DECEMBER 1984

Australia \$1.80, New Zealand \$2.20, Malaysia \$5.50 **£1.00**

TELEUIS ON

SERVICING-PROJECTS-VIDEO-DEVELOPMENTS

Servicing the Sony KV1612UB



Video Cameras • Vintage TV
VCR Clinic • TV Fault Finding
Replacing GCSs with Transistors
DX-TV • Teletalk on Colour
Scrambling for French TV

MANOR SUPPLIES

NEW MKV PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE





- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- Chequerboard.
- Mono outputs with border castellations, cross hatch, grey scale, vertical lines, horizontal lines and dots. UHF modulator output plugs straight into receiver aerial
- Additional video output for CCTV & VCR.
- Facilities for sound output.
- Easy to build kit, standard parts. Only 2 adjustments. No special test equipment required.
- Mains operated with stabilised power supply.
- All kits fully guaranteed with back-up service.
- ★ Also available with VHF Modulator.

Price of Kit £70.00 De Luxe Case (10"×6"×24") £7.40 Optional Sound Module (6MHz or 5.5MHz) £3.90 Built & Tested in De Luxe Case including Sound Module £105.00 SPECIAL TEST REPORT Post/Packing £2.50 Post/Packing £2.50
TELEVISION | Post/Packing £2.50
DEC. 1982 | Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)



- ★ Output at UHF, applied to receiver aerial socket.
- ★ In addition to colour bars R-Y, B-Y etc.
- Cross-hatch, grey scale, peak white and black level.
- ★ Push button controls, battery or mains operated.
- ★ Simple design, only five i.c.s on colour bar P.C.B.

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. DELUXE CASE £7.40. BATT HOLDERS £2.80. MAINS SUPPLY KIT £4.20 (Combined P&P £2.20).

MK 4 DE LUXE (BATTERY) BUILT & TESTED £58,00 + £2.20 P & P. MK 4 DE LUXE (MAINS) BUILT & TESTED £68.00 + £2.20 P & P. VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75. EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V. (ADD VAT 15% TO ALL PRICES)

TELETEXT EXTERNAL ADAPTOR KIT (Less case) with cable remote control £120.00

THORN TX10. PHILIPS G11

Mullard Teletext Decoder + Interface panels suitable for either the above £50.00

Additional Prestel units including line coupler £50.00 p.p.£2.50

Goods available if in stock immediately over shop counter (Mail order between 3 days and 1 week from receipt of order).

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

LOPTs, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

SPECIAL OFFER NEW VALVES
Branded makes, PCF80, PY88, PFL200, PCL84 FOUR for £2.00 p.p. 80p. THORN TX10 Teletext Interface Panels for Mullard Decoders £2.50

p.p. 80p.
THORN TX10 Facia Control Panel incl. Infra Red Remote Control receiver

THORN TX10 Facia Control Panel incl. Infra Red Remote Control receiver £7.50 p.p. £1.50.

THORN TX10 type Remote & Tuning Control Panel £9.40 p.p. £1.50.

THORN TX10 Series Facia Control Panel with 8 position Channel Selector £5.00 p.p. £1.50.

PHILIPS UHF Modulator (Audio & Video Input) £15.00 p.p. £1.00.

SAW FILTER IF AMPLIFIER PLUS TUNER complete and tested for T.V. Sound & Vision. £28.50 p.p. £1.20.

THORN TX9, TX10 Saw Filter IF Panel. £8.50 p.p. 80p.

PAL DECODER KIT for RGB Monitors £27.00 p.p. £1.00.

SPECIAL OFFER TEXAS XM11 Teletext Decoder New & Tested at reduced price. £40.00 p.p. £1.60.

TELETEXT 23 Button De-Luxe Handset with 5 yds Cable. £6.80 p.p. £1.20.

XM11 Stab. Power Supply. £3.80 p.p. £1.20.

CROSS HATCH UNIT KIT. Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. £12.00 p.p. 80p. (Alum. Case £2.55, De Luxe Case £6.80 p.p. £1.80.

CRT TESTER & REACTIVATOR PROJECT KIT For Colour & Mono £28.00 p.p. £2.80.

RICH 7518 RC6100 series IF Panel £5.00 p.p. 9(b)

UHF SIGNAL STRENGTH MELER KIT 220.00 (VITE VEISION also available). Alum. Case £2.55. De Luxe Case £7.40 p.p. £1.80.
CRT TESTER & REACTIVATOR PROJECT KIT For Colour & Mono £28.00 p.p. £2.80.
BUSH 2718 BC6100 series IF Panel £5.00 p.p. 90p.
BUSH A816 IF Panel (Surplus) £1.65 p.p. 90p.
DECCA 80 Series IF, Frame, T.B. £5.00 p.p. £1.40.
GEC 2040 IF Panels £2.80 p.p. £1.60.
GEC 2040 IF Panels £2.80 p.p. £1.60.
GEC 2110 PANELS Frame £8.50, Preset (Touch Tune) Control £5.00, Convergence £5.00, p.p. £1.80.
GEC "20AX" Series Switch Mode Power Supply £5.00 p.p. £1.80.
PYE 691-7 CDA Panels. Makers tested stock. £6.00 p.p. £1.80.
PYE 691-7 CDA Panels Makers tested stock. £6.00 p.p. £1.80.
THORN TX9 Panels ex factory for small spares. Includes I.Cs & Semiconductors etc. £5.00 p.p. £2.00.
THORN TX9 Panels salvaged ex factory for spares incl. LOPT & Mains Transformers. £10.00 p.p. £2.80.
THORN TX9 Panels ex factory salvaged complete cond. £20.00 p.p. £2.80.
THORN TX10 T.B. Panels salvaged ex factory. £15.00 p.p. £3.00.
THORN TX10 T.B. Panels salvaged ex factory. £15.00 p.p. £3.00.
THORN 3000/3500 Power supply P.C.B. £3.50 p.p. £1.00.
THORN 3000/8500 Frame T.B. Panels salvaged £3.20 p.p. £1.80.
THORN 8000/8500 Frame T.B. Panels salvaged £3.20 p.p. £1.80.
THORN 9000 Series Control & Receiver Unit £6.80 p.p. £1.80.
THORN 9000 Series Control & Receiver Unit £6.80 p.p. £1.80.
THORN 9000 Series Long panel facia unit incl. 6 Position Channel Selector & Loudspeaker £6.00 p.p. £2.00.
PHILIPS G8/G9 IF/Decoder Panels for small spares £1.50 p.p. £1.40.
G9 Scan Panel. Basic PCB in Fibreglass £14.50 p.p. £1.80.
G11 PANELS, Power, Frame, IF, Decoder £18.00 each, p.p. £2.00.
GRUNDIG 8630 Series Varicap Tuners £5.00 p.p. £1.00.
VARICAP. U321. U322, ELC1043/5 £6.80 p.p. 80p. Makers Varicap Controls PYE CT200 4PSN £7.50, BUSH 4PSN £4.80, DECCA 4PSN £5.80, 6PSN £6.80 p.p. 80p. etc.
SPECIAL OFFER ELEVEN POSITION Varicap Control Unit UHF/VHF £1.80 p.p. £1.00.

SPECIAL OFFER ELEVEN POSITION VARICAP CONTROL COM. £1.80 p.p. £1.00.

BUSH "TOUCH TUNE" Varicap Control Z179. Z718 types £3.80 p.p. 95p. VARICAP UHF-VHF ELC2000S £9.80, BUSH £7.80 p.p. 90p. VARICAP VHF PHILIPS, £6.90 p.p. 80p. UHF-625 TUNERS, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position £2.50, JAP Rotary £4.80 p.p. £1.80.

TV SOUND IF Panels £6.80 p.p. £1.00.
LOPT TESTER, Service Dept approved £15.90 p.p. £1.20.
LOPTS New and guar, P/P Mono £1.35, Colour £1.50, Bobbins 80p.

BUSH 161 to 186 (twin panel). £5.90
BUSH, MURPHY 774 series. £8.50
BUSH, MURPHY 774 series. £8.50
BUSH, MURPHY 7816 series. £8.50
BUSH, MURPHY 2816 series. £8.50
FERG., HMV, MARCONI, ULTRA
950, 1400, 1500, 1580, 1590, 1591 £5.90
THORN 1600, 1615, 1690, 1691 £9.15
GEC 2000 to 2038 series. £6.80
GEC series 1 & 2 £8.00
INDESIT 20/241:GB £7.65
HTT/KB VC200, 300 £7.65
MURPHY 1910 to 2414 (twin panel) £5.90
PHILIPS 170, 210, 300 series. £7.65
PYE, INVICTA, EKCO, FERR.
368, 169, 569, 769 series. £7.65
SPECIAL OFFER
DECCA 20/24, 1700, 2000, 2401 £3.80
GEC 2114J/Junior Fineline. £2.80
PYE 40, 67 £1.75
KB VC ELEVEN (003). £1.75

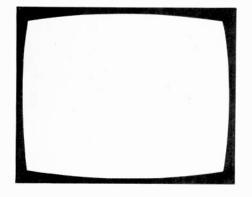
PYE /25 (907) /31 to /41 ... £9,20 PHILIPS (8 ... £8,80 PHILIPS G9 ... £10,80 PHILIPS 570 .571 ... £6,80 PHILIPS KT3 ... £12,50 THORN 3000/3500 SCAN, EHT ... £6,90 THORN 9000/07500/8800 ... £12,90 THORN 9000 to 9600 ... £12,90

KB V() £2.80 THORN 9000 to 9600£12,90
OTHERS AVAILABLE, PRICES ON REQUEST. ALSO LOPTS.
TRIPLERS Full range available. Mono & Colour.
Special Offer: Thorn 8000 (2 lead) EHT Tray £2.80 p.p. 80p.
TRANSDUCTORS suitable for G8. A823. Bradford etc. £1.50 p.p. 60p.
6-3V CRT Boost Transformers for Colour & Mono £5.40 p.p. £1.20.
CALLERS WELCOME AT SHOP PREMISES
THOUSANDS OF ADDITIONAL ITEMS, ENQUIRIES INVITED
LARGE SELECTION TESTED COLOUR PANELS POPULAR MODELS
TELEVISION MAGAZINE PROJECT PARTS & REPLACEMENTS
STILL AVAILABLE
Telephone 01-794 8751, 794 7346

MANOR SUPPLIES 172 WEST END LANE, LONDON, N.W.6.

NEAR: W. Hampstead Tube Stn. (Jubilee) Buses 28, 159, C11 pass door W. Hampstead British Rail Stns. (Richmond, Broad St.) (St. Pancras, Bedford) W. Hampstead (Brit. Rail) access from all over Greater London. Mail Order: 64 GOLDERS MANOR DRIVE, LONDON N.W.11.

PLEASE ADD VAT 15% TO ALL PRICES



December 1984

Vol. 35, No. 2 Issue 410

COPYRIGHT

©IPC Magazines Limited, 1984, Copyright in all drawings, photographs and articles published in Television is fully protected and reproduction or imitation in whole or in part is expressly forbidden. All reasonable precautions are taken by Television to ensure that the advice and data given to readers are reliable. We cannot however guarantee it and we cannot accept legal responsibility for it. Prices are those current as we go to press.

CORRESPONDENCE

correspondence advertisements should be addressed to the Advertisement manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

SUBSCRIPTIONS

An annual subscription costs £11 in the UK, £12 overseas (by surface mail). Send with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH

BINDERS AND INDEXES

Binders (£4.50) and Indexes (45p) can be supplied by the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF. Prices include postage and VAT. In the case of overseas orders, add 60p.

BACK NUMBERS

Some back issues are available from the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF at £1:20p inclusive of postage and packing.

OUFRIES

We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in Television, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. All correspondents expecting a reply should enclose a stamped addressed envelope. Requests for advice on dealing with

servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to address given above (see "correspondence").

this month

73 Leader

RGB-Linear Interface Circuit K.M. Curtis, B.Sc. (Hons) Designed to link an RML 380Z microcomputer's RGBlinear outputs to the RGB output stages of a Panasonic TC6200 projection set for large-screen software displays.

VCR Clinic

Reports on VCR servicing from Steve Beeching, T. Eng., Derek Snelling and John Coombes.

Michael Pitt

Chas. E. Miller

David Botto

A. Bouskill

Fault reports, mainly on the Philips K30 chassis.

N1700 Timer Modification

A method of extending the duration of timed recordings when a machine has been modified for halfspeed operation.

Don't Panic Les Lawry-Johns

You can't get a big head when you've only yourself to rely upon. It's a question of don't panic – run for your life!

Vintage TV: The View Master Features and performance of an early TV receiver kit sponsored by a group of component manufacturers.

Taming the Sony KV1810UB Bernard Pruden, B.Sc., A.M.I.E.E. Modifications to the chopper and line output stage circuits to use transistors in place of the troublesome and expensive gate-controlled switches.

Servicing the Sony KV1612UB

A servicing guide to this attractive 16in. colour

portable.

Video Servicing Mike Phelan

A look at the technical aspects of video cameras, starting with the lens system, the tube, viewfinders, zoom and auto-iris circuits.

90 Letters

Next Month in Television

Long-distance Television Roger Bunney Reports on DX conditions and reception, plus news and latest equipment.

Teletopics

Teletalk on Colour

Malcolm Burrell

Colour displays seem to have changed with developments in TV receiver technology, leading to a consistent but perhaps mediocre standard.

100 TV Fault Finding Reports from Mick Dutton, John Coombes, Hugh Allison and Malcolm Burrell.

102 Canal Plus Scrambling

Andy Emmerson

The vision/sound scrambling system used by the French fourth TV network.

103 Service Bureau

105 Test Case 264

OUR NEXT ISSUE DATED JANUARY WILL BE PUBLISHED ON DECEMBER 19





Telephone: Accrington (0254) 36521 Accrington (0254) 32611 Telex: 635562 Griffin G (For P.V.)

SUPPLIERS OF TELEVISION COMPONENTS

104 ARREV STREET ACCRINGTON LANCS RRS 1FF

	ACCRINGTON, LANCS			N COMPONENTS
TRADE COUNTER OPEN	MON-FRI 9 a.m5 p.m.	SAT 9.30 a.m5 p.m	. TRADE COUNTER CLOSE	D WEDNESDAY p.m.
ELC1043-06 8.40 ELC2003 16.50	SWITCHES & ACCESS. On/off gen. purpose 4A 75 G8 on/off 1.38 G11 on/off 1.58		PHILIPS KT3 SPECIFICS KT3 posistor 1.50 Mains electrolytic 225/25 380V 2.50 Selector unit Mod. 933 13.42	SPECIFIC COMPONENTS Philips G8 knobs sm/lg 50 90° transductor 2.60
Philips 68/G9 10.50 Philips 611 (U321) 8.50 U322 7.20 U341 9.50	G11 on/off remote 1.58 Gen. purpose rotary 66 Thom Tx 9/10 1.05 GEC 2040 98	B+K tube bases Dynascan No. 3 9.50 No. 13 11.	_ 2003 IF MODUME 14.95	Thorn 1591 speakers sm lg 4.50 Thorn 1500 controls 59 390K frame 470K line contrast 1k5 each
Rank T20 13.00	Thom 1591 push on/off Rank tuner buttons 1½"×½", 2"×½", 2"×½" 35 Rank drive cams 15		78 U321 IF module 13.50 86 R.G.B. panel 10.30 25 Sound panel 8.50	Focus control Thorn/GEC 1.83 Thorn 9000 focus unit 5.95 Thorn 8500 focus unit 4.75 Thorn Tx10 focus cont. 9.00
PUSH BUTTON ASS. Decca 4 way 6.88 6 way 7.50 GEC 2110 6 way 7.98	Thorn 3500 A1 beam 70 GEC 2110 A1 cont. R/B/G 58	C18 computer cass. 5½" floppy disc s/s s/d 1.	33 Mains input panel 14.30 33 Line sync panel 10.20 61 Mark II chroma panel 16.50	Decca bridge trans. 1.97 Decca 30 width cont. 50 Decca 2M2 HT cont. 25 Rank T20 focus cont. 2.20
GEC Slim 6 way 6.50 GEC/ITT/PYE 7 way 14.50 Pye 4 way (713/15) 9.00	ITT mains switch + solenoid 4.50 A.50 4.50	G11 line lin coil 2.	95 LOPT 9.70 Focus unit 3.50	Pye 731 HF choke 6.50 Delay lines DL20, DL60, DL700, DL50 2.20 CRT tube base 70
Pye 697 repair kit 9.00 1 Pye 725-735 11.00 Phillips G8 (early) 15.50	EAGLE MULTIMETERS KEW 7N 6.75 KEW 14 9.00 KEW 20 14.50	G11 power panel 37. G11 timebase panel 37.	50 K30 LOPT 17.50 K30 focus unit 2 90	FHT final anode cap 53
Philips G8 (late) 13.90 Rank A823 10.75 Rank T20A 9.75 Hitachi 4 way 10.75 Philips G11 unit 23.00	EM5 . 11.95 EM20A 15.95 EM10 13.95 MM50 31.25 Bench	G11 EW correc. coil 1. G11 final anode lead 1.	95 TMS 1000 panel 1234 13.90 so Euro decoder panel 1234 46.90	AFC unit G8 8.82
Phillips KT3	MM100 44.50 Meters MMT20 21.50 MM150 75.00 T1206 intercom 8.50	G11 RGB 10G diodes Labgear CM7091 UHF/VHF colour I	60 On/off switch 2.60 50 Selector unit 1002 (late) 9.90 Hand set 1201 14.50 Hand set 1234 14.50	SPARK GAPS
Thom 9000 unit 10.60 Thom 9000 switchback 5.30	MMC100 21.95 Case TS350 21.95	gen. 116. Televerta up converta 37. SUNORY EQUIPMENT	.00 Diode ZTX 33B 90 .20 DL 20 delay line 2.20	0.75 pf 1.50 0.01 pf 32
SERVICE AIOS SERVISOL Freeze-It 1.02 SUPER SERVISOL 92 SERVISOL Foam Cleanser 89	ANTEX SOLDERING EQUIPMENT C15W iron 240V	Test Lead Set 4. Degaussing Coil Stick 17. Signal Injector 4.	20 Sidecutters sm. 1.20	Specific Video Leads (please state models) 4.25 Universal Video Lead Kit 6.00 EHT Cable per mtr 25
SERVISOL Plastics Seal 1.00 SERVISOL Silicone Grease 1.08 SERVISOL Tubes Silicone Grease 1.64	106 90 820 90 821 90 CS17W Iron 240V 4.41	5A Choc Bloc (12) Fuse Wire 5A, 15A, 30A	50 Quick Set Adhesive 75 40 Sm. Neon Screwdriver 40 50 Lg. Neon Screwdriver 65 60 Min. Screwdrivers 15	BNC to BNC Lead 1.75 BNC Plugs 1.16 PLUGS
SERVISOL Aero Klene	C\$240 Element 2.25 Bits 1100 90 1101 90 1106 90	Safe Block (mains) 7.	00 Antistatic Foam (12" sheet) 75 80 I.C. Inserters 1.18	Phono Plugs 12 DIN Plugs 3 pin 22
Fire Extinguisher 640G 2.50 Heat Sink Compound 25G 1.08 Silicone Rubber Tube 110G 2.98 Solda Mop standard reel 74	X\$25W Iron 240V 4.59 X\$240 Element 2.25 Bits 50 90 51 90	Probes (x1) 10. CRT Tester/Rejuven. 172. KHP30 Meas. Probe 30kV 32.	90 00 PATA BOOKS (5. 1147)	stnd 5 pin 20 Car Aerial Plug 18 2.5mm Jack Plug 14
ELECTROLUBE PROOUCTS Electrolube Adhesive 62 Electro-Mech lubricant 1.49 Elect. cleaning solvent 1.62	Temp. Centrolled 30W fron CSTC 10.50 40W fron XSTC 10.50 1	Mains Cable (circular 100m) (2 core) 10.	TVT 80 2N-2S only 4.00 .75 TVT 80/80 A-Z/2N-2S (pair) 7.50 .25 LIN IC Books (data only not equiv.)	Stand Jack Plug 20 Stereo Jack Plug 36 Coax Plugs each 18
Freezer 1.49 Foam cleanser 1.12 Heat transfer compound 1.14 Silicone compound 1.94	MLXS Auto Repair Kit 6.30	Avo Bátteries 2. Vero Board 2. Isolating trans. 500vA 240V 40.	.20 LIN2 5.95 .59 2M Ry Lead 70 .00 4M Ry Lead 1.20	PL259 40 Reducers for PL259 16
Special contact fluid (Snorkell) 3.20 Permagard 1.52 Elec. mech. lubricant pen 74	WELLER Heat gun 12.00 Heat gun tips (pair) 57 3/16" Iron tips 25W (MT5) 57	D.I.Y. Solder Solder Sucker 6. Nozzles	45 Figure 8 Mains Lead 62 .50 Computer to TV 97 81 7 pin din to 5 pin din 98	35m 35 46mm 37 57m 37 66m 39 71m 43 76m 43
VIOEO Video care kits 3.50 VHS E30 video tape 3.06	37 TO HOLL UPS 2344 (WILD) 37	_		90m 43 110m 59
VHS E60 video tape 4.00 Scotch E120 video tape 5.00 E180 video tape 4.50 Beta L500 video tape 4.90 Beta L750 video tape 5.80	LABGEAR CM7261 Power Unit 12V 10.70 CM7262 Reg. Power Unit 12V 11.67 CM7060 MHA 10db 12V W/8 9.39 CM7065 VHF/UHF MHA W/B 12V 13.66	COUDIC LOCAL	P.V. MICROCOMPI ny not pay us a visit and see our range of Micro ring for pri pectrum 48K Vic 20 Oric Commodore 64	s, Software Books and Peripherals. Please
Philips VCC 240 6.20 Philips VCC 360 8.30 Philips VCC 480 10.21 Philips LVC 1700 15.10	CM7067 UHF 12V MHA (Specify A-B or C/D) 10.21 CM7068 UHF 12V MHA High Gain (Specify A-B or C/D) 15.19	WE HAVE A FULL RANGE OF AERIALS ANO ACCESSORIES	SHARP VIDEO HEADS VC2300	SURPRISES £55
VIDEO HEADS 3HSS VHS 32.50 4HSS VHS 32.80 PS3B Beta/Sony 42.00	CM7053 Behind Set UHF Amp. (Mains) 12.13 CM7054 Behind Set UHF Amp. (Battery e.g. Caravans) 9.92 CM7043 Second Set Amp. UHF 11.54	FROM TRADE COUNTER AERIAL EQUIPMENT Outdoor Splitter 5.	VC6300 VC7300/7700/7750 50 VC8300	
VIDEO RECORDER HEADS Philips V2000 52.00 Philips 1700 52.00 Video lamps 1.20	CM7093 Behind Set UHF Amp. 3 Sets 14.54 CM7063 Dist. Amp. VHF/UHF 17db/out- put 12V 20.10	F.M. Plugs Set Top Aerial 2. Loop Aerial 1.	00 CANYO MOSO HEADS	500 £45
Video lamps	CM7108 VHF/UHF 8+1 Dist, Amp. 41.20 CM9700 27mhz CB Suppress. 3.86 CM6011 Outdoor Splitter (2 way) W/B 7.46	Attenuator 6dB, 12dB, 18dB 1.	08 VTC 9300/9500. 80 VTC 5300/5000	143
JVC HR3360/3660 4.50 Panasonic NV/300 4.50 Panasonic NV/7000 4.50 Sorry SLC7/SLJ7 4.50	CM9003 Flush Single Outlet 1.40 CM9010 Flush Twin Outlet 1.86 CM9034 UHF Group Filters with DC Through Pass (state A/B/CD) 6.97	Single Outlets Surface Splitter 1. A Splitter	80 VTC 5500 70 VTC 9350 00 REMOTE CONTROL HAND	IINITS
Sony SL8000/8080	CM6006 6 Way Passive Splitter CM7042 TV Games Combin. 2.68 CM9009 Flush TV/FM Outlet 2.90 CM7091 Col. Bar Gen. 116.00	Coax Plugs per 10 1. 1" U Bolts	80 Grundig Telepilot 200/300 18.87 F 25 Grundig Telepilot 12/16 13.87 F Philips KT2/KT3 13.87 D	Philips G11 Teletext 23.80 Philips G11 non-Teletext 22.00
AUOIO HEAOS AND MOTORS Mono record/playback 4.32 Stereo playback 4.79	STATIONERY	SB11 Splitter 1. COB11 Outlet CS200 Combiner/Splitter 3.	91 JVC/Ferguson TX 10 16.87 80 TELEPHONE JACK SOCKETS	5.00
Stereo record/playback 4.99 Stereo record/playback (Dolby) 6.90 Mono/stereo erase 2.25 Eleginonic/rotation clockwise motors 6/ MD6515	Service Call Pad (100) 1.20	PU1240 Power Unit 11.	25 We also have a full range of Please ring	telephone fixing accessories. for prices.
6V MD6515 4.95 .9V MD9516 4.95 12V MD12517 4.95	Rental Agreements (100) 3.50 H.P. Agreements (100) 3.50 Maintenance Agreement (100) 3.50	4 way VHF/UHF Amp 33. 6 way VHF/UHF Amp 42. XG8 High Gain Aerial A-B-CD-WB 16.	00 TO AVOID DO	LATEST COPY OF MAG. CE INCREASES

74LS04 58 74LS42 80 74LS109 58 74LS7 74LS08 58 74LS48 83 74LS112 50 74LS7 74LS109 58 74LS48 83 74LS113 44 74LS1 74LS09 58 74LS51 33 74LS114 70 74LS7 74LS11 58 74LS51 43 74LS125 85 74LS1 74LS13 37 74LS55 60 74LS123 80 74LS7 74LS15 33 74LS7 66 74LS138 83 74LS7 74LS15 33 74LS7 65 74LS138 83 74LS7 74LS20 35 74LS7 65 74LS151 85 74LS2 74LS22 35 74LS76 65 74LS151 85 74LS2 74LS26 44 74LS838 89 74LS155 65 74LS3 74LS26 44 74LS838 89 74LS155 65 74LS2	61 85 74LS253 95 7605 78 62 4.04 74LS253 1.2 7806 78 63 85 74LS258 95 7808 78 64 85 74LS258 1.70 7815 78 65 1.50 74LS273 1.90 7815 78 74 85 74LS283 1.30 7818 78 75 85 74LS293 1.20 7824 78 91 1.02 74LS351 1.40 78L05 68 892 1.30 74LS353 1.40 78L06 68 892 1.30 74LS353 1.40 78L06 68 892 1.30 74LS353 1.40 78L06 68 94A 75 74LS366 82 78L24 68 94A 75 74LS366 82 78L24 68 94A 75 74LS367 1.55 7905 98 40 2.20 74LS367 1.57 7912 98 41 2.20 74LS373 1.40 7912 98 42 2.20 74LS373 1.40 7912 98 43 2.20 74LS373 1.40 7912 98 43 2.20 74LS373 1.40 7912 98 44 2.20 74LS373 1.40 7912 98 45 2.30 74LS670 1.78 7918 98 45 2.30 74LS670 1.78 7918 98 45 2.30 74LS670 1.78 7918 98 45 2.30 74LS670 1.78 7912 72 72 45418 96 1.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	MAINS DROPPERS DECCA 20 DECCA 27R/47R 1.4 DECCA 56R/6R8 1.4 R.B.M. A823 56R/68R 8.B.M. 161 GEC 2000/2018 GEC 2784/3 PYE 713/15 3R5/15/45R 1.6 PYE 725/31 3R0/56R2/27R 1.6 PYE 725/31 3R0/56R2/27R 1.7 PHILIPS 210/5050 30R/125R/2165 PHILIPS G8/5081 47R Section PHILIPS G8/5081 47R Section PHILIPS G8/5081 47R Section PHILIPS G8/5081 17R Section	A0	NGTON THER- 800 1.38 PL508 2.90 MISTORS 801 1.13 PL509/19 VA1104 75 802 1.12 5.30 VA1040 75 806 1.30 PY80 2.30 VA1040 75 806 1.63 PY800/1 69 807 1.20 UCL83 1.82 GEC Dual 808 1.20 UCL83 1.82 GEC Dual 808 1.30 PR800/1 69 807 1.35 VA1039 35 808 1.30 PY80 (KI) 1.35 809 1.20 UCL83 1.82 GEC Dual 805 1.09 40KD6 5.30 0 2.93 21LU8 3.00 200 1.86 17DW44 1.60 6 1.87 34 728 5.00 1 94 128Y7A 3.75 3 1.43 12HG7 3.20
4012B 21 4042B 58 4077B 22 4519E	76 45618 74 22 way 32 76 45618 74 22 way 32 1.68 45668 1.20 22 way 32 88 45908 3.60 33 way 45 84 45918 1.84 40 way 84 1.20 45828 80 1.00 DIL to QUIL 10 45848 45848 40 16 way 34 72 45978 1.84 18 way 37 1.00 45968 2.40 QUIL to QUIL 2.64 45998 2.00 14 way 32 1.04	THORN 9800 DECCA 3R9 Modulohm CRYSTALS & FILTERS 6Mhz 74 4.3Mhz 1.30 GEC T 9.94Mhz 6.00 PHILLIF 10.692Mhz 6.00 DECCA	THERMAL CUT OUT	L.E.D's 5mm Red, Green, Yellow 14 11 3 Amber 22 11 3mm Red, Green, Yellow 14 Flashing Red CDX21 62 CDX22 66 3 Colour VI18P 76 Panel Clips 3mm 4 5mm 4 DISC CERAMIC CAPS 8kV (12kV) 399F, 2000F, 40p
R.B.M. 720A 13.95 THORN 950 Mk I R.B.M. A774 Mono 11.74 THORN 1400 3 S THORN 1500 3 S THORN 3000/350 THORN 3000/350 THORN 3000/350 THORN 3000 THORN 3000 S	4.25	400/200V 2.74 Volts	33 9 2.2 12 22 10 47 12 47 10 10 11 100 10 15 12 220 15 22 13 470 20 47 19 33 11 100 23 68 11 220 37 220 16 470 49 1000 27 1000 58 3300 53 2200 94 10 11 700V 10 13 22 13 22 15 47 15 47 20 100 15 100 36 220 29 220 70 470 30 450 1 33 1000 55 4,7 30 2200 51 10 30 4700 98 22 65 10 10 500 10 32 20 10 500 10 32 20 10 500 10 30 20 10 500 10 30 20 10 500 10 30 20 10 500 10 30 20 10 500 10 30 20 10 500 10 31 20 10 500 10 32 20 10 500 10 32 20 10 500 10 33 22 10 500 10 32 20 10 500 10 32 20 10 500 10 32 20 10 500 10 31 20 10 500 10 32	150pF, 220pF, 180pF, 250pF 807/100V A range of pref. values 22pF-4700pF 8p POLYESTER CAPS 250V 0.01mF 12p 0.1mF 0.22mF 400V 0.01mF 0.22mF 100mF 90 16V 10mF 22 22mF 28 47mF 1.03 22mF 28 47mF 1.03 22mF 13 0.22mF 17 4.7mF 26 10mF 57 CONVERGENCE POTS 3W/5R-6RB-10R-15R-20R 50R-100R-200R-500R 60 METRIC CONVERGENCE POTS PHILIPS G8 5R-10R-15R-20R-50R 60 60 METRIC CONVERGENCE POTS CONVERGEN
FUSES Per type of 10 1½" QUICK BLOW 100ma 250ma-500ma-750ma-1A 50 1½" ANTISURGE 250ma, 500ma, 600ma, 630ma, 750ma, 850ma, 1A, 1 25A, 1, 5A, 2A 2.5A, 3A, 5A 2.70 20mm ANTISURGE 80ma 100ma 2.50 160ma, 200ma 315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A 2.5A, 3.15A, 4A, 400ma, 5A 2.5A, 3.15A, 4A, 400ma, 5A 20mm QUICK BLOW 100ma, 250ma, 500ma, 630ma, 800ma 1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A 1" MAINS 2A, 3A, 5A, 10A, 13A STOP PRESS Special Prices 5½" Floppy Disc 1-10 10-40 50-90 100+ SS/SD 1.61 1.17 1.12 1.05 SS/DD 1.70 1.23 1.17 1.10 DS/DD 2.00 1.44 1.37 1.29	THORN 1590/1 4.00 VIDEO 3V(1615 2.95 3V(1640/1 5.00 5.00 9000 8.20 DECCA 30 9800 6.80 80	18" A47/343X (Stnd Focus) 20" A51/120X 22" A56/120X 22" A56/120X 22" A56/120X 22" A56/120X 26" A66/120X 26" A66/120X 26" A66/120X 26" A66/140X (410X) 110" 26" A66/140X (410X) 110" 20" A51/161X 22" A56/510X A56 540X A66 500X P.I.L. TUBES – we can rebuild your glass – please ring for quotes. NUALS (Zero VAT) 00 24.00 110 22 24.00 PHILIPS G8 29/30 33.00 G9 4.75 G11 5.35 K30 //90 3.90 KT3	GLASS POTENT Log or Lo	MIOGET CONTROLS Insulated Spindle Length 44mm Lin Without Switch Mithout Switch Michael Sch-SoK-100K-250K-50K-10K 39p P. S.T. Switch 10K-25K-50K-10K 81p 0K. 500K, 1M, 2M 1.25 Michael Sch-Sok-10K

P. V. TUBES

PLEASE NOTE OUR NEW ADDRESS - COME AND SEE US 104 ABBEY STREET, ACCRINGTON, LANCS BB5 1EE. Tel: 0254 36521/32611 Telex: 635562 Griffin G (For P.V.)

HOW TO ORDER ADD 75p per order P+P (U.K.). Heavier parcels e.g. colle, service aids, degaus. colle, service aids, degaus. colle please allow £1.30 P+P (U.K.). Export orders charged at cost. First Class Mail is used whenever possible. Add 15% VAT to total except where it states zero rate.

SPECIAL OFFER FROM OUR COMPUTER DEPT. HIGH RES. GREEN SCREEN MONITORS £69.95 + CARRIAGE £5.95

TAPE RECORDER SUITABLE FOR COMPUTER USE - WITH CONVERTER ONLY £16.95 + CARRIAGE £2.50

WHILE STOCKS LAST

It's Christmas again and Sheila's misses send you all their Christmas kisses. But this last year we've had to change. We've added men to our staff range. So for Christmas sparkle in their lives, our lads send kisses to your wives!! Sheila, Brian, Christine, Susan, Margaret 1, Margaret 2, Dawn, Julie, Janet, Maureen, John, Christopher, Richard and Jack would like to wish all their friends a very happy Christmas and a prosperous new year.

104 Abbey St. Accrington, Lancs.



Get on the hot-line today!

SUPERIOR QUALITY TUBES

051 **428 877**7

DELTA RE-BUILDS

most types of Inline Re-builds or

new ex-stock

★ 2 YEAR WARRANTY ★ 4 YEAR OPTIONAL

Delta Rebuilds

Up to 19"£28	
Up to 22" £30	
Up to 26"£34	
110° up to 22" £34	
110° up to 26" £38	
Low focus +£2	
A47 342 New £34	

Delta only. Less $7\frac{1}{2}\%$ 5+ Less 10% 10+ and over

Inline Rebuilds

Up to 22".				
Up to 26".			į.	. £45
A56 - 540x			,	. £56
A66 - 540x				. £58
Bonded Co	il			+£5

ALL SIZES OF NEW MONO TUBES AT COMPETITIVE PRICES

IN LINE TYPES EX-STOCK SELECTION NOT REBUILDS

370 HFB	£45
370 HUB	. £45
420 CSB	£45
420 EDB	£45
420 EZB	£45
420 ERB	. £45
510 UFB/A51-590	. £55
A51-570	£55
A51-210	£55
510 VSB	£60
AXT 51-001	. £60
560 DYB	. £62
560 EGB	£62
560 CGB	£62

560 DMB £62 AXT 56-001 £62 660 AB £65 A67-701 £65 670 CZB £65 H6817 £65 370 KRB £55

> CARRIAGE £5 Singles. 2-3 £10. 4 £12 10 £15. 10+ Carriage paid EXCLUSIVE OF VAI TERMS Cash with order

QUANTITY DISCOUNT AVAILABLE Ask for details

★ OUR TECHNICAL DEPT WILL ADVISE YOU ON PROBLEMS YOU MAY ENCOUNTER ON FITTING INLINE TUBES

Ask for details DELIVERY: Ex stock items immediate dispatch on receipt of order Others allow 14 GJys.

THE COMPANY WHO PUT HIGH STANDARDS FIRST



CHROMAVAC LTD. UNIT 7, BEAR BRAND COMPLEX, ALLERTON ROAD, WOOLTON, LIVERPOOL 25 Ask for Mr Butterworth or Betty Ford 'ON: 051-428 8777



FREE CAREER BOOKLET

Train for success in Electronics Engineering, T.V. Servicing, Electrical Engineering—or running your own business!

ICS have helped thousands of ambitious people to move up into higher paid, more secure jobs in the fields of electronics, T.V., electrical engineering—now it can be your turn. Whether you are a newcomer to the field or already working in these industries, ICS can provide you with the specialised training so essential to success.

Personal Tuition and 80 Years of Success

The expert and personal guidance by fully qualified tutors, backed by the long ICS record of success, is the key to our outstancing performance in the technical field. You study at the time and pace that suits you best and in your own home.

You study the subjects you enjoy, receive a formal Diploma, and you're ready for that better job, better pay.

TICK THE FREE BOOKLET YOU WANT AND POST TODAY

ELECTRONICS ENGINEERING

A Diploma Course, recognised by the Institute of Engineers & Technicians as meeting all academic standards for application as an Associate.

T.V. & AUDIO SERVICING

A Diploma Course, training you in all aspects of installing, maintaining and repairing T.V and Audio equipment, domestic and industrial.

ELECTRICAL ENGINEERING

A further Diploma Course recognised by the Institute of Engineers & Technicians, also covering business aspects of electrical contracting.

RUNNING YOUR OWN BUSINESS

If running your own electronics, T.V. servicing or electrical business appeals, then this Diploma Course trains you in the vital business knowledge and techniques you'll need.

Name	
Address	



Stewarts Road ndon SW8 4UJ



WE WILL ONLY SUPPLY TOP QUALITY, BRANDED COMPONENTS. **REPUTATION COUNTS WITH US**

.1.88

STK011

STK016 STK020

STK032 STK035

LA1201 LA1230

LA1230 LA1365 LA2200 LA3122 LA3301 LA3350

G.G.L.COMPONENTS
108 SCOTLAND ROAD, CARLISLE, CUMBRIA CA3 9EY



E.H.T. TRAYS RBM T20/22A RBM A823 PHILIPS G8-550

PHILIPS G9 . .

.7.35 .7.85 .7.90



NEFUIATIO	A CODIAL 2 AA	iin oa	PH	ONE (0228)	20358/	3969	3							_		.10.00
INTEGRATED	TYPE PRICE (£)	TVDE DI	RICE (£)	řýšE D	RICE (£)	TYPE PE	RICE (£)	TRA	M-	TYPE	PRICE	TYPE	PRICE	LINE O/P	TR.	THORN1500-3S	5.05
CIRCUITS	LA40311.66			TD ARAA	SU LICE (II)	UPC1176C	2.15	SIST		BC548	10	BR100.	18	RBM T20/22A.	12.20	THORN3500	. 8.25
		STK043					2.30		PRICE		10	BR101.	32	RBM Z718 18/2	JU/22 I	THORN8000	.5.20
AN1031.95		STK050		TBA820	1.40			AC127.		BC558		BR103.	55	DUILIDO CO	22.95	THORN8500/8800	7.60
AN2142.25	LA40512.79		21.95		2.95			AC128.		BD124	P 70	BT106.	1,15	PHILIPS G8	7.90	THORN9000	8.70
AN240 2.20		STK077		TBA9200				AC128K	30	BD131	33	BT116.	1.30	PHILIPS G9		PYE 731	7.30
AN2531.93		STK078		TBA950/2				AC187K	30	BD132	33	BU126.	1.78	PHILIPS G11	13.50	DECCA 2230	7.20
AN3151.66		STK082		TBA990	1.55				33	BD201				THORN 1590/1	8.8	DECCA 2230	7.20
AN3186.95			12.89				23.30	AD149.	70	BD202	70	BU208/	۱.40 ا	THORN 1690/1	9.68	DECCA 100	7.35
AN3374.41		STK415		TCA800	4.10					BD203				THORN 1615	9.75	ITT CVC 20/30	6.85
AN3601.45		STK433		TCA940	1.55		2.10	AD162.	42	BD204				THORN TX10	12.50	Universal	5.90
AN63326.97	LA44222.75	STK435		TDA1002		UPC1198H				BD222		BU407.	1.12	PYE 731/713 (1		Universal	
AN71101.93		STK437		TDA1003		UPC1200V	1.90	AU110		BD232			1.80	PYE 725 (90)			
AN71142.33	LA44602.95	STK439	7.86	TDA1004	A2.70	UPC1208C				BD233		BU526.	2.00		9.60	DIDDES	
AN71152.37	LA44612.95	STK441	9.52	TDA1035			4.05			BD234			3.20		8.30		PRICE
AN71202.43	MB37122.30	STK443	11.33	TDA1044	3.10	UPC1215V				BD235				DECCA 80		BY127	10
AN71402.10	MB37132.25	STK459		TDA1170	1.80	UPC1216V			14	BD236	43			OECCA 100		BY133	15
AN71453.25	MB87195.20	STK461	9.95	TDA1412	90	UPC1217G			26	BD237	40	R2540		ITT CVC 20			40
AN71502.89	MC1327A1.00	STK463		TDA2004		UPC1218H			23	BD238		TIP31C		ITT CVC 25/30			160
AN71512.89	MC1358P1.60	STK501	8.98	TDA2020	2.95		2.05		25	BD410	50	TIP32C	47	ANTI-SURGE		BY210/800	30
	MC1330P90			TDA2522		UPC1223 UPC1225				BD434		TIP33B		A/S20MM 80N			26
HA11442.39	ML231B1.95	TA7108P.	2.10	TDA2523	2.25	UPC1225	3.10 2.55	100170.			70	TIP41C		100, 160, 200M			23
HA1151 1.97			2.05			UPC1227	2.10	100137		BD438		TIP42C		315, 400, 500, 6		BYX10	20
HA11561.97	ML2372.50	TA7129		TDA2532		UPC1230H	3.45	100100.		BD707		TIP295		800MA, 1A, 1.2		BYX55/600	26
HA11662.65	ML2384.22		1.20			UPC1245	1.99	BC159.		BDX32		TIP305		2A			07
HA11972.30	SAA10242.55			TDA2560			2.45					TV106/			1.35		07
HA11992.30										BF195			55	NEW VA	TAF2	1N5401-8	12
HA12021.75	SAA12503.85			TDA2590			2.60			BF196							10
HA12111.87	SAA12515.20			TDA2591						BF197		2SC117	24		86		
HA13062.97		TA7176A		TDA2593									1.85	PCL82			
HA13192.99		TA7193P		TDA2600						BF241	15			PCL805	01	MOTORS	1
HA13222.10		TA7202P.	3.00	TDA2611	A1.50	LIBCIDEEC	2.85				LC 25	2SC207		PCLB6		MOTORS 6-9-12-13.2V Motor	rs 5.00
		TA7203P		TDA2640		11 IDC1267C	2.85			BF258			9 . 2.45				
HA13382.78		TA7204P		TDA3560		LIPC13680	3.76	IDCZ IZL	10	BF259				PL504			
HA13392.80		TA7205A		UPC41C		UPC13700	23.80				28	1		PL508	2.00	PYE IF GAIN MOD	n 785
HA1342A2.33					1.30	UPC1373F	11.20	1		BF338 BF458		l NE	W			E/W COIL G11	1.65
HA1366		TA7210P		UPC555H		UPC13770	4.60			BF459				PY88		VA1104	70
		TA7222P				UPC1378F				BFR90			13/			G8 TRANSOUCTO	IR 225
HA13682.20	SN76013N2.30							BC547						PV91 /900		G8 ON/OFF SW.	1.60
HA13712.97		TA7227		UPC5850			12.20	100047		Di 151	22	3300	0.50	101/000		30 514, 511 644.	
HA13742.56							V ELEC	TROLY	TICE		DITE	H RUT	CONS/1	TUNERS			
HA13773.80	SN76226DN .1.45			UPC1017 UPC1018		1 55001				. 2.55	DECCA			6.45		lable also a rang	
	SN76227N1.00 SN76660N65	TBA120A		UPC1018		1				. 2.50				7.95	2SA	/B/C/D Transist	tors.
	STK00396.45							**************************************		.2.90	PYE201			15.80	Phon	e or write for I	lists.
		TBA1205		UPC1026 UPC1028				300V			PHILIPS			14.90			
HΔ11221 2.77		TRA395		UPC 1020							PHILIPS			12.00		OPPERING	

3	UPC1017G2.55	TV ELECTROLYTICS	PUSH BUT
1	UPC1018C1,15	DECCA 30(400/400)350V 2.55	
5	UPC1025H3.30	DECCA 80/100(400)350V	DECCA/ITT 6W
	UPC1026C1.45	DECCA 80/100(400)350V (800)250V	PYE201 6W
	UPC1028H2.15	PHILIPS G8(600)300V 2.00	PHILIPS G8S/L
	UPC1031H2.85	PHILIPS G9(2200)63V1.15	PHILIPS G8S/Q
	UPC1032H0.85		HITACHI 4W
	UPC1035C2.50		ITT CVC5 7W .
	UPC1042C2.40	RBMA823(2500/2500)30V 1.10	
	UPC1043C2.45		PHILIPS G11 (TI
'n	UPC1156H2.45	400)350V	1043/05TFK
	UPC1168C2.70		
	UPC1170C1.55		
_	· · · · · · · · · · · · · · · · ·	<u> </u>	
-			

TICS PUSH BUTTONS/TUDECCA/ITT 4W DECCA/ITT 6W PYE201 6W PHILIPS G85/L PHILIPS G85/L TIT CVCS 7W TT CVCS 7W TT CVCS 7W TT CVCS/9 PHILIPS G11 (TIP SW.) .7.95 .15.80 .14.90 .12.00 . . 8.95 . 10.40 . 12.80 . 26.90 .8.30

ORDERING
Please Add 50p For P/P U.K.
Add 15% VAT To This Total.
Export Orders — Cost.
DELIVERY BY RETURN ON
ALL STOCK ITEMS.

TV LINE OUTPUT TRANSFORMERS PRICES INCLUDE VAT & CARRIAGE

TBA396

TBA520

TBA550... TBA550... TBA560Q TBA750Q

.7.50 .7.35 .7.65

7.15 TBA530

...9.05 ...11.32 ..12.67

1.30

...1.00 ...1.27 ...1.40 ...1.60

Delivery by return of post.

ı	1	0.7 57 1	otarii or poot.	
	RANK BUSH MURPHY A774 with stick rectifier A816, T16, T18, Z712, Z715 T20, T22, T26, Z179, A823 Z718 Basic unit T24e, T24h split diode DECCA: 1210, 1211, 1511 1700, 2001, 2020, 2401, 2404 CS1730, 1733, 1836, 1835 30, 70, 80, 90, 100, 110, 130 Serie	9.78 10.35 11.50 13.50 P.O.A. 11.50 9.20 9.20 9.20	ITT: VC200, VC205, VC207 VC300, 301, 302, 400, 401, 402 CVC1, CVC2 (FDRGESTONE) CVC5, CVC7, CVC8, CVC9 series CVC20, CVC30, CVC32, CVC45 CVC40 split diode FT110, FT111. P/no AT2063/02 PYE: 169, 173, 569, 368 series CT200, CT200/1, CT213 series 725-731, 735, 737, 741 Series	9.20 9.20 11.50 9.20 9.20 16.74 11.50 9.20 10.35 9.78
	FERGUSON, THORN: 1590, 1591 1690, 1691. built in rect. 1600, 1615, 1700 series 1790 mono portable 3000, 3500, 8000, 8500, 8800 9000, 9200, 9300 series 9500, 9600, 9650 series 9800, TX9, TX10 series	9.20 9.78 11.78 9.39 P.O.A. 12.00 10.99 P.O.A.	PHILIPS: 170, 210, 300 series 320 series TX, T8 mono series KT2, KT3 series colour G11 series split diode G8 and G9 Series K30 BINATONE: 9909 mono	9.20 9.78 P.O.A 9.20 P.O.A. 9.20 P.O.A.
	FIDELITY: FTU12 mono CTV14R, CTV14S colour G.E.C. 2047 to 3135 mono	12.00 10.35 15.83 7.50	GRUNDIG: most models in stor NORDMENDE: FC125, Z206, Z30 SANYO: CTP5101, 5103, TJ serio SHARP: C1851H, C2051H TELETON: TH14 mono TOSHIBA: C800. C800B	6 11.50
	1201H, 1501H, 2114, 3133, 3135 DUAL & SINGLE hybrid col. SINGLE STD solid state SINGLE STD split diode	9.20 10.00 12.00 P.O.A.	TANDBURG: 190, CTV2-2, CTV3-3 TELEFUNKEN: most models in LINE OUTPUT TESTER Tidman Mail Order I	3 P.O.A. stock 16.79
	INDESIT: 24EGB hybrid	9.50	236 Sandycombe Ro	

10.35

6.33

237

6.00

6.90

236 Sandycombe Road, Richmond, Surrey. Approx. 1 mile from Kew Bridge

> Phone: 01-948 3702 Mon-Fri 9 am to 12.30 pm & 1.30-4.30 pm Sat 10 am to 12 noon.



Telegen-1

- PRICE E17.20 (Inc. VAT)

 *EXCEPTIONALLY LIGHT AND DURABLE

 *POCKET SIZE FOR OUTSIDE SERVICE

 *PP3 BATTERY POWER SOURCE

- FIVE DIFFERENT TEST PATTERNS FOR COLOUR & MONO TV
 CROSSHATCH GRID * DOT MATRIX
 *WHITE RASTER
 +HORIZONTALS * VERTICLES
 3.5mm JACK SOCKET FOR OPTIONAL P.S.U.

A lightweight, extremely portable and versatile pattern generator for black/white and colour T.V. alignment and service at the customer's home. At the turn of a switch, the generator can provide five essential test patterns for correct installation, fast checks and repairs. Pattern stability is first class and compares favourably with other more costly bulky generators only suitable for bench work. The generator is pocket size measuring 10x 7.5×4 cm and weighs only 190 grams. Switched 3.5 mm jack socket allows use of external power supply with battery in situ.

Telegen-2

- PRICE 534.45 (Inc. VAT)
 *EXCEPTIONALLY LIGHT & DURABLE
 *COMPACT 10 × 12 × 4.5 cms
 *RED RASTER * GREEN RASTER
 *BLUE RASTER

- * COLOUR BARS
- *3.5 mm JACK SOCKET FOR P.S.U. *PROVIDES UHF SIGNAL APPROX. CHANNEL 35



Telegen 2 is a colour bar generator at a very modest price and yet is extremely effective, stable and durable. It is the perfect compliment to Telegen 1, giving colour bars arranged in the following sequence: white, yellow, cyan, green, magenta, red, blue and black. The unit provides a signal in the UHF band approx. Channel 35 and requires a supply of 14 to 18 volts 0.C.

Power Supply

A switchable power supply ideally suited to both Telegen 1 and Telegen 2.

