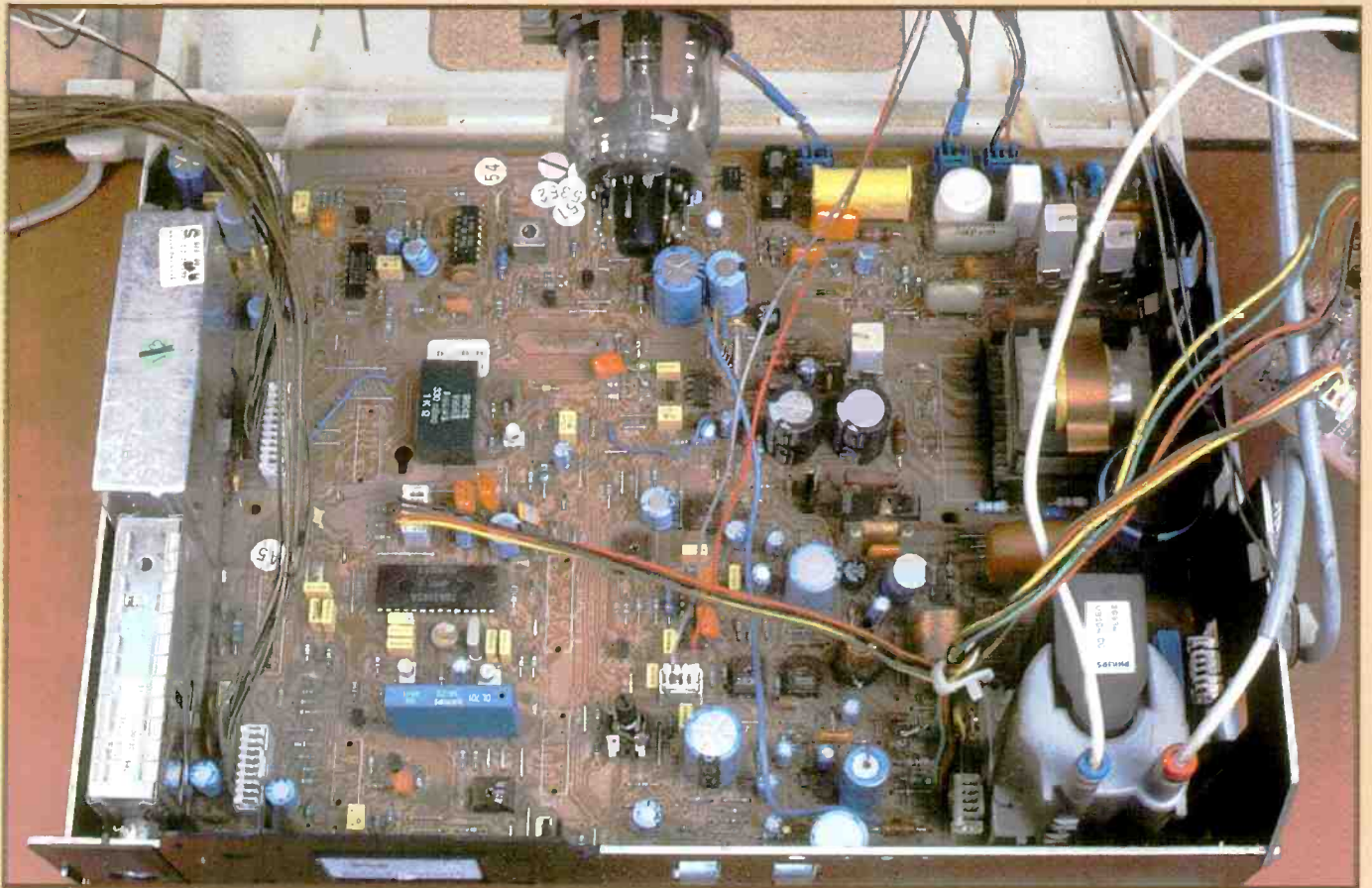


DECEMBER 1992

£2.20

# TELEVISION

SERVICING-VIDEO-SATELLITE-DEVELOPMENTS

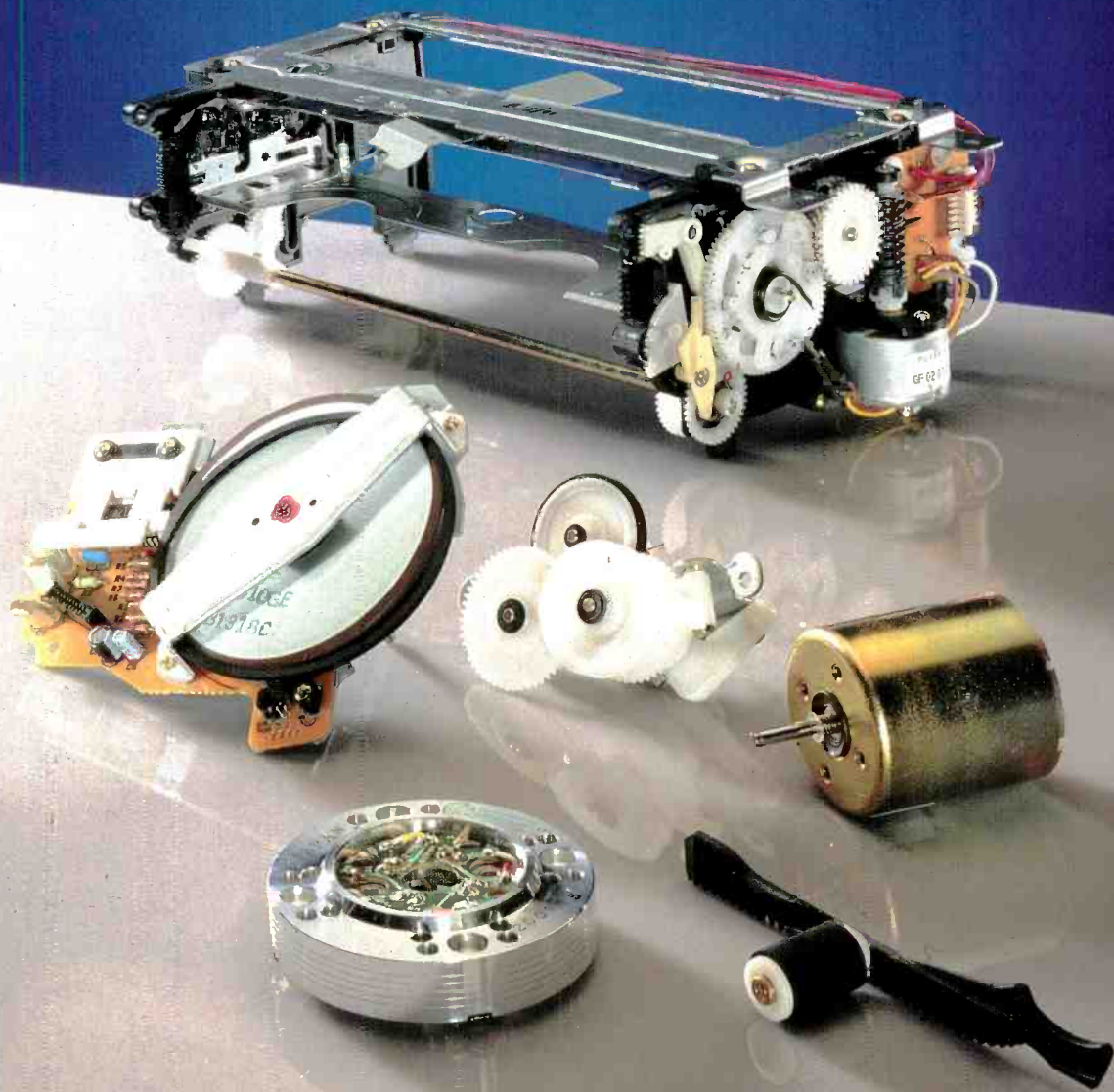


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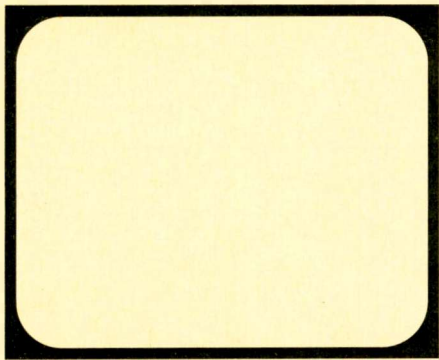
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# TELEVISION

December  
1992

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BC149	8p	BDW33	50p	TP30	25p			PCF806	115p	AN7261	90p	LA3350	110p	SA550	110p	STK4332	410p	STR50113	650p			TA3657	150p
BC157	8p	BDW34	50p	TP31A	22p			PCF81	100p	AN7270	150p	LA3350	110p	SA550	110p	STK4332	410p	STR50113	650p			TA3658	150p
BC159	8p	BDV92	100p	TP31C	22p			PCF81	100p	AN7270	150p	LA3350	110p	SA550	110p	STK4332	410p	STR50113	650p			TA3659	150p
BC160	30p	BF137	30p	TP32	24p			PCF81	100p	AN7270	150p	LA3350	110p	SA550	110p	STK4332	410p	STR50113	650p			TA3660	150p
BC171	10p	BF160	30p	TP32C	28p			PC.805	80p	AY3-1015	250p	LA4011	140p	SA10125	250p	STK4332	410p	STR50113	650p			TA3661	150p
BC172	10p	BF181	20p	TP32C	28p			PC.805	80p	AY3-1015	250p	LA4011	140p	SA10125	250p	STK4332	410p	STR50113	650p			TA3662	150p
BC177	14p	BF181	20p	TP33	50p			PFL200	110p	AY3-8912	400p	LA4100	85p	SA10175	350p	STK4803	720p	STR50401	650p			TA3663	150p
BC179	14p	BF183	20p	TP33C	50p			PL36	120p	BA301	65p	LA4102	100p	SA11224	200p	STK4813	950p	STR50401	650p			TA3664	150p
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BC184L	7p	BF200	10p	TP35C	65p			PL84	80p	BA333	100p	LA4112	120p	SA11251	280p								











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3V35/36/38/39/49  
 HRD110/111/120/121/225  
**Contents**  
 BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND  
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3V29/3V30  
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**Economy Kit Contents**  
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**Order Code: SK16** £4.00

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**Economy Kit Contents**  
 LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER TYRE  
**Order Code: SK28** £4.50

NV332  
**Contents**  
 BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE  
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**Economy Kit Contents**  
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**Contents**  
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**Economy Kit Contents**  
 BELT SET, PINCH ROLLER, IDLER TYRE  
**Order Code: SK24** £3.50

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

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**Contents**  
 SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND  
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**Economy Kit Contents**  
 SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE  
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**Economy Kit Contents**  
 BELT SET, PINCH ROLLER, IDLER TYRE  
**Order Code: SK22** £3.50

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**Contents**  
 BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND  
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**Economy Kit Contents**  
 BELT SET, PINCH ROLLER, IDLER TYRE  
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**Order Code: SK61** £6.50

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**Economy Kit Contents**  
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**Order Code: SK65** £6.25

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**Economy Kit Contents**  
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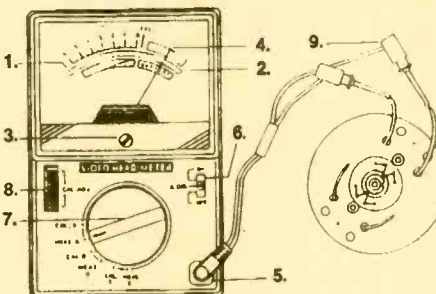
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HS300, 301, 302, 310 £17.00

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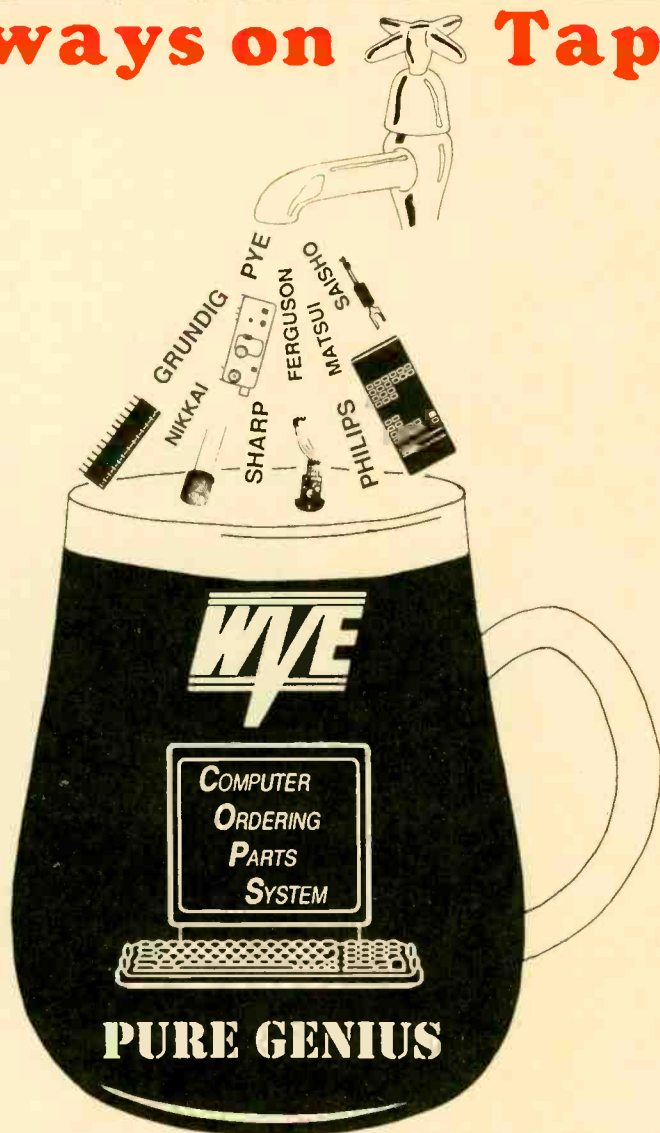
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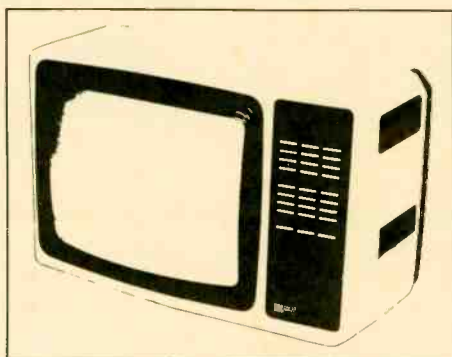


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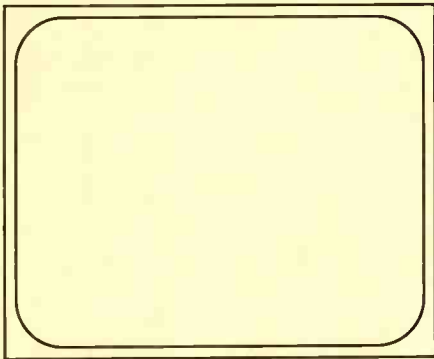
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# Willow Vale Electronics Ltd



# TELEVISION

## Broadcasting Metamorphosis

There are grounds to believe that broadcasting in the UK is undergoing a sea change. Already satellite TV has become an established feature in many people's lives. Whatever you may think of him, one has to hand it to Rupert Murdoch for getting TV broadcasting off the ground and, it seems, making a success out of it – apparently BSkyB is expected to make a profit of some £65m in the present financial year. Sales of satellite TV systems, about the only economic activity at present experiencing boom conditions in the UK, are expected to have exceeded one million in 1992, an increase of 22 per cent over 1991. Sales of around a million and a quarter in 1993 is a not unreasonable expectation. The UK Gold channel should add to the growing success of satellite TV broadcasting. It can call on a library of 130,000 BBC and Thames Television programmes of proven popularity. Satellite TV looks like doing for the Nineties what the video boom did for the Eighties. It's sad to see a firm like JVC, almost synonymous with video, reduced to a loss-making position – some £70m pretax in the current half year and the interim dividend suspended. JVC's sales of video equipment fell by 31 per cent, suffering particularly in the European market. Lack of consumer confidence and market saturation are the obvious causes and the company sees no prospect of any improvement at present. One wonders why the traditionally deft Japanese haven't moved into the satellite TV market to any great extent so far.

But there's more to the changes than pointing the aerial to the sky instead of the relevant point on the radio horizon. UK Gold's publicity talks of the service being free until next autumn "at least". It's using soft encryption, which means that a receiver with a VideoCrypt decoder will provide reception without the need for a smart card. Within a year UK Gold expects to move to full encryption. Once viewers have had a chance to find out that they have a taste for UK Gold's offerings they'll be expected to pay. That's the way it's going. First get satellite TV started, then start charging. An announcement from News Corporation, which has just formed a partnership with the successful French pay-TV operator Canal Plus, refers to exploiting the possibilities being brought about by developments in signal processing, encryption and satellite transmission. There has been talk of making various currently free services such as Sky One part of a subscription package. All fair enough. If people's wish to view the services is sufficiently strong they'll be willing to pay. But it's nevertheless a surprising development, since one thing the public has always been reluctant to do is to pay for its broadcasting services. One wonders quite how the feat is being carried off – and its effect on the traditional terrestrial services.

The latter will suffer, probably in the same way that the US networks have suffered from the effects of the growth of cable TV there. The BBC has, for the present, its licence-based income but is clearly seriously concerned about its future role and prospects. The ITV companies with their new franchises should keep going but if smaller audiences mean reduced advertising income there could be a downward spiral in quality and profitability. One obvious possibility is to start charging for terrestrial services. After all, Canal Plus has made a success of it. We could end up with all programmes except for a small "public TV" service being paid for directly.

All this is a far cry from the ideals that went with broadcasting in what, presumably, we will now have to see as having been its pioneering phase. But initially the bands were very limited, to be used with discretion and the aim of cultural improvement rather than simply entertainment plus news and a bit of culture on the side to get past whatever regulation is left. The remorseless increase in the frequencies that can be used and the ways in which they can be exploited technically has changed all that. Broadcasting seems to be rapidly becoming no more than just another facet of the consumer economy. Sad, when you consider the earlier ideals, but probably inevitable.

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### COVER PHOTO

This month's photograph shows the Philips 2A chassis – see servicing article on pages 102-4.



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10uf at 250v	35
22uf at 250v	40
33uf at 250v	55
47uf at 250v	65
100uf at 250v	1.25
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1uf at 400v	23
4.7uf at 400v	30
10uf at 400v	37
22uf at 400v	85

(All PCB Mounting)

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# Replacing a 3in with a 3.5in Disc Drive

Gus Cusick

Replacement 3in. disc drives for the Amstrad PCW8256, 8512 and 9512 are becoming scarce and expensive. A 3.5in. 1Mbyte drive can be fitted instead at around half the cost.

Two different types of 3in. drive were used in these machines. The single-head FD2 version (180K format) was used as the A drive in the 8526 and 8512 (it was also used in the Spectrum +3 and the CPC664 and 6128 machines). The dual-head FD4 version (720K format) was used as the B drive in the PCW8512 and as the A drive in the PCW9512.

The following information gives wiring details to enable either type to be replaced with an industry-standard 3.5in. 1Mbyte (unformatted) drive with a 34-way IDC plug.

## Wiring

Power is supplied to the 3in. and 3.5in. drives via an in-line, keyed four-way socket. With the 3in. drive the connections are +12V, 0V, 0V and +5V. With the 3.5in. drive the connections are +5V, 0V, 0V and +12V. So be careful! As a further complication 5V is orange and 12V red with the 8256/8512: with the 9512 5V is red and 12V orange.

Data connection with the 3in. drive is via an unkeyed 26-way plug. The correct orientation for the 26-way socket is when the ribbon cable edge colour marker is nearest to the power connector.

Make up a data cable using 26-way ribbon cable, with a 26-way IDC plug at one end and a 34-way IDC socket at the other end. Table 1 lists the connections. Pins 1-6, 13 and 14 of the 34-way connector are not used.

With 1Mbyte 3.5in. drives the pin connections are standard but pin 34's function is usually selected by means of shorting links. Drive selection 0 or 1 can be by means of either a shorting link or a switch.

## Fitting

The simplest approach is to use an external cased drive with a 30-way ribbon cable between the drive and the computer, splitting into 4- and 26-way inside the cases. The ribbon cable can be fed into the PCW alongside the printer port connector. The redundant drive would in this case be left inside the machine.

There's sufficient room for an internal fit. This of course involves cutting the cabinet and making mounting brackets. We'll not go into this here.

## Notes

As the 3in. drive data plugs are unkeyed the keying on the mating socket can be of any type – and is! So check before you order your 26-way plug.

To use as a B drive, ensure that the drive select link/switch is set to drive 1.

## Uses and Formats

The first thought that springs to mind is "how can I use my 3in. discs with the 3.5in. drive?" The answer is that you can't. The data will have to be transferred to 3.5in. discs. How?

The options are to have them transferred commercially, which costs up to £5 a disc, or to transfer them yourself.

If you have access to a working machine you could make up a switch box as shown in Fig. 1. This allows transfer of data using existing copy software – Disckit etc. When the PCW prompts you to insert source or destination disc, switch to internal or external respectively. To avoid any chance of corruption use on-off-on toggle switches

A 3.5in. 8256/8512 A disc will have a formatted capacity of 180K. This seems a lot of wasted space, but with discs being cheap and the "hassle factor" of having to remember to switch in or out of the other areas I decided to leave well alone.

A 3.5in. 9512 A/8256 B disc has a formatted capacity of 720K. Mark your discs A or B – this saves a lot of error messages.

Note that the PCW and PC formats are incompatible.

Before copying data it's necessary to format the 3.5in. disc. Use Disckit to format to either 180K A (8256/8512) or 720K B (8256) or A (9512).

**Table 1: Data plug/socket connections.**

34-way socket	26-way plug	Function
7	1	Earth
8	2	Index
9	3	Earth
10	4	Select drive 0
11	5	Earth
12	6	Select drive 1
15	7	Earth
16	8	Motor on
17	9	Earth
18	10	Direction
19	11	Earth
20	12	Step
21	13	Earth
22	14	Write data
23	15	Earth
24	16	Write gate
25	17	Earth
26	18	Track 00
27	19	Earth
28	20	Write protect
29	21	Earth
30	22	Read data
31	23	Earth
32	24	Side one select
33	25	Earth
34	26	Ready/change/open

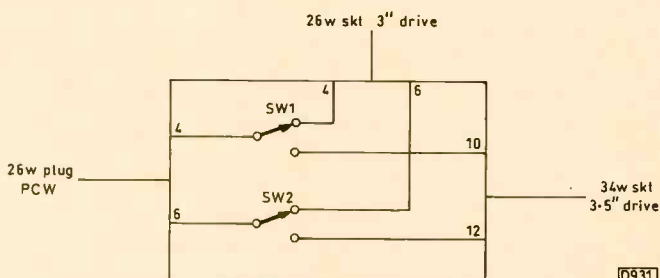


Fig. 1: Switch box for data transfer.



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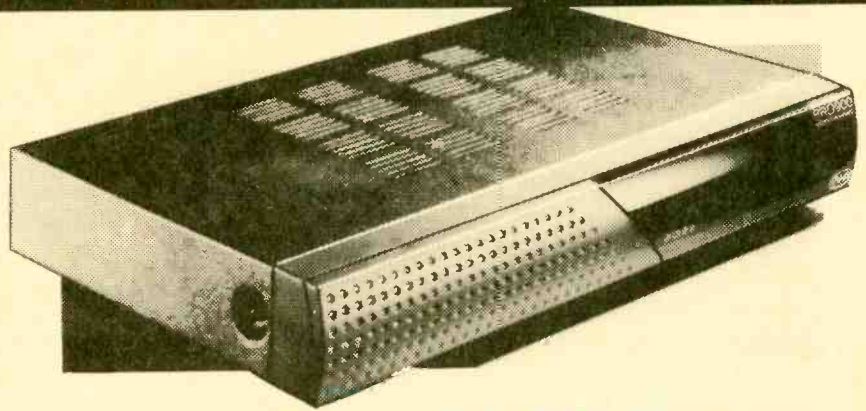
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# VCR Clinic

*Reports from Philip Blundell, AMIEE, John Edwards, Jeff Herbert, Chris Watton, Steve Beeching, T. Eng., Michael D. Maurice, Michael Dranfield, Stephen Leatherbarrow, Brian Storm and Mick Dutton*

## Mitsubishi HSB27

This machine was dead. As it was a Mitsubishi I had a quick look round for open-circuit safety resistors before I got too involved and sure enough R5K3 on the lower board was open-circuit. A short to chassis could be measured from one end of the resistor however. I traced this to the deck where a spring was shorting one end of the latch magnet to the chassis: the reel disc unit had sprung apart and as a result the spring had fallen out. **P.B.**

## Grundig VS310

The sound wasn't being muted in search or ATTS. Muting is carried out on the sound (TON) board, where R1351 (10k $\Omega$ ) was found to be dry-jointed. **P.B.**

## JVC HRD170/Ferguson FV11R

When this machine was connected to the mains supply the clock flashed as usual but the tape in indicator came on although a tape hadn't been inserted. When the operate button was depressed the indicator remained out and the machine went into the rewind mode for two seconds after which it shut down. An STK5481 chip is used in the power supply. This seemed a good place to start and a replacement restored normal operation. **J.E.**

## Akai VS66

The customer's complaint was that fast forward, rewind and record were o.k. but the machine wouldn't play back a tape. The child lock mode was in operation, easily proved by pressing play on the handset for about eight seconds. When the lock mode is selected with this machine, either deliberately or accidentally, by pressing the stop button on the handset for eight seconds the lock symbol in the display lights up only briefly. It's thus easily missed, with the result that the user isn't aware of what has happened. **J.E.**

## Ferguson FV26D

When the on button was pressed the deck mechanics shuffled back and forth for a couple of seconds and the channel indicator appeared briefly then the machine shut down. The cause was loss of the 12V and 5V supplies because the STK5481 chip was faulty. **J.E.**

## Philips VR6870

The machine was completely dead – no displays and no deck functions. This is a nice stock fault. Go straight for C112 (33 $\mu$ F, 25V) on the stand-up subpanel in the power supply module. It goes open-circuit or changes value. **J.E.**

## Ferguson 3V29/JVC HR7200

A loud clanging noise and tape judder during rewind and fast forward were due to the fact that the idler was broken in half – most unusual. When a replacement had been fitted the tape functions worked well except for noise bands and vertical

judder during playback. Out came the carriage again. We then noticed that the back-tension band was crinkled at the tension-lever pivot: it had been adjusted by bending the band with pliers instead of adjusting the screw. The phantom fiddler had struck again – this time it was a "helpful" neighbour. **J.E.**

## Panasonic NVF65

The capstan motor ran at full speed in all modes – load, playback and search. Supply choke L2002 on the main PCB was open-circuit. It supplies 5V to the capstan motor's FG stage. Because there were no FG pulses the servo ran the motor at full speed. **J.H.**

## Ferguson 3V35/JVC HRD120

No playback or record colour is not uncommon with these machines, due to faults around the crystal oscillators. On this particular machine however the cause was the colour/monochrome/test switch at the back. It had become leaky. As the customer didn't know it was there and obviously never used it I simply removed the connections to the offending portion of the switch. Everything then worked correctly. **C.W.**

## Saisho/Matsui VCRs

A number of Saisho and Matsui VCRs use a small plastic item to release the limiter post. It commonly breaks, the usual complaint from the customer being that the machine is stuck in the pause mode though what actually happens is that the pinch roller is jammed by the limiter post. There are various sources for this plastic part. Unfortunately in some cases the pivot hole is too large. As a result the limiter post again jams, because it hasn't been moved far enough from the pinch roller. **C.W.**

## Sharp/Orion Decks

Many decks look similar to the Sharp VC381 type and most use a similar reel-drive system. This tends to be unreliable, the symptoms being poor winding and search and poor or no reclaim of tape so that a hanging loop is left. The use of genuine spares is generally best but I've recently been replacing the original nylon hub on the motor shaft with a brass drive hub. I don't know whether this is actually a genuine spare but it certainly works very well and is easy to fit. For example this is how it goes in an Amstrad VCR7000.

