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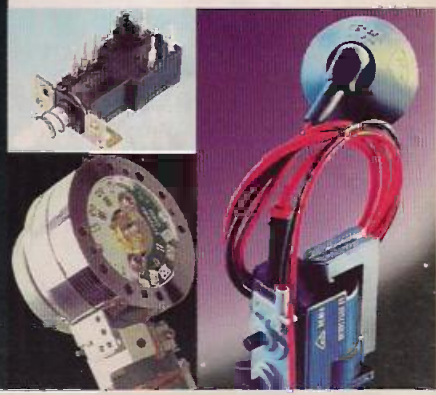
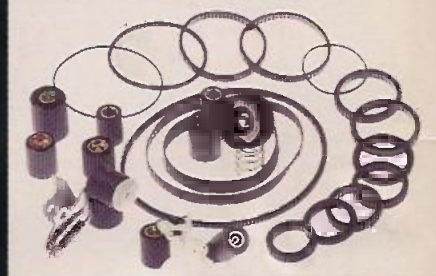
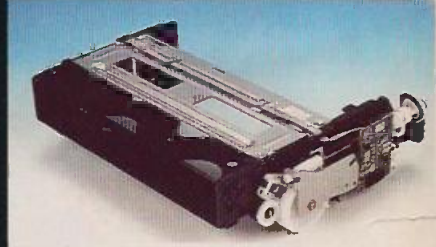


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CONTENTS

MAY 1997

VOL. 47, NO. 7

- The BBC's Role** 463
- Camcorner** 467
Servicing notes on camcorders.
- Automatic ADX Control with the Pace SS9000/9200** 468
Martin Pickering describes a way of providing automatic selection of the Astra 1D services with a Global ADX plus channel expander.
- VCR Clinic** 472
- Teletopics** 476
Latest satellite and cable TV news, changes at the BBC and other items.
- TV Fault Finding** 490
- Letters** 494
- Monitors** 507
Reports on monitor fault conditions.
- What a Life!** 508
Donald Bullock is brought down to earth after a string of successes with faulty TV sets.
- Servicing the Mitsubishi HSMX1** 510
John Coombes presents a servicing guide that covers the mechanical and electronic faults you could experience with this VCR.



Channel 5 Reception Guide 478
Squeezing Ch. 5 into the channel 35-37 gap, with lower ERPs than the existing services and sometimes different transmitter sites, is causing many reception problems. **Eugene Trundle** provides an illustrated guide to the various symptoms that can be experienced, with advice on the best ways of tackling them.

NVQs - The Way Forward 482
Joe Cieszynski, who has had considerable experience with setting up NVQs in the intruder alarm field, feels that they can make a positive contribution to the Brown Goods servicing industry. But there will be huge difficulties in implementing them, not the least being cost.

Book Reviews 485

Satellite Notebook 486
Problems with satellite receivers and installations.

Willow Vale's CD-ROM 488
How Willow Vale came to produce a CD-ROM catalogue and the version distributed with this issue of *Television*, and instructions on using it.

LCR Bridge Extensions 514
Ray Porter, M.Sc., C.Eng., MIEE, takes an inexpensive LCR bridge and adds range extensions plus performance improvements to make it ideally suited to the needs of the TV/video workshop.

Coincidences 516
Andrew Tebbutt on how faults tend to repeat.

Digital TV the French Way 517
Hugh Cocks has been trying out a Thomson digital receiver-decoder intended for reception of the French satellite pay-TV services.



Satellite Workshop 520
Jack Armstrong's column on satellite receiver servicing.

Test Case 413 521

Long-distance Television 522
Roger Bunney reports on DX and satellite TV reception and news, and describes the principles of wideband aerial design.

Next Month in Television 528

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Sorry!
Because of some last minute changes to the page layout in last month's issue there were one or two errors in the contents list and the advertisers' index. Our apologies for any inconvenience caused by this.

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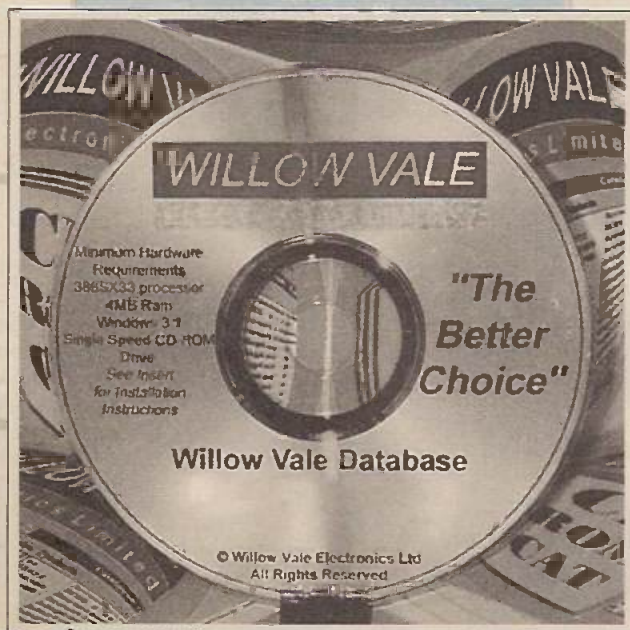
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The BBC's Role

The BBC is finding itself in an increasingly ambiguous and difficult situation: the question is just where to draw the line between being an outright commercial broadcasting outfit and being the guarantor of traditional public service broadcasting. Over the past decade or so it has been increasingly successful in developing its commercial side – by promoting its channels, publishing books and other works based on its programmes and selling its material to broadcasters worldwide. This has not impinged on its role as a public service broadcaster, though it has led to complaints from commercial broadcasters and publishers that it has unfair advantages. This has always seemed strange: those who have encouraged it to act commercially have been upset when it has successfully done just that. But the extent and rate of change has changed significantly in recent months.

The BBC is likely to enter increasingly into joint venture and other agreements with commercial broadcasters. For some time it has been involved, through a programme licensing agreement, with the UK Gold satellite channel. But the agreement signed last month with Flextech, the cable and satellite channel provider which is controlled by TCI, the largest US cable TV operator, is a significant step farther. Its purpose in the UK is to run eight new digital pay-TV channels. This has obvious advantages for both parties. Flextech

will be putting up a considerable amount of money which will help fund the BBC's programme making. The BBC desperately needs this if it is to produce an adequate output to remain a force in the modern world of multi-channel broadcasting. Its traditional source of income, the licence fee, is being allowed to increase by only a small annual amount to take inflation into account. The agreement with Flextech will provide the BBC with capital and, subsequently, an income from pay-TV broadcasting. Flextech benefits in gaining access to the BBC's vast store of programme material and being able to take advantage of the BBC's highly regarded programme making capabilities. It seems that Flextech will concentrate on commercial management, while the BBC gains channels and income with editorial control.

The joint venture with Flextech will create eight new channels, which are being called BBC Horizon, BBC Showcase, BBC Style, BBC One, BBC Arena, BBC Learning, BBC Catch-up and BBC Sport initially. Four of them form part of British Digital Television's proposed terrestrial digital TV package.

This raises various questions about the BBC's future. For one, can it retain its basic public service broadcasting role, with no advertising revenue from its own channels? There will be a tendency to suggest that, having ventured

this far into the commercial sphere, it should go the whole hog and join the ranks of the commercial broadcasters. But independence for the BBC means its status under the BBC's charter, with freedom from commercial pressures. It is important to maintain this. It means not only complete editorial independence, but the ability to set and maintain broadcasting standards. Without the contribution to TV made by an established public service broadcaster, there is little to stop standards falling.

In a related move, the Commons National Heritage Select Committee has suggested that the time has come to alter the way in which the BBC is governed. It considers that "gifted or well-intentioned amateur" part-time governors should be replaced by a board of professional managers. How would they acknowledge and nurture the BBC's vital public service role? We could end up with a board of accountants, and a Corporation that's just another old plc. The BBC claims that its governors act as the custodians of the licence payers' interest, and see no need for such a change. These are contrasting views indeed. It looks as if some sort of compromise is possible, in fact desirable, here. But we don't, whatever happens, want the BBC to become just another broadcaster amongst the others, fighting to optimise its profits. Its unique culture must be preserved. It will not be readily recreated once destroyed.

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ZSC2023	3.10	7805	0.78	BC547	0.11	BF759	0.38	BYV10-40	2.56	MJ3340	0.45	TAB205AH	4.50	TDA3658	1.54	TC225M	1.82
ZSC2060	0.30	7808	0.72	BC547A	0.84	BF763	0.52	BYV95B	0.21	MJ3400	2.95	TAB207	2.74	TDA3658C	2.55	TC225M	1.82
ZSC2078	1.00	7809	0.89	BC547B	0.11	BF788	0.23	BYV99C	0.21	MJ3800A	3.80	TAB210AH	4.10	TDA3659CQ	2.57	TC225M	1.82
ZSC2120	0.23	7812	0.52	BC548	0.86	BF869	0.45	BYV96D	0.27	MN650	2.36	TAB210M	4.79	TDA3659	1.80	TC225M	1.82
ZSC2230	0.55	7815	0.82	BC548A	0.11	BF869S	0.28	BYV96E	0.53	MPS406	0.35	TAB210M	4.96	TDA3659D	2.82	TC225M	1.82
ZSC2235	0.38	7815S	0.35	BC548B	0.86	BF871	0.41	BYV96E	0.21	MPS442	0.23	TAB210M	9.82	TDA4500	4.66	TC225M	1.82
ZSC2236	0.36	7912	0.35	BC548C	0.09	BF899	0.18	BYV96E	0.40								

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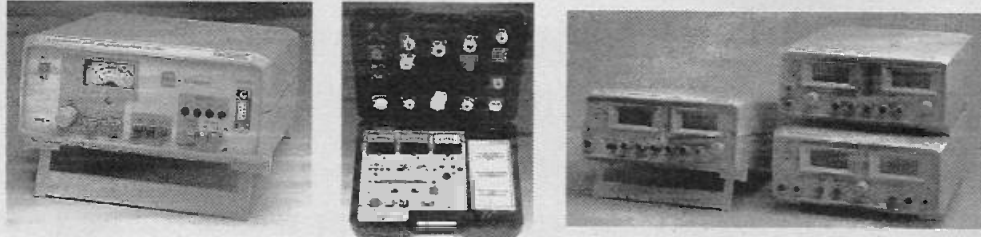
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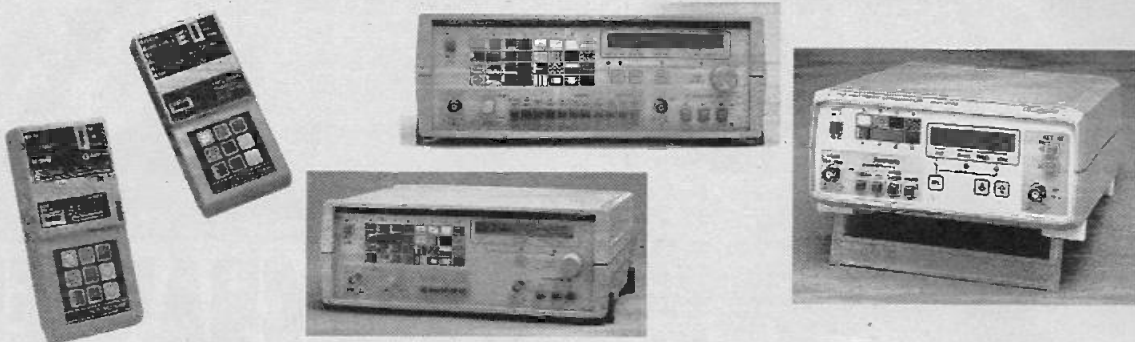
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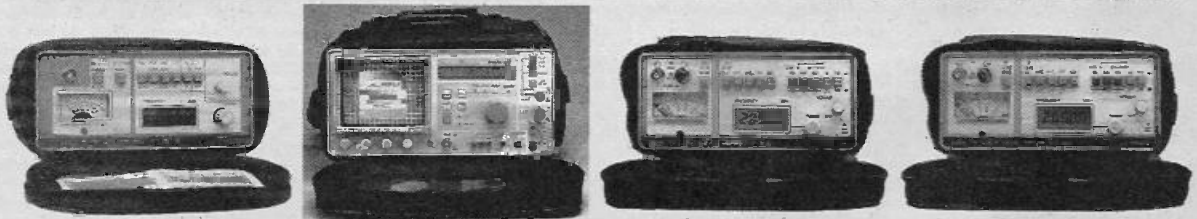
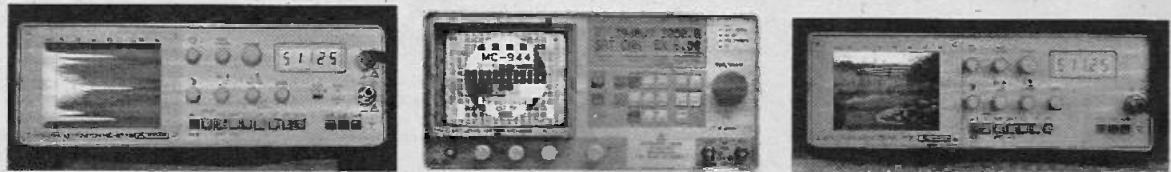
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Reports from
Simon Bodgett
and
David C. Woodnott

JVC GRS707

If the symptoms are no functions or some missing, with no E-E camera pictures, the power regulator transistor Q203 is defective. Great care is required when replacing it and reassembling the camera. The usual cause of the trouble is a defective AV lead. S.B.

JVC GRS77

No playback colour, E-E OK was the complaint with this unit. It's a common fault that calls for replacement of the H8B7101 colour processing chip IC8. This is not easy to accomplish, as the main PCB may be covered by two or more flexiprints that have to be removed. After replacing IC8, a 47k Ω preset must be fitted in position R423 and the 320FH VCO set up. S.B.

JVC GRS707

This was a particularly difficult problem that involved a Philips-made VITC unit which was connected between the camcorder and the viewfinder. The camcorder itself operated normally. So did the VITC unit when it was checked with another GRS707! But when the two were connected and the stop-start button was pressed the pictures went off. This impeded recordings!

I won't go into the amount of time it took to get a circuit diagram for the VITC unit, or the time spent cross-checking. What it came down to was earth paths. One was miss-

ing, the one used by the VITC unit. There was an open-circuit earth connection at pin 5 of connector CN803 on the camera operations panel. I doubt whether anyone will get this fault again! S.B.

JVC GRC7

This old-timer suffered from EVF picture flicker in the E-E mode. The obvious diagnosis would have been lack of EVF field lock, but the output signal was also affected. Close examination of the video waveform showed that the field period was not 20msec. The master oscillator crystal X101 was the culprit. S.B.

Canon A9E

No autofocus was the complaint. Internal inspection showed that the unit had been dropped. As a result, the infra-red autofocus lens assembly had become detached from the main lens unit.

A single screw secures the AF assembly to the underside of the main lens unit, and part of the moulding had broken away. As a complete new lens unit is an expensive item, we decided to try to rescue the original units. This proved to be possible. With this type of problem, the broken moulding can often be redrilled – there's a section of undrilled plastic at the mounting point.

Use a small drill (a pin vice is helpful) to cut into the previously undrilled section. A slightly longer screw than originally used is required to refit the AF lens unit.

We've carried out the repair with several Canon models that use this type of IR AF assembly. So far, none have failed. A warning to the customer that further impact damage will result in an expensive bill probably encourages greater care than is customary!

Note that this type of unit is used in other makes and models. D.C.W.

Sharp VLC73H

It's unusual with this model to find faults other than the common corroded PSU print problem. But this one was different! The playback picture was marred by an overall

effect that was similar to the black inversion symptom produced by a worn or incorrectly set up video head. The camcorder's recordings were OK when played back via another machine. It seemed unlikely that the heads were the cause of the fault, but they couldn't be ruled out completely.

After much checking I discovered that an 0.01 μ F chip capacitor, C427, was open-circuit. It connects pin 5 of the skew jump PCB connector AG to pin 7 of IC402 (3fC signal). A replacement cured this rather misleading fault. D.C.W.

Minolta 406E

Rewind would fail after running for a few seconds. All other functions worked, and rewind search was OK. The cause of the fault was leakage from the 220 μ F capacitor on the main PCB. A replacement capacitor and PCB clean up restored the unit to normal operation.

The machine is an Hitachi clone. D.C.W.

Sony CCDF375E

The playback fault symptom gave the impression of a defective video head. But the drum was OK. So was the head amplifier assembly, which commonly fails in this and similar models.

After much checking I discovered that the supply to pin 27 of the ATF process chip IC506 was missing (the supply to pin 28 was OK). The cause was C562 and C563 (both 10 μ F, 16V), neither of which are surface-mounted types. They had leaked and corroded the PCB, effectively disconnecting the supply to pin 27. After cleaning and repairing the PCB, replacement capacitors restored normal operation. D.C.W.

Sony CCDFX500E

If the symptom is no playback after one of this series of models has been dropped, check whether the head amplifier connector on the main PCB has become detached from the print. We've had this fault three times recently. D.C.W.

Automatic ADX Control with the Pace SS9000/9200

Martin Pickering describes a simple modification to provide automatic Astra 1D channel selection with these Pace receivers and their clones

In an article last month I described a modification that provides automatic selection of the Astra 1D channels when using a Global Connections ADX-Plus channel expander with an Amstrad SRD400 satellite TV receiver. A more elegant solution is possible with these Pace receivers because, hidden in the menu, there's selection of LNB1 or LNB2. This is not used with single-input tuner receivers. By connecting a 4.7kΩ resistor between link 28 and link 12 on the PCB, this option can be made active. Link 28 will now switch between 0V and 3V depending on the LNB selection in the menu.

Wiring Up

Fig. 1 shows how to add a simple BC547B transistor buffer circuit to provide a 12V output. Connect this to pin 14 of the decoder scart socket (see Fig. 2). Pin 14 is normally connected to chassis, i.e. unused. It should be snapped at its narrow centre point to disconnect it from the board. Solder the wire to the contact above the break.

Note that this conversion can be done without having to remove the PCB from the chassis. I do however recommend that you replace the electrolytic capacitors while you have the covers off. These capacitors die of old age. Failure to replace them results in streaks and lines on the pictures at best, or a modified receiver whose power supply fails when the mains is reconnected at worst. A capacitor kit that contains correctly rated components with instructions is available from SatCure - phone 0589 355 411 or e-mail me at

repairman@netcentral.co.uk

Commercial over!

The LED shown in Fig. 1 is optional. Its cathode can be soldered to the right-hand side of the infra-red sensor housing, so that the light can be seen through the front panel. As an alternative, most 90-channel receivers have a large front panel 'smoked window' that enables the LED to be seen when it's mounted as shown in Fig. 3. There is a small, square solder pad that's connected to 0V. Take great care when you drill the board at this point.

Once you have soldered the extra components in place, check very carefully to ensure that they correspond with

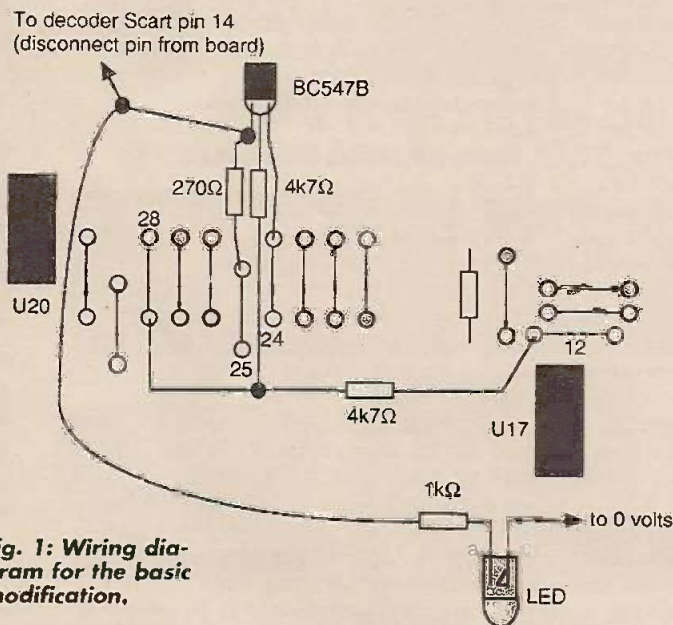


Fig. 1: Wiring diagram for the basic modification.

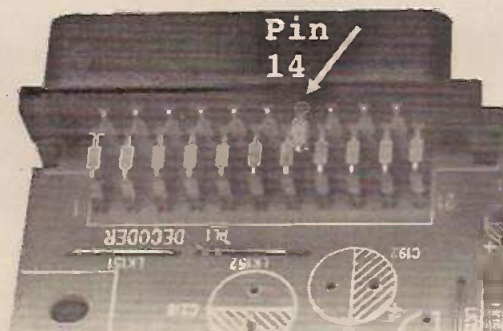


Fig. 2: Where to connect the output from the added buffer transistor in Fig. 1.

the arrangements shown in Figs. 1 and 3. The links on the board are connected directly to the microcontroller chip: a mistake could destroy it.

New Menu Option

Reassemble the receiver and check the second menu screen. A new option, LNB1, should be present.

Make sure that the channel expander unit's silver toggle switch is permanently off. Remove the scart plug from the unit and discard it. Look at the back of the receiver. The channel expander's single connector must be fitted to pin 14 of the decoder socket. That's the fourth hole in the top row, counting from the left (see Fig. 4). This leaves the TV scart socket free for you to use normally should you want to do so. If you use an external decoder, disconnect pin 14 inside the decoder's scart plug and connect the channel expander's control wire to it instead.

Now, each time you go to a channel which you have set for LNB2, the channel expander light will come on and the expander will automatically switch to Astra 1D. Simple! In addition, you can use the timer mode for recording without worrying whether the channel expander will be in the correct mode – it will.

Setting up 60-channel Models

For every Astra 1D channel, press **SETUP** 1 4 7, then **STATUS**. This will select the line that says LNB1. Use the channel up key to change this to LNB2, then press **STORE** twice to store the change.

For encrypted channels, make sure that the internal decoder is selected:

DECODER INT
AV INT

Leave the old channels (which don't need the channel expander on) set to LNB1.

Tune in the Astra 1D channels with the channel expander light on.

Note that when LNB2 is selected the channel frequencies with a standard 10GHz LNB will read 0.995MHz higher than the true frequencies, because the LNB2 input was originally intended to be used with a Telecom Band LNB.

Setting up 90-channel Models

For every Astra 1D channel, press **SETUP** 1 then **STATUS** until you reach the line that says LNB1. Use the channel up key to change this to LNB2, then press **STORE** twice to store the change. Most 90-channel models will select the internal decoder automatically. If you don't see any decoder messages, set the decoder as described under 60-channel models.

Tune in the Astra 1D channels with the channel expander light on.

When LNB2 is selected with a standard 10GHz LNB the channel frequencies will read correctly.

Clones

The Pace Models SS9000 and SS9200 appeared under various other guises, including the Ferguson SRV1, Grundig GIRD2000 and GIRD3000 and the Nokia SAT1500. It's easy to tell – simply look at the markings on the front edge of the PCB (see Fig. 3).

The Philips STU801 differs slightly from the other models mentioned. Set the old channels (which don't need the channel expander to be on) to LNC2. Press **SETUP** 1 then **STATUS** (above **VIEW**) until you reach the line that says LNC1. Use the channel up key to change this to LNC2,

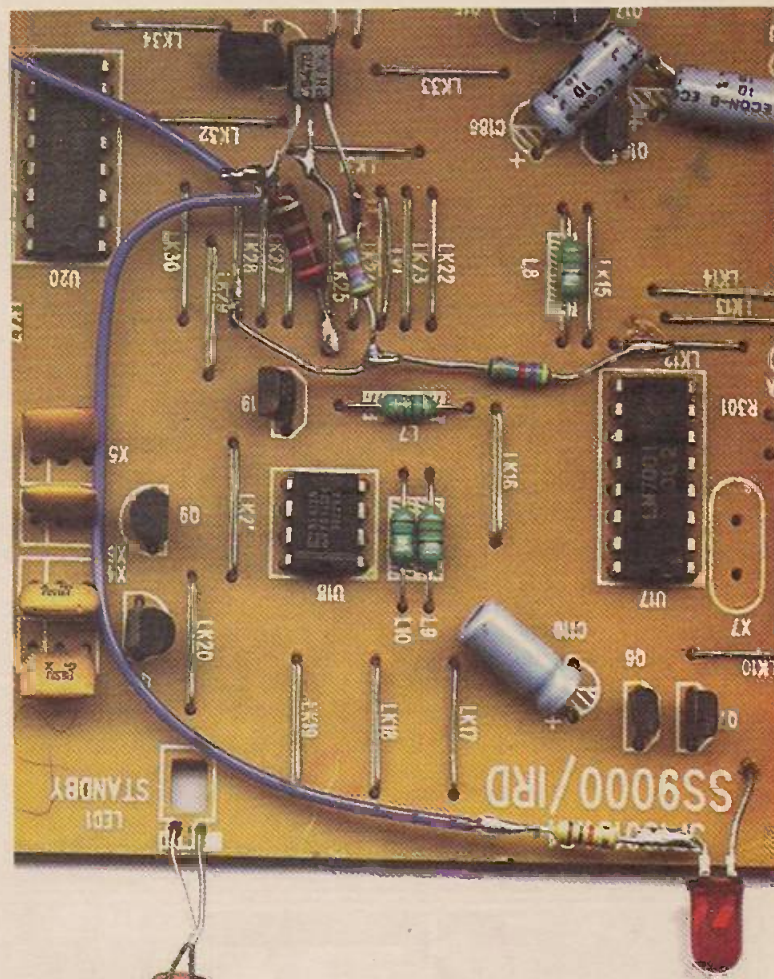


Fig. 3: The completed modification.

then press **STORE** twice to store the change. The operation is the opposite to that for other Pace made receivers. Also make sure that the internal decoder is selected.

LNB Selection

A standard 10GHz LNB is not designed to work at the Astra 1D frequencies or course. Most do, but some give very poor pictures or none at all. An ADX-Plus channel expander is normally set to move all channels up by 500MHz. This brings the Astra 1D frequencies within

Components required

- General-purpose npn transistor, BC547B or similar
- One 270Ω 0.5W resistor
- One 1kΩ 0.25W resistor
- Two 4.7kΩ 0.25W resistors
- One 5mm bright LED
- Thin insulated multistrand wire

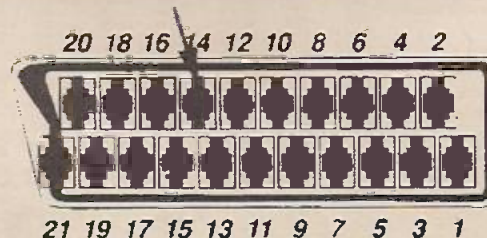


Fig. 4: Where to connect the channel expander's control wire.

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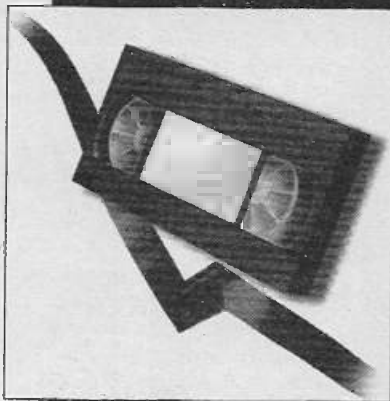
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Reports from
Philip Blundell, AMIEEIE
Terry Lamoon
Roger Burchett
Richard Newman
Bob Longhurst and
Martin Cleaver

Grundig VS920

If the power supply is dead, check C1626 (47 μ F, 25V) by substitution.

If the sound is wowy, with the capstan tending to run slow, try replacing the capstan brake lever before spending time testing the servo circuit. **P.B.**

Toshiba V404

If the machine is dead, with the power supply outputs low and pulsing, replace CP008 (100 μ F, 25V) and CP007 (10 μ F, 50V). **P.B.**

Matsui TVR151

This is a combined TV/VCR unit, and for a change an easy one to get at and work on. The fault was no tape playing. When the video section was removed it was found to be a standard Matsui unit. After replacing the troublesome mode switch and realigning the mechanism, which is very simple, it worked perfectly. **T.L.**

JVC HRD860

This VCR's alignment was all out. According to the customer it had happened after he'd rewound a tape. Once the mechanism had been realigned it worked perfectly, but I replaced the reel and tape sensors to be on the safe side – they often cause problems. I've not seen the machine since, so presumably it has been cured. **T.L.**

Matsui VPA9401 etc

If you get problems on the primary

side of the power supply with this and similar models, it's advisable to replace every semiconductor device and check all the passive components. This should guarantee a long-lasting repair. **T.L.**

Panasonic NVF65B

If the problem with one of these VCRs is low E-E output, don't assume that the cause is the RF converter. It's more likely to be the M51292FP switching chip IC1300. Replacement should cure the problem. **T.L.**

Matsui VP Range

If there's no E-E audio, check C5015 for dry-joints. This is becoming quite a common problem. **T.L.**

Ferguson 3V29/JVC HR7200

After replacing the cassette bulb, which was open-circuit, there was still no illumination. Checks around the circuit produced 12.5V readings everywhere, including the earthy end of the cassette switch. Odd, to say the least. The penny dropped after much checking around the mechacon board: sockets 11-13 (supplies from the regulator board) and 71-73 (main solenoid) had been transposed.

Fitting them correctly produced a lit bulb, but there was no capstan drive. The driver transistor, on the separate motor drive board, was dry-jointed.

Finally circuit protector CP2 was open-circuit, hence no reel drive. Any idea which fault occurred first?! **R.B.**

Philips VR6860

A number of ex-rental VR6860s came my way recently. The BD678 Darlington transistor was faulty in most of the repairable ones. This removes the 12b supply (switched 12V supply to the modulator).

Hence no E-E or playback signals – no test signal either.

This one appeared to be another such case, but a quick check on all the symptoms revealed that there was no display either. The PCF 8571P memory chip 7501 was shorting the data and clock lines to chassis. **R.B.**

Ferguson FV31R

There were no E-E or V-V signals. I found that LW03 (22 μ H) was open-circuit, removing the 12V standby supply (U4) to the power splitter. Unfortunately the owner had 'looked at it' and had neglected to refit the insulating washer under the right-hand PCB's mounting screw. The TA8607P FM amplifier chip IQ40 had objected and died. **R.B.**

Sharp VC750

The complaint with this machine was that it "would sometimes go straight to still in playback or record, then quickly shut down". On inspection I noticed that the idler didn't always reach the take-up reel. A more detailed look at the operation revealed that a lever which is directly driven by a cam didn't go over far enough. The cause was broken plastic in the grease on the cam. The debris hadn't come from the machine. **R.B.**

Hinari VXL6

This machine started to dislike the 47 μ F, 16V capacitors that are sprinkled throughout its circuitry. The cause of no erase was C160 short-circuit, with R164 (22 Ω fusible) open-circuit. There was no record because C212 in the head preamplifier can was short-circuit (record 12V line). Just for variety C145 (100 μ F, 10V) went short-circuit, with the result that the 6V supply to IC104 (drum feedback amplifier) was very low. The symp-

tom this time was that the machine unthreaded immediately after threading. **R.B.**

Philips Turbo Deck

There have been reports that in VCRs which use this deck the new-style head doesn't fit the lower drum spindle. In severe cases, dealers have been replacing the lower drum as well. Here's a tip that may save some money.

When the old head has been removed, try using some rubbing compound on the lower drum spindle. Duraglit or some other metal polish may even work. It's possible that the cause of the problem is slight corrosion because of migration from the old head. If you are careful, the new head should now slide on to the shaft easily, using the special tool. **R.N.**

Ferguson 3V32/JVC HR7655

This old-timer had been running for years with no problems. Then the ravages of time took their toll. First the record function failed, then the machine refused to play a tape. The second fault was easily cured: a new loading belt was required. I fitted a new economy repair kit, which included the turntable rubbers. The machine then worked extremely well mechanically, and the playback picture was of excellent quality. But there was no E-E signal.

Scope checks showed that video was present at the output from the IF board, and that it arrived at the video processing board. The signal entered pin 7 of the BA7001 chip IC201, but it didn't emerge at pin 4. Voltage checks didn't tell me much, and the control switching was OK. A new chip restored normal results. **R.N.**

Philips VR838

This VCR wouldn't accept a tape. When a cassette was inserted there was no resistance and the housing flopped about. The coupling gears driven by the main cam and the worm had sprung apart, because the claws of the red plastic lever were weak and wouldn't hold the gears together.

A new L kit was fitted. This cured the main fault, but a new housing was also required – the original one was bent. **R.N.**

Matsui VX730/Saisho VR3200

The complaint with this machine was intermittent E-E signals. Some careful tapping around the main PCB brought me to the area of the

phono input/output sockets. As there were no obvious dry-joints here, waveform checks were necessary. It soon became apparent that the cause of the trouble was the video input socket. Rather than cleaning it and risking a comeback I fitted a new socket. **B.L.**

Mitsubishi HSB82

E-E and playback suffered from pulling and low contrast. The scart output was also faulty. A scope check on the power supply outputs proved that the cause of the pulling wasn't ripple. Without a circuit diagram, the next step was careful heating of components in the video areas. This produced some improvement. The cause of the trouble was eventually traced to C232 (10 μ F, 15V), which is just behind the video 1 socket. It's a small, metal-cased, surface-mounted electrolytic capacitor. **B.L.**

Saisho VR1600/Matsui VX880

After a straightforward service I found that there was no playback colour. E-E was OK. Mindful of Panasonic power supply faults, I started off in this area. Bingo! C08 (100 μ F) looked stressed. When it was replaced the playback picture had good colour. **B.L.**

Ferguson 3V35/JVC HRD120

The channel selector LEDs lit up but not the red power LED. Checks in the power supply showed that the switched 9V output was low. The always 9V output was OK. Although the relay produced a healthy click when power-on was operated, the contacts for this line were not very healthy. Carefully cleaning them with fine emery paper and slight bending cured the problem. **B.L.**

Panasonic NVHD610

This VCR came in with a dead power supply. The field engineer had replaced the 1A fuse F1, which had soft-blown. After doing this the power supply was still dead but various resistors were glowing hot!

