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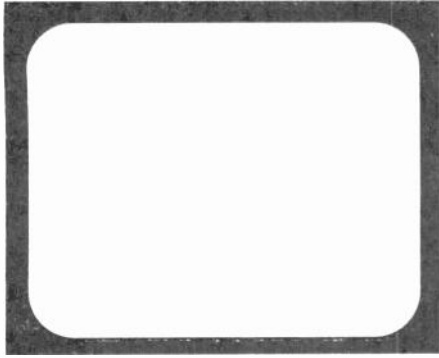


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**Vol. 43, No.10
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Table listing various electronic components and their prices. The table is organized into columns with component names and prices. A 'COMPUTER ICs' section is highlighted in a dark box on the right side.

Table listing various electronic components such as VCR Pinchrollers, Diode Split Transformers, Video Motors, Cassette Housing, and Motor Switches, with their respective part numbers, descriptions, and prices.

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VCR700
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FERGUSON & JVC

3V42/43
 HRD455/HRD725
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 BELT SET PINCH ROLLER SUPPLY CLUTCH TAKE UP CLUTCH
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 HRD170/180/210/230/300/320/370/400/430/530/700/750
 HRS5000
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 HR7200/7300/7350
Contents
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 Order Code: SK05 £6.00

3V35/36/38/39/49
 HRD110/111/120/225
Contents
 BELT SET PINCH ROLLER TENSION BAND IDLER TYRES
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3V31/3V42
 HR7600/7610/7650/7655
Contents
 BELT SET T/U REEL TABLE TYRE PINCH ROLLER REEL IDLER T/U CLUTCH T/U IDLER TENSION BAND VIDEO LAMP
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Economy Kit Contents
 BELT SET T/U REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T/U IDLER TYRE T/U CLUTCH
 Order Code: SK34 £5.50

3V35/36/38/39/49
 HRD110/111/120/121/225
Contents
 BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T/U CLUTCH T/U IDLER REEL IDLER TENSION BAND
 Order Code: SK35 £10.50
Economy Kit Contents
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 Order Code: SK36 £6.50

3V29/3V30
 HR7200/7300/7350
Contents
 BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER REEL IDLER T/U CLUTCH T/U IDLER TENSION BAND VIDEO LAMP
 Order Code: SK31 £11.50
Economy Kit Contents
 BELT SET T/U REEL IDLER TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T/U IDLER TYRE T/U CLUTCH
 Order Code: SK32 £5.60

3V44/45/48/53/54/55/57
 HRP50/HRD140/150/158/160
 HRD250/257/565/566/755
Contents
 BELT SET PINCH ROLLER CLUTCH MECHANISM TENSION BAND
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Economy Kit Contents
 BELT SET PINCH ROLLER
 Order Code: SK40 £9.50

FISHER

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 BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND
 Order Code: SK57 £13.00
Economy Kit Contents
 BELT SET PINCH ROLLER IDLER TYRE
 Order Code: SK58 £5.00

FVHP615/618/620/622/710/711/715/716/720/721/722/725/
 730/830/840
Contents
 BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND
 Order Code: SK68 £12.50
Economy Kit Contents
 BELT SET PINCH ROLLER IDLER TYRE
 Order Code: SK69 £3.60

HITACHI

VT11/VT33
Contents
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 Order Code: SK08 £6.00

VT11/VT33
Contents
 BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER FF/REW IDLER CLUTCH PLATE TENSION BAND
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Economy Kit Contents
 BELT SET PINCH ROLLER FF/REW IDLER TYRE T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE
 Order Code: SK46 £4.50

VIDEO SERVICE KITS (Cont.)

HITACHI

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 Order Code: SK49 £14.00
Economy Kit Contents
 BELT SET PINCH ROLLER FF/REW IDLER
 Order Code: SK50 £3.25

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/
 510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85-88
Contents
 TIMING BELT PINCH ROLLER FF/REW ARM CLUTCH BASE TENSION BAND
 Order Code: SK52 £11.50

VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/
 175/220/225/250/255/258/260/VTL30
Contents
 BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND
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PANASONIC

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Economy Kit Contents
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 NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/
 AG1810 (PK)
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Economy Kit Contents
 LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TYRE
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NV332
Contents
 BELT SET PINCH ROLLER PLAY IDLER FF/REW IDLER TENSION BAND FF/REW TYRE
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 BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW IDLER TYRE
 Order Code: SK30 £5.10

NV230/250/260/280/430/450/460/470/650/810/890/
 AG1200PK/AG1500PK
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 Order Code: SK23 £7.00
Economy Kit Contents
 BELT SET PINCH ROLLER IDLER TYRE
 Order Code: SK24 £3.50

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 BELT SET PINCH ROLLER PLAY IDLER FF/REW IDLER TENSION BAND
 Order Code: SK25 £13.00
Economy Kit Contents
 BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW IDLER TYRE
 Order Code: SK26 £6.50

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 SLOT IN BELT LOADING BELT PINCH ROLLER IDLER TYRE
 Order Code: SK20 £4.30

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Economy Kit Contents
 BELT SET PINCH ROLLER IDLER TYRE
 Order Code: SK22 £3.50

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 BELT SET PINCH ROLLER IDLER UNIT TENSION BAND
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Economy Kit Contents
 BELT SET PINCH ROLLER IDLER TYRE
 Order Code: SK18 £4.00

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 BELT SET PINCH ROLLER REEL IDLER TYRE
 Order Code: SK48 £5.00

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Economy Kit Contents
 BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE
 Order Code: SK65 £6.25

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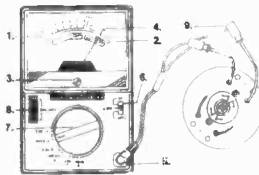
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VS170	4600P
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VT60	1500P
VT660E	2600P
VT6700, VT6800	1200P
VTL30	2100P

VT522, VTM620, VTM622, VTM720, VTM722, VTM822	2000P
VTM725, VTM726, VTM728	1600P
ITT	
VR3520, VR3701, VR3719, VR3720, VR3721, VR3759, VR9720	2000P
VR3730, VR3731, VR3749, VR3907, VR3908	2700P
VR3918, VR3919, VR3938	1800P
VR396B	7000P
VR3984	2300P
VR3958, VR4993	650P
VR4913, VRP3833	650P
LUXOR	
9245, 9251, 9254	1225P
9255, 9256	2150P
9270, 9271, 9273	1800P
9272, 928217	2700P
9252	2500P
928017, 928077, 928097, 929107, 929117	1700P
9253	2500P
9281	2700P
9284, 9295, VR3701, VR3721, VR3731, VR3761	2100P
MATSUI	
VX600	1100P
VX750	1500P
VX990	1600P
MITSUBISHI	
HSE12, HSE22, MX1	2400P
HS411EZ, HS411GZ	2900P
HS273	1700P
HSB10, HSB20, HSE10, HSE20, HSE21, HSE41	2200P
HSB11, HSB21	2200P
HSB30	2400P
HSE31, HSB31, HSE32	2800P
HSE50	3300P
NATIONAL	
NV8050, NV8051	2800P
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AG6010, AG6015	2500P
AG6840	2400P
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NVF51	4200P
NVG19	2300P
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NVJ35	3000P
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NVF65	3200P
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N9052, N9530	3400P
N9110, N9120, N914C	2700P
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SANYO	
VHR7900	3600P
SHARP	
VC585, VC685	2300P
VC90ET	3900P
VFH815	2800P
SONY	
SLV373UB	3000P
TOSHIBA	
V660	2350P
V880MS	2600P
V700G	3700P
V500G, V509G	2500P
V9680	2900P
V300G, V301, V305, V309G	2550P
V61, V63	1700P
V110, V120, V130, V140, V210, V220	1800P

TELEVISION ON/OFF MAINS SWITCHES

Baur, Normende, Nova, Pioneer, Quelle, Saba, Salora, TEC, Thomson & Vega 375P

VIDEO MOTORS

HITACHI	
VT11, VT14, VT15, VT16, VT17, VT19, VT35, VT39, VT57, VT88 (capstan motor)	3100P
BANG & OLUFSEN	
VHS65, VHS90 (capstan motor)	3100P

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VP3946, VR3906, VR3948, VR3986, VR3995, VR6948	1500P
JVC	
HRD110, HRD111, HRD120, HRD121, HRD225	1100P
HRD140, HRD150, HRD157M, HRD158MS, HRD160, HRD250, HRD257MS, HRD566, HRP50	1250P
HRD455, HRD725, N895	1500P
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VR6006, VR6007, VR608, VR6009, VR6018, VR7007, VR7018, VR9006	1250P
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TELEFUNKEN	
VR1925, VR1930, VR1940, VR1950, VR925, VR930, VR940, VR950	1100P
A920, VR2920, VR12970, VR7921, VR7926, VR7931, VR7971, VR975	1250P
VR1970, VR1980, VR7970, VR7980, VR970, VR980	1500P
THOMSON	
V320, V321, V323, V326, V4200, V4300	1100P
V342, V343, V352, V353, V360, V4210, V4230, V4260	1250P
V364, V368, V4400, V6000	1500P
THORN-FERGUSON	
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	1100P
3V44, 3V45, 3V48, 3V54, 3V55, 3V57, 8947, 8947B, 8948	1250P
3V43, 9845	1500P
TOSHIBA	
V55, V57	1100P
V65, V66, V67	1250P
V61, V63	1500P

CASSETTE HOUSING

AKAI	
VS35, VS53, VS55, VS66, VS75	2600P
FERGUSON	
FV31R	4300P
JVC & FERGUSON	
HRD515, HRD520, HRD527, HRD540, HRD550, HRD580, HRD600, HRD610, HRD620, HRD660, HRD670, HRD830, HRD840, HRD850, HRD860, HRD4050, HRD6600 & FV37H	1350P

IC TRANSISTORS

M491BB1	500P
SAAS243PE	800P
TIP112H	50P
UPC1488H	150P
STR4090A	650P

IC AND TRANSISTORS

BU506DF	120P
BUZ11	200P
BUZ80	200P
M494B1	700P
SAAS231	300P
SAAT293	550P
S2000A3	175P
S2000AF	175P
S2055A	175P
S2000AF	200P
S2530A	100P
TEA201BA	200P
UC3844	100P
UPC1185H2	400P

REMOTE CONTROLS

AKAI	
RC-V10A	1000P
RCV37B	1000P
V25A	1000P
BUSH	
2020T, 2114T, 2321T, 2514T	1000P
2020, 2114, 2321, 2514	1000P
DECCA	
RC70	850P
FISHER	
RC905B	1000P
GRANADA/REDIFFUSION	
UNIVERSAL, 79500C, 986700	850P
SATELLITE	1000P
MK4 TEXT, 70115G, 70133G, 70357E	850P
MK4A TEXT, 70375C	850P
95288E	1000P
94490D	1000P

REMOTE CONTROLS

GRUNDIG	
TP160E	1050P
TP200, TP300	1000P
TP400	850P
TP590-600	1050P
TP390, TP610	1050P
TP621	1050P
TP630, TP650	1000P
TP660	1050P
TP661	1050P
HITACHI	
CLE800-CLE830	900P
A617402/655602	1000P
A512120/230	1000P
A514790	1000P
A5088470	1000P
A518612	1000P
SCL002	1000P
C2096	1000P
A511940	1000P
655602H	1000P
ITT	
IFB13, 14, 15	900P
FS4	850P
RG305	900P
RG306	900P
FS9/1-10/1	900P
VS5 RUK	900P
VS4-1	900P
MULTICONTROL (17C20)	1000P
KORTING	
18279, 18396, 18460, 18521 SE	1000P
40540 VTS	1000P
LOEWE	
DC11	1000P
MATSUI	
010270601	1000P
VX770	1000P
METZ	
JAVA COLOR (6890)	1000P
COLOR (7156)	1000P
JAVA (7180)	1000P
MITSUBISHI	
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NOKIA	
SATELLITE	
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NORDMENDE	
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CMC1, TC3519	1050P
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CARVEL, CONCORDE, MERCURY	1000P
TELESTAR	
TC10	1000P
PHILIPS	
RC5002, 5154	900P
KT3 NON TEXT	900P
69117032	1050P
69117194	1050P
RC5991 UNIV	850P
RC3B	900P
KT3 TEXT	900P
RC5352	900P
RC5375	900P
RC5 STANDARD	900P
RC5901	900P
RC5903	900P
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TC356	1050P
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SERIES L	1000P
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JXDE	1000P
VHR2300	1000P
RC628	1000P
SHARP	
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FXA	1000P
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TELEFUNKEN	
FB632	1000P
FB639	1000P
THORN/FERGUSON	
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3V31-32	900P
3V57-58	1050P
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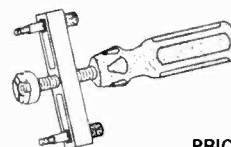
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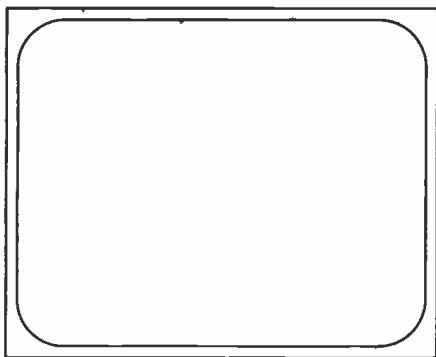
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TELEVISION

The Right Business?

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COVER PHOTO

This month's cover photograph shows Steve Oldis using a PC in the Service Department. See article on pages 704-7.

Did you ever have the feeling that you're in the wrong business? It's common enough in our trade. With prices continually on the decline and customers harder to please, where's the profit? What are we all slaving away for? The consumer electronics retail trade has been doing poorly for several years now, the setmakers are boomed out and servicing struggles: equipment still goes wrong, but customers with several sets/VCRs put off doing anything about it or buy a give-away special offer. Maybe we should all be doing something else, but what? Well, as everyone will have probably noticed by now the video games market is the one that's been booming away. Last year Nintendo, the market leader, made a pre-tax profit of some £1bn. That's more than either IBM or Microsoft managed, and about as much as Matsushita, which is still the world's largest consumer electronics manufacturer, achieved. As another way of looking at it, Nintendo made twice the profit recorded by Sony on a sixth of turnover and with a tenth of the staff. Or a greater profit than all the US film makers put together. Quite an achievement for a company that for a hundred or so years had been quietly making playing cards. It's no wonder that more and more companies want to get into this field. Sega, a major firm in the arcade games industry, has already succeeded in doing so – and managed a sixty per cent profit increase last year.

It's particularly significant that the success of these two companies has not been achieved through competitive pricing. The games and the equipment required to play them – no nonsense about compatibility and common standards in this field – are decidedly expensive. No, the fact is that the companies have the right products and have made a success of their marketing. They have succeeded in a notoriously fickle market – selling to children. But of course once something becomes a craze in this market there's no stopping it. Until boredom sets in. Nintendo and Sega have got round that one by upgrading their games to maintain interest (and profits!). A further factor seems to be that once the habit catches on people go on playing: the age limit has yet to be determined, if there is one.

The other aspect of Nintendo and Sega's success is control of the software and hardware. You can devise a game to be played on a Nintendo games console but you have to get approval and pay a licence fee on every game you sell. And you don't get to do the manufacturing and packaging: Nintendo insist on doing that. Hence total quality and market control. There could possibly be grounds for action on the basis of restrictive trade practice, but no one has seen fit to try that so far. It's a complete contrast to the video games boom in the USA a decade ago. That came to an end when vast quantities of poor-quality games virtually destroyed the market. It seems that children are often less easy to fool than adults.

While all this has been going on, Philips and others have been less than successful with a product that should have far greater potential – CD-i. Maybe the games companies will help out here. Sega has introduced a dual CD player/Mega Drive games console which has been a success – an upgraded version is due in time for the next Christmas selling season. Nintendo is understood to be developing a next generation machine that will incorporate a CD player. It will be interesting to see what the games firms can do with CD-i. Meanwhile, a bit of shelf space for the games would help your profits no end and, come to think about it, the publishing aspect of the games phenomenon is also booming – there are at present at least twenty five magazines in the UK devoted to the interests of Nintendo and Sega games players. Cheerio?!



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Teletopics

GOING DIGITAL

The Independent Television Commission has published a discussion document on converting to digital terrestrial TV. Use of the present TV frequency allocations could, with digital transmission, provide viewers with around a hundred channels. This would involve dropping the present analogue system. Such a course would be unacceptable in the immediate future, so the discussion is about ways of getting there eventually. The ITC feels that a notice period of at least ten years would be required before discontinuing the present services. Initially the commission favours a gradual introduction of digital TV, using a combination of simulcasting – duplicating present services in digital form – and the addition of new, digital channels. This could give viewers up to twenty extra channels, depending on the number of current transmitters in operation in the region – some areas are more congested than others, particularly the south and south east. Existing sets could continue to be used in conjunction with a receiver-decoder to convert the digital signal to conventional analogue PAL form. The ITC also feels that a European standard should be agreed before the start of digital TV transmissions.

NEWS

After a lengthy period of argument the European Community has agreed to a four-year, £180m plan to promote widescreen TV. The money will be made available to broadcasters and programme makers for equipment upgrading and the production of new programmes. It will be released subject to a matching investment being made by the recipient. Originally the idea was to link the Community initiative to the introduction of HDTV but the present move is limited to encouragement of the widescreen format.

Time Warner, Microsoft and cable TV operator TeleCommunications Inc. are to co-operate in the development of interactive TV in the USA. The system would give viewers access to films and games from a vast electronic library, enable various news and information sources to be selected and provide services such as shopping by television.

Video games should be available via TV before long. The Sega Channel is to be launched as a cable service in the USA early next year and is likely to appear in Europe as a satellite TV service shortly afterwards. The channel will make about fifty games available for downloading via a special tuner-decoder that can be plugged into a Sega Megadrive games system. The BBC however has scrapped plans to expand its BBC Select subscription service, in which more than £10m has been invested. Existing contracts and the three current services – the Executive Business Club, Accountancy Television and Legal Network Television – will be maintained. The number of subscribers failed to reach anything like the hoped for levels. 'Open access' programmes that can be recorded without an adaptor will continue to be broadcast.

A further report on the future of Channel 5 is due shortly from the ITC. It will consider three main options: a similar service to the one dropped last year; a narrower option based on local TV services; and the use of the frequencies for digital TV services.

In early June the BBC and Thomson demonstrated digital TV technology to the European parliament. Live satellite transmissions via Eutelsat I F4 used equipment developed by the BBC, Thomson-CSF Laboratories and other partners within the RACE programme. A compression system that reduces the data rate of an HDTV signal by a factor of thirty (from around 1,000Mbits/sec to about 30Mbits/sec), a digital sound coding system that provides five high-quality channels and a broadband optical network were included in the demonstrations.

DEVELOPMENTS

The European Launching Group for Digital Video Broadcasting (DVB), which has been co-ordinating European research and development work on digital TV systems, expects to reach agreement on a European standard by the end of the year. This could result in the start of services within two years. Meanwhile a likely specification for the US digital HDTV system has begun to emerge: 787.5 lines and 60 fields/sec without interlacing.

Xerox has developed a prototype LCD screen that provides a resolution similar to that of a laser printer. It has 6.3 million pixels and an apparent resolution of 300 dots per inch. Active-matrix, amorphous silicon thin-film-transistor technology is used. The US government Advanced Research Projects Agency provided aid.

BT researchers are developing a new video data compression algorithm that could increase the compression ratio by a factor of two hundred. The system works by second-guessing movement to increase substantially the amount of picture information discarded. It would be independent of the resolution of the original picture source.

Last month we mentioned (page 647) a ghost-cancellation system being developed by the ITC. It's based on a 24µsec pulse that's inserted in line 318, during the field blanking period. The pulse is no ordinary one however: it sweeps from 0Hz to 5MHz and is then cut off sharply. The rest of the line is left without modulation. To make use of the pulse the set has to contain a memory in which the basic pulse waveform is stored. This enables the set to compare the standard and the received pulse. After analysis of any reflections the set produces a mirror image of the ghost signal and uses this to achieve cancellation.

Ultra definition TV (UDTV) is another thing that was mentioned last month (page 638). This Japanese programme involves not just UDTV but versions 0-III, with a development period extending to the year 2015. The ultimate result would be a 4,000-line picture.

DOLBY SURROUND SOUND

BBC Manchester recorded the Corporation's first official Dolby Surround Sound production. The programme, 'For Those in Peril', was a documentary commemorating the fiftieth anniversary of the Battle of the Atlantic. It was shown on BBC-1 on May 30th.

Dolby Pro-Logic Surround Sound is a feature of two new Hitachi models, the C2574TN and C2874TN. Suggested prices are £850 and £950 respectively. They provide a total output of 55W r.m.s. in the Dolby Pro-logic mode and come complete with all the speakers required.

THEM DISCS

Philips and Paramount Pictures have agreed to make fifty films available in the CD-i format over the next two years.

The full-length films will have MPEG-compressed full-motion video, which gives 'better than VHS' picture quality. Each disc can store up to 72 minutes of video with digital stereo sound - the first will appear in the UK this autumn. Philips also plans to launch a series of CD-i music videos and interactive movies (the viewer can control how the plot develops). Prices will range from £15 to £50. A full-motion video (FMV) cartridge, Model 22ER9141, that will plug into the back of existing CD-i decks is to be launched. It will provide an additional 1.5Mbytes of memory for extra features.

Nimbus Records plans to launch its video CD format next spring. The system will enable the user to watch CD video movies via a TV set and hi-fi system - provided the CD player has a digital output socket (according to Nimbus a third of the world's 120 million CD players and eighty per cent of new players have one). A video adaptor unit containing MPEG expansion chips will be required between the player and the TV set - Nimbus hopes that future CD players will have this chip set built in as standard. Video CD discs will have up to 79 minutes of MPEG video. No price details have been announced.

3DO, the US-Japanese consortium that's planning to introduce an interactive multimedia system as a 32-bit competitor to CD-i, made several announcements during the Chicago Consumer Electronics Show in June. Panasonic intend to introduce a 3DO interactive multiplayer (IMP), Model FZ1, later this year, though a working prototype was not on display. AT&T has signed a 3DO hardware licence agreement and may develop a network version of IMP. Sanyo is also understood to have entered into a licence agreement. 3DO players will use an MPEG decoder developed by C-Cube Microsystems. Although

3DO talks of a US launch this autumn and a European launch next year, there seems to be doubt as to whether development work on the players could be completed in this short time. Crystal Dynamics of California has announced two 3DO games, 'Crash 'N Burn' and 'Total Eclipse': they will include full-motion video, 3D graphics, high-quality animation and multi-channel sound.

Kodak and Philips have entered into a licensing agreement for the mass-production of prerecorded Photo CD discs.

HARDWARE

JVC has launched a second multimedia player, the Wonder-mega Model RGM2, in Japan. It uses a 68000 processor and plays audio CDs, CD plus graphics discs, karaoke CDs, Sega Mega Drive and CD-ROM computer games and Wonderlibrary electronic books. Up to eight channels of PCM audio are provided. Price is the equivalent of £370 - no UK launch date has been suggested.

Panasonic has introduced an ultra-slim VHS-C camcorder, Model NVR50, at a suggested price of £900. Its slim shape has been achieved by using an 0.25in., 320,000-pixel CCD imager and a combined PCB for the camera and VCR sections. Features include digital picture effects, programmed auto-exposure, a long-play mode and index search.

AT&T intends to launch a videophone costing less than \$500 in the USA later this year. It will be a very considerable reduction in price compared with AT&T's first generation consumer videophone. New video signal compression technology is being developed to reduce the cost of the system.

<table border="1"> <tr><td>AC138</td><td>3.9%</td><td>2SA748</td><td>0.85</td><td>2SD2340</td><td>0.45</td><td>STK461</td><td>6.00</td></tr> <tr><td>AD161</td><td>0.50</td><td>2SA841</td><td>0.40</td><td>2SD355</td><td>0.35</td><td>STR1050</td><td>7.25</td></tr> <tr><td>AD162</td><td>0.50</td><td>2SA893</td><td>0.50</td><td>2SD400</td><td>0.48</td><td>STR2129</td><td>4.75</td></tr> <tr><td>BC108</td><td>0.07</td><td>2SA1011</td><td>1.35</td><td>2SD467</td><td>0.15</td><td>STK3042</td><td>4.20</td></tr> <tr><td>BC141</td><td>0.30</td><td>2SA1102</td><td>1.60</td><td>2SD525</td><td>0.65</td><td>STK3042*</td><td>4.75</td></tr> <tr><td>BC142</td><td>0.20</td><td>2SA1123</td><td>0.49</td><td>2SD560</td><td>0.40</td><td>STK3525</td><td>4.45</td></tr> <tr><td>BC307</td><td>0.08</td><td>2SA1175</td><td>0.40</td><td>2SD612</td><td>0.80</td><td>STK5332</td><td>1.80</td></tr> <tr><td>BC337</td><td>0.07</td><td>2SA1282</td><td>0.90</td><td>2SD836</td><td>0.10</td><td>STK5332</td><td>2.40</td></tr> <tr><td>BU546</td><td>0.07</td><td>2SA1307</td><td>1.50</td><td>2SD718</td><td>0.95</td><td>STR542</td><td>4.70</td></tr> <tr><td>BU131</td><td>0.30</td><td>2SB370</td><td>0.40</td><td>2SD725</td><td>3.50</td><td>STK5476</td><td>4.00</td></tr> <tr><td>BU132</td><td>0.30</td><td>2SB524</td><td>0.65</td><td>2SD836</td><td>0.75</td><td>STK7348</td><td>3.15</td></tr> <tr><td>BU243</td><td>0.38</td><td>2SB541</td><td>1.90</td><td>2SD856</td><td>0.55</td><td>STK73410</td><td>4.00</td></tr> <tr><td>BU246</td><td>0.65</td><td>2SB546</td><td>0.55</td><td>2SD1136</td><td>0.50</td><td>STAD11</td><td>3.50</td></tr> <tr><td>BUK33</td><td>0.50</td><td>2SB618</td><td>3.05</td><td>2SD1273</td><td>0.70</td><td>STAD11</td><td>3.80</td></tr> <tr><td>BUK35</td><td>0.50</td><td>2SB641</td><td>0.11</td><td>2SD1275</td><td>0.58</td><td>STAD11</td><td>2.50</td></tr> <tr><td>BU197</td><td>0.20</td><td>2SB649</td><td>0.38</td><td>2SD1278</td><td>0.58</td><td>STAD11</td><td>4.75</td></tr> 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<tr><td>BU508B</td><td>1.35</td><td>2SC1382</td><td>0.30</td><td>HA1377</td><td>4.00</td><td>UCP1032</td><td>0.60</td></tr> <tr><td>BU508C</td><td>1.10</td><td>2SC1429</td><td>0.55</td><td>HA1227</td><td>1.50</td><td>UCP1185</td><td>4.00</td></tr> <tr><td>BU536</td><td>1.05</td><td>2SC1447</td><td>0.80</td><td>KA2.01</td><td>1.00</td><td>UCP1230</td><td>1.50</td></tr> <tr><td>BU526</td><td>1.45</td><td>2SC1514</td><td>0.42</td><td>KA2.63</td><td>1.50</td><td>UCP1363C</td><td>1.90</td></tr> <tr><td>BU108AF</td><td>1.20</td><td>2SC1569</td><td>0.55</td><td>LA1352</td><td>1.45</td><td>UCP1378</td><td>1.80</td></tr> <tr><td>BU508DF</td><td>1.35</td><td>2SC1674</td><td>0.15</td><td>LA1460</td><td>2.05</td><td>UCP1394</td><td>1.50</td></tr> <tr><td>BU111A</td><td>0.70</td><td>2SC1767</td><td>0.36</td><td>LA4.82</td><td>1.65</td><td>UCP1456</td><td>0.50</td></tr> <tr><td>BU111AF</td><td>0.85</td><td>2SC1815</td><td>0.12</td><td>LA4200</td><td>1.30</td><td></td><td></td></tr> 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<tr><td>2M1035</td><td>1.10</td><td>2SC3182</td><td>1.50</td><td>MC14426</td><td>2.50</td><td></td><td></td></tr> <tr><td>2M3773</td><td>1.50</td><td>2SC3262</td><td>3.60</td><td>MC14943</td><td>0.03</td><td></td><td></td></tr> <tr><td>2M6130</td><td>0.40</td><td>2SC3345</td><td>1.00</td><td>SA1293A</td><td>4.85</td><td></td><td></td></tr> <tr><td>2SA350</td><td>0.60</td><td>2SC3306</td><td>3.40</td><td>SA1293 B</td><td>5.15</td><td></td><td></td></tr> <tr><td>2SA606</td><td>2.85</td><td>2SC3883</td><td>2.80</td><td>SA1293 C</td><td>5.15</td><td></td><td></td></tr> <tr><td>2SA679</td><td>1.95</td><td>2SC4742</td><td>1.40</td><td>SAAS010</td><td>4.95</td><td></td><td></td></tr> <tr><td>2SA722</td><td>0.62</td><td>2SD198</td><td>1.60</td><td>SAAS243P</td><td>7.15</td><td></td><td></td></tr> </table>	AC138	3.9%	2SA748	0.85	2SD2340	0.45	STK461	6.00	AD161	0.50	2SA841	0.40	2SD355	0.35	STR1050	7.25	AD162	0.50	2SA893	0.50	2SD400	0.48	STR2129	4.75	BC108	0.07	2SA1011	1.35	2SD467	0.15	STK3042	4.20	BC141	0.30	2SA1102	1.60	2SD525	0.65	STK3042*	4.75	BC142	0.20	2SA1123	0.49	2SD560	0.40	STK3525	4.45	BC307	0.08	2SA1175	0.40	2SD612	0.80	STK5332	1.80	BC337	0.07	2SA1282	0.90	2SD836	0.10	STK5332	2.40	BU546	0.07	2SA1307	1.50	2SD718	0.95	STR542	4.70	BU131	0.30	2SB370	0.40	2SD725	3.50	STK5476	4.00	BU132	0.30	2SB524	0.65	2SD836	0.75	STK7348	3.15	BU243	0.38	2SB541	1.90	2SD856	0.55	STK73410	4.00	BU246	0.65	2SB546	0.55	2SD1136	0.50	STAD11	3.50	BUK33	0.50	2SB618	3.05	2SD1273	0.70	STAD11	3.80	BUK35	0.50	2SB641	0.11	2SD1275	0.58	STAD11	2.50	BU197	0.20	2SB649	0.38	2SD1278	0.58	STAD11	4.75	BU259	0.70	2SB717	0.57	2SD1398	1.40	STR451	11.25	H494	0.16	2SB861	1.50	2SD1426	2.05	STR5412	1.40	BFE81	0.30	2SB1015	0.63	2SD1441	3.50	STR14090	5.90	BFY51	0.80	2SB1016	1.10	AN318	4.40	STR50103	2.65	BFY90	2.00	2SC377	0.77	AN511	3.50	STR59041	6.40	BU24	1.35	2SC458	0.68	AN521	1.35	TA7157	1.20	BU180	0.80	2SC591	3.20	AN522	1.35	TA7270	2.00	BU106	0.85	2SC611	3.00	AN567	3.80	TA7280	2.75	BU208	0.68	2SC667	3.00	AN673	2.25	TA7604	2.35	BU208A	0.70	2SC941	0.12	AN7115	1.40	TAR205	2.90	BU208A	0.80	2SC998	3.05	BA318	1.75	TAR207	1.65	BU26A	1.10	2SC1008	0.20	BA658	3.60	TAR210	3.50	BU407	0.65	2SC1103	0.50	BA130	1.50	TAR214	3.40	BU409	1.10	2SC1123	0.49	BA5466	2.50	TAR215	3.00	BU426	1.50	2SC1222	0.11	BA6219	1.20	UCPS14	0.50	BU508A	0.85	2SC1277	0.38	BA156	1.35	UCP1320	2.00	BU508B	1.35	2SC1382	0.30	HA1377	4.00	UCP1032	0.60	BU508C	1.10	2SC1429	0.55	HA1227	1.50	UCP1185	4.00	BU536	1.05	2SC1447	0.80	KA2.01	1.00	UCP1230	1.50	BU526	1.45	2SC1514	0.42	KA2.63	1.50	UCP1363C	1.90	BU108AF	1.20	2SC1569	0.55	LA1352	1.45	UCP1378	1.80	BU508DF	1.35	2SC1674	0.15	LA1460	2.05	UCP1394	1.50	BU111A	0.70	2SC1767	0.36	LA4.82	1.65	UCP1456	0.50	BU111AF	0.85	2SC1815	0.12	LA4200	1.30			BU112A	0.85	2SC1852	0.49	LA4440	1.18			BU112AF	1.10	2SC1914	0.15	LA4660	1.30			BU156A	0.80	2SC1983	0.90	LA4700	1.40			TIP30C	0.25	2SC2007	0.22	LA6320	1.90			TIP31A	0.25	2SC2027	2.20	LM318	1.15	815	0.20	TIP32B	0.30	2SC2076	1.10	LM318	1.15	820	0.20	TIP41A	0.35	2SC2236	0.25	LM318	2.25			TIP47	0.45	2SC2278	1.00	LM4002	5.25			TIP110	0.45	2SC2347	0.18	MS143P	1.40			TIP112	0.85	2SC2500	0.25	MS220L	1.75			TIP142	0.90	2SC2599	1.25	MS1172	2.60			TIP1791	1.30	2SC2603	0.12	MS4884	4.50			TIP2955	0.50	2SC2658	0.10	MB3731	2.80			ME3400	0.25	2SC2688	0.30	MB3731	2.45			ME3521	0.35	2SC2738	3.00	MB3731	2.45			2M222	0.20	2SC2759	2.00	MC132	0.65			2M1035	1.10	2SC3182	1.50	MC14426	2.50			2M3773	1.50	2SC3262	3.60	MC14943	0.03			2M6130	0.40	2SC3345	1.00	SA1293A	4.85			2SA350	0.60	2SC3306	3.40	SA1293 B	5.15			2SA606	2.85	2SC3883	2.80	SA1293 C	5.15			2SA679	1.95	2SC4742	1.40	SAAS010	4.95			2SA722	0.62	2SD198	1.60	SAAS243P	7.15			<table border="1"> <tr><td colspan="2">VIDEO SPARES</td></tr> <tr><td>AKAI</td><td>VS1-5</td></tr> <tr><td>Video head</td><td>15.00</td></tr> <tr><td>Pinch roller</td><td>1.45</td></tr> <tr><td>Belt kit</td><td>3.00</td></tr> <tr><td>Reel idler</td><td>3.00</td></tr> <tr><td>Take/uidler</td><td>1.15</td></tr> <tr><td>Clutch</td><td>2.10</td></tr> <tr><td>Lamp</td><td>0.30</td></tr> <tr><td>Lamp+skt</td><td>0.75</td></tr> <tr><td>Loading belt</td><td>1.40</td></tr> <tr><td>Repair kit</td><td>19.23</td></tr> </table>	VIDEO SPARES		AKAI	VS1-5	Video head	15.00	Pinch roller	1.45	Belt kit	3.00	Reel idler	3.00	Take/uidler	1.15	Clutch	2.10	Lamp	0.30	Lamp+skt	0.75	Loading belt	1.40	Repair kit	19.23	<table border="1"> <tr><td colspan="2">FERGUSON JVC</td></tr> <tr><td>3D29 MR7200</td><td>6.40</td></tr> <tr><td>Video head</td><td>7.50</td></tr> <tr><td>Pinch 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lift assy</td><td>18.50</td></tr> </table>	PHILIPS		VTR451	6.68	6169 641B	6.18	Video head	45.00	Belt kit	1.30	Pinch roller	6.85	Clutch drive assy	4.75	Clutch	4.85	Pulley	11.40	Ra+k assy	12.40	Ca/ssette lift assy	18.50	<table border="1"> <tr><td colspan="2">SAMSUNG</td></tr> <tr><td>VV110 712 720</td><td>2.00</td></tr> <tr><td>720 970 971 972</td><td>1.70</td></tr> <tr><td>Video head</td><td>15.10</td></tr> <tr><td>Pinch roller</td><td>3.50</td></tr> <tr><td>Idler wheel</td><td>1.55</td></tr> <tr><td>FF/ew clutch assy</td><td>12.25</td></tr> <tr><td>FF/ew clutch assy</td><td>11.85</td></tr> <tr><td>Belt kit</td><td>3.45</td></tr> </table>	SAMSUNG		VV110 712 720	2.00	720 970 971 972	1.70	Video head	15.10	Pinch roller	3.50	Idler wheel	1.55	FF/ew clutch assy	12.25	FF/ew clutch assy	11.85	Belt kit	3.45	<table border="1"> <tr><td colspan="2">MITSUBISHI</td></tr> <tr><td>VX17/D</td><td>4.75</td></tr> <tr><td>Video head</td><td>15.15</td></tr> <tr><td>Pinch roller</td><td>1.65</td></tr> 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(R)</td><td>0.45</td></tr> <tr><td>Idler arm</td><td>4.75</td></tr> <tr><td>Repair kit</td><td>9.38</td></tr> </table>	MITSUBISHI		VX10 330 340 350	6.25	Video head	6.25	Pinch roller	1.30	Belt kit	1.20	Ca/astan belt	1.30*	Loading belt	1.50*	*pk of 5	4.15	Idler (D)	4.45	Idler (R)	0.45	Idler arm	4.75	Repair kit	9.38	<table border="1"> <tr><td colspan="2">SHARP</td></tr> <tr><td>VE361</td><td>9.60</td></tr> <tr><td>Video head</td><td>12.50</td></tr> <tr><td>Pinch roller</td><td>3.50</td></tr> <tr><td>Belt kit</td><td>1.15</td></tr> <tr><td>Repair kit</td><td>11.81</td></tr> <tr><td>Idler (D)</td><td>3.10</td></tr> <tr><td>Idler (R)</td><td>1.65</td></tr> </table>	SHARP		VE361	9.60	Video head	12.50	Pinch roller	3.50	Belt kit	1.15	Repair kit	11.81	Idler (D)	3.10	Idler (R)	1.65	<table border="1"> <tr><td colspan="2">SONY</td></tr> <tr><td>RC140</td><td>9.60</td></tr> <tr><td>RC140TM</td><td>9.60</td></tr> <tr><td>RC141</td><td>9.60</td></tr> <tr><td>RC160</td><td>9.60</td></tr> </table>	SONY		RC140	9.60	RC140TM	9.60	RC141	9.60	RC160	9.60	<table border="1"> <tr><td colspan="2">MITSUBISHI</td></tr> <tr><td>VX10 330 340 350</td><td>6.25</td></tr> <tr><td>Video head</td><td>6.25</td></tr> <tr><td>Pinch roller</td><td>1.30</td></tr> <tr><td>Belt kit</td><td>1.20</td></tr> <tr><td>Ca/astan belt</td><td>1.30*</td></tr> <tr><td>Loading belt</td><td>1.50*</td></tr> <tr><td>*pk of 5</td><td>4.15</td></tr> <tr><td>Idler (D)</td><td>4.45</td></tr> <tr><td>Idler (R)</td><td>0.45</td></tr> <tr><td>Idler arm</td><td>4.75</td></tr> <tr><td>Repair kit</td><td>9.38</td></tr> </table>	MITSUBISHI		VX10 330 340 350	6.25	Video head	6.25	Pinch roller	1.30	Belt kit	1.20	Ca/astan belt	1.30*	Loading belt	1.50*	*pk of 5	4.15	Idler (D)	4.45	Idler (R)	0.45	Idler arm	4.75	Repair kit	9.38	<table border="1"> <tr><td colspan="2">GRUNDIG</td></tr> <tr><td>TP150</td><td>10.00</td></tr> <tr><td>TP410</td><td>8.00</td></tr> <tr><td>TP421</td><td>10.00</td></tr> <tr><td>TP430/650</td><td>9.60</td></tr> <tr><td>TP431</td><td>10.00</td></tr> </table>	GRUNDIG		TP150	10.00	TP410	8.00	TP421	10.00	TP430/650	9.60	TP431	10.00	<table border="1"> <tr><td colspan="2">HITACHI</td></tr> <tr><td>RC140M</td><td>9.60</td></tr> <tr><td>RC132</td><td>9.60</td></tr> <tr><td>RC200</td><td>9.60</td></tr> <tr><td>RC301</td><td>9.60</td></tr> <tr><td>RC302</td><td>9.60</td></tr> <tr><td>RC303</td><td>9.60</td></tr> <tr><td>RC310</td><td>9.60</td></tr> <tr><td>RC311</td><td>9.60</td></tr> </table>	HITACHI		RC140M	9.60	RC132	9.60	RC200	9.60	RC301	9.60	RC302	9.60	RC303	9.60	RC310	9.60	RC311	9.60	<table border="1"> <tr><td colspan="2">PHILIPS</td></tr> <tr><td>RC134</td><td>9.60</td></tr> <tr><td>RC135</td><td>9.60</td></tr> <tr><td>RC138</td><td>10.00</td></tr> <tr><td>RC180</td><td>10.00</td></tr> <tr><td>RC300</td><td>8.10</td></tr> <tr><td>RC301</td><td>9.60</td></tr> <tr><td>RC303</td><td>9.60</td></tr> <tr><td>RC352</td><td>9.60</td></tr> <tr><td>RC5375</td><td>9.60</td></tr> <tr><td>RC5534</td><td>9.60</td></tr> <tr><td>RC5901</td><td>9.60</td></tr> <tr><td>RC5903</td><td>9.60</td></tr> </table>	PHILIPS		RC134	9.60	RC135	9.60	RC138	10.00	RC180	10.00	RC300	8.10	RC301	9.60	RC303	9.60	RC352	9.60	RC5375	9.60	RC5534	9.60	RC5901	9.60	RC5903	9.60	<table border="1"> <tr><td colspan="2">SONY</td></tr> <tr><td>RC140</td><td>9.60</td></tr> <tr><td>RC140TM</td><td>9.60</td></tr> <tr><td>RC141</td><td>9.60</td></tr> <tr><td>RC160</td><td>9.60</td></tr> </table>	SONY		RC140	9.60	RC140TM	9.60	RC141	9.60	RC160	9.60
AC138	3.9%	2SA748	0.85	2SD2340	0.45	STK461	6.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
AD161	0.50	2SA841	0.40	2SD355	0.35	STR1050	7.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
AD162	0.50	2SA893	0.50	2SD400	0.48	STR2129	4.75																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BC108	0.07	2SA1011	1.35	2SD467	0.15	STK3042	4.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BC141	0.30	2SA1102	1.60	2SD525	0.65	STK3042*	4.75																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BC142	0.20	2SA1123	0.49	2SD560	0.40	STK3525	4.45																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BC307	0.08	2SA1175	0.40	2SD612	0.80	STK5332	1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BC337	0.07	2SA1282	0.90	2SD836	0.10	STK5332	2.40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU546	0.07	2SA1307	1.50	2SD718	0.95	STR542	4.70																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU131	0.30	2SB370	0.40	2SD725	3.50	STK5476	4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU132	0.30	2SB524	0.65	2SD836	0.75	STK7348	3.15																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU243	0.38	2SB541	1.90	2SD856	0.55	STK73410	4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU246	0.65	2SB546	0.55	2SD1136	0.50	STAD11	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BUK33	0.50	2SB618	3.05	2SD1273	0.70	STAD11	3.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BUK35	0.50	2SB641	0.11	2SD1275	0.58	STAD11	2.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU197	0.20	2SB649	0.38	2SD1278	0.58	STAD11	4.75																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU259	0.70	2SB717	0.57	2SD1398	1.40	STR451	11.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
H494	0.16	2SB861	1.50	2SD1426	2.05	STR5412	1.40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BFE81	0.30	2SB1015	0.63	2SD1441	3.50	STR14090	5.90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BFY51	0.80	2SB1016	1.10	AN318	4.40	STR50103	2.65																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BFY90	2.00	2SC377	0.77	AN511	3.50	STR59041	6.40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU24	1.35	2SC458	0.68	AN521	1.35	TA7157	1.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU180	0.80	2SC591	3.20	AN522	1.35	TA7270	2.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU106	0.85	2SC611	3.00	AN567	3.80	TA7280	2.75																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU208	0.68	2SC667	3.00	AN673	2.25	TA7604	2.35																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU208A	0.70	2SC941	0.12	AN7115	1.40	TAR205	2.90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU208A	0.80	2SC998	3.05	BA318	1.75	TAR207	1.65																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU26A	1.10	2SC1008	0.20	BA658	3.60	TAR210	3.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU407	0.65	2SC1103	0.50	BA130	1.50	TAR214	3.40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU409	1.10	2SC1123	0.49	BA5466	2.50	TAR215	3.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU426	1.50	2SC1222	0.11	BA6219	1.20	UCPS14	0.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU508A	0.85	2SC1277	0.38	BA156	1.35	UCP1320	2.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU508B	1.35	2SC1382	0.30	HA1377	4.00	UCP1032	0.60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU508C	1.10	2SC1429	0.55	HA1227	1.50	UCP1185	4.00																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU536	1.05	2SC1447	0.80	KA2.01	1.00	UCP1230	1.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU526	1.45	2SC1514	0.42	KA2.63	1.50	UCP1363C	1.90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU108AF	1.20	2SC1569	0.55	LA1352	1.45	UCP1378	1.80																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU508DF	1.35	2SC1674	0.15	LA1460	2.05	UCP1394	1.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU111A	0.70	2SC1767	0.36	LA4.82	1.65	UCP1456	0.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
BU111AF	0.85	2SC1815	0.12	LA4200	1.30																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
BU112A	0.85	2SC1852	0.49	LA4440	1.18																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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TIP30C	0.25	2SC2007	0.22	LA6320	1.90																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
TIP31A	0.25	2SC2027	2.20	LM318	1.15	815	0.20																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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TIP41A	0.35	2SC2236	0.25	LM318	2.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
TIP47	0.45	2SC2278	1.00	LM4002	5.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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TIP142	0.90	2SC2599	1.25	MS1172	2.60																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
TIP1791	1.30	2SC2603	0.12	MS4884	4.50																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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2M3773	1.50	2SC3262	3.60	MC14943	0.03																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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DON'T FORGET YOUR IDLER TYRES

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Philips VR6290/6291 BSU	E9 65
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Sharp VCC 113 cassette housing kit	6 35
VCR spring kit	5 75
VCR cleaning & washer kit	5 45
Fibre cleaning pencil	2 95
Refill for pencil (pk of 3)	1 50
Plastic trimming tools (pk of 3)	3 00
Audio video cleaning sticks (pk of 5)	1 50
GEC C1403H PSU kit	11 99

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BU SDBA (Philips) 10 p/c	7 20
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TV Fault Finding

Reports from Stephen Leatherbarrow, Steve Cannon, Hugh MacMullen, Roger Burchett, Richard Flowerday, Richard J. Avis, Nick Beer, Richard Newman, Michael Dranfield and John Edwards

Philips KT4 Chassis

This set was tripping. Not much of a problem you'd have thought – a line output stage fault or something connected to one of the chopper power supply's outputs. Not this time though. Try as I might, I couldn't find anything amiss on the secondary side of the power supply. So checks were made on the primary side. After testing various components I switched on and was quite taken aback – the set started up. Though the h.t. was low there was a picture and sound. There were also five or six hum bars on the screen. After much head scratching and the replacement of several perfectly good decoupling capacitors I decided to try replacing C2128, which couples the drive to the base of the chopper transistor. When a new 100µF, 50V capacitor had been fitted the h.t. came up nicely and the set was declared fit. S.C.

Sony KVX2132

The problem was crackling Nicam, but only on the video channel in the E-E mode. Very strange! Definitely a case where a call to Sony's ever efficient technical line at Cumbernauld was required. As usual they had the answer. We were told to replace or fit into vacant spaces in the PCB D1104 (DAN202K), Q1104 (DTC144EK), R1128 (1kΩ), R1130 (4.7kΩ) and C1128 (10µF, 50V). With the exception of C1128 these are all surface-mounted devices. They didn't say it would be easy! S.C.

Philips FL1.2 Chassis

This set was completely dead with only the power-on LED alight. Usually with this chassis the display will show, by means of flashing LEDs, where the source of the fault is likely to be. The most common thing is to find that the mute, Nicam and standby LEDs are lit, indicating that the set is in the protection mode. A check at L5381 in the protection control line produced a reading of 0.7V. This had triggered the protection circuit and shut the set down. So the set *was* in the protection mode, even though the LEDs weren't indicating this.

When the set is in the protection mode the cause of the fault can lie in one of six areas. The only sure way of determining which one is firing the protection circuit is to disconnect each in turn. The place to start is at the audio protection transistor Q7010: if there's a fault in the line output stage, or a fault somewhere else is loading the h.t. line, this transistor will conduct because of an imbalance between the +11V and -11V supplies generated by the chopper circuit. With Q7010 disconnected the h.t. reached 40V and the set remained lifeless.

I suspected the line output stage, but checks on the transistor and tuning capacitor were inconclusive. On closer examination I saw that the field shift transistors Q7512 and Q7513 were cracked and in a sorry state. They proved to be short-circuit. It seemed to me that the line output transformer had given up the ghost and taken these two transistors with it. Note that several types of transformer are used, depending on the type of tube fitted. This particular set had a Philips tube without DAF (dynamic focusing). When a

new transformer and field shift transistors had been fitted we had full h.t. – even with the audio protection transistor reconnected. Up came the raster but there was an EW fault. Replacing the BDT60F transistor Q7610 cured this final problem. S.C.

Philips G110 Chassis

This set wouldn't power up. It's not an uncommon complaint with this chassis. Unfortunately if the chopper transistor fails a power supply rebuild is necessary. A further problem is that the majority of the components are surface mounted. This wasn't going to be necessary here however. The h.t. was low at 20V, but obviously the power supply was working to some extent. I suspected a fault in the line output stage, and by disconnecting the h.t. feed to the transformer and fitting a dummy load the full h.t. was obtained. But there was nothing amiss in this area. When pin 3 of the transformer was disconnected the set started up and we had full h.t. and e.h.t. There was no 14V supply however as pin 3 provides the feed, hence no sound or raster.

What was happening was that the timebase generator chip was working in the start-up mode. It receives an initial supply from the chopper circuit, the 14V supply taking over once the line output stage gets going. Thus with the 14V supply disconnected the chip wasn't working at its full capacity. We had however established that the fault was connected with the 14V rail. The problem is that it feeds the 12V regulator, whose output goes all over the place. To isolate the cause of the fault we had to disconnect various feeds. In fact the faulty component was the BC858 transistor Q7284 in the audio protection stage – it's another surface-mounted device.

A tip for this chassis: before you start, get your SMD transistor kit ready. S.C.

Philips CP110 Chassis

We're experiencing, and have done for some time, a high failure rate with the mains rectifier's reservoir capacitor C2656 (150µF, 385V). It tends to go low in value, with the result that there's no start-up supply to the TEA1039 chopper drive chip IC7669. Pin 9 is the place to check. Around 14V should be found here. If this supply is low or absent, replace C2656 despite being able to measure 300V or more across it S.L.

Ferguson ICC7 Chassis

This set was dead with its 1.6AT mains fuse FP01 open-circuit and the BUH515 chopper transistor TP29 short-circuit. Checks failed to reveal any obvious causes for the failure of these devices. On replacing them the power supply still didn't work but at least there were no fireworks. As there were no shorts across the secondary lines we looked at the drive to TP29. This is produced by IP01 (TEA2261), which proved to be faulty. There's a d.c. connection between the base of TP29 and IP01, which was

presumably killed when TP29 went short-circuit – all ways. After replacing this device the h.t. appeared but the set still refused to produce results. RP62 (0.1Ω) in the 24V supply was open-circuit. A replacement finally brought the set back to the land of the living. **S.L.**

Matsui 2091

A dead set with h.t. present at the collector of the line output transistor directed our attention to the line driver stage. The 2SC2230 transistor here had 18V at its collector but no drive at its base. This comes from the TDA1940 chip IC401 which was without its supply at pin 4. Tracing the print back (we'd no manual) brought us to D407 which was open-circuit with 9V at its anode but nothing at its cathode. **S.L.**

Panasonic TC481

Intermittent loss of signals (no 12V supply) is caused by R545 (3.3Ω) developing a dry-joint. In the early stages of the fault the set will respond when tapped and continue working indefinitely. **R.B.**

Toshiba 261T4B

This set could be switched on and off but all one got was a rather loud grating noise from the line output transformer. A check showed that the h.t. at the transformer was low at only 50V. We suspected the transformer but found that the 2.4Ω resistor in series with its supply (R481) read 200Ω, though its colours were perfect. A replacement restored normal operation. **H.MacM.**

Philips CTX Chassis

This set had remote control. It came to us twice for much the same fault. On the first occasion there was no tuning memory. Simple that, the memory battery was flat. A week later it was back again, this time with no brightness or colour memory. It's the only time I've had to replace the M5840A chip. **H.MacM.**

ITT CVC25 Chassis

These sets are normally quite reliable. Every so often however this one didn't want to start – it would need a few pushes on the mains switch. The cause of the trouble was eventually traced to a very dirty line hold control. This potentiometer, R710, is on the little plug-in panel. **H.MacM.**

B and O 3316 etc

A large number of these sets are in use in this area. A common fault, which can be cured by a tap on the cabinet, is loss of sound and vision. It occurs only when the chassis is warm. The cause is a microscopic dry-joint on a couple of the TCA270S chip's pins. This chip resides in can E. It's a very difficult fault to trace because checking with a feather will produce it! **H.MacM.**

Mitsubishi CT21M1TX

The power supply would start up at switch on then immediately shut down. This sort of trouble is normally caused by a heavy overload, but checks for shorts across the outputs and subsequently disconnecting them individually failed reveal any. The run supply rectifier D905 and its associated safety resistor R905 were in order and replacement of the

TEA2261 power supply control chip made no difference. We eventually found that the opto-isolator PC951 was defective, a replacement restoring normal operation. In retrospect we should have gone for this first as the set had failed during a thunderstorm. **R.F.**

Tatung 190 Chassis

The complaint was "sound but no picture". We found that the line output stage wasn't working because there was no line drive at pin 26 of the TDA4505 chip IC101. Further scope checks around this chip showed that the line oscillator frequency at pin 23 was nearly 1MHz instead of 15.625Hz. The 2.7nF timing capacitor C111 had gone open-circuit, a replacement restoring normal operation. **R.F.**

Sony KV2212UB

The complaint was of random channel changing. We found that the cause was defective up-down switches in the top flap. **R.J.A.**

Salora J Chassis

I've seen many of these sets over the years. They still seem to work well. This one had peak brilliance at switch on however, then shut down. We traced the cause to an open-circuit in the thin wiring loom, at connection 1 where it meets the main board. **R.J.A.**

Sony K VX2121U (AE1 Chassis)

Loss of sync and/or picture caused us some difficulty. We eventually traced the cause to dry-joints on coil T101. It's on the right-hand side of signals panel A. **R.J.A.**

Samsung BT110/Alba PTV9C

We've had two of these sets in recently. The first one came from a dealer who replaced the fuse but found that the set remained dead. There was an output from the d.c. power supply, and when d.c. was connected across the battery terminals the set worked. But when the supply was fed to the d.c. jack it was dead. The cause of the trouble was a faulty changeover switch in the d.c. socket – it read 2MΩ from centre to the output.

The problem with the other set was no TV tuning – radio was fine. When the case had been removed we found that the PCB was cracked for some distance near the tuning/volume controls. This had already been attended to and there were no other breaks. The cause of the trouble was that the 6.8kΩ resistor R128 which feeds the 33V regulator IC102 was open-circuit. **N.B.**

Ferguson TX80 Chassis

If one of these sets fails to come on from standby, check whether the line output transistor is short-circuit and either RP01 (27kΩ) or RP36 (75kΩ, 3W) is open-circuit. **N.B.**

Fidelity ZX3000 Chassis

This set took upwards of an hour to come on. Faint pulsing from the power supply had been noted by the observant customer. A check at pin 9 of the TDA4600 power supply control chip IC8 showed that the 13.5V start-up supply was low. It built up from 4V to 10V, but this was not enough to start the set. The two 10kΩ resistors R82/3 and rectifier D7

in the start circuit were all o.k. As the voltage at pin 9 varied it seemed likely that the associated 100 μ F, 25V reservoir capacitor C87 was open-circuit. When it was removed we found that it had a discharge from its positive leg. **N.B.**

Panasonic TC431GR (M12C Chassis)

These excellent sets have proved to be very reliable but now have a stock fault. No go, often intermittent, can be caused by loss of the h.t. supply to the line driver stage because of dry-joints on the 680 Ω feed resistor R513. **N.B.**

Mitsubishi CT2141BM

The cause of an intermittently fading picture was loss of heater supply to the c.r.t. because of a dry-joint at pin 9 of the socket. All the pins were going the same way. **N.B.**

Ferguson A59F (ICC7 Chassis)

A number of early production sets suffered from poor focus because the focus lead connector came adrift from its socket on the c.r.t. base panel. Some customers have complained about lack of straightness of the verticals and horizontals with the very flat tubes fitted. There doesn't seem to be anything one can do about this. **N.B.**

Blaupunkt Milano IL32 (FM100 Chassis)

This set was dead. The relay could be heard to click on when the remote control unit was used to switch the set on from standby, and the standby LED was on. So at any rate the standby power supply was operating. There was no mains feed to the main chassis however as relay M865 was open-circuit on one pole. **N.B.**

Panasonic TC2110 (U5N Chassis)

The first problem with this set was an intermittent mains switch. Its remote contacts were faulty: if the switch button was flicked the set would more often than not work all right. A replacement switch put that right. The set then ran for about half an hour after which it died. The power supply relay wasn't working and I soon found that there was no supply to the remote control panel. This comes from a small transformer which is mounted in the bottom left-hand corner of the set. It had an open-circuit primary winding. **R.N.**

Philips CP110 Chassis

This set refused to start. I went through all the usual things without success. Scope checks then showed that there was a very damped waveform at the collector of the BUT11AF chopper transistor Tr7665. I eventually found that the BYD33D rectifier diode D6672 in the 32V supply on the secondary side of the circuit was faulty, reading about 1.5k Ω each way. A replacement restored normal operation. **R.N.**

Philips KT3 Chassis

This 16in. set was dead. When we removed the back we found that something had been spilt into it – something brown and gungy. We cleaned up generally and replaced various items, including the chopper transistor, but the set still failed to start up. We eventually found that the cause of the fault was a short between the primary and secondary sides of the chopper driver transformer. This had presumably occurred when the chopper transistor had failed. We

were subsequently told that the set was used in the kitchen, and that the offending substance was brown sauce. **M.Dr.**

Hitachi CPT1444

The LED channel display lit and the channel numbers could be changed. But there was no picture or sound. Before ordering a manual I decided to check the fuses and found that FS901 (1.6AT) behind the on/off switch was open-circuit. No contributory cause could be found. Note that if the fuse next to it, FS902, goes open-circuit there will be no channel display and no tuning, just a snowy raster. **M.Dr.**

Grundig CUC2400 Chassis

The man who traded in this set told us that another shop had taken a look and found that the tube was faulty. In fact R769 (15k Ω) on the c.r.t. base panel was open-circuit. A replacement restored the blue in the picture. **M.Dr.**

Osume CTV1486T

The symptoms with this set were intermittent loss of sync, a blank raster, no sound, switching to standby and the LED channel display going off. We eventually found that the output from the 5V regulator, IC105, was varying. The chip wasn't the cause of the trouble however. The standby transformer was faulty. **M.Dr.**

Alba CTV12

This set was dead though the channel indicator was alight. We eventually traced the cause to dry-joints on the line driver transformer. **J.E.**

Philips KT3 Chassis

The cause of intermittent tripping was eventually traced to the degaussing resistor. These devices usually rattle when they fail, but this one didn't. A very long test run after replacing it proved that the fault had been cured. **J.E.**

Mitsubishi BB1201B

No line or field lock was the problem with this set. Slight adjustment of the line oscillator coil L501 restored line lock but the field hold preset VR401 had to be replaced to restore field lock – there was a break in its track. **J.E.**

Philips 2A Chassis

There was an over bright raster with flyback lines and the first anode control had no effect. We found that the feed resistor R3473 (910k Ω) had gone open-circuit. **J.E.**

Hitachi CPT1456

This set was dead with the power supply screaming in agony. We found that the 2SD1453 line output transistor was short-circuit collector-to-emitter. Unfortunately the cause of its failure was the line output transformer. **J.E.**

Sony KVDX271

Sound all right but just a blank screen because there's no first anode voltage is becoming quite a common fault with these sets. You find that R807 (1k Ω , 1W) is open-circuit and D803 short-circuit. **J.E.**

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A Serviceman's Guide to PCs

Part 1

David Botto

A computer, preferably a PC (Personal Computer), is rapidly becoming a 'must' in the service department. It will increase your profits, balance your accounts and keep VAT and tax records in impeccable order, taking the tedium out of book-keeping – in fact making it rather fun.

Neatly kept, accurate records printed out as a spreadsheet mean that your accountant will charge less for preparing your annual return for the tax people. A PC will produce letters and customers' bills with minimum effort. How often have you laboriously typed or written the same phrases or paragraphs? A stock phrase or paragraph can be rapidly recalled from the PC's memory and inserted into the document you are preparing. You can store a list of every video/TV fault you've ever encountered or read about in a computer. To recall the required information, just type in the make and model and the monitor's screen will instantly display what you want.

The service engineer has just so much energy to use during a day. With a PC you can avoid those energy-wasting arguments with Mrs. Whoever about what was done to her TV set and when: touch the keys and within seconds the screen will show the date of the last repair, the amount charged and the work done. Press another key and a copy of the original bill will be printed out.

The IBM PC was introduced in 1981. Today the term PC

is generally applied to any computer that will run IBM programs. IBM and IBM-compatible computers (PC clones) have become the accepted standard for business use. More software programs are available for them than for any other type.

As a result of fierce competition, PC prices have fallen by almost fifty per cent during the last year or so. This hasn't happened with Apple Mac and Acorn computers. So if you don't already own a PC, now is the time to buy one.

There's a certain mystique about computers. They are nothing more than super-fast adding machines that process binary signals however. Any mathematical problem can be solved by the process of addition, and this is just what a PC does. The engineer who services colour TV sets, VCRs and camcorders will experience no difficulty in gaining an understanding of PC principles. Table 1 explains some commonly used computer terms that puzzled me and may puzzle you. PC terms are spelt the American way, for example program rather than programme.

What's Inside?