PRICE £4.55 (Inc. VAT)

POST AND PACKING £1.44 (Inc. VAT)

32 TEMPLE STREET, WOLVERHAMPTON WV2 4AN. TEL: (0902) 773122

12LGB, 12SGB mono portables

WALTHAM: W125 eht winding

WALTHAM: W190, W191 eht coil

TYNE: main winding

RBM: T20, T22, T26, Z179

KORTING: hybrid winding

WINDINGS

INCREASE YOUR PROFITS IMPROVE YOUR SERVICE WITH RELIABLE COST EFFECTIVE TEST EQUIPMENT

Ö.

0

LEADER LCT-910A C.R.T. TESTER-REJUVENATOR

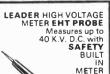
Our top selling instrument is designed to readily test the various characteristics and rejuvenation of both colour and B/W C.R.T's.

- ★ Tests for shorts and leakage between electrodes.
 ★ Tests cathode emission characteris-
- ★ Separately checks condition of guns.
 ★ Removal of shorts and leakage between electrodes.
 ★ Checks heater warm-up characteris-

- tics.

 * Rejuvenation of low emission cathodes with automatic timing.

 * Super rejuvenation with manual con-
- ★ Complete with tube base adaptors.
 Size: H 230mm W 330mm D 120mm.





LOPT TESTER BK's REVOLUTIONARY DYNAMIC

PRICE £186 + £27.90 VAT

"LOPT' TESTER
Revolutionary L.O.P.T. tester. Operates in dynamic mode which actually tests the L.O.P.T. under high voltage conditions without de-soldering or removal. Size 75×100×40 mm. Supply 240V AC

PRICE £25:99 +£3.VAT



BK's C.R.T. TESTER-REJUVENATOR Tests and rejuvenates blue, green & red guns separately. Fitted with delta and P.I.L. sockets. Compact size 120×65×60 mm. Supply 240V AC

PRICE £32.00 + £4.80 VAT



THE VERY LATEST SC110A LOW POWER, FULLY PORTABLE OSCILLOSCOPE.



ALSO AVAILABLE Analogue Multimeters Digital Multimeters Digital Multimeters
Oscilloscopes
Signal Generators
Digital Frequency Meters
Pattern Generators
CRT Tester/Rejuvenator T.V. Field Strength Meter Digital Capacitance Meter LARGE S.A.E. FOR COMPLETE LIST.

The new Thandar SC110A represents a break-through in oscilloscope development. The SC110A is ONLY TWO INCHES thick and weighs under two pounds, yet retains the standard features and controls of a bench oscilloscope.

- Full Sized Performance

 10 MHz bandwidth

 10 mV per division sensitivity.

 Full trigger facilities are provided including TV frame, or TV filtering.

 Runs on 4 to 10V DC via disposable batteries, re-chargeable cells, or AC edaptor.

 Size 255mm x 148mm x 50mm.

 PRICE £165.00 + £24.7

PRICE £165.00 + £24.75 VAT

Accessories: Carry Case £5.95 + £0.89 V.A.T.

× 1 Probe £7.50 + £1.13 V.A.T.

× 10 Probe £8.50 + £1.28 V.A.T.

× 1/× 10 Switched Probe £10.50 + £1.58 V.A.T.

AC Adaptor £6.95 + £1.04 V.A.T.

HAMEG HM 203-4 20MHz DUAL TRACE OSCILLOSCOPE

SPECIFICATION:

- SEANDWIDTH DC-20MHz
 SENSITIVITY CHI,CH2 2mV-50V/DIV
 "TIMEBASE 40m40 TO 0.25 CM
 "TRIGGER DC-40MHz Auto-Normal-TV
 "CALIBRATION OUTPIT
 "CH1 ADD AND INVERT FACILITY
 "ALT/CHOP SWITCH
 "LABGE RECTANGUAR SCREEN A x 10 c
- TARGE RECTANGULAR SCREEN 8 x 10 cms.
- *BUILT IN SEMICONDUCTOR COMP. TESTER *SIZE 285mm x 145mm x 380mm. *SUPPLY 110-125-220-240V AC 50-60Hz

2 YEAR WARRANTY



WITH COMPONENT **TESTER**

PRICE £264.00 + £39.60 VAT Optional probes as above

U.K. Post Paid, Export orders welcome, please deduct V.A.T. and enquire for Overseas carriage cost. Barclaycard/Access orders welcome, or Cheque, Bank Draft, etc., with order please. Large S.A.E. for technical leaflets of complete range. Delivery normally within 7 days.



£28.00

+ £4.49 VAT

米 FULLY GUARANTEED

ELECTRONICS Dept. 'T', UNIT 5, COMET WAY, SOUTHEND-ON-SEA, ESSEX. SS2 6TR TEL: 0702-527572



JOHN GREEN TELEVISIONS

FOR BEST QUALITY EX-RENTAL TVs **ALL SETS IN A1 WORKING ORDER**

BUSH 20"-22"

DECCA 17"-26"

FERGUSON 17"

GEC 22"

PHILIPS 550

Single/Double IC

Decoder

6 Button, Varicap Tuner

Hybrid Chassis

Solid State

Plastic or Wood Cabinet 6 Button, Solid State

Solid State

ALL £20 + VAT

ALL £25 + VAT

ALL £25 + VAT

ALL £30 + VAT

ALL £30 + VAT

DISCOUNT ON ORDERS OVER 10 PHONE NOW ON

LACKPOOL 696266

JOHN GREEN TELEVISIONS, 1 CORNFORD ROAD, MARTON, BLACKPOOL TEL. BLACKPOOL 696266

EAST CORNWALL COMPONENTS

					-
ZENER DIODES 400mW Plastic 3V–25V8p each. 10/75p 1.3W Plastic 3V–200V 15p each. 10/£1.40 1.5W Flange 4.7-47V £1.26 each 2.5W Plastic 7.5-75V 64p each 20W Stud 7.5-75V £1.35 each	TRA641BX1 450	UPC1181H 1.60 UPC1185H2 3.75 UPC1212C 1.30 UPC1228H 0.54 UPC1230H 3.90 UPC1350C 4.25	MULTIMETER SPECIAL Russian type U-324 – (20,000 C,P.V.) DC Volts: 0.6, 1.2, 3, 12, 30, 60, 600, 1200, AC Volts: 3, 6, 15, 60, 150, 300, 600, 900, DC Curr, M/A: 0.06, 6, 6, 6, 6, 60, 3000.	THORN 850 100 + 300 + 100 + 150/300V 1.50 1500 150 + 150 + 150 + 100 + 300 V 1.50 150 + 150 + 150 + 150 + 150 + 150 + 100/300V 1.50 150 +	VDRs. etc. E295ZZ 01/ 0.28 02/ 0.28
INTEGRATED CIRCUITS. IE) EACH AN240P 3.42 SN76226DN 1.80 AN214Q 3.88 SN76227N 1.10 AN7150 2.90 SN76530P 1.40	TBA810P 1.10 TBA810S 1.20 TBA820 1.60 TBA820 3.88 TBA920/Q 3.00	UPC1367C 3.40 UPC1378H 4.40 UPC2002H 2.80	AC Curr. M/A. 0.3, 3.0, 300, 3000. DC Resistance: 0.2, 5.50, 500, 5000 (level dB: -10 to +12 Supplied with rechargeable batteries. Price £12.00 incl. of p/p & VAT.	3500 175/400V+100+100/350V 1.70 8000 400/350V 2.10 8000 8500 2500+2500/63V 1.35 8000 700/250V 2.10 1000/70V 0.13 9000 400/400V 2.25	E298CD /A258 0.25 E298ED /A258 0.22 /A260 0.22 /A262 0.22
CA4031P 2.88 SN76650N 1.05 CA4031P 2.88 SN76650N 0.75 CA4102 3.30 SN76660N 0.75 CA4250 3.50 SN76666N 0.80 CA4400 2.98 STK015 6.50 CA4422 3.07 TA7108P 3.20	TBA950/2A 3.05 TBA970 4.05 TBA990 1.88 TCA160C 3.90 TCA270S 4.00 TCA270SA 4.02	D CONNECTORS 9 15 25 way way way Way Male Solder .75 1.00 1.50	C SOCKETS C SO	Timer Amp 4700/25V 0.70 DECC 470/30 400+400/350V 3.52 1700 200 +200+400/350V 3.52 GEC 2047 2048 2083 2084 2104 200 +200+150+50/300V 2.32 600/250V 1.50	/A265 0.22 /P268 0.22 E298ZZ /05 0.25 /06 0.22
LC7120 5.33 TA7120P 2 20 LC7130 5.26 TA7129AP 3.65 LC7137 5.16 TA7130P 1.65 LM380N 1.65 TA7172 1.80 LM1303N 2.52 TA7193 5.50 HA1151P 3.12 TA7172P 1.80	TCA940 3.10 TCA940 1.90 TDA440 3.80 TDA1002 1.90 TDA1003A 5.50 TDA1006A 2.40	Angle 1.40 2.00 2.40 . Female Solder 1.00 1.45 1.85 Angle	Incl. Wiring Inst.	TT7/KB	E299DD/P116- P354 all 0.23 E299DH /P230 0.72 VA1015 0.92
MC1307P 1.85 TA7176 2.50 MC1310P 1.85 TA7202P 4.18 MC1312P 2.55 TA7204P 1.86 MC1327P 1.25 TA7205AP 1.50 MC1330P 0.83 TA7208P 3.70 MC1349P 1.86 TA7210P 6.50	TDA1035S 4.50 TDA1034 4.30 TDA1170S 3.00 TDA1190 3.50 TDA1200 2.98 TDA1270Q 3.70	1.50 2.00 2.40 Covers .80 80 .80 PLUS & SOCKETS Matal Co-ax Plug 0.18	Universal Ni-Cad charger, charges PP3, AA, C, D Price Rechargeable Batteries AA (HP7) £0.85 10/ 759 each TWIN FIGURE 8	A823 2500+2500/30V 0.98 220/400V 1.75	VA1033/34/38/ 39/40/53 all 0.20 VA1055s/56s/66s/ 67s all 0.23 VA1074 0.20 VA1077 0.31
MC1350P 1.20 TA7222P 2.12 MC1351P 2.50 TA7223P 3.68 MC1352P 1.50 TA7227P 5.60 MC1357P 2.88 TA7310P 1.80	TDA1327A 1.66 TDA1352A/B 1.56 TDA1412 1.20 TDA2002 2.80 TDA2020 4.60 TDA2030 2.78	Plastic Co-ax Plug 0.14 Metal Line Socket 0.50 Single Junc Socket 0.80 Plastic Phono 0.10 F.M. Plugs 0.20	C (HP11) £1.75 10/£1.85 each D (HP2) £2.05 10/£1.95 each PP3 £2.05 10/£1.95 each PP3 £3.80 10/£3.70 each Ret& Black 38p per metre CHART RECORDER SPECIAL Brand new 3 channel pen recorders complete with charts. Full	SERVICE AIDS Excel Polish 0.76 ALL SERVISOL Fire Extinguisher PRODUCTS Switch Cleaner 0.88 Video Head Circuit Freezer 0.96 Cleaner 0.88	VA1091 0.29 VA1096/97/ 98 all 0.20 VA1103 0.32
ML231B 2.10 TAA263 2.46 ML232B 2.10 TAA310A 2.68 ML232B 2.10 TAA550 0.50 MRF475 2.50 TAA570 1.99 MRF479 5.20 TAA611A12 3.50 MRF477 10.00 TAA630S 3.90	TDA2140 5.90 TDA2521 4.10 TDA2523 3.50 TDA2523 2.70 TDA2530 2.70 TDA2540 3.80	PL259 Plugs 0.38 Reducer 0.15 Low loss splitter 1 in, 2 out 1.00 SOLDERING SECTION	Spec. upon request once only price £40 + £10 p&p + VAT. 1½" Panel Mounting 1½" Chassis Mounting 1½" Quick Blow. 100, 150, 250mA £1.30. 1, 1.25, 1.5, 2, 2.5, 3, 1	0.06 FoamCleanser0.84 SoldaMop(Std)0.7: Aero Klene 0.78 Solda Mop 0.12 Silicone Grease (L/Gauge) 0.72 0.10 (Tube) 1.60 HeatSinkComp1.04 0.15A AntistaticSpray0.82 Additional P&P on	11/12 all 0.24 VA8650 1.20
NE555 0.50 TAA661B 1.70 C-mos 555 0.88 TAA700 2.80 NE556 0.80 TAA840 3.38 SAA1024 5.35 TAD100 2.80 SAA1025 8.40 FM FILTER 1.20 SAS560A 2.50 TBA120 AS,	TDA2560 3.50 TDA2571A 2.50 TDA2581 3.20 TDA2590 3.20 TDA2591 2.98 TDA2593 2.98	XS25 Watt Iron complete with steel and plug at- tached 7.20 CS 18W, as above 7.00	55p. 1;* Time Delay. 100m £33.50. 150mA £2.25. 250, 300, 50 750, 850mA £1.84. 1, 1.25. 1.5, 1.6, 2.6 £1.84. 2.5A, 3.15, 3, 5A. 20mm Quick Blow. 100, 125. 160, 200, 250, 315, 400, 500, 630 100, 125, 160, 200mA £1.80. 250, 315, 400, 500, 630, 800mA. £* 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A 85p. 1* Mains. 2, 3, 5, 7, 10, 13. Manufactures please note Very attractive quantity prices av	E2.82. RESISTORS - CARBON FILM 5% etay.	ach. 15p/10. 75p/100 ach. 15p/10. 75p/100 ach. 65p/10. 6.00/100 ach. 70p/10. 6.00/100
SAS560S	TDA2610 3.20 TDA2611A 1.94 TDA2640 2.90 TDA2680 3.40 TDA2690 3.50 TDA3950A/B 2.60	Antex 15W iron 5.00 Antex 18W iron 5.00 Antex 25W iron 5.20 Antex elements 2.00 Antex bits 0.95 Antex stands 1.90	Upon request. REPLACEMENT TV MÁINS DROPPERS GEC2010 8R + 15R + 17R + 70R + 63R + 188R GEC 2018 10R + 15R + 19R + 70R + 188R	RESISTOR KITS — each value individual W pack 10 each value E12 — 10R to 1 W pack 5 each value E12 — 10R to 1 W pack 10 each value E12 — 2R2 to 2 W pack 10 each value E12 — 2R2 to 2	M 610 pieces 5.00 1 305 pieces 3.00 M2 730 pieces 6.00
SL901B 5.20 TBA4800 1.50 SL917B 7.25 TBA400 2.30 SL1327Q 1.10 TBA510 2.60 SN76003N 2.44 TBA5100 2.60 SN76013N 1.90 TBA520/Q 1.60 SN76023ND 2.90 TBA530/Q 1.30	UPC554C 1,32 UPC557H 0.90 UPC566H 2.95 UPC575C2 3.20 UPC1018C 1.10 UPC1025H 2.90	Soldersucker 4.50 Nozzles 0.65 TERMINAL BLOCKS 2 amp 12 way 0.19	Philips G8 2.2R + 68 R Philips 70 6R + 124R + 84R Philips 300 118R + 148R (with link) Philips 300 30R + 125R + 2.86K .RRI A640 250R + 14R + 156R 50W .RRI A816 302R + 7.0R + 6.2R	0.68 1.05 2.5W - 0.22 to 270R - Available in pre	M 353 pieces 15.00 18.00 19.00
		5 amp 12 way 0.20 10 amp 12 way 0.40 15 amp 12 way 0.46 32 amp 12 way 0.90	Thorn 1500 350R + 20R + 148R + 1.5K + 317R Thorn 3000/350 6R + 1R + 100R Fused Thorn 8000 56R + 1K + 47R + 12R Thorn 8500 1K5 + 40R + 50R	1.34 4W — 1R0 to 10K — Available in prefer 0.93 7W — 0.47R to 22K — Available in prefer 0.95 11W — 1R0 to 22K — Available in prefer 1.28 17W — 1R0 to 22K — Available in prefer	rred values 0.25 rred values 0.29 ed values 0.37

1984 CATALOGUE AVAILABLE - Many prices reduced - range increased - 123 pages fully illustrated. Price 65p, per copy (free upon request with orders over £5) - includes 30p Credit Note, special offer sheets, order form and pre-paid envelope. SEND NOW FOR YOUR COPY.

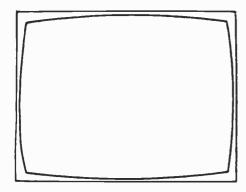
VALVE	S	TRANSIS	STORS + DI	ODES															
Type	Price (£)	Type	Price (£)	Type	Price (£)	Type Pri	ce (£)	Туре	Price (£)	Туре	Price (£)	Туре	Price (£)	Type	Price (£)		Price (£)	Type	Price (£)
DY802	0.88	AC127	0.30	BC108	0.10	BC302	0.32	BD244A	0.65	BF258	0.30	BT101/300	1.15	BYX36/150 BYX36/600	0.22	TIC106A	0.70	2AC1449 2SC1507	0.63 0.63
DY86/87	0.75	AC128	0.30	A,B or C BC113	0.12	BC303	0.32	BD375 BD410	0.32	BF259 BF262	0.32	BT101/500 BT102/300	1.25 1.35	BYX48/300	0.72	TIP30A TIP31C	0.46 0.54	2SC1507	1.06
ECC81	0.95	AC128K	0.34	BC113	0.14	BC307 BC308A	0.10	BD410	0.76	BF263	0.30	BT102/500	1.65	BYX49/300	0.47	TIP32	0.40	2SC1758	0.68
ECC82 ECC83	0.65 0.75	AC132 AC141	0.55 0.26	BC115	0.12	BC323	0.99	BD436	0.68	BF270	0.30	BT106	1.50	BYX55/350	0.29	TIP32C	0.60	2SC1909	1.20
ECC84	0.75	AC141K	0.40	BC116	0.15	BC327	0.14	BD437	0.76	BF271	0.26	BT108	1.30	BYX55/600	0.33	TIP33A	0.63	2SC1923	0.30
ECC85	0.90	AC142	0.26	BC117	0.22	BC328	0.14	BD438	0.75	BF273	0.18	BT109	1.18	BYX71/600	1.18	TIP34A	0.72	2SC1945	2.88
ECC88	0.95	AC142K	0.48	BC118	0.17	BC337	0.12	BD439	0.68	BF274	0.32	BT116	1.25	BYZ12	0.42	TIP41C	0.46	2SC1953	0.74 0.76
ECF80	0.95	AC151	0.45	BC119 BC125	0.30	BC338 BC350	0.12	BD507 BD508	0.48 0.53	BF323 BF336	0.92	BT119 BT120	3.62	C106D E1222	0.80	TIP42A TIP47	0.52	2SC1957 2SC1969	2.88
ECH81	0.75	AC152	0.45 0.28	BC140	0.12	BC440	0.30	BD509	0.54	BF337	0.26	BT121	3.02	E5024	0.30	TIP110	0.88	2\$C2028	0.73
ECH84	0.75	AC176 AC176K	0.46	BC141	0.42	BC441	0.32	BD510	0.48	BF338	0.26	BT138/600	1.30	GET872	0.48	TIP2955	0.60	2SC2029	2.10
ECL82	0.75	AC187	0.42	BC142	0.30	BC461	0.32	BD517	0.56	BF355	0.42	BT151/560		ITT44	0.04	TIP3055	0.60	2SC207B	1.05
ECL86 EF80	0,98 0.65	AC187K	0.48	BC143	0.30	BC547	0.12	BD520	0.66	BF363	0.82	BT151/300		ITT2002	0.11	TIS43	0.32	2SC2091 2SC2098	0.73
EF86	1.60	AC188	0.44	BC147 A or B	0.08 0.10	BC548 BC549	0.12	BD699 BD707	1.25 0.88	BF367 BF371	0.24 0.27	BTY79/400 BU100A	R 2.80 2.30	ME0402 ME0404/2	0.20 0.24	TIS88 TIS90	0.40 0.25	2SC2122A	2.90 3.20
EF183	0.75	AC188K ACY40	0.50 0.88	BC148	0.10	BC550	0.12	BDX18	2.35	BF422	0.38	BU104	2.00	MEU21	0.60	TIS91	0.25	2SC2166	1.20
EF184	0.75	AD142	1.10	A or B	0.10	BC550C	0.18	BDX32	2.10	BF450	0.38	BU105	1.20	MJ400	1,25	ZTX108	0.12	2SC2314	0.80
EH90	0.94	AD143	1.10	BC149	0.09	BC557	0.12	BF115	0.32	BF457	0.33	BU105/02	1.56	MJ2955	0.90	ZTX109	0.12	2SC2335	1.50
EL34	2.50	AD149	0.96	BC157	0.10	BC558	0.12	BF117	0.54	BF458	0.36	BU108	1.80	MJ3000	1.98	ZTX212	0.28	2SC2371	0.90 2.70
EL84	0.69	AD161	0.42	BC158 BC159	0.10 0.10	BCX34 BCY70	0.27	BF119 BF120	0.82 0.38	BF459 BFR39	0.44	BU124 BU126	1.75 1.25	MJE240 MJE340	0.60 0.54	IN4001 IN4003	0.05	2SC2749 2SC2752	0.60
EL509 EM87	5.50 2.55	AD162 AD161/A	0.42 D162 0.98	BC159	0.10	BCY71	0.15	BF123	0.40	BFR40	0.22	BU133	1.80	MJE370	0.88	IN4003	0.06	2SD234	0.64
EY86/87	0.67	AF106	0.48	BC161	0.30	BCY72	0.18	BF125	0.42	BFR41	0.22	BU204	1.35	MJE520	0.48	IN4006	0.07	2SD348	3.30
EY500A	1.65	AF114	2.10	BC168B	0.12	BCZ10	1.68	BF127	0.38	BFR51	0,30	BU205	1.30	MJE2955	0.99	IN4007	0.07	2SD986	0.62
PCC84	0.50	AF115	2.10	BC169C	0.10	BCZ11	1.45	BF152 BF154	0.16	BFR61	0.32 0.28	BU206	1.70	MJE3055	0.70	IN4148	0.05	2SJ50	5.20
PCC85	0.65	AF116	2.10	BC170 BC170B	0.14 0.12	BD124P BC130Y	0.80	BF154 BF157	0.23 0.40	BFR62 BFR88	0.28	BU208 BU208A	1.55 1.63	MPSLO1 MRF475	0.28 2.50	IN5400 IN5402	0.12 0.15	2SK134 2SK135	3. 80 4.60
PCC89	0.74	AF117 AF118	2.10 0.85	BC171	0.12	BD131	0.34	BF158	0.22	BFR90	1.72	BU208/02	2.05	MRF479	5.20	IN5402	0.15	13N126	1.90
PCC189 PCF80	0.85 0.75	AF121	0.62	BC171	0.10	BD132	0.34	BF159	0.24	BFT41	0.38	BU326S	1.75	MRP477	10.00	IN5406	0.18	3N211	2.52
PCF86	1.25	AF124	0.48	A or B	0.08	BD131/BD132		BF160	0.23	BFT43	0.38	BU407	1.65	OA47	0.10	IN5408	0.20	3SK45	0.76
PCF200	1.95	AF125	0.48	BC172 A or B	0.08	BD135 BD136	0.32	BF167 BF173	0,30	BFW10 BFW44	0.79 0.76	BU407D BUX80	1.80 3.70	OA90 OA91	0.08	IS920 2N697	0.08	35K88 35K135	0.66 5.20
PCF801	1.45	AF126 AF127	0.48	BC177	0.12	BD137	0.36	BF177	0.42	BFX29	0.28	BUY20	1.75	OA95	0.09	2N706A	0.33		
PCF802	0.85	AF139	0.68	BC178A	0.22	BD138	0.38	BF178	0.30	BFX30	0.30	BUY69A	2.60	OA200	0.06	2N2904	0.28	PVC Insula Tape. 6 co	ating
PCF806 PCL82	1.20 0.90	AF178	0.68	BC182	0.09	BD139	0.38	BF179	0.32	BFX80	3.56	BUY69B	1.98	OA202	0.15	2N2906	0.24	available.	10
PCL82	2.50	AF239	0.68	A,B or C	0.09	BD140 BD144	1.60	BF180 BF181	0.35	BFX84 BFX85	0.24	BY101 BY118	1.10	OC25 OC26	2.10	2N2926G 2N3053	0.10 0.22	rolls	£1.50
PCL84	0.90	AF279S AL100	0.75 2.50	BC182L A,B or C	0.09	BD145	1.82	BF182	0.33	BFX86	0.26	BY122	0.68	OC26	1.70 1.50	2N3054	0.56	PRESE	TS
PCL86	0.98	AL102	5.90	BC183	0.09	BD150A	0.51	BF183	0.32	BFX87	0.26	BY126	0.12	OC29	2.47	2N3055	0.45		
PCL805/		AL113	2.20	A,B or C	0.10	BD159	0.65	BF184	0.32	BFX89	0.65	BY127	0.10	0035	1.75	2N3702	0.10	V & H 10n	e 100R-4M7 em. 10/90p
PD500	3.75	ASY80	1.75	BC183L	0.08	BD160	1.65	BF185 BF194	0.32	BFY50 BFY51	0.21	BY133 BY135	0.16	0036	1.75	2N3704	0.10	0.1W Type	100R-1M
PFL200 PL33	1.35 1.50	.AU110	1.40	A,B or C BC184L	0.12 0.10	BD165 BD175	0.45	BF194	0.08	BFY52	0.21 0.21	BY164	0.25	OC42 OC42K	0.72 1.40	2N3708 2N3772	0.10 1.90	V & H 7p	
PL35	1.45	AY102 BA102	4.32 0.34	A,B or C	0.10	BD182	1.00	BF196	0.10	BFY57	0.40	BY179	0.66	OC44	0.72	2N3773	2.70	CAPACIT	TORS
PL81	0.85	BA110	0.67	BC207	0.15	BD183	1.10	BF197	:0.10	BFY90	0.90	BY182	3.87	OC45	0.58	2N3904	0.16	Metallise	
PL82	0.75	BA121	0,40.	BC208	0.16	BD184	1.20	BF198	:0.14	BFY90S	1.34	BY184	0.40	OC71	0.50	2N3906	0.16		V AC 24p
PL83	0.65	BA129	0.38	BC212 A,B or C	0.09	BD201 BD202	0.72	BF199 BF200	0.16 0. 26	BR100 BR101	0.20 0.44	BY 187 BY 189	0.72 4.75	OC72 OC81	0.52	2N5294 2N6107	0.48 0.71	10nF 100	0V DC 22p
PL84 PL95	0.75 2.00	BA148 BA154	0.16 0.08	BC212L	0.10	BD204	0.80	BF222	0.48	BR103	0.58	BY198	0.44	OC200	0.68 2.46	2N6107 2N6126	0.68	10nF 500	
PL504	1.20	BA155	0.08	A,B or C	0.10	BD222	0.80	BF224	0.20	BRC4443	1.76	BY199	0.47	OC202	2.20	2SB337	1.60	15nF 300 22nF 300	
PL508	2.40	BA156	0.08	BC213	0.09	BD225	0.86	BF224J	0.16	BRY39	0.38	BY206	0.24	ORP12	0.85	2SC495	0.65	100nF 10	
PL509/5	19 5.95	BA157	0.28	A or B	0.10	BD232	0.45	BF240	0.20	BRY56	0.42	BY207	0.24	R2008B	1.50	2SC1172			46p
PY88 PY500A	1.80 2.40	BA164	0.14	BC213L A or B	0.10 0.10	BD233 BD234	0.60	BF241 BF244	0.20 0.26	BRY61 BSS17	0.86 0.56	BY210/400 BY210/600	D.25	R2010B SHG1.5	1.52 0.40	2SC1173 2SC1302			00V DC60p
U26	1.90	BB104B 8B105B	0.52	BC237	0.10	BD235	0.63	BF244A	0.28	BSS27	0.92	BY210/800		TAG1/100	1.40	2SC1226	0.84		Ceramic (†)
UCH81	0.90	BB105G	0.30	BC238	0.12	BD236	0.63	BF244C	0.24	BSX19	0.34	BY223	1.20	TAG3/400	1.78	2SC1279	0.50	1kV 1.5n	F 18p
UCLB2	1.70	BB1108	0.42	BC239C	0.14	BD237	0.65	BF245A	0.28	BSX20	0.34	BY227	₩ 26	TIC44	0.40	2SC1306	0.92	8kV 10, 4 82, 100, 1	17, 56, 120, 150
6J5GT	1.75	BC107	0.10	BC251	0.12	BD238	0.56	BF254 BF256	0.15	BSX59 BSX76	0.62	BY229 BY238	₩.30 0.68	TIC45	0.45	2SC1307	1.40	180, 200	220pF 30p
6\$J7 30FL12	1.60	A or B	0.12	A,B or C BC301	0.14	BD241 BD243A	0.60	BF257	0.40	BT100A/0		BYX10	0.24	TIC46	0.48	2SC1413 2SC1444	A 2.70 1.45	270, 300g	
JUL 12	1,00		N. A. St. Bell	00001	0.50	-	- 00		RING: A					ew and				Please	THE RESERVE

EAST CORNWALL COMPONENTS 119 HIGH STREET

SHROPSHIRE SY4 5TT



All components are branc new and to full specification. Please add 45p postage/packing (unless otherwise specified) to all orders and then add 15% VAT to the total. Either send cheque/cash/postal order or send/telephone your Access or Visa number. Official orders from schools, universities, colleges etc most welcome. (Do not forget to send for our 1984 catalogue – only 65p per copy – details in middle of advertisement.) Delivery by return on ex-stock items. NEW RETAIL 1000 sq ft shop now open Mon-Fri 9.00-5.00. Sat 9-12.00.



EDITOR

John A. Reddihough

ADVERTISEMENT MANAGER

Roy Smith 01-261 6671

CLASSIFIED ADVERTISEMENTS

Barbara Blake 01-261 5897

QUERY SERVICE CHARGE

We regret the need to increase the charge made for replying to readers' servicing queries to £1.50 (inc. VAT) from this month. The service is a non-profit one for the benefit of readers but it's essential to cover some of the cost of running it.

READERS' PCB SERVICE

The readers' PCB service will continue in operation until further notice. For details of the boards available see page 389, May 1984. Enquiries should be sent to: Readers' PCB Services Ltd. (TV), Fleet House, Welbeck Street, Whitwell, Worksop, Notts.

ADDRESS PLEASE

Would Freddie Archer, who wrote on the Philips N1700 in the October issue, please send us his new address.

CORRECTIONS

Frowds Ltd.'s post code is PO6 3TJ, not as given on this page last month. Robert Barwick's VCR lock patent application was taken out on November 4th 1983, not 1984 (Teletopics last month).

TELEVISIOM

Cable TV - bordering on farce

The cable TV situation in the UK is becoming a greater shambles by the day. We were given to believe, by those who produced the Information Technology Advisory Panel report on cable TV back in January 1982, that by now the cable layers would be busy ripping up the roads while people would be falling over themselves in the scramble to get connected up to the new multi-channel cables. It's all turned out rather differently. So differently that many of the firms that promoted the idea of "recabling Britain" are now falling over each other in the scramble to get out and forget the whole thing as fast as possible.

As mentioned on a later page, the two largest cable operators in the UK, BET (Rediffusion) and ERG (Visionhire), are in the process of pulling out. For many years Rediffusion virtually was cable TV in the UK. The company started with audio cable distribution in 1928, adding TV to the network in 1951. Its service is available to about six per cent of households in the UK and it has 600,000 subscribers. There are 128 Rediffusion networks, 53 of which are reasonably large scale. Thirty one of the larger networks have been converted to provide a four-channel service (channels other than the broadcast ones). But Rediffusion is reputed to be losing around £3 million a year on its UK cable networks. The company operates in several overseas countries and has much technical expertise. It obtained only one of the initial batch of eleven new cable franchises awarded last year. Visionhire entered the cable field in 1978 when it bought networks with 240,000 subscribers. All but ten of the networks have been closed down in recent times and the company failed to win any of the new franchises. Both BET and ERG have decided that the economics of cable no longer make commercial sense over any acceptable time span for business investment. Rediffusion is being sold off while Visionhire is closing down and will make no applications for future franchises.

Whether BET came to its decision to sell unaided or was forced into it by others' refusal to provide financial backing is not clear. Thirty million was required to establish the Guildford network but the sum couldn't be raised. Of the eleven cable franchises awarded last year, only Thorn-EMI's Swindon network has actually started operations, though it will take some time, and an investment of £16 million or so, before all 53,000 households in the area can be offered the service. Most of the other franchise holders seem to have put their schemes into mothballs, some after failing to obtain any financial

backing whatever from the city.

The government has come in for some criticism over all this – for failing to act promptly and for changing the financial conditions with the last budget. This is perhaps a little unfair. That famous ITAP report did after all place great emphasis on the fact that "recabling" the UK would require no public assistance and could be done with readily available private sector finance. In fact a lot of the blame for what's gone wrong can be attributed to that ITAP report, which put forward a number of reasons for encouraging cable operations without providing a coherent overall view of what cabling was to be about or for. Was it to be a cheap and cheerful addition to existing off-air services? Or the start of a much more sophisticated information network? Or a bit of both? No one seemed too sure, perhaps with good reason. A complex information network, computers and all, could have ended up as an expensive white elephant. One feels that the ITAP emphasised the information network aspect because it lent prestige to the idea of cable. In retrospect it would probably have been better to encourage cheap and cheerful entertainment to start with, moving on to the computer network approach at a later date when the usefulness of such a service would have been easier to assess.

The government seems to have been particularly badly advised on the subject of cable. But some criticism nevertheless seems justified. Firstly on the financial aspects. The cable companies could before the last budget take advantage of tax allowances to offset their initial investments in installing the networks. The aim of the government's change however was to encourage investment that made money sense rather than tax sense. Cable was always doubtful without tax concessions. Criticism over dilatoriness on the other hand is probably more justified. Compare the haste with which the Hunt committee was set up and ordered to report on cable in 1982 with what's happened since. The Cable and Broadcasting Act was not passed until 1919 1984, confirmation of the initial franchises was delayed, and the Cable Authority which is to supervise the whole thing has still be to established – at present it has a chairman but no members.

whole thing has still be to established – at present it has a chairman but no members.

One of the strangest aspects of the whole fandango is the emergence of Robert Maxwell as almost a monopoly in cable TV. Having bought (assuming the sale is approved) Rediffusion's cable interests, which bring with them a 14 per cent interest in Ten — The Movie Channel, Robert Maxwell has been having talks with Merseyside Cablevision and Clyde Cablevision. Thorn-EMI Cable Television's managing director Peter Gosling commented "it's very encouraging to see that someone like him is prepared to invest in the future of cable". That may be so, but surely the original intention was not monopoly tendencies in the cable field. Why Robert Maxwell should be so interested in cable is hard to say. But if you were to back cable TV with powerful press support (Maxwell now owns the Mirror newspaper group) the whole thing could possibly be made worthwhile. Just think – a bingo channel maybe?

All this is surely far from what was originally intended. Whatever was envisaged at the start of the great "recabling Britain" saga – and it was always rather vague – the result so

far has been a shambles bordering on farce.

RGB-Linear Interface Circuit

K. M. Curtis, B.Sc. (Hons)

The advent of microcomputers has brought with it a need to be able to demonstrate software to large audiences. Most microcomputers are equipped with a u.h.f. modulator so that they can be connected to a standard domestic or projection TV set. Modulating a computer's characters/graphics then demodulating them introduces distortion however. This, combined with the fact that most projection television systems have a relatively narrow frequency response, makes them unsuitable for displaying 80-column text. Some microcomputers come with a 1V peak-to-peak composite video output that can be directly plugged into many projection receivers.

Most microcomputers provide either RGB-linear (RML 380Z etc.) or RGB-TTL (BBC etc.) outputs. With both of these there are four separate signals. In the case of RGB-linear there are three analogue R, G and B signals that vary between 0V and 1V and a composite sync signal. RGB-TTL differs in that the RGB signals are at either 0V = off or 5V = on.

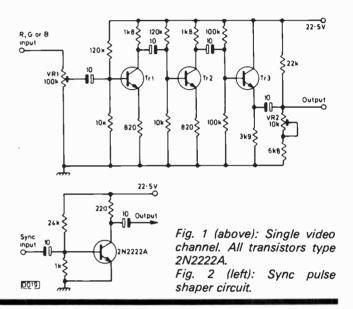
Our problem at the Computing Studies Unit, University of Leicester, arose when we wanted to demonstrate software using a Panasonic TC6200G/H/A projection receiver. We decided to interface the RML 380Z microcomputer's RGB-linear outputs with the projection set's RGB output stages. The RGB-linear input signals need to be amplified 4.5 times to drive the output stages. We decided to use two common-emitter stages for the purpose, each with a gain of 2.25 (see Fig. 1). The reason for this was the good frequency response and low cost. A final emitter-follower was incorporated in each RGB amplifier to supply the current drive required. VR2 sets

the bias at the output.

The RML 380Z's composite sync output is handled by a single 2N2222A transistor (see Fig. 2) which is driven into saturation by the sync pulses, providing a pulse output with sharp rising and falling edges.

The outputs from the three emitter-followers are fed to pin 4 on L(R), L(G) and L(B). The sync output is connected to pin 2 on board D2.

The system has been used successfully for over three years.



VCR Clinic

JVC HR7350

Star date: Aug 1984. Place: Newark Video Centre ... Beam the spares down Scotty!!!

Sorry, I got carried away again. Andy reckons that I should be! After a short holiday in Chroma (sorry, Cromer) for a much needed rest I returned to find a large pile of broken VCRs.

First a JVC HR7350 with an intermittent tape transport fault. Every third blue moon the pinch roller failed to operate, sometimes. In one fleeting moment I saw the solenoid drive pulse on the scope at a time when the pinch roller didn't move. Obviously an intermittent solenoid wasn't it? No it wasn't! The trouble with a fault like this is that one doesn't know one's got it wrong until the item in question has been replaced (after a struggle), the machine's been sent back to the customer after meticulously testing it for three days, and the call then comes to say it's happened again.

It's fairly well known that the UL switch slider in these machines is liable to stick because the grease has aged and hardened, thus preventing the drum motor switching off. A similar problem was the cause of the fault under investigation. In the front right-hand corner of the chassis

Reports from Steve Beeching, T. Eng., Derek Snelling and John Coombes

a sliding lever from the solenoid was found to be sticking on the grease, thus preventing solenoid operation from time to time.

S.B.

Sharp VC381 and VC9300

For poor fast forward, rewind and visual search within the warranty period I usually replace the idler pulleys, though they sometimes respond to cleaning with emery paper. One customer had the cheek to complain that visual search was too fast after I'd replaced the pulley. Sound warble can be due to the reel motor, the capstan motor or both.

S.B.

Sony C7

As this machine ages various common faults are appearing – there's also the well known rewind kit job. Lately I've encountered worn audio/sync heads, some audio and some sync. The capstan bearings are tending to squeak loudly: the only cure is to replace the motor, which is a bit of a bind. Failure of the power supply is now more often

due to electrolytics than to semiconductor devices: I suggest that replacement of all the high-voltage electrolytics is in order if one fails. Use only Sony replacements.

S.B.

Sharp VC7300

The tape was looping after rewind. No messing about here, I replaced the take-up turntable, the main brake and idlers. It's more economical in the long run to replace all suspect items.

S.B.

Toshiba V9600

In a few cases we've had head failure after 15 to 20 months. We also have a lot of trouble with upper cylinder wear. As with the earlier V5470, a mechanical overhaul can be very beneficial – Toshiba machines repond well to this, giving them many more years' life.

S.B.

Toshiba V8600

There was no colour on playback – probably none on record either. The colour a.f.c. loop was working normally – all waveforms checked out – but there was no 685kHz input to the submixer as the divide-by-eight circuit wasn't functioning. It's in IC208 (MB14300).

The New Machines

To my mind Sony have dropped a b...k with their new hi-fi machine. It has mono sound on the linear audio track, making it non-compatible with SLC9 stereo tapes if the customer wants to upgrade. The machine of the autumn is

without doubt the JVC hi-fi (Ferguson will say that their's has the best sound Previn has ever heard and for once be right). I can say no more at this stage than six heads on the drum, no glass delay line in the luminance replay system, multi-speed playback and a host of other goodies that boldly go where no video has ever gone before... Beam me up Scotty!! It's getting too much: I have to work with this idiot.

S.B.

Mitsubishi VCRs - Colour Trouble

Here's a fault that's becoming common on Mitsubishi VCRs. The symptom may be no colour on playback, no colour on record or both, and may be intermittent. The problem is that the various 4.43MHz oscillators need adjustment. A frequency counter is essential for this as they must be within 50Hz of the nominal figure. You'll usually find that at least one of them is over 200Hz out. The trouble seems to show up when the machines have had about eighteen months' use.

Sanyo VTC9300

A problem that's showing up on Sanyo VTC9300s is intermittent playback. The cause is dry-joints in the can that houses the head preamplifiers. It's on board W1 – the one on the left.

D.S.

Toshiba V8600

A grainy picture/no test signal can be due to low supply to the r.f. converter as a result of the switching transistor Q661 (2SC2236Y) on the servo/logic panel being high-resistance.

J.C.

TV Fault Notes

Michael Pitt

Philips K30 Chassis

One of the main chassis we deal with is the Philips K30. The arrival of the 30AX tube caused a lot of unnecessary worry, with lots of complaints about "coloured patches" around the edges – remember? I wonder how many engineers had to go out just to push the scan coil assembly back into its correct position? Things like that become routine after a while, and worth checking anyway.

An interesting fault we had recently with one of these sets was red static convergence errors. This caused havoc for a while as the merits of adjustmentless tubes were discussed. Then we noticed that one of the small metal shields just in front of the screw collar which locks the position of the scan coils had disappeared – though the locking substance used by Philips was in full view. The missing shield was retrieved from right inside the yoke and realigned back to the existing marks: hey, presto – instant convergence!

An old favourite that crops up occasionally to keep you awake is partial field collapse, generally the lower half: the usual cause is the field scan coupling capacitor C1521 $(1,500\mu F)$.

Always check that the chopper's h.t. output (HT2) is 139V on this chassis. I've found it set anywhere between 125V and 146V, which can give you some pretty awkward moments.

The sync ran wild on another of these sets about ten

seconds after switching on. A replacement TDA2571AQ sync/line generator chip produced only a slight improvement and it was necessary to replace the four transistors on this panel (line/field generator module) to get a complete cure.

Philips KT3 Chassis

A loud "clack" woke up the department when a KT3 was switched on. On inspection we found that C1581 $(0.033\mu\text{F}, 600\text{V})$ which decouples the first anode supply was flashing across to the focus preset.

Decca 80 Chassis

The problem with a Decca set fitted with the 80 chassis and touch-button tuning was no channel change. We found that Tr713 on the little panel behind the buttons, associated with the AV button, was at fault. D300 on the timebase panel was also defective – replace it with a 1N4003 as in later production (not 1N4148).

Hitachi NP8CQ Chassis

Hitachi sets are another of our lines. A dead CBP222 (NP8CQ chassis) came along recently – not really dead,

the tube heaters were very intermittent. The cause was a dry-joint on pin 11 of the line output transformer. Another set fitted with this chassis produced an audible whine from the power supply and once again the heaters were out. Hitachi have a fault-finding guide to help with this problem: it points to a number of possible candidates. All too frequently however, as on this occasion, it's simply R717 (1 Ω) open-circuit. As a result there's no 12V rail. A fairly common fault with the remote control version of this chassis is that the set comes on in standby only. In this event investigate stand-by panel PC036, paying particular attention to the two 10V zener diodes, the two BC548 transistors and the $4.7\mu \rm F$ and $22\mu \rm F$ electrolytics. The $1000\mu \rm F$ electrolytic may also need to be replaced.

Sanyo CT7118

It's not often that a Sanyo CTV comes my way nowadays. A CT7118 however had the EW fault that was so common with this model initially. D601/2 and R626 in the diode modulator circuit required replacement, also the

driver transistor's (Q752) emitter resistor R764. At switch on the collector of Q752 was at 48V, as a result of which R626 again died. A new Q752 (BD537) and R626 restored normal operation.

Mitsubishi on/off switches

Finally a moan. If you get called to a Mitsubishi set with an intermittent on/off button, be prepared to stay there a while. Not one of the easiest components to change, as it's right down in the bottom left-hand side. On Model CT2027TX you have to remove the remote control receiver panel then the huge mains transformer just to reach the required position to undo the screws holding the mains switch assembly in place. If you don't secure the mains transformer out of your way its sheer weight will encourage it to flip over and crash down on the main panel – the effect can be compared to hitting the board with an 11lb hammer. Care is essential here, which is o.k. in the workshop but not with the customer watching your every move.

N1700 Timer Modification

A. Bouskill

A major drawback remains after modifying the Philips N1700 for half-speed operation as described in the April 1983 issue of *Television*. This is the inability to make an unattended recording of more than two hours due to the timer i.c.'s limitations. A two-hour timer limit is inconvenient at normal speed: on long-play, with up to six hours' recording time available, it's restrictive to say the least.

Users of the N1700 will know that if the VCR is set to make an unattended recording and starts at the preset time, pressing the on/off button for a few seconds will return the machine to the untimed mode so that it will record to the end of the tape. This feature of the design is the basis of the modification to be described.

An examination of the timer board and a few measurements showed that to modify the timer itself would be complicated and, if the timer i.c. was damaged, probably expensive as well. Five colour-coded leads emerge from the timer board and go via a plug and socket to the timer connection subpanel (see Fig. 1). They are then linked via another plug and socket to the rest of the machine. Pin 3 of the timer plug goes high during a timed recording and this aspect of the design can be used to operate a relay.

The circuit adopted is shown in Fig. 2. When pin 3 of the timer plug goes high transistors Tr1 and Tr2 switch on. They form a Darlington pair that energises relay RL1. With RL1 energised, the normally-open contacts 1 and 2 close, short-circuiting the normally-open contacts of the N1700's on switch. Contacts 3 and 4 also close, connecting R2 across C1. The capacitor discharges slowly, and after a few seconds Tr1 and Tr2 switch off, releasing the relay. D1 protects the transistors against the relay coil's back e.m.f.

To install the modification, remove the cassette lift then the top cover (bearing in mind that it's a tight fit). Take off the top half of the cabinet by removing the four crossheaded screws in the corners and then a fifth screw, visible when the record key is depressed, in the front centre of the cabinet. When the right-hand side panel is hinged vertically the timer connection subpanel can be seen, held by a single screw.

Build the modification circuit on a piece of Veroboard approximately 50 × 25mm, with two 75mm long wires to connect to pins 1 and 3 on the subpanel. Use two longer wires (approximately 500mm) to connect contacts 1 and 2 of RL1 to the N1700's on switch, in parallel with the existing wires which in the modified machines are white and blue/white tracer. Use two wires about 150mm long to connect the 12V supply at pin 4 of the timer connection subpanel via a single-pole switch to the modification panel. Label this switch "timer override" and mount it on the front panel between the tuner buttons and the timer control panel, where the plastic is thin and accessible to the rear. The modification panel can be fitted to the base of the VCR, close to the fixing screw for the timer connection subpanel, by means of a stiff wire soldered to the Veroboard copper and trapped under a convenient screw.

The cost of this modification shouldn't exceed £2.00. It will greatly extend the machine's flexibility – this is worth doing since these VCRs are basically very reliable. The prototype has worked well for some months now. Use a small double-pole relay with two sets of normally-open contacts and a coil with a resistance of more than 180Ω .

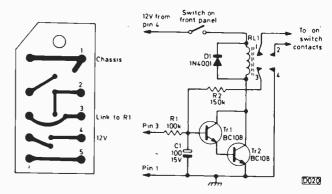


Fig. 1 (left): Timer connection subpanel. Fig. 2 (right): Relay circuit adopted.

POST A PART ELECTRONICS 6 CHAPMAN COURT, CHARFLEETS ROAD, CANVEY ISLAND, ESSEX SS8 0PO.

Telephone 0268 690868 Telex 99305 ROSSER G.



ORDERS DESPATCHED SAME DAY
ADD 60p P&P, THEN 15% VAT.
ADD POSTAGE FOR OVERSEAS ORDERS.
ORDERS WITH AEROSOLS, PLEASE ADD 25p PER CAN.