On inspection I found that C1117 (0.1 μ F, 50V) in the slow-start circuit had blasted in two, Q1101 (STP3N60FI-M) and IC1101 (TDA4605-3) were short-circuit while R1114 (0.75 Ω) and R1119 (220 Ω) were open-circuit. R1114 is the primary current sensing resistor – R1119 is connected from pin 1 of IC1101 to chassis. Having had this fault before with

Philips VR231 and clones

There has been comment in the magazine about poor picture quality with these machines. While the cause can be worn video heads, there are other possibilities. Here are a few things to check first:

- (1) That the tape guides, all heads and the lower drum knife edge are clean.
- (2) That the back tension is correct.
- (3) That nothing in the tape path causes tape creasing. Check especially the fixed guide between the ACE head and the pinch roller.
- (4) That the tape moves across the CTL head correctly and is not riding up or down. Test by selecting reverse search then play. If in doubt, scope the CTL pulses.

If the power supply is the type that uses an SPH4690 IC, add a 33 μ H coil (part no. 4822 157 53006) in series with inductor 5204. This should reduce the dots in the dark areas of the picture, and help the auto-tracking system to find the off-tape FM amongst the power supply hash. Watch out for poor electrolytic capacitors as these machines age.

Put the machine in the service mode (method varies with the make and model) and check the X position of the ACE head as laid down in the manual.

If the drum has already been replaced, use the Mylar shims supplied with the new head as a feeler gauge to check that the upper drum to lower drum gap is correct.

When replacing the drum, beware if the old one is tight on the shaft. If the securing screw has been over-tightened, the motor shaft can be scored with the result that the new head jams as it is fitted. Make sure that the shaft is clean and undamaged. If there is slight damage, careful application of fine abrasive paper may remove the scoring. Otherwise a new lower drum/motor will be needed. Later video heads have a triangular circlip at the top and bottom of the drum instead of the single-screw fixing. A special tool (part no. 4822 395 90977) is required to release this type of drum.

If the tracking is OK at the top and bottom of the picture but the FM dips at the centre of the screen, the lower drum is probably worn.

As long as the machine is picking up the CTL pulses all right, the auto-tracking should search three times then go into play in the best position it has found. If the off-tape FM is low or the CTL pulses are intermittent, the tracking comes to the wrong conclusion. If it goes past the best position, pressing play when the best place is found during auto-tracking will result in play continuing at that tracking value.

Remember that these VCRs use narrow video heads that are optimised for LP use, not SP. **P.B.**

these modern machines we had the parts in stock. Service departments wishing to be prepared may wish to order the following: C1117 part no. ECQV1H104JM; R1114 part no. ERX12SJR75; R1119 part no. ERDS2FJ221; IC1101 type TDA4605-3; Q1101 now type STP3N60. **M.C.**

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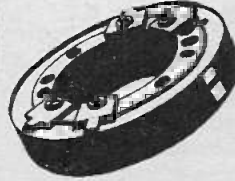
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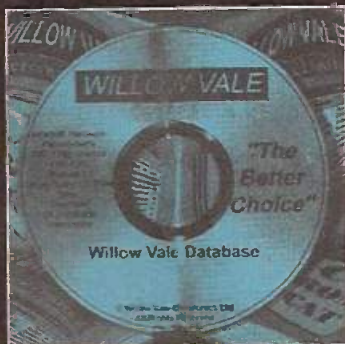
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TELETOPICS

Satellite Television

Nokia has launched the first digital satellite receiver to be marketed in the UK, the Mediamaster Model DVB9200S. It's a 'free-to-air' unit able to receive unencrypted DVB transmissions. Ex-patriots who wish to tune in to programmes from abroad are expected to be the main purchasers, at a suggested price of about £530.

The proposed alliance between BSKyB and the German digital TV company DF-1, part of the Kirch group, has been called off. This has upset Rupert Murdoch's plans to enter the German pay-TV market. It has also left the fledgling German digital TV market in disarray. DF-1, the first to start up, has not been a success to date – it is estimated to be costing the Kirch Group DM1m a day. So far it has attracted only some 30,000 subscribers, way behind forecasts. There is at present a lot of jockeying between prospective players in this field.

Eutelsat has confirmed that it will be launching a commercial multimedia service based on the DVB standard later this year. Several such services are already being operated via Eutelsat, including DirectPC and Net On Air.

A number of plans to offer systems which bring together digital broadcasting and data transmission have been announced recently. SES, the Astra parent company, and chip maker Intel have

formed a new company, European Satellite Multimedia Services (ESM), which aims to bring multimedia material to PCs via satellite. The two companies are investing \$15m in the project, with SES holding the major share. ESM will launch a new communications system called Astra-Net, using the Astra satellite system to deliver a wide range of services to home and office PCs at speeds much faster than a standard telephone line. Internet material and Web pages will be included. Phone lines will complete the two-way links. The company points out that with more than sixteen million PCs sold in Europe last year and almost twenty three million households having direct access to Astra there is wide acceptance of the technologies involved.

Philips has developed the CleverCast PC system, which offers high-speed multimedia data broadcasting to PCs. In the USA, PointCast and Microsoft have developed what they call Webcasting technology. PointCast is offering royalty-free licences to publishers with a Web site.

Over six million homes in the UK can now receive Astra satellite TV either directly or via cable: this is the equivalent of one in four homes. According to Astra a further 720,000 homes were added last year.

Funke Antennen has added a 47cm dish to its range of 60 and 90cm models. Efficiency and durability were the main aim in developing the new dish, to meet the need for smaller models suggested by Astra. The dish is made of pre-lacquered steel or aluminium, and can be mounted on a range of different attachments. The connection cable is fed through the head support, which is made of round, hollow aluminium tubing. Funke Antennen has also introduced a new shielded module system for use in setting up small distribution systems. For further information on these products phone +31 (0)411 672 440.

Pacc has developed a new satellite radio receiver, Model MSS331-G DMX, for the reception of DMX and Astra Digital Radio channels. A suggested price has not been announced.

Below: The Funke Antennen 47cm dish.



Changes at the BBC

The BBC has sold its 738 transmitter sites in the UK to Castle Transmission Services, a consortium headed by Castle Tower of Houston. The BBC is to receive £244m, which it will invest in digital production technology and related operations. As part of the deal, Castle Transmission Services will transmit the BBC's analogue TV and five national radio services for ten years. Now that NTL, which transmits the ITV services, is US

owned the entire UK transmitter network is in foreign hands.

The BBC has also entered into a joint venture with Flextech, a media company 51 per cent owned by Tele-Communications Inc., the largest US cable company, to establish eight new digital pay-TV channels in the UK. Flextech is to contribute £20m for a fifty per cent stake in the venture, which is to run for thirty years initially. The BBC will not have to contribute

any cash. Instead, it will provide the programming, while Flextech gains access to the BBC's vast programme library. Some channels will be run jointly by the BBC and Flextech, but with BBC editorial control. There will also be two channels under sole BBC control: these will not carry advertising. Programmes funded by the BBC's licence revenue will always be shown on BBC-1 or BBC-2 first.

Cable Television News

The three largest UK cable TV operators, Telewest Communications, Bell CableMedia and Nynex CableComms, have appointed General Instrument (GI) as their main supplier of digital TV equipment. The groups plan to launch digital services, with many more channels and interactive TV, towards the end of the year. Services such as Internet access, video-on-demand and home shopping are under consideration.

Customers will pay for the services through increased subscriptions. GI is to supply subscriber connection boxes and other equipment. The box requirement is expected to run to hundreds of thousands during 1998, the order being worth around £500m to GI over the next two years.

In a separate move Bell CableMedia and Nynex CableComms are to become part of Cable and Wireless Communications (CWC), which is currently being set up by C&W and already owns Videotron. The deal is a complex one and will leave Bell Canada and Nynex Corporation with 14.2 and 18.5 per cent stakes respectively. Mercury Communications will also be a part of CWC, which will have 1.1m telecoms and 580,000 cable TV customers. Cable and Wireless is to invest £110m on bringing digital TV to its networks.

Product Highlights

Sharp has demonstrated a combined digital camcorder and still camera, the ViewCam Model VLDX1. It takes digital photographs, processes recorded video and photo information separately and can transmit them via an IR interface to a PC or printer. Two separate memories allow a combination of video clips and photos. Launch is expected later this year at around £2,000.

The Mitsubishi HS761VB is the first in the company's new 7 series range of Nicam stereo VCRs, which feature high performance with easy use. New features include insert editing and audio dubbing. The Excellent Picture facility has sharpness, noise reduction and detail enhancement adjustments, with preset settings for different programme types. It's an LP machine that uses Mitsubishi's Just Track four-head system for good LP playback and near-perfect still frames and slow-motion playback in the SP mode.

Toshiba has unveiled its first European DVD player, Model

SD3006D, which includes PAL/NTSC playback and 5.1 Surround sound. It will be launched later this year at around £500.

Toshiba is launching the first UK TV sets that include 5.1 Surround sound. The company's two latest VCRs, Models V857B and V727B, are "Channel 5 ready" – they include an auto-seeking output that finds a free channel, with no interference, for the RF output signal. Prices are £450 and £360 respectively.

Mitsubishi and Grundig have demonstrated large-screen plasma display TV sets. Grundig's 42in. model includes Dolby Pro-Logic and will sell at around £8,000.

Sony plans to introduce a 28in. widescreen Super Flat Trinitron TV set that also has VGA inputs. It will be launched in the autumn. Other new products announced by Sony include a combined VHS/Video-8 VCR, Model SLVT2000, at £900; a compact Mini DV digital camcorder with 2.5in. flip-out LCD screen, Model DCRPC7 at £2,000; and a digital still camera, Model DSCF1,



Telecam Electronics Ltd. has added the "International TV Antenna" to its range of aerials and TV signal amplifiers. The aerial has been designed for wideband operation, using a log-periodic configuration for UHF reception. The elements consist of 95 per cent pure silver printed on to a transparent plastic base. A pair of telescopic rods can be added for VHF reception: when not in use the rods can be stowed away in the base. To minimise interaction, the UHF and VHF signals are combined using a balun and a duplexing filter. For further details contact Telecam Electronics Ltd., 1 London Road, Great Shelford, Cambridge CB2 5DB (01223 578 055, fax 01223 578 054).

at £700 – it can store up to 108 images on a 4Mbyte flash memory card.

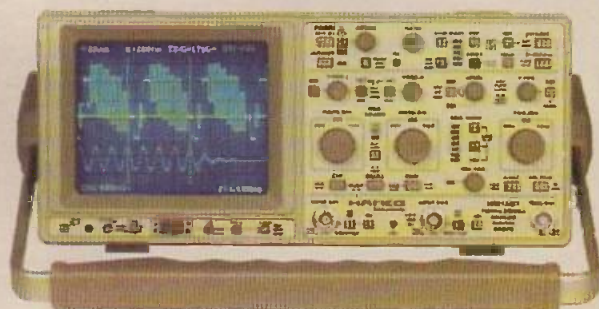
Hitachi is to launch a camera that records up to half an hour of MPEG-1 video or 3,000 still images on a 260Mbyte PC card. It will cost around £2,000.

Increased Ch. 5 Coverage

Channel 5 has been given approval to use UHF ch. 35 for transmissions from a further nine sites. This will make the service available to an additional two and a half million households. The ch. 35 transmitters will be at Bilsdale (H), Darvel (H), Fenton (V), Hannington (H), Kilvey Hill (V), Ridge Hill (H), Sudbury (H), The Wrekin (H) and Waltham (H), with polarisation as indicated.

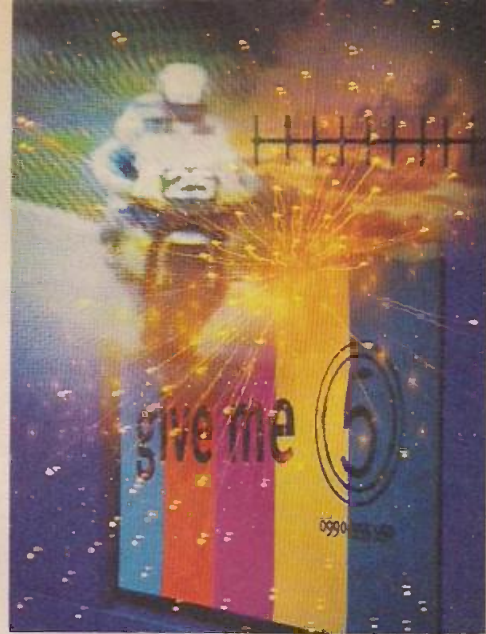
New Hameg Scope

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Channel 5

Reception Guide



The advent of Ch. 5 transmissions could give rise to a number of reception problems of various sorts. Eugene Trundle's pictorial guide has been devised to enable symptoms to be identified and possible remedies assessed



Picture 1: Patterning produced by a carrier clash.



Picture 2: Random colour pattering caused by spurious beat signals.



Picture 3: The effect of downwards mistuning.

Much has already been published, in this magazine and elsewhere, on the new Channel 5 service. Most of it has been concerned with Channel 5's impact on UHF Channel 37. But, as Bill Wright pointed out in the November and December 1996 issues of *Television*, there are many other factors and considerations that may have to be taken into account:

Now that the new service has started, the problems are here to be solved. To help, we have prepared this picture guide. It illustrates the effects that can be introduced by the new transmissions. The pictures and accompanying text will enable you to analyse what's happening and why, and thus assess what can be done in practical terms to alleviate or eliminate problems.

Carrier Clashes

We'll start, as the Ch. 5 retuners have done, with the two basic requirements: to move the UHF output from VCRs and satellite TV receivers away from channels 37 and, soon, 35 (they were previously reserved for non-TV purposes); and to tune in TV receivers to the new service.

The RF modulators used in VCRs and satellite TV receivers don't have sideband filters. Because of this, their output occupies 12MHz of spectrum space – with a sound carrier at each end giving a spiky marker. The new Ch. 5 transmissions would beat with these signals, producing complex heterodyne frequencies. These show on the screen as herringbone and moiré pattering, see picture 1. If

some component of the spurious beating occurs in the colour sub-carrier region (4.43MHz after demodulation), the result is random colour pattering, see picture 2. The effect of all this is mutual: if the locally-modulated (VCR etc.) picture is spoiled, the Ch. 5 picture will probably also be spoiled.

Since the Ch. 5 carrier can't be moved, the frequencies used by the local modulators have to be shifted. The most effective way of 'retuning' is to switch the VCR and/or satellite TV receiver to standby, tune the TV set's number five button to the new Ch. 5 transmission, then switch on the VCR and look for pattering on the Ch. 5 picture. If it's present, tune the VCR's modulator downwards in channel until all signs of interference just disappear. Next select the TV set's VCR channel and, with a tape in the playback mode, retune it to the new VCR output you've set. There should be no pattering. Check the other (BBC/ITV) channels for interference. If necessary readjust the VCR's modulator frequency slightly to clear any pattering present. Retune the TV set's VCR channel to correspond.

If there's also a satellite TV receiver in use, this is where the fun starts! Switch it out of standby while watching the Ch. 5 picture. If pattering is present, leave the TV receiver on Ch. 5 and adjust the satellite receiver's output channel upwards (towards UHF channel 40) until the picture just clears up. Then select the TV receiver's satellite button and tune it for clear satellite TV pictures. Recheck the BBC, ITV

and VCR playback pictures. If you are lucky, they will all be clear of interference. If not, careful, progressive tweaking and a lot of patience may do the trick. Other solutions are available where it's impossible to find enough spectrum space for the locally-generated carriers.

You can disconnect the aerial while watching VCR or satellite TV pictures: you can fit a ch. 37 or ch. 35 notch filter in the downlead, perhaps a switchable one; or you can use a channel-changing unit to move the Ch. 5 signal out of the way. You can replace the satellite receiver with one that has a programmable ch. 21-68 modulator, or the VCR with one that has an alternative modulator channel assignment.

Much better is the use of scart leads (not fully-wired ones) to link the TV set to the VCR and satellite TV receiver. Most satellite TV receivers have two or three scart sockets and the ability to route AV signals automatically by using the scart pin 8 switching line: where relevant, stereo sound transfer also now becomes possible. Use of a scart link avoids the need for the terrestrial signals to pass through the satellite TV receiver. They must be looped through the VCR however, for off-air recording.

This leaves us with only one local carrier (VCR output) to worry about. This is not in use, but there may be a clash between the Ch. 5 transmission and something else that's being recorded. The solution is again to retune the VCR, or use one with alternative output channel settings; to disable its UHF modulator; or to change to a newer model which has a modulator that can be switched off, typically by installation software.

Beat patterns similar to those shown in pictures 1 and 2, though probably less severe, can arise from image (channel $n + 5$ and $n + 9$) effects in the TV or VCR tuner. While those caused by locally-generated carriers may be alleviated by careful tweaking of output channel trimmers, those caused by BBC/ITV/Ch. 5 service carriers cannot. Relief may be obtained by selective attenuation of the interfering signal, or selective boosting of the wanted one, if this can be done within the constraints of noise on the one hand and trouble elsewhere on the other. If not – and it's a fiddly, fussy business – a channel-changer is the solution.

Beat patterning apart, tuning in to Ch. 5 is a relatively simple process

that depends on receiver design – ranging from a rotary tuning knob through seek-and-stab to auto set-up in the newest gear. Where the viewer does it, there's the potential to get it wrong!

Picture 3 shows the effect of downward mistuning, with the picture in black-and-white and lack of detail. This is usually accompanied by a raucous buzz on sound. The other extreme is shown in Picture 4, where the receiver has been tuned too far up band. The result this time is crosshatch patterning in coloured areas, instability, and a 'ringing' effect on vertical edges and outlines in the picture.

Signal-strength Problems

Many of the Ch. 5 transmitters are much less powerful than their long-established BBC/ITV/Ch. 4 counterparts. In some areas the Ch. 5 ERP is only a few per cent of that available with the alternative channels. The result, on screen, is the grain, snow and confetti shown in picture 5. It can vary from hardly perceptible snow to a picture that's barely perceptible because of the snow. If a solution is possible, it consists of increasing the aerial gain. But before you climb the ladder, waving aerials about and dangling amplifiers, take a cool look at the coverage and service area maps. In some places it's just not going to be possible to pull in a sufficiently strong signal to lift the picture clear of the noise.

A long Yagi aerial, narrowly tuned to the channel of interest, has the highest gain. Extra gain can be obtained by adding a masthead amplifier. Tilting the farther end of the array upwards will sometimes add a little to the received signal strength.

In the early days of UHF TV, stacked and phased arrays, with two or more aerials, were used to pull in weak signals – a 3dB increase for a lot of money. Maybe this would offer a partial solution where Ch. 5 is required and cost is of not too much concern.

When you are scraping the bottom of the barrel to maximise gain, it's surprising how much the noise figure varies between different makes and types of UHF tuner: switching between TV- and VCR-received pictures from the same transmission will often show this up.

The opposite situation is an over-strong signal. This problem is unlikely to occur with Ch. 5 transmissions, except in locations in close proximity to a newly-estab-



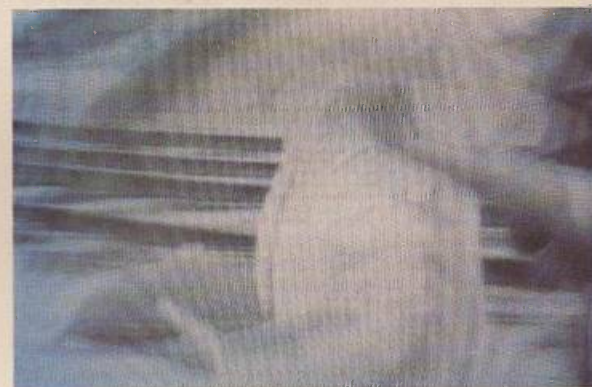
Picture 4: The effect of upwards mistuning.



Picture 5: Grain, snow and confetti because the signal level is low.



Picture 6: Cross-modulation, caused by excessive signal strength.



Picture 7: RF overloading, again caused by excessive signal strength.



Picture 8: Effect of local interference on the picture.

lished, powerful transmitter – perhaps at Croydon, Burnhope, Mouteagle or Lichfield. Excessive signal strength can cause cross-modulation and RF-overload effects. The many possible forms are represented by pictures 6 and 7 respectively, though cross-modulation can produce images similar to those resulting from co-channel interference and carrier beating (see pictures 9 and 1 respectively), while overloading produces a whole raft-full of symptoms in different makes and models in addition to the black-and-white, sideways-pulling effect shown here – some sets exhibit a ‘wipe-out’ effect, or default to a plain coloured raster.

In this sort of situation the need is for signal attenuation. Check on the effect of any local/distant (local/DX or high/low) switch at the back of the VCR, then if necessary try a coaxial attenuator in the downlead. Careful adjustment of the AGC cross-over (RF gain) control in the receiver may help, but it will sometimes be necessary to reposition or change the aerial to overcome this problem.

Signal overloading is more likely to be experienced with reception of the established broadcasters or where extra RF amplification has been added in the aerial line in an

Picture 9: The effect produced by co-channel interference.



attempt to equalise the signal levels with a weak Ch. 5 transmission. The best solution here, though it's not an easy one, is selective amplification of the Ch. 5 frequency, with or without its own separate aerial array.

Interference Effects

Where reception is poor, as will often be the case with Ch. 5, it is more susceptible to interference of any sort, from local or distant sources. Local interference is represented by picture 8, where streaks of ragged dots and dashes are visible in the lower half of the screen. This type of pulse interference is generally caused by sparking or arcing. On a momentary basis this may come from a thermostat, a mains switch, fluorescent lamp start-up, etc. More prolonged interference can be produced by electric motors of any type, vehicle ignition systems and such like.

The stronger the received signal, the less likely is interference intrusion – in weak signal conditions the receiver's gain will be at maximum, magnifying the effect of any pulse interference present. But the best way to tackle this problem is to suppress the interference at its source: it's seldom possible to do anything at the receiver. The offending item will usually be old, worn and made before the increasingly demanding EMC standards that are now imposed. In practice, suppression very often means replacement.

The interference shown in picture 9 is of an entirely different type. It's the on-screen effect of co-channel reception. This was once the occasional result produced by a high-pressure weather system when viewing BBC/ITV programmes. With the advent of Ch. 5 transmissions it has become, in the transitional period at least, an everyday feature of viewing in some parts of the country. Our picture shows a very severe case. Milder forms produce black, floating venetian-blind effects on the picture, generally with noticeable vertical and/or horizontal bars that mark the line and field intervals of the intruding signal when it carries a different programme.

Co-channel disturbance may upset Ch. 5 reception or reception of one of the established services. It stems from UHF channel sharing by transmitters whose coverage overlaps. It's unlikely to be caused by Ch. 5 transmissions in chs. 37 or 35 except in areas, such as the

North Midlands, where two of the new transmitters can be received at one site. In this case the interference will be of the floating black bands type, without the heavy horizontal bar present in our picture – this is caused by scan-phase differences between the two different programme sources. In areas where the Ch. 5 transmissions share UHF channel slots with a BBC or ITV transmission, either of the services may be disturbed.

This is not an easy problem to deal with, particularly as the level of the interfering signal has to be reduced by 43dB or more with respect to that of the wanted signal. The key to eliminating the trouble, if it can be accomplished, is to maximise reception of the wanted carrier while minimising the presence of the intruder. The aerial is the important thing here – its type (for high directivity/narrow beamwidth), alignment and positioning. The Yagi type aerial has greatest directivity and highest gain, but in cases where high gain is not required and the two transmissions come from opposite or nearly opposite directions the bowtie/grid type of array offers good suppression of signals coming from the rear.

Having got on to the subject of aerial types and characteristics, we should perhaps add that the third main type of aerial array, the log-periodic, is no great performer with respect to gain and directivity. Its advantage is wide bandwidth, which is useful where the Ch. 5 transmitter is co-sited with but not in the same group as the existing channels and the signal strength is reasonably good.

Nulling out co-channel interference is almost as much an art as a science.

Multipath Reception

Perhaps better known as ghosting, the effect shown in picture 10 arises when the signal reaching the aerial comes via two or more paths. The longer paths will consist of reflections from walls, trees, pylons or hill sides. Because of this propagation delay, one or more false images, in positive or negative form, appears to the right of the directly received image. It's seldom possible to remove the reflective surface (viewers in North East London would love to demolish Canary Wharf Tower!), so it's again a matter of aerial choice and alignment. The problem is most likely to arise where a Ch.

5 signal that comes from a site other than the local BBC/ITV one is received using the existing aerial system.

In some situations aerial realignment may provide at least a partial cure. In others a new aerial may be required, perhaps a log-periodic or grid type where the reflections come from the back of the array. In difficult cases it is not unknown for the aerial to be aligned for reception of the reflected rather than the direct signal, or to use a nearby wall as a shield. With time and trouble, two aerials stacked and carefully phase matched can help. As with co-channel problems, this is an art as well as a science.

The solution is most often to use a separate aerial for Ch. 5 reception. The aerial's gain, directivity and beamwidth are important, and it must be correctly aligned with the new transmitter. Its output must then be spliced into the existing download using a channel-pass filter or diplexer.

Picture 11 shows a more subtle multipath reception effect, once known as 'ringing'. The intruding image appears as a single halo close to the right of vertical edges – look at the elephant's ears. In short, sharp doses the effect can actually seem to improve the sharpness of the picture – it's used deliberately for this purpose in some domestic VCRs. As a fault condition, caused by slight mistuning or a single close reflection, it can make small captions hard to read, reduce the definition of fine, repetitive detail, and play havoc with teletext and Nicam reception.

Reflections of this type can also be caused by feeder damage, poor download connections or mismatching, or faults within the receiver (defective delay lines, SAW IF filters etc). These problems do not just affect Ch. 5 reception of course.

Where the problem arises before the feeder, its cause is likely to be reflection from a very close object. This is common in lofts. A small aerial reorientation will usually cure the problem.

Another form of multipath reception doesn't necessarily show up as multiple images. Instead it attenuates the signal on one or perhaps two channels only, giving the snowy effect shown in picture 3 – it was once known in my neck of the woods as 'suck-out'. Viewers may suspect an imbalance in the signal levels from co-sited transmitters. The cause however is a

reflected, out-of-phase signal – from the ground, a nearby aerial, wall, chimney, steel joist or whatever – that partially cancels a wanted, direct signal. In the odd, extreme case it may be necessary to use vertically-stacked, phased arrays. Usually however slight repositioning of the aerial will cure the problem. Beware of this possibility when you install a new Ch. 5 aerial close to an existing BBC/ITV one.

Data Corruption

Very close reflections that give rise to virtually unnoticeable picture defects can nevertheless badly upset the decoding of data pulses such as those used for teletext and P.888 subtitles. Where the temporal ghost spacing is comparable to the data rate (145nsec for a positive echo, 290nsec for a negative one) the zeros and ones run together, blurring the distinction between them. This makes discrimination and decoding a hit-and-miss affair.

Except in very bad cases, the heavily Hamming-protected header line at the top of the page comes through unscathed. Minor corruption is indicated by blanks in the text. As conditions worsen, incorrect symbols and attributes occur. Both effects are shown in picture 12. In practice, their severity varies between channels.

The same situation can occur with Nicam reception, whose data rate is 728kbits/sec. In this case the symptoms are crackling and dropout of the stereo sound, with intermittent reversion to the mono FM signal, again varying in severity between channels.

The other defects described in this guide can all upset teletext and Nicam reception. Except in the special case of close reflections, the data decoding problems are usually accompanied by obvious picture defects of the sorts shown in the other off-screen shots. When the picture problem has been cured in one of the ways already described, correct teletext and Nicam operation should, hopefully, be restored.

In Conclusion

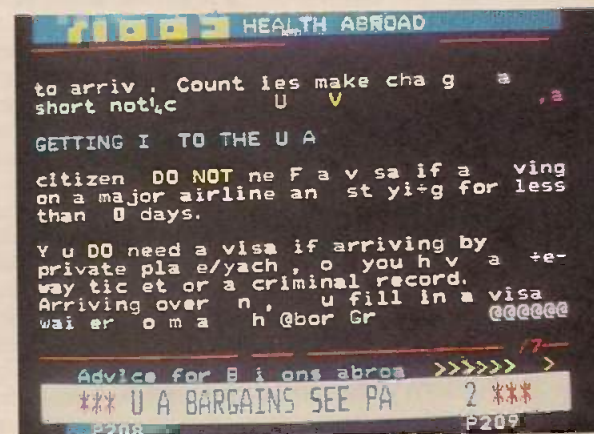
This off-screen fault guide has been prepared to help you pinpoint the causes of the several strange effects that could arise from the new terrestrial TV service, giving you some clues to go on. No doubt many specific cases and cures will be reported in these pages over the coming months for us all to share.



Picture 10: Ghosting, caused by multipath reception.



Picture 11: Ringing, another effect produced by multipath reception.



Picture 12: Teletext corruption caused by multipath signals.

Meanwhile the pictures here, used on the shop or service reception counter, may help your customers to identify and describe fault symptoms when they report them.

Go forth, with ladders and twiddlers in hand, and don't be afraid to charge a reasonable rate for your professional services. Whatever you make won't be a fraction of that creamed off by other interested parties who didn't have to face angry viewers, climb ladders in the rain, and do the near impossible.

Joe Cieszynski feels that NVQs could make a positive contribution to the Brown Goods servicing industry, while recognising that there will be many problems in implementing them

NVQs

The Way Forward

In his forum article "NVQs – A Nightmare" in the March issue Steve Beeching outlined the Domestic Appliances NVQ system which is about to be imposed on the domestic servicing industry in the UK, and drew attention to various problems that could or will arise. I would like to add some further comments on this important matter.

Some readers may recall an article I wrote in the June 1994 issue of *Television*. It was intended as a forewarning of things to come, based on my experience of implementing NVQs in intruder alarm installation and maintenance. The domestic servicing industry can learn much from the experience of others who have had NVQs in place for several years now. Bear with me as I start with a brief case study of the Intruder Alarm Systems NVQ, so that I can go on to point out not just the pitfalls but also the positive advantages of NVQs.

The Intruder Alarm NVQ

I can still recall my first impressions of these NVQs as I contemplated the sheer volume of assessment required to achieve even a level 2 (basic) qualification. I felt that the industry had created a qualification that would be far too bureaucratic and expensive to implement. Four years and many hours of hard work later, this view has been borne out. I was recently invited to attend a meeting of the security industry's

Training Managers Forum, where with a unified voice the industry was calling for a major review of its NVQs.

The majority of colleges did not take up the security NVQ, because they couldn't see how it could possibly be implemented within a college context. As a result, the industry lacked places to send its trainees – because the funding bodies (TECs) that hold the purse strings of further education will fund only courses which lead to an NVQ. A few colleges, including mine, did however take up the challenge. We managed to implement a very effective training and assessment programme – by using a great deal of creativity and imagination.

Perhaps suppliers could make available dummy accounts, with which candidates could place orders without the parts ever being dispatched.

College Implementation

We were able to assess alarm engineers to the standards required by moving the assessment out of the workshop and into other areas of the building, such as motor vehicle body repair, refrigeration, gas appliance servicing, etc. Thus fault location for example is in a genuinely real environment with real customers, real hazards and real documentation. Thanks to strong support from the security industry, we have live digital communicators that signal a central monitoring station, while BT has given us a REDCARE communication link. Thus the systems on which candidates work are as real as anything they will encounter when employed, with the added bonus that we can control the assessment and introduce problems, both technical and administrative, to ensure that the full requirements are covered.

The security industry is so impressed with what we and a few other colleges have been able to achieve that it accepts our assessments as real and not simulated. It has been acknowledged that these few colleges are the only ones to have made any headway at all in implementing NVQs for this industry.

Industry Implementation

Companies have found that the cost of carrying out assessments themselves is prohibitive, especially in the current situation where workforces are minimal and overstretched. Supervisors, on whose shoulders the burden of assessment is supposed to rest, are far too busy to run around with a clipboard ticking hundreds of boxes just to see one candidate achieve a level 2 NVQ.

Implications for Domestic Servicing Industry

What then are the implications for the domestic servicing industry?

First, remember that funding for the current C&G 2240 Electronics Servicing course will be cut when the NVQ comes on stream. So unless the NVQ is somehow made accessible through colleges, we will be left with no option but to discontinue most training in domestic electronic servicing. People who wish to undertake such training would find themselves having to attend other, more general electronics courses in order to learn the fundamental electrical/electronic theory, and perhaps resort to books or distance learning packages to pick up



specialised TV, VCR, Audio or other theory.