Fig. 1 shows in block outline form the items that go to make up a typical PC installation. But remember that, as with TV sets and VCRs, the layout and design of individual

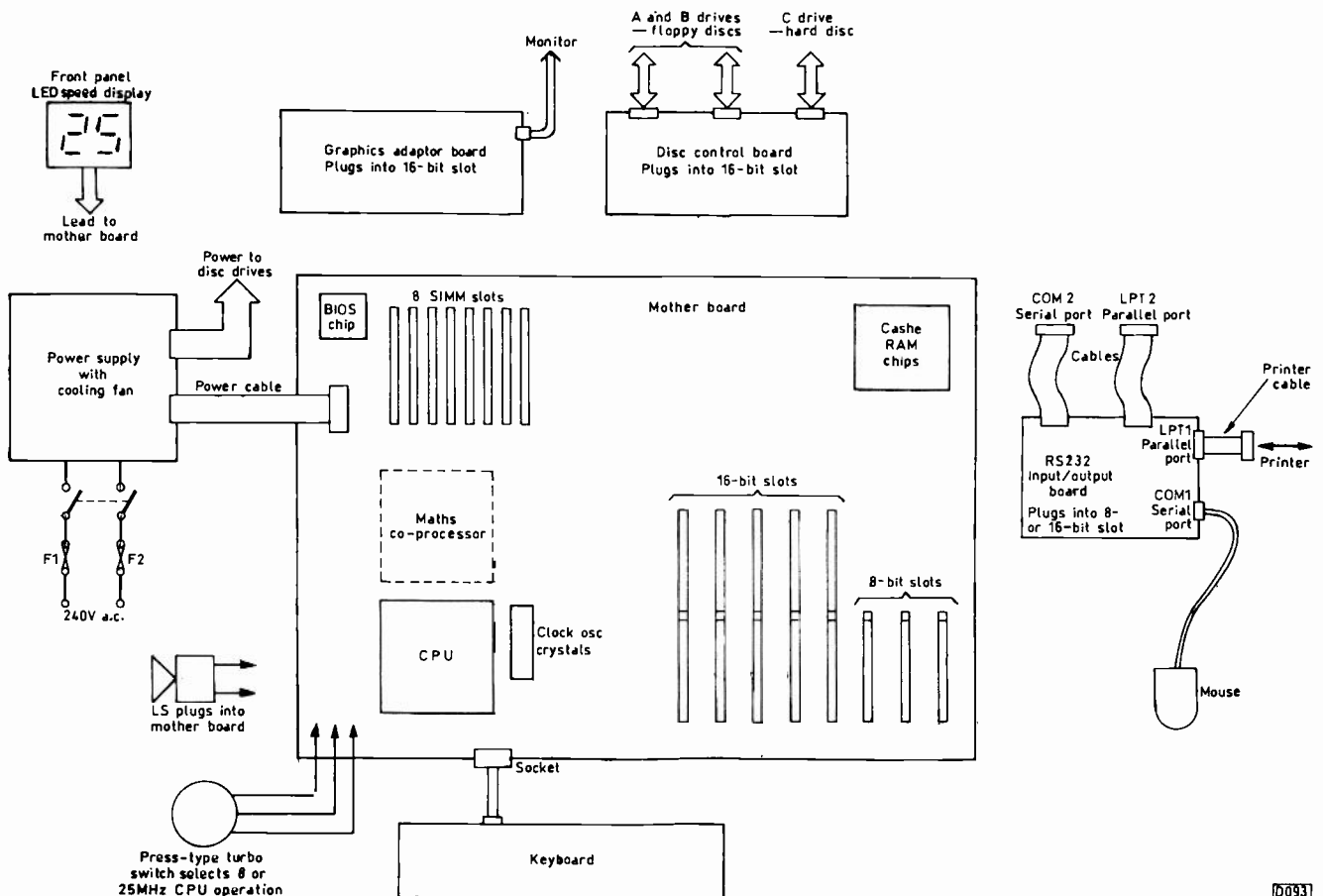


Fig. 1: Block outline of a typical IBM-compatible PC.

models can vary considerably. The basic principles remain the same however.

The 'system unit' is the case that houses the computer. It includes the mains-fed power supply that provides outputs for the mother board and the disc drives. A quiet cooling fan is incorporated. You've a choice between a desktop computer case, a floor-standing mini tower case, a midi tower or a full tower system. Tower computers are popular because they don't take up desk space and have plenty of inside room for future hardware expansion.

The mother board holds the CPU (central processing unit) which can be regarded as the computer's brain. It processes information, in digital form of course, in accordance with instructions contained in a program. The 80286, 80386 and 80486 are popular CPU chips (micro-processors).

Because the 386 and 486 microprocessors use high-speed clock oscillators the PC's basic memory chips can't respond to CPU instructions and data fast enough. So with these CPUs the binary data stored in the memory chips is preloaded into a small, faster memory area that's known as the processor 'cache RAM' or 'cache memory'. A turbo switch enables two clock oscillator speeds to be selected, 8MHz or 25MHz.

A maths co-processor can be added on the mother board. Don't expect an improvement in the PC's performance unless a program that's designed for use with a co-processor is used. Examples include CAD packages, some spreadsheet programs, many graphical programs and number-crunching mathematics programs. Note that the 80486DX chip has a built-in cache memory and maths co-processor.

Thus the mother board has the main electronic circuitry, plus various expansion slots. The computer's RAM (Random Access Memory) chips are mounted on plug-in modules known as Single In-line Memory Modules (SIMMs) or Single In-line Packages (SIPs). Eight slots for SIMMs are shown in Fig. 1. Not long ago a PC would have a typical memory capacity of 1Mbyte. Today a minimum of 4Mbytes is desirable. Plugging extra PCBs into these slots provides additional memory capacity or facilities.

The RS232 board, known as the serial/parallel input/output interface, plugs into the mother board. It provides typically one-four serial data ports so that devices such as a mouse, light pen or scanner can be connected. It also drives Centronics compatible parallel data line ports (labelled LPT1, LPT2 etc.) that provide links to devices such as a printer, a modem – or another computer.

The Graphics Adaptor board also plugs into the mother board. It drives the monitor. Although a monochrome monitor is appropriate for business use, it's worth investing in a high-resolution colour monitor. Choose your monitor carefully: go for one that produces deep, rich colours without fringing around white letters.

The currently popular super VGA colour monitors provide a resolution as high as 1,024 x 768 pixels with 16 colours, or 800 x 600 pixels with 256 colours. Line scanning frequencies – higher than used in TV sets – are typically between 30 and 38kHz. Field scan rates may range between 45 and 85Hz. Early colour monitors responded to digital input signals. This limited the range and quality of the colours that could be produced, because the signals changed in distinct digital steps. Today's analogue monitors produce far superior colours.

A 14in. super VGA interlaced monitor, set to 640 x 480 pixels with 16 colour modes, is suitable for service department use. If you intend to use the PC for desktop

publishing, or with a CAD (Computer Aided Design) package, a 17 or 20in. high-resolution, non-interlaced monitor is desirable. With a TV receiver an interlaced display is necessary because of the limited signal bandwidth. For some PC applications however the signal bandwidth may be 80MHz or higher.

A screen glass anti-glare filter is a 'must'. Don't take chances with precious eyesight. A good filter screen protects the user from ultraviolet rays, eliminates external light reflections and improves the sharpness of letters. Buy one that has an anti-static chassis earthing lead and complies with the new EC legislation.

In the arrangement shown in Fig. 1 a Small Computer Systems Interface (SCSI) PCB, or 'Scuzzy' as it's called, plugs into mother board to provide links to the discs. It controls the outputs to and inputs from a hard disc drive (drive C) and 3.5in. microfloppy and/or 5.25in. floppy disc drives (drives A and B). An alternative to the SCSI board is an Integrated Drive Electronics (IDE) board – these are becoming popular. With an IDE board some circuitry that was once in this area is moved into the hard disc drive unit.

The Hard Disc Drive contains several aluminium platters. Each one has a thin magnetic surface that can store many Mbytes of digital data, including the computer's Disc Operating System (DOS). The floppy disc drives are used to back-up information, to store additional data and load programs etc. on to the hard drive.

A program that's known as the Basic Input/Output System (BIOS) is contained in a chip on the mother board. When you switch the PC on, the BIOS first carries out some test routines. It then orders the DOS program that's stored on the hard disc to load itself into the RAM chips. The BIOS chip also contains other programs that give orders to the system hardware.

The Keyboard

The older 'standard' keyboard is now obsolescent. You need a modern 102-key (UK) enhanced version. Before buying a keyboard, satisfy yourself that the keys have a firm, positive feel.

The Mouse

This is a small device that you roll around on the desk surface to control the movement of the cursor on the screen. When the required function or Window's icon is covered by the cursor you select it by pressing the button on top of the mouse. Get a mouse matt: it's inexpensive and makes it much easier to use a mouse.

The Disc Operating System

The Disc Operating System (DOS) program is stored on the hard disc. When the PC is switched on it first 'boots up'. This expression comes from the old saying to 'lift yourself up by your bootstraps'. You see a changing series of numbers and statements on the screen. The PC is testing its functions, booting itself up and giving itself instructions. It then loads the DOS into the RAMs connected to the mother board.

There's also on the hard disc a collection of statements in a file known as the CONFIG.SYS. After loading the DOS into the RAMs the computer reads this file and immediately carries out the CONFIG.SYS instructions. These specify vital DOS settings, such as the number of files DOS can have open, and the keyboard settings.

The computer then searches the hard disc for a file called AUTOEXEC.BAT. This orders the DOS to load certain commands into the RAMs, and sets what is known as a 'path' for certain programs. Type a few keystrokes and these programs are instantly available. AUTOEXEC.BAT commands also set the time and date, mouse control and other factors.

The DOS program acts as a general manager. It controls the flow of digital data between the various disc drives, and translates the instructions received by the computer from its electronic bits and the installed software program. Instructions typed on the keyboard make DOS talk to BIOS which in turn tells the CPU what to do.

Three popular disc operating systems are MSDOS 5 (Microsoft DOS no. 5), IBM's new OS/2.0 and Digital Research's DRDOS 6.0. They are all good and you won't go wrong with any of them. When you buy a PC or a separate hard disc you may find that an operating system has already been installed.

My personal choice is DRDOS 6.0 which includes DiskMAX, a program that's claimed to double the hard disc storage capacity, TaskMAX and MemoryMAX. It also has ViewMAX, an optional user-friendly graphical interface, and a comprehensive set of excellent instruction manuals.

Buying a PC

How much PC power will you need? Not enough means that the machine won't meet your needs. Too much means that hard-earned money has been wasted on features you'll never use. The nice thing about a PC however is that additional RAM and plug-in expansion PCBs are easy to add – make sure that the PC has plenty of expansion slots before you buy it. With many PCs you can update, usually by changing the mother board, to a faster, more powerful CPU.

My minimum recommendation for service department use is a PC with a 25MHz 80386 CPU and 4Mbytes of RAM. Anything less will soon become obsolete. Buy one with a high-quality hard drive which has a minimum storage capacity of 60Mbytes. For the larger business 120Mbytes or more is advisable.

You'll also need at least one 3.5in. floppy disc drive. A full tower system will have space for several floppy disc drives and additional hard drives. A 5.25in. floppy disc drive can be fitted if you wish, but 5.25in. discs are now on their way out.

Building a PC

A profitable undertaking for the service engineer is to build your own PC. The one that I'm using to write this article was assembled from separate PCBs in a full tower case. The PCBs and parts are all readily available. You don't even need a soldering iron, as everything plugs into the mother board or connects by means of plug-in leads.

Not only will you save money: the finished unit will not be just a mysterious box of tricks. You'll know how it operates and, if necessary, will be able to service it yourself. To call in a computer engineer to fix a faulty PC is expensive, as is a maintenance contract. A PC is easier to repair than a VCR or a camcorder, and is a lot more reliable. The TV engineer will naturally be quite at home should the monitor require attention.

Another point is that PC construction, installation and servicing offer an extra and profitable source of income for the competent service engineer.

Several companies have available complete PC kits. With one of these everything is to hand when construction starts, and the completed unit will be as good as any other one on the market. Another advantage of buying a kit rather than separate items from different suppliers is that a help line is available should a problem arise.

At the time of writing Maplin has reasonably priced IBM compatible desktop kits. Maplin and Watford Electronics can supply individual boards and components with which to build your own desktop or tower PC.

Constructing and testing a DIY PC will be the subject of a separate article later.

Printers

Printer prices have dropped to an all time low. The dot-matrix type, in which the printed letters are formed by a series of dots made by pins that strike through a ribbon, is the most economical type. You can get from 9-pin types (draft quality) to 24-pin types that provide good, clear near letter or letter-quality print. Prices range from about £100 upwards.

Inkjet and Cannon's Bubblejet printers produce better results. PaintJet colour printers are available at around £700-£800. Laser printers produce the best quality printing. They are more expensive to buy and cost more to run, though at the time of writing prices continue to fall.

The Daisywheel printer is now virtually obsolescent. New ones are still available however. They are low cost devices that are cheap to run. The Daisywheel printer uses the same technology as a top-quality electronic typewriter, with superb print. Its drawbacks are slowness and inability to print graphics and drawings.

Some printers are noisy. If this worries you a sound-proof acoustic lid can be fitted – but this may cost more than the printer! Before buying a printer try to see (and hear) it working.

Paper is handled either in the form of continuous sheets with tear-off holes or via a sheet feeder. The sheet-feeder is probably the best arrangement for the service department: it saves the bother of having to separate the sheets and tear off yards of sprocket holes.

Bundled Software

'Bundled software' is supplied with many PC systems. It may consist of an operating system program with integrated software to provide wordprocessor, spreadsheet, database and other facilities. Personally I think it best to buy or build your own PC system at the most advantageous price then select software programs to suit your particular requirements.

CLI and GUI

Software programs come on floppy or microfloppy discs with instruction manuals. You load the program into your computer and store it permanently on the hard disc. You can choose between text-driven Command Line Interface (CLI) and point-and-click Graphic User Interface (GUI) software programs. Before making your choice, try to see both types in action.

If you are happy with a screenful of little coloured pictures (icons in computer jargon), you may favour GUI (Windows). With GUI you move the screen pointer to the icon that represents the required program, function or setting, then click a mouse button to select it. Many computer enthusiasts love GUI with its pretty pictures.

Windows programs require a lot of hardware – hefty chunks of hard disc space and many Mbytes of RAM. You also need to buy and install Microsoft's Windows 3.1 program plus a DOS operating system. The quoted system requirements for Microsoft Windows 3.1 are 7Mbytes of hard disc space and a minimum of 2Mbytes of RAM.

Other Windows programs require more RAM and plenty of hard disc space, while at least a 386 CPU and preferably a 486 type is desirable. The state-of-the art Windows NT program calls for yet more Mbytes of hard disc space plus, it seems, at least 8Mbytes of RAM and a 486 CPU.

With DOS-based CLI programs you start with a clear screen at the DOS prompt (C). A few brief keystrokes select the desired program. In a business context the competent touch-typist who doesn't need to look at the keyboard will probably prefer a DOS-based program (the incompetent two-finger basher who does look at the keyboard will also be happy with CLI, and to hell with the icons – editor!). It's easier than using a mouse to chase little icons over the screen.

Next Month

In the concluding instalment we'll consider software programs that are suitable for the forward-looking service engineer who wants to boost his income. We'll also discuss several wordprocessing, spreadsheet and CAD packages, modems/fax programs and virus prevention programs helpful to the video/TV engineer.

Table 1: Some computer terms

AT PC: Advance Technology PC – has an 80286, 80386 or 80486 CPU.

Batch file: File containing a sequence of commands. Typing in the name of the file loads the desired program.

Boot: The start-up process when a PC is switched on. The PC tests itself then loads the disc operating system from the hard disc into RAM.

Bus: An expansion lead that carries data between different sections of the computer.

Centronics port: Usually called a parallel port. Used to feed data into and out of a computer. Often feeds a printer.

Crash: Program failure where the PC locks solid. You must then reboot the computer (see below).

Default setting: Settings/colours used by a PC automatically unless you chose something different.

Disc cache: Section of memory used to store a copy of binary data recently read from the hard disc.

DPI: Dots per inch – the resolution of a printer.

FAT: File Allocation Table. Found at the start of every disc. Contains information used by the DOS to locate file entries.

File: Section of data stored on a disc for retrieval by the PC.

Mailmerge: Enables customers' names and addresses held

in a database to be inserted at any desired point in a standard letter. This gives the impression of a personal letter.

Memory terms: One byte is eight bits, a nibble four bits. A RAM is a random access, i.e. read/write, memory. A ROM is a read-only memory. An 'extended memory' (one Mbyte and above) cannot be addressed by DOS, though 80286/386/486 CPUs can in a special mode. An 'expanded (EMS) memory' is one that uses a bank-switching procedure to give access to up to 32Mbytes of memory in 64Kbyte chunks.

Multitasking: Running two or more programs together.

Macro: A time-saving way of recording a keystroke sequence that can be recalled when needed.

Pixel: Pixture element – each dot on the screen.

Program: A series of instructions that tell the CPU and thus the computer what to do.

Reboot: Force the PC to repeat its start-up procedure.

RS232: International standard for serial port operation.

WIMP: Stands for Windows, icons, mouse and pointers.

XT PC: Extra Technology PC. Has the older 8088 or 8086 CPU.

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What a Life!

Donald Bullock

Life has been easier since son Steven started to work with me. What has distressed me a bit however is the speed with which he's picked up technical knowledge that took me forty years to acquire. But it does mean that I can slip off to Spain whenever I like, in the knowledge that life in the workshop goes on – just as long as I slip back often enough to sweep the floor, wash the teacups, empty the dustbins and tackle the tricky ones that pop up now and again. The fax machine has proved to be a boon to us, but one thing I could do with is a set of the last fifty or sixty copies of *Television*. Can anyone oblige?

Mr Nutt's Problems

We have been in this business a long time now – to the extent that we've had the valued custom of four generations of some local families. Those whom I moan about are a minority. It's just the relentless dedication with which they afflict us! Take Mr. Nutt for example. He's the paranoid smallholder who is convinced that everyone is watching him and eavesdropping. The other day he called in with his Philips 16in. portable – it's a KT3 chassis set.

"My neighbour has aimed a dish transmitter at my place" he confided. "But I've got him rumbled. This old set lets me know whenever he listens in to us. The picture turns into a transmitter. I want you to build something into the set to stop him."

Now I know Mr. Nutt of old. Apart from this fixation he's perfectly sane. Arguing with him about it is useless. "All right Mr. Nutt" I said, "leave it with us."

For the first ten minutes the set suffered from intermittent line collapse. I confidently resoldered the pins of the line output transformer but this made no difference. I then found, by tapping and flexing the chassis, that the cause of the trouble lay somewhere in the area around the U470 sync and U450 power modules. Resoldering every doubtful joint on the two panels and lightly cleaning the edge contacts again failed to cure the problem. So I finally switched off the workshop lights, drew the blinds, felt my way back to the chassis and began tapping about on it. As I did so I noticed a spark. When I switched the lights back on again I found that it had come from one leg of the degaussing resistor R292. It was dry-jointed, though it looked all right. Resoldering it cured the trouble.

Nostalgia

I was going to study the circuit to see why R292 should have had this effect but the phone went and Greeneyes came in with the tea. She was just in time to hear me being less than enthusiastic about attending to a satellite TV system.

"What's the matter with you?" she asked. "When I came to work with you as your secretary colour TV was just starting and you sailed into colour servicing quite cheerfully. It's not at all like that now." Steven wanted to know what it was like in the early days, which always gets me going.

When I started there was only monochrome BBC in Band I. Most of the sets were of the t.r.f. type, gramophone records were shellac 78s and classy homes had radiograms.

Then ITV started up in Band III, bringing signal problems the like of which we'd never seen before, and

programme converters that sat on the top of the set. They too caused problems galore. Cyldon and Brayhead subsequently came up with a family of rotary tuners that were designed to be fitted into the sets. When converting a set for ITV reception we first had to make sure that we had the right tuner. Then, armed with braces and bits, we'd cut a huge hole in the side of the customer's highly polished and valued TV set, hoping against hope that our conversion would be satisfactory.

All sorts of things could blight our plans. If we weren't careful, the bulky tuner wouldn't align with the hole we'd made. But the most common headaches were that the Band III signal available, from Birmingham in our case, wouldn't be enough, or that the pictures obtained would be heavily patterned. Sometimes the neighbours would experience patterning.

In this area every conversion was a chancy business. As the ITV signal was dicey and weak, service calls multiplied. "Poor ITV" was a common complaint, and we'd trot off with a pocketful of r.f. amplifier valves. The Mullard PCC84 was the most common one, but there were also UCC84s and ECC84s, and some of the more exclusive brands like Murphy and Ekco used Mazda valves – the 30L1 to start with, then later the higher-gain 30L15. It wasn't long before we resorted to the dodge of using the high-slope 30L15 whenever a low-emission r.f. amplifier valve had to be replaced. It meant adjusting the r.f. padders in the tuner, something that was supposed to be taboo, but the effect was little short of miraculous – until the valve's emission settled at a lower level.

Most Mazda valves had metal skirts and fitted rigidly into the special holders. They seemed to present instability problems however. Trying to calm an Ekco i.f. strip was a difficult business. I settled for using Hunt's paper capacitors connected between the screen grids and chassis, followed by careful realignment. I never did find an answer for use with the red, metal-cased Mullard EF50 valves. They seemed to be determined to float regardless.

But the picture quality with those early Ekco and Murphy sets was remarkable for their day. Our favourite was the Ekco 327. There was a scramble for it every time one came in part exchange. Eventually we all had one.

Relaying these things to Steven suggested to me why he's so bright and receptive to the latest developments while I'm less so. "Your brain is like a brand new computer loaded with miles and miles of virgin tape" I said. "Mine's an old valve model with the tape worn out by repeated erasure of redundant technical knowledge. I used to know countless valve equivalents, and furthermore which pin was connected to which electrode in them all. I can still remember dozens of them. All useless knowledge now, taking up space in my napper. Same with all the technical tips and ruses for scores of radio and TV brands that are now just memories. There's hardly any room left for all the new-fangled things you pick up so easily!"

Later, I heard Steven talking to Greeneyes as they looked through an ancient photo album he'd found.

"Dad looks bright and young in these pictures" he said. "Funny what happens as time passes."

I poked my head around the door. "That old Decca you're stuck on – the one with no luminance. You can put your scope and meter away. Just pop in another luminance delay line. There's one in that old Tatung chassis you couldn't fix. And that Bush 2020T that's still giving you problems even though you've changed the TDA3562A. Take it out and fit a Telefunken one – or do the mod. Oh, and that Saba you were waiting for help to lift it off the bench: I've popped it in the van for you."

Test Case 368

Workshop Sage, dragged away from his bench to the reception desk, was confronted by a customer who wanted an instant quote for video head replacement in a fairly ancient Panasonic front-loading VCR. Quizzed as to how he knew that the heads were faulty, Mr. Wells explained that the diagnosis had been made some months earlier by another dealer who was no longer in business. Mr. Wells mentioned that the dealer had twice boosted the heads. This puzzled Sage somewhat. He'd heard of picture tubes being boosted, but not video heads. What wonder technology had the now defunct dealer used?

Anyway, Sage went off to consult price lists and suchlike and came back with alternative prices for pattern, rebuilt and Panasonic original drums. Mr. Wells accepted the lowest of the three quotes, which was probably wise in view of the age of the machine. So an upper drum assembly was ordered and the machine was taken to the waiting-spares rack.

The job of fitting the replacement, when it arrived, was given to Sherlock who had said that he wanted more experience in this side of servicing. Before he fitted the drum Sherlock checked out the machine. During playback of a known good tape all the classic symptoms of worn heads were seen – there were worms, dots and streaking in the picture. The machine's own recordings were very much worse. So there was no doubt that the heads were in need of replacement. Donning his cotton gloves, Sherlock soon had the old drum out and the new one in. He'd changed one upper drum before, so he knew the ropes reasonably well. He also found that the back tension was far too high, as it often is with Panasonic VCRs.

Sage wouldn't let him use the alignment tape for setting up! He was given a colour-bar cassette, with an

assurance that it was a perfectly acceptable substitute. Sherlock then set about the mechanical alignment, which is not difficult provided the necessary test equipment – primarily an oscilloscope and a good format-standard tape – is available. With this vintage of machine there's no fancy auto-tracking system to worry about. The job progressed well, a good straight-edged r.f. envelope pattern being obtained with minimal tweaking of the entry and exit guides. Lateral adjustment of the audio/control head assembly then enabled best tracking to be made to coincide with the tracking control's centre position. At the end of the session the quality of the playback picture was excellent for an old machine and Sherlock was well pleased with the results of his efforts. His pride evaporated within minutes however!

The trouble occurred when Sherlock did a test recording and then viewed the playback picture. It was marred by steaking and white/black inversion effects. These were similar to those present before the drum had been replaced, though they were not quite so bad. Sherlock tried another tape, with exactly the same results. Cleaning the heads didn't help at all, and Sherlock began to suspect that he'd fitted a faulty drum. There wasn't another one in stock with which to carry out a substitution test, and almost every idea that occurred to Sherlock had to be discounted because the playback performance was so good. The back tension was rechecked and found to be correct, as were the lead-out connections from the new heads. Time for a consultation!

While Sherlock described the setting-up and alignment procedures he'd gone through since fitting the replacement drum, Sage looked at the playback picture with a recording made by the machine itself. It was very plain to Sage where the trouble lay, and how the previous service department had 'boosted' the performance of the worn heads. If it's not plain to you, give it some thought before turning to page 739 for the solution!

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Modern TV Receiver Techniques

Part 8: The Shadowmask Tube

Eugene Trundle

The basic operating principles of the shadowmask colour tube have remained unchanged since it first came into use in the USA some forty years ago. There have however been many refinements and improvements in that time.

Basic Mode of Operation

Three cathodes, one for each of the primary colours red, green and blue, are heated in a vacuum. Under these conditions electrons are emitted from the surface coating of the cathodes. They are formed into sharply-focused beams which are accelerated towards the screen. As they emerge from the gun, the beams are deflected from side to side and from the top to the bottom of the screen to trace out the raster. This beam deflection has to be synchronised with that in the camera or other picture source, for which purpose sync pulses are added to the picture information. Deflection is carried out by generating magnetic fields in the neck of the tube. Synchronised, sawtooth-waveform currents are passed through coils (the scanning yoke) around the neck of the tube to produce these fields. The line-frequency current waveforms produce side-to-side deflection and the field-frequency waveforms top-to-bottom deflection.

As the beams emerge from the neck into the bowl of the tube they are accelerated by a very high voltage so that they strike the phosphor-coated screen at high velocity. Thus bombarded, the red, green and blue phosphors glow brightly, forming a pattern of light, shade and colour. Continuously refreshed with new information, the screen displays coloured, moving pictures.

The key to the operation of a colour picture tube is the shadowmask, which is mounted about a centimetre behind the phosphor-coated glass screen. Precision-aligned with the vertical stripes of red, green and blue light-emitting phosphor on the rear surface of the screen, the shadowmask acts as a filter to ensure that each of the three beams strikes only the coloured phosphor assigned to it. By using the red, green and blue drive waveforms to modulate the intensity of the three beams the amount of each type of light produced at the tube screen is continuously varied. In various proportions, the combination of red, green and blue light can produce white, grey and almost any colour that occurs in nature. Cutting off a beam removes that colour, while cutting off all three beams leaves us with black. Though we take it for granted, the colour TV picture tube is a truly amazing piece of precision technology.

Driving the Tube

Most of the 'hardware' within a conventional TV set is concerned with control of the tube and the scanning process rather than signal handling. Thus the circuitry we've looked at so far in this series represents only a small proportion of the cost and bulk of a set's contents.

Apart from the easily obtained power to heat the tube's cathodes, it's necessary to generate high voltages to modulate, focus and accelerate the electron beams, and to provide precision generators of the sawtooth currents that flow

through the deflection coils. All this depends in turn on the provision of a closely-stabilised and efficient power supply. Much of the energy produced by this power supply is dissipated as heat in the shadowmask and in the tube drive system. Despite this, the shadowmask tube looks set to remain for many years to come the standard TV picture display system. Only in somewhat specialised applications, e.g. for very small and very large pictures, is it being usurped by other technologies such as LCD devices. In taking a closer look at the operation of the shadowmask tube, we'll start at the back end.

The Electron Gun

The electron gun generates, modulates, focuses and accelerates the three electron beams. The process starts with a tungsten heater that's buried in but insulated from a cylindrical cathode. This has a coating that consists of a mixture of oxides of barium, strontium and calcium. When heated to over 1,000°K this coating emits electrons which form a cloud, or space charge, around the cathode. Closely surrounding the cathode and spaced about 0.1mm from it is the so-called grid, in practice a nickel cylinder with a closed end except for a pinhole in the centre (see Fig. 1). The beam emerges from this pinhole, its intensity being controlled by the potential difference between the grid and the cathode. In practice the grid is held at a fixed voltage of around zero while the cathode voltage is varied above and below some 140V, thus altering the effective grid bias. The more negative-going the cathode voltage with respect to the grid the greater the electron current flow, since this is equivalent to making the grid more positive with respect to the cathode. (The beam consists of electrons that carry a negative charge: they are thus attracted to a point at a more positive voltage.)

The electron beam is brought to a sharp focus, or crossover, just beyond the grid by the electron-lens effect of the grid and the next electrode, the first anode (often referred to as the screen grid), which is held at a constant potential of a few hundred volts. The purpose of the next electron lens is to focus an image of this sharp crossover point at the phosphor screen. It's done by two or more cylindrical electrodes which, as shown in Fig. 1, are held at progressively higher voltages.

After the initial crossover, the diverging beam of electrons is pre-focused by the lens formed by the first and second anodes. The main electron lens consists of the cylindrical anodes two and three, which are usually operated at about 5kV and 25kV respectively. The beam of electrons

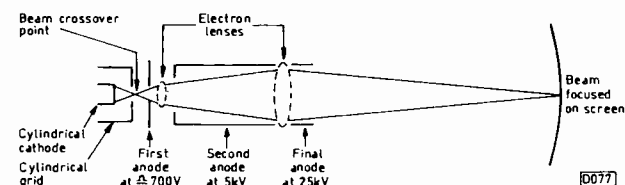


Fig. 1: Basic arrangement of a picture tube electron gun.

diverges until it reaches a point between these two electrodes, then begins to converge again, being brought to a focal point at the phosphor surface behind the tube's faceplate (screen). By adjusting the voltage applied to the second anode the focal length of this second electron lens is altered, enabling the beam to be precisely focused at the screen. The focus control takes the form of a potentiometer which in modern sets is generally integrated with the line output transformer.

What we have described so far is the basic electrode system. Various more complex arrangements have been designed. They depend on the tube's neck diameter and the characteristics of the deflection fields. Fig. 2 shows a lens system with five anodes. This is often used in narrow-neck, wide-angle tubes to compensate for the small lens diameters for each beam.

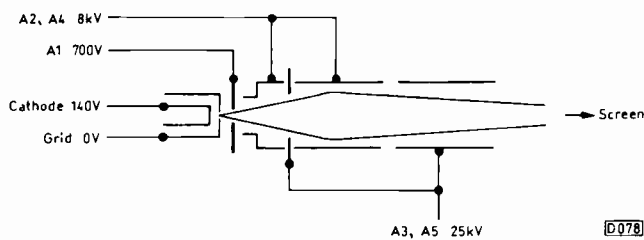


Fig. 2: This combination of a high uni-potential and a bi-potential lens gives reduced spherical aberration in the lens system as a whole.

With a conventional electron gun structure the three cathodes are mounted close together side-by-side and the accelerating and focusing electrodes are common to all three beams, though with separate apertures for each beam: the effect is of three small electron-lens systems side-by-side.

Other types of tube, notably the Sony Trinitron, have a single, large-diameter electron-lens system that's common

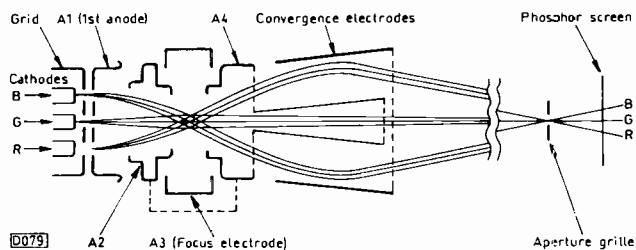


Fig. 3: The Trinitron gun system, which has a common electron lens for all three beams.

to all three beams. Fig. 3 shows the basic arrangement. Here the three beams cross over in the centre of the gun. The single, large lens system focuses the electrons in each beam, the following convergence electrode system setting the outer (blue and red) beams so that all three beams converge at the shadowmask (in the Trinitron the shadowmask takes the form of an aperture grille). With a conventional tube this convergence function is performed by magnets, as we shall see next.

Beam Alignment and Landing

During manufacture of the picture tube the phosphors are laid down on the faceplate – in effect printed – with reference to fixed points for each beam at its deflection centre (the centre of the area under the influence of the deflection fields), since seen from the shadowmask and

screen the deflection centre is the apparent origin of the beam. To ensure that each beam lands on only the correct phosphor stripes, the beams must be prealigned after leaving the gun and before entering the deflection fields. This can be done by means of a pair of two-pole magnet rings that move the positions of all three beams in the horizontal plane. The rings are adjusted for correct colour purity, i.e. so that the beam from one gun doesn't spill over on to the adjacent phosphor stripes, 'staining' the colour reproduction.

In effect the colour picture consists of three separate red, green and blue images which must be overlaid exactly and kept in registration at all points over the screen. To take up tolerances in tube manufacture, a means of adjusting the positions of the images traced out by the two outer beams (red and blue) so that they are precisely overlaid with the green image produced by the centre beam (green) is generally provided. Again this is done by means of ring magnets, a pair of four-pole magnets and a pair of six-pole ones. Their magnetic fields affect only the paths of the outer beams and can move them in either direction, either together or differentially, the adjustment being known as static convergence. Aim for no colour fringing at or near the centre of the screen.

In some types of tubes, notably Philips ranges, these beam alignment magnets are neither visible nor manually adjustable: during manufacture they are induced in a magnetic ring that's mounted at the end of the electron gun assembly. With most other types of tube the external ring magnets are aligned and sealed at the factory, and are not intended to be adjusted or disturbed during the life of the tube.

Beam Deflection

We have seen how the beams are generated, modulated, focused and aligned with respect to each other: they amount to a sort of three-colour pen that can be used to trace out the picture. This tracing action is carried out by the powerful magnetic fields produced in the neck of the tube by the deflection yoke, a double pair of saddle-wound (usually) coils on a ferrite former. The yoke is a tight fit on the tube's neck and embraces part of the flared section of the tube where the neck opens out into the bowl. Vertical lines of magnetic force deflect the beams horizontally while horizontal flux lines produce vertical deflection. With sawtooth current waveforms at the correct frequencies flowing in the in the line and field deflection coils, a rectangular raster is traced out on the screen. So long as the scanning is synchronised with the video information, the image is correctly positioned with everything on the screen in the right place and correctly proportioned.

Dynamic Convergence

As we've seen, the primary purpose of the scanning yoke is to deflect the beams. In a monochrome tube with a single beam the yoke generates homogeneous (evenly spaced) magnetic fields in the tube's neck. With a colour tube the yoke has two secondary but very important functions: it has to correct for the inherent pincushion distortion that occurs when a relatively-flat, rectangular screen is scanned; and it must converge the beams so that the images they produce coincide over the entire screen area, at the edges as well as the centre.

Pincushion correction is achieved by precision shaping of the magnetic field density in the tube's neck. Dynamic convergence as it's called is also a function of magnetic flux

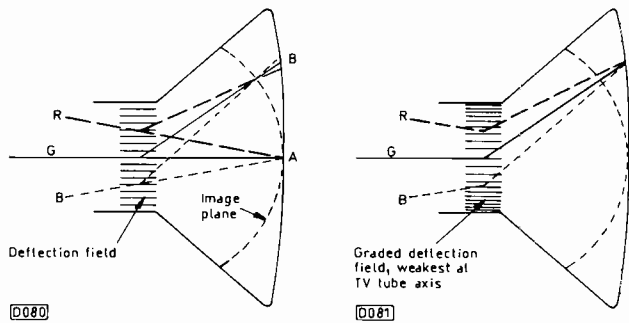


Fig. 4 (left): With a uniform deflection field the three beams converge at point A in the centre of the screen, because the screen and the image plane coincide here. Near the edge of the screen (point B) the three beams are no longer in registration – being beyond the image plane they diverge. The beam approach angles in the neck of the tube have been exaggerated to illustrate this.

Fig. 5 (right): By using a specially-tailored deflection field of graded density, each beam's deflection angle is slightly different, ensuring convergence of all three beams across the width of the screen. Again the beam approach angles have been exaggerated.

tailoring in the deflection field – see Figs. 4 and 5.

Fig. 4 shows the effect of a uniform horizontal deflection field in a cross-section of the tube. The three beams converge at the centre of the screen: since each beam is affected equally by the magnetic flux, convergence is maintained along an arc called the image plane. Away from the centre the beams diverge, striking the screen out of registration with each other, the misregistration increasing towards the edges of the screen. Fig. 5 shows how the design of the deflection yoke can prevent this: the flux density of the magnetic field varies across the neck of the tube so that the angle through which each beam is deflected depends on the path it takes through the deflection zone. The outer (blue and red) beams can especially be seen to pass through 'magnetic gradients' as they are being deflected. The result is that the three beams converge at the same point on the screen at all horizontal deflection angles.

For vertical scanning a barrel-shaped field is required to achieve the same effect. Fig. 6 shows the astigmatic flux fields required for vertical and horizontal beam deflection. The yoke is designed to produce these fields, and is closely matched to the tube with which it is intended to be used: many yokes are sealed on to the tube, forming an integral part of the picture-tube assembly.

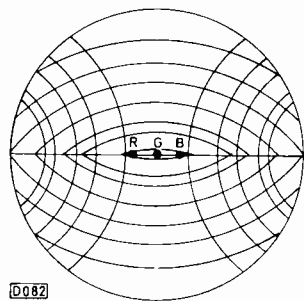


Fig. 6: Cross-section of the tube neck at the deflection centre, where the neck opens out into the bowl. The lines show the astigmatic fields required to retain correct convergence of the beams over the entire screen area.

In general, tube sizes up to 53cm (21in.) have 90° deflection angles and no need for external pincushion-correction circuitry in the scan-drive circuits. Larger screen sizes employ deflection angles of around 110° and require an amplitude-modulated line scan drive (EW correction) to cancel out the inherent pincushion distortion in the raster. We'll examine these correction circuits when we come to the timebases later in this series.

Earlier colour tubes required elaborate dynamic convergence correction arrangements (a separate yoke assembly and coil on the tube neck) and raster correction systems. Spot defocusing at the edges of the picture was a particular problem. Improvements in electron lens design and the use of computers to design precision deflection yokes has rendered this unnecessary.

The Shadowmask

All consumer-type, direct-view picture tubes have shadowmasks with vertical slots. Most have a matrix of slots as shown in Fig. 7(a): Trinitron tubes have an aperture grille

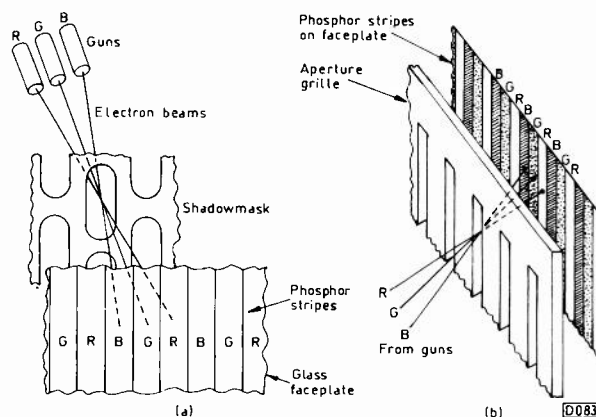


Fig. 7: Slot mask/phosphor stripe screen system used with a conventional tube (a), alternative aperture-grille arrangement used in Sony Trinitron tubes (b).

with long, continuous slots as shown in Fig. 7(b). With large Trinitron grilles there are three very fine (three-micron diameter) wire cross-braces to keep the assembly rigid, especially when hot. The principle of the shadowmask is illustrated in Fig. 8: it depends on the slightly different approach angles of the three beams to intercept and block beam electrons heading for the 'wrong' phosphor – we've already seen that the beams are prealigned to ensure that their approach angle to the shadowmask is correct.

In doing its job the shadowmask absorbs over 75 per cent of the energy of the beams, dissipating it as heat – between 5W and 25W depending on tube size and picture brightness. This heating results in expansion of the steel shadowmask, bringing with it the risk of doming or bulging and consequent picture colour impurity. Various measures can be taken to combat this. First the whole mask is held in a spring- or swing-support system for controlled expansion. Blackening the mask assists dissipation, while a surface coating of ceramic material can be applied to stiffen it. Instead of using steel, a metal called invar can be used: it's more expensive and difficult to work, but has a lower coefficient of expansion.

Degaussing

If the shadowmask, its mounting system or the tube's rimband becomes magnetised, beam landing is upset and

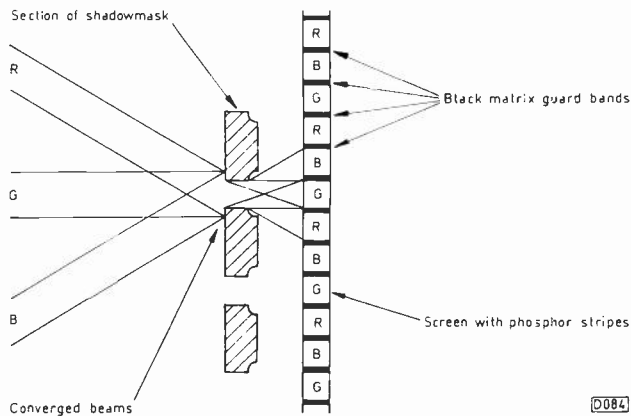


Fig. 8: Illustrating the filter action of a shadowmask. The electron beams are wider than the slots in the shadowmask and are sharply 'chopped' by them. The beam approach angles have been exaggerated to help show the effect. The same principle is used by the Trinitron tube's aperture grille.

the result is colour impurity. A magnetic shield inside the tube acts as a barrier to ambient fields such as that of the Earth. This, the mask and the rimband are magnetically neutralised at each switch-on from cold by a degaussing coil harness mounted on the outside of the tube's bowl. At switch-on the coils are briefly energised by a 50Hz a.c. mains current that decays to virtually zero within a second or so as the control element heats up.

The Phosphor Screen

The phosphors used are chemical compounds, based on zinc- and oxy-sulphides, that glow when bombarded by electrons. Each phosphor is dyed (pigmented) in its own emissive colour in order to increase the absorption of ambient light. The screen is thus made darker and less reflective, improving the picture contrast – especially when the screen is being viewed in high ambient light conditions. For the same reason the spaces between the red, green and blue phosphor stripes, present to provide guard bands against the effect of slight horizontal beam-landing errors, are filled with a carbon- or graphite-based black pigment. This is called black matrixing: with more recent tube designs there have been improvements in the way in which the black pigment is deposited on the screen, giving better

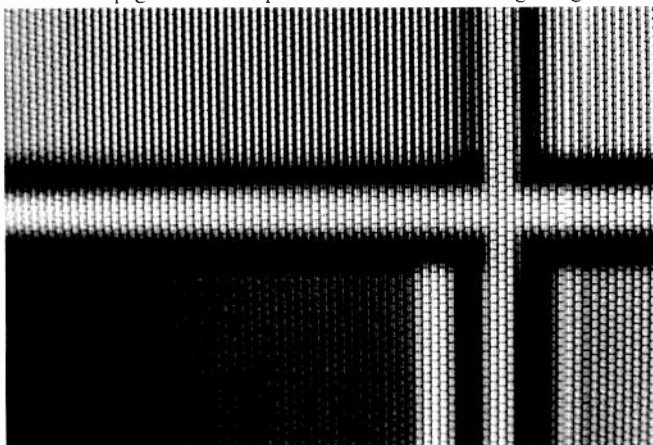


Fig. 9: Phosphor stripes in action on the faceplate of a TV picture tube. The black matrix stripes between the colour phosphor stripes can be seen. Though the phosphor stripes are continuous vertically, the lozenge-shaped shadowmask perforations are visible, breaking the colours into elongated dots.

resolution, saturation, brightness and white uniformity. Fig. 9 shows a close-up of part of a test pattern on a 68cm screen.

Each phosphor stripe is about 180 microns wide: an RGB triplet, with black guard bands, is typically 800 microns (0.8mm) wide in a large-screen picture tube. With smaller tubes (say 51cm and less) the stripe triplet is about 600 microns wide. Obviously the stripe pitch is a limiting factor for picture definition, and small screens cannot resolve the full detail available with a broadcast transmission or an S-VHS or Hi-8 tape recording. For special purposes, e.g. for high-resolution picture monitors and computer VDUs, tubes with a finer stripe pitch – down to 300 microns/0.3mm – are available. Their price is correspondingly high.

The back of the phosphor layer is sprayed with a coat of shiny, conductive aluminium, just like a mirror. This serves three purposes. It reflects the phosphor light forwards, forms a barrier for harmful ions (heavy charged particles) in the electron beam, and equalises the electrostatic charge over the entire screen area. The back of the aluminium layer is in turn coated with a black pigment to absorb heat radiated from the nearby shadowmask and dissipate it in the large heatsink/exchanger formed by the tube's glass faceplate.

The Faceplate

To withstand the huge atmospheric pressure upon it, the glass faceplate of even a relatively small tube is 12.5mm (0.5in.) thick at the centre, more at the edges and corners. It's made of darkened glass, the transmission factor being typically fifty per cent. Although this light-filtering effect halves picture brightness, the contrast is improved: while the picture light passes through the glass only once, reflected ambient light (from the viewing area) has to pass through twice. This makes the screen appear darker, improving the perceived picture contrast.

Apart from providing the viewing area, the glass faceplate acts as a barrier to X rays and provides implosion protection. X-ray radiation occurs when metalwork is under electron bombardment at a high enough potential. Any X-ray radiation is contained within the tube by including strontium carbonate in the glass mix from which the tube's envelope is made. Protection against implosion is provided by the sheer strength and thickness of the glass, aided by the rimband which contains the outward pressure of the faceplate edges due to the tension within it.

Because of the need to keep the aperture grille in tension, the faceplate of the Trinitron tube has a dead-flat vertical profile: the curvature in the horizontal plane corresponds to a section of a large cylinder. Other types of tube have a front profile that matches a small section of a large sphere, with in some cases a flatter central section.

Miscellaneous Features

A graphite-based conductive coating is applied to both the inner and the outer surfaces of the picture tube's bowl. In conjunction with the glass envelope of the tube as the dielectric, a capacitor is thus formed: it acts as a reservoir/smoothing capacitor for the e.h.t. supply. Sometimes the charge held may be suddenly released in the form of a flashover – a spark between electrodes within the tube. This suddenly-released energy can be life threatening to

semiconductor devices in the TV set/monitor. Its effect is minimised by making the internal conductive coating resistive (to reduce and dissipate the surge) and by providing spark gaps and series resistors on the tube base panel to intercept the voltage spike when a flashover occurs.

The e.h.t. connection is made to the internal conductive coating. The beam current thus returns to chassis via the relatively high-impedance e.h.t. system. By including a resistor at the earthy end of the e.h.t. system the beam current can be monitored to provide protection in the form of beam-current limiting via the tube drive circuits and/or some other arrangement such as shutting down the tube drive.

Before it's sealed the tube is pumped to a high vacuum. During the life of the tube however gases are liberated from the electrodes and chemicals within it: they are absorbed by the gas-hungry getter, which is made of a barium compound and is activated by r.f. heating after evacuation of the tube.

Widescreen Tubes

The new generation of widescreen tubes (16:9 aspect ratio) do not differ in principle from the latest types of

conventional tubes. But the large deflection angle and the huge variation in beam path length from the corners to the centre make high demands on the electron gun and the beam-converging deflection yoke. They are overcome by enhanced design along the lines already described.

Viewfinder Technique

An interesting colour display technique is used in the viewfinder section of some consumer-type camcorders. It retains the high definition and low power consumption of a small monochrome tube but provides colour pictures by means of a rotating colour wheel between the face-plate and the viewer's eye. This filter-wheel has red, green and blue segments and rotates at 150 r.p.m. RGB video signals are fed to the tube sequentially, in synchronism with the rotation of the wheel. The results are very good.

Next Month

In the next instalment we'll take a look at projection systems and various types of LCD devices, including the three-panel LCD projector systems now coming into favour for large picture displays.

The Satmaster Pro PC Package

Nick Beer

The original Satmaster computer program was designed to run on IBM PCs and any one hundred per cent compatible machines. Its basic purpose is to facilitate the design of and simulate a satellite system on screen via a link budget calculation, enabling you to check various 'what if' possibilities presented to it. It can calculate azimuth, elevation, compass bearings, polar mount settings, and circular and rectangular aperture beamwidths, providing full graphical plotting of theoretical lobe patterns.

Data is provided on the majority of satellites required. As the program provides set-up angles and data for dish installations it's an ideal way for those unfamiliar with such matters to learn about the subject. In addition to data such as magnetic variations for Europe, noise temperature versus noise figure and all manner of other items Satmaster contains a 20,000 word technical guide. Throughout operation a help facility is available via the F1 key.

Subsequently an expanded version called Satmaster Pro was introduced. As a way of evaluating it we'll first consider the differences between the two. At the start however I must say that the Pro version is not a replacement for the original one, but rather a version that's aimed at a somewhat different section of the satellite fraternity.

Advantages

The Pro version offers the following advantages with respect to the basic version:

(1) Extra data, including world, Far East and European CCIR climatic zone maps; more town and country files, mainly for the Middle East and South Africa; world

seasonal temperature and water vapour density maps (helpful for predicting atmospheric absorption); and apex and polar elevations for each town.

(2) Laser printer support, enabling superb quality graphs, maps and charts to be obtained from the program.

(3) Automatic calculation of rain fade margins, and taking linear or circular polarisation into account in link budget analysis.

(4) Calculation of rain attenuation, atmospheric absorption and cross-polar discrimination – particularly helpful in areas where rainfall is high and with installations where the elevation is low.

Performance

The menu layout is more friendly and logical than with the basic version. Operation is simple: menus pull down from the header bar and escape takes you backwards – all standard stuff for the computer operator. There's no mouse support however.

The country and town files provide latitude and longitude figures for major towns and cities, but some files are more detailed than others. For most people this won't be noticeable, but users in some parts of the world will find the information somewhat sparse – there are no country files for India, Sri Lanka, Russia, Singapore and South America. Town and country listings can easily be added via the editor however, and advice is given in the user manual on how to obtain such data.

The satellite data files and graphics are detailed for our

part of the world, but those in America for example will not find data on their satellites. A noteworthy point however is that when you ask for a listing of data on satellites above the horizon for a given plot all satellites are listed, not just those detailed in the satellite files.

The following craft are covered: Arabsat 1B and 1C; Astra 1A and 1B; DFS Kopernikus; the Eutelsat II series; Hispasat 1 and 2; the Intelsat K and VI series; Marco Polo 1 and 2; TDF 1 and 2; Tele-X; Telecom II; and TV-Sat 2. Satellite files can be edited and new ones created.

Link Budget

Although both versions have the ability to calculate link budgets it would not do to omit mention of the incredible detail and power of calculation they offer. Under this menu one enters the site and satellite data followed by link budget parameters and obtains a remarkable set of results, which can be tailored to CCIR grade 4 or 5 requirements. One can follow on by calculating beamwidths and plotting lobes for circular or rectangular apertures. This menu allows printouts to be made.

Business Use

Effort has gone into making the program directly and instantly usable for those in the satellite business. Your business header can be fed in during the set-up procedure and is thus present on hard copies. As the Pro version can be used with a laser printer, professional-looking paperwork can be produced for estimates etc. You can provide simulated representations of the performance of a given system throughout the year by correlation with the vapour density and seasonal temperature maps and data for example.

Installation

Any one hundred per cent IBM compatible PC with at least 384K of RAM and using DOS higher than 3.1 will run the program. About 1Mbyte of hard disc space is used. The program comes in compressed form on a 3.5in. floppy disc. To install it on the hard disc is simplicity itself. From DOS select the drive in which the floppy disc has been inserted, type INSTALL C: or just INSTALL then press enter. A directory called SATPRO will be created. To run the program select this directory from DOS (cd/SATPRO) then type SATMAST.

Findings

The program is very well presented and is designed for easy, logical operation. Thought has been given to operation. Data can often be retained from one operation to another and there's out-of-range parameter rejection and advice on suitable values, cursor or single key facility selection within menus and so on. Anyone can use this program!

Some graphics are not too clear however and the varying scale of maps is disappointing. One or two items could have been presented more clearly – for example with the Far East rain climatic zone map what is a zone boundary and what is a coastline is at first sight barely discernible. The use of shading or colour would remove such confusion.

Some of the points I have made about omissions may seem unduly fussy, but the Satmaster Pro is intended for world-wide use. The fact that the program is upgradeable means that data can be added however – a super feature. So long as you have the location and satellite data the Pro will

do the calculations.

The Satmaster Pro program has two distinct characters, passive and active. The former consists of an extensive database which can be used in the active mode or as a source of facts and figures. The active role consists of its ability to carry out calculations. This enables even the most demanding system engineer to design an installation with great confidence.

Thus Satmaster Pro has great potential for both institutional and industrial training, while specialist satellite installers will find it very useful. In all fairness however one would find it difficult to convince a small dealer installing only Astra systems supplied as packages that it would have practical benefits for him. The potential for installation work is in working out what would be required to achieve superior results. Unfortunately at present price seems to be the main consideration here, and Sat Pro can't help with this!

Manufacturers and distributors of equipment could make use of both programs to provide technical data for inclusion with their products, thereby helping installers and assisting with decisions about the suitability of particular products under given conditions.

Use with a portable PC would provide invaluable help for those aligning portable links around the world.

And aside from its business uses the program is a fascinating plaything for anyone interested in satellite reception.

The versions I've tried were Satmaster 4.02 and Satmaster Pro 1.12. Although the instruction guide supplied seemed a bit thin and was apparently 'temporary' it provided just the right amount of prompting in addition to that on-screen. The technical and help guides can be printed from the floppy disc.

The Satmaster (version 4) and Satmaster Pro programs are available from Swift Television Publications, 17 Pittsfield, Cricklade, Swindon SN6 6AN (telephone/fax 0793 750 620) at £35 and £69 plus postage respectively. More recently a Satmaster Pro for Windows version has become available at £99 plus postage. The package includes anti-piracy measures and updates are available for earlier versions.

SERVICES/ADDRESSES

Electrotech Distribution, one of the UK's largest satellite equipment distributors, is expanding its range and setting up a service and repair centre. The latter will take on general service and repair work for any satellite related equipment and will be available to anyone in the trade, not just Electrotech customers. Phone no. is 081 830 0366, address 33 Fapcote Trading Estate, Dudden Hill Lane, London NW10 2DJ. The company considers that present standard repair charges of around £65 for out-of-guarantee receivers are 'far too high – particularly in view of what's inside a receiver and what normally goes wrong'.

Daewoo has set up a service and spares operation to support brand sales which start in August. Address is Daewoo Electronic Sales UK Ltd., Unit 640, Winners Triangle, Wokingham, Berks RG11 5TP. Spares ordering telephone number is 0734 695666. Spares for OEM products should be obtained from the original distributor.

Euras International Ltd. has moved to Euras House, 51 Bristol Road, Keynsham, Bristol BS18 2BA. Telephone 0272 860 900, fax 0272 860 343, videotext 0272 860 007.

Satellite Solutions is running a series of one-day courses on installing motorised dish systems. They are being held at various venues around the country during July-August. Details can be obtained from Debbie Halliday on 0604 670 900. The first one is at South Mimms on July 22nd.

A Simple Nicam VCR Upgrade

Ian Martin

Many stereo VCRs without a built-in Nicam decoder must be in use. Some appear on the second-hand market. My own machine, a Panasonic NV830, is one of these. It has performed very well for several years with only a change of heads. Rather than replace it with a newer, Nicam model I decided to add an external decoder.

Adding Nicam has been described in *Television* on various occasions, so I'll just give some brief details that could also be applied to other non-Nicam stereo VCRs. Instead of using the Sendz decoder, as Michael Harris described in the May issue, I used a Nicam decoder that was salvaged from a damaged TV receiver. Any self-contained module or salvaged board should in fact be suitable, as the principles remain the same.

One advantage of modifying the NV830 in the manner described here is that it still continues to record f.m. audio on the linear mono track whilst simultaneously recording the Nicam sound on the hi-fi stereo tracks. As the machine has track selector buttons, either f.m. mono, Nicam stereo or Nicam left channel or right can be selected for playback. Thus the machine is capable of dual-language operation should this feature ever be used in the UK.

The Conversion

Fortunately the Nicam decoder panel I used already had 12V and 5V regulators, so all that was required was to provide an unregulated input. A redundant Ferguson BSB receiver case and power transformer were thus used to house and power the Nicam board. As luck would have it, the only other thing required was an i.f. input signal, the panel supplying buffered stereo audio outputs. The decoder normally provides Nicam reception, f.m. being selected instead by a switch signal. I avoided the complexity of

adding a switch by not using the decoder's f.m. audio output, retaining the VCR's own audio for recording on the linear mono track.

If we cut the mono f.m. audio feed to the recording amplifiers for the hi-fi tracks and add the decoded Nicam sound at this point we can let the VCR do the switching. Panasonic, and probably many other manufacturers, had produced machines of this vintage for use with the German Zwi-tone stereo system. Because of this there's a simple mono link connecting the left- and right-hand hi-fi channels. It can easily be removed. Fig. 1 shows a block diagram of the whole system while Fig. 2 shows the relevant part of the NV830's f.m. audio sub-circuit board.

When plug P4303 is disconnected there is no f.m. feed to the hi-fi channels. Removal of the wire link next to D4318 then separates the left- and right-hand channels. The Nicam left and right inputs can be connected to P4303 via suitable coupling capacitors, the f.m. feed to the plug being cut. I connected the right channel to pin 1 and the left to pin 4. Matching the levels of the Nicam and f.m. audio signals can be done by using simple resistive potential dividers or altering the gain of the op-amps in the Nicam decoder. To be honest however I didn't bother to adjust the Nicam signal level (it's about 3dB higher) as the NV830 has a manual record-level control.

If you don't want to modify the audio sub-board you could connect the Nicam stereo signals to the external audio phono input sockets instead and set the machine permanently to the 'simulcast' mode. A mono version of Nicam would then be recorded on the linear audio track instead of the f.m. mono signal. This would be no great loss as the linear track's output will probably never be used.

The input to the Nicam decoder was taken from the VCR

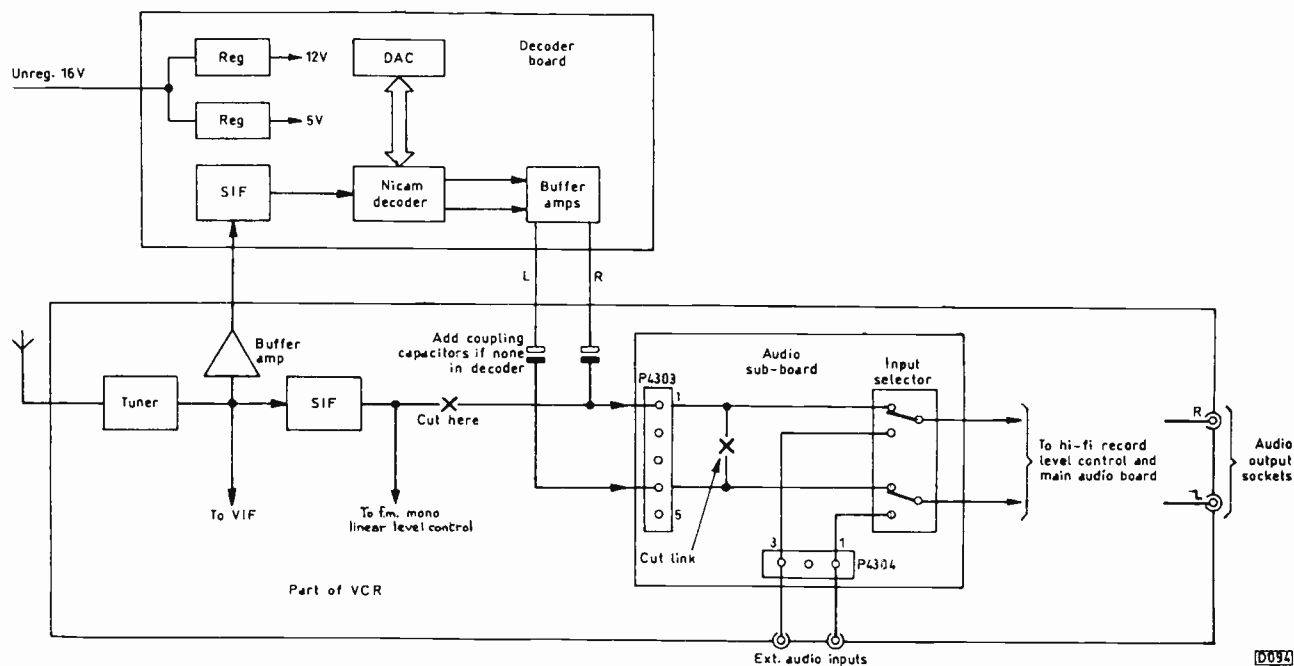


Fig. 1: Block diagram of the complete system.

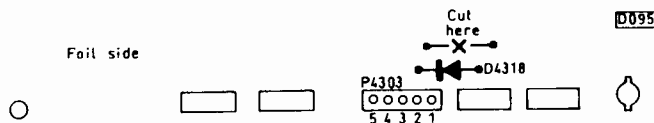


Fig. 2: Modifications to the audio sub-circuit board. Remove the existing P4303 plug then connect the Nicam inputs as follows: pin 1 right channel; pin 2 right earth; pin 3 left earth; pin 4 left channel. Pin 5 was not used (it previously provided audio muting).

tuner's i.f. output pin. I added an emitter-follower stage as a buffer, though a simple high-value resistor might do. Buffering is necessary because the additional load will otherwise spoil the vision i.f. signal's h.f. response. Without buffering there was a slight loss of the higher video frequencies: this could not be seen on recordings but was noticeable in the monitor mode.

Help Wanted

Can anyone supply a circuit diagram for, or technical assistance with, the Excel 20in. monitor made by Niven of Andover? All costs would be covered. J. Howells, Protech Audio Visual, 4 Kingsway Road, Fallings Park, Wolverhampton WV10 0SD. 0902 728 242.

I am trying to obtain a digital display and circuit board, part no. 13VE001C, or a digital display only, part no. F1P8KM8A, for the Saisho Model VR705. Can anyone supply or suggest a source? M. Zwierzanski, 92 Locks Crescent, Portslade, East Sussex BN41 2AD. 0273 420 040.

Wanted: A Connoisseur tone arm with head shell. Trevor Smith, 41 Clifton Road, Wallington, Surrey SM6 8AN. 081 773 2660.

Wanted: Circuit diagram and instruction manual (photocopies will do) for the Tektronix 5110 scope and 5A19 and 5B10 plug-in units. S. Beukes, PO Box 5963, Durban, South Africa, 4000.

Wanted: LOPT for the Matsui Model 1460. John G. Collyer, 17 Riverside Court, Longford Close, Grundpont, Oxford OX1 4NG. 0831 641 877.

Wanted: Circuit diagram or service manual for the Nord-Mende FG3360 PAL colour signal generator and the Rohde and Schwarz HUZ-BN 15012/2 v.h.f. field strength indicator. P. Gascoyne, Shaunton, Main Street, West Hanney, Wantage, Oxon OX12 0LH. 0235 868 695.

Wanted: Russian version of the Vega 402D circuit diagram. Does anyone know of equivalents for TR9/10 on the TB board, or a source of spares for these sets? Can anyone suggest a cure for intermittent field bounce with the Thorn 9600 chassis? S. Quick, 51 Robin Gardens, Waterlooville, Hants PO8 9XF. 0705 232 264.

Wanted: Philips UV616S/6456 four-band TV tuner. J. Evans, 7 Shap Drive, Warndon, Worcs WR4 9NY.

Wanted: Capstan motor for the Hitachi VT17E and service manuals for the Akai VS427EK and Panasonic NV780E (photocopies would do). P. Thomas, 5 Lingfield Green,

Just three cables are required to link the VCR to the decoder. These are for the i.f. input and the left and right audio outputs. All should of course be individually screened. I earthed the screen of the i.f. lead at the VCR tuner end and the screens of the audio leads at the decoder end. This avoids hum loops. No additional switches or indicators were required as all the signals are available within the VCR which already has switches and indicators as part of its audio mode selection system.

