JUNE 1984

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TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

Scope Component Test Unit

Improved Replacement Modules

HV2000 Sync Adaptor Unit

Servicing: Körting Chassis 9

VCR Clinic · TV Fault Finding

Long-distance TV · VCR Servicing

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TELEVISION

June 1984

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Issue 404

CORRESPONDENCE
All correspondence regarding 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.

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QUERIES
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 the address given above (see "correspondence").

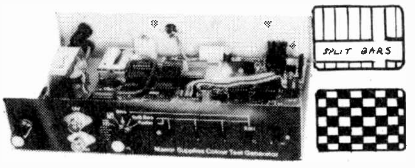
this month

OUR NEXT ISSUE DATED JULY WILL BE PUBLISHED ON JUNE 20

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 socket.
- ★ Additional video output for CCTV & VCR.
- ★ Facilities for sound output.
- ★ Easy to build kit. 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	£80.50
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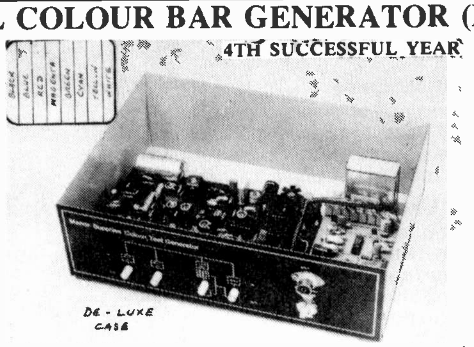
Built & Tested in De Luxe Case including Sound Module	£120.75

SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.50
All above prices include VAT 15%

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.

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MK 4 DE LUXE (MAINS) BUILT & TESTED £78.20 + £2.20 P & P.
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74LS11	58	74LS54	43	74LS125	85	74LS191	1.02	74LS352	1.40
74LS13	37	74LS55	60	74LS126	60	74LS192	1.30	74LS353	1.40
74LS14	46	74LS73	60	74LS132	63	74LS193	1.30	74LS365	75
74LS15	33	74LS74	65	74LS138	83	74LS194A	75	74LS366	82
74LS20	35	74LS75	65	74LS139	65	74LS197	95	74LS367	1.65
74LS21	35	74LS76	65	74LS151	85	74LS240	2.20	74LS368	65
74LS22	35	74LS78	65	74LS153	85	74LS241	2.20	74LS373	1.40
74LS26	44	74LS83A	89	74LS155	65	74LS242	2.20	74LS374	1.55
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74LS32	35	74LS90	60	74LS158	65	74LS245	2.30		

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7805	78
7806	78
7808	78
7812	78
7815	78
7818	78
7824	78
78L05	68
78L08	68
78L12	68
78L24	68
7905	98
7906	98
7908	98
7912	98
7915	98
7918	98
7924	98
79L05	72
79L12	72
79L15	72
79L24	72

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		4027B	39	4069B	22	4511B	76	4539B	77
		4028B	64	4070B	22	4512B	72	4541B	96
		4029B	90	4071B	22	4513B	1.68	4543B	1.12
4001B	21	4032B	1.04	4072B	22	4514B	1.88	4551B	96
4002B	21	4035B	80	4073B	22	4515B	1.88	4553B	2.40
4008B	72	4038B	99	4075B	22	4516B	76	4554B	1.20
4011B	21	4040B	72	4076B	80	4518B	76	4556B	48
4012B	21	4042B	58	4077B	22	4519B	64	4560B	1.76
4013B	30	4043B	71	4078B	22	4520B	76	4561B	74
4014B	74	4044B	71	4081B	22	4521B	1.68	4566B	1.20
4015B	76	4046B	96	4093B	43	4522B	88	4580B	3.60
4016B	31	4047B	70	4094B	1.56	4526B	88	4581B	1.84
4017B	66	4049UB	32	4099B	1.20	4527B	1.20	4582B	80
4018B	32	4050B	32	4160B	72	4528B	88	4583B	1.00
4020B	76	4051B	72	4161B	72	4529B	1.04	4584B	40
4021B	70	4052B	72	4162B	72	4530B	62	4585B	88
4022B	70	4053B	72	4163B	72	4531B	72	4597B	1.84
4023B	21	4060B	96	4502B	72	4532B	1.00	4598B	2.40
4024B	50	4066B	43	4505B	1.88	4536B	2.64	4599B	2.00
4025B	21	4068B	22	4510B	76	4538B	1.04		

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8 way	22
14 way	29
16 way	32
18 way	32
20 way	32
22 way	32
24 way	34
28 way	45
40 way	84

DIL to QUIL

14 way	32
16 way	34
18 way	37

QUIL to QUIL

14 way	32
16 way	36

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DECCA 56R/6R8	1.40
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R.B.M. 161	82
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GEC 27840	64
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ECC81	1.08	EL34	3.50	PCF802	1.12		
ECC82	98	EL84	1.05	PCF805	1.80	PY88	81
ECC83	1.07	EL90	82	PCF806	1.30	PY500A	2.30
ECC84	80	EY86/7	68	PCF808	1.63	PY800/1	69
ECC85	98	EY500A	1.50	PCH200	1.45	UCH81	2.25
ECC88	1.35	EZ80/1	56	PCL82	1.20	UCL83	1.82
ECF80	80	GY501	1.45	PCL84	1.20	UY85	1.35
ECF82	88	GZ34	3.50	PCL86	92	PL802T	4.00
ECH81	1.60	KT66	8.50	PCL805	1.09	40KD6	5.30
ECH84	1.66	KT88	12.00	PD500	2.93	21LU8	3.00
ECL80	84	PC92	3.00	PFL200	1.86	17DW4A	1.60
ECL82	1.30	PC97	1.65	PL36	1.87	3AT2B	5.00
ECL86	1.99	PCC85	85	PL81	94	12BY7A	3.75
EF80	95	PCC805	1.40	PL83	1.43	12HG7	3.20
EF86	1.96	PCF80	1.00	PL84	84		

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VA1040	75
VA8650	55
VA1039	35
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THORN 3000 2A Metal	1.60
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T1 ¾ Amber	22
T1 3mm Red, Green, Yellow	14
Flashing Red CQX21	62
CQX22	66
3 Colour VJ18P	76
Panel Clips 3mm	4
5mm	4

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GEC TCE	55
PHILIPS G8	
DECCA, RANK	55

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	22mF	25
	47mF	94
25V	22mF	42
35V	0.1mF	12
	0.22mF	12
	0.47mF	12
	1mF	12
	2.2mF	15
	4.7mF	24
	10mF	52

CONVERGENCE POTS

3W/5R-6R8-10R-15R-20R 50R-100R-200R-500R — 60

METRIC CONVERGENCE POTS

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DECCA 1730	8.58
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B+O (3000 EHT)	18.90

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THORN 1500 3 Stick	5.20
THORN 1500 5 Stick	5.29
THORN 1600	4.95
THORN 3000/3500	7.98
THORN 8000	5.28
THORN 8500/8800	7.15
THORN 9000	7.93
DECCA 1730/1830	4.48
DECCA 30	6.76
DECCA 80	6.60
DECCA 100	7.50
UNIVERSAL ITT or REMO	6.00
GEC 2100	7.40
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GEC 2040/2028	6.60
GEC 2110 Pre Jan '77	7.00
GEC 2110 Post Jan '77	7.00
PHILIPS G8 Short Focus Lead	6.75
PHILIPS G8 Long Focus 550	6.75
PHILIPS G9	6.37
Pye/Philips K3 Tripler	10.65
PYE 691/3	6.58
PYE 713/4 Lead	8.79
PYE 713 Doubler 5 Lead	8.79
Philips/Pye KT3	6.67
PYE 731/725	7.60
R.B.M. A823 (plug in) AV	7.60
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ITT KB CVC5/9	6.90
ITT KB CVC20/25/30 (Mullard)	5.95
RRI T20	6.80

RECTIFIER STICKS

TV11	74	TV18	90
TV13	79	TV20	1.20

REPLACEMENT ELECTROLYTICS

PYE 169 (200/200/100/32)	3.40
PHILIPS 320 (400/400/200V)	2.07
DECCA 30 (400/400/350V)	3.40
DECCA 80 (400/350V) / DECCA 100 (800/250V)	3.97
DECCA 1700 (200/200/400/350V)	4.83
PHILIPS G8 (600/300V)	2.30
PHILIPS G9 (600/300V)	2.21
PHILIPS G11 (470/250V)	2.90
PYE 691/7 (200/300/350V)	2.70
PYE 731 (600/300V)	2.31
RBM A823 (2500/2500/30V)	1.66
RBM A823 (600/300V)	2.83
RBM Z146 (300/300/350V)	3.55
RR1 T20A (220/400V)	2.00
ITT CVC5/9 (200/200/75/25)	2.98
ITT CVC 20 (220/400V)	2.00
GEC 2110 (600/250V)	1.94
GEC 2040 (1000/2000/35V)	1.19
GEC 2040 (300/300/150/100/50)	4.10
THORN 3500 (400/40V)	30
THORN 950 (100/300/100/16/275V)	1.83
THORN 1400 (150/100/100/100/150/320V)	2.79
THORN 1500 (150/150/100/300V)	2.20
THORN 1500 (12/300V)	31
THORN 3500 (175/100/100/400/350V)	2.78
THORN 3500 (1000/63V)	86
THORN 3500 (1000/70V)	86
THORN 8000/8500 (2500/2500/63V)	3.38
THORN 8000/8500 (700/250V)	2.31
THORN 8000/8500 (400/350V)	2.56
THORN 9000 (400/400V)	3.28
GEC (200/200/150/50)	2.64
PHILIPS 69 2200/63V	1.25
THORN 4700 P/C 25V	1.20
PHILIPS 320 400/400/200V	2.74
THORN 1591/1691 4700/25V	1.20

CAPACITORS AXIAL

Volts	Mfd	Price			
			63V	1	12
6V3	33	9		2.2	12
10V	22	10		4.7	12
	47	10		10	11
	100	10		15	12
	220	15		22	13
	470	20		47	19
16V	33	11		100	23
	68	11		220	37
	220	16		470	49
	1000	27		1000	58
	3300	53		2200	94
25V	10	11	*100V*	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
40V	10	10		33	75
	22	10	*500*	10	32
	400	48	*600*	1	41

MIXED DIELECTRIC CAPS

Volts D.C.					
250V	0.91mF	84	*1250V*	0.1mF	59
400V	0.22mF	29		0.91mF	1.15
600V	0.1mF	38	*1500V*	0.0022mF	28
1000V	0.01mF	24		0.0047mF	32
	0.047mF	46		0.022mF	30
	0.033mF	33		0.033mF	62
	0.1mF	35		0.005mF	65
	0.22mF	66	*2000V*	0.0052mF	1.20
	0.47mF	98			

FUSES

Per type / Pack of 10

1¼" QUICK BLOW

100ma	73
250ma-500ma-750ma-1A	60
1.5A-2A-2.5A-3A-5A	60

1¼" ANTISURGE

250ma, 500ma, 600ma, 630ma, 750ma, 850ma, 1A, 1.25A, 1.5A, 2A	1.70
2.5A, 3A, 5A	2.70

20mm ANTISURGE

80ma	4.80
100ma	2.50
160ma, 200ma	2.20
315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A	1.30
2.5A, 3.15A, 4A, 400ma	1.90

20mm QUICK BLOW

100ma, 250ma, 500ma, 630ma, 800ma	90
1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A	60

1" MAINS

2A, 3A, 5A, 10A, 13A	1.00

LOTS OF NEW ADDITIONS IN THIS ISSUE

NEW MONO TUBES

MULL. A31/510 110° 12"	18.50
MULL. A34/510 110° 14"	20.00
A50/120WR 110° 20"	15.00
A61/120WR 110° 24"	17.50
VEGA 12" 90° (Jap Types)	15.00
CME1520 (15" Mono)	15.00

MULLARD COLOUREX*

18" A47/343X	59.00
19" A49/120X	53.00
20" A51/110X	53.00
22" A56/120X	43.00
25" A63/200X	55.00
26" A66/120X	57.00
26" A67/120X	58.00
22" A56/500X	58.00
A51 570X	63.00
A56 510	58.00
A66 510	92.00

WHILE STOCKS LAST

1 year warranty Option on 4 years. Quotes on delivery and glass charges

REBUILT COLOUR TUBES

ALL AVAILABLE EX-STOCK ON GLASS FOR GLASS EXCHANGE FROM TRADE COUNTER. SOME TYPES AVAILABLE WITHOUT EXCHANGE FOR SMALL GLASS CHARGE

17" A44/271X	32.00
18" A47/342X (Low Focus)	32.00
18" A47/343X (Stnd Focus)	32.00
20" A51/110X	30.00
19" A49/120X	30.00
22" A56/120X	30.00
22" A55/14X	30.00
25" A63/200X	34.00
26" A66/120X	34.00
26" A67/120X	34.00
22" A56/140X (410X) 110°	36.00
26" A66/140X (410X) 110°	36.00
20" A51/161X	60.00
22" A56/510X	50.00
A56 540X	89.00
A66 540X	75.00
A66 500X	64.00

P.I.L. TUBES – we can rebuild your own glass – please ring for quotes.

SLIDER POTENT

Lin or Log 470R-1K-2K2-4K7 10K-47K-470K — 65

MIDGET CONTROLS

Insulated Spindle Length 44mm

Log or Lin Without Switch

5K-10K-25K-50K-100K-250K-500K-1M	39p
With D.P.S.T. Switch Log: 5K-10K-25K-50K-100K 250K, 500K, 1M, 2M	81p
Dual gang Controls	1.25
16mm Rotary Controls 10K, 22K, 100K, 1M, 10K	39p

SKELETON PRE-SET POTS

Standard or miniature Horizontal or Vertical

100R-2M2 — 16p

THICK FILM RESISTOR NETWORK

THORN 3500 (5 pin connection)	1.98
PYE 731 (6 pin connection)	2.20
THORN 9000 (Circuit Ref. R704/7)	1.98

WIREWOUND RESISTORS*

4W 1R-10K	24p
7W 1R-22K	26p
11W 1R-22K	29p
17W 1R22K	32p

(Preferred values)*

EVER READY BATTERIES

HP2	26	PP6	82
HP7	12	PP7	82
HP11	24	PP9	84
HP16	13	R6PP	17
PP3	42	R14PP	26
PP3-C	53	1289	45

SERVICE MANUALS (Zero VAT)

THORN 1590/1	3.00	VIDCO 3V22	22.50	PHILIPS G8 550	2.50
1615	2.50	3V29/30	32.00	G9	3.50
1640/1	4.50	DECCA 30	2.50	G11	3.00
9000	7.50	80	4.75	K30	3.00
9800	6.50	70/90	3.00	KT3	3.00
Tx9	15.50	100	4.00		
Tx10	18.50	110	3.50		

CARBON RESISTORS*

¼W 3R3-8M2	20
½W 3R3-8M2	20
1W 10R-10M	36
2W 10R-10M	62

Sold in packs of 10 per type i.e. per value

RECHARGEABLES

EVER READY

RX6 (HP7)	1.10
RX14 (HP11)	1.95
RX20 (HP2)	2.15
RX22 (PP3)	3.75
Universal Charger	6.00

P. V. TUBES

PLEASE NOTE OUR NEW ADDRESS – COME AND SEE US

104 ABBEY STREET, ACCRINGTON, LANCS.

TEL: 0254 36521/32611

ADD VAT 15% TO ALL PRICES

HOW TO ORDER
ADD 65p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degaus. coils please allow £1.20 P+P (U.K.). Export orders charged at cost. First Class Mail is used whenever possible.

Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible. We try our best to give a speedy, fair and efficient service. As our regular customers know, orders telephoned in before 4 p.m. will be despatched the same day. V.A.T. invoice on request. Give us a ring – we'll give you service. Please ask if what you need is not listed – we will try to help. Prices are subject to change without notice.

SEMICONDUCTORS

AC107	35
AC126	30
AC127	32
AC128	32
AC128K	40
AC141K	39
AC142K	38
AC176	35
AC176K	35
AC186	41
AC187	38
AC187K	38
AC188	35
AC188K	39
AD143	82
AD161	54
AD162	54
AD161/62 MP	1.15
AF106	49
AF114	89
AF118	1.20
AF121	75
AF124	48
AF125	46
AF126	46
AF127	38
AF139	58
AF178	1.54
AF239	60
AL102	2.00
AU106	2.50
AU107	2.00
AU113	2.00
BC107	20
BC108	20
BC109	20
BC114	12
BC115	17
BC116A	16
BC117	30
BC118	24
BC119	36
BC139	28
BC140	32
BC141	26
BC142	30
BC143	31
BC147	13
BC148	9
BC149	12
BC157	16
BC158	16
BC159	15
BC160	25
BC161	28
BC170B	15
BC171	15
BC172	15
BC173	12
BC174	10
BC177	27
BC178	26
BC182L	9
BC183L	12
BC184L	14
BC186	18
BC187	18
BC204	10
BC208	13
BC209	10
BC212	9
BC212L	13
BC213	13
BC214	10
BC237	14
BC238	14
BC251A	18
BC252	12
BC261	18
BC262	18
BC300	50
BC301	53
BC303	33
BC307	20
BC308	25
BC323	99
BC327	18
BC328	18
BC337	18
BC338	18
BC461	30
BC547	13
BC548	13
BCX32	30
BCX34	27
BC549	8

BC550	7
BC557	8
BC558	9
BCY72	13
BD115	45
BD116A	65
BD124P	79
BD131	50
BD132	49
BD133	60
BD135	38
BD136	38
BD137	38
BD138	35
BD139	35
BD140	44
BD144	1.70
BD150	60
BD159	65
BD160	1.90
BD166	52
BD179	70
BD182	1.20
BD183	75
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
BD232	68
BD233	60
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
BD243	85
BD244	85
BD410	79
BD434	74
BD437	86
BD438	94
BD507	52
BD508	55
BD509	56
BD510	60
BD278A	81
BD517	60
BD520	75
BD526	62
BD535	82
BD536	91
BD696A	1.49
BD697	1.24
BD695	1.39
BD698	1.50
BD707	95
BDX32	2.10
BF115	38
BF117	36
BF125	26
BF127	47
BF154	23
BF158	18
BF160	27
BF167	24
BF173	22
BF177	52
BF178	46
BF179	28
BF180	39
BF181	39
BF182	36
BF183	29
BF184	36
BF185	36
BF194/394	16
BF195	16
BF196	16
BF197	16
BF198	18
BF199	21
BF200	35
BF224	25
BF225	20
BF241	25
BF256	55
BF257	28
BF258	25
BF259	35
BF262	84
BF263	75
BF271	24
BF273	24

BF274	24
BF336	36
BF337	41
BF338	41
BF355	56
BF362	68
BF363	72
BF371	30
BF392	35
BF422	34
BF423	46
BF435	35
BF457	35
BF458	43
BF459	43
BF460	86
BF462	86
BF469	46
BF470	66
BF597	10
BF757	54
BF758	54
BFR39	27
BFR40	30
BFR79	85
BFR90	1.74
BFT42	39
BFT43	39
BFW10	60
BFX29	40
BFX84	42
BFX85	30
BFX86	30
BFX88	46
BFY50	30
BFY51	30
BFY52	24
BFY90	95
BR100	34
BR101	45
BR103	83
BRC4443	94
BRC4444	98
BRX46	40
BRY39	56
BRY55	45
BRY56	57
BSW67	68
BSV57B	72
BT100	1.65
BT101	1.20
BT102/500	1.20
BT106	1.60
BT107	1.69
BT108	1.69
BT109	99
BT116	1.21
BT119	3.66
BT120	3.66
BT151/800	1.20
BU104	2.00
BU105	1.58
BU108	1.80
BU124	1.90
BU126	1.75
BU204	1.50
BU205	1.42
BU206	1.80
BU208	1.60
BU208A	1.65
BU208/02	2.10
BU326A	1.75
BU407	1.70
BU426A	3.07
BU500	2.30
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BUW84	1.45
BUW91A	3.84
BUX84	1.50
E1222	40
MCR101	45
MCR220	1.50
MED411	20
MJE340	68
MJE520	50
MJ3000	1.98
MPSA92	35
MR814	45
MR854	55
MR475	2.46
MR479	2.60
ON447	99
ON448	99

OT112	1.91
OT121	1.91
R2008B	1.90
R2010B	1.92
R2265	1.50
R2322	62
R2323	67
R2461	1.50
R2540	2.80
RCA16334	90
RCA16029	99
RCA16039	99
RCA16091	2.95
RCA16092	99
RCA16040	96
RCA16041	84
RCA16334	90
RCA16335	90
RCA16799	99
RCA16957	2.88
TIC45	90
TIC46	60
TIL32	65
TIL78	48
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP34B	1.06
TIP41C	47
TIP42C	50
TIP47	70
TIP120	65
TIP2955	90
TIP3055	63
TIS91	21
TU106/02	1.80
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	60
2N3702	11
2N3703	10
2N3705	10
2N3706	10
2N3708	17
2N2904	30
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.50
2SC1096	1.72
2SC1172Y	2.20
2SC1173Y	1.69
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73
DEC1	2.20
DEC2	2.20
THY15/80	2.20
THY15/85	2.20
BU208B	2.20

We will try to supply the original part when we can. Under certain circumstances we may have to supply an equivalent.

INTEGRATED CIRCUITS

AN214Q	3.91
AN240	3.84
AN318	3.98
AN262	2.45
AN301	5.15
AN715Q	3.97
AN6340	7.85
AN6341	4.45
AN6341N	5.10
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA566	84
CA741	25
CA748	45
CA3065	1.80
HA1124	1.65
HA1151	3.89
HA1322	2.65
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1392	3.95
HA11219	2.49
LA4031P	3.21
LA4032P	2.90
LA4102	3.37
LA4250	3.57
LA4400	3.05
LA4422	3.28
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
LM1303N	2.63
MB3712	1.95
MC1307	1.99
MC1310P	1.60
MC1327	1.70
MC1351P	2.93
MC1330P	90
MC1349	1.99
MC1350	1.50
MC1352	1.75
MC1358P	1.50
MC1495L	3.00
MC13002	3.90
MC14011BCP	66
MC14049UB	43
MC7742	1.35
MC7812	1.35
ML231 ETTR8016	2.20
ML232	2.20
ML236	5.35
ML237	2.50
ML238	6.00
ML239	2.50
ML920	4.12
ML922	3.29
ML926	2.18
ML928	2.18
MM5387ANN	4.15
MM5402N	6.65
MRF475	2.50
MRF477	10.00
MSN5807	7.87
MS1513L	2.80
MS1515L	3.28
SAA1025	4.40
SAA1124	2.50
SAA1250	3.94
SAA1251	4.90
SAA5000	4.39
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAA3210	2.93
SAS560S	1.89
SAS570S	1.89
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	5.50
SL917B	6.50
SL1310	1.80
SL1327Q	1.20
SL1430	1.25
SL1432	3.35
SL76544	2.05

SN76003N =SN76013N	2.49
SN76023N	2.00
SN76110N	1.15
SN76115N	2.27
SN76131N	2.00
SN76226DN	2.00
SN76227N	1.18
SN76532N	1.50
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35
SN76650N	1.05
SN76660N	80
SN76666N	80
SN76530A	1.47
STK015	6.25
STK032	13.25
STK043	11.05
STK433	5.65
STK435	9.06
STK436	5.50
STK437	7.85
STK459	8.20
STK441	8.10
STK461	9.60
STK463	14.30
SW153	2.74
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	1.00
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7141P	95
TA7146P	4.67
TA7193P	5.67
TA7171P	1.85
TA7172P	1.85
TA7173P	1.85
TA7176P	2.50
TA7202P	4.27
TA7204P	3.77
TA7205AP	3.72
TA7208P	3.40
TA7210P	6.60
TA7222	2.42
TA7223P	3.74
TA7227P	5.98
TA7228P	5.98
TA7310P	2.78
TA7609P	4.39
TA7611AP	2.92
TAA300	58
TAA310	2.83
TAA320	2.00
TAA350A	60
TAA550	55
TAA630	3.90
TAA8400S1	1.96
TAA661B	1.20
TBA120A (A),(S),(AS),(SA).	80
TBA120B	1.30
TBA120SB	1.37
TBA120T	95
TBA120U	1.10
TBA395	1.20
TBA396	80
TBA440N (TBA1441)	2.75
TBA440P	2.50
TBA480Q	1.50
TBA510	3.00
TBA520(Q)	1.68
TBA530(Q)	1.38
TBA540	1.68
TBA550(Q)	1.58
TBA560Q	1.59
TBA570	1.79
TBA690	1.50
TBA641BX1	3.50
TBA673	2.45
TBA700	2.12
TBA720	2.64
TBA750	2.98
TBA800	1.62
TBA810AS	1.10
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	3.00
TBA950(2X)	3.05
TBA970	4.09

TBA990	1.90
TBA14406	2.44
TCA160	1.20
TCA760	2.30
TCA270SQ	2.50
TCA800	3.10
TCA830	2.44
TCA830S	1.75
TCA900	2.20
TCA910	2.20
TCA940	1.95
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1004A	3.35
TDA1006A	2.50
TDA1005	3.60
TDA1010	1.54
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1062	1.56
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1180	2.91
TDA1200	2.95
TDA1220A	2.12
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.20
TDA1415	1.40
TDA1470	4.67
TDA1770	4.80
TDA2002	2.80
TDA2003	1.20
TDA2004	2.52
TDA2006	1.78
TDA2010	2.00
TDA2140	5.95
TDA2150	2.22
TDA2190	4.70
TDA2020	4.66
TDA2030	2.80
TDA2521	4.17
TDA2522	2.40
TDA2523	3.40
TDA2524	2.25
TDA2525	3.64
TDA2530	2.70
TDA2532	2.66
TDA2540	3.84
TDA2541	3.84
TDA2560	3.50
TDA2571	2.56
TDA2576	3.75
TDA2576A	3.75
TDA2577	3.25
TDA2581	3.30
TDA2582	2.60
TDA2590	3.25
TDA2591	2.95
TDA2593	2.95
TDA2600	5.30
TDA2610	3.20
TDA2611A	1.95
TDA2640	2.92
TDA2652	3.96
TDA2680	3.40
TDA2690	1.35
TDA3190	2.00
TDA3500	6.90
TDA3560	6.00
TDA3561	6.50
TDA3571	3.75
TDA3651	6.50
TDA3950	3.15
TDA4420	4.22
TDA4600	2.95
TDA9503	2.50
TEA1002	3.50
TEA1009	1.37
UPC554	1.34
UPC566H	2.95
UPC575C2	3.40
UPC576H	1.90
UPC587C2	1.60
UPC1025H	2.95
UPC1028H	2.52
UPC1032H	64
UPC1042C	1.56
UPC1156H	4.26
UPC1158H	78
UPC1163H	98

UPC1167C2	94
UPC1168C	1.28
UPC1176C	1.46
UPC1177H	1.56
UPC1178C	1.28
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
UPC1183H	1.38
UPC1185H	3.66
UPC1188H	2.20
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UPC1211V	2.70
UPC1212V	1.34
UPC1215V	1.66
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UPC1217G	1.13
UPC1218H	1.80
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UPC1245V	1.35
UPC1350C	4.15
UPC1353C	1.92
UPC1365C	6.38
UPC1356C2	2.08
UPC1367	2.08
UPC1378H	2.70
UPC1358H	1.88
UPC1360C	2.20
UPC1363C	2.16
UPC1366C	1.84
UPC1368H2	2.15
UPC1370C2	2.58
UPC1382C	1.08
UPC1384	3.78
UPC1447H	58
UPC41C	2.80
UPC5743	38
UPC577H	2.46
UPC585C	1.28

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA317	26
BAX13	4
BAX16	8
BB105B	30
BB105G	30
BY126	12
BY127	11
BY133	15
BY164	45
BY176	85
BY179	63
BY182	87
BY184	55
BY199	28
BY206	14
BY210/600	28
BY210/800	33
BY223	90
BY227	28
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX36/600	35
BYX55/600	30
BYX71/600	90
OA47	9
OA90	10
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	5
IN4007	6
IN4148	2
IN4448	10
IN5401	12
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TELEVISION

A Flat Patch

Right now there seems to be growing pessimism on one front (cable TV), a deathly hush on another (DBS), and a subsidence in the frothy marketing conditions that characterised another (video) until recently. All this despite signs of increased economic activity in the UK. The world of TV appears to have got out of step with the rest of the economy: it peaked while most other sections were in the doldrums, and has now turned rather flat.