Will it be possible to make the NVQ more accessible through colleges? Steve Beeching suggests that this would be very detrimental to the industry, because an NVQ is an assessment of competence in carrying out set tasks rather than a training course. He suggests that colleges could take this as an opportunity to train cowboys to "wave soldering irons" (shouldn't his be branding irons?!) in the air. But it's a fact that the majority of lecturers in colleges came from the industry, and that many – like myself – take steps to keep up to date not only with developments in theory but also the practical side of modern servicing. So a college that is aware of the operation of a modern service department could possibly, with the type of support from industry we've had in the security business, be able to create suitable conditions to train and assess many skills to the required standards.

Support from Industry

What sort of support would be needed from industry? Equipment is one thing. NVQs quite rightly require that training is done with modern equipment. But colleges cannot afford to buy a range of Nicam TVs and VCRs, camcorders, CD players and so on in addition to the service information required. If industry wants training to this level, it must be prepared to help with the provision of such equipment, either on a permanent or loan basis.

Component suppliers could also assist. Steve highlights the difficulty of simulating spares ordering. Perhaps suppliers could make available dummy accounts, with which candidates could place orders without the parts ever being dispatched. We would be going beyond simulation into the real thing with the use of catalogues/CD-ROMs and placing orders by phone, letter and computer link. For the supplier there's the spin-off that people are being trained to use their catalogues, leading to possible future customers – security equipment manufacturers have benefited a lot from the support they have given our college over the years.

Assessing on Site

The main difficulty will be in assessing a candidate's interaction with customers. From my experience in assessing security engineers, there's no substitute for the real thing. To use other students or college lecturers in role-play is simply not the same. So this will mean assessing on site, which is a wonderful idea until we examine the consequences.

Suppose that an assessor is to be paid to shadow a candidate for a morning. This may cost up to £100 in assessor's fees. And how can we be sure that customers will be happy to allow an assessor to enter their premises? If

he's introduced as an assessor, the customer may feel that an unqualified engineer has been sent out to service his equipment. Furthermore when a customer with a grievance, or just a plain awkward one, is encountered, he might try to use the assessor to intervene, thus altering the outcome. This whole business is a real minefield, though a tactful assessor can handle some of these difficulties. I've had some very interesting experiences with on-site assessment – perhaps one day I'll write a book called "Confessions of an NVQ Assessor"!

Experience

Steve points out that the NVQ is intended for engineers who have had enough experience to undergo assessment. This implies that he/she has been involved in servicing for several years, otherwise the necessary skills and experience would not have been acquired. In one sense this is correct, but when we take into account the funding restrictions we find there's an expectation that all students will have attained level 2 within two years. Admittedly they then have until the age of 25 to attain level 3, but this is not of much help to someone who enters the industry later in life. There is currently very little funding for the assessment of existing engineers.

Assessment in Industry

This brings us to how existing engineers are to be assessed. The idea is that every company will have its own assessment facility. To achieve this however a company will have to pay a few hundred pounds to have someone trained to be an assessor – to attain what is known as the D32 and D33 certificates. Someone else must then be trained to be an internal verifier (D34 certificate). His job is to check on the assessors constantly. At this point, for a fee, the company can attain centre approval and the assessment of the other engineers or trainees can begin.

The problem here is that in the domestic servicing industry most of the firms are small and have not the time, manpower or money for all this. Perhaps they could buy in an assessor. This might be possible, but who would it be? It's highly unlikely that a trained assessor from a rival company would be acceptable, so the assessor would have to be a freelancer or someone from a college or other training establishment. However this is done, the cost would run into hundreds of pounds – provided the candidate is successful in every assessment on the first attempt.

If industry wants training to this level, it must be prepared to help with the provision of such equipment, either on a permanent or loan basis.

In reality then will existing engineers bother to undergo NVQ assessment? After all the majority already have a qualification, and there's currently no advantage in acquiring an NVQ.

Standards

Now to Steve's point about the danger of colleges lowering standards. This is a bit unfair, because companies could do just the same. There is evidence that this has, in isolated cases, happened in the security industry. But because this industry has an adequate team of external verifiers who make regular checks on all assessment centres, such practices do not go unnoticed for long. We should however remember that it is very tempting for an assessor who is a member of a particular company to pass work that is not to standard, because he is too busy to keep repeating assessments or is under pressure from above to get people through – the company can then boast that it has a fully qualified staff. A system in which the assessor is not independent must, I feel, be fundamentally flawed.

Personal Note

Personally I've become something of a convert to the NVQ system, having seen it at work in the security industry. The principle that someone is not considered to be qualified until he has proved himself in all practical aspects of the job is sound. On-site assessments take into account many things that will never occur in a college or training establishment. And the fact that each candidate is tested on all aspects of the job and not just his technical knowl-

edge is a real step in the right direction.

In the security industry, NVQ has brought together for the first time installers, manufacturers and colleges. Perhaps this has had a greater impact on the industry than the NVQ itself, because there is the opportunity for the industry to make colleges more aware of its needs. Colleges can in turn provide what the industry wants, and the whole programme can be underpinned by support from the manufacturers (and other related industries, such as BT and monitoring stations) who provide not just equipment but also technical support, product specific training, software, etc.

To be fair to the Brown Goods manufacturing industry, support of this type is already in evidence. Our college has received much support from two manufacturers in particular – so much so that we are now all set to "go NVQ". If the introduction of the NVQ in our industry results in an increase in such relationships throughout the country, this can only be of benefit to everyone.

In Conclusion

The main problem with the NVQ is that it is simply too expensive to implement. In the end, a compromise will perhaps be necessary, with the majority of assessment performed in colleges (but still to modern industrial standards) and a smaller amount of on-site assessment to test skills such as customer relations.

Let's hope that in three years' time we will be able to show a far better performance than just 85 successful candidates, though with the heavy emphasis on assessing things other than fault diagnosis I wonder whether this will be possible.

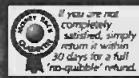
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Book Reviews

Television Microprocessor IC Data Files, compiled by John Edwards, published by Butterworth Heinemann Limited under the Newnes imprint. 240 pages 156 x 234mm. £14.99.

This book is a companion to *Television IC Data Files*, by the same author, which we reviewed in the January issue. Its aim is to provide workshop technicians and field service engineers with a convenient reference to signal processor and microcontroller chips commonly encountered in TV and video equipment. For each chip there's a pin layout diagram which also tells you the conditions and voltages to be expected at each pin. Just the information you need to check a suspect chip quickly.

It's handy to be able to refer to the clear, well laid out pages of this book instead of having to search through a service manual or a complex circuit diagram for the information you require. And it could save you the cost of many an expensive manual. The measurements and data provided in the book were all taken by the author under actual working conditions.

The book can be obtained from:

Customer Services Department,
Heinemann Publishers Oxford,
PO Box 382,
Halley Court, Jordan Hill,
Oxford OX2 8RU.

You can phone orders to 01865 314 301 or fax 01865 314 029. The book should prove to be a worthwhile investment. J.A.R.

The Communications Miracle, by John Bray. Published by the Plenum Publishing Co. Ltd., New Loom House, 101 Back Church Lane, London E1 1LU at £17.50.

In this book John Bray traces the history of electronic communications from the pre-birth era when the fundamentals of electrical and electromagnetic phenomena were first being discovered, in the 1700s, right through to the present world of digital satellite and fibre-optic communications.

The book has been well researched, and the author draws heavily on the personal experience he gained during over forty years spent with the British Post Office (later British Telecom), primarily as a research engineer. Amongst other things he was involved in the development of microwave radio relay systems, international agreements on RF allocations through the CCIR, and the building of the Goonhilly Downs earth station for the first Telstar transmissions in 1962.

In the author's words, the book is aimed at "the innovators of tomorrow, in the hope that the innovators of yesterday provide inspiration to them to match the communications needs of the future". It succeeds in bringing out both the romance of the story of communications and the pioneering spirit of the men who played key roles in the tremendous developments that have taken place over the years. The book is well set out, with short chapters that keep the story moving along briskly.

Overall, this is a worthwhile read for anyone who is in any way involved in the electronics communications industry. J.C.

European Scrambling Systems – The Black Book. Fifth edition, by John McCormac. Published by Waterford University Press. £34.

John McCormac's first Scrambling Systems book appeared over eight years ago. Such is the pace of change that we are now into the fifth edition. During these years TV signal encryption has become more and more complex, as programme providers have put increasing effort, research – and desperation – into attempts to prevent unauthorised viewing of their output. But within quite short periods pirates have, through ingenious electronic wizardry, found ways of getting round the latest encryption techniques, then selling illegal cards/decoders on the open market.

The author presents an accurate, factual account of the TV encryption techniques at present in use across Europe. The first simple encryption (SAVE) simply reversed the video polarity. Then an integrated sinewave was added to the video signal. This technique was used for the first UK film channel, Premiere, and for several months when Red Hot Dutch first hit the air waves.

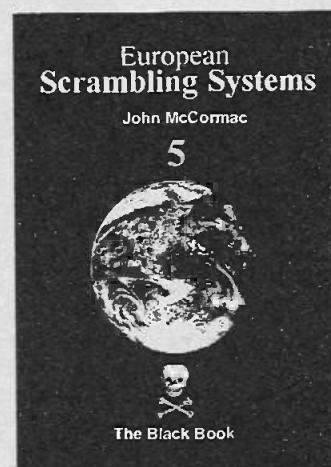
In addition to covering the basics, John McCormac charts the history and progress – the various techniques, who used them and when. There are many circuit diagrams throughout the book: a massive section is simply entitled "Decoder Building Blocks" – enough said!

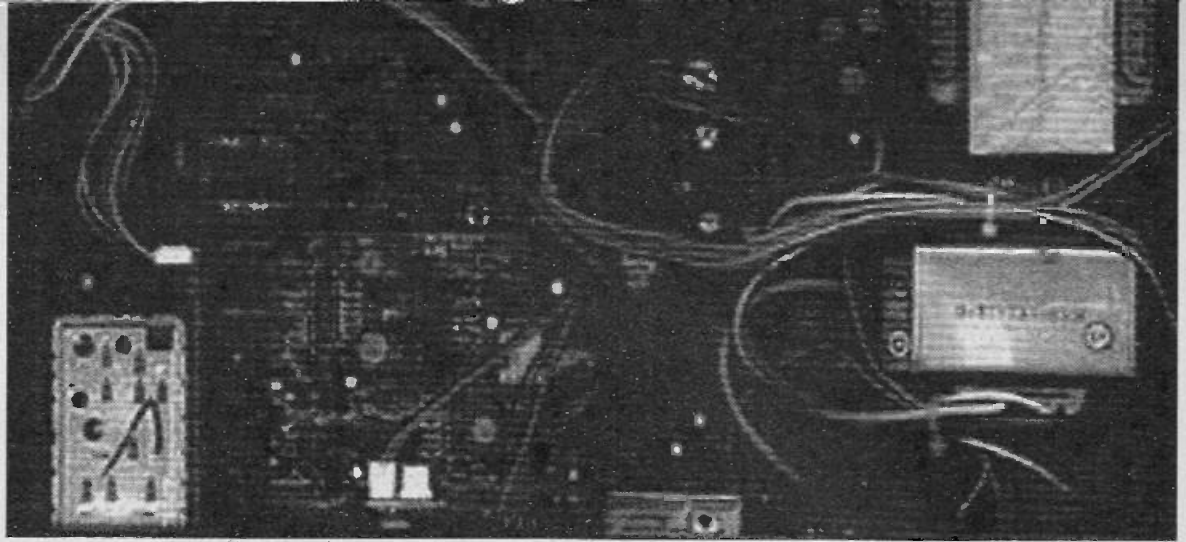
Simple analogue encryption moved to more devious schemes – line shuffle, addressable subscription bases and smart cards. This is the history of Sky TV's scrambling. VideoCrypt 1 and 2 and the many card issues are all covered in detail. The Sky problems make an absorbing read. There's "Black Tuesday – the death of the 09 card", and how a card hack data bank at a Web site was used with the Phoenix/Season interface – you need to read the book to get to grips with all this.

The section that deals with microwave TV distribution systems (MMDS) will be of specific interest to readers in Ireland. John comes up with aerial and downconverter designs and other electronic hardware to enable the 2.5GHz signals to be resolved.

Personally I find the text rather hard going where it concentrates on computer technology – algorithms and so on. But those who have grown up with the technology should be more at ease. Despite this, the story is fascinating and, like pirate radio in the late Sixties, exciting.

Something I'd like to see in the next edition is a page numbered index: at present it takes quite a time to check through the book to find the information you want. It's nevertheless an excellent reference work which I can highly recommend. £34 may sound expensive, but that's what you have to pay for such a specialised work. You can obtain it from Swift Television Publications (phone 01793 750 620) or Baylin Publications (phone 01836 582 785). Add 10 per cent for orders from continental Europe, 30 per cent for orders from elsewhere in the World (the book is heavy to send by air mail). The book has some 580 pages in soft card covers. R.B.





Satellite Notebook

*Reports from
Hugh Cocks
Michael Dranfield
Bob Longhurst
Pete Haylor and
Hugh Allison*

LNB Problems

The winter months produced an abundance of LNB problems. After a time the O ring beneath the plastic feed cover seems to compress a little. As a result, water gets into the feed, more often than not killing the LNB. The same compression seems to occur with the rubber ring that seals the cover plate.

For long-term reliability with a new installation it's a good idea to remove the feed cover and smear some grease around the O ring. This should prevent the ingress of water – the cover can normally be removed by twisting it off the feed. Removing the main cover and doing the same here will invalidate the warranty however.

I notice that the latest universal LNBs from Cambridge have a packet of silica gel inside the main cover to absorb moisture, so manufacturers are aware of the problem. These LNBs seem to be identified by a warranty seal. Presumably the thinking behind this is that the silica gel will absorb moisture during the warranty period! H.C.

Pace SS9200 Decoder Problem

A customer complained that "your card is invalid" was displayed on the TV screen, and that the same thing happened when he tried the card in a friend's decoder. Suspecting that the card had been killed by an intermittent high-voltage supply to the decoder board, I cut the centre leg of Q16. This removes the 27V supply to the BD139 switching transistor, so that it can't reach the card – the supply is no longer required.

The supply was probably

intermittent because of poor contact between the decoder board and the pins that come up from the main board. These were cleaned and their soldered contacts to the main PCB were checked. So far the new card is OK! H.C.

BT SVS250

If the decoder stops decoding and the "please insert card" message disappears after a few minutes, replace the 1µF, 50V capacitor C45 on the decoder PCB. It's next to the PTV111 chip. M.Dr.

Pace PRD800

This receiver produced a blank blue screen. Voltage checks showed that the LNB was being supplied with only 3-5V. The LNB voltage was OK at the power supply, where 20V was present, so back to the tuner. The voltage was also OK at C91, beside the tuner, but was low at the other side of the 1Ω resistor R543, which was also cold. So it had to be this. R543 had in fact gone high in value, a replacement restoring normal reception. B.L.

Amstrad SRD510

After a power supply repair I was greeted with pulling and a low video level. As the customer hadn't mentioned this, I decided that either I was to blame or there was a cold electrolytic capacitor somewhere. The latter proved to be the case. Gentle heat pinpointed the cause of the trouble as being the 10µF coupling capacitor C6, which is one of a cluster of electrolytics near the tuner. A replacement cleared the fault.

Incidentally I've modified my daughter's old Baby Bliss Volumair hand-held hair-styling blower, which is a two-speed 195W unit.

The hot end consists of long plastic prongs for hair combing. Taping them together provides a long hot-air tube, which is ideal for short periods of localised heating. I've had no overheating problems, and although the modification is probably not recommended I've yet to find anything better. It's still OK after a year's use. B.L.

Pace PRD800

No remote control operation and intermittent loss of the picture and sound were the complaints with this receiver. The remote control problem was an easy one: there were poor solder joints around the IR module. The other fault had been caused by the cat, which slept on the receiver. Over a long period of time, the PCB had become coated with a blanket of hair which restricted the ventilation. As a result, the large 100kΩ resistor in the power supply (R2) had changed value. P.H.

Dish Problem

This was an interesting problem. Although the customer had replaced his receiver and fitted a new 9.75GHz LNB the pictures were poor. When I used a spectrum analyser to check that the dish was correctly aligned I found that the signal from the LNB was poor. So another one was tried, with the same results.

On examining the dish, I noticed that a small area just behind the end of the LNB bracket appeared to be in better condition than the rest of the dish. It transpired that the customer had also replaced the LNB holder, which was now too short to achieve the correct focal point. As the old dish was an obscure type a new one was installed. All was then OK. P.H.

Luck

A recent job brought home to me how lucky some customers are. The job sheet said "no sound and vision". A check showed that there was no signal output from the LNB, which was fitted to an outhouse gable end. After climbing up the roof to the dish I found that the LNB tested OK. But when the wind blew the whole wall moved with the dish!

The installer had fitted the bracket to the edge of the sloping roof brickwork, just two rows from the top of the wall and six inches from the edge. The only thing that held the wall together was a good strong rendering. When the bracket was removed the bricks fell away from the rendering as the coach bolts were removed.

The dish is now fixed to good solid brickwork, with extra brackets just in case. **P.H.**

Some Channels Poor

The complaint was that some channels were poor, others OK. A spectrum analyser check showed that the only good signals were from Astra 1D: the others were almost non-existent.

The cable run was 30m, the property being a newly-built farmhouse. We found that the cable had been tightly clipped inside the mortar courses. This had altered the cable characteristics, especially at 90° bends. A complete rewire was required. **P.H.**

Pace PRD800 Plus

The customer complained about "intermittent lines on the picture". They had been getting worse over the past few weeks. The connection between his satellite and TV receivers was via coaxial cable.

In the workshop, with video output via a scart connector, the picture was excellent. The culprit was our old friend Q105, which drives the UHF modulator. It's situated near U10 in the middle of the board, and is a BC846B surface-mounted npn device. With later production boards Q105 seems to develop problems and die, the cause being excessive current. If you are really stuck for a surface-mounted transistor a BC547 will do, with careful soldering and leg bending!

In early production runs Q105 had a single 220Ω emitter load resistor, R559. With later boards there are two parallel resistors with values of 150Ω and 330Ω. Pace recommend removing the 330Ω resistor in such receivers, and that this modification

Experiments with LNBs

It isn't often that this magazine publishes an item about doing things against the rules, but here goes. Some years ago I 'inherited' a 2m dish. This was in the pre-Astra days, and the dish was several years old then. It will come as no surprise that the LNB was an ancient device with a noise figure of 2.9dB. I was quite happy with this until, at a friend's house not long since, I noticed that he had totally noise-free UK Gold pictures from a 90cm dish – I was having to watch the channel through a swarm of white bees. . .

I bought a non-working Marconi Blue Cap LNB for 50p at a radio rally. A touch of Superglue to refix the dielectric resonant oscillator (DRO) soon had it working again. This LNB produced noise-free UK Gold, and I was once again happy – until I visited another friend who was using the same type of LNB with a steerable 90cm dish. He was getting fairly noisy pictures from Intelsat 601's CMT channel. Because it's a half transponder power channel, this is generally thought to require a 2m dish. Yet I couldn't get a locked picture and there was no sound. Out of ignorance I tried swapping over the LNBs, but my friend still had the better picture. I think most Blue Caps have a noise figure of about 1.4dB.

Then, at the last British Amateur

Television Convention, a member told me about the differences between an offset and a prime-focus LNB. I wandered around the flea market there until I found some duff prime-focus LNBs for sale. Having sussed out the loose DRO problem, I went through the duff LNBs until I found one that rattled. I bought it, Superglued the DRO back in position, then fitted the LNB to the dish. Bingo, I had noise-free CMT. This particular LNB is supposed to have a noise figure of 1dB.

At a more recent rally I came across a very up-to-date but duff dual-band offset LNB with a noise figure of 0.7dB. Since the Telecom band appealed to me and the LNB rattled, I bought it. A touch of Superglue had it up and running, the intention being to mount it alongside the 1dB prime-focus LNB to see what could be seen on Telecom. I was amazed to find that at the lower frequencies the 0.7dB offset LNB outperformed the 1dB prime-focus LNB.

So, we get improved results by moving from a 2.9dB prime-focus to 1.4dB offset LNB, then to a 1dB prime-focus LNB and finally to an 0.7dB offset LNB. Surc. I'm talking about repaired rubbish, and I do appreciate that there are massive performance spreads between supposedly similar LNBs with the same noise figure. What I am suggesting is that if it's cheap enough the wrong LNB may well be worth a try. **H.A.**

should be carried out whenever a receiver comes into the workshop, for whatever the reason. All models suffixed "+" seem to have the additional resistor fitted. The affected PCBs have the last three figures of their part numbers ending in 204, 214 or 224 (look near the card reader). **H.C.**

VH-1 Germany

A German customer said he was very keen to receive the new VH-1 Germany channel, which is transmitted by transponder 27 (11.612 GHz, horizontal polarisation) aboard Astra 1B in the evening (Nickelodeon is transmitted during the day). The transponder was previously used for TV3 Denmark, with MAC signals. He reported that Nickelodeon Germany was OK, but when it changed to VH-1 the picture was scrambled – all other channels remained fine. The receiver was a Pace SS9200, which I told him to bring along to be tested.

On test the SS9200 gave good results with Nickelodeon, but immediately the transmission changed to VH-1 the picture scrambled itself, the sound remaining OK. The remedy was

simple. I went into the tuning menu and switched off the internal VideoCrypt decoder (AV SOURCE – INT DECODER – NONE). VH-1 was then clearly received. It appears that because VideoCrypt data is transmitted the decoder thinks it has to decode the picture. German viewers, who usually don't have VideoCrypt IRDs, are not affected. What a funny old world we live in!

It's very difficult to disable the VideoCrypt decoder with some models. The Pace MSS100 can provide a clamped video output at its decoder socket: linking pins 19 and 20 (video in/out connections on the scart connector) and selecting DEC-V on this channel will effectively bypass the decoder. If you have an old Luxcrypt decoder (the old Dutch system, now defunct) this could be used to clamp/de-emphasise a baseband video signal from the receiver, then send it back in via the decoder socket.

I've acquired a mass of these Luxcrypt decoders in the past few months – they are being dumped by their Dutch owners as a result of the move to digital reception. I find them a useful source of scart plugs and mains adaptors if nothing else! **H.C.**

Your Free WVE CD-ROM

We are pleased to present with this issue, for readers in the UK, a special version of the Willow Vale Electronics CD-ROM catalogue. Here's the story of how this came about.

Willow Vale Electronics Ltd. (WVE) has been at the forefront of the consumer electronics industry in the UK, distributing genuine manufacturers' spares, tools and test equipment, for more than 35 years.

In 1985 WVE decided to increase the range of products it handled. A wide range of accessories to support and enhance the operation of consumer electronic products was added. Then, in 1992, the company diversified into audio and security products as well. And more household names were added to the already impressive list of WVE's principal distributorships.

But this led to a problem: how to make available to WVE's trade customers all the information they might require, in an acceptable and comprehensive form, on this enormous range of products? Just think of the size of the problem. What was required was a catalogue that listed all key UK spare parts for the branded models produced by virtually every major manufacturer in the world over an eight-year period. And it had to be arranged so that WVE's customers could easily find exactly what they want.

WVE decided to use the very latest technology, and make it a 'multi-media experience', by producing in-house a CD-ROM disc that covered the entire product range.

This was released, to customers who qualified, in December 1995. Every copy was snapped up. WVE was the first independent distributor in the industry to make use of the exciting new CD-ROM format for this purpose.

The original disc contained some 400,000 descriptions and 340,000 part numbers. It listed 280,000 products, with 3,000 colour pictures and sound, and was a runaway success.

Issue 2 of the disc was released in July 1996, with a run of 2,000 copies, and was again snapped up by the trade.

In January this year WVE faced the problem of making its revolutionary information technology available to

the wider trade. This is where *Television* came in. The result is the CD-ROM disc attached to our front cover. It comes with the compliments of Willow Vale, supported by Philex Plc who sponsored the sleeve.

This special edition of the disc, issue 4, contains 587,000 product descriptions and 351,000 part numbers. 300,000 products are featured, with sound and 3,000 colour pictures.

Confidentiality is the key to this development.

Existing or new Willow Vale account holders will, provided their account details are current, be given a password to gain access to the trade prices on-screen. This password will be allocated the first time connection is made with Coplink via the CD-ROM's database. It's the only way in which trade price access is available.

Non-trade readers will see only WVE's retail prices, excluding VAT.

If you are a WVE account holder who has not used COPS or Coplink, or you wish to set up an account, you will find the telephone number you need on page 72 of the WVE 1996/97 General Spares Catalogue. Trade customers without an account can use an on-screen application form to apply, and will be able to see the correct trade prices as soon as the application is approved and the password has been released.

This version of the WVE CD-ROM also includes video film extracts from a range of VCR and TV servicing tapes that demonstrate servicing techniques. For those readers who use WVE's COPS viewdata facility, there is direct access to the company's mainframe computer.

It is vital to follow the installation steps carefully (see opposite page), as no liability can be held against Willow Vale or *Television* magazine should a disc be installed incorrectly. Your computer system must be IBM compatible, running Windows '95 or 3.1, with as a minimum a 486 DX33 processor and 4Mbytes of RAM with a CD-ROM drive.

How to Use Your CD-ROM

EQUIPMENT REQUIRED

IBM Compatible PC running either Windows '95 or Windows 3.1, with a minimum of a 486 DX33 processor, 4Mb of RAM and a CD-ROM drive.

INSTALLATION INSTRUCTIONS

Boot up the computer and run Windows, ensuring that no other program is running that could affect the installation.

Windows 3.1

From Program Manager Select the Run option from the File menu. Type the following in the space provided:

D:\setup

where D: represents the drive letter of your CD-ROM drive. Now Click on 'OK'

Windows '95

From the Start Button, select Run, and type in the details as above in the space provided.

The installation program will now run.

You will be asked to confirm the drive and directory, in which the program files should be placed. You may alter the default details if you wish, but if you already have a previous copy of the CD you should install the program to the same directory as the original.

IMPORTANT: LOADING SHARE.EXE

On versions of Windows prior to Windows for Workgroups/WIN '95, share.exe has to be installed prior to running the database for the first time, otherwise the program will not run. Using the DOS edit program or similar, add the following line to the config.sys file in the root directory of your hard drive:

INSTALL=C:\DOS\SHARE.EXE /L:500

where C:\DOS is the path to your MSDOS directory and should point to the directory where share.exe resides.

If you've added the above line, the computer MUST be re-started for the command to take effect.

RUNNING THE PROGRAM

The default mode when the program is first run is RETAIL, i.e. the prices shown are our retail prices, and access to our mainframe is available only for CREDIT CARD orders and retail enquiries. If you do not have an account with Willow Vale and are a bona-fide member of the Radio and TV trade, then you may apply for an account and password which, when verified by COPLINK**, will give access to trade prices.

To use the CD and COPLINK as a retail catalogue, just enter your name and address and credit card details in the 'Account Details' form which is shown when the program is first run.

**COPLINK

COPLINK is a direct computer to computer ordering and enquiry system requiring the use of a modem with a recommended communication speed of 14400 baud. The database contains its own communication facilities to our mainframe computer.

Except during periods of essential maintenance, COPLINK is available 24 hours a day seven days a week.

EXISTING/NEW ACCOUNT HOLDERS

Provided your account details and password are correct, access to trade information will be available after your first successful connection to COPLINK via the database. This is the ONLY way that trade access can be provided. If you are a Willow Vale account holder and have not previously used COPS or COPLINK then you will find the phone number for password registration on page 72 of the 1996/97 General Catalogue.

TRADE AND RETAIL MODE

The retail mode database has the following options disabled:

Coplink Menu: Mailbox, Logon Setup, Set Order Defaults.

Edit Menu: Access Code Entry.

Messages may still be sent to Willow Vale in retail mode, but you should include your name and address or phone/fax number for us to reply to you.

All retail orders will be subject to a post and handling charge of £2.00 + VAT, irrespective of order value.

WHAT TO DO IF THE DATABASE DOESN'T WORK

The package is supplied with extensive help files which are designed to guide you through the operation of the database. Additional information is given in "Readme" files which are in the root directory of the CD. Please study all the information supplied first, since your problem may well have a simple (and documented) answer.

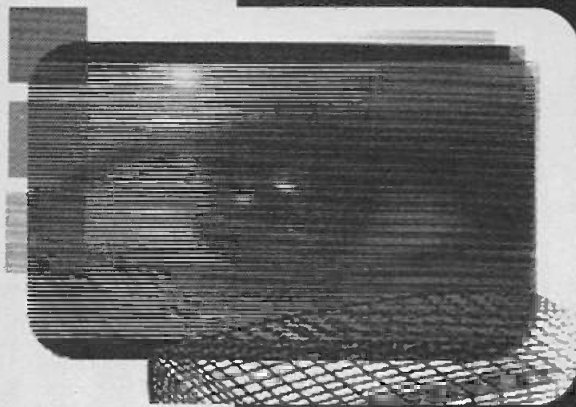
Account holders may phone the help line number given in the catalogue if unable to resolve a problem with the database.

DISCLAIMER

The software is supplied 'as is' and is provided subject to the conditions of supply and use stated in the installation program. If you do not agree to the conditions, do NOT install the software. Installation of the software will be deemed to indicate your acceptance of the terms and conditions.

COPYRIGHT

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Reports from
Philip Blundell, AMIEEIE
Terry Lamoon
Bob Longhurst
Denis Foley
Chris Watton
Eugene Trundle
Michael Dranfield
Giles Pilbrow
Graham Colebourn
and **Michael Maurice**

Ferguson ICC8 Chassis

This set was dead with the line output transistor short-circuit. When a replacement had been fitted the set was still dead, because there was no line drive – the BSR51 line driver transistor TL17 was short-circuit. The set worked when a new BSR51 had been fitted, but after only a few minutes' use the line output transistor was overheating and in danger of again failing.

Checks around TL17 showed that its collector was at 50V instead of 23V. The collector supply comes from the U1 24V rail, which was also at 50V, though the other three supplies from the chopper circuit were all normal. How could this be?

The 24V supply and the line output stage derived 65V supply meet at the field output stage, where DF16 (BA157) was found to be short-circuit. Thus the two supplies were shorted together. As the 65V supply was providing more current than usual, the voltage had fallen to 50V. P.B.

Grundig CUC3400 Chassis

If there's no raster but the sound and EHT are present, check for first anode (G2) voltage at the relevant pin of the CRT base socket (thank you Grundig for marking the pins on the PCB). If the voltage is missing, suspect an internal leak in the socket. Check it by replacement. P.B.

TV Fault Finding

Philips GR1-AX Chassis

The complaint was that this set would shut down completely every two to three hours. It was put on test and sure enough shut down after the allotted time. Switching it off then on again restored normal operation. I removed the back and tried tapping around various parts, but there was no reaction to this. When a visual inspection was carried out however I found that the line scan coil connector was badly dry-jointed. The set worked perfectly once the connector had been cleaned and resoldered. Puzzles: why didn't it respond to tapping, and why didn't it fail more often?! T.L.

Matsui 1482

The picture produced by this set would all of a sudden go bright and smeary. So I tapped around on the CRT base panel. This produced a dramatic effect. The cause of the trouble was a shorting wire on the ribbon connecting cable. It was possible to carry out a repair to the cable. T.L.

Sony KV1421

The display produced by this 14in. portable consisted of a blue screen with flyback lines. A new TDA3505G video matrixing/control chip put matters right. T.L.

Hitachi C2564TN

When this set was powered there was partial field collapse, a very bright screen then tripping. It's quite a common fault. You'll find that the 1 Ω safety resistor R609 is open-circuit because IC601 is faulty. Replace them. IC601 is the TDA8178 field output chip. R609 is in the rectifier circuit that produces the 27V supply for IC601. T.L.

Akura CX26

There was intermittent loss of the picture to a blank raster. The teletext panel has a mass of tinned copper wire links. Desoldering and

resoldering the lot solved this problem. B.L.

Hitachi G7P Mk II Chassis

There was tuning drift between channels 23-33 and nothing above channel 36 could be tuned in. We first suspected a tuner fault, but there was only some 7V across the 33V regulator ZD101. The cause of this was none of the usual suspects (regulator, feed resistors etc.). It was the HD401304R12S chip IC101. A clue was provided by the fact that the on-screen tuning bar swept the whole band. B.L.

Beko 12220

When this set was powered it tripped off. With a 60W bulb as the load, we found that the HT was 125V. Further checks brought us to the BY299 diode D801 which was short-circuit. A replacement restored normal operation. If D801 fails at switch on the LOPT is suspect. B.L.

Texet TX2045VR

This set wouldn't power up. The start-up resistors and C806 were OK, and the STR5412 chip appeared to be all right. D805 (1N4937) was short-circuit however while C808, a 1kV, 4,700pF blue disc capacitor, had split its case. Replacing these two items and fitting a new STR5412 chip for good measure provided a complete cure. B.L.

Sony AE1 Chassis

When this set was switched to standby it produced a motorboating groan. This was caused by the main metal plate across the PCB. It was dry-jointed. Resoldering the lugs put matters right. B.L.

Sanyo E4-A21 Chassis

There was intermittent loss of the picture, with the sound remaining OK. When the fault occurred, winding up the first anode preset produced a blank raster with reduced

height. In the fault condition the voltage at the collectors of the RGB output transistors rose from 140V to 180V.

