MJE3055	0.52	STR441	28.40	TA1524A	1.88	TD48305	7.21
1N4004	0.07	ZSC2229	0.28	ZSD718	2.21	BC303	0.24	BF758	0.32	BY03M	0.21	HM6232	10.46	MJE3055T	0.74	STR451	23.50	TA1530	4.79	TD48380	2.53
1N4005	0.00	ZSC2230	1.66	ZSD734	0.26	BC307	0.06	BF759	0.38	BY10-40	2.55	HM6251	9.57	MJE340	0.50	STR50020	9.02	TA1554Q	0.12	TD49303	2.13
1N4006	0.06	ZSC2235	0.35	ZSD762	1.80	BC307B	0.14	BF760	0.26	BY195B	0.19	JOB	0.00	MN650	5.98	STR50103	4.10	TA16700A	2.80	TEA1014	1.87
1N4007	0.06	ZSC2236	0.36	ZSD820	5.06	BC307C	0.15	BF762	0.30	BY195C	0.21	KAZ205	1.32	MPS406	0.35	STR54041	4.36	TA1675A	3.85	TEA1039	2.14
1N4118	0.06	ZSC2240	0.16	ZSD837B	1.12	BC308	0.06	BF788	0.52	BY1960	0.27	KAZ223	0.60	MPS442	0.23	STR5412	3.68	TA1701	2.65	TEA2018A	1.70
1N5061	0.00	ZSC2271	0.67	ZSD856	1.03	BC308A	0.09	BF869	0.25	BY1965	0.21	KAZ263	0.55	MPS443	0.15	STR58041	6.41	TA1770A	30.29	TEA2029C	5.69
1N5062	0.01	ZSC2274	0.35	ZSD863	0.35	BC308C	0.06	BF870	0.29	BY1969	0.65	KAB301	1.46	MPS455	0.26	STR59041	6.67	TA1872A	4.83	TEA2031A	3.40
1N5400	0.07	ZSC2314	0.38	ZSD869	5.18	BC309	0.04	BF871	0.41	BY196E	0.94	KBL08	1.42	MPS456	0.12	STR6020	5.38	TA1905	2.12	TEA2164	2.96
1N5401	0.14	ZSC2335	1.12	ZSD870	3.81	BC309C	0.10	BF872	0.18	BY195500	0.23	KAG210AH	6.15	MPS492	0.18	STR620KIT	15.05	TA1908A	2.14	TEA2165	4.27
1N5402	0.12	ZSC2458	0.14	ZSD871	5.08	BC327	0.14	BF873	0.10	BY1960	0.30	KR2001	0.14	MR854	0.65	STR4420	11.16	TA1950	1.86	TEA2165A	9.58
1N5404	0.13	ZSC2482	0.35	ZSD880	0.36	BC327B	0.17	BF876	0.26	BZT03C120	0.62	KSR1004	0.14	MR855	0.11	T6064V	2.63	TA2002	1.12	TEA5101A	3.95
1N5406	0.12	ZSC2525A	0.30	ZSD882	0.43	BC328	0.07	BF877	0.30	BZV10	1.34	KSR2001	0.14	NE545B	3.20	T6076V	5.94	TA2003	0.90	TEA5115	2.91
1N5408	0.09	ZSC2548	3.08	ZSD898B	6.41	BC337	0.14	BF970	0.12	BZV8C5V1	0.15	KSR2004	0.14	NE555A	0.40	T6093V	5.04	TA2004	2.57	TC1060	0.82
1N914	0.04	ZSC2603	0.25	ZSD965	0.67	BC337L	0.22	BF970A	0.06	BFR34A	0.78	BZV110	0.19	NE555B	0.43	T9052V	5.84	TA2005	1.63	TC1065	0.75
2N2222	0.22	ZSC2625	2.94	ZSD973	0.38	BC338	0.06	BFR90	0.59	BFR90A	0.59	BZV112	0.02	NE592N	1.91	T9062V	1.51	TA2006	1.05	TC225M	1.02
2N2222A	0.22	ZSC2655	0.31	ZSD115	7.69	BC338A	0.11	BFR90A	0.68	BZV1120	0.09	LA1503	1.25	NE646N	4.45	TA7109AP	3.23	TA2006	1.05	TC225M	1.02
2N2369A	0.18	ZSC2705	0.22	ZSK1117	3.06	BC339	0.17	BFR91	0.60	BZV113	0.11	LA4261	2.73	OA200	0.22	TA7205AP	1.68	TA2030H	0.74	TC2260	0.68
2N2907	0.20	ZSC2724	0.19	ZSK192A	0.36	BC372	0.43	BFR91A	0.92	BZV120	0.19	LA4270	2.29	OA90	5.23	TA7217AP	1.46	TA2030V	0.74	TC2260	1.95
2N3053	0.38	ZSC2979	2.74	ZSK794	6.41	BC461	0.31	BFR96	0.55	BZV127	0.19	LA4282	8.89	OC71	1.03	TA7222P	1.28	TA2040H	2.11	TL111	9.64
2N3055	0.50	ZSC3117	0.60	ZSK878	2.57	BC517	0.14	BFY51	0.39	BZV133	0.19	LA4422	1.36	PS00A	0.33	TA7227P	2.29	TA2170	7.08	TL110	0.36
2N3440	0.35	ZSC3153	2.40	ZLS247	0.62	BC546A	0.07	BR100	0.21	BZV156	0.07	LA4440	2.88	PC814	1.29	TA7233P	1.97	TA2270	2.45	TP112H	0.95
2N3442	1.00	ZSC3156	5.61	ZM705	0.78	BC546B	0.12	BR103	0.53	BZV162	0.11	LA4445	2.98	PC1605XTSO	6.51	TA7240P	2.74	TA2540	1.12	TP121	0.42
2N3707	0.12	ZSC3179	0.82	ZM806	0.60	BC547	0.11	BR303	1.22	BZV175	0.09	LA4460	2.31	R2M	0.67	TA7250	4.07	TA2541	0.72	TP127	0.47
2N3773	0.34	ZSC3182	2.49	ZM808	0.72	BC547A	0.04	BR444	1.02	BZV182	0.19	LA4465	2.11	R4050	3.04	TA7250P	3.74	TA2576A	5.35	TP132	0.65
2N3819	0.55	ZSC3199	0.43	ZM809	0.69	BC547B	0.11	BR449	0.43	BZV191	0.09	LA4475	2.99	R4051	4.80	TA7270P	1.59	TA2577A	2.99	TP137	0.48
2N3904	0.32	ZSC3225	0.60	ZM812	0.52	BC548A	0.11	BR555	1.20	BZV192	0.10	LA4476	2.99	R8156	2.40	TA7271P	11.33	TA2578A	2.91	TP2955	0.94
2N3905	0.00	ZSC3242	0.19	ZM815	0.82	BC548B	0.06	BR556	0.46	BZV195	0.09	LA4478	2.77	RC4558	0.48	TA7273P	3.10	TA2579A	4.10	TP2955	0.31
2N4123	0.30	ZSC3310	2.12	ZM805	0.35	BC548C	0.06	BR559	0.75	BZV195	0.17	LA4480	4.27	REG8ABY10	17.56	TA7274P	2.74	TA2581Q	4.27	TP2955	0.47
2N5296	0.69	ZSC3311	0.29	ZM805	0.35	BC549B	0.11	BS338	1.77	BZV199	0.11	LA6358S	0.60	RGP106	0.26	TA7280P	2.74	TA2581Q	2.89	TP3055	0.94
2SA1013	0.35	ZSC3330	0.22	ZM805	0.35	BC550	0.15	BT139600	1.29	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1015	0.11	ZSC3355	0.86	ZM805	0.82	BC550C	0.09	BT151500R	1.44	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1015GR	0.11	ZSC3355	0.86	AA119	0.36	BC556A	0.06	BT151800	1.15	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1016	0.26	ZSC3428	0.55	AA143	0.13	BC557	0.05	BU1610	1.43	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1020	0.44	ZSC3423	0.80	AC127	0.52	BC557A	0.15	BU205	1.07	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1029	0.26	ZSC3502	0.45	AC151	0.32	BC557B	0.06	BU208A	1.44	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1046	0.19	ZSC3565	0.18	AC153K	0.40	BC558B	0.08	BU208AT	1.25	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1286	0.60	ZSC3579	4.45	AC187X	0.53	BC560C	0.06	BU208AT	1.25	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1370	0.43	ZSC3788	0.77	AC188	0.40	BC635	0.19	BU208AT	1.25	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1489	2.40	ZSC3795	1.97	AC188K	0.82	BC636	0.14	BU208AT	1.25	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA1706	0.52	ZSC3795B	2.63	AD149	0.52	BC637	0.11	BU406	0.69	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA562	0.17	ZSC3807	0.84	AF124	1.75	BC639	0.09	BU406D	0.92	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA564	0.33	ZSC3883	5.92	AF125	0.82	BC640	0.06	BU407	0.56	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA608	0.24	ZSC3892A	4.78	AF126	2.23	BC649	0.40	BU4170	0.58	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA673	0.12	ZSC3953	0.72	AF127	0.77	BCY71	0.27	BU425A	1.03	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA684	0.43	ZSC4106	2.05	AF139	0.29	BD131	0.26	BU426A	1.01	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA733	0.12	ZSC4242	2.31	AN5265	1.76	BD132	0.26	BU426A	1.01	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA769	1.29	ZSC4517	4.70	AN5435	1.46	BD135	0.33	BU5050F	1.35	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA844	0.26	ZSC4517A	2.52	AN5512	1.01	BD136	0.20	BU508A	0.95	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA872	0.35	ZSC4558	0.12	AN5515	1.29	BD137	0.46	BU508AF	1.08	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA872A	0.35	ZSC4742	4.70	AN5521	1.66	BD139	0.18	BU508APH	1.99	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA916	0.57	ZSC536	0.30	AN6610	0.94	BD140	0.24	BU508D	1.32	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA933	1.00	ZSC639	0.56	AN7161N	3.47	BD203	0.47	BU508D	1.32	BZV206	0.10	LA6510	2.94	RGP15G	0.34	TA7281P	2.80	TA2582	2.05	TP305C	0.17
2SA940	0.82	ZSC710	0.12	AN7171N	4.74	BD232	0.42	BU508DF	1.46	BZV206	0.10										

# TELEVISION

## TV/VCR SPARES GUIDE SPRING 1996

The following list gives spares department addresses and telephone numbers or, where these are the same, service department or head office addresses and telephone numbers. Also included are details of various spares distributors.

**Aiwa** UK Ltd., P.O. Box 443, West Drayton, Middx UB7 0NZ.  
**0181-899 5820 or 5838**  
Fax 0181-899 0055.  
See also CPC and Willow Vale.

**Akai** UK Ltd., Haslemere Heathrow Estate, 12 Silver Jubilee Way, Parkway, Hounslow, Middx TW4 6NQ.  
**0181-897 6388**  
Fax 0181-759 6118.  
See also CPC, Wizard and Chas Hyde.

**Akura**. Spares available from Akura Components Ltd., 44 Deerdykes View, Westfield, Cumbernauld, Glasgow G68 9HW.  
**01236-457 022**  
Fax 01236-457 053.

**Alba** Radio Ltd., 12 Thames Road, Barking, Essex IG11 0HZ. Spares for Alba, Bush, some Goodmans and Hinari models and some Brother microwave.  
**0181-787 3000**  
Fax 0181-787 3110  
See also Willow Vale, CPC, Wizard.

**Ambassador**. Brand name used by Sentra Electronics.

**Amstrad**. Spares handled by CPC Ltd. See also Chas Hyde & Son Ltd., Willow Vale and Wizard.

**Autovox**. See Comet Group plc.

**Beko** (UK) Ltd., 40 Caxton Way, Watford Business Park, Watford, Herts WD1 8QZ.  
**01923-818 121**  
Fax 01923-819 652/3.

**Beon Corporation**, 6-10 Badenheath Place, Westfield Industrial Estate, Cumbernauld, Glasgow G68 9HX.  
**01236-728 845**  
Fax 01236-738 477.

**Beovision/Beocord**. Bang and Olufsen UK Ltd., Unit 630, Wharfedale Road, Winnersh, Wokingham, Berks RG41 5TP.  
**01734-692 288**  
Fax 01734-694 477.  
See also CPC.

