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The Broadcasting Debate

The last few weeks have been notable for the number of statements and reports that have appeared on the future of TV broadcasting in the UK. We have had the suggestion that BBC 2 and Ch 4 might be made into satellite TV only services so that their terrestrial transmitter networks could be freed for additional advertisement-funded national and regional channels, the Home Secretary Douglas Hurd has been openly questioning the funding of the BBC via the licence fee and the role of the IBA, the Commons all-party Home Affairs select committee’s report on the future of broadcasting has been published, and plans for considerable expansion of satellite TV services have been announced. All this comes as the government’s White Paper on the subject is awaited in the autumn.

The government has called for discussion and debate on the future of broadcasting arrangements in the UK. How much notice it will take of views put forward remains to be seen. The Home Affairs committee’s 195-page report The Future of Broadcasting presents a cogent case for leaving things much as they are at present. In welcoming the report, Mr. Hurd commented that “I can understand the uncertainty that’s unsettling the broadcasting institutions as fresh ideas are put forward and examined”. Well he would say that – after all it’s the government that has all along been pressing for change.

Two factors suggest a possible need for change. First, developments in technology are bringing about change anyway. Secondly, the fact that the BBC and IBA have been around for a considerable time in their present form may mean that they have outlived their usefulness.

The technology argument means cable and satellite TV of course. These are already giving viewers greater choice. Cable TV in its new form, as opposed to the old relay networks, has been around for some time now but has hardly led to a revolution in TV. Things might change when Murdoch and Maxwell get going with their satellite TV services – British Satellite Broadcasting’s services are also due to start late next year. So the public is going to be given a considerably wider choice quite soon regardless of the amount of debating that goes on. In which case, why all the fuss?

If the BBC and the IBA could be shown to be providing inferior services, there would certainly be a case for change. The only yardstick for such an assessment is by way of international comparisons. These always highlight the superiority of the established UK broadcasting services. Some members of the government may feel that this service is a publicly funded service such as that provided by the BBC does not fit in with current thinking about a market led economy. The case has been forcefully argued in some quarters that the BBC should seek its money through subscriptions, pay-to-view or whatever rather than taking its money and providing what it thinks fit. But this could jeopardise a perfectly good system – as viewing figures attest – for the sake of ideology. Hardly a wise course.

The Home Affairs committee came to the conclusion that the BBC, funded by its licence revenue, was “remarkable value” and should continue much as it is. Its main TV recommendations are as follows: that there should be no change in the basic role of the BBC; that Ch 4 should remain substantially as it is; that a fifth terrestrial TV channel based on a network of local stations should be established as soon as possible; that the IBA should be replaced by a new Commercial Television Authority that would regulate the ITV, cable and satellite TV services; that a system of regulated tendering should be used when the current ITV franchises come up for renewal in 1992; that British Satellite Broadcasting’s DBS services should be given a fair trial; that separate night-time TV franchises, from midnight until 0600, should be introduced in 1993; that franchises for the two remaining DBS channels should be awarded as soon as possible after 1993; and that the newly set up Broadcasting Standards Council should have its findings on proper research rather than the representations of pressure groups. The Committee spent six months on its deliberations and members visited the USA and Italy to sample the offerings of overseas TV broadcasters. It might seem that the IBA has come out of all this badly, but the committee’s chairman John Wheeler pointed out that the proposal for a new Commercial Television Authority had not been made because of any shortcomings but because “a new body is required for a wider and more flexible task”.

The IBA has proved itself to be flexible in the past however, and there is no reason to think that it couldn’t cope with any added responsibilities given to it. Finally, Mr. Wheeler suggested that public service broadcasting should remain at the centre of a recast UK TV service, with the interests of viewers rather than advertisers at the forefront. “In the medium term” he continued, “we think that the majority of viewers will still watch the same four channels as they do now. We don’t want the success of new services to be at the expense of the present much-valued ones.”

Thanks!

There was an incredible response to our questionnaire in the June issue – we received several thousand completed forms. Our thanks to all who assisted in this way. A computer analysis of the results is under way and will help us in determining future policy.

Arialems

Thanks!
Long-distance Television

Roger Bunney

At first there seemed to be a poor start to the 1988 Sporadic E season. During the latter half of May however there was a considerable improvement, with a number of exotic signals being logged and several intense openings. The log is as follows:

6/5/88
An aurora on the 5th extended into the 6th, giving auroral TV reception that included RAI (Italy) ch. IA and unidentified signals on chs. E3 and 4. It gradually developed into an SpE opening, with signals in the UK noted from RAI chs. IA, B; TVE (Spain) E2, 3, 4; RTP (Portugal) E2, 3; JRT (Yugoslavia) E3, 4; TVR (Rumania) R2; TVP (Poland) R1; ARD (West Germany) E2, 3, 4; DFF (East Germany) E4; TSS (USSR) R1, 2; CST (Czechoslovakia) R2; RUV (Iceland) E3; TDF (Canal Plus) L3; RIT (Tunisia) E4.

7/5/88
TVE E3, 4; RAI IA, B; JRT E3; ARD E2; ORF (Austria) E2a; +PTT (Switzerland) E3, 4; TDF (France) L2, 3, 4.

8/5/88
TVE E3, 4.

9/5/88
SVT (Sweden) E2.

10/5/88
SVT E2; NRK (Norway) E2.

11/5/88
ARD E2, 3, 4; RTB-F (Belgium) E3; +PTT E2, 3; RAI IA; DR (Denmark) E3, 4; ORF E2a, 4; TVE E2; RTP E3; CST R1; TSS R1; TVP R1; NRK E2, 3, 4; SVT E2, 3, 4.

12/5/88
EPT (Greece) E3.

13/5/88
RUV E4.

14/5/88
SVT E3.

15/5/88
TVE E2, 3, 4; TVE-2 E2; RAI IA, B; ORF E2a; JRT E3, 4; EPT E3; RTP E2; 3; TDF L2, 3, 4; +PTT E2, 3; TVP R1, 2, 3; NRK E3; SVT E2; MTV (Hungary) R1, 2; Tele-Unio IA (Italian free station).

16/5/88
TVE E2, 4.

17/5/88
CST R2; TSS R1; TVE E2.

18/5/88
RAI IA, B; TVR R2; CST R2; NRK E2, 3; Tele-Grasso E2 (Italian free station).

19/5/88
RAI IA, B; NRK E2, 3, 4; SVT E2, 3; RUV E4; TSS R1, 2; TVR R1, 2; CST R2; +PTT E3; JRT E3, 4; TWM IA (Italian free station).

20/5/88
TVP R1, 2; TSS R1, 2; TDF L2; +PTT E2; CST R2.

21/5/88
TVE E2.

22/5/88
RAI IA, B; TVE R1, 2, 3; TVP R1, 2; NRK E2; SVT E2, 3, 4; TDF L2, 4; TVA IA (Italian free station).

23/5/88
RAI IA, B; TVA IA; TVP R1; TVP R2; TSS R1, 2; 3; JRT E3, 4; SVT E2, 3, 4; NRK E2, 3, 4; CST R1; DR E3, 4; RUV E4; RTS (Albania) IC; YLE (Finland) E3, 4. A coloured announcer was seen on ch. E3 at 1800, the signal (NTV?) being from the south.

24/5/88
TSS R1, 2; SVT E2, 3, 4; NRK E2, 3, 4; YLE E3, 4; CST R1; JRT E3, 4; TVE E3, 4; Syria E3 from 1505-1815 with long, fading weak signals in southern UK.

25/5/88
EPT E3; CST R1, 2; TVP R2, 3; JRT E3, 4; TSS R1, 2; NRK E3, 2, 3; SVT E2; RAI IA.

26/5/88
RAI IA, B; EPT E3; RTS IC; CST R1, 2; ARD E2, 3, 4; DR E3, 4; NRK E2, 3, 4; SVT E2, 3, 4; YLE E3, 4; TSS R1, 2, 3; TVP R1, 2; JRT E3, 4; TVE E2, 3, 4.

27/5/88
RAI IA; RTP E2, 3; TVE E2, 3, 4; TDF L2; +PTT E4; ORF E2a, 4; ARD E2, 3; TVR R1, 2; TVR R1, 2; JRT E3, 4; CST R1, 2, 4; TSS R1, 2, 3, 4; TVP R1, 2; TVP R1, 2, 3; RUV E3, 4; DR E3, 4; YLE E3; NRK E2, 3, 4; SVT E2; 3; JTV (Jordan) E3 from 0720-0845.

28/5/88
TSS R1, 2; JRT E4; RAI IA; SVT E2; TVP R1; ZTV (Zimbabwe-Gwelo) E2 at 1910.

29/5/88
RAI IA; Syria E3.

30/5/88
RAI IA, B; TVE E2, 3, 4; TDF L2, 4; JRT E3, 4; Syria E3 at 1900; ZTV Gwelo E2 at 1820.

31/5/88
RTP E2; 3; TVE E2, 3, 4.

1/6/88
RAI IA.

3/6/88
TSS R1.

There was a remarkable all-day SpE opening on June 6th. At about 2300 system M signals from the USA/Canada were noted on chs. A2, 3, 4 and vision only on ch. A5 (77.25MHz). More details next month.

There was a minor tropospheric opening on the 7th and a major one that lasted from the 14th to the 17th. Quite remarkable Band III reception from the Low Countries, France, West Germany. Denmark and the nearer Scandinavian stations was experienced. The first two days were best in northern parts of the UK, but conditions later improved in the south, giving DR chs. E5, 8, 10, NRK E9, 11, SVT E8 and RTL E7. Simon Hamer did extremely well in north Wales, logging every ITV region including the Channel Islands. Interesting that he received Radio Jersey and Radio Guernsey on the 17th.

The Syrian ch. E3 SpE signals on the 24th/29th were logged by Tim Anderson in Hastings, Dave Shirley in St. Leonards and, on the 30th, by Cyril Willis at Kings Lynn – a corner-screen logo made identification possible. Cyril logged Gwelo, Zimbabwe (ZTV) ch. E2 on two occasions, on the 28th from 1910-1930 with a dark skinned lady announcer and on the 30th with English language sound, followed by Syria ch. E3. The Jordanian ch. E3 reception on the 27th consisted of a weak PM5544 test pattern followed by an English-language police-type programme from 0800-0845 – an Arabic caption was seen floating over the Jordanian signal at 0845! The ch. E3 Greek (EPT) reception on the 26th also produced a PM5544 type pattern, with the white background grid intermittently flashing, from 0745-0800 after which the display stabilised. On several occasions the FUBK pattern...
was seen on ch. E4 carrying the identification NEI I: it’s thought that this is NDR Flensburg carrying a test transmission sourced from Niebuell. Back-scatter SpE was noted on several occasions, producing very short-skip signals such as Copenhagen ch. E5, noted in Essex.

French radio amateurs have been heard via SpE at 50MHz, though they don’t at the time of writing have authorisation to be on air. The 50-032MHz Ascension Is. beacon ZD8VHF was heard at high levels in the southern UK on May 15th, and again next day in central UK. On both days the signals were present at 1700 onwards. Obviously this is the time to look for African Band I signals from Nigeria, Ghana and Zimbabwe. Finnish amateurs will have access to the 50MHz band from the end of June. During April a Johannesburg amateur (ZS6WB) reported reception of European ch. E2 TV signals at around 1910 GMT.

Personally I’m finding that Band I is becoming cluttered up – in the more built-up areas it’s becoming an r.f. dustbin! Apart from computers that radiate spurious signals throughout the v.h.f. spectrum, over quite some distance, (it seems that the UK is well behind the FCC standards) the 49MHz segment is becoming choked with baby alarms, toy walkie-talkies, pagers and cordless phones. I’ve even seen a 49MHz f.m. radio three-channel intercom system for domestic use. A local baby alarm radiates over a half mile radius, producing a noise-free raster here. Despite all this the DTI seems to be quite happy.

My thanks to the following for sending in reception reports to add to my own meagre loggings: Dave Shirley (Hastings), Tim Anderson (St. Leonards), Roger Fussell (Torpoint), David Oliver (Birmingham), Simon Hamer (Powys), Ryn Munthe-erff (Holland), Tim Healey (Plymouth), Dr. Eric Duncan (Fife), Peter Schubert (Rainham), Bill Cotterill (Tipton), Iain Menzies (Aberdeen), Mark Baldwin (Rushden), Mel James (Anglesey) and Cyril Willis (Kings Lynn).

News Items
UK: The late-night British Medical TV service test transmissions continue, with Canal Plus type scrambling. Apparently the BBC is working on a different scrambling format which will be used when the service starts in the autumn. It’s understood that the programmes will be transmitted during the very early morning period, before the BBC-2 Open University programmes.

Denmark: Test transmissions from the new Hove (Copenhagen West) ch. E31 and E53 outlets started on May 9th. Programmes in ch. E31 are due to start on June 1st – the PM5534 test pattern carries the identification DR at the top and KBH VEST at the bottom. The E53 outlet is due to start transmitting DR-2 on October 1st.

India: Band III rather than Band I is likely to be used for future extension of the networks. The Delhi based second channel, which at present covers seventy per cent of the country, is to have more regional opt-outs. Major network linking across the country will not be complete until the Insat II series is in operation from 1990 onwards.

Satellite TV: Launch of the Scandinavian TELE-X project has been postponed until late 1989 at the earliest. With Denmark unlikely to participate it seems that only two

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Above: Test pattern being used during an EBU news transmission via the ECS satellite at 7E. Off-air photograph from Ian Waller (Lincoln).

TELEVISION AUGUST 1988
programmes will be carried. NRK (Norway) can now be seen via the Intelsat satellite at 1°W; tune to 11-45GHz, horizontal. The DTI is making available to multipoint satellite telecommunications services six uplink points; applications have been invited for twelve-year licences and services could include sound/TV entertainment.

**Satellite Dishes**

I've received several queries on the use of dishes for home satellite reception, in particular as to whether planning permission is required. The regulations are laid down by the Town and Country Planning General Development Order 1985 – Amendment No. 2. This permits the installation of a receiving dish not exceeding 90cm in diameter on or about a domestic/residential/industrial property, or at chimneys/eaves height providing the system is attached no higher than the highest part of the roof. If the location is designated as one of outstanding beauty however, or is a conservation area, planning permission must be sought before a dish is mounted on a building or fixed to a stable/permanent foundation. Since the main requirement is a clear view of the sky, reasonable reception should in many cases be possible with the aerial at ground level, in a discreet location such as a rear garden. The system is unlikely to be more than 4-5ft high and thus unseen, so my own reaction would be to go ahead and install. The patio mount system I described in recent issues is less than 42in. high above ground level in its wheeled rotating frame. Interesting to note that several satellite TV suppliers now offer wall; balcony and chimney mounting dish systems.

**From our Correspondents...**

Two letters in particular heartened me this month. J. Walley wrote from the Birmingham area; he's eighty years young, completely deaf and has read this magazine from issue no. 1! He recently bought a basic 90cm TV/RO satellite system from Alston-Barry (Cambridge) who pre-tuned the receiver and described where to tune and look. Mr. Walley is now receiving numerous satellite signals. His basic patio mount is similar to mine but he moves his dish with the aid of lawn markers and a cheap gun sight for location. Sky, Super and RAI-UNO all carry teletext, which helps with his deafness – RA1 even has English news. Tim Healey, a veteran DX-TXer, has been ill with a heart condition: a recent aortic valve replacement has made him feel a new man and he's now back DXing and keeping busy in Plymouth. Our best wishes to these two active gentlemen!

**VHF TV – the UK decision**

As mentioned briefly last month, the government has decided against reintroducing Band I/III TV transmissions in the UK. Consideration had been given to this possibility as a means of adding extra TV services, sharing the bands with the newly established PMR and other services that now use these frequencies. The feasibility study that had been undertaken came to the conclusion that Band III couldn't accommodate a new broadcast channel while living in harmony with its mobile radio neighbours. Band I could perhaps have provided a service for the major population centres (but not all of them), but the coverage would have had to be at the expense of moving the newly arrived mobile and other services, at a high compensatory cost. Ironic perhaps is the comment that re-establishing high-power TV transmissions in Band I could have upset our European neighbours who've made their r.f. management plans on the assumption that the UK has opted out of v.h.f. TV. The SpE phenomenon was given as a further reason for not returning to Band I, because of the high-level interference problems that prevail during the summer months. Finally the Civil Aviation Authority suggested that harmonic interference could be a problem.

The 405-line v.h.f. TV system officially closed down on January 6th, 1985; though several relays continued for a few days. Bands I and III are still allocated to TV broadcasting in the European broadcasting region, and are extensively used by countries in both west and east Europe. Will the newly established Band I mobile radio services be subjected to severe disruption during the summer months as a result of SpE propagation?

**Airborne TV**

We have previously described the activities of the Blue Eagle flight, which during the Vietnam war provided wide TV coverage from transmitters aboard high-flying aircraft. Recently (April 1988) the US magazine *Popular Electronics* described a series of tests that were carried out much earlier, in the mid-1940s, with a view to achieving wide TV coverage from airborne transmitters.

Staff of Westinghouse Radio designed a prototype system in July 1945. The “Stratovision” project would use aircraft equipped with i.m. radio and TV transmitters, flying at 25-30,000ft. Narrow beamwidth signals would be received on a particular channel and retransmitted on another channel with coverage over a vast area. Details were shown to the Glen L. Martin Aircraft Company, which by spring 1946 had equipped a World War Two surplus bomber with Band II (107-5MHz) and ch. A21 (515MHz) transmitters. Initial test flights proved that successful reception was possible over an area of about 250 miles. Areas flown over during these tests included Philadelphia, Wilmington, New York, Washington, North Carolina, Baltimore, Pittsburgh and Detroit. It seemed that eight Stratovision aircraft would give coast-to-coast coverage while fourteen would cover three-quarters of the US landmass. The transmitting aerials were mounted on a 10ft mast that hinged down from the bomb bay.

The encouraging results led to the conversion of a much larger B29 airplance. In a 1948 test at Pittsburgh it relayed signals uplinked from Baltimore over an area that extended from south Virginia to New York state. At about this time the US airforce also experimented with airborne TV transmissions. The Stratovision project was considered to be a success, but was overtaken by progress with land-based communications technology, in the shape of a nationwide microwave network. The experience gained was however put to use in the very successful Blue Eagle service of the late 1960s.

