

## Test Report:

 The Tektronix TekMeter
## Satellite TV Workshop

The Planar Transformer

Camcorder Repairs

> Toshiba Service Briefs

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Reading (01734) 876444 Manchester (0161) 6821415
696 Planar MagneticsMark PaulThe use of planar instead of conventional wound contruction forinductors and transformers offers considerable advantages inh.f. power conversion applications.
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Ray Meadows
The control system used in the chassis, the timebases and theprotection circuitry.
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Servicing and modification notes for satelite receivers.
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714: Test Report: The Tektronix TekMeter David BottoThis combiñation of a full-specification digitāl multimeter and
an autoranging dual-channel scope is the ideal field servicing tool, enabling almost anything to be checked.

## Satellite Workshop

Jack Armstrong
The sorts of problems that arise during day-to-day work in a busy satellite servicing workshop. Many are caused by the punters themselves.

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## JAPANESE TRANSISTORS




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## VIDEO SERVICE KITS

## AMST

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Brder Codie: SK41
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3V4243
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HFASS000
GELTSET FINCHROLLER. IDELR ARA TENSIONBAND Order Corda: SK44
3v293V30
HRF2007731877350
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BELT SET PINCH ROLLER. TENSIONBAND. IDIER TYRES
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$£ 5.00$
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Order Code: SKOA
$31313 V 42$

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der Code: SK46

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| TENS:ON BAND |
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NV2000 N2010

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| LOADHOM BELT. CAPSTAN | LOADHG SEIT CAPSTA |
| BEIT PANCH ROLLER IDLER | BELT PINCH ROLLER IDLER |
| TENSION SAND | Trise |
| Order Cade. SK27 E6.00 | Order Code: 5128 53.00 |
| N:332 |  |
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| PLAY IDLEP FF,REW IDLER. | PLTY IDIER TYFE FFRRE |
| TENS:ON BANO FFFREW TVRE | THER NAE |
| Order Ceste: Sk29 $\$ 12.00$ | Order Cade SK30 \$5.10 |
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| AGI200PF/AGI 1500 PK |  |
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| BELT SET PINCH ROLLER. BELT SET PANCH ROL |  |
| LOEER TENSION BAND | CRER TYRE |
| Order Cade: SK23 E6.00 | Order Cade: 5124 |
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| BEETSET PINCH POLLER. BELT SET PINCH ROLI |  |
| PLAY IDEER. FFIREN IOLER. PLAY HALER |  |
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| SLOT W BLIT. LOADNE BELT. SLOT |  |
| PiNCH ROLIEF IDER UNT PINC |  |
| TEISION BANO |  |
| Order Code: SK19 E5.00 | Order Code: SK20 |
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 EEITSEI PACHROLLER BELSSET FWNCHROAER FEE DREVENTI BHEKON REELDRHEUNITTMRE $\begin{array}{llll}\text { Order Cade: } 5852 & \text { E13.58 Order Code: SK63 } & \text { E5.00 }\end{array}$

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REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES
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Replaces Philips Part No's:
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Replaces Philips Part No's
REPLACEMENT FERGUSON NH-CAD BACKUP BATTERES
Replaces Ferguson Part Nos:
00E6-066-001, 2.4 V
Used on: 3V35, 3V56, 3V58, 3V65



## REMOTE CONTROLS



[^0]
## JUST ARRIVEDHH NEW ITEMS

## Satellite PSU Repair Kits

Experience shows that $50 \%$ of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all the recommended parts is supplied for the 4 most popular models, which when fitted should overcome this.

| Maxe \& mopat | OROEA COPE | Price |
| :---: | :---: | :---: |
| PACE PRD900, PRDSOO | SATPSUT | G50p |
| PACE S59000, 9200, 9010, 9020, 9220 | SATPSU2 | 850p |
| AMSIRAD SRD510, SRDS20 | SATPSU3 | ${ }^{\text {ssap }}$ |
| AMSTRAD SRDS00 | SATPSU4 | 650p |

## Replacement Video Heads

| make | majes | PRKE |
| :---: | :---: | :---: |
| HITACHI | VTST0, VT575, VTE76, VT500, VT585 VT588, VTF70 | 3100p |
| I.T.T. | VR3761 | 31000 |
| JVC \& fERGUSSON | HRD950. HRD960. HRD980. FN46 | 5000p |
| Luxar | VR3761 | 3100p |
| MITSUBISHI | HSE5? | 3000 p |
| NATIONAL PANASONIC | NVFS 200 . NVFS 90. NYVB8000 | 46000 |
|  | NVHD100. NVHD101, NVHF100 | 31000 |
|  | NVSO | 14009 |
|  | AG7330. A67350.AG7355, AG7450 | 5000p |
|  | NVFS100 | $5000{ }_{p}$ |
| NE.C. | D5600 | 3500p |
| SAAYO | TSS10000, TLS 1001 P , TLST100 | 3100 p |
|  | VHR7800, VHR7810. VHRB000SP. VHR8801SP, VHRD4800 | 3100p |
| SHARP | VCH80. VCH81, VFHE15 | 28000 |
|  | VCA 33 VCA36, VCA43, VCAAC. VCA46, VCAA9 | $1500{ }^{\text {P }}$ |
|  | VCA55, vCA63 | 2200p |
| SONY | SLV656, SLV775. SLV357, SLV777. SLVB15. SLV825 | $48000^{\circ}$ |
|  | Stv353UB | 3200p |
|  | CCOF340E, CCDF500E. CCOVYOE. CCDV95E, CCOSP5E | 4800 p |

## Original Video Heads

| Mave | modeas | PRLCE |
| :---: | :---: | :---: |
| NATIONAL. PANASONIC | NVG20, NVG21, NVG22, NVG25 NVG25.NVG28, NVG200, NVD48 PART NO: VEH 0343 | 30000 |
|  | NVG33, NVG45, NVG46, NVL23 NVL25. NVL28 <br> PART NO: VEH 0417 | 2900p |
|  | NVJ30. NYHJ33, NVL20, NYL21. NVG30, NVG31, NVG40, NVG13a. PART NO: VEH 0416 | 2700p |

## Audio Control Head

AMSTRAD ORIGNAL NO: 150751
Used on: AMSTRAD TVA $3,2,3$, VCR $4600,4600 \mathrm{MKII}, 4770$.
FUNAI VS2, VCPA $600,4800,5200,5600,6600$, VIP 3000,5000
TOWADA, UNIVERSUM ORDER CODE: AHO1 PRICE: 1350 p
AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, $6000,6100,8600,8602$. 8503, VCR8504, 8700, 8704, 8714, 8600, 9005, 8244
Also fits: ANITECH, EONDSTEC, CASIO, CROWN, FOELITY,
GOUDHAND. GRANADA HINARI. MAROUANT, OMEGE, PROFEX GOIDHAND. GRANADA HINARI. MAROUANT, OMEGE, PROFEX SCHNEDIER, SEG, SENTRA, SHINTOM, TASHIKO. TATUNG, TOWADA. UNIVERSUM ORDER CODE: AMR2 PRICE: 1450,
Replacement Audio Control Video Sound Head for National Panasonic

| PAFt munteler | mopets | PRICE |
| :---: | :---: | :---: |
| Var 0091 | NVG77etc | 875p |
| yeprooso | NV300, NY340etc | $875 p$ |
| VBR D0061 | NV773 otc | 875p |
| VBR 0103a | NV250, NV450 etc | 825p |
| VBR 0125 |  | 625p |

## 8 way Preprogrammed Universal Remote <br> Control <br> A single remote control to operale Tolavisions, Videos and Satelite <br> Receivers. Plus Auxalifiary Options II <br> - Reptaces up to 8 remotes with one - Simple 4 digit setup routine <br> - Controts 1000 of modsis * Teletext functions with Fastext - Clear ilerge kay) layous * Code Sesrch Facility <br> - Stivish and easy to operate * Replace broken or lost remotes Orde

Replacement Video Cassette Housings

| maxc | MODELS | coue | Price |
| :---: | :---: | :---: | :---: |
| AKAJ | VS35, VS53. VS55, V556, VS75 | CH18 | 28009 |
| Granada | VHSOP1 | CH05. | 11000 |
|  | VHSYJ2 | CH01 | 2800\% |
| golostar | GHVS2900, 1291P, 1295P, 5400, 73401, GSE1295P, GSE18STIP, 200010, 200510. VCP4200, 4300. 4301, 4305, YCP4306, 3311. 4315, 4316,4320, 4321, 4325 | CH2S | $2000{ }^{\text {cosp }}$ |
|  | GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200 | CH26 | 2800 p |
| FERGUSON \& J.V.C. |  | CHO1 | 2500 p |
|  | $3 V 42,3 V 43,3 V 44,3 V 45,3 V 46,3 V 53,3 V 54,3 V 55,3 V 57,3545,844,8948$, HROI 140. 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755 | CHO2 | 2800 p |
|  | 8948. 2050, FV108, 12L, 13H, 14T, 208, 218, 22L, 26, 395, HRO230, 430, 530 | CHO | 2800 p |
|  |  | CH04 | 2600 p |
|  | FV31R | CH19 | 4300p |
|  | HRD515, 520. 527, 540, 550, 580, $500.610,620,660,670$, HRD830, 840, 850, 860, 5050 6600, FV37H | CH20 | 24000 |
|  | HRD5 $50,580,830,860,910,960$, HRO970. HRDX20, FERGUSON FV5TH | CH27 | 24000 |
| ..T. T . | VR3605, VR3905 | CHO1 | 28800 p |
|  | VR3916, 3926,3946, 3948, 3976, 3986, 3995, 3997. 29948 | CH02 | 25500 p |
|  | V73996, 3926, 3946, 3949, 3976, 3996, 3995, 3997, 6948 | СН02 | 2800 p |
| NATIONAL PANASONIC | NV730 | С¢08 | 4300 p |
| N.E.C. | N830EG, N831EG, N832, N833EG | CH01 | 2600p |
|  | N895 | CH02 | 2800 p |
| PHILIPS | CASSETIE UFT ASSEMELY (69120366) OV186, 190, 286, 471,562. 761, VR6180. 6182, 6185. 6285, VRR290, $6291,6293,6362,6667,6393,6467,6468,6470$, V76561. 6670, $6760,6761,6870,6970$ | СН05 | 1100p |
|  | VR69a3 | CH22 | 29000 |
|  | V86448 | $\mathrm{CH}_{2} 3$ | 25000 |
|  | $495 B 6$ | $\mathrm{CH}_{24}$ | 2500 p |
| SHARP | VCATOO, VCH851, VCH852 | $\mathrm{CH}_{2} 2$ | 29000 |
|  | VCA $103.103 \mathrm{GV}, 106,106 \mathrm{GVM}, 254 \mathrm{GVM}$ | CH23 | $2500 \%$ |
|  |  | $\mathrm{CH}_{2} 2 \mathrm{~S}$ | 2500 p |
| TELEFUNKEN | VR2970 | CHO2 | 2600p |
| THOMSON | 4320, 321, 323, 326, 4200, 4300 | С CH 1 | 28000 p |
|  | V342, 343, 352, 353.360, 364, 368, 4210,4230, 4260, 4400. V5500, 60000,5540 . | CH02 | 26000 |
| TOSH:BA | V55, V57 | C10\% | 26000 |
|  | Ve5, V66 | CH02 | 26009 |

## Service Aids

| DESCAIPTION | VOLUME | CODE | PRICE |
| :---: | :---: | :---: | :---: |
| YDEO HEAD CIEANER | 35ML | SpO1 | 140p |
| SWITCH CLEANER | 176ML | SPO2. | 150p |
| SHICONE GREASE | 200ML | SP03 | 170p |
| FREEZE IT | 170ML | SFO4 | 200p |
| FREEZEIT | 409 ML | SPิ16 | 350 p |
| FOAM CLEANER | 400 NfL | SP05 | 170p |
| ANTISTAILC | 250 ML . | SP06 | 170p |
| AEROKLEANE | 135AML | SP07 | 140p |
| AERODUSTER | 150ML | SPOB | 200 p |
| AERO DUSTER | 400 mL | SP17 | 425p |
| PLASTIC SEAL | 200M1L | SP69 | 200 p |
| GLASS CLEANER | 250ML | SP10 | 160.0 |
| COLDKIENE | 250ML | \$P13 | 160 p |
| EXCEL POLSH 80 | 250ML | SP18 | 150 p |
| ADHESTVE 12 | 400MfL | SP99 | 190p |
| LABEL, REMOVER 130 | 200 ML | SP20 | 240p |
| REFURE 140 | 400ML | SP21 | 240 p |
| TUBE SILHCON GREASE | 50 GRAMMES | SP11 | 2000 |
| TUBE SLLICON SEALANT WHITE | 75AdL | SP22 | 2800 |
| TUBE SHICON SEALANT CLEAR | 75ML | SP23 | 280p |
| TUBE HEAT SLIK COMPOUND | 25 GRAMMES | SP12 | 4509 |
| DRIVE CLEANER | 2ROML | SP24 | 150p |
| SCREEN CLEANER | 200 ch, | SP25 | 7500 |
| COMPUTER CARE KTT |  | SP26 | 2100p |

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300p for 5 cans 450 for more than 5 cans

## CD Pick Ups

## SONY OPTICAL PLCK UP

PART NO: KSS2IOA SONY COPC 30MM, CDPC 305M
2200p
Fits most Sony. Akal \& 2V.C. Portabie Mifi and Midi Systems
PART NO: KSS210B
USEO ON MODELS
CFD100, 105L. 120, 300, 440, 454. 455, 50, 500, 55, 58,60
CFDEB, $750.765,760,765,770,775.450 \mathrm{~S}$, W 400 , 702 S
22000,

Cassette DC Motors

| MOTOR TYPE | PLICE |
| :--- | :--- |
| GV MOTOR | 170 p |
| GV MOTOR | 170 p |
| 12 VCWMOTOR | 170 p |
| 12 CCW MOTOR | 170 p |
| 13.2 CCW MOTOR | 290 p |

## Cassette Tape Heads

REAB TYPE

| REAB TYPE | PRICE |
| :--- | ---: |
| MONOHEAD | $90 p$ |
| STEREO-AEAD | $110 p$ |
| MANIHEAD | $150 \%$ |
| AUTO REVERSE HEAD | 2009 |

Soldering Accessories

| DESCRIPTION |  |  |  | CODE | PRICE |
| :---: | :---: | :---: | :---: | :---: | :---: |
| ANTEX SOLDERING IRONS |  |  |  |  |  |
| 25 WATT 2 S0 VAC (XS25W 2400 V ) |  |  |  | S101 | soop |
| 35 WATT $2 ¢ 0$ VAC ©XS $15 W$ 240V) |  |  |  | 5102 | 900 p |
| 25 WATT SPARE ELEMENT |  |  |  | 5103 | 450 p |
| 15 WATT SPARE ELEMENT |  |  |  | St.04 | 450p |
| SOLOERING STAND İ SPONGES |  |  |  |  |  |
| SOLDERING STAND (MADE BY ANTEX) |  |  |  | S108 | 350p |
| SPARE SPONGE |  |  |  | S109 | 550 |
| SOLDER |  |  |  |  |  |
| 18 SWG 500 GRAMMES |  |  |  | 5110 | 500p |
| 20 SWG 500 GRAMMAES |  |  |  | STIT | esap |
| 22 SWG 500 GRAMBES |  |  |  | S112 | 700p |
| DESOLDERANG AIDS |  |  |  |  |  |
| SOLDER \# $\ddagger$ OP STANDARD GALGE $1.2 \mathrm{~mm} \times$ |  |  |  | S107 | 70p |
| SOLDER MOP $12 \mathrm{~mm} \times$ 10M |  |  |  | S113 | 400 p |
| DESOLDEPANG PUMP SPARE NOZZLE |  |  |  | S105 | 320p |
|  |  |  |  | S106 | E0p |
| Transistors \& ICS |  |  |  |  |  |
| 6U 508 A (PHIL) 80p | MUE 13009 | 100p |  | 38854 | $350 p$ |
| BU810 110p | MJE 18004 | 125p |  |  | 70 |
| BUZ904 180\% | STK 8982 H | 600\% |  | 1680 | 225p |
| CXA 1044P 550p | STK 7253 | 450 D |  |  | 400p |
| Ha 13408 350p | TDe 2030 H | 100 p |  |  | 1400 p |
| IRFBCso 400 p | TEA2019 | 200p |  |  | 550 p |
| 2272 2000 | Thap 47C434N | 12500 |  | 1342 | 750 p |
| 162103250 p | SAA 1300 | 200p | 2SK | 1358 | 600 p |
| MC 3423P 100p | 2SA 1540 | 55 p |  |  | 500p |
| M 415015 250p | 2SC 3788 | 800 | 82S1 |  | 450p |
| M 15016 350\% | 2SC 3885 | 350p |  |  |  |

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# TELEUIIION 

## A Peep at the Crystal Ball

Could there be a future in which the BBC and the ITV operations as we know them are no longer around to provide us with broadcasting services? The idea was suggested recently by the National Heritage Secretary Stephen Dorrell. It may have seemed inconceivable just a few years ago, and is still extremely unlikely, but it is nevertheless something that ought to be considered. After all, things can change quite quickly. It is only just over seven years (June 1988) since Sky Television signed its initial contracts with the Astra operator SES to start broadcasting four channels. The start of its services had a decidedly tentative air about it, yet the latest ITC annual report shows that BSkyB now has the highest income of any individual UK broadcasting company. Another recent ITC report shows that cable TV is beginning to take off in a big way: in the year to April Ist the number of broadband cable subscribers rose from 642,000 to 963,000 , an increase of over fifty per cent. Recent mergers amongst cable TV companies are producing more powerful cable operators. The traditional UK broadcasters are clearly facing increasing and stiffer competition.

We are almost at the start of a ncw era in broadcasting, one that could see a complete change in the services available to the public: I refer to all those hundreds of channels that digital technology plus satellite and broadband cable distribution are about to make possible. Where will the traditional
broadcasters stand in this new scene?
Although a lot of change has already occurred, and a lot more is inevitable, it remains possible and likely that the core UK broadcasting services, the BBC and the ITV companies in particular, will remain much as they are today. It's worth recalling that the traditional three major US broadcasting networks went through a difficult period just a few years ago, when cable networks expanded rapidly. Their audiences declined sharply, but the decline eventually bottomed out. Although the majors lost audience share, they seem to be safe enough for the present. What it all boils down to is whether a broadcaster can provide what a sufficient number of viewers require, thus achieving an adequate income. With their considerable experience and resources, the established broadcasters should be able to survive.

The thing that surprises this observer is people's willingness to subscribe to TV services. There must be some good salesmen around! But then again there has been a lot of churning in both the satellite and cable TV fields. This is not always clearly apparent, as new subscribers take over from lapsed ones.

The big questions are whether people's viewing behaviour might change. and if so whether such change would be permanent or a brief fad (remember citizens' band radio?). Three possible new viewing patterns suggest themselves. We could see increasing
interest in hundreds of minority-interest channels. We could see an increasing emphasis on interactive TV services of one sort or another. And we could see ever larger numbers of people surfing the World Wide Web.

None of these look like serious threats to traditional broadcasting as we know it. Far more people will want to continue watching sport and yet more sport rather than plug themselves into the Internet, while the interactive TV experiments that have been conducted to date suggest that interest in such services is decidedly limited. It is interesting that interactive cable services have long been possible and have been tried in the past, with little success. Minority interests are probably better served by other media.

The main danger is that a multiplicity of new services could result in a substantial reduction in average audience sizes and thus broadcasting service revenues. This could lead to reduced quality and in tum a further loss of viewers. Once the rot set in, it might be difficult to find any quality TV. But it seems reasonable to assume that the established broadcasters will be able to look after themselves and avoid this situation.

It may be that we shall all get used to linking our PCs to cable networks to simplify our banking, shopping and other needs, but traditional broadcasting will probably remain much as we know it now.

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## COVER PHOTO

This month's cover photograph shows the Hitachi G6P chassis, in Model CPT2178. See servicing article on pages 704-707.

## Camcorner

## Panasonic NVMS70

The symptom with this camcorder was intermittent colour from the camera head. On examination I found that the fault could be instigated or cleared by applying a tiny amount of pressure to the titler PCB above the lens. This pressure was in turn flexing the process PCB where IC317, a surfacemounted chip, had a couple of dry-jointed connections. Resoldering cured the problem.
N.B.

## JVC GR45, 60 etc

We've had several of these camcorders in recently with symptoms that suggested worn or contaminated video heads. The cause however was poor connection of the ribbon cable between the lower drum and the head amplifier PCB. The action required is to tighten the contacts of the connector on the head amplifier PCB.
D.C.W.

## Sony CCDV800E etc

We were recently asked to check the autofocus action with one of these Hi-8 models. The point to note is that at the wide-angle end of the zoom range the focus lens assumes a mid-position (approximately 7 ft ) and will not alter from this state even when an object is positioned closer ( 4 ft minimum). This doesn't affect the quality of the picture, but can be misleading as some models operate differently - the focus lens moves to a closer setting when the zoom is moved towards the telephoto end of its range. D.C.W.

## JVC GRAX7E

This camcorder had been dropped and as a result was inoperative, the emergency code E04 showing in the viewfinder. We found that the mechanism was jammed in the halfloaded position, with no drum rotation. The mechanism problem was simply due to a piece of cassette lid that had broken off and become stuck in the supply-side guide rail base. Fortunately we were able to put this right without any need to realign the loading rings etc. But the drum still refused to rotate.

The cause of this second fault condition was a 'nick' in the drum-motor ribbon cable, which is dressed around the underside of the loading motor. Because of its position between the motor and the lower case this cable is often a casualty when one of these camcorders has been dropped. In our experience the cable can usually be saved by carefully removing the insulation and linking across the damaged print. The damaged area can then be insulated and the cable refitted - saving the cost of a replacement drum assembly.
D.C.W.

## Sanyo VMD6P

The cause of flickering camera E-E pictures with several of these camcorders has been traced to poor soldering of the CCD imager's pins, on board CA1.
D.C.W.

## Minolta 8100E

We don't sce many of these camcorders. But those we do see seem to suffer from the same problem - a very loud
'screeching' sound when loading and unloading. To the customer this probably sounds like an expensive matter. In fact it can usually be cured by lubricating the loading motor bearings suitably. Unfortunately it isn't the easiest of camcorders to take apart, but once you know the method it's not too bad. Don't forget to refit the sliding cover over the AV socket!
D.C.W.