			3
Thorn 10\(\) 20\(\) (3500) R751 Safety Resistor 75p Pye 713 Speaker \$Y \times \$Y \times \$T\$ 70\(\) 10.00 Pye 713 Speaker \$Y \times \$Y \times \$T\$ 70\(\) 10.00 Pye 713 Complete Tube Base Panel with Focus Sirder & Leads 2.75 Pye 713 Control Knobs 4 for 50p Tube Base Socket ITT CVC32 45p Tube Base Socket ITT CVC32 45p Tube Base Socket ITT CVC32 45p Tube Base Socket Thorn 3000/8000 etc 50p Large IC Extractor 50p Crystal 4,430MHz 655p EHT Lead & Cap for Split Diode Lopt 90p Anode Cap Assy + Lead 12TCD-CT-16650 Degause Thermistors. P73P, P1T/GEC 35p Degause VDR E299D/HP230 3000/8000 25p Casters Set of 4 190 Double Fuse Holder on Smell Pax Board 20mm type 5p Direct Panel Mounting 20mm Fuse 5p Direct Panel Moun	300 Mixed Capacitors 150 Mixed Electrolytics 100 W/W Resistors 20 Mixed Conv Pots 40 Mixed Pots 20 Mixed Sliders 40 Mixed Presets 20 Mixed VDR & Thermistors 20 Mixed Ferrite Cores 100 Mixed Ceramic Discs 20 Mixed Valve Bases AC128 39 BC172 9 BC559	50p 30 Mixed Neons & Bulbs 1.00 Thom 350+20+148+ Baird 8750 [1.00] 1.00 BF167 24 BFR81 25 NKT453 1.65 BF173 32 BFR81 25 NKT453 1.65 Thorn 8/8500 Plastic BF179 32 BFR87 25 OT112 1.92 Thorn 8/8500 Plastic Universal	5.50 3.50 6.00 7.90 6.00 1.50 5.97 6.35 5.00 7.10 7.10 6.50
Clips	AC131 40 BC1748 23 BC595, AC138 40 BC1748 24 BCX33 AC1414 39 BC1821 B 12 BCX34 AC1424 39 BC1821 B 12 BC134 AC1426 39 BC184 15 BD132 AC176K 3 BC204 9 BC132 AC188 38 BC213 9 BC134 AC188 38 BC213 9 BC134 AC188 38 BC213 9 BC134 AC188 AC18	22 BF181 30 BF192 2.08 R1038 80 11 BF184 30 BF143 30 R1039 80 80 81854 30 BF143 30 BF143 30 BF143 30 BF143 30 BF143 30 BF143 30 BF144 30 BF144 30 BF144 30 BF144 30 BF145 30 BF145 30 BF145 30 BF145 30 BF145 30 BF146 30 BF146 30 BF146 30 BF147 30 BF148 30 BF148 30 BF148 30 BF148 30 BF195 34 BF255 30 BF273 38 BF198 19 BRC116 1.50 R2322 50 12.70 BF199 15 BRC1680 1.33 R2432 25 12.70 BF199 15 BRC1680 1.33 R2432 12.70 BF199 15 BRC1680 1.35 R2416199 1.25 12.70 BF199 1.33 R2432 12	OV 55p 5 OV 60p OV 55p OV 55p OV 55p OV 55p OV 55p OV 1.20 OV 1.80 OV 65p
Ambersi Freezer 1202 1.99 Ambersi Amberlube 602 1.89 Ambersi Ambertube 1602 1.95 Ambersi Amberton 1602 1.95 Ambersi Amti-Static Screen Cleaner 702 1.95 Ambersi Amberdens Foeming Cleaner 1302 1.26 Ambersi Circuit Lacquer 1402 2.15 THICK FILM RESISTOR UNITS 3500 Thorn (5 Pin Connection) video 1.70 4000 Thorn (4 Pin Connection) 1.90 723/731 Pye (6 Pin Connection) 2.20 713 Pye (6 Pin Connection) 2.20	BC125 26 BC328 18 BD244 BC126 23 BC337 17 BD278A BC139 27 BC338 17 BD386 BC141 34 BC347 8 BD433 BC142 30 BC394 8 BD433 BC143 31 BC454 8 BD592 BC147 12 BC455 8 BD589 BC148 12 BC456 10 BD707 BC153 16 BC463 22 BC708 BC1540 16 BC546 8 BDX10 BC1541 16 BC546 8 BDX10 BC1547 12 BC548 8 BDX10 BC157 12 BC548 12 BDY82 BC158 12 BC547 12 BC548 8 BDY82 BC158 12 BC557 10 BF153 BC157 BC557 BC557 BC557	81 BF381 21 E9005 25 F9039V 1.00 88 BF391 21 E9005 25 F9039V 1.00 88 BF391 21 E9005 25 F9039V 1.00 98 BF423 53 ME6002 10 TIC106C 48 98 BF423 53 ME6002 10 TIC106C 48 99 BF459 40 MJ2340 50 TIP32 42 99 BF566 35 MJ2595 1.50 TIP42 45 99 BF566 35 MJ25955 1.50 TIP42 45 99 BF566 35 MJ25955 1.50 TIP42 45 90 BF566 35 MJ25955 1.50 TIP42 45 90 BF566 35 MJ25955 1.50 TIP42 45 90 BF566 35 MJ25955 1.50 TIP42 45 91 BF577 62 NKT241W 8 TIP110 61 91 MF250V 700 2200MF 450V Thorn 4K 920MF 350V Thorn 3K 920MF 30V Th	1.00 1.05 50p orn 4K 95p
20mm 1½" 10 for 70p 250MA 10 for 65p 315MA A/S 10 for 50p 750MA 10 for 65p 500MA 10 for 50p 7A 10 for 50p 1A 10 for 50p 10A 10 for 50p 15A 10 for 100 25A 10 for 1.00 20A 10 for 50p 3.15A 10 for 1.00 50A 10 for 50p	INTEGRATED CIRCUITS	TBA530 1.26 TDA2002 2.80 1.80 TBA540 1.00 TDA2030 2.10 1.80 TBA550C 1.82 TDA2502 2.10 TDA2530 2.01 TDA2530 2.61 1.50 TDA2540 3.50 1.84 EA661 2.05 TDA2561 3.00 1.84 EA661 2.40 TDA2561 3.00 1.85 TBA720A 2.49 TDA2561 3.00 1.85 TBA720A 2.49 TDA2591 1.96 1.00 TBA500 1.62 TDA2640 2.90 1.00 TBA810S 1.00 TDA2690A 1.50 1.80 TBA810S 1.00 TDA2690A 1.50 1.00 TBA810S 1.00 TDA2690A 1.50 EA660 2.90 TDA2591 1.50 EA660 2.90 TBA810AS 1.00 TDA2690A 1.50 EA660 2.90 TBA810AS 1.00 TDA2690A 2.90 2.90 TDA2690A 2.90 2.50 PDA2690A 2.90 TBA810AS 1.00 TDA2690A 2.90 2.90 2.50 PDA2690A 2.90 PDA2690A 2.90 PDA2690A 2.90 2.50 PDA2690A 2.90	75p ush to 75p
Thorn EHT TX 3000/3500 6.00 Thorn LOPT 19800 12.00 Thorn LOPT 1980 17.25 Thorn LOPT 1990/91 7.25 Thorn LOPT 3000 9.80 Thorn LOPT 3000 9.80 Thorn LOPT 731 10.00 Pys LOPT 732 9.85 Pys LOPT 731 10.00 Pys LOPT 731 10.13 Philips LOPT 69 8.80 Philips LOPT 69 8.80 Philips LOPT 611 13.75 EEC LOPT 3113 7.40 Diode Spirt LOPT AT2076/35 14.75 Seryo LOPT AM—WM-21 6.75 Saryo LOPT AM—WM-21 6.75 Saryo LOPT AM—WM-21 5.75 Saryo LOPT AM—WM-4 7.30 Philips LOPT 68 7.80 Saryo LOPT CVS-9 9.60 LOPT LOPT CVC5-9 9.60 LOPT LOPT CVC5-9 LIT LOPT CVC5-9 LIP LOPT CVC	Untested	1.92 TBA950	4p 5pp 5pp 5pp 5pp 6pp 8pp 2pp 14pp 112pr 12pr 14pp 8pp 8pp 8pp 8pp 8pp 8pp 8pp 15pp 12pr 15pp 1.00 1.500 1.500 1.500 3.000 3.

PORTABLES GALORE!!

B/W PORTABLES

PHILIPS

12"

£36.50

14"

£40.00

12" REM. £44.00

CLASSIC PORTABLES £25.00

COLOUR SETS

G.E.C.	INLINE	18"	£50.00 WRK.
G.E.C.	INLINE	26" + 22"	£80.00 WRK.
G.E.C.	2110	20"	£35.00
G.E.C.	2011	20"	£40.00
G.E.C.	2211	22"	£45.00
G.E.C.	2021	20"	£45.00
G.E.C.	2221	22"	£50.00

VCR STANDS TO FIT COLOUR SETS FROM £4.00 ALL COLOUR SETS ARE VCR MODED
ALL READY TO GO STRAIGHT TO THE CUSTOMERS HOUSE

ALL PRICES ARE PLUS V.A.T.

CHROMA VISION

811A WASHWOOD HEATH ROAD, WARD END, BIRMINGHAM 8 2NP. TEL: 021-784 2561

LONDON'S LARGEST TELEVISION WHOLESALER . . . with over $4\frac{1}{2}$ thousand sq. feet.

"TELEMANN"

8-10 RHODA STREET, (Off Bethnal Green Road) LONDON E.2. FREE CAR PARK TEL: 01-739 2707

PHILIPS 22" Parcel of 10 G8/550 (Piano Keys)

£15 EACH

(THE SAME PARCEL IN A 26" £13 each)

★ FREE DELIVERY TO THE LONDON AREA ★

I HE only wholesaler with a guaranteed single price. If the sets work or not our price is the same!

01-739 2707 - LINES! - 01-739 3123

Genuine "CASH DISCOUNTS" for quantities

FURTHER SPECIAL OFFERS.

FREE CAR PARK + NO YELLOW LINES OUTSIDE!

SATELLITE RECEIVING EQUIPMENT

1.9M, 2.5M and 5M Harrison Dishes Sat-Tec R5000 4GHz Receivers Avcom COM-2B 4GHz Receivers California Amplifier 4GHz LNAs Chaparral Feed Horns

Components: Chip capacitors and Resistors, Microwave Substrate, PTFE etc.

HARRISON ELECTRONICS

22 Milton Road,

Westcliff-on-Sea, Essex SS0 7JX. Telephone: Southend (0702) 332338

TELEVISION

DIGITAL TV — SATELLITES — TV REPEATERS — MICROWAVE TV — COMPUTER CONTROL — VIDEO RECORDING — SPECIAL EFFECTS — TV COMMUNICATION.

Don't get left behind. There's something for everyone in television, the fastest growing interest around.

The BRITISH AMATEUR TV CLUB deals with every aspect of TV but in a way that the non-professional can understand. CQ-TV MAGAZINE is loaded with construction projects, articles, information, news etc., and the club produces books and publications as well as printed circuit boards and components to help the TV enthusiast.



JOIN THE TV REVOLUTION

Send a large (9" \times 6") SAE stamped with 21p for a sample magazine and membership details to: BATC, 'Grenehurst', Pinewood Road, High Wycombe HP12 4DD.

Don't Panic

Les Lawry-Johns

If there's one thing you can't get in this job it's a big head. As soon as you've cleared up one impossible problem and are congratulating yourself (no one else will) on being a clever boy, along comes another swine that completely deflates you, leaving you lonely, frightened, deflated (always that) and dreading the next customer with a set that's "an easy job – won't take you more than five minutes".

It's all right for ET down there on the south coast, surrounded by his comrades, senior, medium and junior technical advisers plus a caravan full of thin wire specialists, but when you're on your own and there's no one to turn to except Honey Bunch who always diagnoses a dryjoint (very helpful except in the case of G11s where even I can often find the right one) it's more awesome. I can phone Geoff but he tends to laugh and say "you've a weirdie there old boy, let us know what it turned out to be – cheers". It's nice to have friends, real friends who send you funny cards when you're in hospital, wishing you the best of bad luck. Thank you Jan, Geoff, Eddie – I know you didn't mean it, er . . .

The T20

Listen to this and wonder. A friend from the Medway towns sent the set along but I won't mention his name because he's a reader. I confidently approached it with my one ohm resistor, my BU208A, my 910Ω resistor and my BYX71s at the ready. But the problem turned out to be that the remote control receiver showed only a 0, which couldn't be moved, in the window. Despite my inclination to rush at the chips (SAS580/590) on the touch-tune panel I employed the slowly, slowly catchee monkey approach, which is to check the voltages carefully throughout to see where they vary from normal. I had the correct 200V h.t. supply on the line output stage panel so I checked at the EW modulator diodes - and was surprised to find negative voltages here. I looked at the meter and checked the 200V again. Yes, the leads were right. Move over and check the 12V regulator. Negative.

Feeling a bit shaken I made sure the diodes were the right way round and then checked the earth pin 4Z2-2 – second one up on the swing-down timebase panel. It was heavily negative, as was the earth on the line output stage panel. I could have kicked myself. The panel screws were loose and tightening them restored normal voltages and my sanity. The window still said 0 however and wouldn't

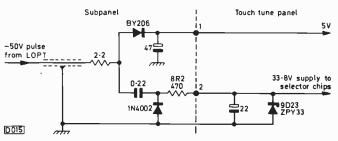


Fig. 1: Rank T20 chassis, touch tune power supply circuit. The tuning voltage is separately derived.

shift. So out came the panels involved with tuning and I soon found that $8R2~(470\Omega)$ on the supply subpanel (see Fig. 1) had burnt out. I replaced it and the new resistor got hot with the voltage low at the pin 2 end. I accused zener diode 9D23 of being leaky but it wasn't. I replaced the SAS580 and the voltage remained low so I refitted it. Remove the SAS590 and the voltage goes up to normal. Ah ha! In went a replacement and we could now select half the numbers. A new SAS580 also had to be fitted before we had full selection. The set now worked well and we were left wondering whether the poor earthing on the line output panel had had anything to do with the demise of the SAS chips.

Later that day

A chappie in the trade popped in. "Hallo Les, you don't happen to have a line output transformer for the ITT CVC32 chassis do you? I'll pay you for it."

I looked on the shelf. Only one left. So I let him have it. After all I wasn't likely to need another right away, was I? Not right away, no. Just next morning. I told the customer I'd phone him as soon as I'd got one and fitted it. Right away I phoned those nice people at SEME and, bless them, the parcel was in my hands within 24 hours. What a contrast to . . . well, never mind, you probably know who I mean.

When Stan Westover came in for his order later in the week I told him how pleased I was with this speedy service. "Think nothing of it" he smugly replied. "Yes Stan, but when I give the order to you it takes four days to come through."

"Well it has to be processed you see Les."

"Oh I see. Thanks for explaining it Stan."

Stan wasn't happy. The true explanation dawned on him.

"And in addition to that Les, I do take your order on Friday, so taking the fourth day as Monday it's still speedy service."

"Er, yes, of course" I mumbled. "Should have thought of that."

Why is it that whenever I try to shoot someone down in flames I always seem to get fried myself? Still he's not a bad bloke, really, and I don't mind HB making him a cup of coffee when he calls, not really. It would be different if he took milk and sugar in it. No wonder his humour has a bitter edge.

More Panic

This chap came struggling in with a white Philips G11. I smiled and suggested that he waited a minute or two for my immediate diagnosis. He said it had given a couple of short cracks, then the picture had severely decreased in size and finally gone, leaving the sound and a small blank raster.

Two possibilities raced through my muddled head. The line output stage tuning capacitor could have gone open-circuit, resulting in a large increase in e.h.t. (hence the arcing). In doing so the beam limiter might have suffered, hence the partial shut down and loss of signals.

With these things mulling around in my mind I whipped out the power supply panel and attacked the beam limiter. The transistors read all right but I've been fooled by this before – they're interconnected. I unsoldered the npn one (BC148) and it read faulty. "What about that!" I thought as I fitted another BC148 and refitted the panel.

Switch on and check the voltage at the h.t fuse. 100V instead of 150V. I pulled out the BU208A's plug to disconnect it, at the same time wondering why the fuse hadn't failed if the load was excessive. The voltage remained low. Out with the panel and in with my spare one. Still 100V – and the line output stage was still inoperative. Either the fault was still there or my panel was faulty in exactly the same way. I didn't believe that. Check beam limiter voltages which were again wrong. There was a line coming off marked "only on some chassis" – remote control ones. This was such a set. So I pulled out the lower plug and the voltage immediately rose above 150V. I replaced the line output transistor plug and the set burst into life.

"It's on the remote control panel" I explained.

"Never use it" he said. Coward to the last I let him take the set away without investigating further – having cleaned off the e.h.t. cap etc.

The Final Drama

We'd sold this Fidelity CTV14S some months ago to a couple we knew. We'd sung its praises and here it was tripping like mad. "Put it right in no time" I assured them.

I checked the usual things (the TDA2581 chip and dryjoints in the power supply) but they were without fault. When the line output transistor was disconnected the tripping stopped, but the transistor itself was all right. Theservices provided by the line output transformer all declared their innocence, so we were left with the line output transformer itself. This was of the original type, round and black. I whipped a stock set out of its box. The LOPT was smaller and white with the focus and first anode presets on it (these were on the tube base board on the set we'd sold).

"I'll have to phone for one. Won't keep you long. I'll give you a ring."

The husband was back a couple of days later, looking a bit peeved. "It's not come in yet" I explained. Just at that moment it arrived. "Oh good" he said. "I can wait for it then."

"Well, er, if you wish" I said dubiously. How right I was. The replacement transformer was of the same type as the one in the stock set, white with knobs on. It came with a small subpanel and a note giving instructions on the modifications required. So I suggested he popped off for an hour or so unless he wanted to stay and see me suffer. He said he didn't mind and elected to watch.

It's no easy job to remove the original type and I could hear him sighing as I struggled. Eventually it was out and the new one went in – much better. The original focus and first anode controls had to be removed from the tube panel and the leads from the new transformer fitted directly, but it was done at last.

Now was the time to test it. What if I'd been wrong? What if the set still tripped? Not giving a sign of my inner turmoil, I smiled and switched on. There was the usual grrump and on it came. A pig looked at me from the screen and winked. I winked back.

"Well done" said Mr. Savage. "How much do they pay you for doing that?"

"They don't. They only supply the parts. The labour is one of love."

"Oh well. I suppose it comes out of the profit you make when you sell the set."

"Yes sir, all seven pounds fifty of it."

I could see that he didn't believe me but it's true, give or take a penny or two. I suppose I should buy in larger quantities to get larger discounts. Never mind, I was never cut out for business.

Vintage TV: The View Master

Chas E. Miller

For several years after World War 2 home constructors of TV sets relied extensively on ex-services equipment – in particular the Pye radar i.f. strip, which operated at a frequency close to that of the Alexandra Palace transmitter, and the VCR97 electrostatic c.r.t. The latter had a screen diameter of about 6in., a length of just over 16½in., and a green fluorescent screen, so it could hardly be called ideal for domestic viewing! Nevertheless it found its way into innumerable amateur sets of the late 40s. As a matter of fact I've one on the desk as I write this, complete with its Mumetal shield!

It was obvious that something better was needed, and in 1949 a group of component manufacturers sponsored the design of a set that was to be made available in kit form and would be up to the standards of contemporary commercial models – in fact it excelled them in some respects. The result was the View Master, designed by W.I. Flack. Constructional details were sold in a packet for 5/- and the various parts were available from the sponsoring firms. Considering the general complexity of most commercial receivers at that time, W.I. Flack's design was little less than inspired and fully realised his hope that it would result in "a television set that embodies all the latest technical developments and when finished will be a credit to the constructor's workmanship and skill,

one he'll be proud to own".

So that the set's receiver section could be aligned by an amateur enthusiast without the aid of a signal generator, a t.r.f. design was chosen. The valves used were the well known (one might almost say notorious) EF50s. For the benefit of younger readers, these were among the first allglass valves designed for h.f. amplification and were widely used in wartime radar equipment. They were not particularly small - somewhat larger than the latter-day PL508 - and were permanently fitted with a metal screening can that extended right round the base pins as well. The pins were a little too short for comfort, and much of the criticism levelled at the EF50 was due to poor base connections. For applications where expense was unimportant the valves were supplied with gold-plated pins to help alleviate the problem. On the good side the valve's mutual conductance was high for the period, at 6.5mA/V. Depending on circuit application, it could be controlled by applying between 0V and -6V to the control grid or 0V to -55V to the suppressor grid. Another advantage so far as the home constructor was concerned was the fact that services equivalents (ARP35, VR91) could be obtained from surplus stores at a fraction of the price.

Three EF50s were used to amplify the vision signal

prior to detection, the first being common to the sound signal as well. The detector was one half of an EB91 double diode whose second half acted as the sync separator. Another EF50 was used as the video amplifier (see Fig. 1). As an example of Mr. Flack's attention to detail, a negative bias supply was provided for the valve's control grid to avoid the loss of gain that would have occurred with a cathode bias resistor. As a result, the stage gain was just over 30, only slightly below the theoretical maximum. The shunt peaking coil L10 was adjustable to increase the response at 2.7MHz by some 6dB. Interference suppression was provided by a Westinghouse miniature metal rectifier (MR5) and capacitor connected across the video amplifier's anode load. This clipped signals above peak white. Since there was inevitably some peak white clipping and the rectifier's capacitance degraded the video response, the recommendation was to omit the interference suppression network where there was little interference or the signal strength was high.

The simple diode sync separator V4b was driven into conduction by the positive-going sync pulses at its anode, developing the sync pulse output across its load resistor R20. The diode's heavy conduction charged C18 whose time-constant with R21 resulted in the diode remaining cut off until the arrival of the next sync pulse.

The sound receiver was a simple three-valve affair – EF50 r.f. amplifier, EBC33 detector/amplifier and EL33 output. Sound interference was again undertaken by a Westector metal rectifier – hardly surprising as Westinghouse was one of the firms involved!

Timebases

Both timebases used thyratron generators driving pentode output valves but, wonder of wonders, the line output stage was right up to the moment with flyback e.h.t. and a boost diode (the boost voltage was 320V). As Mr. Flack pointed out, this reduced the line output stage consumption to 20W as opposed to the 32W a straight class A amplifier output stage would have consumed. The boost and e.h.t. diodes were both Westinghouse metal rectifiers, though provision was made for using an EY51 e.h.t. rectifier instead if wished.

Power Supply

The power supply was very simple, with a transformer to supply the heaters and a Westinghouse 14A86 metal rectifier plus choke-capacitor filter to provide the 285V h.t. line. The only complications were a network to

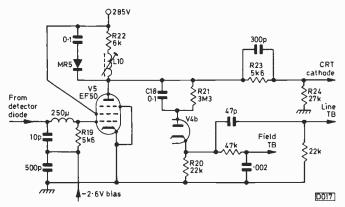


Fig. 1: The View Master's video output stage and the diode sync separator circuit.

	Horsham, W. (Sussex RH12 1	INL
3AT2B £4.60	EF85 Mul£1.75	KT88 (USA) £12.00	PL36 £0.8
30FL1/2 £1.50	EF85 + £0.35		
DY86/7 Mul£1.50			
DY87 + £0.53		PCL83 + £2.00	PL509 + .£5.2
DY802 £0.85			
ECC81 .£0.95			
ECC82 Philip£0.90		PCL85 + £0.90	PY81 £0.6
ECC83 Mul£2.30			
	EL509 .£6.90		PY500A + £1.6
EF80 Mul £1.20		PFL200 Maz£1.30	
EF80 + £0.30		PFL200 + £0.85	
PLE	ASE ADD postage/pack	ing at 70p and V.A.T. at	15%
Valves listed are new, and prices are correct	boxed and guaranteed, bu on 1/11/84,	us, for 90 days. All types i	isted are in stock today,
"+" denotes imported t	arand of valve, 'Mul' = M	ullard, 'Maz' = Mazda	
SAE FOR QUOTATION	ON ANY TYPE NOT LISTE	0	
(2 I.R.C. from overseas)	. See page 31 of Novemb	er T.V. mag. for full listing	
Send large, stamped S.	AE and 15p in stamps for	our latest catalogue	
		09/19, PCL805, PX4, PX25.	

provide the negative bias for the video output stage and a neon tell-tale to guard against live-chassis operation – it gave instant indication that the mains plug should be reversed.

Getting it Together

Several alternative c.r.t.s were available for use with the set: 9 or 12in. tubes could be used, from the Ferranti, GEC, Mazda or Mullard ranges. Focusing was by means of a permanent magnet, a much better idea than the electromagnetic system then prevalent (this usually required frequent adjustment during the course of an evening's viewing). Cabinets of either the table or console type could be bought in flat kit form for home assembly.

When correctly assembled and aligned the View Master's performance was first rate. This was as well, since it was in no way a cheap proposition for the constructor, even though the individual items sound remarkably cheap at a first glance at the price list. The receiver chassis for example, of 24 s.w.g. tin plate, was supplied by the Whiteley Electrical Radio Co. Ltd. with eight valveholders, insulating bushes, screens and all screws at an inclusive price of £1 2s 6d. The larger timebase chassis with its four valveholders cost the same – but I could just have afforded both for one week's wages at the time! A complete set of 59 capacitors, made by the Telegraph Condenser Co. (for whom Mr. Flack was a senior engineer) cost £7 complete with fixing clips. The Morganite resistor kit retailed at £1 15s 11d while the Plessey line output transformer was priced at £1 1s 3d. My copy of the original construction manual has an annotated shopping list by an unknown hand totalling £55 7s 11½d, of which the major items were the tube (£11 6s 5d), the valves (£10 10s 0d) and the cabinet (£6 17s 6d).

Despite omission of the cost of the constructor's time, this total was a lot more than the price of some contemporary commercial sets. The 9in. GEC model BT2147 and 12in. Model BT5144 cost £36 17s 5d and £48 0s 4d respectively for example. But then, as the instruction manual said, "the satisfaction and thrill of being able to say 'I built it and it works' is the great incentive."

Firms Involved

The firms associated with the View Master project were Belling and Lee, Bulgin, Colvern, Ediswan, Morganite Resistors, T.C.C., Wearite, Westinghouse and Whiteley Electrical. Assistance was provided by Cossor, Ferranti, GEC, Mazda and Mullard.

Taming the Sony KV1810UB

Bernard Pruden, B.Sc., A.M.I.E.E.

There can be few service engineers who don't greet the request to repair a Sony KV1810UB with some trepidation. The cause of this is the tendency of the expensive gate-controlled switch devices (GCSs) used in the chopper circuit and line output stage to commit hara-kiri for no obvious reason. The main cause of the problem relates to GCS characteristics. The GCS is basically a thyristor that can be turned on and off by applying positive and negative pulses respectively to its gate. Troubles usually begin when there is a momentary interruption of gate drive to either or both of these two GCSs. Such a seemingly trivial fault may leave either or both GCSs on for a long enough time to destroy the two devices well before mains fuse F601 blows. Repair by GCS replacement is likely to lead to further expensive failures at switch on or perhaps hours or days later unless the underlying cause is found. If the fault is intermittent this can be a difficult and frustrating task, with large numbers of components being replaced in an attempt to eliminate the fault.

When my own KV1810UB (Mk.I) ate its third pair of GCSs I set about designing a modification to eliminate these troublesome devices. The modification replaces the two main GCSs used in the chassis (Q603 chopper, Q510 line output) with modern high-voltage silicon transistors. Use of transistors in these positions ensures that any drive interruption will leave them in the off condition. This will stop the set working, but won't result in destruction of the transistors.

The modification involves some minor mechanical changes to mount the different case styles of the transistors. In addition, as the transistors require a greater current drive than the GCSs, modifications to the drive circuits are necessary. These include replacement of the chopper and line drive transformers (T603 and T502 respectively). The cost of the components for the modification is less than the cost of two GCSs. This assumes the use of new components: if driver transformers from scrapped chassis are used, which is quite feasible, the cost is significantly reduced. The suggested modifications could save many a KV1810UB from being declared beyond economic repair.

Modified Chopper Circuit

Fig. 1 shows the modified chopper circuit. The changes are confined to board PR, its heatsink and surrounding metalwork. Note that new or modified items are asterisked and have reference numbers starting "16". The transistor selected for the chopper position is the BU426A, which is in a plastic TO218 package. It lends itself to being conveniently mounted in approximately the same position as Q603 which it replaces. The increased drive current is provided by a BFX85 transistor (Q1601) plus heatsink in the driver position and a driver transformer (T1600) of the type used in the Thorn 3500 chassis. It's also preferable to use a crowbar over-voltage protection circuit if the set hasn't already been modified in this way.

To carry out the modification, proceed as follows. Remove Q603 (SG6533 or equivalent), D607 (HF-1Z)

and R619 (15 Ω) from board PR. Make a small bracket to mount the replacement driver transformer T1600 on the PR board's metal frame (see Fig. 2). The replacement transformer's spring clip has to be dismantled to accept the bracket, then reassembled. Mount the bracket and transformer as shown, using two suitable self-tapping screws. Fig. 2 also shows how to mount the BU426A (Q1600), using one of the bush clearance holes vacated by Q603. Take care to use heatsink compound on the mica washer and the high-voltage type of insulating bush, which requires a 6mm clearance hole. Incorporate a solder tag on the transistor mounting screw, on the copper side of the board. Connect the BU426A to the pads vacated by O603 - emitter to cathode, base to gate and collector to anode. Connect Q1601 (BFX85) directly in place of Q604 and fit it with a short corrugated heatsink. Connect R1602 (3.9 Ω , 4W) in place of D607 on the copper side of the board. This completes the chopper circuit modifications.

Crowbar Circuit

The suggested over-voltage protection circuit shown in Fig. 1 can be built on a piece of Veroboard approximately 60mm x 40mm and mounted, using two suitable selftapping screws, on the PR board's surrounding metalwork, alongside the ETC board. The layout is not critical. On the PR board itself, cut the track joining R607 and R610. Remove R607, replacing it with R1600 (10 Ω , 17W). Connect R1601 (2.2 Ω , 4W) between R1600 and R610, effectively bridging the track cut just mentioned. All these components should be mounted on the copper side of the board. This change ensures reliable operation of the crowbar thyristor THY1. Disconnect the supply end of R608 and reconnect it to the junction of R1600 and R1601. As Fig. 1 shows, this point should also be connected to the crowbar thyristor. This ensures that in the event of R1600 going open-circuit the start-up circuit is disabled, thus protecting R608 and Q602 on the PR

The voltage sensing input connection is made to pin 19 on the PR board. Don't make the connection at this stage however.

Modified Line Output Stage

The modified line output circuit is shown in Fig. 3 and is confined to the VH board and associated heatsink. The type of line output transistor chosen is the BU208A. Base drive for the transistor is obtained from the modified driver stage, which uses a BD131 transistor (Q1500) and the driver transformer from the Rank A823 chassis (use one secondary winding only).

Since the BU208A has a different outline from the GCS it replaces, it's mounted in a different position on the VH board heatsink – see Fig. 4. This diagram also shows the mounting positions for the BD131 (Q1500) and the new driver transformer.

Carry out the modification as follows. First remove the following components from the VH board: driver transis-

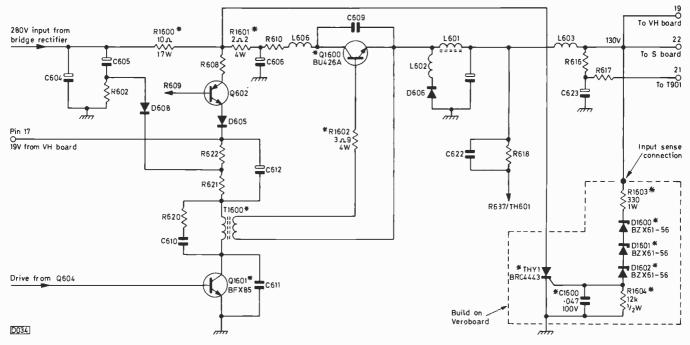


Fig. 1: Modified chopper circuit. Asterisks indicate new or modified items.

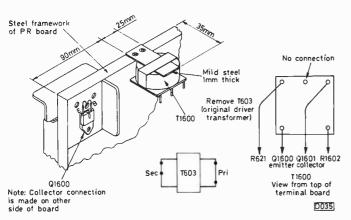


Fig. 2: PR board - physical details.

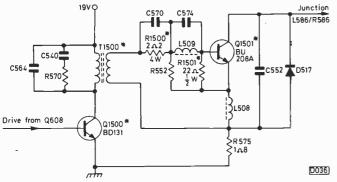


Fig. 3: Modified line output circuit.

tor Q509 (2SC1475); driver transformer T502; D585 (SIB01-02); R597 (56 Ω , 2W); GCS Q510 (SG6533 or equivalent). Note that D585 may be marked as D582 on the copper side of the board. Also remove the field output transistors Q503 and Q504 (2SC867) and the efficiency diode D517 (TD15) with its heatsink – do this carefully as these items have to be replaced later.

The VH board heatsink can now be removed. Make holes to mount the BU208A as shown in Fig. 4: using a TO3 mica washer as a marking template, drill the transistor fixing holes for the high-voltage type of insulating bush, as used for the BU426A. Then drill the mounting

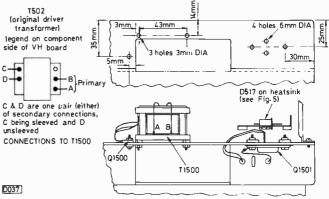


Fig. 4: VH board - physical details.

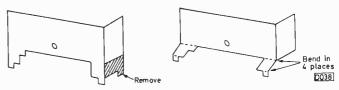


Fig. 5: D517 heatsink modification.

holes for the BD131 and the new line driver transformer in the approximate positions shown. Mount the BD131, BU208A and the transformer on the heatsink – remember to use heatsink compound with the transistors, and make sure that the heatsink surfaces in the area beneath the mica washer are free from burrs. Incorporate a solder tag for the collector connection to the BD131 – on the top face of the transistor.

Mount the following components on the VH board itself: R1500 ($2\cdot2\Omega$, 4W) in place of D585 and R1501 (22Ω , 0.5W) across the gate-cathode junction of Q510 (now the base-emitter junction of Q1501). These two items should be mounted on the copper side of the VH board.

Modify D517's heatsink as shown in Fig. 5 and replace this assembly on the board. This modification ensures adequate clearance between Q1501's base-emitter pins and D517.

Reassemble the heatsink on the VH board, taking care

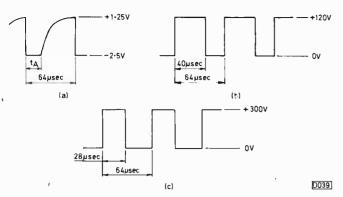


Fig. 6: (a) Chopper drive waveform – at secondary of the driver transformer. (b) Waveform at the emitter of Q1600 with 100V r.m.s. input. (c) Waveform at the emitter of Q1600 with 240 r.m.s. input.

to ensure that Q503 and Q504 are properly mounted and that the mica washers are in good order. Connect Q1500 directly in place of Q509, using sufficiently thin wire to pass through the holes in the board (1/0.4mm is suitable). Connect the replacement transformer directly to the connection pads vacated by the previous one (see Fig. 4). Connect Q1501 to the pads vacated by Q510, using 1/0.4mm wire as follows: emitter to the cathode connection, base to the gate connection, collector to the anode connection. Use additional sleeving over the wire from Q1501 where it passes through the heatsink to avoid any possibility of insulation breakdown.

The VH board can now be replaced in the chassis. Check for broken wires at pins 1 to 15 on the board – these single-strand wires are particularly prone to breakage during the above modification.

Setting up

Now to get the modified set working. The following procedure assumes that a variac and an oscilloscope with 10:1, $10M\Omega$ probe are available.

Start with the chopper circuit.

- (1) Disconnect the wires from pins 19, 21 and 22 of board PR. This prevents the h.t. from the chopper circuit reaching the rest of the receiver. Do not connect the set to the mains supply.
- (2) Connect a 19V supply between chassis and pin 17 on the PR board (positive to pin 17), using a stabilised supply or two PP9 batteries (the former is preferable since the current drain is a substantial 280mA or so).
- (3) Connect the oscilloscope to monitor the chopper drive earth probe to the emitter of Q1600, probe tip to the transformer side of R1602. The waveform should be as shown in Fig. 6(a). Adjust VR504 (line frequency) until the period of the displayed waveform is 64μ sec. Time tA should then be approximately 18μ sec.
- (4) Turn the h.t. control VR601 fully clockwise (as viewed from the copper side of the board) and temporarily connect pin 17 to the junction of R618/R637. This should have no effect on the waveform.
- (5) Turn VR601 slowly anticlockwise whilst monitoring the waveform. Ensure that at some point during the travel of VR601 time tA increases to approximately 40μ sec with some increase in amplitude. This test provides a manual check on the ability of the control circuit to vary the markspace ratio of the chopper drive.

Remove the temporary connection and set VR601 to mid-position.

(6) Disconnect one end of D605. This will keep Q602 turned off during subsequent testing and prevent R608

overheating. Connect the set's mains input to a variac, set initially to zero volts. Connect a 240V, 150W lamp between pin 19 on board PR and chassis. Connect a multimeter between pin 19 and chassis, and the scope between the emitter of Q1600 and chassis.

Increase the input from the variac to approximately 100V r.m.s. The d.c. output should be about 70V and the waveform should be roughly as shown in Fig. 6(b). If all is well, continue to increase the input from the variac whilst monitoring the chopper output voltage. At about 200V r.m.s. from the variac the output should settle at around 130V and remain at this value after increasing the input to 240V r.m.s. The waveform displayed by the scope should approximate to Fig. 6(c). Check that adjusting VR601 from end to end varies the multimeter's reading by about 30-40V. Reset VR601 for 130V output at 240V r.m.s. input. Then set the variac to zero output and disconnect the scope.

- (7) With the lamp load still connected to pin 19, connect the overvoltage circuit's sense input to pin 19. Set the variac for 240V r.m.s. input and check that the voltage at pin 19 is 130V as before.
- (8) Momentarily short-circuit zener diode D1602. This should result in F601 blowing in spectacular fashion and the 130V rail dropping to zero. Disconnect the mains input, replace F601 and remove the short from D1602. Reconnect the mains input and check that the h.t. supply at pin 19 returns to 130V with 240V r.m.s. input.

Disconnect the lamp load and the multimeter. This completes the chopper circuit checks. Now to the line output stage.

- (9) Leave the 19V supply connected as during the chopper tests (no mains input). Connect the oscilloscope to check the waveform between the transformer side of R1500 and chassis. The waveform should be as shown in Fig. 7(a). If it's not correct, find out why not and take whatever action is necessary before proceeding further.
- (10) Connect an 82Ω , 1W resistor between the positive side of the 19V supply and pin 7 on board VH. Measure the voltage between pin 7 and chassis with the multimeter. The reading should be approximately 14V. This test checks the impedance of the 130V input to board VH.
- (11) Connect the scope between the collector of Q1501 and chassis. The waveform should be as shown in Fig. 7(b).

If all's well it's time to connect the chopper and line output stages together.

- (12) Disconnect the scope and multimeter and remove the 82Ω resistor. Reconnect the wires disconnected from pins 19, 21 and 22 on board PR. Connect a rectifier diode, e.g. 1N4001, in series with the external 19V supply, with the cathode end to pin 17. This diode ensures that the 19V supply generated in the line output stage and the external 19V supply don't interact.
- (13) Connect the mains input via the variac. Increase it from zero to 100V while monitoring pin 10 (200V supply) on board VH with the meter. The reading should be about 150V at 100V r.m.s. input. Slowly increase the input from the variac. The multimeter reading should increase and stabilise at approximately 200V from 200V r.m.s. input through to 240V r.m.s. Disconnect the meter.
- (14) Disconnect the 1N4001 diode and the external 19V supply. Reconnect D605 on board PR. Increase the input from the variac from zero. If the chopper start-up circuit is working, the 130V rail (pin 19 on board PR, monitored with the meter) should jump to about 20V with an r.m.s. input of 70V. Increase the input and ensure that the

voltage at pin 19 stabilises at 130V between 200V and 240V r.m.s. input.

The set should now be working satisfactorily and the variac can be disconnected. Check for overall satisfactory performance with the set connected directly to the mains supply. No adjustments other than those mentioned should be required as a result of the modifications.

The KV1810UB Mk. II

As noted earlier, the modifications described were carried out with the Mk. I version of the KV1810UB. Although we've not had an opportunity to try out the modifications with the Mk. II version, they should be applicable when due account is taken of Q510's slightly different drive circuitry. The following approach is suggested for anyone wishing to modify a Mk. II set.

Carry out the chopper modification as described above. With the line output stage, proceed as for the Mk. I but instead of removing R597 remove R556 and R574 (both 22Ω , 2W). This will result in a line output stage as shown in

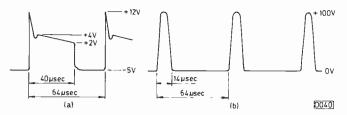


Fig. 7: (a) Line drive waveform – at secondary of the line driver transformer. (b) Waveform at the collector of Q1501 in the test condition.

Fig. 3 apart from the fact that L508 will not be present. This difference should have little effect on the operation of the circuit.

In conclusion, I hope that the modifications described will be of value to anyone wishing to extend the useful life of a Sony KV1810UB. The author's modified set has worked faultlessly for many months and can be used with confidence that if anything goes wrong it won't be the fault of a GCS – unless of course Q602 should fail. But then it can probably be replaced with a transistor . . .

Servicing the Sony KV 1612UB

David Botto

We rather like the Sony KV1612UB: it's a well-made 16in. set that gives a good picture. Though the circuitry is quite complex it's arranged on just a few boards that, as usual with Sony sets, are identified by letters.

Panel Layout

After removing the casing you'll see the large D board, which contains the power supply and the complete line and field timebase circuitry, mounted horizontally at the bottom of the set. To the left, again mounted horizontally at the bottom, is the M2 board which contains the circuitry for the a.f.t., the remote control, mute, volume and the picture and colour control. At the left side (we're looking in from the rear) you'll see the vertically mounted A board. This contains the tuner, the i.f. strip and the decoder. Also on the left, towards the front, are two small horizontally mounted boards, one above the other. The smaller is the X board that carries the remote control receiver; the larger one is the M1 board which contains the channel selection circuit and presets. Slightly towards the right are two vertically mounted boards, H which carries the customer controls and M3 with the channel indicator and its drive circuit. The letter C is used for the tube base panel which houses the RGB output stages. There's also provision for a plug-in teletext board.

Power Supply

At first sight the power supply looks a lot like those used in earlier Sony models. There are some significant differences however. The circuit is shown in Fig. 1 from which it can be seen that the main elements are a series chopper, its driver, a pulse-width modulator, protection circuits and the mains rectifiers.

The 240V a.c. mains supply comes in at plug D1. It passes via the mains fuse F601 and filter circuit, also thermistor TH605, to the bridge rectifier D601/2/8/9 (all

U05Gs). A mylar polyethylene capacitor is connected across each side of the mains filter coil T601 – C601 and C602. We've been waiting for one of these to go short-circuit, but to date this hasn't happened!

The power switch S901 has an extra switch pole which is used to reset the remote control i.c. (IC002, M58485P) at switch on. This i.c. is on board M2 and is the heart of the remote control system. If it was not reset the receiver would switch on in the standby mode.

The a.c. mains input also goes to the degaussing circuit and to transformer T603 which drives a full-wave rectifier (D611/612). This produces 39V across the reservoir capacitor C623. The following regulator circuit (Q607, D613) provides a stabilised 13V supply for the remote control i.c. on board M2 and remote control receiver board X.

A 5V supply derived from the line output transformer is fed via connector D3 (pin 3) to boards M1–M3. Suspect R804 (1·2 Ω , 0·25W carbon nonflammable) if this supply is missing.

Chopper Action

The chopper circuit is conventional and produces a regulated 110V supply. Q605 is the chopper transistor and L603 the series choke. Diode D606 conducts to maintain the current flow when the chopper transistor is off. The driver transistor Q604 receives its base drive from the astable multivibrator circuit Q602/3 which acts as the pulse-width modulator under the control of the error detector/amplifier transistor Q601.

Protection Arrangements

In the event of excessive h.t. current the voltage developed across R637 will be sufficient for Q608 and Q609 to switch on, shorting the base of Q602 to chassis. The chopper drive will thus be temporarily removed. In

the event of a short or serious overload the voltage developed across R651 will turn transistors Q651/2 on. These will latch on and stop the multivibrator, shutting the set down.

Dealing with a Dead Set

The problem when confronted with a dead set is whether the fault is in the power supply or elsewhere. The way to tackle this is to remove R513, R514, L501 and R563 from board D, thus rendering the line oscillator, driver and output stages and the field output stage inoperative. Connect a 240V, 100W bulb across the smoothing capacitor C621 and supply the set from a variac or a tapped mains transformer. Gradually increase the mains input to 240V. If the bulb lights at about half brilliance, the power pack is o.k. When you replace the choke and resistors, make sure you fit the right one in the right place or the results will be horrible!

Should the power pack prove to be faulty the first items to check are Q651/2 (a component tester will enable you to check these quickly). These transistors sometimes fail, removing the 110V supply. If necessary carry out further component checks in the following order: D651, C654, Q608, Q609, Q607, D613. Smoothing capacitor C621 changing value can give rise to all kinds of trouble, including excessive h.t. The chopper circuit transistors are very reliable. If necessary check them in the following order: Q605, Q604, Q601 – then D603.

The multivibrator circuit can be tested by disconnecting the set from the mains, connecting a scope via its 10:1 probe to the collector of Q602, and powering the circuit from an external 18V supply (two PP9 batteries or a very well smoothed supply) connected between the junction of R603/R609 and chassis. The waveform seen should be similar to that shown in Fig. 2. As the multivibrator is running free you might not get quite this waveform – the important thing is that it's there.

Fig. 3 shows the waveforms at the collector of Q604 and at the junction of coils L601/2/3 when the receiver is working correctly with a 240V a.c. mains supply.

The Timebases

If all's well with the power supply and R513/R514/R563/L501 have been replaced correctly there's probably a fault in the line timebase. It's possible that a fault on one of the other boards could be loading down the 110V line, but we've not had this happen yet.

The first item to check is the 2SD869 line output transistor. Then check the driver transistor's feed resistor R514 ($2.2k\Omega$, 2W). If necessary check rectifier diodes D801, D802, D803, D811 (all type GH3F), the line oscillator transistor Q501 (2SA677) and the line driver transistor Q502 (2SC2230A).

A few failures have been experienced as a result of shorted turns in the line output transformer T801. The only reliable test is by substitution. Since the e.h.t. rectifier is encapsulated within the transformer, you'll need to remove the tube's e.h.t. connector. It helps a lot if you've got the correct tool – part number 3-702-436-01. Don't forget to short both the cap and the tube's anode to chassis: high voltage could be lurking there in waiting for you... Note that the tube's anode cap has two connections. Short them together and you'll have three nice pictures!

Line timebase waveforms are shown in Fig. 4.

Field timebase faults are uncommon. The coupling capacitors C555 (33 μ F, 25V) and C557 (330 μ F, 25V) can cause no or reduced field scan if they fail. We've not so far had any problems with the transistors used in the field timebase.

The Receiver Side

From serial number 523,001 some changes were made. Boards M1, M2, M3, C and D were altered though the circuitry remains the same. Modifications were made to the remote control unit and board A.

The first version of the remote control unit used a 6V battery supply: with the second version the supply is 4.5V. Version one contains two transistors (type FRB828B, 2SC945 or 2SC1364): the second version has a single 2SC1364 transistor. Both use the same M58484P encoder i.c. There's little to go wrong with these units. A scope (with 10:1 probe) and counter should show 6V and 6.2V peak-to-peak 480kHz signals at pins 2 and 3 of the i.c. The best and fastest check is to try the unit with a known good receiver.

On the remote control receiver board the scope and counter should show a 15V 480kHz waveform at pins 12 and 13 of IC002 (M58485P). The only problem we've had with this board is the tendency for transistor Q005 (2SA733 or 2SA1027R) to fail. This can have a couple of effects: the sound and picture can mute, or the set may go into the standby condition and refuse to come out.

We've not had any faults on boards X, M1 and M3.

In the earlier version of the set a U321 tuner followed by a couple of 2SC2009 i.f. preamplifier transistors were used on board A. The later version has a BT882 tuner followed by a single 2SC1128 i.f. preamplifier transistor. The earlier panel has a tuner a.g.c. drive transistor Q214 (2SC1128, 2SC1364 or equivalent) which can fail. In the later version the tuner a.g.c. drive is taken direct from pin 5 of the TDA1440G i.f. i.c. (IC201). These seem to be the only differences between the two versions of the panel.

If the fault is a raster but no picture and Q005 on board M2 is all right, the cause of the trouble could well be in the beam limiter circuit. Short the emitter of Q304 (2SC633A, 2SC1364 or equivalent) to chassis. If this restores the picture, the beam limiter circuit is at fault. Check Q304 first. Next suspect C318 (0.47 μ F, 50V), C319 (3.3 μ F, 50V) and then R802 (180k Ω , 0.5W – on board D).

If necessary check Q301 (2SA733), C305, C306 (both 470pF) and make sure that the video mute diode D304 (1S1555) is in order.

The decoder i.c. is a μ PC1365C (IC301). Don't be in a hurry to take it out – so far faults have always proved to lie elsewhere. We've found no simple way of disabling the colour killer – Sony didn't know either! – but it's quite easy to check the waveforms. With a colour-bar input signal, start at TP12 on board A where the composite video signal should be present. Next check at the collector of Q305. The waveform should be as shown in Fig. 5. The 4-43MHz reference signal should be present at pin 21 of IC301. Other waveforms are clearly shown on the official circuit diagram. If all is not well, suspect components associated with the i.c., starting with capacitors C320 $(4.7\mu\text{F}, 25\text{V})$ and C321 $(3.3\mu\text{F}, 50\text{V})$ which can give various strange effects when they fail.

Decoder adjustments are best left untouched. The only one that may, not all that often, need to be adjusted is the a.p.c. control RV303. To do this, solder a $100k\Omega$ resistor from pin 13 of IC301 to chassis and a $10\mu F$, 25V capacitor

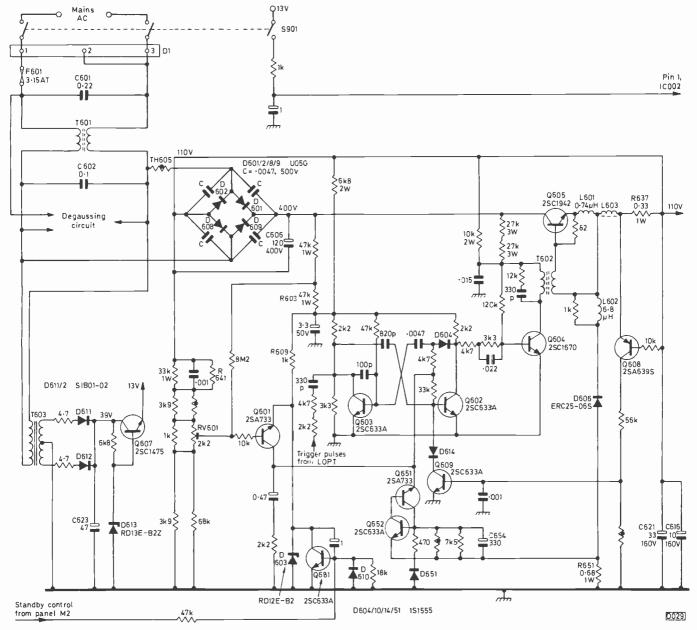


Fig. 1: Power supply circuitry, Sony Model KV1612UB.



Fig. 2: Waveform at the collector of Q602 with an 18V supply. The waveform can vary a lot – the important thing is that it's present.

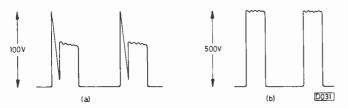


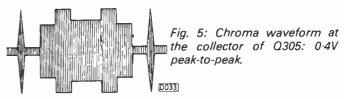
Fig. 3: (a) Waveform at the collector of Q604 with 240V input. (b) Waveform at the junction of L601/2/3.

from the junction of C335/6 to chassis. Set up RV303 on a colour transmission for a steady picture.

The RGB output transistors on panel C are of the reliable 2SC2278 type. Only very rarely does one fail,



Fig. 4: (a) Waveform at the collector of Q502. (b) Waveform at the collector of Q503 (measure with care).



giving the predominance or absence of one colour symptom.

If the sound has failed, check whether R230 (180 Ω , 0.25W carbon nonflammable) has gone high-resistance.

Finally, it's best to use a digital meter for all measurements.

Video Servicing

Mike Phelan

This month we'll take a look at the principles involved in TV (or perhaps we should now say video) cameras – in particular the non-professional types intended for the consumer market. There are not many monochrome cameras in this category so we'll concentrate on colour ones. Apart from the electronics, the camera consists of a lens system to focus the image on the target, the tube itself (usually a vidicon type) and some sort of viewfinder.

The Lens

Taking these in order, the lens will be a high-grade optical component with the front element movable for focusing purposes. Most video camera lenses also have a zoom facility. This means that by operating a lever the positions of some of the elements in the lens system can be altered in the longitudinal direction so as to vary the effective focal length, i.e. the magnification. A typical range is $\times 6$.

With a photographic camera there are two ways of altering the amount of light that passes through the lens: the lens aperture and the length of time during which the shutter is open can both be varied. Since video is a continuous process there's no shutter and only the aperture can be varied. This is done by means of an iris diaphragm that's similar to that used in a still camera but has the option of automatic setting by means of a small servo motor. This is operated by a type of a.c.c. system that senses the mean signal level and adjusts the iris accordingly. Unfortunately the auto-iris tries to make the average picture content a medium grey. This is all right if the picture content averages out at this level, but at the extremes, e.g. snow scenes or night shots, it's not much good: these subjects need to end up at high and low average brightness respectively. Because of this there's always a manual override for the iris, with some sort of warning in the viewfinder to draw attention to under- or over-exposure. There's also occasionally an auto position giving "one stop above" for back-lit subjects etc.

The motor and reduction drive to operate the zoom are also attached to the lens assembly. As this has to be manually adjustable as well, some sort of a slipping clutch arrangement is used. Many lenses have a macro setting for focusing down to less than one inch, operated by turning the zoom ring beyond the end of its travel.

Some cameras, e.g. the Ferguson 3V06, have interchangeable lenses with a screw fitting known as a C mount. This means that the connections to the iris servo and zoom motor must be made by plug and socket and that care must be taken to cap the camera when the lens is out.

With artificial light it's necessary to take the colour temperature of the light into account. To put this simply, a tungsten bulb gives a redder (lower colour temperature) output than natural light. To correct for this a filter must be inserted in the light path. It can be fitted on to the front of the lens or built into the camera and operated by means of a knob. There may also be a semi-opaque filter to insert when the camera is not in use. The Grundig FAC1900

(Sony) camera has a four-position switch for different light sources, introducing both mechanical and electronic correction.