Checks around the TDA3566 colour decoder chip IC202 showed that the amplitude of the sandcastle pulses, which come from the TDA4505M multifunction chip IC101, was varying. I then found that the supply at pin 7 of IC101 was 10V instead of 12V. This took me back to the L78M12-RA 12V regulator chip IC362, whose input was perfect. A new 12V stabiliser cleared the fault.

Incidentally the set in which we had this fault was an Akai Model CT2158. B.L.

Contec KT8135

If the set is dead, check/replace the 330k Ω start-up resistors R501 and R502. B.L.

Tatung C Chassis

If the line scan produces a folded picture for the first five minutes, or there's a vertical white bar down the centre of the screen, check R413 (18 Ω , 0.5W) which tends to go high in value. It provides the 18V feed to the line driver stage.

Replace it then ensure that the HT voltage is correct – 115V with 14 and 20in. models, 109.5V with 15 and 21in. models.

We've had this fault with several models, including the Goodmans 2050R. D.F.

Bush 1452T/Alba CTV841

The picture was rolling and jumping and the top half was distorted. We replaced the field output and jungle chips, and several electrolytic and tantalum capacitors in the field timebase, before we eventually traced the cause of the fault to R413 in the field feedback/correction circuit. It had risen in value from 6.8k Ω to 125k Ω . D.F.

Toshiba 175T9B

The power supply was producing an odd whine. The cause was traced to C749 (680nF, 2kV) which was short-circuit. It's connected across the line output transistor. C.W.

Sony KV2090 (XE4 Chassis)

This set was intermittently dead, though the power supply continued to work with the HT, 7V and 14V rails OK. The line drive was disappearing, and once this had happened the set wouldn't come on again until it was switched off then on. Tapping the PCB gave the

Hitachi C1709T (G7PS Mk 2 Chassis)

We've had a number of these sets in recently and have found that the following faults are quite common.

If the set is dead with the standby LED alight, one of the 82k Ω start-up resistors R902 and R903 is probably open-circuit. As they sometimes go open-circuit intermittently it's wise to replace them both. If these resistors are OK, check for a short across the HT line. This can easily be done by checking, on the ohms range, between the collector of the line output transistor and its heatsink. If a short-circuit is recorded here, it's likely that the 130V protection diode ZD903 has gone short-circuit. The usual cause of ZD903's failure is R909 (39k Ω) changing value.

The small electrolytics in the power supply should be replaced without testing them. They can be responsible for poor starting and false tripping.

If the power supply is providing an output but the set won't go, check for line drive at the collector of the line driver transistor. It's absence usually means that the 'X-ray' pro-

tection circuit is operating. If you suspect this, short-circuit the base and the emitter of the line output transistor and connect a 40W bulb between this point and the transistor's collector. Connect a 100 Ω resistor across C701, then power the set while monitoring the HT voltage. If this is OK at approximately 112V – the voltage varies a bit, but should be less than 130V with a bulb as the load – check ZD701, ZD702, R717 (100k Ω), R716 (51k Ω) and R715 (270k Ω).

If the HT voltage is low rather than high, check C905 (100 μ F). If it is only 30-40V, but might rise to 130V intermittently, check Q905 (BF423).

If there's no picture but the sound is OK, the line output stage is working and the CRT's heaters are alight, first check whether the on-screen display is working. If it is, check the LVA532S AV switching chip IC1302 for the scart input. Video goes in at pin 6 and should come out at pin 4. If there are no on-screen graphics, the field output stage is suspect. C.W.

impression that dry-joints were present, but a blanket resoldering job didn't improve the situation.

Eventually gentle probing revealed that C513 (0.0027 μ F) had an internal connection problem. It's connected to pin 15 (line oscillator) of the TDA2579 timebase generator chip IC501. C.W.

Hitachi CTP2508

This set was dead though there was 320V at the collector of the chopper transistor Q901 and 7.7V at pin 9 of the TDA4601 chopper control chip IC901. A scope check at the base of Q901 showed that start-up was attempted but lasted for only a few pulses, indicating an overload. We found that the RU2M 20V supply rectifier D911 read about 100k Ω in the wrong direction.

Dry-joints were evident at the chopper transformer. As the set has separate speakers, we didn't try the sound until later. We then found that the LA4270 audio output chip had a hole in it. C.W.

Finlux 1111W

This set had been in on a number of occasions, the fault being lack of height – about half an inch at the top and bottom according to the customer. We'd not seen the fault however. What we had done was to replace the height control and carry out some resoldering in the field output stage, but still the customer complained that the fault would occur at odd times.

Then the set came in because it was dead with a shorted line output

transformer. Although this is not uncommon with these sets, we checked for a possible cause and discovered that the HT was at 166V instead of 138V, quite high in fact. Checks in the power supply showed that the set-HT potentiometer was duff – any movement changed the HT from the correct level to 166V. So at last we'd found the cause of the field fault: as the HT rose, the width increased and the height decreased.

We also replaced the 1 μ F, 63V electrolytic capacitor in the feedback circuit associated with the chopper control chip. C.W.

Matsui 1460

Field collapse was the problem with this portable. The 35V supply to the field output transistors was present and correct, and there was a good sawtooth waveform at the field hold control. A few cold checks soon brought us to R323 (1.8 Ω) which was open-circuit. C.W.

Hitachi C2146/2546/2846

Nicom reception problems with this range of sets can be caused by a production problem in the form of a solder bridge between pins 24 and 25 of the Nicom decoder chip IC4201. The effect is intermittent stereo sound reception or a time delay between selecting a programme and getting a Nicom caption and stereo sound. E.T.

Philips 2A Chassis

Lack of height with cramping and centre crossover distortion was the

problem with one of these sets. After rather a lot of checks we traced the cause to R3573 in the field feedback circuit. With 110° sets its value should be 51kΩ – in our faulty set the resistor measured 120kΩ. With 90° sets the value should be 2.7kΩ. M.Dr.

Granada/Salora Ex-rentals

If you get one of these sets with the problem that channels 1-4 cannot be tuned in, enter the service mode – the Hitachi CPT2656 manual describes how to do this – and switch off bit zero, the little dot. All channels are then available for tuning and storing. M.Dr.

Ferguson TX100 with Teletext

No line or field sync with one of these text sets was cured by replacing the SAA5030 video input processing chip on the text panel. There should be a video input at pin 16, with a video output at pin 12 to the sync separator. The video output at pin 12 was missing. M.Dr.

Saisho CT149TXA

This 14in. text portable was dead. After replacing the usual parts – the STR50103A chip etc. – the set remained dead, as can happen. The power supply is extremely simple, consisting of about eight components. We replaced them one by one, including the chopper transformer. The culprit turned out to be the 103V HT supply reservoir capacitor C506 (100μF, 160V) which was open-circuit.

This is one to watch out for with any set that uses an STR type chopper chip – we would have expected just a low output, not a dead set. M.Dr.

Hitachi CPT2488 (Salora K Chassis)

The picture was slow to appear and when it did the centre was blanked for several minutes. The cause was C574 (100μF) in the field output stage. I wouldn't recommend using freezer to prove the point, as this results in the sudden demise of the field output chip! G.P.

JVC AV25F1EK

When teletext was selected the screen would blank for a second then a normal picture would return. The cause was IC004, type PCF84 C81P/064, on the text PCB. G.P.

Hitachi C2114R

This set would cut out after about half an hour. We found that the

protection thyristor Q703 was being fired because transistor Q704 (BF423) in the excess-current protection circuit became leaky when warm. G.P.

Sanyo CBP2180A

The symptoms with one of these sets were field non-linearity (very squashed two inches from the top of the picture), crooked verticals and intermittent colour. All were caused by a dry-joint at pin 2 (chassis connection) of the 12V regulator IC552. As a result the 12V supply was high at 14V. G.P.

Mitsubishi CT29B2STX, CT25A2STX, CT21A2STX

If the line output transistor Q522 is short-circuit, the four small electrolytics in the power supply should be replaced using high-temperature (105°C) components. They are as follows: C905 (470μF, 35V), C906 (47μF, 50V), C909 (2.2μF, 50V) and C920 (100μF, 25V). Note that the transistor type varies with screen size. With a 21in. tube it's type 2SD1877, part no. 260P606010; with a 25in. tube it's type 2SD1878 (part no. 260P607010) while with a 29in. CRT it's type 2SD1879 (part no. 260P608010). G.P.

Bush 2057NTX

When this set was switched on at the mains there was a rather large crackle of EHT but no picture. The HT was found to be over 170V instead of 115V because C910 (10μF) and C909 (47μF) in the power supply had dried up.

On advancing the tube's first anode control a blank, unmodulated line appeared and the set wouldn't go to standby. The standby fault was caused by Q907 (2SC2335) which was short-circuit. Replacing ZD402 (12V, 1W) and R442 (3.9Ω, 1W fusible) brought back the signals, while the field scan was restored by replacing the TDA3563B field output chip IC401. G.P.

Philips CP90 Chassis

There was field collapse with an uncontrollably bright line because the 163V video HT supply was missing. Safety resistor R3623 (8.2Ω) was open-circuit. The 163V supply also provides bias for the field output transistors. G.P.

GoldStar CIT2190F/Matsui 2091

If the TDA1170N field timebase chip IC301 has failed, C302 (100μF, 35V) must also be

replaced. Otherwise IC301 could fail again. G.P.

Aiwa VXT1010K

This combined TV/VCR wouldn't start up from cold. We found that C524 (47μF, 10V) in the power supply had dried up. G.P.

GoldStar CIT2168F (PC04A Chassis)

A black screen with normal sound was the result of failure of the TDA1170N field timebase chip IC301. In addition R320 (10Ω, 1W) in the supply to IC301 had burnt out. The correct current through R320 is 170mA.

To cure slight foldover at the top of the picture we replaced the 27V supply's reservoir capacitor C423 and the bootstrap capacitor C302 – they are both 100μF, 35V components.

Note that great care should be taken when removing the back from these sets to prevent damage to the loudspeaker terminals. The only plug and socket available to disconnect the loudspeakers is placed inaccessibly under the CRT rim, and the chassis will not slide out until a front screw is removed. G.C.

Hitachi C2544TN, C2564TN, C2844TN, C2864TN

I've had two of these sets with intermittent loss of the sound and picture. When the fault is present, the red standby LED is lit and blinks once every two seconds. This indicates that the failure is in the main chopper power supply circuit.

In both cases the cause was traced to a cracked joint at one end of the ferrite bead link FB911, which feeds unregulated HT to the chopper transformer. It's located near the front of the power panel, but its connections are obscured by the plastic divider rail. G.C.

Toshiba 217D9B

The cause of intermittently excessive picture brightness was traced to a cracked solder joint at the line output transformer's auxiliary earth pin. This connection earths the low-voltage end of the voltage divider network that includes the first anode potentiometer. G.C.

Philips 14PT156B

This fairly new portable produced perfect sound but no picture. The screen was black. When the setting of the first anode control was advanced there was a thin line

across the screen, denoting field collapse. The field output chip was deprived of its supply because the fusible 4.7Ω resistor R3449 was open-circuit.

The current through a temporary 15Ω ballast resistor seemed to be acceptable at 120mA and restored the picture. So a new 4.7Ω resistor was fitted and the first anode control was returned to its original setting. G.C.

Beko 16228NX

The picture and sound would disappear soon after this 28in. Nicam set was switched on, leaving either a blank screen or traces of chroma. If teletext was selected the sound would return but there was no text! The video signal path was being interrupted by a cracked joint at the 470nF polyester capacitor C208 in the IF module. It feeds the signal from pin 11 of IC201 to pin 8 of the video preamplifier IC202. G.C.

Philips CP110 Chassis

This set came in dead with the chopper transistor short-circuit. After replacing this, the TEA1039 chopper control chip and a few

other items I disconnected the feed to the line output stage, connected a bulb as a dummy load and switched on. The lamp glowed for a fraction of a second then went out – the power supply had tripped.

Further checks showed that the cause of the fault lay in the optocoupler circuit. This was narrowed down to the standby switching. In the standby mode the BD438 transistor Tr7727 switches on, supplying more current to the optocoupler. The outputs from the power supply then fall. In fact in standby the transistor was supplying too much current. When its collector was disconnected the voltage at this point was found to be 32V instead of 8-10V. Although there was no measurable leak, a new BD438 transistor cured the problem. M.M.

Fidelity CTV2000

The chassis used in this set appears to be a modified version of the ZX3000, with a slightly different layout. The set was dead apart from a pop from the loudspeaker. A quick check in the power supply showed that it was producing an

HT output, but this didn't reach the line output stage. The cause was R97, whose legs were too large to fit correctly in the holes. As a result it had never been soldered properly. Enlarging the holes and resoldering R97 cured the fault. M.M.

Ferguson D59F

This set would switch on but appeared to be stuck in the AV1 mode. After replacing the EEPROM IR02 and setting it up I was rewarded with a good working set. M.M.

Mitsubishi CT2964STX

The reported fault was that the sound would fade and disappear. If you turned the volume up the fault would right itself. Sometimes a tap on the side of the cabinet would restore the sound. I removed the IF can and inspected it, but someone had got to it first: all the joints were OK. So attention was turned to the audio module, which contains the Nicam and mono sound processing and the audio output stage. Here I found that Q3005 had all three legs dry-jointed. Resoldering this transistor cured the fault. M.M.

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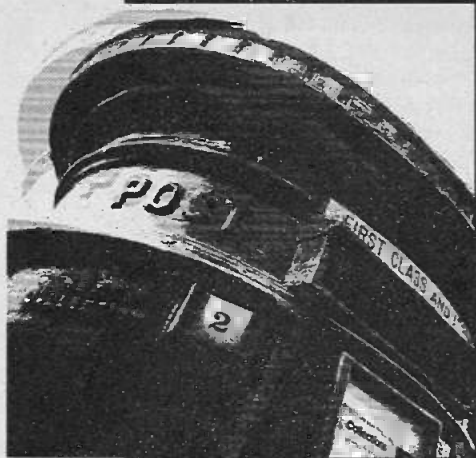
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We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Channel 5 Reception

Having pretuned most of my receiving equipment to avoid channels 35-37, I was looking forward to receiving the Channel 5 test signal (on ch. E37) one Sunday. In this area we receive good, strong signals from both Wenvoe (HTV Wales/S4C) and Mendip (HTV West/C4 UK), the transmitters using groups B and C/D respectively. In addition there are relay signals from Machen and Chepstow, both group A. I am using two high-gain Yagi aerials for the main transmitters, with a diplexer to combine the signals. Just after the diplexer, there is a two-way mixer where I add the outputs from two satellite receivers (channels E22 and E25). The mixer's unamplified output then supplies the house with ample signals, without any co-channel interference. The only problem occasionally encountered is a slightly low BBC-2 Wales signal, possibly due to the fact that its channel (E51) is close to the changeover frequency of the diplexer.

Alas the Channel 5 results were very disappointing, with severe ghosting that caused colour dropout and distorted sound. This made me think about yet another potential problem awaiting many Ch. 5 viewers who are served by more than one transmitter.

Locally, Ch.5 is being broadcast

Letters

from only the Mendip transmitter, using channel E37. Most viewers, particularly in South Wales, already receive both main transmitters – a quick glance out of the window confirms the presence of two aerials on most rooftops. The problem is that the outputs from these aerials are likely to be combined using a diplexer which, until now, has been the best solution. Ch. 5 is being transmitted from Mendip as a Group B channel however. It will thus be filtered out from the Mendip transmissions by the diplexer. The Wenvoe aerial will meanwhile receive Ch. 5 off-beam (about 90° out), producing a ghostly signal.

I checked out two other installations, both with diplexers. Both produced a similar result: heavy ghosting, which fluttered with the wind and rain, and sometimes noise caused by insufficient signal. What can be easily or cheaply done to cure this problem?

Well, we could scrap the diplexer and mix the two aerial outputs together, though this would probably result in ghosting on all channels with the possible exception of Ch. 5! Or we could dispense with the Wenvoe aerial altogether, thus losing or severely spoiling reception of the Welsh channels. The cheapest way to receive the lot might be to have two separate aerials with two separate downleads, then change the aerial when you change channel (not recommended for couch potatoes!).

We might need to change the Mendip aerial from a group C/D to a wideband type as well. Or we could do nothing and forget about Ch. 5. If anyone has a cheap, simple solution suitable for widespread use, I'd like to hear it.

Whatever is done, retuning your VCR won't fix it. By the way, I forgot to retune the VCR in the bedroom from channel E36. There were no interference problems however. The VCR completely obliterated the Ch. 5 signal.

I have read that some companies are making Ch. 5 notch filters to remove the channel from aerial systems where interference problems cannot be resolved, but is anybody making a bandpass filter for Ch. 5? This could be used to pass channel 37 from the Mendip aerial to the output from the diplexer. Or how about a triplexer with a special E35/37 input? Or a two-input TV tuner?

The easiest solution may be to wait until Ch. 5 appears as yet another channel on a digital multiplex, satellite or cable system.

*Ian Martin,
Newport.*

Samsung VIK310 Series VCRs

Have you ever wondered why so much damage is done when there's a fault in the power supply in Samsung VIK310/320/350 VCRs, especially when zener diode D606 fails? We have done some extensive tests on a scrap machine we have in stock and have discovered the root cause of the problem: the excess current trip is set at far too high a threshold – so high that a 1Ω wirewound resistor connected between the 16V rail and chassis will not shut the power supply down.

The trip threshold is set by the current that flows through R107 (0.47Ω, 2W WW). We have found that with this resistance value only a dead short across one of the secondary side rails will shut down the power supply. If a 1Ω resistor is used in position R107 the power supply will shut down nice and gently in the event of an excess-current condition. This may not however be the optimum value to use – the value would have to be calculated using the information in the manufacturer's data sheet for the STR11006 chopper chip. Perhaps Samsung would like to investigate this problem.

*Michael Dranfield,
Buxton, Derbyshire.*

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TRANSISTORS/LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price		
BC107	8p	BD434	30p	BU126	65p	BUV48AF	325p	MJ4502	300p	4N35	50p	LINEAR ICs				AN6340	600p	BA335	55p	BA7004	200p
BC108	8p	BD435	31p	BU128	125p	BUV48C	280p	MJ10012	300p	AN203	210p	AN6341	200p	BA338	80p	BA340	200p	BA340	75p	BA7007	200p
BC109	8p	BD436	30p	BU133	125p	BUV80	425p	MJ10116	300p	AN210	185p	AN6342	325p	BA343	60p	BA343	60p	BA343	60p	BA7022	350p
BC109C	10p	BD437	28p	BU137	150p	BUV81	1000p	MJ11032	800p	AN211	150p	AN6343	440p	BA346	175p	BA346	175p	BA346	175p	BA7025L	100p
BC140	20p	BD438	40p	BU180	100p	BUV70	200p	MJ11033	800p	AN214Q	170p	AN6344	400p	BA401	60p	BA401	60p	BA401	60p	BA7107	475p
BC142	20p	BD439	40p	BU184	100p	BUV90	175p	MJ11033	800p	AN217P	95p	AN6345	350p	BA511	145p	BA511	145p	BA511	145p	BA7212S	200p
BC143	20p	BD440	40p	BU204	65p	BUV93	375p	MJ15003	200p	AN228	280p	AN6352	450p	BA516	150p	BA516	150p	BA516	150p	BA7252S	100p
BC147	8p	BD441	40p	BU205	70p	BUW11A	200p	MJ15004	300p	AN252	150p	AN6356	300p	BA519	160p	BA519	160p	BA519	160p	BA7604N	100p
BC149	8p	BD533	50p	BU206	100p	BUW11AF	225p	MJ15012	350p	AN259	250p	AN6359	500p	BA516	150p	BA516	150p	BA516	150p	BA7751LS	150p
BC159	8p	BD534	38p	BU207	150p	BUW12A	150p	MJ15022	250p	AN262	145p	AN6360	320p	BA519	160p	BA519	160p	BA519	160p	BA7752S	250p
BC180	8p	BD538	35p	BU208A	75p	BUW12F	250p	MJ15023	400p	AN271	230p	AN6362	400p	BA521	150p	BA521	150p	BA521	150p	BA7754	150p
BC182L	7p	BD538	38p	BU208B	200p	BUW13A	200p	MJ15024	400p	AN274	250p	AN6363	375p	BA524	240p	BA524	240p	BA524	240p	BA7767AS	150p
BC172	10p	BD538	40p	BU208T	200p	BUW32A	200p	MJ15025	700p	AN277B	400p	AN6367NK	400p	BA526	180p	BA526	180p	BA526	180p	BA8504	350p
BC177	14p	BD538	40p	BU208T	200p	BUW48	550p	MJ15025	700p	AN278	28p	AN6368	275p	BA527	95p	BA527	95p	BA527	95p	BA15218	60p
BC178	14p	BD643	50p	BU209D	130p	BUW48	550p	MJ15025	700p	AN301	330p	AN6371	360p	BA532	100p	BA532	100p	BA532	100p	CA3140E	38p
BC179	14p	BD645	50p	BU209	90p	BUW48	550p	MJ15025	700p	AN302	650p	AN6377	480p	BA534	220p	BA534	220p	BA534	220p	CXN62A	80p
BC182	7p	BD647	50p	BU228	110p	BUW50	400p	MJE350	80p	AN329-1200	150p	AN6380	150p	BA536	160p	BA536	160p	BA536	160p	CXN32A	325p
BC183	7p	BD649	50p	BU228	110p	BUW81A	150p	MJE2955T	65p	BY448	20p	AN304	360p	AN6381	100p	AN6381	100p	AN6381	100p	CXN33A	80p
BC183L	7p	BD675	40p	BU312	90p	BUW84	75p	MJE3065T	65p	BYT11	25p	AN315	210p	AN6382	120p	AN6382	120p	AN6382	120p	CX136	600p
BC184	7p	BD677	38p	BU325	55p	BUW85	85p	MJE13004	100p	BYT13-1000	30p	AN316	350p	AN6383	80p	AN6383	80p	AN6383	80p	CX139A	750p
BC184L	7p	BD677	38p	BU328A	75p	BUX10	150p	MJE13005	60p	BYV986	25p	AN337	600p	AN6385	50p	AN6385	50p	AN6385	50p	CX141	750p
BC212	7p	BD678	40p	BU406	60p	BUX11	150p	MJE13007	100p	BYV966	35p	AN360	100p	AN6386	35p	AN6386	35p	AN6386	35p	CX145	450p
BC212L	7p	BD679	40p	BU407	85p	BUX12	150p	MJE13009	100p	BYX10	15p	AN362	100p	AN6387	60p	AN6387	60p	AN6387	60p	CX150B	325p
BC213	7p	BD681	45p	BU407D	70p	BUX20	350p	MJE15028	200p	BYX55/600	25p	AN363	150p	AN6388	45p	AN6388	45p	AN6388	45p	CX178	825p
BC213L	7p	BD682	45p	BU408	60p	BUX21	450p	MJE15029	200p	IN4001	3p	AN386	150p	AN6389	45p	AN6389	45p	AN6389	45p	CX187	725p
BC214	7p	BD705	50p	BU408D	75p	BUX22	450p	MJE15030	250p	IN4002	3p	AN610	160p	AN6390	45p	AN6390	45p	AN6390	45p	CX200A	800p
BC214L	7p	BD707	50p	BU409	85p	BUX23	900p	MJE15031	400p	IN4003	3p	AN3211K	375p	AN6391	45p	AN6391	45p	AN6391	45p	CX201B	700p
BC223	7p	BD711	50p	BU412	175p	BUX37	220p	MJE15031	400p	IN4004	3p	AN3215K	350p	AN6392	40p	AN6392	40p	AN6392	40p	CX201C	300p
BC229	7p	BD736	50p	BU414B	250p	BUX38	450p	MJE18004	175p	IN4006	3p	AN3236K	450p	AN6393	40p	AN6393	40p	AN6393	40p	CX20015A	600p
BC300	20p	BD826	50p	BU415A	170p	BUX42	200p	MJE18204	350p	IN4007	4p	AN3100K	325p	AN6394	40p	AN6394	40p	AN6394	40p	CX20106A	750p
BC301	20p	BD828	50p	BU426A	70p	BUX47A	220p	OC28	250p	IN4148	4p	AN3312	350p	AN6395	85p	AN6395	85p	AN6395	85p	CX20109	140p
BC302	20p	BD839	55p	BU433	120p	BUX48A	220p	OC35	350p	IN4540	9p	AN3313	300p	AN6396	225p	AN6396	225p	AN6396	225p	CX20187	700p
BC303	20p	BD887	50p	BU500	100p	BUX48A	220p	OC38	250p	IN4541	9p	AN3320K	450p	AN6397	75p	AN6397	75p	AN6397	75p	CX20187	700p
BC304	25p	BD899	50p	BU500D	225p	BUX80	180p	S2000AF	175p	IN4542	8p	AN3331K	450p	AN6398	200p	AN6398	200p	AN6398	200p	CX20187	700p
BC327	7p	BD977	50p	BU505	90p	BUX81	160p	S2055A	175p	IN4543	8p	AN3794	325p	AN6399	200p	AN6399	200p	AN6399	200p	CX20187	700p
BC328	7p	BDX33	60p	BU505D	90p	BUX84	50p	S2055AF	200p	IN4544	11p	AN3814K	450p	AN6400	150p	AN6400	150p	AN6400	150p	CX20187	700p
BC337	7p	BDX37	100p	BU505DF	90p	BUX85	50p	S2530A	100p	IN4546	12p	AN3821K	600p	AN6401	60p	AN6401	60p	AN6401	60p	CX20187	700p
BC338	7p	BDX44	100p	BU506	100p	BUX86	30p	S2530B	100p	IN4547	12p	AN3822K	600p	AN6402	60p	AN6402	60p	AN6402	60p	CX20187	700p
BC441	28p	BDX47	60p	BU506D	115p	BUX87	20p	TIP29A	22p	IN4548	12p	AN3830K	600p	AN6403	60p	AN6403	60p	AN6403	60p	CX20187	700p
BC446	28p	BDX52C	60p	BU506DF	120p	BUX88A	350p	TIP29C	25p	IN4549	12p	AN3890K	600p	AN6404	60p	AN6404	60p	AN6404	60p	CX20187	700p
BC477	16p	BD6K6C	150p	BU508A	70p	BUZ71	75p	TIP29E	40p	IN4550	12p	AN3931K	400p	AN6405	60p	AN6405	60p	AN6405	60p	CX20187	700p
BC516	22p	BD6K6C	175p	BU508AF	85p	BUZ71AF	100p	TIP30	25p	IN4551	12p	AN3931K	400p	AN6406	60p	AN6406	60p	AN6406	60p	CX20187	700p
BC537	25p	BDX64C	175p	BU508APH	80p	BUZ72A	100p	TIP30C	25p	IN4552	12p	AN3931K	400p	AN6407	60p	AN6407	60p	AN6407	60p	CX20187	700p
BC546	8p	BDX65	80p	BU508D	90p	BUZ72AF	100p	TIP31A	150p	IN4553	12p	AN3931K	400p	AN6408	60p	AN6408	60p	AN6408	60p	CX20187	700p
BC547	8p	BDX86C	150p	BU508DF	120p	BUZ73AF	100p	TIP32	24p	IN4554	12p	AN3931K	400p	AN6409	60p	AN6409	60p	AN6409	60p	CX20187	700p
BC548	8p	BDX71	70p	BU508F	110p	BUZ76A	110p	TIP32A	21p	IN4555	12p	AN3931K	400p	AN6410	60p	AN6410	60p	AN6410	60p	CX20187	700p
BC550	8p	BDX77	175p	BU508FV	110p	BUZ80AF	200p	TIP32C	21p	IN4556	12p	AN3931K	400p	AN6411	60p	AN6411	60p	AN6411	60p	CX20187	700p
BC556	8p	BDX87C	175p	BU526	75p	BUZ80AF	200p	TIP33	60p	IN4557	12p	AN3931K	400p	AN6412	60p	AN6412	60p	AN6412	60p	CX20187	700p
BC557	8p	BDX88C	150p	BU536	100p	BUZ83	200p	TIP33C	60p	IN4558	12p	AN3931K	400p	AN6413	60p	AN6413	60p	AN6413	60p	CX20187	700p
BC558	8p	BDW24	55p	BU560	100p	BUZ83A	180p	TIP34	60p	IN4559	12p	AN3931K	400p	AN6414	60p	AN6414	60p	AN6414	60p	CX20187	700p
BC559	8p	BDW93	50p	BU603	125p	BUZ91A	400p	TIP34C	60p	IN4560	12p	AN3931K	400p	AN6415	60p	AN6415	60p	AN6415	60p	CX20187	700p
BC560	8p	BDW94	50p	BU606	225p	BY448	20p	TIP35	60p	IN4561	12p	AN3931K	400p	AN6416	60p	AN6416	60p	AN6416	60p	CX20187	700p
BC637	20p	BDY29	225p	BU608D	100p	BYT11	25p	TIP36													

REPLACEMENT VIDEO HEADS

Model	Price	Model	Price	Model	Price	Model	Price	Model	Price
AKAI		VHSAN3	800p	HRD250, HRD257	2300p	NVFS 100	5000p	TL51100	3100p
VS105, 112, 115, 116, 120, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8		VHSAY3	1200p	3V32, 8942, HR7655	2200p	NVFS1	4850p	VHR120, 130, 14, 141, 143G, 145P, 15, 156, 171, 220, 23, 244, 274, VHR310, 330, 4100, 4105, 4200, 430, 4300, 4400, 4500, 5080, 5100, 7250, 7300, 8070, 8100, 8101, 8200, VHR7800, 7810, 8000SP, 8801SP, VHRD4400, 4410, 4500, 4800, 4800, VHRD4610, 6700, 4800	
VSP2	1000p	VHSB31, VHSCH1	2300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N.E.C.		SHARP	
VP7200, VS8300, VS9500	650p	VHSBP1	850p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 903A, N9034, 9040, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC390, VC393, VCA96	2750p
VS1	1250p	VHSB32	2600p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC778	1800p
VS2	1200p	VHSB33, VHSB34	1600p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC785, VC790	2500p
VS3	1350p	VHSB35, VHSB36	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC220, 220, 300, 381, 383, 384, 385, 386, 387, 388, 471, 477, 481, 482, VC483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700	
VS10	1350p	VHSB37, VHSB38	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC108, 206, 382, 402, 405, 408, 500, 550, 571, 573, 580, 584, 600, 882, 650, 570, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106	
VSP1	2100p	VHSB39, VHSB40	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC111, 113, 116, 131, 140, 202, 203, 211, 234, 244, 254, 255, 30, 35, VCA40, VC83110, 320, VC0801, 802, VCM73, CT212, 310, 410, VCT510, 72, VCT514, VCT513	
VS33, 35, 37, 38, 38CG MKII, 53, 55, 65, 75, 76, 767, 768, 865, 867, VSF30, 33, 4, 400, 410, 420, 430, 440, 441, 450, 455, 480, 490, 497, VSG51, 54, 55, VXS450, VXS470		VHSB41, VHSB42	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC500, 6200, 6300, 7300, 7700, 7770, 8000, 8300	
VSP1	2100p	VHSB43, VHSB44	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC773	3000p
VS512, VS515, VS516	2250p	VHSB45, VHSB46	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC699, VCA501, VCA602	2200p
VS482, 485, 467, 467CG2, VSF12, 15EK, 15EOM, 300, 301, 310, VSF320, 330, 340, 350, VSG30, 33, 34, 35		VHSB47, VHSB48	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC30ET	3000p
VS11, VS12	1200p	VHSB49, VHSB50	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VFH815	2800p
VS6, VSA, VS9	2250p	VHSB51, VHSB52	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH850, VCH851, VCH852, VCH882	2700p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB53, VHSB54	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH882, VCH883, VCH884, 681, 684, 685, 750, 780, 781, 683, 684, 402, VC500, 571, 573, 580, 584, 600, 882, 693, 700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB55, VHSB56	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC500, 6200, 6300, 7300, 7700, 7770, 8000, 8300	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB57, VHSB58	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC773	3000p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB59, VHSB60	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC699, VCA501, VCA602	2200p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB61, VHSB62	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC30ET	3000p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB63, VHSB64	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VFH815	2800p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB65, VHSB66	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH850, VCH851, VCH852, VCH882	2700p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB67, VHSB68	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH882, VCH883, VCH884, 681, 684, 685, 750, 780, 781, 683, 684, 402, VC500, 571, 573, 580, 584, 600, 882, 693, 700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB69, VHSB70	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC500, 6200, 6300, 7300, 7700, 7770, 8000, 8300	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB71, VHSB72	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC773	3000p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB73, VHSB74	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC699, VCA501, VCA602	2200p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB75, VHSB76	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC30ET	3000p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB77, VHSB78	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VFH815	2800p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB79, VHSB80	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH850, VCH851, VCH852, VCH882	2700p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB81, VHSB82	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH882, VCH883, VCH884, 681, 684, 685, 750, 780, 781, 683, 684, 402, VC500, 571, 573, 580, 584, 600, 882, 693, 700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB83, VHSB84	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC500, 6200, 6300, 7300, 7700, 7770, 8000, 8300	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB85, VHSB86	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC773	3000p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB87, VHSB88	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC699, VCA501, VCA602	2200p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB89, VHSB90	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC30ET	3000p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB91, VHSB92	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VFH815	2800p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB93, VHSB94	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH850, VCH851, VCH852, VCH882	2700p
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB95, VHSB96	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VCH882, VCH883, VCH884, 681, 684, 685, 750, 780, 781, 683, 684, 402, VC500, 571, 573, 580, 584, 600, 882, 693, 700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB97, VHSB98	1300p	HRD370, HRD430, HRD470, 3V58, VFD208, 26, 30, 32, 33, VCT14L	2050p	N9051, 9052, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077		VC500, 6200, 6300, 7300, 7700, 7770, 8000, 8300	
VSA1100, 1110, 650, VSF500, 510, 550, 580, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VXS50, 580		VHSB99, VHSB100	1300p	HRD370					