In Conclusion

The hardest part of the project was hiding the decoder box! It can be tucked down behind the VCR, under the TV set. The performance of the upgraded VCR is good, enabling me to record stereo (and Dolby stereo) programmes without any noticeable audio playback degradation. It has given the old machine a new lease of life.

Darlington, Co. Durham DL1 1DD.

Wanted: Pin connections for the Mitsumi TIF5-E31P-8630/40T satellite tuner head and a copy of the first edition of *European Scrambling Systems* by J. McCormac. J.G. McCormack, 920 Manchester Road, Castleton, Rochdale OL11 2SR.

Wanted: New or used remote control unit for the Sony SLC9 VCR. Colin McCormick, 23 Shapleys Gardens, Staddiscombe, Plymouth, Devon PL9 9TY. 0752 405201 (evenings).

Wanted: Technical information on the Sweda electronic cash register type 350: IC14 is getting hot. Also ON811, ON812 or PG780G chips for the Sweda 2550 cash till. Steven Nicholson, 77 Deerlands Avenue, Parson Cross, Sheffield S5 7WS.

Wanted: Circuit diagram, parts list and any other information for the Fisher CA345 hi-fi amplifier. T. Edwards, 11 Birch Grove, Windsor, Berks.

Wanted: Manual or circuit diagram for the TI Crypton Motorscope Mk. V or VI, also an 0.15µF, 3.5kV capacitor for this motor servicing item. Brian West, 5 Yew Tree Walk, Clifton, Shefford, Beds SG17 5HN. 0234 267 433 day, 0462 815 421 evenings.

Wanted: Any information (manuals/circuits) for the IBM VGA Models 8503, 8512, 8513, 8514, 8515, 8518 and 9515. Has anyone seen technical information for Sega/Nintendo systems? S.P. Skinner, 432 Stratford Road, Shirley, Solihull, W. Midlands B90 4AQ. 021 744 3811.

Wanted: J17 sound de-emphasis circuit for use with French Telecom 2A/B. Brian Webb, 42 Westways, Havant, Hants PO9 3LN. 0705 474 938.

Wanted: Service sheet or any other service information for a Supervision Filmnet/Rt1 4 decoder, or same type of decoder for spares. A.S. Dhada, 180 Headfield Road, Savile Town, Dewsbury WF12 9JH. 0924 466 439.

Wanted: Any service information and sales brochures for pre-1960 Dynatron equipment. John Howes, 11 Crendon Park, Southborough, Tunbridge Wells, Kent TN4 0BE. 0892 537 288.

Test Report: Denon SC7000 Desoldering Tool

Steve Beeching

Desoldering tools can generally either suck or blow: the Denon SC7000 can do both. In terms of its size and weight the SC7000 is similar to the instant soldering irons, with bent copper wire tip, used by many service technicians. This is the whole point of the SC7000: instant operation for intermittent rather than continuous use. It's not that instant as there's a warm-up time of a couple of minutes or so. In practice the sample I used for this review took about thirty seconds to reach its set temperature then another minute for the tip to reach the working temperature.

Operation

As with any hand-held gun type of tool there's a trigger. This one operates a pump for either desoldering or hot-air soldering. There's an on/off mains switch at the bottom, where the mains cable enters the unit. A small vertical slider at the side controls the blowing/suction action: maximum blow at the top position, reducing as the slider is moved downwards, with a fixed suction setting at the bottom. The temperature control at the rear provides variation over the range 300-450°C. I found that 420°C is a suitable temperature for most applications.

In the suck mode solder is drawn into a small cartridge which is mounted in the cut-out at the top. A pair of sliding knobs at either side, top rear, enable it to be released – to change the cartridge is quick and easy. Two cartridges come with the tool, so the user can whip a full one out and pop a clean one in without unduly delaying the job in hand. Several tips are available: the one I used had a tip size of 2.5mm with a 1mm hole. A set of cleaning pins of different sizes is provided to poke down the hole in the tip if it becomes clogged.

On Test

I first set the tool to suck for desoldering at just over 400°C. I also cleaned the tip: otherwise reflow of the soldered joints would be impaired as they wouldn't be wetted.

Ordinary chips whose pins pass through holes in the PCB were no problem at all. I sat the heated tip on to the i.c.'s leg so that the leg went inside the tip as the solder melted. When the trigger was pressed the solder disappeared into the cartridge. Once all the legs had been dealt with in this way I gave each one a little wiggle, using small pliers, to free it from the print. The chip was then removed. Finally the desoldering tool was used to clean any excess solder from the print – solder wick would do as well for this purpose of course.

VCR motor drive chips present a different problem. Because of the cooling effect of their thick legs there is often print damage when a desoldering tool such as a wick of spring-loaded sucker is used. A heated desoldering tool is without doubt the only way of removing chips of this type safely – particularly the ones found in camcorders.

Surface-mounted devices require different treatment. This is where the ability to switch between suck and blow comes into its own. Three-terminal devices such as diode blocks and transistors can be lifted in two stages. First, use

suction to remove the solder. I found that applying a small amount of flux solder to the pads considerably helped reflow. Then switch to blow to heat the pads, using tweezers to tilt the device to release two legs then ease off the other one. A similar technique works with small dual in-line i.c.s. Desolder the pads along one side, then blow hot air on to them while gently easing this side of the device from the print. An advantage with this approach is that when the component's pads are eased up there's not enough solder left to bridge between the pads and the print, so that they come off cleanly. Then simply heat the other side of the device with hot air, lifting it off when the solder melts. Print cleaning completes the job. With such a device it's always difficult to decide whether removal of the solder from all the pads would be better. If you do this only a thin film of solder will be left bonding each pad to the print: the film is more likely to break than the print. On the other hand the presence of plenty of solder on the pads stores heat during reflow, making it easy to lift the device. It's a question of judgement.

Sucking then blowing can cause problems, as the previously sucked up solder can be blown out, splattering everywhere. There are two ways of avoiding this. First, to blow the loose molten solder into a container, out of the way. Alternatively fit a clean cartridge – as previously mentioned doing this is quick and simple. This is probably a good time to poke the cleaning rod down the spout, blowing at the same time, to remove any loose debris clinging to the internal surfaces.

When solder paste is used for resoldering, the hot-air blower can be used to reflow it. I found that the air flow has to be adjusted once or twice during this process to find a compromise between paste reflow and a howling gale that blows it all over the place.

As with all desoldering tools, efficient operation depends on the solder holder and pump. Regular cleaning is essential. The operating manual tells you clearly how to dismantle the unit and clean it – though some of the spelling leaves a bit to be desired.

As I said at the start, the SC7000 is intended for intermittent use. After ten-fifteen minutes the handle becomes too hot to hold. Thus a rest period is enforced while the user rushes off to immerse his/her hands in a tub of cold water. . .

The pump is a diaphragm device and does vibrate. I didn't find this excessive or disruptive, though it does mean that you can't carry on a telephone conversation while the device is being used.

Conclusion

Apart from that the tool is a very useful item to have in the workshop for removing and replacing i.c.s in TV sets and VCRs. It does not readily stretch to camcorder use without the optional SMD accessory kit that was unfortunately not available at the time of our evaluation. The SC7000 is available from Farnell Electronic Components Ltd., Canal Road, Leeds, West Yorkshire LS12 2TU (telephone no. 0532 636 311) under part no. 226889 at £285 (one-off price) plus VAT and postage. Farnell stock all the spares for it, including a comprehensive range of tips.

Servicing the Samsung Model BT110

J.W. Riggs

This is a 5in. monochrome TV receiver incorporating an a.m./f.m. radio section. Two other models, the Alba PTV9C and Goodmans Q9001, incorporate the same chassis and are identical in appearance.

The power options are as follows: mains operation via an unregulated mains adaptor; operation via internal batteries (1.5V x 6); or operation from a car/caravan battery. There have been two versions, the main difference being in the type of u.h.f. tuner fitted. The early version (mainly Goodmans sets) used type TEB5736VJID, the later version type EBU5731BL. These tuners are not compatible. The later version also has an earphone socket and provision to adjust the field hold control via a hole in the side of the cabinet.

Circuitry

The power supply circuit is shown in Fig. 1. It uses a series regulator, with the regulating transistor Q701 (KSD288) connected in series with the negative side of the supply. Q702 (KSC815C or KTC1815) is the driver and Q703 ((KSA539C or KTA1015) the error detector. R706/R704/D702 provide a start-up feed. The regulated output across C701 is 10.2V. Since the internal batteries provide only 9V, when these are used a boost diode (D406) is brought into operation in the line output stage to generate the required 10.2V across C415.

There are only five other transistors. Q401 (KSC1008C or KTC1959) is the line driver which is RC coupled (with a d.c. restorer) to the base of the KSD362R line output transistor Q402. Q501 (KSC2310 or KTC2229) is the video output transistor. Q101 (KSC1674C or KTC1923) is the SAWF driver. Q601 (KSC815C or KTC1815) is used for a.m./f.m. switching.

Most of the circuitry is contained in four chips. IC01 (KIA7792P), which is on a separate panel, is the a.m./f.m. radio receiver. IC101 (KA2913A) is the TV sound/vision i.f. strip. IC201 (KIA7313) or KA2212) is the audio amplifier. IC301 (KA2133) is the timebase chip, providing an output at pin 9 for the line driver transistor and an output at pin 8 to drive the field scan coils (there is feedback to pins 3 and 6).

Faults

The following list of faults is based on experience gained whilst repairing a large number of these receivers.

No mains operation: Mains adaptors tend to run fairly hot in normal operation and are prone to failure. Replacement will normally restore power.

No power (mains or battery operation): Check whether Q701 (KSD288) is open-circuit. The TIP41A is a suitable replacement.

If necessary check D702, D701, R706, Q702 and Q703.

You sometimes find that the on/off switch has worn contacts. Also check the print between the switch and the d.c. input socket for cracks.

Fuse F701 (2A) can blow for no apparent reason.

L.T. voltage high: There should be 10.2V across C701. If the voltage is high, try adjusting VR701. If this has no or

only very little effect, VR701 could have gone high in value or have an open-circuit centre contact.

No internal battery operation: Check whether boost diode D406 (SR306) is open-circuit.

No raster: Check the c.r.t. heater (pins 3 and 4). If o.k., check for 250-300V at pin 5 (first anode) of the c.r.t. If this supply is missing, check R414 (1.2k Ω). D408 (1N4004) may be short-circuit if R414 is open-circuit, also C414 (0.01 μ F, 400V) may be faulty. Occasionally replacing these components results in R414 burning up because there's internal leakage in the c.r.t.

If the KSD362R line output transistor Q402 is hot, check whether the FR104 (or PS104R) efficiency diode D404 is short-circuit.

If there's no line drive at the base of Q401, check the voltage at pin 9 of IC301 (KA2133) – the reading here should be 0.4V. If this voltage is missing, before replacing the chip check that its 10V supply is present at pin 4. Absence of this voltage is often due to the safety resistor R509 (1 Ω , 0.5W) being open-circuit for no apparent reason – it's mounted on the c.r.t. base panel. Alternatively L401 (330 μ H) may have gone open-circuit.

No line hold, or line jitter: Replace C406 (47 μ F, 16V).

Field roll or excessive height: Check C309 (1,000 μ F) and VR301 (10k Ω).

Low u.h.f. gain: Check the aerial socket and adjacent print. L104 (2.3 μ H) may have gone open-circuit, Q101 then acting as a wideband amplifier with low gain.

Check for a break in the print between the i.f. output from the tuner and C108.

Check the value of the a.g.c. preset VR105 (10k Ω).

The tuners are fairly reliable. A replacement is worth trying as a last resort.

No sound: Check for an open-circuit loudspeaker, also the earphone socket if one is fitted.

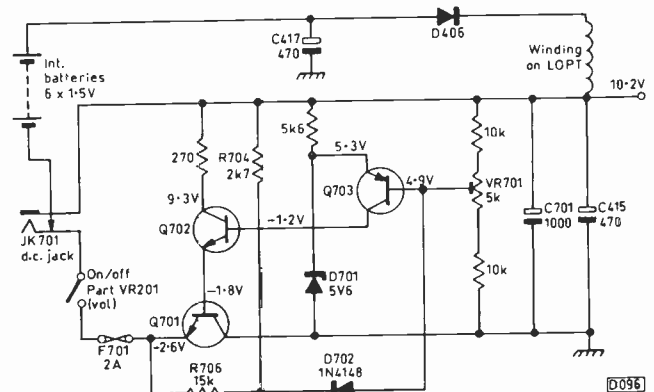


Fig. 1: The simple power supply circuit. An adaptor is required for mains operation. Note that the regulator transistor Q701 is in series with the negative side of the supply.

Modifying the Amstrad MP3 TV Adaptor

Brian Williams

The Amstrad MP3 TV adaptor was designed to enable various computer monitors – the Amstrad CPC6128, Philips 8833 and CBM 1084 – to be used for TV reception as well. It has been available as a surplus equipment item from various sources. At the time of writing this Bull Electrical have the MP3 in stock. The experimenter, TV-DXer or someone who requires TV from his monitor when this is not being used for its usual purpose will find the MP3 of interest.

The modifications outlined in this article are all simple and easy to carry out. There are many possibilities. For example, if a monitor is not available a u.h.f. modulator can be added and the adaptor used with a standard TV set: this has the advantage that any signal processing modifications required can be carried out in the adaptor, leaving the TV set unmodified.

The MP3 is an ideal item for the newcomer to DX-TV. There's plenty of room for additions within the case, and the PCB is easy to work on.

The modifications described here include the addition of a tuning meter, a.f.c. normal/defeat switching, positive/negative-going baseband video switching, modulation of the output to u.h.f., extension of the tuning range to include the ATV band, and adding a narrowband i.f. stage.

General Notes

The adaptor requires an external 12V power supply; consumption is around 180mA. Fig. 1 shows a suitable circuit using a 78 type series regulator, a transformer, a bridge rectifier and a handful of other components. It may

be possible to obtain the 12V supply from your monitor or TV set, but don't do anything that will interfere with the built-in safety arrangements. The supply must be regulated.

The adaptor generally comes with a few instructions and diagrams. One advertiser even included a couple of 6MHz filters to replace the 5.5MHz ones.

Individuals will want to decide for themselves what use to make of the modifications suggested here. The front

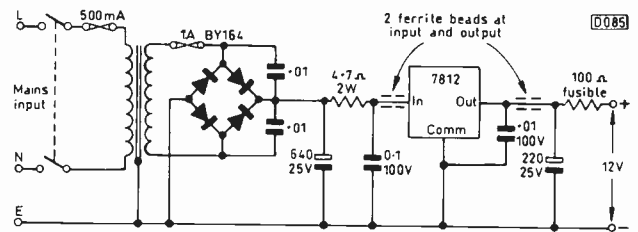


Fig. 1: Suitable 12V power supply. The transformer's secondary winding should provide 12-18V a.c. (two 6.3V windings connected in series and in phase can be used). Put a 3A fuse in the three-pin mains plug.

panel has enough room for all the suggested modifications, which can be carried out without removing the PCB from the case.

Portable operation from a car battery is feasible. This would be of interest to the TV-DXer who likes to take his rig to a local high spot – or a quiet r.f. location! In this case battery power can be saved by snipping out the 560Ω resistor R406 which supplies the sync generators – these are

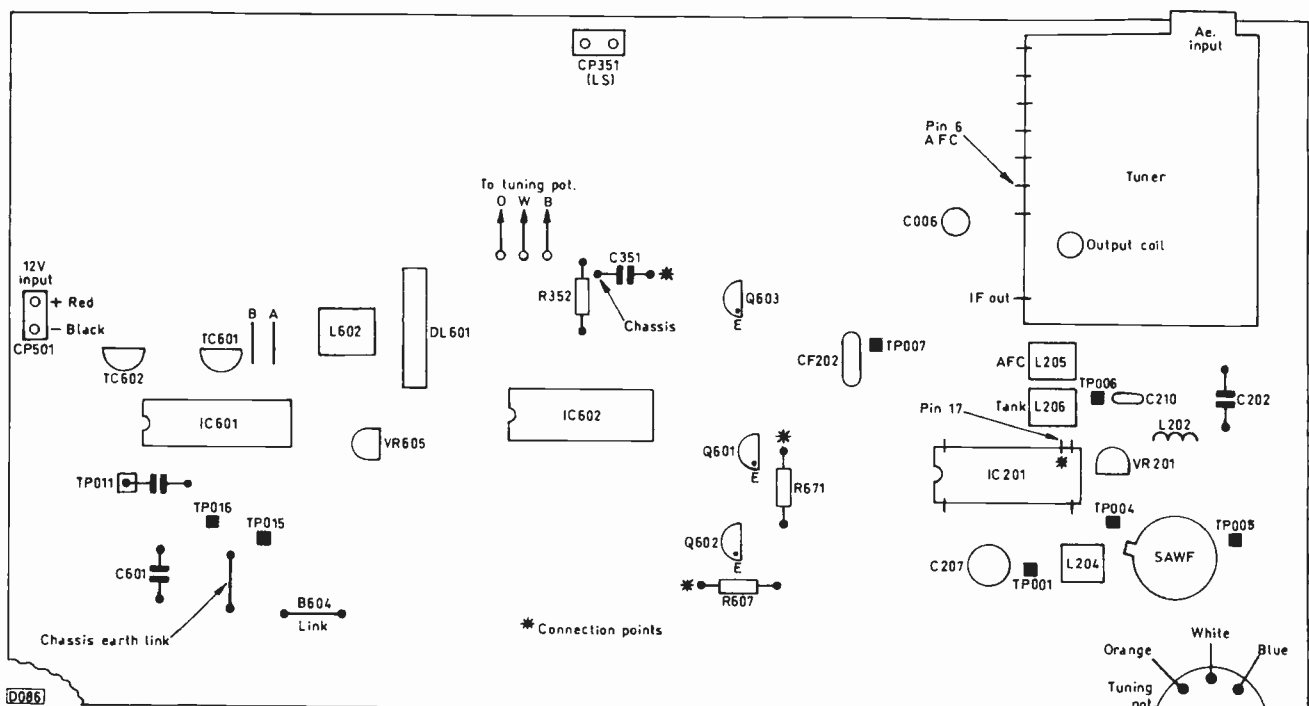


Fig. 2: Top side of the PCB, showing items relevant to the modifications described in this article.

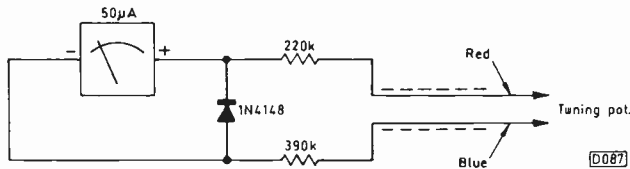


Fig. 3: Adding a tuning meter. Connect the red lead to the slider (centre tag) of the tuning potentiometer and the blue lead to its earthy end (blue wire). Earth the screen near the potentiometer, leaving it open at the meter end.

not needed when RGB outputs are not used.

The one drawback of the MP3 is the lack of any tuning indication. Fortunately the Maplin 4in., 50µA meter, part no. RX54J, fits nicely in the hollow in the case. Some may prefer to use an 'outboard' tuning potentiometer with a scale. The integral tuning potentiometer however is geared down and is entirely suitable, with the suggested modification, for use with a tuning meter.

For normal UK TV reception it's a good idea to remove the 5.58MHz dot/pattern and intermodulation filter CF202 and short-circuit coil L202. Otherwise the 6MHz sound may suffer from distortion on peaks.

The inclusion of a switchable wide/narrow bandwidth i.f. stage is highly recommended for DX reception. The difference narrow-bandwidth operation makes with a weak signal has to be seen to be believed. It is also useful where two DX signals are so closely spaced that there's cross-modulation. During a summer SpE opening for example there are often signals in channels R1 and R2 simultaneously. Narrow-bandwidth i.f. operation will separate them nicely. Note that this mode of operation will remove the colour and sound with say ch. E2 reception.

Fig. 2 shows items on the top/component side of the PCB relevant to the modifications described in this article.

Adding a Tuning Meter

You can easily fix the 50µA Maplin meter, stock no. RX54J, by its own terminal screws to the top of the MP3's case, in the gap. Fig. 3 shows the connections. When wiring it up, leave plenty of flex to allow the top cover to be taken off.

To calibrate it, open the meter carefully then reverse the scale plate, which can be marked in pencil with the positions of the various R and E channels or whatever. Be

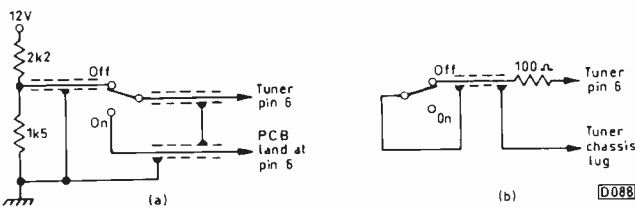


Fig. 4: A.F.C. on/off switching arrangements, (a) boffin's way, (b) lazy man's way.

careful not to drop anything down the gap of the meter movement.

Mount the resistors directly at the meter's terminals, then cover them with insulating tape. Use miniature twin screened flex. The diode is not essential, but does away with any worries should the meter be wired incorrectly. Because of the use of preferred value resistors, slight juggling may

be necessary to get the meter to read full scale when the tuning potentiometer is set to maximum voltage (about 33V). In my experience it's best not to use a preset for this purpose, as this will lead to eventual calibration inaccuracies (unless a very high-grade component is used).

ATV Reception

A simple modification enables the varicap tuner's i.f. coverage to be extended down to 435MHz. Cut the blue wire from the earthy end of the tuning potentiometer at the point where it is connected to the PCB, then solder it to one of the tuner's earth lugs. The purist may prefer to link out R003. This entails removal of the PCB, which is easy enough.

The extent of the tuner's coverage will depend on manufacturing tolerances, component values, setting up etc. Both my MP3s will cover the ATV band however.

AFC on/off

This facility is required when a tropospheric opening brings many Band III signals. With the a.f.c. wired so that it is permanently on, the tuner won't receive a weak signal when there's an adjacent stronger one. The modification is an essential one for the serious DX-TV enthusiast.

There are two ways of going about it. First the boffin's way, see Fig. 4(a). Two resistors and a miniature, single-pole changeover toggle switch are required. Use screened wire for the connections to the switch. There's plenty of room to mount it on the front panel. Earth all the screens at a single point – the tuner can lug. Unsolder the tuner's a.f.c. pin (see Fig. 2) from the print carefully, or cut the pin so that soldered connections can be made to both sides.

The alternative is the lazy man's or brute-force way, see Fig. 4(b), though there seem to be no ill effects after carrying out the modification in this way and making daily use of it for over six months. An on-off toggle switch is used to short pin 6 of the tuner to chassis via a 100Ω resistor, thus defeating the a.f.c. action. Solder the resistor to pin 6, connecting it to the switch via a screened lead. This action removes most of the power from the relevant place within IC201 and seems to work well. The current drain through R221 (22kΩ) is negligible.

Baseband Video Switching

Switching for positive-going vision is required if you want to receive French system L signals. There's room on the front panel for two independent phono sockets for this purpose, and ready-made buffer stages are present.

Negative-going baseband composite video (i.e. not RGB) can be tapped from the emitter of Q601. Its emitter load resistor R671 (560Ω) is marked on the PCB and a soldered joint can be made to the leadout wire. If only a negative-going signal is used, link B604 is a more convenient tap-off point. Use a miniature screened lead: there's a chassis link that can be used to earth the screen. It's in order to take a d.c. output from this point, going to a 75Ω load resistor. The result will be a lower d.c. voltage at the emitter of Q601, but this doesn't seem to have any adverse effects – sync clipping is a danger if capacitive coupling (say 47µF) is used. I found that a.c. coupling to the Hitachi VT11 VCR led to problems with the automatic ext/int switching – a d.c. connection must be used with this VCR.

Positive-going baseband video can be tapped from the emitter of Q602, i.e. from across R607 (820Ω). Note that there's a 47pF coupling capacitor (C601) connected to this

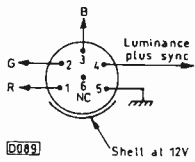


Fig. 5 (left): DIN socket connections, looking into the socket from the plug side.

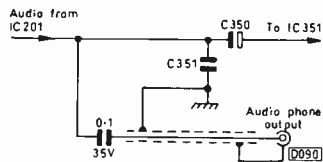


Fig. 6 (right): Adding a phono audio output socket.

point – it feeds the chroma signal to IC601, which is used when RGB outputs are required. C601 can be ignored or taken out if required – it must be left in if the DIN output is required. As before, use a miniature screened lead.

If preferred, instead of using two separate sockets take the feeds via a front-panel mounted changeover switch to a single output phono socket.

The DIN Socket

Fig. 5 shows the connections to the DIN socket on the MP3's front panel. I removed it as it wasn't compatible with the plug to the other equipment I have. If you use it, note that the shell is at +12V while pin 5 is the earth connection.

Adding a UHF Modulator

A standard u.h.f. TV receiver can be used as the monitor if a u.h.f. modulator is added to the MP3. Note however that it won't be possible to resolve system B/G sound. The MP3 has an integral system B/G sound system which gets around this problem so long as the original 5.5MHz crystals are left in place.

Various u.h.f. modulators are available from advertisers in this magazine. The Astec UM1289 is a good choice. Note that some modulators operate with a 5V instead of the usual 12V supply. If you use one of these a regulated 5V supply will have to be provided. You can run a 7805 directly off a 7812, and this will suffice.

The UM1289 presents no undue problems. With other types a check should be made on the standing d.c. voltage at the inputs – this will determine the polarity of any electrolytic capacitor used to tap the outputs from Q601 and Q602. Likewise the audio input – see Fig. 6.

Adding an Audio Phono Socket

A phono socket can be fitted to the front panel to provide an audio output for a tape recorder, VCR, etc. Use a screened lead as shown in Fig. 6, and an 0.1µF coupling capacitor. Take the output from the jungle chip IC201 – nearly everything in this receiver is done inside IC201! The electronic volume control works on pin 29 of this chip and cannot be 'got at'. This means that you can only tap from the chip audio that's controlled by the front-panel volume control. Thus any sound that's recorded via the phono socket is affected by the front-panel volume control: a suitable level will have to be found by trial and error. Solder the 0.1µF coupling capacitor to the right-hand side of C351, looking at the top of the PCB - see Fig. 2.

Narrowing the IF Bandwidth

This is the largest modification, but as previously mentioned is very well worth doing for DX operation. With

the circuit shown in Fig. 7 the i.f. passband will be narrowed to about 2.8MHz. Two alternative circuits are provided to suit different requirements.

A simple but quite effective i.f. filter is shown in Fig. 8. It will narrow the passband to about 3.5MHz. This is achieved by setting the cores of the two coils to the same frequency at the centre of the passband.

Both circuits are easy to incorporate in the MP3 and can be built 'ugly' fashion on to the corner of the tuner can, occupying some space near C202 (0.01µF). This capacitor couples the tuner's i.f. output to the base of Q201, a low-gain buffer/amplifier that drives the SAW filter.

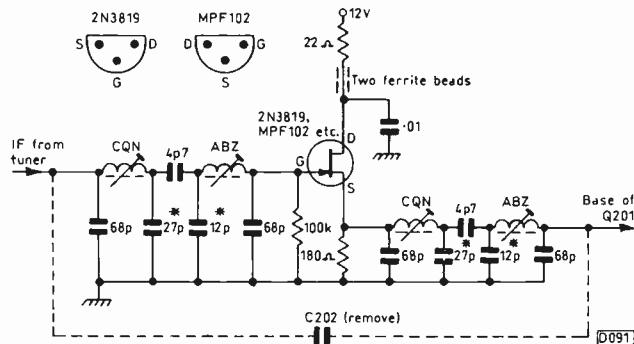


Fig. 7: Extra i.f. stage to reduce the passband to about 2.8MHz. Leave C202 in position when a switch is used to select a narrow or wide bandwidth (see text).

You can obtain coils from various sources or wind them yourself with the aid of a grid-dip oscillator (all right, a f.e.t.-dip oscillator!). I used Toko coils, type TKXCA34732CQN or alternatively KXCAK3347AHC, with internal 27pF capacitor, in position CQN, and type KXCAK2499ABZ with internal 12pF capacitor in position ABZ. Electronically the difference between the two circuits is the provision of a buffer/amplifier and use of doubled up coils in Fig. 7. Both circuits work well and there has been no hint of instability. If i.f. instability should be experienced a possible cure would be to increase the value of R204 from 27Ω to say 56Ω or 68Ω. But first look for the cause in the added circuitry. Note that Q201's emitter is not decoupled, so there's a degree of negative feedback in this stage.

To incorporate either circuit in the MP3 all that's necessary is to remove C202. It can be cut out, leaving enough leadout wire to make solder connections to the added circuit. This saves having to take the PCB out of the case to gain access to the underside. Note that the Toko coils incorporate capacitors as indicated above: they are marked with asterisks in Figs. 7 and 8.

You might wish to include switching so that either narrow- or normal-bandwidth operation can be selected. I use a simple single-pole changeover toggle switch for this purpose, the switching being done at the input end. Use a short length of good-quality miniature coaxial cable to connect the signal to the switch. Having a common input at

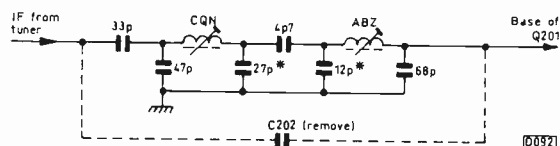


Fig. 8: Simple i.f. filter to reduce the passband to about 3.5MHz.

the base of Q201 introduces no coupling of any consequence.

It might be possible to find room for the old Philips G8 chassis i.f. selectivity module, type U800. I use these successfully in another rig. They are ready-made, three-stage i.f. amplifiers. All that need be done is to provide 12V and switch the module in/out of circuit. As an upmarket approach, small 12V relays with DPDT contacts could be used.

General Hints

(1) Setting the a.g.c. crossover potentiometer RV201. Disregard the procedure in the leaflet! If a signal generator is available, feed 40µV at about 210MHz into the aerial socket and adjust RV201 so that the signal is seen just to drop from the level at the anticlockwise position. If a signal generator is not available, use a weak but stable off-air u.h.f. signal. First adjust RV201 (use an analogue meter on the 2.5V range) for 0.9V at the potentiometer (NOT at the tuner's a.g.c. pin). Then make slight final adjustment with an off-air signal.

(2) It's desirable to provide reverse-polarity protection in the MP3. This is easy to do: solder a hefty diode, BY127 or similar, across the power input plug CP501 (see Fig. 2) with its cathode to the positive connection. A fuse must be included in series with the positive (red) lead: 250mA is suitable.

(3) Note that the contrast and colour controls on the front panel work only when RGB outputs from the DIN socket are used.

(4) Opening the top of the case is not as simple as the instructions imply! After removing the three screws, ease the top front of the case upwards so that the lugs inside are released. Don't attempt to force the case open by pushing the slots at the rear.

To remove the PCB from the bottom part of the case first pull off the front knobs (except the tuning one), then push down the plastic latches at each side of the PCB and ease it forwards and upwards. Watch the bandswitch as it is loose on its mounting. Pull off the power and speaker plugs carefully.

Note that the tin plate fixed in the top cover is a magnetic shield to help prevent purity errors with a nearby tube, as the speaker's magnet is of the open type.

(5) French system L signals have a.m. audio which can't be demodulated by the MP3. There's no easy answer to this one! Possibilities are a separate receiver that takes the i.f. directly from the tuner, or a receiver similar to a scanner tuned to the off-air signal.

CORRECTION

Our apologies for the printing error that occurred in last month's issue. The drawing for Fig. 5, page 637, appeared as Fig. 1 on page 655 and vice versa.

Next Month in TELEVISION

HELP WITH THE ICC5 CHASSIS

The ICC5 was the first Thomson designed chassis to be used in Ferguson TV sets. It caused much concern amongst those used to traditional Ferguson designs. J. LeJeune provides fault-finding guidance based on a lot of bench experience with this chassis.

SIMPLE TRANSFORMER TESTER

It's helpful to be able to test a transformer before going to the trouble of obtaining and trying a replacement. This simple tester can be used with LOPTs and other types of transformer. A scope is used as the monitoring device - some waveforms show what to expect.

MORE ON PANASONIC'S DIGITAL CHASSIS

Start of a short series that will describe the circuitry used in the Panasonic Euro 1 digital TV chassis. In this initial instalment Ray Meadows looks at the power supply and timebase output stage circuitry.

VHS VCR SERVICING

Regular maintenance will prolong the life of any VCR. It can be done during quiet periods. John Coombes provides a schedule for regular checks on VHS machines.

ALTERNATIVES TO THE CRT

In the next instalment in his current series Eugene Trundle describes alternative display systems to the c.r.t. They are based on the LCD, either as a directly viewed device or as a light valve.

FERGUSON FAULT NOTES

Alex Mason reports on recent Ferguson chassis including the new TX90 (Models B39 and B49F).

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15/85S	3.84	2SC15730	0.26	2SD667	0.26	BC139	0.33	BD179	0.34	BF966	0.61	CD4011	0.21	M51102L	1.77	SK64F210	0.97	TA7207P	1.68	TD1270	1.79	TD18190	3.30
17052	3.20	2SC1675	0.09	2SD669	0.55	BC140	0.21	BD189	0.41	BF970	0.30	CD4013	0.34	M51231P	2.03	SK65F310	0.68	TA7210P	1.58	TD1412	0.77	TD18953	2.13
17053	2.38	2SC1685	0.17	2SD669A	0.63	BC141	0.34	BD190	0.31	BF939	0.35	CD4016	0.14	M51393AP	4.64	SL1430	1.41	TA7214P	3.74	TD1470	0.00	TD18102	4.98
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17089	3.39	2SC1741	0.17	2SD718	1.45	BC148	0.12	BD203	0.46	BF879	0.60	CD4052	0.22	M51521L	0.54	SL1432	1.90	TA7222	1.24	TD1506	4.59	TD18104	1.87
17127	1.77	2SC1815	0.14	2SD734	0.24	BC148A	0.06	BD232	0.46	BF890	0.61	CD4053	0.20	M52128L	0.48	SL471	1.70	TA7222AP	1.27	TD1510	3.23	TD18109	2.15
1N4001	0.04	2SC1826	0.72	2SD762	1.51	BC148B	0.04	BD234	0.25	BF90A	0.77	CD4066	0.30	M5231P	0.55	SL490	2.31	TA7227P	2.02	TD1512	3.17	TD18104	1.49
1N4002	0.07	2SC1827	1.00	2SD774	0.43	BC149	0.04	BD237	0.30	BF921	0.43	CD4069	0.17	M52316P	1.48	SN29764AN	1.99	TA7230P	1.75	TD1515A	2.54	TD18164	2.96
1N4003	0.05	2SC1845	0.20	2SD787E	0.26	BC149C	0.04	BD238	0.11	BF986	0.53	CD4070	0.14	M54532	0.00	SN7474N	0.38	TA7233P	1.95	TD1516Q	3.56	TD18165	5.23
1N4004	0.07	2SC1846	0.51	2SD837	0.90	BC157	0.13	BD239	0.29	BF92A	0.48	CN62A	0.94	M54543L	1.32	SN76013ND	7.99	TA7240AP	0.00	TD1518Q	3.32	TIC106D	0.55
1N4005	0.06	2SC1923	0.14	2SD841	1.61	BC159	0.06	BD241	0.41	BFX85	0.55	CRC3M	2.62	M54544L	1.87	SN7666N	1.07	TA7240P	2.46	TD1670A	2.81	TIC106M	0.75
1N4006	0.06	2SC1942	3.33	2SD856	0.94	BC160	0.00	BD243	0.39	BFY50	0.34	CR02AM	2.17	M54548L	3.29	SN7666N	1.26	TA7241	2.40	TD1701	4.86	TIC45	0.59
1N4007	0.06	2SC1959	0.11	2SD869	3.28	BC161	0.27	BD243A	0.43	BFY51	0.34	CV12E	2.70	M54644BL	3.30	SN76705AN	1.70	TA7243P	0.00	TD1770	0.00	TIL100	0.52
1N4148	0.04	2SC1969	2.46	2SD870	2.96	BC167	0.42	BD243C	0.55	BR100	0.17	CX109	7.05	M54648L	6.31	SR2M	0.00	TA7250	4.03	TD1870	3.37	TP110	0.36
1N4448	0.06	2SC1983	0.87	2SD871	5.08	BC171B	0.14	BD244A	0.34	BR101	0.98	DTA124EF	0.13	M54898AP	19.47	ST341M	2.38	TA7267P	2.02	TD1904	1.21	TP112	0.10
1N5061	0.38	2SC2001	0.14	2SD880	0.48	BC177	0.14	BD244C	0.42	BR103	0.98	DTA144EF	0.17	M58485P	5.95	ST4401	2.30	TA7270	1.68	TD1905	0.94	TP112H	0.58
1N5402	0.12	2SC2029	0.00	2SD882	0.43	BC178	0.11	BD245C	0.72	BR303	1.22	ER1400	2.15	MB3730	2.38	ST441C	2.80	TA7270P	1.95	TD1908A	1.74	TP120	0.57
1N5404	0.13	2SC2073	0.51	2SD898B	2.97	BC182	0.06	BD246C	0.71	BRX44	1.02	HAI1235	1.68	MB3731	2.20	STK0029	5.88	TA7271P	1.95	TD19140	2.17	TP121	0.42
1N5406	0.12	2SC2078	0.77	2SD904	5.95	BC182A	0.00	BD278A	0.56	BRV56	0.43	HAI1244	3.83	MB3732	2.47	STK0039	7.11	TA7273	3.21	TD19150	0.86	TP126	0.48
1N5408	0.12	2SC2141	1.48	2SD913	0.38	BC182L	0.06	BD317	0.67	BSS38	0.23	HAI124A	1.21	MC13002	0.00	STK0040	7.40	TA7274	2.72	TD1920	1.85	TP29E	0.46
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1S1555	0.22	2SC2168	0.85	7805	0.28	BC183	0.06	BD380	0.34	BT129	3.26	HAI1440	2.92	MC1310P	0.85	STK025	9.61	TA7281	0.00	TD19204	1.27	TP2955	0.83
1S2076	0.29	2SC2236	0.25	7805T022	0.00	BC184	0.09	BD433	0.29	BT139600	1.14	HAI166A	3.43	MC1327AP	1.62	STK043	6.00	TA7299	2.34	TD19205	1.36	TP29C	0.30
2N2219A	0.27	2SC2271	0.22	7808	0.30	BC184L	0.04	BD434	0.34	BT151/500R	3.40	HAI1713	1.24	MC1330AIP	1.26	STK3042	6.90	TA7313AP	0.62	TD19206	1.06	TP29E	0.55
2N2222	0.22	2SC2274	0.22	7812	0.30	BC184LC	0.10	BD435	0.38	BT151800	1.15	HAI1741	6.77	MC1350P	1.82	STK3062	8.88	TA7317P	0.93	TD19209	2.29	TP3055	0.77
2N2905	0.21	2SC2274K	0.22	7815	0.30	BC204	0.37	BD436	0.32	BU205	1.07	HAI1745	5.10	MC1352P	1.45	STK4131	7.79	TA7325P	0.45	TD19220	3.72	TP30C	0.17
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2N3053	0.36	2SC2335	1.43	7905	0.34	BC212	0.06	BD438	0.31	BU208D	1.53	HAI3108	0.87	MC14439P	0.00	STK4142	8.21	TA7358P	0.78	TD19230H	0.61	TP31A	0.32
2N3054	0.98	2SC2458	0.12	7912	0.43	BC212B	0.06	BD441	0.34	BU236A	1.36	HAI3118	0.87	MC1452BCP	1.70	STK4162M	9.51	TA7358P	0.68	TD19230V	1.05	TP31B	0.30
2N3055	0.77	2SC2482	0.34	AA119	0.36	BC212L	0.06	BD442	0.29	BU406	0.68	HAI3119	2.03	MDA2062	2.21	STK4171	10.50	TA7360P	2.62	TD19240	0.00	TP31C	0.44
2N3442	1.00	2SC2547E	0.24	AA143	0.13	BC213	0.11	BD510	1.34	BU406D	1.02	HAI3403	4.66	MJ2955	0.97	STK4181 II	12.85	TA7609P	1.95	TD19270	2.55	TP32A	0.38
2N3702	0.11	2SC2565	0.40	AC127	0.11	BC214	0.00	BD529	0.97	BU407	0.53	HAI374A	0.00	MJ2982	2.29	STK4181A	12.46	TA7630	0.00	TD19270	1.68	TP32C	0.39
2N3704	0.14	2SC2570A	0.29	AC141K	0.46	BC214L	0.09	BD530	1.10	BU407D	0.97	HAI377	2.42	MJ3300S	0.82	STK4332	5.54	TA7630P	1.87	TD19250	0.00	TP33	0.00
2N3773	1.02	2SC2757	1.46	AC176K	0.30	BC237	0.10	BD535	1.43	BU426A	0.96	HAI388	2.63	MJ3300S	0.68	STK4352	1.70	TA7640AP	0.98	TD19250	3.76	TP33A	0.92
2N3819	0.34	2SC2581	3.05	AC187	0.16	BC237A	0.00	BD536	0.48	BU426E	2.13	HAI389	2.52	MJ3305S	0.51	STK437	8.30	TA7676P	4.25	TD19250	0.88	TP33C	0.80
2N3904	0.11	2SC2632	0.43	AC187K	0.33	BC237B	0.05	BD5675	0.30	BU500	1.09	HAI392	1.61	MJ340	0.50	STK4392	5.92	TA7680AP	3.81	TD19251	0.72	TP34	0.00
2N4444	3.22	2SC2655	0.25	AC188	0.36	BC238	0.11	BD677	0.51	BU508A	0.95	HAI397	2.63	ML237B	0.00	STK441	11.54	TA7698AP	5.93	TD19260	5.95	TP34C	0.89
2N6292	0.62	2SC2671	0.68	AC188K	0.82	BC238B	0.05	BD707	0.32	BU508AF	1.27	HAI398	2.33	ML923	14.26	STK459	10.27	TA7705P	1.68	TD19267A	2.55	TP41A	0.38
2SA1015	0.10	2SC2688	0.30	D149	0.52	BC239	0.04	BD839	0.97	BU508D	1.27	HAI452	4.86	MM1405VFK	11.08	STK461	10.49	TA7769P	1.43	TD19277	0.00	TP41B	0.31
2SA1016	0.17	2SC2785	0.12	AD161	1.02	BC252B	0.07	BD901	0.51	BU508DF	1.49	HM6232	10.36	MM14435VX	14.35	STK4843	11.10	TA8205	3.89	TD19277A	4.25	TP142	0.37
2SA1020	0.43	2SC2791	5.44	AD162	0.96	BC300	0.48	BD902	0.51	BU508V	1.32	HM6251	9.52	MM1435VXII	10.66	STK5211	15.78	TA8210H	4.74	TD19278A	2.55	TP42A	0.34
2SA1020Y	0.43	2SC2791	5.44	AD162	0.96	BC300	0.48	BD902	0.51	BU508V	1.32	HM6251	9.52	MM1435VXII	10.66	STK5211	15.78	TA8210H	4.74	TD19278A	2.55	TP42A	0.34
2SA1095	7.44	2SC3153	2.37	AF127	0.59	BC302	0.36	BD912	0.63	BU536	1.60	ICH281	0.26	MPSA42	0.23	STK5325	5.92	TA8591N	6.67	TD19281	5.75	TP47	1.51
2SA1102	2.54	2SC3156	6.28	AF139	0.29	BC303	0.28	BD912	0.63	BU536	1.60	ICH281	0.26	MPSA42	0.23	STK5325	5.92	TA8591N	6.67	TD19281	5.75	TP47	1.51
2SA1143	0.17	2SC3182	3.25	AF239	0.43	BC307	0.06	BD968	1.16	BU608	1.66	KAZ101	0.60	MPSA56	0.12	STK5326	6.20	TA8550	0.00	TD19281Q	15.10	TP1791A	0.11
2SA1143	0.17	2SC3182	3.25	AF239	0.43	BC307	0.06	BD968	1.16	BU608	1.66	KAZ101	0.60	MPSA56	0.12	STK5326	6.20	TA8550	0.00	TD19281Q	15.10	TP1791A	0.11
2SA1143	0.17	2SC3182	3.25	AF239	0.43	BC307	0.06	BD968	1.16	BU608	1.66	KAZ101	0.60	MPSA56	0.12	STK5326	6.20	TA8550	0.00	TD19281Q	15.10	TP1791A	0.11
2SA1143	0.17	2SC3182	3.25	AF239	0.43	BC307	0.06	BD968	1.16	BU608	1.66	KAZ101	0.60	MPSA56	0.12	STK5326	6.20	TA8550	0.00	TD19281Q	15.10	TP1791A	0.11
2SA1143	0.17	2SC3182	3.25	AF239	0.43	BC307	0.06	BD968	1.16	BU608	1.66	KAZ101	0.60	MPSA56	0.12	STK5326	6.20	TA8550	0.00	TD19281Q	15.10	TP1791A	0.11

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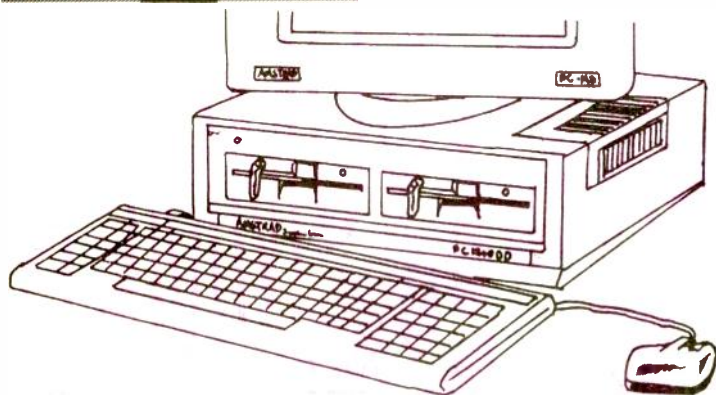


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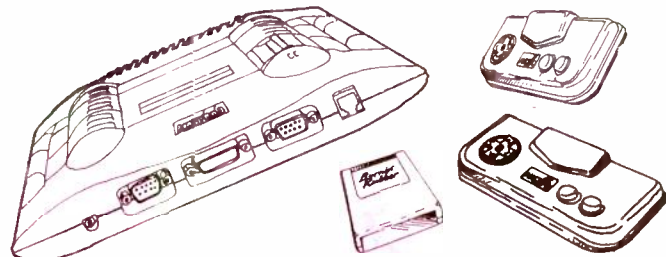
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Z9012 Memorex MRX IV 1/2" computer tape. 600 ft on 175mm dia spool. 6250BP1. In case, in sealed poly bag. List £7.49

Our price **£3.50** 50 + 2.00
SALE PRICE £1.00

Z5123 Modem. Fully functional brand new and boxed. Standard 160 x 100mm Eurocard with DIN41612 connector. Only 300 baud, but at the price we're asking represents superb value for money!! Supplied complete with wiring details - needs ±12V.

Price **REDUCED TO £8.00**
SALE PRICE £3.95

QUICKSHOT MOUSE

High quality optomechanical mouse by Bondwell

- * Microsoft compatible
- * IBM PC XT or AT compatible
- * Hardware selectable mouse standard
- * Programmable resolution 29-1450 DPI
- * High tracking speed 500 mm/s
- * Silicone rubber coated tracking ball

Includes

- * Universal mouse driver
- * Performance Test Programme
- * D9-D25 connector adaptor

ORDER CODE QS158

PRICE REDUCED TO £19.95

SALE PRICE £14.95

Z9010 Tape streamer. Tandberg TDC3319. Internal fitting (same size as 5 1/4" disk drive). Takes DC600 tapes. Unsure of capacity - possibly 60Mb. Does anyone know?

Price **£250.00**

SALE PRICE £100

Magnetic card reader head - used for detecting when credit card or similar is swiped. Made by DRH. Type no 01.635. No other info (but our technical expert is working on it)

Order Code **Z2121**

Prices **£2.00** 100 + £1.00

SALE PRICE 2/£1.00

Atari 2600 Games Console



These popular consoles are complete, refurbished units with joystick, power supply, TV lead **£29.95** and games cartridge (Centipede).

SALE PRICE £14.95

Z8940 2400 ft of superb quality used 0.5" tape on 10" reels 6250 CPI. Various manufacturers. Supplied in carrier. New, they cost £12.00. Could probably be used as video tape - we're checking this out. Meanwhile, why not buy a few reels - useful as cheap 'twine' for tying up garden plants etc!!

Price **Only £2 a reel**
- or come and collect **100 for £50 + VAT**

SALE PRICE £1.00

CROSSTALK

XVI

Another super software deal! - We've purchased a number of the best selling 'CROSSTALK XVI' data communication packages. New and sealed containing a 5 1/4" disk and 182 page manual. PC DOS V3.61, last selling for around £60 - our Special Price

£17.95

Order Code: Z5495

SALE PRICE £8.95

PC-MIX

Z5444 Multitasking Interface Executive for the IBM PC and compatibles. Enables up to 3 programs to be run simultaneously. 96 page handbook and 5.25" disk £4.95

SALE PRICE £3.50

See Page 33 for details of **WINDOWS SOFTWARE** just received

WORDS & FIGURES

Features Include:

Spreadsheet

- 1-2-3 1A compatible WKS files
- 9999 rows by 256 columns
- Supports 1-2-3 1A functions, macros
- Protected and hidden cells
- Horizontal or vertical split screen
- Move, copy, transpose ranges
- Sparse matrix data storage
- Supports LIM: Expanded Memory
- Uses 8087, 80287 math coprocessor

Word Processor

- Include "live" spreadsheet data in document
- Two-line headers and footers
- Bold, underline shown on-screen
- Global find and replace
- Right & left justify, centering
- Automatic reformat, word wrap
- Import text from ASCII files
- Supports over 200 printers

Auditor

- Toggle from worksheet to audit display with a single command
- Pinpoint circular references
- Identify source of other errors

Data Management

- Three-key data sort
- 7 database statistical functions
- Query using up to 32 search criteria, wild card parameters

Graphics

- Line and XY graphs, scatter plots, pie, bar and stacked bar charts
- Superset of 1-2-3 1A type fonts
- High-resolution display (EGA, Hercules)
- High-resolution output to printers and plotters

Requirements: DOS 2.0 or higher, 256K RAM two disk drives, monochrome or color display

Printers: Text—over 200 including Epsoms, IBM, Tandy, HP LaserJet™ and many others; Graphics—Epson, HP LaserJet, PostScript™ printers, and others

3 1/2" disk version available; requires 1 disk drive

WORDS & FIGURES by LIFETREE

Comes with 546 page manual and spread out menu + disks, all in a library case

Z5442 5.25" version

Z5443 3.5" version

ONLY £14.95
SALE PRICE £9.95

'INDIVIDUAL' Tutors

Nicely boxed sets for IBM PC's with handbook and disk

Z5446 Learn to type 3.5" £3.95

SALE PRICE £2.50

Z5447 Learn to type 5.25" disk only £1.95

SALE PRICE £1.00

Z5448 Learn to use DOS 5.25" £3.95

SALE PRICE £2.50

Z5449 Learn to use DOS 3.5" £3.95

SALE PRICE £2.50

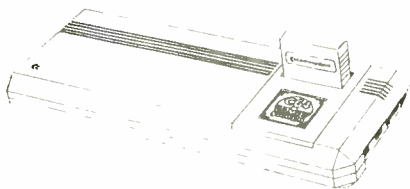
Z5450 Learn to use your PC 5.25" £3.95

SALE PRICE £2.50

Z5451 Learn to use your PC 5.25" disk only £1.95

SALE PRICE £1.00

C64 GAMES CONSOLE



TY1 Clearing final stocks of this popular console. They are customer returns, and are sold "as seen" - no test, no guarantee, except they are complete. Final reduction to £20

SALE PRICE £15



Z1101 Sinclair P15/G Pack. 7 cassettes (no library cases) in a boxed set with over 100 games, all with documentation.

ONLY £2.95

SALE PRICE £1.50

Z1102 Sinclair Soft888 pack. 6 cassettes, all in library cases in a boxed set. Oh Mummy, Treasure Island, Punchy, Disco Dan, Crazy Golf, Alien Destroyer.

ONLY £2.95

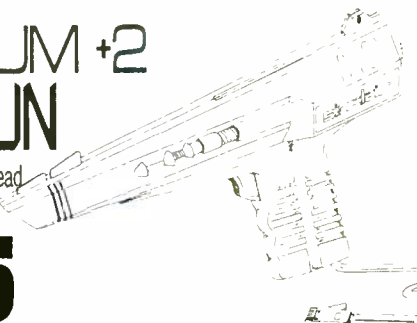
SALE PRICE £1.50

SPECTRUM +2 LIGHT GUN

Action Pack - complete with lead software and instruction book

£6.95

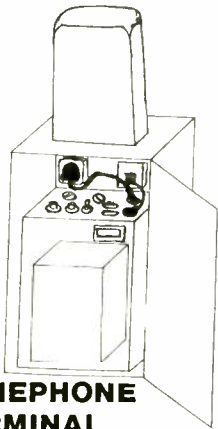
SALE PRICE £2



4**SUPER SENSATIONAL SUMMER SALE****GREENWELD**27 Park Rd. Southampton SO1 3TB
Tel: 0703 236363 Fax: 236307
All one off and pack prices **INCLUDE V.A.T.** Qty. prices do not.

ZONEPHONE ZAPPED!!!

You've probably seen in the press the much hailed personal phone has been a dismal flop - with 3 different systems and the restraints imposed on its use meant it had little practical value. Failure seemed inevitable - but there's a silver lining to every cloud and it's an ill wind that blows nobody any good, etc, etc ... we've purchased some of the goods with more to follow.



ZONEPHONE TERMINAL

Z8956 These were the units screwed to various buildings throughout the UK which you stood next to whilst making a phone call with your incredibly useful handset! Too bad if you weren't in range (99.9% of the UK wasn't!) but it was a nice toy while it lasted. There was a lot of clever technology involved, and we're selling these at probably about 1% or

2% of their real cost! So what do you get for your money?

Well, a lot of case for a start - in the outer steel case (a) 480 x 300 x 150mm with fibreglass aerial case on top (b) 250 x 160 x 75mm there's another steel case (c) 325 x 245 x 130mm and inside this there's a plastic box (d) 200 x 15 x 75mm.

(a) contains a metal surface mounting 13A socket and a BT line socket

(b) has 2 whip aerials 200mm long terminated in PL259 plugs*

(c) contains 8V 3.8Ah sealed lead acid battery, mains transformer (10V 2A Sec), mains filter and a plethora of plugs and sockets mounted on top - 3 BNC and 2 x 9 pin 'D' type, also 2 fuseholders, a lead with 13A plug and another lead with BT plug, and a power on/ off toggle. Screwed to the inside of the lid is a PCB 250 x 160 with lots of nice bits - 64180 CPU, 27C256 EPROM, 5256-15 256k RAM x 3, LM2940, LM317T, BD680 x 2, 3.6V AA size lithium cell in holder, about 30 various linear/ logic chips, 3 xtal's etc. etc. (You're getting great value for money here!)

(d) contains the Tx/Rx panel 170 x 135mm. Lovely bit of kit, this, all surface mount - about 20 chips Inputs

and outputs are taken to 2 min PCB sockets.

There's another panel the same size in this box, with lots of hi-tech devices - 2 x TMS77C82 programmable 8 bit microcontroller, 77C01, TMS320MC10FNL 16/ 32 bit signal processor, LM2984 triple 5V output regulator and another 10 chips, 4 'D' plugs/ sockets and lots of other bits. And that's about it!

Previously £17.95 & £12.95

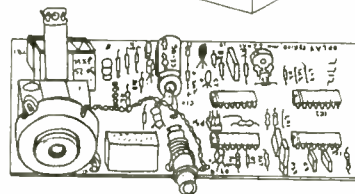
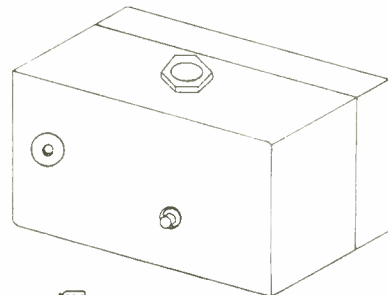
SALE PRICES

COMPLETE LESS AERIALS & FIBREGLASS CASE

Z8956 Z8985

£13.95 £9.95

VERSATILE TIMER UNIT



Z5438D Here's an interesting bit of kit. In a white 2 part ABS case 145x85x75mm is a timer PCB 142x70mm. Mains is applied directly to the board and the seemingly unnecessarily complicated timer (4 chips where one would do) enable times from 1min to 2 hrs (can be extended). There are 2 heavy duty relays with 10A contacts, a piezo sounder and MBC indicator. The unit, made by Energy Conservation Systems was designed to switch off lights. Supplied with original instructions + some useful data and ccts from our technical dept.

Previously £4.95
SALE PRICE £3.95

CABLE TV RECEIVER

Z9135 Made by Cabletime, model 280, this unit is brand new and boxed with a smart black plastic case 220x150x60mm. It has a **6 digit starburst LCD** with internal character generator and I²C bus at the front and 3 push buttons on top with well for remote control (not included). 3 connexions on back - TV co-ax skt, input co-ax skt and 16 pin IDC data plug, 2 core mains cable 2m long. Inside, the high quality PCB 187x133mm is packed with useful components: mains transformer, 2xW005 bridges, 7805 & 7812 v. regs, smoothing caps, fuse + holder, 2 xtal's, 7 small signal transistors, 4 green 5mm LED's. TDA5930, 4093 & 89C51 PROM in skt. **IR receiver LED with integral pre-amp** made by Mitsumi. I²C bus interfaced channel selector/**UHF modulator unit**, ceramic filters, presets, R's, C's etc. Great component value

- and all for

Previously £4

SALE PRICE £2.95

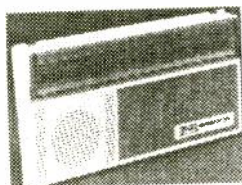


CABINET SPEAKERS



Z9121 Dark veneered wood finish, size 330x217x116mm. Single wide range 4R speaker. Max total output 20 watts music power. Ideal as extension speakers for kitchen, workshop, etc. **Only £12.95 per pair.**

HOME ALARM SYSTEM



Sophisticated hi-tech fire and burglary control system that will:

- Automatically dial a pre-programmed telephone number
- Play the relevant synthesized speech message
- Set off a visual/audible alarm
- Allow up to 32 transmitters to be used
- Program entry, exit and delay times
- Program user codes

No wiring required! Designed to ensure ease of operation for the user by responding with spoken instructions.

Detectors (not supplied) communicate with the panel by radio transmitter

Comprehensive instructions supplied - more info on request.

group 4
SECURITAS

Giving the world a sense of security

NORMAL SELLING PRICE £300

Previously £79.95

SALE PRICE £49.95

Xtra Special

Development Boards

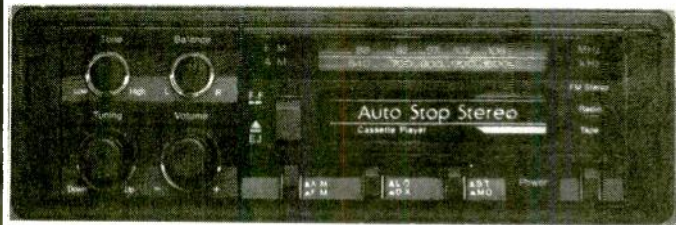
Uniqard PCB's for RAM/ROM

129PCB012 6U-160 extender **£3**

129PCB014-112 horiz mntg **£2**

Star Buy!!

STEREO CAR RADIO/CASSETTE



B002 JCS2228
RADIO/CASSETTE PLAYER

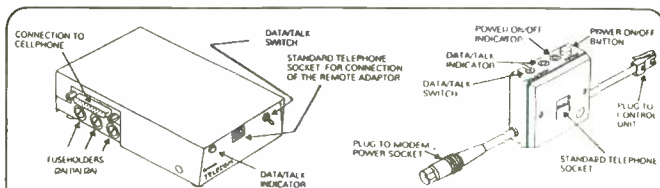
DIN standard mounting car radio/cassette player unit with metal tuner. Analog tuning with AM/FM, Local/Distant and Mono/Stereo push button selectors. Overall tune, volume and balance controls, Auto stop cassette mechanism with fast forward control. Orange back-lighting.

Output power... 8.5W per channel RMS
 ... 20W per channel peak
 FM range... 88-108MHz
 ... 540-1600kHz
 AM range... 540-1600kHz
 Power... 13.8Vdc negative earth
 Dims... 140 x 178 x 50mm (body)

Featured in our 1993 Catalogue at £44.95 - now offered at nearly half price! Buy now while stocks last!

£24.95
 12+ 14.00

SALE PRICE £19.95



DATA INTERFACE

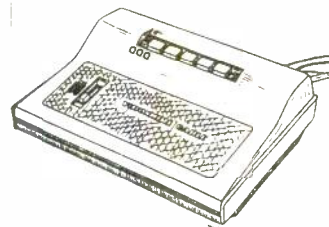
Z8976D DS1000 data interface for using cellular phones for fax transmission. Comes in 2 parts: a) Control Unit in a steel case 170x102x45mm with connections to cellphone and remote adaptor and b) Remote Adaptor, which is a BT socket that has plugs to the control unit and modem, a standard telephone skt, data/talk switch and indicator, and on/off button and indicator. Must have cost a fortune. Brand new and boxed, we're selling these for the useful parts - relays, pot cores chips, plugs, sockets etc.

The whole lot, with data for just **£5.95** 100+ 3.50

SALE PRICE £3.00

CABLEVISION CALAMITY !!!

Seems like Visionhire became a bit overstocked on their cablevision consoles - we've just purchased a quantity of these superb brand new units which contain some great electronics and as ever can offer them at an absolute BargainPrice!



Two tone brown case (dimensions as shown) contains PCB 192x195mm with easily removed UHF modulator made by Labgear (Sound and Vision); video pre-amp; stabilized power supply and all the decoding circuitry (9 transistors and TBA673 chip).

On the front of the case is a cable/off air switch and 5 push buttons (4 channels and on/off mains switch). There are 4 cables coming from the rear (these alone are worth what we are asking for the whole thing!) - 2m mains lead, 1.5m 8 core screened cable with 9 pin plug, 2m video in lead with coax plug and 2m video out lead with coax socket. As you would expect from a company like Visionhire, everything is top quality. The case can easily be utilised for other purposes - the dark brown inserts on the front are both easily removable, if required. Please note the low price we are asking in no way reflects their true worth - they're taking up a lot of space, so we need to shift them quickly!!

Z8939 £6.95 100+ 3.50 1k+ 2.50. Add VAT to quantity prices

SALE PRICE £2.50

VISTEL CLEARANCE

Visual telephone + "Ansaphone" for deaf people. Keyboard + 40 character LCD display in case 340x450x137mm. All sorts of facilities - full details in earlier supplements. Although complete with handbook, there is no guarantee they work.

SALE PRICE £20.00

FIRE DETECTOR
75% OFF!!