**Binatone** Electronics plc., Binatone House, 1 Beresford Avenue, Wembley, Middx HA0 1YX.  
**0181-903 5211**  
Fax 0181-903 5521. Trade only.

**Blair's** Electrical Services, 13 Belgrave Road, Dresden, Stoke-on-Trent ST3 4PR.  
**01782-599 377**  
Fax 01782-599 378.

**Blaupunkt**. Merrivale Television Services, 1 Lockside, Totbank Road, Oldbury, Warley, W. Midlands B69 4NS.  
**0121-544 6250**  
Fax 0121-552 1503.

**BPL**. Spares for these TV sets available from Falmouth Hi Fi, 14 Market Strand, Falmouth, Cornwall TR11 3DE.  
**01326-313 412**  
Fax 01326-211 210.

**Bush**. See Alba Radio Ltd. Also CPC, HRS and Willow Vale.

**Cambridge**. Spares available from SEME.

**Canon** UK Ltd., Photo Division, Brent Trading Centre, North Circular Road, Neasdon, London NW10 0JF.  
**0181-459 1266**  
Fax 0181-459 4202.  
See also CPC.

**Cathay**. Spares available from Diamond Television.

**Commodore**. Spares available from CPC.

**Comet** Group plc., Service Dept., Unit 5, City Park Ind. Estate, Gelderd Road, Leeds LS12 6DR.  
**01132-311 024**  
Fax 01132-311 463.

**Connexions** UK plc., Unit 3, Travellers Close, Travellers Lane, Welham Green, Herts AL9 7LE.  
**01707-272 091**  
Fax 01707-269 444.

**Contec** CTVs sold by Dixons. Spares available from Partmaster.

**CPC** Ltd., Component House, Faraday Drive, Fulwood, Preston, Lancs PR2 4PP.  
**01772-654 455**  
Fax 01772-654 466.

Authorised spares distributor for Aiwa, Alba, Amstrad, Bush, Citizen, Commodore, Ferguson, Fidelity, Finlux, GEC, GoldStar, Goodmans, Hinari, Ingersoll, ITT, Logic, Luxor, Matsui, Nokia, Orion, Osume, Pace, Philips, Pye, Saisho, Salora, Samsung, Sinclair, Skantic, Sony, Toshiba and Triumph.

Compatible spares available (video certain models only) for Akai, Bang and Olufsen, Canon, Crown, Daewoo, Decca, Dual, Funai, Grundig, Hantarex, Hitachi, JVC, Kenwood, Marantz, Mitsubishi, NEC, Nikkai, Panasonic, Pioneer, Questar, Sansui, Schneider, Sentra, Sharp, Solavox, Tashiko, Tatung and Telefunken.

**Crown Corporation** Spares available from Key Electronics. See also CPC and HRS.

**Daewoo** Electronic Sales UK Ltd., Unit 640, Wharfedale Road, Winnersh Triangle, Wokingham, Berks RG41 5TP.  
**01734-272 272**  
Fax 01734-699 000.  
**Note:** Daewoo brand products only, not OEM products. For the latter, refer to the original distributor.  
See also CPC and Willow Vale.

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CPC, Faraday Drive,  
Fulwood, Preston, Lancashire.

**Dainishi.** Spares available from Eurotronic, 24 Medway Parade, Perivale, Middx UB6 8HR.  
**0181-998 1531.**

**Dansai** TV and Video spares available from NEI.

**Decca.** See Tatung (UK) Ltd., CPC and Wizard Distributors. Spares for chassis up to and including the 110/115 series available from D&S Electronic Services, Building 15, Unit 4, Stanmore Industrial Estate, Bridgnorth, Salop WV15 5HR.  
**01746-766 641**  
Fax 01746-766 641.

**Definition.** Spares available from Wilts Grove Ltd.

**Denon.** Hayden Laboratories Ltd., Hayden House, Chiltern Hill, Chalfont St Peter, Gerrards Cross, Bucks SL9 9UG.  
**01753-888 447**  
Fax 01753-880 109.

**Diamond Television**  
15a Rodbourne Road,  
Rodbourne, Swindon, SN2 2AG.  
Spares for Cathay and Venturer products. Murphy TVs with model numbers starting CTV, the Murphy VCR7101, Sansui SV77 VCR and Osaki VCR31/2/3 plus mechanical parts for the VCR35, also spares for the Venturer audio range.  
**01793-497 591**  
Fax 01793-431 687.

**Dynatron.** Pre 1981 sets see Philips Service, post 1981 sets spares from SEME.

**Elftone** Electronics Ltd., 4 Beresford Avenue, Wembley, Middx HA0 1YZ  
**0181-902 6222**  
Fax 0181-903 501 F.

**Etron.** Brand name used by Nikkai Imports Ltd.

**Expert.** Sets use Tatung, GEC, or Luxor chassis.

**Ferguson** Ltd., Service Division, Crown Road, Enfield, Middx EN1 1DZ.  
**0181-344 4412**  
Fax 0181-344 4452.  
See also CPC, HRS, Chas Hyde, SEME, Willow Vale and Wizard.

**Fidelity.** Spares available from

SEME, HRS, CPC, Wizard and Willow Vale.

**Finlux.** Spares available from NCS and CPC.

**Finlandia.** Spares available from Granada Rental Services.

**Fisher.** Spares available from Sanyo UK Sales Ltd., Sanyo House, Otterspool Way, Watford, Herts.  
**01923-222 244**  
Fax 01923-818 251.  
See also Chas Hyde.

**Fujitsu General,** 154 Great North Road, Birchwood Industrial Estate, Hatfield, Herts AL9 5JN  
**01707-272 841**  
Fax 01707-273 111.

**GEC.** Spares available from CPC, HRS, SEME and Willow Vale.

**General.** See Fujitsu General

**GoldStar.** LG Electronics UK Ltd., LG House, 264 Bath Road, Slough SL1 4DT.  
**01753-691 888**  
Fax 01753-693 061.  
See also CPC, and Willow Vale.

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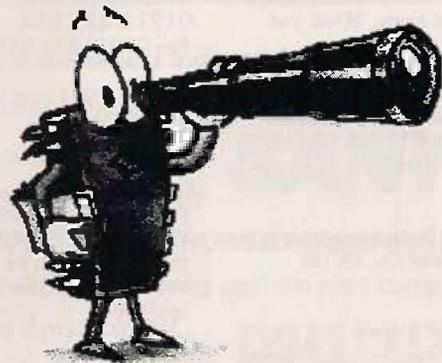
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Fax 01276-600 521.  
Trade only. See also CPC, HRS, Chas Hyde, Willow Vale and Wizard.

**Trical.** Brand name used by Hinari Consumer Products Ltd.

**Trio-Kenwood** (UK) Ltd., Kenwood House, Dwight Road, Watford, Herts WD1 8EB.  
**01923-816 444**  
Fax 01923-819 133.  
See also CPC.

**Triumph.** Brand name used by Currys. See Partmaster, CPC.

**Ultra.** See Ferguson Ltd.

**Uniden.** Eurosat Distribution Ltd., Oxgate Lane, London NW2 7JA.  
**0181-452 6699**  
Fax 0181-452 6777.

**Venturer.** Audio spares available from Diamond Television.

**Willow Vale** Electronics Ltd., 11 Arkwright Road, Reading Berks RG2 0LU.

**01734-876 444**  
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**0161-682 1415**  
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**Wiltsgrove Ltd.,** 28-29 River Street, Digbeth, Birmingham B5 5SA.

**0121-772 2733**  
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**Wizard** Distributors, Empress Mill, Empress Street, Manchester M16 9EN.

**0161-872 5438** or **0161-848 0060**  
Fax 0161-873 7365.  
Spares stocked include Akai, Alba, Amstrad, Decca, Ferguson, Fidelity, Grundig Satellite, Hitachi, IIT, Loewe, Matsui, Mitsubishi, Nikkai, Pace, Philips, Pye, Saisho, Samsung, Schneider, Sentra, Sharp, Sony, Tatung, Toshiba. Trade only.

## General/miscellaneous parts suppliers

**AZ Electronics,** 18 Brookwood Rd, Southfields, London SW18 5BP.  
**0181 877 3492**  
Fax 0181 877 3518.

**Economic Devices,** 32 Temple Street, Wolverhampton WV2 4AN.  
**01902-773 122**  
Fax 01902-29 052.

**East London Components,** 63 Plashet Grove, East Ham, London E6 1AD.  
**0181-472 4871**  
Fax 0181-503 5926.

**Electromail,** PO Box 33, Corby, Northants NN17 9EL.  
**01536-204 555**  
Fax 01536-405 555.

**Electronic Workshop Distributors,** 101 Rocky Lane, Tuebrook, Liverpool L6 4BB.  
**0151-260 4825.**

**Electrovalue Ltd.,** Unit 3, Central Trading Estate, Staines, Middx. TW18 4UX.  
**01784-442 253.**  
Fax 01784-460 320.  
Northern branch  
680 Burnage Lane, Manchester M19 1NA.  
**0161-432 4945**  
Fax 0161-432 4127.

**Express TV Supplies,** The Mill, Mill Lane, Rugeley, Staffs WS15 2JW.  
**01889-577 600**  
Fax 01889-575 600.

**Farnell Electronic Components** Canal Road, Leeds LS12 2TU.  
**01132-636 311**  
Fax 01132-633 411.

**Grandata Ltd.,** KP House, Unit 15, Pop In Commercial Centre, Southway, Wembley, Middx HA9 0HB.  
**0181-900 2329**  
Fax 0181-903 6126.

**J.W. Hardy,** 231 Station Road, Stechford, Birmingham B33 8BB.  
**0121-784 8478**  
Fax 0121-789 7931.

**Harrison Electronics,** Century Way, March, Cambs PE15 8QW.  
**01354-51 289**  
Fax 01354-51 416.

**Irwin Electronics,** Unit 200, JC Albyn Complex, Burton Road, Sheffield S3 8BX.  
**0114-273 9622**  
Fax 0114-275 9909.

**JJ Components,** 63 The Chase, Edgware, Middx HA8 5DN.  
**0181-952 4641**  
Freefax 0800 318 498.

**KSA Wholesale Components** 582 Green Lane, Small Heath, Birmingham B9 5QG.  
**0121-772 2834**  
Fax 0121-772 7487

**LRC (Spares),** 3-5 Whitfield Street, London W1P 5RA.  
**0171-323 2107**  
Fax 0171-323 2191

**Manor Supplies,** 172 West End Lane, London NW6 1SD.  
**0171-794 8751/7346**  
Fax 0171-431 5778.

**Marapet Electronic Components,** 1 Hornbeam Mews, Gloucester GL2 0UE.  
**01452-532 253.**

**MPS Electronics,** PO Box 777, Rayleigh, Essex SS6 8LU.  
**01702-554 171**  
Fax 01702-553 935.

**Nikko Electronics,** Dalbani House, 257 Burlington Road,

New Malden, Surrey KT3 4NE.  
**0181-336 0566**  
Fax 0181-336 0579.

**Philex PLC,** 110-124 The Broadway, West Hendon, London NW9 7PP.  
**0181-202 1919**  
Fax 0181-202 0015.

**PV Tubes** 104 Abbey Street, Accrington, Lancs BB5 1EE.  
**01254-236 521/390 936**  
Fax 01254-395 361.

**RS Components** PO Box 99, Corby, Northants NN17 9RS.  
**01536-201 201**  
Fax 01536-201 501.

**TW Electronics (Newbury) Ltd.,** Beacon House, Harts Lane, Burghclere, Newbury, Berks RG20 9JZ.  
**01635-278 678**  
Fax 01635-278 266.

**Vista Electronics,** Unit 1B, Wingate Grange Industrial Estate, Wingate, Co. Durham TS28 5AH.  
Tubes: **01429-837 100**  
Components: **01429-838 057**  
Fax 01429-837 101.

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# TV Fault Finding

Reports from  
 Philip Blundell, AMIEEIE  
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## Philips G90AE Chassis

"Drifts off tune" it said on the job card. On test, no channels were tuned in. When retuning was tried a station was found but was lost again as soon as it was stored. A scope connected to the tuning PWM signal showed that it changed at the instant the store button was pressed, indicating that data was not being stored. A new X2402 EEPROM put matters right. P.B.