VCR BELT KITS/VIDEO LAMPS & SWITCHES

Model	Price	Model	Price	Model	Price	Model	Price	
GRANADA		323, 535, VR20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 21D, V3, 25B01, 25B02, 11, 12, 302, 303, 305, 310DV1, 310DV2, 31D, V3, 35B11, 35B12, 35B13, 725B8, VR30DV2, 35B02, 35B03, 635B7, 715B4, 715B5, 715B8, VR56B2, 915B2, 925B3, VR6180, 6182, 6185, 6285, 6290VR6291, VR8293, 6362, 6367, VR6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, VR6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, VR685B4, 865B1, 925B3		Models & Description		Order Code	Price	ON/OFF MAIN SWITCHES
VHSDF1, VHSFV2	80p			UNIVERSAL VIDEO LAMP 9V	VL01	25p	GRUNDIG	
VHSTJ1, VHSTJ2	150p			80mV (310mm WIRES)			PART NO:	
VHSTJ3	65p			PANASONIC VIDEO LAMPS	VL02	30p	29703, 29102	
VHSWJ1, VHSWJ2	120p			SHARP VIDEO LAMPS	VL02	30p	C7500, C7500TT, C8500, C8502, C8712, C8714, C8894, M68-190, M68-190/99, M70-195, P40-345, ST66-1602, T55-340, V7722	
VHSXJ1	85p			HITACHI 5381682 (VT63, VT64)	VL04	135p	PRICE: 140p	
VHSYJ2	80p			VIDEO LAMPS			MATSUI/SAISHO	
VHSFJ2	140p			AIWA, AKAI, ALBA, AMSTRAD, VL05	100p		USED ON: MATSUI-2190, SAISHO-PST21 30TX	
VHSF51, VHSF52	130p			BLAUPUNKT, FERGUSON, FIDELITY FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA			PRICE: 140p	
VHSFG1, VHSFG2, VHSFG3, VHSFG4, VHSFG3	180p			AKAI, GRANADA (VHSTJ2), VL01	25p		PHILIPS	
GRUNDIG		2X40800, 0850, 0880, 1600, 2000, 2060, 2200, 2280, MVS200RC		AKA, GRANADA (VHSTJ2), VL01	25p		USED ON: K30, K35, K40, KT3, KT4	
MVS400	90p			HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 5912, 8922, 8925)			PRICE: £0.95	
VS150	160p			BLAUPUNKT, ORION (VH1, 2A), VL02	30p		SONY	
VS150	75p			NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8300)			PART NO:	
VS150	70p			AKAI IVS10), GRANADA (VHSXJ3), TT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)			USED ON:	
VS150	70p			AUTHENTIC (N850), DECCA VL07	40p		(POWER SWITCH + REMOTE SWITCH)	
VS150	70p			GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963) JVC (HT7200, 7300, 7350, 7700) TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)			USED ON:	
VS150	70p			SHARP			KV1612, MK1, KV1612, MK2, KV1614, KV2052, KV2056, KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KX20PS1, KX20PS2, KX27PS1	
VS150	70p			SONY			PRICE: 1.50p	
VS150	70p			SHARP			PART NO:	
VS150	70p			SHARP			(POWER SWITCH + REMOTE SWITCH)	
VS150	70p			SHARP			USED ON:	
VS150	70p			SHARP			PRICE:	
VS150	70p			SHARP			2 PIN (FUNCTION SWITCH)	
VS150	70p			SHARP			USED ON:	
VS150	70p			SHARP			PRICE:	
VS150	70p			SHARP			REPLACEMENT IDLER TYRES	
VS150	70p			SHARP			AKAI M132773 M32773	
VS150	70p			SHARP			IT01	
VS150	70p			SHARP			MZ366960J2	
VS150	70p			SHARP			IT02	
VS150	70p			SHARP			GOLDSTAR VXP0521	
VS150	70p			SHARP			IT03	
VS150	70p			SHARP			HITACHI 6861471	
VS150	70p			SHARP			IT04	
VS150	70p			SHARP			6861482	
VS150	70p			SHARP			IT05	
VS150	70p			SHARP			6886971	
VS150	70p			SHARP			JVC/ FERGUSON	
VS150	70p			SHARP			PU 48967B	
VS150	70p			SHARP			IT06	
VS150	70p			SHARP			PU 51380	
VS150	70p			SHARP			IT07	
VS150	70p			SHARP			PU 51402A	
VS150	70p			SHARP			IT08	
VS150	70p			SHARP			PU 55373	
VS150	70p			SHARP			IT09	
VS150	70p			SHARP			PU 55374	
VS150	70p			SHARP			IT10	
VS150	70p			SHARP			NATIONAL VXP 0329	
VS150	70p			SHARP			IT11	
VS150	70p			SHARP			PANASONIC VXP 0343	
VS150	70p			SHARP			IT12	
VS150	70p			SHARP			VXP 0344	
VS150	70p			SHARP			IT13	
VS150	70p			SHARP			VXP 0401	
VS150	70p			SHARP			IT14	
VS150	70p			SHARP			VXP 0433	
VS150	70p			SHARP			IT15	
VS150	70p			SHARP			VXP 0463	
VS150	70p			SHARP			IT16	
VS150	70p			SHARP			VXP 0521	
VS150	70p			SHARP			IT17	
VS150	70p			SHARP			VXP 0581	
VS150	70p			SHARP			IT18	
VS150	70p			SHARP			SANYO	
VS150	70p			SHARP			1430662T15620	
VS150	70p			SHARP			IT19	
VS150	70p			SHARP			SHARP	
VS150	70p			SHARP			NIDL005GEZZ	
VS150	70p			SHARP			IT20	
VS150	70p			SHARP			NIDL006GEZZ	
VS150	70p			SHARP			IT21	
VS150	70p			SHARP			NPLY0107GEZZ	
VS150	70p			SHARP			IT22	
VS150	70p			SHARP			PRICE	
VS150	70p			SHARP			20p EACH	
VS150	70p			SHARP			16p EACH FOR A PACK OF 5 FOR EACH MODEL	
VS150	70p			SHARP			13p EACH FOR A PACK OF 10 FOR EACH MODEL	
VS150	70p			SHARP			GRANDATA LTD	
VS150	70p			SHARP			Tel: 0181-900 2329	
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VIDEO SERVICE KITS

AMSTRAD	
VCR700	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP	
Order Code: SK41	£5.50
FERGUSON & JVC	
3V12/43	
HRD455/HRD725	
<i>Contents</i>	
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, SUPPLY REEL CLUTCH, TAKE UP CLUTCH
Order Code: SK37	£16.00 ORDER CODE: SK38 £9.00
3V58/59/64/65	
HRD170/180/210/230/300/320/370/400/430/530/700/750	
HRS5000	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND	
Order Code: SK44	£7.00
3V29/3V30	
HR7200/7300/7350	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK05	£5.00
3V35/36, 38/39/49	
HRD110/111/120/225	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK04	£5.00
3V31/3V42	
HR7500/7610/7650/7655	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP	<i>Economy Kit Contents</i>
	BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH
Order Code: SK33	£11.00 ORDER CODE: SK34 £5.00
3V35/36/38/39/49	
HRD110/111/120/121/225	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER TYRE, REEL IDLER TYRE
Order Code: SK35	£10.00 ORDER CODE: SK36 £5.50
3V29/3V30	
HRD7200/7300/7350	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP	<i>Economy Kit Contents</i>
	BELT SET, T/U REEL IDLER TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH
Order Code: SK31	£10.00 ORDER CODE: SK32 £5.00
3V44/45/48/53/54/55/57	
HRP50/HRD140/150/158/160	
HRD250/257/565/566/755	
<i>Contents</i>	
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER
Order Code: SK39	£15.00 ORDER CODE: SK40 £9.50

FISHER	
FVHP905/906/907/908/910/911/916/918	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE
Order Code: SK57	£13.00 ORDER CODE: SK58 £5.00
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, GEAR IDLER UNIT, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE
Order Code: SK68	£11.00 ORDER CODE: SK69 £300
HITACHI	
VT11/VT33	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	
Order Code: SK08	£5.00

UNIVERSAL TRIPLER
Price: £5.00 each

AMSTRAD MODE KIT
Price: £2.75 each

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SPECIAL OFFERS
ON PAGE 506**

VIDEO SERVICE KITS (Cont.)

VT11/VT33	
<i>Contents</i>	
BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE
Order Code: SK45	£13.00 ORDER CODE: SK46 £3.75
VT52/61/62/63/64/65/85/86/640	
<i>Contents</i>	
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, FF/REW IDLER
Order Code: SK49	£14.00 ORDER CODE: SK50 £3.00
VT400/405/410/431/415/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88	
<i>Contents</i>	
TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND	
Order Code: SK52	£9.75
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30	
<i>Contents</i>	
BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND	
Order Code: SK51	£14.00

PANASONIC	
NV2000/NV2010	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
Order Code: SK03	£5.00 ORDER CODE: SK02 £5.00

NV300/NV330/NV333/NV340/NV366	
<i>Contents</i>	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE	
Order Code: SK07	£5.00

NV2000/NV2010	
<i>Contents</i>	
BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE
Order Code: SK13	£5.00 ORDER CODE: SK14 £3.50

NV7000/NV7200/NV7800	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE
Order Code: SK11	£8.50 ORDER CODE: SK12 £3.25

NV300/NV330/NV333/NV340/NV366	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE, PLAY IDLER
Order Code: SK15	£7.00 ORDER CODE: SK16 £3.25

NVG7/NV69/NV610/NV611/NV612/NV614/NV615/NV616/NV618/NV630/NV6210/NV6130/NV6400/NV665 (PX/ACV/AG1810 (P/K))	
<i>Contents</i>	
LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT, PINCH ROLLER, IDLER TYRE
Order Code: SK27	£6.00 ORDER CODE: SK28 £3.00

NV332	
<i>Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE
Order Code: SK29	£12.00 ORDER CODE: SK30 £5.10

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE
Order Code: SK23	£5.00 ORDER CODE: SK24 £3.25

NV600/NV688	
<i>Contents</i>	
BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, PLAY IDLER TYRE, FF/REW IDLER TYRE
Order Code: SK25	£12.00 ORDER CODE: SK26 £6.00

NV730/NV770	
<i>Contents</i>	
SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND	<i>Economy Kit Contents</i>
	SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE
Order Code: SK19	£5.00 ORDER CODE: SK20 £3.00

NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE
Order Code: SK21	£5.00 ORDER CODE: SK22 £2.75

NV771/NV788	
<i>Contents</i>	
BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, IDLER TYRE
Order Code: SK17	£6.00 ORDER CODE: SK18 £4.00

VIDEO SERVICE KITS (Cont.)

SHARP	
VC381	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, REEL IDLER TYRE
Order Code: SK47	£8.00 ORDER CODE: SK48 £3.25
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, REEL IDLER
Order Code: SK60	£9.50 ORDER CODE: SK61 £5.00
VC781/VC781Q/VC7822/VC785/VC786/VC789/VC800/VC100/VC102/VC104/VC104202	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE
Order Code: SK64	£13.50 ORDER CODE: SK65 £3.75
VC681/VC682/VC684/VC685/VC689/VC693/VC700	
<i>Contents</i>	
BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND	<i>Economy Kit Contents</i>
	BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE
Order Code: SK62	£13.50 ORDER CODE: SK63 £5.00

**FOR MORE DETAILS OF OVER 500
TYPES OF SERVICE KITS ...
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BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES		
Replaces Ferguson Part No: 00E6-067-001, used on TX10, L2V		90p
Replaces Philips Part Nos: 138-10138, 138-10313, 1.2V - 90mAh		75p
Replaces Philips Part Nos: 138-1229, 2.4V - 90mAh		£1.35
REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES		
Replaces Ferguson Part Nos: 00E6-066-001, 2.4V		150p
Used on: 3V35, 3V56, 3V58, 3V65		

REPLACEMENT LINE OUTPUT TRANSFORMERS

Description	Price	Order Code
HITACHI 2433752	1500p	LOT01
ORION 3714002	1500p	LOT02
FIDELITY ZX300	1500p	LOT03
FE TX100 90 DEG	1500p	LOT04
SABA 490007182	1500p	LOT05
FE TX90 WHITE	1650p	LOT06
ITT D307/37 EQ	1600p	LOT07
BLAUPUNKT 210	1800p	LOT08
GRUNDIG 2922010	1500p	LOT09
ITT CVC800/1/3	1500p	LOT10
ITTD218/37 EQ	1600p	LOT11
NORMENDE 5255	1600p	LOT12
SABA 81000 200	1600p	LOT13
SALORA T236 EQ	1650p	LOT14
SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
TELEFUNKEN AT1	1450p	LOT17
TELEFUNKEN EQ	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
ITT CVC 1150/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1400p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1200p	LOT33
FE TX100 110 D	1500p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1300p	LOT37
FERGUSON 00D3-508-002	1650p	LOT38
Fits Chassis TX99 41cm + 51cm		
Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3		
PANASONIC TLF14567F	1850p	LOT39
Used On: TC2043, TC2242, TX300		
PANASONIC TLF14568F	£15.00	LOT40
Used On: TX2231, TX2244		
PANASONIC TLF14584	2000p	LOT41
Used On: TC2210, TC2160, TX1752, TX2112		
TX2112, TX2162, TXC22		
PANASONIC TLF14586F	£18.00	LOT42
TC1851, TC2051, TC2061, TC2253, TC2263, TX5500		
HINARI	1600p	LOT43
Used On: CT15		
HITACHI 2434274	1250p	LOT44
CPT2174, CPT2176, CPT2178, 2434274		
We stock line output transformers for over 100 different models. Please ring 0181-900 2329 for more information.		

Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all recommended parts is supplied for the most popular models, which when fitted should overcome this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	650p
PACE SSR900, 9200, 9010, 9210, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	650p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	730p
PACE MSS200/300 APPOLL	SATPSU9	900p
PACE MSS500/1000	SATPSU10	1230p
FERGUSON SRD4	SATPSU11	835p
ECHOSTAR SR6500	SATPSU12	1735p
ECHOSTAR 6500/7700/8700	SATPSU13	3125p
AMSTRAD SRD600	SATPSU14	3125p
MIMITEC (Surenson)	SATPSU15	775p
AMSTRAD SRD700/SR850/SRX100/301 SRX501/1002/2001/SRD2000 SAT250	SATPSU16	730p

PACE 9000 SWITCH MODE TRANSFORMER

Order Code: PACE 9000 Price: 800p

PACE PRD800/PRD900 SWITCH MODE TRANSFORMER

Order Code: PRD800 Price: 550p

SATELLITE TUNERS

PACE PRD800/MSS200 2Ghz

Order Code: TUNER 01 Price: 1650p + VAT

PACE PRD900/MSS1000 2Ghz

Order Code: TUNER 02 Price: 1650p + VAT

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POWER SUPPLY REGULATOR

ALBA CTV10 TRAVELLER

NIKKAI BABY 10

ORDER CODE: BABY 10

PRICE: 1200p + VAT

Audio Control Head

AMSTRAD ORIGINAL NO: 150751

Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134

Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8802, 8803, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLD-HAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0061	NV67 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

8 way Preprogrammed Universal Remote Control

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

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

Order Code: 8 WAY PRICE: 14.50p + VAT

Cassette DC Motors

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

Replacement Video Cassette Housings

NAME	MODELS	CODE	PRICE
AKAI	V535, V553, V555, V556, V575	CH18	3200p
	VHSDP1	CH05	1100p
GRANADA	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4308, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p
	8948, 8950, FV108, 12L, 13H, 14T, 208, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p
	HRD540, 580, 630, 860, 910, 960, HRD970, HRDX20, FERGIUSON FV57H	CH27	2400p
I.I.T.	VR3905, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR3918, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR8180, 8182, 8185, 8285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6861, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	495B6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 1065VM, 2546VM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCB0866, 8106, VCT212, 310, 4106, 610	CH24	2500p
TELERJUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
	V55, V57	CH01	2800p
TOSHIBA	V65, V66	CH02	2800p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	160p
SWITCH CLEANER	176ML	SP02	170p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	170ML	SP04	310p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SP08	310p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	230p
EXDEL POLISH 80	250ML	SP18	190p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	-	SP26	2100p

All the above items are manufactured by Servisol

If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 5 cans 450p for more than 5 cans

Cassette Tape Heads

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

Soldering Accessories

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S108	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M	S107	80p
SOLDER MOP 1.2MM X 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	80p

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Satellite Fault Finding Guide Issue 1.
Listing about 1,000 faults for over a range of 24 different brands.
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A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.
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Price 17p each 15p each pack of 10pcs
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Set of 8 Allen keys packed in a plastic wallet
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Specifically designed for video maintenance

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

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Fax: 0181-903 6126

REPLACEMENT LINE OUTPUT TRANSFORMERS/CD PICK UPS

REPLACEMENT LINE OUTPUT TRANSFORMERS			CD PICK UPS			
Part No.	Code	Price			Order Code	Price
AIKAI						
45150344	LOT56	1650p	4515 01 24	LOT137	1600p	
101-14017-03	LOT278	1600p	4515 01 46	LOT136	1600p	
101-22005-03A	LOT72	1650p	4515 03 01	LOT169	1500p	
D 0503/7	LOT27	1450p	4515 03 02	LOT180	1550p	
D 053/37	LOT207	1550p	4515 03 04	LOT169	1500p	
D 056/37	LOT56	1650p	4515 03 05	LOT180	1550p	
D 069/37	LOT200	1600p	4515 03 06	LOT168	1550p	
D 069/37	LOT56	1650p	4515 03 08	LOT22	1500p	
FCM 2015 AL	LOT78	1600p	4515 03 09	LOT178	1500p	
FERGUSON			4515 03 10	LOT168	1550p	
00 D-3-508-001	LOT38	1850p	4515 03 11	LOT30	1500p	
00 D-3-508-002	LOT38	1850p	4515 03 12	LOT30	1500p	
00 D-3-508-003	LOT278	1600p	4515 03 13	LOT30	1500p	
00 D-3-515-001 PL1	LOT276	1550p	4515 03 14	LOT174	1700p	
00 D-4-208-001	LOT79	1800p	4515 03 15	LOT22	1500p	
00 D-4-208-002	LOT79	1800p	4515 03 18	LOT192	1550p	
00 D-4-235-002	LOT240	1250p	4515 03 19	LOT30	1500p	
00 D-4-235-002 HTI	LOT81	1600p	4515 03 20	LOT192	1550p	
00 D-4-235-0021G	LOT81	1600p	4515 03 21	LOT179	1550p	
00 D-4-260-004 HTI	LOT38	1850p	4515 03 22	LOT207	1550p	
00 H-0-701-2400	LOT182	1550p	4515 03 23	LOT207	1550p	
06 D-3-083-001	LOT82	1400p	4515 03 24	LOT193	1550p	
06 D-3-083-002	LOT82	1400p	4515 03 25	LOT27	1450p	
06 D-3-084-001	LOT23	1400p	4515 03 26	LOT200	1600p	
06 D-3-087-001	LOT23	1400p	4515 03 27	LOT196	1550p	
06 D-3-088-001	LOT84	1450p	4515 03 28	LOT196	1550p	
06 D-3-093-001	LOT204	1600p	4515 03 29	LOT193	1550p	
06 D-3-095-001	LOT87	1450p	4515 03 30	LOT179	1550p	
06 D-3-095-002	LOT87	1450p	4515 03 31	LOT207	1550p	
06 D-333-512-001	LOT204	1600p	4515 03 34	LOT182	1550p	
FETX 100 90 DEG	LOT04	1600p	4515 03 35	LOT207	1550p	
FETX 90 WHITE	LOT08	1650p	4515 03 38	LOT193	1550p	
FETX 100 100 DEG	LOT34	1500p	4515 03 38	LOT27	1450p	
			4515 03 40	LOT200	1600p	
			4515 03 41	LOT196	1550p	
			4515 03 44	LOT196	1550p	
			4515 03 46	LOT207	1550p	
			4515 03 50	LOT27	1450p	
			4515 03 51	LOT27	1450p	
			4515 03 75	LOT56	1650p	
			4516 16 01	LOT22	1500p	
GRUNDIG			MITSUBISHI			
29201.008.01	LOT153	1750p	731003	LOT51	1650p	
29201.014.01	LOT140	1800p	276-16399	LOT49	1800p	
29201.015.01	LOT149	1400p	334 B 07803	LOT50	1700p	
29201.017.01	LOT60	1250p	334 B 07830	LOT50	1700p	
29201.018.01	LOT163	1300p	334 B 08104	LOT74	1600p	
29201.018.02	LOT61	1700p	334 B 08108	LOT295	1600p	
29201.019.01	LOT62	1250p	334 P 18507	LOT51	1850p	
29201.019.02	LOT62	1250p	5906-0008A-AA	LOT75	1800p	
29201.022.01	LOT63	1700p	D 108/37	LOT49	1800p	
29201.022.02	LOT168	1800p	DCF1577	LOT273	1700p	
29201.022.03	LOT185	1750p	DCF2077A	LOT272	1650p	
29201.022.04	LOT185	1750p	KFS 602268	LOT279	1550p	
29201.024.04	LOT165	1750p	MSH-1FBW08	LOT78	1600p	
29201.024.04	LOT164	1800p	NIKAI			
			BABY10	LOT67	1450p	
HINARI			ORION			
154 138 K	LOT24	1500p	3714002	LOT02	1500p	
151 13914 I	LOT24	1500p	PANASONIC			
151 14184 I	LOT24	1500p	TLF 14512 F	LOT39	1850p	
CF 44 A	LOT24	1500p	TLF 14520 F	LOT40	1600p	
HM51-1411834-1	LOT24	1500p	TLF 14521 F	LOT39	1850p	
HITACHI			TLF 14557 F	LOT39	1850p	
2424593	LOT44	1250p	TLF 14568 F	LOT40	1500p	
2432101	LOT79	1800p	TLF 14584 F	LOT41	2000p	
2432461	LOT169	1500p	TLF 14586 F	LOT42	1800p	
2432511	LOT80	1800p	TLF 15606 F	LOT256	2500p	
2432651	LOT80	1800p	TLF 70012	LOT78	1500p	
2432761	LOT169	1500p	TLF 70012 F	LOT78	1500p	
2432981	LOT37	1300p	TLF 70012A	LOT78	1500p	
2432981	LOT37	1300p	TLF 70018	LOT274	1550p	
2432982	LOT37	1300p	TLF 70018 F	LOT274	1550p	
2433011	LOT171	1850p	TLF 70161	LOT278	1550p	
2433012	LOT171	1850p	TLF 70162	LOT72	1600p	
2433014	LOT171	1850p	TLF 70162A	LOT72	1600p	
2433212	LOT168	1500p	TLF 70162G	LOT72	1600p	
2433251	LOT172	1700p	TLF 77001 B	LOT72	1800p	
2433301	LOT246	1600p	PHILIPS			
2433441	LOT188	1900p	8222 140 10142	LOT142	1800p	
2433442	LOT191	1600p	8222 140 10145	LOT134	1450p	
2433451	LOT81	1600p	8222 140 10146	LOT112	1700p	
2433452	LOT82	1400p	8222 140 10151	LOT102	2150p	
2433453	LOT82	1400p	8222 140 10161	LOT103	1250p	
2433455	LOT234	1600p	8222 140 10171	LOT104	2150p	
2433521	LOT85	1600p	8222 140 10171	LOT114	1150p	
2433581	LOT22	1500p	8222 140 10198	LOT105	1750p	
2433721	LOT83	1600p	8222 140 10198	LOT115	1750p	
2433751	LOT79	1500p	8222 140 10201	LOT104	2150p	
2433752	LOT101	1600p	8222 140 10236	LOT118	1750p	
2433752	LOT250	1600p	8222 140 10246	LOT111	1780p	
2433891	LOT23	1400p	8222 140 10247	LOT105	1750p	
2433892	LOT84	1450p	8222 140 10254	LOT107	1600p	
2433893	LOT23	1400p	8222 140 10283	LOT117	1750p	
2433952	LOT33	1200p	8222 140 10269	LOT210	1650p	
2434002	LOT200	1600p	8222 140 10271	LOT208	1650p	
2434141	LOT93	1200p	8222 140 10274	LOT123	1600p	
2434274	LOT44	1250p	8222 140 10282	LOT122	1600p	
2434443	LOT86	1650p	8222 140 10283	LOT104	1450p	
2434455	LOT234	1600p	8222 140 10294	LOT125	2150p	
2434893	LOT44	1250p	8222 140 10306	LOT110	1600p	
2435062	LOT295	1600p	8222 140 10325	LOT132	1300p	
2435121	LOT87	1450p	8222 140 10326	LOT122	1850p	
2435131	LOT251	1600p	8222 140 10328	LOT124	1450p	
2435141	LOT282	1450p	8222 140 10349	LOT106	1450p	
2435301	LOT88	1450p	8222 140 10353	LOT284	1450p	
2435671	LOT89	1650p	8222 140 10356	LOT284	1400p	
2436201	LOT109	1450p	8222 140 10367	LOT286	1400p	
2436202	LOT109	1450p	8222 140 10369	LOT109	1450p	
2432101-2	LOT79	1800p	8222 140 10381	LOT128	1450p	
2433451H	LOT81	1600p	8222 140 10384	LOT127	2150p	
2433453H	LOT82	1400p	8222 140 10395	LOT116	1750p	
2433891H	LOT23	1400p	8222 140 10406	LOT73	1500p	
2433892G	LOT84	1450p	8222 140 10421	LOT109	1450p	
L.T.T.			8222 140 10778	LOT103	1250p	
4515 01 08	LOT113	1400p	SANYO			
4515 01 15	LOT136	1600p	094-00020/0.9	LOT113	1400p	
4515 01 16	LOT139	1675p	094-00035/0.2	LOT182	1350p	
4515 01 17	LOT139	1675p	094-01020/0.7	LOT59	1750p	
4515 01 19	LOT169	1500p				
094-01021/0.6			094-01027/0.0	LOT196	1825p	
094-01028/0.7			094-01038/0.7	LOT245	1900p	
094-01052/0.8			094-01052/0.8	LOT186	1825p	
094-01057/1.1			094-01057/1.1	LOT286	1450p	
610.018.6620			610.018.6620	LOT189	1650p	
SHARP			SHARP	LOT215	1800p	
RTRNF 1220 CEZZ	LOT39	1850p	RTRNF 1220 CEZZ	LOT39	1850p	
RTRNF 1783 BMZZ	LOT202	1800p	RTRNF 1783 CEZZ	LOT202	1800p	
RTRNF 1786 CEZZ	LOT211	1850p	RTRNF 1786 BMZZ	LOT211	1850p	
RTRNF 1786 CEZZ	LOT211	1850p	RTRNF 1786 CEZZ	LOT211	1850p	
RTRNF 2000 BMZZ	LOT214	1750p	RTRNF 2000 BMZZ	LOT214	1750p	
RTRNF 2002 BMZZ	LOT307	1450p	RTRNF 2002 CEZZ	LOT307	1450p	
RTRNF 2003 BMZZ	LOT308	1425p	RTRNF 2003 BMZZ	LOT308	1425p	
RTRNF 2004 BMZZ	LOT307	1450p	RTRNF 2004 BMZZ	LOT307	1450p	
RTRNF 2005 BMZZ	LOT308	1425p	RTRNF 2006 BMZZ	LOT308	1425p	
RTRNF 2006 BMZZ	LOT307	1450p	RTRNF 2007 BMZZ	LOT307	1450p	
RTRNF 2023 BMZZ	LOT310	1500p	RTRNF 2023 BMZZ	LOT310	1500p	
3753100	LOT275	1700p	3753100	LOT275	1700p	
1-329-243-00	LOT91	1700p	1-329-243-00	LOT91	1700p	
1-329-243-11	LOT91	1700p	1-329-243-11	LOT91	1700p	
1-329-243-12	LOT91	1700p	1-329-243-12	LOT91	1700p	
1-329-243-31	LOT229	1700p	1-329-243-31	LOT229	1700p	
1-329-243-32	LOT229	1700p	1-329-243-32	LOT229	1700p	
1-329-244-00	LOT48	1800p	1-329-244-00	LOT48	1800p	
1-329-244-11	LOT48	1800p	1-329-244-11	LOT48	1800p	
1-329-244-21	LOT48	1800p	1-329-244-21	LOT48	1800p	
1-329-256-00	LOT45	1800p	1-329-256-00	LOT45	1800p	
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VIDEO RECORDER POWER SUPPLY REPAIR KITS

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

NEW NATIONAL PANASONIC VCR SERVICE KITS

This Service Kit consists of the parts for the upperside of the G deck, G rev. deck and G2 deck.
Suitable for the following models:
AG5150, AG5250, AG5700, AG6024, NVF55, NVF55F, NVF65, NVF75, NVF77, NVJ30, NVJ33, NVJ35, NVJ36, NVJ37, NVJ40, NVJ42, NVJ45, NVJ46, NVJ47, NVJ48, NVL20, NVL21, NVL23, NVL25, NVL28, NVV1, NVF5100, NVFS200, NVFS88, NVFS90
This kit consists of the following:
Pinch Roller Unit, Mode Switch, PS Pull Out Gear, Sub Loading Arm Unit, Pinch Cam, Pinch Cam Cap, PS Unit, Cut Washer, Connection Gear, Cut Washer
Order Code: SK134 Price: 1100p

This Service Kit consists of the parts for the lower side of the G deck, and the G rev. deck.
Suitable for the following models:
AG6024, NVF55, NVF55F, NVJ30, NVJ33, NVJ35, NVJ36, NVJ37, NVJ40, NVJ42, NVJ45, NVJ46, NVJ47, NVJ48, NVL20, NVL21, NVL23, NVL25, NVL28, NVV1

This kit consists of the following:
Main Cam Gear, Ring Gear, Sub Cam Gear, Timing Belt, Centre Gear, Play Arm Unit, Clutch Disk, Loading Gear (take up), Centre Pulley Unit, Loading Gear (supply), Loading Cam Gear, Cut Washer, Retainer Gear Unit, C Ring, Detent Arm
Order Code: SK135 Price: 1000p

TRANSPARENT REPAIR/ADJUSTMENT CASSETTE

This transparent videocassette replaces a normal videotape during measurements, adjustments and inspection. The mechanical parts come into sight and become accessible.
Order Code: Tool23 Price: 500p

VOLTAGE TESTER

A terminal screwdriver incorporating continuity and voltage detection supplied complete with batteries on blister card. With Eusotol and instructions for use.
Order Code: Tool11 Price: 220p

SPRING HOOK

Spring Hook, to unlock springs in audio tape recorders and VCR's
Order Code: Tool20 Price: 265p

SATMETER

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

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

Order Code: Tool22 Price: 8500p

DIGITAL MULTIMETERS

CM2300 DIGITAL MULTIMETER

- Features:**
- 3.5 LCD Display
 - Height 12mm
 - Max Reading 1999
 - HV Indication for High Voltage
 - Single Manual Rotary Switch for Function and Range Operation
 - All Ranges Overload Protected
 - 10A DC Current Test
 - DC Voltage 2V/20V/200V/500V
 - AC Voltage 200/500V
 - DC Current 200mA
 - Resistance 2k Ω /20k Ω /200k Ω /2M Ω
 - Supplied with test probes
- Order Code: CM2300 Price: 975p**

CM2400T DIGITAL MULTIMETER WITH TEMP MEASUREMENT

- Features:**
- 3.5 LCD Display
 - Height 12mm
 - Maximum Reading 1999
 - 10A DC Current Test
 - DC Voltage 200mV/2V/20V/200V/1000V
 - AC Voltage 200/750V
 - DC Current 0.2mA/200mA/20mA/200mA/20A
 - Resistance 200 Ω /2k Ω /20k Ω /200k Ω /2M Ω
 - Supplied with Test Probes
 - Temperature measurement
 - Continuity Test
 - Diode Test and Continuity Check
 - All Ranges Overload Protected
- Order Code: CM2400T Price: 1450p**