Precautions

Before we go any further, a word on the care of camera equipment. The most important "don't" is not to point the camera at a very bright scene (with or without the lens) for any length of time. Otherwise an impression that may be permanent will be made on the tube's target. Accidentally pointing the camera at the sun will almost certainly write off the tube.

Next lenses. I know that there are such things as lens tissues, brushes and all sorts of other paraphernalia around for cleaning lenses, but my advice is don't rub the surface of a lens with anything. O.K., you may pick up a few specks of dust on the surface. But if they won't blow off, leave them. The amount of light lost is infinitesimal anything on the surface of the lens is completely out of focus and therefore invisible on the picture. Far worse is the pattern of fine scratches produced by rubbing the soft lens coating with a tissue. This scatters light, reduces the picture contrast and impairs definition. The resultant "soft-focus" effect may look great for still portraits but is of little use for anything else. Lenses are coated to reduce light scatter. The coating is soft and will also be etched by fingermarks. If you should be unfortunate in having a lens with a thumb print on it, don't dry to rub it out.

The kindest thing you can do for a camera lens is to buy it an ultra-violet filter. These are available to fit any front thread and will reduce haziness on distant summer shots. Much more importantly, the filter will protect the lens. It should be left on all the time therefore. The light loss is minimal and a UV filter is much cheaper than a lens!

The Tube

The next thing in the chain is the vidicon tube (see Fig. 1) which looks something like a long, thin valve. The usual size is $\frac{2}{3}$ in., so the deflection angle is very narrow. It's essential that the lens and tube are held in rigid mechanical alignment with each other – especially in the case of a colour camera. The tube is clamped in a Mumetal shield to provide magnetic screening, the shield being rigidly mounted on the diecast chassis. The deflection coils are inside the shield – due to the narrow scan angle they are cylindrical in shape. A couple of beam alignment magnets (like purity rings) are mounted on the tube's neck.

The vidicon has six grids (or anodes, if you like). The sixth is the mesh electrode which in operation is at about 1.5kV. It acts as the final beam accelerator. G3 and G5 form a converging lens with the focus electrode G4. G2 is at about 350V and G1 is held negative with respect to the cathode, the bias being adjustable.

The target, a layer of semiconductor material on a glass plate, closes the front of the tube: the minute signal is taken off via a metal ring connector. A stripe filter in front of the target produces colour signals. It also has an optical black portion at the bottom to provide a reference level during the field playback. In front of the stripe filter there's an optically flat glass faceplate.

Without going into detail on the theory of operation, what basically happens is that the beam scans the target and a signal corresponding to the light falling on each part of the scanned target is taken off at the ring connector. This signal enters the head preamplifier, which is mounted

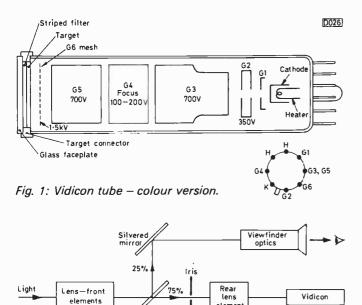


Fig. 2: Optical viewfinder arrangement.

D027

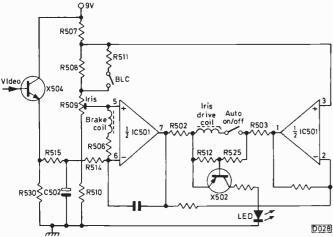


Fig. 3: The auto-iris circuit used in the Ferguson Model 3V20 colour camera.

in a screened box adjacent to the tube's shield in order to keep the input lead very short. The signal is thus amplified to a value suitable for passing to the later signal stages without loss or stray pickup.

Viewfinders

Viewfinders fall into two categories. At the lower end of the camera price range an optical viewfinder is used (see Fig. 2). About a quarter of the light from the scene is reflected into the viewfinder by an unsilvered mirror, leaving the remainder of the light to pass to the tube. A second mirror is required to turn the light path through a right angle for ease of viewing. Note that the light for the viewfinder is taken off prior to the iris to allow maximum viewfinder image brightness. This type of viewfinder is found on the Ferguson 3V17 and other similar cameras, especially monochrome ones.

The other type of viewfinder is the electronic type (EVF) – used on the Ferguson 3V06 and 3V20 for example. In effect it's a very small TV monitor with a c.r.t. screen about 1.5in. square. As the input is video (CVBS) there's no tuner, i.f. strip or sound channel. The timebases use very little power, so the unit is extremely compact. It's mounted separately on the 3V06: an extension lead

together with a remote start/stop control can thus be used – useful when filming in a situation where there's no access to the camera. In the 3V20 the EVF is built into the camera's body. To facilitate mounting, the EVF's c.r.t. is in some cameras aimed at a 45° mirror.

One advantage of the EVF is that with suitable switching the camera can receive a playback signal. A recorded section of the tape can thus be checked and if necessary retaken. For the same reason an earpiece to check the audio can be plugged into most cameras. The EVF screen can be used to display other information along with the picture. One of the most common arrangemenets is to have a horizontal white line whose position on the display varies with the iris setting – for correct exposure it should be about half way up. When the trigger is pulled the line shortens to prevent the picture being obscured.

Both types of viewfinder can incorporate LEDs to show various items of information. Three LEDs may show correct, over- or under-exposure; alternatively one LED may illuminate the whole display if there's insufficient light available (as with the Sharp XC30). There's usually an LED to show whether the VCR's battery is going low – this is often done by making one of the diodes flash rather than using an extra LED. On cameras with an optical viewfinder an indication that the tape is running is necessary – again a LED. On the Grundig/Sony 3000 it's duplicated on the front of the camera so that the subject knows he or she is "on the air"!

Before considering the main parts of the camera's electronics we'll look at the auto-iris and power zoom circuitry – these items have no connection with the rest of the circuitry.

Power Zoom

The power zoom circuit is simply a four-transistor bridge that drives the motor, opposite quadrants being switched on by the switches. The motor has a built-in reduction gearbox and the final pinion drives a toothed ring on the lens assembly. This ring is a friction fit so that manual zooming places no strain on the gear teeth.

Auto-iris Circuit

The auto-iris circuit can take various forms. On the 3V20 (see Fig. 3) the iris is controlled by a type of motor that resembles a moving-coil meter's movement. The moving parts are very light so little power is required – the motor is driven by an operational amplifier. This particular circuit is rather ingenious, as it eliminates the potentiometer that's usually driven by the servo motor in similar arrangements – this is a source of extra friction of course. The emitter-follower X504 is fed with a video signal whose amplitude depends, amongst other things, on the light passing through the lens. The voltage at pin 5 of IC501 is set by the preset iris control R509. R515/R514/C502 form a T-filter that removes instantaneous video level variations, giving the circuit a time-constant.

If the iris is closed and the ambient light level decreases the amplitude of the video signal will decrease. The voltage at pin 6 of IC501 falls and as a result the voltages at pins 7 and 2 increase, driving current through the motor in the direction required to open the iris. If the voltage at pin 2 rises above that at pin 3, pin 1 will fall to nearly chassis potential and the current through the drive coil will further increase. The system eventually finds a balance with the voltages at pins 5 and 6 equal. To prevent

hunting, a brake coil and limiting resistor (R506) are connected across pins 5 and 6 – while there's a voltage difference between the two pins, current flows through the coil and damps the movement of the iris motor.

If insufficient light is available the iris will open fully. The voltage at pin 6 will be low and current will continue to flow through the drive coil. The voltage developed across R512 will forward bias X502, illuminating the under-exposure LED. It will be apparent that this LED may flash momentarily each time the iris opens: these flashes are of very short duration however and of no consequence.

Next month we'll take a look at the rest of the electronics.

Letters

BAIRD'S STUDIOS

Thank you for Harold Peters' interesting article on prewar TV. I feel I must make a correction about the Baird studios however. As I understand it, the flying spot of light technique was used in only the earliest studios, to increase the sensitivity of the "camera" by using large arrays of photocells and also to avoid frying the performer with the enormous amount of light that would otherwise have been necessary. By the time the Baird intermediate film technique came into use the studio lighting was of the conventional type, the scanning process taking place in the telecine unit. Apart from the fact that there would have been no point in scanning twice, it would have been impossible to record in this way using any conventional film process.

Antony P. Marsden, MBKS, Poole, Dorset.

PRE-WAR TELEVISION

I found Harold Peters' article on pre-war TV (October issue) very interesting, particularly his recollections of the programmes: I hope there'll be no offence if I correct one or two technical points.

Baird's high-definition system of 1936 used 240 lines, not 202. I think Mr. Peters has confused the intermediate film system with the spotlight studio. In the former a cine camera was used to record the scene in a studio lit by conventional film lighting. The film, which incidentally was 17.5mm not 35mm, was then immediately processed and scanned in the manner described by Mr. Peters. In the spotlight studio the single performer sat in darkness except for a flying spot of light that came from an arc lamp via a Nipkow disc. The light reflected from the subject was picked up by sensitive photocells that produced a video signal directly. Both these systems were in use at Alexandra Palace in 1936-7 but they were clearly clumsy compared to the flexible Emitron cameras. It was this operational difference rather than considerations of picture quality that led to the Baird system being abandoned after only three months of regular service.

As Harold Peters correctly points out, the fact that the electron gun in the Emitron tube was mounted at an angle to the target resulted in the need to use keystone correction in the scanning waveforms. This correction could be preset however, rather after the manner of EW and NS

correction in a shadowmask tube, and was not the reason for the famous tilt and bend controls. These were needed because the Emitron tube was subject to spurious shading effects due to the clouds of secondary emission electrons that were released from the target by the high-velocity electron beam. These secondary emission electrons upset the charge distribution across the target and hence the average brightness of the picture. To provide correction, sawtooth (tilt) and parabolic (bend) waveforms were added to the video signal. As the effect was picture dependent, these controls had to be readjusted for every scene. The Emitron tube had a gamma of 0.5 which was ideal for transmission purposes: thus gamma correction wasn't necessary.

For anyone interested in this period of TV history Bruce Norman's recent book *Here's Looking at You*, published by the BBC, makes fascinating reading. *David Looser*, *Ipswich*.

HISTORICAL RECORD

I gather that other correspondents have dealt with various technical points arising from Harold Peters' article on prewar TV. May I put the record straight on some historical matters?

(1) It was not the EMI team who developed radar in the UK, though many of them worked on it later, during the war, when two of the team — Alan Blumlein and C.O. Browne — were killed in an aircraft crash while flight-testing H2S. Credit for the early radar experiments is due to Sir Robert Watson-Watt, a scientific civil servant. The work was done at the Radio Research Station, Slough. Most of the electronic equipment for the early radar chains was manufactured by A.C. Cossor. It was originally called "RDF", later "radiolocation": it was finally agreed to adopt the American term "radar".

(2) The EMI team didn't develop the complete 405-line package. The original transmitters and aerials were contributed by the Marconi Company, with whom EMI formed Marconi-EMI in 1934. While the Ally Pally station took about 18 months to complete, the electronic TV system was the result of several years' work. The Emitron camera tube, though developed independently, owed something to Zworykin's work at RCA where electronic interlaced scanning was developed. The early work on v.h.f. television in Germany should not be overlooked — the intermediate film technique used by Baird was also developed in Germany. Baird used this for his "live" transmissions, but he also had a good telecine for transmitting film. In fact apart from more flicker his film transmission gave significantly better results than the original Marconi-EMI 405-line telecine.

(3) Finally the article was less than fair to the BBC in suggesting that they came near to backing the wrong horse. The BBC had been virtually forced by the PMG to transmit Baird's 30-line system and were much impressed by the EMI work as early as 1932. The decision to share the high-definition service between Baird and Marconi-EMI stemmed from the Selsdon Television Committee of 1934 and the subsequent Television Advisory Committee. Baird's pioneer work on low-definition TV and his later wartime work on high-definition colour deserve to be acknowledged but the 405-line fully-electronic system was what the UK needed in 1936 (though not in 1946) and that came from the EMI and later Marconi-EMI team: the BBC seems to have recognised early on that this would be

the final solution to their long and often bitter struggle with Baird lasting, with occasional lulls, from about 1927. *Pat Hawker, Dulwich.*

RADIOLYMPIA

I must be in the same age bracket as Harold Peters, for I too can remember the burning down of the Crystal Palace, though it was only a faint glow in the clear night sky to us at Herne Bay some 60 miles distant. Because of my enthusiasm for wireless my father took me to the pre-war Radiolympias. The 1937 one stands out in my memory as the first and last time that I saw a television set operating from the Town Gas supply. Hundreds of little bunsen burners heated thermocouples and the set showed what appeared to be an OB from Henley. In 1937 there were still thousands of houses in the London area with gas lighting only, so there may have been a market for such a device.

Harold Peters mentions the 1939 theatre show. In fact the show was being televised live from the theatre in 1937 — I still have my 1937 theatre programme, autographed by the stars of the show. The TV cameras were on the stage, supported on frames equipped with bicycle wheels, and the compère made jokes about the colour of the shirt he had to wear so that it would appear as a proper white in viewers' homes. There must have been public doubts about the reliability of the push-button tuners used on some radio sets at the time, as several manufacturers' displays had life testing machines punching away at the push-buttons in turn: as the radios were on, the sound kept changing from programme to programme, causing absolute bedlam around the stands.

The 1938 Radiolympia was more disciplined in that all receivers had to be tuned to the same programme. For a mischievous schoolboy this naturally took some of the fun from the show. I still have my Bulgin component catalogue from that show, price 3d, which I could just about afford. I didn't get to the 1939 show.

W.R. Harris, Potters Bar.

TV AUDIO VALVES

Nick Lyons suggested in the October issue that the PCL86 is a less reliable valve than the PCL82. I can only say that during a period of six years servicing ITT and Decca hybrid colour sets I had to replace over fifty PCL82s while just two PCL86s failed. This might of course be due to the better design of the ITT audio circuit but certainly doesn't point to the PCL86 being unreliable.

Derek Snelling, Brownhills, Staffs.

THE PLUGTOP MYSTERY

I've read with interest the various letters on the great plugtop mystery. Here's my solution. Think of the neon bulb. When it lights, it's the negative connection that "holds" the glow. If you consider the neutral and live plugtop connections as the leads of a neon bulb and whatever consumes the current as the neon gas you'll appreciate why it's the neutral plugtop connection that gets burnt.

Lim Chin Siang, Singapore.

next month in

TELEVISION

SIMPLE PATTERN GENERATOR

The heart of this pattern gernerator is a Ferranti ZNA234E i.c. which provides grey-scale, dot, crosshatch plus vertical and horizontal line outputs. The circuit used also enables black and peak white rasters to be selected. The PCB has been designed to fit into a compact Vero box with battery holder. Though originally intended for video circuit testing, a u.h.f. modulator will fit into the case to provide an r.f. output.

• THE VHS HI-FI SYSTEM

VHS and Betamax VCRs featuring hi-fi stereo sound have recently appeared on the market. The same basic system is used with both formats. Extra heads on the drum record the audio, on f.m. carriers, along helical tape tracks. Derek Snelling explains the system and the techniques involved.

GOODBYE TO 405

January sees the close down of the 405-line network that's served us well for nearly fifty years — since the BBC started the world's first public nigh-definition service in 1936. Pat Hawker looks at the technical history and some of the things that never happened — you could have had two networks in Band III for example, with colour!

• SERVICING THE S-S INDESIT T24

The solid-state Indesit T24 was technically one of the most interesting sets sold — a sort of big brother to the T12. Mike Phelan describes common faults and some of the unusual circuitry—the line output transistor is emitter driven for example.

• CHRISTMAS LIGHTS!

Well the next issue will be published just before Christmas, so William Harrison decided to present a flashing light circuit using LEDs and a 12V supply.

PLUS ALL THE REGULAR FEATURES

ORDER YOUR COPY ON THE FORM BELOW:

TO(Name of Newsagent)
Please reserve/deliver the January issue of TELEVISION (£1), on sale December 19th, and continue every month until further notice.
NAME
ADDRESS

I	ECO	NO	MI	CD	EVI	CES,	P	O E	30	X	228	8,	T	EL	FOR	D 1	ΓF2	80	P	
18029 16181 16182	1.58 1.13 1.13	2SC1061 2SC1096 2SC1104	0.54 1.85 2.80		2.67 0.45 1.39	AN320 AN322 AN331	4.97 4.30 2.99	BC171 BC172 BC172B		0.10 0.89 0.24	BD166 BD168 BD175	-	0.30 0.86 0.39	BF137 BF152 BF153	0.11 9.29 9.52		2.6 0.5 0.5	10 BY203.		0.18 0.17 0.22
16334 16335 16446	0.88 0.72 0.89	2SC1106 2SC1114 2SC1124	4.12 5.61 1.10	40595 40636 40871	1.39 0.86 1.39	AN337 AN340P AN355	3,99 1.06 3.36	BC173 BC174B BC177		9.15 0.24 0.18	BD177 BD179 BD181	(0.39 0.44 0.90	BF154 BF157 BF158	0.23 0.23	BR103 BR88B BRC-M-	0.4 0.1	15 BY210- 38 BY210-	400 600	0.24 0.27 0.30
18800 16799	1.25 2.16	2\$C1151A 2\$C1152	4.29 4.25	40872 60857	1.39 1.10	AN362 AN5111	1.47 2.34	BC178 BC179		0.23 0.23	BD182 BD183		0.90 0.90	BF159 BF180	0.16 0.16 0.28	BRC116 BRC1330	0.i 1.i	BY223 BY224	400	0.85 0.90
16901 16902 16903	0.86 1.03 4.81	2SC1157 2SC1162 2SC1172	4.12 0.95 1.92	74LS132 74LS138 74LS157	0.72 0.85 0.79	AN5132 AN5250 AN5435	3.99 3.33 2.80	BC182 BC182B BC182L		0.86 0.23 0.89	BD184 BD187 BD189		1.10 0.40 0.35	BF167 BF173 BF177	0.34 0.30 0.50	BRC4443 BRC4444		2 BY226	1	0.79 0.20 8.44
16905 17074 17127	1.35 6.00 3.91	2SC1195 2SC1213 2SC1226	2.83 0.75 1.32	74LS161A 74LS196 74LS20	N 1.18 1.25 0.25	AN5610 AN5613 AN5620X	6.75 3.72 4.63	BC182LI BC183 BC183L	3	0.12 0.89 0.89	BD190 BD201 BD202	- 1	0.59 0.54 0.54	BF178 BF179 BF180	0.36 0.32 0.32	BRC5296 BRC6109 BRC82		5 BY255	1	0.54 0.57 0.25
17376 1N4001 1N4002	1.43 0.05 0.05	2SC1306 2SC1307 2SC1316	0.85 1.35 3.40	74LS244 74LS30 74LS367	1.65 0.29	AN6320N AN6342 AN6344	3.89 1.36	BC183LI BC184	3	0.23 0.09	B0203 B0204	1	0.54 0.54	BF181 BF182	0.29 0.30	BRC83 BRC84	0.1 0.1	BY299 BY476	A	0.25 0.76
1N4003 1N4004	0.05 0.06	2SC1364 2SC1383	0.49 1.39	74LS373 74LS47	1.05 1.55 1.05	AN6363 AN6551	4,88 10,20 0.56	BC184L BC184LI BC186	В	0.09 0.23 0.24	BD207 BD208 BD222		1.00 1.00 0.44	BF183 BF184 BF185	0.35 0.39 0.35	BRX44 BRX49 BRY39	0. 8. 0.	15 BYX10 50 BYX55	-350	0.30 0.26 0.48
1N4005 1N4006 1N4007	0.07 0.07 0.07	2SC1398 2SC1410 2SC1413	0.51 2.17 3.88	74LS73 74LS74 74LS75	0.39 0.39 0.52	AN6552 AN7145 AN7150	0.52 2.04 2.22	BC187 BC204 BC207		0.18 0.14 0.12	BD225 BD228 BD229	1	0.44 0.57 0.63	BF194 BF195 BF196	0.15 0.12 0.15		9.0 0.1 1.1	BYX71	-350	0.25 0.67 0.85
1N4148 1N4448 1N5401	0.03 0.12 0.12	2SC1505 2SC1578 2SC1617	0.56 6.67 3.35	74LS86 74LS90 74LS92	0.49 0.75 0.75	AN7151 AN7156 AN7158	2.05 2.05 2.34	BC212 BC212B BC212L		0.10 0.23 0.09	BD231 BD232 BD234		0.45 0.44 0.30	BF197 BF198 BF199	0.14 0.15 0.15			BYY56		9.18 1.89 0.72
1N5402 1N5403 1N5404	0,13 0,14 0,15	2SC1670 2SC1678 2SC1810	2,84 1,25 1,40	74LS93 74LS95B 7805 TO-2	0.75 0.85 220 0.63	AN7218 AP58076 AS560S	1.49 4.25 1.43	BC212LI BC213 BC213L	3	0.23 0.09 0.09	BD235 BD236 BD237		0.43 0.45 0.36	BF200 BF216 BF218	0.33 0.32 0.32	BSTC02 BSTC02 BSTC02	46 2. 33 2.	25 BZV15 25 BZV15	-C12R - -C24	0.72 0.72 0.72
1N5408 1N914 1S44	0.18 0.05 0.06	2SC1815 2SC1829 2SC1875	0.41 2.91 4.77	7805 TO-3 7806 7808		AU106 AU110 AU113	1.96 1.96	BC213LI BC214	3	0.23 0.09	BD238 BD239		0.29 0.44	BF222 BF224	0.50 0.15	BSTC12 BSTC31	33 3.1 46 0.1	91 BZV15 71 BZX61	-C30R Range	0.72 9.16
1S5012A 1S921	0.73 0.09	2SC1891 2SC1929	3.35 2.25	7812 TO-3	3 0,54 220 1.05	AY102 AY105K	2.15 2.62 1.89	BC214L BC214LI BC225	3	0.12 0.23 0.24	BD240 BD240D BD241	1	0.36 0.47 0.45	BF237 BF240 BF241	0.59 0.15 0.15		43 3.1 2.1	BZX70 BZX70	-C12 -C15	9.54 9.54 9.54
2582 2N1302 2N1303	1.94 0.24 0.34	2SC1942 2SC1945 2SC1953	5.70 4.11 1.75	7815 7818 7824	0.55 0.55 0.55	AY106 BA102 BA1310 (IC)	1.90 0.30 1.72	BC237 BC238 BC238A		0.09 0.09 0.11	BD242 BD243 BD243A		0.45 0.44 0.50	BF244 BF245A BF255	0.23 0.33 0.18	BSW68 BSX19 BSX20	0. 0. 0.	BZX70	-C47	0.54 0.54 0.09
2NZ218 2NZ219A 2NZZZZ	0.30 0.29 0.34	2SC1957 2SC1959 2SC1962	0.86 0.36 1.75	AC107 AC117 AC123K	0.86 0.39 0.39	BA1320 (IC) BA1330 (IC) BA145	1.22 1.82 0.17	BC239B BC251A BC252		0.08 0.15 0.12	BD244 BD244A BD245C		0.44 0.77 0.88	BF256 BF256L BF257	0.25	BSX21 BSY52 BSY79	8. 8. 0.	15 BZY88 15 BZY93	Range C12	0.09 0.99 0.99
2N2646 2N2904 2N2905	0.75 0.32 0.39	2SC1969 2SC2027 2SC2028	2.92 2.67 1.91	AC128 AC138 AC141	0.28 0.08 0.25	BA154 BA155-01 BA156	0.08 0.12 0.12	BC258 BC261A BC262		0.22 0.29 0.20	BD246C BD253 BD278A	1	0.74 0.95 0.80	BF258 BF259	0.29 9.30	BT100A BT106	1.0 1.2	6 BZY93 80 BZY93	-C24 -C24R	0.99 0.99
2N2906 2N3053 2N3054	0.34 0.24 0.90	2SC2029 2SC2057 2SC2073	1.49 1,07	AC142K AC151	0.39 0.25	BA157 BA159	0.17 0.12	BC287 BC294		0.45 0.45	BD317 BD318		1.96 2.08	BF262 BF263 BF264	0.51 0.51 0.33	BT108 BT109 BT112	1. 1. 2.	81 BZY93 25 BZY93	-C47 -C68	0.99 0.99 0.99
2N3055 2N3055H	0.55 0.77	2SC2078 2SC2091	1.40 1.25 0.59	AC153 AC153K AC176	0.30 0.36 0.17	BA182 BA222 (IC) BA284/2	0.17 1.26 0.15	BC301 BC302 BC303		0.36 0.30 0.34	BD375 BD377 BD379		0.23 0.89	BF271 BF273 BF274	0.30 0.18 0.18	BT113 BT116 BT119	2.1 1.1 1.1	52 ZTK33		0.99 0.39 2.47
2N3442 2N3702 2N3703	1.05 0.12 0.12	2SC2122A 2SC2141 2SC2186	4.65 1.69 1.35	AC176K AC179 AC183	0.40 0.25 0.65	BA301 (IC) BA302 BA311 (IC)	0.92 0.90 1.06	BC307 BC307A BC308		0.09 0.14 0.12	BD380 BD410 BD412		0.69 0.44 5.70	BF324 BF336 BF337	0.16 0.27 0.36	BT120 BT121 BT122	1.0 2.1 2.1	25 C1129		0.46 0.52 2.45
2N3704 2N3705 2N3706	0.12 0.12 0.12	2SC2216 2SC2233 2SC2271	0.62 2.20 3.64	AC186 AC186K AC187	0.30 0.50 0.35	BA312 (IC) BA313 (IC) BA316	0.98 1.28 0.07	BC308A BC309 BC317A		0.09 0.15 0.11	BD418 BD433 BD434		0.76 0.33 0.39	BF338 BF355 BF362	0.36 0.36 0.54	BT123 BT125 BT126	1.1 2.2 2.3	0 CA304 5 CA304	4 6	3.18 2.23 1.50
2N3707 2N3711 2N3771	0.14 0.14 1.85	2SC2278 2SC2335-KIT 2SC2526	1.03 7.61 1.70	AC187-01 AC187K AC188	0.40 0.39 0.33	BA317 BA318 BA328 (IC)	0.07 0.08 0.00	BC323 BC327 BC328		0.92 0.15	BD435 BD436 BD437		0.42 0.42	BF363 BF371	0.54 0.45	BT128 BT128P	2.1 2.1	5 CA308	5 9	1.17 3.35
2N3772 2N3773 2N3819	1.55 1.65 0.28	2SC2551 2SC2570	0.95 1.80	AC188-01 AC188K	0.40 0.39	BA333 (IC) BA401 (IC)	1.24 0.58	BC337 BC338		0.10 0.08 0.10	BD438 BD441		0.41 0.44 1.29	BF391 BF393 BF417	0.36 0.90 1.20	BT129 BT151-8 BT151 5	00R 1.3	7 CA309 5 CA309) :	1.30 1.25 2.00
2N3823 2N3904	1.06 0.56	2SC2570A 2SC264A 2SC2671	0.95 4.38 1.99	AC193K AC194K AD140	0.59 0.59 0.96	BA511 (IC) BA521 (IC) BA532 (IC)	1.98 1.81 1.86	BC360 BC368 BC440		0.30 0.23 0.99	BD442 BD507 BD508		0.56 0.54 0.54	BF418 BF422 BF423	1.70 0.26 0.26	BTT8018 BTT6218 BTT8024	4.1	19 CA313 12 CAH78	ZEN 023N	2.83 2.83 6.00
2N3908 2N4101 2N4240	0.56 1.10 3.00	2SC2728 2SC372 2SC373	0.95 1.27 1.05	AD142 AD143 AD145	0.96 0.96 1.45	BA536 (IC) BA6304A (IC) BA843 (IC)	2.72 2.65 3.80	BC441 BC454 BC455		0.40 0.32 0.32	BD509 BD510 BD518	- (1.29 0.45 1.36	BF435 BF450 BF451	0.49 0.30 0.26	BTT8124 BTT8214 BTT8224	5.4	4 CD400	1 (1.41 0.24 0.24
2N4443 2N4444 2N4914	1.35 1.12 0.65	2SC383 2SC388 2SC41	1.20 0.45 1.99	AD149 AD161 AD162	0.81 0.30 0.30	BAV10 BAV18 BAV19	0.10 0.10 0.10	BC460 BC461 BC462		0.38 0.42 0.27	BD519 BD529 BD530	i	1.36 0.38 0.80	BF457 BF458 BF459	0.37 0.35 0.35	BU105 BU106 BU108	1.0 2.1 1.0	6 CD400 5 CD401	B (0.96 0.23 0.24
2N5064 2N5293 2N5294	0.64 0.45 0.45	2SC458 2SC495 2SC508	0.55 0.83 3.36	AD262 AF114 AF115	0.95 2.24 0.79	BAV20 BAV21 BAX12	0.10 0.17 0.10	BC463 BC464 BC465		0.58 0.58 0.58	BD533 BD534 BD535	(0.80 0.36 0.44	BF460 BF469 BF470	0.54 0.27 0.28	BU109S BU110 BU111Y	1.9 2.1 3.7	10 CD4013 12 CD4016	B (0.37 0.37 0.74
2N5296 2N5297 2N5298	0.40 0.45 0.55	2SC515A 2SC537 2SC558	1.28 0.49 3.35	AF116 AF117 AF118	0.79 0.75 0.75	BAX13 BAX16 BB105B	0.10 0.10 0.22	BC477 BC478 BC479		0.25 0.29 0.29	BD536 BD537		0.55 0.60	BF471 BF472	0.26 0.28	BU124 BU126	12 1.1	5 CD402) i	0.92 0.24
2N5490 2N5496 2N6107	1.35 0.45 0.53	2SC605L 2SC620	1.05 1.32 1.40	AF121 AF124	0.50 0.36	BB119 BC107	0.15 0.13	BC532 BC546		0.25 0.15	BD538 BD544B BD580	!	0.80 0.75 1.06	BF479 BF480 BF495	0.55 0.54 0.58	BU134S BU204 BU205	4.1 1.2 0.5	9 CD4029 8 CD4029	5 (0.25 0.54 0.76
2N6109 2N6122	1.43 1.60	2SC643A 2SC673 2SC681	1.11 4.00	AF125 AF126 AF127	0.36 0.36 0.36	BC107B BC108 BC108A	0.14 0.12 0.12	BC547 BC548 BC549		0.09 0.09 0.89	BD590 BD598 BD645	1	1.06 1.13 3.62	BF506 BF509 BF523	0.39 0.37 0.18	BU206 BU207 BU208	1.2 1.3 0.5	6 CD4049 18 CD4050	9 (0.96 0.52 0.50
2N6130 2N6133 2N6178	0.65 0.57 0.66	2SC684 2SC685A 2SC893	1.50 2.62 0.89	AF139 AF178 AF179	0.48 0.75 0.50	BC108B BC109 BC109B	0.15 0.11 0.13	BC550 BC556 BC557		0.36 0.12 0.89	BD677 BD680 BD681	(0.55 0.69 1.34 2.69	BF594 BF595 BF596	0.24 0.24 0.16	BU208/0 BU208A BU208D	12 0.9 0.9 1.4	18 CD4052 18 CD4053 13 CD4085	2 (0.68 0.72 0.23
2N6180 2N696 2N698	0.66 0.39 0.39	2SC710 2SC717 2SC734	0.62 1.52 1.30	AF180 AF181 AF182	0.50 0.48 0.50	BC113 BC114 BC115	0.12 0.17 0.14	BC558 BC559 BC580C		0.09 0.09 0.10	BD695 BD696 BD697	- 2	2.09 2.24 3.27	BF597 BF617 BF618	0.24 0.95 0.95	BU209 BU226 BU312	1.0 2.0 2.1	18 CD4081 18 CD4093	i (0.26 0.72 1.00
2N707 2SA1027 2SA1076	0.39 1.15 1.78	2SC735 2SC782 2SC790	1.05 2.24 1.15	AF186 AF239 AF279	0.48 0.40 0.80	BC116 BC116A BC117	0.20 0.53 0.18	BC835 BC836 BC837		0.18 0.18 0.18	BD698 BD699 BD700	1	1.66 3.17 3.36	BF694 BF757 BF758	0.20 0.59 0.59	BU326A BU326A BU326S	0.7 1.6 2.2	5 CD4517 0 CP5521	, 1 10	1.06 6.20 2.49
2SA329 2SA351 2SA489	0.36 1.06 1.06	2SC806 2SC814 2SC828	10.26 1.26 0.25	AL100 AL102 AL103	3.86 1.75 2.43	BC118 BC119	0.18 0.30	BC638 BC639		0.18 0.18	BD702 BD707	2	2.94 0.55	BF759 BF780	0.30 0.59	BU406 BU407	1.3 0.7	5 CX034 4 CX095E	10	9.75 2.85
2SA490 2SA493	1.51 0.95	2SC867A 2SC926A	2.49 1.29	AL113 AN208	1.80 3.22	BC125 BC126 BC132 BC136	0.18 0.18 0.12	BC840 BC879 BC880 BCY22		0.18 0.20 0.28	BD709 BD710 BD807		0.72 0.72 0.60	BF762 BF870 BF871	0.30 0.27 0.84	BU407D BU412 BU426	1.2 4.8 1.5	0 CX108 5 CX109		8.49 6.92 6.92
2SA628 2SA637 2SA673	1.03 1.32 1.11	2SC930 2SC935 2SC936	0.49 3.75 1.58	AN210 AN214 AN2140	2.07 2.05 2.05	BC135 BC138 BC137	0.12 0.15 0.16	BCX32 BCX33 BCX34	•	0.33 0.24 0.36	BD809 BD810 BD879	6	0.80 0.80 0.84	BP900 BP907 BP959	0.86 1.62 0.36	BU426A BU427 BU500	1.0 2.0 1.0	7 CX130 1 CX131	10	0.75 4.90 0.75
2SA683 2SA684 2SA748	1.46 1.33 0.86	2SC937 2SC940 2SD1138	3.25 4.25 0.78	AN231 AN234 AN235	5.56 5.02 4.84	BC138 BC139 BC140	0.30 0.32 0.33	BCX37 BCY70 BCY71		0.80 0.27 0.19	BD895 BD899	1 2	1.98 1.98 2.25	BF970 BFR39 BFR52	0.55 0.36 0.45	BU508A BU526 BU6080	1.3 1.6 1.4	3 CX134 5 CX136 2 CX137	10 10	0.75 0.75 0.75
2SA818 2SA835 2SA940	1.65 2.27 1.64	2SD198 2SD234 2SD235	3.51 0.42 0.54	AN236 AN238 AN239	3.02 4.98 3.95	BC141 BC142 BC143	0.28 0.30 0.28	BCY72 BD115 BD116		0.18 0.29 0.63	BD901 BDV64B BDV65B	1	0.55 1.14 1.14	BFR62 BFR79 BFR81	0.36 0.29 0.45	BU806 BU806D BU807	1.2 1.3 1.4	9 CX139 5 CX157	10	0.75 4.40 3.44
2SA951 2SA966-Y 2SB325	1.23 0.54 3.51	2SD257 2SD291 2SD292	2.67 2.67 2.35	AN240P AN241 AN245	1.88 1.55 2.54	BC147 BC147A BC148	0.10 0.42 0.11	BD124 BD124P - BD131	+KIT	1.19 0.62 0.38	BDX32 BDX53 BDX53A	1	1.50 3.88 3.66	BFR86 BFR89 BFT41	0.90 0.39 0.27	BU826A BUV46 BUV84	2.7 1.1 1.1	9 CX170 3 CX177	9	6.92 5.99 8.48
2SB337 2SB375 2SB400	1.65 3.51 0.36	2SD313 2SD315 2SD325D	2.59 2.67 1.36	AN247P AN252 AN253	2.82 2.33 2.70	BC148B BC148C BC149	0.11 0.11 0.10	BD132 BD133 BD135		0.30 0.48 0.32	BDX54B BDX62A BDX63A	1	2.37 1.92 1.95	BFT42 BFT43 BFT84	0.39 0.39 0.36	BUN81A BUN84 BUX84	3.1 1.5 1.4	5 CX507 6 CX758		6.92 6.92 2.35
2SB407 2SB411 2SB511	2.94 3.80 1.40	2SD350 2SD350A 2SD353	7.63 2.08 3.25	AN262 AN272 AN281	1.58 5.36 5.52	BC149B BC153 BC154	0.11 0.12 0.12	BD138 BD137 BD138		0.32 0.32 0.41	BOX64A BOX65A BOX76	2	2.37 2.37 2.37	BFW10 BFX29 BFX30	0.79 0.30 0.59	BY126 BY127	0.1 0.1	1 DEC1 1 DEC2	1	1.52 1.52
2SB54 2SB56 2SB618A	1.26 1.26 1.40	2SD389 2SD401 2SD551	2.19 1.57	AN295 AN301 AN302	5.01 3.30	BC157 BC158	0.14 0.09	BD139 BD140		0.27 0.33	BDY20 BDY62/01	1	1.10 1.20	BFX84 BFX85	0.33 0.25	BY133 BY164 BY176	0.1 0.5 1.3	0 E5024 0 E5386	0	0.36 0.25 0.22
2SB681 2SB695	2.44 1.70	2SD588A 2SD621	2.20 1.25 8.88	AN303 AN305		BC159 BC160 BC161	0.14 0.36 0.36	BD144 BD150 BD157 BD150		1.30 1.08 0.80	BDY81 BF115 BF117	0	1.07 1.36 1.36	BFX87 BFX86 BFX89	0.50 0.30 0.36	BY179 BY182 BY184	1.4 0.5 0.4	5 E8021 2 E9003	1	0.22 1.17 9.41
2SB75 2SB861 2SC1034 2SC1050	0.94 0.86 5.61 3.66	2SD657 2SD731 2SD811 2SD869	2.54 1.72 3.86 2.40	AN313 AN315 AN316 AN318		BC167 BC168 BC169C	0.32 0.32 0.14	BD159 BD160 BD163		0.48 1.45 0.64	BF118 BF121 BF123	0).00).22).11	BFY50 BFY51 BFY52	0.24 0.24 0.24	BY187 BY189 BY198	0.7 1.2 2.3	8 ER1400 6 ESN310	10 BP 3	0.45 0.12 3.86
				AN318 (FOR Q	4,75 UOTE, GIV	E MAKE M	0.14 ODEL	BD166 LOCAT	10N. R	0.56 REME	BF127 MBER T	O AD).11 D 0.	BFY90 60p P (0.96 1AH & TSC	I BY201/2 NDLING	1.3 ADD 15	6 ESM43 % VAT :	TO TOTA	4,18 AL:

