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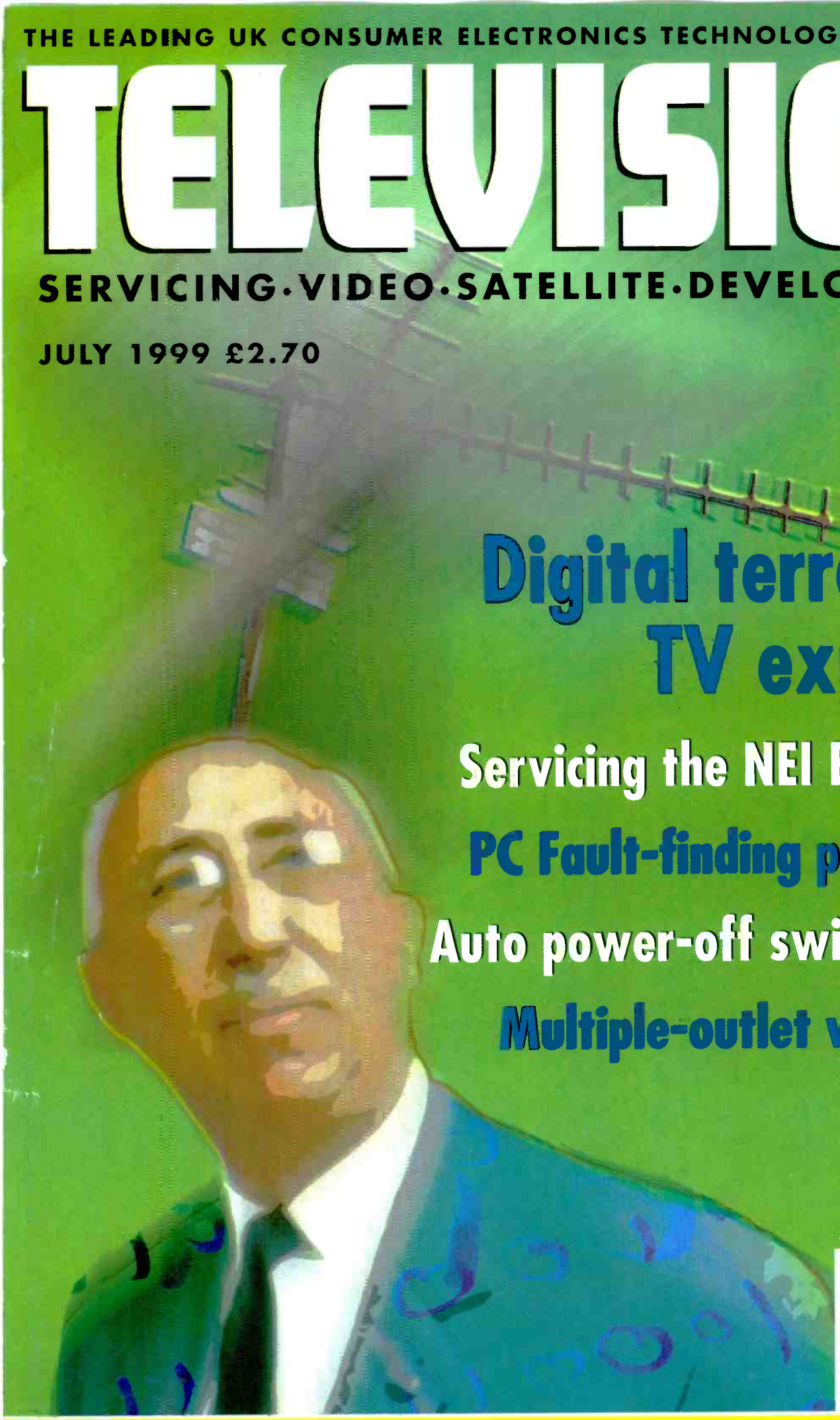
JULY 1999 £2.70



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CONTENTS

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July issue on sale June 16th.

Next issue, dated August, on sale July 21st.

Hard Times

Speaking at this year's RETRA conference John Binks, of market analysts GfK, commented on the overall decline in the value of the electrical market in the UK last year. With consumer electronics there was a 1·2 per cent sales decline in value, not because of reduced volume but because of lower prices. VCRs were a particularly significant example. In quantity, sales rose to a record three million, but prices fell by almost 20 per cent. The outcome: a 10 per cent volume rise and a 10 per cent decline in turnover. As John Binks put it, "a crazy situation – and an amazing bargain for the consumer". What it means for our trade is negligible profitability – and with such low prices who is going to get anything repaired?

To some extent the problem has been caused by the high value of the pound, making imports cheap, but rather more important have been market conditions in the Far East. What has happened is that excess stock has been shifted at ridiculously low prices – one suspects much of it below cost.

The situation in China illustrates just how bad things are. China is important because it has become probably the largest manufacturer of TV sets in the world. To try to halt what the *Financial Times* refers to as "the relentless slide in TV prices in a chronically oversupplied sector of the Chinese market", leading Chinese colour tube manufacturers recently agreed to suspend production for one month, from May 30th to June 30th. The eight companies concerned account for 80 per cent of the domestic market.

As a result of excessive capacity, China's leading TV manufacturer Changhong recently reported a 23 per cent decline in profits last year compared to 1997. According to official figures, a price war cut the profits of Chinese TV manufacturers by some £390m last year. To try to halt self-defeating price cuts, the Chinese government recently imposed what amount to anti-dumping penalties on Chinese manufacturers found selling sets below cost in the home market. It doesn't take much imagination to appreciate the consequences of all this for exports, some of which end up in the UK.

A string of recent announcements from Japanese electronics manufacturers tell a similar story of a weak domestic market for consumer products and loss of profitability. Much the same situation exists throughout SE Asia.

It's hard to see any chance of improvement in the immediate future. The Chinese figures mentioned above relate to 1998. The situation is unlikely to have improved since. There is excess capacity worldwide, and a reluctance to close plants. So low prices are likely to be with us for some time.

The UK now has its own self-inflicted problem, with the digital broadcasters clobbering the trade in their efforts to gain subscribers and secure their future. SkyDigital is "investing" some £315m, ONdigital some £200m, in subsidising digital TV receiving equipment. This should mean that a substantial amount of hardware is distributed, but there will be minimal benefit to the TV trade.

It's quite extraordinary. Whenever there has been a technological breakthrough in the past it has been good news for business. Think of it: Band III, colour TV, the advent of domestic video equipment, stereo sound and so on. One would have hoped that the coming of multi-channel digital TV would bring similar benefits. As probably the most significant development to date, it should have meant a bonanza for the industry. But Messrs Murdoch and Grabiner have put an end to any prospect of that. It is hard to see if and when it will be possible to rescue anything from the mess these gentlemen have landed us in.

The problem doesn't stop with free STBs and subsidised IDTVs. When a significant technological change such as this occurs, people are not in a hurry to buy new equipment. Many want to wait and see how things develop. Public confusion over the alternative ways of getting multi-channel digital TV is exacerbating the problem. People certainly won't feel inclined to buy conventional analogue sets at the present time, or to have existing ones repaired. Perhaps Sir Stanley Kalms did the right thing in turning his attention to the internet! The hard times are likely to be with us for some while.

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Indexes for Vols. 38 to 48 are available at £3.50 each from SoftCopy Ltd., who can also supply an eleven-year consolidated index on computer disc. For further details see page 656.
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2SC2236	7407	BC557A	BRX49	BYW56	MJE3055T	TA7280P	TDA4510	UPC574H
2SC2240	7805	BC557B	BSX20	BYW76	MJE340	TA7281P	TDA4600	ZTK33B
SC2274	7806	BC558B	BT139600	BYW95C	MJF18004	TA7698AP	TDA4600/2/3	ZTX650
SC2310	7809	BC558C	BT151500R	BYW96E	MJF18006	TA8205AH	TDA4601	
2SC2314	7812	BC635	BTA08400S	BYX10	MJF18204	TA8207	TDA4601D	
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But the subject doesn't stand still. New models, new faults - there is always something to add. So here we have the fifth edition, which has been completely updated and now has 300 pages and a more attractive cover. In addition to receiver fault notes and general information you'll find many useful button sequences for resetting parental lock codes, resetting installation choices to factory defaults and other less well known operations, practical information on LNB's with typical current drains, a list of manufacturers and suppliers addresses, other useful information and a beginners section. Digital receivers are now available so the manual includes a chapter to deal with these too."

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What a Life!

Everything from a troublesome microwave oven to an ancient radio and a bucket aerial. Donald Bullock's commentary

I was musing the other day about couples. Married ones, friends and those who go into business together. Sometimes they are both pleasant or both nasty, or both pushy or both considerate. More often however they compensate for one another. One may be dominant for example and the other easygoing, prepared to take the back seat. This became very clear to us when we began our lives in the TV trade. Figuring out which of a pair to concentrate on when selling a set or discussing a repair can be half the battle.

Take Mr and Mrs Hudson. He had recently retired and was slight, mild, well-mannered and, I suppose, a bit doddery. She was big, loud and blunt, as insensitive and self-centred as they come. They were an interesting though unnerving pair.

He'd brought in a little bathroom extractor fan for repair. Because I liked him, we had accepted it – expecting the cause of the trouble to be a dicky switch. We should have known better. Its motor had burnt out, as they very often do. So when they called in I handed it back to him.

"We'll pay you for your trouble" he said, reaching for his wallet.

"Don't be an old silly" she cut in. "Mr Bullock wouldn't charge you for a job he can't do. Just pick the fan up. We'll take it somewhere else to get it done. Snoddies are better for some jobs. And don't keep holding your belly – it isn't going to run away."

She carried only her bulky handbag. He was festooned with shopping. While he struggled to pick up the fan she made her way out.

"How about that?!" I said to Steven. We were to have further dealings with the Hudsons, but more about that another time.

Funny Noise

Mr Shawster then came in with a 14in. Philips portable, one fitted with the CP90 chassis. Like Mr Shawster, it was well past its prime.

"'E's been a good set" Mr Block. "But lately it's been 'm m m m m'. That's all. 'Just m m m m m'. Then last night, about ten past eight, just as I was putting the cat out, he burst out like thunder. It was 'M M M M M'. Yea! 'M M M M M'. Me missus nearly had a yuppilectric fit. That can't be right, can it?"

I looked his missus over. "I dunno" I said, "but leave it with me. The set, I mean. Steven will have a look at it. He's very clever with these sets."

"That makes about six of them in recent weeks" Steven said as they departed. "Philips advise replacing the 6MHz ceramic filter, circuit reference 1103. I did that with the first one and it certainly worked. When the second one came in I didn't have a filter and decided to try adjusting the slug of the detector coil 5108. That worked too, and I've done the same with the others. I've not had any bounces!"

A Sharp Microwave

Paul had been working on a Sharp combination microwave oven. "Don't get it" he said. "They're usually easy to fix, but this one is tricky." A while later he was still at it, and looking glum.

"Can't work it out" he said. "The fault is in the convection section of the oven. When convection cooking, it stops after exactly three minutes. When you restart it, there's another stop after precisely three minutes. And so it continues."

"Timer?" I suggested.

"No, I've tried that."

"Er . . . I'll go and make the tea."

Steven went over and had a look at it. He was equally baffled.

"We could e-mail Jim Bryant" he suggested, "he lets the trade e-mail him for microwave oven advice. I bet he'll have the answer."

He did too. The reply was in Steven's computer next morning.

"To diagnose this fault" he wrote, "set the convection temperature to 250°C and press start without entering a time. The oven will then go to 'pre-heat' to raise its temperature to 250°C. After a few minutes, press and hold the convection button. Read off the oven's temperature at this point. It might be say 78°C. If it isn't, the chances are that you have a faulty thermistor. To get to it, remove the rear cover. You will then see it close to the back of the machine, at the bottom right, embedded in insulation material. It will probably be cracked through the middle."

It was all just so! We ordered a new one from Willow Vale, and it arrived next day. Once it had been fitted the oven worked perfectly. The part no. is 31868T – the cost £3.75 plus VAT.

Our thanks to Jim and, while at it, to *Television* for bringing so many of the trade's top brains together (don't ask me how we managed to creep in!).

A Wireless set!

Meanwhile Steven had picked up an ancient Philips wireless set. "Oh look, valves!" he said.

"What's the trouble?" I asked.

"Belongs to Syd Tubb over at the garage. It's been on all day, every day, for the past thirty years. Now it produces bursts of thunder-

storm noises in sympathy with the music."

"Can you blame it, after thirty years?" I said. "Clean all the valve bases with switch cleaner. That should do it. With any other make I'd advise checking the yellowy waxed-paper capacitors around the audio output stage. But this set will be full of black-pitch encapsulated ones that last for ever."

He soon had it working right.

Reminiscence

The set reminded me of an experience I had about forty years ago, in a seedy backstreet. It was an identical set, with the same fault. I found that I was out of switch cleaner – the Radiospares stuff in a red and yellow spout tin – and asked the lady of the house whether she had any cleaning spirit. Petrol? I suggested as she lit a Woodbine with her lighter.

Then her young daughter came down from upstairs. She had varnished nails. Perhaps nail-varnish remover would help?

"Do you have any nail-varnish remover?" I asked. A small bottle of clear liquid was promptly produced. I poured some into the output valve's base, then lifted it and pushed it home a few times. When I plugged the set in and switched it on it spluttered and sent up a column of blue smoke. I'd been given nail varnish! The only thing to do was to take the set back for bench attention.

When I returned to the workshop next day I found Joe, the inside engineer, livid. He'd had a few difficult faults that day and had then picked up the set I'd brought in.

"You won't believe this" he ranted, "but someone has glued the output valve into this set with Durafix!"

I said not a word.

The Baby Ten

The Baby Ten portable TV has probably appeared under more guises than any other set. The one Mr Bradshaw brought in was a Goodmans Compact 10. It's a 10in. mains/battery set of course. The trouble is that Mr Bradshaw mumbles.

"Mm yib yob banged an smoke an mmmmmm. Frightmmmd us to death" he said.

When he'd departed, Paul opened it up and found the contents of an electrolytic capacitor plastered all over the place. It took ages to clean up the mess. Paul then discovered that it had been the non-polarised 4·7μF, 50V capacitor that couples the line scan coils to the output stage. He tried to find the cause of its failure before fitting a replacement, then spent some further time checking its operating conditions. Everything seemed to be OK, and the replacement ran cool. It produced a perfect picture. After a good soak test the set was pronounced fit to travel.

Interlude

Greeneyes clip-clopped in looking as gorgeous as ever.

"Thanks a million" she said, planting a kiss on my forehead.

"For what?" I asked as I reached for my handkerchief.

"For buying me that beige skirt to match the trouser suit" she breathed.

"Beige skirt?" I said. "What trouser suit?"

"The one you're going to get me from Marks for Steven's wedding. To go with the oatmeal shoes I'm getting from Debenhams."

"And when do we go and win you all these treasures? I asked.

"As soon as you've finished your silly article. By the way, why does it take you so long to write a ten-minute article?"

Sky News

I dropped in on Sky News the other night, and dropped out just as quickly once I'd sampled it. The newsreader occupied only a square cutout in the centre of the screen. While he was recounting the day's tragedies, the space around him was a swirling mess of globes or something. In addition, an intrusive musical thumping accompanied his comments, and phantom flames played over various news pictures. Not for me.

John Berryman's Aerial

John Berryman the undertaker lives in the deep and leafy countryside. I was happy to call on him – he'd complained about his picture. It had been raining, and I had to pick my way to his front door via masses of tall grasses and overhanging lilac. By the time I got there I was sweet-smelling but wet. He greeted me through the window.

"You can't get in this way, Don. We never use the front door. Go back down the lane, cross over the brook's stepping stones, through the paddock, past my hearse and up to the back door. Take no notice of Banger the bull.

When I reached him he threw

He gave me a leg up . . .

me a towel. "How are you keeping?" he asked.

"Never mind the business enquiries. What's the trouble? How's trade?"

"Awful" he replied, "it's all this good weather."

"You'll have to sneak out with your twelve-bore" I said, "hurry them up a bit."

"If I did, I'd start with the clergy" he laughed.

I looked at his TV picture. It was a mass of hazy ghosts.

"The aerial's down the garden, Don. Just follow the cable."

I did. It led to the privy, where the cable was taped to the handle of a bucket on the roof. He gave me a leg up and I saw that the bucket contained various bits of metal – some horseshoes, a few old spanners, some coathangers and an old egg-whisk. Also a lot of water. Warm water.

I was astonished, and decided to pour the water away. John's wife then came running from the house.

"Picture's good now" she called.

"I should think so" John said, "the aerial was full of water. Don twigged it. Clever chap, always was."

"Good 'ealth Don. It ain't many I says that to you know. But I don't mind how long you keeps me waiting. Straight I don't."

TELETOPICS

Digital Update

ONdigital has matched SkyDigital's free set-top box offer and has in addition dropped the £20 connection charge. Alternatively, ONdigital has arranged with Bush for integrated analogue/digital TV sets to be sold at subsidised prices starting at £299 for a 21in. 4:3-format tube model with remote control, stereo sound, a smart-card slot and a built-in modem – provided a year's subscription is taken out. There is also a 40 per cent reduction in BT standard-rate phone-call charges. Subscription rates have been increased by £2 a month for the initial packages, to £9.99 and £11.99, but a new basic-level package at £6.99 has been introduced. Those who had taken out subscriptions prior to the latest offer have the charges frozen at the previous rate until the end of 2001. What if you get your free STB then decide to stop paying the monthly subscription? It's not on, as ONdigital can switch the box off remotely. ONdigital is investing £200m in its receiver subsidy initiative. The company's aim is for at least two million subscribers, the break-even point, within three years.

The prices of other TV sets that incorporate an ONdigital decoder are expected to fall. There are five models in all in the Bush range, with 21, 28 or 33in. 4:3 tubes or 28 or 32in. 16:9 tubes. Many companies planning to launch digital decoders and IDTV sets are revising their plans.

Cable & Wireless Communications' digital cable service is now becoming available in various areas. The monthly £17.95 subscription includes a digital TV decoder, the line rental and access to up to 100 interactive sites, also an expanded near video-on-demand service. The decoders, made by Pace, include a high-speed cable modem and internet-based operating software, DTV Navigator, developed by NCI. CWC is investing £60m in the new service and hopes to gain 70,000 new subscribers and convert 150,000 existing ones during the first year of operation.

The first "sidecar" module, to give users of DTT STBs access to the SkyDigital services, was on display at Cable and Satellite Mediacast '99 (report next month). It has been developed by SCM Microsystems for BSkyB – the project started in May 1998, when the ITC called for interoperability between digital terrestrial and satellite TV services. A sidecar to give access to DTT via a SkyDigital box will probably be developed later this year. It's unlikely that these sidecars will become available until next year however, as BSkyB and ONdigital have yet to reach a simulcrypt agreement. Because the two broadcasters use different conditional access systems, additional code would have to be transmitted.

Microsoft is to buy the 29·9 per cent stake in Telewest held by US cable operator MediaOne. Microsoft already owns a 5 per cent stake in NTL, and is expected to take a 30 per cent stake in CWC. These moves could lead to consolidation of UK cable TV and telephony operations, with Microsoft's CE software used in the decoders.

Philips says it has already delivered over 2,000 IDTV sets (Model 28DW6734). Panasonic plans to launch an IDTV set with a built-in SkyDigital decoder and a free-to-air DTT tuner early next year. A similar product is expected from Sharp towards the end of the year.

LSI Logic has announced a chip, type SC2000, that carries out all the baseband signal processing required in a digital STB. The chip has a MIP microprocessor core and carries out MPEG-2 decoding, PAL/NTSC encoding and 2D graphics generation. Data from a DVD can be fed in, so the STB can provide DVD playback when fitted with a disc drive.

The new Kenwood PDS120-6 universal bench DC power supply provides maximum outputs of 120V DC and 6A. It uses a combination of switch-mode and linear technology to provide a compact, lightweight unit with excellent performance – voltage line and load regulation is better than 0·005 per cent, current line and load regulation 1mA. For further details contact Kenwood on 01923 655 291 or fax 01923 655 297.

Eutelsat News

Eutelsat, which was set up as an intergovernmental organisation in 1977, is to become a private company under French law on July 2nd 2001. The privatisation could be sooner if two thirds of the member states ratify the legal texts by the end of year 2000. Eutelsat S.A., the new company, will be based in Paris. The change will enable Eutelsat to develop international activites and alliances beyond its basic European coverage.

Eutelsat W3 is now in service at 7°E. As a result, Eutelsat II F4 has been transferred to 10°E while II F2 is now at the 12·5°W Atlantic Gate position.

Eutelsat currently has a fleet of 14 satellites which transmit more than 450 digital and analogue TV channels to over 70m satellite and cable households, and provide corporate networks, newsgathering, telephone and mobile voice, data and positioning services.

Broadcasting Developments

The ITC has commissioned a study from NTL and The Smith Group on how best to provide digital terrestrial TV coverage in the UK following the switch-off of all analogue transmitters at some time in the future. The overriding aim will be to establish how to maximise DTT coverage. Other issues to be considered include public-service coverage obligations, the optimum use of spectrum space for TV broadcasting and the impact various proposals would have for viewers and their receiving installations.

Previous research on DTT coverage, carried out by Castle Transmission International, suggested that an extra 400,000 households in South Wales could be provided with DTT services via a single-frequency network of relays – the mountainous terrain in S. Wales would, in conjunction with the use of COFDM, make this possible. It also suggested coverage increases in the Midlands and East Anglia.

A start has been made to the use of one and a half extra lines in the vertical blanking interval to provide extra teletext capacity with Channel 3 (ITV) and Channel 4 transmissions. There will be an extra 40 non-regional and two new regional pages of sport, six new travel pages providing flight arrivals information at domestic airports, and three new non-regional and one regional news page. Some of the increased capacity will be used to reduce teletext access times.

Servicing Information

Welcome news from U-View Technical Publishers. *Television Servicing Book Five*, with over 400 pages of circuit diagrams, is now available at £99. Over 380 models are covered. For further details contact U-View on 01302 719 997 or fax 01302 719 995.

Savoy Hill Publications, 50 Meddon Street, Bideford, North Devon EX39 2EQ has acquired a substantial collection of service manuals for test equipment produced from the Thirties to the Seventies. Well-known brands include Advance, Avo, EMI, Heathkit, Grundig, Hameg, Marconi, Philips, Scopex, Taylor, Tektronix, Telequipment and many, many others. A new, updated catalogue is being prepared, but this will take some time. Meanwhile you can check on 01237 424 280 (phone/fax).

Technology

Philips Semiconductors has developed what it calls the Ultimate One Chip Television. The chip uses analogue (BiMOS) and digital (CMOS) circuitry to provide TV signal processing, a closed-caption decoder and a microcontroller core with an extended 80C51 instruction set. Sample chips and evaluation boards are currently being made available: quantity production is due to start this autumn.

Dolby Laboratories and NDS have demonstrated the first DVB-compliant broadcasting system that uses Dolby Digital audio coding. Although the European DVB standard uses MPEG-2 audio, other countries that are planning to use the DVB standard, Australia for example, will use Dolby Digital audio.

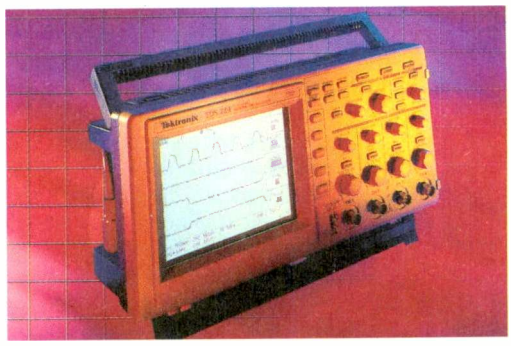
A team of scientists from Hitachi and Cambridge University have developed a new type of semiconductor memory that could store the entire contents of a feature film in a single chip. The device is called PLEDM (Phase-state Low Electron-number Drive Memory). Each bit is stored in a two-transistor cell which has the advantage of being non-volatile and much smaller than a conventional DRAM cell. It's fast and, unlike flash, individual bits can be erased. While a current DRAM requires about half a million electrons per stored bit, the PLEDM uses 1,000 – and this could decrease as the PLEDM technology shrinks.

A chip and keyboard developed by World CallNet could be used to provide TV sets with low-cost e-mail operation and internet access, using CallNet's own subscription-free internet service. This is based on InterText information pages, which are similar to Web pages but formatted for TV viewing. The system is called M@il.TV.

Sharp's new TV Model 76EF20H is fitted with a 76cm pure-flat, super-clear 16:9 format CRT whose "ultra-transmissive" glass gives improved brightness and contrast. The set has been designed to take advantage of the quality provided by DVDs and digital broadcasting. It has 100Hz flicker-free scanning, a digital comb filter, and digital gamma correction for improved contrast in darker areas of the picture. Other video features include digital picture still, picture-in-text, and on-screen now-and-next programme information. The sound system matches the impressive video specification, with full Dolby Pro-Logic processing and a multispeaker system that provides 90W MPO of Surround sound.

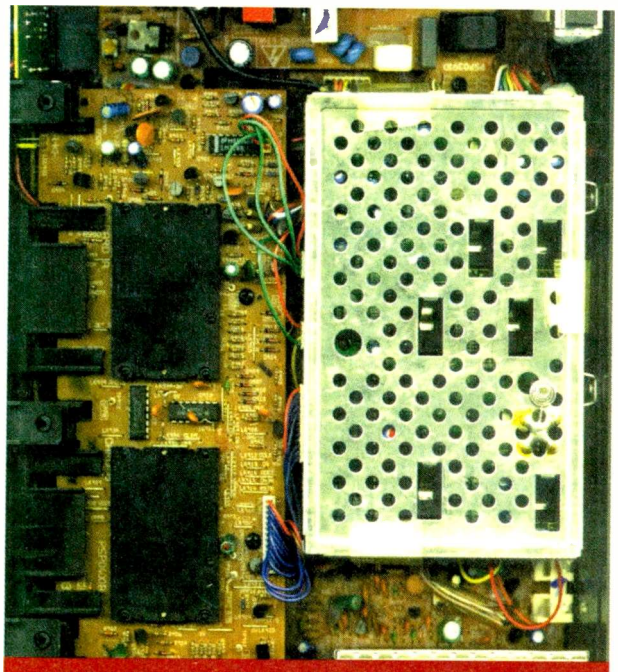
Super Audio CD

Sony and Philips have launched a new audio format, Super Audio CD, which uses a recording system called Direct Stream Digital to provide improved audio quality in comparison with standard audio CDs. The first player, Model SCD1, has been launched by Sony in Japan at the UK equivalent of about £2,600. At present only thirteen titles are available, from Sony Music. DVD-Audio, a rival format, is due for release later this year.



Tektronix has added the TDS224 four-channel, real-time 100MHz digital storage oscilloscope to its TDS200 range. The scope has an impressive specification for its suggested price of about £1,560. For further details apply to Tektronix UK Ltd on 01628 403 300, fax 01628 403 301.

Satellite WORKSHOP



Jack Armstrong

Pace PRD800

When I called at the greegocer's Alice gave me a nice smile. "Glad to see you" she beamed.

I wondered whether it was my lucky day, but my hopes were quickly dashed.

"I've got lines all over."

"Sounds nasty. Seen the doctor?"

"No, silly, on the Sky."

I looked out of the window, but couldn't see anything unusual.

"On my Sky at home" she added.

I gave her a puzzled look and backed towards the door.

"She means the satellite" her husband explained.

I offered to take a look.

When I checked the receiver back at the workshop I found that there was indeed a whole mass of lines across the picture. So my first move was to fit all the low-ESR capacitors from Relkit 1. I also checked all the 10µF capacitors around the Nicky chip U9 with my Genie ESR meter. As they all produced high-impedance readings, I changed the lot. This usually cures such symptoms. The picture was now much better, but there were still soft, white horizontal lines that moved up then down.

I found that the TV scart picture was perfect and that the lines were present with the RF output only – and then only with channels that have horizontal polarisation, when the LNB is supplied at 17V. This threw me off-track for a time as I checked the 17V supply for noise (there was less than 10mV) and measured the ESR of all the capacitors around the power supply.

I eventually discovered that the LNB took more current from the 17V supply than from the 13V supply (for vertical polarisation), and that the effect was to change the chopper power supply's frequency and increase the ripple on the RF modulator's 5V feed, which is smoothed by C26. Goodness knows why it did this, but the problem was fixed by changing C26 from 10µF to 1,000µF (16V).

Since then I've noticed that the fault can be even worse with later models, where the warm-running 12V regulator REG1 sits next to C26. So this capacitor is now included in Relkit 1 from SatCure (01270 753 311).

It is also worth replacing C337 (4·7µF) in the RF modulator's frequency-synthesis PLL.

Pace MSS300

A local installer phoned to ask for advice. The screen of his customer's MSS300 had turned blue, with the "no signal" message emblazoned across it. As he had no way of measuring the LNB voltage, I suggested that he connect the LNB's output to input 2 of the receiver and use the on-screen menu to select this input. When he did this he had pictures, but he nevertheless whined at me.

"I don't have to reprogram every channel to input 2, do I?" he complained.

"Looks like it" I replied, encouragingly. He continued to moan, so I told him to bring the troublesome receiver to the workshop.

I suspected failure of Q25, and was surprised to find that the LNB voltage was present. Q25 was obviously OK. I pressed F, then store, to turn off the blue screen generator. After that the TV set displayed snow on every channel.

A replacement tuner made no difference, and voltage measurements in this area proved that everything was working correctly. So why no pictures? It occurred to me that power supply interference might be switching my universal LNB to high band. To check, I put the receiver into the frequency-scan mode. Sure enough, pictures were available at the top end of the tuning range. But a quick probe with my oscilloscope showed that there was no ripple on the LNB supply, so that idea was wrong.

I decided to check the installation menu, and found that input 1 had 10·750GHz selected for the LNB's local oscillator. Once I'd changed this to 9·750GHz normal operation was restored. I'm not sure who won the 'idiot's prize' for this one: the installer for not checking it; me for not realising sooner; or the customer who must have altered the setting!

Pace PRD800+

This receiver arrived with a label that said "Sky News scrambles after thirty seconds". It did, and the other encrypted channels also did so. I'd not seen this symptom before, but I had my suspicions that the cause was a decoder switching problem rather than a decoding one. The problem was solved by replacing the PTV2 chip – with one obtained from a scrap receiver.

Decoder problems can be very difficult to diagnose without the correct equipment. I was probably lucky this time, but experience plus a basic knowledge of how the signals are routed is always a help.

Nokia ACU8152 Positioner

I love decorators! Mr Winstanton is a typical satellite enthusiast. He has

an enormous motorised dish, a Nokia receiver and an Antenna Control Unit (what we call a positioner). Nokia equipment is generally very reliable, but Mr Winstanton had had the decorators in while he was at work. He hadn't thought about labelling his cable connections so, when he returned, he found that the decorators had disconnected everything and left him to sort it all out.

Apparently he stuck wires into connectors in a random fashion, and the result was a non-working positioner. It would send the dish east or west with a few jerks, then stop. I normally turn away anything associated with motorised systems, because the customer will want me to spend four hours reinstalling the system for no wages. On this occasion however a local installer had been brought along, so I knew that I wouldn't be lumbered.

The ACU8152 positioner had a screw missing, and Mr Winstanton saw my worried look.

"Oh, Wossname up Church Street had a quick look. He couldn't find anything."

I agreed. He clearly couldn't find all the screws either!

Fortunately the PCB didn't appear to have been touched.

I inspected the pulse input protection circuit, which consists of two 6·8V zener diodes, DA27 and DA28, and two 10µH inductors, LA04 and LA05. Of these, LA05 was clearly burnt and DA28 discoloured. My ESR meter indicated that they were both short-circuit. After removing both components I confirmed this with a multimeter. It seemed that someone (I glanced at my customer) had connected the wires incorrectly!

Replacement of the two damaged parts seemed to be all that was required. When we met in the Lion and Swan later that evening the installer confirmed that the repair had been successful. I charged him two pints and a tenner. That must have been cheap, because he grinned.

Pace MSS200

This receiver arrived in a local installer's van. His customer had complained that the screen flashed "LNB Short", but when I connected the receiver up it wouldn't come out of standby. The fault report was useful however, since it prompted me to check the LNB current-sensing resistors. In this model there are two 1·8Ω surface-mounted resistors which are connected in parallel, just below the front edge of the board. They were open-circuit.

The installer was in a hurry, so I confess to a bodge. When I soldered a 1Ω fusible resistor across the burnt out current-sensing resistors the receiver worked perfectly. The installer payed up with good grace, and I warned him to find the short-circuit in the cable or the LNB before reconnecting the receiver.

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

jacksat@netcentral.co.uk

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

Test Case 439

As VCR decks become more flimsy and 'plasticy' with each new design, one cannot help but wonder how long they are going to last. Certainly not the ten, twelve or more years of their sturdy predecessors from a decade or more ago – whose prices in real terms were much higher.

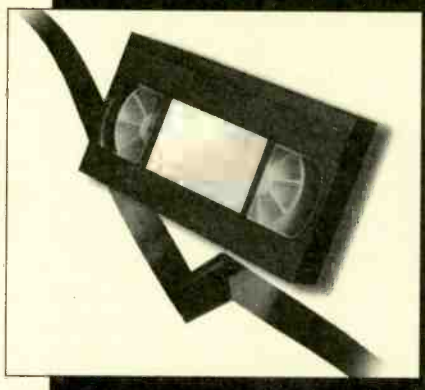
A typical example of sturdy build and longevity came into the workshop recently and arrived on TechnoCrat's bench. It was a Mitsubishi Model HSM37, born in 1992 and set to go well into the new millennium – at least once it had been properly repaired. A cassette was stuck inside, with the tape fully laced around the head and the loading mechanics apparently stuck fast in this position. TechnoCrat's first test – an excellent opening move in cases like this – was to hook a DC-coupled oscilloscope across the loading motor. It revealed that 12V was being applied to the motor, which remained still, when the VCR was connected to the mains supply. This suggested a mechanical fault, which was confirmed when the worm on the motor shaft was found to be difficult to turn by hand.

Once released however the mechanics – indeed the whole machine – worked perfectly, and it took much cycling of the deck to get it to jam again. When it did, there was a sort of 'graunchy squeak' from the region of the motor and its driving worm, after which it was again bound up solid, as if it had overrun – perhaps because of failure of the mode switch to signal 'fully loaded' to the control system at the crucial moment. That was TechnoCrat's conclusion anyway. So he fitted a new mode switch, and called it a rotary encoder to impress the customer. As a precaution, he also removed the pinch-roller assembly and its drive cam and cleaned their bearing surfaces and the two shafts: seize-ups here commonly cause breakage of the guide lugs on the pinch-roller assembly. Lots of hardened grease was cleaned off and replaced with a better lubricant. The customer happily paid the bill and took his Mitsubishi home.

It came as something of a surprise when, two days later, the recalcitrant machine was back in the workshop, having once more jammed with the tape fully loaded. Its owner, waving his invoice and receipt, expressed his opinion about the situation very freely to TechnoCrat, who took the machine straight back to his bench. He found that, as before, the loading worm and pinion were tight – too tight for the motor to release them even when, again as before, the control system applied 12V to it as soon as the machine was plugged in. When the worm was forced around by hand it soon released, then the machine worked all right – until the next time!

It was unlikely that the new mode switch was defective. It was also unlikely, in view of the recurrence of the fault, that the previous one had been faulty. Nor, TC thought, was it likely that the control system was responsible for the fault. The loading-motor drive chip may perhaps have been doing funny things, but the drive electronics tried to restore order at switch on.

The cause of the trouble was subsequently tracked down, and was repaired at no further charge. The machine has now been running happily for many weeks. What had ailed it? For the solution, turn to page 656.



VCR Clinic

Reports from
Philip Blundell, AMIEelec
Eugene Trundle
Chris Watton
Gerald Smith
Colin J. Guy
Pete Gurney, LCGI
Terry Lamoon
Denis Foley and
Ronnie Boag

Panasonic NVFS100B

For the first half hour or so the playback picture was ragged with low contrast. This suggested a dried-up electrolytic capacitor, but the hairdryer seemed to have no effect. My thanks to Steve at Merrivale who suggested checking for faulty electrolytics in the two metal screening cans on the small PCBs in the base of the machine. C1 (1µF) on the small piggyback board VJB03680 was the main culprit, though C9, C10 and C16 produced faulty readings when checked with a capacitor bridge. Fit 110°C replacements. **P.B.**

Grundig VS540

A locked-up machine with AO showing in the display usually means that the security lock is set. If you clear the lock by connecting together for a moment the two test pins on the front PCB, then find that the timer and station tables are filled with gibberish, the back-up battery is probably flat – but not always.

Sometimes the battery is fine but the RAM has somehow lost its contents. Check the soldering around IC190, IC120 and IC119 on the sequence-control (lower) PCB. If there are no dry-joints here, replacing the PCF8583 clock/RAM IC and the back-up battery as a pair should cure the problem.

To avoid having to change the Nicad battery every few years, the manufacturer suggests removing the charging diode MD612 and fitting a lithium battery (27400-220-97) instead. **P.B.**

Hitachi VTF550E

If you have problems with cassette lift operation or tape threading, remove the deck and see what falls out! You could well find that the clutch assembly has come apart (manual reference number 229 231 239). The Hitachi part number is KX17581. **P.B.**

Ferguson FV82LV

The E-E picture was snowy though aerial loopthrough and playback of a known good tape were fine. Continuity checks on the main PCB revealed that the track from the tuner's output to the IF module's input was open-circuit. **P.B.**

Philips VR6557

If one of these machines comes in dead, check whether the N20 Wickman circuit protector CP801 is open-circuit. **P.B.**

Tatung TVR912/914

These machines were made by **Sharp**. This one would jump between SP and LP during playback of its own LP recordings. The cause of the fault was within IC801, which combines the functions of system and servo control and the CTL amplifier. It's quite an expensive chip. **E.T.**

Matsui VX1100

This model's Orion deck is also used in the **Tatung** DVR634/832, TVR734/932 etc., the **Orion** VLBF and no doubt other machines. It's becoming common for them to suffer from intermittent front-loading problems, in which case the machine may shut down at some point during the cassette-loading cycle or eject as soon as front-loading is complete.

The cause is usually the mode switch, which is available as part of a small, cheap PCB assembly. Alternatively the centre-cassette LED can be responsible. **E.T.**

Amstrad TVR3

This combi unit's VCR section didn't produce colour. The cause was the AN3331K chip IC1 in the head amplifier module. You may not spot this item in the service manual, as the IC reference doesn't appear. To check it, play back a test tape while monitoring the video waveform at test point 9. No waveform or only noise usually means that the IC has failed.

An alternative symptom is sometimes seen: the picture is in monochrome for a second when the tape starts to play, then takes on a greenish hue. **C.W.**

Aiwa HVF125

The card said that this machine rewound all the time. Prior to removing the cover I suspected an end sensor fault. I then discovered that the tape didn't lace up fully and that the pinch roller was stuck at the top of its shaft. It had seized up because the grease had turned into glue. A clean up and relubrication restored normal operation. **C.W.**

Daewoo V225

The cause of a dead machine can be failure of the chopper transistor's base drive coupling capacitor C53 (1µF, 100V). It's inside the power supply can. **C.W.**

Sharp VCMH60HM

This machine wouldn't record video – the old picture was still present. Checks showed that there was no drive at the full erase head: the bias oscillator wasn't in opera-

tion, because the 8V bias line voltage was missing. The cure was to replace Q950. **G.S.**

Grundig GV6401

There was no E-E sound output from this VCR. Playback was normal, and the machine's recordings were OK when played back via another VCR. Audio from the tuner arrived at the sound processing PCB, but there was no RF or scart output from it. IC7100 had audio signals through to the noise-reduction section at pins 44-48, but there was no output at pins 17-22. A replacement chip restored normal operation. **G.S.**

Panasonic NVG40

The E-E and looped-through signals were very weak. The cause was not a faulty aerial amplifier this time. Because Q1004 in the power supply was open-circuit there was no 12V supply to the aerial amplifier. **C.J.G.**

Sanyo VHR287E

It took me a long time to be convinced that this machine had a fault. The customer insisted that it would stop after half an hour, but it wouldn't stop for me – with my tape, the customer's tape or even when wrapped up in a blanket. When it came back for the third time, the customer mentioned that the fault occurred in the record mode only, never during playback. Some time would have been saved if I had been told this in the first place. Sure enough it did stop.

While discussing the fault in the pub with a friend who works for a national rental company I discovered that the fault is a common one in this range of machines. The cure is to replace fusible resistor PR512. It's a safety component – the correct type is available from CHS. **C.J.G.**

Matsui VP9301

There were no E-E signals, just snow. I found that R6035 (33kΩ) in the tuning voltage filter was open-circuit. **C.J.G.**

Panasonic NVHD100

This machine would shut down a few seconds after powering up. Its capstan motor couldn't rotate because the brake pad was stuck solid to the flywheel. A clean up and a new brake unit, part no. VXA5138, cured the fault. **C.J.G.**

Sharp VCA140HM

The complaints with this old machine were that it chewed tapes intermittently, that lines sometimes appeared on the picture, and that the sound sometimes disappeared. After a long soak test I discovered that the fault symptoms put in an appearance only after a function change or when a new tape was inserted. The cause was the half-loading arm, which would intermittently stick because the grease had become quite viscous. When the arm jammed, the tape was lifted from the AC head to a varying extent.

The cure was to remove, clean and realign the arm. The pinch roller was replaced as a matter of course. **P.G.**

Sony SLV270UB/Grundig VS600

This machine had failed when it was disconnected from the mains supply to be moved from one room to another. When it was reconnected the clock display remained out and an audible squealing came from the drum as it tried to rotate to initialise. Suspecting a power supply fault, I checked the various supply lines with an oscilloscope. There were large amounts of ripple on most of them. The main causes were C1736 and C1737, which are both 220μF, 25V. When checked with an ESR meter they were found to be virtually open-circuit. For reliability I replaced all the electrolytic capacitors on the secondary side of the power supply, using low-ESR types. **P.G.**

Hitachi VTF860E

This VCR was dead with no clock display and no output from the power supply. Quick checks on the primary side of the power supply confirmed that there was 320V across the mains bridge rectifier's reservoir capacitor, and that all the fuses and safety resistors were intact. As I didn't have a circuit diagram, I then set about finding out how the start-up supply is obtained. It appeared to be derived from three series-connected resistors across the 320V DC supply, with a kick-start capacitor (C6) connected two-thirds of the way down this network. When I checked C6 I found that it was open-circuit. A replacement (1μF, 250V, 105°C) restored normal operation. **P.G.**

Toshiba V218

The customer complained that this machine wouldn't start up from switch on at the mains – he didn't leave it plugged in overnight. I found that the start up voltage at TW020 was very low. Tracing back through the circuit I came to RP024 which should read 47kΩ but read very much higher. A replacement cleared the fault. **T.L.**

JVC HR255

There was no drum rotation. Voltage checks showed that there was no LT supply to the drum. The N15 circuit protector CP4001 was open-circuit. Once this had been replaced there was normal operation. **T.L.**

Sanyo VHR798

This machine chewed tapes. When I inspected the deck I found that the tension band had come away from its metal band and got stuck in the gears. A new band and a new mode switch were fitted, then the machine was given a good clean. After that it worked well. **T.L.**

Toshiba V856

Intermittent failure to record in colour was the complaint with this machine. It can be a tricky fault to trace, so I decided to consult Toshiba Technical. Their suggestion was to replace CV30, which tends to develop leakage. A new 0·047μF capacitor, part no. 70041704, did the trick. **T.L.**

Ferguson FV62LV

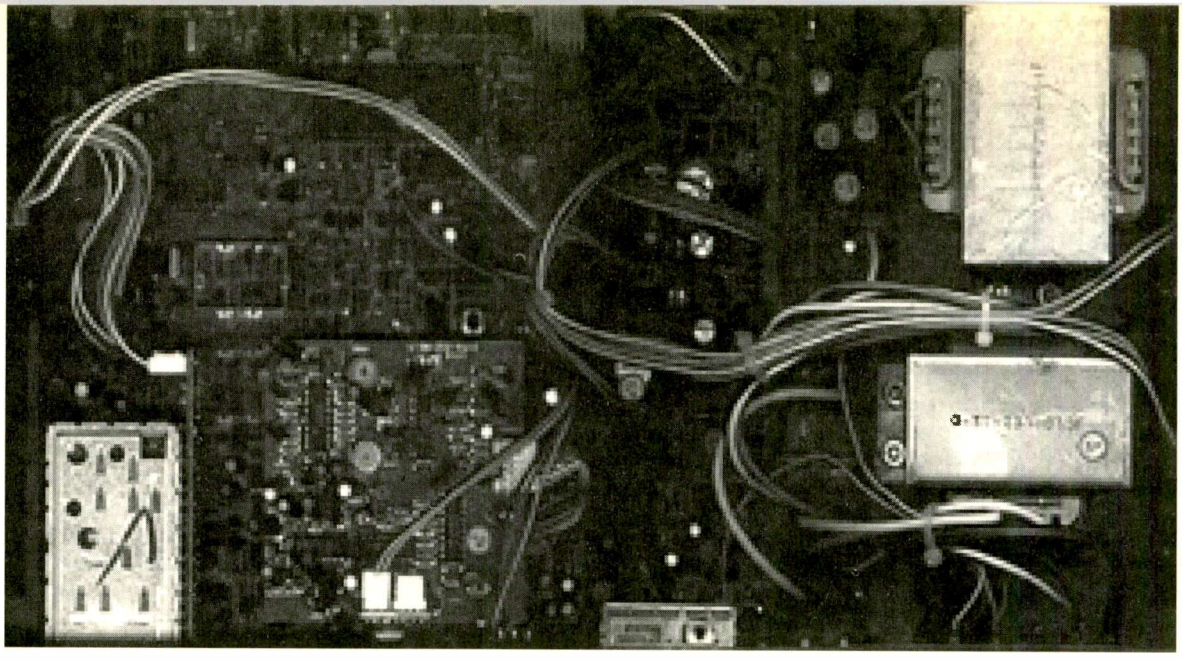
The playback picture flickered from side to side with loss of line sync and no colour. When I placed a finger gently on the top edge of the drum to slow it down there was a near normal picture. It appeared that the servo control was defective, but there was nothing technical about the cure. Inspection of the head motor and the photosensor on the motor panel showed that an extraordinary amount of dust was present. Use of a soft brush to remove it was all that was required to restore normal pictures. **D.F.**

Sanyo VHR775

This machine sometimes failed to accept a cassette. There was also noisy loading and unloading. Replacement of the mode switch and the loading motor cured the faults. **R.B.**

Ferguson FV95V

This VCR wouldn't accept cassettes: the loading motor ran all the time. The cam lever was broken. I replaced the mode switch as well as a precuation. **R.B.**



Satellite Notebook

Reports from
Christopher Holland
Hugh Cocks
Pete Haylor and
Pete Gurney, LCGI

Digibox use with a motorised dish

Very occasionally you come across a satellite enthusiast customer who wants to connect a digibox to an existing motorised dish controlled by an analogue receiver-positioner such as the Pace MSS500 series. If not already installed, a prime-focus universal LNB must be fitted. The dish motor limits may then need to be adjusted so that the motor can drive the dish to the 28·2°E Astra 2A position. If the customer has a particular interest in the French Telecom satellites, which have a non-standard polarisation skew compared with Astra/Eutelsat, he should be encouraged to go for a fixed SkyDigital dish.

A universal LNB's optimum low-band and high-band skew settings can be fractionally different – because the signal rotation in the feed alters at the different wavelengths, from 10·7 to 12·7GHz. A good method of adjustment is to start by optimising the skew with Moroccan TV from Eutelsat at 16°E. The signal is at 10·97GHz, with vertical polarisation (there is almost nothing with the opposite polarisation, and any cross-polarisation is easily seen). Mark the position on the feed, then reoptimise the skew at 28·2°E. Make another mark, then finally set the feed midway between the two marks.

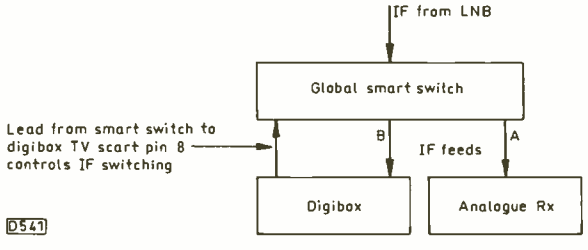


Fig. 1: Connection of a digibox to a motorised-dish system via a Global Communications smart switch. The LNB must be a universal, prime-focus type. The dish is controlled by the analogue receiver – the connection is not shown here. The digibox controls the operation of the smart switch via pin 8 of its TV scart socket.

Dish position is fairly easy to set with a receiver such as the MSS500. If you've just fitted a universal LNB, remember to set the LNB type as universal in the installation menu. Then go to high band and enter 11·727GHz, horizontal polarisation. As the dish is driven east from the Astra 1 position at 19·2°E, there should be a large signal-strength readout deflection on the front panel when it reaches the new position, though no picture is seen. Unfortunately the analogue PAL test pattern that was transmitted by Astra 2A at 11·991GHz horizontal is no longer there! The new satellite position can be stored in the receiver as a convenient channel number for the customer. I often use 111 or 222: the receiver has 500 channels, so why not make use of a convenient, high number?

The mechanical reset accuracy of some older dishes leaves something to be desired. It's best to show the customer how to fine tune the dish position E-W, using the analogue receiver, though he probably knows about this already if he's an enthusiast!

Next comes the problem of connecting the two receivers to one LNB feed. Unfortunately the digibox produces a continuous 22kHz tone at its IF input. Thus if the digibox is powered and connected via a two-way IF splitter, the universal LNB will remain at high band – 11·7GHz upwards – leaving the analogue receiver with not much to see!

A new switching device that takes this into account has recently been introduced by Global Communications. Port B is connected to the digibox and port A to the analogue receiver, see Fig. 1. A flying lead goes to pin 8 of the digibox's TV scart socket. This is a high-impedance lead, and can be fitted in parallel with the existing TV scart socket to allow automatic TV/AV switching to continue. When the digibox is switched from standby to normal use, the voltage at pin 8 of its TV scart socket goes to 12V: the Global Communications smart switch then routes the IF away from port A, the analogue output, to port B for the digibox.