This same magazine mentions that the first terrestrial u.h.f. TV transmitter, KC2XAK at Bridgeport, Connecticut, was tried out in December 1949. The vision carrier frequency was 530-25MHz (approximately ch. A24). Ch. A4 programmes from WNBT-TV in New York were relayed over a distance of 45 miles via a 2GHz link between the 85th floor of the Empire State building and a 9ft dish mounted at 1800ft up the 250ft transmitting mast at Success Hill. Transmitter power was 1KW peak vision with 500W sound, the omnidirectional aerial providing a gain of 20dBi. The results were found to be equal to or better than existing v.h.f. services, and following this experiment the FCC opened up u.h.f. for TV broadcasting, with channel allocations made in 1951/2.
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The video tape market has come a long way since the time when all that was on offer to the consumer was standard-grade, ferric oxide tape. These days tape manufacturers offer a bewildering variety of tapes, using various materials including cobalt doped ferric oxide, chromium dioxide and pure metal particles. Furthermore there are numerous grades of tape within the ferric oxide group. Metal evaporated tape may yet appear on the domestic video tape market, and perhaps even 4mm tape.

**Ferric Oxide Tape**

A high-coercivity tape is required for video signal recording. Most video tape is made from gamma ferric oxide, which has a natural coercivity of around 400 Oersteds. This isn’t a high enough value for successful video recording, so the coercivity is raised by doping the oxide particles with cobalt and reducing the particle size. The particles are acicular (needle shaped) and, in VHS standard-grade tape, are around 0.4 microns in size.

Most ferric oxide tape is made up of several layers – seven-layer tape is not unknown. The first layer (see Fig. 1) is the back coating, which is made from carbon and is about 1 micron in thickness. Its job is to reduce the static build up that attracts dust and degrades performance. Next comes the tape’s “backbone”, the polyester base film that supports the magnetic coating. This layer is around 13 microns thick and needs to be flexible, strong and non-electric. The magnetic layer is an emulsion around 5 microns thick. It consists of a complex mix of ingredients comprising magnetic powder, binder, colouring pigment, anti-static agents, abrasive material (for head cleaning and good tape-to-head contact) and solvents. Each manufacturer has his own secret recipe, and you won’t find many ingredients listed on the tape package!

Video recording makes heavy demands on the tape. In the VHS system for example the magnetic particles must be able to record wavelengths as short as 1.3 microns. The emulsion must be highly resistant to flaking, otherwise dropouts will occur. Head-to-tape contact must be good, but at the same time sticking must be avoided. And so it goes on. The performance of video tape depends on a large number of factors, including temperature, humidity and the condition of the deck’s mechanics.

Using tape specifications to compare one manufacturer’s tape with another’s is not an accurate way of assessing performance. For one thing all tape manufacturers use their own reference tape as a yardstick for tape standards. There’s no standard reference tape, and what’s more the reference tapes are regularly upgraded. That’s why you sometimes find that a new set of tapes appears to have a worse specification than the older ones they’ve replaced!

**Tape Manufacture**

Video tape manufacture is a demanding business. Most makers will tell you that production is part chemistry, part technology, part cookery – and part luck.

The various ingredients of the magnetic layer are mixed to form an emulsion which is spread on to a jumbo sized polyester base that runs along a conveyor belt system. The coated base next passes through an orientation magnet which aligns the metal particles in the same direction. This is followed by drying, after which the coating is polished to produce a smooth top surface. This smooth surface improves the tape-to-head contact and reduces the degrading effect known as modulation noise. With VHS tape the surface irregularities are limited to around 0.05 microns. The tape is finally slit into half-inch wide strips, tested and spooled into cassettes.

**VHS Tape**

Ferric oxide and chromium dioxide tapes are used with the VHS format. The ferric oxide tapes are available in a number of different grades.

The standard VHS grade is also sometimes called regular or normal grade tape (but never low grade!) and is by far the largest seller (see Table 1). Quality brand E180 tapes are now available for as little as £2.50. One welcome result of this is the virtual disappearance of dodgy brands which could produce poor picture quality, clogged VCR mechanics and head damage.

The VHS tape specification (see Table 2) was set over ten years ago. Since then, tape and head performance have far outstripped the original specification. The performance of JVC’s current standard-grade tape is included for comparison – but remember the point made earlier about performance comparisons.

**High-grade Tape**

Although today’s standard-grade tapes perform much better than older ones, various developments of the VHS system have led to a demand for higher specification tapes. VHS long-play operation increases the recording time by halving the video tracks to 24.5 microns. The system is very intolerant of tape dropouts. Depth multiplex recording is used for VHS hi-fi. This calls for a thick, even coating with improved audio response. Since the audio tracks are 40 per cent narrower than the video tracks, accurate tape tracking is essential. With the VHS HQ system the white clip level is 1.5 per cent narrower than that of JVC’s current standard-grade tape.

**Table 1: UK video tape market shares**

<table>
<thead>
<tr>
<th>Type of tape</th>
<th>Market share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard VHS tape</td>
<td>87%</td>
</tr>
<tr>
<td>High-grade VHS tape</td>
<td>3%</td>
</tr>
<tr>
<td>VHS-C tape</td>
<td>1%</td>
</tr>
<tr>
<td>Standard Beta tape</td>
<td>8%</td>
</tr>
<tr>
<td>High-grade Beta tape</td>
<td>&lt;0.5%</td>
</tr>
<tr>
<td>8mm tape</td>
<td>1%</td>
</tr>
</tbody>
</table>

Source: 3M/trade estimates

**Fig. 1: The layers of a typical ferric oxide video tape.**
raised from 160 to 200 per cent, so a better frequency response is required. As a result of these developments tape manufacturers have introduced all manner of tape grades including high grade, extra high grade, super high grade, ultra high grade, master grade, hi-fi grade, library grade and pro-grade.

Audio tapes conform to an IEC standard classification, but this does not apply to video tape. The International Tape Association (ITA) tried to set such a standard a couple of years ago but met with little success. Part of the problem is that while audio tapes are grouped according to the materials used for the coating, e.g. chrome, metal, etc., all these different video tape grades use ferric oxide. The problem is further compounded by the fact that when you test the tapes you can on some occasions find that there's no difference between a high-grade tape and its standard counterpart. Also, it's not unknown for standard-grade tape to outperform the high-grade type!

Early high-grade tapes were simply standard-grade tapes with a better than average dropout performance. Today's high-grade tapes incorporate a number of real improvements however. First, particle size is reduced to around 0.24 microns, which greatly improves the information packing density. The BET value is defined as the surface area covered by one gram of tape particles. With standard-grade VHS tape the BET value is around 30m²/g, which means that one gram of particles occupies 30m² of space. High-grade tape has a BET value of between 40-50m²/g. This increases the coercivity to over 700 Oersteds, greatly improving the frequency response.

Many high-grade tapes have additional coatings and new formulations. For example, to achieve improved high-frequency response JVC's new pro-grade uses barium ferrite in addition to ferric oxide. The coating process is also more tightly controlled, so that whereas with standard-grade tapes the average number of dropouts is around 15-20 per minute with some high-grade tapes the dropout rate is as low as three per minute.

Overall, high-grade tapes have a higher f.m. output, better signal-to-noise ratio and lower modulation noise than standard-grade types (see Table 2). The cassette shells are also made to finer tolerances and the boxes are often more robust. They incorporate features such as anti-static treatment and magnetic protection.

Tape manufacturers recommend the use of high-grade tape for long-play operation, hi-fi recording, archiving and recordings that are to be edited on to another tape. But, as Table 1 shows, the general public appears to be more interested in economy than performance.

**S-VHS Tape**

With the S-VHS system picture detail is greatly increased by shifting the f.m. carrier to 5.4-7MHz (deviation) as opposed to 3.8-4.8MHz. With the wider bandwidth that this makes possible, some of the higher frequencies have wavelengths as short as 0.8 microns. At these dimensions there's a danger of self-erasure, and to reduce this risk tape with a higher coercivity than that of high-grade tape is required.

The use of high coercivity metal tape was proposed when JVC first began research on S-VHS. Eventually JVC settled on a special grade of ferric oxide tape. The coercivity is raised to 900 Oersteds by reducing the particle size to just 0.18 microns, enabling the tape to record the higher frequencies.

To ensure that only S-VHS tape is used for S-VHS recording, the cassettes have an identification (ID) hole on the underside. If a VHS cassette is inserted the machine's S-VHS recording mode is rendered inoperative. VHS recordings can be made on S-VHS tape, and there has been some controversy as to whether ordinary VHS machines will be able to record and erase S-VHS tapes. JVC, 3M (Scotch), TDK and others have carried out extensive tests using blank S-VHS tape in old-style piano-key VHS machines, camcorders and hi-fi machines, using both the
The remanence for chromium dioxide tape is quoted as 1,450 Gauss. There is no specification for the remanence of ferric oxide tape, but the figure for most standard-grade tape is between 1,200 and 1,400 Gauss.

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Chromium Dioxide Tape

Chromium dioxide was first used in audio tapes. It initially found its way into video tape as an abrasive additive in the tape emulsion. BASF however markets a range of "chromdioxid" tapes in a variety of grades. To start with there was some controversy as to whether their use would accelerate head wear, but BASF claims that its chromium tapes actually increase head life. A tape life of over 500 passes (most ferric oxide tapes have a life of 100-300 passes) is quoted. Table 2 includes the specifications of a typical chromium dioxide tape, but for the reasons previously given comparisons with ferric oxide tapes are again difficult.

Metal Tape

Ferric oxide tape development has probably reached the end of the road with S-VHS. To record even shorter wavelengths than with S-VHS requires a higher coercivity, and that means metal tape.

Metal tape is widely used in professional formats such as the M11 and Betacam SP camcorder ones and for the D1 and D2 digital video recording systems. Domestic systems that use metal tape include the 8mm and Extended Definition (ED) Beta formats. It's also used with the Digital Audio Tape (DAT) system. Several VHS manufacturers, notably Matsushita (Panasonic) and Hitachi, have developed digital VHS recorders that require metal tape use the MP type.

One of the problems with MP tape is that the high coercivity and relative thickness of the metal coating mean that a high recording current is required. As a result there's a danger of the ferrite video heads saturating. To overcome this the ferrite heads are sputtered with an alloy of iron, aluminium and silicon called sendust (see Fig. 2). This greatly improves the recording characteristics.

ME tape is made by passing the base film through a vacuum chamber and heating the metal alloy with an electron beam until it boils. The metal vapour condenses on to the film, forming a very thin layer just 0.15 microns thick. Coercivity is much the same as with MP tape, but the thinness of ME tape gives much longer playing times. ME tape is expensive to produce however: all current formats use metal tape. With the 8mm system wavelengths around 0.6 microns are recorded. Tapes that provide playing times of 15, 30 and 60 minutes are 13 microns thick while 90 minute tape is 10 microns thick. Technical problems have so far thwarted the introduction of 120 minute tape in the PAL markets.

The recently announced high-band 8mm format will use a special type of tape, but no details of this have been announced so far.

Developments

The ED Beta format has a carrier deviation of 6-8-9-3MHz and uses an audio-sized cassette. The system would not be possible without the use of high-density, high-coercivity metal tape. With the 8mm system wavelengths around 0.6 microns are recorded. Tapes that provide playing times of 15, 30 and 60 minutes are 13 microns thick while 90 minute tape is 10 microns thick. Technical problems have so far thwarted the introduction of 120 minute tape in the PAL markets.

The recently announced high-band 8mm format will use a special type of tape, but no details of this have been announced so far.

Table 2: VHS tape specifications

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Basic specification</th>
<th>Current JVC standard grade</th>
<th>JVC Pro-grade tape</th>
<th>Chromium dioxide tape</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.M. output</td>
<td>−2dB</td>
<td>0.5dB</td>
<td>3.5dB</td>
<td>4dB</td>
</tr>
<tr>
<td>Chroma output</td>
<td>−2dB</td>
<td>0.5dB</td>
<td>2dB</td>
<td></td>
</tr>
<tr>
<td>Video s/n ratio</td>
<td>−2dB</td>
<td>1.1dB</td>
<td>3.2dB</td>
<td>0dB</td>
</tr>
<tr>
<td>Chroma s/n ratio</td>
<td>−2dB</td>
<td>1.7dB</td>
<td>3.9dB</td>
<td>0dB</td>
</tr>
<tr>
<td>Audio frequency response</td>
<td>±2dB</td>
<td>0.5dB</td>
<td>2dB</td>
<td>2dB</td>
</tr>
<tr>
<td>Coercivity</td>
<td>600</td>
<td>680</td>
<td>approx. 1,450</td>
<td>600</td>
</tr>
</tbody>
</table>

The remanence for chromium dioxide tape is quoted as 1,450 Gauss. There is no specification for the remanence of ferric oxide tape, but the figure for most standard-grade tape is between 1,200 and 1,400 Gauss.
remanence 2,500 Gauss. ED Beta tape cannot be used with standard Beta recorders.

Samsung has developed a video recording format that uses 4mm DAT tape. This is an MP type with similar remanence, coercivity and tape thickness to 8mm MP tape. The DAT cassette is about half the size of a conventional audio cassette. It offers great portability and a recording time of 80 minutes, nearly three times that of a VHS-C cassette. The system is unlikely to be launched without widespread industry support.

The next stage of development is likely to be a move away from tape with longitudinally orientated particles to vertical recording with the particles standing upright. This would greatly increase the recording density. JVC’s work on vertical recording has resulted in the development of hexagonal barium ferrite particles – the accompanying photo gives an idea of the kind of particle shape this work is producing.

Acknowledgements
I would like to thank BASF, JVC, Maxell, Scotch, Sony and TDK for their help in providing information that has been used in this article.

Teletopics

SKY TELEVISION
Rupert Murdoch’s News International has announced a major extension of its subsidiary Sky Television plc’s satellite broadcasting interests. The company plans to start a four-channel satellite TV broadcasting service via the Astra satellite, which is due to be launched this November. A ten-year lease has been signed for three of Astra’s transponders, which will be used for a general entertainment and arts channel, a news channel and a feature film channel. An option has been taken on a fourth transponder for a sports channel which would be a joint venture with a consortium of EBU members. The services will be uplinked by British Telecom and will be regulated by the Cable Authority. Transmissions are due to begin next February, following tests in December. The services will be free, supported by advertising, so there will be no question of scrambling. A 24-hour radio service will also be offered, with stereo sound quality, presenting non-stop music from compact discs. Sky Television will be operated from a new facilities centre in the UK: it will include news studios, transmission suites, post-production facilities and offices. The services will be known as Sky Channel, Sky News, Sky Movies and Sky Radio.

To coincide with the start of the new services Amstrad will be entering the satellite TV market with an Amstrad Fidelity branded 60cm dish and receiver package aimed at the mass market, with a £199 VAT inclusive price tag. This low price is helped by the fact that the transmissions will be to the PAL standard, with no scrambling or access control. The company is tooling up for production of up to 100,000 units a month, with deliveries scheduled to begin in the first quarter of 1989. An assembly line has been planned in the UK though certain key components will be sourced in the Far East. It’s understood that an agreement has been reached with GEC-Marconi for the supply of one million LNBs. The basic model will be known as the SRX100, but there will be a series of models with extra features including a £259 unit with remote control. Distribution will be via the company’s traditional High Street and independent outlets. Aerial contractors are expected to charge £40 or so for an installation.

SES, the Luxembourg company that owns the Astra satellite, has decided to order a second satellite which will be launched in 1990. This will provide a back-up for Astra and will increase the total channel capacity to 32.

Maxwell Communications, W.H. Smith and British Telecom have jointly announced their intention to start a satellite TV service with probably six channels. Either the Astra satellite or a second-generation, medium-power Eutelsat satellite will be used and the transmission standard will be D-MAC. The companies plan to offer a new service Amstrad and are likely to be Astra’s main competitor, though the Home Office is investigating the idea of making BBC-2 and Ch. 4 available via satellite only in order to increase the number of national and regional channels, the aim being to give the viewer a wider choice and advertisers a better deal through increased competition between broadcasters. The government has stressed that the scheme is still at an exploratory stage, and that terrestrial BBC-2 and Ch. 4 transmissions would continue for a number of years. One suggestion would be to use the two spare transponders on the BSB satellite.

In a recent speech the Home Secretary Douglas Hurd called into question the traditional licence fee. He is reported to have commented that “as the viewer has more and more channels to choose from it will become less and less defensible that he should have to pay a compulsory licence fee to the BBC regardless of the extent to which he watches its programmes”. It seems that the alternative would be a subscription scheme. The Home Secretary also questioned whether the role of the IBA in setting detailed schedules would in future be necessary, and put forward the suggestion that transmission and the provision of programmes should be separated.

MICROWAVE TV
GEC-Marconi has been advocating the use of microwave TV services in the UK. The firm estimates that 80-90 per cent of the population could be provided with up to 30 channels at a relatively modest cost – transmitters could cost as little as £30,000 and receivers less than £100. The 2.5GHz band would be used for such MMVD (multi-channel microwave video distribution) services, with low-power transmitters each covering an area with a radius of 30km. A demonstration of the technique was given recently at the Chelmsford headquarters of Marconi Communications Systems. The firm points out that distribution of TV services via a microwave network would be a much cheaper solution than either cable or satellite systems.

TELEVOX
A new teletext-based service for advertising holidays, houses, jobs etc. has been introduced by McCallum Televox. Subscribers phone the Televox Centre at Cam-
Thorn EMI subsidiary MultiBroadcast is starting a retail chain which will trade under the name Value Vision. One of its main activities will be the sale of reconditioned ex-rental equipment. The first two shops are in Nottingham and Wolverhampton. Ten or so more outlets will be opened during the coming year, in the midlands and south. Servicing will be looked after by MultiBroadcast's service organisation, which is being expanded to take on contract work.

Woolworth's electrical subsidiary Comet has bought from Granada fifteen Connect outlets in Northern Ireland.

**JOBS LOSSES IN MANUFACTURING**

Both Philips and Thomson have announced substantial staff cutbacks. Philips will be shedding 900 jobs at its Eindhoven consumer electronics division, the largest single reduction to be announced by the company in fifty years. Most of the cuts will be made next year. The move is part of an overall plan to cut 20,000 jobs and close at least 70 factories worldwide. Philips' aim is drastic cuts in production costs and more rapid product development from initial idea to market launch. The company has already shed over 4,000 jobs this year, mainly in the consumer electronics division. More redundancies could follow.

Thomson's newly formed Thomson Consumer Electronics subsidiary is expected to announce shortly plans for large-scale job reductions world-wide. The division has 40 plants in 17 countries and a workforce of over 50,000, including the GE-RCA operation in America.

**1988 HAM EXAM**

A Radio Amateurs' Examination course is to be held at Paddington College, commencing at 6:30 p.m. on September 13th. Enrolments take place during the week commencing September 5th, between 1-4 p.m. in the afternoon and 6-8 p.m. in the evening, on the third floor of the college at Paddington Green, London W2 1NB. Because of ILEA agreements this is likely to be the only ILEA sponsored RAE course to be held in the ILEA area during the academic year 1988-9. The Paddington course covers the City and Guilds RAE exam syllabus and also makes use of the College's facilities to enable students to carry out practical experiments in the electronic theory covered, the aim being to provide a grounding in electronics as well as an Amateur Radio licence. The course tutors are David Peace (G4KKM) and David Hunt (G6MFR). Further information can be obtained from the college on 01-402 6221 or David Peace on 01-892 7585.