Remove the lift, the post that releases the cassette brakes and one screw from the plate that secures the motor and the idler spring. Loosen the other screw until the plate can be moved. Remove the idler spring when loose, then the idler. Retighten the screw in the motor so that it's held steady, but make sure that the plate is clear of the motor shaft. Now, using a medium-sized screwdriver, prise up the nylon drive hub. Pliers can be used, but make sure that you don't bend the motor shaft. The hub comes off quite easily and can be discarded. Next fit the new brass drive hub: some care is called for to make sure that it's in the right place, as the height is important – the idler and hub must contact correctly and the new hub is not as tall as the nylon one. To fit the

brass hub you need a soldering iron and a screwdriver or similar to push it down when the hub is hot. Place the hub on the shaft: it will fit just enough to hold in place. Put the iron on top of the hub. When the hub is hot enough it will slide on to the shaft and, usually, stop at just the right place. When the hub has cooled down the machine can be reassembled and you'll have no more problems.

I don't know whether the major spares firms carry this item but it's advertised in the magazine and is also available from VAS in Derby. **C.W.**

### **Grundig VS500**

The voltage at the power supply pin of the sequence-control microcomputer chip CIC230 in this machine was low at 2V instead of 5V. The dealer the machine had come from asked us to replace the chip as he didn't have the tools to complete the task. Fair enough, at least this would save damaging the print. But let's see, is the chip getting hot? It wasn't. So perhaps the 5V regulator was faulty. A replacement made no difference and I then noticed that the 12V supply was also affected. I checked both supplies by powering them from an external source: the 5V rail took 330mA while the 12V rail took 125mA. No shorts then. The power supply was either not regulating or not providing sufficient power.

The power supply was actually switching in bursts, so it could have been working in a heavy-load mode. In fact this was not the case. The cause of the problem was an open-circuit capacitor (C1326) in the regulator control feedback circuit. Grundig tell me that the fault is not unknown to them. **S.B.**

### **Ferguson FV42L**

This new machine could be tuned in to the TV set and played back a prerecorded tape, but with record and E-E operation the picture was terrible. Checks showed that there was a very distorted video signal as coil FW11 was open-circuit, in fact physically damaged. **M.D.M.**

### **Panasonic NV730**

The complaint was of critical tracking in the LP mode, the SP mode being good. A check showed that one head's output was low in the LP mode. Fitting a new head made no difference, so we quoted for a new lower drum assembly and replacement video heads (they come together when you purchase the lower drum) and a service. Surprisingly, in view of the high cost, the customer gave us the go ahead. Correct operation was restored when the work had been completed. **M.D.M.**

### **Matsui VX850**

The top of the picture was jumping and the sound was like listening to chipmonks! The first fault was cured by retuning the VCR to programme 0 on the TV set, the second fault being caused by a faulty bias oscillator – it had been damaged by liquid spillage. The new recordings were made in the SP mode: the old ones, which were not being erased, were in the LP mode – hence the chirpy sound. A new bias coil (T01) put matters right. **M.D.M.**

### **Panasonic NVG45**

Prerecorded tapes were played back correctly but the machine wouldn't play back its own recordings properly. A check with another machine proved that the cause of the fault was in the record circuitry – the fault was also intermittent.

The record track wasn't being recorded as pin 1 of IC2102 in the servo section was dry-jointed. **M.D.M.**

### **Akai VSF33**

A dead machine with the power supply working should lead to a check on TR408 (2SD1292) on the main PCB. If this is short-circuit check the 4.7Ω safety resistor FB498 and replace the two 56μF, 16V electrolytics C446/7. Failure to replace these two capacitors will result in a very dim clock display with TR408 overheating and leading a short life. It's also a good idea to remove that blob of brown glue near C446/7 – the one with the blue wire running through it – as it absorbs moisture. This results in corrosion of the PCB beneath. **M.Dr.**

### **Saisho VR3300X/Matsui VX735A**

The E-E picture appeared to be slightly off tune and the drum motor didn't rotate. Two faults or one? A check showed that the 4.43MHz reference signal at pin 3 of the digital servo chip IC2001 was missing. We checked back to the buffer transistor Q3004 on the YC subpanel where the collector voltage was only 2.5V instead of 4.9V. Further tracing back brought us to Q506 (2SD734) which is labelled "power control 5V switch". Its base and collector voltages were correct but there was only 2.5V at its emitter. A new 2SD734 transistor cured both faults. **M.Dr.**

### **JVC HRS5000**

This all-singing, all-dancing machine came in because of intermittent slow playback with some tapes. After watching the tape supplied by the customer we came to the conclusion that the tape transport system was running too fast. As lengthy efforts failed to instigate the fault we left the machine on the soak test bench. About two weeks later the fault finally showed up. The loading cycle hadn't been completed and as a result the pinch roller hadn't been pulled on to the capstan shaft. Thus the reel motor was driving the tape. A replacement mode switch cured the fault. **M.Dr.**

### **Fidelity VTR1000**

Although the clock was o.k. this machine wouldn't switch on. A check at the power-in pin 13 of the microcontroller chip IC501 showed that everything was in order here, but pin 2 wasn't producing a low signal to switch on the 15V line. As a test we shorted pin 2 to chassis. This brought the machine to life, but when a tape was inserted there were no deck functions. Further checks around IC501 showed that the reset pin 15 was floating at around 2.5V. Zener diode ZD504 in the reset circuit was leaky. The manual doesn't give its rating, which is 10V. **M.Dr.**

### **Samsung VI510**

There was patterning on the E-E picture, similar to that present when the modulator has been tuned too close to a TV station. After eliminating this possibility we carried out checks on the tuner-i.f. panel. The TAA550B tuning voltage stabiliser chip IC2 was found to have about 1V peak-to-peak of ripple across it. When a 150μF, 63V electrolytic was temporarily connected across IC2 the ripple fell to about 20mV and the fault had been cured. The source of the 50V line is a small switching converter within the power supply: we found that the 33μF, 100V smoothing capacitor C7 was leaky, with one leg rotted away. A replacement restored good results. **M.Dr.**

## Hinari VXL8

This machine was switching between the SP and LP modes in both record and playback. In the past we've found that this has been due to tape wrinkling, usually as a result of a faulty pinch roller or incorrectly adjusted back tension. This causes distortion of the signal from the control track, a problem from which the Amstrad VCR6000/6100 series machines also suffer – they use the same deck. The tape path was carefully examined, but was blameless.

The control track pulses can be monitored at pin 7 of IC103. They were seen to be of reduced amplitude and varying, but adjustment of the control head failed to produce any improvement. This was in no small part due to the large amount of hum on the "µcom +5" rail. You can measure this at pin 1 of the power supply plug. The cause of the trouble was bridge rectifier D506, which had an open-circuit diode. We also replaced the associated 2,200µF, 16V reservoir capacitor C505. S.L.

## Ferguson 3V35/JVC HRD120

This was a straightforward fault though it did involve a chase through three boards to find the cause. In the E-E mode the video signal would fade out or disappear instantly in a very unpredictable manner. A check showed that the i.f. panel's video output was present. Over to the luminance section then. The signal was present at pin 8 of the switching chip IC501 but didn't emerge at pin 4 because the voltage at switching pin 2 was incorrect. This voltage should be zero in the TV mode and 7.5V in the video/aux mode. It was 1.6V and varying. We eventually found that the TV/video switch itself was the cause of the trouble. The sound remained unaffected throughout. S.L.

## Tashiko VVD951/Sharp VC681H

This machine was stuck in the pause mode. The deck would accept a cassette and attempt to play it, but on completion of loading it would enter the pause mode. The pause LED remained lit from cassette acceptance until ejection. During a timer recording however the machine performed faultlessly. This at least eliminated the front operation panel, but to confirm this we disconnected the data input to the panel at HA2. The pause LED then went out, confirming that something upstream was the cause of the indication.

We noticed that the key input at pin 47 of the IX0151 microcontroller chip IC801 changed following selection and cancellation of pause. The chip's 5V supply at pin 58 was clean and correct, and the still output at pin 54 changed state on request. This appeared to exonerate the system control chip.

We next moved to the still panel where we found that disconnecting the still input (pin 29) got the machine running up to a point and extinguished the pause LED. Something was wrong with the syscon's pause output therefore, and replacement of the chip cured the fault. Diagnosis of faults on serial data lines can be very difficult, even when direct comparisons are carried out with a working machine. We find that substitution is a more valid test and that this usually saves time and money. S.L.

## Panasonic NVJ40

This is a tale of two videos, one with no E-E sound, the other with no search tuning lock. No apparent connection – but read on. We tackled the one with no sound first and soon found that no sound left the demodulator pack because

Q713 (audio defeat) had a high at its base. There are two feeds to Q713, a mute from the syscon department and an interstation mute that's generated by IC7651. During search tuning IC7651 receives a video feed: it generates a sync-low signal to stop search tuning when a station is found. With a station already tuned in there should be nothing at IC7651's sync-low pin 9, but there was 5V here. A new AN5421 cured the fault. The problem was the same with the other machine but as there were no previously tuned in stations there was no search lock. A new AN5421 restored full tuning capability. B.S.

## Panasonic NVF55B

I've had a few of these machines that all too readily misload a videocassette, often throwing the tape out three times in four attempts. Check the tension of the cassette gripping flanges: slight readjustment is all that's needed. B.S.

## Sharp VCA5011

The complaint was that a bar moved up the recorded picture. On test this proved to be a hum bar: it was also present when the VCR channel was viewed while recording. What could cause a hum bar in record but not playback? A logical starting point seemed to be the bias control line (record 9V supply) which is derived from Q8801 on the main panel and passes to the YC panel then the head amplifier. A check with the oscilloscope showed that there was 2V of hum on this line.

To try to isolate the source of the fault we disconnected the head amplifier. The hum bar disappeared from the monitor. An ammeter connected in series with the supply to the head amplifier produced a reading of 40mA. We pondered for a long time then decided to check the power supply – but wasn't it common to playback? A check on the always 9V line showed that the voltage was correct but there was about 4V of hum that wasn't present in playback. Checks farther back showed that the input to the 9V regulator chip was low at 10V instead of 15V. There was also a very considerable hum voltage. There was more headscratching when we found that the reservoir capacitor C902 was perfect. We decided to connect the scope across the rectifier diodes. This is a full-wave circuit but the two diodes in each leg are in series. A check on the individual diodes showed that one of them, D904, was partly open-circuit. This was the cause of the excessive ripple: incredible that the extra 40mA drawn by the head amplifier was enough to cause the fault to show up on the display. M.D.

## Philips VR6870

The complaint was of no functions and flashing in the display. On test this turned out to be the case: no operation was possible and there was random flickering within the display. A check showed that the power supply outputs were all slightly low. As we were carrying out checks we noticed that more display segments lit then, after about ten minutes, the machine came into operation with all the supplies correct. When we applied freezer to the VA4006B power supply control chip the machine shut down, but a replacement produced the same results. More careful use of the freezer then showed that C2311 was very sensitive. When a replacement, 33µF as fitted, was installed the machine would start up after about 90 seconds. Reference to the circuit diagram suggested that the correct value for this capacitor is 10µF. Operation was normal when we fitted a 10µF capacitor. M.D.

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# Teletopics

## SATELLITE TV NEWS

UK Gold, the entertainment channel operated by Thames Television and BBC Enterprises, began broadcasting via transponder 23 (11.55275GHz) on Astra 1B on November 1st. The launch campaign has a budget of £3m which will be spent on terrestrial and satellite TV advertising, a national press campaign, direct mail shots and other publicity. Initially the channel, which provides classic British drama and comedy programmes, will be supported by advertising but the expectation is that it will eventually become a subscription service. It should at any rate give a boost to sales of satellite TV equipment. The station has its own Video Plus number, 23, which corresponds with the transponder.

News Corporation and Canal Plus have formed a partnership to develop new TV services in Europe. The idea is to take advantage of "future technologies in satellite transmission, digital compression and encryption". A working group that includes senior executives of the two companies has been set up to consider programming, technology and strategy. The UK operations will be run by BSkyB. It seems that the aim is to provide pay-per-view services, probably starting in 1995.

New satellite TV installations have been held back by shortages of equipment. They were estimated at around 61,000 in September. BSkyB claims that sales are now running at around 80,000 a month and is expecting them to rise to around 200,000 a month. According to Rupert Murdoch, chairman of News Corporation, BSkyB is now making a profit of around £700,000 a week and should clear £65m during the present financial year.

## BROADCASTING NEWS

The recent Granada Television/Home Box Office co-production *Hostages* was broadcast with Dolby Surround Sound. According to Dolby around eight million TV sets, VCRs and AV amplifiers incorporate Surround Sound decoders. Annual production of products featuring the decoders recently passed two million.

PAL Plus test transmissions, in the widescreen format with extended definition, have been successfully carried out by the BBC in conjunction with the UK Independent Broadcasters Group. All BBC-2 transmitters and a number of high- and low-power Ch. 4 transmitters and relays were used for two nights, proving that existing equipment and networks can handle the signals. Prototype PAL Plus encoders and decoders were used for the tests.

Three Canadian TV programme makers and a Toronto engineering firm have developed and successfully tried out a system that uses digital compression technology to squeeze four NTSC channels into a single 6MHz Anike 2 satellite channel. The aim is to cut distribution costs to cable networks.

## SATELLITE TV PRODUCTS

Cambridge Computer Ltd. (1 Crompton Way, North Newmoor Industrial Estate, Irvine, Scotland KA11 4HU) has introduced a new satellite TV tuner/demodulator with synthesised channel selection from 950-2,050MHz. It's

available in single- or dual-input versions and can be customised for OEM orders. The extended range, to 2,050MHz instead of the usual 1,700MHz, assists with SMATV operation, enabling a single cable to be used for horizontal and vertical polarisation with Astra 1A and 1B. There's a switched i.f. bandwidth option for multi-standard use with different satellites.

Various new products are available from Satellite Solutions (UK) Ltd., 35 Quarry Park Close, Moulton Park Industrial Estate, Northampton NN3 1QB (0604 670 900). The UnaOhm POL 5 polariser power supply is designed to help installation engineers who have in the past experienced difficulty in adjusting electromagnetic polarisers while making signal strength measurements. It provides 0 to  $\pm 60$ mA from a 12V d.c. source or the 11V/50mA auxiliary output provided by UnoOhm field strength meters. There are three new UnaOhm signal strength meters. The competitively priced EC891, at £200, covers the FSS, DBS and Telecom bands and requires no operator adjustment. A large analogue display shows the signal level: there's also an audio tone output and front-panel XY outputs to obtain a spectrum display on an oscilloscope. The EP791MEM uses a frequency-synthesis system to tune over 950-2,000MHz, with a four-digit LCD to display the selected frequency, a large analogue meter and an audio tone output. Sound carriers can be tuned in and heard via an internal speaker and there's an optional colour LCD monitor. The FSM5991 is a lightweight, portable TV and f.m. signal strength meter designed to enable MATV and CATV installation engineers to carry out measurements directly from the aerial or from distribution points. The frequency range is 45-860MHz, signal amplitude being displayed on an analogue meter that has additional scales for a.c./d.c. voltages, resistance in ohms and return loss. When used with the optional P138 external reflectometer the latter scale enables mismatch problems in a distribution system to be checked. A button enables audible signal level indication to be selected.

Satellite Solutions has been appointed an authorised stockist for the Chaparral Monterey 20 and 40 multi-satellite stereo receivers. It has exclusive distribution rights to the Strong range of motorised satellite receivers and has been appointed an authorised distributor for Global Communications products. These are used in satellite i.f. distribution systems and include splitters, taps, interfaces and amplifiers and VH, coupler and Magic switches. Satellite Solutions has opened a second outlet at Edinburgh. The company is running a further series of hands-on i.f. installation training courses. These will be held at Leeds on November 26th, Sevenoaks on December 2nd, Bromsgrove on December 9th, Exeter on December 15th, Bury St Edmunds on January 20th, Newbury on January 27th, Perth on February 3rd and South Mimms on February 10th. For details contact Debbie Halliday on 0604 670 900.

## VIDEO AND CD NEWS

Philips latest Laser Disc player, Model LDP600WS at £700, can play 8 and 12in. CAV and CLV discs in PAL or NTSC form and 3 and 5in. audio CDs. It's being handled by Active Laser Distribution (081 292 1136). Philips has reduced the price of its CDI205 CD-I player by £100 to £499. The company is working on record/playback/erase CD technology (CD-E) but doesn't expect to have hardware available for four years. The recorded discs will be playable on current models. Pioneer has launched two new Laser Disc players, the CLD2700 at £550 and the CLD700 at £350, and a home entertainment system, Model CLD150K, at £800. The latter plays CDs, Laser Discs and Laser

Karaoke discs: other features include a system that fades the lead vocals on music CDs and digital sound processing. Pioneer is developing versions of its video disc recorder (see October, page 878) that record the video signal in digital form: they will be aimed at the professional/broadcasting markets. Another development announced by Pioneer is an extension of the Laser Barcode system that uses bar codes to control CAV discs: the extension, called LB2, will enable users to control CLV discs – commands include slow motion and freeze frame.

Sharp has launched in Japan a 4in. LCD TV set, Model 4EL1, that's half the thickness and a quarter of the weight of previous 4in. models while offering improved picture quality. No details of a UK launch so far. Sharp's latest UK introduction is a VCR with a built-in satellite TV receiver-decoder – Model VCBS97HM at £600. Features include a 99-channel satellite TV tuner, a VideoCrypt decoder, Wegener Panda stereo sound, a Nicam decoder, a D-MAC output socket and NTSC playback.

Hitachi has launched at £370 a VCR, Model VTM140, that includes a built-in Video Plus timer and a control for improving the picture quality with rental tapes. The Hitachi VME31 at £880 is one of the world's lightest Hi8 camcorders, weighing just 790g with battery and tape.

Akai is the latest VHS company to launch a range of Video 8 camcorders, the PVM2 at £600, PVM4 at £700 and PVM8 at £850. All include IHQ picture enhancement. The PVM4 adds stereo sound to the specification while the PVM8 is a Hi8 model with a higher-resolution CCD.

Several interesting video products have been introduced by Sony. The Video Walkman Model GVS50 at £800 records and plays back 8mm cassettes and in addition plays back Hi8 recordings. It's an extremely compact stereo model with a 4in. fold-over colour LCD screen, a v.h.f./u.h.f. tuner with 60 preset memories and the ability to play back NTSC tapes. The GVS50 can also be used as an editing accessory. Model CCDTR8 is Sony's smallest camcorder to date, weighing just 690g. Sony has developed a lithium-ion battery, type NP500, to power this camcorder. The battery doesn't suffer from the "memory effect" associated with conventional camcorder batteries: thus it doesn't have to be fully discharged before recharging, and can be topped up at any time. The CCDTR8 is a stereo Hi8 camcorder with a 440,000-pixel, 1/3in. CCD image sensor. Quick and accurate full-range auto focus is maintained by the Sony Inner Focus System – manual control is possible, with a convenient dial at the front of the camera. Manual exposure and gain control are provided in 24 steps, while programme auto exposure features portrait, sports and HSS modes. The CCDTR8 comes with the Sony camcorder station. This ensures easy connection and use. The camcorder station can be left connected to the TV set permanently, the CCDTR8 being easily clipped and unclipped from its base: in addition there's automatic battery charging when the camcorder is connected to the station. Price of the CCDTR8 has still to be announced.

The CCDFX300 at £600 is a mono 8mm camcorder that uses the same chassis as the CCDFX500: it has a two-speed x10 power zoom lens, the Sony Inner Focus System, three-mode auto exposure and fader. At £700 the CCDTR303 camcorder is smaller, weighing less than 800g. With this model the number of auto-exposure modes is increased to four – portrait, sports, high-speed shutter and twilight. There's also remote control. Finally the EVC45 at £350 is a Video 8 recorder/player without tuner, designed to complement a Video 8 camcorder for editing. Features include hi-fi stereo sound and a voice boost facility.

The Amstrad DD9900 at £400 is a compact successor to

the company's original twin-deck VCR. This time the two decks are side-by-side instead of one on top of the other, yet the machine is no wider than most standard single-deck VCRs. Each deck is a record/playback unit with LP/SP options.

NEC in Japan has developed a high-definition digital VCR that uses cassettes about three-quarters the size of a standard VHS cassette and has a playing time of two hours. The Hi-Vision digital VCR, which NEC considers to be a potential consumer product, uses three techniques to reduce the size of the machine and the cassette: a new very high video compression system, a new high recording density head and new ultra-thin (11µm) tape. The storage required for the recorded signal is about a fifth of that of a conventional VCR system.

Fujifilm has opened a camcorder service department at its Bedford distribution centre, replacing third-party service. The move coincides with the opening of Fujifilm's first dedicated camcorder factory at Sendai, Japan.

## SERVICING AIDS

Antex (Electronics) Ltd., 2 Westbridge Industrial Estate, Tavistock, Devon PL19 8DE (0822 613 565) has introduced a non-electric vacuum pick-up pencil to enable small components to be picked up and placed without being touched. There are two pick-up probes, one straight and one angled, and three silicone suction cups with diameters of 4, 6 and 9mm.

Ferguson Ltd., Service Division, Crown Road, Enfield, Middx EN1 1DZ has introduced a training videotape that covers servicing the power supply and the line field timebases in the ICC5 chassis. Playing time is 47 minutes, price £28 plus VAT.

## CATALOGUES

Greenweld's 164-page 1993 catalogue is now available at £2 (£4 overseas) from Greenweld Electronic Components, 27 Park Road, Southampton SO1 3TB (0703 236 363). In addition it has a 32-page bargain supplement that includes software at 3p per game, power supplies from £2 and the Amstrad PC1640 at £99.95.

The latest RS Components catalogue, for November 1992 to February 1993, is in three parts, one each for components, equipment and mechanical items. For details on account requirements etc. write to RS Components Ltd., PO Box 99, Corby, Northants NN17 9RS (0536 201 234).

## IN BRIEF

Cable and Satellite '93 will be held on 5-7th April 1993 at Olympia-2 in London. . . IBM's PC-based videophone, which is being developed with BT, is likely to go on sale in the UK next July at around £3,000. Trials are due to start in March. BT is contributing the video compression system, which will enable PC pictures to be transmitted via a 64kbits/sec ISDN telephone line, while IBM is contributing a software interface that it hopes will become an international standard. Coco, as the system is to be called, will be sold as a PC expansion card and camera for fitting to any IBM-compatible 386 PC. . . Oki Electric and the Japanese broadcasting organisation NHK have developed a 25in. (diagonal) colour gas-plasma display device for TV use. The display has 768 x 512 pixels, each with red, green and blue light emitting cells. Only prototype screens have been produced to date: a demonstration was given at Electronica '92 in Munich last month (November).

# Servicing the Philips 2A Chassis

Richard Newman

Sets fitted with the Philips 2A chassis first appeared in 1985. Because of the inherent reliability of the chassis little seems to have been written about it. These sets are now appearing on the secondhand market however and, provided the tube is good, they are well worth repairing for resale. As with most sets, problems occur mainly in the power supply and the line output stage. A fairly comprehensive guide to servicing the power supply is given in the following article. Service manuals are available from Philips and advertisers in this magazine and should be used with the notes below.

## The Power Supply

The power supply used in the 2A chassis is the now familiar SOPS (self-oscillating power supply) type. It provides mains isolation, which is necessary because of the external AV connections that can be made via the scart socket. Fig. 1 shows the circuit.