Two reports on cable prospects have appeared recently. Management consultants McKinsey see a bleak and unprofitable future if reliance is placed mainly on entertainment. Just how unprofitable can be seen from the following quotation: "total operating losses under optimistic assumptions will, for a 100,000 home franchise, reach £10 million by the late 1980s, never to be recouped". That and other conclusions follow a fifteen month study.

McKinsey consider that the prospects would be very much better if greater emphasis was placed on cable as a medium for providing a number of services – in particular by incorporating telephony services from the outset. This seems strange. Why should laying expensive wideband cable to do what the current telephone lines do quite adequately make such a difference? The McKinsey researchers seem to think it would however. They suggest that telephony could add 40–45 per cent to total system revenues, making it possible to break even – by 1994! This is of course all a matter of conjecture, and there's no reason why we shouldn't hazard our own guess. We'd say that entertainment is primarily what people want and are prepared to pay for, and that if entertainment can't be relied upon to make cable pay, the prospects are dim indeed.

McKinsey comment that much work has been done on the office of the future but little on the home of the future. Unless we all turn into robots, we'd suggest that the home of the future is likely to be much as it is today, though hopefully providing greater comfort. The cat was rather let out of the bag officewise in a recent *Financial Times* survey on office automation. Ms Emma Bird, a senior consultant with an electronic office specialist firm, was quoted in this as saying that "managers generally say that the introduction of plans to acquire new technology can go ahead if significant staff savings or gains in productivity will result: in practice, such hard justifications are rarely achieved." If the great information technology revolution is so hard to justify in the office, how much more difficult will it be to justify it in the home? So much for all that home banking and so on. When it comes to the use of the computer in the domestic setting, one can't help but feel that it will be like the VCR – people selecting their own uses/programmes without need for a cable link to some central computer system. In fact entertainment is what home computers are at present mainly used for!

The other report on cable comes from CIT Research, an independent UK market research company. This organisation last published a study on pan-European cable prospects in late 1982. Its new study sharply downgrades growth forecasts – it now expects that at best 19·5 per cent of European households will be linked to cable TV by 1992 – the previous forecast was 27 per cent. Its conclusion is that cable TV will be a commercial failure in W. Europe unless government policies are radically changed, warning that most new cable systems planned under existing policies will lose money or be only marginally profitable – if they ever begin operating at all – and will find it hard to attract subscribers quickly. There is of course no particular reason why governments should leap in to assist something that doesn't seem to be wanted.

It's interesting that CIT Research's conclusions seem to be the opposite of McKinsey's. CIT Research comment that "too much emphasis is being placed on the design of the cable systems themselves and too little on the production of commercial programmes to be carried on them." Further, "there's little sign of a demand for interactive services providing information – except for details of television and radio programmes which could as easily be obtained from the press: most of the interactive services envisaged for cable could as well be provided on existing telephone networks."

Thumbs down it seems for cable. When it comes to DBS, the reason for the present hush is perhaps best summed up by a quote from Lord Thomson, chairman of the IBA, who commented during a recent speech at the Anglo-German Chamber of Commerce in Munich that "the economics have turned out to be chilling". This is the reason for ITV and the BBC suggesting a joint effort to try to get a UK DBS service going. The plan is that the BBC would have a 50 per cent interest in the venture and the ITV companies along with other outside commercial interests the other 50 per cent, the IBA being given the job of finding outside investors and recommending them to the Home Office. At the time of writing this the government has yet to give approval to such a deal, which would involve an extra eight years' guaranteed franchise for the ITV companies regardless of whether they participate in the scheme. The decision rests with the cabinet, and is likely to be introduced as an amendment to the Cable and Broadcasting Bill during the second reading.

Finally the video market. As figures quoted in Teletopics show, the momentum has come to a halt, with VCR sales/rentals stabilising and disc player sales failing to take off. There are one or two points that seem worth making on the technical front. The increasing dominance of the VHS system makes the introduction of 8mm equipment look like being a very long term affair, while solid-state imagers seem to be out for the time being. As regards digital TV sets, the advantages are hard to see – just think of all those watts wasted in AD/DA conversion.

Servicing the Körting Chassis 9

John Coombes

The Körting Chassis 9, which was introduced in 1979, was designed to drive several different types of tube – PIL in the 20in. size, and 20AX/30AX in the 22 and 26in. sizes. It was used in a range of models with serial numbers 40,000, 41,000 and 59,000, e.g. the 22in. Model 59571 and the 26in. Model 59671. There's a main vertical panel into which a number of subpanels are plugged – the arrangement is shown in Fig. 1.

A self-oscillating chopper circuit (Siemens type) provides various regulated supplies, also mains isolation. See Fig. 2. The line output stage employs a BU208 transistor and an e.h.t. tripler. It requires a 150V h.t. supply with the 20AX tube, 155V with the 30AX – this is set with R623 on the chopper panel, at minimum brightness. Though they all look similar, different line output transformers are required with the different tube types. The tripler also differs, due to the different focus voltage requirements of the 20AX and 30AX tubes. A diode modulator is used for EW correction, driven by a BU125S transistor. The correction waveform is produced by an i.c., type TDA1082. See Fig. 4. The field timebase consists of a TDA1170 followed by a three transistor driver/output stage. There's also an output stage flyback voltage doubling circuit. See Fig. 3. Sync separation and line generation are carried out by a TDA2591 i.c. In later versions a different subpanel with a TDA2576A i.c. is used.

On the signals side there's a single i.c. (TDA2541) i.f. strip and a three chip (TDA2560/TDA2522/TDA2530) decoder. The RGB output stages are of the complementary symmetry type (BF715/BF716 or BF869/BF870 transistors). There are two alternative sound modules. The basic one uses a TBA120U intercarrier sound chip followed by a TDA2611 audio chip that provides an output of 3·5W. For up-market models there's a board with TDA2790 and TDA2030 i.c.s delivering 15W and incorporating bass and treble controls.

No Sound or Raster

In a set of this type, the no sound or picture symptom can be caused by many things. First check the 3·15AT mains fuse Si601. If this is open-circuit, check the mains filter capacitors C601 and C603, the mains bridge rectifier G601 and the rectifier's protection capacitors C609-612.

If the mains input circuit is o.k., check R634 (1MΩ) and D632 (1N4007) in the chopper's start-up circuit. R634 can also be responsible for intermittent failure to operate. It was subsequently reduced in value to 470kΩ. Next check for dry-joints on the chopper transformer Tr601 and the chopper panel, then check the rectifier panel where the usual offenders are the 150/155V rectifier D651 (BY299) and its reservoir capacitor C651 (47μF). They tend to go short-circuit.

If everything is in order up to this point, it's necessary to pay closer attention to the chopper circuit. Check for voltage at the collector of the BU326A chopper transistor T622. If this if missing, check the continuity between pins 7 and 1 of the chopper transformer. If voltage is present, check the chopper circuit fuse Si621 (1·6A). If this is open-circuit, check the chopper transistor and the switch-off thyristor Th621 (BR303) for being short-circuit. These two items must be replaced in pairs.

If the power supply seems to be all right, move on to the line timebase. Check the 12V supply to pin 1 of the TDA2591. If missing, check the filter resistor R434 (120Ω) for being open-circuit. If R434 is o.k. and the voltage at pin 1 of the i.c. is missing or low, suspect the i.c. With the TDA2576A the supply pin is 16 and the filter resistor R453 (56Ω, 1W). With both boards there should be 17·5V at pin 6 of the panel.

Next check the line driver stage. There should be 150/155V at pins 9/10 of the line output subpanel. If there's no output from the driver, check the feed resistor R1005 (1·8kΩ) for being open-circuit and its decoupler C1003 (0·047μF) for being short-circuit. If necessary check the transistor (T1001, type BD232) for being short-circuit or leaky. Check for dry-joints at the pins of the line driver transformer U1001. On rare occasions you may find that the primary winding is open-circuit.

The most likely cause of a dead line timebase is failure of the BU208 (T1002) line output transistor however. It usually goes short-circuit, and in this event R1008 (1Ω) in its base circuit is likely to be open-circuit. If the line output transistor is all right, disconnect the lead from the line output transformer to the tripler. If the set then bursts into life either the tripler or the transformer is faulty. It's usually the tripler.

Tripping

If the set is tripping, ensure that the line output stage h.t. voltage is correctly set (test point U4) for 150V or 155V depending on tube type. Adjust with R623. If R623 cannot be adjusted for the correct voltage, check transistor T621 (BC557) and zener diode D621 (BZX83C7·5) in the chopper control circuit. If the h.t. voltage is varying,

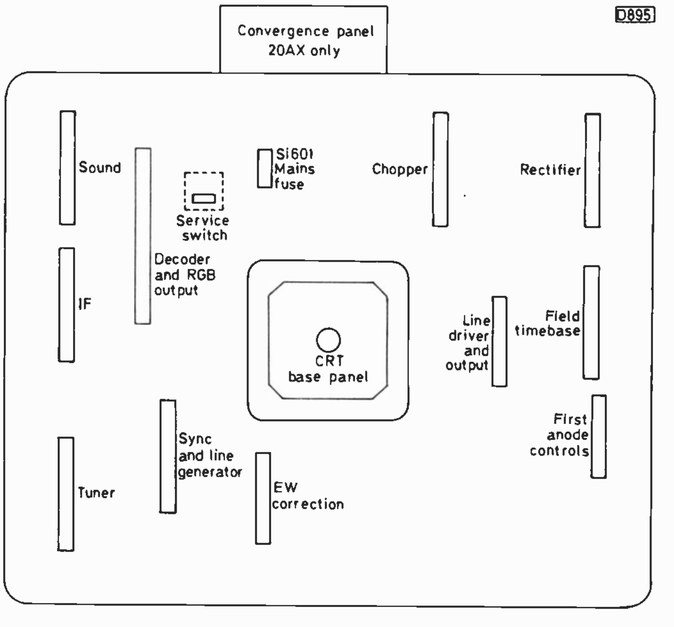

Fig. 1: Positions of the subpanels on the main board.

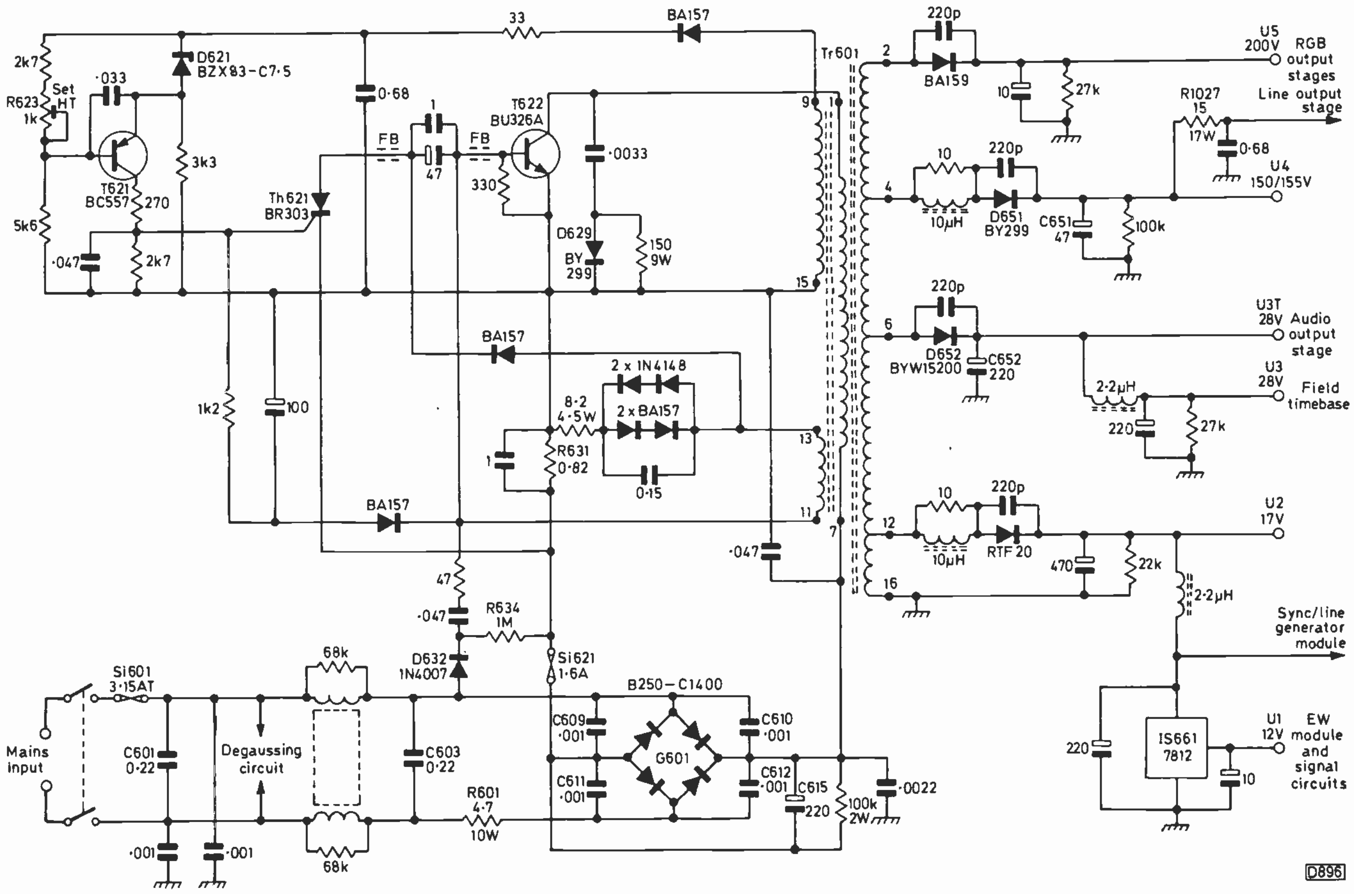

Fig. 2: The power supply circuit.

check the condition of R623's carbon track.

Next check the line output transistor which could be short-circuit or leaky, and the EW modulator diodes D1001 (BY223) and D1002 (BYX71-600R). Finally check the line output transformer and tripler by disconnection as previously described.

Focus Faults

The most likely cause of focus trouble is the control, which is mounted on the tripler. Less likely is the series resistor R1218 (1MΩ) on the tube base panel (this resistor is not present in all models), the spark gap FU1, or corrosion on the focus pin. A faulty tripler is another possibility. The focus spark gap can also be responsible for intermittent focus variations.

Collapsing Picture

A collapsing picture with the sound cutting in and out as the picture collapses could be tripping, see above, or a faulty line output transistor.

Line Timebase Faults

For line collapse check the output transistor, the scan correction capacitor C1021 (1μF – check for being open-circuit or for dry-jointed leads), the scan coils, plugs and sockets, and for dry-joints on the linearity coil L1023. The linearity coil is the usual cause of line whstle – check by replacement.

For excessive width check whether the width control R396 is set correctly, then check D1002 in the diode modulator circuit and if necessary the line output transistor, both by replacement. If there's evidence of ballooning, suspect the tripler.

For EW correction faults, check the modulator diodes D1001/2 and the driver transistor T371, then suspect the TDA1082 chip (IS371).

If the line shift control has no effect, check the control

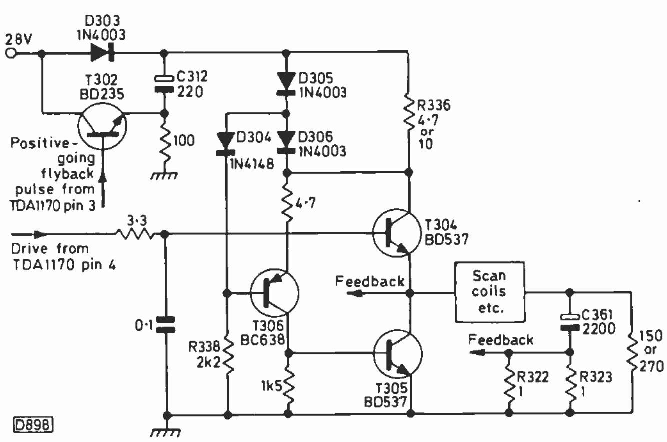

Fig. 3: Field driver and output stage. Output transistor T304 is on throughout the scan, the drive at its base (from the TDA1170 i.c.) being negative going. During the first half of the scan, coupling capacitor C361 charges via T304, D306 and D305. Towards the centre of the scan the current flowing via T304 is insufficient to keep D306 in conduction. The rising voltage at its collector then drives the emitter of T306 which begins to conduct, driving T305. The current in the scan circuit then reverses as C361 discharges via T305. T302 conducts during the flyback so that the voltage at the negative plate of C312 is 28V. During the scan, C312 is charged via D303. When T302 conducts, D303 is cut off and the supply to the output stage is doubled. T304 conducts during the flyback.

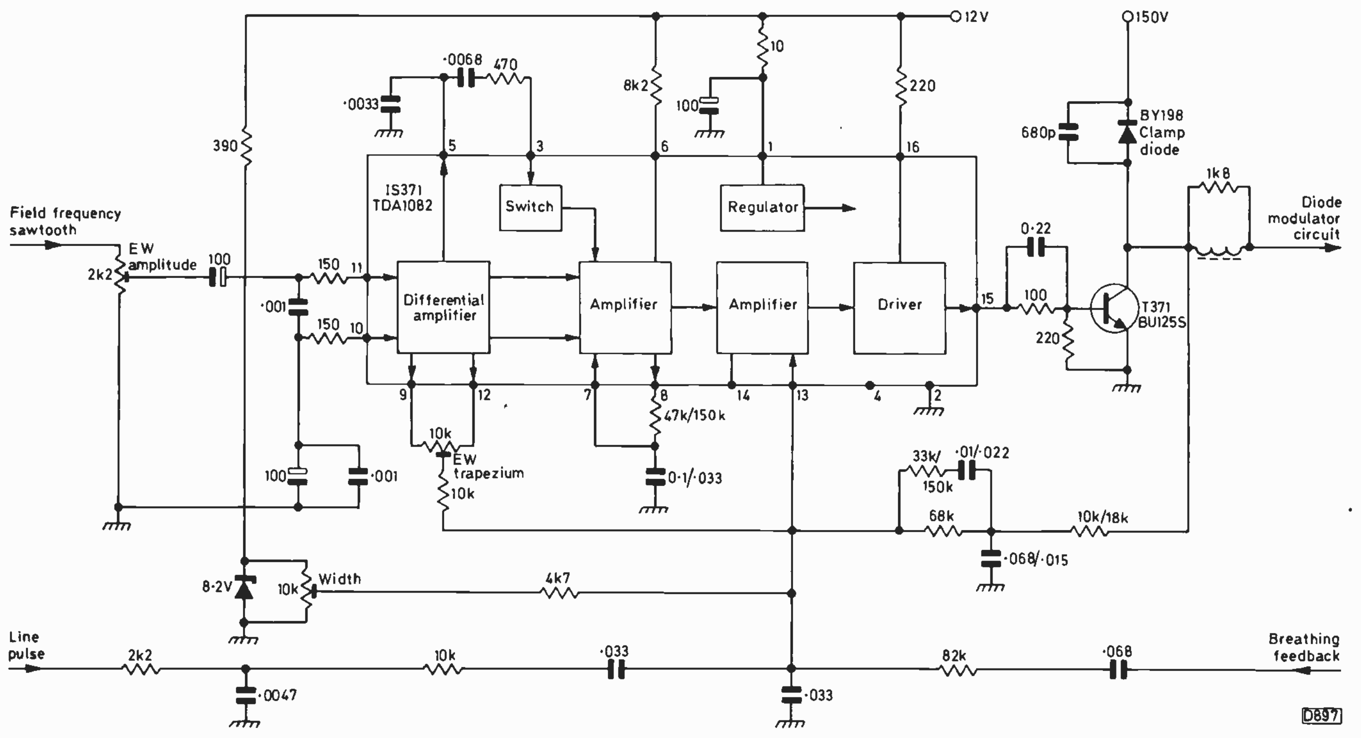

Fig. 4: EW diode modulator drive circuit. The switch stage in the i.c. is used to cut off the second amplifier during the field flyback.

itself and the resistor in series with its slider. With the TDA2591 these are R435 (47kΩ) and R438 (180kΩ) respectively. With the TDA2576A the control is R427 (100kΩ) and the series resistor R423 (100kΩ).

Field Collapse

In the event of field collapse, first check that the 28V supply is reaching pin 2 of the TDA1170 i.c. If the voltage is very low, suspect the decoupling capacitor C310 or the chip. If there's no voltage, check back to the rectifier panel: D652 (BYW15200) could be open-circuit or C652 (220μF) short-circuit. If the supply is correct, check the following items: the field output transistors T304 and T305 (both BD537); the height control R321 (100Ω), and R317 (6·8kΩ or 5·6kΩ depending on model) which is in series with it; the scan coupling capacitor C361 (2,200μF); R951 (2·2Ω) on the convergence board (20AX sets); finally, suspect the scan coils.

Sync Troubles

For no sync at all, check the TDA2591/TDA2576A i.c. For no field sync check the TDA1170, and C306 (0·01μF) for being short-circuit.

Signal Faults

If the sound is all right but there's a blank raster, check the TDA2541 i.f. i.c.

In the event of tuning drift, check that the 50V supply from the line output stage is not varying. If it is, replace D1039 (BA157). If the tuning voltage is varying, check R051 and R053 (both 2·2kΩ) and D05 (ZTK33) by replacement. If the tuning voltage doesn't vary, suspect the tuner unit.

In the event of the loss of one colour, check the appropriate first anode preset control for being open-circuit and the condition of its track, then check the relevant output transistors. If necessary check the voltages around the TDA2530 matrixing i.c. The TDA2522 demodulator i.c. is a less likely possibility.

If the brightness level rises when the set has warmed up, check the TDA2560 chroma/luminance processing i.c. by substitution.

For no colour, first check the voltages around the TDA2522 demodulator/reference oscillator i.c. carefully. If necessary replace the i.c. Other causes we've had are the 8·8MHz crystal and dry-joints on the chroma delay line. The TDA2560 is a less likely possibility. If it's suspect after making voltage checks, replace it.

We've had several cases of Venetian blinds. In this event check the setting of the amplitude control R755 and the condition of its track, then check that the phase coils L706/7 are set up correctly. If still in trouble, check the chroma delay line by substitution.

Sound, No Raster

If sound is present but there's no raster, check the e.h.t. and first anode voltages. Absence of e.h.t. points to the tripler while absence of first anode voltage is normally due to R1031 being open-circuit. It may be 560kΩ or 270kΩ depending on model.

If the c.r.t. heaters are out but the line timebase is operative, check R1208 (2·7Ω, 2W) on the tube base panel.

No Sound

We'll deal with the basic sound module as we've not had much experience with the 15W one. In the event of no sound, check the following items: the loudspeaker for being open-circuit; the presence of the 28V supply at pin 12 of the sound module and the 12V supply at pin 7 – if 12V is not present at pin 11 of the TBA120U, check R504 (33Ω) for being open-circuit; the two chips; the coupling capacitor C531 (220μF).

