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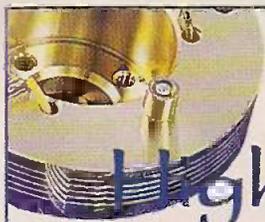
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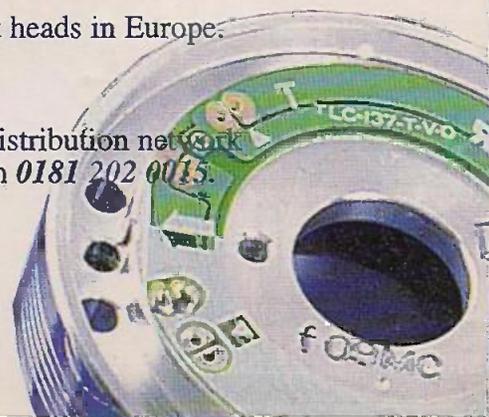
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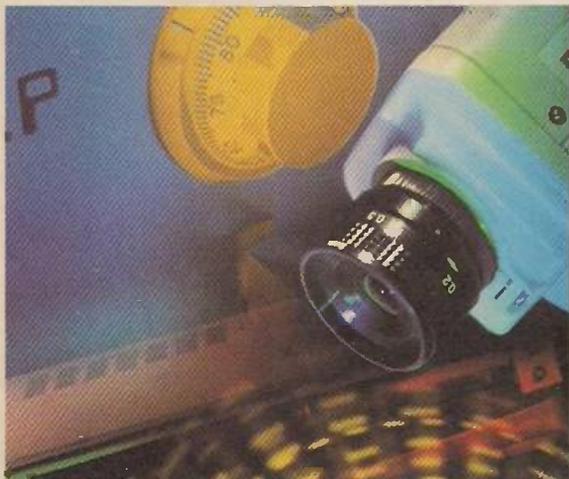
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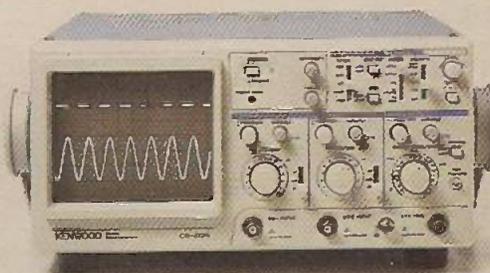
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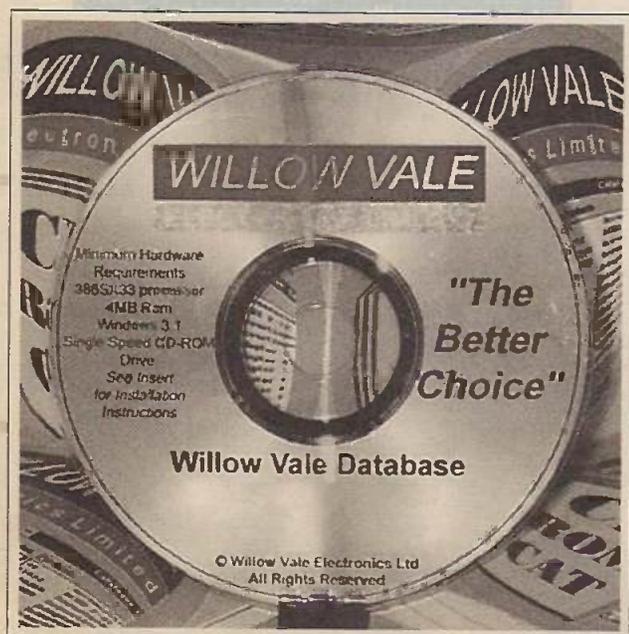
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# A Link with the Past

The death of Tony Bridgewater on February 28th, at the age of 89, breaks a link with the earliest days of television. His distinguished career in television engineering started with work on the Baird 30-line mechanical system. As a boy, he had built crystal and then valve radio sets. He subsequently undertook training in telegraphy, and at the age of 18 went to sea as a wireless operator. After that he worked for the Post Office on high-power transmitters. Then, in 1928, he started to work with Baird and was involved in many of Baird's early TV demonstrations.

This led to the first experimental TV transmissions, using a BBC medium wave transmitter after normal radio broadcasting had closed down for the night. There was limited bandwidth of course and to start with, the pictures and the accompanying sound couldn't be transmitted simultaneously – they couldn't be synchronised either. So the transmissions consisted of alternating two-minute periods of vision and sound. Nothing of entertainment value, but at any rate a start.

In 1932 the BBC took over full responsibility for the experimental TV broadcasts and Tony Bridgewater, with two other engineers, joined the Corporation. He went to work at the newly built Broadcasting House in Portland Place, and was in charge of the studio team when the BBC started regular TV transmissions from Alexandra Palace in 1936. By then Baird's system had evolved to 240 lines, while EMI had developed an electronic camera, the

Emitron, and the famed 405-line system. In retrospect, it's amazing what was achieved, with minimum funding, during those years in the early Thirties. The foundations of TV broadcasting as we know it today were being laid.

One of Tony Bridgewater's early achievements was the first major outside TV broadcast, when the Coronation procession of George VI was televised as it passed Hyde Park Corner in 1937. This was significant since early TV camera tubes were very insensitive, relying on high studio light levels. But by now the Super-Emitron camera tube had arrived, which was fifteen times more sensitive than the initial Emitron. The broadcast also used a new mobile control room that had been delivered by EMI only days beforehand. Apparently the equipment played up, and the story is that the proverbial thump was required to get it back into action in time as the procession approached. But again it was a start, and soon the boat race and other events were being broadcast regularly – to those 15,000 or so TV sets that were in use in the late Thirties.

TV transmissions from Alexandra Palace ceased on September 1st, 1939: it was felt that the transmitter might have been of help to the German air force for direction-finding purposes. Tony Bridgewater served in the RAF during the war years, working on radar. He returned to the BBC at the end of the war, and assisted with the restart of TV in time for the Victory Parade in June 1946.

From 1946-1962 Tony Bridgewater

was engineer in charge of BBC outside broadcasting. There were many significant events: the Olympic Games; the first cross-channel TV transmission; the Queen's Coronation and her first Christmas TV broadcast from Sandringham; and the funeral of Sir Winston Churchill. During this time Tony Bridgewater organised the first broadcasts from a submerged submarine and from an aircraft in flight.

In 1962 Tony Bridgewater was made Chief Engineer of the BBC. He was involved in the start of BBC-2, which meant UHF transmission, the increase to 625 lines and the start of colour TV in the UK. He retired in 1968, but continued to be involved in various aspects of TV. He was active in the Royal Television Society, being its Honorary Treasurer for twenty years and its Chairman of Council. It was only natural that he would be a founder member of the RTS History and Archives Group.

It is extraordinary that one man's work life should have covered virtually the whole of TV development, from the flickering images of the early experimental days to superb quality colour pictures transmitted at UHF. When he started with Baird, TV was wholly mechanical – Baird didn't even have a video amplifier initially. By the end of Tony Bridgewater's active career TV was moving towards solid-state circuitry. Digital TV was yet to come, but Tony Bridgewater played a part in most of the major developments in TV engineering. He was awarded the OBE in 1965.

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2SC1959	0.18	7407	0.89	BC372	0.16	BF470	0.34	BU147B	1.59	MIE1300S	0.86	TA7281P	3.20	TDA2611A	4.27	TP2732	10.05
2SC2001	0.23	74HC04	0.34	BC346A	0.11	BF471	0.37	BU147B	1.59	MIE18004	2.06	TA7281P	5.97	TDA2611A	5.98	UC2898	2.40
2SC2023	3.18	7805	0.78	BC547	0.11	BF759	0.38	BU147B	1.59	MIE30055T	0.74	TA8201	3.93	TDA2611A	12.02	UC3342	1.46
2SC2060	0.30	7806	0.72	BC547A	0.84	BF763	0.23	BU147B	1.59	MJE340	0.45	TAB205AH	4.50	TDA2611A	1.54	UC3844	1.20
2SC2078	1.80	7809	0.88	BC547B	0.11	BF788	0.38	BU147B	1.59	MJE8004	2.85	TAB207	2.74	TDA2611A	2.55	UC3844M	1.91
2SC2120	0.23	7812	0.52	BC548	0.06	BF869	0.25	BU147B	1.59	MN650	3.30	TAB210AH	4.10	TDA2611A	2.57	UC3844M	3.40
2SC2230	0.55	7815	0.82	BC548A	0.11	BF869S	0.48	BU147B	1.59	MPSA06	0.53	TAB210M	4.79	TDA2611A	1.84	UC1318AV	3.05
2SC2235	0.36	78L05	0.35	BC548B	0.06	BF871	0.41	BU147B	1.59	MPSA42	0.23						

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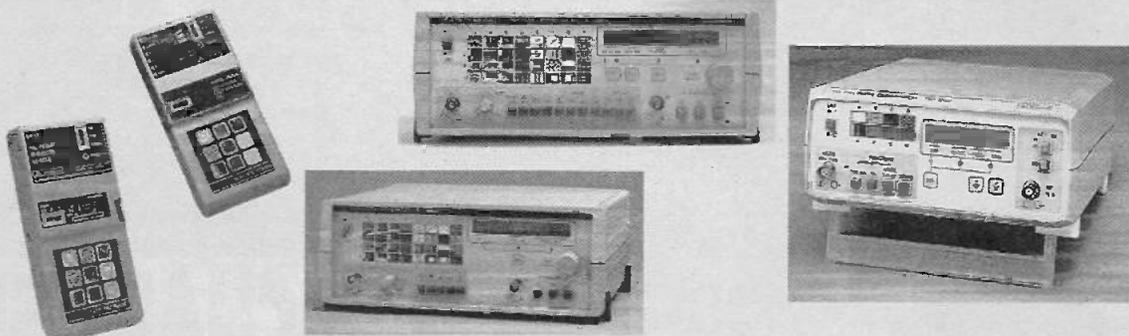
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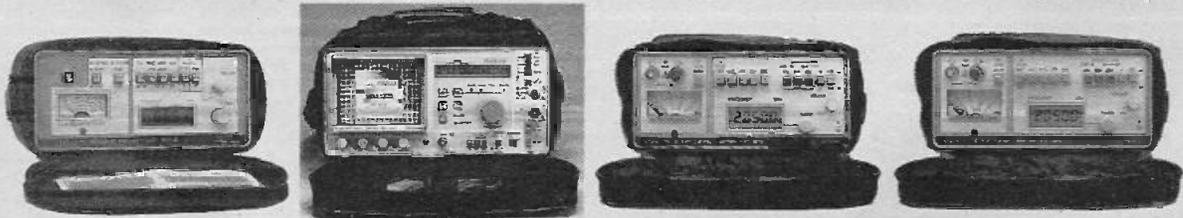
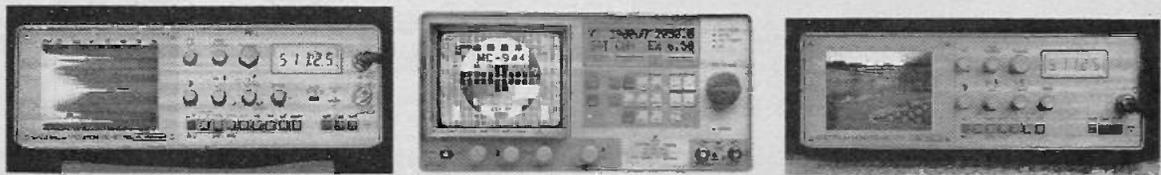
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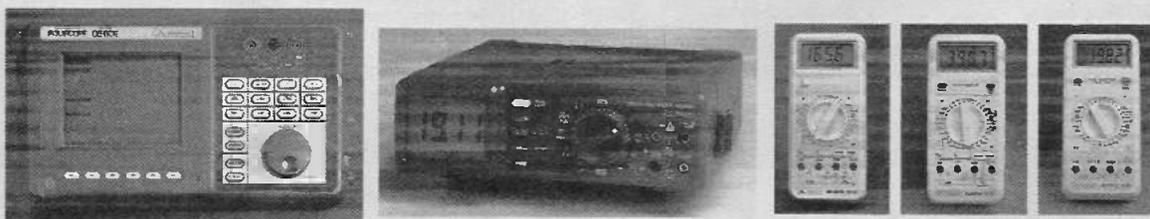
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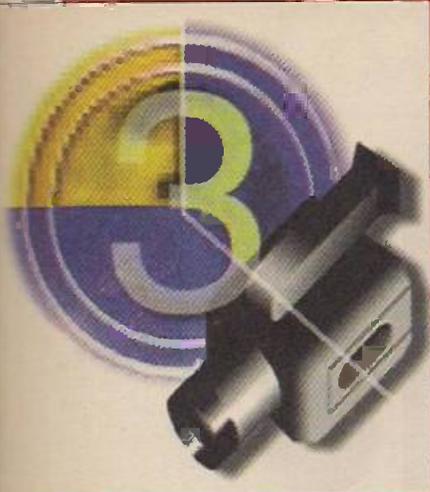
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### JVC GFS1000

The complaint was that this camcorder would shut down intermittently in the record mode. It did so in the playback mode as well, because the cause of the trouble was dry-joints at R15 in the drum motor drive circuit. The board concerned is mounted above the tripod base and is subject to stress. **S.B.**

### JVC GRAX10

The scribbled fault report said that the picture was out of focus and the sound was too quick. When we tested the machine there was severe capstan motor warble in the playback mode. We decided to tackle this first, and it took some time to narrow the cause of the problem down to a defective capacitor, C116, which decouples the servo non-linear filter to a reference source. Adjusting the viewfinder's optical focus control cured the out of focus picture. **S.B.**

### JVC GRS707

The customer couldn't eject tapes and said that the rewind button was slow to respond. This camcorder's eject function is routed through the main operations panel, and as this is a single unit it had to be replaced. Both faults were then cleared. **S.B.**

### JVC GRM3

There was no camera operation though playback was OK. Obviously a camera head fault. The head has a DC-DC converter module/IC, DD1. Fusible resistor R85 in the feed to this

# Camcorner

IC was open-circuit. So it seemed that the chip was faulty. Did it die or was it killed? We shall never know: a replacement IC and resistor restored normal operation. The repair was not an easy one.

There's an interesting anomaly with this model. To operate the autofocus and zoom while service testing, the EVF and the T/W zoom switch must be connected at power up – otherwise the functions don't operate. **S.B.**

### JVC GRS707

Circuit protector CP204 had failed. The replacement held OK until the camera head was reconnected. We eventually traced the cause of the failure to C122 on the YC board – it was leaky. **S.B.**

### Sharp VLE31

A clicking sound from within when the mechanism was operating was the complaint with this camcorder. The offending noise came from the head drum. My first thought was that a foreign body might be lodged between the upper and low drum, but on investigation I found that one of the small screws on the upper drum was loose and was fouling against the lower drum. All was well when the offending part had been adjusted and secured. **D.C.W.**

### Panasonic NVS6B

The reported fault was no digital functions, all other operations being OK. The cause turned out to be a faulty switch on the camera operation assembly (part no. ESU39013).

It's not unusual for one function only to fail with this type of assembly. You get similar problems with other Panasonic models that use similar membrane-type units. **D.C.W.**

### Samsung VPE807

No camera E-E picture with playback OK is a common fault with this model. It can usually be cured by removing and replacing the lithium clock battery. We've never had one come back for a more serious repair after doing this. **D.C.W.**

### Ferguson FC08

We don't see many of these camcorders nowadays. This one had a fault that was always common with them, a poor viewfinder picture. For some reason JVC, which had always provided good viewfinder pictures with previous models, slipped up with this one.

The thing to do is to remove the 'blue' substance around the CRT base and pins. This will usually brighten up the picture to an at least acceptable level. It may still not be considered up to scratch however. The later Model FC28 didn't suffer from this problem despite the fact that its EVF is very similar. **D.C.W.**

### Sanyo VARS12B Adaptor

If one of these units fails to operate, check whether limit resistor R5104 is open-circuit. As yet we have found no external cause for this resistor's failure, nor have any units been returned after its replacement. **D.C.W.**

### Panasonic WVCL350 Camera

These cameras often fail to produce a picture because C52 (100 $\mu$ F, 16V) on the power supply PCB has dried out and fallen in value. In this situation you'll find that the voltage on the 5V line is slightly low.

Although this is the only electrolytic capacitor that normally fails on PSU board, we usually replace the others as well. They all run rather 'warm'. **D.C.W.**

### Canon UC15E

We were told that this camcorder's cassette housing was permanently open. When we powered it the housing closed, but when a cassette was inserted the housing again refused to close. The cause was failure of the drum to rotate. An inspection showed that there were dry-joints at the upper drum commutation PCB's connections. It's always worth checking for faulty connections on this board: we've had other faults – for example no FG pulses etc. – that were caused by this problem. **D.C.W.**



# Simple video security system

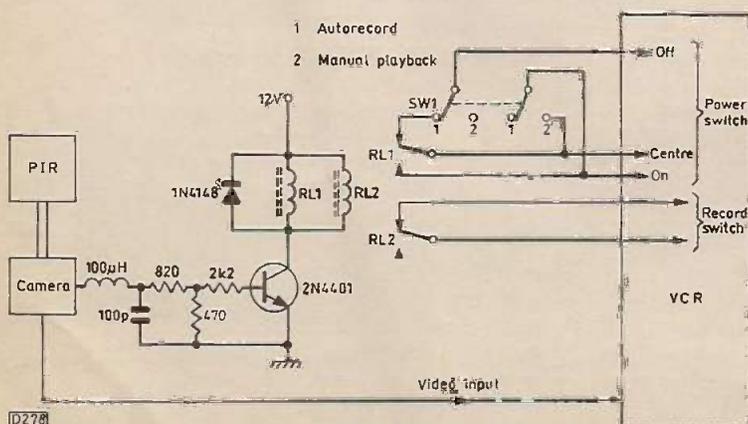
**Denis Mott** describes a video surveillance system that triggers a VCR to provide evidence of the presence of intruders

**D**uring the past two years my home has been attacked by burglars on three occasions, despite PIR flood lights, steel bars on some windows and the obvious burglar alarm. It seems that the modern thief is not deterred by such measures, especially when his aim is to obtain money for the next fix. So I decided that if I can't keep them out, why not try to identify the fellows instead? There were three aims in the system described in this article: simplicity, low cost and reliability.

## Equipment Required

Maplin market a range of security cameras, in kit form or complete, all using the latest CCD technology. I chose the monochrome type AY16S, which is a CCD module that requires a 12V supply at 175mA. Its output is 1V peak-to-peak composite video at 75Ω. The module also has six infra-red LEDs that illuminate the immediate area, giving a good image in total darkness. To reduce the power requirement, in the application described here the IR diodes were removed.

Fig. 1: Single-camera system.



I needed a two-camera system, one to cover the back of the house and another for the front, each triggered by a PIR. This would automatically switch on a VCR while either PIR is in use.

A VCR with all-electronic control is required – the older mechanical types are not suitable. I used a Sharp VC381. The modifications it requires are described later.

## Circuit Description

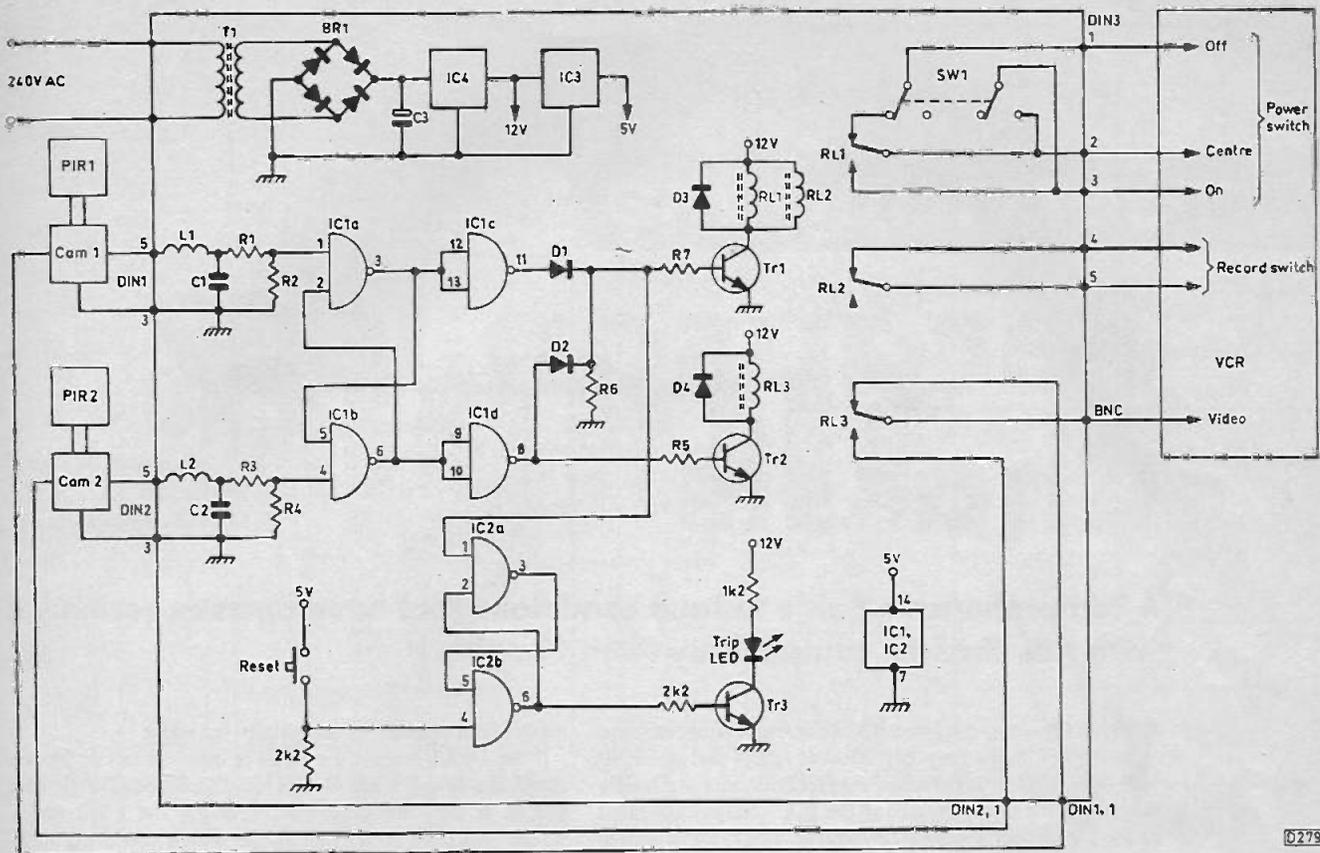
The circuit shown in Fig. 1 is for one camera. It has two relays, one to control the VCR's power switch and the other as a record switch override. SW1 enables the system to be overridden to allow manual control of the VCR for playback viewing.

Fig. 2 shows a two-camera system. TTL logic is used, though CMOS could be used for simplicity. IC1a and b are arranged as a set/reset flip-flop, selecting whichever camera is active. The supply to IC1/2 is reduced from 12V to 5V by IC3. The outputs from the flip-flop are inverted then fed to a two-diode or gate (D1 and D2). The output from this switches Tr1 on, energising RL1 and RL2 to power the VCR and activate the record mode. If camera 1 is activated, the output from IC1a inhibits IC1b. The opposite occurs when camera 2 is activated.

Tr2 is activated from camera 2, operating relay RL3 to switch over the VCR's video input.

An additional pair of IC gates (IC2a and b) operate a visual indicator to show if the system has been activated. This is a refinement and is not necessary. As in the single-camera circuit, SW1 overrides the controller circuit to enable the VCR to be manually operated.

Further cameras could be added, though this complicates the logic and video switching chips instead of a relay would be required to select the video source. Fig. 3 shows a possible arrangement with a PIC54



D279

microcontroller replacing the previous logic circuitry. Relays are still required for simple VCR control.

**VCR Modifications**

As mentioned earlier, I use a Sharp VC381 in my system. It was modified as follows. First the power switch. Remove the front control panel to gain access to the control switches. Cut the track to the closed contacts when the switch is off (these contacts enable the VCR to power up in the timer mode). Connect two wires to the normally-open contacts and one wire to the unswitched side of the cut track. Then simply solder two wires to the record switch.

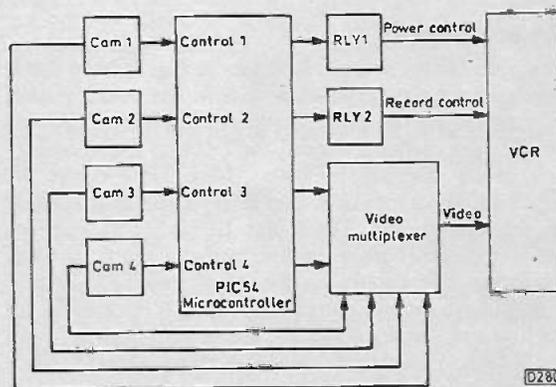
Although I've not tried the controller arrangement with any other VCR, the control method should be the same for most of them as they all use strobe signals from a microcontroller chip to detect switch states.

**Operation**

To make connection easy, I use 5-pin DIN plugs and sockets for the connections to the control box. To trigger the camera select logic, a twin screened cable comes from each camera. This carries the video signal and 12V from the camera's internal power supply. Thus each time a camera is powered from the PIR the select logic is activated. The VCR comes on in the record mode, taking about three seconds to lace up. At power off the VCR shuts down in the normal way and the tape is unlaced.

One desirable item is a date/time code generator to provide evidence for legal purposes. Because of the complexity however the development of this will take some time. If any reader has an already developed circuit that could be added, I would appreciate details.

The system in its present form has been in operation for many weeks now, with an average of four triggerings a night. Up to now the local cats and a dog have been all that we've seen, but it is comforting to know



D280

Fig. 2: Two-camera system.

Fig. 3: Suggested arrangement with four cameras.

that the system works reliably.

**Construction**

The project was designed and built in a hurry, so I used Veroboard for the circuitry involved. If there is sufficient interest, a PCB and/or a kit could be made available. ■

**Parts list for the two-camera control unit**

R1	820Ω	R4	470Ω	R7	2.2kΩ
R2	470Ω	R5	2.2kΩ	R8	2.2kΩ
R3	820Ω	R6	2.2kΩ	R9	2.2kΩ
All 0.5W					
C1, C2	100pF, 50V	D1-D4	1N4148		
C3	1,000μF, 25V	Tr1-3	2N4401 or similar		
		IC1-2	74LS00		
		IC3	7805		
		IC4	7812		
		BR1	50V bridge rectifier		
RL1-3	12V miniature single-pole changeover relays				
T1	12V, 12VA mains transformer				

## Servicing the

# Ferguson ICC7 Chassis

A comprehensive guide to fault conditions that have been experienced with this chassis, compiled by **John Coombes**

The Thomson-designed ICC7 chassis first appeared in the UK in the Ferguson Models A51N and A59F, in late 1991. It superseded the ICC2 chassis. An article describing the circuitry used in the ICC7 chassis appeared in the December 1993 of *Television*. The present article summarises our fault experiences to date.

### Power Supply

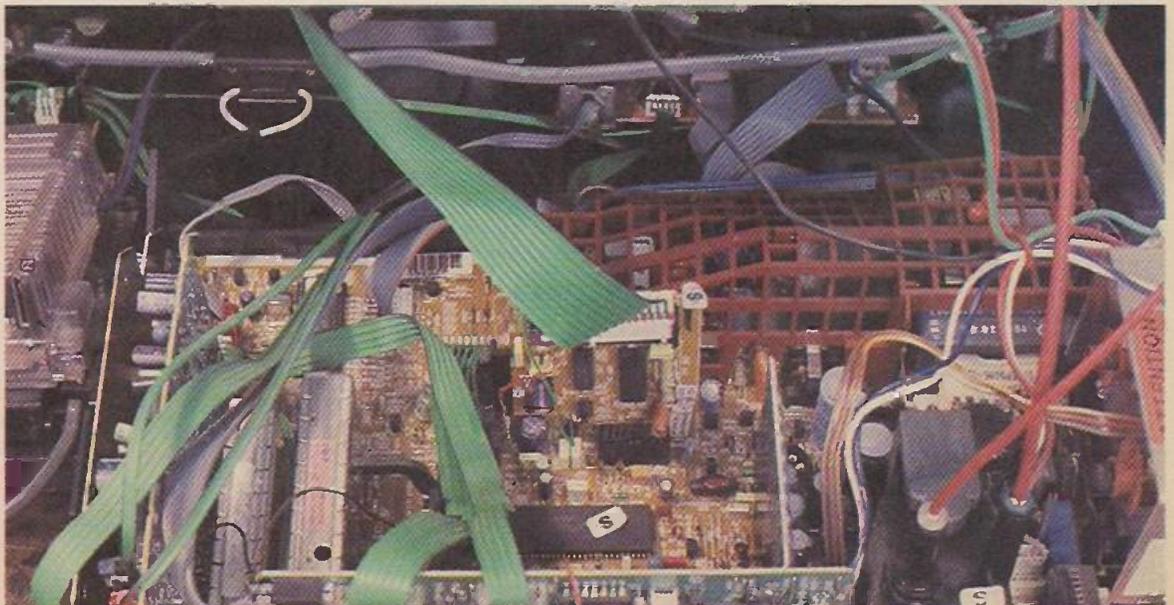
The power supply circuit is shown in Fig. 1. Note that it uses a master-slave regulation system. The master control is provided by the error amplifier transistor TP53 and pulse-width modulator transistor TP54 on the secondary side of the circuit. The output from TP54 drives the TEA2261 slave regulator chip IP01, on the primary side of the circuit, via TP69 and LP42. TP54 receives integrated pulses from the line output stage at its base, while the 13V supply for the emitter of TP53 is also derived from the line output stage. IP01 is responsible for start-up and standby operation. Because of this, you can't use a dummy load (bulb) to test the power supply: since the line output stage will be out of action, the power

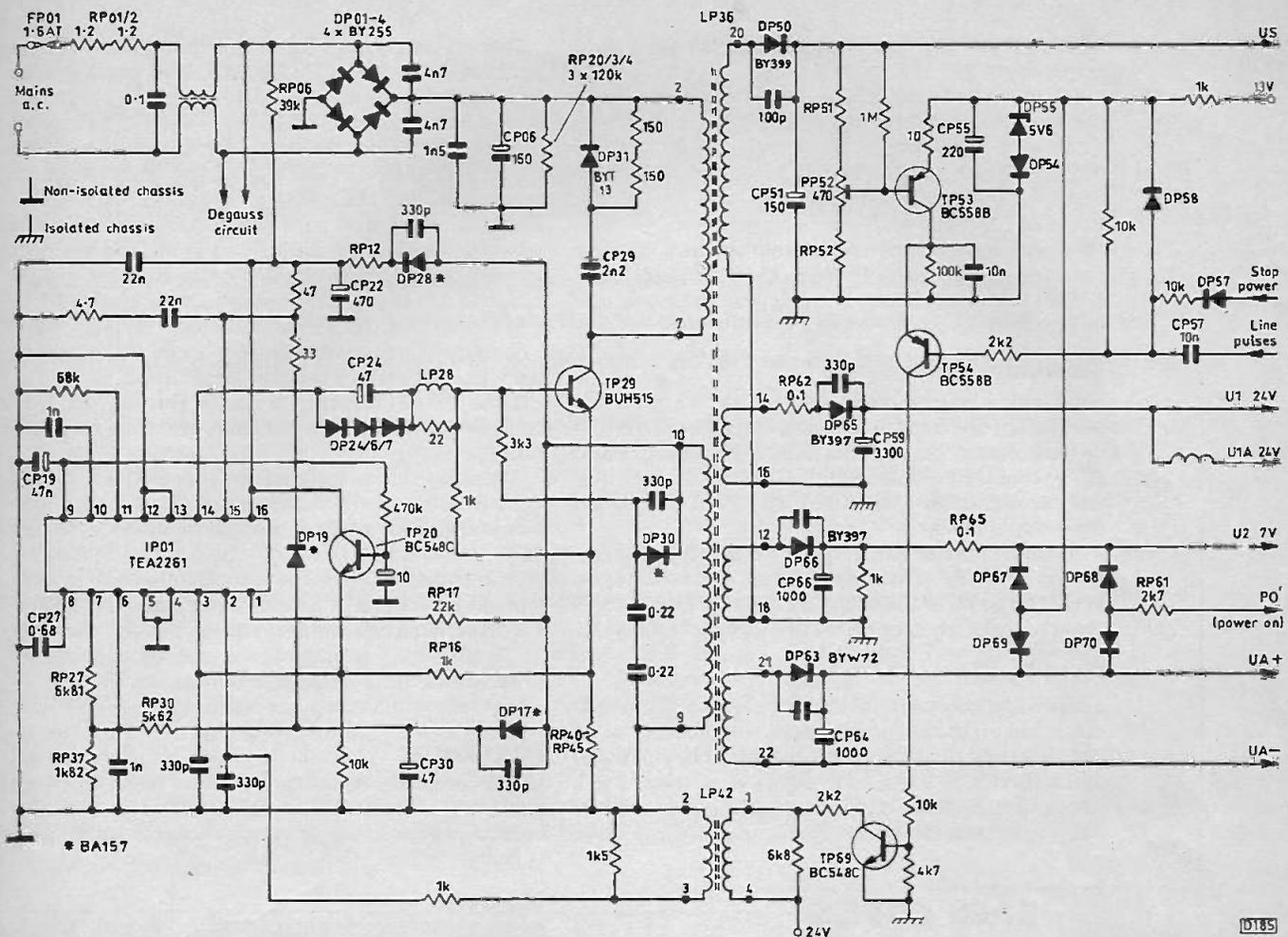
supply will operate in the standby mode.

If the 1.6AT mains fuse FP01 is open-circuit or blown, check the four BY255 bridge rectifier diodes DP01-4 for shorts. If they are short-circuit, check the 1.2Ω surge-limiter resistors RP01 and RP02 which could be open-circuit. If the bridge rectifier circuit is OK, check whether the BUH515 chopper transistor TP29 is short-circuit. If it is, you may have to replace IP01 as well to prevent TP29 going short-circuit again. Also replace CP29 (2.2nF) in the snubber network. CP29 can be responsible for repeated failure of TP29. Other possible causes of a dead set with FP01 open-circuit are the BY399 HT rectifier DP50 and the PH9135 degaussing thermistor RP05.

If the set is dead because the power supply doesn't start up, check for voltage at pins 15 and 16 of IP01. No or a low voltage here could mean that the start-up resistor RP06 is open-circuit or high in value. Alternatively DP28 (BA157) could be short-circuit or leaky, IP01 shorted internally or CP22 (470μF) faulty.

If the primary side of the power supply is OK, check the voltages produced by the various rectifiers on the





secondary side of the chopper transformer LP36.

DP50 and CP51 should produce 145V for the line output stage (155V in models fitted with a planar CRT). Check whether DP50 and/or CP51 is short- or open-circuit.