The most common problem is failure of the BUT11 chopper transistor Tr7687. In this event the mains fuse F1651 will usually be blackened or even shattered, with possible failure of one or more of the bridge rectifier diodes D6654-7. The surge limiter resistor R3654 will sometimes

have failed as well. Remove the faulty BUT11 transistor and check D6663, D6664 and C2664. This capacitor can split: use a good quality 1.5kV capacitor in this position. In later sets the snubber network D6663/R3663/C2663 may be omitted, in which case the chopper transistor is type BUT11A. It's important that the correct type of transistor is used in this position. A BUT11 fitted in a set without the snubber network will fail again, but it's perfectly in order to fit a BUT11A in all sets. Transistors Tr7685 and Tr7686 should also be checked and, we've learnt from experience, it's best to replace the CNX62 optocoupler Tr7668 in the error signal feedback circuit

Once replacement components have been fitted as necessary there's an official modification that should be carried out on earlier sets to reduce the likelihood of chopper transistor failure. It consists of fitting a BYD33D diode with its anode to the collector of transistor Tr7686 and its cathode to the base of the chopper transistor Tr7687, and reconnecting R3687 so that one end remains connected to the base of Tr7686 while the other end is moved to connect with the base of Tr7687. I also fit a BYD33D diode in position D6672.

Before you switch on it's best to carry out a visual exam-

## POWER SUPPLY OPERATION

The chopper circuit relies on feedback from the transformer to sustain oscillation. As with any chopper circuit, regulation is achieved by controlling the on/off timing of the chopper transistor. For control purposes the base of Tr7717 monitors the 140V h.t. supply. Its emitter is provided with a stable 6.2V reference voltage by zener diode D6715. The error voltage produced at the collector of Tr7717 drives Tr7719 which controls the current through the LED in the CNX62 optocoupler Tr7668. This device is used to provide mains isolation in the feedback path. The light-sensitive section of the optocoupler sets the d.c. voltage at the base of transistor Tr7685.

At switch on the base of the chopper transistor Tr7687 is forward biased via R3686. It switches on and a sawtooth current flows through the primary winding 5-7 of the chopper transformer T5663. Tr7687 and T5663 form a blocking-oscillator circuit. Positive feedback via winding 1-9 on the transformer and D6672 drives Tr7687. When the transformer saturates, the drive is removed and Tr7687 switches off. The resonant circuit formed by C2664 with the primary winding of T5663 then oscillates, producing an overswing that switches Tr7687 on again.

In normal operation Tr7687's switch-off timing is controlled by the pulse-width modulator consisting of transistor Tr7685 and its associated components. As mentioned above, the d.c. conditions at the base of Tr7685 are set by the conduction of the optocoupler. The base of Tr7685 is also fed with a sawtooth

waveform that's developed across C2675, which with R3678/9 integrates the feedback from winding 1-11 on the transformer via D6667. In addition a negative reference voltage is established across C2690 by the action of D6689 and D6672 while Tr7687 is conductive. When the sawtooth waveform at the base of Tr7685 has risen to a sufficiently positive value Tr7685 and Tr7686 switch on, removing the drive from Tr7687 which switches off very rapidly.

The nominal operating frequency of the chopper circuit is 40kHz – it can vary between 20-60kHz.

Over-voltage protection is provided by thyristor Ty6698 whose gate voltage is obtained from one of the rectifiers connected to the line output transformer. If the voltages in the line output stage are excessive Ty6698 conducts, placing a short-circuit across the 140V line. In this state the chopper circuit operates at a very low frequency of approximately 1.3kHz, with low voltage/current conditions. Current via D6696 holds Ty6698 on – switching the set off removes this short-circuit condition.

In the unloaded state the circuit operating frequency is approximately 100Hz.

In the standby mode thyristor Ty6727 is switched on to maintain the 5V supply to the control section without the need for a separate power supply. In this mode the control circuit provides drive to the anode of the optocoupler LED and the voltages delivered to rest of the set are far below the normal levels.





of the BUT11A transistor, but in my experience this is uncommon.

## The Line Output Stage

Not many faults occur in the line output stage, which uses conventional circuitry. One point to note is that the line output transistor is type BU508V. A BU508A is not suitable and will fail within a very short time. Another common problem is failure of C2618. Its value depends on the screen size: the rating is 2kV. C2609, whose value is also dependent on screen size (voltage rating 2kV), can also be a problem.

One case of line clamp at the right-hand side of the screen was caused by a defective line driver transformer. So far I've never had to change the line output transformer in this chassis, but it does seem to suffer from dry-joints. These should be attended to as a matter of course.

If, when the brightness setting is advanced, you have a blank raster with flyback lines check C2496 (22nF). When this capacitor goes open-circuit the luminance amplifier in the colour decoder chip is biased off. It's part of the beam limiting circuit.

## Timebase Generators

The sync circuitry and timebase generators are contained within the well-known TDA2579 chip IC7535, which also provides sandcastle pulse and transmission identification outputs. No line drive with the h.t. supply present should lead to a check at pin 16 of this chip. This pin receives a start-up supply from the chopper circuit via R3556 (270Ω) and R3555 (560Ω) – during normal operation the chip is operated from a line output stage derived 11V line (+13a). The voltage is stabilised at 9V within the chip. If the voltage at pin 16 is low, check whether the external zener diode D6555 (BZX79/C12) is leaky or short-circuit. The chip itself could be faulty. If removing the solder from pin 16 makes the 9V supply come up, replace the chip.

## Field Output

The field output stage consists of a TDA3653 chip in 20 and 21in. models or a TDA3654 in larger-screen sets. The most common fault is for the chip to have failed. Whenever

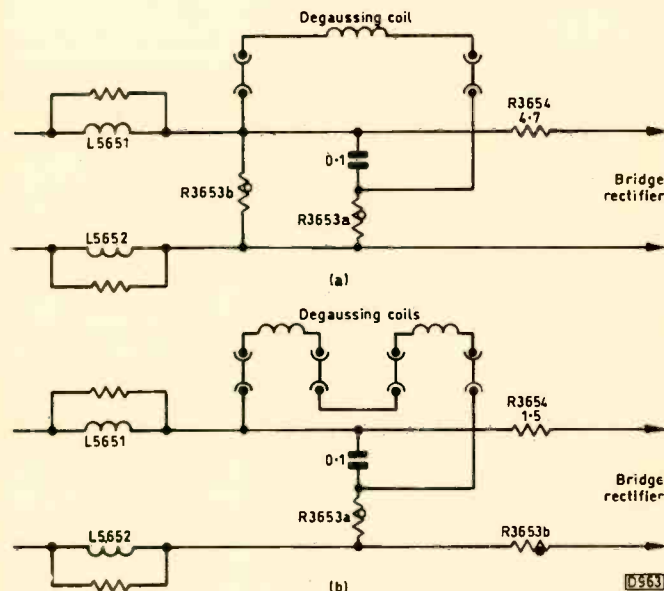


Fig. 2: The degaussing circuit, (a) version used in 90° sets, (b) 110° version.

## Models fitted with the 2A chassis

### Philips

21CE2340/05S	22CE2567/05R
21CE2640/05S	24CE2370/05S
22CE2060/05T	24CE2670/05S
22CE2061/05T	26CE2080/05T
22CE2065/05T	26CE2081/05T
22CE2261/05T	26CE2281/05T
22CE2267/05R	26CE2581/05S
22CE2561/05S	27CE2390/05S
22CE2565/05T	27CE2690/05S

### Pye

52KE2403/05R	59KE2706/05R
52KE2406/05R	66KE2800/05R
56KE2600/05R	66KE2812/05R
56KE2610/05T	66KE2815/05R
56KE2612/05R	68KE2903/05R
56KE2615/05R	68KE2906/05R
59KE2703/05R	

you have to fit a replacement, C2571 (100μF) and C2565 (390pF) must also be changed. Failure of these two capacitors can result in failure of the chip. C2565 is a small, plate-ceramic capacitor that's mounted on the print side of the board, between pins 1 and 5 of the i.c. If it's left out, a herringbone-type pattern may be seen on the screen followed by the rapid demise of the chip.

## Audio Stages

The audio output chip is a TDA1013A. No problems here apart from occasional failure of the chip itself. Another possible cause of no sound is the headphone socket.

The well-known TBA120S intercarrier sound chip is used (IC7111), with the inter-station mute voltage being applied to pin 4. Between these two chips there's an HEF4053BP i.c. (IC7122) for switching between internal or external audio, the latter being fed via the scart socket. This chip has been known to fail, giving the no sound symptom: as a quick check pins 13 and 15 can be shorted together so that the off-air sound is fed directly to the audio chip.

## Video Section

A TDA3561A colour decoder chip is used. No colour or no luminance can be caused by the chip itself. With no luminance however first check the voltage at the contrast control pin 7. If the voltage here is negative or very low and not controllable, you might find that the trouble is caused by the previously mentioned capacitor C2496 in the line output stage. Failure of the 8.867MHz crystal X1269 is an occasional cause of no colour.

The only problems I've had with the c.r.t. base panel mounted RGB output stages have been dry-joints, giving intermittent colours.

## Tuner and IF Circuits

The tuner is normally a U343C or U344C depending on whether the set has remote control. It's understood that these have been superseded by later versions and that no

modifications are required when fitting one of these as a replacement.

The i.f. module U1040 is not considered to be a repairable unit. If the can is opened however you find that there's a standard TDA2541 chip and a SAW filter. I.F. problems are usually caused by the chip itself, which can be replaced. There's a single transistor in the can, Tr7065 (BC548). It's the video emitter-follower.

The video signal leaves the i.f. can at pin 15, passing to the TDA5850 chip IC7526 which switches between internal and external video. This chip can fail, the result being loss of video signal. Make sure that the set hasn't been switched to external video via the remote control unit however!

### Teletext

A strange "net-curtain" effect can sometimes be seen on the screen with teletext models. It takes the form of fairly close, evenly-spaced faint bars that run from the top to the bottom of the screen. The cause is the SAA5241 chip IC7770 on the teletext panel going high-resistance in its socket. To cure the trouble remove the chip and its holder then solder the chip into the board directly. Apart from this

the teletext panel is very reliable. Odd dropouts can sometimes be cured by careful adjustment of the 6MHz oscillator (trim C2802).

### Control Section

Few faults occur in the control section. I've had stuck buttons on the control panel, giving continuous programme changing etc. The most common problem is loss of memory due to failure of the nicad backup battery. When this has to be replaced the set must be retuned and the personal preference levels reset.

Another occasional problem is failure to come out of the standby mode. If it's not due to the nicad battery, check that the BZX79/C4V7 zener diode D6734 isn't leaky.

### Conclusion

It's hoped that these notes will be of help to engineers who are not too familiar with the 2A chassis. Notes on some later Philips chassis will follow in subsequent articles. Since the SOPS power supply circuit was used in several chassis the notes on this in the present article also apply to the other related chassis.

## *Improving VHS Picture Quality*

*Steve Beeching, T. Eng.*

When a standard VCR is used to play back old and worn tapes the picture suffers from excessive noise and black streaking after peak white – this is most noticeable with caption text. The underlying cause of the black streaks is loss of the h.f. part of the playback f.m. signal. The noise comes from the worn tape.

There are several ways in which the signal-to-noise ratio can be improved and compensation provided for the reduced h.f. signal component. Most of the techniques used for this purpose involve some compromise between picture resolution and video noise, since increasing the sharpness of the picture also increases the noise, particularly on the edges of items in the picture.

Another cause of low playback definition is the use of very high-grade tapes in machines that were not designed for them. This is particularly the case when S-VHS tape is used in, for example, a portable VCR deck/camera system designed in the early 80s – such tapes were unknown in those days. There are two reasons for this loss of definition, one being too low an f.m. record carrier drive level for the tape, the other reduced amplitude at around 1-2MHz in the playback f.m. signal.

Picture sharpening systems enhance the edges within the picture by exaggerating rapid changes from black to white and vice versa. Use of a double limiter helps to maintain the higher frequencies, but with distortion at the edges of transients.

Video noise-reduction systems work on both the amplitude and frequency of the demodulated signal. Low-level h.f. signal information is very similar to noise and can be cancelled as noise. Examples are grass or the leaves on a tree: both represent low-level h.f. signal components which will be reduced or even eliminated by the use of noise-reduction techniques. The result is an overall smeared effect lacking detail. Any compensation provided by picture sharp

ening will increase the picture's visible noise content.

In order to understand the problems and the solutions offered I'll start with basic f.m. modulation theory. This will make clear the need for correction systems. Two fairly recently introduced techniques that offer unique but different solutions will then be described, the Akia IHQ system and the Nokia ASO system. Both allow high-grade or S-VHS tapes to be used to the best advantage for recording and playing back, but not when playing back S-VHS standard recordings.

### FM Video Recording

For recording purposes with VCRs the luminance signal is frequency modulated on to a carrier, the lower sideband and part of the upper sideband of the resultant modulation being used. The frequencies involved differ little from base-band video. The upper sideband is not redundant: only by restoring it can the original signal be faithfully demodulated. The easiest way to consider this is to point out that while the lower sideband contains most of the video information and detail the upper sideband and the higher frequencies are required for optimum resolution.

Fig. 1 shows the basic video (luminance) f.m. spectrum, with the tips of the sync pulses at the carrier's unmodulated frequency of 3.8MHz. As the video signal rises in amplitude, the carrier's frequency rises to 4.8MHz at peak white. Because the video signal has been subjected to pre-emphasis there are overshoots. The dark overshoots beneath the sync tips are limited to 40 per cent of the overall signal level while the peak white overshoots are limited to 80 per cent (recent systems have expanded this to over 100 per cent). Peak white overshoots extend the f.m. deviation to 6MHz or more.

The video signal's bandwidth produces upper and lower

f.m. carrier sidebands. A filter limits the video bandwidth to about 3.2MHz. The record/playback video bandwidth consists mainly of the lower sideband, as you can see from the shaded portion of the spectrum. The upper sideband falls off rapidly from the ideal full double sideband response. This doesn't restrict the actual frequency response: what it does impair is the transient response because of the loss of upper sideband signal energy. Although the carrier is deviated from 3.8MHz, its rest frequency, the centre carrier frequency is taken as being mid-grey, at 4.2MHz.

To work out the system bandwidth, which is dictated by the lower sideband, we subtract the video bandwidth (3.2MHz) from the carrier centre frequency (4.2MHz). The result, 1MHz, is the lower sideband cut-off point. To increase the bandwidth a lower cut-off frequency of 0.8MHz is possible, but this is best avoided because it causes crosstalk with the upper sideband of the colour signal whose carrier frequency is at 626.9kHz.

So what are the restrictions on the upper sideband? The most obvious one is the frequency response of the record/playback system, which means the record amplifier, the video heads and rotary transformer and the tape itself. Playback preamplifier characteristics and the residual tape noise limit the option of simply amplifying the higher frequencies, as this would degrade the signal-to-noise ratio, bringing us to the response/signal-to-noise compromise mentioned earlier.

High-grade tapes have an amplitude/frequency response that significantly increases the output level from the tape above 4MHz. The lower frequencies in the lower sideband have to be reduced in comparison with the average f.m. playback signal level, resulting in a drop in resolution, but more on this later.

Another problem is the amplitude modulation that occurs, distorting the f.m. signal. An ideal f.m. signal has a constant amplitude at all frequencies. If the modulating signal varies the amplitude as well as the frequency of the carrier, the result is a form of distortion. With any VCR, when the f.m. carrier is modulated by a grey scale there is, as shown in Fig. 2, a reduced level corresponding with the upper grey-scale steps. This is caused by increased attenuation at the higher signal frequencies, the attenuation being proportional to the increased video signal level.

### **Use of a Double Limiter**

Some of the signal loss caused by level reduction at the higher modulation frequencies can be recouped by the use of a double limiter circuit. This was the first correction technique to be used in VCRs – most of them from the earlier JVC models around 1980 feature this technique.

Waveform (a) in Fig. 3 shows the type of signal waveform that comes from the video head preamplifier when there are h.f. losses. Because of a.m. distortion with a complex waveform mixing has occurred in the record/playback process, the result being that high frequencies sit on a lower frequency. The upper and lower horizontal lines represent limiter clip levels: as you can see, the higher frequencies are not able to drive the limiter on and off because their level is insufficient. Waveform (b) shows the output from a simple limiter, with the effect of loss of h.f. information in the centre section.

The top part of Fig. 3 shows the double limiter in basic block diagram form. A complex waveform applied to the input is separated into its higher and lower frequency components by the high- and low-pass filters. After passing through the high-pass filter the low-level h.f. signal is separately amplified and limited. The high gain of the limiting

amplifier produces the waveform shown at (c). The higher frequencies have been amplified and limited, or clipped to the same amplitude as the lower frequencies, though the very highest frequencies, at much lower level, may not actually square off. The two parts of the signal are then added, producing the reconstituted waveform shown at (d). This is further amplified and clipped by a second limiter, producing waveform (e) which has the h.f. component restored. Mixed waveform (d) also contains in residual form the l.f. a.m. distortion upon which the h.f. waveform sat. This is present as a slight tilt, at a relatively reduced level, and is lost in the second limiter.

### **Transient Response**

Transient response is the ability to handle a rapid change from black to white (or vice versa), i.e. a step waveform. Fig. 4 shows such a step, from black to white, at the top. The second waveform shows the equivalent frequency change of the recorded f.m. carrier from l.f. to h.f. During playback the frequency change is not as precise. Because of bandwidth limitations and over compensation by the carrier equalisation circuits after the video head preamplifier some harmonic mixing takes place. Because of this mixing, when the high and low frequencies are demodulated the step waveform loses its definition – the original fast rise-time step becomes a playback slope. Since the mixing is non-linear the slope varies line by line as the mixing components vary. This produces the "busy" edge noise, which can be seen more clearly when the sharpness control is advanced to maximum. Black streaks occur when the mixed component is too small to drive the limiter fully – see the lower two waveforms in Fig. 4.

When the limiter cannot be driven fully its output is zero. Zero carrier is extra black, below the sync tip level. The recovery time is thus extended and black streaking can be seen to the right of any transient signals or steps from black to white, for example caption lettering.

In a VCR's f.m. modulator there's little difference between the upper video frequencies and the higher carrier frequencies. The highest signal frequency may be 3.2MHz for example, the corresponding carrier frequency being not much higher than 4.5MHz. As we've seen, attenuation of the higher carrier frequencies is quite high. These two factors both contribute to a reduction in the level of the higher video signal frequencies, and as a result playback edge noise cannot be avoided. Despite the use of non-linear pre-emphasis and de-emphasis and other video noise reduction techniques for large picture areas, edge noise is still a problem when picture sharpening circuits are used.

### **Nokia's ASO System**

ASO stands for active sideband optimum, but the system is usually referred to simply as ASO: it provides edge sharpening without adding edge noise and represents a unique solution that was developed by the Nokia engineers at Pforzheim.

Fig. 5 shows at (a) a video signal transition from black level to peak white and at (b) the recorded f.m. carrier, with a nearly instantaneous change from low to high frequency and only a very small reduction in carrier level. The problem that occurs during playback is that higher frequencies suffer a greater phase delay while passing through the processing circuits (propagation delay) than lower frequencies. The effect is shown in the next two waveforms, at (c) and (d), where the l.f. signal stops at the broken line but the h.f. signal starts slightly later. Between the two points this

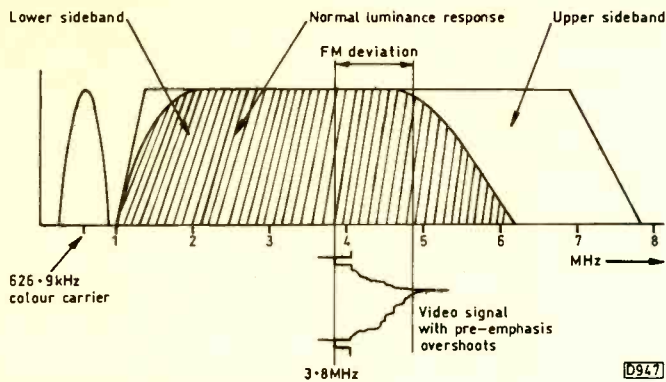


Fig. 1: VHS signal spectrum.

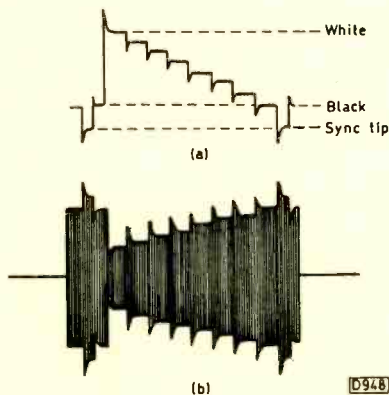


Fig. 2: Video staircase waveform (a) and resultant playback f.m. (b).

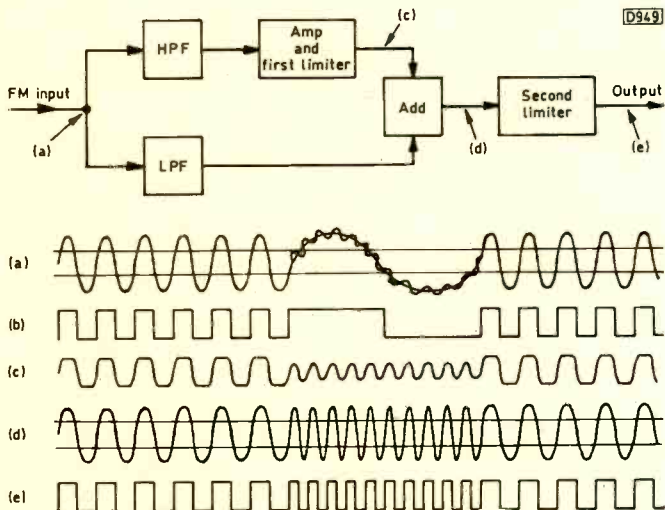


Fig. 3: Operation of a double limiter circuit. Waveform (a) is the f.m. input from the head preamplifier, (b) the output from a simple limiter, (c) the output from a high-pass filter plus amplifier/limiter, (d) the input to the second limiter in the double-limiter arrangement and (e) the output from the second limiter.

phase distortion produces a random harmonic signal which, when demodulated, varies line by line to give the "busyness" of edge noise. The demodulated transition is no longer clearly defined and the remnants of video noise from a noise-reduction system add to this, reducing the picture definition.

The solution devised by Nokia is very simple: if the l.f. signals can be defined and phase delayed by the same period as the h.f. signals, the gap during which the phase distortion occurs can be closed. The edge will be sharpened without reducing the signal-to-noise ratio, in fact an improvement

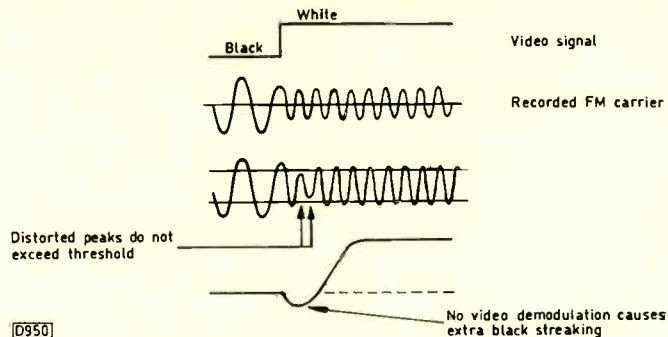


Fig. 4: Distortion caused by poor transient response.

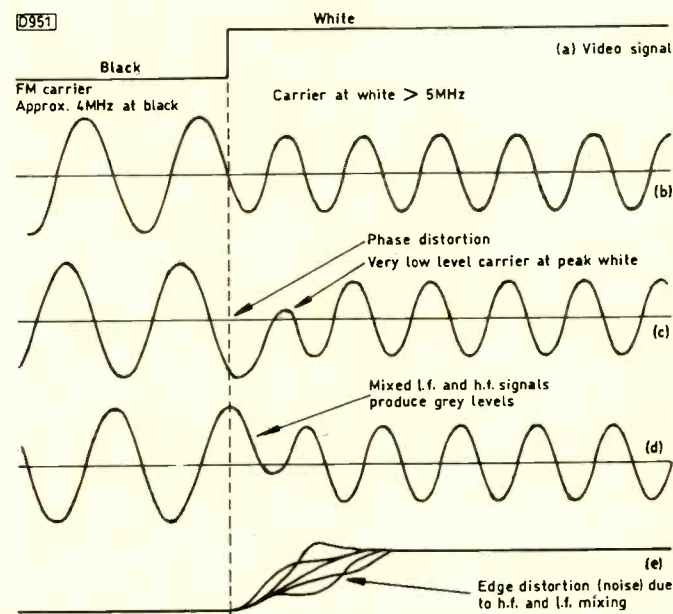


Fig. 5: Effect of phase distortion on a sharp video signal transition.

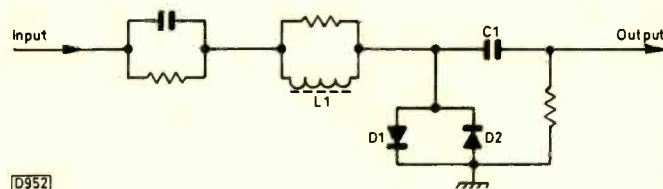


Fig. 6: Basic ASO filter circuit.

will be obtained because of reduced edge noise. As the ASO correction is provided at the video head preamplifier's output, it takes place at source where the l.f. signals are larger in proportion. Thus ASO provides correction for the propagation delay effect by level-controlled delay of the l.f. components of the playback signal.

The basic ASO circuit is shown in Fig. 6, the delay being provided by L1 and C1 which act as a bandpass filter. In practice the equalisation delay network is more complex than this.