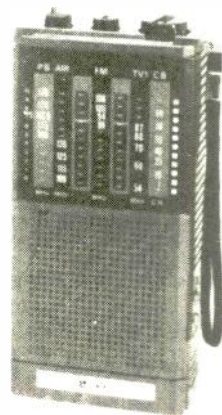


Z5371 Simplex rate-of-heat rise and 135°F detector, model 4255. A rise of more than 15°F per minute, or if temp reaches 135°F will close contacts. Supplied boxed with installation instructions. These normally sell for around 18.00. Our price **£10.00** 100+ 5.50

Z5391 Apollo series 30 heatrise fire detector. Set temp 60°C. Supply 17-28V. DP around 18.00 Our Price **£9.50**

SALE PRICE - EITHER TYPE
£2.50

MULTIBAND RADIO



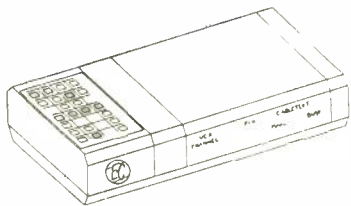
This compact piece of equipment 200 x 95 x 50mm comes in an attractive metallic grey case with controls on top - tuning, on/off and volume, squelch. The telescopic aerial extends to 500mm and can be rotated in any direction. The 3 wavebands are:

- 1) CB, channels, 1-80
- 2) TV1 54-87 MHz & FM 88-108 MHz
- 3) AIR 108-145 MHz & PB 145-176 MHz

The large 3" full range speaker delivers 280mW of undistorted power. There is an earphone jack and DC adaptor jack. The unit is powered by 4 x AA cells. All this technology for just **£17.95** 10+ 11.90
 Order Code **MB100**

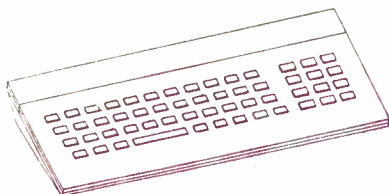
SALE PRICE £14.95

Become a Bargain List Subscriber!
 A new list every month for just **£6** a year. See page 47 for details



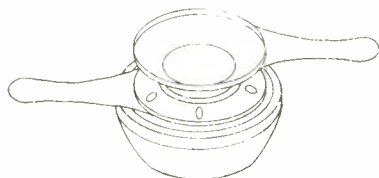
Z8970 Remote control cable TV unit made by GEC. Attractive black plastic case 205x120x40mm with membrane pushbutton keypad (22 keys). Front panel has 4x5mm red LED's to indicate status and a dual 7 seg display to show channel. On the 195x102mm PCB is a small regulated power supply (12V & 5V) derived from Z5226 plug in PSU (not supplied). The main chip is a KS49429 and there are also TBA120T, ULN2003B, 4049 + 4.000MHz crystal & 3 small signal transistors as well as the IR detector diode. 2 screened cases contain (a) a PCB with some filter circuitry utilizing surface mount technology, few small chokes, couple of trimmer caps and input and output sockets; and (b) the infra red decoding circuitry using a TDA3047 chip. Regrettably, we don't have any remote controllers, but these units offer great value for money - just **£5.95 each**

SALE PRICE £3.95



Z8963 Tandata "Homedeck". These are later versions of Z8963 and are (a) smaller and (b) remote controlled. The two tone grey case is 270x110x28mm and has a full qwerty keyboard and separate numeric keypad. Inside, on the PCB are a few components to transmit the data via 2 IR LED's to the receiver. The unit is powered by a PP3 battery. Super value at just **£3.00**

SALE PRICE £2.00



Z5200 Spirit Burner. Very useful in science labs or for the home experimenter. Chromed steel container 93mm dia x 48mm high has absorbent material covered in wire mesh. Adjusting lever allows variations in temperature. Complete with 70mm dia dish for heating substances in. **Only £2.50**

SALE PRICE £1.00



Z5499 UM1233 Astec UHF modulator, brand new, full spec. Currently being sold for around **£6.00**

OUR PRICE £2.00
SALE PRICE £1.00

Viewdata Terminal/Modem



Tandata TD1100 alphanumeric Viewdata/Prestel Adaptor. These units were used with a home banking system. The console was hooked up to your TV and telephone line, and by using the standard qwerty keyboard with separate numeric keypad, you could access your account. The well styled black and grey case 300x180x75/40 has a 75 key keyboard connected inside by a DIL plug to the main PCB. This has mounted on it the modem sub-panel + 3 relays, UM1286 Astec colour modulator with sound, + SAA5020, 5050, 5070, SY6504, 68B10, MCM51101P45, 2x2114 & 2732 EPROM all in sockets, as well as over 20 other LS and linear chips, transistors etc. There's a back up nicad battery and a regulated power supply. On the rear panel is an on/off rocker switch, UHF output socket, printer skt (15 way D), and cassette DIN socket for recording data.

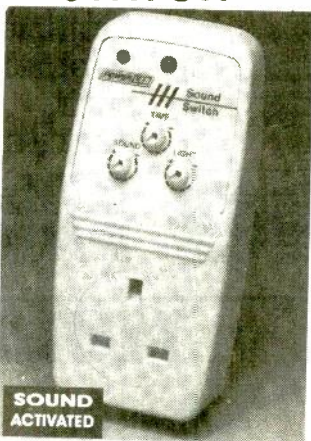
There are 3 leads attached; 4m long mains lead with 13A plug, 4m long BT lead with old-style plug, and a 3m long TV co-ax lead.

All in all, a versatile, useful compact unit either to use as it is or for the parts within. The component value alone is over £60, so you can see what a bargain this is - it even comes with a photocopied handbook!!

Order Code Z8963. The whole unit as described for just **£12.95**

SALE PRICE £5.00

SOUND ACTIVATED SWITCH



F605 AML768

SOUND ACTIVATED SWITCH

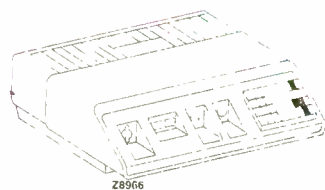
Plug-in sound activated switch, ideal for switching on lights automatically. On detection of a sound above a preset level power will be switched on to the built-in socket for a preset length of time. A photo transistor with control prevents the switch from activating during daylight. Controls: Sound level, time, light level

Power 220/240Vac 50Hz
 Max load 500W

Superdeal Price

£12.95

SALE PRICE £9.95



Z8966 Prestel set less monitor. This cased unit 420x430x100mm made by Phillips, model HU01 contains all the logic and control circuitry for Prestel - the monitor (not supplied) sits on top. On the back panel there is an 8 pin DIN socket for text output to monitor, mains outlet to monitor and an 8 pin DIN printer socket. There's also a mains lead and old type lead to telephone socket. On the front panel there is a detachable (on curly lead) keypad (20 keys) on/off keyswitch, tape and keyboard sockets and indicator lamps. Inside there's a large transformer and power supply and 4 PCB's - one is a modem panel; one has 8048 and SBB2626 in sockets + 15 other chips, transistors etc; the third has SAA5030/5042/5020/5050, a bit of memory (2x2114) + a few other chips. The fourth panel has SAA5010 in socket, 9xBSX20, 4xBC548/558. All boards are interconnected with plugs and sockets. These units are complete but not new and may well be in working order - but we're selling them for the parts value only - just **£16.00**

SALE PRICE £4.95

Xtra Special
INTERFACES
 Z5130 Spectrum £1.00
 Z5131 Dragon £1.00
 Z5132 CBM £1.00
Star Buy !!

TELEPHONE LEADS AND HANDSETS

Z5361 Curly lead, new. BT handset plug one end, 4 spade terminals the other. Pale grey. DP 4.11 **Our Price £2.00**

Z5362 4 core telecom lead 3m long with BT line plug one end, 4 way socket the other. DP 4.40. **Our Price £2.00**

Z4309 BT 'breakout' lead. One end has moulded housing with 6 pin BT plug and socket. Other end has 6 pin FCC68 plug (as used on some computers). Overall length 3m
Price £2.20

Z5500 Telephone handset in pale grey with black 4 core lead. No plug **£2.00**

Z5512 Ivory telephone handset, 4 way curly cord with spade terminals which can be unplugged (unusually) from handset. **£2.50**

Z5360 New brown telephone handsets by BT, complete with curly cord and 4 way socket. **£4.50**

ALL HALF PRICE

Z9118 Phillips Sopho K8 Telephone System. Brand new wall hung unit, still in original packing until we undid it to find out exactly what it was. Just plug in to the mains, add your lines, buy a few handsets and you've saved a packet!! Wired for 3 lines and 8 extensions. Max capacity 5 lines and 12 extensions (Extensions can be bought second hand for £25-40 each) **Our price (1 only) £175.00**

SALE PRICE £75.00

GREENWELD 27 Park Rd. Southampton SO1 3TB
 Tel: 0703 236363 Fax: 236307
 All one off and pack prices INCLUDE V.A.T. Qty. prices do not.

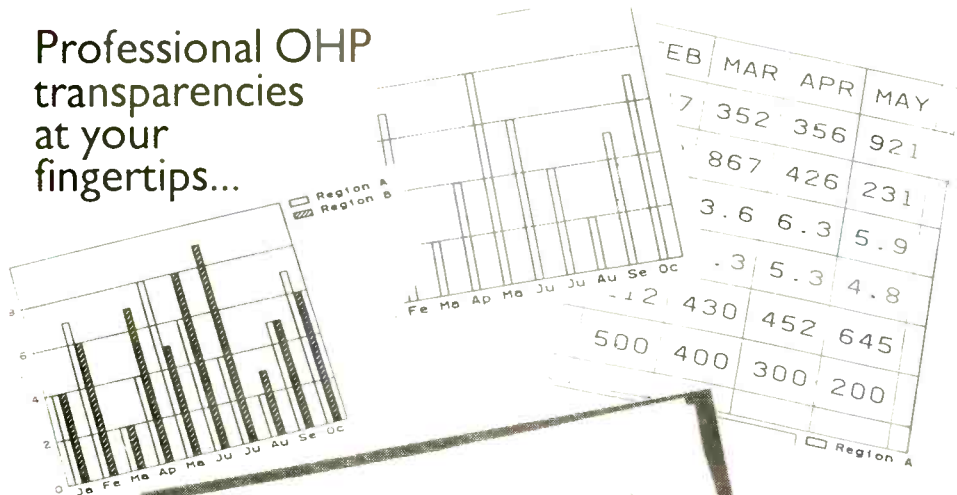
SUPER SENSATIONAL SUMMER SALE

7

HANIMEX

Electronic Graphic Writer

Professional OHP transparencies at your fingertips...



HELVETICA
 standard
 Bold
 Bold
 italic



TEXT

Portions of the keyboard are printed in your own fonts and in 15 different colours.

PRINTS ON PAPER OR CLEAR FILM IN UP TO 4 COLOURS

Interchangeable pen facility allows choice of colour with paper or acetate film option. Use ballpoint pen set with A4 paper, or special felt tip OHP pen set with A4 size OHP transparency film. Both sets available in set of four colours Black, Blue, Green and Red. Pens easily changed for multi colour productions.

3-MODE OPERATION

TYPE MODE: Characters, Numbers and Symbols are printed immediately on pressing the keys.
LINE MODE: A line of characters is entered into the line memory. Up to 16 Characters can be arranged on the LCD display and then corrected before printing.
EDIT MODE: Allows for easy editing of the page memory. Add, delete, insert words or graphics as you wish then press 'PRINT' to automatically produce the amended version.

MEMORY

LINE MEMORY 250 Byte
 PAGE MEMORY 3k Byte 1800 Byte for characters
 1200 Byte for graphs and layout

4 GRAPH MAKING FUNCTIONS

Layouts (for tables) bar graphs, Linear Graphs and Pie Charts easily and accurately produced in choice of three sizes with multi-colours if desired. It is possible to enter into page memory a maximum of two layouts and/or three graphs (Bar, Linear, Pie) for a Maximum of five.

18 FONTS IN 9 TYPE SIZES

Choose from Gothic Courier and Helvetica outline type faces each in plain or italic, and each available in nine character sizes ranging from 75 characters per line to 8 per line. Letters may be printed in **Standard**, **Half bold** or **Full bold**.

COMPACT, PORTABLE AND CONVENIENT

Measuring a mere 320 mm (W) X 60 mm (H) X 260 mm (D) and weighing 2.3 kg (excluding batteries) the Hanimex OHP Graphic Writer will travel anywhere. Takes four size 'D' 1.5V Alkaline Batteries fitted with 6V DC input for use with AC Mains Adaptor. (Batteries and AC Mains Adaptor available extra)

Price INCLUDES mains PSU + FREE OHP set containing 10 OHP sheets and 2 x 4 colour pen sets!!

ORIGINAL SELLING PRICE £299!!

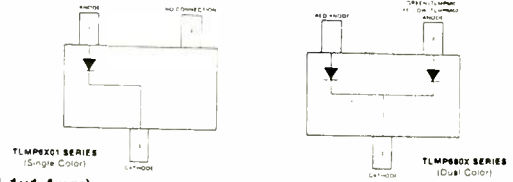
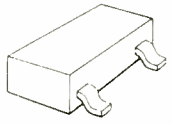
Order Code HAN101

SALE PRICE £69.99



EVERYTHING ON THIS PAGE 2 FOR THE PRICE OF 1

SURFACE MOUNT LED'S

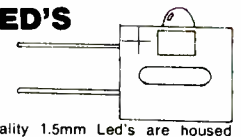


These LED's are in a SOT23 package (2.9x1.1x1.4mm)

CODE	PART NO	COLOUR	SPEC	£2 PACK	100+	1k+
Z2671	TFS056	Red	1.6mcd @ 10mA	12	.08	.06
Z2672	TFS059	Green	1.6mcd @ 10mA	12	.08	.06
Z2673	TLMP6301	Orange	0.5mcd @ 10mA	15	.06	.045
Z2674	TLMP6311	Red	1.6mcd @ 10mA	12	.08	.06
Z2675	TLMP6401	Yellow	0.5mcd @ 10mA	15	.06	.045
Z2676	TLMP6411	Yellow	1.6mcd @ 10mA	12	.08	.06
Z2677	TLMP6501	Green	0.5mcd @ 10mA	15	.06	.045
Z2678	TFS021	Red/Green	0.5mcd @ 10mA	8	.12	.09
Z2679	TLMP6802	Red/Yellow	1.6mcd @ 10mA	6	.16	.12
Z2680	TLMP6803	Red/Orange	1.6mcd @ 10mA	6	.16	.12
Z2681	TLMP6811	Red/Green	1.6mcd @ 10mA	6	.16	.12

KS106 A mixed pack of 100, containing most of the above types for just £8.95

SUBMIN LED'S



These excellent quality 1.5mm Led's are housed in a 6.2x5x2.4mm package with built in resistor for 5V operation (add 470R resistor for 12V). Available in Green (DP £1.73) or red (DP £1.16).

Z2135 Red 3/£1 100+ 0.15
Z2136 Green 2/£1 100+ .25



Z2461 PC mntg packaged red LED - mounts at right angles to PCB. 10.5x8x3.9mm. LED is 3mm. Ore type 9301A. Pack of 10 £1.00 100+ 0.05; 1k+ 0.04

Z1934 Stackable red LED - white casing round 6x3.5mm. Pack of 10 for £1.00

A couple of small matching rectangular LED's, 3.8 x 1.75 mm :

Z2500 Green Pack of 12 £1 100+ .05 1k+ .04
Z2501 Red Pack of 12 £1 100+ .05 1k+ .04

Z1845 Rectangular LED 7 x 2.5 Red. Unusual size by Hewlett Packard type LMP301.
Price Pack of 12/ £1.00

Z1464 3 way white* (lights up red) 7.5mm . 20p 10/ 1.40

Z1932 Red square LED with rounded corners. 5mm. Pack of 15 for £1.00

Z1933 Thin rect. red LED - 5x1.5mm. Pack of 20 £1.00

MINIATURE LED'S



These LED's have axial leads

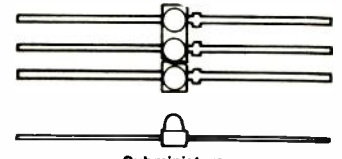
CODE	PART NO	COLOUR	SPEC	£2 PACK	100+	1k+
Z2691	TFS065	Red 1.8mm	2.8mcd @ 10mA	10	.10	.07
Z2692	TFS066	Red 1.8mm	2.8mcd @ 10mA	10	.10	.07
Z2693	TFS068	Green 1.8mm	4.5mcd @ 10mA	10	.10	.07

STANDARD LED'S

These LED's have radial leads

CODE	PART NO	COLOUR	SPEC	£2 PACK	100+	1k+
Z2682	MV6052	Red 5mm	0.7mcd @ 20mA tint/undiffused	25	.045	.03
Z2683	SL35091G	Orange 3mm	16mcd @ 10mA	16	.06	.04
Z2684	HLMP3850	Yellow 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2685	HLMP3950	Green 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2686	TLMP7413	Yellow 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2687	TLMP7513	Green 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2688	TLMP7313	HE Red 5mm	150mcd @ 20mA untint/undiffused	12	.075	.05
Z2689	LST712L	Orange/Green 5mm	4mcd @ 20mA milky/diffused	10	.09	.06
Z2690	XC5549R	Red 5mm	4mcd @ 10mA tinted/undiffused	30	.04	.025
Z2694	TLMP5401*	Yellow 5x2mm	4mcd @ 20mA tinted/undiffused	15	.055	.035

*These have an interlocking moulding incorporated to enable accurate alignment when stacked.



Subminiature (Last digit of Type No. denotes array length)

Z2571 Hewlett Packard sub-min red LED array type HLMP6204. Strip of 4 x 1.8mm LED's, easily separated if required. DP 1.27. Our Price: Pack of 6 £2.00

Z2091 Red 5mm square, Lilon type LTL9223A. Pack of 12 £1.00; 100+ 0.038; 1k+ 0.03

Z2098 Red 7x2.55mm rectangular by Senior type SE6511D. Pack of 12 £1.00; 100+ 0.038; 1k+ 0.03

Z2095 Red 5mm square with rounded corners by Phillips type HR444LD. Pack of 12 £1.00; 100+ 0.038; 1k+ 0.03

Z2096 Clear infra red 4.5x1.5mm rectangular, Honeywell type 8406. Pack of 8 £1.00; 100+ 0.06; 1k+ 0.04

Z2097 Red 5x2mm rectangular by GI, type MV57123. Pack of 12 £1.00; 100+ 0.038; 1k+ 0.03 .

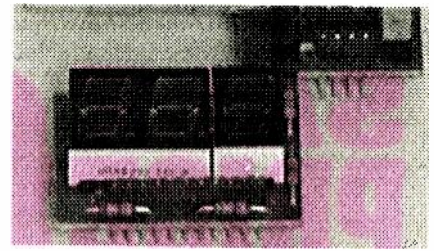
Z2182 Standard 5mm red LED with 18mm leads, bent at right angles. 18/ £1.00 100+ 0.03 1k+ 0.02 10k+ 0.015.



Hermetically sealed, TO46 case

CODE	PART	COL	RATING	£2 PK	100+
Z2764	TLMP9210	GRN	3.0 mcd@20ma	15	.07
Z2765	TLMP9310	YELL	3.0 mcd@20ma	15	.07

Z5501 Panel 71x27mm with dual 7 seg LED+red and green rect LED's. Pack of 10 £2.00



Z5502 Another, this time with a dual and single 7 seg LED+red and green rect LED's. Pack of 8 £2.00

CODE	TYPE	COLOUR	SIZE	SPECIFICATION	TU/DU	QTY	£2 PACK
Z2907	HLMP0401	YELLOW	2.5X7MM	0.9MCD @ 10MA	TD	1900	12
Z2908	HLMP0504	GREEN	2.5X7MM	0.9MCD @ 10MA	TD	296	12
Z2909	HLMP1321	HE RED	3MM	6.0MCD @ 10MA	TU	1700	16
Z2910	HLMP1421	YELLOW	3MM	6.0MCD @ 10MA	TU	100	12
Z2911	HLMP1521	GREEN	3MM	4.2MCD @ 10MA	TU	400	12
Z2912	HLMP3050	RED	5MM	2.0MCD @ 20MA	TU	6880	30
Z2913	HLMP3316	HE RED	5MM	20.0MCD @ 10MA	TU	1192	15
Z2914	HLMP3416	YELLOW	5MM	20.0MCD @ 10MA	TU	5444	12
Z2915	HLMP3517	GREEN	5MM	6.7MCD @ 10MA	TU	1514	14
Z2916	HLMP3519	GREEN	5MM	10.6MCD @ 10MA	TU	2172	12
Z2917	HLMP3862	YELLOW	5MM	8.0MCD @ 10MA	TD	200	14
Z2918	HLMP4610	HE RED	5MM	2.0MCD @ 10MA	TD	8422	25
Z2919	MV54123	GREEN	2X5MM	1.0MCD @ 20MA	TD	592	15
Z2920	MV6051	RED	5MM	0.4MCD @ 20MA	UD	4400	15
Z2921	MV64520	GREEN	5MM	12.0MCD @ 20MA	TU	514	12
Z2922	MV6752	HE RED	5MM	17.0mcd @ 20MA	TU	19112	20
Z2923	TF5012	HE RED				2416	20
Z2924	TF5031	HE RED	5MM	6.3MCD @ 10MA	TD	56170	25
Z2925	TF5032	RED	5MM	10.0MCD @ 10MA	TD	1564	20
Z2926	TLMP5001	RED	2X5MM	INTERLOCKING	TD	2775	20
Z2927	TLMP5301	HE RED	2X5MM	INTERLOCKING	TD	12823	15
Z2928	TLMP5501	GREEN	2X5MM	INTERLOCKING	TD	3600	15
Z2929	TLMP5801	RED/GRN	2X5MM	INTERLOCKING	TD	567	10
Z2930	TLMP7003	UB RED	5MM	200.0MCD @ 20MA	UU	1278	10
Z2931	TLMP7005	UB RED	5MM	300.0MCD @ 20MA	UU	924	8
Z2932	TLMP9710	HE RED	TO46	3.0MCD @ 20MA	H	95	12

H = Hermetic; TU/DU = Tinted/Untinted/Diffused/Undiffused

Traffic Light LED modules. Plastic moulding 15x10x7.5mm that have 2 x 3mm LED's mounted in them. Ideal for railway modellers etc.

Z2855 Red and Orange
Z2856 Red and Green
Z2857 Green and Yellow
All the same price - any mix, 10 for £2.00

Panel mntg LED's in chrome bezel, with long leads. Require 6mm hole

Z2744 Yellow Pack of 6 £1.00
Z2745 Green Pack of 6 £1.00

Z2860 3mm red diffused IR LED. No other info, so 10 for £1

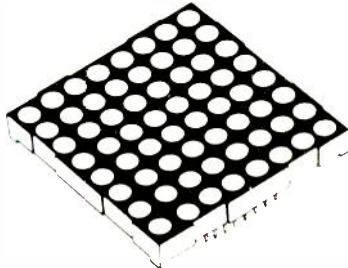
EVERYTHING ON THIS PAGE FOR THE PRICE OF 1



(B) (i) PHOTOTRANSISTORS, INFRA RED

All are in TO18 hermetically sealed cases.

CODE	PART NO	ImA	mW/cm	£2 PK	100+ QTY
Z2766	TDET800W	0.3	5	10	.10
Z2767	TDET801W	0.5	5	10	.10
Z2768	TDET802W	2.5	5	10	.10
Z2769	TDET803	4	5	10	.10
Z2770	TDET804	7	5	10	.10



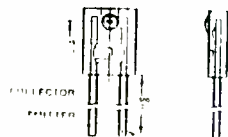
(C) LED BLOCKS

CODE	PART NO	SIZE (MM)	MATRIX	COLOUR	PRICE
Z2759	TFB3358C	35	5X8	YELLOW	1.60
Z5469	TFB3458C	35	5X8	GREEN	1.60
Z2760	TFB3758A	35	5X8	HE RED	1.60
Z5470	TFB3758C	35	5X8	HE RED	1.60
Z2761	TFB5357A	51	5X7	YELLOW	1.80
Z5471	TFB5357C	51	5X7	YELLOW	1.80
Z5474	TFB5457A	51	5X7	GREEN	1.80
Z5475	TFB5457C	51	5X7	GREEN	1.80
Z5478	TFB5757A	51	5X7	HE RED	1.80
Z5479	TFB5757C	51	5X7	HE RED	1.80
Z5472	TFB5388A	58	8X8	YELLOW	3.50
Z5473	TFB5388C	58	8X8	YELLOW	3.50
Z5476	TFB5488A	58	8X8	GREEN	3.50
Z5477	TFB5488C	58	8X8	GREEN	3.50
Z5480	TFB5788C	58	8X8	HE RED	3.50

The suffix A or C to the part number indicates common anode and common cathode respectively.

Z1847 4 Photo:transistor SDP8405 with data.

Price £1.00



Z1846 2 pairs of infra red emitter/ receiver SDP8406/ 8506 by Honeywell with comprehensive data.

Price £1.00



Z2122 Vactel Type VTL 10DI - IR emitter and detector can be removed from the plastic housing if required. An extremely cheap version of TIL100/TIL38!

Pack of 5 £1.00 100+ 0.10 1k+ 0.07

Z1743 TIL143 Opto slotted switch. These have cropped leads and some are ex-equip. but are all working.

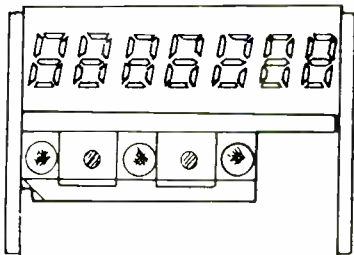
Price Pack of 3/ £1.00



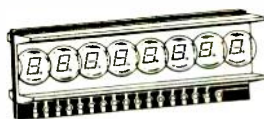
Z1499 Opto slotted switch on small (25x26mm) panel Type P850 75p

Z1500 Opto reflective switch type OPB6076 with 3pin connector 75p

PS4005 Opto slotted switch £1.00



Z2658 LED module. An interesting little PCB 50x35mm that has mounted on it a 7 digit 7 segment red display, and a plastic moulding under which are 3 surface mount LED's, one each red, yellow and green. On the back of the PCB is a SED5031M chip. Offered without info at present, although we are working on it. Believed to have been the display on a mobile phone. **Only £1 each**



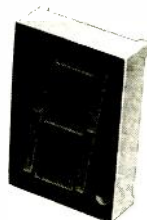
Z2903D Red LED PCB mounted display - 12 bubble digits 0.11" high. Full data supplied. **Only £1.50** 100+0.80

Z415 Display. 8 digit LED multiplexed. With data. 31 x 16mm.

Price 80p

Z5501 Panel 71x27mm with dual 7 seg LED + red and green rect LED's. **Pack of 10 £2.00**

Z5502 Another, this time with a dual and single 7 seg LED + red and green rect LED's. **Pack of 8 £2.00**



Z1855 7 seg LED 81720R - giant 1" digit. red. common cathode **£1.00**

Z2722 7 seg LED, MAN74A 0.3" CC red. A tube of 25 for £3.50 500+ 0.10

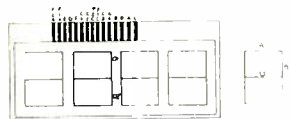
Z2435 Single 7 seg LED 10mm high digit. Type LN514RK. Common cathode. **4 for £1.00; 100+ 0.15; 1k+ 0.10**



Z2434 Dual 7 seg LED, type TDDR5250 by TFK. Red common anode 13mm digit height. DP 1.14. Our special low price (we have 10000 to clear) **2 for £1.00; 100+ 0.25; 1k+0.18**

Z2905D Red 2 digit 0.5" display as above. Common cathode **2 for £1.00 100+ 0.50**

Z2906D As above but common anode **2 for £1.00 100+ 0.50 1k+0.35**



Z2362 MS463M 0.6" common cathode 4 digit multiplexed display on PCB 70x30 with 15 way connector. Intended for digital clock use. Supplied with pin out. **ONLY £1.50**

Z2904D Red 3.5 digit 0.5" PCB mounted LED display. Common anode multiplexed output and stackable with full data. **£1.00 100+0.50**

Z1361 Right angle DIL socket for mounting 7 seg displays (takes our MAN6740 dual digit). Extremely high quality. **Prices: 40p 10+ 0.26 100+ 0.17.**

NEON INDICATORS

Top quality range by IMO - they are cheap because they're 110/120V - but we supply a suitable resistor for mains operation



Type A - Panel mounting 33 x 15mm with 0.25" tags. Clip fix. requires 25 x 12.5mm cut-out

Z1899 Green **5 for £1 100+ 0.10 1k+ 0.06**

Type B - Panel mounting 36.5 x 26.5mm with 0.25" tags. Clip fix. requires 30 x 22.5mm cut-out

Z1901 Red **(Any mix) 5 for £1**

Z1903 Amber **100+ 0.10 1k+ 0.06**



Type C - Small round face 10mm dia. Clip fix. requires 9mm dia hole

Z1905 Red **(Any mix) 5 for £1**

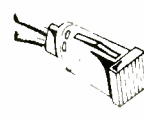
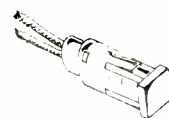
Z1906 Green **100+ 0.10 1k+ 0.06**

Z1908 White

Type D - Large round face 13.5mm dia. Clip fix. requires 12.5mm dia hole

Z1910 Green **(Any mix) 5 for £1**

Z1912 White **100+ 0.10 1k+ 0.06**



Type E - Small square face 10.5mm. Clip fix. requires 9.5mm dia hole

Z1914 Green **(Any mix) 5 for £1**

Z1915 Amber **100+ 0.10 1k+ 0.06**

Z1916 White

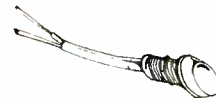
Type F - Large square face 13.5mm. Clip fix. requires 12.5mm dia hole

Z1917 Red **(Any mix) 5 for £1**

Z1918 Green **100+ 0.10 1k+ 0.06**

Z1919 Amber

Z1920 White



Type G - Small round face 7.5mm dia. threaded body. requires 6.5mm dia hole

Z1921 Red **5 for £1; 100+ 0.10; 1k - 0.06**

Price:

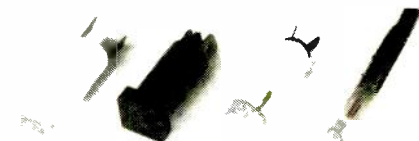
Type H - Body dia 17.5mm - chrome bezel. Wire ends

Z2066 Clear **5 for £1.00**

Price **100+ 0.10 1k+ 0.06**

K700 Pack of indicators, types A-G. May include any of those listed above. Great value for money! **20 for £2.50**

Z459 Neon bulbs 5.5mm dia x 15mm long - wire ended 30V neons at a great saving over normal prices! Made by VCH International. **In packs of 100 at £4.00 10+ 3.00**



Z511 Mains neon, clear 0.25" tabs require 15mm hole. **Prices: 20p 10/ 1.30 100/ 10.45**

Z514 As above, but 110V red. Same prices.

Z517 Mains neon, orange. Square face. Req 12mm hole. **Prices: 20p 10/ 1.30 100/ 10.45**

Z518 Mains neon, white. 0.187" tabs. Req 15mm hole. **Prices: 20p 10/ 1.30 100/ 10.45**

Z529 Mains neons - 90V neon + resistor with clear sleeve over and leads 70mm long. Some have dry joints.

Price **100/ £6.00**

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LED INTEGRATED DISPLAYS

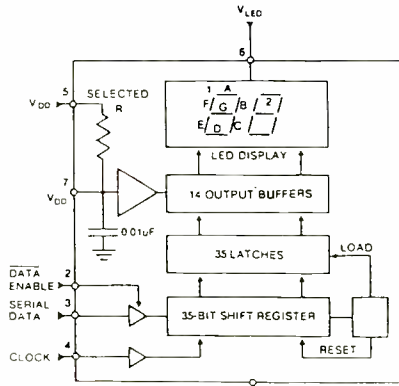
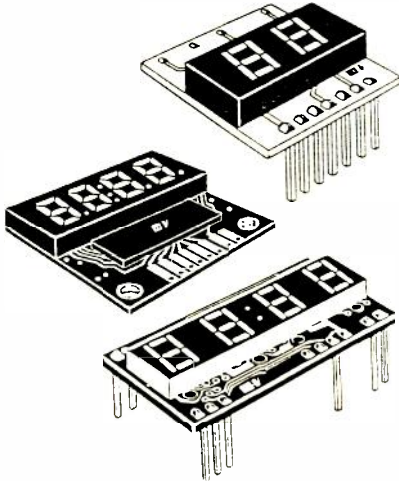
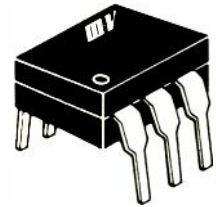


FIGURE 1—Block Diagram



(A) OPTOCOUPLERS

(i) Transistor

CODE	PART NO	VOLTS (RMS)	CTR% MIN	NOTE	£2 PK 100+ QTY
Z2773	4N35	2500	100		10 .12
Z2775	CNY1711	3000	63		10 .12
Z2777	CNY33	1770	20		10 .12
Z2779	CNY47	2000	20		10 .12
Z2780	CNY47A	2000	40		10 .12
Z2782	CNY51	4000	100		10 .12
Z2783	H11A2	1060	20		10 .12
Z2788	H11A3	1770	20		10 .12
Z2790	H11A520	4000	20		10 .12
Z2791	H11A550	4000	50		10 .12
Z2792	H11AA2	1770	10	D	6 .20
Z2793	H11AG1	4000	300	A	6 .20
Z2794	H11AV1	4000	100		10 .12
Z2795	H11AVIA	4000	100	B	10 .12
Z2796	H11AV3	4000	20		10 .12
Z2797	H11AV3A	4000	20	B	10 .12
Z2800	H11D4	1770	10		10 .12
Z2822	H11F2	1770		C	10 .12
Z2826	H11J3	NO INFO			20 .06
Z2835	MCT2	1060	20		10 .12

Notes: A: CMOS CTR @ 1mA
 B: GULLWING
 C: FET - NO OTHER DATA
 D: AC INPUT

K845 Mixed pack containing many of the above, plus others in quantities too small to list. 25 for £2.95

(ii) Darlington

CODE	PART NO	VOLTS (RMS)	CTR% MIN	£2 PK100+ QTY
Z2771	4N30	1060	100	8 .13
Z2772	4N31	1060	50	10 .10
Z2778	CNY35	1060	10	10 .10
Z2781	CNY48	1500	600	6 .16
Z2798	H11B2	1770	200	8 .13
Z2799	H11B3	1700	100	8 .13
Z2823	H11G1	2500	1000	4 .25
Z2824	H11G3	1500	200	8 .13
Z2825	H11G46	4000	500	6 .16
Z2831	MCA230	2500	100	8 .13
Z2832	MCA231	2500	100	8 .13
Z2835	MCA255	2500	200	6 .16

K846 Mixed pack containing many of the above, plus others in quantities too small to list. 25 for £3.95

(iii) Triac/SCR

CODE	PART NO	VOLTS (RMS)	Itr mA MAX	Vb	NOTE	£2PACK100+ QTY
Z2774	4N39	1060	14	200	S	6 .16
Z2776	CNY30	1770	11	200	S	6 .16
Z2783	GE3009	7500	30		T	6 .16
Z2784	GE3010	7500	15		T	6 .16
Z2785	GE3012	7500	5		T	6 .16
Z2786	GE3021	7500	15		T	6 .16
Z2836	MOC3009	7500	30		T	6 .16
Z2837	MOC3011	7500	10		T	6 .16
Z2838	MOC3012	7500	5		T	6 .16
Z2840	MOC3021LP	7500	15		TP	6 .16

Note: S = SCR T = Triac P = Surface mount pins
 K847 Mixed pack containing many of the above, plus others in quantities too small to list. 20 for £3.95

(iv) Schmitt

CODE	PART NO	VOLTS (RMS)	Itr mA (MAX)	£2PACK100+ QTY
Z2827	H11L2	2500	10	3 .35
Z2828	H11L3	2500	5	3 .35
Z2830	H11N1	3750	3	3 .35

A selection of 2 & 4 digit red and green displays with on board serial data in/parallel data out chips. Designed to operate with minimal interface. TTL compatible. Wide power supply operation. Direct current drive. Comprehensive data available - see below for details.

CODE	TYPE	COLOUR	DESCRIPTION	QTY	PRICE
Z2888	TSM4307	RED	2-DIGIT 0.3"p	429	£1.00
Z2889	TSM4507	RED	2-DIGIT 0.5"p	873	£2.40
Z2890	TSM5032	RED	2-DIGIT 0.3"	543	£1.00
Z2891	TSM5032P	RED	2-DIGIT 0.3"p	354	£1.00
Z2892	TSM5052	RED	2-DIGIT 0.5"	131	£1.40
Z2893	TSM5052P	RED	2-DIGIT 0.5p	955	£1.40
Z2894	TSM5232P	GREEN	2-DIGIT 0.3"p	654	£1.10
Z2895	TSM5252	GREEN	2-DIGIT 0.5"	14	£1.50
Z2896	TSM5252P	GREEN	2-DIGIT 0.5"p	14	£1.50
Z2897	TSM5732	HE RED	2-DIGIT 0.3"	663	£1.10
Z2898	TSM5735P	HE RED	4-DIGIT 0.3"p	74	£2.00
Z2899	TSM5752	HE RED	2-DIGIT 0.5"	98	£1.50
Z2900	TSM6232P	GREEN	2-DIGIT 0.3"p	248	£1.10
Z2901	TSM6732P	HE RED	2-DIGIT 0.3"p	358	£1.10

The p suffix indicates pcb with 0.1" pitch pins

Individual data sheets are supplied with each device, and a booklet, Z2999 is available with applications data + program listing on all the devices, price £2.00

K848 A pack of 10 assorted of the above types £5.00



Z2163 4 Digit multiplexed LCD. 50 x 30mm probably for an electronic balance-symbols include balance pens, 5 stage bar graph, lb's and kg's etc. Digit height 12mm Self adhesive pad on back. 13 pin PCB connector. **£2.00**



Z1637 LCD Display - Direct drive 3 1/2 digit with 'LO-BATT'. 12.7mm high digits Op voltage 4-12 RMS or 32Hz type. Consumes only 25µA with all segments on. Trade price £7.97 each Supplied with data, but no edge connector.

Prices **£1.00** 25+ 0.65 100+ 0.50

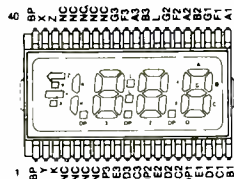


Z2119 4 digit LCD 12.5mm high with low battery and clock symbol. Complete with edge connector.

Price **£1.50** 25+ 0.95 100+ 0.65

Z4115 8 digit 12.7mm high LCD and holder. These are 14 segment devices allowing alphanumeric display. Normally costing over £15.00 we are offering these for just **£4.50**

Z2432 LCD 8 digit 10mm high. Single sided 36 way edge connector. **Only £2.00** 100+ 1.00 1k+ 0.80



Z2655D Clock or 3 1/2 digit LCD with 40 way connector. 12.7mm character height like H1331CC, DP 4.70. **Our price £2.00**



Z5287 Here's an oldie - we had a batch of these some time ago - the 'Tyrometer' - used to indicate tyre pressures on HGV's, this is the pod that fitted into the drivers cab. On the front panel are two small push and a toggle switch. Inside is a PCB with 11 miniature wire ended bulbs, a choke, 2 caps and a buzzer. There's a short length of 14 way ribbon cable, too. **£3.95**

GRAPHIC & DOT MATRIX DISPLAYS



LM225 Hitachi 640x200 dot matrix LCD for PC's, WP's, and industrial equipment. Module size 270x150x13mm. Display area 239x104mm. Dot size 0.32x0.46; pitch 0.49. Has on board 16 x HD61100 & 4 x HD61103 chips. Reduced from £39.50. **Now only £25.00**

SALE PRICE £14.95

Z5424D Graphic module LCD by Hitachi type LM212. Viewing area 240 26mm. Overall size 270 63mm. Similar to LM211 but narrower, for which we have data (supplies). £20

SALE PRICE £12.95

Z5489 20x2 dot matrix display by Toshiba, type TLC501 with 2xHD44100 & HD44780A00 chips on board. Fitted with 14 pin IDC type plug. PCB 115x37mm. £7.00

SALE PRICE £4.95

Z5460 Epson dot matrix display type EG2401A. Display area 139x39mm. Overall size 178x69mm. No data at present £15.00

SALE PRICE £9.95

Z5458 Epson 20 character x 8 line LCD, model EA-Y-20080AT, with backlight. This is the same spec (apart from the size) of our Z4372. Overall size 140x95mm. Display area 83x63mm. Supplied with comprehensive data. £25.00

SALE PRICE £14.95



(D) LCD DOT MATRIX MODULES

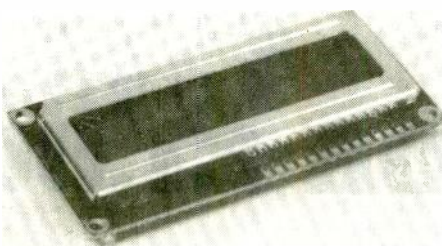
All with HD44780 controller (and HD44100 on larger displays)

CODE	PART No.	SIZE	CHAR	HT	PRICE
Z5482D	TLCM1620	16X2	5X7	4.27	6.00
Z5484D	TLCM2011	20X1	5X7	5.20	4.60
Z5486D	TLCM4021	40X2	5X7	5.20	9.50

A data sheet is included in the price.

Application notes: A 16 page booklet is available, price £2.00 order code Z2842

SALE PRICE 25% OFF



Z5096 16 character x 1 line Very similar to our Z1814 but slightly larger character -6.3x3.15 (8x5 dots) Type LCDM16166 by Refac. Supplied with data. Uses Hitachi HD44780A00 chip.

Price £8.00

SALE PRICE £4.95



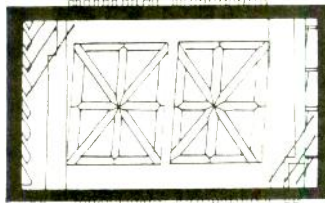
Z1731 NEC Vacuum Fluorescent Display FIP8B11 8 digit multiplexed output 10mm high Heater voltage 2V grid/anode voltage 24V. (Use Z4248 transformer to power)

Price £3.00

SALE PRICE £1.00

Z5459 Futaba 16 character x 2 line vacuum fluorescent display, type 162-BY-C1Z. Supplied with pin out. Next month's 'Guardian' will have some driver circuits shown. Only £2.50

SALE PRICE £1.00



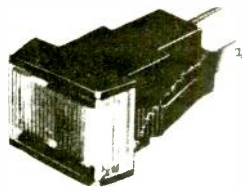
Z5118 Giant 30mm fluorescent 2 character green star burst display. 88 x 49 x 8mm Futaba type 2-JY-02Z Needs 3V and 10-18V Data supplied. Only £2.00

SALE PRICE £1.00



Z2586 6" 4W fluorescent tubes. T5 miniature. DP 1.95 Our Price £1.00 100+ 0.70

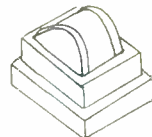
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Lampholders - rectangular snap in type that take LES bulb. Needs 16.1x11.6mm cut-out. DP (1978) 92p
Z5193 Red 3/£1.00 100+0.15

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PIR SENSOR



Z2700 PIR sensor. Extremely neat basic sensor (no electronics) in plastic moulding 33x28x30mm. Supplied with circuits and lots of information. Has 10m range. 164° angle of view. <1mW power consumption. £9.95

SALE PRICE £7.95



Z1921 Large square face 13.5mm. Clip fix, requires 12.5mm dia hole. Red. Price: 5 for £1.00; 100+0.10; 1k+0.06.

SALE PRICE 10/£1



Z2172 40 character x 1 line LCD by Optrex (Japan) High quality double height display with 192 character ROM other characters can be displayed by generation in RAM Other features include cursor with control, blink character scroll display, read and write display data, single +5V supply data and power inputs by one 16 pin 0.05" SIL socket, pin outs star tard and compatible with other Optrex displays, contrast control, easily interfaced with either 4 or 8 bit uP's. Supplied complete with data. Dimensions Characters are 5 x 12 dot arrays measuring 3.2 x 10mm Display size 170 x 17.5mm. Module size 220 x 40mm DP over £50.00 **Our Price £15.00**

AMAZING REDUCTION! 80% OFF! SALE PRICE £3.00

Z2659 LCD module. Probably intended for use in mobile phones. Size 44x28mm. One row of 10 digits + a load of Japanese characters. Uses 2xOKI M5259 chips. No other data (yet) £2.50

SALE PRICE £1.00

Z5352D Densitron alphanumeric LCD module 40x1 character type H2572HT. Farnell's price 29.28 - **Superdeal Price: £9.95**

SALE PRICE £6.95

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18 PIN IC SOCKETS
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(ONE THOUSAND)
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High Quality Audio/ Video Leads

Packed in poly bags with header cards, these 'Nu-Way' leads are offered at a surprisingly low price. 16 types available all 2m long except * which are 1.5m long. All connectors on all leads are screened - none of your cheapo plastic plugs here!!

Code	Type	Description	1 +	25 +
Z5033	677	PL259 + 5 pin DIN 180° plug to phono plug + 5 pin DIN 180° plug	£1.64	0.82
Z5034	686	PL259 + 2 phono plugs to phono plug + 5 pin 180° plug	£1.96	0.98
Z5035	687	Phono plug + 5 pin 180° plug both ends	£1.24	0.62
Z5037	680	PL259 + phono plug to BNC plug + 3.5mm plug	£2.46	1.23
Z5038	685	PL259 + phono plug both ends	£2.12	1.06
Z5039	683	PL259 + 2 x phono plug to BNC plug + 5 pin DIN 180° plug	£2.62	1.31
Z5040	VTV015*	BNC plug + 3.5mm plug to 6 pin DIN plug	£1.77	0.88
Z5051	VTV025*	PL259 + phono plug to 6 pin DIN plug	£1.43	0.71
Z5052	691	6 pin DIN plug to 5 pin DIN 180° plug + phono plug	£1.04	0.52
Z5053	669	PL259 + phono plug to 2 phono plugs.	£1.72	0.86
Z5054	672	PL259 + 5 pin DIN 180° plug to 3 phono plugs.	£1.96	0.98
Z5055	675	PL259 + 5 pin DIN 180° plug to PL259 + 2 phono plugs	£2.36	1.18

SALE PRICE ANY 4 £2.00



Z4186 3m multicore lead terminated both ends with 50 way centronics (IEEE-488) socket. Ideal for stripping down for flex - total 150m of multicoloured 7/0.2. Connectors alone worth £12.80

Price Only **£9.95**

SALE PRICE £2.50

PL616	DC adaptor lead for Walkman, 1.8m long		
Price	30p	100 + 0.15	
PL528	2 pin DIN line socket to phono plug 0.2m long.		
Price	20p	100 + 0.10	
PL708	Video lead. PL259 plug to F type plug. 3m low loss coax.		
Price	85p	100 + 0.45	
PL508	5 pin DIN - 3 pin DIN audio lead 1.2m long.		
Price	40p	100 + 0.20	

ALL HALF PRICE MIXED PACK 5 OF EACH £3



Z4353 6 way DIN lead. 1.5m lead terminated one end with a 6 pin DIN plug. Bare wires the other end

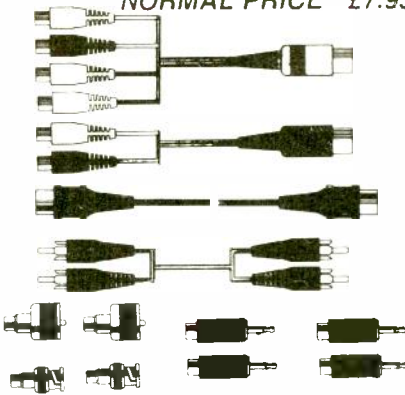
Prices Pack of 4/£1.00; 100/£12.00; 1000/£90.00

SALE PRICE 8 for £1

Z5332 PC keyboard cable - standard heavy duty high quality curly lead with 5 pin DIN plug one end, push in connectors the other. Ex-new equipment. £2.00

SALE PRICE £1.00

NORMAL PRICE £7.95



SALE PRICE £4.00

T120A Video/audio dubbing kit.

- ★ 1 screened lead - 5-pin DIN plug to 5-pin DIN plug. Mirror image. 1.5m.
- ★ 1 twin, screened lead - 2 phono plugs to 2 phono plugs. 1.5m.
- ★ 1 twin, screened lead - 2 phono sockets to 5-pin DIN. 180mm.
- ★ 2 twin, screened leads - 4 phono sockets to 5-pin DIN. 180mm.
- ★ 2 adaptors - phono socket to PL259 (UHF plug)
- ★ 2 adaptors - phono socket to BNC plug
- ★ 4 adaptors - phono socket to 3.5mm jack plug

Z4350 A set of 3 different pairs of test leads, offering great value! - a) 67mm long, 2mm probes both ends; b) 110mm long, 2mm probes one end, 4mm plugs the other; and c) 90mm long silicon rubber, 2mm probes one end, shrouded 3mm sockets the other. All are red and black pairs. All three for just £2.00

SALE PRICE £1.00

Z5401 Spider leads - like our P0650 at 99p, but they are grey. 2m long and have a 1.3mm power plug (for Walkmans) as well as the normal 2.1 and 2.5 power plugs, and 2.5/3.5 jack plugs. 2 For £1.00 100+ 0.24; 1k+ 0.16

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Z5387 Car power lead - cigar plu one end, 2.1mm power plug the other. 2m long £1.75 100+ 1.00

SALE PRICE £1.00

Z5417 Scoop purchase on 5PIN DIN - 5PIN DIN leads - 1.2m long, moulded on plug, black lead. Pack of 10 £2.95

SALE PRICE £1.50

Z5087 Lead - 6 PIN DIN to 3 coloureu phono plugs (video + L and R audio) using flat splittable screened lead. Nice and long-2M. Cheap enough to cut the DIN plug off and reterminate with phonos!

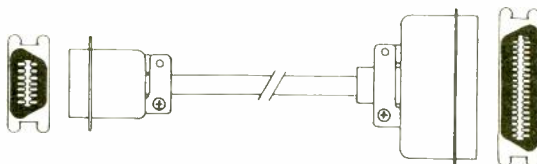
Price 2/£1.00 10+ 0.35 100+ 0.25

SALE PRICE 4 for £1

BULK DEAL ON HIGH QUALITY 2.5mm AND 3.5mm SCREENED PLUGS & SOCKETS BY ADASTRA!

- P9 3.5mm mono plug ~~36p~~ 10 for £2; 100+ 0.10; 1k+ 0.06
 - P10 2.5mm mono plug ~~34p~~ 10 for £2; 100+ 0.10
 - P11 3.5mm enclosed mono chassis skt ~~36p~~ 20 for £2; 100+ 0.05; 1k+ 0.035
 - P12 2.5mm enclosed mono chassis skt ~~36p~~ 20 for £2; 100+ 0.05; 1k+ 0.035
- Also 1/4" stereo jack plug at less than half normal price!
- 5 for £2** 100+ 0.25; 1k+ 0.18

25% OFF ALL THESE PLUGS AND SOCKETS!

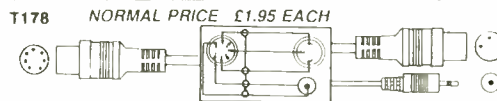


NORMAL PRICE £5.95

T190B **£2.00**

14-way Centronics plug to 36-way Centronics plug. MSX printer lead
Length 2m

SALE PRICE 2 FOR £1.00



T178 NORMAL PRICE £1.95 EACH

7-pin DIN plug to 3-pin DIN plug and 2.5mm jack plug Colour grey
Length 1m

5 FOR £1.00

SALE PRICE 10 FOR £1.00

CAT PRICE £2.58



T108 BUC12 BNC plug to PL259 (UHF) plug
Length 1.2m

CLEARANCE PRICE £1.00; 100 FOR £50.00

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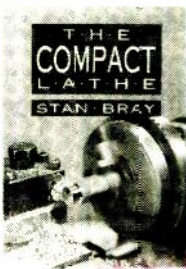
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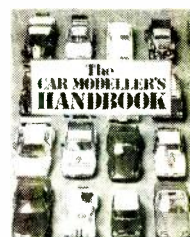
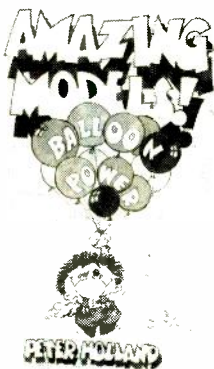
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£3.50

K560 We've now collected together enough semis to offer this pack again - it was extremely popular a couple of years ago. All types of semiconductor included - diodes, transistors, I.C.'s etc all new full spec and marked Qty. is approximate depending on the number of power devices included.

PRICE: Pack of approx 100 £5.95; 300 £12.95 1000 £42.95

K851 74F fast logic. Types included 00, 02, 04, 08, 51, 74, 158, 240, 244, 245, 280, 373 + stacks more. Over 25 types.

PRICE: Pack of 100 £6.50

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K852 74HC. Nice selection of highspeed CMOS logic including 00, 05, 151, 157, 245, 273, 280, 423, 451, 4053, 4060. Over 25 types.

PRICE: Pack of 100 £7.00

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SALE PRICE £1.75

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PRICE: Pack of 200 £3.50

SALE PRICE £2.50

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PRICE: Pack of 50 £2.00

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K582 Polystyrene Caps. An amazing range of values from a few pF to .01. Tolerances 20% Voltages to 500V.
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K530 100 Assorted Polyester Caps. All new modern components radial and axial leads. All values from 0.01 to 1uF at voltages from 63 to 1000V!
Super value at: £3.00

SALE PRICE £2.50

K714 Power Supply Capacitors. All cans, mostly computer grade including popular values like 10,000uF 40V etc. Big mix of values and voltages up to 100V or more and 50,000uF.
PRICE: for box of 25 £12.50

SALE PRICE £10.00

K549 Trimmer Capacitors. A nice selection of small value caps ranging in value from a few pF to 100pF or more, various dielectrics.
PRICE: Pack of 20 £1.75

SALE PRICE £1.50

K548 Tant bead capacitors. About a dozen different types from 0.1uF to the rather pricey 100uF, voltage from 6-50V.
PRICE: 50 for £3.00

SALE PRICE £2.50

RESISTORS

K540 Black in stock! after a long absence, we can again supply this popular assorted resistor pack - mostly 1/4 & 1/2W, some larger. Big range of popular values, all with full length leads.
PRICE: Pack of 500 £2.95.

SALE PRICE £2.00

EXTRA SPECIAL PACK PRICE

K531 Precision Resistor Pack . High quality close tolerance R's with an extremely varied selection mostly 1/4W and 1/2W tolerances from 0.1% to 2% - ideal for meters, test gear etc.
PRICE: 250/ £3.00

£1.50

K523 Resistor Pack . 1000 - yes 1000 mainly 1/2W 5%, 10% & 20% carbon/carbon film resistors with preformed leads for PCB mounting. Fair range of preferred values.
PRICE: only £2.95

SALE PRICE £1.50

EXTRA SPECIAL PACK PRICE

K572 Resistor Networks. both SIL and DIL in here, from 6 to 16 pin. Plenty of popular values like 1K, 4K7 and 10K and a good sprinkling of many other values.
PRICE: Pack of 100 £4.50

£2.00

K503 100 Wirewound Resistors. From 1W to 12W, with a good range of values.
PRICE: £3.50

SALE PRICE £2.00

K525 Preset Pack. Big, big variety of types and sizes-sub-min, min and std, MP, slider, multiturn and cermets are all included. Wide range of values from 20R to 5M 100 assorted
PRICE: £6.75

SALE PRICE £3.50

K505 20 Assorted Potentiometers. All types including single, ganged, rotary and slider.
PRICE: £2.30

SALE PRICE £1.20

K827 Cermet trimmers. An excellent range of multiturn miniature cermets from 10R to 2M.
PRICE: Pack of 50 £7.95

SALE PRICE £4.50

K828 "Lo-ohm" wirewound pack. Values less than 10R are always popular and this pack contains only resistors between 0R1 and 10R.
PRICE: Pack of 50 £4.30

SALE PRICE £2.50

OPTOELECTRONICS

K701 110V Indicators. This pack of neon indicators comprises round and square panel mounting types in red, green, amber and clear.
PRICE: Pack of 20 £2.50

SALE PRICE £1.75

K539 LED Pack . Not only round but many shaped LED's in this pack in red, yellow, green, orange and clear. Fantastic mix.
PRICE: 100/ £6.50

SALE PRICE £3.95

K524 Opto Pack . A variety of single point and 7 segment LED's (incl. dual types) of various colours and sizes, opto isolators, numicators, multi digit gas discharge displays, photo transistors, infra red emitters and receivers.
PRICE: 25 asstd. £4.50

SALE PRICE £3.00

K806 LED Pack contains only red LED's round, square, rectangular etc, from 3mm to 7x 2.5mm.
PRICE: 100/ £5.00

SALE PRICE £3.00

EXTRA SPECIAL PACK PRICE

K801 Seven seg. LED pack . Big variety of sizes in this pack . May include Red and green also overflow/polarity displays, single/ double digit also 7/8/9 digit. magnified displays . Sizes from 0.11" to 0.8".
PRICE: 20 peices for just £ 3.95

£1.95

K804 Lamp Pack. A superb quality pack containing a wide variety of small lamps. Many different types - wire ended bi-pin, slide, MBC, MES, LES, TI, wedge, miniflange etc in voltages from 2.5V to 220V. Most are marked with voltage/ current
PRICE: Pack of 50 £ 4.00

SALE PRICE £2.50

16**SUPER SENSATIONAL SUMMER SALE****GREENWELD**27 Park Rd. Southampton SO1 3TB
Tel: 0703 236363 Fax: 236307
All one off and pack prices **INCLUDE V.A.T.** Qty. prices do not.**SWITCHES & RELAYS**

EXTRA SPECIAL PACK PRICE

K532 Relay pack . We've now built up enough surplus relays to offer this popular pack once more. Could contain anything from 2V to 250V coils, SP to 6 pole contacts switching up to 10A.
PRICE: 20 for £6.95

£3.50

W4700 Push button banks. An assortment of latching and independent switches on banks from 2 to 7 way DPCO to 6PCO. A total of at least 100 switches.
PRICE: 100/£6.95

SALE PRICE £3.50

K592 Pack of 25 miniature rocker and lever switches from page 125 of the 1991 catalogue.
PRICE: £4.00

SALE PRICE £3.00

K593 Pack of 25 push and slide switches from page 125 of the 1991 catalogue.
PRICE: £3.50

SALE PRICE £2.50

K520 Switch pack. 20 different assorted switches - rocker, slide, push, rotary toggle, micro etc. Amazing value.
PRICE: £2.50

SALE PRICE £2.50

K542 Reed Relays. Mostly DIL single pole & double pole also some changeover, these are manufacturers rejects, but a good proportion work. 5V to 50V coils. 50 assorted.
PRICE: £3.30

SALE PRICE £1.50

K715 DIP Switch pack tremendous selection of DIP switches mostly from page 121 of 1991 catalogue. everything from 1 - 9 way at astonishingly low price.
PRICE: Pack of 20 £3.25

SALE PRICE £2.00

K824 Rocker switches, both miniature and standard, single and double pole illuminated red/green/amber and plain Fantastic value.
PRICE: Pack of 20 £4.95

SALE PRICE 100 £6.00

K825 as above but also included some illuminated push switches.
PRICE: Pack of 20 2.95

SALE PRICE £1.95**PLASTIC/SLEEVING**

K564 PCB Stand - Offs. A mixture of 8 different styles and sizes from 4.5 to 12.7 mm high.
PRICE: 100/£2.95

SALE PRICE £2.00

K826 Jumbo pack of plastic stand - offs & a few cable clips and bits and peices. 1000 parts.
PRICE: £9.95

SALE PRICE £6.00

K533 Silicon Rubber Sleeves. 15mm long 5.5mm bore, 1mm wall.
PRICE: 100/ 50p

SALE PRICE £0.40**HEATSHRINK SLEEVING**

K843 This normally expensive sleeving offered at a fraction of normal trade prices. A pack of 10m, black and clear with at least 5 different sizes from 3.5 to 4.2 mm dia. for just
£3.95.

SALE PRICE £3.00**CONNECTORS**

K557 Terminal Blocks. In all shapes and sizes, solder and screw from single way to 12 way in many different current ratings.
PRICE: 20/ £2.95

SALE PRICE £2.25

K803 PCB pack with/without ears, straight and right angle from 10 to 64 way.
PRICE: Pack of 20 £5.50

SALE PRICE £3.00

K802 Pack of DIN41612 connectors. These popular PCB connectors come as 32/64/96 way Both plugs and sockets, some with pins missing normally costing £1- £3 each.
PRICE: Pack of 25 £8.00

SALE PRICE £5.00

K836 DIL Socket Pack A super selection of DIL IC sockets from 8 to 64 way, low profile and standard mntg, turned pin tinned, gold plated, wire wrap and solder terminals
PRICE: 100 for £14.95

SALE PRICE £9.95

K705 PCB Headers. SIL & DIL PC mounting header plugs straight and right angle mostly 0.1" pitch in a variety of ways from 3 to 30
PRICE: Pack of 100/£6.00

SALE PRICE £4.00

K837 Lead pack. Assortment of signal and power leads terminated with a variety of plugs and sockets
PRICE: 25 for £3.95

SALE PRICE £2.00

K562 Edge connectors. Mostly 0.1 pitch some 0.15, 0.156 and 0.2 as well Single / double sided / tinned / gold plated solder/ wirewrap / PC connections
PRICE: Pack of 20 £3.95

SALE PRICE £2.20**MOTOR+GEAR PACK**

K579 This pack contains 10 assorted battery powered motors (mostly 3V) + 90 gears etc. 16 - 60 mm dia. + worms and shafts amazing value.

PRICE: £7.95**SALE PRICE £6.95****HARDWARE**

K553 2BA Screw mix . Mostly steel, few brass / nylon etc, cheesehead, hex, countersunk , slot and pozi , mainly in lengths from 7 - 63mm. Excellent selection.

PRICE: 100/ £2.60**SALE PRICE £2.00**

K552 4BA screws - Super mix of types mostly steel, with round pan, cheese, c/s heads in lengths from 5mm to 50mm great value.

PRICE: 200 for £2.75**SALE PRICE £2.00**

K811 6BA Screws. Nearly all pan head pozi in plated steel. Lengths to 16mm.
PRICE: Pack of 100 £1.50

SALE PRICE £1.20

K807 M3 Screws. Good selection of sizes including a few brass. Most heads. Lengths to 35 mm.

PRICE: Pack of 100 £1.50**SALE PRICE £1.20**

K808 M4 Screws. Huge variety! Pan, c/s, cheese, set, slide, pozi. From 4-50mm long. All steel, plated, black / hi-tensile.

PRICE: Pack of 100 £1.60**SALE PRICE £1.30****K809** M5 Screws. As above.**PRICE: Pack of 100 £2.00****SALE PRICE £1.60**

K833 M6 pack. Excellent value - contains screws in various lengths and head. Mostly steel, some hi-tensile.

PRICE: pack of 100 £ 4.50

SALE PRICE £3.00

K830 M8 screws and bolts. Good assortment from 16-90mm long, c/s hex, pozi some hi-tensile. All steel.

PRICE: pack of 50 £3.80

SALE PRICE £2.30

K831 M10 Bolts. Mostly hi-tensile hex head lengths from 16 - 90mm

PRICE: Pack of 20/ £3.20

SALE PRICE £2.00

K832 M12 Bolts. Mostly high tensile hex head. Lengths from 40 - 15mm

PRICE: Pack of 10/£2.40

SALE PRICE £1.70

K820 Large bolts and set screws. Could weigh as much as 150g each (up to 16mm dia x 90mm long) Practically all are steel Many different heads.

PRICE: Parcel weighing 5kg £10.00

SALE PRICE £7.00

K527 Hardware Pack This has a large variety of PK (caps) and self tapper screws from 2 x 1.5" up to 8 x 1.25 also washers, some BA metric and whit. Screws plus other miscellaneous brackets, captive nuts and bits and peices 1kg (up to 1000 peices)

PRICE: 1kg £4.00

SALE PRICE £2.50

K581 Copper Clad Board A selection of single and double sided, mostly fibreglass in useful sizes.