	All goods should be delivered within 4 working days.			
ESM532C 4.18 LM1303P/N 1.50 MPSU05 0.78 SAA5010 4.90 SV/4190 1.31 T0A22V 0.39 TBA3950 1.80 TDA1235 3.52 TO ESM632C 4.18 LM1310P/N 1.25 MPSU10 0.78 SAA5012 6.50 SN/420N 0.30 T6032V 0.39 TBA3950 1.00 TDA1270 2.64 TE	9503 2.60 9513 2.40 27 1.25			
ESM/732C 4.18 LM3085N 0.77 MPSU55 0.99 SAA5020 5.25 SN743U 0.28 1833Y 0.73 TBA400 2.17 TDA1327A 1.65 TE ETTB016 2.45 LM317CKC 1.30 MPSU56 0.00 SAA5020 7.50 SN7440N 0.24 TB035Y 0.68 TBA400 2.17 TDA1327A 1.65 TE CONTROL OF TRANSPORT OF TRANS	38 0.36 26 1.35			
FINDSO 5.25 LMS407 1.29 MR510 0.30 SAA5050 8.56 SN7474N 0.72 T6037 1.91 TBA480 1.42 TDA1330 1.30 TB FINDSO 5.25 LMS407 1.29 MR510 0.30 SAA5050 8.56 SN7474N 0.72 T6037 1.91 TBA480 1.42 TDA1335 6.35 TI FINDSO 5.25 LMS4075 0.75 MR812 0.80 SAA661B 1.80 SN7490AN 0.93 T6041V 0.86 TBA4800 1.47 TDA1412 0.85 TDA	11002 3.15 11009 0.96 11020SP 5.34			
GF758 0.82 LM340T12 0.75 MR914 0.46 SAA700 3.00 SN75T10N 0.75 H8044V 0.86 IDASUNTU 1.55 TDA1420 1.48 TI GASTON 1.55 LM340T5 0.75 MSSD7002 0.65 SAB1009B 4.53 SN760D1ANQ 2.25 T6045 1.09 TBA510 1.55 TDA1420 1.48 TI TDA1420 1.	1087 9.46 106C 9.55			
GH3F 1.65 LM384N01 1.84 MVS460 0.39 SAB3011 7.34 SN78013ND 3.83 T8052V 0.76 TBA520 1.67 TDA1512 2.20 TDA1670 3.85 TBA520 1.57 TDA1670 3.85 TDA1670 3	106M 0.55 116D 0.90 44 0.65			
HA11215 4.86 LM746 1.65 ME545B 2.95 SAB3013 3.28 SAP8013DIG 8.97 18059 1.89 18A530 0.85 17DA1905 1.25 TI HA11225 3.90 LM6360 2.78 ME545B 3.86 SAB3021 7.18 SAP8023N 2.35 T800TV 1.89 TBA5300 0.85 TDA1906 2.95 TI	45 0.70 47 0.70			
HA11226 7.56 LMX565 2.76 ME555 0.34 SAB30238 11.18 SN76033N 2.33 T3005V 2.16 TBA5400 1.15 TDA1910 2.38 T HA11229 2.51 M1024 2.55 ME555 0.34 SAB30238 11.18 SN76033N 2.33 T3005V 2.16 TBA550 1.95 TDA1940 2.54 T HA11226 3.00 M1025 3.00 M1025 3.76 ME556 0.75 SAB3024 4.77 SN76105N 2.36 T9010V 0.87 TBA550 1.95 TDA1940 2.54 T	120 0.96 1110 0.48 1112 0.80			
HA1124 4.70 M1124 2.54 ME560N 3.16 SAB3009 4.75 SN/6110N 1.13 1901V 1.27 108-500 2.60 TDA2002 1.20 THA11244 4.32 M1130 4.86 ME565N 1.28 SAB3210 2.93 SN/6115AN 1.46 19013V 5.81 TBA560C 0.66 TDA2002 1.20 TDA2002 1.05 TDA2002 1.05 TDA2002 1.05 TDA2002 1.05 TDA2003 1.0	117 0.86 120 0.73			
HA1125 3.38 M193 18.55 MEBABN 3.00 SAF1031 2.38 SN76226DN 1.20 T9016 0.92 TBA570 1.55 TDA2004 2.52 T HA11251 3.38 M193 18.55 MEBABN 3.00 SAF1031 2.38 SN76227N 0.00 T9022N 0.39 TBA570A 1.55 TDA2006 1.25 T HA1137W 2.57 M51102L 4.02 MEB60N 3.94 SAF1032 5.06 SN76227N 0.00 T9022N 0.39 TBA570A 1.55 TDA2010 1.25 T	1121 1.08 1126 0.96 1127 1.30			
HA1138 3.56 M5115P 4.34 ME645BN 3.00 SAF1039 11.66 SN76228V 2.97 19035V 1.26 TBA625A 1.97 TDA2020 2.75 T HA11414 2.50 M51231P 2.79 MP1106 4.00 SASS010 7.62 SN76231 2.31 T9035V 1.26 TBA625B 1.97 TDA2020 1.65 T	2955 0.78 29A 0.41			
HA1156 1.23 M5134-9341 3.75 0A202 0.10 SAS580S 2.97 SN76243 4.75 T9051 2.55 TBA625C 1.97 TDA2150 1.44 1 HA1156D 7.00 M51394P 6.25 0A47 0.10 SAS580T 2.85 SN76322 2.51 T9053V 1.03 TBA641A12 3.75 TDA2150 5.63 T MA1156D 7.00 M51394P 6.25 0A47 0.10 SAS580T 2.85 SN76322 2.51 T9053V 1.03 TBA641A12 3.75 TDA2151 1.75 T	298 0.57 29C 0.40 23055 0.65			
HA1160 3.45 M5142P 4.38 0A90 0.07 SAS570 1.61 SN76590 2.00 T9067V 0.63 TBA651 1.60 TDA2160 3.66 T HA1166 3.08 M5143P 6.06 0A91 0.00 SAS570S 0.00 SN76390 2.00 T9067V 0.63 TBA651 1.60 TDA2160 3.66 T TDA2161 1.68 T TDA2	230A 0.41 230B 0.63			
HA11711 16.13 M51513L 2.06 OC28 0.96 SASS80 4.41 SN76510N 0.95 TA5814 1.35 TBA7000 2.19 IDA2190 3.11 HA11713 6.70 M51515BL 3.10 DC29 1.95 SASS800 2.62 SN76530P 1.90 TA7200P 4.36 TBA720 2.85 TDA2500 1.80 TBA720 2.85 TDA2500 1.80 TBA720 2.85 TDA2500 1.80 TBA720 1.75 TDA2500 1.80 TBA720 1.75 TDA2500 1.80 TBA720 1.75 TDA2500 1.85 TBA720 1.85 TBA720 1.75 TDA2500 1.85 TBA720 1.85	731B 0.35 731C 0.63 732B 0.35			
HA11714 7.05 M51518L 3.40 UL.5 0.99 SAS590 9.93 SAS590 1.56 TAXD50 1.58 TBA7500 1.46 TDA2521 2.15 THA1715 7.05 M51517L 2.90 UC.36 1.16 SAS5900 2.32 SN76530N 1.56 TAXD50 1.58 TBA760 1.55 TDA2522 2.01 T	732C 0.66 733C 1.25			
HA11724 15.80 M51522 4.90 DC45 0.40 SAS6800 1.20 SN76544 1.60 TA7060AP 0.60 TBA780 3.00 TDA2523 2.75 TA7061AP 0.78 TBA800 0.00 TDA2524 4.50 T HA11725 18.80 M5191P 4.49 DC75 0.40 SAS680S 1.20 SN76545 4.55 TA7061AP 0.78 TBA800 0.00 TDA2524 4.50 T TA7061AP 0.78 TBA800 0.00 TDA2525 4.50 TA7061AP 0.78 TBA800 0.00 TB	P34 1.07 P41A 0.39 P41B 0.28			
HA1180 4.60 M5182 2.60 ON188 1.70 SAS670 1.20 SN76546 3.15 TA7070P 1.52 TBA810S 1.46 TDA2530 2.19 THA1203 1.74 JM5273P 0.52 ON256 2.90 SAS670 2.50 SN76546N 3.15 TA7070P 1.52 TBA810T 1.46 TDA2532 2.51 TA7070 1.74 JM5273P 1.70 DT112 0.98 SAS670 1.20 SN76549 2.35 TA7071 3.35 TBA810T 1.46 TDA2532 2.51 TA7070 1.74 JM5273P 1.70 DT112 0.98 SAS6700 1.20 SN76549 2.35 TA7071 3.35 TBA810T 1.46 TDA2532 2.51 TA7071 3.35 TBA810T 1.46 TDA2532 3.51 TA7071 3.51 TA7071 3.51 TA7071 3.51 TBA810T 1.46 TDA2532 3.51 TA7071	241C 0.44 242A 0.39 242B 0.71			
HA1332 1.74 MA06 0.97 0T121 0.70 SAS670S 1.20 SN76550 0.30 TA7072P 1.35 TBA820 0.83 TDA2543 2.89 HA1339 1.76 MA001 0.74 PD144 2.83 SAS6710 1.20 SN76551 1.35 TA7073P 4.05 TBA820M 1.65 TDA2540 1.95 TA7073P 1.76 TDA2540 1.95 TA7073P 1.76 TDA2541 1.75 TDA2	P42C 0.44 P47 0.65			
HA1342 1.80 MB37/05 1.62 PTI017 2.43 3A3680 1.30 SN7660 1.10 TA7076P 4.95 TBA900 2.25 TDA2545Q 3.16 TA2560 1.97 TBA900 1.97 TB	P48 0.83 P49 3.28 S43 1.21			
HA1366WR 1.62 MB3730 2.94 R1038 1.99 SBA750 1.46 SN76620 2.35 IA7089P 1.36 IBA940 1.70 IDA2575A 2.95 I HA1367 3.20 MC13002 4.66 R1039 1.99 SC9468P 1.90 SN76622 1.50 ITA7092P 3.85 IBA940 1.70 ITDA2575A 2.95 I	S90 0.22 S91 0.26			
HA1368R 1.86 MC1307P 1.90 R2009 1.20 SC9504P 1.46 SN76630 2.31 TA7102P 5.34 TBA970 2.98 TDA2577 5.31 HA1370 2.97 MC1310P 1.25 R2001B 1.20 SC9511P 1.90 SN76640 3.85 TA7108P 1.40 TBA970 2.99 TDA2581 1.95 TA7108P 1.90 SN76640 3.85 TA7108P 1.90 SN76640 3.90 SN	071CP 2.02 AS1000NL 10.78 AS3748NS 11.86			
HA1377 2.00 MC1327P 1.20 R2029 1.20 SCR957 1.20 SN76651 1.35 TA7120P 0.50 TBA590 1.95 TDA2590 2.00 THA1389 1.02 MC1330P 1.23 R2030 1.20 SG264A 4.30 SN76650 1.35 TA7120P 0.50 TBA590 1.95 TDA2590 2.00 TA7122B	AS4116 1.97 /106 1.29			
HA1392 2.90 MC1350P 1.10 R2265 1.95 SG829 6.28 SN76865N 1.35 TA7124P 2.00 TC4001 1.29 IDA2591 2.80 HA1397 2.97 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6533 9.37 SN76865N 0.98 TA7130P 1.15 TC4053BP 3.94 TDA2593 2.24 MC1351P 0.75 R2305 1.07 SG6539 2.24 MC1351P 0.24 MC1351P	6010B 2.70 25G 1.03 43M 2.80			
HA1398 2.88 MC1352P 1.91 R2305 123 SI-1UZUN 4.76 N76705N 3.99 TA7137P 0.85 TCA160B 1.62 TDA2600 5.00 HA1405 1.80 MC1357P 1.95 R2322 1.26 SI-1125HD 10.70 SN76705N 3.99 TA7147P 3.51 TCA270Q 1.55 TDA2610 2.53 HA1377P 5.88 MC1359P 1.55 R2323 1.23 SI-1130N 6.30 SN76707N 3.99 TA7141AP 3.51 TCA270Q 1.55 TDA2610 2.53	8700 0.55 87003 0.44 A723CA 5.02			
HBF4000AF 2.25 MC14001 7.15 R2348 1.92 SKB2/08 0.70 SN76709 4.95 TA7148P 1.51 TCA270SQ 1.65 TDA2611AQ 2.55 HD4480 15.00 MC14011 0.23 R2354A 1.92 SKE2F 1/04 1.26 SN76709N 4.95 TA7148P 1.51 TCA270SQ 1.65 TDA2612Q 4.25 HD4480 15.00 MC14011 0.23 R2354A 1.92 SKE2F 1/04 1.26 SN76709N 4.95 TA7148P 2.10 TCA270SQ 2.65 TDA2612Q 4.25 HD4480 1.65 TDA2612Q 4.25 T	A758PC 3.06 A783P3C 1.07			
H04801A05 15.90 MC14013 0.37 R25945 132 SREZG 2/04 0.95 SN78810N 0.62 TA7153P 4.53 TCA420A 1.90 TDA2620 1.96 HM6231 8.50 MC14016CP 0.37 R2441 1.23 SREZG 3/04 0.95 SN78810N 0.62 TA7153P 4.53 TCA420A 1.90 TDA2620 2.34 HM6232 7.71 MC14025 0.54 R2443 0.90 SKE4F I/02 1.26 SN78920N 2.63 TA7161P 5.86 TCA4400 1.65 TDA2630 2.34	AA170 2.14 AA180 2.14 LN2165 1.35			
HM9102 2.92 MC14049UBC 0.52 R2461 2.10 SKE4F 1/06 9.66 SN94041 3.45 IA/162P 4.25 ICA630 1.90 TDA2640 2.25 IHM9104 2.94 MC1438R 0.95 R2477 0.92 SKE4F 2/06 2.10 SN94042 3.95 TA7169 4.80 TCA630 1.90 TDA2640 2.25 IM9104 2.94 MC1438R 0.95 R2477 0.92 SKE4F 2/06 2.10 SN94042 3.95 TA7161P 2.53 TCA640 2.63 TDA2643 6.93 IM9104 2.94 MC1438R 0.95 R2477 0.92 SKE4F 2/06 2.10 SN94042 3.95 R2477 0.92 SKE4F 2/06 SN94042 3.95 R2477 0.92 SKE4F 2/06 SN94042 3.95 R2477 0.92 SKE4F 2/06 SN94042 3.95 R247	N2204 7.00 N2216F 1.95			
H14207 15.80 MC14510BAL 3.15 R2540 1.80 SKE4G 2/02 0.87 STA441C 2.27 TA7172P 1.28 TCA650 1.85 TDA2651 2.95 SKE5F 3/10 1.45 STK0029 3.42 TA7176P 2.25 TCA660B 2.63 TDA2652 7.05 STK0029 3.42 TA7176P 2.25 TCA660B 2.63 TDA2652 7.05 STK0029 3.42 TA7176P 2.25 TCA650B 2.63	PC1001H 2.50 PC1009C 5.74 PC1020H 2.12			
TT2003 9.29 MC1712 3.52 R2615 0.00 SL1310 2.05 ST00050 4.90 IA/1397 3.25 TCA740 2.25 TDA2664 2.91	PC1025H 2.49 PC1026C 1.24			
NC2101 2.59 MC7824CP 4.25 RCA18083 4.81 SL1430T 2.18 ST00080 8.32 TA7700P 1.95 TCA900 2.79 IDA2680 2.24 CCCCC 1.05 TCA900 1.95	PC1028H 0.90 PC1030H 2.06 PC1031H 8.05			
KC582C 4.80 MC78M12 0.5 RCA16334 0.32 SL(432 2.25 STK013 7.04 TA7206 1.25 TCA800C 2.25 TDA2670 2.50 L128V 1.70 MCR101 0.80 RCA16836 1.25 SL(414 3.35 STK013 7.04 TA7206P 1.95 TCA830S 1.94 TDA2670A 1.76 L128V 1.70 MCR101 0.80 RCA16800 1.25 SL(432 3.12 STK014 7.14 TA7206P 1.95 TCA830S 1.94 TDA26800 2.30 L218 L138V 1.70 MCR10675 1.77 RCA16799 2.16 SL(437 6.80 STK015 5.12 TA7210P 3.25 TCA930 1.85 TDA2680A 2.40 MCR2207 1.34 RCA16879 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 MCR2207 1.34 RCA16801 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 MCR2207 1.34 RCA16801 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 MCR2207 1.34 RCA16801 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 MCR2207 1.34 RCA16801 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 MCR2207 1.34 RCA16801 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 MCR2207 1.34 RCA16801 0.86 SL(439 2.25 STK016 4.82 TA7214P 2.90 TCA910 1.50 TDA2680A 2.40 RCA16801	PC1031H2 6.00			
LAITI1AP	PC1156H 1.45 PC1181H 1.25			
LA1201 0.99 ME0002 0.27 RCA1880Z 0.98 SL490 5.00 ST0025 7.20 TA7217AP 1.36 TCE330 3.53 TDA2790Q 5.92 LA1320 1.46 ME0004/2 0.42 RCA17074 6.00 SL901B 6.00 ST0040 7.00 TA7217AP 1.36 TCE320 3.53 TDA2790Q 5.92 LA1320 1.46 ME0004/2 0.42 RCA17074 6.00 SL901B 6.00 ST0040 7.00 TA7227P 1.00 TCE527 1.37 TDA2791 2.50 LA1352 1.40 ME0411 0.45 RCA17376 1.43 SL917B 7.95 ST0043 7.00 TA7227P 1.00 TCE52 0.90 TDA2795 2.95 LA1352 1.40 ME0411 0.45 RCA17376 1.43 SL917B 7.95 ST0043 7.00 TA7227P 4.00 TCE52 0.90 TDA2795 2.95 LA1352 1.40 ME0411 0.45 RCA17376 1.43 SL917B 7.95 ST0043 7.00 TA7227P 4.00 TCE52 0.90 TDA2795 2.95 LA1352 1.40 ME0411 0.45 RCA17376 1.43 SL917B 7.95 ST0043 7.00 TA7227P 4.00 TCE52 0.90 TDA2795 2.95 TDA2795 2.95 TA7227P 4.00 TCE52 0.90 TA7227P 4.0	PC1182H 1.82 PC1185H 2.94 PC1186H 0.95			
LA1210 1.38 ME0M04 0.23 RCA17028 2.25 SL490 1.78 STR025 7.20 TA7217AP 1.36 TCE537 3.33 IDA2799U 5.32 LA1320 1.46 ME0M04/2 0.42 RCA17074 6.09 SL901B 6.00 STR040 7.09 TA7222 1.95 TCE527 1.37 TDE32791 2.59 LA1352 1.40 ME0M11 0.45 RCA17376 1.43 SL917B 7.95 STR043 7.09 TA7222P 1.09 TCE52 0.90 TDA2795 2.55 LA1357N 5.90 MEDM11 0.45 RCA17376 1.43 SL917B 7.95 STR043 7.09 TA7212P 1.09 TCE52 0.90 TDA2795 2.55 LA1357N 5.90 MEDM12 0.45 RCA17376 1.43 SL917B 5.52 TR054 6.40 TA7219P 1.09 TCE52 0.90 TDA2795 2.55 LA1354 2.79 MEM0412 0.21 RCA10857 4.50 SL918A 5.63 STR054 6.40 TA7219P 1.50 TCE52 0.90 TDA2795 2.55 TA7310P 1.50 TCE52 0.90 TDA2000 6.12 LA13554 2.79 ME5M5B 9.10 TMA2795 1.23 TR054 6.40 TA7313AP 1.36 TCE54 0.90 TDA30001 2.31 LA1365 1.70 ME5M5B 9.10 TMA2795 1.23 STR077 7.00 TA7313AP 1.36 TCE5100 4.90 TDA30001 1.044 TCEF1000 4.90 TDA30001 1.75 LA1365 1.70 ME6M02 0.22 RT905A 2.00 SN16967N-07 1.60 STR077 7.00 TA7313AP 3.00 TCEF1000 9.31 TDA3190 1.75 TDA3000 7.75 TDA3000 7.75 TDA3000 7.75 TDA3000 7.75 TDA3000 7.75 TDA30000	PC1212C 0.95 PC1213C 0.95 PC1217C 2.24			
L1257V 1.78 MCR101 0.00 MCR101 0.00 RCA16900 1.25 SL422A 3.12 STK014 7.14 TA7200P 1.95 TCA930	PC1350C 1.75 PC1351C 1.64			
LA3155 0.99 MEBOD1 0.28 S0281 1.94 SN19895 8.13 ST0086 9.90 TA7611AP 3.54 10.95 10.99 10.9	PC1032H 0.94 1.75 PC1159H 1.75 PC1159H 1.75 PC1159H 1.25 PC1181H 1.25 PC1182H 1.26 PC1182H 0.95 PC1212C 0.95 PC1212C 0.95 PC1212C 0.95 PC1212C 1.75 PC1351C 1.64 PC1353 6.75 PC1360C 4.10 PC1365 5.79 PC1366 4.23 PC1366 4.23			
LA3800 1.40 MJ2501 4.95 SUAP 1.46 ST 139 ST	PC1365 5.79 PC1366 4.23			
LAGGOP 2.37 MJ30028 2.40 S2062D 1.88 SX2972Z 10.65 STK433 9.35 TAA350A 1.82 TDA1081A 2.10 TDA3561 12.17 LAGGOP 1.48 MJ801 1.39 S2800 5.25 SN29723AN 6.95 STK435 5.44 TAA435 1.65 TDA1005A 2.15 TDA3561 7.50 LAGGOP 1.48 MJ802 4.95 S2800D 5.25 SN29723AN 6.95 STK435 5.70 TAA550 0.33 TDA1004A 2.15 TDA3561 7.50 LAGGOP 1.48 MJ802 4.95 S2800D 3.25 SN2973AN 3.38 STK437 8.10 TAA570 1.59 TDA1005A 2.15 TDA35710 2.25 LAGGOP 1.42 MJE2955 1.71 S2802 3.15 SN2978AN 3.38 STK437 6.75 STK437 6.75 TAA570 1.59 TDA1005A 2.15 TDA35710 2.25 STK437 6.75 STK437 6.75 TAA570 1.59 TDA1005A 2.15 TDA35710 5.67 STK437 6.75 STK437 6.75 TAA61812 1.50 TDA1005A 2.15 TDA35710 5.67 STK437 6.75 STK437 6.75 TAA61812 1.50 TDA1005A 2.15 TDA35710 5.67 STK437 6.75 STK437 STK437 6.75 STK437 6.75 STK437 6.75 STK437 6.75 STK437 6.75 STK	IPC2002 1.48 IPC30C 2.22			
LA4031P 3.00 MJ481 1.39 S2800 5.25 SN291/24N 8.99 STK437 5.00 STK4	IPC32C 4.49 IPC41C 3.72 IPC554C 1.68			
LA4100 1.62 MJL9340 0.44 S37037 4.73 SR297718N 4.23 STK443 9.35 TAA630S 3.31 TDA1011 2.60 TDA3950 2.81 LA4101 1.18 MJL9520 0.44 S3707 3.92 SN297718N 4.23 STK443 9.35 TAA630S 3.31 TDA1011 2.60 TDA3950 2.81 LA4102 2.55 ML231 2.20 S40W 7.99 SN297728N 4.21 STK459 6.56 TAA640 3.65 TDA1028 2.22 TDA3950B 1.40 LA4112 4.35 ML232B 3.30 S551 4.12 SN29773 2.20 STK460 5.70 TAA661B 1.59 TDA1028 2.20 TDA4180P 1.74	JPC558C 3.67 JPC586H 2.78			
LA4112 4.35 ML222B 3.39 S551 4.12 SN29773 2.28 STK460 5.78 TAA661B 1.99 IDA1029 4.99 IDA4030 2.35 TDA4030 1.74 LA4125 2.46 ML237B 2.28 S552 4.12 SN29791 3.89 STK461 7.14 TAA700 2.35 TDA4030 1.40 IDA4030 1.40 LA4125 2.40 ML238 4.82 S0000B 2.75 SN29798N 3.89 STK463 7.32 TAA930 4.42 TDA4035T 1.45 TDA4250 6.45 LA4140 0.89 ML741CS 0.36 S0087AR 4.45 SN2948 2.18 STK465 7.32 TAA930 4.42 TDA4031 1.95 TDA4230 4.06 LA4140 2.08 ML238 2.08 SAA1020 4.32 SN2948 1.65 STK465 10.70 TAA970 2.57 TDA4041 1.95 TDA4230 4.06 ML238 4.02 2.08 SAA1020 4.32 SN2948 1.06 STK465 10.70 TAA970 2.57 TDA4041 1.95 TDA4230 4.06 STK465 10.70 TAA970 2.57 TDA4041 1.95 TDA4230 4.06 STK465 10.70 TAA970 2.57 TDA4041 1.95 TDA4230 4.06 STK465 10.70 TAA970 2.57 TDA4041 1.95 TDA4401	JPC572 3.51 JPC575C2 3.72 JPC576H 2.60			
LA4138 2.00 ML741CS 0.36 S0067AR 4.45 KN29945 2.14 STK.465 7.32 TAA350 4.42 TDA1037 1.45 TDA4230 6.45 LA4132 2.88 ML923 2.18 SAA1020 - 4.32 SN29948 1.66 STK.465 10.70 TAA970 2.57 TDA1041 1.95 TDA4230 4.06 LA4132 2.88 ML923 2.18 SAA1020 - 4.32 SN29948 1.66 STK.501 5.74 TAD100 1.91 TDA1044 1.61 TDA400 1.95 TDA400 1.95 TAA970 2.65 TAD104 TDA104 1.61 TDA400 1.95 TDA40	JPC577H 0.64 JPC587C2 2.34			
LA420 1.34 MIL0266 3.25 SAA1021 4.32 SNZ965 2.48 STK502 5.74 TAG222-00 0.48 TDA187 2.14 TDA4800 2.06 LA400 2.04 MM5314N 3.72 SAA1025 4.78 SNZ969 0.40 STK41 6.34 TAG626-60 0.48 TDA1854N 1.10 TDA4820 4.25 LA400 1.56 MM5316N 3.72 SAA1025 4.78 SNZ9709 0.40 STR441 6.34 TAG626-600 0.48 TDA1854N 1.10 TDA4820 4.25 LA400 1.56 MM5316N 3.72 SAA1025 4.78 SNZ9709 0.40 STR441 6.34 TAG626-600 0.48 TDA1855 0.50 TDA1859 0	JPC592H 1.02 JPD1514C 7.56 JPD851 14.39			
LOSTY 1.66 MCR105.65 9.37 RCA16799 2.16 SL497 9.26 ST0105 5.12 TA7210P 3.25 TCA800 1.85 TDA6880 2.26 LA1210 0.90 MCR002 0.27 RCA16802 0.98 SL480 5.00 ST0022 4.77 TA7213P 2.90 TCA810 1.90 TDA6880 2.26 LA1210 0.90 MCR004 0.23 RCA17024 6.00 SL480 5.00 ST0022 4.77 TA7213P 1.38 TCCE00 1.95 TDA6890 2.56 LA1320 1.46 MCR004 0.23 RCA17024 6.00 SL501B 6.00 ST002 4.77 TA7213P 1.38 TCCE00 1.95 TDA6890 2.56 LA1320 1.46 MCR004 2.21 RCA17024 6.00 SL501B 6.00 ST002 4.77 TA7213P 1.38 TCCE00 1.95 TDA6890 2.56 LA1320 1.46 MCR004 2.21 RCA17024 6.00 SL501B 6.00 ST002 4.77 TA7213P 1.38 TCCE00 1.95 TDA6890 2.56 LA1320 1.46 MCR004 2.21 RCA17024 6.00 SL501B 6.00 ST002 4.77 TA7213P 1.38 TCCE00 1.95 TDA6890 2.56 LA1320 1.40 MCR011 4.45 RCA17376 4.50 SL501B 6.00 ST002 4.70 ST002 1.40 ST002 1.40 MCR011 4.45 RCA17376 4.50 SL501B 6.00 ST002 4.47 MCR012 4.21 MCR012 4.21 MCR012 4.21 RCA26057 4.50 SL501B 6.00 ST002 4.21 MCR012	JPX27C 1.98 0022CE 3.67			
LA4460 1.92 MM/5387AA/N 11.50 SAA1051 3.28 SN/402N 0.99 1800/N 0.82 TBA120S 0.99 TDA1104 5.95 TDA432 2.06 LA4461 2.59 MM/5981N 5.99 SAA1075 4.41 SN/404N 0.21 TB015 0.36 TBA120S 0.99 TDA1151 0.59 TDA4440 2.52 LA5112N 1.62 MM/98112 1.35 SAA1082 8.04 SN/408N 0.24 TB015 0.36 TBA120S 0.99 TDA1151 0.46 TDA4400 2.52 LA5112N 1.62 MM/98112 1.35 SAA1082 8.04 SN/408N 0.24 TB017 0.45 TBA120T 0.95 TDA1170 2.59 TDA4400 2.52	(0035TA 4.35 (0056CE 3.90 (0062CE 4.95			
LA461 2.80 MM6841N 5.90 SAA1075 4.41 SN/408N 0.21 100U/N 0.82 136120S 0.95 TDA4450 2.52 LA512N 1.82 MP812 1.35 SAA1082 8.94 SN/408N 0.24 T8016 0.36 TBA120T 0.95 TDA1170 2.15 TDA4650 2.58 LA7020 6.66 MP813 1.35 SAA1121 4.32 SN/410N 0.24 T8017 0.65 TBA120T 0.95 TDA1170 1.15 TDA4650 2.58 LA7025 7.31 MP8512 1.23 SAA1121 4.32 SN/4101 0.95 TB021	(0085CE 3.48 (0109CE 6.10 (1074AF 6.36			
LA420 1.34 ML0926 3.25 SAA1021 4.32 SN2985 2.08 STK501 5.74 TAGC22-800 0.08 TDA1047 2.14 TDA400 2.06 LA4400 1.55 MMK5316N 3.72 SAA1025 4.79 SN72709 0.40 STR441 6.34 TAGG22-800 0.08 TDA1059M 1.10 TDA402 4.25 LA4402 1.56 MMK5316N 2.82 SAA1025 4.79 SN72709 0.40 STR443 6.34 TAGG22-800 0.08 TDA1059M 1.10 TDA402 4.25 LA4402 1.55 MMK5316N 2.82 SAA1050 3.78 SN7400N 0.24 STR602 7.20 TBA120A 0.95 TDA1059 2.01 TDA402 4.34 LA4400 1.92 MMK536N 1.82 SAA1051 5.30 SN7401N 0.24 STR602 7.20 TBA120A 0.95 TDA1059 2.01 TDA403 4.34 LA4400 1.92 MMK536N 1.82 SAA1051 3.28 SAA1051 3.28 SAA1051 3.28 SAA1051 3.29 SAA1052 3.29 TDA4030 2.10 TDA4030 2.06 TDA4031 2.06 LA4401 1.92 MM536N 1.92 SAA1051 3.29 SAA1051 3.29 SAA1051 3.29 SAA1051 3.29 SAA1052 3.29 TDA4030 3.29	(C949P 1.20 7730 0.24			
LD3101 1.20 MPSA42 0.59 SAA1250 3.78 SN74151 1.41 T6026 0.89 TBA14406 3.40 TDA1912 2.25 TDA5700 2.10 LM1011N 2.95 MPSA56 0.24 SAA1251 5.30 SN74151N 1.51 T6027 0.73 TBA1441 1.59 TDA1200 1.30 TDA5700 2.10 LM1017N 1.96 MPSA52 1.11 SAA5000 3.85 SN7415N 1.15 T6028V 0.35 TBA240A 3.42 TDA1220 2.25 TDA9403 2.90 LM1017N 1.96 MPSA52 1.11 SAA5000 3.86 SN7415N 1.15 T6028V 0.35 TBA240A 3.42 TDA1220 2.25 TDA9403 2.90 LM1017N 1.96 MPSA52 1.11 SAA5000 3.86 SN7415N 1.15 T6028V 0.35 TBA240A 3.42 TDA1220 2.25 TDA9403 2.90 LM1017N 1.96 MPSA52 1.11 SAA5000 3.86 SN7415N 1.15 T6028V 0.35 TBA240A 3.42 TDA1220 2.25 TDA9403 2.90 LM1017N 1.96 MPSA52 1.11 SAA5000 3.86 SN7415N 1.15 T6028V 0.35 TBA240A 3.42 TDA1220 2.25 TDA9403 2.90 LM1017N 1.96 MPSA52 1.11 SAA5000 3.86 SN7415N 1.15 T6028V 0.35 TBA240A 3.42 TDA1220 2.25 TDA9403 2.90 LM1017N 1.96 LM1017N 1	/969 0.60 /AT TO TOTAL			

Long-distance **Television**

Roger Bunney

September was a very poor month for long-distance signal propagation of all types. By tradition, September is usually a good month for tropospheric reception. Not this time however. The rains have caught up with those who spent a dry, hot summer! There was the usual autumn SpE decline, so there's little to report. Solar storms and associated ionospheric disturbances towards the end of the month produced auroral activity – from the 17th onwards - though the effects of this were restricted to northern locations. The main auroral activity occurred on the 23rd and 30th. This month's short SpE/auroral log is as follows:

7/9/84 TSS (USSR) ch. R1; ARD (W. Germany) E2.

8/9/84 TVE (Spain) E2.

9/9/84 TSS R1, 2; TVP (Poland) R1, 2; CST (Czechoslovakia) R1, 2; ORF (Austria) E4; ARD E2, 4; +PTT (Switzerland) E2, 3; JRT (Yugoslavia) E3; RAI (Italy) IA; TVE E2, 4.

10/9/84 TSS R1, 2; TVP R1, 2; CST R1. 11/9/84 TSS R1, 2; TVP R2; CST R1, 2; ORF E2a; JRT E3, 4.

12/9/84 TSS R1.

13/9/84 TVE E2, 3.

17/9/84 Auroral activity noted in Band I.

23/9/84 Strong auroral activity throughout Band I, with signals (of sorts) seen on all channels - though with the usual identification problems. RTE (Ireland) IB.

29/9/84 TVE E2.

30/9/84 Strong auroral activity in Band I.

1/10/84 CST R1; ORF E2a.

My thanks to Dave Shirley (Hastings), Cyril Willis (Ely), Paul Barton (Harrogate), Simon Hamer (Powys) and Iain Menzies (Aberdeen) for sending in reception reports. Dave mentions that the present World Television Club series (Antenne-2, TDF) has come to an end. It will be resumed next year.

TV Pirates - UK Style

On the evening of October 7th a pirate TV transmitter was noted testing from 1930 on ch. E28 with the caption "Thameside TV". Observations from the Esher and Teddington areas suggest that the station's location is in the Croydon/Thornton Heath area. The caption features a circle within which there's an outline of London buildings and the "Thameside TV" identification – a further identification, "Channel 28 Thameside TV", appears at the bottom. The background colour is orange and the sound channel carries music. The transmission continued for several hours, with programmes from 2200. The sound is also transmitted at 90.5MHz (f.m.). Press reports earlier in the week had suggested that the transmissions would be on ch. E36.

Thameside returned at 2200 on the 8th, with programmes from 2300 until 0100. On the 9th a pirate transmission with excellent quality was received in the Twickenham area with the carrier some 1MHz below ch. 21. The identifications were "36" and "Late Night London Television" – there were no signs of signals on ch. 36. Programmes started at 0100 and continued until 0230,

with pop videotapes and an Egyptian film - the programme content is intended for Greek/Arabic viewers. It was announced that this "test transmission" will be followed by future programmes. It seems that the London airwaves could become an interesting field for late night DXing.

News Items

UK: The Dolby company is working on a stereo TV sound system using delta modulation as a possible alternative to the digital system proposed by the BBC.

France: Although Canal Plus transmissions started on November 4th, scrambling is not likely to be used before January 1985 - the idea is to get some initial publicity for the programming on offer. Apparently over 100,000 subscribers had signed up by the end of September. Boulogne and Amiens-St. Just will operate on ch. F10. Denmark: Some independent (of Danmarks Radio) lowpower local TV transmitters are now in operation, including Horsens ch. E52 (seen at over 100 miles during tropospheric openings), Copenhagen-1 E52, Odense E53,

Aarhus E54, Copenhagen-2 E56 and Bornholm E59.

Satellite Equipment

Frank Lumen has sent further details of his satellite reception in Colorado (see last month). His garden sited parabolic dish is a 12ft diameter mesh type with a gain of 41dBi and a beamwidth of 1.5°: it can be swung from 53°W to 143°W and elevated to 45°. The LNA is a 90°K Aventek that feeds a Dex downconverter mounted just below the actuator arm. The receiver is a Drake ESR240 with infra-red remote control. Interesting that the downcoverter provides a single conversion to 70MHz at 72 Ω , with an image rejection figure of 20dB. The receiver has an i.f. bandwidth of 25MHz (-3dB) and a threshold at 8dB carrier-to-noise ratio. The audio is tunable and the modulated output is available on ch. A2 or A3 at 3mV.

We've received information from North East Satellite Systems on some relatively inexpensive dishes and supports they can supply. A 1m diameter dish complete with stand, elevation/azimuth adjustment mount and a feed tripod is available at £140 plus VAT and carriage (depends on distance). The dish is of spun aluminium and is accurate to within ±3mm. It can be used at 4 or 12GHz but as there's little margin for signal attenuation, e.g. in wet weather, a 1.5m dish has also been produced. Both Hugh Cocks and North East can supply electronics for Music Box and other downlink transponders in the 11-12GHz band. For rock music fans North East offer a stereo decoder/expander for disco use, taking its feed from a satellite baseband output receiver. The cost of the 1.5m dish assembly, based on an initial production run of 50, is quoted as £249 plus VAT. For further information write to the company at Cropton, Pickering, N. Yorkshire telephone 075 15 598.

Wideband Band I Aerial

Weston Developments (33 Cherville Street, Romsey, Hants SO5 8FB) have introduced a new four-element wideband (47-68MHz) Band I array with the emphasis on higher gain. The elements are spaced for optimum gain over the band, matching back to 75Ω unbalanced with an in-line matching cable section. A 1:1 balanced-to-unbalanced ferrite transformer is available for use with this and other aerials in the WB1-4 series. Gain is 2dBd at 50MHz rising to 5.5dBd at 65MHz with the front:back ratio typically 20dB. Wideband aerials for the higher OIRT

channels R3-5 and the OIRT 67-73MHz f.m. band are also available.

TV Station List

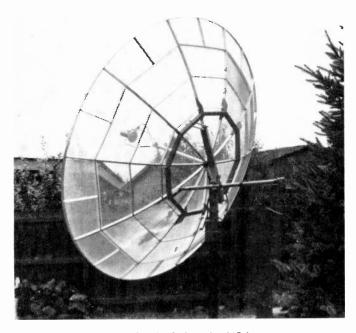
The EBU's "List of European Television Stations, No. 29" is now available at 750 Belgian Francs from the EBU, 32 Avenue Albert Lancaster, B-1180, Bruxelles, Belgium. This annual publication lists TV transmitters with powers down to mW operating in the European broadcasting area, including N. Africa and the closer Middle East, and is updated bimonthly with supplements. Highly recommended to all TV-DXers.

Circular Polarisation

In his Technical Topics column in Radio Communication (September 1984) Pat Hawker mentions the use of circular polarisation, particularly in Band II. The advantage is that reception is more acceptable and siting less critical with the types of aerials commonly used with portable receivers. For amateur satellite reception, crossed Yagi arrays with a phasing harness for switching between rotation modes gives circular polarisation. Bill Sykes (G2HCG), well known in the aerial industry and previously associated with J-Beam, has designed a device called "Polaplex" for use with crossed Yagi arrays: it provides accurate matching and control of the phasing between the two feeders over a full 360° so that all polarisation modes can be catered for using a control next to the receiver. This would make it easy to optimise reception from a satellite as it passes across the sky and might also make it possible to minimise ghosting and cochannel interference problems. It's hoped that the device will be made available commercially though there are no firm plans to do so at the time of writing.

TV from the Air

In the late 60s there was great press excitement when Ronan O'Rahilly announced that he intended to start commercial u.h.f. TV transmissions from an aircraft flying a figure-of-eight over the North Sea. No more was heard of it however and nothing was seen. The subject of



Frank Lumen's 12ft. dish in Colorado, USA.

SOUTH WEST AERIALS



£69.95

The WALTHAM 416 is a VHF/UHF 6" screen mono TV for System B/G operation (5.5MHz sound) and is ideal for serious TV/DXing, or Continental travel and domestic use. Operation is via mains power or an external 12 volt source (all plugs and leads supplied). This receiver has a modern moulded cabinet and carrying handle, the controls are in a conveniently recessed but easily accessible position on the top of the television.

The 416 features extremely good sensitivity and sharp selectivity with its 4 individually tuned IF stages. All bands (VHF and UHF) feature continuous varicap tuning for ease of operation. Tuning controls and a clear scale readout are situated at the front of the receiver. ALL Band 1 & 3 TV/DX channels are covered, together with all UHF channels 21-68. Aerial input is via a 75 ohm coaxial socket, in addition a strong ten section whip antenna (40" extended) is provided at the rear. Two internal speakers for maximum sound quality are another feature of the 416. The WALTHAM 416 is a modern and reliable export receiver made for the W. German market. South West Aerials are the sole UK distributor for this model.

distributor for this model.

WALTHAM 416 6" screen VHF/UHF mono TV (5.5MHz sound) inclusive of VAT £69.95 plus £3.75 carriage and insurance (adjustment to 6MHz sound is available at an additional cost of £2.50). Delivery 3-5 days.

Send 60p for our NEW extensive 1985 CATALOGUE detailing Aerials (DXing and domestic), Amplifiers, Filters, Rotators etc. Customer consultancy available to solve difficult reception problems, TV/FM DXing our speciality (include SAE with all enquiries please). ACCESS & VISA mail and telephone orders welcome.



SOUTH WEST AERIALS (T)
11, Kent Road, Parkstone,
Poole, Dorset BH12 2EH. Tel: 0202 738232.



airborne transmissions came up recently in an American magazine. In addition to a project for Band III transmissions from a Super Constellation flying over Vietnam a considerable number of test transmissions were carried out in the USA. Harry Caul (KIL9XL) writes that radio transmissions at 19,100kHz and 532kHz with "This is the Voice of Blue Eagle" were heard over a wide area. The FCC took no action apart from announcing that the pirate station had been warned of the penalties, and it subsequently transpired that the transmissions were being organised by the military to gain information on coverage at various heights. It seems that a converted C121 was used as a flying radio/TV studio. These tests continued throughout 1964, then ceased. In 1965 the aircraft was used over the Dominican Republic following an attempted revolt and in 1966 it appeared over Saigon with two u.h.f. TV transmitters aboard - though there were no u.h.f. receivers in the area at the time! Rumour has it that some 1,500 receivers were subsequently distributed to the local population, and a second TV plane arrived. The planes seem to have operated at 20,000ft, on ch. A12. Information is rather vague however - has anyone more substantial details?

Band I

The use of cordless phones in the 49MHz band has been a considerable nuisance to TV-DXers in recent times. Their use has now become a criminal offence and if a unit is attached to the public network BT are obliged to report this to the DTI – prosecution could result in a fine of £2,000 for both the user and retailer, with the latter's stocks liable to be seized.

A further 60 special permits for operation in the 50-

52MHz band are expected any time now. The RSGB's 50·05MHz beacon is operating on a 24-hour basis at 15W from the Potters Bar HQ, using crossed dipoles.

From our Correspondents . . .

Reg Roper (Torpoint) has been experimenting with CB aerials. He's found that two "Firestick" CB mobile aerials fitted on to an X 90° insulator work very well as a DX-TV aerial! I'd anticipate that direct connection to a 75Ω coaxial feeder would result in considerable mismatch, though this could be corrected by using a transistor amplifier for each element, combining down to 75Ω . Since $2 \times 27 \text{MHz} = 54 \text{MHz}$ performance could be good – further details are awaited.

Robert Copeman (Melbourne, Australia) reports that closure of SBS-TV ch. 0 has been delayed until 1986 to allow more people to obtain u.h.f. sets (there are at present parallel transmissions on chs. 0 and 28).

I've received a long letter from Peter Tomlinson (Bristol), who works for the r.f. design company Iosis, following comments in this column on microcomputer interference. He says that the AR2001 general-coverage receiver seems to suffer from poor cross-modulation performance, with breakthrough from police, radio amateurs, radar and other sources. Others have reported this problem in areas where there's a strong local group A u.h.f. TV signal and Lowes (Matlock) apparently have available a modification sheet to overcome it. Peter

continues: "There's a new generation of high-resolution video display units at present being designed with video dot rates in the range 200-300MHz. One display designer tells me that he can stop radiation through the c.r.t. by using a metal shield that acts as a waveguide. Properly designed, this blocks r.f. The video signals have large components at submultiples of the dot rate however. The same designer reports that the electronics generating the digital video signals seem to be more of a problem from the radiation point of view than the c.r.t." All this suggests increasing interference problems ahead. Perhaps the DTI should introduce legally enforceable standards as required by the FCC in the USA rather than guidelines.

East Germany

An official DFF transmitter list has been published by *Tele-Audiovision*. The channels for the first and second services respectively are as follows (V = vertical polarisation, H = horizontal):

Berlin	C . II	F27 III : :	F0 **	
		E27 H Leipzig	E9 V	E22 H
Brocken	E6 H	E34 H Lobau	E27 H	E39 H
Dequede		E31 H Marlow	E8 H	E24 V
Dresden	E10 V	E29 H Schwerin	E11 H	E29 H
Helpterberg	E37 H	E22 H Sonneberg	E12 H	E33 H
Inselberg	E5 H	E31 H Cottbus	E4 H	
Karl Marx Stadt	E8 H	E32 H		

The Cottbus E4 transmitter may close in 1986, transmissions moving to ch. E53.

Teletopics

CABLE CONFIDENCE FADES

The two largest operators in the UK cable TV industry, (Rediffusion) and Electronic Rentals Group (Visionhire), have decided to pull out. In addition, Thorn EMI is reconsidering the extent of its financial commitment to CATV. The Visionhire East Kilbride network is being closed and other networks will be continued only until contractual commitments come to an end. The company will not participate in any further cable TV activities. BET is selling its Rediffusion cable interests, subject to Home Office and DTI approval, to Robert Maxwell's Pergamon Press for £11 million. Rediffusion had the "showcase" Guildford cable TV franchise, which was expected to be the most successful of the systems approved last year, but had been unable to raise the £30 million it would have required to install the cables. Robert Maxwell, whose other interests include the British Printing and Communications Corporation and Mirror Group Newspapers, is also chairman of the small and so far lossmaking cable company SelecTV. He now becomes the UK's largest cable operator and it will be interesting to see whether he can make a go of cable where others have so far largely failed.

BET and ERG both blame delays in getting cable TV started, and the changes in the treatment of capital allowances introduced with the last budget, for their decisions to withdraw from cable TV. As David Hurley, managing director of ERG, put it "we now believe that the prospects of generating meaningful profits from this area on a normal commercial time-scale are too remote to justify our continued involvement". Thorn EMI says it has no intention of pulling out but is looking for minority

shareholders to assist with financing some of its franchises.

Earlier this year (see Teletopics, July) BET sold its Rediffusion TV rentals operation to Granada. This has led to union trouble since Granada recognises the electricians' union EEPTU while Rediffusion recognises the General, Municipal and Boilermakers' Union. Strike action has been threatened over Granada's plans to rationalise the Rediffusion operation.

HIGH STREET CHANGES

Changes are afoot amongst the high street electrical chains. Dixons, which has 280 stores, has announced a take-over bid for the family-run Currys group which has 531 outlets plus 25 Bridgers discount centres and 16 Carousel Colourhire shops. The bid follows the announcement of poor interim results by Currys and is being opposed by the Currys board. It seems that Dixons' trading has not been as badly affected as most other electrical retailers in recent months. The general situation is highlighted by Amstrad's announcement that it is for the time being withdrawing from the large-screen CTV and VCR markets to concentrate on audio and its home computer, which has been well received. Amstrad's founder and chief executive Alan Sugar has predicted a price war in the video and large-screen CTV fields.

Further high street rationalisation has resulted in the merger of the Trident retail and Telefusion rental chains to form the new Connect group.

DIGITAL TVs AND LCD DISPLAYS

TV sets using digital signal processing circuitry have been announced by Toshiba, Panasonic and Zenith in the USA. It's understood that all these sets use the ITT Digivision range of chips. Most have a "picture-within-picture" feature enabling a picture from an external video source, e.g. a VCR, computer, etc., to be displayed in the corner of

the screen, with remote switching between the two as the main picture. Mitsubishi have also announced a digital TV set, in this case with a still picture function using a one frame video memory. Other features of the set are a timelapse mode that enables nine different TV programmes to be monitored on the screen simultaneously, with image renewal at four second intervals. Alternatively the ninesection display can be used to provide stroboscobic pictures, the intervals between shots being variable with a minimum of one thirtieth of a second – this feature is useful for studying golf form and providing other slowaction sport's shots. The set is expected to go on sale in Japan next autumn.

Casio has demonstrated a prototype 6in. liquid crystal colour TV display in Tokyo and plans to start production next year in various screen sizes from 2.5 to 12in. Seiko have announced a 2in. screen colour TV set in the USA, using a liquid crystal display with fluorescent backlighting and 52,800 pixels, each separately driven by a thin-film transistor. The liquid crystal is of the twisted-nematic type. Similar sets are planned by Citizen and Sanyo.

DISCS

Interactive video discs have been launched by JVC in Japan. The VHD discs can be used with a domestic computer to give realistic displays on the screen. As a result of interfacing the disc player and computer the user can modify and control the display. Programmes on the initial discs include road racing, casino games and chemical experiments. The move could well boost the prospects for disc systems – Philips have already announced an interactive LaserVision disc player in the UK, Model VP831, for the professional market, with computer interconnection via an RS232 port.

Thorn EMI is to supply VHD discs to Toshiba for sale in Japan. Deliveries are expected to reach 50,000 a month by the end of the year.

Hitachi have announced that spares for their CED disc players, now no longer in production, will be available for at least seven years.

FERGUSON CAMCORDER

The Videostar C Model 3V41 camcorder has been added to the Ferguson range of video equipment. This combined colour camera/VHS-C recorder has numerous features including an electronic viewfinder with eight recorder/camera mode indicators, a half-inch saticon tube, colour picture search and back space edit. The comprehensive range of accessories includes a super-directional microphone (which can be used with other Ferguson cameras) and a character generator. The latter enables the user to generate captions and titles when filming – four different types of pages, different sizes of lettering and options for positioning on the page make a variety of styles possible.

8mm VIDEO

The Kodavision series 2000 8mm video system has now been launched in the USA. A significant advance is a two-hour cassette which is to be made available for worldwide distribution in mid-1985. The tape is produced for Kodak by TDK and is 10 microns thick – the present ninety minute cassette uses 13 microns thick tape. There's still no date for the UK launch of the Kodavision system.

Sanyo has announced an 8mm video system in the USA, comprising a separate VCR and a camera that looks like a 35mm photographic one and takes standard 35mm lenses. The Electronic Industries Association of Japan

expects sales of 8mm equipment to reach six million annually in seven years' time, accounting for some 20 per cent of the world VCR market.

JAPANESE-EEC MOVES

The Japanese Ministry of International Trade and Industry has asked Japanese VCR manufacturers to reduce their exports of complete, i.e. non-kit, VCRs to the EEC by over ten per cent during the current financial year in order to avoid excessive price cutting. There has already been an 11·7 per cent decline in Japanese VCR exports to the EEC, where demand is currently slack. Not that the Japanese VCR manufacturers need worry unduly: exports rose to a record 1,993,000 in August, with 52·5 per cent going to the USA and only 19·1 per cent to Europe.

A standing joint committee to decide on common standards for consumer electronics goods has been proposed at a Japanese/EEC conference attended by eighteen leading electronics companies. The Japanese delegation was led by Sony's chairman Akio Morita while the European delegation was led by Philips' president Wisse Dekker.

CHANNEL FOUR COVERAGE

Almost fifty million people can now receive the Channel 4/S4C transmissions, roughly 97 per cent of the population. Ultimately the coverage should equal that of ITV/BBC at over 99 per cent. During 1985 another one hundred low-power relay stations will be equipped for Channel 4/S4C transmission, bringing a further 600,000 people within range. This will leave roughly 200 transmitters to be equipped in 1986/7 to complete the programme. In addition, new fill-in relays for all IBA/BBC channels continue to be built at the rate of about one a week.

PRESTEL MAILBOX NATIONWIDE

Prestel's 24-hours a day electronic message service Mailbox is now available throughout the country at local call rates, enabling messages to be sent instantly between any of the 47,000 terminals on the Prestel network. There are no sending/receiving charges above the normal Prestel operating costs. Mailbox was launched in 1981 as a local service for London subscribers, though users elsewhere could use it by making a long-distance call to the Mailbox computer. Users can either send their own messages via a typewriter keyboard or, if they have only a standard Prestel numeric keypad, they can select from a list of over 400 stock messages and phrases. To despatch the message the sender keys in the recipient's Mailbox code: the recipient is informed that a message awaits him whenever he calls Prestel. Up to five messages can be stored indefinitely in the Mailbox computer until called up by the recipient. The use of personal code numbers ensures that messages go only to the correct destination without interception by other users. A recorded delivery feature is to be added next year.

V2000 HI-FI

Now that Betamax and VHS VCRs with hi-fi sound are with us, using the same basic techniques, what about the V2000 system? Not to be left out, a prototype V2000 hi-fi machine was on display at the recent Dusseldorf Hi-Fi and Video Show. Models are expected to be released during 1985, though whether they will appear in countries other than the Netherlands and W. Germany, where the system has a reasonable share of the market, remains to be seen.

The technology involved is quite different from Beta/VHS: the audio is converted to digital form, using pulse-code modulation, and is compressed so that it can be inserted in the video waveform's field blanking period—it's laid down in the 0·325mm centre section of the tape originally intended as a cue track but never in practice employed for this purpose. The introduction of models on the market awaits the development of i.c.s to carry out the audio signal processing, which in addition to compression/expansion and coding/decoding involves noise reduction in both the recording and playback modes. The audio heads are mounted on the same piezoelectric actuators as the video heads so that both are subject to the dynamic track following that's a major feature of the V2000 system.

As to the future of the V2000 system, it's interesting that Philips' president Wisse Dekker commented in a recent interview with *Electronics Weekly* that "Philips is certainly not as strongly committed to V2000 as it was a year or so ago". In his view the decision by Philips to manufacture and market VHS machines should have been taken earlier while "now it's up to the market to decide". Grundig expects its VCR production to settle at two thirds VHS to one third V2000.

CHANNEL 7

Atlas Leisure has launched a video service called Channel 7 for the 2,000 large-screen video projectors installed in pubs and clubs by TeleJector. The service will consist of a mixture of sport, comedy, films, music, travel and news and will carry advertisements (the advertising rate is £2,800 for two thirty second slots shown daily for a week). Atlas hopes to increase the number of installations to 3,000 by mid-1985 and eventually to serve one in five of the UK's pubs and clubs. The use of satellite transmission is planned.

FOREIGN NEWS

The Australian government has decided to use the MAC-B transmission system for the AUSSAT satellite radio/TV service which is due to start next year, carrying ABC programmes to the outback... The Italian government has issued a decree making the three private TV networks legal – magistrates had earlier closed the networks in three areas on the grounds that they infringed the state-run service's monopoly... Grundig is to supply VHS VCRs in kit form to China for local assembly under licence. The company already has an agreement with China on CTV production... The launch of the first French DBS satellite, originally planned for November 1985, has been postponed until late 1986 due to technical problems with the high-power output tubes.

BBC AT IBC 84

The BBC's sound-in-syncs system for the distribution of mono sound and video signals via a single link was developed over fifteen years ago and has since been widely used throughout the world. The BBC is at present developing a system for two-channel sound, taking advantage of an important development in digital audio techniques – the NICAM-3 near-instantaneous companding system. In order to get twice the information into the same bandwidth and much the same time slot, a quaternary coding system and slightly more of the line sync pulse period are used. The technique was amongst several interesting exhibits shown by the BBC at IBC 84.

Of particular interest to TV engineers will be the fact that the BBC now have a digital generator for test card F.

The geometric patterns are generated by computer techniques with reference to the original drawings, with edges both vertically and horizontally anti-aliased for optimum accuracy. The central picture with the little girl was copied from a slide by means of a YUV "picture grab", the resulting data being inserted into the geometric pattern during the computer preparation process. So it seems that the well known and much appreciated pattern will be with us for some time yet.

VIDEO NOTES

Panasonic's latest VCR, Model NV730, is less than four inches high. It's a two-speed machine expected to retail at about £633·50. BSR is to manufacture under licence Mitsumi r.f. modulators for VCR use at its Stourbridge, W. Midlands factory. Akai's new European VCR factory is to be built at Honfleur, western France, where the company already has a plant manufacturing hi-fi equipment and assembling VCRs. It had been hoped that Akai would set up the factory in the UK.

Panasonic have developed a still-picture camera using electronic technology. Up to 25 colour shots can be stored in digital form on a magnetic disc. The system is similar to Sony's Mavica camera and is expected to go on sale in a couple of years' time.

WILLOW VALE TRADE SHOW

The next Willow Vale Electronics trade show will be held at the Ladbroke Mercury Motor Inn, Exeter on November 28th, 1984. For further details apply to the Sales Manager, Willow Vale Electronics Ltd., 11 Arkwright Road, Reading, Berks (telephone 0734 876 444).

HEAD CLEANER AEROSOL

Electrolube have introduced a Video Tape Head Cleaner aerosol that loosens and removes accumulated deposits of dirt and tape oxide, drying quickly without leaving any residues on the tape. It's designed for use on all magnetic tape heads and comes in a 110 gram can. Application is by spraying directly on to the heads and the tape path – alternatively it can be sprayed on to cleaning tapes or other cleaning devices such as cotton buds. For further details contact Electrolube Ltd., Blakes Road, Wargrave, Berks RG10 8AW (073 522 3014).

PROPOSED ATV REPEATERS

A number of people have expressed interest in a 23cm ATV repeater for the Southampton/Bournemouth area and several possible locations have been considered. It has been suggested that two separate repeaters, one for the Bournemouth/Poole area and another for Southampton, would give better coverage of low-lying areas. Amateurs interested in 23cm operation are invited to contact Nick Foot, G4WHO, 47 Mallard Road, Colehill, Wimbourne.

EXHIBITIONS

The next Berlin Radio Show, now known as the Audio and Video Fair Berlin, will be held on August 30-September 8 1985. Details can be obtained from AMK GmbH, Postfach 19 17 40, Messedamm 22, D-1000, Berlin 19.

The twelfth annual Audio Visual Exhibition, AV85, will be held on April 22–25 1985, at the Wembley Conference Centre. The organisers are Maclaren Exhibitions Ltd., PO Box 138, 79-81 High Street, Croydon CR9 3SS. AV85 will be sponsored by *Audio Visual* magazine.

Teletalk on Colour

Malcolm Burrell

I was mulling over the question of colour picture quality recently. It seems that one result of so much circuitry being taken over by the silicon chip is greater consistency with our colour pictures. When colour started in 1967, and became more popular in 1969 as it spread to all channels, everyone would remark on the variation between the sets on display. True, variation still exists, but it's now more a matter of how well the set is tuned in and things like that. Most of us probably tend to take colour pictures for granted: the quality is more consistent than it was, but I feel that it's settled at a rather mediocre level of consistency.

The Early Sets

In 1967 we had dual-standard hybrid sets like the Decca CTV25, the GEC 2028 and the Philips G6. They used valves in the output stages and colour-difference drive, i.e. luminance at the tube's cathodes and the three colour-difference signals at its grids. This made grey-scale adjustment much simpler and somehow gave slightly better colour. To me the first G6s had a certain something that amounted to richer colour. The reds were red and flesh tones had a certain Technicolor golden hue that few other sets matched.

By 1969 we had single-standard sets. These often bore a more than passing resemblance to their predecessors but had somehow begun to loose something. I personally thought that the Thorn sets of the era, with their solid-state circuitry and RGB drive, never quite made it for colour quality, though a friend of mine still has a 25in. one that gives quite exceptional pictures for one of this breed. Decca went on to make the famous 10 and 30 series Bradford chassis which, though beloved by many engineers – they were excellent for quick servicing – somehow lacked something when it came to colour quality. They gave good pictures but the colours were not outstanding. Even the single-standard G6 didn't quite match its elder brother unless you got a really good one.

The K70

Then suddenly the Philips K70 came upon the scene. A few of these appeared in discount stores while some went to the rental outlets. The first thing of note about them was the use of varicap tuning, something we'd not experienced before in the UK. Imagine, I thought, no more mechanical tuners to fall to pieces! When you switched one of these sets on the next thing that became apparent was the superb sound quality, which was almost as well matched by the picture.

I remember being bewildered when I first made a call to service one of these sets. It had an elaborate but flimsy chassis that hinged outwards. The layout looked much the same as the G6 – but there were two line output valves! I always admired the sound reproduction, which came from the combination of just a single PCL86 and two speakers. I wondered what the secret was. The speaker at the front was a tweeter while the side-mounted bass unit was of special construction. I can remember substituting (temporarily) an ordinary type to compare the results. The

difference was startling. I'd secret designs on the speaker in the set but had to return it reluctantly to its rightful place. In subsequent years I did manage to get one from a scrap set but found that it didn't give much of an improvement when installed in a conventional TV set. It just shows how much thought was put into this Philips system – the loudspeaker, the circuit, the output transformer and the cabinet.

Orientals

I first encountered a 13in. Sony portable a good few years ago. The Trinitron system impressed me, as did the overall picture and colour quality. I subsequently bought a KV1810UB and found the pictures acceptable though not quite so outstanding. My main reason for buying this set however was its hue control – it was the last set sold in the UK to feature one of these. It enabled me to trim the phase of the reproduced colour slightly – unlike the tint controls provided on some sets (these altered the grey-scale as well). The 1810 had a 114° 18in. tube that didn't quite seem to have the sparkle associated with the earlier 90° types. It seems that the early 110° tubes that were used mainly in sets of Continental origin didn't produce sparkling pictures for very long.

I had thought that most 90° delta-gun tube sets had long passed their prime. Then last year I encountered an Hitachi CNP190 that had never required a service call in all its nine years of operation. Amazingly, the tube gave a superb, clearly defined picture with vivid, rich colours and would have put many a new set to shame. I must admit however that most of these sets are now well passed their best.

I live with a Sony KV2704 now, and though the colours don't sparkle they're certainly very good. Why did I buy it? First because I wanted a large screen and prefer the Trinitron's shape to the conventional goldfish bowl type. Secondly the Trinitron grill principle seems to me to be a more sensible one for in-line gun tubes than the segmented-slot arrangement. Thirdly the "turbo-drive" – a sort of dynamic focus system that was described briefly in the November 1981 issue (page 39) – really does seem to give sharp images right out to the edges of the screen.

What is True Colour?

As to what is true colour, it depends I suppose on what you're watching. A newsreader should look natural. If he's been sitting inside a studio all his life perhaps he should look pasty-white, but isn't it nice to see an old British film with scenes of London where the buses are much redder than they would ever have been in real life?

Then I think of photographs and slides. Do you remember the experimental colour test transmissions during the 50s and 60s, with endless slides of telephone boxes and young ladies in hats?! I came across a slide recently of a picture taken from a GEC 405-line colour receiver (TT4, see Practical Television early 1959) working on the NTSC system. Being from a photograph, the flesh tones were rich and golden. I once wrote to the IBA with some comments on Test Card F – that one should aim to get a

sort of warm golden brown in the upper arm area of the little girl. I think this caused some amusement, but I found that subjectively if you got this then a vectorscope was irrelevant!

In Conclusion

This is not to suggest that we return to the days of the G6. Most engineers who remember them prefer today's sets. In any case, I think that for clarity the in-line tube is preferable. It's not likely that one can improve on years of design work. A TV set is designed to give a certain picture quality at a price. Minor improvements sometimes work, also correct adjustment. Why for example was it that

almost every Decca 30, certainly the ones I've encountered, seems to have left the factory with Hanover bars when quite a simple adjustment puts this right?