**END OF RTS**

This year will be the first since the early fifties that does not see the publication of an annual volume of Radio and Television Servicing. In the early days the books were published by Newnes; for the last decade or so they have appeared under the Macdonald imprint. At one time your editor used to compile the TV section. There's good news however for those who still want a book of circuits etc. U-View TV Tubes of 29 Warmsworth Road, Doncaster South Yorkshire DN4 0RF, which has been acting as a main distributor of these books, will this year be publishing its own Television Circuit Book - a quality hard-bound book in A4 size. No clock radios or record players, but more TV circuits. A Video Circuit Book is to follow. We understand that both books should be available by the end of the summer.

**SPARES NOTES**

Following the recent changes at Fidelity Radio, reported in this column last month, SEME Ltd. point out that these will not affect the spares situation. SEME will continue to fulfill Fidelity's obligations for the supply of spare parts, in particular the policy of maintaining supplies for major products for five years. The company will also continue to provide technical advice on spare parts. SEME Ltd. is located at Unit 2E, Saxby Road Industrial Estate, Melton Mowbray, Leicester LE13 1BS, telephone 0664 65392 or 66881. HRS Electronics Ltd. has moved to Garretts Green Lane, Garretts Green, Birmingham B33 0UE. The new premises give the firm a five-fold increase in space, to 109,000 sq. ft. The new telephone numbers are: sales 021 789 7575; accounts 021 789 7676; general 021 789 7171. Note that this firm operates a trade only policy.

**NEW CATALOGUE**

The summer 1988 edition of the Cirkit constructors' catalogue is now available, featuring many new products in its 184 pages. Items featured for the first time amongst the 3,000 lines include a low-cost 10MHz oscilloscope, the Easiwire fast circuit prototyping system, an automatic nicad charger-cycler and two new hand-held scanning receivers. There are also additions to the components range, including scart and mains connectors, r.f.i. filters, ABS and 19in. rack cases and cyano adhesive. The catalogue costs £1·30 and is available from Circuit Distribution Ltd., Park Lane, Broxbourne, Herts. EN10 7NQ, telephone 0992 44111 (sales desk) or 0992 441306 (other departments).

**IN BRIEF**

Sony has launched in Japan a video version of its Walkman. The combined display unit and tape deck is housed in a casing the size of a fat paperback and sells for around £550 . . . Agreement has been reached between European consumer electronics manufacturers and the EBU on the specification for the Eurocrypt satellite TV scrambling and conditional access system ... Under proposals that have been added to the Copyright, Designs and Patent's Bill, users of VCRs will have to wipe out their recordings within 28 days. The aim is to stop viewers building up home video libraries. It's not certain how such a regulation could be enforced . . . The IBA's engineering division has completed the installation of replacement high-power u.h.f. transmitting equipment at Mendip, Somerset. It's the first station to be re-equipped in a major modernisation programme. All the original u.h.f. colour transmitters will be replaced over the next ten years. The new transmitters at Mendip use pulsed klystrons for high electrical efficiency and low maintenance, and will be capable of providing high-quality NICAM digital stereo sound. Stereo sound will be available in London and parts of the Yorkshire region from autumn 1989: the full ITV and Ch. 4 service will begin in 1990.
TV Fault Finding

Amstrad CTV2200

There have been various comments on this set in recent issues. I’ve found that the main reason why it self-destructs at switch on or soon after, blowing Q501 (2SC3156), Q802 (2SD139B) and sometimes Q503 (2SA916), is dry-joints on the line driver transformer T801. They can also be responsible for reduced width at one side, sometimes intermittently. Also check the h.t. smoothing capacitor CS20 (100µF) which works very close to its tolerance of 160V. If you don’t have a 2SC3156 to hand a BU208A will work quite happily as a replacement.

D.D.

Ferguson TX9 Chassis

The customer complained that faces were green, which is not acceptable even here in Ireland. On checking the grey scale everything seemed to be normal, so it was a case of straight into the colour decoder to look for the cause of the phase reversal. The chip (IC52) was changed first, with no luck. Balance control RV67 which has been known to cause this trouble, also the chroma delay line and the components in the ident circuit, were then tried. Still no luck. The voltages and waveforms all looked fine. With despair setting in I rang friend Snow, who is never stuck with Ferguson sets. “Have you checked the degaussing circuit?” he asked, “if not try it now.” I’d spent a whole day trying to find the fault in the decoder, but three seconds with a degaussing coil cleared the green faces. The culprit was the posistor.

W.H.C.

Some Quickies

Waltham W350: This set had reduced width when warm and sometimes failed to start when cold. Without being in any way intermittent, the line oscillator transformer could be removed by hand without the use of a soldering iron.

Philips K30 chassis: A noiseless raster was cured by changing the i.f. module, but this turned out to be a red herring. R1412 (12Ω) which smooths the 12.5V supply for the tuner and the i.f. module was intermittently open-circuit. When disturbed by changing the i.f. module, but this turned out to be a red herring. R1412 (12Ω) which smooths the 12.5V supply for the tuner and the i.f. module was intermittently open-circuit. When disturbed by changing the i.f. module it was o.k. for a while.

NordMende 4230: This 16in. colour set uses the same chassis as the Ferguson Model 3878. When the mains supply was applied via our variac we found that it wouldn’t operate with an input of more than 150V. It took us a considerable time to discover that CA13 (0.47µF) which couples the drive to the line flyback thyristor was slightly leaky.

H. MacM.

GEC C2000

This and other Tatung models that use the TDA4503 signal processing chip seem to give a crackling noise on sound during video search. The only cure found so far is to alter the value of R106 to give 3-7-4-2V at pin 28 of 1101 when the AV position is selected. This usually calls for a resistor value in the range 150kΩ to 180kΩ.

P.B.

Grundig CUC2401 Chassis

If you find that the sound mutes on playback of a prerecorded tape, check which type of ABL module is fitted. If it’s type 29504-107-31, change it for a 29504-007-28 or disconnect the link from the TDA8185 chip to pin 9 of the ABL module. Removing the link disconnects the mute, so the self-seek tuning won’t stop when a station is found etc.

P.B.

Finlux 9000 Series

You sometimes get failure to start from cold with these sets, especially in cold weather. We’ve come across two causes of this trouble. Either Ru17 (270kΩ) has been intermittent or Cu6 has dried up.

P.B.

Grundig CUC2600 Chassis

I’ve had this fault on two occasions now. From cold the set gives either a blank raster or snow on the screen, with no sound. The slightest movement of the chassis will cure the fault for days. On both occasions tuner replacement has provided a permanent cure.

P.B.

Amstrad CTV1400

These sets are very prone to developing dry-joints on one or all of the line driver transformer’s pins (T701). If the owner doesn’t bother to do anything about the resultant intermittent faults (they very seldom do) the first thing the service engineer knows about it is when he’s presented with a set with a dead line output transistor (Q705). The original is a 2SD904 but Amstrad now supply a 2SD822. Incidentally, take circuit details on the panel and in the service manual with a pinch of salt. The LA7800 sync/timebase generator chip IC701 has pin 8 marked correctly on the underside of the panel but pin 16 is marked pin 1. In the manual the voltage at pin 12 of this chip is shown as 1.2V instead of 12.2V.

Q705’s collector connection to the print is via a stud that’s soldered in. This is not very reliable. An extra lead from the connecting nut through one of the convenient holes in the board to the print land is a good idea.

In my experience these sets benefit from having the board cleaned up and coated with circuit varnish.

R.B.

Rank T20/22 etc Series

This one should appeal to those who, like me, delight in minimal cost repairs. The ultrasonic remote control handset used with these sets has a phosphor-bronze leaf spring that not only returns the switch to the off position but gives an audible click when doing so. After a number of years the spring fractures. There are several ways to restore operation without the click, but if you wish to retain this feature
you either need a new spring (if you can obtain one) or you must improvise. If you don’t have phosphor-bronze of the right flexibility, here’s a free source of substitute material: cut up a drinks can! These are made of spun aluminium which is already work hardened. Cut out the required shape (see Fig. 1) and hammer it over a suitable rod or tube to get the spring to rest in the off position. The spring doesn’t have any electrical function – this is taken care of by separate fingers. Only time will tell how long this repair lasts, but it takes just a few minutes to do and must be a cost-effective solution.

**Ferguson TX90 Chassis**

The fuseholder for FS102, the secondary fuse on top of the mains transformer, tends to overheat and cause intermittent operation. It’s of the type with a Paxolin base, and you’ll find this scorched. As this is the fuse that blows when the mains rectifier diodes short — often intermittently — the problem could be due to regular fuse changing before the fault is tackled properly, i.e. change all four diodes to type BYD33G. The fuse has been uprated from T1A to T1-6A.

**Decca/Tatung 145 Series Chassis**

For chopper transistor failure in this chassis check R808 (100kΩ) and R810 (82kΩ).

**Ferguson TX9 Chassis (PC1001 Panel)**

If the BZX79C4V7 zener diode W54 goes open-circuit the result is flyback lines at the bottom of the screen, increasing in size over the bottom third. The lines are always green — perhaps someone can explain why? W54 is the blanking input clamp diode at pin 2 of the µPC1365C colour decoder chip IC52.

**Thorn 3500 Chassis**

One of these elderly sets began to eat chopper transistors, always when no one was watching it. The only fault I could find in the power supply was a suspect joint at one end of the 30V line fuseholder. Flexing the board quite hard in a darkened room enabled me to see a spark. I’d previously seen the picture fluttering, and tapping the panel had caused line collapse, but the joints all looked reasonable. Going over all possible bad joints in the area seems to have put matters right.

**Salora 1F3**

In the June issue John L. Howard mentioned condensation as a cause of field slip from cold in these sets. What often happens is that condensation on the tripler causes tracking which in turn upsets the field sync.

**Bang and Olufsen 4402 (35XX Series)**

The width varied intermittently, accompanied by a nasty crack of e.h.t. followed by line collapse. A dirty connection on the scan coil plug, at the coil end, was responsible. It had started to arc and burn the plastic plug casing.

**Panasonic TC2205 (U2 Chassis)**

Stuck on standby is a fairly common fault with these sets. I dived for the chopper power supply rectifier diodes D852/3 etc., the usual cause, but they were all intact. After much time spent checking around I decided to replace the line driver transistor Q501. This restored a bit of life but the trouble was by no means cured. In the end I came to the conclusion that the line output transformer was probably faulty, something that’s virtually unknown in Panasonic sets. Fitting a replacement cured the trouble.

**Panasonic TC381G**

After thirty seconds the picture would flare up bright green and the set would then trip. The cause of the trouble was traced to a grid-cathode short in the 320BTB22 tube. This is an expensive item to replace, so I played around with my newly acquired B and K 467 tube restorer and cleared out the short, thereby saving an otherwise first class set.

**More Quickies**

**Sanyo C1P/130/1/2:** If the line output transistor fails at switch on or some time later check for a dry-joint on the heatsink support tag. Resoldering provides a cure.

**Thorn 1615 chassis:** For reduced field scan check whether the HT2 rectifer diode W34, type BY210-600, is open-circuit.

**Grundig CUC70 chassis:** For intermittent mains fuse failure replace D657 (MZD160).

**Triumph CV8520**

The fault report said “crackles” and it turned out that the tripler was duff. I hadn’t got one so, after moving a few components to the copper side of the board, a universal tripler was fitted. These sets have an unusual focus arrangement, built into the tripler, so I left the focus lead off. When I switched on there was e.h.t., closely followed by an out-of-focus picture. So far so good! Numerous focus units were then tried. The one that eventually worked was for the Thorn 9000 chassis. I fixed it on to the plastic chassis and gave the set a long soak test. It’s since gone back to the customer and there have been no complaints to date.

**Hitachi CPT2064**

This set came in dead, with fuse F901 blown. We found that IC901 (STR440) and Q781 (2SD898B) were both short-circuit. Everything seemed to be all right when these items were replaced but the set was back with us next day, the complaint this time being that the set couldn’t be operated by remote control. The handset was working so we replaced the M58485 chip IC3003. This restored normal operation.
The Importance of VCR Back Tension

Nick Beer

Back tension in a VCR is the reverse force encountered by the tape when threaded up. My reason for writing this short article on the subject is to help engineers who may be nagged by odd intermittent deck faults in playback/record or encounter machines with a tendency to premature head wear. The importance of correct back tension seems to be either unknown or ignored. It's amazing how many workshops that have a fairly large throughput of VCRs don't possess any method of back tension measurement.

Back tension is provided by braking (the soft brake band) on the supply reel and the back-tension lever, see Fig. 1. Usually one or other of these can be adjusted to obtain correct back tension.

Without back tension there would be no control over the tape as it passes the entry guide to go round the head drum, i.e. the tape would be slack, not taught as it should be. The tape would therefore loop into the mechanism and the picture would be severely impaired — in fact the machine would be unusable.

Incorrect Back Tension

Very low back tension is not a common problem except in the Mitsubishi Model HS303 where the back-tension lever has a tendency to stick in its rest position, usually giving the impression that one of the heads has failed (back tension is still partially present due to the effect of the soft brake).

Slightly low back tension usually means that the tape snatches or loops as it passes the back-tension lever, particularly in the forward search mode and just after completion of threading.

Excessive back tension is by far the most common condition. Unfortunately it often goes unnoticed because the machine has come in for some other reason, for example a worn head, though excessive back tension is very often the underlying cause of the trouble. The reason for excessive back wear is that the back tension opposes the take-up torque. It therefore directly affects the pressure exerted by the tape on the head drum, by determining how tightly the tape is wrapped round the drum. Thus constant operation with too much back tension will lead to premature head failure.

Some Panasonic machines provide good examples of this sort of thing. When head wear is mentioned the NV730 springs to mind. This is a two-speed machine with super still, so the heads are pricey — about £75 retail plus VAT for a new drum, though MCES now do excellent rebuilds. A high proportion of these machines have had to have new heads after eighteen months to two years' use. Some are coming in for head replacement yet again. In most cases a check on the back tension would have showed the basic cause. I'm not saying that incorrect back tension is in every case the cause, but the machines I've adjusted haven't been back.

In older Panasonic VCRs back tension is generally 25-30g, but with most of the NV730s I've had in it has been between 50g and 60g! Only the other day one came in with duff heads. The customer said he knew it was the heads because he had had the same trouble 12-18 months previously. Someone else had fitted a new drum and when I measured the back tension I found that it was 50g.

Staying with the Panasonic range, I've had head failure with a number of NV-G21s and NV-G25s — under guarantee of course. In all but two cases the back tension was over 45g. With these machines it should be 20-25g!

I must apologise to Panasonic for keeping on about their machines, but they do provide good, well-known examples of the problem — other manufacturers are guilty of inaccurate setting up at the factory.

Measuring Back Tension

Having made the case for checking the back tension, how do you measure it? We use the Panasonic Tenteleometer (see Fig. 2). It's a hand-held meter with three probes through which the tape runs, as shown in the accompanying diagram. It comes with a calibration weight and instructions and is a superb device for the purpose. Place the three probes around the tape, as shown, at a point between the erase head and the entry guide. Take measurements with an E120 cassette, approximately half way through, ensuring that the meter's probes are kept vertical with respect to the tape. The device works by calculating the tension as the amount of force the tape applies to the middle probe and this probe's movement with respect to the other two probes.

There are cassette type meters like the type you use for fast forward/rewind and take-up torque measurement. An example that's as good as any is available from Willow Vale under part no. 20-998A — it's a Thorn unit. Use is by playing the tape as usual and reading off the scale.

Adjustment

Back tension adjustment is carried out by one or other of the following methods — the service manual will tell you what to do:

(1) Adjustment of the supply reel soft brake tension.
(2) Adjustment of the landing position of the back-tension lever, by increasing or decreasing the actuating spring pressure for correct tension.
(3) As (2) but using a jig with marked graduations and ensuring that the lever falls within a specified area — there is no need for a tension measuring device in this case, which applies for example with some Sanyo models.

TELEVISION AUGUST 1988
They were all coming into the shop. "Call the fire brigade, start the car, but it didn't want to know. Next thing I knew wife and two children were with him. I heard him trying to close the boot and got in behind the driving wheel. His set which, on investigation, had turned out to be not worth repairing. He carried the set out, put it in the car, his set. A red Consul drew up outside. Its driver came in to collect the set. It was Bill Bevan, whose wife is expecting.

The Blaze

Les Lawry-Johns

A red Consul drew up outside. Its driver came in to collect his set which, on investigation, had turned out to be not worth repairing. He carried the set out, put it in the car, closed the boot and got in behind the driving wheel. His wife and two children were with him. I heard him trying to start the car, but it didn't want to know. Next thing I knew they were all coming into the shop. "Call the fire brigade, my car's on fire!"

So I dialled 999. When I got through to the fire people I told them there was a car on fire outside my shop and they promised to be there in a moment. As I turned from the phone I saw Phil, who comes in on Saturdays, struggling with the shop fire extinguisher. I took it from him, whipped out the wire and went out to the car. Flames were coming from under the bonnet. So I bashed the top of the extinguisher and directed the spout up near a front wheel. The extinguisher gushed out a white cloud, and at that moment the car's starter started up. After a few more moments the white cloud stopped gushing and the flames were out - there was still a lot of smoke, but the fire was dying down. H.B. shouted at me to get away from the car - she was leaning out of an upstairs window and thought it was about to blow up. It wasn't.

Just then the fire brigade arrived, along with a police car. The firemen lifted the car's bonnet and looked at the mess inside. It was a mess. I recognised the policemen as he got out of his car. It was Bill Bevan, whose wife is expecting. He took the car driver's name and address, and the number of the car. He suggested that when I got the bill for refuelling the extinguisher I should send it to the car's owner who would present it to his insurance company. When I got the estimate it was for eighty pounds plus VAT. I wrote to the address Bill gave me, but haven't had a reply. Oh well! And what did the local rag say next week? "Fire brigade puts out car fire." Thanks a million!

The Fidelity ZX2000 Chassis

I've serviced hundreds of Fidelity TV sets. In the earlier ZX2000 chassis failure of the line output transformer is the usual cause of R901 in the supply to the line output stage being burnt out. Normally you replace the transformer with the later type from the ZX3000 chassis, fitting the adaptor base, remove the focus and first anode controls as these are built into the new transformer, replace the resistor and everything works fine.

The last one I did this to came back a few days later. This time I found that the chopper transistor and the chopper circuit efficiency diode D24 (RGP15J) had failed. I must confess that the diagnosis and repair were not as straightforward as this account suggests - my muddled head is going to get me into some trouble soon.

How's This for Service?