Some care is required when a digibox is used with a movable dish. It can 'crash' from time to time. The customer must be made aware of this and shown how to restore normal operation by unplugging at the mains supply then reconnecting it.

Extra channels from another satellite can be added to the digibox provided the symbol rate is 22,500 or 27,500. If the customer wants to pick up a lot of digital free-to-air channels however he should be persuaded to buy a receiver designed for the job.

If the customer has agreed to a telephone line connection in his contract, remind him to park the dish at 28·2°E when it's not in use

and to leave the receiver on, not in standby. Otherwise it won't have a live signal feed from the dish – this could be a problem if a software upgrade is sent over the air or the box is asked to "phone home" over the air. **C.H.**

Dutch Digital Problem

The owner of a two-year old Pace DVR500 digital receiver said it stopped producing pictures at about 10 p.m. each night. At about 10 a.m. next morning the pictures would return as quickly as they had disappeared. The dish was correctly aligned, and I didn't fancy waiting around until 10 p.m. to see a blank screen! The receiver indicated that it had found its default frequency but couldn't load up or produce any channels.

We'd been having some relatively cold nights, and the LNB in use was an early Cambridge universal type. When I removed its outer cover I found that the inner cover's securing screws were far from being as tight as they should have been. If the inner cover isn't tight, all sorts of strange microwave feedback effects can occur within the LNB. I suspected that the cold night-time temperatures made the LNB go unstable. So I tightened the inner cover down and arranged to call back in a few days, during which time the owner could monitor his system's behaviour.

He phoned that night to tell me reception was perfect. When I called a couple of days later to check, everything was OK. **H.C.**

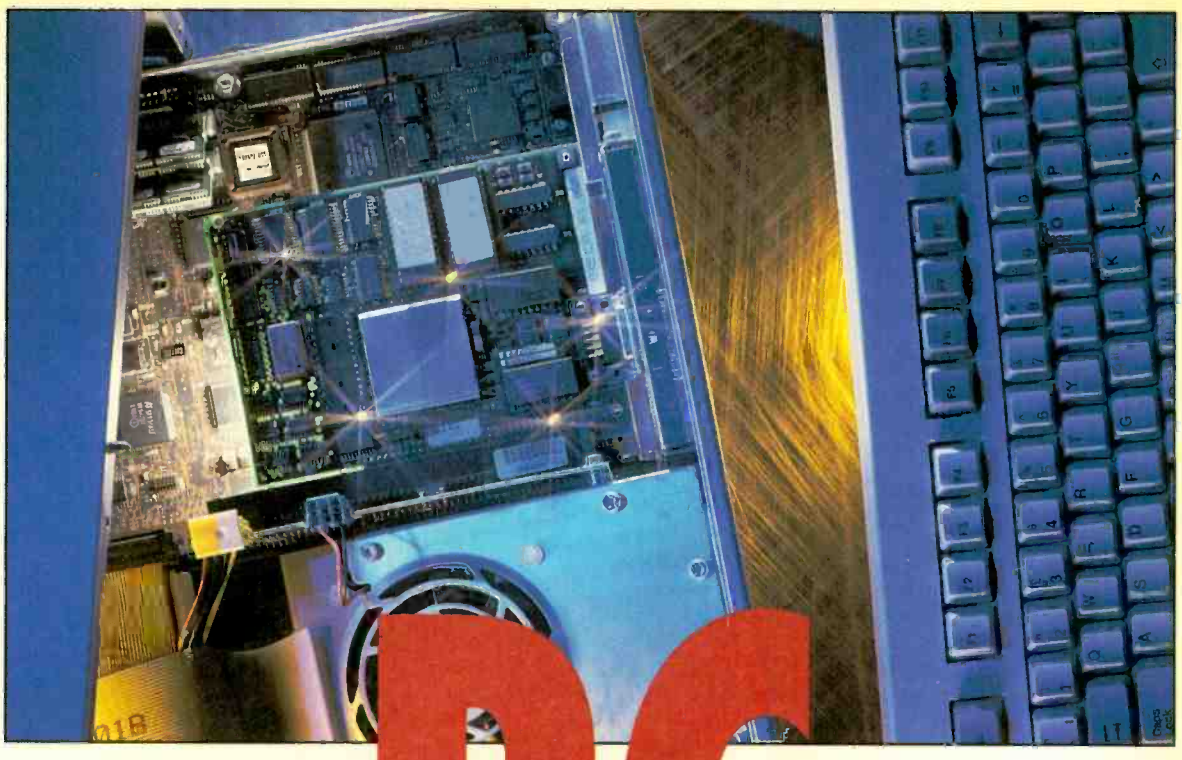
Fault Round-up

Pace D150: This receiver was dead because its 100kΩ, 2W, 2% start-up resistor R212 was open-circuit.
Echostar SR90: This receiver was brought back to life by replacing C805, C810 and C625.
Pace MSS1000: When this receiver had warmed up, the picture slipped sideways. The cure was to replace U29 (PTV111) on the VideoCrypt panel.
Pace Prima: This receiver was dead because the TOP201 chopper chip U1 had failed.
Pace MSS1000IP: Distorted sound was cured by replacing C11, C12 and C216.
Pace PRD800/900: Several of these receivers have come in dead with capacitor trouble: replacing C5, C7 and C8 restored normal operation. **P.H.**

Amstrad SRD550

This receiver suffered from the usual leaking capacitor problems on both the primary and secondary side of the power supply and was tripping. I replaced all the capacitors, using the correct types, cleaned the board, then powered the receiver. Unusually, the supply still refused to start and continued to trip, accompanied by a rather evil hiss. Fitting a known good power supply panel proved that the cause of the problem was definitely on the original one, but the culprit was difficult to isolate.

It was purely by chance that I saw a small wisp of smoke appear from the chopper transformer. Although the transformer seemed to be sound electrically, a replacement cured the fault. **P.G.**



This concluding instalment of K.F. Ibrahim's series deals with logical PC fault-finding procedures

PC Operation & Repair

K.F. Ibrahim is a Senior Lecturer at the College of North West London. This series of articles is based on Mr Ibrahim's book *PC Operation and Repair* which was published in April last year by AWL under the Longman imprint.

Fault finding must follow a logical sequence, whose purpose is to identify the cause of the fault then rectify it. The number of tests carried out should be kept to a minimum: unnecessary or pointless tests must be avoided. Ensure that the fault-finding process does not itself cause damage, introduce further faults or create conditions for potential component failure in the future. For this reason, strict precautions must be taken at all times.

The fault-finding process begins with turning on the computer and observing what happens. A 'dead' PC points to a power supply, a system clock or a reset failure. Otherwise a boot-up process will commence. Amongst other things, this carries out a number of checks that test the integrity of the system. These checks include a series of self tests in addition to an examination of the PC's setup and configuration. Being an intelligent device, the PC displays basic information on the system's configuration while carrying out these checks, and where necessary generates error messages and beeps. A vast amount of information on the PC system's working condition can be gained from these initial checks. This information is indispensable for fault finding.

A number of diagnostic aids are available and are useful to varying degrees. The best aid however is a good knowledge of the workings of the system coupled with a logical approach to fault diagnosis.

Precautions

Precautions of two types must be taken before any attempt is made to check a PC for faults. These are software/anti-virus and hardware/antistatic.

A virus is an unwanted fragment of computer instruction code or a program that can replicate itself in other areas and cause loss of data or degradation of a program. Apart from program failures or loss of data, a virus may introduce malfunction symptoms that are similar to those produced by actual software or hardware faults. For this reason, viruses must be isolated and removed before any attempt is made at fault finding.

Microsoft and other software providers supply anti-virus routines that must be used to create a virus-free working condition. This involves checking for viruses in the PC, scanning all its components including memory and the hard disk, and also checking all floppy discs before they are used.

Movement of the human body generates energy in the form of an electrostatic charge. When electric contact is then established with a device, be it a PC, TV set or other piece of equipment, an electrostatic discharge (ESD) takes place. It consists of a very brief flow of current. Although the discharge current is very small, the voltage can be in the region of a few thousand volts. A discharge of this type can damage MOS-based ICs such as CMOS and NMOS support and memory chips. The result of the ESD may be instant failure, but it is more likely that chip(s) will be weakened and their life span shortened.

Antistatic precautions are as follows:

(1) Use an earthed wrist strap designed to provide static discharge or, alternatively, touch earthed metal when handling PCBs and components.

(2) Handle PCBs by their edges only. Avoid touching the components on the PCB.

(3) When handling components, avoid touching the pins.

(4) Use an earthed antistatic work surface or mat to ensure that all parts of the surface are kept at the same potential (earth).

(5) Keep all system and other PCBs, as well as peripheral devices, in antistatic bags when not in use.

(6) Touch an earthed metal object or wear an earthed antistatic wrist strap when removing a board, component or device from its antistatic bag.

(7) Make sure that the system's chassis provides good earth contact between the power supply unit, the case, the mounting fasteners and the motherboard.

Boot-up Failure

Table 1 lists, stage by stage, the sequence of events in the boot-up process following a system power-on. If the process comes to a halt, this will provide a very good indication of the cause of the trouble. The point at which failure occurs can be deduced by careful observation of the symptoms, including any displayed messages and listening to any sounds and beep codes.

Stage 1 failure (a 'dead' PC): A check on the mains power cable and the mains fuse is an obvious first step. If the PC is dead with the cooling fan in operation, there could be a power supply fault, a system clock or reset failure, or a short-circuit on the motherboard, an expansion card or a peripheral. There is no particular order in which tests should be carried out: it's a matter of preference and intuition. The following is intended as a guide.

The power supply outputs could be tested first. The best place to do this is as the power supply connection on the motherboard. Correct voltage readings, including the Power Good line, indicate that the power supply is OK. Alternatively, replace the power supply with a known good one of the same specification. The system clock can be checked at B30 of one of the ISA slots, using a logic probe. Where a reset button is provided, its operation can be quickly tested by disconnecting it from the motherboard. Otherwise, use a voltmeter to check the voltage as the computer is reset or rebooted.

If a short-circuit is suspected, disconnect the power

Table 1: The boot-up process.

Stage	*Action*
1	The cooling fan rotates and the DC outputs from the power supply build up to their working level. The hard disk begins to rotate – it makes a slight whirring sound.
2	The BIOS performs POST (Power On Self Test) routines as follows: (1) Motherboard test, including processor and other support chips. Coded beeps indicate errors. (2) Video adaptor test. A successful test is indicated by the appearance of a cursor or some sort of display on the screen. Errors are indicated by coded beeps. (3) Memory test. The total size of the system memory is usually indicated when the test is completed. (4) Peripheral tests. These include the hard and floppy disk and CD-ROM drives, serial and parallel ports, the keyboard and mouse. Flashing LEDs may indicate a device test. Errors may be reported as coded beeps or on-screen messages. (5) A single beep indicates a successful series of tests.
3	System configuration is displayed on the screen. The information provided depends on the ROM BIOS manufacturer, its version and date. Two different configuration displays, AMI and Award, are shown in Fig. 1.
4	The operating system is loaded. The usual boot-up sequence is A:;C:. Flashing indicator LEDs may indicate the sequence.
5	CONFIG.SYS and AUTOEXEC.BAT file information is executed, in that order.
6	The MS-DOS prompt appears on the screen.

AMIBIOS System Configuration (C) 1985-1994, American Megatrends Inc.,

Main Processor	: 80486DX2	Base Memory Size	: 640KB
Numeric Processor	: Built-In	Ext. Memory Size	: 3072KB
Floppy Drive A:	: 1.44 MB 3·5"	Display Type	: VGA/EGA
Floppy Drive B:	: None	Serial Port(s)	: 3F8, 2F8
AMIBIOS Date	: 10/10/94	Parallel Port(s)	: 378

Hard Disk(s)		Cyl	Hd	Sec	Size	LBA Mode	32Bit Mode	Block Mode	PIO Mode
Primary Master	: C:	1024	12	34	204MB	Off	Off	16Sec	3

Award Software, Inc.
System Configurations

CPU Type	: 80486DX2-S	Base Memory	: 640K
Co-Processor	: Installed	Extended Memory	: 7168K
CPU Clock	: 66MHz	Cache Memory	: 256K

Diskette Drive A	: 1.44M, 3.5in.	Display Type	: EGA/VGA
Diskette Drive B	: None	Serial Ports	: 3F8, 2F8
Pri. Master Disk	: Mode 1, 272MB	Parallel Port(s)	: 278
Pri. Slave Disk	: None		
Sec. Master Disk	: None		
Sec. Slave Disk	: None		

Fig. 1: Two practical system-configuration displays.

Table 2: AMIBIOS beep codes.

Beeps	*Message/meaning*
1	POST test successful.
2	Parity error. Parity error in the first 54KB of memory.
3	Base 64KB memory failure.
4	Timer not operational. Memory failure in the first 64KB, or Timer 1 on the motherboard is not functioning.
5	Processor error. The CPU generated an error.
6	8042 – Gate A20 failure. The keyboard controller may be defective. The BIOS cannot switch to the protected mode.
7	Processor exception interrupt error. The CPU generated an exception interrupt.
8	Display memory read/write error. The video adaptor is missing or its memory is faulty. This is not a fatal error.
9	ROM checksum error. The ROM checksum value does not match the value encoded in the BIOS.
10	CMOS shutdown register read/write error. The shutdown register for CMOS RAM has failed.
11	Cache error/external cache bad. The external cache is faulty.

Table 3: Interrupts.

IRQ	*Function*
0	Reserved for interval timer.
1	Reserved, keyboard buffer full.
2	Reserved, cascade interrupt for slave PIC.
3	COM2*
4	COM1*
5	LPT2. Plug and play option/audio/user available.
6	Floppy disk drive.
7	LPT1*
8	Real time clock.
9	User available.
10	User available.
11	Windows sound system*/user available.
12	On-board mouse port (if present, otherwise user available).
13	Reserved, math coprocessor.
14	Primary IDE (if present, otherwise user available).
15	Secondary IDE (if present, otherwise user available).

*Default, but can be changed to another IRQ.

cables that supply the motherboard, the hard-disk drive (HDD), the floppy-disk drive (FDD) and other peripherals one by one. After each disconnection, turn on the power supply and check its DC outputs. When you do this, at least one set of power cables must remain connected – to either the motherboard or a peripheral. If necessary repeat this process, this time by removing the expansion cards one at a time. This process of elimination will enable the faulty item to be located.

Cooling fan failure: If the cooling fan doesn't rotate there will be absence of the turning noise and air flow at the back of the PC. When the cooling fan fails, the power supply overheats and the result is a thermal cut-out: the power supply shuts down and the computer remains 'dead'.

The fan can be checked by connecting a 12V supply to its terminals. If it works, check its connections.

Stage 2 failure (POST error codes): Faults that are detected during the Power On Self Test (POST) are generally indicated by one or more types of error message. These come in three possible forms: audible beeps, I/O POST codes, and displayed messages. To benefit from the latter, a video card and monitor in good working order are required.

Error beeps generated by the computer are coded in accordance with the BIOS manufacturer. Table 2 lists the beep codes produced by AMIBIOS. Other manufacturers, such as Phoenix, use more elaborate codes, with a combination of beeps to indicate a variety of errors encountered by the POST.

The I/O POST codes provide a more reliable and detailed error indication. As each POST test starts, a two-digit HEX code is entered into I/O port 0080H. It can be displayed by slotting a POST adaptor card into an ISA expansion bus. If the PC fails at any point during the start up process, the POST code present at port 0080H indicates the failed test. If you know the full sequence of POST codes generated by the BIOS in use, the displayed code will identify the fault area.

A more straightforward fault indication is provided by error messages on the screen, such as C: DRIVE ERROR or KEYBOARD ERROR.

The motherboard can be the source of a wide variety of faults, such as defective processor or support chips or a faulty expansion slot. There may be a faulty adaptor card. Before you replace the motherboard, try to isolate the defective device so that the fault can be cleared by replacing just the defective component or card. You may have to remove adaptor cards one at a time and replace the CPU and other pluggable components such as the keyboard controller chip, using known good units.

On-board options provided by the motherboard, such as serial/parallel ports and IDE (Integrated Drive Electronics) connectors, can be checked by first disabling the option (change the relevant part of the CMOS setup) then installing the peripheral (adaptor card such as an I/O or IDE controller).

Stage 3 failure – system configuration errors: Configuration errors invariably cause start-up failure. Some configuration errors, such as FDD or HDD types and parameters, may be recognised by careful observation of the displayed system configuration. Correct errors by carrying out the appropriate changes to the CMOS setup.

Stage 4 failure – no operating system: After a successful POST, indicated by a single beep, several factors can cause failure to boot up by loading the operating system. For example, a non-system floppy disc may be inserted in drive A:. In this case, remove the disc and attempt a reboot. Alternatively there may be absent system files in drive C:, a wrong configuration, or wrong cabling to drive C:.

First try to boot the system up from drive A:, using a known good system disk. If the start up is successful, check drive C: for hidden system files (IO.SYS and MSDOS.SYS) and the not-hidden file

COMMAND.COM. The MS-DOS command DIR C:/A will display all files, with their attributes. Any missing system files can then be transferred from the system floppy disk (with Windows 95 this means a Windows 95 startup disk) by command SYS C:. This command usually transfers COMMAND.COM as well. If not, a simple copy command will suffice.

If the system fails to recognise drive C:, an unformatted or unpartitioned hard disk may be the cause of boot-up failure. Check by entering the partitioning procedure, using command FDISK. At least one partition must be created on the hard disk: it must be set ACTIVE for the operating system to be loaded from drive C:. Each partition must be formatted separately. Formatting erases stored data and should therefore not be attempted unless absolutely necessary.

Boot-up failure can also be caused by incorrect parameter entry of drive C: (master drive) in the CMOS setup, wrong cabling, or loose connections for the power and data/control lines. Check these before you consider replacing the hard disk.

Stage 5 failure: errors in CONFIG.SYS AND AUTOEXEC.BAT: Faults in these files do not usually prevent PC boot-up. Errors are normally indicated on the display. Such errors can be avoided by pressing F8 to bypass or single-step both files at the point when Windows 95 begins to be loaded. This can be followed by booting up in the safe mode. For MS-DOS, press F5 to single-step both files or F8 to bypass them.

When rectifying faulty entries, pay attention to the loading of device drivers and other TSRs for most efficient use of the available memory space.

Responding to Error Messages

Follow up error messages and codes by first checking relevant cable and adaptor card connections, such as the mains and video cables when confronted by a blank monitor screen. In this particular case, check the operation of the monitor's brightness control and examine the video card to ensure that it is properly inserted in the expansion slot.

When there is a memory error, ensure that the SIMM and/or DIMM modules are properly seated in the slots. Before you replace SIMMs, empty the memory banks one by one, with the higher-numbered banks first, and reboot the system. The faulty module(s) can thus be isolated and replaced with known good ones. To ensure compatibility with the CPU's clock frequency, check the speed of any replacement memory chips.

Faulty Peripherals

Either a software or a hardware fault can be the cause of malfunction of a peripheral device. The majority of faults, such as wrong cabling or configuration, may be picked up during the POST routine. A fault in the adaptor/controller card however, or in the device's electromechanical and control units, such as a disk's read/write head or a CD-ROM's speed control circuitry, can be confirmed only by replacing the card or the peripheral device with a known good one.

Conflict Faults

A PC provides fifteen hardware interrupts (IRQs) for use by hardware devices and their adaptor cards. Some, such as IRQ0 (system timer) and IRQ1 (keyboard), are assigned for specific purposes and are therefore not available for other use. Table 3 lists the IRQs and their allocations. A number of port addresses, such as 330H and 240H (H for Hexadecimal), are also available.

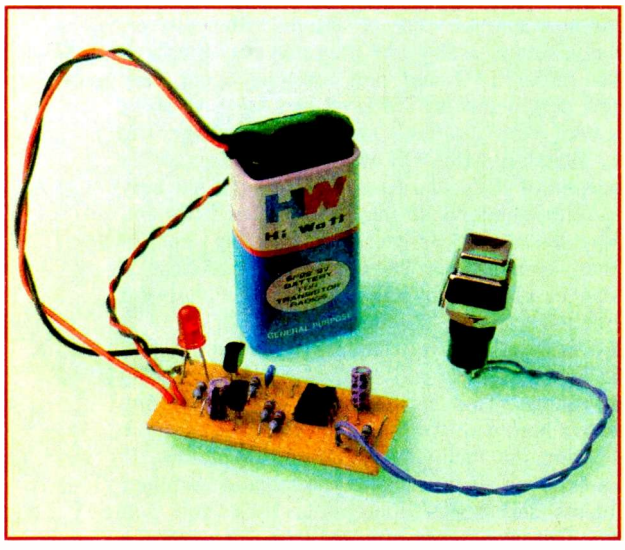
When it is necessary to allocate IRQs and port addresses to peripherals, it is important to ensure that the same IRQ and/or port address is not allocated to more than one peripheral device. Should this happen, it's known as a conflict and neither peripheral will operate correctly. IRQs and port addresses can be assigned manually or, more likely, automatically with plug-and-play (pnp).

Conflict faults (IRQ and port address) occur only when new peripherals are installed or CMOS setup or adaptor card configurations are changed. Diagnostic routines, including MS-DOS MSD, that purport to list the allocation of IRQs and base addresses are not very reliable. With Windows 95 the allocation of IRQs and port addresses can be observed by selecting 'control panel' then 'system' then 'device manager'. Their allocation can be checked by clicking on each hardware peripheral and selecting 'resources'.

When a new adaptor is installed, Windows 95 will ascertain its requirement and assign an appropriate IRQ and port address. This can be carried out by selecting 'add/remove hardware' from the control-panel window and following the menu-driven routine. Windows 95 will then examine all the installed peripherals and their requirements and assign appropriate IRQs and port addresses. This takes a relatively long time. It is also the way in which conflicts can be resolved.

Alternatively, and more reliably, conflicts can be resolved by removing or disabling the peripherals and their controllers one at a time. Each time a peripheral is removed, the system should be tested to check whether the conflict has been resolved. This enables the offending peripheral to be identified.

An Auto Power-off Switch



Alan Willcox has designed this auto power-off switch to save on current consumption with low-power, battery-operated equipment. It's suitable in particular for use with the ESR meter project

This switch-off circuit was designed as an addition to the recently published ESR meter project (see March and April 1999 issues of *Television*). It's quite a handy little circuit however, one that can be used with other low-power, battery-operated (6-18V) equipment. The circuit uses a 555 timer IC which, in this application, is connected in the monostable mode. Fig. 1 shows a simplified block diagram of the 555.

The 555 as a Monostable Multivibrator

Operation of the 555 chip has been explained in detail many times, so only a few relevant points will be mentioned here. The active (timed) period is initiated when the voltage at pin 2 falls below one third of the supply voltage. The output (pin 3) remains high during the timed period, which is determined by the *RC* time-constant components connected to threshold pin 6. At the end of this period the capacitor is discharged via pin 7 and the chip reverts to the stable state.

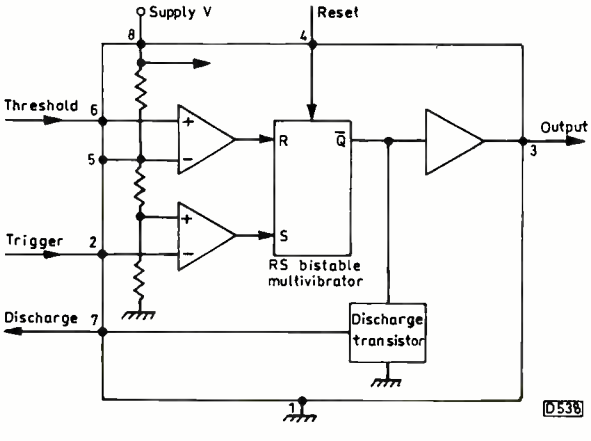


Fig. 1: Simplified block diagram of the 555 timer chip.

Circuit Description

Fig. 2 shows the complete circuit. In its quiescent condition both transistors are non-conductive, so no current is drawn from the battery. An initial supply to the timer chip IC1 is provided by closing the push-to-make switch SW1. At this stage the trigger input 2 is held low, because C2 is in the discharged state, so the timing sequence begins. The output at pin 3 remains high for the duration of the period determined by the time-constant set by the values of R1 and C1. Thus Tr2 switches on, providing a return path for the supply to the load, in this case the ESR meter circuit. Tr1 is also switched on, taking over from SW1, as forward bias is applied to it via R5.

The voltage across C1 rises slowly as it charges via R1. When the voltage across it reaches two thirds of the supply voltage, pin 7 goes low and C1 is discharged via a transistor within the chip. Pin 3 also goes low, so Tr2 switches off. The supply to the load is thus disconnected, and as Tr1 switches off as well IC1 ceases to be powered. The system has reverted to its initial state.

Because of the regenerative nature of the circuit as a whole, C3 is included to slow the response and avoid false triggering by transients.

SW2, which is connected to pin 4 (reset), is an option to end the timing period: it serves as a manual power-off switch. If this option is not required, omit R2 and connect pin 4 directly to the supply line.

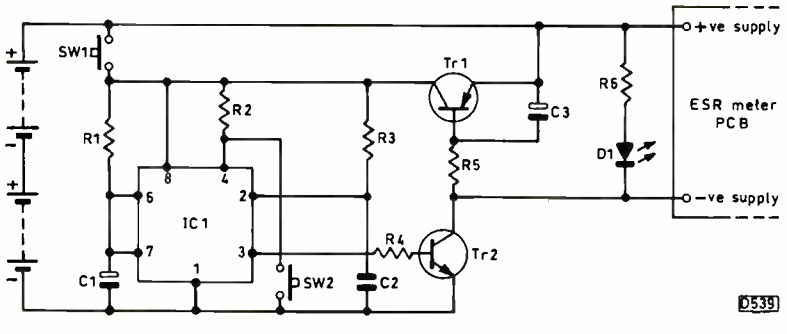


Fig. 2: Circuit of the auto power-off switch for use with low-power, battery-operated (6-18V) equipment.

Components

There is nothing critical about any of the components, which are readily available. For convenience, Maplins order codes are given in the parts list. The CMOS version of the timer chip is used because of its higher supply voltage rating (18V).

The power-on time in seconds is a little higher (x 1·1)

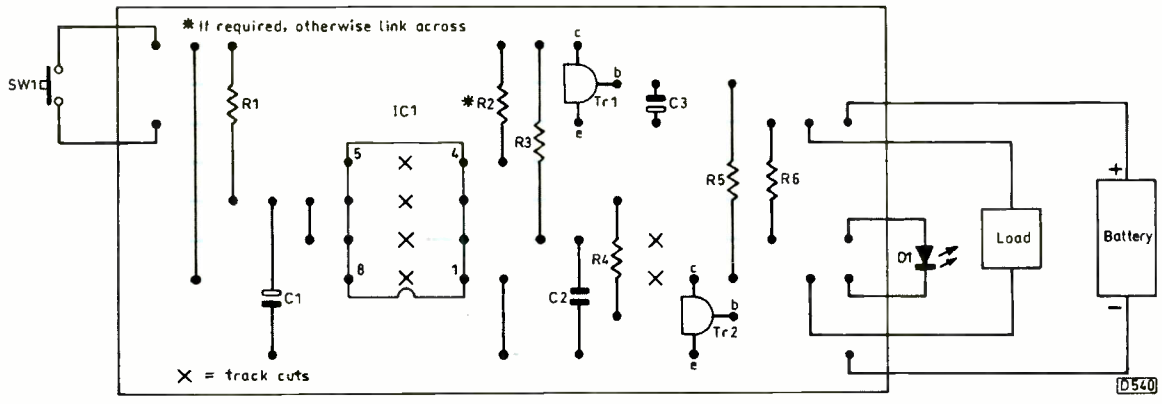


Fig. 3: Layout of the auto power-off switch on 0·1in. pitch stripboard.

than the value of C1 (in µF) multiplied by the value of R1 (in MΩ). In this circuit it works out at

1·1 x 47 x 2·2 = 114 seconds.

The upper *CR* limits for the device are usually quoted as 470µF and 10MΩ.

Construction

The board is small enough to be attached to the side of the ESR meter's case, near the existing switch, with a sticky fixer. A simple toggle switch was originally specified for the ESR meter (or should have been – my mistake – see correction on page 499 of the May issue) so that the hole could easily be enlarged to accommodate a light-action push switch. The original flashing LED can be retained, or an ordinary low-current LED as specified in the parts list could be used instead.

PARTS LIST

Item	Value/type	Maplin code
R1	2·2MΩ	M2M
R2-R5	47kΩ	M47K
R6	6·8kΩ	M6K8
C1	47µF, 16V	VH11
C2	0·1µF	RA49
C3	1µF, 63V	VH03
IC1	7555	YH63
Tr1	BC558	QQ17
Tr2	BC548	QB73
D1	2mA 5mm LED	AFA3, UK48 or CZ31
SW1	Push-to-make	FG45
	Stripboard	JP54

Nokia 9600 Series Receivers: the blue service menus

The blue service menus available with these receivers can be used to enter new signals in the EPG and carry out certain adjustments. Hugh Cocks on how to go about it

The 'red' menus used with Nokia 9600 series satellite receivers (9600, 9602, 9610) are fairly well known by satellite enthusiasts. Less well known are the 'blue' service menus (not to be confused with the standard blue menus). They enable new satellite signals to be entered directly into the EPG (Electronic Programme Guide) and adjustments to be made to receiver settings in more ways than by using the standard installation menu.

The service menus are similar to those used with Nokia 9200 series receivers, but are not exactly the same (I don't have much experience of that range however).

Later versions of the 9600 series have a UHF modulator fitted. The frequency is adjusted via a screwdriver slot in the rear panel, not via the software control we are becoming used to nowadays.

Entering the Blue Service Menu System

Go to the normal installation menu by pressing the remote control unit's menu button. Highlight, but don't call up, the System Settings menu (see Photo 1). Then press the remote control unit's 1, 2, 3 and 4 buttons in quick succession. The blue service menu will then be seen (Photo 2).

It's best to gain some experience of the blue menus. Service pages 8, 7 and 6 (Photos 3, 4 and 5) are ideal as, unlike the others, accidental adjustments cannot be carried out via these pages.

Pages 6-8

To enter service page 8, hardware versions (Photo 3), use the main up/down buttons on the remote control unit to highlight it in white, then press the middle round (OK) button. This menu provides details of the receiver's hardware and QPSK software. Highlight return at the top of the screen and press the OK button to return to the blue service menu.

It is useful that you can at any time exit a blue service menu by pressing the remote control unit's TV button twice. Pressing it once takes you back to the normal installation menu (Photo 1). Press it again and you are back to the programme the receiver was tuned to prior to calling up the service menus. Highlight return on any blue service page and press OK to go back to the blue service menu (Photo 2).

Service page 7 (Photo 4) shows the receiver system version. When a smart card is used, details appear in the bottom two rows. Information on the CAM (Conditional Access Module) that the smart card slots into would probably be available as well.

Service page 6 (Photo 5) shows the IRD settings, including the current volume control level set by the remote control unit. Note that in the service mode the volume control doesn't work, as the keys are used for other tasks. The mute button is available to mute the programme sound however. Otherwise it continues as before if a signal was being received prior to calling up the service menus.

The Test Functions Menu

Service page 5 (Photo 6), the test functions menu, and all the other service pages can be used to make adjustments to the receiver. I recommend that all the original receiver settings in these pages are written down, in case incorrect operation is subsequently experienced. This will enable you to check them. If in doubt, leave the setting alone.

When Test picture is highlighted and is switched to on via the left/right remote control buttons a colour-bar pattern appears on the screen. It can be removed in the same way. If you have an urgent need for a colour-bar generator, either PAL or RGB, this is the quick solution!

It's safe to switch the Signal Quality indication on: the front display will then provide a numerical value, usually in excess of 50, that indicates the relative quality of the incoming signal. This can also be done via the red menu. It's very useful when you are seeking new signals. The value remains in the front display after leaving the service menu. It's updated every second or so until the receiver is switched to standby then back on again: the display then returns to normal channel identification. Load factory channels, which is highlighted in Photo 6, loads a lot of out-of-date channel listings in the EPG and is best left alone. It may also delete your current EPG list. So beware of this adjustment!

The Control signal options are for LNB 13/18V (V/H polarisation) selection, for 22kHz tone on/off and for 0/12V selection via the rear-panel socket. It's best not to touch these when the LNB is working correctly.

I haven't gone into the DiSEqC option at the bottom of

this menu. LNB DiSEqC switching is well catered for by going into the Antenna configuration option in the installation menu (Photo 1) when initially setting up the receiver.

As there was no PC connection to the RS232 serial data port at the rear of the receiver when this photo was taken, the channel memory upload/download options aren't highlighted.

Service Settings

Photo 7 shows the Service Settings menu (page 4). This enables two important adjustments that can't be done elsewhere to be carried out.

First, Head End mode. If this is highlighted and is then toggled to on via the remote control unit's left-right buttons the remote control unit won't operate the receiver when the service mode is left. This is indicated by a star to the right of the programme name in the front panel display. The front panel buttons still work however, and once the receiver has been switched to standby and back via these buttons operation via the remote control unit is again possible, maybe for only a brief period, the receiver still being in the Head End mode until you go back to this menu and switch to off.

We have several Nokia receivers at SMATV headends and have never used this facility. After a power cut the receiver, under normal circumstances, returns to the last channel selected. The remote control unit is normally well hidden from fiddling fingers!

The RGB shift adjustment is used to centre scart-derived RGB pictures on the screen – they are often shifted slightly to the left in comparison with PAL pictures. A Philips PM5544 test pattern can normally be found via Hot Bird at 13°E: shifting the RGB picture to screen centre is then easy to do.

Some adjustments have to be done using the volume control +/– buttons rather than the remote control left/right ones. TS_clock is best left well alone, also the tuner frequency adjustments. LNB Power in standby can be useful in climatic extremes, when the LNB can drift a little in frequency if it's not powered all the time. Sometimes when the receiver is switched on you can find that the LNB's local oscillator has drifted and the receiver can't find the digital signal package. Remember that the receiver will run a little warmer in standby when the LNB is powered all the time.

The Advanced Tuning Menu

If you know the frequency and symbol rate (SR), channels can be entered in the Advanced tuning menu (Photo 8). This is an alternative to doing a standard channel scan in the normal tuning menu. Enter the frequency and SR – in the example shown, it's Egyptian TV at 4,178GHz (C band) from the Intelsat craft at 1°W – then highlight add channel and press the remote control unit's OK button. After a few seconds the Add channel menu will appear (Photo 9). The signal's Network ID, Transport Stream ID and Service ID can be found here. If you wish to add the channel to the EPG list, highlight "Save channel as xxx DEMO" and press OK on the remote control unit. Photos 9 and 10 show an example that will be saved as "115 DEMO": the receiver automatically enters the new channel at the end of the EPG list. Note that the signal characteristics shown in these photographs have no connection with the Egyptian channel shown in Photo 8.

If you know the frequency but not the SR, the latter can be entered as 0000. Then try pressing add channel: a picture may appear! When the SR is set at 0000, the receiver enters a search mode – the FEC/Viterbi value

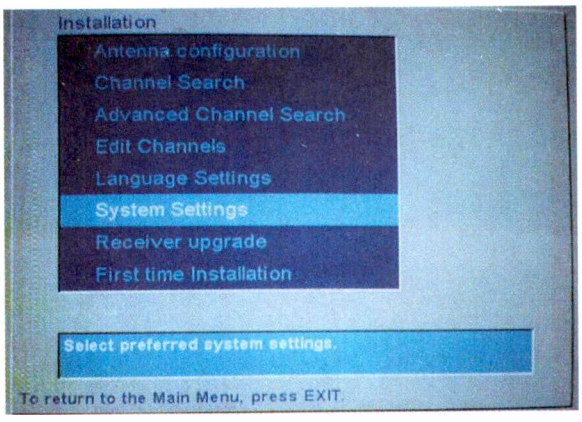


Photo 1: The normal installation menu.

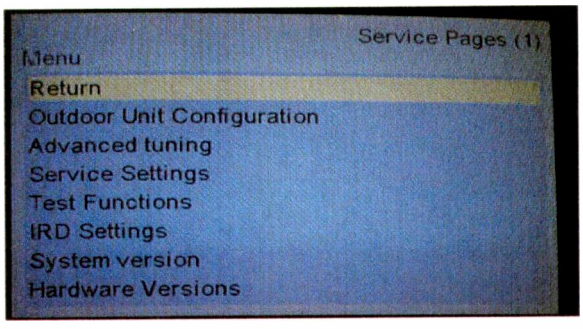


Photo 2: The blue service menu.

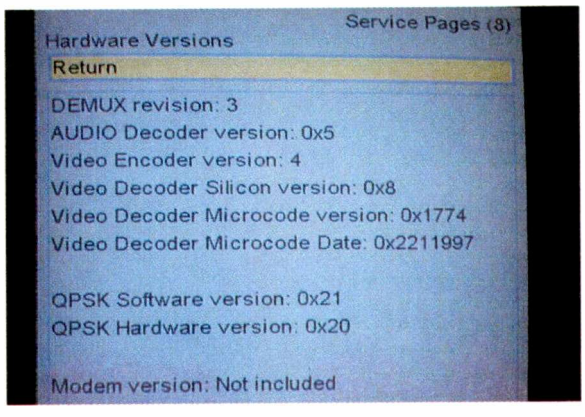


Photo 3: Service page 8, hardware versions.

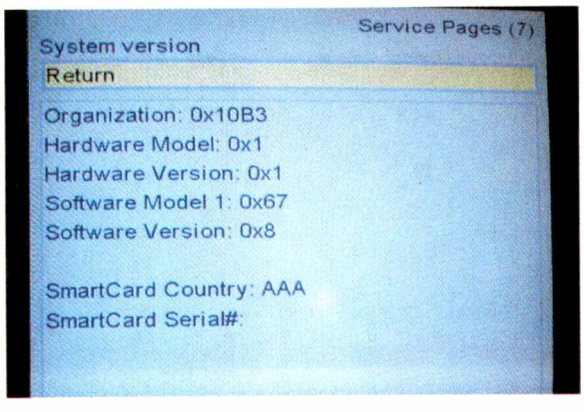


Photo 4: Service page 7, system version.

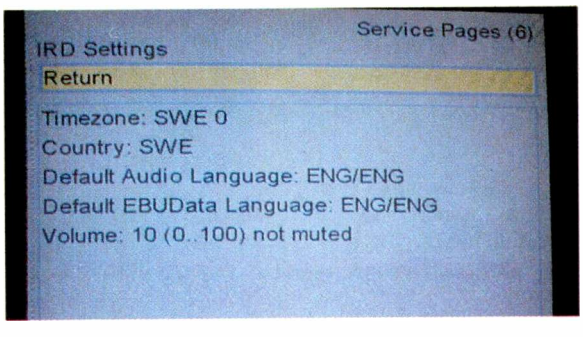


Photo 5: Service page 6, IRD settings.

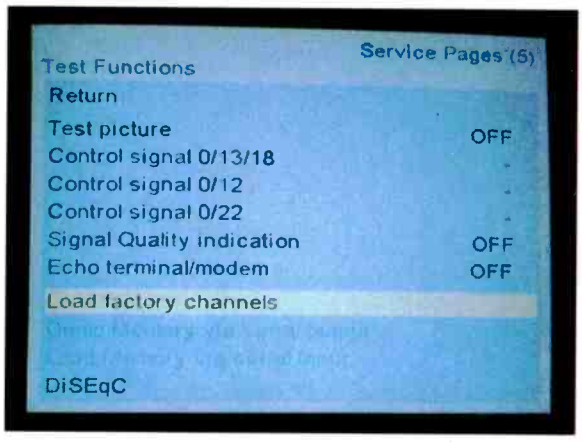


Photo 6: Service page 5, test functions.

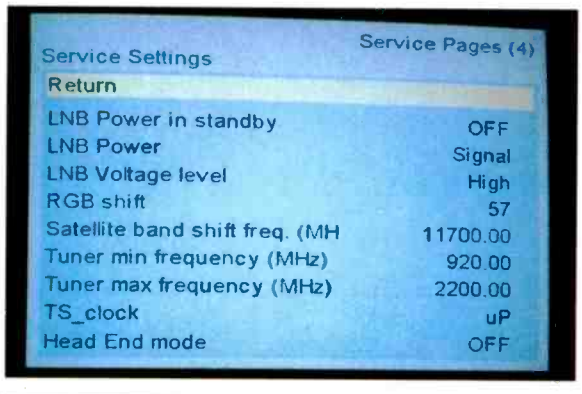


Photo 7: Service page 4, service settings.

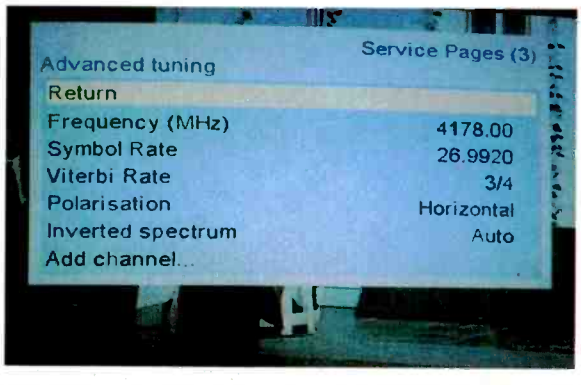


Photo 8: The advanced tuning menu, service page 3.

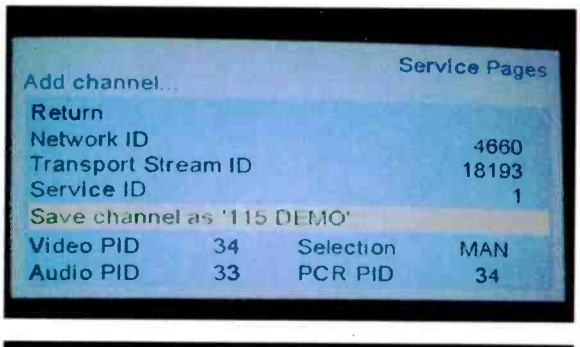


Photo 9: The add channel menu.

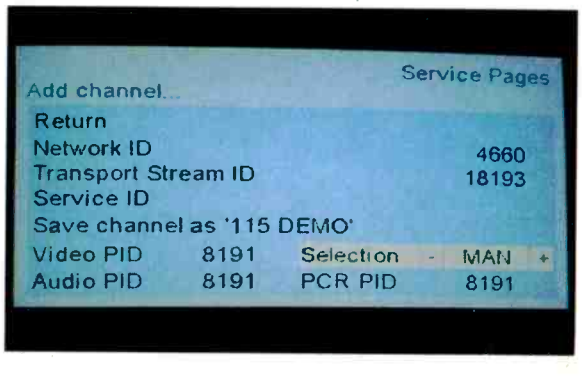


Photo 10: Packet identifiers (PIDs) at 8191.

entered in the menu doesn't matter. In Photo 9 the PIDs (packet identifiers) were manually entered: in Photo 10 they started as 8191. In this example no signal was found after entering the signal characteristics in the add channel menu. Normally at this stage PID selection would be on auto: in the Photos I'd moved it to manual.

If the receiver cannot find a channel though the correct SR and FEC (referred to as Viterbi Rate in the advanced tuning menu) have been entered, it will show the video, audio and PCR PIDs as 8191. If the PID values are known, they can be entered manually by moving selection from auto to manual then highlighting each PID and entering the number.

At this stage a picture should appear. It can help to have the Signal Quality activated, via service page 5, to see if any value is displayed on the front panel. QPSK demodulator lock is achieved at about 40, though a picture will not be seen properly until a value of about 50 is reached – though signals with a lower FEC ratio of 1/2 quite often give a good picture at below 40.

Signals such as news feeds are sometimes intermittent. At the time of writing many varied ones can be found at the Eutelsat 36°E slot. If you know the characteristics, for example 11,684GHz, horizontal polarisation, SR 5,632, FEC 3/4, V PID 308, A PID 256, PCR PID 308, these can be entered manually and the channel saved as "xxx DEMO" in the main EPG list. When a signal is present it should then appear on screen!

The Add channel facility can also be used to rescan a multiplex package such as the Egyptian one shown in Photo 8. If you go to this menu while receiving a channel in the multiplex (the RAI one via Hot Bird at 11,766GHz, vertical polarisation is a good example) and highlight Add channel, should a new channel have been added to the package it will appear as a picture along with its PID characteristics. You can save it as "xxx DEMO".

This can also be done via the main channel search menu in the "normal" mode however. In this case go to the main channel search menu from the programme package being received and select "advanced channel search". Start the search procedure (the frequency and digital signal characteristics don't need to be entered – they are there automatically, as the menu has been entered from the relevant multiplex). The receiver should add to the EPG list any new channels found in that package.

You can use the channel search or advanced channel search menu. When using the channel search menu, set the network search to no unless you want to search other multiplexes – the EPG may become cluttered with some channel duplications however.

Miscellaneous Points

Option 1 in the service page menu is "outdoor unit configuration" (no photo). Some LNB adjustments can be carried out via this menu, but I find that they are best done via the normal installation menu using the Antenna configuration option.

Don't add more than about 300-350 channels to the TV channel EPG list and 50 channels to the radio EPG list. If many more are added the receiver can crash and, when booting up again, a block of 50-100 channels may be lost. Some warning of this can sometimes be had, with slow or strange receiver operation. If you experience this and have a lot of channels in the EPG, it's time to start editing some of them out quickly.

I've found that some channels in the EPG can be lost following a receiver reboot after a power cut when in the red menu option.

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INFRA RED REMOTE CONTROLS made for TV's but may have other uses pack of 100 £39 ref IREM

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ELECTRONIC SPEED CONTROLLER KIT For the above motor is £19 ref MAG17 Save £5 if you buy them both together, 1 motor plus speed controller rrp is £41, offer price £36 ref MOT5A

SONY STEREO TV CHASSIS assemblies comprising complete TV PCB excluding tube and scan coils. Nicam stereo, mains input. Appear to be unused but sold 'as seen' Would probably be good for spares or as a nicam stereo TV sound receiver and amplifier For KV29F1U and KV25F1U(BE3D) PCB no's 1-659-827-12 1-659-826-14 1-711-800-11 £20 ref STV1

RCB UNITS Inline IEC lead with fitted RC breaker. Installed in seconds.
Pack of 3 £9.98 ref LOT5A

RADIO CONTROLLED CARS etc No remotes but good strippers for servo's motors and receivers Sold as is, no returns, mixed types £3 each ref RCC2

VOICE CHANGERS Hold one of these units over your phone mouth piece an you can adjust your voice using the controls on the unit! Battery operated £15 ref CC3

servicing

Alan Dent reports on fault conditions that can be encountered with these sets

the NEI E5 Chassis

The E5 chassis was used in a number of models released by NEI, including the E14C1R, E14C1X, E20C1R, E20C1X, E25G1TFXN, E28G1TFXN and the ART701. As these numbers suggest, the chassis will drive tubes with sizes from 14 to 28in., only minor circuit modifications being required.

Models with 110° tubes (25 and 28in.) have an EW modulator panel and usually incorporate Nicam stereo (Zweiton stereo in Continental sets). The 90° models have mono sound. Teletext is an option, with a one-page memory for 14 and 20in. models and an eight-page memory for 28in. sets.

The main PCB used in 14in. models is physically smaller than the one used in larger sets, but electronically the two versions are virtually identical. Transformer types change, but their operating conditions are the same.

The Power Supply

The power supply is based on a TDA4605-2 control chip (IC651) and a BUZ90AF chopper FET (T651). Fig. 1 shows the circuit. Here are the faults we've encountered:

No output: Check whether R654 (820kΩ) is open-circuit. Check the voltage across the mains bridge rectifier's reservoir capacitor C665 (100µF in 90° sets, 220µF in 100° sets). If low at about 260V, C665 is open-circuit. IC651 could be faulty.

IC651 and T651 short-circuit: Check whether snubber diode D653 (BA159) is short-circuit. Change it to type BYT52M. Check the print between pin 5 of IC651 and T651's gate, also the earth track to pin 4 of IC651, to ensure there is no damage.

Low output, power supply appears to be tripping with bursts of energy at 0·3sec intervals: Check whether D652 (BA157), C657 (47µF) or R664 (10Ω) is open-circuit. T651 (BUZ90AF) could be low-gain. If the voltage across C665 is 260-270V, replace it.

Low output, 140V maximum: The HT preset P651 (2·5kΩ) has fallen in value.

Tripping: The line output transformer TR702 could have shorted turns. Check for shorts on any supply line. IC681 (LM317) could be faulty if the 12V supply is low. The CRT could have an internal short-circuit. IC751 (TDA4950) can go short-circuit in 110° sets, pulling down the 27V field output stage supply.

Squealing chopper transformer, with outputs normal but T651 hot: D653 short-circuit but T651 still OK. Use a BYT52M as a replacement.

Transformer chirps at low brightness/line jitter (14in. sets): Check that the values of R655 (330kΩ) and the 1MΩ resistor in parallel with it are correct. These components can go high-resistance.

The microcontroller's 5V supply is low: C692 (1,000µF) is probably open-circuit.

Excessive width, reduced height: The value of the HT preset P651 (2·5kΩ) is varying intermittently.

Line Timebase Faults

The line output stage is conventional, with certain component value changes depending on size and type of CRT. When the tube is a 110° type an EW modulator subpanel, with a TDA4950 chip (IC751), is added and the line output transistor T702 is type BU508A – it's type BU508D (with integrated diode) in 90° models. IC101 (TDA8361) generates the line drive. Fault experiences are as follows (see also preceding power supply section):

The line output transistor T702 goes short-circuit at power up: Check whether the BA157 25/27V supply (90°/110° tubes) rectifier D705 is short-circuit. The CRT could have an internal short-circuit at its final anode. Disconnect the 25/27V supply to the field timebase. If T702 is then OK, disconnect pin 38 (sandcastle pulse input) of the jungle chip IC101 (TDA8361) and reconnect the supply to the field output stage. If T702 is still OK, C124 (2·2nF) is open-circuit – it's connected to pin 39 of IC101.