## Grundig Cinema 9050

The EHT splitter had arced over. When this had been replaced there was sound but no picture. The cause of this was soon tracked down to a faulty TMS3743 chip on the tuning module: pin 5 was stuck at 2V when it should have been at 0V for a picture.

A new chip produced a picture, but with unlocked colour running through it. The TDA3510 colour decoder chip had died. After replacing this the picture was OK and it was time to try teletext. Oh dear! Just a blank screen with an unlocked "P100" to see. Substitution checks proved that the cause of this was the SAA5020 chip.

All that was needed to complete the repair was to clean the mirrors and set up the convergence. Remember convergence?! P.B.

## Grundig ST72-760/9DPL (CUC7861 Chassis)

This Dolby Pro-Logic set came along from another dealer. The fault symptoms were as follows: poor field – there were striations at the top of the screen; the set wouldn't tune in – unless the fine tuning was set at maximum; and when a station was found there was no colour in the picture, which looked smeary. Could there be a common cause?

## Philips G110 Chassis

This set was dead apart from a buzzing sound that came from the power supply. We disconnected the HT feed to the line output stage – by pulling out the scan coil plug – and connected a dummy load in its place. This proved that the cause of the trouble was in the line output stage rather than the power supply.

No shorts could be detected with the scan coil plug removed: when the plug was refitted, a short appeared across the line output transistor. The scan coil coupling/S-correction capacitor C2550 was short-circuit. P.B.

All became clear when the tuning voltage was measured. There was only 20V instead of 30V at pin 1 of the tuner. The tuning voltage is obtained from the 45V supply via R337, but this supply was low as well. It's also used by the field timebase and the IF stages. The 45V supply is derived from the line output transformer, D551 being the rectifier. A check here showed that its cathode voltage was low. There's a 2.2Ω safety resistor (R552) in the AC feed to D551, but a resistance check seemed to show that it was OK. So why was the 45V supply low?

This model is fitted with a Toshiba tube and a dynamic focusing module. These additions place a parallel path across R552. Disconnecting plug DF removes the parallel path – and proved that R552 was in fact open-circuit. For the record, pin 1 of plug DF on the mother board connects with pin 4 of plug DF on the dynamic focusing board, i.e. the cable crosses over. It's a general rule with Grundig circuits that interconnecting cables cross over, with the lowest number being connected to the highest etc.

A new 2.2Ω safety resistor and a retune (isn't automatic tuning wonderful?!) brought back the picture. The sound side of the receiver worked, apart from the fact that only weak sound came from the bass speaker in the back cover. A fault tracing session with the signal generator brought us to chip transistor CT4140 (BC849C) which was open-circuit. P.B.

## Panasonic Alpha 3 Chassis

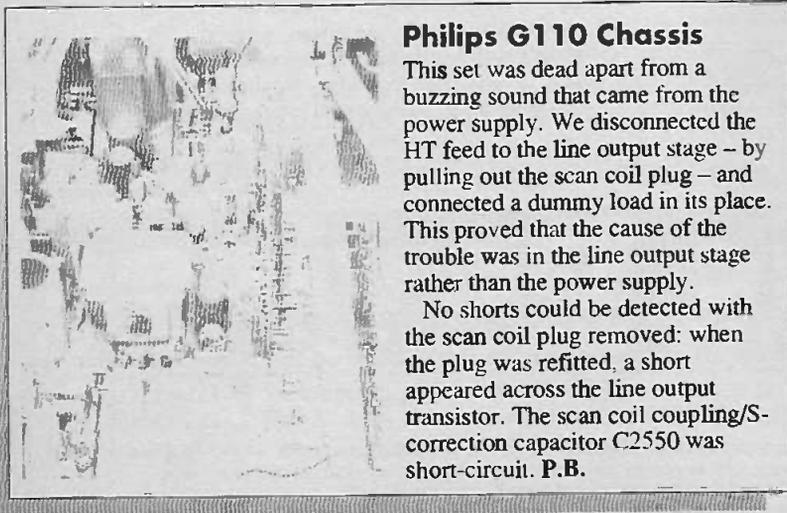
This set would become dead very intermittently. In the fault condition the standby LED glowed but nothing else happened. It took many weeks of soak testing before we discovered that C1251, which decouples the reset line to the main microcontroller chip IC1213, was leaky. As a meter check on the capacitor produced a reading of 700Ω, it was understandable why the set was sometimes inoperative. This capacitor was one of those infamous 10nF, 50V ceramic ones that earned a deserved reputation as prime suspects a few years ago. B.S.

## Panasonic Alpha 2 Chassis

No line or field sync from cold was the complaint with this set. But when the back was removed everything returned to normal. Eventually, after many days of cold starts, we declared C3550 on the text panel to be faulty. A new 1μF, non-polarised capacitor cleared the fault. B.S.

## Panasonic Euro 1 Chassis

This digital chassis would intermittently produce a light raster with no sync – but never with the back off! After



some inspired guesswork I decided to replace the SAD2140 video AD converter chip IC1601. Fortunately this solved the problem. **B.S.**

### Panasonic Alpha 2 Chassis

For the first few seconds of each day this set behaved as though its tuner unit was faulty. The picture would come on all snowy, but very soon there would be a quick flash and the selected programme would appear. During the first few days that we had this set on test the tuner unit proved to be OK, as did IC171 which generates the tuning voltage. Over the course of a further few days we tried all the capacitors in this area, one by one. The culprit turned out to be C15. A replacement 2.2 $\mu$ F capacitor restored normal operation. **B.S.**

### Panasonic Euro 1 Chassis

Intermittent loss of colour was the complaint with this digital set. So it came as no surprise when, after about an hour, the colour disappeared completely. By going into Service Mode One I was able to discover that the colour VCO adjustment couldn't be pulled in. As a first guess as to the cause, I decided to replace the PAL master oscillator crystal X1656. Fortunately this cured the problem. **B.S.**

### Tatung 160 Series Chassis

As these receivers age, internal failure of the SAW filter in the IF strip has become an increasing problem. The symptom, either permanent or intermittent, is a ghosting effect, the spurious image being displaced about 1cm (with a 20in. tube) to the right of the main one. **E.T.**

### Tatung B Series Chassis

Some of the sets fitted with this chassis emit a 'line whistle' similar to that you sometimes get from a line linearity coil or output transformer. You'll search in vain amongst the inductors however. What's required is a modification. Add a 220pF capacitor between pin 5 and (floating) pin 6 of optocoupler IC802 in the power supply. **E.T.**

### Bush 2114T

This set was dead because the power supply had supplied too much power to the rest of the set – the HT voltage was at around 150V. The basic cause of the trouble was a duff capacitor, C818 (1 $\mu$ F, 63V), which is part of the power supply feedback system. This is in fact quite a common fault, but further troubles were being caused by IC301 (TDA3563), IC601 (TDA2006), R607 (10 $\Omega$ ), C806 (1,000 $\mu$ F, 25V) and C808 (1,000 $\mu$ F).

When the set eventually came on the display showed 6.6. We found that the SAA1293A-03 tuning/remote control decoder chip and the three-pin supply regulator IC5 were faulty. **C.W.**

### Bush 1452T

If you get one of these sets with a blown power supply, you will probably find one or two capacitors with lifted lids. After replacing them, make sure that C911 has its negative end connected to the base of the chopper transistor. It's sometimes fitted the wrong way round during manufacture, or the panel may be incorrectly marked. It is also wise to uprate it to 63V. **C.W.**

### Salora 22L37

The complaint with this set was no signals. We discovered that the TDA4505 IF chip was switched off



### Hitachi CPT2176 (G6P Chassis)

There was no audible whistle from the power supply in this dead set, which indicated a power supply rather than a line output stage fault – a squealing power supply is usually caused by something amiss in the line output stage. A few cold checks soon showed that D902 (ES1A) was short-circuit. A replacement cured this one. **C.W.**

as pin 19, the muting input, was low. The cause of this state of affairs was RB135 (330k $\Omega$ ) which was open-circuit. For good measure we replaced its 1 $\mu$ F decoupler CB131 as well. We then had 6V at pin 19 to switch the TDA4505 chip back on. **C.W.**

### Hitachi C2118T (G7PS Chassis)

This set was dead though there was 320V on the primary side of the power supply. Experience has shown that R903 and R902 (both 82k $\Omega$ ) can be the cause of various faults, so these were replaced. The set was now in standby and no function would get it started. Further checks in the power supply brought me to the 130V zener diode ZD903, which was short-circuit. A replacement restored normal operation. I wonder which item went first? **C.W.**

### ITT TX3835 (Compact 80R Chassis)

This set would run for hours, then the sound and picture would be lost for about half a second. In the fault condition the standby light came on and the display went out. Then the picture returned. After a while the fault would recur. Close monitoring showed that in the fault condition the HT was still present and the line output stage remained in operation. The culprit turned out to be the 5V regulator IC05 on the customer control panel. **C.W.**

### Tatung 145 Chassis

This set, which was actually a Finlux 1014M, was sometimes reluctant to start. Once it was up and running it never failed. We replaced all the diodes and electrolytics in the power supply before we found that R816 (100 $\Omega$ , 1W) was intermittent. **C.W.**

### Finlux 3021F

The usual cause of a concave picture is D28 on the power supply/line output panel. But in this case the TIP41A EW diode modulator driver transistor TK4 was open-circuit. I'm sure that the cause of its failure was the loose mounting screw, which meant that it wasn't held in proper contact with the heatsink. **C.W.**

### Philips GR1-AX Chassis

This dead set had all the stock faults in one go: D6613 (15V zener), D6610 (10V zener) and D6644 (1N4148) were all leaky and the line output transistor was short-circuit. Once the power side of the set was working properly there was a green screen with all sorts of on-screen displays. The TMP47C4323559 microcontroller chip was also duff. **C.W.**

### Bush 1452T

If you find that the 5.6 $\Omega$ , 3W surge limiter resistor R425 is open-circuit, check the 12V zener diode

ZD402 as well. The cause of the failure may be high or intermittently high HT, so replace C911 (47 $\mu$ F, 25V) and possibly the 9.1V zener diode ZD902. See also note about C911 (polarity and rating) in another fault report. C.W.

### Toshiba 2939DB

Because circuit protector ZP82 was open-circuit there was no 18V supply and the set was stuck in standby. ZP82 had failed because the TA8211AH Surround sound output chip ICS01 was faulty. Part nos. are 23144450 for ZP82, B0376856 for ICS01. T.A.

### Hitachi C2564TN (G10 Chassis)

If one of these sets is tripping, check fuse F902 (630mA) on the line output panel. Failure of this fuse will result in the protection circuit operating. Check for dry-joints in the line output stage, the power supply and at the joint which earths the heatsink of IC800 on the tube's base panel when F902 has failed. T.A.

### Sony KVX2962U (AE2 Chassis)

This set suffered from what appeared to be field roll. Scope checks at board M showed that noise was present on the field pulse that goes from pin 9 of the TDA2595/V9 chip IC501 to the digital timebase chip. As a result the latter was operating in the 60Hz mode. Replacing IC501 cured the fault – part no. is 8-759-513-48. T.A.

### Sanyo CBP2180

This set was stuck in standby. If the remote control unit's standby button was pressed the standby light would go off then come back on again a few seconds later. During this time all the supplies except the 12V line came up. The reason for the failure of the 12V supply to appear was that the 78M12 regulator IC552 had gone open-circuit. T.A.

### Hitachi CPT2656 (Salora K Chassis)

This set was o.k. in standby, but died when any attempt was made to switch it on. Checks in the line output stage showed that DB506 (BY228), one of the diodes in the EW modulator circuit, was leaky. T.A.

### Panasonic Z4 Chassis

There was no sound and the picture had shifted over to one side, the H-centre control R509 having no effect. The cause of these problems was traced to C503, which decouples the horizontal centring voltage. It's a

10nF disc ceramic capacitor and had developed a 1.2k $\Omega$  leak. T.A.

### Sony KVA2542U (AE2B Chassis)

It was not possible to change channels once this set had warmed up. When a different one was selected the picture and on-screen display would change to the new station, but after a few seconds the set would revert to the previous channel. The cause of this peculiar fault was the X24C16P memory chip IC072 – part no. 8-759-073-14. T.A.