CM2900 PACKET DIGITAL MULTIMETER

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

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

Order Code: CM2900 Price: 1150p

CM2700 AUTORANGING DIGITAL MULTIMETER

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

Order Code: CM2700 Price: 4050p

CM3230 DIGITAL CAPACITANCE METER

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

Order Code: CM3230 Price: 3950p

REPLACEMENT IDLERS & PULLEYS

Make	Models	Description
Hitachi	VT11, 14, 17, 19, 33, 34, 35, 38, 39, 52, 57, 61, 62, 63, 64, 65, 85, 86, 330, 350, 640, 165, 5030	FF Rew Idler 6886792 Price: 100p
Order Code:	IDL01	
Make	Models	Description
Hitachi	VT680, 6500, 6800, 9300, 9500VT9700, 9900	Play Idler 6861482 6861481 Price: 160p
Order Code:	IDL02	
Make	Models	Description
Blaupunkt	RTV301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 404, 414, 424, 434, 444, 478, 707	Idler
Goldstar	GHV1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, GHV1248, 8000, 8200, 8210, 8215, GVHP51, VCP4100, 4130	Idler
Grundig	MVS400, 440, VS400, 410, 440VS450, 460	Idler
National	NV230, 250, 260, 280, 370, 380, NV430, 431, 433, 450, 460, 465, 470, 480, 630, 650, 730, 780, NV810, 830, 850, 870, 890, NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, AG1000, AG1050, 1200, 1500, 1810, AG2100, 2200, NVH65, 70, VR6460, VR6520, VR6920	Idler Arm VXP 0521
Philips		Idler Arm 40340162 Price: 100p
Order Code:	IDL08	
Make	Models	Description
Amstrad	VCR7000	Idler 150280
Sharp	VC200, 381, 383, 384, 385, 386, VC388, 390, 393, 3300, 8381, 9100, 9300, 9500, 9700	Idler NIDL0005GEZZ Price: 100p
Order Code:	IDL10	
Make	Models	Description
Philips	VR6540	Idler
Sharp	VC300, 387, 402, 471, 473, 477, VC481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, 5F3, 5W20E	Idler NIDL0006GEZZ Price: 100p
Order Code:	IDL11	
Make	Models	Description
Akai	VS10	Reel Idler
Ferguson	3V23, 3V29, 3V30, 3V31, 3V323V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	Reel Idler PU48967
J.V.C.	HR7200, 7300, 7350, 7600, 7610, 7650, 7655, 7700	Reel Idler PU48967 Price: 175p
Order Code:	IDL20	
Make	Models	Description
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Idler PU 51402 Take Up Idler PU 51402A Price: 100p
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610, HRD110, 111, 120, 121, 225	
Order Code:	IDL22	
Make	Models	Description
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Clutch PU 51380 Take Up Clutch PU 53462A PU 51380 Price: 200p
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610	
Order Code:	IDL23	
Make	Models	Description
Philips	DB532, VR6520, 6843, 644	Reel Idler
Sharp	VC600, 651, 681, 682, 684, 685, 693, 699, 700, 783, 6FR, 6V3, 6F3	Idler Assembly NPLY0107GEZZ Price: 615p
Order Code:	IDL88	
Make	Models	Description
Philips	VR6843, 6943, 44S89, VR44S8920, 44S8922, 6943	Reel Drive Unit
Sharp	VC772, 780, 781, 782, 785, 786, VC787, 800, 793, 799, 7810, 7822, VCA100, 102, 104, VCA131, 140, 170, 202, 203, 234, 501, VCA602, 5011, VCD801, 802, VCH851, 852, VCH882, VCM73, VCT72, VC782MK11	Idler NPLTV0111GEZZ Price: 700p
Order Code:	IDL90	
Make	Models	Description
N.E.C.	N911, 915, 916, 917, 9012, 9013N9014, 9016, 9033, 9034, 9053, N9054, 9055, 9056, 9066, 9096, N9110, 9120, 9510, 9520, 9530, N9610, DX1000, 1600, 2000, DX3000, PX1200	Idler Arm Assembly Price: 270p
Order Code:	IDL245	
Make	Models & Description	
Philips	Pressure Roller Assembly PS403-40205	
	DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, 3210, 3219, 322, 3229, 323, 53580, VR486, 471, 562, 582, 571, 761, 201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, 6291, 6293, VR6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, 8681, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB9, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 25B01, 25B02, 25B11, 25B12, 30DV2, 31DV1, 31DV2, 31DV, 33SB02, 33SB03, 33SB05, 33SB11, 33SB12, 33SB13	Idler
Toshiba	V91, V95 Pressure Roller Assembly - PS403-40205	
Order Code:	PR232	Price: 300p

CM3900A DIGITAL MULTIMETER

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

Order Code: CM3900A Price: 2900p

CM3920 DIGITALMETER WITH TEMP MEASUREMENT

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

Order Code: CM3920 Price: 4100p

REMOTE CONTROLS

Description	Code	Price	Description	Code	Price	Description	Code	Price
AKAI			ITT			SALORA		
RC-V10A	RC876	750p	IFB13, 14, 15	RC143	800p	SERIES L	RC190	750p
RCV 37 B	RC891	750p	FS4	RC148	750p	86173	RC882	750p
V25A	RC896	750p	RG305	RC305	675p	SANYO		
DECCA			RG306	RC306	750p	RC218, RC222, RC228, RC238	RC140	700p
RC70	RC894	750p	FS9/1-10/1	RC307	750p	JXGE	RC878	800p
FISHER			V55 RUK	RC308	750p	JXDE	RC884	750p
RC905B	RC879	750p	VS4-1	RC308	750p	VHR2300	RC890	750p
GRANADA			MULTICONTROL (17C20)	RC311	750p	RC628	RC865	750p
UNIVERSAL TEXT	RC309	750p	LOEWE			SHARP		
MK4 TEXT, 70155G, 70115G, 70133G	RC880	750p	DC11	RC146	800p	G0121CESA, 123CESA, 204, 251	RC140	700p
95288E	RC882	750p	MATSUI			SONY		
94490D	RC884	750p	010270601	RC889	750p	RM604, RM605, RM606	RC140	700p
GRUNDIG			VX770	RC892	750p	32 CHANNEL	RC140	700p
TP160E	RC107	900p	NOKIA			RM613	RC141	750p
TP200, TP300	RC380	750p	SATELLITE	RC550	750p	RM632, RM636	RC160	675p
TP400	RC401	675p	ORION			TATUNG		
TP590-600	RC600	750p	RC53	RC892	750p	FXA	RC877	750p
TP390, TP610	RC610	750p	PANASONIC			RC70	RC883	750p
TP621	RC612	800p	EUR51200	RC200	800p	FX70 FASTTEXT	RC894	750p
TP630, TP650	RC650	750p	TC2200	RC204	750p	TELEFUNKEN		
TP666	RC660	750p	V5Q0357/NV730	RC202	750p	FB632	RC632ST	750p
TP661	RC661	750p	TNQ1621	RC203	750p	FB639	RC639	750p
HITACHI			PHILIPS			THORN/FERGUSON		
CLE800-CLE830	RC140	700p	RC5002,5154	RC134	750p	3V35-42	RC342	650p
A617402/655602	RC1920	800p	KT3 NON TEXT	RC135	750p	3V31-32	RC344	750p
A512120/230	RC900	750p	69117032	RC178	800p	3V57-58	RC628	750p
A514790	RC901	750p	69117194	RC180	750p	TX10 TEXT	RC732	575p
A5088470	RC902	800p	RC5991-UNIV	RC300	580p	TX10 STEREO TEXT	RC738	575p
A518612	RC903	750p	RC38	RC301	750p	TC9-90-100	RC740	675p
SCL002	RC904	750p	KT3 TEXT	RC5901	750p	3V55, FV11	RC783	750p
C2096	RC905	800p	RC5352	RC5301	750p	TX100 FASTTEXT	RC789	650p
A511940	RC906	750p	RC5375	RC5352	750p	TX100 ST, FASTTEXT	RC789	650p
655602H	RC1920	800p	RC5 STANARD	RC5375	750p	PROFESSIONAL	RC790	650p
			RC5903	RC300	580p	TOSHIBA		
				RC5903	700p	CT937	RC950	750p
						CT9117	RC951	750p

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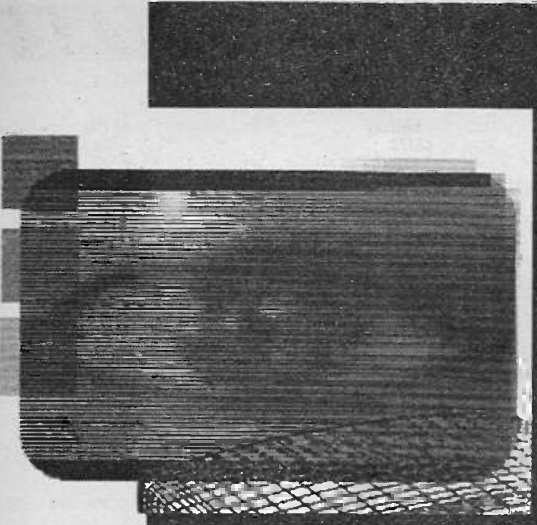
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Monitors



Reports from
Philip Blundell, AMIEEIE
John Pitt-Francis
Graham Thomson
Christopher Nunn and
John Edwards

Compaq 420T

This monitor produced a red screen. A quick check showed that there was no voltage at the collector of the red output transistor. The cause was an open-circuit coil, L404 (4 μ H). Fitting a coil from a similar monitor solved the problem. P.B.

Dell Ultrascan D1526TX-HS

The slightest tap on the CRT base panel produced loss of blue in the display. This made location of the offending dry-joint very difficult. It was found at R320, a 33k Ω , 2W resistor in the blue drive circuit. J.P.-F.

Mitac M1420-01N-E

The RGB processor chip U701 was found to be responsible for no red in the display. We proved this by swapping over its red and blue drive inputs (pins 6 and 4 respectively) – the blue parts of the display then dropped out instead. A new LM1203N chip restored an excellent display. J.P.-F.

Raster-OPS GDM1950

There was no green content in the display. The cause of this was traced to Q202, which was short-circuit emitter-to-base, and R207 which was well cooked. When these two items had been replaced, also Q201 and R208 for good measure, we had an excellent 21in. display.

This chassis, of Sony origin, has the best circuit I've come across for convergence. The screen is divided

into fifteen sectors, with an H and a V control for each. They really work and don't interfere with each other. Wonderful! J.P.-F.

Philips 7CM5279/20T

No line drive is a common problem with these monitors. The cause is loss of the supply to the line driver FET. This supply is provided by a BC640 constant-current source transistor, Tr7519, which is in the habit of going short-circuit. As a result, its feed resistor R3512 (47 Ω safety) goes open-circuit. G.T.

Philips 7CM5279/20T

Field collapse was the problem, or to be more precise there was a narrow, wedge-shaped raster. The monitor had been elsewhere for repair, and persons unknown had cracked the small connection PCB on top of the scan coils. When this had been repaired we had a normal picture. G.T.

Acer 7015

There was intermittent line tearing, mainly when the monitor was cold. When we checked with heat and tins of freezer the culprit was revealed. It was C908 (10 μ F, 160V) in the power supply. Its value had fallen to 1-8 μ F. C.N.

Daewoo CMC1414ADE

This monitor came to us with the complaint that it was dead. On checking we found that there was HT, but it was very low at only about 30V. Heating the power supply brought the monitor back to life. As I almost got to the end of my supply of freezer I came across the culprit, which was C014 (1 μ F, 50V). Its value had dropped to 0-68 μ F. C.N.

IBM 6322-002

No picture correction via the touch pads at the front was the complaint with this monitor. The cure was to replace C418 (22 μ F, 63V) in the EW correction circuit. It had a slightly

swollen appearance but measured OK. C.N.

Commodore 1960

The power supply was OK but there was no line output stage operation. The cause of this was a carbonised hole that surrounded one leg of L403. Fortunately the inductor itself was still intact. Scraping away the burnt board area and adding a wire link across the hole restored normal operation. J.E.

Escom EM1448RPD

This monitor was dead with the SGSF444 line output transistor short-circuit. When I fitted a replacement the monitor performed normally. But the transistor was running very hot – too hot. It ran a little cooler when I replaced C414 (100 μ F) in its base circuit (the original capacitor checked out OK when tested). With monitors tending to be on all day every day, some of the line output transistor heatsinks fitted leave much to be desired. J.E.

Thorn 8513002

There was no picture because the tube's heater supply was open-circuit. The action required was to resolder the relevant pins on the line output transformer. J.E.

Sony CPD15F13/Gateway 2000 Series

Intermittent picture break up was the complaint. The fault would either rectify itself, or the monitor would revert to standby. I found that the line output stage was littered with dry-joints. After a thorough resoldering operation I gave the monitor a long test run. This proved that it was now OK. J.E.

Opus CM1448M

A sizzling noise came from the power supply and there was line tearing with ragged edges on the display. This was all caused by the 330 μ F, 250V HT reservoir capacitor C808 which was open-circuit. J.E.

What a Life!

Mostly faulty TV sets this time. A string of successes was followed by a nasty that brought Donald Bullock back to earth

Over the years the items we have been concerned with in our trade have become ever more complex. What's more, they are sold at prices which twenty years ago would have been unbelievable – unthinkable even ten years ago.

People no longer bring us faulty radios to repair, unless the equipment is fairly modern and incorporates a twin cassette recorder. Even then they make it clear that they are unwilling to pay more than peanuts. New ones are just so cheap! We no longer have to turn stacking units and hi-fi systems away. Their owners buy new. Portable colour TV receivers are going the same way. So are basic VCRs.

A week or two ago a couple of teletext sets were brought in for repair estimates. Neither had serious faults, and we kept our estimates low. Yet the customers turned into Scotch mist on hearing them. People don't even pick the sets up. These days more and more are left on our hands.

Steven's Expertise

"'E shuts down every now and again Mr er.. er.. hnnn hnnn" said the lean little man with the Panasonic video recorder. "But if I taps 'im here he tries to come on. hnnn hnnn."

It was an NVL20B, and the dusky patch on its top smelt of Guinness. But he was quite right. When I opened it up the capstan soon stopped, followed by the rest of the mechanism.

Steven had been watching. "I've had a lot of experience of this one" he said. I stepped back and he tapped around plug 1 on the main panel. The capstan immediately sprang to life. In no time he'd resoldered pin 15. "Plug 1 feeds the capstan motor" he said.

Mr Mincing

Then I saw Mr Mincing carrying a 14in. Ferguson TX90 from his car. I don't like Mr Mincing. Too loud and familiar. "Don't go away" I said to Steven. "Handle old Mincing as best you can and think up a few ideas on the Fergie while I make the tea." Then I hurriedly departed.

"Wherr's 'e gone?" bawled Mincing. "Miserable old bugger. 'Fraid I'll bite 'im he is."

Steven took the set and found that the problem was field collapse. It was the usual dry-joint trouble. When he'd done the necessary resoldering he had a picture. But it was distorted, with vertical strips of shading that varied with the setting of the brightness and contrast controls.

"I 'en't watching that" bawled Mincing. "I wants 'im right."

Steven busied himself in the power supply, and soon found that the 22 μ F, 50V boost reservoir capacitor C189 had fallen in value to only 0.01 μ F. A replacement cured the fault.

"That 'ent gonna cost much. I know" Mincing commented. "Them resistor things cost almost nothin'."

"Twelve pounds twenty five" said Steven, boxing up the set. As Mincing gulped at the air, Steve added "five bob for the capacitor. the rest for our time and suffering."

Monitors and TVs

Mrs Twog lumbered in as we were drinking our tea.

"Car" she said. "Hoop... hoop... ah."

Steven went to her car and returned with a Supertron colour monitor.

"Dead" said Mrs Twog. "See you tomorrow. Hoop... hoop... ah."

When we put it on the bench it was dead all right. So we opened it up and Steve went around it with his DC meter. When he touched the base of the chopper transistor the set chirped and sprang to life. The 330k Ω bias resistor R902 was open-circuit – a replacement restored normal operation.

"Hoop... hoop... ah" said Steven, "next please!"

He didn't have long to wait. Old Miss Porcelain called in with her Alba portable colour set.

"Hwuh... hwuh... oh, Mr Burper, it made such an unpleasant smell then went 'phff'. Now there's no picture. Hwuh... hwuh... hwuh" she said.

We pursed our lips and smiled sweetly. When she went we pulled her set on to the bench. I switched it on and the standby light glowed, but the set was otherwise dead. After opening it up I found that one of the pins of L401 was sitting in a large scorched hole in the PCB. The cure was to remove all traces of carbon and resolder the coil with a jumper. After that the set produced a particularly good picture.

A Satellite Receiver

C.C. Kilby, our next caller, is an expressionless accountant from a nearby town. The C.C. stands for Complete Control. Kilby won't break down and smile, or even be himself. Dealing with him is heavy going.

He opened his briefcase and took out a Pace SS9200 receiver-decoder which was actually dressed up as the Nokia SAT1500. "This instrument failed in use. Hweh.. hweh.. hweh" he said drily. "I'd be obliged if you would repair it. Settlement in cash, of course. Hweh.. hweh.. hweh." Then he

walked off as though freshly starved.

His receiver was dead and the 1A mains fuse had gone to its Maker. We soon discovered that the chopper transformer T2 was faulty, with all four pins on the primary side shorted together. We ordered and fitted a replacement, and also replaced the BUT11A chopper transistor Q1 and its 1 μ F, 16V base drive coupling capacitor C9. That completed the job.

When C.C. Kilby came to collect his receiver he was clearly pleased, and I fancied that the germ of a smile touched his face. But Steven insisted that he was suppressing a cruel attack of wind.

The Muck Bros

The Muck brothers, Hawley and Malc, are a pair of jolly farmers. They staggered in with a huge 59cm Goodmans set. Model 2575.

"Have a look at thisun, boys. Kuh!" said Malc. "We don't want to spend too much, mind. If it's more than ninety quid, say, ring us first on this joker."

He waved a mobile phone at us and we took the number he gave.

"We'em off to the market for a few hours. Kuh."

We got them to bounce the set on to the bench, and as they left we removed its back and switched on. A few thin wisps of smoke rose from the main panel. Steven studied them. He homed in on the spot and found that link 13, which carries some spikey chopper transformer voltages, was dry-jointed and getting burnt up about it.

It was another case of clearing the carbon and resoldering the joint. When this had been done we switched on and were rewarded with a good picture.

We rang the Muck Bros on their mobile phone and were answered by a bellowing bull. "Tell Hawley and Malc that their set's done" I said, "at something less than ninety."

Mr Thick's Solavox

Mr Thick comes from the Severnside village of Elmlode. He came in carrying a Solavox TV set. Steven looked at it and started to gibber, but I stood there resolutely and faced Mr Thick with great dignity.

"It works when you plug it in Mr Pullet, but it's dead" he announced. "Huh!"

"You don't say" I replied, drawing up a job card and filling in his name. "Phone number?" I

asked.

"Elmlode 456. Huh" he said.

I racked my brains for the local code, then looked at him.

"What's Elmlode, Mr Thick?"

"What do you mean, 'what's Elmlode' huh, Mr Pullet."

"Never mind" I said.

"Any more questions, Mr Pullet?"

I waived him out and put his set on the bench. It was a Solavox 22R19. When I opened it up I found that it contained an ITT Compact 80 chassis. I shouted the news to Steven, who cheered up and came over.

The set was dead but the standby light was on. There was no HT supply. On further investigation we saw that there was a dry-joint at one end of an 0.01 μ F, 1.6kV capacitor in the line output stage and that one of its leadout wires had burnt away. We replaced it and switched on, but there were still no results. So we dived for the line output transistor, which sure enough had shrugged off its mortal coil. After fitting a replacement we switched on and a good picture came up.

"You know, Steven, I reckon this is not such a bad trade after all" I said. "We've fixed several sets with no effort at all. We're so clever we can now take all these faults in our stride. Yep, that'll be it." I reckoned without Mr Sly.

The Bush 2114

Mr Sly appeared out of thin air. He's an enquiry agent-cum-bailiff, and is the only man I've come across who can swivel his eyes in opposite directions. He was carrying a Bush Model 2114.

"If I as much as look at it it whines" he said. "Nyahh."

We nodded understandingly and promised to look into it.

When we switched the set on we found that in addition to the whining there was no vision and the raster covered only the lower two-thirds of the screen. We noticed that two electrolytics, C806 (1,000 μ F, 16V) and C830 (220 μ F, 25V), had blown their tops. We replaced them, checked the associated rectifiers and switched on. They blew their tops once more.

After fitting replacements we studied the board. C808 (1,000 μ F, 16V) and the HT reservoir capacitor C810 (220 μ F, 160V) both had bulging tops. All these electrolytics are reservoir/smoothing capacitors on



The Muck brothers staggered in with a huge 59cm Goodmans set . . .

the secondary side of the power supply.

It seemed clear that the outputs were high because something was amiss on the primary side of the circuit. We eventually found that C818 (1 μ F, 50V) had fallen in value to 0.5 μ F.

We replaced C808, C810 and C818 and switched on. This time the set no longer whined and we were able to tune in a picture. But there was no sound.

C606 (1,000 μ F, 25V) and C607 (470 μ F, 25V) in the audio output stage had both gone very low in value. Replacements failed to restore the sound, and further checks revealed that the 1 Ω safety resistor R811 in the power supply had blown. A replacement went open-circuit immediately, so we replaced the TDA2006 audio output chip IC601.

It took us some hours of bench time to get the set working properly.

About half an hour later, as we were about to pass the set OK, it banged and showered the bench with electrolytic innards. Steven looked at the set, then at me.

"What was that you said about us being so clever and taking the sets in our stride?" he asked.

"I don't recall saying anything of the kind" I retorted. "It was you who said that."

Servicing

the Mitsubishi HSMX1

John Coombes presents a servicing guide that deals with the mechanical and electronic sections of this VCR

Most of the mechanical faults you get with this VCR can be cured with the aid of the Mitsubishi service kit part no. 789C014010. Unfortunately it doesn't include a capstan pulley. When faulty this item can be responsible for no eject, the tape being jammed in the machine or even no rewind/fast forward. When they first occur these faults may be intermittent – until the pulley breaks completely. Other symptoms are tape chewing and half loading.

The Service Kit

The item you are most likely to need in the service kit is the pinch roller. It can break, with the result that the tape is jammed in the machine or won't go in. If the roller's surface becomes highly polished, you may get tape creasing at the top and/or bottom.

To replace the pinch roller you have to remove the cam pinch, on which the pinch roller travels. Clean this, removing all the thick, black grease.

Clean the spindles and loading motor, and regrease with PG641 (part no. 859D55030). This will prevent intermittent play – cutting out for no apparent reason.

If the machine won't load and go into play the cause may be the grease on the pinch or a faulty loading motor. The latter can be checked by slightly rotating with a finger. If the motor is free with no resistance, it's OK. If there's slight resistance, replace the motor.

The next item in the kit to replace is the tape tension regulator arm. It can be responsible for the tape stopping just after the start of playback. Alternatively tape movement may continue but because of the loss of the pad there's no playback. Check this by reseating the pad. This should restore normal playback.

The capstan brake can wear. The result will be poor still pictures, or there may be a squeak at the start of recording. These faults can also be caused by a defective reel belt, which can also be the cause of a jammed tape.

The tape tension brake band can cause bent verticals, hooking at the top of the picture or up and down movement of the playback picture.

If the supply/take-up brakes wear they won't work in the rewind and/or fast forward modes.

The final item in the kit is a lever brake. Replace it to

prevent picture noise at the start in the slow rewind mode. This item is not present in all models.

Mechanical Faults

Noisy rewind/fast forward: Check that the take-up and supply turntable reel spindles are lubricated and free running. If necessary check the gear reel units. Remove, clean and relubricate them. This usually cures the problem.

Poor playback/lines on the picture: Misaligned guide poles can cause this. Reset and seal the screw with Loctite paint. Also ensure that the guide pole arms aren't bent. If so, replace the complete guide pole.

Noisy playback/stills: On rare occasions the cause can be a faulty drum motor bearing. In this case replace the complete drum assembly. Alternatively the cause may be the earthing brush on the drum spindle. To prevent any further noise, ensure that it's greased.

Intermittent clicking noise during playback: This can be a very intermittent fault. Its cause is the spring in the gear idler unit. Check by replacement. Clean all the mechanical components here and lubricate the spindles.

Poor sound/muffled sound: Ensure that the audio/control head is clean and not clogged with oxide. If the AC head is OK in this respect, check whether the pinch roller is worn – if it is, the tape will slide and slip. The audio/control head could be faulty.

No erase: We've always found that the head is dirty. When worn it may keep on getting dirty. Only replacement will cure this.

Mechanism jams: We've had this fault on rare occasions because the gear arm TU-G2 has cracked or lost its teeth.

Mode switch faults: The mode switch S570 can be responsible for many problems – no play, no eject or no fast forward and rewind. The condition may be very intermittent. Be sure that the VCR is in the eject mode when you replace the mode switch.

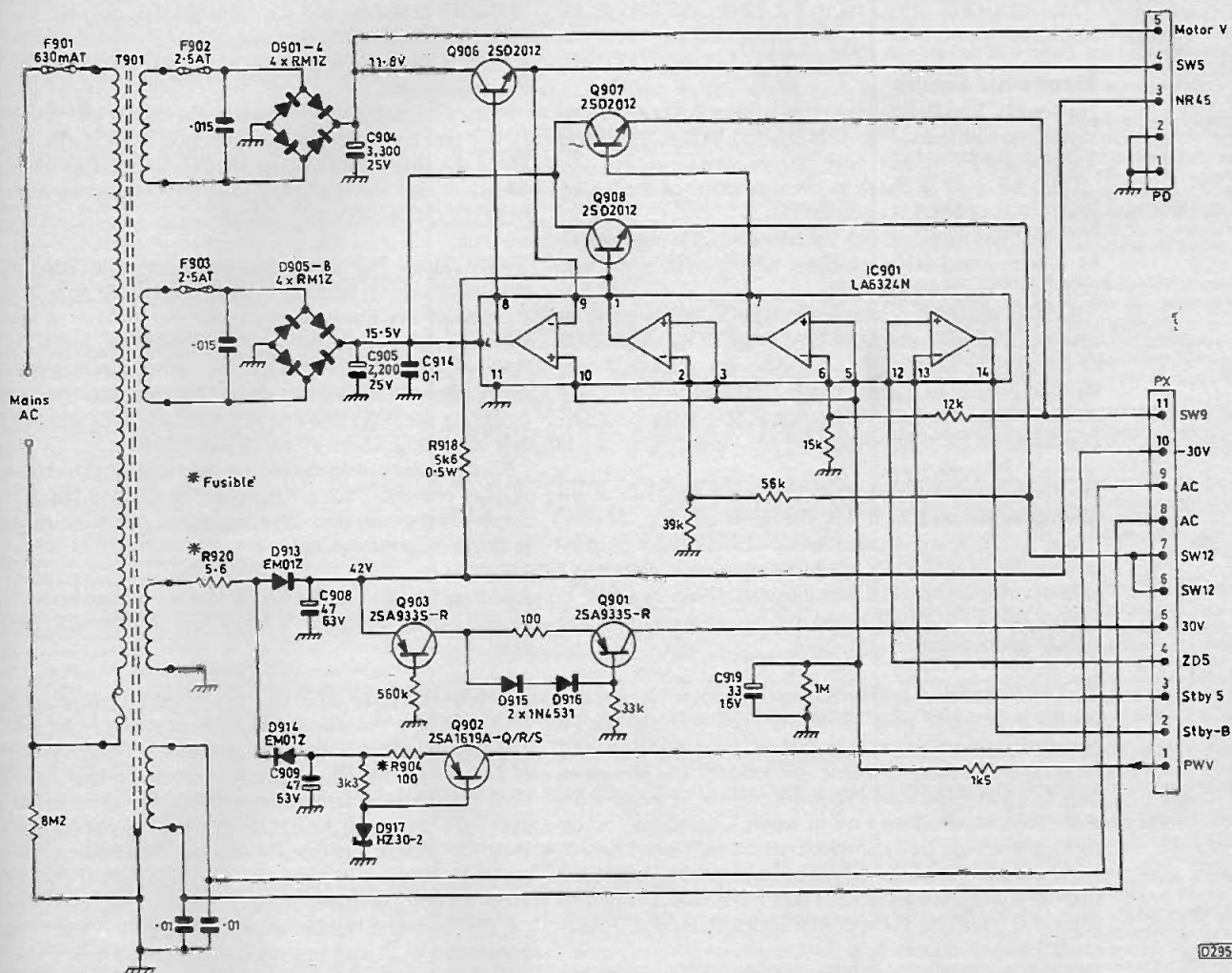


Fig. 1: The power supply circuit used in the Mitsubishi Model HSMX1B VCR.

Intermittent pause in playback: This can be a very intermittent fault. We've found that the capstan motor is usually the cause.

Cassette housing faults: If the front loading door arm A or B jams and breaks, the front door won't open and the tape will be trapped inside the VCR.

The cause of the cassette tape not seating correctly on the take-up/supply spools can be a bent or damaged bottom cassette plate.

If the cassette housing doesn't load or unload the tape, check the front loading gear for wear, and the gear and/or drive gear for cog damage or being split.

If the tape is jammed in the cassette housing or fails to

load, check the front loading arms for a break or displacement.

Picture jitter: A worn lower drum or a faulty audio/control head can cause this. Another thing to check is for a faulty tape tension band brake or maybe a bent tension arm.

Tape looping out because a reel disc doesn't rotate: We've had this fault with many different Mitsubishi VCRs. It's caused by the pulley gear being incorrectly seated, because the split washer has been pushed down past the slot on the shaft that holds the reel gear unit. If you wish to prove the point, swap with the washer on top of the belt pulley.

Video head faults: The most common problem is a snowy picture because the heads are dirty (clean them) or faulty. One head may be clogged, with the result that there is a picture on part of the screen, the rest being snowy. Check also for poor connections at plug/socket GB. If the lower drum is badly worn, the video heads can clog prematurely.

If the heads are OK, check back through the video head amplifier. The first step is to ensure that the XRA7254S

Transistor voltages

Transistor	C	B	E
Q901	32	41	41.6
Q902	-30	-30.7	-40.6
Q903	42	41.6	42
Q906	11.8	5.8	5.1
Q907	15.5	9.9	9.3
Q908	15.5	13.2	12.6

IC901 Voltages

Pin	V
1	13.2
2	5.1
3	5.1
4	15.4
5	5.1
6	5.1
7	9.9
8	5.8
9	5.1
10	5.1
11	0
12	5.1
13	5.1
14	5.8

chip IC201 is receiving its 5V supply – if not, check back to source. IC201 could be faulty: check the DC conditions before trying a replacement.

This of course brings us to the electronic side of the machine.

Electronic Faults

No results: The first thing to check is the 630mA mains input fuse F901, see Fig. 1. If this has blown, the power transformer T901 could have shorted turns.

The next thing to check is whether either of the 2.5AT fuses F902 or F903 is open-circuit.

If F902 has blown, check the four RM1Z bridge rectifier diodes D901-904, transistor Q906 (2SD2012) and C904 (3,300 μ F) for shorts.

If F903 has blown, check the RM1Z bridge rectifier diodes D905-908, transistor Q907 (2SD2012) and C905 (2,200 μ F) for shorts. Q907 could be dry-jointed. If necessary, go on to check Q908 (2SD2012) and C914 (0.1 μ F), then the LA6324N chip IC901 (check its DC conditions or by replacement).

No display – power supply fault: Check for –30V at pin 10 of plug/socket PX. If this voltage is missing, the first things to check are whether Q902 (2SA1619A) is open-circuit, D917 (HZ30-2) is short-circuit or R904 (100 Ω safety) open-circuit. It's possible that Q902 or D917 is leaky. D914 (EM01Z) could be open-circuit or C909 (47 μ F) short-circuit.

Tuner/IF faults: A broken RF input or output socket is a common problem with all VCRs. The sockets can be physically damaged as a result of plug removal and replacement, or may become dry-jointed. The symptom may be a snowy picture, a flickering picture or just a complete snow storm. Don't try to repair a damaged socket, fit a replacement. See also converter/booster faults below.

If the sockets are OK and the picture is snowy the tuner (TU01) could be faulty. Check its LT and tuning supplies. If there is no tuning voltage, R08 and/or R09 (both 10k Ω) could be open-circuit.

Check for poor or dry-jointed connections within and external to the tuner. Take great care not to use too much solder or too hot an iron inside the tuner – otherwise you may create shorts.

Tuning drift: Check IC8A2 (type μ PC574J) which could be faulty.

Colour/luminance faults: Luminance faults are generally caused by a defective BA7255BS chip (IC2A0), and/or associated components. The low-pass filter LPF2A0 (part no. ELB-4M089N) could be open-circuit. Check for dry-joints in this area.

For loss of colour the LA7333 chip IC6A0 is suspect. First check that its DC supply is present. If not, check back to source. The 4.43MHz crystal X6A0 could be faulty or dry-jointed. Check for dry-joints around IC6A0 and the chroma delay line DL6A0 (type CF873). Also check all relevant connections and plugs/sockets.

No or low playback sound: Check the audio/control head which could be worn or dirty. Clean the head then try a test recording/playback. If the sound is still low or muffled, replace the head. Use an alignment tape to set up the new head, and seal the screws with Loctite paint to prevent movement.

If the head is OK, the LA7295 audio processor chip IC310 is suspect. Make sure that its 12V supply is present at pin 8, then check the DC conditions around the chip. If

incorrect voltages are present, replace it.

No E-E sound: Check whether the audio signal is present at the RF converter and the NJM2233BL chip IC311. If IC311's 5V supply is missing (pin 2), check back to source. IC311 or IC310 (LA7295) could be faulty – check by replacement.

It may be necessary to check the M51496P IF chip IC101 and its associated components. If all is OK here, check the signal path through the NT/VPS/SIF PCB. The 6MHz crystal filters CF51 and/or CF53 could be faulty, or Q51 (2SC2058S) open-circuit.