No raster, pulse voltage at the collector of T702 is 400V instead of 1kV peak-to-peak: Check whether the S-correction capacitor C709 (470nF or 330nF depending on CRT) is open-circuit. If so C710 (2·2µF, 350V) and R709 (10kΩ fusible) may have failed.

No raster (no line drive): If the drive at the base of the

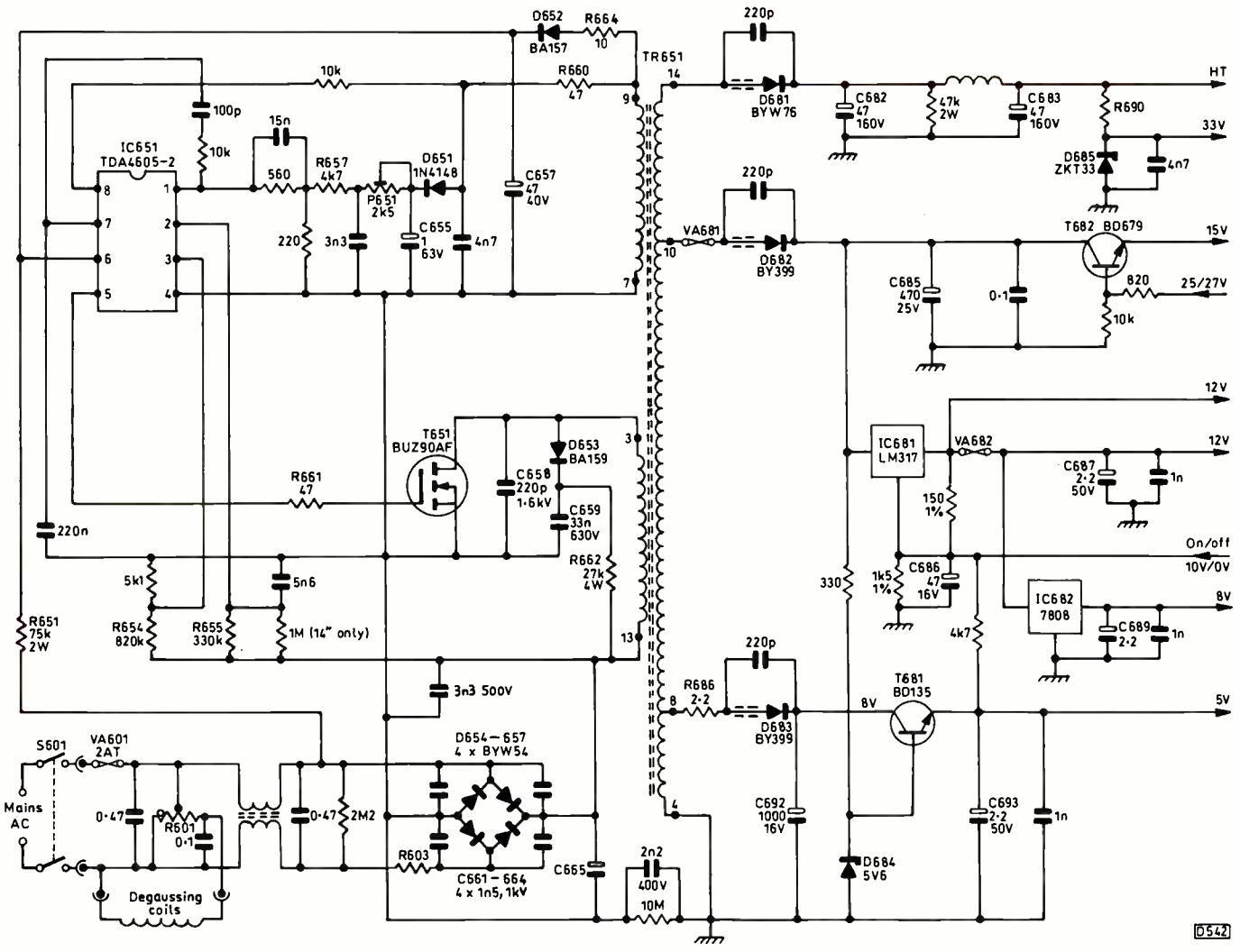

Fig. 1: Circuit diagram of the chopper power supply used in the NEI E5 chassis. In 110° models the HT is 150V, C665 is 220µF and R603 is 5·6Ω, 11W; in 90° models the HT is 118V, C665 is 100µF and R603 is an NTC thermistor. The 1MΩ resistor in parallel with R655 is present in 14in. models only. VA681 is 2AT in 110° models, 1·25AT in 90° models. VA682 is a link in 90° mono sets: in 110° stereo sets it's a 500mAT Wickman fuse.

BC639 line driver transistor T701 is mostly negative-going, the 1N4148 clamp diode here (D701) is open-circuit.

No raster (low line drive): If the waveform at the collector of T701 is 10V instead of 30V peak-to-peak, check whether the BA157 25/27V supply rectifier D705 is leaky. The resistance of the driver transformer's primary winding may be high – it should be 4·3Ω. If the ratio of the drive is not 50:50, IC101 (TDA8361 jungle chip) is faulty.

Line jitter at low brightness (14in. sets): See power supply section (R655).

Narrow raster (low EHT, reduced height): The line-drive frequency is too high, probably 40µsec. The colour reference oscillator crystal Q101 (4·43MHz) also acts for the line generator circuit: C127 (18pF), which is in series with it, can go open-circuit. If IC101 is replaced, R121 may have to be changed to 8·2kΩ if 47kΩ or to 8·2kΩ if 47kΩ – it depends on the chip's mask version.

Visible picture breathing – particularly noticeable when going from text to picture: Change the value of C711 in the beam limiter circuit from 47µF to 4·7µF (16V).

Line frequency incorrect (just off, but colour OK when locked): C122 (4·7nF) leaky. It's connected to pin 40 of IC101.

Varying brightness: Potentiometer assembly on the LOPT faulty (especially if the first anode voltage is varying). See also CRT base panel section and the following section on EW modulator faults.

EW Modulator (110° Sets)

IC751 short-circuit, L751 gets hot: Check whether D751 (BY299) is open-circuit or dry-jointed.

L751 burning (gets hot): The line scan coils could be open-circuit or K703A's pins dry-jointed.

Incorrect width control (works at maximum and minimum only, other controls have no effect): Width

control P752 (1kΩ) open-circuit. Could have happened if IC751 has failed.

No controls operative (line pulse output at pin 5 of IC751 unmodulated): IC751 could be faulty, R753 (0·22Ω) open-circuit or L751 could have shorted turns (approximate DC resistance should be 8Ω).

R753 open-circuit: IC751 (TDA4950) faulty.

Controls operative but will not reduce width to correct setting: R753 (0·22Ω) open-circuit.

Full width, no EW control: D751 (BY299) short-circuit.

D751/2 have failed, R707 (2·7Ω, 2W) open-circuit: Pin 4 of K701 is open-circuit or dry-jointed.

Lack of width (25mm each side): Replace C704 (2·2nF, 1·6kV) if white-cased Iskra type.

Tapered kink (not adjustable) in all four corners: L751 is faulty (resistance measures OK).

Intermittent width variation: IC751 (TDA4950) is probably faulty.

Bowed, half-width picture: C753 (680nF, 400V) is dry-jointed or open-circuit.

Field Timebase Faults

The field output chip IC301 is type TDA3653B/C with 90° tubes, type TDA3654 with 110° tubes. The field drive is provided by IC101. Fault conditions we've experienced are as follows:

Field collapse: Check the PCB for cracks around IC301's pins: the cracks can be repaired but IC301 will have failed. Check the supply via R301 (2·2Ω fusible with 90° tubes, 0·22Ω fusible with 110° tubes). The supply voltage is 25V with 90° tubes, 27V with 110° tubes. C308/9 (4·7nF) could be leaky (below 2kΩ). R115 (100kΩ), R116 (1MΩ) or C120 (100nF) could be open-circuit (no ramp at pin 42 of IC101). C306 (2·2µF) could be leaky or short-circuit. D301 (1N4003) or R307 (1·5Ω with 90° tubes, 0·82Ω with 110° tubes) could be open-circuit. Check for dry-joints at the heatsink/PCB connection, or copper broken. C307 (470pF) could be leaky, in which case the voltage at pin 5 of IC301 will drop to approximately 5V.

Nearly complete field collapse (approximately one inch of severely distorted scan if the first anode voltage is increased): C303 (100µF, 40V) is open-circuit. This may kill IC301.

Varying height (Model ART701 mainly): Height control P302 has faulty pin to carbon track connection. Heatsink earth tab/PCB connection cracked or dry-jointed.

Top foldover: Check whether D301 (1N4003) is leaky or R302 (470Ω 90°/1kΩ 110° sets) is open-circuit.

Top foldover and bottom cramped: C304 (220nF) is leaky.

Line pairing, top linearity stretched: R304 (270Ω) is high in value or open-circuit.

Severely cramped field scan (bright foldover in centre, also curving in from horizontal edges): One scan yoke segment is open-circuit. Check resistance (13·5Ω with 90° tubes, 5·5Ω with 110° tubes).

Bottom cramped (lower linearity varying): C308/9 (4·7nF) could be leaky, or ramp capacitor C120 (100nF) could be open-circuit or intermittent (it's connected to pin 42 of IC101).

Bottom severely cramped – linearity control has no effect: C306 (2·2µF) is open-circuit.

Picture shifted upwards (no real change of linearity): C305 (1,500µF with 90° tubes, 3,300µF with 110° tubes) is leaky.

Horizontal lines visible on still pictures: A scope check will show that there are line pulses on the output waveform. C304 (220nF) is open-circuit.

Picture blanks out after several hours: C303 (100µF) is leaky or fitted incorrectly (the positive side should go to pin 6 of IC301, the negative side to pin 8).

Signal Section Faults

The IF circuitry is contained in the TDA8361 (PAL only models) jungle chip IC101, along with the timebase generators and the colour decoder. Note that the TDA8361 cannot be interchanged with the TDA8361A.

Vertical lines on noisy raster (ringing on pictures): There's an open-circuit in the SAWF F101 or the track to pin 45 or 46 of IC101 is open-circuit.

No video, on-screen displays OK. No AV video. May be intermittent: Check at pin 21 of IC101. This pin must be low for normal video. It goes high for teletext or OSDs. Check the sandcastle pulse input at pin 38 of IC101. If the pulses are missing or distorted, check the track from R710 (220kΩ, 1kV) to C714 (100nF) – it may be open-circuit adjacent to the heatsink tab.

No video, no OSDs: Check the sandcastle pulses at pin 38 of IC101 and the line-frequency pulse input at pin 26 of IC901. If either is missing, check R705 (4·7kΩ), R710 (220kΩ, 1kV) and C714 (100nF).

No video, no OSDs. Blanked screen for three seconds then snow. Delay also if any function is selected: Check the field-frequency pulse at pin 27 of the microcontroller chip IC901. If missing check C301 (4·7µF, 63V), R941 (4·7kΩ) and D914 (4·7V zener diode).

Slight floating pattern or noise in background: This can be produced by noise on the tuning line. Change C105 from 220nF to 1µF, 50V.

Picture very noisy and ringing. Alignment voltage at TP5 OK but alignment seems to be incorrect: SAWF F101 wrong type or faulty.

Raster blanks out after several hours: See field timebase section.

Colour Faults

No colour or colour drops out occasionally: Crystal Q101 could be slightly off frequency. Check C127 (18pF), R122 (100kΩ), C129 (4·7nF) and C130 (100nF) as necessary.

No red and other colours very smeared with TV/AV operation, RGB OK: IC103 (TDA4662) low output at pin 11.

Incorrect colours, RGB and text OK. Chroma will be tearing horizontally on colour bars: IC103 (TDA4662) has incorrect outputs at either pin 11 (R – Y) or pin 12 (B – Y).

Low chroma, DC control voltage at pin 26 of IC101 OK: Low output level from IC103 (TDA4662).

Intermittent blue with RGB inputs (scart socket): Cause was C160 (100nF) shorting to T1501 on the Nicam PCB. Very unusual.

CRT Base Panel

There are minor component changes depending on the type of tube fitted. Smaller-screen (90°) sets may have either a 22·5mm mini-neck tube or a standard 29mm neck tube. The physical layout differs but the panels are compatible electrically.

Low or varying brightness: C206 (22nF, 1kV) could be leaky or R215 (33kΩ) open-circuit. These components filter the first anode supply. If necessary check the track which could be open-circuit. See also the line timebase section.

Smeary picture with very bright colour, as if one gun is fully on. Cannot set up the cut-offs: One of the RGB output transistor collector load resistors (R210/1/2, 12kΩ 2W) has gone high-resistance or open-circuit. The collector voltage might be about 95V.

Cannot set the first anode voltage correctly (may set in steps): Open-circuit track to pin on CRT base.

Audio Faults

Also see the Nicam section. In all cases the output stage is of the balanced-bridge type. If external equipment such as active loudspeakers are connected, they must be isolated from chassis ground using an isolating transformer. The output chip, of whichever type, is rather 'fragile' and can easily fail if lines or pins are accidentally shorted.

No sound, with an audible hiss when the volume setting is increased: In some early sets the alignment of L101 is suspect. See manual for alignment details. Check that F102 is the correct type (6MHz in UK). Check for RF at pin 5 of IC101 (TDA8361): if OK, IC101 may be faulty.

Correction

Note that Tr2 in Fig. 2 on page 501 of the May issue, in the mains-operated remote control tester article, should have been shown as a pnp transistor. The corrrect transistor type is shown in the parts list.

AN240 = 150
AN316 = 390
AN3301K = 350
AN5015 = 250
AN5256 = 150
AN5512 = 100
AN5515 = 160
AN5321 = 100
AN5615 = 300
AN5701 = 150
AN5900 = 130
AN6612 = 080
AN7178 = 180
AN8377 = 400
BA3812 = 080
BA5115 = 075
BA5402 = 180
BA5406 = 180
BA6222 = 100
BA6235 = 050
BA6247 = 130
BA6248 = 150
BA7258 = 300
BA7751 = 125
BA2751S = 1450
CNX62A = 080
CNX82A = 060
CNX83A = 080
CNYIT = 225
DPY2540 =
HA1137 = 150
HA1199 = 130
HA1377 = 140
HA11215 = 299
HA11847 = 700
HA11351 = 765
HA11412 = 600
HA11702 = 300
HA11720 = 650
HA11744 = 330
HA12005 = 180
HA12411 = 575
HA13002 = 200
HA13118 = 140
HA13119 = 140
HA13151 = 800
HA13155 = 900
HA17384 = 200
KA2206 = 150
KA9257 = 120
KIA6210 = 400
KIA6281 = 250
LA 1180 = 075
LA1235 = 130
LA1260 = 075
LA1369 = 200
LA3155 = 175
LA3241 = 105
LA3400 = 250
LA4108 = 125
LA4178 = 150
LA4200 = 350
LA4275 = 200
LA4280 = 250
LA4282 = 350
LA4440 = 200
LA4445 = 200
LA4446 = 170
LA4498 = 275
LA4557 = 150
LA4700 = 350
LA5601 = 110
LA5700 = 300
LA6510 = 150
LA7018 = 130
LA7223 = 485
LA7323 = 325
LA7505 = 500
LA7696 = 500
LA7830 = 090
LA7832 = 130
LA7835 = 150
LA7860 = 350
LB1234 = 225
LB1412 = 300
LC7011 = 500
LM317T = 150
LM348 = 050
LM1035N = 350
LM1111 = 180
M105BI = 300
M490BBI = 1299
M5106P = 550
M5218L = 285
M51308SP = 550
M5136S = 350
M52307SP = 600
M58658P = 699
MB3712 = 600
MB3732 = 240
MC1377P = 200
MDA2060 = 350
MDA2061 = 400
MDA2062 = 700
NE545B = 225
NE645N = 1225
SAA1006 = 300
SAA1070 = 550
SAA1294 = 1000
SAA1293-3 = 515
SAA5010 = 220
SAA5231 = 850
SAA5250 = 750
SAA7010 = 680
SAA7274 = 600
SAB3034 = 985
SAB3035P = 275
SAB3037 = 1400
SAF1032P = 2099
SAF1039 = 699
SAS580 = 250
SDA3002 = 1115
SDA3206 = 400
SDA4212 = 775
SL486 = 375
SL490 = 220
SL1454 = 750
STA441C = 220
STA901M = 310
STK0040 = 795
STK011 = 895
STK015 = 1440
STK078 = 1680
STK1049 = 700
STK433 = 400
STK441 = 650
STK457 = 470
STK463 = 750
STK561 = 450
STK583 = 500
STK2125 = 575
STK2240 = 700
STK3082 = 550
STK4017 = 400
STK4060 = 1510
STK4211/2 = 600
STK4211/V = 800
STK4362 = 450
STK4392 = 500
STK4773 = 820
STK4833 = 650
STK5324 = 450
STK5335 = 750
STK5337 = 500
STK5361 = 375
STK5431 = 1250
STK5441 = 400
STK5461 = 500
STK5466 = 500
STK5471 = 630
STK5478 = 380
STK5481 = 470
STK5725 = 450
STK6932 = 725
STK730-060 = 645
STK73907 = 599
STR450 = 700
STR1195 = 350
STR2105 = 550
STR3215 = 275
STR6020 = 270
STR10006 = 450
STR11006 = 325
STR20015 = 450
STR40090 = 350
STR44115 = 475
STR50020 = 350
STR50092 = 260
STR50103A = 260
STR50115 = 500
STR53041 = 400
STR54041 = 320
STR56041 = 850
STR58041 = 250
STR81159 = 400
STRD1806 = 360
STRD4412 = 400
STRD4420 = 550
STRD5441 = 400
STRD6001 = 515
STRD6108 = 450
STRD6602 = 400
STRD6802 = 375
STRM6545 = 775
STRM6546 = 795
STRM6549 = 725
STRM6559 = 900
STRS5701 = 1700
STRS5717 = 500
STRS5741 = 600
STRS5942 = 700
STRS6307 = 450
STRS6309 = 550
STRS6525 = 1350
STRS6545 = 725
STRS6707 = 800
STRS6708 = 550
STRS6909 = 550
STRZ2152 = 1000
STV2110B = 685
STV9379 = 400
STV9379F = 415
TA7075 = 300
TA7145P = 400
TA7210P = 200
TA7248P = 575
TA7271P = 220
TA7299P = 200
TA7318P = 490
TA7324P = 050
TA7401P = 250
TA7609AP = 170
TA7616P = 300
TA7636P = 400
TA7658P = 100
TA7680AP = 275
TA7691P = 165
TA7698AP = 400
TA7719P = 200
TA7743P = 600
TA7772P = 140
TA8111AP = 210
TA8200AH = 325
TA8210AK = 275
TA8205AH = 220
TA8210AH = 265
TA8211AH = 200
TA8215AH = 300
TA8220H = 500
TA8227P = 215
TA8238K = 200
TA8403K = 250
TA8427K = 350
TA8449P = 375
TA8611AN = 025
TA8631N = 415
TA8690AN = 700
TBA120T = 030
TBA130-2 = 1299
TBA750C = 150
TBA820M = 035
TBA990Q = 200
TCA650 = 250
TD6359P = 600
TDA1012 = 120
TDA1013A = 110
TDA1022P = 330
TDA1035 = 799
TDA1044 = 110
TDA1054 = 180
TDA1062 = 140
TDA1085C = 270
TDA1170N = 135
TDA1170N-TFK = 850
TDA1170S = 135
TDA1220A = 550
TDA1327 = 200
TDA1412 = 085
TDA1589 = 275
TDA1771 = 200
TDA1904 = 199
TDA1908 = 299
TDA1905 = 080
TDA1950 = 175
TDA2004 = 150
TDA2008 = 100
TDA2161 = 590
TDA2504 = 200
TDA2530 = 300
TDA2542 = 215
TDA2546A = 950
TDA2556 = 230
TDA2560 = 899
TDA2577A = 200
TDA2578A = 225
TDA2579A = 210
TDA2581 = 100
TDA2600 = 400
TDA2611A = 100
TDA2640 = 350
TDA2680 = 1299
TDA2700 = 550
TDA2790 = 400
TDA2820M = 100
TDA3190 = 375
TDA3500 = 525
TDA3505 = 275
TDA3530 = 365
TDA3562A-ST = 525
TDA3562A-PHI = 525
TDA3565 = 220
TDA3566 = 300
TDA3580 = 499
TDA3645 = 385
TDA3653B = 250
TDA3654 = 080
TDA3654Q = 080
TDA3827 = 200
TDA3858 = 500
TDA4050 = 145
TDA4228T = 360
TDA4420 = 120
TDA4439 = 220
TDA4442 = 240
TDA4427 = 899
TDA4443 = 250
TDA4480 = 280
TDA4500 = 300
TDA4503 = 250
TDA4505A = 300
TDA4505E = 400
TDA4505K = 450
TDA4556 = 370
TDA4560 = 270
TDA4568 = 300
TDA4600-2 = 160
TDA4600-2D = 260
TDA4601 = 120
TDA4605 = 190
TDA4605-2 = 395
TDA4605-3 = 395
TDA4610 = 685
TDA5660 = 250
TDA5820 = 400
TDA6101Q = 215
TDA7000 = 170
TDA7056 = 200
TDA7222 = 100
TDA7245 = 350
TDA7250 = 400
TDA7251 = 400
TDA7255 = 400
TDA7273 = 080
TDA7350 = 300
TDA7385 = 900
TDA8138 = 200
TDA8140 = 200
TDA8145 = 120
TDA8171 = 200
TDA8175 = 450
TDA8177 = 215
TDA8190 = 299
TDA8215B = 225
TDA8304 = 400
TDA8349 = 350
TDA8350Q = 399
TDA8351 = 200
TDA8370 = 1125
TDA8376 = 1200
TDA8380 = 200
TDA8391 = 675
TDA8421 = 500
TDA8443 = 295
TDA8540 = 215
TDA8568Q = 695
TDA8709 = 600
TDA9045 = 1350
TDA 9102C = 250
TDA9610H = 1185
TDA9860 = 500
TEA1002 = 650
TEA1015 = 300
TEA1035 = 200
TEA1061 = 250
TEA2014 = 080
TEA2018A = 110
TEA2019 = 1550
TEA2026CV = 650
TEA2029CV = 400
TEA2031A = 125
TEA2164 = 160
TEA2260 = 225
TEA2261 = 345
TEA2262 = 350
TEA5170 = 140
TEA5581 = 200
TEA5701 = 650
TEA6101 = 550
TEA6417 = 600
TEA8170 = 240
TFMS1380 = 085
TFMS5300 = 170
TFMS5360 = 170

No sound, no audible hiss: Check supply to output chip via R506. If missing, check T682 (BD679) and the associated components. Also check the supply track, as it runs around the perimeter of the PCB. Check the decoupling capacitors C532, C534 and C535 before replacing the IC.

Sound buzz (90° mono only): This is usually associated with remodulated signals on cable feeds. Fit a 10µH inductor and 68pF capacitor in parallel from the junction of C148 and F102 to chassis earth. Can be fitted in the F103 position if this item is not present.

Distorted sound, probably one channel, sometimes both: The cores of DU573-DU578 on the loudspeaker/headphone panel become saturated. Remove the coils, take two turns off each, then replace.

Nicam Section

Nicam sound is processed by IC1511 (SAA7283ZP) with IC1501 (TDA2545A) for signal conditioning.

Sound buzz when mono is selected: Occurs with early chassis (serial nos. 601XXXX to 605XXXX). Carry out the following modification. Remove C150 (33pF) from the main chassis and fit it in position C1591 on the Nicam panel. Add a 100mm length of wire from the open end of C1591 to the right-hand hole of the removed C150 on the main panel.

No Nicam, 5V supply missing: Check whether C1592 (10nF) is leaky or R1594 (1kΩ) has gone high in value.

No Nicam, OSD shows yellow bar when Nicam is selected: IC1511 (SAA7283ZP) or Q1511 (8·192MHz crystal) could be faulty.

No Nicam or mono, loop voltage at pin 39 of IC1511 very noisy or high (4V): Q1511 (8·192MHz crystal) faulty.

Microcontroller Section

No remote operation (no OSD, may operate from handset once then no more function control): R686 (2·2Ω fusible) open-circuit or high in value.

Drifts off tune when OSD goes off, also no text functions: R686 (2·2Ω fusible) open-circuit or high-resistance.

Drifts off tune (33V supply noisy or low): Check D685 (ZTK33), C695 (4·7nF) and C907 (4·7µF).

No tuning bars or store function (yellow bar only when tuning or store is selected): D904 (1N4148) leaky or resistor fitted in this position by mistake.

Wrong OSDs flash up when either the handset or control panel is used: This applies with early sets, serial nos. 601XXXX-605XXXX, E28G series only. Inspect the front control buttons for concaving/dishing – they must be convex. If concave they will be on continuously. On later sets a different switch with a white actuator is used. They are not interchangeable unless the plastic button assembly is also changed. It is also wise to check the straightness of the PCB: if it's bent, warm it up and straighten it.

No OSD or control when powered up by handset (screen lights up): Inspect the function and clear buttons on the front control panel for dishing (concave). Check that line sync pulses are present at pin 26 of IC901. If missing, check the print track opposite the line output transistor T702.

CRT lights but no OSD or control when the set is powered up: Check the I^2C lines at pins 39/40 of IC901. One or both may be low – they should be high. There may be a crack in the PCB near IC901.

Blank raster, no OSD. Snowy raster after three seconds. Also delay in unblanking after any function change: Check the field sync pulses at pin 27 of IC901. If missing, check R941, C301, D914 and the print track from C301.

Set goes to standby after a short period, no other function controls. Must power off to reset. Other obscure symptoms, e.g. OSD colours change, odd OSD symbols, tuning drift): Internal arcing in the LOPT.

Set comes out of standby but LED goes off instead of to half brightness. No other functions: Crack in tracks under D703. No line drive etc. Internal CRT short-circuit, EHT rises monentarily then stops. Applies mainly with 14/20in. sets.

Set comes out of standby then immediately goes back: Most likely cause is shorted turns in the LOPT (TR702), as a result of which the power supply trips. IC751 (TDA4950) in 110° models could be short-circuit, pulling down the 27V supply to the field output stage. D705 (BA157) could be leaky.

Sweep tuning does not stop: Ident doesn't change state because pin 4 of IC101 (TDA8361) is open-circuit. If the AFC voltage at pin 9 of IC901 is correct (approximately 2·5V DC) when the picture is tuned manually, check the supply at pin 42. If at 5·5V, check whether the 5·6V zener diode D684 is touching T681 (BD135). If the supply is at 6·5V, T681 (BD135) is short-circuit.

Tuning bar travels very fast then locks up all functions (other functions may be OK): IC901 is faulty.

All buttons at front and on handset produce "store" display (may be OK sometimes): IC902 (24C02) faulty.

Teletext Faults

No text operation or other faults: Check whether R686 (2·2Ω fusible) is high-resistance or open-circuit.

Fastext page select incorrect, text OK: IC403 (P83C654) faulty.

Page number floats from left to right and back: Check C407 and C411 (both 100nF) which can go open-circuit. Alternatively IC401 (SAA5281P/E) may be faulty.

Text symbols and letters break up: IC401 (SAA5281P/E) faulty.

Spares

Spares for these sets should be available from Maplin Electronics (NEI Spares Division), Unit 11, Valley Court, Station Road, Wombwell, Barnsley, S. Yorkshire S73 0BS. Phone 0113 277 4310, fax 0113 277 4312.

TRANSISTORS/LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
BC107	8p	BD434	30p	BU126	65p	BUV48AF	325p	MJ4502	300p
BC108	8p	BD435	31p	BU128	125p	BUV48C	250p	MJ10012	300p
BC109	8p	BD436	30p	BU133	125p	BUV50	425p	MJ11015	250p
BC109C	10p	BD437	28p	BU137	150p	BUV61	1000p	MJ11016	300p
BC140	20p	BD438	36p	BU180	100p	BUV70	200p	MJ11032	800p
BC142	20p	BD439	40p	BU184	100p	BUV90	175p	MJ11033	800p
BC143	20p	BD440	40p	BU204	65p	BUV93	375p	MJ15003	250p
BC147	8p	BD441	40p	BU205	70p	BUW11A	200p	MJ15004	300p
BC149	8p	BD533	50p	BU206	100p	BUW11AF	225p	MJ15015	250p
BC159	8p	BD534	38p	BU207	150p	BUW12	125p	MJ15016	350p
BC160	30p	BD535	38p	BU208	70p	BUW12A	150p	MJ15022	400p
BC171	10p	BD536	38p	BU208A	75p	BUW12F	250p	MJ15023	400p
BC172	10p	BD537	40p	BU208AT	200p	BUW13A	200p	MJ15024	400p
BC177	14p	BD538	40p	BU208B	200p	BUW32A	500p	MJ15025	700p
BC178	14p	BD643	50p	BU208D	130p	BUW48	550p	MJE340	25p
BC179	14p	BD645	50p	BU209	90p	BUW49	550p	MJE350	80p
BC182	7p	BD647	50p	BU225	120p	BUW50	400p	MJE520	30p
BC182L	7p	BD649	50p	BU226	120p	BUW81A	150p	MJE2955T	65p
BC183	7p	BD675	40p	BU312	90p	BUW84	75p	MJE3055T	65p
BC183L	7p	BD676	40p	BU325	55p	BUW85	85p	MJE13004	100p
BC184	7p	BD677	38p	BU326A	75p	BUX10	350p	MJE13005	60p
BC184L	7p	BD678	40p	BU406	60p	BUX11	200p	MJE13007	100p
BC212	7p	BD679	40p	BU406D	85p	BUX12	150p	MJE13009	100p
BC212L	7p	BD680	40p	BU407	55p	BUX20	350p	MJE15028	200p
BC213	7p	BD681	45p	BU407D	75p	BUX21	450p	MJE15029	200p
BC213L	7p	BD682	45p	BU408	60p	BUX22	450p	MJE15030	250p
BC214	7p	BD705	50p	BU408D	75p	BUX23	900p	MJE15031	400p
BC214L	7p	BD707	50p	BU409	85p	BUX37	220p	MJE18004	125p
BC237	7p	BD709	50p	BU412	175p	BUX39	450p	MJF18004	175p
BC238	7p	BD711	50p	BU413	175p	BUX40	210p	MJF18204	350p
BC239	7p	BD736	50p	BU414B	250p	BUX41	200p	OC28	350p
BC300	20p	BD826	50p	BU415A	170p	BUX42	200p	OC29	250p
BC301	20p	BD828	50p	BU426A	70p	BUX47A	220p	OC35	350p
BC302	20p	BD839	55p	BU433	120p	BUX48A	150p	OC36	250p
BC303	20p	BD897	50p	BU500	100p	BUX55	800p	S2000A3	175p
BC304	25p	BD899	50p	BU505D	225p	BUX80	180p	S2000AF	90p
BC327	7p	BD977	50p	BU505	90p	BUX81	160p	S2055A	175p
BC328	7p	BDX33	60p	BU505D	90p	BUX84	50p	S2055AF	175p
BC337	7p	BDX37	100p	BU505DF	90p	BUX85	50p	S2530A	100p
BC338	7p	BDX44	100p	BU506	100p	BUX86	50p	TIP29	15p
BC441	28p	BDX47	60p	BU506D	70p	BUX87	50p	TIP29A	22p
BC446	8p	BDX54C	75p	BU506DF	100p	BUX98A	350p	TIP29C	25p
BC477	18p	BDX62C	150p	BU508A	60p	BUZ71	75p	TIP29E	40p
BC516	22p	BDX63C	175p	BU508AF	60p	BUZ71AF	100p	TIP30	25p
BC537	25p	BDX64C	175p	BU508APH	60p	BUZ72A	100p	TIP30C	25p
BC546	8p	BDX65	80p	BU508D	75p	BUZ72AF	100p	TIP31A	22p
BC547	8p	BDX66C	175p	BU508DF	85p	BUZ73A	150p	TIP31C	27p
BC548	8p	BDX67C	275p	BU508DR	130p	BUZ73AF	60p	TIP32	24p
BC549	8p	BDX71	70p	BU508V	110p	BUZ76A	110p	TIP32A	21p
BC550	8p	BDX77	175p	BU508VF	100p	BUZ80	135p	TIP32C	28p
BC556	8p	BDX87C	175p	BU526	75p	BUZ80AF	200p	TIP33	50p
BC557	8p	BDX88C	150p	BU536	100p	BUZ83	200p	TIP33C	60p
BC558	8p	BDW24	55p	BU546	125p	BUZ90A	180p	TIP34	65p
BC559	8p	BDW93	50p	BU603	125p	BUZ91A	260p	TIP34C	60p
BC560	8p	BDW94	50p	BU606D	225p	BY448	20p	TIP35C	65p
BC637	20p	BDY29	225p	BU608D	120p	BYT11	25p	TIP36C	65p
BC639	20p	BDY56	225p	BU626	120p	IRF120	225p	TIP41A	20p
BC640	20p	BDY58	500p	BU705	130p	IRF130	475p	TIP41C	22p
BCY33	200p	BDY90	125p	BU706DF	175p	IRF140	550p	TIP42A	20p
BCY34	200p	BDY92	100p	BU706F	150p	IRF230	550p	TIP42C	22p
BCY70	16p	BF137	35p	BU724A	100p	IRF240	425p	TIP47	40p
BCY71	16p	BF167	30p	BU801	70p	IRF250	375p	TIP48	40p
BCY72	16p	BF181	18p	BU806	70p	IRF330	600p	TIP50	60p
BD115	30p	BF183	20p	BU807	60p	IRF340	325p	TIP51	80p
BD124P	50p	BF195	7p	BU807F	75p	IRF350	750p	TIP52	80p
BD131	25p	BF199	8p	BU808DF	210p	IRF450	650p	TIP54	85p
BD132	25p	BF200	16p	BU810	110p	IRF510	110p	TIP102	70p
BD133	50p	BF225	30p	BU824	60p	IRF520	110p	TIP105	65p
BD135	20p	BF240	16p	BU826	120p	IRF530	120p	TIP106	65p
BD136	20p	BF245	25p	BU826A	160p	IRF540	120p	TIP107	65p
BD137	20p	BF254	15p	BU902	110p	IRF610	120p	TIP110	40p
BD138	20p	BF255	12p	BU903	110p	IRF611	120p	TIP111	40p
BD139	20p	BF256	18p	BU910	80p	IRF620	160p	TIP112	35p
BD140	20p	BF257	18p	BU912	100p	IRF630	110p	TIP112H	50p
BD144	90p	BF259	18p	BU920	100p	IRF640	300p	TIP115	30p
BD157	38p	BF262	25p	BU922	110p	IRF642	200p	TIP116	30p
BD166	30p	BF270	18p	BU930	130p	IRF650	200p	TIP117	30p
BD175	30p	BF273	15p	BU932	175p	IRF710	150p	TIP120	37p
BD177	30p	BF311	21p	BU941	250p	IRF720	150p	TIP121	35p
BD179	32p	BF336	20p	BU2508A	100p	IRF730	125p	TIP122	30p
BD181	45p	BF337	20p	BU2508AF	110p	IRF740	125p	TIP125	30p
BD182	60p	BF338	20p	BU2508D	130p	IRF820	110p	TIP126	40p
BD184	60p	BF362	30p	BU2508DF	120p	IRF830	110p	TIP127	35p
BD187	30p	BF367	13p	BU2520AF	170p	IRF840	110p	TIP130	30p
BD201	33p	BF371	17p	BU2520DF	225p	IRF9140	1000p	TIP131	30p
BD202	38p	BF421	18p	BU2525A	325p	IRF9510	150p	TIP132	30p
BD203	42p	BF422	21p	BU2525AF	220p	IRF9511	150p	TIP136	40p
BD204	42p	BF423	25p	BU2527AF	400p	IRF9520	150p	TIP137	65p
BD222	31p	BF455	12p	BUF405A	200p	IRF9530	200p	TIP162	110p
BD225	31p	BF458	19p	BUH315	200p	IRF9531	200p	TIP141	65p
BD232	31p	BF462	50p	BUH315D	175p	IRF9540	240p	TIP142	75p
BD233	30p	BF471	28p	BUH515	200p	IRF9541	200p	TIP145	50p
BD234	32p	BF472	28p	BUH515D	250p	IRF9610	120p	TIP146	70p
BD235	28p	BF479	30p	BUH517	275p	IRF9620	110p	TIP147	80p
BD236	30p	BF494	16p	BUH517D	175p	IRF9622	200p	TIP150	90p
BD237	21p	BF495	16p	BUH715	425p	IRF9630	180p	TIP151	60p
BD238	24p	BF595	16p	BUT11A	35p	IRF9640	280p	TIP2955	50p
BD239	30p	BF596	16p	BUT11AF	35p	IRFD9220	100p	TIP3055	50p
BD240	40p	BF615	30p	BUT12	80p	IRFBC30	150p	TIPL760	100p
BD241A	40p	BF617	30p	BUT13	310p	IRFBC40	250p	TIPL762A	200p
BD243A	50p	BF760	40p	BUT18	80p	IRFP140	250p	TIPL763A	200p
BD244	50p	BF763	40p	BUT18AF	65p	IRFP150	300p	TIPL791A	80p
BD245	50p	BF870	22p	BUT30V	1700p	IRFP240	300p	2N2369	15p
BD246A	50p	BF871	22p	BUT56A	65p	IRFP250	280p	2N2646	40p
BD265	45p	BF960	38p	BUT76A	80p	IRFP350	325p	2N2904	20p
BD267	45p	BF961	35p	BUT90	1300p	IRFP450	325p	2N2905	20p
BD269	45p	BF964	38p	BUT92	1200p	IRFP460	775p	2N2906	18p
BD278	50p	BFQ232	75p	BUV18	650p	IRFP9140	1450p	2N2907	18p
BD311	100p	BFQ252A	60p	BUV20	650p	IRFP9240	350p	2N3019	28p
BD314	100p	BFR90	85p	BUV21	400p	IRFPC50	600p	2N3053	18p
BD315	150p	BFR91	99p	BUV23	475p	IRFRC20	250p	2N3054	40p
BD317	150p	BR100	14p	BUV24	350p	IRFZ20	65p	2N3055	38p
BD331	40p	BR103	37p	BUV25	110p	IRFZ42	275p	2N3055H	50p
BD332	40p	BR303	85p	BUV26	150p	IRFZ44	160p	2N3440	45p
BD361	60p	BU105	80p	BUV27	125p	MJ2501	100p	2N3441	175p
BD362	60p	BU108	100p	BUV28	110p	MJ2955	55p	2N3442	85p
BD370	30p	BU109	80p	BUV37	175p	MJ3000	100p	2N3771	85p
BD371	30p	BU110	90p	BUV46A	75p	MJ3001	100p	2N3772	90p
BD410	50p	BU111	100p	BUV47	120p	MJ4032	175p	2N3773	100p
BD433	28p	BU124	60p	BUV48A	175p	MJ4035	175p	2N3819	29p

Part	Price
4N35	50p

RECTIFIER DIODES

BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY206	11p
BY207	20p
BY227	19p
BY228	28p
BY298	15p
BY299	18p
BY329-1200	150p
BY448	20p
BYT11	25p
BYT13-1000	30p
BYV96E	25p
BYW96E	36p
BYX10	15p
BYX55/600	25p
IN4001	3p
IN4002	3p
IN4003	3p
IN4004	3p
IN4005	3p
IN4006	3p
IN4007	4p
IN4148	2p
IN5400	9p
IN5401	8p
IN5402	8p
IN5403	8p
IN5404	8p
IN5405	11p
IN5406	12p
IN5407	12p
IN5408	12p
RGP10	25p
RGP15	25p
RGP30	16p
SR2M	50p

I.C. SOCKETS

8 PIN	4p
14 PIN	5p
16 PIN	6p
18 PIN	9p
20 PIN	10p
22 PIN	12p
24 PIN	13p
28 PIN	13p
40 PIN	15p

ZENER DIODES

400 mWatts

2V7 to 39V	5p

1.3 Watts

2V7 to 39V	9p

VOLTAGE REGULATORS

7805	18p
7806	18p
7808	25p
7812	18p
7815	25p
7818	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
LM309K	100p
LM317T	100p
LM323K	350p
78H08KC	800p
79H12KC	700p
79HGKC	800p

LEDs

3mm

RED	5p
YELLOW	8p
GREEN	8p

5mm

RED	5p
YELLOW	8p
GREEN	8p

RECTANGULAR LEDs

5mm x 2.5mm

RED	5p
YELLOW	8p
GREEN	8p

Part	Price
LINEAR ICs	
AN203	210p
AN210	165p
AN211	150p
AN214Q	170p
AN217P	95p
AN228	280p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN277B	400p
AN278	80p
AN301	330p
AN302	650p
AN303	250p
AN304	360p
AN315	210p
AN316	350p
AN337	600p
AN360	100p
AN362	140p
AN363	150p
AN366	150p
AN610	160p
AN3211K	375p
AN3215K	350p
AN3231K	300p
AN3236K	450p
AN3310K	325p
AN3312	350p
AN3313	300p
AN3320K	450p
AN3331K	450p
AN3792	300p
AN3794	325p
AN3814K	450p
AN3821K	600p
AN3822K	600p
AN3830K	800p
AN3990K	300p
AN3991K	400p
AN5010	250p
AN5011	225p
AN2020	80p
AN5025	250p
AN5033	400p
AN5034	400p
AN5070	125p
AN5071	100p
AN5111	450p
AN5132	250p
AN5135NK	400p
AN5138NK	350p
AN5150	400p
AN5151	200p
AN5210	675p
AN5215	100p
AN5222	200p
AN5250	160p
AN5256	150p
AN5260	300p
AN5262	175p
AN5265	80p
AN5315	600p
AN5352	600p
AN5411	450p
AN5421	150p
AN5429	420p
AN5431	275p
AN5435	125p
AN5436N	160p
AN5512	100p
AN5515	160p
AN5520	550p
AN5521	100p
AN5560	350p
AN5601K	750p
AN5612	200p
AN5613	200p
AN5615	300p
AN5620	250p
AN5622	275p
AN5625	400p
AN5630	375p
AN5633	350p
AN5635N	330p
AN5640	500p
AN5700	90p
AN5701	150p
AN5710	100p
AN5712	180p
AN5720	70p
AN5722	140p
AN5730	160p
AN5732	120p
AN5750	75p
AN5753	130p
AN5763	250p
AN5790	240p
AN5791	225p
AN5836	450p
AN5862K	225p
AN5900	130p
AN608P	125p
AN620	250p
AN6130	130p
AN6135	120p
AN6209	350p
AN6250	50p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	380p
AN6310	200p
AN6320	180p
AN6326N	250p
AN6332	320p
AN6340	600p
AN6341	200p
AN6342	325p
AN6344	440p
AN6345	400p
AN6346	350p
AN6350	610p
AN6352	450p
AN6356	300p
AN6359	500p
AN6360	320p
AN6362	400p
AN6363	375p
AN6367NK	400p
AN6368	275p
AN6371	350p
AN6387	480p
AN6550	100p
AN6551	50p
AN6552	45p
AN6554	80p
AN6555	50p
AN6605	35p
AN6612	60p
AN6650	45p
AN6651	45p
AN6652	45p
AN6671K	425p
AN6676	600p
AN6780S	80p
AN6870	450p
AN6875	150p
AN6878	65p
AN6879	225p
AN6880	75p
AN6882	300p
AN6884	200p
AN6888	150p
AN6889	100p
AN6913	60p
AN700	650p
AN7010K	250p
AN7025K	90p
AN7060	175p
AN7062	300p
AN7072	250p
AN7081K	200p
AN7105	170p
AN7106K	135p
AN7110	75p
AN7111	100p
AN7112	45p
AN7114	120p
AN7115	110p
AN7116	90p
AN7117	65p
AN7120	100p
AN7130	75p
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HA12412	175p
HA12413	70p
HA12430	200p