Phil dropped in during the week to see if I had an SN76532N for an ITT VC300 monochrome portable he was repairing. I looked here, there and everywhere but couldn't find one. He left and enquired around the town but didn't have any luck. Someone told him that Gosling Electronics would have one, but they are in south London, some twenty miles away.

Not to be deterred, Phil jumped into his car and sped off there - after checking by phone to ensure that they had one. He found the shop, but the chip was in the outside engineer's van. Gosling drew a diagram to show where his calls were and Phil once more set off on the chase. First here, then there and eventually, would you believe it, Phil caught up with him. The engineer had the chip and let Phil have it (too cheaply I thought). When Phil got back and fitted the SN76532N sync was restored. You think you go to a lot of trouble to please your customers!

Two Old Dears

These old dears brought their white Ferguson 3848 (1690 chassis) along in a black dustbin bag. As I got it out they told me there was no sound or vision. While they nattered away I whipped the back off, releasing the aerial etc. panel for easier access. When I switched the set on there was slight sound and the tube's heater was dim. On removing the e.h.t. cap the set showed more life.

I switched the set off and clipped the e.h.t. lead. The right sort of e.h.t. diode wasn't in stock - the only one I could find was the little white Thorn 8000 chassis type. I screwed this on to the line output transformer's screen, then connected the line output transformer to it - after removing the new unit's stud and carefully insulating the connection. When the e.h.t. cap was connected to the tube the set sprung to life, with a good picture and full sound. I know I should have replaced the complete overwinding, but it wasn't necessary. Meanwhile the ladies were still nattering away as I replaced the cabinet etc. I heard one of them say "makes you wonder what it's all for".

"Don't you know?" I asked.

"No I don't" one of them replied.

So I explained to them what life is all about.

"When you're young you get a partner, then a child whom you bring up as best you can. When it has repeated the process it's time for you to go to make room for the newcomer. That's all there is to it, whether you like it or not. No point in belly aching about it."

They looked at me as though I was mad.

"I don't think much of that view of life - when will the set be ready?"

"It's ready right now and the charge is ten quid."

They paid up and departed, still thinking they were important, as we tend to do. When will we learn? From the red salmon for example, which dies after spawning. But why do some spirits survive - like the soldiers under the local fort. They keep on appearing, though their boss General Gordon never does...
Letters

SELLING PARTS TO THE PUBLIC

How interesting to read the letter (Sharp Spares, June) from a spares wholesaler on selling parts to the general public. Our firm is situated near a large electronics design and development facility, consequently we know what we speak about. Judging by some of the clear-ups we’ve had to perform, most qualified electronics engineers are incapable of carrying out simple TV and video repairs. I’m a qualified electronics engineer myself, but I chose to leave the industrial side because I found consumer electronics more challenging. From my experience in industry, I can say that many of my contemporaries there readily recognise that their skills are different from those required in the servicing profession. Not superior skills, but different ones.

More importantly, the wholesaler has not considered the practicalities of dealing with a customer of this type. He comes into service reception and says he wants say car audio spares. Has he got the part numbers? No. Has he got the manual? No. Call an engineer to discuss his requirements and add the cost of his time to that of the receptionist. Wade through the spares list and try to identify the spares by name alone. Remember that if you order the wrong ones the wholesaler won’t give you a refund. Total the order. Find it incurs a small-order charge as well as a hefty post and packing charge.

Phone customer (more receptionist time) to tell him that the cost of processing his order on time and a 30 per cent mark up is more than £30 and see what he says. Charge him trade price for parts plus 30 per cent. Big deal, less than £5 profit which won’t even cover the surcharge and postage, let alone staff time. What a cheek this wholesaler has! We’re in business to earn a living as service engineers, not to act as wholesalers’ middle men. If he wants this sort of trade he’s welcome to it. Just a minute, the qualified electronics engineer has just come in again. He says one of the parts we supplied doesn’t fit . . .

Jon D. Woodward, Proprietor, Technovision, Wookey, Wells, Somerset.

THE FULLY QUALIFIED ENGINEER PROBLEM

I have often come across letters complaining about the much-maligned retailer. The one from Willow Vale (Sharp Spares, June) is no exception. I’m not one of those Stevenage dealers, but if the “fully qualified engineer” had called at my shop he may have found me as equally unhelpful with regard to the sale of spare parts. You see, the problem of selling spares to an unknown visitor is fraught with problems. First I have to assess the reliability, ability, knowledge and common sense of the individual. We harassed, self-employed service engineers are at the sharp (no pun intended) end of life in general. We are squeezed between the massive general public, whom we try to please and who in turn patronise us, and its backing from such entities as the local consumer services, television and radio consumer programmes and various other organisations set up to help Joe Public, and on the other hand the suppliers of stock, parts and equipment, some of whom are helpful and some decidedly unhelpful, also the various government organisations that have been set up to remove our profits and the sometimes arbitrary controls, regulations etc. they see fit to impose. It amazes me how many truly independent shops remain in business, whether they deal with electronics or other goods.

Back to that stranger who wants us to order spares for him. Does he know what he’s talking about? I’m not certain that I could myself name each and every item, component, assembly etc. in every piece of equipment that comes across the counter of my shop! I’m not so sure that the manufacturers of the equipment could do so either. The same item is often given a different name by different manufacturers, hence the plethora of computerised part numbers. If the wrong part is ordered I have to repack and return it.

Next, is the customer going to fit the part correctly? If he doesn’t and the item is damaged the customer is likely to bring it back and say that it was faulty, demanding a replacement or his money back. This can be a particularly difficult problem as in many cases the item concerned may well have been faulty, a fact that’s not always obvious on physical inspection, for example a defective i.e. Then what if the customer’s diagnosis was wrong, something that happens to the best of us at times? He may well find that he doesn’t need the part, bring it back and demand a refund—especially if it’s an obscure item that one is never likely to need to use, and is now of suspect quality! Finally, and possibly with far-reaching consequences, what would my position be if in the process of fitting his spare part the customer injured himself? Could I be held liable for encouraging him to dabble with something dangerous, say an e.h.t. tripler?

As you can see, selling spare parts is often not worth the candle, especially as one sometimes makes only a few coppers out of the deal!

One of the many things I’ve learnt in this trade is to beware of the so-called expert. I’ve discovered that the more qualified and the more a customer proclaims to know the less he seems to be able to actually do the job! The local hobbyist on the other hand is usually far more practical, enjoys what he does and is generally all the more interesting to deal with.

A final point. It may take quite a time to establish what’s wanted, then one has to look up the catalogues (even Willow Vale don’t stock everything!) and ring up to find whether it’s in stock, if so how much and not to forget to add the processing charge, the packing charge, the postage charge and of course VAT. Say I double the final sum and charge the customer accordingly, I’m not exactly going to be able to buy the baby a new pair of shoes! But if I were to take on the complete job and fit the item myself, then of course I would be much more interested: I would earn considerably more money in as much time as it has taken me just to order the required part! If Willow Vale feel piqued at producing such a costly catalogue, why don’t they advertise in the press and deal direct with the public? I somehow feel that the reason is the points made above.

Adrian Irwin, Waltham Forest, London E17.

A SHARP DEALER REPLIES

In reply to Brian Tuckfield’s letter (Sharp Spares, June) we, being in the service trade, have had several instances of so-called fully qualified electronics design engineers asking us to order parts. Invariably they ask for the wrong parts and we get lumbered with them. If we send them back to Willow Vale we are charged a 50 per cent restocking charge! If we complete the repair ourselves however we know that the work will be carried out to our mutual satisfaction.

TELEVISION AUGUST 1988
In conclusion I'd like to ask three questions, bearing in mind that Willow Vale is "dealer bashing": (1) Is it policy to supply direct to the public? (2) Had they proof that the customer did approach a Sharp stockist? (3) Did the customer show his diploma?

*Sharp Dealer, North Devon.*

**SERVICE COSTING**

Brian Tuckfield of Willow Vale has written two letters recently attacking the service trade. In the first he criticised engineers for not being aware of what is available from his company. Have you tried to get a WVE catalogue? We've been trying for at least eighteen months and have been told it's still being printed. On our last attempt the young lady, embarrassed at having to use the same excuse, suggested that it was being done by Mr. Caxton himself. It's also worth saying that parts lists are infuriating things to have to plod through: a well indexed catalogue giving say a section on reel motors with the total list of makes and models available would be much more helpful.

The second letter concerned Sharp spare parts. A recent costing of ours might indicate the type of problems faced by retailers and service departments. Initial customer enquiry (five minutes) followed by seven abortive attempts to phone WVE (six minutes), cost so far £2.74. Placement of order and stock availability check (3½ minutes), labour 87p, phone 51p plus VAT. Cost of part £3.50 plus VAT. Small-order surcharge £2.25 plus VAT. Total cost to ourselves £10.80.

Even if we added a mark up of 100 per cent on the cost of the part we wouldn't cover our costs let alone make a profit. The only way Brian Tuckfield's firm makes a profit on these small orders is to charge a small-order handling charge. Now according to the latest price information received from WVE (July 1986) we should have charged the customer £3.96 including VAT, which produces a nice profit. The only way Brian Tuckfield's firm makes a profit of the part we wouldn't cover our costs let alone make a further £1 or £2 profit for the dealer the customer would end up with a bill of say £7 or £8. There's no guarantee that he would pay that amount for a few rubber belts and wheels. In many cases they don't consider it worthwhile and there is then no way in which the dealer can get his money back. He's stuck with the spare parts, all for the sake of £1-£2 profit.

If Mastercare doesn't find it viable to supply a photo-copied service manual for less than £10, and Willow Vale charge £2.50 whether they supply a belt or £100 worth of spares, most dealers won't find it worthwhile selling small parts for a petty profit, let alone repairing that particular cassette player. The cost of repair in this case might be £20, which the customer might consider scandalous. Perhaps if suppliers reduced their handling charges for small orders it would be viable for the dealer and customer alike to have such equipment repaired. It would be very helpful if suppliers undertook field research, got to know their dealers better and found out why they don't bother about small repairs.

It seems that, with the cost of manuals and spares today, more and more dealers are turning away small, unprofitable jobs. I hear lots of customers complaining about not being able to find anyone willing to repair some brands of equipment sold by the large chain stores. The more shops that do so and stick with brands that provide good backing at sensible prices, the sooner the public will be educated into spending a few pounds more for good equipment. It's been said many times before in these pages!

*C. Deus,*

King's Lynne, Norfolk.

**LACK OF HELP**

I must agree with Mr. Barnes-Wallis's remarks (July). We all need help at some time or other, but in many cases the manufacturer/importer is most reluctant to give the information required. Blank refusals of help have come from both Sony and Grundig because I'm not an account holder, though I've bought replacement parts for their models over the years from wholesalers.

One fault that comes to mind concerned a Sony SFL1UB VCR. The problem was tape snatching, and it cost me dear. Not being familiar with the Betamax lace-up I misread the symptoms and deduced that the trouble was in the reel motor/servo control loop. Waveform checks seemed to confirm this deduction, but chip changing made no difference. At this point I suspected the reel motors, so a phone call was made to Sony to confirm the diagnosis and price the unit. Advice was refused, leaving me with a problem. I bought the reel motor PCB (expensive) but it didn't help. Your service bureau supplied the cure - shiny heads, creating a vacuum so that the tape sticks to them, now a common problem. Easy when you know, but I've ended up with a surplus reel motor PCB.

Only companies with a large throughput of equipment for repair seem to be able to acquire such information. A single engineer on his own, however good and well equipped with test gear, can never obtain it.

I've recently written to two companies asking for information on intermittent loss of colour when using a BBC or Amstrad/Sinclair Plus Two computer with Triumph CTV8209 series TV sets and their badge engineered counterparts, but have had no help. Can anyone assist?

Giving credit where it's due, a call to GEC Glasgow some years ago provided the answer to a problem I'd not have solved without completely rebuilding the power.
supply. That help was welcome indeed.

Service manuals are another problem. Granted they cost money to produce, but without them service engineers cannot maintain equipment in a way that reflects manufacturers’ standards and reputation.

Ray Crocket, Eng. Tech., Television and Video Services, Anglezarke, Thrumsper, Wick, Caithness KW1 STX.
Telephone 095 585 214.

ORACLE PUZZLE

Could any reader tell me what’s going on with HTV teletext? For some months HTV page 777 has consisted of a continuously-changing display of jumbled numbers and figures, but now there’s an intermittent flash of a text page.

I’ve recorded this with a camera and on playing it back with pause I find that the page heading has “Televox” or “Myrzad”. It appears to be a computer service of some sort. Any ideas would be welcome.

Chris Place, DER, Swansea.

FS TUBE SETS

I feel I must reply to the reader who complained about a Toshiba FST model. I’ve been a retailer/service engineer dealing with Toshiba sets since 1973, and have taken delivery of FST models since 1984. The quality of the convergence, grey scale, purity and focus has been excellent with all models. I demonstrate the conventional tube 222T series alongside the FST 212T series and customers all comment on the superb results with these models. I would be interested to know which model your reader has, and would be only too pleased to sort out the problems. Toshiba offer a two year parts and labour guarantee, and to date I’ve had only very minor problems such as the odd tuner etc. despite having sold a large number of sets. All customers – and they are the best judge – are delighted with the product.


With reference to Colin McCormick’s complaint (June) about the convergence/focus/purity/grey scale with sets that have FS tubes, we’ve had a Sony set with convergence errors and an Hitachi set with convergence/purity/focus errors, but these have been the only two sets out of thousands. A check in the showrooms under the right conditions suggests that FS tubes are very good. Some of us, I suppose, are just unlucky.

Paul C. Rowe, Camborne, Cornwall.

LOW PRICES

I can only assume that whoever wrote your July leader is either a major shareholder in Amstrad or has never had to try to earn a living in the TV service industry. Manufacturers seem to have a kamikaze obsession with cutting each other’s throats, and expect the dealers and service engineers to join them.

In the coronation year, 1953, a 9in. monochrome set that received a single channel cost approximately £100. Today, in spite of years of inflation and technological advances that have added many features, a colour TV set which can receive at least four channels can cost as little as £140 - a little extra secures remote control, a larger screen size, teletext etc. Not content with this, the manufacturers now supply household goods, free licence stamps and five-year guarantees with their give-away sets. To be fair, they do pay the dealer the princely sum of £8 for a major repair under guarantee. These prices have created a “throw it away” age, and it’s little wonder that the service industry is suffering in the way it is.

As you say, Amstrad assemble some equipment in this country, from imported parts. I suggest that this is in effect dumping from the UK instead of the Far East. Alan Sugar has made for himself and his shareholders a great deal of money, but he’s not doing the TV trade or the service industry any good at all, and neither he nor your editorial can expect any applause from me.

R. A. Holmes, Enfield, Middlesex.

Editor’s note: The editor does not hold shares in Amstrad or any other consumer electronics company, and has never done so.

WYLEX MAINS PLUGS

I read Brian Renforth’s letter (June) on Wylex mains plugs with interest. These plugs and sockets, and variants, are still widely used in the Manchester area. In fact the Wylex company is only a few miles away from here, at Wythenshaw, South Manchester.

In addition to the normal 5A and 13A types there was a variation with offset live and neutral pins, also a 13A plug that allowed a 5A one to be plugged in piggy-back style. There must be thousands still in use, judging from the number of homes in which I’ve encountered them. Every so often a bag of plugs and adaptors appears for sale in the under £50 domestic sales adverts in the Manchester Evening News. I understand they are rapidly disposed of!

Roderick Ballarde, Timperley, Cheshire.

NOISY HITACHI VT63/64

Keith Pemberton (July) mentioned the use of Hita-sol grease to cure a noisy Hitachi VT64 VCR. A permanent cure for this problem is to fit the flywheel holder used in the earlier VT33. This has a nylon bearing that requires no lubrication. GEC also issued a technical bulletin for Model V4005H (March 1986) explaining in detail how to overcome this problem. The GEC part number for the flywheel holder is V7386832.

Dick McDonald, Bargoed, Mid-Glamorgan.

MISCELLANY

A couple of points relating to my article on the Decca 80/100 series chassis (June) should perhaps be clarified.
First the section on power supply faults rather suggests that R801, the 6.81 of the dropper, is on the power supply PCB. It isn’t, of course. Replace it for intermittent fuse blowing or bridge rectifier faults if all else fails. Secondly, in nine times out of ten you’ll find that the field output transistors in the 100 chassis are BD707s rather than BD278As. Common spares such as tuners, button units, volume controls, triplers, LOPTs and smoothing capacitors are available from Willow Vale, HRS etc.

In connection with my report on the Panasonic NV-G25B in the same issue (page 685), Panasonic do provide details on setting up the mechanics, including the mode switch, in a separate G Mechanism manual which we’d not received at the time of writing. The manual has some errors.
however, so my notes may still be helpful - but note that the pip is about 100° clockwise from the slots in the mode switch, not 180° as shown in Fig. 2.

I'd like to applaud Brian Tuckfield's concern (letters, same issue) and interest in the matter of the customer from Stevenage. If I was one of those "dealers" I would be thoroughly ashamed of myself. Here we are trying to uphold and improve the image of the trade and these dealers let us down badly. We are trying to root out the cowboys and the "couldn't care less" brigade and need all the help we can get. My WVE representative tells me that though non-technical he always reads Television to pick up any problems or grievances he may be able to sort out and put right. He's certainly helped us in the past. I hope the retail trade, particularly it seems in Stevenage, will take notice.

Also a quick note on Philip Blundell's reference in VCR Clinic to non-genuine belt kits for the Sharp VC6300. We've had identical troubles with the Hitachi VT5000 and Sony SL8000 series machines. The moral is - fit genuine belts!

Nick Beer, Bideford, N. Devon.

JAPANESE SYMBOLS PREFERRED

The Japanese practice of using the same symbols in layout diagrams as in circuit diagrams is to be commended. It's so easy to locate components - zigzag resistors, parallel-plate capacitors and spirals for coils. The UK system is much harder to follow, with all components shown as rectangular boxes. German diagrams are even worse, with thick straight lines for wound components. The weakness of Japanese service manuals is their lack of description of how circuits work.

Although conductance is rarely used, I think the mho was a far more practical unit. It was simplicity itself, which is surely what standards should be.

K. J. Treeby, St. Judes, Plymouth.

HELP WANTED

I've a Rigonda VL100M (one of the Russian 5in. TV sets) which I have been using for DX-TV reception - it has good sensitivity and rock-steady sync that seems to be able to cope with the dirtiest signals. Unfortunately the LOFT has developed shorted turns in the heater winding, rendering the set useless. The importers tell me the part is no longer available, and the only other source of supplies (Star Radio) I know of seems to have gone out of business. I would be grateful if anyone who has a transformer or knows of a source would get in touch.

J. C. Chandler, 1 Bramhall Moor Lane, Hazel Grove, Stockport, Cheshire SK7 4AJ. Telephone 061 428 0811 Ext. 297 day, 061 483 9659 evenings.