## Canon E300E

This camcorder recorded and played back all right but there were only lines in the viewfinder display. The cause of this was traced to $\mathrm{C} 468(4.7 \mu \mathrm{~F}, 25 \mathrm{~V})$ which had leaked over the track to pin 1 of IC462 on the grip PCB.
D.C.W.

## Sanyo VEMS1P

White flashes on the playback picture was the complaint with this camcorder. $\mathrm{Cl} 005(10 \mu \mathrm{~F}, 16 \mathrm{~V})$ on board VD1 was the culprit: it had leaked over the print directly around its connections.
D.C.W.

## Canon E50E

Yet another leaky electrolytic problem! This time the symptoms were no playback and no EVF pictures, also no zoom operation and no clock or data information. The cause was C2931 ( $47 \mu \mathrm{~F}, 16 \mathrm{~V}$ ) on the grip PCB. It had leaked over and severly corroded the EVF 'on' L signal print between pin 7 of CN2901 and pin 2 of IC2931. Cleaning up the PCB, replacing the capacitor and fitting a link between the two points mentioned provided a complete cure for this curiously varied set of fault symptoms.
D.C.W.

## Sony CCDV8AF

Because it had been dropped on its rear end this old-timer was, except for E-E pictures, inoperative. Fortunately the VTR operation PCB had survived without damage, needing only to be refitted in its correct position. The cause of the failure was the fact that PS601 (board HS5) and PS602 (board MC8) were both open-circuit. Why they had both failed is difficult to say, but their replacement restored the unit to working order.
D.C.W.

## Sanyo VMD6P

There are some common faults with these popular camcorders, but they seldom fail completely as this one had. There was no response to power-up or eject, and a cassette was stuck in the machine. The cause of the fault was traced to an incorrect reset condition at IC301 on board SY1 (VTR operation). A discrete-component circuit produces the reset pulse. Transistor Q3014 in this circuit was found to be leaky, the result being a permanent low at IC301's reset pin. Replacing the transistor cured the fault.

When fault finding it's helpful to know that the camera section can be disconnected for work on the VTR unit - but the SY2 board must be connected to the SY1 board. D.C.W.


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# Planar Magnetics and H.F. Power Conversion 

Mark Paul

The use of switch-mode power supplies of various types has increased greatly in recent years, introducing some intriguing engineering ideas and unusual circuits to the service engineer. Designers have concentrated on power conversion systems in order to achieve higher power density, the advantages being greater efficiency, cooler running, improved reliability and reduced PCB size.

In theory the size of the magnetic components (coils and transformers) and capacitors used in such systems should decrease as the operating frequency increases. In reality however a higher switching frequency will not by itself necessarily lead to higher power density. To avoid losses and retain the benefits of high-frequency power conversion it's necessary to reduce switching losses, improve filter capacitor current handling, avoid copper losses caused by the skin effect (at high frequencies the current flow tends to be greatest at the surface of a copper conductor), reduce core losses and improve heat conduction.
Most of the
problems arise as the switching frequency is increased relate to the magnetic components used. Unless copper and core losses are minimised, the net reduction in component size as the operating frequency is increased my be only marginal.

The purpose of this article is to identify the main problems that have to be overcome in the design of magnetic components for h.f. switching power conversion systems, and to introduce the technology of planar magnetics as the solution. I feel that it is important for
parts with no wire whatsovever: they consist of copper foils (lead frames) that are self-supporting, or flat copper spirals on a thin dielectic substrate. The windings are stacked on flat ferrite cores; and glued


Fig. 1: Basic planar transformer construcłion.
the service engineer to appreciate the reasons for changes in circuit design as they come along.

Planar magnetics offer the designer a cost-effective solution to h.f. power conversion. At frequencies as low as 20 kHz , planar technology is a viable alternative to wound magnetic components, especially where large production quantities are involved. Planar transformers can be designed to operate in both d.c.-tod.c. and a.c.-d.c. systems.

The main differences between planar and conventional, wound magnetic components relate to the geometry of the ferrite core and the structure of the 'windings'. Both approaches conform to the same basic laws of physics of course.

## Planar Transformer Construction

In a conventional wound component the windings are made of solid or litz wire. Planar 'windings' however are made from pre-tooled
together using low-grain diameter epoxy resin. Thin slices of mylar, nomex or kapton insulating material provide inter-winding isolation.

Most planar transformers have a split primary that consists of two or more boards. There is usually one board on the top of the stack with another at the bottom. With a 'multiwound' transformer the two halves of the primary are on top of and beneath the main secondary 'winding'. The remaining secondaries are evenly spaced on both sides of the stack. The main winding delivers fifty per cent or more of the total power. This technique provides a significant improvement in the magnetic coupling where it's most needed. Fig. 1 shows the idea.

The primary winding of a transformer for use in an a.c.-d.c. switchmode power supply is assembled using special high-isolation plastic mouldings, referred to as 'bobbins', that conform to strict creepage and clearance distance safety requirements laid down by international standards. The bobbin approach also enables the secondaries to be split equally on both sides of the primary. The technique is illustrated in Fig. 2.

In both cases the stacked inductive elements are linked together in series and/or parallel externally to meet specific user requirements.

## Characteristics

This sandwich assembly provides greatly increased primary-secondary coupling and significantly reduces the parasitic leakage inductance. As a result the design of the power supply is simplified and reliability is increased.

Assembly of the 'windings' with this pre-tooled PCB and lead-frame design is easy and fast. And because both inductive components have precisely defined positions it's possible to predict the planar magnetic geometry and electrical characteristics much more accurately than with conventional magnetic components. This applies with both
inductors and transformers. Planar technology's high degree of repeatability and predictability mean that operational parameter spreads are reduced.

Another major difference between planar magnetic and conventional construction is found in the ratio of the ferrite to the copper used. A planar magnetic device typically has a core with a relatively larger cross-sectional area and 'windings' with a smaller number of 'turns'. The result is a lowprofile device that uses less copper.

## 'Windings'

The self-supporting foil conductors are shaped to fit the core as a single turn and can carry a heavy current, up to 200A per winding layer. They are


Fig. 2: Planar transformer construction with bobbins.
produced by a conductor on the conductor itself. The proximity effect is caused by electromagnetic interaction between adjacent conductors. Both tend to push the current towards the surface of a conductor, thereby reducing the effective cross-sectional area of a round conductor. The foil inductor technology used in planar magnetics reduces this problem because the conductors have a large surface area compared to the width.

## Leakage Inductance

Leakage inductance represents a coupling loss between the primary and secondary windings of a transformer. In many applications, such as a flyback converter, the energy stored in the leakage inductance is lost, reducing the efficiency of the device. (Chopper and line output transformers that release energy to rectifiers on the secondary side when the initial current flow in the primary side ceases are flyback converters.) The remedy is to reduce the distance between the primary and secondary windings. Because of the foil conductor structure and the reduced number of 'turns', leakage inductance is
thus suitable for low-voltage, highcurrent applications, used in either a single- or multi-layer winding arrangement. The PCB approach is better suited to high-voltage, low-current applications, and can also be arranged in single- or multi-layer form.

Planar foil conductor technology has direct and indirect advantages in h.f. switching applications. Some relate to copper losses, others to the magnetic properties of the devicc.

At high switching frequencies the uneven current distribution in conventional wire contributes significantly to copper loss. As a result the a.c. resistance may be appreciably higher than the d.c. resistance. Two factors contribute to this: the skin and proximity effects. Both are caused by the interaction of the current and the magnetic field associated with it.

The skin effect is caused by the influence of the magnetic field
minimised in a planar magnetic device. In fact in some cases a planar magnetic transformer has a tenth of the leakage inductance of a conventional transformer. About 0.2 per cent of the primary inductance is claimed as typical.

## Core Loss

Another area where planar technology improves on the performance of conventional magnetic technology is in core losses. These are in the main caused by eddy currents and hysteresis effects. Because ferrite and powder cores have a high volume resistivity, eddy losses with them are normally negiligible. They are thus economical solutions for switch- and resonantmode power conversion systems. Planar magnetic devices provide a considerable reduction in hysteresis loss however, because of the large core cross-sectional area but relatively
small volume, this ratio being larger than with a conventional core.

## Heat Dissipation

The useful power level of a device is basically determined by thermal conduction away from the component's 'hot spot'. Poor thermal conduction causes an unsafe temperature rise and eventual failure. With planar magnetics the geometry of the core design means short thermal paths: the large surface area helps to dissipate heat. This means that planar is more economical than conventional technology, since the power handling capability is higher.

The power handling capability can be further enhanced by using a hightemperature electrical isolation material and heatsinks. The large, flat footprint of a planar magnetic core can be easily and efficiently connected to a large surface, so that the device will run cool with or without a fan. The reduced thermal impedance to the heatsink means that there is a smaller temperature rise for the same power loss or increased converted power for the same temperature rise. Thus with planar technology the power density can be appreciably increased, in fact by up to three times in comparison with a conventional transformer.

## The Futurē

Planar magnetic technology using foil windings is not a new concept, and its benefits have long been appreciated. Lack of commercial availability has until now been the main restriction on its use. A family of planar transformers and inductors that range from a few watts to 20 kW per unit at frequencies between 20 kHz and 1 MHz is now available to manufactures in the UK however.

The trend in electronics is towards low-profile designs, with higher component density on smaller PCBs and reduced ambient temperatures. Planar technology offers a viable and economical alternative to conventional magnetics in meeting these needs. Not least in importance is its efficiency rating, which is claimed to be up to 98 per cent without volume increase.

Because of its efficient core shielding, planar technology offers inherently low EMI emission. It is therefore an attractive approach in h.f. switching applications.

Finally, planar technology offers simple and easily customised construction, lending itself readily to full integration into multi-layer PCB designs.

# Inside the Panasonic Alpha 4 Chassis 

The sections of the chassis we'll focus on this month are the main microcontroller chip and the timebase and protection circuitry - a slight change from the previously announced coverage.

## The Main Microcontroller

The main microcontroller chip IC1213 is from the Matsushita MN18XXXXXX series, the exact type depending on the features incorporated in the particular model. For example, the UK Model TX25X1DP with Dolby Pro Logic sound uses an MN18P73233 while the TX21V2 variant for the German market is fitted with the MN1872432TME. These devices have similar pin-out arrangements to the microcontroller chips used in the Z 4 chassis. They all contain 16 K of RAM, 24 K of ROM, twelve control function digital-to-analogue converters (DACs), an 12C bus interface and a full on-screen display generator.

Pin allocations are as follows:

[^1]40 Standby control output
41 OSD blanking output
42 OSD blue output
43 OSD green output
44 OSD red output
45 Volume control output
46 Picture noise reduction output
47 Colour system 1 output
48 Colour system 2 output
$4950 / 60 \mathrm{~Hz}$ height adjustment output.(DP models only)
50 AV control 2 output
51 AV control 1 output
52 RGB contrast output
53 Mute 1 output
54 Reset input
55 Field sync input
56 Mute 2 output
$5750 / 60 \mathrm{~Hz}$ scan sense input
58 Tint control on/off output
59 I2C bus data connection
60 I2C bus clock connection
61 5V supply
62 Clock oscillator connection 1
63 Clock oscillator connection 2
64 Chassis connection
EEROM chip IC1202, reset chip IC1212 and the remole control receiver chip IC1131 are all part of the control system with IC1213. There are also four option-set resistors and an on-board control panel. Some unused microcontroller chip outputs are left disconnected. while unused inputs are connected to chassis via resistors.

Because the Alpha 4 chassis uses frequency=synthesis tuning, one major difference between its microcontroller chip and that used in the $\mathrm{Z4}$ chassis is the absence of a voltage-synthesis tuning output.

Some pins have slightly different functions depending on the mask. Pin 16 for example is normally the sound balance;


Fig: 1: Simplified block diagram of the control system.

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## IC SELECTION




Fig. 2: The timebase generator and field scan circuitry used in $110^{\circ}$ models.
control output. In Dolby Pro Logic models this pin still provides a balance control function, but as a noise-generator control output that tells the Pro Logic decoder to send a burst of noise sequentially to each of the speakers for balance adjustment (see the February 1994 issue, page 255).

In-line chokes protect most pins that are connected to the external circuitry from flashovers. The OSD output pins 4144 are each connected via an $L C$ T-filter.

Pin 34 (video mute) has a tri-state (logic high, logic low or high impedance) output.

Fig. 1 provides a simplified view of the control system.
To simplify the connections, there's no provision for multiplexed key scanning. Instead, a resistor chain connected to the local keyboard on panel $M$ presents different resistance values when different keys are operatcd. The keyboard is split into three sections, each of which is monitored by a separate microcontroller chip input. The Alpha 4 chassis doesn't use the key scan 1 input. The key scan 2 input monitors the preset tuning keys while the key scan 3 input monitors the main user keys (volume and channel change).

Resistors are used in the same way for the model options. These are read by the chip which can then determine the model's type, i.e. whether it is PAL or PAL/Secam set, has a single- or a triple-band tuner, etc.

At power on, or at any time when the 5 V supply line falls below $4.5 \mathrm{~V}, \mathrm{IC} 1212$ sends a logic-low reset signal to pin 54 of the microcontroller chip which then clears any erroneous data from its internal memory.

Tuning and user volume, colour, contrast etc. settings are stored in the EEROM chip IC1202, which is connected to the microcontroller chip via the I2C bus. The remote control receiver chip, which is mounted on panel $M$, sends commands to pin 1 of the microcontroller chip via its own serial data line. As these devices are all powered by the 5 V supply derived from transformer T1201 they remain in operation when the set is in the standby mode.

As in the Alpha 3 and Z4 chassis we've looked at previously, the microcontroller chip itself rarely causes problems. If a control system fault is suspected, start by checking the operation of the clock (pins 62 and 63 of IC1213). Failure of
the set to come on is much more likely to be caused by failure of the standby supply. In this case there will be no standby LED illumination.

One feature, the scart slow switch, is added to models with Dolby Pro Logic. It had previously been available only with Continental models and other makers' sets that use these microcontroller chips. What it means is that the set is forced, when a satellite receiver or other signal source supplies a logic high at pin 8 of the scart socket (pin 9 of the microcontroller chip), to accept the signal from this source in place of the tuner signal. Although installers will be familiar with the advantages (and disadvantages) of this arrangement, there will no doubt be cases where a customer upgrades from an older Panasonic model without this function and gets 'unexpected' results. Rather than delve into the set to disconnect pin 9 of the microcontroller chip you can make a quick snip at pin 8 of the scart cable!

As mentioned when we covered the teletext decoder last month, the Alpha 4 chassis does not have a text mix mode as standard. The circuitry required is present however. To improve text legibility in the text mix mode Q3502 (see Fig. 5 . page 637 last month) is switched on, reducing the reference level voltage at pin 18 of IC3501. The same control signal, produced at pin 20 of IC3501, reduces the video contrast level by pulling down the voltage from the subcontrast control via the diode at the bottom left of Fig. 5 (the labelling and arrow were a bit misleading in this respect). If you want the mix mode with an Alpha 4 set, either use a Z4 remote control handset (part no. TNQ8E0445) or cut a hole in the panel of the Alpha 4 remote control unit where you will find the unused mix button hidden!

## Sync and the Timebase Generators

The Alpha 4 chassis retumed to the tried and tested sync/timebase generator system based on the Philips TDA2579 chip, dropping the rather unusual arrangement used in the $\mathrm{Z4}$ chassis. The basic TDA2579A circuit dates back to the U5 chassis. Fig. 2 shows the arrangement as used in the Alpha 4 chassis

Pin 12 of the teletext decoder chip IC3501 on panel H


Fig. 3. The line putput and EW correction circuits, shown simplified.
produces a composite video output in the TV mode or an internally-generated composite teletext sync output in the text mode. This output was not shown in Fig. 5 last month. It's fed to pin 5 of the TDA2579B chip 1C501, with Q502 providing a clamp action at this point.
lC501 contains a sync separator and line oscillator. The field drive output at pin 1 is generated by dividing down from the line frequency. An internal phase detector system ensures that the outputs produced remain locked to the video signal, field and line feedback signals playing a role in the overall operation. The phase detector has three operating modes, to take into account the different requirements with normal, weak or VCR-sourced signals. Internal black-level detection as a reference and a noise-inversion system ensure stable operation of the sync separator.

There are only three adjustments, height (R405), line frequency (R502) and line phase (R507). A horizontal shift signal from the main microcontroller chip IC1213 is fed to pin 14. It's used to centre the picture in the text and extemal RGB input modes.

The outputs are line drive (pin 11), field drive (pin 1), ident (pin 13) and sandcastle pulses (pin 17).

## Field Output and EW Correction

The field drive output from pin 1 of IC501 is applied to pins 1 and 3 of the field driver/output chip IC451. In $90^{\circ}$ deflection models this is a TDA3653C while in $110^{\circ}$ deflection models it's a TDA3654. Although the chip is powered by a 27 V line it can generate a 50 V peak-to-peak output, thanks to the voltage doubler formed by D451 and C455. This part of the chassis is similar to the AN5521-based arrangement used in the Alpha 3 chassis.

The overall gain is set by the feedback, which is returned to pin 2 of IC501. There are d.c. and a.c. paths, so that both linear and non-linear correction can be applied. The d.c. path is via R458/9 while the a.c. feedback is taken from the junction of the field scan coupling capacitor C458 and R462. A

Third path, via diodes D452/3, provides simple NS correction. A three-position plug and socket arrangement adds a small d.c. voltage to the scan circuit for field shift correction.

In the event of field scan failure there's no feedback to IC501 and the drive is cut off. The service switch is also connected to pin 2 of IC501. When S401 selects the service mode the field feedback is blocked and the field drive is removed. The beam is enabled however, via zener diodes D305-7 which are connected to the colour decoder chip's RGB outputs. We'll look at this feature next month.

Models fitted with $110^{\circ}$ deflection tubes - the 25 and 28 in . types - require EW correction. A conventional diode modulator is used for this purpose, see Fig. 3. It's driven by the Philips TDA4950 chip IC701, which is functionally identical to the SGS-Thomson device used in the Alpha 3 chassis. The field-frequency input is taken from the junction of C458/R462. There are adjustments for parabola (R704) , and keystone (R714) correction. R708 provides width adjustment: its slider is connected to D701 and C705 which rectify the pulses tapped from pin 6 of the line output transformer. A switching transistor, Q701, is used to adjust the width when a 60 Hz signal is being received.

## Line Timebase

The line-drive output from pin 11 of IC501 is fed to conventional driver and output stages. Fig. 3 shows the basic circuitry. Note that $110^{\circ}$ models have additional components for scan-correction, EW correction and line linearity adjustment. Also that $90^{\circ}$ and $110^{\circ}$ models use different line output transformers with quite different pin connections.

## Protection

In the event of an excessive load on the 12 V line the voltage will fall, zener diode D870 will cut off (see Fig. 4) and Q851 will turn on. As a result Q542 is forward biased, in tum turning on Q541. As the collector of Q541 is linked to

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the base of Q542 these two transistors latch on until the power is removed. The output from this circuit is applied via D1253 to the base of the line driver transistor Q531 and via D890 to the base of Q890, which drives the optocoupler in the power supply (see Fig. 3, page 550 June). Thus under a fault condition the line output stage and the power supply both shut down. Excessive beam current will also produce shut down as a result of the link via R542.
The system also provides over-voltage protection. Q880 senses the voltage developed across R880 which is in the h.t. feed to the line output stage. In the event of excessive
voltage or current conditions here Q880 conducts and, via D880, activates the latch Q541/542. The operation of this protection arrangement is controlled by the time-constant of R880/C880/R882.

## Next Month

In the concluding instalment next month we'll take a look at the video processing and audio circuits, inluding the Dolby Pro Logic module and the extra circuits used in the surround sound Models 25X1DP and 28X1DP.


Fig. 4: The protection circuit.

## Satellite Notes

## Reports from Philip Blundell, AMIEEIE, Christopher Nunn and Hugh Cocks

## Maxat SAX1100

There were no signals from this satellite receiver, only a hum bar being visible at the r.f. output. A check on the voltages produced by the power supply - they are marked on the top PCB - showed that they were all at about half the specified level. Visual inspection of the power supply revealed a sorry-looking $47 \mu \mathrm{~F}$ capacitor, C 3 , next to a hotlooking 2 W resistor. A new $47 \mu \mathrm{~F}$ capacitor brought the pictures back.

## P.B.

## Âmstrad SRD500

The power supply in this receiver was ticking very quietly. On other occasions I've had these receivers with no LED illumination at all and sometimes with the standby LED flashing on and off in time with the power supply ticking. The circuit diagram shows C 5 in the power supply as being a $33 \mu \mathrm{~F}, 25 \mathrm{~V}$ type. Whenever I've encountered these faults its value has been $47 \mu \mathrm{~F}$. Changing it to $33 \mu \mathrm{~F}$ restores normal operation. Incidentally a capacitance meter check on the $47 \mu \mathrm{~F}$ capacitor will almost always show that it is o.k.
C.N.

## Pace SS9000

The fault with one of these receivers was no sound at all in any mono mode and only weak, hissy sound in the stereo mode. A replaccment U2829B sound demodulator chip (U1) restored normal operation.

It's wise to ensure that these receivers are well ventilated, especially if the PCB looks at all black around the power supply area. Make sure that nothing lives on top, and that if the receiver is housed in a recess below the TV set there is a large gap above it. Also make sure that the receiver is not above a hot VCR. Doing this will prolong the receiver's life no end. It's amazing to think that the earliest 9000 s are now nearly five years old! H.C.

## Grundig GRD250

This receiver emitted what can best be described as a rasping noise, while hum bars were present on the video display. The noise seemed to consist of a high-frequency component together with 50 Hz modulation. Once the receiver had been opened up it was obvious that the $47 \mu \mathrm{~F}$, 400 V reservoir capacitor in the mains rectifier circuit had been in some distress. Why the fuse hadn't blown was something of a mystery. The receiver lived on a boat in the local marina and was fed with a wildly varying mains supply via a very long cable.

Replacing the electrolytic and cleaning up a small amount of fluid around it produced a quiet power supply and good pictures. Just two weeks later the same thing happened again, but this time the fuses blew. The owner now runs the boat's generator when he wants to watch TV!
H.C.

## Pace SS9200

All the front LEDs were alight but there was no response to any command from the remote control unit. In addition a loud squealing noise came from the power supply. The
fault occurred after a brief power supply interruption. Prior to that the receiver had been working well. Considering its age, the power supply section of the PCB was a healthy colour.