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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
HA13001	650p	LA2800	350p	LA7096	200p	LF353	48p	MC3302	50p	SAB3029	525p	STK3102 II	530p	STK5478	380p	STR16006	500p	TA7281	200p
HA13002	200p	LA3120	200p	LA7113	275p	LF355	60p	MC3401	45p	SAB3035	275p	STK3106	2500p	STK5479	300p	STR17006	500p	TA7282	160p
HA13006	400p	LA3150	200p	LA7116	125p	LF357	70p	MC3423P	100p	SAB3036	725p	STK3122 III	725p	STK5481	470p	STR20005	450p	TA7210	200p
HA13007	300p	LA3160	120p	LA7123	1300p	LF398	300p	MC3488AP	250p	SAB3037	700p	STK3152 II	900p	STK5482	285p	STR20012	450p	TA7283	200p
HA13108	280p	LA3161	40p	LA7210	60p	LH2426S	600p	MC34063AP	300p	SAB3042	825p	STK3156	500p	STK5483	440p	STR20015	450p	TA7284P	400p
HA13117	175p	LA3210	65p	LA7212	150p	LM301	26p	MN1220T	600p	SAB3064	130p	STK4017	400p	STK5486	450p	STR30110	330p	TA7288	220p
HA13118	140p	LA3226	60p	LA7214	150p	LM311	35p	MN1226	450p	SAB3209	225p	STK4019	480p	STK5487	525p	STR30115	275p	TA7291P	200p
HA13119	140p	LA3246	75p	LA7220	125p	LM319	165p	MN1228	600p	SAB3210	250p	STK4021	380p	STK5488	480p	STR30120	400p	TA7292P	325p
HA13127	350p	LA3300	140p	LA7222	110p	LM324	30p	MN1276	1300p	SAB6456	125p	STK4024 II	550p	STK5490	450p	STR30123	450p	TA7294P	450p
HA13128	400p	LA3301	110p	LA7224	150p	LM335Z	120p	MN1280	70p	SAB8048	225p	STK4025	530p	STK5632	450p	STR30125	550p	TA7299	200p
HA13130	450p	LA3361	100p	LA7225	250p	LM339	35p	MN3004	600p	SAB8051AP	700p	STK4026	480p	STK5720	400p	STR30130	250p	TA7302P	75p
HA13135	500p	LA3365	70p	LA7292	275p	LM348	50p	MN3005	2000p	SDA2003	450p	STK4028	550p	STK5725	450p	STR40090	350p	TA7303	70p
HA13139	600p	LA3370	70p	LA7294	200p	LM358	45p	MN3011	4000p	SDA2004	325p	STK4032 II	1050p	STK5730	450p	STR40115	600p	TA7307	100p
HA13150A	1150p	LA3373	70p	LA7295	160p	LM380	80p	MN3101	110p	SDA2005	700p	STK4034 X	925p	STK6316	300p	STR41090	330p	TA7310	100p
HA13151	875p	LA3375	300p	LA7297	120p	LM381	150p	MN3102	110p	SDA2007	300p	STK4036	470p	STK6324B	500p	STR43111	950p	TA7312	120p
HA13403	400p	LA3376	80p	LA7305A	350p	LM382	130p	MN3207	375p	SDA2008	400p	STK4038	680p	STK6327	1200p	STR44115	475p	TA7313	70p
HA13406W	400p	LA3380	300p	LA7308	70p	LM386	60p	MN3208	950p	SDA2112	450p	STK4040 II	650p	STK6328A	800p	STR45111	550p	TA7314	175p
HA13408	350p	LA3390	250p	LA7311	200p	LM387	100p	MN6030B	350p	SDA2120	200p	STK4042 II	800p	STK6431	850p	STR50020	350p	TA7315	200p
HA13412	600p	LA3400	250p	LA7320	120p	LM389N	105p	MN6163A	700p	SDA2131	225p	STK4044	950p	STK6607	400p	STR50092	550p	TA7317P	120p
HA13426	500p	LA3401	90p	LA7323	325p	LM393	45p	MTA001M	600p	SDA2208	450p	STK4046	950p	STK6722	725p	STR50103A	260p	TA7320P	200p
HA13432	400p	LA3410	150p	LA7330	350p	LM431	50p	NE555	20p	SDA4212	775p	STK4048	1280p	STK6732	1000p	STR50113	500p	TA7322	130p
HA13441	450p	LA3430	135p	LA7331	250p	LM710	45p	NE556	40p	SDA5241	725p	STK4050 II	1600p	STK6822	900p	STR50115	500p	TA7323	80p
HA17524	250p	LA3600	60p	LA7332	225p	LM723	40p	NE558	80p	SDA5243-2	450p	STK4060	510p	STK6922	1000p	STR51041	500p	TA7234	75p
KA2102	100p	LA3605	100p	LA7340	300p	LM741DIL	18p	NE565	110p	SDA5343	1450p	STK4065	650p	STK6932	525p	STR50213	500p	TA7325	90p
KA2130	150p	LA3607	125p	LA7376	150p	LM741MET	45p	NE567	115p	SDA5640	200p	STK4101	500p	STK6962	275p	STR53041	400p	TA7326	200p
KA2131	110p	LA4030	180p	LA7391	550p	LM747	55p	NE571	290p	SDA5642	450p	STK4111	500p	STK6972	490p	STR54041	320p	TA7328	110p
KA2206	150p	LA4031	140p	LA7520	200p	LM1017	200p	NE592	85p	SGSF444	500p	STK4112	500p	STK6981B	600p	STR55041	450p	TA7330P	80p
KA2209	125p	LA4032	140p	LA7530	200p	LM1035N	350p	NE5532P	140p	SGFS465	500p	STK4121	480p	STK6982	600p	STR56041	550p	TA7331P	80p
KA2210	230p	LA4051	160p	LA7535	175p	LM1040N	650p	SAA1000	350p	SLA4031	750p	STK4122	560p	STK6982H	600p	STR58041	250p	TA7333	100p
KA2212	65p	LA4100	85p	LA7545	160p	LM1203	225p	SAA1004	650p	SLA7020M	450p	STK4131	480p	STK7216	420p	STR59041	300p	TA7335	85p
KA2213	130p	LA4101	80p	LA7550	275p	LM1203AN	225p	SAA1005	325p	STA301A	200p	STK4132 II	600p	STK7217	400p	STR60001	525p	TA7336	180p
KA2214	100p	LA4102	100p	LA7555	150p	LM1875T	330p	SAA1006	300p	STA341M	180p	STK4133 II	750p	STK7225	500p	STR80145	475p	TA7337P	175p
KA2224	50p	LA4110	120p	LA7620	500p	LM1881N	375p	SAA1008	450p	STA401A	220p	STK4141 II	420p	STK7226	600p	STR81145	375p	TA7339P	175p
KA2244	75p	LA4120	270p	LA7680	675p	LM1886	250p	SAA1010	400p	STA403A	270p	STK4142	530p	STK7251	500p	STR90120	425p	TA7341	250p
KA2261	100p	LA4138	105p	LA7681	650p	LM1889	300p	SAA1024	250p	STA405A	280p	STK4147 II	540p	STK7253	450p	STRD1206	500p	TA7342P	70p
KA2263	100p	LA4140	60p	LA7710	250p	LM1894N	200p	SAA1025	250p	STA431A	250p	STK4151	680p	STK7308	700p	STRD1406	600p	TA7343	120p
KA2264	100p	LA4142	65p	LA7800	90p	LM1895N	275p	SAA1026	400p	STA432A	220p	STK4152	650p	STK7309	400p	STRD1706	360p	TA7347P	120p
KA2284	75p	LA4145	65p	LA7801	100p	LM2901N	35p	SAA1027	400p	STA434A	270p	STK4161	650p	STK7310	470p	STRD1806	360p	TA7348P	125p
KA2309	175p	LA4160	100p	LA7802	300p	LM2902N	40p	SAA1029	150p	STA435A	270p	STK4162	550p	STK7348	400p	STRD1816	350p	TA7349P	175p
KA2401	150p	LA4162	110p	LA7806	260p	LM2903N	40p	SAA1042	325p	STA441C	220p	STK4164 II	1175p	STK7356	425p	STRD1906	550p	TA7354P	65p
KA2412	225p	LA4178	150p	LA7808	250p	LM3900	40p	SAA1043P	675p	STA451C	280p	STK4171	900p	STK7358	440p	STRD3035	300p	TA7357	340p
KA2912	125p	LA4180	150p	LA 7820	100p	LM3909	100p	SAA1044	400p	STA456C	240p	STK4172 II	680p	STK7402	560p	STRD4412	500p	TA7358	85p
KA2913A	175p	LA4182	180p	LA7823	200p	LM3911N	200p	SAA1056	300p	STA471	210p	STK4181	680p	STK7404	600p	STRD4420	550p	TA7359P	90p
KA2914A	200p	LA4190	300p	LA7824	130p	LM3914	160p	SAA1057	375p	STA901M	280p	STK4182 II	750p	STK7406	650p	STRD4512	400p	TA7360	125p
KA22427	100p	LA4192	140p	LA7830	90p	LM3915	160p	SAA1058	225p	STK0025	420p	STK4191	700p	STK7408	675p	STRD5441	475p	TA7361	125p
KIA6213S	60p	LA4200	130p	LA7831	85p	LM3916	270p	SAA1060	375p	STK0029	1000p	STK4192	700p	STK7410	1500p	STRD5541	450p	TA7362	150p
KIA6210AH	400p	LA4201	120p	LA7832	130p	LM8363	320p	SAA1061	250p	STK0039	600p	STK4211 II	1000p	STK7458	1250p	STRD6008	575p	TA7364P	175p
KIA6281H	250p	LA4260	230p	LA7835	150p	LM8560	175p	SAA1062	250p	STK0040	520p	STK4211 V	800p	STK7554	600p	STRD6009E	450p	TA7366P	65p
KIA6283K	150p	LA4261	300p	LA7837	150p	LM13600	150p	SAA1063	250p	STK0049	510p	STK4221 II	1200p	STK7561	650p	STRD6018	450p	TA7368P	35p
KIA6299H	210p	LA4265	125p	LA7838	200p	LM13700	125p	SAA1064	275p	STK0050	440p	STK4231 II	1050p	STK7562	1000p	STRD6602	475p	TA7373F	150p
KIA7227CP	200p	LA4270	300p	LA7850	225p	LM18293	500p	SAA1070	550p	STK0059	620p	STK4241	1050p	STK7563	800p	STRD6601	650p	TA7374	175p
KIA7313	45p	LA4282	350p	LA7851	200p	M491BB1	800p	SAA1073	325p	STK0060	820p	STK4241 V	1250p	STK7573	400p	STRM6545	900p	TA7376P	100p
L149V	300p	LA4420	140p	LA7910	150p	M494B1	700p	SAA1075	350p	STK0070	1100p	STK4272	500p	STK7576	1500p	STRM6546	900p	TA7378P	60p
L165V	250p	LA4422	130p	LA7913	90p	M5265P	200p	SAA1086	175p	STK0080	1000p	STK4273	550p	STK7703	1000p	STRM6549	500p	TA7401	250p
L200	200p	LM4425A	200p	LA7930	350p	M50115P	320p	SAA1089	325p	STK011	330p	STK4301	500p	STK8050	1600p	STRS5741	800p	TA7402P	200p
L272	200p	LA4430	130p	LA7940	200p	M50117P	500p	SAA1101	700p	STK015	440p	STK4311	650p	STK8250	500p	STRS5941	750p	TA7403	325p
L272M	110p	LA4440	200p	LA7953	300p	M50119P	525p	SAA1124	200p	STK016	760p	STK4332	365p	STK8260	1200p	STRS6307	600p	TA7404	150p
L290B	225p	LA4445	200p	LA9200	300p	M50422P	750p	SAA1130	550p	STK025	650p	STK4352	500p	STK8280	1850p	STRS6308	600p	TA7405P	200p
L291B	300p	LA4446	170p	LB1205	170p	M50461	350p	SAA1250	280p	STK050	1600p	STK4362	450p	STK3405 II	550p	STRS6309	600p	TA7406P	150p
L292	750p	LA4460	120p	LB1216	150p	M50784	300p	SAA1251	380p	STK077	520p	STK4372	600p	STK3410	350p	STRS6707	1000p	TA7411AP	150p
L293B	225p	LA4461	120p	LB1258	100p	M50786	500p	SAA1271	400p	STK078	1800p	STK4392	500p	STK3140 II	500p	STRS6708	575p	TA7414	150p
L293C	325p	LA4466	225p	LB1268	70p	M50790	600p	SAA1274	280p	STK080	550p	STK4412	450p	STK73605	375p	TA7054	190p	TA7415P	350p
L293D	225p	LA4470	300p	LB1274	85p	M51014L	120p	SAA1290	750p	STK082	2000p	STK4432	600p	STK73907	700p	TA7061	115p	TA7417AP	225p
L293E	250p	LA4475	225p	LB1290	120p	M51143AL	110p	SAA1293	550p	STK084	600p	STK4773	820p	STK78617	2400p	TA7062	200p	TA7420P	350p
L294	475p	LA4476	225p	LB1292	110p	M51161	300p	SAA1294	800p	STK085	900p	STK4793	800p	STR370	300p	TA7066	120p	TA7427AP	225p
L295	450p	LA4480	225p	LB1405	70p	M51161P	250p	SAA1300	200p	STK086	1000p	STK4803	1000p	STR371	400p	TA7075P	300p	TA7521P	350p
L297	525p	LA4485	300p	LB1407	130p	M51162P	250p	SAA1310	200p	STK0100	900p	STK4813	800p	STR380	350p	TA7089	300p	TA7607	200p
L298	400p	LA4495	250p	LB1409	200p	M51164AL	80p	SAA1350	275p	STK0100II	1200p	STK4833	850p	STR381	390p	TA7102P	500p	TA7608	360p
L465A	525p	LA4496	250p	LB1412	300p	M51166P	300p	SAA1351	750p	STK420	400p	STK4843	720p	STR383	410p	TA7119	150p	TA7609	170p
L482	400p	LA4498	275p	LB1415	100p	M51182L	110p	SAA1900S	475p	STK430	500p	STK4853	1700p	STR384	350p	TA7120	55p	TA7612	300p
L497B	525p	LA4500	200p	LB1416	85p	M51191L	85p	SAA3004	400p	STK433	400p	STK4863	700p	STR440	800p	TA7124	250p	TA7613AP	90p
L702B	400p	LA4505	220p	LB1426	125p	M51231P	200p	SAA3006P	225p	STK435	375p	STK4873	1100p	STR441	950p	TA7130P	85p	TA7614	170p
L702N	325p	LA4508	200p	LB1450	110p	M51308SP	550p	SAA3007P	130p	STK436	430p	STK4893	1000p	STR442	1600p	TA7137	60p	TA7616	300p
L2720	150p	LA4510	100p	LB1615	270p	M51310AP	900p	SAA3008P	200p	STK437	600p	STK4913	900p	STR450A	700p	TA7140	100p	TA7621	300p
L2722	175p	LA4520	170p	LB1620	210p	M51316P	300p	SAA3010P	300p	STK439	500p	STK5314	475p	STR451	800p	TA7141	825p	TA7622	420p
L4960	325p	LA4550	200p	LB1622	220p	M51320	200p	SAA3027P	375p	STK441	680p	STK5315	500p	STR452	600p	TA7150P	250p	TA7628	110p
L6203	600p	LA4555	120p	LB1630	80p	M51356P	400p	SAA3049P	550p	STK443	700p	STK5322	500p	STR453	500p	TA7157	100p	TA7629	220p
L6210	250p	LA4557	150p	LB1639	300p	M51358P	150p	SAA4700	425p	STK457	470p	STK5323	600p	STR454	1300p	TA7172P	150p	TA7630	200p
L6221AS	300p	LA4558	125p	LB1640	150p	M51365P	350p	SAA5000	200p	STK459	560p	STK5324	450p	STR455	550p	TA7193	320p	TA7632	400p
L6506	300p	LA4570	130p	LB1641	75p	M51366P	360p	SAA5010	220p	STK460	660p	STK5325	370p	STR456	470p	TA7200	200p	TA7637	400p
LA1130	240p	LA4571	175p	LB1642	150p	M51381P	200p	SAA5012	400p	STK461	600p	STK5326	750p	STR457	600p	TA7205	1200p	TA7640	90p
LA1135	120p	LA4581	175p	LB1645	100p	M51384AP	750p	SAA5020	350p	STK463	950p	STK5330	850p	STR470	400p	TA7207	150p	TA7641	140p
LA1145	200p	LA4597	125p	LB1648	200p	M51387P	600p	SAA5030	440p	STK465	900p	STK5331	300p	STR1096	275p	TA7208	125p	TA7644BP	480p
LA1150	150p	LA4620	400p	LB1649	190p	M51392P	300p	SAA5040A	280p	STK501	550p	STK5332	180p	STR1195	350p	TA7210	200p	TA76545P	65p
LA1170	90p	LA4630	325p	LB3500	125p	M51393AP	350p	SAA5040B	400p	STK561	450p	STK5333	650p	STR1229	325p	TA7214	220p	TA7658	100p
LA1177	130p	LA4700	350p	LC4966	65p	M51395AP	450p	SAA5041	550p	STK563	415p	STK5335	350p	STR2005	400p	TA7217	145p	TA7659P	400p
LA1180	75p	LA4705	400p	LC7011	500p	M51397AP	425p	SAA5042	425p	STK583	500p	STK5336	350p	STR2012	400p	TA7220	220p	TA7660P	325p
LA1185	150p	LA5005	90p	LC7060	600p	M51436P	350p	SAA5050	650p	STK760	600p	STK5337	500p	STR2013	300p	TA7222	90p	TA7666P	100p
LA1186	35p	LA5112	200p	LC7120	350p	M51496P	275p	SAA5051	400p	STK770	400p	STK5338	295p	STR2015	550p	TA7223	210p	TA7668	100p
LA1201	75p	LA5511	50p	LC7130	300p	M51533	300p	SAA5052	500p	STK772	650p	STK5339	400p	STR2024	575p	TA7225	300p	TA7672	400p
LA1205	75p	LA5512	50p	LC7131	260p	M51544	150p	SAA5054	500p	STK772B	480p	STK5340	350p	STR2105	600p	TA7226	290p	TA7676AP	450p
LA1207	120p	LA5522	45p	LC7132	400p	M51848	150p	SAA5230	850p	STK780	575p	STK5342	245p	STR2124	675p	TA7227	700p	TA7679	475p
LA1210	140p	LA5523	150p	LC7137	450p	M54523P	200p	SAA5231	170p	STK795	450p	STK5343	380p	STR3105	525p	TA7230	100p	TA7680AP	200p
LA1222	80p	LA5524	80p	LC7181	350p	M54563P	200p	SAA5240PA	600p	STK1039	460p	STK5353	400p	STR3113	225p	TA7232	95p	TA7681AP	425p
LA1230	130p	LA5527	150p	LC7185	350p	M58484	500p	SAA5243PE	360p	STK1040	640p	STK5361	375p	STR3115	400p	TA7233	120p	TA7687AP	100p
LA1235	130p	LA5530	65p	LC7191	300p	M51516	260p	SAA5244AP	950p	STK1049	700p	STK5362	400p	STR3123	400p	TA7237	300p	TA7688	150p
LA1240	80p	LA5531	65p	LC7207	275p	M51518	200p	SAA5246AP	380p	STK1050	650p	STK5372	260p	STR3125	480p	TA7238	400p	TA7698	400p
LA1245	110p	LA5537	45p	LC7215	160p	M51995P	250p	SAA5246P	750p	STK1060	700p	STK5373	375p	STR3130	500p	TA7240	160p	TA7699	600p
LA1260	75p	LA5655	175p	LC7217	350p	M51977P	300p	SAA5250P	750p	STK1070	850p	STK5391	375p	STR3135	250p	TA7241	165p	TA7705	300p
LA1261	75p	LA5658	225p	LC7218	250p	M52307P	900p	SAA5351	375p	STK1080	940p	STK5392	500p	STR3212	275p	TA7242	190p	TA7709P	150p
LA1265	125p	LA5665	250p	LC7230	700p	M54646AP	400p	SAA7000	550p	STK2025	620p	STK5421	450p	STR3214	275p	TA7243	320p	TA7719P	200p
LA1266	130p	LA5667	200p	LC7267	550p	MB3708	275p	SAA7020	600p	STK2028	500p	STK5422	375p	STR3215	275p	TA7245	225p	TA7727P	125p
LA1267	150p	LA5700	300p	LC7351	200p	MB3712	600p	SAA7210P	1300p	STK2029	480p	STK5431	550p	STR3315	275p	TA7245BPO	200p	TA7750	200p
LA1354	225p	LA6339	35p	LC7364	200p	MB3713	130p	SAA7220PA	550p	STK2030	1000p	STK5434	570p	STR4090A	650p	TA7248P	575p	TA7757	200p
LA1363	90p	LA6355	50p	LC7432	425p	MB3714	225p	SAA7274P	600p	STK2038	700p	STK5436	500p	STR4142	450p	TA7250B	325p	TA7760	200p
LA1364	200p	LA6510	150p	LC7522	350p	MB3715	250p	SAA7280P	1450p	STK2048	950p	STK5441	400p	STR4211	315p	TA7251BP	325p	TA7769	130p
LA1365	120p	LA6515	150p	LC7535	300p	MB3722	200p	SAA9050	450p	STK2058IV	1600p	STK5443	575p	STR4512	400p	TA7256P	225p	TA7772P	150p
LA1368	220p	LA6520	175p	LC7537AN	400p	MB3730	900p	SAA9057	475p	STK2101	1050p	STK5446	350p	STR5015	500p	TA7259P	225p	TA7784	250p
LA1369	200p	LA6531	250p	LC7537N	450p	MB3731	220p	SAB0600	600p	STK2110	550p	STK5451	390p	STR5100	550p	TA7262P	400p	TA7792P	250p
LA1385	170p	LA7007	400p	LC7560	750p	MB3732	240p	SAB0601	525p	STK2125	580p	STK5461	500p	STR5214	475p	TA7263P	325p	TA7796P	75p
LA1503	120p	LA7011	220p	LC7565	300p	MB3735	400p	SAB0602	625p	STK2129	750p	STK5462	500p	STR5315	575p	TA7265AP	300p	TA8101N	230p
LA1805	175p	LA7016	45p	LC7582E	300p	MB3756	160p	SAB1009BP	225p	STK2139	675p	STK5464	300p	STR5412	280p	TA7267	220p	TA8105N	140p
LA1810	130p	LA7018	100p	LC7800	175p	MB3759	200p	SAB1016	600p	STK2155	900p	STK5466	500p	STR6020	270p	TA7267BP	120p	TA8110AP	110p
LA1851	300p	LA7019	130p	LC7815H	175p	MB3771	110p	SAB1046P	350p	STK2230	470p	STK5467	400p	STR7001	600p	TA7269	260p	TA8122AN	250p
LA2000	150p	LA7033	400p	LC7818	280p	MB3773	110p	SAB2015P	525p	STK2240	740p	STK5468	300p	STR9005	400p	TA7270	170p	TA8127N	100p
LA2001	200p	LA7042	280p	LC7820	325p	MB8719	360p	SAB2016P	150p	STK2250	650p	STK5471	900p	STR9012	300p	TA7271	220p	TA8132AN	200p
LA2101	270p	LA7046	300p	LC7821N	250p	MC1391	120p	SAB2022P	525p	STK3041	370p	STK5472	375p	STR10006	450p	TA7272	260p	TA8136N	100p
LA2110	150p	LA7051	130p	LC7822N	160p	MC1455	45p	SAB3012	675p	STK3042	375p	STK5473	480p	STR11006	325p	TA7273	300p	TA8139P	70p
LA2200	190p	LA7053	130p	LC7881B	135p	MC1488	35p	SAB3013	200p	STK3044	950p	STK5474	500p	STR12006	450p	TA7274	210p	TA8142AN	250p
LA2205	150p	LA7054	350p	LC7881M	325p	MC1489	35p	SAB3017	320p	STK3062	500p	STK5476	350p	STR13006	500p	TA7279P	325p	TA8147N	100p
LA2211	350p	LA7060	150p	LF347	110p	MC1496	65p	SAB3021	450p	STK3082	550p	STK5477	450p	STR15006	500p	TA7280	190p	TA8152AN	200p

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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
TA8164P	100p	TDA1180	120p	TDA2760	400p	TDA4661	225p	TDA8391	675p	UPC1004C	130p	2SA771	90p	2SA1177	25p	2SB561	30p	2SC738	15p
TA8184P	350p	TDA1185A	190p	TDA2780	600p	TDA4670	475p	TDA8395	360p	UPC1009	950p	2SA773	50p	2SA1179	20p	2SB562	20p	2SC739	150p
TA8189P	130p	TDA1190	80p	TDA2791	275p	TDA4680	350p	TDA8405	550p	UPC1018	170p	2SA777	35p	2SA1182	20p	2SB564	15p	2SC761	110p
TA8200AH	325p	TDA1200B	80p	TDA2795	150p	TDA4685	275p	TDA8415	650p	UPC1020	200p	2SA778	100p	2SA1184	120p	2SB566	90p	2SC762	150p
TA8201AK	300p	TDA1220	50p	TDA2822M	60p	TDA4700A	750p	TDA8416	625p	UPC1023	60p	2SA781	150p	2SA1185	200p	2SB596	50p	2SC783	85p
TA8205	220p	TDA1235	300p	TDA2824	85p	TDA4714C	350p	TDA8417	550p	UPC1024H 2	75p	2SA786	25p	2SA1186	500p	2SB598	30p	2SC790	50p
TA8207K	175p	TDA1236	240p	TDA2840	200p	TDA4716C	450p	TDA8421	300p	UPC1025	230p	2SA794	50p	2SA1198	40p	2SB600	500p	2SC792	380p
TA8210	260p	TDA1251	150p	TDA3047	100p	TDA4718A	250p	TDA8425	500p	UPC1026	95p	2SA798	30p	2SA1201	40p	2SB601	60p	2SC805	225p
TA8211AH	200p	TDA1270	150p	TDA3048	130p	TDA4725	750p	TDA8432	550p	UPC1028	90p	2SA812	15p	2SA1202	25p	2SB605	25p	2SC828	20p
TA8214K	260p	TDA1327	200p	TDA3082	200p	TDA4800	300p	TDA8433	600p	UPC1031H	150p	2SA814	60p	2SA1204	225p	2SB631	40p	2SC829	15p
TA8215	300p	TDA1405	50p	TDA3083	200p	TDA4810	500p	TDA8440	300p	UPC1032	60p	2SA816	70p	2SA1206	60p	2SB632	45p	2SC839	20p
TA8216H	300p	TDA1410	220p	TDA3190	200p	TDA4814A	300p	TDA8442	200p	UPC1035C	110p	2SA817	20p	2SA1207	25p	2SB633	80p	2SC867	900p
TA8217P	120p	TDA1412	35p	TDA3301B	1600p	TDA4850	475p	TDA8443	350p	UPC1043C	125p	2SA825	20p	2SA1208	70p	2SB641	12p	2SC870	100p
TA8220AH	500p	TDA1506	275p	TDA3310	120p	TDA4851	325p	TDA8444	200p	UPC1158H	70p	2SA836	20p	2SA1209	100p	2SB647	20p	2SC897	175p
TA8221AH	600p	TDA1508	175p	TDA3410	150p	TDA4852	325p	TDA8451	325p	UPC1161	110p	2SA837	200p	2SA1210	120p	2SB648	45p	2SC900B	30p
TA8225H	475p	TDA1510	170p	TDA3420	200p	TDA4860	200p	TDA8452	200p	UPC1167	125p	2SA839	110p	2SA1215	600p	2SB649	35p	2SC930	15p
TA8225L	475p	TDA1512	140p	TDA3501	300p	TDA4866	275p	TDA8453	350p	UPC1170	150p	2SA841	20p	2SA1216	550p	2SB673	100p	2SC936	300p
TA8227	250p	TDA1514A	325p	TDA3502	360p	TDA4881	200p	TDA8461	950p	UPC1173	200p	2SA844	20p	2SA1217	100p	2SB676	85p	2SC941	15p
TA8229K	200p	TDA1515A	200p	TDA3504	300p	TDA4935	300p	TDA8490	225p	UPC1176C	120p	2SA847	25p	2SA1220	75p	2SB688	90p	2SC944	140p
TA8400P	200p	TDA1516Q	350p	TDA3505	275p	TDA4940	200p	TDA8540	250p	UPC1178H	250p	2SA854	30p	2SA1221	70p	2SB703	90p	2SC945	10p
TA8410K	200p	TDA1517	150p	TDA3506	260p	TDA4942	200p	TDA8702	275p	UPC1180C	200p	2SA861	45p	2SA1222	50p	2SB705	200p	2SC950	40p
TA8410P	200p	TDA1519	200p	TDA3507	450p	TDA4944	175p	TDA8703	500p	UPC185H2	400p	2SA872	25p	2SA1226	25p	2SB707	200p	2SC959	225p
TA8432	200p	TDA1519A	200p	TDA3510	200p	TDA4950	100p	TDA8708	600p	UPC1186	80p	2SA872A	50p	2SA1227	250p	2SB716	20p	2SC980	40p
TA8605N	350p	TDA1520	275p	TDA3520	250p	TDA5030A	100p	TDA8730	225p	UPC1187	150p	2SA879	30p	2SA1232	180p	2SB718	60p	2SC982	20p
TA8606N	350p	TDA1521	210p	TDA3530	250p	TDA5140A	200p	TDA8732	300p	UPC1188H	350p	2SA884	100p	2SA1237	25p	2SB727	100p	2SC983	120p
TA8607P	320p	TDA1522	110p	TDA3540	200p	TDA5330T	300p	TDA8735	175p	UPC1191	300p	2SA885	35p	2SA1238	30p	2SB733	75p	2SC1000	20p
TA8611AN	250p	TDA1524	200p	TDA3541	175p	TDA5331T	200p	TDA8740	625p	UPC1197	140p	2SA886	45p	2SA1239	30p	2SB734	35p	2SC1001	950p
TA8615N	480p	TDA1526	225p	TDA3560	600p	TDA5332T	150p	TDA8741	550p	UPC1198H	200p	2SA887	20p	2SA1240	45p	2SB737	20p	2SC1008	20p
TA8628N	350p	TDA1534	2000p	TDA3561	300p	TDA5500	400p	TDA8808T	325p	UPC1210	150p	2SA893	15p	2SA1242	80p	2SB739	22p	2SC1010	225p
TA8631	500p	TDA1540	420p	TDA3561A	300p	TDA5600	450p	TDA8809T	350p	UPC1215V	125p	2SA896	25p	2SA1244	120p	2SB744	55p	2SC1012	75p
TA8632N	550p	TDA1541	500p	TDA3562	260p	TDA5660P	250p	TDA9045	300p	UPC1222	130p	2SA899	40p	2SA1245	55p	2SB750	60p	2SC1013	170p
TA8644N	425p	TDA1542	250p	TDA3562TF	300p	TDA5700	200p	TDA9080	400p	UPC1225H	220p	2SA900	45p	2SA1246	80p	2SB753	100p	2SC1014	140p
TA8646	375p	TDA1543	200p	TDA3563	350p	TDA5701	200p	TDA9102C	250p	UPC1227V	225p	2SA904	20p	2SA1248	35p	2SB754	80p	2SC1030	150p
TA8653N	1500p	TDA1552Q	350p	TDA3564	325p	TDA5708	275p	TDA9403	130p	UPC1228HA	45p	2SA907	650p	2SA1249	100p	2SB764	30p	2SC1046	250p
TA8659AN	900p	TDA1553AQ	325p	TDA3565	220p	TDA5709	375p	TDA9500	750p	UPC1230	200p	2SA909	500p	2SA1252	20p	2SB765	70p	2SC1047	20p
TA8690N	700p	TDA1555Q	375p	TDA3566	280p	TDA5800	850p	TDA9503	550p	UPC1237HA	70p	2SA912	70p	2SA1253	30p	2SB772	25p	2SC1050	280p
TA8691N	450p	TDA1557Q	300p	TDA3567	350p	TDA5820	370p	TDA9513	225p	UPC1238	120p	2SA913	100p	2SA1256	30p	2SB774	50p	2SC1051	250p
TA8701AN	275p	TDA1558Q	300p	TDA3569	300p	TDA5832	125p	TDA9800	225p	UPC1241H	150p	2SA914	90p	2SA1257	30p	2SB775	100p	2SC1061	85p
TA8718N	550p	TDA1560Q	675p	TDA3570	375p	TDA5850	175p	TDA9821	200p	UPC1242H	150p	2SA915	30p	2SA1258	70p	2SB776	110p	2SC1069	175p
TA8720	525p	TDA1571	300p	TDA3580	300p	TDA5930	225p	TEA0652	150p	UPC1245V	130p	2SA916	30p	2SA1261	150p	2SB788	35p	2SC1070	65p
TA8739P	450p	TDA1572	175p	TDA3586	750p	TDA6100Q	150p	TEA0653T	80p	UPC1270H	250p	2SA921	40p	2SA1262	110p	2SB791	130p	2SC1079	300p
TA8872N	450p	TDA1574	125p	TDA3590	250p	TDA6101Q	120p	TEA0655	300p	UPC1274V	250p	2SA928A	25p	2SA1263	280p	2SB794	40p	2SC1080	225p
TAA550	25p	TDA1576	170p	TDA3591	360p	TDA6111Q	225p	TEA0665	300p	UPC1277	240p	2SA933	30p	2SA1264	280p	2SB795	45p	2SC1096	40p
TBA120S	40p	TDA1578A	210p	TDA3592A	300p	TDA6200	750p	TEA1002	650p	UPC1278	240p	2SA934	30p	2SA1265	200p	2SB810	15p	2SC1098	120p
TBA396	70p	TDA1579	130p	TDA3601Q	375p	TDA6600-2	700p	TEA1007	120p	UPC1288V	230p	2SA935	40p	2SA1283	50p	2SB816	160p	2SC1106	180p
TBA520	120p	TDA1589	275p	TDA3602	225p	TDA6610-2	1100p	TEA1009	100p	UPC1297CA	325p	2SA937	20p	2SA1284	60p	2SB817	175p	2SC1114	415p
TBA530	100p	TDA1591	275p	TDA3611	450p	TDA6612-2	900p	TEA1015P	110p	UPC1298	320p	2SA939	140p	2SA1286	60p	2SB819	60p	2SC1115	280p
TBA540	90p	TDA1596	200p	TDA3640	350p	TDA7000	170p	TEA1017	280p	UPC1313H A	100p	2SA940	50p	2SA1289	50p	2SB822	40p	2SC1116	290p
TBA560	90p	TDA1598	160p	TDA3645	400p	TDA7010T	120p	TEA1019	130p	UPC1316C	70p	2SA942	60p	2SA1290	150p	2SB824	60p	2SC1124	270p
TBA800	40p	TDA1600	200p	TDA3651	200p	TDA7020T	175p	TEA1024	150p	UPC1318	300p	2SA949	70p	2SA1293	110p	2SB825	135p	2SC1161	110p
TBA810AS	40p	TDA1602A	400p	TDA3652	500p	TDA7021T	200p	TEA1035	200p	UPC1330HA	80p	2SA950	18p	2SA1294	450p	2SB826	75p	2SC1162	30p
TBA820	55p	TDA1670A	200p	TDA3652-TX10	800p	TDA7050	100p	TEA1039	150p	UPC1335V	320p	2SA951	60p	2SA1295	500p	2SB827	200p	2SC1164	600p
TBA820M	35p	TDA1675	200p	TDA3653	85p	TDA7052	120p	TEA1045	300p	UPC1350	115p	2SA952	30p	2SA1301	260p	2SB828	200p	2SC1165	750p
TBA920	100p	TDA1701	500p	TDA3654	80p	TDA7053	200p	TEA1060	225p	UPC1352C	450p	2SA953	60p	2SA1302	300p	2SB829	200p	2SC1166	100p
TBA950	100p	TDA1771	200p	TDA3654Q	85p	TDA7056	200p	TEA1061	175p	UPC1360C	200p	2SA954	30p	2SA1303	400p	2SB835	75p	2SC1170	180p
TBA990	60p	TDA1870A	200p	TDA3710	300p	TDA7057Q	225p	TEA1062	250p	UPC1362C	250p	2SA957	185p	2SA1304	110p	2SB857	80p	2SC1172	150p
TC5020	200p	TDA1872A	275p	TDA3720	175p	TDA7072	100p	TEA1064	250p	UPC1363	190p	2SA958	60p	2SA1306	110p	2SB861	110p	2SC1173	33p
TC5081AP	80p	TDA1904	80p	TDA3724	300p	TDA7077	175p	TEA1067	150p	UPC1363C	300p	2SA963	120p	2SA1307	100p	2SB863	220p	2SC1195	210p
TC5082P	170p	TDA1905	80p	TDA3725	300p	TDA7211	100p	TEA1068	350p	UPC1364C	350p	2SA965	30p	2SA1309	50p	2SB865	25p	2SC1212	35p
TC5090A	230p	TDA1908A	90p	TDA3730	400p	TDA7220	65p	TEA1080P	170p	UPC1365	250p	2SA966	25p	2SA1315	100p	2SB882	180p	2SC1213	10p
TC9125BP	410p	TDA1910	160p	TDA3740	400p	TDA7222	100p	TEA1087	40p	UPC1366C	130p	2SA968	55p	2SA1317	30p	2SB885	45p	2SC1214	15p
TC9130P	150p	TDA1940	180p	TDA3750	400p	TDA7230A	150p	TEA1101	425p	UPC1370C	300p	2SA970	25p	2SA1318	20p	2SB891	35p	2SC1215	25p
TC9134	750p	TDA1941	300p	TDA3755	425p	TDA7231A	80p	TEA1330	65p	UPC1373	85p	2SA979	35p	2SA1319	25p	2SB892	25p	2SC1216	200p
TC9135P	125p	TDA1950	175p	TDA3760	350p	TDA7233	60p	TEA1511	150p	UPC1377C	200p	2SA984	25p	2SA1320	45p	2SB895	60p	2SC1222	15p
TC9137P	500p	TDA2002	50p	TDA3765V	225p	TDA7240	175p	TEA2000	500p	UPC1378	1000p	2SA985	60p	2SA1321	80p	2SB908	70p	2SC1226	75p
TC9138AP	150p	TDA2003	65p	TDA3771	460p	TDA7241	250p	TEA2014A	80p	UPC1379C	170p	2SA988	25p	2SA1327	130p	2SB926	30p	2SC1237	250p
TC9142	320p	TDA2004	150p	TDA3780	400p	TDA7245	225p	TEA2018A	80p	UPC1382	110p	2SA991	30p	2SA1329	200p	2SB941	60p	2SC1247A	35p
TC9143	300p	TDA2005	150p	TDA3791	200p	TDA7250	400p	TEA2019	600p	UPC1384	425p	2SA992	30p	2SA1346	20p	2SB950	180p	2SC1252	850p
TC9145	150p	TDA2006	70p	TDA3800	250p	TDA7255	400p	TEA2025B	75p	UPC1387C	250p	2SA993	50p	2SA1348	45p	2SB951	190p	2SC1278	110p
TC9148	200p	TDA2007	120p	TDA3803A	500p	TDA7256	400p	TEA2028	325p	UPC1394	120p	2SA995	60p	2SA1352	100p	2SB953	90p	2SC1279	30p
TC9149	225p	TDA2008	100p	TDA3810	200p	TDA7262	325p	TEA2028B	375p	UPC1397	350p	2SA999	30p	2SA1353	100p	2SB975	100p	2SC1308K	350p
TC9150	425p	TDA2009	160p	TDA3825	150p	TDA7272	170p	TEA2029A	650p	UPC1403CA	650p	2SA1005	25p	2SA1356	100p	2SB985	30p	2SC1312	40p
TC9151P	425p	TDA2010	150p	TDA3827	110p	TDA7273	80p	TEA2029C	270p	UPC1406HA	70p	2SA1006	90p	2SA1357	65p	2SB986	40p	2SC1318	10p
TC9152	425p	TDA2020	120p	TDA3840	200p	TDA7274	45p	TEA2031A	125p	UPC1420CA	450p	2SA1008	125p	2SA1358	130p	2SB1009	110p	2SC1325	400p
TC9153	300p	TDA2030	80p	TDA3842	200p	TDA7275	75p	TEA2037	200p	UPC1421CA	650p	2SA1009	200p	2SA1359	45p	2SB1010	25p	2SC1327	20p
TC9154AP	225p	TDA2030H	100p	TDA3843	200p	TDA7282	50p	TEA2114	200p	UPC1423CA	550p	2SA1010	225p	2SA1360	45p	2SB1012	55p	2SC1328	15p
TC9156	300p	TDA2040	140p	TDA3845	225p	TDA7284	100p	TEA2117	450p	UPC1470	200p	2SA1011	80p	2SA1362	25p	2SB1015	60p	2SC1342	15p
TC9158P	450p	TDA2048	600p	TDA3856	300p	TDA7302	450p	TEA2130	350p	UPC1474HA	75p	2SA1012	85p	2SA1370	50p	2SB1016	130p	2SC1343	200p
TC9162	275p	TDA2051V	450p	TDA3857	200p	TDA7310	800p	TEA2164	160p	UPC1484CA	300p	2SA1013	100p	2SA1371	100p	2SB1017	40p	2SC1345	15p
TC9163	375p	TDA2052V	525p	TDA3950	225p	TDA7313	650p	TEA2260	225p	UPC1488H	115p	2SA1015	10p	2SA1376	30p	2SB1018	130p	2SC1346	100p
TC9164	400p	TDA2054M	110p	TDA4001	250p	TDA7318	550p	TEA2261	185p	UPC1498H	500p	2SA1016	30p	2SA1380	75p	2SB1020	120p	2SC1358	270p
TC9167P	100p	TDA2107	250p	TDA4050	150p	TDA7330A	700p	TEA2262	275p	UPC1505C	400p	2SA1018	100p	2SA1381	100p	2SB1039	65p	2SC1359	15p
TC9172P	300p	TDA2148	325p	TDA4052	500p	TDA7350	300p	TEA3717DP	160p	UPC1513HA	70p	2SA1020	30p	2SA1382	120p	2SB1066	40p	2SC1360	70p
TC9174P	325p	TDA2151	375p	TDA4060	500p	TDA7359	300p	TEA3718S	175p	UPC1514CA	200p	2SA1021	35p	2SA1385	180p	2SB1068	160p	2SC1364	25p
TC9176P	500p	TDA2170	1300p	TDA4092	250p	TDA7360	700p	TEA5030	135p	UPC1515CA	250p	2SA1023	60p	2SA1386	400p	2SB1077	180p	2SC1368	75p
TC9177P	225p	TDA2220	200p	TDA4100	150p	TDA7361	175p	TEA5040	650p	UPC1520CA	250p	2SA1026	90p	2SA1387	75p	2SB1098	80p	2SC1382	40p
TCA9940	100p	TDA2270	250p	TDA4173AF	325p	TDA7370V	325p	TEA5101A	175p	UPC1521HA	120p	2SA1029	60p	2SA1396	120p	2SB1099	75p	2SC1383	25p
TCEP100	100p	TDA2320	80p	TDA4180	145p	TDA7374V	350p	TEA5110	175p	UPC1536C	550p	2SA1036	60p	2SA1399	25p	2SB1109	40p	2SC1384	20p
TD62308AP	200p	TDA2501	300p	TDA4190	180p	TDA7770	140p	TEA5114A	200p	2SA329	75p	2SA1037	50p	2SA1400	150p	2SB1123	50p	2SC1393	20p
TD62382	200p	TDA2502	175p	TDA4200	300p	TDA8114	225p	TEA5115	220p	2SA467	40p	2SA1038	40p	2SA1423	30p	2SB1133	50p	2SC1394	15p
TD62506	200p	TDA2503	200p	TDA4210	160p	TDA8115	200p	TEA5116	220p	2SA473	29p	2SA1048	25p	2SA1428	35p	2SB1134	65p	2SC1398	55p
TD62705	250p	TDA2504	200p	TDA4260	250p	TDA8116	350p	TEA5170	200p	2SA483	90p	2SA1051	300p	2SA1441	110p	2SB1135	60p	2SC1399	100p
TD6304AP	300p	TDA2505	220p	TDA4280	320p	TDA8120B	400p	TEA5500	325p	2SA484	80p	2SA1052	15p	2SA1442	110p	2SB1140	45p	2SC1400	50p
TD6306P	350p	TDA2506	400p	TDA4282	360p	TDA8124	250p	TEA5501	225p	2SA489	50p	2SA1060	120p	2SA1443	130p	2SB1143	40p	2SC1403	500p
TD6350P	200p	TDA2507	450p	TDA4283T	450p	TDA8134	225p	TEA5550	150p	2SA490	45p	2SA1061	300p	2SA1450	30p	2SB1151	75p	2SC1407	50p
TD6359P	300p	TDA2507T	450p	TDA4290	125p	TDA8135	225p	TEA5560	130p	2SA493	25p	2SA1069	150p	2SA1459	40p	2SB1162	400p	2SC1413	150p
TDA1001	200p	TDA2510	450p	TDA4400	175p	TDA8136	225p	TEA5570	85p	2SA495	40p	2SA1073	375p	2SA1462	25p	2SB1163	370p	2SC1419	50p
TDA1002	200p	TDA2514A	500p	TDA4420	120p	TDA8137	200p	TEA5580	165p	2SA496	30p	2SA1076	230p	2SA1469	100p	2SB1168	50p	2SC1426	700p
TDA1003	150p	TDA2515	450p	TDA4421	300p	TDA8138	200p	TEA5581	200p	2SA505	120p	2SA1077	300p	2SA1475	95p	2SB1182	40p	2SC1429	50p
TDA1005A	175p	TDA2530	300p	TDA4426	170p	TDA8138A	130p	TEA5591	200p	2SA509	35p	2SA1080	125p	2SA1488	150p	2SB1185	50p	2SC1431	400p
TDA1010A	80p	TDA2532	100p	TDA4427	300p	TDA8138B	200p	TEA5620	300p	2SA537	170p	2SA1081	80p	2SA1489	300p	2SB1202	45p	2SC1444	275p
TDA1011	75p	TDA2540	150p	TDA4431	150p	TDA8139	200p	TEA5630	225p	2SA539	20p	2SA1082	80p	2SA1490	225p	2SB1203	45p	2SC1445	350p
TDA1012	120p	TDA2541	70p	TDA4433	100p	TDA8140	200p	TEA5640E	750p	2SA544	650p	2SA1083	20p	2SA1491	300p	2SB1204	45p	2SC1446	55p
TDA1013A	110p	TDA2542	110p	TDA4437	125p	TDA8143	160p	TEA5701	650p	2SA550	150p	2SA1084	100p	2SA1492	260p	2SB1205	40p	2SC1447	70p
TDA1015	85p	TDA2543	210p	TDA4439	220p	TDA8145	120p	TEA6000	400p	2SA562	30p	2SA1085	75p	2SA1493	500p	2SB1223	60p	2SC1449	120p
TDA1016	140p	TDA2544	200p	TDA4440	180p	TDA8146	200p	TEA6100	350p	2SA564	15p	2SA1091	100p	2SA1494	450p	2SB1243	40p	2SC1450	200p
TDA1020	110p	TDA2545	120p	TDA4442	240p	TDA8160	125p	TEA6200	225p	2SA571	650p	2SA1093	180p	2SA1516	280p	2SB1274	40p	2SC1454	250p
TDA1022	330p	TDA2546A	200p	TDA4443	250p	TDA8170	170p	TEA6300	500p	2SA603	100p	2SA1094	190p	2SA1519	20p	2SB1282	300p	2SC1470	120p
TDA1023	130p	TDA2548	200p	TDA4445	220p	TDA8172	200p	TEA6310T	425p	2SA606	200p	2SA1095	300p	2SA1523	45p	2SB1318	40p	2SC1472	40p
TDA1024	150p	TDA2549	300p	TDA4450	225p	TDA8173	175p	TEA6414A	425p	2SA608	15p	2SA1096	80p	2SA1535	175p	2SB1375	45p	2SC1473	15p
TDA1025	320p	TDA2555	175p	TDA4452	250p	TDA8174	200p	TEA6415B	525p	2SA614	150p	2SA1102	130p	2SA1538	55p	2SB1382	350p	2SC1474	45p
TDA1028	175p	TDA2556	230p	TDA4453	275p	TDA8175	300p	TEA6420	360p	2SA628	20p	2SA1103	130p	2SA1540	50p	2SB1468	100p	2SC1501	70p
TDA1029	200p	TDA2557	225p	TDA4480	280p	TDA8178	650p	TEA8172	125p	2SA634	50p	2SA1104	140p	2SA1598	220p	2SC182	75p	2SC1505	55p
		TDA2558	400p	TDA4481	215p	TDA8179S	750p	TL431	45p	2SA636	50p	2SA1105	250p	2SA1599	220p	2SC372	25p	2SC1507	45p
TDA1038	500p	TDA2574V	350p	TDA4482	200p	TDA8185	180p	TL494	100p	2SA639	60p	2SA1106	160p	2SA1600	250p	2SC380	10p	2SC1509	35p
TDA1041E	250p	TDA2575A	100p	TDA4500	300p	TDA8190	200p	TLO61	40p	2SA640	60p	2SA1111	90p	2SA1601	200p	2SC388A	25p	2SC1514	35p
TDA1041P	180p	TDA2577A	200p	TDA4501	280p	TDA8191	425p	TLO64	80p	2SA642	50p	2SA1112	150p	2SA1625	40p	2SC394	60p	2SC1515	60p
TDA1044	110p	TDA2578A	200p	TDA4502	400p	TDA8192	200p	TLO71	38p	2SA643	25p	2SA1115	30p	2SA1626	90p	2SC403	25p	2SC1520	45p
TDA1047	200p	TDA2579A	210p	TDA4503	325p	TDA8196	120p	TLO74	80p	2SA673	15p	2SA1120	40p	2SA1640	100p	2SC454	15p	2SC1541	110p
TDA1048	200p	TDA2582	130p	TDA4505A	300p	TDA8205	1250p	TLO83	55p	2SA677	35p	2SA1123	40p	2SA1652	70p	2SC458	10p	2SC1545	120p
TDA1053	300p	TDA2590	170p	TDA4505E	275p	TDA8213	175p	TLO84	70p	2SA678	26p	2SA1124	60p	2SA1667	175p	2SC460	10p	2SC1567	40p
TDA1054	180p	TDA2591	110p	TDA4505K	450p	TDA8214B	225p	TMP47C-434N	1250p	2SA683	25p	2SA1127	50p	2SA1668	180p	2SC461	15p	2SC1568	35p
TDA1057	60p	TDA2591Q	150p	TDA4505M	1000p	TDA8215H	300p	TPU2732	800p	2SA684	25p	2SA1133	120p	2SA1671	310p	2SC495	45p	2SC1569	55p
TDA1059B	40p	TDA2593	80p	TDA4510	200p	TDA8217	225p	TPU2735	500p	2SA699	100p	2SA1135	130p	2SA1673	425p	2SC496	25p	2SC1570	40p
TDA1060	140p	TDA2594	450p	TDA4532	200p	TDA8303	250p	UC3524	100p	2SA705	70p	2SA1141	200p	2SA1680	40p	2SC497	85p	2SC1571	50p
TDA1062	140p	TDA2595	200p	TDA4555	275p	TDA8304	400p	UC3842N	60p	2SA706	140p	2SA1142	100p	2SA1706	25p	2SC515	100p	2SC1573	25p
TDA1068	75p	TDA2600	400p	TDA4556	370p	TDA8305	500p	UC3843	125p	2SA708	50p	2SA1143	15p	2SB175	45p	2SC535	30p	2SC1576	550p
TDA1072	150p	TDA2611A	100p	TDA4557	200p	TDA8340	150p	UC3844	70p	2SA711	280p	2SA1145	40p	2SB324	40p	2SC536	20p	2SC1580	600p
TDA1074	280p	TDA2616	250p	TDA4560	270p	TDA8341	250p	UPC20C	220p	2SA715	50p	2SA1146	200p	2SB337	150p	2SC605	100p	2SC1583	25p
TDA1077	250p	TDA2630	300p	TDA4565	150p	TDA8349A	350p	UPC554	130p	2SA719	50p	2SA1151	30p	2SB474	250p	2SC619	100p	2SC1586	540p
TDA1082	275p	TDA2640	350p	TDA4566	250p	TDA7350Q	275p	UPC555	60p	2SA720	20p	2SA1152	150p	2SB492	80p	2SC641	80p	2SC1617	340p
TDA1083	95p	TDA2653A	350p	TDA4568	225p	TDA8351	200p	UPC556H	80p	2SA725	80p	2SA1153	30p	2SB511	55p	2SC644	10p	2SC1619	170p
TDA1085	170p	TDA2654	200p	TDA4570	200p	TDA8360N3	800p	UPC571	220p	2SA726	20p	2SA1154	22p	2SB525	65p	2SC647	300p	2SC1623	50p
TDA1087	60p	TDA2658	300p	TDA4580	400p	TDA8361N3	900p	UPC574	60p	2SA733	15p	2SA1156	90p	2SB527	130p	2SC681	250p	2SC1624	60p
TDA1092	100p	TDA2670	150p	TDA4600	200p	TDA8362AN	1200p	UPC575C2	90p	2SA740	90p	2SA1162	30p	2SB531	400p	2SC683	35p	2SC1626	55p
TDA1097	475p	TDA2690	100p	TDA4600II	160p	TDA8362N3	1200p	UPC577	64p	2SA742	450p	2SA1163	15p	2SB536	80p	2SC708	100p	2SC1627	15p
TDA1151	40p	TDA2710-1	400p	TDA4601	120p	TDA8366N2	1500p	UPC592	95p	2SA747A	425p	2SA1169	500p	2SB537	90p	2SC710	15p	2SC1628	75p
TDA1154	50p	TDA2721	200p	TDA4605	190p	TDA8372A	1650p	UPC595	190p	2SA748	60p	2SA1170	500p	2SB544	22p	2SC711	15p	2SC1634	50p
TDA1170	85p	TDA2730	200p	TDA4610	370p	TDA8380	200p	UPC596	190p	2SA764	200p	2SA1173	60p	2SB546	45p	2SC730	350p	2SC1667	450p
TDA1170N	85p	TDA2740	300p	TDA4650	300p	TDA8385	275p	UPC1001	220p	2SA769	80p	2SA1174	25p	2SB549	50p	2SC732	40p	2SC1669	100p
TDA1175	175p	TDA2750	200p	TDA4660	200p	TDA8390A	650p	UPC1004C	130p	2SA770	200p	2SA1175	30p	2SB560	25p	2SC735	40p	2SC1674	15p