Editorial note: We receive other letters from time to time asking about spares for these sets. If there are any sources, we'd like to know too.

FOR DISPOSAL

I have for disposal a home-constructed, 405-line single-channel (London) TV receiver in a cabinet. It was working when put in the loft some years ago. Would anyone like it?

A. Newton, 9 Millais, Horsham, West Sussex RH13 6BS. Telephone 0403 66 018.
Satellite TV Filter Unit

In the April 1988 issue I described a very simple bandwidth limiting filter that can be used to reduce noise/sparklies with very weak/marginal signals. The filter is inserted in the 70MHz i.f. in/out loop that's present at the rear of many imported satellite TV receivers and is intended for descrambler use. Since then I've built a more versatile filter unit with three switched positions, see Fig. 1. This gives either straight through operation, amplification without bandwidth limiting, or bandwidth limiting with amplification. On its own the filter introduces a loss of 3dB which is more than compensated for by the amplifier.

The system is simple and requires little explanation. Fig. 2 shows the power supply which provides a regulated 12V output. In my case I also use it to power an outboard System I sound/vision modulator. This is a compact, steel-cased unit made by Technicolor for its now obsolete video format. It's currently available from Star Satellite Systems Ltd., 27 Galgate, Barnard Castle, Co. Durham (tel. 0833 38385) at £13 plus £1.50 post and packing. The output is variable over chs. 30-39.

The filter circuit itself is shown in Fig. 3, while Fig. 4 shows the amplifier circuit. The latter uses a low-cost BFX88 transistor and has minimal filtering. Gain is controlled by means of a BA479 pin diode (D1) which gives a variable attenuation of up to 28dB. The amplifier's gain is 12-15dB.

Construction is generally non-critical, though as with all v.h.f. circuitry a compact layout should be adopted. As shown in Fig. 1, the main connections use thin coaxial leads with the screens earthed: it's not necessary to use coaxial leads for the switch pin cross connections. The BA479 is available from Cirkit by mail order while the Toko moulded r.f. coils can be obtained from Maplin.

The two coils in the amplifier circuit provide a degree of selectivity - you'll find that they give a vague peak. The main selectivity is provided by the filter unit of course. This has five coils which are tuned to the spot frequencies listed in Table 1, giving a bandwidth of 16-18MHz. Having made

### Components list

**Filter unit:**

- L1: UF67X
- L2, 4, 5: UF69A
- L3: UF66W
- Maplin UF series

**Amplifier:**

- C1: 5-6pF silver mica
- C2, 3, 4, 7: 0-1pF 100V ceramic
- C5, 6: 1kF feedthrough
- L1, 2: UF69A
- L3: V.H.F. choke
- Tr1: BFX88
- D1: BA479

**Power supply:**

- BR1: 1A, 100V p.i.v. bridge
- T1: 9-0-9V sec., 200mA
- C1: 1,000pF, 63V
- C2, 3, 5: 1kF, 100V
- C4: 470µF, 40V
- R1: 1-5k, 0-5W
- RV1: 5k linear
- F1: 250mA
- LED, DPDT switch and 7812 regulator
Table 1: Alignment frequencies

<table>
<thead>
<tr>
<th></th>
<th>Adjust for maximum output</th>
<th>Adjust for minimum output</th>
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<tbody>
<tr>
<td>L1</td>
<td>76MHz</td>
<td>L3 85.5MHz</td>
</tr>
<tr>
<td>L2</td>
<td>70MHz</td>
<td>L5 54.5MHz</td>
</tr>
<tr>
<td>L4</td>
<td>64MHz</td>
<td></td>
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</tbody>
</table>

In the absence of upmarket test equipment alignment can be carried out in either of two ways. Use a signal generator to inject the appropriate frequencies, with a field strength meter to observe the output. Alternatively, use a signal generator and feed the unit’s output to a receiver such as an Eddystone 770R, a scanner, etc., preferably with the a.g.c. off. Use the S meter for peaking, reducing the sensitivity as levels rise.

The unit was built into a diecast box which, with adhesive feet, sits atop the satellite receiver. It’s a simple but very effective arrangement.

Practical Computer Programming

Mike Phelan

Part 6

Next on the list of topics comes the user interface. By this we simply mean the bits of the software the user actually sees, that is the screen displays and the printed material produced. Most of the inner workings of the software need not be known or understood by the person who enters data via the keyboard or interprets the output on the screen or on paper.

As most of us who design systems do it for our own use, you might think that the general rules would differ from those of commercial software. This is not really the case. Bad habits and sloppy design are as much an inconvenience when it’s your own fault that the program crashes or the screen display is hard to read! Then again, could you guarantee that no one else will ever use your system? You may pass it on to a colleague or, if it turns out to be very useful, place it in the public domain or even market it! So a code of practice of some sort is advisable. This should cover all aspects of the design, not only the user interface.

In previous articles we have considered the basic problems and suggested ways of deciding whether the use of a computer is an appropriate solution. We followed this by outlining a suitable data structure or dictionary, which lays down the data items we need to store, their types and sizes. The next stage is design of the screen displays or prints.

There are four basic types of display: (1) pure text, e.g. help screens, instructions, etc.; (2) menus to enable the user to select a choice from several options; (3) data entry screens; (4) reports. In this context a report means any output from the system, whether on the screen or a hard print-out. Types (3) and (4) can sometimes overlap: for example the data entry to a database system can allow the user to see previous inputs. We’ll deal with these types of display in turn.

User friendliness is a good thing to aim for, within reason — a system that explains every move on the screen, and asks for confirmation of every entry, is rather tiresome to use.

The next step is to make a list of the screens and print required and to draw them all on paper. Layout grids are available to make this job easier, but are not essential. At this point you will need to decide what menus, if any, you require, and whether any help screens should be included. The rest of the process consists of establishing the design rules. Some of the latter are the writer’s own personal preferences, but others are established practice.

We’ll split the guidelines into those for menus, data entry and report design, though some of the points to be made apply to all three. One common requirement is consistency. If for example you call something a “service docket number” in one place, don’t call it a “job number” somewhere else. Make a note of such conventions on paper. Indeed keep all the notes you make during the design, and convert your rough notes into more readable form as the design progresses. Otherwise if you need to extend or change the system in say twelve months’ time you will have forgotten most of how it was designed! In the design of a small to medium piece of software, as in my current role, I usually get through a few A4 ruled pads and a few dozen screen layout grids.

General Rules

I’m going to lay down some general rules, also some specific to our requirements. No excuses will be given for the fact that some of the guidelines may appear to be too exacting for “own use”; when we come to the design stage I shall be advocating simplicity. This may sound like a contradiction in terms, but the two principles can and do go together.

The first rather obvious point about screen displays is that they should be readable. As most microcomputers can have a colour monitor with a capability of sixteen colours or more there’s a great temptation to use them all. Don’t! A maximum of four colours should be sufficient for most purposes. If you must have frames round things on the screen, use the 8-bit frame characters (if your computer supports them). Alternatively, home computers without these characters in their sets usually allow some sort of line drawings in BASIC. Frames made from asterisks look amateurish, as do those made from the bar and minus sign characters. A wide frame can be made by changing colour and printing a series of spaces. A few examples are shown in Fig. 1. If frames are not needed or are impractical, horizontal lines can be drawn using the minus (———) or underline (______) characters.

Don’t clutter the screen with rubbish. Does the user...
really need to know that NURDLE.BAS is currently running, or that there is 17K of memory free? Do not display everything in upper case (capitals): this makes reading difficult, though you can use upper case for headings etc.

When using colour, choose ones that are easy on the eye. Personal taste probably plays a part here, but good combinations are white, cyan, light green or light blue with black, either colour being used for the foreground.

Printed Reports

The most important factor with printed reports is the layout. Don't have too much spacing between rows, and take care to justify numeric and character data correctly. This means lining up the right- or left-most digit. Generally, character fields should be left justified, numeric fields right justified. Underline the column headings to the width of the heading, not the data. The remarks about the use of lower case apply equally to printed reports. Here are some examples:

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Make</th>
<th>Labour</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloggs</td>
<td>12 High St</td>
<td>Toshiba</td>
<td>22:50</td>
<td>58:00</td>
</tr>
<tr>
<td>Smith</td>
<td>3 The Avenue</td>
<td>ITT</td>
<td>100:25</td>
<td>0:50</td>
</tr>
</tbody>
</table>

Here's how not to do it:

NAME ADDRESS MAKE LABOUR MATERIALS

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Make</th>
<th>Labour</th>
<th>Materials</th>
</tr>
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<tr>
<td>Smith</td>
<td>3 The Avenue</td>
<td>ITT</td>
<td>100:25</td>
<td>0:50</td>
</tr>
</tbody>
</table>

The second example is untidy and if there were more than a few lines it would be difficult to read.

Don't use fancy printer tricks, i.e. different fonts etc. These are more suited to desktop publishing than business reports.

Putting a date on the report is useful. And give it a title, especially if more than one type of print is used.

Always give the user an option to confirm that the printer is on and the paper lined up before printing. If printing the report changes any of the data or clears it out, allow for printing the report as many times as required before updating anything. This takes care of the paper running out or jamming in mid-print.

Menus

Menus allow the user to choose an option, which can be a further menu, but try to avoid too complicated a menu hierarchy. If the number of options is three or less a menu might not be necessary: a simple prompt with three possible replies would do just as well.

There are basically two types of menu, the lightbar type and the older format where the choices are displayed with a letter or number against each item. There is a always a quit or exit option to return to the previous menu or out of the program. It's best to use letters with the letter or number choice type of menu – this will give you 26 possibilities for a single key press. To trap invalid choices, make the program ignore them rather than bothering with an error message. The key used for exit should be consistent if there are several menus. In such cases it's a good idea to make the choice default to the exit character, say "X", so that it's only necessary to hit return to go to the previous menu, but for the first menu to default to a space so that a definite effort has to be made by the user to type in a letter. This avoids problems caused by typing ahead or holding the return key down.

It's a good idea for all the menus in a system to look alike, and for the name or title of the menu to appear at the top. The items should be centred and left justified, with the choice letter prominent. Here's an example:

SERVICE HISTORY SYSTEM MAIN MENU

(A) . . . Enter data from service docket
(B) . . . Clear completed jobs
(C) . . . Reports menu
(D) . . . Back-up data

Please enter choice from above or Q to quit.

A very readable screen with only the required information present.

The lightbar menu is a slightly different animal – the choices are selected by using the cursor keys to highlight choices with inverse video, then using the return key or space bar to confirm. Further enhancements are to print an on-screen explanation of each choice – known as expansion – and to allow selection by the initial letter of the choice. The latter assumes of course that the initials are unique. Unless the language you intend to use supports lightbar menus they take quite a lot of programming, though it can be fairly simply done with BASIC or C and dBase III plus has its own function to make them easy to produce. Enhancements can be added after the system has been tested and the bugs have been ironed out.

We cannot leave the subject of lightbar menus without mentioning pull-down menus, though these are really outside the scope of the article. A typical pull-down menu has an initial row of choices across the top of the screen. On selection by initial or cursor plus return a small lightbar menu appears giving further options from the initial choice. Moving right or left changes the pull-down menu to a different one relevant to the choice that appears below. All very sophisticated.

Data Entry Screens

With a screen-based system a data entry screen looks like a form to be filled in, rather then prompting for items one at a time. The ideal is also to have "full-screen editing", where the user can move around the screen using the cursor keys, possibly correcting previously entered items. dBase II etc. allows for this without need for any extra programming, but it can be done in other high-level languages.

Give the screen a name or title.

Prompt the user to fill in the items in a logical order, and always start at the top left corner. Proceed either by row or column.

Try to arrange the items so that they are left justified. The prompts should also be left justified. If the prompts are
of different length, so that a prompt is far from the item box, use a row of dots to connect them. As follows:

Name of customer ................ [ ]
Date ................................. [ ___/___/____ ]

There should be no need for more than three pairs of foreground/background colours, one for the normal text, one for the data windows and one for any error messages, in ascending order of visibility. Flashing error messages are acceptable. Where a limited number of choices is available, display them. For example:

Colour, mono or video? (C/M/V) [ ___ ]

Note that [ ___ ] means a data entry window in which a cursor will be visible.

Again, if there's more than one data entry screen, give each one a title. Don't get carried away with drawing boxes etc., and if you must do so make them consistent throughout the system. For example, a double line box for the title, single lines elsewhere, or simply a row of minus signs above and below the title.

Make the data entry screens of similar appearance to your menus, and preferably of the same colour.

The matter of validating inputs, i.e. checking for user errors, really comes in at the program design stage and will be left until then.

**Screen Reports**

Screen reports can be used as an alternative to printed reports, and are in some cases preferable. For example, suppose that you have a database of suppliers and part numbers by model. It would be a waste of time printing these every time you want to order a part! In other cases you might want the choice between screen or hard copy:

- This may take the form of first providing a screen report then asking the user if he wants a print. The two versions might appear like this:
  - Screen or print? (S/P) [ ___ ]
  - Print this screen? (Y/N) [ ___ ]
  - before printing, or

- after the screen display.

Don't lose sight of the fact that there are fundamental differences between screen reports and hard copy. You must bear this in mind when using the same chunk of program to perform both. Screen reports must stop when the screen is full, awaiting a key to be pressed (preferably any key), but printed ones must perform a form-feed or "page throw" after the appropriate number of lines have been printed. If the report is of any length page numbering (pagination) needs to be done, with the title and column headings repeated on each page.

Most screens are limited to 80 characters per line (CPL), as is A4 paper, but wider paper with 132 CPL is in common use - provided your printer can handle it. The normal size of print is ten characters per inch and six lines per inch. The latter very seldom needs to be changed, but printing a fairly wide report on A4 sometimes calls for condensed print, usually 17 CPI. With most matrix printers this can be selected by a switch, or the software can send a control code - normally ASCII 15 - to do the job.

**Design Progress**

If you are designing a system you should by now have a large collection of bits of paper, among them a rough draft of the system requirements, a data dictionary or structure, and the screen and print layouts. In the next instalment we should be able to sort them out in order to start on the program design and the choice of language to use.

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**Servicing Notes on the Luxor SX9 Chassis**

The Luxor SX9 chassis was introduced in late 1983 and is used in various models including the 5634, 5639, 6734, 6739 etc.

The most common problem is caused by the two copper heatsinks in the power supply. Unfortunately in early production sets they were used to bridge parts of the circuit. They quickly became dry-jointed, giving rise to a number of different symptoms - intermittent loss of picture, faint bars running across the screen, failure of the line driver (more on this below), failure of the line output transistor, and any fault that cannot easily be explained. They must be resoldered using a large iron, after which they normally give no further trouble.

The mains on/off switch can go short- or open-circuit; replacements are of a better quality. Tuning and memory faults are caused by the back-up battery going down and the earthing points inside the tuner. If the set changes channel on its own, or for that matter performs any other function on its own, the cause is likely to be air trapped in the touch membrane. This can be proved by wiping across it, when the fault will be temporarily cured. Replacements come with the plastic framing and have a green connecting strip.

As mentioned above the BD419 line driver transistor TH01 can fail, going short-circuit. This will in turn burn up RH03 (6-8Ω) and RN19 (10Ω). If these resistors, which are safety types, start to cook again the most likely cause is LH01 shorted: be warned - it may read o.k.!

Power supply faults are rare, but a strange fluttering noise followed by the set going into standby is caused by lack of heatsink compound on the TDA4600 chopper control chip IN01. The trip circuit puts the set in standby through TN02 removing the 12V supply.

Recently we've had several cases of line output transformer failure. If you find that the h.t. is only 30-40V, disconnect RH07. This should restore sound and full h.t. (121V or 142V depending on version). Failure of the line output transformer usually takes the line output transistor as well. Note that there are 90° and 110° versions of the chassis.

Whenever a set is serviced it's worth checking for dry-joints around the linearity coil, the line driver transformer, RH07 and the chopper transformer. Dry-joints are by far the most common problem with these sets, often causing the microcomputer control chip to lock up.

Poor operation of the remote control can be cured by washing the rubber pressure pad and handset board; they tend to become sticky due to a reaction between the pad and board. At the same time it's best to disconnect the store button on the handset by sticking tape under the pad: this saves a lot of service calls for sets tuned to the same channel.

---

**J.R. Trimmer**

TELEVISION AUGUST 1988
Although there are now many teletext-equipped TV receivers on the market, some being available at relatively low cost secondhand, a teletext adaptor is invaluable to the aurally handicapped who wish to record subtitled programmes. For some years Manor Supplies sold an adaptor which used the Tifax XM11 decoder module. As has been pointed out in previous letters and articles in Television, the XM11 was designed before the UK teletext specification had been finalised. For this reason it now gives trouble. I decided to have a go at removing the Tifax module from my Manor Supplies adaptor and fitting in its place a Mullard VM6101 decoder module. Previous articles (December 1986/January 1987 and September 1987) have described ways of using the VM6101 with an 8748 programmable microcomputer chip to provide keypad/decoder module interfacing.

My Manor Supplies adaptor was still in use despite the missed lines. It had developed a further fault: with multiple pages, such as page 502 C4, it would skip to a following page when the subpage changed. Rather than using the microcomputer chip solution to the problem of providing control signals for the VM6101 decoder module I decided to make a simple unit from TTL chips and some diodes. This has the advantage that the user can select what codes are chosen and what codes go to what key, enabling the Manor Supplies unit's key configuration to be retained. If the constructor already has some diodes and some of the chips, this will probably be the cheapest solution.

**Modifications to the VM6101 Module**

As noted in the previous articles, some minor modifications to the VM6101 unit have to be carried out (see Fig. 1). These consist of reversing the polarity of the 1µF video input coupling capacitor, adding a 4.7kΩ resistor to pull up the superimpose line to 5V, and adding a link between pins 4 and 5 of PL3. The VM6101 unit I obtained from Sendz Components had plugs with it and a small board with transistors was plugged into PL5. This small board was removed and jumpers were connected to bring out the RGB and blanking signals from spare pins on PL4. I found that the link on PL3, for the sync supply, was already in place.

**Modifications to the Manor Supplies Unit**

The wiring harness in the Manor Supplies unit was modified as follows: everything to plug A on the video/pulse board was disconnected, as were the RGB wires from plug B on this board to the encoder. The RGB wires were also removed at the encoder end.