Replacing C9 and C11 (both $1 \mu \mathrm{~F}$ ) in the power supply restored normal operation, but I then noticed that the programmed channels had returned to the factory settings. This is quite a common occurrence when there's a power supply problem or the mains supply is very spikey. To cap it all C416 $(2 \cdot 2 \mu \mathrm{~F})$ in the tuner, mounted above IC401, had as usual dried up, causing patterns on the picture. Often the first sign that C 416 is failing occurs when the mains power has been off for a while and the receiver is cold: at switch on the pattering is very bad, decreasing after a few minutes as the receiver warms up - the patterning may even disappear. It's interesting to listen to customers' descriptions of this fault over the phone!
H.C.

## Notes from Pace

Astra 1D crosstalk when using a 10 GHz LNB: The symptom is as follows. An Astra ID transmission is seen in the background with terrestrial reception of channels above ch. 54 or with satellite reception where the r.f. modulator frequency is set at above ch. 54. The interference occurs because the 10 GHz LNB down-converts the Astra 1D channels to the upper part of the u.h.f. spectrum. At present ch. 60 is the one mostly affected, but it can be expected that the interference will eventually affect chs. 55 upwards.

Changing to a 9.75 GHz LNB provides a complete solution. Many owners may object to the expense however. As a second-best solution, replace all interconnecting leads between the TV set, the VCR and the satellite receiver with good-quality, double-screened coaxial cable, using metal plugs with soldered connections. Check the quality of the terrestrial and satellite TV downleads and improve if necessary. The satellite downlead should consist of CT100 or equivalent quality cable. The terrestrial TV downlead may also have to be changed to CT100 or similar quality cable to increase crosstalk immunity, particularly where both cables run together down a wall or inside trunking. Low u.h.f. signal level makes the problem worse. Because of the high level of crosstalk they introduce, combined u.h.f./satellite TV wall outlet plates are unusable with a 10 GHz LNB.

Crosstalk from Astra 1D i.f. signals may occur on all satellite channels where the u.h.f. modulator in the satellite receiver has been set in the range ch. 54-69 and an r.f. connection to the TV set is used. The solution is to retune the output from the satellite receiver to the range ch. 21 50.

MSS200/300 Series receivers: The menu background colour changing to monochrome can occur with some TV receivers. The cause is 17.7344 MHz colour oscillator tolerance spreads. To ensure that the oscillator runs at the correct frequency, change the trimming capacitors C213 and C214 from 12pF to 8.2 pF , Pace part no. $950-0825301$. These are 50 V surface-mounting capacitors with a tolerance rating of $\pm 0.25 \mathrm{pF}$.

# Servicing the Hitachi G6P Chassis 

Glyn Dickinson

The Hitachi G6P chassis was used in five models which were introduced in 1986. Model numbers are CPT2174, CPT2176, CPT2178, CPT2476 and CPT2478. As these numbers suggest, there were 21 and 24 in . versions. The former are housed in plastic cabinets, the latter in a rather cumbersome wooden one. All models have on-screen displays and FS tubes. The final digit of the model number indicates the basic features: 4 denotes a standard set, 6 remote control and 8 teletext. Don't confuse these sets with the earlier CPT2074/6/8 and CPT2274/6/8 which were fitted with the NP83 Mk. II chassis, or the CPT2578 which has the later G8 chassis.

The smaller-screen sets have a Mullard or Philips A51EAL30X tube or the Hitachi equivalent. The focusing of the Mullard tubes tends to deteriorate after a few years. Thus a compromise has to be adopted when the set includes teletext. As the emission fails, the picture begins to streak. This is especially noticeable with the green content of the display. The 24 in . sets are fitted with a peculiar Hitachi tube, type A56JKZ61X. It gives a very good picture, though some faults make it look as if the tube is faulty (see later).

The sets are a few years old now, but provided the tube is in good shape they can, with a little care, be persuaded to give several more years' service. The CPT2174 was in production for some years as it was Hitachi's last manual model.

## General Features

As with most Hitachi sets the chassis is mounted horizontally. The line output stage is to the right, with the power supply behind it. The tuner and i.f. stages are on the lefthand side, tuning control in the rear centre and the decoder at the front centre. If fitted the teletext panel is on the
cabinet, at the left. With later models the power supply is on the right-hand side.

The chassis is of Japanese design and there are several unusual i.c.s in it. Some, the microcontroller and colour decoder/timebase generator chips in particular, have the pins spaced much closer than usual for chips of this period. Thus care must be taken to avoid print damage or shorts between pins.

As with many sets, the control flap is easily broken. We usually leave it with the customer, having first checked that it's still in one piece, as replacements are quite expensive and it is difficult to persuade the customer that the flap was broken to start with!

There are several differences between models. The 24in. versions have a different line output transformer which is not interchangeable with that used in 21 in . sets. Later remote control and teletext sets have a separate power supply, which makes servicing much easier. An unusual (for the time) feature with remote control models is the standby system, which removes the supply to the line oscillator. The power supply is very much alive in the standby condition!

## The Power Supply

The switch-mode power supply circuit varies slightly between models but will be familiar to those who have handled earlier Hitachi sets. Fig. 1 shows a representative example. It uses an MN650 (2SD1496) series chopper transistor (Q901), with voltage stabilisation achieved by means of thick-film module CP901. A feedback winding on the line output transformer synchronises the operation of the chopper and line output stages. The free-running frequency


Fig. 1: The power supply circuit used in Models CPT2176/2476.
is determined by C911. R905 and R906.
Error comparison is carried out within CP901. Feedback at pin 3, from the secondary side of the chopper transformer T901, is compared with approximately 110 V from the primary side of the transformer, at pin 5.

There are varations between models, the main difference being the fact that CP901 is type HM9024 in the CPT2174 and type HM9205 in the other versions. One point to remember about this type of power supply is that it is not mains isolated. Thus the AV sockets fitted to some models are isolated by means of optocouplers.

## Faults

The power supply itself is very reliable. Most failures are caused by the line output transformer developing an interwinding short, which leads to destruction of the power supply. This is usually indicated by the fact that the chopper transistor Q901 has exploded! If you encounter this situation, replace the transformer (T761). assuming it is the original one, also Q901 and CP901, then check C911, C910, C905, R906 (56 ) and ZD901 (11V) if fitted. C911 should be a $4.7 \mathrm{FF}, 160 \mathrm{~V}$ electrolytic: early models may have a $2 \cdot 2 \mu \mathrm{~F}, 50 \mathrm{~V}$ non-polarised capacitor in this position. Hitachi advise that this is replaced with the later type, positive connection to R906. In models that have the power supply on the main PCB there may be the remains of some hot-melt glue around the LOPT. Scrape this off, as it will have become conductive. The mains fuse F901 and the surge limiter resistor R 901 ( $3.9 \Omega$. 7 W ) will usually have survived, so before you handle the panel make sure that the mains bridge rectifier's reservoir capacitor C906 is fully discharged.

As mentioned above, CP901 is a different type in Model CPT2174 compared to the other models. The two types are not interchangeable. Replacements come with the suffix A. With this a capacitor (C933) has to be added or changed. It's fitted between pins 4 and 7 of the module, and may not be present in sets without remote control though the holes are there. The suggested value was 100 pF , but Hitachi now suggests 33 pF or 47 pF . If this capacitor is left out the power supply screeches. My experience has been that the exact value depends on the set. With too high a value the power supply will whistle. The value may have to be as low as 15 pF . Make sure, when fitting CP901, that it is positioned vertically and away from Q901's mounting bolt.

Before running the set, disconnect L795 in the h.t. feed to the line output stage and apply the mains supply via a variac, building up slowly to about 120 V . If the power supply appears to be working without distress, apply the full mains voltage - this type of power supply doesn't seem to like being run up on a variac! Reconnecting L795 should get the set running again.

If the set is intermittently dead, resolder both earthing tags on the line driver transformer T721. It's advisable to do this with any of these sets.

An annoying buzz from the set is usually, as with many Hitachi models, caused by the mains filter choke L901. This item is cheap to replace, so it's not worth attempts to silence it.

The cause of a dead set with a ticking noise and low h.t. was traced to $\mathrm{C} 910(4.7 \mu \mathrm{~F}, 160 \mathrm{~V})$. Ageing capacitors are often the cause of no-go faults - a capacitance meter comes in handy.

CP901 can be responsible for odd faults including lack of height and a hum bar at the top of the screen. The 110 V h.t. voltage seems to be very critical.

Over-voltage protection is provided by the CR5AS8 crowbar thyristor Q902. Its gate monitors the voltage at pin 5 of the line output transformer T761 via zener diode ZD752.


Fig. 2: The remote control on/off switching circuit. 0905 is switched on for standby, switching off 0904 and thus the 12 V supply to the line oscillator circuit in IC501.
the current through the line output transistor Q 781 via zener diode ZD753 and (not all models) the h.t. voltage via ZD902. These items can fail, giving the impression that the line output transformer is faulty. Q902 can become thermally intermittent and is best checked by substitution.

## The Line Output Stage

The line output transformer is responsible for most service calls with this chassis. The versions used in 21 in . and 24 in . models are not interchangeable, being different both physically and electrically. They fail in various ways. Presenting a dead short across the h.t. line is one possibility. This gives the impression that the line output transistor is short-circuit: it rarely is. You get no other damage with this fault condition. The most common situation is that the set works for a couple of seconds then trips. It's worth checking ZD752 and ZD753 (types vary between models) for leakage, but the cause is usually the transformer. As mentioned previously, it can also be responsible for failure of the power supply.

The price of a transformer for a 24 in . set from Hitachi is over twice that of the one for a 21 in . set. This might make the repair of a larger-screen set uneconomic. Fortunately however pattern parts are available. They seem to give good results, and are often to BS specification. Some of the more obscure transformers (usually of a garish colour) are not as reliable and their safety is not proven.

## The Field Timebase

The field output stage is based on a uPC1378H/LA7830 chip, IC681. The most common fault is internittent cramping at the top of the screen. This can be caused by a dry-joint, but it's best to remove the i.c., thoroughly clean the PCB print and fit a new chip, using plenty of heatsink compound.

If the chip has gone short-circuit R762 ( $2 \cdot 2 \Omega$ fusible) will be open-circuit. This resistor sometimes fails for no apparent reason. but it's wise to replace the chip at the same time.

C611 $(0-1 \mu \mathrm{~F})$ can be responsible for lack of height, C686 $(2 \cdot 2 \mathrm{nF})$ can cause lines at the bottom of the screen while C682 $(100 \mu \mathrm{~F})$ can be responsible for lines at the top.

## The Colour Decoder/Timebase Generator Chip

IC501 (M51338SP) carries out the colour decoder and sync/timebase generator functions. If the set is dead with
the power supply fuctioning, check for 12 V at pin 24 of IC501 and at pin 7 for the line drive output, assuming a remote control set. If the 12 V supply is missing, check the standby switching transistors Q904 and Q905 which are controlled by pin 30 of the microcontroller chip IC1101. If the standby 12 V supply is missing at Q904, check R926 (if fitted) and D904 in the power supply. The main 12 V supply is derived from pin 3 of the line output transformer, via the $1 \Omega$ fusible resistor R761 and rectifier diode D761, and is stabilised by Q791 (2SD882). This supply is applied to pin 25 of IC501.

Because of the different versions/manuals and the two 12 V supplies, faults here can be a little confusing. A strange fault can occur when the conditions around Q904 and Q905 change. The set works, but when standby is selected the timebases continue to run leaving a peak white raster with no sound. Slight leakage in one of the transistors or the associated diodes can cause this: alternatively in one set we had R919 and R916 had been transposed during manufacture! As previously mentioned a set that starts up only to shut down within seconds has a faulty line output transformer that's causing protection circuit operation or a protection circuit fault, while intermittent operation should lead to a check for dry-joints at the metal tags of the line driver transformer T721

The colour decoder section of IC501 is fairly troublefree, the on-screen display circuitry being responsible for most faults whose cause appears to to lie in this area. A peak white raster should lead to a check on the transistors Q301 (2SA673C-D) and Q302 (2SC458C-D/2SC1740QR ) which couple the luminance signal to the tube base panel. IC501 supplies colour-difference signals, at pins 1 , 2 and 3 , to the RGB output stages on the c.r.t. base panel, via the teletext board if one is fitted.

Luminance and beam-limiting faults, such as smearing or crushing, are often caused by the on-screen display driver transistors, which can sometimes give the impression that the c.r.t. is tired. Also check Q1112 and the associated diodes for this fault.

Failure of IC501 in a 24 in . set can be caused by tube flashover. Later versions are fitted with an improved tube base socket. It's slightly conical, the original one being cylindrical. When replacing IC1101, IC501 or any onscreen driver chip or transistor it's vital to check the tube base socket and if necessary change it to the later type. Fig. 3 shows the modification required. This problem does not seem to affect 21 in . sets as much, but tube base socket replacement is often a sensible precaution to take, especially if any chips have previously been replaced.

Note that there are two mask numbers for IC501. If the replacement is not identical, there will be erratic start up. Fortunately modification is easy. For mask number SP-03 there should be a $330 \Omega 2$ resistor across C711. This resistor should not be present with the SP-01 version.

## Tuning and the On-screen Display

The microcontroller chip is IC1101. It works in conjunction with the non-volatile memory chip IC1102 and the on-screen display generator chip IC1104. No, I don't know what happened to IC1103! Things start to get complicated with the suffixes used here, since different versions of the chassis have different chips.

IC1101 is type M50161-554SP for Model CPT2174, type M50432-551SP for Models CPT2176/2476, type M50432-552SP for Models CPT2178/2478. IC1102 is type M58655P in remote control and teletext sets, type M58658 in Model CPT2174. IC1104 is type M50143-006P in the

CPT2174, type M50450-023P in Models CPT2176/2476 and type M50450-030P in Models CPT2178/2478.

Confused? You will be if you fit the wrong ones! This can result in hieroglyphics instead of captions. I have to admit to fitting the wrong control chip once and telling the customer that the new one was programmed for the Japanese market, the strange symbols being intended for that market. He was very impressed, and showed his friends. Luckily none of them were Japanese!

A feature with teletext sets is that you can write your own captions on the screen for each channel - it's wise to check whether anyone has been adding rude comments instead of the channel names, especially if you intend to sell the set as a reconditioned one!

Possible faults include a lively set with no on-screen display or a set stuck in standby because IC1101 is faulty. If the channels can be tuned in but not stored, suspect lack of the -30 V supply at pin 2 of IC1102 because zener diode ZD1152 is leaky: if this supply is present, IC1102 is suspect.

A bright red or green screen, red fringeing, weak or poor luminance, poor contrast or the impression that the c.r.t. is tired can be caused by IC1104, D1120 or Q1112. As previously mentioned, check that the tube base socket is the later type when replacing semiconductor devices in this area.

Various odd faults can be caused by spillage through the front, especially with non-remote control sets. To tune manual sets, turn the preset knob on then hold the recall button together with the + or - buttons for fast tuning. Fortunately the silver buttons and the associated switches give far less trouble than with previous models.

A complaint you sometimes get with Model CPT2176 is that the 'normal' settings are wrong - the colour too high and the brightness too low. To cure this, add a $22 \mathrm{k} \Omega$ resistor in parallel with R1139 and reset the grey scale. The resistor is part of CPOO8, to the left of ICl 101.

## Signals Circuitry

The tuner is either a Mullard U743 or an Hitachi special type ET568A. They are not interchangeable. On odd occasions they can be responsible for drifting. We have experienced no i.f. circuit faults.

## Sound Faults

The audio output stage uses a pair of 2SD401 transistors; run from the h.t. rail, and an output transformer. The transistors can be responsible for distorted sound but the cause is more likely to be leakage through the hot-melt adhesive that anchors them. In cases of intermittent sound, don't forget the headphone socket. According to Hitachi Q1108 can cause loss of volume control operation, but we've not come across this one.

A modification to cure a buzz with VCR sound is to reduce the value of $R 224$ from $68 \mathrm{k} \Omega$ to $18 \mathrm{k} \Omega$.

## Teletext

The teletext panel comes as a shock to some - not an SAA device in sight! The circuit uses a Texas design which has its own peculiarities. Not the least of these is the lack of a hold button, using instead the idea of storing the page as a sub-page in memory. This is fine - unless the customer is familiar with conventional teletext.

Faults here are usually 'one-off', generally because of a chip failure. It's a good idea to make sure that the supplies are correct before diving in with the desoldering gun. A
display that consists of only the top line can be caused by IC2102 (TMS3551), which can also be responsible for no text sync. IC2108 (4016) can also cause this latter fault. If there's no text but the set switches to text it's helpful to have a spare panel for test purposes, as IC1101 or the power supply can cause this. But almost any chip on the panel can be the cause. In view of the age of the sets and the cost of the chips, text faults are often uneconomic to repair. This is not very satisfying from the engineering point of view, but it can lead to a large sigh of relief! Things got worse with the G8 chassis, which has a smaller and less accessible PCB, a more complex circuit and double-sided print.

## The Tube Base Panel

The RGB output and on-screen display output transistors are on the c.r.t. base panel. Remote and text versions are more complex because the graphics are in two colours and, for improved teletext handling, the RGB output stages each use two transistors. The arrangement is unusual in that the text is injected, in colour-difference form, after the colour decoder chip, with separate output transistors for the red and green on-screen display graphics, the Y signal then being blanked. This is why the circuit can give such strange faults. As a help when fault finding, the OSD signals can be disconnected at the panel while the text panel can easily be eliminated. Tube base panel faults are confined to the odd transistor failure.

## Miscellaneous Matters

Flashovers can cause the set to go into the standby mode - replacing the tube base socket (see Fig. 3) provides a cure

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| STK5372H | 7.57 | TDA1180p | 1.55 | TDA2540 | 1.08 | TDA3803A | 4.75 | TDAB196 | 1.68 |
| STK5421 | 4.49 | TDA1 1902 | 79 | TDA2541 | 1.70 | TDA4050 B | 3.80 | TDA8380 | 2.50 |
| STK5422 | 3.72 | TOA1220b | 80 | TDA2542 | 1.09 | TDA4280 ${ }^{\text {U }}$ | 4.15 | TDA8443 | 3.65 |
| STK5451 | 3.88 | TDA1270 | 1.79 | TDA2543 | 2.06 | TDA4400 | 1.69 | TDA8702 | 2.55 |
| STK5464 | 2.98 | TDA1412 | . 35 | TDA25453 | 1.19 | TDA4420 | 7.19 | TDA9403 | 1.99 |
| STK5466 | 559 | TDA1510 | 3.29 | TDA2546a | 199 | TDA4426 | 190 | TDA9503 | 2.10 |
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of faults recorded here they are very reliable, with just two components, the line output transformer and the c.r.t. base socket, giving rise to the majority of problems. The sets look modern, especially the 2 lin. version, give good results and have features that were well ahead of their time.

My thanks to Hitachi's computer brain dump for some of the more obscure faults mentioned above.

## Useful Part Numbers

| Tube base socket | 2953101 |
| :--- | :--- |
| MN650 (Q901) | 2326622 |
| HM9204 (CP901) | 2371674 |
| HM9205 (CP901) | 2371675 |
| LOPT (21in. models) | 2434274 |
| LOPT (24in. models) | 2434002 |
| L901 (mains filter) | 2122694 |
| IC501 M51338SP-01 | 2913612 |
| IC501 M51338SP-03 | 2913613 |
| IC1101 (Model CPT2174) | 2913561 |
| IC1101 (Models CPT2176/2476) | 2915081 |
| IC1101 (Models CPT2178/2478) | 2915082 |
| IC1104 (Model CPT2174) | 2368742 |
| IC1104 (Models CPT2176/2476) | 2915091 |
| IC1104 (Models CPT2178/2478) | 2915092 |
| Flap (Model CPT2174) | X252892 |
| Flap (all other models) | 3796811 |

Those who do not have an account with Hitachi can obtain spares from Charles Hyde and Son Ltd., Prospect House, Barmby Road, Pocklington, Yorks YO4 2DP, telephone no. 01759303068 , fax no. 01759303620.
as long as the chips have survived. An unusual fault is the set coming out of standby at random intervals! This happens with some Mullard tubes that have a $1 \mathrm{M} \Omega$ resistor on the scan coil assembly: it goes open-circuit, allowing static build up to send a pulse to the microcontroller with the result that the set switches on. Strange, but true!

To cure pulling with VCR playback signals, increase the value of R 706 and R 716 from $2.7 \mathrm{k} \Omega$ to $5.6 \mathrm{k} \Omega$.

## Conclusion

These sets are making their way into the ex-rental market and are well worth renovating. Despite the long list

Fig. 3: The modified tube base socket, which has integral spark gaps to prevent the failure of i.c.s as a result of flashovers. When fitting this socket to the PCB, pin Y must be cut off so that it does not protrude beyond the central boss and bend pin 10 in the direction shown by the arrow. After fitting to the PCB, connect a length of insulated wire between pins 2 and 10. It should be 50 mm long and stripped back 7 mm at both ends. Wrap the wire once around pin 10 and dress it away from the copper track.

# Eutelsat's Hot Bird 

Eugene Trundle

For all but a very small minority - the satellite enthusiasts Astra and BSkyB have monopolised satellite viewing since direct-to-home transmissions started six years ago. The price at which complete Astra receiving outfits are currently being offered in multiple stores - less than $£ 100$ - represents little more than a four-month movie-package subscription, which is obligatory when you buy at this price. At this price there's little incentive for the independent dealer to try to compete, and very little profit if he does - especially if any sort of call-back is required. Neither is there much joy


Fig. 1: Hot Bird 1 super-widebeam footprints.


Fig. 2: Eutelsat II F1 widebeam footprints.


Fig. 3: Eutelsat II F1 superbeam footprints.
or profit for professional riggers in fixed-dish, single-feed Astra installations; whose price is similarly cut to the bone.

## Significance of Hot Bird 1

The many other TV satellites in orbit have relatively little appeal for the ordinary viewer. The situation has now changed however with the launch of Eutelsat's Hot Bird 1. This relatively high-power satellite, positioned at $13^{\circ} \mathrm{E}$, is dedicated to public broadcast transmissions. It's co-sited with Eutelsat’s II F1 craft, and in 1996 and 1997 will be joined by Hot Birds 2 and 3, with more powerful transponders.