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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
2SC1675	90p	2SC2261	700p	2SC2719	25p	2SC3263	280p	2SC3798	220p	2SD257	195p	2SD880	40p	2SD1327	150p	2SD1763A	60p	2SK312	750p
2SC1678	80p	2SC2267	90p	2SC2721	120p	2SC3264	390p	2SC3807	120p	2SD287	250p	2SD882	25p	2SD1328	60p	2SD1764	70p	2SK315	70p
2SC1683	100p	2SC2270	60p	2SC2724	15p	2SC3269	50p	2SC3808	70p	2SD291	250p	2SD889	35p	2SD1330	50p	2SD1765	70p	2SK320	120p
2SC1684	30p	2SC2271	25p	2SC2738	200p	2SC3270	50p	2SC3811	80p	2SD313	25p	2SD892A	75p	2SD1347	70p	2SD1769	110p	2SK323	130p
2SC1685	30p	2SC2274	15p	2SC2749	350p	2SC3271	75p	2SC3831	250p	2SD315	75p	2SD894	35p	2SD1348	65p	2SD1773	100p	2SK332	175p
2SC1729	900p	2SC2275	50p	2SC2750	300p	2SC3277	280p	2SC3832	135p	2SD325	30p	2SD895	100p	2SD1350	150p	2SD1776	70p	2SK359	40p
2SC1730	10p	2SC2278	70p	2SC2751	270p	2SC3279	30p	2SC3833	250p	2SD330	65p	2SD896	200p	2SD1376	60p	2SD1783	70p	2SK363	50p
2SC1735	70p	2SC2283	700p	2SC2752	75p	2SC3280	200p	2SC3851	100p	2SD348	300p	2SD898B	225p	2SD1378	60p	2SD1785	160p	2SK364	40p
2SC1740	10p	2SC2290	1800p	2SC2767	300p	2SC3281	200p	2SC3852	80p	2SD350	320p	2SD900	400p	2SD1379	100p	2SD1789	210p	2SK367	40p
2SC1741	35p	2SC2291	40p	2SC2769	400p	2SC3284	600p	2SC3853	220p	2SD357	40p	2SD905	450p	2SD1380	100p	2SD1796	120p	2SK369	30p
2SC1755	90p	2SC2298	35p	2SC2773	700p	2SC3293	85p	2SC3855	220p	2SD358	40p	2SD916	130p	2SD1382	60p	2SD1802	75p	2SK373	40p
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2SC1810	250p	2SC2328A	50p	2SC2808	40p	2SC3310	125p	2SC3884A	200p	2SD386	70p	2SD957A	520p	2SD1398	120p	2SD1847	275p	2SK423	75p
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2SC2216	50p	2SC2668	10p	2SC3202	25p	2SC3729	450p	2SC5044	250p	2SD850	170p	2SD1289	250p	2SD1710	200p	2SK195	150p	2SK1143	1500p
2SC2221	650p	2SC2671	100p	2SC3209	120p	2SC3746	100p	2SC5086	250p	2SD856	48p	2SD1291	280p	2SD1718	275p	2SK197	140p	2SK1144	1500p
2SC2228A	60p	2SC2681	170p	2SC3210	550p	2SC3747	120p	2SC5129	300p	2SD858	250p	2SD1292	60p	2SD1729	230p	2SK212	35p	2SK1145	1500p
2SC2229	15p	2SC2682	70p	2SC3211	220p	2SC3748	100p	2SC5148	300p	2SD863	23p	2SD1293	70p	2SD1730	275p	2SK214	170p	2SK1146	1500p
2SC2230	80p	2SC2688	27p	2SC3212	260p	2SC3752	250p	2SC5149	300p	2SD864	200p	2SD1297	300p	2SD1732	250p	2SK216	200p	2SK1147	1500p
2SC2233	100p	2SC2690	60p	2SC3225	50p	2SC3781	150p	2SC5250	300p	2SD866	120p	2SD1302	20p	2SD1739	180p	2SK223	50p	2SK1148	1500p
2SC2235	60p	2SC2694	3500p	2SC3242	30p	2SC3782	75p	2SD188	350p	2SD866A	140p	2SD1306	45p	2SD1740	125p	2SK240	140p	2SK1149	1500p
2SC2236	20p	2SC2705	40p	2SC3244	45p	2SC3783	300p	2SD198	140p	2SD867	350p	2SD1308	80p	2SD1748	90p	2SK241	30p	2SK1150	1500p
2SC2237	540p	2SC2706	250p	2SC3246	50p	2SC3787	100p	2SD199	195p	2SD868	260p	2SD1309	140p	2SD1756	275p	2SK246	30p	2SK1151	1500p
2SC2238	45p	2SC2710	50p	2SC3259	350p	2SC3788	60p	2SD200	180p	2SD869	150p	2SD1310	140p	2SD1758	60p	2SK300	25p	2SK1152	1500p
2SC2240	15p	2SC2712	20p	2SC3260	220p	2SC3789	75p	2SD201	260p	2SD870	140p	2SD1311	65p	2SD1760	80p	2SK301	40p	2SK1153	1500p
2SC2258	30p	2SC2714	20p	2SC3261	230p	2SC3790	120p	2SD213	250p	2SD871	260p	2SD1313	1000p	2SD1761	60p	2SK303	40p	2SK1154	1500p
2SC2259	60p	2SC2716	50p	2SC3262	280p	2SC3795	140p	2SD234	90p	2SD879	60p	2SD1326	200p	2SD1762	50p	2SK304	25p	2SK2038	295p
																		2SK2134	225p

REPLACEMENT VIDEO HEADS

Model	Price
AKAI	
VS105, 112, 115, 116, 120, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82	850p
VP7100, VS9300, VS9500	650p
VP7200, VS9700, VS9800	900p
VS1	900p
VS2	900p
VS3	900p
VS10	1350p
VSP1	900p
VS33,35, 37, 38, 38EQG MKII, 53, 55, 66, 765, 766, 767, 768, 865, 867, VSF30, 33, 4, 400, 410, 420, 430, 440, 441, 450, 455, 480, 490, 497, VSG51, 54, 55, VXS450, VXS470	1600p
VS512, VS515, VS516	2250p
VS462, 465, 467, 467EOG2, VSF12, 15EK, 15EOH, 300, 301, 310, VSF320, 330, 340, 350, VSG30, 33, 34, 35	2300p
VS11, VS12	1000p
VS6, VS8, VS9	2400p
VSX9	2250p
VSA1100, 1110, 650, VSF500, 510, 550, 560, 580, 590, 600, 650, VSG60, 64, 65, VSG70, 73, 74, 75, VSX560, 580	3600p
VS155, VS165	2300p
VS20, 22, 23, 24, 25, 26, 27, 422, 425, 426, 427, 485, VSF10, 11, 180, 190	2300p
VSF200, 210, 220, 221, 222, 230, 240, 260, 261, 262, 265, 270, 275, 280, VSF290, 510, 550, VSG20, 204, 205, 206, VSG21, 211, 212, 215, VSG217EOG , 23, 24, 25, 405, 411, 415, 417, VSP 100, 100EM, 110, VSP88, 88KC, 8111, VSP9, VSR100, 100EDG, 100EM, 110, VSX400	1250p
VSR9	1300p
VS 109, VS603, VS606, VS607	2500p
VS75	2500p
VS965, VC967	3450p
VSF400, 410, 420, 430, 440, 441, 450, 455, 480, 490, 497, VSX450, 470	2850p
VSG20, 204, 204, 205, 206, 20, 21, 211, 212, 215, 217, 225, 23, 24, 25, VSP100, 110, 88, VSR100, 110, VSX400	1300p
VSG415, VSG415EA, VSG425	2800p
VS75, VSA77	2700p
VSF1000, VSF1010, VSF1030	5800p
ALBA	
VDR3000, VCR4000, VCR5000, VCR6000	1650p
VTV10	1000p
VCR7000, 7800, 8000, 8800	1100p
AMSTRAD	
VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	1000p
VCR1000, 2000, 6000, 61000, 62000, 8600, 8602, 8700, 9005, DD8900, DD8904, TVR4	1100p
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR400	1100p
VCR8800, VCR8804, VCR9340	2100p
VCR8603, VCR8604, VCR8704, VCR8714	1350p
VCR9140, VCR9142	2550p
VCR9340	3650p
VCR9244	3450p
UF020, 22, VCR3000, 3002, 9500	1750p
FISHER	
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 716, 720, FVHP721, 722, 730, 830, 905, 906, 907, 908, 910, 911, 915, 916, 918, FVHP5000, 5001, 5005, 5050, 5075	1100p
VBS3500, 7100, 7500, 7600, 9900, VBR330	1800p
VBS7000, VBS7100, VBS9000	2000p
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720	1100p
FVHP725, FVHP830, FVHP980	2500p
FVHP990	2700p
FVHP975	2400p
FVHD407, FVHD140, FVHP1, FVHP10, FVHP20	1150p
FVHD230, FVHP1100, 1200, 130, 1340, 1410, 2000, 200, 210, 300, FVHP310, 410, 420	1800p
FVHD250, 270, 370, FVHP1500, FVHP250	2700p
FVHP132, 1400, 1440, 320, 440, 445	3550p
FVHP470S, FVHP475HV	4800p
FVHP1250, FVHP430S	1950p
GOLDSTAR	
8000 3HSSDB, GHV121, RQ2011, 2031, 2051	1900p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p
GHV1232, 1233, 1241, 1242, 1243, 1244, 1245, 1246, 1266, 1290, 1291	
GHV1295, 1296, 1891, 8210, 8215, 1221, 1240, 1241, 1247, 1248, 2145	
VCP400, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, VCP4320, 4321, 4325, 4326	900p
C211, GHV1392P, 1393P, 19OOP, 1290, 1291PQ, 12931Q, 1295P, GSE1295PQ, GSE1296, 1297, 1891, 1910, 20005, 2000, GSEC200, GSEC205, 211, 2301, GSEG2301, GSEQ12, 204, 20, 22, P416P, P500P QUISY22, QUISY24, RC205P, RG11P, RG20, RG2001, RQ20, RQ204HP, RQ241, VCP100P, GSEG10	1300p
GHV4400, 4400, GSE-Q404P, QUISY40, RC405P	2350p
GSEQ121, RQ2011, RQ2031, RQ2051	1950p
G.E.C.	
4000H, 4001H, 4002H	1200p
V4001H, V4004, V4100	1200p
V4005H	1500p
GRANADA	
CSI, DS2	1600p
VHSAH1	1100p
VHSAH3	2400p
VHSAN3	800p
VHSAY3	1200p
VHSBH1, VHSCH1	2100p
VHSBP1	850p
VHSBY3	2600p
VHSD52	1600p
VHSEH2, VHSDH2	1600p
VHSEY1, VHSEY2	1400p
VHSFS1, VHSFS2	1300p
VHSFG2, VHSFG4, VHSF63, VHSFB3	1300p
VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3, VHSYJ2	700p
VHSVH4, VHSWH1, VHSXH1, VHSYH2	1600p
VHSWJI VHSXJ3	700p
GRUNDIG	
VS410, 415, 435, 450, 456, 460, 500, 505, 510, 520, 521, 530, 546	1600p
BARCELONA, MVS5400, 440, 500, 600, SE5100, 6100, 6110, 9100 TVR4500, 4510, 5510, VS400, 440, 441, 500, 505, 510, 518, 600, 610, VS5180, VS6190, 700, 900, 901, 902, 9091, GV200, 201, 2092, SE2100, 5110	1400p
MADRID, SE5140, VS540, VS5480	3000p
MVS550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p
VS120	2300p
VS680, GV280	4600p
VS160, VS740	4400p
VS170	4600p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
GRUNDIG	
MVS710, 720, 910, SE7120, 9120, VS710, 716, 720, 800, 810, 910, 920, VS922, 9291, GV210, 211, 220, 2292, MV2105, 2115, SE2120	1700p
HINARI	
VXL2, 3, 4, 20, 25, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 19, 90, VCR34H, VTV 100, 200	1100p
HITACHI	
VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30	850p
VT7, VT17, VT18, VT19	1600p
VT35, VT350, VT38, VT39	1800p
VT100, 110, 111, 112, 113, 115, 118, 120, 125, 128, 220, 225, 400, 405, VT410, 413, 414, 415, 416, 418, 510, 515, 517, 518, 520, 525, 526, VTM625, 626, 725, 210, 211, 215, 726, 727, 728, 820, 821, 825, 920, 921	1100p
VT3000	550p
VT4000, VT4200, VT5000, VT5500, VT5600	1100p
VT77, 680, 6500, 6700, 6800, 7000, 8000, 8030, 8040, 8100, 8300, 8500 VT8700, 9000, 9300, 9500, 9700, 9900	850p
VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588	2500p
VT65	1800p
VT130, 135, 138, 145, 250, 255, 258, 420, 425, 426, 428, 430, 431, 435 VT438, 535, 536, VTL30, 301, VTM630, 635, 636	1400p
VT52, VT60, VT61E, VT62E, VT63, VT64, VT640	850p
VT168, VT150, VT260, VT450, VT498 (4 HEAD)	1900p
VT530	1400p
VT522, VTM212, 620, 622, 720, 722, 822, 922, 925	1300p
VT660E	2600p
VT570, VT575, VT580, VT585, VT588, VTF70	2500p
VT540, 545, 546, 548, VTD660, 665, VTM598, 640, 645, 646, VTM730, 731, 735, 736, 740, 745, 746, 748, 753, 754, 830, 831, 835, 838, 840, VTM841, 845, 930, 931, 935	1800p
VTF770, 774, 775, 860, 861, 865	4100p
VT85, VT86, VT88	2000p
VTF780, VTF785	4800p
VTF180, VTF185, VTF280	8500p
VTF350, VTF351	5150p
VTM220, VTM220E, VTM220UK	3000p
VTS390E	5150p
J.V.C. & FERGUSON	
HR2200, 3300, 3320, 3330, 3350, 3360, 3660, 3750, 3860, 4100 3292, 8900, 8901, 8902, 8903, 8906, 8922, 8928, 3V01, 3V06, 3V22	550p
HR3660, 7600, 7610, 7650, 7700, HRD110, 111, 120, 121, 220, 225, HRS100, 8904, 8923, 8924, 8925, 8929, 8935, 8941, 8943, 8944, 3V16, 3V233V24, 3V31, 3V35, 3V36, 3V38, 3V39, 3V49	550p
BR1600, HRD140, 141, 142, 143, 150, 152, 156, 157, 158, 160, 5101 HRS10, 8947, 8948, 3V42, 3V44, 3V45, 3V46, 3V47, 3V52, 3V54, 3V55, 3V56, 3V57	900p
HRD154, 170, 171, 210, 211, 217, 310, 320, 321, 350, 521, 522, 525, 526 HRD527, 540, 550, 560, 590, 770, HRDX20, HRDX22, 8950, 8951, 3V64, 3V65, FV10, FVII, FV20, FV21, FV26	900p
HRD565, HRD566, 3V48	1800p
HRD725, HRD755, 3V43, 3V53	1800p
8930, 8931, 8933, 8940, 3V29, 3V30	550p
8945	2400p
3V00, 8902, 8903, 8909, 8912, 8922	1000p
FV31, FV41R	1150p
FV37, FV43H, HRD860	2000p
BR7000E, BR7000S, BR7030, BR7030/40H, BR7040	2100p
HR7200, 7300, 7350, 2650, BR6200	600p
HRD455	1600p
HRD520	1400p
HRD300, 400, 580, 600, 620, 640, 650	1500p
HR4100	1000p
HRD750, HRD830, HRD860	1900p
HRD250, HRD257	1800p
3V32, 8942, HR7655	1800p
HRD180, 190, 230, 610, 3V59, FV12L, FV20B, 26, 30, 32, 33, VC141L	1600p
HRD370, HRD430, HRD470, 3V58, FV13H	1800p
HRD530, HRD700, HRD840, HRD870, HRD910, FV14T, FV57H	2300p
GRC1, GRC2, 3 V41	2800p
BR8060, HRD330, 337, 440, 441, 637, 641, 660, 670, 720, 730, 740, 820	
HRFC100, SR3300MS, FV44L	1600p
HRD950, HRD960, HRD980, FV46	4500p
HRS5000, HRS5500, 5800, 9000, FV395 BRS600, SRS368E	5550p
FV22L	1400p
FV42	2600p
VR182LV, VR202LV	1950p
FV67HV, FV68TX, FV77	3800p
R2000 SERIES	4500p
FV61LV, FV62LV, FV67HV	4000p
FV42L	£101.00p
VP160L, VR172L	1950p
HRJ200, HRJ205	3300p
HRJ600EG, HRJ600EK, HRJ605EG, HRJ605UK, HRJ610EK	7100p
HRJ300, HRJ305, HRJ315, HRJ316EG,HRJ318E	3750p
HRJ615, HRJ715, HRJ815	9200p
HRJ400, HRJ405, HRJ407MS, HRJ41 OEK, HRJ415, HRJ416	4500p
MATSUI	
VX500E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p
VX900	2650p
MITSUBISHI	
HS303, HS304, HS320, HS700	1100p
HS306, HS318, HS710	1100p
HS307	1900p
HS319	1900p
HS330	2000p
HS400	2800p
HS349, HSE27, 31, 32, HSB27, 31, 32, HSM33, 34, 35, 37G	1650p
HS411	2400p
HSE30, HSB30	1600p
HS338	1600p
HSE10, HSE11, HSE20, HSE21, HSE41, HSB10, HSB20	1500p
HS300, HS301, HS302, HS310, HS273, HS550Q	1000p
HS200	550p
HS337, HS347	1000p
HSB12, HSE12, HSE22, HSM16G, 18, 23, 25, 30, MX1	1700p
HS411EZ, HS411GZ	2100p
HSB11, HSB21	1600p
HSB52, HSE50, 52G, HSM36, 50, 54, 55, 57, 58, 60	3100p
HSE51	2600p
HS410	3000p
HS412, HS421GZ	3100p
HS5300, HS5424, HS5600	2500p
HSM20, HSM55	1900p
HSM40	2350p
HSM59, HSM68E	6050p
NV300, 322, 332, 333, 340, 390, 2000, 2010, 3000, 7000, 7200.7500, NV7800, 7850, 8170, 8200, 8400, 8600, 8610, 8620	625p
NV777, NV330	1150p
NV8050, NV8051	2500p
NATIONAL PANASONIC	
AG1000, 1050, NV250, 260, 280, 450, 460, 465, 470, 480, 650	1100p
AG6010, AG6015	2000p
AG6840	2000p
NV100, NV200, NV370, NV380, NV630	675p
NVD80, NVH65	2600p
AG5150, AG5250, NVF65, NVH75, NVH77	2600p
NVF51	4200p
NVGI9	2300p
NVJ30, NVHJ33, NVL10, 20, NVL21, NVG30, 31, 40, 130, NVJ37, 40, 42, NVSD30, 10EE, 11, 2, 30, 35	1000p
NVJ35, NVG46	1400p
NVM1, NVM3, NVM5	4200p
AG2100, AG2200	700p
NV430, NV431, NV433, NVSD2, NVSD22, NVSD25, NVSD3	800p
NV730, NV730F, NV770 4 HEAD	1150p
NV366	1700p
NV21 HQ, NV 180, NVD48	1700p
NV7881	1700p
NV810, NV8301	1800p
NV850, NV950	2000p
NV870, NV890, NV970	2400p
AG6024, NVG33, 46, NVL23, 25, 28, NVJ47, 49, 700PX, NVSD20EE, 400, 44, 45	1200p
NVG10, 11, 12, 14, 16, 120, NV250, 280, 450, 465	1100p
NVG18	1400p
NVG20, 21, 22, 25, 28, 200, NVD48	1200p
NVG50, NVG300	1600p
NVG45	1100p
NVH70	2400p
NV688	1650p
NV600	1050p
AG6800, AH6810, AG6820	2100p
AG6100, AG6200, AG6300	2100p
NVG7, NVG9, NV230	700p
NV780	2000p
NVG 15, NVG400	2600p
NVM7, NVMC20	3800p
NVF70	5200p
NVJ45, NVJ47	1200p
NVSD40	1050p
NVF75, NVF77	4300p
NVF55	2800p
NVFS200, NVFS88, NVSF90, NW8000	3600p
NVHD90, NVHD 100, NV HD 101, NVHF 100	2300p
NVSD1	1000p
AG7330, AG7350, AG7355, AG7450	5000p
NVFS 100	4500p
NVFS1	4200p
N.E.C.	
N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 9033, N9034, 9040, 9053, 9054, 9055, 9056, 9063, 9065, 9066, 906, 9077, N9096, DX1000, 1600, PX1200	850p
N911A, 914C, 915A, 916A, 917, 9110, 9120	2400p
PVC600, 740, 744, 754, 763E, 764, PV2300, 2400, 760, 794, 770, 774	1650p
N380, N381, N830, N831, N832, N833, N834, N835, N836	550p
82611AH1 (FOR MODEL DX3000), DX4000, N9610, NS7000	2400p
N895	1800p
N9052, N9530, DX2000	3400p
VCP1	1700p
PVC2300, 2400, 740, 744, 760, 764	1400p
DS6000	3500p
D5600	3500p
VH3, VH555, VH600, VH700, VH844, VH900,	
VH1000 (ALL MODELS)	1100p
VH1, VH2A	700p
D1000, D1100	1600p
D1000X, D1500X, D4500, VPCD100, D1200, D2000X, D5000	1600p
VR6460, VR6520, 64VR60, VR6420	725p
VR6711 4 HEAD	1800p
VR6440	2500p
VR6441, VR6540, VR6541, VR6640, VR6642	1300p
DV761, VR512, 522, 5229, 63SB7, VR6760, VR6761, VR6762, VR63SB7 7172	7200p
VR6920	2750p
41DV2, 4SB11BVR412, 415, 6485, 6490, 6880	1600p
VR6948	4850p
20DV1, 20DV2, 20RW7, 21DVI, 21DV2, 21DV3, 2SB01, 02, 11, 12, 30DV2, 31DVI, 31DV2, 31DV3, 3SB02, 03, 05, 11, 12, 13, 68SB4, 71SB4, 86SBI, 91SB2, 92SB2, DV186, 190, 291, 292, 468, 471, VR201, 202, 203, 2115, 212, 213, 223, 231, 232, 302, 303, 305, 311, 312, VR313, 3210, 3219, 322, 3229, 323, 501, 6180, 6182, 6185, 6290, 6291, VR6293, 6362, 6367, 6467, 6468, 6470	4600p
VR3260, 6349, 6442, 663, 6448, 6449, 6542, 6643	1250p
VR601	1800p
49SB6, VR6548, VR6648, VR6843	2750p
SAISHO	
VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600	1200p
VR3300X, VR3600X, VR3650X, VR3800	1400p
VR3200, VR3500	1400p
VR2000, VR3300, VR3600	1400p
VR2500	2650p
VRS5000X, VX6000A, VXL12X	1500p
SALORA	
6500, 6600	1600p
SV7300, SV8200, SV8300, SV9200	1500p
SV7400, SV8400	1600p
SV8100	1200p
SV900, SV9900	3450p
SV601, SV611, SV6910	1500p
SV800, SV810	2800p
SV6700, SV8710, SV8750	1500p
623N, SV6800, SV6900, SV8850, SV8870, SV8970	1750p
SV88110, SV8910	2650p
823N, SV8920	3500p
923N	4500p
SV8600, SV8700	1550p
SV8420	2400p
SV8620	2100p
SV9300	2500p
SV8830	2200p
SV8720	2250p
SV8520	1900p
SAMSUNG	
SV8500	1500p
SVX301, VB900, 910, VVT510, VT320, 5600, VX510, 511, 520.616, VX626, 627 717, 614, 619, 629, 710, 712, 720, 730, 970, 971, 972, SV716, 717, SVX303, 305, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 710, 971, V1520, 616, 621, 626, 900, 910,	1200p
SVX319, VB770, V1710, 730, 731, 735, 750, 751, 770, VB750, VK8220, VX750, VX7330, VK770, VK8225, VR1730, 1735, XR20	1900p
V11560, VN1560, VN1561, VX1530, VX1560, VX1561, VX1580	2200p
PL30LR, PX3031, 31R, 32R, 990, 992, 991, PXP30, PXR30, VX 1260, SVX503, SX3230, 3231, 3260, 3261, VK30, 300, 1230, 1260, 1261, VK30R, 31R, 32R, VXK300, 301, 306, 320, 321, 326, 336	1900p
S11230, 1240, SVX600, SX1230, 1231, 1260, 1261, 7120, 7121, 7220, SX7221, 7230, 7301	1900p
SANYO	
VTC5000, 5400, 600, 6000, 6010, 6500, VPR5000, VTC 1500, VTCM 10, 11, 20, 21 VTCM25, VTC2000, 5100, 5150, 5300, 5400,	
VTC5350, 5370, VTCNX10, VTCNX15, 20, 30, VPR5800	1800p
VTC5500, 5550, 9100, 9300, 9350, 9355, 9455, 9500	1700p
VHR1110, VHR1150, VHR1300, VHR1700, VHR2300, VHR2370	800p
VHR3200, 3270, 3100, 3110, 3150, 3300, 3400, 3310, VHRD500	1100p
VHR1500, VHR2500, VHR3330	1500p
VHR2700	2450p
VHR7900	3000p
VHR5700, VHR7700E, VHRD4710	2700p
VHR150E, 153, 154, 1501R, 240, 250, 251, 27, 350, 474, 5350E, 7500, VHR7530, 7540, 8500SP, 8800, VHRD5350E, 5450E, 6550	1800p
TLS1000P, TLS1001P, TLS1100	3100p
VHR120, 130, 14, 141, 143G, 14SP, 151, 15, 16, 171, 220, 23, 244, 274, VHR310, 330, 4100, 4105, 4200, 430, 4300, 4400, 4500, 5080, 5100, VHR5200, 5600, 6850, 7100, 7200, 7250, 7300, 8070, 8100, 8101, 8200, VHR7800, 7810, 8000SP, 8801SP, VHRD4400, 4410, 4500, 4600,	
VHRD4610, 6700, 4800	3100p
TLS2000	4250p
VHR5300, VHR6500, VHR7400	4500p
VHR3500EX	2150p
VHR16, 235, 335E, 4150, 4160, 4350, 7250, 7260, 8250	1950p
VTC3000	1400p
SHARP	
VC390, VC393, VC496	2750p
VC488	4200p
VC779	1800p
VC789, VC790	2900p
VC200, 220, 300, 381, 383, 384, 385, 386, 387, 388, 471, 477, 481, 482, VC483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700	850p
VC108, 208, 382, 402, 405, 408, 500, 550, 571, 573, 581, 582, 583, VC8W20E, 600, 651, 674, 681, 684, 6V3, 750, 780, 781, 683, 684, 402,	
VC500, 571, 573, 580, 584, 600, 682, 693, 700, 772, 7810, 782, 7822, VC783, 8481, 8581, VCA10, 100, 102, 103, 1031, 103, 104, 105, 106,	
VCA111, 113, 116, 131, 140, 202, 203, 211, 234, 244, 254, 255, 30, 35, VCA40, VCB311N, 320, VCD801, 802, VCM73, VCT212, 310, 410, VCT510, 72, VCT1314, VCTS313	850p
VC6000, 6200, 6300, 7300, 7700, 7750, 8000, 8300	1800p
VC793	3000p
VC473, VC785, VC786	1600p
VC699, VCA501, VCA602	2400p
VC585, VC685	1700p
VC90ET	3900p
VFH815	2800p
VC800, VCH851, VCH852, VCH882	2700p
VCH80, VCH81, VFH815	2800p
VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
VCA55, VCA63	1800p
VC570	2800p
SONY	
DSR-19R FOR SL-T 9ME	3100p
DSR-21 R FOR SLC 8-C9	2600p
DSR-35R FORC20, C30, C40, SLF1UB, SLF1E2 PIN, SLC24PS, 33E, 34, 44PS, SLF11, 30PF, 35, 60PS, SLK85, SLT20ME, 30ME, SL100	1500p
DSR-43R FOR SLC7 RANGE, SL5000, SL5100, SL3000 1 PIN, SLC6E, SL36ES, SL37E	1300p
SL3000, SL8000, SL8080, SLC5E, SLT7ME	1600p
SLV201, SLV202	1500p
SLK95, SLT50ME	2900p
SLV275, SLV373VB, SLV410, SLV412, SLV427, SLV474	1900p
DSR49R, SLHF100P, SLHF100UB	3000p
SLV656, SLV715, 725, 727, 757, SLV777, SLV815, SLV825	4100p
SLV353UB	2100p
CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p
SLV801, SLV802	2500p
SLV310, SLV315, SLV325, SLV335	1200p
SLV210, SLV212, SLV270, SLV273, SLV285, SLV300	950p
SLV125, 213, 225, 252, 255, 262, 280, SLVX1, 20, 3	1150p
SLV363, SLV416, SLVX50, SLVX55	2000p
SLVX75, SLVX90, SLVX95	3000p
SLV282, SLVX30, SLVX35	2025p
SLHF100P, SLHF100UB	3400p
SLVE7, SLVE8, SLVE9	3600p
SLVE90	5150p
SLV615, SLV625, SLVE600, SLVE700, SLVE800	3450p
TOSHIBA	
V63	1500p
V9680	3400p
V8600, V8650, V8700	3000p
V21, V31, V32, V33, V50, V51, V52, V53, V9600	1100p
V55, V57	550p
V71, V73, V74, V75, V77, V80, V81, V82, V83, V841V85, V86, V87, V88	1050p
DV90, 96, 97, NM3, V108, 109, 199, 200, 202, 205, 207, 209, 80, 93, 94	1150p
V5470, V5480	1300p
V600	2350p
V880MS	2600p
V700G	3700p
V500G, V509G	2500p
V9680	2900p
V300G, V301, V305, V306, V309G	2550p
V61, V63	1200p
V110, V120, V130, V140, V210, V211, V212,	
V220, V221, V222	1100p
V711, V880	2700p
VCPB1E, VCP2C2	1000p
V65, V66, V6	950p
V312, V322, V412	2600p
V91G	4600p
V609, V610V610B, V610UK, V611, V659F, V660, V660F	2200p
V312, V403T, V413G	9200p
V703W, V813G	4000p
V95G	8000p

ALL TV & VIDEO PARTS SOLD ARE REPLACEMENT PARTS

VCR BELT KITS

Model	Price
AKAI	
VP7100, VS9300, VS9500, VS9700, VS9800	120p
VS1, VS2, VS3, VS5, VS12, VS15, VP88	70p
VS10	65p
VSX9, VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, VS24, 240, 244, 245, 247, 248, 250, 512, 515, 516	200p
VS22, VS23, VS25, VS35, VS37, VS38, VS53, VS55, VS66	80p
VS4, VS6, VS8, VS9	95p
VSA77	120p
VSS99	105p
ALBA	
VCR40000	130p
VCR5000, VCR6000	105p
VCR161, VCR222	100p
VCR3000X, VCR4000, VCR4000X	75p
VCR7000, VCR7800, VCR8000,VCR8800	110p
VTV10	105p
AMSTRAD	
TVR123, VCR4600, VCR4700, VCR5200	80p
VCR7000	80p
VCR1000, 2000, 6000, 6100, 6200, 8600, 8602, 8603, 8604, VCR8700, 8704, 8714, 8800, 8804, 9000, 9005, 9244, 9340, DD8900, DD8904, TVR4	100p
TX3650, UF20, 22 24, VCR3000, 3002, 4000, 9500	75p
VS1004	105p
BLAUPUNKT	
RTV100	200p
RTV200, RTV222, RTV224	90p
RTV202, RTX200	150p
RTV322, RTV248	100p
RTV306, 307, 309, 310, 311, 312, 328, 414, 434, 444, 707	135p
RTV211, RTV214	140p
RTV324, RTV32565p	
RTV315, RTV316, RTV319, RTV320, RTV317	50p
RTV301, RTV333, RTV338, RTV404, RTV424	85p
FERGUSON	
3292, 3V00, 3V01, 3V16, 3v22, 8900, 8901, 8902, 8903, 8904,	
8906, 8909, 8912, 8922	120p
3V23, 8923, 8924, 8929	50p
3V29, 3V30, 8930, 8931, 8933, 8940	65p
3V31, 3V32, 8941, 8942	60p
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	60p
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948	45p
3V58, 3V43, 3V44, 3V59, 3V64, 3V65, 8950, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, FV39, VC141L	45p
FV31R	110p
FV61L, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77	50p
FV43H, FV44L, FV46T, FV57H	125p
FV37H	80p
3V52	55p
FV41R, FV42L	100p
FIDELITY	
HQS200, VCR1000, 2000, 600, 6000, 6100	180p
VCR100	160p
VTR1000, VTR1001	100p

Model	Price
TX3650, VCR3000, VCR3002, VCR9500	75p
FISHER	
VBS7000	245p
VBS9000	120p
FVHP520, FVHP530, FVHP420	60p
FVHP615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 725, 730,	
FVHP830, 840	60p
FVHP905, 906, 907, 908, 910, 911, 915, 916, 918	75p
VBR330, VBS7500, VBS7600,	
VBS9900	100p
VBS3500	75p
FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20	110p
FVHD230, 250, 270, 370, FVHP1100, 1200, 1250, 130, 132,	
FVHP1340, 1400, 1410, 1440, 1500, 2000, 200, 210, 250, 3, 300,	
310, 320, 2000, 410, 420, 430, 440, 445, 470, 475, FVSD2905	85p
FVHP5000, 5005, 5050, 5075, 5100, 975, 980, 990	95p
G.E.C.	
4005	150p
V4004	100p
V4007	80p
GOLDSTAR	
GHV1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245,	
GHV1246, 1247, 1248, 1250, 1266, 51, 8000, 8200, 8210, 8215,	
VCP4100, VCP4130	80p
GHV1290, 1291, 1295, 1296, VCP4000, 4200, 4300, 4301,	
VCP4305, 4306, 4310, 4311, 4315, 4320, 4321, 4325, 4326	120p
GRANADA	
VHSH1, VHSAH3	100p
VHSVH4, VHSWH1, VHSXH1	60p
VHSYH2	50p
VHSBH1, VHSCH 1	150p
VHSBP1	135p
VHSAN3	110p
VHSDS2	125p
VHSAY3	125p
VHSBY3	100p
VHSEY1, VHSEY2	70p
VHSCC1	100p
GRANADA	
VHSDP1, VHSFV2	80p
VHSTJ1, VHSTJ2	150p
VHSTJ3	65p
VHSWJ1, VHSWJ2	120p
VHSXJ3	85p
VHSYJ2	80p
VHSFJ2	140p
VHSFS1, VHSFS2	130p
VHSFG1, VHSFG2, VHSFG3, VHSFG4, VHSF63	180p
GRUNDIG	
MVS400, 440, VS400, 410, 415, 435, 440, 441, 450, 456, 460	55p
VS180, 200, 220, 226, 262, 265, 267, 2X40800, 0850, 0880,	
1600, 2000, 2080, 2200, 2280, MVS200RC	90p
VS150	160p
VS310, 311, 315, 320, 326, 340, 345, 380, 385, 445	85p
VS150	75p
LC290N, LC295SN, SVS 180, VS 170	70p
VS 160, BARCELONA, FLORENZ, GV4000, 4000, 4001,	
GV4002, 400, 401, 4010, 402, 403, 404, 405,	

Model	Price
406, 407, 4092, 410, GV411, 412, 414, 415, 416, 417, 4192, 4200, 420, 430, 434, 435, GV437, 440, 450, 4592, 460, 464, 470, 500, 501, 5050, 5095,	
GV5105, 511, 530, 5395, 540, 560, 5695, MV4005, 4105, SE4100, 4104, 4120, 5102, 5104, 5106, TVR37001	70p
HINARI	
VXL2	80p
VXL7, VXL8, VXL9, VXL10, VXL11, VXL19, VXL90, VCR34, VTV 100, 200	100p
VXL4, VXL35, VTV300	70p
VXL5, VXL6	100p
VXL3, VXL20	90p
HITACHI	
VT11, 14, 16, 17, 19, 33, 330, 34, 35, 350, 38, 39, 88, 165, 5030	75p
VT5000, VT5500, VT18	120p
VT7000, VT8000, VT8030, VT8040, VT8300, VT8500, 8700	60p
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, 9900	75p
VT52, VT57, VT61, VT62, VT63, 64, 65, 85, 86, 640	60p
VT3000	120p
VT100, 110, 111, 113, 115, 118, 120, 125, 128, 130, 135, 138,	
VT145, 150, 168, 170, 175, 220, 225, 250, 255, 258, 260, VTL30	60p
VM500 VM600	90p
J.V.C.	
HR3300, HR3330, HR3360, HR3660, HR4100	130p
HR7200, HR7300	50p
HR7350, HR7600, HR7610, HR7650, HR7655	50p
HR7700	50p
HRD110, 111, 120, 121, 220, 225, BP5000	60p
HRD140, 141, 143, 150, 152, 157, 158, 160, 190, 250, 257, 310, HRD455, 565, 566, 725, 755, HRP50	45p
HRD170, 171, 180, 210, 211, 217, 230, 300, 320, 321, 330, 337, HRD350, 370, 400, 430, 440, 44 1, 500, 530, 700, 750.950,	
HRS5000, 5500, 8000, 9000, BR9060, BRS600, 605, 920, 925	45p
HRD227, 520, 52 1, 522, 527, 600, 610, 620, 637, 641, 650, 830,	
HRD840, HRDX20, 22, HRJ200, 205, 300, 305, SR330, HRS10	125p
HRD840, 550, 560, 580, 590, 640, 660, 670, 720, 730, 740, 770, HRD820, 860, 870, 880, 910, 960, 980, HRDX20, 25, HRJ2 10,	
HRJ215, 315, 316, 318, 400, 405, 407, 410, 411, 415, 416, 507, HRJ6 10, 615, 715, 97,	
HRS4700, 5800, SR3200, SRS368E	125p
HRJ600	40p
LOGIK	
VR955	180p
MATSUI	
VX600, 730, 735, 750, 755, 765, 850, 6000, VS888	75p
VX1000, VX2000, VX2500, VX3000, VX6000	80p
VX800	70p
MITSUBISHI	
HS200	200p
HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, 480, HSB10, 20, 30, HSE10, 20, 30, 70	80p
HS303, HS304, HS306, HS307, HS330, HS400, HS700	110p
HS318, HS319, HS410	110p
HSM1000, 16, HSM23, 25, 33, 34, 35, 37, 54, 55, 57, 58, 59, 68	55p

Model	Price
N.E.C.	
N830, N831, N832, N833	100p
N895	80p
PVC2300, PVC2400	180p
DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, N9033, 9034, 9053, 9054, 9055, 9056, 9066, 9096, 9110, 9120,	
N9510, 9520, 9530, 9610	80p
NATIONAL PANASONIC	
NV300, NV330PX, NV332, NV333 NV340, NV366	100p
NV777, NV788	100p
NV2000, NV2010, NV3000	80p
NV7000, NV7200, NV7800	75p
NV8600, NV8610, NV862	145p
NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 650, 730, NV770, 810, 870, 890, 970, AG 1000, 1050	85p
NV370, NV380, NV480, NV630, NV780, NV830, NV850	70p
NV600, NV688, AG6010, AG6015	85p
NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, NVH70	50p
NVFV1, NVM10, 3000, 3300, 40, 7, 9000, 9900, NVMS1, 4	70p
NVM 1, NVM3, NVM5	70p
PHILIPS	
VR6460, VR6920	170p
VR6540	100p
VR6442, VR6542	70p
VR2025, VR2580	100p
DV186, 190, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, 203, 211, 2115, 212, 213, 223, 311, 312, 313, 3210, 3219, 322, 32, 29, 323, 535, VR20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 21D, V3, 25BO1, 25BO2, 11, 12, 302, 303, 305, 31DVI, 31DV2, 31D, V3, 3SB11, 3SB12, 3SB13, 72SB8, VR30DV2, 35BO2, 35BO3, 635B7, 715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6182, 6185, 6285, 6290VR6291, VR6293, 6362, 6367, VR6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, VR6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, VR68SB4, 86SBI, 92SB3	75p
VR445B9, VR445B920, VR445B922, VR6443, 6843, 6843, VR6943	100p
VR3260, 6349, 6448, 6449, 6548, 6648, 49SB620, 644869S, 49SB6	110p
VKR6850, VKR6855	70p
VR501	110p
VKR6800, VKR6810, VKR6820	70p
SE4104, VR231, 2310, 2319, 231, 232, 2329, 237, 23, 241, 2410, 2419, 242, 243, 245, 2469, 247, 2479, 251, 252, 256, 257, 258, 33, 19, 332, 3329, 333, 337, 339, 3419, 342, 343, 3469, 347, 3479, 35, 1, 352, 357, 358, 422, 4229, 432, 437, 442, 4229, 432, 437, 442, 44, 5, 4469, 447, 4479, 451, 452, 457, 458, 459, 512, 522, 5229, 6379, 642, 647, 722, 7229, 723, 7379, 747, 8389, 848, 9489	70p
SAISHO	
VR2000, VHL3	90p
VR3800, 3200, 3300, 3500, 3600, 3650, VRS4400, 5000	75p
VR3400	100p
SAMSUNG	
SV716, 717, V1616, V-621, V1626, VX616, VX617, VX619, X626, VX627, VX629, VX714	75p
VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V1510, 520, V1611, 616, 621, 626, VX510, 511, 520, VT320, 5600	80p
VB900, VB910, V1900, V1910	110p
PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, VB750, 770, 8220, 8225, V1770, 790, 8220, 8225, VK8220, VPX31, VX750, VX770, 790, 8220, 8225, SE9000, 9001	90p
SVX301, 303, 305, SX7301, VB710, 971,	

Model	Price
V1710, 730, 750, 970, VX710, 712, 720, 730, 970, 971, 972	100p
VX9880	110p
SX7121	95p
SANYO	
VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50	65p
VTC5300, VTC5350, VTC5400, VPR5800	80p
VTC5500	70p
VTC9100, VTC9300	140p
VTC1100, 1300, 1500, VHR1100, 1110, 1150, 1200, 1300,	
VHR1500, 2370, MVR220	80p
VHR2100, VHR2300, VHR2500, VHR2700	100p
VHR3100, 3110, 3150, 3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700, TLS1000, TLS1001	65p
VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, VHR194, 220, 23, 235, 240, 244, 250, 251, 274, 297, 310, 330,VHR335, 390, 4100, 4105, 4150, 4200, 430, 4300, 4350, 474, VHR4770, 5080, 5100, 5200, 5300, 5350, 5700, 6850, 7100, VHR7200 7250, 7260, 7300, 7400, 7500, 7520, 7530, 7530, VHR7540, 7700, 774, 7800, 7810, 8000, 8100, 8200, 8250, 8500,VHR8800, 8801, VHRD4400, 4410, 4500, 4600, VHRD4610, 4710, 4890, 6700	60p
VMD66, VMD68P	80p
VTR1000	70p
VTC6010	75p
SHARP	
VC200, 381, 384, 385, 386, 388, 390, 393, 838, 9100, 9300, 9500, VC9700	80p
VC7300, VC7700, VC7750, VC7800, VC8000	110p
VC8300	115p
VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481	80p
VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3, VC8581	80p
VC108, 405, 408, 550, 600, 651, 674, 681, 682, 682, 684, 685, 693	
VC700, 750, 783, VC6F3, VC6V3	70p
VC208, 671, 772, 779, 780, 781, 782, 785, 786, 787, 793, 800,VC7810, 7822, VCA100, 102, 103, 104, 131, 140, 170, 202, 03, VCA234, 501, 502, 602, 5011, VCB311, 361, VCD801, 802, VCH851, 852, 882, VCM73, VCT72	65p
VCA10, 103, 105, 106, 113, 11613, 211, 234, 244, 254, 30, 33, 35, VCA36, 37, 40, 43, 454, 48, 50, 505, 51, 52, 53, 54, 55, 56, 57, 58, VCA60, 605, 615, 67, 68, 1031, VCB320, VCBS97, VCD805, VCD806, 810, 815, VCH80, 81, 85, 865, 910, VC51000, VCT212, 310, 410, 610, VCT1314, VCTS312, 313, VC790ET	80p
VCC10	70p
SONY	
SLC6, SLJ10, SLT6ME	140p
SLC5, SLC7, SLJ7, SLJ9, SLT7ME	140p
SLC9, SL8000, SL8080, SLT50	165p
SL8000E, SL8080E, SL8200, SL8600	175p
SLV255, 125, 213, 225, 262, SLVX1, 20, 3	95p
TOSHIBA	
V55, V57	85p
V33, V31, V32, V51, V52, V53, V9600, V9680	85p
V61, V63, V65, V66, V67	150p
DV80B, DV80D, V71, 73, 74, 75, 77, 81, 83, 85, 86	80p
V108, 109, 110, 120, 130, 140, 199, 209, 210, 211, 220, 221, 411,V421, 609, 610, 611, 659, 660, 711, 880	120p
V91 G, V95G	115p
V212, 213, 22-2, 312, 322, 403, 412, 413, 610, 703, 813	50p
VCPB1E	110p

REPLACEMENT IDLERS & PULLEYS

Make	Models	Description
Hitachi	VT11, 14, 17, 19, 33, 34, 35, 38, 39, 52, 57, 61, 62, 63, 64, 65, 85, 86, 330, 350, 640, 16S, 5030	FF Rew Idler 6886792
Order Code: IDL01		**Price 100p**
Hitachi	VT680, 6500, 6800, 9300, 9500VT9700, 9900	Play Idler 6861482 6861481
Order Code: IDL02		**Price: 180p**
Blaupunkt	RTV301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 404, 414, 424, 434, 444, 478, 707	idler
Goldstar	GHV1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, GHV1248, 8000, 8200, 8210, 8215, GVHP51, VCP4100, 4130	Idler
Grundig	MVS400, 440, VS400, 410, 440VS450, 460	Idler
National	NV230, 250, 260, 280, 370, 380, NV430, 431, 433, 450, 460, 465, 470, 480, 630, 650, 730, 780, NV810, 830, 850, 870, 890, NVG7, 9, 10, 11, 12, 14, 15, 16, 18, 30, 130, 400, AG1000, AG1050, 1200, 1500, 1810, AG2100, 2200, NVH65, 70	Idler Arm VXP 0521
Philips	VR6460, VR6520, VR6920	Idler Arm 40340162
Order Code: IDL08		**Price 100p**
Amstrad	VCR7000	Idler 150280
Sharp	VC200, 381, 383, 384, 385, 386, VC388, 390, 393, 3300, 8381, 9100, 9300, 9500, 9700	Idler NIDL0005GEZZ
Order Code: IDL10		**Price: 100p**
Philips	VR6540	Idler
Sharp	VC300, 387, 402, 471, 473, 477, VC481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, 5F3, 5W20E	Idler NIDL0006GEZZ
Order Code: IDL11		**Price: 100p**
Akai	VS10	Reel Idler
Ferguson	3V23, 3V29, 3V30, 3V31, 3V323V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	Reel Idler PU48967
J.V.C.	HR7200, 7300, 7350, 7600, 7610, 7650, 7655, 7700	Reel Idler PU48967
Order Code: IDL20		**Price: 175p**
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Idler PU 51402
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610, HRD110, 111, 120, 121, 225	Take Up Idler PU 51402A
Order Code: IDL22		**Price 100p**

Make	Models	Description
Ferguson	3V39, 3V30, 3V31, 3V32, 3V353V36, 3V38, 3V39, 3V49, 8930, 8931, 8933, 8940, 8941, 8942, 8943, 8944	Take Up Clutch PU 51380
J.V.C.	HR7200, 7600, 7650, 7655, 7300, 7350, 7610	Take Up Clutch PU 53462A PU 51380
Order Code: IDL23		**Price: 200p**
Philips	DB532, VR6520, 6843, 644	Reel Idler
Sharp	VC600, 651, 681, 682, 684, 685, 693, 699, 700, 783, 6FR, 6V3, 6F3	Idler Assembly NPLYV0107GEZZ
Order Code: IDL88		**Price: 615p**
Philips	VR6843, 6943, 44SB9, VR44SB920, 44SB922, 6943	Reel Drive Unit
Sharp	VC772, 780, 781, 782, 785, 786, VC787, 800, 793, 799, 7810, 7822, VCA100, 102, 104, VCA131, 140, 170, 202, 203, 234, 501, VCA602, 5011, VCD801, 802, VCH851, 852, VCH882, VCM73, VCT72, VC782MK11	Idler NPLTV0111GEZZ
Order Code: IDL90		**Price: 700p**
N.E.C.	N911, 915, 916, 917, 9012, 9013N9014, 9016, 9033, 9034, 9053, N9054, 9055, 9056, 9066, 9096, N9110, 9120, 9510, 9520, 9530, N9610, DX1000, 1600, 2000, DX3000, PX1200	Idler Arm Assembly
Order Code: IDL245		**Price: 270p**
Philips	DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, 3210, 3219, 322, 3229, 323, 535BO, VR486, 471, 562, 582, 571, 761, 201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, 6291, 6293, VR6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970, 6975, 86B1, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DV1, 31DV2, 31DV, 33SB02, 3SB03, 3SB05, 3SB11, 3SB12, 3SB13	Pressure Roller Assembly PS403-40205
Toshiba	V91, V95	Pressure Roller Assembly PS403-40205
Order Code: PR232		**Price: 300p**

REPLACEMENT IDLER TYRES

Akai	M32773	IT01	**Ferguson**	PU51380	IT07		VXP0433	IT15
	MZ366960J2	IT02		PU51402A	IT08		VXP0463	IT16
Goldstar	VXP0521	IT17		PU55373	IT09		VXP0521	IT17
Hitachi	6861471	IT03		PU55374	IT10		VXP0581	IT18
	6861482	IT04	**National**	VXP0329	IT11	**Sanyo**	1430662T15620	IT19
	6886971	IT05	**Panasonic**	VXP0343	IT12	**Sharp**	NIDL0005GEZZ	IT20
JVC	PU48697B	IT06		VXP0344	IT13		NIDL0006GEZZ	IT21
				VXP0401	IT14		NPLY0107GEZZ	IT22

Price:
20p each
16p each pack of 5
13p each pack of 10

Packs are for each model

SPECIAL OFFERS!!!! See Page 634 SPECIAL OFFERS!!!!