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AC138	40	BC177	24	BCX33	22	BF181	30	BFR91	2.08	R1038	80
AC141K	39	BC182LB	12	BCX34	11	BF184	30	BFT42	30	R1039	80
AC142K	38	BC183L	12	BD115	49	BF185	30	BFT43	30	R2008B	1.40
AC153	39	BC184L	13	BD131	30	BF194	16	BFX38	40	R2010B	1.10
AC176	33	BC187	24	BD132	46	BF195	16	BFY50	30	R2030	70
AC176K/		BC204	15	BD133	59	BF196	16	BFY51	34	R2265	1.30
AC128K	93	BC208	9	BD139	36	BF197	15	BFY52	34	R2305	80
AC188	38	BC212L	9	BD140	38	BF198	19	BRC116	1.50	R2322	50
AD142	1.18	BC213L	12	BD144	1.70	BF199	15	BRC1693	1.43	R2443	25
AD143	1.08	BC237	12	BD150	50	BF223	18	BU105	1.00	RCA16446	30
AD149	98	BC238B	8	BD163	98	BF224	19	BU126	1.10	RCA16599	1.25
AD161	32	BC238L	8	BD201	74	BF238	20	BU207	1.05	RCA16600	1.40
AD162	32	BC250A	15	BD203	78	BF240	9	BU208	1.15	RCA16799	1.13
AD263	1.05	BC251	8	BD204	99	BF241	21	BU208A	1.15	RCA16800	1.42
AF127	45	BC252A	20	BD222	48	BF255	10	BU326A	1.30	RCA16802	1.38
AF139	38	BC294	37	BD225	52	BF256S	20	BU407	1.70	S1299	2.25
AF239	41	BC301	32	BD232	50	BF257	28	BU408	2.76	S28000	1.25
BC107	15	BC303	31	BD233	60	BF259	28	BU500	2.30	S6080A/B	3.50
BC108	15	BC307	10	BD234	60	BF271	25	BU526	2.46	T6050V	1.30
BC109	15	BC308	8	BD237	55	BF274	11	BU807	2.94	T6052V	1.30
BC115	16	BC309	14	BD238	65	BF337	29	C1129	9	T9003V	1.25
BC117	21	BC327	18	BD241	59	BF338	34	C1172B	9	T9010V	1.45
BC125	26	BC328	18	BD244	85	BF355	40	E5386	54	T9053V	1.30
BC126	23	BC337	17	BD278A	81	BF362	50	E9003	28	T9054V	1.00
BC139	27	BC338	17	BD386	68	BF391	21	E9005	25	T9039V	1.10
BC141	34	BC347	8	BD433	71	BF394	16	ME0404	10	TIC45X	50
BC142	30	BC394	8	BD437	83	BF422	47	ME0412	10	TIC46	48
BC143	31	BC454	8	BD592	1.20	BF423	53	ME6002	10	TIC106C	40
BC147	12	BC455	8	BD589	1.20	BF450	43	MJ2501	2.36	TIP29	42
BC148	12	BC456	10	BD677G	1.35	BF453	53	MJ3001	2.21	TIP30	42
BC149	12	BC460	40	BD707	95	BF458	37	MJE182	47	TIP31	35
BC153	16	BC463	22	BD708	95	BF459	40	MJE340	50	TIP32	43
BC1540R	16	BC546	8	BDX10	93	BF461	59	MJE520	50	TIP33	61
BC154YL	16	BC547	12	BDY20	1.09	BF556B	35	MJE2955	1.40	TIP41	42
BC157	12	BC548	12	BDY82	99	BF596	15	MJE3055	1.50	TIP42	45
BC158	12	BC549	8	BF137	20	BF694	16	NKT241W	8	TIP110	61
BC159	15	BC557	10	BF153	20	BF757	62	NKT241G	8	TIS91	25
BC171	9	BC558	10	BF154	25	BFR52	31	NKT241Y	8	ZTX550	30

INTEGRATED CIRCUITS

				TBA530	1.26	TDA2002	2.80
BRC1330	1.40	SN76013ND	1.80	TBA540	1.00	TDA2030	2.10
BRC3064	1.00	SN76023N	1.80	TBA550Q	1.82	TDA2522	2.10
BRC/M/200	1.00	SN76033N	2.00	TBA560C	1.50	TDA2530	2.61
BRC/M/300	1.00	SN76115	2.00	TBA641	2.05	TDA2540	3.50
CA3060	1.58	SN76131N	1.58	TBA651	2.50	TDA2560	3.50
LM1303P	1.48	SN76226N	1.25	TBA720A	2.49	TDA2581	3.00
ML231B	2.20	SN76227N	1.00	TBA750	2.20	TDA2591	1.96
ML237B	2.00	SN76530P	1.30	TBA800	1.62	TDA2611A	1.95
ML239B	2.86	SN76622N	1.00	TBA810S	1.00	TDA2640	2.90
MC1327AP	1.25	SN76660N	80p	TBA810AS	1.00	TDA2690A	1.50
MC1358P	1.30	SN76666N	75p	TBA920	2.08	TDA3560	6.00
MC1455P	18p	SN76744	1.92	TBA950	1.95	TDA9503	2.90
MC14516BCP	60p	TA7117P	1.00	TBA1440	1.92	TCEP100	3.48
SAA1025	7.20	TA7109AP	2.80	TCA270SA	1.05	TEA1009	1.95
SAA1124	4.50	TAA611	1.40	TCA270C	1.05	MC14426P	4.80
SAA5010	6.00	TBA120B	1.20	TCA270CQ	1.05	MC14429P	4.50
SL432A	1.80	TBA120C	1.20	TDA1004A	4.00	MC14514	5.00
SL1430	2.50	TBA120CQ	70p	TDA1035T	3.50	UA758PC	2.50
SN15846N	60p	TBA120S	70p	TDA1037	2.72	UA1008A	2.66
SN74123N	65p	TBA120U	1.00	TDA11705	1.50	ULN2165	1.30
SN74154N	1.40	TBA395	1.00	TDA1200	2.42	ULN2216A	1.25
SN76001N	1.40	TBA480Q	1.40	TDA1270	2.76	UPC1365C	5.75
SN76110N	1.14	TBA510	1.90	TDA1327	2.53	SC9488P	1.40
						SC9511P	1.40
						SW153	2.50

Thorn 8/8K5 ex equip panels untested

PSU	2.88
FTB	3.75
Decoder	4.00

Thorn 9K ex equip panels untested

PSU	12.00
Decoder	5.00

Thorn 9K6 ex equip panel untested

Decoder	5.75

Thorn 3/3K5 ex equip panels untested

PSU	3.75
LTB	3.75
Video	2.50
Chroma	2.00
FTB	2.75
IF	1.75
Conv. 3K	3.00
Conv. 3K5	3.75
Autovox Decoder FG/01 new boxed	5.00
Thorn 4000 Convergence panel ex-factory	3.75

Thorn 4000 PSU panel ex-factory	2.50
Thorn 3K5 beam limiter board new	1.75
Thorn 3K5 PSU bottom board PC206 new	2.75
Thorn 3K5 IF panel new	3.00
Thorn 3/3K5. EHT & scan TX + R2008B on alum chassis ex-equip	1.80
Thorn 8/8K5 damaged FTB for spares	1.25
Thorn 8/8K5 damaged decoder for spares	2.25

UHF TV Aerial for portable	50p
Indoor Aerial Parabolic Type Reflector to Help Combat Ghosting Problems	2.50
Line Connectors	38p
Coax Plugs	10 for 1.65
Band Change Switch Assy, Pye 725	40p
Flush Mounting TV/FM Diplexer	1.00
Switched Flush Fitting Aerial Outlet	1.00

Pye 78+161	50p
Pye 147+260	50p
Thorn 56+1K+47+12	1.24
Thorn 50+40+1K5	60p
Thorn 128+16+1K7+116+462+126	50p
Thorn 120+72+300	50p
RBM 250+14+58 (TV161)	63p
Pye 3R5+15+45 (713)	90p
Philips 2R2+682	90p
Philips 47R	52p
Thorn 350+20+148+1K5+317	1.40
Thorn 6+1+100	92p
Thorn 3000 Metal	1.45
Thorn 8/8500 Plastic	1.45

EHT TRAYS

Thorn 3000	5.50
Thorn 8000	3.50
Thorn 8500	6.00
Thorn 9000	7.90
Thorn 9600	6.00
Thorn 900/950	1.50
Pye 713 4 lead	5.83
Pye 713 5 lead	5.97
Pye 725	6.35
Decca Bradford	5.00
Baird 8750	7.10
Korting AZ9100	7.10
Philips G8 (520)	6.50
Philips G8 (550)	6.50

MULTISECTION CAPACITORS

100+150+150	350V	50p
220+47	350V	65p
200+150+50	350V	60p
200+200+100	325V	54p
32+32+16	275V	52p
200+200+100+32	350V	70p
100+50+150	350V	58p
400+400	200V	72p
32+32+16	350V	52p
200+32+300+100	350V	70p
225+25	350V	50p
200+200+100	350V	70p
200+100	325V	65p
16+16	450V	45p
200+100+100+50	350V	60p
200+200+100	350V	55p
200+200+75+25	350V	60p
50+50+8	300V	55p
100+50+100	350V	55p
100+150+50	350V	55p
2500+2500 (Thorn 8K)	63V	1.20
150+150+100	300V	1.80
200+47	250V	65p
500+500 175V Thorn TX9		1.00
175+100+100 350V Thorn 3K5		2.25
400 400V Thorn 9K		2.50
470 250V Philips G11		1.50

CAN TYPES

0.2MF 250V	50p
2MF 250V	50p
22MF 275V	50p
50MF 275V	50p
100MF 150V	65p
100MF 250V	70p
100MF 450V	75p
220MF 400V Thorn 9K	1.30
220MF 450V Thorn 4K	1.30
400MF 350V Thorn 8K	1.00
800MF 250V Print type	80p
800MF 250V	70p
1250MF 40V	50p
1250MF 50V	50p
1500MF 70V Thorn 3K	1.00
1500MF 100V	1.05
2000MF 30V	50p
2200MF 40V Thorn 4K	95p
2200MF 63V Philips G9	1.25
2500MF 35V	65p
2500MF 40V	65p
3000MF 30V	65p
3300MF 16V	50p
3300MF 25V	60p
4700MF 16V	72p
4700MF 40V	75p

Thorn/Decca/GEC On/Off Switch. Push to make	75p
Philips G11 On/Off Switch. Push to make	75p
ITT CVC8 On/Off Switch	65p
ITT CVC9 On/Off Switch + Relay	90p
Philips G8 On/Off Switch	75p
Thorn 3/3500 A1 Switch	50p
Thorn 4000 A1 Switch	50p
Korting Shift Pot 50Ω	65p
2·5A Push to make on/off switch	15p

DIODES

AA112	8p	IN4003	4p
AA119	8p	IN4004	5p
AA143	8p	IN4005	5p
BA115	8p	IN4006	5p
BA154	8p	IN4007	6p
BB103	8p	IN4148	2p
BB105B	30	IN4149	6p
BR103	52p	IN4742A	8p
BR303	46p	IN5254B	8p
BT106	1.50	IN5349	14p
BT116	1.00	IN5400	12p
BT119	2.56	IN5401	12p
BT120	2.82	IN5402	14p
BT151 650	1.00	IN5404	12p
BY127	12p	IN5406	16p
BY188	16p	IN5408	16p
BY204	26p	IS025	8p
BY206	16p	IS131	8p
BY207	16p	IS1658	8p
BY208/800	38p	MR854	35p
BY223	95p	SKE1/02	20p
BY225	1.20	MCR106/1	1.00
BY227	28p	MCR406	35p
BY298	22p	2N4444	1.50
BYX22/400	30p	Y827	80p
BYX55/600	30p	Y969	75p
BYX71/350	80p	ZX150	12p
BZV15 C12R	1.16	OA91	5p
BZV15 C24R	1.16	MCR106/7	1.00
IN60	8p	MCR106/8	1.50
IN2070	8p	TD3F800H	2.80
IN4001	4p	TD3F800R	3.00
IN4002	4p	BY255	30p

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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**
560 ATB	**£65**
660 AB	**£65**
A67-701	**£65**
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What's Up Doc – 2?

Les Lawry-Johns

The indignities I suffered during the preliminary examination to find the cause of my lump and pains were described last month. I then had to await the X-ray appointment, which was twice postponed. During this time the problem got worse then started to improve. By the time I went for the X rays I was beginning to feel a bit of a fraud. On top of that I was hungry, because you're told not to eat or smoke after midnight on the previous day.

I arrived and reported. "Ah, Mr. Lawry-Jones. Will you just go through there, up there, turn right and take a seat?" So I went down there, through there and turned left, then asked someone for directions. I finally arrived where I should have been and sat down next to a man in a white robe and dressing gown. I thought he'd been cheating – there was this white mark around his mouth. A nurse then came and took me to a changing room where I had to put on just a white apron and a dressing gown. Next I had to take this drink, and realised what the white mark was. Barium meal. Made me appreciate what cathodes have to put up with.

When my turn came I went in and found all this interesting electronic gear. There was a monitor just beside the "inspection trolley", which was vertical. I was told to stand against it while the scanner was swung up against my stomach. This was followed by further indignities – why do they have to do so much pushing and shoving around? The man pushed a button and I was lowered to a horizontal position. Something was swung over and he said "don't breathe". I hadn't since the first bit, and was feeling rather puffed. Clonk went the machine and I was told to go and get dressed. I let my breath out with a gasp. "Can I breathe now?" "Of course, you fool. How did you manage to keep it up for so long?" "They call me windbag" I explained.

That bit over, the man who'd taken the pictures suddenly appeared and asked me to follow him. When we reached a secluded spot he told me he was going to talk about pain. If I was badly injured that would be ten. The dentist's drill would be five. Stubbing my toe one. Had I got the idea? What was the pain number when he pushed my stomach around?

"Zero" I said. He told me to go and I've not heard anything since. Perhaps I shouldn't have bothered.

Return to the Ranch

There was a man waiting outside when I got back to the shop. He started off before I'd even opened the car door. "That music centre you repaired last week . . . it's gone off again." I'd put my last pair of SN76003s in it and can't get any more. What a welcome! Inside there were more people waiting to tell me their troubles. No one wanted to hear about mine. Back to normal – but not quite. There followed three days of absolute agony as the barium meal clogged my innards.

What about the music centre with the SN76003 output chips? One was open-circuit and the other dead short, same as before. I studied the SN76023 and decided to try a couple of these with modifications to the feedback. Cut the print from pin 16 to the 100μF capacitor and add a 100Ω series resistor, then add a 27kΩ resistor between pins 4 and 16. It worked. But I won't be paid . . .

The 3000

The next patient was an old Thorn 3000 that was suffering from various ailments. All but one of these responded to quick treatment. What we couldn't get was reliable line lock. It seemed that there were no feedback pulses to the flywheel line sync discriminator circuit. We checked for dry-joints, then ensured that the feedback/integrating resistor R506 was intact. After this we decided to change the line timebase panel complete, to prove that the fault was on this and not in the sync separator circuit, which is on the video panel, or the interconnections. The fault was still present with the replacement panel fitted, so we chased through the wiring loom. This was intact and a replacement video panel failed to improve matters. I just didn't believe it. The field sync was perfect, but the line sync almost unlockable.

I fiddled with this, that and the other, then looked at a 3000 that was on soak test and working perfectly. I took the line timebase panel from this and fitted it in the set on the bench, removing our "reliable" test panel. Perfect lock. I shouted at the test panel and called it a traitor. A resistance check proved that R506 was not returned to the timebase earth at the transformer end – the earth lead was off at connection C on the e.h.t. transformer (T503). Only just off, so as not to call attention to itself. When resoldered, the earth connection was complete. Refitting the panel produced solid line lock.

Back to the original panel. Again no earth return path, this time due to a fault in the transformer. Scrape away the blue jelly and find the winding leadout disconnected from C. Two panels with the same fault condition. It could happen only to us?

A Moan

The PL802T solid-state replacements aren't what they used to be. The valves themselves are getting dearer and dearer – if you can get them at all – so we do use the T version. Of late the heater resistor section seems to keep springing open. The original versions didn't have this spring. After being let down on several occasions, we now make the spring an offer it can't refuse – we wrap a piece of wire around it prior to resoldering. Why the spring type is used beats me. Come back valves, all's forgiven.

Jenny's Visit

Jenny came in whilst I was busy with this music centre that wouldn't come apart. She's a nice middle aged lady who lives up the road. As an ex-hospital sister, she'd been interested in my problem. A strangulated hernia she called it, and commented that it would probably turn to gangrene. As I say, a real nice lady, now here to enquire about the X ray. So I told her about the barium meal and what it did to my guts and the effects on my piles.

"Oh yes it does happen. Take it easy and I'll be around to help."

"Clear off and leave me be" I bawled, frightened out of my life.

The Music Centre

It was a Waltham music centre, and refused to be dismantled. Now when something refuses to come apart, I'm a firm believer that it knows best and doesn't have to be taken to pieces.

It's really that ET who stands above the desk and points at me all day long. I swear he talks to me. That soft voice . . . "It doesn't have to come apart Les, just think for a moment."

Since the complaint was that the cassette section was making a funny noise (through the speakers), I decided that the record/playback switch needed exercise and cleaning. So I managed to squirt some Servisol on to the switchbank, then inserted a blank tape so that the button could be depressed a few times. Record stop, record stop, record stop. No more noise and no further action required. Thanks ET.

Long-distance Television

Roger Bunney

From the lack of reports from other enthusiasts and the fact that my own loggings, day after day, consisted of only MS pings (and these only average) I think we can say that March 1984 was just awful. The high-pressure system that persisted over March 7-14th failed to produce any activity, due in part to the penetrating easterly winds in the south. Sunday the 18th was relatively active, with short duration SpE propagation during the morning, mainly on chs. E2/R1/E3. There was a short SpE opening on the 24th, with RTVE (Spain) present on chs. E2/3 at high levels. Colour was good, with sports programming, till lunch time. The only other notable event consisted of auroral activity on the evening of the 27th, with signal reception on chs. E2/R1/E3. Perhaps the shortest log on record . . .

I've been clearing up the interference problems associated with my ATV transmissions at 437MHz. To date, all the households affected have either used a head amplifier or been coupled to a local distribution system. Suppression indoors has usually been sufficient, using a Teldis bandstop filter that provides a 34dB rejection at 435MHz. In one case it was necessary to fit a Labgear CM9034 group-pass filter between the aerial and a masthead amplifier, due to problems with the latter. This filter provides 30dB attenuation at 435MHz. The distribution system was dealt with by adding a front-end filter (in agreement with the operators).

New Products

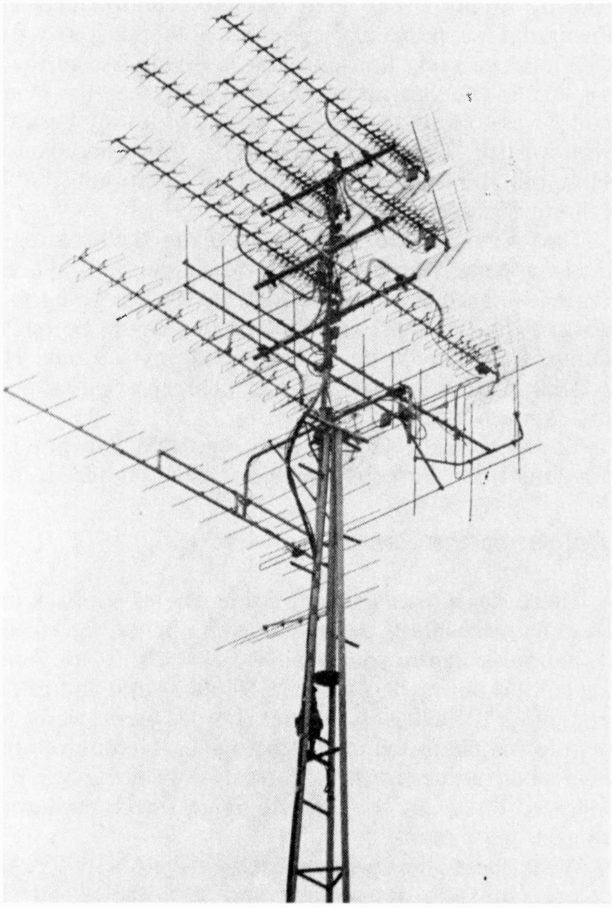
A series of TV sound receivers has been introduced by Kingsbrook Marketing Co. Ltd. (92E Macadam Road, Earlstrees Industrial Estate, Corby, Northants NN17 2JN). In addition to a UK system I u.h.f. version there are others for v.h.f./u.h.f. reception including French TV. The receivers are aimed at the hi-fi enthusiast and have six push-button tuning (UK version anyway). The specification looks good, with features such as dynamic noise reduction. Prices range from around £100 to over £140 for a model with a built-in hi-fi amplifier. The tuner is a Mullard MOSFET type.

Garex Electronics (7 Norvic Road, Marsworth, Tring, Herts HP23 4LS) have expanded the range of accessories to go with the famed SX200 v.h.f./u.h.f. scanner. The H01 frequency converter gives coverage of the 96-108MHz band (or 88-108MHz to order). It's a downconverter for in-series connection and costs £35. A converter for 200-400MHz is promised. A signal strength meter kit drives either a meter or bar LED display: this costs £13·75 (meter and stand assembly £16·50). Additional memory capacity (an expansion unit) is promised, also an auto a.m. selector for use as an airband monitor and a v.h.f./u.h.f. notch filter. Prices don't include VAT. The SX200 series has proved to be very popular with TV-DXers due to its 26-88MHz coverage – it's ideal as a video surveillance monitor, particularly on weak signals.

News Items

Holland: AFN-TV is now operating from Soesterberg on ch. E71, at some 25kW e.r.p. (vertical). The standard AFN-TV pattern and a "simple" test card F are used.

Belgium: The ch. E25 transmitter reported as being a Wavre replacement last month is in fact located in central Brussels, near the Botanic Gardens. The e.r.p. is 5kW and the station has been received by several DXers at various distances.



The impressive array of u.h.f. and Band III aerials on Ryn Muntjewerff's mast at Beemster, Holland. Details were given in the April issue (page 324).

A scrambled pay-TV service is being planned by RTBF, to start towards the end of the year, feeding cable networks and several low-power transmitters.

Eire: We've a sound cassette recording made in December 1983 referring to Nova TV, ch. 60, with a Dublin telephone number (606878). Reception reports are requested from viewers – the test transmissions apparently consisted of colour bars, with programe origination from video tape. Has any reader news of any progress with this station?

France: The new Paris ch. 1 (Band III) transmitter is in operation with test transmissions, normally from 1400-1800. These consist of the PM5544 test pattern with TDF identification at the top, RESEAU 4 at the bottom, cartoons and an identification slide. The cartoons carry their own sound, otherwise the TDF FIP radio programme is used. TF1 is radiated at 1200, with scrambling. All times are local.

Czechoslovakia: A new 1kW ch. R41 transmitter in Prague broadcasts the USSR Gorizont TSS-1 programme. The Czechoslovakian 66-73MHz f.m. radio band is to be closed, with a move to 88-108MHz by 1990 or soon after. A similar transfer is planned by Magyar Radio (Hungary). In recent years f.m. radios have been equipped for reception of both bands.

Satellite services: The Dutch Broadcasting authority NOS has decided to abandon plans for a DBS service via the ECS-1 satellite, on grounds of cost. The transponder allocated to NOS will be offered to private interests.

Miscellany

We understand that the French AFATELD DX-TV club has ceased operation for the present, due to lack of support.

The British Telecom Milton Keynes cable TV system mentioned last month has been closed down on instructions from the Department of Trade and Industry. The problem was interference centred on 144MHz. A different frequency will be used.

From our Correspondents . . .

Not much reception, not many letters! Robert Copeman (Victoria, Australia) reports the loss of his aerial system when a severe storm, with winds up to 112km/hour, hit the Melbourne area on March 26th. Conditions there during March were similar to those in the UK.

Robin Crossley (125 West Street, Dunstable, Beds LU6 1SG) has for sale a Thorn 1690 chassis in excellent condition with the following modifications: ET021 tuner, 4-7MHz tunable sound i.f., r.f. gain control and video detector polarity switching. Price is £40 – if interested, write to Robin directly. His present aerial system consists of a wideband Triax Unix 92 aerial for u.h.f., a wideband eight-element array for Band III, and a wideband four-element system for Bands I/II.

Correction

A correction is required to my mention of Belgian cable charges in the April column. The 67 franc charge refers to the equivalent of the UK British Telecom fee to the cable company, not the payment made by cable viewers. The subscriber charge was some 3,588 francs (about UK £45) in 1983, before the addition of BBC and TV5. The charge to the cable company is for the microwave link between the coast and Brussels.

Scope Component Test Unit

David Botto

In view of the increasing complexity of present day TV sets and VCRs, anything that makes life easier for the service engineer is welcome. You'll find the component test unit described in this article one of the most useful and time saving instruments on your bench – it won't stand idly on a shelf. It can be used with almost any oscilloscope to test transistors, diodes, thyristors, zener diodes, capacitors and even resistors, the condition of the component being displayed on the scope's screen.

The component tester really proves its worth when checking semiconductor devices. The usual method of checking a transistor or diode is with an ohmmeter. This is quite good, up to a point: as engineers know from hard and sad experience however, it's not a method that's one hundred per cent reliable. With the scope component tester the slightest leakage or fault in a transistor or diode is revealed – the test method has proved to be completely reliable. With the exception of thyristors, there's a further advantage – only two test leads are required. This is a lot easier than juggling with three test prods to check a transistor.

Basic Principle

A knowledge of how the tester works will help in getting the best results from it. Fig. 1 shows a simplified circuit. An a.c. voltage is applied to resistors R-low and R-high via terminals A and B. Experiments have shown that the frequency of this a.c. input can be anything between about 25Hz and 20kHz. For convenience, the tester uses the 50Hz mains frequency. The scope's internal horizontal timebase is not used. Instead, the oscilloscope's external horizontal input (X input) is connected to point X. Point E goes to the scope's chassis and point Y to the vertical (Y) input. With the scope correctly set up, the screen display will consist of a horizontal line. This is because resistor R-high has an ohmic value several hundred times that of resistor R-low. If test points E and T are joined together, a vertical line will appear on the screen.

If a semiconductor junction, for example a diode, is connected across points E and T with the cathode to E, the diode will conduct when the a.c. waveform is such that point T is positive with respect to point E. When the waveform swings negatively, the diode will cease to conduct. Fig. 2 shows the display on the screen. Reverse the diode and you get the waveform shown in Fig. 3.

Capacitors connected across test points E and T will produce ellipses of varying width depending on their capacitance value. A resistor produces a line set at an angle dependent upon its ohmic value.

External view of the unit.

Circuit

The complete circuit of the scope component test unit is shown in Fig. 4. Resistors R1 and R2 were not included in the original prototype but were added later. With no load connected to the transformer, the voltage across the primary winding is 240V a.c. When a load is connected to the secondary winding, the a.c. voltage across the primary winding is considerably reduced. The power applied to the component under test is thus limited, protecting small diodes and transistors.