An additional couple of transistors (see Fig.2) were added in order to make use of the sound mute on text feature. This arrangement sets the d.c. volume control connection to the TBA120SQ chip (pin 5) low when text is selected. One of these transistors was fitted to the VM6101 panel, using the panel's 5V supply, the other transistor being fitted on the receiver module's sound subpanel. The input to the first transistor was taken from pin 1 of PL1. Power for the VM6101 module and the interfacing circuit was taken from the regulators already present in the Manor Supplies unit – the 5V supply was taken from regulator no.
2. The VM6101's video input was taken from pin 7 of PLA on the video/pulse board. The RGB outputs from the VM6101 module were connected to the encoder's RGB inputs, the inverters previously required being left out of circuit. The blanking output from the VM6101 module goes to the video/pulse board, which also receives a sync input from pin 3 of PL3 on the VM6101 module – disconnect the end of R7 previously connected to R5 and connect it to the VM6101's sync output. This latter modification overcomes the annoying fault of teletext judder when a bright, nearly white picture is transmitted.

**Keypad and Interfacing Circuitry**

The interfacing arrangement I used (see Fig. 3) has the advantage that the circuit can be built in stages, each section being tested before proceeding. The start is the oscillator, which uses half a 7413. Its output is fed to a 7400 section being tested before proceeding. The start is the advantage that the circuit can be built in stages, each

**Table 1: Keypad connections**

<table>
<thead>
<tr>
<th>Key</th>
<th>Multiplexer bit connections:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>D</td>
</tr>
<tr>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>x</td>
</tr>
<tr>
<td>4</td>
<td>x</td>
</tr>
<tr>
<td>5</td>
<td>D</td>
</tr>
<tr>
<td>6</td>
<td>D</td>
</tr>
<tr>
<td>7</td>
<td>D</td>
</tr>
<tr>
<td>8</td>
<td>x</td>
</tr>
<tr>
<td>9</td>
<td>x</td>
</tr>
<tr>
<td>Reveal</td>
<td>D</td>
</tr>
<tr>
<td>Update</td>
<td>x</td>
</tr>
<tr>
<td>Mix (= set small)</td>
<td>D</td>
</tr>
<tr>
<td>Video on</td>
<td>D</td>
</tr>
<tr>
<td>Text on</td>
<td>x</td>
</tr>
<tr>
<td>P</td>
<td>Not used.</td>
</tr>
</tbody>
</table>

The mix key is used to set to small characters. This is done in case any glitches would make the large character set appear. Connect the video on key to bit 0 as well. Connect the text on key to pin 6 of the 7430 i.c. See Fig. 4.

Additional keys that could be used are:

- **Time on**
  - D = diode present, x = no connection, see Fig. 4. Press any key for the same effect as originally.

**Book Note**


The second edition of this book has been virtually rewritten, such is the rate of progress in the video field. It contains a great deal of information on almost everything that could be roughly classified as video, including television standards etc. The book does not seem to have a very clearly focused readership, dealing as it does with subjects as diverse as professional video equipment, community TV services and TV production techniques.
VCR Clinic

Sharp VC386
This is a nasty fault which we've had twice so far. It appears only when channel change is attempted, and then only intermittently, the symptom being no signals with the tuner's varicap control voltage awry. The cause is a dry-joint at socket TA on PWB (printed wiring board) T. This removes the pulses on the control-1 or control-2 line, whereupon IC1401 throws a wobbly.

Mitsubishi HS338
If the proffered cassette goes in at an angle and is then almost immediately ejected, the cause is probably that the cassette drive cog on the left-hand side of the front-load housing has jumped a tooth or two - check that the housing is parallel with the front of the machine in the ejected position. Like many such troubles this is probably brought about by the owner using excessive force.

Blaupunkt RTV321
There was weak sound on E-E and record. Replacing the i.f./tuner board brought the level back up, so attention was turned to the circuitry around IC751 (AN5215). Transformer T752 wouldn't peak up as C755 (39pF) was open-circuit. When T752 is off adjustment the voltage at pin 7 of IC751 changes from the 3.5V usually present.

Ferguson 3V57
The part of the display that shows fast forward, play etc. didn't work though the clock part did. IC301 (MN1250) drives the faulty part of the display. Its serial data lines (pins 14 and 17) had the same signals on them, which seemed odd until we found that they were shorted together by a solder bridge across pins 7 and 8 of CN304.

Grundig VS180
There appeared to be a tape path fault. The off-tape f.m. at the start of the rotation of the heads was very low, though the last half was o.k. The paint seals on the guides were unbroken, the tape tension was normal and a replacement tension arm had no effect. A new head drum was finally tried and this restored normal operation.

Samsung V1-621
"Whirring noise, horrid smell of burning and won't load the tape" was the way the customer put it. The noise was the loading motor running while the smell came from the plastic pulley on the motor shaft - it had almost slipped off the end and had become stuck against a plastic moulding. The pulley's centre hole was sealed with plastic which had melted. We had to order the pulley by description as Samsung have left out the part number list for the main mechanism exploded view.

Panasonic NV730
When the on/off button was pressed all this machine did was beep and light the on LED. The fluorescent display was out due to loss of the -45V supply and hence the -30V supply to the display. There was also no power-on signal at the main regulator chip IC5001. This was because the 45V supply was missing. Both these supplies are derived from a common winding on the mains transformer via a 4.7Ω safety resistor (R1002) which had gone open-circuit.

Panasonic NV-G7
This machine was dead apart from the clock display. The digital counter display appeared when the on/off button was pressed, but there was no channel number, no on LED display and no mechanical functions worked. A faulty STK5331 main regulator chip (IC1001) was responsible.

Amstrad VCR4700 and Hinari VX15
These VCRs have very similar cassette decks and seem to suffer from the same fault. When play or record is selected they may operate for about twenty seconds then shut down. In all cases to date the cause has been the take-up reel sensor. The clue to the fault is to select tape counter on the front panel then press play: the numbers displayed will be very erratic and irregular.

Ferguson 3V35,36/JVC HRD120,225
A number of these machines are coming in with loading belt faults, the complaint being intermittent failure to play or record. The belt is the same as the one in the 3V29/3V30 and is just as difficult to replace. The Ferguson part no. is OX1-040-006.

Akai VS4
The fault report on this machine was "rewinds then dead". On the bench we found that it was totally dead, with no functions whatsoever and no channel display number. Our first check was on the power supply. The 12V and 14V outputs from the STK5325 regulator IC1 were missing because the control line (pin 9) was at 4.5V instead of 0V. I've had this before when the cassette deck lamp has been open-circuit. A quick check confirmed that it was, but a replacement left things as before. We decided to short-circuit pin 9 of IC1, and when this was done we had 2V and 3V respectively on the 12V and 14V lines. As there didn't seem to be excessive current a new STK5325 was fitted. This produced the 12V and 14V supplies - but only with pin 9 held at 0V. Also the reel motor went into continuous rewind. With the short-circuit removed from pin 9 of IC1 the machine stayed dead.

There was no response when the function-on button was pressed, so a check around the key scanning chip IC3 seemed to be a logical course of action. A scope showed that there were no key scanning pulses on pins 12-15. Replacing the MB88401 microcomputer chip restored the scanning pulses, but I still had no 12V and 14V rails. Back to system control chip IC5, another MB88401, that provides the turn on control signal for the regulator. Scope and meter checks here were inconclusive, so the chip was replaced. When the function button was pressed the function LED and the channel display lit, but the reel...
motor still went into rewind for a few seconds after which the machine shut down again.

Time was wasted on a fruitless search through the motor and system control circuitry before we found that the cause of the final fault was a slipping loading belt. Somehow it managed to get the system control confused. Once it was replaced everything worked correctly. I assume that this was the original fault and that a second fault, the defective regulator, had killed the lamp and the two microcomputer chips. Just my luck!

D.D.

Philips VKR6800 Camcorder

This camcorder displayed and recorded only in blue. While the tuner - it seemed as if it might have had a fair knock of the final fault was a slipping loading belt. Somehow it was aligned the camera produced excellent results.

A.D.

Mitsubishi HS349

We've had two of these machines that were faulty from new. The first had an intercarrier buzz on all channels in the E-E mode, with the difference that the buzz was being recorded. Component checks in the sound i.f. circuit revealed that C307 was open-circuit. It's one of those capacitors that look like a resistor.

The fault with the second machine was no picture, only lines. When a test tape was tried it was obvious that the drum speed was wrong. We found that D4A4 in the drum servo circuit was broken, a new 1N4148 putting matters right.

A.D.

Sanyo VHR3300

This brand new machine would intermittently go into standby. You could tap the case anywhere and it would turn off, but the fault could be provoked more easily on the servo/syscon board. On removing the bottom cover the cause of the problem was obvious - the board had jumped out of its retaining clips during transit, and was shorting to chassis via the bottom case.

A.D.

Ferguson 3V29/JVC HR7200

The capstan motor wouldn't start: the VCR would load the tape, then after five seconds it would unload. We found that the "motor stop control" input from the mechacon board was high, as though the machine was in pause. Pin 22 of IC4 on the mechacon board should be at 0V during play and at 10V in pause. It was actually at 5-6V, which was high enough to change the state of the following gate. Replacing IC4 restored normal operation.

A.D.

Samsung V1-626

Rapid drifting off tune was traced to a number of dry-joints on the tuner - it seemed as if it might have had a fair knock from above. We've traced a number of faults in these machines to dry-joints.

N.B.

Panasonic NV-G25

Having cleaned the heads, a field engineer brought this one in for the following faults: the noise bars on cue and review were wider than normal (they are usually almost invisible); at 1/25th speed every other frame was obliterated by noise; odd frames were noisy with the 1/5th and 1/10th speeds; and the still frame was very poor. On examination we found that the heads were faulty. When I used the special Panasonic tool - wonderful machine - to replace the heads I noticed that all the relevant adjustments (tracking fix, head frequency response etc.) had been set at one end of their tracks. Presumably the original head had been a borderline one.

N.B.

Salora SV8500

This Mitsubishi clone would erase and play 'sound but wouldn't record any. The trouble was traced to Q302 and Q304 which were both leaky. It's a major job to dismantle this machine for service!

N.B.

Sony CCDV8AF

New heads had been fitted but within a week this camcorder was back because the zoom motor ran all the time, keeping the lens fully out. We found that there was a break in the print around the zoom motor circuitry.

N.B.

Ferguson 3V35/JVC HRD120

The customer's complaint was that the machine would occasionally stop as soon as play had started. After many hours of soak testing we found that the cause of the trouble was a lazy drum motor. With no drum rotation, the machine stopped.

N.B.

Panasonic NV333

Until recently the cause of the tape riding up and spooling into the machine in the review mode has always been a worn upper drum. Recently however we've had some machines where the same end result has been caused by the lower drum becoming too smooth. Sometimes a good rub with Brasso will provide a temporary cure, staving off replacement for a while. This is worthwhile as the cost of a new direct drive unit is considerable.

N.B.

Sony CCDV100E

Field buzz on sound when recordings are made with the built-in microphone is usually caused by the microphone harness being too close to the deflection yoke leads.

N.B.

Sharp VC8300

No display was fairly quickly traced to an open-circuit digitron heater. A simple fault, but one that in practice is not as common as you might expect.

N.B.

Panasonic NV-G12

Tuning problems due to IC7551, D7555 and Q7551/2 going short-circuit have been a problem with these machines. Some guidance has now come from Panasonic. It seems that all machines with the serial number prefix E7 can be affected. Resistor legs around the i.c. were bent over during assembly, before soldering, and they can intermittently touch lands on the PCB. The cure is to straighten suspect legs. Some machines have already been done by Panasonic themselves.

N.B.

Sony CCDV8AF, EVA300 etc

If replacement of the tension regulator arm is required because the shaft slips out of place be sure you fit the modified type, part No. X-368-652-84.

N.B.
Storing TV Pictures in Chips

Part 3: Picture-in-picture displays

Eugene Trundle

The systems described in Parts 1 and 2 of this series present the picture stored in memory as a full-screen display. This enables the video signal to be stored in composite form. To inlay a small picture in the main picture display calls for more complex digital and analogue circuitry. The inlay picture (PIP) is not presented in real time – its width is a fraction of the 52μsec active line period while its height is a fraction of the 18-4μsec active field period. To achieve a PIP display a “time warp” in the readout from the memory is required. It’s done by using different writing and reading rates. In addition the composite video signal for the PIP display must be decoded to YUV form (separate luminance plus U and V chrominance signals) before storage in digital form in the memory, then recoded to PAL (or whatever system is in use) form after readout from the memory and DA conversion. One advantage however is that the memory capacity required is not so great as with a full-screen display, since the information processed and stored occupies only a small area of the screen, typically one ninth.

The need for colour decoding/encoding becomes obvious when it’s appreciated that for correct colour the processed PIP signal must be governed by the same subcarrier as that used for the main picture on the screen. The U and V components of the reconstituted PIP signal are PAL encoded, then added to the PIP luminance signal and finally the composite PIP signal is switched into the main-screen video signal in synchronism with the latter’s line and field scanning. The timing of the PIP readout, in relation to the main-screen scanning, determines the position of the inserted PIP – it’s usually placed in one of the four corners of the screen.

The Hitachi VT250

The description which follows is based on the PIP processing section of the Hitachi VT250 VCR. That used in the Sanyo Model CBP2146 colour TV receiver (see the photograph on the cover of the July 1987 issue) is similar in many respects.

Video Sampling

The first step in producing a PIP display is to sample the video waveform of the picture to be used for the purpose. Fig. 17 shows this process. The outer rectangle is 20μsec high and 64μsec wide, embracing the entire field period. The longer dashed line shows the active (display) picture area, consisting of 288 lines each containing 52μsec of video information. The shorter dashed rectangle shows the part that’s sampled for PIP use. It consists of 264 lines each of which contains part of the line blanking period (for clamping purposes) and all the picture information. Sampling is done at a frequency of about 10-74MHz (intervals of 93-122nsecs). Thus each line is divided into 687 samples. The first 32 samples of each line are discarded, leaving 655 samples. Two out of every three of these are discarded, the remaining 218 evenly-spaced samples being retained. Similarly, two out of every three scanning lines are discarded, leaving 88 lines.

We now have a rather coarse picture consisting of 88 lines each with 218 samples. This is what’s committed to memory. When it’s reproduced, the lack of detail (with a test card, the lack of some of the horizontal and vertical features!) will be consistent with its size in relation to the main picture. We can’t anyway reproduce detail that’s smaller than one standard scanning line. The original picture to be used as the PIP display has thus been compressed to about one ninth (one third by one third) of its original area.

Memory Capacity

After sampling, quantisation to give 64 possible levels of signal amplitude takes place, the result being an AD converted signal consisting of six-bit words. We can therefore calculate the memory capacity required for the PIP display. One field of 88 lines with 218 six-bit samples gives us a total of 115,104 bits. For reasons that will become clear shortly, it’s necessary to store two such fields, so the memory must be able to store 230,208 bits. Two memory chips are used, each arranged in 64K × 4-bit form: this total of 512K is very sparingly used, in order to simplify the addressing and memory management. Writing into the memory takes place in real time, whereas the readout is three times faster in order to print the PIP in a small area of the screen.

Signal Processing

The PIP signal processing carried out in the Hitachi VT250 VCR is outlined in Fig. 18. The incoming signal is first fed to a PAL decoder which splits the composite signal into baseband Y, U and V outputs. It also produces an alternating V subcarrier for ident purposes. The YUV outputs are then bandwidth limited by filters, the Y signal to 1.3MHz and the U and V signals to 200kHz each. The alternating V characteristic (the PAL R – Y signal switching) is removed by a switched inverter that works at 7-8kHz. The three separate video signals are next applied to the “contacts” of an electronic multiplexing “rotary switch” that revolves at 3-58MHz (fs), which is one third of the effective sampling frequency of 10-74MHz. Thus this is the point at which two in three of the signal samples are discarded.

![Fig. 17: PIP sampling area of the incoming picture. The area within the broken lines is processed in digital form. Sampling takes place during lines 22 to 285 inclusive, embracing vertical columns 32 to 687.](image-url)
The output from the “wiper” of the rotary switch consists of a time-division multiplexed sequence as follows: U, Y, Y, V, Y, Y. So the Y signal is sampled four times for each sample of U and V, giving a sampling frequency for the Y signal of about 2.4MHz and a sampling frequency for each of the U and V colour-difference signals of about 600kHz. Hence the need for the low-pass signal filtering: the sampling rate in AD conversion must be at least twice the highest likely frequency of the signal being sampled. Next comes a 6-bit AD converter, which again operates under the control of the 3.58MHz clock signal. Its output is the highest likely frequency of the signal being sampled. The output from the “wiper” of the rotary switch consists of a multiplexed sequence: U, Y, Y, V, Y, Y. So the Y signal is sampled four times for each of the U and V colour-difference signals of about 2.4MHz and a sampling frequency for each of the U and V colour-difference signals of about 600kHz. Hence the need for the low-pass signal filtering: the sampling rate in AD conversion must be at least twice the highest likely frequency of the signal being sampled. The next comes a 6-bit AD converter, which again operates under the control of the 3.58MHz clock signal. Its output is passed into the memory.

**PIP Readout**

The sequential YUV digital data read from the memory passes to a demultiplexing rotary switch which this switch operates in synchronism with the memory readout, the YUV data is separated on a strobe basis. It’s then passed to separate DA converters, which are controlled by the same 3fs clock signal. After passing through individual low-pass filters/integrators the analogue Y, U and V signals are ready for recoding into composite PAL form. Two subcarrier feeds from the main-screen video signal are used to govern this process, so that the colour of the PIP display is correct—the main-screen swinging burst signal acts as the reference for both.

Finally a white box (PIP outline) is generated, to emphasise the border between the inlay picture and the main picture, and added to the composite PIP signal. Gating then inserts the PIP signal into the video output while the main-screen display is blanked for the duration of the PIP.

**The PIP Memory**

Fig. 19 shows the way in which the storage DRAMs are arranged. We have to store six bits at a time, for which all four pages of DRAM one plus two pages of DRAM two are used. Each page consists of 256 x 256 cells, and is divided into two halves. The upper halves form one field store, the lower halves forming the second—from as previously mentioned, two fields are stored. This need to store two fields arises from the fact that we must be able to write and read data simultaneously. As the upper store is being written into, the lower store is being read and vice versa.

Consider a field of incoming video being written into the upper half of the memory. It comes in on a unidirectional bus, with the first bits being stored on the top left-hand corner of each of the six pages in use. The first TV line to be stored is no. 22 (see Fig. 17). It starts at memory cell 0, with a V (R – Y) sample—a memory map is shown in Fig. 20. Next come two Y samples, then one of U (B – Y), two of Y and so on until the end of the PIP TV line is reached at memory column 218. The second PIP TV line (“real” line 25) is next stored in row two of the memory and so on until all 88 lines of the PIP field have been written in. We have now reached column 218 in row 87 of the memory page.

Memory rows 88-127 are not used. PIP field two is stored in the lower half of the memory page, on rows 128-215 inclusive. As PIP field two is being written in—synchronism with its own line and field sync pulses—PIP field one is being read out of the memory. Each row of 218 bits passes into a 256-bit buffer memory within the storage chip. At the beginning of each main-screen line scan, one line (218 bits x 6) of PIP data is transferred from the main memory to the line buffers. It’s then read out at 3fs to shorten the time-axis to one third. This ability to write and read at different rates is the key to TV standards conversion as well as PIP effects.