DP65 (BY397) and CP59 should produce 24V. This supply is used by the line driver stage, so its absence will mean no line output stage operation. The usual fault here is that RP62 goes open-circuit, possibly because DP65 has gone short-circuit.

DP63 and CP64 provide  $\pm 30/40V$  supplies for the audio output circuitry (voltage depends on whether mono or stereo).

DP66 and CP66 produce a 7V supply which is used primarily by the text board.

If all these supplies are correct, it may be necessary to check for short-circuits in the line and/or field output stages.

Failure of the BA157 rectifier DL09 that produces the 65V supply for the field output stage can be responsible for a dead set without tripping. It's in the line output stage. Another cause of a dead set without tripping is failure of the TDA8178F field output chip IF01.

If the set starts to work but does so for only a short period, check the DC conditions around TP54 – there should be 5.9V at its emitter, 5.5V at its base and 0.5V at its collector. TP54 may be faulty – check by replacement. IP01 (TEA2261) can be responsible for intermittent no results. Check by replacement. Another possible cause is CV01 (220 $\mu$ F). Again check by replacement.

Common causes of tripping are failure of the 5.6V zener diode DP55 or the BA157 diode DP17 which, with CP30, produces the error voltage input for IP01 (at pin 6). Other possible causes are DF16 (BA157) in the field output stage

and the BSR51 line driver transistor TL17 being short-circuit – either can also cause the dead set symptom.

### Stuck in Standby

When the power supply starts up but stays in the standby mode the usual cause is a faulty BUH515 chopper transistor (TP29) and/or CP29 (2.2nF) in the snubber circuit. Check them by replacement. If still in trouble, check CP30 (47 $\mu$ F). Another possibility is loss of TP54's base drive: in this case RL11 (15 $\Omega$ ) could be open-circuit or DL11 (BA157) short-circuit.

If the power supply appears to be OK, check the TA8659/CN chip IV01 by replacement. This IC incorporates the colour decoder and timebase generator sections of the receiver.

Another possible cause is the microcontroller circuit. Check whether the 8MHz crystal QR01 is operative. There should be oscillations at pins 31 and 32 of the microcontroller chip IR01. Either IR01 (type varies with model) or QR01 could be faulty. Another possibility here is TR76 (BC558B).

### The Line Timebase

The line output transistor TL19 (type 2SD1546 or S2000AF) could be faulty if the receiver starts up then stops. Other things to check in the line timebase for the dead set symptom are RL21 (value varies with tube type) in TL19's base circuit; the BSR51 line driver transistor TL17 which could be short-circuit; and DL17 and DL18 (both type 1N4148) in TL17's base circuit. Check RP62 (0.1 $\Omega$ ) in the power supply – it could be open-circuit; and DF16 (BA157) in the field output stage.

Dry-joints on LL19 can kill TL19.

**Fig. 1: The chopper power supply circuit used in the Ferguson ICC7 chassis.**

IV01 (TA8659/CN) is suspect if there is no line drive output at pin 39.

You might find that CL21 in the EW modulator circuit has burnt and gone short-circuit, damaging the PCB, with TL19 also short-circuit. If so replace CL21, CL16 (0.22µF), RL21, and TL19 (use a 2SD1546), and change RV01 in the protection circuit from 4.7kΩ to 5.6kΩ. The values of CL21 and RL21 vary with tube type.

Suspects in the event of intermittent line timebase operation are TV01 (BC558C), TV02 (BC548C) and DV08 (13V zener diode). The only way to be sure is to replace them.

### Geometry Faults

For faulty EW correction with the width control not working the best thing to do is to check IG01 (TDA4950) by replacement. Zener diodes DL48 (10V) and/or DL41 (2.7V) could be leaky or DG01 (8.2V) faulty – check it by replacement. Other possibilities are PG06 (470kΩ) and dry-joints at LG08.

For faulty NS correction, check whether LG84 is dry-jointed or RG87 (2.2Ω) open-circuit, the condition of PG79 (1kΩ), TG76 (BC557B) and TG84 (BD137) which could be leaky, short-circuit or dry-jointed.

### Field Faults

The obvious suspect for field collapse is the TDA8178F output chip IF01, but the symptom will probably be no results. Check DF16 and DF17 (both type BA157), also DF18 (BAV21). If the 65V supply is missing, check whether DL09 (BA157) is open- or short-circuit or CL09 (47µF) short-circuit.

There could of course be no field drive pulse output at pin 31 of the TA8659/CN chip IV01. If so, check that the 13V supply is present across CL14 (1,000µF). No voltage here means that DL13 (BY397) is open-circuit. IV01 could be faulty, but the field drive circuitry should be checked first. RF03 (680Ω) could be open-circuit, or transistors TF25 (BC548B) or TF08 (BC548B) faulty. There should be drive pulses at the base of TF25, and a sawtooth waveform at the base of TF08. The sawtooth waveform depends on the 200V supply being present across CL11 (10µF). If it's missing, check whether RL11 (15Ω) is open-circuit and/or DL11 (BA157) is shorted.

Another thing to check is the plug-socket connections to the scan coils – which could be open-circuit.

If the TDA8178F chip is faulty you can get field collapse followed by the trip mode or the set switching off.

When this chip is replaced you may find that there's field foldover. In this case check the 4.7Ω surface-mounted resistor which is marked on the PCB as link J238.

Other causes of field foldover are DL09 and DF16 (both type BA157), either of which may be leaky, and IF01.

If there is picture shrinking at the bottom, transistor TF25 (BC548B) is suspect – it may be clipping the sawtooth waveform at the base of transistor TF08.

Incorrect field linearity can also be caused by TF08.

### Poor Focus

Check for good connection at the lead to the tube base panel and that the focus control PT01 is operating correctly with no arcing. It's always possible that the CRT is faulty.

### No Sync

Check whether the coupling capacitor CV37 (2.2µF) is open-circuit. If it's OK, IV01 is probably faulty.

### No Video

For loss of the luminance and chrominance (a blank raster), check DL42 (1N4148) which could be shorted.

### No Colour

The 4.43MHz crystal QC66 can be responsible for this symptom, also of course the TA8659/CN chip IV01. In some ICC7 series sets there's an S video switch: if it's in the S position, there will be no colour.

For no colour via the scart socket, check CC58 (470µF) and LC47.

For loss of one colour, check the relevant BF422/BF423 pair – TT07/TT12 for no red, TT17/TT22 for no green and TT27/TT32 for no blue. IV01 could also be the cause.

### Tuning Drift

Check the 33V stabiliser DH04. If this is OK, the tuner unit is suspect.

### Sound Faults

Sets with stereo sound have two TDA2030A audio output chips. If there is no sound, check that their LT supplies are present – they are produced by DP63 (BYW72) and CP64 in the power supply. If only one channel is present, check the relevant TDA2030A chip then back through IS04 (TDA6200). For Nicam sound problems check IS03 (CF70123).

### 'P' on Screen

On odd occasions the letter P may appear at the centre of the screen. This is a very intermittent fault. The microcontroller chip IR01 is responsible. ■

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# Help Wanted

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department - do not write to or phone the advertisement department about this feature.

**Wanted:** Back cover, volume control knob and speaker for the pre-war HMV Model 904 radio/TV receiver, also operating instructions for the Fifties Beamec CRT tester/booster and an audio head for the Sanyo VHR3100E VCR. Robin Howells. Please leave message with Clive on 01384 872 744.

**Wanted:** Service manuals for the Luxman K230 cassette recorder and the Tandy Realistic open-reel tape deck TR3000, Model 14-700. Good photocopies OK or will copy and return originals. All reasonable costs reimbursed. Dr. C.N. Barnes, Glebe Farmhouse, Billington, Stafford ST18 9DQ. 01785 780 164.

**Wanted:** Service manual (photocopy OK) for the Nicolet 3091 digital storage scope. David Lacey, 7 Green Leach Avenue, St. Helens, Lancs. 01744 753 072.

**Wanted:** Service information and operating instructions for the Philips 22DC670 car radio, and suggestions to cure VHF/FM search running through. Also circuit for the Akai CSF110 cassette deck. Ken Dominney, 7 Chestnut Close, Eastbourne BN22 0SZ. 01323 500 174.

**Wanted:** Standby transformer for the Matsui Model 1460 CTV, also a side chassis (L) assembly (part no. 7395241) for the Hitachi VT88E VCR.

Jim Lynch, WIES, Old School, Balivanich, Benbecula HS7 5LA. 01870 602 035.

**Wanted:** Switching regulator board for the JVC Model HRC-C3E VCR. Scrap machine or BA1632 IC chip would be helpful. Chris Johnson, 7 Dryden Road, Scunthorpe, N. Lincs DN17 1PW. 01724 855 997.

**For disposal:** Type 551 oscilloscope in good condition, £35. F. Nedza, 40 Brynhyryd, Glynneath, Neath SA11 5BA. 01639 720 429.

**Wanted:** Sound IF module for the JVC C140EG portable (European model), also a circuit diagram or 29-pin module (UK version). Someone has tried to

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TK99	KT40	BA718	1.80	M5454L	2.99	STR13030	8.00	TD42633	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13031	8.00	TD42634	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13032	8.00	TD42635	9.00
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TK99	KT40	BA718	1.80	M5454L	2.99	STR13057	8.00	TD42660	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13058	8.00	TD42661	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13059	8.00	TD42662	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13060	8.00	TD42663	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13061	8.00	TD42664	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13062	8.00	TD42665	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13063	8.00	TD42666	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13064	8.00	TD42667	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13065	8.00	TD42668	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13066	8.00	TD42669	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13067	8.00	TD42670	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13068	8.00	TD42671	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13069	8.00	TD42672	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13070	8.00	TD42673	9.00
TK99	KT40	BA718	1.80	M5454L	2.99	STR13071	8.00	TD42674	9.00
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convert the sound strip but has broken one of the adjusters. Two 6MHz filters are fitted, but there are four places to fit them and I'm not sure whether they are in the correct position. Only a loud buzz can be obtained. Brian Milne, 22 Aldwych Place, Blackburn, Lancs BB1 9QP. 01254 246 127.

**Wanted:** Service manual (photocopy OK) for the Period Hi Fi tuner/amplifier Model ST202/PHF8/11. M.L. Richardson, 20 Dale Close, Skegby, Sutton-in-Ashfield, Notts NG17 3AF.

**Wanted:** Circuit diagram (photocopy OK) for the Goodmans 3250 hi-fi system. Mike Wade, 89 Porthcawl Green, Tattenhoe, Milton Keynes, Bucks MK4 3AL. 01908 507 574.

**Wanted:** Data on converting the SVA1 VideoCrypt decoder to VideoCrypt 2 operation. V. Stanley, 36, Meadow Court, Littleport, Ely, Cambs CB6 1JW. 01353 862 076, fax 01223 441 249.

**Wanted:** Circuit diagram and any other information (photocopies OK) for the Philips Visiopass 810175X V1-C D2 MAC receiver. W.M. Waldron, 9 Minge Lane, Upton-upon-Severn, Worcs WR8 0NN.

**Wanted:** TV/satellite signal strength spectrum analyser. Ian Broadbent, 125 East Bawtry Road, Rotherham, S. Yorks S60 4LQ. 01709 700 571.

**Wanted:** EHT transformer for the Tektronix 502 scope or photocopy of the manual. M. Humphrey, 45 Broadmead, Tunbridge Wells, Kent TN2 5NE. 01892 541 614.

**Wanted:** Lower drum assembly for the Ferguson FV37H with or without motor. Also service manuals for the JVC video system GXN7E/HRS10EK/TUS10EK and the GEC Model C1401H. Photocopies OK. L. Miles, 32 Waun Wen, Cwmavon, Port Talbot SA12 9TB. 01639 885 027.

**Wanted:** STR4090S IC for a Sharp portable and an old Fidelity ZX2000 power panel with EHT transformer or a PCB adaptor board for Model FCC2015BE. Donald Bills, 69 Greenfields Road, Kingswinford, DY6 8EG.

**Wanted:** Circuit diagram (photocopy OK) for the Lincoln Model 35C and/or help with clearing a field blanking fault (teletext lines at top of picture). J. Magill, 146 West Circular Road, Belfast BT13 3QJ. 01232 719 996.

**Wanted:** Circuit diagram for the Viglen CA1428-LE colour SVGA monitor. A.B. Taylor, 11 Birch Close, North Hykenham, Lincoln LN6 8LR. 01378 876 885 or 01522 680 865 (after 6 p.m.).

**Wanted:** MAB8461P/W002 microcontroller chip (part no. 4822 2091 1013) for the Philips 37CS5690 projection receiver. Andrew Gibson, 96 Argyll Street, Dunoon, Argyll PA23 7NE. 01369 702 147.

**Wanted:** Circuit diagram and any mods for the Skyscan K1 satellite TV receiver. Mr Outen, 2 Heol Vaughan, Burry Port, Dyfed SA16 0HF. 01554 833 024.

**Wanted:** Sinclair Microvision circuit diagram and pin connection details for the 25-way D-type connector in the Olivetti DSM2412C PC colour monitor. G. O'Brien, 105 Roxborough Road, Harrow HA1 1NT.

**Wanted:** LOPT for the Perdio Model P2503 or spares source information. John Stevens, 9 Hodson Close, Whetstone, Leics LE8 6EU. 01162 865 821.

**Wanted:** Panasonic Model TC800 - scrap set or cabinet parts. Also an RC handset for the Akai VS12 VCR. Leon Electronics, 11 Woodend Close, Three Bridges, Crawley, W. Sussex RH10 1RS. 01293 520 536.

**Wanted:** B9G, IO and B8A valve bases for restoration of a 9in. Bakelite-case Bush TV set. Also EF50, EB41, EL42, PY31, PL38, PZ30 and EY51 valves. Colin Boggis, 2 Larks Way, Knaphill, Woking, Surrey GU21 2LB. 01483 476 831, fax 01483 797 893.

**Wanted:** Grundig VS500 VCR, working or not but must be complete. Circuit diagram (photocopy OK) for the Philips Model 37KT2040-25 (K40 chassis). C. Graves, Orchard Cottage, High Street, Spaxton, Bridgwater, Somerset TA5 1BW. 01278 671 225.

**Wanted:** LOPT for the Sanyo CTP3106 (80P B14 chassis). Alan P. Brown, 27 Narronine Drive, Calcot, Nr Reading, Berks RG31 7ZL. 01189 415 553 (evenings/weekends).

**Wanted:** Copy of the SMPS circuit diagram for the Panasonic NVD48. Graeme Duggan, 31 Cresswell Drive, Red House Farm, Gosforth, Newcastle upon Tyne NE3 2SY. 01912 846 471.

**Wanted:** Manual/circuit diagram for the Hikona Model 1437. Also information on the amplifier IC used in the Rotel Model RX500. Tom Breen, 164 Carrigwood, Firhouse, Dublin 24, Ireland.

**Wanted:** Grundig/Philips V2000 type VCR. slimline model preferred. Also a Grundig VS200 VCR for spares. Have a Toshiba V8600B VCR for disposal. P. Woodhouse, 80 Edgehill, Off Brant Road, Lincoln LN5 9TZ. 01522 722 888.

**For disposal:** Vintage Ch. 1 only Vidor TV set, with service data and some spare valves. Model unknown but similar to the CN377. Tube and LOPT good but EHT reservoir capacitor shorted. Free to good home were it can be restored but must be collected. Dave Hawley, 3 Ashfield Court, 113 The Grove, Ealing, London W5 3SN. 0181 567 3672.

**Wanted:** Manual or circuit diagram

for the Toshiba 219V5M multi-standard TV set. S.J. Taylor, 30 Bland Road, Leicester LE3 9PB.

**Wanted:** Service information (photocopy OK) to buy or borrow for the Acer 7156L 15in. SVGA monitor. Also scrap or unwanted unit for spares. Paul Burgess, 19 Wareham Green, Clifford Park Estate, Walsgrave, Coventry, W. Midlands CV2 2JL. 01203 617 671.

**Wanted:** 420DKB22 tube (part no. 2351971) for the Hitachi Model CAP162E (NP8C chassis). Would be willing to buy complete set. Dennis E. Andrews, 91 Victoria Avenue, Bloxwich, Walsall, W. Midlands WS3 3EH. 01922 479 393.

**Wanted:** Source of silica flour glass abrasive powder and advice on CRT face polishing. Also photocopy of the manual for the Tequipment D31 oscilloscope. R.E. Bailey, 22 Grebe Close, Waterlooville, Hants PO8 9UT. 01705 783 811.

**Wanted:** Supplier of spares/service data for the Academy TV Model P1402L. A. Robertson, 261 Warrington Road, Abram, Wigan WN2 5RQ.

**Wanted:** Silver bottom tray for the Matsui VP9301. R. Walker, 50 Blanchland Avenue, Newton Hall, Durham DH1 5XP. 01913 860 779.

**Wanted:** 2SK97 6-pin DIL dual FET for the Sansui AU-X1 amplifier, or current spares source. J.A. Duthie, 3 Whitford Gardens, Mitcham, Surrey CR4 4AB. 0181 646 0255.

**Wanted:** Battery pack type VM-BP21, battery pack type VM-BP22 and character generator type VM-CG20E for the Hitachi VM500E camcorder. R.W. Goad, 7 Chipstead House, Chipstead Road, Cosham, Hants PO6 3JJ. 01705 382 918.

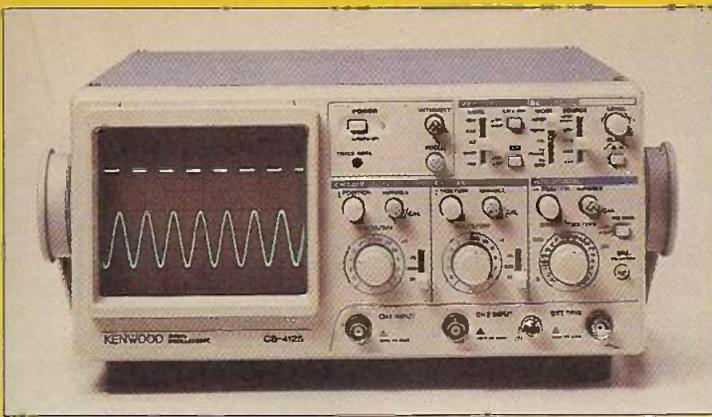
**Wanted:** LCD module for the Sony ICF2001 radio. According to the manual the part no. is 1-548-129-00, but the board is marked 1-548-129-21. There is also a Sharp part no., S-801151. A non-working radio might be the answer. Eddie Jones, Roseacre, Llanteg, Narberth, Dyfed SA67 8PU. 01834 831 208.

**Wanted:** 2SK46A transistor for the Tatung TMR7602 World Band receiver. P.D. Lacon, 24 Victoria Avenue, Winton, Bournemouth, Dorset BH9 2RN. 01202 529 633.

**Wanted:** Power unit for the Mitsubishi HS700B, or the switch-mode power supply transformer. R.G. Coates, 35 Tetbury Hill, Avenue, Tetbury, Glos GL8 8LT. 01453 832 720.

**Wanted:** Video PCB, part no. DUNKT 7033 CTV2. for the Sharp Model DV5105H. Phone Ray on 01159 783 751 day, 01159 411 537 evenings. 16 Newstead Grove, Nottingham NG1 4GZ.

# 20MHz Kenwood oscilloscope — £100 discount



This 20MHz Kenwood oscilloscope features automatic trigger-level detection for stable waveforms without complicated adjustments.

Featuring circuitry that synchronises the displayed waveform automatically – removing the need for complex sync adjustments – the dual-channel CS4125 20MHz oscilloscope represents excellent value for money at its normal retail price of £410 including VAT but excluding delivery.

For a limited period, Vann Draper is offering readers this instrument at the special discount price of £319 – including VAT and delivery – representing a saving to you of over £100.

## Features

**Fix synchronisation** – detects the trigger level automatically for the acquisition of stationary waveforms without complicated sync level adjustments.

**Vertical-mode triggering** – enables the acquisition of stationary waveforms for both CH1 and CH2 even when the input signals to the two channels have different frequencies.

**High withstand** – input voltage of 400V, 800V p-p

**Relay attenuator design** – New relay attenuator provides longer life. Capable of varying vertical sensitivity continuously from 1mV/div to 5V/div.

- Switching to X-Y operation is a simple one-touch operation.
- Sensitivity is high, and continuously variable within 1mV/div to 5V/div for optimum observation of a wide range of phenomena.
- Wide -3dB bandwidth of dc to 5MHz at sensitivities of 1 and 2mV/div, dc to 20MHz 5mV/div to 5V/div.
- High-speed sweep with time resolution of 20ns/div at  $\times 10$  mag.
- High accuracy – both the vertical axis sensitivity and sweep rate are within 3%.
- Large 150mm rectangular crt with an internal graticule
- Accelerating voltage of 2 kV allows easy-to-see, parallax-free waveform observations with high intensity.
- Vertical trace angle is easily corrected.
- Auto free-running allows traces to be checked even without input.
- TV triggering – dedicated circuitry provides FRAME and LINE with adjustment-free, stable triggering from small to large amplitudes.
- Use of VERT as the trigger source allows automatic selection of trigger signal in VERT mode.
- CH1 input can be monitored through the CH1 output terminal.
- Auto-focusing
- When intensity is changed, focusing errors are corrected automatically
- Convenient handle offers choice of tilt angles.
- Probe attenuation switchable between 1/1 and 1/10
- Dimensions, inc. protrusions 343w by 150h by 430mm, weight approx. 7kg.

## Specifications

<b>Vertical amplifier</b>	
Sensitivity	5mV to 5V/div, $\pm 3\%$ , 1 to 2mV/div $\pm 5\%$
Attenuator	1-2-5 steps, 12 ranges, fine adjustment
Input impedance	1M $\Omega$ $\pm 2\%$ , approx. 22 pF
Frequency response	
5mV to 5V/div	DC-20 MHz -3 dB or 10 Hz to 20 MHz -3 dB on AC range
1mV to 2mV/div	DC-5 MHz -3 dB or 10 Hz to 5 MHz -3 dB on AC range
Rise time	
5mV to 5V/div	Approx. 17.5ns (20MHz)
1mV to 2mV/div	Approx. 70ns (5MHz)
Crosstalk	-40 dB
Operating modes	
CH1:	CH1 single-trace
CH2:	CH2 single-trace
ALT:	alternate CH1 and CH2 display
CHOP:	chopping display of CH1 and CH2
ADD:	Combined waveform of CH1 and CH2
Chopping frequency	Approx. 150kHz
Polarity inversion	CH2 only
Maximum input	800V p-p or 400 V, DC+AC peak

## Horizontal amplifier

Sensitivity	same as vertical axis (CH2)
Input impedance	same as vertical axis (CH2)
Frequency response	
DC:	DC to 500kHz -3dB
AC:	10Hz to 500kHz -3 dB
	X-Y phase matching within 3° at 50kHz
Operating modes	
CH1:	Y axis, CH2: X axis
Max. input voltage	Same as vertical axis (CH2)

## Sweep

Modes	
NORM:	trigger sweep
AUTO:	auto free-running with no signal
Sweep time	
0.5 $\mu$ s to 0.5s/div $\pm 3\%$ (0.2 $\mu$ s/div uncal.), 1-2-5 steps, 20 ranges w. fine adjustment	
Sweep magnification	
$\times 10 \pm 5\%$ (20ns/div uncal.)	
Linearity	
$\pm 3\%$ (0.22 $\mu$ s/div uncal.) ( $\times 10 \pm 5\%$ , 20ns/div uncal.)	

## Triggering

Trigger sources	
VERT MODE:	input signal selected in VERTICAL mode
CH1:	CH1 input signal
CH2:	CH2 input signal
LINE:	commercial power supply
EXT:	EXT. TRIG input signal

## External triggering

Input impedance	approx. 1M $\Omega$ and 22 pF
Max i/p voltage	800V p-p or 400V DC+AC peak
Coupling modes	
AUTO, NORM, FIX:	AC coupling
TV-FRAME:	TV-LINE:

## Calibration o/p

Intensity modulation	square wave, positive polarity, 1Vp-p $\pm 3\%$ , approx. 1kHz
Input	TTL level, DC to 3.5 MHz
CH1 o/p	50mV/div, 50 $\Omega$ load, $\pm 3$ dB 100Hz-10MHz

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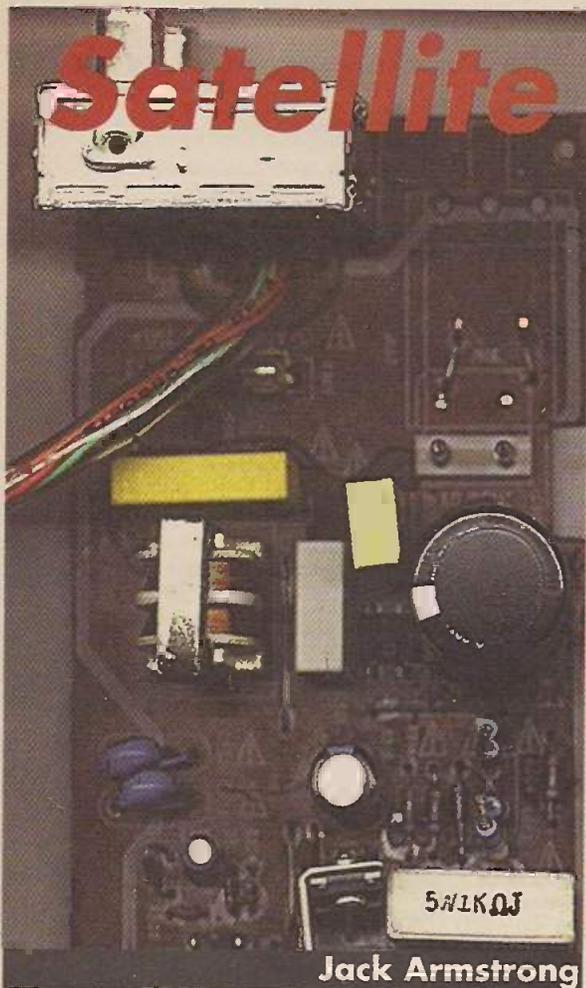
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Jack Armstrong

### A Dead Ferguson

From time to time I still see Ferguson SRV1 receivers (the Pace SS9000 clone). The large, buxom lady who brought this one in obviously meant business. She thumped it on the counter and got straight to the point.

"I just collected this from Wosname up Church Street. He said the power thingy's dead. But he's had it for six weeks and can't fix it. If I don't get it back tomorrow 'e's going to go bonkers. It's the football you know."

I took advantage of the pause to tell the lady that it would certainly be ready tomorrow, yes definitely madam, without fail, and no we don't close for lunch.

An hour later I was beginning to regret my rash promise and starting to understand why Wosname had been unable to fix it. Something was definitely wrong with it, and I couldn't figure out what. I'd replaced every single component in the power supply, including the horrible little surface-mounted ones, and it still didn't work. The DC voltages around the chopper control chip U23 were correct, but it simply

# WORKSHOP

refused to produce any drive output.

With the aid of a cup of tea, I compared the board with a scrap one. When I was about to give up I suddenly spotted the cause of the problem. Pins 14 and 15 of U23 are supposed to be joined via a common pad, but someone had run a knife between them, neatly dividing the copper pad. Clearly Wosname had assumed that there was a short-circuit and had removed it. His work was so skilful that an eyeglass was needed to confirm what had been done. A blob of solder cured the fault.

### BT SVS300

These receivers seem to have been manufactured by the same Far Eastern company that made the later Amstrad receivers. Certainly the 'repairman' who brought me this one thought so. Unfortunately he'd fitted an Amstrad kit, which is not quite right. In addition the '2R2' resistor he'd used was actually 0.22Ω, so the current sensing circuit was a little unhappy.

Once I'd fitted the correct kit the receiver seemed to work. But it switched to standby each time a vertically polarised channel was selected. I confirmed the fault by watching the menu of a horizontally polarised channel then altering the setting to vertical. Into standby it went. For some reason it was providing a 0V LNB supply instead of 13V. But it worked fine while my scope probe was on one connection of the power supply output socket!

After messing about for what seemed like hours I finally decided on a bodge and fitted a 56kΩ resistor between the power supply H/V select input and chassis. I still don't know what had caused the problem, but my little 'fix' did the trick.

### Fishy Business

My brother is the manager of a local trout farm. He brought me a Pace PRD800 that belonged to one of his lads. Apparently it would decode Sky One but no other channel. The card tested OK in another receiver.

Suspecting a problem with the contrast setting, I plugged the

receiver into the mains supply. It didn't light up, and there was a smell of fish! Fearing the worst, I removed the cover. As the receiver was perfectly clean inside I reconnected the power and tried again. This time the display lit up dimly. I could change channel, but there was no picture or sound.

The dim display and fishy smell gave me a clue. I measured the supply to the microcontroller chip and found that it was only 3V. Sure enough C15 (2,200μF), the reservoir capacitor in the 5V standby supply, had leaked. Hence the smell and the low DC reading. A replacement restored normal receiver operation, with the card producing clear pictures on all the encrypted Sky channels.

### Well Done

Some customers won't settle for medium rare: they like their satellite receivers to be well done. The Pace MSS1000 that arrived by carrier from Birmingham was one of them. I knew it had been cooked when I saw that the rubber feet had disappeared, leaving a sticky mess behind.

The PCB was completely black in places, and as a start I replaced every single electrolytic capacitor in the power supply. This cured the dead condition (actually it was tripping at high speed). So I left the receiver on test. After about an hour the decoder messages disappeared. Liberal application of freezer seemed to pinpoint the PTV111 sync separator chip U29 as being the culprit. Replacement (twice!) failed to clear the fault however. After some thought I replaced all the electrolytics around the chip. As usual it was the very last one, C208 (1μF), that put matters right. I really must remember to replace the last one first next time...

### Cowboys!

A dealer brought an Amstrad SRD500 to my workshop last week. It bore a label that said "live", but there was no other information. He was reluctant to explain, muttered something that sounded like "kit" and scurried back to his van.

Being cautious, I didn't plug it in but removed the cover instead. Just as well. The white ceramic radial-lead surge-limiter resistor had been replaced with an axial-lead type. Its live lead had been pressing against the steel top cover.

I resolved to ask the dealer whether his public liability insurance was up-to-date.

### Philips STU824

I've mentioned this model before: it tends to suffer from memory corruption when the power supply fails, and also seems to be prone to dry-joints at the infra-red sensor pins. Memory corruption leads to a variety of symptoms, the most common being that the LNB voltage cannot be changed or that odd things happen in the menu settings.

Martin Pickering of SatCure has asked me to point out that the latest edition of his book *Satellite Repair Manual* (fourth edition) lists a factory reset code that's actually for an earlier model. Unfortunately there's no reset code for the STU824. The only way to reset it is to download the information from an identical model or replace the 24C16 EEPROM.

### Cambridge RD480

It seems that everybody in Scotland owns one of these receivers, possibly because they were produced there. Unfortunately they don't seem to like the moderate warmth of Glasgow. As a result the plastic cases become brittle. The Scotsman who sent me one recently didn't understand that packing involves more than a Sainsburys carrier bag with my address glued to it. The receiver was well and truly smashed when it arrived. Fortunately I still have a few 'unrepairables' in the workshop, and was able to use mouldings from them.

The initial fault symptom was a screen that was black apart from the top few centimetres which were white. As this looked like a power supply fault I replaced all the large electrolytics. There was a noticeable improvement, but the picture I now had was obscured by hum bars and interference lines. So I removed all fourteen 1N4003 diodes, by the usual method of cutting each lead flush with the board then poking the remainder through with my soldering iron. It's the only way to avoid damage to the tracks and pads. With new diodes neatly formed and

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems via e-mail. Mention *Television*. You can reach him via the Internet at:

[jackarm@netcentral.co.uk](mailto:jackarm@netcentral.co.uk)

One fault per message – state make/model and fault symptoms/history. If you have no e-mail facilities you can write to him c/o *Television*, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.

soldered in place, the picture was almost perfect.

The sound was extremely crackly however, and a loud hiss was apparent in the background. I replaced the middle crystal, the U2829 FM demodulator chip and all the electrolytics around it. After this the sound was much improved, though still with a little sibilance. But as I'd already spent an hour on the job, I decided to call it quits. I've heard worse sound with a receiver straight from the factory.

## Test Case 412

Most TV repairs have to be done once. Maybe twice, if they bounce. This is the story of a repair that had to be done several times before we were able to guarantee that the fault had been cured. Such a saga is, unfortunately, not all that uncommon in the workshop.

The set was an old Philips one fitted with the CTX-E chassis. It was about twelve years old. The symptom was straightforward enough. The set had been brought in with the complaint "no results". We found that the 2AT mains fuse had blown violently, for the very good reason that the BUX84 series chopper transistor TR7355 was short-circuit. TechnoCrat replaced the transistor and fuse and left the set to run on soak test – this is our policy with all TV repairs now. When TC returned from his lunch the set was once more dead. The same two components had failed, just as before. Two more replacements were fitted, but before the end of the day they too had failed.

TechnoCrat is suspicious of all replacement semiconductor devices. He reckons that they are the rejects from the production lines. So he went off to the scrap pile and dug out a BUX84 transistor from a chassis he found there. It lasted about a day before sharing the same fate as its predecessors in the set. Plainly something else was amiss – and there were lots of possibilities!

TC started off by replacing C2355, the 470pF capacitor that's connected in parallel with the chopper transistor. Then he resoldered the connections to the chopper transformer T5335. Resistance checks were carried out on all the diodes in the power supply, and on the high-value resistors. These items were all OK. A fault in the line output stage could of course have been the cause of the trouble, so TC disconnected it and in its place connected a 60W bulb as a dummy load across the 40µF HT (125V) reservoir

capacitor C2330b. The set was switched on and left to run as before, but this time with an oscilloscope connected to monitor the waveform at the collector of the chopper driver transistor TR7353.

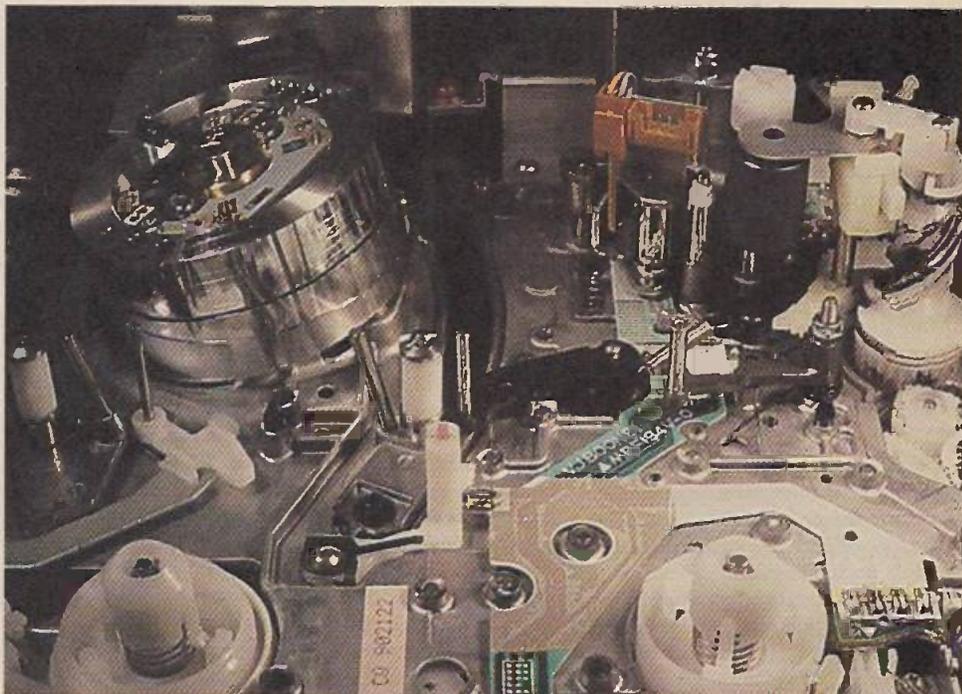
After a few hours the dummy-load bulb began to flicker. This was accompanied by 'twitching' sounds from the chopper transformer. TC rushed over to look at the scope's display. It showed spasmodic, marked variations in the drive waveform's duty cycle. Finally the bulb dimmed, the pulses in the waveform widened and, to avoid loss of another BUX84 transistor, TC switched off.