Most of the European countries are members of Eutelsat, which was established in 1977. It has long been in the businesses of public telephony, mobile communications, business services, satellite newsgathering and point-to-point links - as well as broadcast TV. The organisation at present has eight satellites in operation over an arc that ranges from the original Eutelsat I F1 at $48^{\circ} \mathrm{E}$ to Eutelsat II F4 at $7^{\circ} \mathrm{E}$.

Hot Bird 1 has been operational since April, with 70w per channel. This compares with 45 W for Astra 1 A and 60 W for the later Astra satellites. Hot Birds 2 and 3 will have 110 W transponders. This will permit the use of smaller dishes in single-feed, direct-beam systems. It's likely however that the main limitation on dish size reduction will be interference from adjacent satellites rather than signal strength.

## What's on Offer?

Table 1 lists the programmes currently available from Hot Bird 1 while Table 2 shows what's on offer from Eutelsat II F1. The co-siting of the two satellites ensures that a Hot Bird installation will also pull in the II F1 programmes provided its gain is sufficient.

Although there are no premium movie channels so far they will come in the fullness of time - there are programmes that will appeal to a wide spectrum of viewers, including those interested in music, news, adult features, Italian football and in particular science fiction. The sixteen transponders aboard Hot Bird 1 and II F1's 22, some of which are operated in the half-transponder mode. currently offer thirty TV channels and fifty radio stations. When Hot Birds 2 and 3 arrive, each with twenty high-power transponders, there will be the potential for seventy analogue or hundreds of digital TV channels.

Euteisat hopes that 3.8 m UK homes, representing fifteen per cent of the population, will be able to receive its transmissions by the year 2000 . The $13^{\circ} \mathrm{E}$ slot is to be given over to TV and radio exclusively. Thus, so Eutelsat maintains, a receiving installation can be regarded as an investment. Certainly $13^{\circ} \mathrm{E}$ at present has more in-the-clear channels than any other location.

## Technical Details

Hot Bird l's transmissions are in the FSS band (10.9511.7 GHz ). They range from 11.2 to 11.534 GHz (carrier

Table 1: Hot Bird 1 channels and frequencies.

| Channel | Frequency (GHz) |
| :--- | :--- |
|  |  |
| Canal Horizons | 11.408 V |
| CLT | 11.492 V |
| CLT | 11.534 V |
| EBN (European Business News) | 11.263 H |
| EDTV (Emirates Dubai TV) | 11.513 H |
| Eurosport | 11.387 H |
| MCM | 11.304 H |
| MTV Europe | 11.242 V |
| Polsat | 11.428 H |
| RAl Uno | 11.336 V |
| RAI Duo | 11.449 V |
| Sci-Fi Channel | 11.283 V |
| TV5 | 11.325 V |
| TVE International | 11.220 H |
| TV Polonia | 11.471 H |
|  |  |
| One other to be announced. |  |

frequencies). The co-sited Eutelsat II F1 has seven wideband ( 36 MHz ) and five conventional ( 27 MHz ) transponders in this band plus nine conventional and one wideband transponder in the Telecom band ( $12 \cdot 5-12 \cdot 75 \mathrm{GHz}$ ). By 1997 Hot Birds 2 and 3 will introduce an extra forty transponders that will operate in the DBS band ( $11.7-12.5 \mathrm{GHz}$ ). One implication of this is that a 10 GHz LNB will be o.k. for the present but will not provide reception of the forthcoming Hot Bird 2 transmissions.
Field-strength footprint diagrams for Hot Bird 1 and Eutelsat II Fl are shown in Figs. 1, 2 and 3. In general a 60 cm dish is adequate for direct-on-beam reception, assuming a modern LNB, though an 80 cm dish is preferable - to minimise the risk of co-channel interference from adjacent satellites. For Ireland and Scotiand the corresponding rule-of-thumb sizes are 80 cm a 1 m .

## Practicalities

Much as Eutelsat would like to see dish/LNB combinations pointed solely at $13^{\circ} \mathrm{E}$, in practice few of those who have splashed out on a new receiver and dish, or an upgrade, will want to miss out on Astra/BSkyB at $19.2^{\circ}$ E. So the norm will be a single dish that gives reception from $13^{\circ}$ and $19 \cdot 2^{\circ} \mathrm{E}$.

There are three ways of going about this. First to move the complete dish/LNB assembly betwcen the two locations,


Fig. 4: The single dish, dual-feed system.
using a motorised system. Secondly to use a motorised arm to move the LNB so that it points at different parts of a fixed dish. Thirdly to fit two LNBs, each aligned for reception from either location via the fixed dish. The ultimate way of implementing this last approach is to use the SMW

Table 2: Eutelsat II F1 channels and frequencies.

| Channel | Frequency (GHz) |
| :--- | :--- |
|  |  |
| BBC World | 11.620 V |
| Deutsche Welle TV | 11.163 V |
| Euronews | 11.575 V |
| Eurotica | 11.181 H |
| Kabel 1 | 11.055 H |
| Landscape Channel | 11.181 H |
| MBC (Middle East Broadcasting) | 11.554 H |
| NBC Superchannel | 10.987 V |
| Polonia 1 | 11.673 H |
| RTL 2 | 11.095 H |
| RTL TV | 11.596 H |
| TRT International | 11.181 H |
| Viva TV | 11.006 H |
| Viva 2 | 11.146 H |
| Worldnet | 11.163 V |
| There is capacity for other channels. Note that |  |
| some transponders are shared. |  |

multi-focus dish shown in the June issue, on page 580.
A fully-motorised system is not really appropriate for use with just two satellites in a domestic/entertainment set-up. The motorised arm technique is both more expensive and less reliable than the dual-feed system (see Fig. 4), which

looks as if it will come to be the most widely used approach. It also has the advantage of offering simultaneous reception from the two satellites, for separate viewing or recording from one while watching a programme from the other.

The dual-feed system consists of a single offset dish (recommended size $80-85 \mathrm{~cm}$ in England and Wales, 1 m in Ireland and Scotland) with two separate LNBs at the end of the boom. These look at the dish from slightly different angles. Both the LNBs should be of the enhanced type (with 9.75 GHz local oscillator) or, ideally, of the universal type (see later), and have their own separate double-screened; high-quality coaxial cable feed to the indoor receiver.

The accompanying photograph (Fig. 5) shows a dualfeed arrangement. Many dual-LNB mounting brackets are available for the purpose, costing typically about $£ 15$ retail. But if possible it's best to buy a bracket produced by the dish manufacturer: this will ensure correct positioning and focusing.

## Alignment and Fixing

If the dish is fixed so that it's aligned with one satellite and is then fitted with a second LNB on a $6^{\circ}$ bracket, the loss with this second feed will be typically 1.8 dB . If, on the
other hand, the dish is aligned midway between the two satellites and the LNBs are equally offset from the centre line, the loss with each feed will be little more than 0.5 dB . With the first approach the idea is to aim the dish and the 'primary' LNB at the less powerful satellite, offsetting the LNB that will be used for reception from the more powerful satellite. Our experiments however suggest that to align the dish to a mid position is better - there's a useful alignment aid in the shape of Eutelsat II F3 at $16^{\circ}$ E. This approach also minimises the risk of interference from other satellites.

With this dual-feed technique the vertical alignment of the wall bracket, and hence the centre-line of the dish, becomes important. Greater care with drilling and alignment is required. There's an elevation difference of about $0.75^{\circ}$ between the $13^{\circ}$ and $19^{\circ}$ orbital slots.

The other physical point to bear in mind is the size and diameter of the two LNBs. Some are too fat to sit easily side-by-side with a $6^{\circ}$ spacing. A 40 mm diameter clamp is becoming the norm - some older non-standard shapes and diameters are difficult to adapt for dual-feed operation.

Alignment of the dish and the LNBs is more difficult than with an Astra-only set-up, requiring greater care with
switching system to select the LNB or, with a multi-band LNB, the required band. This is programmable with user-set software. You can get stand-alone tone generators and receiver/switches to adapt non tone-equipped gear. The 22 kHz selection tone is superimposed on the LNB's supply voltage ( 13 V for vertical polarisation, 17 V for horizontal polarisation) at an amplitude of 600 mV .

The receiver itself needs no special features for reception from $13^{\circ}$ E. As with Astra reception, suitable decoders will be required for scrambled/encrypted transmissions. Today's receivers will not be able to handle the digital broadcasts that are expected to be with us before too long. The analogue transmissions will not disappear overnight of course, rending receivers obsolete. More relevant perhaps for future-proofing is the type of LNB you use for new $13^{\circ} \mathrm{E}$ or dual-satellite reception.

## The Universal LNB

The first of a new breed of 'universal' LNBs is the Continental Microwave UA type. It's designed to give reception of the entire 2.05 GHz frequency spectrum $(10.7-12.75 \mathrm{GHz})$


Fig. 6: Block diagram of a universal type LNB with tone switching for band selection.
the direction setting of the dish itself. The dish should be fixed and tightened before aligning the separate LNBs for maximum signal pick up.

A spectrum analyser type instrument is best for dual-feed installation work - the common dish-peaker or sat-finder type can give confusing results with their all-embracing, untuned and uncalibrated readout. The Satlook, a new and relatively cheap instrument available from Satellite Solutions ( 01604787888 ), is helpful for this type of work. It displays the satellite spectrum, picture and signal level, though it's not calibrated in terms of absolute signal strength. It also has 22 kHz tone generation and $13 / 17 \mathrm{~V}$ powering, comes with a battery charger and carrying case, and is amenable to being hung from the neck. Its price is just under $£ 500$ trade.

## LNBs and Receivers

With two LNBs the ideal receiver is obviously a dualinput type. Many are currently available - the Amstrad 550, Echostar 800, Grundig 250, Maspro ST8 Mk II, Nokia 1700 and Philips 824 are examples amongst budget/domestic models. There are several types of LNB selector, automatic and manual, for use with receivers that have only a single LNB input. Manufacturers such as Global Communications supply them.

The latest LNB and receiver ranges have a 22 kHz tone
used for TV (and other purposes) in the Ku band. As the design of an indoor receiver than can handle a frequency range of 2 GHz is difficult, the universal LNB switches between low-band ( $10.7-11.7 \mathrm{GHz}$ ) and high-band ( 11.7 12.75 GHz ) operation. This is done by using two separate local oscillators that run at 9.75 and 10.6 GHz , switched by the 22 kHz tone, as shown in block diagram form in Fig. 6. The block-converted i.f. outputs are at $950-1,950 \mathrm{MHz}$ (low band) and $1,100-2,150 \mathrm{MHz}$ (high band).

Polarity is switched in the nomal way, by the $13 / 17 \mathrm{~V}$ supply. The noise figure achieved is 1.5 dB maximum in the low band, 1.3 dB maximum in the high band. Polar rejection is 20 dB minimum, conversion gain typically 52 dB . Particular attention has been paid in this design to the phase stability of the local oscillator: phase noise is a factor that will become important when digital TV transmissions, which use phase modulation of the carrier signal, come into general use. Intended as an industry standard for Europe, this is the most future-proof LNB available at present. It's retail price is understood to be in the region of $£ 100$, with normal trade discounts offered.

## In Conclusion

Eutelsat is very actively promoting $13^{\circ} \mathrm{E}$ reception. There's a dealer/installer helpline at PO box 846, Bristol BS99 5HR - telephone 0117925 3525. Point-of-sale
material, system information, programme information and schedules, technical advice, planning permission help and even a Fax-back site survey service are available.

To simplify installation, setmakers are being encouraged to factory-preprogram receiver software for the Hot Bird and Eutelsat transmissions so that their sat boxes come pretuned and even captioned. Pre-assembled dualfeed LNB brackets and fitments are to be made available to speed dish installation and alignment.

Many satellite equipment wholesalers have special offers and package deals for dual-feed outfits and upgrade kits. Typical examples are a conversion kit that consists of a clamp plus an 0.9 dB enhanced ( 10 GHz ) LNB for $£ 26.95$; and a dish pack that consists of an 80 cm dish (pole- or wall-mounting), a dual LNB bracket and a pair of 0.9 dB LNBs for $£ 49.95$. These prices are trade only, exclusive of VAT, from Satellite Solutions. Non-trade customers can obtain upgrade and dual-feed packages from Trac ( 01642 452 555) and M.A. Riley (01604 602959 ).

## Test Case 392

Cathode Ray peered again at the display on the oscilloscope screen as the playback picture produced by the newlyrepaired VCR juddered and rolled vertically. He was examining the off-tape f.m. playback signal envelope at field rate, and couldn't see much wrong with its shape. But it wouldn't synchronise the field scanning of either of the monitors he'd tried, though the picture produced by the little Hitachi set didn't jig up and down quite as much as the picture produced by the little Tatung set.

Ray had replaced the middle-aged machine's upper drum. The old one had been worn out and had produced a very spotty, streaky picture. It hadn't rolled or juddered until the drum change however. There was little doubt therefore that the new fault arose in some way from the repair - the E-E pictures were steady enough.

This sort of thing normally arises because of poor signal transfer from the tape to the video head at the very start of the head's scan across the video track on the tape. The two most common causes are physical misalignment of the entry tape guide at the left-hand side of the head-drum assembly, and insufficient tape back tension. Both conditions are part of the routine checks and adjustments that follow replacement of a video-head drum, and both had been very carefully checked a dozen times! - by Ray. With both scope beams producing displays, one to show the drum flipflop waveform (SW25) and the other the envelope waveform, and the scope's sweep triggered by the flipflop waveform, Ray was able to examine the shape of the f.m. envelope closely. Guide adjustment had made it straight-edged and full-bodied, while X (lateral) adjustment of the audio/control head during playback of an alignment tape had optimised the tracking for maximum signal amplitude at the mid-point setting of the tracking control. So what could be wrong?

Ray set up the scope for maximum horizontal expansion (X gain) and adjusted the sweep trigger control to magnify the portion of the signal envelope corresponding with the beginning of the head sweep. There was no 'bottlenecking' or signal shortfall there. Tweaking the tape entry guide obviously couldn't improve on that. As he slowly wound the guide in either direction the amplitude of the f.m. signal display on the scope's screen dropped sharply, which certainly didn't help the stability of the picture!

If the envelope signal was correct, what could be wrong with the video signal derived from it? Ray switched back to single-beam operation, turned the scope's gain control down and connected the test probe to the video-out test point. With the scope sweep still running at field rate, he carefully examined the waveform now displayed. As far as he could see nothing was missing.

Ray appealed to Sage for help. That gentleman had problems of his own, in the shape of an ITT Digivision TV set that
had been on his bench all morning, but he came and peered, with Ray, at the display on the scope's screen, zooming in on the field sync pulse component of the composite waveform. Sage got the second beam up and running and very soon discovered the cause of the problem - and cured it!

What had Cathode Ray forgotten in his attempts at fault diagnosis? Certainly the problem was to do with the head-drum replacement job, but the new heads were not in any way faulty. Neither was there anything wrong with the guide alignment or the tape back tension. The solution will be found on page 725 but don't go there until you've given it some thought!

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# Service Briefs from Toshiba 

The following information is based on Toshiba Technical Bulletins CDH50-CDH54 issued between October 1994 and June 1995. This month we feature TV Receivers.

## Model 155R9B

No control over brightness although the graphics scale alters: Replace leaky 1N4148 diode in position D204, part no. 23115599 T .

## Models 156R9B/T9B

Field creep from the bottom when the set is hot: Replace ZPD24 zener diode in position D322, part no. 23118982.

## Models 175R9B/T9B

Faint vertical lines from the left-hand side of the screen to the centre: Replace C902 $(4,700 \mathrm{pF}, 1.6 \mathrm{kV})$ on the tube base panel.

## Model 210T6B

Lack of height and width at switch on: Replace C814 $(100 \mu \mathrm{~F}, 50 \mathrm{~V})$.

## Model 259D9B

Patterning on white scenes, sometimes turning black: Replace the $1 \mu \mathrm{~F}$ capacitor CV01 on the back terminal PCB, connected to pin 6 of the TA8628N chip ICV01.

## Model 289T6B

Dead set: Cause could be Q801 (type 2SD1279, part no A686553) going short-circuit because $\mathrm{C} 811(0.47 \mu \mathrm{~F})$ is open-circuit. If so replace Q801 and C811.

## Model 1400RB

Stuck in standby: Replace leaky $5 \cdot 1 \mathrm{~V}$ zener diode in position DA43, part no. A7116325. Clue is that the 5 V supply to the microcontroller chip is low.

## Model 1400TBT

Tuning drift: Replace leaky 1 N 4148 diode in position DA17. part no. 23115599.

Power supply tripping or h.t. low at approximately 26V: Replace the 2 SC 3425 transistor in position Q803, part no A6361601. The transistor leaks when under load, measures o.k. with a test meter.

Field cramping: Replace R 317 ( $7.5 \Omega, 0.5 \mathrm{~W}$ ) which can change value.

Screeching from chopper transformer T802; picture has a small kink on verticals: Power supply is not synchronised with the line timebase. Replace C811 (22nF) which goes low in value.

No colour: Can be caused by a base-collector leak in the 2SC2482 transistor Q510, part no. A6330059.

## Model 1510TB

Intermittent dead power supply: Replace the 2SC3425 transistor Q803, part no. A6361601.

## Models 2100RB/TBT

Loss of sync: R302 ( $24 \mathrm{k} \Omega$ ) can go high in value or opencircuit to cause this fault. The clue is that the voltage at pin 33 of the TA8659AN chip IC501 is about 10 V instead of 1.3 V .

No station tuning: Can be caused by no line sync input to the microcontroller chip because QA09 (type BC557A, part no. 23114961) has failed.

## Model 2112DB

Holds station until the channel is changed, then goes off tune; won't stop during search tuning: Replace leaky 1N4148 diode in position DA04, part no. 23115599.

Screeching noise from chopper transformer T803, h.t. voltage normal: Replace D811 (BYD33J), part no. 23118479.

## Models 2112DB 2512DB 2812DB

Very intermittent switch off: Pin 52 (excess beam current protection) of the TA8783N chip IC501 is being activated in error because of a static discharge from the speaker grilles to the speaker body (chassis). If a static problem exists, change the cabinet. Otherwise connect pin 52 of IC501 to chassis at the nearest available point, using a short length of insulated wire.

## Models 2132DB 2535DB 2539DB 2835DB 2939DB 3339DB

A different Nicam unit is used in later production receivers. It has an SAA7283ZP Nicam chip in place the the previous TB1204N chip and is not interchangeable. Although both modules fit physically, use of the wrong one will result in loss of sound. Part no. of the later unit is 23703040 . The earlier unit is $2 \cdot 5 \mathrm{in}$. high, the later one $3 \cdot 5 \mathrm{in}$. high.

A different microcontroller chip (ICA01) has to be used with the later Nicam unit. Later and earlier microcontroller chips are not interchangeable. Details are as follows:

Model 2132DB: Earlier version M37210M2-580, later version M37210M2-681SP (part no. 23904757).

Models 2535DB/2835DB: Earlier version CXP85332-103S, later version CXP85332-111S (part no. 23904758). Note
that with the later version pins 25 (S/S) and 33 (WDT RST) are reversed: this can be identified by the additional wire links A (red wire) and B (yellow wire) on the component side of the PCB.

Models 2539DB 2939DB 3339DB: Earlier version CXP80424-166S, later version CXP80424-169S (part no. 23904759).

If a set fitted with the new unit reverts from Nicam to f.m. when hot either replace the Nicam unit or carry out the following modifications: change RD11 to $1.8 \mathrm{k} \Omega$ (from $2 \cdot 2 \mathrm{k} \Omega$ ), change RD12 to $33 \mathrm{k} \Omega$ (from $100 \mathrm{k} \Omega$ ), change CD18 to 47 nF (from 22 nF ).

## Model 2145DB

Sound mutes with very bright scenes, reducing the contrast setting to half way avoids occurrence of the fault: Cure is to add a $1 \mu \mathrm{~F}, 25 \mathrm{~V}$ electrolytic capacitor between the base of Q604 and chassis, on the print side of the PCB. Cause of the fault is that Q604 in the off mute circuit is being activated when the beam current is high.

## Models 2145DB 2539DB 2545DB

These sets are fitted with the later Nicam unit referred to under Models 2132DB etc. above. The note on reverting to f.m. also applies to these models.

With models that use a CXP85332A-105S microcontroller chip in position ICA01, note that pins 25 and 33 are shown correctly connected in the circuit diagram but the pin function descriptions should be reversed.

## Models 2512DB 2812DB

A blank screen with a Nicam display in white appears during channel change, the picture returning to normal when the display goes: Replace the TA8775N RGB switching chip ICY50, part no. B0383930.

## Models 2527DB 2539DB 2927DB 2939DB 3327DB 3339DB (C2D Chassis)

Note that the base and emitter markings of Q841 (2SA1015) are shown incorrectly on both sides of the PCB and in the layout drawing. Fit the transistor as the white symbol on the PCB shows, i.e. the opposite way round to Q842.

Lack of width and height, picture and sound distorted: Replace R868 ( $270 \mathrm{k} \Omega$ ) in the low-voltage limiter circuit. This resistor tends to go high in value: all the power supply secondary voltages then fall.

No picture, sound o.k.: Caused by the top of the sandcastle being absent because D402 reduces the amplitude of the line-frequency pulse at pin 38 of IC501. Replace D402, type UZ33135B, part no. 23316367.

Teletext has slight drop-out, mix mode no sync and channel change no text in the ident box: Replace the 2SC3852 transistor in position Q861, part no. 23314141. Cause is the $5 \mathrm{~V}+2$ supply being low at $3 \cdot 5 \mathrm{~V}$.

Channel indicator appears intermittently: Replace the 6.2 V zener diode in position D864, part no. 23316313. Cause is the $12 \mathrm{~V}-2$ supply being unstable.

## Models 2535DB 2835DB

Note that two different Dolby modules have been used in these models, part nos. 23148189 and 23703550. They are not interchangeable - the pin spacing is different.

Another point to note about these models is that the mains lead is located in a channel that runs undermeath the back cover, from front to back. It's then routed up the back over a moulded support and is anchored with a cable tie. This is done to prevent damage to the lead when the set is moved around on a flat surface. After servicing, the lead must be relocated in the same way as it may otherwise be damaged. Push the cable tie off rather than cutting it - so that it can be re-used.

At switch on scart 2 and 16:9 are immediately selected: Replace leaky 1 N4148 diode in position DW04, in parallel with the base and emitter of QW04. Part no. 231115599.

## Models 2539DB 2939DB 3339DB

No centre channel souind: Replace leaky 6.2 V zener diode in position DA31, part no. 23316312. It's connected to pin 56 of ICA01 and pulls down the data line to the Pro Logic PCB.