### Philips 14GR1221 (GR1-AX Chassis)

This remote-control set wouldn't come out of standby. We found that C2631 (22nF), which decouples the base of the standby switching transistor Tr7631, was leaky. As a result the voltage at this point was low. T.A.

### Sony KVX2162U (AE2 Chassis)

There was no sound. Checks in the power supply revealed that R627 (27 $\Omega$  fusible) was burnt. After fitting a replacement there was sound from both channels, but it was distorted and the  $\pm$ 22V supplies were uneven. The cause of this was the TDA2052 chip IC261, which is one of the audio output i.c.s. It was drawing excessive current from the +22V supply. A replacement restored correct sound – part no. 8-759-072-099. T.A.

### Ferguson TX100 Chassis

Lack of width, about two inches at either side of the screen, was the problem with this set. As the HT voltage was correct at 119V, we decided to try a replacement plug-in EW panel. This made no difference, neither did replacement EW modulator diodes. We then found that the 148V supply obtained from the line output transformer was low at 129V. In view of this we decided to replace the transformer. This cured the fault. M.Dr.

### Philips G110 Chassis

The power supply was shut down and we found that there was a low resistance reading across the line output transistor. We checked various components before coming to the 390nF, 250V line scan coupling/S-correction capacitor C2550 – the large blue one. It read 10 $\Omega$  both ways and on removing it we found that there was a small, black pinhole burnt into the case, near one of the leadouts. A replacement brought the set back to life. M.Dr.

### Ferguson TX85 Chassis with Remote Control

This set was dead. The power supply was running, but there was no output from the 12V regulator although D13 was providing an output of 16V. The thing to do in this situation is to check for dry-joints at the standby switching transistor TR902 on the remote control panel. We've had this problem on quite a few occasions now. M.Dr.

### Samsung C15913W

The problem with this set was excessive width with severe EW distortion. When we measured the HT voltage with a digital meter we found that it was at 135V and full of nasty line pulses. An analogue meter check produced the correct reading of 155V. The culprit turned out to be C416 (2.2 $\mu$ F, 250V), which decouples the anti-breathing resistor in the supply to the line output stage. It had dried out. This doesn't seem to be the best choice of capacitor type for this position, as the large

### Ferguson ICC9 Chassis

This set suffered from various intermittent field faults, such as top cramping or expansion of the centre of the scan as the set warmed up. Freezing almost any component in the field output stage would clear the fault. The cause of the trouble turned out to be the BA157 diode DF31, which is in the flyback boost voltage generator circuit. It was going high-resistance. T.A.

line pulses impose too much stress. A polyester type would have been more appropriate. **M.Dr.**

**Ferguson B14R (TX80 Chassis)**

This set was dead – stuck in standby, with only 2V at the bottom end of the 9.1kΩ, 9W start-up resistor RP17. The cause of the problem turned out to be DP36 (BA157) which was short-circuit. **M.Dr.**

**Sony KV211XMTV**

We'd fitted a new tube in this set a couple of months previously because the original one had a red heater-cathode short. Here it was back with a ticket that read "same fault as before". On test we found that the picture was covered with flyback lines and was too bright. Excessive first anode voltage was the cause of the trouble. R722 (680kΩ) at the chassis side of the first anode potentiometer was open-circuit. **M.Dr.**

**Ferguson TX100 Chassis**

This set would revert to standby after half an hour. If it was left to cool it would run for another half an hour before giving a repeat performance. As we've had this fault before we fitted a new chopper transformer. The clue is that the power supply will run all right until it's loaded. **M.Dr.**

**Matsui 1420**

The problem with this portable was intermittent colour. We traced the cause to a dry-joint at the chroma delay line. A good resolder worked wonders. **T.L.**

**Nokia ST37H1**

Field collapse was the complaint with this set. Everything seemed to be o.k. until I checked the I.t. supply to i.c. DD01. It was very low. When I traced back to the source I ended up with the supply to the tuner. When the tuner was isolated, up came the field scan! A new tuner cleared the short. **T.L.**

**Sharp DV5103H**

After replacing the line output transistor and transformer in this set (by arrangement with the customer's bank manager!) we were left with a blank raster and no on-screen display. There was good sound however. Panic set in, as all the processing is carried out on the digital board. We've had the non-volatile RAM chip cause this fault, but replacing the PCB with a test one made no difference. As the line output transformer had failed, we decided to investigate the beam limiting circuit where we found that C612 had burnt out. Phew! **G.D.**

**Bush 2020**

This set was brought in because some of the front panel push-buttons had no effect. A glance at the manual showed that column d on the key scan wasn't working. This line is also connected to the HEF4066 chip IC3, which was found to be faulty.

The customer also asked if we could enable the three-band tuning for him. After some experimentation we found that bit 5 of option byte 3 toggles this function. The set used an SAA1293A-03 tuning/remote control decoder chip. **G.D.**

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# VCR Signal Processing

This concluding instalment, Part 6 in Joe Cieszynski's series, covers the techniques required for playback of the recorded chroma signal

A typical chroma signal playback system is shown in block diagram form in Fig. 1.

The off-tape FM signal is first fed to a low-pass filter with a cut-off frequency of around 1.2MHz. This removes the higher frequency luminance FM signal, leaving the 627kHz chroma signal.

The next step is automatic colour control (ACC). This circuit plays a much more important role in the playback mode than in the record mode: because of irregular tape/head contact and differing head output levels, chroma signal amplitude variations are far more evident in the playback mode.

If correction was not applied, irregular tape/head contact would result in fluctuating colour saturation as the chroma signal amplitude varied with the strength of the magnetic field.

As we saw previously, differing head output levels can result in a 25Hz colour flicker with prerecorded tapes, because of the different off-tape colour levels on each field. As long as the FM channel balance control is adjusted correctly, the machine's own recordings should not be affected. This adjustment is correct only for the machine's own recordings.

As in the record circuit, playback ACC is based on the amplitude of the burst signal. Unlike the chroma signal proper, the amplitude of the burst signal should remain constant.

Burst de-emphasis is carried out by reducing the gain of the ACC amplifier during the burst (back porch) period. As a result, the pre-emphasised burst signal is restored to its original level while the off-tape noise receives little amplification.

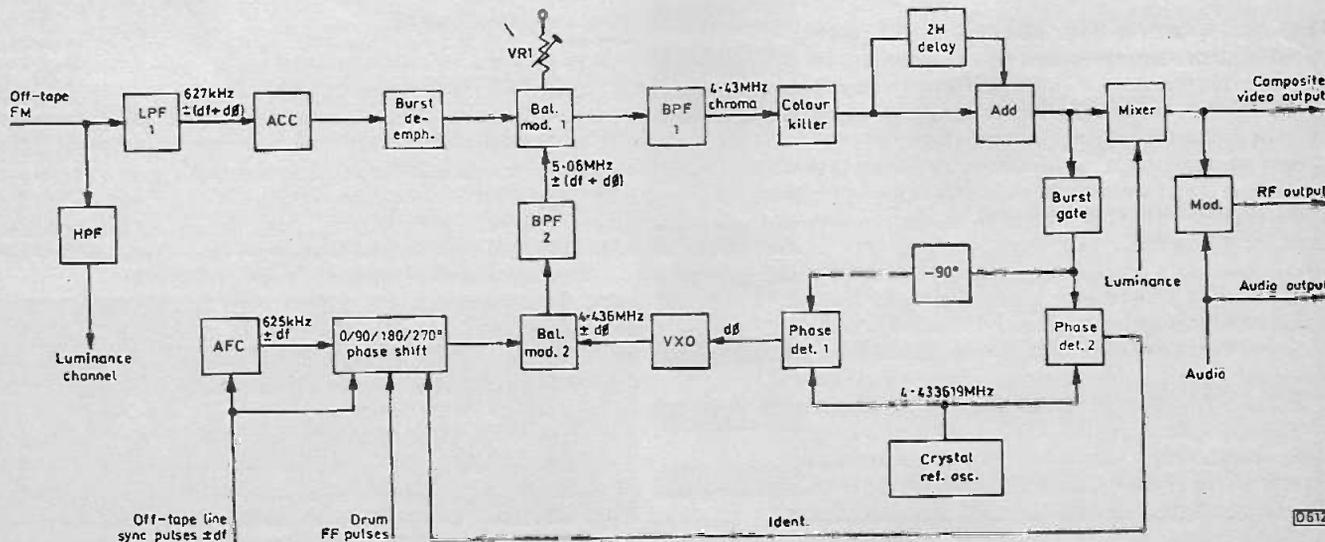
As in the record circuit, bandpass filters 1 and 2 are used to select the difference-frequency output from balanced modulator 1 (BPF 1) and the sum-frequency output from balanced modulator 2 (BPF 2). If the other outputs produced by the balanced modulators were allowed through, they would beat with the playback luminance and chroma signals. The result would be patterning.

## Colour Killing

The purpose of the colour killer is to remove coloured background noise when a chroma signal is not present, i.e. during playback of a monochrome recording, and also when the quality of the chroma signal on the tape has seriously deteriorated - this usually means a pirated tape. The amplitude of the burst signal is generally used as the reference for colour killing. When the amplitude of the burst signal falls below a particular threshold, the colour channel is muted. There may be an additional link from the ident signal output: this is used to mute the chroma when there is excessive signal jitter.

Some, usually older, machines have a colour-killer

Fig. 1: Block diagram of the standard VHS chroma playback signal processing arrangements.



manual override switch for viewer use. It's generally mounted at the rear of the machine – where the customer can't find it! – and may have three positions: auto colour, colour and B/W.

When auto colour is selected, the colour killer operates in the normal manner. In the colour position, the colour killer is overridden and any chroma signals, including noise, will be displayed. In the B/W position the colour killer provides permanent muting, i.e. a monochrome display at all times.

The idea of this switch was to give the customer greater choice with regard to the quality of the colour seen, rather than having to depend on design criteria set by the manufacturer. In practice few customers knew of the existence of the switch, let alone its purpose.

## The Two-line Delay

The action of the comb-filter circuit was described when crosstalk cancellation was discussed in Part 4 (February). The heart of the filter is a two-line (128µsec) glass delay line. This enables off-tape and delayed off-tape chroma signals to be added so that crosstalk signal components are cancelled. You will recall that the key to this is the line-by-line 90° phase shift introduced when the signals are recorded.

## Jitter Correction

The output from LPF 1 in Fig. 1 is shown as  $627\text{kHz} \pm (df + d\phi)$ . Factors  $df$  and  $d\phi$  indicate that the 627kHz chroma playback signal contains two unwanted components. These are frequency ( $df$ ) and phase ( $d\phi$ ) variations introduced by such things as tape transport speed variations, tape stretch, back tension variations, drum speed variations, drum eccentricity, etc. The overall effect of these mechanical anomalies is to alter fractionally the length of time taken by each head to scan its tracks, either during record or playback, thus altering the wavelength of the chroma signal components.

Minor timing errors introduce a chroma subcarrier phase shift: slightly larger errors will produce a frequency shift. In either case the error must be corrected, otherwise the result will be incorrect colours or no colour at all. The term used to describe frequency and phase errors is 'jitter'. The circuits used to correct the errors are often called 'jitter correction circuits'.

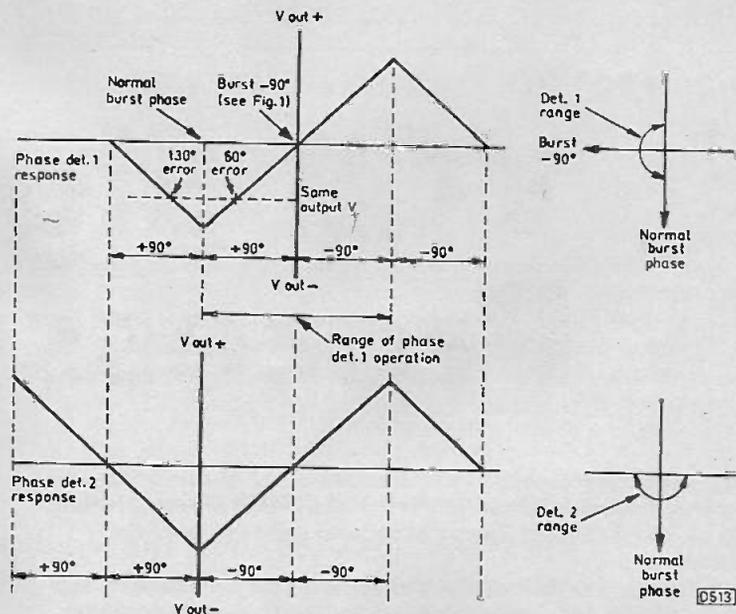
In the playback mode the primary function of the AFC circuit is to correct frequency jitter errors. Phase jitter errors are corrected by the two phase phase detectors and the 4.433619MHz crystal reference oscillator. This circuit forms an APC loop.