A rising signal edge has no effect until diode D1 conducts. Energy is then stored in L1 as the current increases. At the end of the slope the diode cuts off and current passes via C1. In this way the signal is delayed for a short period. D2 acts on a falling edge. The effect is shown in Fig. 7, where the clipped part of the l.f. waveform is delayed by the action of the filter. As we've seen the correction is bipolar, operating on both positive and negative transitions

The large sinewaves shown in waveforms (b), (c) and (d) are the original uncorrected ones as shown in Fig. 5. The

clipped and shaded parts of the waveform are those that have been phase delayed and corrected. Waveform (b) shows that a good signal is unaffected, with a precise change from l.f. to h.f. Waveforms (c) and (d) show how edge distortion is eliminated as the intermodulation products are removed. The delay switches off as the signal changes from l.f. to h.f. The crossover from l.f. to h.f. is made much faster because l.f. signals are delayed but h.f. ones aren't. By comparing waveforms (e) in Figs. 5 and 7 you can see the improvement in the transient edge, which in Fig. 7 is steeper with less variation. As the correction for a white-to-black step is the same, all edges are improved. The process effectively restores the missing part of the upper sideband.

In addition to the significant improvement in h.f. response and thus picture sharpness, without added noise, a.m. distortion of the f.m. carrier is improved. This occurs because the clipping action of the diodes reduces the amplitude of the higher level l.f. signal components to match the lower level of the h.f. signal components.

When high-grade or S-VHS tape is used to record a video signal the higher signal frequencies are played back at much higher levels. This reduces noise on edges and in coloured areas but is not good for resolution as the pre-emphasis and subsequent de-emphasis used increase the level of the main carrier (at 3-4MHz) and the upper sideband (at 4-6MHz) with respect to the lower sideband (at 1-3MHz). There is thus some loss of resolution/detail with high-grade tapes because of the reduced level of the lower sideband. The level-dependent ASO phase-shift network acts as a level-dependent bandpass filter, equalising the levels of the carrier and the lower and higher sideband frequencies.

Acting in the playback mode the ASO system eliminates the need for complex noise reduction and sharpness circuits. It's level dependent and restores the lost parts of the upper sideband with high-amplitude f.m. signals. Thus much more of the spectrum can be demodulated, maintaining a wider baseband video bandwidth. S-VHS tape can be used for recording and playback, and advantage can be taken of the high contrast with scenes that contain detail such as trees, grass and leaves as no noise reduction circuits are required because of the inherent lower tape noise. Thus no low-level detail is lost.

By varying the ASO filter's bandwidth according to signal level, low-level video transients on poor quality tapes are recovered. By reducing the filter bandwidth to eliminate a.m. products the overall quality obtained from such tapes is significantly improved. This leads to better quality copying for the "film your wedding" brigade.

### **Akai's IHQ System**

Akai's Intelligent High Quality (IHQ) system uses a different approach to picture quality improvement. It makes use of a principle originally designed for audio cassette recorders – to arrange that the bias and equalisation employed suit the tape. The audio recorder undertakes a short record/rewind/playback sequence to determine the type of tape being used and then adjusts the parameters for optimum results. Akai designed a similar arrangement for VCRs.

Akai's IHQ technique addresses two problems. The first is the lack of picture detail/resolution when a professional grade tape or even S-VHS tape is used for recording/playback with a standard or HQ VCR. Fig. 8 shows the response with normal, high-grade and S-VHS tape. Remember that the pre-emphasis and de-emphasis in a standard VCR are set to provide a record/playback characteristic that boosts the higher signal frequencies. When this is done with high-

grade or S-VHS tape, in the playback mode the level of the frequencies above 3MHz will be more than twice that of the lower frequencies. As most modern VCRs have some form of f.m. a.g.c. in the preamplifiers the level of the lower sideband with respect to the rest of the signal will be very much reduced. Since the lower sideband of the recorded signal carries the detail information, there will be a loss of detail in the demodulated video signal. This is shown in Fig. 9. The use of high-grade tapes in a standard VCR thus gives improved edge noise, improved colour noise but reduced resolution or, put another way, low contrast in picture areas that include detail.

In the record mode the Akai IHQ system carries out a short record/playback test to determine the grade of tape being used. It then modifies the record response, boosting the level of the lower frequencies as shown in Fig. 10 to provide equalisation. Recording can be done with the IHQ system on or off. Fig. 11 shows a comparison of the record/playback video frequency response using high-grade tape. With the IHQ system in operation, providing an equalisation boost at around 1MHz, the frequency response is much flatter.

In the playback mode IHQ operates on the picture noise reduction system levels. With a good-quality tape the general noise level is much lower than with say a well-worn library film. Standard noise-cancelling systems operate at a fixed nominal noise-reduction level. This means that at one extreme, when using high-grade tape, the noise-reduction system reduces both the noise and the contrast with low-level detail such as leaves and grass. At the other extreme the noise level is so high that it won't all be cancelled – it extends beyond circuit limits and breaks through. The Akai IHQ noise-cancellation system is dynamic, that is it alters its operating point to suit the noise level.

This is illustrated in Fig. 12. The use of high-grade tape with a low noise level is shown at (a): the IHQ system has modified the operating point of the noise-cancellation circuit so that it works at a lower level, allowing transient detail peaks to be recovered at a much higher amplitude (and contrast). Very high noise conditions are shown at (c), typical of a well-worn tape: in this case the noise-cancellation circuit's operating level has been raised to prevent the noise contaminating the picture. But picture detail is reduced as well, as the amplitude of the transient pulse has been reduced. The result is a "softened" picture.

I carried out some tests with the Akai VSF1000, copying from an S-VHS tape recorded using a professional camcorder. The scene was of my dogs romping in a field of grass, an ideal test. A high-grade professional tape was used, with the IHQ system on and off. When both sections were played back with the IHQ system off an increase in picture detail could be seen. When comparing an IHQ recording/playback with a straight recording/playback however the increase in picture detail without any comparable increase in edge noise was significant. A further check with a test pattern confirmed these results – the graticule bar sections were much clearer. In fact switching the IHQ system off then on during playback of a non-IHQ recording increased the resolution of the h.f. gratings without any noticeable increase in edge noise. When the sharpness control was advanced instead there was an increase in both resolution and edge noise.

### **New JVC Technology**

Japanese manufacturers are putting much work into improved picture quality. The development of HD-TV and higher-grade FST TV sets with the resolution increased to

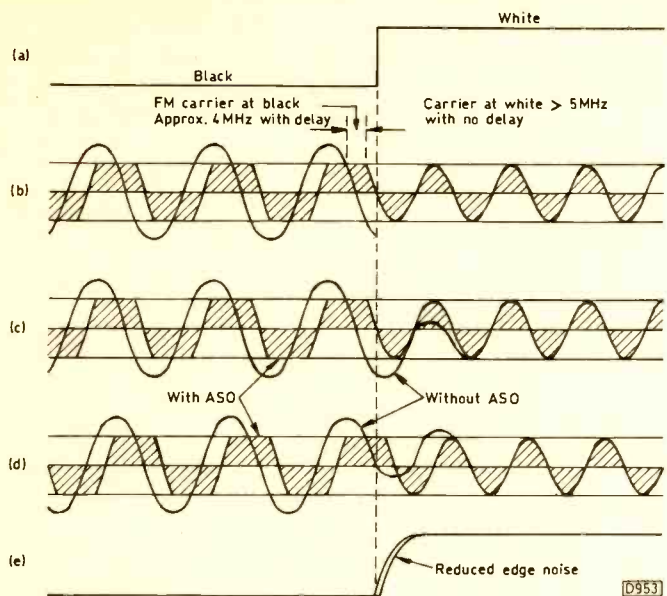


Fig. 7: Effect of the ASO circuit.

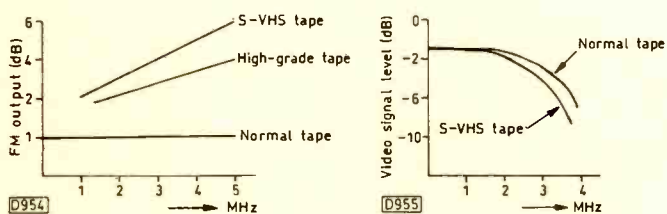


Fig. 8 (left): Frequency response with different types of tape.

Fig. 9 (right): Demodulated video response.

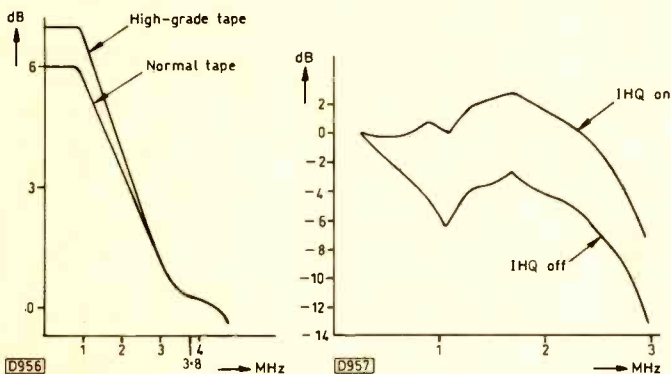


Fig. 10 (left): Lower sideband equalisation.

Fig. 11 (right): Video frequency response with IHQ on and off.

some 600 lines is likely to create a demand for improved picture quality from video equipment. Recent JVC developments are reported in the following notes.

Irregular control track pulses and field sync pulses produced by copying can cause vertical picture flicker. In addition vertical lines can become irregular or crooked, with a vertical rippling effect. A video stabiliser has been developed to avoid these effects. The field sync pulses are removed and replaced with pulses from a stable source, probably from some form of genlock pulse generator although details have not yet been revealed.

As most modern TV sets have FS tubes the video head switching point at the bottom of the screen can be seen as a horizontal disturbance. The video switching noise compensator (SNC) avoids this by using a two-line delay to replace the head changeover period with two earlier lines. There's

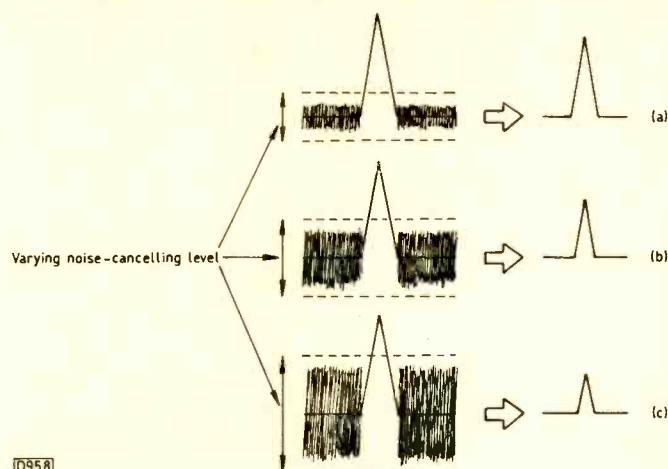


Fig. 12: Action of the dynamic noise-cancelling system.

also a colour stabiliser to minimise colour flicker at the top of the screen because of loss of PAL phase continuity during the head changeover.

A new high-grade video noise reduction system reduces noise where it's most noticeable, for example in large mid-tone areas such as facial cheek bones. It uses a multiband digital transform technique to split the signal components into multiple frequency bands, eliminating the noise in those bands where it would be most noticeable. I am told that it's called Hadamard transform after the French mathematician Jaques Hadamard.

S-VHS recordings can suffer from black sparklies after peak whites, particularly on still pictures with superimposed captions. This occurs because the captions come from a source that has a wider dynamic contrast range than an off-air transmission. A dynamic double limiter, used for S-VHS operation only, prevents black/white reversal from causing over-modulation and subsequent loss of h.f. signal components.

### Acknowledgements

I would like to thank Paul England of Nokia and Steve Groves of Akai for their help in providing technical information used in this article.

## BACK COPIES

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# TV Fault Finding

Reports from Philip Blundell, AMIEIE  
Stephen Leatherbarrow, Alfred Damp,  
John Edwards, Michael Dranfield  
Steve Cannon, J.K. Potts, Edward Branch,  
Michael D. Maurice and Graham Rees

## Sony KV2092 (XE4 Chassis)

This set was dead – the mains fuse had blown and the chopper transistor Q602 was short-circuit. As no dry-joints or obvious causes of the failure could be seen a BU508 was fitted temporarily and the set was tried again. The BU508 failed immediately. Further checks showed that both D605 and D614 were short-circuit. Fitting new diodes and the correct 2SD1497 in position Q602 restored normal operation. P.B.

## Blaupunkt Madagascar Model IS32

This set would work normally for half an hour, then the screen would go blank with flyback lines after which the excess-current trip would operate. The cause of the trouble was that the 250V (U1) supply disappeared because the chopper transformer had an intermittently open-circuit winding. Fortunately we had a spare transformer on a scrap chassis. P.B.

## Philips K40 Chassis

This set was dead with a whistling noise that came from the power supply. As the BU508 was short-circuit a replacement was fitted and the set was tried. I switched off quickly when the final anode connector arced over. A check on the e.h.t. showed that it was over 40kV! The 141V supply was o.k. but the tuning capacitor C2163 (9.1nF) was open-circuit. Fortunately the arcing had caused no further damage. P.B.

## Amstrad CTV2200

These sets often come in dead. No shorts this time however. The standby light was inoperative because the 12V supply to the front panel was missing. This is provided by IC103, which is a standard three-leg regulator. Its input, of around 16V, comes from a bridge rectifier/capacitor combination on the main chassis and was correct. IC103 was open-circuit, a replacement bringing the set to life.

This wasn't to be the last time we saw the set however. On its return IC103 had again failed and a check showed that the reservoir capacitor for the 16V supply, C524 (470µF, 35V), was virtually open-circuit. IC103 obviously didn't like the 100Hz ripple at its input.

We subsequently had this fault on a couple of other occasions. Something to watch out for now that these sets have a lot of programmes behind them. S.L.

*Editorial note:* This is presumably a later version. Our circuit diagram shows a discrete component 12V regulator though the other component reference numbers match.

## Grundig CUC2401 Chassis

The customer's complaint was of intermittent loss of picture. When it was switched on the set worked all right, so we left it on soak test with the first anode control set high. After an hour or two we were rewarded with a field collapse display. So we tiptoed across and measured the 26V supply at pin 8 of the TDA2655B field timebase chip. It was a mere 4V, though there was ample voltage at the anode side of the rele-

vant rectifier D2758. We replaced this item, using a BY298, and also the reservoir capacitor C2758 (1,000µF, 35V). S.L.

## Osaki P31H

This chassis turns up under all sorts of guises, e.g. Hinari, Osaki, Asumi etc. When the set is working the results are very good. This one was dead with the 120V supply low at 70V and the input to the 12V regulator low at only 4V. R109 had risen in value from 180Ω to 1.8kΩ. It's in the feed to pin 2 of the STR5412 chopper chip IC104. Don't be fooled by the resistor's colours, which are far from distinct (browns that look like reds etc.). S.L.

## Fidelity ZX3000 Chassis

A common fault is no sound and no picture. Advancing the first anode preset usually produces a blank raster and a heavy heart. The first step should be to check all supply lines, which will usually be found to be blameless. Next hook up the scope to check that a video output is present at pin 12 of the TDA3541 i.f. chip IC2. This output goes via various filters to the TDA3562A colour decoder chip IC7 (chrominance input at pin 4, luminance input at pin 8). Some sets have a scart socket however, and in these there's a TEA1014 switching chip (IC5) between IC2 and IC7. Check that there's a video input at pin 3 of this chip and a video output at pin 12. The TEA1014 chip is often the cause of the trouble. In an emergency and if the customer doesn't use the scart facility you can remove this chip and link the video/audio inputs and outputs across – for audio the input/output pins are 8 and 6 respectively.

If everything is o.k. up to this point have a look at the sandcastle pulse output at pin 15 of the TDA8180 timebase generator chip IC4 (in later versions of the chassis a TDA2578 chip is used in this position, with the sandcastle pulse output at pin 17). For proper operation the sandcastle pulse waveform must be absolutely correct in terms of amplitude and shape. If it's distorted in some way, as it often is, disconnect pin 15 before condemning the TDA8180 chip – the TDA3562A decoder chip can load the pulse. We've had these two chips (TDA8180 and TDA3562A) fail as a pair. S.L.

## Ferguson SRV1 Satellite TV Receiver

We've had several of these receivers in for repair, under various guises. All have been dead with the BUT11A chopper transistor Q1 short-circuit and the 1AT mains fuse FS1 blown: in one case the two safety resistors R12 and R13 had also been destroyed. The cause of the trouble has in each case been Q1's base drive coupling capacitor C9 (1µF, 16V). It becomes leaky and loses capacitance. A.D.

## Saisho CM260TT

This set had been got at before it arrived in our workshop. Supply resistors had been cut and lifted and a wire had been cut. When this damage had been repaired and the set was



powered it became obvious that the line output transformer was faulty. The set came to life when a new transformer had been fitted – but for only about a minute. If the set was switched off then on again it would do the same thing, run then stop. This final problem was caused by the 5V regulator overheating as the clip that secures it to the heatsink was missing. **A.D.**

### Tatung Quickies

**190 Chassis:** With a dead set you may find R802 open-circuit and R803 discoloured. Replace them both (both are 15k $\Omega$ , 0.5W types).

**140 Chassis:** For field roll with the hold control at one end of its travel check whether R423 (2.2M $\Omega$ ) is open-circuit. **A.D.**

### Philips KT3 Chassis

An uncontrollably bright raster with flyback lines has been the symptom with a couple of portables we've had in recently. The sets also tripped out. The cause was cracks in the print around the line output transformer, especially around D1454 and D1455. **M.D.M.**

### Ferguson TX10 Chassis (PC1560 Panel)

If standby was selected the light would come on but the set would otherwise remain dead. The cause is R724 (1.2k $\Omega$ ) going open-circuit – we've had this fault a couple of times now. **M.D.M.**

### Sony KVE2912

After about ten minutes the sound and picture would disappear, leaving a raster with an unlocked display and no colour. Removing the i.f. can and resoldering just about every joint inside provided a cure. **M.D.M.**

### Philips 10CX1120

We've had the same very intermittent and obscure fault on a number of these 10in. colour portables. Fortunately the first one I had to work on had been taken in part exchange, so repair wasn't urgent – in fact it took about six months! The list of symptoms is as follows: the channel display shows 88; the picture drifts slightly off tune and you can't change channels; the picture goes dark and the sound level drops; some channel display segments light up brighter than others; the set won't switch on from cold; the line output transformer screeches and the output transistor gets red hot, eventually burning out. On one occasion this first set worked for days without even blinking. . .

We eventually got a clue when we found that with the fault present there was excessive ripple on the supply lines – all of them. Naturally the mains bridge rectifier's 150 $\mu$ F reservoir capacitor C621 was the first suspect, but a replacement made no difference. Neither did replacing an endless number of smoothing capacitors. At one point I even tried a new line output transformer.

The breakthrough came when the ripple was seen to be at line frequency, something I'd not previously noticed. A check around the line output transformer showed that the voltage at the cathode of the 16V supply rectifier D551 had risen to 20V. Now the supply from the chopper circuit hadn't changed, neither had the flyback pulse. So the only way in which the 16V supply could rise would be if pin 12 of the transformer wasn't connected to chassis. Under the

fault condition we were able to measure about 1.2V between pin 12 and the tuner. Linking these two together cured the fault.

This set uses double-sided print and the top and bottom earth planes weren't properly connected – there was a resistance of a few ohms between them. This was probably due to a poor soldered-through joint, but I wasn't able to locate it. The solution was to make another connection. There's a convenient large hole at the rear edge of the PCB, between the scart socket and the line output transformer. Scrape away the varnish on both sides and link through with some thick desoldering braid. Don't use the semicircular hole or the back won't go on, and don't try linking up earths anywhere else because this will create earth loops, starting other faults like buzz on sound.

This modification cured all the faults and I've since had several other sets that have been repaired in the same way. I wonder how many of these sets there are laying around in service departments because no one has the time to track down the cause of this obscure condition? **M.Dr.**

### Panasonic U5W Chassis

This set was dead except for a high-pitched squeal from the line output stage. When the collector of the 2SD1441RL line output transistor Q551 was disconnected we found that the h.t. was correct at 155V. As there were no shorts across the secondary windings we fitted a new transformer. This restored normal operation. **J.E.**

### Fidelity F14

When this set was switched on we found that there was just noise on the screen and station search didn't function. The station search and memory buttons are at the back of the set, below the aerial socket. They are part of the back cover moulding. When pressed down they contact circuit switches on the main board. As someone with a heavy hand had been involved the buttons were stuck down hard on the switches. We were able to bend them back gently, away from the board and the switches. Fortunately there was still plenty of spring so that the search tuning system could be operated if required. **J.E.**

### Ferguson TX9 Chassis

This set was of the earlier type with a thyristor power supply. It was dead with a blackened mains fuse. The regulator and crowbar trip thyristors CSR1 and CSR2 were both short-circuit. We replaced them then checked the bridge rectifier diodes, which were o.k. As a precaution we also checked the resistance between the h.t. supply and chassis. We then had a quick look through Gordon Haigh's excellent article on the chassis (July 1987 issue). As everything seemed to be in order we switched on and found that the set was now working normally. **J.E.**

### Toshiba 212T4B

The customer said that when he'd switched on there had been lots of smoke and the set had remained dead. On investigation we found that there was a large, carbonised hole near the line output transformer. The hole had started at the cathode of D400, which is connected to pin 3 of the transformer, and had grown in size to the point where four printed tracks had been burnt away. Cleaning off the carbon deposits, cutting away the damaged print and wiring across to good portions of the print restored the set to life. In view

of the damage it must have been a very fast burn up. **J.E.**

### NEI 2031

I've had two of these Turkish-made sets with the same fault – sound but no picture/e.h.t. As R605 looked rather stressed and measured open-circuit I decided to change it. The trouble was that I couldn't read the value because of its discoloured state. When a circuit diagram had been obtained I found that R605 is a 5.6k $\Omega$  resistor rated at 4W. As it seems to be under-rated I fitted a 5W wirewound type. **E.B.**

### Ferguson TX10 Chassis

When this set was switched on I was greeted with rapid tripping. After checking the focus unit, the chopper/e.h.t. transformer and the line output transistor I found that the line output transformer T721 was the cause of the trouble. A second-hand replacement produced a good picture and sound for half an hour then this went the same way as the original one. A new replacement was ordered and fitted – and lasted for about an hour. Then I did what I should have done before – I consulted K. Rutherford's article on the chassis in the January 1989 issue. This stated that D831 in the line output transistor's base circuit can be responsible for failure of the transformer. A new transformer and diode cured the trouble even though the original one measured all right. **E.B.**

### Philips CP110 Chassis

We've had several of these sets in with line output transformer failure. After fitting the replacement we were left with no EW correction. The cause is R3599 (47 $\Omega$ , 1/8W metal oxide) which, surprisingly, is on the tube base panel. **J.K.P.**

### Toshiba 212R4B

A two-inch hum bar travelled up the screen, distorting the verticals. We initially turned our attention to the low-value, high-voltage electrolytic capacitors in the chopper and line output stages. This proved fruitless however and we were eventually left with the 120 $\mu$ F, 400V reservoir capacitor C810. It tested perfectly on the bridge but a replacement provided a complete cure. **J.K.P.**

### Bush 2520T

The complaint with this set was that it worked all right from cold but wouldn't switch back on when warm. In the fault condition there was h.t. at the collector of the chopper transistor but there was no h.t. output from the power supply. To cut a long story short, R809 (820k $\Omega$ ) in the power supply was open-circuit. I can only guess how the set worked at all in this condition. **J.K.P.**

### Decca/Tatung 120/125 Series Chassis

The problem with one of these sets was field cramp after a couple of hours' use. We found that the slider of the set-h.t. control R813 (10k $\Omega$ ) was intermittent. **J.K.P.**

### Philips KT3 Chassis

The symptom with this set was a four-inch band of teletext lines across the centre of the picture. It was one of the earlier models with the two-chip colour decoder panel. IC192 (TDA2560) on this panel was faulty. **J.K.P.**

### Philips G110 Chassis

The complaint with this Nicam set was no sound. As it came from another branch we first tuned it to our transmitter. This is where the cause of the fault lay: the set would scan the band but wouldn't lock to a channel as it scanned past. A bit of jiggery-pokery enabled us to stop the tuning at the required point, but there was no sound. There was also no on-screen display and the set went to standby after ten minutes or so. We assumed that the latter symptom occurred because the set thought it was in the "sleep" mode, and a problem on the video identification line was suspected. This would fit in nicely with the other faults.

We carried out a meter check on the signal identification voltage at pin 13 of the TDA2579A timebase generator chip IC7470. The voltage should be very low, a few mV above zero, with no aerial input, rising to 9V when a signal is present. In this set the voltage remained low, signal or no signal. Thus the microcontroller chip thought that the set wasn't tuned in, muted the sound and operated its "ten minutes to power off mode". The set wouldn't lock because the microcontroller depends on this line going high to halt the tuning.