PRICE: 200 sq ins £3.00

SALE PRICE £2.00

K535 Spring Pack. Approx 100 assorted compression, extension and torsion springs up to 22mm in diameter and 30mm long.

PRICE: £1.70

SALE PRICE £1.00

K595 Big mix of screws - very few BA mostly metric BSF Whitworth DZU etc. Tremendous variety of heads - cheese, cs, pan, hex, allen round etc. As for size, well we've seen some as small as 3mm and a few as long as 80mm. There's even some 12.5 mm dia in this pack! You'll probably also find a few odd clips washers, nuts etc. too.

PRICE: 500gm pack £2.70

SALE PRICE £2.00

K717 Keyboard caps - a wide variety of sizes and colours from 17 x 16 mm to 25 x 25 mm. Some long ones too. Most have words - some numbers.

PRICE: Pack of 100 assorted £3.50

SALE PRICE £1.50

SURFACE MOUNT

K577 Surface mount FETs including SM versions of 2N4301, 4392, 4857 5488/9/60/1, also 2N7001/2 etc. Big variety at a low price.

PRICE: Pack of 50/ £4.00

SALE PRICE £3.00

KS102 Transistors - about a dozen different types plus a few diodes, mostly SOT23. Type numbers include BCF29/30, BSR15, BC856, BCV71 BCW29/71/72/81. Supplied with code sheet.

PRICE: Pack of 100 for £3.00

SALE PRICE £2.00

KS103 Resistors. 0.125W 2% in a range of values from 3R3 to 10M. Although there is a fair range (about 50 values) many are E24.

PRICE: Pack of 1000 for £3.00

SALE PRICE £2.00

KS104 Capacitors - over 20 different values from 1pF to 470nF.

PRICE: Pack of 100 £4.00

SALE PRICE £3.00

KS107 3 values only of tants: 1uF, 4uF and 22uF. Pack of 30, 10 each value with DP of 12.70 for just £3.00

SALE PRICE £2.00

KS105 Surface mount coil pack, only a few different values 70, 80, 120, 150 and 180uH.

PRICE: Pack of 50 assorted £3.00

SALE PRICE £2.50

EXTRA SPECIAL PACK PRICE

KS106 Surface mount LEDs. This really is an excellent pack, containing a great selection of red, green, yellow and orange LEDs, including some dual types (red/green and red/yellow) mostly SOT23 package.

PRICE: 100 for £8.95

£4.40

FUSES & HOLDERS

K555 Fuses. A marvellous selection of 15, 20, 25 and 32mm fuses both carriage and wire ended in quick blow and antisurge varieties. May be anything from 32mA to 50A.

PRICE: 100/£3.95

SALE PRICE £2.50

K834 Thermal fuses 104, 109, 121 & 152°C, some with cropped leads.

PRICE: Pack of 20 £2.95

SALE PRICE £2.00

K713 Fuse holders. Panel and chassis mounting from basic clip to high current enclosed types for 15, 20 and 32mm fuses.

PRICE: Pack of 50 £4.00

SALE PRICE £2.50

MISCELLANEOUS

K541 Printed Curcuit boards. A wide variety of high quality printed curcuit boards including audio, RF, digital etc all covered in components - resistors, capacitors, transistors, IC's LED's switches etc, etc. A big pack of 2Kg.

PRICE: only £7.00

SALE PRICE 5KG £10.00

K712 Crystals. Mostly HC60 and HC18U in a wide variety of frequencies from a few hundred kilohertz to many megahertz and the odd crystal oscillator module or two

PRICE: 20 for £4.95

SALE PRICE £3.00

K829 Transducers. Piezo, electromagnetic, permanent magnet in assorted sizes from 15mm dia upwards. Lovely mix.

PRICE: Pack of 25 £3.50

SALE PRICE £3.00

K506 This one's an absolute gem! Contains a selection of conventions and switch mode power supplies, including AA12531, Z660, Z5307/8 + Lots more! Parcel of 10 originally selling for £40 +.

PRICE: £25.00

SALE PRICE £15.00

K835 New transformer pack. All mains, primary, secondary range from 6-35V, 0.5 to 3A.

PRICE: Pack of 12 £10.00

SALE PRICE £7.00

K574 Wire link pack. A wide range of sizes from 3mm to 50mm for use with Breadboards or PCBs. Some are bare, a few are not preformed.

PRICE: per pack of 250 £1.00

SALE PRICE £0.50

K561 Coils and Chokes. Pot cores, IF cans, open wound coils, chokes, etc from a few uF upwards in a wide variety of sizes and values.

PRICE: 50/£2.80

SALE PRICE £2.00

K844 A small parcel of miniature chokes by Greendale. 8 values from 1uF to 68mH, either radial 11x8mm or axial 10x4mm.

PRICE: Pack of 25 £2.60

SALE PRICE £1.80

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SUPER SENSATIONAL SUMMER SALE

GREENWELD 27 Park Rd. Southampton SO1 3TB
Tel: 0703 236363 Fax: 236307
All one off and pack prices INCLUDE V.A.T. Qty. prices do not.

SAM POWER SUPPLY & MODULATOR

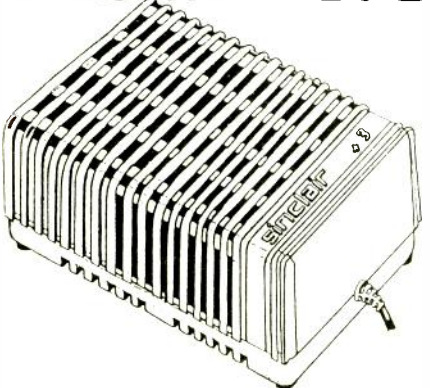


Z9111 Never heard of the SAM Coupé Computer? Well, the holding company SAMCO went bust, and now someone is trying to resurrect it - but the liquidators were anxious to turn piles of stock into cash, so we purchased all remaining stocks of the Astec made PSU's and can offer them at an amazing price! Inside the 170x150x70mm grey and black vented case is a linear power supply (240V ac in; 5V 2A & 12V 0.1A dc out) PLUS a UM1286 UHF colour TV + sound modulator! There are 3 leads: 2.2m phono to co-ax; 2m mains & 1.9m output lead fitted with a 6 pin DIN plug. All brand new stock. All this for just

£9.95 100+ 4.40

SALE PRICE £4.95

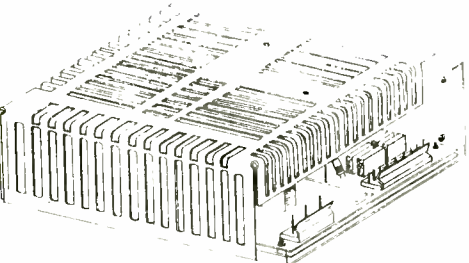
SPECTRUM +3 PSU



Brand new product - our scoop purchase of these linear power units enable you to buy at less than one third the normal price! Attractively cased in a black vented plastic case 155x102x70mm, they have a 1.3m mains lead and an output lead 2m long fitted with a 6 pin DIN plug. Input: 220/240V ac. Output: +5V @ 2A; +12V @ 0.7A; -12V @ 50mA. Z9110

£9.95 100+ 4.50

SALE PRICE £4.95

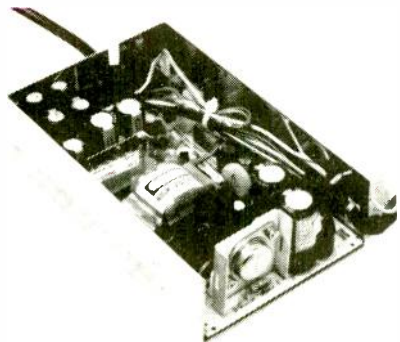


Z9114 This is a super unit 168x110x50mm in its steel case. Again, removed from gaming machines and tested before despatch. Std mains input. Outputs: +5V 3A; +12V 3A; -5V 0.5A; +12V 0.3A. Excellent Value at

£12.50 100+ 5.75

SALE PRICE £5.95

SWITCH MODE PSU's



AA12531 Switch mode PSU by Astec partially cased. 160x104x45mm overall with 160x100mm Eurocard PCB. Inputs and outputs are on colour coded flying leads. Input 115/230V 50/60Hz. Outputs: +5V @ 5A; +12V @ 0.15A. Total wattage 50W.

£8.95; 25+ 5.43; 100+ 4.53

SALE PRICE £2.50

Conversion Kit

K725 This kit converts the AA12531 PSU into a much more versatile supply, giving +5V @ 2.5A; +12V @ 2A; -12V @ 0.1A and -5V @ 0.55A. Complete set of parts and full instructions £3.50 Instructions only (K726) £1.00



Farnell NO55P Power Supplies

We've taken delivery of these popular supplies from several different sources, and now have the following models available. All are switch mode 115/230V input rated 55 watts max. Size of cased units 182x112x55mm, uncased size 160x100x40mm.

Z5304 Model 326, cased. Outputs: +5V 3A; +12V 0.1A; -12V 0.1A. Price £12.95

SALE PRICE £6.95

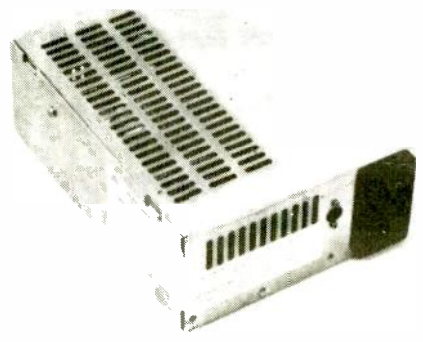
Z5334 Model 314. Outputs: +5V 3.5A; +12V 3A -12V 1A. Price £14.95

SALE PRICE £7.95

LIGHT UP YOUR LAYOUT

K692 Super deal for modelers - we supply a mains power supply, 100 miniature lamps for wiring into your railway layout or dolls house, and 100m of flex. Circuits and details of how to wire up the lamps in series/parallel are provided. Everything for just £19.95

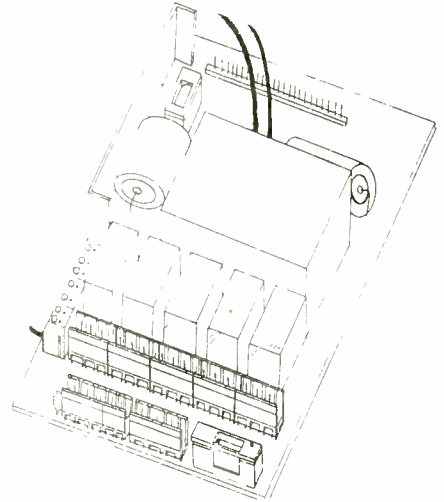
SALE PRICE £14.95



BM41012 Superb switch mode PSU made by Astec. Enclosed case 175x136x65mm with switched and fused IEC mains inlet. 160x80mm PCB with output pins extended to external connector. Input 115/230V 50/60Hz. Outputs: +5V @ 3.75A; +12V @ 1.5A; -12V @ 0.4A. Total wattage 65W

£14.95; 25+ 11.70; 100+ 9.75

SALE PRICE £9.95



MODEL RAILWAY CONTROL AND SWITCHING UNIT

This ready built versatile piece of equipment allows:
* Full forward and reverse control of trains using regulated and smoothed supply (1.5A)*
* Requires 3 components (supplied) to be soldered to each panel.
* Relay control of 5 separate circuits, (10A changeover contacts; ideal for points operation)
* Powering of auxiliary equipment - 2 separate 5V 1A outputs.

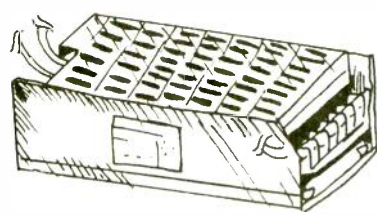
A mains powered panel 185x105mm contains all electronics. All voltages are fully stabilised and both input and output are fused.

Connections, both input and output are by screw terminals which are clipped onto the on-board pins.

The five 12V relays are controlled by transistor circuits which require only 5V 30mA, supplied by the on board power supply.

Supplied uncased with circuit and wiring diagram. (SAE for free copy.)

Suitable black ABS plastic case £3.50
Order Code Z8897 Price reduced to £14.95



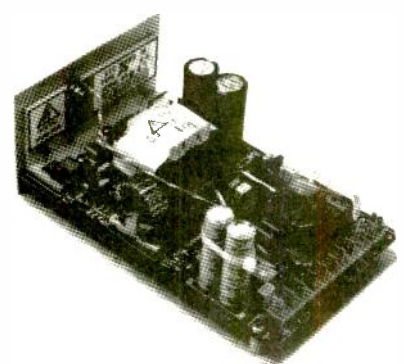
Z9109 Although these PSU's are boxed and look in excellent condition, we don't believe they are brand new. However they are all full spec working units made by Source Electronics Ltd, model HSE250-30 and offered at a cost substantially below the market price. The units are fully cased and measure 380x125x65mm. Standard mains input and 3 useful outputs: +5V @ 30A, +12V @ 8A and -12V @ 1A. Maximum total wattage is 250 watts. These would cost around £200 from a distributor - Our price £24.95.

SALE PRICE £19.95

SALE PRICE £9.95

**SWITCH MODE
POWER SUPPLY
BONANZA
ALL IN THIS BOX
HALF PRICE**

- Z5504** 197x98mm PCB 50 watt unit: +5V 5A; +12V 1A; -5V 0.5A; -12V 1A. **£9.95**
- Z5503** 126x76mm PCB. 30 watt unit: +5V 4A; -5V 1A. **£4.95**
- Z5505** 205x102x45mm uncased unit rated 120W. +5V 6A; +12V 2A; -12V 1A. Also has a number of leads attached, one with a 15 way D socket, and a small PCB with LM339 and other bits on it. **£14.95**
- Z5508** Cased unit for monitor 205x130x60mm by Source Electronics Ltd, model HSL80-47. Rated 80 watts. +70V 0.9A; +6.3V 0.7A; +15V 1A; -15V 0.4A. **£16.95**
- Z9133** Cased unit 380x128x75mm rated 500 watts by Source Electronics Ltd, model SAX500-02. +28V 16A; +5V 6A, also + and - sense. Super robust unit. **£39.95**



Z8887 Made by STC, this 160x100mm panel is attached to an aluminium chassis. 165x102x65mm and has a single 5V 6A output. Supplied with connection details, we can offer these at a fraction of their normal cost.

Price £5.95 10+ 4.30 100+ 3.43
SALE PRICE £2.00

Z8888 A larger version of the above, PCB 220x100mm and chassis 225x102x65mm providing a single 5V 10A output. Supplied with connection details.

Price Only £8.95 10+ 6.50 100+ 5.20
SALE PRICE £3.00

Z5280 Neat switch mode PSU on panel 120x100mm and only 32mm high. Mains input via skt supplied, 3 outputs on socket are +5V@2A; +12V@0.3A; -12V@0.2A. These have been removed from equipment, but are clean and in full working order **£7.50**

SALE PRICE £3.75

Z5418 Switch mode power supply - brand new unit, as fitted in Z8945 micronet terminals (which are now sold out) This is a 60 watt unit on a panel 280 x 240mm (although 120 x 240mm is unused). Each unit is supplied with a final test sheet, listing output voltages and currents which are, typically, +12v 2A; +5v 4A; +5v 0.25A; -12V 0.5A; 13.8V 0.1A (trickle charger output). 115/230v ac Input. **Excellent value at £14.95**

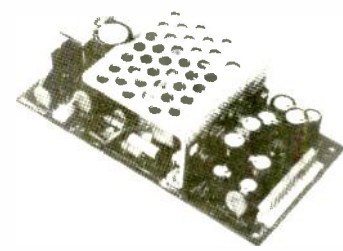
SALE PRICE £7.95

Couple more 125 watt cased SMPSU's by Source in small qty's:
Z9136 +5V 10A; +12V 4A; +12V 1.5A; -12V 0.5A. **£17.95**

SALE PRICE £9.95

Z9137 +5V 2.5A; -12V 0.25A; +16V 4.5A (Useful for battery charger?) **£17.95**

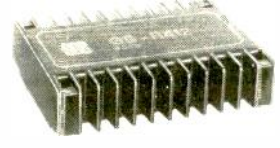
SALE PRICE £8.95



Z5256 Switch mode PSU made by Tamura Corporation. Board 195x100mm with outputs on PCB pins. Input 120/240V ac; Outputs: +5V @ 7.5A; +12V @ 1.25A (2A peak); -12V @ 0.1A. **All this for just £12.95**

SALE PRICE £6.95

DC-DC CONVERTERS



Z5406D High efficiency step down power regulator module by SGS. This is a GSR400 type, as listed by Farnell at £41.11 each. Output is 7V @ 4A from a DC input of 10-46V. Possible uses include battery charger. **Our special price - just £5.75**

SALE PRICE £3.00



Two 5 watt regulators PCB mounting. D-C-DC converters. These are encapsulated in a 51x51x10mm package with output pins on 0.1 pitch. These are ex-equip but guaranteed DP £59.75

Z1893 Input 48V (43-52V), output 5V 1A
Price £2.50 100+ 1 00

Z1894 Input 48V (43-52V), output 12V 420mA
Price £2.50 100+ 1 00

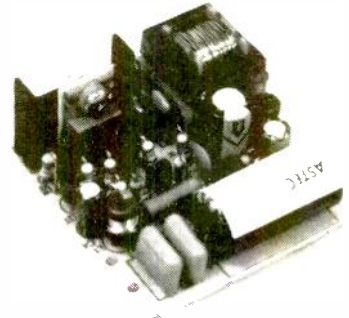
**EITHER TYPE
SALE PRICE 2 for £1**

Z8890 DC-DC CONVERTER BOARD
These panels 220 x 195 require 50V DC Input for 5V 19.5A output. Inputs and outputs on DIN41612 connector. These brand new panels made by STZ are now being offered at just: **Prices £7.95** 25+ 5.20 100+ 3.89

SALE PRICE £2.95

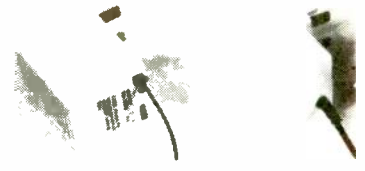
Z5411 Marconi panel 225x195mm. No info on this PSU, but it's got some really nice bits on it - 2x2N3716 TO3 transistors, 13 BCY71, 2XBC107, BFW43, BFX29, LM317K and LM33K TO3 variable voltage regs some high power zeners, pot cores, R's, C's etc., toggle switch with locking device. **Great value at £3.95B**

SALE PRICE £2.00



Z660 Astec switch mode PSU type AA7271. This small PCB, just 50x50mm will accept 8-24V Input and give a stable 5V dc at up to 2A output. The 6 transistor circuit provides current overload protection, thermal cut-out and excellent filtering. Offered at a remarkably low price.

Price £5.00
SALE PRICE £2.50



Z5278 Plug in wall type 24V ac 100mA output on 2m lead **£1.75** 100+ 1.10

SALE PRICE £1.00

Z9115 Double Ringer by Weir. Right angle panel 190x72x46mm with 2x2BUV46 MOSFET's, 3xBF471, some small signal T's, 3xLM358, 75453, R's C's etc. There are 7 wires leading to the inverter transformer which looks about 50VA. This unit was probably designed to take a low level signal and turn it into ringing current - about 75V 25Hz, but we have no further data. **Only £4.00**

SALE PRICE £1.75

Z5292D 'Power one' power supply. Conventional unit, 120/240V input, output 15V @ 1.5A fully stabilized. Part enclosed size 123x102x54mm. Comprehensive data supplied **£10.00**

SALE PRICE £4.95

Z5293D 'Power One' power supply. Conventional unit, 120/240V input, outputs +5V @ 2A; + or -12V @ 0.4A; -5V @ 0.4A. Each output uses a 723 regulator and has a preset for adjusting voltage. With data **£14.50**

SALE PRICE £7.50

The other item is a high quality 12V 2A power supply kit with current limit protection. This comprises a ready built PCB - you just need to add the power transistors supplied. It comes with a full circuit and instructions, but you'll need a 16V transformer and a heat sink. **Order Code Z5298 Price £3.50**

SALE PRICE £1.75

Z5413 KRP PCB mounting power source 90x65x23mm. 220V ac in ±15V 100 mA DC out. Some of these are ex-equip. DP around 30.00 **Our price £5.00**

SALE PRICE £2.50

Z5404 Stabilized power supply panel 140x85mm. AC Input is rectified and smoothed and is taken via a couple of regulator transistors and a relay to a 12 way terminal block. Probably 24V. **Only £2.25**

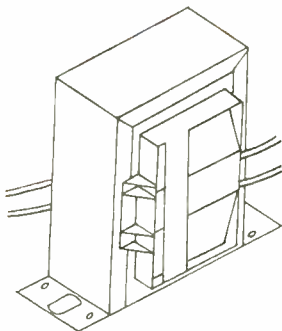
SALE PRICE £1.00

20

SUPER SENSATIONAL SUMMER SALE

GREENWELD

27 Park Rd. Southampton SO1 3TB
Tel: 0703 236363 Fax: 236307
All one off and pack prices INCLUDE V.A.T. Qty. prices do not.



Z5206 Super transformer for railway and other modellers. Mains primary, secondary 16V 3A. Size 50x55x60mm high 61mm FC. Great value for money only £3.00 100+ 2.00 1k+ 1.50

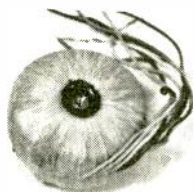
SALE PRICE £2.00
BOX OF 60 £80

Z4369 Very useful 18VA mains transformer with 0-6, 0-6 secondary, each at 9VA giving 6V or 3A or 12V or 1.5A PCB mounting 65 x 52 x 28mm

Excellent value £2.50
SALE PRICE £1.25

Z2305 Neat 6VA PCB mounting low profile mains transformer 53 x 44 x 22mm Primary 0-120V, 0-120V. Secondary 0-15V, 0-15V, each at 0.2A. DP £8.33

£2.50 100+ 1.80
SALE PRICE £1.00



Toroidal Transformers made by Belclere. These are all physically the same size, rated at 35VA but have different windings as listed below 75mm dia x 33mm thick. Fixing by means of a tapped bush. All mains primaries.

Z4290 Type TR7353 5V 1.4A and 12-0-12V or 120mA.
Price £2.50

SALE PRICE £1.00

Z4291 Type TR7252 12V or 130mA, 12V or 80mA, 5-0-5V or 600mA.
Price £2.50

SALE PRICE £1.00

Z5520 15VA toroidal transformer in screened case with mounting plate by Avel-Lindberg. Bridge rect connected. Pri: 0-120, 0-120; Sec: 0-9, 0-9 @ 7.5VA per winding. £3.50

SALE PRICE £2.50

Z2643 Oscillator transformer has push, pull and feedback windings and a secondary of around 385 turns, giving a ratio of about 100:1. As used in high frequency voltage converter circuits. 2 for £1.00

SALE PRICE 5/£1

Z7012 27V 4A Chassis mntg Pri 0-240V Size 98x83x73mm. DP around 18.00 Our Price £9.00

SALE PRICE £4.95

Z7013 40V 1.5A chassis mntg. Pri 0-240V Size 79x65x58mm. DP around 7.00 Our Price £4.00 100+ 2.50

SALE PRICE £2.00

Z7014 12V 1.5A PC or drop through mntg. Pri 0-240V Size 57x48x52mm DP around 6.00 Our Price £3.50 100+ 2.00

SALE PRICE £2.00



Z2450 Tadiran AA size battery 3.6V PC mounting. Date code 6/89. DP on these is 5.17. Our price £2.00 25+ 1.50 100+ 1.20

8 FOR £5



Z2307 Lithium battery 1/2 AA size, PC mounting 3.7V, 0.85Ah. Individually boxed with instructions. DP £4.57.

Our price £2.50

SALE PRICE £1.25

Z2452 Lithium battery - inorganic type by Tadiran, type TL5104. AA size, 3.6V PC tabs. Date code 06/88 £1.70

2 FOR £1.50

Z2453 As above, but type SL360, date code 4/87. £1.50

2 FOR £1.50

Z2719 Lithium battery, Varta 6201 3V 1500mAh PC mntg 60mm long x 11.2mm dia. DP 6.00+ Our Price £2.00

SALE PRICE £1.00

Z2720 Lithium Battery, Vidor G06/53, 3V 1400mAh PC mntg. 50mm long x 15mm dia, individually boxed. DP 6.00+. Our Price £2.00

SALE PRICE £1.00

Z2721 Lithium battery 11mm long x 12.5mm dia. 3V 160mA PC mntg. DP 3.73. Our Price £1.20

2 FOR £1.20



Z2451 Tadiran 0.5AA size battery, 3.6V PC mntg. Date code 8/86. DP 4.58 Our price £1.75 25+ 1.35 100+ 1.05

2 FOR £1.50

Xtra Special

FINAL CLEARANCE

BIB ACCESSORIES

BCC8 Comp term mnce kit - soft & stiff brush, cleaning fluid, air-blast, antistatic liquid, cleaning cloths £2.95

BCC11 Liquid static eliminator in spray can + cloth £1.00

Both for £2

Star Buy !!

Z4248 Mains transformer, 110/ 240V input via PCB pins. Secondary, 6.5V or 8VA; 22V or 8VA, 22V or 1VA; 1.5-0-1.5V or 1VA. Nicely made by Skot.

Price £3.00

SALE PRICE £1.20

Z4213 25V 1.5A Clamp type 70 x 57 x 47mm terminated with wires.

SALE PRICE £1.75

ANOTHER SUPPLY OF YUASA LEAD ACID BATTERIES!

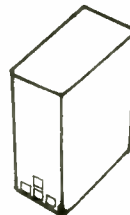


Z8920 Type NP10-6 rated 6V 10A, size 150x95x50mm. Not new, but regularly maintained and full spec. Last time we had these, they flew out the door, and we had many disappointed customers! Don't miss out on this batch - only £12.00 each

SALE PRICE £8.00

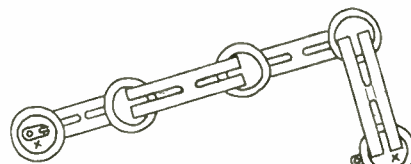
Z9131 12V 24Ah sealed lead acid battery by Dryfit. Not new, but only used for about a year and kept carefully maintained. Size 125x166x175mm. DP 59.33 Our Price £30.00

SALE PRICE £15.00



Z4149 Ex-mobile radio Ni-cad batteries, discarded because they either have broken cases and od/or a dud cell - but at the price being asked they are amazing value! Pack of 8 cells, like AA but 73mm long, in a tough plastic case. Either use as a 10V battery pack, or remove from case and use cells individually. Each cell rated 1.25V 900mA. £3.50

SALE PRICE £1; 10/£6



Z5329 A set of 5 Ni-Cad button cells 23diax5mm joined together in series in an L shape (easily split into singles) giving out 6V @ 250mA. Removed from new equipment. DP £4. Our Price £1.50; 100+ 0.80.

2 FOR £1.50



Z4216 Much sought after 4.8V 150mA batteries with PCB mounting tags on 25mm pitch. Battery size 25 x 16 dia. Ideal for paralleling. Some corrosion.

Prices reduced to 50p each 25+ 0.35 100+ 0.25

BOX OF 25 £3



Z1830 Saft 40 RF310 back up Nicad battery PC mounting on 70 x 22.5mm centres. Rated 3.6V. 10mAh (20mA). Overall size 76 x 28 x 8mm.

Price £2.00

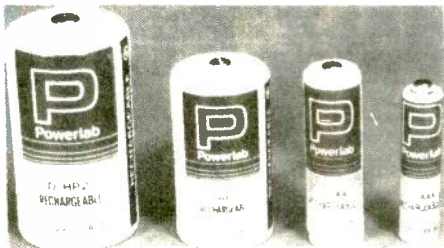
SALE PRICE £1.00

LITHIUM BATTERIES

The popular 'coin' type, now available at excellent prices. Individually blister packed Qty prices exclude VAT

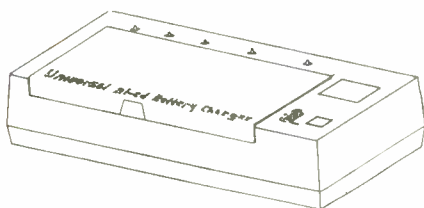
CR2016	£1.00	10+	0.66
CR2025	£1.00	10+	0.66
CR2032	£1.00	10+	0.66

NI-CAD BATTERIES



Code	Type	Rating	1+	25+	100+
X131	AAA	180mA/H	£1.20	0.85	0.62
X132	AA	500mA/H	£0.99	0.72	0.55
X133	C	1.2A/H	£2.20	1.76	1.20
X134	D	1.2A/H	£2.30	1.82	1.23
X135	PP3	110mA/H	£3.95	3.26	3.10

10% OFF ALL BATTERIES!!



A123 NI-CAD CHARGER

Neat attractive instrument will charge 4 different sizes of battery: AA, C, D and PP3 either singly or in any combination. Charge time 7-8hrs for AA, 14-16 hrs for others. Test facility to check if battery needs charging. Size 210x100x50mm
PRICES £6.95 10+ 4.12

SALE PRICE £4.95

Xtra Special

HEADPHONE COVERS

Z5547 Large

Z5548 Small

Either size

10prs for £1

Star Buy !!

VERO CLEARANCE

We've stopped selling veroboard and accessories, as imported stripboard is just as good and far cheaper. So grab a Bargain - all remaining stocks at HALF PRICE - and that's half the 1991 cat price - now over 2 years old!

Type	Description	Qty	Was	Now
03-0109	211x213 double sided veroboard	39	11.07	£5.53
02-0134	95x455 plain veroboard	12	4.42	£2.21
10-2445	100x160 DIP board	40	7.07	£3.53
03-0026	100x160 Square pad board	24	7.87	£3.93
03-2989	100x160 do with ground plane	44	10.57	£5.28
10-27563	100x160 microboard	18	8.45	£4.22
18-56070	single sided pins 1.32mm*	119	1.24	62p
18-56071	double sided pins 1.32mm*	54	1.55	52p
18-56067	wirewrap pins single sided*	6	3.97	£1.98
18-56068	do double sided*	55	3.97	£1.98
22-0230	Pin insertion tool for 1.02mm pins	41	3.55	£1.77
22-0229	do for 1.32mm pins	27	3.55	£1.77
10-2445	160x100 DIP breadboard	47	6.92	£3.46
806-21021	156x113 DIP breadboard	17	5.80	£2.90
10-27564	234x160 fibreglass DIP board	7	18.86	£9.43
801-21084	148x74 VQ board	122		£1.95

*All pins are in packs of 100

ALL ABOVE VERO HALF PRICE

Keyboard Enclosure

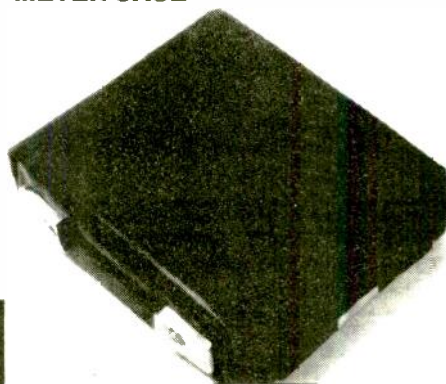


J063 High quality keyboard enclosure 550 x 225 x 70mm with black aluminium mask Top professional quality - made by Data Packaging Normally £38.69

Our price **£11.00**

SALE PRICE £5.00

METER CASE



Z4224 Meter case 135 x 120 x 45mm, suitable for our smaller models

Price **£1.00**

SALE PRICE 2 FOR £1

Z5165 Zonephone Case. These are black simulated leather cases that held the portable phone. Size 190x50x30mm, they have a Velcro fastener along the length, a belt strap and a detachable swing handle with one of those trendy keyring type connectors. I suppose you could keep your pac-a-mac in it - or even use it as a pencil case! 2 for £1.00

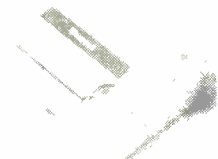
SALE PRICE 5 for £1

Z5142 Vacuum moulded case 225 x 175mm. Ideal for storing software/ audio cassettes, etc. 3/ **£1.00** 100+ 0.22

SALE PRICE 6 for £1

Z5125 Potting box PB105B 75 x 50 x 35mm. List price 48p. Our Price 4 for **£1.00** 25+ 0.14 100+ 0.09

SALE PRICE 8 for £1



Z5288 Polycarbonate grey sealed box 82x80x55mm with clear lid (DP 9..11!). Inside is a steel panel with loud 12V buzzer and a PCB with push button (operates when lid is removed) a green LED and IN4005. There's a 12mm hole in the side of the box and a cable gland to fit. Exceptional value at **£4.00**

SALE PRICE £2.00



Z8969 Superb heavy duty steel instrument case finished in light grey 426x290x78mm with 4 plastic screw on feet. This was an isolan repeater for use on a data network, and although the contents have been removed (before being used), the front and back panel remain, the former having 4 oblong red LED's and the latter a fused, suppressed IEC mains inlet, on/off DP rocker switch and 2 x 15 way D sockets joined to 16 way IDC skts with a short length of ribbon cable. There's a 60mm circular cut-out for a speaker on one side and mounting pillars in the base. Just look around and see the price this type of high quality case normally costs! - somewhere around the £30-£40 mark - then compare it to our low, low price - just **£9.95**

SALE PRICE £6.95

22

SUPER SENSATIONAL SUMMER SALE

GREENWELD

27 Park Rd. Southampton SO1 3TB

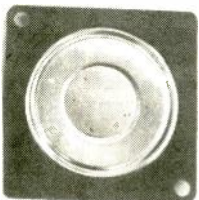
Tel: 0703 236363 Fax: 236307

All one off and pack prices **INCLUDE V.A.T.** Qty. prices do not.



Z5306 Adastra 8 ohm 10 watt white 135mm dia boxed horn speaker, model H52. Adjustable bracket. Very similar to our PS109 @ £6.50, but at a much better price **£3.95** 25+ 2.75

SALE PRICE £3.50



Z578 Super flat speaker 30 x 30 x 3mm by Fuji, rated 16R 0.4W. DP £1.50.

Our Price 60p 25+ 0.35 100+ 0.22 1k+ 0.15

SALE PRICE 4 FOR £1

Z533 Danavox transducer - used as a speaker in pocket pagers. Impedance 50R. 20mm dia leads 90mm long. Extremely high quality unit.

Prices 50p 10/ 3.65 50/ 14.80

SALE PRICE 4 FOR £1



P111D

8 x 5 inch plastic horn speaker with built-in line matching transformer for 70 and 25V line and 8Ω usage. Transformer tapped at 2, 4, 8 and 16W for 70V line and 1, 2, 4 and 7.5W for 25V line, selectable by rotary switch on rear. Mounting bracket fully adjustable for angle and direction. All white plastic.

Size 8" x 5"
Output: 70V line 2, 4, 8 or 16W
25V line 1, 2, 4 or 7.5W
8Ω 16W

SALE PRICE £9.95



Z8988 Super high power siren. Std 5" 5W 8R gold horn mounted on an ABS box (ourV216) which contains the driver PCB. Can supply either single or swept tone and works from 6-28V **£8.00**

SALE PRICE £5.95

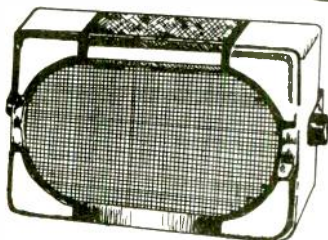


SB5 CAR SPEAKERS. 4" air suspension unit with centre coaxial tweeter and crossover. All black plastic cabinet. Shelf or door mounting.

Power nom 7W
Power max 20W
Impedance 4Ω
Size of speaker 4" coaxial
Magnet weight 10oz
Dims 120 x 120 x 90mm

REDUCED TO **£8.00**

SALE PRICE £5.00



High quality foreground music speaker providing excellent music quality for pubs, clubs, etc. Ported bass reflex system contains a 5 1/4" bass driver, 1" soft dome mid and two piezo tweeters. Modern styled all moulded cabinet. Complete with adjustable wall mounting bracket. Supplied in pairs.

power nom 30W
power max 80W
Frequency response 80 - 20000Hz
Sensitivity (SPL) 87dB @ 1wm
Speakers 5 1/4" bass, 1" mid, 2 x 1" piezo tweeters
Overall impedance 4Ω
Dims (each) 275 x 170 x 125mm
Weight (each) 1.8kg

P114B LOUDSPEAKERS

Exceptional quality and value!

Originally sold for over £75 per pair!

OUR PRICE **£39.95**
SALE PRICE £35.00

40 WATT TWEETER

Z5516 55mm Dia, 3R5 impedance. Ideal replacement for many speaker systems **£4.00**

SALE PRICE £2.50

ALARM BOXES

Z5396 24V DC buzzer housed in a bright red surface mounting MK switch box 80x78x40mm with louvred front panel **£2.00**

Z5397 24V LES lamp with red bezel mounted in MK switch box 80x78x40mm with red fascia plate **£2.00**

Z5398 As Z5396 but with white fascia plate **£2.00**

Z5399 As Z5397 but with red box **£2.00**

Z5400 MK surface mntg box in red with 24V buzzer and lamp. Red fascia plate marked 'FIRE ALARM' **£3.50**

ALL ALARM BOXES HALF PRICE

SOUNDERS & SIRENS

A range of piezo-ceramic sounders made by STC. These are top quality units with extremely high output, up to 115dBm. Now reduced even further to 1/4th the original 1 off trade price!!



Current consumption 10mA
Frequency 2.7KHz
Pulsing frequency 204 10Hz selectable
Sound level at 1 metre 85dB(A)
Dimensions 60 x 33 x 70mm
Z108 U25ORD1D2, 24V, level 85dBm **£1.70**
Z109 U25ORD1D2H, 24V, level 90dBm **£2.00**

EITHER TYPE SALE PRICE £1.00

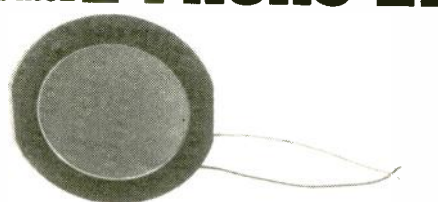


A parcel of piezo and magnetic transducers

Code	Manf'r	Type	P/M	Size	£1 Pack	100+
Z2176	Murata	PKM25-6AO	P	25 x 8	6	0.08
Z2180	Star	OMB-12A	M	15 x 22	4	0.12

* P - Piezo; M - Magnetic

EITHER TYPE SALE PRICE 2 PACKS £1



Z1429 Murata piezoelectric speaker type VSB41D25. Only 2mm thick x 50mm dia, weight 3.3gm. Freq. res. 500Hz-20kHz. Z=1.2k at 1kHz. Max input 200mW. Normally **£2.33**

Our prices 75p each 10+ 0.52 100+ 0.40

SALE PRICE 3 FOR £1

Burglar Alarm Bell

Z9138 A loud motor driven bell for home or industrial security systems.

Features include: Internal NiCd battery to drive bell in the event of cable being cut; internal anti-tamper switch; output for external strobe; selectable positive or negative return for control panel type; positive or negative ring control.

Dimensions: Gong diameter 185mm, bracket diameter 220mm, assembled thickness 75mm. Requires additional weather proof case for external mounting. **£12.95**

SALE PRICE £9.95

Z9139 Similar to above but requires small 12 volt sealed lead acid battery (not included). **£9.95**

SALE PRICE £7.95

RADIO SCANNERS - Send SAE for full details of our range of high quality scanners at great prices!

HELIX MATHS SET

Colourful 4 piece set - protractor, 15cm rule, 45 and 60 degree set squares in bright primary colours, in a handy pouch

Big Discounts for quantity!
 100+ 0.45
 1000+ 0.35

99p
 Order Code Q86013



(a) Stationery products - mostly as used in plotters.
Pental Rolling Writers. These line point cartridges are essentially complete pens without an outer casing, so can be used as they are. Current price is around 60p. Now look at our prices! (State 2nd choice)
 Z23199 Black
 Z23201 Blue
 Z23200 Red
 Prices (any mix) **30p each**
 24 + 0.20 96 + 0.15

ANY COLOUR 12 FOR £1

Z01268 Staedtler/Mars lumochrom leads Pack of 12 in dispenser Blue 2mm Fits all standard lead holders
 Prices **30p** 10 + 0.20 50 + 0.15
 Z01158 Tube of 12 x 2H leads 2mm dia
 Prices **25p** 10 + 0.17 50 + 0.12
 Z01159 Tube of 12 Green leads 2mm dia
 Prices **30p** 10 + 0.20 50 + 0.15

ALL LEADS HALF PRICE

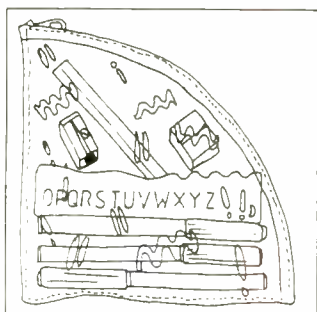
SPECIAL OFFERS FROM HELIX

A range of 'Clearance Lines' offering super value for money on top quality product



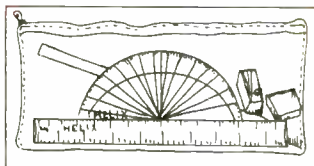
A10000 Economy maths set - 2 set squares, protractor, 15cm rule all in bright colours together with compasses and an eraser in a rigid see-through pack.
 Only **£1.50**

H40 Lettering guide value pack. Contains 4 popular sizes - 5mm & 10mm upper and lower case and 20 & 30mm upper case only. Supplied in compartmentalized clear plastic case. **£1.99**



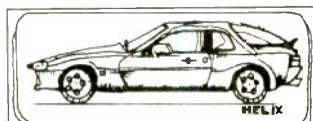
R55 Wedge Pencil Case - Great for younger children! 2 shape templates, 2 letter stencils, 5 felt tips, pencil, eraser and sharpener all in a colourful clear zip case!

OUR PRICE £2.20



A01 Mini maths set - clear zip pencil case with rule, protractor, pencil, rubber and sharpener.

OUR PRICE 99P



A30 Car Pencil Tin 180x75x20mm

OUR PRICE 99P

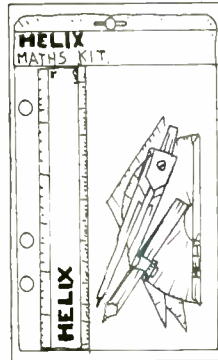


Y93021 Helix erasers. Good quality rubbers in blue, yellow and red, each 50x23x10mm. In boxes of 36 for **£3.95**



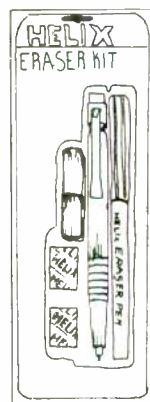
R08 Magic Pencil Box - amaze your friends - a box within a box makes things disappear

OUR PRICE £1.99



Q86 Small maths set - colourful rule, 2 set squares, protractor, and a pair of compasses.

OUR PRICE 99P



E50 Eraser kit - 5 different retillable pencil

OUR PRICE 99P

Xtra Special CONTACTORS

Z5154 240/415V 32A 3p £4
 Z5155 240/415V 50A 2p £3
 Z2354 240/415V 10A £1
 Z5260 16A 400V 4p £1.50

Star Buy !!

Xtra Special MICROSWITCHES

Z4370 20A - 1c/o, 1b 4/£1
 Z5158 10A 380V 1m 1b 2/£1
 Z5191 2A thermal CB 2/£1
 Z5192 3A thermal CB 2/£1
 Z2084 Skeleton spco 5A 8/£1
 Z2166 Low I 1m 12/£1
 Z2486 15A spco 4/£1
 Z2487 15A 380V 2/£1.50
 Z2488 5A roller lever 2/£1
 Z2489 5A air operated 2/£1.50
 Z2490 As above, double 2/£3.50
 Z2491 Sp heavy duty 4/£1
 Z2499 Limit sw, 1m 1b 8/£1
 Z2947 65mm lever 2/£1

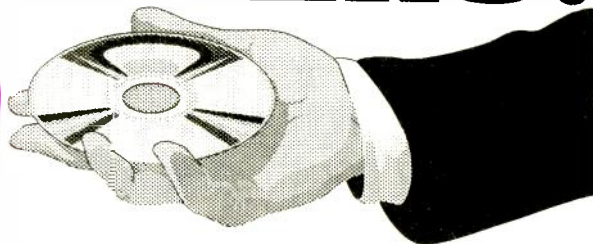
Star Buy!!

25% OFF ALL HELIX CLEARANCE LINES

SUPER CD OFFERS!

All CD's listed on these two pages are just

£3.95 each!



Regrettably, at this low price, we cannot list individual tracks.

JHD003 La Toya Jackson
JHD005 Chris De Burgh
JHD006 Bee Gees
JHD007 Paul Anka
JHD012 The Ultimate Surfing Album
JHD013 Beach Hits
JHD014 Howard Keel
JHD015 Neil Sedaka
JHD016 Duke Ellington
JHD017 Showaddywaddy
JHD018 Kim Carnes
JHD019 Immaculate Mixes
JHD020 The Taste of Brazil
JHD022 Donna Summer
JHD023 Just The Two of Us
JHD025 Bay City Rollers
JHD026 Gloria Gagnor
JHD027 Amii Stewart
JHD028 Heatwave-Boogie Nights
JHD031 Paul Young & The Q-Tips
JHD035 Val Doonican
JHD037 Heat Energy
JHD040 Sabrina
JHD042 Soul of the 80s
JHD043 Dance of The 80s
JHD044 Shirley Bassey
JHD045 Pavarotti
JHD046 Carreras
JHD047 Domingo
JHD048 Sandie Shaw
JHD049 The Bachelors
JHD050 Kiri Te Kanawa
JHD051 Chris Andrews
JHD054 Chris Farlowe
JHD055 Anita Ward
JHD056 Hazel O'Connor
JHD057 Shirley Bassey vol 2
JHD058 Greyhound
JHD060 Jimmy James & The Vagabonds
Bidhu
London Invasion
Wild Connections
Roy Harper
Python Lee Jackson
Gary US Bonds
Elvis Presley
Steve Harley
Carl Douglas
Tina Turner
Gibson Brothers
Ottowan
Immaculate Mixes Vol 2
60's Mixes
70's Mixes
Disco Mixes

SYM013 ORFF Carmina Burana
SYM014 MUSSORGSKY Pictures
SYM015 MOZART Sym No. 40
SYM016 MENDELSSOHN Sym No. 4
SYM017 HOLST The Planets
SYM018 BERLIOZ Sym Fantastic
SYM019 HAYDN The Suprise
SYM020
SYM021 GREIG Peer Gynt Suits
SYM022 GERSHWIN Rhap in Blue
SYM023 DEVORAK Symphony No. 9
SYM024 BEETH Sym No. 9
SYM025 BEETH Sym No. 6
SYM026 BEETH Sym No. 5
SYM027 BEETH Piano Sonatas
SYM028 RAVEL Bolero etc
SYM029 ROSSINI etc
SYM030 BORODIN etc
SYM031 DEBUSSY
SYM032 J.S.BACH Violin C
SYM033 BRAHMS Sym No. 1
SYM034 STRAUSS Piz Polka
SYM035 BIZET Carmen Suit
SYM036 MOZART Sym No.41
SYM037 CHOPIN Eludes
SYM038 HANDEL Water Music
SYM039 BEETH The Emperor
SYM040 BEETH Sym No. 3
SYM041 DVORAK
SYM042 OVERTURES
SYM043 J.S.BACH
SYM044 LISZT
SYM045 MENDELSSOHN
SYM046 HAYDN
SYM047 SAINT-SAENS
SYM048 R.STRAUS
SYM049 STRAVINSKY
SYM050 SCHMANN&GREG
SYM051 BEETH The Great Composer
SYM052 TCHAIK The Great Composer
SYM053 BALLET MUSIC Highlights
SYM054 VIRTUOSO PIANO
SYM055 VIRTUOSO VIOLIN
SYM056 MOZART The Great Composer
RODRIGO
QUIETNIGHTS
J.S.BACH
TCHAIKOVSKY
ELGAR
BRAHMS
SCHUMANN
MENDELSSOHN
TCHAIKOVSKY
PAVAROTTI SINGS VERDI
BRUCH/PAGANINI
VIVALDI
PLACIDO DOMINGO
LUCIANO PAVAROTTI
PUCCINI La Boheme
VERDI Aida
PUCCINI
VERDI La Traviatta
ROSSINI
BEETHOVENS SYM 5+7
BEETHOVENS SYM 6+8
BEETHOVEN SYM 9 CHORAL
M.CALLAS & L.BERNSTEIN

GRF001 60'S VOL 1
GRF002 60'S VOL2
GRF003 COUNTRY GIANTS VOL1
GRF004 COUNTRY GIANTS VOL2
GRF005 LOVE SONGS VOL1
GRF006 LOVE SONGS VOL2
GRF007 THIS IS SOUL
GRF008 KING OF ROCK AND ROLL
GRF009 ROCK AROUND THE CLOCK
GRF010 THE JAZZ SELECTION VOL1
GRF011 THE JAZZ SELECTION VOL2
GRF012 BIG BAND SOUND VOL1
GRF013 BIG BAND SOUND VOL2
GRF014 FATS DOMINO
GRF015 GENE CHANDLER
GRF016 BING CROSBY
GRF017 JUDY GARLAND
GRF018 JONNY AND THE HURRICANES
GRF020 CRUISIN VOL1
GRF021 LITTLE RICHARD
GRF022 NINA SIMONE
GRF023 JOHN LEE HOOKER
GRF024 DEL SHANNON
GRF025 MUDDY WATERS
GRF027 KENNY ROGERS
GRF028 BOB MARLEY
GRF029 MUD FEATURING LES GRAY
GRF030 THE DRIFTERS
GRF031 THE SHANGRI-LAS
GRF032 WILLIE NELSON
GRF033 RAY CHARLES
GRF035 CARL PERKINS
GRF036 LOUIS ARMSTRONG
GRF037 CRUSIN VOL2
GRF038 NAT KING COLE
GRF039 DUKE ELLINGTON
GRF040 MANTOVANI
GRF041 WESTERN THEMES
GRF042 SHIRELLES
GRF043 SURFIN'SAFARI
GRF044 FRANKIE LAINE
GRF045 OHIO PLAYERS
GRF046 SANTANA
GRF047 JAMES BROWN
GRF048 GLADYS KNIGHT
GRF050 JERRY LEE LEWIS
GRF051 LAMBADA
GRF052 GENE PITNEY
GRF053 BILLY OCEAN
GRF054 FRANKIE VAUGHAN
GRF055 GENE VINCENT
GRF056 ACKER BILK
GRF057 ULTIMATE WORKOUT
GRF058 WAYLON&WILLIE NELSON
GRF059 MEMPHIS SLIM
GRF060 LIGHTNING HOPKINS
GRF062 LENA HORNE
GRF063 CHARLIE PARKER
GRF064 ELLA FITZGERALD
GRF065 DIZZY GILLESPIE
GRF066 OAK RIDGE BOYS
GRF067 JIMMY DORSEY
GRF068 TOMMY DORSEY
GRF069 WOODY HERMAN
GRF070 JOHNNY PAYCHECK
GRF071 SUMMER LOVIN
GRF072 FREDDY FENDER
GRF073 FARON YOUNG

SYM001 PACHELBEletc
SYM002 TCHAIKOVSKYetc
SYM003 WAGNER Overture
SYM004 VIVALDI 4 Seasons
SYM005 TCHAIK Sym No 6
SYM006 TCHAIK Ballet
SYM007 TCHAIK Violin Concerto
SYM008 SIRELIUS Fintandia
SYM009 SCHUBERT The Trout
SYM010 SCHUBERT Sym No. 5 & 8
SYM011 RIMSKY-KORS Schcherazade
SYM012 PROKOFIEV Romeo & Juliet

GRF074 MICKEY GILLY
GRF075 BILLIE HOLIDAY
GRF076 GLENN MILLER
GRF077 CAB CALLOWAY
GRF078 DIXIELAND JAZZ
GRF079 BIX BEIDERBECKE
GRF080 SCOTT JOPLIN
GRF081 AL JOLSTON
GRF082 GEORGIE FAME
GRF083 PETULA CLARKE
GRF084 KINGS OF GYPSY MUSIC
GRF085 ART TATUM
GRF086 JIMMIE LUNCEFORD
GRF087 BENNY CARTER
GRF088 FLETCHER HENDERSON
GRF089 DJANGOREINHARDT
GRF090 LIONEL HAMPTON
GRF091 ELLA FITZGERALD
GRF092 EARL HINES
GRF093 COLEMAN HAWKINS
GRF094 SONGS OF HOAGY
CARMICHAEL
FATS WALLER
MAURICE CHEVALIER
AL BOWLLY
NOEL COWARD
GRACE FIELDS
SIDNEY BECHET
JOE LOSS
BESSIE SMITH
REGGAE HITS VOL 1
REGGAE HITS VOL 2
TRUCKING GREATS
RVING BERLIN SONGBOOK
HITS FROM THE MUSICALS
GEORGE GERSHWIN
COLE PORTER SONGBOOK
JAMES BOND
SOUTH PACIFIC
MY FAIR LADY
3WEST SIDE STORY
THE SOUND OF MUSIC
ATMOSPHERIC SYNTHESIZER
6SWEET SOUL MUSIC 1
7SWEET SOUL MUSIC 2
8WHOLE LOTTA SHAKIN'GOIN
ON

GRF119 ROCK AND ROLL IS HERE TO
STAY
GRF120 SEND ME THE PILLOW
GRF121 BLUE EYES CRYIN IN THE RAIN
GRF122 LETS TWIST AGAIN
GRF123 SAVE THE LAST DANCE FOR
ME
GRF12 4WHEN THE SAINTS GO
MARCHING
GRF125 ONE O'CLOCK JUMP
GRF126 WHEN YOUR LOVER HAS
GONE
GRF127 I GOT IT BAD AND THAT AINT
GOOD
GRF128 IT DONT MEAN A THING
GRF129 STOMPIN' ATTHE SAVOY
GRF130 WILL YOU STILL LOVE ME
GRF131 DEDICATED TO THE ONE I
LOVE
GRF132 SANTANA
GRF133 SOCA DANCE
GRF134 JOHN TRAVOLTA

GRF138 BOB MARLEY
GRF139 SWITCHED TO CLASSICS
GRF140 ANDREW LLOYED WEBBER
RGF147 SPACE THEMES
GRF148 QUIET NIGHTS IN
GRF149 ITS IN HIS KISS

GRF151 BOXCAR WILLIE
GRF152 GLENN MILLER
GRF153 SOUND OF VANGELIS
GRF154 THE HAUNTING PAN FLUTE
GRF155 POP OPERA
GRF156 MUSIC OF THE MOVIES
GRF157 SOUSA-GREAT HITS
GRF158 EROTIC DREAMS
GRF159 THE MIGHTY WURLIZER

GRF160 HITS OF THE PET SHOP BOYS
GRF161 ISLEY BROTHERS
GRF162 B.B.KING
GRF163 TECHNO RAVE
GRF164 BROOK BENTON-ENDLESSLY
GRF165 ITALIAN LOVE SONGS
GRF166 HITS OF 1960
GRF167 HITS OF 1961
GRF168 HITS OF 1962
GRF169 HITS OF 1963
GRF170 HITS OF 1964
GRF171 HITS OF 1965
GRF172 HITS OF 1966
GRF173 HITS OF 1967
GRF174 HITS OF 1968
GRF175 HITS OF 1969
GRF176 THE FOUNDATIONS GREATEST
HITS
HITS OF THE 70'S VOL1
HITS OF THE 70'S VOL2
MARTHA REEVES
BRIAN POOLE OF THE
TREMELOES
CONNIE FRANCIS
GLENN CAMPBELL GREATEST
HITS

GRF177
GRF178
GRF179
GRF180

GRF181
GRF182

GRF185 MIKE PENDERS &THE
SEARCHERS
GRF186 THE FORTUNES
GRF187 SHOWADDYWADDY

GRF189 TRINI LOPEZ
GRF190 ALLEGRO MILANA PLAY A
TRIBUTE
GRF191 GERRY AND THE
PACEMAKERS
GRF192 HOLLYWOODS GREATEST HITS
GRF193 INSPARATIONAL SAX
GRF194 MIDNIGHT GUITAR
GRF195 THE MAGICAL MUSIC OF BERT
BACHARACH
DOO WOP CLASSICS
LES MISSEABLES
TELEVISION GREATEST HITS
JIM REEVES
GARY GLITTER
GRF200 STEEL DRUM
GRF201 SOUND OF HAWAII
GRF202 HITS OF THE SHADOWS
GRF204 DONOVAN
GRF207 ALAN PRICE
GRF209 THE ULTIMATE HOUSE
GRF210 DISCO EXPLOSION
GRF211

GRF213 THE RUBETTES
GRF214 SWITCHED ON COUNTRY
GRF215 THE PLATTERS

GRF218 KE & TINA TURNER

BAL001 CHA CHA
BAL002 SAMBA
BAL003 WALTZ
BAL004 FOX TROT
BAL005 TANGO

BAL007 LATIN
BAL008 RHUNBA-BOLERO

PAT201 JUNIOR PARTY MEGAMIX
PAT301 PRAISE
PAT911 TOP 20 VOLUME 1
PAT914 CHRISTMAS PARTY
PAT918 TOP 20 VOLUME2
PAT929 TOP 20 VOLUME3
MER001 MADONNA VOL 1
MER002 MADONNA VOL 2
MER003 MARC BOLAN VOL1
MER005 BRYAN ADAMS
MER006 MARC BOLAN VOL 2
MER007 ELKIE BROOKS(PEARLS 3)
MER008 SKY VOLUME 1
MER009 SKY VOLUME 2
MER010 BUCKS FIZZ
MER011 MOTOR HEAD

CD-ROM's

More and more software is becoming available on CD-ROM - and once you've purchased a suitable drive, it's an incredibly cheap way of buying shareware. We can supply a Mitsumi CD ROM drive kit which is Kodak Photo CD compatible (multi-session) with the following spec. We can vouch for it's speed and reliability, as we have one fitted to one of our computers. Look at these features:

- Slide Top Loading
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- Multi Media Support
- Audio Playback
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- 380 Millisecond access

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SHAREWARE CD-ROM's

MIN2 Well balanced material, 7,700 files, 630Mbytes. **£29.95**

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Two further disks are due out soon.

Bargain List Subscribers Only -
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FREE
**MIN2 disk with
ROM drive kit!**

Also the popular **Soundblaster V2 Pro**. This amazingly versatile package will give you stereo music, voice, game port, midi, CD-ROM interface. Supplied with Sereo Card, Audio cables, 3.5" disks, Manual + lots of exciting software - Indy 500, Lemmings, Text to speech, multimedia encyclopaedia (really amazing - includes still & moving pictures + sound). We'll send you more info on request.

The whole package for just


£149.95



Z611 Finned heatsink 86x27x38/20mm fitted with 2 x 7805 5V 1A voltage regulators - brand new. Only **£1.00**

SALE PRICE 2 for £1

Solder



Z5099 Ersin multicore HMP (high melting point) solder, 22 swg on 500g reels. Composition: 5% tin, 93 52% lead, 1.5% silver. Melting temp 301 C. Rec. bit temp 350 C DP £18.00.

Our price **£8.00**

SALE PRICE £5.00

STEREO CASSETTE PLAYER

Z5405 High quality heavy duty all metal construction stereo cassette player mechanism, probably intended for continuous background music. This is a lovely bit of kit - starts playing as soon as a cassette is inserted. Has fast forward, rewind and eject keys. It's bi-directional, and the sensing circuit automatically reverses the tape at the end. Has a Canon motor and works off 12V DC. Great value at **£4.95**.

SALE PRICE £3.95

Z5488 9V stereo cassette deck mech. Record/replay and erase heads, 6 push buttons - fwd, rev, play, rec, pause and stop. Only **£2.95**

SALE PRICE £1.00

Z8885 TAPE DECK PANEL. A type of telephone answering machine believed to have been used as an alarm system - a recorded message was sent down a BT line if premises were being entered illegally. Steel chassis 245x220x35mm contains PCB 228x145mm and an 8 track cassette unit almost identical to Z4307. This is attached to the panel by 3 screws and is easily removable, being connected to the PCB with a 5 way socket. The output from the tape head is fed into an MC3301 quad op-amp. The PCB also has 10 CMOS gates, 3 relays, isolator transformer, several transistors, R's, C's etc. 12 way connector for BT line, 12V supply etc, also plug and socket arrangement for Auto/ Manual and Bell delay. Made by Munford & White PLC. Price: Reduced to **£7.95**

SALE PRICE £3.95

Z5246 Mains synchronous motor with easily accessible gearbox giving a final speed to the 5.5mm dia 12 toothed gearwheel of 0.2RPM (12 revs per hour). Only **£3.95**; 100+ 2.50

SALE PRICE £2.00

Z5488 9V stereo cassette motor 35mm dia x25mm. Only **£1.00**; Box of 200 **£65**

Xtra Special

K857 MASSIVE CONNECTOR PARCEL

Z5085 1000	Z5084 100
Z2154 100	Z2158 1000
Z5086 1000	Z2157 1000
Z5083 100	Z2160 100
Z5082 100	Z2156 294
Z2155 100	
Z5081 100 25W D Plug	
Z5082 200 25W D Plug	

TOTAL 5194 Parts!

£25

Star Buy!!

Z5427 Tachometer. Here's a nice little unit at a fraction of its true worth - made by Transicon Inc, this will give an accurate voltage for any given speed. Gradient 1.55V/1000RPM. Only **£8.00**

SALE PRICE £4.95

Fans



Z4056 'Patriot' fan. High quality cooling fan for mounting into equipment 170mm dia x 51mm Only problem is they operate on 48V ac (but still work down to 24V).

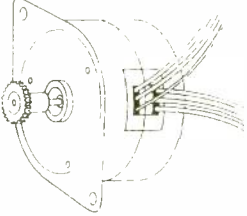
Price **£3.00**

SALE PRICE £1

Z5006 120mm Fan Guard, 110mm FC Chrome plated steel

Price **£1.20** 25+ 0.70

SALE PRICE 5 for £1



Z5045 Superb little 12V motor by Airpax 35mm dia x 21mm deep with a 16 tooth 9.5mm dia gear wheel mounted on the 2mm dia spindle. FC 42mm, 7.5° 48 step. Supplied with data. 100+ DP 9.04. Our Price **£3.00**; 100+ 2.00

SALE PRICE £1.50

Z5487 Mabuchi hi-torque 9V cassette motor 35mm dia x 25mm Only **£1.00**; Box of 200 **£65**

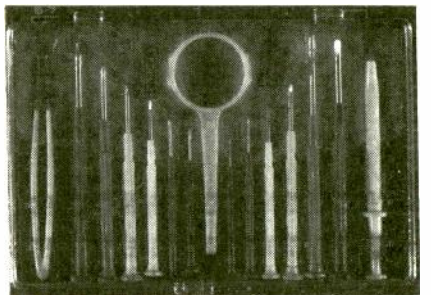
SALE PRICE 2 FOR £1

HIGH QUALITY LOW COST SOLDERING IRON + STAND



Y061DA Mains element with interchangeable bit (std Antex CS types fit). Rated 15 watts. Ideal general purpose BS approved iron. **£4.95**

SALE PRICE £3.95



18068 Colourful precision tool set - clear hinged plastic case 210x135mm contains 15 instruments with coloured plastic handles - tweezers, pick up tool, 37mm magnifying glass (not plastic), 6 each pozi and straight screwdrivers. Great value at

£5.95

SALE PRICE £4.95

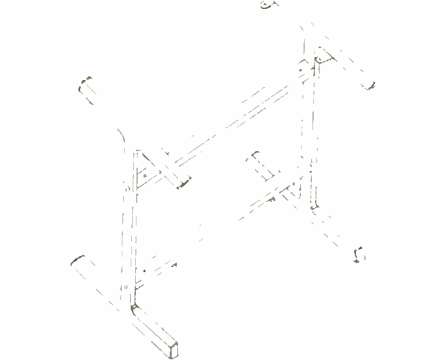


Z314 Precision spring bow compasses 88mm long. Max circle dia 70mm. Replaceable pencil lead and steel tip

Price **£1.00**

SALE PRICE 2 for £1

TV Stand



Z8930 TV/Video/Hi-Fi stand. Satin finish steel side pieces with black ends held apart by veneered timber. Overall dimensions 485 wide x 350 deep x 450 high.