Subsequently, by watching the scope while twiddling the set-HT potentiometer R3325, TC established that with wider drive pulses the HT should have increased. In the fault condition the opposite was true. TC thought about this vital clue. He decided that the drive pulse generator and HT regulation sections of the circuit were probably working correctly, even when the fault was present. And the fact that the trouble persisted with the dummy load connected seemed to suggest that the cause of the fault was nearby, certainly not in the line output stage.

Well, chopper transformer failure is not unknown with these sets. So the wrecked chassis in the scrap pile was again raided and robbed of its chopper transformer (the scrap set was known to have been working all right before it had been dropped!). Even with this known good transformer in it, the sick set continued to produce its fault from time to time – and indeed blew another BUX84 chopper transistor before the culprit was finally found and consigned to the dustbin. It was neither a large nor an expensive item. What was it? Bear in mind the set's age!

The power supply circuit was shown on page 719 of the August 1994 issue of *Television*. The solution to the problem is on page 446 of this one.

These VCRs are well worth renovating. With the faults list and recommendations provided by **Brian Storm** you should be able to clear any incipient troubles



# Renovating the Panasonic NVG21 / 25

**T**hese now elderly VCRs are well worth renovating, particularly as the picture quality they provide is exceptional. The NVG21 and NVG25, along with their up-market relative the NVH65, were the first models to appear with the compact G mechanism. This helped to reduce considerably the size and weight of Panasonic VCRs. Another contributory factor to this was the introduction of a much smaller switch-mode power supply module. Other features of these models are real-time counter functions and bar-code scanners for timer and clock functions.

## Power Supply

Fig. 1 shows the power supply circuit used in these models. The electrolytic capacitors in the switch-mode power supply of any machine that's about ten years old are likely to be reaching retirement age. Always replace the electrolytics in the primary side of the circuit because, as they decrease in value, the voltages on the secondary side of the circuit can increase, with possible damage to the items supplied.

Always resolder the legs of the STR10006C chopper chip Q1001 and the STK5338 series regulator

chip IC1001. With both, the solder ages and eventually becomes dry.

On the secondary side of the circuit, electrolytic capacitors C1023, C1018 and C1022 should be replaced.

Here are some fairly common power supply faults:

**Bad patterning, no colour and maybe drum servo problems:** Replace C1023 (1,000 $\mu$ F, 10V).

**White patterning, varies with the setting of the tracking control:** Replace C1022 (47 $\mu$ F, 50V).

**Loses the E-E picture when a tape is inserted:** Replace C1018 (47 $\mu$ F, 50V).

**Intermittent mains fuse blowing:** D1002 (type ERA22-08) in the snubber network is probably leaky.

**Clock display goes off intermittently:** Replace C1018 (47 $\mu$ F, 50V).

**Red power LED remains on when the machine is**

switched off: Cause is open-circuit print between IC6001 and the base of QR6014

**The Mechanism**

After attending to the power supply, the next area most likely to require attention is the now familiar G mechanism. In these machines the capstan motor also carries out the functions of a front-loading motor and main loading motor. Because of this the mechanism is driven by a gear train that engages with the capstan motor via a solenoid at the appropriate times. The phasing and integrity of the gears are critical. Faults here can cause numerous symptoms. Here is a list of fairly common mechanism faults:

**Cassette housing keeps going out of line with the main mechanism:** Replace the cassette mechanism right-side housing assembly (part no. VXA2677) which is probably worn or broken.

**Tape damage at bottom edge:** The pinch roller is worn or the audio/control head is tilted down.

**Tape damage at top edge:** Arm P5 is bent or the A/C head is tilted up.

**No rewind or fast forward:** The centre pulley assembly (part no. VXP0769) is faulty (split).

**Intermittent horizontal twitching:** The impedance roller is sticking.

**Intermittent tape damage (looping):** Replace the play

arm unit, part no. VXL1490.

**Squeaking noise from the mechanism:** Replace worn capstan rotor pressure pad, part no. VXL1500.

**Rattling noise in rewind or fast forward:** The belt tension roller is worn. Replace it, part no. VXA2674.

**Intermittent solenoid operation:** Connector loose in plug 1504.

**Tape loads but plays fast for a few seconds then the machine cuts out:** The mode switch is out of phase with the mechanism by one gear tooth.

**Machine cuts out in the review mode:** The mode switch is out of phase with the mechanism by one tooth in the opposite direction to fault above.

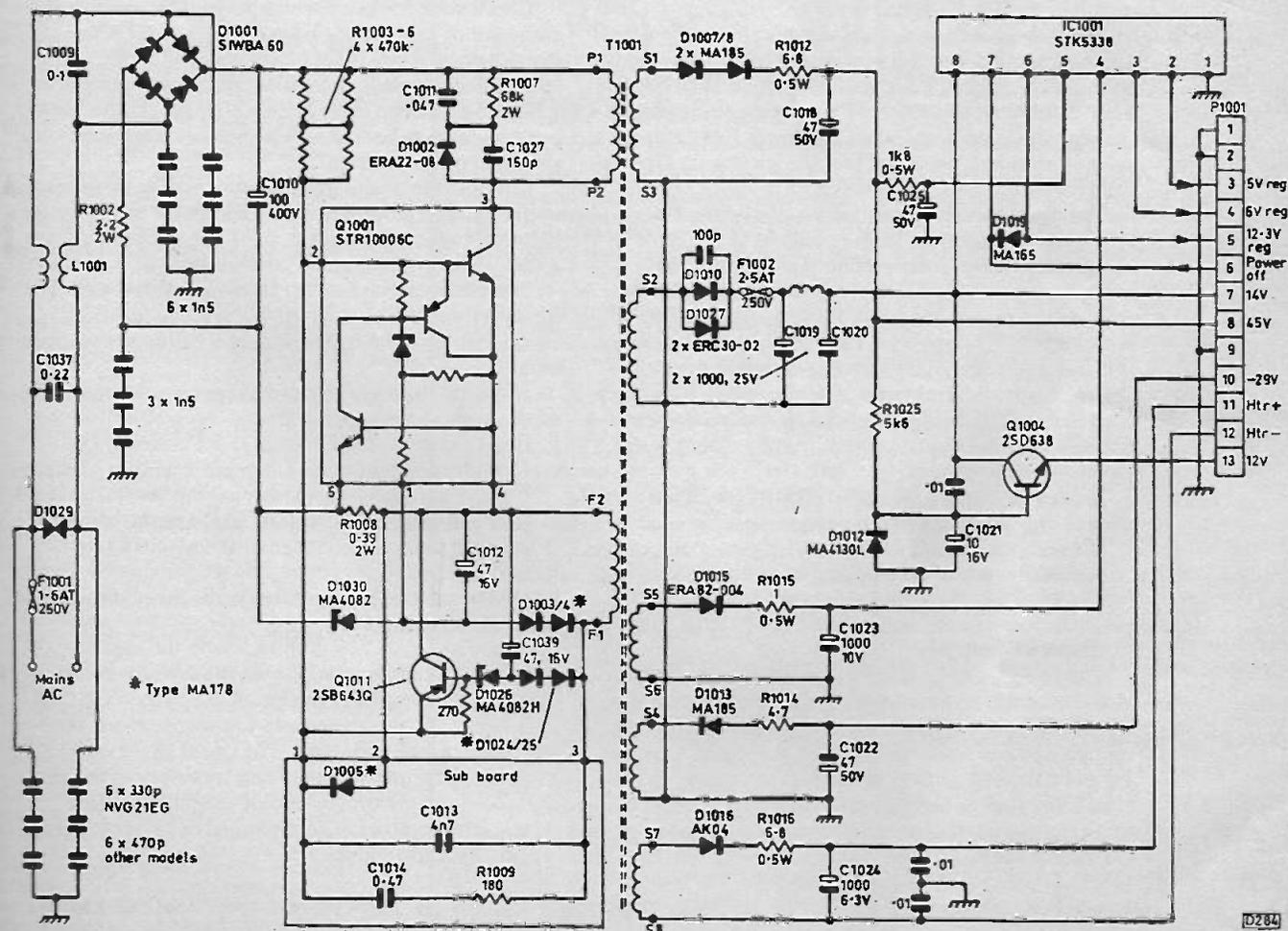
**A tape is accepted then ejected almost immediately:** There's a phase error between the cassette housing rack gear and the drive gear.

**Arm P4 broken:** This occurs when there's a phase error between the planet and cam gears.

With older G mechanisms it always pays to check the tape path carefully, especially between the audio/control head and arm P5 via the pressure roller.

I recommend checking the A/C head for wear whenever the video head is replaced. A grid of white parallel lines is printed on the flexi-cable beneath the head. This is convenient. The pattern is reflected by the video tape as it passes across the A/C head. Thus any tape

**Fig. 1: Power supply circuit used in the Panasonic Models NVG21 and NVG25. D1029 is type ENB461D-05A.**



curling or deviation is easily observed.

For tape curling or flagging, also check arm P5. It can be twisted or bent by a tight cassette.

The impedance roller should be removed and cleaned and the lower drum cylinder cleaned as necessary, also the entry and exit guides.

### Sound Faults

Here's a list of sound faults you could encounter:

**No sound and counter not working:** C240 (10 $\mu$ F, 16V) open-circuit.

**Muffled or low playback sound:** Audio/control head (part no. VBR0125) is worn.

**Recorded sound is of low amplitude with lack of HF content:** Can be caused by excessive record bias. Check the adjustment potentiometer, which can be intermittent.

**Noisy and distorted sound:** Check whether R4021 (47 $\Omega$ ) is open-circuit.

### Video Faults

Most intermittent video faults are caused by dry-joints on the luminance and chrominance sub PCB, where it's joined to the main PCB.

Permanent or intermittent loss of the E-E video, with the sound all right, is usually caused by poor connection at the switch on the video input socket.

## The Panasonic G Deck

John Coombes adds: G deck alignment is very important. Any replacements/resetting should be carried out as laid down in the service manual. This includes refitting the cassette housing, where alignment should be done very carefully.

Pinch roller wear is a common problem. The result can be tape creasing or chewing at the top and bottom, or the tape can loop out causing damage when it's ejected.

A lot of upper drum wear is caused by excessive back tension. The correct setting is around 25g. Check the back-tension band and replace it if necessary. Excessive back tension can also cause line pulling at the top of the picture. If resetting fails to cure this problem, replace the upper drum.

The video heads can cause various problems such as a snowy picture, streaking on peak whites, or possibly poor quality playback because the picture is covered in lines. Sometimes playback of prerecorded tapes is OK but recordings are very poor. The heads can be damaged or even badly marked because a cleaning tape has been used.

The mode switch causes various problems. Examples are incorrect loading/unloading; the tape being ejected after insertion; no fast forward, or rewind, or visual search in either direction; fast forward visual search instead of playback; tape ejection before rewind is complete. The mode switch has five soldered tags: dry-joints here can cause all sorts of strange faults. Several types of mode switch have been used in the G deck over the years. If you come across one with a metal centre, replace it immediately – this type is prone to trouble.

If the tape doesn't lace up correctly, check the play control arm which may be broken.

Noise in the rewind and/or fast forward mode can be caused by lack of take-up and/or rewind turntable lubrication. Other possible causes are a faulty centre pulley unit and/or the intermediate gear – check by replacement.

The G deck can be noisy. This can be a real problem should the SS brake arm unit (VXL1500) become worn at the bottom of the capstan motor. It can break into pieces here when badly worn. If there is a knocking noise, mostly in the playback mode, check the clutch disc and/or the play arm unit. If these are OK, suspect the main pulley and/or intermediate gear. Check that they are clean and free running, and then if

necessary by replacement.

A grating noise from beneath the deck is caused by worn or stripped gears, e.g. the ring gear, retainer gear, the three planet gears, the centre gear, sub-cam gear and disc drive along with the main cam gear. The sub-cam and ring gears will have to be replaced if the mode switch is incorrectly aligned and constantly becomes misaligned. Set all the gears and the mode switch very carefully, as laid down in the manual.

A sticking or bent P5 arm can cause tape chewing or damage at the top or bottom edge.

The cassette housing can cause troubles, i.e. a jammed cassette or failure to accept a cassette. First ensure that the wiper arms haven't gone out of alignment, failing to return to the correct position. Check that the main shaft is in the correct position, and that the cog on the side has not been damaged.

Check for a broken opening lever if the tape won't come out of the housing because the blinder panel doesn't open. Then if necessary check that the left/right side panels and slide switch unit operate correctly. If a cassette can't be inserted, check whether the opening lever is broken or whether its spring has stretched or dropped off.

Lower drum assembly wear may not be noticeable in the SP mode. If the machine has an LP mode, wear here can cause picture jitter, field roll or even an intermittently snowy picture on one 'channel'.

Some models have rotary heads for hi-fi sound. If the upper and/or lower drum is worn, the playback sound may give the impression of a helicopter whirling around.

If the top third of the picture is snowy in the review mode, suspect the upper drum.

Ensure that the back tension is set correctly before replacing the upper drum.

If the drum motor keeps running but the VCR won't play, check for a faulty Hall IC in the drum assembly. If this item is faulty, complete drum assembly replacement instead of repair is strongly recommended. But it may be worth checking for dry-joints in and around the direct drive assembly.

I have had very few problems with the capstan motor. On a couple of occasions it has been responsible for the no functions symptom. All inputs and outputs were OK, also the supply to the motor, but the machine refused to operate. The cause of the mechanism jamming intermittently can be failure of the friction clutch on the capstan motor to slip free – this occurs with some of the earlier models. The cure is to replace the capstan motor.

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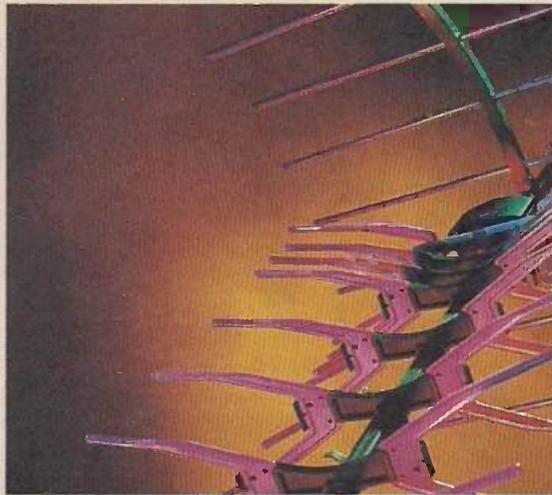
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# Channel 5 Challenge



**Reception of the new Channel 5 transmissions can present severe problems at some locations. Nevertheless Keith Cummins achieved excellent results – at a cost**

**A**s I live not far from Fawley, one of the Channel 5 transmitter sites, I decided to ring up a local aerial contractor last January to see if he could tell me what was going on.

"They're running tests, mate" he replied. "It's very weak – we're going to be fitting high-gain aerials and amplifiers everywhere."

I asked if he knew the channel number and power.

"About 100W, on channel 37" he said.

"Doesn't that involve retuning?" I asked.

"I've not heard anything about that" came the reply.

## Channel and Power

All this left me very dubious. I tried tuning through the band, and found a weak and grainy Ch. 5 test signal. I also discovered that it was accompanied by a page of teletext which listed all 33 Ch. 5 transmitters, their channel numbers and polarisation. The text kept turning to garbage, but in its more lucid moments I was able to read that Fawley was on ch. 34, with horizontal polarisation. I was particularly uncertain about the suggested 100W, preferring to believe the 1kW quoted by Bill Wright in the November 1996 issue of *Television*.

As my VCR is smart enough to search for channels and tell me their numbers, I set it the task of finding Ch. 5. It did this, confirming ch. 34 and the frequency. This differs from the original Ch. 5 plan described by Harold Peters in the July 1992 issue: at that stage, Fawley was expected to be on ch. 35, at 2kW, with vertical polarisation. Things had obviously changed. Ch. 34 is at the top end of the group A channels; and by using horizon-

tal polarisation, the same as the main local group A transmitter at Rowridge on the Isle of Wight, there was a slim chance that a fortunate few would be able to receive satisfactory pictures from Fawley without the need to change their aerial arrangements.

## Local Geography

Apart from the small village of Fawley, the area is known for an oil refinery and a power station, both of which lie on the eastern side of Southampton Water. These two plants are responsible for some nasty ghosting with reception from Rowridge. The power station chimney produces a single, strong ghost signal, while the refinery complicates matters by producing a large number of weaker echoes.

Fortunately at my location the normal group A aerial is broadside to the refinery when aimed at Rowridge, while the dreaded power station chimney is at an angle of about 45° to the aerial's axis. I have an aerial mounted in a carefully chosen position inside my bungalow's garage roof.

Where does Ch. 5 fit in? Finding the exact location of the transmitter proved to be difficult initially. I tried phoning the ITC, NTL and Ch. 5 Broadcasting, but was unable to get any precise information. Then, when driving past the power station one day, I noticed what appeared to be transmitting aerials attached to the north side of the chimney. My wife suggested that I try phoning the power station. Bingo: within five minutes of calling, a helpful gentleman in the control room confirmed that the Ch. 5 transmitting aerial is attached to the chimney. By mounting the directional array on the north side of the chimney, the latter effectively blocks southerly radiation, thus avoiding interference to continental services.

But this means that my Ch. 5 receiving aerial has to be pointed at the prime source of powerful Rowridge ghosting. And I really do mean powerful: Rowridge transmits at 500kW, compared with Fawley's 1kW. In other words the Fawley signal is 27dB down, the most disadvantageous ratio in the UK.

## Plan of Attack

Having set the stage, I'll now outline the approach I adopted to achieve acceptable (actually very good) Ch. 5 reception.

The first thing to consider is the normal reception level from Rowridge, the main group A station here. Once I'd got some idea in terms of numbers, I could do some calculations for the Fawley transmissions. I had to decide upon a reference level, which I took to be 0dB, defined as the signal that a simple dipole would receive at my location from the group A station.

To this, various figures have to be added and taken away. It works out as follows: 0dB + 10dB aerial gain - 6dB (a typical figure) loss because of the inside roof installation. Thus the final figure is +4dB. This is purely arbitrary, but it provides an aiming point when the Ch. 5 situation is assessed.

For the Fawley transmitter the figures look like this: dipole reference -27dB, aerial gain to be calculated, distance factor +14dB. Distance factor? Well Fawley is in this case five times closer to the receiving site than Rowridge. This has to be taken into account, using the familiar square law. Thus the received power is increased by  $10 \log 5^2$ , i.e. approximately 14dB.

If the final figure for Fawley is to be +4dB, as for Rowridge, the aerial gain must be  $4 + (27 - 14) = 17$ dB.

An aerial gain of 17dB is a demanding requirement, and such an aerial will be large. Furthermore we can't tolerate loss because of roof tiles, so the aerial must be mounted outside.

It's tempting to use a smaller aerial with an amplifier. But remember that in this case powerful ghosts of the normal group of four transmissions will be present: they could intermodulate with the weaker Ch. 5 signal. Thus a large aerial is best. Since it's a passive device, intermodulation cannot occur, while its narrow beam width will reduce the amount of unwanted reflected signal energy received via the refinery. This will in turn make the job of the aerial combining unit (diplexer) less demanding.

As Bill Wright pointed out in his excellent and detailed article in the November 1996 issue, you cannot use a splitter to combine the outputs from two aerials without disastrous effects on their directional characteristics. I tried, just to prove the point. While Ch. 5 was not too bad, the remaining channels were, as expected, seriously degraded by the strong reflections introduced via the Ch. 5 aerial.

Thus to do the job properly you must install a suitable combining unit. I used a Triax diplexer which is wideband - except for a stop filter tuned to ch. 34 - at one input, and narrowband (ch. 34 only) at the other input. It has to be specially ordered - you specify the dedicated channel. The ch. 34 input filter introduces a -3dB loss, the wideband input being attenuated by 1dB.

The overall figures are shown in Table 1. Theoretically, they indicate that Fawley is 2dB down on Rowridge. This is acceptable. The figures cannot be all that accurate, but a viable parity of performance is nevertheless indicated. This was borne out by the observed results. The assessment procedure can easily be applied in other localities provided you know the transmitter powers, the distances and local conditions.

## The Installation

To obtain the overall performance suggested by the calculations, I used a Triax 100 aerial (group A, highest channel 34) and a Triax 5740 combining unit. There is no perceptible difference in the results achieved with

the five channels when viewed on any of the four receivers fed via my distribution system. By introducing 12dB of attenuation at one receiver input, all five channels became noisy to about the same extent.

But this performance doesn't come cheaply. The aerial and combining unit alone cost nearly £80, plus VAT. Then there are the mounting brackets, cable, pole, etc. - and I did all the work myself. When you consider that for less than double this figure you can buy a multichannel satellite system, the economics look rather dubious - though Ch. 5 is free.

Finally I would like to thank David Martin of Aerial Techniques (a regular advertiser) for his advice concerning aerials and diplexers. ■

Table 1: Assessment of signal levels.

Parameter	Rowridge	Fawley
Radiated power	500kW	1kW
Reference level (dipole)	0dB	-27dB
Distance factor	0dB	+14dB
Aerial gain	+10dB	+17dB
Roof-tile loss	-6dB	0dB
Diplexer loss	-1dB	-3dB
Final signal level	+3dB	+1dB

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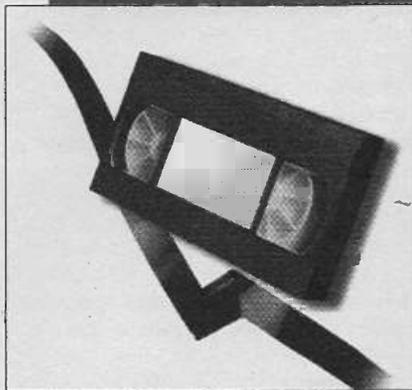
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#### **Philips VR422**

The mechanism was OK but there was no picture or sound (just a blank raster) in any mode. While tracing the video path back from the modulator, I soon discovered that the +12a supply was missing. Safety resistors R3151 and R3147 (both 6.8Ω, part no. 4822 050 26808) were open-circuit. No reason for their failure could be found, and the replacements didn't fail during a soak test. **P.B.**

#### **Toshiba V110**

This VCR would only receive channels below 43. Channels above 43 could be stored correctly, but only snow was displayed. Checks in the power supply showed that the voltage at test point BP08 was low at 13V instead of 33V. A new ZTK33B voltage regulator (DP04) restored normal operation. **P.B.**

#### **Philips VR727**

Take care when ordering deck parts for VCRs that use the Philips Turbo deck. Although they look similar, there have been changes in later versions – mainly in the braking system. Instead of using a trigger-operated brake, the main cam operates the brake directly. To do this, the design of the main cam has been changed (the cam has a sun or star shape moulded in to its top surface), the worm shaft is simplified and the trigger components are omitted.

Unknown to me, the machine that

# VCR Clinic

caused me problems had had the wrong cam fitted. The deck wouldn't initialise. When a cassette was inserted, the tape threaded up and unthreaded twice, then the machine powered down. A check on the error memory in the service mode showed that the microcontroller chip sensed a threading error, though visually the deck appeared to be operating correctly.

The microcontroller chip senses the threading position by counting the pulses from the 'windmill' optosensor on the threading worm in relation to the moment when the INIT switch closes. Because the wrong cam had been fitted, the INIT switch closed later than it should have done. The microcontroller chip sensed this.

A cam from the N kit instead of the A kit had been fitted. If you find that the marks on the main cam are different, or the threading worm is a different shape from the one originally fitted, check that you've got the correct part no. **P.B.**

#### **JVC HRJ215**

This machine had no functions and an erratic display. On checking we found that the 5V supply was low at 2.5V. The cause was a faulty circuit protector (CP1). **G.S.**

#### **Toshiba V204**

This machine was dead. The primary side of the power supply was pulsing but wouldn't run. The cause of the fault was the U4614B chopper control chip IP001. **G.S.**

#### **Mitsubishi HSB330**

A rolling E-E picture from cold was the complaint with this machine. The cause was C111, which had fallen in value. **G.S.**

#### **Toshiba V212**

This machine would try to accept a

tape then eject it after a few seconds. The usual cause of this is the loading motor. On this occasion however the cause was tinfoil that had been jammed in the loading area.

There was also a squeal on rewind. We found that the take-up reel was dry – a little oil silenced the squeal.

Next, the playback picture pulled from side to side, as though there was a drum fault. The cause was dust on the plastic cap beneath the drum – it provides information on the drum speed and position, via an optical pickup.

Finally the audio head and pinch roller had to be replaced. **G.S.**

#### **Sharp VCM20**

If there is intermittent loss of response to jog shuttle, or functions are erratic, check for dry-joints at plug and socket AO and OA. **G.S.**

#### **Saisho VR1600**

These machines are now quite old, but still produce good results. This one had the common fault of going into play, the picture freezing, then shutting down. The cause of the problem is usually the limiter post near the take-up reel. When you remove it you'll find that the pin is missing. A replacement will restore full working order. **T.L.**

#### **Matsui VPA9601**

A common problem has appeared with this relatively new model: when the machine goes into the review mode the tape is not taken in and loops. The cause is wear on the plastic slide plate underneath. For a complete repair replace this plate and the idler. **T.L.**

#### **JVC HRD560**

Snowy bars at the top of the picture was the complaint with this

machine. If you get this problem, the thing to check is the loading arms. They usually become loose, or become disengaged altogether. You can tighten them, but for a good repair it's best to replace them. **T.L.**

### Akai VSG815

This model differs from most VCRs in that the front display is in the cassette flap and there's a quite complicated loading mechanism. This seems to be causing problems. Levers at the top of the cassette housing run along the cassette as it's being ejected. Normally there is no problem, but if the cassette has a loose plastic window the lever's downward pressure can push the window out. The lever then gets caught in the cassette, the result being shut down.

It's quite easy to remove the lever and faulty cassette. The real problem comes when the customer tries to remove the cassette himself. If he pulls too hard, there's a danger of damage to the gears and mechanism misalignment, which is not so easy. I feel that Akai should be looking into this. **T.L.**

### Ferguson FV81

Our customer complained that the clock reset itself to 3:00 a.m. every night. These machines use a signal to set the clock each night, but there's a set-up sequence when the machine is first powered. This was odd, as the customer had owned the VCR for two years. What had happened was that he'd switched the machine off when he went away on holiday.

The correct sequence from first power up is:

- (1) Do not set the clock.
- (2) Tune in to BBC-1 and leave the machine on this channel.
- (3) Switch to standby.
- (4) At 3:00 a.m. the clock will set itself. It will remain OK while still powered. **T.L.**

### Matsui VX990/Saisho VR2500

It's common to find that there is no output from the 12V regulator circuit. Not so common to find that the transistor is OK but the zener diode is short-circuit, as was the case with this machine. **R.B.**

### Ferguson FV26D

There was no display, though commands were accepted and the relevant LEDs lit up. The cause of this was traced to IC1 (type UPD75212ACW-015) on the

memory PCB. The owner had had a go - there were odd screws everywhere. **R.B.**

### Ferguson 3V45

Odd symptoms occur when the 5.1V zener diode D408 is leaky. In this machine the drum immediately took off backwards at high speed, and there was just a quick burst from the capstan motor. A replacement put that right.

But the remains of the back-tension band were jammed in the carriage. This prevented the arm coming into contact with the tape. I know that the machine had been used like this. What had the owner been watching?! **R.B.**

### Hitachi VT120

This machine showed the cassette-in symbol at all times and the carriage wouldn't stay up. All functions were normal, including eject. But you had to be quick about getting the cassette out before the carriage took it back in again. For once the sensors were OK. I followed the wiring from the plug (socket on the main board) and found a dry-joint at R906. Resoldering this cured the problem. **R.B.**

### Panasonic NVG12

This machine would sometimes unlace immediately because the drum failed to rotate. The reason for this was a dry-joint at the motor drive plug/socket. **R.B.**

### Ferguson FV70B

The customer complained that there was a flickering picture and intermittent loss of sound. I found that the tape path was slightly out of alignment. Resetting this cured the fault. **M.M.**

### Ferguson 3V32/JVC HR7655

I had serviced this machine about three months previously, and had been called back because of what looked like dirty heads. Cleaning them seemed to cure the problem. I was then called back again. The heads appeared to be dirty once more, but if the machine was left to cool down the picture would be restored. The fault could be induced by going into the search mode.

I took the machine back to the workshop and left it running until the fault appeared. I then scoped the drum flip-flop waveform which, instead of being a square wave, was a series of pulses. As the amplified drum pick-up pulses were OK, I froze the BA853 chip IC7 and found

that the fault cleared. So a new BA853 chip was obtained from JVC and fitted.

Imagine my horror when the machine produced exactly the same symptoms (the chip costs over £40 trade). I subsequently tweaked R57, which sets the drum pick-up pulse level at IC7. Fortunately this cured the problem. A long soak test proved that everything was OK.

It's possible that the drum pick-up pulse head may be starting to fail. Only time will tell. **M.M.**

### Ferguson 3V32/JVC HR7655

After carrying out a service I found that the display wasn't working. Checks showed that its -28V supply was missing. This is derived from the timer/tuner board, where zener diode D233 was found to be short-circuit. A replacement brought the display to life. **M.M.**

### JVC HRJ205

A loop of tape was left when you tried to eject a cassette. The cause of this can be a faulty mode switch or capstan motor. As the mode switch is cheap and readily available I decided to change it first. Fortunately this cured the fault. **M.M.**

### Ferguson FV71LV

We were told that this machine was found to be dead after a thunderstorm. When I tested it the power supply was tripping. The cause of this was RP18 (1.5Ω), which had risen in value to approximately 8.8Ω. A replacement stopped the tripping and brought the machine back to life. **M.M.**

### JVC HRD610

When a tape was inserted this machine would start to lace up then stop and switch off. I tried this several times: each time the point at which the machine stopped varied. When I removed the mode switch I found that it was starting to break up. A replacement put matters right. **M.M.**

### Sanyo VHR7700E

If the machine goes off within a split second of being switched on and there are no functions, check transistor Q5402 on the main PCB (CP1). You'll probably find that its base-emitter junction is leaky. From the dissipation point of view the device seems to be hard pressed. I've found that the higher-rated 2SD1207 is a more reliable replacement. **E.T.**

**Sony SLVE200/250**

We've had intermittent tape looping at eject with a couple of these machines. The cause is excessive capstan brake friction, something that also affects certain Sanyo models. With the Sony machines this is best dealt with by replacing the brake-lever assembly complete and cleaning the periphery of the capstan flywheel. **E.T.**

**Orion D1094**

This note applies to the above VCR, to the **Tatung** Models DVR634VN, DVR832V, TVR734VN, TVR932V, and probably others – the problem is with the Orion deck. Symptoms are intermittently stopping short of full cassette eject or when the cassette is half way in, and intermittent deck functions like load and play. The cause is a dirty or tarnished mode switch. You can clean it, but replacement is better. **E.T.**

**Panasonic NVL20/25**

An intermittent fault that's difficult to diagnose is spasmodic deck shut down because the capstan motor stops during play or record. The cause is usually dry-joints where P2001 is soldered to the main PCB – they are not obvious to the naked eye, but a times eight magnifier shows them well enough. It's a good idea to replace C1122 (330µF, 10V) in the power supply while you are about it – use a 105°C type. **E.T.**

**Tatung TVR6122**

The reported fault was tuning drift. In addition we found that when a new channel was selected it took several seconds to arrive. The stabilised tuning voltage supply was low because the 2SA1038 transistor Q1001 in the 50V supply line was faulty. It's mounted at the top edge of the PSU-stabiliser board. **E.T.**

**Samsung S1124**

The symptoms were no RF output from the modulator and no video from the scart socket, though RF-through was OK, the deck worked and its functions were displayed on the fluorescent panel. We found that the IN4001 diode D110 in the 5V supply on the main PCB was open-circuit. The nearby diode D109 can also fail, producing various puzzling function and servo faults. **E.T.**

**Thorn VR182LV**

This machine was dead, with no outputs from the power supply. Full

HT was present across C5003 on the primary side of the circuit. Resistance checks showed that regulator IC5003 on the secondary side was short-circuit, though a replacement failed to cure the fault. D5004 (1SS244) on the primary side was then found to be leaky. A new diode restored the machine to working order. **D.C.**

**Matsui VX6600**

If the E-E sound is OK but the picture goes to blue mute when the channel is changed, the problem being worse from cold, replace C17 (0.1µF, 50V) on the IF PCB. **M.Dr.**

**Panasonic NVJ30**

Playing slow was the complaint with this machine. On inspection we found that the real-time tape counter was counting up on its own, even with no tape in the machine! It must have been counting pulses from the power supply. Replacing C22 (330µF, 10V) in the power supply cured both symptoms. It had dried out. **M.Dr.**

**GoldStar GSE2000IQ**

This machine wouldn't accept a tape. If a tape was held in the cassette housing, the loading motor would shuffle backwards and forwards. The culprit turned out to be R537 (100kΩ), which was open-circuit. We discovered this thanks to the low input impedance (20kΩ) of our analogue meter – while taking voltage measurements the tape loaded. **M.Dr.**

**Alba VCR6200 etc**

We've seen a number of these machines under different names, for example the Akura VX150, all with the same fault – the BA6209N loading motor chip burnt out. Sometimes the PCB is badly scorched. The cause of the fault is the loading motor going short-circuit intermittently. Sometimes the bearing seizes up.