As we've had a number of defective TDA2579A chips, causing this particular fault amongst others in sets from several manufacturers, we fitted a replacement. Everything then seemed to be o.k., so the set was returned. A couple of days later it bounced, with exactly the same fault present. We went through the same procedure and replaced the chip. The only other item we thought might cause the trouble was the 0.1 $\mu$ F chip capacitor C2451, which is connected to pin 18 of the i.c. After removing it we fitted a conventional capacitor in the same position. This definitely cured the fault. **S.C.**

### Sony KVD2512 (AE1 Chassis)

For very intermittent faults such as the Nicam sound dropping out or crackling, the set going off tune or the picture going dark or negative, remove the i.f. can from the tuner panel and resolder the two transformers within the can. We've had this trouble with quite a number of these sets and others fitted with the same chassis: tiny dry-joints develop at the legs of the transformers. **S.C.**

### Ferguson TX89 Chassis

This set was dead with R88 and R102 open-circuit and the TIPL791A chopper transistor TR6 short-circuit. I replaced these items, also the TEA2018A chopper control chip IC4, but didn't get sound or a picture when I switched on. At least the set didn't go with a bang. This time I found that the TIPL791A line output transistor TR13 was short-circuit. A replacement restored the sound and picture but the height and width were varying. A check on the h.t. line showed that the voltage was varying over the range 90-105V. D7 (BYD33G) which provides the supply for IC4 was found to have a slight leak. Replacing this diode cured all the problems. **G.R.**

### Orion 14ARX

This set was stuck in standby. There was no 103V h.t. supply, though we found that it did come up initially at switch on, subsequently dying down. The video/chroma/i.f. chip IC401 had no voltage at pin 40. This comes from the 103V line via R458, being stabilised by the 9.1V zener diode D403 which was short-circuit. A replacement restored normal operation. **G.R.**

# Camcorner

Reports from David C. Woodnott,  
Savio Da Costa and Mick Dutton

## Hitachi VM200

The symptoms were no mechanical functions, just a loud whirring noise when any mode was selected. E-E pictures were o.k. The cause of the failure was simply a very worn loading belt. On closer inspection the belt was seen to be rather oily: it transpired that the customer had tried to cure a squeaking noise with a liberal application of oil. A new belt and mechanical service restored normal operation. **D.C.W.**

## Ferguson 3C01

The customer's fault description was "green pictures with purple flashing". To my surprise at switch on the camcorder was o.k. Apart from a small problem with the burst vector position the camcorder seemed to be satisfactory. Some of these older camcorders, especially ex-rental ones, can be rather noisy mechanically but this one was fine. When the case was removed however the cause of the problem was obvious: the focus connection at the tube base was just touching. A quick refit provided a complete cure. **D.C.W.**

## Panasonic NVMS70

Intermittent operation of the auto-focus system with these camcorders is often caused by imperfect ribbon cable connections. **D.C.W.**

## Ferguson 3V46

This unit, used in conjunction with a 3V33 camera, failed to operate. The only thing that happened was that the capstan motor ran in reverse – at speed! The cause was a faulty BA6109U3 mode-control chip, IC5. The loading drive had failed between modes, causing the rather misleading symptoms. **D.C.W.**

## Canon VME1

I don't see many Canon products and have extreme difficulty in getting parts. This rather elderly machine had no E-E camera picture though playback was o.k. Service manuals are hard to get, but the similarity between various Canon and Sony models can be a great help. In this case the tube supplies were correct and the SSG circuits seemed to be o.k., but there was no picture. After various scope and meter checks attention was turned to the preamplifier PCB which, as usual, is housed in its own screening can. The signal-injecting finger was applied but produced none of the noise and patterning one expects. A quick voltage check then showed that the preamplifier's supply was missing. The cause was a short-circuit 220 $\mu$ F, 6-3V decoupling capacitor on the SSG PCB. Replacing this restored the E-E picture. **D.C.W.**

## Panasonic NVM10

This is a simple but common fault nowadays. The report was of no record sound, playback being o.k. The culprit was the external microphone jack socket, which has a built-in switch that opens when an external microphone is connected. It normally needs to be closed. What happens is

that corrosion develops at the switch contacts. It's easy to rectify by cleaning and retensioning. **D.C.W.**

## Panasonic NVMC20

The problem with this camcorder was intermittent zoom operation. Since the fault showed up only occasionally we had to dismantle the machine and watch carefully. When the fault occurred we found that voltage was present at the zoom motor terminals but there was no motor rotation. The motor was defective. **S.DaC.**

## Panasonic NVM1000

There was no record or playback operation for the simple reason that the drum didn't rotate. R1075, a fusible circuit protector, was open-circuit. Thankfully there were no further problems. **S. DaC.**

## Panasonic NVM3

The customer had attempted to use a damp tape, the result being that it jammed around the drum. We had to cut it out and give the mechanism a thorough clean up. When we tried the machine it didn't work. The loading motor drive chip seemed to be a good starting point and we soon found that there was no supply at pins 2 and 8 because the 2.2 $\Omega$  resistor R6020 was open-circuit. A replacement got the machine working normally. **M.D.**

## JVC GRS77

This camcorder had been dropped. As a result there were no functions though the cabinet hadn't been damaged in any way. Surprisingly the main d.c.-d.c. converter had failed. Replacement of this produced normal deck operation – and a very spotty picture. The cause of this was pixel dropout in the CCD image sensing chip. After fitting a new image sensor the spots had gone but the picture was still less than perfect. On further investigation we found that there was an intermittent dry-joint at one end of R9, which is in one of the clock pulse feeds to the CCD sensor. After resoldering this all we had to do was to check and adjust the camera video 1 and 2 PCB settings. But I would still like to know how dropping a camera can cause a d.c.-d.c. converter and a CCD chip to fail! **D.C.W.**

## Canon E50

Poor recording and playback after the use of a head cleaning tape made me wonder. We made the usual scope checks around the signal and a.t.f. circuits then changed the heads. This produced a complete cure. **D.C.W.**

## Ferguson FC27

Playback was o.k. but there was no camera picture. The culprit was the camera d.c.-d.c. converter along with the F20 type circuit protector CP4. **D.C.W.**

# 25 Years of Colour TV

Keith Hamer and Garry Smith

The first regular colour TV service in Europe began on BBC-2 a quarter of a century ago, on December 2nd 1967. Thus service engineers have been setting up TV receivers using the BBC's colour test card F for the past twenty five years. But the pioneering days of colour TV in the UK began long before Carole Hersee, the little girl in the test card, was born.

## Early Research

Although TV as we know it began in 1936, the first demonstration of true television took place on January 27th 1926 when John Logie Baird displayed his apparatus to a less than enthusiastic audience. He went on to give the first demonstration of colour TV, albeit on a very simple basis, in August 1928.

The BBC began preparatory work on colour in the laboratory as long ago as 1946. Engineers investigated the problems associated with colour optics without considering any particular colour TV system. The research work included an appraisal of colour fidelity, involving colour analysis and synthesis, and of fundamental physiological aspects such as the effects of colour flicker and the problems associated with colour visual acuity.

This research led to the design of a colour TV camera channel and, later, a 16mm slide and film scanner. The use of this equipment enabled colour pictures to be produced and studied on a colour monitor built for the purpose. A sequential scanning process was used, with separate red, green and blue signals.

Prior to 1949 it was thought that a practical colour TV system would require the transmission and reception of these three primary-colour signals, each occupying a bandwidth equal to that used by the existing monochrome transmissions (3MHz in the days of the British 405-line system). But this would have represented a grossly inefficient use of spectrum space, even had the space been available, and would also have had the disadvantage of being incompatible, i.e. existing monochrome receivers would not have been able to produce satisfactory black-and-white pictures.

In 1953 the National Television System Committee (NTSC) in the USA put forward proposals for a colour TV system that required only two signals to be transmitted. One of these, the luminance signal, provided the information on scene brightness. The other, the chrominance signal, provided information on saturation and hue. The proposals were accepted and enabled the USA to go ahead with colour TV services. The basic ideas were also adopted in the subsequent European PAL and SECAM systems. The luminance and chrominance signals are transmitted simultaneously, interleaved in such a way that they occupy no more bandwidth than the equivalent monochrome transmissions. A normal monochrome receiver is able to produce satisfactory pictures using the luminance signal while ignoring the chrominance part of the transmission.

## Compatible Colour TV

On October 7th 1954 the BBC radiated its first compatible colour TV pictures from the medium-power transmitter at Alexandra Palace. The transmission consisted of slides

and 16mm motion pictures and was generated by 405-line equipment, using a modified version of the NTSC system. The transmission standard used during the October 1954 BBC tests was very similar to that subsequently used for regular tests from October 10th 1955. On that historic occasion on October 7th 1954 only one colour TV receiver was available to display the pictures, but by all accounts a large viewing public watched the compatible pictures in their own homes using standard domestic TV receivers. Members of the press were given a demonstration of colour TV on October 20th 1955.

Many hundreds of tests were subsequently carried out as a joint effort by the Marconi Wireless Telegraph Company's Research Department and the BBC's Engineering Division. Observers concluded that the adapted NTSC system represented a standard capable of providing excellent colour pictures and compatible monochrome signals of very high quality.

A regular series of test transmissions was radiated from Alexandra Palace during the winter of 1955-6. The main purpose of the transmissions was to test the compatibility of the pictures with a comparatively large sample of domestic TV receivers. Once again only slides and 16mm films were used, the equipment this time being of BBC design and manufacture.

## Studio A

Prior to the start of the tests Studio A at Alexandra Palace had been equipped with a single colour TV camera of Marconi design. The first time that live scenes from the studio were transmitted in colour was on April 3rd-5th 1956, when a special demonstration was given to delegates of Study Group IX of the CCIR. They were visiting the UK as part of a world-wide assessment of colour TV development.

By the autumn of 1956 Studio A at Alexandra Palace had been equipped with a second experimental colour camera. A little later a 35mm Cintel film scanner was added to supplement the slide and 16mm film scanner. With this equipment installed a small, enthusiastic group of staff broadcast an ambitious and comprehensive series of programmes. Following the closure of the Alexandra Palace transmitter on March 28th 1956 they were beamed from the Crystal Palace outlet. The tests took place in the winter of 1956-7 and were watched in people's homes on specially developed experimental colour receivers. A much larger audience viewed the transmissions using ordinary monochrome sets. On January 30th and 31st 1957 a special programme was broadcast for the benefit of a large gathering of members of both Houses of Parliament: six receivers were installed in a room in the House of Lords.

## UHF Trials in the Fifties

Experimental 405-line monochrome TV transmissions in Band V started, from Crystal Palace, on November 11th 1957. During the winter of 1957-8 a further series of experimental colour programmes from the Alexandra Palace studio was broadcast and was seen in colour by a much larger audience than during the previous year. The main

objective of the tests carried out during this period was to obtain a critical assessment of the quality of the colour pictures that could be obtained in the home under normal domestic viewing conditions. The tests also gave engineers the opportunity to investigate any problems that may have arisen at the transmitting end. A substantial number of live broadcasts from the studio were included in the transmissions since these would, in a normal broadcasting service, represent a major source of programmes.

When the results of the tests had been analysed it became clear that an acceptable colour service could be started. With the full agreement of the British Radio Equipment Manufacturers' Association (BREMA), which had co-operated with the experimental colour work from its beginnings, the decision was made to transmit a further series of tests during 1957-8, but this time with some change of emphasis. The new objectives were as follows:

(1) To assess the technical performance and operation of the camera equipment.

(2) To evaluate, as far as possible, the artistic potential of colour TV.

(3) To explore further the technical qualities of the colour picture.

At the conclusion of these tests in 1958 the Alexandra Palace studio was dismantled and the cameras were temporarily installed in a van that carried out two outside broadcasts. The slide and film scanning equipment was moved to the Lime Grove studios, from where a regular series of colour test transmissions was radiated outside normal broadcast hours. This series of tests began in the autumn of 1958 and continued, with only short breaks, until 1960.

The series of test transmissions had by now continued for almost six years which, by BBC standards, was a quite exceptional length of time. Some people at the BBC began to ask why the introduction of colour TV remained in a state of suspended animation, with the prospect of a colour TV service apparently no nearer by 1960. By that year it was expected that the NTSC system would eventually be adopted worldwide! The famous systems battle, which in the UK ended with the adoption of the PAL system for colour TV, had still to take place.

### ***Famous Studio Converted for Colour***

As we've seen the studio from which the experimental colour programmes originated was the old Studio A at Alexandra Palace, where the world's first regular, public high-definition TV service began on November 2nd 1936. It was appropriate that these first experimental colour programmes to be transmitted in the UK should come from this same studio, using the original scanning standards with the addition of the chrominance signal.

Studio A had a floor area of some 2,000 sq. ft and was equipped with a lighting system of simple design capable of providing about 150kW of power for the modern illuminators that were necessary to produce an acceptable colour picture. The two cameras were three-tube, 3in. image orthicon types manufactured by Marconi. It was necessary to match the three tubes closely for geometry, shading and transfer characteristics. For studio use, where the lighting's colour temperature was about 3,200°K, the most sensitive tube was selected for the blue channel while the tube with the best definition was used in the green channel.

Until March 1957 only RCA image orthicon tubes – type 6474, with a G5 decelerator electrode and no field mesh – were used except for the demonstration at the Houses of Parliament on January 30-31st 1957 when one camera used English Electric image orthicons – type P809 – which were on loan from the English Electric Valve Company. A number of tubes with an antimony-caesium photocathode were tested at Alexandra Palace since these could, theoretically, have had a sensitivity in the blue part of the light spectrum four times greater than that of a tube with a conventional caesium-bismuth-silver photocathode. The results were disappointing however – many tubes were found to be less sensitive. The tubes had a service life of only seventy one hours after which they had to be withdrawn because of ion burn.

A good-quality 7in. tube was used in the camera's viewfinder. The outputs from the red, green and blue head amplifiers could be selected for viewing either singly or with red or blue superimposed on green or with all three colours superimposed. During programmes the viewfinder was normally switched to receive the green channel output although the red channel was occasionally selected. Because of the large physical size of the cameras the viewfinder was often at an inconvenient height for the operator. An attempt was made to use a periscope attachment to lower the effective height of the viewfinder: this hi-tech innovation proved to be extremely unpopular with most of the cameramen!

Studio A's sound facilities consisted of one boom-mounted microphone and five fixed points.

The Rank-Cintel 35mm colour film flying-spot scanner was installed in an adjacent room. There was also a combined flying-spot scanner, made by the BBC, for viewing 2in. or 3.25in. transparencies as well as 16mm film.

The signals from these machines and from the studio cameras were fed to the combined apparatus and production control room in RGB form, where each source had its own coder to produce an NTSC output. The mixer was a standard eight-channel type operated without a line-clamping amplifier: it was fed with composite coded signals from each source. To enable fades to black level to be made, one of the eight channels was fed with "syncs and burst". In order to maintain the correct picture-sync ratio it was necessary to fade up the second channel as the first one was faded down. This was adequate for most programme requirements, but it was not possible to superimpose two channels that required full modulation from each because the resulting double-amplitude colour burst would have operated the chrominance a.g.c. circuit in receivers, reducing the saturation accordingly.

All the ancillary equipment, such as the waveform generator, camera control units and distribution apparatus, was also housed in the control room. A seven-way mixer was used to control the inputs from the six microphone points in the studio and the sound from the desk and tape machines plus the audio from the 16 and 35mm film scanners.

There were three colour monitors of BBC design and manufacture, fitted with RCA shadowmask tubes. One displayed the picture being transmitted to the network, another previewed the next camera shot while the third monitor was used for general purposes including display of the broadcast picture as received off-air from Crystal Palace.

### ***Transmitting the Colour Signal***

The programmes were transmitted from Crystal Palace, a land line being used for the feed from Alexandra Palace. The outlet at Crystal Palace consisted of twin transmitters

with a common carrier drive and separate modulators and carrier amplifiers. The latter were connected in parallel to provide the required power for a common aerial.

### **Receivers**

The BBC arranged for colour receivers to be installed at the homes of research staff. The majority were manufactured by Murphy Radio Ltd., using 21in. RCA shadow-mask tubes. At any one time there were about eighteen of these receivers in various homes. In addition a number of experimental receivers, mainly using the RCA tube, were available to members of BREMA. By 1960 the General Electric Company had developed a prototype commercial receiver that provided much improved performance, particularly with regard to brightness, sharpness and image registration.

### **Programmes**

During 1957-8 seven different programmes were transmitted in colour from Studio A. The programme was changed each month and was broadcast on six occasions in the first week of the month. Three transmissions took place in the evening following the closedown of normal programmes, from about 11.15p.m. until midnight. The other three transmissions occurred during the trade test

period in the afternoon, at about 3.30p.m. A film was usually transmitted from Crystal Palace as a separate part of the colour programme: additional film transmissions took place in the third week of each month on four occasions, two in the evening and two in the afternoons.

The programmes consisted of plays, evenly divided between modern and historical settings; revues; and programmes with the emphasis on dancing, including ballet. The film transmissions were from 35mm stock.

To provide an assessment of picture quality viewers were asked to complete a questionnaire which covered twelve aspects including noise, registration, picture sharpness and colour fidelity. The results obtained from the non-technical viewers indicated that the worst problem was misregistration. In this respect the English Electric image orthicon tubes, which incorporated a field mesh, gave better performance than the RCA ones.

### **Test Cards and Patterns**

In a concluding article we'll be featuring a selection of vintage BBC colour test cards and tuning signals. So stay tuned as they say! In the meantime if any readers have photographs or videos showing archive BBC-TV identification symbols or captions it would be appreciated if they would write to Keith Hamer, 7 Epping Close, Derby DE3 4HR (telephone 0332 513 399)

## ***A Visit to Nokia***

***George Cole***

During mid-September Nokia took a handful of journalists to Finland to see some of the company's research and development work. The company is closely involved with the Eureka 95 HD-MAC project, Eureka 625 VADIS (Video-Audio Digital Interactive System) and also picture enhancement systems and Pay TV.

Nokia has 27,000 employees and net sales of some £2bn a year, with consumer electronics accounting for about a third of the company's turnover – mobile phones, telecommunications, cables and machinery, tyres and power account for the rest. Its UK consumer electronics base is at Swindon. In April Nokia acquired Finlux and the Finlux Ltd. sales company at Stourton.

### **TV and Video Developments**

Nokia has its HQ in an elegant house in the centre of Helsinki. We started with an excellent session here with Helmut Stein, vice-president of R and D for home electronics. It began with a discussion about Nokia's ASO (Active Sideband Optimum) VHS picture enhancement system (for more technical details see elsewhere in this issue). Nokia has now developed an enhanced version called, you guessed it, ASO Plus. ASO systems process the luminance signal but there are plans to improve the chrominance signal as well.

According to Nokia nine companies have taken out ASO licences, six of them outside Europe. So far the only other company that uses ASO is Sanyo, which makes some of Nokia's VCRs. ASO was originally designed to extend VHS playing time by a factor of three but JVC, which developed and controls the VHS system, objected on the grounds that this would be a breach of the basic VHS standard. It can however be used for this purpose in NTSC markets which have an EP (Extended Play) facility built

into the standard – in Europe the standard has only SP and LP modes. Nokia has been holding talks with JVC to see whether a longer playing time could be introduced with PAL machines. Although Nokia markets S-VHS machines Mr. Stein said that there was little call for this format in Europe, where picture quality is not an issue so far as most consumers are concerned.

The company is a keen MAC supporter but the problem at present is that there aren't many D2-MAC transmissions. Only about a fifth of the programmes from the thirteen TV satellites that transmit over a hundred channels to Europe are in D2-MAC. Mr. Stein argued strongly in favour of the European HD-MAC programme, though an increasing number of people believe that it should be abandoned in favour of a digital TV system. He commented that MAC technology is available now, whereas digital TV systems won't be ready until the turn of the century. But he admitted that time was running out for MAC and said that the system has less than four years to establish itself.

### **R and D**

The next day involved a trip to Nokia's Tampere R and D centre where digital signal processing work is being carried out – the company works closely with Tampere Technical University. Seppo Kalli, the signal processing R and D manager, explained that Nokia is working on HDTV, IDTV (Improved Definition TV) and digital TV. The company is working on three systems that give improved screen displays – IPC (Interlaced to Progressive Scan), FRU (Field Rate Upconversion) and LRU (Line Rate Upconversion), see Fig. 1.

IPC helps to remove effects caused by interlacing and improves the vertical resolution. It doesn't eliminate large-area flicker however. This can be removed by doubling the

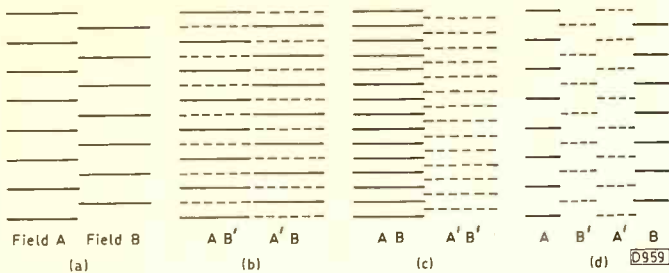


Fig. 1: Diagrammatic representation of different scanning arrangements. (a) Conventional 625-line, 50Hz field scanning with 2:1 interlacing. (b) IPC - 625-line, 50Hz field scanning without interlacing. (c) Line rate upconversion - 1,250-line, 50Hz field scanning with 2:1 interlacing. (d) Field rate upconversion - 625-line, 100Hz field scanning with 2:1 interlacing.

field rate to 100Hz, but the result can be to reduce picture quality. Likewise doubling the number of lines to 1,250 by means of interpolation can reduce edge detail. Nokia has been developing algorithms that improve FRU and LRU. Professor Yrjo Neuvo of Tampere University made the point that in some cases telling people about a new picture enhancement system can simply draw their attention to a problem they didn't realise they had. . .

We had a chance to see some of the picture enhancement work in the research laboratory. The first demonstration used filters to reduce noise. A TV screen showed four images, with the picture quality improving from one image to the next. The first image was poor, suffering from the type of noise you get with a weak satellite TV signal. A non-linear pre-filtering system removed much of this noise while another filter provided a further noise reduction. The filter was designed so that it didn't blur moving objects. The demonstrations were impressive. The only visible problems were a loss of fine detail in some portions of the picture and the fact that the filter had trouble with noise removal where there was high contrast, e.g. at the borderline between very dark and light areas.

Another demonstration showed the use of a motion compensator with HDTV FRU. The problem here is that with the HD-MAC system the motion information encoded and sent with the picture can't be used in field rate upconversion because artefacts are produced when the field rate is doubled. Nokia showed a conventional 100Hz picture produced by field repetition and one produced using the company's motion compensation system. The Nokia pictures looked better, though the improvement was more subtle than dramatic.

### Digital TV

One of the demonstrations showed work carried out by the VADIS group, which is also known as MPEG 2. MPEG (the Moving Pictures Expert Group) is the ISO/IEE working party that's developing a standard for moving digital pictures. MPEG 2 is using a DCT (Discrete Cosine Transform) data compression system that reduces a 166Mbits/sec video data stream to just 4Mbits/sec (claimed to be the equivalent of PAL pictures) and 9Mbits/sec (equivalent to MAC).

The video source material was from a D1 digital VCR. We were able to compare ordinary PAL pictures with the 4 and 9Mbits/sec DCT pictures. Not surprisingly the higher bit rate pictures looked much sharper. But both sets of pictures suffered from some blurring when the camera moved past an object. Even so the work was impressive: the

# Next Month in TELEVISION

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## MODERN TV TECHNOLOGY

Start of a new series, by Eugene Trundle, that will look at the circuits and techniques used in modern TV receivers. The idea is to examine each section of the set in turn to see what it does, how it does it and how it interfaces with the rest of the set - for newcomers to the TV field, those who may have become a bit rusty and those practising engineers who never quite got to the bottom of such things as the I2C bus, switch-mode field scanning and colour transient improvement.

## THE ACORN/BBC MODEL B COMPUTER

Arthur Rumbelow, G3KKC provides guidance on servicing this popular model, with a list of some sixty "stock" faults.

## ALL ABOUT ELECTROLYTICS

Electrolytic capacitors are used where large capacitance values are required. Because of their construction however they are troublesome devices. Ray Porter describes their construction, operation, characteristics and modes of failure.

## TEST REPORT: FLUKE MODEL 12 DMM

Fluke's Model 12 represents the leading edge of DMM technology. David Botto had one to test and provides an account of its operation and capabilities.

## BACK TO THE PHILIPS KT3

There are still a lot of these receivers around. John C. Priest describes some recent servicing experiences.

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aim is to produce the final compression algorithms by the beginning of next year.

### **TV and Newspapers**

At Tampere University we saw a system that enables newspapers to take HD-MAC pictures off the air. The principle isn't new but the Tampere researchers aim to produce better quality pictures. The system uses a Sun workstation computer to process the HD-MAC picture. Pictures printed in this way by the Finnish newspaper Aamulehti were sharp but there was a problem in getting the correct colour balance – the newspaper's pictures had a red cast.

### **Pay TV**

Nokia is heavily involved in the Pay-TV business. For the past nine years the company has been in partnership

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## **Test Case 360**

Our shop manager Harold has been in the business a long time. In his younger days he had erected aerials, mended TV sets, delivered and installed them. He knew misconvergence when he saw it, and was certain that this secondhand stock Ferguson set (Model 14L1, TX86 chassis) had a misconverged picture: there were green fringes and outlines to features in the picture. Harold sent it off to the service department with a note to that effect. The young man in the workshop, Sherlock, didn't know about misconvergence: he'd never come across a set whose picture tube had to be set up manually. As a result he was puzzled by Harold's job card, and also by the little set's picture display. The right-hand edges of all sharp picture features had a smeary green fringe while the left-hand outlines had, to a lesser extent, a purple contour. Harold pointed out that it was reminiscent of the effect of misconvergence in an early colour TV set, when the green image wasn't registered correctly with the red and blue images.

Sherlock disconnected the drive to the picture tube's green gun to turn it off. The magenta image that was left was sharp and clear. He reconnected the green drive then checked the voltages at the three cathodes. They were all correct at about 100V. A scope check on the green drive waveforms was the next step. With a broadcast picture being received the waveforms at pin 11 of the TDA3565 colour decoder chip and at pin 9 of the c.r.t. looked all right, and there was no marked difference between them and their counterparts in the red and green channels. Maybe the cause of the problem was in the tube itself, i.e. the green gun was faulty in some way? The tube testing machine didn't record any defects however, and there were no differences in the readings and indications produced by the three guns. Sherlock's next test confirmed that the tube was o.k.: he swapped over the blue and green drives, whereupon the smearing and fringing effect appeared in blue. Plainly then the fault was in the set's green channel, either in the colour decoder chip IC3 or the green output stage.

Sherlock changed the green output transistor TR603 and restored the original drive connections on the tube's base panel. The fault was still present. A check on the three parallel-connected collector load resistors showed that they were o.k., as was the emitter resistor R619. The voltages

with the US firm Zenith and currently produces decoders under licence. Two cable Pay-TV systems, a baseband system called SACOM and an r.f. system called SPM, are widely used in Scandinavia.