No r.f. picture and sound, scart input o.k.: Can be caused by faulty solder connections to Q103 in the PIF unit. Resolder the connections and bend the transistor over to avoid contact with the PIF can's metal cover.

## Model 2835DB

Stuck in standby: Can bé caused by circuit protector ZP31 (type PRF1000, part no. 23144452) in the 27 V supply to the field timebase going open-circuit. When this occurs the h.t. rises and the protection thyristor D471 is fired, activating the standby mode.

Intermittent loss of sync and teletext: Replace crystal ZF01, part no. 23153012. When this crystal is faulty the 27MHz text clock stops.

Intermittent audio muting with dark scenes, mainly with VCR or satellite TV signals: Increase the value of RB12 from $27 \mathrm{k} \Omega$ to $39 \mathrm{k} \Omega$.

Repeated failure of the audio output chip IC670: Check C682 ( $100 \mu \mathrm{~F}$ ), C685 ( $1,000 \mu \mathrm{~F}$ ) and C686 ( $0 \cdot 12 \mu \mathrm{~F}$ ) for leakage and replace as necessary.

## General Points

New versions of several long-running models have been introduced. The basic model number remains the same, with 5,6 or 7 added, e.g. Model 2100 TB becomes Model 2100 TB 5 . There are important circuit differences between the different versions however, including a new teletext module, microcontroller chip (ICA01), chroma/timebase generator chip (IC501) and remote control handset.

Different tubes have been fitted in several models. This may involve a front cover change. It's thus important to specify the tube type number when ordering replacements for either of these items. Models concemed are the $1400 \mathrm{RBT}, 2100 \mathrm{~TB} 5,2101 \mathrm{~TB} 5,2102 \mathrm{~TB} 7,2145 \mathrm{DB}$, $2500 \mathrm{~TB} 5,2527 \mathrm{DB}$ and 2539 DB .

NEXT MONTH: We featurē VCR's


# Test Report: The Tektronix TekMeter 

David Botto

Tektonix' new TekMeter, Model THM565, could be the answer for the field engineer who is looking for a lightweight instrument that tests virtually everything. It combines the power of a true r.m.s. digital multimeter, an autoranging dual-channel scope and a whole lot more in a single, compact hand-held instrument.

## General Description and Features

Its appearance is neat, with all the controls arranged on a single front panel. Weight was found to be only 1 kg ( 2 lb 3 oz ) on my scales, including batteries. Measurements are $140 \times 210 \times 43 \mathrm{~mm}(5 \times 8.3 \times 1.7 \mathrm{in}$.). A dimple pattern moulded into the case enables the instrument to be held with the left hand and operated with the right hand. Four well-insulated sockets at the top cater for the inputs: the red socket is marked DMM, the black socket COM while yellow and blue sockets are marked CH1 and CH 2 respectively. These sockets have a tough appearance and should stand up to hard use.

The test leads are light and designed so that components on compact PCBs can be easily checked. They are well insulated and incorporate finger guards at the business end.

There are two versions of the TekMeter, Models THM560 and THM565. The THM565, which was the one sent to us for review, has extra features such as an event clock, extended built-in memory, a line test and a motor drive test. The latter can also be used with three-phase motors.

The bright, clear display uses an advanced, supertwisted liquid-crystal panel. Model THM565 has a useful electroluminescent back-lit display. A low-battery indicator appears at the upper right of the display when the internal battery voltage falls below a certain point. It's important that you don't expose the display panel to direct sunlight for long periods.

What makes the TekMeter so special? Unlike a conventional DMM, the large display shows all you need to see at a glance. It includes an autoranging numerical readout and an analogue bar readout. It also shows you max, min, max-min and hold readings. Computer-type menus select the required range and function. The TekMeter is controlled by an advanced
microprocessor and a hefty chunk of static RAM.
There's a handy facility for mounting the instrument on an ordinary photographic tripod. This can be useful in certain circumstances.

## Voltage Measurements

The THM565's full-scale reading is 4,000 counts, or 3.75 digits. For d.c. measurements the manual or autoranging coverage is 400 mV to 850 V with an accuracy of $\pm 0.5 \%$ of the reading plus five counts. The a.c. ranges cover 400 mV to 600 V with a resolution of 100 mV in the lowest range: accuracy is specified as $\pm 2 \%$ plus five counts, with a signal peak (true r.m.s. crest factor) to r.m.s. value ratio of three. The DMM ranges are all autoranging, though any range can be selècted manually.

Measurements I made using precision voltage sources show that the TekMeter operates well within the claimed accuracy limits. My readings were as follows:

Precision source TekMeter THM565

| 1.21 V d.c. | 1.21 V d.c. |
| :--- | :--- |
| 1.406 V d.c. | 1.40 V d.c. |
| 2.39 V d.c. | 2.39 V d.c. |
| 11.30 V d.c. | 11.30 V d.c. |
| 16.00 V d.c. | 15.99 V d.c. |
| 32 V d.c. | 32.10 V d.c. |
| 17.0 V a.c. | 17.06 V a.c. |
| 34 V a.c. | 34.19 V a.c. |
| 240 V a.c. | 244 V a.c. |

The clear, linear bar graph proved to be excellent for observing varying voltages.

The TekMeter is virtually auto-everything. This saves much time. Besides its autoranging facilities the instrument has max, min, max-min, hold and maths facilities. A DMM store/recall menu enables you to store and recall instrument setups.

## Resistance Ranges

The six resistance ranges span, in decades, from $400 \Omega$ (resolution $0 \cdot 1 \Omega$ ) to the maximum reading of $40 \mathrm{M} \Omega$
(resolution $10 \mathrm{k} \Omega$ ). When I checked these ranges 1 found that the accuracy was spot on.

## Diode Tests

The diode test voltage is 0.2 V , the test current being 1.6 mA . An excellent feature, in addition to the diode good/bad readout, is the ability to check forward and reverse diode voltages. You then have no doubt about the condition of the diode being tested.

## Continuity Tester

The continuity test indication is an audible tone/graphic display arrangement. On screen you see a large picture of an open switch: when continuity of $150 \Omega$ or less is detected the switch visibly closes and an audible tone is heard. This test takes some beating for practical servicing work.

## The Scope Functions

The meter/scope button selects either DMM or scope operation. In the scope mode the THM565 operates as a double-channel display device with buttons and menus to enable the required range to be selected quickly. The hold button freezes the display. Operation is autoranging, the display scaling and tracking automatically as the input varies. This provides the advantage of hands-free operation.

The built-in interface provides fast access to a whole range of features such as cursors, automatic measurements, true power and spike detection. Patented features are claimed to give you fifty times more information about the signal being measured. For example the 'dynamic display DSP' updates the signal a hundred times a second, providing the equivalent of an analogue display. You always see the real signal.

There are six vertical channel ranges from 5 mV to 500 V . The analogue bandwidth is d.c. to 1 MHz at $5 \mathrm{mV} /$ div, d.c. to 5 MHz at $10 \mathrm{mV} /$ div to $2 \mathrm{~V} /$ div, and d.c. to 1 MHz at $5 \mathrm{~V} /$ div to $500 \mathrm{~V} / \mathrm{div}$. Most TV/video work will be done at a range setting between $10 \mathrm{mV} / \mathrm{div}$ and 2V/div.

The TekMeter seems to handle most TV and VCR signals without difficulty but it won't. when you are working on a modern PC, check the frequency of the central processor. CPU frequency tests are now normally carried out using specialised software however: such processors as 80 MHz 486 s and the powerful Pentiums are far too expensive to be put at risk of static or other damage by jabbing at their pins with test probes.

The horizontal timebase covers $60 \mathrm{~s} /$ div to $200 \mathrm{~ns} /$ div in a 1-2-5 sequence. A choice of triggering arrangements enables spikes to be captured at all timebase speeds.

## Scope Use

To view a waveform you connect the common and channel one probes across the signal source. To view the channel two signal the common and channel two probes are used. The exact position of the triggering signal is always clearly shown. An electronic graticule system has provision for no graticle, crosshair or a calibrated grid display.

A comprehensive computer-type scope menu tree makes both manual and auto setups easy to understand. The store feature enables waveforms to be stored and
recalled as required. Model THM565 stores up to eight sctups, eight waveforms and eight screens. Selecting print provides hard copies of saved waveforms via an RS232C interface. Model THM565 date and time stamps the stored waveforms: this is shown on the printed hard copies.

Disturbances on mains and other power supply sources can cause obscure problems with some modern high-tech equipment, including PCs. Thus a fast method of detecting such disturbances can be very useful. With the scope test probes connected across the power supply exhaustive tests can be made using a special on-screen line-check menu.

It's important nowadays to be able to check the motors you find in equipment such as VCRs and CPs. Is the motor or its drive circuit at fault? Waveform checks will enable you to find out fast. This includes three-phase, delta-configuration motors. The waveforms and any faults can be clearly seen on the display, labelled on screen and with their phase differences shown.

## Protection

The TekMeter is UL and CSA certified to 600 V a.c. or 850 V d.c. and is surge protected to 6 kV . The case is solidly built and has a pleasant, chunky feel. It's also well insulated.

## Optional Accessories

A soft case (THM5SCA) or alternatively a neck strap transport case (THM5HCA) is available. Whichever you choose costs $£ 70$. To save unnecessary expense with dry batteries a NiCad battery pack (THM5BAT) is available at $£ 40$. A mains $/ 12 \mathrm{~V}$ car cigar socket recharger (THM5CHG) is available at $£ 130$. An adaptor (THM5AC) to enable the TekMeter to be operated with a 240 V mains supply can be obtained at $£ 45$.

The RS232 communications adaptor (THMCOM1) enables a printer or a PC with suitable software to be connected. Its price is $£ 45$.

Current probes are available to enable you to measure up to 500 A a.c. (type A605), up to $2,000 \mathrm{~A}$ a.c. (type A621) or up to 100 A a.c./d.c. (type A622).

## Conclusion

The TekMeter is a beautiful instrument and l'd love to own one. My only reservation is that I would prefer to have vertical scope input channcls with a wider bandwidth - even if this meant a higher price. The current price of the THM565 is $£ 995$ while the THM560 is $£ 685$. Both prices are exclusive of VAT. The TekMeter is sold via distributors. For addresses etc. and further details if required apply to Tektronix UK Ltd., Fourth Avenue, Globe Park, Marlow, Bucks SL7 1YD, telephone 01628 403300.

If you decide to buy a TekMeter I'd recommend the THM565. As with all test gear, it's best to see and try out the instrument before buying it. The TekMeter will represent a substantial investment which will be with you for a long time.

## Acknowedgement

My thanks to Barbara Rodriques for the loan of the test TekMeter and for supplying photographs and technical information,

# TV Fault Finding 

## Philips 3A Chassis

If you have a power supply fault and find that the BC369 transistor $\operatorname{Tr} 7686$ is faulty, take extra care in checking that the pin connections of your replacement match the circuit requirement. Check with the circuit diagram: take the writing on the PCB with a pinch of salt.
P.B.

## Ferguson ICC5 Chassis

If the line output transistor has a short life, check CL48 in the flyback tuning circuit by replacement. The value varies with different models. It was 11 nF in this case (Model 51K7).

## Philips 25PT410A (GR2.2 Chassis)

If the set always comes on in standby, and yoū have to use the remote control unit to get it going, the child lock in the special functions menu has been set to on!

## Philips 2A Chassis

If there's no sound or vision, the 140 V h.t. supply line is at $40-50 \mathrm{~V}$ and a screaming noise comes from the power supply, check whether the h.t. reservoir and smoothing capacitors C2697 and C2701 are open-circuit. They are both $47 \mu \mathrm{~F}, 250 \mathrm{~V}$ types.
P.B.

## Samsung Cl5937AN

This set was dead and whining. A check showed that there was a dead short across the h.t. line because the R2K, 170 V overvoltage zener diode D808 had tripped. The cause was traced to a dry-joint at pin 2 of the optocoupler PC801 there was thus no illumination within the device and no feedback.
N.B.

## Ferguson A51F (IKC2 Chassis)

When this set was switched back to standby a fairly loud plop came from the speaker. The owner hadn't complained about this and we were not sure whether it was normal or not. So we looked at the circuit and found the power muting system. Checks here brought us to CA15 ( $10 \mu \mathrm{~F}$ ) which you could say was open-circuit - it had never been fitted! According to the circuit the power muting system is not fitted in the 17in. Model 41P3.
N.B.

## Samsung Cl6837AN

This 28 in . monster was dead: it whistled even in standby. I came to the conclusion that there must be a short on the secondary side of the power supply, even though one couldn't be measured, and was correct - the TDA2616 audio output chip IC603 was shorting to chassis internally under load.

These sets are menu-driven for the service adjustments. but the manual is a disgrace in this respect. A call to the

Reports from Philip Blundell, AMIEEIE, Nick Beer, Chris Watton, Michael Dranfield, John Edwards, Graham Thompson and Tony Ashworth

Samsung Technical Advice line will produce a clear version of how to gain access to and use the service mode. N.B.

## Panasonic U4 Chassis

There was a burst of life at switch on, then the set went off as the protection system came into operation. A check showed that the h.t. rose to far too high a level. The feedback to the error detector transistor is developed across C808 ( $47 \mu \mathrm{~F}, 16 \mathrm{~V}$ ) which had dried up and was virtually open-circuit.
N.B.

## Ferguson B14R (TX80 Chassis)

The red standby LED was alight but there was a rumbling noise from the set which would do nothing else. A check showed that the start-up voltage at RP71 $(9 \cdot 1 \mathrm{k} \Omega)$ was very low, at about $1 \cdot 1 \mathrm{~V}$. Rather interestingly, RP71 had fallen in value to about $8 \mathrm{k} \Omega$. But the cause of the fault was DP36 (BA157) which was short-circuit.
N.B.

## Panasonic Alpha 2 Chassis

This set was dead apart from a whine that came from the power supply. The 2SD1441RL line output transistor Q551 was short-circuit and the fusible resistor R567 in the feed to the stage was open-circuit. When these items had been replaced the set was still dead, the SR2KL overvoltage diode D854 having gone short-circuit. Removing this diode and disconnecting the line output stage enabled me to confirm that the h.t. voltage was much too high. The cause was IC801 (STR54041M).
N.B.

## Toshiba C1401B

This rather aged portable was dead. The mains fuse was black and the 2SD820FA-1 chopper transistor Q801 shortcircuit. When these items had been replaced the power supply worked but was being heavily loaded by the line output stage, which we isolated by lifting R444. Not only was the 2SD869 line output transistor Q404 short-circuit but C464 ( 560 pF .2 kV ), which is in parallel with it, produced a resistance reading of $150 \Omega$.
N.B.

## Ingersoll XK505B

This combi monochrome TV/cassette/radio was dead. A check showed that the small power supply circuit in the back of the cabinet produced just 4.5 V instead of 9.8 V . Its output couldn't be adjusted and the transistors there all read o.k. The cause of the trouble was the $100 \Omega$ set-voltage potentiometer SFR 800 which was open-circuit all ways round.
N.B.

## Samsung Cl3351X

There was no red in the picture though the on-screen
displays were fine. The signals that produce the latter are injected after the RGB chip, so it was a question of working back from the output stages. The chroma delay line in this chassis is a TDA4661 chip, IC501. It's a perfect point for checking the $\mathrm{R}-\mathrm{Y}$ and $\mathrm{B}-\mathrm{Y}$ signals, as they loop through it. I soon found that there was an $R-Y$ input at pin 16 but no output at pin 11. A new delay-line chip restored correctly coloured pictures.
N.B.

## Ferguson ICC8 Chassis

No picture was the complaint with this set, though it worked fine when put on test. The next day it failed: there was no vision though the tube's heater and e.h.t. supplies were present. Vision was restored when the video drive board CD17000 was flexed. On removing this plug-in subpanel we found that every through-the-board joint had been resoldered, as had the socket connections to the mother board. The cause of the trouble however was that the MELF devices CD41, RD42 and CD12 had not been correctly soldered from new: solder was present, but it had not taken to the pads. Correcting this cleared the fault.
N.B.

## Philips CP90 Chassis

Only the number 3 showed on this otherwise dead set. After a few seconds the display changed to F1. Checks in the power supply revealed that the 95 V and 22 V outputs were both missing, the former because the BYW95B rectifier D6695 was open-circuit and the later because the 400 mA Wickman fuse F1690 had failed. I wonder which went first? C.W.

## Tandy CTV1406

There was no sound output from this Turkish-made portable, just a burp from the speaker at switch on. The supply to the discrete-component audio output stage was present but there was no bias as R132 (8.2k $\Omega$ ) was opencircuit.
C.W.

## Philips 2A Chassis

This set ticked all the time it was in standby. At least I had to take others' word that it did, as my permanently whistling ears couldn't detect the ticking. Replacing C2690 ( $1 \mu \mathrm{~F}$, 100 V ) cured the fault. Thanks to Steve Cannon who reported it in the April 1993 issue (page 440). C.W.

## Salora J Chassis

The problem with this set was no sound. So checks were carried out around the TDA2030 audio output chip ICB100. The 28 V supply was correct at pin 5 , the speaker was linked to pin 4, and audio could be seen when a scope check was made at the input coupling capacitor CB108. But the feedback/input pins 1 and 2 were both at 26 V . Potential divider RB124/5 provides a bias voltage for these pins. RB124 $(1.8 \mathrm{k} \Omega)$ had risen in value to around $6 \mathrm{k} \Omega$, upsetting the d.c. conditions with the result that the chip was cut off. C.W.

## Finlux 3021F

There was excessive width, with EW correction troubles. In addition bright pictures produced tearing at the top and bottom of the screen. We started by checking the supplies, which were all correct and smooth. Moving to the EW correction circuitry. we found that the waveform at pin 19 of ICH2 was incorrect. This pin is linked to pin 8 of the line
output transformer, the beam sensing point. The voltage here was varying much more than it should have done. Checks along this line brought me to $\mathrm{CH} 29(0 \cdot 1 \mu \mathrm{~F})$ which was open-circuit. It's on the signals panel. A replacement restored perfect geometry.

Incidentally the set had been very poorly serviced in the past, with resistors and capacitors stuck on the wrong side of the panel on full-length leads. Criminal with such a good set.
C.W.

## Ferguson A10RWH

The 1.6A mains fuse was open-circuit. As no obvious shorts could be measured we tried a new fuse. It shattered at switch-on. Further checks led us to a low-resistance posistor which crumbled when it was opened. The set is rather tedious to work on, as there are scores of wires to unclip then reclip afterwards. But it was nice to use my old 4 BA nut spinner.
C.W.

## GEC C2662H

This set had been plagued by intermittent loss of red for many years. Any attempt to repair it would restore the red, which might remain for months on end. We eventually found that R819 was going open-circuit, though the slightest movement would join it up again.
C.W.

## Sony KV2075

The convergence was poor. As the customer said, everyone had red and blue lines around them. We traced the cause of the trouble to L 551 , a 27 mH inductor in the Y bow correction circuit. Unfortunately A.N. Other had been adjusting those bits around the tube's neck.
C.W.

## Unitra 349

This Polish made set is old-fashioned but very sturdy. The one we had in had an EW correction fault: after a few hours' operation the picture width would vary, with a concave effect. The EW driver transistor T660 was the cause of the trouble, a TIP41C making a suitable replacement.
C.W.

## Ferguson A59N (ICC8 Chassis)

The e.h.t. and other supplies were present but there was no sound or picture: just a volume-at-minimum on-screen display was present. The cause of this was the set's volume button being short-circuit. It's a membrane type assembly. Unfortunately the stupid thing is glued to the front of the cabinet.
C.W.

## Matsui 1481B

Stuck on one channel, no remote control operation and no response from the set's on-board controls means microcontroller chip lock-out. Replacing R158 will cure the fault. But be careful. In the manual it's shown as a 315 mA circuit protector (ICP401). It looks like a small, white wirewound resistor.
M.Dr.

## Triumph CTV8209

The complaint with this set was flashovers from the tube's final anode cavity. After cleaning the bowl of the tube with trichloroethane and applying a smear of silicone grease the fault was still present though not as bad. We found that the
h.t. was spot on at 112 V , but the e.h.t. was 32 kV . So we removed and tested the flyback tuning capacitor. The digital capacitance meter said 8.2 nF , which was the value stamped on the capacitor, but the manual said 10 nF . When this value had been fitted and the height had been readjusted everything worked correctly. Could the set have been like this from new, or had the 'it's near enough' brigade been at work? M.Dr.

## Panasonic TX3 (Alpha 1 Chassis)

If you get one of these sets that is dead with 300 V at pin 2 of the STR54041 chopper chip, try shorting out pins 3 and 4 of the standby control optocoupler D811. If this brings the set on, replace the optocoupler (ON3105TV).
M.Dr.

## Hitachi CPT2218 (NP81CQ Chassis)

This set came in with field collapse. We had replaced the HM6251 field output module some months previously. A scope check at pin 4 produced a field-rate squarewave. Odd - this could only mean that the set was running without the effect of the field coils' inductance being present. So we checked the $220 \mu \mathrm{~F}, 50 \mathrm{~V}$ field scan coupling capacitor C610. It had dried out, a replacement restoring normal operation. M.Dr.

## Sharp DV5150

This set would come on then, after two seconds, switch back to standby. We found that the 24 V supply to the field output chip was missing because R612, a $3 \cdot 3 \Omega$ safety resistor, was open-circuit. When we checked through our Sharp Technical Bulletins we found that there's a modification here. R612 should be changed to $2 \cdot 2 \Omega$, again a safety type, part no. RR-XZ0204BMZZ; and wire link J13 should be replaced with a $1.2 \Omega, 0.5 \mathrm{~W}$ resistor, part no. VRDRA2HDIR2J.
M.Dr.

## Toshiba 140R4B

There was an odd fault with this set. The local stations could all be tuned in and memorised but if, after changing channels, BBC-2 (ch. 24 in our area) was selected it would be slightly off tune. We came to the conclusion that the TMM842P memory chip was faulty. As we didn't have one in stock we tried a TMM843P from a 10 in . Samsung set after fitting a 16 -pin i.c. base. It not only worked, it cured the fault.

## Sony KVX25TU (AE1 Chassis)

There was intermittent loss of the sound and picture, leaving a blank screen. Normal operation would be restored if the metal section that runs along the centre of the main board was tapped. All three legs of the 781212 V regulator Q608 were found to be dry-jointed. For reliability with these receivers we resolder the chopper transformer's pins, the metal plate's through-board tags and C612 in the power supply.