Replace the motor with a different type, part no. MOTOR4305, from SEME. But note that you have to reverse the leads, as it's wired in the opposite polarity. Replace the BA6209N chip with the uprated BA6209, which has a small heatsink tab. **M.Dr.**

**Sanyo VHR390E**

The symptom with this mid-mount machine was cyclic noise bars, which is caused by a capstan phase problem. As a start we cleaned the audio/control head, but this made no difference. So we scoped the control amplifier output at pin 26 of

the BU2890DK chip IC351. No problem here. There is also a control pulse output to the microcontroller chip, at pin 15. This was also OK. When we scoped the pulse-width modulator output at pin 44 however we could, by changing the scope's timebase speed, resolve two waveforms. One looked like serial data. A replacement BU2890DK chip – it's a 44-pin flatpack type – cured the fault. **M.Dr.**

**Fisher FVHP725**

This VCR produced an over-modulated picture, with inversion on the whites. Playback of a prerecorded tape was OK, so this ruled out the modulator. The video coupling capacitor C050 (1,000µF, 6.3V) turned out to be dead short. This item is on the video in/out jack socket PCB at the rear of the machine. I seem to recall having had a similar problem with an Amstrad machine. **M.Dr.**

**Akai VSF600**

This Nicam machine was brought in because playback of prerecorded tapes was bad. Its own recordings were satisfactory. I decided to realign the mechanism and, going to the ACE head to adjust its X setting. I found that it was loose. Playback of all tapes was perfect once it had been reset.

When I queried this the customer said that someone else had replaced the ACE head some months previously. Whoever had done this must have forgotten to tighten up the screws, and really should have applied some Locktite paint. Still, we all make mistakes occasionally. **T.L.**

**Matsui VXA1100**

This VCR chewed tapes, usually when they were being rewound. Once we'd opened it and inserted a test tape we soon saw what was wrong. When the machine was stopped in the rewind mode the brakes failed to come on. The best thing to do when you get troubles with these machines is to replace the mode switch. I did this and lo and behold the VCR had been cured. **T.L.**

**Matsui VP9401**

Odd mechanical functions is something we've had with several of these machines. The thing to do is to carry out a visual check on the little brake lever coupling that sits under the cassette housing. When its securing clip wears or breaks, it becomes loose. The result is half actions etc. Replace it if it has come adrift. **T.L.**

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# Auto Channel Expansion for the Amstrad SRD400

Martin Pickering, B.Eng., describes a simple modification that provides automatic switching to Astra 1D channels with this satellite receiver

The Amstrad SRD400 satellite receiver has proved to be a reliable workhorse since it was introduced over six years ago. Despite its age technologically, and its 48-channel limitation, it still provides excellent sound and picture quality. In fact the only limitation of any significance is its tuning range.

## The Problem

With the advent of the Global Communications ADX-plus channel expander, even this limitation can be overcome. You can use the expander to watch the programmes from Astra 1D along with the best: it will shift the entire band of frequencies 500MHz higher. But the ADX has to be selected manually when you want it to do this, which is a drawback.

The only switching operation that can be readily used with the SRD400 is the TV/SAT button. This selection can't be stored on a per-channel basis however. The ideal solution would be to allocate a specific number of

channels to Astra 1D programmes and to have the ADX switch on automatically when each of these channels is selected. This article explains in detail a simple, low-cost solution.

## The Solution

My initial thought was that it would be simple to use a number-display segment that lit up for only a specific range of channels. As shown in Fig. 1, the top left segment of display three was selected. It's ideal, since it lights for only channel 40 through to 48.

But a glance at the circuit diagram showed that the LED segments are multiplexed. They are actually pulsed by the display driver chip which, in turn, receives from the microcontroller chip serial data that would be difficult to interpret. In addition, the common cathode of each seven-segment display is strobed. There is no steady DC voltage, or even some usable pulses with respect to the 0V reference.

Luckily the old bonce, now sans hair, remains cool and immediately (well, seven months after the original idea to be truthful) came up with a solution. An optocoupler hooked across the relevant LED segment would provide a pulse output that could be smoothed and used to control the ADX expander. This is what the modification does.

## Realisation

Since every Amstrad SRD510 power supply uses a CNY17 (or equivalent) optocoupler, I wasn't short of these. Fig. 2 shows the modified circuitry. The optocoupler's LED is connected between pin 16 of the LED display driver chip IC151, on the front panel, and the centre leg (collector) of the pnp strobe transistor Q152. With the emitter of the optocoupler's transistor connected to chassis, and a 1kΩ resistor connected between its collector and the 12V supply, the goal was achieved.

The pulses from pin 5 of the optocoupler are fed via a 10kΩ resistor to the base of a BC557B pnp transistor (almost any pnp transistor will do), with a 100µF capac-

Fig. 1: The display LED segment used to obtain the conol action.

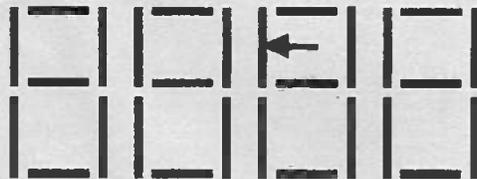
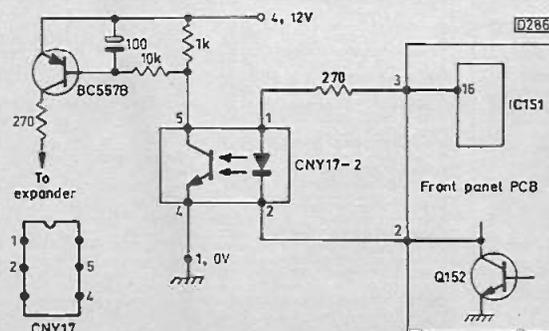


Fig. 2: Circuit of the modification.



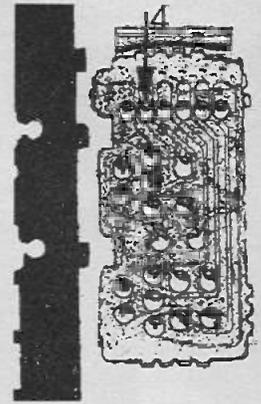
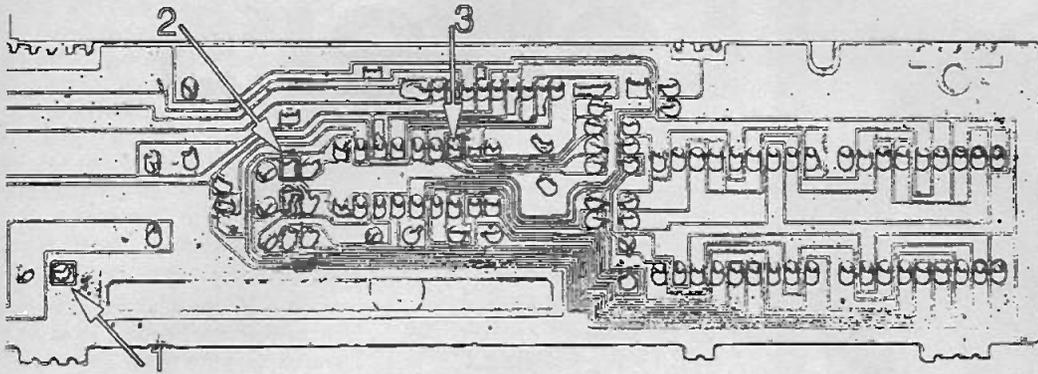


Fig. 3: Where to make the four connections.

itor to provide smoothing. The collector of the pnp transistor is connected via a 270Ω resistor to the channel expander unit.

The handful of components required cost very little, and can easily be assembled on a piece of Veroboard or similar stripboard. Keep the assembly small. After attaching wires for its connections, insulate it and tuck it away beneath the decoder board.

The sketch of the SRD400's front panel shown on the left in Fig. 3 indicates where to solder three of the connecting leads. Chassis (0V) in point 1; the collector of Q152 is point 2; IC151 pin 16 is point 3. The 12V supply is obtained from point 4 on the small regulator board that's bolted to the heatsink – see right-hand side of Fig. 3.

light when you are tuning the receiver. To overcome this nuisance, disconnect the lead and switch the ADX on while tuning. Once the channels have been tuned in and stored, switch the ADX off and reconnect the control wire. It will then switch on automatically for channels 40-48 only.

The system will also work with the Amstrad SRX200, the later version of which has 48 channels, but you will have to hunt for the 12V supply (it's at one of the ICs near the back of the receiver). The front panel connections are similar.

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A minor drawback is that the chosen segment will

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We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Television, Room 1302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

### A Cautionary Tale

This is a cautionary tale on removing damaged parts.

A Matsui TV set was brought in because it was dead. When I examined it I found that the line driver transistor and transformer were both open-circuit. When they had been replaced I switched the set on and could hear and see the EHT rise to a fiendish level – well in excess of 30kV. It arced down to the PCB and also the tube base, where a firework display fit for November 5th started up. By the time I managed to switch the set off, it had already expired. Needless to say, this Matsui was now deceased, defunct – had shaken off its mortal coil. I removed the parts I had fitted, as they were OK, and boxed the set up.

I told the customer what had happened and explained that the set was a write off. I asked him to collect it and said that there would be no charge. He was not very happy. When he asked for an insurance estimate, which I refused, he was even more unhappy. He took the set and left the shop.

Two days later I had a visit from PC Wopsey (a very attractive policewoman).

"I've come to arrest you on suspicion of theft of parts from a TV set. Would you please

# Letters

accompany me to the station to make a statement."

Well, I was gobsmacked. I explained the situation and what had happened. She said she was sorry but that as a complaint had been made (the customer had taken the set elsewhere and had been told that two small parts were missing) she had to follow it through. She then told me that if I were to go to the Police Station at 2pm and give a voluntary statement I would not be arrested.

I agreed of course and went to make my statement. I also handed her a transistor and transformer to replace the ones I had taken out.

The matter has now obviously been dropped, but what a waste of time and resources. The moral is DON'T LEAVE OUT PARTS! If you take any out, hang on to them just in case.

I hope that this is a one-off experience. It won't happen to me again, anyway.

*S. Woodbridge-Smith,  
Argyle TV & Video,  
Plymouth.*

### Digital Transmissions

We all know about digital signals – teletext, Nicam, RDS satellite, etc. But are they as good as claimed?

We go out on many service calls, and find that Nicam stereo is a growing problem. Customers update their VCRs and TV sets, but the Nicam signal drops out because the signal is poor or there's ghosting. The TV picture, though not good, is perfectly watchable. Even a good picture with a slight ghost can cause problems.

We've had similar difficulties with the RDS used for car radios – no station ID, and the real time clock won't run hence no clock display. I hate to think what will happen with the digital radio transmissions planned for the future. With FM radio you can still hear the programme when the signal level is very low and the digital signal has said bye-bye.

Teletext also causes problems, when the TV pictures are OK to

watch but there's no text or so many errors you don't bother. How do you explain this to the customer?

Digital services are good so long as the signal is strong and is correctly tuned in. But they are not the best thing since sliced bread! In fact they are of no use to the customer when the signal level is low though acceptable results are still obtained with analogue signals.

From a worried and disappointed bits and bytes man!

*Geoff Chadwick,  
Behington, Wirral.*

### Future of the Trade

Michael Maurice's article (January issue) was certainly food for thought, though a bit pessimistic. Having read it and decided against topping myself after all, I decided that a better course of action might be to come up with something more positive on the subject.

(1) With the rapid product development currently taking place, we can look forward to making pots of money (provided the manufacturers don't get involved in price wars) by selling the following: digital TV receivers, be they set-top units or dedicated TVs, and VCRs; wide-screen TVs (this is at present a very small market, but soon people may start to feel deprived); DVD equipment; interactive TV equipment, etc., etc.

(2) As long as TVs contain a power supply and a line output stage, and as long as VCRs and CD players contain cheap plastic cogs and levers, there will no shortage of servicing work.

(3) The ridiculous belief of manufacturers that a basic VCR must cost less than those of its rivals cannot go on indefinitely. We must be reaching the point where it is no longer viable to manufacture and sell on price rather than quality.

(4) If the quality of products continues to fall and manufacturers continue to build down to a price, this should at any rate keep those of us in the service side busy.

(5) Finally, the worlds of computers and home entertainment are going

to become more closely linked. This is inevitable, as discs can be used for audio, video and computing and a monitor can be used for computer or TV display purposes. How long before we see the first TV/Video/CD/radio/cassette/fax/modem/CD-ROM/security/ansaphone/teasmade, and who will have to fix it?

So my message for 1997 is: don't panic, there is work in this trade for many years to come. But some adaptation may be required, particularly by those who normally turn a deaf ear when ROMS, RAMS, NAND gates etc. are mentioned.  
*Shane Humphrey, LCGI, Bideford, Devon.*

I heartily agree with Michael Maurice's article (January issue) on the future of the trade. The abolition of resale price maintenance in the Sixties dealt a severe blow to the trade. The shop where I worked went out of business, after thirty years, largely because a discount store opened in the same street. What dealt the final blow however was the advent of solid-state receivers. Before that receivers needed service every six months or so on average. So a repair workshop was essential, and even with increased price competition a business stood or fell on its service. When the reliability of sets improved to the point that many of them would work for five years or more without a fault, not only did the income from servicing fall by about 90 per cent, it also meant that any Tom, Dick or Harry could enter the market with little by way of servicing back-up and the accompanying cost.

Until about fifteen years ago my business supported a staff of three and we were very busy. Now there is hardly enough work for me – in fact this year my expenditure exceeded my income. I'm fortunate in being able to supplement my income by going into the Bed and Breakfast business. But not everyone is blessed with a pleasant rural location or the facilities to do this.

Several engineers have started up on their own in this area in recent years. Most have failed, as there is just not enough work to go round. This is a rural area of course. Perhaps things are different in towns and cities. But I certainly wouldn't want to try and set up a business here now.

*Peter Nutkins,  
Charmouth,  
Dorset.*

### Sky can have 'em

We have made very little money out of servicing satellite receivers. The main reason for this is the fact that people are reluctant to spend realistic money on having repairs carried out to items that, because of Sky promotion and free units offered by multiples as part of package deals etc., are now considered to be of little or no value. So I was very interested to read John Hopkins's letter (December issue) on Sky's free service arrangement.

It has always been my policy to bury bureaucrats under mountains of often meaningless paperwork, this being one of the most effective ways of keeping them off my back. So I'm extending this philosophy to Sky. If it wants to promote free units and service them, making it uneconomical for service organisations such as mine to become involved, then so be it. As far as I'm concerned, they can have the lot.

Now, when a customer presents a satellite unit for repair, before he's even had time to tell me that there's nothing much wrong with it and that it shouldn't cost much and should be ready by tea time, I slap a preprinted handout into his hand. It explains the procedure, which was so clearly outlined by John Hopkins, for contacting Sky.

If Sky wants them it can have them – receivers, IRDs, LNBs, sparklies, the lot. Every satellite grizzler who walks through our door is now directed straight to Sky.

*Bernie Hinton,  
West Ewell, Surrey.*

### Demagnetisation

I read Peter Graves's letter (December issue) about Test Case 406 with a great deal of agreement. I, too, would never pass DC through any tape head. In fact I remember that in the days of amateur construction of reel-to-reel recorders the switching of bias oscillators had to be arranged to provide a gentle rise and decay of the signal applied to the head. This was usually done by including an electrolytic capacitor on the load side of the bias oscillator HT switch.

The main point of this letter however is to pass on a tip that could prove helpful when the problem is stubborn magnetisation of tape-path components. I've wound a hefty coil of thirty turns of insulated 1.5mm copper wire, using a broom handle as a mandrel. Three layers, each of ten turns, are manageable. The coil is energised from a Weller soldering pistol of the type that has a wire bit fed from a transformer in the body. Remove the soldering bit and fit the coil in its place. The coil will be self-supporting if the lead-out wires are not too long, but the wires could always be supported by a short piece of dowel.

I use the same approach as when degaussing a CTV tube – switch on well away from the magnetised object, then bring the 'gun' in close and sweep it around. Finally, move it well away again before switching off. The few seconds it takes to do this will not overheat the coil or the transformer to any appreciable extent. The results are excellent, and the device can be used to degauss watches and VCRs as well. Head testing for continuity

remains a problem. A bench-top tester that uses the head as part of a tuned circuit could possibly be built, i.e. when the head is connected an audio oscillator is formed, showing whether the head is OK. Constructional article someone?

*J. LeJeune,  
Nottingham.*

### Poor Circuit Diagrams

I recently purchased a service manual from Comet for the Goodmans 5160TT TV receiver. Unfortunately the circuit diagram was unreadable. On ringing them to ask for a better copy I was told that (a) it is the best they had and they are all the same; (b) the charge was only £1.29 (the £3.50 handling charge was tactfully overlooked); (c) it's an old model anyway, hardly worth repair; and (d) there's a microfiche, but I can't have one!

It seems a shame that, while Comet makes an effort to support the trade, it falls down badly in this respect. If a microfiche is available, excellent copies can be produced. If the charge is £5 instead of £1.29, so be it. An unreadable copy is useless, a waste of time and effort.

*Colin Boggis,  
Woking, Surrey.*

### CORRECTION

In the TV Tuning Aid article (February issue page 264) the connection between pins 3/12/13 and 5/6 of IC2 was omitted in Fig. 1. Without this connection the oscillator will not run.

Our apologies for any difficulties this omission may have caused.

# Pace's MSS100 Technology

J. LeJeune concludes his description of the technology used in this advanced, budget-priced satellite receiver

In this second, concluding article on the Pace MSS100 receiver we'll look at audio signal processing, the graphics chip, the modulator, the microcontroller system and the scart socket arrangement.

## Audio Processing

Fig. 5 shows in block diagram form the audio section of the signals processing chip U500. A simple RC high-pass filter, augmented by a series-tuned trap resonant at 4.433MHz, extracts the audio subcarriers from the tuner's baseband video output for feeding to pin 23 of U500. The input goes to two gain-controlled amplifiers, one for each of the two demodulators (for left and right audio). The AGC range is 40dB, the amplifiers providing a constant 1V peak-to-peak output.

The operation of the two demodulators resembles that of a phase-locked loop, but is more accurately described as a locked-oscillator phase detector. Each uses a voltage-controlled oscillator (VCO) which is set to operate at the required subcarrier frequency. The outputs from these VCOs are the reference inputs to a pair of comparators, the input FM signals being the other inputs. The comparators generate error signals which are directly

proportional to the original modulation. This is the basic demodulation process.

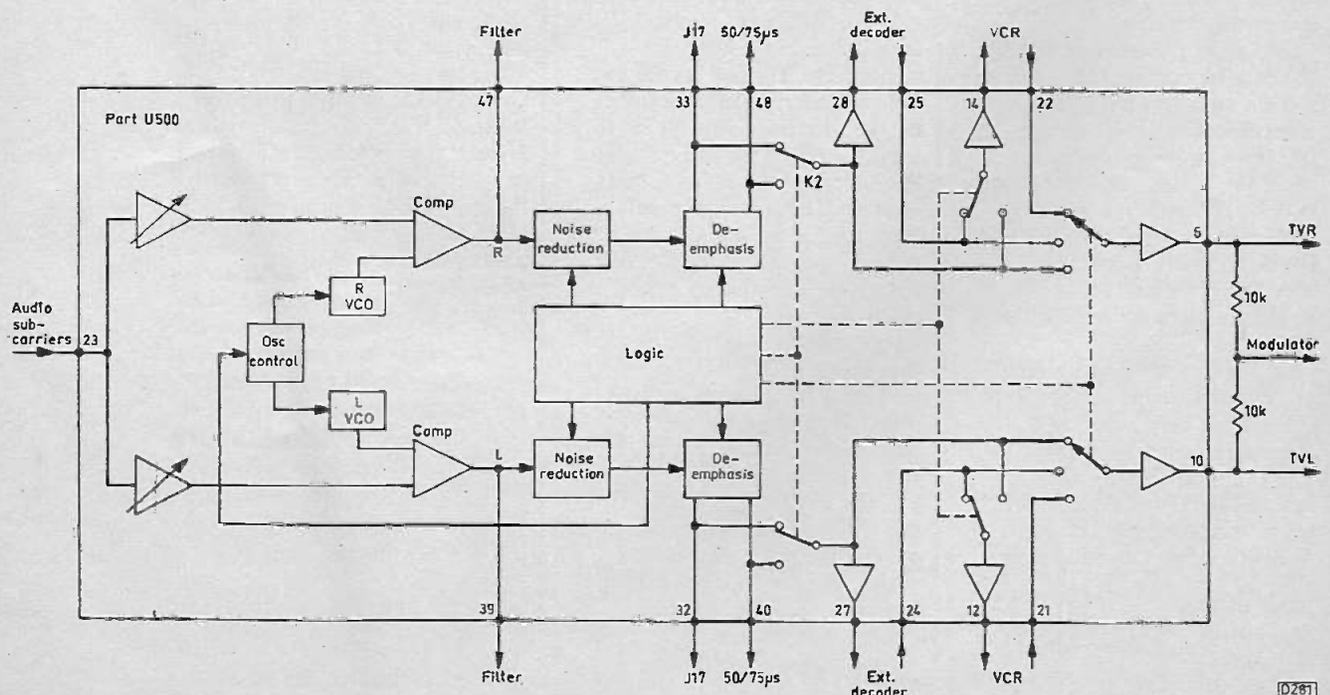
Once the VCO frequency and the centre frequency of the FM subcarrier coincide, the VCO is locked to the incoming FM. Filtering of the L and R audio is carried out by RC networks connected to pins 39 and 47 of the chip. This is important, as it removes any 180kHz beats that might arise between the adjacent subcarriers.

The demodulated audio signals are passed to a noise reduction system. This can be set to recover Panda compressed audio by selecting Panda de-emphasis. Audio without noise reduction compression can be selected by an internal bypass switch (not shown in Fig. 5).

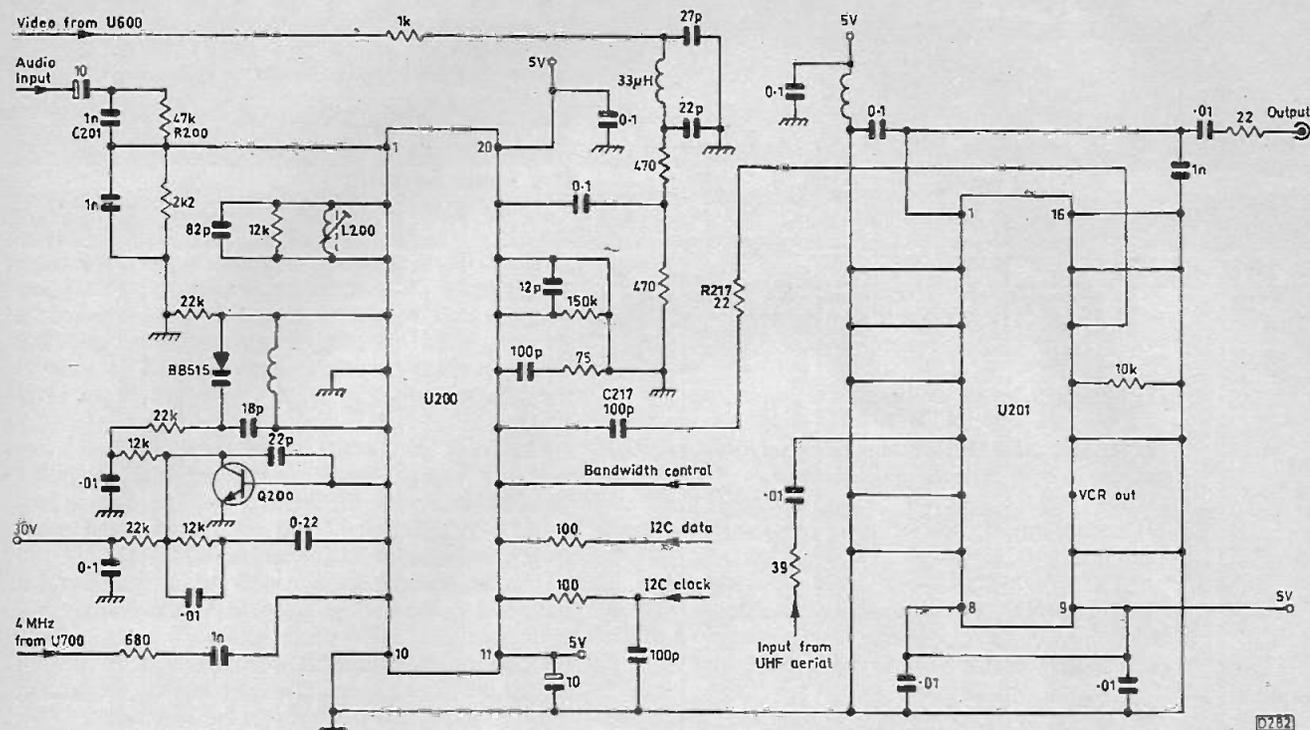
De-emphasis is provided by external components, J17 for the left- and right-channels at pins 32 and 33 respectively. 75µsec de-emphasis is provided at pins 40 (L) and 48 (R): the 50µsec de-emphasis can be switched in internally, by parallel connection of an on-chip 44kΩ resistor at each of these pins.

De-emphasis is followed by switched selection of internal/external audio by a four-input, three-output cross-wire matrix. This enables de-emphasised satellite audio to be fed to the decoder, VCR and TV scarts. The audio outputs

Fig. 5: Simplified block diagram of the audio signal processing arrangements in the STV0056 chip.



D281



at pins 6 (R) and 10 (L) can be level-controlled. They are fed to the TV scart socket and, after summing, to the modulator. Switching can be set by the pin 8 levels at the respective scart connectors. Volume controlled audio is also available via phono socket outputs at the rear of the receiver.

**Control of U500**

The video/audio processor chip U500 is controlled by the clock and data lines from the microcontroller chip U700. U500 doesn't have an independent crystal oscillator, relying on a 4MHz signal at pin 35. This is generated by U700 and buffered by Q700. In addition, an accurate 22kHz tone signal for switching a universal LNB is fed in at pin 29.

A one per cent tolerance 273kΩ resistor connected to pin 50 sets the current-bias reference for some of the internal amplifiers and also controls the roll-off frequencies for filters employed in the audio sections of the chip. If this resistor changes value, the operation of U500 will stop.

**Colour Graphics**

The video output at pin 9 of U500 is fed via buffer amplifier Q600 to the VCR scart socket and to pin 10 of the colour graphics chip U600 (see Fig. 2 last month). U600 generates background screen colour for the menus and on-screen messages: as an alternative, the graphics can be superimposed on the picture.

U600 has its own crystal oscillator to generate the colour subcarrier frequency. It employs a 17.734MHz (four times the subcarrier frequency) crystal which is connected to pins 16 and 17. The oscillator has an accuracy of a few Hz.

An LC oscillator with external components connected to pins 1 and 2 runs at around 7MHz to generate the character pixels. When the graphics have to be synchronised with the picture, character generation also depends on line and field sync inputs at pins 18 and 19. These come from the timing generator circuit in the VideoCrypt decoder - from pins 5 and 6 respectively of U300. U600 generates its own sync pulses for graphics on a plain background.

Graphics insertion into a plain background or the pic-

ture is a simple switching function, the switches being controlled by signals on the data bus from U700/U701 (the microcontroller and memory chips). A potential divider network connected to pin 9 of U600 sets the white level of the characters. Video leaves U600 at pin 8, passing to the the modulator via buffer transistor Q601.

Spare data processing capacity in U600 is used to provide port expansion facilities for U700, generating control lines for pins 8 (external AV) and 16 (RGB switching) of the TV scart socket.

**The Modulator**

The modulator circuit, see Fig. 6, uses two Philips surface-mounted ICs. The TDA8722 chip U200 is an amplitude modulator while the TDA8725 chip U201 is an active UHF combiner.

U200 contains its own phase-locked loop for tuning purposes. The PWM tuning signal at pin 7 is fed to an integrator and amplifier-inverter circuit based on Q200. The reference signal for the PLL is the 4MHz signal generated by U700. It's divided down internally to 31.25kHz, the frequency at which the PLL comparison is made. The carrier oscillator tuned circuit is connected to pins 4 and 6 of U200. A programmable divider within U200 converts the carrier frequency to 31.25kHz, under the control of the tuning data from U700.

The audio input is pre-emphasised by C201 and R200 and passed to pin 1. The audio subcarrier oscillator is connected to pins 2 and 3 - coil L200 can easily be tuned to 5.5MHz for system B and G TV receivers.

U200's UHF output appears at pin 15 and is fed via C217 and R217 to pin 14 of U201. The TDA8725 was designed principally for VCR use, but is ideal for satellite receiver applications. Mixed terrestrial and satellite RF emerges at pin 1 of U201, passing to the UHF output socket.

**The Microcontroller**

The Z86C21 microcontroller chip used in the MSS100 is a member of the Zilog Z8 family. It's a custom-masked microcontroller which is linked via the I2C bus to the 32K EEPROM U701. U700's functions are as follows:

**Fig. 6: The modulator circuit, which is based on two Philips surface-mounted ICs.**















# TELEVISION

## TV/VCR SPARES GUIDE SPRING 1997

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See also CPC and Willow Vale.

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**0181-897 6388**  
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**Akura** Spares available from Akura Components Ltd., 44 Deerdynes View, Westfield, Cumbernauld, Glasgow G68 9HW. plus spares for Minoka and Royal Lux.  
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**Alba** Radio Ltd., 12 Thames Road, Barking, Essex IG11 0HZ. Spares for Alba, Bush, some Goodmans and Hinari models and some Brother microwave and Dirt Devil.  
**0181-787 3000**  
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See also Willow Vale, CPC, Wizard.

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

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

**Autovox** See Comet Group plc.

**Beko** (UK) Ltd., 40 Caxton Way, Watford Business Park, Watford, Herts WD1 8QZ.  
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**Binatone** Electronics plc., Binatone House, 1 Beresford Avenue, Wembley, Middx HA0 1YX.  
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**Blair's Electrical Services**, 13 Belgrave Road, Dresden, Stoke-on-Trent ST3 4PR. Spares for Saba, Thomson, Telefunken and Nord Mende.  
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**Bush** See Alba Radio Ltd. Also CPC, HRS and Willow Vale.

**Cambridge** Spares available from SEME.

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

**Cathay** Spares available from Diamond Television.

**Commodore** Spares available from CPC.

**Comet** Group plc., After Sales Service H.Q., Unit 5, City Park Ind. Estate, Gelderd Road, Leeds LS12 6DR.

**01132-310 523**. Spares only – accessories direct.  
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**Contec** CTVs sold by Dixons. Spares available from Partmaster.

**CPC** Ltd., Component House, Faraday Drive, Fulwood, Preston, Lancs PR2 4PP.  
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Authorised spares distributor for Aiwo, Alba, Amstrad, Bush, Citizen, Commodore, Ferguson, Fidelity, Finlux, GEC, GoldStar, Goodmans, Hinori, Ingersoll, ITT, Logic, Luxor, Matsui, Nokia, Orion, Osume, Pace, Philips, Pye, Saisho, Salora, Samsung, Sinclair, Skantic, Sony, Toshiba and Triumph.

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**Crown Corporation** Spares available from Key Electronics. See also CPC, HRS. Made in India models see BPL.

**Daewoo** Electronic Sales UK Ltd., Daewoo Building, Wharfedale Road, Winnersh Triangle, Wokingham, Berks RG41 5TP.  
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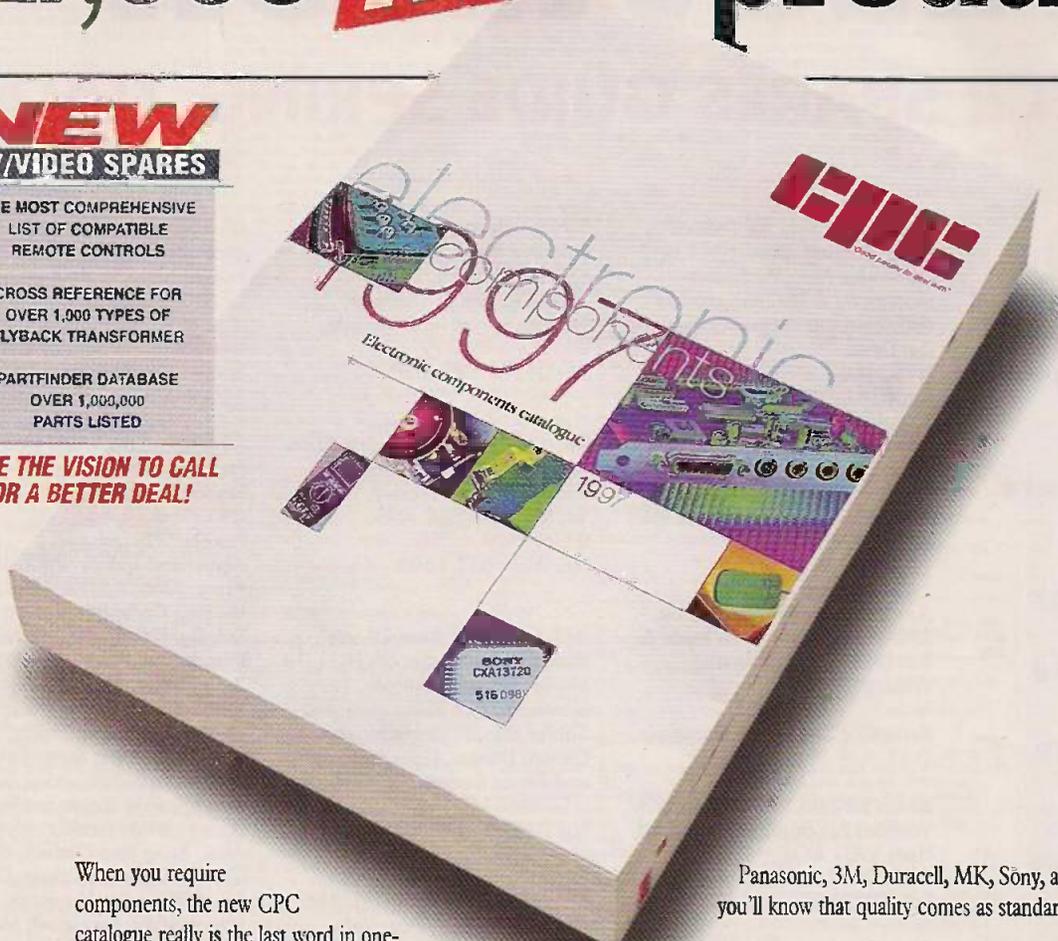
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**Datsura** See BPL.

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

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

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

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

**Elftone** Electronics Ltd., 4 Beresford Avenue, Wembley, Middx HA0 1YZ  
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Fax 0181-903 5011.

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

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

**Ferguson** Thomson Multimedia Sales UK Ltd., Spares Dept, Crown Rd, Enfield, Middx EN1 1DZ.  
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**Finlux** Spares available from NCS and CPC.

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

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

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

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

**General** See Fujitsu General

**GoldStar** LG Electronics UK Ltd., LG House, 264 Both Road, Slough SL1 4DT.  
**01753-500 400**  
Fax 01753-517 445.  
See also CPC, and Willow Vale.

**Goodmans.** See Alba Radio Ltd or Comet Group plc. depending on model. Also CPC.

**Granada Rental Services** Unit 37, Roman Way Ind. Estate, Longridge Road, Ribbleson, Preston, Lancs PR2 5BD.  
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**Matsui** Brand name used by Currys and Dixons. Spares available from Partmaster. Also CPC, Chas Hyde, SEME and Wizard.