PINCH ROLLERS

Model	Price
AKAI	
VS10, VS9300, VS9500, VS9700, VS9800, VP7100, VP77	140p
VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9, VS12, VS15	140p
VS105, 112, 115, 116, 120, 125, 126, 155, 165, 205, 220, 240, 244, 245, VS247, 248, 250, 512, VS515, 516, VSX9	140p
VS201, 301, 303, 304, 603, 606, 607, VSP8, VSP82, VP58, VP82	140p
VS125, VS155, VS165, VS220, VS240, VS250, VS512	140p
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 462, 465, 467, VS485, 765, 766, 767, 768, 865, 867, 965, 967, VSA77, VSA650, VSF10, 11, 12, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 33	140p
VSF330, 4, 500, 550, VSP88, VSR100, VSX400, 450, 470	140p
VSF260, 261, 262, 265, 270, 274, 275, 280, 290, 340, 350, 410, 420, 43C	
VSF441, 440, 450, 455, 480, 490, 497, 510, 560, 580, 590, 599, 600, VSG20, 21, 23, 24, 25, 30, 33, 34, 35, 51, 54, 55, 60, 64, 65, 70, 73, 74, 75,	
VSP110, VSX560, VSX580	140p
VS17, 20, 22, 23, 24, 25, 26, 27, 35, 37, 38, 53, 55, VSA77	775p
PINCH ROLLER ASSEMBLY VS422, 425, 426, 427, 462, 465, 467, 485, 498, 765, 766, 767, 768, 865, 867, 965, 967, VSA650, VSF10, 11, 12, 14, 15, 180, 190, 200, 210, 220, 221, 222, 230, 240, 30, 300, 301, 310, 320, 33, 330, 4, 500, 510, 600, VSR110, VSX100, 400, 450, 470	800p
PINCH ROLLER ASSEMBLY VSS99	140p
ALBA	
VCR3000X, VCR4000	140p
VCR5000, VCR6000	140p
VCR161, VCR222	140p
VCR7000, VCR7800, VCR8000, VCR8800	140p
VTV10	140p
AMSTRAD	
VCR1000, 2000, 4500, 4600, 4700, 5200, 6000, 6100, 6200, 8600, VCR8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9005, VCR9244, 9340, DD8900, 8904, TVR1, 2, 3, 4	140p
VCR7000	140p
DD8900, DD8904, VCR6000, 6100, 6200, 8600, 8602, 8603, 8604, VCR8700, 8800, 900>9, 9140, 9244, 9340	700p
PINCH ROLLER ASSEMBLY PART NO: 153148 TX3650, UF20, VCR3000, VCR3002, VCR4000, VCR9500	300p
PINCH ROLLER ASSEMBLY PART NO: 2554966 DD9900, 9904, TX3650, UF20, 22, 24, VCR3000, 3002, 9500	140p
VS1004 VS1104	140p
FERGUSON	
3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929	140p
3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8933, 8940, 8941, 8942	140p
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FVII, FV12, FV14, 8943, 8944, 8945, 8947, 8948	140p
3V52	140p
8950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R, 22L, 26D, 31R, 32L,FV33H, 39S, 41R, 42L, 50B, 51R, 52L, VC141L	140p
FV37H, FV44L, FV46T, FV43H, FV57H	140p
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944	1100p
PINCH ROLLER ASSEMBLY 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948	1350p
PINCH ROLLER ASSEMBLY FV37, FV57, FV58	350p
PINCH ROLLER ASSEMBLY FV31R	140p
FV41L, FV42L	925p
PINCH ROLLER ASSEMBLY 3V58, 3V59, 3V64, 3V65, FV10, 11, 12, 13, 14, 20, 21, 22, 26, 30, 32, 33 FV39, VC141L	875p
PINCH ROLLER ASSEMBLY FV43H, FV44L, FV45X, FV46T	700p
PINCH ROLLER ASSEMBLY FV61, FV62, FV67, FV68, FV70, FV71, FV72, FV74, FV77	775p
PINCH ROLLER ASSEMBLY	
FISHER	
FVHP420, 520, 530	140p

Model	Price
FVHP615, 618, 620, 622, 710, 711, 715, 716, 720, 721, 722, 725, 730, FVHP810, 830, 840	140p
FVHP905, 906, 907, 908, 910, 911, 915, 916, 918, 970, 975, 980, 990, FVHP 5000, 5005, 5050, 5075, 5100	140p
VBR330, VBS3500, 7000, 7100, 7500, 7600, 9000, 9900	140p
FVHD230, 250, 270, 370, 2000D, FVHP3, 210, 250, 300, 310, 1100, FVHP1200, 1250, 130, 132, 1340, 1340, 1400, 1410, 1440, 1500, 200, FVHP320410, 420, 430, 440, 445, 470, 475,	140p
FVSP290S, 495, 2905	140p
FVHD140, FVHD40, FVHD55, FVHP1, FVHP10, FVHP20	140p
FVHD140, 40, 55, FVHP1, 10, 25, 30, 40, 4000,	
FVHS10, 30	1350p
PINCH ROLLER ASSEMBLY **GOLDSTAR**	
GHV51, 1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245, 1246,140p	
GHV1247, 1248, 1250, 1266, 1290, 1291, 1295, 1296, 1392, 1393,	
GHV1891, 1900, 2145, 3000, 3010, 4400, 4410, 51, 8000, 8200, GHV8210, 8215, 8430	
GHVP1240, 1241, 1247, 1248, 1290, 1291, GHVP1295, 1296, VCP4000, 4100, 4130, 4200, 4300, 4301, 4305, VCP4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350, GSE1290, 1291, 1295, 1296, 1297, 1891, 1910, 20005, 2000	140p
HITACHI	
VT7, 11, 14, 16, 17, 18, 19, 33, 34, 35, 350, 38, 39, 88, 330, 680, 4200, VT5000, 5030, 5500, 6500, 6800, 7000, 8000, 8300, 8500, 8700, 930, VT9500, 9700, 9900, VM600	140p
VT8, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100, 110, 111, 113, 115, 118, VT120, 122, 125, 128, 130, 135, 138, 145, 150, 168, 170, 175, 200, 225, VT250, 255, 258, 260, 400, 405, 410, 413, 414, 415, 416, 418, 420, 425	
VT426, 428, 430, 431, 435, 438, 450, 498, 510, 515, 517, 518, 520, 525, VT526, 530, 535, 536, 540, 545, 546, 548, 570, 575, 576, 580, 585, 588	
VT640, 830, VTF660, 665, 70, 770, 774, 775, 780, 785, 860, 861, 865, VTL30, 1000, 2000, VTLC50, VTM598, 620, 622, 625, 626, 630, 635	
VTM636, 640, 645, 646, 720, 722, 725, 726, 727, 728, 730, 731, 735, VTM736, 740, 745, 746, 748, 753, 754, 820, 821, 822, 825, 830, 831, VTM835, 838, 840, 841, 845, 920, 921, 922, 925, 930, 931, 935, VTS80, 85, 890, 895VM200, 2300, 2380, 3200, 3280, 500, VMS7200	140p
VT3000	140p
VT410, 420, 428, 430, 450, 498, 518, 520, 522, 530, VTF770, 780, VTM598, 622, 722, 740, 748, 753	650p
PINCH ROLLER ASSEMBLY VTF150, 155, 180, 185, 250, 255, 260, 265, 280, 285, 350, 351, 355, VTF360, 365, VTM140, 141, 145, 145, 210, 211, 212, 215, 220, 221, VTM230, 231, 235, 284, VTS390	140p
HINARI	
V20H, VXL5, VXL6, VXL7, 8, 9, 10, 11, 19, 90, H13V, VTV100, 200	140p
VXL2, VXL3	140p
VXL4, VXL20, VXL35	140p
VTV100, VXL10, VXL11, VLX9, VXL90	700p
PINCH ROLLER ASSEMBLY V20H, VXL5, VXL6 MOD KIT	275p
J.V.C.	
HR2200, 3300, 3330, 3360, 3660, 4100, 7700	140p
HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655	140p
HRD110, 111, 120, 121, 140, 141, 142, 143, 150, 152, 156, 157, 158, HRD160, 220, 225, 250, 257, 445, 455, 565, 566, 725, 755, HRP50, BP5000, BR7000, BRS611, 811	140p
HRD520, 540, 550, 560, 580, 600, 610, 620, 637, 640, 641, 650, 660, HRD670, 720, 730, 740, 770, 820, 830, 840, 860, 870, 880, 910, 960, HRD980, HRDX20, 22, 25, HRJ200, 205, 210, 215, 300, 315, 316, 318	
HRJ400, 405, 407, 410, 411, 415, 416, 507, 600, 605, 610, 615, 715, 815	
HRJ97, HRS4700, 5800, 5900, 6800, 6900, SR3200, 330, 368	140p
HRD170, 171, 180, 210, 211, 217, 230, 300, 320, 321, 330, 337, 350, HRD370, 400, 430, 440, 441, 470, 500, 530, 700, 750, 950, HRS5000, 5500, 8000, 9000, BR7030, 7040, 9060,	

Model	Price
BRS600, 605, 747, 777, 920, 925	140p
HRS10	140p
BP5000, HRD110, 111, 120, 220, 225, 455	1100p
PINCH ROLLER ASSEMBLY HRD140, 141, 142, 143, 150, 152, 157, 158, 160, 565, 566, 725, 755,	
HRP50	1350p
PINCH ROLLER ASSEMBLY HRD1520, 510, 520, 521, 522, 525, 527, 560, 600, 610, 620, 637, 641, HRD650, 720, 830, 840, 910, HRJ205,	
HRS5800	350p
PINCH ROLLER ASSEMBLY BR7030, BRS600, HRD160, 170, 171, 180, 190, 210, 211, 217, 227, HRD230, 271, 300, 310, 320, 321, 330, 337, 350, 400, 430, 440, 441, HRD470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000	875p
PINCH ROLLER ASSEMBLY HRD540, HRD550, HRD580, HRD660, HRD860, HRD960	700p
PINCH ROLLER ASSEMBLY HRJ600, HRJ605, HRJ815, HRS9200	875p
MATSUI	
VX6000, 730, 735, 750, 755, 765, 800, 850, VS888	140p
VX1000, VX2000, VX2500, VX3000, VX6000A	140p
MITSUBISHI	
HS12, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSE12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 15	
0, 16, 170, 190, 210, 23, 25, 250, 27, 33, 34, 35, 36, 37, 370, 380, 45, 450, 5	
4, 55, 555, 57, 58, 59, 68, HSMS2, 9, HSS11, 14, 15, 17, 19, 25, 5600, HV	
F125, 150, 303, 85, SV8900, 8930	750p
PINCH ROLLER ASSEMBLY PART NO: 948D020010 HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 150, HSM16, 170, 18, 190, 210, 23, 25, 250, 27, 30, 33, 34, 35, 36, 37, 370, 38, HSM380, 40, 45, 450, 50, 54, 55, 555, 57, 58, 59, 60, 68, HSMS2, 9, HSMX1, 18, 19, 2, HSS11, 12, 14, 15, 17, 19, 21, 25, 5600, HVF125, HVF150, 303, 85, SV8900, 8930	140p
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS360, HS700	140p
HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410, HS411, HS412, HS421, HS480, HS710, HSB 10, HSB20, 30, HSE 10, 20, 30, 70	140p
NATIONAL PANASONIC	
NV100, 180, 300, 330PX, 332, 333, 340, 366, 600, 688, 777, 788, 3321, AG6010, 6015, 6100, 6200, 6400, 6800, 7450	140p
NV230, 250, 260, 280, 370, 380, 430, 431, 433, 450, 460, 465, 470, 480	
NV630, 650, 730, 770, 780, 810, 830, 850, 870, 890, 2000, 2010, 3000, NV7000, 7200, 7800, 8050, 8150, 8170, 8200, 8300, 8400, 8500, 8600	
NV8610, 8620, NVG11, 14, 16, NVG7, 10, 12, 15, 18, 30, 130, 400, AG 1000, 1050, 1200, 1500, 2100, 2200, 6500, 6810, 7500, 7510,	
NVH70	140p
NVG9, NVG120	140p
AG6840, 6720, 7150, 7330, 7350, 7355, 7650, NVH65, 75, NVJ30, NVL20, 23, 25, 28, NVG300, NVF65, NVF70, NVFS1 NVFS 100, NVG 19, 20, 25, 33, 40, 50,	
NVV8000	140p
NVD48, NVD80, NVG21 NVG45	140p
NVJ700PX	140p
NVHD100, NVHD101, NCHD90, NVSD30, NVSD40	1125p
PINCH ROLLER ASSEMBLY AG5150, 5250, 5700, 6024, NVD38, 48, 80, NVF55, 65, 70, 75, 77, NVFS1, 100, 200, 88, 90, NVG 19, 20, 21, 22, 25, 28, 300, 33, 40, 45, 46, NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40, 42, 45, 47,	
NVL20, 23, 25, 28, NVW 1	300p
PINCH ROLLER ASSEMBLY **N.E.C.**	
N830, 831, 832, 833, 895	140p
PVC2300, 2400, 740, 744, 746, 760, 764, 766	140p
DX1000, 1600, 1800, 2000, 3000, N9012, 9013, 9014, 9016, 9033	
N9034, 9053, 9054, 9055, 9056, 9066, 9096, 9110, 9120, 9510, 9520,	
N9530, 9610, PX 1200	140p
DS6000G, DX4000, N9077	

Model	Price
NS7000	140p
ORION	
VH1, VH2	140p
VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312	
VHF2A, VP2948	140p
COMB 15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML, TVP230RC, VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 666, 730, 735, 744, 774, 790	
VH800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050, VH1060, 1070, VH1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004, VH2151, 2308, 22042400, 2500, 2600, 2700, VH2960, 2970, 3050, VH3060, 4000, 4008, 4010, 4012, 4015, 4015, 4020, 4300, 5020, VP 10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30	140p
PHILIPS	
VR6460 VR6920	140p
VR2020, VR2021, VR2022, VR2023, VR2024	140p
VR6711	140p
VR6540	140p
DV856, 586, VR702, 703, 6485, 6585, 6589, 6785, 6880, 6948	140p
VR445, VR6442, VR6542, VR6643, VR6843, VR6943, 44SB9	140p
DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560,	
VR6660, 6860, 6861, 6862, 6863	140p
N-1700, VR2870	140p
VR2025, VR6580, VR6581	140p
49SB6, VR3260, 6349, 6448, 6449, 6548, 6648	140p
PRESSURE ROLLER ASSEMBLY PS403-40205	
DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313,	
VR3210, 3219, 322, 3229, 323, 535BO, 486, 471, 562, 582, 571, 761,	
VR201, 202, VR203, 302, 303, 305, 6180, 6182, 6185, 6286, 6290,	
VR6291, 6293, 6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561	
VR6570, 6581VR6670, 6676, 6710, 6760, 6761, 6762, 6870, 6970,	
VR6975, 86BI, 63SB7, 68SB4, 71SB4, 71SB5, 72SB8, 72SB8, 92SB31, 20DV1, 20DV2, 20RW7, 21DVI, 21DV2, 2SB01, 2SB02, 2SB11, 2SB12, 30DV2, 31DVI, 31DV2, 31DV33SB02, 3SB03,	
3SB05 3SB11 3SB12 3SB13	280p
VR231, 232, 332, 422, 4229, 512, 5229, 722, 7229, 723	140p
VR501	PR38 140p
SANYO	
VHR1100, 1110, 1150, 1200, 1300, 1500, 2100, 2300, 2370, 2500,	
VHR2700, 3330, MVR220	140p
VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6010, 6500, 9100,	
VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50,	
VPR5800	140p
VHR3100,3300, 3310, 3400, 3500, 3700, 3800,	
VHRD500, 700	140p
VTC3000	140p
VHR120, 130, 14, 141, 143, 14, 150, 151, 153, 154, 15, 16, 171, 194, 22	
0VHR23, 235, 240, 244, 250, 251, 274, 27, 297, 310, 330, 335, 350, 390, VHR4100, 4105, 4150, 4200, 430, 4300, 4350, 4400, 474, 4770, 5080,	
VHR5100, 5200, 5300, 5350, 5600, 5700, 6850, 7100, 7200, 7250,VHR7260, 7300, 7400, 7440, 7500, 7520, 7530, 7540, 7700, 774, 780,	
0VHR7810, 8000, 8070, 8100, 8200, 8250, 8500, 8800, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700, VHRS700	140p
VCR100	140p
VHR120, 135, 150, 190, 4150, 4160, 4350, 5200, 5240, 5350, 7200, 7250, 7260, 7700, VHRD4410, 4610, 4710, 4890, 5450, VHRS700	975p
PINCH ROLLER ASSEMBLY VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 7000	1350p
PINCH ROLLER ASSEMBLY **SHARP**	
VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, VC6200, 6300, 7300, 7700, 7750, 7800, 8300, 838, 9100, 9300, 9400,	
VC9500, 9600, 9700, 9800	140p
VC300, 387, 402, 471, 473, 477, 481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, 8481, VC5F3, VC5W20E, VCA1031	140p
VC108, 208, 405, 408, 550, 600, 651, 671, 674, 681, 682, 684, 685, 693, VC699, 700, 772, 750, 779, 780, 781, 7810, 782, 782MK2, 7822, 783,	
VC785, 786, 787, 793, 800, 7810, 7822, VCT72, VC6F3, VC6V3, VCA 100, 102, 104, 131, 140, 170, 202, 203, 211, 234, 303, 501, 502, VCA602, 5011, VCD801, 802, 851, 852, 881, 882, VCM73, VCT73, VCT72,	
VCB361	140p
VC220	140p
VCA10, 30G, 60, 103, 105, 106, 111, 113, 131, 211, 244, 254, 33, 35, 36, VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 51, 52, 53, 54, 55, 57, 58, 505, VCA60, 605, 615, 62, 63, 67, 68, 1031, 11613, VCB311, 320, VCBS97, VCD805, 806, 810, 815, VCH80, 81, 865, 910, VCS 1000, VCT310, VCT410, 610, VCT 1314, 5313, VC790	140p
VC780, 790, VCA10, 103, 1031, 105, 106, 211, 244, 254, 255, 30, 35, VCA340, 43, 47, 50, 60, 605, 615, VCD806, 815, VCH80, 81, 83, 85, VCH865, 87, 910, VCS 1000, VCT212, 310, 410, 510, 610, VCTI314,	
VCTS313	525p
PINCH ROLLER ASSEMBLY **SAISHO**	
VHL3, VR1000, 2000, 2500, 3200, 3300, 3500, 3600, 3650, 3800, VRS4400, VRS5000	140p
VR3400	140p
SAMSUNG	
SV716, 717, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 900, V910, V1510, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616,	
VX617, 619, 626, 627, 629	140p
SVX301, 303, 305, 307, 319, 322, VB710, 713, 750, 770, 971, 8220, VB8225, V1710, 730, 750, 770, 790, 8220, 8225, 970, VX710, 712,	
VX720, 730, 750, 770, 790, 825, 8225, 970, 971, 972, 8220, PX980, 981, 982, SE9000, 9001, SX7120, 7121, 7220, 7221, 7230, SX7301, VK8220,	
VPX31	140p
VX9880	140p
PX31 R, 32R, PXR30, SV80, SX3230, 3231, 3260, 3261, VS390, VX30, 31, 32, 3560, 3561, 370, 375, 380, VXK300, 301, 306, 307, 320, VXK321, 326, 330, 331, 336, 337, 350, 351, 356	140p
PX990, 991, 992, S11230, 1240, SVX4000, 503, 504, 600, SX1230, SX1231, 1260, 1261, 1566, V11560, VPK43, VX1230, 1260, 1261, VX1560, 1561, 1850	140p
SONY	
SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ 10, SLT6ME, SLT7ME	140p
SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 35, 60, 100, SLF200, SLF60PS, SLF90E, SLFH150, 850, SLK88, 95, SLT20ME, SLT30ME, SLT50ME	140p
BMC 100, BMC200, BMC500	140p
SLV201, 202, 301, 302, 401, 402, 801, 802	140p
SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715	300p
SLV757, 777	140p
SLV255	140p
SLV275, 282, 315, 325, 353, 363, 373, 410, 415, 416, 474, 625, 656, SLV715, 725, 727, 757, 777, 815, 825, SLVX30, 50, 55	140p
SLV125, 213, 225, 252, 255, 262, SLVXI, 20, 3	140p
SLV215, 216EE, 275, 282, 315, 325, 353, 363EE, 373, 393, 410, 415, SLV416EE, 474, 494EE, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV60W, 615, 625, 656, 676UC, 686HF, 696HF, 715, 725, 727, 757, SLV767B, 777, 815, 825, SLVE7, 8, 9SLVX30AS, SLVX35AF, SLVX50AS, SLVX55DH, SLVX65BR, SVO140, 160	1250p
PINCH ROLLER ASSEMBLY PART NO: X37277701 SLV210, 212, 270, 273, 275, 285, 300, 310, 335, 425, 427	350p
PINCH ROLLER ASSEMBLY SV6700.8750, 9700, VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 700	1350p
PINCH ROLLER ASSEMBLY SL100, 200, SLC20, 30, 33, 34, 40, 44, 80, 88, 9, SLF1, 20, 25, 30, 35, 45, SLF60, 65, 73, 90, SLHF100, 150, 950, SLK85, 95, SLO1700, SLS550, SLT0, 30, 50	300p
PINCH ROLLER ASSEMBLY	

VIDEO LAMPS

Models & Description	Order Code	Price
UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	VL01	25p
PANASONIC VIDEO LAMPS	VL02	30p
SHARP VIDEO LAMPS	VL02	30p
HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p
AKAI IVS10),GRANADA (VHSXJ3), TT (VR3993,3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411,TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p
AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON,TOSHIBA	VL05	100p
GRANADA (VHSAY3),SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	45p
AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 5912, 8922, 8925)	VL01	25p
BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200,2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8300)	VL02	30p
AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963) JVC (HT7200, 7300, 7350, 7700) TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL07	40p

VIDEO SERVICE KITS

AMSTRAD
VCR700
Contents
BELT SET. PINCH ROLLER. REEL IDLER. VIDEO LAMP
Order Code: SK41 £5.50

FERGUSON & JVC
3V42/43
HRD455/HRD725

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND	BELT SET, PINCH ROLLER SUPPLY CLUTCH, TAKE UP CLUTCH
Order Code: SK37 £16.00	**Order Code: SK38** £9.00

3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
Contents
BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND
Order Code: SK44 £7.00

3V29/3V30
HR7200/7300/7350
Contents
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
Order Code: SK05 £5.00

3V35/36, 38/39/49
HRD110/111/120/225
Contents
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
Order Code: SK04 £5.00

3V31/3V42
HR7600/7610/7650/7655

Contents	*Economy Kit Contents*
BELT SET, T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP	BELT SET, T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
Order Code: SK33 £11.00	**Order Code: SK34** £5.00

3V35/36/38/39/49
HRD110/111/120/121/225

Contents	*Economy Kit Contents*
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER. REEL IDLER. TENSION BAND	BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER TYRE. REEL IDLER TYRE
Order Code: SK35 £10.00	**Order Code: SK36** £5.50

3V29/3V30
HRD7200/7300/7350

Contents	*Economy Kit Contents*
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP	BELT SET. T/U REEL IDLER TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLE TYRE. T/U IDLER TYRE. T/U CLUTCH
Order Code: SK31 £10.00	**Order Code: SK32** £5.00

3V44/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND	BELT SET. PINCH ROLLER
Order Code: SK39 £15.00	**Order Code: SK40** £9.50

FISHER
FVHP905/906/907/908/910/911/916/918

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

FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. TENSION BAND	BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK68 £11.00	**Order Code: SK69** £300

HITACHI
VT11/VT33
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK08 £5.00

VT11/VT33

Contents	*Economy Kit Contents*
BELT SET. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. FF/REW IDLER. CLUTCH PLATE. TENSION BAND	BELT SET. PINCH ROLLER. FF/REW IDLER TYRE. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE
Order Code: SK45 £13.00	**Order Code: SK46** £3.75

VT52/61/62/63/64/65/85/86/640

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, FF/REW ARM. CLUTCH PLATE. TENSION BAND	BELT SET, PINCH ROLLER FF/REW IDLER
Order Code: SK49 £14.00	**Order Code: SK50** £3.00

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88
Contents
TIMING BELT. PINCH ROLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND
Order Code: SK52 £9.75

VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30
Contents
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSIDN BAND
Order Code: SK51 £14.00

PANASONIC
NV2000/NV2010NV7000/NV7200/NV7800

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK03 £5.00	**Order Code: SK02** £5.00

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
Order Code: SK01 £5.00

NV2000/NV2010

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION BAND. VIDEO LAMP	BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE
Order Code: SK13 £6.00	**Order Code: SK14** £3.50

NV7000/NV7200/NV7800

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, IDLER UNIT. PLAY IDLER. TENSION BAND	BELT SET, PINCH ROLLER IDLER TYRE. CLUTCH TYRE
Order Code: SK11 £8.50	**Order Code: SK12** £3.25

NV300/NV330/NV333/NV340/NV366

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, IDLER UNIT. PLAY IDLER. TENSION BAND	BELT SET, PINCH ROLLER IDLER TYRE. PLAY IDLER
Order Code: SK15 £7.00	**Order Code: SK16** £3.25

NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)

Contents	*Economy Kit Contents*
LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TENSION BAND	LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER. TYRE
Order Code: SK27 £6.00	**Order Code: SK28** £3.00

NV332

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, PLAY IDLER. FF/REW IDLER TENSION BAND. FF/REW TYRE	BELT SET, PINCH ROLLER PLAY IDLER TYRE. FF/REW IDLER TYRE
Order Code: SK29 £12.00	**Order Code: SK30** £5.10

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, IDLER. TENSION BAND	BELT SET, PINCH ROLLER IDLER TYRE
Order Code: SK23 £6.00	**Order Code: SK24** £3.25

NV600/NV688

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, PLAY IDLER. FF/REW IDLER, TENSION BAND	BELT SET, PINCH ROLLER PLAY IDLER TYRE. FF/REW IDLER TYRE
Order Code: SK25 £12.00	**Order Code: SK26** £6.00

NV730/NV770

Contents	*Economy Kit Contents*
SLOT IN BELT. LOADING BELT PINCH ROLLER. IDLER UNIT. TENSION BAND	SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER TYRE
Order Code: SK19 £5.50	**Order Code: SK20** £3.00

NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, IDLER. TENSION BAND	BELT SET, PINCH ROLLER IDLER TYRE
Order Code: SK21 £5.00	**Order Code: SK22** £2.75

NV777/NV788

Contents	*Economy Kit Contents*
BELT SET, PINCH ROLLER, IDLER UNIT. TENSION BAND	BELT SET, PINCH ROLLER IDLER TYRE
Order Code: SK17 £6.00	**Order Code: SK18** £4.00

SHARP
VC381

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND. VIDEO LAMP	BELT SET. PINCH ROLLER REEL IDLER TYRE
Order Code: SK47 £8.00	**Order Code: SK48** £3.25

VC500/VC571/VC581/VC582/VC583/VC584/VC5F3

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND	BELT SET. PINCH ROLLER REEL IDLER
Order Code: SK60 £9.50	**Order Code: SK61** £5.00

VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND	BELT SET. PINCH ROLLER REEL DRIVE UNIT TYRE
Order Code: SK64 £13.50	**Order Code: SK65** £3.75

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700

Contents	*Economy Kit Contents*
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND	BELT SET. PINCH ROLLER REEL DRIVE UNIT TYRE
Order Code: SK62 £13.50	**Order Code: SK63** £5.00

FOR MORE DETAILS OF OVER 500 TYPES OF SERVICE KITS . . .
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SERVICE KIT & UPGRADE FOR ONWA TV CHASSIS

FAILURE OF ZD401 (ZD401 ON THE 20/21 CHASSIS) IS NOT UNCOMMON.

THIS KIT HAS BEEN ASSEMBLED AS A REPAIR KIT FOR COMPONENT FAILURES AND AS AN UPGRADE FOR THE POWER SUPPLY.

THE KIT CONSISTS OF ALL THE REQUIRED COMPONENTS AND COMES COMPLETE WITH FULL INSTRUCTIONS AND CIRCUIT DIAGRAM.

THE KIT IS DESIGNED TO FIT THE FOLLOWING MAKES AND MODELS.

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* GOODMANS
* HINARI
* JVC
* MATSUI

ORDER CODE : ONWAKIT PRICE: 1200p
* SOME MANUFACTURERS HAVE ALREADY TAKEN STEPS TO UPGRADE THE POWER SUPPLY

REPLACEMENT VIDEO CASSETTE HOUSINGS

Name	Models	Code	Price
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	3200p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L. 26, 395, HRD230, 430, 530	CH03	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20,		
FERGUSON	FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49SB6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CH01	2800p
	V65, V66	CH02	2800p

AMSTRAD MOD KIT

FITS :
VCR 4500 , 4600 , 4700 , 5200 , TVR 1,2,3

PRICE : £2.25 + VAT each

MODE SWITCH

NV2000, 2010, 7000, 7200, 7800 (VS50048)	
NV230, 260, 430, 810, 870, 2300, 4300	**£3.50**
(VSS0110)	**£2.25**
NV830 (VSS0091)	**£2.10**
NV300, 333, 340, 366, 688, 777, 778	
(VSS0060	**£3.75**
NVG21, 25, NVH65, NVD80 (VSS0175A)	**£2.00**

AUDIO CONTROL HEADS

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM **ORDER CODE: AH01 PRICE: 1350p**

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANTECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLD-HAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM **ORDER CODE: AH02 PRICE: 1450p**

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
VBR0125		625p

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VIDEO CLEANING STICKS

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

VIDEO MAINTENANCE TOOLS

Set of 8 Allen keys packed in a plastic wallet
Order code: TOOL 9, Price 125p
Specifically designed for video maintenance

UNIVERSAL HEAD EXTRACTOR

Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various heads.
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VCR ALIGNMENT KIT

CONTAINS: SET OF 7 HEAD & TAPE PATH ALIGNERS
- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

SET OF 8 ALLEN KEYS
0.77mm 0.90mm
1.27mm 1.50mm
1.60mm 2.00mm
2.40mm 3.00mm

3 REVERSIBLE SCREWDRIVERS **CIRCLIP PLIERS**
SPRING HOOK **MICRO SCREWDRIVER**
VCR HEAD EXTRACTOR
Order code: TOOL 10, Price 2900p

TRANSPARENT REPAIR/ADJUSTMENT CASSETTE

This transparent videocassette replaces a normal videotape during measurements, adjustments and inspection. The mechanical parts come into sight and become accessible.
Order code: TOOL 23, Price 500p

BACK UP BATTERIES

PHILIPS
Part Nos: 138 - 101138, 138 - 10313 1.2v 90mAH
Order Code: BB01 Price: 70p
Part Nos: 138 - 10229, 2.4v 100mAH
Order Code: BB02 Price: 135p

FERGUSON
Part No: 00E6 - 067 - 001 1.2V 100mAH
Order Code: BB03 Price: 90p
Part Nos: 00E6 - 606 - 8001 2.4V 100mAH
Order Code: BB04 Price: 150p

SATELLITE PSU REPAIR KITS

MAKE & MODEL	CODE	PRICE
PACE PRD800, PRD900	SATPSU1	600p
PACE SS9000, 9200, 9010, 9210, 9220	SATPSU2	550p
AMSTRAD SRD510, SRD520	SATPSU3	600p
AMSTRAD SRD500	SATPSU4	600p
AMSTRAD SRX340, SRX345, SRX350	SATPSU5	600p
PACE D100/150	SATPSU6	650p
CHURCHILL D2MAC	SATPSU7	650p
PACE MSS100	SATPSU8	1100p

MAKE & MODEL	CODE	PRICE
PACE MSS200/300 APPOLL	SATPSU9	900p
PACE MSS500/1000	SATPSU10	1230p
FERGUSON SRD4	SATPSU11	650p
ECHOSTAR SR5500	SATPSU12	1600p
ECHOSTAR 6500/7700/8700	SATPSU13	2750p
AMSTRAD SRD600	SATPSU14	2600p
MIMTEC (Surensen)	SATPSU15	700p
AMSTRAD SRD700, SR950, SRX100, 301, 501, 502, 1002, 2001, SRD2000 SAT250	SATPSU16	1250p

SATELLITE TUNERS

PACE PRD800/MSS200 2Ghz (221-2077062)
ORDER CODE: TUNER01 PRICE: 1400p + VAT

PACE PRD900/MSS1000 2Ghz (221-21770112)
ORDER CODE: TUNER02 PRICE: 1400p + VAT

SWITCH MODE TRANSFORMERS

PACE 9000
ORDER CODE: PACE9000 PRICE: 800p

PRD800/PRD900
ORDER CODE: PRD800 PRICE: 550p

SATMETER

The Satmeter is a professional portable satellite strength meter designed for the installation and maintenance of satellite TV systems. The Satmeter can be used as stand alone with powering the LNB as well as in loop.
Through operation with satellite RX powering the LNB.
* Acoustical signal: On signal strength *LED indicator: Vert/Hori
* Frequency Range: 900 to 2050 Mhz *Input impedence: 70 Ohm
* Power amplifier: 18db *Detection Range: –60 to –10 DBM
* Max. input signal: –10 DBM

ORDER CODE: TOOL22 PRICE: 8500p

REPLACEMENT TV SWITCHES

GRUNDIG

PART No: 29703, 29102
USED ON:
C7500, C8500. C8502, C8712 . . .ETC
Order Code: SW1 Price: 100p

PHILIPS

USED ON:
K30, K35, K40, KT3, KT4
Order Code: SW13 Price: 95p

SONY

USED ON:
KV1612, KB1612, KV1614, KV2052, V2056
KV2062, KV2067, KV2212 . . .ETC
Order Code: SW5 Price: 130p

USED ON:
KV1400, KV1440, KV2040, KV2060
(POWER SWITCH 26mm)
Order Code: SW12 Price: 110p

SONY

USED ON:
KV2020
(POWER SWITCH 21mm +Remote)
Order Code: SW6 Price: 130p

SONY 2 PIN FUNCTION SWITCH

Order Code: SW9 Price: 35p

FUSES

CURRENT RATING	TIME LAG (20mm) ORDER CODE	PRICE	QUICK BLOW (20mm) ORDER CODE	PRICE
100mA	FUSE36	75p	FUSE37	60p
160mA	FUSE01	75p	FUSE17	60p
250mA	FUSE02	75p	FUSE18	60p
315mA	FUSE03	75p	FUSE19	60p
400mA	FUSE04	75p	FUSE20	60p
500mA	FUSE05	75p	FUSE21	60p
630mA	FUSE06	75p	FUSE22	60p
800mA	FUSE07	60p	FUSE23	60p
1A	FUSE08	60p	FUSE24	60p
1.25A	FUSE09	60p	FUSE25	60p
1.6A	FUSE10	60p	FUSE26	60p
2A	FUSE11	50p	FUSE27	60p
2.5A	FUSE12	50p	FUSE28	60p
3.15A	FUSE13	55p	FUSE29	50p
4A	FUSE14	55p	FUSE30	50p
5A	FUSE15	60p	FUSE31	50p
6.3A	FUSE16	60p	FUSE32	50p

CERAMIC PLUG TOP

CURRENT RATING	ORDER CODE	PRICE
3A	FUSE33	100p
5A	FUSE34	100p
13A	FUSE35	100p

32 mm CERAMIC SLOW BLOW

CURRENT RATING	ORDER CODE	PRICE
8A	FUSE44	185p
10A	FUSE45	185p
15A	FUSE46	185p
20A	FUSE47	210p

NB. All fuses are made in the UK and fully meet BS4265 & BS1362 safety standards and should not be compared with cheap imported types

20mm CERAMIC TIME LAG

CURRENT RATING	ORDER CODE	PRICE
6.3A	FUSE38	100p
8A	FUSE39	100p
10A	FUSE40	100p
3 15A	FUSE41	85p
4A	FUSE42	85p
5A	FUSE43	85p

38mm CERAMIC TIME LAG

CURRENT RATING	ORDER CODE	PRICE
10A	FUSE48	825p

**** ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES ****

VOLTAGE TESTER

A terminal screwdriver incorporating continuity & voltage with Eurosłot

ORDER CODE: TOOL11 **PRICE: 220p**

SPRING HOOK

Spring Hook, to unlock springs in audio tape recorders & VCRs

ORDER CODE: TOOL20 **PRICE: 265p**

FAULT FINDING / COMPARISON BOOKS

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

Video Recorders Edition 5 1997
Over 300 pages packed with more than 5500 faults for different brands
Price £15.00 – No VAT. Order Code: BOOK01

TELEVISION Edition 7
This new A5 size guide lists more than 9600 faults and to approx. 474 pages in size.
Price: 1650p only – no VAT (+ £2 Postage)
Order Code: BOOK02

Satellite Repair Manual Edition 5
346 pages of receiver faults plus notes and general information such as many useful button sequences for resetting parental lock codes, resetting installation choice to factory defaults.
Price £16.00 – No VAT plus Postage £1
Order Code: BOOK03

SEMICONDUCTOR COMPARISONS 1999
With over 650 pages listing more than 34,200 Semiconductors with suitable alternatives complete with descriptions and base information.
Price: 1900p only – No VAT (+ £2 Postage).
Order Code: BOOK04

SEMICONDUCTOR COMPARISONS 1999
The new 1998 Jaeger Semiconductor comparison with 1100 pages packed with information on over 95,000 semiconductors in much greater detail plus marketing data on SMD devices and a separate generic table of all the type designations.
Price: £47.00 only – No VAT (+ £5 Postage).
Order Code: BOOK06

SERVICE AIDS

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	145p
SWITCH CLEANER	176ML	SP02	155p
SILICONE GREASE	200ML	SP03	180p
FREEZE IT	170ML	SP04	295p
FREEZE IT	400ML	SP16	580p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	200ML	SP06	180p
AEROKLEANE	200ML	SP07	200p
AERO DUSTER	200ML	SP08	340p
AERO DUSTER	400ML	SP17	580p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	200ML	SP10	160p
COLDKLENE	200ML	SP13	220p
EXCEL POLISH 80	200ML	SP18	160p
ADHESIVE 120	500ML	SP19	250p
LABEL REMOVER 130	200ML	SP20	260p
REFURB 140	400ML	SP21	260p
TUBE SILICON GREASE	50 GRAMMES	SP11	225p
TUBE SILICON SEALANT WHITE	75ML	SP22	250p
TUBE SILICON SEALANT CLEAR	75ML	SP23	250p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	145p
COMPUTER CARE KIT	–	SP26	2100p

All the above items are manufactured by Servisol
If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 2- 5 cans **500p** for more than 5 cans

SOLDERING ACCESSORIES

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2MM X 1.5M	S107	100p
SOLDER MOP 1.2MM X 10M	S113	420p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

I.C. PROTECTORS

ICPF10, ICPF15, ICPF20, ICPF25, ICPF38, ICPF50, ICPF75
ICPN5, ICPN10, ICPN15, ICPN20, ICPN25, ICPN 38, ICPN50, ICPN75

PRICE: 30p EACH ONLY

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CASSETTE DC MOTORS

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

CASSETTE TAPE HEADS

MONO HEAD	90p
STEREO HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

CD PICK UPS

Models & Description	Order Code	Price
AIWA		
XC007	KSSS151A	**1900p**
DX-990A, DX-DIA	KSS152A	**1600p**
CXL60, CXL66G, CXL80, CXN3100, CXN320, CXN3300, CXN360, CXN400, CXN430, CXN540, CXN550G, CXN990, CXN999, CXNV20, CXSL70, DXZ9100M, FDN636, FDN6636, FDN939, LCX60, LCX66G, LCX70M, LCX80, M7400, M75, NSX320, NSX360, NSX400, NSX430, NXS990, NSX992, NSX999, NSXD636, NSXD939, NSXV20, SXFN550.SXFN520, XC300, XC550, XC750, XC900, XC950, XCN992, XG320, XG360, XG400, XG990, ZD3000M, ZD3100M	KSS152A	**1600p**
CXAP1, CXL7, CXL8G, CXLC50P, CXZ58, DXM740, DXM75, DXM76, DXM77, LCX50, LCX7, LCX8G, LCXAP1, XC002, XC004, XC005, XC777	KSS210B	**2000p**
XP31, XP33, XP55, XP80G	KS220A	**2500p**
XP6.XP7	KSS331A	**3400p**
AKAI		
CD73, DC93	KSS151A	**1900p**
CD25, CD26, CD27, CD32, CD36, CD37, CD52, CD55, CD57, CD650, CD670, CD69, CD750, CD79, CDM480, CDM600, CDM670, CDEM770, CDM959, MX550, MX570, MX650, MX670, MX750, MX950	KSS210A	**1300p**
DENON		
DCD1500II, DCD1520, DCDE3520	KSS151A	**1900p**
DCD1400, DCD600, DCD800	KS152A	**1600p**
DCD1420, DCD520, DCD610, DCD620, DCD660, DCD810, DCD820, DCD860, DCD910, DCD920	KSS210A	**1300p**
DCD1015, DCD1290, DCD2060, DCD2060G, DCD315, DCD480, DCD580, DCD615, DCD715, DCD825, DCD890, DCD895, DN2000F	KSS240A	**2000p**
GOLDSTAR		
CD952A, CD952AJ, CD952LJ, CD952SJ, FFH101KL, FFH101WL, FFH222A/L, FFH272L, FFH333L, FFH373K, FJ606, FR606L	KSS210A	**1300p**
CD320A/L, CD630S/L, FFH212A/L.FFH212E	KSS210B	**2000p**
GRUNDIG		
CD360, CD435	HOPM3	**2150p**
CCD300, CD101MCD904, MC10, NEW ORLEANS CD	KSS210A	**1300p**
KRCD100, RR1900CD, RR3100CD, RR4000CD, RR610CD, RR700CD	KSS210B	**2000p**
CDP60, CDP90	KSS220A	**2500p**
CDP65	KSS331A	**3400p**
CD905	OPTIMA5	**1600p**
HITACHI		
DAW560	HOPM3	**2150p**
FX-10	KSS210A	**1300p**
AXC10	KSS210B	**2000p**
J.V.C.		
1990-1992, LATE 1987-1988 - XLE300BK, XLE31BK, XLE51BK, XLE900BK, XLME91BK, XLV101BK, XLV211BK, XLV222BK, XLV311BK, XLV333BK, X-Z1010TN, XLZ411BK, XLZ444BK, XLZ555BK, XLZ611BK	OPTIMA3	**4000p**
CDRADIO CASSETTE, MINI SYSTEMS - MODELS 1990-1992	OPTIMA4S	**5000p**
CA-C33, CA-MX30BK, CA-MX33BK, UX-A5, UX-A6, XL-M309, XL-M403BK, XL-M408, XL-M409, XL-M504BK, XL-M505TN, XL-M508, XL-M509, XL-M705TN, XL-V131BK, XL-V151TN, XL-V221BK, XL-V241TN, XL-242BK, XL-V251TN, XL-V252BK, XL-Z1050TN, XL-Z551TN, XL-Z552BK	OPTIMA5	**1600p**
1994 ONWARDS - CAE48BK, CAMCG7, CAMXG9, CAS20BK, CAS30BK, VAS50, CAS60RBK, MXS20, MXS30, MXS60, PCX105, PCX130, PCX95, RCX230, RCX320, RCX520, RCX620, RCX720, UXA4, UXA5, UXA55, UXC7, UXT1, UXT3, XLF115, XLF116, XLF215, XLF216, XLMC100/M, XLMXG7, XLMXG9, XLV163TN, XLV164BK, XLV174, XLV263TN, XLV264BK, XLV274BK, XLZ463TN, XLZ464BK, XLZ574, XLZ674, XTMXG7, XTMXG9, XTS60	OPTIMA6S	**1600p**
KENWOOD		
DP47, DP660SG, DP8020, DP87, L1000D	KSS152A	**1600p**
DP1030, DP1510, DP2010, DP2030, DP3010, DP3030, DP3050, DP4030, DP491, DP5010, DP5030, DP5040, DP520, DP7030, DP7040, DP7050, DP730, DP920, DP930, DP950, DPM650,DPM6630, DPM7730, DPM850, DPM991, DX6620, M225, M25, M450, M850, PD3030, PDM991, RDX25, RXDC3, RXDC3L, UD202, UD302	KSS210A	**1300p**
DPC42, DPC72, DPC77, DPC80, DPC92	KSS220A	**2500p**
DP1050, DP2050, DP3060, DP501, DP5060, DP722, DP76, DP85, DP89, M77A, PD3060, UD502, UD70, UD701, UD90, XE5	KSS240A	**2000p**
DPC321, DPC521, DPC531, DPC631K, DPC721, DPC731	KSS331A	**3400p**
DP1060, DP2060. PART No: RCTRH8136AFZZ	RH8136A	**4500p**
PANASONIC		
SLP177A, SLP202A, SLP212A, SLP222A, SLP277A, SLP377A, SLP477AK, SLP477A, SLPG100A, SLPG200A, SLPG400A, SLPG500AK, SLPG500AS, SLPJ24A, SLPJ26A, SLPJ27A, SLPJ28A, SLPJ325A, SLPJ325A, SLPJ37A, SLPJ38A, SLPJ46A	691-30209	**5500p**
SAD30, SLCH9, SLP150, SLP170, SLP200, SLP202, SLP222, SLP230, SLP250, SLP333, SLP370G, SLP400C, SLP555, SLP777, SLP999, SLPA10, SLPC20, SLPC25, SLPJ25, SLPJ26, SLPJ27, SLPJ37, SLPJ45, SLPK25, SLPK26, SLPS50, SLPS70, SLPS700, SLPS840, SLPS900	SOAAD70A	**2350p**
PHILIPS		
AZ8304, CD070, CD080, 690, 910, 920. PART NO. 4822-691-20768	4822-691	**3100p**
CD100, CD130, CD1380, CD1482, CD200, CD204, CD210, CD300, CD303, CD304, CD380, CD480, CD482, CD500, CD502, CD582, CD583, CD584, CD610, CD620, CD630, CD780, CD781, CD782, CD840, CD883, CD960, CDF104, CDM4/19, FCD185	691-30209	**5500p**
AS440, AS445, AS540, AS640, AZ8048, AZ8640, CD070, CD080, CD091, CD163, CD165, CD690, CD710, CD720, CD732, CD740, CD750, CD910, CD920, CD935, FW17, FW21, FW26, FW330, FW36, FW360, FW380I, FW40, FW41, FW46, FW56, FW66, FW68	CDM12.1	**1800p**
CD1210/40	CDM12.4	**2200p**
AZ8006	KSS210B	**2000p**
FW11	OPTIMA6S	**1600p**
PIONEER		
PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDT503, PDX940M, PDX950M. PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XDZ53T, XDZ54T	KSS151A	**1900p**
N32, N90M, , PD101, PD201, PD32, PD41, PD4500, PD4700, PD52PD5700, PD65J PD6500, PD6700, PD7700, PD8700, PD970, PDCP420, PDCP520M, PDCP520T, PDJ400T, PDJ500T, PDJ800M, PDJ900M, PDM430, PDM450, PDM550, PDM630, PDM650, PDM750, PDM901, PDP710T, PDP720T, PDP910M. PDP920M, PDS501, PDS601, PDS701, PDS701G, PDS901, PDT310, PDT510, PDZ, PDZ570T, PDZ74T, PDZ84M, PDZ970M, PXA1349, S125CDT, S135CDT, S303CDM, S303CDT, S505DM, S505DT, S707DM, S707DTM, S909DM, S990DT, XCP410M, XCP410T, XDZ54T, XDZ55T, XDZ64M, XDZ84T, XRP310, XRP320	PEA1030	**4400p**
PDM400, PDM410, PDM500, PDM510, PDM600, PDM610, PDM700, PDM710, PDM730, PDT303, PDT403, PDT503, PDX940M, PDX950M, PDZ560T, PDZ72T, PDZ73T, PDZ81M, PDZ82M, PDZ83M, PDZ960M, XDZ53T, XDZ54T, XDZ55T, XDZ62, XDZ62M, XDZ630, XRZ82	PWY1009	**4800p**
SAMSUNG		
CD20	HOPM3	**2150p**
CD1200, CD1310, SCM-6000, SCM6900	KSS210A	**1300p**
RCD1200, RCD1300, RCD1350, RCD1600, RCD2600, RCD990, RCD995, SCM6900	SOH90T4N	**3600p**
SANYO		
DCFS3, DCT55, DCX502, DCX701, DCX702, DCX802, DCX891, DCX891N, MCDZ10. PART No. 6142186855	614218	**2300p**
DCFS5, MCD450K, 660K, MCDZ30L, 60F. PART No. 6142205006	614220	**5600p**
DCX1000MD, DCX1003, DCX900MD, DCX903, DCX915	KSS210A	**1300p**
DCD10, DCD11U, DCD20, DCD30, DCD30AT, DCD6, DCD8U, DCMS1, DCX110, DCX120, DCX210, DCX220, DCX993, DCX994, MCDMS40L, MCDMS50L, MCDMS660L, MCDZ1L, MCDZ2L, MCDZ3L. PART No. 6142391303	614239	**3300p**
DCD12. PART No. 6450055966	645005	**3700p**
MCDZ31L, MCDZ41L, MCDZ61L, MCDZ71L	KSS210B	**2000p**
SHARP		
CD-111, CD-301, CD-302, CD-304, CD-310, CD-C3, CD-L700, CD-L800, CD-U1, CD-U10, CD-X10, CD-X12, CD-X15, CD-X16, CD-X17, CD-X20, CD-X9, CKL650, CMS95CD, DX-150, DX-160, DX-450, DX-460, DX-461, DX-650, DX-660, DX-999, DX-A3, DX-N45, DX-R554, DX-R7, DX-R75, DX-R750, DX-R77, DX-R770, DX-R820, DX-R840, DX-Z100, DX-Z1000, DX-Z1500, GFCD55, QT-30CD, QT-33CD, QT-350CD, QT-37CD, QT-38CD, QT-CD20, QT-CD33, RS95, SC-77CD, SC-99CD, SC-RS95, SG-A1, SG-W1CD, SG-W2CD, SYS302, ZCD7CD. PART No. RCTRH8122AFZZ	RH8122A	**5750p**
QT-50CD, QT-60CD, QT80CD. PART No. RCTRH8124AFZZ	RH8124AF	**2900p**
DXR-840B. PART No. RCTTRH8130AFZZ	RH8130AF	**2900p**
CDS360E, 360H, 370, 450H/E, CMS150CDH, CMSR400CDH, CP150, CPR400, CPS360, 370. PART No. RCTRH8136AFZZ	RH8136AF	**4500p**
SONY		
KSS240A	KSS240A	**2000p**
KSS121A	KSS121A	**3500p**
KSS151A	KSS151A	**1900p**
KSS210A	KSS210A	**1300p**
KSS210B	KSS210B	**2000p**
KSS220A	KSS220A	**2500p**
KSS331A	KSS331A	**3400p**
KSS360A	KSS360A	**2600p**
TECHNICS		
SLP200, SLP230, SLP250, SLP333, SLP555, SLP777, SLP999,SLPA10, SLPC20, SLPJ25, SLPJ45, SLPS700, SLPS900	SOAD70A	**2350p**