The memory system does not require a refresh operation since there’s no PIP freeze frame facility with this design.

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**Fig. 18: Simplified block diagram of the PIP processing system in the Hitachi VT250 VCR.**

**Fig. 19: Way in which the memory is arranged and used.**

**Fig. 20: Memory map for the storage DRAMs. All six memory pages (arrays) are laid out similarly.**
Thus the write/read cycle is continuous in 20msec periods, during which the data can be sustained in the DRAM cells.

**PIP Control Chip**

As with the previous systems we’ve looked at, the memory control chip is a complex gate array. It governs the write/read operation and provides clock pulses for the AD and DA converters, the multiplexer, the internal demultiplexer and the PIP-insert switching. A block diagram showing its main functions is provided in Fig. 21. The stack at its input data port is required because reading from memory is given priority over writing into memory. This calls for a temporary “queueing area” for the data to be written in. It takes the form of six pairs of memory cell arrays, in which the data to be written into the memory is held for a 1/fs period then released in the following cycle. The stack process is triggered by the main-screen display line sync pulses. Further functions carried out by the memory control chip are mode control, the provision of blanking and clamping pulses for the PIP analogue processes, generation of the pulses that provide the edge (white border) and PIP position control.

**Next Month**

In the concluding instalment next month we’ll look at the multi-function memory that provides a comprehensive range of digital functions in the Sanyo VHRD500/700 series of VCRs.

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**The Ferguson TX99 Chassis**

The TX99 is the latest development from Ferguson in the evolution of its TV chassis designs. It’s partly a replacement for the popular TX90 chassis, which was originally introduced for small-screen colour portables and went on to drive tube sizes up to 20in. The TX85 (see *Television*, October 1987) has already been introduced to cater for small-screen colour portable use. The new TX99, which is very much updated in comparison with the TX90, is to be used as a basic 90° chassis capable of driving a wide variety of tubes, though most models will probably be fitted with 15, 17, 19 and 21in. FS tubes.

Major improvements on the TX90 chassis are automatic grey-scale correction, non-interlaced teletext and improved line sync – there’s a dual-loop oscillator in the TDA4505 chip. The customer controls are no longer fixed to the main PCB, giving greater freedom over cabinet presentation. The new chassis is SECAM/NTSC adaptable and has automatic 50/60Hz field rate switching. A free-running switch-mode power supply provides mains isolation and operation over a mains input voltage range of 175-265V a.c. r.m.s.

The c.r.t. base panel varies to suit the tube type. The following circuit description covers the basic PC1210 PCB. A block diagram of the receiver is shown in Fig. 1.

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**The Power Supply**

The switch-mode power supply (see Fig. 2) is based on the well-known Siemens TDA4600 control chip, the circuit being very similar to that used in the TX100 chassis. A bridge rectifier produces a rough d.c. supply of around...
350V from the mains input. The degaussing and mains filtering is conventional, the degaussing coils being double-insulated.

The chopper transistor TR3 is driven from pins 7 and 8 of the control chip. Forward drive to turn TR3 on is from pin 8 via R88 which is used to adjust the level of drive. The pull-down pin 7 ensures that TR3 turns off rapidly, preventing unwanted power dissipation.

A start-up voltage for the power supply is provided by thyristor SCR1. A.C. from one side of the bridge is fed to the anode of this device, whose gate is connected to the same source via R84/5. At switch on C87 will be discharged and the cathode of SCR1 will be at 0V. SCR1 charges C87, and when the voltage at its cathode is approximately 6.5V R84/5 can no longer turn the thyristor on because the voltage at its cathode exceeds the peak voltage at its gate. The voltage thus developed across C87 is applied to pin 9 of IC6 to drive the chip. It's sufficient to bring IC6 to life, delivering short

input via

the chip. The effect of this is to offset the 4V reference voltage by about 1.5V so that the voltage at pin 3 is about 2.5V. It can also be varied by RV6, which sets the output voltages from the power supply - the on/off times of TR3 determine the

output voltages.

A 4V reference supply produced within the i.c. is available at pin 1. This reference voltage is coupled to pin 3 via R93. The output of a small winding on the transformer is rectified by D15 to produce a negative voltage which is also coupled to pin 3, via the set-h.t. control RV6 and R92. The effect of this is to offset the 4V reference voltage by about 1.5V so that the voltage at pin 3 is about 2.5V. It can be varied by RV6, which sets the outputs obtained from the power supply - the on/off times of TR3 determine the output voltages.

Pin 2 of IC6 is the input to a zero-crossing detector which senses, during TR3's off period, the point at which the voltages across the transformer's secondary windings fall to zero. When the a.c. at pin 14 of the transformer crosses zero and attempts to reverse, IC6 switches TR3 on to produce the next cycle of operation.

Three rails are derived from the chopper transformer, 115V for the line output stage, 50V for the field output stage and 18V for the audio circuit. This last rail also feeds a 7812 12V regulator which supplies the small-signal sections of the receiver.

Standby operation is obtained by turning TR4 off from the remote control unit. When its base goes high TR4 switches off, disabling the audio circuit, all the signal circuit and the line and field oscillators. The switch-mode power supply keeps working in the standby mode, maintaining the supplies to the field and line output stages. Although there is a slight temperature rise within TR3 due to the high operating frequency in the standby mode, this is of no consequence.

**Tuner and Signals Processor**

The UK version of the TX99 comes equipped with a Ferguson SC4 tuner, the export versions having a combined v.h.f./u.h.f. tuner. The tuner's output is amplified by approximately 26dB in a single transistor (BF959) i.f. preamplifier stage which drives the i.f. bandpass shaping SAW filter. This is followed by a TDA4505-N4Y chip which contains most of the signal circuitry, apart from the colour decoder, and also the sync and timebase generator circuits. A pnp transistor (TR1) in the a.f.c. circuit clamps the a.f.c. line at 6V during setting up and channel changing.

A block diagram of the TDA4505-N4Y chip (IC2) is shown in Fig. 3. It contains the vision and sound i.f. amplifiers and detectors, the a.f.c. and a.g.c. systems, the sync circuitry and the line and field generators. The field output stage is driven directly from pin 3 but the line drive output at pin 26 goes to a conventional transformer-coupled driver stage.

The i.f. input is at pins 8 and 9. Synchronous detection is employed for low harmonic distortion and there's no a.f.c. detection coil, the 90° phase shift required by the a.f.c. detector being achieved within the chip. The detector tank coil L6 is set for a 6V a.f.c. output with a 39-5MHz carrier input; the sound detector coil L9 should be adjusted for best sound reception of an off-air transmission. A d.c. volume control sets the voltage at pin 11 of the chip and the audio output appears at pin 12 for feeding to a separate TDA2611A.
power amplifier (IC4). A.G.C. for the tuner appears at pin 5, an inverting stage (TR10, BC307B) being required with the SC4 tuner (but not with the UV411 v.h.f./u.h.f. tuner). The video output at pin 17 is fed to the colour decoder chip via an emitter-follower transistor (TR11, BC237B) and returns to the intercarrier sound section of the chip via a 6MHz ceramic resonator. A bridged-T filter in TR11's emitter circuit removes the 6MHz sound from the feed to the colour decoder chip and the return feed to the sync separator in IC2. TR11 is included to provide a low-impedance video source: this results in greater tolerance to stray capacitance effects, which can seriously degrade picture definition, in the PCB layout.

A flywheel sync circuit with two control loops maintains the line drive output at pin 26 in phase and frequency lock with the incoming line sync pulses. To set the line oscillator's free running frequency, the chip's sync input pin 25 should be linked to the 12V rail. The first control loop's error voltage appears at pin 24, where R23, C25 and C26 form a time-constant network. R22 couples this point to the line hold control network R21/RV2/C24 which sets the free-running frequency. The second control loop's error voltage output appears at pin 28 where the time-constant is set by C29 and R25. The earthy end of R25 is connected to the slider of RV3, which provides a means of varying the line phase for horizontal shift purposes.

The field oscillator makes use of a conventional RC network which is connected to pin 2 – C31 and R27 set the free-running field frequency, no field hold control being required. Field sync is achieved internally. A divide-by-312 circuit determines the window for the field sync pulse. Direct sync is used, the divider controlling the period during which the oscillator can be reset by a sync pulse.

A signal derived from the field divider is used to generate the appropriate amount of field blanking for the standard in use, 50 or 60Hz. The amplitude and duration of the field blanking signal are determined by the vertical blanking generator, whose output is mixed with the line blanking and burst gate pulses in the sandcastle pulse generator circuit.

Line blanking is most easily derived from the line flyback pulses, which are clipped and mixed in at pin 27. Correctly timed burst gate pulses are obtained from the rising edge of the line sync pulses, their duration being determined by accurate timing circuits within the chip.

**Colour Decoder Chip**

The TDA3301 is a newcomer to the range of colour decoder chips available. A block diagram is shown in Fig. 4. It incorporates automatic grey-scale correction which is now a standard feature, easing colour balance adjustment during manufacture and providing compensation as the tube ages. Three coils and one potentiometer comprise the only variable components for setting up. L13 forms part of a high-pass filter at the chroma input while L11, L12 and RV4 are associated with the chroma delay line. L11 is tuned to 4-43MHz. L12 and RV4 are adjusted for minimum Hanover bars. There's no subcarrier rejector adjustment: this is now incorporated in the luminance delay line.

Composite video is fed in at pin 37 while filtered chroma is fed in at pin 1. The luminance signal is first amplified by 10dB within the i.c., emerging at pin 35 to pass through the
Fig. 4: Simplified block diagram of the TDA3301 colour decoder chip.

The chroma circuitry follows conventional practice. The reference oscillator operates at 4-43MHz, and the 90° phase shift required for U demodulation is achieved within the i.c. After filtering, the demodulated colour-difference signals are matrixed with the luminance signal and blanking signals are inserted. Blanking, burst gating and clamping are carried out by pulses produced by timing logic counters A and B.

Changeover to RGB teletext inputs (or from a peritel socket if fitted) is controlled by the "fast blanking" pin 23 which requires a steady d.c. input in excess of 700mV.

Automatic grey-scale correction is carried out by three clamps, one each for R, G and B. These are gated on to coincide with test signals which are added to the RGB outputs during the line blanking periods - this is done within IC3. Feedback is from resistors in the collector circuits of the emitter-followers TR22/24/26 incorporated between the RGB output transistors TR21/23/25 and the c.r.t.'s cathodes. The dark level beam current is set at 16µA by resistors R65/6/7. There is also dynamic beam limiting which is set by R57 and limits the peak current of any one gun to 3mA.

RGB Output Stages

Fig. 6 shows one of the RGB output circuits (green). TR23 is a class A amplifier whose output is buffered by the emitter-follower TR24. The resultant low-impedance c.r.t. drive allows fast charge and discharge of the c.r.t.'s cathode input capacitance, giving good bandwidth. The output circuits follow convention in being mounted on the c.r.t. base panel, removing the bandwidth limitations associated with long leads. The video gain is set by RV22 which allows peak-white colour adjustment during grey-scale alignment.
Drive from TDA3301 pin 17 to TDA3301 pin 19.

Fig. 6: The green output stage and the circuit for overriding the auto-grey-scale system at switch on.

Flyback pulse output.

R4050 line output transistor. This is a Texas Instruments device with a quoted maximum operating collector voltage rating of 1,300V. The peak flyback voltage measured at the collector was 900V, so there appears to be a good safety margin.

Because of the intention to use various different types of c.r.t. with the chassis, Ferguson has included what it refers to as a “c.r.t. personality” panel (PC1690). This carries the scan-correction capacitor and allows for different connections to the width control.

Field Output Stage

Fig. 8 shows the discrete component field output stage. The lower transistor of the output pair, TR6, is a Darlington device. This reduces the drive current requirement, enabling the output stage to be driven by the TDA4505 chip directly. A feature of the circuit is the four 11Ω resistors in the feed to TR5’s collector. These reduce the collector voltage and the dissipation in the transistors during the first half of the scan, restoring the voltage to 50V during the second half of the scan in preparation for the flyback, giving a short flyback time. A.C. feedback from RV8 via C107 controls the height while RV7/R112/C106 provide linearity correction. D.C. feedback from the junction of R111/R114 stabilises the operating conditions in the output stage.

In Conclusion

The chassis does not incorporate stereo sound capability, either base band or off-air, presumably because it’s not intended for use in up-market receivers. Teletext capability is built in however, reflecting the rising popularity of the broadcast text services. A plug on the chassis appears to cater for low-voltage operation via a d.c.-to-d.c. converter, a feature that will be welcome in many applications.
THE HEAD DRUM RUNS FAST UNTIL THE MACHINE HAS BEEN IN OPERATION FOR ABOUT HALF AN HOUR, AFTER WHICH THE DRUM SLOWS AND THE SERVO LOCKS. WHEN THE DRUM RUNS FAST THE VOLTAGE AT PIN 13 OF IC404 IS EXCESSIVE. THE SUPPLIES TO THE I.C.S ARE NORMAL.

FIRST CONFIRM THAT THE DRUM FG SIGNAL IS PRESENT DURING THE FAULT – CHECK AT TP421. IF NOT, CHECK THE FG WINDING ON THE MOTOR, IC404 ETC. IF THE FG SIGNAL IS PRESENT CHECK THE CONDITION AND SETTING OF R463 BEFORE SUSPECTING IC404 AND IC403 IN THAT ORDER. USE OF FREEZER AND GENTLE HEAT FROM A HAIRDRIER MAY HELP IN TRACING THE SOURCE OF THIS FAULT.

A TELETEXT FAULT HAS RECENTLY DEVELOPED: OCCASIONALLY SINGLE CHARACTERS ARE MISSING FROM THE TEXT AND ON OTHER OCCASIONS HORIZONTAL BANDS OF SEVERAL LINES ARE MISSING – VERY OFTEN THESE ARE PART OF THE PAGE HEADER. THE PROBLEM STARTED WITH BBC-2 AND HAS NOW SPREAD TO BBC-1. ITV IS ALL RIGHT.

WHILE IT'S POSSIBLE THAT THE FAULT COULD BE IN THE RECEIVER CIRCUITRY, IN WHICH CASE VERY SLIGHT ADJUSTMENT OF THE VISION DETECTOR TANK COIL AND/OR THE A.F.C. COIL WILL PROBABLY CLEAR IT, MUCH MORE LIKELY IS DEGRADATION OF THE AERIAL SYSTEM. CHECK THE AERIAL, ITS DOWNLEAD AND THE ASSOCIATED CONNECTIONS. A DECODER FAULT IS MOST UNLIKELY.

THE PROBLEM IS SLIGHT PULLING ON VERTICAL BARS. IT'S NOT AFFECTED BY ANY OF THE CONTROLS.


THE PICTURE IS GOOD BUT THERE'S A LOW-INTENSITY BACKGROUND WARBLE ON THE SOUND. IT APPEARS TO ALTER SLIGHTLY IN FREQUENCY AND LEVEL DEPENDING ON THE PICTURE CONTENT. THE PROGRAMME SOUND VERY OFTEN MASKS THE WARBLE, BUT IT'S/plainly audible on quiet passages.

THIS MAY BE DIFFICULT TO TRACK DOWN. THE MOST LIKELY CAUSE OF THE BUZZING IS RADIATION FROM THE C.R.T. GETTING BACK TO AN UNSCREENED AUDIO LEAD. YOU WILL HAVE TO TRACE THROUGH THE CIRCUIT AND ELIMINATE STAGES PROGRESSIVELY.

THE LED INDICATORS ON THE FRONT PANEL OF THIS PORTABLE UNIT FLASH FROM LEFT TO RIGHT AND THE MACHINE WILL NOT OPERATE. THIS IS THE ALARM MODE OF COURSE AND I'VE BEEN TOLD THAT A FAULTY CASSETTE LAMP IS OFTEN THE CAUSE, BUT A CHECK HAS SHOWN THAT THE LAMP IS WORKING.


ITV, BBC-1 AND BBC-2 ARE ALL RIGHT BUT ON CHANNEL 4 THERE'S SOMETIMES FIELD ROLLING THAT CANNOT BE STOPPED BY FIELD HOLD CONTROL ADJUSTMENT. THE FAULT IS RANDOM: SOMETIMES THE PICTURE IS ROCK STEADY, SOMETIMES THE PICTURE WILL Flick THEN ROLL FOR A FEW MINUTES BEFORE SETTLING DOWN AND AT OTHER TIMES IT JUST KEEPS ROLLING.


IF NECESSARY TRY THE EFFECT OF ADDING AN ATTENUATOR (SAY 6 OR 10dB) AT THE AERIAL INPUT.

THE PRIMARY SOURCE OF THE 10V SUPPLY YOU MENTION IS Q1795, WHICH COULD WELL HAVE FAILED WITH INTERNAL LEAKAGE.

THIS WOULD ACCOUNT FOR THE FUSE BLOWING. USE A BC171B IF THIS TRANSISTOR HAS TO BE REPLACED. IF, DUE TO TOLERANCES IN THE MANS TRANSFORMER, THE VOLTAGE AT TP1792 EXCEEDS 21V, INCREASE R1768 TO 150Î. CHECK ALSO DIODE D1769 (V06C) AND ZENER DIODE ZD1769 (HZ-11C). NOTE THAT THERE'S AN ERROR IN THE BACK-UP CIRCUIT IN THE MANUAL – Q1795'S EMITTER VOLTAGE SHOULD BE SHOWN AS 10V.

THERE'S AN INTERRMITENT WHISTLE, BUT ONLY WITH A PICTURE PRESENT. WITH NO SIGNAL INPUT THERE'S NO WHISTLE. WHEN IT'S PRESENT THE WHISTLE IS ACCOMPANIED BY HANOVER BARS. I'VE TRIED DISTURBANCE CHECKS ON ALL THE CHOKE'S AND THE TRANSFORMERS BUT HAVE BEEN UNABLE TO PINPOINT THE SOURCE OF THE WHISTLE.

THIS EFFECT GENERALLY STEM FROM INSTABILITY IN THE POWER SUPPLY CIRCUIT, THE CAUSE BEING DRIED UP ELECTROLYTIC CAPACITORS. WE SUGGEST YOU CHECK C612 (3-3μF-4-7μF will do) AND C622 (33μF).

One coupon, plus a £1.50 (inc. VAT) cheque or postal order, must accompany EACH PROBLEM sent in accordance with the notice printed above.

TELEVISION AUGUST 1988
ITT CVC1215 CHASSIS

The EW modulator driver transistor T563 and a couple of components (C511 and R503) in the line scan circuit had to be replaced, but now the set powers up at a reduced rate, all outputs from the line output stage being down to 25V. With the power supply isolated and a dummy load connected the maximum output that can be obtained is 125V instead of the correct 145V. The line output stage does not seem to be loading the power supply and the set doesn't show any signs of stress.