Preset resistor VR1 controls the voltage applied to the scope's Y input while VR2 controls the voltage applied to the X input.

The battery and variable resistor VR3 (level control) are used for thyristor testing. A battery rather than a diode fed from the transformer is used to turn on the thyristor under test as this produces a good, clean waveform. The battery lasts a long time – almost its shelf life.

Construction

There's nothing critical about the construction – the photographs show the finished appearance and the internal layout. The small board used was designed to hold two i.c.s but proved to be ideal for use in the tester. If you decide to make your own board, the only point to watch is that the a.c. mains input circuitry is spaced well away from the rest of the circuit. An on/off switch was not included as we always unplug the tester when it's not in use – one could be incorporated as shown in Fig. 4. Fuses can also be added.

The screened leads that feed the scope's X and Y inputs were fitted with 75Ω BNC connectors, but this is not critical – fit connectors that suit the scope's input terminals.

The test leads have 4mm plugs at one end and mini or micro clips at the other end – these are very useful for making in-circuit tests.

It's a sound policy to apply a very thin coat of circuit varnish to the print side of the board when the basic construction has been completed. Then use a small brush to apply a thin coat of circuit varnish to all solder tags, joints, etc. This will help to ensure trouble-free operation in the long term.

Setting Up

Set the two controls VR1 and VR2 to the mid-position and the level control VR3 to its minimum position

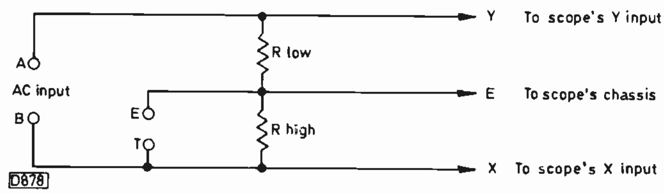


Fig. 1: Principle of the tester.

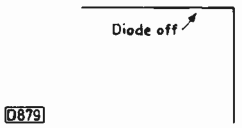


Fig. 2 (left): Diode off/on display.

Fig. 3 (right): Diode on/off display.

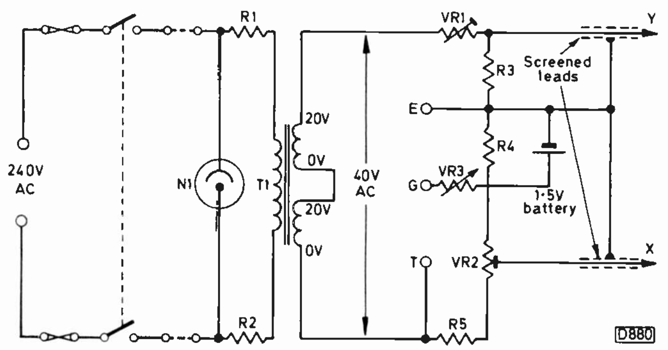
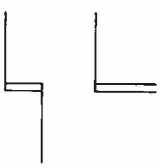


Fig. 4: Circuit of the test unit.



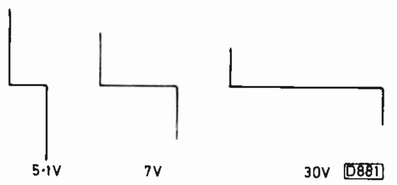


Fig. 5 (left): Double image obtained with a.c. coupling.

Fig. 6 (right): Displays obtained with zener diodes.

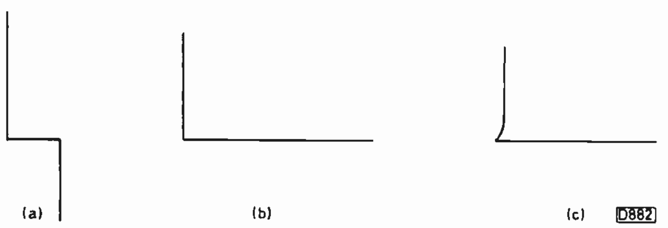


Fig. 7: Silicon npn transistor displays. (a) Base-emitter. (b) Base-collector. (c) Collector-emitter.

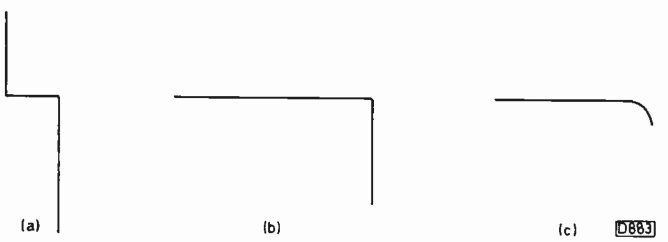


Fig. 8: Silicon pnp transistor waveforms. (a) Base-emitter. (b) Base-collector. (c) Collector-emitter.

(maximum resistance). Switch the scope to external X drive and set the Y input to the least sensitive d.c. range. The tester will work if an a.c. input is used, but with some scopes a double image may be obtained – see Fig. 5.

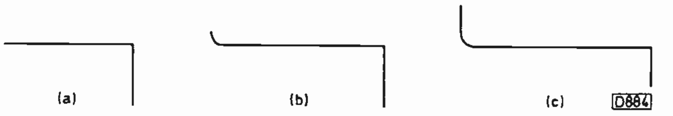


Fig. 9: Displays obtained with germanium transistors. (a) Base-collector. (b) Base-emitter. (c) Collector-emitter.

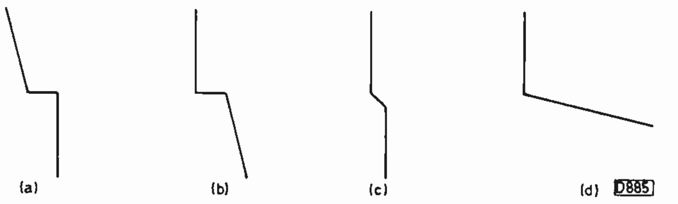


Fig. 10: Transistor fault conditions. (a)-(c) Leakage in a transistor's base-emitter junction or a zener diode. (a) In or out of circuit check. (b)-(c) Out of a circuit check. (d) Transistor base-collector junction or diode leakage, out of circuit check.

Adjust the scope's controls for a centred horizontal line with slight over scanning. Short test leads E and T to produce a vertical line, then adjust the vertical gain control so that the line just scans the screen. VR1 is included for fine setting if needed.

Checking Zener Diodes

A very useful feature of the tester is the ability to check zener diodes and measure their voltage ratings against the scope's graticule. You'll need about four or five zener diodes for calibration, with voltage characteristics between 5V and 38V. With the cathode connected to E and the anode to T, a zener diode gives the waveform shown in Fig. 6: the higher its zener voltage, the wider the horizontal part of the trace. By using the scope's horizontal gain control to keep the width correct, at the same adjusting the preset VR2, the zener voltages can be calibrated against the graticule divisions. VR1 and VR2 should then be sealed with a tiny spot of sealant.

Transistor Tests

To check an npn transistor, connect lead E to its base and lead T to its emitter. The waveform displayed should be as in Fig. 7(a). Transferring lead T to the collector should produce the waveform shown in Fig. 7(b). With lead E connected to the emitter and lead T to the collector, the waveform should be as shown in Fig. 7(c). It's not usually necessary to make emitter-collector checks in day-to-day testing.

Use exactly the same procedure with a silicon pnp transistor to get the waveforms shown in Fig. 8(a-c).

The transistors used in power supplies and line output stages produce the same traces except that the horizontal section is wider. Germanium transistors give waveforms similar to those shown in Fig. 9.

Field effect transistors of either the junction or MOS type cannot be checked and could be damaged if you try.

A short-circuit device will produce a vertical line, an open-circuit device a horizontal line. Some other fault conditions are shown in Fig. 10.

Checking Thyristors

To check a thyristor, connect the E test lead to the cathode and the T test lead to the anode. The display

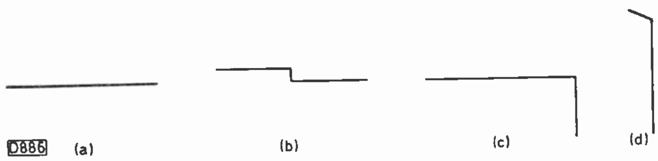


Fig. 11: Waveforms obtained with a BT106 thyristor. (a) With VR3 at minimum. (b) Thyristor just starting to conduct. (c) Thyristor on. (d) Saturation.

Fig. 12: Testing a diode-thyristor combination. (a) Diode test only. (b) Thyristor turned on.

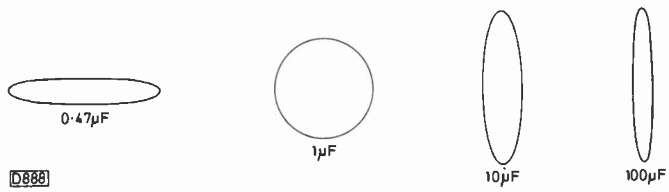


Fig. 13: Measurement of capacitance.

Fig. 14: Tests on LEDs. (a) Waveform for a small LED. (b) Waveform from a seven-segment LED.

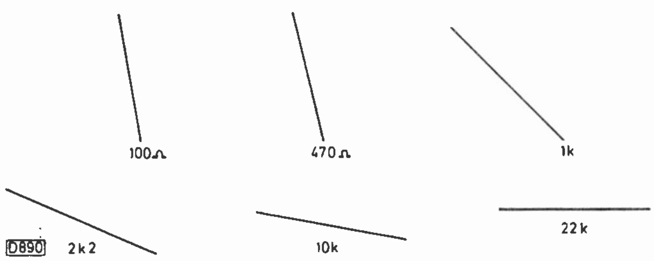


Fig. 15: Waveforms produced by various resistor values.

should then consist of a horizontal line. With the level control at minimum (maximum resistance), connect the lead from socket G to the thyristor's gate. Some small thyristors, such as the TIC44, will then produce the waveform shown in Fig. 2. With larger thyristors such as the BT106, the level control must be turned slowly to obtain this waveform.

This test is also useful if you suspect that a thyristor is turning on too early or too late. Compare it with a known good thyristor of the same type.

On disconnecting the G lead, the horizontal line should reappear. Fig. 11 shows waveforms for the BT106.

The thyristors used in applications such as TV line output stages often have a diode incorporated in the same encapsulation, connected across the thyristor's anode and cathode. With the E lead to the cathode and the T lead to the anode, the waveform shown in Fig. 12(a) should be seen. This shows that the diode is o.k. Next connect the G test lead to the thyristor's gate and slowly turn up the level control. When the thyristor turns on, you'll see the waveform change as shown in Fig. 12(b).

Measuring Capacitance

Capacitors with values between about 0·22µF and some hundreds of microfarads can be measured. With the capacitor connected to test leads E and T, an ellipse will be seen, the size depending on the capacitor's value – see Fig. 13.

Large value capacitors will produce an almost vertical line. With these, use either the scope's X times five (or ten) control or increase the setting of the X gain control. If you calibrate settings with capacitors of known value, you'll find this test extremely useful and reliable.

LED Tests

To test an LED, connect the E lead to the cathode (usually identified by a flat side or notch) and the T lead, with a 100Ω resistor in series, to the anode. The LED should light and the waveform shown in Fig. 14(a) should be seen. Reversing the leads will simply reverse the waveform – the LED will still produce light.

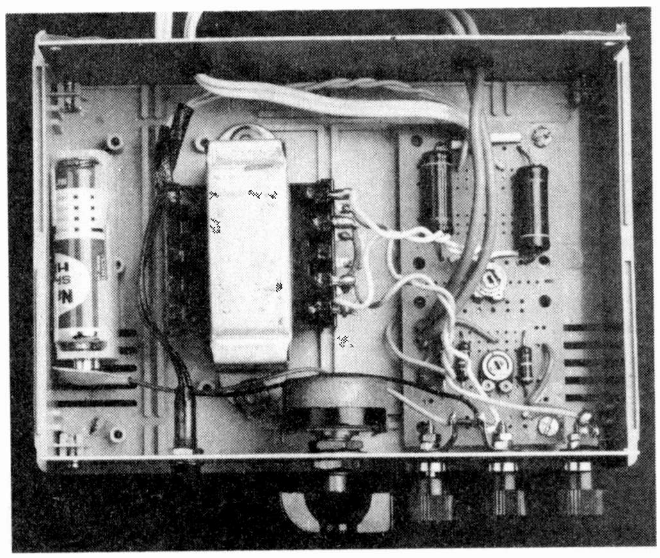
Seven-segment LEDs can also be tested. This test is particularly useful when one segment is not lighting. Is it due to the LED or the complex drive circuitry? Connect the E lead to the common cathode (or anode) connection and the T lead, via a 100Ω series resistor, to each segment

Components list

R1 4·7k 2W
R2 4·7k 2W
R3 1·2k 1W
R4 330k 1W
R5 820k 1W

VR1 1k miniature horizontal preset
VR2 100k miniature horizontal preset
VR3 3k wirewound potentiometer

T1 RS 207-661 mains transformer.
N1 Tandy 272-708 or similar miniature 240V a.c. neon.
PCB Tandy 276-159 experimenters' board.
Plastic case with feet – Tandy 270-9501 or similar.
Two BNC 75Ω connectors, RS, or as required.
Battery holder and 1·5V battery – UM3 or equivalent.
Screened audio lead, mini-clip test leads, etc.
Three terminals, two red one black, Tandy 274-661.
Optional: Double-pole on/off switch; two 630mA 20mm anti-surge fuses with holders.



Internal view of the unit.

connection in turn. The segments should light and the waveform shown in Fig. 14(b) should be displayed – an FND500 was used to get this trace.

Resistor Waveforms

The displays obtained when resistors of various values are connected across T and E are shown in Fig. 15. This test won't replace your ohmmeter, but is useful when making in-circuit checks.

In-circuit Tests

A helpful feature of the tester is its use for in-circuit tests. Many transistors, diodes, capacitors, etc. can be tested whilst still in circuit – disconnect the equipment from the mains supply of course! Also make sure that reservoir/smoothing capacitors and the c.r.t.'s final anode are discharged.

In some cases the waveforms will be affected by other components in the circuit, i.e. those shunting the component being checked. In practice you'll soon get used to this. If you service particular TV sets or VCRs regularly, it's helpful to note various key waveforms you should obtain. If there's room, these can be drawn on or around the circuit diagram.

If it's necessary to isolate a transistor, unsolder only two of its leads and keep them clear of the print. Check the transistor, then resolder the two leads if it tests good. This saves time and also avoids the problems of finding the board unmarked after removing a transistor completely – and perhaps putting it back the wrong way round . . .

The same principle applies with diodes, capacitors etc. – with only one lead being unsoldered of course.

Continuity Testing

Continuity checks on print and transformer windings etc. can also be made. Doubtless you'll find many additional uses for your component tester.

VCR Clinic

Reports from Steve Beeching, T.Eng. (C.E.I.), Derek Snelling, Hugh Allison, Les Harris and M.S. Barakat

Toshiba V8700

The fault on this machine was no colour in the still picture or picture search modes, though there was some evidence of flashes of colour. As the colour was perfectly stable in normal playback, attention was paid to the still chroma stabilisation circuit – Q228, IC204 and delay line X204. Direct and delayed (64μsec) signals are fed to pins 8 and 9 respectively of the i.c., the idea being that when a disturbance is detected the delayed signal is used. The output at pin 6 should be a 4·43MHz chroma signal with a burst level of around 600mV. If the burst is varying in amplitude, it can be balanced by the "still twiddler" R255. In this particular case however the burst level couldn't be stabilised. We've had this happen before, due either to the i.c. or the coupling capacitor C246. On this occasion the culprit turned out to be the delay line – proved by substitution. (The input at pin 9 of the i.c. was much lower than that at pin 8.) **S.B.**

Ferguson 3V23/JVC HR7700

Interesting to note (April issue) that others have experienced problems with the tuner/timer board due to failure of one of the TA57 transistor logic gate arrays. In the last instance we had the machine would switch to "prog set" just after being powered and refused to have anything further to do with the T/T functions, though the mechanical functions were o.k. One of the gate transistors had a collector-base leak that dragged a data line high enough to cause trouble. **S.B.**

Toshiba V9600

A couple of V9600s. The reported fault on the first one was noisy playback. So I inserted a tape which disappeared at a great rate of knots, followed by an all time record lace up. In playback there were horrible great straining noises, so the cassette was ejected – at about 90 miles an hour! It was obvious that all the motors involved were running somewhat fast, mainly due to the 14V power rail being 22V. This was traced to failure of transistor Q902 in the d.c./d.c. converter (regulated power supply to the likes of you and I) – panel U901. A BC328 was used as a replacement – it's getting a bit like the old days when a BC109 was used as a replacement in almost every conceivable circuit.

The next machine had almost the opposite fault – it could barely turn the cassette motor, which drives the lift in the cassette compartment. This time the 14V rail was missing due to fuse F802 being high impedance. After replacing this there was very little drive, the culprit being transistor QL85 on the UT01 motor drive panel. We replaced it with a TIP31 – who was that shouted "bodge artist"? **S.B.**

Sony SLF1

Finally . . . After going on a Sony training course run by a nice guy called Rob I felt better able to tackle SLF1 faults. When ET rang up about that fault mentioned under the heading "defeat" in the March issue – the cassette wouldn't thread up – I was confidently able to tell him to change IC2 (which is the one I didn't change) instead of IC3 which issues the threading instruction. Needless to say it turned out to be IC3. You just can't win. **S.B.**

Problem with a Drum

How to make a simple head change difficult – the machine in question was a Ferguson 3V22. The head needed replacement, so I fitted a new one, then did a recording and playback. The head switching was slightly out – showing up as excessive foldover at the bottom of the picture. Out came the scope and we set the record and playback switching points. Lovely picture. Put the top on the machine and do a test card recording as a final check. Oh dear, the switching points are way off. This time they didn't want to set correctly, and even appeared to drift.

The problem had not been present prior to head change, so I thought the new head might be faulty. As changing it was easier than thinking of another cause for the fault I went to remove the newly installed head. It was at this point that the deliberate mistake was discovered – I'd forgotten to screw the head on. No wonder the switching points were varying – the head was slowly moving around on the spindle, thus constantly altering the position of the heads relative to the switching magnets beneath. **D.S.**

Hitachi VT8500

Now to an Hitachi machine with a genuine fault – a VT8500 with no visual search. All other modes worked correctly, but when visual search in either direction was selected the machine went into the stop mode. It did this with both the front panel controls and the wired remote unit, so problems with the switches or the ladder network could be eliminated.

In cases like this I usually start at the microcomputer i.c. and work outwards. Not because this i.c. tends to be faulty – quite the opposite in fact. I just find it the easiest way to go about fault-finding. In this case pins 3 and 4 of the i.c., the search and reverse pins, were found to be high instead of low when visual search was selected. For once the HD44801A05 was responsible. **D.S.**

Ferguson 3V22

Our tea lady's grandson had posted a marble through the tape loading flap, then inserted a cassette and switched to play. The picture (after removal of the marble) and all the waveforms showed the classic symptoms of a broken head. A new drum was fitted, but the symptoms remained the same. An eagle-eyed colleague spotted that the slanted pole on the supply loading arm was not fully locating in the supply arm stopper (V-block). Although the gap was only about 1/16th of an inch, there was insufficient adjustment to take up this slack using the method described in the manual. No levers or anything seemed to be bent, and the problem was eventually solved by slackening the set screw on the take-up loading arm lever (underneath), pushing the supply loading arm slightly forward, then retightening. The tape has to run round the head properly of course! **H.A.**

Hitachi VT14

This machine would intermittently fail, with the "operate" light not lit. Voltage checks during the fault condition revealed that the regulators Q101, Q102 and Q103 were all off. These regulators are controlled by IC902 on the system control panel, via an inverter. IC902's power

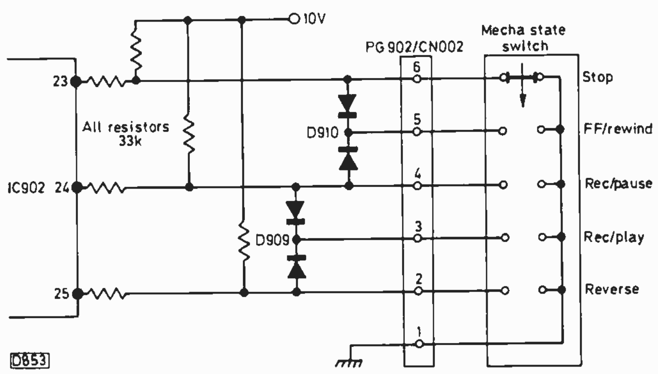


Fig. 1: Mecha state switch connections, Hitachi VT14.

control pin 3 was low instead of high as it should have been, but changing IC902 made no difference. Further checks with the machine in the stop mode under the fault condition revealed that pin 24 of IC902 was low instead of high (pin 23 should be low, pins 24 and 25 high, see Fig. 1). The mecha state switch was checked and found to be in the correct positon, the fault being due to D910 being leaky. Incidentally PG902/CN002 are numbered incorrectly in the official circuit – Fig. 1 is correct. **L.H.**

Sony C5 and C7

The mother-in-law rang up to say that there was no sound coming out of the video (oh that it could be the other way about!). In fact the accompanying TV set produced sound when a prerecorded tape was played, but there was no sound in the E-to-E mode or with a recording made on the machine. Obviously the sound i.f. chip, a TBA120UB. A quick check with the AVO revealed that there was no voltage at pin 14, one of the input pins. This should be biased up by an internal resistor. With the machine still on, hands were placed on the board to position it ready for removal of the chip when, guess what? – sound! Bung in a 10MΩ resistor from pin 14 to the supply pin (11) and there we were. The next video in for repair was a C7. Same symptoms – and the same bodge worked again! **H.A.**

Remote Control Problem

I'd been handed this Ferguson infra-red remote control handset for repair during the weekend. When I opened it up on Monday I found a spare inch of wire shorting the infra-red LEDs to the supply. Remove wire and check waveform to LEDs with scope. This looked good but were the LEDs o.k.? Being infra-red, I couldn't see, and I'd nothing to try the unit out on. Suddenly a stroke of genius. Get out old monochrome TV camera and monitor and point the control unit at the camera. When it was activated, the monitor displayed white light, the TV camera's spectral response being wider than that of the human eye. Who's a clever boy then? **H.A.**

ITT VR3905

This machine (basically the same as the Ferguson 3V35) would load, but the capstan motor wouldn't run – except for unloading (the capstan motor also drives the reels, as with the Hitachi VT11). Checks revealed that there was no voltage at pin 3 (motor drive) of IC206, due to the motor having gone short-circuit to its metal casing. **L.H.**

Hitachi VT14

This machine stopped displaying timer functions only a week after delivery. The supplies to the timer board were correct, and during our investigation plug/socket 703, which links the timer and programme panels, was disconnected. The timer display then came on and continued, even after reconnecting PG/CN703. All functions were fine except that there was no channel movement up or down. Voltage checks around the programme control chip IC721 revealed that pin 13 was at approximately 1·2V instead of 10V, but the cause didn't seem to be due to anything connected with this pin. Eventually we found that C712, connected to pin 17, measured 40pF instead of 0·01μF. Replacing this capacitor restored normal operation. **M.S.B.**

TV Fault Finding

Reports from Jim Rainey, John Coombes, Malcolm Burrell, George R. Wilding and M.S. Barakat

Decca 100 Series Chassis

Intermittent mains fuse blowing on these sets can be due to the earth tag of the h.t. reservoir/smoothing block C801/2. We've had at least six cases recently. It can also cause the fusible resistor R282 on the decoder panel to go open-circuit, giving the white raster with flyback lines symptom.

Field collapse can be the result of resistors R361/8/9 in the field scan circuit going open-circuit. They are all 1Ω, ½W and are connected in parallel to provide the earth return path and develop a field feedback waveform. **J.R.**

Grundig CUC220 Chassis

We've had several cases of field collapse due to D2764 (SKE2F1/01) going open-circuit. The clue is a voltage reading of about 7V at pin 8 of the TDA2655B field timebase i.c. instead of 23·5V. **J.R.**

Philips G11 Chassis

The fault with this set was reduced field scan. It was found to be due to R2104 (1Ω) going open-circuit. This is one of two parallel-connected resistors that provide the earth return path for the field scan current, their main purpose being to provide feedback waveforms. Since one resistor only was open-circuit, the amplitude of the feedback waveform increased – and since this is negative feedback, the field output was reduced. We discovered the cause of the trouble by scoping waveforms and finding the one concerned to be almost twice what it should have been in amplitude. **J.R.**

Thorn 1690 Chassis

This set had an awkward fault: it would operate quite happily, then the sound and vision would suddenly vanish. It had been in a couple of times already. We'd changed the a.g.c. transistor and the video driver transistor and everything had seemed to be o.k., but back it would come. The problem was to pounce on the set before the fault cleared.

A.G.C. problems can be difficult. Is the fault in the a.g.c. circuit or the controlled stage(s)? A sort of chicken and egg situation. The a.g.c. gating was checked with a scope and was in order. Voltage checks weren't much help, so the scope was used to monitor the a.g.c. voltage at each of the two controlled transistors VT1 and VT2 (see Fig. 1). When the fault occurred, the voltage varied widely. The reservoir/smoothing capacitors in the a.g.c. circuit were suspect, but proved to be o.k.