## ITT CP3125 (Pico S/3 Chāssis)

This set was dead apart from a brief flicker from the standby LED when the on/off switch was pressed. There was 300 V at the collector of the BU902 chopper transistor Tr701, but the power supply wasn't producing any outputs. When pin 4 of the line output transformer T501 was disconnected we
got an h.t. reading of 97 V . As no shorts could be measured in the line output stage we fitted a new transformer. This cured the fault.
J.E.

## Goodmans 2185T

This set was dead and the customer said that two other dealers had refused to look at it. Although we didn't have the circuit diagram we decided to have a go. Checks around the STK54041 chopper chip produced a reading of around 300 V at pin 3 but nothing at the other four pins. As there were no signs of any stress, such as an open-circuit surge limiter resistor or a blown fuse, we decided to take a look at the secondary side of the power supply. A CNX82A optocoupler lives here, so apparently some sort of h.t. monitoring and feedback to the primary side of the circuit is used. It seemed that the chopper chip was for some reason being told to switch off. There was nothing for it but check the few capacitors, resistors and transistors in the power supply individually. This paid off. After a few minutes we found that R104 ( $270 \mathrm{k} \Omega$ ) was open-circuit. As it showed no signs of having had a hard time we fitted a replacement The set then burst into life. Some we win, some we lose! J.E.

## Philips V7620 (K40 Chassis)

After a while the signals would disappear as the tuning drifted, leaving a snow-filled raster. By monitoring the tuner's VT pin during the fault condition we found that the voltage here dropped to 0.7 V , though the 33 V feed via R3104 and D7104 to the tuning control PCB remained correct. To solve the problem we had to resolder all the joints on the tuning control PCB, spray switch cleaner on the edge connector and socket, and finally resolder the socket pins on the mother board.
J.E.

## Bush 2114 T

For normal colour in the text mode but only monochrome in the TV mode replace the TDA3562 colour decoder chip. But be sure to use only the Telefunken version. Others are not compatible.
J.E.

## Grundig CUC41KT

This set remained dead although its power supply was producing the correct 124 V and 18 V outputs. There was no 12 V supply to the timebases however as the TY40164 (7812) regulator had failed. It takes its input from the 18 V supply. A replacement brought the set to life.
J.E.

## Toshiba C2295B1

The screen would blank out intermittently, the sound remaining normal. We found that the $2.2 \Omega, 2 W$ c.r.t. heater supply resistor R920 on the tube base was badly dry-jointed. J.E.

## Bush 2114

This set would die after being on for two-three minutes. We found that the 5 V regulator IC5 on the remote control/tuning PCB was getting rather hot and shutting down. The cause of the trouble was C22 (470 HF ) which was short-circuit.
G.T.

## Soundwave CTV1405R

The problem we had with one of these sets was intermittent low brightness. We found that C588 was dry-jointed. It's

mounted near the line output transformer.
If one of these sets comes on in the child lock mode and the customer can't remember the code, press the programme up and down buttons on the set or the remote control unit together for a few seconds.
G.T.

## Beko

All the Beko models we've had seem to have the same chassis. For field collapse, check R717 and R722 which go open-circuit.

## G.T.

## Alba CTV600

This set would shut down intermittently. To cut a long story short, the cause was eventually traced to a hairline crack in the print, near a screw that fastens the PCB to its plastic frame. The relevant section of print connects the emitter of the chopper transistor to chassis, via R914.

There are several screws through the PCB. The one that caused the trouble is near Q904's heatsink and the main reservoir capacitor.
G.T.

## Elbex ECM1400 Monitor

This monitor was dead with no h.t. supply to the line output stage. The cause was simply that R254, a $1 \Omega$ safety resistor, had gone open-circuit.
G.T.

## JVC AV21F1EK (JX Chassis)

This set suffered from an unusual effect that looked like a
hum bar. Scope chccks showed that there was indeed ripple on the h.t. line, but the cause proved to be rather elusive until L2001 in the chopper transistor's base drive circuit was checked. It was open-circuit (part no. CELC005-2R5).
T.A.

## Toshiba 2112DB

Failure of the line output transformer (T461, part no. 23236427) seems to be quite a common occurrence in this model. After replacing it always check the standby operation as the standby switching transistors Q843 and Q845, which are in the power supply, are often damaged. T.A.

## Philips 25ST2716/05B

The cause of distorted left channel Nicam sound was traced to the TDA1543 DA converter chip IC7168. This little eight-legged device is commonly found on CD player PCBs. Part no. 482220973236. T.A.

## Sony KVX2562 (AE2 Chassis)

This set's problem was bands of field non-linearity through the picture. It looked as if there was ringing in the field output stage, but extensive checks here failed to reveal the cause. In desperation I swapped over panel M with one from another set. This cured the fault. The cause of the trouble turned out to be the CXD2018Q chip IC561. This 48 -pin surface-mounted device provides the deflection circuit drives, under the control of the microcomputer chip. The part no. is 8-752-347-92.
T.A.
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# Satellite Workshop 

Jack Armstrong

We get some curious customers in our workshop. This one was no exception. He hopped from one foot to the other in an agitated manner as he waited for me to finish soldering a tuner in place.

## Too Much Skew

I looked up and he grinned nervously.
"It's got too much skew" he explained, thrusting a Swedish Microwave LNB and polariser at me. "I got it from this bloke but it won't work. It's definitely got too much skew and I can't get the channels. It got hot when I plugged it in, then the fuse blew."

Occasionally the mind boggles. Mine was boggling like mad. "Can you tell me what you did and what happened?"
"I got it from this bloke in the pub. It's an Echostar. When I connected the wires to the mains it went really hot and there must be too much skew."

Light began to dawn. After further questioning I discovered that he had fitted a second-hand satellite system. Not knowing where the ferrite polariser should be connected, he'd joined the wires to a mains cable then plugged it in. It had become a little warm. Unbelievable!

Equally unbelievable was the fact that I had one in stock. It was a more modern wideband type, but it was exactly the same size and shape. I'd ordered it last year for an enthusiast who never came back to collect it. I still had his $£ 20$ deposit. Mr Agitated seemed happy to give me $£ 38$ for it, so I fitted it to his LNB and explained how to connect it to the receiver. Armed with the telephone number of a local installer, he trotted away happily enough.

## A Pace SS9200

Back on the repair bench I'd just completed the tricky job of fitting a Sharp tuner kit in a Pace SS9200 receiver. The old tuner had expired and even a nice new tantalum bead capacitor had failed to revive it. Soldering surface-mounted components is not my favourite pastime,
but they are part of the kit and I had made quite a neat job of fitting them.

When the receiver clicked into life however the decoded pictures looked distinctly streaky. I'd seen this before after fitting this kit and immediately replaced C21, the reservoir capacitor for the 12 V supplies. It's a $2,200 \mu \mathrm{~F}$ electrolytic rated at $105^{\circ} \mathrm{C}$, but the high temperature rating hadn't saved it from the cooking it had received. Honestly, I think most customers keep their receivers in an oven! The picture was now better but still a little streaky. This was going to be tricky.

I decided to replace the connector on the decoder board, since it can cause the same effect. At this point my $£ 600$ desoldering station decided to clog its nozzle. Consequently a two minute job took fifteen minutes. A pity, because the streaky patterning was still present! In desperation I began to replace all the electrolytics around the tuner and at the secondary side of the power supply. No improvement.

At last I had a moment of inspiration. I increased the value of C 125 , which decouples the tuner's 5 V supply, to $1,000 \mu \mathrm{~F}$. Result: a nice clean picture! Since Pace had supplied a $470 \mu \mathrm{~F}$ capacitor to replace the original $10 \mu \mathrm{~F}$ capacitor in this position, I guessed that the new tuner was particularly sensitive to noise on the supply rail. Increasing the value further had done the trick. A quick call to the Pace technical heip line confirmed that they are aware of the problem.

## By Post

A lot of my repairs arrive by post. Most of them are reasonably well packed, but today the postman placed the parcel carefully on the floor then ran. As I picked up the box I found out why - it rattled. To be fair, it wasn't the postman's fault. This Ferguson SRVI (Pace SS9000) had been squeezed into a box which was an exact fit. There was no resilient packing and the cardboard was single layer, not corrugated. It hadn't stood a chance.

When I pulled the receiver out, the front panel was detached and the
cover had a large dent in it. I thought it was a no-hoper. But on removing the screws to look inside I found that there was just a tiny crack in the PCB - and it hadn't gone right through.

There was no letter with the unit, but a 'Postit' sticker said "Faulty, please fix and add a crystal for more channels".

I removed the PCB and inspected it more carefully for damage. Apatt from the tiny crack and the usual signs of overheating there wasn't any. I replaced C9 in the power supply, always a wise precaution, then connected the receiver to the mains supply. It zipped into life but, with the decoder board removed, it produced a blank screen. When I switched to channel two a mass of horizontal lines with a hint of a picture behind appeared. The audio was fine and I immediately suspected the infamous capacitor in the tuner.

The picture from the decoder scart socket was perfectly clear however. This is obviously not possible with a faulty tuner, so I began to poke around with an oscilloscope probe. Eventually I traced the cause of the problem to a dry-joint on a surfacemounted capacitor below the TEA2029 sync separator chip. As the picture was still a little streaky I replaced the various electrolytics that dry out around the tuner and in the power supply.

Having got a decent picture I replaced the decoder board and retested the unit. The decoder worked all right, but the 'please wait' message was very faint. Reference to the Satellite Secrets book published by Davenham Satellite Systems (I have a terrible memory) reminded me to check R92, on the decoder board. It had already been upgraded from $22 \mathrm{k} \Omega$ to $43 \mathrm{k} \Omega$, and the surfacemounted resistor R342, beneath C171 on the main board, had been replaced with a $680 \Omega$ resistor.

Having eliminated the most likely causes of the fault I checked the outputs from the power supply. This provided a clue: they were all slightly low. Someone had correctly removed the surface-mounted capacitor that makes the $100 \Omega$ resistor run hot but they had not fitted a $270 \Omega$ surface-mounted resistor in place of
the zero-ohms link next to the $43 \mathrm{k} \Omega$ resistor. Once I'd done this the voltages were correct and the decoder messages were much darker.

I was not sure whether the customer was serious about increasing the number of channels, but I decided to fit the ninetychannel upgrade kit from Davenham Satellite Systems (1 Firths Fields,

Davenham; Northwich, Cheshire CW9 8JB - 0160649 085). It consists of a new microcontroller chip and a tiny board with an EEPROM on it. When I applied mains power the timer LED remained on for some twenty seconds as the new micro reprogrammed the memory chip. The receiver was now effectively an

## SS9200

The only problem that remained was the da ge to the front panel. The best so tion seemed to be to fit a panel from a scrap SS9200IRD. It fitled the bill nicely. A quick polish with a quirt of WD40 and the unit was ready for packing. Properly this time, and the customer would be charged accordingly!

## 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: Lower drum assembly (or complete head drum assembly) for the Panasonic NVG10B. S. Oliver, Hunter's Moon, Roman Bank, Holbeach Bank. Spalding, Lincs PE12 8BN. 01406423966.
Wanted: Video head for the Philips N1700/15. N. Smith, Cherry Hinton, Watermill Lane, Beckley, Nr. Rye, East Sussex TN31 6SH. 01797252 399.

Wanted: I.F. panel (part no. VEP07186H) for the Panasonic NV830 VCR, with or without tuner. Carl Anson, 22 Church Street, Beaumaris, Anglesey LL58 8AB. 01248 810758.

Wanted: Radio and Television Servicing books from 1981/2 to 1986/7. B.R. McLeod, 8 Cunningham Road, Horndean, Waterlooville, Portsmouth, Hants PO8 9I.T. 01705 597941.

Wanted: Service manual for the Uniden VM100 miniature LCD camera and monitor, or any information about this or a similar model. Also a service manual for the JVC HR7700/Ferguson 3V23. R. McGrath, 41 Belvedere Place, Dublin 1, Ireland. Wanted: Texas Instruments TMS9129NL video processing chip. Stephen Quantrill, 28 Berryfields, Brundall, Norwich NR13 5QE. 01603 714221.

Wanted: Three-legged, 115V 5A regulator chip for the Sharp SP2 Mark 2 CTV chassis. R. Lane, 29 Hawthorne Crescent, Gilesgate Moor, Durham DH1 1ED. 01913543843.
Wanted: Service manual and source of spares, specifically the mains trans-
former, for the Quen Data Excellence 70 typewriter. I.J. Radford, Forge House, Bromsash, Ross on Wye, Herefordshire HR9 7PJ. 01989750 288.

Wanted: Any information on the Beckman HV211 high-voltage probe. Lance Williams, Kemberton, Ribchester Road, Blackburn. 01254249 668.

Wanted: Service manual/circuit diagram (photocopy would do) for the Atari SM125 high-resolution mono monitor. E.S. Gitsham, 17 Grimston Lane, Trimley, Ipswich, Suffolk IP10 ORU. 01394275261.
Wanted: Circuit diagram (photocopy will do) for the Spectrum Plus 3 computer. G. Cannon, 16 St . Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 0191262 0712.

Wanted: Circuit diagram or any information on an external plug-in module. part no. 8087016, for the B \& O VX5000 VCR. It's a remote IR sensor to enable the VCR to be used with a non-B \& O TV set, to provide direct control rather than via the TV set. David Newton Smith, Little Trecame, Advent, Camelford, Cornwall PL32 9QR. 01840213343.
Wanted: A 510WZB22 tube for the Finlux Model 1122M; a LOPT for the Teleton Model CPL145; a drive belt for the Connoisseur BD1 turntable; and help in identifying a Finlandia Nicam CTV chassis with 59 cm tube, two scart sockets and controls for on/off, channel up/down and fine tuning mid-mounted under the tube. V.E. Buffin, Do-Bits Electronic Services, 2 Southem Terrace, Mutley, Plymouth PL4 7LS. 01752670803.
Wanted: Service manual (copy will do) for the Telequipment D67 or D31 scope. Phone Bill on 01814453503.
Wanted: Service manual for the Fisher FVHP907 VCR. W. Boylan, 98 Upton Road, Moreton, Wirral, Merseyside L46 0SF. 01516778111.
Wanted: Circuit diagram for the WEM Copycat echo unit, made by Watkins Electronic Music Ltd. M.P. Quinn, 21 Hawarden Way, Mancot, Deeside, Clwyd. 01244531639.

Wanted: I PT for the Triumph CTV8000 Sms. mains/battery colour portable, or a source for this item. Vic Stevens, 337 Rochester Road, Gravesend, Kent DA12 4TH. 01474 334156.

Wanted: Circuit diagram for the Ferrograph Encore Model IV505 video player - or a machine needing repair. J. Holmes, 2 Lyngford Gardens, Lyngford Lane, Taunton TA2 7LJ.
Wanted: Spares for the Ferguson TX10 chassis, in particular the chopper transformer T705, part no. 00D4-198-001; also a circuit diagram or service manual (good photocopy would do) for the Fisher CA40 stereo amplifier. R. Anderson, 33 Broadmanor, North Duffield, Selby, N. Yorkshire YO8 7RZ.
Wanted: Service manual for the Osume Model CTV1494R or an equivalent model. N. Childs, 30 Chobham Road, Knaphill, Woking, Surrey GU21 2SX. 01483472011.
Wanted: Service manuals for the Baird Model 8233 (Ferguson TX10 text chassis) and the Philips PM5508 pattern generator, also an M28-11W or equivalent monochrome tube and a portable Philips V2000 VCR system. T. Martini, 122B Cannon Street Road, Shadwell, London El 2LH. $0171 \quad 7028774$ (home). 01712513196 (workshop).
Wanted: Cheap working main PCB for the Cambridge ARD200 satellite recciver or clone. Also an on/off switch for the Sony Model KV2217. Kieth Sargcant, 128 London Road, Stanway. Colchester, Essex CO3 5HD. 01206563471 (evenings).
Wanted: September 1985 issue of Television. P. Makin, 6 Fairisle Close, Clifton Estate, Nottingham NG11 8QD. 01159215460.
Wanted: Grid-dip oscillator/f.e.t. dip meter, with or without plug-in coils, up to 250 MHz - or source for samc. John Porter. 4 Cromore Gardens, Greggan Estate, Londonderry BT48 9TF. 01504266794.
Wanted: Circuit diagram (photocopy would do) for the Amstrad PCW8512. IR. Smith, 40 Delaval Road, Billingham, Cleveland TS23 3BT.

# Teletopics 

## DISC DEVELOPMENTS

The Toshiba/Time Warner group is now calling itself the SD-DVD (Super Density-Digital Video Disc) Alliance. Members include Matsushita, Thomson, Hitachi, Pioneer, Samsung and Mitsubishi. The Alliance has announced further developments and has also given the first European demonstration of its system, in Paris. Those present report that the results were most impressive. Six types of disc are proposed, as follows:
(1) SD5. This is a single-sided disc with a 5Gbyte capacity, intended for films. It will offer multiple aspect ratios - 4:3, 4:3 letterbox and 16:9.
(2) SD9. A single-sided disc using a dual-layer system, developed by Matsushita. There are two data layers which are read from the same side of the disc. Capacity is

9Gbytes. This makes it suitable for very long films, advanced ROM applications or interactive games.
(3) SD10. A two-sided disc with a total capacity of 10Gbytes, intended for double-length feature films or film/computer game applications.
(4) SD18. A two-sided disc, each side having a data capacity of 9Gbytes. Intended for future HDTV applications.
(5) SD-R. A recordable (write once), two-sided disc with a capacity of 6.4Gbytes. Intended for archive storage.
(6) SD-Rewritable. A rerecordable, two-sided disc using phase-change technology for writing and erasing the data. Capacity would be $5 \cdot 2 \mathrm{Gbytes}$. The disc would be aimed at computer applications. There are however no plans to release such discs for several years
at least. This disc has also been referred to as an SD-RAM.

The competing Philips-Sony group has also announced a standard for a recordable/erasable disc, which it calls Multimedia CD-R/E. It's a single-sided, dual-layer disc able to record up to 3 -5Gbytes of data.

The SD-DVD Alliance says that over 650,000 SD discs have now been made and that production requires only a slight modification to existing $C D$ manufacturing equipment. Production cost is claimed to be 114-139 per cent more than that of existing CDs, depending on the type of disc.

The Alliance expects to launch the first players and discs next year, with the former likely to .cost around $£ 700$. Despite this relatively high cost for a play-only machine, the Alliance believes that three million SD-DVD players will be sold in Europe during the first year.

## INTERACTIVE TV

In its latest report Interative TV: The Market Opportunity the market research company Ovum says that over fifty interative TV trials are at present being conducted worldwide. Participation increased from a few hundred households in 1992 to several thousand last year and is expected to rise to almost 20,000 next year. The UK is described as the leading European country in this field. According to the report no single equipment manufacturer has established a clear lead, though Digital, Oracle, Hewlett Packard, Silicon Graphics, IBM and

Philips are all involved in trials in more than one continent.

Computer companies are moving into interactive video. Oracle and Intel are developing technology that will enable interative video to be sent to PCs via ISDN phone lines. Digital and Sybase are to integrate two of their product lines to offer a complete system for creating, delivering and managing interative TV services. Novell and Microwave are to develop compatibility between Microwave's DAVID interative TV operating system and Novell's NetWare network operating system.


Thè new flàt aerial, known as the Interial.

## NOVEL INDOOR AERIAL

Rovic Communications Ltd., PO Box 2996, Danbury, Chelmsford, Essex CM3 4RR (01245 226 867) is marketing a new and novel indoor u.h.f. TV aerial known as the Interial. The suggested retail price is £29.95. Unlike conventional aerial designs, it has a figure-of-eight polar response. It is also wideband, but with a choice of two connection points - at the top and bottom - for different bands. The Interial consists of a flat panel measuring $470 \times 450 \times 5 \mathrm{~mm}$ : it has two internal foil elements that are capacitively coupled to the output lead and interact to reinforce the signals they pick up.

## BUSINESS/TRADE NEWS

The sales and servicing of Grundig satellite TV equipment have been transferred to Grundig International at Rugby, the Llantrisant centre now being used solely for manufacturing purposes. The change has involved a number of redundancies. Those who have lost their jobs include service manager Paul Goldring, who had been with Grundig since 1984. He can be contacted on

01443413 175. Spares should be ordered through Grundig International, Willow Vale or Wizard Distributors.

Tatung plans to invest $\$ 250 \mathrm{~m}$ on setting up a UK c.r.t. manufacturing plant that will create up to 3,000 new jobs. When in full operation the plant would be able to produce three million 14 or 15 in . colour c.r.t.s a year.

## LATEST CD NEWS

Philips is planning to launch a new portable CDi player, Model CDi370, at around $£ 1,250$. The machine will be aimed at the professional presentation market and have PAL/NTSC capability and a digital video cartridge.

Philips Media and IPC Corporation, a Singaporebased electronics company, have signed an agreement to produce and manufacture a CDi/PC kit to enable CDi dises to be used with PCs. It consists of a plug-in PCB, a CD-ROM drive and a special cable and is expected to cost approximately $£ 330$. Release will be worldwide, expëcted during the last quarter of the year.

Sony and Philips have released specifications for a new CD standard, referred to as the Blue Book. It's for an Enhanced Audio CD (or CD Plus) that can be used with both CD audio and CD-ROM drives. Microsoft and Apple Computer have taken part in the development of the format.

## DIGITAL TV

NTL and ITC demonstrated a live multi-channel terrestrial digital TV system at the Montreux TV conference. It used MPEG-2 codecs and the new SPECTRE-II 2,000-carrier OFDM modulator. Four TV services were transmitted in a single 8 MHz u.h.f. channel with a digital capacity of $20 \mathrm{Mbits} / \mathrm{sec}$. NTL also showed a new MPEG-2 encoder and announced a codec for digital satellite news gathering - it will be compatible with MPEG-2 and DVB (Digital Video Broad-
casting) standards.
A specification for stan-dard-definition digital TV is likely to be added to the FCC's HDTV specification for US broadcasting. The aim is to be able to provide compatible standard- and high-defi= nition digital TV services.

The MPEG has announced a new low-bit rate coding system, known as MPEG-4, for videophones, mobile AV communication, electronic papers etc. It has a $176 \times 144$ pixel array with a refresh rate of 10 Hz .