A few weeks ago I had to attend an elderly Thorn 8000. It was working with a grotty aerial but the picture was noisier than usual. Out came the decoder/i.f. panel and we soldered the broken print around the i.f. input from the tuner. Having checked that there was indeed a colour picture I zoomed off. One whole month later the call "green faces" came. In my haste I'd accidentally swapped the green and red leads to the tube. I could go on about the old lady who watched a GEC set with a flat blue gun (all yellow) and after I'd fitted a new tube said "it's not as good as it used to be", but I'll close here.

TV Fault Finding

Reports from Mick Dutton, Hugh Allison, John Coombes and Malcolm Burrell

ITT CVC801 Chassis

The problem with this set was no results, though on closer examination we found that there was 320V across the mains bridge rectifier's reservoir capacitor C658. The chassis has a chopper power supply, with the drive coming from the line oscillator chip and the line output transistor driven from a secondary winding on the chopper transformer. Quick checks showed that none of the obvious semiconductor devices was at fault, so the question was where to go from here?

We decided to power the line oscillator from an external supply, and were rewarded with line whistle and a chopper output of some 30V instead of 110V. We then replaced the line output transistor with a low-wattage bulb. The h.t. remained low, proving that the fault was in the chopper control circuit. Voltage and waveform checks were then made in the power supply. Everything was o.k. up to the collector of T731, the pulse-width modulator transistor that drives the chopper driver transistor T750. T750's base waveform was incorrect, T731's collector voltage was slightly high and the voltage reading at the collector of T750 was low. The problem was traced to D750 (1N4148) being slightly leaky - this diode is connected between T750's 28V supply and the 20V rail that supplies the rest of the chopper control/drive circuit. M.D.

ITT CVC1100 Chassis

Another case of no results. There was 300V across the mains bridge rectifier's reservoir capacitor C658 but no 115V h.t. rail. This was due to the fuse being open-circuit and the over-voltage zener diode D658 short-circuit. It's important that the set isn't run with D658 removed as excessive h.t. can result in the e.h.t. rising alarmingly, with possible damage to the tube. The recommended procedure is to check for obvious shorts, then connect a low-wattage bulb across D658 as a load for the power supply. Next disable the line output stage by shorting together the base and emitter of the line output transistor. When we did this the bulb lit and the h.t. line was steady at 115V.

With the bulb still in circuit, we removed the line output transistor short. This produced an h.t. line of about 40V with some obvious straining noises from the chopper transformer. Fine we thought, the power supply is o.k. and there must be an excessive load somewhere. We checked

the secondary supplies provided by the line output transformer and found that the 150V rectifier D504 was short-circuit. This is quite common but usually the associated safety resistor R514 is burnt out. In this case it was intact and replacing the diode made no difference to the overload condition. We checked everything, including the line output transformer by replacement, without success.

Time for thought. Maybe the fault was in the power supply after all? The chopper circuit is self-oscillating, the feedback pulses from tag e on the chopper transformer going via a winding on the line output transformer (to synchronise the action), R722 (4.7Ω), C714 and R723 to the base of the chopper transistor. It turned out that R722 was open-circuit, as a result of which the chopper was operating in the start-up mode. Replacing R722 restored the correct h.t. voltage, but there was a lack of brightness and the picture was much overscanned. We'd left the replacement line output transformer in the set – refitting the original one produced a perfect picture. Our replacement transformer and the two others we had in stock turned out to be faulty.

ITT CVC20 Chassis

The trouble started with faint horizontal lines across the picture when the chassis was in the normal, raised position. To cut a long story short, there was a high-frequency ripple on the h.t. line caused by a spurious oscillation in the TDA2640 chopper control i.c. Before we discovered this another engineer had changed the line output transformer in an attempt to cure the fault. Having sorted things out I had to replace the original transformer. This led to loss of the 24V and 12V lines due to an earthing lug on the transformer connected to D24. Then the contrast became low with no colour. This turned out to be due to D3 (1N4148) in the beam limiter circuit having gone short-circuit. It would have been cheaper to leave the new transformer in the set and say nothing!

Rank Colour Portable

One of these sets, manufactured in W. Germany by Saba, came in with the complaint that there was line pulling and field jitter when it was first switched on. This looked like an a.g.c. problem, and we found that bridging the a.g.c.

time-constant capacitor C284 (4.7μ F), which is connected between pin 4 of the TDA440 i.f. chip and chassis, cured the field jitter. We were left with bent verticals except when the channel 8 button was selected. Replacing C923 (47μ F) which decouples the supply to the TDA2590 sync/line generator i.c. cured this problem. In both cases the capacitors seemed to be o.k. when tested. M.B.

Thorn TX9 Chassis

The fault was field cramping a third of the way from the top of the raster. Voltage checks around the TDA1170S field timebase i.c. (IC55) revealed the fact that the output pin 4 was at around 18V instead of 13·8V. Everything else seemed to be o.k. A replacement i.c. failed to cure the trouble and I eventually found that R288 in the d.c.. feedback loop was high at $50 \mathrm{k}\Omega$ instead of $18 \mathrm{k}\Omega$. If R288 goes open-circuit you get complete field collapse – I tried it out of curiosity!

Hitachi CNP190/CNP192

These sets are built like battleships and seem to soldier on and on. One came in with various complaints that were cured once the main problem was appreciated. The picture was oversize, with a ripple, and the clue was that the h.t. rail was at 150V instead of about 120V. The set h.t. control R911 had no effect and almost every voltage around the series regulator seemed to be 150V. R912 $(18k\Omega)$ which links one end of R911 to chassis turned out to be open-circuit – it must be checked out of circuit. M.B.

Hitachi NP81CQ Chassis

No sound led to a quick check at the d.c. supply pin (pin 10) of the TDA1035S sound channel i.c. The supply was missing, due to a dry-joint at pin 8 of the chopper transformer T901. Note that a lot of intermittent faults are caused by dry-joints in this area.

M.B.

Thorn TX9 Chassis (Stereo)

This stereo sound version of the chassis came in with a tricky problem. Sometimes when the set was first switched on there would be no sound and field collapse! Of course it wouldn't go wrong in the workshop to start with, and when it did go wrong it corrected itself when dismantled. I tried to find a common link between the field and sound circuits on the main board, but there isn't one. There is on the stereo board itself however, since this incorporates 50-60Hz selection for video disc reproduction. Probing here brought to light a hairline crack in the print from PL121/1 to R1243 (12V supply line).

Thorn M2080

The elderly lady who owned this set said that it had spent longer in various workshops than in her own home in the four years she'd had it, while the repairs had cost more than the set itself. The complaint was intermittent tuning instability.

The stabilised supply to the tuning potentiometers was clean, but the output at the tuner was a bit jumpy. The a.f.c. to the tuner was jumping around like a fiddler's elbow but became clean when the aerial was disconnected. So it wasn't an a.f.c. fault. We decided to connect the set's aerial socket to the input of a spectrum analyser and wind the tuning potentiometers to minimum voltage. The tun-



er's local oscillator was found to be rock steady: on winding up the potentiometers the oscillator became more and more unstable. Feeding in a tuning voltage from the bench supply produced the same results, so it seemed that the tuner was at fault. We removed it and fed 12V to the tuning pin, with no other supply, scoping the varicap diodes in turn. One of them had a volt of noise across it while the rest were quiet. Since the tuner is an oddball type that we didn't have in stock we replaced the varicap diode and realigned the tuner. After refitting it the set worked perfectly.

The old lady and I are both a bit puzzled why the last "engineer" called in to deal with the fault disconnected the infra-red remote control unit and charged £45 for doing this. If you're reading this, I hope you feel ashamed! H.A.

Mitsubishi CT2206TX/CT2217TX

For no sound, a green/purple display and no remote control operation check the voltage at the collector of the 12V regulator transistor Q7P1 on the remote control panel. There should be 16V at this point. If it's missing the series resistor R7Q2 (4.7Ω) is probably open-circuit. J.C.

National Panasonic TC492G/TC682GR

For high brightness with flyback lines check the 190V line. You'll probably find this low due to the reservoir capacitor C555 ($10\mu F$) being open-circuit. J.C.

Decca 70/90 Chassis (Touch-button tuning)

In the event of a noisy raster, noisy sound and no LEDs alight, check the voltages on the tuning panel, in particular around the SN76705AN channel selector i.c. The voltage at pin 15 should fall to a low reading when the channel one push button is operated. If this doesn't happen, short the pin to chassis. If this restores results, check the contact between pin 15 of the holder and chassis. If you don't get a short-circuit reading, replace the holder or solder the i.c. into the panel directly.

J.C.

Toshiba C1695

This set wouldn't switch on from standby. We found that the 16.5V supply on the remote control panel was missing due to D408 (BY210) on the mother board being open-circuit.

J.C.

Canal Plus Scrambling

Andy Emmerson

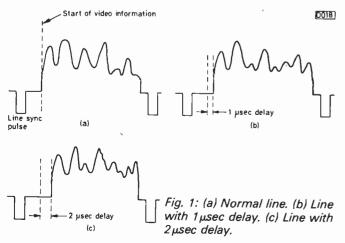
With the official opening of the Canal Plus service on November 4th, pay-TV took to the French airways. It is, I believe, the first instance of a normal, over-the-air TV broadcast service using encryption, in Europe at any rate. The principles involved can be outlined quite easily, but instructions for a DIY decoder would be a different matter!

Canal Plus is France's fourth national TV network. It's organised by the advertising agency Havas and is backed by various financial interests. Subscribers sign up for six months or a year, paying about £10 a month for the programmes – films, interviews, news and sport – and a deposit of some £35 for the decoder. The programming should turn out to be somewhat livelier than the normal French TV fare and is intended for French viewers only: probably for copyright reasons, there will be no foreign subscribers. Reception is nevertheless possible in many parts of southern England Canal Plus is hoping to attract 200,000 subscribers initially. To protect cinema revenue, it's not allowed to announce programme schedules more than two months in advance.

Canal Plus transmissions are mainly in the v.h.f. Bands I and III. Twenty of the planned 57 transmitter sites will use u.h.f. however. Some of the channel allocations and frequencies were given in the October Long-distance Television column. Apart from a v.h.f. aerial, reception requires a hired tuner/decoder and preferably a modern TV set – because the decoder's output is designed to be connected to the set via a SCART socket, which has been a standard feature of new French TV sets for the past three years. To use one of the six million or more pre-1981 sets a modulator costing some £66 is required.

The decoder deals with the encryption of course. Each month paid-up subscribers receive through the post a secret eight-digit number which they tap out on the decoder's keyboard. While the number could easily be discovered (ask your neighbour!) this wouldn't be of much help as Canal Plus repossesses decoders on rental default.

A double scrambling system is used: the sound channel is rendered inaudible by suppressing the carrier, while the picture is scrambled by altering the line timing throughout each frame. The first thing the decoder has to do is to compare the control number keyed in by the subscriber



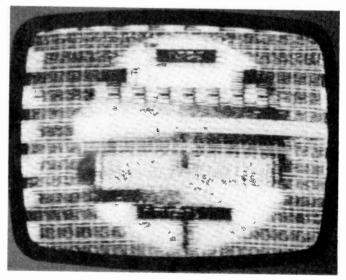
with the equivalent number transmitted by Canal Plus, probably during the field flyback time. If the two correspond the decoder is unlocked, restoring normal sound and vision.

Listening to the encrypted sound on a normal TV set produces a sputtering noise, since it consists of the a.m. sidebands with no carrier. The decoder supplies a carrier so that the receiver can carry out demodulation in the normal manner (the French TV system uses a.m. for the sound channel). The carrier frequency is pretty low, 12-8kHz. There's a reason for using this particular frequency. The oscillator that provides the carrier must have great stability, and the easiest way of achieving this is to reference it to a frequency of known accuracy. The reference chosen is the line frequency, 15-625kHz. When multiplied by 512 (which is a power of two) you get 8MHz. Divide this by 625 and you get 12-8kHz. All this is easy to do using binary counters and phase-locked loops.

If unscrambling the sound encryption appears to be a relatively simple matter the vision signal is rather more of a problem. Whereas in a conventional vision transmission the active video commences at a fixed time after the sync pulse on each line, with Canal Plus the period between the sync pulse and the start of the vision signal varies line by line. As Fig. 1 shows, the delay introduced is either nil, 1μ sec or 2μ sec. It varies in a quasi-random manner line by line. On a conventional set a serrated image is displayed. The decoder deals with the problem by switching compensating delay lines into circuit in the required order.

A six-field sequence is used for the pattern of delays. The decoder holds this sequence in a memory which is likely to be a PROM (programmable read only memory). A reference signal is required to indicate to the decoder the start of the sequence. It takes the form of a peak white signal that indicates the last line of the six-field cycle.

The encryption characteristics described have been noted by observation (not by me unfortunately – acknowledgement is due to the magazine *Science et Vie*). The PROM's programme holds the quasi-random delay sequence but there's nothing to prevent the programme being altered from time to time – provided the alternative programmes have been programmed into the PROM. Signals could be transmitted during the field flyback period to tell the decoder to switch to "sequence two" or whatever. Whether this additional complication has been designed into the system is not so far known.



Effect of the type of scrambling described – photo courtesy of Roger Bunney.

Service ureau

Requests for advice in dealing with servicing problems must be accompanied by a £1.50 postal order (made out to IPC Magazines Ltd.), the query coupon printed below and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

PHILIPS G11 CHASSIS

The set won't start up at switch on - all that happens is that resistors R4019, R4051 and R4052 in the active filter circuit burn up. I've replaced the associated BCX32 transistor but the trouble persists.

This fault is generally caused by the 27V zener diode D4021 (BZX79-C27) which not only burns up the three resistors mentioned by also carries off the two transistors (BCX32 and BD201) in the active filter circuit.

AKAI VS4

There's intermittent sound distortion during playback of prerecorded and self-recorded tapes. Occasionally part of the picture fluctuates sideways when a prerecorded tape is

being played back.

If the sound distortion is in the form of a wow, check that all guide rollers and the capstan are clean and that the reel discs rotate freely. Note whether the tape wrinkles during its passage across the audio/control head - if so the pinch wheel is out of vertical or there's no back tension. Replace the pinch wheel if badly worn. Finally, suspect the. capstan motor: if a scope is available, check for less than 0.5V ripple across the motor in record pause.

TELEFUNKEN 711 CHASSIS

Bowing at the sides was found to be due to the EW modulator driver transistor T591 (BD135) having gone short-circuit. A transistor with the same voltage rating was tried but this blew. The set is otherwise performing well.

The driver transistor needs to be of the correct type and properly heatsinked. Before fitting a replacement, check the two BYX55 modulator diodes D562 and D563 and the pre-driver transistor T592. BYX55s are best replaced with the beefier and better MR854s.

SONY C7

The machine threads but doesn't play. Fast forward won't operate either. With the end-alarm switch on you get the sound and the tape will rewind.

It seems that the forward sensor oscillator has stopped. If pin 8 of IC8 on the syscon panel is above 2V, check the continuity of the connectors and the sensor coil, then suspect the chip.

RANK Z718 CHASSIS

The height has collapsed from full to about half, even with the height control at maximum.

If the field scan is linear, the trouble is likely to be due to one of the resistors in series with the height control. You will probably find that $4R9 (470k\Omega)$ has gone high in

value. If the linearity is poor, check the 32V line then suspect the electrolytic capacitors and transistors in the field timebase. Check back from the output stage to the field oscillator.

PANASONIC NV7000

When play is pressed the tape threads then unthreads. The same thing happens when a timed recording is attempted. The only way to get the machine to play or record is to press the play button then a moment later the forward one.

The syscon is getting a stop message at the end of threading. Watch the drum to confirm that it starts and reaches a reasonable speed within a second or two. If so it's likely that the after-load microswitch is not making or is mechanically defective. Also ensure that the take-up spool gets going - a slipping drive to this will result in the rotation sensor signalling stop to the syscon.

GRUNDIG 1500GB

There's horizontal foldover at the centre of the screen. The line timebase valves have been replaced and all the waveforms seem to be right.

We've seen this fault in similar sets that use valves in the line timebase. It usually stems from lack of decoupling in the line oscillator stage: check C609 (16µF) by substitution. This set is a bit unusual in having a transistor driver stage: if the oscillator is o.k., check this transistor (Tr621, BF259G) and its base bias resistor R623 (1.2M Ω).

NATIONAL PANASONIC TC381G

The line output transistor was replaced using a BU208 instead of the 2SD299 originally fitted. This lasted for a month or so then went short-circuit. Is there some intermittent condition that's killing off the line output transistors?

It's important to use a genuine 2SD299 in this set. Before switching on after fitting a replacement, check the condition and jointing of R520, which is in series with its base, and the line driver transformer T502; also check the anti-breathing resistor R527 (5.6 Ω , 5W) and the efficiency diode D503 (for leakage).

SONY C7

Playback of programmes recorded on this machine is accompanied by severe smearing that cannot be improved with the tracking control. All other functions work perfectly and the only other fault we've had has been the usual rewind problem.

If replay of prerecorded tapes is o.k. and the selfrecorded tapes are smeary rather than having a tracking band the problem lies in the luminance record department. Oscilloscope checks in this area should pinpoint the

QUERY COUPON

Available until 19th December 1984. One coupon, plus a £1.50 (inc. VAT) postal order, must accompany EACH PROBLEM sent in accordance with the notice printed above.

TELEVISION DECEMBER 1984

cause of the fault. If no fault can be found, or tracking is a problem with playback of the machine's own tapes, it's likely that the head drum is in need of replacement.

NATIONAL PANASONIC TC2201

The complaint with this set is sound but no picture. The c.r.t. cathode voltages are high but nothing else seems to be amiss. Apparently there was low saturation before the screen blanked out. I suspect the AN281 chroma demodulator/output chip – any other ideas?

First make sure that the 12V supply is present and correct. If so, check the luminance amplifier transistors and clamp transistor TR605. It could be that the beam limiter transistor TR604 is turning down the brightness because it thinks the beam current is excessive. Condemn the AN281 only if its output pins 11, 13 and 15 are at a low voltage.

RANK T22 CHASSIS

When the field output stage bias preset is adjusted correctly as given in the manual there's bottom foldover. Increase the bias so that the voltage at 4C1 is 20V instead of 16.5V and the foldover has gone, though it's difficult to get reasonable linearity. The field output transistors have been replaced and when the bias is set correctly all the voltages in the output stage seem to be correct.

Some samples of the 17466 transistors used in the output stage can show a tendency to produce this fault. It's sometimes worth swapping over 4VT3 and 4VT4, or trying a different make in the 4VT4 position. The trouble can also be caused by the 36V line having a high source impedance. If a scope across 4C4 shows a parabolic

waveform, check this electrolytic and the 36V line. Other possibles are diodes 4D1/2, the field scan coupling capacitor 4C1 and the amplifier/driver transistors 4VT1/2. Finally ensure that 4VT2's load resistor 4R4 (1k Ω) hasn't changed value.

ITT CVC20 CHASSIS

With the chassis in the working position there are three or four black lines at the bottom on the screen. When the chassis is hinged back about four-five inches they disappear.

First check that the c.r.t.'s Aquadag coating is properly earthed, then check for dry-joints around the NS correction transductor and the NS phase coil. That there's a problem in this area can be confirmed by shorting out C30, i.e. shorting out the NS correction circuit. If necessary check transistor T9 in the field output stage and the flyback blanking pulse coupling capacitor C24 $(1\mu F)$.

GRUNDIG GSC100 CHASSIS

Two-three minutes after the set is switched on there's suddenly a half inch foldover at the bottom of the screen while the top third of the raster is distorted and slightly brighter than the rest. The field timebase module has been checked by replacement, also the scan coupling capacitor, the components in the centring circuit, and C628 which is the reservoir capacitor for the 18-6V line that supplies the field timebase.

The checks already made don't leave very much! It seems likely that the cause of the trouble is in the supply to the field timebase. We have had a case of a high-resistance fuse (Si627) here. Otherwise, suspect the recti-

CAPACITORS	68 Grundig 3010/15003.0
91 5 × .0047/1500 AB23	69 Thorn 3500 7.5
Chassis 1.50	70 Thorn 8500 5.4
92 10 × 220MFD 16V	71 Philips G8 6.3
Elect 0.50	72 Pye 731 4.5
93 10 × .047MFD 400V	89 10 × Anti Track EH
Mul Pol 0.50	Cap 2.0
94 5 × 4.7/100V C514	Cap Z.u
T3500 1,25	
95 5 × .47/1000	
Dubilier 3.00	
97 10 × 0.1/2000V	
W/E 2.00	INTEGRATED CIRCUITS
98 5 × 1/250 Supp ITT	140 5 × TDA440 3.00
etc. 1.50	141 5 × TBA120AS 1.80
,,,,,	142 5 × TBA540 4,00
EHT TRAYS	143 5 × TBA540Q 4.00
50 ITT CVC 5/9 3,00	145 5 × TBA560 3.50
51 Decca 1730/1830 5,00	146 5 × TBA810S 3.00
52 Decca 80 Series 4.50	147 5 × TBA9200 4.50
53 GEC 2040 Hybrid 3.00	148 5 × TBA990 3.25
54 T1500 5 Stick 3.50	149 5 × TBA520Q 4.00
55 Thorn 9000 7,00 1	150 5 × TBA530 4.25
56 Thorn 1400 2.00	151 5 × TBA950 4.50
57 Philips G9 3.50	154 10 × TCA270SQ 4.00
58 Universal ITT Type 4.50	155 5 × MC13270 2.50
59 5 × TV11 EHT Rec for	160 TDA1170 1.35
PTV's 1.00	161 TDA1190 1.90
60 3 × TV45 EHT Rec	162 TDA1006A 1.45
Z718 1.00	164 TDA1035 1,83
61 ITT CVC 45 4,00	165 TDA1044 2.23
63 RRI Z179 3.00	166 TDA1190 1.90
64 Pye 691/697 3.50	167 TDA1412 0.90
65 Pye CT200 4 Leed 3.50	172 TDA2002 1.80
66 Pye CT200 5 Leed 4.50	173 TDA2020 2.50
67 Korting 90 DGR	174 TDA2030 2.15
Hyb 5.00	178 TDA2523 2.35
<u> </u>	
All components as	a A1 muslim f
All components are	e A i quality from
prime manufacture	ers, and are dis-
natched by nost so	

All components are A1 quality from prime manufacturers, and are dispatched by post same day as order received together with any refund due. All goods should be delivered within 4 working days.

Please add 15% VAT and 90p P & P

9 TDA2532 0 TDA2540 1 TDA2541 2 TDA2560 3 TDA2561 4 TDA2591 5 TDA2593 0 TDA2600 1 TDA2611 2 TDA2640	2.40 1.65 2.67 3.28 2.15 0.98 2.23 4.00 1.24 2.35	030 GEC 2100 Hybrid 4,00 032 Thorn T × 9 Chass. 14,50 033 Philips KT3 8,00 035 Philips KT3 8,00 035 Sanyo CTP5101 9,50 037 Split Diode EHT Lead 1,35
D ETTR6016	2.28	
1 ETT6016	2.28	PUSH BUTTON UNITS
2 BTT6018	2 28	110 Pvo 713 4 Wey 747

	114 Thorn
	115 Thorn
LINE OUTPUT TX	116 Decca
001 Philips G8 7.50	117 Decca
002 Decca 30 Series 7,00	118 GEC 2
003 Decca 100 Series 6.50	119 G
004 ITT CVC 25/30/32 7.00	Tapered
005 Philips G9 7.50	120 TT CV
006 RRI T20 9.92	121 ITT CV
007 RRI A823 7.00	122 ITT
008 RRI Z718 18" 18.95	V.C.R.
009 RRI Z718 20/22/26"	123 RRI A8
18.95	124 Hitachi
010 RRI A774 Mono 10.87	125 RRI T2
011 Thorn 1690/91 7,00	125 IIII 12
012 Thorn 1615 6.50	
012 117011 1013 8.30	

220 SL901B Int Circuit 5.00

010 RRI A774 Mono 10.87 011 Thorn 1690/91 7.00 012 Thorn 1691/91 7.00 013 ITT CVC 45 6.50 013 ITT CVC 45 6.50 014 Phil TX Chass. 5.00 015 RRI Ranger 1/2 5.00 016 ITT CVC 5/9 8.50 017 Philips E2 Chass. 5.00 018 Thorn 9500 9800 8.50 020 Polish 161 Mono 6.00 021 Thorn 9500 Scant 4.50 022 Thorn 1590/91 8.50 023 Thorn 1590/91 8.50 024 Thorn 1500 154V 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 028 Pye 691 (wired) 5.00		18.95	1
012 Thorn 1615		010 RRI A774 Mono 10.87	1
013 ITT CVC 45 8.50 014 Phil TX Chass. 5.00 015 RRI Ranger 1/2 5.00 016 ITT CVC 5/9 8.50 017 Philips E2 Chass. 5.00 018 Thorn 9500 9800 8.50 019 Thorn 9500 9800 8.50 020 Polish 161 Mono 6.00 021 Thorn 3500 Scant 4.50 022 Thorn 8500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1500 154V 4.00 025 GEC 2040/2100 Hybrid CTV 026 Bush 161 Mono 5.00 027 GEC Single Std Mono		011 Thorn 1690/91 7.00	1
013 ITT CVC 45 8.50 014 Phil TX Chass. 5.00 015 RRI Ranger 1/2 5.00 016 ITT CVC 5/9 8.50 017 Philips E2 Chass. 5.00 018 Thorn 9500 9800 8.50 019 Thorn 9500 9800 8.50 020 Polish 161 Mono 6.00 021 Thorn 3500 Scant 4.50 022 Thorn 8500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1500 154V 4.00 025 GEC 2040/2100 Hybrid CTV 026 Bush 161 Mono 5.00 027 GEC Single Std Mono		012 Thorn 1615 6.50	⊢
014 Phil TX Chass. 5.00 015 RRI Ranger 1/2 5.00 016 ITT CVC 5/9 8.50 017 Philips E2 Chass. 5.00 018 Thorn 9000 12.00 019 Thorn 9500/9600 8.50 020 Polish 161 Mono 6.00 021 Thorn 3500 Scart4.50 022 Thorn 8500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1500 15KV 4.00 025 GEC 2040/2100 Hybrid CTV 026 Bush 161 Mono 5.00 027 GEC Single Std Mono		013 ITT CVC 45 6.50	1
015 RRI Ranger 1/2 5.00 016 ITT CVC 5/9 8.50 017 Philips E2 Chass. 5.00 018 Thorn 9000 12.00 019 Thorn 9500/9600 8.50 020 Polish 161 Mono 6.00 021 Thorn 3500 Scant 4.50 022 Thorn 8500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1500 154V 4.00 025 GEC 2040/2100 Hybrid CTV 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 6.00	٠	014 Phil TX Chass 5.00	ı
016 ITT CVC 5/9 9.50 017 Philips E2 Chass. 5.00 018 Thorn 9000 12.00 019 Thorn 9500/9800 8.50 020 Polish 161 Mono 6.00 021 Thorn 9500 Scant 4.50 022 Thorn 9500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1590 154V 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 6.00			1
017 Philips E2 Chass. 5.00 018 Thom 9000 12.00 019 Thom 9500/9600 8.50 020 Polish 161 Mono 6.00 021 Thom 9500 Sent 4.50 022 Thom 9500 11.00 023 Thom 1590/91 8.50 024 Thom 1500 15KV 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00		016 FTT CVC 5/9 8.50	1
018 Thorm 9000 12.00 019 Thorm 9500/9800 8.50 020 Polish 161 Mono 6.00 021 Thorm 3500 Scant 4.50 022 Thorn 8500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1500 154V 4.00 025 GEC 2040/2100 Hybrid CTV 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00		017 Philips F2 Chass 5.00	ı
019 Thorm 9500/9800 ILS0 020 Polish 161 Mono & ILD 021 Thorm 3500 Scart 4.50 022 Thorm 8500 11.00 023 Thorm 1590/91 ILS0 024 Thorm 1590/91 ILS0 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00		018 Thorn 9000 12 00	1
020 Polish 161 Mone 6.00 021 Thom 3500 Scant 4.50 022 Thom 8500 11.00 023 Thom 1590/91 8.50 024 Thom 1590 154V 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00			1
021 Thorn 3500 Scent 4.50 022 Thorn 8500 11.00 023 Thorn 1590/91 8.50 024 Thorn 1500 15KV 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00			ı
022 Thorn 8500 11.00 023 Thorn 1590/91 0.50 024 Thorn 1500 15KV 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00			l
023 Thorn 1590/91 8.50 024 Thorn 1500 15KV 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00			l
024 Thorn 1500 15KV 4.00 025 GEC 2040/2100 Hybrid CTV 4.00 026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00		023 Thorn 1590/91 # 80	l
025 GEC 2040/2100 Hybrid CTV 4,00 026 Bush 161 Mono 5,00 027 GEC Single Std Mono 5,00		024 Thorn 1500/51 8.30	
026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00		025 GEC 2040/2100 Hubrid	l
026 Bush 161 Mono 5.00 027 GEC Single Std Mono 5.00			l
027 GEC Single Std Mono 5.00			
Mono 5.00			1
			ı
OZU I YO USI (WREU) S.OU			
		UZO FYO DST (WIREU) 5.00	

110 Pye 713 4 Way 7.87 111 Pye 715 6 Way 11.95 112 Phil G8 Square 12.75 113 Phil G8 Sloping 14.98 114 Thorn 9000 2.59 115 Thom 1615 4 Way 7.87 116 Decca 6 Way 8.95 117 Decca 4 Way 6.50 118 GEC 2110 6 Way 7.95 119 GEC 2136/7
119 GEC 2136/7 Tapered 7.95 20 ITT CVC5 9.25 121 ITT CVC8 11.45 122 ITT 6 Way with V.C.R. 7.95 123 RRI A823 etc. 7.95 124 Hitachi 4 Way 7.95 125 RRI T20 6 Way 8.95
SM0 OTHING CAPACITORS 80 220/400 CVC32/ T20 1200 Pye 691 2.00 81 200 +300 Pye 691 2.00 82 600/300 Phil 68 1.90 3 175 +100 +100 13500 1.50 94 2000/100 Volt 0.50 84 470 Mfd G11 1.50

80	220/400	CVI	C32/
T20)		1.20
81	200 +300 F	ve 691	2.00
82	600/300 Pt	nil G8	1.90
83	179	5+100+	-100
T35			1.50
	2000/100 V		0.50
	470 Mfd G1		1.50
86	400 +400 D	ecca 30	
			2.50
	200 + 200 +	75+25	ITT
	C5/9		1.50
88 4	400/400V T	ho 9000	1.50
	4700/25 T	horn 19	590/
91			0.60
_	-	_	
			Т.

CDECIFIC COMPONENTS
SPECIFIC COMPONENTS
351 Thorn 1591
Speaker 2.00
352 Thorn 1600
Dropper 0.50
353 T × 10 Preset
Drawer 3.00
354 T × 10 CRT Base
Assy 4,00
355 3" Round BR
Speaker 1.00
358 5 × Tho/3500 200
Conv. Pot. 1.00
359 5 × Tho/3500 50A
Conv. Pot. 1,00
360 5 × TCE3500 A1
Rectifier 0.75
362 T9000 Rem. Receive
Assy 5.00
363 T3500 Mains TX 5.00
364 T8500 Mains TX 7.50 365 T8500 (PLastic) Cut
365 T8500 (PLastic) Cut
Out 1.50
370 Pye 731 Thick Film
Resis. 1.50
371 Pye 713/731 Vis. Gain
Mod. 6.50
372 Pye 731 3R3 50W Metal cld. 129
Metal cld. 1.29 373 100K ×3 Drawer P'set
Alt Pve 731 2.00
378 Grundig 5010/6010
Vid Mod. 4.00
384 5 × 10R Phil. G8
Conv. Pot. 2.40
385 5 × 15R Phil. G8
Conv. Pot. 2.40
386 5 × Phil. G8 2k×2
Lin. Bright. 2.50
387 5 × Phil. G8 10k Log.
Colour 2.50
388 5 × Phil. G8 47k Log.
Vol. 2.50
389 G8 Plastic Mains

	_			
390	G8	Meta	I N	lains
SWI	tch			1 23
391	GR	Line	Stor	/Eal
Coil	-		0101	2.25
303	Ce	R/G	e	22
Coil	00	n/u	Syn	wu)
				3.33
39/	ZŪ	× 3.1	5A	A/S
ZUM	m Hus	e × 800		1.50
398	20 :	× 800	MA	A/S
20m	m Fus	8		1.50
399	20 ×	25A A	/S 2	Omer
Fuse				1.40
400	20 ×	2A A	/S 2	Dram
Fuse				1.40
401	20 ×	1A A	/S 2	Omm
F				
402	20	× 1.2	5A	A/S
ZUTTI	n rus	8		1.40
403	5 ×	RRI T	20 1	ube
Rase				4 36
410	Phil. (311 E/	₩L	oad/
Coil				1.50
411	Phil.	G11	Bri	idge
TX				1.50
412	P	hillips		G11
Spea	ker			1.00
413	10 >	< TDA	.2600	IC
Hold	9F			1.50
415 I	ALK	T3 Spe	aker	1.50
135	10 ×	Decca		
Fusib	(8	_		0.50
136) ×	Decca	30	389
MOGI	nopm			1.75
M/	Dec	ca 3 :h	J U	47k
VOL +	Switc	in .		1.25
103	າ ×	5R (Jnive	rsel
Onv	Pot.			1.00
154) X	20R L 100R L	Jnive	rsal
JOHV.	POT.	1000		1.00
000 ;) X	IUUN C	JINNE	rsal
JOHY.	POL.	470R L		1.00
000) X '	4/UH C	JUINE	rsei
JUIIV.	rot.	100L T	/	1.00
יאי ו	u X	100k T	un/h	185
IER E	10.	1006	т.	3.00
roes Too	t GP	100k	. 14	190
. 636 159 F	I C 104	3/05 Ti		3.00
E		3,03 11	#181 1	5.00

460 ELC1043/06 Tuner
6.00
461 U321 New Tuner 7.95
462 U322 New Tuner 7.95
463 98003 Posister 0.99
464 98009 Posister 0.99
465 Mull.DL50 Delay
Line 0.95
466 5 × VA1104 2.70
469 Cut Out Metal GEC
2100 1.00
470 5 × GEC2100 3 Leg
Thermist. 1.00
479 5 × Gen. Purp. Ro-
tary Swtch, 3.60
480 5 × Gen. Purp.Push/
Swtch. 3.75
481 20 × Neons GEC
etc. 2.25
482 5 × Univ. Aerial Skt.
Kit 5.50 483 10 × Metal Coax
Type 1.25 485 Foc/Unit Thorn 8500
485 Foc/Unit Thorn 8500 Type 1.25
486 4.43Mhz Crystal 0.40
488 10 × Ring Type Spk/
Gap 1.50
496 TX10 Chass. Focus
497 De-Soldering
97 De-Soldering Pump 3.50 198 1 × 10 Trimming
498 1 × 10 Trimming
Tool 1.00
TRANSISTOR/DIODES
220 10 60100 6.00

235 50 × BC213L	2.50
250 10 × BD124	9.00
251 10 × BD131	1.60
270 10 × BU208A	8.50
271 10 × BU208	7.50
272 10 × BU326	10.00
273 5 × BU205	3.75
280 25 ×	2N3055
(Texas)	7.50
281 10 × 2N2905	(Equiv.
BC161/303)	0.50
290 10 ×	BT106
Thyristor	9.00
292 5 × BT119	4.50
293 5 × BT120	4.50
335 50 ×	BY127
Diodes	3.00
340 25 × TIP41A	6.50
341 25 × TIP41C	7.00

QUICK SAVE T.V. SPARES

MUXTON HOUSE, MUXTON, TELFORD, SALOP.
REG. OFFICE ONLY. CALLERS STRICTLY BY APPOINTMENT. UK ONLY. PLEASE QUOTE STOCK NO.

fier diode Di627 or dry-joints at pins e or i on the line output transformer. A scope check on the 18-6V line when the fault is present should show what's happening.



264

Each month we provide an interesting case of television servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

Monochrome portables seem to have a very long life – we regularly see ten and twelve year old specimens in good condition. Well made sets getting only occasional use will probably last for many more years, but a recent servicing job involving a Ferguson Model 3816 (1590 chassis) put years on us! It's easy to get blasé about simple monochrome sets and the diagnosis of their ills. Now and again however we come across really sticky faults that are interesting, intriguing even, but don't do much for the workshop production schedule or the bottom line of the profit/loss account.

Such a job has just passed through the mill. The symptoms were plain enough – complete loss of sync and a vastly over-contrasted display. On the strength of this we decided that some sort of a.g.c. problem was present and a modest estimate was given to the owner. This was accepted, and with a "ready tomorrow" promise we hung up the phone and returned to the set.

The sync separator transistor VT7 is followed by a phase-splitter transistor VT8 which drives the flywheel line sync discriminator diodes and also provides the field sync pulse feed from its collector. An oscilloscope check at VT8's collector showed that there were no sync pulses at this point. This proved to be due to the transistor's collector being open-circuit. A replacement restored sync of sorts but the picture was jittery, wobbly and had a "soot and whitewash" effect, indicating problems elsewhere.

The voltages at the emitters of the gain-controlled i.f. amplifier transistors VT2 and VT3 and the video driver transistor VT6 were way out, so to avoid a chicken-and-egg puzzle in the a.g.c. department we connected a 6V battery across the a.g.c. reservoir capacitor C2, thus overriding the a.g.c. action and providing the correct d.c. conditions for VT2 and VT3. This gave us a correct-level video output from the vision detector diode W2 (manual waveform B) with the contrast now at a reasonable level. The sync performance was still very poor however, with ragged verticals and horizontal pulling: field lock would be lost at the drop of a hat.

The cause of this seemed to lie in the video driver stage – the sync separator transistor is driven from the collector of the video driver transistor VT6. We found that the

voltage at this point was abnormally high, the signal level being low and "crushed". VT6's collector and emitter load resistors were both o.k., so we turned to the base where the voltage was markedly low at some 1.8V instead of 5V. This voltage is normally set up by the potential divider network R32/33, which produces 5.8V across the decoupling capacitor C36 – the output from the vision detector is superimposed on this bias voltage.

Why was the voltage at this point so low? Literally every component between the collector of the final i.f. amplifier transistor VT5 and the base of VT6 was checked and double checked. The voltage across C36 stood at about 3V: increasing this by artificial means increased VT6's conduction but still wouldn't reduce its collector voltage (normally 8.5V) below about 12V! We came to the conclusion that some spurious signal was present in the i.f. stages and was being rectified by the vision detector diode to produce a large negative offset voltage across C36. This theory was checked by turning VT5 off (base-emitter leadouts temporarily linked). VT6's base voltage then rose, but only to about 2.5V. Its collector voltage remained high.

The breakthrough came when we monitored VT6's collector signal with the scope while VT5 was cut off. There still appeared to be sync pulses present! They were upside down however, and therein lay the key to the whole sorry business. You've had an easier ride through the diagnostic process than we had, so we're sure you'll have the answer before it's published in the next issue . . .

ANSWER TO TEST CASE 263 - page 49 last month -

Last month we had a line drift with a difference fault – the trouble was with a Panasonic TC481GR which suffered from intermittent loss of line hold. Our extensive checks in the line oscillator and flywheel sync circuits had been quite fruitless.

Now this set incorporates an excess-voltage protection circuit that comes into operation in the event of excessive flyback pulses being generated in the line output transformer. The output from one pulse winding is rectified and monitored by an 11V zener diode which, when it conducts, switches on a pair of transistors (TR551/2) that latch on and short out the supply to the line oscillator transistor. This of course shuts everything down by way of protection. What's significant however is that the oscillator transistor's supply voltage is crucial to the frequency generated. So the protection circuit mustn't load this down in any way.

We found that the symptoms disappeared when we disconnected the protection line and that a varying resistance to chassis was present on the now open-circuited line. Replacing the protection transistors TR551/2 did the trick, though why they didn't latch on when this leakage effect was present remains a mystery. Incidentally the official circuit diagram is incorrect, which doesn't help with a fault like this – it shows a connection from the base of the line oscillator transistor to the protection circuit.

Published on approximately the 22nd of each month by IPC Magazines Limited, King's Reach Tower, Stamford Street, London SE1 9LS. Filmsetting by Trutape Setting Systems, 220-228 Northdown Road, Margate, Kent. Printed in England by The Riverside Press Ltd., Thanet Way, Whitstable, Kent. Distributed by IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF. Sole Agents for Australia and New Zealand – Gordon and Gotch (A/sia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions: Inland £11, overseas (surface mail) £12 per annum, payable to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex RH16 3DH. "Television" is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever. ISSN 0032-647X.

VHS COLOUR CAMERAS

Mains/Mains Battery Portable

TESTED

WORKING

EXPORT

Multiband CTVs 22" & 26"

Grundig/Philips 2000 Series Video Recorders

PLUS

17" 18" 20" 22" 26" Hybrid/ Solid State CTVs

Discount for Quantities

COMING SOON

14" 16" 18" Japanese in Quantity

JOHN CARTER (Electrical) LTD FURNACE ROAD, GALLOWS INN, ILKESTON

Phone: 0602 303124

NO WORKERS!

WITH OVER 1,000 ARRIVING WEEKLY WE DON'T HAVE TIME

ALL SETS UNTESTED

WE ARE ONE OF THE OLDEST ESTABLISHED EX-RENTAL DEALERS WITH THE SAME RENTAL COMPANY FOR OVER 15 YEARS.

LOW SUMMER PRICES

GEC S/State£15
GEC Hybrid£8
BUSH 1 and 2 Chip£10
DECCAfrom £10
AUTOVOX£15
NORDMENDE£15
SALORA S/State, some Remotes£15
SALORA Hybrid£8
TANDBERG S/State Dual Tuners £20
TANDBERG Hybrid Dual Tuners£8
PHILIPS G8from £10
17" THORN£15
22/26" THORNfrom £10
MONO 20" S/STD£5
MONO 24" and D/STD£1

BEST DEAL IN U.K.

CASH ONLY, IT DOESN'T BOUNCE!

MIXED LOADS DIRECT FROM SOURCE AVAILABLE AT KEEN PRICES

FRANK FORD

(TV TRADE DISPOSALS) SCHOOL LANE, GUIDE, BLACKBURN, LANCS. Telephone: 0254 64489

							_		14 15 16	of Real Property	IV.V		1		T			THE REAL PROPERTY.	COLUMN	
AA117 -	9р	BC328	6р	BFX85	20р	TIP112	54p	2N3773	100p	BY×70/500		DY802	45p 40p	4042 4043	58p	7482 7485	70p 45p	74LS367 52p 74LS399 85p	HA-1368 190p LA-1201 120p	TCA270 40p TCA800 80p
AA119	9p	BC557	6p	BFX87 BFX88	15p	TIP115 TIP117	45p	2N3819 2N3866	29p 68p	BY>70/800 BY>71/600	36p 80p	ECC82 ECC83	43p	4044	56p	7486	28p	74LS670 130p	LA-1365 170p LA-3301 180p	TCA940 85p TDA1170 90p
AAY32 AC107	9p 28p	BCY32 BCY33	150p	BFY50	14p	TIP120	43p	2N4031	25p	OA47 OA90	6р 4 р	ECC84 ECC85	40p 40p	4047	65p 49p	7489 7490	100p		LA-3350 150p	TDA1412 60p
AC126 AC127	17p	BCY34 BCY42	150p 20p	BFY51 BFY52	14p	TiP121 TiP122	46p 47p	2N4036 2N4037	25p 25p	OA91	4p	ECH81	49p	4049	40p	7492 7493	45p 35p	LINEAR IC'5 LM324 30p	LA-4031 140p LA-4032 190p	TDA2002 80p TDA2003 150p
AC127 AC128	15p 15p	BCY56	16p	BFY56	25p	TIP125	47p	2N4443	76p	OA200 OA202	7p 7p	ECH84 ECL80	52p	4050 4051	40p	7495	48p	LM380 60p	LA-4051 250p	TDA2020 140p TDA2030 140p
AC128K AC141K	23p 23p	BCY70 BCY71	16p	BFY57 BFY64	25p 25p	TIP126 TIP127	56p	2N4444 2N5061	76p 20p	IN914	2p	ECL82	59p	4052	61p	7497 74107	30p	LM381 100p LM709Dil 30p	LA-4101 140p LA-4102SK 140p	TDA2522 90p
AC142K	22p	BCY72	16p	BFY90	60p	TIP147	100p 34p	2N5294 2N5296	30p 30p	IN4001 IN4002	4p	ECL84	57p	4053	61p 85p	74111	52p	LM723 32p	LA 4420 150p	TDA2530 90p TDA2532 90p
AC153K AC176	23p 18p	BD115 BD124P	26p 50p	BR100 BSX20	14p	TIP2955 TIP3054	38p	2N6106	40p	IN4003	4p	ECL85 ECL86	57p 49p	4055 4056	90p 85p	74116 74119	85p 85p	LM741Dil 15p LM741 Met 45p	MB3712 150p	TDA2640 75p
AC176K	20p	BD124	110p	BT106 BT109	90p	TIP3055 TIS43	34p 45p	2N6107 2N6109	40p	IN4004 IN4005	4p	EF80	31p	4060	72p	74122	40p	LM3900 25p	MC1327 70p SAS560 110p	TDA2560 75p TDA2593 100p
AC187 AC187K	15p 20p	BD128 BD131	35p 25p	BT116	80p	TIS44	40p	3N128	55p	IN4006 IN4007	4р 5р	EF85 EF89	34p	4066 4068	42p	74123 74125	20p 40p	NE556 40p	SAS570 110p	TDA2690 80p
AC188 AC188K	17p 23p	BD132 BD135	25p 20p	BT119 BT120	100p	TIS61 TIS88A	15p 45p	3N143	65p	IN4148	2p	EF183	45p	4069	27p	74126 74132	45p 42p	AN-214P 200p AN-240P 150p	\$N76003N 140p \$N76013N 140p	UPC-555H 60p UPC-556H 80p
ACY18	48p	BD136	20p	BU104	100p	TIS90	15p	JAPANES TRANSIS		IN5400 IN5401	9p 10p	EF184 EL34	53p 190p	407 0 40 7 1	27p 27p	74141	55p	AN-360 120p	SN76023N 140p	UPC-575C2 100p UPC-577H 150p
ACY19 AD142	48p 60p	BD137 BDY92	20p 100p	BU105 BU108	80p 100p	TIS91 TIS93	18p 20p	2SA73	30p	1N5402	10p	EY86 EY87	31p	4072 4073	27p	74145 74153	70p 45p	AN-7110 150p AN 7114 170p	SN76033N 150p SN76110N 70p	UPC-592H2 120p
AD149	45p	BD138	20p	BU110 BU111	110p	VK1010	88p	2\$A104 2\$A198	32p 32p	IN5403 IN5404	11p	PC97	100p	4075	27p	74155	45p	AN-7115 180p	SN76115 70p T2800D 52p	UPC-1025H 300p UPC-1026C 140p
AD161 AD162	22p 22p	BD139	20p	BU126	140p 70p	VN10KM	60p	2SA203	30p 25p	IN5405	12p	PCC85 PCF80	42p 58p	4076 4077	70p 27p	74157 74160	45p 50p	AN-7120 150p AY3-1270 680p	TA-7120 100p	UPC 1028H 160p
AF124	25p	BD140 BD144	20p 90p	BU204 BU205	75p 70p	VN46AF VN66AF	88p	2SB54 2SB77	32p	1N5406 1N5407	13p	PCF200	135p	4078	27p	74164	50p	AY3-1350 300p AY3-8910 360p	TA-7137P 110p TA-7200 200p	UPC-1031H2 180p
AF125 AF127	25p 25p	BD150	30p	BU208	75p	VN88AF	115p	2\$B337 2\$B405	120p 22p	IN5408	13p	PCF801 PCF802	110μ 57μ	4081 4082	27p 27p	74167 74173	35p 50p	AY3-8912 400p	TA-7201 200p	UPC-1032H 70p
AF139 AF239	22p 22p	BD157 BD158	38p 38p	BU208A BU208D	80p 120p	VN89AF	110p	2\$C460	21p	LOW PRO	FILE	PCF806	115p 100p	4093	45p	74174 74175	75p 65p	AY5-3600 570p CA270 40p	TA-7203 240p TA-7204 110p	UPC-1156H 200p UPC-1181H 120p
AL112	70p	BD166 BD175	30p	BU326	85p	ZTX107 ZTX108	11p	2SC495 2SC733	60p	8pin	6р	PCH200 PCL81	54p	4094 4098	85p 85p	74176	45p	CA3046 60p	TA-7205P 90p TA-7210 200p	UPC-1182H 150p UPC-1185H2
AL113 ASZ15	80p	BD177	30p	BU406 BU407	85p 75p	ZTX109	12p	2SC1161	110p	14pin 16pin	8p	PCL82 PCL84	63p	4099 4501	82p 40p	74180 74182	50p 45p	CA3048 190p CA3060 280p	TA-72222AP	250р
ASZ17	100p	BD179 BD181	32p 45p	BU408 BU500	100p	ZTX212 ZTX300	27p 13p	2SC1172Y 2SC1279	150p 24p	15pin	12p	PCL85	55p	4502	55p	74192	40p	CA3080E 70p CA3086 25p	TA-7310P 100p	MEMORIES
AU110 AY102	180p	BD182	60p	BU526	80p	ZTX301	16p	2SC1306 2SC1307	100p	20pin 22pin	14p 16p	PCL86 PCL805	55p 55p	4503 4504	52p 75p	74196 74197	45p	CA3089E 150p	TAA550 16p	2114 200p 2716 300p
AY106	180p	BD183 BD201	60p 33p	C106D MJ2500	23p 100p	ZTX302 ZTX303	24p	2SC1520	25p	2ªpin 28pin	18p 20p	PFL200	85p 80p	4506 4507	110p 45p	74393	70p	CA3090AC 300p CA3130E 80p	TBA120S 45p TBA395 60p	2516 200p
BA145 BA148	10p	BD202 BD203	38p 42p	MJ2501	110p	ZTX304 ZTX320	17p 29p	2SC1969 2SC2029	130p 120p	40pin	25p	PL36 PL504	95p	4508	125p	74LS00 74S04	40p 45p	CA3130S 100p	TBA396 60p	2532 400p 2732 400p
BA154	10р 6р	BD204	42p	MJ2955 MJ3000	55p 115p	ZTX326	29p	2SC2078	120p	ZENERS		PL508 PL519	190p 450p	4510 4511	57p 57p	74LS08	20p	CA3140E 45p CA3189E 250p	TBA530 80p	2764 700p
BA157 BB101	12p 13p	BD222 BD225	31p 31p	MJ3001 MJE29A	115p 30p	ZTX500 ZTX501	13p	2SC2122A 2SC2952	200p 27p	400MV BYZ88 Ran	00	PY81	70p	4512	57p	74LS09 74S10	18p 35p	CA3240E 90p HA-1156W 160p	TBA540 75p TBA560 80p	4116 75p 4164 380p
BB103	16p	BD232	31p	MJE30A	30p	ZTX502	18p	2SD234 2SK135	37p 400p	2V7 to 39V	6р	PY88 PY500A	48p	4513 4514	120p 110p	74\$11	18p	HA-1197 180p	TBA750 100p	6116 600p
BB105B BB205B	18p 24p	BD234 BD237	32p 21p	MJE340 MJE350	25p 80p	ZTX503 ZTX504	18p 25p	MB3712	150p	1.3W Zene EZX61 Ran		CMOS	,,,,	4516	65 p	74S14 74LS20	40p 25p	HA-1306W 220p HA-1319 250p	TBA800 35p TBA810S 60p	1 6809 600p
BC107	7p	BD238 BD433	24p 28p	MJE520	30p	ZTX550	24p	TA7205 UPC575	90p	2V7 to 39V	12p	4000	27 p	4518 4520	65p 65p	74LS30	35p	HA 1339 220p	TBA820 75p	6821 150p 6840 320p
BC108 BC109	7p 7p	BD437	28p	MJE2955K		2N1131	28p	DIODES		VOLTAGE		4001	27p 27p	4522 4526	60p	74LS32 74LS38	60p 40p	HA-1342 200p HA-1366WR	TBA920 80p TBA950 80p	6850 130p
BC115 BC118	10p	BD535 BD536	38p 38p	OC28 OC29	100p 80p	2N1132 2N1613	28p 24p	AA119	9р	REGULAT 7805	35p	4006	80p	4527	60p	74LS73 74LS74	28p 35p	200p	TBA990 80p	8116 80p
BC140	19p	BD537	40p	OC35	100p	2N1711	24p 24p	BY100 BY103	40p 32p	7812 7815	35p 35p	4007 4008	27p 65p	4528	65p	74LS75	38p			
BC141 BC142	19p	BD538 BDX32	40p 100p	OC36 OC45	120p 50p	2N2218A 2N2219	24p	BY126	6р	2818	35p	4009 4010	50p 50p	74 SE	RIES 22p	74LS76 74LS86	30p 38p	Diagno ad	d 50p P&P	and VAT at
BC143 BC147	19p	BDX65 BF180	80p 16p	OC71	30p	2N2221 2N2222	23p 23p	BY127 BY133	8p 8p	7824	35p 35p	4011	27p	7401	16p	74LS112	40p 32p	Please ad	u Supran	ete Ordere
BC148	6р 6р	BF181	18p	OC72 OC200	50p 180p	2N2369	15p	BY164 BY176	22p 85p	7912	40p	4012 4013	27p 50p	7402 7403	18p 22p	74LS113 74LS125	45p		t, Colleges,	
BC149 BC157	6р 6р	BF183 BF184	20p 20p	R2008B	80p	2N2484 2N2646	20p 38p	BY179	35p	7915 7918	40p 40p	4014	60p	74 04 7405	18p 10p	74LS138 74LS139	50p 45p	accepted.	Quotations	given for
BC159	6р	BF185	20p	R2010B	80p	2N2904	20p	BY182 BY184	32p 32p	7924 78L05	40p 28p	4015 4016	60p	7406	100p	74LS151	45p	large qua	ntities. Plea	se allow /
BC182 BC182L	6р 6р	BF194 BF195	5p 5p	TAG06-60		2N2905	20p	BY187	32p	78L12	28p	4017 4018	65 p	7407 7408	80p 25p	74LS153 74LS157	60p	days for	delivery. All	brand-new
BC 183	6р	BF196 BF199	6p	TAG521-2 TAG4443	00 72p 76p	2N2906 2N2907	18p	BY196 BY206	20p 11p	78L 15 78L 18	28p 28p	4019	60p	7409	20p	74LS161	65p	Compone	nts. All valve	es are new
BC183L BC184	6p	BF200	16p	TAG4444	76p	2N2926	8p	BY207 BY208	11p 18p	78L24	28p	4020	75p 53p	7413	35p 45p	74LS163 74LS164	70p 80p			
BC184L BC212	6р 6р	BF240 BF241	16p	TIP29 TIP29A	15p 22p	2N3019 2N3053	28p 18p	BY210	22p	79L12	40p 45p	4021 4022	53p	7417 7420	32p 22p	74LS174 74LS192	60p 50p	22		
BC212L	6р	BF255	12p	TIP29C	25p	2N3054 2N3055	35p 32p	BY223 BY225	72p 120p	791 15	48p	4023	27p 47p	7420	25p	74LS197	52p			

VALVES

ELECTRON GUNS TV TUBE COMPONENTS

If you are Rebuilding or Manufacturing TV tubes - We are the leading suppliers of Electron Guns and TV Tube Components to the TV Tube Industry. We specialise in all aspects of Electron Mount Technology.