A bargain at £2.50 100+ 1.25

SALE PRICE £1

EVERYTHING ON THIS PAGE **2** FOR THE **1** PRICE OF **1**

15,000 RELAYS TO CLEAR - ALL AT ROCK BOTTOM PRICES!

Code	Volts	Coil R	Contacts	MFCTR	Type	Size	Notes	Qty	Price
Z202	3V	35R	Spco@3A		AZ535	32x20x11	Low profile	83	£1.00
Z2400	3V	130R	Spb@1A	Gentech	G42F	33x16x11	PC Mntg	46	£1.00
Z1718	3-24V	Solid State	Spm@4A	Huntleigh	SMT2000/3	43x25x70	Solid State	366	£1.00
Z3009	5V	60R	Spco@8A	Schrack	RP110005	28x24.7x11	Pc Mntg	184	£2.68
Z2406	5V	130R	Spb@1A	Elliott	36876/5	32x15x10	Pc Mntg reed	429	£1.00
Z2402	5V	170R	Spb@1A	Clare	CUPV10201	25x10.9x9	Pc Mntg reed	45	£1.00
Z2310	5V	370R	SPB	AX	400FxX091	10.5x32.5x13	Pc Mntg reed	1067	£0.50
Z2405	5V	470R	Spm@500m A	Clare	PRMEL5005AB	20x7x5	Dil reed	193	£1.00
Z2407	5V	470R	Dpm@1A	Hamlin	HE262A7780	32x12x9	Pc Mntg reed	16	£1.00
Z2401	5V	500R	Spm@1A	AX	175A-4	32x9.5x15	Pc Mntg reed	42	£1.00
Z2408	5V	500R	Dpco@1A	Clare	HGR2M	40x25x10	Pc Mntg mercury	42	£1.00
Z2403	5V	520R	Spm@500m A	AX	132A-4	20x7x7	Dil reed	60	£1.00
Z1958	5V	1200R	Spco	Hamlin	HE3321CO500	23x7x8	Sil reed	26	£1.50
Z2174	9V (5-12V)	410R	4pco@2A30 V	Aromat	DS4E-S DC9V	35x10x10	Pc Mntg 0.1"	104	£3.00
Z2350	12V	68R	Spm@15A			26x24x36	Open .25" Tabs	322	£1.00
Z2848	12V	70R	Sp/5kV 10mA	Kilovac	K43B234	53x17 Dia	2 Wires for coil	36	£3.00
Z2409	12V	370R	Spb/spm1A	Clare	Cupv10302	31x14x9	Pc Mntg reed	22	£1.00
Z2120	12V	710R	Spdt@1A 28V	Taiko	NXE-12K	15.6x10.6x10	Dil Pc Mntg	375	£2.00
Z2545	12V	1000R	Spm 200V.5A	Pickering	97-1-A-12	19x11x10	Dil reed	256	2/1.00
Z2413	12V	1500R	Spco@1A	AX	481F	32x10x10	Pc Mntg Mercury	353	£1.00
Z2411	12V	800R	Spm@1A	Hamlin	HE221A7080	32x10x9	Pc Mntg reed	1334	£1.00
Z2497	12V	110R	Dpco@10A	IMO	60.32	32x35x39	Plug in 8 tags	36	£2.50
Z5179	12V	110R	3pco@ 10A	IMO	60.43	32x35x39	Pc Mntg	21	£1.50
Z2843	12V	285R	Spco' 10A	Omron	G2L	28x11x25.5	Ex equip Pc Mntg	191	3/1.00
Z2137	12V	200R	Spm@5A	Omit	TV5/S-112DM	29x12x20	Pc Mntg	21	£1.50
Z280	24V	288R	Spm@ 500mA	Omron	G68-1114P	20x9x9	Dil Pc Mntg	44	£1.00
Z2048	24V	435R	2pco@ 10A	IMO	60.12	32x35x63	Octal	16	£2.50
Z275	24V	480R	Dpco@ 10A	Relco	MR54-2	35x35x55	Octal	49	£2.50
Z258	24V	520R	3pco@ 10A	B&R	D43	53x37x36	11 Pin plug in	18	£2.50
Z2941	24V	600R	4pco@ 5A	Guardian Elec	1315P	34x28x21	Pc Mntg	2520	3/2.00
Z250	24V	700R	Dpco@ 1A	Perivale	PC2	30x24x19	Plug in continental	35	£0.80
Z2638	24V	974R	Dpco@2A	Omron	G2V/BT47	21x10x11	Dil Pc Mntg	292	4/1.00
W834	24V	1050R	Dpco@2A	RS346-839	346-839	21x10x11	Dil Pc Mnt	70	£1.00
Z2637	24V	1170R	Spco@16A	Ped	11-794-135-740	29x12x25	Pc Mntg	11	£1.30
Z2164	24V	1200R	Spco@8A	Zetter	AZ692-052-52	27.5x25.8x11	Pc Mntg	7148	£0.75
Z2418	24V	1200R	Spco@5A	Oub	SS124D	21x17x15	Pc Mntg	29	£1.00
Z2417	24V	1200R	Dpco@2A	Oub	SS224D	18x10x12	Pc Mntg	35	£1.00
Z2419	24V	2000R	DPCO@1A	National	AE1324	30x20x10	Pc Mntg	45	£1.00
Z230	24V	2600R	Spm@1A	Electrotherm	GR1011	20x11x10	Pc Mntg Reed	82	£0.60
Z2639	24V	8000R	Spm@1A	Hamlin	HE221A2490	32x10x9.5	Pc Mntg Reed	800	£1.60
Z2416	24V	11K	Spm@1A	Hamlin	HE221A4860	32x10x0.9	Pc Mntg Reed	639	£1.00
Z218	26.5V	675R	Dpco@1A	Stc Hi-G	2B-8075	22x20x10	Sealed S Tags	62	£1.00
Z2422	36V	4300R	Spco@1A		AZ1530-Oay	26x14x11	Pc Mntg	563	£1.00
Z252	48V	2500R	2Pco@1A	Perivale	PC2	30x24x19	Plug in Continent	99	£0.60
Z253	48V	2500R	4Pco@1A	Perivale	PC4	30x30x19	Plug in Continent	98	£0.80
Z2424	48V	3000R	Dpco@1A	ITT	A2446	29x16x13	Pc Mntg	53	£1.00
Z3010	48V	3000R	6Pco@		V23030-C2026	40x37x9	Pc Mntg		£1.00
Z2496	48V A.C	630R	4Pco@3A	Omron	MY4	27x20x41	Plug in Cont	15	£1.00
Z219	50V A.C	750R	4Pco@3A	Izumi MY4	RY4S-EC	35x27x21	Plug in Cont	409	£1.00
Z2425	110V	10K	3Pco@10A	Ferne	RCP11	35x35x56	11 Pin	73	£2.00
Z261	240V AC	12K	2Pco@7.5a	P&B	KU11A15	46x36x31	8 Pin Plug in	158	£3.00

EVERYTHING ON THIS PAGE 2 FOR THE PRICE OF 1

Toggle Switches



Z1710 Toggle switch double pole on/off rated 10A 250V ac. Threaded bush with plastic and metal nut, also can be clipped in panel.

Price **£1.50**

Z1711 Another toggle switch, very similar to above. No rating printed on body, but looks about 10A. This one does not have a clip fix.

Price **£1.20**



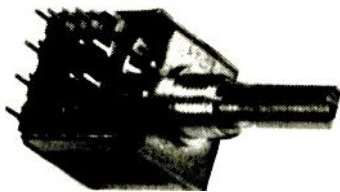
Toggle switches by Bonella. High quality, high current, solder tags. All are rated 10A 250V ac

Z352 Type N11LNZ SPCO (4 tags) Metal dolly **56p**

Z354 Type N41LNZ DPCO (6 tags) Metal dolly **84p**

Above 4 types less 25% for 25+ , less 50% for 100+

Rotary Switches



Z1522 Switch, Alps SRS 40 way. As used in CB's for channel switching. Body 20x20mm. 6mm dia shaft with M9 fixing nut. Not sure if these are binary or BCD. 7 bits per step. Data sheet supplied. **£1.00**

Keyboard Switches



Z1523 PCB mounting illuminated keyboard switch. High quality single pole reed with 5V lamp made by FR. Model 18 x 18mm. No tops unfortunately.

Price **3/ £1.00**

Z1393 PCB mounting keyboard switch with in built yellow LED SP. Size. 12.5 x 12.5mm. No tops.

Price **5/ £1.00**



Z2167 Keyboard switch, single pole clip-in type with standard + stem for cap. 13.6 x 12.9mm 7.5mm pitch DP 75p

Our low price **6 for £1** 100 + 0 10

Rocker Switch



Z1819 Rocker switch in black plastic SP on/off rated 16A 250V ac. Needs 30 x 12mm cutout

Price **Pack of 4/ £1.00**

Z2596 Keyswitch by Lorlin. 1p3w with 2 keys. For low current up to 1A. **£2.00**

Z2597 Keyswitch by Lorlin. 2p5w with 2 keys. PC mntg for low current up to 1A. **£2.50**

Z2853 8 position DIL switch - AMP type 435802-9. Gold plated. Pack of 5 **£2.00**; 100+ 0.25

Z2863 Min high quality push to make switch, overall 19mm long, body 6.4mm dia. 4mm fixing. Plunger 2.6mm dia x 4.5mm long. Pack of 5 **£2.00**

Z2699 Push to make switch, like our W435 only non-locking. Black top. Normally 52p. **Special offer price 8 for £2.00.**

Microswitches



Z4370 Burgess 20A microswitch. Incorporates 2 switches into one housing 20 x 12.5 x 17.5mm - 1 changeover and 1 break.

Price **2/ £1.00** 100 + 0.25

Z2084 Skeleton microswitches. SPCO, 5A rating. Two 3 5mm mounting holes on 10mm centres. They are designed to be mounted side by side - in theory the number is only limited by the length of bolts available! (each switch is 5mm thick)

Price **Pack of 4 for £1.00** 100 + 0.15



Z2165 Omron miniature type SS rated 3A 250V. Single break contact operated by bent lever

Price **5 for £1** 100 + 0.12 1k + 0.08

Z2166 Omron standard type VL631C. These are for signal switching, contact rating 0.1A 125A AC/30V DC. Single make contact.

Price **6 for £1** 100 + 0.09 1k + 0.05

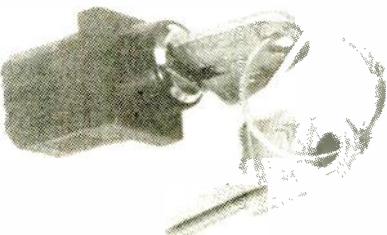
Z5158 High current microswitch by Siemens, model 3 SE3 rated 10A 380V AC Fully shrouded screw terminals (4): 1 pair make and 1 pair break terminals. Overall size 28 x 30 x 32

Price **£1.50**

Joystick Switch



Z004 Skeleton Joystick, switch type. Good quality, made by AB. Brass spindle has 44mm long black plastic handle attached. Body has 4 mounting holes. These really are a fantastic bargain!! **ONLY £1.00**



Z2168 Superb quality British made (TOK) Gold plated DPCO contacts. Key can be removed in either position. PC mounting or clip fix - needs 15x15mm cut-out. Ideal for alarms etc

Price **£1.95** 25 + 1.20 100 + 0.80

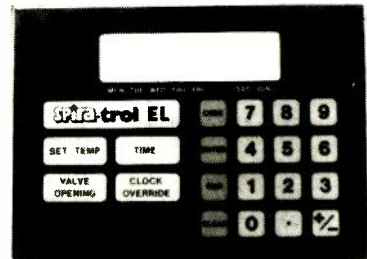
POINTS SWITCHES



Great switch bargains for railway modellers - these small switches 18mm wide and 12mm high (excluding lever) and just 4mm thick with 14mm FC come in two versions:

Z2363 2 position, 2 pairs make and 2 pairs break. Pack of 5 **£1.00** 100+ 0.10

Z2364 3 position, 6 pairs contacts (2 pole 3 way). Pack of 5 for **£1.00** 100+ 0.10



Z1797 Membrane keyboard 155 x 113mm with 80 x 22mm aperture for display from case Z4245. 22 keys. Output to 11 way flexible connector. Self adhesive.

Price **Only £1.00**



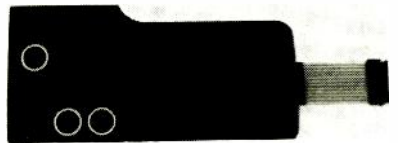
Z4354 Computagraph Colorwriter panel 352 x 67 x 12mm. Ally frame supports a membrane keyboard which has 22keys. On the rear of the panel are 6 yellow submin LED's, a 3mm red LED and 2 x 19W edge conns.

Price **£1.00**



Z4363 Membrane keyboard 225 x 84mm with 11 keys - 1-9 & 2 others. Output (common bus) on 12 way ribbon cable. Could be cut down to 95 x 70mm if only 1-9 needed.

Price **60p** 100 + 0.30



Z4116 24 way (8x3) membrane keypad. Large (200x90mm) area - these were originally used as a teaching aid. Overlay template and pinout supplied. **Now only £2.00**

Neat keypads in various styles by ORCOM, both with encoded and matrix outputs. All PCB's have room for coder chip (74C922) to be fitted. All feature 0-9 keys and other characters as shown. Output via 20 pin plug. Data supplied.

(a) No chip fitted:
Z5107 3 x 4 (* #) **£2.00**

Z9134 Cherry UB70 keyboard, low cost 67 key, std qwerty + F1-5 etc. New and boxed **£3**

Z5440 2 keypads. These are packed in pairs - both have 12 keys, but the legends are different: (a) 0-9, * and # and (b) MO LI MU B LO S F WU A and a couple of symbols. They have the graphite coated rubber membrane, but no PCB. **Only £1.50**

SUPER SWITCH SENSATION!

K838 A nice parcel of ALPS high quality push switches as used with mounting brackets. Enormous variety from DPCO to 10 pole changeover locking and nonlocking including PC mounting + solder lag, all on standard 4mm mounting. Different colours too. Whats more, there's a big selection of buttons to fit them- round, square, oblong etc in red and black. All at a knock-out price - 100 assorted switches + 100 assorted knobs £7.95.
 Pack of 1000 switches + knobs £49.95
 Pack of 10000 switches - no knobs 300.00



Switches in K838 available separately as follows

Code	C'tact	Pins	L/M	E2 Pack	100+	1K+	Qty
Z2801	10PCO	PCB/ST	L	12	10	.058	600
Z2802	8PCO	PCB/ST	M	16	.08	.056	815
Z2803	6PCO	PCB/PCB	L	20	.07	.044	6k4
Z2804	6PCO	PCB/PCB	M	20	.07	.044	2k4
Z2805	6PCO	PCB/ST	L	20	.07	.044	9k4
Z2806	4PCO	LPCB/ST	M	25	.05	.034	4k4
Z2807	4PCO	LPCB/ST	L	25	.05	.034	480
Z2809	4PCO	PCB/ST	M	25	.05	.034	7k1
Z2811	4PCO	PCB/PCB	M	25	.05	.034	3k8
Z2812	2PCO	EPCB/ST	L	40	.03	.022	12k
Z2813	2PCO	EPCB/ST	M	40	.03	.022	4k2
Z2814	2PCO	LPCB/ST	L	40	.03	.022	5k9
Z2815	2PCO	LPCB/ST	M	40	.03	.022	600
Z2816	2PCO	PCB/ST	L	40	.03	.022	5k8
Z2817	2PCO	PCB/ST	M	40	.03	.022	10k3
Z2818	2PCO	PCB/PCB	L	40	.03	.022	3k5
Z2819	NO CONTACTS		M	100	.01	.007	9k4

Contacts used:

Contacts: number of changeover switches

Pins: (All on 4mm pitch; contacts on both sides of switch as listed)

- PCB PCB mounting
- LPCB stand of PCB mounting (8.5mm)
- EPCB stand of PCB mounting (24mm)
- ST solder tags

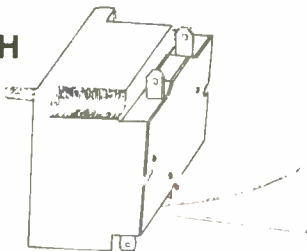
L/M: locking or momentary (non locking)

E2 packs: Qty of switches for £2 (other prices per switch)

QTY: total quantity in parcel

SALE PRICES
Pack of 100 £3.95
Pack of 1000 £25
Pack of 10,000 (no knobs) £175

TIMER SWITCH



Z5174 Timer switch by Diehl of Germany. Superb gearc mains motor, (1 rev per 12 hours) operates a cam that switches 2 change over contacts with centre - off positions rated 16A 250V. Size 60x54x43mm. Spindle ls 14x6mm dia
 Only £3.00 100+ £1.50.

SALE PRICE £1.00

Pressure Switches



These are operated by very low air pressure - just blowing down the tube will operate the SPCO microswitch within. Useful in a 'spark free' environment.

Z024 80mm dia x 45 total depth. SPCO switch rated 16A 250 Vac 80p

Z025 Similar to above, but 37mm thick 80p

Z4200 Pressure switch model LDQ by Actu. Can be activated by gas or air at very low pressure. Range 13 - 150mm w.g. Switch is a SPCO micro switch rated 230V 2A. Precision instrument overall dia 110mm x 48mm £2.00

SALE PRICE
Pack of 2 of each type £2.00

ALL KEYBOARDS £3!!



Z8848 Keyboard by Cherry Room for 104 keys, all normal keys (65) fitted Chips on board LS373 x 2, LS374, LM3086 x 2 LS138 x 3, 555, LS08, 6805 Size 442 x 175mm
PRICE: £10.00



Z8842 Tatung VT4100 keyboard. Cased 85 key units with separate numeric keypad With circuit. Has 2 or 3 broken key tops. 450 x 65 x 125mm
Price £9.95



Z8852D Keyboard. Superb brand new high quality keyboard with LCD displaying 1 line of 10 characters and a further line with various symbols, 100 keys, inc separate numeric keypad. Chips on board are 2x74HC05, 80C48. LCD + driver chip are easily removed. **Amazing low price - only £10.00**

ASCII KEYBOARDS



Z8933 5 1 key QWERTY keyboard by McMurdo O'com with 6 bit ASCII encoded parallel output. Measuring 240 x 115mm makes it ideal for rack mounting applications. With control, shift and shift lock keys this keyboard can generate all 128 standard ASCII codes. The keyboard requires a +12V and +5V power supply connected via a 20 way header type plug. The remaining connections on the plug are DSR, DTR and STR, the strobe and data set ready are switchable to be negative or positive going pulses. The controlling IC is a General Instrument AY-5-3600-PRO chip.

Price £8.50

Z8934 As above but supplied in a vacuum formed grey plastic case 280 x 185 x 60mm

Price £12.00



Z8863 Keyboard. High quality unit made by Micro Switch 69 pale grey and blue keys 6 red 5mm LED's, 15 varicous LS chips and socketed D8048 by Intel. Output via 7 way plug and there's a 4 way edge connector too Keyboard frame is 317 x 128mm. PCB on which it's mounted is 285 x 170mm
PRICE: £10.00

Xtra Special
KEYSWITCHES
 Z2107 sp 4w 2A 250V £1
 Z2596 1p3w 2 keys 1A £1
 Z2597 2p5w 1A 2keys £1
Star Buy!!

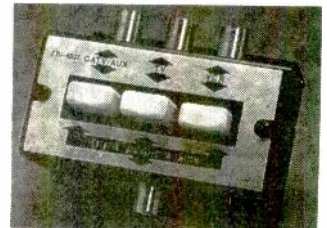


Z8922 Made by Devlin, this keyboard has 94 keys (18 without caps; 20 with removable tops) and runs off a single 5V supply. Serial ASCII output + switch to emulate AT and XT keyboards.

Price £12.00

Xtra Special
SLIDE SWITCHES
 Z301 / 3 / 4 / 5 / 6
 10 OF EACH
 PACK OF 50 **£2**
Star Buy!!

TV SWITCH



T123A Push button selector switch to give 3 inputs to one TV - co-ax skt inputs, co-ax plug output. Auto substitution of 75R load when channel not in use. Size 90x47x39mm
 Normally £3.99
£2.00

TEMPERATURE SWITCHES
 Temperature sensitive switches designed to protect components or equipment from damage by overheating. Snap action bi-metallic disc operates the normally open contact. Switch resets when temperature falls.
 Z2533 130°C
 All the same price - £1.00 each; 25- (any mix) 0.60;

SALE PRICE 3 for £1.00

30

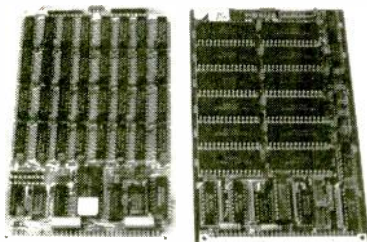
SUPER SENSATIONAL SUMMER SALE

GREENWELD

27 Park Rd. Southampton SO1 3TB

Tel: 0703 236363 Fax: 236307

All one off and pack prices INCLUDE V.A.T. Qty. prices do not.



MASSIVE DISCOUNTS!

A collection of Eurosize panels (160x100mm) with 64 way DIN plugs fitted.

Z5092 8xHM3-6514-9 RAM + few other chips £1.00

SALE PRICE 40p

Z5089 32xTC5514AP-3 1kx4 static RAM + few other chips etc £3.00

SALE PRICE £1.20

Z5090 12xM5M5165P-15L 8kx8 static RAM plus few other chips £4.00

SALE PRICE £1.50

Z5100 16xHM6167LP-8 + few other bits £2.00

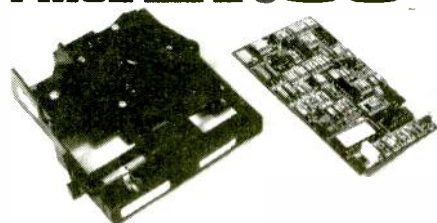
SALE PRICE 80p

Z5101 2xM5M5165P-10C + few other chips £1.50

SALE PRICE 60p

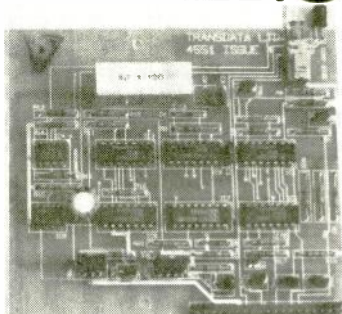
Z5262 8x2764 in skts + 10 LS chips £4

SALE PRICE £1.50



Z5364 Coin acceptor unit. Moulded plastic case 140x130x50mm (believed used in payphone) which has several coils embedded into it. As a coin passes over the coils, the circuitry on the 135x76mm PCB generates a pulse train. PCB contains MM9504, 82S126 in skt, CMOS 4001x2, 4053, KM2902 quad op-amp, LM2903 dual comparator, 5 small signal transistors, 4 small chokes, R's, C's etc. Only £2.95 100+ 1.75

SALE PRICE £1.00



Z653 Control PCB, 140x115mm with 2x4013, 4020, 4011, 4081, 4071, 8211, LM3909, 2af02.003TIP130, 5x2N3906, switch, C'S R's, LED etc. £1.50

SALE PRICE 2 FOR £1

Z631 PCB 170x135mm with 2xLM324, 2xILQ74; 2xMC14416; 4519; 2x4510; 2x4099; 4001; 4584; 2x741; HC14LS05; 74125; 2 relays, Rs, Cs, etc.

Price Reduced to £1.50

SALE PRICE 2 FOR £1.00

Z629 Occasionally we obtain repeat supplies of panels - this one was featured on B/L 30, and is 170x35 with 2xMC3419 loop interface 4510, LS505, LS514, 4584 all in sockets, also LM324, 4519, 2x4099, 4013 plus 2x4.5V DPCC BT type relays. Also 64 way DIN plug, 2 bridge rects, 6 transistors, Rs, Cs, etc.

Price Reduced to £1.00 100 + 0.30

SALE PRICE 3 FOR £1.00

JIMMY
the electronic football game of skill



Z817 Exciting electronic football game - Waddingtons' 'JIMMY'. Brand new models in full working order, but without plastic peripherals, stickers etc. Red plastic case 420mm long x 93mm wide contains keypad and 7 segment LEDs to keep score either end. The centre section 'players' are represented by red 5mm LEDs, 14 altogether. The main chip is the TMS1000, programmed to make odd noises whilst playing and a tune when a goal is scored. Also inside are 13 plastic transistors, 57mm 8R speaker, power supply socket, Rs, Cs etc. Powered by 2x PP3 batteries. Solo or dual play. Supplied with instruction sheet, playing field complete with coloured 'players'. Good fun to play as a game with good value for the electronics within. Originally retailed at £19.95.

Price Only £5.00

SALE PRICE £2.50

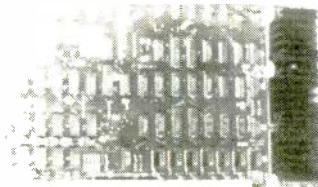
Z5432 Nice little surface mount module. PCB 70x51 has sub panel 56x26mm plugged into 2x18SIL skts. On it are 10 IC's ic. On the main panel are 4 big chips - TMS320, CF34035 & 6, 77C82; 4 xtals - 8MHz, 970, 2048 & 19660.9kHz + some smaller chips - ZN429, TL431C etc. Complete panel for £3.00

SALE PRICE £1.00

Z4294 Neat panel 213 x 37mm with 5 keyboard switches, 3 red LEDs and a DL1416 4 digit LED display with built in memory. There's half a metre of grey ribbon cable attached to a 34 way IDC socket.

Reduced to £3.00

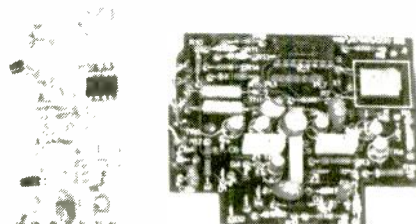
SALE PRICE £2.00



Z4300 Nice panel 330 x 170mm with 3 chunky heatsinks 47 x 36 x 32mm, each with TO220 voltage reg. Also 56 x 74 series ICs including L + LS 3x40W IDC plugs, few tants etc. Attached to the board are 2 x 0.5m long twisted and flat ribbon cables terminated in 50 way IDC sockets.

Price £4.00

SALE PRICE £2.00



Z4319 Small panel 85 x 43mm with 555 timer, BS107 FET, BC109, 3 x BFW43, 47µF 35V tant + other Rs, Cs etc.

Price 3/ £1.00 100 + 0.15

SALE PRICE 10 FOR £1.00

Z4318 Ex - BT tone divider PCB. Panel 84 x 69mm has on it 2559 tone divider chip, 3 579545 Xtal, 7 small signal transistors, tants, Rs, Cs, etc. Produces required tones for telephone system

Price £1.00 100 + 0.30

SALE PRICE 5 FOR £1.00

Z5203 Relay panel - some panel, this! 50, yes 50 DPCC 24V DC min relays, Omron type G2V (our type W834) on PCB 230x160mm with 2xDIN41612 64 way plugs. At 1 off prices, this would cost around £100, but you can have a complete panel at just 20p per relay - that's only £10.00!

SALE PRICE £5.00

Z5372 Small PCB 102x51mm with 8.4V 170mAh nicad button cell (list 7.31), a DPCC relay and a few other bits £3.00

SALE PRICE £1.50

Z5204 Diecast housing 252x140x25mm (subscriber module) contains PCB with lots of nice high frequency bits, much of which is contained within 2 diecast boxes bolted on to the board. Most of the transistors (there are 17 of them) are BF980, BFR90A/91A BFW92 etc. Single output socket, 2 DIN41612 plugs. Great value at £4.50

SALE PRICE £2.00

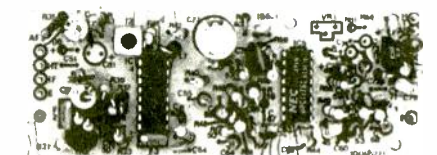
Z5301 Panel from Z4113 Contains all components, including transformer. Believed unused - some are very dusty. £3.00.

SALE PRICE £1.00

Z5411 Marconi panel 225x195mm. No info on this PSU, but it's got some really nice bits on it - 2 x 2N3716 TO3 transistors, 13 BCY71, 2 x BC107, BFW43, BFX29, LM317K and LM337K TO3 variable voltage regs, some high power zeners, pot cores, R's, C's etc., toggle switch with locking device.

Great value at £3.95B

SALE PRICE £1.50



Z910 391 x 39mm. This panel has soldered in components - TCA4500A and TBA651R, AM radio with IF amp. Probably complete RF section of radio, as IF's and trimmer are on board + R's, C's, etc.

Price 60p

SALE PRICE 5 FOR £1.00



Z493 D Module. As above, but PCB has 3 x BC184L, BD124, Rs, Cs etc.

Price £2.00

SALE PRICE 5 FOR £2.00

1/2 MEG MEMORY BOARD

Z8900 Massive panel 460 x 400mm smothered in chips. Could be a complete computer judging by the IC's on the board. Made by Whitechapel Computer Works. Contains at least the following (some panels have extra chips):

64 x 4164-15 RAM's; over 200 74LS, F and other logic chips; 3 x 4016-3, 2 x 8253-5, 8251, 2 x 5516, 6 xtals, 3 x 'D' Plugs and sockets, 3 x DIN 64 way socket, + R's, C's etc. Price equivalent to 4164's @ 30p each and rest of chips @ 3p each!

Price £25.00

SALE PRICE £10.00

RADIO SCANNERS - Send SAE for full details of our range of high quality scanners at great prices!

Z5140 As listed in BL75, but we've found some of these serial parallel interface cards for the Apple II complete with comprehensive 22 page booklet. It provides full serial RS232C output + a fully decoded 8 bit parallel output port. Excellent value at £5.00

SALE PRICE £3.00

Z5408 Heatsink 152x50mm with 4 x T03 devices mounted on it: 2 x 7805CK 5V 1.5A voltage regs (DP 2.00) and 2 x BUY18S, a 200V 15A NPN transistor, in our cat at 2.30. So the total value is 8.60. **our special price £2.50**

SALE PRICE £1.00

Z5263 Panel 80x60mm with FPT100A phototransistor, LM324 quad op amp. 24V SPCO heavy duty relay. BC546, diodes, R's and C's. Smashing little board **only £1.00**

SALE PRICE 2 FOR £1



Z4368 Panel 310 x 90mm with 20 CMOS chips, 3 x MC1488, 2 x MC1489, 6 x C251 opto isolators and a 64 pin chip MB60504.

Reduced to **£2.00**

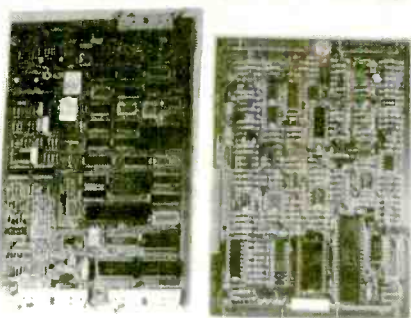
SALE PRICE £1.00



Z4279 Interesting little panel (75mm x 40mm) with 16 position BCD channel switch (24 pins), 2 dual green 7-segment displays: 2 min keyboard switches, and a short A4093. Attached by a short length of ribbon cable is a second panel (same size) with 4518, 4019 and 2 x 5068 chips. Supplied with circuit.

Price **Only £2.20**

SALE PRICE £1.00



Controller Boards

PCB 175 x 122mm containing a wealth of components - 80C39 CPU, 4 x TL066, TL094, CMOS and 74 series chips, 8 x T0126 transistors, 13 T092 transistors and lots of R's and C's etc - also a 3V lithium battery. 3 connectors on it go to (a) card reader (b) motor panel & (c) display panel which is identical to our Z027 (P111 of Catalogue).

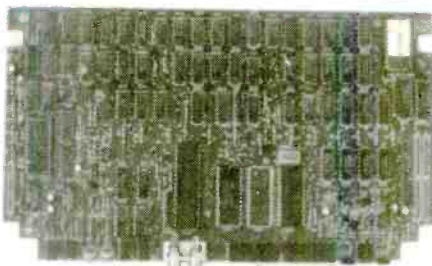
Order Code **Z5047**
 Reduced to **£2.00** 100+ 1.00

SALE PRICE 4 FOR £2

Z5048 Panel 275 x 178mm containing some excellent components: 2 x D8243 I/O expander, 8035 CPU, 8253 timer, 2651 USART all in sockets, 2 x 2111A-4 RAM, 25 mostly CMOS chips, 8 x T0126 transistors, 5 x T092 transistors, R's, C's etc, 26V IDC plug, 2 x 34W IDC plugs, 2 xtals.

Only **£3.00**

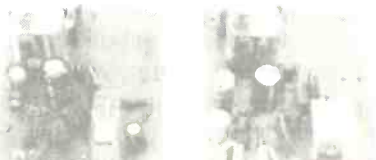
SALE PRICE £1.00



Z672 Newbrain motherboards. Complete but probably faulty **£3.50**

SALE PRICE £2.00

Z674 Newbrain data. Interfaces and connector pin out i/p, o/p, port map, cct diagram + data on CP420C. (This lot replaces cct diag only for 75p) **£2.00**



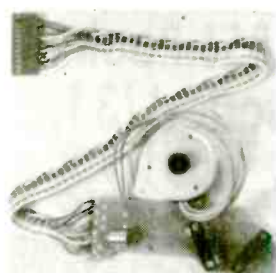
Z925 DPCO 12V 185R relay, 12V DPCO relay with heavy duty contacts, SC146D 400V12A triac, 555 timer, 11 x 1N4001, 2N5061 SCR, 3 x 2N37043, Rs, Cs, etc.

Price **£1.90**

SALE PRICE 3 FOR £2.00

Z926 Similar to above, but instead of heavy duty relay, a T2800D 400V 12A triac and C122D 400V 12A SCR. Both boards 100x75mm **£1.85**

SALE PRICE 3 FOR £2.00

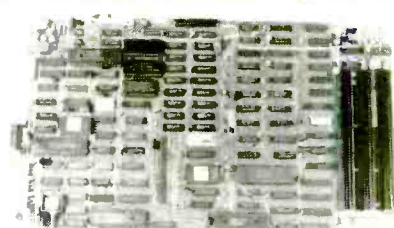


MOTOR PANELS

PCB 92x31mm with mercury tilt switch, 2VTL 10D2 opto slotted switches, length of 11 core cable with socket and stepper motor as described above.

Order Code **Z5046**
 Prices **£3.50** 100+ 2.20

SALE PRICE £1.50



HIGH QUALITY ICL COMPUTER PANELS - 2 types, the first a mother board and the second a panel which plugs into the first.

Z4209 Panel 360x210mm covered in high quality chips: 8085AHC, 8255, 8257, 8251Ax2, 8253 -5, 8275, 8202A, 2732, 2716, all in sockets; 18x41116-2 + other mainly LS chips + min switches, LED's, oscillator, large tants, 3x50 way double sided edge connectors. Amazing value at only **£16.95**

Reduced to **£9.95**

SALE PRICE £5.00



Z5093 Tilt display. Plastic housing 200x95x45mm contains PCB 195 x70mm with 8 7-seg HP LED'S type 5082-7651, red 0.43 CA; 16 5mm red leds, 8255 programmable interface and other chips etc.

Price **£2.50**

SALE PRICE £1.00



1W Amplifier - mono

Z914 Audio amp panel 95 x 65mm with TBA820 chip. Gives 1W output with 9V supply. Switch and vol control. Just connect battery and speaker. Full details supplied

Prices **Only £1.50** 25+ 0.80 100+ 0.60

SALE PRICE 2 FOR £1 BOX OF 128 £35

1W Amplifier - Stereo

Z915 Stereo version of above 115 x 65mm, featuring 2 x TBA820M and dual volume control.

Prices reduced to **£3.00** 25+ 1.80 100+ 1.20

SALE PRICE £1.00 BOX OF 64 £35

Z974 Mixer Amp Panel 115 x 115mm and gives 1W O/P from a TBA820M chip. There are 2 inputs, one via a pre-amp, from phono sockets and separate volume controls. A third pot is used to fade from one input to the other. There are also 2 4p 3w rotary switches. Attached to the PCB by flying leads is a panel on which are mounted the 2 Input sockets, 2 x 5 pin DIN sockets and 2 pin DIN speaker socket. A data sheet is supplied.

Price **Only £2.50**

SALE PRICE £1.00



Z1699 Mini inverter - This handy PCB 31 x 23mm uses a 2 transistor circuit to provide a 60V peak ac supply (20V dc (a 1mA) from a 3-7V dc input. Can be used to drive Z1637 LCD or for powering vacuum displays. Originally used in Newbrain computer.

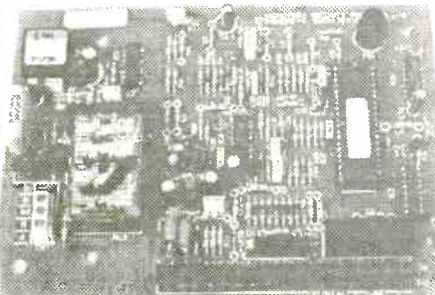
Price **3/ £1.00**

SALE PRICE 10 FOR £1

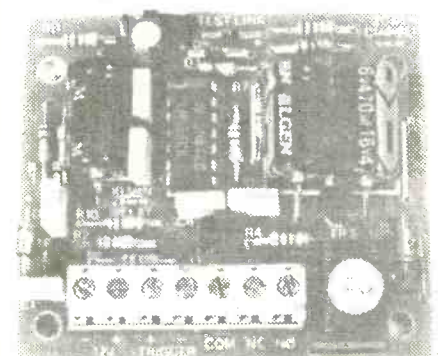


Z5283D Metal detector panel 185x115mm. This is the complete PCB from an expensive (£80+) "treasure detector" - just add wire coil and meter to make a working unit. Circuit uses 15 transistors and 3 IC's. There are 5 pots and a rotary switch. Detailed Info supplied. **£12.95**

SALE PRICE £9.95

ALARM PANEL

Z5515 Brand new panel 165x127 by Microtech Security. These are for use in an alarm unit (Digicom 8) and contain some excellent parts. However they need a programmed PROM to make the board functional. 12V supply. 8 inputs. Connexion to BT line via opto-isolators. Useful parts include 2 min 12V DP relays; 2 larger Omron DPCO 12V relays and a Clare mercury wetted relay. Chips: LM567; LM324; ULN2003A. Wiring diagram included. Individually boxed. Great value at **£3.00**

TIMER PANEL

Z5514 Universal bell timer. Panel 63x55mm uses a 556 + 3 transistors to provide both 10 minute delay and 20 min cut off timers, with ability to disable one or other. +ve or -ve trigger. SPCO relay. 12V operation. Supplied bagged with adhesive stand-offs and connexion data. **£5.95**

Xtra Special**BBC SOFTWARE**

Z4333 Micro Maestro 5.25" disk + tape + C60 stereo cassette + handbook. Concert pitch **£2**

Z4334 As above but B flat **£2**

Z4326 Music Master. Mic to attach to recorder + processor + 5.25" disk + handbook 40t **£3**

Z4327 As above but 80t **£3**

Z4328 Recorder Tutor - 5.25" disk, 38p handbook, C90 cassette with 52 tunes **£2**

Z4329 Ensemble Pack **£1**

Z4330 Duet Pack **£1**

Star Buy!!**25% OFF THESE TWO PANELS****Xtra Special****HEATSINKS**

Z2590 TO5 copper 17diax20 16/£1

Z5338 Black finned 38x20x40 6/£1

Star Buy!!**Xtra Special****TRIPLERS**

K856 Pack of 8
assorted (3 types)

£2.50**Star Buy !!****Xtra Special**

Z2651 16.384M 20/£2

Z2665 55M 3/£1

Z1653 2.4576M 3/£1

Z1654 8.863256 5/£1

Z2079 14M 3/£1

Z2151 2.45760M 3/£1

Star Buy!!**Xtra Special****Suppressors & Filters**

Z2444 Protector 14A 5/£1

Z003 Potted, fused 5/£1

J057 6A IEC inlet £1.00

Star Buy!!**Xtra Special****MK 13A SOCKETS**

Z5010 Unswitched 2/£1.50

Z5011 45A Cooker sw £2

Z5012 Term unit £1

Star Buy!!**Xtra Special****1% CAPACITORS**

Z4428 2.2uF 100V

Z4425 1.0uF 100V

5 of each £1**Star Buy!!****Xtra Special****SEMIS**

LAS1905 5V 5A regulator £1.50

7211 4 digit LCD driver £1

Z2321 25A 400V SCR+diode £1.50

Z5244 78M24. Box of 100 £8.00

Z2651 Crystal Reel of 1000 £50

Z2858 40A 800V Diode 4 for £2.50

Z1661 27C32 12/£1

Z1662 8050AH 4/£1

Star Buy !!**Xtra Special****CALIPERS**

Y024 6" Inside & Outside

1 pair of
each for **£2.50**

Star Buy!!**Xtra Special****SPEAKERS**

Z5266 45mm 15R 6/£1

Z945 5x3" 80R 1W 2/£1

Z578 30mm 16R 0.4W 5/£1

Z5275 57mm 8R 6/£1

Z5267 57mm 75R 6/£1

Z5419 63mm 4R 8/£1

Z533 20mm 50R 3/£1

Star Buy !!

GREENWELD 27 Park Rd. Southampton SO1 3TB
Tel: 0703 236363 Fax: 236307

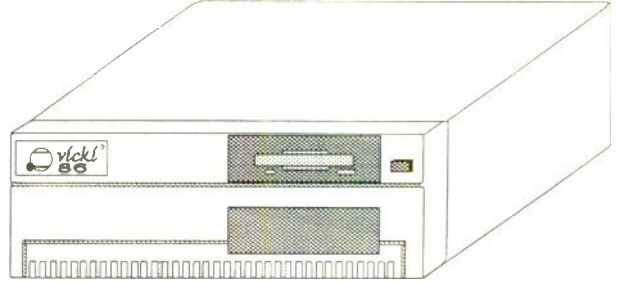
All one off and pack prices **INCLUDE** V.A.T. Qty. prices do not.

SUPER SENSATIONAL SUMMER SALE **33**

VICTOR

vicki 86 XT PC

We have a limited quantity of these high quality units - the beautifully styled beige base unit measures 395x330x130mm and is fitted with an 8086 motherboard with 640k base memory, 3.5" 720k disk drive, 75mm dia speaker and a fan cooled switch mode power supply unit. There are 5 8 bit expansion slots and room to fit a further drive. Socketry includes 9 pin D for standard mono monitor, 25 way D parallel and 9 way D serial ports, 7pin DIN keyboard socket and power inlet. The keyboard is a standard PC XT layout, but some keycaps need to be changed for English version (Intended for the German market; stickers supplied). Excellent build quality - steel case cover with plastic fascia.



SALE PRICE

£99.95

WINDOWS SOFTWARE SCOOP!!

All brand new product in sealed packages at enormous savings!

Microsoft Windows 3.0

Supplied on 5 3.5in 1.44mb Disks
With 640 Page Manual

Order Code **Z9151**

OUR PRICE £14.95

BUY BOTH FOR JUST

£34.95

PFS: Window Works

Integrated package featuring word processor with page layout, chart editor, database, comms module, address book and label maker. Supplied on 3 3.5in 720k disks. Needs 4Mb hard disk space on a 286 or better. Lots of on screen help. Less than a year ago it sold for over £100!!

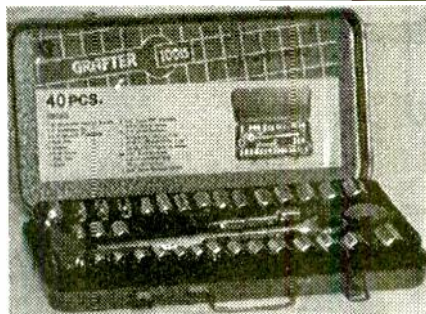
Order Code **Z5554**

OUR PRICE £24.95

SOME MORE GOODS JUST ARRIVED



Z5560 Ni-Cad battery pack. 10 'C' size cells contained in 2 tubes - easily taken apart if required. Rated 12V 1700mAh. Only **£6.95**.



Z9155 40 piece socket set by 'Graftor'. Good selection of sockets at a modest price - 5/32 - 9/16 & 4-14mm + handle, extn, adaptor etc, all in a hinged metal case **£6.95**

HEADPHONES



H8 Excellent quality Adastra stereo headphones with boom microphone. Freq. response 20-20,000Hz, 32R Impedance. Microphone 600R. 2m leads fitted with 3.5mm plug for mic, and 3.5 mm plug + adaptor for headphones. Padded earpieces and leatherette headband.

SALE PRICE £4.95

RADIO SCANNERS - Send SAE for full details of our range of high quality scanners at great prices!

HUGE REDUCTIONS IN AUDIO/VIDEO PROCESSORS SUPER QUALITY PRODUCT FROM HAMA

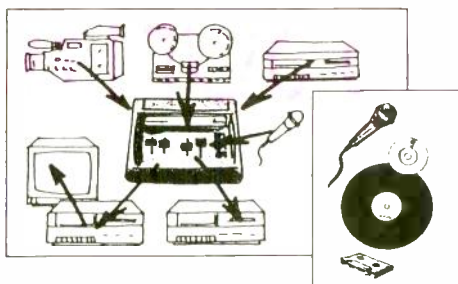


The purpose of video film editing by copying is to improve, and not to diminish, the quality of the original. Yet what is the use of editing out a bungled scene, only to find that copying results in a sharp deterioration of the image quality? This would be totally counter productive. The Audio Video Processor AV 125, described on pages 166-167, polishes up the video signals while they are being copied so that there is no deterioration in quality. On the contrary, flat colours become brilliant, and fuzzy edges become sharply defined, for superb presentations that appeal to the viewers. But there are those who do not have such ambitious aims and also wish to save money. Hama has taken such needs into account with their "beginner's" model which offers remarkable capabilities at a very reasonable price.

Audio Video Processor AV 140
 Corrects the video colour signals from recorders or cameras while copying from tape to tape. Both colour intensity and contrast can be continuously changed. A record player, CD player or cassette deck can be connected to add a new source of sound to the original sound in any variable mixing ratio. A microphone connection is also provided. A significant benefit: Two copies can be simultaneously produced!
 40140

LIST PRICE £179.99

SALE PRICE £79.95



It couldn't be easier

Video film copying is child's play with the HAMA AV 140. Two Euro-AV sockets establish the contact between the playback and recording units. And there is no longer any replugging if the copying direction is to be reversed. Simply push the input key to decide whether copying is from unit 1 to unit 2, or vice versa. Two LEDs indicate the selected direction. And with the bypass switch you can decide whether the signals require enhancement or not. Everything is under your complete control, and the results can always be checked on the monitor which displays either the original or the enhanced picture.

To get the best from your home movies, you'll need the book and the video...



Video Fascination
 The New Guide to Better Video

Superb quality large format (A4) 256 page hardback book full of tips, procedures and equipment produced by Hama. Not just a showcase for their excellent quality goods, but lots of useful information, including how to produce a finished video - storyboard, planning, shooting, editing. Excellent value of £14.95. Order Code 97426

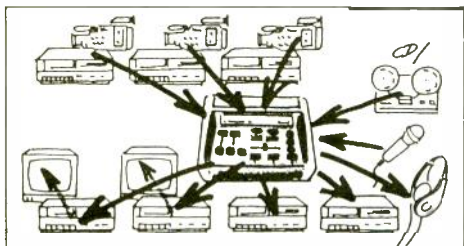
To accompany the book, a 40 minute video has been produced, showing how to achieve the best results from your camcorder. £14.95. Order Code 97598

SALE PRICES:
 (Only when purchased with one of these processors)
£7.50 each

Audio Video Processor AV 142
 This model extends the scope of the AV 140 (see left) by definition, brightness and fades while copying a video film. A screen splitter compares the original picture with the settings that have been adjusted on the screen. The AV 142 offers added scope in the sound area. The mixing ratio between the original sound of the video can be continuously varied with an external sound source such as a record, CD, cassette or microphone. Furthermore, the microphone signal is separately variable from the record, CD or cassette signal. And obviously, the sound can be either stereo or mono. Perfect pitch adjustment with bass and treble tone. Up to 4 copies can be simultaneously produced.

40142

LIST PRICE £259.99
SALE PRICE
£129.95



Xtra Special

RESISTORS

Z2104 1R 6w WW 20/£1
Z2105 50R 15W WW 5/£1
Z2106 225R 23W WW 4/£1
Z1877 0R1 11W WW 18/£1
Z1878 0R27 11W WW 18/£1
Z4402 1R 25W WW 4/£1
Z2701 6R8 5W MC 20/£2
Z2702 8R2 5W MC 20/£2

Star Buy !!

Xtra Special

CAPACITOR CLEARANCE

Z2319 47uF 25V axial 1000/£12
Z4343 2200uF 40V can 100/£5
Z4346 15,000uF 25V can 100/£25

Star Buy !!

Xtra Special

Z4135
STEREO
HEADPHONES

£1

Star Buy!!

Xtra Special

**VIDEO HEAD
CARE KIT
2 for £1**

Star Buy!!

Xtra Special

CAPACITORS

Z1539 4.7nF 380V cer 30/£1
Z5218 22000uF 16V 3/£1
Z4277 25uF 450V 50Hz £2
Z1965 0.01 disc 120/£1
0.22uF 1kV axial 20/£1
Z822 800uF 250V can 3/£1
Z5379 2200uF 35V Ax 15/£1.50

Star Buy !!

Xtra Special

ODDS & ENDS

Z5414 Antistatic warning label. 2000/£5
Z5268 Cord Set £1.75
Z2339 100mH 10A coil 6/£1
Z5060 Italian C60 tape + 32 page book 2 for £1
Z4199 Timer £1.50
Z035/6 Term unit £2
Z5270 Ribbons 4/£1
Z5368 Aerials 5/£1
Z2648 UHF Tuner 3/£1

Star Buy!!

Xtra Special

HARDWARE

Z5144 25D covers 20/£1.50
Z5142 Vacuum case 6/£1
Z2175 4x0.5" pozi pan screws
Z5408 Heatsink with 2x7805 & 2xBUY18S (both TO3) £1.00
Z07007 Sleeved grommet 120/£1
Z2311 Knobs, solid black ally 6/£1
Z4283 Sealing strip 50m/£3
Z5349 32mm conduit clamp 12/£1
Z5149 Self amalgamating tape 125m x 13mm £5
Z5164 As above but 21mm wide £7

Star Buy!!

Xtra Special

SWITCHES

Z2166 microswitch 12/£1
Z2341 DIL switch 10/£1
Z2499 limit switch 8/£1
Z2491 microswitch 4/£1
Z1522 CB switch 2/£1
Z2492 cased uswitch 2/£1.50

Star Buy !!

Xtra Special

Z655 PLASTIC PUMP
(from cream dispenser)

10 for £1

Star Buy!!

Xtra Special

Superb Sub-min mic
Z2642 Ideal for bugs, etc
Size 10x7x4mm

3 for £1

Star Buy!!

Xtra Special

LEADS

at ludicrous prices

Z5416 25D p-25D s £1
Z5087 6pin-3phono 4/£1
Z5433 25D s-10w miniDINp 2/£1
Z2346+Z5169 Cable mntg 3w p + skt with 2m 6A lead £1.50pr

Star Buy !!


Xtra Special

SWITCHES

Z1816 Min PCB togg SPCO 6/£1
Z1837 Illum DP push £1
Z2167 sp keyboard 12/£1
Z2108 4p3w rot 6/£1
Z2140 4p3w rot 8/£1
Z2361 HD push c/o 6/£1

Star Buy !!

EVERYTHING ON THIS PAGE 2 FOR THE PRICE OF 1

Code	Type	Description	List	Our Price	Semiconductors	
Z6124	ICM7170IPG	CMOS µP real time clock - µs to years	8.95	£4.50	We've found a number of odd devices whilst clearing out a store, all offered at silly prices.	
Z6125	IRF740	400V TO220 10A 125W MOSFET	2.09	£1.00		
Z6126	IRFR014	TO252 HEXFET 60V 33A 25W	1.07	2/£1.00	(a) Diodes	
Z6127	L4885CX	?		£1.00		
Z6128	LM2902D	Quad op-amp	0.82	3/£1.00	Z2746 ITT907	Pick
Z6129	LM2903N	Dual low power comparator	0.76	3/£1.00	Z2747 ITT920	anywhere
Z6130	LM293N	Dual comparator		£1.00	Z2748 ITT12601	at 500
Z6132	LM336B25	Voltage ref diode TO92 2.5V	4.58	£2.50	Z2749 XK3117	for
Z6133	LP365N	Quad low power programmable comparator 4000ns	0.90	2/£1.00	Z2750 BAX12A	£5.00
Z6134	MC1489AP	Quad RS232 line driver	0.45	4/£1.00	Z2751 OAZ201	Min 100 of
Z6135	MC3486P	Quad diff RS422/3 line receiver	1.08	2/£1.00	Z2752 TI621425	one type
Z6137	OP07EP	Precision op amp	0.92	2/£1.00		
Z6138	2N4392	TO18 FET, N, 40V 300mW	1.23	3/£2.00	Z2753 1N5361A plastic 27V 5W zener. 6 for £1.00	
Z6139	6N139	Darlington single opto coupler 400%	1.30	3/£2.00	Z2754 Stud mounting rectifier, no nuts. 16F40 400V 16A 4 for £1.00	
Z6140	BD436	4A PNP TO126 32V 36W	0.68	3/£1.00	Z2755 Stud mounting zener 1S5056 rated 10W 5.6V. 3 for £1.00	
Z6141	BF869	50mA NPN TO202 250V 5W	0.66	3/£1.00	Z6123 BB105B varicap diode 17.5pF @ 1V; 11.5pF @ 3V. Pack of 3 £1.00	
Z6143	CDP1871ACE	RC IC?	13.86?	£5.00	Z2756 SD2 pair of recifiers connected thus:	
Z6144	D8753H	?		£10.00		
Z6145	DG417DJ	Precision SPST CMOS analogue switch	1.76	2/£1.00	400 for £2.00	
Z6146	MC6809P	8 bit CPU	2.17	£1.00	Z2757 S03 as above. Same price	
Z6147	MCT2E	Transistor opto coupler 2.5kV 20%	0.45	4/£1.00		
Z6148	MK4501N-12	512x9 Biport FIFO 120ns	4.78	£2.50		
Z6149	NM58274CN	µP real time clock	7.93	£4.00		
Z6150	N82S129AN	1k bipolar RAM (256kx4)	1.95	£1.00		
Z6151	NM1630	Quad translator 5-15V logic isolation	10.10	£5.00		
Z6152	NMA0505S	?		£2.00		
Z6153	NMC9346N	E²PROM	1.43	3/£2.00	(b) Integrated Circuits	
Z6154	OP27GS	Low noise op-amp SM	3.17	£1.50	Z6101 LM305H +4.5V to +40V 45mA TO99 voltage regulator. 3 for £1.00	
Z6156	PALCE29MA16H-25	29 input, 16 prog output		£5.00	Z6102 LM306H voltage comparator £1.00	
Z6157	RC5534ANB	wide bandwidth, low noise op amp	1.18	2/£1.00	Z6103 SN76033N audio amp £3.00	
Z6159	S17660DJ	?		£1.00	Z6104 SN76023ND audio amp £2.00	
Z6160	TIBPAL22V10ACNT	22 input 1 time prog PLD	£10.00	£3.00	Z6105 MC8500P £2.00	
Z6161	TL7705ACP	+5V µP power supply supervisor	£1.75	£1.00	Z6106 MC2116J-15L £1.00	
Z6162	TL7705AID	do		£1.00	Z6107 SH3011 8 pin TO3 device. Voltage reg? £1.50	
Z6164	TLC272CD	dual do	1.17	3/£2.00	Z6108 MC68008L8 £2.00	
Z6166	TMS9129NL	?		£10.00	Z6109 7107 DPM £3.00	
Z6167	UC3524AN	Enhanced SMPSU circuit	1.53	3/£2.00	Z6111 1DAC80-CB1-V-C D/A converter £1.00	

SM = Surface Mount (there may be some SM not so indicated - we're working from a list rather than the devices themselves).

Yet another parcel of semi's - this one has been in stock for some time, but haven't time to sort and list it!

Code	Type	Case	Description	Qty	Price
Z2874	723	TO99	V. Reg. +2V to 37V 0.1A	260	3/£1.00
Z2875	TAG306/400	TO66	Triac 6A 400V	100	3/£1.00
Z2876	TAG310/400	STUD	Triac 10A 400V	34	3/£2.00
Z2877	TAG3/400	TO66	SCR 5A 400V	74	3/£1.00
Z2878	40430	TO39	Unknown	750	5/£1.00
Z2879	TAG240/500	TO220	Triac 6.5A 500V	250	3/£1.00
Z2880	TAG06/200	TO18	SCR 0.8A 200V	94	5/£1.00
Z2881	2S323	TO18	Transistor	1300	£2.00
Z2882	2S324	TO18	do	500	£2.00
Z2883	BC177A	TO18	do	275	10/£1.00
Z2884	2N4905	TO3	do	90	£2.00
Z2885	2N5108A	TO39	do	156	2/£1.00
Z2886	2N3019	TO39	do	30	2/£1.00
Z2887	2N2223	TO5	dual do	34	£1.00

CODE	TYPE	DESCRIPTION	QTY	LIST	OUR PRICE
Z6168	7905CT	-5V 1A TO220 Regulator	353	42p	8/£2
Z6172	81LS95		396		£1.00
Z6173	VT7C122-15	22 Pin Dii	300		£1.00
Z6174	MCM6064P12	28 Pin Dii	150		£1.00
Z6175	AM9517A-4DC	40 Pin Dii	58		£1.00
Z6176	82S09	28 Pin Dii	94		£1.00
Z6177	MJ2813	28 Pin Dii	175		£1.00
Z6178	P8275		16		£1.00
Z6180	TIBPAL6R4-25CN		9	1.64	£2/1.50
Z6181	TIBPAL16L8-15CN		30	1.64	£2/1.50
Z6182	PAL10H8CN		10		£2.00
Z6183	PALCE26V12H-25PC		12		£2.00
Z6284	AM26LS31	16 Pin Dii	29		£1.00
Z6187	AM26LS32		41		£1.00
Z6188	AM9122-25		10		£1.00
Z6189	PALC18U8Q-25CN		20		£2.00
Z6190	Z80A S10-2		6		£1.00
Z6191	MK3887N-4		35		£1.00
Z6192	Z80A CTC		25		£1.00
Z6193	P21256-12	256K Dynamic RAM	238	3.00	£1.00
Z6194	CDM6264E3	28 Pin Dii 64K static RAM	150	3.00	£1.00
Z6195	MK3885N-4		150		£1.00
Z6196	Z80 SIO-1		13		£1.00
Z6197	P82530-6		5		£1.00
Z6198	VT7C122-12		102		£1.00

Don't miss the Bargains - Become a Subscriber!

CODE	TYPE	DESCRIPTION	QTY	LIST	OUR PRICE
Z6169	Z80ACTC	Counter timer and controller	100	1.99	£1.00
Z6170	P82510	High Intergration CMOS UART	41	19.27	£5.00
Z6171	SAB80535-N (plcc)	8 bit CPU,256 bits RAM, 12MHz	65	8.46	£2.50
Z6179	M80C31F (plcc)	8 bit CPU,128 bits RAM, 12MHz	52	2.64	£1.00
Z6199	V20 MICRO	(8609H9V20) NEC	13		£3.00
Z6200	ET12BC	A-D CONVERTER	5		£1.00
Z6202	27C64Q-200	64K EPROM 12.5V Vpp CMOS	80	4.11	£2.00
Z6203	2764D	64K EPROM	65	3.99	£2.00
Z6204	Z80CPU	8 Bit CPU	7	3.00	£1.00
Z6205	51R90035BQ1	24 Pin Device by SEEQ	16		£1.00
Z6206	PAL20R6BCNS	Hex 20 Input and/or Gate Array	55		£1.00
Z6207	MK2716J-8	16 K EPROM	34	5.28	£1.00
Z6208	AM2764A-2	12.5V PGM EPROM 64K	26	3.99	£2.00
Z6209	TMS2732A-35J	32K EPROM	51	4.70	£1.50
Z6210	TMS2764-25JL	64K EPROM	10	3.99	£2.00

LATE ARRIVALS

Stocks listed on this page have only recently arrived, and although not included in our SALE they represent such good value for money, we thought you'd like to see them anyway

Amazing Clock & Min/Max Temp Modules!



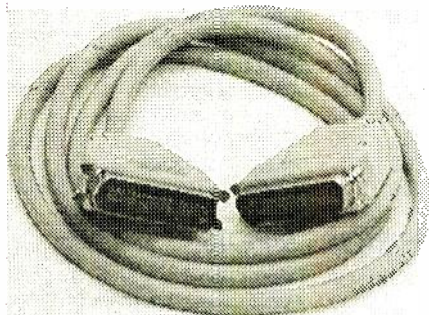
Z5558 LCD Min/max electronic thermometer module. Reads -5 to +50C (23-122F) Resolution 0.1. Accuracy ±1C. Uses single AA 1.5V cell. Size 68x35x24mm. 13mm display. Supplied with comprehensive instructions.

SUPER BARGAIN BUY - ONLY £3 100+ 2.00



Z5557 Clock module with timer and two alarms. Displays day, hour, min and AM/PM. Overall size 48x32x7mm; display 10mm.

AMAZING PRICE! £3 100+ 2.00



Z5555 Centronics lead - 36 way plug both ends, 1.8m long **£2.50**

Some more surplus from Adastra:

Z5553 Intercom lead - 15m of twin flex wound on a handy frame with a 2.5mm plug either end. Great value at **60p**; 100+ 0.25; 1000+ 0.20

XLR connectors - high quality brass chassis mounting:

Z3012 3 pin socket with release catch **£1.00** 100+ 0.60

Z3013 3 pin plug **80p** 100+ 0.50

Z3014 Standard 75R BNC Plug Cat price 99p Superdeal 5 for **£2.00** 100+ 0.25 1000+ 0.20

FIBRE OPTIC CABLE

Just purchased 40,000m of 0.2mm dia top quality fibre optic cable. Ideal for modellers and experimenters. Last time we had this (Winter 91/92) it whizzed out the door - so don't leave it too long before ordering!

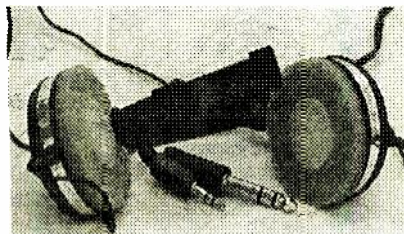
Tech Spec: 1310nm - 0.32-0.39dB/km
1550nm - 0.22-0.24dB/km.