Timer faults: The cause of no timer display is usually in the power supply, but D8Z1 (RD4-7EB) could be leaky or the display's filament open-circuit.

If this is all OK the 64-pin microcontroller chip IC8A0 (type μ PD75216AGF663-3BE) is suspect. Before trying a replacement, ensure that the 4.19MHz crystal X8A0 is operating correctly and that IC8A0's supply is present. If this is missing, check Z8A0 (GPIU72RM).

IC8A0 can be responsible for no display, intermittent display operation, some segments not being alight or the display being very dim. The display may be flickering or giving wrong information.

Loading faults: The TA7291S loading motor drive chip IC4A2 can be the cause of no loading or incorrect operation.

Servo faults: If the drum or capstan speed is incorrect the usual cause is the associated drive or control chip. The capstan and drum servos are within the BU2820S chip IC4A0. Check the DC conditions around this chip. If necessary check it by replacement. When the drum speed is excessive because IC4A0 is faulty it may be impossible to lock the picture on the TV screen. When the capstan speed is incorrect because IC4A0 is faulty there will be noise bars on the screen.

If the drum and capstan are operating greatly out of tolerance the VCR may just cut out and power down.

The drum motor is very reliable, the main problem being a worn lower drum.

A faulty capstan motor can cause noise bars and there may also be poor sound (wow). If the capstan spindle is seizing because of lack of lubrication there will be poor or no operation. The capstan drive chip could be faulty – it's part of the capstan motor assembly.

Low amplitude or no control pulses from the AC head will produce a jittery or rolling picture. The first thing to do is to clean the head. If the head is OK, check IC4A0.

RF converter/booster faults: Physical damage is the main problem with the booster-converter CU01. The usual problem is a snowy picture because the sockets are broken or dry-jointed to the PCB. If water reaches the booster via the downlead the result can be corrosion and a snowy picture. The only solution to this is to replace CU01. If there is also corrosion on the main PCB repair may not be worthwhile. See also tuner/IF faults.

Remote control unit faults: The most likely cause of failure is poor battery connections or low output from the batteries. LED1 could be dry-jointed. The leads to the CSB393PB crystal X1 could be dry-jointed or broken. If these items are all OK, suspect the M50560-248FP chip IC1 – check it by replacement.

If any one function fails to work, suspect a faulty button assembly. This is not listed as a spare in the service manual.

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TV

LCR Bridge Extensions

An inexpensive LCR bridge can be modified to make it better suited to service department use. Ray Porter, M.Sc., C.Eng., MIEE describes the action required

Fig. 1(a): Resistance measurement bridge. Add R20 and change the values of VR2 and R12.

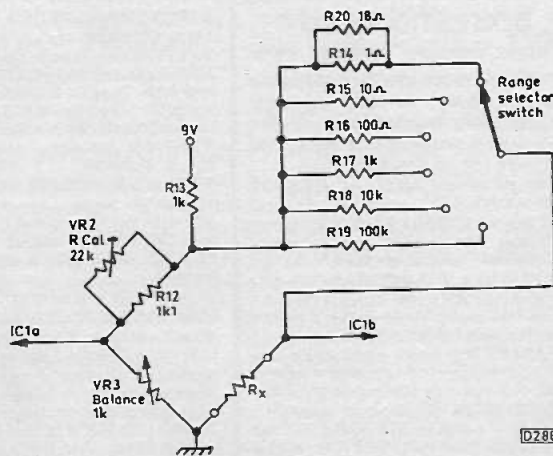


Fig. 1(b): Inductance measurement bridge. Add S5 and VR6.

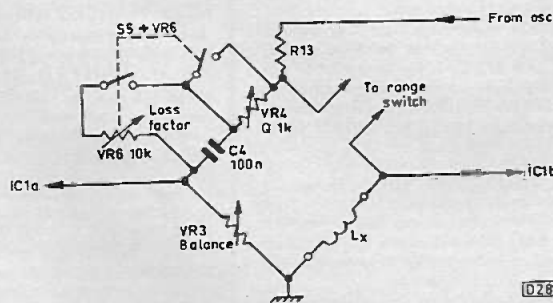
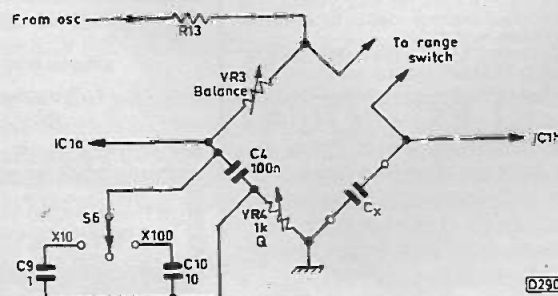


Fig. 1(c): Capacitance measurement bridge. Add C9, C10 and S6.



It can be difficult in a service department equipped with an oscilloscope component tester and a multimeter to check suspect components where the value of a resistor is less than 1Ω , the value of a capacitor is very large or an inductor has a low Q . A professional LCR bridge or meter can cost more than an oscilloscope, and is therefore not a very high-priority item on the equipment list. This article describes a way of adding ranges to an LCR bridge that costs less than £50, so that it covers most service department requirements. The bridge is available from Maplin. Although the extra components cost only a few pounds, the result is a reasonably accurate and versatile bridge.

Table 1 shows the LCR bridge ranges before and after modification. In addition the accuracy of inductance measurements with low- Q coils is improved, measurement becomes possible with very lossy inductors, and the frequency used for bridge excitation is selectable at the industry standards of 100Hz and 1kHz, with 10Hz available for use on the highest capacitance range.

Fig. 1 shows the LCR bridge's configurations for measuring L, C and R as supplied, also the modifications, with the switching details omitted for clarity. The circuits used for null detection, bridge excitation and obtaining a $-5V$ supply are shown in Fig. 2. Fig. 3 shows the front-panel drilling details. The modifications are as follows.

Null Sensitivity Increase

The LED brightness and null sharpness are not adequate on all ranges. An improvement by a factor of about ten is obtained by changing the value of R5 from 33Ω to 10Ω . See Fig. 2(a).

Resistance Range Modifications

As supplied the bridge, when balanced, has its upper-arm resistance ten times that of the lower arms, see Fig. 1(a). Increase the value of VR2 from $2.2k\Omega$ to $22k\Omega$ and the value of R12 from 110Ω to $1.1k\Omega$. Each range is now reduced by a factor of ten, so the lowest range becomes $0-1\Omega$. When the bridge is balanced with VR3 set to full-scale, each arm is now equal. This also makes the null as sharp as is possible theoretically.

Add R20 (18Ω) in parallel with R14 to compensate for

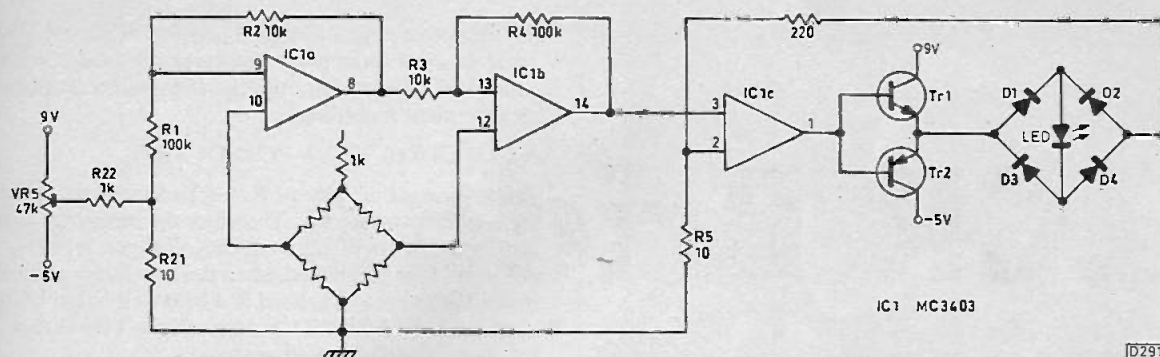


Fig. 2(a): Null detector circuit. Add VR5, R21, R22. Replace R1-R5 and the LED.

track and switch resistance on the 1Ω range.

Add the amplifier offset nulling circuit VR5, R21 and R22 – see Fig. 2(a). There is already track and drilling for VR5. The measurement accuracy with low-value resistors and inductors and high-value capacitors is improved when VR5 is set as follows:

- (1) Select resistance range 1 and connect a 1Ω resistor, any tolerance, in position Rx.
- (2) Set VR3 to the fully clockwise position and short pins 10 and 12 of IC1 together.
- (3) Adjust VR5 until the LED is extinguished.
- (4) Remove the short from IC1, change Rx to $1k\Omega$ $\pm 1\%$ and select range 4.
- (5) Adjust VR2 until the null occurs with VR3 set to exactly 100 per cent, i.e. a scale reading of 10.

Optimise the common-mode rejection of IC1a and IC1b by fitting 1 per cent tolerance components in positions R1-4 – see Fig. 2(a). This will give best accuracy when measuring small capacitors and large inductors.

Adding High C Ranges

This modification, see Fig. 1(c) adds $1,000\mu\text{F}$ and $10,000\mu\text{F}$ ranges to the capacitance ranges. It involves adding C9, C10 and S6.

Measure the end-to-end resistance of VR3, using a digital meter. Calculate the error between this reading and $1k\Omega$. If the value of VR3 is greater than $1k\Omega$, C9 and C10 must for best accuracy be selected to be of smaller than their nominal values of $1\mu\text{F}$ and $10\mu\text{F}$, and vice versa if the value of VR3 is less than $1k\Omega$. Choose values that have the same error as calculated for VR3, i.e. if VR3 is 980Ω , C9 must be $1.02\mu\text{F}$ and C10 $10.2\mu\text{F}$.

The types I used for C9 and C10 were marked $\pm 5\%$, but ten $1\mu\text{F}$ capacitors in parallel produced a reading of $10\mu\text{F}$ within 1 per cent when checked with a professional meter, so fitting in accordance with marked values should produce a reasonably accurate result without special selection.

C9 and C10 can be mounted on stripboard at the bottom of the case, but move the battery through 90° first to allow room for S6.

Frequency Range Selector

Increase the value of R9 and R10 in the Wien bridge oscillator circuit – Fig. 2(b) – from to $10k\Omega$ to $150k\Omega$. Reduce the value of C1 and C2 from 10nF to 1nF . This makes the oscillator run at 1kHz instead of the original 1.5kHz . Fit S4, then add C5-C8, to give the 100Hz and 10Hz frequencies. Increase the value of the output cou-

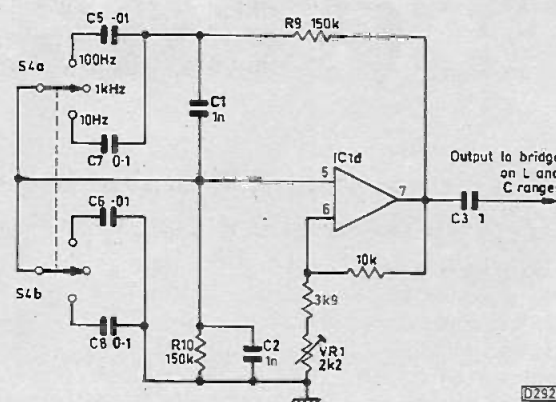


Fig. 2(b): The Wien bridge oscillator circuit. Add C5-C8. Replace C1, C2, C3, R9 and R10.

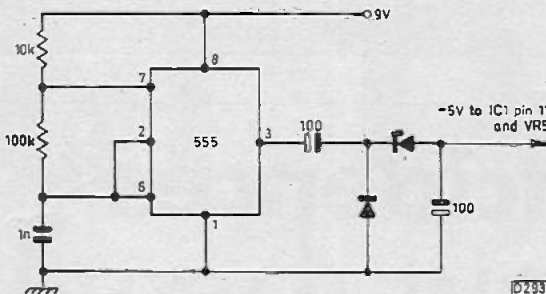


Fig. 2(c): The -5V supply circuit.

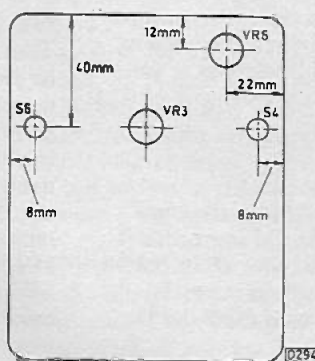


Fig. 3: The front panel, showing the drilling positions for the added components.

pling capacitor C3 from 100nF to $1\mu\text{F}$.

Check, with a meter or earpiece connected to pin 7 of IC1, that the oscillator starts up in each range. Tweak VR1 if necessary. Too much adjustment will distort the sinewave output but doesn't affect the bridge null point noticeably.

Adding Loss Factor Control

The loss factor control is used when the Q control VR4 – Fig. 1(b) – hasn't sufficient range to achieve a null with

Table 1: Full-scale ranges before and after modification

Range	L	R Ω A	R Ω B	C*
1	100 μ H	10	1	100 μ F
2	1mH	100	10	10 μ F
3	10mH	1k	100	1 μ F
4	100mH	10k	1k	100nF
5	1H	100k	10k	~10nF
6	10H	1M	100k	1nF

*Also 1,000 μ F and 10,000 μ F on range 1
A is the resistance ranges prior to modification,
B the resistance ranges after modification.

Items required

LCR bridge	Maplin YB82D	R1, 4	100k Ω 1%
C1, 2	1nF ceramic	R2, 3	10k Ω 1%
C3	1 μ F Maplin WW53H	R5	10 Ω
C5, 6	10nF ceramic	R9, 10	150k Ω
C7, 8	100nF ceramic	R12	1.1k Ω
C9	1 μ F Maplin WW53H	R20	18 Ω
C10	10 x 1 μ F Maplin WW53H	R21	10 Ω
S4	DPDT centre-off toggle	R22	1k Ω
S5/VR6	10k Ω pot with DP switch	VR2	22k Ω horiz. preset
S6	SPDT centre-off toggle	VR5	47k Ω horiz. preset
LED	Maplin UK19V red	Knob for S5/VR6	

inductors that have a low Q . It consists of S5 and VR6. The original inductance measurement bridge with Q control is called a Hay bridge. It provides inductance measurement according to

$$L_x = C_4 R_{sw} VR_3 / (1 + (2\pi f C_4 VR_4)^2)$$

where R_{sw} is the value of R14-R19 as selected and f is the oscillator frequency. Therefore the measured value is affected by oscillator frequency changes, which is not ideal. It is eliminated when the loss factor control instead of Q control is used in a Maxwell-Wien bridge circuit. S5 disables VR4 and introduces VR6 across C4. Inductance is now given by

$$L_x = C_4 R_{sw} VR_3.$$

Tips on Bridge Use

The modifications described here increase the usefulness and overcome some of the shortcomings of the bridge's original design. But don't expect the performance of the modified bridge to equal that of an instrument many times its price.

Sometimes the LED isn't extinguished completely at a null, and sometimes inductance measurement requires several trial settings of VR6 before a null can be found using VR3.

The accuracy of readings at full scale is good, and in general within a few per cent of that obtained with a professional instrument. The resistance of the test leads causes some additional errors at the lowest part of the 1 Ω range however, as might be expected. Measurement of capacitor values above 4,700 μ F requires the use of the 10Hz oscillator in order to see the null. ■

Coincidences

The saying "lightning never strikes in the same place twice" is common enough, but in this trade I feel it should be "lightning never strikes in the same place once". We're all familiar with stock faults. But how often have you replaced a component in one type of set, say a field timebase chip or a mains switch, only to have the same fault in a different set at your next call or soon afterwards? Here are a few examples of what I mean.

Tape Ejection

My first call one day was to a Sanyo VHR244E, the complaint being that it would not eject the tape. On inspection it was easy to see why. The eject button had come off its mounting and was not contacting the tactile switch on the main board. You used to get a similar problem with the Baird/DER clones of the Ferguson 3V30.

If you are dexterous enough with a hot iron you may be able to remount the button in the Sanyo machine, but a replacement front panel provides a more lasting repair.

Different Symptom, Similar Cause

At the next call the cause of the trouble was similar but the symptom was different. The VCR was a Goodmans GVR3400 (Bush VCR185). It would accept a tape but then immediately ejected it. After a detailed inspection I discovered that the eject button was resting on the switch on the panel behind it. I presume that as a result of constant use the plastic hinge had lost its springiness - I've seen this fault in quite a few of these machines (and their clones) that have had odd symptoms

(intermittently going off etc.) because either the eject or the power button is stuck.

No Record

Then off to another town, to two different VCRs with very similar faults. The first was an Orion D1094 whose mode switch had recently been replaced to prevent the usual jiggery-pokery you get with these machines. Since the replacement however the machine wouldn't record - it would immediately go into the play mode, whether the tape inserted was with or without its safety tab. It transpired that when the mechanism had been removed to replace the mode switch the lever that operates the record safety switch had not been positioned correctly.

While on the subject of these machines, here's another point to note. If, after replacing the mechanism, you have no sound, a playback picture that looks as if the heads need cleaning, or another obscure fault, check that the plugs and sockets which connect the mechanism to the main board are seated correctly. I've had faults caused by plug and socket problems with new machines.

The final coincidental call was to a Philips VR2574, the one with the JVC deck. It had recently been returned from the workshop and had identical symptoms to the Orion machine. When it had been in the workshop its reel sensor had been replaced. To do this, you have to remove a PCB on the underside of the mechanism. When he'd replaced it the engineer had not resoldered the record safety switch tags.

I could go on about such coincidences, and am sure that other readers will have had similar experiences. Andrew Tebbutt

Hugh Cocks tries out a Thomson digital TV receiver-decoder for the French services via the Astra 1E satellite. Reception of other services is possible, though there are problems with standards



Digital TV

the French way

I have installed several digital satellite TV receivers for the Dutch channels since describing this in the January issue. More recently a Frenchman called in to ask if it was possible to install a Canal Plus digital IRD for him. Fortunately he left it with me for a couple of days for test purposes prior to the installation. After my first encounter with the Dutch unit I felt that this was essential.

The Thomson Digital IRD

The IRD is made by Thomson for the Canal Plus 'Numerique' (digital) service via the Astra 1E satellite and is called the 'Mediasat' box. It uses the 'Mediaguard' controlled-access system – the Dutch and Italian digital services use the Irdeto system. With the French IRD the access module is not connected externally via a rear slot. All these digital services use MPEG-2 signal compression.

The receiver is of similar dimensions to the Pace DVR500 previously installed. It has a digital clock on the front as well as two smart-card slots. The clock sets itself to French time once a transmission has been found. There is no UHF modulator, which I understand is normal for the French market, though there are telephone modem and PC sockets in addition to the normal scart sockets.

Incidentally in French a computer is an 'ordinateur'. This caused a bit of panic initially – I've a limited French

vocabulary, and had not come across the term before. But I found the French instruction manual easier going than the Dutch one. Canal Plus actually supplies two books, one for installation and the other for day-to-day use. This is quite helpful: once you've got the unit up and running you can put the installation book to one side and use the other one – plus a dictionary in my case.

Installation

The installation menu enables a PAL or Secam output to be selected. PAL wins hands down in coping with on-screen graphics – direct comparison using a PAL/Secam receiver is possible (for Secam read Streakham!).

The LNB menu is preset to the standard 10.6GHz local oscillator frequency used with universal LNBs with 22kHz tone switching. The default frequency is set at 11.778GHz with vertical polarisation. Canal Plus uses this transponder frequency, also 11.817 and 11.856GHz, all with vertical polarisation. The receiver's tuner hops between the transponders depending on which programme has been selected. Other LNB types and default frequencies can be entered.

A standard F socket accepts the signal from the dish. There's a second socket for IF loop through to an analogue receiver if used (the Pace DVR500 doesn't have

this facility).

The signal-strength menu consists of five blocks. Anything below 3, displayed in red or yellow, is not considered adequate. Once 3 is reached the display goes to green. Our installation, with a 1m dish and Cambridge Gold universal LNB, reached the dizzy heights of 3.5 blocks.

On-screen Results

After coming out of the installation menu and waiting thirty seconds or so about twenty channels in the Canal Plus package appeared. The viewing card subscription was valid for only the basic channels, not the premium film ones – these appeared as a name on the screen, but reception was not possible. The charge for the basic channel tier is just under 100 Francs (FFr) a month.

When the channel is changed you see an on-screen identification of the programme together with the time it finishes – this is similar to the Pace Dutch receiver. There is also a 'mosaic' channel, which shows most of the programmes at once, and a channel marked 'pilote'. This one is intended to provide a lot of programme information, but wasn't fully up and running during my test. Pilote could be found on ch. 198 or by pressing a dedicated button on the remote control unit. A further facility is called 'grille'. This wasn't working but seemed to be similar to pilote.

Picture quality was similar to that previously experienced with the Dutch Pace receivers. Colour is good, with absence of chroma noise, but sound and vision synchronisation could be variable with speech. After a channel change parts of the picture would sometimes go into 'blocks' for a second or so. I didn't find this annoying. A 'freeze frame' facility is possible by disconnecting the cable from the dish!

One channel was showing a football match during the evening of my brief encounter with the receiver. Some motion disturbance could be seen if the ball and players moved very fast. In a scene of general rapid movement, with the camera panning as well, the area of 'dead' green on the pitch lacked definition during the pan.

Overall the pictures were pleasing to the eye, but there was the lip sync problem on occasions.

Once found, the channels can be sorted into a favourite list. This appears to be best done after bandscanning (see later).

The radio stations in the package come as a list on chs. 42 and 43. They include several French national stations, also a host of pop, jazz and classical stations. Selection is made from the list. Audio quality is excellent, as you would expect. Chs. 42 and 43 can be put into the favourite channel listing on lower numbers if required.

Pay Per View

To be able to watch a pay per view (PPV) programme the receiver's modem socket has to be connected to a telephone line. You then insert a French bank/credit card in the second slot at the front of the receiver. This card must be a smart type, not the 'dumb' type with a magnetic strip used in the UK and elsewhere at present. The next step is to use the remote control unit to select the PPV menu. This lists the PPV channel numbers and the films on offer. Once your PPV choice has been made and the modem has made contact with your bank's computer, the appropriate sum is deducted from your bank account.

Basic operation is not affected if the modem connection is not made. At the time of my test some films were being offered on a PPV basis, though they seemed to be

free when I came across them. Presumably the system wasn't in operation at the time. From what I saw on the screen, the charge would be 29FFr a film.

PC Software Downloading

This facility didn't seem to be working either – the service had been in operation for only a few weeks. According to the Canal Plus book, you connect your PC (micro-ordinateur) to the receiver and a menu lists available software for downloading. Some if not all has to be paid for via the bank card arrangement before downloading starts.

Bandscanning

The receiver can be made to scan the entire frequency range and list all the MPEG services found. This process can take up to half an hour. While it's in progress, indication is given on screen of the number of Canal Plus and other channels found (two separate lists) and there's a 0-100 per cent black horizontal bar. But it's a tedious business.

Once the scan had been completed, the lists contained over fifty MPEG TV channels, though we can receive only the vertical Astra 1E/F channels here. Those in more fortunate locations will get even longer lists.

The lists don't seem to be permanently held in the receiver's memory – after disconnecting the unit for the night, all stored information had been lost by the morning. A brief power cut of several minutes was tolerated.

Reception of Other Services

The Canal Plus booklet mentions that reception of CNN and some German channels is possible (we can't receive CNN as it's on the Astra 1E horizontal digital channel at 11.837GHz).

But having the name of a channel on a list and being able to view it are, in the MPEG digital world, two quite different things! The Dutch channel names were listed, but selecting the numbers on the remote control unit produced just a blank screen. This is not surprising, as the smart card and access system are totally different. The Dutch radio channels could be received, not as a list on a channel number as with the French ones but each as a separate channel number – received as sound with a blank screen.

I had more success with the German ARD/ZDF package at 12.168GHz with vertical polarity (though the receiver doesn't give you any frequency information). ARD, ZDF, Pro 7 and others were seen, also several test patterns. Several blanked out (identification only) numbers included ARD studios across Germany, e.g. ARD Studio Hamburg. Presumably these are used for link transmissions and are encrypted. RTP International (Portugal) seemed to be batched with the German stations, but reception lasted for just a few seconds before being blanked out altogether.

As I understand it the ARD and ZDF channels use clear MPEG coding. But it wasn't possible to view them unless the Canal Plus smart card was in its slot.

One of the strangest programmes seen consisted of a tape of the film *Four Weddings and a Funeral*. It was actually an approximately seven-minute loop of the tape, together with a time-code display. At the end of the seven minutes the tape jumped back. Occasionally the film would stop in mid flight. If this happened during a scene with movement, the largest moving area would judder. Everything else stayed still. In this frozen state the scene looked 'surreal', for want of a better description. The film was present on several different channels.

I also had enough time (just) to scan the Eutelsat slot at 13°E for digital signals, using an old 10.95-11.7GHz LNB. Despite this item being 'non-digital', the results were encouraging. The main problem with MPEG band-scanning is lack of indication of the received frequency, together with uncertainty as to whether the signal is clear or encrypted.

The following channels were found at 13°E. VH1 science fiction channel. MTV with the sound available for only two seconds then muted, the picture remaining OK. VH1 with World Radio Network sound (clear) at another position. Bloomberg TV (financial news and information). And several positions for the Italian Telepiu PPV weekend football service – these had music and a caption to remind customers to insert their smart cards before the match. Channels with identification but no access included BBC Prime and the main Telepiu channels.

The main problem at present is the lack of transmission standard information. For example, is VH1 science fiction a clear MPEG channel, and if so why does the sound mute after two seconds? If it is clear, it can't be to exactly the same specification as the German clear channels. I thought it was transmitted using the Irde

conditional access system, but so are the Dutch channels and the receiver wouldn't pick these up.

In Conclusion

It seems a lifetime from 405 lines at VHF to MPEG. But they do have something in common – bandwidth. There are around six MPEG channels per Astra 27MHz transponder, which works out at around 4.5MHz per channel, not dissimilar to the space taken for a 405-line VHF transmission!

Incidentally the Pace DVR500 digital receiver I wrote about in January seems to have been superseded by the DVR501. This has a scart socket above the RF modulator, but otherwise appears to be physically identical to the DVR500.

A colleague recently installed a DVR501 to receive the Italian Telepiu TV service via Eutelsat. Good pictures were received, and there were menus in Italian and English – but the Italian instruction book caused problems. The DVR501 is now used for the Dutch services as well, so maybe there are also Dutch menus – there weren't initially. But reception of clear MPEG channels still appears to be blocked.

Help Wanted

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

Wanted: Circuit diagram/operating instructions for the Panasonic UF400 and Rank Xerox X295 fax machines. Will reimburse. D. Williams, 16 Heol Elli, Llanelli, Carmar. SA15 1LX. 01554 759 035.

Wanted: Cassette deck for the Amstrad VCR4600 Mk. 2. Phone Steve on 0181 537 6631.

Wanted: Can anyone supply a current name and phone number for NAD speakers? L.D. Rudham, 46 The Vineyard, Richmond, Surrey TW10 6AN. 0181 940 0888.

Wanted: Salvaged abstimplatte (tuner control) panel 27504-086 for the Grundig VS200 VCR. David Martin, 21 Church Street, Bishop's Stortford, Herts CM23 2LY. 01279 506 212, fax 01279 466 389.

Wanted: Main PCB for the Saisho/Orion VXL12 VCR. J. Dewar, 31 Stancliffe Road, Bedford. Beds MK41 9AP. 01234 359 479.

Wanted: Technical information or parts to help with the repair of a Radofin Tele-Sports 3 TV game dating from the 70s. Russ Phillips, 103 Victoria Street, Maltby, Rotherham, S. Yorkshire S66 7JE. 01709 818 425.

Wanted: Circuit diagram and/or information on spares/manual availability for the Soundwave Model CTV1405R. Roger Dowling, 393 Blackfen Road, Sidcup, Kent DA15 9NJ. 0181 303 1721.

Wanted: Service manuals for the JVC HRD725ES or Ferguson 3V43E VCR and Sanyo M9996L cassette recorder, also a function switch for the Sanyo M9616L cassette recorder. R. McGrath, 41 Belvedere Place, Dublin 1, Ireland.

For disposal: *Television* magazines from 1956 to 1964, a

few odd ones missing, then 1965 to 1990 complete. Any offer. M.N. Hussain, 26 Chetwynd Road, Chilwell, Notts NG9 5GD. 01159 228 708.

Wanted: Pinout information and operating voltages for the Brimar D13/47GH oscilloscope tube. Roger Chacksfield, The Old Telephone Exchange, South Town Road, Medstead, Alton, Hants GU34 5ES. 01420 563 760.

Wanted: A 325572-01 40-pin programmable logic array chip for the Commodore 1541 5.25in. disc drive, information on where it can be obtained, or any suggestions on a replacement or something that could be used in its place. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 01912 620 712.

Wanted: On/off switch mounting plate and knob for the Ferguson Model 20G2 (TX100 chassis). Roger Walton, 44 Johnson Street, Cleethorpes, NE Lincs DN35 7NA. 01472 362 071.

Wanted: LOPT for the Saisho Model CM215TS – or a set for breaking. John Martin, 161 Francis Close, Ewell, Epsom, Surrey KT19 0JT. 0181 224 8401.

Wanted: Front hinged cassette holder for the GEC R9002H Stardeck radio cassette player. T.A. Carrick, 12 Saint Aubyn Crescent, Newquay, Cornwall TR7 2RQ.

Wanted: A copy of *Radio and Television Servicing 1986-87*, a mains/battery switch for the older Philips T8 chassis, and a Hosiden type slider switch as used in Sanyo radio/cassette players sold in the Seventies. W. Milne, 20 Graham Road, Wimbledon, London SW19 3SR. 0181 543 9542.

Wanted: Amstrad SRD600 or D2MAC chips and CCU300 processor chip. Terry Dactill, 01772 463 775.

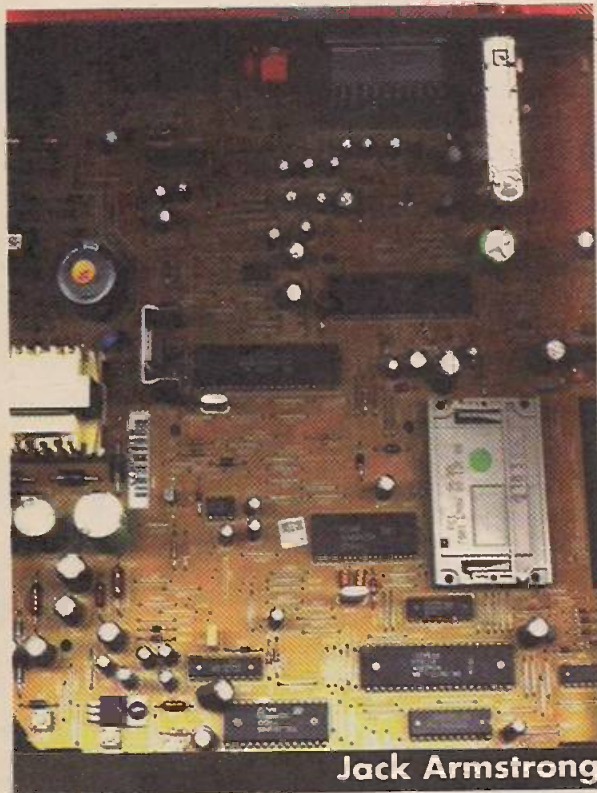
Wanted: Video heads for the Grundig 2 x 4 (not Super) V2000 type VCR. Also an 8in. colour tube for the Sony Model KV9000UB. R.J. Bartlett, 27 Trelawny Road, St. Agnes, Cornwall TR5 0TP. 01872 552 896.

Wanted: LOPT for the Technisonic Model 1451 colour portable and a circuit diagram (photocopy OK). T.N. Casey, 17 Sparkbridge Road, Harrow, Middx HA1 1TJ. 0181 248 7880.

Wanted: IF can for the ITT CVC40 chassis – scrap one will do. J. Boyd, 98 St. Quivox Road, Prestwick, Ayrshire KA9 2ER. 01292 475 175.

Wanted: Wish to buy CRT reconditioning plant with one or more ovens. Bogdan Tataeu, str. V. Alecsandri, 19 Bis. Ploiesti, COD 2000, Romania.

Satellite Workshop



Jack Armstrong

Pace MSS1000

I sometimes come across repair attempts that are beyond belief. A good example arrived recently in a Range Rover and was carried into my workshop gently by a portly gentleman in tweeds, with a big dog. He told me that his MSS1000 had "died", and that his local repair shop had failed to fix it despite having it for six weeks. He had finally managed to snatch it back after a long argument that ended when his German Shepherd bitch lost her patience because she was hungry.

I didn't ask for the gory details, but remained behind the counter, keeping good English oak between me and the bitch. I promised to do my best, and the animal towed her rotund master back to his vehicle.

The MSS1000 was a mess inside. The power supply had been 'repaired', but not with the proper kit. The electrolytics appeared to me to be underrated, but I left them alone because they were sticking proud like mushrooms and I didn't want to risk more damage to the tracks.

The display panel was amazing.

It had been snapped in two, then someone had soldered about forty wires across in a futile attempt at repairing it. I fitted a replacement I had in stock. Yes, honestly! – I keep one for each model, mainly for testing purposes, because the display panel contains a second microcontroller chip which must talk to the one on the main board for the unit to work. The panel is flimsy and tricky to fit, but with good foresight Pace devoted a page in their service manual to sketches and an explanation of the procedure. It's quite easy after reading this.