## Answer to Test Case 392

\author{

- see page 711-
}

With all helical-scan VCRs the field sync pulse train is recorded and read off at the beginning of each head's scan across the tape. consisting of some 6.5 TV lines (about 400 usec ) after the headswitching point. That's why Ray and Sage had, in their investigations with the scope, concentrated on the waveforms corresponding with this point. If the field sync pulse train is missing, damaged or corrupt, the inevitable result will be field roll and judder on the screen of the TV set/monitor.

While looking at the composite, field-rate playback video signal on the scope's screen, and magnifying it in both the X and Y directions, Sage saw that there was a burst of noise just at the point where the broad field sync pulses should occur. This led him to compare the phase of the noise with the rising and falling edges of the head-drum flipflop waveform (SW25). They coincided of course!

Ray had neglected to check the head switching point adjustment in the servo section of the machine. Because of lateral 'tolerances' in the replacement drum's position, the switching point was occurring about seven-eight TV lines late - slap in the middle of the field sync pulse. The inevitable noise generated by the head switching virtually obliterated the most vital section of the sync pulse train. Tweaking the appropriate preset restored the switch timing to the correct point, whereupon the playback picture became rock steady. As we write, Sagc is still struggling with that ITT Digivision set.

## Next Month in TELEVISION

## SERVICING MATSUI AND SAISHO VCRs

Jack Barclay on repairs to Matsui and Saisho VCRs that appeared in the post-1990 period. Models include the Saisho VR3400, VXL12A, VR6000A and VRS5000A and the Matsui VX1000, VX1100, VX2000, VX2500, VX2700, VX3000, VX6400, VX6600, VP9301, VP9401 and VP9501. They were fitted with a new mechanism that has a single motor to drive the front loading assembly (carriage) and the main mechanism.

## DESIGNING FOR RELIABILITY

Building reliability into electronic equipment is largely a matter of appropriate component selection/specification. All too often a component that is not up to the particular requirements of its circuit function is used, leading to repeated failures. It seems that the lessons are seldom learnt, as new generations of designers repeat the old mistakes. Martin Pickering on some points to watch. There are, naturally, lessons for the servicing side of the industry as well.

## TEST REPORT: THE OZAN TELETEST-PRO

Eugene Trundle on Ozan's latest pattern generator, which is intended for professional and semiprofessional users. It has a wider range of patterns than the standard model, also a choice of audio test tones and both composite and $S$ video outputs.

## SERVICING PIONEER CD MULTIPLAYERS

John Coombes on how to tackle faults experienced with the widely sold Pioneer multi CD players.

## JVC CAMCORDER POWER SUPPLIES

Keith Keeton on faults encountered with the switch-mode power supply adaptor/charger units used with JVC camcorders

## PLUS ALL THE REGULAR FEATURES



# VCR Clinic 

Reports from Eugene Trundle, Brian Storm, David Belmont, Chris Watton,<br>R.J. Longhurst, Mike Rathbone, Jeff Herbert, Richard Newman, Nick Beer, Gerald White and Michael Dranfield

## Panasonic NVJ42

This was a true video nasty! The machine would run for days without misbehaving, then suddenly shut down to stop, giving us a diagnosis time of perhaps two seconds. But we solved it! The waveform produced by the supply spool rota-tion-detector optocoupler was of low amplitude, just borderline for tripping the operational amplifier switch that's connected between it and the microcontroller chip. A new optocoupler solved the problem.
E.T.

## Sony VHS Models

This note applies to a large number of Sony domestic VCRs in the SLV model range. How many times have you replaced the pinch roller to cure tape edge damage (scalloping, crinkling) only to find that the job bounces shortly after? Very often the cause is a warped capstan motor housing. To avoid the high cost of a new motor, a repair kit, part no. A6759-567-A, is available from Sony. It includes four surface-mounted capacitors that must also be fitted to certain types of motor.
E.T.

## Tatung TVR7121

Intermittent failure to operate in the fast forward or rewind modes seems to be an increasingly common complaint with these machines. Sometimes the cause is a faulty clutch solenoid under the deck, but far more often the mode switch is responsible. It's mounted under the loading motor and is quite easy to change. At a pinch it can be cleaned, but replacement is far better.
E.T.

## Akai VSS99

A dead machine, with all the fuses intact and current flowing in the primary winding of the mains transformer, may well be the result of the fusible resistor in position R902 going open-circuit. This $6 \cdot 8 \Omega, 0.25 \mathrm{~W}$ safety component seems to fail for internal reasons. We've never seen a failed one with signs of overheating, and have never had a bounce back after fitting a replacement.
E.T.

## Sanyo VHR135E

Intermittent failure to operate in the fast forward or rewind modes has been the problem with a number of these machines that have come into the workshop. In every case the cause has been failure of the cam slide assembly, item 29 in the exploded diagram. The part no. is 6130949240. What happens is that its claw sometimes fails to engage. Replacement involves a lot of dismantling and reassembly: when you put everythipg back together, ensure that the mechanical phasing of thechanism and the mode switch is correct.
E.T

## Akai VS765

After a very involved, costly and time consuming job elsewhere in this machine we were dismayed to find that the u.h.f. tuning drifted and dithered when the machine warmed up. The cure was to replace all the capacitors -

C11-14 - in the low-pass $R C$ filter that produces the tuning voltage.
E.T.

## JVC HRD180/Ferguson 3V59

If the fault with one of these machines is permanent or intermittent failure of some of the front-panel keys (station selection etc.) to operate, look for dry-joints at CN1, where it's soldered to timer PWB no. 15, before getting involved with the front panel
E.T.

## Akai VS765

A very puzzling no-go situation, with the main power supply section working correctly, can be caused by loss of the BU (back-up) 5 V supply to the microcomputer chip on the front control panel. The usual cause is R221 (15ת) on the main PCB going high-resistance or open-circuit. E.T.

## Panasonic NVL25

This machine suffered from intermittent operation. After a few hours' use the mechanism would just shuffle, cut out then power down. A replacement deck mode switch, part no. VSS0175A, cured the problem.
B.S.

## Panasonic NVG18

The reason why this machine was dead seemed to be a corrupted reset voltage at the front display microcontroller chip IC7501. Adjusting the TH.ADJ control on the main board restored operation: the real cause of the problem then became apparent, as there was a bad ripple on the E-E picture. Replacing $\mathrm{C} 1104(100 \mu \mathrm{~F}, 63 \mathrm{~V}$ ) on the power supply panel restored correct operation B.S.

## Panasonic NVF55B

When a tape was inserted, the capstan motor would judder around very slowly. If you were lucky, the tape might load. We checked the voltages around the capstan motor drive chip. They all appeared to be correct. So we tried a new stator, which made no difference Time for some drastic action! We earthed pin 16 of the chip. This time the motor rotated, but fast. Pin 16 is controlled by the syscon/servo chip IC6001. Replacing this cured the fault.
D.B.

## Ferguson FV62

This machine appeared to be dead. There was no display, no nothing. The cause of the trouble was in the r.f. converter/tuner, where the SDA and SCK lines were shorted. A replacement module cleared the trouble. D.B.

## Matsui VX1000Y

This machine didn't record sound and there was no output from the bias oscillator. We found that there was liquid spillage in the vicinity of T5001 and the surrounding components. After removing them we cleaned the board
thoroughly. Then T5001, 15002 and C5031 were replaced. This restored sound recording.
D.B.

## JVC HRD910

A tape was stuck in this machine. It couldn't be ejected nor could any other function be selected. This wasn't surprising, as the loading motor drive chip IC1 had a large hole in it, probably caused by the motor. Replacing IC1, the loading motor and the circuit protector restored normal operation. D.B.

## Logik VR950/Samsung VI611

These machines have never been favourites of mine. The customer's complaint was that there was no record picture or sound. It transpired that someone had had a good twiddle. The f.m. record level, carrier and deviation controls had to be set up correctly. Good results were obtained after doing this.
D.B.

## Panasonic NVL25

The customer complained that the counter would stop when the machine was in forward search. On inspection we found that the tape was riding up the audio/control head. As the pinch roller was worn we fitted a replacement, but this made little difference. Next comes post P5, which will produce the condition if even only very slightly bent. But it was o.k. Attention was next turned to the AC head, which was worn. Replacing this and realigning the machine cured the fault. The upper drum was also wom. The customer accepted a further estimate, and once a new upper drum had been fitted the machine worked fauttlessly.
D.B.

## Sanyo VHR135

This machine worked only intermittently. We found that most of the pins at connectors CN301 and CN302 were dryjointed.
D.B.

## Grundig VS510

When this machine was powered all that could be heard from it was a clicking noise. It was otherwise dead. Whenever you get an odd fault like this with one of these VCRs head straight for the electrolytic coupling capacitor in the chopper transistor's base circuit (usual value $47 \mu \mathrm{~F}$ ). In this case replacing it stopped the clicking and restored the power to the rest of the circuitry.
D.B.

## Sony SLV270

This Grundig clone was dead. Replacing C1325 and C1326 in the power supply brought it back to life.
D.B.

## Philips VR6462

No picture was the complaint with this machine. Bench tests showed that the fault was no loop-through and no test signal. When checks were carried out in the power supply we found that there was a short-circuit across the 12 V line. The cause was traced to C2404 ( $330 \mu \mathrm{~F}, 16 \mathrm{~V}$ ) on the audio panel.
C.W.

## Hinari VXL90

We were told that there was intermittent slow playback. On test we soon noticed that the tape was travelling at the

LP speed when an SP cassette was being played. The tape speed indicator showed SP however. The tape speed was constant but slow. Checks in the servo section were fruitless. The supply was at the correct voltage, but a scope checked showed that noise was present. This was upsetting the action of the CTL amplifier. Replacing the bridge rectifier (D506) in the power supply restored normal operation.
C.W

## Alba VCR5000X

This machine had a tuning problem. When search tuning was tried it generally wouldn't stop. On some occasions it would stop at a station and when this was stored it would be remembered, but when the channel was changed the previous one would would remain for anything up to five seconds before the correct station appeared. All this was caused by wire link C on the tuner/i.f. board not being soldered at one end.
C.W.

## Panasonic NVL20

This machine was completely dead. Therè was rectified mains voltage at the bridge rectifier's reservoir capacitor but no start-up ripple for the power supply because C1 109 ( $1 \mu \mathrm{~F}$, $400 \mathrm{~V}, 105^{\circ} \mathrm{C}$ ) was open-circuit.
C.W.

## Hinari VTV100

No playback colour was the complaint with this VCR/TV combi machine. The cause of the fault turned out to be in the TV section. We noticed that unless the off-air signal was perfect the colour lock was poor (good job we've some dodgy flyleads to help with tests!). So attention was tumed to the chip that seems to do almost everything, including colour decoding. A check at pin 38 showed that the line pulse input was incorrect. C481, an $0.47 \mu \mathrm{~F}, 50 \mathrm{~V}$ electrolytic, was low in value. A replacement restored good lock with both off-air and off-tape signals.
C.W.

## GoldStar RO504I

There were white spots and lines across the playback picture. The static discharge brush had obviously fallen off. Wrong again! As numerous checks on the earthing failed to bring anything to light, attention was turned to the bottom of the machine. I temporarily connected another earth wire to the shaft of the drum spindlc. This made a difference to the spots, but only for an instant. So I took the motor apart and found that one of the stator tums was loose and had been rubbing on the rotor/magnetic flywheel. Redressing and fixing it with some superglue kept it away from the flywheel, clearing the discharge effect
C.W.

## Sanyo VHRD4890E

The complaint with this machine was crackling on sound. The cause was dry-joints at filter XF02 on the Nicam PCB.
R.J.L.

## Panasonic NVG500EM

This machine was dead following a power cut. We found that C3 $(4.7 \mu \mathrm{~F}, 250 \mathrm{~V})$ was the cause.
R.J.L.

## Matsui VX820/880/Saisho VR1200

During playback the colour drifted in and out and there was
a gurgle on sound. E-E operation was o.k. The cause of the trouble was the $100 \mu \mathrm{~F}$ capacitor C 2508 .
R.J.L.

## Sony SLV270

There was no display and you could hear the deck solenoid clicking. Checks showed that all the outputs from the power supply were varying. C1326 ( $47 \mu \mathrm{~F}, 25 \mathrm{~V}$ ) was the cause of the trouble.
R.J.L.

## Matsui VX6600

There was a blue screen in the E-E mode and recordings showed i.f. pulling and a.g.c. overloading. C 17 was responsible. It's an $0 \cdot 1 \mu \mathrm{~F}$ tantalum capacitor.
R.J.L.

## Panasonic Bar-code Remotes

Panasonic combined remote control/bar-code readers such as the VEQ1107, VEQ1119 etc. sometimes fail to respond when the scanner on/off button is pressed. This usually happens after the customer has replaced the batteries. If you get this problem, remove the batteries and short the power terminals together for ten seconds or so. After replacing the batteries the display should come alive when the button is pressed. Don't ask me why this works, but I've used this trick successfully about a dozen times over the past few years.
M.R.

## Mitsubishi HSM20V

There was no playback colour, though a recording made by the machine produced colour when played back on another VCR. This suggested that there was a fault in the chroma playback processing circuitry, but in fact Q289, a surfacemounted buffer transistor in the record signal path, was responsible. It was leaky, causing the no playback colour fault by upsetting the d.c. bias at the input to the main chroma processing chip. The record signal passed through the faulty stage without being affected.
J.H.

## Matsui VX2500

The problem with this machine was very intermittent shutdown to standby after several hours' use in the play or record mode. The cause turned out to be intermittent loss of the FG pulses from the drum motor because Cl 1 , which couples the pulses to the servo chip, was dry-jointed. The drum would suddenly run at full speed: as the head-switching squarewave was then so far off frequency, the microcontroller chip would switch the machine to standby.
J.H.
blown. A closer look at the power supply revealed the cause. The STR11006 chip had overheated so badly that its plastic clamp had melted, allowing it to fall free of the metalwork and thus run without a heatsink. D02 and Q11 were short-circuit. also D05 on the little subpanel. R1009 on the subpanel was dry-jointed. I used a BYD33J in position D02, a BC640 in position Q11 and a 1 N4148 in position D05. A new STR11006 and a 1.6A fuse completed the repair.
R.N.

## Ferguson FV31R

This machine was completely dead with no clock display. Checks on the supply voltages revealed that the on/off monitor wasn't working. We traced back to the timer display board and found that RK44 ( $1 \Omega$ fusible) was open-circuit. A replacement restored normal operation.
G.W.

## GoldStar GHV94001

If the $\mathrm{E}-\mathrm{E}$ sound is low, remove R460 and fit à wire link in its place.
G. $\bar{W}$.

## GoldStar GSE129010

If the machine won't accept or eject a tape, remove diode D521 and fit a wire link in its place. G.W.

## Hitachi VT150

Though intermittent the fault was present most of the time. The symptom - snow over the playback picture - gave the impression that a head had failed or was clogged. It could be instigated by touching the YC board almost anywhere. The HT4757A luminance processing hybrid chip was the cause. When this item fails the symptom is often patterning on the playback and E-E pictures. Not on this occasion however.
N.B.

## Sony SLV280

This machine uses a Sanyo mechanism and sufferes from the same tape chewing on eject problem - the capstan brake pad becomes sticky. For a lasting cure replace it. N.B.

## Hitachi VT410

Very intermittently when play or record was selected the drum would just kick rather than rotate. The cause was traced to failure of the thick-film chroma processing chip IC301.
N.B.

## Matsui VX3000

If the capstan motor appears to have lost its torque, operating slowly with some tapes, try cleaning and lubricating the bearing. This may enable you to avoid having to replace the motor.
M.Dr.

## Panasonic NVJ40

There was no recorded chroma though playback was o.k. After carrying out scope checks around the VEFH14D hybrid chroma chip we came to the conclusion that it was faulty. But in view of its price, about $£ 42$ plus VAT, we decided to give Panasonic technical a call before ordering a replacement. A nice man agreed with our diagnosis, and a new chip cured the fault. Phew!
M.Dr.

## TV TUBES

VIDEOCOLOR<br>HITACHI TOMPSON TOSHIBA<br>PANASONIC<br>SHARP<br>BEON<br>ITT<br>PHILIPS<br>SONY<br>NOKIA<br>SAMSUNG<br>ORION<br>MITSUBISHI CHUNGHWA ETC

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## Whant a Liffe!

## Donald Bullock

I was scribbling away in my little Spanish hut the other day when I heard a sudden shout from inside the house. It was Greeneyes. I ran over and found her looking at a fax.
"It's from Steven" she said. "He's taking you to task for being away so long. Says he's redesigned the workshop and has some interesting sets awaiting your attention."

So, pausing only to buy a few $£ 3$ bottles of Scotch for me and a gallon of Jalon Valley red wine for Steven, I retumed to a proper pint of British beer and another batch of the oddballs who seem to comprise the major portion of our clientele.

## Gladys's Toshiba

Once I'd settled down, the first customer to arrive was scruffy Gladys Mugwump. She brought a Toshiba 213D4B black-stripe colour set in just as I was trying to complete a tricky bit of soldering. I decided that she could wait a minute. Then I noticed a strong smell. Perhaps I'd better get her out quick. So I put the soldering iron down.
"What's your trouble?" I asked briskly.
"Keeps going dead. Then it thinks it's a rainbow" she said. I waved her out and returned to my soldering. Only the smell got worse. It turned out to be the flux in Steven's reel of CEL 60/40 solder.

She'd been right about the set. I opened it up, reached for my giant magnifier and found some dry-joints. First at pins 2 and 3 of the line output transformer, then at both legs of the safety resistor R 421 . The rainbow effect on the picture was trickier. Its cause turned out to be a crumbling carbon tablet in the degaussing posistor.

## Looking Ahead

Later Mr and Mrs Lee brought along a JVC HRD180 VCR. She was thin and baked while he looked like a Spanish gypsy. "You enta spendin' much" he said to her as he stretched his face to the top video shelf. "You enta spendin' much."

The VCR turned out to be dead. I soon found that the STK5481 regulator was the cause. It's like a large, twentylegged domino. Once a replacement had
been fitted the machine came back to life and worked well. Except that the LP picture was broken up and unwatchable - the accompanying sound was perfect however. After a good deal of work I contacted the boys at JVC, who were keen to help. But they couldn't and it's still not fixed. Any ideas?

Mrs Lee called in alone next day Instead of asking about her VCR she picked up the cup I'd just put down and studied the tea leaves.
"I see that your life is a string of problems" she said. "As fast as you overcome one, along comes another." I nooded sadly. "Your money line tapers to nothing, and you're the victim of a hard woman. I see only work and worry and a fceling of failure. And there's going to be the pain of an accident. But I can see some fun. A fool will soon enter your life and there'll be rueful laughter." With that she departed.

## Field Collapse

It was time for lunch. Steve decided to have some of his Jalon wine and was quite talkative by the time Mr Creep came in with his Ferguson TX90 set.

Mr Creep talks slowly, as his eyes dart about your face. "The picture cramps up and tums into a straight line" he drawled. "Don't sound like much to me, do it? 'T isn't the tube, I knows that. And it ain't the line transformer thing, the dear 'un. I knows that too. Ent much else in 'em, is there?"

I soon found that R198, one of the string of four $6.2 \mathrm{k} \Omega$ resistors that provides bias for the field output stage, was open-circuit. It seemed sensible to replace the lot, also the field output transistors TR104 and TR105 as a precaution.

As time goes by I find the thin print in this chassis less easy to work on. Meanwhile Steven was grinning as he reached over for the Avo, which fell on to my foot. I howled - I was wearing sandals. "Well" I said, "so much for the fool and the pain of the accident."

I next picked up a GoldStar CIT2168 Fastext set - the PC04A chassis. The sound was all right, but there was nothing on the screen. As with most sets these days, the screen blanks out when the field output stage stops working. I advanced the setting of the first anode preset to confirm this - after carefully
marking its original position with a blob of paint. This produced the tell-tale horizontal line.

Visual examination showed that R320, a $10 \Omega$ 1W resistor, had cooked. It read open-circuit. I replaced it and switched on and the new resistor went the same way. So I got out the circuit diagram. The field timebase is a simple one based on a TDA1170N chip (IC301), with R320 and C301 ( $1,000 \mu \mathrm{~F}$ ) filtering its supply. C301 was obviously suspect but tumed out to be all right. Further checks brought me to C302 $(100 \mathrm{HF}, 35 \mathrm{~V})$ in the flyback boost network. It had fallen in value to $80 \mu \mathrm{~F}$, thus damaging the chip. Replacing these two items and fitting another $10 \Omega, 1 \mathrm{~W}$ resistor cured the trouble. Up came a plucky picture on a model that always seems to me to look as if it has a slightly flat tube.

Before boxing the set up I checked, as usual, for dry-joints. There were quite a few, and I resoldered every one of them:

## Julian's Saisho

There are certain people I can't stand. Julian Jaunty is an example. He brought in a Saisho CM16TT portable and stood too close, grinning at me as though we shared some secret.
"What's up?" I asked, rather coldly.
"Dcad as a door nail, Donny old chap" he grinned.

When I tried it I heard the rustle of e.h.t. but there was no sound or brightness. Again I marked and upped the setting of the first anode preset. This produced a blank raster, which was not what I expected. Rather than think too hard I flexed the PCB and was rewarded with a good picture and sound. It didn't take me long to find that one end of D408 was dry-jointed. I resoldered it, to the accompaniment of that strong smell, and that was that.

## A Dead Samsung

When I saw Mr M'Babwa approaching the shop with his Samsung TV I toyed with the idea of popping under the counter.
"This set no good" he announced. "No sound, no picture, no nothin"."
"O.k., o.k." I said, "just leave it and don't worry."

When I tried the set, a Model

# J J'S MIDSUMMER BONANZA FROM 14/7/95 - UNTIL 15/8/95 



CL54129, I found it dead though the channel indicator was alight. Seeking an easy way out 1 examined the chassis with my magnifier, looking for dry-joints. I found some around relay RL801 and P802, a funny little blue resistor thing. Resoldering them restored the set to good health and made me think of a glass of Guinness.

## An Old Sport

Mr Prism is old but slim and sporty. Since I have no interest in any games or sports except fishing, I find him a decent old bore. He sprang in with a Ferguson 2203 and told me that Newcastle had just won six to five and that Sid Munks of Spurs had cracked his ribs. Then he pointed to the set.
"It's a TX100" he said. "Have you worked on TX100s?"
"Like no one else" I replied. Then I pulled it on to the bench.