REMOTE CONTROLS

Description	Code	Price
AKAI		
RC-V10A	RC876	650p
RCV 37 B	RC891	650p
V25A	RC896	650p
DECCA		
RC70	RC894	650p
FISHER		
RC905B	RC879	650p
GRANADA		
UNIVERSAL TEXT	RC309	650p
MK4 TEXT, 70155G, 70115G, 70133G	RC880	650p
95288E	RC882	650p
94490D	RC884	650p
GRUNDIG		
TP160E	RC107	650p
TP200, TP300	RC380	650p
TP400	RC401	600p
TP590-600	RC600	650p
TP390, TP610	RC610	650p
TP621	RC612	650p
TP630, TP650	RC650	650p
TP666	RC660	650p
TP661	RC661	650p
HITACHI		
CLE800-CLE830	RC140	650p
A617402/655602	RC1920	650p
A512120/230	RC900	650p
A514790	RC901	650p
A5088470	RC902	650p
A518612	RC903	650p
SCL002	RC904	650p
C2096	RC905	650p
A511940	RC906	650p
655602H	RC1920	650p
ITT		
IFB13, 14, 15	RC143	650p
FS4	RC148	650p
RG305	RC305	650p
RG306	RC306	650p
FS9/1-10/1	RC307	650p
VS5 RUK	RC308	650p
VS4-1	RC308	650p
MULTICONTROL (17C20)	RC311	650p
LOEWE		
DC11	RC146	650p
MATSUI		
010270601	RC889	650p
VX770	RC892	650p
NOKIA		
SATELLITE	RC550	650p
ORION		
RC53	RC892	650p
PANASONIC		
EUR51200	RC200	650p
TC2200	RC204	650p
VSQ0357/NV730	RC202	650p
TNQ1621	RC203	650p
PHILIPS		
RC5002,5154	RC134	650p
KT3 NDN TEXT	RC135	650p
69117032	RC178	650p
69117194	RC180	650p
RC5991-UNIV	RC300	550p
RC38	RC301	650p
KT3 TEXT	RC5301	650p
RC5352	RC5352	650p
RC5375	RC5375	650p
RC5 STANDARD	RC300	550p
RC5903	RC5903	650p
SALORA		
SERIES L	RC190	650p
86173	RC882	650p
SANYO		
RC218, RC222, RC228, RC238	RC140	650p
JXGE	RC878	650p
JXDE	RC884	650p
VHR2300	RC890	650p
RC628	RC865	650p
SHARP		
G0121CESA, 123CESA, 204, 251	RC140	650p
SONY		
RM604, RM605, RM606	RC140	650p
32 CHANNEL	RC140	650p
RM613	RC141	650p
RM632, RM636	RC160	600p
TATUNG		
FXA	RC877	650p
RC70	RC883	650p
FX70 FASTTEXT	RC894	650p
TELEFUNKEN		
FB632	RC632ST	650p
FB639	RC639	650p
THORN/FERGUSON		
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TX10 STEREO TEXT	RC738	575p
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3V55, FV11	RC783	650p
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D 050/37	LOT27	1450p
D 053/37	LOT207	1550p
D 056/37	LOT56	1650p
D 059/37	LOT200	1400p
D 069/37	LOT56	1650p
FCM 2015 AL	LOT78	1500p
FERGUSON		
00 D-3-508-001	LOT38	1250p
00 D-3-508-002	LOT38	1250p
00 D-3-508-003	LOT276	1400p
00 D-3-515-001 PL1	LOT276	1400p
00 D-4-208-001	LOT79	1600p
00 D-4-208-002	LOT79	1600p
00 D-4-235-002	LOT240	1250p
00 D-4-235-002 HTI	LOT81	1350p
00 D-4-235-00201G	LOT81	1350p
00 D-4-260-004 HTI	LOT38	1250p
00 H-0-701-2400	LOT182	1450p
06 D-3-083-001	LOT82	1250p
06 D-3-083-002	LOT82	1250p
06 D-3-084-001	LOT23	1400p
06 D-3-087-001	LOT23	1400p
06 D-3-088-001	LOT84	1450p
06 D-3-093-001	LOT204	1600p
06 D-3-095-001	LOT87	1000p
06 D-3-095-002	LOT87	1000p
06 D-333-512-001	LOT204	1600p
FETX 100 90 DEG	LOT04	1500p
FETX 90 WHITE	LOT06	1650p
FETX 100 100 DEG	LOT34	1500p
GRUNDIG		
29201.008.01	LOT153	1750p
29201.014.01	LOT140	1500p
29201.015.01	LOT149	1400p
29201.017.01	LOT60	1250p
29201.018.01	LOT163	1300p
29201.018.02	LOT61	1700p
29201.019.01	LOT62	1250p
29201.019.02	LOT62	1250p
29201.022.01	LOT63	1700p
29201.022.02	LOT166	1600p
29201.022.03	LOT165	1350p
29201.022.04	LOT165	1350p
29201.022.04A	LOT165	1350p
29201.024.01	LOT65	1500p
29201.024.04	LOT164	1400p
HINARI		
154 138 K	LOT24	1500p
51 13914 1	LOT24	1500p
51 14184 1	LOT24	1500p
CF 44 A	LOT24	1500p
HM51-1411834-1	LOT24	1500p
HITACHI		
2424593	LOT44	1050p
2432101	LOT79	1600p
2432461	LOT169	1500p
2432611	LOT80	1800p
2432651	LOT80	1800p
2432761	LOT169	1500p
2432981	LOT37	1200p
2432981	LOT37	1200p
2432982	LOT37	1200p
2433011	LOT171	1600p
2433012	LOT171	1600p
2433014	LOT171	1600p
2433212	LOT168	1500p
2433291	LOT172	1350p
2433301	LOT246	1600p
2433441	LOT188	1900p
2433442	LOT191	1600p
2433451	LOT81	1350p
2433452	LOT82	1250p
2433453	LOT82	1250p
2433455	LOT234	1600p
2433521	LOT85	1600p
2433581	LOT22	1250p
2433721	LOT83	1400p
2433751	LOT01	1300p
2433752	LOT01	1300p
2433752	LOT250	1350p
2433891	LOT23	1400p
2433892	LOT84	1450p
2433893	LOT23	1400p
2433952	LOT33	1000p
2434002	LOT200	1400p
2434141	LOT33	1000p
2434141	LOT33	1000p
2434274	LOT44	1050p
2434274	LOT44	1050p
2434453	LOT86	1600p
2434455	LOT234	1600p
2434593	LOT44	1050p
2435062	LOT296	1400p
2435121	LOT87	1000p
2435131	LOT251	1450p
2435141	LOT282	1300p
2435301	LOT88	1450p
2435671	LOT89	1600p
2436201	LOT109	1200p
2436202	LOT109	1200p
2432101-2	LOT79	1600p
2433451H	LOT81	1350p
2433453H	LOT82	1250p
2433891H	LOT23	1400p
2433892G	LOT84	1450p
I.T.T.		
4515 01 08	LOT113	1400p
4515 01 15	LOT136	1600p
4515 01 16	LOT139	1675p
4515 01 17	LOT139	1675p
4515 01 19	LOT169	1500p
4515 01 24	LOT137	1600p
4515 01 46	LOT136	1600p
4515 03 01	LOT169	1500p
4515 03 02	LOT180	1550p
4515 03 04	LOT169	1500p
4515 03 05	LOT180	1550p
4515 03 06	LOT168	1500p
4515 03 08	LOT22	1250p
4515 03 09	LOT178	1500p
4515 03 10	LOT168	1500p
4515 03 13	LOT30	1250p
4515 03 14	LOT174	1400p
4515 03 15	LOT22	1250p
4515 03 18	LOT192	1550p
4515 03 19	LOT30	1250p
4515 03 20	LOT190	1650p
4515 03 22	LOT196	1550p
4515 03 24	LOT194	1550p
4515 03 25	LOT22	1250p
4515 03 26	LOT198	1550p
4515 03 28	LOT27	1450p
4515 03 29	LOT193	1550p
4515 03 30	LOT179	1350p
4515 03 31	LOT207	1550p
4515 03 34	LOT56	1650p
4515 03 35	LOT193	1550p
4515 03 38	LOT27	1450p
4515 03 40	LOT200	1400p
4515 03 41	LOT56	1650p
4515 03 43	LOT196	1550p
4515 03 44	LOT56	1650p
4515 03 46	LOT201	1550p
4515 03 50	LOT27	1450p
4515 03 51	LOT27	1450p
4515 03 75	LOT56	1650p
4516 16 01	LOT22	1250p
MITSUBISHI		
731003	LOT51	1550p
276-16399	LOT49	1500p
334 B 07803	LOT50	1450p
334 B 078030	LOT50	1450p
334 B 08104	LOT74	1600p
334 B 08108	LOT295	1600p
334 P 18506	LOT51	1550p
334 P 18507	LOT75	1500p
5908-05008A-AA	LOT70	1500p
D 108/37	LOT49	1500p
DCF1577	LOT273	1700p
DCF2077A	LOT272	1300p
KFS 60226B	LOT279	1550p
MSH-1FBW08	LOT78	1500p
NIKKAI		
BABY10	LOT67	1450p
ORION		
3714002	LOT02	1500p
PANASONIC		
TLF 14512 F	LOT39	1850p
TLF 14520 F	LOT40	1500p
TLF 14521 F	LOT39	1850p
TLF 14567 F	LOT39	1850p
TLF 14568 F	LOT40	1500p
TLF 14584 F	LOT41	1700p
TLF 14586 F	LOT42	1700p
TLF 15606 F	LOT256	2000p
TLF 70012	LOT78	1500p
TLF 70012 F	LOT78	1500p
TLF 70012A	LOT78	1500p
TLF 70018	LOT274	1550p
TLF 70018 F	LOT274	1550p
TLF 70161	LOT278	1300p
TLF 70162	LOT72	1600p
TLF 70162A	LOT72	1600p
TLF 70162B	LOT72	1600p
TLF 70162G	LOT72	1600p
TLF 77001 B	LOT274	1550p
PHILIPS		
4822 140 10142	LOT142	1800p
4822 140 101145	LOT134	1450p
4822 140 10146	LOT112	1700p
4822 140 10151	LOT102	1700p
4822 140 10161	LOT103	1250p
4822 140 10171	LOT104	1500p
4822 140 10176	LOT114	1150p
4822 140 10194	LOT105	1500p
4822 140 10198	LOT116	1600p
4822 140 10201	LOT104	1500p
4822 140 10236	LOT118	1550p
4822 140 10246	LOT111	1500p
4822 140 10247	LOT105	1500p
4822 140 10254	LOT107	1450p
4822 140 10263	LOT117	1550p
4822 140 10269	LOT210	1350p
4822 140 10271	LOT208	1650p
4822 140 10274	LOT123	1450p
4822 140 10282	LOT122	1300p
4822 140 10283	LOT104	1500p
4822 140 10294	LOT125	2150p
4822 140 10306	LOT110	1200p
4822 140 10325	LOT132	1500p
4822 140 10326	LOT122	1300p
4822 140 10328	LOT124	1450p
4822 140 10349	LOT106	1250p
4822 140 10353	LOT284	1400p
4822 140 10356	LOT284	1400p
4822 140 10367	LOT286	1400p
4822 140 10369	LOT109	1200p
4822 140 10381	LOT128	1300p
4822 140 10384	LOT127	1550p
4822 140 10395	LOT116	1600p
4822 140 10406	LOT73	1150p
4822 140 10421	LOT109	1200p
4822 140 17078	LOT103	1250p
SANYO		
094-00020/0.9	LOT113	1400p
094-00035/0.2	LOT162	1350p
094-01020/0.7	LOT59	1400p
094-01021/0.6	LOT59	1400p
094-01027/0.0	LOT186	1825p
094-01038/0.7	LOT245	1900p
094-01052/0.8	LOT186	1825p
094-01057/1.1	LOT285	1450p
610.018.6620	LOT189	1650p
610.018.6637	LOT215	1800p
SHARP		
RTRNF 1220 CEZZ	LOT39	1850p
RTRNF 1783 BMZZ	LOT202	1600p
RTRNF 1783 CEZZ	LOT202	1600p
RTRNF 1786 BMZZ	LOT211	1850p
RTRNF 1786 CEZZ	LOT211	1850p
RTRNF 2000 BMZZ	LOT214	1600p
RTRNF 2002 BMZZ	LOT307	1450p
RTRNF 2002 CEZZ	LOT307	1450p
RTRNF 2003 BMZZ	LOT308	1350p
RTRNF 2004 BMZZ	LOT307	1450p
RTRNF 2005 BMZZ	LOT308	1350p
RTRNF 2006 BMZZ	LOT308	1350p
RTRNF 2007 BMZZ	LOT307	1450p
RTRNF 2023 BMZZ	LOT310	1500p
SONY		
3753100	LOT275	1500p
1-439-243-00	LOT91	1600p
1-439-243-11	LOT91	1600p
1-439-243-12	LOT91	1600p
1-439-243-31	LOT229	1700p
1-439-243-32	LOT229	1700p
1-439-243-41	LOT229	1700p
1-439-244-00	LOT48	1600p
1-439-244-11	LOT48	1600p
1-439-244-21	LOT48	1600p
1-439-244-31	LOT48	1600p
1-439-256-00	LOT45	1650p
1-439-256-11	LOT45	1650p
1-439--256-21	LOT45	1650p
1-439-256-22	LOT45	1650p
1-439-276-21	LOT230	1700p
1-439-280-00	LOT92	1600p
1-439-280-13	LOT92	1600p
1-439-286-00	LOT46	1300p
1-439-286-11	LOT46	1300p
1-439-286-12	LOT46	1300p
1-439-286-13	LOT46	1300p
1-439-286-21	LOT46	1300p
1-439-288-00	LOT228	1750p
1-439-288-12	LOT228	1750p
1-439-289-00	LOT47	1400p
1-439-289-21	LOT47	1400p
1-439-289-22	LOT47	1400p
1-439-289-31	LOT47	1400p
1-439-294-00	LOT93	1450p
1-439-294-11	LOT93	1450p
1-439-294-21	LOT269	1550p
1-439-303-00	LOT94	1300p
1-439-303-11	LOT94	1300p
1-439-303-31	LOT94	1300p
1-439-303-32	LOT94	1300p
1-439-311-00	LOT95	1550p
1-439-311-11	LOT95	1550p
1-439-311-13	LOT95	1550p
1-439-311-31	LOT95	1550p
1-439-311-32	LOT95	1550p
1-439-331-22	LOT96	1550p
1-439-331-41	LOT98	1550p
1-439-332-00	LOT99	1600p
1-439-332-11	LOT99	1600p
1-439-332-21	LOT99	1600p
1-439-332-41	LOT100	1500p
1-439-332-42	LOT101	1450p
1-439-332-52	LOT100	1500p
1-439-333-00	LOT270	1550p
1-439-333-11	LOT270	1550p
1-439-333-12	LOT270	1550p
1-439-363-11	LOT268	1400p
1-439-363-21	LOT268	1400p
1-439-387-11	LOT311	1450p
1-439-387-21	LOT311	1450p
1-439-416-11	LOT255	1600p
1-439-416-12	LOT255	1600p
1-439-416-21	LOT255	1600p
1-439-416-23	LOT255	1600p
1-439-416-41	LOT255	1600p
1-439-416-51	LOT255	1600p
1-439-430-21	LOT271	1550p
154125A	LOT275	1550p
TOSHIBA		
37010	LOT131	1450p
37011	LOT131	1450p
37012	LOT131	1450p
37013	LOT131	1450p
37014	LOT131	1450p
37015	LOT131	1450p
37016	LOT131	1450p
37017	LOT131	1450p
37018	LOT131	1450p
37019	LOT131	1450p
1810951	LOT55	1400p
2433751	LOT01	1300p
2433752	LOT250	1350p
23236023	LOT281	1300p
23236052	LOT131	1450p
23236098	LOT288	1400p
23236198	LOT288	1400p
23236255	LOT289	1500p
23236424	LOT129	1400p
23236425	LOT288	1400p
23236428	LOT289	1500p
3122113837011	LOT131	1450p
150F6D	LOT131	1450p
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TFB 4048 AD	LOT281	1300p
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- MAXIMUM READING 1999 + UNIT
- SINGLE MANUAL ROTARY SWITCH FOR FUNCTION AND RANGE OPERATION
- AUTO POWER OFF (APPROX 15 min)
- DIODE TEST FUNCTION
- ALL RANGES OVERLOAD PROTECTED
- SUPPLIED WITH TEST PROBES
- DC VOLTAGE: 200mV/2V/20V/200V/1000V ACCURACY * 0.5%
- AC VOLTAGE: 200mV/2V/20V/200V/700V
- DC CURRRENT A; 2mA/20mA/200mA/20A
- AC CURRENT A: 200mA/20A
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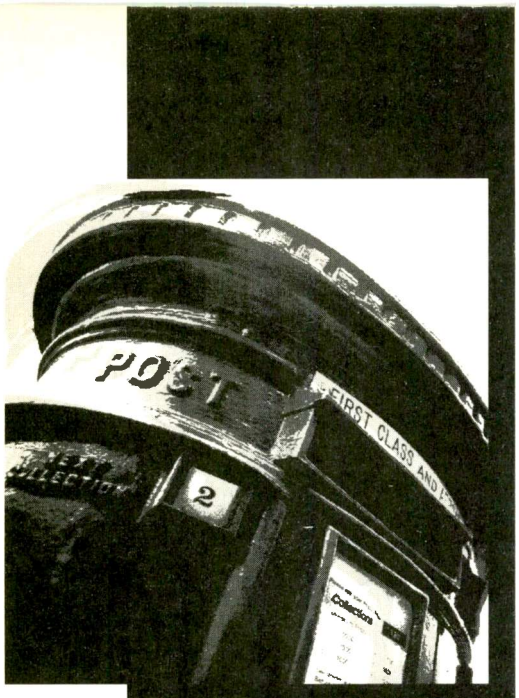
Letters



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

Digital Servicing

With reference to Jack Armstrong's letter (June) concerning digital equipment repair, I agree that the current digibox offers will distort people's perception of the equipment's worth. Economic servicing of digiboxes thus appears to be hardly viable.

The difficulties exist from the manufacturer onwards. After leaving the TV trade I spent twenty years in industry and worked through the transition from analogue to digital in communications recording. Board faults were initially easy to diagnose to component level. Dedicated test gear was used to check these analogue boards, which were assembled using conventional components. The boards were easy to work on and had plenty of useful test points.

By the time I retired, things had changed dramatically. Digital chips, often with over 100 connections, were surface-mounted on multilayer boards which were assembled using automated processes. Clever young chaps designed them. But, ironically, they would still ask me for advice on TV repairs or how to fix a fluorescent light!

Manufacturing economics now dictated an entirely different approach to testing. Bare boards were bought in already checked by their manufacturers for track continuity and freedom from short-circuits. Extensive antistatic precautions were observed during manufacture and handling. Dedicated test gear still checked that the boards worked, but was not suitable for sophisticated fault diagnosis. Most faults were the result of dry-joints or solder splashes: vigilance during manufacture minimised such problems. A 'drop-dead' time was imposed, which meant that any difficult board had to be scrapped rather than all day being spent on troubleshooting. Expensive devices such as ASICs and EPROMs could be removed and transferred to another board – on a once-only basis (further transfer could prejudice a chip's long-term reliability). The philosophy was to build the product correctly so that it always worked straight away.

This principle worked well until the day someone loaded the wrong components into the pick-and-place machine! There was panic in the production area, but once the incorrect components had been identified it was a simple though tedious matter to replace them. A concentrated effort was required to solve the problem within an acceptable time scale. To speed the process, we conscripted the help of one of our circuit designers. You can't do that in a TV workshop!

It seems that field or even bench repair of fast digital boards is hardly viable. I support Jack in his view that defective digiboxes will almost certainly be replaced. On the brighter side, industrial experience shows that once a digital board works correctly it tends to go on doing so for a long time.

Keith Cummins,
Chale Green, Isle of Wight.

Video Resolution

I cannot agree with J. Alan McKeown (letters March) that expressing horizontal resolution as lines per picture height is "bizarre and highly misleading". On the contrary, it provides a more meaningful comparison between displays with different aspect ratios.

When comparing a 4:3 display with a 16:9 display it is usual to think of the latter as having increased width rather than reduced height – it is, after all, 'widescreen' not 'squatscreen'. So, for the same subjective horizontal resolution, one needs more 'cycles' across the width of the 16:9 display than across the 4:3 display. This is exactly what is implied by quoting the resolution in lines per picture height. It has been the standard way of specifying horizontal resolution for a long time. To change it now would increase rather than reduce confusion.

R.T. Russell, M.A., C.Eng., M.I.E.E.,
Orsett, Essex.

CD Player Lenses

In his article on CD player servicing (June) John Coombes suggests the use of isopropyl alcohol to clean a laser unit's lens. On a previous occasion when this subject came up in the magazine Sony protested and said that only their proprietory lens cleaner (part no. J-250-100-0A) and cleaning swabs (part no. J-250-102-3A) should be used with Sony models. On the few occasions when I now clean a lens, I prefer to use the Sony cleaner (detergent based?) whatever the make of player.

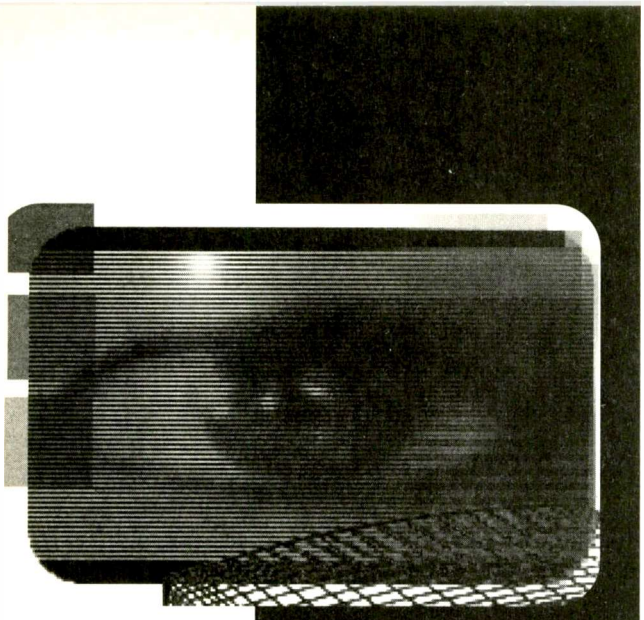
L.K. Austin,
Kirk Michael, Isle of Man.

Faulty BUT11A Transistors

Here's a serious warning. Another batch of faulty BUT11A transistors has entered the supply chain. They are marked "932" at the lower, right corner of the plastic section. The problem is that they can explode when used in a chopper power supply.

Any BUT11As held in stock, including transistors supplied in Satkits, should be checked. This precaution should be continued for several months, as the devices are likely to be around for some time.

Martin T. Pickering, B.Eng.,
SatCure, Sandbach, Cheshire.



TV Fault Finding

Reports from
Philip Blundell, AMIIEelec
J. LeJeune
Pete Gurney, LCGI
Kevin J. Green, TMIIE
Michael Dranfield
Alan J. Roberts
Colin J. Guy and
David Smith

Philips 32PW9763/25 (MD2.25 chassis)

There was no sound output. This chassis has a separate power supply for the audio section. Checks here revealed that the BU508AF transistor 7302 was short-circuit and resistor 3300 (6·8Ω, part no. 4822 117 12681) was open-circuit. Ohmic checks on the ±16V lines showed that there was a low resistance across them. One of the audio output ICs (7740) was short-circuit. **P.B.**

Grundig CUC6310 Chassis

"Set dead, LED flashes" the label said. Initial tests showed that the line output transistor T568 was leaky. As there were no dry-joints in the line driver or output stages, and the line drive signal and the supply voltages were OK, I fitted a replacement and switched on. The new transistor lasted about a second.

The next step was a check the line output transformer, using my trusty Konig tester. It got a green light. I then noticed three blue 'box' type Philips capacitors. The 9nF one, C969, was almost open-circuit. Its part no. is 8515 911 114. **P.B.**

Daewoo T594 (CP760 chassis)

The cause of the picture being displaced to the left is normally a crack at pin 10 of the line output transformer. As a result there's no feedback pulse for the line generator's AFC loop. **J.LeJ.**

Salora 21L57

There was no picture though the sound was OK. A check on the voltage at pin 26 (fast blanking) of the luminance/chrominance processor chip produced a reading of 2·5V. The voltage here should be 0V for TV reception. This pin is DC connected to the TPU2732 chip IC13 on the STG110E digital module. A new digital chip cured the problem. **J.LeJ.**

Mitsubishi CT25M1

This set would run for days then die. In the dead condition, the standby light would pulse between half and full brightness, as in the trip condition. The power supply used in this chassis is quite happy to run when removed from the set with a lamp as a dummy load at plug PZ, where there should be 112V/120V depending on tube size. I tried this and found that the fault was still present, confirming that it was in the power supply.

The usual causes are C905 (470µF) and C906 (47µF) on the primary side of the circuit or any of the reservoir capacitors on the secondary side. They were all blameless however. Regulation is via an optocoupler, with a potential-divider network on the secondary side for voltage monitoring. R960 (160kΩ) in this network often goes high but was OK. The voltage at the excess-current sensor pin of IC901 was correct, so excess current wasn't the cause of the problem.

To break the loop to determine on which side of the power supply the fault lies, you can remove the optocoupler (PC951) and connect a 10kΩ resistor across pins 4 and 3. When this was done everything was OK, proving that the cause of the fault was on the secondary side of the circuit. But extensive component checks failed to bring any faulty ones to light. I then received a tip that the optocoupler's driver transistor Q953 can occasionally refuse to work though it checks out all right. The BC547 is a suitable replacement. I finally solved the problem by fitting one. **P.G.**

Sony KV2215

The complaint with this set was sound but no picture. The line timebase was working, but none of the supplies derived from the output stage were correct. When I checked the outputs from the chopper power supply I found that the main HT line was at about 80V, with considerable ripple, instead of 135V. The other outputs were correct. The cause of the trouble was C652 (33µF, 250V), which was open-circuit. To ensure future reliability, I decided to replace all the electrolytic capacitors on the secondary side of the power supply. **P.G.**

Ferguson ICC8 Chassis

When this set was switched on there was a very dark, greenish picture with streaking. It gave the impression that the tube was faulty (low emission). A check on the CRT voltages was fairly inconclusive: most were approximately as specified in the manual. I felt that there was probably a drive problem, and disconnected the CRT's base PCB to check the resistors around the RGB output chip. The three 39kΩ, 1W feedback resistors RT24, RT44 and RT64 were all open-circuit. **P.G.**

GoldStar CIT2190F

This set was brought in because it was 'dead'. In fact the power supply was working. All outputs were

present apart from the HT. Simple: the HT recifier diode D803 had gone open-circuit. **P.G.**

Philips GR1-AX chassis

There was a very intermittent fault – it usually occurred when the set had been on for several hours. Sometimes the picture would shift to the left slightly, with reduced width. At other times the lower half of the picture would exhibit line tearing. The cause was eventually traced to C2523 (6·8µF, 50V) which smooths the supply to the line driver stage. It would go open-circuit intermittently. **P.G.**

Nokia SP71D1

This set was dead with the S2000AF line output transistor short-circuit. After checking that the HT was correct, and various relevant components, a replacement was fitted. It failed at switch on. When a more detailed check on the line output stage was carried out I found that capacitor CK51 (8·7nF, 1·6kV) was faulty. It appeared to read correctly in circuit, but one leg remained behind when it was removed from the board. Its appearance was very discoloured where the lead entered, but otherwise it appeared to be OK. **P.G.**

Mitsubishi CT21A5STX 14FS chassis)

The picture's brightness would sometimes change. The cause of the trouble was eventually traced to C593 (22µF, 350V) in the first anode supply. **K.J.G.**

Sony KVM2171U

There was a picture and sound but no text or on-screen display. I found that R081 had gone open-circuit because, in turn, C810 was open-circuit. As a result of C810's failure, the flyback pulse was much larger than normal. Hence the failure of R081. **K.J.G.**

Crown CRV37 (11AK08 chassis)

This 14in. portable was dead. Checks in the power supply showed that R809 (0·47Ω) was open-circuit. I suspected the chopper FET, but it read OK when checked with a meter. I then found that R809 would go open-circuit with the FET removed. After many component checks I came to the conclusion that the chopper transformer TR802 was faulty. This was proved by replacement. Since then we've had another of these sets with the same fault. **K.J.G.**

Mitsubishi CT25A5STX (14FS chassis)

According to the job card this set should have been dead. But when it was switched on a picture covered with bad herringbone patterning appeared. A check on the LT rails showed that there was heavy ripple on the 16V line. The reservoir capacitor C955 (2,200µF, 25V) was faulty. Once this had been replaced all that remained to be done was to attend to the dry-joints to cure the dead-set fault. **K.J.G.**

JVC 14ET1EK

It seemed that this set was in the hotel mode, as channels couldn't be stored with the memory button and a green H was present in the top right-hand corner of the screen. JVC told us that the set doesn't have a hotel mode. This one did, but it was off! The cause of the trouble was eventually traced to the pull-up resistor R605 (47kΩ) for the chip-select pin – it was open-circuit. **K.J.G.**

Sharp DV5940H (4BSC chassis)

The HT supply came up, then the set went dead. The trip in this chassis has a time delay: you have to wait thirty seconds before the set can be switched on again. Operational amplifier IC600 forms part of the trip circuit – its other half is the EW modulator driver. One of the inputs to IC600 monitors the supply to the field output chip. The cause of the problem was here: R645 (1Ω, 1W safety) was open-circuit. **M.Dr.**

Nokia SP71D1

If the BC337 line driver transistor VK22 blows a few minutes after switch-on, replace capacitor CK22 (2·2µF, 100V). **M.Dr.**

Bush 1427T

When there's a bright screen with flyback lines, check the CRT cathode voltages first. If they are low at about 100V, replace R435 (0·68Ω, safety). Don't twiddle the first anode potentiometer, as a near-perfect picture can be obtained when R435 is open-circuit and the potentiometer is carefully adjusted. **M.Dr.**

Sharp C3710H (8PSR chassis)

The line oscillator chirped at switch-on and the standby light lit up. The set then died. In this chassis the trip shorts the line drive to chassis via D614, but the set still refused to come on with D614 disconnected. I then found that the line oscillator's supply at pin 8 of IC801 was low – only 3V. The cause of the trouble was R679 (100kΩ), which was open-circuit. It's connected to the base of Q610. When the set is in full operation, Q610 is switched off and the 12V supply is derived from the line output stage via Q606. **M.Dr.**

Naiko N1096

This 10in. mains-battery set is a revised version of the Baby 10 made by Onwa. The first time I came across one I was surprised to find that it's fitted with the switching regulator I designed (see *Television* May 1996), but the circuit wasn't copied to the book. Possibly for cost reasons, a radial instead of a toroidal choke is used. As a result, the field scan coils pick up radiation from the choke. This gives rise to very fine horizontal lines across the screen.

A while back we bought seven of these sets at auction. We think they were customer returns, unloaded by Makro. Four of them required a new DC socket as the original one had melted. The other three were dead. The cause was traced to a dry-joint at C308 (3·3nF), which is connected to pin 34 of the TA7698AP chip. This is part of the line oscillator circuit. The problem arises because of C308's position on the PCB. When the chassis is pushed in, C308 is forced against the side of the cabinet. As a result it's pulled out of the PCB. **M.Dr.**

Hitachi CPT2158

There was a blank raster and no sound. A few scope checks soon revealed that there was no video output from the TDA4505 IF/timebase generator chip. Another problem then arose: apparently the TDA4505 is no longer available. I thought I had one somewhere however, and after turning the workshop upside down I found a new TDA4505E. Would it work? Some of these chips are specially selected – different suffix types are listed for different manufacturers. As I had nothing to loose, I fitted the E one. The set then worked perfectly. The TDA4505E is still in the lists, so this information may help with other sets. **A.J.R.**

Philips G90AE Chassis

Roy Rodger's Repairs had had a go at this one. They'd tried to fit some standard transistors in the power

supply in place of surface-mounted types. Fortunately the print was still in good condition, so I started with a new repair kit. After fitting this there was some activity when the set was tried with a variac and a dummy load in place of the feed to the line output stage, but a fault was present on the secondary side of the power supply.

I then discovered that T7652 was missing and that one of the series-connected zener diodes, D6659, was short-circuit. When these items had been replaced the HT rose to 70V, but no higher. I disabled the protection circuit and reduced the mains input voltage. This made no difference. Rather than try to isolate the faulty component, which can be quite difficult where surface-mounted components are used, I decided to replace the remaining BAS32 surface-mounted diodes. This took about fifteen minutes: the result was a working power supply.

The set still didn't work however – it screamed when the line output stage was reconnected. The BUT11AF line output transistor was faulty, though it measured OK. Once a replacement had been fitted there was a good picture.

I wish that certain types of dealer would leave these sets alone if they can't cope with surface-mounted components. **A.J.R.**

Philips G110 Chassis

Not all problems with these sets relate to the power supply! The complaint with this one was poor width regulation at high brightness levels. It was most noticeable with pictures that went from light to dark very quickly: the picture width would vary considerably. When the brightness was turned up towards maximum, the width came in by an inch or so. As the HT remained rock steady at 148V, the cause of the fault was almost certainly somewhere in the EW correction circuit.

It took a long time to find the culprit. Various chip resistors and diodes were checked, then finally chip capacitor C2526 (8·2nF) was found to have a leak of about 50kΩ. A replacement restored normal operation and stable width. I've since had another set with the same fault. **A.J.R.**

Hitachi G6P Chassis

The complaints were "white screen and sometimes dead". I ran the set for several hours before the screen went bright white. A tap on the main panel then brought the picture back. This fault was cured by resoldering numerous dry-joints.

The "sometimes dead" problem was more of a challenge. After two days on soak test the set died, with no HT output from the power supply. Not being familiar with this chassis, I spent some time before I discovered the cause. The crowbar thyristor across the HT supply was being triggered because the EHT sensing diode ZD752 had a very slight reverse leak. A new 24V zener diode put that right. **A.J.R.**

Mitsubishi CT29AT5

The sound was slow to come on from cold, often taking up to an hour to appear. The cause was C9F4 (1,000µF) on the power supply panel. It had leaked goo over adjacent components. Cleaning this off and fitting a new capacitor cured the fault. **C.J.G.**

Toshiba 2927DB

The picture was displaced about half an inch to the left. After much searching I noticed a hairline crack in the PCB near the line output transformer: the track connected to R404 was open-circuit. Bridging the crack cured the fault. Failure of the resistor would presumably produce the same symptom. **C.J.G.**

Thorn P1470R (Philips GR1-AX chassis)

There was no sound or picture, with a low hum from the speaker. Investigation showed that the TDA8305 chip's line drive output was missing, because C2058 (22µF) was open-circuit. It's connected to pin 11 of the chip (IC7020). This is the volume control input, which is also used for the line oscillator start up. **C.J.G.**

Beko 16328NX etc

If the front panel controls with this and related models are ineffective, remote control operation being normal, the child lock is on. To release it, hold down the + and – buttons while switching on the mains supply. **C.J.G.**

Hitachi C2524T (G7PS chassis)

This set had been repaired elsewhere because of a power supply blow up but had striations on the left-hand side of the screen. They were not visible when a signal fed in via the scart socket was being displayed. Careful checks on the video waveform at various points showed that the spurious signal was present at the output from the video detector. It took some time to find the cause, which was L101, a little choke in the 12V supply to the tuner. It had a burn mark on it, but wasn't open-circuit. A replacement cured the fault. It think it must have been damaged by excess current when the original fault occurred. **C.J.G.**

Ferguson D14R (TX805 chassis)

This set produced a loud squeal then went dead. I found that CP17 (100µF, 160V) was short-circuit. It's the reservoir capacitor for the 103V supply. **C.J.G.**

Sharp 66CS03H (CS chassis)

This set has several expensive-looking digital surface-mounted chips on the main PCB. It was slow to start from cold. The cause was C714 (1,000µF, 16V), which is the reservoir capacitor for the 5V standby supply. I hope I don't meet one of these sets after an EHT flashover! **C.J.G.**

Hitachi CPT2658 (Salora L chassis)

The complaint with this set was distorted sound. A tweak of L102 cleared the distortion, but the setting was very critical. R121 (3·9kΩ), which is connected in parallel with the coil, was open-circuit. **C.J.G.**

Sanyo CBP2866

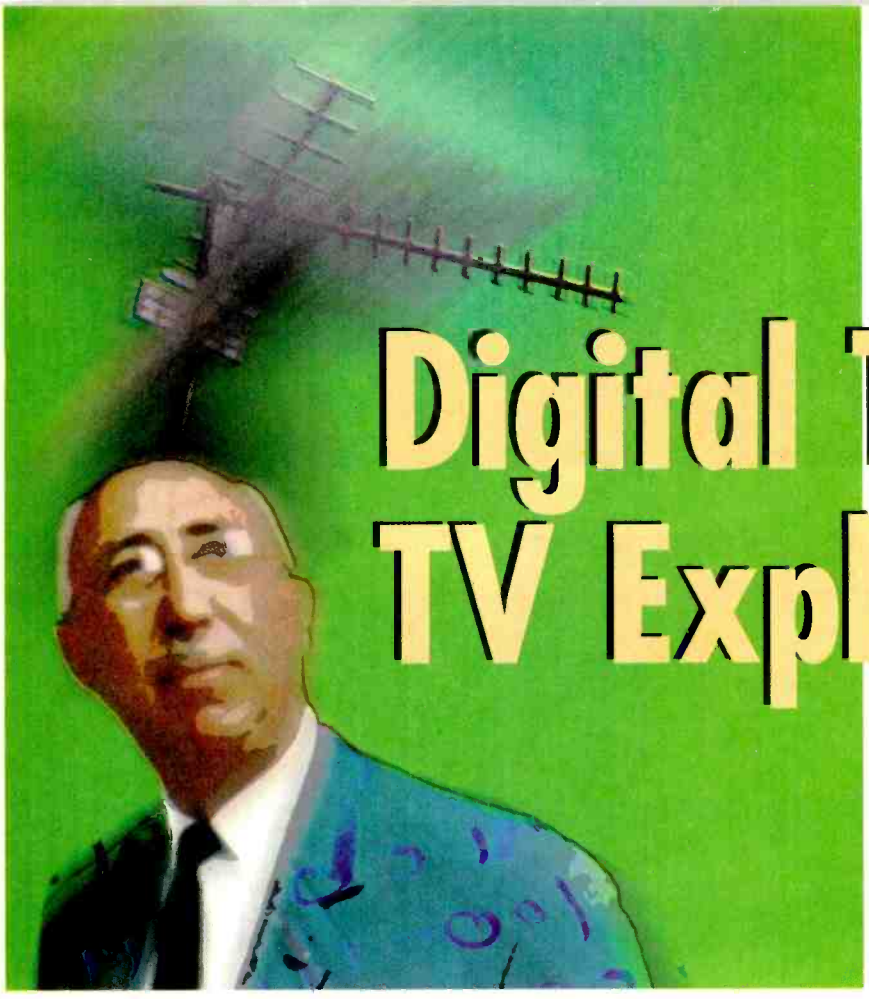
This set would sometimes trip or produce anything from a plain raster to unlocked field sync. The cause was the 12V regulator IC780, type 3122V, which according to Sanyo is no longer available. A 12V, 1W type was tried but it ran too hot for comfort. A TIP41 transistor with a 13V zener diode and a 27Ω dropper resistor ran much cooler and continuously without any problems. It was either this or scrap a set that produced an excellent picture. **D.S.**

Samsung CI5937AN

This set was dead because its TDA2616A audio output chip had gone short-circuit. It was OK once the chip had been replaced. The duff one had been loading the power supply, preventing operation. **D.S.**

Sony KVM531

When this set had been working for some time its picture would drift to monochrome. A new 8·8MHz crystal cured the fault. **D.S.**



Digital Terrestrial TV Explored

When it comes to DTT reception, the number of channels you can get depends very much on where you are, as Ian Martin found out. But the quality of the pictures is generally excellent

Much has been written about the 'digital TV revolution', but little has appeared about the practicalities of reception. There seem to be SkyDigital dishes everywhere: without the need for a dish, ONdigital systems are more difficult to spot. As one of ONdigital's selling points is that you just take a set-top box home and plug it in, I thought I'd do just that. The box selected was of Pace manufacture.

Signals

Each DTT channel consists of a digital multiplex of several programme channels, typically six. More or fewer programme channels can be fitted into each multiplex, with a change of bit rate for each one. To an ordinary analogue TV set, the DTT signals appear as an empty, noise-filled channel.

Depending on where you live, you should be able to receive up to six digital multiplexes. They are transmitted from the same sites as the analogue channels, but at much lower power. This should not, in theory, be a problem, as the digital transmissions are affected by poor signal-to-noise ratio and multipath distortion less than analogue ones.

Where possible the digital channels are included within the existing analogue channel group, but in many cases some of them are outside the group. In this case a new wideband aerial will be required. This should not be a problem: ONdigital says it will adjust or upgrade aerial installations, sometimes free of charge. Table 1 shows the present DTT multiplex arrangement.

Set-top Boxes

Philips was the first manufacturer to supply DTT set-top boxes, followed quickly by Pace. Nokia, Toshiba, Sony and others followed. LG and Hitachi produced the first integrated digital TV receivers with built-in DTT decoder boxes.

Being first to the marketplace is not always an advantage, as Philips found out. The original STBs suffered from several software problems. Over-the-air updates to ensure correct operation followed. Having heard that the Philips box still suffered from one or two bugs, I decided to obtain a Pace one – only to find that the same bugs were present. It seems that the cause is a poorly defined specification rather than any shortcomings in the STBs. The problems are only minor however, and will presumably be corrected by future over-the-air software upgrades.

The most obvious remaining bug is a meaningless PAL I/S-video option in the set-up menu. This is worrying, since it suggests that whoever checked the menu system didn't understand the meaning of these terms. Needless to say, selecting this option has no effect. Even the operating manual refers to this option, with the advice "do not change this setting". Some magazines have suggested that an S-video output will be added to ONdigital boxes by means of a future software update. This seems unlikely. The TV scart output is in RGB form and, as far as I am aware, software cannot spontaneously create hardware!

All ONdigital receivers have the same physical specification, with aerial loopthrough, two scart sockets, RCA audio jack sockets, a Smartcard slot and simple front-panel controls. The back of the box sports an RJ45-style telephone socket for the internal modem and a nine-way D connector for an optional external modem. A PCMCIA (or PC card) slot is also fitted for a possible future Conditional Access Module. Neither the modem nor the CAM feature is currently in operation, but internet shopping, banking and other interactive services that use the modem are promised for later in the year.

The carton also included a scart cable, an RF cable, a remote control unit, batteries, a very long telephone-line cord cable, a customer reply card, a manual and a quick reference folder that contains the Smartcard.

Setting up

Setting up the STB is easy. You plug the aerial cable

into the STB and connect the loopthrough from the box to the TV set (or VCR). The RF modulator's default setting, channel 21, can easily be changed via an on-screen menu to any channel in the range 21-69. Alternatively the scart cable can be used. The box doesn't have to be connected to a telephone line and there is no cost penalty, as with SkyDigital, for not doing so.

The Smartcard is then inserted, and search tuning is initiated using the on-screen menu system. All available channels will be automatically stored by the receiver. According to the manual this can take up to twenty minutes, but I found that the box completed the task in less than five minutes. All available channels are listed, but you need to telephone ONdigital to authorise reception of premium channels.

While I was talking to the ONdigital operator I was asked to go to the receiver's settings menu and read out the software version number. I was then told that an over-the-air software update was required. This took about a quarter of an hour, with the STB set to the Cartoon Network channel. Top marks to the ONdigital operator for providing clear and concise instructions, but consumers may be troubled by the need for an update with a new product straight out of the box.

I was now set up. What could I receive?

Location is Everything

My location is about twenty miles from the Mendip transmitter, slightly farther from Wenvoe. The signals arrive at right angles. Analogue reception from the two transmitters, using two aerials and a diplexer, is excellent – though the diplexer removes Ch5 from Mendip. Because of this I currently use only a group C/D Mendip aerial, which is installed in the loft. This is not ideal – engineers always sort out their own systems last – but provides excellent analogue pictures. Anyway, a digital search using this arrangement revealed 25 channels from Mendip plus another six from Wenvoe. This surprised me: the analogue channels from Wenvoe are, without a diplexer, unwatchable because of multipath distortion.

As a further test I popped a mile down the road and tried the 'add channels' feature with a dual-aerial installation. This brought in another five channels from Wenvoe. The problem with using a diplexer is that some of the digital channels are filtered out because they are outside the band originally agreed for the local transmissions. Customers who receive signals for two ITV regions may thus have to trade off one of the regions for the DTT channels.

Table 2 lists the main broadcast channels available at my location. It illustrates the problem. Most of the digital multiplexes from Mendip are close to analogue channels, so a group C/D aerial should cover them. With Wenvoe reception, the four available digital multiplexes are scattered across the UHF band, so a group W instead of a group B aerial is required.

The set-up menu includes a signal-strength meter to aid tuning. It provides an indication of signal 'quality' by means of a coloured bar-graph display, with a signal-strength indicator of 0 to 4. In practice I found that all signals produced a 'good' indication. This may not be as pointless as it sounds: with digital TV you either have a signal or you don't. The meter proved to be useful when it came to optimising the aerial direction for reception of the weaker multiplexes. The maximum reading corresponded with the correct direction, confirmed with an analogue signal meter. But I never obtained a reading of better than 2·5 from a possible 4, even with the most 'powerful' multiplexes.

For one more test I set up the receiver in Corley, near Coventry. There are good analogue signals available here from Sutton Coldfield and a few weaker ones from places such as Sandy Heath. At last I could receive the full 36 digital channels, all from Sutton Coldfield.

This highlights a major problem: not all channels are available at all locations apparently served by DTT. In the case of Mendip, there are six digital multiplexes. But while four are transmitted at 3kW, the other two are transmitted at only 250W. Thus 'fringe' area locations may not receive all the multiplexes. At first I thought

Table 2: Main channels available at the test location.

Channel	*Service*	*Transmitter*	*ERP*
30	Mux 1	Wenvoe	10kW
34	Mux 2	Wenvoe	4kW
37	Ch5	Mendip	127kW
41	HTV Wales	Wenvoe	500kW
44	BBC1 Wales	Wenvoe	500kW
47	S4C	Wenvoe	500kW
48	Mux D	Mendip	0·25kW
51	BBC2 Wales	Wenvoe	500kW
52	Mux C	Mendip	0·25kW
54	Ch4	Mendip	500kW
55	Mux 2	Mendip	3kW
56	Mux A	Wenvoe	6kW
58	BBC1 West	Mendip	500kW
59	Mux 1	Mendip	3kW
61	HTV West	Mendip	500kW
62	Mux A	Mendip	3kW
64	BBC2 West	Mendip	500kW
65	Mux B	Mendip	3kW
67	Mux B	Wenvoe	10kW

Table 1: Digital terrestrial TV multiplexes.

Multiplex	*Operator*	*Programme channels*
1	BBC	BBC1, BBC2, BBC Choice, BBC News 24, BBC Text, BBC Parliament (audio only)
2	Ch3/4	ITV, ITV2, Ch4, FilmFour, Teletext
A	SDN	Ch5, S4C, regional Welsh/Gaelic channels*, SDN test signals
B	ONdigital	Sky One, Sky Premiere, Sky Sports 1, Cartoon Network, Carlton Cinema, British Eurosport
C	ONdigital	Granada+, Shop!, UK Gold, MTV*, First ONdigital, Sky Sports 3, Sky MovieMax
D	ONdigital	UK Play, UK Style/Horizons, Carlton Kids/World, Carlton Food Network/Select, Granada Breeze/Men and Motors, Games channel

* Not yet on air.

The Pace ONdigital set-top box.

that the lower-powered multiplexes from Mendip were not in operation (ONdigital couldn't confirm), but playing about with a large aerial at an upstairs window proved that they were there.

In the case of Wenvoe, because of the multitude of local relay stations in the Welsh valleys there are insufficient free channels available to accommodate all six digital multiplexes.

To be fair, ONdigital says that it does not recommend that dealers sell receiving equipment in such areas at present. Yet most dealers in South Wales display equipment, and many use a promotional ONdigital DVD to 'simulate' reception! It's hard to believe that more channels will become available in the near future.

Channel Allocations

The set-top box's search mode automatically stores TV channels at preset programme numbers, though you have the option to change them. For example BBC1 is always programme 1, ITV2 programme 6, etc. Programme numbers up to 20 seem to be reserved for BBC/ITV/SDN channels in the local and a second region. Sky/Granada channels start at programme number 21, FilmFour is programme 41 and so on. There are some exceptions to this, and you can use the add-channels feature. But as the numbers are basically fixed, you find that there are some gaps in the table of programme numbers. As the channel up/down function skips empty channels, there's no need to alter the default channel allocations.

Programme 45 is reserved for the Games channel. When this is selected, the message "Your games are loading, please wait . . . " appears. Press the yellow key and the current game choices are displayed. At present two simple games are available, a memory game and a 'tic tac toe' type game.

Programmes 800-804 currently carry test transmissions for SDN (S4C Digital Networks). These sometimes appear to be at a lower data rate than other channels. It's then very easy to see digital processing anomalies. ONdigital says that this service will in future carry regional-language programmes.

User Interface

The receiver has an on/off button and seven other function keys. But it will almost always be operated using the remote control handset and the on-screen menu system. Unlike SkyDigital, different ONdigital receiver brands have different remote control handsets, the quality of which may influence the customer's choice of receiver. The handset that comes with the Pace receiver is well sized and balanced.

In standby the receiver's LED display shows the time in the 24-hour clock mode. When the standby/on button is pressed, the receiver powers up with the last channel viewed, the display changing to this number. This is as one would expect. But switching on by pressing any number button also selects the last channel, not the number pressed. Is this a bug or a feature?

To change channel you can either press the relevant channel number or press the remote control unit's *select* button, which produces an on-screen menu that shows the six nearest channels numerically. Press the cursor up/down buttons and the cursor focus moves up or down the programme menu. When the cursor arrives at the required programme, a quick press on select produces that programme.