When the mains supply was connected to the unit it sprang to life and worked perfectly, though the pictures were a little streaky. I decided to leave it at that, because the panel alone costs over £40. But I offered to upgrade the electrolytics if the owner would pay extra. He declined, on the grounds that he'd already paid the previous 'engineer' for an estimate and was short of funds.

Pace MSS500

This receiver came from a shop with a report that said, helpfully, "dead". Someone had already fitted a power supply repair kit, quite neatly, and the DC voltages were all correct. But the receiver didn't work. Closer inspection revealed that the display panel had melted copper tracks! Clearly the original power supply fault had caused more widespread damage.

After fitting a replacement display panel the receiver worked perfectly. This was a rather expensive 'power supply' repair, but I've come across several of these receivers in which the tuner, the microcontroller chip, the audio processor and the decoder chips have also been destroyed, so the owner was lucky.

The very same day another MSS500 arrived. Fortunately it didn't need a display panel! The faults were a whistling power supply and a lack of decoder messages. The whistling was cured by resoldering the large 1kΩ, 5W ceramic resistor R7, which was dry-jointed, and replacing every electrolytic capacitor in the power

supply area. This also cured severe streaking on the pictures, but there were still no decoder messages.

When I checked the installation menu I found that the contrast had been set at its maximum level of 8. So I reduced it to the correct value, 4, but the pictures were now very dull. The next step was to use my scope to trace through the video path, with the aid of the Pace service manual. It took me about ten minutes to discover that the BC856B surface-mounted transistor Q58 was faulty. A replacement cured the contrast problem, and the decoder messages reappeared. Note that other transistors in this area can cause problems. I had a report from Holland that Q62 (BC846B) can fail.

Echostar SR800

Some satellite 'installers' seem to lack any sort of formal training. In fact some even seem to be incapable of reading the user instructions. Here's an example. I was sent an Echostar SR800 that was "under warranty". The chappie who sent it was under the impression that I'd repaired it for him about nine months previously. I hadn't, but that's another story. The complaint was "no channel display on the front panel". For those who are not familiar with this model, I should explain that it doesn't have a number display!

I returned the unit with a curt note and an invoice for carriage. Blow me if it didn't come back next week with a label that said "U/G, picture still too bright". I used the menu to adjust the video deviation from 16 to 21MHz, which is best for Astra. The picture then looked less bright. I'm now awaiting payment for my pro forma invoice before I send the receiver back again. I may have to charge for storage too!

Interference

A local installer asked me to help him with a Pace Apollo receiver. His customer was complaining about interference on the terrestrial and the satellite channels, and he'd "tried everything". As the receiver produced excellent pictures in the workshop, I agreed to go with him

to the customer's house -- but only after he agreed to my normal rate of £1 per minute.

"That doesn't worry me" he said, "you'll have it sorted out in five minutes!" My charge includes driving time, but I decided not to mention that until we'd completed the forty mile round trip.

The interference was clear to see at the customer's house: the terrestrial TV picture had a ghost picture in the background. I advised the installer to replace the standard 10GHz LNB with an enhanced one, which has a 9.75GHz local oscillator. This would lift the satellite channels by 250MHz, out of the range of terrestrial signals. I also suggested that he should move the aerial cable away from the LNB cable, since the two cable runs were actually touching.

The interference on the satellite channels disappeared when I removed the aerial plug from the receiver. Adding a -6dB attenuator before refitting it cleared most of the patterning. Moving the two cables apart would surely clean up the rest.

A week later the installer confirmed that my diagnosis had been

correct, as he begrudgingly paid me. I still don't understand why he needed me to tell him how to do his job. This was simple stuff. How on earth does he cope with multi-point distribution systems?

Pace MSS100

I thought the pretty girl was bringing me her bathroom scales to repair. But no, it was a Pace MSS100 that wouldn't light up. The power supply was tripping. It didn't take long to trace the cause to the UF5402 rectifier D11 in the 17V supply, on the secondary side of the chopper circuit.

The unit appeared to have been 'investigated' by Wosname up Church Street, because the cover had been removed by prising with a large screwdriver and the aerial connection had disappeared inside. I pushed the tiny contact tube out, and ran solder down the outside to prevent it being pushed back in. When the damaged cover had been repaired and the missing screws had been replaced the receiver was as good as new.

That reminds me. Most of the receivers that are brought in for repair have at least one screw

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

jackarm@netcentral.co.uk

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

missing. Will the person who is collecting screws please send me some?

Echostar SR5500

Alex Hoyle of Trackdown Consultants has finally obtained a number of remote control handsets for the Echostar SR5500. Several people had contacted him while he was without stock. You can reach him, for this and other handsets, on 01608 678 057.

Test Case 413

Spring is here again, and once more Sage has abandoned the workshop and headed for the sunshine. The Isle of Man this year apparently, for a thrash on the narrow-gauge railways there. Happy days! Back at the ranch however the others have to repair the VCRs Sage normally handles. One of them gave Television Ted more than its fair share of trouble.

It was an Hitachi VTF860E (UKN) with a real nasty. The machine would run happily in playback for several hours before the problem arose. When it did, the picture broke up into a mass of lines, rather like the effect produced by a misadjusted line hold control, while the sound wavered in pitch and the speed indicator flicked between SP and LP. The drum and capstan speeds were obviously very wrong.

Ted tried slowing the drum with his finger. This restored a somewhat wobbly picture, in colour, even though the capstan speed continued to vary. So the problem was not confined to the drum. Nevertheless there was probably a common cause - time to check out the servo department.

IC601 (type HD49741ANT) is the heart of the servo section in this machine. It produces control voltages for the two drive motors. These voltages depend on the inputs IC601 receives from the motor FGs, the drum PG and the control track head. So these inputs and the chip's supply (A5V) were all checked. They were all present and correct. Ted's next move was to scope the subcarrier input at pin 42 of the chip, where he found a good sine wave. This input operates the reference clock for the digital counters on which servo operation is based. Ted froze the chip: the fault remained. He heated it to heaven knows how many hot degrees with a hairdryer. Still the fault remained. As the operation of both motors was affected, and the chip's external condi-

tions were all correct as far as he could see, Ted ordered a replacement chip and put the machine aside.

It didn't take long to arrive. When it had been fitted, the machine worked fine - as it always did to start with. Ted set the machine to run on test for a day. He was not pleased when, after a few hours, the monitor's display consisted of a mass of horizontal lines, with the sound pitch varying - just as before in fact.

After lunch, during which the machine had been switched off, Ted connected a meter to pin 12 (drum control voltage output) of IC601. The voltage, with the machine operating normally, was 2.3V. When he slowed the drum by hand, the voltage dropped in an attempt to achieve compensation. Armed with this information, Ted waited until the fault returned. He was surprised to find that there was little change in the control voltage despite the fact that the drum's speed had now increased. As he slowed the drum with his finger, the control voltage dived towards 1V. It was as if the servo was working properly and the drum motor was faulty. But why did the capstan run erratically when the fault was present? Some strange tie-up within the chip maybe. Even so, Ted wasn't going to bet the price of a motor on it. He swapped the entire drum assembly, motor and all, with one from another similar machine. In went the Mary Poppins tape and on went the play key. Ted returned to a recalcitrant Daewoo TV receiver.

They had got through Chim-Chimney, Twopence, Spoonful of Sugar, Supercalifragilisticexpialidocious and most of the other tracks before the fault cropped up again: Mary and Bert were lost in a basketweave of lines, and their voices wavered up and down. So it was not the drum motor! What was the cause of the problem? For the solution, turn to page 528.

Long-distance Television

DX and satellite TV news and reception. Wideband aerial design for SpE reception in Band I. Roger Bunney reports

February was wet and windy, with poor reception conditions to match. I've now moved to the new house, but have not been able to get around to installing the aerials. So monitoring has been minimal. I've not even been able to assess the interference situation here. As it's a new housing estate, I fear that the ch. E2/R1 spectrum will be filled with 49MHz baby alarms, radio-controlled garage door systems and the like.

Peter Schubert reports that only poor tropospheric reception, mainly from the Netherlands, was possible during the month at his Rainham location. Cyril Willis (King's Lynn) also received Dutch Band III signals on several days. He mentions slight tropospheric lifts on February 22nd and March 3rd, though there were no identifiable signals. So I don't appear to have missed much.

Interesting news from Ryn Muntjewerff in Holland however.

He has at last identified a Sporadic E signal he received back in June 1995, on ch. E3. It was from a commercial station in Turkey and had the logo 6 in the top left-hand corner. Ryn says that this is the 65th country from which he has received TV.

Satellite Sightings

David Gilroy mentions that the France 3 signal from Telecom 2B at 5°W is very strong. Check at 12.732GHz: the audio is at 5.8MHz and it's a Secam colour signal. The channel recently carried the full France v. England rugby match, the UK networks offering only recorded highlights during the evening.

I'm still at the planning stage at my new location. Because of the soft ground, a pole-mounted dish with H-to-H motor drive and a 1.2m 'reference' reflector is under consideration. My vintage 1.5m dish with stand has had to be set aside until the ground has settled. It may then be used for C band reception. A few years ago such a small dish would not have been considered feasible for C band reception, but with low-noise LNBS, threshold extension etc. practical results are possible.

Speaking of C band, Bandula Gunasekera (Sri Lanka) reports that he has received only one new channel during the first weeks of 1997, an Iraqi programme via AsiaSat-2 at 3.644GHz (extended C band). He mentions that an increasing number of downlinks are going digital and looks forward to the upcoming launch of AsiaSat-3. Many AsiaSat channels are to move to the new satellite, hopefully with

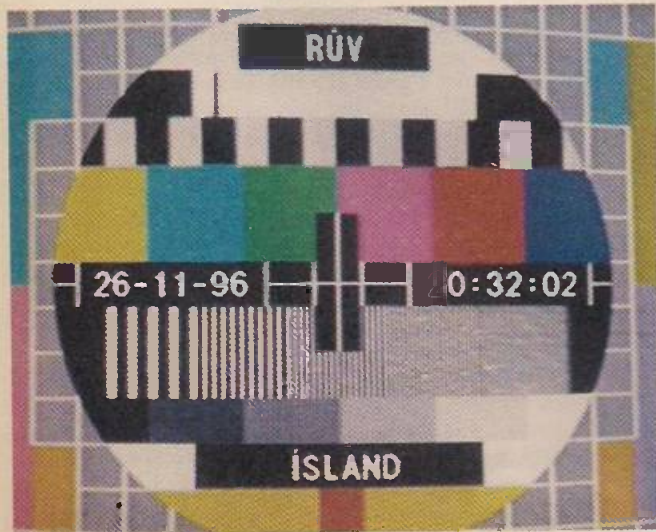
better signals.

John Locker in the Wirral is also on the move. His dish system is up and running however and gives him reception from as far east as 68°. He is just able to resolve signals from PAS-4, almost at the horizon. He mentions that the Russian GALS satellite at 36°E is now producing three visible channels, all with different programming in Secam. There's a strong carrier at 12.702GHz. Incidentally John is also into UFOs. He'd like to hear of any odd sightings. Write in to me via the magazine.

Roy Carman (Sandown, Isle of Wight) has sent in a very long satellite reception list. For local reasons, his dish is mounted on a 5m high garden mast with an upper cross-piece arm to which guy wires are attached. The bottom of the mast is concreted into the ground. He is using a 1.2m offset Channel Master dish which is tracked with an 18in. Echostar arm. The SWM wideband LNB with Racal polariser feed an Echostar 8700 receiver. On the same mast he has a fixed 80cm Lenson Heath dish for Astra reception. His main dish gives reception across an arc from 53°E to 53°W.

Roy comments that an increasing number of feeds are going digital, though he still receives many analogue signals. Favourites in recent months have been PAS-3R at 43°W and Hispasat at 30°W, though many of the latter's signals are now digital. On January 28th 3R carried Ajax v. AC Milan via a new transponder operating at 12.592GHz with vertical polarisation. He's seen another new transponder at 12.575GHz vertical,

This test pattern is often received in the UK during SpE openings. On this occasion however it was received by John Locker via Eutelsat II F4 at 7°E.



so far with colour bars only.

Because of my move I missed all the Ramadan ceremonies from Mecca. Apparently Eutelsat II F2 at 10°E carried various religious ceremonies for most of the day – the feed was for TGRT (Turkey).

The recent football trial from Winchester was featured in a news feed carried by Telecom 2C (3°E) for the BBC's lunchtime news. 2C often carries BBC regional news feeds from the Corporation's SNG trucks, with 12.583GHz horizontal a commonly used transponder. The ITN South of England News Bureau also used a satellite link for the trial, with the UKI 131 truck relaying via Eutelsat I F4 (25°E) at 11.134GHz horizontal – this satellite is in inclined orbit. Telecom 2C is often used for the OB sections of Noel's Houseparty – last on February 15th at 12.524GHz vertical with sound in syncs.

There was lots of skiing and mountain activity during February as the Winter Sports season continued. The old RTP transponder (11.656GHz vertical) aboard Eutelsat II F2 at 10°E was pressed into service for an OB with Ski jumping at Trondheim. Despite the increase in the number of digital transmissions, the good old analogue signals keep going.

News Items

The RSGB has applied to the Radiocommunications Agency for eleven FM repeater station licences within the 50MHz band. The stations would be at Shaftesbury, Portsmouth, Fleet, Nottingham, Amersham, Stoke-on-Trent, Huddersfield, Barkway, Tenby and Winter Hill. The 50MHz band is now in official use in Holland.

A new Earth station has been opened in the Czech Republic for the Premiera TV channel. It will uplink via the DFS Kopernikus satellite, giving direct connection to main terrestrial transmission and cable head-end sites. New Earth stations for the various Arabsat craft have been brought into operation at Riyadh and Tunisia.

Next time you visit Sainsbury's, check for a new dish on the roof. BT Global Satellite Services has won the contract to provide a corporate video hook-up for the 364 Sainsbury's stores, providing a nationwide demonstration and information service which uses digital compression (Scientific Atlanta's PowerVu MPEG system). Safeways has a similar satellite video arrangement but is

understood to use the MAC format.

The German Mascom 9500 auto-selecting digital receiver is to undergo an upgrade before it is launched in Germany. The receiver can self-programme and produce rapid MPEG picture displays simply by tuning to the correct frequency. Most such receivers, for example the Nokia/Kirch D box, require specific FEC and bit rates to be accurately programmed in before pictures can be resolved. As soon as we have more information on this interesting receiver we'll pass it on.

North Sea Reception

I received an interesting letter from John Thierjung recently. Some ten years ago he asked about aerials for reception in the North Sea. The widely used mushroom wideband marine aerial with integral preamplifier suffers from low gain, is expensive and usually works only up to 30-50km from the coast. In addition, as it's omni-directional co-channel interference is a problem. A Yagi works well but requires continuous rotator adjustment and can snap in half.

I suggested a Triax BB grid type UHF system. Although the four-stack version is rather cumbersome, it produces excellent results with its fairly wide beamwidth. Reception in the North Sea is possible at up to 120km in winter and in excess of 300km in summer – it's common to view Danish TV as far out as Aberdeen. John considers that a two-stack system provides a good compromise between gain, beamwidth and a physically safe installation. The BB grid four-dipole per aerial assembly also restricts the vertical beamwidth and helps to reduce the ducting and low-signal (wave-top scatter) reflection that can mar reception. Interesting to know that a wideband preamplifier will also enable the BB grid system to work in Band III.

John now works in Thailand and is involved with satellite reception. The equipment prices he quotes are interesting. A 10ft C/Ku band dish sells for the equivalent of £295. A locally made version sells for £220, or £165 for an 8ft dish. Gardner 20K C band LNBS start at £45, while a 24in. Superjack arm costs just £40. The dish prices include the polar mounts and stands!

Several receivers have been tested by John. He found that the Strong 700XT Mk 2 is the best performer, particularly with its



threshold extension switched in. Equally impressive is its rugged power supply, which can handle the voltage supply swings that are experienced locally – between 175V and 220V AC.

Despite the relative cheapness of satellite receiving equipment, quad-band LNBS are not available in

The source of this test pattern received by John Locker via Eutelsat II F4 at 7°E has not been identified. Any ideas?

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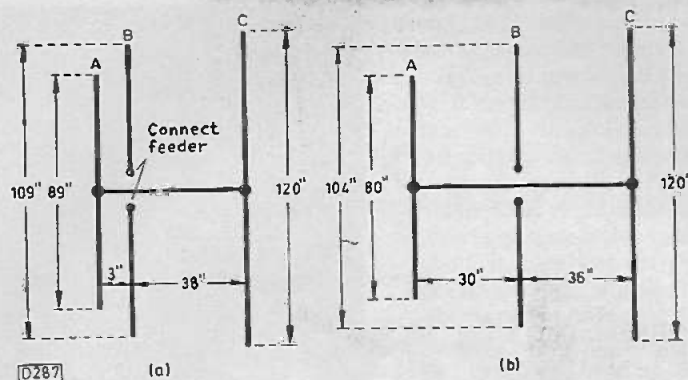


Fig. 1: Wideband aerial designs for Band I. (a) A wideband dipole (elements A and B) with a reflector (C). (b) A three-element Yagi array with a single director (A), dipole (B) and reflector (C). The designs give coverage of the 48-70MHz spectrum. Use 75Ω coaxial feeder cable.

Thailand. We look forward to hearing more about life in SE Asia.

Band I Aerials for SpE

Sporadic E reception places less stringent demands on the aerial than say weak tropospheric reception. SpE signals can be very strong. So a high mast system is not necessary, though it's best to have the aerial above chimney-pot height. A low-height aerial, say 10ft, is ideal for reducing local interference, which can be considerable nowadays. Though a single dipole will work, its bandwidth is limited – Band I extends across 48-70MHz, and a single dipole certainly won't cover the 22MHz efficiently.

Over the years I've made many wideband Band I aerials, ranging from dipole systems to five-element Yagis. The bandwidth of a

dipole can be increased by mounting two elements close to each other to form a wideband dipole – see Fig. 1(a), left-hand side. This is the Antiference Tru-match principle. One of the simplest systems I've used is the crossed wideband dipole arrangement – two wideband dipoles mounted 90° apart, with one aligned north-south and the other east-west. Rudimentary directional pick-up is achieved by switch selection of the output from one or the other wideband dipole. This at least saves the cost of an aerial rotor.

An improvement is obtained by adding a reflector behind the wideband dipole, as shown in Fig. 1(a).

The main problem with a wideband system is to minimise the reactive variation across the

bandwidth while maintaining the correct 75Ω resistance at the feeder cable connection point. The Antiference Tru-match design works very well in this respect, in both Band I and Band III. I've used variations on this principle in many of my own designs.

A resonant aerial element is narrowband. To create a wideband aerial, two or more elements resonant at different frequencies within the required bandwidth have to be combined. This is the principle used in the designs shown in Fig. 1. With the three-element wideband Band I Yagi aerial design shown Fig. 1(b), the reflector's length corresponds with a point at the LF end of the required bandwidth, the dipole is resonant at midband while the director is cut for HF resonance.

If you examine a UHF Yagi array, you'll see that the directors nearest to the dipole are closely spaced and that the spacing increases with each director towards the front of the array.

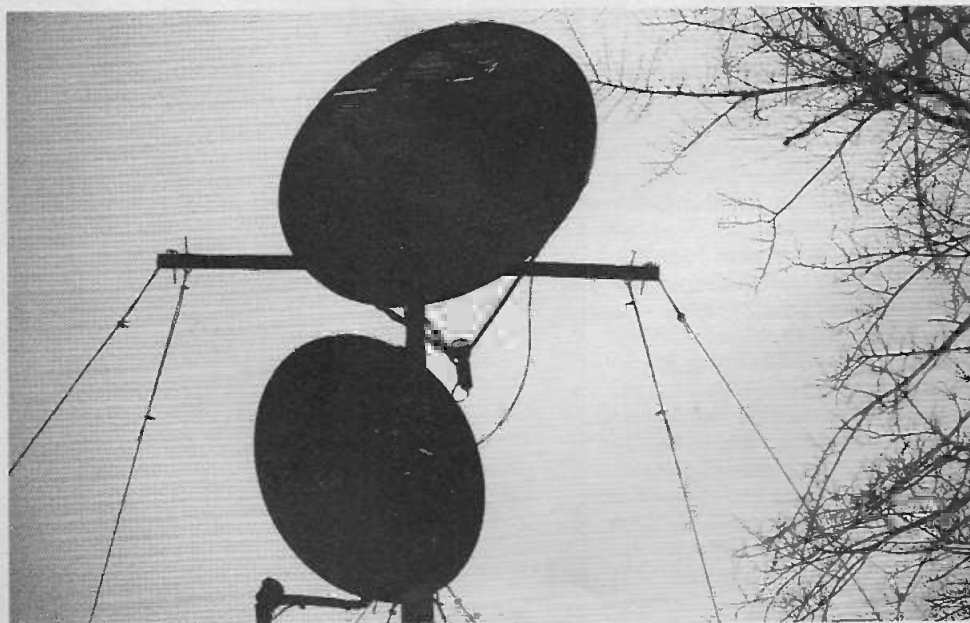
Directors contribute to the aerial's gain by reducing its horizontal beamwidth. This enables the aerial to be made highly directional.

Close director spacing adjacent to the dipole ensures tight inductive coupling and optimum in-phase signal transference. The spacing may be as little as 0.1 wavelength. The reflector-to-dipole spacing is wider, perhaps 0.2 wavelength. All element spacings affect the forward gain, directivity, front-to-back pickup ratio and matching to the feeder.

A wideband Band I aerial with an unfolded dipole will give adequate matching to the feeder when up to three elements are used, as with the designs shown in Fig. 1. With a greater number of elements the dipole's centre impedance will become too low. Use of a folded dipole increases the impedance by a factor of four, though the element spacings must be altered to compensate for this impedance change.

The two wideband aerial designs shown in Fig. 1 are easy to make, using half inch OD alloy tubing with a one inch standard aerial mast as the boom. Aerial hardware such as dipole insulators and element clips can be obtained from HS Publications, 7 Epping Close, Mackworth Estate, Derby DE3 4HR (01332 381 699). Complete aerials can be supplied by Aerial Techniques (01202 738 232) – see advertisement on page 523.

Roy Carman's mast-mounted dish system at Sandown, Isle of Wight.



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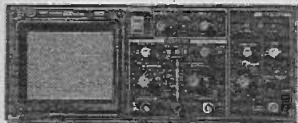
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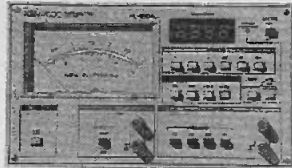
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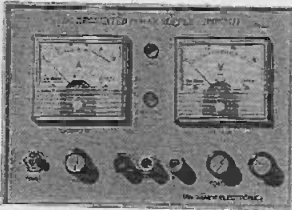
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Answer to Test Case 413

– see page 521 –

Apart from introducing, in the last paragraph, the longest word ever printed in *Television* (even though the Norwegian for IF amplifier is, apparently, mellomfrekvensforsterker and for VCR videokassettopptakeren), this month's conundrum shed an interesting light on an area that seldom causes trouble nowadays: the servo electronics. Since the problem affected the speed of both the drum and the capstan motors, there had to be a common cause. But it was difficult to see what this could be once the servo control IC had been replaced and its 5V supply line was found to be stable.

The search for the cause of the fault might have gone on forever, but Ted remembered an almost identical playback problem with a Panasonic VCR whose owner had switched it, at the front panel, to NTSC operation. There was no obvious NTSC/PAL switch here, but maybe the syscon section was producing a fault command. While searching through the circuit diagram, Ted found a control line marked NTSC/PAL (with a bar over PAL). Sure enough, when the fault occurred the line went high. Linking it to chassis restored normal operation.

NTSC servo switching is governed by pin 9 of the expander chip IC751 in the syscon section. This is where the cause of the trouble lay. When the chip was subjected to heat and freezer the fault came and went. There was, it seemed, an intermittently open-circuit internal connection to pin 9. Tilpasning kompleksiteten!

NEXT MONTH IN TELEVISION

Grundig Satellite Receivers

Start of a new series in which Steve Beeching will be taking a look at the technology used in the Grundig E series and Omni chassis. The receivers have also appeared in the Matsui, JVC and Philips ranges.

Servicing the Sony SLV757

John Coombes presents an extensive fault guide for this VCR, covering the mechanical and electronic problems you could encounter.

Satellite Polarity Checker

This handy unit, designed by Michael Dranfield, enables the LNB supply provided by a satellite receiver to be checked in seconds. Three colour LEDs indicate whether the output is at 13V, 17V or in excess of 22V. A must for the satellite equipment installer/repairer.

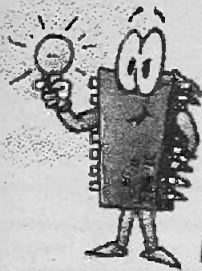
Servicing Amstrad PCW Disc Drives

The disc drives used in Amstrad PCW series word processors are now getting old and giving trouble. They can usually be restored to good working condition however. D.F. Wheatley tells how.

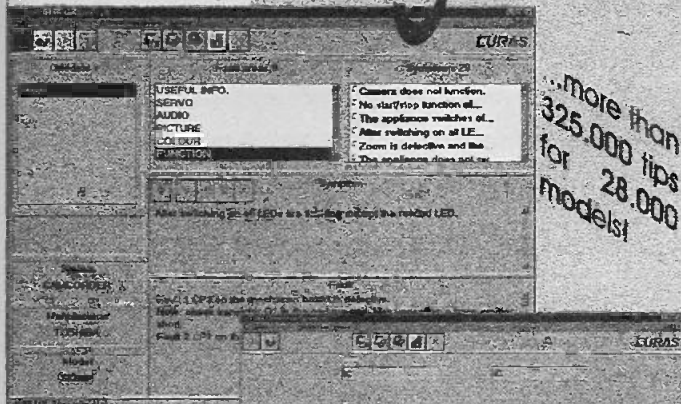
Amstrad SRD600 Mod for Astra 1D

Martin Pickering describes a way of providing automatic Astra 1D selection with the Amstrad SRD600 and the Global ADX plus channel expander.

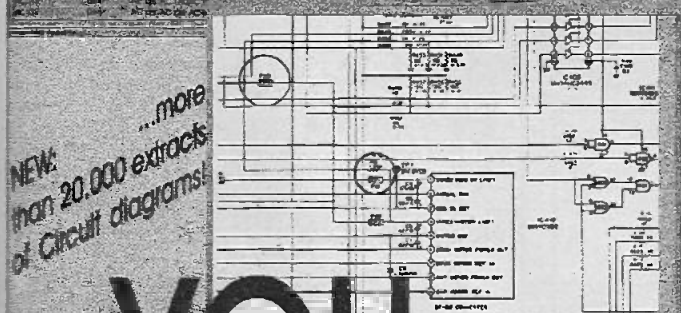
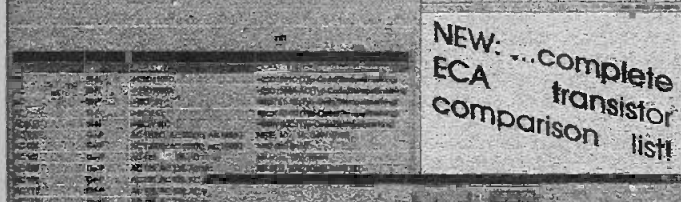
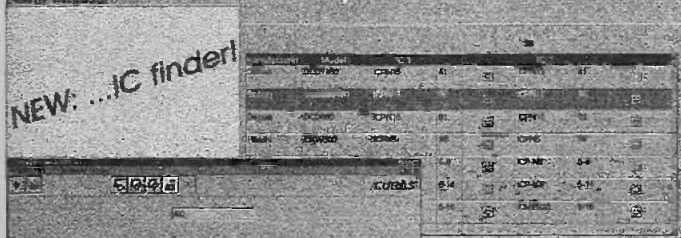
Published on the third Wednesday of each month by Reed Business Information Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. **Filmsetting** by Marlin Imaging Ltd., 2-4 Powerscroft Road, Sidcup, Kent DA14 5DT. **Printed** in England by BPC Magazines (Carlisle) Ltd., Newtown Trading Estate, Carlisle, Cumbria CA2 7NR. **Distributed** by Marketforce (UK) Ltd., 247 Tottenham Court Road, London W1P 0AU. **Sole Agents** for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.; South Africa, Central News Agency Ltd. **Television** is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever.



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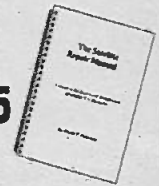
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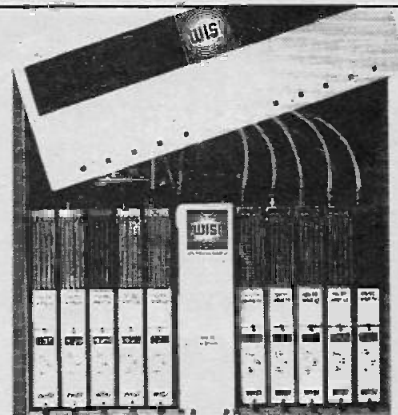


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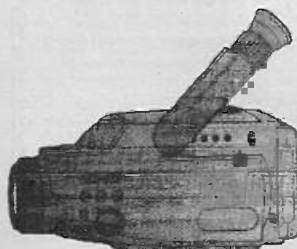
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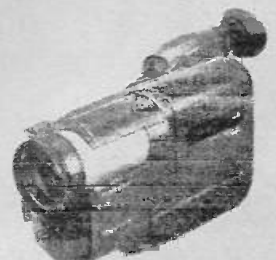
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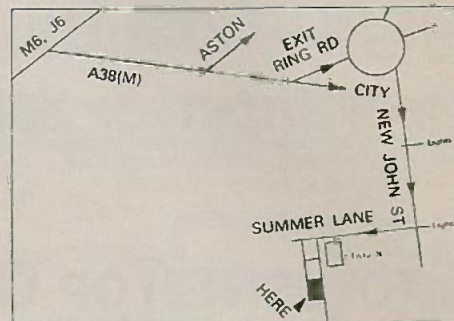
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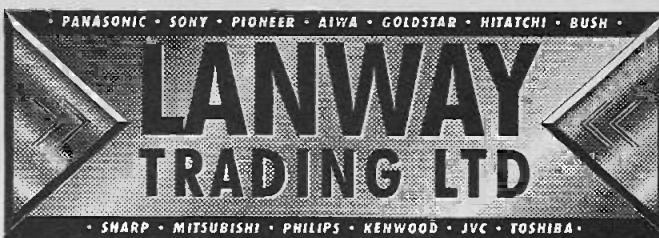
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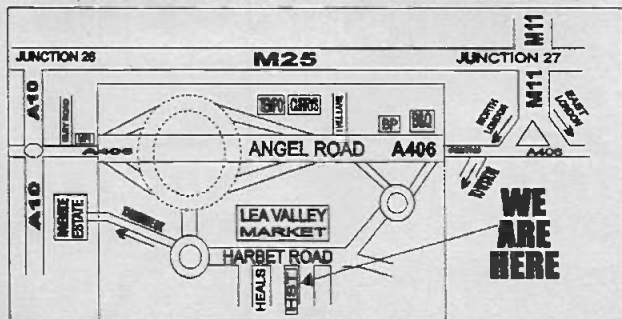
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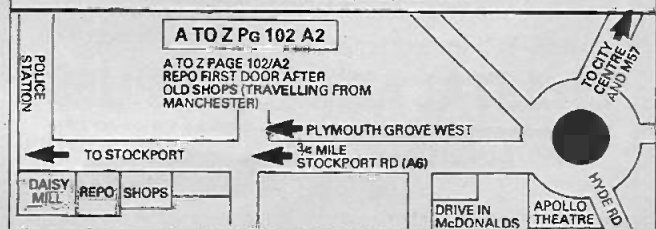
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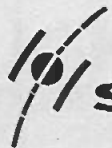
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Aerial Techniques.....	523	Marapet Electronic Components.....	474
Alban Electronics Ltd.....	466	M.C.D.R.....	535
Besco.....	532	MCES.....	474, 529
Bull Electrical.....	513	Muter, Ulrich.....	537
Campion Wholesale TV Ltd.....	534	OZAN.....	484
Central TV Wholesale.....	535	Philex.....	IFC
Coastal Aerial Supplies.....	536	Radcom UK.....	527
Colour Trade.....	532	Repo TV.....	535
Cricklewood Electronics.....	527	Senz Components.....	IBC & BC
CTV.....	536	Smart, B.....	533
East London Components.....	470	Star Vision.....	536
Economic Devices.....	464-465	Stewart of Reading.....	527
Electronic Sound Systems.....	525	Superscreen.....	536
Euras.....	529	Swift Television Publications.....	525
Express TV.....	534	Tree, W.....	533
Grandata Ltd.....	495-506	Vista Electronics.....	526
Hardy, J.W.....	529	Welwyn Tool.....	447
Harrison.....	474	West Midlands TV.....	533
HCTV.....	531	Willow Vale Electronics Ltd.....	462, 475
HST Distributors London.....	534	Wiltsgrove Ltd.....	530
J.J. Components.....	493	Wizard.....	527
Lanway.....	533		
Manor Supplies.....	471		

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