It was lifeless, though the relay clicked at switch on. I reached for the old cream-coloured Avo that Steven had picked up somewhere and checked at the collector of the BU508A line output transistor TR10. The reading was only 55 V . It was no better when I disconnected TR10. So I moved back
to the h.t. supply source where I found that the $47 \mu \mathrm{~F}, 160 \mathrm{~V}$ reservoir capacitor C121 was almost open-circuit. A new one brought the h.t. back to 119 V and the set came to life.
"Well" bawled Mr Prism when he called to collect it, "didn't Arsenal take a drubbing?"

## Familiar Fault, Unfamiliar VCR

I next picked up a VCR and almost put it down again when I saw that it was a Blaupunkt. A Model RTV301, the first Blaupunkt I'd seen. But it looked vaguely familiar. I opened it up and saw that it was really a Panasonic NV370. The fault had a familiar ring about it as well. The clock display was all right, but at switch on the capstan motor shuffled a bit then the machine shut down. I homed in on the power pack at the rear right of the machine and spotted a couple of fusible resistors in yellow plastic overcoats. One of them, R1101, was opencircuit. A replacement restored normal operation.

## Final Round Up

"It's ticking" said the sweet little thing who came in with a Ferguson

22B2. It was another TX100. Apart from the ticking it did nothing. When I opened it up I found that the solder joint where the mains lead joins the chassis was dry and arcing. Resoldering it cured the trouble.

Saisho and Matsui sets continue to come our way. This one was a Model 147614 in . portable, just out of guarantee. At switch on the standby light lit. It went out when the set was switched from standby, but the set refused to come to life. I suspected the STR50103 chopper chip IC501, but cold checks suggested that it was o.k. Though working without a manual, I soon found the cause of the trouble: the chip's start-up voltage was missing. Pin 2 should receive a feed via two $330 \mathrm{k} \Omega$ resistors, R502 and R503. One of them was open-circuit. In view of the high value of these resistors, I expect to come across the fault again in the months ahead.

It had been a long day. After our meal Steven and I settled down for a drink - or two.
"You won't believe thish" said Steven, "I'm beginning to feel a bit squiffshy."
"Personally I feel fine. Ish because I'm more mature I shpect."

# Long-distance Television 

Roger Bunney

This is being typed on June 2nd, and at last I can report the start of the 1995 Sporadic E season. Today's reception was in fact good, with Band I wide open when I switched on at around 0845 . The band was still very active when I got back from work at 1750, with several programmes floating across each channel. The mass of interacting signals made identification mostly impossible, but their presence was very welcome!

My own log for May was extremely thin. Fortunately several other enthusiasts sent in reports. Taken together, these logs give a reasonable impression of activity. Actual log presentation is still being made difficult by the split up of the USSR, Czechoslovakia and Yugoslavia. We'll do our best. The following is a collated $\log$ of May SpE reception:

| 8/5/95 | RAI (Italy) chs. IA, B; unidentified ch. |
| :--- | :--- |
|  | E2, 3 signals. |
| 9/5/95 | TVE (Spain) E2. |
| $11 / 5 / 95$ | NRK (Norway) E3; DR (Denmark) E3; |
|  | RAI IA, B; Italian commercial station |
|  | with 'Video' comer logo ch. E2. |
| 15/5/95 | TVE E2. |
| $20 / 5 / 95$ | YLE (Finland) E3; TVE E2; TVE-2 E2; |
|  | unidentified ch. R1, 2, E3 signals. |
| $21 / 5 / 95$ | RAI IA, B; 'Video' E2; Canal + L2, 3; |
|  | RTP (Portugal) E2, 3, 4; TVE E2, 3, 4; |
|  | TVE-2 E2; +PTT (Switzerland) E2; TVB |
|  | (Yugoslavia) E3; unidentified ch. E4, R2 |
|  | signals. |
|  | RAI IA; 'Video' E2; +PTT E2; TVE E2, |
| $22 / 5 / 95$ | 3; HRT (Croatia) E3; unidentified ch. E4, |
|  | R2 signals. |
| $23 / 5 / 95$ | TVB E3; RAI IA; TVE E3; RAI E3; |
|  | 'Video' E2; TVS-1 (Slovenia) E3. |
| $27 / 5 / 95$ | TVS-1 E3; RAI IA; 'Video' E2; ARD |
|  | (Germany) E2, 3, 4; SVT (Sweden) E2, 3; |
|  | OK-1 (Russia) R1, 2; YT (Ukraine) R1; |
|  | Nova TV (Czech Rep.) R2; ORF (Austria) |
|  | E2a. |

At last a respectable $\log$ for the time of year, mainly thanks to Garry Smith (Derby), Roger Fussell (Torpoint), David Glenday (Argyll) and Peter Schubert (Rainham). Roger Fussell received good tropospheric signals from Spain on May 5th (TVE chs. E35 and 37). George Gaskin (Gibraltar) reports that SpE conditions were good there on many days throughout May, with signals mainly from the north east and east - Belgium, the Netherlands and Italy.

Roger Fussell has various old circuit diagrams, valves etc. for disposal. Anyone interested should write to him at 55 Peacock Avenue, Torpoint, Cornwall PL11 2EX.

## Satellite Sightings

Mystery morse signals heard by several enthusiasts via various satellites, particularly PAS-1 at $45^{\circ} \mathrm{W}$, were mentioned recently in this column. Len Wooley (Bude) tells us that he has received them via Eutelsat and Intelsat craft and that they are used for identification purposes. With these craft they consist of similar length groups of numbers followed by a unique label, 'PSSI STAR' with Intelsat and 'STI KU2' with Eutelsat. They are mentioned in the World Satellite Almanac.

The Bosnian problems have led to much satellite activity. The Reuters Eutelsat transponder ( 12.522 GHz horizontal) at $13^{\circ} \mathrm{E}$ was extremely active, with numerous feeds from Europe, news conferences etc., while the Intelsat 603 Sarajevo link ( 10.979 GHz vertical) at $34.5^{\circ} \mathrm{W}$ fired up for long periods. Unfortunately a new development with this uplink is sound in syncs (SIS), which gives rise to an unstable picture when audio modulation is present - there's also no sound of course. The signal level fluctuates. A 1.5 m dish and 0.7 dB LNB produce a gritty picture. The feed has also been seen at 10.996 GHz and is often relayed via leased EBU capacity on Eutelsat II F4 at $7^{\circ} \mathrm{E}$.

There are obviously problems with the Sarajevo mains supply. An SNG feed at 1700 on May 29th, via Eutelsat II F3 $\left(16^{\circ} E\right)$ at 12.539 GHz to CBS then Sky, showed picture instability with mains-frequency bars moving downwards rapidly. The reporter shown was agitated and complained


Left: An African C band feed using digital compression (DSNG = digital satellite news gathering), snapped by lan Waller. It was received in Europe via the Med TV transponder aboard Eutelsat II F2 at 100. Contre: John Locker caught this bunch of cosmonauts on the MIR space station, downlinked via Cosmos 2054 at $16^{\circ}$ E then Eutelsat II F4 at $7^{\circ}$ E. Right: A version of the FubK pattern used by Tunisian TV (RTT).
that his "IFB keeps cutting out". IFB stands for international foldback: it's the sound signal the reporter receives through an earpiece from the distant programme source so that he can follow the questions etc.

Early on the same evening an unknown identifitcation was noted via Eutelsat II F4 at $7^{\circ} \mathrm{E}$. It consisted of colour bars with the identification 'CPT CAPAJEGO'. Can anyone suggest the source?

As far as Ku band is concemed Intelsat 603 at $34 \cdot 5^{\circ} \mathrm{W}$ is normally quiet. In recent weeks however programmes from NBC New York have been present at good signal levels. John Locker (Wirral) noted these signals first, at 11.639 GHz vertical with clear PAL - and all the US commercials.

I was puzzled by late evening colour bars and the identification 'DSTV - C HAGEN' via Eutelsat II F2 at $10^{\circ} \mathrm{E}$ ( $11 \cdot 177 \mathrm{GHz}$ horizontal). Leaving the receiver tuned to this frequency, I rcturned half an hour later to find pictures. Not the expected late news but Eurotica TV! The signals subsequently became scrambled. An unusual sighting: Erotica and Eurotica TV are usually seen at $16^{\circ} \mathrm{E}$ (II F3).

A new arrival at $16^{\circ} \mathrm{E}$ is TV10 Gold, which shares a transponder with The Music Factory (TMF) - at $12 \cdot 557 \mathrm{GHz}$ horizontal. TV10 shows mainly older English-language programmes, during the day and early evening, with TMF filling in later. TMF has adopted a simple form of scrambling - video inversion. The Dutch PTT test pattern is another signal that's been seen with video inversion, via Orion Atlantic 1 at $37.5^{\circ} \mathrm{W}$ : It shares the 11.496 GHz transponder with the German VH-1 service (in the lower half).

A transmission about which little is known was noted at 2050 on May the 8th via this satellite: "Air Force Satellite News" appeared at 11.620 GHz . Featuring several news packages, it seems to have been intended for American forces in Europe. The transmission ceased abruptly without any source identification being provided.

Bandula Gunasekera (Sri Lanka) has been busy assembling small units for reception of the u.h.f. TV transmissions from the Ekran satellite at $99^{\circ} \mathrm{E}$. They are sold to a satellite dealer in Colombo. The PCB comes from India. It has five main signal processing chips and includes a low-noise head amplifier. Bandula reports that NAM TV has been replaced by Tamil Bimkam: the Russian first programme can still be received.

Ian Waller (Lincoln) is using his 3.4 m dish again for C band monitoring. His recent reception includes Reykjavik, Iceland from $1^{\circ} \mathrm{W}$ and the Caribbean Satellite Corporation (Puerto Rico) via the TDRS satellite at $41^{\circ} \mathrm{W}$.

The Intelsat craft at $60^{\circ} \mathrm{E}$ has presented many African signals, including the Newsforce SNG crew back in action in Zaire. This latter link was also seen on Eutelsat II F4 at $7^{\circ} \mathrm{E}$ via EBU leases.

Altogether a very active month - I've had room to mention only a few of the signals of interest. Finally a request from Aidan Murphy, Main Street, Dunshauglin, Co. Meath, Ireland. He's seeking information on the use of inclined orbit tracking systems. Anyone who can help can write to the above address or phone +35318250414 - after 1900 hours.

## News Items

Video compression: According to Television Broadcast International the Houston Advanced Research Centre has devised a "revolutionary new form of digital compression" that exceeds the currently accepted MPEG/JPEG standards. 300:1 compression enables VHS quality pictures to be delivered at $200 \mathrm{kbits} / \mathrm{sec}$, which compares with


11 Kent Road, Parkstone, Poole, Dorset BH12 2EH Tel: 01202-738232 Fax: 01202-716951
$1.5 \mathrm{Mbits} / \mathrm{sec}$ with MPEG-1. An advantage is that decompression can be achieved in real time - MPEG decoders require additional software, cards etc. to provide the high processing power needed. In short, HARC-C compression means that far less bandwidth is required, enabling more channels to be squeezed in.

Korean manufacturer Hyundai Electronics intends to launch an MPEG decoder globally starting this August.
Japan: NHK has drawn up plans to start transmitting digital terrestrial TV early in the next century. The current NTSC analogue services would continue in use for a time before being phased out. The Hi-Vision HDTV system would be redeveloped in digital form and incorporated within the proposed Integrated Services Digital Broadcasting (ISDB) system.
Iran: The proposed fourth channel will have a pay-TV option.
Ghosts: NTL is to start testing a ghost-busting system in the UK next year. It's based on the transmission of a reference signal (GCR) during the blanking period. The receiver uses this as a sample for a secondary image cancellation system.
Solomon Islands: A local TV service is to start in late 1995/early 1996, with a small studio in the capital Honiara.
UK: Eddystone Radio, part of the Marconi group, is to supply the transmitters for the BBC's digital audio broadcasting service, which is to start this September in the London area. Some 27 transmitters will be required netween now and 1997 for phase 1 of the national DAB network.
Russia: The government has made illegal all forms of picture encryption that have not been accepted by FAPSI, the Federal Agency of State Communications and Information. This has hit local MMDS and satellite broadcasters

## THE SATELLITE NEWSLINE

The Satellite Newsline is available, 7 days a week, 24 hours a day and covers all the latest news, including:

- New Channel Launches
- The Latest Scams and Cons
- New Products and Services
- Adult Viewing - What's Really Going On
- Smartcards \& Decoders - who has What and Where
- The latest Rumours and Issues Investigated
- All the News that affects the Satellite World

Either Call and listen to todays news in the Satellite World, updated twice a day, 7 days a week

0336-413 413 (NOCE BASED)
Or Using your Fax machine call this number and follow the instructions for a written copy of the Satellite Newsline. This written copy is downloaded onto your Fax machine immediately.

$$
\text { 0336-422 } 888 \text { (FAXBASED) }
$$

## TRANSDONDER WAT(H

## 0336-422 889 (FAX ASSED)

Using your Fax machine call this number and follow the instructions for a written copy of the current Transponder Watch. This written copy is downloaded onto your Fax Machine immediately. This Line is Updated at least 4 times a week and contains:

- The lates! Transponder and Satellite Information
- News on New channels
- Test Cards
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hard. The law also makes the import of non-approved coders and decoders illegal.

A new commercial station in Moscow, Kosmos 10, is in operation on ch. R51. The present service area covers a radius of 25 km . This is to be extended with an increase in the e.r.p.

## Transmitter Listings

Estonia: Tallinn ch. R3 is now off air.
Finland: Ruka has moved from ch. R4 (3kW) to ch. E36 ( 300 kW ).
Latvia: The following transmitters are now in operation. Kraslava (10W) and Targale (5W) ch. R2; Oagda (10W) and Ugale (3W) ch. R4; Odbele ( 50 W ) ch. R5. These are low powers, but during intense SpE conditions it's possible to receive signals from transmitters using only a few watts.

I have received a list of nearly thirty Polish Premiera TV stations that use u.h.f. transmitters in the ch. R23-58 spectrum with powers in the range $2-50 \mathrm{~W}$. It's unlikely that many will be received in the UK, but I'll be pleased to send readers a photocopy of the list on request.

## Satellite TV

Intelsat 705 is now in operation at $50^{\circ} \mathrm{W}$, offering links between Europe and N/S America in the C and Ku bands. Intelsat 706 was launched on May 17th to provide similar services at $53^{\circ} \mathrm{W}$. Intelsat 506 has moved from $50^{\circ} \mathrm{W}$ to $31 \cdot 1^{\circ} \mathrm{W}$

Egypt intends to launch a satēllite, Nile-Sat, in late 1997, offering twelve TV channels across the region. The Israeli
government has given approval to an Arab/Israeli commercial satellite TV channel serving the Middle East.

The SportsWire channel seen via Intelsat 601 at $27.5^{\circ} \mathrm{W}$ has closed. Its football coverage was a familiar sight for many satellite zappers.

WTN has leased a digital transponder aboard Asiasat 2, whose footprint covers all Asia into the Middle East.

BSkyB is planning to start a 120 digital TV channel service for the UK by early 1997. It would include a pay-per-view film service showing current releases time-shifted across five channels.

## Transatlantic Propagation

Much attention to the possibility of two-way transatlantic communication in the 144 MHz band was given in the June issue of the RSGB's publication RadCom - the Irish Radio Transmitters Society is to present an award to the first amateur stations that achieve this feat. An article in the issue covers every potential way of establishing transatlantic contact at v.h.f. F2 layer propagation is at present nil, since we are at the bottom of the current sunspot cycle, i.e. solar activity is low; tropospheric propagation with ducting might just be possible, assuming a favourably located weather system; SpE presents the best chance, especially if accompanied with tropospheric enhancement at either or both ends. Signal reflection via the moon (EME) or meteor scatter (MS) is vaguely possible but extremely difficult for two-way communication. Auroral reflection offers some potential but is again much more likely during a period of high solar activity.

My own feeling, based on DX-TV experience, is that at present only SpE can provide transatlantic propagation. Long-hop signal reflection occurs at times of intense $E$ layer ionisation. and it has often been noted that SpE can increase when solar activity is low. Since a single hop (reflection) rarely exceeds $2,000 \mathrm{~km}$, a double hop is required to bridge the Atlantic, even with end-path tropospheric enhancement.

Thus UK SpE reception from the eastem seaboard of Canada/the USA requires two ionised patches suitably positioned to reflect the incident v.h.f. signals. With increasing ionisation the maximum usable frequency (m.u.f.) rises, enabling higher-channel signals to be propagated in this way.

In most years there are a couple of SpE Band I openings between Canada and the UK. While they can occur from the early afternoon, the most likely times are from about midevening to around 2300 , sometimes extending past midnight local UK time. The period from late June through July to early August offers the best opporunities. Such SpE openings can be intense, with multipath propagation common. The lowest channel (A2, with the vision carrier at 55.25 MHz ) may fall off in intensity, with the higher channels (A3, possibly A4 and 5) then being favoured. As the ionised clouds above the Atlantic move, so the pattern of received stations changes - often over a few minutes, an initial signal fading as another one comes up, with perhaps two or three providing co-channel interference. A good indication of the possibility of transatlantic reception is when ch. E3 and 4 signals from Iceland appear, indicating the build up of SpE towards the north west.

Reception is generally confined to the north eastern comer of Canada, i.e. the Newfoundland/New Brunswick region, though stations deeper into Canada. for example in Montreal or Quebec, are occasionally received. There has even been suspected reception of a prairie station in the lower part of the band.

I've known only low-band transmitters to be received in
this way - usually chs. A2, 3, possibly chs. A4 or 5 under extreme conditions - and have never seen a report of transatlantic reception at above 100 MHz . To achieve twoway amateur communication at 144 MHz would be remarkable, though hopefully it will happen. If it does, the low-band channels should be wide open! But one has to bear in mind that whereas a TV-DXer is looking for a bandwidth of at least 1.5 MHz , amateur communication requires only a few kHz .

It's well worth checking for such exotic signals during the summer period. While there have been many cases of European SpE reception from North American TV stations, I've never heard of reception in the opposite direction. The channels to check are as follows: A2 55.25 MHz video, 59.75 MHz sound; $\mathrm{A} 361.25 \mathrm{MHz}(\mathrm{V}), 66.75 \mathrm{MHz}$ (S); A4
$67.25 \mathrm{MHz}(\mathrm{V}), \quad 71.75 \mathrm{MHz}(\mathrm{S}) ;$ A5 $77.25 \mathrm{MHz}(\mathrm{V})$, 81.75 MHz (S); A6 83.25 MHz (V), 87.75 MHz (S). They use the N. American System M - 525 lines, 60 fields, negativegoing video modulation, f.m. sound spaced at 4.5 MHz , NTSC colour.

## Correction

There was an error in Fig. 1 last month (page 648). The connection between ICl's common (adjust) pin and the $240 \Omega$ resistor at its output was omitted. The three resistors ( $240 \Omega, 820 \Omega$ and $2 \cdot 2 \mathrm{k} \Omega$ ) are connected in series, with ICl's common pin connected to the junction of the $240 \Omega$ and $820 \Omega$ resistors and switch SW1 used to short out the $820 \Omega$ resistor in the 18 V position.

## Letters

## PRERECORDED TAPES

In reply to Michael Maurice's letter last month, the problem he raises with hi-fi VCRs is caused not by anti-copying signals but by the audio levels recorded by the tape manufacturers being too high, the result being overloading in the audio section of hi-fi decks.

There were problems with a Ferguson 3V48 I used to own when playing back prerecorded tapes. I found that correct playback could be achieved by backing off the hi-fi tracking control, thereby reducing the signal fed to the hi-fi section. With modern decks auto-tracking or dynamic tracking is used, so that overloading is achieved automatically! Some decks however have a manual override, so that the tracking control can be backed off, but this usually affects the video signal as well. Nevertheless a happy compromise can be established. I can't comment on colour dropout with Disney film cassettes as I've never tried one.

The onus is on the manufacturers of prerecorded tapes to sort out their audio levels, especially with the hi-fi signal. It might help however if VCR manufacturers built in an attenuator that could be switched in as required.
Ian R. Potts,
Congleton, Cheshire

## WILLOW VALE'S COPS

In his article on Computer Communication and Modems last month Jon Lye wrote: "The best solution seems to me to be an ordering system which allows the part number to be found offline in a database". Willow Vale was aware of the need for this service some years ago and introduced a PC-based catalogue called 'Catdisk' to enable parts to be looked up off-line. Although Catdisk is no longer supported, a Windows-based Willow Vale Database is currently available to qualifying account holders via our area sales managers. This enables searches to be carried out using Willow Vale order codes, manufacturers' part numbers or a model/description. It includes a fax
or print order facility.
In addition the current version (2.00) of the database program is COPS II ready, with a modem pushbutton that enables orders to be 'uploaded' to COPS when the communications module becomes available (due July). This will allow the transfer of offline generated orders to our mainframe at the rate of several lines per second, thereby reducing phone charges.

I'd like to remind COPS users that our modems at present support all speeds between 300 and 2,400 bauds, with the possibility of 14,400 bauds in the near future for customers with PCs and fax modems.
Dave Allen, Technical Director,
Willow Vale Electronics Ltd.,
Enterprise Park, Manchester.

## SATELLITE SOUND RECEPTION

I was surprised that Donald Bullock went to so much trouble to get the 6 MHz UK intercarrier sound output from a satellite TV receiver to work with a Spanish TV set designed for 5.5 MHz sound (June, page 582). In most satellite receivers it's simple to retune the modulator's intercarrier frequency. Failing that, use a scart connection. Some small-screen TV sets still use phono sockets for AV connection, depending on the market for which they are intended, but it's rare for AV connection to be impossible. An additional advantage is that the TV set can continue to pick up Spanish TV, whereas converted to 6 MHz sound it won't.

With Pace MSS/PRD receivers the intercarrier ferrite core is at the top of the modulator can and retuning is very easy. It's best to remove the modulator from a Pace $9000 / 9200$ chassis: you will then find the core near the channel adjustment screw. Amstrad 510s are a little more difficult. The core is near the channel adjustment screw, but a hole has to be made in the plastic, about 1 mm below and 5 mm to the right of it. Failing this, remove the main PCB from the case to carry out the retuning.

Use the correct trimmer, as the cores are easily cracked.
I agree that satellite radio reception is much better when the receiver's output is remodulated on to the f.m. band. With care an entire mono sound transmitter can be built into a scart plug, power being provided from the receiver itself via one of the scart pins.
Hugh Cocks, Algarsat Lid.,
Algarve, Portugal.

## IRWIN



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