The 145V supply reservoir capacitor C733 (10µF) could be low in value and should be replaced. Also try C728 (22µF) which provides the 13V supply in the chopper circuit. We've known C614 (100µF) which decouples the supply to the TDA1940F sync/line oscillator chip cause problems of this sort.

The set was then left to run while waiting collection. Within a few minutes the colours were once again wrong, and a squirt of freezer on the new MC1327 chip brought them back to normal. It seemed unlikely that the original and a squirt of freezer on the new MC1327 chip brought the supply to the TDA1940F sync/line oscillator chip. We've known C614 (100µF) which decouples the supply to the TDA1940F sync/line oscillator chip cause problems of this sort.

Study of the circuit diagram (see Fig. 1) suggested a very obvious cause for all this. The chip receives it's 25V supply at pin 14, the supply being stabilised by zener diode D202 which is fed from the 37V rail via R246. It seemed likely that D202 had gone open-circuit and that the chip's supply to the TDA1940F sync/line oscillator chip. We've known C614 (100µF) which decouples the supply to the TDA1940F sync/line oscillator chip cause problems of this sort.

A quick way of proving the point would have been to short out the sampling resistor, which is connected in series with the chopper transistor. If there had been a real overload fault present however this would have invited disaster! Better to connect the scope across C513 (4.7nF), which decouples the TDA2640 chip's current sampling input pin, to see whether the excess-current pulses are well shaped. The technician dealing with it was also rather languid if his random, shot-in-the-dark approach to diagnosis was anything to go by – maybe it had something to do with the ventilation system, or lack of one, in the workshop. His more alert colleague soon got to the bottom of the trouble.

Their first joint action, removal of the line shift choke, could well have cured the fault. Chokes of this type often develop short-circuit turns in sets of this vintage, triggering the excess-current trip. In fact the excess-current trip in the set was operating, though not because of excessive current. What had happened was that the current sampling resistor R530 (1Ω) had gone high in value. The reading obtained on the ohmmeter varied around the 3Ω mark. The equivalent resistor in the ITT CVC20 chassis is R89; in the CVC30/32 it's R86.

A hot and sultry workshop was the setting for last month's puzzle, in which a GEC Model C2026 (PIL tube chassis) would pump half a dozen times at switch on then lapse into rest. The technician dealing with it was also rather languid if his random, shot-in-the-dark approach to diagnosis was anything to go by – maybe it had something to do with the ventilation system, or lack of one, in the workshop. His more alert colleague soon got to the bottom of the trouble.

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A quick way of proving the point would have been to short out the sampling resistor, which is connected in series with the chopper transistor. If there had been a real overload fault present however this would have invited disaster! Better to connect the scope across C513 (4.7nF), which decouples the TDA2640 chip's current sampling input pin, to see whether the excess-current pulses are well in excess of the normal 50mV level.

ANSWER TO TEST CASE 307 — page 686 last month —

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<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>3H3SV - JVC</td>
<td>Ferguson most models</td>
<td>£18.00</td>
<td></td>
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<tr>
<td>3H3SV - JVC</td>
<td>Ferguson Most models</td>
<td>£18.00</td>
<td></td>
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<tr>
<td>3H3AV - Ferguson</td>
<td>3V32, JVC</td>
<td>£18.00</td>
<td></td>
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<tr>
<td>3H3AV - Ferguson</td>
<td>3V32, JVC</td>
<td>£18.00</td>
<td></td>
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<tr>
<td>3H3SN - Panasonic most models</td>
<td>£18.00</td>
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<tr>
<td>3H3SN - Panasonic NC37/38/100 Phillips</td>
<td>£18.00</td>
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**REMOTE CONTROLS**

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<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>3H3AV - Ferguson, Grundig, TTT, Phillips, Pye, Sony various models</td>
<td>£13.50</td>
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**CAPACITORS**

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<th>Part Code</th>
<th>Description</th>
<th>Model</th>
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<tbody>
<tr>
<td>3H3AV - Ferguson</td>
<td>30W, 220V</td>
<td>£1.25</td>
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<tr>
<td>3H3AV - Ferguson</td>
<td>30W, 220V</td>
<td>£1.25</td>
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<table>
<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>3H3AV - Hitachi</td>
<td>VT11/1-3/33 etc</td>
<td>£22.00</td>
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<tr>
<td>3H3AV - Sharp</td>
<td>3000/5500 etc</td>
<td>£22.00</td>
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**VIDEO HEADS**

<table>
<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>3H3AV - Sony</td>
<td>CV620/520/525 etc</td>
<td>£2.95</td>
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</table>

**REEL MOTORS**

<table>
<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>3H3SSY - Sony</td>
<td>VHC100/100</td>
<td>£20.00</td>
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**CAPTAIN MOTORS**

<table>
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<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>3H3AV - Ferguson</td>
<td>VC35/35 etc</td>
<td>£2.25</td>
<td></td>
</tr>
</tbody>
</table>

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**VIDEO MOTORS**

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<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>3H3AV - Ferguson/JVC</td>
<td>Mechanical models</td>
<td>£2.15</td>
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**REEL MOTORS**

<table>
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<th>Part Code</th>
<th>Description</th>
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<th>Price</th>
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<tr>
<td>3H3SSY - Sony VHC3000/5150/5300/5400</td>
<td>£7.90</td>
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**CAPTAIN MOTORS**

<table>
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<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>3H3AV - Ferguson</td>
<td>VC35/35 etc</td>
<td>£2.25</td>
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<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>3H3AV - Most models</td>
<td>From</td>
<td>£0.95</td>
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**Idler Assemblies**

<table>
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<th>Part Code</th>
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<th>Price</th>
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<td>Sharp 3V000, 3V050 etc</td>
<td>£1.75</td>
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**Video Heads**

<table>
<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tbody>
<tr>
<td>TDA19080</td>
<td>Hitachi</td>
<td>£14.75</td>
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**Cassette Motors**

<table>
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<th>Part Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>STK5324</td>
<td>Sharp</td>
<td>£2.25</td>
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<thead>
<tr>
<th>Part Code</th>
<th>Description</th>
<th>Model</th>
<th>Price</th>
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<tr>
<td>3H3AV - JVC</td>
<td>VC929</td>
<td>£9.00</td>
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**Video Spares**

<table>
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<th>Part Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>3H3AV - Sony</td>
<td>3V32, 3V37</td>
<td>£1.95</td>
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**CASSETTE HEADS**

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<th>Part Code</th>
<th>Description</th>
<th>Model</th>
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<tbody>
<tr>
<td>3H3AV - Sony</td>
<td>3V32, 3V37</td>
<td>£1.95</td>
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<td>3V30 £59.00</td>
</tr>
<tr>
<td>9600 £15.00</td>
<td>Stereo £59.00</td>
</tr>
<tr>
<td>9200 £15.00</td>
<td>3V23 £59.00</td>
</tr>
<tr>
<td>9900 £15.00</td>
<td>Mech £32.00</td>
</tr>
<tr>
<td>Tx £30.00</td>
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<thead>
<tr>
<th></th>
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<td>ELECTRONIC VIDEOS</td>
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<td>HITACHI VT11</td>
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<th>TUBE SIZE UP TO &amp; INCLUDING</th>
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<td>£52</td>
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<td>£85</td>
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SONY, PHILIPS, TOSHIBA etc

SPECIAL OFFERS THIS MONTH

<table>
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<th>Model</th>
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<td>TX10 TEXT</td>
<td>£65.00</td>
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SUBJECT TO QUANTITY + 15% VAT

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<td>01-884 1314</td>
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TELEVISION AUGUST 1988
785
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TX9-10 Text

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3V30 .................. £75
3V35 .................. £90
3V32 .................. £100
3V36 .................. £75
3V266 .................. £75
3V2010 ................. £75
3V7200 ................. £75
MECHANICAL
VIDEOS £40
MECHANICAL
VIDEOS £40

SHARP VC383 ....... £85
HITACHI VT8300 .... £70
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MONTH ONLY

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<td>20</td>
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All prices include Postage & Packing. But + VAT.

UNTESTED TV's

<table>
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<tr>
<th>Model</th>
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<tbody>
<tr>
<td>Bush T20/22</td>
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</tr>
<tr>
<td>Pye G11</td>
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<tr>
<td>Pye KT3</td>
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<td>Pye K30</td>
<td>£35</td>
</tr>
<tr>
<td>Ferguson TX9</td>
<td>£15</td>
</tr>
<tr>
<td>Grundig</td>
<td>£10</td>
</tr>
<tr>
<td>Hitachi</td>
<td>£10</td>
</tr>
<tr>
<td>Thorn 9000</td>
<td>£10</td>
</tr>
<tr>
<td>Plus many more; GEC, ITT, etc from £5</td>
<td></td>
</tr>
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UNTESTED VIDEO's

<table>
<thead>
<tr>
<th>Model</th>
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<tr>
<td>Sharp 7300</td>
<td>£35</td>
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<tr>
<td>Ferguson 3V29</td>
<td>£50</td>
</tr>
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<td>Sharp 8300</td>
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</tr>
<tr>
<td>National Panasonic</td>
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</tr>
<tr>
<td>Ferguson 3V30</td>
<td>£55</td>
</tr>
<tr>
<td>Sharp 9300</td>
<td>£55</td>
</tr>
<tr>
<td>Betamax all makes from</td>
<td>£10</td>
</tr>
</tbody>
</table>

HOWROOM

ADAY TO SELL VIDEO's & TV's
WILL BE DELIGHTED!

NOW IN STOCK

Hitachi VT33
Hitachi 60/64, ur 60,
any more

T & BASED ON QUANTITY

ACCESS/VISA WELCOME

MANCHESTER
UNIT 3,
MERSEY ROAD
INDUSTRIAL ESTATE,
FAILSWORTH

OPEN
6 DAYS
SAT 9-5.30

TELEVISION AUGUST 1988
INDEPENDENT TELEVISION & VIDEO CO.

DON'T TRAVEL THE COUNTRY LOOKING AT "BUTCHERED JUNK"
ALL OUR COLOUR TELEVISION'S & VIDEOS ARE IN EXCELLENT CONDITION, WITH UNMARKED CABINETS AND ARE SUPPLIED WITH REMOTE CONTROL
WE ALWAYS HAVE 1000s IN STOCK OF ALL FAMOUS MAKES
WE DON'T JUST SAY THAT – SEE FOR YOURSELF AT YOUR LOCAL BRANCH FRANCHISES NOW AVAILABLE WITH MINIMUM INVESTMENT

BULK PURCHASE:-
V.H.S. Electronic Working ........................................ From £75.00
V.H.S. Electronic Untested ....................................... From £55.00
V.H.S. Electronic For Spares .................................. From £35.00
Mechanical V.H.S. Video's Untested ....................... £35.00
Mechanical V.H.S. Video's For Spares ................. £25.00
All Beta Videos .................................................. From £10.00

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Enquiries welcome C.I.F. & F.O.B. Prices – Telex: 378414 BLBIRDG – Fax: 0602 861027

<table>
<thead>
<tr>
<th>TELEVISIONS</th>
<th>CTV’S WORKING FROM £8</th>
<th>WORKING</th>
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<tr>
<td>Thorn 9000</td>
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<td>Decca 80 &amp; 100</td>
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<td>G.E.C.</td>
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<td>I.T.T. – Ferguson Stereo Text</td>
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<td>£130.00</td>
<td>£105.00</td>
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PLUS MANY MORE LATE MODEL T.V.'s TOO LONG LIST TO LIST THEM ALL.
ALL PRICES ARE PLUS 15% VAT.

NOTTINGHAM
(10,000 SQ. FEET WAREHOUSE)
UNIT 3-3A MEADOW TRADING EST.
MEADOW LANE
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(6,000 SQ. FEET WAREHOUSE)
2 MIN FROM JUNC. 34 OF THE M1
UNIT 17, MEADOWHALL TRADING EST.
27 AMOS ROAD
SHEFFIELD 4
TELEPHONE: (0742) 422633
A space ship was seen today outside a local television warehouse in Basildon. Passers by were held spellbound by the sight of three space aliens appearing from within the store, carrying what appeared to be Television sets and video recorders.

In an exclusive interview with one of the aliens, our reporter was told that they had travelled a great distance across our galaxy to this particular T.V. store, because as they said "Bobs T.V. & Video deals cannot be beaten". They were also particularly impressed by the large selection of reconditioned sets.

The Alien went on to say that as a main dealer for T.V. equipment on his own planet Trinitron, he found that the trip to earth was justified and rewarding due to the amazing deals he found at Bobs.

Two of the aliens were also impressed by the variety of makes including Ferguson, Philips, National Panasonic, Hitachi, Sharp, Grundig etc. plus B grade Philips machines.
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BANKRUPT AND SURPLUS STOCKS OF
TV’s AND VIDEOS

NOW OPEN IN LEEDS

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SILLY PRICES

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9000 £12
9200 Basic Monitor 2 function remote £20
9200 Full infra red remote £30
9600 Basic 2 function remote £15
9900 2 function remote £25
9900 Full infra red remote £30
Text TV’s £50
Stereo Text £80

MANY MORE TOP BRAND NAMES • HITACHI • JVC
• PANASONIC • SONY • TOSHIBA • FERGUSON • PHILIPS • GEC

VIDEOS
3V22 £35
3V23 Full infra red remote £60
3V29/30 £60
JVC, SHARP, AKAI, HITACHI £65

NEW VIDEO HEADS
Ferguson/JVC Universal Heads £17
THE ABOVE OFFERS APPLY ONLY WHILE STOCKS LAST

RING OUR HOT LINES NOW!

ACORN TV
(SOUTH WEST)

Doric MKII (NW to clear @ £80 for 10.

OFF 5
500
OFF

3V22 Videos @ £59.00 working
3V30 Videos @ £90.00 working
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We are now South West stockists’ of Konig remote controls. Phone for requirements.

ACORN TV WAREHOUSE
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You’ll find us behind Elf Garage
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TOP QUALITY – HIGH PROFITS

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£15 to £65. Delivery £4 per Tube.
ONE YEAR GUARANTEE
14” 370 - KR - HMB - HGB - HFB - HUB -
GUB - ECC - EFB - DLR - B - 2B - 8B -
AXT - 37-001 37 - 504 - 570 - AXM -
AXT - 37.001 - A34 EAC DOX - A34 EA
DOX.
Broken Tube - We Can Help.
16” 420 EDB - EFB - GAB - - GLB - GJB -
GUB - CSB - FSB - EFB - ERB - 42 - 556 -
570 - 590 - AXT-42-001.
20” 51 - 161 - 241 - 427 - 500 - 570 -
580 - 590 - 510 ABLB - GLB - HMB -
JKB - RCR - SW - LDR - UFB - ULB -- USB -
YKB - YZB - 95 490KX.
NEW MULLARD - 51 - 427 555.90
22” 56 - 500 - 510 - 540 - 610 - 701 - 708 -
AXT-56-001 - 560 AKB - E7B - DZB - DYB -
H8 - EGB - GAB.
26” 66 - 500 - 510 - 540 - 611 - 67-701
UNIVERSAL
£5.95
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INCLUDING VAT & DELIVERY
MACDONALDS RADIO &
T.V. SERVICING BOOKS
1984-85. 1985-86 £21 each
Includes Delivery
OTHER EDITIONS
available at discount prices
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£19.50
£22.50 including VAT
& Delivery for most
FERGUSON, PANASONIC,
JVC, BLAUPUNKT, ITT,
NORDMENDE, SABA,
TELEFUNKEN, SANSA,
BAIRD, TATUNG, DECCA,
AKAI
Plus prices slashed on
HITACHI, SONY, TOSHIBA,
NEC, MITSUBISHI, FYE,
PHILIPS, SOLARA, HINARI,
EGC, ORION, SHARP,
SANNO, FISHER,
AMSTRAD, FIDELITY
U-VIEW,
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COLOUR TELEVISIONS
THORN-8 800
9,000
9,600
TX9-TX10
THORN-3V23
3V29
3V30
DORIC-MK1, MK111, M4.
HITACHI-Various Models.
PHILIPS-G11, KT3, KT30.
ITT-Various Models.
GEC-Various Models.

VIDEOS
NAT PAN-Various Models.
HITACHI-Various Models.

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Phone: (091) 2722 303

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OPEN 10am-5pm MON-FRI
PRICES BASED ON QUANTITY
ALL PLUS VAT
G11 20” 22” & 26” FROM UNDER £20
KT3 FROM £30
TELETEXT with H/UNIT FROM £30 EACH
Thorn TX9-TX10, TX Stereo
Beta VCRs Remotes etc.

CLEARANCE COLOURS
ALL TYPES. BLOCKS OF 10 SETS
FROM £40 PER BLOCK

TELEVISION AUGUST 1988
793
## TV & VCR's

**C.R.T.'s**

<table>
<thead>
<tr>
<th><strong>Brand</strong></th>
<th><strong>Model</strong></th>
<th><strong>Price</strong></th>
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<td>3V29</td>
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<td>NAT. PAN 333</td>
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<tr>
<td>HITACHI</td>
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<td>£85</td>
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</table>

**Components**

- **Belt Kits**
- **Pinch Rollers**
- **Idlers**
- **Lamps**
- **Tyres**
- **Focus Units**
- **Motors**
- **Carrages**
- **Ferguson Resistors**
- **Sharp Capacitors**
- **Hitachi I.C.s**
- **Nat. Pan Transistors**
- **Sony Diodes**
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**30 AX Pre-Converted**

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- Carlisle 0228 39693

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**Goodmans**

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- SUPERSLIM CAR GRAPHIC
- EQUALISER/STEREO AMPLIFIER

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- £9.50 each. Min order 5

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**Sanyo**

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- £0.75p each. Min order 24

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  - 470KUB22
  - 470FTB22R
  - 510DUB22
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**SATELLITE TV**

**Reception Equipment**

- **Envis**
- **Japanese I.R.**
- **Antennas**
- **Germany**
- **Spain**
- **Portugal**

**Kesh Electronics Ltd**

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OCV40 8.50
FT100 FT110 8.50

PAPWORTH
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CTV 2-4-126

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60 series Braided colour 10.00
100 series colour 9.50
200 series colour 9.50

PHILIPS
GB & GB series colour 8.90

KA - ITT
OCV5 OCV7 OCV9 OCV11 10.00
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OCV40 8.50
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80 Merton High Street,
3-1-156 3-3-164
CTV 2-4-126

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OCV5 OCV7 OCV9 OCV11 10.00
OCV20 series colour 9.00
OCV30 OCV32 series colour 8.50
OCV40 8.50
FT100 FT110 8.50

PAPWORTH
TRANSFORMERS
80 Merton High Street,
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