I decided to try operating both controlled transistor's with bias from a battery/potentiometer combination instead of the a.g.c. line, whilst monitoring the a.g.c. voltage. The biasing of the controlled stages remained erratic but the a.g.c. voltage was stable. At least we'd cleared the a.g.c. circuit of suspicion. The a.g.c. was then reconnected to VT1 while VT2 was biased from the battery. The fault persisted. The biasing arrangements were then swapped over, with VT1 externally biased. The fault was less apparent, but the bias at VT1 still varied. I concluded that the fault was in the first i.f. stage. Having checked the transistor, C10 was checked. It seemed o.k. when checked with a meter, but the fault went when it was disconnected. After fitting a replacement the set ran on soak test for several days and was then returned to the customer. **M.B.**

Thorn 1590 Chassis

As far as we could see, the picture on this monochrome portable was of about normal height and linearity. It was displaced however so that it filled mainly the top of the screen – as if there was a shift control that was turned to one extreme. The only possible reason for this unusual condition was an abnormal d.c. supply through the field scan coils. The cause was evident on removing the back. R95 (6·8kΩ), which feeds a small current from the 95V rail to the field scan coils, was badly discoloured. On test it was found to have fallen to a very low value. Replacement restored normal conditions. **G.R.W.**

Fidelity CTV14R

The contrast level was low, the control itself having negligible effect. This potentiometer varies the voltage, normally about 6V, at pin 7 of the TDA1365 colour decoder i.c. We found that there was little voltage at pin 7 whatever the setting of the control, due to a leak in the electrolytic C116 which decouples its slider. The basic cause of the trouble was that the capacitor had been connected the wrong way round. It had managed to stand up to the effects of incorrect polarity for some time, but had eventually succumbed. We've since heard that this was not an isolated case of C116 being inserted the wrong way round. **G.R.W.**

Philips G11 Chassis

There was reduced height and width, but the most disturbing feature was the way in which the raster periodically varied in size and jumped about. Our first impression was that the h.t. supply was incorrect and unstable, but a check at TP1 produced a normal reading of 156V. We've had cases of dry-joints on the line scan panel in this chassis, particularly on the oblong, green-cased capacitors. Applying pressure to one of them produced a distinct

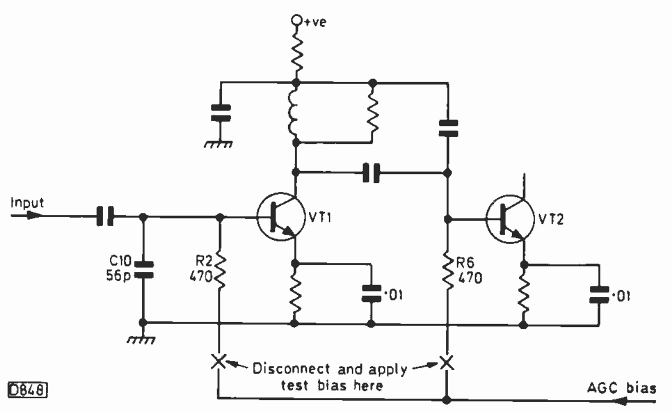


Fig. 1: A.G.C. checks using a battery.

rocking movement, indicating an unsoldered connection. When this connection and one on the other similarly encased capacitor had been resoldered we had a stable, full-sized picture. Since the leadout wires of these capacitors fit straight into the PCB holes without bending, it seems that they may drop away from the board, thus leaving insufficient lead protruding for correct soldering during production. **G.R.W.**

Toshiba C1480B

If there's no channel memory, check whether the indicator LED DA20 lights – note that it's shown as DA01 on the circuit diagram and DA20 on the panel. If it does light, check whether it goes out when the memory switch SA21 is operated. Replace DA20 or SA21 as necessary. If these items are all right, check the voltages around the TC9002P control i.c. (ICA01). Replace the i.c. if any discrepancies are found. If necessary check the TMM841P memory chip (ICA02) in the same way. **J.C.**

Grundig 8610

The problem with this set was no colour. A replacement colour module was fitted, but still no colour. Next an RGB module was tried, this time restoring the colour. So where was the fault in the original module? This module contains part of the colour decoder, including a rather unusual i.c. (IC941, type TCA660) which seems to be to do with Secam operation. Scope checks showed that the demodulated chroma signals were reaching pins 8 and 9 of this i.c., but there were no colour-difference outputs at pins, 7, 10 and 12. Voltage checks around this i.c. were then made. All voltages were present and correct except for pin 6, which was at approximately 0·8V instead of 5·5V. This pin is associated with Secam operation, and the only thing connected to it in UK models is C904 (0·01μF). It turned out that this capacitor was leaky, replacement restoring normal operation. **M.S.B.**

Decca 110 Series Chassis

For a bright picture with flyback lines, check whether R913 (220kΩ) on the tube base panel is open-circuit. It's in the earthy side of the tube's first anode supply network. **J.C.**

Toshiba C2090B

The field output transistors TR306 (2SC2073) and TR307 (2SA940) can be responsible for field jitter on this model. Check them by substitution. If still in trouble suspect the TA7609P timebase i.c. (IC301). Again check by replacement. **J.C.**

Improved Replacement Modules

Tony Thompson

It's odd that some of us tend to have an irrational fondness for certain older TV chassis even though we know all too well that they suffer from various weaknesses due to poor design. Occasionally the illnesses to which they are prone become so acute that repair is impossible. An alternative in this case is replacement of the offending module. But this isn't always possible. Manufacture of the module concerned may have ceased, or a serviceable unit may be demanded before a working one is provided – an illogical requirement, since non-repairability is the usual reason for the need to fit a replacement!

We are fortunate nowadays in often having an alternative to the units supplied by the original manufacturers. Such panels and modules are generally of improved design, produced by enterprising smaller firms that are quick to spot a servicing need and can make the quantities required economically. The claim is that such units are not only as good as the originals but often capable of providing measurably better results.

The following notes cover various currently available tuners, tuner selector switches, convergence and colour-difference amplifier panels, i.f. gain modules, transistorised replacement units for valves and certain e.h.t. trays and line output transformers. I'm not claiming that the list is exhaustive: it should however give an idea of what's available, and the items mentioned have all been tried and found to be satisfactory. The chassis involved are getting on a bit, but the endemic faults that call for a replacement module will show up as a set ages.

GEC CTVs

I've been well served by the solid-state GEC C2110 series over the years. It's a chassis with no really bad features apart from the annoying double-sided print. The main problem arises in those models fitted with touch tuners. These are prone to sticking on one channel, or tend to return to the same channel despite the customer's efforts to watch his favourite programme. They can also vacillate between channels at a fair old speed, seemingly unable to decide which one to pick. It's mainly due to the neons, or to dirt or moisture on the touch pads. You sometimes come across a really troublesome one.

The problem can be eliminated by fitting a conversion tuner. These come complete with a new escutcheon with the station titles screened on – the touch pads are replaced by light-action switches. Fitting this conversion unit is in my experience well worthwhile, especially if you are renting the sets out or selling them under guarantee.

There are still some of the older hybrids with us. In this case I don't know of any alternatives, so it's out with the file, soldering iron and the thick copper wire and the hope that the burn-up on the timebase panel is not too severe!

The Philips G8

The later 550 version of the popular Philips G8 chassis suffers from three basic weaknesses: the tuner head switches, the line output transformer and the convergence panel.

The tuner control unit has six flap switches in two rows of three, the whole thing pivoting forwards for adjustment. It's often unreliable and is rather fiddly to tune – there's an uncertain quality that gives the conscientious engineer a guilt complex even when he's taken care, switch parts have been refitted and a new a.f.c. switch has been installed. S.E.M.E. Ltd. (address later) can supply a new head that's a direct replacement for the original but has a radically different and more robust switch action and an easier to adjust potentiometer bank. The unit can be fitted without having to remove the back cover – a real bonus, as anyone who's struggled with the G8's awkward back will testify! I've not tried it on the earlier 520 version of the chassis, but it seems probable that with a little enlargement of the space the switch could also be used with this.

The 550 series convergence panel is troublesome, with a tendency to burn-ups and drift. The print will often be found in a badly charred state, making a satisfactory repair difficult. The alternative replacement panels available from the same source offer no great technological improvements but are better designed and give greater reliability with cooler running and generally better performance. They are direct plug-in units, requiring no soldering and needing only the minimum of adjustment.

I'm sorry to say that to date I know of no replacement for that infernal transformer! All I can suggest is careful balancing of the two-transistor output stage whenever the transformer or the transistors are replaced. This does seem to help, but I'm never without a couple of spare transformers in stock . . .

Pye CTVs

The Pye hybrid CTV series that's so popular with many engineers has long suffered from a colour-difference amplifier panel with a self-destruct tendency. This badly designed unit is crowded with heat generating valves and resistors and sits horizontally at the base of the cabinet, secured around its extremities by springy wire retainers – in other words its support is inadequate! In addition there are numerous whisker thin print tracks. As a result of this, after the flexing and straining caused by many thousands of on-off cycles there's a tendency for lots of elusive intermittent faults to begin to show. Identical replacements were once available, but only on receipt of a repairable panel – a burnt one was not acceptable. Happily there's a solid-state replacement with transistorised output stages. Better definition is claimed, but you must decide for yourself. Some care is necessary in fitting the unit, with thoughtful dressing of the leads, if patterning and other instability problems are to be avoided.

Before splashing out on a replacement panel however the condition of the rest of the set should be assessed – pay attention to the power supply, especially with the later line timebase/power supply panel which suffers from the same malady of thin print tracks and flexing due to the heat and the weight of components (it's also somewhat inaccessible).

The module that gives most trouble in the subsequent solid-state Pye chassis (the 713/725/731 series) is the i.f. filter/gain unit. I've found the replacement developed by LEDCo a useful alternative.

Tuner Control Conversions

The ITT CVC8/9 chassis have proved their reliability. Due to the fact that the tubes seem to last forever, they are deservedly popular. The problem here is the five-way, square button tuner bank. There's a conversion replacement (Alderson-James Ltd.) with six round buttons: well worthwhile.

Piano key versions of the Decca hybrid chassis can be fitted with more reliable six- or eight-key units – some Telefunken sets were fitted with this chassis. The solid-state 70/90 series, which feature touch tuning, can be easily converted to light-action push buttons.

General Replacements for CTVs

There are two main items when it comes to general replacements rather than modules for particular chassis. First the universal e.h.t. tray. These are available from a number of sources to fit, with slight modifications, a whole range of UK and Continental chassis including those from Luxor, Decca, ITT, Telpro, Autovox and dozens more. The main exception is the Thorn range, from the 2000 onwards. Thorn went their own way in the matter of triplers, and you've just got to fit the proper replacement.

The second item relates to the luminance output stage. Most hybrid sets use the PL802 valve, which has been scarce and expensive for a long time. When a solid-state version came on the market many of us breathed a sigh of relief. The device works tolerably well, but I find that care is sometimes needed in adjusting the a.g.c. etc. I have to admit that I prefer the valve.

Monochrome Sets

"Solid-state" line output transformers are available for use in a number of monochrome chassis including the Pye 169/173 series, the Philips 210/300 series and the Rank A774 – they are solid-state in the sense that a stick e.h.t. rectifier is used in place of the troublesome thermionic diode type. They cost no more than the conventional type of transformer: I'd recommend the change if replacement is necessary.

The problem with some Rank portables is hard to obtain tuner units. Modified tuners based on standard electronic types are now available at prices that make the repair of these previously too costly to fix sets once more worthwhile.

Assess the Set First

Finally, a word of caution. These improved units can be tempting, but the general condition of the set should be carefully considered. A new tuner head or panel won't give the whole set a new lease of life and may cost a fair proportion of the set's market value. If the set is in generally good condition however it will often benefit from this updating.

Sources

The items that have been mentioned are available from various advertisers in this magazine. Other sources include:

S.E.M.E. Ltd., Unit 2E and F, Saxby Road Industrial Estate, Melton Mowbray, Leics. Tuner head conversions and convergence panels for the G8, solid-state CDA panels for Pye hybrid colour sets, universal triplers and the solid-state PL802 are available from this source.

Willow Vale Electronics, Old Hall Works, Arborfield Road, Shinfield, Reading can supply solid-state monochrome receiver line output tranformers, universal e.h.t. triplers, LEDCo i.f. filter/gain modules for the Pye 713-741 series, solid-state CDA panels for the Pye Hybrid chassis, and GEC C2110 series tuner head conversion kits from touch-tune to light-action switching.

HV2000 Sync Adaptor Unit

John Hammond

The Sony HV2000 provides a 12V d.c. supply for a colour and a monochrome camera and enables the user to switch synchronously between the two cameras. In addition the monochrome signal can be faded or superimposed on the colour display, and can be synthetically coloured. A description appeared in the February 1981 issue of *Television*. It's a good quality unit, considering the low price, but its flexibility is limited by the unusual sync drive it provides for use with Sony's own monochrome camera. The simple circuit described in this article allows you to use any camera that requires HD and VD drive pulses, e.g. the National WV241 or various "industrial" cameras that can be bought cheaply secondhand.

Circuit Operation

The circuit is shown in Fig. 1. It produces HD and VD pulses directly from the HV2000's inverted mixed sync output. This means that there's a slight delay, and there are no syncs of any sort if there's no signal applied to the HV2000's colour camera input. The delay is no real problem, because the monochrome input is "cut" into the colour signal. The lack of syncs means that the camera's scan circuits must free run in the absence of any drive. The drive pulses provided are not to CCIR specifications or anything like it, but all the cameras tried have been quite happy.

Since we have to change only the form of the sync signal, the circuit is very simple. Regardless of what feeds the HV2000 unit, the mixed sync signal it provides is the same – all the separation and filtering have been done for us.

Vertical Drive Pulse Circuit

R2 and C2 form a low-pass filter that gives us a VD signal to feed to Tr1 for amplification and inversion. Tr1 just about saturates, which helps to reduce any HD ripple on the VD signal. Diode D2 ensures that Tr2 turns off completely between sync pulses, giving a clean back edge. The VD pulse thus obtained is buffered by the emitter-follower Tr3 – a pnp device is used because current for a negative-going pulse is required.

If you compare the two pulses on a scope, you'll see that the VD pulse is slightly behind the incoming vertical component of the mixed syncs. Altering the value of C2 will reduce this delay if necessary, but the value of R7 will probably need to be changed as well to ensure that D2 operates correctly.

Horizontal Drive Pulse Circuit

The HD pulse is fed to the base of Tr4 by the coupling network C1, D1, R13. Tr4 is another saturating amplifier which inverts the pulse to obtain the correct polarity. The output is buffered by Tr5. The sync signal from the HV2000 unit swings nicely about earth potential once the operating conditions have settled after switching on – hence R1. This means that on the negative swings (the VD pulse part) D1 conducts. C1 then sees a path to earth, whereas on the positive swings it sees R13. Thus adequate *RC* filtering of the HD pulses and d.c. clamping are both obtained, providing a good operating point for Tr4.

Construction

Several types of transistors were used in the prototype and seemed to behave well. Avoid using very high or low gain types. Boxed versions of the BC107 and BC117 were finally used. The power supply required comes from the HV2000 which can also supply the camera if this is suitable for 12V operation.

The original prototype was housed in a diecast box with a 10-pin socket at the side for the camera cable. A BNC

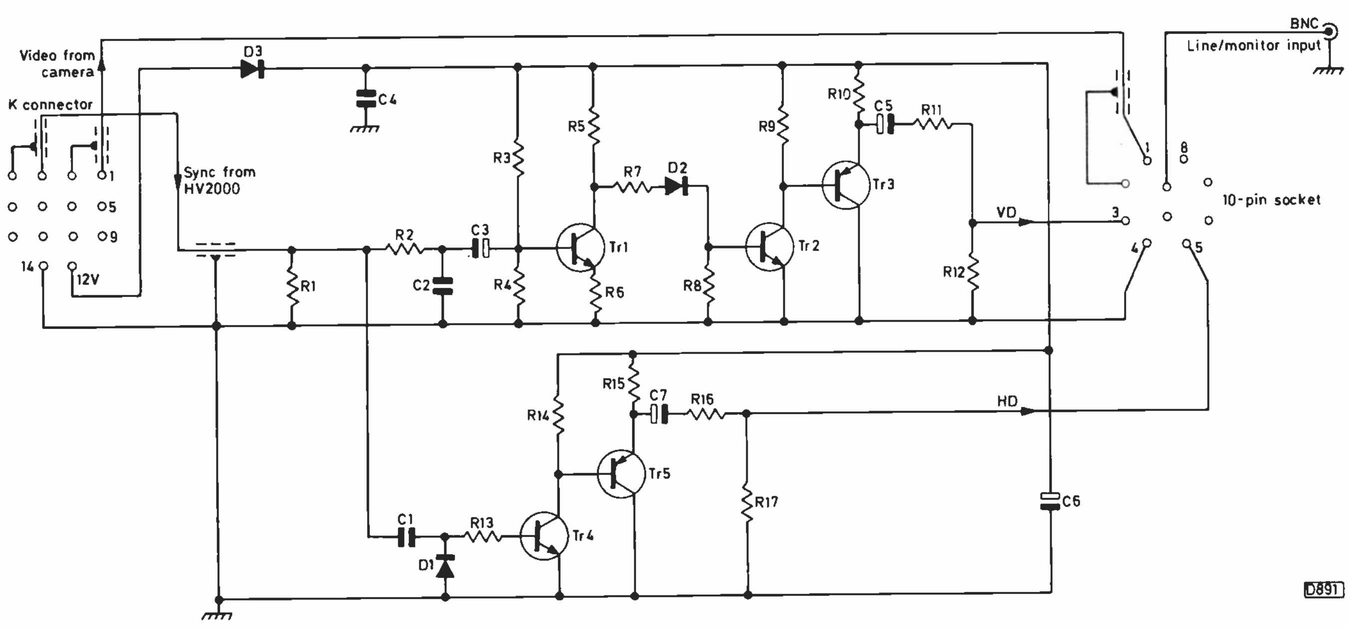
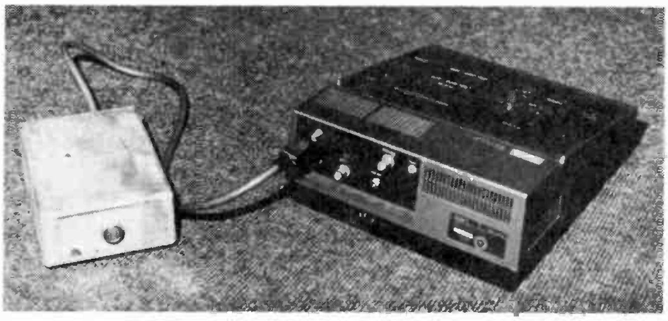
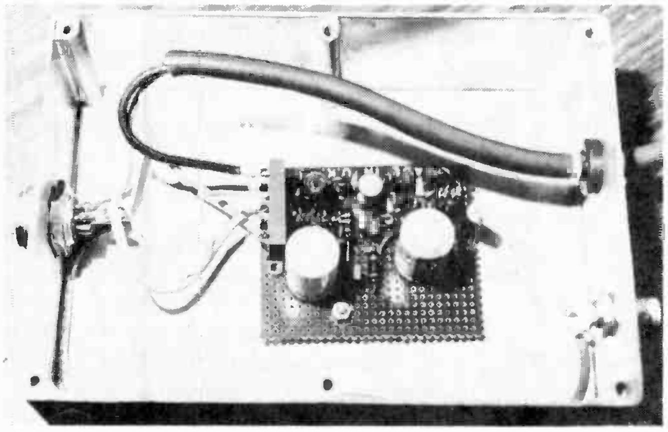


Fig. 1: Circuit diagram of the sync adaptor unit.



The sync adaptor unit (left) in its diecast box connected to the Sony HV2000 video unit (right).



Internal view of the sync adaptor unit. The circuit is built on Veroboard and is not critical.

socket was also fitted as a video return feed to the camera. Cameras such as the WV241 have a camera/line switch in the viewfinder. By connecting the HV2000's monitor output to this socket, a caption can be lined up in the viewfinder to see how it looks.

A short multicored lead was fitted, with a K connector, to suit the HV2000. Separate leads could have been used of course. Suitable coaxial cable must be used for the video lead. The sync lead should be the same or at least an audio type screened lead.

The camera was tried with 10-pin leads up to 50ft long and no problems arose. Remember the sync delay however – this will mean that the caption or whatever will shift, so go by the centring as seen by the "lineview" position or any other monitor connected to the HV2000's monitor output.

Components list

Resistors:

R1	1k
R2	4k7
R3	22k
R4	10k
R5	10k
R6	470
R7	10k
R8	6k8
R9	4k7
R10	1k
R11	47
R12	4k7
R13	2k2
R14	4k7
R15	1k
R16	56
R17	5k6

Capacitors:

C1	0.0033
C2	0.022
C3	10μF, 25V
C4	0.047
C5	1,000μF, 25V
C6	1,000μF, 25V
C7	47μF, 25V

Semiconductor devices:

D1-2	1N4148
D3	1N4001
Tr1-2	BC107
Tr3	BC177
Tr4	BC107
Tr5	BC177

TV Test Pattern Generator

Part 2

Tony Jenkins, G8TBF

This month we'll look at the colour encoder section and the power supply. A separate printed circuit board has been prepared for both of these and details, along with constructional and setting up details, will be given next month.

Coder and Modulator

The colour encoder takes in separate sync, red, green and blue signals (also the grey-scale signal) and produces a composite video output. This is available at v.f. or, via the modulator, at u.h.f.

The encoder/modulator circuit is shown in Fig. 6. The heart of the encoder is a Mullard i.c. (IC3), type TEA1002. A block diagram for this device is shown in Fig. 7. It has an internal 8·86MHz oscillator from which the R−Y and B−Y carriers are generated. Composite sync, burst gate enable, PAL switch and composite blanking timing signals are required in addition to the RGB and grey-scale inputs. The output is a 16-colour (including black and white) composite video signal, based on 75 per cent colour bars.

The RGB, composite sync and composite blanking signals are fed directly to the i.c. from the logic board where they are generated and inverted as required. The burst gate enable and PAL switch signals are generated on the colour encoder board from the composite sync signal. The grey-scale drive is also generated on the encoder board. The burst gate enable signal is derived from one half of IC4, type 4528, a dual retriggerable-resettable monostable. A CMOS device is used deliberately to introduce a small delay at the start of the signal. The *RC* network R4/C2 sets the pulse width at around 2·2μsec. The output goes to pin 15 of the TEA1002.

The other half of IC4 is used to provide a line frequency trigger pulse for one half of the 4013 dual D-type flip-flop IC5. This produces the 7·8kHz PAL switch signal which is fed to pin 12 of the TEA1002.

The three-bit binary-coded grey-scale information is fed to IC1 (a quad two-input OR gate) along with the grey-scale enable signal. The outputs from these OR gates (when enabled) are fed to sections of IC2 (hex driver with open-collector outputs) and arrive, via the three presets VR1, VR2 and VR3, at a common summing point that drives the TEA1002's luminance input (pin 7). FC2 is the most significant bit, causing a single transition from black to white. FC1 is the next most significant bit, producing the "almost black" and "almost white" bars. FC0 is the least significant bit, filling in the greys. The background enable signal simply inserts a level of grey, set by VR4, to lift the crosshatch background out of black.

Since the current capability of the video output from the

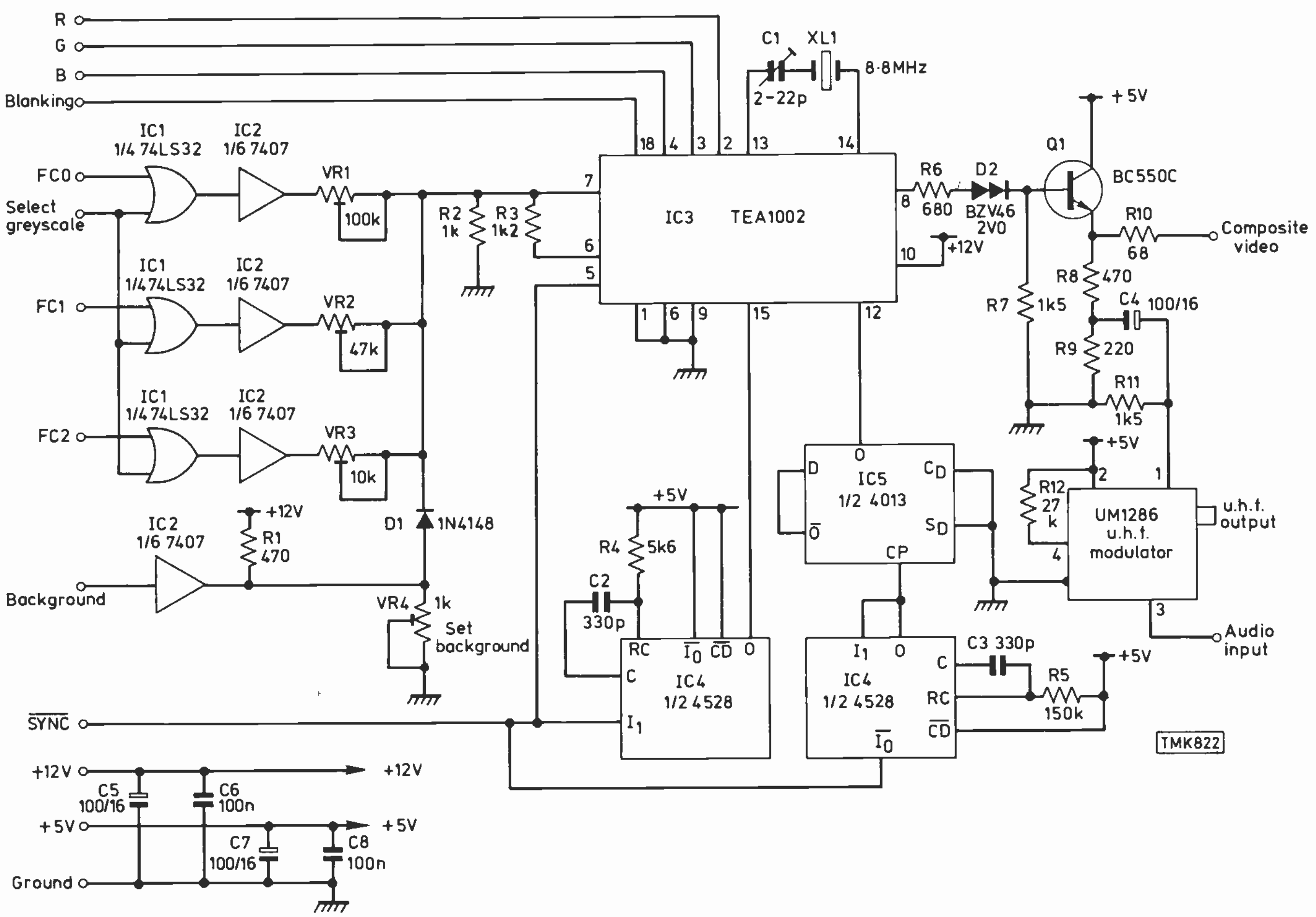


Fig. 6: Circuit diagram of the encoder and modulator sections of the pattern generator.