Sold in the following packs:

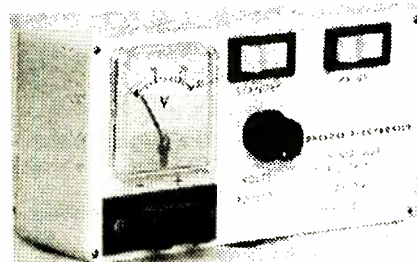
Z3015 10m **£2.00**

Z5559 100m **£12.00**

Z9153 1000m reel **£85**



Z5560 These headphones have excellent quality transducers, although the gimmicky fold-up style leaves a bit to be desired. Supplied with mini plug + adaptor to std size. **£3.95**



BENCH POWER SUPPLY

Z9154 Well made by Wednesday Electronics, this variable output PSU has std mains input and 0-30V DC 1.5A output. Line regulation 0.01%/V; Load regulation 0.1%; Ripple rejection 65dB; Quiescent current 3.5mA; Output noise 150µV; Size 168x82x55mm. Individually boxed with instruction leaflet.

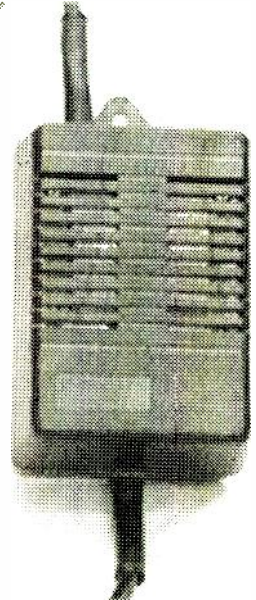
PRICE £29.95

We're re-offering some red LED displays which have appeared in previous lists; now at much reduced prices.

CODE	TYPE	SIZE	CA/CC	DP	QTY	£2PACK	100+	1000+
Z3001	S806RWB	20mm	CA	RH	792	8	.12	.08
Z3002	LTS312R	0.3"	CA	BOTH	1325	15	.08	.05
Z3003	3719	0.3"	CA	RH	1075	20	.05	.03
Z3004	3729	0.3"	CA	RH	9807	20	.05	.03
Z3005	MIP4710	0.43"	CA	RH	1705	20	.05	.03
Z3006	MAN4710A	0.43"	CA	RH	1441	20	.05	.03
Z3007	MIP4720	0.43"	CA	LH	977	20	.05	.03
Z3008	MIP4920	0.43"	CA	NONE	3983	20	.05	.03

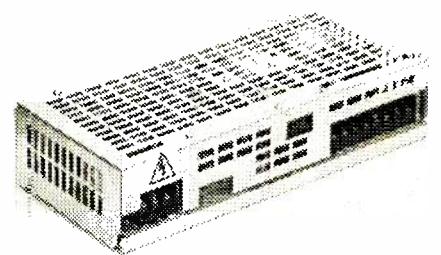
MORE POWER SUPPLIES!

Nice parcel of PSU's, -2 switch mode, 2 linear.



Z5549 Black plastic cased transformer 102x77x70mm with single 'keyhole' hook for hanging on wall. 2m long 3 core mains cable and 2m long output lead terminating in 3 pin socket. 240v ac input, 18v 2.15A ac output. Room inside for bridge, cap and regulator if required. **£4.95**

Z5550 Similar to above, but output lead has 4 way socket. This one is rated 230v ac input, 12v+12v each at 1A ac output. **£4.95**



Z9148 QUEL Powerline switch mode PSU. Ventilated case 267x120x57mm. Input: 42-56V DC. Output: +5V 25A; -5V 4A; +12V 4A; -12V 4A; +24V 4A. Max. output power 200 watts. **£ 9.95**

Z9145 As above, but input 115/230vac (or 325v DC). Outputs: +5v 25A; -5v 4A; +12v .3A; -12v 3A; -48v 2A. Max output power 200 watts. **£19.95**

1/3rd OFF ALL ITEMS ON THIS PAGE

Bi-Pak Clearance 1/3rd off all remaining Bi-Pak product - please give alternatives where possible, as stocks are low on some items

SEMICONDUCTOR PACK

An incredible assortment of devices ranging from small signal diodes through transistors, ICs, regulators, SCRs, triacs, small signal, power, AF, RF. All are new full spec devices, so this pack offers really great value:

Table with 3 columns: Code, Description, Price. Includes items like VP917 Pack of approx 200 Transistors, 4A, with data. £8.00 and VP918 Pack of approx 1000 Transistors, 4A, with data. £30.00

TRANSISTORS

Table with 4 columns: Pack No, Qty, Description, Price. Lists various transistor types such as PNP, NPN, and Sil Transistors with their respective prices.

Table with 4 columns: Pack No, Qty, Description, Price. Lists NPN and PNP Transistors like BFY50/51 and BD244AX.

ICS

Table with 4 columns: Pack No, Qty, Description, Price. Lists various ICs including 74LS00, 74LS74, CD4001B, and 741P 8 pin.

74 SERIES SALE 'ROCK BOTTOM' PRICES

Table with 4 columns: Pack No, Qty, Description, Price. Lists 74 series TTL ICs and other components like 74111 Dual J-K Master Slave and 74121 Monostable Multi Vibrator.

CAPACITORS

Table with 4 columns: Pack No, Qty, Description, Price. Lists C280 Capacitors metal foil mixed values and Electrolytics all types.

Table with 4 columns: Pack No, Qty, Description, Price. Lists Electrolytics, Miniature layer metal Capacitors, Tantalum Bead Capacitors, and various other capacitor types.

RESISTORS & POTS

Table with 4 columns: Pack No, Qty, Description, Price. Lists Assorted resistors, Carbon resistors, 0.25-0.5W performed mixed, and Precision resistors.

MINIATURE CARBON FILM RESISTORS 0.25 & 0.5W 5%

Resistance values from 1Ω-10megΩ. Available in lots of 100 pieces per value. To order state R100 0.25W or R200 0.5W, plus resistance required. eg R1001k = 0.25W 1k.

BI-PAK PRICE PER 100 PIECES R100 £1.00 per pack. R200 £1.30 per pack.

RESISTOR DEVELOPMENT PACK

R199 100 of each value individually packed from 1R to 10M 1/4W 5% resistors. Total 8,500 would normally cost £85.00. Special low price £45.00

1/3rd OFF ALL ITEMS ON THIS PAGE

A range of miniature pots with spliced 6mm shaft. Body is 17mm dia. and fixing requires a 7mm hole.

Code	Qty	Description	Price
BP633	4	50k lin.	£1.00
BP634	4	100k lin.	£1.00
BP636	4	5k log.	£1.00
BP638	4	50k log.	£1.00
BP639	4	100k log.	£1.00
BP640	4	1M log.	£1.00
BP641	10	Assorted lin values.	£2.00
BP642	10	Assorted log values.	£2.00
VP144	4	100k lin multi turn Pots, ideal variable cap tuning.	£1.00
VP145	10	Assorted Pots, inc dual and switched types.	£1.00
VP148	30	Pre-sets, horizontal and vertical mixed values.	£1.00
VP273	10	10k Lin rotary potentiometers, slim spindle.	£1.00
VP23	10	40mm track slider pots. 100k lin.	£1.00

TOOLS

Vice

VP95 Plastic miniature vice with suction base. £1.75

Rules

VP405 Steel Rules 1 x 4", 1 x 10", measuring ins and mm. 2 for £1.00

VP89 2m/6ft steel tape measure. ABS plastic case. Autopush return. £1.75

Hacksaw

VP406 Junior hacksaw and 3 blades + Hobby knife and 2 blades. £1.00

Hex wrenches

VP410 18 pc Hex Wrench keys. AF sizes in wallet. £1.50

Pliers, Snips & Cutters

VP417A Miniature 4" adjustable wrench. Forged alloy steel. £2.25

VP417 6" adjustable wrench. Forged alloy steel. £2.50

VP415 5" grip locking pliers. £3.00

VP414 End Action Stripping Pliers, adjustable jaws. £1.00

VP221 Miniature Long-nose pliers. £1.55

Snipe & Combination Pliers. 5" red insulated handles. £4.50

VP412 Crimping Pliers, Wire Strippers and Bolt Cutters. £2.00

VP571 4½" pliers. Green insulated handles. £1.95

VP570 4" end nippers. Blue insulated handles. £1.95

VP418 8" tin snips. Hardened steel spring joint. £2.00

Screwdrivers

VP218 Watchmakers Screwdriver Set 6 pieces. £1.75

VP425 7 pc high quality screwdriver set. £8.00

VP426 7 pc high quality screwdriver set 1000V. £12.50

VP427 6 pc cushion grip screwdriver set chrome steel. £4.00

VP103 6pc STANLEY screwdriver set, flat and crosspoint. £3.50

VP422 Screwdriver 400mm long No 2 crosspoint, extra long reach. £3.00

VP421 Screwdriver 400mm long 6mm flat blade, extra long reach. £3.00

VP420 'Chubby' screwdrivers, flat blade 4.5 & 6mm. 2 for £1.50

VP419 'Chubby' screwdrivers, crosspoint No 1 & 2. 2 for £1.50

VP575 Ball Grip Ratchet Screwdriver with 2 flat, and 2 pozidrive bits. £2.50

Files

VP407 10 pc Needle File Set. £3.00

Soldering

VP258 1 Multicore Solder, 5m total, 18 and 22SWG. £1.00

VP247 15W 'Lightweight' high quality low cost soldering iron. 1.7m lead. £3.50

VP491 12V 15W soldering iron, 4.3m lead with car cigar type plug for mobile use. £3.00

OPTO

Pack No	Qty	Description	Price
VP26	15	Small 0.125" red LEDs.	£1.00
VP28	10	Rectangular 0.2" red LEDs.	£1.00
VP*30	6	Red 7 seg CC 14mm x 7.5mm RDP FND353 LED Display.	£2.00
VP131	4	Green 7 seg CA 0.6" LDP XAN6520 LED Display.	£2.00
VP133	6	Red overflow 0.6" 3 x CA 3 x CC 6630 50 LED Display.	£2.00
VP*34	5	Green overflow 0.6" CA XAN 6530 LED Display.	£2.00
VP138	20	Assorted LED Displays our mix with data.	£5.00
VP147	1	Pair Opto Coupled Modules with data.	£0.60
VP*99	4	DL707R LED display CA.	£1.00
VP203	15	Triangular shape LEDs mixed colours.	£1.00
VP207	10	Small 3mm yellow LEDs.	£1.00
VP243	3	Tricolour LEDs rectangular, 5mm, red, green, yellow.	£1.00
VP266	10	Large 5mm orange LEDs.	£1.00
VP279	10	OCP71 Photo Germanium Transistor PNP.	£1.00
Code	Qty	Contents	Price
VP284	2	Opto-isolator IL74-4N27, single.	£1.00
VP285	1	Dual Opto-isolator ILD74.	£1.00

INDICATORS

Code	Qty	Description	Price
1534	5	T 1½ LES Bulbs 6V 0.36W.	£1.00
1535	5	T 1½ LES Bulbs 6.5V 1W.	£1.00
1536	5	T 1½ LES Bulbs 14V 0.75W.	£1.00
1542	5	MES Round 12V 2.2W.	£1.00
1539	5	MES Round 6.5V 0.15A.	£1.00
1552	5	Panel mounting bezel. High quality black plastic with recessed aperture. 6mm dia. For use with 3mm LED.	£1.00
1553	5	As above, but with convex end.	£1.00
VP578	3	12V indicator. Red, 8mm dia x 30mm long. 220mm long wires.	£1.00
VP579	3	Panel mounting 3mm Green LED in chrome holder. Needs 7mm hole.	£1.00

DIODES & SCRS

Pack No	Qty	Description	Price
VP29	30	Assorted volt Zeners, 50mW-2W.	£1.00
VP30	10	Assorted volt Zeners, 10W coded.	£1.00
VP31	10	5A SCRs TO66, 50-400V, coded.	£1.00
VP32	20	3A SCRs TO66, up to 400V, coded.	£1.00
VP33	100	Silicon Diodes like IN4148.	£1.00
VP34	200	Silicon Diodes like OA200/BAX13-16, 40V.	£1.00
VP35	50	1A IN4000 Diodes all good uncoded.	£1.00
VP49	30	Assorted Silicon Rectifiers 1A-10A mixed volts.	£1.00
VP141	40	IN4002 Silicon Rectifiers 1A, 100V preformed pitch.	£1.00
VP184	3	4A 400V Triacs plastic.	£1.00
VP187	10	SCRs 800mA 200V	

Code	Qty	Contents	Price
BP814	10	7482	£1.00
BP816	10	7484	£1.00
BP817	8	7491	£1.00
BP818	8	7492	£1.00
BP819	8	7493	£1.00
BP820	8	7494	£1.00
BP821	8	7495	£1.00
BP822	8	7496	£1.00
BP828	5	74141	£1.00
BP829	8	74151	£1.00
BP830	8	74153	£1.00
BP831	8	74155	£1.00
BP832	8	74156	£1.00
BP833	8	74157	£1.00
BP834	8	74160	£1.00
BP835	8	74161	£1.00
BP836	8	74164	£1.00
BP837	8	74165	£1.00
BP840	8	74174	£1.00
BP841	8	74175	£1.00
BP842	5	74181	£1.00
BP843	8	74182	£1.00
BP844	8	74191	£1.00
BP845	8	74193	£1.00
BP846	8	74195	£1.00
BP847	8	74196	£1.00
BP848	8	74197	£1.00
BP849	8	74199	£1.00
BP850	10	74LS11	£1.00
BP852	10	74LS20	£1.00
BP853	10	74LS26	£1.00
BP854	10	74LS33	£1.00
BP855	6	74LS42	£1.00
BP856	8	74LS55	£1.00
BP857	8	74LS73	£1.00
BP858	8	74LS74	£1.00
BP859	8	74LS76	£1.00
BP860	6	74LS93	£1.00
BP861	8	74LS95	£1.00
BP862	6	74LS122	£1.00
BP863	6	74LS148	£1.00
BP865	8	74LS173	£1.00
BP866	6	74LS221	£1.00
BP868	6	74LS275	£1.00
BP869	8	74LS279	£1.00
BP870	6	74LS393	£1.00

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VP194	50	2N5064 plastic TO92 OA91 point contact germanium diodes uncod.	£1.00
VP195	50	OA47 gold bonded germanium Diodes uncod.	£1.00
VP196	50	OA70-79 detector germanium Diodes.	£1.00
VP197	50	OA90 type germanium Diode uncod.	£1.00
VP198	40	BA248 Silicon Diode 350V 2A fast recovery.	£1.00
VP222	20	3A stud Rectifiers, 50-400V assorted.	£1.00
VP264	4	3A 400V Bridge Rectifiers.	£1.00
VP265	25	OA10 germanium Diodes.	£1.00
VP274	12	SCRs (Thyristors) 1A 100-400V TO39.	£1.00
VP275	3	5A 400V SCRs, TO220, TIC106D.	£1.00
VP276	5	SCRs standard type 5-16A to 400V.	£1.00
VP277	4	Triacs 2A 400V TO39.	£1.00
VP278	4	6A 1000V plastic Silicon Rectifiers.	£1.00

MISCELLANEOUS

VP872 4 channel light sequencer, chassis version. PCB 143 x 41mm ready assembled for immediate use. Takes up to 200 watts per channel. 4 mode settings. Variable speed control. Each channel individually fused. Just wire in lamps and mains to connector blocks on PCB. £12.95
 VP873 Wireless Babyphone. Small PCB 55 x 20mm contains ready built transmitter operating from 88-108MHz. Operates from PP3 battery. £7.95

VP875 Speaker terminal. Pax panel 60 x 20mm has phono socket and 2 screws. FC52mm Pack of 4 £1.00

ZON X-81 SOUND UNIT

The ZON X-81 sound unit is completely self-contained and especially designed for use with the ZX-81. It just plugs in: no dismantling or soldering.
 No power pack, batteries, leads or other extras. Manual Volume Control on panel - ample volume from built-in loudspeaker.
 Standard ZX-81 - 16K Rampack or printer can be plugged into ZON X-81 Sound Unit without affecting normal ZX-81 operation.
 Huge range of possible sounds for games or: Music, Helicopters, Sci-Fi, Space Invaders, Explosions, Gunshots, Drums, Planes, Lasers, Organs, Bells, Tunes, Chords, etc. or whatever you devise!
 Uses 3-channel sound chip giving programme control of pitch, volume of tones and noise, all with envelope control.
 Easily added to existing games or programmes using a few simple 'BASIC' lines.
 Full instructions with many examples of how to obtain effects and the programmes, supplied.
 Fully guaranteed. £9.95

LOPT TESTER

Dynamic Line Output Transformer Tester. This invaluable piece of test equipment will allow an engineer to test LOPTs under working conditions. It has been designed by a TV engineer with 30 years experience and is both simple to use and effective. Mains operation. £19.95

Tool Sets

VP514	6 pc min. screwdriver set, crosspoint 2.4; 3mm; flat 1.4; 2.4; 3mm.	£1.65
VP513	6 pc min. screwdriver set, sizes 1.4; 1.8; 2.4; 3; 3.8mm.	£1.65
VP512	5 pc min. tool set, 3 hex key wrenches; 2 crosspoint screwdrivers.	£1.75
VP511	5 pc min. wrench set, sizes 4; 4.5; 5; 5.5; 6mm.	£1.75
VP510	5 pc min. nut driver set, sizes 3; 3.5; 4; 4.5; 5mm.	£1.75
VP490	41 pc T-bar socket driver bits set. High quality steel set consists of: 1 pc T-bar magnetic driver handle. 3 pc Phillips bits, Nos 1, 2 & 3 4 pc Slotted bits, Nos 3-4, 6-8, 8-10, & 10-12. 4 pc Allen bits, Nos 3/32 1/8 9/32 & 3/16. 2 pc Square Recess bits, Nos R1 & R2. 6 pc Torx Bits, Nos T-10; 15; 20; 25; 30 & 40. 9 pc Metric Sockets, 5; 6; 7; 8; 9; 10; 11; 12 & 13mm. 9 pc SAE sockets 3/16" 7/32" 1/4" 9/32" 5/16" 11/32" 3/8" 7/16" 1/2". 1 pc 1/4" Socket adaptor. 1 pc Bit adaptor. 1 pc 90° Offset adaptor. Housed in matt steel box. 40 tools in 1 box.	£9.95

Wirestrippers

VP573	Wirestrippers with adjustable stop for 12-26g.	£1.20
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WIRE & FLEX

Pack No	Qty	Description	Price
VP17	50	Metres PVC single strand wire, mixed colours.	£1.00
VP18	30	Metres PVC multi strand wire, mixed colours.	£1.00
VP19	40	Metres PVC single/multi strand wire, mixed colours.	£1.00

BATTERIES & CAGES

VP178	5	Assorted battery holders & clips, PP3/9, AA/D, etc.	£1.00
VP904	2	Battery cage to take 10 'AA' cells. Uses PP3 connector.	£1.00
VP905	6	Battery cage to take 1 1/2 'AA' cell. Solder tags.	£1.00
205	5	Battery cage to take 4 'AA' cells, 2 each side in line.	£1.00
VP238	4	AA Ni-cad Batteries 1.25V 500mAh CR MA.	£4.00
VP239	2	C-HP11 Ni-cad Batteries rechargeable.	£3.50
VP240	2	D-HP2 Ni-cad Batteries, rechargeable.	£4.00
VP912		Large battery clips with insulated red and black handles. Rated 30A. Overall length 75mm. Per pair 75p.	
VP913		Gun type probes - pull on lever to open jaw. Takes 4mm plugs. Red and black. Per pair	£1.95

MICS, SPEAKERS, EARPIECES

1338	2	Crystal mic insert 23mm dia x 12mm	£1.00
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VP908	2	Magnetic mic holder for CB mic.	£1.00
VP909	1	2" dia speaker, 8R 0.3W	£1.00
1918	1	2 1/2" dia speaker 80R 0.3W	£1.00
VP910	1	4" dia high power speaker for bass applications. Frequency range 50-8000Hz, max power 20W 8R.	£9.95
VP911	1	8" 8R speaker, max 12W. 60-15000Hz.	£7.95
VP525	1	8Ω earpiece, magnetic, 2.5mm plug.	£0.25
VP526	1	8Ω earpiece, magnetic, 3.5mm plug.	£0.25
VP260	1	9" x 6" elliptical 8Ω 10W RMS speaker. Freq res 60-10000Hz. Gauss 10000. Centre HF cone.	£4.50
VP260A	1	2.25" transducer waterproof speaker. Polyester film diaphragm. Moisture resistant, 8Ω 300mW RMS freq res 20-20000Hz.	£1.00

CASSETTES ETC

VP232	1	Cassette head cleaner/demagnetizer in case.	£2.00
VP230	10	C90 Cassette tape. 2 x 45 minute, low noise.	£6.00

FUSES/HOLDERS

VP176	30	Fuses 20mm and 1.25" glass, assorted values.	£1.00
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BUZZERS, SIRENS

VP107	1	Piezo buzzer miniature, 12V.	£1.25
VP83	1	Electronic buzzer 6V 25mA.	£0.95
VP84	1	Electronic buzzer 9V 25mA.	£0.95
VP85	1	Electronic buzzer 12V 25mA.	£0.95

CONNECTORS

Pack No	Qty	Description	Price
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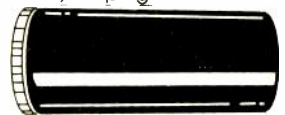
2.5mm Jack



1696	3	2.5mm Metal screened jack plug	£1.00
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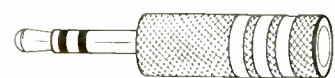


1706	5	2.5mm Black plastic jack plug	£1.00
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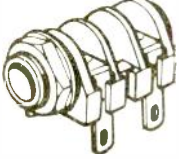
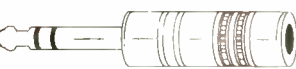
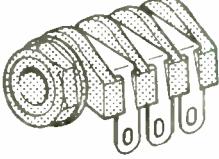



















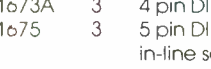

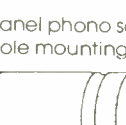


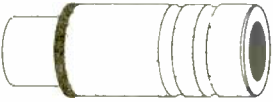






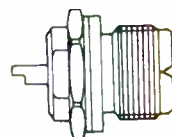

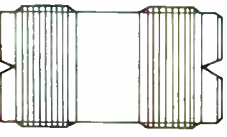
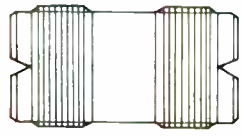

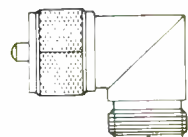
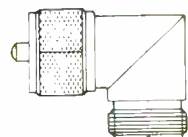

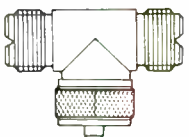
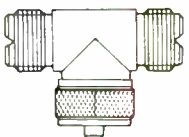
1676	4	2.5mm In-line jack socket	£1.00
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3.5mm Jack

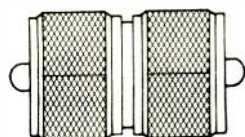


1746A	2	3.5mm Metal stereo plug	£1.00
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- | | | | | | | | | | | | | | | |
|-------|---|--|-------|--|--|-------|--|--|--|---|-------|---------------------------------|--|-------|
| 1628 | 5 | 3.5mm Chassis mounting socket, enclosed | £1.00 |  | 1664 | 3 | 1/4" socket. Mono switched. Panel mounting. Black Plastic. | £1.00 |  | 1736 | 1 | Panel mounting. 3 pin XLR plug. | £1.00 | |
| 1677 | 4 | 3.5mm In-line socket. Black plastic | £1.00 |  | 1669 | 3 | 1/4" socket. Stereo switched. Panel mounting. Black Plastic. | £1.00 |  | 1737 | 1 | Panel mounting. 3 pin XLR plug. | £1.00 | |
| | | | | 1/4" Jack | | | | | DIN | | | | | |
| 1701 | 2 | 1/4" stereo Jack Plug. Metal; screened. | £1.50 |  | 1669A | 4 | 1/4" socket. Stereo switched. Panel mounting. Black Plastic. | £1.00 |  |  | 1689 | 6 | 2 pin DIN plug. | £1.00 |
| 1707 | 4 | 1/4" stereo Jack Plug. Black plastic. | £1.50 |  | 1673A | 3 | 4 pin DIN in-line socket. | £1.00 |  |  | 1689A | 6 | 2 pin DIN speaker plug, single piece. | £1.00 |
| 1707A | 3 | 1/4" high quality plastic stereo plug with cord grip. | £1.50 |  | 1665 | 2 | 1/4" socket. Built in DPDT switch for headphones Stereo. | £1.00 |  |  | 1691 | 4 | 4 pin DIN plug. | £1.00 |
| 1678A | 4 | 1/4" high quality plastic mono plug with cord grip. | £1.50 |  | Phono | | | |  | 1693 | 4 | 5 pin DIN 180° plug. | £1.00 | |
| 1678 | 3 | 1/4" mono in-line socket. Black plastic. | £1.00 |  |  | 1665 | 2 | 1/4" socket. Built in DPDT switch for headphones Stereo. | £1.00 |  | 1694 | 4 | 5 pin 'Domino' plug. | £1.00 |
| 1679 | 2 | 1/4" mono in-line socket Metal. | £1.00 |  |  | 1665 | 2 | 1/4" socket. Built in DPDT switch for headphones Stereo. | £1.00 |  | 1627 | 3 | 7 pin DIN plug. | £1.00 |
| 1680 | 3 | 1/4" stereo in-line socket. Black plastic. | £1.00 |  |  | 1660 | 8 | Panel mounting phono socket with plastic surround. | £1.00 |  | 1673A | 3 | 4 pin DIN in-line socket. | £1.00 |
| 1681 | 2 | 1/4" stereo in-line socket. Metal. | £1.50 |  |  | 1660A | 4 | Panel phono socket single hole mounting | £1.00 |  | 1675 | 3 | 5 pin DIN 240° in-line socket. | £1.00 |
| 1658 | 3 | 1/4" socket. Mono switched. Panel mounting. Metal. | £1.00 |  |  | 1682 | 3 | In-line phono socket. Metal screened. | £1.00 |  | 1655 | 4 | 5 pin DIN 240° socket. Chassis mounting. | £1.00 |
| 1659 | 2 | 1/4" socket. Stereo unswitched. Panel mounting. Metal. | £1.00 |  |  | 1687 | 6 | In-line phono socket. Plastic in assorted colours | £1.00 |  | | | | |
| 1640 | 0 | 4mm socket. Black | £1.00 |  |  | 1708 | 3 | In-line phono plug. Metal screened | £1.00 |  | 1717 | 2 | SO239SH chassis mounting socket single hole fixing. | £1.00 |
| 1703 | 2 | Car aerial plug. | £1.00 |  |  | 1718 | 2 | PL259 double ended line connector. 2 sockets back to back. | £1.50 |  | 1718 | 2 | PL259 double ended line connector. 2 sockets back to back. | £1.50 |
| 1666 | 3 | Car aerial chassis mounting socket | £1.00 |  |  | 1720 | 5 | PL259 reducer for PL259 plug. | £1.00 |  | 1721 | 2 | Right angle coupler for PL259 and SO239. | £1.50 |
| 1733 | 2 | Car aerial plug. | £1.00 |  |  | 1722 | 1 | T-Adaptor. 2 x PL259 sockets to 1 x PL259 plug. | £1.50 |  | 1760 | 2 | TNC plug. | £1.00 |

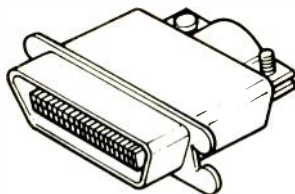
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1723 2 Double end line connector. 2 x PL259 plugs back to back. £1.50



1732 1 BNC line socket. £1.50



1759 1 IDC amphenol connectors. 36 way plug. £2.00

DC Power



1644 3 2.5mm DC in-line plug. £1.00

1645 3 3.1mm DC in-line plug. £1.00

1646 3 2.1mm DC in-line plug. £1.00



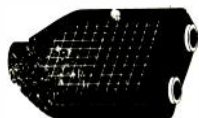
1741 2 3.5mm plug to phono socket. £1.00



1744 2 2.5mm plug to 3.5mm socket. £1.00

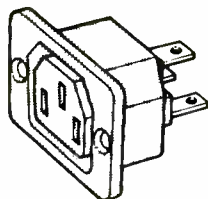


1764 2 3.5mm mono plug to 3.5mm stereo socket. £1.00



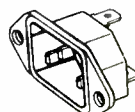
1779 1 1/4" mono plug to 2 x 1/4" mono socket. £1.50

Power

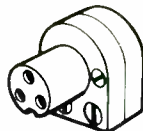


1630 2 3 pole mains outlet. 6A 250V Panel mounting socket. £1.50

1632 2 2 pole mains outlet. 6A 250V Panel mounting socket. £1.50



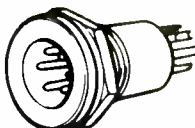
1638 2 Mains inlet. 3 pin EEC Panel mounting plug. 6A 250V. £1.00



1639 1 3 pin right angled in-line Bulgin socket. £1.50



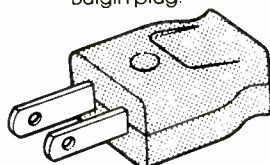
1641 1 6 pole Bulgin in-line socket, mains connector. £1.50



1642 1 6 pole Chassis mounting plug. Bulgin mains inlet fits 1641. £1.50

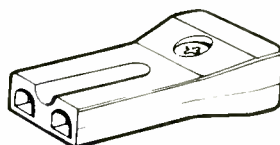


1643 2 3 pole Chassis mounting Bulgin plug. £1.50



1667 3 2 pin AC mains socket. USA type panel mounting. £1.00

1711 3 2 pin USA type flat pin plug. Plastic £1.00



1713 3 cassette mains in-line socket in black plastic with guide. £1.00

VP226 20 DIN chassis sockets metal 2-8 pin 180° 240° 360° mixed. £2.50

VP227 18 DIN in-line sockets plastic 2-8 pin 180° 240° 360° mixed. £2.50

VP484 1 Pair line socket and chassis plug Euro style 6A 250vac. £1.00

VP485 1 Scart plug, 21 way Euro Video plug. £1.00

VP486 1 2 x 23 way edge connector and matching PC board, blanked at pin 3 as for ZX81, etc. £1.00

LEADS & TELEPHONE ACCESSORIES

VP300 10m Speaker lead, 2 pin DIN socket. £1.00

VP301 2m video lead coax socket - coax socket + 2 adaptors. £1.20

VP302 3m 4 core cable individually screened 5 pin DIN plug - 5 pin DIN plug. £1.80

VP303 TV extension lead. Coax plug - coax plug, white. £1.00

VP304 1.5m 4 core cable individually screened 5 pin DIN plug - tinned open end. £1.00

VP305 1.5m cable 5 pin DIN plug - 3.5mm jack plug pin 1 & 4 connection. £1.00

VP306 2m typewriter/calculator lead 3 pin plug, angled European IEC configuration, 6A 250Vac. 2 for £2.00

VP307 60cm patch lead, PL259 plug - PL259 plug. £1.00

VP308 1.2m patch lead, PL259 plug - PL259 plug. £1.50

VP309 1.2m lead, 4 phono plugs - 4 phono plugs. £1.50

VP310 20cm lead 2 x 2 pin DIN plug - stereo in-line jack socket. £1.00

VP311 2m lead, scart plug - 5 pin DIN plug and 2 BNC plugs. £6.00

VP312 1.2m video lead, BNC plug - phono plug. £1.50

VP313 3m headphone lead, 3.5mm jack plug - 3.5mm jack socket. £1.00

VP314 2m coax lead, BNC plug - BNC plug, 75Ω. £3.00

VP315 2m coax lead, BNC plug - UHF plug, 70Ω. £3.00

LEADS & CABLE

Code	Qty	Description	Price
397	1m	2 core oval mains cable, 2.5A.	25p/m
VP301A	1	Phono plug to coax plug lead 2m long	£1.00
366	1	Enamelled copper wire 38swg, 2oz reel.	£1.20
383	1	Tinned copper wire 16swg, 4oz reel.	£1.70
382	1	Tinned copper wire 18swg, 4oz reel.	£1.70

SWITCHES & RELAYS

Code	Qty	Description	Price
1991A	1	Calculator keypad 24 way + data matrix output.	£2.00
1973	5	Min slide switch DPDT.	£1.00
1974	4	DPDT slide switch.	£1.00
1965	2	1p 12 way rotary switch.	£1.00
1965A	1	Rotary switch, 25mm dia, 5 wafers. 1p 12 way each.	£2.00
1962	2	Min latching push button 3A SPST, red top.	£1.50
1963	2	Min latching push button 3A SPDT, red top.	£1.50
1995	1	Heavy duty push - foot action 6A DPDT.	£2.50
VP174	5	DIL switches 1 & 2 way slide, 6 way SPST, assorted.	£1.00
VP114	1	Coax Antenna Switch, 3 way.	£4.75
VP115	1	High pass filter/suppressor CB/TV.	£0.50
VP281	4	Plug-in relays, mixed volts, etc.	£1.00

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HARDWARE

(a) Fasteners (steel)

Code	Qty	Description	Price
839	25	1" OBA cheesehead screws	95p
840	25	1/2" OBA cheesehead screws	75p
842	25	1" 2BA cheesehead screws	70p
843	25	1/2" 2BA cheesehead screws	55p
844	25	1/4" 2BA cheesehead screws	65p
847	25	1/4" 4BA cheesehead screws	35p
848	25	1" 6BA cheesehead screws	50p
850	25	1/4" 6BA cheesehead screws	30p
863	25	1/2" 8BA cheesehead screws	40p
864	25	1/4" 8BA cheesehead screws	35p
865	25	8BA nuts	30p
859	25	OBA washers	15p
860	25	2BA washers	15p
861	25	4BA washers	15p
866	25	8BA washers	15p
851	25	OBA solder tags	45p
854	25	6BA solder tags	35p

(c) Knobs (all for 1/4" spindles)

Code	Qty	Description	Price
1101	4	Black plastic knob with calibrated metal skirt. 30mm dia x 18mm high.	£1.00
1109	3	As above, but 28mm dia x 16mm high.	£1.00
1111	3	Similar to above without black inlay 24mm dia x 17mm high.	£1.00
1113	4	Matches 1101, but with indicator line.	£1.00
1115	6	Pointer knob with skirt. Black plastic silver insert. 22mm dia x 14mm high.	£1.00
1115A	10	Slider 19 x 13 x 13mm. 4mm slot.	£1.00
VP474	12	Slider Pots knobs, black/chrome, push fit.	£1.00

DATA BOOK

BPX6 Excellent value TTL data book. Includes H, L S & LS. A5 format. 116 pages, giving mechanical data, Interchangeability Guide, Function Selection Guide, and pin outs of TTL from 7400-74670. As this was published some years ago, the very latest types do not appear, but at the price, this book offers superb value. Price Only £1.50

TRANSFORMERS

(All have mains primary)

Code	Qty	Description	Price
2036	1	0-17V 250mA	£2.30
2034	1	0-35V 1.7A	£4.90
2042	1	0-25V 2A	£4.40
2035	1	0-55V 2A	£8.95
2043A	1	20-0-20V 500mA	£3.80
2031	1	0-19-25-33-40-50V 500mA	£7.50
2032	1	0-19-25-33-40-50V 1A	£9.30
2038	1	Miniature driver, Primary 20k. Secondary 2k CT	£1.20

(b) Heatsinks

Code	Qty	Description	Price
873A	3	TO3 black finned sink 46 x 46 x 20mm	£1.00
877	10	TO18 Black push fit. 13 dia x 6mm	£1.00
VP42	10	Black heatsinks fit TO3 and TO220 drilled.	£1.00
VP43	4	Power-fin heatsinks 2 x TO3, 2 x TO66.	£1.00
VP44	15	Assorted heatsinks TO1; TO3; TO5; TO18; TO220.	£1.00

(d) Cases

Code	Qty	Description	Price
161	1	4" x 2 1/4" x 1 1/2" aluminium box. 102 x 57 x 38mm.	£1.30
1o5	1	7" x 5" x 2 1/2" aluminium box. 178 x 127 x 63mm.	£2.70
166	1	8" x 6" x 3" aluminium box. 203 x 152 x 76mm.	£3.50

(e) Miscellaneous

Code	Qty	Description	Price
2	.	Solder - 3 yds of 22g solder in handy dispenser.	£1.00

BULK PACKS FOR LARGE USERS

(See relevant pack numbers for full details of contents.)

VP1	Resistors	20,000	£35
VP2	Pre-formed resistors	20,000	£35
VP10	Polyester Caps	10,000	£50
VP11	Electrolytics	10,000	£80
VP200	OC71	5,000	£70
VP145	Assorted Pots	1,000	£50
VP42	Heatsinks	1,000	£50
VP224A	74 Series inc LS - gates & complex logic, all new in tubes.	1,000	£60

These transistors are part of Bi-Pak's stock. Offers are invited for those un-priced:

Type	Qty	100+	Description	Price
2N696	550	0.10	2S012	26
2N708	276	0.07	2S013	31
2N718	942	0.10	2S302	310
2N726	6500	0.15	2S303P	63
2N743	532	0.15	2S304	67
2N914	200	0.70	2S306	343
2N929	161	0.07	2S324	35
2N1131	500	0.20	2S3210	4087
2N1132	485	0.21	2S389A	100
2N1488	20	0.50		
2N1613	40	0.12		
2N2193	350	0.19		
2N2217	220	0.28		
2N2218	758	0.10		
2N2218A	656	0.10		
2N2219A	133	0.10		
2N2220	500	0.08		
2N2221	740	0.08		
2N2221A	420	0.08		
2N2368	374	0.09		
2N2411	287	0.40		
2N2412	517	0.19		
2N2711	3170	0.09		
2N2904A	680	0.10		
2N2904	1115	0.09		
2N2906A	5000	0.10		
2N2906	200	0.10		
2N2906	4500	0.10		
2N3011	899	0.09		
2N3114	1800	0.85		
2N3416	96	0.09		
2N3708	592	0.03		
2N3710	3223	0.03		
2N3711	3858	0.03		
2N3789	26			
2N3792	41			
2N4058	2388	0.03		
2N4061	480	0.03		
2N4099	82			
2N4901	10	0.40		
2N4911	23	0.60		
2N4914	9	0.40		
2N4915	44	0.45		
2N5295	2030	0.18		

2N6286	15			
2N6289	104	0.22		
2N6403	10			
BD196	50	0.50		
BD206	25	0.20		
BD208	55	0.20		
BD235	100	0.15		
BD236	200	0.16		
BD239	600	0.18		
BD240	500	0.17		
BD244	1000	0.17		
BD312	145	0.17		
BD508	400	0.37		
BD609	127			
BD1540	10			
BD1560	10			
BD2550	10			
BET885	400			
BFX29	476	0.10		
BFX48	250	0.10		
BFX86	155	0.10		
BFX87	87	0.10		
BF119	160	0.19		
BF152	700	0.09		
BF153	1724	0.09		
BF159	2565	0.10		
BF160	6460	0.10		
BF181	840	0.12		
BF186	155	0.12		
BF254	3000	0.10		
BF255	1178	0.11		
BF257	541	0.12		
BF337	826	0.12		
BF355	2260	0.12		
BF496	1000	0.12		
BF595	3000	0.07		
BF679S	1000			
BF742	216			
BFR52	500	0.08		
BFT83	505			
BFX29	476	0.10		
BFX48	250	0.10		
BFX86	155	0.10		
BFX87	87	0.10		
BIP20	33			
BIP20	46			
BRV56	372	0.17		
BSY10	880	0.08		

CV7001	134			
CV7086	25			
CV7644	50			
CV7735	197			
CV9507	1000			
CV9507	2000			
CV9790	950			
FB0320	47	0.20		
FB0223	47	0.20		
FT432	6			
IRF132	300	0.60		
MC7724	76			
ME1120	12000			
MPSA06	2273	0.07		
MPSA56	26750	0.07		
MJE340	595	0.15		
MJE521	97	0.28		
MJ490	140	0.50		
MJ3000	2			
OC41	81	0.15		
OC42	2245	0.15		
OC42	935	0.15		
OC45	145	0.15		
OC70	500	0.15		
OC71	1700	0.17		
OC72	208	0.15		
OC73	400	0.15		
OC75	200	0.15		
OC75N	470	0.15		
OC76	11550	0.15		
OC79	73	0.15		
OC82	530	0.15		
OC200	600	1.80		
RCA16083	100	1.00		
TIP29C	60	0.12		
TIP30A	1470	0.12		
TIP30B	1354	0.12		
TIP30C	590	0.12		
TIP32B	96	0.12		
TIP30A	102	0.12		
TIP62B	96			
TIS90	4000	0.07		
TIP111	22	0.20		
TIP112	55	0.20		
TIP117	42	0.20		
TIP126	15	0.20		
TX504	643	3.08		

NOTE: PRICES EXCLUDE VAT

CLEARANCE OF CAPACITORS AND PRESETS

C280 POLYESTER CAPACITORS. All new and boxed, 250V working. Samples free on request.

Value	100	1000
5.6nF	.02	.015
10nF	.02	.015
12nF	.02	.015
15nF	.02	.015
13nF	.02	.015
27nF	.02	.015
33nF	.02	.015
63nF	.02	.015
82nF	.02	.015
120nF	.03	.02
150nF	.03	.02
180nF	.03	.02
330nF	.04	.03
390nF	.04	.03

ELECTROLYTICS, axial leads.

Value	100	1000
10µF 160V	.03	.02
47µF 16V	.03	.02
22µF 16V	.04	.03

PRESETS

100R	V AB	.03	.02
220R	V AB	.03	.02
1K	V AB	.03	.02
4K7	V AB	.03	.02
47K	V AB	.03	.02
47K	V Piher	.04	.03
47K	H AB	.03	.02
47K	H Piher	.04	.03
47K	M AB	.03	.02

We also have large quantities of many values of pots, especially switched and dual types which we are clearing at 10p each.

LOGIC PROBE

Suitable for displaying the logic state of each gate of TTL, CMOS etc. Logic state displayed in light and sound. Pulse enlargement capability allows pulse detection down to 25ns. Supplied with comprehensive instruction manual

Order Code Y132

SPECIAL PRICE

£8.88



Working voltage: 4-16V
 Thresholds: Hi: 70% Vcc; Lo: 30% Vcc
 Input Z: 1M. Max input freq: 20MHz

MICROPHONE

M9 Adastra general purpose mic with stand. Omni directional, 500R. Freq Res. 100-8000Hz. Sensitivity 76dB±4dB. To clear at

£1.00

AMPLIFIED SPEAKER SYSTEM

Order Code

A179P

Output Power 2x2W

Freq. Res. 50-12kHz

Speakers 2x2 1/4"

Size (folded)

107x51x70mm

SUPER VALUE!



Foldable, designed to give portable radios, cassettes or CD players a high quality boosted sound output. Amp can be switched in or out. Powered by 4xAA cells or external supply (neither included)

OUR PRICE £5.95

SALE PRICE £4.95

9 BAND RADIO RECEIVER

Order Code B118C

Frequency Coverage:

FM 87.5-108.5MHz

MW 522-1620kHz

LW 150-281kHz

SW1 4.5-5.1MHz

SW2 5.82-6.2MHz

SW3 7.1-7.5MHz

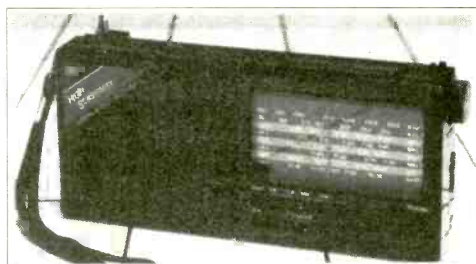
SW4 9.45-9.9MHz

SW5 11.45-11.95MHz

SW6 17.45-18.06MHz

Uses 2xAA cells

Size 170x60x30mm



Compact receiver covering FM, MW, LW and 6 SW bands (19, 25, 31, 41, 49 & 60m). Built in ferrite rod + telescopic aerial. Tuning LED, earphone skt.

Great spec. at a low, low price! **£12.95**

SALE PRICE £10.95

AMPLIFIED UHF/VHF/FM AERIAL

Order Code T143A

Dish can be rotated to pick up best signal, then boosted using built in amp with gain control - can also be used with external aerial.

Gain..... 20dB VHF; 30dB UHF
 Gain Control 0-30dB
 Max Output level..... 100dBuV
 Power..... 12V DC
 Size..... 340x220x110mm

£9.95

SALE PRICE £8.95

Y136C INSULATION TEST UNIT

Intended for use with the M260 and M266 clamp ammeters, but now they are no longer available - however instructions are included to use with almost any digital meter

Original Selling Price £45+

£12.95



500Vdc insulation test unit designed for use with the M260 (Y136B) and M266 (Y136A) digital clamp ammeters. Unit plugs directly into the meter sockets. Insulation resistance readings directly on clamp meter display. Complete with leads, instruction manual, battery and carrying case.

Measuring voltage 500Vdc
 Measuring ranges 100k-20MΩ ±2%
 10MΩ-1999MΩ ±4%

Batteries 4 x AA (supplied) Dims 90 x 70 x 50mm

SALE PRICE £6.95

Xtra Special

LEARN 3 LANGUAGES FOR £2

Z5060 Italian
 Z5062 Portugese
 Z5064 Russian

90 minute tape + 32 page handbook for each language

Star Buy !!

Xtra Special

HARDWARE

Z1834 4BA solder tags 1000/£3
 Z592 Yellow tape 3mmx66m 5/£1
 Z1440 Screws 4x8mm 1000/£1
 Z2170 Veropins DS for 0.15 1000/£1
 Z2333 Ceramic beads 3.4mm od 400/£1
 Z2335 Stand offs 24mm, 3.5mm thread 12/£1
 Z2336 Stand offs 11mm, 2.5mm thread 20/£1
 Z2337 Screws 6BAx12mm pozi/pan 1000/£3

Star Buy !!

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CONNECTORS

Z042 2 pin DIN spkr skt 50/£1
 Z598 PC IEC skt 3/£1
 Z1987 75R conn 3/£1
 Z2055 8pin DIN skt 12/£1
 Z2021 BNC 3/£2
 Z1714 5pin DIN 240 - box of 36 £1.00
 Z2504 PS2 k/b adaptor £1

Star Buy !!

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Tel: 0703 236363 Fax: 236307All one off and pack prices **INCLUDE V.A.T.** Qty. prices do not.**Sale prices for items from Bargain List 85 (Yellow Pages)**

Z5 Z5201 2/£1
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Z2819 £1.00
Z5435 £1.50
Z5437 £9.95

Z8 All half price except T120A

Z9 All half price

Z10 All half price

Z11 All half price

Z12 All half price

Z13 BP701 Less 10%
Mags no discount
£3.95

K693 Rest half price for packs & 1-offs.

Z14 All half price

Z15 All half price

Z16 All half price

Z25 All half price

Z26 All half price

Z27 Manuals less 25%
Rest half price

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Z7 All half price

Z8 All half price

Z9 All half price

Z10 All half price

Z11 All half price

Z12 All half price

Z13 All half price

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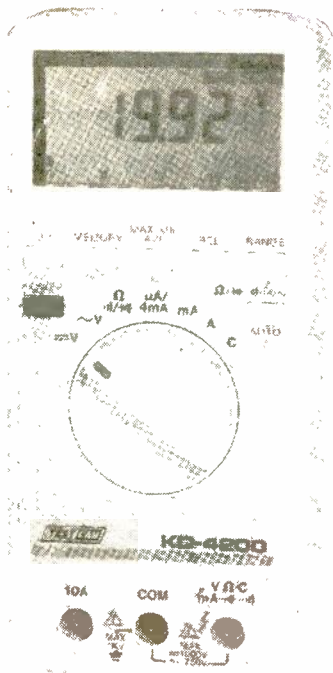
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Dims	160 x 35 x 20mm

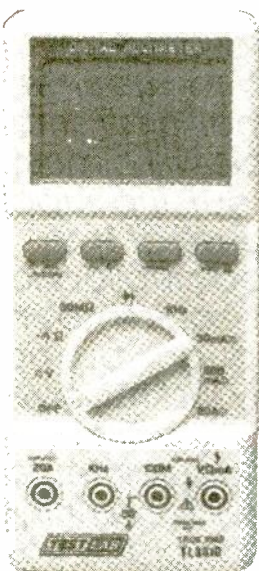
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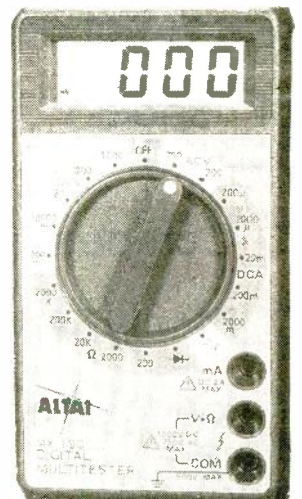
AC voltage Auto	0-20-200-700Vac ± 1%
Manual	0-30-300-700Vac ± 1%
DC voltage Auto	0-200m-2-20-200-1000Vdc ± 0.7%
Manual	0-300m-3-30-300-1000Vdc ± 0.7%
AC current	0-30m-300m-20Aac ± 1.8%
DC current	0-30m-300m-20Adc ± 1%
Resistance Auto	0-200-2k-20k-200k-2MΩ ± 0.8%
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VCR Clinic

Reports from Nick Beer, John Edwards, Noel E. Evans, Alfred Damp, Michael Dranfield, Richard Flowerday, Brian Storm, Ronald Aranha, Richard J. Avis, Terry Lamoon, Richard Newman and Stephen Leatherbarrow,

Ferguson 3V30/JVC HR7300

The problem was no reel drive. I found that CP2 in the supply to the 10VT05 reel driver chip IC12 was open-circuit while the chip itself, a hybrid device, had burnt up. The cause of all this was an intermittently short-circuit reel motor. **N.B.**

NEC9033

The fault symptom I've had with a couple of these machines has been low, varying sound. The sound is low because the audio/control head wears out: it varies because the pinch roller is barrelled, as a result of which the tape moves out of position. **N.B.**

Panasonic NV2000

The customer's complaint was that there were no deck functions. This was because the cassette didn't sit right down on the left-hand side when the carriage closed. The cause of the problem was that the cassette balance spring on this side was very weak – part no. VMB0730. **N.B.**

Ferguson FV61LV

There were a number of faults with this brand new, centre-mechanism machine, some of them intermittent. Here's the list: excessive fast-wind torque (to the extent that once-wound tapes were too tight to play!), no tape end sensing, failure to accept a cassette, failure to eject a cassette, no capstan operation and switching off with no mechanical movement. Just about every operation is controlled by the ST90T30-QFP80 servo microcontroller chip IT01. It's a many-legged, four-sided flatpack device mounted on the lower PCB. We found that it was thermally faulty. **N.B.**

GoldStar GSE1891I

The customer said that this machine had for some time refused to eject cassettes. On the last occasion he'd used a breadknife to force it to release the cassette. As a result, the right-hand mount for the synchronisation bar and gears had broken. Obtaining replacement parts turned out to be a bit of a problem. In the process I learnt that the usual cause of the problem is broken gears. Not this time though! I eventually obtained the part number for the side piece required from GoldStar technical. CPC then supplied both sides as a kit. They were easy to fit – unlike many carriages, this one is very simple and easy to reassemble. **N.B.**

Akai VS425EK

There were two faults on this machine. First, the customer complained that very intermittently it would chew a tape on eject. A new belt, clutch and mode switch cured that. I also noticed that there was a nasty graunching when the cassette was ejected, the blinder moving very urgently. Investigation showed that the graunching came from the mechanism only when the front was fitted – to be more

specific when the blinder was lifted to eject the cassette.

I carried out the eject spacer modification – fitting the spacer under the front rack lug on the left-hand side – and noticed that the synchronising gear (arm loading BLK, item 43) that links the drive from one side of the carriage to the other was buckled on the right-hand side, where the blinder lifting lever sits. When this had been replaced everything ran as smooth as silk. **N.B.**

Panasonic NVJ30

This machine couldn't be tuned in the E-E mode. Because of an instruction from the timer microcontroller chip IC7501, which handles tuning, it was locked in the Band I mode. The instruction comes via IC7502 (MN12C261D5) which was faulty – it provides parallel switching lines from the serial data fed to it. **N.B.**

Samsung VI710

There was no go at all. While plenty of unregulated voltage reached the STK5333 multiregulator chip no supplies left it. A replacement restored normal operation. **N.B.**

Philips DMP Series Decks

A common failure with these decks is the rather unusual pinch roller assembly. The rubber roller seems to decompose rather alarmingly. Symptoms vary – poor or varying sound or tracking for example or tape damage. **N.B.**

Alba VCR3000X

There were no functions and no displays. This is not unusual – replace C821. When this had been done the machine came to life but wouldn't accept a cassette. Fortunately I've had this one before. It's usually due to microcontroller lock-out. Load the tape by rotating the carriage motor by hand, then press the power on/off button followed by the eject button. The cassette will then be ejected and future instructions will be obeyed. **J.E.**

JVC HRD610

The playback picture had five thin tracking lines spaced equally apart across the picture and the sound was muted. The cause was that the exit guide was loose. Slight adjustment of the guide's height, followed by tightening the grub screw, corrected the fault. It's worth noting that a defective mechacon chip can produce almost identical symptoms – but in this case the audio track will be erased whilst you are looking at the symptom. **J.E.**

Panasonic NVG7

There was vertical rolling when a known good tape or a self-recorded one was played back. In addition the tape would be crinkled along its bottom edge. The pinch roller

was glossy and tape ridges were evident. A new roller cured both problems. **J.E.**

Akai VS35

This machine would stop at random in the record mode. The tape would remain threaded and the pinch wheel would be engaged on the capstan shaft. To try to simulate the fault we disconnected the take-up reel pulses while the machine was working correctly. The machine stopped, but the pinch wheel was disengaged and the tape was released from the drum. So absence of the reel pulses was not the cause of the problem. We next tried stopping the capstan motor physically, whereupon the normal stop mode was entered. So the capstan department was not the cause of the fault. When the drum was stopped physically the symptoms matched those of the fault condition. So we had a drum servo fault.

We replaced the BU2735S servo chip IC503 but after recording for two hours the fault reappeared. Voltage and waveform checks were of no use because of the intermittent nature of the fault. So we replaced the motor circuit board on the lower drum assembly. Numerous test recordings proved that the fault had been cured. **J.E.**

Akai VS55

As there was no record colour, checks were carried out around the LA7330 chroma processing chip IC400. The video input, filter input and output, sync signals and d.c. levels appeared to be o.k. but there was no record output signal at pin 9. We then found that the frequency of the 4.433MHz voltage-controlled oscillator was erratic – about 1.2kHz low on average. Because of failure of the oscillator to lock, the colour-killer was active. Careful monitoring of the oscillator's control voltage (nominally 2.2V) at pin 15 showed that it was about 100mV low. After some further checks we found that steering diode D401 had a reverse leakage of 50kΩ. A replacement restored normal operation. **N.E.E.**

Sony SLVX10

"No sound" it said on the job card that accompanied one of these machines. When we inserted a cassette and pressed the play button there was a snowy picture and of course no sound. There was little improvement when the tracking control was adjusted – capstan servo symptoms appeared on the screen instead. The audio circuit is centred on the LA7294 chip IC201, pin 12 being the mute input. We found that the mute action, which is controlled by the syscon chip, was in operation. As there was a servo problem we checked for CTL pulses at pin 10 of the servo processing chip IC351: they were missing. This took us back to pin 4 of the LA7123 CTL pulse amplifier chip IC352, where the pulses were also missing. After carrying out voltage checks we decided to replace IC352. This restored a beautiful picture along with sound as the mute was released by the syscon chip.

Another of these machines was brought in because of intermittent failure to record the sound. We set it to record and connected a scope to the bias oscillator's output point. After an hour or so oscillation suddenly stopped. The switched supply for the 2SD734 bias oscillator transistor Q2001 comes from pin 1 of the LA7294 chip IC201. A voltage check here produced a reading of only 0.6V. When Q2001's collector was disconnected the voltage at pin 1 of IC201 rose to the correct figure. We found that Q2001 had a 40Ω leak between its collector and emitter, though it behaved perfectly at times, especially when cold. When a

new transistor was fitted the machine worked without any further problems – because of stock shortages we used a 2SD774. **R.A.**

Amstrad VCR4600

When a function was selected the mechanics would start but the machine would almost instantaneously power down. Scope checks on the supply lines showed that there was a large negative-going pulse on the 5V rail. As a result, the supply to the microcontroller chip was being regularly removed. Thus functions wouldn't latch on. Our first suspect, the 5V regulator, proved to be o.k. The culprit was eventually found to be the bridge rectifier. **A.D.**

Samsung SI1260

This machine came in with a fully laced tape inside. When it was powered it refused to unlace the tape. We eventually found that the cause of the problem was D212, which was open-circuit. It provides IC206 with a -15V supply. **A.D.**

Ferguson 3V42/JVC HRD455

This one could apply to other models which use the same deck. We found that during the last part of the loading cycle, as the pinch roller starts to pull in, the loading motor would slow down and struggle to complete the loading sequence. The cause was traced to the grease on the lower drum casting – the bit with the V blocks. Though it wasn't as hard as in some models it was nevertheless very sticky, impeding the slant pole base. To cure the problem clean the grease off with solvent then apply a smear of graphite grease. **M.Dr.**

Akai VSF410

There was no clock display and no manual or remote functions would operate. The machine would accept and play a prerecorded tape however. The supplies to the operation PCB were all o.k., and the timer microcontroller chip's two clock oscillators were running. But there was no activity at any other pin. Voltage checks showed that the 'not power down' input at pin 5 was low, putting the chip into its idle mode as though the mains supply had failed. Tracing back to the power-down detector circuit brought us to transistor TR203 which had an open-circuit collector. A replacement restored normal operation. **R.F.**

Samsung SI1260

As soon as the machine was powered the loading motor would run in the eject direction, stopping only when the syscon microcontroller chip decided that a fault condition was present and shut down the switched supplies. Attention was eventually turned to the mode switch, where the voltage at pin D never rose above 1.8V regardless of the position of the mechanism. This pin is effectively the cassette-up switch – so the machine must have thought the cassette housing was down even though it wasn't. A new mode switch (part no. 63579-101-026) provided a complete cure. **R.F.**

Akai VS485

Apart from a hum bar, and picture disturbance that appeared only when the loading motor ran, i.e. when ejecting or inserting a cassette, this machine performed normally.

Scope checks showed that there was significant ripple on the IDL 10V supply. There was a smaller amount of ripple on the IDL 5V line. As the ripple was at 50Hz it seemed that there was an open-circuit rectifier diode somewhere in the supply, but investigation showed that D9 was short-circuit while the fusible resistor FR6 (0.1Ω) was open-circuit. Aren't these resistors expensive?!

R.F.

Panasonic NVF70

As these machines age, particularly the mechanics (G mechanism with review motor), various squeaks and rattles can arise. This is particularly the case with models, such as this one, that have jog shuttle dials. A delightful series of shrieks, whines, rattles and buzzes can be demonstrated. Replacement of the tension unit (part no. VXA3516) and the soft brake (VXL1873) usually restores relatively quiet operation.

B.S.

Panasonic NVFS90

The complaint, a very unusual one with these machines, was of poor picture quality. An abundance of faint, flickering lines were present in the background of the playback picture. The condition was even worse in the LP mode. I decided to check on the HQ pack. As I removed the screening can X3301, the crystal associated with the 1H delay CCD chip IC3302, came out of the board. Resoldering it back into the board restored the normally excellent playback picture.

B.S.

Matsui VX6600Y

No E-E picture with normal sound is becoming a very common fault with this model. Check inductor L4801 which goes open-circuit.

T.L.

Akai VS427

No playback sound caused us some problems. The sound circuits were being switched off because the main microcontroller chip was sending out the wrong signal. Must be the chip we thought, but to be on the safe side we tried a new front operations panel. This cured the fault. The μPD75216A-268 timer microcontroller chip IC1 was the culprit, a replacement restoring the sound.

T.L.

Hitachi VT410

The problem was poor or very noisy eject. In this model the cassette carriage is driven by the capstan motor via a series of cogs and gears. The cause of the fault was the worm on the right-hand side of the carriage, part no. 6435571. As a precaution I also replaced the worm wheel assembly, part no. 6896971.

R.J.A.

Akai VSF33

Low or no clock display was caused by the fact that the power supply wasn't oscillating. Akai has a modification sheet and kit, AV10015, part no. EX744015JOAP, to correct this.

R.J.A.

Philips VR6293

This machine had a tendency to eject tapes at odd intervals. The customer had put up with this for some time, complaining only when the machine failed completely. Total

failure was caused by a power supply fault – a new 3.3Ω resistor was all that was required to put this right. I then called up the service test program, which indicated that the drum motor had stopped although the machine was working perfectly. I was able to catch the machine in the fault condition just once, when it was switched on from cold one morning: the drum gave a little kick then refused to turn again, after which the machine shut down. Various component replacements in the drum motor driver stages failed to cure the fault, so a new lower drum was eventually tried. This provided a complete cure. I'm finding that motors which cause this sort of fault are becoming very common.

R.N.

Sharp VC581

This machine had been looked at by a dealer who had decided that it was not worth repair. It eventually came to me via a neighbour. As there was no take up I looked at the idler wheel. This had been changed, but was not making contact with the take-up spool or the reel motor. There was too much clearance between the idler and the motor, and the idler was fouling the motor fixing screws. After removing the motor I realised that it could be fitted in either of two ways. When it was turned through 180° and refitted the machine worked. A good clean up and a new set of belts completed the repair, saving what turned out to be a very good machine from the scrap heap.

R.N.

Panasonic NVL20

This machine produced very poor E-E pictures that could be cleared by tapping the tuner and r.f. converter. As MCES were on holiday I removed the tuner and converter and had a look inside. I found a large number of dry-joints along the output pins in both units and very carefully resoldered them. When the units had been refitted the machine worked perfectly and didn't even need to be retuned.

R.N.

Ferguson 3V53/JVC HRD755

This hi-fi machine wouldn't switch on. It would accept a cassette but wouldn't eject it. The clock was flashing away and could be set, but basically the machine was dead. No faults could be found when initial checks were carried out in the power supply. I then found that the on line didn't go low when the on button was pressed. The switch itself was o.k., but the power-on output from the microcontroller chip IC202 didn't change. If a shorting lead was used to take the line low the machine made an attempt to start and various supply lines became active. A replacement microcontroller chip, type M50742-621, put matters right.

R.N.

Hinari VXL5

The video signal was low, smeary and contained crushed sync pulses in the playback and E-E modes. Sound was not affected. As we didn't have a manual we carried out scope checks back from the r.f. modulator. Things were clearly wrong around Q306, where we found that C353 (47μF, 16V) was short-circuit. It appears to be a video signal coupling capacitor.

S.L.

Sharp VCA5011HM

The cause of failure to accept a cassette was incorrect voltages around the BA6238AM chip IC803. D805, type HZS12EB3, was short-circuit. A standard 12V zener diode in this position restored normal operation.

S.L.

Coaxial Cable RC Relay System

Keith Wevill, B.Sc.

I was very interested in Alan Beech's IR remote control relay article in the June issue as I had for some time been considering something similar. My interest in the subject started when my brother wanted to be able to control his VCR and satellite receiver from the bedroom.

The difference between Alan's system and what I had been contemplating is that rather than fit extra cables I wanted to use the coaxial lead between the VCR downstairs and the TV set in the bedroom to carry the remote control signals. This approach presents a number of problems, but the solution described here overcomes them and means that no extra wiring is required.