Our product range includes more than 250 gun types for Colour, In Line, Mono and Display Tubes along with Mount Parts, Bases, Getters, Sealoffs, and all other associated items for TV Tube Production.

A Full Technical Back-up and Advisory Service is available to all customers World-wide.

Please request our current catalogues and Data Information.

GRIFTRONIC STUDLEY

NEW ROAD, EMISSION LTD WARWICKSHIRE B80 7LY

Telephone: 052-785 2684 or 2639 Telex: 336924 Grifem G.

IRISH TV NOTICE (SUMMER SALE)

We can supply in good working order Bush, Pye and Ferguson from £60, Philips G.8. From £80, Decca from £90, B/White £25, Re-Gunned C.R.T.s from £40 (We have our own Re-Gunning plant). 500 sets to choose from. Fresh stocks weekly. Phone now for full price list to Ireland's largest distributor of used TVs to the trade.

> ALL PRICES INCLUDE V.A.T. We can deliver to any part of Ireland.

TELE SPARES LTD.

Unit 113, Elm Road, Western Industrial Estate, Dublin 12, Ireland. Telephone: Dublin 521211/521756.

TV LINE OUTPUT TRANSFORMERS

FAST RETURN OF POST SERVICE

PHILIPS RANK BUSH MURPHY Z146 A640 dual std mono Bush A792, A793 single std mong A774 single std mono 7 00 A816 solid state mono DECCA MS17002001 2020 2401 mono 7.00 MS2404 2420 2424 mono 7.00 CS1730 1733 colour 8.00 CS1830 1835 colour 8.00 '30' series Bradford colour 80 series colour 8.00 8 00 8.00 100 series colour FERGUSON HMV MARCONI 8.00 2047 to 2105 7.00 2000 to 2064 dual std mono 7.00 DUAL STD hybrid colour 8.00 SINGLE STD hybrid colour 8.00.00 Indesit 20EGB 24EGB mono 9.00

VC200 VC205 VC207 mono CVC5 CVC7 CVC8 CVC9 col. 8.00 CVC20 series colour CVC30 CVC32 series colour 8.00

170 series dual std mono 210 300 series mono 7.00 7.00 8.00 G8 & G9 series colour PYE 368, 169, 569, 769 mono 725-741 colour 7.00 WALTHAM 125 9.00 REWIND SERVICE - available for most continental types, i.e. Kuba, Luxor, Korting, Tyne, Berry Skantic,

GRANDATA LTD 9 THE BROADWAY, PRESTON ROAD. WEMBLEY, MIDDLESEX, ENGLAND Telephone: 01-904 2093 & 904-1115/6 Telex No: 932 885 (Sunmit)

K80 £15.00 inc pp, VAT. Old lopt required.

WINDINGS SOVEREIGN FARA PLUSTRON PALLADIUM £15.00

PLUSTRON PALLADIUM
14" colour overwind
RANK BUSH MURPHY
T20a T22, T26 Pri & Sec 6.00
Z718 primary state 18" or 22"6.00
Z718 EHT overwind 7.00
ULTRA THORN
1690–1691 EHT overwind 7.00
1590 EHT overwind 6.00 1590 EHT overwind

173P, 174P, 175P, T57 chassis EHT overwind 8.00 or send old LOPT for rewind £10.00

PRICES INCLUDE P.P. & 15% VAT

All lopts and windings are new and guaranteed

Open Mon.-Fri. 9 to 5.30 pm Delivery normally by return.

CVC45

PAPWORTH TRANSFORMERS

80 Merton High Street, London SW19 1BE

S.A.E. all enquiries Barclaycard and Access welcome

For orders placed at the post office Trans

01-540 3955

TRAINING COURSES

TELEVISION & VIDEO SERVICING

THESE FULL-TIME COURSES INCLUDE A HIGH PERCENTAGE OF COLLEGE BASED PRACTICAL WORK TO ENHANCE FUTURE EMPLOYMENT PROSPECTS

12 MONTHS

LEC Diploma

TELEVISION & VIDEO SERVICING
(Basic Electronics, TV, VCR, CCTV, Testing & Fault Diagnosis)

6 MONTHS

LEC Diploma

TELEVISION & VIDEO SERVICING

(Suitable for applicants with previous electronics training — e.g. BSc, HND, CGLI, B/TEC, etc.)

3 AND 6 WEEK

LEC Diploma

VIDEO CASSETTE RECORDER SERVICING

(Intensive highly practical course suitable for qualified TV Technicians or similar)

6 MONTHS EVENING COURSES in

BASIC TELEVISION SERVICING

(An introductory practical course)

VIDEO CASSETTE RECORDER SERVICING

(Professional level course with 50% practical - covers same ground as 3 week full-time course)

All the above courses commence on January 7th.

ADDITIONAL FULL-TIME COURSES APPROVED BY THE BUSINESS & **TECHNICIAN EDUCATION COUNCIL**

2 YEAR

BTEC National Diploma (OND) ELECTRONIC &

COMMUNICATIONS ENGINEERING (Electronics, Computing, Television, Video, Testing & Fault Diagnosis)

15 MONTHS

BTEC National Certificate (ONC) ELECTRONIC EQUIPMENT SERVICING

(Electronics, Television, Video, Cassette Recorders, CCTV, Testing & Fault Diagnosis)

15 MONTHS

BTEC National Certificate (ONC) COMPUTING TECHNOLOGY

(Electronics, Computing Software/Hardware, Microelectronic Testing Methods)

9 MONTHS

BTEC Higher National Certificate (HNC) COMPUTING TECHNOLOGY & ROBOTICS (Microprocessor Based Systems, Fault Diagnosis, ATE, Robotics)

Full Prospectus from:

LONDON ELECTRONICS COLLEGE (Dept TF) 20 PENYWERN ROAD, EARLS COURT, LONDON SW5 9SU. Tel: 01-373 8721

TEL-X BLACKBURN

FOR THE VERY BEST IN TELEVISION DISPOSALS

Decca **Philips**

Thorn ITT

Pve **GFC**

Bush + Remotes

* * * * * * * * *

HUNDREDS TO CHOOSE FROM WORKERS FROM £25.00

Off the Pile from

£ 8.00

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆

DELIVERIES ARRANGED ON QUANTITY

TEL-X BLACKBURN

Unit P3, Roe Lee Industrial Estate, Whalley New Road, Blackburn, Lancs.

Tel: 0254 679984

T.V. DISTRIBUTORS NORTHERN







Leeds newest wholesaler is now open. Stockists of good quality ex rental/part exchange colour TVs. Philips, ITT, Thorn, GEC, Pye, Decca, J.V.C.

DISCOUNT FOR QUANTITY

TEL: LEEDS (0532) 624996 T.V. DISTRIBUTORS NORTHERN

Unit 10, Ashley Trading Estate, Buslingthorpe Green, Leeds LS7 2HG

TUNERS + TUNERS

- ★ If you repair sets regularly phone us today and we will dispatch immediately - no need to send cash 'up front'.
- ★ All tuners dispatched by first class post for receipt by you the next day.
- All popular tuners/tuner repairs supplied 'off the shelf'.
- Unusual types repaired same day as received (subject to spares availability).



32 Temple Street, Wolverhampton, WV2 4LJ. Phone: (0902) 773122.

The World of

"TELE PANELS"

52 Mount Pleasant Road, Chigwell, Essex. Telephone 01-729 0506.

COMPARE OUR PRICES!

COMPARE OUR SERVICE!

					COMITABLE CONTROL! Y					
	IF	TUNER	DECODER	G8/G9 DECODER IF COMBINED	LINE OUTPUT	POWER	CONVERG	FRAME	VIDEO	6 WAY TUNER SWITCH BANK
PHILIPS G.8	5.00	4.50	7.00	15.00	14.00	8.00	5.00	5.00		3.50
THORN 3000/3500	2.00	5.75	4.00		8.00	8.00	5.00	6.00	5.00	1.75
GEC 2110	10.00		5.00		12.00	6.00	5.00	5.00	5.00	5.00
PYE 731	8.00		10.00		18.00	10.00	7.00	8.00		4.50
PUSH Z/718	7.50	6.50	14.00		24.00	3.00	5.00	14.00		
BUSH T/20	7.50	6.50	14.00				5.00	14.00		
DECCA BRADFORD	3.00		7.00			4.00		FRAME TIME BASE £4		
DECCA 80	12.00	P.O.A.	14.00		12.00	10.00		14.00		P.O.A.

Other makes of panels — telephone for prices!

TRIPLERS FOR ALL MODELS £3.00 SPEAKERS £1.50

P+P 1 PANEL £1.50 2 PANELS OR MORE £3.00

CASH WITH ORDER - PLEASE

POST OFF YOUR CHEQUE NOW! & YOUR PANELS SENT BY RETURN OF POST!!!

HOCKLEY DISCOUNT TELEVISIONS

94 Soho Hill, Hockley, Birmingham B19 1AE. Telephone: 021-551-2233

BEST QUALITY SETS AVAILABLE AT UNBEATABLE PRICES

PHILIPS G8 550 FITTED WITH REGUNNED TUBES £38

Philips G8, G11, Bush T22, GEC, Starline, Japs., Decca 1800, Pye 222s, BRC 9000, 9600, 9800, Sony, latest Hitachi, ITT, CVC30, CVC45, plus remote control models.

PRICES START FROM £6
WORKING SETS FROM £18
FROM OUR SHOWROOM

DISCOUNT ON QUANTITY

NORTHERN T.V. DISTRIBUTORS
Unit 2, Perth Court, Team Valley Ind. Estate,
Gateshead, Tyne & Wear
Telephone: 091-487 5389

Opening hours 9 - 7 Monday - Saturday Sundays by appointment.

NORTH WALES TELEVISION SUPPLIES

FLINT 5878







Working sets from £25
Untested sets from £15
Mono £4
Portable £15







Unit 32, Manor Industrial Estate, Bagillt, Clwyd.

CENTRAL T.V.

LATE MODEL T.V. NOW IN STOCK

G.11 REMOTE + TEXT, ITT REMOTE, THORN 9600, 9800, BUSH T20/T22/T26, DECCA 80/100, G.E.C. IN LINE

SPECIAL OFFERS ON WORKING SETS	SPECIAL OFFERS ON OFF THE PILE SETS
10 550 G8 22" £220	10 550 G8 22"£130
10 520 G8 22" £180	10 520 G8 22"£90
10 ITT CVC 5-8-9£180	10 ITT CVC 5-8-9£120
10 DECCA HYBRID£180	10 DECCA HYBRID£120
10 BUSH MIXED£140	10 BUSH MIXED£90
10 THORN 8500£250	10 THORN 8500£170
	10 THORN 3000, 3500£100

VHS VIDEOS - 100's IN STOCK **BRAND NEW 14" AND 16" PORTABLES**

BRAND NEW PYE 20", 22", 26" WITH STEREO - TEXT - REMOTES

MANY MORE BARGAINS IN STOCK - PHONE AND HAVE YOUR ORDER READY FOR COLLECTION LORRY LOADS DIRECT FROM SOURCES DELIVERED TO YOUR DOOR

HOT LINE BIRMINGHAM 021-622 1023 021-622 1517

48/52 PERSHORE STREET **BIRMINGHAM B5 4RR**

HOT LINE LONDON 01-807 4090 01-884 1314

CEDAR HOUSE, NOBEL ROAD. **ELEY ESTATE, EDMONTON, LONDON**

CUSTOMER CAN'T PAY? DONT LOSE HIM FIT A TV METER



COMPLETELY VARIABLE TIMINGS



METERS LIMITED

MANUFACTURERS OF TV COIN OPERATED METERS CONTACT (0202) 674272 87-89 Sterte Avenue, Poole, Dorset. BH15 2AW. Telex: 418253 LUMIC G

2 YR. GUARANTEE APOLLO 20/30 AX TRADE AND QUANTITY DISCOUNTS

FREE LOCAL DELIVERY --- SAME DAY • FITTING SERVICE £20. FAST MAIL ORDER GB 2-3 DAYS -- OVERSEAS ON REQUEST.

A47 32/343X 470 BCB22	£37
470 ESB22/EFB22/ERB22	£45
A51-161X	£45
A51-220X/192X	£37
510 JKB22/JEB22/JDB22/ALB22	£45
A56-120X/123/140/410	£38
560 DZB22/HB22/AKB22 A63-120X	£45
A66-120X A67-120X/140/150/200X	£39
20AX A56-500X/510X A66-500X/510X	£39
30AX A56-540X/A66-540X	E40
	L40

If your tube type is not in stock we can arrange collection - rebuilding + redeliver

PLEASE PHONE BEFORE CALLING

061-799 0854. 24 hour answering service 43 Clarke Crescent, Little Hulton, Worsley, Nr Manchester M28 6XL

SEND NO MONEY

Your order despatched C.O.D. from our comprehensive stocks of Audio, Video and T.V. spares.

Price list sent with your first order.

Simply phone us 0934-419147

Freeway Components, The Airport Weston Super Mare, Avon BS24 8RA RADIO/AMP PANELS

7908 Panel 147 ×38mm with 2 × TDA 1000 6W audio amp ICs not soldered int so they can easily be removed. Also 1000/16, 1000/10 × 2, 470/16 elecs, ceramic discs, Rs, also choke. (All easily removed) Stereo Amp? Only £3.00 (ICs

cost £4 eal 2509 Another board which escaped the clutches of the flow solder machine – 103 ×39mm, this is an RF panel with a TDA1200 FM/IF chip & uPC1176C noise canceller + Rs & Cs inc. tants. Chips cost around £8 together. Price for panel £2.50.

2910 139×39mm, this panel has soldered in components — TCA4500A and TBA651R, AM radio with IF amp. Probably complete RF section

radio with ir amp. Probably Collipted his Section of radio as IFs and trimmers are on board, + Rs Cs etc £2.50.

2911 L shaped board 125 × 35mm. Looks like RF section of radio – BF194-5 etc + trimmers & IFs, but tuner is absent. £1.00.

Z912 Same as Z909, only components have been

Z912 Same as Z909, only components have been soldered. **62.50**.
Z913 Another L shaped panel 135×40mm with non-soldered components including: BC549C × 2, BC208 × 3, BF241 × 6, BF194, coils, trimmers, Rs. Cs etc. £1.00.

Rs, Cs etc. £1.00. 1W AMPLIFIER

2914 – Audio amp panel 95×65mm with TBA820 chip. Gives 1W output with 9V supply. Switch and vol. control. Just connect bett. and speaker. Full details supplied. Dnly £1.50; 10 for £12; 25

For £25; 100 for £75.

2915 — Stereo version of above 115×65mm featuring 2 × TBA820M and dual vol. control. £3.50; 10 for £30; 25 for £65; 100 for £200.

Sa.50; 10 for £30; 25 for £55; 100 for £200.

AM TUNER PANEL
2916 - For use with mono amp above. Neat panel 80 x45mm. Only £1.50; 10 for £12.00.

NI-CAD CHARGER SCOOP!!
Ever-Ready model CH4, this charger will take up to 4AA. C or D cells plus 2 PP3 if required. Smart two tone grey case 212 x97 x80mm. Only £7.95.

VEROBOARD & RIBBON CABLE
Discontinued lines, some at less than ‡ pricel!
e.g. Dipboard 158 x165mm £3.50; 26W Grey ribbon £4/3m; Red wirewrap wire 24AW6 £2.50/10m. Fuil details on List 18.

RESISTORS — FROM 60p/10001
K529 RESISTORS — only for bulk buyers, these parcels have all new boxed and bandoliered resistors. This means between 100 and 5000 of one value, so to get a reasonable selection resistors. This means between 100 and 5000 or noe value, so to get a reasonable selection you'll need to buy 25000 or more. Most are ½ and ½w at various tolerances. Carbon, film and oxide types. 25000 £26, 100,000 £90, 250,000 £200 + CARR, I million £600 + CARR. Ring for appointment to view, samples on request.

1984/85 CATALOGUE

84 page A4 size – Bigger, Brighter, Better – more components then ever before! With each copy there's discount vouchers, Bargain List, Wholesale Discount List, Bulk Buyers List, Order Form and Reply Paid Envelope. All for just £1.00!! Winter Supplement due out November – Send large SAE for your free copy.

GREENWELD

- The Pack People! -

— Ine Pack People! —

More packs — more in them — more value! All our packs contain brand new, marked full spec components at a fraction of the normal price and offer constructors the widest range of perts at the lowest cost! How do we do it? By buying manufacturers end-of-run and surplus components. Because we purchase from many sources, we have an extremely wide range of top quality parts — too costly to sort hence the packs described below. Our larger packs are ided for schools, groups or clubs.

NEW PACKS:

NEW PACKS:

NEW PACKS: K524 OPTO PACK – a variety of single point and seven segment LEDS (incl. dual types) of var-ious colours and sizes, opto isolators, numica-tors, multi digit gas discharge displays, photo transistors, infra red emitters and receivers. 25 assorted £3.95; 100 £14.95; 250 £35.

RS25 PRESET PACK – Big, Big variety of types and sizes – submin, min and std. MP, skider, multiturn and cermats are all included. Wide range of values from 20R to 5M. 100 assorted £6.75; 250 £12.95; 1000 £48.

K528 ELECTROLYTIC PACK - All ready cropped for PCB mounting, this pack offers excellent value for money. Good range of values and voltages from 0.47 μF to 1000 μF, 6v to 100v. 100 £3.95; 250 £8.95; 1000 £32.

K531 PRECISION RESISTOR PACK – High quality, close tolerance h's with an extremely varied selection of values mostly 1 and 1 w tolerances from 0.1% to 2% – ideal for meters, test gear etc. 250 £3; 1000 £10.

NEXT MONTH: Established Favourites Official orders welcome – minimum invoice charge £10. No. min. on CWO. Goods normally despatched by return of post Our shop has enormous stock of components and is open from 9-530 Mon-Sat Come & see us!!

GREENWELD

443S Millbrook Road Southampton SO1 0HX Tel (0703) 772501/783740 All prices Inc VAT Just add 60p p&p

TV TUBE POLISHING

Your Own Premises with our DIY Polishing Kit

The Kit includes: The Kit includes: Everything you need to polish approx. 25° tubes to a high standard. Detailed instructions on how to do the polishing. All you require is an Electric Drill.

> Kit Price £45 inc P&P and VAT. Available from Luton only.

*Depends on depth and area to be polished

TV TUBES TUBE POLISHING FREE DELIVERY*

Quality, High Temperature Reprocessing

Colour Tubes	One year guarantee (optional extension	Two year guarantee (optional extension	
Delta 90° up to 20″ 90° up to 22″ 90° up to 26″	up to three years) £26 £30 £32 £33	up to four years £29 £33 £35 £36	
110° 26" (fast heat, narrow neck) In Line & PIL Up to 20" Up to 22" Up to 26"	£36 £38 £40	£42 £44 £46	

All tubes exchange glass required.

Your good, working tubes with scratches or small chips, can be POLISHED with our purpose built polishing equipment. Only £7 per tube.

Delivery charge on colour tubes: Within 40 miles of Luton 1 tube £4. 2 or more tubes FREE DELIVERY ★ Nationwide delivery available, charges on application.

Please add 15% VAT to all prices. Callers welcome. Please phone first.

WELL VIEW

114-134 Midland Rd. Luton Beds.

Open Mon-Fri 8am-6pm, Sat 9am-5pm. Tel. 0582-410787

Your Local Tube Stockist:

Well View, Southampton. Tel. 0703 331837. Retach Ltd., Northwood, Middx. Tel. 09274-27019
West One Distributors Ltd., Chesham, Buckinghamshire Tel. 0494-778197

Rushden Rentals Ltd., Rushden, Northants. Tel. 0933-314901 Daventry Rentals, Daventry, Northants. Tel. 03272 77436 Rea & Holland, Ipswich, Suffolk. Tel. 0473 827562

WANTED A56/A66-510X/540X Old glass for cash

***** 1000 sets now being taken per week. All makes and sizes. Untouched off the pile. Ring now for prices. From £3.

> PRICES AVAILABLE ON THESE SETS NOW!!!

PYE G11's **PYE CHELSEA's** PYE 721s, 731s, 725s **PHILIPS 520s. 550s BUSH T20, T22, T24s**

(Remote Control)

THORN 8000 & 8800s THORN 9000, 9200, 9600

(Remote Control)

OF THE ABOVE SETS, MOST HAVE BEEN FNGINEERED AND ARE IN PERFECT **WORKING ORDER**

Massive reductions for bulk Minimum 5 Sets

20 Salora 22" Colour £100

Big reductions for export orders over 100 sets

COLOUR **TELEVISION & MUSIC CENTRE**

35 Stafford Road, Weston Super Mare, Avon

Opening hours: 9-6 Mon-Sat, Sundays by appointment

(Weston Super Mare 413537)

(Note new address)

(15 minutes past Bristol Southward on M5)

Manchester's No. 1 in Ex-Rental TVs Over 2,000 TVs in stock Special Offer on Working Colour TV's

All sets are Serviced with repolished cabinets ready for sale

Philips G8 550s 22/26 £45 Philips 18" £40 Philips G8 520s 22/26 £35 GEC S/State from £35 Thorn 17" 8000 £30 Decca 30 18/20/22/26 £30 Japanese from £30 Many other makes available from

> £25 Discount on quantity

Some Examples of UNTESTED TVs available

Thom 10 for £125 **Philips** 6 for £90 Bush 6 for £80 GEC 6 for £60 Decca 6 for £60 Mono TVs avail. s/s £4 each New TV trolly stands. All sizes £4.95

All Prices subject to V.A.T.

Ex Equipment Panels & Tubes Available

Deliveries may be arranged to the North and Scotland. Ring for quote. Callers welcome.

419 Barlowmoor Road, Chorlton, Manchester 21 2ER. Tel: 061 861 8501 ************

ELETRADE

Forde Road, Brunel Industrial Estate, **Newton Abbot, Devon** Telephone: (0626) 60154

The Best Quality Sets Available **Anywhere**

All First Class working order and excellent cabinets.

Philips G8 550 £40 Philips G11 £85 **GEC Solid State** £35 Thorn 3500 Electronic 22" £35 Thorn 9000 £60 **Thorn 8800** £45 Thorn 9800 £55 Thorn 1500 Mono 20" very clean

Full spares back-up of tubes and panels -Bulk terms to other wholesalers

THE NO. 1 WHOLESALER IN THE SOUTH

SATELLITE RECEIVING SYSTEMS

1m and 2m glassfibre dishes other sizes available.

Feeds, support and mounting systems. Low noise amplifiers, downconverters. Complete terminals for 4 Ghz, other frequencies available.

Demonstrations by appointment.

L & S Bear Electronics Ltd. Yeo Lane, Colley Lane, Bridgwater, Somerset. Telephone: Bridgwater (0278) 421719

MONOLITH

HIGH QUALITY UNIVERSAL VIDEO HEAD REPLACEMENTS FOR ALL VHS AND BETAMAX VCR MACHINES

VHS Part No. 3HSS (5mm Centre Hole) £29.95 PRICE
VHS Part No. 4HSS (15mm Centre Hole) £29.95 EACH
BETAMAX Part No. PS3B £38.95 EX.
REPLACEMENT KIT (17 Pieces Boxed) £17.35 V.A.T.
PLEASE ADD 15% V.A.T. PLUS P&P £2.00 PER ORDER
OUR FULL CATALOGUE AVAILABLE ON REQUEST.

Please allow between 14 and 28 days for delivery. AUDIO + VIDEO HEADS - MOTORS - PARTS

Suppliers to most U.K. Distributor/Service Organizations

THE MONOLITH ELECTRONICS CO. LTD

5-7 Church Street, Crewkerne, Somerset TA18 7HR, England Telephone Crewkerne (0460) 74321 Telex 46306 MONLTH G

CentreVision

TEL: 0222-44754 SLOPER ROAD LECKWITH CARDIFF CF1 8AB

OPPOSITE CITY FOOTBALL GROUND 5 MINS FROM M4

> TELEVISION/VIDEO (VHS + BETA) FROM £165

*	ITT CD752 REMOTE	£115
*	PHILIPS G11	£50
*	GEC STARLINE 22-20 (Remote)	£35
*	PYE CHELSEA	£25
	THORN 9000 20"	£39
*	DECCA 22" BLACK FRONT VERICAF	£25
*	RANK T20 REMOTE	£50
*	PHILIPS 550	£25
i		

PRICES SUBJECT TO VAT

OPENING HOURS: MONDAY - FRIDAY 9.00 - 5.30 SATURDAY 9.00 - 1.00

1,000 EX-RENTAL COLOUR TV's AVAILABLE

Philips 550's£18	Philips 520's £14
Pye Chelsea Series£15	Pye 725 £15
,	Japanese£18
GEC s/state£15	Decca Bradfords£12
ITT Hybrid £14	Thorn 8500£15
OU DECOM 00 9 100's and	C/Ctoto ITT now Ameiving

GII's, DECCA 80 & 100's and S/State ITT now **Arriving.**Mono **Single** Standard — £2

Various **Beta** non-wks VCR's — **£50.** PHILIPS LVC (1500/1700) Tapes.

★ SPECIAL ★

MIXED LOADS DELIVERED DIRECT FROM SOURCE UNTESTED AND INCLUDING WORKERS ${\bf £15}$ + V.A.T.

Also Stands, Panels and Tested Tubes FREE DELIVERY LONDON AREA

All Prices Exclusive V.A.T.

SOUTH LONDON TELEVISION

Mission Hall, Southey Road, London SW19. Telephone: 01-543 5437

COLOUR TELEVISIONS

THORN 9000, 9200, 9600 Remote Control PYE 420/450, G11 MANY OTHER TYPES

Working panels and tubes available.

REBUILT TUBES

Delta – In Line – PIL.

SOUTHBRIDGE TV CENTRE 120, Selhurst Rd., London, S.E.25. Tel: 01-771 3535.

EMCO - EUROSONIC - GRUNDIG - TELETON + ALL BRITISH MAKES ETC. ETC. ● ALL SPARES READILY AVAILABLE ●

IMMEDIATE CREDIT AVAILABLE — TRADE ONLY

If you are a trader simply phone for the part you require and we will send it – no quibble – no hold up for status check. Satisfy us over the phone that you are a trader and we will supply almost any TV component by return "off the shelf". e.g. LOPTX – EHT trays – droppers – OSC coils – switches – cans – smoothers – I.C.'s, etc. etc.

YOU CAN BE 95% SURE WE CAN SUPPLY ANY TV COMPONENT BY RETURN IF YOU NEED SPARES FAST — RING NOW!

ACCESS AND BARCLAYCARD ACCEPTED.

Applies to U.K. only.

TELE-PAI (W'TON)

32 TEMPLE STREET, WOLVERHAMPTON (0902) 773122

IRISH T.V. DEALERS

Large selection of fully reconditioned precision in-line UHF-VHF colour T.V.s at keen prices

Also in stock: Dual Standard Beta & VHS Video Recorders

Quantity discount. Delivery arranged.

(Limited amount of spare panels, components, button units, etc.)

SPECIALISTS IN OVERSEAS ORDERS

T.V. TRADE SALES

EDI House, Kylemore Park West, Ballyfermot, Dublin 10. Tel: 264139 ext. 11.

(Open 10 a.m.-5.30 p.m.)

SETS & COMPONENTS

JAPANESE COLOUR TVs. Panasonic, Hitachi, Mitsubishi, Toshiba, Sharp. Fully refurbished. Trade only. J.M. Pearson Television. 0484 863489.

SECOND HAND Colour TV spares and tubes. Most makes. Telephone Southport (0704) 74411. Anytime.

PHILIPS G11 and Bush T20. Regular supplies. For prices phone 01-845 2036.

GRUNDIG SETS, PANELS, MANUALS.Nordemende and Telequipment spares, manuals.
Ochre Mill. Tel. 0785 814643.

TELEVISION

No other consumer magazine in the country can reach so effectively those readers who are wholly engaged in the television and affiliated electronic industries. They have a need to know of your products and services.

The prepaid rate for semi display setting £6.00 per single column centimetre (minimum 2.5 cms). Classified advertisements 35p per word

SCREENPLAY

Guaranteed – Complete Sets Trade Workers

Panels by Post Mono's

Stands Aerials Accessories Etc.

TV Business from £5.00

from £25.00 from £3.00

Your Friend in the

from £1.00

TO CLEAR

BUSH SINGLE/DOUBLE CHIP 5 for £25.00 BRADFORD DECCA 5 for £45.00

PHONE US FIRST FOR WORKING SETS IN QUANTITY, WE'LL GIVE AN UNBEATABLE PRICE.

OPEN 6 DAYS 10-6.30pm/10-5.00pm SAT.

Phone:

Baldock 894905

SECTION THREE, UNIT FOUR, SERL COMPLEX, LONDON ROAD, BALDOCK, HERTS.



GRUNDIG 6010 R/C £30. Sony 1820 £25. GEC 2110 R/C £25. A44 -271X £35, 560DZB22 £35, Z179 chassis new £30, GEC 2040 decoder £12, CDA £6. 5 Pye 691 triplers £20. Gravesend 65782.

TELEVISION

GOOD QUALITY TRADE TVs COLOUR OR MONO SUITABLE FOR SALE OR RE-RENT, WIDE CHOICE OF MAKES AND MODELS

GENERAL FACTORS

UNION STREET DONCASTER DN1 3AE

TEL (0302) 68416

GOOD MOTORWAY ACCESS

WETSTED UBES PRESENTS AN UNBEATABLE OFFER

£26 ALL DELTAS ONE PRICE

£40 ALL P.I.L. ONE PRICE * SPECIAL CRT POLISHING SERVICE

- * SPECIAL CRT POLISHING SERVICE
 WHILE U WAIT Only £5
- * ALL DELTA SIZES FROM STOCK
- * DISCOUNT FOR ORDERS OF 5 CRTs OR OVER
 - * FREE DELIVERY WITHIN 20 MILE RADIUS OF MAIDSTONE

Ring Now Maidstone 872400 or visit our factory.

or visit our factory.
Unit 32, Branbridges, Ind Est.
East Peckham, Kent.

* Agents required in South
Prices do not include VAT

CANVEY COLOUR TUBES

Unit 3, Charfleets House, Charfleets Industrial Estate, Canvey Island, Essex. Tel: Canvey Island (0268) 690577

CURRENT PRICE LIST

DELTA TUBE TYPE FROM £27.50 to £31.50 INLINE TUBE TYPE FROM £35.00 MONO TYPES P.O.A.

ALL PRICES EXCLUSIVE OF VAT.

All Tubes Guaranteed for 2 YEARS and Reprocessed to Original Manufacturers Specifications.

EX GRUNDIG TEST EQUIPMENT. E.g. 0-15V power supply with voltmeter £13.50 + £2.95 P&P. Also millivoltmeters isolating transformers and units for spares, etc. S.A.E. lists, S.H.E. 5 St Josephs Park, Ballycruttle, Downpatrick BT30 7EN.

MULTISTANDARD Colour Television. LUXOR VHF/UHF TV/Monitors to most standards, including PAL'L/SECAM'L (UK/French) option. 20", 22" & 26" from £280. ex VAT. PORTATEL CONVERSIONS LTD., 25 Sunbury Cross Centre, Sunbury, Middlesex. Tel. 09327 88972.

TELEVISION TUNER REPAIRS

BRITISH, EUROPEAN _ JAPANESE ETC.

ELC 1043/05 TUNERS AS NEW £4.60 inc.

MEN-TU ELECTRONICS LTD. SALTERNS LANE, FAREHAM, HANTS.

Tel: 0329-235116

CATHODE RAY TUBES

Extensive range of guaranteed rebuilt mono & colour tubes

BRITISH & JAPANESE IN LINE – COILS FITTED AS REQUIRED P.I.L., 20 AX, 30 AX, DELTA & MONO EX STOCK

TRINITRON TYPES REBUILT

Free delivery London area by own vehicles
Rest of U.K. by carrier

SUFFOLK TV TUBES

1 Park Road, Hackbridge, Nr. Wallington, Surrey SM6 7ER

Tel. 01-669 7825/7826

SERVICE PAGE

(minimum 12 words), box number 70p extra. All cheques, postal orders etc., to be made payable to Television, and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance, should be sent to the Classified Advertisement Dept., Television Room 2612, IPC Magazines Limited, Kings Reach Tower, Stamford Street, London SE1 9LS. (Telephone 01-261 5846).

IRISH TV TRADE

CAN WE BE OF SERVICE TO YOU? Regular supplies of Quality Colour TVs LOWEST PRICES

Working Sets from £18 Non-working Sets from £8

FREE DELIVERY ANYWHERE

contact: J. M. G. Electronics

Omagh, Co. Tyrone,
Northern Ireland.
Omagh (0662) 46032 night
Omagh (0662) 47911 day

COLOUR TV PANELS Fully Tested & Working

		CDA/			Line	
	IF.	Video	Decoder	LTB	8oard	Power
GEC 2040	3.50	3.50	4.00	5.00	_	-
DECCA 13/30	3.00	-	7.00	5.00	-	4.00
BUSH A823	4.00*	-	10.00*	5.00*	2.50	4.00
THORN 8/83	-	-	10.00	5.00	-	5.00
PYE 205	3.00	3.50	5.00	10.00	-	-
THORN 3/3	5.00	5.00	5.00	8.00	-	10.00
G8	6.00	-	8.00	7.00	15.00	5.00
*Please specify prefi	x A or Z.				fitted with	
		than add non	t i nackina		brand new	
Please add 15% VAT		then add pos			transformer	

Post + Packing: 1 panel £1.50; 2 panels £2.25; 3 panels £3.00 etc. Hybrid panels do not include valves.

Terms cash with order. Also a vast selection of modern working and non-working TVs at low prices. Please ring for current stock.

GOLCAR T.V. SERVICES (formerly LAVITE LTD.).

Old C of E School, Church Street, Golcar, Huddersfield. Tel.: 0484 643273 Callers by appointment only.

TORBAY (TRADE) T.V.

Have now moved to larger premises. Good quality small screen colour TVs Chelsea's, 560, 207, 9000, etc.

> 178 Union Street. Torquay, Devon. Tel. (0803) 22767.

STARLITE **ELECTRONICS**

NOW MOVED TO: WILLOWS FARM, A13 RAINHAM, ESSEX. Rainham 23225 also Hornchurch 50238.

- TV TUBES -2 year guarantee Most types available Japanese including Sony Ex-Rental TVs from£15.00 Untested Panels.....£4.00

11GHz Satellite TV Receiver

Receives 'Music Box' Pop music TV Channel on ECS satellite. Can be supplied with or without dish (1.5M minimum in most of UK). Stereo sound decoders available shortly for this channel. Phone or write for more details.

HUGH COCKS TV SERVICES, Cripps Corner, Robertsbridge, Sussex TN32 5RY. Tel: 058083 317.

PANELS PARTS, Tanberg CTV2 A823 Decca 30 GEC 2110 Grundig 5010 tested tubes, all cheap. 731/ 725 panels wanted. S.A.E. lists 2 North Street, Newton. Derbyshire DE55 5TS.

A.B.D. TELEVISIONS

Suppliers of colour and mono televisions to the trade.

> Workers and non-workers:

Pye Chelsea, Philips, Pye, GEC. Thorn 8500, 8800, 9000 and 9600, Bush T20 and TT22, ITT 600 series, Japanese, Hitachi, Nat. Pan J.V.C.

Many other modern sets by popular manufacturers.

For quotation and prompt service: Ring Notts (0602) 864627 UNIT 3+3A, Meadow Trading Est. Meadow Lane, Nottingham NG3 3HQ.

TURN YOUR SURPLUS capacitors, transistors, etc., into cash. Contact COLES-HARDING & CO, 103 South Brink, Wisbech, Cambs. 0945 584188. Immediate settlement.

WOODSDALE COMPONENTS RANK BUSH MURPHY **TRANSFORMERS**

Line Ouput Z718 (T703A, T706A) £20.50 New (Complete) Less Focus Module and Rectifier £10 50 T20, T22 (T705A) £11.00 (T705B) £11.00 **Switch Mode** T114A/B £8.00

Genuine RBM Units.

AERIALS

UHF Aerials P & C Wideband 4 Bay £20.00 Bowtie (12.5 dB) Above with built-in Broadband amp. (27dB) plus stabilised power

£45.00 vlagus Prompt Postal Service P&P Paid. Add 15% VAT to all prices. DISCOUNT for QUANTITIES.

34 Field End Road, Eastcote, Pinner, Middlesex. HA5-2QT. Tel: 01-868 5580. N. Skehan

Agents Office. Callers by appointment only.

- Britain's most reliable source of quality TVs.
- Hundreds of working polished TVs.
- **GEC Starline**
- * Decca 80
- * Decca 88
- Decca 100
- Pye G11
- Thorn 8800
- * Pve 222 Series

All working and polished. These are not from major companies. A lot are from hotels and have had very little use.

Excellent reliable sets for rental.

Krystal Marketing Ltd. Breedon Cross

Dale Road, Selly Oak, Birmingham B29 6AQ.

Phone 021-471 3023 Telex 335540-G Ask for Les

SPARES, PANELS AND MANUALS PHILIPS · GRUNDIG

TELEVIEW 01-994 5537 194, Acton Lane, London W.4.

Thorn 3000/3500 Thorn 9000

UNIVERSAL 1 year guarantee

TRIPLERS

The UNIVERSAL TRIPLERcan be G E.C., I.T.T., Pye. Rank, Decca & Continental

WING ELECTRONICS

15 Waylands, off Tudor Rd, Hayes End, Middlesex

N.W.ELECTRONICS

25 YEARS SUPPLYING THE TRADE

HUGE STOCKS OF COLOUR TV'S 2000 NOW IN STOCK

ROCK BOTTOM PRICES. ALL MAKES, ALL MODELS.

90% WORKERS (off the pile)

GENUINE REPOSSESSIONS AND EX RENT, NOW IN STOCK!
PYE KT 3, PHILIPS G11, G8, BUSH T20, 22, 718, GEC, 2010, 2201, 2002, 2659, HITACHI, SANYO, PYE 222 THORN 9000, 3500, 8800 ETC.

SPECIAL OFFERS

BUSH 2 chip 20"/22" Exc. CAB Cond. GENUINE CHANGE OVERS £15 EACH (special quotes on bulk orders) . . . Single Chip £10.

PHILIPS 26" G8 EXC. COND. 550 model £20 each	BUSH 718 P
BUSH 22" REMOTE 718 ONLY£30	BUSH T20 L
HITACHI 20'' MODEL 190 EXC. CAB £20	in lots of 10
THORN 9000 PIL TUBE£35	in lots of 50

VHS VIDEO

SHARP 7300, 8300, 9300. FERGUSON 3V28 3V22. SONY BETA.

MONO TV'S £1each (lots of 25)

BUSH, GEC, PYE, PHILIPS ETC. THORN 1500 £4. THORN 1600 £12 (like new).

REFURBISHED TV'S TO ORDER

PHILIPS G11 £80

BUSH T20/22 £70

GEC 2010 £38

LATER MODELS PHONE FOR QUOTATION

WHITE GOODS

HOOVER TWINS FROM £6. HOTPOINT 1460 FROM £10. AUTOS ALL MAKES FROM £10

WORKING T.V. PANELS

	1.F	DECODER	LINE 0/P	POWER	CONVERG.	VIOEO	FRAME T3
BUSH 2 CHIP	3.00	B.00	6.00	3.00	3.00	_	5.00
3000/3500	2.00	4.00	8.00	8.00	5.00	5.00	6.00
G8	5.00 with sound panel	7.00	14.00	8.00	5.00	-	5.00
GEC 2110	10.00	5.00	12.00	6.00	5.00	5.00	5.00
BUSH 718	8.00	15.00	25.00	3.00	5.00	_	15.00
8USH T20	8.00	15.00	20.00	20.00	5.00	_	15.00

Unit 12, Wharfedale Road M606 Euroway Estate Bradford P&P 1 panel £1.50, 2 panels £2.00, 3 panels £2.50 etc. Quick Despatch – C.W.O. please **ALL PRICES PLUS VAT.**

CASH ONLY — DELIVERY CAN BE ARRANGED

(0274) 688458 OPEN 6 DAYS

OPEN MON-SAT 9-5.30 Don't forget! We are open all day Saturday!

TELEVISION

Trade & Retail supplies of s/h colour & mono TVs. makes available, Most workers or non-workers

SOUTHPARK DISTRIBUTORS

Unit 4 Rubastic Road, Brentpark Industrial Estate, Southall, Middx. UB2 5LL. 01-574 4631, Ext 28

JABCO

SWITCH MODE POWER SUPPLY

Self oscillating with outputs isolated from mains. Model A-8v-plus 18v-plus 125v or 150v. Capable of running up most modern T/Vs. Independent of its own P.S., many of which need trigger pulses from the Line T.B. Fit this P.S. complete into SONY 1340, 1810,

2000 and others for complete reliability. Model A £32 VAT and postage included.

Model B has an optional 200v output in addition, £34 inclusive. Full circuit & instructions.

JABCO LOPT Tester still £16.50 inclusive.

J. BAKER & CO.

1 Old Shoreham Road, Southwick, Sussex BN4 4RD Tel: Brighton 593315

Sandwell T.V. Gentre

1000's of T.V.'s at tremendously low prices. mono's from £1-00-----colour from £7-00. WORKING HYBRID £15 Brunswick Park rd Wednesbury off jct.9 M6.

*

* * *

*

*

*

*

*

*

*

*

*



COLOUR BAR GENERATOR

Pal Colour Generator with 11 patterns plus sound. Grey scale, Colour Bars, Red, Green & Blue Raster, Crosshatch, Dots, Chequer Board, Black Raster, White Raster, Half Black & White



£11.50 Line Transformer Tester Line Transformer Tester

B/W Generator, Crosshatch, Peak White, Dots, Half
Black & White and Grey Scale
In Circuit Transistor Tester

Capacitance Meter measures 10pF to 1μF complete with moving coil meter S.A.E. for details. - Prices include P&P & VAT.

C.M.J. ELECTRONICS Unit 8, 16 Union Mill Street, Horseley Fi Wolverhampton WV1 3DW. Tel: (0902) 871563

! YOU HAVE TRIED THE REST NOW TRY THE BEST!

Quality 6 Button TVs on Offer

Ultra 6725 22" Furg. 3738 22" T/T Furg. 3749 22" GEC S/S ITT CK505 Philips 550 22" Furg. 3722 22" Bush T20

Also 17" 8000 various models + many more to choose from.

SCARBOROUGH TV TRADERS CO LTD 85 Columbus Ravine, Scarborough, N. Yorks. 0723 368087. 1 hour from A64/A1 junction

****** SERVICE PAGES **SERVICE PAGES**

This space could cost you as little as £4.44 (i.e. 12 words at 37p). Complete the coupon or ring 01-261 5846 NOW!

SERVICE PAGES SERVICE PAGES ·******

HAYRES TV CENTRE MIDLANDS NEWEST WHOLESALERS

CHRISTMAS SALE

G8 520 from £9.00 G8 550£11.00 PYE 222 from £23.00 Hybrids in stock from £6.00 Minimum 5 Sets. Working sets ready for showroom from £16.00

RING US NOW 021-523-0698

TRADE-TEL TV DISPOSALS 051-709 1734

G8550s from £8.00 Polished & Tested £30.00

UNIT B11A South West Brunswick Dock Liverpool L3 Merseyside

WORKING COLOUR T.V's

TO THE TRADE FROM

£15

LARGE SELECTION OF COLOUR T.V's INCLUDING GOOD DISPLAY OF WORKING SETS, MANY LATE MODELS, IN **OUR SHOWROOM**

DELIVERY CAN BE ARRANGED PHONE MARK WOODWARD 0299-250161

TRADE, UNIT 40, HARTLEBURY TRADING ESTATE, NR. KIDDERMINSTER, WORCS.

Tabes 31 RADCLIFFE ROAD, WEST BRIDGFORD, NOTTINGHAM THE QUALITY REBUILDER

PHONE: (0602) 813329
ALL TUBES CARRY A TWO YEAR GUARANTEE
EXTENDABLE TO FOUR YEARS

All Sizes of Standard Deltas ONLY £27.50 (A56-120 - A66-120 etc).

A51-161 - A51-163 £39.00

A56/66 500/510 (20 AX) £42.00

A56/66 540 X (30 AX) £49.00

510 VLB22 - 560 OZB 22 - 560 EGB22 £43.00

JAPANESE TYPES OUR SPECIALITY 1000's more available, VDUs, MONO's, Industrials etc.

EXCHANGE PANEL SERVICE

SONY TUBES
Phone for details

STOCKISTS
Peterberough: H. DONNOR Derby Derby: VTA WORKSHOPS 0332 369132 0733 71809

TECHNICAL ADVICE SERVICE All prices + VAT & Exchange



PHILIPS - GEC - THORN FTC DUCH

BUSH - DECCH - FILLING - GEO THOM		•
		ROM
SPECIAL BUSH 2 CHIP	£10	+ VAT
G8 26	£8	+ VAT
MONTH: GEC 2010	£25	+ VAT
PHONE PAUL FOR STOCK AVAILABILI	TV	
FRUNE FAUL FUN STUCK AVAILABILI	, ,	

01-514 1333

841 Romford Road, Manor Park, London E12.

VHS VIDEOS ... VHS ... VHS **NOW IN:** ********

Order form Please insert the enclosed	advertisen	ment in the next available issue of Television
Heading		
Signature		
Date		
No. of ins Chq/PO TELEVISION Classified Advertisement Department, Room 2612, King's Reach Tower, Stamford Street,		NAME AND ADDRESŚ
SE1 9LS.	12/84	

EAST ANGLIA SUPPLIES

Fully working colour TVs from £25.00 plus VAT straight from our retail shelves. Most makes are available and small regular orders are welcome. Personal services guaranteed and if we can help you boost your rental or retail trade we would be delighted.

> Free delivery available (only petrol charged).

Contact John, Dave or Steve at **Barry T.V. Services**

> on Cambridge 69215 or Elv 61462

WIZARD DISTRIBUTORS **MANCHESTER**

Visit our trade counter and see the huge range of components inc. tubes and video heads.

Only minutes from the town centre and motorway routes.
Fast friendly service and technical assistance

available.

Come in and see our trade counter special

offers

Open Monday to Friday 9 am to 4.45 pm Trade Only

EMPRESS STREET WORKS Empress Street Manchester M16 9EN Tel: 061-872-5438, 061-848-0060

WORKING CTV's

The Best & Cheapest in Lancashire

I.E. Decca 18" to 26"	£24.00
GEC 20" to 26"	£30.00
Philips G8 22" to 26"	£25.00
Bush 20" to 26" 2 chip	£18.50

All sets are tested & working

Many more makes & types available. Working mono's only £3.50. Non workers available.

> Phone: John Powney at Kirkham, near Preston (0772) 683392.

T.V PANELS

REPAIR EXCHANGE SALES SERVICE PRICES FOR REP. EXC. AS FOLLOWS

Chassis	IF	Decoder		Power Supply	Frame
Philips GII	18	16	20	18	16
Bush T20	X	12	16	15	12
Bush T26	X	16	18	15	X
Bush 718	X	12	18	X	12
All papale	250 500	.:	-0	4	

All panels are repaired and aligned according to rank std.

Ring for prices to buy panels. Prices shown inclusive of postage, etc.
All panels guaranteed for 3 months.