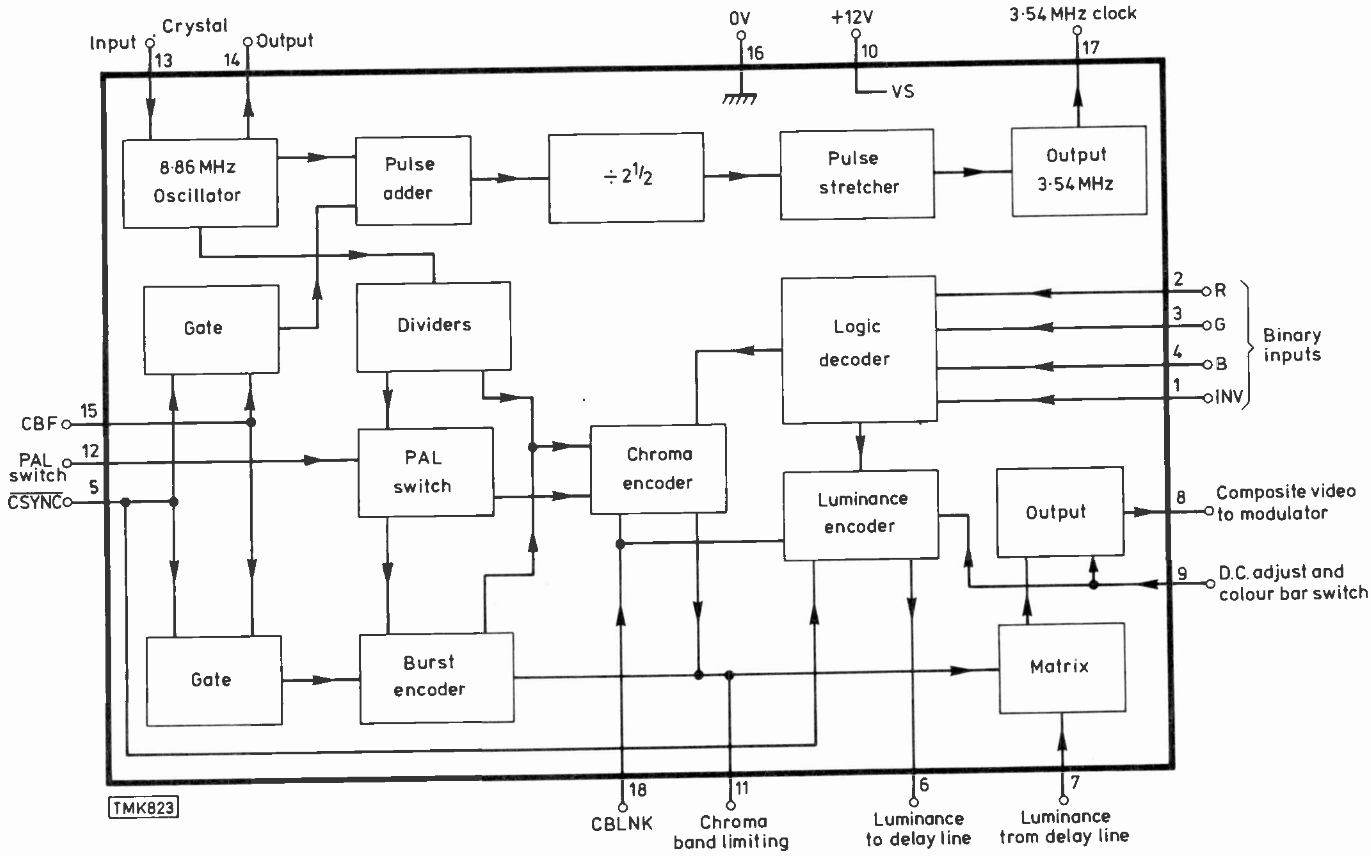


Fig. 7: Block diagram of the TEA1002 encoder i.c. The 3.54MHz clock output is not used.

Components list: encoder

Resistors:
R1 470
R2 1k
R3 1k2
R4 5k6
R5 150k
R6 680
R7 1k5
R8 470
R9 220
R10 68
R11 1k5
R12 27k
All ¼W, 5% carbon film
VR1 100k
VR2 47k
VR3 10k
VR4 1k
miniature skeleton presets, horizontal mounting

Capacitors:
C1 2-22pF trimmer
C2 330pF ceramic
C3 330pF ceramic
C4 100μF, 16V radial el.
C5 100μF, 16V radial el.
C6 0·1μF ceramic
C7 100μF, 16V radial el.
C8 0·1μF ceramic

Semiconductor devices:
D1 1N4148
D2 BZV46-2V0
Q1 BC550C
IC1 74LS32
IC2 7407
IC3 TEA1002
IC4 4528
IC5 4013

Miscellaneous:
XL1 8·8MHz crystal with HC18/U case
Astec UM1286 u.h.f. modulator. PCB.

Components list: power supply

C1 1,000μF, 25V axial el.
C2 1,000μF, 25V axial el.
C3 4,700μF, 16V axial el.
C4 100μF, 16V axial el.
C5 0·1μF ceramic
C6 100μF, 16V axial el.
C7 0·1μF ceramic

D1 1N4001
D2 1N4001
BR1 KLB02
IC1 7812
IC2 7802

Mains transformer RS 208-333, 18VA.
Heatsink 50mm length of RS 401-497 (for IC1/2).

TEA1002 is rather limited, a buffer transistor (Q1) is used. Resistors R6 and R7 reduce the input level at the base of this transistor to 2V peak-to-peak. The output is a 75Ω signal which is reduced to the normal 1V peak-to-peak when terminated at 75Ω. D2 is the equivalent of two diodes in series but giving a close-tolerance forward voltage drop of 2V. Its purpose is to remove 2V from the 2·6V d.c. pedestal on which the video signal sits. Q1's base-emitter voltage drop removes the residual 0·6V. In practice there's a very small residual d.c. voltage, though it's insignificant. D2 can be omitted if a 2V pedestal can be tolerated.

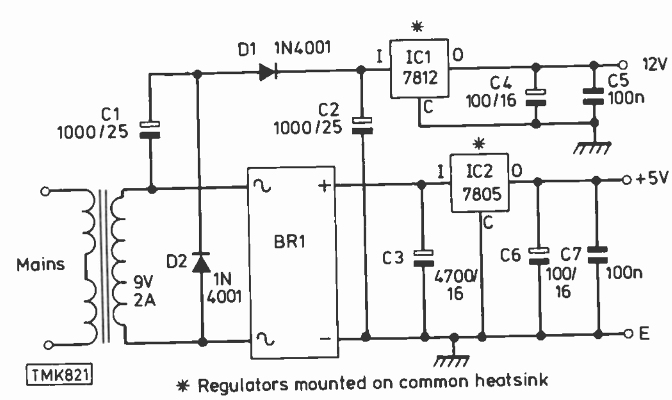


Fig. 8: Power supply circuit.

Another potential divider, in Q2's emitter circuit, reduces the signal to the level required to drive the UM1286 u.h.f. modulator. R11 sets the modulator's d.c. working point. This should be 2·2V: any significant departure from this voltage will cause sync crushing or even loss of sync. The value of R11 may need to be adjusted.

The modulator selected is a good-quality wideband type which also contains an intercarrier oscillator. If required, the frequency of this can be changed to 5·5MHz. An add-on audio oscillator will be described later. Constructors can if they wish use a CMOS divider circuit fed from the 7·8kHz output of IC5 to produce several frequencies, one of which can be fed directly to the modulator's audio input pin.

Power Supply

The power supply is straightforward, using a 7805 regulator to produce the 5V rail and a voltage doubler followed by a 7812 for the 12V rail. This arrangement is an economical design requiring only one mains transformer providing one secondary voltage, without excessive dissipation in the 5V regulator. Connect the transformer's primaries in series and the secondaries in parallel.

Teletopics

THE FS TUBE

There have been several major developments in colour tube technology over the years. First, in the early seventies, came the self-converging, in-line gun tube. More recently there's been the development of tubes that require neither EW nor NS raster correction. The latest development is the FS (flat, square) tube, which has squared off edges and an almost flat faceplate. As with previous advances, the main improvements have been made possible by developments in yoke design – and in electron gun focusing arrangements. The advantages claimed for the new tubes include absence of display geometry distortion, reduced ambient light reflection as a result of the flat screen, and improved legibility at the corners of the screen. The new tubes have been under development for some time by Toshiba, Philips and Mitsubishi amongst others. They are expected to be used initially in up-market receivers and monitors.

The first domestic receiver in the UK to be fitted with such a tube has already been announced – the Fisher Model CFB2110STX. This is a full-specification 21in. model featuring a SCART socket, stereo sound, remote control and a built-in teletext decoder. It's expected to retail at around £530.

1983 TRADE FIGURES

The official BREMA figures for TV and VCR deliveries during 1983 have now been released. Total CTV deliveries during the year were a record at 3,496,000, an increase of 19·2 per cent on the 1982 figure. VCR deliveries showed a slight (0·05 per cent) decline at 2,234,000. This decline was much sharper during the final quarter however, the fourth quarter figure of 546,000 being 40 per cent down on the total recorded during the final quarter of 1982. Various reasons for this decline have been suggested, including price rises. Whatever the cause, it appears that the boom is over for the present at any rate.

TV deliveries for 1983 break down as follows: Large-screen colour sets 2,240,000 (10·7 per cent increase); small-screen colour sets 1,256,000 (37·9 per cent increase); teletext equipped sets 641,000 (12·3 per cent increase); monochrome portables 1,131,000 (11·8 per cent increase). Imports of large-screen colour sets increased by 44·2 per cent to 519,000 while imports of small-screen colour sets increased by 39·3 per cent to 787,000. Deliveries of UK manufactured small-screen colour sets increased by 35·5 per cent to 469,000: it's clear that UK capacity at this end of the range is still nowhere near adequate.

RCA ENDS DISC PLAYER PRODUCTION

RCA has decided to cut its losses and cease production of CED video disc players, leaving production entirely to Hitachi. Production of the discs will continue at RCA's Indianapolis plant. This seems to be a rationalisation measure since the system has not done as well as hoped and there is little point in having two player manufacturers at current rates of production. RCA, Hitachi and GEC have announced that the decision on player production will make no difference to current plans to promote the system in the UK. Greater emphasis is to be placed on selling the discs in competition with audio records rather than video cassettes.

THORN'S MOULDING INVESTMENT

Thorn EMI Ferguson is investing £8 million in a new plant to make high-quality plastic mouldings for consumer electronics and computer products – the largest single investment ever made by the company. The plant will occupy a seven acre site at High Wycombe and is expected to be in production by the end of the year. The aim is to meet Thorn's own needs for TV and VCR cabinets etc. and increase the sales of mouldings to other information technology companies. About 60 per cent of production will be used initially for Ferguson brand products. Thorn plan to increase production by 50 per cent within two years, when external sales should rise to 60 per cent of production. The present Elco Plastics plant at High Wycombe and a smaller plant at Gosport are to be closed. A statement from the company comments that "the decision to invest in high technology capital equipment, which includes robotics, follows a period of investigation into developments in consumer electronics and information technology and is in direct response to the recent National Economic Development Office report and recommendations." Thorn's investment should certainly help overcome the excessive dependence on imported small-screen colour sets noted above – you can't produce sets without cabinets to put them in, and this seems to have been something of a production bottleneck in the UK in recent times.

TELEVISOR RENOVATED

Engineers and apprentices at Plessey Radar, Cowes, Isle of Wight have combined their talents – and patience – in restoring an antique Baird televisor dating from the early thirties. It had been found under a pile of rotting firewood in an Essex outhouse and has now been lent to the

National Wireless Museum at Arreton Manor, IOW. Only six televisors have survived: they are believed to be priceless. To operate the 30-line televisor a household also had to own two radio sets. This lot gave them pictures that were described as "barely discernible". They were broadcast for two hours each evening, on the medium wave band. One radio provided the vision signal, the other the sound. It's hoped that with the aid of a scan converter the televisor may eventually be adapted to show current 625-line pictures. The greatest problem was presented by the aluminium Nipkow disc, which had been buckled and torn. It couldn't be restored, so a copy had to be made. Fortunately the televisor was complete, with no bits missing, but it was extremely tarnished and needed much cleaning up.

VCR LATEST

Philips have now released details of their plans to market VHS VCRs in the UK. The initial VCR, Model VR6520, will be imported from Matsushita. A subsequent model, the VR6460, will have Japanese mechanics and Philips' electronics. Later machines will be wholly produced in Philips' plants, starting this autumn. A new generation of lightweight V2000 machines is due to go into production at the same time.

Grundig (now controlled by Philips) appears to be ahead of its new parent company with its plans to launch European produced VHS machines. The initial Grundig VHS machines (the VS range), due for release this summer, are expected to be of almost entirely European design and manufacture.

An agreement has been reached between Sony and the Spanish Industry Ministry to establish a plant for the manufacture of Betamax VCRs in Spain. The plan is for production to start by 1987 at an initial annual rate of 125–150,000 machines.

Two VHS VCRs have been added to the Decca/Tatung ranges – Models VRH8400TK/VRH8400DK and VRH8500TK/VRH8500DK respectively.

A Betamovie camcorder, Model VCR100P, has been added to the Sanyo range. It's fitted with a ½in. SMF Trinicon tube and is expected to retail at around £1,000.

There are reports that a half-speed 8mm video system is under development, giving a record/playback time of three hours.

The latest EIAJ figures, for February, show that Japanese VCR exports during the month rose to 1·49 million units, an increase of 55·5 per cent on February 1983. The main increase was in shipments to the USA: these rose by 167·4 per cent, accounting for 43·4 per cent of the total. Exports to the EEC fell by 14·7 per cent – by 47·1 per cent in the case of the UK.

12GHz CONVERTER

A low-noise 12GHz downconverter has been announced by Wave Devices Ltd. (9 Betterton St., London WC2H 9BF). Key to the light weight and compact size, which enable the converter to be mounted on a dish as small as 2ft in diameter without excessive mechanical stress or shadowing of the reflector surface, is the use of microwave i.c.s. The 1·5 × 1·5 × 5·4in. unit contains an ultra low-noise gallium arsenide f.e.t. preamplifier, a block downconverter, local oscillator and i.f. amplifier, and weighs only 16oz. There are two models, the ACA1170X which converts signals in the 10·95–11·75GHz band to an i.f. of 900–1,700MHz, and the ACA1270X which accepts signals at 11·7–12·7GHz and provides an output at 950–1,950MHz. Both have a 50dB conversion gain with a maximum noise figure of 3dB at 25°C and a typical output power of +7dBm at the 1dB gain compression point. The i.f. amplifier consists of three microwave i.c. modules occupying just 0·3 square inches of the board and providing a gain of 30dB, the output power level being sufficient to minimize the possibility of noise pick up in the downlead.

The downconverters can be used to drive any number of receiver/demodulators by signal power division – additional signal amplification will in most cases not be required. A high or low local oscillator is available for either a normal or an inverted signal. Installation is easy, the units coming equipped with a standard WR75 waveguide flange and being self-supporting when bolted to the aerial's waveguide flange mount. A 15–28V d.c. supply is required, fed in via the N output female connector. The converters can be factory preset to a number of international downlink bands.

DIGITAL TV TRANSMISSION

A two-way digital microwave link has been installed between the IBA's Engineering Centre near Winchester and the Isle of Wight for the investigation of digital transmission systems using frequencies above 10GHz and a data rate of 140 Mbit/second. The link will provide the IBA with a test bed for the evaluation of digital transmission techniques and the assessment of the effects of microwave terrestrial propagation on transmission performance. The video coders/decoders sample the composite TV signal at three times the colour subcarrier frequency, using eight bits per sample. Differential pulse-code modulation is then used to reduce the bit rate to give a difference signal with a five-bit resolution. The audio codecs use the NICAM system to code up to six high-quality programme channels at 2Mbit/sec. This is added to the coded video signal to produce a 68Mbit/sec channel carrying one vision and up to six audio channels. Two such 68Mbit/sec data streams are multiplexed for transmission over the link at 140Mbit/sec.

The digital transmission system uses quadrature phase-shift keying (QPSK) at the carrier frequency. Two types of circuit are being used in the receivers and transmitters to permit direct comparisons to be made between coherent and differential demodulators and between solid-state and travelling-wave tube 250mW transmitter amplifiers.

BBC experiments using a TV signal consisting of separate luminance and colour components were briefly mentioned in this column last March.

REDIFFUSION'S FOUR NEW CHANNELS

Rediffusion is now offering cable TV subscribers four additional channels, each catering for a particular interest – sport, music, films and general entertainment. Screen Sport is providing the sports programmes, Music Box the music-video channel, Sky Channel the general entertainment service and TEN (The Entertainment Network) the film service – at least 50 films per month, of which 15 will be new to television. The channels will be offered in two packages: Super at £4·95 a month provides Sky Channel, Screen Sport and Music Box; Super Plus at £12·95 a month includes the movie channel as well. Programmes are repeated to enable viewers to pick and choose their times of viewing, the scheduling being such that programmes can be seen at different times on different days.

Satellite links are being used to distribute the services from a central location to local stations. A Cabletext service provided by Oracle will be available on each channel between programme transmission times.

RANK HI-BEAM 250 PROJECTOR

Rank's new Hi-Beam 250 video/data colour projection system has been designed for educational, commercial or entertainment purposes where a display between five and ten feet horizontal is required. Many of the features of the Hi-Beam 800, which provides displays up to 24ft wide, are incorporated, including keystone correction (±20°), flat, curved or "white wall" projection, and video or RGB inputs as standard. In addition the Hi-Beam 250 has dual-focus high-resolution lenses giving improved edge definition.

Eighty per cent of the components are mounted on pluggable Eurocards, making replacement quick and easy and simplifying modification when tailoring the specification to interface with various computers. Rank Video Systems' sales manager Alex Taylor comments that "the projection of computer graphics and text is likely to be the biggest growth area for this type of product". The suggested price for the Hi-Beam 250, with remote control and ceiling or floor mount, is £4,400 plus VAT. The larger-screen Hi-Beam 800 system comes at £7,200 plus VAT. Stereo amplifiers and speakers and an input select/enhance unit are available as extra accessories. The latter allows up to six video inputs to be connected.

IN BRIEF

Matsushita has announced the development of an 8-bit analogue-digital video signal converter i.c. whose high speed makes it suitable for use with high-definition TV systems. It appears to be intended for use with the 1,125 line system proposed by NHK for use in Japan.

GEC TV sets are to be distributed by the revived GEC Radio and Television instead of GEC McMichael, which will in future concentrate on professional broadcasting equipment. This change, following GEC's withdrawal from joint production with Hitachi (see last month), restores the marketing arrangements to the set up in operation until eighteen months ago.

The US International Trade Commission has at last ruled on the charges of dumping of colour sets from South Korea and Taiwan on the US market. The decision that US companies are being materially harmed means that the import duties already being imposed by the Commerce Department will become permanent (up to 16 per cent in the case of Korean CTVs and 23 per cent with Taiwanese sets). Duties were first imposed last October following a preliminary Commerce Department ruling. US companies and unions had charged that the imported sets were being sold at less than the fair market value.

VCR Servicing

Mike Phelan

Before we get down to fault finding in the 3V24/5/6, I omitted last month to mention the operation of the sawtooth generator used with the chopper that controls the supply to the reel motor drive amplifier in this machine. It employs a BA222 i.c., which we've already met used as a monostable multivibrator. For it to operate as a free-running oscillator, the input pin 5 is connected to the timing capacitor pin 1, the output being taken from this point. The squarewave that appears at pin 6 is not used.

We'll dismiss the 3V25 and 3V26 tuner/timer and charger briefly. They are very reliable but, like all portable equipment, they tend to get knocked about a bit. Nevertheless a 24/25 or 24/26 combination represents a good buy on the secondhand market if the price is right – cabinet parts are easy to obtain and are not too expensive.

Cabinet Assembly

The 3V24 is, as we've seen, a very compact machine. Before doing any work it's best to remove the cabinet entirely. This is good practice when working on any equipment, to ensure that screws go back in the correct places. It's doubly important with the 3V24, as the chassis can be cracked by fitting wrong screws. Unfortunately if someone else has got there first the screws may not be correct to start with.

First remove the cabinet bottom. There are six self-tapping screws (two also secure the front feet). The front screw is longer and the rear screw shorter than the other four. Don't loose the two rubber feet. Next remove the handle, its attachment screws, the two plated screws and the side plates. The cabinet top slides off after removing the two screws at the rear and opening the cassette lift. The front unclips. Don't loose the eject knob or the flap that covers the rear sockets. The machine cannot be battery operated with the cabinet removed.

Alarm Mode

The most common fault symptom seems to be that the 3V24 goes into the alarm mode, i.e. all LEDs flashing in sequence. If this happens within six seconds or so of switching on, before any functions have been selected, check the cassette lamp. Most of the other causes of this condition relate to the solenoid control arrangements – as you'll recall, the brake and pinch solenoids are both held in by a permanent magnet and are driven electrically by a bridge circuit. Each also operates a switch to tell the microcomputer i.c. which position it's in. At switch on both solenoids are pulsed in the off direction irrespective of their initial states. If either the drive circuit is faulty or the switch doesn't operate, the alarm mode will be entered. Both the switches are rather flimsy, with open contacts moulded in a block of plastic. The metal loses its spring and the switch remains either open or closed. Usually the brake solenoid switch sticks in the closed position. Alarm is then entered when a function is selected. When the pinch solenoid switch sticks in the closed position the alarm mode is entered without a function being selected.

To gain access to the switches, take off the tracking knobs and remove the servo panel (front bottom). The brake solenoid switch is the one operated by the long bar at the front; the pinch solenoid switch is next to it, with an orange lead. Bending the contacts may work, but the switch will fail again. Replacement is best. Look out also for loose bits of mechanism due to broken plastic posts on the deck – caused by an attack of switch cleaner?

Both solenoid drive bridges give trouble. If any transistor is faulty, replace all four – X25-X28 in the case of the pinch solenoid, X21-X24 in the case of the brake solenoid. If these are defective the solenoid will be either permanently energised or repelled. The transistors are on the audio/microcomputer board and are rather inaccessible – the two bottom boards and the front one must be removed first. These devices must all be replaced with the *exact* type.

If all these things are found to be in order, check the keyscan output waveforms at pins 2, 4 and 6 of IC6 on the audio/microcomputer board – just to the left of the microcomputer i.c. (IC4). Each waveform should be 10V peak-to-peak. If one is stuck at 10V or chassis or is much reduced in amplitude, suspect IC6 – it's a buffer between the microcomputer i.c. and the keyboard.

The microcomputer i.c. itself can cause this fault, but this is unusual. Two types have been used, the μPD553C-066 and the later μPD553C-159. They are completely interchangeable. The μPD553C-159 has a revised program that gives certain benefits.

Common Faults

A blank screen with no sound in the E-E mode, plus a constantly running drum motor, means that the clock oscillator has stopped. This is common with the -066 microcomputer i.c., but check the ceramic resonator first.

IC4 can also be responsible for a permanently on audio-dub LED.

If the alarm mode is entered on playback but the machine appears to be running normally, check at TP2 (drum flip-flop signal) on the servo panel. If this waveform is missing, try adjusting the pulse level control R82. Other causes are leaks in X1 and an open-circuit pickup head. A similar effect occurs when the take-up reel sensor goes open-circuit – it's located below the reel disc. Occasionally it doesn't fail completely but the machine packs up towards the end of an E120 or E180 tape, when the reel speed is slow.

Failure of the tape to take up at all points to the chopper transistor X49, the operational amplifier IC8 or the reel motor itself – 2V ±0·3V across the motor during playback is normal. Check that the reel idler is free to move.

A very strange set of symptoms arises when the 9V fuse FS1 on the chroma panel goes open-circuit, as the 12V rail is still present. Select play and the reel and capstan motors take off, alarm is entered and the flashing LEDs are accompanied by the sound of tape being mangled.

The Servos

Most drum servo and motor drive amplifier faults result in the drum rotating at a terrific speed (in either direction!). The most common cause is that C24 or C25 (both 4·7μF) in the loop filter circuit is leaky – remove them and the drum should run at the correct forward speed, though erratically. C1 and C2 (0·022μF) on the MDA board can also cause this. IC3 (VC1029, back to the servo board again) can also be responsible for excessive forward speed, as can a couple of its associated components, namely C34 (10μF) and C35 (0·01μF). There should be 6V ±0·2V at pin 9 of a VC1029, as it contains its own 6V regulator.

The same remarks apply to IC5 (SFF and SREW speed control) and IC13 (capstan speed control). With these two VC1029s there will be excessive tape speed when the voltage at pin 9 is low – so much so that line lock is lost, leading one to suspect the drum servo. The head speed is correct however, line lock being restored in the still frame and slow motion modes.

The HA11711 drum/capstan phase control i.c. can give problems but is generally reliable.

One other component in the capstan servo circuit causes trouble, C17 (0·047μF). It can leak or go short-circuit. It's the trapezoid (TP5) integrating capacitor – the trapezoid will either disappear altogether or be severely distorted, with rounded slopes. The result is excessive tape speed or severe wow and a noisy picture.

Signal Circuits

The signal circuits are reasonably reliable. Picture quality with early models can be improved by changing C47 to 22μF, R52 to 180Ω and replacing R62 with a shorting link. These components are on the luminance panel.

Any spillage of liquid into the machine ends up on the luminance and servo boards. Sometimes the only answer is to replace them both, as the component and i.c. leads corrode away. The *LC* filters on the luminance board, LPF1 and EQ1 in particular, seem to be prone to corrosion after an accident, causing either complete loss of E-E video or a negative picture (because we've altered the d.c. conditions at X6 and thus the a.g.c. amplifier in IC2).