## AFC Jitter Correction

The AFC circuit arrangement was shown when we dealt with the record mode, see Figs. 3 and 4 on page 355 last month. The playback AFC system is identical, so the following notes refer to the same diagrams.

The difference in the playback mode is not in circuit operation but in its function. As mentioned above, the prime function of the AFC system in the playback mode is to correct frequency jitter errors. This is done by using the off-tape line sync pulses, which will be subjected to the same degree of jitter error as the chroma subcarrier, as a measure of any frequency jitter present in the signal.

The line sync pulses form one input to a phase detector. The other input is the counted-down output from a 2.5MHz voltage-controlled oscillator (VCO). The output produced by the phase detector is a correction voltage which adds an equal degree of jitter to the oscillator's output. In other words, the AFC circuit produces a 625kHz signal with the same amount of jitter as the off-



tape signals.

Because the 625kHz signal is used in the frequency up-conversion process, any frequency errors in the off-tape 627kHz chroma signal are cancelled – by introducing an equal frequency shift in the conversion signal frequency. The net effect of the balanced modulator 2's sum output and balanced modulator 1's difference output is to provide this cancellation, as we shall see.

## APC Jitter Correction

The APC circuit starts with a burst gate which extracts the burst from the playback signal. Unlike the chroma signal proper, the burst is not phase modulated (except for the PAL alternations, which average out). It can therefore be used to check on unwanted phase variations.

The rest of the APC system consists of a 90° phase shift, two phase detectors and a 4.433619MHz crystal reference oscillator. Note that the oscillator is used only during playback, and is for the sole function of phase jitter correction.

We'll consider the action of phase detector 1 first. In many respects it works in the same manner as the AFC circuit. To simplify matters, we'll assume that the burst phase is in the normal NTSC position,  $-270^\circ$ . See Fig. 2.

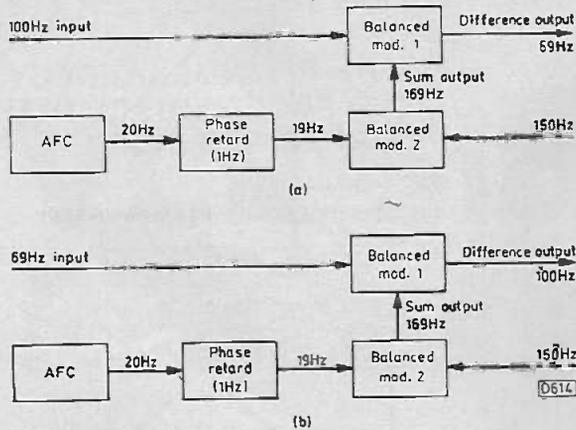
After separation from the off-tape chroma signal, the up-converted burst is shifted through 90° to place it in the correct phase for phase detector 1 to function. This detector compares the burst phase with the output from the 4.433619MHz crystal oscillator. Any small degree of jitter detected will produce a correction voltage output which is used to add the same jitter to the output from the 4.436MHz voltage-controlled crystal oscillator (VXO). As with the AFC action, the result is cancellation of the off-tape jitter at the output from balanced modulator 1.

Phase detector 2 is necessary to correct for any larger phase errors that fall outside the range of phase detector 1. To understand the action of the two phase detectors, refer to Fig. 2.

Phase detector 1's response shows that a phase detector has an effective operating range of only  $\pm 90^\circ$ . An error greater than this will still produce an output, but it will be meaningless. Consider for example a phase shift of  $+60^\circ$ . This will produce a certain negative voltage output (see vertical scale). Now consider a shift of  $+120^\circ$ . This will result in a correction voltage output of the same negative DC value. Thus the circuit has no way of distinguishing

**Fig. 2: Phase detector responses, with corresponding phasor diagrams alongside. The top response is for phase detector 1, which produces a negative correction voltage for a leading burst phase error and a positive correction voltage for a lagging phase error. Note that errors greater than 90° cannot be distinguished from errors of less than 90° (see text).**

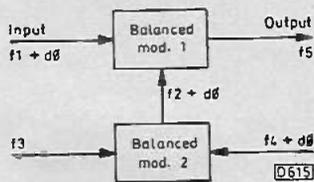
**The lower response shows how the operation of phase detector 2 differs. Phase errors of less than 90° always produce a negative voltage output while phase errors of greater than 90°, outside the capture range of phase detector 1, produce a positive voltage output. This output, known as the ident, is used to move the phase shifter through 180°.**



**Fig. 3: Illustrating the phase shifting action of the phase shifter and the balanced demodulators. (a) Effect in the record mode, (b) effect during playback. Simple figures have been used to clarify the operation.**

The shifter always retards the phase. In this simple example, the frequency of a 20Hz signal is reduced by 1Hz to simulate a phase retard of 360° - in reality the shifter carries out a 90° (quarter wave) phase retard.

As you can see, while the down-converted 'chroma' is 1Hz lower in frequency than it should have been in the record mode, during playback it's restored to the correct frequency.



**Fig. 4: Jitter cancellation by using two balanced modulators and**

between phase shifts greater or less than 90°.

Phase detector 2 is included to overcome this problem. Although it's a conventional phase detector circuit, it is not operated in the usual manner. The phase of the burst signal applied to it is such that the detector will produce a negative correction voltage for a small phase shift in either direction. Note that in Fig. 1 this correction voltage is referred to as the ident signal and is fed to the 90° phase shifter at the AFC circuit output.

By comparing the two phase detector responses shown in Fig. 2, you can see that a burst phase shift of less than 90° in either direction will produce a correction voltage from phase detector 1 (fed to the VXO) and a negative ident voltage output from phase detector 2. This negative voltage has no effect on the phase shifter.

Should the burst phase error exceed ±90°, which is outside the effective range of phase detector 1, phase detector 2 will produce a positive ident voltage output. This increments the phase shifter by 180° from wherever it was at that instant. As a result, the output from balanced modulator 1 (and hence the burst) is moved through 180°, placing the burst back within the operating range of phase detector 1 which can now produce a correction voltage output.

A burst phase error of +130° for example will result in a positive voltage output from phase detector 2. After 180° phase shifting, the burst phase error will be -50°. This will produce a positive correction output voltage from phase detector 1.

**The Phase Shifter**

As we saw in Part 4 (February), to cancel chroma crosstalk the channel 2 chroma signal is retarded by 90°

per line during the record signal processing. Cancellation does not however occur until the phasors have been advanced again (see Fig. 4, page 273, February). The phase must also be restored to the normal condition for the TV receiver to be able to decode the chroma signal correctly. For these reasons, the phase shifter must phase advance the channel 2 chroma signal during playback.

It's generally thought that the phase shifter circuit retards the chroma signal in the record mode then advances it during playback. This is not true however. The shifter circuit is a digital arrangement, and it would complicate circuit design considerably if it had to be able to both retard and advance the phase. In practice the phase shifter retards the phase in both the record and playback modes. Playback advance occurs because of the mathematical effect of the outputs from the two balanced modulators.

A simple illustration of the phase retard and advance effects of the balanced modulators is shown in Fig. 3. Actual chroma frequency figures have not been used, because their complexity would hide the effect we are trying to show. Simple, round figures have been used instead.

**Jitter Cancellation**

Having seen how frequency and phase errors are detected by the AFC and APC circuits, and the effect of the sum and difference outputs from the two balanced modulators on the chroma phase (Fig. 3), we can now look in more detail at how the addition of the jitter components to the outputs from the VXO and AFC circuits results in correction at the output from balanced modulator 1. This is shown in Fig. 4, where a phase error of dθ is shown.

The output from balanced modulator 2 is f3 + f4 = f2. Selecting the sum output (BPF 2) means that any jitter components in the outputs from the AFC and APC circuits will be added to f2.

Consider the effect if a phase error of dθ is present and the sum output from balanced modulator 1 is selected. We would have:

$$f5 = (f2 + d\theta) + (f1 + d\theta) = f2 + f1 + 2d\theta.$$

The jitter components have been added, giving twice as much jitter! Now consider the effect when BPF 1 is used to select the difference output from balanced modulator 1:

$$f5 = (f2 + d\theta) - (f1 + d\theta) = f2 - f1.$$

The jitter components have been cancelled by subtraction. This illustrates why the sum output from one balanced modulator and the difference output from the other is used.

**In Conclusion**

This completes our look at the signal processing techniques used in standard VHS machines. As we have seen throughout, VHS principles are not peculiar to this particular format. Indeed all domestic VCR formats are basically the same with regard to signal processing.

Improved specifications have been made possible by developments in tape manufacture. More recent formats, such as S-VHS (to all intents and purposes VHS Mk 2) and 8mm, have been able to take advantage of these developments to offer higher resolution, improved noise characteristics and a reasonable editing performance.

We will not see any significant changes to signal processing however until total digitalisation of the luminance and chroma signals is introduced, which is probably not all that far away. If we bear in mind that the domestic VCR came about as basically a cheaper version of the broadcast format, we need only to look at where the broadcast industry is at present to see how domestic machines will progress. Professional TV production is now carried out on highly sophisticated digital machines such as those conforming to the Panasonic D2 and D3 formats. They are designed to interface with PC systems that can provide apparently limitless special effects.

Now that the technology has been developed for the professional market, manufacturers will be keen to exploit it in domestic equipment, offering the public the ability to produce very high-quality home movies with just a camcorder, a digital VCR and a PC. Heaven help us: we'll probably find the channels inundated with Jeremy Beadle type programmes, showing all sorts of over-edited, over-the-top home movie efforts, as the TV companies see a cheap way of filling the time!

The other major development that could come our way at the same time as signal digitalisation might be a shift from magnetic tape to laser disc technology.

A domestic machine capable of recording to broadcast quality, available in camera format, PC compatible and capable of insert editing is possible with the technology available today. It only needs someone to decide on the format. When they do, we service engineers will have to return to the classroom to learn it all over again. But aren't we used to that by now? ■

## Answer to Test Case 400

— see page 411 —

When you consider the cost of the equipment and blank tape, domestic analogue video tape systems perform very well. Their limitations are made plain when copies are made from tape to tape, especially when the final copy is a third-generation one. The horizontal picture jitter experienced, and much of the hue error, are caused by timing jitter in the off-tape signal. This is increased with each copy from tape to tape. The lack of definition is caused by progressive deterioration as the signal is passed through more bandwidth-limited circuits. Audio deterioration stems from successive tape passes through longitudinal, low-speed tape-head interfaces that are not really up to the requirement. These types of problems have dogged home videographers since the advent of home TV cameras.

The first two suggestions made by Sage were to do the initial shooting in the SP rather than the LP mode, thus making the most of the camcorder's limited sound and vision performance; and to use the camcorder to play back its own tape, thus minimising the build up of timing jitter as the video signal is copied. It would also be better to use the master tape itself for presentation, rather than a copy made from it.

Further improvement can be achieved, but only at considerable expense. Origination and copy/editing in a high-band or, better still, digital format gives much improved results. With analogue systems, a timebase corrector can be used to iron out timing jitter and the image defects this causes — TBCs are now relatively cheap.

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# Camcorner

Reports from David C. Woodnott and Nick Beer

## Sony CCDFX500

Although this camcorder powered up all right it wouldn't load a tape. The E-E pictures were fine, but there was no autofocus or zoom operation. These symptoms were all caused by the failure of PS501, an 0.8A circuit protector on board CS35. It protects regulator transistor Q509, which provides the MT5V supply for the loading and zoom/autofocus motors. **D.C.W.**

## Sanyo VMD6P

Complete loss of power is unusual with this camcorder. But here we were, confronted with a blown 3-15A ceramic fuse – doubtless because the DC-DC converter unit B1001 had failed. We fitted replacements, carried out cold checks for shorts etc., then applied power. It was distressing to find that there was no response to our request for activity! The cause of this problem was traced to connector CN304, where pin 3 (VTR PWR UP) was open-circuit.