**Metz** No UK source of spares. Manufacturers address: Metz Werke GmbH 2 Co., D8510, Furth, Germany.

**Minoka** Spares available from Akura Components Ltd.

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**NEC** Spares available from SEME and CPC.

**NEI, Network** Spares Division, Unit 6, Southfork Industrial Park, Dartmouth Way, Leeds LS11 5JL.  
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**Orion** See CPC.

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**Prinz** Brand name used by Dixons. See Partmaster.

**Proline** Brand name used by Comet Group plc.

**Pye** See Philips Service.

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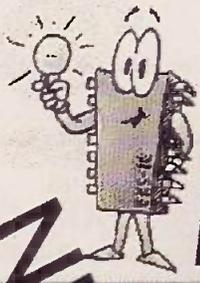
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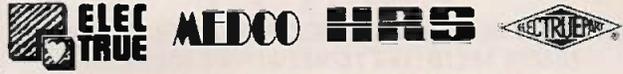
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**Uiden** Eurosat Distribution Ltd., 1 Oxygate Centre, Oxygate Lane, London NW2 7JA.  
**0181-452 6699**  
Fax 0181-452 6777.

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

**Willow Vale** Electronics Ltd., 11 Arkwright Road, Reading Berks RG2 0LU.  
**01189-876 444**  
Fax 01189-867 188  
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**Wiltsgrove** Ltd., 28-29 River Street, Digbeth, Birmingham B5 5SA.  
**0121-772 2733**  
Fax 0121-766 6100.  
Official distributor for Antex, Adcola, CME, Konig, Nikkai, Philex and Thorn.

**Wizard** Distributors, Empress Mill, Empress Street, Manchester M16 9EN.  
**0161-872 5438** or  
**0161-848 0060**  
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**Zenor** See BPL.

## General/miscellaneous parts suppliers

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**01922-613 654**  
Fax 01922-613 654

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

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

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

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

**Electrovalue Ltd**, Unit 5, Beta Way, Thorpe Ind. Park, Egham, Surrey TW20 8RE  
**01784-433 604**  
Fax 01784-433 605  
Northern branch 680 Burnage Lane, Manchester M19 1NA.

**0161-432 4945**  
Fax 0161-432 4127.

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

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

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

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

**Harrison Electronics**, Century Way, March, Cambs PE15 8QW.  
**01354-651 289**  
Fax 01354-651 416.

**Irwin Electronics**, Unit 200, JC Albyn Complex, Burton Road, Sheffield S38BX.  
**0114-273 9622**

Fax 0114-275 9909.

**JJ Components**, Rear Of 243/7 Edgeware Road, The Hyde, Collindale NW9 6LU  
**0181-205 9055**  
Fax 0181 205 2053.

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

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

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

**Marapet Electronic Components**, 1 Hornbeam Mews, Gloucester GL2 0UE.  
**01452-532 253**  
Fax 01452 549 514

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

Fax 01702-554 001

**Nikko Electronics**, Dalbani House, 257 Burlington Road, New Malden, Surrey KT3 4NE.  
**0181-336 0566**  
Fax 0181-336 0579.

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

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

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

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

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



## VIDEO SERVICE KITS

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<b>FERGUSON &amp; JVC</b>			
3V42/43			
HRD455/HRD725			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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Order Code: SK37		£16.00 ORDER CODE: SK38 £9.00	
3V58/59/64/65			
HRD170/180/210/230/300/320/370/400/430/530/700/750			
HR55000			
<i>Contents</i>			
BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND			
Order Code: SK44		£7.00	
3V29/3V30			
HR7200/7300/7350			
<i>Contents</i>			
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES			
Order Code: SK05		£5.00	
3V35/36, 38/39/49			
HRD110/111/120/225			
<i>Contents</i>			
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Order Code: SK04		£5.00	
3V31/3V42			
HR7600/7610/7650/7655			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP		BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH	
Order Code: SK33		£11.00 ORDER CODE: SK34 £5.00	
3V35/36/38/39/49			
HRD110/111/120/121/225			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND		BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER TYRE, REEL IDLER TYRE	
Order Code: SK35		£10.00 ORDER CODE: SK36 £5.50	
3V29/3V30			
HRD7200/7300/7350			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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		BELT SET, T/U REEL IDLER TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER, T/U CLUTCH	
Order Code: SK31		£10.00 ORDER CODE: SK32 £5.00	
3V44/45/48/53/54/55/57			
HRP50/HRD140/150/158/160			
HRD250/257/565/566/755			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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Order Code: SK39		£15.00 ORDER CODE: SK40 £9.50	
<b>FISHER</b>			
FVHP905/906/907/908/910/911/916/918			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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Order Code: SK57		£13.00 ORDER CODE: SK58 £5.00	
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK68		£11.00 ORDER CODE: SK69 £3.00	
<b>HITACHI</b>			
VT11/VT33			
<i>Contents</i>			
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<b>VT11/VT33</b>		<i>Contents</i>		<i>Economy Kit Contents</i>	
		BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND		BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE	
Order Code: SK45		£13.00		ORDER CODE: SK46 £3.75	
VT52/61/62/63/64/65/85/86/640					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND		BELT SET, PINCH ROLLER, FF/REW IDLER		BELT SET, PINCH ROLLER, FF/REW IDLER	
Order Code: SK49		£14.00		ORDER CODE: SK50 £3.00	
VT400/405/410/1314/1518/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND		TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND		BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND	
Order Code: SK52		£9.75		ORDER CODE: SK51 £14.00	
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VT130					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND		BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND		BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND	
Order Code: SK51		£14.00		ORDER CODE: SK52 £5.00	
<b>PANASONIC</b>					
NV2000/NV2010					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES		BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK03		£3.00		ORDER CODE: SK02 £5.00	
NV300/NV330/NV333/NV340/NV366					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, VIDEO LAMP		BELT SET, PINCH ROLLER, TENSION BAND, VIDEO LAMP		BELT SET, PINCH ROLLER, TENSION BAND, VIDEO LAMP	
Order Code: SK13		£6.00		ORDER CODE: SK14 £3.50	
NV7000/NV7200/NV7800					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE	
Order Code: SK11		£8.50		ORDER CODE: SK12 £3.25	
NV300/NV330/NV333/NV340/NV366					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER	
Order Code: SK15		£7.00		ORDER CODE: SK16 £3.25	
NVG1/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER, TENSION BAND		LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER, TENSION BAND		LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER, TYRE	
Order Code: SK27		£6.00		ORDER CODE: SK28 £3.00	
NV332					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE		BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE		BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE	
Order Code: SK29		£12.00		ORDER CODE: SK30 £5.10	
NV230/250/260/280/430/450/480/470/650/810/890/AG1200P/AG1500PK					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK23		£6.00		ORDER CODE: SK24 £3.25	
NV800/NV688					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND		BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND		BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE	
Order Code: SK25		£12.00		ORDER CODE: SK26 £6.00	
NV730/NV770					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND		SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND		SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE	
Order Code: SK19		£5.00		ORDER CODE: SK20 £3.00	
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK21		£5.00		ORDER CODE: SK22 £2.75	
NV777/NV788					
<i>Contents</i>		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND		BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND		BELT SET, PINCH ROLLER, IDLER TYRE	
Order Code: SK17		£6.00		ORDER CODE: SK18 £4.00	

## VIDEO SERVICE KITS (Cont.)

<b>SHARP</b>			
VC381			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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Order Code: SK47		£8.00 ORDER CODE: SK48 £3.25	
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND		BELT SET, PINCH ROLLER, REEL IDLER	
Order Code: SK60		£3.50 ORDER CODE: SK61 £5.00	
VC781/VC781Q/VC782Z/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202			
<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND		BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE	
Order Code: SK64		£13.50 ORDER CODE: SK65 £3.75	
VC681/VC682/VC684/VC685/VC683/VC699/VC6F3/VC700			
<i>Contents</i>		<i>Economy Kit Contents</i>	
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BLAUPUNKT 210	1600p	LOT08
GRUNDIG 2922010	1600p	LOT09
ITT CVC800/1/3	1500p	LOT10
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NORMENDE 5255	1600p	LOT12
SABA 81000 200	1600p	LOT13
SALORA T236 EQ	1650p	LOT14
SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
TELEFUNKEN AT1	1450p	LOT17
TELEFUNKEN EQ	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
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ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1400p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT 81	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 581010	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1200p	LOT33
FE TX100 110 D	1500p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1300p	LOT37
FERGUSON 00D3-508-002	1650p	LOT38
Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3		
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TX2112, TX2162, TXC22		
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AMSTRAD SRD500	SATPSU4	650p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	650p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p
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ECHOSTAR SR5500	SATPSU12	1735p
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ORDER CODE: AH01 PRICE: 1350p

**AMSTRAD ORIGINAL NO: 153134**  
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 8100, 8600, 8602, 8603, VCR8804, 8700, 8704, 8714, 8800, 9005, 8244  
Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM  
ORDER CODE: AH02 PRICE: 1450p

### Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0081	NV67 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

### 8 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxiliary Options!

- Replaces up to 8 remotes with one • Simple 4 digit setup routine
- Controls 1000s of models • Teletext functions with Fastext
- Clear (large key) layout • Code Search Facility
- Stylish and easy to operate • Replace broken or lost remotes
- Original remote not required

Order Code: 8 WAY PRICE: 14.50p + VAT

### Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CCW MOTOR	170p
12V CCW MOTOR	170p
13.2V CCW MOTOR	290p

### Replacement Video Cassette Housings

NAME	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	3200p
GRANADA	VHS0P1	CH05	1100p
	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1200P, 1291P, 1295P, 9400, 73401, 6SE1295P, 6SE1891P, 20001C, 20081Q, VCP4200, 4300, 4301, 4305, VCP4300, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1248, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p
	3V42, 3V43, 3V44, 3V45, 3V46, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 180, 250, HRD257, 495, 565, 566, 725, 756	CH02	2800p
	8948, 8950, FV108, 12L, 13H, 14T, 20S, 21R, 22L, 26, 39S, HRD230, 430, 530	CH03	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 8600, FV37H	CH20	2200p
	HRD540, 580, 630, 860, 910, 960, HRD970, HRD920, FERGUSON FV57H	CH27	2400p
L.T.T.	VR360S, VR390S	CH01	2800p
	VR391S, 392S, 394S, 394S, 397S, 398S, 399S, 3997, 6948	CH02	2800p
	VR391S, 392S, 394S, 394S, 397S, 398S, 399S, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (89120368)		
	DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6333, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49S86	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2800p
	VCA103, 103GV, 106, 106GVM, 254GV	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806S, 810S, VCT212, 310, 410S, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CH01	2800p
	V65, V66	CH02	2800p

### Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	160p
SWITCH CLEANER	175ML	SP02	170p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	170ML	SP04	310p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SP08	310p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	190p
COLDKLENE	250ML	SP13	230p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	260p
TUBE SILICON SEALANT CLEAR	75ML	SP23	260p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT		SP26	2100p

All the above items are manufactured by Servisol  
If you purchase more than one Servisol Product, postage & pack-  
age will be charged as follows:  
300p for 5 cans 450p for more than 5 cans

### CD Pick Ups

SONY OPTICAL PICK UP  
PART NO: KSS210A SONY CDPC 301M, CDPC 305M 2000p  
Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems

PART NO: KSS210B  
USED ON MODELS:  
CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60  
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S 2000p

### Cassette Tape Heads

HEAD TYPE	PRICE
MONO HEAD	80p
STEREO HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

### Soldering Accessories

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (KS25W 240V)	S101	900p
15 WATT 240 VAC (KS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 900 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M	S107	80p
SOLDER MOP 1.2MM X 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

### FAULT FINDING GUIDE BOOKS

Satellite Fault Finding Guide Issue 1.  
Listing about 1,000 faults for over a  
range of 24 different brands.  
Order Code: BOOK05.  
Price £8.50 - No VAT.

### Video Recorders Edition 4

Lists more than 4,500 faults for  
43 different brands  
Order Code: BOOK01  
Price £12.75 - No VAT.

### TELEVISION Edition 6

Lists more than 8,450 faults with 460  
pages covering 58 different brands  
Price: 1600p only - no VAT. Order Code: BOOK02

### Satellite Repair Manual Edition 4

A comprehensive guide to receiver  
reviewing, featuring stock faults and  
installation tips.  
Price 1400p Only No VAT Postage 100p  
Order Code: BOOK03

### SEMICONDUCTOR COMPARISONS 1996

Listing more than 29,000 Semiconductors with  
suitable alternative complete with descriptions  
and base information.  
Price: £14.50 - No VAT. Order Code: BOOK04

### VIDEO CLEANING STICKS

Order Code: SP14  
Price 17p each 15p each pack of 10pcs  
13p each pack of 25pcs

### VIDEO MAINTENANCE TOOLS

Set of 8 Allen keys packed in  
a plastic wallet  
Order Code: TOOL9  
Price 125p  
Specifically designed for video maintenance

### UNIVERSAL HEAD EXTRACTOR TOOL

Hand tool designed for  
extracting hard to remove  
heads without damage to  
either the head or the  
mounting assembly.  
Adjustable so as to suit  
various brand heads.  
PRICE - 600p

### GRANDATA LTD

Tel: 0181-900 2329

Fax: 0181-903 6126



**VIDEO RECORDER POWER SUPPLY REPAIR KITS**

- PHILIPS**  
For ES7047 Chassis: CP110  
**Order Code: VCRPSU1** Price: 675p
- PANASONIC**  
For ES 7054 Chassis: HSM  
**Order Code: VCRPSU2** Price: 1125p
- For ES 7053 Chassis: JSM  
**Order Code: VCRPSU3** Price: 900p
- For ES 7050 Chassis: KSM  
**Order Code: VCRPSU4** Price: 1500p
- For ES 7051 Chassis: LSM  
**Order Code: VCRPSU5** Price: 1500p
- For ES 7055 Chassis: MSM  
**Order Code: VCRPSU6** Price: 1650p
- For ES 7052 Chassis: NSM  
**Order Code: VCRPSU7** Price: 1750p

**NEW NATIONAL PANASONIC VCR SERVICE KITS**

This Service Kit consists of the parts for the upperside of the G deck, G rev. deck and G2 deck.

Suitable for the following models:  
AG5150, AG5250, AG5700, AG6024, NVF55, NVF55F, NVF65, NVF75, NVF77, NVJ30, NVJ33, NVJ35, NVJ36, NVJ37, NVJ40, NVJ42, NVJ45, NVJ46, NVJ47, NVJ48, NVL20, NVL21, NVL23, NVL25, NVL28, NVW1, NVFS100, NVFS200, NVFS58, NVFS90

This kit consists of the following:

Pinch Roller Unit, Mode Switch, PS Pull Out Gear, Sub Loading Arm Unit, Pinch Cam, Pinch Cam Cap, PS Unit, Cut Washer, Connection Gear, Cut Washer

**Order Code: SK134** Price: 1100p

This Service Kit consists of the parts for the lowerside of the G deck, and the G rev. deck.

Suitable for the following models:  
AG6024, NVF55, NVF55F, NVJ30, NVJ33, NVJ35, NVJ36, NVJ37, NVJ40, NVJ42, NVJ45, NVJ46, NVJ47, NVJ48, NVL20, NVL21, NVL23, NVL25, NVL28, NVW1

This kit consists of the following:

Main Cam Gear, Ring Gear, Sub Cam Gear, Timing Belt, Centre Gear, Play Arm Unit, Clutch Disk, Loading Gear (take up), Centre Pulley Unit, Loading Gear (supply), Loading Cam Gear, Cut Washer, Retainer Gear Unit, C Ring, Detent Arm

**Order Code: SK135** Price: 1000p

**TRANSPARENT REPAIR/ADJUSTMENT CASSETTE**

This transparent videocassette replaces a normal videotape during measurements, adjustments and inspection. The mechanical parts come into sight and become accessible.

**Order Code: Tool23** Price: 500p

**VOLTAGE TESTER**

A terminal screwdriver incorporating continuity and voltage detection supplied complete with batteries on blister card. With Eusolint and instructions for use.

**Order Code: Tool11** Price: 220p

**SPRING HOOK**

Spring Hook, to unlock springs in audio tape recorders and VCR's

**Order Code: Tool20** Price: 265p

**SATMETER**

The Satmeter is a professional portable satellite strength meter designed for the installation and maintenance of satellite TV systems. The Satmeter can be used as stand alone meter with powering the LNB as well as in loop. Through operation with satellite RX powering the LNB.

- Acoustical signal : On signal strength
- LED indicator : Vertical/horizontal
- Frequency range : 900 to 2050 MHz
- Input impedance : 70 OHM
- Power amplifier : 18 DB
- Detection range : -60 to -10 DBM
- Max. Input Signal : -10 DBM

**Order Code: Tool22** Price: 8500p

**DIGITAL MULTIMETERS**

**CM2300 DIGITAL MULTIMETER**

- Features:**
- 3.5 LCD Display
  - Height 12mm
  - Max Reading 1999
  - HV Indication for High Voltage
  - Single Manual Rotary Switch for Function and Range Operation
  - All Ranges Overload Protected
  - 10A DC Current Test
  - DC Voltage 2V/20V/200V/500V
  - AC Voltage 200/500V
  - DC Current 200mA
  - Resistance 2k $\Omega$ /20k $\Omega$ /200k $\Omega$ /2M $\Omega$
  - Supplied with test probes

**Order Code: CM2300** Price: 975p

**CM2400T DIGITAL MULTIMETER WITH TEMP MEASUREMENT**

- Features:**
- 3.5 LCD Display
  - Height 12mm
  - Maximum Reading 1999
  - 10A DC Current Test
  - DC Voltage 200mV/2V/20V/200V/1000V
  - AC Voltage 200/750V
  - DC Current 0.2mA/200mA/20mA/200mA/20A
  - Resistance 200 $\Omega$ /2k $\Omega$ /20k $\Omega$ /200k $\Omega$ /2m $\Omega$
  - Supplied with Test Probes
  - Temperature measurement
  - Continuity Test
  - Diode Test and Continuity Check
  - All Ranges Overload Protected

**Order Code: CM2400T** Price: 1450p

**CM2900 PACKET DIGITAL MULTIMETER**

- Features:**
- 3.5 LCD Display
  - Compact and Lightweight Pocket Size

- Maximum Reading 1999
- DC Current and Resistance Overload Protected
- Slide Switches for Function and Range Operation
- Supplied in Wallet with Test Probes
- DC Voltage 2V/20V/200V/500V
- AC Voltage 200V/500V
- DC Current 200mA
- Resistance 2k $\Omega$ /20k $\Omega$ /200k $\Omega$ /2M $\Omega$

**Order Code: CM2900** Price: 1150p

**CM2700 AUTORANGING DIGITAL MULTIMETER**

- Features:**
- 3.75 LCD Display with Decimal Point
  - 33 Segment Bargraph display
  - Override Indication
  - Rotary Switch for Function Selection
  - Auto Power off (approx 15 mins)
  - Auto Polarity with Indication
  - Diode Test and Continuity Test with Buzzer
  - All ranges overload protected
  - Low Battery Indication
  - Supplied with Test Probes
  - DC Voltage: 320mV/3.2V/32V/320V/600V
  - AC Voltage: 320mV/3.2V/32V/320V/600V
  - DC Current A: 320 $\mu$ A/3200 $\mu$ A/32mA/320mA/10A
  - AC Current A: 320 $\mu$ A/3200 $\mu$ A/32mA/320mA/10A
  - Resistance: 320 $\Omega$ /3.2k $\Omega$ /32k $\Omega$ /320k $\Omega$ /3.2M $\Omega$ /32M $\Omega$

**Order Code: CM2700** Price: 4050p

**CM3230 DIGITAL CAPACITANCE METER**

- Features:**
- 3.5 LCD Display
  - Height 18mm
  - Maximum Reading 1999
  - Capacitance 9 Ranges from 200pF-20000 $\mu$ F
  - Measuring from 1pF-20000 $\mu$ F
  - Single Manual Rotary Switch for Function and Range Operation
  - Zero Adjust Knob

**Order Code: CM3230** Price: 3950p

**REPLACEMENT IDLERS & PULLEYS**

Make	Models	Description
Hitachi	VT11, 14, 17, 19, 33, 34, 35, 38, 39, 52, 57, 61, 62, 63, 64, 65, 85, 86, 330, 350, 640, 16S, 5030	FF Rew Idler 6886792

**Order Code: IDL01** Price: 100p

Make	Models	Description
Hitachi	VT680, 6500, 6800, 9300, 9500/VT9700, 9900	Play Idler 6861482 6861481

**Order Code: IDL02** Price: 180p

Make	Models	Description
Blaupunkt	RTV301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 404, 414, 424, 434, 444, 478, 707	Idler

Make	Models	Description
Goldstar	GHV1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, GHV1248, 8000, 8200, 8210, 8215, GVHP51, VCP4100, 4130	Idler

Make	Models	Description
Grundig	MVS400, 440, VS400, 410, 440V/S450, 460	Idler

Make	Models	Description
National	NV230, 250, 260, 280, 370, 380, NV430, 431, 433, 450, 460, 465, 470, 480, 630, 650, 730, 780, NV810, 830, 850, 870, 890, NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, AG1000, AG1050, 1200, 1500, 1810, AG2100, 2200, NVH65, 70	Idler Arm VXP 0521

Make	Models	Description
Philips	VR6460, VR6520, VR6920	Idler Arm 40340162

**Order Code: IDL08** Price: 100p

Make	Models	Description
Amstrad	VCR7000	Idler 150280

Make	Models	Description
Sharp	VC200, 381, 383, 384, 385, 386, VC388, 390, 393, 3300, 8381, 9100, 9300, 9500, 9700	Idler NIDL0005GEZZ

**Order Code: IDL10** Price: 100p

Make	Models	Description
Philips	VR6540	Idler

Make	Models	Description
Sharp	VC300, 387, 402, 471, 473, 477, VC481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, 5F3, 5W20E	Idler NIDL0006GEZZ

**Order Code: IDL11** Price: 100p

Make	Models	Description
Akai	VS10	Reel Idler

Make	Models	Description
Ferguson	3V23, 3V29, 3V30, 3V31, 3V323V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	Reel Idler PU48967

Make	Models	Description
J.V.C.	HR7200, 7300, 7350, 7600, 7610, 7650, 7655, 7700	Reel Idler PU48967

**Order Code: IDL20** Price: 175p

Make	Models	Description
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Idler PU 51402

Make	Models	Description
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610, HRD110, 111, 120, 121, 225	Take Up Idler PU 51402A

**Order Code: IDL22** Price: 100p

Make	Models	Description
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940 8941, 8942, 8943, 8944	Take Up Clutch PU 51380

Make	Models	Description
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610	Take Up Clutch PU 53462A PU 51380

**Order Code: IDL23** Price: 200p

Make	Models	Description
Philips	DB532, VR6520, 6843, 644	Reel Idler

Make	Models	Description
Sharp	VC600, 651, 681, 682, 684, 685, 693, 699, 700, 783, 6FR, 6V3, 6F3	Idler Assembly NPLYV0107GEZZ

**Order Code: IDL88** Price: 615p

Make	Models	Description
Philips	VR6843, 6943, 44S89, VR44S8920, 44S8922, 6943	Reel Drive Unit

Make	Models	Description
Sharp	VC772, 780, 781, 782, 785, 786, VC787, 800, 793, 799, 7810, 7822, VCA100, 102, 104, VCA131, 140, 170, 202, 203, 234, 501, VCA602, 5011, VCD801, 802, VCH851, 852, VCH882, VCM73, VCT72, VCT82MK11	Idler NPLTV0111GEZZ

**Order Code: IDL90** Price: 700p

Make	Models	Description
N.E.C.	N911, 915, 916, 917, 9012, 9013N9014, 9016, 9033, 9034, 9053, N9054, 9055, 9056, 9066, 9096, N9110, 9120, 9510, 9520, 9530, N9610, DX1000, 1600, 2000, DX3000, PX1200	Idler Arm Assembly

**Order Code: IDL245** Price: 270p

Make	Models & Description	Description
Philips	Pressure Roller Assembly PS403-40205	

- DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, 3210, 3219, 322, 3229, 323, 53580, VR486, 471, 562, 582, 571, 761, 201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, 6291, 6293, VR6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, 8681, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RWF7, 21DV1, 21DV2, 25SB01, 25B02, 25B11, 25B12, 30DV2, 31DV1, 31DV2, 31DV, 33SB02, 35B03, 35B05, 35B11, 35B12, 35B13

Toshiba V91, V95 Pressure Roller Assembly - PS403-40205  
**Order Code: PR23** Price: 300p

**CM3900A DIGITAL MULTIMETER**

- Features:**
- Large LCD Display
  - Height 18mm
  - Maximum Reading 1999 + Unit
  - Single Manual Rotary Switch for Function and Range Operation
  - Auto Power off (approx 15 min)
  - Diode Test Function
  - All Ranges Overload Protected
  - Supplied with Test Probes
  - DC Voltage: 200mV/2V/20V/200V/700V Accuracy  $\pm$ 0.5%
  - AC Voltage: 200mV/2V/20V/200V/700V
  - DC Current A: 200 $\mu$ A/20mA/200mA/2A/20A
  - AC Current A: 200 $\mu$ A/20mA/200mA/2A/20A
  - Resistance  $\Omega$ : 200 $\Omega$ /2k $\Omega$ /20k $\Omega$ /2M $\Omega$ /20M $\Omega$ /200M $\Omega$

**Order Code: CM3900A** Price: 2900p

**CM3920 DIGITALMETER WITH TEMP MEASUREMENT**

- Features:**
- Temperature Measurement
  - Diode and Transistor HFE Test
  - Large LCD Display
  - Height 18mm
  - Maximum Reading 1999 + Unit
  - Single Manual Rotary Switch for Function and Range Operation
  - Auto Power off (approx 15 min)
  - Diode Test Function
  - All Ranges Overload Protected
  - Supplied with Test Probes
  - DC Voltage: 200mV/2V/20V/200V/1000V Accuracy  $\pm$ 0.5%
  - AC Voltage: 200mV/2V/20V/200V/700V
  - DC Current A: 2mA/20mA/200mA/20A
  - AC Current A: 200mA/20A
  - Resistance  $\Omega$ : 200 $\Omega$ /2k $\Omega$ /20k $\Omega$ /2M $\Omega$ /20M $\Omega$ /200M $\Omega$
  - Capacitance: 2nF/20nF/200nF/2 $\mu$ F/20 $\mu$ F

**Order Code: CM3920** Price: 4100p

# REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	750p
TP200, TP300	RC 380	750p	KT3 TEXT	RC 5301	750p
TP400	RC 401	675p	RC5352	RC 5352	750p
TP590-600	RC 600	750p	RC5375	RC 5375	750p
TP390, TP610	RC 610	750p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	800p	RC5901	RC 5901	850p
TP630, TP650	RC 650	750p	RC5903	RC 5903	700p
TP660	RC 660	750p			
TP661	RC 661	750p	SABA		
HITACHI			T6772	RC149	900p
CLE800-CLE830	RC 140M	700p	TC319-320	RC 328	800p
A617402/655602	RC 192	800p	TC356	RC 356	800p
A512120/230	RC 900	750p	TC358	RC358	800p
A514790	RC 901	750p	TC360	RC 360	750p
A5088470	RC 902	800p	TC365	RC 365	750p
A518612	RC 903	750p	SALORA		
SCL002	RC 904	750p	SERIES L		
C2096	RC 905	800p	86173	RC 190	750p
A511940	RC 906	750p		RC 882	750p
655602H	RC 907	800p	SANYO		
ITT			RC218, RC222, RC228, RC238	RC 140M	700p
IFB13, 14, 15	RC 143	800p	JXGE	RC 878	800p
FS4	RC 148	750p	JXDE	RC 884	750p
RG305	RC 305	675p	VHR2300	RC 890	750p
RG306	RC 306	750p	RC628	RC 865	900p
FS9/1-10/1	RC 307	750p	SHARP		
V55 RUK	RC 308	750p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
VS4-1	RC 310	750p	SIEMENS		
MULTICONTROL (17C20)	RC 311	750p	FC616	RC 130	850p
KORTING			FC631	RC 132	750p
18279, 18396, 18460, 18521 SE	RC 108	750p	FC742	RC 164	750p
40540 VTS	RC 108	750p	SONY		
LOEWE			RM604, RM605, RM606	RC 140	700p
DC11	RC 146	800p	32 CHANNEL	RC 140M	700p
MATSUI			RM613	RC 141	750p
010270601	RC 889	750p	RM632, RM636	RC 160	675p
VX770	RC 892	750p	TATUNG		
METZ			FXA	RC 877	750p
JAVA COLOR (6890)	RC 166	800p	RC70	RC 883	750p
COLOR (7156)	RC 183	800p	FX70 FASTTEXT	RC 894	750p
JAVA (7180)	RC 184	800p	TELEFUNKEN		
MITSUBISHI			FB632	RC 632 ST	750p
939P/03607, 939P/03609	RC 140M	850p	FB 639	RC 639 ST	750p
NOKIA			THORN/FERGUSON		
SATELLITE	RC 550	750p	3V35-42	RC 342	650p
NORDMENDE			3V31-32	RC 344	750p
TC2336	RC 351N	750p	3V57-58	RC 628	750p
CMC1, TC3519	RC 356	800p	TX10 TEXT	RC 732	575p
OCEANIC			TX10 STEREO TEXT	RC 738	575p
390C9500	RC 339	750p	TX9-90-100	RC 740	675p
ORION			3V55, FV11	RC 783	750p
RC53	RC 892	750p	TX100 FASTTEXT	RC 785	650p
PANASONIC			TX100 STEREO FASTTEXT	RC 789	650p
EUR51200	RC 200	800p	PROFESSIONAL	RC 790	650p
TC2200	RC 201	850p	TOSHIBA		
VSQ0357/NV730	RC 202	750p	CT937	RC 950	750p
TNQ1621	RC 203	750p	CT9117	RC 951	750p
PHILCO			201R4B	RC 952	750p
CARVEL, CONCORDE,	RC 108	750p			
TELESTAR					
TC10	RC 152	900p			
PHILIPS					
RC5002,5154	RC 134	750p			
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630mA	FUSE 06	75p	FUSE 22	60p
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BA8219	£3.80	MD4262C	£3.80	STK441	£11.80	STR10006	£5.80	TCA270	£1.80	TD2070	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
BA8229	£3.80	MN1220	£6.80	STK441	£11.80	STR10090	£6.80	TDB16AP	£4.80	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
BA8238A	£6.80	MN15425	£15.80	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
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BA8435	£9.80	SA11024	£5.80	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
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CCURFG07	£14.40	SA11250	£3.80	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
CNR50	£6.00	SA11251	£8.40	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
CNR50	£6.00	SA11283.03	£5.00	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
CNR62	£4.00	SA11283.03	£5.00	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
CNR83A	£4.80	SA11296	£12.00	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
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HA11422	£3.80	SA11301	£5.80	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
HA11498	£9.80	SA11302	£5.80	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
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LA7520	£2.80	SAB3037	£8.80	STK4211 II	£7.00	STR4115	£9.80	TD1011	£3.20	TD2070A	£3.90	TD4650A	£4.00	TD4650	£22.50	TEA2251	£3.80
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# What a Life!

**Is the world full of oddballs, Don Bullock wants to know. Or is it just that they all home in on him?**

I left the shop to stack up some old sets. When I returned, Steven was grinning.

"Had a right oddball crone in" he said. "Name of Swampe. Wanted us to traipse through a mile of riverside weeds and scrubland to refit a coaxial plug. I've had dealings with the couple before. Call you back forty times and keep you waiting ages for payment. Then you get the equivalent of seven and six pence. So I referred her to Snoddy's."

## Greeneyes' Microwave

Just then Greeneyes came in, breathing fire. "What's Snoddy's number?" she demanded. "The microwave's playing up again. You took a week to fix it last time and it's never been right since. What's the matter with it - and you?"

"Hang on" I replied. "I'm clever, yes, even brilliant, but not clairvoyant. Last time it was the magnetron, and we had to get one. What are the symptoms?"

"When I switch it on it goes 'tuh, tuh, tuh'. It doesn't produce its usual droning noise, and refuses to stop when I try to switch it off."

"Yes, you'd better ring Snoddy's. And you could tell them to send the bill to Crubb's Foodstore. They're into electronics."

Anyway, we naturally took a look at it. It's a Sharp R8880, which has a grill as well. After opening it up we noticed the small motor under the magnetron. It opens and closes a little flap at the back, depending on whether the grill or oven is being used. It was trying to do this but failed: the flap was offering physical resistance because it was sticking on some gunge. A thorough clean restored normal working.

"Snoddy's indeed" I commented.

## Aerial Leads

Then Steven came back. "I've to pop along to Mrs Senile" he said, "to unplug her teamaker and plug in her TV set instead. I have to do it about once a week. When she finishes watching TV at night she plugs the teamaker in ready for the morning. Then she doesn't understand why she can't watch TV while she drinks her tea."

I understood the situation all too well. About half a century ago I had a similar customer. She had a Decca monochrome set with separate aerial sockets for TV and VHF radio. In those days TV closed early. Each weekend she'd plug her TV aerial into the VHF socket to listen to late-night radio. Next morning she'd find herself without TV and give us a call.

## A Goodmans C1401R

As Steven left, Mrs Bustler came in. Her husband followed, carrying a Goodmans C1401R colour portable.

"Watch that step" she said over her shoulder. "we don't want anything to happen to our TV." Then she looked at me. "Where's the usual nice young man?" she asked.

"He's gone for a crate of matches" I said. "He's a firebug, you see. What seems to be the trouble?"

"This thing" she replied, nodding towards the set and her husband. "He does nothing, just blinks at me. 'Ere, didn't you used to be old Mr Bullock?"

I agreed to take on the set, and they tramped off. We've had this trouble before with these Goodmans. The cause is usually the STR5412 chopper chip. I sensed a quick buck, but it took a bit longer.

The first thing to do is to check for about 100V at pin 2 of the chip.

It was there all right, but not at the other side of the 1N4937 diode D806 which was leaky. As we didn't have a 1N4937 I fitted a BYD33D. This brought the set to life, and I boxed it up. A soak test proved that all was well.

"Old Mr Bullock" I muttered as I put the set to one side, "used to be old Mr Bullock. . ." I went back outside to finish stacking my sets.

## Down by the Riverside

Greeneyes came in to say that there'd been a call. "If you feel up to it. Actually she said she wanted the old man, not Steven. At the back of Deadend Lane, down by the riverside. Ever such a nice old girl. Name of Swampe, place called Bodkin's Shack. Something to do with an aerial."

I made to reply, but her eyes darkened. So I got together some coaxial cable, connectors and clips, and set off.

As I neared the river it started to rain. The road became a track, then a footpath. I gathered my bits and pieces, got out of the van and continued on foot. I could see Bodkin's Shack in the distant, misty scrubland. Before long I'd got to the door and knocked.

An emaciated old girl opened it. "You'll be old Mr Bullock, hasn't it?" she said, "Pop and I have been expecting you."