If there's no picture, or severe limiting in both E-E and playback, the fault must lie towards the "back" end – X14, X15 or the r.f. converter. We've also had C69 (10μF) go open-circuit, causing cogging and field jitter, i.e. poor video l.f. response. There are lots of electrolytics in video recorders and some of them are starting to age. Don't forget to check the E-E and PB 9V rails with no picture faults – they are switched by X20/21 and, for E-E 9V, X22/23. We've actually had X22 going leaky to give E-E and playback at the same time – stereo pictures!

Most chroma faults are down to i.c.s or crystals. As always, scope the main converter first (IC2, pins 6, 8 and 9). Don't forget that if the signal is being lost at a later point on playback there'll be no gated out burst and no a.c.c. The input at pin 6 of the converter will thus be of excessive amplitude and the output at pin 9 will be severely distorted. BPF2 (4·43MHz) going open-circuit is the favourite.

Scopes and Probes

We'll finish off by stating the importance of having a reliable, accurate scope with good probes that are correctly adjusted. X1 probes are not much use – even a 25Hz trapezoid will end up with curved sides! X10 probes must be correctly adjusted each time they're used on a different instrument, or even changed to the other Y input of the same scope. It's no use trying to look at an f.m. signal at 3 or 4MHz or so if the probe's frequency response takes a dive at 2MHz – even with a super-duper 50MHz scope. We use the Trio CS1830 scope which has a 30MHz bandwidth – adequate for our needs (up to now!). We also have some nice probes by a firm called Coline. The plugs, tips, leads and earth leads are all removable and obtainable as spares.

Trailer

Next month a little chat on the Grundig 2 × 4 Super (V2000 system) by way of a change.

DX Amplifier Unit

Roger Bunney

Over the years I've built up quite a range of amplifiers, filters, switches, etc. for DX use, all housed in diecast cases. The February-April 1982 issues of *Television* featured a DX receiver system with i.f. bandwidth switching and an upconverter to enable the system to be used with an unmodified u.h.f. TV receiver. Later that year a converter for reception of French system L signals was featured. This pile up of diecast boxes led me to consider some rationalisation at the front end. Hence the present article.

Basic Requirements

There are certain conflicting factors when it comes to amplifiers for DX use. Ideally one wants high gain with linearity, low noise, freedom from interference and stability. Unfortunately high gain will with most receivers cause adjacent channel interference problems – when for example you're trying to receive a weak ch. 25 signal and there's a 500kW BBC ch. 24 transmitter a few miles down the road! The problem of interference in fact seems to be the main constraint with weak signal reception, at least in the populated areas where most of us live. Thus along with amplification there'll be a need for filtering.

The average DX enthusiast will have perhaps two or more v.h.f. aerials and at least one u.h.f. aerial. So one requirement is to minimise the amount of aerial lead plugging and unplugging needed. With a receiving system that's external to the main set, there'll be several stages without a.g.c. To prevent overloading, some form of gain control should be provided. This may be preset, but is better made available to the operator to adjust. The present unit meets these requirements and also incorporates a simple distribution amplifier with six outputs to enable several receivers to be used on various channels. The building block approach adopted will enable others to vary the design to suit their needs.

Block Diagram

A block diagram of the system is shown in Fig. 1. There are four preamplifiers, three for v.h.f. and one for u.h.f. The prototype was fitted with Wolsey Supa Nova v.h.f. amplifiers with the BFY90 transistor's biasing modified to give a slight increase in gain and a reduced noise figure of around 3-3·5dB. For Band I use a noise figure of 4dB will suffice – this equates with the general cosmic/terrestrial noise present. As the frequency increases, the amplifier's noise figure should fall: 2dB is ideal in Band III. For u.h.f. the demand is yet more stringent – 1·5dB should be sought in Band IV. My own DX installation uses masthead amplifiers for Band III and at u.h.f., and these largely set the overall noise figure. For u.h.f. reception the unit incorporates the single-stage BFR91 preamplifier featured in the April issue (page 303).

The three v.h.f. preamplifiers receive inputs from the Band I, II and III aerials. In view of the future plans for Band I, it was decided that the provision of filtering in this channel should be made as simple as possible. To this end a single switch enables the incoming Band I signal to be routed via appropriately biased pin diodes to a varicap tuned notch filter (for example). In the straight through position there will be a loss of some 2dB. The Band II input goes directly to the preamplifier while the Band III input is modified slightly to allow for masthead amplifier powering (24V). This provision is also made in the u.h.f. input. The masthead powering is switchable with LED indication (see Fig. 2).

All four preamplifiers have on/off supply switching with LED indication via a DPDT switch – the second pole is used to apply 12V to the relevant gain control which operates by biasing a pin diode in the signal path. Placing the pin diode at the output of the amplifier minimises mismatching effects – having the pin diode at the low-level end would degrade the input matching.

A four-pole, two-way switch enables either the built-in or external gain controls to be selected. The remote unit I use is again diecast housed and simply duplicates the on-board controls. Each preamplifier's output is taken to a coaxial socket to enable it to be connected directly to other equipment, fed to a diplexer or linked to the integral distribution amplifier. The Labgear CM6032/BF is an

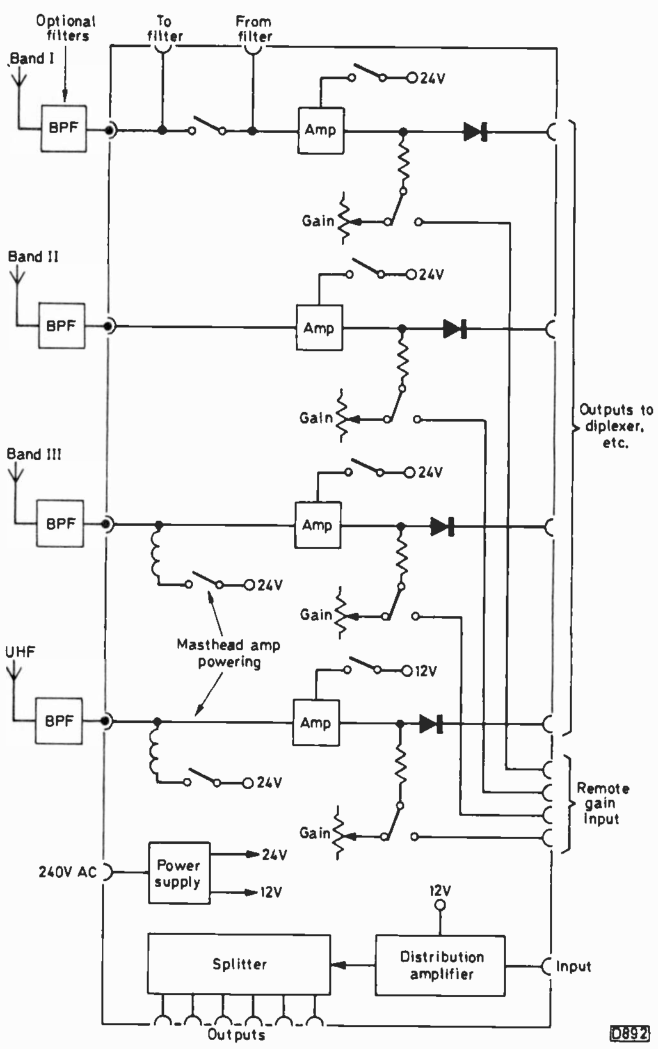


Fig. 1: Block diagram of the unit.

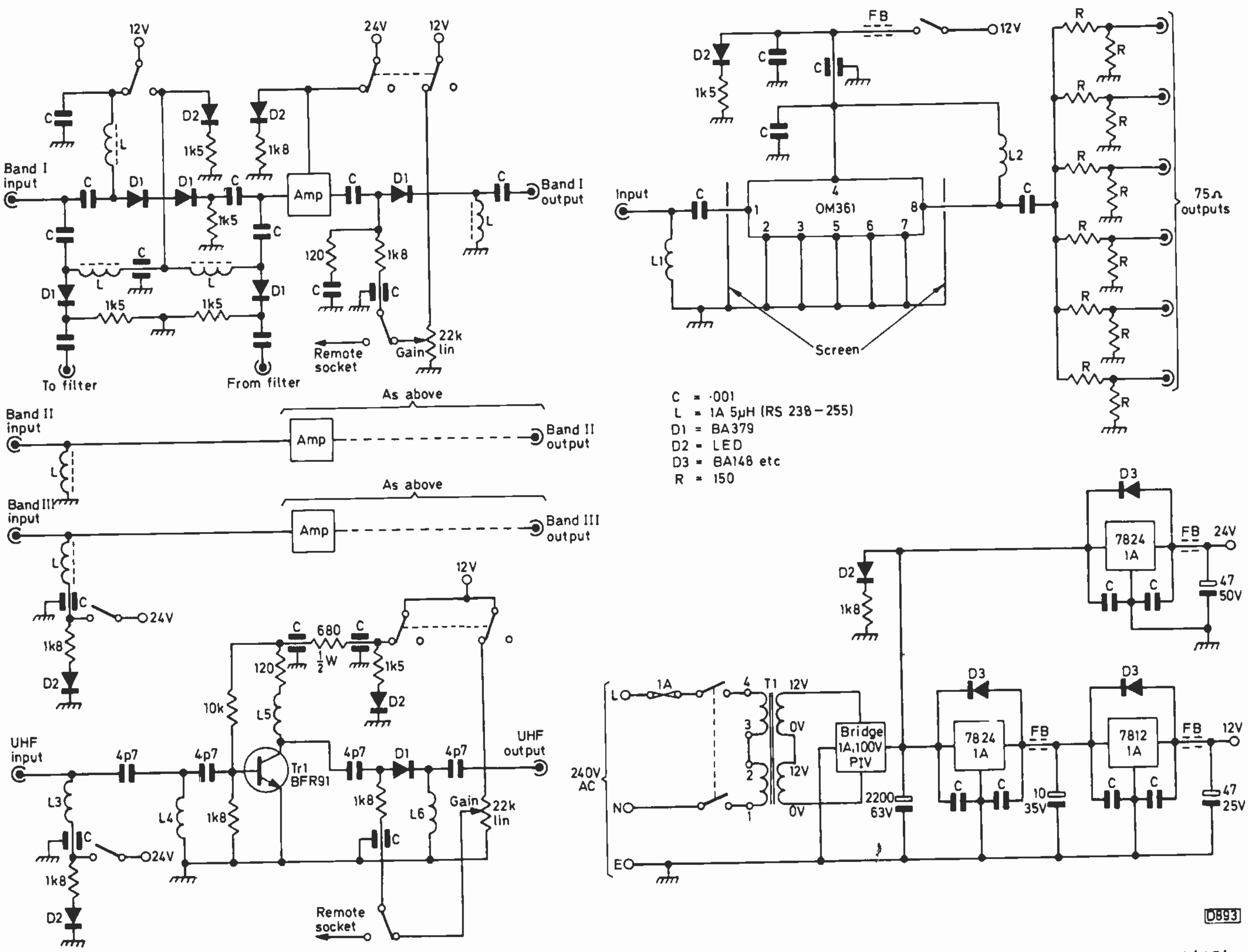


Fig. 2: Circuit diagram. Mains transformer RS type 207-649. Coil details: L1 11 turns 2/10in. diameter; L2 11 turns 1/10in. diameter; L3 8 turns 1/8in. diameter; L4/5/6 2 turns 1/10in. diameter.

ideal diplexer for DX-TV use (see later).

To minimise out-of-band interference, commercial in-line bandpass filters are available for use at the inputs.

The power supply arrangements are conventional and the whole thing fits into an RS 509-254 diecast box.

Distribution Amplifier

The hybrid RS OM361 i.c. is used as the distribution amplifier, giving a single output with a gain of typically 28dB and a noise figure of 6dB. It requires 12V at 50mA. The advantage compared to the better known OM335 is the greatly improved signal handling characteristics. The output is split six ways, at 75Ω. This part of the circuit could be used as the basis of a domestic distribution system in view of its wide bandwidth (40-860MHz).

Gain Figures

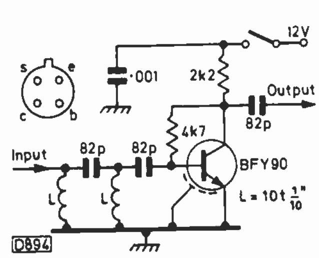
The Supa Nova amplifiers were used because I had them in stock – they are no longer in production but might be available from some suppliers. As an alternative the simple BFY90 wideband amplifier circuit shown in Fig. 3 can be used.

Gain figures with Supa Nova amplifiers are as follows. Band I 11dB at 50MHz, 12dB at 65MHz (pin diode attenuation 45dB maximum at 60MHz). Band II 13dB at 76MHz, 13·5dB at 90MHz, 12·5dB at 108MHz (pin diode attenuation 42dB maximum at 99MHz). Band III 12·5dB at 170MHz and 195MHz, 12dB at 220MHz, 11dB at 230MHz (pin diode attenuation 35dB maximum at 200MHz). The u.h.f. preamplfier gain figures are 6dB at 470MHz and 500MHz, 7·5dB at 600MHz and 700MHz, 11dB at 800MHz, 7dB at 860MHz (pin diode attenuation 26dB maximum at 650MHz).

The u.h.f. gain figures for the BFR91 amplifier may look rather low, but in most installations a head amplifier will be in use – in my own case the masthead amplifier provides a gain of 30dB with a noise figure of 1·8dB and further gain simply isn't needed. If a head amplifier is not used, the gain could be increased by adding a second BFR91 stage in cascade.

If the simple BFY90 wideband amplifier circuit is used, gain figures of 14dB at 60MHz, 13dB at 100MHz and 11dB at 200MHz are to be expected, with a typical noise figure of 3·5dB.

The OM361 distribution amplifier is stable in use, the



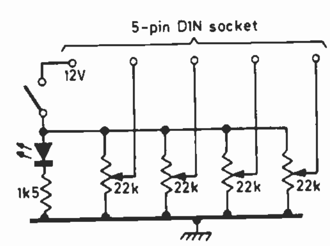


Fig. 3 (left): Suitable v.h.f. amplifier circuit.
Fig. 4 (right): Remote gain control arrangement.

gain at any output being 8dB at 50MHz, 9·5dB at 100MHz, 7·5dB at 250MHz, 8dB at 700MHz. These figures are for a single output terminated at 75Ω. If all outputs are terminated at 75Ω, each will be loaded down by 2·5dB.

Use

The end result is a compact amplifier system with head amplifier powering, a distribution amplifier and gain control on all channels. Should additional gain be needed, which is unlikely, further gain blocks could be added as an outboard facility prior to the input sockets. I have available v.h.f. and u.h.f. low-noise Mutek amplifiers should more gain be required. Note that in my own system ATV signals in the 434-440MHz band are not passed through the amplifier, being routed via separate selective filtering circuits instead.

The Labgear CM6032/BF diplexer is ideal for combining several feeds in a DX installation. Of particular interest are the Band I/II input bandpass curves – the crossover is such that the Band II section picks up at −2dB (76MHz), just below the ch. R3 vision frequency. Typical insertion loss is only 1dB (confirmed by measurement). The −1dB bandpass curve is 40-74MHz for Band I, 76·5-110MHz for Band II and 164-240MHz for Band III. Adjacent band attenuation is claimed as −20dB, though measurement showed isolation as −30dB. The inputs and outputs are via standard Belling Lee 75Ω sockets.

Letters

FERGUSON FEEDBACK

In the April issue Service Bureau column there's mention of converting the Ferguson Videostar 3V31 so that the clock operates on a twelve-hour cycle. I agree that by linking pins 40 and 41 of IC401 a twelve-hour indication is obtained. This does not produce a corresponding a.m./p.m. indication however. As a result, any attempt to use the timer function could be abortive, since there will be no way of determining whether one is setting up for the morning or the afternoon.

Frank Pack,
Editor, Ferguson Feedback.

SPECTRUM PROBLEM

With reference to the Sinclair Spectrum/Grundig GSC200 chassis no-colour problem mentioned in Service Bureau (April), the cause is not to do with signal levels but the Spectrum's burst timing. Neither product is in any way faulty, but it's easier to modify the TV set. With decoder type 29301-024-61, a longer burst gating pulse is required. This can be obtained by changing the value of C843 from 1nF to either 2·2nF or 4·7nF – choose the lowest value that gives stable colour.

The same problem occurs with the Network Model NWC1401 – the decoder design is very similar. In this case increasing the value of C29 to 4·7nF will cure the problem.

Denis G. Mott,
Service Manager, Network Industries Ltd.

SONY KV1340UB

After servicing a couple of Sony KV1340UBs – the switching transistor Q601, the series regulator transistor Q604, and the converter and line output transistors Q801/2 had all gone short-circuit – I noticed that there was an unacceptable amount of teletext interference at the top of the screen. This couldn't be removed by adjustment. The cure, suggested by Sony, is to remove R568 (56kΩ) on the VH panel and replace it with a 100kΩ preset. This should be adjusted for minimum disturbance – I've found that it's best to do this with a low brightness picture and that the resistance remaining in circuit will be around 27kΩ. The preset fits nicely on the print side of the panel. It adjusts the field flyback blanking pulse fed to the video/decoder panel.

G. Haigh,
Morley, Leeds.

BUZZING 3V22s

In connection with the 3V22 buzzing problem mentioned in the April issue Service Bureau column, I've found that a lot of buzzing with these VCRs can be cured by careful adjustment of the sound potentiometers in the r.f. converter – I think Steve Beeching first commented on the need to do this a year or so ago.

Derek Snelling,
Brownhills, W. Midlands.

THOSE BLUE TUBES

Your Teletopics column (April) slipped up in suggesting that sets fitted with tubes that have light blue screens would not be sold in the UK. In fact these tubes are used in the Mitsubishi Blue Diamond range which has been widely advertised in the UK.

P. M. Litler,
Stockport, Cheshire.

THE VL100 AND OTHER EXPERIENCES

I was interested to read Malcolm Burrell's article on the Rigonda VL100 (April issue) as I've serviced many of these receivers in the past and still see the odd one occasionally. In addition to the faults mentioned, a frequent cause of the no results symptom, with reduced voltage from a heavily loaded regulator circuit, is the line output transformer – it tends to develop short-circuit turns. When diagnosing this fault, experience has helped me to develop a feeling (usually of the sinking kind) for what's wrong. The relative ease with which a replacement transformer can be fitted makes hunch-proving a speedy process however. Incidentally the Vega 402D, a younger brother (comrade?) of the VL100, also suffers from this weakness: unfortunately the line output transformers are not interchangeable. Beware also of the high capacitance/low voltage Russian electrolytics used in these sets, particularly the 500μF, 6V types in the audio and field output stages. I use a 10V or 16V 470μF electrolytic as a more reliable replacement.

I'm fortunate in owning a successful radio and TV servicing business with no new set sales, offering repairs to equipment of all makes and ages and working by myself (with my own H.B. of course). In my more modest moments I often think that this success is due less to my undoubted technical brilliance than to the appalling incompetence and indifference of the competition. Here's an example.

A new customer brought in a Teleton T12BS monochrome portable, saying that he'd been to two dealers who'd both examined the set before declaring it to be "not worth repair". The symptoms were an enlarged picture severely distorted by 100Hz hum bars, the cause being a hard-on series regulator transistor that produced an output at 15V instead of the correct 12V. Adjusting the relevant preset made no difference, so the series regulator transistor TR601 was checked. The circuit shows this to be a 2SA473Y silicon pnp device, so what was a TIP136 Darlington pair doing in there?! In went a TIP32, on went the power, and up went the l.t. rail to 15V . . . I was preparing to make quick in situ tests on the other two transistors in the regulator circuit when I noticed that the reference zener diode had also been replaced – the wrong way round. Refitting this and adjusting the preset gave us 12V and a surprisingly good picture considering the age of the set and the recent tube heater cooking. The tube's an NEC type – Not Easily Clobbered?

As one regular and much enjoyed contributor to the magazine frequently admits, TV servicing makes fools of us all from time to time – usually when a simple fault gets us chasing red herrings, condemning innocent chips and ending up with egg on our faces (if you'll forgive the mixed metaphor!). But even TV receiver designers can make mistakes, a comforting thought for us lesser mortals though it's the cause of many a discomforting headache. Those of us with higher grey hair counts can nostalgically recall the open-circuit 10kΩ carbon composition oscillator load resistor in a certain turret tuner, the charred remains of an 18kΩ EH90 sound detector feed resistor (and its 5·6kΩ partner) in a certain TV chassis, the field oscillator feedback capacitor (PCL85 pentode anode to triode grid) rated at 400V, and other such things!

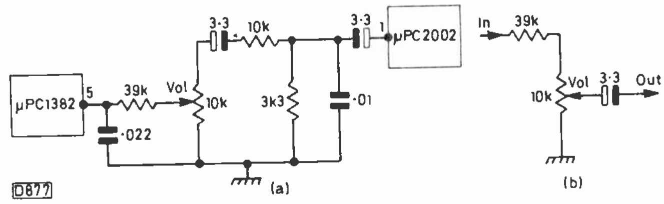


Fig. 1: Suggested modification to the Amstrad CTV1000.

More recently a customer brought in an Amstrad CTV1000 10in. colour portable with the complaint that the sound was severely distorted at low volume settings. Apparently the fault had been present from new, but the owner had got round the problem by using a high volume control setting and covering the speaker with a cushion! The obvious things were suspected – the speaker, the μPC2002 audio chip and the μPC1382 intercarrier sound i.c. – but these were all o.k. The circuit was then consulted and revealed a rather unusual volume control arrangement – see Fig. 1(a). It seemed reasonable to suppose that the changed d.c. conditions in the μPC1382 at low volume control settings were the cause of the distortion, and changing the circuit to that shown in Fig. 1(b) provided a complete cure. I wrote to Amstrad about this but didn't get a reply – maybe they were all at the *Guardian* offices receiving their awards . . .

Chris Avis,
RadioVision, Exeter.

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £1·00 postal order (made out to IPC Magazines Ltd.), the query coupon from page 447 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.

PANASONIC NV7000

There's a slight but annoying colour playback problem, most noticeable on saturated reds. The effect is something like Hanover bars, i.e. cancellation of the colour in approximately one line in every three or four. The machine records all right – proved by trying its recordings on another VCR.

The problem is likely to be around the chrominance crosstalk-cancelling delay line DL8001. While the delay line or the AN6360 chroma amplifier/switching chip IC8001 could be responsible, dry-joints in the area are a more likely cause. Check also the condition and setting of the comb balance control R8021.

RANK T20 CHASSIS

The horizontals on a crosshatch pattern are o.k. but the verticals have loops where they meet the horizontals. In addition, the vertical edges of the picture are slightly irregular. Otherwise the picture is very good.

A degree of this sort of thing is present in many TV receiver designs and is quite normal. If the effect is worse at high brightness levels, check the earth strapping between the c.r.t.'s Aquadag coating and the base connector, and from there to chassis. If necessary, check the sync separator bias resistor 4R50 (1·2MΩ) on the timebase panel.

PHILIPS KT3 CHASSIS (Mk. I)

The set works perfectly off air and with a VCR, but colour drop-outs occur when it's used with a camera. These happen on a change of scene, colour returning after a brief period when the syncs and burst have settled down. The problem seems to be to do with the colour-killer/ident system, since reducing the value of the colour-killer reservoir capacitor C3231 gives some improvement though not a cure.

On later boards the value of C3231 was reduced from 4·7μF to 1μF. A much greater improvement can be obtained by altering the values of the components in the relevant detector filter circuit as follows: increase the value of R3128 from 1·5kΩ to 5·6kΩ and reduce the value of C3219 from 4·7μF to 1μF.

GRUNDIG 6022

When the set is switched on, standby only is indicated – it's necessary to bring the remote control unit into action to get results or alternatively to operate the on switch on the manual panel.

There's an auxiliary contact on the mains switch to connect, momentarily at switch on, pin B8 of the Telepilot receiver with D4 of the "electronic" module. Try linking these two points during standby. If the set switches on, a new mains switch is required.

REDIFFUSION Mk. I CHASSIS

I look after a number of these sets which have proved to be very reliable. There is however a tendency for teletext lines to be visible. Any suggestions? A recent case of ragged verticals was traced to the VA1038 thermistor TH430 which is used to stabilise the supply to the line oscillator – a new one to me!

We don't know of any official modification for the teletext problem, but would suggest that experimentation with the values of the components in the field flyback blanking pulse network – C242, C428 and R448 – should be fruitful. Thanks for the tip about the thermistor.

BOOST DIODE

The problem we had with a Toshiba monochrome portable was an open-circuit boost diode. Several replacements of different types have been tried but they all tend to overheat, though the picture and sound are o.k. Any suggestions?

Diodes such as the MR854, BYX71 and the "blob" type that Sony supply as a replacement for their SID30 type work well in this position. They tend to be a bit expensive for this application, but reliability is good.

SONY KV1300UB

The picture is perfect at switch on but after about five-ten seconds there's vision interference. This takes the form of striations across the screen, similar to the effect when the aerial is loose, though disconnecting the tuner fails to remove the fault. I've checked for dry-joints etc. The effect varies in intensity. The sound is perfect at all times.

We've known this effect to be caused by the i.f. transistors. The most common offenders are the two (Q751/2) in the i.f. preamplifier can. A dose of freeze and heat should sort out the culprit.

THORN 9800 CHASSIS

At switch on the picture is broken up. Adjusting the tuning and a.f.c. corrects this but drift can happen several times until the set has fully warmed up. Even then the picture is lost when changing channels and adjustment is necessary. A new tuner has been tried.

We suspect the ML237 channel selector i.c. on the touch-tune panel – this device has a certain notoriety. Before condemning it however try heat and freeze treatment on the BC212 35V stabiliser transistor on this panel and the two associated diodes.

ITT CVC30 CHASSIS

The problem is intermittent field collapse, preceded sometimes by a two inch foldover at the top of the screen. I've resoldered most earth points but the fault remains.

The problem you describe could well be due to transistor T8 (FT3055) or bias diode D10 (BY133) in the field output stage being faulty. Check also for flux on the pins of the CMF30 field timebase module. The symptom is occasionally caused by dry-joints around the raster correction transductor or its peripheral components.

CORRECTION

The burst transformer in the Hitachi CNP190 (page 390 last month) is T502, not T503. The no-colour symptom appears to be quite common on these otherwise reliable sets (CNP190/CNP192). Other things worth checking are the ident amplifier emitter decoupling electrolytics C535 and C538 (both 22μF, 16V).