Once this minor hiccup had been dealt with, all was well in the power-up department. But when a tape was loaded there were no functions. The cause of this final problem was traced to connector CN355 being dry-jointed. It conveys the cassette-down signal to the syscon microcontroller chip. At last all was well! **D.C.W.**

## Sony CCDV88

The customer's complaint had been that this camcorder wouldn't load a tape. When we inserted one however it was accepted and loaded and the machine worked correctly in all modes. We had the machine on test for some time before it decided to exhibit its fault state by going into the caution mode. Switching off then on again showed that the trouble was being caused by absence of the drum FG signals.

We quickly traced the cause to the pick-up device on the top of the drum assembly – the FG section

was failing intermittently. The unit is available only as part of a complete drum assembly, which means an expensive repair when the motor and heads are OK. Fortunately we had a spare unit from a faulty drum. This saved the day. **D.C.W.**

## Sanyo VMD3P

The JU0336 hybrid chip IC201 was the cause of no sound with this camcorder. After fitting a replacement we changed the dozen or so leaky electrolytics we've mentioned before in this column. This restored the machine to good order. **D.C.W.**

## Hitachi VME10E

The cause of wavy lines that drifted up the E-E picture was traced to C1218, a 10 $\mu$ F, 16V electrolytic on the main camera processing PCB. We cleaned the PCB before fitting a replacement, then finally checked the adjustment of the subcarrier VCO's lock and PLL. **D.C.W.**

## Sony CCDTR8

We removed, cleaned and refitted a stuck iris assembly in one of these miniature machines only to have the problem recur a couple of months later, after little use. An inspection showed that further amounts of excess lubricant were present on the iris vane assembly. We decided to fit a new unit – this is a relatively easy job, as it slides out of the optical block without too much dismantling. The main work involved is to remove the camera's case assemblies. Because of the construction and the method of ribbon cable fitment, this is not as easy as with earlier Sony designs. The moral seems to be to fit a replacement unit the first time. **D.C.W.**

## Panasonic NVR50

Powering up then off is a common symptom with this range of otherwise excellent camcorders.

You will find that the cause is almost always dry-jointed connections at the main and MDA PCB ribbon connectors FP6005, FP302, FP6007 and FP2003. All that's usually required is some resoldering. But access to the connector pins calls for care – with some, screening cans have to be removed to ease the soldering operation. **D.C.W.**

## Canon 850HiE

This unit would power up then go off within ten seconds. Our experience, particularly with Model A10E, suggested trouble with the clock battery. We removed and refitted it, then gave the machine a long soak test. All was well.

Canon has issued a modification when similar symptoms are experienced with Model A10E. It involves fitting a new microcontroller chip. But we don't know of a modification for this model. **D.C.W.**

## Sanyo VMEX22P

The tape couldn't be ejected, though all the other functions operated correctly. The unloading sequence would start when the eject button was pressed, but would stop short of the point where the housing should release the tape. Loading would then restart. The cause of the trouble was that the contacts of the cassette-down switch were permanently made. A new switch put matters right. **D.C.W.**

## Panasonic NVS90

The playback picture's video level varied and the field sync was very weak at best. Scope checks on the luminance playback signal's connections to IC3001 showed that the DC level at pin 2 was excessive. This is the luminance re-entry point for timebase-correction processing. The cause of the trouble was a short between pins 1 and 2 of this hybrid chip, caused by a tiny blob of solder. **N.B.**



# The Pace Link

**The Link system enables Pace satellite receivers (PRD series on) to be tuned, reconfigured etc. using a PC to simplify the job. Hugh Cocks decided to try the system and has been converted to its use**

**I**spend a lot of time installing and servicing Pace satellite receivers. In fact I've installed more of this brand than all the others put together. Repairing them is generally straightforward, as most of the problems are very much 'stock faults' and servicing information and parts are readily available.

## A Time-consuming task

One of the most time consuming tasks these days is tuning in new channels and reconfiguring old ones, adding radio, changing channel names, adjusting for the new-frequency LNBS and so on. A colleague who came with me to a customer's house one day noticed that I don't even look at the remote control buttons when I do this. The sometimes lengthy process is not unlike a teenage Nintendo addict who is frantically trying to beat the previous best score. The operation can take half an hour for a simple update, much longer if it hasn't been done for some time.

As a somewhat reluctant victim of the computer age, when I heard that all this could be done using a PC I decided to seek more information. Anything to save time and the wear and tear on my thumb! A software disc and a 'black box' interfacing unit were soon on their way here.

## The system

The Link black box is 3 x 3 x 12cm and has a cable at each end. One, with a nine-way D connector, is plugged into the PC's serial port. The other, with a scart connector, is plugged into the satellite receiver's decoder/descrambler socket (with the MSS100 you plug it into the VCR socket). No external power is required: this is cleverly derived from the PC's serial port. The box contains a custom chip that translates the standard serial communication data from the PC to the two-line data/clock system used by Pace PRD/MSS series satellite receivers.

## Software

The Pace Link software comes as a set-up program, on a single HD floppy disc. Installation is straightforward. Load Windows V3.1\* or '95 and run

a:setup

The installation program takes over from here. If you say OK to each step, you'll end up with a new program group called Pace Link in your PC and two new icons – one to run the Pace Link software, the other to de-install it. It will soon be apparent to you that considerable trouble has been taken to make everything easy to set up and use.

## First steps

Click twice on the Pace Link icon and a new display will appear on the screen, with a toolbar across the top left-hand side. A stroll across this toolbar with the mouse cursor brings a help box that shows what each button does. These items are also available via conventional drop-down menus, the help button explaining the various functions in greater detail.

During the installation a number of data files are created. A click on the file open button brings up a list of samples to load. Choose one – it takes a few seconds for the program to decode the data – and a spreadsheet style display of the channel contents appears, see Fig. 1.

The fun now begins. Select (highlight) a channel and click on it twice. The channel editor box appears, allowing you to change the name, frequency, polarisation and any of the other channel attributes – much faster than my Nintendo fingers can! Use the left-hand mouse button to click and hold a channel number (at the left-hand side of the channel spreadsheet). Move that channel to a new position in the list: all the other channels fall into place again. Create your own favourite-channel list in seconds rather than hours!

There's more. Click on the globe toolbar button and the first page of the global options is displayed. Here you can find and edit the PIN number, contrast, UHF channel and more. Other pages give similar access to the LNB options, audio modes etc.

## Downloading

Now connect the interface unit between the PC serial port and a receiver's decoder/descrambler scart socket (VCR scart socket with the MSS100). Select 'download' from the file menu (or alternatively click on the download toolbar button). A new display appears, headed 'Download data Wizard'. Click on the serial port to which the Pace Link unit is connected, then click on the

PACE Link - [PACE MSS 508-IP - C:\PACE\1MSS508P.IRD]

File Options Window Help

Checksum 74A77193

Chan	Name	Freq.	Pol.	Band	Tone	Dec.	LNB	Audio	Category	Sat	AV	Lock	Skip	Radio	Ex.Sw.	Car
1	SKY ONE	11.318	Vert	Low	Off	PAL	1	St A	Light Ent.	1	Auto	Off	Off	Off	N/A	1
2	SKY NEWS	11.377	Vert	Low	Off	PAL	1	St A	News	1	Auto	Off	Off	Off	N/A	1
3	SKY MOVIES	11.436	Vert	Low	Off	PAL	1	St A	Films	1	Auto	Off	Off	Off	N/A	1
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7	NIKELODEON	11.156	Vert	Low	Off	PAL	1	St A	Children	1	Auto	Off	Off	Off	N/A	1
8	BRAVO	11.097	Vert	Low	Off	PAL	1	St A	Films	1	Auto	Off	Off	Off	N/A	1
9	DISCOVERY	11.082	Hor	Low	Off	PAL	1	St A	General	1	Auto	Off	Off	Off	N/A	1
10	CHILDRENS	10.994	Hor	Low	Off	PAL	1	St A	Children	1	Auto	Off	Off	Off	N/A	1
11	UK GOLD	11.553	Hor	Low	Off	PAL	1	St A	Light Ent.	1	Auto	Off	Off	Off	N/A	1
12	QVC	11.038	Vert	Low	Off	PAL	1	St A	General	1	Auto	Off	Off	Off	N/A	1
13	UK LIVING	10.979	Vert	Low	Off	PAL	1	St A	Light Ent.	1	Auto	Off	Off	Off	N/A	1
14	MTV	11.421	Hor	Low	Off	PAL	1	St A	Light Ent.	1	Auto	Off	Off	Off	N/A	1
15	VH-1	11.538	Vert	Low	Off	PAL	1	St A	Light Ent.	1	Auto	Off	Off	Off	N/A	1
16	SPORTS 2	11.171	Hor	Low	Off	PAL	1	St A	Sport	1	Auto	Off	Off	Off	N/A	1
17	CMT	11.568	Vert	Low	Off	PAL	1	St A	Light Ent.	1	Auto	Off	Off	Off	N/A	1
18	CARTOONS	11.023	Hor	Low	Off	PAL	1	St A	Children	1	Auto	Off	Off	Off	N/A	1
19	EUROSPORT	11.259	Vert	Low	Off	PAL	1	Mo 2	Sport	1	Auto	Off	Off	Off	N/A	1

Next button. If you've chosen the correct serial port, the receiver model selection menu appears.

Click on the relevant model number, then on the Next button. The following screen tells you to put the receiver in its download mode: press menu/installation/download/store on the receiver's remote control unit. If you don't do this within about fifteen seconds the PC will 'time out', displaying the error message 'Receiver is not in the download mode'. Just click on OK and try again. Once you've done this successfully you will be told to press the receiver remote control's store button again. The download then starts, with a percentage gauge indicating the progress.

When message completed successfully appears, click on the Finish button and the receiver's contents will be decoded and displayed in the same way as the spreadsheet file opened earlier. You can now modify, save or print the receiver's contents.

### Uploading

Now that you've got ready a receiver contents, you can upload it to the same type of receiver. Disconnect the receiver's mains supply and select upload from the file menu (or click on the upload toolbar button). The serial port selection appears again (defaulted to the same port you used last time). Click on Next and you are told to switch the receiver's power on. This triggers the upload

process. Once again, wait for the completed successfully message then click on the Finish button.

### Conclusion

The Pace Link should be an extremely useful addition to any busy satellite shop or repair centre's facilities. If you display it at the point of sale, you could well find that it turns out to be the 'benefit' that all customers look for when shopping around.

It's a pity that the older SS9000/9200 series receivers have no data transfer system. A common fault as the power supply in these receivers carbonises is channel reset to how it was programmed up to five/six years ago. Lifestyle and Screensport reappear, and with the 9000 the decoder has to be enabled on each channel. It seems that there is work for my Nintendo fingers yet!

I have suggested that it would be helpful for dealers to see this software in operation. If you would like some free demo software, send a formatted HD disc and a stamped addressed envelope to Mr G. McCrea, Pace Link (UK), 6 Main Street, Kesh, Co. Fermanagh BT93 1TF, quoting "Television free Pace Link demo".

The Pace Link system is available from the above address at £199 plus VAT - this is the professional version, which incorporates the model selection arrangement so that it can be used with all Pace satellite receivers in the PRD and MSS series. ■

Fig. 1:  
The channel  
spreadsheet.

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**SURVEILLANCE TELESCOPE** Superb Russian zoom telescope adjustable from 15x to 60x complete with metal tripod (impossible to use without this on the higher settings) 66mm lens, leather carrying case £149 ref BAR69

**RADIATION DETECTOR SYSTEM** Designed to be wall mounted and connected into a PC, ideal for remote monitoring, whole building coverage etc. Complete with detector, cable and software. £19.95 ref BAR75.

**WIRELESS VIDEO BUG KIT** Transmits video and audio signals from a miniature CCTV camera (included) to any standard television! All the components including a PP3 battery will fit into a cigarette packet with the lens requiring a hole about 3mm diameter. Supplied with telescopic aerial but a piece of wire about 4' long will still give a range of up to 100 metres. A single PP3 will probably give less than 1 hour use. £99 REF EP79 (probably not licensable)

**CCTV CAMERA MODULES** 46X70X29mm, 30 grams, 12v 100mA. auto electronic shutter, 3.6mm F2 lens, CCR, 512x492 pixels, video output is 1v p-p (75 ohm). Works directly into a scarf or video input on a tv or video. IR sensitive. £79.95 ref EF137.