I went into the barest room I've ever seen, with an old iron woodstove whose chimney flu rose through the roof. An ancient, thin man with glinting eyes sat in a rocking chair close by.

"Connie, get Mr Bullock a chair" he said. Connie did as bidden.

"Now fetch that plug for Mr Bullock." A used coaxial plug was brought at once. They looked an odd couple, as she stood beside him.

"It came off the aerial lead by our bed, look you" said the old man. "And I want you to put it back on. Show Mr Bullock where the cable is, Connie."

Connie pulled open a curtain, and we walked through a cloud of dust into their dingy bedroom. An ancient Ferguson monochrome set of the 1400 chassis type sat on a stool beside the huge bed. The plugless cable hung beside it.

I refitted the plug and tried the set. To my surprise there was a reasonable picture – with the usual vision modulation buzz on the sound.

We went back to the old man to report that the job had been done.

"I'll send you seven and six next pension day" he said. "Now Connie, show Mr Bullock out."

As we went out into the rain, Connie pulled the door behind her. She touched my arm.

"Please understand" she said, "he's not my husband. I'm his daughter."

The old man's voice came through the gap in the doorway. "Connie. Come here, now" he piped. Connie turned and fled inside.

It took me a while to reach the van. Once inside it I sat and thought. Is the world full of these oddballs, or do they just home in on me?

### The Porkpie Hat

When I got back I found this chap in sunglasses with a cravat and a porkpie hat. He had a cigarette in a long holder, and his fingers were encrusted with rings. He also had a gold watch as large as a mantle-piece clock, and a loud, ringing voice.

"Slimey" he said. "Nigel Slimey, and pleased to meet you." He pumped my arm as though I was the village pump and idiot. "It's about this old Fergie portable. Got it here. No picture, though the sound's all right."

He removed his sunglasses and screwed a monocle into his eye socket. Then he stood back to look at me. "Now, can you mend it? Eh?!"

I took the set and waived him out. It was a 16in. model, fitted with the TX9 chassis (series 1044). When I switched it on there was EHT but the screen remained blank. I soon discovered that the tube's first anode voltage was missing. R233 (300k $\Omega$ ) in the feed to the first anode supply potentiometer was open-circuit. A replacement

restored the picture.

While the set was on soak test I noticed that it emitted a discordant, high-pitched whine when the beam current was high – on bright scenes. So I made a simple stethoscope with the outer of a length of coax, made sure that it was dry (I'm not stupid), jammed one end into my ear and moved the other end around the chopper and line output circuits.

It didn't take long to pinpoint the source of the whine. The graphite core of the chopper transformer was cracked. I glued with epoxy resin and the set stopped its whining.

### A Dead Hitachi

Old Miss Brittle stepped into the workshop gingerly. She was accompanied by a small, watery-eyed man who was carrying an Hitachi TV set. He put it on the counter and Miss Brittle waved him away.

"This set's no use to me as it is, Mr Snoddy" she said. "What's the use of a televisor that doesn't televise?"

So now, on top of everything else, I'm Mr Snoddy I thought as I took the back off the set. It was fitted with the G8Q chassis and, apart from the LED display lighting, was quite dead.

I checked the voltage at the HT reservoir capacitor C931. The HT was present, but didn't get much farther. One end of the HT smoothing coil L931 had never been soldered, so there was no voltage at the smoothing capacitor C936.

When I'd cleaned off the connection and resoldered it the set worked well enough.

### John Berryman

Our next caller was the happy and ruddy undertaker John Berryman. He looks more like a gamekeeper.

"Hi Don" he called as he breezed in. "How are you, eh? How are you keeping?"

"Never mind the trade enquiries, John" I replied. "Busy?"

"Champion" he said. "They're poppin' off a treat, so I can't complain. Anyhow, come and look in the van. I've a corpse that might interest you."

He beckoned me out to his big closed van, flung open the doors and pointed to a GEC C2200 colour set. "That's him" said John.

We carried the set to the bench and I plugged it in. When I switched it on it just squealed.



The road became a track. . . .

"That's all the rotten thing does" he said.

I checked the BU508A line output transistor, which read barely leaky. When a replacement had been fitted the set sprang to life.

"Bet you can't do that with your jobs" I said. "By the way, why are you so much happier in your work than I am in mine?"

"Well, my customers all come with the same fault, Don. No intermittents, and none of them give me any old buck."

"What you you get for each job?" I asked him.

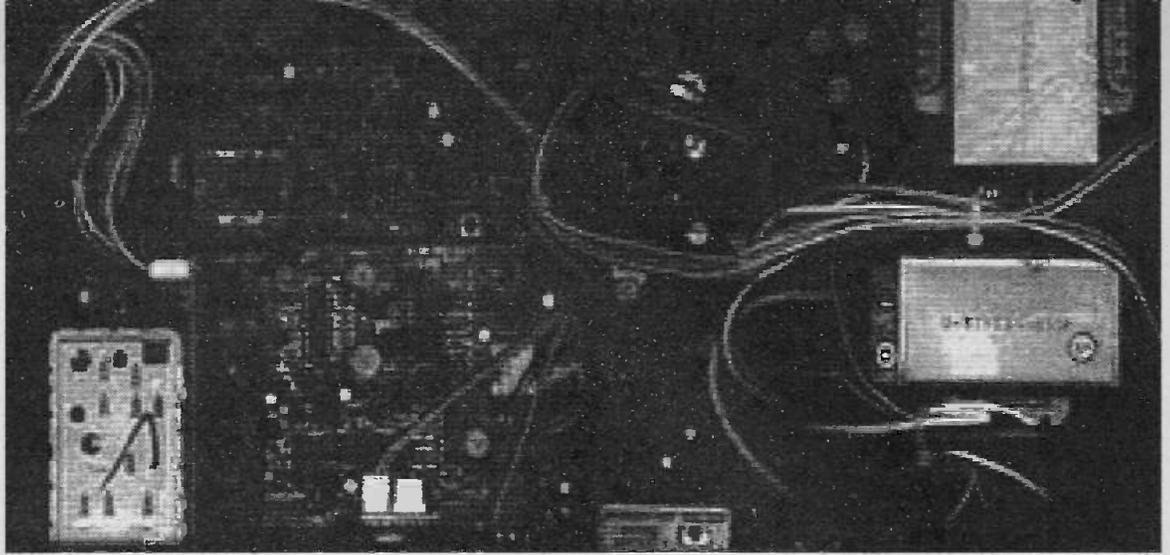
"A thousand" he replied. "Yup, life is good! Wanna job as my assistant?"

"Don't tempt me" I said.

### Well Done!

The other day we had to order a service manual for the Grundig E1 satellite receiver-decoder. When it arrived we were struck by the exceptionally high quality of its production. It covers the Omni and E2 chassis as well as the E1, and also covers receivers in the Philips, JVC and Matsui ranges. Several of the fifty or so A4 pages – the ones with circuit and layout diagrams – fold out to A3 size. The quality of the text and drawings has to be seen to be believed. It was obtained from Grove Farm Publications, Long Lane, Barnby in the Willows, Newark, Notts NG24 2SG (01636 626 327).

Highly recommended!



# Satellite Notebook

*Reports from  
Hugh Cocks  
and  
Pete Haylor*

## Hotbird 2 Reception

Eutelsat's Hotbird 2 is now in operation at 13°E. The transmissions are mainly digital, though there are analogue signals from Poland, Portugal and Dubai in the range 11.7-11.8GHz, which is within the tuning range of most receivers. The Arabic channel ART (Arabic Radio and TV) also transmits in analogue form, but at the top of Hotbird 2's frequency range – approximately 12.01GHz, with horizontal polarity. Apparently ART transmits a lot of high-quality Arabic football, which might appeal to some customers.

If an old 10GHz local oscillator LNB is used, with a 2MHz tuner, ART will be found right at the top of the band – despite being some 300MHz above the highest (specified) output frequency. Even with distribution via a magnetic switch, I've not so far come across a 10GHz LNB that doesn't produce good pictures. No doubt when these LNBs were made little thought was given to the upper cut-off frequency in either the low-noise amplifier or the IF amplifier sections.

If a new 9.75GHz, enhanced LNB is used, ART's IF will be at around 2.25GHz, which is possibly outside the range of all tuners currently on the market! This seems to go against the idea that the latest is always the best. If you are installing a Eutelsat system, the older type of Astra LNB could be used for the purpose, with a new one for Astra.

I use a 10GHz LNB (actually an enhanced 9.75GHz LNB detuned to 10GHz) with a Pace MAC receiver and motorised dish. The Pace receiver covers 700-2,150MHz which, with a motorised dish, gives reception from Arte via Astra 1D at 10.714GHz to the Spanish

Teledeporte sports channel via Hispasat at 12.14GHz. **H.C.**

## Twisted Dishes

The son of a local builder for whom we do a lot of work recently bought a secondhand offset solid 1m dish he'd been offered at a reasonable price. But after installing it all he could get were very sparkly pictures. Could we call round and adjust it?

The pictures were indeed very poor, way below what should have been obtained with a dish of that size. There wasn't much doubt what was the cause of the trouble though – the dish was badly twisted out of shape. To check a dish, close one eye and look across the rims. This is an easy check for twisting. The rims should be parallel with each other. A certain amount of twisting is tolerable, but if the distortion is excessive the signals that arrive at the focal point start to cancel out and a dramatic loss of gain occurs.

Fortunately this dish was made of light aluminium. Judicious bending and 'eyeballing' across the rims produced a dramatic change, with the signals back where they should have been.

A signal level meter will also show up distortion, where the signals increase when say the west side of the dish is pushed east, indicating that the dish wants to go a little east. If pushing the east side west also increases the signals, you've got distortion. In this case pull both the east and west rims back (pull from the rear), then eyeball the rims and try again with the meter. Note that you can't really do this with a 1.8m solid prime-focus monster!

If pushing the LNB support arm up or down (usually up) gives more

signal with an offset dish but adjusting the dish doesn't, the dish support frame is probably forcing the dish to distort a little out of shape. The support arm is normally fixed to the frame: bending it flexes the frame. **H.C.**

## A Thomson VideoCrypt Decoder

This stand-alone VideoCrypt decoder had clocked up quite a few years' service with an elderly Drake ESR4240E receiver. It's in circuit all the time. The screen symptom was a series of white dots after a sudden white-to-black video transition, mainly with non-coded channels. This was mentioned in passing when I called to tune in some new channels – the owner blamed the satellite.

I wasn't so sure that Astra was the culprit, and in fact the cure turned out to be surprisingly simple – a small anticlockwise tweak to the left-hand preset PP02 in the power supply removed the offending dots completely. **H.C.**

## The Drake ESR3240E

These black, manually-tuned receivers date from the early Eighties. They are of very sturdy construction in comparison with their more modern counterparts. We still have one or two private customers who use them, and sold a lot to pubs/bars at the time – these are almost all still working. Various decoders have been linked to them over the years, and Marconi H/V polarisation switching has been added, changeover being carried out by operating a switch added to the front panel (located between the fine tune and audio controls). The main drawback is that only 24 internally preset channels are available

together with a fine-tune facility at the front. Crunch time came when Eurosport dropped its 6.5MHz wideband sound feed. The Drake receiver has tunable sound, but only with a wide bandwidth. Tuning in the narrow-band carriers produces very poor, hissy sound.

Modification to narrow-band sound is not too difficult however. The circuitry used is conventional: the incoming signal is mixed with the output from a variable-frequency oscillator, the result being passed through a wideband 10.7MHz ceramic filter to an LM3089 demodulator chip that's situated at approximately the centre of the PCB.

Replace the existing ceramic filter with a couple of 10.7MHz filters in series – you can get these from a scrapped receiver somewhat younger in age than the Drake one. Avoid using the 10.52MHz 'left-channel' filters from scrapped stereo receivers, as the demodulator in the Drake receiver uses a non-adjustable 10.7MHz ceramic resonator (a 10.52MHz filter might work if nothing else was to hand).

The wideband filter in the Drake receiver is situated in the middle of the PCB, adjacent to pin 1 of the LM3089 chip, has an orange dot on it and is labelled "J 10.7A". It looks like two filters in one pack. The "proper looking" blue-dot filter (labelled D10.7A) between pins 8 and 9 is the ceramic resonator.

As PCB removal is difficult, cut the wideband filter off the board carefully. The replacement filters must be connected in series and the input/ground and output/ground connections soldered to the original positions. The original filter was connected via solid plated-through holes, so soldering is easy using a small bit.

You should now be rewarded with good Eurosport audio. The receiver has a 6.65MHz fixed or variable audio system. An internal preset between the audio pushbuttons, conveniently labelled on the PCB, sets the fixed audio frequency. It can be tuned to 7.02MHz, leaving the external variable control for tuning other frequencies as required. One of our customers likes the 'feel' of the audio tuning knob going across the BBC subcarriers on UK Gold, saying that it reminds him of a good old-fashioned radio! The audio isn't expanded of course, but sounds quite good – even when passed through a hi-fi system.

The tuner in the ESR3240E has a wide range for a receiver of this age.

It goes down to the Granada channels with a 10GHz LNB and to well above 1,750MHz. The local oscillator of an Astra 1D LNB could possibly be tweaked to give Sky Sports 3 at the top of the band and CNBC/ARTE at the bottom. The ESR3240E has the potential to be a good DXing receiver, but I've never had the time to pursue this. The IF is 70MHz, which dates it! Reducing the 'IF gain' by means of a preset at the rear of the receiver produces a dramatic increase in sensitivity with very weak signals.

The power supply is conventional, i.e. not switch-mode. The main problem you get is a jammed manual selector knob. It's mounted on a PCB sub-assembly and has to be removed and greased. With care, the Drake receiver may see analogue transmissions out! H.C.

### A Pace MSS1000

One of these receivers had suffered from a severe supply voltage overload. Various other items in the house had died as well, and I wasn't very optimistic when its owner mentioned that "a smell of burning" had come from the receiver.

As the receiver lives on a high shelf, the owner had not been able to see the top cover. The plastic top had melted immediately above the HT electrolytic, leaving the bare case metal exposed. An incredible amount of heat in a very short time would have been needed to do this.

I reconnected an Amstrad receiver that had previously been used and took the MSS1000 back to the workshop. By this time the local power supply problem had been rectified – it was something to do with a cable that had broken in a nearby village.

After a nasty encounter with an MSS500 a few months back following a lightning strike, I wasn't very optimistic about the MSS1000. When I opened it up I found that the electrolytic hadn't exploded, as the mains fuse had fortunately blown in time. I removed it, cleaned the PCB in the area and replaced both the electrolytic and the fuse – after checking the four bridge rectifier diodes (they were all OK). To my surprise the receiver worked first time! I had to clean up the top, but because of the receiver's location the damage couldn't be seen.

Strangely, a Hitachi VCR that had been on standby at the time of the overload continued to work, though the Grundig TV set connected to the VCR and satellite receiver had died. Insurance companies here in the

### Quick Tips

**Ferguson 99-channel receiver:** All was lost when store was pressed following adjustments. A replacement SDA2586 chip cured the problem.

**Amstrad SRD545:** The red and green LEDs were pulsing. The cure was to replace C302 (100µF), which is inside the small can on the power supply panel.

**Pace Models:** We've had a number of cases where the main reservoir capacitor has been faulty. Some have been short-circuit, others leaky. Symptoms have been a dead set, hum on sound and distorted graphics. P.H.

Algarve now offer an "electrical risk" option with their household policies. For around £16 a year you get cover on up to £4,000 worth of electrical equipment for damage caused by power fluctuations and lightning – well worth having. H.C.

### Connexions 8520

A few of these receivers are still in use here. The earliest must be about ten years old. The 8520 was one of the first receiver-positioners and was way ahead of anything else in its range at the time. The receivers were manufactured for Connexions by a Canadian company called Tee-Com – in fact some Tee-Com branded receivers did appear at the end of the production run, in about 1989/90.

One owner rang to say that only some of the VideoCrypt channels could be decoded, the others refusing to appear. This sounded odd, but was in fact the case. The higher-frequency channels could be decoded but those near the bottom of the band could be seen encoded but not decoded. Non-coded channels nearby, such as TNT and ZDF, produced good pictures.

The decoder in use was an old Thomson SVA1 stand-alone type. Curing the problem was actually quite simple. When the baseband video gain preset in the receiver (near the phono video/audio output sockets) was turned up a fraction decoding was obtained on all channels. Very odd!

I have since tried an experiment with another of these receivers. When I reduced the video output to the decoder the same effect was seen at a critical setting. I've not scoped the video output, but it must be lower. The demodulator is an old-fashioned 70MHz IF type mounted on the main PCB. The only explanation that occurs to me is that the AGC is not even across the band, and that altering the IF level from the bottom to the top of the band produces a fractionally different video output level. Strange that this has taken so many years to show up! H.C.



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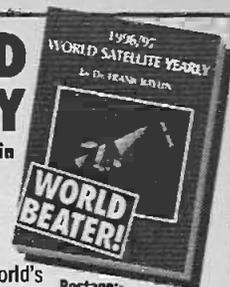
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# TELETOPICS

## Store Closures

Store closures, 'rationalisation' and job losses have been announced by both Granada and Radio Rentals. In both cases the plan is to close smaller outlets and reduce head office staffing.

Radio Rentals is to close 90 of its 616 stores, with a loss of some 200 jobs. The 90 accounted for just seven per cent of new business last year. In addition, 150 head office staff are to be made redundant. The company blames store location as the cause of the problem, and is to concentrate on "new-generation" super stores –

three have recently been opened in prime high street positions. A 33 per cent fall in profits (to £76.1m) for the nine months to the end of December was recently announced, though turnover rose five per cent to £1.2bn.

Granada is to close 100 of its 562 outlets, with a loss of some 250 jobs. The shops to be closed contributed just two per cent to overall profits last year. In addition, 90 out of almost 1,000 jobs are being made redundant at the company's Bedford head office and its Ashby-de-la-Zouch

(Leicester) warehouse is to be closed with a further loss of about 100 jobs. The company is moving to "just in time" store deliveries, to improve efficiency and speed up its response to market conditions. At its peak in 1988 Granada had 750 high street outlets.

Granada is also to change the role of some of those it employs in field jobs. Technicians are to become "more involved with customers rather than fixing equipment" as the emphasis moves to replacements rather than repairs.

## Electronic programme guide via teletext

A new electronic programme guide for analogue satellite, cable and terrestrial TV services has been jointly developed by EACAM (the European Association of Consumer Electronics Manufacturers) and the EBU. Known as NextView, it uses the teletext channel to transmit programme data in the form of enhanced text and graphics.

Features offered by NextView include the ability to display programme details up to a week in advance, provision of information on the current and next programme, an on-screen message system which tells viewers when a programme is about to start, and VCR timer programming by simply clicking on an on-screen menu. A new communication protocol, known as NextView link, enables control

signals to be sent between suitably equipped TV sets and VCRs. Timer data is sent from the TV set to the VCR via pin 10 of a scart connector.

NextView is an open, royalty-free standard that's gained support from many companies including Bang and Olufsen, Grundig, Hitachi, JVC, LG Electronics, Loewe Opta, Metz, Mitsubishi, Panasonic, Philips, Samsung, Sanyo, Selec, Semi-Tech, Sharp, Siemens, Sony, Thomson Multimedia and Toshiba. Several chip manufacturers support the system.

Philips, Sony and Thomson plan to launch equipment incorporating NextView in Europe later this year. No price information has been announced so far, but a premium of three-five

per cent is expected when NextView is featured. Broadcasters in Switzerland and The Netherlands have already announced plans to transmit NextView data. EACAM forecasts that around thirty-four million TV sets and VCRs in Europe will be equipped with NextView by the year 2000.

The ITC has released a draft code of conduct on Electronic Programme Guides. Its main concerns are with the assembly and presentation of TV schedule and programme details by EPG providers, and with the way in which the EPG data is transmitted. A recently released BBC document on EPGs stresses the importance of developing electronic guides that don't discriminate between an operator's programmes and those of its competitors.

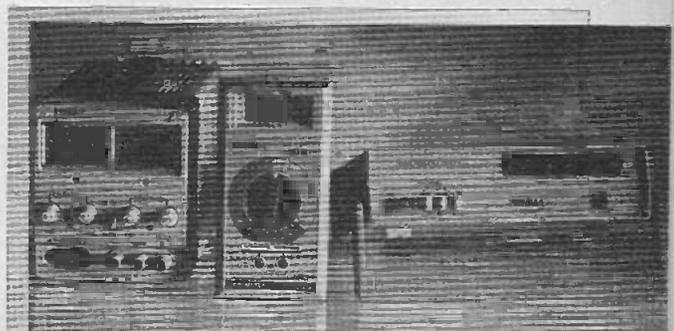
## Channel 5

The lower transmission powers and different channel groups used by Channel 5 could mean a bonanza for aerial installers when the service starts on March 30th. It could also mean a lot of complaints from potential viewers as the coverage is limited and there are to be no relay stations.

An interesting situation could arise in parts of south London near Crystal Palace. The London transmissions will actually be from Beulah Hill, some kilometres to the north of the Crystal Palace mast, which could lead to aerial alignment problems. Your editor has found the signal to be perfectly all right at his west London home,

using his little set-top log-periodic aerial (what an admission!).

Multiview's TIM (Tune-In Module) has just been released and should be helpful with some of the problems Channel 5 will bring. It's a small, simple to connect modulator that has been designed for use with all types of satellite receiver. TIM increases the RF range from typically 30-39 to 50 channels without affecting the signal. It uses the LNB 13/18V supply for power. Suggested retail price of the unit, which comes with simple installation instructions, is £25. For trade enquiries call EuroTechnic Distribution on 0171 381 0022 (fax 0171 386 8131).



CPC has been appointed exclusive UK distributor for the US Tenma range of quality test equipment. Items available from CPC initially include audio analysers, bench power supplies, capacitance meters, frequency counters and multimeters – over 40 product lines in fact. For further information check with CPC on 01772 654 455.



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## DVD News

JVC has launched its first DVD player, Model XV1000, in Japan. It includes linear PCM audio at 20- and 24-bit resolution with 96kHz sampling and is compatible with DVDs, music CDs and Video CDs. Price is the equivalent of about £465. No UK launch details have been announced. JVC is also marketing DVD software titles in Japan, at around £20 each.

Thomson has announced its plans for the launch of DVD in Europe. Initially, DVD players will be shown and demonstrated at key retail outlets. Actual hardware launches will depend on the availability of movie discs. The players will be made by Panasonic, which expects to launch its own players in Europe late this year or early next year at around £600.

C-Cube Microsystems has announced a range of chips, designated the ZiVA family, designed to

lower the cost of DVD players. The ZiVA-DS chip incorporates an MPEG-2 video decoder, Dolby/AC3, MPEG and linear PCM audio decoders, sub-picture decoding and an on-screen display controller. An alternative device, the ZiVA-D6, adds six-channel AC3 audio decoding. Further development work on the range is in progress. This could include a chip that in addition to decoding incorporates a microcontroller and an NTSC/PAL encoder.

Matsushita has announced what is claimed to be the first integrated pickup for DVDs and CDs. It has a dual-focus system that can read CD-ROM, DVD-ROM and other phase-change discs. The pickup is suitable for several types of disc drive, including DVD players that offer compatibility with music, computer and Photo CDs. With the addition of several items it can also be used for CD-recordable discs.

## Digital Developments

Pace and Hitachi are co-operating in the development of a PC satellite data broadcasting card which will enable audio, video and data services to be broadcast directly to PCs. Suggested uses include pre-packaged or bundled Internet services, business and/or financial services, video and film clips, home shopping and banking, news data services and advertising.

Harris Semiconductor has introduced the first multimedia decoder/encoder chip set for enhanced PC video capture, domestic PC video editing cards and other applications. The chips are designed to enhance the performance and simplify the implementation of multimedia applications including MPEG1/2 set-top box systems. Applications could include home VCR-to-PC editing systems, PC video capture, teleconferencing, digital video disc and VCR systems.

The two chips are the HMP8112 decoder and the HMP8156 encoder. The HM8112 accepts PAL or NTSC video, also S video, and converts it to either 8- or 16-bit 4:2:2 YC digital video. It incorporates provision for

brightness, contrast, colour saturation, hue and sharpness adjustment. The HM8156 accepts digital video in this form or 16/24-bit RGB or ITV-R Bt-656 data and converts it to standard PAL, NTSC, RGB or S video.

The chip set's main innovations are in the decoder IC. They include a patented, cost-effective comb filter for improved luminance/chrominance separation without loss of vertical detail, a patented sample rate converter (SRC) that enables the decoder to use any available clock instead of a specific separate video clock frequency, and digital PLLs for steadier images with PC-based home video editing.

Further details of these chips can be obtained from the Harris Information Centre, Osprey House, Berkeley Business Park, Finchamstead, Berkshire RG11 4YJ (01734 328 585, fax 01734 328 148).

The ITC has published its code of subtitling, sign language and audio description for DTT services. This states that no category of programme will be excluded from the minimum statutory

requirement, and that by the tenth anniversary of the start of the digital service fifty per cent of programmes must be subtitled, ten per cent must have audio description and five per cent must have sign language.

WebTV, which is based in California, has claimed a breakthrough with its new VideoFlash technology. This enables full-screen, TV quality video to be sent via the Internet using standard modems. The technology, which is based on software algorithms, is being incorporated in the company's set-top TV boxes to add Internet browsing to normal TV viewing. The data compression ratio used is understood to be ten times higher than MPEG-1. VideoFlash can be automatically downloaded as a software update for those who have a monthly subscription to WebTV's Internet service. Because of patent applications, few other technical details are available. WebTV's set-top boxes are manufactured and sold in the USA by Philips and Sony. The technology was demonstrated at the recent Las Vegas CES.

# TV/Video Equipment

Products to be released by JVC in the UK this year will introduce some interesting new technology. There will be TV sets that include 4:3 Panoramic Zoom, which expands a 14:9 or 16:9 picture to fill a 4:3 display. This is the opposite effect to the Panoramic feature incorporated in some widescreen JVC sets. Panoramic Zoom 4:3 minimises distortion by leaving the centre portion of the picture untouched while the top and bottom are stretched. The sides of the picture are also compressed.

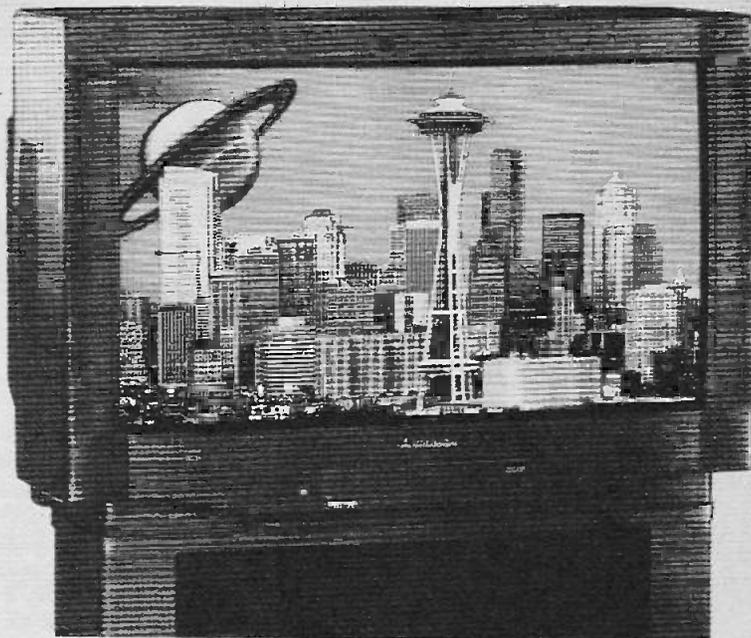
Some widescreen sets will offer Auto Panoramic Zoom, which senses the picture signal format automatically then adjusts its dimensions to fill the screen.

JVC has come up with a 3D Phonic chip that improves the audio performance. A number of TV sets and VCRs will include a Spatialiser chip to widen the stereo sound effect. The 32in. widescreen JVC Model AV32WP2EKR incorporates 3D Phonic, with a built-in centre speaker for dialogue, 100Hz Digiscan and a split-screen facility to enable viewers to watch two different video sources on a single screen. It will cost around £2,000.

Most of JVC's new VCRs will offer three picture enhancement systems in addition to VHS-HQ. These are the tape tuning system BEST, the VHS Pro Digi chip set for S video operation, and 3R which is said to give sharper pictures.

The GR-DVJ70EK is a special edition of the DV1 mini digital camcorder launched to mark the company's seventieth anniversary. Price is around £1,600. Model GR-DVM1EK, at around £2,000, is a digital camcorder with a fold-out LCD screen. Model GR-SZ3000EK is an S-VHS-C camcorder with mono sound priced at around £800.

Mitsubishi has released two 28in. widescreen sets, Model CT28BW2B with Nicam sound at £850, and Model CT28BW2BD with Dolby Pro Logic Surround sound at £1,000. The sets incorporate elaborate speaker arrangements and a choice of 4:3, 14:9, 16:9, Cinema and Panoramic viewing modes. Dark-tinted Superflat



**The Mitsubishi CT28BW2**

CRTs with Invar shadowmasks provide improved contrast, especially in the darker areas of the picture, and higher brightness without colour shift. Dynamic white control enhances detail in the brighter areas of the picture, while colour temperature control enables the viewer to select a warmer or cooler looking picture. Scan velocity modulation improves picture sharpness. The on-screen menu selection system is colour coordinated with the remote control unit's buttons. There's Fastext with a seven-page memory, and automatic subtitling in three modes. In addition the sets can provide NTSC and SECAM playback from a VCR, LaserDisc player or a camcorder.

## NEC's Flat Panel TV

NEC has started to sell a 42in. screen flat panel TV set, called the PlasmaX, in Japan. It's priced at the equivalent of nearly £6,000 and has the screen, receiver circuitry and speakers in a panel only 99mm thick. To achieve good brightness and contrast, the screen uses clear, thin capsulated filters which cut out external light. NEC hopes to be able to reduce the price to about a third by the year 2000. Mass production of the plasma display panels is to start in June.

## New Editor for CQ-TV

A warm welcome to Ian Pawson who has taken over as editor of CQ-

TV, the magazine of the British Amateur Television Club. This excellent journal is issued free to members of the club. It publishes much technical information, also projects, for those interested in generating, transmitting and receiving TV signals.

For information on membership of the club, apply to Dave Lawton, G0ANO, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD (01494 528 899. Dave's e-mail address is: 100046.1056@compuserve.com

## Trade News

Willow Vale Electronics is now distributing in the UK the full range of wall brackets from AVF. The stylish range includes brackets to support TV sets, VCRs, speakers and microwaves.

## INDEX AND FAULTS DISCS

Version 5 of the consolidated index and directory disc, covering volumes 38-46 (1988-96) of *Television*, is now available from SoftCopy Ltd. Also fault report discs for volumes 38-46. For further details refer to the box at the top of page 446.

## Correction

Our apologies to Manzan Electronics for printing the company's old address on page 357 last month. Manzan has moved to 60 Church Road, Higher Tranmere, Birkenhead, Merseyside L42 0LH (01516 511 121). Independent reports confirm that the Kontakt Chemie products the company is now distributing in the UK are first rate while being competitively priced.

# Servicing the Accountants' Way

**W**hen I was a service engineer working for a company that serves a large retail organisation it became clear to me that in order to achieve a reasonable income I would have to engage in practices that would otherwise be considered unacceptable. When accountants bring in methods that they hope will cut costs, and engineers' salaries are tied to the number of jobs completed compared to the number issued, some pretty horrendous things can happen.

To back my view, here are some examples. In my opinion they represent only the tip of the iceberg. The problem should be of great concern to the public, manufacturers and insurance companies alike, as equipment could be left in an unsatisfactory state when the correct procedures and practices are ignored.

A Sony TV set should have had its mains switch replaced with a modified

type. But the switch obtained from Sony was defective. Instead of re-ordering the switch, an original type from stores was fitted. The job sheet and rear cover indicated that the modified switch had been fitted.

A JVC VCR needed a new RF converter. As the type used in an own-brand model could also be used, one was obtained from a scrap unit. After fitting it the RF output was realigned to that of the original modulator. As the JVC machine was under manufacturer's warranty, the part no. was taken off the JVC converter and attached to the job sheet to enable an under warranty claim to be made. Note that JVC lists the RF converter as a safety item.

It's well known that the electrolytic capacitors in the power supply in many Panasonic VCRs dry up. Replacements (1.000 $\mu$ F instead of 680 $\mu$ F) obtained from own-brand TV sets were sometimes used. They are not high-temperature types. Customers were charged as if new capacitors had been fitted.

Another common fault with one Panasonic VCR power supply is failure to start because a 1 $\mu$ F, 400V electrolytic has dried up. We didn't have one. So the voltage across it was measured and found to be about 70V. A replacement rated at 100V was then fitted.

A Sony KV2572U TV set had a crack around its line

output transformer. The board was removed, the green resist was scraped off with a fibre pen, then desoldering braid was soldered across the cracks to bridge the broken tracks. The set then worked correctly. To enable a labour claimback to go through, the engineer's report said that the trouble had been dry-joints.

The cause of field collapse in an Hitachi C2564TN TV set was an open-circuit fusible resistor. As the correct type was not stocked, a CP was fitted. The job card indicated that a new Hitachi resistor had been fitted, the Hitachi part number being used to make a labour claimback.

A Sony TV set's plastic cabinet mounting into which the CRT is bolted had broken. The CRT was removed and Araldite was used to glue the mounting to the cabinet. When it had set, the CRT and chassis were refitted.

The gears in the Panasonic G deck can cause the mechanism to jam. In this event they should all be replaced. In fact Panasonic supplies service kits with all the parts considered necessary to service these decks. But only a couple of the gears were held in store. These, not the complete train, would be replaced. Provided the machine worked, it would be sent out. One bounced back like a yo-yo. Each time the deck was realigned and returned.

A Sony multidisc CD player had chewed teeth on one of the gears. A screwdriver and pliers were used to straighten the teeth, after which the machine worked – just!

There was an EW fault with a Philips set fitted with the CP110 chassis. The cause was the bridge coil and its associated 390nF capacitor. The correct coil came but not the capacitor. So a 470nF, 200V capacitor obtained from a scrap Sony board was fitted.

A Ferguson FV62L VCR was sent in with a new carriage. But the problem was caused by the loading motor, not the carriage. So a motor obtained from a scrap Akai deck was fitted. To enable a warranty claim to be paid, the Ferguson part no. was put down on the job sheet. The same thing could happen with Toshiba models.