The main problems with using the coaxial lead are in avoiding interference to the u.h.f. signal and powering the IR receiver. Separate supplies could be used for the IR receiver and the LED driver, but if a single supply can be used the overall system is simpler, with only a small receiver unit next to the remote-controlled TV set and just one on/off switch. The method I use to power the receiver is similar to the way in which a line-powered aerial preamplifier is supplied via the coaxial downlead, with a minor modification to enable the control signals to be sent down the coaxial lead without interrupting the power.

Fig. 1 shows the circuit. I haven't shown the IR receiver, the LED driver or the mains supply circuit as these can be the same as in Alan's system. In fact almost any IR receiver and LED driver can be used. The receiver I used in my initial experiments was designed for remote-control versions of the Ferguson TX9/TX10 chassis, the driver and LEDs being taken from a scrap remote-control unit. The only receiver requirements are that it should operate at 5V, with a quiescent consumption of less than 10mA, and that it should provide positive-going output pulses. Many chips and discrete circuits fit these requirements.

Power for the IR receiver comes from the 12V regulator and is fed to the coaxial lead via a 100Ω, 2.5W resistor and a 1μH choke. The resistor has two functions. First, it limits the maximum current. Secondly, it allows the control signals to be extracted. The choke presents a low impedance to the d.c.

supply and the control pulses, and a high impedance at u.h.f. It thus isolates the power and the control signals from the u.h.f. signal path. Capacitive coupling is used for the u.h.f. signals to prevent the VCR or the TV set's aerial connector shorting the d.c. supply. At the remote-control end the d.c. feed and the control signals are similarly separated, using a capacitor and choke. The choke also removes some of the h.f. components of the remote control signal, thus minimising interference to the u.h.f. feed.

The BC108 transistor at the IR receiver end of the link is used to transmit the pulses down the coaxial line, being switched on whenever the output from the IR receiver goes high. This connects the two 100Ω resistors across the line. As a result, a 40mA pulse is transmitted down the line. This produces a 4V pulse across the 100Ω, 2.5W resistor at the LED driver end. It's coupled by the 0.022μF capacitor to the base of the BC558 pnp transistor, which inverts the pulse to provide the input for the IR LED driver. This capacitive coupling prevents damage to the LEDs should a short occur on the line.

The IR receiver is powered by the 5V regulator, whose d.c. input comes via the choke, 100Ω resistor and 1N4002 diode. The latter is included to isolate the d.c. input when the line goes low during pulse transmission. The 10μF capacitor supplies the regulator during the brief period when a pulse is being transmitted. The IR receiver should not consume more than about 10mA, otherwise the voltage drop along the line may result in the input to the regulator falling below the minimum value of 8V.

Construction and Use

Construction is not critical, but all leads that carry the u.h.f. signal should be kept as short as possible. Although transistor types have been quoted, there's nothing critical about them. Virtually any npn transistor that can carry 40mA can be used to drive the line, while almost any pnp transistor can be used to provide the output to the LED driver.

The circuit can be used with Alan Beech's system by inserting it between the output of the BC547 emitter-follower buffer stage and the 1kΩ resistor that's in series with the base of the LED driver transistor. As mentioned above, the 5V supply for the SL486 IR receiver chip comes from the 78L05 regulator that's powered via the coaxial lead.

For correct operation of this system it's essential that there is a d.c. path via the inner conductor between the connections at each end of the link. There should be no or a very high d.c. resistance across the cable. Some aerial sockets include a series isolating capacitor which must be shorted out for the system to function. Any series resistance, for example a resistive splitter, will reduce the voltage of the pulse transmitted down the line. The maximum series resistance that can be tolerated before problems occur is approximately 700Ω.

No picture interference has been seen with the unit in use, but this could occur with a weak signal. If so try increasing the value of the chokes or the 100Ω series resistors. Don't increase the values too much as this could impair the operation of the system.

It should be possible to use more than one IR receiver unit fed from a single power supply, but check that the input to the 5V regulators doesn't fall below 9V otherwise the operation of the system may be impaired.

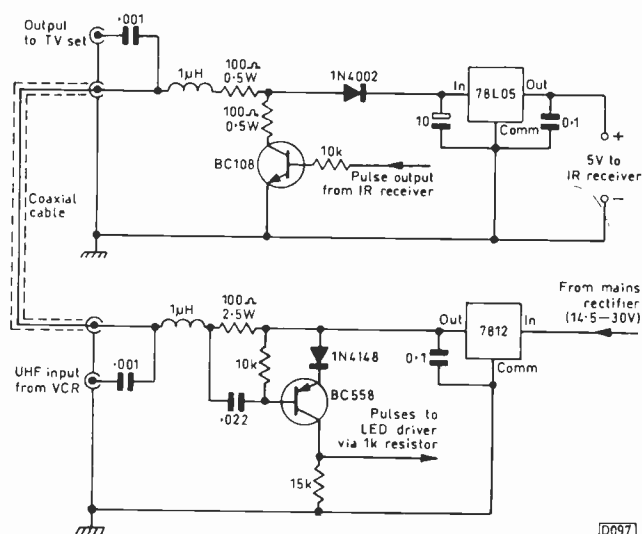


Fig. 1: Circuit diagram.

Letters

CITY AND GUILDS SCHEMES

I am writing this in reply to Andrew Woods' letter in the June issue, under the heading 'Training Inadequacies'. Mr. Woods expressed two main concerns, with the relevance to the industry of the City and Guilds 2240 Electronics Servicing schemes and with the value of 'paper qualifications' in general. On behalf of the City and Guilds of London Institute I would like to update you and your readers about the 2240 schemes in particular and perhaps dispel some concerns that may be current about qualifications.

The 2240 schemes comprise three parts. They were fully revised in 1985-86. As a result they incorporated practical assignments and course-work assessments in addition to written examinations. Parts 1 and 2 were revised again in 1989-90, to put them into a 'competance-based' format. The new syllabus thus covers both the knowledge and skills required to perform certain tasks. At the same time compulsory practical tests, administered through the Electronics Examinations Board (EEB), were introduced at all three levels in order to increase the practical aspects of these qualifications.

When introducing new qualifications or revising existing syllabuses the City and Guilds of London Institute always consults a wide range of representatives from the industry concerned and from the educational sector in order to take into account current needs. In the case of 2240 the schemes are specifically designed to complement practical experience in industry, so that learning and knowledge are put into practice. Naturally further time and experience in an industry will enhance an individual's abilities.

City and Guilds is very proud of its vast range of qualifications, which cover most industries at all levels. The awards, together with our involvement in the National Vocational Qualifications initiatives, play an important part in working towards a better trained and more competent workforce.

*Di Walster, Divisional Manager, Division 13,
Electrical and Electronic Engineering,
City and Guilds of London Institute,
46 Britannia Street,
London WC1X 9RG.*

MUTER REACTIVATOR TIP

Here's a tip for anyone who, like us, bought a Muter c.r.t. analyser/reactivator and found it impossible to buy the 9-pin plug to make up an adaptor. The solution lies inside the old Waltham ST30 stereo music centre. There are three suitable plugs here. They fit the Muter lead a treat.

*J. Howells, Protech Audio Visual,
Fallings Park, Wolverhampton.*

SCRATCHES

I was rather perturbed by the May issue front cover photograph, which shows Eugene Trundle's video monitoring jig. It is arranged to record a mechanical fault with a VCR that's standing on its side on a bare bench. So what, you may ask?

How many times have you had to try to talk your way out of the fact that a piece of equipment you accepted for repair

has a scratch which wasn't there to start with? My credibility has taken a few knocks over this one, thankfully a long time ago. Now when I have to put a unit on its side etc. I use what was previously a liner from an old velvet curtain, folded a couple of times. I also point out to the customer any scratches and other marks on the unit when it's accepted for repair, thereby eliminating any complaints later.

*M.K. Hayter,
Moseley, Birmingham.*

FITTING MULTIPINNED COMPONENTS

Here's a 'dodge' I use when fitting multipinned components such as line output transformers, chips etc. With a suitably sized twist drill I slightly countersink each hole by hand. You will find that components slide in quite easily when this has been done.

*K. Wright,
Preston, Lancs.*

VIDEOCRYPT PATTERNING

I read with interest Chris Watton's article 'A Western' in the June issue. Chris says that he doesn't know whether patterning caused by VideoCrypt decoders occurs in areas that don't use channel 25. It does!

A large proportion of the area in which I work is served by the Bilsdale transmitter, which uses channels 29 and 23 for ITV and Channel 4 respectively. Patterning caused by a VideoCrypt decoder is a common problem with satellite installations in this area. The purpose of this letter is to provide some tips for others who are plagued by the problem.

First, use of the highly-screened type of coaxial cable normally employed for the LNB to satellite receiver feed for other r.f. runs can provide a solution due to the high screening factor. Secondly I find that a little experimentation with lead positioning, particularly the satellite receiver's mains lead, can also help.

With the ever-increasing use of scart sockets, the approach I have adopted with my own equipment is as follows. The aerial signal is connected directly to the TV receiver via a low-loss signal splitter, the second feed going to the VCR for off-air recording of terrestrial TV channels. The Pace 9200 satellite receiver is not connected to the TV set or VCR at r.f., being hooked up via the scart sockets, one to the VCR, one to the TV set. This prevents any patterning on ITV or Channel 4, as happened previously when the 'standard' way of interconnecting equipment was used. I do have an r.f. feed from the satellite receiver to the VCR, but this is purely so that the VCR's r.f. output socket can be used to feed a distribution amplifier for sets in other parts of the house.

Finally there's a small modification that can be done to Pace receivers of the IRD type: it can also sometimes help to prevent patterning. Inside the receiver you'll see a crystal at the rear, right-hand side of the decoder board. If it is stood up on the board, remove it and lay it flat. Fit wire links in the holes at either side and solder them to the body of the crystal. You'll find that this has already been done in some receivers.

*Andrew Tebbutt,
Salthurn-by-sea, Cleveland.*

SAFETY

Your June issue appears to show a technician working on a live TV set with both bare hands. The test equipment shows

readings and oscillograms, so we must assume that there is life of some sort in the set. It's very bad practice to have both hands in the back of a set like this. Even though you may be on a rubber mat and the supply is mains isolated via an RCD you can still receive a lethal shock from even a relatively small voltage, since any shock received will be across your heart muscle.

*L. Mackenzie, T.Eng.,
Edinburgh.*

Editor's note: A point worth emphasising though Richard's left hand is not actually in contact with the chassis – it's at rest on the workbench. The photograph, being two-dimensional, fails to make this clear.

SONY MAINS SWITCH

I often seem to see an article in *Television* soon after having had to solve a similar problem the hard way. Examples that come to mind include the Philips 'C' wrap mechanism (March 1992) and the tuning of a locked-out 3V55 (February 1993, page 253). More recently (May) Steve Cannon's article 'It's only the on-off switch' seemed relevant when I was called to attend to a dead Sony KV2090. Before taking the back off I indicated that the cause is rarely the switch, expecting a power supply problem. But this time it was the mains switch!

A phone call to the nice people at SES referred me to the nice people at Sony Special Operations. For those who have not come across this matter, the switch (part no. 1-554-762-21) was the subject of a callback some time ago. A check on the set's serial number revealed that it hadn't been modified, so Sony arranged for the replacement to be carried out, free of charge to the owner.

It shows that one should start with the very obvious sometimes!

*Peter Delaney, B.Sc.,
Wargrave, Berks.*

NIKKAI BABY 10

In the May issue L. Mackenzie cast doubt on the alternative regulator I suggested (RS type LT1084CP-12) as a replacement for the AL2411 in the Nikkai Baby 10. May council for the defence reply?

Two different samples of original Baby 10 working regulators gave me measured outputs of 10.85V (not 10.4V). The RS 12V regulator with the recommended series diode produced 10.9V, making L. Mackenzie's dire predictions rather unlikely.

I have since used the variable output version of the RS device (LT1084CP, stock no. 265-320) which requires about 180k Ω from pin 1 to chassis for the correct output and no series diode (I used a 220k Ω preset to enable precise adjustment to be carried out). This is cheaper than the fixed 12V version, but runs hotter and is best mounted on the metal side plate behind the mains transformer.

Another increasingly common fault with these sets is the appearance of what look like hum bars after an hour or so of mains operation. It's easy to blame the AL2411 again (or that useless Avis modification) but closer inspection shows that the 'hum bars' are random, vary with picture content and disappear if the signal is attenuated! The cause of the problem is overheating of the TA7680AP i.f. chip IC101 inside the screened case by the tuner. My simple remedy is to cut a suitable rectangle from an old screening cover and bend it, by trial and error, so that one end presses flat against the top of IC101 (heatsink compound helps) while

the other end is soldered along the inside edge of the i.f. screening compartment, nearest the front of the set, before replacing the top cover. This is crude but is easier than it sounds – and it works!

I rest my case, m'lud.

*Chris Avis,
Exeter.*

PHILIPS VR6870 POWER SUPPLY

In a letter in your January issue I pointed out that two VCR Clinic reports misidentified a capacitor in the power supply of the Philips VR6870 VCR. Once again I have to return to the same subject. In the June issue Clinic there is reference to a 10V zener diode identified as D4. But D4 is a BYV10-20 rectifier diode. The BZX79C10 zener diode is D3.

*R.R. Hamilton,
Ashted, Surrey.*

CIRCUS TRICKS

"I'll give you sixty quid for that video in the window" he said.

It was priced at £85, but I said I'd let it go for £75.

He explained that he was from the circus up the road, and would take it without guarantee for £60.

I patiently explained the sale of goods act, pointing out that I couldn't sell the VCR without a guarantee. But I could reduce it from three months to one for £70.

He then said that the shop up the road had one for £50 with a 12-month guarantee.

Being doubtful about this, I asked why he hadn't bought it instead of trying to buy one from me for £70?

He replied that they wouldn't sell it to him. When I tried to understand the logic of this he took from his pocket the "sixty quid". It turned out to consist of circus tickets.

I showed him the door.

*S. Woodbridge-Smith, Argyle TV and Video,
Peeverell, Plymouth.*

BEST OF BOTH WORLDS

Some time ago I wrote on the subject of commentary-free TV sound. Sky Sports now provides such a service. One subcarrier has the complete sound while with another only the effects microphone is live during actual play. With a football match for example the pre-match, half-time and post-match chit-chat are normal but during play there are only the crowd sounds. Sheer bliss!

On giving the matter more thought I realise that my objections were not so much to the commentators, more to the 'special guests' who, though experts and like talking, are certainly not commentators. Anyway, you can now have Sky Sports on two channels, one with commentary and one without.

*Gus Cusick,
Preston, Lancs.*

BACK INJURY

Following previous published letters more and more engineers have been in touch with us about suing for back injuries caused by lifting heavy TV sets. This is just to let others know that we can provide advice and suggest possible legal representatives. Keep writing in!

*Harry and Pam Todd,
37 Northdene, Chigwell, Essex IG7 5JS.
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AN261P	£1.80	84540Z	£2.40	M51416	£1.10	SA4507	£10.00	SRK7378	£4.75	TA16758	£2.00	TD42030H	£2.00	25C2639	£2.00	BC1332	£0.07		
AN261P	£1.80	84540Z	£2.40	M51417	£1.10	SA4508	£3.50	SR1996	£3.40	TA16768	£1.50	TD42030V	£1.75	11011CP	£2.00	BC1335	£0.07		
AN261P	£1.80	84540Z	£2.40	M51418	£1.10	SA4509	£11.00	SR1997	£3.50	TA16769	£1.50	TD42032	£1.95	25C1402	£0.45	BC1341	£0.07		
AN261P	£1.80	84540Z	£2.40	M51419	£1.10	SA4510	£10.00	SR1998	£16.00	TA16781AP	£3.75	TD42151	£3.00	25C15-9	£3.75	BC1342	£0.07		
AN261P	£1.80	84540Z	£2.40	M51420	£1.10	SA4511	£10.00	SR1999	£8.00	TA16787	£2.00	TD42161	£1.75	IMS1944ZNL	£2.00	BC1343	£0.07		
AN261P	£1.80	84540Z	£2.40	M51421	£1.10	SA4512	£3.50	SR1999	£5.95	TA16796A	£1.85	TD42170	£3.20	IMS1952	£2.50	BC1344	£0.07		
AN261P	£1.80	84540Z	£2.40	M51422	£1.10	SA4513	£3.50	SR1999	£3.40	TA16798AP	£1.85	TD42170	£3.20	IMS1956	£2.20	BC1345	£0.07		
AN261P	£1.80	84540Z	£2.40	M51423	£1.10	SA4514	£3.50	SR1999	£14.00	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1346	£0.07		
AN261P	£1.80	84540Z	£2.40	M51424	£1.10	SA4515	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1347	£0.07		
AN261P	£1.80	84540Z	£2.40	M51425	£1.10	SA4516	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1348	£0.07		
AN261P	£1.80	84540Z	£2.40	M51426	£1.10	SA4517	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1349	£0.07		
AN261P	£1.80	84540Z	£2.40	M51427	£1.10	SA4518	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1350	£0.07		
AN261P	£1.80	84540Z	£2.40	M51428	£1.10	SA4519	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1351	£0.07		
AN261P	£1.80	84540Z	£2.40	M51429	£1.10	SA4520	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1352	£0.07		
AN261P	£1.80	84540Z	£2.40	M51430	£1.10	SA4521	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1353	£0.07		
AN261P	£1.80	84540Z	£2.40	M51431	£1.10	SA4522	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1354	£0.07		
AN261P	£1.80	84540Z	£2.40	M51432	£1.10	SA4523	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1355	£0.07		
AN261P	£1.80	84540Z	£2.40	M51433	£1.10	SA4524	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1356	£0.07		
AN261P	£1.80	84540Z	£2.40	M51434	£1.10	SA4525	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1357	£0.07		
AN261P	£1.80	84540Z	£2.40	M51435	£1.10	SA4526	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1358	£0.07		
AN261P	£1.80	84540Z	£2.40	M51436	£1.10	SA4527	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1359	£0.07		
AN261P	£1.80	84540Z	£2.40	M51437	£1.10	SA4528	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1360	£0.07		
AN261P	£1.80	84540Z	£2.40	M51438	£1.10	SA4529	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1361	£0.07		
AN261P	£1.80	84540Z	£2.40	M51439	£1.10	SA4530	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1362	£0.07		
AN261P	£1.80	84540Z	£2.40	M51440	£1.10	SA4531	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1363	£0.07		
AN261P	£1.80	84540Z	£2.40	M51441	£1.10	SA4532	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1364	£0.07		
AN261P	£1.80	84540Z	£2.40	M51442	£1.10	SA4533	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1365	£0.07		
AN261P	£1.80	84540Z	£2.40	M51443	£1.10	SA4534	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1366	£0.07		
AN261P	£1.80	84540Z	£2.40	M51444	£1.10	SA4535	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL	£2.00	BC1367	£0.07		
AN261P	£1.80	84540Z	£2.40	M51445	£1.10	SA4536	£3.50	SR1999	£1.90	TA16799	£1.50	TD42170	£3.20	IMS1963NL</					

AMP KITS

30 WATT SINGLE CHANNEL

30 watt rms into 8ohm, 20HZ-20KHZ harmonic distortion 0.1%, sensitive to 150MV, mic sensitivity 50MV, 36V x 2 psu's required complete with base, treble and volume controls and heat sink.

Our Price : £8.00 each

Our Ref : EE/W8P7

120+120 WATT STEREO AMP

240 watts rms into 4 ohm, 10KZ-20KHZ, harmonic distortion less than 0.01%, sensitivity 3MV (phono), 130MV (aux), 2 x 30V psu's required

Our Price : £30.00 each

Our Ref : EE/W30P3

30 WATT STEREO AMP

30 watts rms into 8ohm, harmonic distortion 1%, sensitivity 3MV (phono), 130MV (tuner), signal to noise 80db, 36V x 2 psu's required

Our Price : £16.00 each

Our Ref : EE/W16P1

300 WATT MONO AMP

300 watt rms output, harmonic distortion less than 0.05% 10KHZ. 2 x 60V psu's required

Our Price : £40.00 each

Our Ref : EE/W40P3

AMSTRAD MP3

A complete fully tunable VHF/UHF TV receiver with RGB and composite video out, audio on internal speaker. Intended for use with CTM644 colour monitor but can be used with monitors that have a 15.825kHz line frequency. Needs 12V DC psu. **BRAND NEW AND CASD.**

Our Price : £19.00

Our Ref : TV/V19P1

WE HAVE HUNDREDS AND HUNDREDS MORE STOCK LINES - TOO MANY TO LIST IN ONE ADVERT ! CHOOSE FROM...

AERIAL AMPLIFIERS	FANS
AEROSOLS	FUSES
ALARMS	GLUE GUN AND GLUE
AMPLIFIED SPEAKERS	HEADPHONES
ANALOGUE MULTIMETERS	HEATSHRINK SLEEVING
APPLIANCE LEADS	HI FI SPEAKERS
BATTERIES AND HOLDERS	IONISERS
BATTERY CHARGERS	LED'S
BOOKS	LASERS AND LASER PSU'S
BOXES AND CASES	LOGIC PROBES
CAMCORDER BITS	LOUD AND MARINE SPKRS
CAPACITORS	MICROPHONES
CAR AMPS, RADIOS & SPKRS	PIR LIGHTS AND DETECTORS
CB SPEAKERS AND PSU'S	POWER SUPPLIES
COMPUTER BITS	POWER AMPLIFIERS
CONNECTORS	RADIOS
DESOLDER PUMP	SERVICE AIDS
DIGITAL MULTIMETERS	SOLDERING EQUIPMENT
DISCO LIGHTING	STEAM ENGINES
DISPLAYS	TRANSISTERS
DUBBING KIT	TRANSFORMERS
DRILLS	WIRELESS MICROPHONES

MINIMUM GOODS ORDER £5.00 TRADE ORDERS FROM GOVERNMENT, SCHOOLS, UNIVERSITIES & LOCAL AUTHORITIES WELCOME. ALL GOODS SUPPLIED SUBJECT TO OUR CONDITIONS OF SALE AND UNLESS OTHERWISE STATED GUARANTEED FOR 30 DAYS. RIGHTS RESERVED TO CHANGE PRICES & SPECIFICATIONS WITHOUT PRIOR NOTICE. ORDERS SUBJECT TO STOCK. QUOTATIONS WILLINGLY GIVEN FOR QUANTITIES HIGHER THAN THOSE STATED.

THIS MONTHS SPECIAL OFFERS

COMMODORE 64 & PSU

Once again available due to a bulk purchase. Commodore 64 together with Power Supply, supplied and tested in working order.

Our Price: £50.00 Ref: TV/W50P1

PIR MOVEMENT DETECTOR

Once again we have acquired stocks of this popular line and are able to offer you a very high quality and professional detector at only ***£15.00***. Range: 20 Mtrs with a 90° arc. Day and Night Mode Dimensions: 15cm x 9cm x 11cm. New and boxed complete with installation guide.

Our Price: £15.00

Our Ref : TV/W15P2

ELECTRIC MOTOR - 3 PHASE

GEC Alpak Induction Motor. This is an extremely well made industrial 3 phase motor **BRAND NEW & UNUSED.** Supplied with full installation and maintenance literature.

Our Price: £60.00

Our Ref : TV/W60P1

PORTABLE ALARM SYSTEM

'PAL' Portable Multi Bean Scanning System. Lockable Stand-alone PIR unit with removable keys (3 supplied). This unit uses a PP3 battery and when activated emits a piercing SHRILL! The units scans the room and memorises the layout. Should this change, the alarm is triggered. There is a 60 second exit delay.

Our Price: £17.00

REF : TV/W17P1

CAR PHONE HANDSETS YUPPIES LOOKOUT!!

Brand New High quality handsets originally intended for use with Phillips Mobile Phone System. We have acquired a number of these handsets, supplied in two parts, speaker and combined phone rest unit plus handset with LCD display, LED indicators and push button dialling. 6 additional keys as well as the conventional 12 numeric keypad. No transmitter/receiver. 5 Mtr 12 core black cable attached. Excellent Dummy Mobile Phone!!!

Price: £6.00 each

Ref : TV/W6P3

MINI MULTI TESTER

Mini multi-tester with 9 ranges. AC Volts up to 1000. DC Volts up to 500. Ohms/mA ranges. 1K ohm/V. Ideal for pocket or toolbox use and at only £5.00 each - replaceable!!

Our Price: £5.00

Our Ref : TV/W5P2

HEAT DETECTOR

This is a Japanese made combination type heat detector which could be linked to a suitable fire alarm panel. 105mm dia. 30V operational.

Our Price: £4.00 Our Ref: TVW4P1

SOME OF OUR PRODUCTS MAY BE UNLICENSABLE IN THE UK

BULL ELECTRICAL

250 PORTLAND ROAD HOVE SUSSEX BN3 5QT

MAIL ORDER TERMS: CASH PO OR CHEQUE WITH ORDER PLUS £3.00 POST PLUS VAT.

PLEASE ALLOW 7 - 10 DAYS FOR DELIVERY TELEPHONE ORDERS WELCOME

TEL: 0273 203500 FAX: 0273 323077



USEFUL POWER SUPPLY - £5.00

14.5V DC @ 400Ma battery charger Plug in type with sleeved pins. Lead terminates in 3 pin din plug, easily removable. Originally intended for mobile phone charging. (Large quantities available)

Our Price : £5.00 each

Our Ref : TV/W5P8

AMSTRAD PRINTER MECHS

We have both Amstrad LQ3500 and Amstrad DMP4000 printer mechanisms. No case or electronics but complete with print head. Ideal for replacement. The mechanism comes with two high quality stepper motors which together with the print head are worth much more than we are selling the whole unit for!!!! This unit could also be utilised for a number of other projects including coil winding, laser scanning(*) etc.

(Quantity Prices available on application)

AMSTRAD LQ3500 units

Our Price : £10.00 each

Our Ref : TV/W10P5

AMSTRAD DMP 4000 units

Our Price : £20.00 each

Our Ref : TV/W20P3

MANY MORE SPECIAL OFFERS IN OUR REGULAR NEWSLETTERS

PC CORNER

PC CASES desk top case +psu £51.60 ref BPC/C1 Deluxe slimline case +psu £60.00 ref BPC/C2. Minitower case +psu £51.60 ref BPC/C3. Deluxe midi case +psu £90.00 ref BPC/C4. **MONITORS** Mitac 14" SVGA 39DP £174.00 ref BPC/MO2. Mitac 14" SVGA 28DP £202.00 ref BPC/MO1. **MEMORY** 256K Simm 70ns £8.40 ref BPC/M11. 1MB Simm 70ns £26.40 ref BPC/M12. 4MB Simm 70ns £96.00 ref BPC/M13. **MOUSE** 2 button serial mouse with 3.5" s/ware £8.40 ref BPC/M16. 3 button serial mouse with 3.5" s/ware £9.60 ref BPC/M17. **KEYBOARDS** 102 AT UK standard keyboard £18.60 ref BPC/M14. Deluxe keyboard 102 AT UK £26.40 ref BPC/M15. **SOFTWAREMS DOS 5 OEM version** £39.60 ref BPC/M18. **MS WINDOWS 3.1 OEM version** £42.00 ref BPC/M19. **6 286-16** Headland chipset £46.80 ref BPC/MB1. 386SX-33 Acer chipset £82.80 ref BPC/MB2. 386SX-40 UMC with 64K cache £110.00 ref BPC/MB3. 486SX-25 UMC with 64K cache £191.00 ref BPC/MB4. 486DX-33 UMC with 256K cache £378.00 ref BPC/MB5. 486DX-66 UMC with 256K cache £515.00 ref BPC/MB6. **FLOPPY DRIVES** 1.44mb 3.5" drive £32.34 ref BPC/DD05. 1.2mb 5.25" drive £38.40 ref BPC/DD02. 3.5"-5.25" mounting kit £5.00 ref BPC/DD07. **HARD DRIVES** 42MB IDE 17ms £99.00 ref BPC/DD01. 89MB IDE 16ms £166.00 ref BPC/DD02. 130MB IDE 15ms £215.00 ref BPC/DD03. 213MB IDE 14ms £298.00 ref BPC/DD04. **VIDEO CARDS** 256K C&T 8 bit SVGA card £22.20 ref BPC/VC01. 512K Trident 9000 16 bit SVGA card £31.20 ref BPC/VC02. 1MB Trident 8900 16 bit SVGA card £45.00 ref BPC/VC03. 1MB Cirrus AVGA3 16 7M colours £48.00 ref BPC/VC04. 1MB Tseng multimedia £82.80 ref BPC/VC05. **ADD ON CARDS** Multi I/O card 2s. 1p. 1g. 2fdd. 2hdd £11.00 ref BPC/AOC01. ADLIB sound card with speakers £37.00 ref BPC/AOC02. Orchid sound card with speakers £63.00 ref BPC/AOC03.

EXAMPLES OF COMPLETE SYSTEMS

386SX-33 SYSTEM

386SX-33 board at £82.80. case £51.60. 2MB ram £52.80. 42MB drive £99.00. SVGA colour monitor £174.00. 102 keyboard, £25 build fee if required. Total £579.34

486DX-33 SYSTEM

486DX-33 board £378.00. case £51.60. 2MB ram £52.80. 89MB drive £166.00. 512 SVGA card £31.20. 3.5" FDD £32.34. multi I/O card £11.00. SVGA monitor £174.00. 102 keyboard £18.60. £25 build fee if required. Total £939.84

ALL PC PARTS AND SYSTEMS ARE GUARANTEED FOR 1 YEAR PARTS AND LABOUR.

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CALL IN AND SEE US!!

TURN YOUR SURPLUS STOCK INTO CASH. IMMEDIATE SETTLEMENT. WE WILL ALSO QUOTE FOR COMPLETE FACTORY CLEARANCE.

MUCH MUCH MORE IN OUR 1993 CATALOGUE. PLEASE SEND 41P, A4 SIZED SAE FOR YOUR FREE COPY.

Camcorner

*Reports from Simon Bodgett,
Ronald Aranha, David C. Woodnott
Brian Storm and John C. Priest*

Ferguson FC06

There was intermittent sound because the tape shifted in height as it ran across the audio head: the cause of the problem was the pinch roller. **S.B.**

Sony CCDTR55

This 790g wonder had a cassette stuck in it. Pressing the eject button had no effect, though motor noise and mechanical movement could be heard for a while, followed by shut-down and then the caution indicator blinking. When we opened the unit we found that the camera block could be separated from the VTR section. The machine unloaded without problem when an external d.c. voltage was applied to the loading motor, so the load/unload mechanism seemed to be all right.

We next checked for reel pulses at the syscon chip IC601 on board VS37. These and the head switching pulses were present, but in comparison with another machine the capstan motor movement seemed to be much too fast. A check showed that the capstan FG pulses at pin 62 of IC601 were missing. They come from the CX20115A chip IC503, which produced no output pulses at pin 12. The d.c. voltage here was also incorrect. A new CX20115A chip restored normal operation. It's an SMD, so special care is required. **R.A.**

Sony CCDV90E

We had to attend to this camcorder on three occasions. It showed the no power symptom, i.e. no display in the LCD window. On the first two occasions the LCD appeared and all other functions were restored when the lithium battery, which is used to store day and date information, was removed then replaced. On the third occasion manipulating the lithium battery made no difference. So voltage checks were carried out around IC151 (μ PD7503G) and reset transistors Q156/8/9 on board FD4P. No abnormal readings were found, but when C153 (1 μ F) was momentarily shorted the LC display came on. Shorting C153 makes Q159's collector, which is connected to IC151's reset pin, go high. On the assumption that IC151 was not able to reset internally we fitted a replacement. Everything then functioned normally. **R.A.**

Sony CCDTR75E

The reported fault was that there were no functions and a tape was stuck in the mechanism. After removing the tape and checking for any obvious mechanical problems we inserted a cassette. It seemed to load correctly but when we tried there were no functions and the tape was once more stuck. After several more attempts at loading it became clear that the cause of the problem was a capstan fault. In fact the capstan motor didn't turn – it merely twitched. A new CXA1127AM capstan drive chip restored normal operation: one of its three-phase drive outputs had failed. **D.C.W.**

Bauer VCC526AF

The complaint with this full-size VHS Panasonic clone was that it produced noise on the sound with recordings. We

soon found that the noise was there during playback as well – the lower capstan motor bearing was worn to the extent that the rotor scraped against the motor's windings. When the capstan shaft was rotated by hand the noise was not evident: the symptom occurred only when sideways pressure from the pinch roller was present. A new set of bearings cured the problem. **D.C.W.**

Sony CCDF375E

There was no playback sound. A check with another machine proved that sound was being recorded. The playback audio f.m. signal from the video heads passes via the servo/syscon PCB, where there are a buffer stage and a stage of amplification. The 0.01 μ F coupling capacitor between the two stages, C401, was open-circuit. **D.C.W.**

Panasonic NVS5B

The complaint was of a 'cinemascope viewfinder'. On inspection we found that the fault was lack of height in the electronic viewfinder display. Recordings made and then played back on another machine proved that the camera operation was o.k., and an AV link to a monitor to display the live picture proved that the fault was within the EVF unit.

The EVF PCB is fitted inside the camcorder's right-hand side casing. Viewfinder brightness and focus controls are accessible through a small oval hole sealed with a rubber cap. There's also a height control on this PCB, but it's not within reach of the adjustment hole. A little judicious pressure on the PCB, using a plastic probe inserted through the hole, cured the fault intermittently however. There was obviously a dry-joint somewhere.

The palmgrip casing was dismantled to gain access to the EVF PCB, which was then removed and examined. The cause of the fault would probably lie in the area of pins 1 and 5 of IC801 and resistors VR801 (height) and R802/R827. But despite a close examination, using a x10 headband magnifier, no fault could be seen. We decided to apply a small bead of rework flux to each suspect joint in the area, using a sharpened matchstick, and then use a Weller hot-air soldering tool to heat each joint in turn until the solder flowed. During this operation the surface-mounted components were held in place with fine tweezers, to prevent them moving while the solder was fluid.

When we reassembled the camcorder and tested it we found that the fault had been cleared completely. This was confirmed by several periods of recording and playback with 'rough' handling and vibration to try to recreate the fault. Everything was o.k.

A week later another NVS5 arrived in the workshop with exactly the same fault. It also responded to the reflow treatment. **J.C.P.**

Panasonic NVS5B

Intermittent no zoom was the complaint with this palm-corder. When we stripped it down we found that simply touching the flexicable between the process CBA and the main CBA produced the fault. A new flexicable (VWJ049S) cured the fault. **B.S.**

Long-distance Television

Roger Bunney

The 1993 Sporadic E (SpE) season got off to a dismal start. As I write this in early June there have been few signals to excite or captivate. An interesting reception was a possibly Arabic double-hop signal floating under a single-hop signal from Yugoslavia: whenever a signal is present from the 'Yugoslavian' area it's always worth checking for Arabic signals. The absence of an SpE opening in April and the late start of the season in May, plus the closeness of the last sunspot peak, suggest that the 1993 season will be poor and will fizzle out early. The following log shows what May produced by way of SpE signals:

- 12/5/93 CST (Czechoslovakia) ch. R1; CIS (Russia) R1; JRT (Yugoslavia) E3, 4; ARD (Germany) E4; RAI (Italy) IA, B; RTP (Portugal) E3; TDF (France) L2.
- 13/5/93 RAI IA; SVT (Sweden) E2; NRK (Norway) E2; CST R1, 2.
- 14/5/93 RUV (Iceland) E4; NRK E3; SVT E2; RTP E3.
- 16/5/93 Suspected JTV (Jordan) or IRIB (Iran) E3.
- 17/5/93 JRT E3; Arabic ch. E3/4 signals 1610-1615.
- 18/5/93 RAI IA.
- 21/5/93 NRK E2; SVT E2, 3.
- 25/5/93 CIS R1, 2.
- 26/5/93 CIS R1, 2; RAI IA.
- 27/5/93 TVE (Spain) E3; RTP E3; MTV (Hungary) R1, 2; CST R1; ORF (Austria) E2a; SVT E3; DR (Denmark) E3.
- 30/5/93 NRK E2, 3, 4; SVT E2, 3, 4; CIS R1-4; TVP (Poland) R2.
- 31/5/93 DR E3, 4; CIS R2; JRT E3.

Tropospheric activity was noted on the 7/8th and 11/12th, with Band III/u.h.f. reception of German and Scandinavian signals in the north east, then on the 22nd/23rd with reception of French and Benelux signals in the south/south east.

Tim Anderson (St. Leonards) reports that several DXers have received on their scanners a tropospheric scatter signal at 36-83MHz, with at times weak audio. The signal is always present and has been received across the southern UK and as far north as S. Wales. Can anyone suggest the source?

My thanks to Iain Menzies (Aberdeen), David Glenday (Arbroath), Brian Williams (Penarth), Peter Schubert

(Rainham), Simon Hamer (Powys) and Tim Anderson (St. Leonards) for sending in reception reports.

News Items

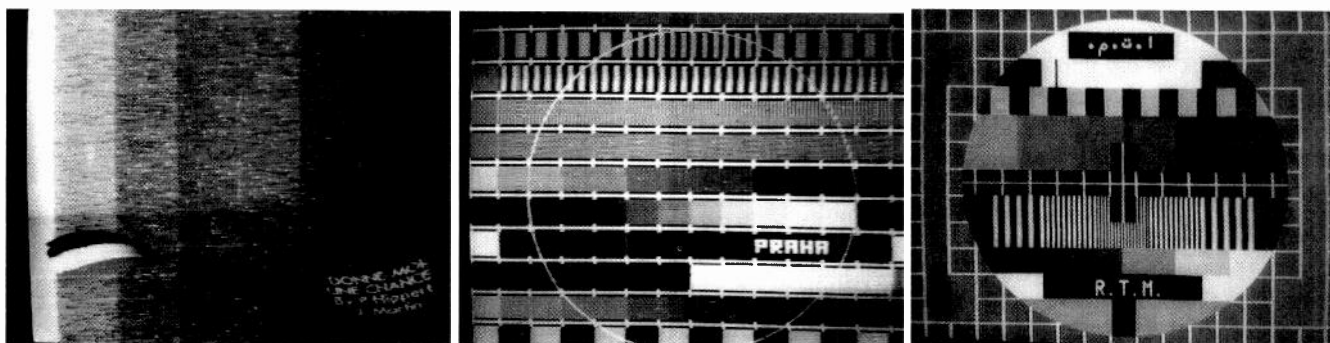
Planning permission: The RSGB recently provided details of planning law changes that may affect readers seeking permission to erect a TV-DXing mast. It states in Annex 4 of PPG8 para 1 of the Department of the Environment/Welsh Office document *Planning Policy Guidance Note 8 – Telecommunications (PPG8)*, issued last December, that generally potential interference is irrelevant to planning applications since other controls exist to deal with interference. It's thus unlikely that permission would be refused on interference grounds, whether the equipment is to be used for transmission or not. Should an application be refused solely on the grounds of anticipated interference, if an appeal is made the planning authority must produce detailed evidence of interference or anticipated interference, together with reasons for there being 'no reasonable remedies that would be satisfactory'.

Holland: A new station, TV Zuid-Holland, is due to start up in Rotterdam this autumn. It is intended to provide a feed for cable systems but will also operate a 30kW e.r.p. u.h.f. transmitter with output from the 180m Waalhaven harbour PTT tower. Transmissions, on a channel still to be decided, will be in the clear.

Baltic states: The BDXC News reports that there are now two high-powered Band I transmitters in Latvia, Riga ch. R3 (150kW) and Kuldiga ch. R1 (10kW). The UIET test pattern used has the identification 'LATVIJAS TV' for local Latvian channels or 'UT' for the Ostankino (Moscow) service. The identification 'OP C' means that the signal originates from the Kalingrad region. At times the pattern is transmitted without identification. A new US-financed commercial station, 'Baltic TV', is now in operation at Vilnius, Lithuania.

Belgium: The ARTE/21 service is now being transmitted from Anderlues on ch. E61. The ARTE service has scrambled vision but clear sound. When ARTE programmes are not being transmitted the feed is taken from either RTBF-1 or Sport 21. Apart from Brussels ch. E45 the former Tele 21 transmitters now carry the RTBF-1 service or Sport 21. A new main transmitter is under construction at St. Pieters-Leeuw, some 15km south west of Brussels: it will carry the Wavre replacement transmissions and should be on air by the end of the year.

Amateur radio: On February 6/7th there was, as previously reported here, an attempt to bounce 50MHz signals via the moon between the US West Coast and Europe. I heard nothing on my scanner but others were more successful and heard weak signals. It seems that stacked Yagi aerials were



Left: A sound-in-sync signal received from Ireland via Eutelsat II F4 at 7°E during rehearsals for the 1993 Eurovision song contest. Centre: A familiar test pattern, received this time via a Pace satellite receiver. Right: The RTM (Morocco) test pattern received via Eutelsat II F3 at 16°E. All reception by Andrew Sykes in Yorkshire.

the best bet for reception. The least that was required was a six-element array cut to frequency. Polish amateurs can now use the 50-52MHz band, with SSB/CW at up to 10W. At least a hundred stations should be in operation by the time that this is read. The Ukraine is also to allow 50MHz operation, probably by mid-summer.

Sunspots: The minimum count in sunspot cycle 22 is expected to be in 1997, with cycle 23 peaking in the year 2000. Time flies! Thanks to *Six News* for this information.

Satellite TV

The mystery of the Space Shuttle pictures via Houston TV/NASA TV has been cleared up: the satellite link was via Intelsat 504 at 31.4°W. This satellite is now in an inclined orbit, having been moved from 40.5°W last spring.

The BBC SNG unit UKI-17 is in operation in Yugoslavia and can often be seen feeding back via Eutelsat II F1 at 13°E – try 11.68GHz. Another new SNG identification is Starbird UKI-94, also seen at 13°E.

Astra 1C was successfully launched on May 11th and was seen on test while being moved to 19.2°E. Telecine Romandie has been given permission by the Swiss authorities to transmit its Cinevision service via an Astra transponder, with subcarriers for German, French, Spanish, Italian and English sound. A decision has still to be made on the encryption system: the subscription would be about 15 swiss francs (£6) a month.

Red Hot Dutch has been granted a licence to broadcast in Denmark. Although the supply of equipment for viewing it is illegal in the UK, it's not illegal to view the programmes. The encryption system is Enigma, a variant on VideoCrypt.

A Turkish channel, ATV, was due to go on air via Intelsat II F2 at 10°E on June 14th. An English-language channel, Wire TV, is seen in the clear via Intelsat 601 at 7.5°W (11.5GHz horizontal). Programming includes live Bs from various parts of the UK.

We've had Gorizont and Ekran: now we have Coupon, a new group of three broadcasting satellites that provide global coverage with transponders which are available for lease. Its phased aerial system provides steerable-beam up and down links with a variable e.i.r.p. of 30-50dBW. The system should be in operation early next year.

Intelsat is to lease three Express class satellites from Russia, operations starting next summer. The satellites will be positioned over the Atlantic, Pacific and Indian Oceans, each one having ten C band and two Ku band transponders.

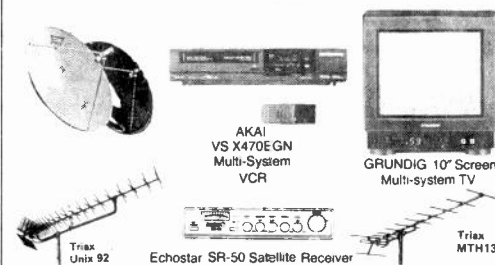
The Deutsches Bundespost has withdrawn from Eurosat, which means that the project – for a new DBS service from 0°W – is likely to be abandoned.

The Middle East Broadcasting service via Eutelsat II F1 13°E now carries teletext.

Satellite Reception for DXers

With the gradual reduction in the number of Band I TV transmitters in operation in recent years and increasing interference in this band, satellite TV has seemed to many DXers, including the writer, to be the best alternative way of seeking unusual signals. At my valley location, where tropospheric reception has never been outstanding, a 1.5m dish on a small site in the back garden gives me any TV that's being down-linked in the Ku band from – in my partially screened position – 16°E to 40°W. A clearer view to the east would offer an even more exotic fare. The dish can provide a vast number of signals, even 'real DX' such as the Israeli TV spot beam aimed at Tel Aviv! The signals are available day and night, all year round, and are constantly changing.

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Aerial Techniques

What's required for practical, cheap satellite DX-TV reception? First, obviously, a dish: it should be at least 90cm in diameter, though 60cm Astra dishes have been pressed into use. There are two basic types, offset and prime focus. The offset type has the advantage of null shadowing since the electronics are on an arm beneath the dish. For it to traverse the Clarke Belt (where the geostationary satellites are in orbit) the dish has to be mounted on a tracking mechanism. This can be either an horizon-to-horizon or a polar mount.

The assembly required at the dish's focal point consists of a feed horn, a wideband magnetic polariser to convert the incoming vertically- and horizontally-polarised signals to a common plane, and an LNB (low-noise block) which converts the Ku band signals to an i.f. of 950-1,750MHz for linking via coaxial cable to the receiver. The LNB will have a gain of typically 50-60dB: the noise figure should be well under 1dB. Note that the sections of the Ku band used for TV transmissions are 10.95-11.7GHz (FSS - fixed satellite service), 11.7-12.5GHz (DBS) and 12.5-12.7GHz (telecom).

We'll take this further next month.

Warning

An Australian reader recently ordered a copy of the book *European Scrambling Systems* from a UK source. On arrival at Melbourne the book was seized by the Attorney General's Department for consideration by the Literature Classification officer as a possible prohibited import. Some five weeks later it was released. Several countries seem to be touchy about encryption, hacking and industrial espionage. Anyone ordering publications from abroad should note that problems may be encountered.

Satellite Notebook

Nick Beer

A worrying factor with the introduction of IRDs is what will eventually happen to equipment with a VideoCrypt circuit fault? At present manufacturers don't supply spares for the VideoCrypt circuit. Thus either the equipment has to be returned for repair or a complete new PCB has to be obtained. A recent experience with a Finlux/Cambridge unit made me think about the problem. The unit was brand new with a faulty i.c. in the VideoCrypt circuit. I couldn't get the device of course. No great surprise, except that the chip was included in the parts list with no specific note about availability. In some units it's easy to isolate the VideoCrypt circuitry which is on a separate PCB that can be removed and linked across, but in this IRD all the circuitry is on one double-sided PCB – the current Pace PRD800/900 IRDs are also built in this way.

It worries me that there are circuits which dealers cannot repair in items they are selling. If this policy is continued throughout the life of a VideoCrypt unit, customers and dealers will be at the mercy of the manufacturer with respect to repairability. Should a manufacturer decide that he won't repair a unit over say five years old, or quote a high price for doing so, there will be no chance of a second opinion.

I can only see the situation in the satellite and terrestrial subscriber-service field getting worse: more decoders, more services and thus more that has to be sent away. I would be very interested to know what manufacturers' long-term policies on such matters are, but a statement on current policy is about all that you can get. In fairness, I suppose that licensed VideoCrypt manufacturers have to abide by the rules laid down by the licensor.

Problems

It was perhaps predictable that, having in a previous column extolled the virtues of Manhattan LNBS, I would soon have a problem with one of them. Sure enough I did – and no ordinary problem either. Our installation chap had fitted an 80cm Lenson Heath dish on an az/el mount, with an 0-8dB Manhattan LNB and a Racal feed/polariser. This lot was to be used with a B and O LM satellite receiver built into an MX3500 TV set. Because of a supply problem at B and O, there was a delay of a couple of weeks before the LM unit could be installed.

I called to fit the LM receiver, did so then started to set it up. To start with I had problems because I couldn't move up or down the menus with the fast-wind keys, though I noticed that I could do so with the step keys. When I selected the video tuning menu, I got a slim strip across the top of the screen instead of a large black-backed menu. A ha! The software has been changed and no-one's told me! A check with the installation guide that comes with the unit confirmed this. Interesting that to move up a menu you press the forward step key while to move down you press the backwards step key, the complete opposite of what you'd expect and of what was previously the case!

The new screen layout is sensible: the picture is no longer obliterated by the menu when you carry out tuning. Another thing that I noticed is that the Astra 1C channels

are pretuned in amongst the 1A and 1B channels: the first 24 presets are tuned to the horizontal channels and the second 24 to the vertical channels. This means that there are at present lots of blank channels in amongst the used ones and that the majority of favourite channels are in the 20s.

Anyway, back to the installation. Having set up the polarisation current on about ten channels I noticed some faint beat bars across the picture, with satellite reception only. These became worse, causing corrugation of the entire image, including the menus. There was also a faint 1kHz tone with the sound. Then the colour disappeared from the on-screen displays and the program list option disappeared from the main menu. A hard reset cured the menu problems, but the only way to remove the vision problem was to let the unit cool down. I popped in another LM unit and everything was fine – for about half an hour. As I didn't have a scope or manual with me I decided to try another power supply module, in case there was hum/poor regulation with a supply used by the satellite unit. This seemed to cure the problem, but it was back within another three-quarters of an hour. So I replaced the LNB, using the customer's own ladder to battle through overgrown cotoneaster. At last the problem had been cured: I can only assume that something in the LNB was drawing too much current.

Buzzes with a Pace PRD900

One of our rental customers, who has a Luxor 9272 VCR and 5587 colour set, purchased a Pace PRD900 system from us and installed it himself. He then complained of a buzz on the sound, via the VCR at r.f. only, i.e. in the E-E mode and therefore also on recorded satellite material. This was indeed the case, and was a nuisance as the customer said. A Salora 5902 system he'd previously rented didn't produce the problem.

Checks showed that the 9272 was correctly aligned r.f.- and i.f.-wise, and that the problem was present with other PRD800 and PRD900 IRDs. Another 9272 made no difference. It appeared that the problem was to do with the satellite receiver's video modulation level. I contacted Pace technical, who said that it was not a known problem and couldn't offer any advice. Without a manual at the time, I decided that a home-brew modification was the only solution – unless the customer decided to buy a different system.

I found the r.f. modulator's video input and fitted a 47Ω resistor in series with it. This had virtually no effect. After trying several different values I had to go up to about 180Ω before the video level and the buzz could be reduced. During a subsequent call Pace confirmed that the video modulator incorporates a.g.c., hence my problem. The resistor remains in place and the customer is delighted with the result, despite being apprehensive about having to have his unit modified. This doesn't get to the root of the trouble of course, though it does provide a solution. The contrast control built into the receiver failed to provide a cure, but after adding the 180Ω resistor its range enabled the buzz to be reduced to an undetectable level.

And finally . . .

Here's a little tale to cheer you up. A satellite/aerial installer I know specialises in MATV and SMATV work. He was called some distance to look at an Astra SMATV head end that had not long since been installed by a large, reputable company for a local authority. The strange complaint was that Eurosport was the only Astra channel available. A check with a compass and meter soon showed why: the dish was pointing at Eutelsat II F1. Oops!

CD Player Casebook

Reports from Mike Leach
and Nick Beer

Kenwood DPM6630

This machine was brought in with two discs stuck in the mechanism. One was in the six-disc magazine, the other in the single-disc tray assembly. Nothing happened when the open/close button was pressed to open the tray or the eject button was pressed to open the magazine. Initially I thought that there might be a power supply fault, but checks in this department showed that everything was in order. Perhaps the LA6510 loading motor drive chip was faulty? As the same type of chip is used as the bus/tracking driver I interchanged the two. This made no difference. I removed the two discs by unwinding the mechanism by hand, after gaining access to the series of gears at the bottom of the mechanism. When this had been done there was still no movement from the mechanism, so checks were made around the system microcontroller chip IC7. As a high of around 0.7V was obtained at pins 35 and 36 when eject or open/close was pressed I came to the conclusion that IC7 was probably faulty, but a replacement wouldn't alter the situation.

Having provision for a tray and a six-disc magazine, the mechanism used in this player is very complicated. Several switches dotted around it tell the main microcontroller what the mechanism is doing. If the mechanism goes out of sync the microcontroller chip gets thoroughly confused. The result can be complete lock-out, which is what had happened. Part of the plastic chassis had broken, affecting the series of cogs driven by the loading motor. The only cure is a complete new plastic chassis, part no. 10-2994-11. If nothing on the main chassis is actually broken Kenwood advise fitting the counter-measure parts part no. W05-0434-00. This should rectify any other problems that might occur should a disc get stuck. It won't

however rectify problems such as the one we had. If the plastic is broken, the mechanism must be replaced. M.L.

JVC RCX510

There was no CD sound from this portable music system. It read the TOC all right and went into the play mode, but nothing came from the speakers. The tape and radio functions were o.k.

I stripped the unit down to gain access to the CD board in order to carry out some voltage checks, plug checks, etc. When this had been done my first move was to give the CD board a gentle twist while in the play mode to see if any cracks in some of the finer print showed up. No luck: the fault remained the same. Then I spotted the cause of the problem. It was a fault I've not had before. Two or three of the data processor chip's pins had come away from the board and weren't making proper contact. Very careful soldering in this area restored normal operation, after which all was fine. M.L.

Toshiba RT8089

This CD/radio/cassette unit would read the TOC but when it was asked to play it would spin up then rotate the disc backwards at high speed. There was evidently a focus fault, and we found that the focus servo couldn't be set up because of an offset error caused by the optical unit. After fitting and setting up a new unit the results were superb. A new cassette belt was also required on the PB deck: the old one had wrapped itself around the single motor's pulley, stressing both decks! N.B.

Answer to Test Case 368

— see page 709 —

ing video heads indeed! You cannot boost a video head. But some compensation for the loss of inductance as the heads wear can be achieved by reducing the recording current. This is a temporary measure only, because the probability of further wear occurs. And once the playback inductance is also impaired there's no alternative to fitting new upper drum. On two occasions the previous dealer had reduced the luminance writing current in order to get the best from the deteriorating heads. The new, highly-inductive heads called for a much greater writing current than the old worn ones, but Sherlock had not checked and reset the luminance writing current after replacing the video

head assembly. With the adjustment made correctly, the Panasonic VCR's recordings played back as well as the test tape.

The moral of this story is always to check the recording current after fitting new heads. This is important even where the presets haven't been disturbed. The optimum current depends to some extent on the characteristics of the individual heads. The new ones may not be identical to the originals when they were new. The same applies with rotary hi-fi audio heads, while with a stationary (longitudinal-track) audio head it's essential to check the bias level after replacing the head assembly.

It turned out that the one VCR whose drum Sherlock had previously replaced was a later type with no provision for manual adjustment of the recording current.

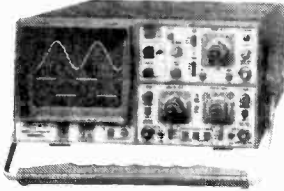
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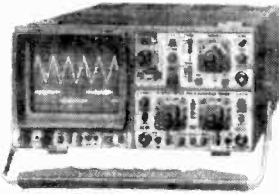
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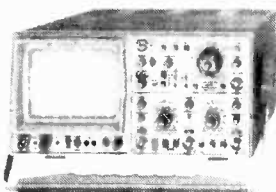
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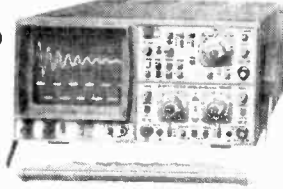


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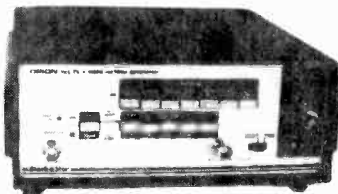
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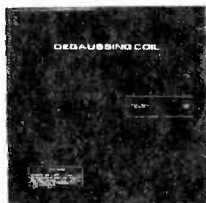


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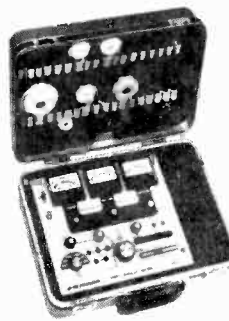
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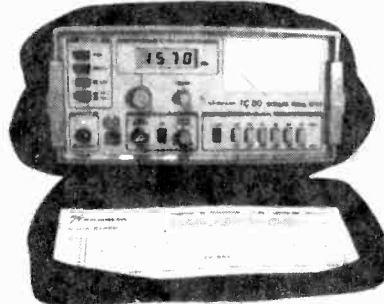
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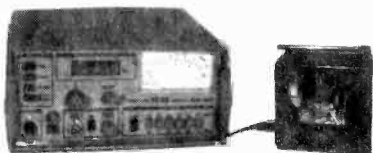
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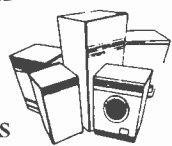
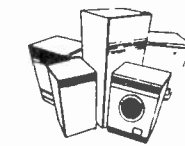
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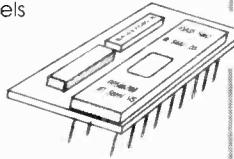
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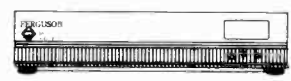
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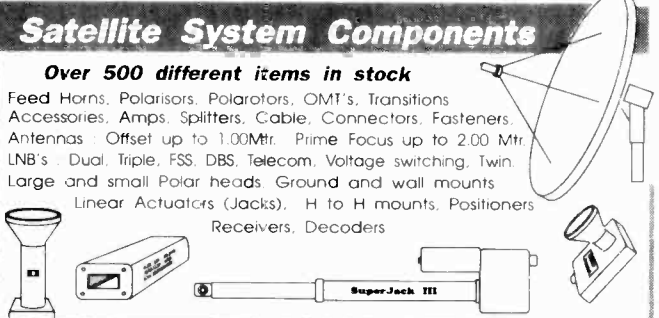
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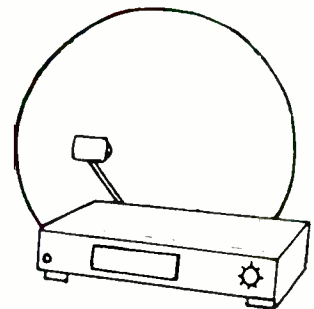
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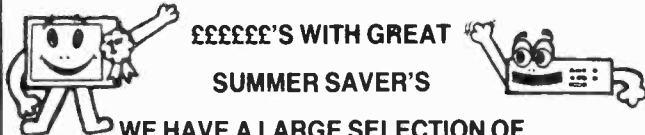
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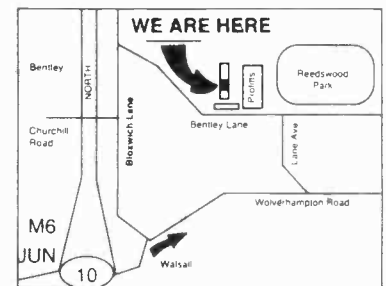
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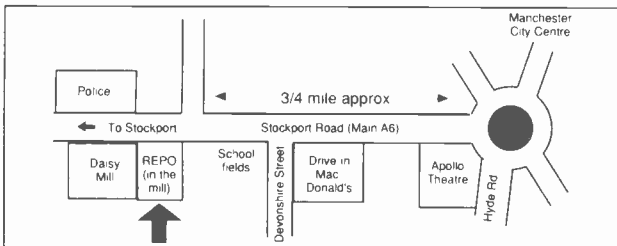
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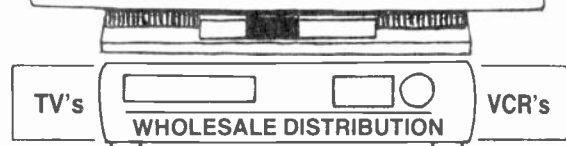
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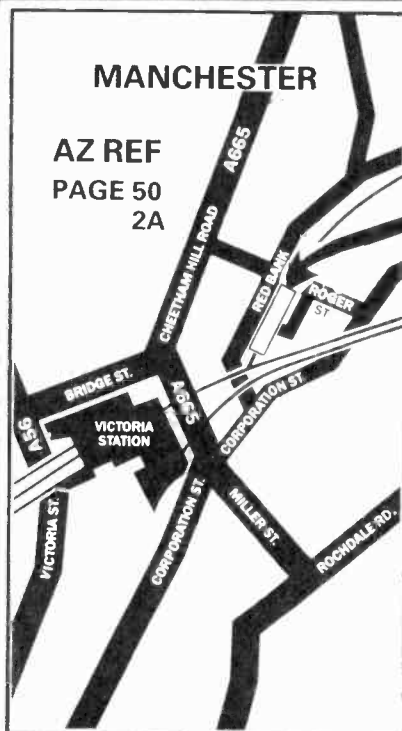
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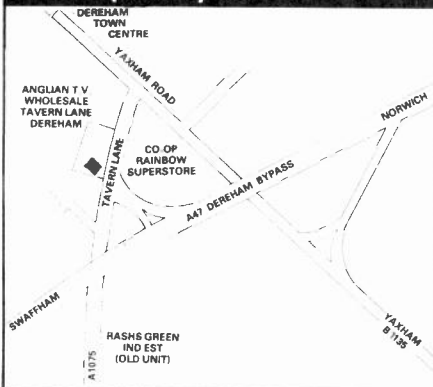
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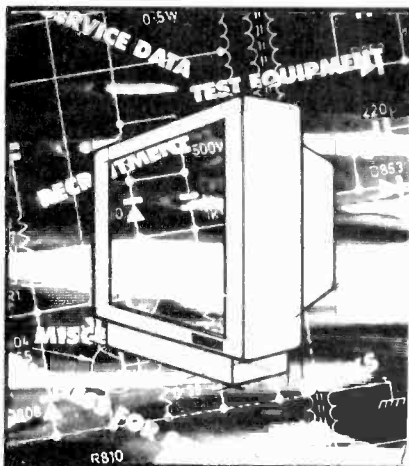
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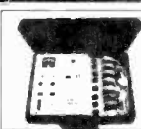
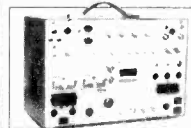
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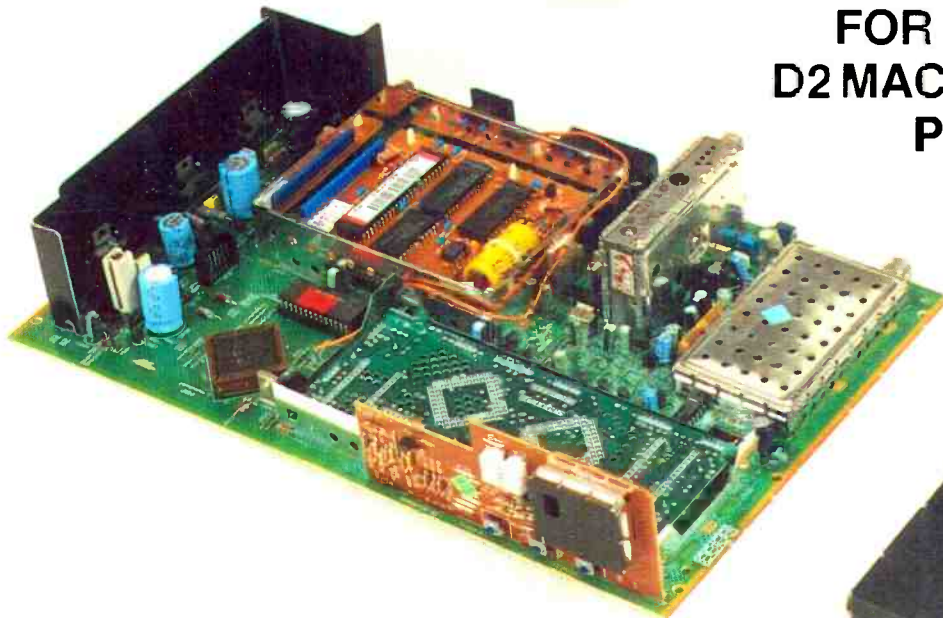
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