**IR LAMP KIT** Suitable for the above camera enables the camera to be used in total darkness! £5.99 ref EF138.

**REMOTE CONTROL/TANDATA TD1400 MODEM/VIEWDATA** Complete system comprising 1200/75 modem, auto dialler, infra red remote keyboard, (could be adapted for PC use?) psu, UHF and RGB output, phone lead, RS232 output, composite output. Absolute bargain for parts alone! £9.95 ref BAR33.

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**COIN OPERATED TIMER KIT** Complete with coin slot mechanism, adjustable time delay, relay output, put a coin slot on anything you like! TV's, videos, fridges, drinks cupboards, HIFI, takes 50p's and £1 coins. DC operated, price just £7.99 ref BAR27.

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**LIQUID CRYSTAL DISPLAYS** Bargain prices, 16 character 2 line. 65x14mm £1.99 ref SM1612A 16 character 2 line, 99x24mm £2.99 ref SM1623A 20 character 2 line, 83x19mm £3.99 ref SM2020A 16 character 4 line, 62x25mm £5.99 ref SMC1640A

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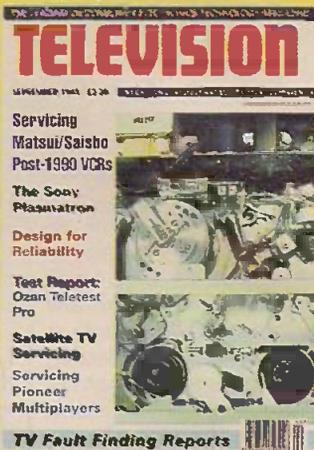


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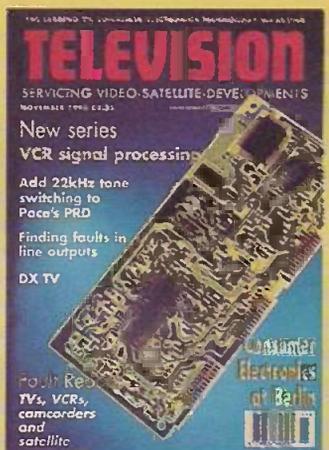
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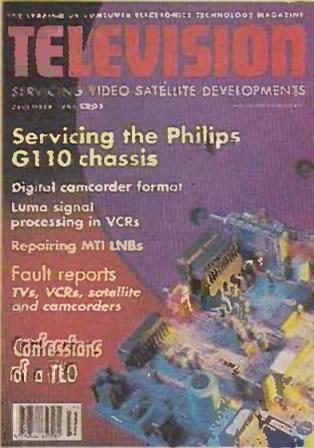
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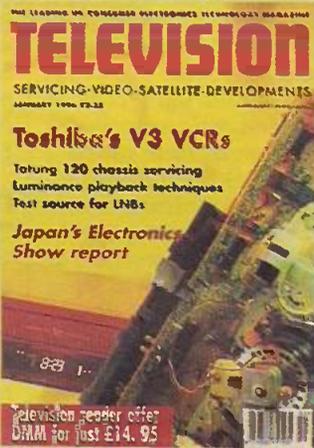
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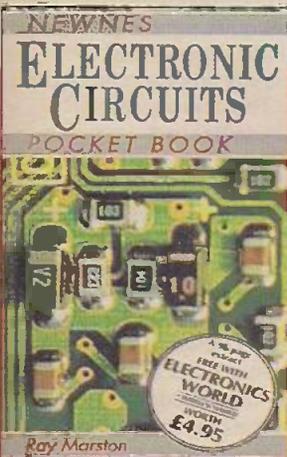
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### Tape Problems

With regard to Nicholas Arnold's letter in the January issue, under the heading 'audio tape path problem', I have to say that he is not being in the least bit paranoid. In fact he's right, and it's not a one-off case!

The problem of bits of oxide 'burning themselves' into the pinch roller has been known for some time amongst professional sound engineers. But because of the greatly increased thickness of professional recording tape the effect, when the pinch roller is in contact with the backing and the oxide runs against the capstan, is virtually inaudible. The fun begins when, in some machines, this situation is reversed, the roller being in contact with the oxide. Thus the oxide left on the pinch roller introduces noise on the tape with every revolution, damaging the recording irreversibly. The tape that originated all this woe will, of course, have only one small drop-out!

The obvious cure is to replace the contaminated pinch roller, if possible with a urethane one. These are guaranteed not to pick up any oxide. But whenever I have asked for one I've either been told that "they are to special order" or have been given a look that suggests I am not of this planet.

The problem could be more interesting when it comes to video tapes. In a VCR the tape oxide is in contact with the pinch roller – and the tape is little different from that in an audio cassette. It's not difficult to guess at the result of a few extra 'control pulses' being added to your favourite tape. And the real fun bit is that the effect will show up only with a subsequent playback, possibly after the tape has been stored away for a lengthy period!

This leads to another subject, the life time of the tape. Pressed on the point, a well known manufacturer said that after ten years its anyone's guess. Well, that's no good at all. Ten years is usually the time that elapses before you need to take the

master tape from the library to do something else with it – remastering for CD is the best example I can think of.

Hands up those of you who have heard of the "sticky tape syndrome". For the uninitiated, this is usually discovered when the ten-year period has elapsed and you put your valuable tape on the machine, only to find either profuse oxide shedding or, more commonly, that a horrible squealing noise comes from the friction of the tape against the heads. This noise is also heard from the speakers. In the worst case the tape will seize on the mechanism. And don't forget that with such equipment there will be three drive motors.

Ampex is one of the few manufacturers to have recognised the problem. The company offers a service to owners of any of its tapes that are affected in this way. The technique used is to bake the tape in a temperature-controlled oven for a period of not less than five days. This apparently offers only a temporary relief from the problem: a year or so later you are back to square one. It does however give you enough time to copy the recording on to a new tape.

"How come", I hear you ask, "that the tapes I recorded on my old reel-to-reel machine in the Fifties through to the Seventies still play today?" The answer is that these tapes were made before whale oil was discontinued as an ingredient. Modern tapes use a different type of lubricant that seems to vanish from the tape once the ten-year lifetime guarantee has expired.

So how will modern video tapes fare? Well, don't ask me, I'm not the man with the answers! I do know this much however. I have extracted from my own machine a couple of video tapes that exhibited the sticky effect. There's this difference with a VCR: you get no warning that thirty feet of tape is about to wrap itself around your expensive hi-fi stereo heads, coming to a stop only when the thickness of the tape build-up reaches the loading arms!

Finally, the death of George Lawson on Christmas Eve 1994, at the age of fifty four, went without mention in your pages. George was the G.G.L. of G.G.L. Components. To many in this trade he was a friendly voice at the end of the line, always ready to help with the latest spares problem. His knowledge of the spares business often led to lengthy discussions, much to BT's delight! I was often astounded at his revelations about various aspects of spares and manufacturing, including some about the professional audio equipment I thought I knew. Rest in peace, George.

*Peter Graves,  
Clapton, London.*

### ITT DIGI 3 Chassis

The TDA2170 field output chip used in this chassis seems to be unavailable. I have been told by all the known suppliers that is is obsolete. Nokia spares department has told me that although many requests for the device have been received it cannot be supplied!

There have been problems of this nature in the past and someone usually comes up with a solution – I hope there will be one this time.  
*Forever Hopeful,  
Huntingdon*

### Philips G110 Chassis

Martin Cole (February letters) was quite right in pointing out that I omitted mention of two screws in my article on the above chassis. This was a genuine oversight on my part.

I am always intrigued by the fact that different engineers seem to encounter different faults with particular chassis. Loss of blue tube emission has certainly been a problem with some of the G110 projection sets I've come across. One set had virtually no blue output. On another occasion I replaced the cooling fluid to try to improve the blue before finding that the tube was the cause of the problem. With care you can remove a tube without loss of fluid.

I have seen sets that produce a murky picture because the cooling

fluid has turned a brownish colour. I've also found foreign matter floating about in the fluid. Could some sort of fungus be responsible for this?

It's essential to clean the lenses thoroughly, including the front of the tube, before refitting them.

*Richard Newman,  
Croydon.*

### Technical Help

There have been a number of letters recently regarding manufacturers' reluctance to supply spares, manuals or technical assistance. This is by no means a new phenomenon. Five years ago I wrote to Binatone for an audio component but was unable to get a reply. Consequently the music centre concerned, which only needed an operational switch, had to be scrapped. The owner obviously wasn't too pleased, and I suspect he thought we were to blame in some way as we haven't seen him since.

A year later one of my engineers required an i.c. for a friend's computer monitor. He phoned the manufacturer and spoke to the service manager who, far from offering help, was totally uncooperative. He suggested that the monitor be sent back, the charge for repairs being £40 per hour.

As I deplore this sort of attitude I wrote a letter of complaint to the managing director. In his reply he accused us of "tampering" with the monitor and told me it was not the same as a television. I wrote again, pointing out our technical qualifications (which include microprocessor computer systems and digital techniques) and our careful approach to repairs. All to no avail. In the end my engineer advised his friend to dispose of the monitor as soon as possible.

I think engineers and the public should be made aware of companies that encourage the purchase of imported equipment but refuse to provide any back-up when it fails. I have a list of some of them displayed on my wall. It states that equipment bearing the names listed will not be accepted for repair as these companies refuse to supply parts or provide service information.

Incidentally, while looking through some back issues I noticed a couple of small errors. In TV Fault Finding, February 1994, the Ferguson Model A51F was listed as using the ICC7 chassis. It's actually fitted with the IKC2 chassis. The

cause of absence of the line oscillator supply at pin 40 of IV01 was traced to the standby switching network TR16/17, where TR17 was open-circuit. There was reference to TR18 being shown on the circuit diagram but not being present in the set. In fact it's shown in the ICC7 circuit but not in the IKC2 one. Apart from this the circuitry is similar and the fault could apply with either chassis.

In a TV Fault Finding item in the May 1995 issue the Hinari CT4 was listed as being equivalent to the Matsui 1450/Saisho CTV147R. This is incorrect: the Hinari CT4 is fitted with an altogether different chassis. Models that are very similar to the Matsui 1450/Saisho CTV147R include the Binatone 01/9014, the Boots CTV1414R and the Dansai CTV1477.

*Dave Mackrill,  
St Leonards-on-Sea,  
East Sussex.*

### Is It a Rip Off?

From our experiences over the years, we in the repair industry are seldom surprised by the high costs of spares from companies such as Sony and Philips. Simple standard parts are often priced at twice, or more, their trade cost from a general component supplier.

Being used to this, most of us ring round our standard suppliers for the best price. However, recently I had the misfortune of needing a twin-speed cassette motor for a Marantz twin deck hi-fi separate. As I did not have an account with them, Marantz spares department put me on to one of our normal trade suppliers who was able to supply the part - but at an unbelievable price of £45.70 inc. VAT! We estimate that any other manufacturer would charge around £20 for a similar part.

It seems that most of Marantz's spares are similarly overpriced. The flat cassette drive belt for the same model is £8.81 inc. VAT. They usually cost around £1, and the small square section 43mm dia. FF/RW belt, which would normally cost around 30p, a staggering £7.17. Although I would be the first to admit that Marantz equipment is reliable and well built, I cannot see how such prices can be justified. Is this a record for a 43mm belt, or does someone out there know differently?

I feel that I must warn prospective Hi-Fi buyers, when they ask advice on the best and most reliable systems, what they are likely to face

in repair costs if such equipment goes wrong.

*Radio and Electronics Engineer,  
Cambridgeshire.  
(Name and Address Supplied)*

### Benefits of C&G 224

There has in the past been discussion in these columns on suitable qualifications for our trade. While there are many ways of becoming an electronics engineer, my view is that the City and Guilds 224 course is particularly suitable for entrants to our trade. You will find that recruitment advertisements for TV engineers almost always specify 224 part two as the minimum requirement, so obviously potential employers agree with this.