The fault with a JVC HRD910 was no video through the scart socket on aux input. It was caused by a faulty video processor chip. This was ordered from JVC but was out of stock. While we were waiting, the customer complained about the length of time the job was taking. Coincidentally another HRD910 came in, with mechanical problems. I was told to contact the customer about the problems he was having and to ask casually whether

**Bob Chisholm argues that standards fall when accountants control servicing operations in large organisations**

he used his machine to copy via the scart socket. Having ascertained that he didn't, I was told to swap over the video processor boards so that the first machine could be returned. I protested, but was told to "get on with it". I had to guess at a suitably high video processor board price to insert on the job sheet so that a claim against the insurers could be made. The second customer was left with a faulty machine

A Sony TV set under manufacturer's warranty came in because it was said to require a new CRT. The fault had been diagnosed by a field engineer. In such a case the practice was to check the set to confirm the diagnosis. I couldn't find any fault with the CRT, nor could the senior engineer. So I suggested that the "CRT" was cancelled from the job sheet, and "no fault found" written in the engineer's report. I was told by the manager to write "fitted CRT" on the job sheet and invent a suitable report so that a labour and parts claim could be submitted to Sony.

The spares buyers sometimes substituted pattern parts instead of original spares. Examples are the BU508A transistor, which can't cope with switching speeds; an alternative for the TA7698AP chip; and the use of a substitute 2SD1497 transistor in Sony sets. The original Sony transistor is a plastic-encapsulated device. The substitute has a metal tab that shorts to the heatsink (the type no. is the same). Cheap, unmarked idlers would be used in own-band VCRs.

With many of these repairs, claims are made to manufacturers or insurance underwriters who, unwittingly, pay up.

In all the above cases the correct parts were readily

available from the manufacturer. So you might wonder why I and, to the best of my knowledge, others went to so much trouble to bodge. The basic reason was that engineers' grading and remuneration depended on the conversion rate they achieved. This is a term now widely used in assessing performance. In our industry it's the ratio of the number of jobs completed compared to those issued. This meant that you could be penalised for ordering parts that were not held or were temporarily not in stock. One could also be penalised when the wrong parts were ordered or those received were faulty.

The bodesges and dodges used to improve conversion rates were suggested and seemed to be used by other engineers. With the exception of the JVC VCRs and the Sony TV set with no fault found, I didn't actually have to carry out repair in the manner described. Indeed many products were repaired properly. But to do my work correctly could be costly in terms of income.

To make a successful labour claimback from a manufacturer the product type, the model and serial number, the fault report and part numbers must all be correct. We might be asked to rewrite a report where it was felt that a particular claim might not go through. The report has to tie in with the symptom reported by the customer: this could lead to a certain amount of inventiveness to make the claim plausible.

In my opinion the local management team knew exactly what was going on at local level but didn't condone it.

Apart from short-changing customers and manufacturers, the sorts of things mentioned above have a ripple effect on the trade, since they affect the prices at which all dealers must buy and sell products.

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# Long-distance Television

**DX and satellite reception. News from abroad. Receiving digital signals. A Band I phaser circuit. Roger Bunney reports**

**B**ecause of my current move to a new house the column differs a bit this month from the usual one. After twenty six years, I'm moving from central Romsey to a house towards the north of the town. Sorting out receiving equipment, aerials and miscellaneous bits and pieces acquired over a quarter of a century is a continuing activity as I write these lines. There is also the little job of dismantling my 50ft lattice mast. So bear with me!

January is, anyway, a traditionally quiet month for DX reception. So I probably won't miss much.

Back in 1971, when we came here, Cherville Street was a quiet location. Now it's a very busy main road. In 1971 we had just the local BBC-1 service in Band I. Now we have a mass of interference instead.

As I chuck out the accumulated rubbish of 26 years, I find lengths of alloy tube that were parts of various experimental aerials. There were many failures, but a number of successes as well. Activities

extended from VHF to UHF, then the ATS-6 satellite in 1976. Twenty years on and we are up to 12.8GHz.

A number of friends have been lost during this time. Charlie Rafarel, Reg Roper, Simon Hamer and Andrew Sykes to name just a few. It's a time to reflect and also look forward. What, I wonder, will the next quarter century bring?

## Terrestrial News

**UK:** A new challenge for Northern UK DXers is about to hit the airwaves. During mid-March the Edinburgh-based 'Channel 6' will start transmitting in ch. E34, initially as a text-based service with 300 pages of local information. The University, the council and other groups and organisations are being invited to participate. The operation is to be financed by advertisements – two sales staff will try to fill the other 500 text pages available.

There's now a Band I operation in the Birmingham area, near ch. E2 at 48.45MHz. The 1W wideband FM radio link from the Dudley Road Hospital transmits the BHBH hospital radio programme to other establishments in the vicinity. If it causes DX interference, a sharply tuned notch filter should reduce the signal, allowing some sort of ch. E2 (48.25MHz) reception.

**Norway:** An Oslo ch. E12 caption in early January announced the closure of the transmitter and five slave relays – on January 22nd. It advised retuning to ch. E30 from the Tryvann Tower. The NRK-1 ch. E6 Oslo outlet will probably also close shortly, as the plan is to move all Norwegian TV transmissions to UHF.

Norkring, jointly run by

NRK/Telenor, now owns all the terrestrial NRK/TV2 transmitters, microwave links, SNG trucks and the technical facilities for both internal and overseas links.

**Kazakstan:** To overcome illegal TV transmissions in Almaty and Akmola, the state is to auction commercial broadcasting licences. These will provide competition for the state broadcaster Kazak TV and the only approved commercial broadcaster NTK.

**Czech Republic:** Nova TV started teletext transmissions on January 1st. Stereo and dual-language broadcasting are unlikely in the near future.

**Slovak Republic:** The ch. R4 and R5 transmitters have all now been closed down to allow expansion of CCIR Band II FM radio. The TV services have been moved to UHF.

## Satellite News and Views

A contract worth \$100m has been awarded to Matra Marconi to contract the Intelsat K-TV satellite, which will take up orbital position at 95°E with thirty Ku band transponders. Planned launch date is Autumn 1998. Coverage will extend across India and China, with switchable beams for areas in the Far East. Satellite TV services to the Indian subcontinent are on the increase. They include Rupert Murdoch's 40-channel Star TV package, which is due to start in April.

Ted Turner plans to increase his European programming, probably via his London HQ. A general entertainment channel based on the TBS Superstation is a possibility. Input from the Warner Brothers satellite channel might be included.

*A mystery signal, coloured squares with dots. Any ideas?*



Increased use of the transponders aboard the Amos satellite at 4°W is planned. The Telenovela Channel would provide programmes, mainly Venezuelan soaps, derived from South America. The target is Eastern Europe, with dubbing into five languages. The adult channel Babylon Blue is intended for Romanian cable TV operators. Amos carries four Polish ATV channels, using two analogue transponders.

RTL Plus, which is to start operations this spring, will provide time-shifted offerings from the other RTL services (RTL, RTL2 and Super RTL).

Rupert Murdoch's Japan Sky Broadcasting service JSkyB is to start in April, initially with twelve channels. If successful, the number of channels could be increased to some 150 over the next twelve months. The signal technology will be similar to the rival PerfectTV service, which started in Autumn 1995 with the aim of increasing to 100 channels. A third broadcaster, DirecTV, intends to target Japan with 100 channels from late 1997.

The Spanish government is to provide some £120m to back TVE's proposed commercial digital satellite TV service TVE Tematica, which will provide competition for the current Canal Plus Espagne service.

Late last year we warned against buying B-MAC decoders to view the American Forces' TV service (AFRTS). It has now been confirmed that from July MPEG-2 digital coding will be adopted by the service, based on the Scientific Atlanta PowerVu package.

After some days of testing with the Polish ATV channel (11-643GHz horizontal) Telecom 2D at 5°W fired up on January 23rd, with nine high-powered transponders.

Hot Bird 2 was extremely busy over Christmas and into the New Year, with new channels arriving and existing ones changing frequencies. There have been corresponding changes in the transmissions from Eutelsat II F2 (10°E) and II F3 (16°E).

### Digital Satellite TV

Experiences reported by the few 'pioneers' who have so far attempted MPEG digital reception suggest that it's fraught with difficulties. Far from being DVB compliant, the receivers seem to be inflexible. As a result, careful and detailed programming of bit and

error rates are, where possible, required. This is far from the fast-moving needs of the active satellite zapper! The receivers are also expensive.

Tom Cardwell recently acquired a surplus ex-Reuters/NTL MPEG receiver that needed very careful programming, also a relatively high signal input. It transpires that these are MPEG-1/1.5 receivers which are rather touchy when used for MPEG-2 reception. A Nokia manufactured Kirch D-box from Germany proved to be more successful – the photo on the right shows a Reuters Belgrade MPEG news feed as received. In addition several TV programme packages from Eutelsat at 13°E locked up with ease. The bit rates differed considerably. This gives hope, but receiver programming was both prolonged and difficult. It's a start, anyway.

The first happier MPEG news arrived in late January, in the form of a product review of the German Mascom 9500 receiver in *Tele-Satellite* magazine. A prototype had been supplied for test, and the results were encouraging. Provided the correct frequency is tuned in, the receiver automatically adjusts itself to the incoming signal parameters – low for a news feed, high for a programme. The testers tapped in false parameters to try to fool the receiver, which proved able to correct itself. The receiver is simple to use and locks up quickly. With experience of the new technology, operation should become still easier. Volume production is due to start in early spring. I'm trying to obtain one to test but, being manufactured in Germany, it's likely to be expensive.

The Taiwanese manufacturer Sun Moon Star has started mass production of a digital MPEG receiver which is being marketed under various names, e.g. the Skandia SK888. It has several MPEG transmission parameters preprogrammed within its software, so it should be possible to skate between different MPEG services and achieve almost instantaneous lock up.

In view of the direction in which the technology is moving, I feel it's likely that a user-friendly MPEG receiver will be available within the coming year.

### Band 1 Aerial Phaser Unit

Back in the days of 405-line VHF transmissions in the late Seventies I



suffered from computer VDU interference here. It came from a nearby office complex, and extended across the band. After trying various stacked/variably-spaced element aerials, I came across an HF aerial phasing system then being marketed by Radmic Systems in Crawley. I scaled it down for low VHF operation, and obtained remarkable interference rejection – in excess of -40dB with co-channel interference. A detailed article on this appeared in the

**A Reuters Belgrade MPEG digital news feed received by Tom Cardwell.**

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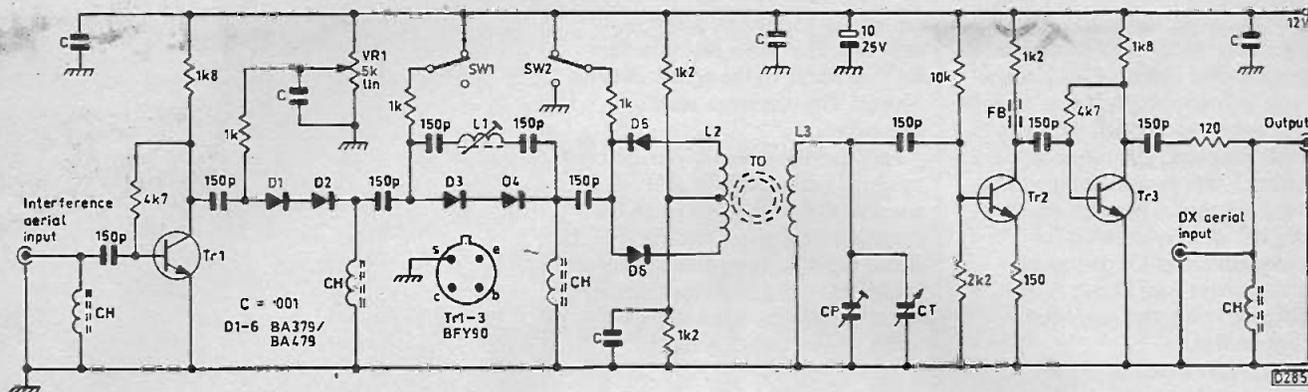


Fig. 1: Circuit diagram of the Band I aerial phaser unit. Tr1-3 BYF90. CH VHF choke or 12 turns of 22g enamelled wire close spaced at 4mm diameter. CP 3-22pF subminiature preset. CT 3-30pF Jackson air-spaced aerial trimmer. TO T37-12 toroid from Cirkit. L1 7 turns on 1mm coil former or wound round toroid. L2 5 turns centre-tapped, wound between central turns of L3. L3 9 turns wound over two-thirds of toroid, 26/28g enamelled wire. Use nail varnish or equivalent to hold turns in position.

January 1981 issue of *Television*. Other enthusiasts adopted the design, generally with great success. 405-line transmissions have long since gone, and in more recent years the Band I/III spectrum has been gradually filled with PMR, beacons, walkie-talkies, baby alarms – you

name it and I'm sure it's there somewhere! Band I in particular has been filled with interference, to the extent that TV-DXing has become threatened. In my own area for example the 48-52MHz band is always jammed with noise. But Band I continues to be used in various European/African countries for TV services. The TV-DX hobby is still alive, though greater technical knowledge is required for success.

Various amateur/SWL phasing systems that offer similar rejection levels at HF and up to VHF have appeared in recent years, costing up to £200. My original design was quite complex. A simplified, cheaper version is shown in Fig. 1. The most expensive item is the Jackson air-spaced/ceramic phasing capacitor CT. If you already have one of these, the unit can be made for around £5.

The principle is simple. High-level interference from an interference pickup aerial is amplified, attenuated to match the interference picked up by the DX aerial, phase shifted by 180°, then added to the DX signal to provide interference cancellation. In practice complete interference cancellation is unlikely, but at about 45dB down the interference is pretty hard to see!

My original problem was with interference that came from about fifty yards to the south. I had a five-element wideband Band I array at 53ft, and the interference was rising from beneath. A two-element wideband Band I interference pickup aerial was installed at 30ft on the same lattice mast, directed at the interference source. I found that the interference could be cancelled out and, if the main DX aerial was pointing south, some additional

wanted signal gain was often provided. When the main aerial was rotated, the phase cancellation conditions changed and adjustment was required. With practice, this could be done in seconds.

With the circuit shown in Fig. 1, the input from the interference aerial is fed via the BYF90 preamplifier transistor Tr1 to a variable attenuator network that consists of a 5kΩ linear bias potentiometer (VR1) and two series-connected pin diodes, D1 and D2. A following pair of pin diodes, D3 and D4, is short- or open-circuited by switch SW1. When SW1 is open-circuit, the interference signal passes via the phase-shift coil L1. When SW1 applies bias to the diodes, L1 is bypassed. The next two pin diodes, D5 and D6, are connected to the ends of the primary winding L2 on the toroid TO. They determine the signal direction/phase, with selection by SW2. TO's secondary winding L3 is tuned to resonance by CT. CP is set to the LF end of the required coverage with CT at maximum mesh (it tunes higher when unmeshed). This is followed by a buffer stage (Tr2) then an amplifier (Tr3). The phase-shifted interference is finally mixed with the input from the DX aerial.

By adjusting VR1 to control the amplitude of the interference signal, and CT to vary its phase, possibly with L1, the amount of interference can be considerably reduced.

Some improvements could be tried, for example a FET in position Tr2 and varicap tuning instead of the mechanical trimmer CT, which is an expensive item. But the phasing system shown should make it possible to operate on channels that were previously jammed.

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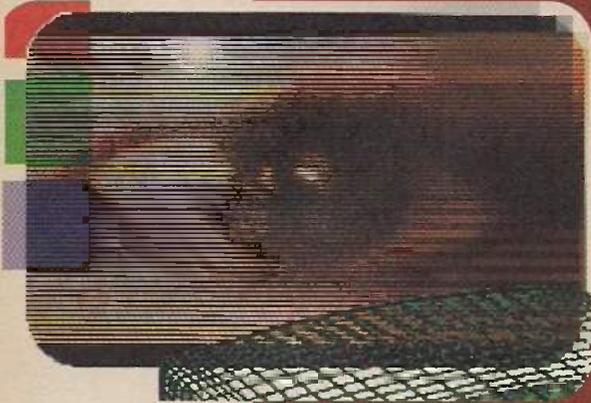


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# TV Fault Finding



Reports from  
**Philip Blundell, AMIEEIE**  
**Justin Smith**  
**David A. Chaplin**  
**J.K. Potts**  
**Adrian Farnborough**  
**Michael Maurice**  
**Michael Dranfield**  
**Chris Watton**  
**John Edwards and**  
**Terry Lamoon**

## Grundig G1000 Chassis

There was no blue in the picture. A scope check at the blue output (pin 19) of the MC44007 chip showed that the signal was of lower amplitude and at a lower DC level than the signals at the red and green outputs (pins 17 and 18). Comparisons with the voltage table in the manual also showed that the B - Y input (pin 26) was low at 1.2V instead of 3V. C825, which is an 0.1µF surface-mounted capacitor, was leaky. P.B.

## Sanyo CBP2152 (E4-A21 Chassis)

This set was dead. It would come out of standby for a few seconds, then go back to standby again. The HT supply to the line output stage was present, but the drive was missing at the line output and driver transistors. Checks around the TDA4505 chip showed that there was no line drive output at pin 26, though there was oscillation at pin 23. In addition the 12V supply at pin 7 was low. Tracing the source of this back to the power supply, I found that the output from the L78M12 regulator chip IC362 was also low. A new L78M12 restored the set to life. P.B.

## Grundig XS63/8 (CUC5360 Chassis)

This set had no Nicam sound, and a whistle accompanied the mono sound. Fortunately we had a set in

stock with the same IF module. This enabled us to prove that the fault was in the IF module. (I was led up the garden path recently by a Ferguson VCR with no Nicam sound: the cause was the tuner unit!) Checks showed that the supplies to the IF module and the clock signals were all OK. As the MSP2400 chip is in a socket, a replacement was tried. It cured the trouble. When we looked into the price of the chip we were in for a bit of a surprise however: an exchange module is only slightly more expensive. P.B.

## Ferguson TX100 Chassis

Line tearing from cold was the symptom with this set. Many possible causes are listed, and I checked out every one - with no success. Matters were made worse by the fact that the fault would reappear only when the set had been off for quite some time. Finally, more out of desperation than anything else, I decided to replace the line driver transformer. I then waited for two hours before switching on again. This time everything was OK. J.S.

## Ferguson TX98 Chassis

I nearly gave up with this bouncer (Model 51P7) and refunded the customer his money! The original complaint had been "intermittently cuts out". I resoldered a number of joints, then soak tested the set for five days. No problem. But after returning it the customer was on the phone within four hours! The set was intermittently resetting itself to programme 1.

Unfortunately no amount of flexing, tapping, cooling or heating would instigate the fault. But I discovered that running the set for a few hours covered with a blanket would produce a reset action. During the following week I replaced the IR receiver diode, the IR amplifier chip, undertook the capacitor modification

in the remote control input line and resoldered every single joint that looked even halfway suspicious. Still no joy.

As a last attempt, I replaced the TDA8138 5V/12V regulator chip IC11. I then covered the set with a blanket and put it on test, taking a tentative look each hour. It stayed resolutely on programme 3.

Hindsight is wonderful. When I re-examined the circuit diagram it became obvious that IC11 also has a reset function. J.S.

## Matsui 2074/Bush 2152

I was told that this set was dead. But it worked all right when I switched it on. I tried it again later and it came on, but with a few seconds' delay. When I tried it next day it was dead. It transpired that relay RLY901 had intermittent contacts. D.A.C.

## Saisho CM250R

Low volume that couldn't be adjusted using the up/down buttons was the complaint with this set. When I checked it I discovered that none of the picture controls worked either, though channel changing was OK. I noticed that the set would switch on directly when the mains switch was used, though there's a standby button. The plastic standby button was found to be damaged, and was holding the standby touch switch in its closed position. When a new button was fitted the controls all worked correctly. D.A.C.

## NEI 2031TX/Bush 2520

This set would switch on OK from cold, but if it was switched back on when warm there were no results. The set would come on if the posistor in the start-up circuit, R802, was frozen or tapped. A replacement posistor cured the fault. These sets are fitted with the Indiana 100 chassis. D.A.C.

### Decca/Tatung 190 Chassis

Sometimes these sets switch on with no sound or raster and 0 showing in the channel display. The cause is usually a faulty control switch membrane – one of the touch pads is making permanent contact. A check can be made by disconnecting the membrane from its PCB socket: the set should then switch on with normal sound and vision.

Two types of switch membrane are used in the 190 series chassis. One is straight and plugs into a horizontally mounted socket. The other has a bend so that it can be plugged into a vertical socket. D.A.C.

### Ferguson TX86 Chassis

The TIPL791A chopper transistor TR6 and the TEA2018A chopper control chip IC4 were both short-circuit, while the 1-8Ω surge limiter resistor R88 was open-circuit. The cause of the trouble was a dry-joint at pin 4 of the line deflection coils socket 13. D.A.C.

### Amstrad TVR3

Very poor off-air reception and recording quality were the complaints with this TV/VCR unit. With prerecorded tapes the picture quality was OK. The aerial input is on the TV section. It consists of a coaxial socket/phono socket adaptor. The phono plug on the lead that feeds the aerial signal to the tuner is plugged into the back of this adaptor, then soldered in place. The solder had cracked and no longer held the phono plug. When the aerial had been plugged in, the phono plug had been pushed back, taking with it the centre contact tube of the coaxial socket. Reception was back to normal when a new aerial socket assembly had been fitted and securely soldered in position. D.A.C.

### Akura CX18

This colour portable's standby transformer had an open-circuit primary winding. Because of this there were no results. D.A.C.

### Quickies

**Ferguson 20E2:** There was no memory on chs. 1-4. The M293 chip was faulty.

**Philips 2A chassis:** This set was tripping. TR7598 was short-circuit collector-to-emitter and R3601 (5-6Ω) was open-circuit.

**Matsui 2080:** Set went off after ten minutes. The STR50103A chip was faulty.

**Fidelity ZX3000 chassis.** Picture

tearing was the complaint with one of these sets. The cause was the 33μF, 250V capacitor on the right-hand side of the chopper transformer.

**Philips CF1 chassis:** There was no raster though the EHT was OK. R3585 (1Ω) was open-circuit.

**Sony KV1340UB:** An overbright picture flashing green were the complaints with one of these sets. R709 (330kΩ) on the tube base panel was open-circuit.

**Philips CTX-E chassis:** Tripping was cured by replacing D6564 (BY448) and D6482 (BYV95B). J.K.P.

### Mitsubishi CT2554TX

Line output transistor failure at switch on can be a disconcerting fault when all the usual causes (power supply and incorrect line drive waveform) have been excluded. This particular set had short-circuit line scan coils. A.F.

### Mitsubishi CT2531BM (Euro 4 Chassis)

The HT voltage should be 156V in these sets. In this one it had risen to 190V. As a result, it was destroying line output transistors. The STR59041 chopper chip IC901 can be troublesome, but in this case C908 (10μF, 100V) was responsible. It's the reservoir capacitor for IC901's -41V supply. A.F.

### Bush 2114

This set had come to us ten months previously because of power supply problems. We'd replaced a number of capacitors and resistors in the chopper circuit. This time it was dead but the power supply was working. The cause of the problem was no line drive output at pin 11 of the TDA2579 timebase generator chip IC401. At switch on this chip receives a start-up supply at pin 16. The voltage here was found to be low at 4.9V because C808 (1,000μF, 25V), the reservoir capacitor for the chopper derived 24V supply, was leaky. A replacement restored normal operation. M.M.

### Philips CP90 Chassis

Field bounce was the complaint with this set. Checks showed that this originated in the IF/sync panel. A new TDA2579 timebase generator chip cured the problem. M.M.

### Mitsubishi CT21M5BT

This set was dead, with the chopper transistor Q901 short-circuit and R991 open-circuit. We replaced

these items along with IC901, D909 (3V) and C914 (47μF, 25V). At switch on the set tried to start then died. A check on the line output transistor Q552 showed that it was leaky both ways. After fitting a replacement the set went into the standby mode and attempts to switch it on were rewarded with tripping. The line output transformer was the cause of this. The set worked once the LOPT had been replaced: all we had to do was to reprogram the EPROM. M.M.

### Hitachi C2114T

This set lost its sound after a few hours and wouldn't respond to either front panel or remote control commands. We found that the TNP47C1237N microcontroller chip responded to heating and cooling. A replacement cleared the fault. M.M.

### Sharp DV5103H

This set appeared to be dead. A check showed that the HT voltage was low at about 45V instead of 113V. As there appeared to be no short-circuits I checked around the feedback loop in the power supply and found that the 6-2V zener diode D754 had a 62Ω leak both ways. Replacing D754 and the CNX82A optocoupler cured the fault. M.M.

### Sony KV2212 (YE2 Chassis)

This set had a narrow band of picture across the screen, similar to field collapse. As the field output stage's 40V supply was present and correct, I started to check the electrolytic capacitors in the area. When I came to the field scan coupling capacitor C522 (470μF, 63V) one leg came out as I lifted it off the board. It was in a very sorry state. A replacement cured the fault. M.M.

### Sony KVX25TU (AE1 Chassis)

The complaint with this set, which came from another dealer, was intermittent loss of the sound. This is normally caused by dry-joints around the audio chip, but the dealer had resoldered these. He hadn't resoldered the connection to the chopper transformer's 40V pin however. Doing this cured the fault. M.M.

### Mitsubishi CT2153STX (Euro 4Z Chassis)

Very intermittent luminance, with parts of the picture breaking up, was the complaint with this set. Teletext was not affected. I traced the video

signal through the circuitry on the decoder panel. It was present at pin 17 of the TDA4565 delay line chip IC602, but there was virtually no output at pin 11 – and what there was jumped all over the place. A new TDA4565 chip put an end to the mischief. **M.M.**

### **GoldStar CIT2168F (PC04A Chassis)**

There was no sound, and lack of a manual didn't help. I found that there was no volume control pulse-width modulated output from the microcontroller chip, so I assumed that this chip was faulty and replaced it. Wrong! In fact the sound was being muted because the microcontroller chip thought there wasn't a locked signal. The culprit turned out to be the TDA1940 sync separator/line generator chip IC401, which wasn't producing an output when coincidence was detected. **M.M.**

### **Matsui 1436**

This set would come out of standby but otherwise remained lifeless. The power supply was working, and there was HT at the collector of the line output transistor. There was also line drive at the output from the driver transformer. But it didn't reach the base of the output transistor, because of a dry-joint on the link between these two items. The dry-joint was visible only when examined with a magnifying glass. Resoldering it cured the trouble. **M.M.**

### **Samsung CI591**

There was sound but no picture. When the setting of the first anode preset was turned up a dim picture appeared. It was also too wide. A check on the HT voltage showed that it was correct, but a scope check on the HT feed to the line output transformer showed that about 50V p-p of noise was present. C41 (4.7µF, 400V) had a bulging case: a replacement restored the picture. **M.M.**

### **Saisho CM260T/T (Fidelity ZX5000 Chassis)**

If you find that the BUT11A chopper transistor is short-circuit, replace the following items as well: C5 (4.7µF, 63V); C7 (220µF, 25V); IC1 (UC3844N); and the CNY75B optocoupler IC13. The set will then switch on first time. **M.Dr.**

### **Hitachi G8Q Chassis**

If the set is tripping, try loading the 145V HT line with a 100W bulb. We've found that these sets trip

when the line output stage isn't working. The most common reason for this is failure of the TDA2579A timebase generator chip IC701.

If the set still won't come on, lift R713 which is connected to pin 16 (trip input) of IC701. You will probably find that the set springs to life, but with a snowy screen and no activity around the microcontroller chip IC1501. In this situation the first suspect is the 4MHz crystal X1501. The cause of the fault could however be IC1501 or the MDA2062 EEPROM chip IC1502 – we've had all these items fail at one time or another.

If the set is fitted with the PCF84C type of microcontroller chip, the replacement comes with a modification sheet – it requires a different supply voltage. **M.Dr.**

### **Amstrad CTV1410**

This set had us fooled for a bit. It was dead with no HT, i.e. no voltage could be measured at the cathode of the 112V supply rectifier D904. The HT supply is switched on/off by relay RLY901, but the supply's 100µF, 160V reservoir capacitor is on the output side of the relay. Hence the no-voltage situation at the cathode of D904 – things would have been clearer if we had made a scope check at the cathode of D904 first. The cause of the problem was RLY901's contacts, which were open-circuit. **M.Dr.**

### **Matsui 2086**

The power supply was running but the set wouldn't come out of standby. Checks in the line output stage showed that D406 (BYT52J) was short-circuit, R421 (0.5Ω) open-circuit and the 12V zener diode ZD401 short-circuit. The basic cause of the trouble was a common one: the HT voltage had risen because the 47µF capacitor in the power supply had dried up. **M.Dr.**

### **Philips CP90 Chassis**

If the top of the picture flickers and wavers to one side, replace the following capacitors in the IF can: C2044 1µF, 63V; C2045 22µF, 35V; C2073 33µF, 16V; C2087 1µF, 63V; C2093 22µF, 35V; and C2098 1µF, 63V. **M.Dr.**

### **Sharp DV5150**

This set was dead when it was brought to us. On removing the back we noticed that both speakers and the degaussing coils were disconnected, then that lots of parts were missing from the PCB. All was

revealed when we turned the PCB over: someone had been replacing components surface-mount style! To top it all, the replacement resistors and diodes on the underside hadn't even had their leads cropped. All in all a cowboy job to the highest extent.

After fitting the correct components in the right places, and resoldering pins 1, 2 and 3 of the line output transformer, we were back with the original problem: the set would power up then return to standby. It's a stock fault with these sets. The cause is no supply to the field output chip because the 3.3Ω safety resistor R612 is open-circuit.

It transpired that the owner had been quoted a very high price to replace the LOPT – the previous 'repairer' had presumably discovered that disconnecting pins 1, 2 and 3 stopped the set returning to standby. There should be a law against people who do things like this. **M.Dr.**

### **Ferguson ICC5 Chassis**

This set was as good as dead: there was just a flick from the standby LED when it was switched off. This indicated that there was a heavy load on the power supply. Some cold checks in the line output stage brought us to CL44 (300nF, 250V) which was split from end to end. It read OK when checked with a capacitance meter, but presumably couldn't take it when the voltage was up. **C.W.**

### **Salora J Chassis**

Two of these sets, actually the **Granada Model C16BZ4**, came in with colour faults. The first one had a yellow picture, i.e. no blue. Checks in the RGB output stages showed that the tube's blue gun was cut off – there was 194V at the blue cathode, with the correct 120V at the red and green cathodes. The blue control RTB270 had the effect of an on/off switch: it would produce either no blue or a flooded blue raster which became so bright that beam limiter action tripped the set. The cause of the fault was RB271 (56kΩ) which was open-circuit.

The problem with the second set was a little more difficult to sort out. It had a perfect mono picture but there was no R – Y. A new TDA3562A colour decoder chip made no difference, and its supply voltage and the sandcastle pulses were as specified. Some time was then spent carrying out checks in the chroma delay-line circuit, all to no avail. To cut a long story short, the

cause of the problem turned out to be the TDA2653A field output chip ICB400! It was presumably affecting the sandcastle pulse, though this was not apparent from scope checks. Anyway, a new TDA2653A restored correct colours. **C.W.**

### Philips 2A Chassis

Very intermittently the standby and mute LEDs would flash and the channel display would go off. After a lot of work I found that the 7V supply to the search tune/control PCB, at pin 7 of M3, was fluctuating. The symptom was so infrequent that the cause couldn't be traced to a particular component. Replacing C2716 (1,500 $\mu$ F), D6726 (1N4148) and D6642 (BYD33G) seems to have stopped the flashing lights however. **C.W.**

### Finlux 5000 Chassis

The customer said that the set produced a screenful of snow then went dead. The dead set bit was no problem: there's auto switch off when the set isn't receiving a signal. The cause of the tuning fault was rather more difficult to trace.

The tuner is controlled, at pins 5 and 6, by an I2C bus. Its tuning supply, at pin 3, should be variable from 0V to 24V but was stuck at 30V. The on-screen programming worked and showed the correct numbers, and scope checks at the tuner's I2C pins showed plenty of activity which altered when the channel was changed. A new tuner was tried, but there was still no tuning. The cause of the problem turned out to be the SDA2586 memory chip ICa2, which is an eight-pin pre-programmed EPROM, part no. 4400267056. It's available from Nokia or CPC. **C.W.**

### Goodmans 2575

This set was dead with only a few volts at the collector of the line output transistor. When the HT supply was disconnected from the line output transformer the power supply worked normally. Checks in the line output stage showed that a BY448 diode in the EW correction circuit had shorted and burnt the surrounding print. A print repair job and a new diode got the set working again but the raster had bowed sides, indicating loss of EW correction. A new TDA4950 chip (IC18) put that right. You'll find the BY448 diode alongside the large EW coil. **J.E.**

### Sony AE1 Chassis

The job card read "dead after water spillage". Fortunately the damage

was restricted to the 2.7 $\Omega$ , 7W surge limiting resistor, the TEA2164 power supply control chip and the 2SD1548 chopper transistor. I replaced these items then wound the set up using a variac. All was well. **J.E.**

### Saisho CM2880TX/Matsui 2890

Dead with no standby LED indication. I found that the mains input wasn't reaching the bridge rectifier because the relay wasn't being energised. Further checks showed that the primary winding of the standby transformer T101 was open-circuit. It's available from CPC under part no. MA040535009C. I've had to order three in as many months. **J.E.**

### Samsung CI3482

The cause of no red picture content was traced to the 2SC2330 red driver transistor Q503 on the CRT base panel. It was short-circuit base-to-emitter. **J.E.**

### Hinari CT16

This portable was dead. When I tried to power it there was a short, timid sssh noise then the set shut down. Checks in the line output stage showed that the boost diode D552 was short-circuit. A replacement brought the set back to life, but the diode was very warm. I decided to use a BY229 fitted to a mica kit, bolted to a very convenient hole in the chassis above the line output transistor, with fly leads for connection to the PCB. The set then worked normally, with the diode nice and cool. **J.E.**

### Fisher FTS711TX

This set was dead with "PA" in the display. The power supply was working, but there was no line drive because the 12V supply at pin 10 of the TDA2578 timebase generator chip ICh1 was missing. I connected a scope to pin 11 to watch the line drive at switch on, and found that there was a very brief squarewave before the set shut down to standby.

The line output stage was being heavily loaded, and cold checks showed that the PY55-600 26V supply rectifier Dz1 was short-circuit. Amongst other things it supplies the TDA3652 field output chip. After fitting a replacement I switched on and was rewarded with a raster that was blank apart from the figure "1". Then smoke appeared and I hurriedly switched off. Ck10 (1,000 $\mu$ F, 25V) in the field scan circuit had shorted. In

went a replacement, rated at 63V. This time the set produced a normal picture and all was well. I thought the original capacitor had been a bit near its limit. So, out of curiosity, I measured the voltage across the replacement. The reading was just under 25V. **J.E.**

### Beon 1401

Sound distortion was the complaint with this set. Checks in the audio output stage eventually brought us to R153 which had risen in value from 82k $\Omega$  to over 2M $\Omega$ . **J.E.**

### Sony KV21VX-IMT

Picture rolling was the complaint with this set. When freezer was applied to the UPC1377C timebase generator chip the picture temporarily locked. A replaced cured the rolling.