Nokia has developed a new system called NLS (Nokia Line Shuffling) that will be available next summer. This is a digital encryption system for PAL signals, though it could also be used for MAC. The decoder has some interesting features such as the ability to handle downloadable individual consumer messages so that, for example, a subscriber could be reminded to keep up with payments.

### **Design**

Nokia TV sets are now being designed using CAD (Computer Aided Design) which provides 3-D modelling and can simulate the temperatures and pressures that the plastic moulding may face in practice.

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conformed with those given in the manual and with the corresponding voltages in the red and blue output stages. What next?

Sherlock applied a crosshatch signal from a pattern generator to the set. This showed the fault up very clearly: the vertical lines had a purplish appearance while the horizontal lines were white, as they should be. This gave Sherlock an idea. He connected a double-beam scope to pins 11 (green output) and 12 (blue output) of the colour decoder chip. The green and blue video signal pulses for the crosshatch pattern's vertical lines were of equal amplitude. When he turned down the gain in the two Y channels and connected the probes to the tube's green and blue cathodes however he found that the amplitude of the green pulses was very much lower than that of the blue pulses. Very soon after this he found the cause of the fault and had the set working correctly. What had Sherlock overlooked in the early stages of his investigation? For the solution, see page 130.

### **ANSWER TO TEST CASE 359 – page 51 last month –**

Last month's problem would probably have been solved more quickly had the VCR involved had the "self-diagnosis" feature that many camcorders and certain Grundig and Philips home VCRs have. Dylan would then have got a readout of F6 or whatever, which would have told him that the syscon chip was shutting the deck down because the drum PG feedback pulses were missing. But hadn't he checked this?

He had, but not thoroughly enough. The generator in the drum motor produces a pulse waveform that triggers a bistable multivibrator within the servo amplifier chip IC4002. The 25Hz squarewave thus generated is the drum flip-flop pulse – the head switching waveform that's used in the drum servo and colour signal processing sections of the machine. It enters the main servo chip IC4001 at pin 12, and this was as far as Dylan had checked. Had he moved on to check the output at pin 4 he would have found that the waveform was missing. It is from this point that the vital keep-me-going feedback pulses pass to pin 20 of the syscon chip. In practical fault-finding it pays to check right at the relevant chip pin. This will show up the presence of print cracks, discontinuities or dry-joints.

The fault was in the LC7412 servo chip IC4001. After fitting a replacement Dylan had learnt a little more about the foibles and failings of video machines. . .



# Servicing the Texet TX1434/TX2034

Andy Gallacher

You couldn't say that Texet colour receivers are thick on the ground. We've had quite a few of them to deal with however and pass the following information on in the hope that it will be helpful to others who find one of them on the bench.

**Set dead, no 103V supply:** There should be 103V at pin 4 of the chopper chip Q801 and the positive terminal of the smoothing capacitor C807. If this supply is missing, replace Q801 (STR5412), C807 (100 $\mu$ F, 160V) and the over-voltage protection diode D807 (SR2M).

**Set dead, 103V line at over 103V:** Replace L405 (94mH) and D408 (1N4937) in the feed to the line output stage.

**Set dead, mains fuse F801 (4AT) open-circuit:** Replace the mains bridge rectifier diodes D801-4 (type 1N5397).

**Set dead but display lit:** The surge limiting resistor R801 (3.3 $\Omega$ , 10W) is open-circuit.

**No raster, sound o.k.:** Repair cracked print around the line output transformer T402.

**Blank raster, no 12V supply:** There should be 12V at the positive terminal of C431. If this supply is missing, replace the 12V regulator chip I502 (7812EC) and R437 (2.2 $\Omega$ , 0.25W). It's not uncommon for C431 (470 $\mu$ F, 16V) to be the cause of this problem.

**No or weak sync:** Replace the TA7698AP timebase generator/colour decoder chip IC501.

**No colour:** Check and replace the following in the order listed: R552 4.7k $\Omega$  semi-fixed preset; the 4.43MHz crystal X501; demodulator coil L552 (TRF-5605Q); IC501 (TA7698AP).

**Speckling on picture plus low/distorted sound:** Replace IC101 (TA7680AP).

**Low sound and high-pitched whine when the volume is turned up:** This is usually caused by IC101 (TA7680AP). Alternatively in a few cases L651 may need very careful adjustment. Also replace the 1 $\mu$ F, 50V audio coupling capacitor C609 (connected to pin 3 of IC101).

**Bleep on volume up/down with whine on sound:** Retune L651 carefully.

**Washed out colours, no colour/brightness/volume control:** Replace the M50431-101SP microcontroller chip IV01.

**Inverted sync pulses at pin 12 of IV01:** Replace the KTC1815Y transistor QV06.

**No tuning voltage:** Replace the 33V zener diode DV18 and the 10 $\mu$ F, 50V electrolytic capacitor CV22.

**Loss of tuning memory:** Replace the M58655P memory chip IV02.

**No lock on search tune but set can be fine tuned through the band:** The cure is to replace the M51207L dual voltage-comparator chip IV03. Unfortunately this item is rarely available from suppliers. We have therefore devised the following modification. Remove IV03, RV52/3 (both 30k $\Omega$ ) and CV25 (2.2 $\mu$ F). Build the circuit shown in Fig. 1 on a small piece of Veroboard – be sure to leave long lengths of connecting lead. The board can be housed in a small project box that's glued to the inside of the cabinet and connected as shown. Be sure that you get the connections to IV01 the right way round or the set will tune for ever. The component values shown are as close to the design of this chip as it's possible to get – C1 is a miniature electrolytic. The circuit is very reliable and perfectly safe.

**Warning:** Because there is no e.h.t. adjustment in this set it's essential that the 103V supply is correct. To check this, proceed as follows:

(1) Connect a high-accuracy e.h.t. meter to the tube's final anode.

(2) Set the brightness and contrast controls to minimum, i.e. zero beam current.

(3) Rotate the brightness control to both ends of its travel while watching the meter. The voltage must not at any time exceed the following limits:

**14in. sets:** 24.5kV at zero beam current, 25kV at full brightness.

**20in. sets:** 25.5kV at zero beam current, 26kV at full brightness.

**Circuit correction:** Pin 2 of the STR5412 chopper chip Q801 should be shown connected to the junction of R802/3/4 in the official circuit diagram for these receivers, i.e. the connection blob is missing.

**Spares:** Spares are available from the Hiro Co. Ltd., Elizabeth House, Elizabeth Street, Manchester M8 8JJ (telephone 0618 347 432).

The following items are available from CPC plc, 186-200 North Road, Preston, Lancs PR1 1YP (0772 555 034):

Q801 STR5412	CPC code AB033-505412-38
IC101 TA7680AP	CPC code TSB 0356804
I301 AN5515	CPC code AB1AN5515
IC501 TA7698AP	CPC code AB033-207698-14

I301 is the field output chip.

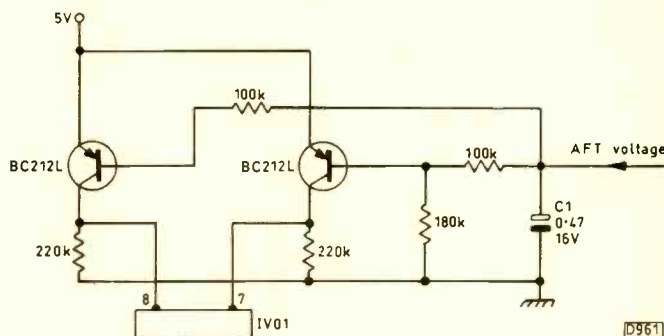


Fig. 1: A.F.T. drive circuit using discrete components. All resistors have a 2% tolerance and a rating of 0.25W.

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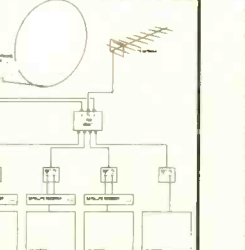
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Tension Band	VD 1423	Tension Band	VD 1423	Tension Band	VD 1423	Tension Band	VD 1423	Tension Band	VD 1423	Tension Band	VD 1423	Tension Band	VD 1423
Reel Table Rubber Tyre	VD 1335	Reel Table Rubber Tyre	VD 1335	Reel Table Rubber Tyre	VD 1335	Reel Table Rubber Tyre	VD 1335	Reel Table Rubber Tyre	VD 1335	Reel Table Rubber Tyre	VD 1335	Reel Table Rubber Tyre	VD 1335
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Reel Motor	VD 2198	Reel Motor	VD 2198
Capstan Motor	VD 2160	Capstan Motor	VD 2160
Tension Band	VD 1411	Tension Band	VD 1411
<b>VR-1500 EX x 6</b>		<b>VR-1500 EX x 6</b>	
Video Head	VD 2585	Video Head	VD 2585
Pinch Roller	VD 1787	Pinch Roller	VD 1787
Bel Kit	VD 1001	Bel Kit	VD 1001
Reel Drive Roller	VD 1076	Reel Drive Roller	VD 1076
Reel Motor	VD 2198	Reel Motor	VD 2198
Capstan Motor	VD 2160	Capstan Motor	VD 2160
Tension Band	VD 1411	Tension Band	VD 1411
<b>YTC M10 x 11 x 20 x 21</b>		<b>YTC M10 x 11 x 20 x 21</b>	
Video Head	VD 2530	Video Head	VD 2530
Pinch Roller	VD 1758	Pinch Roller	VD 1758
Bel Kit	VD 1001	Bel Kit	VD 1001
Reel Drive Pulley	VD 1079	Reel Drive Pulley	VD 1079
Idler	VD 1219	Idler	VD 1219
Reel Motor	VD 2179	Reel Motor	VD 2179
Tension Band	VD 1418	Tension Band	VD 1418
Supply Reel Table	VD 1319	Supply Reel Table	VD 1319
<b>SEINFRA</b>		<b>VR-5000 x 8000</b>	
Video Head	VD 2713	Video Head	VD 2713
Pinch Roller	VD 1787	Pinch Roller	VD 1787
Bel Kit	VD 1001	Bel Kit	VD 1001
Idler	VD 1049	Idler	VD 1049
Cassette LED	VD 1381	Cassette LED	VD 1381
Tension Band	VD 1399	Tension Band	VD 1399
<b>TD,000 Line Catalogue</b>		<b>TD,000 Line Catalogue</b>	
available with order, or by request. SAE please if 4.		available with order, or by request. SAE please if 4.	
Prices quoted are subject to stock availability and may be changed without notice.		Prices quoted are subject to stock availability and may be changed without notice.	
Orders from Govt. institutions, Schools, Nationalists etc., accepted with official order.		Orders from Govt. institutions, Schools, Nationalists etc., accepted with official order.	

TRADE COUNTER OPEN DAILY 9am-5pm — FAX NUMBER: 0902-29052

# Long-distance Television

Roger Bunney

September was a relatively quiet month for DX-TV reception. There were only a few minor Sporadic E openings and two periods of tropospheric enhancement. Such quiet conditions reflect the approach of winter. Now that solar cycle 22 is on the decline there's little chance of the prolonged F2 layer reception we've experienced during previous winters. There's always the possibility of a sudden peak in sunspot activity during the cold days ahead however, so it's worth keeping a check on chs. E2/R1 during the morning periods. Now for the SpE log.:

5/9/92	NRK (Norway) ch. E2; RTBF (Belgium) E3; DR (Denmark)E3; TVE (Spain) E2, 3, 4.
6/9/92	TVE E3.
7/9/92	JRT/HTV (Yugoslavia) E3.
8/9/92	SVT (Sweden) E2; JRT E3; RAI (Italy) IA, B; TVA (Italy)IA.
9/9/92	CSI (Russia) R1.
12/9/92	RAI IA.
13/9/92	+PTT (Switzerland) E2.
14/9/92	SVT E3; YLE (Finland) E4; +PTT E2; TVE E2, 3; Canal Plus (France) L2.
15/9/92	DR E3.
16/9/92	TVE E2, 3.
18/9/92	TVE E2, 3.
20-22nd	DR E3.
25/9/92	TVE E3.
28/9/92	TVE E2, 3, 4; DR E3.
30/9/92	TVE E3; DR E3.

There was a remarkable tropospheric opening that started on the 15th, peaked on the 16th and faded out on the following day. The 15th produced an increasing number of Band III/u.h.f. signals from France, Germany, the Benelux countries and Switzerland (chs. E7, 12, 27, 30, 31 and 34). Numerous ARTE test patterns were also seen. During the improved conditions on the 16th Scandinavian signals (Norway, Sweden and Denmark) also appeared, even

Finland ch. E6 (Espoo, at 180kW e.r.p.) which was received by Simon Hamer in Powys. Reception included Norwegian ch. E12 TV2 and Swedish TV4 test patterns. Mainly Benelux/German signals were logged on the 17th though Tim Anderson (St. Leonards) received his most distant Band I tropospheric signal to date, Carcassonne ch. L3 from the south of France – the signal was present all day. A minor lift on the 20th produced many RTE (Ireland) signals in the west country. Oddly, during a low-pressure period on the 26-27th signals from the nearer French u.h.f. stations appeared along the south coast, also signals from a few German ARD stations.

My thanks to Cyril Willis (King's Lynn), Brian Williams (Penarth), Simon Hamer (Powys), Peter Schubert (Rainham), David Glenday (Arbroath), Iain Menzies (Aberdeen), Roger Fussell (Torpoint) and Tim Anderson (St. Leonards) for sending in reception reports.

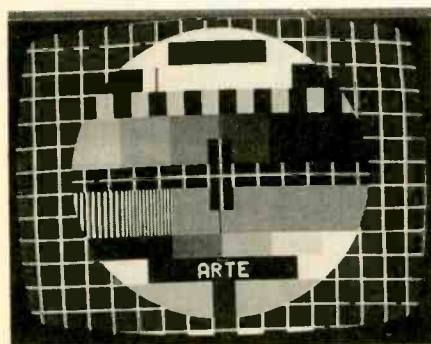
Bandula Gunasekera reports F2 reception of Iran ch. E2 in Sri Lanka on August 28th. He subsequently logged intense signals from Iran on several days in September. Optimum times for reception were 1130-1530 GMT, which of course is evening in his part of the world. This suggests that the east-west signal path was made possible by spread F, i.e. the break up of the F layers at sunset, which can produce MUFs greatly in excess of those at the noon high. Bandula has built much of his own TV-DXing and satellite reception equipment, and comments that the Japanese 2SC2570 transistor will replace the widely used BFR91 with only slightly degraded performance but a much lower price.

Veteran TV-DXer Graeme Wilson is now station engineer at United Christian Broadcasters, Shelton, Stoke-on-Trent. He's currently designing another all digital sound studio for his company. UCB is transmitted on the Children's Channel, Astra 1A transponder 24, at 11.568GHz vertical, using the 7.56MHz subcarrier to provide a 24-hour Christian radio service. Various programmes can also be heard on ILR and cable systems. Any DXer wanting a QSL letter for receiving UCB can write to Graeme at PO Box 255, Stoke-on-Trent ST4 2UE, including a s.a.e.

## EBU Listings

**Albania:** There are now 39 relays in operation in Band I, three using ch. E2, six ch. E3 and 30 ch. E4. System B is used for the transmissions and the highest power is 50W. These must be possible via SpE!

**Belgium:** Leglise RTBF-1 is now on ch. E57 with horizontal polarisation and 200kW e.r.p.



Left: The ARTE test pattern, which resembles the PM5544 less side panels, used by the French/German cultural channel now being radiated by the former La Cinq transmitters, also via the Telecom satellite. Centre: The Romanian TVR-1 logo, received in Holland by Ryn Muntjewerff via SpE propagation. Right: This Dubai TV identification was received by Ian Waller of Lincoln Satellite via the 4GHz band Arabsat 1B satellite at 33°E – it's often received via F2 propagation.

**Denmark:** The Fyn (E3) and Koebenhavn (E4) vision and sound offsets have been changed.

**Sweden:** The following new stations all carry SVT-3. Stockholm ch. E42, Goeteborg E46, Karlstad E46 (200kW), Malmoe E47 (150kW), Hoerby E50, Sundsvall E50, Vaesteraas E51, Uppsalla E52 (200kW), Norrkoeping E54, Oerebro E58. Powers 1,000kW unless otherwise stated. All with horizontal polarisation.

### News Items

**Holland:** The American Forces service from Soesterberg is now on ch. E24 with vertical polarisation and 25kW e.r.p. A ch. E28 AFN transmission received in Holland is believed to be from Geilenkirchen, Germany: the output from this transmitter is at 800W horizontal over 180-170° and 200W vertical at 60°.

Filmnet and RTL-4 have signed an agreement to co-operate, with RTL-4's owner CTL taking a ten per cent interest in Filmnet.

**Poland:** Transmitters rated at 1kW are being installed at the following towns in the north: Olstyn (chs. R21 and 23), Ostrolekach (R21), Bialystok (R41), Bualaystok (R60), Kolobrzeg (R57), Lomza (R57) and Suwalki (R41). At least five unlicensed TV transmitters are understood to be in operation at present.

**Latvia:** The ch. R31 transmitter at Riga is now used by independent companies: the ch. R7 transmitter carries the services previously broadcast on ch. R31 (3-SAT, DW-TV, BBC and CNN).

**Moldova:** The Cahul ch. R1 and Cimisia ch. R2 medium-power transmitters now carry TVR-1 (Romania).

**Russia:** Sankt-Peterberg TV now includes the logo TV-P.

**Thailand:** Five new commercial TV stations are to open in the Bangkok area.

**Italy:** The government is to allow many of the privately-owned local TV stations that didn't obtain a licence during the recent franchise operation to remain on air.

**Czechoslovakia:** Following a series of tests in May the use of PAL as a replacement for SECAM by both the STV (Slovak) and CTV (Czech) networks has been confirmed.

**Bangladesh:** A further four main relay stations are to be added to the network, bringing the total to 14 giving 90 per cent coverage of the population.

**Sunspots:** The RSGB expects the minimum point in sunspot cycle 22 to be reached in mid-1996.

### Satellite TV

The new German-language programme RTL-2 now uses Superbeam transponder 21 on Eutelsat II F1 at 13°E. The Der Kabelcanal feed via the same satellite has changed from PAL to D2-MAC and will shortly adopt Eurocrypt encryption.

Canal Plus Espagne is to use transponders 30 and 32 on Astra 1B and may take two transponders on 1C. Nagravision encryption will be used, though several transmission slots will be clear during the day.

Filmnet has bought a substantial interest in the group that

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This is what the TVDX/Satellite enthusiast has been waiting for, a fully manually controlled receiver with communications facilities! I.F. looping, fully variable I.F. control (12MHz-26MHz) plus a secondary audio I.F. bandwidth control - these really dig that signal out of the noise! No less than 8 front panel user controls and a signal level meter! Video and audio output options, 14/16volt LNB options, C/Ku switching! Two standard 5.5/6MHz System B/G/I modulator. Two individual audio subcarrier tuning outputs for stereo or dual mono/bilingual signals! Plus of course the usual satellite receiver facilities. **AERIAL TECHNIQUES** have enhanced the performance of this brilliant receiver for weak signal working and increased non AFC tuning bandwidth. The customised SR-50 is available in this version only from **AERIAL TECHNIQUES**.

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11 Kent Road, Parkstone, Poole, Dorset BH12 2EH  
Tel: 0202 738232 Fax: 0202 716951

owns the Tele-X satellite. There's a possibility that the recently purchased Marco Polo 1 satellite will be co-located alongside Tele-X.

Matra Marconi has been contracted by Eutelsat to build the Eutepusat 1 craft to be launched by late 1994 into a slot at 19°W. It will provide fourteen TV channels at 110W, sufficient for 30cm dishes with PAL or 45cm dishes with 16/9 D2-MAC. Its channels will be shared by France, Germany and Switzerland.

Eutelsat II F4 is now in operation at 7°E. RIK-1 Cyprus is transmitted at 11.145GHz in clear PAL and ET-1 Greece at 11.176GHz in clear SECAM. RTV (Belgrade) is at 11.596GHz horizontal.

Intelsat has placed contracts for another VIIA craft and two VIII craft, the latter for delivery in 1995/6.

ABC (Australia) has been given the go-ahead to start an Asian TV service, possibly using an Indonesian Palapacraft. The recently launched Optus B1 craft is to take over from Aussat 1. It has fifteen ku-band transponders. Optus B2 is to be launched this month (December).

The Spanish Hispasat 1A satellite has been successfully launched and will operate at 31°W, providing DBS services to the Iberian peninsula. Its secondary footprint extends to the southern UK. The companion 1B is to be launched this month.

### Early TV

A recent article in *The Maple Society Newsletter* provided a splendid account of TV reception tests organised by radio dealer W.G. Sherratt at a house in Newport Road, Isle of Wight in 1938, in conjunction with the Marconiphone Company. It had previously been considered

that reception of the Alexandra Palace transmissions would not be satisfactory at distances of greater than 25 miles, and TV across a sea path had never before been tried. Various local dignitaries were present and the pictures were reported to have been of good quality, though marred by ignition interference at times – suppression was unheard of in those days. At the conclusion of the tests G.W. Godfrey from the Marconiphone Company commented that although the signal path was 90 miles entertainment quality reception had been achieved. He went on to point out that because of local conditions such reception would not be possible elsewhere in the island. This was perhaps one of the first UK reports of tropospheric DX-TV.

Within two years the Chain Home radar station at St. Boniface Down, Ventnor was using similar frequencies to

detect the approach of German planes across the channel. On a famous occasion in 1938 Alexandra Palace transmissions were received at the RCA Research Laboratories in New York State, via F2 enhancement.

A lot of experimental work was going on in the USA at the time. By 1936 First National Television in Kansas City (call sign W9XAL/W9XBY) was transmitting TV signals in the 42-56MHz and 60-86MHz bands. There were three stations in operation in New York in 1936, including W2XF (NBC) which operated at 5kW e.r.p., two in Philadelphia and one each in Boston, Milwaukee, Jackson and Iowa City. The experiments proved that v.h.f. TV would work, and six v.h.f. channels were allocated. The economic conditions of the time and inability to agree on a standard prevented the start of regular services until later.

## CD Player Casebook

Reports from Mike Leach

### Philips CD104

This machine wouldn't read discs. The laser chirped all right and the disc span but nothing else happened. It looked as though some soldering had been done on the servo and decoder boards, but I went over them all the same. Unfortunately on this occasion resoldering didn't cure the problem. All the waveforms (focus, etc.) seemed to be o.k., and all the supply lines were up and correct.

I turned the machine on its side to watch what happened when the laser tried to read the TOC. Well, basically nothing happened! The laser didn't move at all. Often when mains power is applied to these machines the laser assembly gets a kick and a slight jolt can be noticed before it comes to rest. This didn't happen. The cure was to remove the loading carriage assembly, take out the laser completely then clean and lubricate the moving parts with oil. Although no friction had been noticed when the laser was moved by hand this cured the problem – it seemed loose enough to do the job but it was obvious that a certain amount of wear had occurred over the years.

The machine performed perfectly when the laser supply had been set and the lens had been cleaned. M.L.

### Samsung RCD1200

This portable music system, or Ghetto Blaster as these things have come to be known, came in with a no CD operation fault. There was no laser beam, nor was there any focus coil movement when the lid-down switch was shorted. I thought that the lid-down switch was possibly broken, so we stripped the thing down to gain access to the CD mechanics. When the complete assembly had been removed it was clear that the sled assembly had jammed. The lid-down switch was working but with the sled jammed the laser unit couldn't return to its centre position to give the laser-on switch a kick to activate the beam and focus servos.

The problem was purely mechanical, though it was unclear why the mechanism had jammed in the first place. After stripping the mechanism down and lubricating the drive cogs all seemed to be well and the machine worked normally. The laser drive cogs are plastic, but there were no broken teeth and the motor itself was o.k. The cause of the problem could have been lack of lubrication from manufacture. M.L.

## PHOTOSTATS SERVICE

Newer readers may have missed important servicing features that have appeared in *Television* over the past few years. We have therefore in operation a photostat service to make this information readily available. Photostats of the following servicing features, listed in alphabetical order, can be supplied at the prices shown. Please send requests to: Television Editorial Department, Room L323, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Cheques/POs should be made payable to Reed Business Publishing Ltd. There are two standard prices, see below.

Feature	Price
B and O L/LX2500/2800 chassis	A
Decca 80/100 chassis	A
Decca 120/130 chassis	A
Ferguson FV31R VCR	A
Ferguson TX10 chassis	A
Ferguson TX100 chassis	A
Finlux 1000 series chassis	A
Fisher FVH-P520 VCR	A
Mitsubishi CT2227	A
Mitsubishi Euro-4 chassis	A
Mitsubishi HS304 VCR	A
Panasonic D1 VCR deck	A
Panasonic G VCR deck	B
Panasonic NV333/366 VCRs	A
Panasonic NV370/830/850 VCRs	A
Panasonic NV730 VCR	A
Panasonic NV777/780 VCRs	A
Panasonic NV2000/2010/3000 VCRs	A
Panasonic U3 chassis	A
Panasonic U4 chassis	A
Panasonic U5 chassis	A
Salora F chassis	A
Salora G and H chassis	B
Salora J chassis	A
Salora K and L chassis	B
Sanyo CTP7130/1/2	A
Sony KV2252/2256/2752/2762	B

Prices, A = £2.50, B = £3.50  
Please allow 14 days for delivery.

# Letters

## DISTRIBUTORS' PRICES

I wonder if some of the major distributors would care to tell us, through your pages, why the prices in their current 1993 catalogues often have no bearing on the price charged when the invoice arrives? Why does it have to be a case of surprise, surprise? – the emphasis being on the rise in surprise. I'm talking about the latest catalogues, many of which have been out for only a few weeks.

As just one example, a Philips switch is listed at £2.74. When the invoice arrived the price had risen to £9.63. Is inflation really running at 300 per cent at present? How can such an increase be justified? Why, when we order parts that have risen dramatically in price, aren't we informed about this? Do distributors really think so little of their customers?

Most of them are the sole source of parts for those who don't have accounts with the manufacturers. They thus have a "captive audience" of smaller dealers. Maybe this is why we're treated in this way.