TEST CASE

258

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.

We're sometimes bewildered by the sheer number of Grundig TV models! They all seem to be called Super Colour, but the colour is not necessarily super after a few years' use, and trying to relate model numbers to chassis types can be difficult.

The Super Colour Grundig entrusted to us for repair recently was a Model 2222GB. The chassis used in this receiver was designed in the mid-seventies when delta-gun tubes were giving way to in-line types, and variants on the basic chassis design were able to drive either type of tube with 110° deflection. All versions share decoder module 07247-072-00, and it's here that we focus attention this month.

Ironically enough, the problem was no colour. It was plain that the tuning was correct since with the set tuned "on the nose" to the Channel 4 test pattern a prominent dot pattern was visible on the colour bars. We gleaned another important clue from the pattern displayed – it told us that the colour killer was operative, but we'll leave you to puzzle that one out as a mini bonus! The options were to replace or repair the colour module, and as the modules in this chassis can be plugged into the print side of the mother board we decided to have a go at repair. There are two chips in the decoder module, a TBA510 for the chroma processing and burst gating stages and a TAA630 for demodulation, PAL switching and colour-difference signal matrixing and amplification. The burst detector, reference oscillator and ident stages use discrete component circuitry.

The first step in a case like this is to override the colour killer – this is conveniently done by linking pins 13 and 14 on the colour module. On doing this we were greeted with very bright unlocked colours that floated up and down, an indication that the reference oscillator was unlocked. For starters we hooked an oscilloscope to pin 13 of the TBA510 to check that the burst gating pulse was present. This was correct, and further confirmation that all was well within the chip was given by the emergence of correct-amplitude gated bursts at pin 12. A further check at the collector of the burst amplifier transistor Tr845 showed that this transistor was working, so attention was turned to the reference oscillator circuit.

Adjustment of the RN (set frequency) control R871 had some effect on the bars of colour, but at no setting could we get a "zero beat" effect. Plainly the oscillator was off frequency, and as a first move the 4·43MHz crystal was replaced. Our suspicions of this item were strong, following several recent struggles with VCR under-colour circuits, where the crystals seem to be rather restless devices, but on this occasion we were wrong. Back went the old crystal, and we then spotted some high-value resistors (220kΩ) in the phase discriminator circuit. These are R863 and R864: we measured them carefully out of circuit. Both proved to be o.k., and since the d.c. voltages around the oscillator transistor Tr881 were correct at a certain setting of R871 we next tried the feedback capacitors C882 and C885. Once again we drew a blank, and we couldn't proceeed with our next intended check because we didn't have a BB109 varicap diode in our stores.

We didn't need one however! With so much of the relevant circuitry eliminated from the search, you shouldn't have too much difficulty in arriving at the answer! Full details next month.

ANSWER TO TEST CASE 257
– Page 392 last month –

Our ailing Thorn 3000/3500 chassis last month had several short-circuit semiconductor devices on the power supply and line timebase panels (and elsewhere too, as we subsequently discovered!). In the second or two between switching it on and subsequent failure it had given a fair imitation of the Battle of Waterloo . . . We'd traced the source of the problem to the line output/e.h.t. department, and by taming the h.t. voltage and disconnecting the e.h.t. tray had got the set working in a way that enabled us to scope the line flyback voltage pulse.

This one reading was enough. It showed that the pulse was of far too short duration – it was very much less than the normal 12μsec. The output voltage from a flyback transformer is proportional to the rate of change of current flowing in it: the rapid rate of change resulted in an enormous voltage pulse input at the e.h.t. tripler, and indeed to all other circuits fed from the line output and e.h.t. transformers T504 and T503. The flyback time is set by the tuned circuit consisiting of the output transformers and the tuning capacitor C518. As we suspected, C518 (0·028μF) was virtually open-circuit, a replacement restoring normal operation. The fact that several other areas of the set had suffered when the sparks flew is a depressing corollary to our tale, but is one we needn't go into here.

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TELEVISION JUNE 1984

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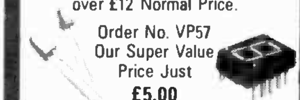

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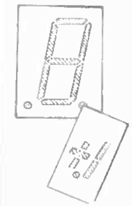

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(1) You have not received the goods or had your money returned; and
(2) You write to the Publisher of Television summarising the situation not earlier than 28 days from the day you sent your order and not later than two months from that day.

Please do not wait until the last moment to inform us. When you write, we will tell you how to make your claim and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the Advertiser has been declared bankrupt or insolvent.

This guarantee covers only advance payment sent in direct response to an advertisement in this magazine not, for example, payment made in response to catalogues etc., received as a result of answering such advertisements. Classified advertisements are excluded."

SETS & COMPONENTS

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

SCHRADER TUNABLE UHF Masthead Amplifier RB45 A.S. MV 30DB gain, 1.6DB noise. CH. 17-65. P.S. inclusive £39.50 P&P £1.50. R. VAN REYSEN, 28 Pemberton Road, East Molesey, Surrey.

TELEVISION

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

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

KM

- **Britains most reliable source of quality TVs.**
- **Hundreds of working polished TVs.**
- **New adjustable TV stands.**
- **Pye 18" Chelsea's working & polished £35.00 in quantity.**

Krystal Marketing Ltd., Breedon Cross Storage, Dale Road, Selly Oak, Birmingham B29 6AQ.

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

WIZARD DISTRIBUTORS
MANCHESTER

SPECIALIST DISTRIBUTORS TO THE TRADE OF T.V. & VIDEO SPARES.

WE STOCK A FULL RANGE OF PARTS & COMPONENTS INCLUDING C.R.T.'s, VIDEO HEADS ETC.
RANK – THORN – PHILIPS – ITT – DECCA – GEC ETC.

TRADE COUNTER OPEN: 9-4.30
CATALOGUE ON REQUEST. TRADE ONLY.
Mail Order Enquiries Welcomed
**EMPRESS STREET WORKS,
EMPRESS STREET,
MANCHESTER M16 9EN.
TEL: 061-848 0060.**

TV VALVES

COLOUR VALVES PY500/A-65p, PL509/519-£1.50.
MONO VALVES ECC82, EF85, EF183, EF184, DY87, DY802, PCF80, PCF802, PCL82, PCL83, PCL84, PCL85/805, PCL86, PCC84, PCC89, PC92, PC97, PC86, PC88, PFL200, PL36, PL504, PY800, PY88 ETC.
**MONOCHROME VALVES ALL 35p EACH.
ALL VALVES EX-EQUIPMENT & TESTED.**
P&P 50p Per order, Access/Visa Cards welcome.
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The prepaid rate for semi display setting £6.00 per single column centimetre (minimum 2.5 cms). Classified advertisements 35p per word

Thorn 3000/3500
Thorn 9000
UNIVERSAL
1 year guarantee

TRIPLERS £4.50 inc. p&p

The UNIVERSAL TRIPLER can be used in most G.E.C., I.T.T., Pye, Rank, Decca & Continental sets.

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Receives 4GHz band. Ideal for demonstration terminal in U.K. 100 degree Kelvin LNA. £392 + VAT (+ Carr). LNA/down converter PCB's stocked for the constructor. *SAE data.*

**HUGH COCKS TV SERVICES,
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THORN COLOUR TVs

Most models. Excellent condition. Working or untested.

★ **Philips 550/660**
★ **Decca 1051/1052**
★ **Pilot (JVC) etc.**

Phone or call for competitive prices. Regular supply.

REPOSSESSED TV CENTRES LTD.,
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Tel. 061-273 2854.

GENERAL FACTORS

TELEVISION TRADE SALES

3-5 UNION ST. DONCASTER

Telephone:
2 lines (0302)
49583-68416

Regular weekly supplies of good quality TVs, all with excellent cabinets, we look after our sets, we don't knock them about, as you'll see if you call, suitable for re-sale or rent. Working or off the pile. We're always happy to see you, whether its for one TV or one hundred and one.

MONDAY TO SATURDAY 9 to 5.30

GOOD SETS
GOOD SERVICE
CALL & SEE US YOU
WON'T BE DISAPPOINTED
Special Prices on Philips G8's & Other Lines

STANDS, LEGS, SLOTMETERS, PANELS, TUBES ETC.

PHILIPS
PYE, JAPANESE
DECCA, GRUNDIG
GEC, ITT

**PHONE NOW
(0302) 49583
(0302) 68416**

RANK
SABA
KORTING
THORN
EKCO
ETC.

**EXCELLENT MOTORWAY ACCESS FROM MOST PARTS VIA M1 OR A1
WE'RE ONLY A SHORT DRIVE AWAY**

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(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).

TUBES £29.00 INCLUSIVE, REGUNS TWO YEAR GUARANTEE, QUANTITY DISCOUNTS
TUBES £14.50 SIX MONTH GUARANTEE SLIGHTLY USED

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or 343 A44-270-1 A66-120 A67-120
(All 26" add £5)

IN-LINE 51-161 From £35 plus 100's more

Delivery £5 per tube. British Isles. No need to spend £5 returning old tube if you buy from us.

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Callers ring first. Open every day including Sunday Tel: 0302-855017

THORN SPARES AND PANELS. Send s.a.e. for quotation examples. Good triplers, TX10 focus units £5.00. S. KNIGHT, 2 Claremont, Hastings, East Sussex.

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PRESENTS AN UNBEATABLE OFFER
£26 ALL DELTAS ONE PRICE
£40 ALL P.I.L. ONE PRICE

* 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
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or visit our factory.
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* **Agents required in South**

Prices do not include VAT

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Example Prices
All sizes up to 22" — **£28.00**
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All In Line P.I.L. Mono
Gaming Machine C.R.T.s

20 AX £38.00 **Fast U.K. Delivery** 30 AX £48.00

Call or Phone:

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PLANE STREET,
OLDHAM, LANCS.
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Wholesalers Required in certain parts of the U.K.

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100 WORKING THORN 3500 G8 ITT, some remote control Thorn £30.00 each. Tel. Camborne 718043.

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200 + TVs WEEKLY

LOADS SMALL SCREEN WORKING SETS TO ORDER — ALL MAKES

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From £10
Also all modules from **£4** untested.

STARLITE ELECTRONICS,
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Telephone Romford 752537
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Bursting with Stock!

SPECIAL CLEARANCE
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Guaranteed - Complete Sets	**from**	**£10.00**
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Phone us first for quantity, we can give an UNBEATABLE PRICE! ! !
OPEN 5 DAYS –
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SECTION THREE, UNIT FOUR, SERL COMPLEX, LONDON ROAD, BALDOCK, HERTS.

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We deliver bulk orders anywhere in Northern Ireland. New loads arriving regularly so phone now for latest stocks.

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Tel: Cookstown (NI) 06487/64277.

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100's Colour TV's in stock in excellent condition – working sets for the trade.

Fresh stocks weekly
Untested – complete
(Majority working)

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Bush 22"-26" CTV Solid State	£5
Hybrid Decca - ITT	£12
Philips G8 - 550	£18
G.E.C.	£20

Philips G11, Bush T20, ITT CS 600
Prices on quotation
Many other makes to choose from

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Line Ouput	
Z718 (T703A, T706A)	
New (Complete)	**£20.50**
Less Focus Module and Rectifier	**£10.50**
T20, T22 (T705A)	**£9.00**
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Genuine RBM Units.

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UHF Aerials P & C Wideband 4 Bay Bowtie (12.5 dB) **£20.00**

Above with built-in Broadband amp. (27dB) plus stabilised power supply **£45.00**

Prompt Postal Service.
Add 15% VAT to all prices.
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Tel: 01-868 5580.
N. Skehan
Agents Office. Callers by appointment only.

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	IF	CDA/ Video	Decoder	LTB	Line Board	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 8/8½	–	–	10.00	5.00	–	5.00
PYE 205	3.00	3.50	5.00	10.00	–	–
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*Please specify prefix A or Z.

Please add 15% VAT to above prices, then add post + packing.
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.

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Callers by appointment only.

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We are a good reliable supplier of QUALITY colour T.Vs.
We can DELIVER
Try use for SIZE (18"-26")
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DELTA TUBE TYPE FROM **£27.50** to **£31.50**
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MONO TYPES **P.O.A.**

ALL PRICES EXCLUSIVE OF VAT.

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

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Heading ....

Signature ....

Date ....

No. of ins.......... Chq/PO ....

Classified Advertisement Department,
Room 2612,
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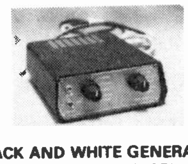
SE1 9LS.

6/84

NAME AND ADDRESS

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 **£75.90.**



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Crosshatch, Peak White, Dots, Half Black & White and Grey Scale	£18.50
In Circuit Transistor Tester	£14.25
Capacitance Meter measures 10pF to 1μF complete with moving coil meter	£14.75

Prices include P&P & VAT.

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Tel: (0902) 871563

TRADE COLOUR TV's ALWAYS 200 IN STOCK

Phillips G8 from £10
Bush Twin Chip from £8
Pye Chelsea from £15

Avo repairs prompt service scopes etc.
Colour TV's in good working order from **£35.**
E.G. Phillips G8's 22" **£35.**
Ring us for spares and type availability anytime.
Also Videos. V2020 and V2023's etc.
ALL STOCK CHANGES WEEKLY
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Repair, exchange, sales service, prompt efficient service. All chassis covered. New PCB available to replace burnt T20 line Panel. We charge only £16 to repair switch mode power supply. Ring Monday to Saturday and ask for Mr. Kheli.

T. K. Panels Service,
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Tel. (0438) 61567.

BOURNEMOUTH COLOUR TVs

GOOD WORKING ORDER

THORN 22" 3500	From **£23**
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COMPLETE FULL-SIZE SETS any published service sheets £2 + LSAE except CTVs/Music Centres from £3 + LSAE. Manuals from 1930 to latest. Quotations, free 50p magazine, price lists, unique technical publications for sale. Repair data/circs almost any named TV/VCR £8.50 by return. TIST, 76 Church Street, Larkhall, Lanarks ML9 1HE. Phone (0698 883334).

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For a good selection of used TV sets in good cabinets . . .

★ Large stock of working sets.
★ U.K. Delivery Service.
★ Stands, Aerials, Tubes and Panels.

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30,000 SERVICE SHEETS IN STOCK. COLOUR MANUALS ALSO AVAILABLE

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Brit CTVs	3 vols £45
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1983 Brit. CTV or Foreign CTV 4	
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Unique T.V. Repair course	**£9.50**
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Large SAE brings FREE 50p magazine inc. service sheet/details of unique T.V. publications. Any quotation plus price lists, etc.	
Full size service sheets	**£2** + l.s.a.e.
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Worlds largest collection of service manuals 1930 to date. From **£4.50** to **£35 each.**	
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Integrated TV repair system	**£195.**
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FOR FAST QUOTES RING 0698 883334

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Cheque or postal order made payable to:
Tanaton Electronic Ltd.
Add 60p P+P.

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BURGLAR ALARM EQUIPMENT. Latest discount catalogue out now. Phone C.W.A.S. ALARM 0274 731532.

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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.

WANTED I.F. PANEL for National colour portable TC361GM. Lowestoft (0502) 81136.

WANTED, Television Servicing Equipment, Scope Manuals etc. REINA, 2A Boothferry Road, Hessle, Hull. 0482 643142.

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"Late Late Breakfast Show"
Is urgently looking for any bizarre funnies/bloopers on Film or V.T. (any format). If you have a gem please contact:
B.B.C. T.V. CENTRE
Wood Lane, W12
Telephone 01-576 1969
(Reverse Charges)

WANTED

T.V.s, VIDEOS, HI FI, AUDIO

£100,000 TO SPEND

If you have a surplus, we would be delighted to make an offer.

Contact:
Mr Fred Tuck
(0934) 413537

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FOR SALE

A small television repair business in East Devon seaside town.
Considerable number of T/V, Radio Service Sheets 1934 to date.
Elderly Test, P.A. and similar gear.

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AERIAL BOOSTERS

Next to the set fitting

B45H/G-UHF TV, gain about 20dbs, Tunable over the complete UHF TV band. **Price £8.70.**

BII-VHF/FM RADIO, gain about 14dbs, when on the off position connects the aerial direct to the radio. **Price £7.70.**

All boosters we make work off a PP3/006p/6F22 type battery or .8V-18V DC. **P&P 30p per order.**

ELECTRONIC MAIL ORDER, 62 Bridge St, Ramsbottom, Lancs BL0 9AG. Tel. (070682) 3036

Access/Visa Cards Welcome SAE Leaflets

2 METRE PARABOLIC DISHES

Glassfibre Construction
Suitable for 4 and 12 GHz **£290**
Polar Mounts and Feed Supports Available.
Send S.A.E. for Details

SP ANTENNA SYSTEMS,
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Tel: 0580 291090

AERIALS AND ACCESSORIES

North Londons Specialist Aerial Supplier Wholesale and Mail Order.

VHF/UHF antennas, masts, brackets, cable, amplification and distribution equipment etc. All types of aerial hardware and software supplied. Single and multipoint systems planned and installed.
Send 50p for our new 1983 catalogue and price list.

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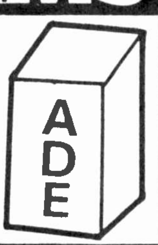
IT TELLS YOU ALL YOU NEED TO KNOW

TRADE ENQUIRIES WELCOME.



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FOR YOUR FREE COPY!
Prop. J. Chadwick

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with over 4½ thousand sq. feet

"TELEMANN"

8-10 RHODA STREET,
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– SINGLE STANDARD £3

FREE DELIVERY TO THE LONDON AREA!

TELEPHONE 01-739 2707 – NOW!

WE CAN DELIVER ANYWHERE IN U.K. INCLUDING REPUBLIC OF IRELAND

VISIT OUR NEW LUXURY SHOWROOM FOR WORKING T/Vs FROM

£25 TRADE ONLY!

TELEMANN – TELEMANN – TELEMANN

T.V. SALE

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Bush A Mechanical	£18.00
Bush Electronic	£28.00
3,500 Electronic	£28.00
GEC Solid State	£35.00
Bush Z718	£38.00
Philips G8 (V.C.R.)	£38.00
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SN7472N	£1
SN74107	£1.00
SN74167	70p
SN7472N	20p
SN75108AN	£1.00
SN76001	£1.00
SN76003	£1.00
SN76013ND	£1.50
SN76018	£1.00

SN76008	£1.00
SN76023N	£1.50
SN76033	£1.50
SN76110N	£1
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	60p
SN76228N	£1.00
SN76270	£1.00
SN76532N	50p
SN76544N	£2.00
SN76545	£3.50
SN76546	£1.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76650	50p
SN76660N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
UA783P3C	40p
BT100A/02	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA640	£1.00
TCA660	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£2.00
TCA830	£1.00
TCEP100	£2.25
TCE120CQ	£1.00
TDA440Q	£1.00
TDA1003A	£1.00
TDA1010	£1.00
TDA1060A	£1.50
TDA1072	£1
TDA1151	30p
TDA1170	£1.00
TDA1190	£1.00
TDA1327A	£1.00
TDA1412	50p
TDA2003	80p
TDA2004	£2
TDA2010	£1.00
TDA2140	£3.50
TDA2522	£1.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2571AQ	£2.50
TDA2575A	£1.00
TDA2581	£2.50
TDA2590	£1.00
TDA2593	£1.00
TDA2560	50p
TDA2600	£5.00
TDA2611	£1.00
TDA2653	£1.00
TDA2002	£1.00
TDA2640	£2.00
TDA2680	£1.00
TDA2690	£1.00
TDA2593	£1.00
TDA3190	£1.00
TDA3500	£2.00
TDA3560	£3.50
TDA3571Q	£1.50
TDA9403	£3.00
TDA3651AQ	£3
SN74LS 125AN	30p
SN74LS 248	50p
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
RGP30G	10p
MPSA14	10p
MPSA43	10p
MJ13005	30p
MJE51T	25p
MJE340	28p
MJE660	25p
MJE661	25p
MJE3055	£1.00

MJE2801	30p
MJE2955	50p
MJE13005	30p
Sanikron Diode SKE2G2/04	30p

Transistors

AC106	15p
AC121	15p
AC124	15p
AC128	15p
AC137	15p
AC151	15p
AC131	15p
AC138	15p
AC152	15p
AC153K	15p
AC142K	15p
AC169	15p
AC176	15p
AC176K	15p
AC178K	15p
AC179	15p
AC186	15p
AC187K	15p
AC188	15p
AC188K	15p
ACY21	25p
AD143	50p
AD149	50p
AD161/162	pair 40p
AF139	25p
AF181	£1.00
AF239	25p
AF367	25p
AL102	£1.75
BC161	30p
BD507	50p
BD509	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p
BD646	50p
BD676A	30p
BD678	50p
BD681	25p
BD807	20p
BD826	50p
BD948	30p
BDX75	20p
BDX32	£1.25
BF115	20p
BF121	20p
BF127	20p
BF137	20p
BF157	20p
BF160	20p
BF161	20p
BF164	60p
BF179	30p
BF180	20p
BF181	20p
BF182	20p
BF184	20p
BF194	10p
BF195	10p
BF196	10p
BF197	12p
BF198	10p
BF199	10p
BF200	20p
BF222	10p
BF224	15p
BF238	20p
BF240	16p
BF244	40p
BF245b	20p
BF256	10p
BF257	20p
BF258	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF324	25p
BF337	50p
BF355	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF423	15p
BF448	30p
BF450	20p
BF458	30p
BF459	30p
BF468	30p
BF469	30p
BF470	20p
BF480	50p
BF594	10p
BF597	10p

BF694	10p
BF758	30p
BF760	30p
BFT34	15p
BFT43	10p
BFT84	8p
BFW11	20p
BFX29	30p
BFX84	25p
BFY50	15p
BFY52	20p
BFY90	25p
BPW41	25p
BRC116	40p
BRX43	15p
BRX48X	10p
BRY56	30p
BSS68	10p
BSY79	10p
BSY95a	10p
BTY80	20p
BSX19	17p
BSX20	17p
FT3055	30p
TCE82	30p
2N930	5p
2N2221	8p
2N2222	8p
2N2906	10p
2N3055	40p
2N3566	10p
2N3702	10p
2N3711	10p
2N3583	50p
2N3904	15p
2N4355	10p
2N4442	£1.00
2N4444	£1.00
2N5296	40p
2N5983	30p
2N6099	40p
2N6109	40p
2N6130	50p
2N6133	20p
2N6348	20p
2N6399	10p
2X 2N6099 on heat sink	50p
2SA437	20p
2SB407 Sanyo TO3	10p
2SB474	30p
2SB566	10p
2SC381	10p
2SC458	50p
2SC515	10p
2SC732	10p
2SC733	10p
2SC828	10p
2SC1030	£1.00
2SC1172A	10p
2SC1173	10p
2SC1419	20p
2SC1546	20p
2SC1725	20p
2SC2068	20p

2SC2073	8p
2SC2122A	£1.00
2SC2229	15p
2SC7350	15p
2SD180 TO3 80v/6A	15p
2SD200	£2.00
2SK30A	10p
BC107	10p
BC108	10p
BC109	5p
BC113	10p
BC114	10p
BC115	10p
BC116	10p
BC117	20p
BC119	20p
BC125	10p
BC126	10p
BC139	10p
BC140	30p
BC141	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC158	10p
BC159	10p
BC160/16	25p
BC171	10p
BC172	10p
BC173	10p
BC174	10p
BC183	10p
BC184	10p
BC204	10p
BC207	10p
BC212	10p
BC213	10p
BC214	10p
BC237	10p
BC238	8p
BC239	10p
BC250	8p
BC251	10p
BC252	10p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	10p
BC349b	10p

BC350	20p
BC365	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p
BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
BCX31	25p
BCX32/36 Pair	75p
BCX32	25p
BD116	25p
BD124	50p
BD124 (metal)	60p
BD130Y	25p
BD131	30p
BD132/238	30p
BD135	25p
BD136	30p
BD138	30p
BD175	30p
BD176	25p
BD182	£1.00
BD183	70p
BD202	60p
BD204	60p
BD221	20p
BD222	30p
BD228	30p
BD226	20p
BD233	30p
BD235	30p
BD238	30p
BD239	15p
BD243c	30p
BD244	50p
BD250a	30p
BD252	20p
BD253B	50p
BD331	20p
BD332	20p
BD373b	20p
BD416	25p
BD433	25p
BD437	25p
BD439	50p
BD501	30p

Filters

5-5MHz	15p
6MHz	30p
BFU455K	5p

Thyristors

BT106 Plastic	30p
BT106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
G11 Thyristor	60p
Decca 80-100	60p
2N4444	£1.00

Thermistors

VA1104	50p
ITTP7266312	15p
PTH451 AOR	15p
PT37P Fits Pye & PT34	20p
Degausing Thermistor (fits most sets)	20p
GEC Double Thermistor	75p

3 Pin Blue Thermistor (fits most sets)	20p
BLY49	50p
I.C. Heat Sink	20 for £1
20×TO5 Heat Sink	£1.00
CVC 9 power supply board	£1.50
CVC 20/2 mains panel	£2.00
ITT Mains Filter .1/250v/	
CVC 20 to 45 chassis	50p
Pots 10 k with Switch	25p
Pots 47 k with Switch	25p
Mullard Surface Wave Filter RW 153P Colour TV Filter	40p
Mullard Surface Wave Filter RW 154 Colour TV Filter	40p
G11 Line Scan P.C.B.	£1.00
ELC 1042 P.C.B.	30p

TV Crystals

4MHz	
4.433-619	
6MHz	
8.867238	
Large or small	50p each
GEC Power Panel TV106 Thermistor PT34 New	£1.00

I.C. Holders

DIL – DIL		DIL – QIL	
40 Pin × 4	£1.00	16 Pin × 10	£1.00
42 Pin × 5	£1.00	18 Pin × 10	£1.00
28 Pin × 5	80p	28 Pin × 4	£1.00
16 Pin × 10	70p	8 Pin × 10	50p
24 Pin × 5	75p		
14 Pin × 10	70p		
18 Pin × 10	80p		