Intermittent or permanent field collapse is usually caused by dry-joints at Q551, Q553, Q554 and Q555. After resoldering these transistors it pays to replace C556 (4.7 $\mu$ F, 160V) and C560 (470 $\mu$ F). **J.E.**

### Panasonic U3W Chassis

The cause of field collapse turned out to be the 2SD837 Darlington transistor Q403, which was open-circuit base-to-collector. **J.E.**

### Matsui 1436

This portable had a really strange fault. When it came on the colour would be in vertical bands that moved across the screen from left to right. Fortunately the fault was intermittent – it responded to gentle tapping with a screwdriver. The cause of the trouble was a badly soldered joint at the chassis side of C140. **T.L.**

### Sony KVX2982 (BE3B Chassis)

The sound would suddenly become very loud for an instant then return to the set level. It would do this only once a day and fortunately a friend of mine knew the answer. You resolder all the joints at RA2 and RA3 on the microcontroller subpanel. It works! **T.L.**

### Matsui 14T

If the display produced by one of these portables has a green, red or blue background, go straight for C821, C824 and C825. Remove them, clean then solder them back in. This normally cures the fault. They are surface-mounted devices on the print side of the main PCB. **T.L.**



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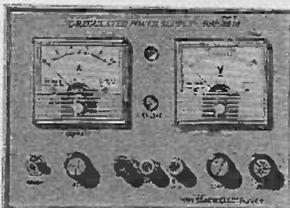
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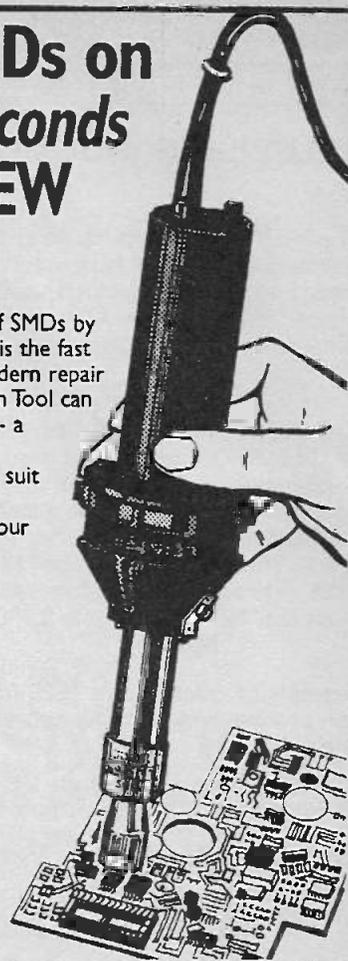
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## TELEVISION INDEX/DIRECTORY AND FAULTS DISCS PLUS REPRINTS SERVICE

### INDEX DISC

Version 5 of the computerised index to TELEVISION magazine covers Volumes 38 to 46 (1988 – 1996). It has thousands of references to TV/VCR fault reports and articles, with synopses. A TV/VCR spares guide, an advertisers list and a directory of trade and professional organisations are included. The software is easy to use and very quick. It runs on any IBM or compatible PC with 512K RAM and a hard disc. Price £30 (3.5"HD, alternatively 3.5DD" or 5.25" if required) Those with previous versions can obtain an upgraded version for £15. Please quote the serial number of the original disc.

### FAULT REPORT DISCS

Each disc contains the full text for TV, VCR, camcorder, satellite TV and CD fault reports published in individual volumes of TELEVISION, giving you easy access to this vital information. Note that the discs cannot be used on their own, only in conjunction with the Index disc: you load the contents of the Fault Report disc on to your computer's hard disc then access it via the Index disc. Fault Report discs are now available for Volume 38 (November 1987 – October 1988); Volume 39 (November 1988 – October 1989); Volume 40 (November 1989 – October 1990); Volume 41 (November 1990 – October 1991); Volume 42 (November 1991 – October 1992); Volume 43 (November 1992 – October 1993); Volume 44 (November 1993 – October 1994); Volume 45 (November 1994 – October 1995); Volume 46 (November 1995 – October 1996). Price £15 each (3.5"HD, alternatively 3.5"DD or 5.25" if required).

### REPRINTS

Reprints of articles from TELEVISION back to 1986 are also available: ordering information is provided with the index, or can be obtained from the address below. Hard copy indexes of TELEVISION are available for Volumes 38 to 46 at £3.50 each.

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### Answer to Test Case 412

- see page 397 -

Faults in power supply circuits can be destructive. When the fault is spasmodic as well, a lot of frustration is likely to be generated! If jobs like this one were priced at their true cost, taking into account the time involved and the number of replacement components fitted, they would seldom be viable – especially in an old set like this one. In this case however the scope display and lamp dimming when the fault occurred provided useful clues, narrowing down the field of search. Full marks to TechnoCrat!

It was plain that the control circuit was trying to restore correct conditions when the output voltage fell, but whatever was causing the upset must have been very painful for the chopper transistor. The cause could have been a fizz up inside the chopper transformer, or an occasional shorting of some of its turns, but not this time. In fact the guilty party was the chopper transistor's 4.7µF base drive coupling capacitor C2351. It could have dried up with age, or have been electrically leaky. Either way the problem would have occurred. Chopper and line output transistors are particularly fussy about their drive conditions. If the pulse waveform is incorrect, they die – either because of punch through or over dissipation.

The replacement capacitor we fitted was a 105°C type. We use them in all our power supply repairs now, for greater reliability. It will certainly outlast the rest of the set. The customer has since phoned back to say that there's something wrong with the sound!

## NEXT MONTH IN TELEVISION

### Channel 5 Reception Guide

Because of the different powers and locations used for the Ch. 5 transmissions, and their relations with other signals, many reception problems are likely to be encountered. To help with this, we have prepared a picture guide which shows the effects that can occur. It will enable you to analyse what's happening and why, and see what can be done to alleviate or eliminate the problems.

### Servicing the Mitsubishi HSMX1B

John Coombes on how to tackle the various mechanical and electronic faults you could encounter with these machines.

### Digital TV French Style

Hugh Cocks describes his experiences when setting up a satellite receiver for reception of French digital TV channels.

### LCR Range Extensions

How extra ranges can be added to an inexpensive LCR bridge to meet service department needs. For a few pounds you can achieve a reasonably accurate and versatile bridge.

### Pace SS9000/9200 Channel Expansion

A further modification from Martin Pickering, this time to obtain automatic ADX control with early Pace satellite receivers.

### PLUS ALL THE REGULAR FEATURES

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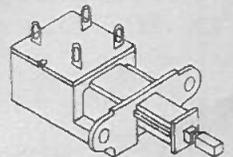
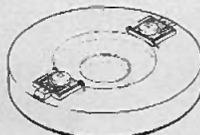
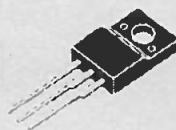
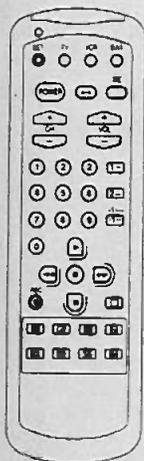
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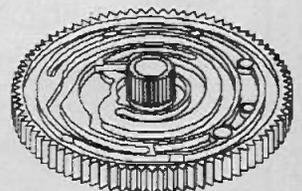
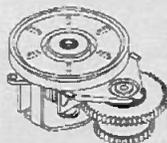
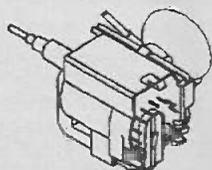


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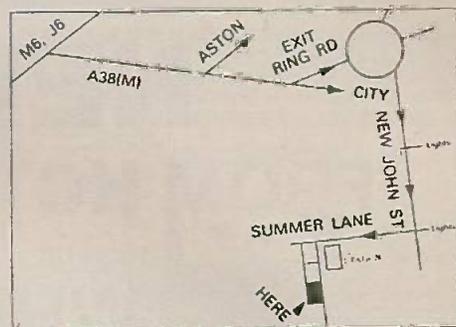
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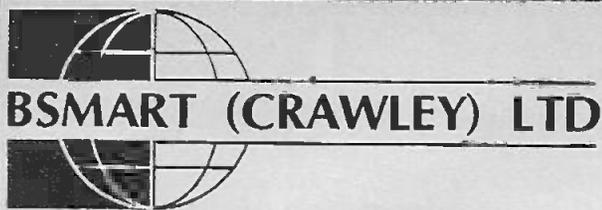
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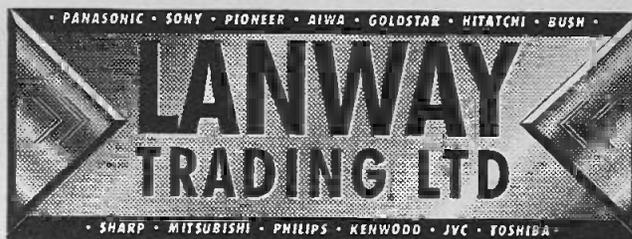
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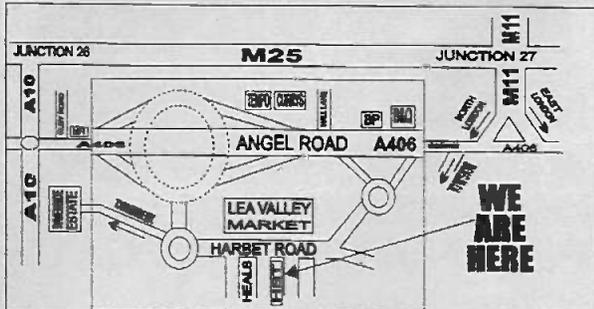
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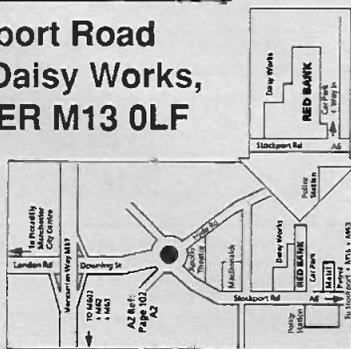
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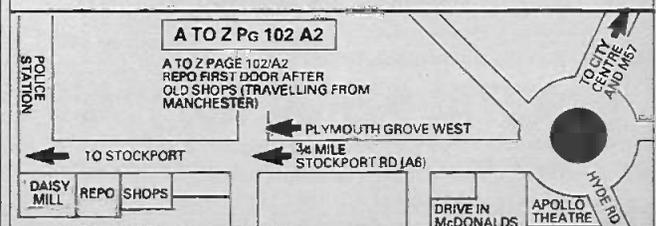
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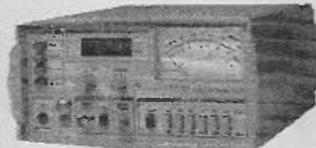
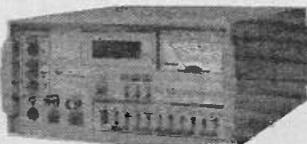
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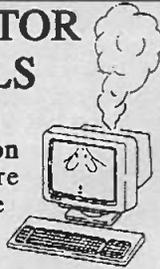
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P/P                  MAIN CONTROL PANEL £12.50                  BURGLAR ALARM SIREN 12 VOLT 50p                  CAMCORDER-UNIVERSAL BATTERY 9.6V 1400MA FOR JVC-PANASONIC-PHILIPS £9.50                  CAMCORDER-TRIPOD SHOULDER POD CAPACITORS: £2.00                  1/2WZK, 2WZ2K, 4WZ4K EACH 15p                  5WZ2K, 6WZ2K, 9WZ12K EACH 15p                  35V-22UF, 50V-4, 70V, 50V-100UF EACH 25p</p> <p><b>COMPONENTS (MIXED) - BUY BY WEIGHT</b>                  1lb for £1.10 per lb £1.00 per lb                  P/P £1.25 per lb                  CRYSTAL-4MHZ OR 6MHZ EACH 30p                  CRYSTAL-TV-4.4MHZ, OR 8.8MHZ EACH 30p                  DESOLDER PUMP £2.00                  DIGITAL CAPACITANCE METER - CMC200 200PF-20MF £28.00                  DIODES-TV 100 MIXED £3.00                  FILTERS - 45S &amp; 450 EACH 20p                  FOCUS POTS-K40 £2.00                  FRONT PANELS (PLASTIC) FOR AMSTRAD, PERDIO, FIDELITY, DECCA, TATUNG ALL 1992 MODELS EACH £4.00                  FUSES-100 MIXED £3.00                  GAS SOLDER IRON-PORTASOL HOBBY £10.00                  HANDSETS-SEE SEPARATE LISTING                  INFRA RED DETECTOR WIDE/SHORT ANGLE WITH RELAY £8.00                  INFRA RED RECEIVER-MATSUMI MINIATURE £1.00                  INVERTER 12V DC TO 230V AC - 100 WATT, SUITABLE FOR 14" TV £15.00                  LOPTS - SEE SEPARATE LISTING                  MAGNIFIER - 2X AND 4X £3.50                  MILLI VOLT METER-ELECTRONIC LEADER LMV-181A 40V AC IN-1MV FS £35.00                  1MV-300V CALIBRATED - COST £225.00  <b>MIXED COMPONENTS BY WEIGHT</b>                  1lb. FOR £1.00 per lb                  P/P £1.25 per lb                  MODULATOR-TUNABLE SATELLITE-TV MODULATOR KIT, 5V TO 12V - FOR ALL CAMERAS £5.00                  MOTORS-SEE SEPARATE LISTING                  PANEL-CM201 £10.00                  PANEL-IC2-FM2211 STEREO £5.00                  PANEL-CYC80-POWER £5.00                  POSITOR-2322 662 98009 50p                  POSITOR-2322 662 98012 50p                  POSITOR-3 PIN PDS (PH45) BLACK TYPE POWER SUPPLY - 12V DC &amp; 24V DC-REGULATED £2.00                  POWER SUPPLY-REGULATED 3-12V 500MA £5.00                  PSU AC 12V 500MA £1.00                  PSU AC 9V 1A £1.50                  QUARTZ HALOGEN - 50W 200V FOR OUTDOOR LAMPS £1.00                  R.S. SAFE BLOC £5.00                  RELAYS SUB MINIATURE 25p                  SATELLITE TUNER UNIT - 2427611 ... BASE BAND VIDEO OUT £6.00                  SCART TO 4 PHONO LEADS 1.5M £4.00                  SCART TO 6 PHONO LEADS 1.5M £4.00                  SCART TO "D" PLUG £2.00                  SCART TO SCART LEADS - ALL PINS CONNECTED - 1.5 METRES £1.00                  SOUND 5.5MHZ MP4M 1000T £1.00                  SOUND 6.0MHZ MP4M 1000 £1.00                  TRANSFORMER-RS ENCAPSULATED MAINS 0-120V-0-120V PRI 0-9V-0-9V SEC £1.00                  TRIPLER BG 2032-642-3002 £7.00                  TRIPLER BG 2087-642-1005 £7.00                  TRIPLER KT3/K30 £4.00                  TRIPLER - UNIVERSAL £5.00                  TUNERS - SEE SEPARATE LISTING                  TUNING POTS - 8 WAY 50p</p> <p><b>AMSTRAD</b>                  DISPLAY PANEL - LONG CHASSIS - 1992/93 £4.00                  FRONT PANEL FOR ALL 1992 MODELS £4.00                  HEAD AND DRUM - 6000 £12.00                  HEAD AND DRUM - NICAM £12.00                  PANEL-CLOCK DISPLAY - 8.900 £5.00                  PLASTIC FRONT WITH FLAP - 8.900 £3.00                  POWER SUPPLY-VS 1000-VS 1100 £5.00                  POWER SUPPLY, LONG OR SHORT CHASSIS 1991/1992 MODELS £3.00                  POWER SUPPLY - SWITCH MODE - DOUBLE DECKER £5.00</p> <p><b>ETRI</b>                  FAN - 6in 240V £5.00</p>	<p><b>FARNELL</b>                  POWER SUPPLY - SWITCH MODE, IN CASE 5V 6A, 12V 3A, 12V 1A X 2, SMALL. £10.00</p> <p><b>FERGUSON</b>                  ADAPTOR - VPT - TEXT - VA354 £5.00                  ADAPTOR-CHARGER - AC MAINS &amp; BATTERY-VA365 P/P £3.00ea £20.00                  AMPLIFIER-TV-2 WAY GAIN 7DB - ICC7 £5.00                  CAMCORDER BATTERY 6V-1400MA-VA366 £8.00                  CAMCORDER BATTERY, HIGH CAPACITY 9.6V 1800MA-VA310 £4.00                  CAMCORDER CAR ADAPTOR CHARGER - AND BATTERY-VA308 £20.00                  CAMCORDER LENS 2 OFF - TELE CONVERSION LENS x1.4 &amp; x0.7 £6.00                  CARDIOID CAMERA MICROPHONE-VA SUPER 218 TELESCOPIC BROOM &amp; PHONE £12.50                  CHASSIS-TX30-NEW-NO TUNER P/P £5.00ea £15.00                  CHASSIS-TX100 VHF/UHF YEL LOW SPOT AND SECAM P/P £5.00ea £20.00                  CHOKE-MAINS INPUT-TX9-TX10 £4.00                  CHROME BOARD-ICCS UC464TKFOR HA 11498 £6.00                  CONVERTOR-RGB-S-VHS - VA341 £20.00                  DECK AND CAPSTAN MOTOR- FV61LV, FV62LV, FV67LV, FV68LV EACH £30.00                  FV70B, FV71LV, FV72LV, FV74LVX EACH £30.00                  FV77LV £25.00                  DECK AND HEAD-FV31R DECK MECHANISM VIDEOSTAR-R2000 P/P £5.00ea £30.00                  DRUM-LOWER-FDM2024A-1 £20.00                  DRUM-LOWER-PUS362931-2 £30.00                  DRUM-UPPER-20439318 £20.00                  DRUM-UPPER-YDM2018B £10.00                  DRUM-UPPER-YDM2037A £20.00                  HEAD-FV31R £12.00                  HEAD AND DRUM-FV21A £15.00                  MODULATOR-SP212315 £25p                  MODULATOR-SRB1 £2.00                  MODULATOR-SATELLITE-T1040-SRD3/4 PANEL-TX89 £10.00                  PANEL-10 MIXED FROM TX9 TO ICC5 £20.00                  PANEL-DECODER-ICCS £5.00                  PANEL-FRONT-TX98 £5.00                  T1353E W/INFRA-RED RECEIVER £5.00                  PANEL-FRONT-TX100 £4.00                  PANEL-IF-TX9, TX10 £4.00                  PANEL-REMOTE AND POWER SUPPLY FV31R DISPLAY P/P £2.00ea £5.00                  PANEL-REMOTE-TX9, TX10 EACH £5.00                  PANEL-REMOTE-TX10-54001 £5.00                  AND 4 ICs - 1544-033C £7.00                  PANEL-REMOTE-TX10 - 139.001 ICs-M293B1 AND MS1000 £10.00                  PANEL-REMOTE-TX100 IC M293B1-SAA5012 £10.00                  PANEL-REMOTE-TX100 WITH STAND-BY BATTERY AND ICs £10.00                  PANEL-T1228B TEXT FOR TX89, TX98, TX99, TX100 £15.00                  PANEL-TX90 THORN FRONT - 8 BUTTONS 01M4-515-002 £10.00                  PANEL-TUBE BASE-ICCS £5.00                  PANEL-TUBE-BASE-TX89, TX98, TX99 £5.00                  PANEL-TUNING 1509G-TX9, TX10 £5.00                  POWER SUPPLY 12V-3A FOR VIDEOSTAR CAMERA PP3 £4.00                  PUSH BUTTON UNIT-TX85, TX86 - 8 BUTTONS RECEIVER - INFRA-RED - ICSL486-TX100 50p                  TRANSFORMERS-SWITCH MODE- TX85, TX86, TX89 EACH £4.00                  TX100 £4.00                  473190.01, 40153000 EACH £5.00                  ICSS 3112-338-326842 £4.00                  TUBE BASE ON PANEL - ICCS £5.00</p> <p><b>GRUNDIG</b>                  TRIPLERS BG2032-642-3002 £9.00                  TRIPLERS BG2087-642-1005 £9.00                  TRIPLER WITH FOCUS POT UNIVERSAL TRIPLER - UPRIGHT PRINTED CIRCUIT TYPE £7.00</p> <p><b>HITACHI</b>                  DECODER-TELETEXT PC232AS - ISSUE 4 £15.00                  HEAD AND DRUM - 620E £12.00                  MAINS SWITCH WITH STAND-BY £5p                  MODULATOR No 5587881 £5.00                  OSCILLOSCOPE 20MHZ DOUBLE BEAM - V212 £188.00                  PANEL-TELETEXT G8P - ISSUE 6 £10.00                  PANEL-TELETEXT PC315-11 - ISSUE 7 £15.00                  PANEL-TELETEXT PCB F.S.T. - ISSUE 6 £15.00                  PANEL-TEXT-VT753E POWER SUPPLY TV SWITCH MODE STR-4211 ISSUE 10 £8.00                  POWER SUPPLY VIDEO SWITCH MODE VTM3112ELM £10.00</p> <p><b>HOSIDEN</b>                  THICK FILM-HM9204A £3.50                  THICK FILM-FRAME OUTPUT &amp; GEC-6251 £9.00                  TRANSFORMER-SWITCH MODE-470036-70 £5.00                  TRANSFORMER-SWITCH MODE-473187-01 £5.00                  TRANSFORMER-SWITCH MODE-473332-00 £5.00</p> <p><b>HOSIDEN</b>                  TUBE BASE - 8 PIN - EK0353 50p</p> <p><b>I.T.T.</b>                  IF MODULES: £8.00                  5827-01 51, 5827-03-51 EACH £8.00                  5828 04 10, 5829-02-58 EACH £8.00                  5929-03-41 EACH £8.00                  PANEL-TTT FRONT-CMC115 £6.00                  PANEL-TTT FRONT-SEL IBF 300 £10.00                  PANEL-TTT FRONT-SEL IBF 150 U.K. £10.00                  PANEL-TTT FRONT-SEL IBF 194P £6.00                  PANEL-TTT FRONT-SEL619 12407 - CMC303 £6.00                  TELETEXT CONVERSION KIT £8.00</p> <p><b>MATSUI</b>                  DECK AND HEAD-VF9501 £20.00                  DECKS WITH HEADS - 3000ORION P/P £5.00ea £16.00                  HEAD-VCR-VX3000 £10.00                  HEAD-VSR1500 - ORION D209E £5.00                  PANEL-MAIN-VSR1500 P/P £5.00ea £3.00                  POWER SUPPLY-VSR1500 £5.00                  POWER SUPPLY &amp; REG - TYPE STK5343-VF9501 £8.00                  POWER SUPPLY-SWITCH MODE-4500 £3.50</p> <p><b>ORION</b>                  MODULATOR-VIDEO MDLX 6B513A £2.50                  MODULATOR-MDF33 UB360D £3.00</p> <p><b>PHILIPS</b>                  DECODER-TEXT-K40-KT3 £10.00                  IF PANEL FOR CP90-CP110 £5.00                  INFRA-RED RECEIVER - HAND SET TESTER £1.00                  SOLDER IRON 25W-240V £6.00                  TRANSFORMER-3111-268-30050 £3.00                  VIDEO REPAIR KIT-3107289 £10.00</p> <p><b>TEXAS</b>                  NICAM BOARDS MK II £10.00</p> <p align="center"><b>TUNERS</b></p> <p><b>IF TERCS-022A TR174-002A-ALPS</b> £7.00  <b>SATELLITE SXT2302180968</b> £3.00  <b>SATELLITE WITH BASE BAND MIN SXT2302234</b> £4.00  <b>SMALL UHF/VHF VHF/UHF - TEKE4-112A 4944</b> £3.50                  U321, U341, U342, U343 EACH £3.00                  U344, U411, U412, U944 EACH £5.00                  U743, U744 EACH £3.00  <b>AMSTRAD UE33-801</b> £3.00  <b>FERGUSON IF2105-RE</b> £5.00                  MTP2011-AP00 £5.00                  UHF - ICSS £5.00                  VHF - ICSS £5.00                  TX85, TX86, TX89, TX90 EACH £4.00                  TX98, T99, TX100 £4.00</p> <p><b>ORION</b>                  1500 - UE33 B09 £4.00                  PANASONIC SMALL UHF/VHF SANYO UHF/VHF TDO 124EB £4.00                  TUNER AND IF 1810587 PA1 UK TATUNG UNIVERSAL 205 OR EQUIVALENT WITH AERIAL SOCKET £8.00</p> <p align="center"><b>MOTORS</b></p> <p><b>MOTOR - CASSETTE TYPE 12V WITH SPEED CONTROL</b> 50p  <b>AMSTRAD</b>                  LOADING-6000 £3.00  <b>CANON</b>                  12V MOTOR 50p  <b>HITACHI</b>                  CAPSTAN ACE G4-B TO ACE G40-B £10.00                  MICROWAVE TURNABLE MOTOR £10.00  <b>MATSUI</b>                  CAPSTAN VSR 1500 UC NO. 356730 ASP £15.00  <b>MITSUBISHI</b>                  MOD MRF-UF3 £5.00                  MOD TMUG3-103A £15.00  <b>MITSUBISHI</b>                  CAPSTAN HSE41-4C MS1782ASP £4.00  <b>ORION</b>                  MOTOR 50p</p>	<p><b>HANDSETS</b>                  CPT1408T, CPT2176, CPT2178 EACH £5.00                  CPT2476, CPT2478 EACH £5.00                  TEXT, REPLACES PHILIPS KT3, K50, K4 ETC. £9.00                  UNIVERSAL, REMOTE TV1, TV2, VCR - SAT, AUX, LCD, VIDEO, TV - ALL NEW 10 MIXED FOR ONLY £15.00</p> <p><b>AMSTRAD</b>                  EXPORT 4600 £3.00                  4700 £3.00                  6000 £15.00                  6800 £4.00                  UNIVERSAL DECCA £3.00                  NICAM LCD FERGUSON £4.00                  BSB £1.50                  FV41R/V52 £20.00                  FV41R/V49 £2.00                  ICCS £5.00                  IK2000, IK7000 EACH £5.00                  SRD2, SRD3, SRD4 EACH £2.00                  T780 £1.00                  TV/SATELLITE WITH PST HITACHI £5.00                  CPT2158 (NO REPLACEMENT) £30.00                  VIDEO RM933E VIDEO FILMS CLERT4B £5.00                  CLERT83A = IR8512, CPT2196, CPT2578 TV MODEL C2558 (IR1820)-CLERT83A £10.00</p> <p><b>MATSUI</b>                  1500 £5.00                  VSR1500 £4.00                  VX3000 £3.00                  3000ORION - TV AND VIDEO £2.00                  RC = PACE 900, FERGUSON, SONY, GRUNDIG £5.00                  MITSUBISHI RM35 - VIDEO £5.00                  RM45 - VIDEO £7.00                  NOKIA RC202 £4.00                  TV AND VIDEO £2.00                  VIDEO WITH LCD - 1992/93 MODELS £5.00</p> <p><b>PANASONIC</b>                  EUR51142 £10.00                  TC1632, TC1642, TC2232 EACH £8.00                  TX2034, TX2044, TX2200, TX2234 EACH £8.00                  TX2244, TX2300, TX2636, TX3300 EACH £8.00                  RC201 - TV - REPLACES TQ1411/2 £8.00</p> <p><b>PERDIO</b>                  PV 1188 £3.00</p> <p><b>PHILIPS</b>                  NEW TYPE UNIVERSAL RC4001 £10.00                  SANYO UNIVERSAL VIDEO £3.00                  SIEMENS TV/VIDEO - 1994 MODEL £5.00                  THORN 9000, TX90, TX10, TX100 TEXT AND NON-TEXT EACH £10.00</p> <p align="center"><b>L.O.P.T.</b></p> <p>36061, 36162, 36362, 36383, 36481 EACH £10.00      36482, 36761, 36831, 36832, 36922 EACH £10.00      36943, 36962 EACH £10.00      2432211, 2432351, 2432491, 2432851 EACH £10.00      2432871, 2432981, 243298A, 2433752 EACH £10.00      2433952, 2434002, 2434141, 2434393 EACH £10.00      2434451, 2434492, 2434494, 2435012 EACH £10.00      2435013, 2435016, 2435062, 2435063 EACH £10.00      2435064, 2435066, 2435085, 2435121 EACH £10.00      2435372, 2435701, 2436771, 2436773 EACH £10.00      2436792, 2436795, 2436797, 2436801 EACH £10.00      3220629, 3714016, 47003481 EACH £10.00      AT207678, AT207688, AT207825 EACH £15.00      AT207781 £15.00      DST81N24372593-00 £10.00      DST85B23547328700 &amp; /40153200 EACH £10.00      DST88N24400086AD &amp; /47805200L EACH £10.00      DST88N2447320041 &amp; /47317590 EACH £10.00      DST186N243473058-00 EACH £10.00      TFB3035D, TFB3069D, TFB4023AD EACH £10.00      TFB4039AD, TFB4066AD EACH £10.00</p> <p><b>FERGUSON</b>                  TX9 £4.00                  TX10 £6.00                  TX85, TX86 EACH £8.00                  TX89, TX98, TX99 EACH £12.00                  Y260781 £8.00                  FSTY260482 £10.00                  LOPT BLUE SPOT &amp; GREEN SPOT EACH £10.00                  LOPT RED SPOT £6.00                  LOPT WHITE SPOT &amp; YELLOW SPOT EACH £8.00</p> <p><b>PANASONIC</b>                  TC2203, TLF 1456B EACH £15.00                  TLF1456B, TLF701/6 EACH £15.00</p> <p><b>TOSHIBA</b>                  TFB 3035D, TFB 4023AD, TFB 4032BD EACH £10.00                  TFB 4038AD, TFB 4110AD EACH £10.00                  TFB 3089D, TFB 4088AD EACH £8.00</p>	<p>7805 20p ZSD1432 £1.00 BU208A £1.50 BUW84 60p BYX38/300 25p HGA1124A 50p SCSIF344 £1.00 TDA2611A £1.00 TDA3654 £1.00 TEA1060 £2.00      7806 20p ZSD1453 £1.00 BU208D £1.00 BUW84 50p BYX55/350 10p HGA1264 £1.00 SCS125L £3.00 TDA2613 £1.00 TDA3654Q £2.00 TEA2014A 60p      7807 20p ZSD1576 £1.00 BU222 £1.00 BUW84 50p BYX55/600 10p ALP-15 £3.50 S2200AF £1.00 TDA3047 £1.00 TDA3710 £3.00 TEA2029C £3.00      7812 20p ZSD1577 £2.00 BU226 £1.00 BUW84AF 50p BYX71/60 10p IKT57 £3.00 TDA3048 90p TDA3800 £2.00 TEA5620 £2.00      7812P 20p ZSD1807D3 15p BU407 40p BU749 20p BYZ106 10p 6391 B1 £3.00 /BFY £3.00 TDA3083 £2.00 TDA3803A £4.00 TIP1361A 90p      78590 £1.00 ZSD1878 £1.00 BU508A 90p BZ-C110 5p 1N4004 3p ST6393 £1.00 TDA3180 £2.00 TDA3903A £4.00 TTP47C834N/ 50p      7859795 £1.00 AN5521 £1.00 BU508AF £1.00 BZ-W03-C20 5p 1R106A 10p B1/JM £2.00 TDA3190 £1.00 TDA4420 £2.00 /2685 £1.00      7859793 £1.00 AN5531 £1.00 BU508D 50p CA3123Q 50p L298N 50p STK4793 £3.00 TDA3505 £3.00 TDA4439 £3.00 TTP47C834N/ 50p      7859313 £5.00 AN5581 £2.00 BU508DF £1.00 CD455BE 30p LA7830 £1.00 STR411 £5.00 TDA3506 £3.00 TDA4501 £3.00 R107 £1.00      7859389 £1.00 C5564C 20p BU705 £1.00 CL8571A £5.00 1R106A £1.00 STR-420 £1.00 TDA3560 £3.00 TDA4502 £3.00 TMS27C256 £1.00      7859500 £2.00 BU706 50p BU801 50p FE18 4p M70K AB1 £1.50 S1R6020 £3.00 TDA3561 £3.00 TDA4600 £3.00 /2685 £1.00      7859500 15p BDV658 50p BU729-200 15p HAI140 £1.00 M708 LB1 £1.50 STR6020 £4.00 TDA3561A £3.00 TDA4601 £3.00 UPC13781 £1.00      7859520 £1.00 HF695 20p BU807 50p HAI185 £1.00 M708 LB1 £1.50 STR804 £4.00 TDA3562A £2.50 TDA4630 £3.00 UPP6376CS £3.00      7859540 40p BR670 20p BU808DF £1.00 HAI196 50p M3720MESP £1.00 STR-420 £1.00 TDA3563 £3.00 TDA4630 £3.00 UPP6376CS £3.00      7859541 £1.00 AN5521 £1.00 BU808AF £1.00 HAI196 50p CL8571A £5.00 TA8991A £2.00 TDA3564 £3.00 TDA4630 £3.00 ZC409233P £8.00      7859577 30p BU105/04 80p BR826 £1.00 BU826 £1.00 HAI180AINT £1.50 HAI180AINT £1.50 TDA3565 £3.00 TDA4630 £3.00      785989 30p BU108 £1.00 BU844/800 £2.00 BU844/800 £2.00 HAI180AINT £1.50 HAI180AINT £1.50 TDA3566 £3.00 TDA4630 £3.00      7859920 £1.00 BU124 50p BUK445/600 £2.00 BU124 50p HAI196 50p HAI196 50p TDA3567 £3.00 TDA4630 £3.00      7859968 75p BU126 80p BUK456/600 £2.00 BU126 80p HAI196 50p HAI196 50p TDA3568 £3.00 TDA4630 £3.00      7859980 30p BU180A 65p BU111 £1.00 BUW29/50 15p HCF4520BE 50p SAA5231 £1.00 TDA1543 £1.00 TDA3592A £3.00 TDA4903 £3.00      7859984 50p BU204 65p BUW95 50p HD6140425 50p (TEXT) £2.00 TDA1908A 90p TDA3650 £7.00 TDA4903 £3.00      7859986 £1.00 BU205 75p BU113 £1.00 HD6140815 £1.00 TDA2450 £2.00 TDA3651 £3.00 TDA4903 £3.00      7859988 £1.00 BU118AF 15p BU118AF 15p HE4588FP 15p SAA5201AF £4.00 TDA2581 £1.00 TDA3651A £3.00 TDA4903 £3.00      7859989 £1.00 BU207 £1.00 BU117/800 15p 100V 8p HEF4029BP 20p SAA5243AP £4.00 TDA2582 £1.00 TDA3652 £3.00 TEA1009 £2.00      7859992 £1.00 BU208 80p BUW11 40p BYX10 8p HEF4093 20p SAA5246AP £4.00 TDA2600 £2.00 TDA3653AQ £2.00 TDA1039 £2.00</p>
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TX100 16 PUSH BUTTON UNIT 01M4-473-165-F <b>£10</b>		<b>SPECIAL PRICE</b> FV31R HEAD AND DRUM <b>ONLY £8</b>
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**SENDZ COMPONENTS**

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