C&G also offers a good opportunity to improve your qualifications, through recognition of your experience and further training in the trade. If you hold 224 part two and three certificates, and have had more than five years post-qualification experience in the trade, including some further training, e.g. by attending manufacturers' training courses, you may be able to apply to the City and Guilds of London Institute for a licentiateship. This entitles you to use the letters LCGI after your name and is, I understand, equivalent to NVQ level four.

*Shane Humphrey,  
Bideford, Devon.*

### Job Prospects

I sympathise with Ms Raynor (letter, February), having seen the gradual decline in education and training in our industry over the last fifteen years or so. Her problems are really part of the trade's current sickness. Well-qualified people eager to enter the trade are inhibited by the severe lack of TV, radio, audio and video servicing courses around the country. They still exist. Exeter College has some excellent ones for example. But these are the exception rather than the rule.

One obvious way of getting into the industry is to try for a servicing job with a reputable dealer. But as this is the day of the accountant, most dealers will probably be looking for experienced engineers rather than beginners, in order to maximise their profits. That's business in 1996, a hard fact but understandable. Except - wait a minute! Where are future generations of experienced people going to come from if we don't train any of today's youngsters? There's only one way to gain

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Sinewave distortion	<1% at ≤200kHz
Triangle non-linearity	<1% at ≤200kHz
Square rise and fall	<20ns

#### Output

50Ω o/p impedance	50Ω ±5%
0dB amplitude	2Vpp to 20Vpp no load
-20dB amplitude	200mV to 2V pk-pk, no load
-40dB amplitude	20mV to 200mV pk-pk, no load
Logic	Capable of driving 20 ttl loads
Offset	±10V no load, ±5V 50Ω load
Duty cycle	10% to 90%

#### General

Operating temp.	+5°C to +40°C
Weight	1100g
Size, overall	203mm x 195mm x 75mm
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experience. Investment is required in people as well as property and plant.

At one time I was a TLO for a well-known TV manufacturer. I was frequently asked to talk to students on servicing courses, lecture to them on the products, and give them an insight into the world of electronic servicing that awaited them. Demand for such talks has now dwindled to about once a year.

Good engineers have left the trade because of the attitude of the general public, and some employers, towards them and their skills. Today's merchandise is cheap, too cheap, and we are all devalued because of it.

It is time that our skills were recognised and our contribution to public well-being was respected. Eager young engineers such as Ms Raynor should be welcomed with open arms. I wish her well.

*Graeme Young,  
Ravenshead, Nottingham.*

### Interference

There was a printing error in my letter last month – the amateur band to which I referred is 10GHz, not 18GHz. Typical equipment used for amateur communications at 10GHz, using a few milliwatts, consists of a Doppler radar alarm module with the Gunn diode oscillator retuned and a small dish on a tripod.

A more important point is that from January 1st this year the UK has agreed to full compliance with the new CE regulations, which place the responsibility on the individual to ensure that any equipment designed and built, or modified or adapted from existing equipment, complies fully with the new emissions regulations. This applies whether the equipment is for personal and private use or for commercial manufacture or use. The regulations relating to transmitting equipment are particularly stringent.

*Geoff Darby,  
Earls Barton, Northampton.*

### On-Line Bulletin Board

I read Geoff Lewis's letter (March) on Internet integrity with interest. Having run an on-line bulletin board for TV engineers for over a year, I believe that the ease with which information can be exchanged through such systems has to be a good thing for us all.

In running the bulletin board I have dealt with a large number of people from all parts of the country and overseas. Many I've come to regard as friends. Without today's technology, all this would have been impossible.

The medium is ideally suited to our requirements. Those who man manufacturers' technical support lines have told me that people phone up saying "I've got a dead set, what do I do?". With an on-line system someone asking for help has to sit down and write a detailed description of the problem. Anyone who just writes "the set is dead" is unlikely to receive a reply.

Geoff Lewis is concerned about information being corrupted. Any information can contain errors – I have

for example a large number of manufacturers' technical bulletins that list corrections to service manuals. With respect to computers in particular, it seems to me that the subject of hacking has been blown up excessively by the media. Hackers are mainly interested in the security of computer systems. They often hack in because people make it easy for them – by leaving passwords stuck on monitor screens and using words like "letmein".

This trade is now beginning to use the new technology, and some excellent products are coming out. Willow Vale's CD-ROM is an example. The technology isn't going to go away, so we have to find the best way to use it.

If anyone is interested in trying The Television Engineers BBS, the number is 01275 879 005, with ANSI emulation and speeds up to 28,800 bits/sec. For further details, see my article in the July 1995 issue of Television.

*Jon Lye, LCG,  
Clevedon, Avon.*

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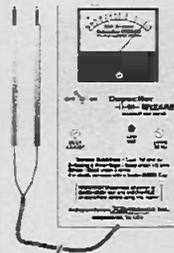
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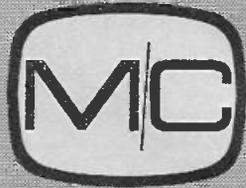
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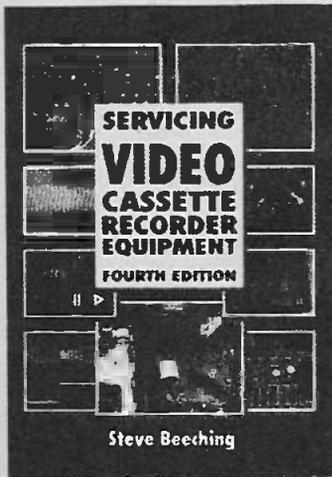
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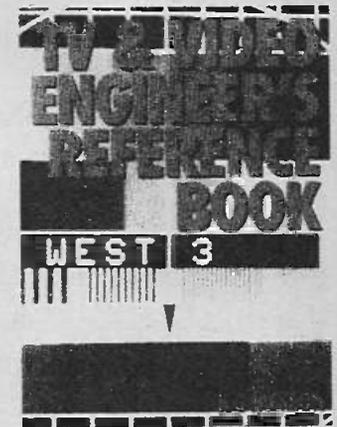
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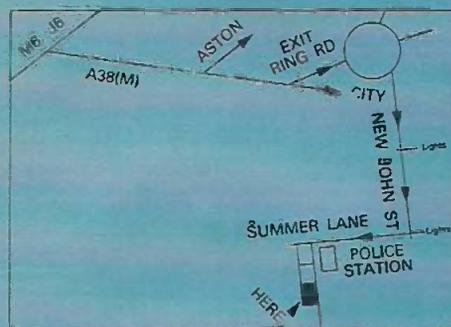
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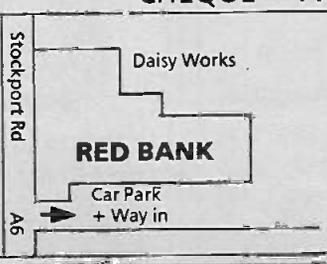
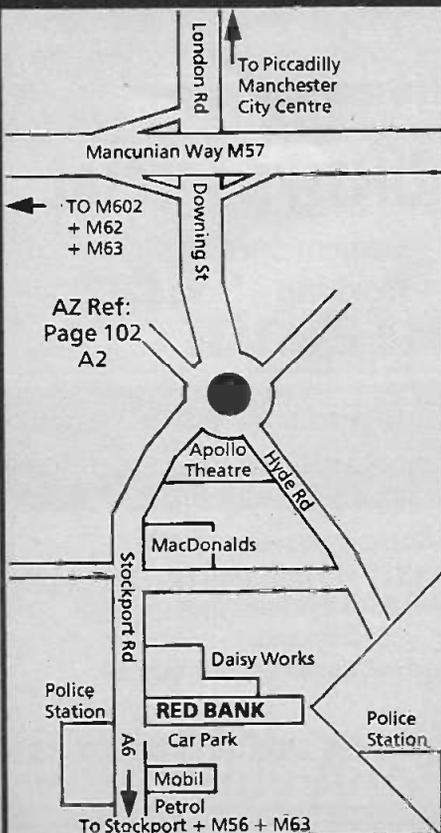
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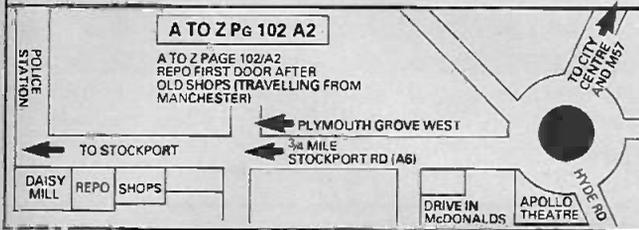
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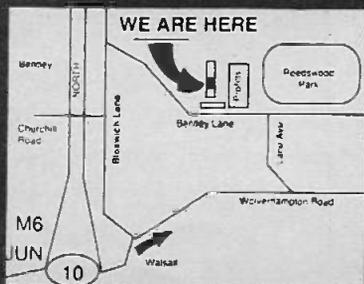
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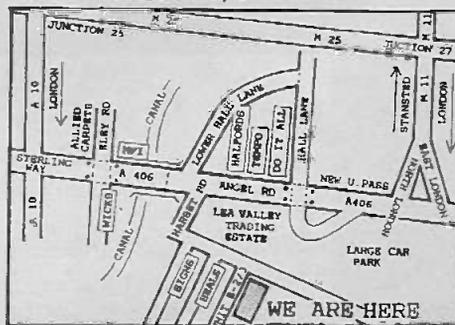
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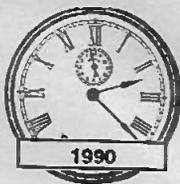
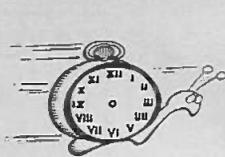
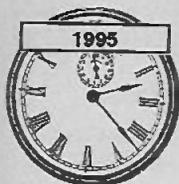
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BYV28/200	£0.10		

2435121	£10.00		
2436792	£10.00		
2436797	£10.00		

VT130 Head & Motor £15.00

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 PC232A5 Issue 4 Teletext Decoder £15.00

2435063		L.O.P.T.	£10	Focus Pots	
2435085				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 RMM35 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

NEW BLUE CAP LNBS £5  
OK TESTED 10.7 to 11.7 GHz

FV31R FERGUSON  
64 pin Main IC HD6140815 £1

Rohde & Schwarz T.V. Generator  
D/D2 Mac SGDF £2,500

Digital Test Pattern Generator  
Model 588A Shibasaki Co. Ltd

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(To order see back page)

Bullet Type L.N.B.S. New £3  
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P.S.U. AC 12v 500MA £1.00  
P.S.U. AC 9v 1A £1.50

ITT CMC201 Panel £10

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

TX89 Tubase Panel	£5.00	Orion Motor 50p each
TX98 Tubase Panel	£5.00	
TX99 Tubase Panel	£5.00	
2N2/2KV	PULS 15p EACH	Capstan Motor £4
4N7/4KV		Mitsubishi HSE41 IC on Motor M51782ASP
5N6/2KV		Burglar Alarm Kit - Professional unit, open and closed circuits, entry/exit delay, adjustable, audible, arming, panic, anti-tamper siren driven direct, 12V D.C. fire quality glass rollerlensed PCB £12.00
6N2/2KV		
9N1/2KV		
11N/2KV		
35V/300 Can	25p	
U412 Tuner	£5.00	8 Way Tuning Pots 50p
UHF Small Tuner UE30 and UE33		£3.00

Power Supply 12V - 5amp  
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 70p

PERISWITCH £6.00

LOPT - 3216001	£5.00
LOPT - 3714016	£5.00
LOPT - AT2071/25 - TOSHIBA	£10.00
LOPT - AT2077/81	£12.00
LOPT - DST85B243 401-532-00 - IK2 FERGUSON	£10.00
LOPT - DST85B243 401-532-00NC - FERGUSON	£10.00
LOPT - DST85B243 472-359-01NC - ICCS	£10.00
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LOPT - DST88B243 400-086-AONC - IK2	£10.00
LOPT - DST88B243 400-086-AONC - TOSHIBA	£10.00
LOPT - DST88N243 478-052-000 - TOSHIBA	£12.00
LOPT - DST88N243 478-052-00C - IK2 FERGUSON	£10.00
LOPT - DST88N243 478-052-00C - TOSHIBA	£10.00
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LOPT - FCC2015DE	£12.00
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PANEL - TX10 - REMOTE PANEL 540/01	£5.00
PANEL - TX89	£10.00
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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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ICC5 Decoder Panel	each £5.00

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