I don't single out any one distributor because I feel that they all tend to follow the same policy. My request is that we are treated as valued customers, not in this cavalier manner. Remember that your business relies on our business.

*E.A. Baker,  
Cheam, Surrey.*

## MANUFACTURERS' POOR SERVICE

What's up with the manufacturers today? It seems that they couldn't care less about service engineers any more. It's a matter of make it, box it, sell it and bye, bye. When you ring technical they say "oh!, I've not had that fault, mmm, stutter, stutter – sorry I can't help but give us a ring if you have any further problems". Problems! It's bad enough having to cope with SMDs, but subpanels are often situated so that no work can be carried out when they are in place. Thus you have to purchase extension leads from somewhere before you can progress.

Amstrad sell this super-doooper Double Decker that's designed to fit into the smallest box possible. You know the type I'm talking about. The mains fuse blows and it means a total strip down. I phoned Amstrad to ask about extension leads. "Yes sir, that will be three leads at a total price of £53.83 plus VAT." The company I work for don't just buy the odd one mind you, they buy thousands from Amstrad.

Another VCR, from Akura, is lethal. You take the cabinet off, that's o.k. But beware. If you attempt to move the machine with your hands down the sides of the cabinet the mains supply is there just waiting. I rang up Akura technical about a fault. Usual response. But he did suggest that I change a certain board. When I said that I didn't think the cause of the fault would be on that particular board he said "well, it's the easiest one to change".

Another one worth a mention and a laugh is Orion. This firm changes chassis more times than Zsa Zsa has had husbands. Every time you get a new delivery through your back door there's a different chassis type inside the boxes. This is where the engineer's problems begin. These chassis never match the circuit diagram you have in stock. A typical problem arose one day when I had no E-E with a Model 1700Y. It's hard to describe the difficulty I had in trying to

get information on the new chassis and part numbers so that I could order them. The conversation went something like this:

Me: "Could you supply an i.c. for a 1700Y?" I gave him the type.

Him: "CPC will have them in stock."

Me: "I've tried them and they've never heard of this chip."

Him: "Have you given them the right part number?"

Me: "Well I've given them the i.c. number."

Him: "That's what's wrong. You've not given them the part number."

Me: "Where do I get the part number?"

Him: "The service manual."

Me: "Ah, that's what it is. Will you send me one?"

Him: "I can't do that, they're still at the printers."

Me "...unprintable.."

Him: "No need to be like that. I'll send you a PCB complete."

Me: "Could you send me two as I've two videos with the same fault?"

Him: "Well if you've got two with the same fault it can't be on the panel."

Me: "I don't want a panel, I want an i.c."

Him: "I'll send you a panel and a photostat of the new type luma board."

This story continued, but it became silly and unprintable. I eventually obtained everything I required for the repair of the videos, but why was so much aggro required? Imagine trying to tell a customer who's just bought a new video "sorry, parts aren't available as it's a new model".

Such machines may be only half the price of a JVC or a Panasonic, but to the customer it still represents a struggle to buy one with his hard earned money.

My comments don't apply to all manufacturers, but they certainly do to many of the not so big ones. What I'm trying to get over to the mass producers of cheaper TVs and videos is that their products do go wrong and do need repairing. So try and give us a bit of encouragement to go on pushing your models.

*Graham Rees,  
Worsley, Manchester.*

## LIBRARY SERVICES

Readers may not know that many local libraries stock radio, TV and video service manuals and can provide photostat copies. My local one has them all, up-to-date, in the reference department. This service can save a lot of time and money.

*Thomas Hall,  
Higher Openshaw, Manchester.*

## INSURANCE QUOTES

In answer to Chris Watton's letter last month, let me say that we have exactly the same situation at our shop.

As a qualified person you have to ensure that a repair to any piece of equipment is as close as possible to the manufacturer's original specification. In the case of an insurance quote your decision must be final and must be based on the following factors:

(a) What is the nature of the fault? Was it caused by contamination or spillage of foreign matter (this can seep into other parts of the unit, causing further damage later)? Was the set dropped? - a cracked cabinet makes the unit unsafe, and bridged panels are not to the manufacturer's

# Help Wanted

Does anyone know of a source of spares for a Silver colour TV set, Model CV252? The manufacturer is Shin-shiratsuna. The set is fairly new. Martin Vaughan, 49 Long Lane, Holbury, Southampton SO4 1LG (0703 892 828).

Can anyone supply a circuit diagram and/or any other servicing information for a Betacom C1000 cordless telephone? Stephen P. Skinner, 432 Stratford Road, Shirley, Solihull, West Midlands B90 4AQ (021 744 3811).

Can anyone supply a LOPT for the Orion/Plustronics 55 colour mains/battery portable CTV receiver, either new or in usable condition? Telephone 0665 78437 or write with price to M.B. Wilson, 1 Playwell Court, Glanton, Alnwick NE66 4BL.

Wanted, a Texas TMS3615 chip for an Ekco Encore 61 keyboard, also Television issues Jan/June/July 1980. Keith Docwra, DTV Service, 38 Kent Road, Margate, Kent CT9 3SN. 0843 231 408 or 226 773.

Wanted, the following issues of Television: Sept/Oct/Dec 1991. A.C. Malcolm, c/o Airds Farmhouse, Airds, Port Appin, Argyll PA38 4DQ.

Wanted, a mains transformer, part no. SLT5L157-W, for the Technics STK808XE tuner/preamp - or alternatively the tuner/preamp itself. N. Reay, 12 Northolt Avenue, Cramlington, Northumberland NE23 9RJ. 0670 715 123.

Wanted, service manual/circuit 'stat for the Kenwood KA4004 amplifier. Also Jap equivalent for the Salora SV8820 VCR. C. Ross, 27 Ness Way, Bletchley MK2 3DT.

Wanted, service sheet or manual for the Plessey Communications Systems Model 100F 180W mixer/amplifier. Fred Ryan, 7-9 Scarva Road, Tandragee, Craigavon, N. Ireland BT62 2BY. 0762 840 421.

Does anyone know where spares can be obtained for the Telequipment 1010 and Scopex 14D10 scopes? I require UEC1843, SU2603, E421 and U441 transistors. J. Anderton, 24 Trafford Street, Preston, Lancs PR1 7XY. 0772 57232.

Wanted: Manual, or loan of one for copying, for the Nordmende UW342U wobblator. Also a B8A valveholder. W.B. Mansell, 48 Bowling Green Road, Thatcham, Berks RG13 3DA.

Wanted: Capstan drive motor for the Ferguson 3V23. Cash waiting! Robin Reiss, 10 Melton Close, The Ridings, Leeds LS10 4RB.

Wanted: Circuit diagram for the Fidelity CRP100 clock/radio/telephone, circa 1984. P.D. Clarke, 28 Wentworth Gate, Linton Park, Wetherby, W. Yorks LS22 4XD.

Wanted: Circuit diagram/operating instructions for the Lowther L18S valve amplifier. M.C. Flis, 8 Church Row, Carharrack, Near Redruth, Cornwall TR16 5RP (0209 820 066).

standard. If there has been storm damage and print has been removed from the panel it cannot be repaired to the correct standard.

(b) If the set is likely to return during your guarantee period, as it may where seepage is a problem, the new repair will not be paid for by the insurance company and your reputation will suffer.

We treat all insurance claims as follows:

(1) We tell the customer that there's a £10 charge which covers stripping the unit, assessing the damage and office work - writing and storing the quote. We put this charge on the quote to the insurance company as part of the claim.

(2) We strip the unit and examine the total area of damage (spillage in VCRs usually means that they have to be written off).

(3) We contact the manufacturer to check on spare parts prices, VAT, delivery and retail prices.

(4) We state that in our opinion the fault will cost £XX to repair, and that the work is either viable or not viable.

(5) If we think that a repair could be done but are uncertain, we say that a temporary repair could be carried out but may leave the set in an unsafe condition. You could say that no guarantee could be given and recommend replacement.

(6) We finish the quote by offering a replacement unit, quoting the value of the scrap unit (this unit has no scrap value or the scrap value is £XX) and, just before signing off, we say that the customer has been charged £10 towards the cost of evaluating the damage (this will/will not be deducted from the cost of a new unit purchased from us).

In cases where a replacement part is not available as a spare or the manufacturer doesn't answer our faxed request for price and availability details we feel that we have honoured our side of the deal by stating "due to the fact that parts are no longer available for this model etc."

This may not be to everyone's taste, and the cost of providing a quote will vary from shop to shop. But at least you will not have said anything that's untrue or may result in future repercussions.

*John Hopkins, The TV Workshop,  
Felixstowe, Suffolk.*

## FERGUSON TX90 CHASSIS

Further to Nick Beer's article on this chassis (September), noisy potentiometers, particularly the volume control RV113, seem to be a regular fault. The line output transistor TR112, the field output transistors TR104 and TR105 and the 12V regulator chip IC105 fail regularly - particularly TR112 and TR105. Because of the way in which they are mounted removing them is quite a tricky job. *R. Potts, Woodham Electronic Services,  
Rustington, W. Sussex.*

## SHARP VCA105HM

Bob McClenning mentioned this machine in the August VCR Clinic. We've had several of them in with the same fault - the back tension arm jamming the mechanism when the machine unlaces. The cause of the fault is not the tape



missing the arm during loading but wear or strain on the operating lever, which is under the sliding cam assembly that runs across the front of the deck mechanism. We change the tension arm and the operating lever, part nos. MLEVP0134GEZZ and MLEVP0133GEZZ, or Willow Vale 27349TR and 27349TA.

G.N. Ashcroft, Newquay TV & Radio, Newquay, Cornwall.

## BACK INJURY CAMPAIGN

Our thanks to the engineers who have written to us to date – please keep the letters coming. To assist with our campaign we would like to ask that when writing to us you provide the following information before describing your particular experiences: (1) Which company did you work for when the accident/incident occurred? (2) Did you enter the accident/incident in an Accident Book? (3) Did you report the problem to management? (4) Are you a member of the union (EEPTU)? (5) Are you aware of lifting aids at your place of work?

Harry and Pam Todd,  
37 Northdene,

Chigwell, Essex IG7 5JS. Telephone: 081 500 1433.

## PHILIPS 2A CHASSIS

I've also suffered from the time-consuming Philips 2A chassis dead set fault condition described by John Edwards in the September issue (page 785). But I can't agree that after replacing the dead components you can, provided there's no short across the 280V reservoir capacitor, confidently switch on. Certainly the set that's causing me so

much trouble just now comes on and stays on – for a variable length of time, usually until it's back in the customer's home, after which it bangs off again. The bag of dead components is growing, also my disillusionment with this chassis. Does anyone know what starts the catastrophic chain reaction, and how it can be prevented? Incidentally this set is not the easiest to work on in the overcrowded power supply area, because the component marking on the print side is almost unreadable.

L.P. Watkinson, Telesonic Services, Holsworthy, Devon.

## SATELLITE TV CABLE

Readers might find the following tip useful. Maplin stock a very good low-loss satellite TV cable, type CT125, but cannot supply a plug to fit it. As they don't stock screw-on F plugs I obtained some from PV Tubes and modified them as shown in Fig. 1. Note that you can't drill out crimp-on plugs.

Chris Meakin,

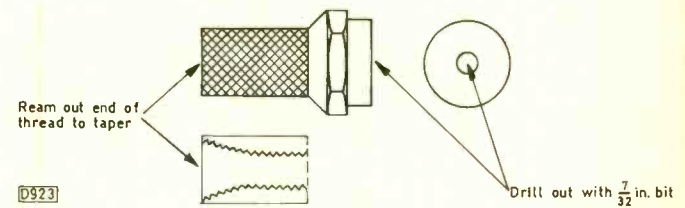


Fig. 1: Screw-on F connector modification for use with CT125 satellite TV cable.

TRANSISTORS		IC's		THYRISTORS		VOLTAGE REGU.		VIDEO BELT KITS	
BC108B	0.07	2SA1020	0.38	B4718	1.65	STK4362	6.10	TDA3560	3.00
BC122B	0.07	2SA1106	1.20	BA515	3.15	STK4432	8.80	TDA3561A	2.25
BC184A	0.07	2SA1123	0.49	BA1330	1.50	STK4773	8.80	TDA3561A	1.45
BC212B	0.06	2SA1156	1.45	BA3506	2.10	STK4813	9.30	TDA3562A	3.20
BC327	0.07	2SA1198	0.60	BA51402	2.30	STK4873	9.20	TDA3592A	3.10
BC548B	0.49	2SA1286	0.78	BA6109	2.10	STK5431	6.30	TDA3653C	2.75
BD131	0.25	2SB173	0.90	BA6209	2.80	STK5451	4.80	TDA4100	3.25
BD132	0.25	2SB407	1.45	BA6219	3.15	STK5481	4.00	TDA4427	4.50
BD204	0.40	2SB434	1.85	BA6322	3.65	STK5490	5.00	TDA4500	3.45
BD707	0.45	2SB509	0.95	HA1392	2.25	STK5720	5.35	TDA4503	3.05
BD711	0.45	2SB554	6.89	HA11235	1.55	STK6732	14.80	TDA4505B	3.00
BD839	0.49	2SB688	1.15	HA11244	1.65	STK7217	5.60	TDA4555	5.50
BF420	0.28	2SB716	0.28	HA11714	3.80	STK7226	7.80	TDA4610	5.25
BF459	0.18	2SB717	0.70	HA11720	2.80	STK7251	12.00	TDA8153	3.15
BF493	0.16	2SB793	0.35	HA1235	2.70	STK7348	4.30	TDA8191	4.10
BU108A	1.00	2SB856	0.42	KA2213	1.45	STK8250	5.60	TDA8442	2.60
BU124	1.35	2SB883	1.60	KA2401	0.75	STR380	4.90	TDA9503	2.20
BU205	0.70	2SB1015	0.60	LA1235	3.65	STR456	5.90	UPC234	0.70
BU208	0.68	2SB1016	3.78	LA4175	1.50	STR1096	3.70	UPC571	1.90
BU208A	0.70	2SC124	0.60	LA4440	1.18	STR12006	5.90	UPC580	3.00
BU208A(T)	0.70	2SC388	0.35	LA4908	2.25	STR2015	5.90	UPC1031	1.60
BU326A	0.95	2SC496	0.30	LA4700	4.40	STR40090	3.30	UPC1042	7.50
BU406	0.78	2SC644	0.20	LA7520	2.20	STR50103	5.20	UPC1183	1.15
BU406D	0.90	2SC710	0.18	LM318	1.15	STR58041	1.80	UPC1178	1.05
BU407	0.55	2SC711	0.35	LM1011	1.80	TA7061	4.00	UPC1212	1.70
BU500	1.00	2SC790	0.75	LM1818	2.25	TA7119	1.30	UPC1278H	2.90
BU508A	1.00	2SC828	0.20	LM6402	5.25	TA7176	2.25	UPC1363C	1.10
BU508D	0.85	2SC1047	0.50	LM6402	5.25	TA7203	1.75	UPC1470	1.90
BU536	1.05	2SC1096	0.58	M5186	4.60	TA7208	1.35		
BU807	0.78	2SC1162	0.30	M50115	2.50	TA7227	1.85		
BUT11	0.70	2SC1358	3.50	M51182	2.50	TA7230	1.80		
BUT11A	0.70	2SC1413	2.30	M51270	2.70	TA7237	3.88		
BUT11AF	0.85	2SC1454	3.10	M54544	6.35	TA7245	4.25		
BU12A	0.85	2SC1473	0.65	M58485	9.00	TA7267	1.45		
BUT56A	0.90	2SC1518	1.45	M83730	1.60	TA7335	1.75		
TIP31	0.20	2SC1760	1.90	MC1377	5.25	TA7358	1.80		
TIP31A	0.22	2SC1881	2.00	MC14493	8.50	TA7368	1.80		
TIP32A	0.23	2SC2660	1.65	SAA5010	5.40	TA7611	2.20		
TIP32C	0.26	2SC2792	5.30	TA401	3.50	TA7769	2.80		
TIP41C	0.22	2SC3153	3.10	STA441	2.50	TA8214	3.25		
TIP42A	0.20	2SC3182	3.40	STK050	19.00	TA8215	3.45		
TIP42C	0.22	2SC3683	2.80	STK080	5.85	TA1015	1.05		
TIP110	0.45	2SD128	2.20	STK0025	4.00	TA1035	1.35		
TIP122	0.45	2SD288	1.05	STK0039	3.90	TA1044	2.80		
TIP142	0.85	2SD357	0.38	STK0392	4.75	TA1072	5.50		
TIP2955	0.40	2SD387	0.75	STK0050	4.40	TA1236	2.75		
TIP3055	0.50	2SD478	0.78	STK433	4.75	TA1510	3.70		
MJE340	0.25	2SD725	3.80	STK437	5.10	TA1670	2.80		
MJE521	0.35	2SD768	1.75	STK438	5.50	TA1870	2.75		
2N3055	0.38	2SD807	2.25	STK443	7.40	TA1908A	1.00		
2N3773	1.00	2SD838	3.85	STK461	6.00	TA1940	1.00		
2N4921	0.60	2SD995	3.65	STK463	7.50	TA1950	2.50		
2SA114	1.05	2SD1273	0.80	STK1039	5.20	TA2005	1.10		
2SA124	0.40	2SD1412	0.90	STK1049	7.75	TA2009	1.85		
2SA473	0.33	2SD1426	3.40	STK2025	6.85	TA2030	1.15		
2SA539	0.30	2SD1497	2.50	STK2029	4.80	TA2161	2.45		
2SA564	0.35	2SD1710	2.75	STK2129	6.00	TA2521/3	7.50		
2SA579	0.40			STK2145	9.00	TA2540	1.00		
2SA608	0.45			STK2155	9.75	TA2576A	2.95		
2SA639	0.58			STK2230	4.75	TA2577	1.90		
2SA720	0.24			STK2240	8.25	TA2578A	1.90		
2SA733	0.25			STK2250	7.45	TA2591Q	4.65		
2SA786	0.45			STK3040	4.50	TA2600	2.35		
2SA794	2.25			STK3042	4.75	TA2740	3.05		
2SA798	0.55			STK4026	5.80	TA2795	2.50		
2SA836	0.38			STK4028/2	6.80	TA2830	4.85		
2SA893	0.50			STK4060	5.50	TA2831	3.68		
2SA913	1.15			STK4151/2	7.00	TA2831	3.20		
2SA1012	0.90			STK4161/2	8.50	TA2830	2.95		

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# Pace PRD800 Satellite Receiver Review

Eugene Trundle

The ill-fated Marco Polo satellite will cease broadcasting Sky programmes on New Year's Eve. Many will regret its passing. My apologies to William McGonagal in offering the following valediction:

Oh beautiful space bird born to die  
With digital technology up in the sky  
You beamed at us from thirty one west  
High quality pictures and sound at its best.

There's now a substantial replacement market amongst owners of D2-MAC receivers and Squarials seeking Astra equipment. This, along with the onset of dark evenings and the approach of Christmas plus the football coverage offered on the Sky Sports channel, is providing manufacturers and retailers with a large and perhaps unrepeatable opportunity to sell satellite gear. The technology has advanced at a furious pace in the four years or so that direct-to-home satellite broadcasting has been with us: today's products are much more sophisticated than the ones that saw in the satellite viewing era in the only recent past.

Satellite receiver manufacturers have geared up to meet the anticipated demand, with market leaders Amstrad and Pace both recently introducing new models aimed at the mass market. An example of the latest IRD (integrated receiver-decoder) technology is the Pace Model PRD800. I obtained a sample to test and review. It proved very popular with the Trundles, large and small. . .

## Features

There are two new models from Pace, the PRD800 and PRD900, made to sell at "package prices" of £229 and £249 respectively with a 60cm black dish. An 80cm dish if required adds £30 to the package price. The PRD800's main features are: an integrated smart-card reader and Videocrypt decoder; true Wegener Panda-1 sound processing with separate output sockets; 120 programme capability; three scart sockets; a u.h.f. modulator whose output can be tuned over channels 21-69; full satellite radio coverage; parental lock; a four-event, 14-day VCR timer; full remote control including customising and setting up; and a sophisticated menu-led control system. For its £20 premium the PRD900 adds 199 programme capacity; twin LNB inputs; an eight-event, 28-day timer; programme recall; channel ident; and a blank-screen radio mode. Both models have an interface for a dish positioner and operate with the Marconi type of voltage-switched LNB.

## Menu System and Software

One of the things that distinguished these models from others is their software and control system, which is based on a purpose-designed microcontroller chip and EEPROM that communicate with virtually all areas of the receiver via a serial control bus. This is similar in many respects to the widely-used I2C system. The large amount of software is packed in by clever use of algorithms in the memory-management system.

The menu tree has six entry points: two for occasional use by the viewer; three for customising the programme order, channel switching protocol, sound tuning, programme captioning etc.; and a third menu option for use by the installation engineer. This latter option has some very interesting features. The LNB offset 'detunes' the receiver by a small amount to match it exactly to the s.h.f. oscillator up at the dish. The u.h.f. tuning facility consists of a frequency-synthesis system that operates on the u.h.f. modulator's carrier generator to select and program any u.h.f. output channel from 21 to 68 – the bad news is that the modulator system is an integral part of the main PCB and is thus not available separately!

The download feature enables all the software you've programmed into one receiver to be transferred into another one's memory, thus producing clones to suit local conditions or to accommodate programme changes, new transponders and different satellites. To do this all that's necessary is a scart link between the programmed master receiver and the 'slave', which can be any receiver in the same range.

## On Test

I first checked the operation of the programmable u.h.f. modulator, setting channels 21, 42, 53 and 68 (the channel numbers appear on the screen, but you can't see them until the set is tuned). They came in precisely on a TV receiver with similar programmable channels. Quite apart from being able to select a 'quiet' channel to avoid r.f. clashes and herringbone patterning I found this very useful for various purposes in the workshop. Next I went over to AV links. Impressive though the r.f. coupling system is, it can't deal with stereo sound and doesn't lend itself to automatic TV and VCR operation.

Results via the AV sockets were very impressive. The picture was as clear and sharp as any satellite PAL ones I've seen, and I could detect no difference between encrypted and clear programmes. There were many downpours during the time that I had the set, but I never saw any sparklies on any channel at any time. It has to be said however that I live in the south east and that the dish had been very carefully aligned.

Maybe I was lucky with the LNB's noise characteristic and/or the receiver's demodulator threshold, but I was able to cover over forty per cent of the dish surface before there was any visible effect on the picture. With most other systems I've tried the onset of sparklies occurs when no more than 20-25 per cent of the dish is covered.

The sound was also very impressive: the receivers have true Wegener Panda-1 stereo processing, which is more expensive for the setmaker to incorporate but a better performer than the 'sound-alike' dynamic expansion systems fitted by some other manufacturers. When it was connected to a hi-fi system as well as the stereo TV set the audio came through very well, with negligible background noise so long as the programme material allowed this. A single key on the handset gives access to satellite radio. This made me an overnight fan of some of the stations – Sky

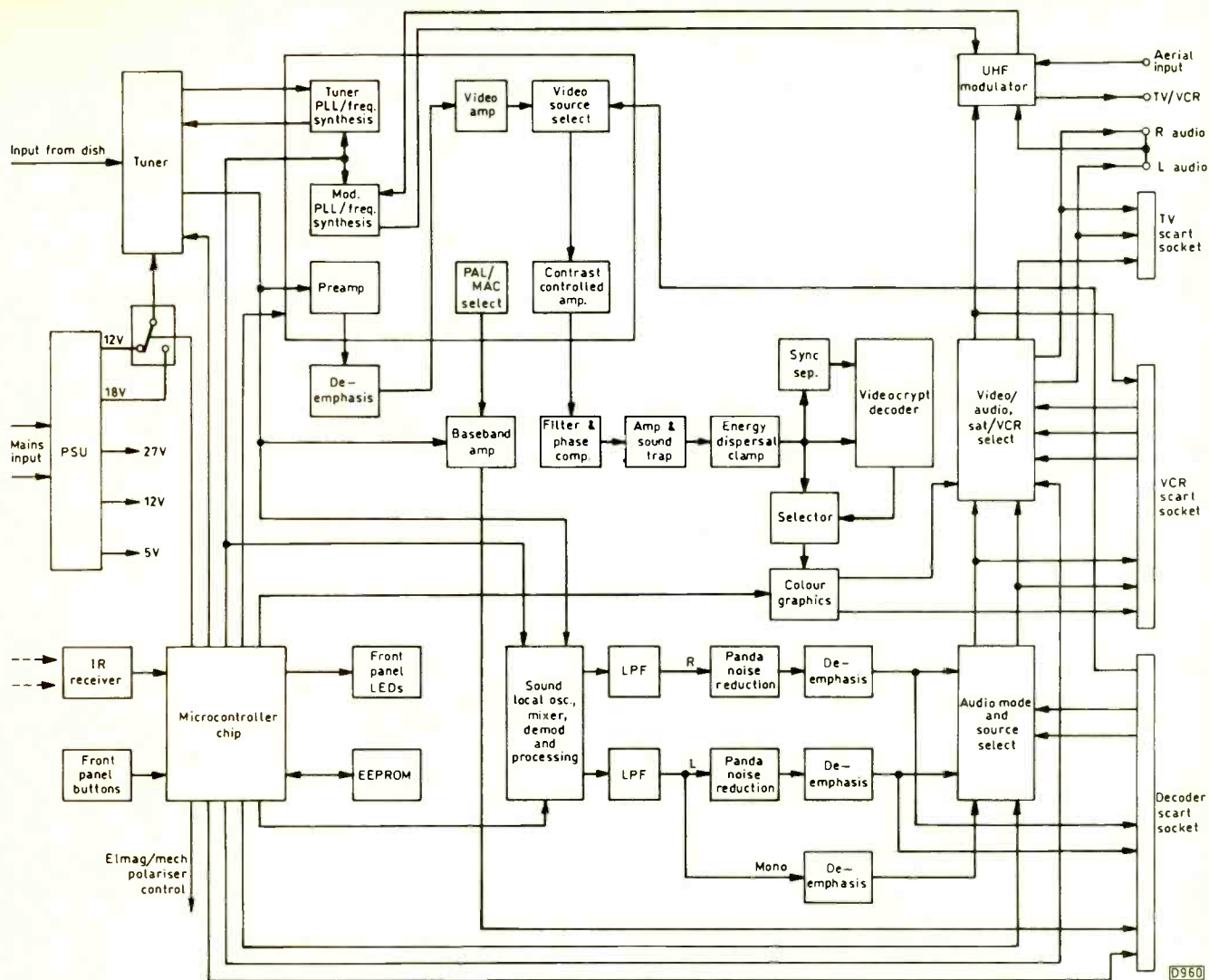


Fig. 1: Block diagram of the PRD800 receiver.