One inconsistency is that the menu lists the programme numbers in descending order. You therefore have to press the down cursor to move up in programme number. If you use the programme up/down buttons instead, up really means up. This could be confusing. It is not possible to use the channel up/down buttons to change channels while any on-screen menu is being displayed. The menus must first be cleared, using the *exit* key. I would have preferred the menus to self-clear and the channel to change on command.

When the *info* button is pressed, details of the current and the next feature on the selected channel appear, overlaid as text in the bottom quarter of the screen. In this mode, pressing the up/down cursor keys displays the programmes on other channels: pressing select takes you to the selected channel. I found this feature useful, as it is easy to check what's on other channels without actually changing channel.

The *wide* button changes the display between the standard and widescreen modes, if available, and depends on the TV type selected in the viewing-preferences menu. This is a useful feature for standard-screen owners who want to see uncropped pictures, though the display always reverts to standard when the channel is changed. I noticed that some broadcasters occasionally transmit a standard-mode programme with the widescreen flag set. The result is a picture with a border all round when you select widescreen with a standard-screen TV set!

The *text* and *guide* buttons don't function at present, and the two text channels are blank. High-resolution graphics and a picture-in-picture style dual display that will integrate the text with the appropriate TV channel are promised.

The *menu* button gives you the set-up menu, which has seven sub-menus. These enable you to preset up to eight VCR event timers; select favourite channels; set the parental lock code and locked channels list; adjust the decoder box, TV set and internal modem settings; tune in channels; check for messages, check signal strength and display software versions. You can also select English, Welsh or Gaelic subtitles (when available), or enhanced subtitles (including sound-effect descriptions) for those with impaired hearing. I found it a little inconvenient to have to go back to the menu system to select subtitles: having three children, I am used to going to terrestrial teletext's favourite-page function to get me instantly to page 888 whenever the kids' volume exceeds that of the TV set!

It's also possible to choose to update the box's software over the air, though I wouldn't recommend this unless you are instructed to do so during installation. The reason is as follows: without an ONdigital operator to 'hit' (their term) your receiver with the update, a self-initiated search will render the box inoperable for about an hour. Pulling out the mains plug does not end the search.

Interference

Interference is often mentioned in connection with DTT reception. I saw no evidence of interference to any off-air channel, though I've recently experienced some interference – even before I obtained my ONdigital box – with the RF outputs from VCRs and satellite receivers. This is probably because the RF modulators are tuned to channels that now carry DTT multiplexes.

The problem is that a DTT channel appears to be blank to an analogue tuner but, when a VCR's output occupies the same or an adjacent channel, the DTT signal causes interference to the generally higher-level analogue signal. As I feed the outputs from two satellite receivers around the house, I had to sit down with a chart of all the frequencies and cross off all the unavailable channels. When you add up all the analogue TV, DTT, local relay and out-of-region channels you will be surprised how little of the spectrum is left.

Conclusions

I was pleasantly surprised with the features of the box and the quality of reception. The few remaining operational bugs can theoretically be fixed by over-the-air software updates. It does however seem that in many cases an improved aerial installation will be required.

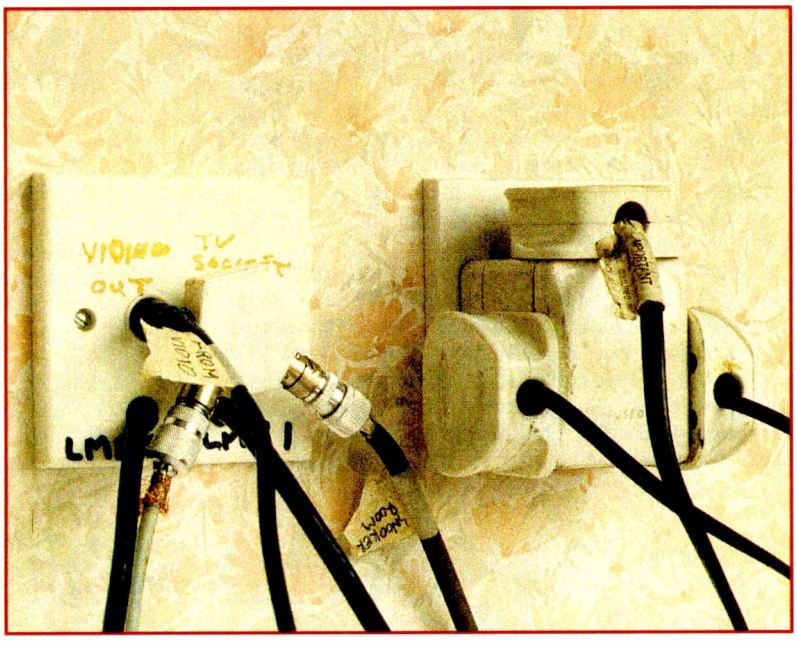
The current choice of channels is somewhat limited at 36, compared to SkyDigital's 140 or even Astra 1's 64. For many viewers however more choice doesn't necessarily mean better quality.

Prior to viewing ONdigital I had a rather biased view of digital TV, based in part on the poor picture quality produced by early examples of TV chassis that used digital signal processing, and not helped by the likes of CDi and Video CDs that used MPEG-1. In general however I am impressed by ONdigital: the pictures are sharp and are free from chroma noise and multipath-related problems. The bandwidth of the video signal is slightly less than that of a good analogue signal – confirmed by switching from one to the other – but this is acceptable, particularly as the result is a cleaner, lower-noise picture. When I compared an ONdigital channel with the same channel via analogue satellite transmission, the latter's grain and line-tilt because of the VideoCrypt process were immediately apparent.

Less impressive is the quality of programmes when the source material is poor. Some of the live European football on British Eurosport is appalling, with ragged contouring and blocking. Because of noise, 'macro cells' appear on large areas of grass. These are blocks of pixels that occur when the picture's bit-rate requirement exceeds the channel capacity. With a very noisy picture, the digital compression views the noise as high-frequency picture information. Hence the HF roll-off normally applied.

A few digital 'effects' occasionally appear – particularly on cross-fades and stop/start motion. But in my opinion these are insignificant compared to those you regularly see with normal, digitally-processed 'analogue' TV signals. MPEG-type compression effects are beginning to be seen with news feeds, commercials etc. even on ordinary terrestrial TV. This makes a true comparison between analogue and digital TV increasingly difficult.

Multiple Outlet Wallplates



With the increasing complexity of many domestic TV installations, there is need for a neat, tidy multipole coaxial wallplate with good electrical performance. Finding nothing suitable on the market, Bill Wright came up with this DIY solution

Most houses built during the past twenty-five years have an aerial cable built into the wall. The length of coax usually runs from an outlet plate in one corner of the living room up to the loft. But what seemed like a fine, futuristic innovation in 1974 is woefully inadequate in 1999.

You often find an unholy mess behind a TV set, with the builder's original wallplate in use and various other cables coming through the wall, along the floor or even through the corner of the nearest window frame. There may be in-line splitters, games switches and suchlike. Photo 1 shows an example. Customers quite often ask whether anything can be done to tidy things up. That's their way of looking at the problem: you appreciate that a jumble of cheap flyleads and loose-fitting, unscreened outlets could seriously affect reception quality.

Let's assume that you rip out all this rubbish and bring new cables in, nice and neat, through the rear of the original backbox. You need a tidy means of terminating this unruly hank of cables, otherwise the result will still be a rat's nest. What's needed is a five- or six-way coaxial socket built on to a standard domestic wallplate. Full screening is essential, to prevent crosstalk between the different coaxial feeds and leakage to and from the outside world. We'll go into this in greater detail in Part 2 next month: it's becoming more and more important.

But as far as I know there's no suitable outlet plate on the market. As the problem came up so often, I had to find a DIY solution. Before I get on to that, let's consider the size of the problem, both now and in the future. Just how many coaxial cables could be required?

Photo 1 (top of page): An example of the untidy and inefficient coaxial cable connections found behind many TV sets.

Cable count

Take a very common type of domestic set-up. A TV set, VCR and satellite receiver sit in the corner of the living room. The VCR and satellite receiver outputs are fed to the main TV set and to various other rooms. If the satellite and VCR outputs are added to the off-air UHF signals in the correct way, using channel-pass filters rather than simply being daisy-chained, the cable tally is likely to be as follows:

(1) Aerial for the TV set.
(2) Aerial for the VCR (carries all UHF signals except the VCR's output).
(3) Satellite dish cable.
(4) VCR output to the distribution system.
(5) Satellite receiver output to the distribution system.

Other possible cables, required now or before long, are:

(1) A second dish cable, usually for Eutelsat at 13°E.
(2) A third dish cable, usually for a specific group of ethnic channels.
(3) An unfiltered feed from a wideband aerial to an ONdigital box.
(4) Output from the ONdigital box to the distribution system.
(5) A SkyDigital dish cable, which may be an addition as many people may retain their old analogue satellite TV equipment despite Sky's efforts to persuade them otherwise.

(6) A VHF-FM radio aerial downlead.
(7) A DAB (digital audio broadcasting) aerial downlead.
(8) A surveillance camera cable.

Practicalities

For years I simply drilled holes in a blank plate, one for each cable. This was OK technically, but there were obvious visual and other disadvantages. So I started to fit up to eight F-type line couplers to each plate. The result: a nice, tidy, multiway outlet, with no possibility for crosstalk, impedance mismatching or excessive through loss. Rear connections are via ordinary F plugs.

At first I made these plates up as they were needed, usually at the last minute. This was a bit of a chore, so I was pleased when my son Paul turned to mass production! Marking out was the worst part of the job: he now has a simple device that makes this unnecessary and allows four plates to be drilled at the same time, with great accuracy – see Photo 2. We keep a stock of two-, four- and six-way plates, see Photo 3. It's a good idea to reuse the original packaging, as the plates can easily mark each other in transit.

Blank plates are available at 25p each. But they shatter when drilled. We've settled on the Contactum 1017 one-gang moulded plate. It's not cheap, but it's very strong and good looking.

If you want to make outlets in this way you can use a normal HSS drill. But don't apply too much pressure. Each hole should take about 15 seconds to drill at 900 RPM. Any quicker and you might splinter the face. A 3/8in. drill is slightly to big but will serve. A 9·3mm drill (RS 513-483) or a 23/64in. drill (RS 202-8432) is perfect. A drill stand makes the job a lot easier.

When the connectors are fitted the nuts should be a really tight fit: don't worry, the plate will not crack. A nut-spinner and a ring spanner used in opposition seem to work best. I don't know the precisely-correct size, but 7/16in. AF or 11mm both fit.

Once installed a plate looks quite impressive, see Photo 4, and I have no difficulty in itemising it on the invoice at a price that well rewards our time and trouble! Now that we've got our act together and can make the plates without too much trouble they've become an absolute boon. I use about five a week, and wonder how I ever managed without them.

Posh people with brass mains fittings will naturally require a matching brass TV outlet. Suitable blanks are available. Find out the make and pattern by looking at the back of a mains socket or light switch. The same applies with brushed, stainless fittings. These two types both scratch very easily, so use masking tape to protect the surface when drilling. These are one-off items of course, so the posh customer will appreciate that they are very, very expensive!

F-type Connectors

The choice of connector was dictated by the need for full screening and by space constraints. Our old friend the Belling-Lee is of course the UK standard for aerial connections. But try to fit six fully-screened Belling sockets on to a single blank plate and you'll see why we settled on the F type, which also has the great advantage that the plug screws firmly on to the socket instead of just pushing into it. The F type originated in the USA as a CCTV connector. I recall how sceptical we were when we first saw it: the use of the cable inner conductor as the centre pin caused raised eyebrows, but the expected problems don't seem to have materialised. Flyleads with moulded F plugs are readily available, though I usually make up my own using CT100 cable.

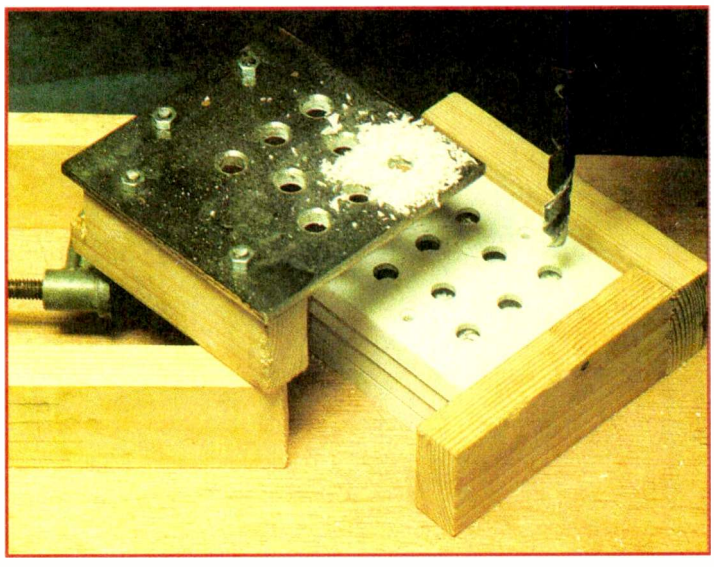


Photo 2: Steel template used to drill the plates. Part of an old G cramp is used to hold four plates and the template firmly in position.

When buying F-type line couplers, which are also called line connectors, through connectors, plug-to-plug connectors, female-to-female adaptors etc., make sure that they are supplied with the nut and washer. Some are but some aren't. The CPC item SECON2 is suitable, and also cheap at 19p.

Cable Routes

It's usually easy enough to get the cables into the room from their various sources. The 'TV corner' of most living rooms has at least one external wall, so it's no problem to remove the existing single outlet from the wall, bash out one of the knock-outs from the rear of the back-box (the steel box set into the wall) and drill straight through the wall to the outside. Be careful not to shell off the face of a brick at the front of a house, and use plenty of silicone sealant to weatherproof the hole once the cables have been fitted.

If possible, find a reasonably camouflaged cable route up to the loft. It's often convenient to hide the cables behind a fallpipe. By the way, the use of individual cable clips on an outside wall for several parallel cables looks awful: use push-in cable-tie holders and secure everything in one neat bunch. Even when the 'TV corner' is not on an outside wall, a bit of scrabbling about

Photo 3: The finished product.

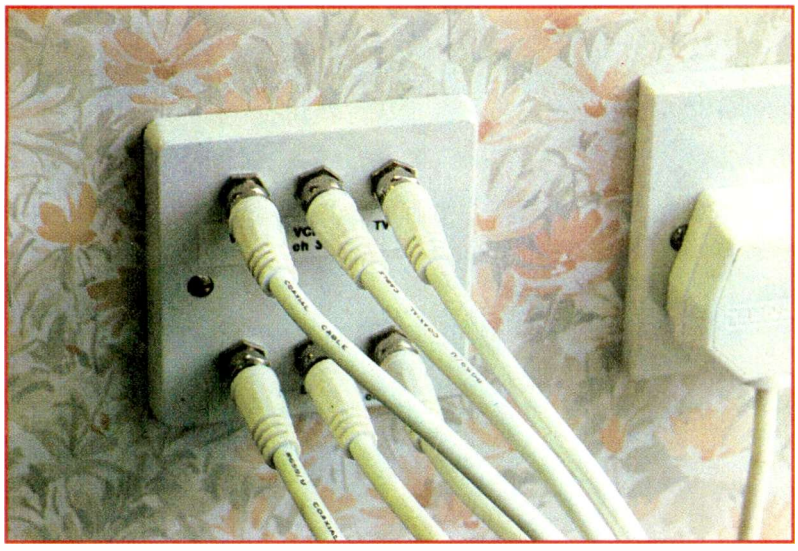


Photo 4: An installed six-way plate. The fly-leads have moulded plugs.

under the floor will usually get the cables through.

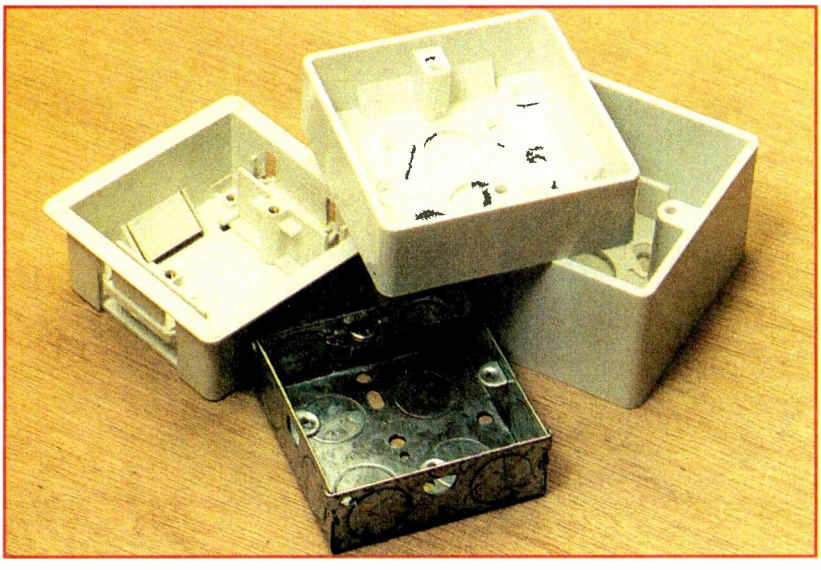
Behind the Wallplate

Each coupler has an F plug screwed to its rear, so a reasonable amount of clearance is necessary. A standard backbox provides about 30mm of depth, which is just enough for a four-way plate. The cables should be just long enough to allow plug fitting, or they won't push back easily into the box. Try not to kink them. When a shallow backbox has been fitted, it might be possible to use right-angle crimp-type F plugs, but often the only answer is to replace the box with a standard one. With care this can be done without disturbing the plaster or wall finish. Use a drill, then a cold chisel, to deepen the hole.

If the wall is faced with plasterboard, with a space behind it, the backbox will be of the 'dry liner' type. These fix into the plasterboard using side lugs, and can have part of their rear wall removed, if necessary, to accommodate cables and plugs.

It will be necessary to fit a patress if there is no suitable backbox. This white, plastic box screws on to the wall surface: the outlet plate fits on to the patress. This is undoubtedly the easiest way to fit a multiple TV wallplate. The only disadvantage is that it's not as neat as a flush fitting, but the finished job will still usually be a great deal better than what went before. The very deep patresses made for cooker switches (Contactum 1055) are ideal. I wouldn't advocate fitting one of these in the centre of the living room wall, but it is usually acceptable in the corner behind the TV set. Photo 5 shows various mounting boxes.

Photo 5: A dry liner box, two patresses of different depths and a standard steel backbox.



The local electrical wholesaler is the place to buy blank plates, patresses, backboxes and so on. Don't go to the DIY megastore for these items – unless you want to pay three times the proper price.

Labels

The electronic labelling machines now available make this part of the job a doddle. Nice, neat plastic labels at the press of a button! When I first got mine I was so pleased I used it to write to our Carolyn at university: the letter was eleven feet long!

When the lady of the house decides to rearrange the living room furniture, probably on Christmas Eve at 5 p.m., she will blithely unplug all the cables behind the TV set. This will lead to annoying phone calls. If every socket has been labelled there is some chance that the problem can be dealt with over the phone. If not, and you have to make a visit, you can put things right very easily. Because all the sockets are labelled and any child could have reconnected everything correctly, the customer will be too embarrassed to balk at the cost of the call-out. You might even get a mince pie, but I doubt it.

It's is worth including on the labels the output channel of the VCR, satellite receiver and any other set-top box that feeds the distribution system. These signals should be fed via channel-pass filters before being added to the off-air signals, so when the customer attempts to install a new VCR or whatever it is unlikely that he will succeed. The result will be a call-out, when the channel number on the label in the living room will save a trip to the loft to look at the label on the filter.

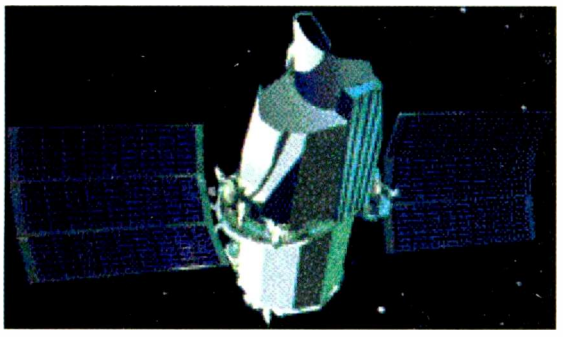
Installation Standards

The aerial and satellite installation trade now needs to work to higher standards than ever before. In the world of large-scale contract rigging however this is often outside the control of the actual installer. Technical standards are often the last consideration here, and those readers who install aerials and satellite dishes on a contract basis will no doubt be reading this article with a wry smile. When you are obliged to complete ten to fifteen installations a day, there isn't even time to drink the infrequently proffered cup of tea, never mind fit fancy outlet plates! Don't worry, I know all about it.

I spent twenty years working like that. As well as earning a lot of money, I developed knee, elbow and back problems that have proved to be much longer-lasting than the cash. For those of you trapped on this particular treadmill, I have the greatest sympathy and can understand how irrelevant this article must seem.

I am now able to work at my own pace, and it's very gratifying to find that a significant number of customers appreciate the finer points of the job and are prepared to pay accordingly. As the volume of domestic aerial work decreases year by year, it seems to me that a survival scheme for the competent, self-employed contractor is to cultivate the top end of the market. Go for the big jobs. If someone else has made an almighty mess, so much the better. Keep to the highest possible installation standards, explain exactly what you are doing and why, don't smoke in the house – and look forward to the recommendations.

In Part 2 next month we'll consider the importance of screening, including various satellite TV interference problems.



DX and Satellite Reception

Terrestrial DX and satellite TV reception. News from abroad and about satellite developments. A note on DAB. How to go about digital satellite DXing. Roger Bunney reports

There were several shortish-duration Sporadic E openings during April – on the 5th (chs. E3 and 4), and on the 11th, 19th and 25th (ch. E3 in each case). As I write this during the late afternoon of May 2nd there is slight SpE activity on ch. E4. This has all been programme reception, and thus unidentified. By the time you read this, let's hope there will be excellent SpE reception throughout Band I!

The tropospherics also show signs of activity. At the time of writing, conditions are ideal for tropospheric reception, with a high-pressure system settling over Europe and the UK, relatively high temperatures, clear skies, nominal winds – and co-channel patterning on the local UHF channels!

I have made some alterations to my aerial arrangements. Crossed dipoles, phased together and mounted at 35ft, are now used for Band I. The rotating mast now carries a Triax Unix 100W wideband UHF aerial plus CM7271 preamplifier, with CT100 cable for the downlead. The system works well, though I feel that the quality of commercial domestic aerials is not what it was. Earlier Fuba and Triax aerials were relatively substantial: in comparison, the present Unix 100 feels fragile and lightweight.

A letter from Garry Smith (Derby) comments on unlisted relay stations. Apparently a temporary relay was in operation at Middleton, north of Manchester, in early March. Channels 22, 28, 31 and 35 were used for BBC1, BBC2, Granada and Channel 4 respectively, with the ERP about 20W. He mentions that LTV (Lithuania) is using a new corner logo – a golden pyramid with a blue square to the right-hand side.

Analogue reception of Kurdish TV via Eutelsat W2 at 16°E.

Satellite Sightings

April was a productive and varied month for satellite reception. The Balkans conflict dominated many logs: as mentioned last month, all reception is digital. The majority of the news feeds are carried by Eutelsat II F3 at 36°E, but there have also been feeds via Kopernikus-2 at 28·5°E and Eutelsat W2 at 16°E. The Serb version of events can be monitored via the RTS-SAT TV channel, which comes from Belgrade via Eutelsat II F2 at 10°E: the frequency is 11·596GHz, with horizontal polarisation. Sislink has at least four trucks in the area, UKI27, UKI30, UKI303 and UKI418. The SIS/ITN uplink is thought to be a transportable terminal. It operates at 11·080GHz with horizontal polarisation, using the common 5,632 SR and 3/4 FEC parameters. This frequency is shared with the UK-based SIS-05 UKI30, which has been covering refugee arrival at Yeadon (Leeds-Bradford) airport. I've noticed that the SIS-28 link (UKI303, 11·064GHz H), which carries the Reuters Albania service, is flagged up as "Encoder Event name not applicable" whatever that means.

Remember the American Forces medical programme *Counter Terrorism* that was aired in clear analogue form via Intelsat K over several evenings late last year? A further *Counter Terrorism* was aired over two nights on April 21st/22nd, via Eutelsat 36°E at 11·010GHz H, using the same format: discussions and demonstrations of medical problems, mainly involving gas and germ warfare. During the programme there was an admission that large stocks of mustard and nerve gas agents are held in various US stores.

The GMTV live Breakfast TV inserts via 36°E have all but disappeared in recent weeks, though SIS-4 produced a live analogue insert from Leeds town centre on April 26th at 0730 – frequency 11·632GHz, H. The Malaysian Grand Prix (motorcycles) was carried as a clear analogue transmission from 36°E on the 18th, via the Belgacom transponder, interspersed with the ident 'Dorna' inlaid on colour bars.

PAS-3R/6 at 43°W has been providing numerous Spanish OBs and feeds in recent months: the

questionable 'sport' of bullfighting is a common spectacle at 12·728GHz V from around 1800 hours. The EBU New York feed is often present at 12·698GHz H.

It will be interesting to see if the EBU moves to the Eutelsat 'Atlantic Gate' at 12·5°W once this new orbital position has become established. Cyril Willis comments that the EBU still uses the Eutelsat position at 7°E (II F4/W3), with MPEG-4:2:2 which cannot be resolved by MPEG-2 DVB receivers. There are still analogue OB transmissions from this position: try 11·139 and 11·174GHz H.

An ITN uplink truck covered the Soho nail bomb explosion on April 30th, with live reports from outside University College Hospital from 2130. This digital link was via SIS using the 11·080GHz transponder at 36°E. This satellite has become a news feed hotspot.

PAS-3R/6 carried considerable analogue traffic on the 25th. There was a Spanish news feed at 12·540GHz H, while at the same frequency but with V polarisation there was TVE programming. An NTSC test card was present at 12·728GHz. At 12·756GHz H there was another test card which cut to a news package "EBU NATO 50 FIBER WASHINGTON DC" that was also captioned as "EBU News Special Events". The news related to the 50th anniversary of NATO. It was presumably carried to the uplink site via fibre-optic cable.

John Locker (Wirral) reports that Arabsat 3A is now on test: a pattern has already been seen at 11·900GHz. While checking Arabsat 2B at 30·5°E I noticed a lengthy religious feed at 4·078GHz RHC from 2030 BST. The only ident was a short Arab script with 'TV' beneath at the bottom left-hand side. Can anyone help identify the signal source?

Terrestrial News

UK: The second RSL-TV station, Lanarkshire Television, opened on April 25th with transmissions from the Clock Tower at Hartwood Hospital, not the main Black Hill transmitting site as earlier thought. The channel is E67, with 10kW ERP and horizontal polarisation. The 24-hour a day service includes local news, sports and programmes of general local and national interest, including a text service. Base is the Lanarkshire Media Centre at Hartwood. My thanks to the British DX Club for this information.

The ITC has so far not offered RSL licences that last for more than two years. LITN (the Local Independent Television Network), which represents the RSL movement, is pressing for longer-duration licences.

Balkans: NATO is transmitting radio and TV programming from a Lockheed EC130E aircraft flying at 6,000m. The plane carries two MW transmitters that operate at 1,003kHz and two FM transmitters that operate at 87·7MHz (South Slavic service of RFE) and 106·6MHz (The Allied Voice in Serbian). TV transmissions are on ch. E21. The 10kW MW signal, monitored at 1,000km from Belgrade, is good with no fading – the 2MW land-based 684kHz Belgrade transmissions suffer from deep fading at the same location. The NATO transmissions are heard over 1000-1400 hours GMT.

France: The government is expected to pass a media bill shortly that will allow the start of at least 48 digital terrestrial channels. They will be shared around the existing national TV networks. The new TF2 channel, run by TF1, will open initially via satellite/cable, then adopt DTT.

Germany: Two DTT multiplexes from twenty transmitters plus relays started testing in mid March in the Niedersachsen area, which includes Hanover, Bremen and Hambourg. One multiplex is operated by NDR-Hanover, with programming that includes ARD and ZDF offerings; the other, operated by Deutsche Telekom, Hanover, includes material from independent broadcasters.

Australia: NTL has acquired over 560 transmission sites across the country for a network that includes TV, radio and mobile telecom services. Programming is to be provided by SBS, ABC and others. NTL is to play a major role in the expansion of DTT across the country.

Ireland: The RTE-1 ch. IB transmitter at Maghera (Gort) is apparently still on air – despite claims that it was closed down nearly two years ago!

Digital TV: Thailand is to launch an interactive DTT service by the end of the year – a joint venture between Broadcasting Network Thailand and the UK-based Yes Television. Japan's first DTT service is to start some time between 2000-2003. Korea has announced that DTT services will be expanded from 2001 onwards: tests start next year. Singapore is expected to announce its decision on a digital TV standard shortly.

An APTN digital news feed from Skopje via Eutelsat II F3 at 36°E.

DAB

Only very few people are at present receiving DAB (Digital Audio Broadcasting – terrestrial) transmissions. Dave Wiltshire (Hants) curently receives Band III DAB from Hannington. He hopes to expand his digital horizon, with reception from more distant sources such as Crystal Palace, by using a cut-down five-element Band III array to cover 217-230MHz. Once

The first BBC SNG feed from Skopje – an initial test via Eutelsat at 36°E. Frequency 11·684GHz, polarisation horizontal, SR 5,632, FEC 3/4. Photo from Hugh Cocks in Portugal.

it becomes established, Band III DAB is likely to provide a lucrative extra for specialist Hi-Fi dealers. I hope to report more on Dave's digital experiences shortly.

Digital DX

With digital transmissions, both satellite and terrestrial, on the increase DX enthusiasts will also have to go digital. At present, digital terrestrial TV is a rather uncertain field, because of the limited and inflexible equipment available. But digital satellite TV offers considerable scope. Many free-to-air (FTA) signals, both broadcast and news/OB feeds, can be received with a 'small' dish, i.e. less than 1·5m.

The Balkans conflict illustrates the way things are going. Almost all news feeds from the area are digital, because less bandwidth is required and lower uplink power. The latter means that a smaller dish can be used, giving greater mobility.

For the DX enthusiast it means buying a digital receiver, either an FTA type or one equipped with a CAM (Conditional Access Module) for use with encrypted signals. The existing dish and LNB will generally cope with digital signals, provided the LNB is stable. My own six-year old LNB works well. So for most of us only a new receiver will be required.

Many receivers are now available, both FTA and CAM. Unless you are interested in particular encrypted channels, which require a smart card, an FTA receiver will do. But there doesn't seem to be an ideal receiver for sat-DXing. What's required is a receiver that is quick and easy to use, able to retune to other signals with minimal complication. Unfortunately with MPEG signals you have to be able to select several parameters: in addition to the frequency and polarisation, you have to know the SR (Symbol Rate) and FEC (Forward Error Correction) ratio. The former is typically between 3,000 and 36,000, the later is a fraction – from 1/3 to 7/8. PIDs (Programme IDentifications) are often quoted – separate numbers for audio and video – but I've never found it necessary to tap these in.

The Nokia receiver is a firm favourite, especially as those with computer skills can get software upgrades via the internet. The Humax (NI) receiver is another popular choice. I've used an RSD ODM-300 receiver over the past six months with reasonable success. With the RSD you can tune to a suspected frequency, set the SR and FEC to auto, and tap in search via the remote control unit. The receiver then hunts for signals, sorts out the SRs and FECs, and stores any channels discovered in memory. Other receivers are not so easy. But experience has shown that the RSD refuses to lock up with some signals which the Nokia receiver accepts. The Nokia receiver is more difficult to tune however. Hence no ideal receiver. You'll have to part with at least £250 or so for a receiver, up to £400 for a Nokia one.

I use an analogue receiver to find the digital signals. Many models are available. My Manhattan LT-6300 Mk II cost under £70 and is ideal – there's a similar BT-badged model. Tune to the bottom of the Ku band, select horizontal polarisation, then fast scan up, ideally while feeding an analogue TV set. When the receiver finds a signal, the scan will stop. With an analogue signal there will be a picture, with a digital signal just shash or a screen darkening. Note the frequency, then continue the upwards scan. In this way you can make a list of frequencies where something other than an analogue signal is present. Enter the frequencies into the digital receiver, set the signal parameters to auto, then search. Hopefully things will be seen.

More upmarket analogue receivers provide a Ku output (IF) for a daisy-chained slave satellite receiver: the former receiver acts as a master for polarisation, dish positioning etc. Over the past few years I've acquired several receivers – a fifteen-year old Echostar SR1000 is still in use! I feed the signal from the LNB via a Global DA (one input, eight outputs) to several receivers, with polarisation control via an outboard circuit using a modified CB power supply that also provides the 13/18V required for the LNB.

When selecting a digital satellite receiver, ensure that it has a variable SR capability of say 2,000-40,000, FEC adjustable from 1/2 to 7/8, PID setting, numerous LNB oscillator settings, ease of tuning and ability to auto operate to seek unknown SRs and FECs. More important perhaps, ask fellow DXers for their views.

If any reader wants to send in questions about this I'll try to help. It's best to ask before parting with hard-earned cash! I'll return to the subject in later issues. Meanwhile, comments from anyone with experience of digital equipment and operation would be welcome.

Satellite News

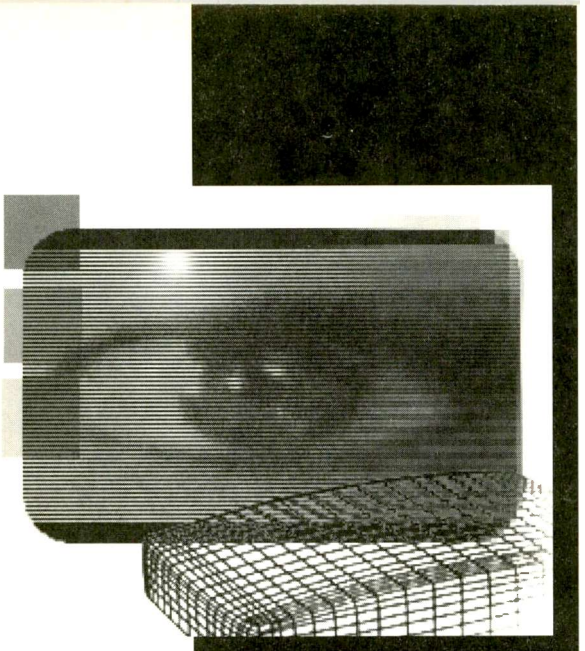
Eutelsat W3 is now in orbit at 7°E, the traditional EBU news distribution slot. It has 24 Ku-band transponders with a very flexible configuration. The wide beam provides coverage of Europe, the Atlantic Islands, North Africa, the Middle East and central Asia: a steerable spot beam is centred on the Aegean region, with coverage extending from central Europe to the Middle East. Transponders can be switched between beams individually. Once W3 is fully operational, Eutelsat II F4 will be moved to the 12·5° Atlantic Gate position. Eutelsat attaches great importance to this slot: a new Atlantic Bird 1 is planned for it, with twenty Ku-band transponders and beam coverage from North and South America to Europe, North Africa and parts of the Middle East.

The ITC has revoked MED-TV's licence because of "incitement to violence": it was a Kurdish TV channel based in London but uplinked from Belgium. KTV transmissions continue from 16°E.

Teleport London International has been bought out by Kingston Communications, an expanding media group with interests in satellite communications, video/TV facilities and broadcast systems.

It seems that PanAmSat may adopt a different digital standard with an FEC ratio of 7/8 instead of the usual 3/4. This calls for a higher threshold point and a larger dish to provide sufficient signal. A high FEC ratio means more data and less protection.

The Irish sports channel Setanta is now being transmitted via the Intelsat/New Skies 603/K satellite (21·5°W) at 11·609GHz V – digital of course!



Monitors

Reports from Ian Field and Philip Blundell, AMIIEelec

Acer JD144F

There was no fault information other than 'dead'. So an inspection was carried out before power was applied. The solder was a bit thin all round: it was worst in the mains input and bridge rectifier area! The posistor in this particular version had a different brand mark to the usual one. The mains fuse was intact, and a general resolder restored normal operation. After a full-spec soak test it was returned to the customer – and hasn't bounced! **I.F.**

IBM6314-002

"Smoke then phut" it said on the fault ticket. Q804/5/6 (2SK1350) on the subpanel next to the scan plug were short-circuit, and two of the pins that connect the subpanel to the main PCB were dry-jointed and had arced and burnt away the copper track. The 2SK1350 has an impressive specification for an insulated TO220 encapsulated MOSFET: 15A, 200V, 45W. The only device I had to hand with an equal or better specification was the metal-tab TO220 IRF640 (note that the IRFI640 has only half the current capability and a third of the wattage rating of the IRF640). Great care is required when using a conventional TO220 device plus insulating kit, as the heatsink has die-stamped locating spigots that can damage a separate insulator.

As the arcing hadn't caused any other damage, the heat-damaged subpanel connector was bypassed – a pair of soldered-in wires were used to replace the two burnt pins. The manufacturer had very thoughtfully provided a hole in the PCB next to the subpanel. The flying leads can be passed through this. **I.F.**

AST Vision 7N (KD1711)

This budget 17in. monitor is easy to work on. The ticket said "bang with flash inside when switched on, now dead". An easy one: the fuse had blown because of failure of the 14ML degaussing posistor.

On inspection the soldering was found to be fine, but I was astonished see that no heatsink compound whatsoever had been applied to the chopper MOSFET in the power supply. It has an ISO-TO220 plastic case which is bolted directly to an unmachined (rough as extruded) heatsink, with no silicone rubber insulator to improve the contact. Although there was no evidence that the MOSFET had suffered from heat stress, I decided to add some heatsink compound to ensure that it stayed this way. **I.F.**

ICL 15502-002

There was an EW fault with this basic VGA monitor. EW correction is carried out using a transductor rather than the more common EW diode bridge arrangement. I started by looking for signs of trouble, such as distressed components. The horizontal shift control R415 (500Ω WW preset) was badly heat damaged, and the plastic sleeve on C313 (3·3µF, 160V) had shrivelled up. So work began with replacement of these items.

As this didn't cure the fault attention was turned to preset R327, which varies the amplitude of the vertical parabola fed to Q302 (2SC1815), and Q303 (2SA966) whose collector drives the transductor (T402). Adjustment of R327 had no effect whatsoever, but the amplifier circuit checked out OK. A replacement transductor made no difference either. So I decided to check the various tuning and coupling capacitors in the line output stage.

C412 (0·022µF, 250V p-p) had been cooked by R415: replacement produced a very slight improvement in the effect when R327 was varied. C419 (7·2nF, 800V) looked as if it had a boil. This capacitor and the one in series with it, C418 (0·01µF, 800V), were replaced along with C420 (another 7·2nF, 800V capacitor). None of this made any difference. But when C425 (0·22µF, 250V) and C426 (0·16µF, 250) were checked C425 was found to be open-circuit. Once this capacitor had been replaced there was full control of the EW correction.

The problem with another of these monitors was vertical ripple at the left-hand side of the screen. Easy, this one: C993 (10µF, 250V) on the CRT base panel was no longer smoothing the 115V supply to the RGB output stages. **I.F.**

Gateway 2000 Crystalscan CS1572FS

The label said "intermittent dull or blank screen". As movement of the CRT base assembly brought the picture back, a dry-jointed heater pin was suspected. But they were OK. I then noticed that the CRT's pins had a heavy blue-oxide scale. When this had been cleaned off there was a much improved picture, but signs of glazed cathodes were present. To ensure that the heater supply smoothing was up to par, C332 (1,000µF, 10V) and C734 (47µF, 16V) were both replaced. The heater supply is negative with respect to chassis, so the positive side of these capacitors goes to the main chassis line. Heavy flux deposits had to be removed before the soldering on the main PCB could be examined – it did need attention! **I.F.**

IBM 6322-002

"Flashes green" was the complaint with this monitor. The CRT base pins were almost detached from the PCB, and the three output transis-

tors also needed fresh solder. The unbalanced CRT drive had left its mark on the grey scale.

When I moved the monitor to get at the presets, the screen began to flash, flicker and generally misbehave. As the poor soldering on the CRT base panel had been dealt with, the main PCB was lifted out of the chassis. It would be quicker to list the parts that didn't need resoldering! Most of the DIL chips and the passive components were OK. Everything else had to be resoldered – some components could have been pulled off the PCB with little effort.

When this job had been completed the screen was much too bright. The A1/G2 preset had to be adjusted (the factory default button on the front panel had been checked to make sure that the excessive setting had not been caused by user interference). **I.F.**

Samsung CVM4967T

The mains fuse had blown. After thorough check on everything on the primary side of the power supply, including the rectifier and the mains filter components, I decided that the degaussing posistor must have been the cause. It looked all right, but a replacement cured the fault. **I.F.**

Dell 1428HS

The display was narrow with vertical bands. I found that the two series-connected diodes D301/2, which form the efficiency diode, were dry-jointed. When they had been checked and resoldered there were no vertical bands but the display was still narrow. Further tests revealed that R368, which is in series with the emitter of Q355, was open-circuit. It was sufficiently heat discoloured for there to be some doubt about the original band colours. The first was almost certainly brown, and the third one definitely gold. Was the middle one originally black? Q355 was undamaged, but the smaller driver transistor Q354 (2SB647) was short-circuit all ways. Since the main effect of R368's value is to alter the width adjustment range, which was about right with a 1Ω resistor fitted, I assume that the middle band was originally black. **I.F.**

Radius PCD/20V

There were purity errors with one of these Apple monitors. The cause was obvious and simple: the main degaussing posistor (there are two) had failed. Once a replacement of the same type had been fitted, there was a perfect picture on the third start-up from cold.

Neither I nor the trader who passed this repair on has an Apple test machine. You can run this monitor from a PC by using a switchable 15-to-15 pin subminiature adaptor set to 1,152 x 870. The adaptor is actually designed to work the other way round, so that a VGA monitor can be used with an Apple computer. This trick worked because the monitor can accept separate line and frame sync inputs. Some Apple video modes provide only a composite sync output, and some Apple compatible monitors will work only with composite sync.

The monitor concerned had a note on the fault label about a problem with saving front-panel settings. I found that the following method worked. Use the up/down buttons to adjust, with the mode LED off, then press the mode button (mode LED lights). Finally press save.

Suitable 15-to-15 pin subminiature adaptors include the Mitsubishi AD-A-205 and the Unimac Fly. **I.F.**

Dell 1528LS

The LED glowed yellow, indicating a fault condition, and there was a fast ticking. After a quick look at my notes on this model I went straight to C826 (1,000µF, 16V). This time I was wrong: the cause of the trouble was the BU2520AF line output transistor Q424, which was short-circuit.

When this happens it's wise to check the IRFS630 HT PWM controller Q802 as well. Only Q424 had failed on this occasion. **I.F.**

IBM 6322-002

If the monitor is dead with the power supply ticking, check CR205 (BY229-600) which could well be short-circuit. **P.B.**

Help Wanted

Wanted: Orega LOPT type DST88N243/478052.00 for the Toshiba 219T9B, or whole scrap set considered. Also teletext panel, working or not, for any Beko TV. Call Julian Salt on 01476 861 107.

Wanted: Information on the Panasonic car radio type G1/VZ505 fitted in a Daihatsu 4-track. Does anyone know how to increase its 77-89MHz FM band? Chris Plaice, 58 Lan Coed, Winch Wen, Swansea SA1 7LL. 01792 310 575.

Wanted: SN76730N IC for the Panasonic Model TC2031. H. Mode, 24 Steven Court, Egerton Road South, Manchester M21 0XH. 0161 862 9628.

Wanted: Circuit diagrams for the Cathay two-band stereo twin cassette Model SRC728Q and the Philips stereo amplifier type 70FA141/05. Loan or purchase. John Anderton, 24 Trafford Street. Preston, Lancs PR1 7XY.

Wanted: User manual for the Sinclair digital multimeter Model PDM35 and any information on calibrating it. P.M. Rae, 158 Blackberry Lane, Sutton Coldfield, West Midlands B74 4JJ.

Wanted: Good working VHF/UHF plug-in tuner for the Grundig CUC120 chassis series S820. Ron White, 29 Nunnery Street, Castle Hedingham, Essex CO9 3ND.

Wanted: Video heads for an Amstrad VMC8 camcorder or complete unit for spares. Exchange for Sony CCD-TR8E camcorder with DC fault, including service manual, battery and charger. Peter Mann, 22 Cresswell Drive, Cottesmore, Oakham, Rutland LE15 7DY. 0171 835 1063 evening/01572 812 354 weekend.

Wanted: Circuit diagram (photocopy OK) for the Compaq 470 monitor. J. Dove, 9 Bernard Street, Ely, Cambs. 01353 662 298.

Wanted: Service manual or circuit diagram for the Telequipment S22 AC/DC portable scope. Exploded deck diagram or full service manual (must have part numbers) for the Akai VX150 VCR. Can copy and return the above. Also a LOPT (TLF70034) for the Alba Model CTV16. Contact Marcus or Matt at Marcus Jones Servicing, tel. 01978 312 784 or e-mail marcus_jones@lineone.net

Wanted: Working remote control units for the Hitachi VT420E and Panasonic NVL28 VCRs, or name and address of a second-hand RC unit supplier. K. Crossley, 641 Bradford Road, Oakenshaw, Bradford BD12 7EJ. 01274 607 440.

Wanted: Service manual (copy OK) for the Philips VR2020 VCR. LOPT for the Huanyu Model 37C-2. LF0115 Ipsalo hybrid chip for the Salora 28M9C. C.A. Jackson, Thornbury, Sutton-on-Forest, York YO61 1EQ. 01347 810 354.

Wanted: VideoPlus+ video programmer made by Gemstar Ltd. Must be able to program Videoway and Jerrold cable boxes and the Panasonic NVHS950B VCR. Clive Dexter, 13 Woodberry Avenue, North Harrow, Middx HA2 6AU. 0181 248 8606.

Answer to Test Case 439

– see page 603 –

Once the mode switch had been replaced and the presence of drive voltage at the loading motor had been confirmed, the cause of the intermittent deck fault with the Mitsubishi HSM37 VCR just had to be mechanical. And so it was.

Mitsubishi originally used a nasty black type of grease on these decks. It stains your hands and cloths, and after a few years it sets very hard. In fact with the passage of time it becomes a binder rather than a lubicant. This was the cause of the trouble: the bearing and shaft of the loading-arm gear (C-065 in the deck-2 parts diagram) were very tight, especially at the end of their travel. The same applied to loading-arm pinions C-060 and C-061. Cam plates C-064 and C-067 were also laden with hardened grease, and there was a lot more of the stuff in and around the loading-guide slots.

TechnoCrat dismantled the mechanism as necessary, thoroughly cleaned the parts, then anointed them with something supplied or approved by Mitsubishi – a clean, buttery-yellow lubricant. After that the mechanism ran very freely and sweetly.

Since this experience we've made a point of checking on the lubrication with these decks. Some of them have been near to seizure.

NEXT MONTH IN TELEVISION

A VCR Soak Tester

A VCR should of course be thoroughly checked before it's returned to the customer. But this takes time, and you can't keep going through the functions. Inevitably some machines will bounce. What can be done to avoid this? Ian Rees decided that the solution was automatic active soak testing. This can be arranged by using an a remote control handset which is cycled through the appropriate commands. Full details of the circuitry involved and the method of use.

Tesco's Tellys

Hopefully you can make more from a repair than Tesco made selling them! Chris Watton describes the circuitry commonly used in these sets and the faults you are likely to encounter.

Cable & Satellite Mediacast '99

George Cole reports on this year's cable and satellite exhibition, at which much new technology was in evidence.

RSL Reception

Reception from an RSL TV transmitter can be rather more of a problem than normal TV reception, as Keith Cummins discovered.

Wallplate Problems

TV wallplate outlets with poor RF characteristics are a common cause of reception difficulties. Bill Wright describes the problem and what can be done about it.

Published on the third Wednesday of each month by Reed Business Information Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. **Filmsetting** by JJ Typographics Limited, Unit 4, Baron Court, Chandlers Way, Temple Farm Industrial Estate, Southend-on-Sea, Essex SS2 5SE. **Printed** in England by Polestar (Colchester) Ltd., Newcomen Way, Severalls Industrial Park, Colchester, Essex CO4 4TG. **Distributed** by MarketForce (UK) Ltd., 247 Tottenham Court Road, London W1P 0AU (0171 261 7704). **Sole Agents** for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.; South Africa, Central News Agency Ltd.

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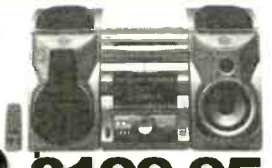

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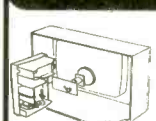

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36943, 36962
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2432871, 2432981, 2432984, 2433751
2433952, 2434002, 2434141, 2434393
2434451, 2434492, 2434494,
2435016, 2435062
2435064, 2435085, 2435121
2435372, 2435701, 2436773
2436792, 2436795, 2436797, 3216001
243066, 243063
3220029, 3714016, 47003481
AT2076/78, AT2076/88, AT2078/25
AT2077/81
DST81N243/472593-00
DST85B235/47328700 & /40153200
DST88N234/4000086AD, &/47805200I.
DST88N234/47320041, &/47317590
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TLF1457B, TLF7016

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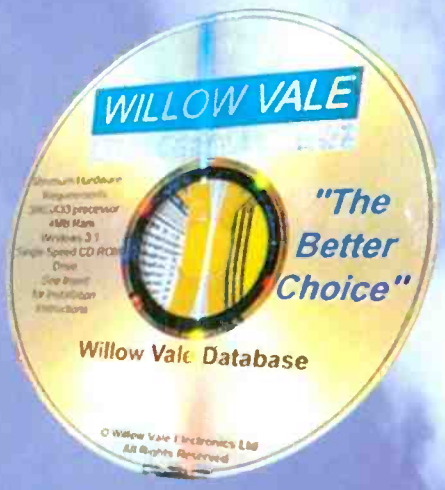

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