T. K. PANELS SERVICE 31 Bronte Paths, Stevenage (0438) 61567

TRADE COLOUR TVs **ALWAYS 200 IN STOCK**

Colour from £5.00 Mono £2.00 Tested colour tubes from £5.00 plus p+p

BRAND NEW VIDEOS V2022 and V2023 VHS and BETA

Just in 20" + 22" GEC Boxed with stand £85.00 ALL STOCK CHANGES WEEKLY

(0934) 514047/512792/27560 P&R SUPPLIES, Unit 5, Worle Industrial Estate, Weston-Super-Mare. Exit 21 M5.

ndreds COUNTY DURHAMS ONLY in stock WHOLESALER

UNTESTED From £12.00 From £12.00 From £30.00 From £20.00 From £20.00 From £20.00 From £20.00 From £30.00 G8 520 G8 550 GEC S/S All Hybrids Jap

All sets sold as working are fully prepared to the highest standards and are ready for retail or

REGUNNED TUBES

Up to 22" Delta Up to 26" Delta Pil & Inline £27.00 £30.00 2 yr guarantee £45.00

All tubes are regunned to the highest specifications. We are the best because we want our customers to come back.

INTERTEL Unit 27 Whessoe Road, Darlington (0325) 486896 Co. Durham.

REBUILT COLOURTUBES

EXAMPLE PRICES DELTA

All sizes up to 22" - £28.00 26" From — £32.00

All In Line P.I.L. Mono Gaming Machine C.R.T.s 560EGB22 56-611-510JKB22

> 20 AX £40.00 30 AX £48.00

Fast U.K. Delivery Call or Phone:

RE-LIFE T.V. TUBES PLANE STREET. OLDHAM, LANCS. 061-665 2668

Wholesalers REG in North & South Wales Competitive Prices

VIDEO

ARE YOU A TV ENGINEER WHO WANTS TO KNOW ABOUT VIDEO RECORDERS?

THEN YOU NEED

"DOMESTIC VIDEO CASSETTE **RECORDERS A SERVICING GUIDE"** by S. R. BEECHING

Available for only £15.50 inc. p&p

From: NEWARK VIDEO CENTRE, 108 London Rd., Balderton, Newark, Notts. Tel: 0636 71475 **ACCESS OR VISA**

EQUIPMENT FOR SALE

COMPLETE TUBE REGUNNING PLANT in good working order. Electric ovens. Re guns 15 colour (Sony Trinitron, Pil, in line etc) tubes in 24 hour cycles. Only £6,000 plus VAT, plus training provided. Tel: 0582 410787

BUSINESS FOR SALE

BOOMING TV/VIDEO Business, Kent. Absolutely unique! Audited turnover £71,500. Current year predicted £120,000+. Gross profit 150%! Behind-thescene secrets just cannot be copied. Must sell quickly for family reasons. Full written details: Box TV189.

WANTED

WANTED. We will clear any amount of colour sets from small Rental Companies, Hotels, etc. Please phone P & R Domestic Electrical Clearance Supplies, Weston Super Mare (0934) 514047

VARIABLE TRANSFORMER WANTED. Preston. Lancashire, Tel. 0772 617329.

TELEVISION September 1975 to March 1981 approx. Phone Burnley 50574 evenings and weekends.

WANTED. Rediffusion Doric Mk3 20". Price, particulars, Phone 0388 745185, 746197 evenings.

WANTED. "Radio and television servicing" post 1970. Any service manuals. Lincoln 695678.

BOOKS AND PUBLICATIONS

"RADIO AND TELEVISION SERVICING" books, new editions for the last 6 years always in stock. Prices on request. BELLS TELEVISION SERVICES, 190 Kings Road, Harrogate, N. Yorkshire. Tel. 0423 55885.

FULL SIZE TOP QUALITY service sheets £2.50 + l.s.a.e. CTV/Music Centres £3.50 + l.s.a.e. Repair data almost any named TV/Video £10.50 inc. circuits. L.s.a.e. brings any quite free magazine/pricelists. TIST, 76 Churches, Larkhall, Lanarkshire. Tel. 0698 883334.

RADIO AND TELEVISION SERVICING BOOKS New 74/75 £15. 76/77, 77/78, 78/79, 79/80, 80/81, 81/82, 82/83, 83/84 £22.50 each. Free delivery. UVIEW, 29, Warmsworth Road, Doncaster. 0302 855017. Callers ring first.

COURSES

FULL-TIME RAINING

15 MONTHS B-TEC NATIONAL CERTIFICATE in TELEVISION & VIDEO SERVICING

15 MONTHS **B-TEC NATIONAL CERTIFICATE** in COMPUTING TECHNOLOGY

9 MONTHS B-TEC HIGHER CERT (HNC) in COMPUTING TECHNOLOGY & ROBOTICS

- PRINCIPLES OF ELECTRONICS
- TELEVISION (MONO/COLOUR)
- VIDEO CASSETTE RECORDERS & CCTV
- COMPUTERS & MICROPROCESSORS
- INDUSTRIAL ROBOTICS

Short courses (from 6 weeks) with previous electronics knowledge.

Courses commence Jan '85, April '85, September '85. Prospectus from:

LONDON ELECTRONICS COLLEGE

Dept: AA, 20 Penywern Road, London SW5 9SU. Tel: 01-373 8721.

SERVICE PAGE

SERVICE SHEETS

30,000 SERVICE SHEETS IN STOCK ALSO COLOUR MANUALS AVAILABLE

TV Sheets, Black and White, also Radiograms, Record Players, Music Centres. Japanese models in stock. Curcuit diagrams only. Also Tape Recorders etc etc., ALL AT £3. Please forward s.a.e. Send cheque or P.O.

C. CARANNA, 71 BEAUFORT PARK, LONDON NW11 6BX.

BELL'S TELEVISION SERVICES for service sheets on Radio, TV, etc. £1.50 plus S.A.E. Service manuals on colour TV and Video Recorders, prices on request. S.A.E. with enquiries to B.T.S., 190 Kings Road, Harrogate, N. Yorkshire. Tel. (0423) 55885.

***** **SERVICE PAGES** SERVICE PAGES PLEASE MENTION TELEVISION WHEN REPLYING TO ADVERTISEMENTS.

SERVICE PAGES SERVICE PAGES ******

TECHNICAL INFO SERVICES - 76 Church St - Larkhall - Lanarks

(By return of post service in most cases.)

Sole suppliers of the Unique Comprehensive T.V. Practical Course and The Complete Radio Repair and Servicing ONLY £9.50 each.

We stock every published service sheet plus produce more ourselves.

Ill service sheets are top quality, full-size sheets supplied in complete sets.

£3.50 + l.s.a.e. for CTV or Music Centres - £2.50 + l.s.a.e. any others.

WORLD'S LARGEST COLLECTION SERVICE MANUALS

Can be seen at our premises any evening 4–6pm. Manuals from 1930 to the latest issue. Col + Mono TVs, Videos, Audio, Com + Test Eqpt. in stock for immediate despatch – Over 400 dif. CTV – Over 200 dif videol

Sample CTV prices: G8 or Pye 697 or A823 or Autovox early (poor copy) at £7.50 each Most manuals are unobtainable anywhere else.

WORLD'S BIGGEST PUBLISHER OF TV/VIDEO REPAIR MANUALS

British CTV Integrated Repair System (3/5) Foreign CTV Integrated Repair System (2/4) Mono TV Integrated Repair System (2/6) Video Integrated Repair System (2/10)

First figure for giant collections of circuits/layouts in binders, 2nd figure for number of repair manuals. Other items not shown.

Free 50p magazine with pricelists, etc. to every query or order - please enclose s.a.e.

FOR FAST QUOTES - PHONE 0698 883334

TELEVISION SERVICE SHEET SPECIALISTS

Thousands of British, European, and Japanese models in stock. Mono £1.50 (post free) Colour £2.00 Manual prices on request

Send stamped envelope for free catalogue and enquiries

SANDHURST TV SERVICES (MAIL ORDER) 49C Yorktown Road, Sandhurst, Camberley, Surrey GU17 7AG

FOR SALE

TUBE REGUNNING. All plant and equipment. Will not split. £3000. 0932 223426 WALTON.

HEATHKIT CMOS TLL Logic Probe complete with instructions £16 only. Tel. 01-289-0598.

Sabaco

For a great deal!

VAN LOAD DIRECT FROM SOURCES

Remember all sets cleaned and soak tested. Most makes available, any quantity e.g. GEC, Bush, Decca, ITT, Pye G11, T22, 9000, 9800 etc.

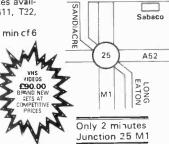
WORKING SETS FROM £20 upwards, e.g. GEC 2110 £25 min cf 6 and etc.

COMPLETE NON-WORKERS from £10 in quantities. Black/White in batches of 10 at £1.50.

SPECIAL OFFER! 26" G8/3500/HYBRIDS QUANTITIES OF 10 @ £5 each SPARE PARTS AVAILABLE AT COMPETITIVE PRICES.

PLEASE SEE SEPT/OCT ISSUES. N.B. Add 30p extra per panel. ALL PRICES SUBJECT TO VAT & AVAILABILITY.

Sabaco Elastic Yarns Building, Derby Road, Sandiacre, Nottingham.



Open 6 days a week 9.30 a.m. - 6.00 p.m.

Telephone: (0602) 397555

AERIALS

SPECIALIST VHF AERIALS, 28-170 MHz, OIRT/ TV-DX, Amateur, AB/MB/Cordless. Folder SAE, AERIALTECH, 33 Cherville Street, Romsey, Hants

AERIAL BOOSTERS

B45H/G-UHF TV next to the set fitting, gain about 20dbs, PP3 battery or 8V to 14V/working. Price £8.70.

2000s, PFS battery of 8V to 14V-Worling. The 25-X-P&P 30p.

UHF TV BOOSTER MODULE. PCB ready made up to cover the complete UHF TV band. Gain 10dbs, noise 1.9dbs. 8V to 14V-W. Price £2.50. P&P 30p.

AMPLIFIED SET TOP AERIALS. Trebles the gain, fully portable, price includes batteries. Price £9.70.

P&P 50p.

P&P 50p. B11 VHF/FM RADIO next to the radio fitting, gain 14dbs. Price £7.70. P&P 30p.

ELECTRONIC MAILORDER,

62 Bridge Street, Ramsbottom, Lancashire, BL0 9AG. Tel: Ramsbottom (070 682) 3036.

for leaflets. Access/Visa Welcome

EX-EQUIPMENT DISH, 1.5 metre on mount, as new £130 o.n.o. Tel. 0789 764040.

CLEARVIEW AERIALS

Clearview have pleasure in announcing a full and comprehensive range of signal amplification equipment. For example: low noise electronically remote controlled masthead pre-amp 1.6db noise. Ch. 17-69. Set side amplifiers, distribution amplifiers, notch filters 4 in 1 or 2 in 1 etc. Combiners for 2 UHF aerials 3db gain or 4 6db gain. Trade and retail.

Send large SAE for our comprehensive catalogue

CLEARVIEW AERIALS, 173 Kings Road, Kingston Upon Thames, Surrey.

MISCELLANEOUS

BURGLAR ALARM EQUIPMENT. Latest discount catalogue out now. Phone C.W.A.S. ALARM 0274 731532.

VIDEO/TV TEST EQUIPMENT (PAL)

Philips PM5519 pattern generator£480 Digitel D4060-01 noise meter£480 (VAT extra)

Contact:

Hi-Test, 64 Castellain Road, London W9 1EX. Tel: (01) 289 3533

The Theory and Practice of PAL Colour Television in three important Video **Cassette Programmes**

Part 1. The Colour Signal Part 2.

The Receiver Decoder Part 3.

Receiver Installation

VHS★★★V2000★★★ BETAMAX★★★UMATIC

For full details telephone

0253 725499 (Day) 0253 712769 (Night)

Or send for precise details

FLINTDOWN CHANNEL 5 339 CLIFTON DRIVE SOUTH, LYTHAM ST ANNES FY8 1LP

(enclosing this advert)					
NAME					
ADDRESS					
	TEL:				

2110 GEC Power Panel £8.00 T/V S54A Osci	loscope 10Mc/s £90.00	BD 517 30 BD 519 30	PHIL	IPS DIY HO	OME SECURITY AL	ARMS KITS	
Line o/p frame panels GEC 20AX £10.00 GEC 20 AX Min 12 volt Relays 75p		BD 534 30 BD 544 30	10 Mixed	10 Mixed VIEW DAT		Prices £54 to £112. FA PANELS 8 SEG LED Display	
Transductor £1.00 Y 933 Y 969 All diodes at 10p or Y 997 less in this list 20 of R 1038	5p 50p 30p	BD 646 30 ₁	p £5 + £2 post		NEW 19 I.C. £5	with driver I.C. LM1017 50p	
OA 47 8p R 2009	40p 40p 80p £1	BD 676 30 BD 678 30 BD 681 30	P 8Ω 4" speakers	£1 P	Philips GP422.4CH (£40 cost) £6	20AX GEC Split Diode lead £1.00	
IN 60 5p R 2029	50p 60p 60p	Voltage Regulators +5V/UA78PO5SC 30 -5V/LM79MO5CP 25	_ 4/00/100 X 10	50p	Stereo Dynamic	GEC Dynamic 20AX Convergence	
IN 914 3p R 2265 IN 2069a 10p R 2305	50p 50p 50p	-8V/79M08c 30 +6V/78M06c 30 +10v/78LA10 20	150/16 × 10 47/25 × 10	50p 50p 50p	Cartridge	C2233H-Ř223GH £2.00	
IN 4001 3p R 2322/2323 IN 4002 3p R 2323 IN 4003 4p R 2396	pair 80p 15p	LM 337 LM 342/18 30	1/250 × 10	50p 12 50p ove	Volt Aerial Changer er Relays 144 Mc/s watts £1	Mullard 12.5V/170 Mc/s 45 watt BLW60 £5.00	
IN 4004 4p R 2461 IN 4005 4p R 2030 IN 4006 4p R 2443=BD124	50p 80p 50p 40p	+12V/LM 340T12 50 +15V/78M15 15	8000/30v	50p		BLW60C £5.00 Mullard Broadband	
IN 4448×40 61 R2775=TTP41c	40p 40p 30p 40p	+18V/MC78M18 201 +24V/78M24 301 MC 7724cp 401	22/100v × 10 100/350v	70p Serie	GEC Hitachi Cap tuner, after 1979 ies £8	R.F. power modules VHF. BGY33 £15 UHF. BGY22E	
IN 4722 10p R3129=T1P47 S 2008b IN 5235 10p IN 5254 10p BU 105/04	40p 80p	MC 7824 40p TIS 90 10p TIS 91 20p	.47/500v 1/600v	25p GE(ush Button Unit for C 2100 Series placement for Touch	£5 PT4236C £5 PT8706C	
IN 5349 10p BU 108 IN 5392 10p BU 124	80p £1 50p	TIS 92 20p TIS 93 20p	.022/1kv		ton Unit £12	£5 PT9783	
IAV 30 10p BU 180a BU 204	80p 65p 70p £1	U 3832 U 3845 15p	Philips Philips Neon Lames		ous Tools and Accessories	£1,00	
IM 72Z55 10p BU 205 IR 106a 20p BU 206 IR 3051 10p BU 207 BU 208	£1 £1	MR 508 10p MR 501 10p MR 502 10p	Freeze	ior I v sets		5p £1.00 £1.00	
IS 164 10p BU 208 on heat BU 208A	£1.10	BCW 71R 30p BYF 1202 10p BYF 1204 10p	Push Button Mains	Jelau Switch fit	most T/V sets, mains 4 ta	£1.00	
IS 3072a 10p BU 222 IS 5024a 50p BU 326	90p £1 £1	BYF 3126 BYF 3214 40p	Sellotage PVC Electr	— up to 2 hor	ours: easy to use, plugs into	socket £3,00	
ITT 921 10p BU 426V	60p 60p £1.10 £1.20	BYX 36/600 BYX 38/300 25p	ITT CVC Screen locking agent.	large can	50p 50mm × 20M £8.25 Chassis	70p £40.00 £1.50	
ПТ 1075 10р BU 526 ПТ 2001 10р BU 807 ПТ 2002 10р BUX 84	75p £1 50p	BYX49/600R 75p BYX 55/350 10p BYX 55/600 (Bead) 10p	20 GEC Service Man Red E.H.T. LAED a	nuals ind Anode Cap	р	£5.00 £1.00	
ZE 1.5 10p BUW 84 BUY 71	30p £1	BYX 71/350 20p BYX 71/600 50p BYX 72/300 20p	Soldering iron 6v/23w TX 10 Focus Units	V		£15,00 £2,50 £6,00	
ZF 3, 3.3, 4.3, 10, 11, 11C 106a TIC 116m R2 10p TIC 116n/Y 1003	30p 40p 35p	BYX 36/600 50p BYV 95B 10p BVY 95C 12p	2 way baby alarm/inte	ercom with lon	ng leads	£5,00 £5	
ZPD 3.9, 4.7, 5.6, 10, TIC 126N	40p 30p	BYZ 106 10p BPW 41 15p BYW 56 2A/1000v G!1 8p	12V Nicad pack. "AA	CHARGER 5.5 A''	5V/150 ma	To Clear £4 £2 £2,50	
47 10p 11C 225S ZPY 8v2, 12, 16, 24, 11C 226E 43, 47, 56 10p 11C 226m TIC 236m TIC 236m TIC 236m	40p 30p 30p	BZU 15/24 54p BZY 93c75 50p BZV 15/18 30p	Hitachi TP 007 Batte Hitachi Silver Oxide I	ry pack 7.2v/1. Battery G13 U	.6A JCC357 IEC SR44 1.5V	£6.00 £7 60p	
ZTK 33 10p (T092 case 2A/40 TIP 29	20m	BZV 15/30 · 30p BZW 70c6v2 · 10p	70ML Silicone Sealer 100 Coax Plugs De-solder pump + 2	(clear)		£1 £10.00	
ZW 27 10p TIP 30A ZW 4-3 10p TIP 30B	35p 35p 40p	Bush thyristor RCA 76122 £1 ITT computer bookset 2020 £2	Plastic box for i.c.s wi Can of handy oil 'mol Flat Red LED	th anti-static pa	ad 6"×3"×∦"	£5.20 75p 40p	
ZW 310 10p 11P 30C TIP 31 TIP 31 ZX 68 30p TIP 32 ZY 47 10p TIP 33B	45p 30p 25p 50p	G8 20 turn 100K pot Transformer 240v/20v- 500Ma 75p	500gm 60/40 solder r Clearweld glue pack			12p £7 30p	
ZŶ 72 10p TIP 33C TIP 34A AA 113 10p TIP 34B	70p 50p	Viewdata toπoidals £6 CVC 20 tube base £2 Tube Base Rank & G11 £1.20	Dual v/u meter -20 - 3 × C90 Cassettes K30 thermistor 23226	6298009		£1 70p 75p	
AA 119 8p TIP 34C TIP 35B TIP 35C	60p 70p 50p 70p	Sankyo tape motor 75p Swiss made 250rpm/240V motor very small 75p	GEC Mains Power Su 1Kg reel of solder	ipply R.E.G.		£3,00 £8,00	
BA 157 BA 159 BA	80p 50p 70p 40p	Mono scan coil 110° small neck £1.50 Infra red led	75R/25 Watt 18R/11 Watt 120R/17 Watt		25p Plastic Boxes 25p 100 Fuses 20p 100 W/W Re	£2.00 £1.50	
BA 182 8p TTP 41D	70p 30p	LD57CA 15p Mono scan coil £3	Front End Music Cent MW/LW 13"×3½" Output Stage for musi		BF 199 10 × 20 Turr Thorn 9 volt p BF 470	20 for £1 100k pots. Rank £2 power supply regulated £3.00	
BA 243 8p TIP 49 TIP 57 TIP 57 TIP 100	40p 30p 30p	G 8 transductor £1 AT 4041/41 transductor £1 2K5 Lin pot with	SONY 1400KV Chron SONY 1400KV Tuner SONY 1400KV Touc	runst :	£6 20 Slider Kno £3.50 6 Mixed UHF	20 for £2	
BA 318 5p T1F 100 BAV 10 10p T1F 112 BAV 21 10p T1F 115	40p 30p 30p 30p 30p 30p 50p 50p 35p	40mm spindle 20p 1982 Hitachi Ae isolator 50p Mullard FM decoder 1401 £1	12 Volt Mains Trans 5 18V or 12 Volt Mains	500M/A 1 Trans 500M/A	£1.00 Philips, Pye	Mixed Packs	
BAW 21 10p TIP 117 TIP 120 BB 103 10p TIP 125	50p 35p 35p	Philips service pack, flat films, 57 condensers 56nf-2.2uf £2 VHF 3 Transistor rotary tuner	Texas Viewdata Decor Issue 3 with all IC's Quantity Re	£1	TO66 12 Pow	er Trans RCA 16182 NPN for BD124 and Mounting	
BB 105A×12 £1 TIP 130 BB 105B×12 £1 TIP 131 BB 105G×12 £1 TIP 136	35p 30p 25p 30p 50p	DX-TV £1 15K-20 turn pots 20p Thorn panel 6×100 pot +	BY204/4 BY206 W005 bridge	25 for 1 25 for 1	£1.00 50 Mixed AC £1.00 15 Panel mou	series Transistor £4.50 nt rocker switch 250V/	
BB 121a 10p TIP 140 BRC 83c13 10p TIP 147 TIP 640 BZX 46c22 15p TIP 2955	50p 50p 50p 35p	changeover switch (Irish) 50p Battery converter TA 75 for colour TV. 12/24v Thorn	KT3 touch button blac G11 touch button red K30 full remote Dawe	k 6 fo	or £1 25 Panel Mou or £1 10A	nt Bulbs & Neons £1.50 £1.50 £1.50	
BZX 61 9-1 6p T 6032 BZX 61c110 6p T 6036	35p 30p 40p 40p	3787 Thorn 3500 2A cut out Stereo GEC amp 20 watt + pre-	I.C. K30 VHF. UHF Dawe BY298 3 amp/fast/R	erAss £	£7.00 Mixed ribbon 25 LED red/y 201/C Holders	ellow/green £1.50 £1.20	
BZX 61c20 10p T 6040 BZX 61c30 10p T 6047 BZX 61c220 10p T 6049 BZX 70c6v2 8p T 6051	40n l	amp with 4 pots + mains power unit with circuit £6	BD239 MR856 BU126	20 for £ 20 for £ 25 for £	£2.00 20 Small LED £1.50 10×20 Turn 1	Red £1.00	
BZX 70c12 20p T 6052 BZX 70c33 8p T 9004 BZX 79c3v9, 4v7, T 9005	40p 40p 40p 40p 40p	SPECIAL OFFER Decca-TTT etc.	BU205 BU105	10 for £ 10 for £ 10 for £	£8.00 20 Convergence £6.00 100 Sticks	£2,50	
5v1, 5v6, 6v2, 6v8, 7v5, 11, 12, 30, ZTX 102c ZTX 107	10p 10p	FEO4/1/250AC/4 Mains filters (grey type) × 4	2\$C2122A BF458 BD136	10 for £ 10 for £ 10 for £	£8.00 10 Thermistor £1.00 20 Slider Pots	50p £1.00	
BZX 83c4v3, 5v6, ZTX 109k 8v2, 12, 13, 24 ZTX 213	10p 5p 5p 10p	BRIDGES	BF224 OA90 BYX10	20 for £ 40 for £ 100 for £	E1.40 15 VDR + th	ermistors, degaussing, HT, £1.00	
BZX 84c6v8×10 30p	10p 10p 10p 10p	SKB 2/08 L5A 30p KBL 005 30p KBL 02 30p	KT3 multicaps 50 Ceramic Condenser Mixed Mounting Kit fo	10 for £		ake switch 70p	
8v2,12 10p each MJ 2253 MJE 3040	10p 60p 60p	KBP 04 30p W02 15p W004 15p	Transistors 300 Condensers 300 Resistors	£	50p 5 Tube Bases 1,000 Diodes,	£1.00 Condensers, Resistors on	
2 amp bridge rec. wire SP 8385 end 15p SAB 3205	10p 50p £1.00	W005 20p GEC remote panel. Main transformer 3/ic SAA 1025/SN	150 Electrolytics 15 Bulbs Antistatic Discloth	£	22.00 Lucky Dip 600 40p Jungle Bag 5K	g £3.00	
CV 8617 10p SAB 4209 Y 716 10p SPECIAL OFFER Y 729 30p Chassis complete	£1.00 CVC 21	74141/TBA 231 £6 AT 2076/35 £7 AT 2076/55 GEC split diode	100 Diodes	£	20mm Fuse H		
Y 730 10p Computer Transfor Y 827: 6A/IKV 20p 20v/2.25A; 20v/1.5	A;	transformer £10 AT 2048/11 LOPTI	SENDZ C	OMPONE	ENTS Chassis Mount IN4001/6 100	20 for £1 mixed £2.50	
Y 860 30p 17/.5A; 19/.5A; 28	.05A £3	Mullard £2.50	IO ONDER SEE	DAUK P	AGE		

SENDZ COMPONENTS TO ORDER SEE BACK PAGE

	E BACK PAGE
Thorn Spares 9000 Frame panel £8	BY 602 10p F 247 10p
9000 Cyclops panel £1.50 8000/8500 timebase panel £8	XK 3102 50p
8800 convergence panel £6	Hitachi 2A/1500V metal case wire
8500 convergence panel £6 4000 Chroma £20	20p
4000 Power supply £3 1600 Mains lead, switch	GEC Degausing Panel 809 with PT37 £1.00
3500 6 push button + cable form £1.50	Line Transformers
T605 IvNPN T066 80v/6A 10p 9000 Sound output panel £1	2 J/Pots 3,500 1 off each type£3.00 G8 Symmetry Coil £2.00
3500 Focus unit £1.50	G8 Trans. Philips £7,00 G11 Split Diode £12.00
3500 Mains Trans £4 3500 2amp thermal cutout 75p	CVC820 Split Diode ITT £10.00 Thorn B/W AD5308F + Stik +
3500 IF panel £2 3500 Frame panel £3	Lead £1.50
3500 Line panel £3 3500 A1 Diode 20p	GEC 2110 £7.00
Export 3500 IF panel £2 IC board with set of SN74LS £1	Mullard AT 2036 £1.50 Pye 169 Line Trans £3.00
4000 Tube base £4	Pye mono £3.00 Rank mono T704A £3.50
3500 A1 pots 50p Beam limiter panel £1.50	GRC 20 AX Split Diode Trans £7.00
3500 Power panel with Y969 £1 3 Way regulated adaptor 240V	CVC20 ITT £3.50 CVC32 ITT £7.50
6V/7.5/9V/300mA £3.50 Rank/Toshiba preh unit	AT2080/15 600M/300V £1
0354 £9.50 2 banks of 3 PB unit. Pye 731 £2	CVC800 Line Trans £6.00 GEC Portable G1OT2041 £3.00
4 Push button unit preh £1.00 6 Push button VHF/UHF for	GEC Portable G1OT2046 £3.00 EHT Split Diode Leads ITT £1.00
v/cap. GEC-Decca type £7.00 7 Push button for CVC5 ITT £8.00	EHT Cable/Metre 20p Ex panel "14" Fidelity portable £5
KT3 12 Push button unit £2.00	Triplers
KT3 (Export) 12 P.B.u £2 6 Push button Unit Thorn £1.00	8500 Triplers £6.50 11 TEZ Rank £3.00
6 Push button Unit fits GEC & Decca etc. £6.00	G9 Philips £4.00 GEC 2110 £4.00 3500 Thorn £3.50
6 Push button unit for GEC 2040 and ELC 1043/05 £6.00	9000 Thorn £5
Hearing aid unit £3 6 Push button unit PYE 713 £7.00	9500 Thorn £4.50 2040 GEC £3.50
7 Button Unit GEC with Lamps £7	GEC TVM25 Tripler £2.00
Mains Droppers G8 2R2+68R £1.25	Universal Tripler £5.00 IVK 76/9 £3.00
G8 47R 15 watt 75p	G8 Philips (Mullard) with cap£6.00 CVC 825 ITT CVC 20/25/30/
Pye 3R5/15R/45R 50p	32 £3.50 Decca 80 100 £4.50
Thorn 50/17/1K5 £1.00 120/20/20/48/117 £1.00	Grundig TVK 52 £2.50 11TBQ Pye 731 £3.00
270/10/6 for Thorn 4000 50p 18/320/70/39 £1.10	11 ITHY £4.00 D22 for Pye 18" colour
Thorn 50-40R-1K5 50p Ae Socket & Lead	portable £4.00 LP 1193/63 £4.00
GEC, ITI, Philips, Pye 25p 7×3‡ Thorn £1	BG 100/41 £3,25
Rank Toshiba Tube Bases 30p	BG 100/61 £3.25 KT3 BG200/43 £3.50
Speakers 6×4 G11 25 ohm 70p	T/text ultrasonic rec'r panel £14.00 Video cassette lamps on lead.
5½×2½ 3 ohm £1.00 5×3 80 ohm 70p	12-14V. 50p or 3 for £1.00 20 for £5.00 200 for £25.00
5×3 50 ohm 50p 5×3 35 ohm 70p	GEC 8 touch unit assy complete with all LC.'s + pots £4.00
h×4 15 ohm £1.00	G11 E.W. coils £1.00 G11 Fransient Suppressors
7×3 70 ohm £1.00 5×3 8 ohm 70p	245V 10 for £1.00 G11 Scan Coils £5.00
7×3 16 ohm £1.00 5" dia 16 ohm £1.00 5" dia 8 ohm £1.50	G11 100K tuner pots 12 for £1
h ₂ dia 4 ohm £1.50	KT3 IF panel KT3 line OSC transformer £1
6½" dia 3 ohm £1.50	kT3/K30 intra-red receiver head £3
3" dia 8 ohm 75p 4½" sq. 15 ohm 75p	K30 drawer unit with IC's (home) £10
KT3 speaker K30 75p 3" dia 15 ohm 60p	K30 drawer unit with IC's (export) £10
K30	KT3 AE Sockets 25p KT3 receiver panel £8
OF-550 E.W. 10p OF-513 correction 10p	KT3 line driver transformer 50p
Diodes	NPN PNP 80V 6 Amp TO66 O.P.
BY 127 BY 133 10p	Trans. pair 25p 5 button touch tuner BBC1/2
BY 134 10p BY 164 50p	TTV1/2 video with ic SAS 560T/ 570T £7.00
BY 176 25p 8Y 179 40p	Control panel 5 sliders + mains lead £1.50
BY 184 25p BY 187 10p	G11 8 touch button unit replaces old 6 P.B.U. £24
BY 190 40p	Tube base + base unit for 820 Euro chassis £4.00
BY 198 10p	GEC Line O/P Trans. & Rec Stick for Portable £3.00
BY 204/4 8p BY 206 8p	CVC 20/25/30/35/40 decoder
BY 208/800 Sp BY 210/400 Sp	panel CVC 20/25/30/35/40 decoder £10
BY 210/800 10p BY 223 60p	panel (untested) £5 CVC 40/45 IF panel £5
BY 224/600, 4.8A/600v bridge 50p BY 226 15p	40K Transducer 50p PHILIPS NE511N £1.20
BY 227 BY 228 15p 20p	LM337M Reg. 30p 20 GEC Black Spark Gaps £1.00
I BY 229/400 30n I	G11 Line Driver Transformer 35p KT3 Front Panel Control
BY 237 5p BY 254 10p	Assy. £2.50
BY 255 BY 298 10p	TELETEX DECODER 50p
BY 299 10p 8n	I.C. SAA 5051 I.C. SAA 5042
BY 527 20p BY 407a 10p	I.C. SAA 5030 I.C. SAA 5020 etc. £12.00
International Rectifier EHT Diodes C	G770/HV34 6KV 3 for 8p
6A/600V Stud Diodes 20p 6A/1000V Stud Diodes 20p	BTW 92/800R £3 25A473 PNP C/P 10p

	NEW PYE 725 line O/P panel with L.O.P.T. & Tripler	£10.00	210/1
	Thorn Mains Isolator unit for 70-89Ω. Ex-speaker NEW GEC 20AX Power Supply Switch Mode	£2 £12.00	1000
	Complete new GEC portable chassis M1201H/M1501H with P.B.U v.cap/LOPTI	., £10	
	Field + Jungle canel for GEC 3132/3135	£1.50	470/2
,	GEC 2110 line panel with transformer GEC 2110 tuner unit + IF Panel	£7.00 £12.00	Thor. 175/1
,	Pye/Chelsea Line op panel	£12.00	KT3/ 300+
	Pye 713 IF panel and tuner Pye 713 Chroma	£7.00 £10.00	350V 47/22
	Pye/Chelsea Timebase panel with LOPTI Pye 731 Frame Panel	£10.00 £5.00	150/1 2500/
	Pye 731 Convergence Panel	£5.00	470/4
1	Pye 731 line O/P panel with transformer + tripler Pye 731 Chroma	£12.00 £10.00	150/2 400/4
Ū	Pýe 731 IF panel + tuner Pye 607/205 Line panel with transformer	£10.00 £10.00	300/1 100/2
,	Pye CDA/205 panel	£6.00	150/1 300/3
	GEC portable chassis + LOPTI 2114 New Thorn 1613/1713 chassis	£4.00 9.75	1500,
	Hills 520 multimeter + case, $20,000\Omega/\text{volt}$, fuse diode protected + 1	ogic	Jelly 150/1
	test facility, 10meg/1200 volt NEW MULLARD TELETEX 250/64	£19.50	100/3 275v
	Decoder Panel (VM6230) £15.00 3300/70	50p 5p	300+ 225+
	Pagel 6330 \$15.0m 1/100 × 10	30p	200/1 500/5
	G8 Tuner Unit + Panel	10p 5p	150/1
	(late type) £12.00 2000/100	20p 70p	200/1
	G8 Power Supply £6.00 4700/100 £8.00 47/160	75p i	CVC
	G8 IF & Chroma £12.00 600M/300V	10p £1.00 50p	cvc
	1/250 Pulse	5p 10p	CVC.
	G11 IF Detector £3.00 G11 0.47/250 G11 Selector gain module Complete CVC 825 Chassis (both 3n3/250 A.C.	10p	CMA
	panels) £40.00 33/250V	10p 20p	ČMA CMA
	AEC V/Cap Resistor Unit UHF with 39/250V IC SAS660 SAS670 £3.00 4n7/250 tested 5KV	15p 25p 35p	CMA
\dashv	Z714 RANK IF Panels 6MHz 1 LC 91/250 SL437F £3.00 91/400	35p 30p	CMC CMC CMC
	Z909B RANK IF Panels 22/250	15p	CMC
ļ	Export 5.5MHz 2 1.C.'s 47/250 TBA1205B TCA2705Q £2.50 100/250	10p 20p £1.75	CMC
	Z743 RANK IF Panel GEC600/250	60p	CMC CMC CMC
	TBA750+SC9504P+ 800/250	£1 40p	CMC CMC
	SC9503P £1.50 32/300 Pye G11 Front panel with transducer, pots, tuner pots, 6 pb 8/350	20p	CMC
	transducer, pots, tuner pots, 6 pb 8/350	5p 8p	CMC
Ì	switch+lead £5.00 12/300 GEC V/cap VHF/UHF tuner and 4.7M/350v	10p 10p	CMD CMD CMD
-	F+ sound O/P PC 706B3 16/350 33/350 GEC Line O/P PC 659B3 £6.00 50/350	25p 20p	CMD
		10p 30p	CMF
	2110 GEC Power Panel £8.00 300/350 300/350 400/350	40p	CMF CMF
	G11 dynamic correction panel £6 10/375	50p 10p	CMF CMH CMH
	mains input panei £4 220/385	15p 75p	CMK CMK
1	With sliders; complete with lamp assy 0.1/400	60р 15р	CMN
1	+ pots £14 KT3 E/W .39/400	20p 20p	CMN CMN CMN
1	CVC 5 Mains on/off + 5 pots £2 Universal Focus. Fits Pye, Thorn and Decca Units 22/400	10p	CMP
-	Decca Units. 8/400	10p 15p	CMP CMP
	Decca Small 75p 400/400	20p 40p	CMS CMS
ļ	KT3 Focus Unit 75p 394K/400V K30 Focus Pot 75p 220/450	20p 40p	CMS CMU CMU
	IX10 Focus Units £6.00 47/500	25p	CMU
1	CVC 32 Focus Unit 0.1/600 Focus Rod 25p 0.47/600	15p 15p	CMU
1	G11 focus £2.00 0.047/1000 1TT Small for use with Split 0.01/1000 0.01/1000	10p 10p	GMA GMC
1	Directs 50m 0.1/1000	10p 20p	GMR TMN
-	Remo TV12SP 50p 4//250V A.C.	10p	VCA
	TV14 50p 0.0047/1500	10p 10p	VCA VMC VMC
-	TV18 60p 0105/1500	10p 10p	VMC
	TV20 £1.00 In8/1500 TV45 50p 2n0/1500	15p 10p	VMC
	TV45	15p 15p 15p	г
	4 blank (Cherry) £3.00 G11.8200/2KV	15p 15p	Trans transd
}	G7000 Philips Video Games Pack: () 1/2KV	20n	8 C.H C2014
İ	G11 drawer ASS 3 pots Mains switch 3n9/2KV	15p	New I
	and lead £2.00 0.0015/2KV 5n2/2KV	10p 10p	Full R Thorn
}	Line O/P panel GEC 2217/2218/ 2213/2214/2226/2227/2228 £10 2n0/2KV	15n	Decca Decca
	3500 thick film £2.00 2n2/2KV 7500pf/2KV	15p 15p 10p	GHI
	and lead £2.00	15p	CH U
Ì	DISPLAYS 0.0082/2500	I ac I	66/02 G9 Pl
-	4040 Clock £1.00 150/3500 1800/4KV	10p	Rank,
	2 digit LED 8.8 50p 170/8KV	10p 10p	Dynat 64
1	2 digit LED ÷ 1.8 with panel + 180/8KV MCI4511 £1.00 210/8KV	10p 10p	Hitach
1	4700/63 £1.50 1000/10KV	10p	Philip 20C9:
	Infra Red and Ultrasonic G11 Teletext Decoder Panel RANK & ITI Mains Remote Or-Off Switch (720R)	£30 £1.50	1ST 6 G11,
1	RANK & ITT Mains Remote Switch 2865 ohm RANK & ITT Remote Switch 2800 ohm	£1.50 £1.50	assy. G11.
	G11 Mains Switch	50p	(excha
	4 amp Mains Switch GEC Mains Switch 4 amp	25p 30p	Philip for 60
	KT3 Mainswitch THORN Rotary Mains Switch	£1.00 50p	Philip chann
+	G8 Mains Switch	75p	Philip:
	Thyristor 600/4 amp C106/2 G11 Preh Red LED P/Button for C.H. Change	24p 20p	KT3/I
-	RANK TOSHIBA Transductors TPC-2011 CVC 5 Mains on/off	50p	KT3 F Hitach
4	+250K+100K+500K+50K+50K Pot on Panel	£2.00	unit. I
	Thorn 12 or 24 volt battery convertor for portable colour T/V Tape Heads R/Play/Back Mono/Stereo	£12.00 £1.00	GEC GEC
		Post £1	

0.00 £2 2.00	210/12KV 1000/12KV 1200/12KV	10p 10p 10p
£10 1.50 7.00	Thorn 3500	or £15
2.00 2.00 7.00	1/5/100/100/350V KT3/200/25/25/385v 300+300+150+100+50MF	£1.75 £1.00 D
0.00 0.00 5.00	350V 47/220/350v 150/150/100/100/100/320v 2500/2500/63v 470/470/250v 150/200/200/300v	60р £2.00 50р
5.00 2.00 0.00 0.00	300/100/100/16/275v	50p 70p £1.70 £1.50
0.00 6.00 4.00	100/200/325v 150/150/100/375v 300/300/100/32/32/390v 1500/2000/30v Jelly pot Thorn 00D4/013 150/150/100/100/320v 100/350 + 300/200/100/16/	40p £1.50 2.00 50p £3
9.75 9.50 10p		£3 £2.00 £2.00
50p 5p 30p	300+300/300 225+25/380 200/100/100/350v	£1.00 70p £1.50
10p 5p 20p 70p	500/500/25v 150/150/100/300v 200/150/150/300v	50p 75p 1.00
75p 10p 1.00 50p	CVC 40/2 Chassis, new £30, complete with intrfase panel CVC 820 Line O/P Panel CVC20 Mains Panel	
5p 10p 10p 10p	111 8 & 6 Push Button Unit CMA 10 CMA 11	€2.00
20p 15p 25p 35p	CMA 11 CMA 30 CMA 40 CMC 10/2 CMC 16	£2.00 £2.00 £1.50 £5.00 £4.00
30р 15р 10р	CMC 10/2 CMC 16 CMC 38 CMC 45 CMC 47 CMC 52 CMC 57 CMC 57	£8.00 £1.50 £1.00 £15
20p 1.75 60p £1 40p	CMC 57 CMC 58 CMC 59 CMC 67 CMC 67/2	£6.00 £8.00 £8.00 £3.75
20p 5p 8p 10p	CMC 59 CMC 67 CMC 67/2 CMC 68 CMD 12 CMD 32	£4.00 £4.00 £10
10p 25p 20p	CMD 33 CMD 40 CMD 41 CMF 25 CMF 26	£5.00 £5.00 £5.00 £5.00 £2.00
10p 30p 40p 50p	LCMF 40	£2.00 £2.00 £1.50
10p 15p 75p 60p	CMH 10 CMH 31 CMK 12 (untested) CMK 30 (untested) CMN 20 CMN 21	£1.00 £4.00 £4.00 £1.50
15p 20p 20p 10p	CMN 40 CMN 45	£1.50 £1.00 25p £2.00
10p 15p 20p 40p	CMP 10 CMP 11 CMP 40 CMS 11 CMS 40	£4.00 £2.00 £2.00 £2.00
20p 40p 25p 15p	CMU 12 CMU 14 CMU 30 CMU 45 CMZ 30	£10,00 £8.00 £7.00 £7.00 £5.00
15p 10p 10p	GMA 90 GMC 120	£5.00 £2.50
10p 20p 10p 10p	GMR 64 TMN 2 VCA 20 VCA 21 VMC 26 VMC 24 VMC 44 + 45 VMC 51	£5.00 £2.00 £10 £10.00
10p 10p 10p 15p 10p	VMC 26 VMC 34 VMC 44 + 45 VMC 51	£3.00 £5.00 £4.00 £5.00
15p 15p 15p 15p	Hand Sets Fransducer Hand Set Insert, of transducer, SAA 1124 & lead	crystal,
20р 15р 15р	8 C.H. Ultrasonic GEC Full F C2014H/C2219H New Replacement for G11 U	Remote £15.00 Itrasonic
10p 10p 15p 15p	Full Remote Thorn 4000 insert with 7 but Decca RC 11 Decca RC 12	£14.00 £14.00
15p 10p 15p	G11 Infra-red full teletext C11 Ultrasonic full teletext fo 674/02 and G22c 66/02	£19.00 or G26c £16.00
15p 10p 5p 10p	G9 Philips R/C Transmitter Rank, Infra-red Dynatron-Full remote CTV 6 64	£8.00 £10.00

nk, Infra-red nk, Infra-red nk, Infra-red nk, Infra-red nk, Infra-red nation-Full remote CTV 62, 63, 219,00 achi infra red handset 198,00 infra-red handset 198,00 infra-red 198

Tuner Units GEC 6 Push Button Unit £6 IT1 6 Push Button Unit £6 DECCA 6 Push Button Unit £6 G8 Tuner GEC or Hitachi 6 push button unit 2110 Conversion GEC 2110 V/Cap £6 ELC 1043/06 (AEG) £6 ELC 1043/05 Mullard £6.00 ELC1043 (Ex Panel) £3.75 ELC1043 (£5.00	SENDZ COMPONENTS 63 Bishopsteignton, Shoeburyness, ESSEX SS3 8AF SAME DAY SERVICE All items subject to availability. No Accounts: No Credit Cards Postal Order/Cheque with order	SAA5000A £1.50 SAA5012A £5.00 SAA5020 £3.50 SAA5030 £5.00 SAA5040 £3.50 SAA5040A £4.40 SAA5050 £3.50 SAF1032p £2.50 SAF10329 £2.00 SAS560 £2.00	\$\text{SN76110N}\$ \$\text{SN76115AN}\$ \$\text{SN76115AN}\$ \$\text{SOp}\$ \$\text{SN76131}\$ \$\text{SOp}\$ \$\text{SN76131}\$ \$\text{SOp}\$ \$\text{SN76131}\$ \$\text{SOp}\$ \$\text{SN76226}\$ \$\text{\$\text{E1.00}}\$ \$\text{SN76227N}\$ \$\text{\$\text{60p}}\$ \$\text{SN7622N}\$ \$\text{\$\text{\$\text{E1.00}}}\$ \$\text{SN7622N}\$ \$\text{\$\text{\$\text{SN76232N}}\$ \$\text{\$\text{SOp}}\$ \$\text{SN76534N}\$ \$\text{\$\text{\$\text{E2.00}}}\$ \$\text{SN765445}\$ \$\text{\$\text{\$\text{\$\text{SN76545}}}\$	MJE2801 30p MJE2955 50p MJE13005 30p Sanikron Diode SKE2G2/04 30p Transistors A1222 15p AC123 15p AC106 15p AC121 15p AC124 15p
EL C2000 \$7.00 EL C2004 \$10.00 EL C2004 \$10.00 EL C2004 \$10.00 EL C2006 \$1	Add 15% VAT, then £1 Postage Add Postage for overseas Callers: To shop at 212 London Rd., Southend. Tel. 0702-332992	SA5660 £1.00 SA5670 £1.00 SL901B £5.00 SL901B £5.00 SL918 £6.20 TA7122 £1.15 TAA320A 50p TAA470 £1.50 TAA570 75p TAA611B £1.50 TAA621 £2.00 TAA661 £1.75 TAA641 £1.50 TA7117 50p TA71120P 50p TA7120P 50p TA7315AP 50p TA7607AP 40p TA7607AP 40p TBA120AS 50p TBA120AS 50p TBA120B 40p TBA120SA 40p	SN76546 £1.00	AC128 15p AC137 15p AC131 15p AC131 15p AC138 15p AC138 15p AC152 15p AC152 15p AC153K 15p AC142K 15p AC169 15p AC176 15p AC176 15p AC176K 15p AC178K 15p AC186 15p AC188 15p AC188 15p AC189 15p AC188 15p AC189 15p AC189 15p AC189 15p AC189 15p AC189 15p AC180 15p AC181 15p AC
Mullard Video Modulator.	10x1.6 amp 80p CA3189 40p 203.15 AS Fuses £1.70 CBF16848 50p CO-Ax Joint 15p DM7492 50p CO-Ax Splitter £1.00 HA1196 40p HA196 40p HA1196 40p HA1	TBA1441 £1.00 TBA231 75p TBA395Q 50p TBA396Q £1.00 TBA396 75p IBA440P £1.00 TBA1440C £1.00 TBA1440C £1.00 TBA520 £2.00 IBA530 £2.00 IBA530 £2.00 IBA530 £1.00 TBA570 £1.50 TBA661 £2.00 TBA651 £2.00 TBA650 £1.50 TBA780 £1.50 TBA780 £1.50 TBA780 £1.50 TBA780 £1.50 TBA800 50p IBA810AS	ICE120CQ £1.00 TDA410Q £1.00 TDA41010 £1.00 TDA1010 £1.00 TDA1010 £1.00 TDA1060A £1.50 TDA1072 £1 IDA1151 30p TDA1170 £1.00 TDA1200 75p TDA1200 75p TDA1327A £1.00 TDA2004 £2 TDA2004 £2 TDA2004 £2 TDA2004 £2 TDA2010 £1.00 TDA2140 £3.50 TDA2525 £1.00 TDA2530 £2.00 TDA2530 £1.00 TDA2532 £1.00 TDA2532 £1.00 TDA2531 £1.00 TDA2531 £1.00 TDA2541 £1.00 TDA2541 £1.00	BDS07 S0p BDS10 30p BDS10 30p BDS110 30p BDS17 30p BDS19 30p BDS34 30p BDS35 30p BDS35 30p BDS44D 30p BDS62 30p BD646 50p BD646 50p BD676A 30p BD676A 30p BD676A 30p BD681 25p BD807 20p BD826 50p BD826 50p BD826 50p BD827 20p BD827 20p BD827 20p BD827 20p BDS75 20p BDS75 20p BDS75 20p BF115 20p BF127 20p BF127 20p BF127 20p BF127 20p BF137 20p BF157 20p BF157 20p BF157 20p BF157 20p BF157 20p BF160 20p BDS75 20p BF160 20p B
Bi-T43 Bi-T43 Bi-T44 Bi-T84 Bi-T85 Bi-T86 Bi	10p BC455 10p BC456 10p BC456 10p BC460 25p BC662 10p BC463 10p BC478 10p BC532 10p BC532 10p BC547 10p BC547 10p BC547 10p BC556 10p BC558 10p BC558 10p BC558 10p BC558 10p BC558 10p BC559 10p	TBA810S 60p TBA820 610 TBA920 £1.50 TBA920 £1.50 TBA920 £1.50 TBA920 £1.50 TBA950 £1.50 TBA950 £1.50 TBA990Q £1.50 TBA990Q £1.50 TMS1000N1 £2.00 TMS1943 (clockchip) £1.00 TMS1943 (clockchip) £1.00 TMS2716JL £1.00 TMS3720ANS £3.00 TMS3720ANS £3.00 TMS3720ANS £3.00 TMS9902 £1.20 ULN2216 75p SN29848 50p SN29771BN £1.00 SN29772BN £1.00 SN2971BN £1.00	TDA2575A	BF161 20p BF164 60p BF179 30p BF180 20p BF181 20p BF181 20p BF182 20p BF184 20p BF195 10p BF195 10p BF196 10p BF197 12p BF198 10p BF199 10p BF199 10p BF200 20p BF222 10p BF224 15p BF238 20p BF244 40p BF245 10p BF246 10p BF247 15p BF258 25p BF263p BF264 15p BF258 25p BF268 15p BF268 15p BF268 15p BF27 1 10p BF27 3 10p BF27 1 10p BF27 3 10p BF35 30p BF36 2 20p BF36 3 15p
2N6109	10p BD228 30p SAA5000 £1.50	CVC 20 to 45 chassis 50p Pots 10 k with Switch 25p Pots 47 k with Switch 25p Mullard Surface Wave Filter RW 153P Cokour TV Filter Mullard Surface Wave	4.433.619 6.MHz 8.867238 Large or small 50p each GEC Power Panel 17/106 Thermistor PT34 New £1.00 DIL = DIL 40 Pin × 4 £1.00	BF391 15p BF394 10p BF419 30p BF422 15p BF423 15p BF448 30p BF450 20p BF450 20p BF458 30p BF468 30p BF468 30p BF468 30p BF470 20p BF480 50p BF480 50p BF490 10p BF597 10p
2SC1419 20p BC347 2SC1546 20p BC349b 2SC1725 20p BC350 2SC2068 20p BC365 2SC2073 8p BC384 2SC2122A £1.00 BC394 2SC2229 15p BC413	10p BFR39 15p VA1104 5 10p BFR52 7p ITIP7266312 1 20p BFR79 15p PTH451 AOR 10p BFR81 15p PT37P Fits Pyc & P134 14 BLBy 7 10p Degraging Degraphy (fits	Filter RW 154 Colour TV Filter	42 Pin × 5 £1.00 28 Pin × 5 80p 16 Pin × 10 70p 24 Pin × 5 75p 14 Pin × 10 70p	18 Pin × 10 £1.00 28 Pin × 4 £1.00 8 Pin × 10 50p 16 Pin G11 each 10p AB Mains Switch u/v 30p