Radio, Supergold and Opus Radio. Dear old Radio Luxembourg is also up there, riding on the back of RTL-4 (transponder 13).

### Scart System

Back to Earth however. The three scart sockets enable the TV set and VCR to be connected with automatic switching by remote control, also connection of an external decoder (for encryptions other than Videocrypt) which Pace will no doubt make available when necessary. Meanwhile the third scart socket can be used for another, e.g. MAC, satellite box, a second VCR, a Laserdisc player, a camcorder or whatever. It has stereo and RGB throughputs to the TV scart socket. I found that this 'intelligent' three-scarts system allows for all the recording/viewing/routing options of the Periswitch unit reviewed in the September 1991 issue. It forms a switching centre for the whole AV system, aided by its twin phono stereo sound output sockets.

### Internal Arrangements

Inside the box there's a single PCB with a separate Videocrypt decoder module that's behind the smart-card slot. The power supply is a cool-running switch-mode type with a heatsinked chopper chip. Fig. 1 shows a block

diagram of the analogue sections of the receiver. These are conventional in operation but software controlled. Many of the chips used here are LSI types specially designed and developed by Pace for this specific application.

Thinking of my experiences with many previous satellite box designs I tried shorting out the LNB supply at the dish input socket. This produced no ill effect. I also carefully examined the remote control unit, the Achilles' heel of so many designs. It looks sturdy and feels as positive as any I've come across, apart from some Bang and Olufsen types.

Some versions of the PRD800/900, suffixed -01, incorporate facilities for driving a magnetic or mechanical polariser. All models have provision for driving a dish positioner, including compatibility with the earlier Pace positioner. Variant models PSR800/900 have different sound system and band coverage characteristics for Continental use.

### Conclusion

I was very impressed with this receiver. Its design, performance and appearance all seem to me to be excellent. Although marginally above that of its lowest-price competitor, the retail price represents good value for money with a reasonable profit margin for the dealer. I'm happy with the after-sales service offered by Pace and the company's orderly way of doing things, both in the design and marketing fields.

# What a Life!

**Donald Bullock**

My twenty-three year old son Steven has been helping me in the workshop recently to gain some experience. He also sees a future in microwave oven servicing and got me to fork out for the servicing course run by Jim Garrod on the Isle of Wight. On the final day I popped over and met Jim, who certainly knows his microwave onions. As a result Steve has come back thoroughly capable. He hopes to take over my TV business if Greeneyes and I ever manage to slope off to warmer climes.

Steve quickly became proficient at dealing with VCRs. Most have mechanical faults of course, but the other day he succeeded in tracing the cause of an absent 5V supply in an Hitachi VT120 to a faulty capacitor in the mechacon circuit.

## **Mr Rubicund's B & O TV**

Mr. Rubicund is one of our nicest customers, a market gardener from the country. The other day he brought in his CTV receiver, a B and O 3503, because it was dead. The trouble turned out to be on the power panel where there were several dry-joints around the pins of the transformer.

When he collected his set Mr. Rubicund tossed it on to a mound of fertiliser in the back of his Land Rover as though it was a bale of hay. We winced and of course it came back almost at once.

"I plugged 'un in and 'e banged. Sorry to be a nuisance."

On examination we found that the power module had been shaken out of its runners and had shorted to the chassis. Two of the bridge rectifier diodes had gone short-circuit and we expected to find that one or both of the two thyristors had also failed, but they were all right. In fact we couldn't find any other faulty components, though the meter indicated that a short-circuit was present.

Then we spotted it, on the track from the bridge at the point where the short to chassis had occurred. A tiny burn had carbonised, and the soot was forming a bridge to the adjacent earth track. It was of roughly the same colour as the dark Paxolin panel, and wasn't at all obvious. We washed it off and, to make sure, treated it with the glassfibre pen that *Television* contributor Ed Rowlands brought us on a recent visit. Then we phoned Mr. Rubicund again.

"Bring your van this time Ruby" we advised. He did, and loaded the set gently, securing it to the side with a webbing strap. Then he brought out a box of mixed vegetables for us and apologised once more.

## **A Ferguson 3V38**

Mrs. Smallpiece asked whether I'd have her son in the workshop for a day. He'd taken a television course and wanted to get some practical experience. As Steven was away on his course and Mrs. Smallpiece is a decent sort I agreed. So along came Ivor. After he'd tidied the workshop I put him in front of a Ferguson 3V38 VCR that Egbert Crust had brought in. He'd bought it secondhand and had been told that its mains transformer had been replaced some eighteen months ago.

Ivor soon announced that the transformer's primary winding was open-circuit. Two such failures in eighteen months? We checked the thermal fuse and found that it was open-circuit. I then suggested that Ivor might check the current being drawn. A few days previously I'd taken

delivery of an Avo 8 Mark 3. Ivor had apparently used one on his course and said that he was familiar with it. He got to work and a few minutes later I heard the Avo's cutout fly open.

"The hand raced to full deflection" he said, "that proves something."

I soon found that he'd connected the meter between the live side of the thermal fuse and earth. "Ivor" I said, "all over England there are scores of power stations working flat out to produce millions of amperes of current. All in unison. You've just connected the Avo across every one of them and have proved two things. One, that the Avo isn't quite up to measuring their combined output, and two that you need a bit more instruction." I could have added a third, but that would have meant me using the word "prat", which Greeneyes doesn't like.

We wired a trip in series with the Avo and connected the two across the open-circuit thermal fuse. "When we switch on, keep you hand on the switch" I said. He did so. The transformer drew only a few milliamps and quickly became warm. It had shorted turns. Odd, two in eighteen months.

## **A Bush TV191S**

Then Mrs. Squinter came in with her daughter Blodwyn, who recognised Ivor. They'd been to school together. She also brought along a Bush TV191S, an old hybrid monochrome set. I never thought I'd see one of them again.

"Nothin' on the screen Mr. Blux" she said.

As I'd nothing on the bench I looked at it straight away. There were a few valves in the drawer, so I tried a new PY88 and PL504. Nothing doing. I next checked the line output valve's screen grid voltage, which was missing. Then I remembered. These sets have a thermally-fused 2k $\Omega$  screen grid feed resistor that's over on the other side of the chassis. It used to go open-circuit when the solder got tired. Sure enough this was the cause of the absent raster. I cleaned and resoldered it, resisting the temptation to wind a bit of fuse wire around its solder blob. This restored the picture but as I was boxing the set up there was a horrifying scream from the drive outside. We rushed out to see Blodwyn jumping about, waving her arms like a semaphore machine.

"Ivor Smallpiece did it to me" she howled, "he connected me to this machine".

I turned to Mrs. Squinter. "Blodwyn will settle down in a minute" I said.

Then I turned to Ivor.

"Ivor" I said, "goodbye."

## **Solution to Test Case 360**

**- See page 118 -**

The cause of the problem was not misconvergence of course. With early colour TV sets that were fitted with delta-gun tubes it was necessary to adjust the ring magnets on the neck of the tube regularly for correct registration of the three primary-colour images. If the convergence was not spot on, the symptom was colour fringes around features in the picture.

The green fringing in the Ferguson TX86 receiver had nothing to do with beam alignment however. What was happening was that green picture detail was being displayed slightly to the right of red and blue detail because of reduced h.f. gain in the green output stage.

Very simple RGB output stages that consist of a single class A transistor amplifier are used in the Ferguson TX86 chassis. Black level is set by adjustment of the emitter voltage. The 1k $\Omega$  emitter resistor is decoupled by a series-connected RC network consisting of a 100 $\Omega$  resistor and a 180pF capacitor. Thus the decoupling is frequency selective, being effective at the higher but not medium and low video frequencies. This boosts the h.f. gain because the negative feedback introduced by the emitter resistor is removed at h.f. The technique didn't work in the green output stage of the set concerned because the 180pF decoupling capacitor C603 had gone open-circuit. A replacement restored the full green output stage bandwidth and a good picture.

## Satellite Notebook

Nick Beer

I remember being well impressed by Mimtec some two years ago. At a time when we needed another quality but competitively-priced brand of satellite TV receiver we were introduced to the Nimbus. Having been told all about who Mimtec are and having examined this well-built unit we put some out. We also ensured that there would be no problems about servicing.

While the units were under guarantee we had a single fault – one of them had a very poor remote control range. By comparing the receiver with another one a colleague discovered that a capacitor had never been fitted. We corrected this and nothing was said. Reliability has continued to be good.

A few weeks ago however a dead one came in. On investigation I found that the chopper transistor had gone short-circuit and that several resistors had burnt up. The circuit used a TEA2018 chip and was virtually identical to that in an Alba colour set I'd worked on some weeks before. So I plodded on and found the same large number of faulty components. The chopper transistor was an MJE something or other that wasn't in any of our books. As no one seemed to list it I fitted a BUT11A, which seemed sensible. The fuse now held but the power supply didn't run. I could go no further without a circuit diagram and tried to order a manual. After three faxes had been ignored I phoned Mimtec and was curtly told that no service information was available and that all units must be returned for repair.

That's understandable and acceptable in most instances when a unit is under guarantee and the manufacturer is

responsible for any repairs. But what justification can there be for such a policy once the unit is out of guarantee? I'm also wondering whether the policy infringes any consumer law. Anyway, let's hear from you Mimtec!

### Fault Notes

I hope that the following recent experiences relating to the Ferguson SRV1/Pace SS9000 IRD will be of interest to others and possibly save them some time and money. The first unit came in dead with its mains fuse FS1 blown – it wasn't black, but checks showed that the BUT11A chopper transistor Q1 was short-circuit. A replacement was soon fitted and the unit then worked. We put it on soak test where, after a few minutes, there was a repeat performance – blown fuse and short-circuit chopper transistor. A look at the circuit diagram suggested that Q1's 1 $\mu$ F base drive coupling capacitor C9 was a likely suspect. In any chopper circuit this component can cause problems and should be suspected when the transistor fails. When I checked it with my capacitance meter I found that the value had fallen to about 220nF. A new 1 $\mu$ F electrolytic, transistor and fuse finally put matters right. But these receivers do run warm: since the cabinet is very small I suspect that electrolytic capacitor failures will become quite common as these units age.

The other receiver had a very odd symptom when "cold" – it cleared when the unit had been on for an hour or so. If the symptom was seen with a terrestrial u.h.f. signal you would say that it was CCI: there were thick, dark wavy bars over the picture, which was over-contrasted and intermittently negative. The bars gradually increased in number, decreasing in size until they became a fine pattern. Then the fault would clear. To cut a long story short we found that the tuner (MOD 1) was the cause of the fault. I've had a number of defective tuners in this receiver but this is the first time that one has produced these symptoms. As yet MCES don't repair these particular tuners and the cost of a new one turned out to be excessive so far as the customer is concerned. He decided to take the easy way out and leave the receiver on all the time!

Here are one or two tips from Pace on this receiver. If drift of the main, i.e. not Videocrypt, on-screen graphics is encountered try resoldering L13. If the Videocrypt on-screen graphics drift replace the transistor shown in Fig. 1 – it's on the Videocrypt PCB. Finally there's been a slight problem with excessive dissipation in R5. To help prevent this, ensure that C10 (10nF) is fitted.

### More on the Ferguson SVR1

Graham Rees writes as follows: A problem that's cropping up fairly regularly now is no vertically polarised channels. Q3 is usually the culprit – it goes short-circuit from collector to emitter. The easiest place at which to check the LNB supply is at the cathode of D17.

One of these units came in with a blank raster and the on-screen graphics not locking – it looked as though the tuner was faulty. In fact the cause of the fault was no 9V supply to the tuner as R323 (4.7 $\Omega$ ) was open-circuit. This resistor is Q2's collector load.

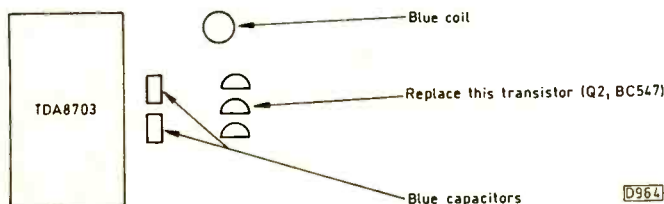


Fig. 1: Pace SS9000 IRD fault – see text.

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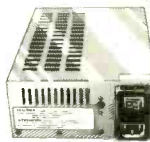
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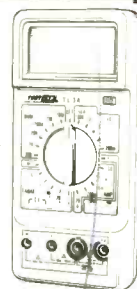
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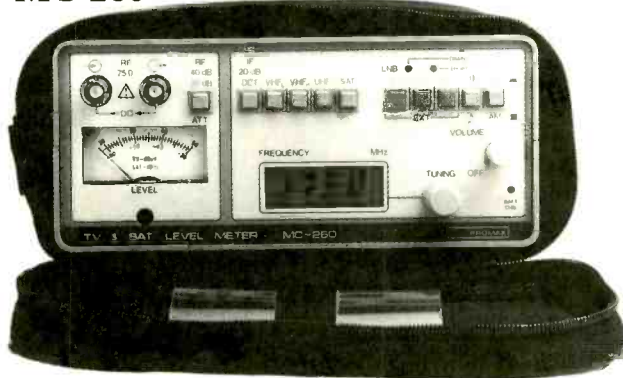
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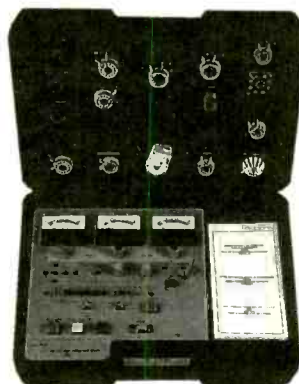
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<b>MAIN MENU</b> 1. VIDEO Tuning 2. AUDIO Select 3. PICTURE Format 4. MODE Select 5. LNB Type 6. PICTURE Cont / Col 7. STORE & Exit VIEW To Exit	<b>MODE Selection</b> 1. D2MAC 2. DMAC MODE 1 3. DMAC MODE 2 0. PAL MENU To Return VIEW To Exit	<b>VIDEO TUNING</b> EUROMUSIC CHANNEL 01 FREQUENCY 11727MHZ USE < > To Adjust MENU To Return VIEW To Exit
<b>D2MAC AUDIO SELECT</b> 0. BACKGROUND 4. RFI SERVICE MONDIAL 5. RFI EN EUROPE 6. VICTOR 9. SOFTSCRAM MENU To Return VIEW To Exit	<b>RECEIVER SETUP PREFERRED LANGUAGE</b> Enter / Cancel to Change ENGLISH MIX UP : 1.Red 2.Blue 3.Green DOWN : 4.Red 5.Blue 6.Green 8.LO Minus 9.LO Plus 0 To Store VIEW To Exit	 Antenna 2 12.034 GHz France 19 deg W

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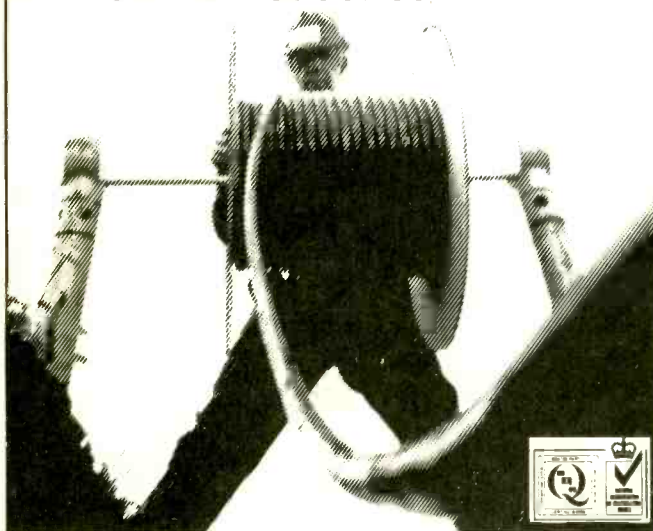
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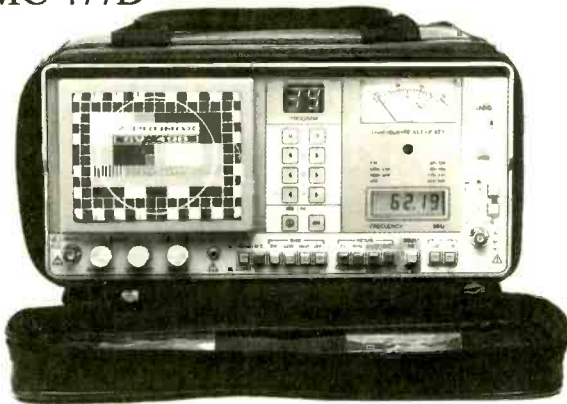
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AN6340	£3.75	HA11788	£4.50	LA7525	£3.20	STK4017	£5.75	STR30130	£4.75	TDA3505	£4.20	BD912	£0.95	2SC2570	£0.50
AN6342N	£2.50	HA11827NT	£8.50	LA7800	£1.50	STK4025	£6.50	STR40990	£5.75	TDA3510	£4.50	BD939	£0.95	2SC2580	£2.80
AN6344	£4.75	HA11870NT	£8.50	LA7801	£1.50	STK4121H	£6.95	STR41090	£6.20	TDA3560	£3.90	BD940	£0.95	2SC2792	£2.95
AN6346N	£3.75	HA12005	£3.20	LA7806	£2.50	STK4122H	£6.95	STR41115	£6.20	TDA3581A	£4.50	BD940	£0.95	2SC2792	£2.95
AN6350	£7.50	HA12047	£3.50	LA7806	£2.75	STK4131H	£6.75	STR5022	£5.20	TDA3582A	£4.50	BD940	£0.95	2SC2792	£2.95
AN6356	£3.85	HA13001	£1.90	LA7910	£1.75	STK4132H	£6.75	STR5023	£4.50	TDA3584	£2.95	BD940	£0.95	2SC2792	£2.95
AN6357N	£4.50	HA13007	£4.50			STK4141H	£7.50	STR50113	£5.70	TDA3730	£4.75	BT152-800R	£1.50		
AN6359N	£5.50	HA13108	£2.95	LB1403	£1.50	STK4141V	£7.95	STR50115A	£5.70	TD3771	£4.75	BTY79-200R	£1.50	2SD288	£0.80
AN6360	£2.60	HA13117	£2.75	LB1405	£1.50	STK4142H	£7.30	STR50213	£6.20	TD4427	£2.95	BTY87-100R	£1.75	2SD401A	£1.80
AN6362	£3.50	HA13118	£2.75	LB1416	£1.50	STK4151H	£7.50	STR54041	£5.20	TD4437	£3.90	BU208A	£1.00	2SD526	£0.80
AN6363	£3.50	HA13119	£2.50	LB1640	£2.50	STK4152H	£7.85	STR58041	£5.20	TD4440	£2.75	BU208B	£1.30	2SD569	£0.65
AN6367K	£5.50	HA13128	£3.95	LB1649	£2.50	STK4161H	£7.95	STR59011	£6.20	TD4450	£3.95	BU326A	£1.20	2SD768	£1.20
AN6387	£5.50	HA13403V	£5.50			STK4162H	£7.95			TD44501	£4.50	BU326A	£1.20	2SD811	£2.95
AN6394	£5.20	KA2206	£1.75	LC4068B	£3.50	STK4172H	£8.95	TOA4510	£4.50	TD44510	£3.95	BU406	£0.95	2SD870	£4.00
AN6671K	£4.95	KA2210	£2.40	LC7137	£4.50	STK4181H	£8.95	TOA4600	£2.75	TD4600	£2.50	BU407	£0.75	2SD871	£4.50
AN6676	£5.50	KA2213	£1.30	LC7815	£2.95	STK4191H	£9.50	TA7205AP	£1.00	TD4600-2	£2.50	BU408	£0.95	2SD880	£0.60
AN6677	£4.95	KA2214	£1.50	LC7818	£2.95	STK4192H	£9.50	TA7217AP	£1.60	TD4600-3	£2.50	BU426A	£0.80	2SD898B	£2.95
AN6873	£2.95	LA1130	£2.50			STK4332	£4.50	TA7222AP	£1.30			BU426B	£1.90	2SD910	£1.80
AN6875	£3.50	LA1132	£2.50	M5218L	£1.95	STK4352	£5.90	TA7229P	£3.25	TD4925	£3.50	BU500	£1.50	2SD1148	£1.90
AN7105	£2.50	LA1170	£1.75	M5219P	£0.95	STK4793TV	£0.95	TA7230P	£1.50	TD4935	£3.95	BU508A	£1.50	2SD1207	£0.60
AN7106K	£2.50	LA1185	£1.60	M51102L	£2.95	STK4803	£8.50	TA7232P	£1.95	TD4960P	£3.30	BU508B	£1.20	2SD1276	£1.20
AN7143	£2.50	LA1240	£1.95	M51104L	£3.20	STK4833	£9.50	TA7233P	£2.50	TD4700	£2.95	BU508V	£1.00	2SD1397	£2.00
AN7147	£2.50	LA1266	£2.95	M51358P	£1.75	STK4843	£8.95	TA7240AP	£2.95	TD4750	£4.95	BU508V	£1.00	2SD1397	£2.00
AN7148	£2.30	LA1266	£2.95	M51393AP	£4.50	STK4853	£9.50	TA7241AP	£2.95	TD4755	£4.95	BU508V	£1.00	2SD1397	£2.00
AN7149	£2.50	LA1365	£1.50	M51397AP	£5.50	STK5315	£6.75	TA7243P	£2.95			BU508V	£1.00	2SD1427	£2.95
AN7158N	£3.95	LA2400	£1.50	M54543L	£1.75	STK5324	£5.75	TA7251BP	£2.95	TEA1002	£1.85	BU508V	£1.00	2SD1439	£2.20
AN7161N	£3.50	LA3101	£1.75	M54544L	£2.75	STK5325	£6.75	TA7251BP	£2.95	TEA1009	£1.90	BU508V	£1.00	2SD1457	£1.95
AN7161 NFP	£3.50	LA3160	£0.95	MB3712	£1.50	STK5332	£3.50	TA7270P	£2.50	TEA1014	£2.20	ZT650	£0.30	2SD1887	£3.75

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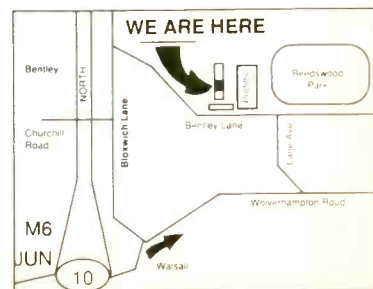
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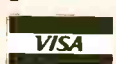
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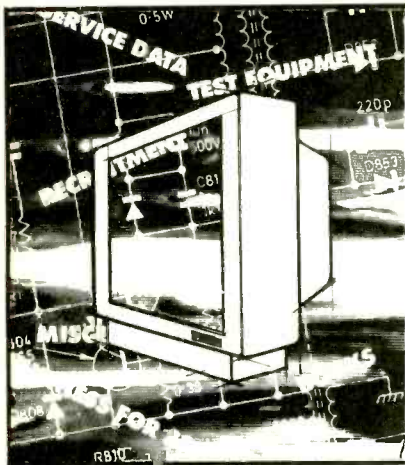


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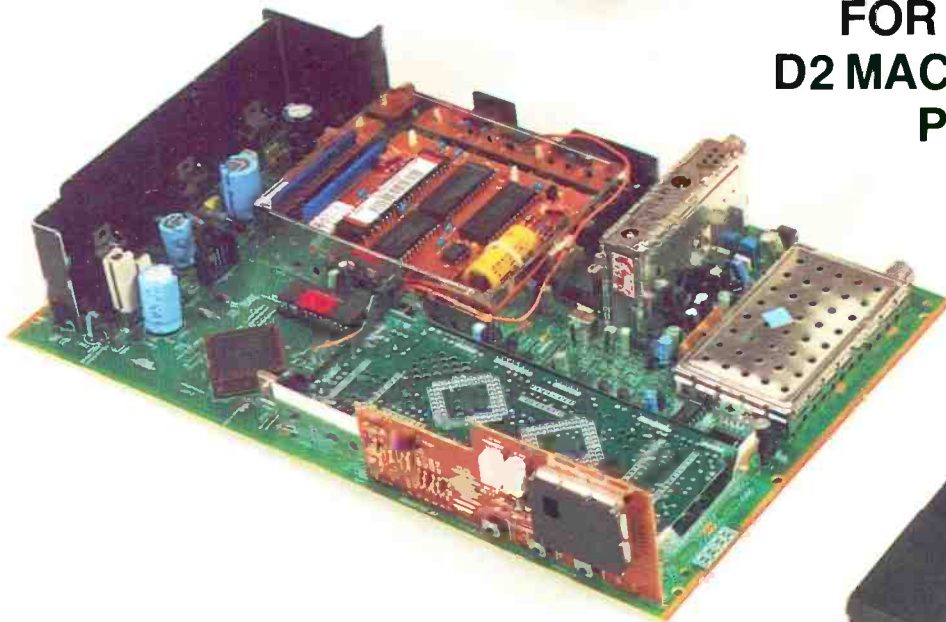
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